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

TSGRP#6(99)638

Title: **Agreed CRs of category "C" (Modification) and "F" (Correction) to TS 25.321**

Source: **TSG-RAN WG2**

Agenda item: **5.2.3**

Doc #	Status-	Spec	CR	Rev	Subject	Cat	Versio	Versio
R2-99k53	agreed	25.321	022	3	Modified MAC header field sizes	C	3.1.0	3.2.0
R2-99f01	agreed	25.321	023		MAC: Multiple shared channels	C	3.1.0	3.2.0
R2-99f02	agreed	25.321	024		Parameters for Status Primitive	C	3.1.0	3.2.0
R2-99k20	agreed	25.321	025	1	Support of shared channel operation	C	3.1.0	3.2.0
R2-99h97	agreed	25.321	028		Modification of Cell Broadcast	C	3.1.0	3.2.0
R2-99k87	agreed	25.321	031	1	Simultaneous mapping of logical	C	3.1.0	3.2.0

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

***Document* (R2-99k53)**
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25.321	CR	022r3	Current Version:	3.1.0

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

For submission to:	TSG-RAN #6	for approval	X	strategic		(for SMG use only)
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Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*

(U)SIM		ME	X	UTRAN / Radio	X	Core Network	

Source: TSG-RAN WG2 **Date:** 1999-12-03

Subject: Modified MAC header field sizes

Work item:

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

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature	X		Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change:
Modified sizes of the TCTF and C/T fields are proposed.
A fixed size of the C/T field is introduced in order to limit the number of possible TB sizes, thereby saving bits in RRC messages.
The UE id type has until now been described as a sub-field of the UE id field. However, the sizes specified for UE id are appropriate for UE id excluding the UE id type sub-field. For the purpose of clarification it is proposed to separate the UE id type field and the UE id fields.
The MAC PDU format for DSCH has been left for further study in S25.321.It is proposed to have the UE identity included in the MAC header. This is a protection against bad decoding of the DSCH channelization code (TFI) in the TFCI. By decoding the UE Id, the UE can confirm that the message is addressed to it, and that it has correctly decoded the DSCH TFI. The C/T field is included if multiplexing on MAC is applied.

Clauses affected: 9.1.1, 9.2.1

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	TS 25.331 CR004
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

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9 Elements for peer-to-peer communication

9.1 Protocol data units

9.1.1 MAC Data PDU

MAC PDU consists of an optional MAC header and a MAC Service Data Unit (MAC SDU), see figure 9.1.1.1. Both the MAC header and the MAC SDU are of variable size.

The content and the size of the MAC header depends on the type of the logical channel, and in some cases none of the parameters in the MAC header are needed.

The size of the MAC-SDU depends on the size of the RLC-PDU, which is defined during the setup procedure.

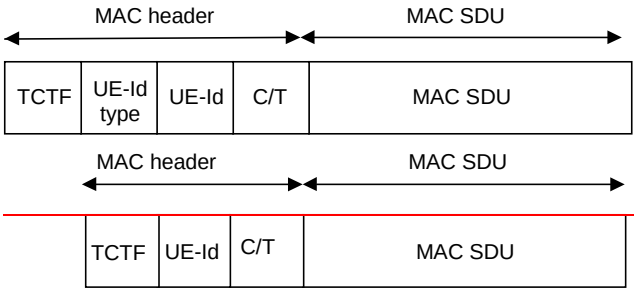

Figure 9.1.1.1 MAC data PDU

9.1.2 MAC Control PDU

9.2 Formats and parameters

NOTE: MAC header field encodings as specified in this section with designation "Reserved" are forbidden to be used by a sender in this version of the protocol.

9.2.1 MAC Data PDU: Parameters of the MAC header

The following fields are defined for the MAC header:

- Target Channel Type Field
  The TCTF field is a flag that provides identification of the logical channel class on FACH and RACH transport channels, i.e. whether it carries BCCH, CCCH, CTCH, SHCCH or dedicated logical channel information. The size and coding of TCTF for FDD and TDD are shown in figures 9.2.1.1, 9.2.1.2 and 9.2.1.3. Note that the size of the TCTF field of FACH for FDD is either 2 or 8 bits depending of the value of the 2 most significant bits.

TCTF	Designation
000	BCCH
001	CCCH
010	CTCH
011	DCCH or DTCH over FACH
100	~~TDD~~: SHCCH ~~FDD: For future use~~
101-111	Reserved (PDUs with this coding will be discarded by this version of the protocol)~~For future use~~

Table 9.2.1.1: Coding of the Target Channel Type Field on FACH for TDD

TCTF	Designation
00	BCCH
01000000	CCCH
01000001-01111111	Reserved (PDUs with this coding will be discarded by this version of the protocol)~~For future use~~
10000000	CTCH
10000001-10111111	Reserved (PDUs with this coding will be discarded by this version of the protocol)
11	DCCH or DTCH over FACH

Table 9.2.1.2: Coding of the Target Channel Type Field on FACH for FDD

TCTF	Designation
00	CCCH
01	DCCH or DTCH over RACH
10	TDD: SHCCH FDD: Reserved (PDUs with this coding will be discarded by this version of the protocol)~~For future use~~
11	Reserved (PDUs with this coding will be discarded by this version of the protocol)~~For future use~~

Table 9.2.1.3~~2~~: Coding of the Target Channel Type Field on RACH

- C/T field
  The C/T field provides identification of the logical channel instance when multiple logical channels are carried on the same transport channel. The C/T field is used also to provide identification of the logical channel type on dedicated transport channels and on FACH and RACH when used for user data transmission. The size of the C/T field ~~may be variable.~~is fixed to 4 bits for both common transport channels and ~~8 bits for~~ dedicated transport channels. Figure 9.2.1.4 shows the 4 bit C/T field ~~for common transport channels. Figure 9.2.1.5 shows the 8 bit C/T field for dedicated transport channels~~.

C/T field ~~(e.g. 4 bits)~~	Designation
0000	Logical channel 1
0001	Logical channel 2
...	...
1110	Logical channel 15
1111	Reserved (PDUs with this coding will be discarded by this version of the protocol)~~For future use~~~~Logical channel 16~~

Table 9.2.1.2~~4~~: Structure of the C/T field ~~for common transport channels~~.

C/T field	Designation
00000000	Logical channel 1
00000001	Logical channel 2
…	…
00001110	Logical channel 15
00001111 - 11111111	For future use

Table 9.2.1.5: Structure of the C/T field for dedicated transport channels

- UE-Id
  The UE-Id field provides an identifier of the UE on common transport channels. The following types of UE-Id used on MAC are defined:

  UTRAN Radio Network Temporary Identity (U-RNTI) may be used in the MAC header of DCCH when mapped onto common transport channels.
  Cell Radio Network Temporary Identity (C-RNTI) is used on DTCH, DSCH in FDD mode, and may be used on DCCH, when mapped onto common transport channels.
  The UE id to be used by MAC is configured through the MAC control SAP. The lengths of the UE-id field of the MAC header are given in Table 9.2.1.365.

UE Id type	Length of UE Id field
U-RNTI	32 bits
C-RNTI	16 bits

Table 9.2.1.365: Lengths of UE Id field

- UE-Id Type
  The UE-Id Type sub-field inside the UE-Id field is needed to ensure the correct decoding of the UE-Id field in MAC Headers.

  The UE-Id Type sub-field definition:

UE-Id Type sub-field 2 bits	UE-Id Type
00	U-RNTI
01	C-RNTI
10	Reserved (PDUs with this coding will be discarded by this version of the protocol)For future use
11	Reserved (PDUs with this coding will be discarded by this version of the protocol)For future use

Table 9.2.1.764: UE-Id Type sub-field definition

9.2.1.1 MAC header for DTCH and DCCH

a) DTCH or DCCH mapped to DCH, no multiplexing of dedicated channels on MAC:
No MAC header is required.

b) DTCH or DCCH mapped to DCH, with multiplexing of dedicated channels on MAC:
C/T field is included in MAC header.

c) DTCH or DCCH mapped to RACH/FACH:
TCTF field~~-~~, C/T field, UE-Id type field and UE-Id are included in the MAC header. ~~C/T field is included if multiplexing on MAC is applied.~~

d) DTCH or DCCH mapped to DSCH:
The UE-Id type and UE-Id are included in the MAC header for FDD only. The C/T field is included if multiplexing on MAC is applied. ~~The MAC-PDU format for DSCH is left for further study.~~

e) DTCH or DCCH mapped to USCH:
The MAC-PDU format for USCH is left for further study.

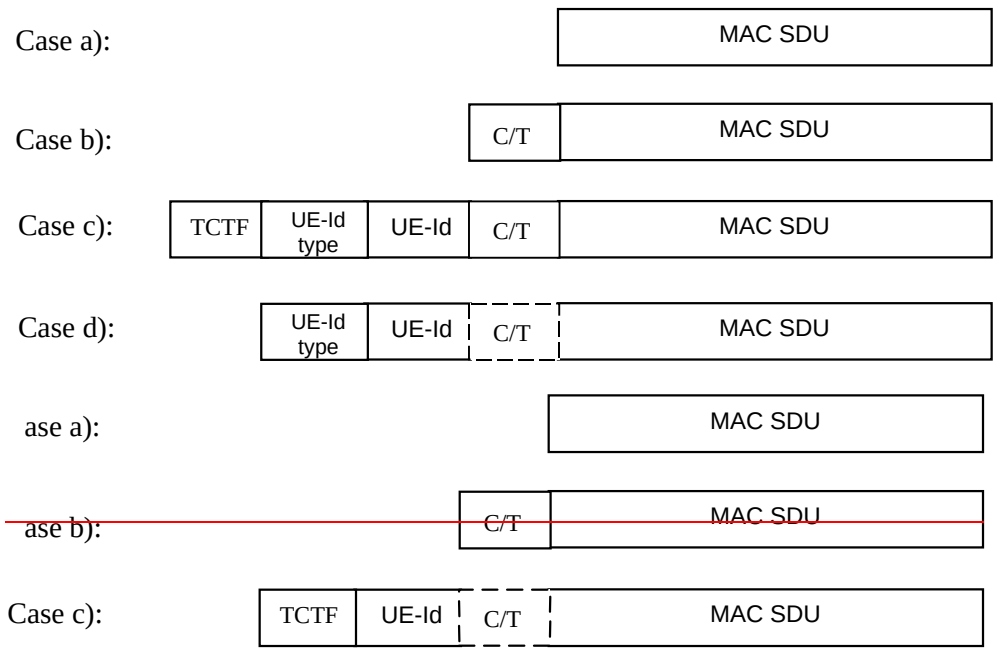

Figure 9.2.1.1.1: MAC Data PDU formats for DTCH and DCCH

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Nice, France, 13-15 December 1999

***Document* (R2-99f01)**
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25.321	CR	023	Current Version:	3.1.0

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

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list expected approval meeting # here ↑		for information		non-strategic		

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

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

Source:	TSG-RAN WG2	**Date:**	20/11/1999		
Subject:	MAC: Multiple shared channels (DSCH/USCH)				
Work item:					

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

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature	X		Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change:

Several shared channels (both USCH and DSCH) may exist according to 25.302v3.1.0.
According changes are performed for consistency reasons.
In order to do not introduce limitations in the usage of shared channels transport format combination selection is performed by MAC.

Clauses affected: 4.2.1, 4.2.3, 4.2.4, 6.1, 6.2.1, 6.2.2

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

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4.2.1 MAC Entities

The diagrams that describe the MAC architecture are constructed from MAC entities. The entities are assigned the following names. The functions completed by the entities are different in the UE from those completed in the UTRAN:

- MAC-b, which identifies the MAC entity that handles the broadcast channel (BCH). There is one MAC-b entity in each UE and one MAC-b in the UTRAN for each cell.

  Note: The separation in two different BCCH is ffs, the control SAP may be split accordingly

- MAC-c, which identifies the MAC entity that handles the paging channel (PCH), the forward access channel (FACH), the random access channel (RACH) and the Common Packet Channel (UL CPCH) for FDD. There is one MAC-c entity in each UE and one in the UTRAN for each cell.

- MAC-d, denotes the MAC entity that is responsible for handling of dedicated logical channels and dedicated transport channels (DCH) allocated to a UE. There is one MAC-d entity in the UE and one MAC-d entity in the UTRAN for each UE. Note: *When a UE is allocated resources for exclusive use by the bearers that it supports the MAC-d entities dynamically share the resources between the bearers and are responsible for selecting the TFI/ TFCI that is to be used in each transmission time interval.*

- MAC-sh, denotes the MAC entity that handles downlink shared channels (DSCH) for both FDD and TDD and uplink shared channels (USCH) for TDD . There is one MAC-sh entity in each UE that is using ~~a~~ one or more DSCHs and ~~a~~ one or moreUSCHs for TDD operation and one MAC-sh entity in the UTRAN for each cell that contains ~~a~~ one or more DSCHs and ~~a~~ one or more USCHs for TDD operation.

- MAC-sy, identifies the MAC entity used in TDD operation to handle the information received on the synchronisation channel SCH

According to the RRC functions the RRC is generally in control of the internal configuration of the MAC.

4.2.3 Traffic Related Architecture - UE Side

Figure 4.2.3.1 illustrates the connectivity of MAC entities. The figure shows a MAC-d servicing the needs of several DTCH mapping them to a number of DCH. A MAC-sh controls access to a common transport channel. It is noted that because the MAC-sh provides additional capacity then it communicates only with the MAC-d rather than the DTCH directly. The MAC-c, which interfaces with the PCH, FACH and RACH common transport channels, is connected with the MAC-d for transfer of data and RNTI. The MAC Control SAP is used to transfer Control information to each MAC entity. The MAC-sh transfers data from the DSCHs to the MAC-d and from the MAC-d to the USCHs (TDD only) under control of the RRC. In the FDD implementation, the MAC-c may transfer data from the MAC-d to the CPCH.

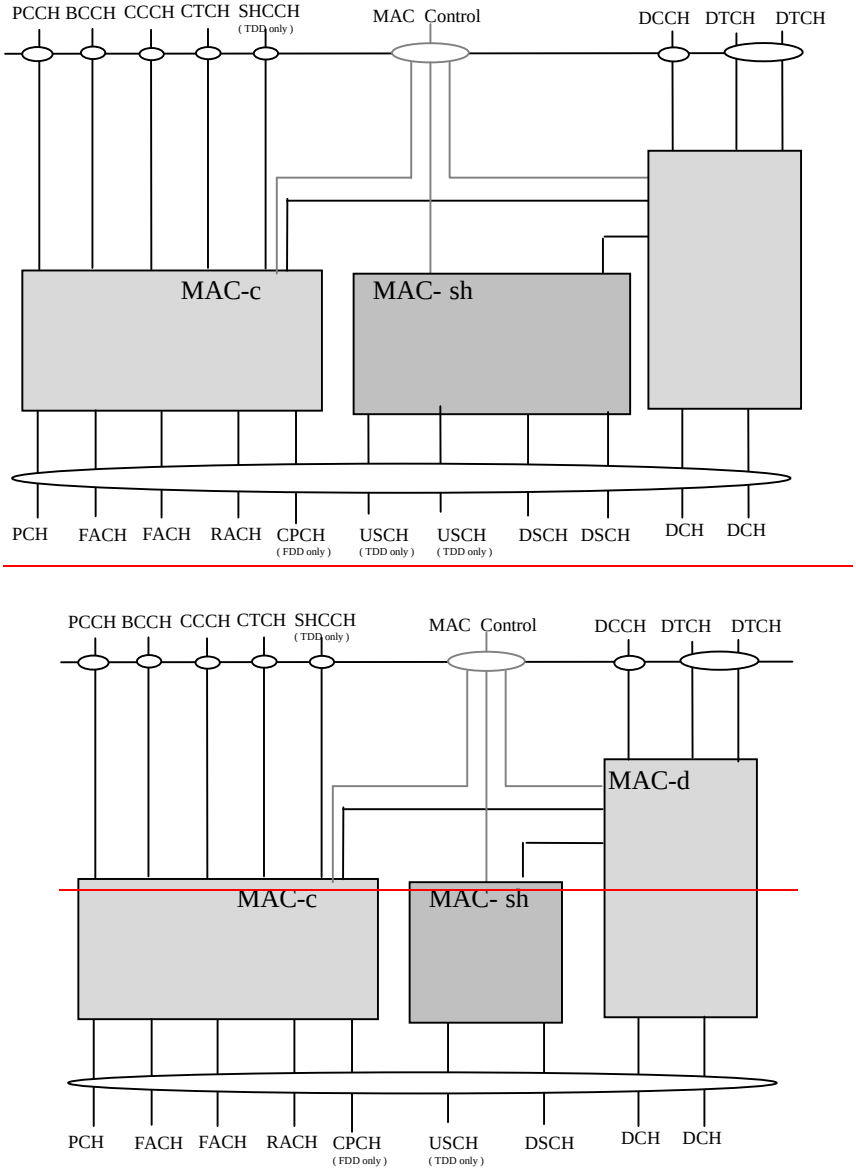
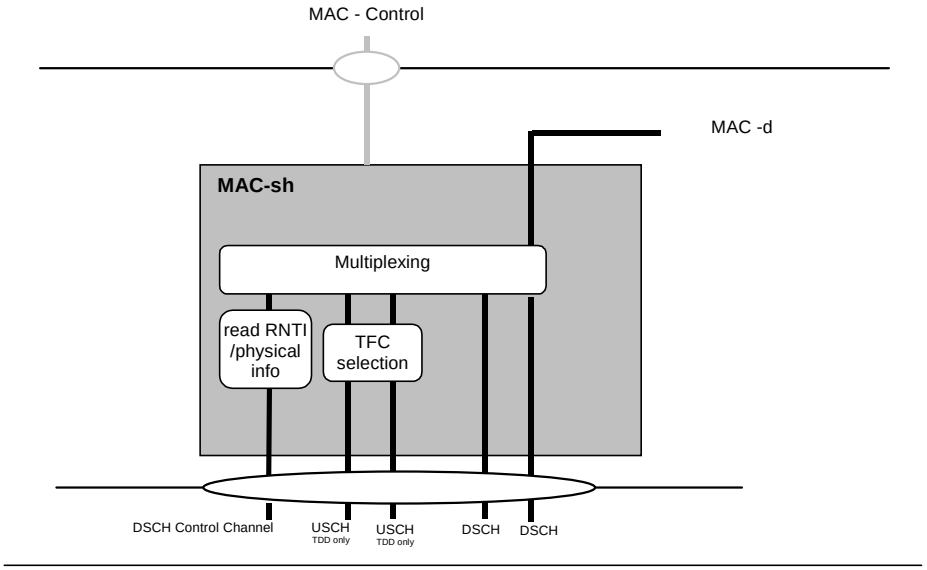


Figure 4.2.3.1 UE side MAC architecture

Figure 4.2.3.4 shows the UE side MAC-sh entity. The following functionality is covered:

- RNTI is used on the DSCH Control Channel to identify the UE. Additionally, some timing / physical information is needed to tell the UE when to listen to DSCH.
- Multiplexing is used to transmit the received information on DSCH and DSCH Control Channels to the Mac-d, for TDD the multiplexing is used to transfer data from MAC-d to USCHs.
- Transport format combination selection (out of the RRC assigned transport format combination set) is performed to prioritise transport channels.

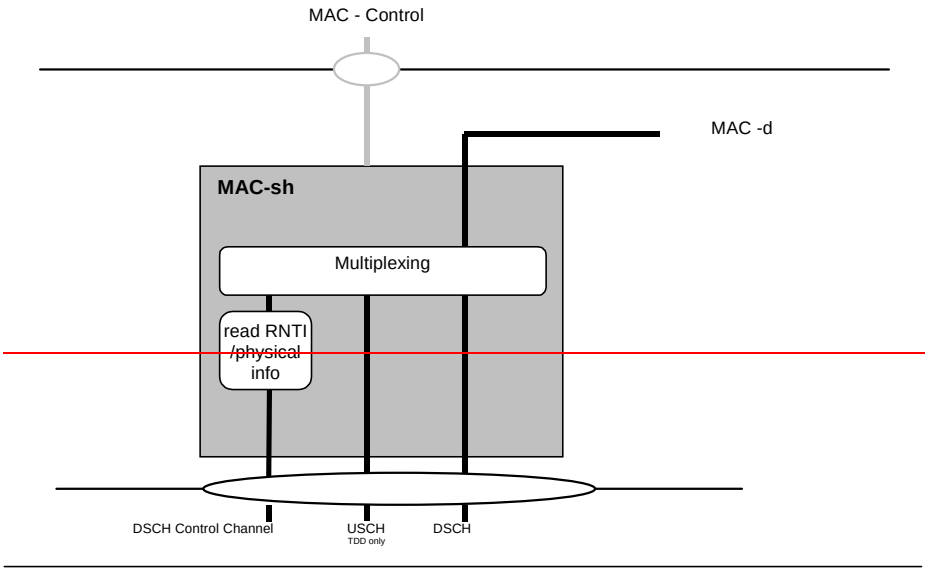
The RLC has to provide RLC-PDU's to the MAC which fits into the available transport blocks on the transport channels respectively.



Data flow
External Control information

NOTE(1): The DSCH Control Channel may be represented by the FACH, details are for further study
NOTE(2): The multiplexing function has to be reviewed, also the connection to read RNTI / physical info box

DL Downlink
TF Transport Format
TFC Transport Format Combination
RNTI Radio Network Temporary Identity
UE User Equipment
UL Uplink



Data flow
External Control information

NOTE(1): The DSCH Control Channel may be represented by the FACH, details are for further study
NOTE(2): The multiplexing function has to be reviewed, also the connection to read RNTI / physical info box

DL Downlink
TF Transport Format
TFC Transport Format Combination
RNTI Radio Network Temporary Identity
UE User Equipment
UL Uplink

Figure 4.2.3.4. UE side MAC architecture / MAC-sh details

4.2.4 Traffic Related Architecture - UTRAN Side

Figure 4.2.4.1 illustrates the connectivity between the MAC entities from the UTRAN side. It is similar to the UE case with the exception that there will be one MAC-d for each UE and each UE (MAC-d) that is associated with a particular cell may be associated with that cells MAC-sh. MAC-c receives the CPCH transport blocks. MAC-c and Mac-sh are located in the controlling RNC while MAC-d is located in the serving RNC. The MAC Control SAP is used to transfer Control information to each MAC entity belongs to one UE.

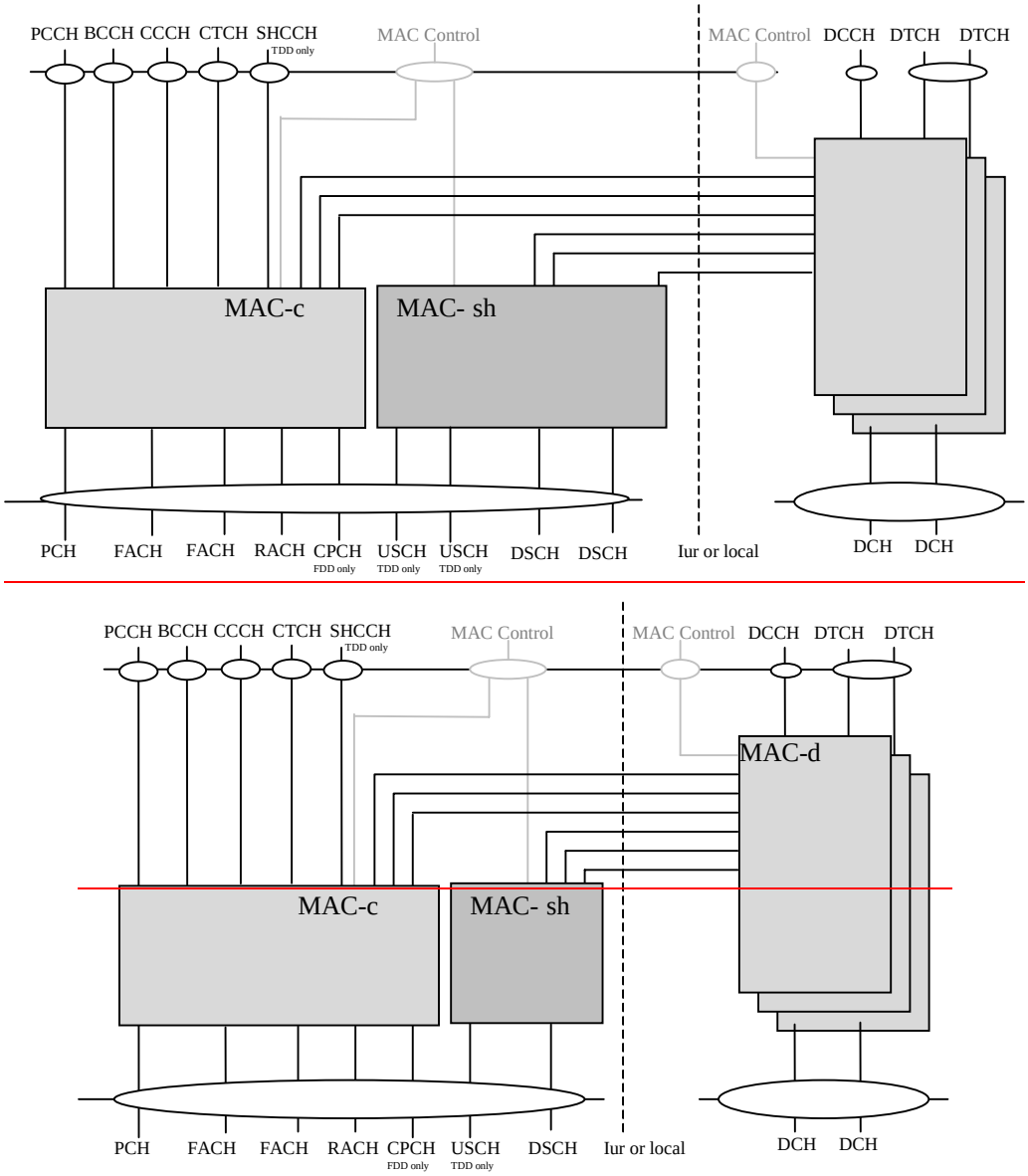
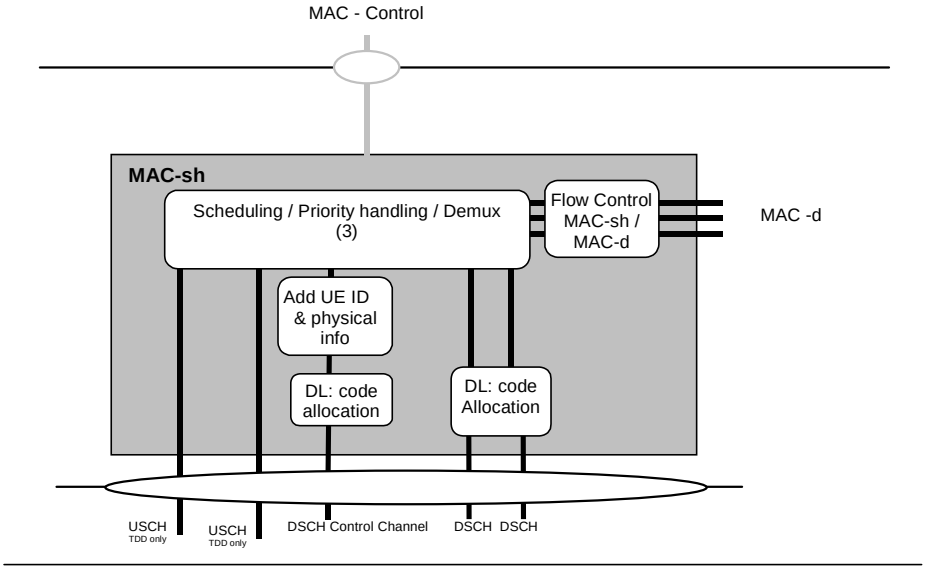


Figure 4.2.4.1: UTRAN side MAC architecture

Figure 4.2.4.4 shows the UTRAN side MAC-sh entity. The following functionality is covered:

- A specific UE ID is needed when using the DSCH Control Channel to identify the UE on the DSCH. This specific UE ID may be optimised for DSCH and will be allocated when a RAB is mapped onto a DSCH. Additionally, some timing information is needed to tell the UE when to listen to DSCH.
- The scheduling /priority handling box in MAC-sh shares the DSCH resources between the UEs and between data flows according to their priority.
- For TDD operation the demultiplex function is used to separate USCH data from different UEs, i.e. to be transferred to different MAC-d entities.
- DL code allocation is used to indicate the code used on the DSCHs and selects the appropriate Transport format combination on the DSCHs.
- Flow control is provided to MAC-d.

The RLC has to provide RLC-PDU's to the MAC which fits into the available transport blocks on the transport channels respectively.



NOTE(1): The DSCH Control Channel may be represented by the FACH, details are for further study, If supported by the FACH the data will be transferred to MAC-c via priority/flow boxes.
NOTE(2): The relation between the scheduling and the adding of RNTI & physical info has to be reviewed
NOTE(3): The Demux functionality is used in TDD
NOTE(4): For the USCH(TDD only) the control channel is represented by the FACH.

DL	Downlink
TF	Transport Format
TFC	Transport Format Combination
RNTI	Radio Network Temporary Identity
UE	User Equipment
UL	Uplink

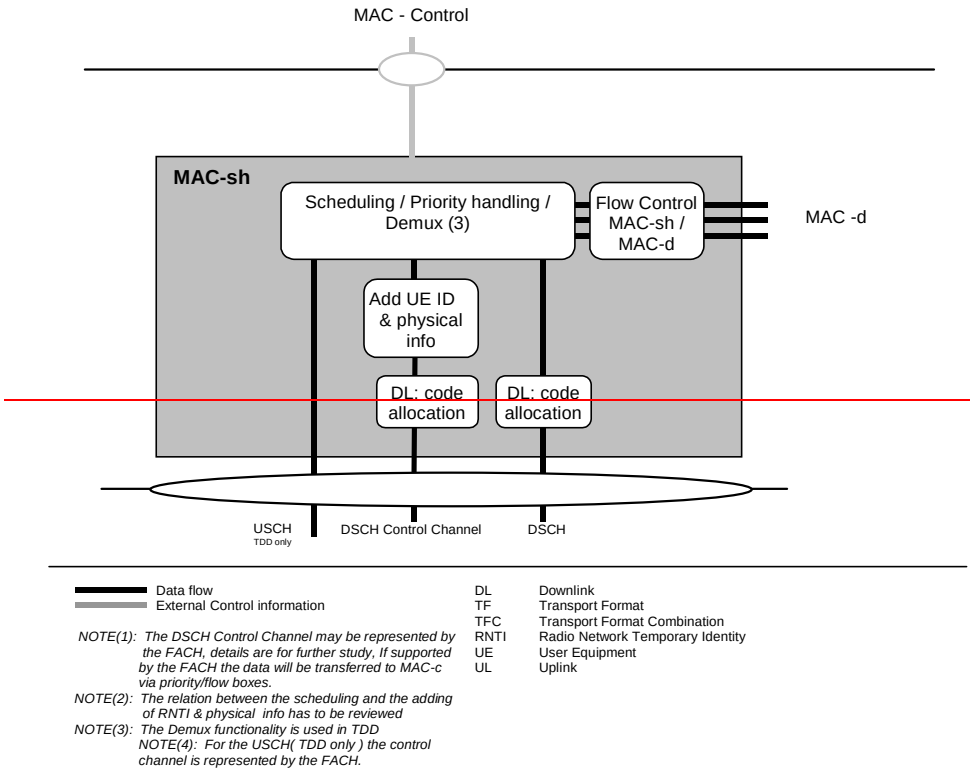


Figure 4.2.4.4 UTRAN side MAC architecture / MAC-sh details

6 Functions

6.1 Description of the MAC functions

The functions of MAC include:

- Mapping between logical channels and transport channels.
- Selection of appropriate Transport Format for each Transport Channel depending on instantaneous source rate
- Priority handling between data flows of one UE
- Priority handling between UEs by means of dynamic scheduling
- Priority handling between data flows of several users on the ~~the~~ DSCH and FACH
- Identification of UEs on common transport channels
- Multiplexing/demultiplexing of higher layer PDUs into/from transport blocks delivered to/from the physical layer on common transport channels
- Multiplexing/demultiplexing of higher layer PDUs into/from transport block sets delivered to/from the physical layer on dedicated transport channels
- Traffic volume monitoring
- ~~Monitoring the links of the assigned resources~~
- ~~Routing of higher layer signalling~~
- ~~Maintenance of a MAC signalling connection between peer MAC entities~~
- Dynamic Transport Channel type switching
- Ciphering for transparent RLC
- Access Service Class selection for RACH transmission

The following potential functions is regarded as further study items:

- ~~Processing of messages received at common control channels~~
- Successive Transmission on RACH

6.2 Relation between MAC Functions / Transport Channels and UE

6.2.1 Relation between MAC Functions and Transport Channels

Associated MAC Functions	Logical Ch	Transport Ch	TF Selection	Priority handling between users	Priority handling (one user)	Scheduling	Identification of UEs	Mux/Demux on common transport CH	Mux/ Demux on dedicated transport CH	Dynamic transport CH switching
Uplink (Rx)	CCCH	RACH						X		
	DCCH	RACH					X	X		
	DCCH	CPCH					X	X		X
	DCCH	DCH							X	
	DTCH	RACH					X	X		
	DTCH	CPCH					X	X		X
	DTCH	DCH							X	
	SHCCH	RACH					X	X		
	DTCH	USCH	X					X		X
	DCCH	USCH	X					X		X
Downlink (Tx)	SCCH	SCH								
	BCCH	BCH				X				
	BCCH	FACH	X			X		X		

PCCH	PCH				X				
CCCH	FACH		X				X		
DCCH	FACH		X			X	X		
DCCH	DSCH		X				X		
DCCH	DCH	X		X				X	
DTCH	FACH	X(note1)	X			X	X		X
DTCH	DSCH	X(note2)	X				X		X
DTCH	DCH	X		X				X	X
SHCCH	FACH		X				X		

Table 1 UTRAN MAC functions corresponding to the transport channel (note3)

(Note1) On FACH channel, the transport format set is limited.
(Note2) Whether DSCH has the transport format set is under discussion.
(Note3) The functions not included in the table are listed below.

- Mapping between logical channels and transport channels.
- Traffic volume monitoring
- Constrained execution of open loop power control algorithms

Note (this table has to be reviewed)

6.2.2 Relation of UE MAC functions corresponding to the Transport Channel MAC Functions and Transport Channels

Functions	Logical Ch	Transport Ch	TF Selection	Priority handling data of one user	Identification	Mux/Demux on common transport channels	Mux/Demux on dedicated transport channels	Dynamic transport channel type switching
Uplink (Tx)	CCCH	RACH				X		
	DCCH	RACH	X(note1)		X	X		
	DCCH	CPCH	X	X	X	X		X
	DCCH	DCH	X	X			X	
	DTCH	RACH	X(note1)		X	X		X
	DTCH	CPCH	X	X	X	X		X
	DTCH	DCH	X	X			X	X
	SHCCH	RACH				X		
	DCCH	USCH	X	X		X		X
	DTCH	USCH	X	X		X		X
Downlink (Rx)	SCCH	SCH						
	BCCH	BCH						
	BCCH	FACH				X		
	PCCH	PCH						
	CCCH	FACH				X		
	DCCH	FACH			X	X		
	DCCH	DSCH				X		
	DCCH	DCH					X	
	DTCH	FACH			X	X		
	DTCH	DSCH				X		
	DTCH	DCH					X	
	SHCCH	FACH				X		

Table 2 UE MAC functions corresponding to the transport channel

(Note1) The RACH channel has the limited transport format set.

Note: This table has to be reviewed

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25.321	CR	024	Current Version:	3.1.0

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

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

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

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

Source: TSG-RAN WG2 **Date:** 28/11/1999

Subject: Parameters for Status Primitive

Work item:

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

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature	X		Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: MAC controls the flow between RLC and MAC. Means to show this are proposed for the MAC model.

Clauses affected: 8.1.1, 8.1.2

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

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8.1 Primitives between MAC and RLC

8.1.1 Primitives

The primitives between MAC layer and RLC layer are shown in Table 8.2.1.

Generic Name	Type				Parameters
	Request	Indication	Response	Confirm	
MAC-DATA	X	X			Data, Number of transmitted RLC PDUs, BO, TD[1)]
MAC-STATUS		X	X		~~[FFS]~~No_PDU, PDU_Size

1) TDD only

Table 8.2.1 Primitives between MAC layer and RLC layer

MAC-DATA-Req/Ind

- MAC-DATA-Req primitive is used to request that an upper layer PDU be sent using the procedures for the information transfer service.
- MAC-DATA-Ind primitive indicates the arrival of upper layer PDUs received within one transmission time interval by means of the information transfer service.

MAC-STATUS-Ind/Resp

- MAC-STATUS-Ind primitive indicates to RLC ~~about changes in~~ the ~~rules under~~ rate at which it may transfer data to MAC. ~~Parameters of the primitive can indicate a transmission timer value, whether the RLC can transfer data and whether that data is restricted to supervisory frames only.~~ Parameters are the number of PDU that can be transferred in each transmission time interval and the PDU size.
- MAC-STATUS-Resp enables RLC to acknowledge a MAC-STATUS-Ind. It is possible that RLC would use this primitive to indicate that it has nothing to send or that it is in a suspended state.

8.1.2 Parameters

a) Data

It contains the RLC layer message (RLC-PDU) to be transmitted, or the RLC layer messages that have been received by the MAC sub-layer.

b) Number of transmitted RLC PDUs (indication only)

Indicates the number of RLC PDUs transmitted within the transmission time interval, based on the TFI value.

c) Buffer Occupancy (BO)

The parameter Buffer Occupancy (BO) indicates the amount of data that is currently queued for transmission (or retransmission) in RLC layer

d) RX Timing Deviation (TD), TDD only

It contains the RX Timing Deviation as measured by the physical layer for the physical resources carrying the data of the Message Unit. This parameter is optional and only for Indication. It is needed for the transfer of the RX Timing Deviation measurement of RACH transmissions carrying CCCH data to RRC.

e) Number of PDU (No_PDU)

Specifies the number of PDUs that the RLC is permitted to transfer to MAC within a transmission time interval.

f) PDU Size (PDU_Size)

Specifies the size of PDU that can be transferred to MAC within a transmission time interval.

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

Document (R2-99k20)
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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

25.321	CR	025r1	Current Version:	3.1.0

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

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

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

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

Source: TSG-RAN WG2 **Date:** 17/11/99

Subject: Support of shared channel operation in TDD

Work item:

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

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature	X		Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: Capacity requests for shared channels can be sent via USCH or RACH, and capacity allocations can be sent via DSCH or FACH. In addition Mac-c and Mac-sh are combined into one functional block Mac-c/sh in order to improve the presentation of the model.

Clauses affected: 4.1, 4.2.1, 4.2.3, 4.2.4, 4.3.3, 6.2.1, 6.2.2, 9.2.1, 9.2.1.1, 11.2.1, 11.2.2

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	25.301CR026, 25.301 CR027, 25.303 CR017
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

help.doc

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

4.1 Objective

Note: FAUSCH is not part of release 99.

4.2.1 MAC Entities

The diagrams that describe the MAC architecture are constructed from MAC entities. The entities are assigned the following names. The functions completed by the entities are different in the UE from those completed in the UTRAN:

- MAC-b, which identifies the MAC entity that handles the broadcast channel (BCH). There is one MAC-b entity in each UE and one MAC-b in the UTRAN for each cell.

  Note: The separation in two different BCCH is ffs, the control SAP may be split accordingly

- MAC-c/sh, which identifies the MAC entity that handles the paging channel (PCH), the forward access channel (FACH), the random access channel (RACH) ~~and ,~~ the Common Packet Channel (UL CPCH) for FDD, downlink shared channels (DSCH) for both FDD and TDD and uplink shared channels (USCH) for TDD. There is one MAC-c/sh entity in each UE and one in the UTRAN for each cell.

- MAC-d, denotes the MAC entity that is responsible for handling of dedicated logical channels and dedicated transport channels (DCH) allocated to a UE. There is one MAC-d entity in the UE and one MAC-d entity in the UTRAN for each UE. Note: *When a UE is allocated resources for exclusive use by the bearers that it supports the MAC-d entities dynamically share the resources between the bearers and are responsible for selecting the TFI/ TFCI that is to be used in each transmission time interval.*

~~- MAC-sh, denotes the MAC entity that handles downlink shared channels (DSCH) for both FDD and TDD and uplink shared channels (USCH) for TDD . There is one MAC-sh entity in each UE that is using a DSCH and a USCH for TDD operation and one MAC-sh entity in the UTRAN for each cell that contains a DSCH and a USCH for TDD operation.~~

- MAC-sy, identifies the MAC entity used in TDD operation to handle the information received on the synchronisation channel SCH

According to the RRC functions the RRC is generally in control of the internal configuration of the MAC.

4.2.3 Traffic Related Architecture - UE Side

Figure 4.2.3.1 illustrates the connectivity of MAC entities. The figure shows a MAC-d servicing the needs of several DTCH mapping them to a number of DCH. A MAC-c/sh controls access to ~~a~~ common transport channels. It is noted that because the MAC-c/sh provides additional capacity then it communicates only with the MAC-d rather than the DTCH directly. The MAC-c/sh, which interfaces with the PCH, FACH, ~~and~~ RACH, CPCH, DSCH and USCH common transport channels, is connected with the MAC-d for transfer of DTCH and DCCH data ~~and RNTI~~. The MAC Control SAP is used to transfer Control information to each MAC entity. The MAC-c/sh transfers data from the DSCH to the MAC-d and from the MAC-d to the USCH (TDD only) under control of the RRC. In the FDD implementation, the MAC-c/sh may transfer data from the MAC-d to the CPCH.

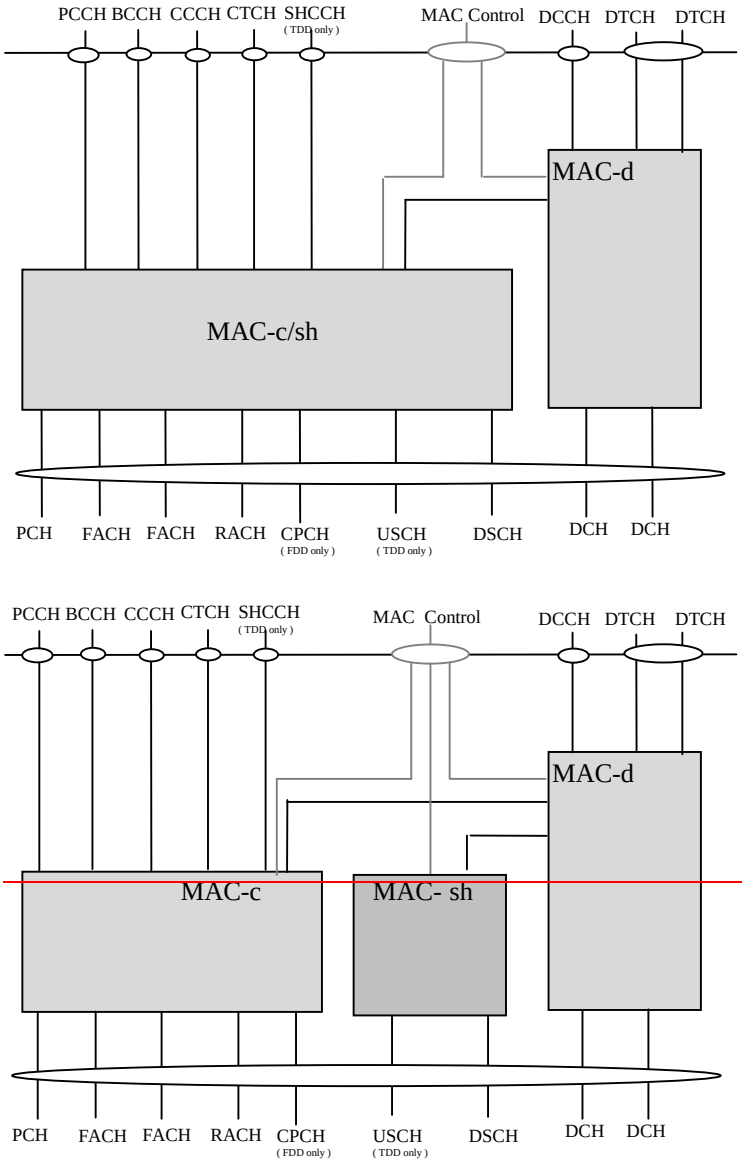


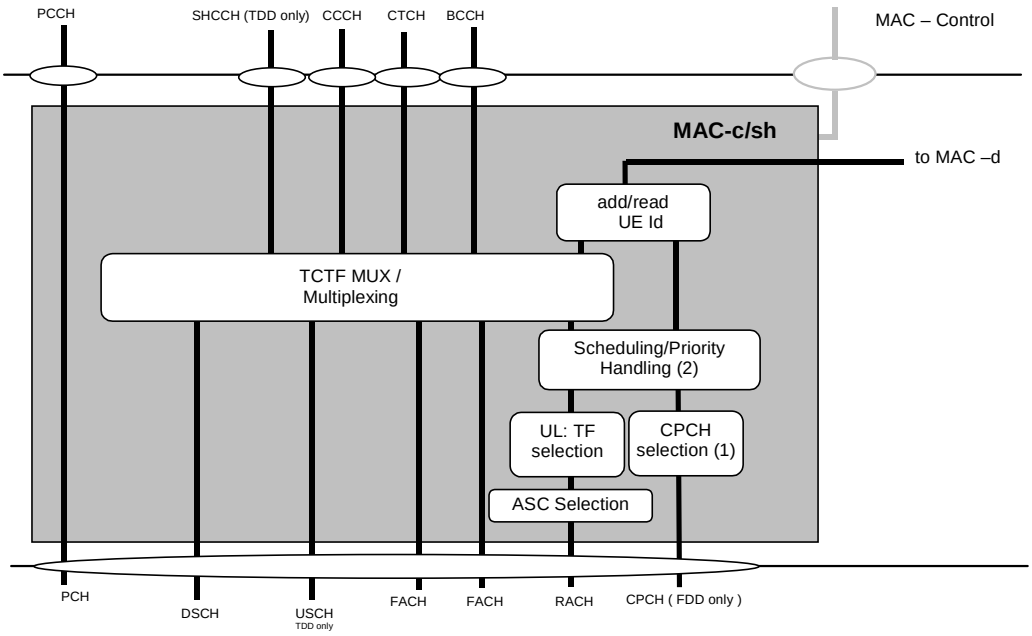
Figure 4.2.3.1 UE side MAC architecture

4.2.3.1 MAC-c/sh entity – UE Side

Figure 4.2.3.2 shows the UE side MAC-c/sh entity. The following functionality is covered:

- The TCTF MUX box represents the handling (insertion or detection and deletion) of the TCTF field in the MAC header, and the respective mapping between logical and transport channels. The TCTF field indicates the common logical channel type, or if a dedicated logical channel is used.
- The UE Id field in the MAC header is used to distinguish between UEs.
- In the uplink, the possibility of transport format selection exists.
- ASC selection: MAC indicates the ASC associated with the PDU to the physical layer (this is to ensure that RACH messages associated with a given Access Service Class (ASC) are sent on the appropriate signature(s) and time slot(s)). MAC also applies the appropriate back-off parameter(s) associated with the given ASC.
- Scheduling /priority handling is used to transmit the information received from MAC-d on RACH and CPCH.
- Channel selection is used to select an appropriately sized and available CPCH for transmission.
- Multiplexing is used to transmit the received information on DSCH to the Mac-d, for TDD the multiplexing is used to transfer data from MAC-d to USCH.

The RLC has to provide RLC-PDU's to the MAC which fit into the available transport blocks on the transport channels respectively.



DL	Downlink	UE	User Equipment
TF	Transport Format	UL	Uplink
TFC	Transport Format Combination		
TCTF	Target Channel Type Field		
(1)	Details are FFS		
(2)	Scheduling /Priority handling is applicable for CPCH, details are ffs.		

NOTE(1): The multiplexing function has to be reviewed,.

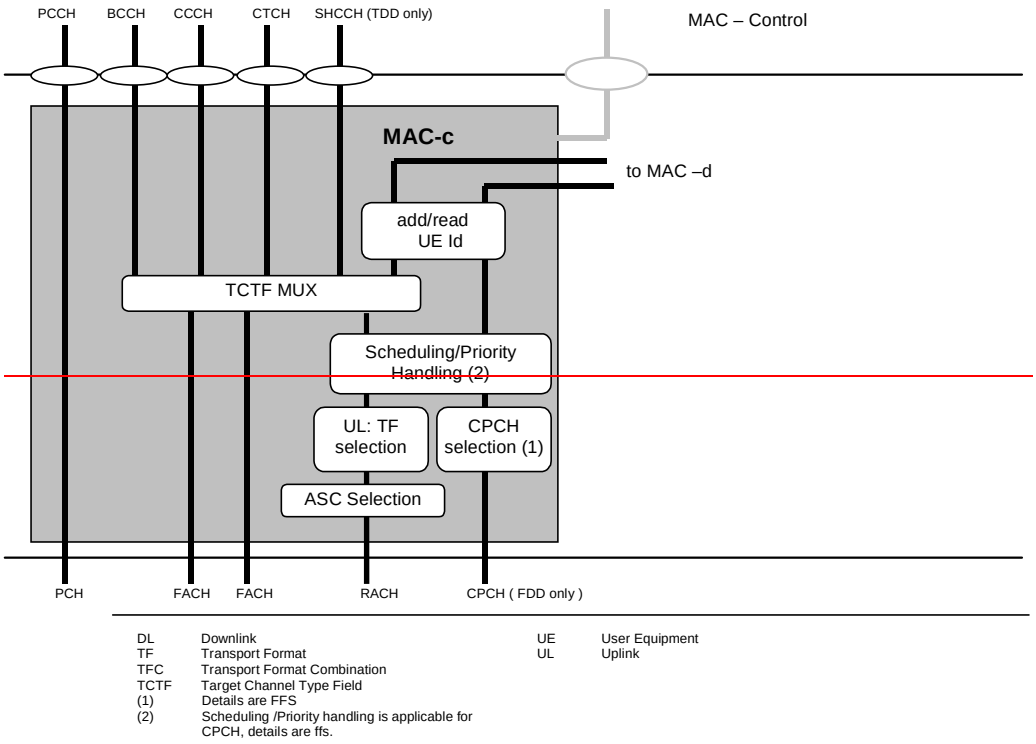
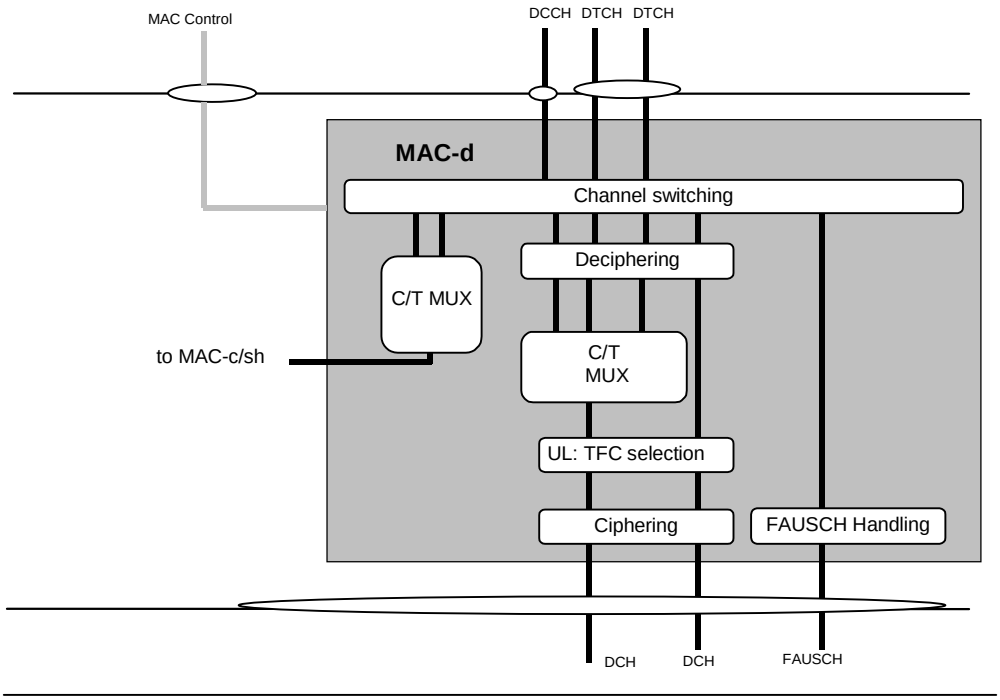


Figure 4.2.3.2. UE side MAC architecture / MAC-c/sh details

4.2.3.2 MAC-d entity – UE Side

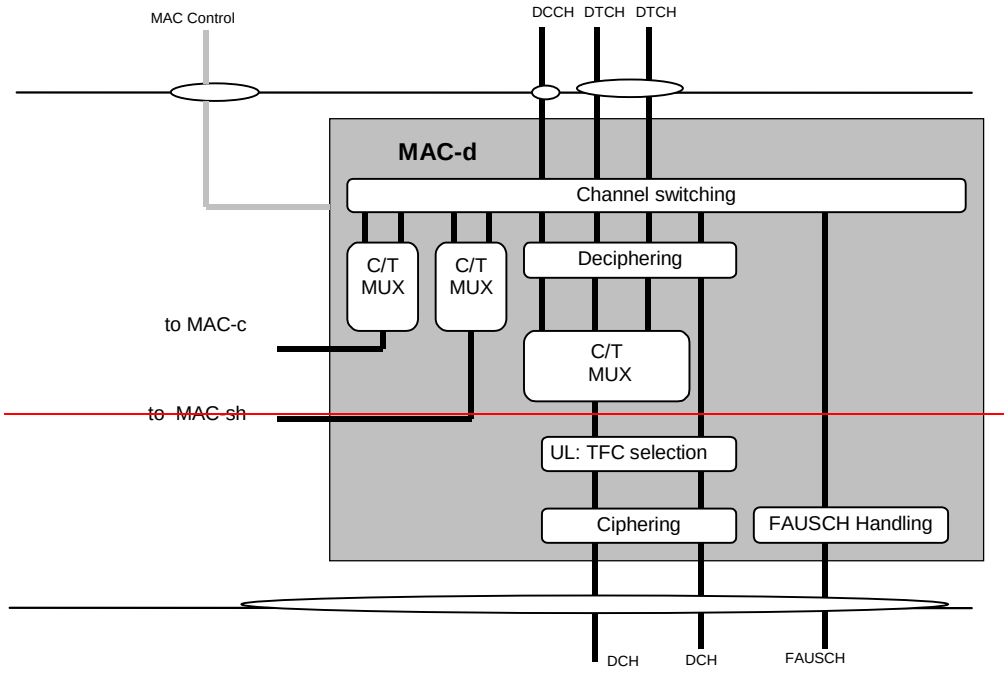
Figure 4.2.3.3 shows the UE side MAC-d entity. The following functionality is covered:

- Dynamic transport channel type switching is performed by this entity, based on decision taken by RRC.
- The C/T MUX box is used when multiplexing of several dedicated logical channels onto one transport channel is used.
- The MAC-d entity using common channels is connected to a MAC-c/sh entity that handles the scheduling of the common channels to which the UE is assigned.
- The MAC-d entity using downlink shared channel is connected to a MAC-c/sh entity that handles the reception of data received on the shared channels to which the UE is assigned.
- In the uplink, transport format combination selection (out of the RRC assigned transport format combination set) is performed to prioritise transport channels.
- FAUSCH Handling indicates the function in the MAC-d supports the FAUSCH, details are ffs
- Support of Ciphering / Deciphering for transparent RLC operation in MAC , see [2] for details on the concept.



DL Downlink
TF Transport Format
TFC Transport Format Combination
Note1 : For DCH and DSCH different scheduling mechanism apply

RNTI Radio Network Temporary Identity
UE User Equipment
UL Uplink
Note 2 : The TFC selection place is under discussion
Note 3 : Ciphering is performed in MAC-d only for transparent RLC mode



DL Downlink
TF Transport Format
TFC Transport Format Combination
Note1 : For DCH and DSCH different scheduling mechanism apply

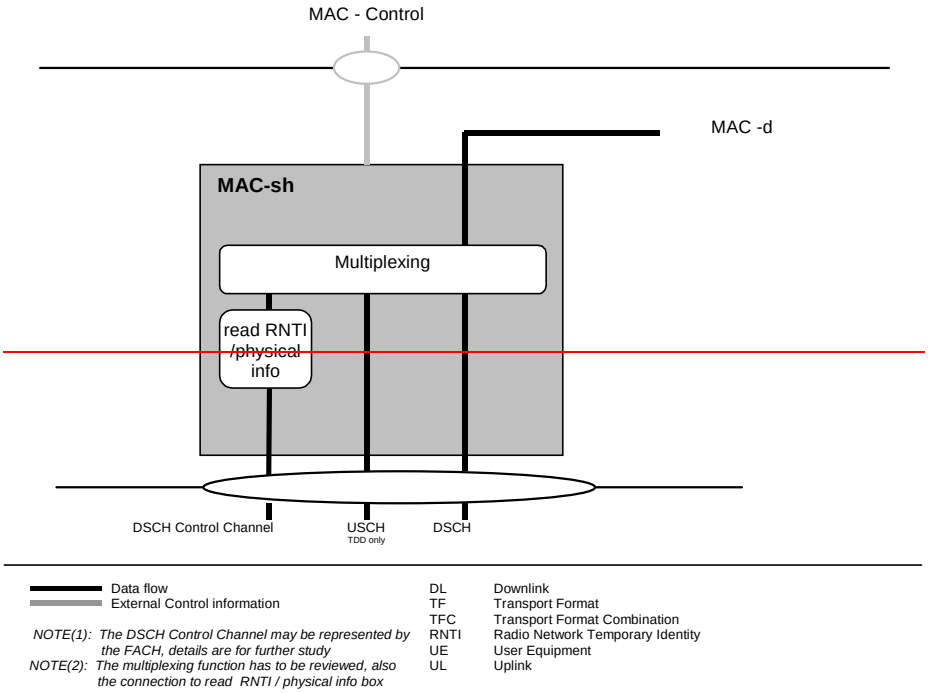
RNTI Radio Network Temporary Identity
UE User Equipment
UL Uplink
Note 2 : The TFC selection place is under discussion
Note 3 : Ciphering is performed in MAC-d only for transparent RLC mode

Figure 4.2.3.3. UE side MAC architecture / MAC-d details

~~Figure 4.2.3.4 shows the UE side MAC-sh entity. The following functionality is covered:~~

- ~~RNTI is used on the DSCH Control Channel to identify the UE. Additionally, some timing / physical information is needed to tell the UE when to listen to DSCH.~~
- ~~Multiplexing is used to transmit the received information on DSCH and DSCH Control Channel to the Mac-d, for TDD the multiplexing is used to transfer data from MAC-d to USCH.~~

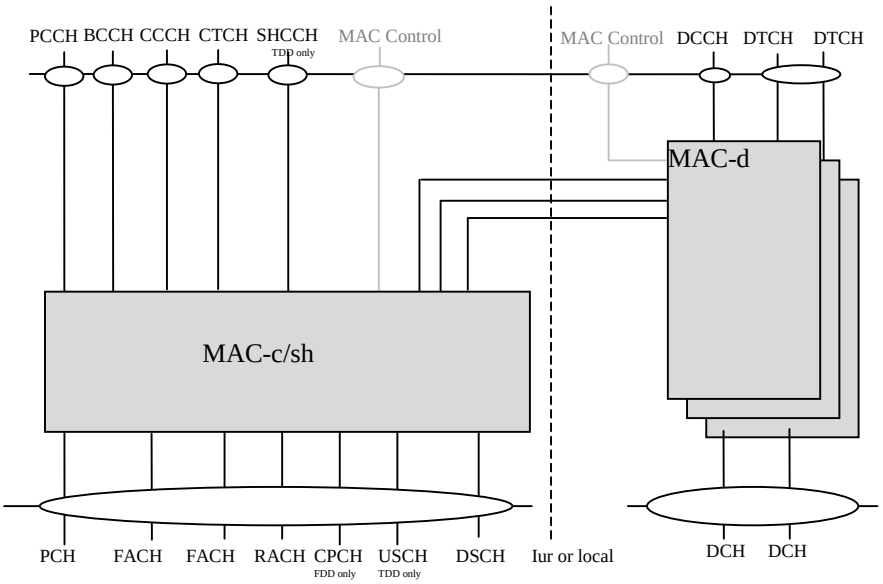
~~The RLC has to provide RLC PDU's to the MAC which fits into the available transport blocks on the transport channels respectively.~~



~~Figure 4.2.3.4. UE side MAC architecture / MAC-sh details~~

4.2.4 Traffic Related Architecture - UTRAN Side

Figure 4.2.4.1 illustrates the connectivity between the MAC entities from the UTRAN side. It is similar to the UE case with the exception that there will be one MAC-d for each UE and each UE (MAC-d) that is associated with a particular cell may be associated with that cells MAC-c/sh. MAC-c/sh receives the CPCH transport blocks. MAC-c/sh is ~~and Mac-sh are~~ located in the controlling RNC while MAC-d is located in the serving RNC. The MAC Control SAP is used to transfer Control information to each MAC entity belongs to one UE.



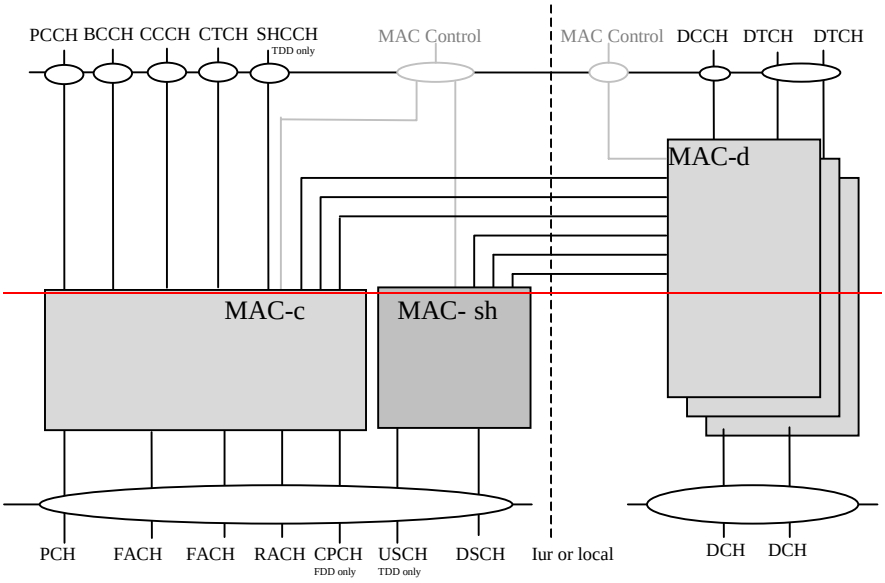


Figure 4.2.4.1: UTRAN side MAC architecture

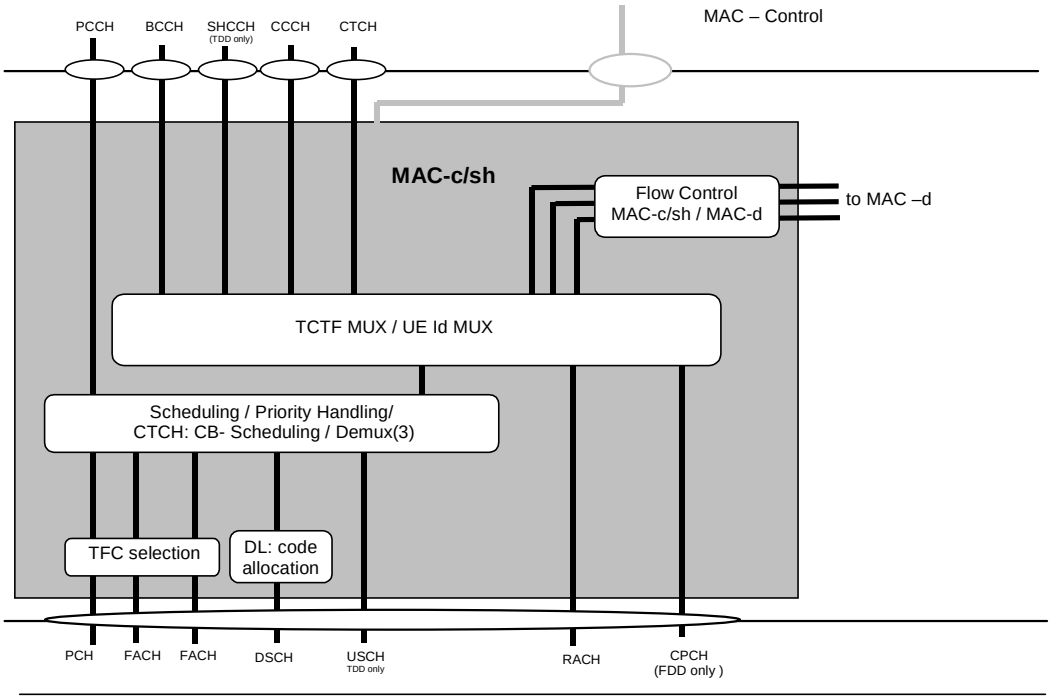
4.2.4.1 MAC-c/sh entity – UTRAN Side

Figure 4.2.4.2 shows the UTRAN side MAC-c/sh entity. The following functionality is covered:

- The Scheduling – Priority Handling box manages FACH resources between the UE's and between data flows according to their priority. DL flow control is also provided to MAC-d.
- The TCTF MUX box represents the handling (insertion or detection and deletion) of the TCTF field in the MAC header, and the respective mapping between logical and transport channels. The TCTF field indicates the common logical channel type, or if a dedicated logical channel is used.
- For dedicated type logical channels, the UE Id field in the MAC header is used to distinguish between UEs.
- In the downlink, transport format combination selection is done for FACH and PCH
- The CB-Scheduling function inside MAC-c/sh supports the Short Message Service Cell Broadcast (SMS CB).

- The scheduling /priority handling function in MAC-c/sh shares the DSCH resources between the UEs and between data flows according to their priority.
- For TDD operation the demultiplex function is used to separate USCH data from different UEs, i.e. to be transferred to different MAC-d entities.
- DL code allocation is used to indicate the code used on the DSCH and the appropriate Transport format on the DSCH.
- Flow control is provided to MAC-d.

The RLC has to provide RLC-PDU's to the MAC which fit into the available transport blocks on the transport channels respectively.



DL	Downlink	UE	User Equipment
TF	Transport Format	UL	Uplink
TFC	Transport Format Combination		

NOTE(1): The relation between the scheduling and the adding of RNTI & physical info has to be reviewed
NOTE(2): The Demux functionality is used in TDD
NOTE(3): For the USCH(TDD only) the control channel is represented by the FACH.

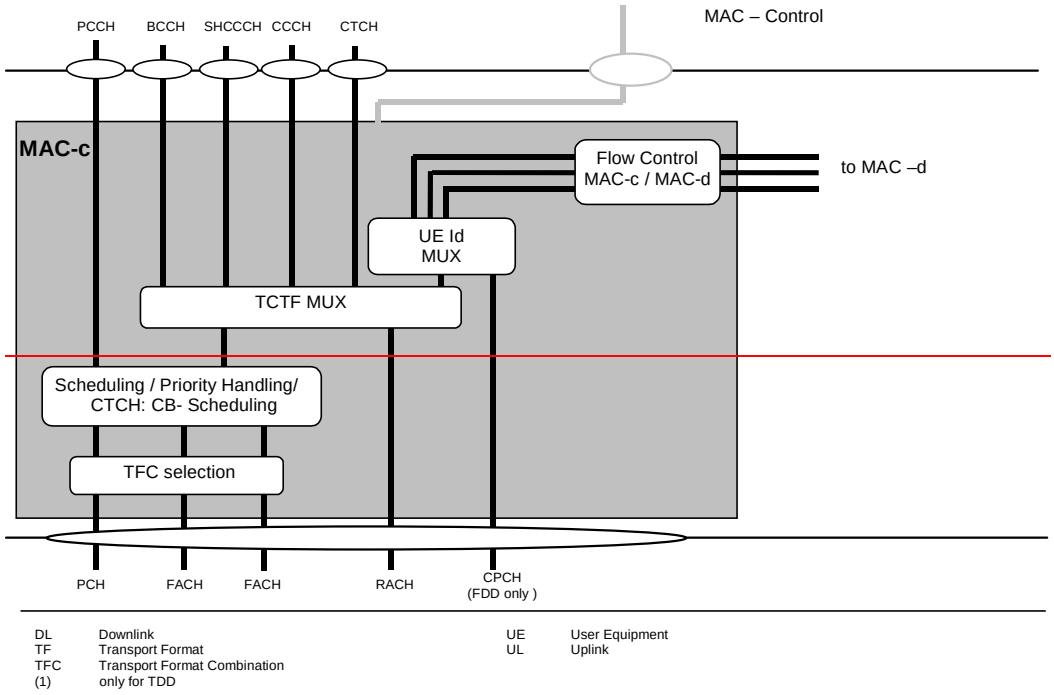
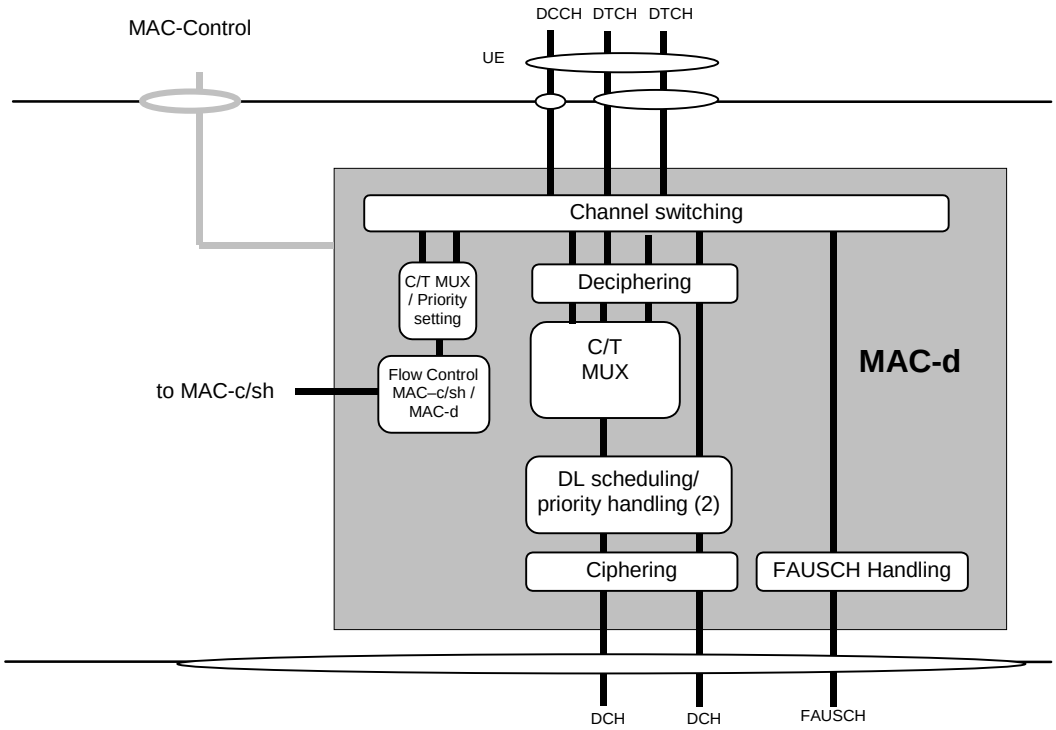


Figure 4.2.4.2 UTRAN side MAC architecture / MAC-c/sh details

4.2.4.2 MAC-d entity – UTRAN Side

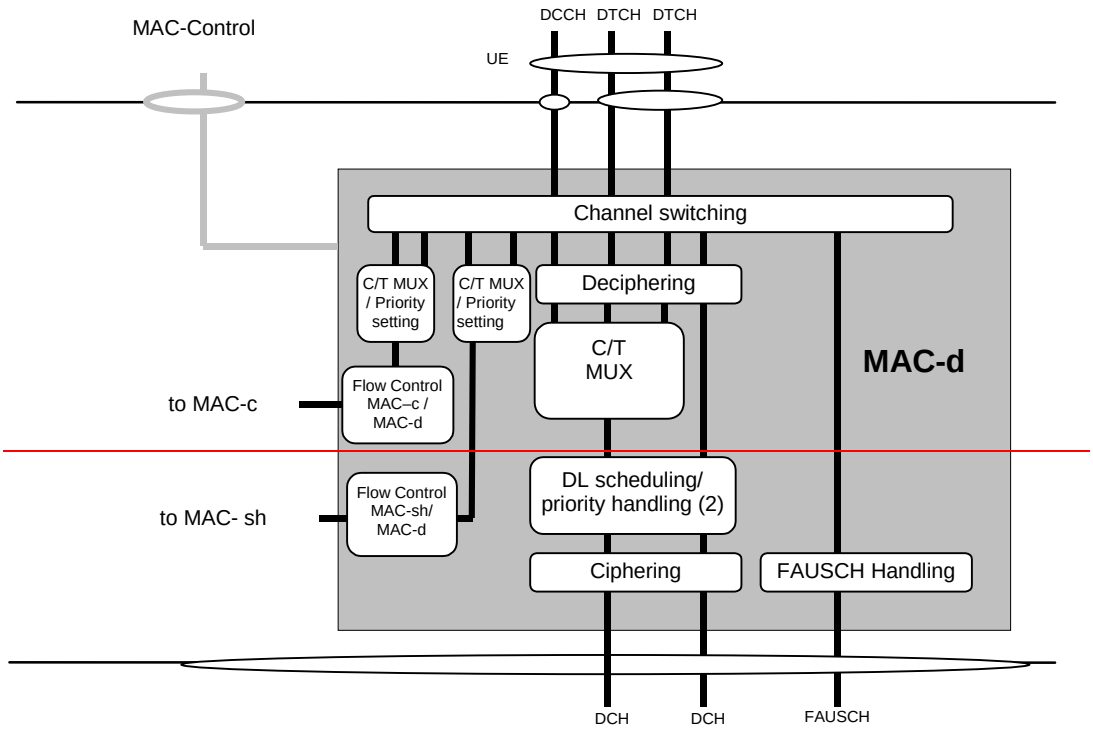
Figure 4.2.4.3 shows the UTRAN side MAC-d entity. The following functionality is covered:

- Dynamic transport channel type switching is performed by this entity, based on decision taken by RRC.
- The C/T MUX box is used when multiplexing of several dedicated logical channels onto one transport channel is used. C/T Mux is also responsible for priority setting on data received from DCCH / DTCH.
- Each MAC-d entity using common channels is connected to a MAC-c/sh entity that handles the scheduling of the common channels to which the UE is assigned and DL (FACH) priority identification to MAC-c/sh (priority identification of each PDU for DTCH NRT data is FFS).
- Each MAC-d entity using downlink shared channel is connected to a MAC-c/sh entity that handles the shared channels to which the UE is assigned and indicates the level of priority of each PDU to MAC-c/sh ~~and to MAC-c~~.
- In the downlink, scheduling and priority handling of transport channels is performed within the allowed transport format combinations of the TFCS assigned by the RRC. This function supports the TFCI insertion in Node B .
- FAUSCH Handling indicates the function in the MAC-d supports the FAUSCH, details are ffs.
- Support of Ciphering / Deciphering for transparent RLC operation in MAC , see [2] for details on the concept.
- A flow control function exists toward MAC-c/sh ~~and MAC-sh~~ to limit buffering between MAC-d and MAC-c/sh ~~or MAC-sh~~ entities. This function is intended to limit layer 2 signalling latency and reduce discarded and retransmitted data as a result of FACH or DSCH congestion. It also allows to handle quality of service if MAC-d requires it.



DL Downlink
TF Transport Format
TFC Transport Format Combination
Note1 : for DCH and DSCH different scheduling mechanisms apply

RNTI Radio Network Temporary Identity
UE User Equipment
UL Uplink
(2) Support TFCI insertion in Node B
Note 3 : Ciphering is performed in MAC-d only for transparent RLC mode



DL Downlink
TF Transport Format
TFC Transport Format Combination
Note1 : for DCH and DSCH different scheduling mechanisms apply

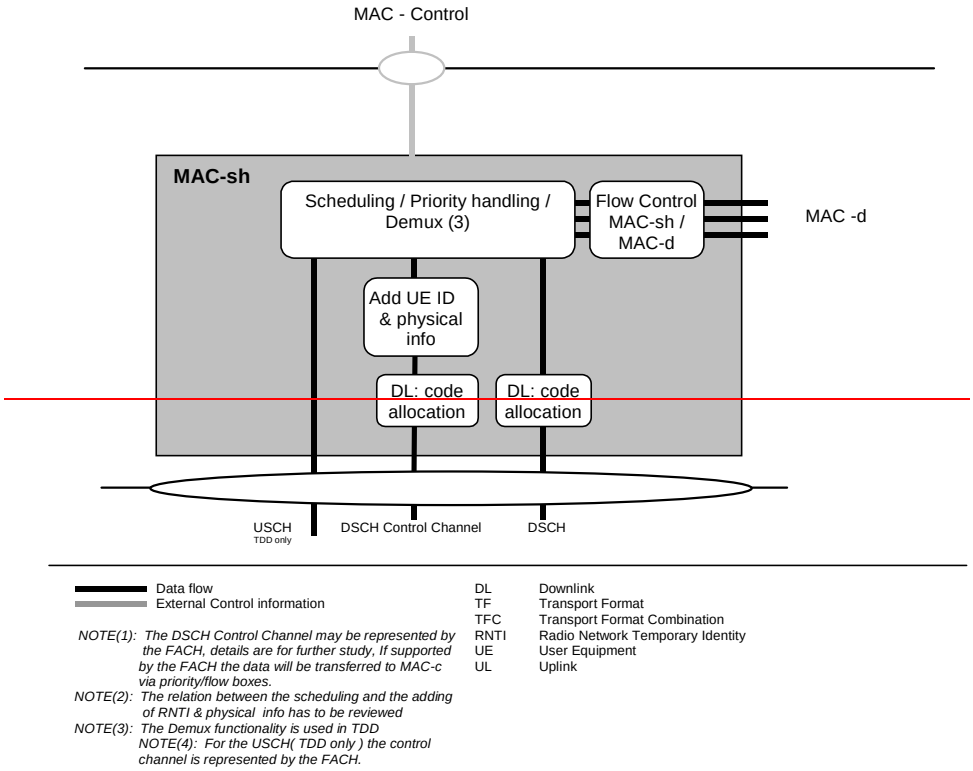
RNTI Radio Network Temporary Identity
UE User Equipment
UL Uplink
(2) Support TFCI insertion in Node B
Note 3 : Ciphering is performed in MAC-d only for transparent RLC mode

Figure 4.2.4.3 UTRAN side MAC architecture / MAC-d details

~~Figure 4.2.4.4 shows the UTRAN side MAC-sh entity. The following functionality is covered:~~

- ~~A specific UE ID is needed when using the DSCH Control Channel to identify the UE on the DSCH. This specific UE ID may be optimised for DSCH and will be allocated when a RAB is mapped onto a DSCH. Additionally, some timing information is needed to tell the UE when to listen to DSCH.~~
- ~~The scheduling /priority handling box in MAC-sh shares the DSCH resources between the UEs and between data flows according to their priority. The TCTF Mux represents the handling (insertion or detection and deletion) of the TCTF field in the MAC header, and the respective mapping between logical and transport channels. The TCTF field indicates if SHCCH or a dedicated logical channel is used.~~
- ~~For TDD operation the demultiplex function is used to separate USCH data from different UEs, i.e. to be transferred to different MAC-d entities.~~
- ~~DL code allocation is used to indicate the code used on the DSCH and the appropriate Transport format on the DSCH.~~
- ~~Flow control is provided to MAC-d.~~

~~The RLC has to provide RLC PDU's to the MAC which fits into the available transport blocks on the transport channels respectively.~~



~~Figure 4.2.4.4 UTRAN side MAC architecture / MAC-sh details~~

4.3.3 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 and may also be connected to~~or~~ FACH
- PCCH is connected to PCH
- CCCH is connected to RACH and FACH
- DCCH and DTCH can be connected to either RACH and FACH, to CPCH and FACH, to RACH and DSCH, to DCH and DSCH, or to a DCH, the DCCH can be connected to FAUSCH.
- ODCCH, OCCCH and ODTCH can be connected to ORACH, ODCCH and ODTCH can be connected to ODCH.
- CTCH may be mapped to FACH and DSCH or BCH, the mapping is ffs
- DCCH and DTCH can be mapped to the USCH (TDD only).
- SHCCH is connected to RACH and USCH/ FACH~~-~~and DSCH.

6 Relation between MAC Functions / Transport Channels and UE

6.2.1 Relation between MAC Functions and Transport Channels

Associated MAC Functions	Logical Ch	Transport Ch	TF Selection	Priority handling between users	Priority handling (one user)	Scheduling	Identification of UEs	Mux/Demux on common transport CH	Mux/ Demux on dedicated transport CH	Dynamic transport CH switching
Uplink (Rx)	CCCH	RACH						X		
	DCCH	RACH					X	X		
	DCCH	CPCH					X	X		X
	DCCH	DCH							X	
	DTCH	RACH					X	X		
	DTCH	CPCH					X	X		X
	DTCH	DCH							X	
	SHCCH	RACH					X	X		
	SHCCH	USCH						X		X
Downlink (Tx)	SCCH	SCH								
	BCCH	BCH				X				
	BCCH	FACH	X			X		X		
	PCCH	PCH				X				
	CCCH	FACH		X				X		
	DCCH	FACH		X			X	X		
	DCCH	DSCH		X				X		
	DCCH	DCH	X		X				X	
	DTCH	FACH	X(note1)	X			X	X		X
	DTCH	DSCH	X(note2)	X				X		X
	DTCH	DCH	X		X				X	X
	SHCCH	FACH		X				X		
	SHCCH	DSCH	X	X				X		X

Table 1 UTRAN MAC functions corresponding to the transport channel (note3)

(Note1) On FACH channel, the transport format set is limited.
(Note2) Whether DSCH has the transport format set is under discussion.
(Note3) The functions not included in the table are listed below.

- Mapping between logical channels and transport channels.
- Traffic volume monitoring
- Constrained execution of open loop power control algorithms

Note (this table has to be reviewed)

6.2.2 Relation of UE MAC functions corresponding to the Transport Channel MAC Functions and Transport Channels

Functions	Logical Ch	Transport Ch	TF Selection	Priority handling data of one user	Identification	Mux/Demux on common transport channels	Mux/Demux on dedicated transport channels	Dynamic transport channel type switching
Uplink (Tx)	CCCH	RACH				X		
	DCCH	RACH	X(note1)		X	X		
	DCCH	CPCH	X	X	X	X		X
	DCCH	DCH	X	X			X	
	DTCH	RACH	X(note1)		X	X		X
	DTCH	CPCH	X	X	X	X		X
	DTCH	DCH	X	X			X	X
	SHCCH	RACH				X		
	SHCCH	USCH	X	X		X		X
Downlink (Rx)	SCCH	SCH						
	BCCH	BCH						
	BCCH	FACH				X		
	PCCH	PCH						
	CCCH	FACH				X		
	DCCH	FACH			X	X		
	DCCH	DSCH				X		
	DCCH	DCH					X	
	DTCH	FACH			X	X		
	DTCH	DSCH				X		
	DTCH	DCH					X	
	SHCCH	FACH				X		
	SHCCH	DSCH				X		

Table 2 UE MAC functions corresponding to the transport channel

(Note1) The RACH channel has the limited transport format set.

Note: This table has to be reviewed

9.2.1 MAC Data PDU: Parameters of the MAC header

The following fields are defined for the MAC header:

- Target Channel Type Field
  The TCTF field is a flag that provides identification of the logical channel class on FACH and RACH transport channels, i.e. whether it carries BCCH, CCCH, CTCH, SHCCH or dedicated logical channel information.

TCTF	Designation
000	BCCH
001	CCCH
010	CTCH
011	DCCH or DTCH over FACH
100	TDD: SHCCH FDD: For future use
101-111	For future use

Table 9.2.1.1: Coding of the Target Channel Type Field on FACH

TCTF	Designation
00	CCCH
01	DCCH or DTCH over RACH
10	TDD: SHCCH FDD: For future use
11	For future use

Table 9.2.1.2: Coding of the Target Channel Type Field on RACH

TCTF	Designation
0	SHCCH
1	DCCH or DTCH over USCH or DSCH

Table 9.2.1.3: Coding of the Target Channel Type Field on USCH or DSCH (TDD only)

9.2.1.1 MAC header for DTCH and DCCH

a) DTCH or DCCH mapped to DCH, no multiplexing of dedicated channels on MAC:
No MAC header is required.

b) DTCH or DCCH mapped to DCH, with multiplexing of dedicated channels on MAC:
C/T field is included in MAC header.

c) DTCH or DCCH mapped to RACH/FACH:
TCTF field and UE-Id are included in the MAC header. C/T field is included if multiplexing on MAC is applied.

d) DTCH or DCCH mapped to DSCH or USCH:
~~The MAC PDU format for DSCH is left for further study.~~ The TCTF field is included in the MAC header for TDD only. The UE-Id type and UE-Id are included in the MAC header for FDD only. The C/T field is included if multiplexing on MAC is applied.

e) DTCH or DCCH mapped to DSCH or USCH where DTCH or DCCH are the only logical channels:
~~The MAC PDU format for USCH is left for further study~~. The UE-Id type and UE-Id are included in the MAC header for FDD only. The C/T field is included in the MAC header if multiplexing on MAC is applied.

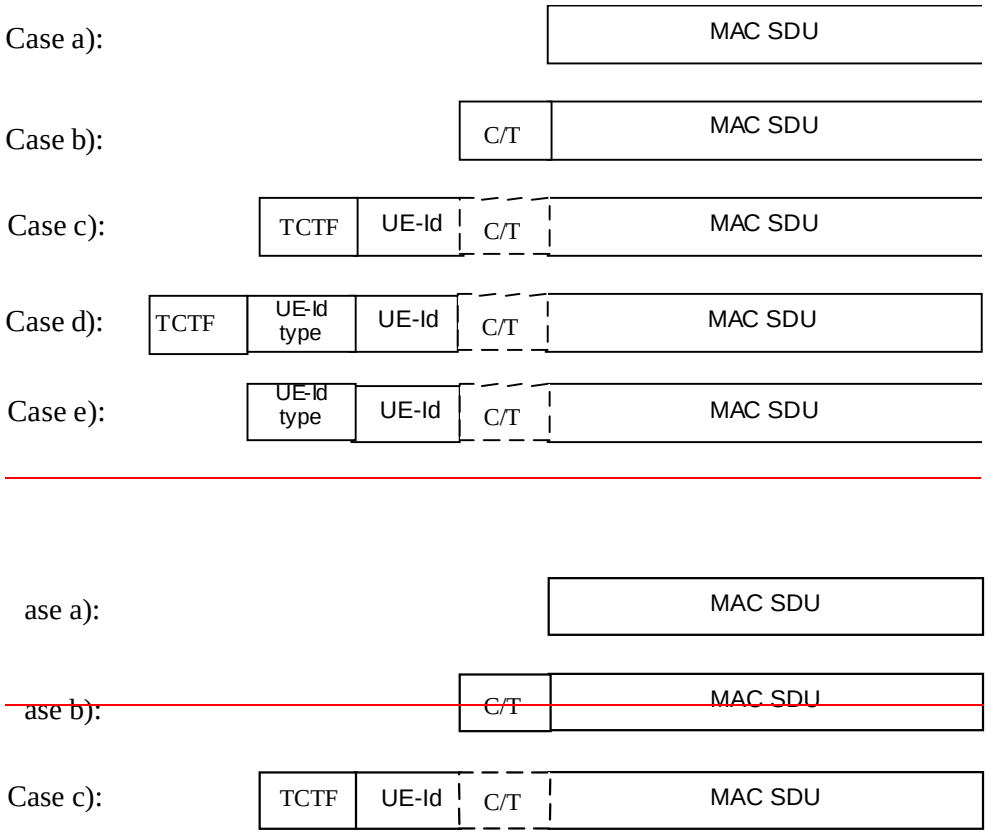


Figure 9.2.1.1.1: MAC Data PDU formats for DTCH and DCCH

9.2.1.6 MAC Header for SHCCH

The MAC header for SHCCH is as shown in figure 9.2.1.3.2

a) SHCCH mapped to RACH and USCH/FACH and DSCH:
TCTF has to be included.

b) SHCCH mapped to RACH and USCH/FACH and DSCH, where SHCCH is the only channel:

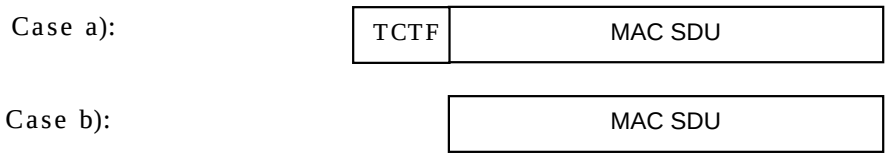


Figure 9.2.1.5.1 : MAC Data PDU format for SHCCH

11.2.1 Control of RACH transmissions for FDD mode

The RACH transmissions are controlled by the UE MAC sublayer as outlined in Figure 11.2.1.
Note that the figure shall illustrate the operation of the transmission control procedure as specified below. It shall not impose restrictions on implementation. MAC controls the timing of each initial preamble ramping cycle as well as successive preamble ramping cycles in case that none or a negative acknowledgement is received on AICH.

MAC receives the following RACH transmission control parameters from RRC with the CMAC-Config-REQ primitive:

- persistence value P (transmission probability),
- maximum number of preamble ramping cycles M_{max},
- range of backoff interval for timer $T_{BO1,}$ given in terms of numbers of transmission time intervals N_{BO1max} and N_{BO1min}, applicable when negative acknowledgement on AICH is received,
- Access Service Class (ASC) parameters.

Based on the persistence value P, the UE decides whether to start the L1 PRACH transmission procedure (see TS 25.214) in the present transmission time interval or not. If transmission is allowed, the PRACH transmission procedure (starting with a preamble power ramping cycle) is initiated by sending of a PHY-Data-REQ primitive. MAC then waits for status indication from L1 via PHY-Status-IND primitive. If transmission is not allowed, a new persistency check is performed in the next transmission time interval. The persistency check is repeated until transmission is permitted.

When the preamble has been acknowledged on AICH, respective L1 status information is indicated to MAC with PHY-Status-IND primitive, and the PRACH transmission procedure shall be completed with transmission of the PRACH message part according to L1 specifications.

When PHY indicates that no acknowledgement on AICH is received while the maximum number of preamble retransmissions is reached (defined by parameter Preamble_Retrans_Max on L1), a new persistency test is performed in the next transmission time interval. The timer T_2 ensures that two successive persistency tests are separated by at least one transmission time interval.

In case that a negative acknowledgement has been received on AICH a backoff timer T_{BO1} is started. After expiry of the timer, persistence check is performed again. Backoff timer T_{BO1} is set to an integer number N_{BO1} of transmission time intervals, randomly drawn within an interval $0 \le N_{BO1min} \le N_{BO1} \le N_{BO1max}$ (with uniform distribution). N_{BO1min} and N_{BO1max} may be set equal when a fixed delay is desired, and even to zero when no delay other than the one due to persistency is desired.

Before a persistency test is performed it shall be checked whether any new RACH transmission control parameters have been received from RRC with CMAC-Config-REQ primitive. The latest set of RACH transmission control parameters shall be applied.

[Note 1: An alternative proposal for determining the backoff additional to persistency drawing and testing in the case of a negative acknowledgement on AICH (L1 status "NACK") has been proposed which is for further study]

[Note 2: There is a need to study the use of multiple persistence values when there are multiple Access Service Classes and multiple RACH partitions.]

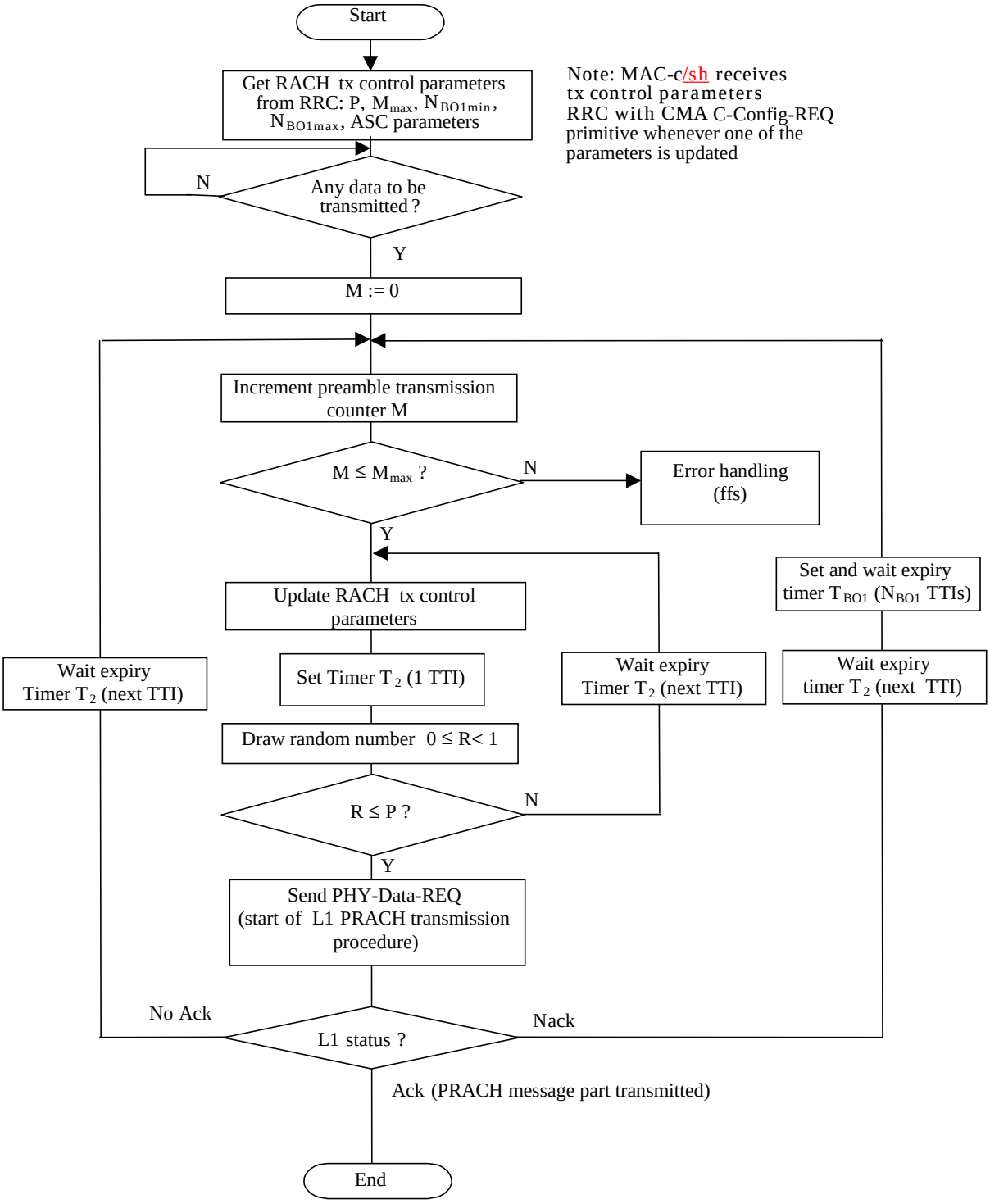


Figure 11.2.1 : RACH transmission control procedure (UE side, informative)

11.2.2 Control of RACH transmissions for TDD

The RACH transmissions are performed by the UE as shown in Figure 11.2.2. Note that the figure shall illustrate the operation of the transmission control procedure as specified below. It shall not impose restrictions on implementation.

MAC receives the following RACH transmission control parameters from RRC with the CMAC-Config-REQ primitive:

- persistence value P (transmission probability),
- Access Service Class parameters

Based on the persistence value P, the UE decides whether to send the message on the RACH. If transmission is allowed, the PRACH transmission procedure is initiated by sending of a PHY-Data-REQ primitive. If transmission is not allowed, a new persistency check is performed in the next transmission time interval. The persistency check is repeated until transmission is permitted.

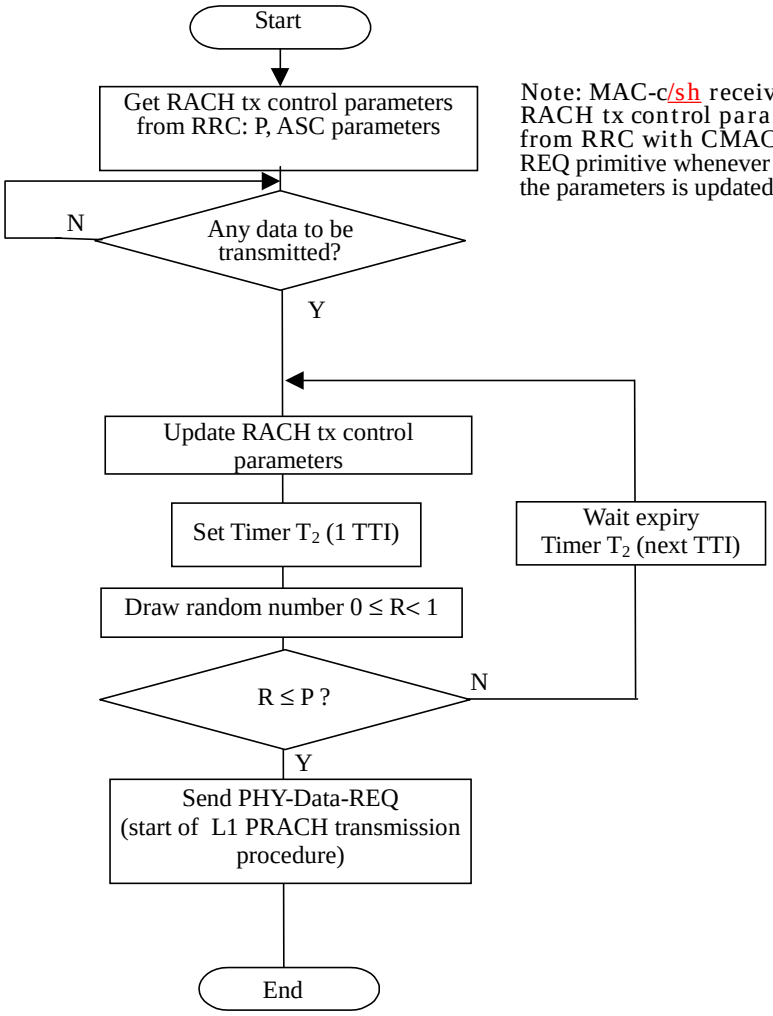


Figure 11.2.2 : RACH transmission control procedure for TDD (UE side, informative)

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Nice, France, 13-15 December 1999

Document (R2-99h97)
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

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25.321	CR	028	Current Version:	3.1.0

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

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

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

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

Source: TSG-RAN WG2 **Date:** 26.11.1999

Subject: Modification of Cell Broadcast Service (CBS) related functions

Work item:

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

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature	X		Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: The scheduling function related to CBS has been moved from Mac to BMC protocol. Further editoral corrections are made regarding CTCH mapping and MAC header for CTCH.

Clauses affected: 4.2.4, 4.3.3, 6.2.1, 6.2.2, 9.2.1.5

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other GSM core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:


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

4.2.4 Traffic Related Architecture - UTRAN Side

Figure 4.2.4.1 illustrates the connectivity between the MAC entities from the UTRAN side. It is similar to the UE case with the exception that there will be one MAC-d for each UE and each UE (MAC-d) that is associated with a particular cell may be associated with that cells MAC-sh. MAC-c receives the CPCH transport blocks. MAC-c and Mac-sh are located in the controlling RNC while MAC-d is located in the serving RNC.The MAC Control SAP is used to transfer Control information to each MAC entity belongs to one UE.

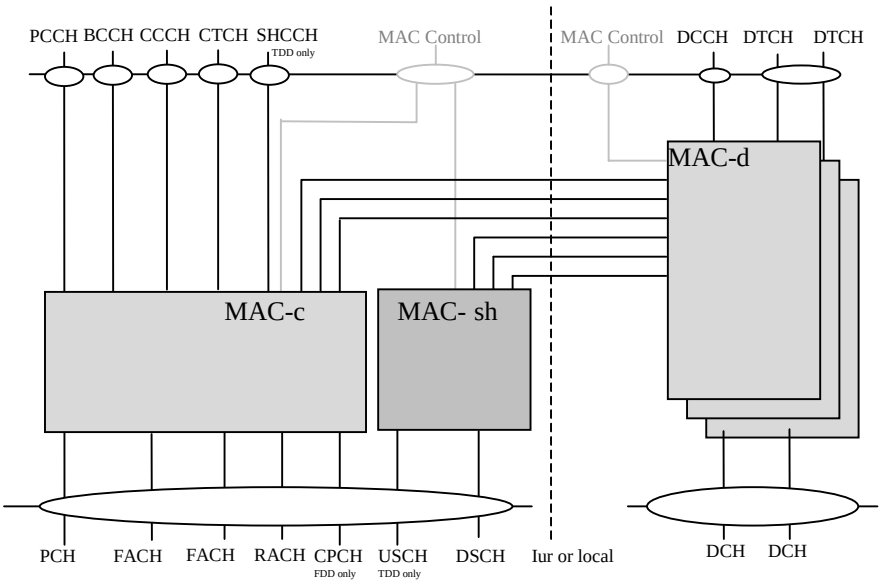


Figure 4.2.4.1: UTRAN side MAC architecture

Figure 4.2.4.2 shows the UTRAN side MAC-c entity. The following functionality is covered:

- The Scheduling – Priority Handling box manages FACH resources between the UE's and between data flows according to their priority. DL flow control is also provided to MAC-d.
- The TCTF MUX box represents the handling (insertion or detection and deletion) of the TCTF field in the MAC header, and the respective mapping between logical and transport channels. The TCTF field indicates the common logical channel type, or if a dedicated logical channel is used.
- For dedicated type logical channels, the UE Id field in the MAC header is used to distinguish between UEs.
- In the downlink, transport format combination selection is done for FACH and PCH
- ~~The CB Scheduling function inside MAC-c supports the Short Message Service Cell Broadcast (SMS-CB).~~

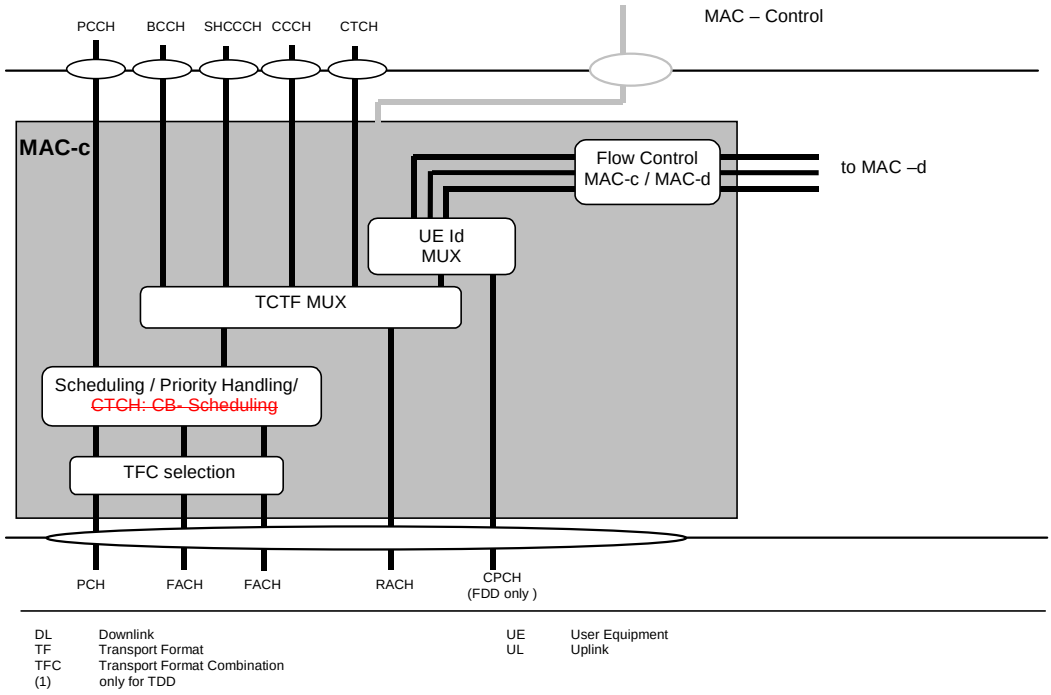
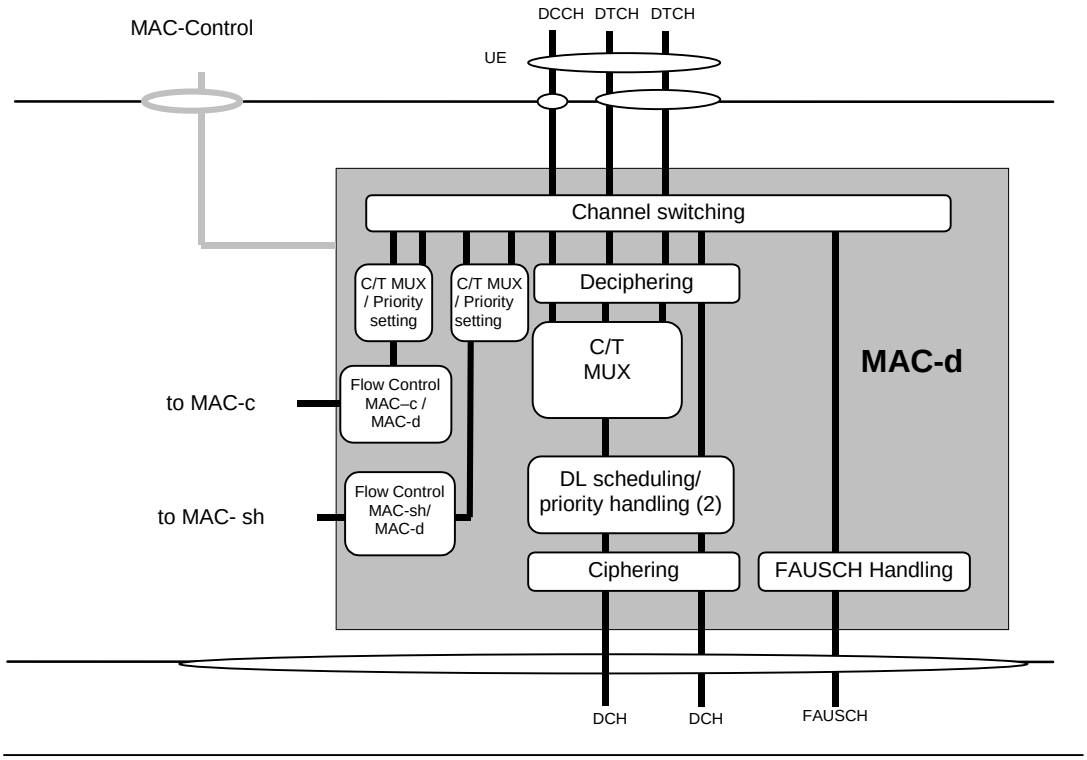


Figure 4.2.4.2 UTRAN side MAC architecture / MAC-c details

Figure 4.2.4.3 shows the UTRAN side MAC-d entity. The following functionality is covered:

- Dynamic transport channel type switching is performed by this entity, based on decision taken by RRC.
- The C/T MUX box is used when multiplexing of several dedicated logical channels onto one transport channel is used. C/T Mux is also responsible for priority setting on data received from DCCH / DTCH.
- Each MAC-d entity using common channels is connected to a MAC-c entity that handles the scheduling of the common channels to which the UE is assigned and DL (FACH) priority identification to MAC-c (priority identification of each PDU for DTCH NRT data is FFS).
- Each MAC-d entity using downlink shared channel is connected to a MAC-sh entity that handles the shared channels to which the UE is assigned and indicates the level of priority of each PDU to MAC-sh and to MAC-c.
- In the downlink, scheduling and priority handling of transport channels is performed within the allowed transport format combinations of the TFCS assigned by the RRC. This function supports the TFCI insertion in Node B .
- FAUSCH Handling indicates the function in the MAC-d supports the FAUSCH, details are ffs.
- Support of Ciphering / Deciphering for transparent RLC operation in MAC , see [2] for details on the concept.
- A flow control function exists toward MAC-c and MAC-sh to limit buffering between MAC-d and MAC-c or MAC-sh entities. This function is intended to limit layer 2 signalling latency and reduce discarded and retransmitted data as a result of FACH or DSCH congestion. It also allows to handle quality of service if MAC-d requires it.



DL	Downlink	RNTI	Radio Network Temporary Identity
TF	Transport Format	UE	User Equipment
TFC	Transport Format Combination	UL	Uplink
Note1 :	*for DCH and DSCH different scheduling mechanisms apply*	*(2)*	*Support TFCI insertion in Node B*
		Note 3 :	*Ciphering is performed in MAC-d only for transparent RLC mode*

Figure 4.2.4.3 UTRAN side MAC architecture / MAC-d details

Figure 4.2.4.4 shows the UTRAN side MAC-sh entity. The following functionality is covered:

- A specific UE ID is needed when using the DSCH Control Channel to identify the UE on the DSCH. This specific UE ID may be optimised for DSCH and will be allocated when a RAB is mapped onto a DSCH. Additionally, some timing information is needed to tell the UE when to listen to DSCH.
- The scheduling /priority handling box in MAC-sh shares the DSCH resources between the UEs and between data flows according to their priority.
- For TDD operation the demultiplex function is used to separate USCH data from different UEs, i.e. to be transferred to different MAC-d entities.
- DL code allocation is used to indicate the code used on the DSCH and the appropriate Transport format on the DSCH.

- Flow control is provided to MAC-d.

The RLC has to provide RLC-PDU's to the MAC which fits into the available transport blocks on the transport channels respectively.

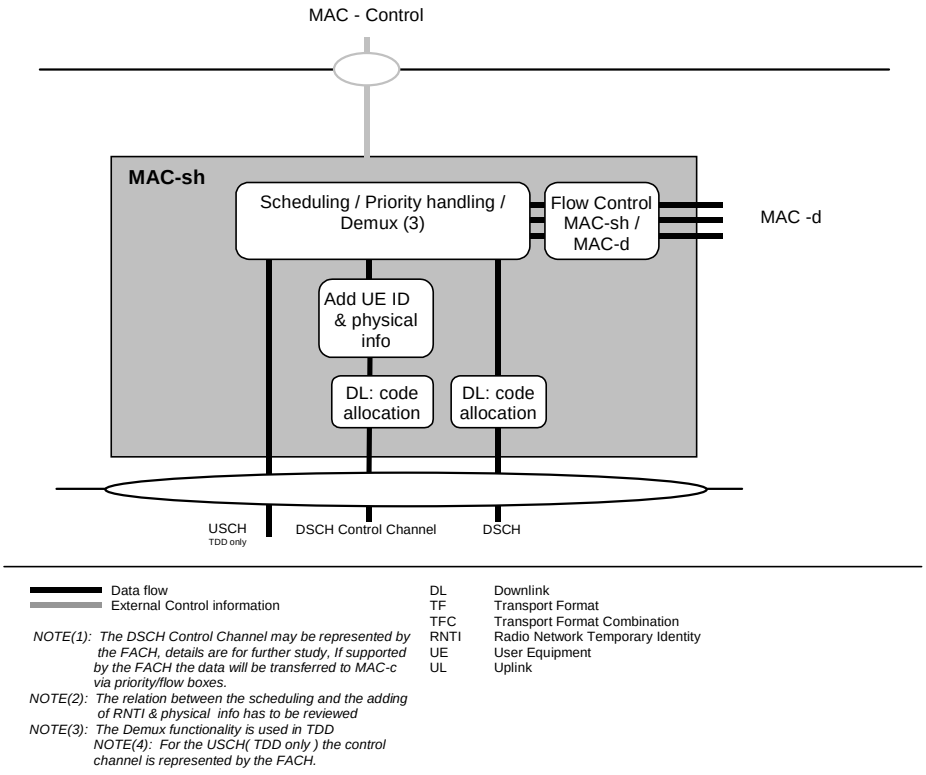


Figure 4.2.4.4 UTRAN side MAC architecture / MAC-sh details

4.3.3 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 or FACH
- PCCH is connected to PCH

- CCCH is connected to RACH and FACH
- DCCH and DTCH can be connected to either RACH and FACH, to CPCH and FACH, to RACH and DSCH, to DCH and DSCH, or to a DCH, the DCCH can be connected to FAUSCH.
- ODCCH, OCCCH and ODTCH can be connected to ORACH, ODCCH and ODTCH can be connected to ODCH.
- ~~CTCH may be mapped to FACH and DSCH or BCH, the mapping is ffs~~CTCH is connected to FACH.
- DCCH and DTCH can be mapped to the USCH (TDD only).
- SHCCH is connected to RACH and FACH.

6.2 Relation between MAC Functions / Transport Channels and UE

6.2.1 Relation between MAC Functions and Transport Channels

Associated MAC Functions	Logical Ch	Transport Ch	TF Selection	Priority handling between users	Priority handling (one user)	Scheduling	Identification of UEs	Mux/Demux on common transport CH	Mux/ Demux on dedicated transport CH	Dynamic transport CH switching
Uplink (Rx)	CCCH	RACH						X		

	DCCH	RACH					X	X		
	DCCH	CPCH					X	X		X
	DCCH	DCH							X	
	DTCH	RACH					X	X		
	DTCH	CPCH					X	X		X
	DTCH	DCH							X	
	SHCCH	RACH					X	X		
Downlink (Tx)	SCCH	SCH								
	BCCH	BCH				X				
	BCCH	FACH	X			X		X		
	PCCH	PCH				X				
	CCCH	FACH		X				X		
	CTCH	FACH	X			X		X		
	DCCH	FACH		X			X	X		
	DCCH	DSCH		X				X		
	DCCH	DCH	X		X				X	
	DTCH	FACH	X(note1)	X			X	X		X
	DTCH	DSCH	X(note2)	X				X		X
	DTCH	DCH	X		X				X	X
	SHCCH	FACH		X				X		

Table 1 UTRAN MAC functions corresponding to the transport channel (note3)

(Note1) On FACH channel, the transport format set is limited.
(Note2) Whether DSCH has the transport format set is under discussion.
(Note3) The functions not included in the table are listed below.

- Mapping between logical channels and transport channels.
- Traffic volume monitoring
- Constrained execution of open loop power control algorithms

Note (this table has to be reviewed)

6.2.2 Relation of UE MAC functions corresponding to the Transport Channel MAC Functions and Transport Channels

Functions	Logical Ch	Transport Ch	TF Selection	Priority handling data of one user	Identification	Mux/Demux on common transport channels	Mux/Demux on dedicated transport channels	Dynamic transport channel type switching
Uplink (Tx)	CCCH	RACH				X		
	DCCH	RACH	X(note1)		X	X		
	DCCH	CPCH	X	X	X	X		X
	DCCH	DCH	X	X			X	
	DTCH	RACH	X(note1)		X	X		X
	DTCH	CPCH	X	X	X	X		X
	DTCH	DCH	X	X			X	X
	SHCCH	RACH				X		
Downlink (Rx)	SCCH	SCH						
	BCCH	BCH						
	BCCH	FACH				X		
	PCCH	PCH						
	CCCH	FACH				X		
	CTCH	FACH				X		
	DCCH	FACH			X	X		
	DCCH	DSCH				X		
	DCCH	DCH					X	
	DTCH	FACH			X	X		
	DTCH	DSCH				X		
	DTCH	DCH					X	
	SHCCH	FACH				X		

Table 2 UE MAC functions corresponding to the transport channel

(Note1) The RACH channel has the limited transport format set.

Note: This table has to be reviewed

9.2.1.5 MAC Header for CTCH

The TCTF field is included as MAC header for CTCH ~~mapped to FACH is~~ as shown in figure 9.2.1.5.1

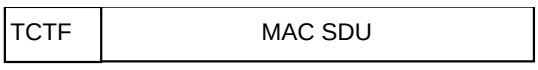


Figure 9.2.1.5.1 : MAC Data PDU format for CTCH

~~The TCTF field indicates whether data is mapped to common or dedicated channels, and whether it belongs to BCCH ,CCCH, CTCH or SHCCH. In case of CTCH, it identifies whether the message is SMS CB message or Schedule message~~

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***Document* (R2-99k87)**
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or for SMG, use the format P-99-xxx

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25.321	CR	031r1	Current Version:	3.1.0

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

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

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

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

Source: TSG-RAN WG2 **Date:** 1999-12-03

Subject: Simultaneous mapping of logical channels on transport channels

Work item:

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

Reason for change: It has been clarified that one logical channel can be mapped simultaneously on common and dedicated transport channels, e.g. on a DCH and DSCH at the same time.
This is captured in the model of the MAC-d entity.

Clauses affected:

Other specs affected:			
Other 3G core specifications		→ List of CRs:	
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

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4.2.3 Traffic Related Architecture - UE Side

Figure 4.2.3.1 illustrates the connectivity of MAC entities. The figure shows a MAC-d servicing the needs of several DTCH mapping them to a number of DCH. A MAC-sh controls access to a common transport channel. It is noted that because the MAC-sh provides additional capacity then it communicates only with the MAC-d rather than the DTCH directly. The MAC-c, which interfaces with the PCH, FACH and RACH common transport channels, is connected with the MAC-d for transfer of data and RNTI. The MAC Control SAP is used to transfer Control information to each MAC entity. The MAC-sh transfers data from the DSCH to the MAC-d and from the MAC-d to the USCH (TDD only) under control of the RRC. In the FDD implementation, the MAC-c may transfer data from the MAC-d to the CPCH.

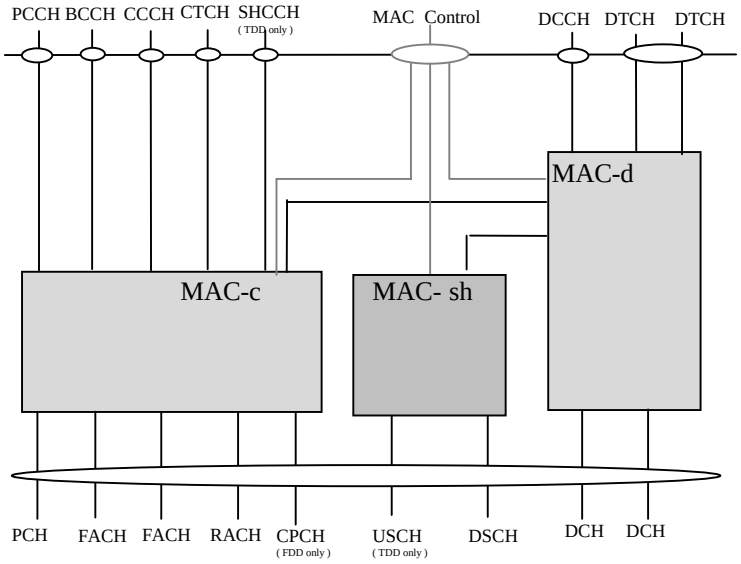


Figure 4.2.3.1 UE side MAC architecture

Figure 4.2.3.2 shows the UE side MAC-c entity. The following functionality is covered:

- The TCTF MUX box represents the handling (insertion or detection and deletion) of the TCTF field in the MAC header, and the respective mapping between logical and transport channels. The TCTF field indicates the common logical channel type, or if a dedicated logical channel is used.
- The UE Id field in the MAC header is used to distinguish between UEs.
- In the uplink, the possibility of transport format selection exists.
- ASC selection: MAC indicates the ASC associated with the PDU to the physical layer (this is to ensure that RACH messages associated with a given Access Service Class (ASC) are sent on the appropriate signature(s) and time slot(s)). MAC also applies the appropriate back-off parameter(s) associated with the given ASC.
- Scheduling /priority handling is used to transmit the information received from MAC-d on RACH and CPCH.
- Channel selection is used to select an appropriately sized and available CPCH for transmission.

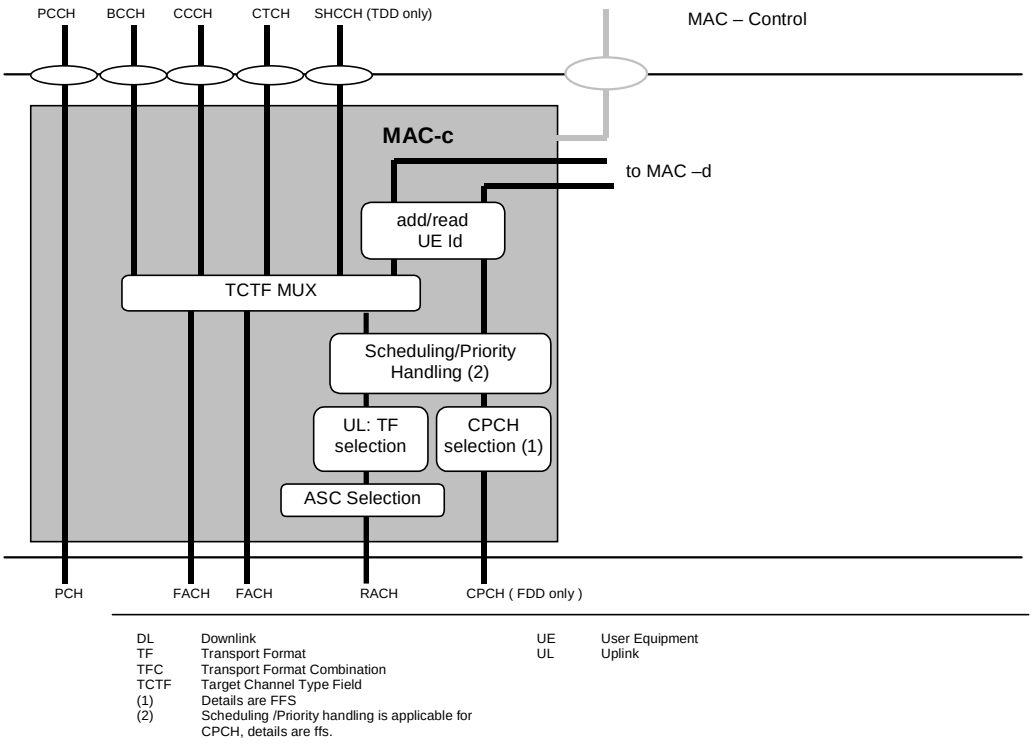
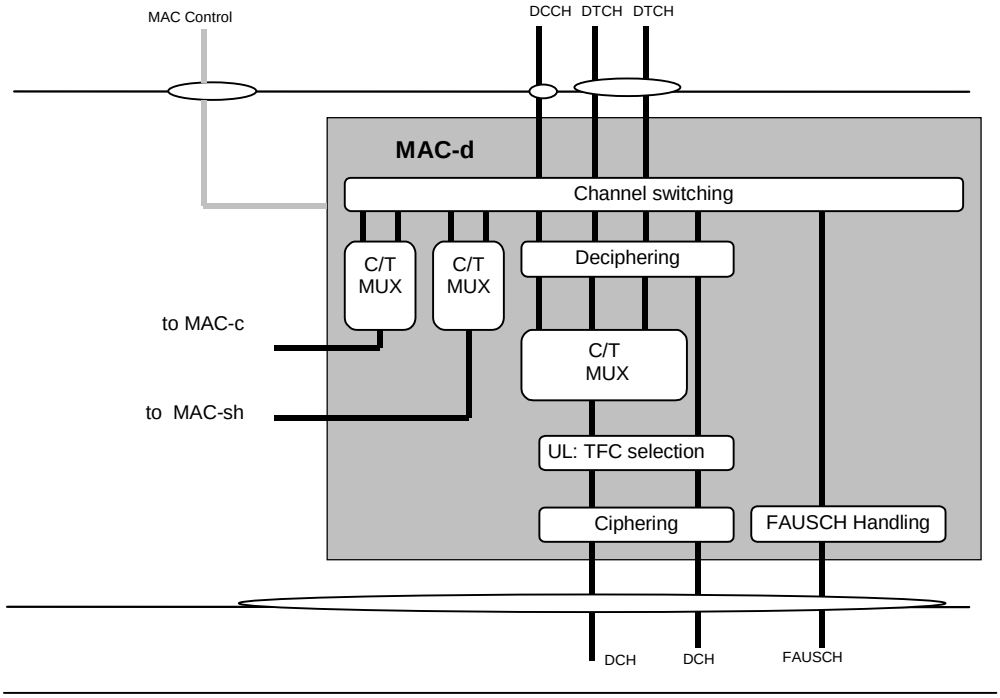


Figure 4.2.3.2. UE side MAC architecture / MAC-c details

Figure 4.2.3.3 shows the UE side MAC-d entity. The following functionality is covered:

- Dynamic transport channel type switching is performed by this entity, based on decision taken by RRC.
- The C/T MUX box is used when multiplexing of several dedicated logical channels onto one transport channel is used.
- The MAC-d entity using common channels is connected to a MAC-c entity that handles the scheduling of the common channels to which the UE is assigned.
- The MAC-d entity using downlink shared channel is connected to a MAC-sh entity that handles the reception of data received on the shared channels to which the UE is assigned.
- The MAC-d entity is responsible for mapping dedicated logical channels for the downlink onto the common and dedicated transport channels . One dedicated logical channel can be mapped simultaneously onto DCH and DSCH.
- In the uplink, transport format combination selection (out of the RRC assigned transport format combination set) is performed to prioritise transport channels.
- FAUSCH Handling indicates the function in the MAC-d supports the FAUSCH, details are ffs
- Support of Ciphering / Deciphering for transparent RLC operation in MAC , see [2] for details on the concept.



DL Downlink
TF Transport Format
TFC Transport Format Combination
Note1 : For DCH and DSCH different scheduling mechanism apply

RNTI Radio Network Temporary Identity
UE User Equipment
UL Uplink
Note 2 : The TFC selection place is under discussion
Note 3 : Ciphering is performed in MAC-d only for transparent RLC mode

Figure 4.2.3.3. UE side MAC architecture / MAC-d details

Figure 4.2.3.4 shows the UE side MAC-sh entity. The following functionality is covered:

- RNTI is used on the DSCH Control Channel to identify the UE. Additionally, some timing / physical information is needed to tell the UE when to listen to DSCH.
- Multiplexing is used to transmit the received information on DSCH and DSCH Control Channel to the Mac-d, for TDD the multiplexing is used to transfer data from MAC-d to USCH.

The RLC has to provide RLC-PDU's to the MAC which fits into the available transport blocks on the transport channels respectively.

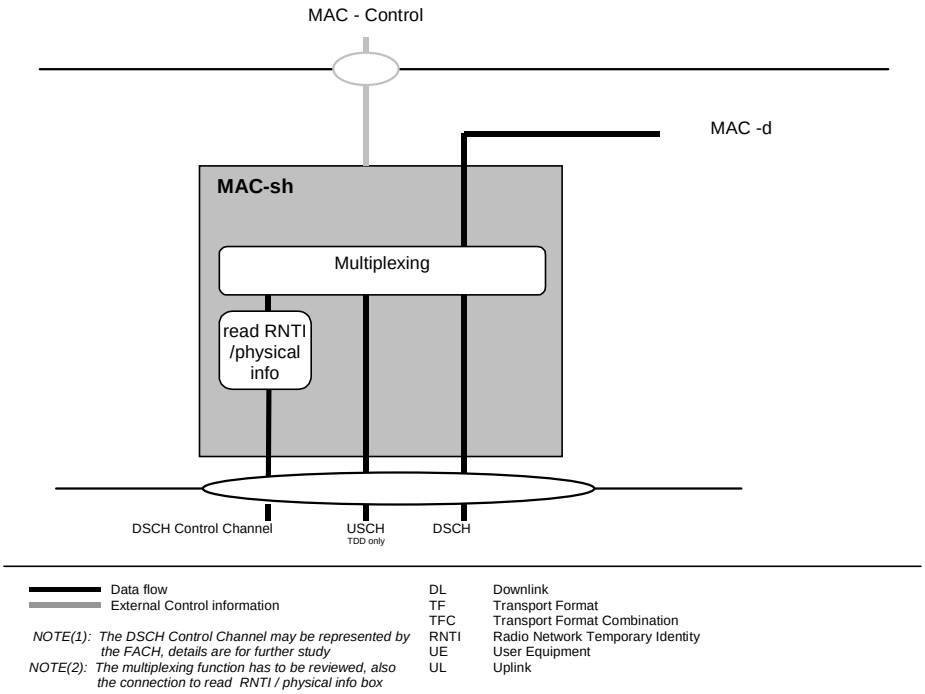


Figure 4.2.3.4. UE side MAC architecture / MAC-sh details

4.2.4 Traffic Related Architecture - UTRAN Side

Figure 4.2.4.1 illustrates the connectivity between the MAC entities from the UTRAN side. It is similar to the UE case with the exception that there will be one MAC-d for each UE and each UE (MAC-d) that is associated with a particular cell may be associated with that cells MAC-sh. MAC-c receives the CPCH transport blocks. MAC-c and Mac-sh are located in the controlling RNC while MAC-d is located in the serving RNC.The MAC Control SAP is used to transfer Control information to each MAC entity belongs to one UE.

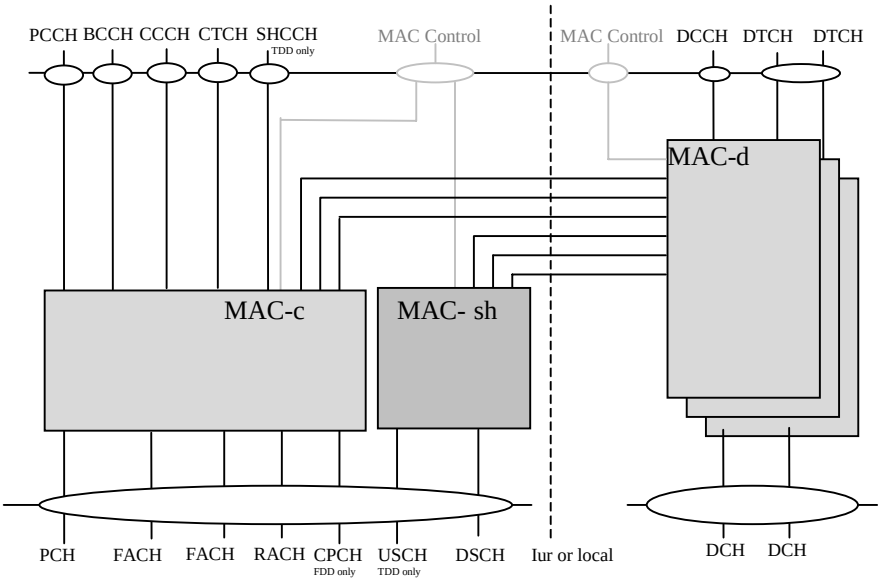


Figure 4.2.4.1: UTRAN side MAC architecture

Figure 4.2.4.2 shows the UTRAN side MAC-c entity. The following functionality is covered:

- The Scheduling – Priority Handling box manages FACH resources between the UE's and between data flows according to their priority. DL flow control is also provided to MAC-d.
- The TCTF MUX box represents the handling (insertion or detection and deletion) of the TCTF field in the MAC header, and the respective mapping between logical and transport channels. The TCTF field indicates the common logical channel type, or if a dedicated logical channel is used.
- For dedicated type logical channels, the UE Id field in the MAC header is used to distinguish between UEs.
- In the downlink, transport format combination selection is done for FACH and PCH
- The CB-Scheduling function inside MAC-c supports the Short Message Service Cell Broadcast (SMS CB).

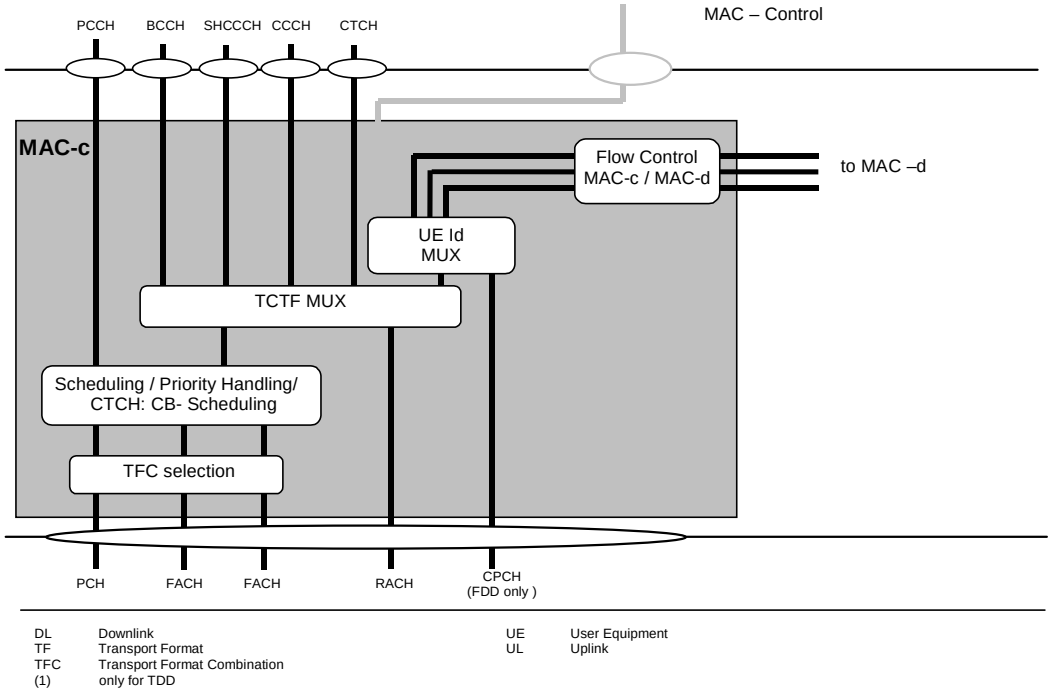
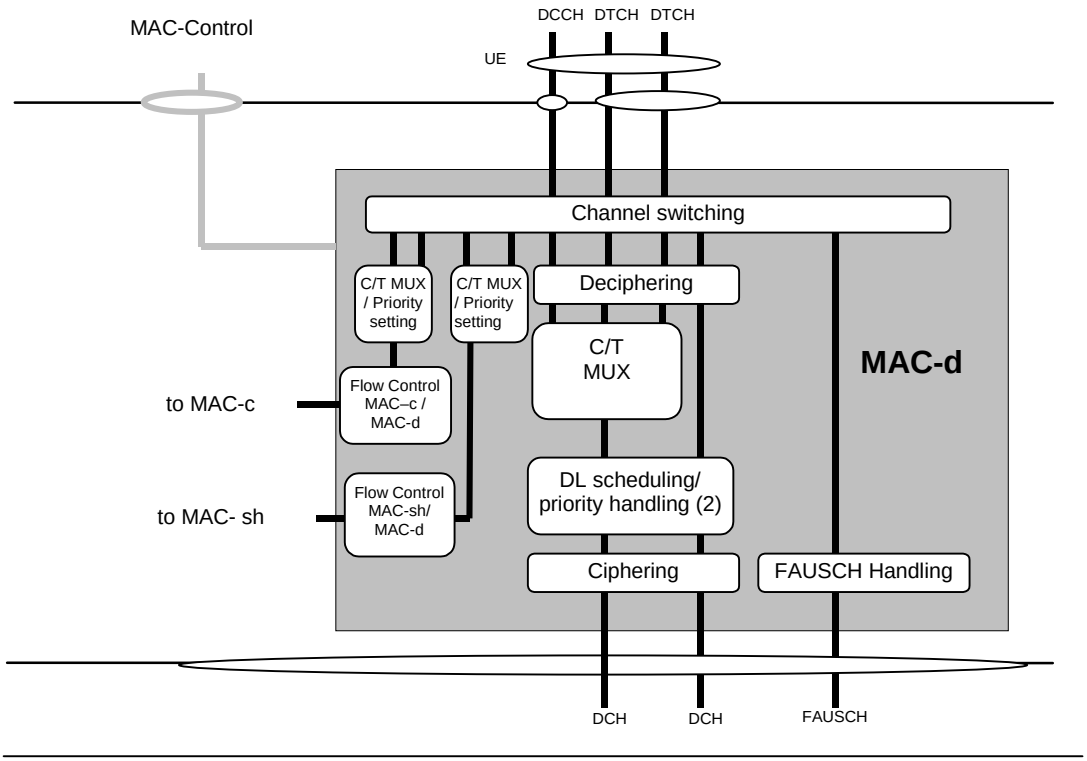


Figure 4.2.4.2 UTRAN side MAC architecture / MAC-c details

Figure 4.2.4.3 shows the UTRAN side MAC-d entity. The following functionality is covered:

- Dynamic transport channel type switching is performed by this entity, based on decision taken by RRC.
- The C/T MUX box is used when multiplexing of several dedicated logical channels onto one transport channel is used. C/T Mux is also responsible for priority setting on data received from DCCH / DTCH.
- Each MAC-d entity using common channels is connected to a MAC-c entity that handles the scheduling of the common channels to which the UE is assigned and DL (FACH) priority identification to MAC-c (priority identification of each PDU for DTCH NRT data is FFS).
- Each MAC-d entity using downlink shared channel is connected to a MAC-sh entity that handles the shared channels to which the UE is assigned and indicates the level of priority of each PDU to MAC-sh and to MAC-c.
- Each MAC-d entity is responsible for mapping dedicated logical channels onto the available common and dedicated transport channels. One dedicated logical channel can be mapped simultaneously on DCH and DSCH.

- In the downlink, scheduling and priority handling of transport channels is performed within the allowed transport format combinations of the TFCS assigned by the RRC. This function supports the TFCI insertion in Node B .
- FAUSCH Handling indicates the function in the MAC-d supports the FAUSCH, details are ffs.
- Support of Ciphering / Deciphering for transparent RLC operation in MAC , see [2] for details on the concept.
- A flow control function exists toward MAC-c and MAC-sh to limit buffering between MAC-d and MAC-c or MAC-sh entities. This function is intended to limit layer 2 signalling latency and reduce discarded and retransmitted data as a result of FACH or DSCH congestion. It also allows to handle quality of service if MAC-d requires it.



DL Downlink
TF Transport Format
TFC Transport Format Combination
Note1 : for DCH and DSCH different scheduling mechanisms apply

RNTI Radio Network Temporary Identity
UE User Equipment
UL Uplink
(2) Support TFCI insertion in Node B
Note 3 : Ciphering is performed in MAC-d only for transparent RLC mode

Figure 4.2.4.3 UTRAN side MAC architecture / MAC-d details

Figure 4.2.4.4 shows the UTRAN side MAC-sh entity. The following functionality is covered:

- A specific UE ID is needed when using the DSCH Control Channel to identify the UE on the DSCH. This specific UE ID may be optimised for DSCH and will be allocated when a RAB is mapped onto a DSCH. Additionally, some timing information is needed to tell the UE when to listen to DSCH.
- The scheduling /priority handling box in MAC-sh shares the DSCH resources between the UEs and between data flows according to their priority.
- For TDD operation the demultiplex function is used to separate USCH data from different UEs, i.e. to be transferred to different MAC-d entities.
- DL code allocation is used to indicate the code used on the DSCH and the appropriate Transport format on the DSCH.
- Flow control is provided to MAC-d.

The RLC has to provide RLC-PDU's to the MAC which fits into the available transport blocks on the transport channels respectively.

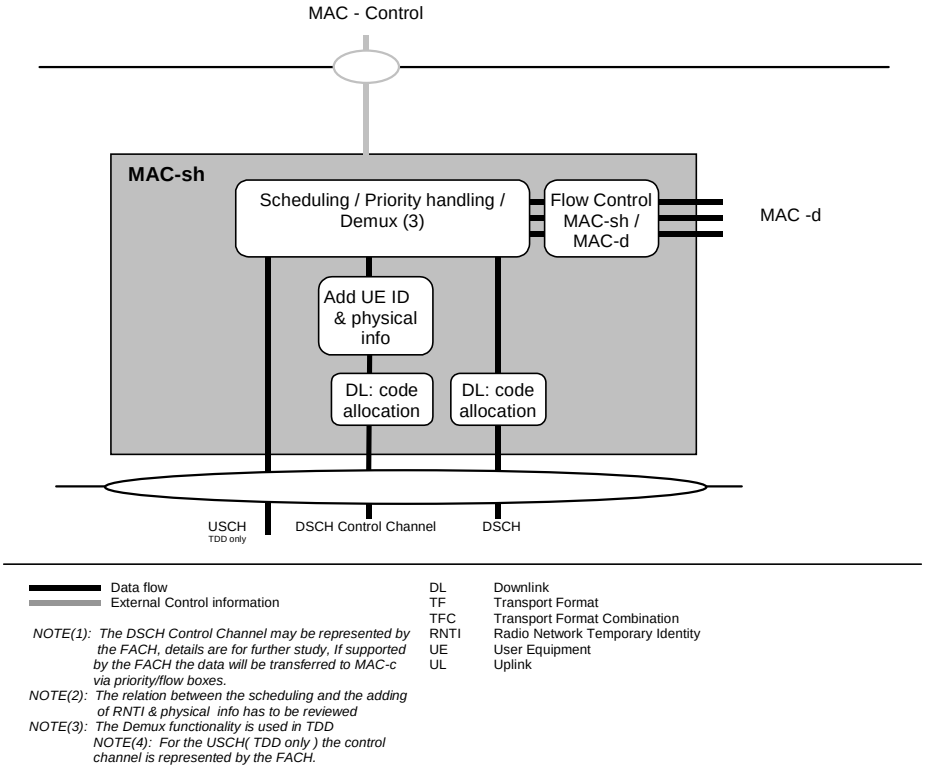


Figure 4.2.4.4 UTRAN side MAC architecture / MAC-sh details