TSG-RAN Meeting #11 *RP-010025*
Palm Springs, CA, USA, 13 - 16 March 2001

Title: **Agreed CRs (Release '99) to TS 25.321**

Source: **TSG-RAN WG2**

Agenda item: **5.2.3**

Doc-1st-	Status-	Spec	CR	Rev	Phase	Subject	Cat	Version	Versio
R2-010096	agreed	25.321	061		R99	Removal of FAUSCH	F	3.6.0	3.7.0
R2-010687	agreed	25.321	066	3	R99	TFC selection algorithm correction	F	3.6.0	3.7.0
R2-010685	agreed	25.321	067	3	R99	Miscellaneous corrections	F	3.6.0	3.7.0
R2-010686	agreed	25.321	068	2	R99	Clarification on Traffic Volume Measurement Procedure	F	3.6.0	3.7.0
R2-010607	agreed	25.321	070	1	R99	Clarification on parameters of the primitives	F	3.6.0	3.7.0

3GPP TSG-RAN WG2 Meeting #18
Edinburgh, Scotland, 15th – 19th January 2001

R2-010096

CR-Form-v3

CHANGE REQUEST

⌘ **25.321** **CR** **061** ⌘ rev **-** ⌘ Current version: **3.6.0** ⌘

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

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

Title:	⌘	Removal of FAUSCH
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	***Date:*** ⌘ 15/01/2001
Category:	⌘ **F**	***Release:*** ⌘ R99

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	RAN#10 plenary has approved CR055r1 on TS 25.321, where FAUSCH should be removed in TS 25.321. The deletion was not applied to figure 4.2.4.2.1: UTRAN side MAC architecture / MAC-d details.
Summary of change:	⌘	4.2.4.2 : FAUSCH removed in figure 4.2.4.2.1
Consequences if not approved:	⌘	Inconsistent models of MAC-d on UE and UTRAN side

Clauses affected:	⌘	4.2.4.2		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

4.2.4.2 MAC-d entity – UTRAN Side

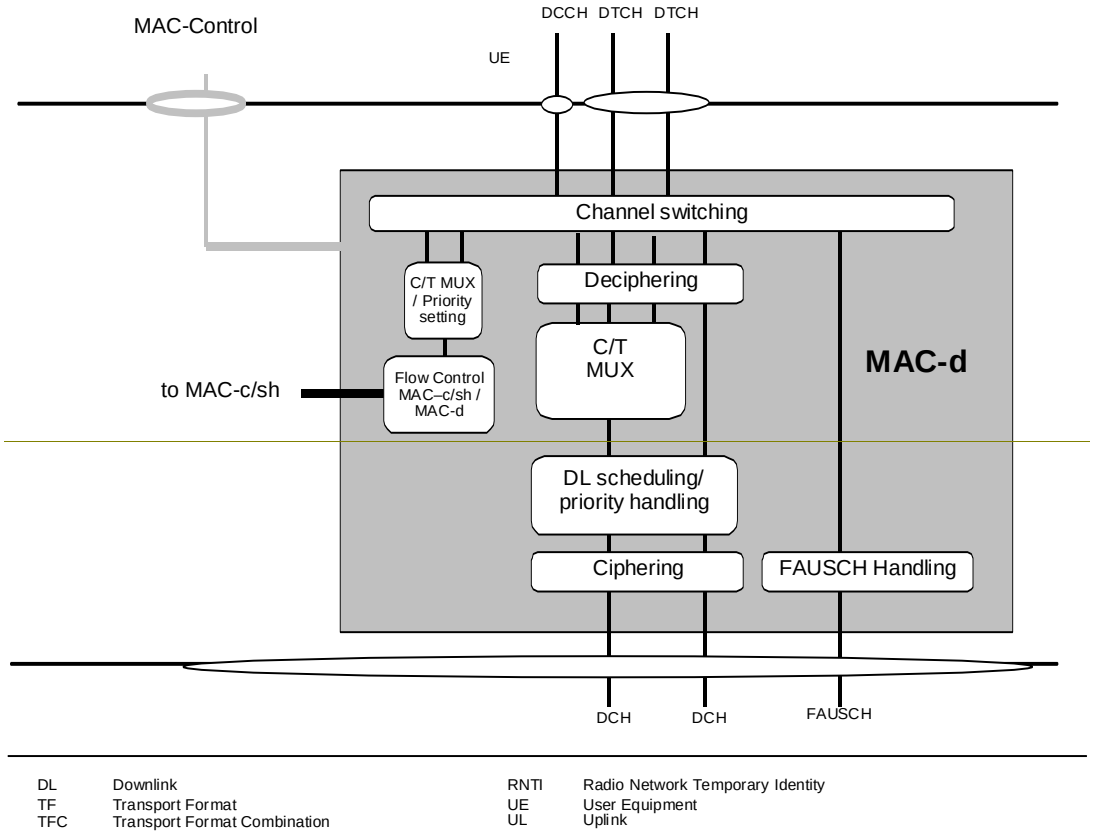
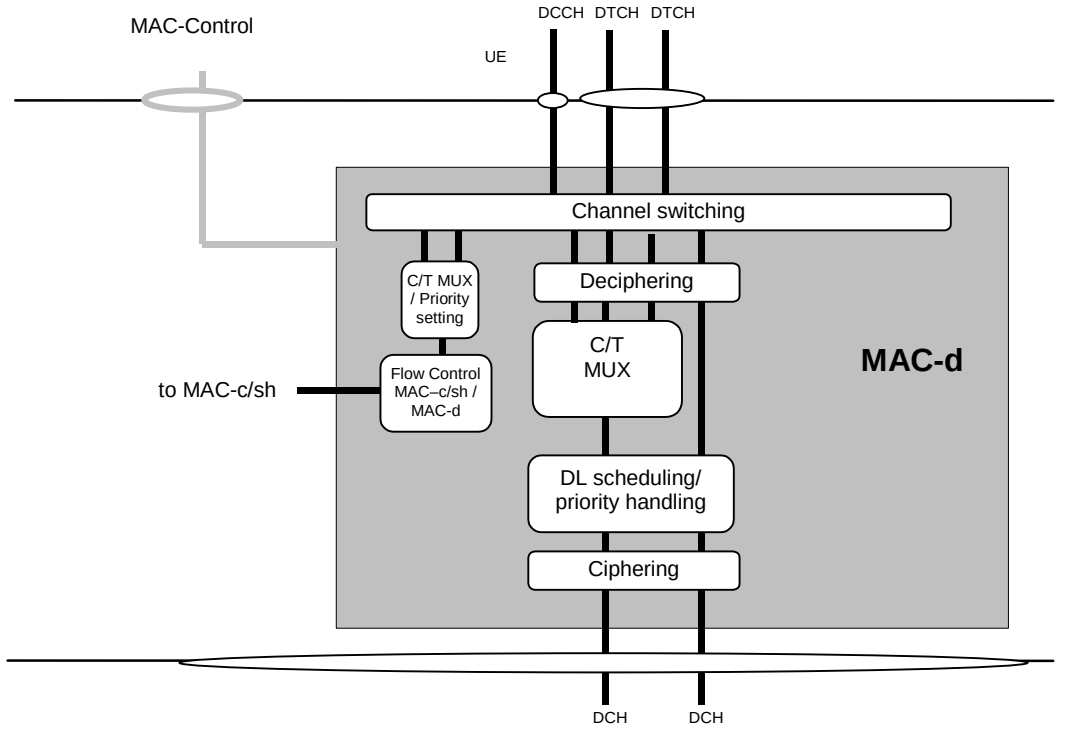


Figure 4.2.4.2.1: UTRAN side MAC architecture / MAC-d details



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

Figure 4.2.4.2.1: UTRAN side MAC architecture / MAC-d details

3GPP TSG-RAN WG2 Meeting #18
Sophia-Antepolis, France, 19 - 23 Feb. 2001

R2-010687

CR-Form-v3

CHANGE REQUEST

⌘ **25.321** **CR** **066** ⌘ rev **r2** ⌘ Current version: **3.6.0** ⌘

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

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

Title:	⌘	TFC selection algorithm correction
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	***Date:*** ⌘ 10 Jan. 2001
Category:	⌘ **F**	***Release:*** ⌘ R99

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
REL-4 *(Release 4)*
REL-5 *(Release 5)*

Reason for change:	⌘	The existing TFC selection algorithm was ambiguous about whether and when the use of padding blocks was allowed. This CR explicitly disallows the use of padding blocks for as long as the TFCS selection follows the guidelines introduced in CR705 (Tdoc R2-010461). Also, it proposes that MAC be the entity in charge of guarantying that the TFC used is consistent with all the RLC configurations. For MAC to be able to make this decision more information is needed. Thus a new primitive is introduced between MAC and RLC. The step by step process is replaced by a set of constraints on the selected TFC.
Summary of change:	⌘	1. The CR was merged with part of CR70 (R2-010373) from ASUSTek, taking into account the corresponding comments that they received when this was visited. 2. The CR was merged with CR71 (R2-010373) from Ericsson. 3. The set of valid TFCs is restricted based on the current RLC configuration and the amount of data available. 4. The step by step process is eliminated in favour of constraints on the selected TFC.
Consequences if not approved:	⌘	Leaving open the use of padding blocks could result in significant degradation of mobile throughput or system capacity depending on how the current algorithm is interpreted.

Clauses affected:	⌘	2, 8.2.1, 8.2.2, 11.4
Other specs Affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

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

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

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

2 References

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

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

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 25.301: "Radio Interface Protocol Architecture".

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

[4] 3GPP TS 25.303: "Interlayer Procedures in Connected Mode".

[5] 3GPP TS 25.304: "UE Procedures in Idle Mode and Procedures for Cell Reselection in Connected Mode".

[6] 3GPP TS 25.322: "RLC Protocol Specification".

[7] 3GPP TS 25.331: "RRC Protocol Specification".

[8] 3GPP TR 25.921: "Guidelines and Principles for Protocol Description and Error Handling".

[9] 3GPP TR 25.990: "Vocabulary for the UTRAN".

[10] 3GPP TS 33.102: "Security architecture".

[11] 3GPP TS 25.425: "UTRAN Iur Interface User Plane Protocols for Common Transport Channel Data Streams".

[12] 3GPP TS 25.133 "Requirements for support of radio resource management"

Primitives between MAC and RLC

8.2.1 Primitives

The primitives between MAC layer and RLC layer are shown in table 8.2.1.1.

Table 8.2.1.1: Primitives between MAC layer and RLC layer

~~Generic Name~~	~~Type~~				~~Parameters~~
	~~Request~~	~~Indication~~	~~Response~~	~~Confirm~~	
~~MAC-DATA~~	~~X~~	~~X~~			~~Data, Number of transmitted RLC PDUs, BO, UE-ID type indicator, TD (note)~~
~~MAC-STATUS~~		~~X~~	~~X~~		~~No_PDU, PDU_Size, BO, Tx_status~~
~~NOTE: TDD only.~~					

Generic Name	Parameter			
	Request	Indication	Response	Confirm
MAC-DATA	Data, BO, UE-ID type indicator, RLC Entity Info	Data, Number of submitted RLC PDUs, TD (note)		
MAC-STATUS		No_PDU, PDU_Size, TX status	BO, RLC Entity Info	
NOTE: TDD only.				

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 for each logical channel the rate at which it may transfer data to MAC. Parameters are the number of PDUs that can be transferred in each transmission time interval and the PDU size; it is possible that MAC would use this primitive to indicate that it expects the current buffer occupancy of the addressed logical channel in order to provide for optimised TFC selection on transport channels with long transmission time interval. At the UE, MAC-STATUS-Ind primitive is also used to indicate from MAC to RLC that MAC has requested data transmission by PHY (i.e. PHY-DATA-REQ has been submitted, see Fig. 11.2.2.1), or that transmission of an RLC PDU on RACH or CPCH has failed due to exceeded preamble ramping cycle counter.
- MAC-STATUS-Resp primitive 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 or to indicate the current buffer occupancy to MAC.

8.2.2 Parameters

a) Data:

- it contains the RLC layer messages (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 for each logical channel 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.

g) UE-ID Type Indicator:

- indicates the UE-ID type to be included on MAC for a DCCH when it is mapped onto a common transport channel (i.e. FACH, RACH or CPCH).

h) ~~TX_Status~~TX status:

- ~~-~~ when set to value "transmission unsuccessful" this parameter indicates to RLC that transmission of an RLC PDU failed in the previous Transmission Time Interval, when set to value "transmission successful" this parameter indicates to RLC that the requested RLC PDU(s) has been submitted for transmission by the physical layer.

i) RLC Entity Info

- indicates to MAC the configuration parameters which are critical to TFC selection depending on its mode and the amount of data that could be transmitted at the next TTI. This primitive is meant to insure that MAC can perform TFC selection (see ~~section~~clause 11.4).

11.4 Transport format combination selection in UE

RRC can control the scheduling of uplink data by giving a priority value between 1 and 8 for each logical channel where 1 is the highest priority and 8 the lowest. The selection of TFC in the UE shall be done according to the priorities between logical channels indicated by RRC. Logical channels have absolute priority i.e. the UE shall maximize the transmission of high priority data.

The scheme is performed each time a TFC selection is performed, i.e., each time the shortest configured TTI begins.

Each time the TFC selection is performed, the UE shall estimate which TFCs that can be supported. If the estimated power needed for a TFC is greater than the maximum UE transmitter power [7], the TFC shall not be used in the TFC selection algorithm below. The requirements for the estimation of supported TFCs are described in [12].

~~Consider the priorities N1..N2 (N2>N1) where data is available for transmission at the time the TFC selection is performed. Let S1 and S2 be sets of TFCs.~~

1. ~~Let S2 be the set of all TFCs in the TFCS that can be supported at the current UE maximum transmitter power.~~
2. ~~Priority N = N1.~~
3. ~~S1 = S2.~~
4. ~~If S1 contains one single TFC, select this TFC and end the procedure.~~
5. ~~Let S2 be the set of all TFCs in S1 that allow the highest amount of available priority N data bits to be transmitted.~~
6. ~~N = N + 1.~~
7. ~~If N > N2, select anyone of the TFCs in S2 and end the procedure.~~
8. ~~Go back to step 3.~~

Before selecting a TFC, the set of valid TFCs will be established. All TFCs in the set of valid TFCs shall:

1. belong to the TFCS.
2. be supported by the maximum UE transmitter power as defined above.
3. be compatible with the RLC configuration .
4. not require RLC to produce padding PDUs (see [6] for definition).

If the TFCS selected by UTRAN does not follow the guidelines specified in [7] the UE may ignore the last constraint mentioned above in determining the set of valid TFCs.

The chosen TFC shall be selected from within the set of valid TFCs and shall satisfy the following criteria in the order in which they are listed below:

1. No other TFC shall allow the transmission of more highest priority data than the chosen TFC.
2. No other TFC shall allow the transmission of more data from the next lower priority logical channels. Apply this criterion recursively for the remaining priority levels.
3. No other TFC shall have a lower bit rate than the chosen TFC.

The above rules for TFC selection in the UE shall apply to DCH, and the same rules shall apply for TF selection on RACH and CPCH.

~~When the UE output power is approaching the UE maximum transmit power and the inner loop for power control can no longer be maintained for coverage reasons, the UE shall adapt to the TFC corresponding to the next lower bit rate, i.e. the TFC with the present total bit rate shall not be used. If the bit rate of a logical channel carrying data from a codec supporting variable-rate operation is impacted, the codec data rate shall be adopted accordingly.~~

~~The UE shall continuously estimate whether the maximum transmitter power is sufficient to support the temporarily blocked TFC. When the maximum transmitter power is sufficient, the temporarily blocked TFC shall again be considered in the TFC selection.~~

The maximum UE power is defined in [25.331].

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

Tdoc R2-010685

CR-Form-v3

CHANGE REQUEST

⌘ **25.321** **CR** **067** ⌘ rev **r2** ⌘ Current version: **3.6.0** ⌘

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

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☒ Core Network ☐

Title:	⌘	Miscellaneous corrections
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	***Date:*** ⌘ 2001-02-20
Category:	⌘ **F**	***Release:*** ⌘ R99

Use one of the following categories:	*Use one of the following releases:*	
F *(essential correction)*	*2*	*(GSM Phase 2)*
A *(corresponds to a correction in an earlier release)*	*R96*	*(Release 1996)*
B *(Addition of feature),*	*R97*	*(Release 1997)*
C *(Functional modification of feature)*	*R98*	*(Release 1998)*
D *(Editorial modification)*	*R99*	*(Release 1999)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.	*REL-4*	*(Release 4)*
	REL-5	*(Release 5)*

Reason for change: ⌘ In RAN2 WG2 Meeting #18, Nortel Networks presented document R2-010224, 'Some issues in 25.321', it was then agreed some point needed clarification and that a CR shall be draft, reviewed internally by the interesting company before RAN2 WG2 Meeting #19 and with eventually some modification coming form feedback from those company represented in RAN2 WG2 Meeting #19.

Summary of change: ⌘

1. 4.2.3.1, 4.2.3.2, 4.2.4.1 and 4.2.4.2: the unused abbreviations have been removed from the picture;
2. The Dynamic Transport Channel Type functionality has been explained a bit more;
3. FAUSCH has been removed from 4.2.4.2.1 (merged with CR 061 R2-010096);
4. 6.2.1 and 6.2.2: the Dynamic Transport Channel Type column has been removed;
5. ~~5.~~11.4: clarification, editorial correction and removal of unused reference to the Temporarily Blocked TFC.
5. Remaining of Dynamic Transport Channel Type Switching to Transport Channel Type Switching
6. Removal of change in section on 11.4 as they are already covered in CR 071 R2-010373.
7. As agreed in the plenary, section 4.3.3 has been removed from 25.321 and a revised version of it will be included in 25.301.

Consequences if not approved: ⌘ Unclarity and Inconsistency of the specification.

Clauses affected: ⌘ 4.2.3.1, 4.2.3.2, 4.2.4.1, 4.2.4.2, 4.3.3, 6.1, 6.2.1, 6.2.2

Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

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

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

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

4.2.3.1 MAC-c/sh entity – UE Side

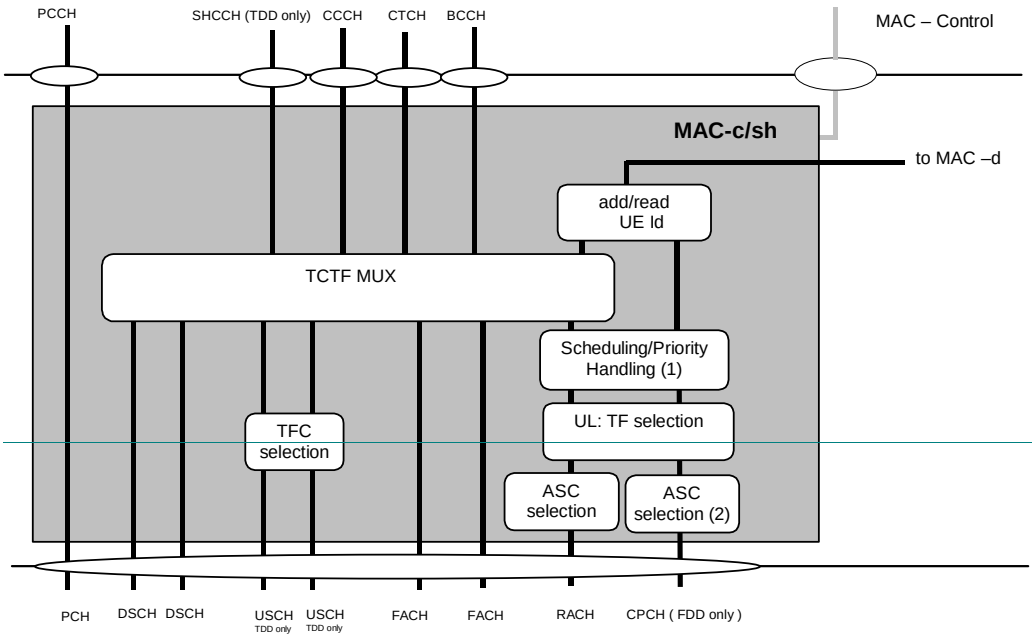
Figure 4.2.3.1.1 shows the UE side MAC-c/sh entity.

The following functionality is covered:

- TCTF MUX:
  - this function represents the handling (insertion for uplink channels and detection and deletion for downlink channels) 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;
- add/read UE Id:
  - the UE Id is added for CPCH and RACH transmissions
  - the UE Id, when present, identifies data to this UE.
- UL: TF selection:
  - in the uplink, the possibility of transport format selection exists.
    In case of CPCH transmission, a TF is selected based on TF availability determined from status information on the CSICH;
- ASC selection:
  - For RACH, MAC indicates the ASC associated with the PDU to the physical layer. For CPCH, MAC may indicate the ASC associated with the PDU to the Physical Layer. This is to ensure that RACH and CPCH 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
  - this functionality is used to transmit the information received from MAC-d on RACH and CPCH based on logical channel priorities. This function is related to TF selection.
- TFC selection
  - transport format and transport format combination selection according to the transport format combination set (or transport format combination subset) configured by RRC is performed,

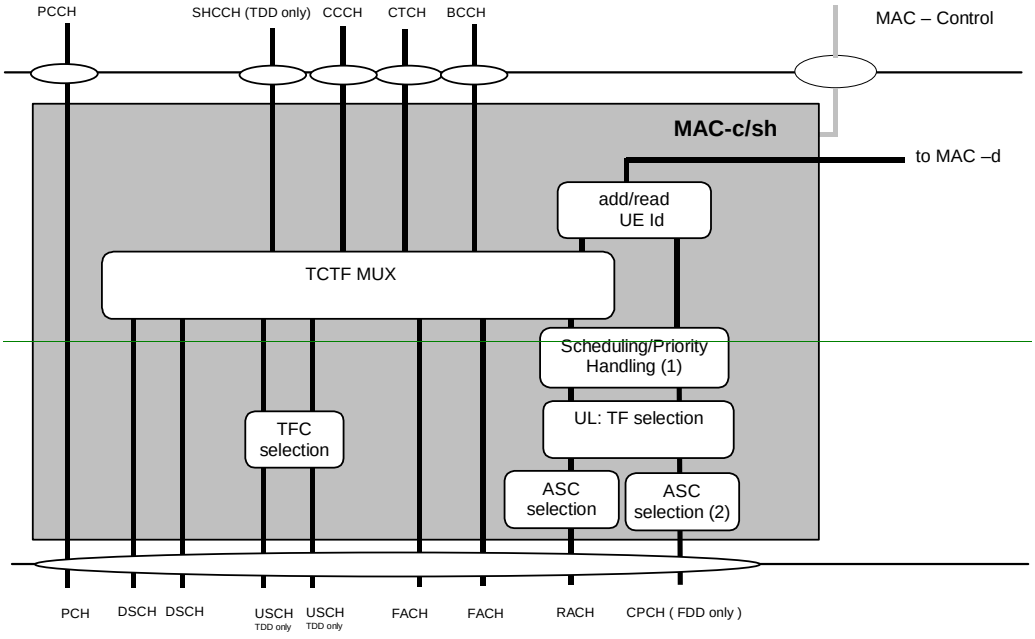
The RLC provides RLC-PDUs to the MAC, which fit into the available transport blocks on the transport channels.

There is one MAC-c/sh entity in each UE.

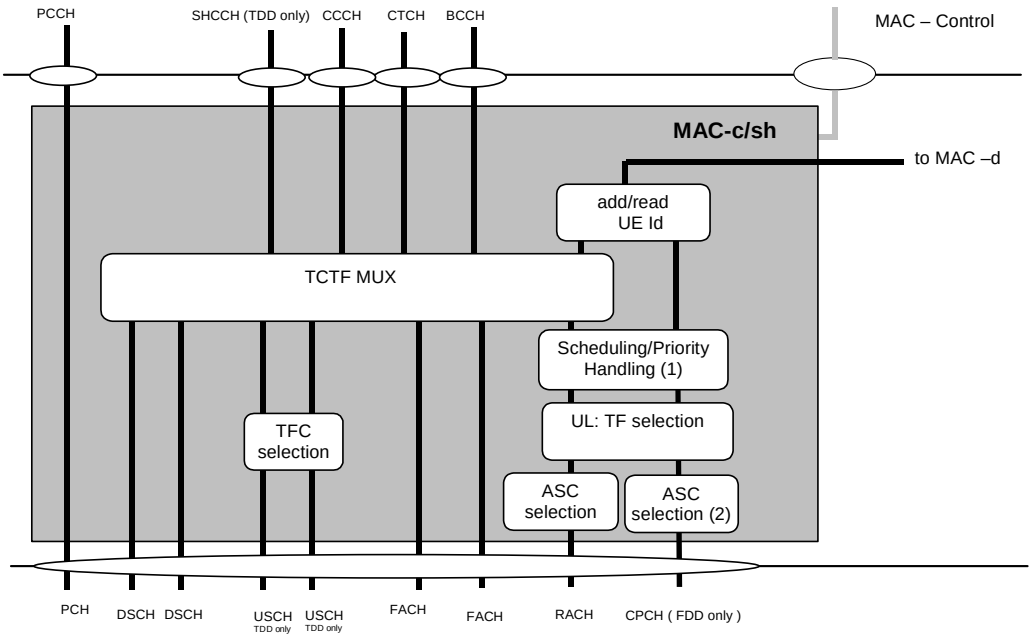


DL	Downlink	UE	User Equipment
TF	Transport Format	UL	Uplink
TFC	Transport Format Combination		
TCTF	Target Channel Type Field		
(1)	Scheduling /Priority handling is applicable for CPCH, details are ffs.		
(2)	In case of CPCH, ASC selection may be applicable for AP preamble.		

~~Figure 4.2.3.1.1: UE side MAC architecture / MAC-c/sh details~~



~~Figure 4.2.3.1.1: UE side MAC architecture / MAC-c/sh details~~



Note 1: Scheduling /Priority handling is applicable for CPCH.
Note 2: In case of CPCH, ASC selection may be applicable for AP preamble.

Figure 4.2.3.1.1: UE side MAC architecture / MAC-c/sh details

4.2.3.2 MAC-d entity – UE Side

Figure 4.2.3.2.1 shows the UE side MAC-d entity.

The following functionality is covered:

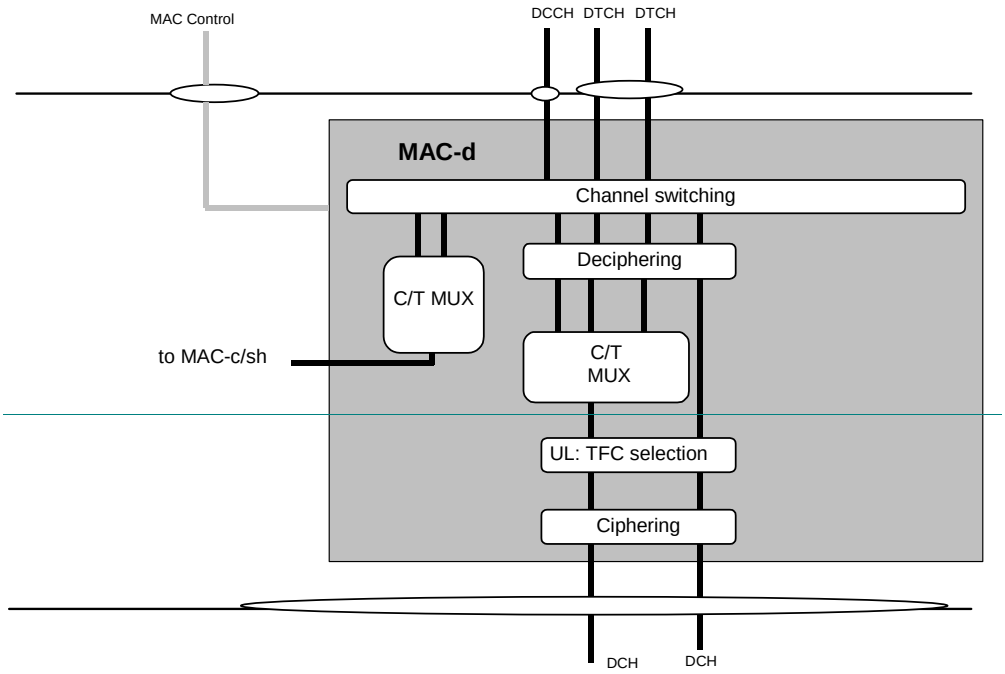
- ~~Dynamic~~ Transport Channel type switching
  - ~~dynamic~~~~Dynamic~~ T~~t~~ransport C~~e~~hannel type switching is performed by this entity, based on decision taken by RRC. This is ~~usually~~ related to a change of radio resources. If requested by RRC, MAC shall switch the mapping of one designated logical channel between common and dedicated transport channels.
- C/T MUX:
  - T~~t~~he C/T MUX is used when multiplexing of several dedicated logical channels onto one transport channel is used. An unambiguous identification of the logical channel is included.
- Ciphering:
  - Ciphering for transparent mode data to be ciphered is performed in MAC-d. Details about ciphering can be found in [10].
- Deciphering:
  - Deciphering for ciphered transparent mode data is performed in MAC-d. Details about ciphering can be found in [10].
- UL TFC selection:
  - T~~t~~ransport format and transport format combination selection according to the transport format combination set (or transport format combination subset) configured by RRC is performed.

The MAC-d entity is responsible for mapping dedicated logical channels for the uplink either onto dedicated transport channels or to transfer data to MAC-c/sh to be transmitted via common channels.

One dedicated logical channel can be mapped simultaneously onto DCH and DSCH;

The MAC-d entity has a connection to the MAC-c/sh entity. This connection is used to transfer data to the MAC-c/sh to transmit data on transport channels that are handled by MAC-c/sh (uplink) or to receive data from transport channels that are handled by MAC-c/sh (downlink).

There is one MAC-d entity in the UE.



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 4.2.3.2.1: UE side MAC architecture / MAC-d details

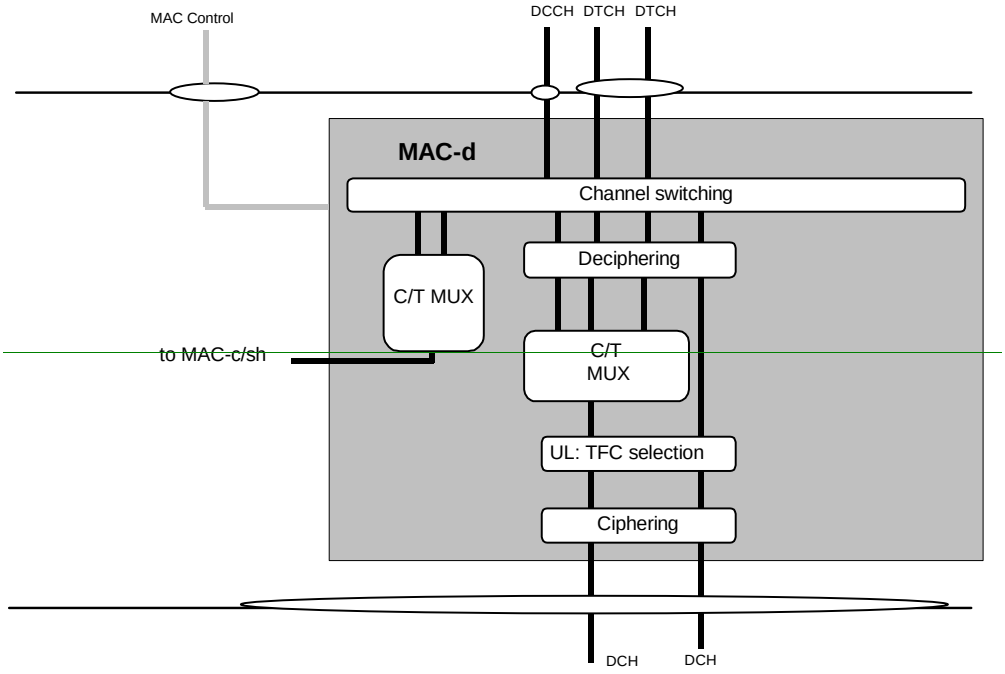
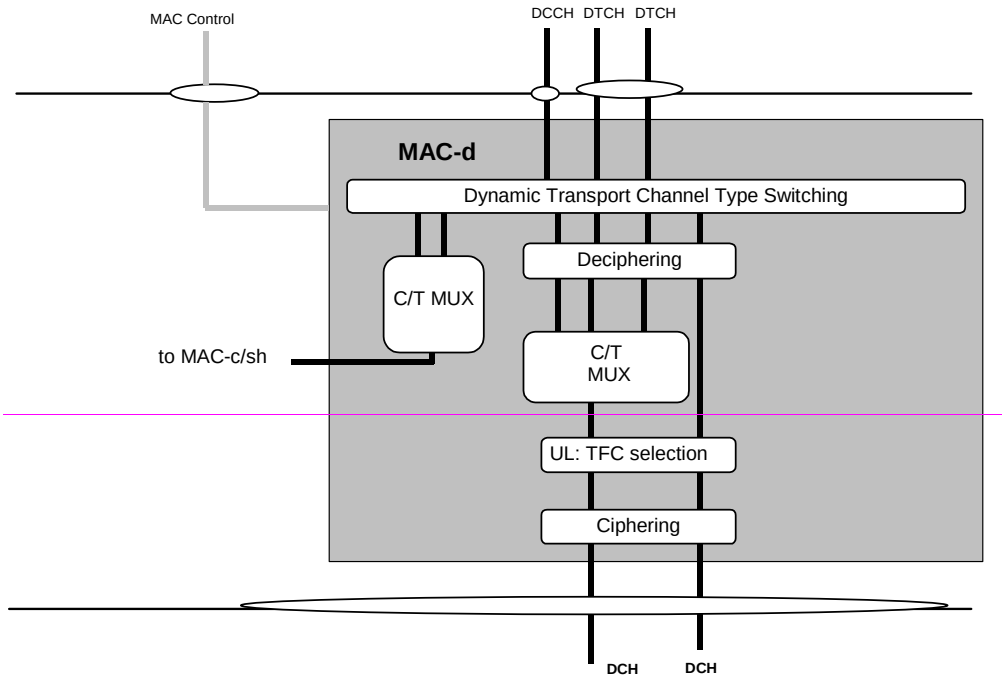
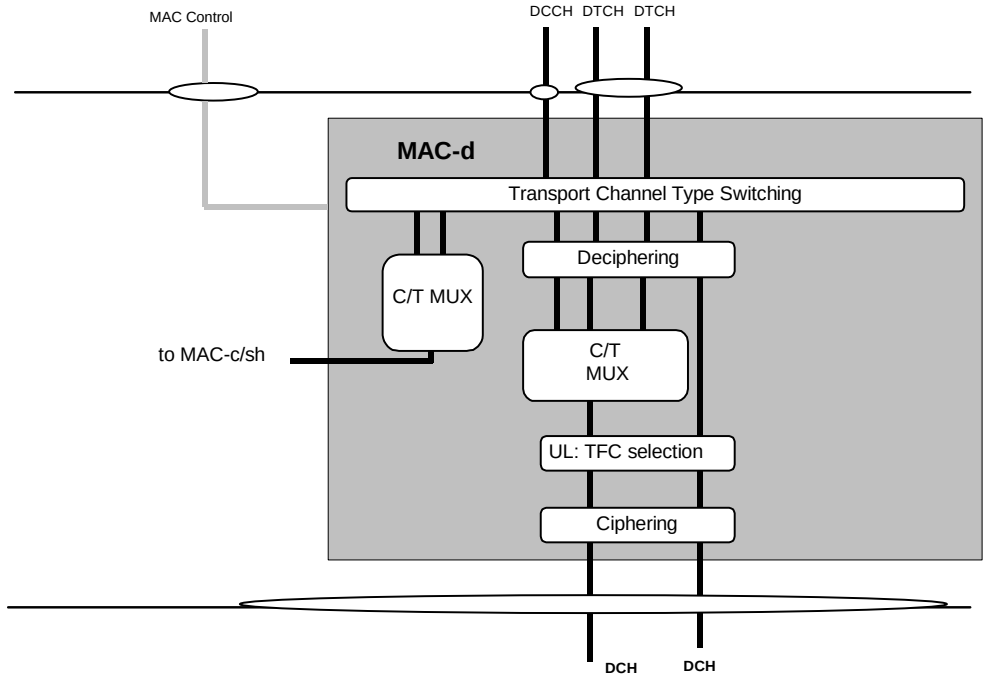


Figure 4.2.3.2.1: UE side MAC architecture / MAC-d details



Note 1: For DCH and DSCH different scheduling mechanism apply
Note 2: Ciphering is performed in MAC-d only for transparent RLC mode

~~Figure 4.2.3.2.1: UE side MAC architecture / MAC-d details~~



Note 1: For DCH and DSCH different scheduling mechanism apply
Note 2: Ciphering is performed in MAC-d only for transparent RLC mode

Figure 4.2.3.2.1: UE side MAC architecture / MAC-d details

4.2.4.1 MAC-c/sh entity – UTRAN Side

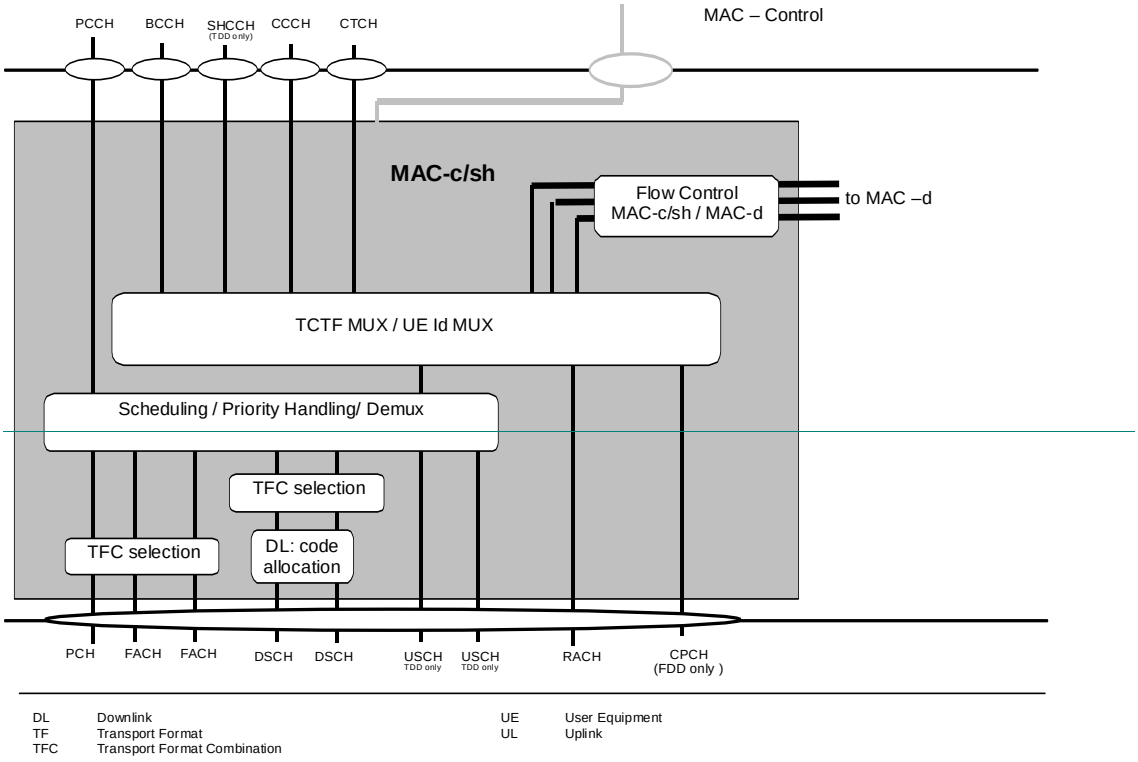
Figure 4.2.4.1.1 shows the UTRAN side MAC-c/sh entity. The following functionality is covered:

- the Scheduling – Priority Handling;
  - this function manages FACH and DSCH resources between the UE's and between data flows according to their priority.
- TCTF MUX
  - this function represents the handling (insertion for downlink channels and detection and deletion for uplink channels) 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;
- UE Id Mux;
  - for dedicated type logical channels, the UE Id field in the MAC header is used to distinguish between UEs;
- TFC selection:
  - in the downlink, transport format combination selection is done for FACH and PCH and DSCHs;
- demultiplex;
  - 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;
  - this functionis used to indicate the code used on the DSCH;

Flow control is provided to MAC-d.

The RLC provides RLC-PDUs to the MAC, which fit into the available transport blocks on the transport channels.

There is one MAC-c/sh entity in the UTRAN for each cell;



~~Figure 4.2.4.1.1: UTRAN side MAC architecture / MAC-c/sh details~~

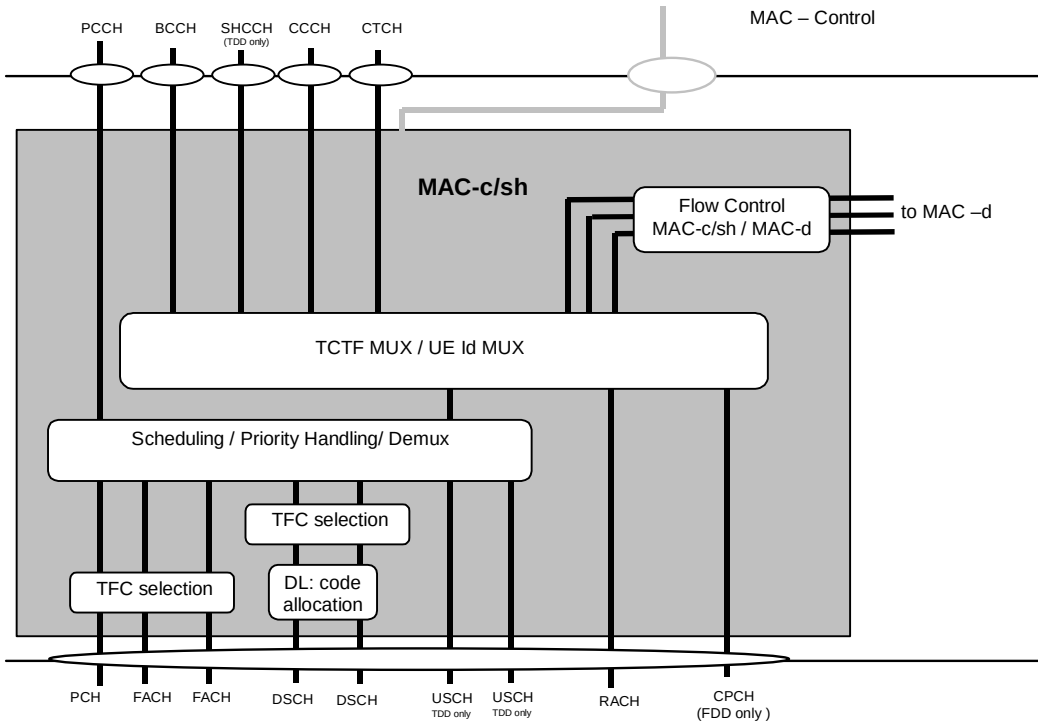


Figure 4.2.4.1.1: UTRAN side MAC architecture / MAC-c/sh details

4.2.4.2 MAC-d entity – UTRAN Side

Figure 4.2.4.2.1 shows the UTRAN side MAC-d entity.

The following functionality is covered:

- ~~Dynamic~~ Transport C~~c~~hannel type switching:
  - ~~D~~d~~ynamic~~ T~~t~~ransport C~~c~~hannel type switching is performed by this entity, based on decision taken by RRC. This is related to a change of radio resources. If requested by RRC, MAC shall switch the mapping of one designated logical channel between common and dedicated transport channels.
- C/T MUX box;
  - the function includes the C/T field when multiplexing of several dedicated logical channels onto one transport channel is used.
- Priority setting;
  - This function is responsible for priority setting on data received from DCCH / DTCH;
- Ciphering;
  - Ciphering for transparent mode data to be ciphered is performed in MAC-d. Details about ciphering can be found in [10].
- Deciphering;
  - Deciphering for ciphered transparent mode data is performed in MAC-d. Details about ciphering can be found in [10].
- DL Scheduling/Priority handling;
  - 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.
- Flow Control;
  - a flow control function exists toward MAC-c/sh to limit buffering between MAC-d and MAC-c/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. For the Iur interface this is specified in [11].

A 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;

A 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;

A MAC-d entity is responsible for mapping dedicated logical channels onto the available dedicated transport channels or routing the data received on a DCCH or DTCH to MAC-c/sh.

One dedicated logical channel can be mapped simultaneously on DCH and DSCH. Different scheduling mechanisms apply for DCH and DSCH.

There is one MAC-d entity in the UTRAN for each UE ~~served UE~~ which has one or more dedicated logical channels to or from the UTRAN.

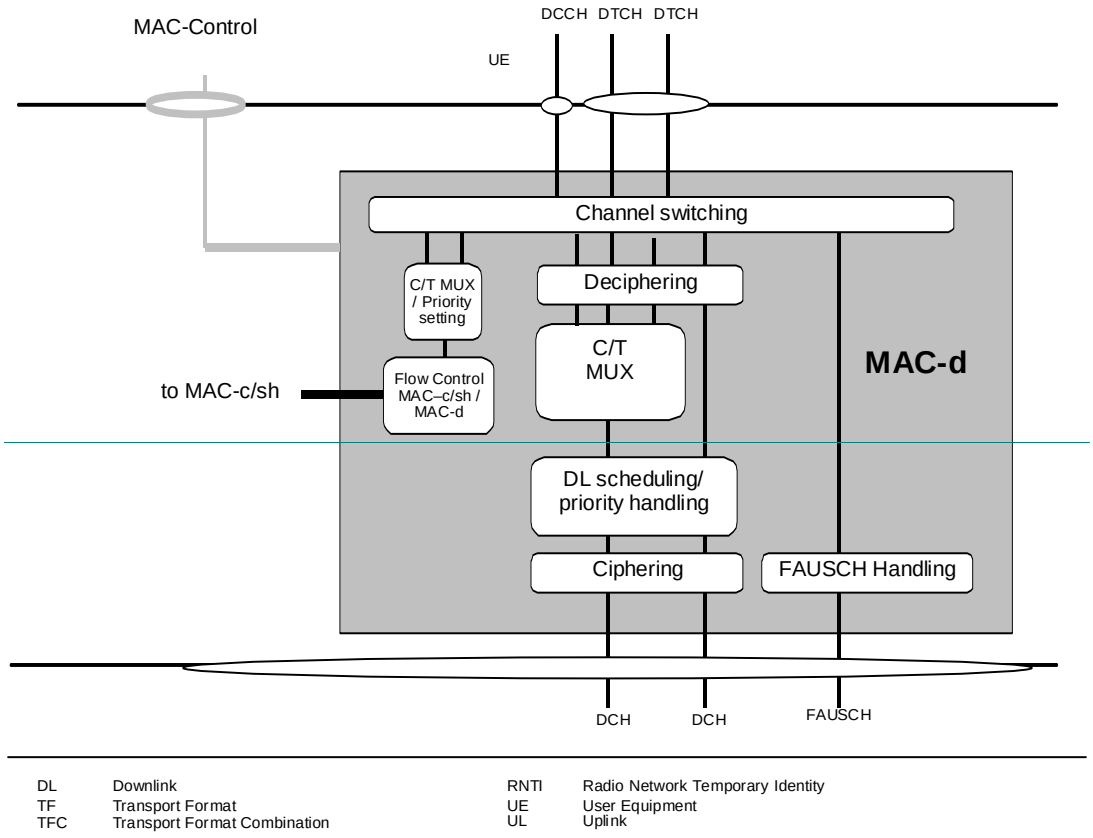


Figure 4.2.4.2.1: UTRAN side MAC architecture / MAC-d details

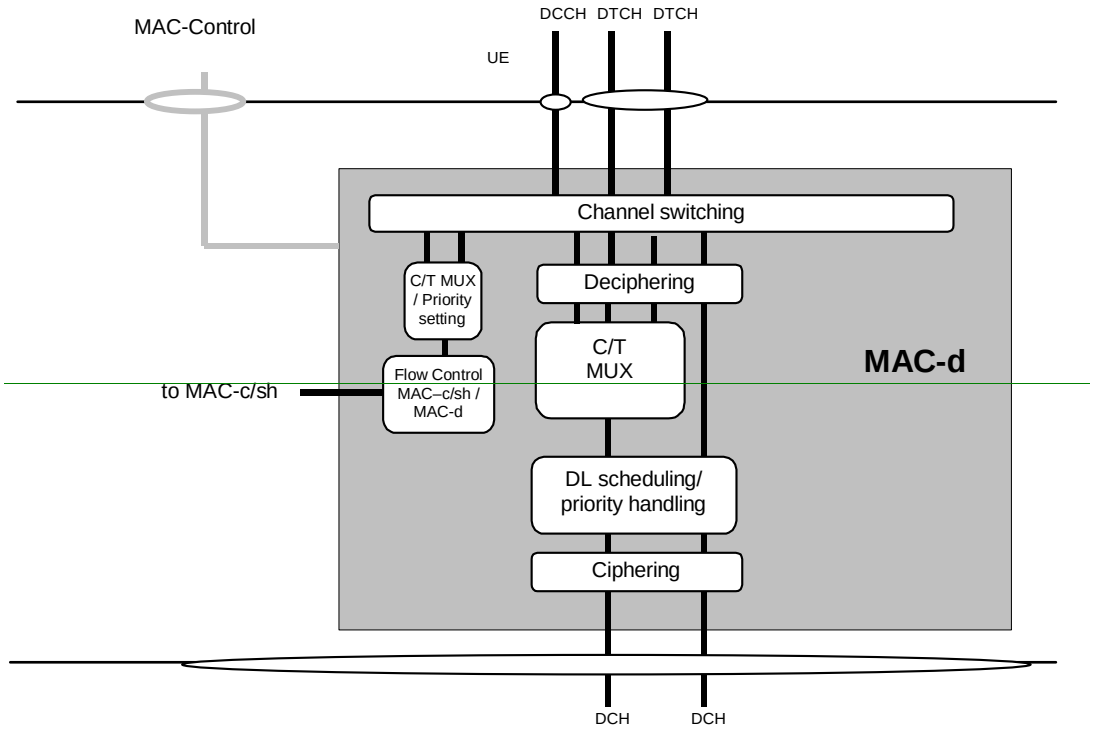
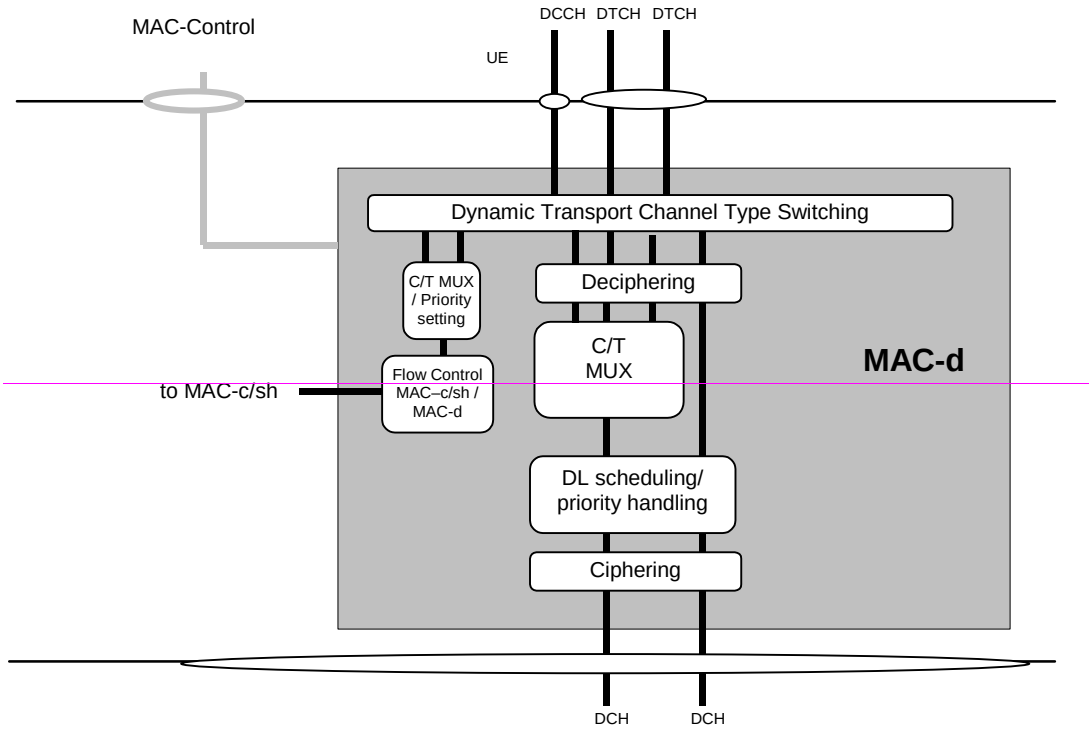


Figure 4.2.4.2.1: UTRAN side MAC architecture / MAC-d details



~~Figure 4.2.4.2.1: UTRAN side MAC architecture / MAC-d details~~

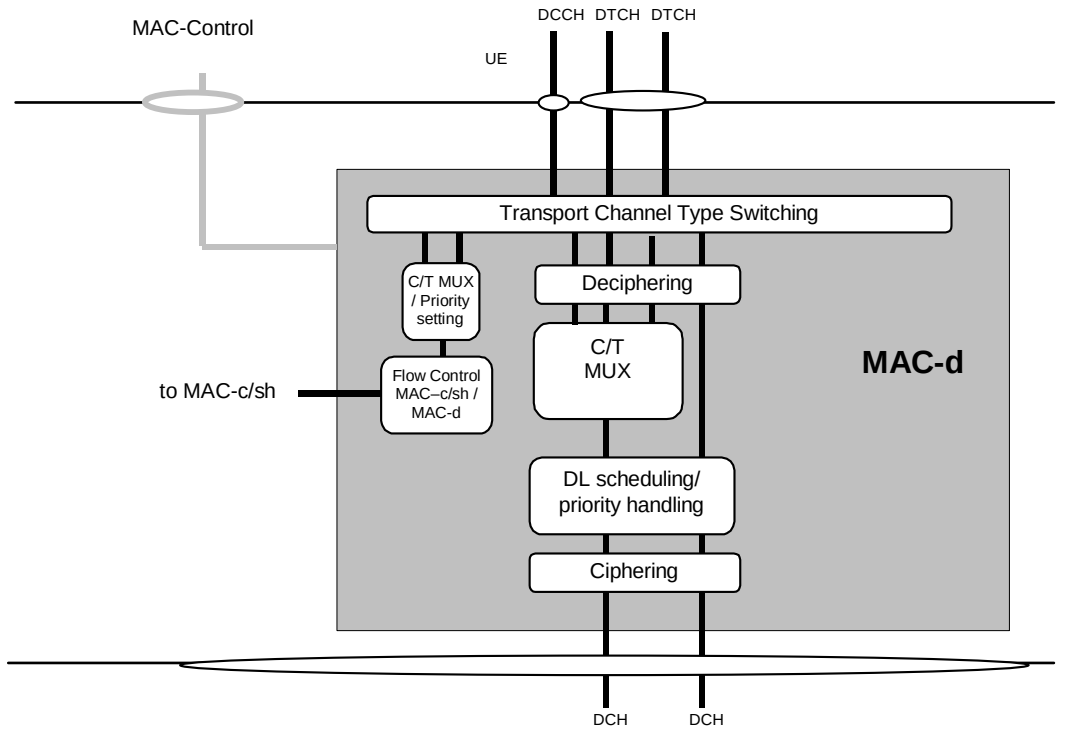


Figure 4.2.4.2.1: UTRAN side MAC architecture / MAC-d details

~~4.3.3 Mapping between logical channels and transport channels~~

~~The following connections between logical channels and transport channels exist:~~

- ~~BCCH is connected to BCH and may also be connected to FACH;~~
- ~~PCCH is connected to PCH;~~
- ~~CCCH is connected to RACH and FACH;~~
- ~~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;~~
  ~~DCCH and DTCH can be mapped to the USCH (TDD only);~~
- ~~CTCH is connected to FACH;~~
- ~~SHCCH is connected to RACH and USCH/FACH and DSCH.~~

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 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;
- ~~Dynamic~~ Transport Channel type switching;
- ciphering for transparent RLC;
- Access Service Class selection for RACH and CPCH transmission.

6.2 Relation between MAC Functions and Transport Channels

6.2.1 Relation between MAC Functions and Transport Channels in UTRAN

~~Table 6.2.1.1: UTRAN MAC functions corresponding to the transport channel~~

~~Associated MAC Functions~~	~~Logical Ch~~	~~Trans-port Ch~~	~~TF Sele-ction~~	~~Priority handling between users~~	~~Priority handling (one user)~~	~~Sched-uling~~	~~Identifi-cation 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~~
	~~DTCH~~	~~USCH~~	~~X~~					~~X~~		~~X~~
	~~DCCH~~	~~USCH~~	~~X~~					~~X~~		~~X~~
~~Downlink (Tx)~~	~~BCCH~~	~~BCH~~				~~X~~				
	~~BCCH~~	~~FACH~~	~~X~~			~~X~~		~~X~~		
	~~PCCH~~	~~PCH~~	~~X~~			~~X~~				
	~~CCCH~~	~~FACH~~	~~X~~	~~X~~		~~X~~		~~X~~		
	~~CTCH~~	~~FACH~~	~~X~~			~~X~~		~~X~~		
	~~DCCH~~	~~FACH~~	~~X~~	~~X~~		~~X~~	~~X~~	~~X~~		
	~~DCCH~~	~~DSCH~~	~~X~~	~~X~~				~~X~~		
	~~DCCH~~	~~DCH~~	~~X~~		~~X~~				~~X~~	
	~~DTCH~~	~~FACH~~	~~X~~	~~X~~		~~X~~	~~X~~	~~X~~		~~X~~
	~~DTCH~~	~~DSCH~~	~~X~~	~~X~~				~~X~~		~~X~~
	~~DTCH~~	~~DCH~~	~~X~~		~~X~~				~~X~~	~~X~~
	~~SHCCH~~	~~FACH~~	~~X~~	~~X~~		~~X~~		~~X~~		
	~~SHCCH~~	~~DSCH~~	~~X~~	~~X~~				~~X~~		~~X~~

Table 6.2.1.1: UTRAN MAC functions corresponding to the transport channel

Associated MAC Functions	Logical Ch	Trans-port Ch	TF Sele-ction	Priority handling between users	Priority handling (one user)	Sched-uling	Identifi-cation of UEs	Mux/ Demux on common transport CH	Mux/ Demux on dedicated transport CH
Uplink (Rx)	CCCH	RACH						X	
	DCCH	RACH					X	X	
	DCCH	CPCH					X	X	
	DCCH	DCH							X
	DTCH	RACH					X	X	
	DTCH	CPCH					X	X	
	DTCH	DCH							X
	SHCCH	RACH					X	X	
	SHCCH	USCH						X	
	DTCH	USCH	X					X	
	DCCH	USCH	X					X	
Downlink (Tx)	BCCH	BCH				X			
	BCCH	FACH	X			X		X	
	PCCH	PCH	X			X			
	CCCH	FACH	X	X		X		X	

	CTCH	FACH	X			X		X	
	DCCH	FACH	X	X		X	X	X	
	DCCH	DSCH	X	X				X	
	DCCH	DCH	X		X				X
	DTCH	FACH	X	X		X	X	X	
	DTCH	DSCH	X	X				X	
	DTCH	DCH	X		X				X
	SHCCH	FACH	X	X		X		X	
	SHCCH	DSCH	X	X				X	

6.2.2 Relation of MAC Functions and Transport Channels in UE

~~**Table 6.2.2.1: UE MAC functions corresponding to the transport channel**~~

~~Func-tions~~	~~Logical Ch~~	~~Transport Ch~~	~~TF Selection~~	~~Priority handling data of one user~~	~~Identifica-tion~~	~~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~~	~~X~~	~~X~~	~~X~~		
	~~DCCH~~	~~CPCH~~	~~X~~	~~X~~	~~X~~	~~X~~		~~X~~
	~~DCCH~~	~~DCH~~	~~X~~	~~X~~			~~X~~	
	~~DTCH~~	~~RACH~~	~~X~~	~~X~~	~~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~~
	~~DCCH~~	~~USCH~~	~~X~~	~~X~~		~~X~~		~~X~~
	~~DTCH~~	~~USCH~~	~~X~~	~~X~~		~~X~~		~~X~~
~~Downlink (Rx)~~	~~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~~		
	~~SHCCH~~	~~DSCH~~				~~X~~		

Table 6.2.2.1: UE MAC functions corresponding to the transport channel

Func-tions	Logical Ch	Transport Ch	TF Selection	Priority handling data of one user	Identifica-tion	Mux/Demux on common transport channels	Mux/Demux on dedicated transport channels
Uplink (Tx)	CCCH	RACH				X	
	DCCH	RACH	X	X	X	X	
	DCCH	CPCH	X	X	X	X	
	DCCH	DCH	X	X			X
	DTCH	RACH	X	X	X	X	
	DTCH	CPCH	X	X	X	X	
	DTCH	DCH	X	X			X
	SHCCH	RACH				X	
	SHCCH	USCH	X	X		X	
	DCCH	USCH	X	X		X	
	DTCH	USCH	X	X		X	
Downlink (Rx)	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	

	SHCCH	DSCH				X	

3GPP TSG-RAN WG2 Meeting #19 ***R2-010686***
Sophia Antipolis, France, 19 – 23 Feb. 2001

CR-Form-v3

CHANGE REQUEST

⌘ **25.321** **CR** **068** ⌘ rev **r2** ⌘ Current version: **3.6.0** ⌘

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

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

Title:	⌘	Clarification on Traffic Volume Measurement Procedure
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	***Date:*** ⌘ 22 Feb. 2001
Category:	⌘	**F** ***Release:*** ⌘ R99

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change: ⌘
1. It is not clearly specified the meaning of Buffer Occupancy.
2. The comparison quantity in Event Trigger mode is unclear.
3. The reporting quantity is not aligned with other specs.
4. It is not clearly specified how MAC layer deals with “Average” and “Variance”.
5. Makes current Traffic Volume Measurement Procedure clearer.

Summary of change: ⌘
1. Clarify the meaning of Buffer Occupancy.
2. Measurement information elements are specified more clearly.
3. In Event Trigger mode, a new quantity Transport Channel Traffic Volume is defined and compared with the thresholds.
4. Triggering is performed on a Transport Channel basis.
5. Some text is added for the “Average” and “Variance” of Traffic Volume Measurement.
6. In measurement report, all reporting quantities are made optional.
7. Reporting is performed on a Radio Bearer basis.

In Rev2, the calculation of average and variance of BO is clarified.

Consequences if not approved: ⌘ The Traffic Volume Measurement procedure will not work properly.

Clauses affected: ⌘ 8.2.2, 8.3.2, 11.1

Other specs Affected:	⌘	**X** Other core specifications	⌘	25.331 25.922
		☐ Test specifications		
		☐ O&M Specifications		

Other comments: ⌘	

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

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

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

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

8.2 Primitives between MAC and RLC

8.2.1 Primitives

The primitives between MAC layer and RLC layer are shown in table 8.2.1.1.

Table 8.2.1.1: Primitives between MAC layer and RLC layer

Generic Name	Type				Parameters
	Request	Indication	Response	Confirm	
MAC-DATA	X	X			Data, Number of transmitted RLC PDUs, BO, UE-ID type indicator, TD (note)
MAC-STATUS		X	X		No_PDU, PDU_Size, BO, Tx_status
NOTE: TDD only.					

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 for each logical channel the rate at which it may transfer data to MAC. Parameters are the number of PDUs that can be transferred in each transmission time interval and the PDU size; it is possible that MAC would use this primitive to indicate that it expects the current buffer occupancy of the addressed logical channel in order to provide for optimised TFC selection on transport channels with long transmission time interval. At the UE, MAC-STATUS-Ind primitive is also used to indicate from MAC to RLC that MAC has requested data transmission by PHY (i.e. PHY-DATA-REQ has been submitted, see Fig. 11.2.2.1), or that transmission of an RLC PDU on RACH or CPCH has failed due to exceeded preamble ramping cycle counter.

- MAC-STATUS-Resp primitive 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 or to indicate the current buffer occupancy to MAC.

8.2.2 Parameters

a) Data:

- it contains the RLC layer messages (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 for each logical channel the amount of data in number of bytes that ~~is currently queued~~is available for transmission ~~(or~~ and retransmission~~)~~ in RLC layer. When MAC is connected to an AM RLC entity, control PDUs to be transmitted and RLC PDUs outside the RLC Tx window shall also be included in the BO. RLC PDUs that have been transmitted but not negatively acknowledged by the peer entity shall not be included in the BO.

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.

g) UE-ID Type Indicator:

- indicates the UE-ID type to be included on MAC for a DCCH when it is mapped onto a common transport channel (i.e. FACH, RACH or CPCH).

h) TX_Status:

- when set to value "transmission unsuccessful" this parameter indicates to RLC that transmission of an RLC PDU failed in the previous Transmission Time Interval, when set to value "transmission successful" this parameter indicates to RLC that the requested RLC PDU(s) has been submitted for transmission by the physical layer.

8.3 Primitives between MAC and RRC

8.3.1 Primitives

The primitives between MAC and RRC are shown in table 8.3.1.1.

Table 8.3.1.1: Primitives between MAC sub-layer and RRC

Generic Name	Type				Parameters
	Request	Indication	Response	Confirm	
CMAC-CONFIG	X				UE information elements RAB information elements TrCH information elements RACH transmission control elements Ciphering elements CPCH transmission control elements
CMAC-MEASUREMENT	X	X			Measurement information elements (for Request), Measurement result (for Indication)
CMAC-STATUS		X			Status info.

CMAC-CONFIG-Req:

- CMAC-CONFIG-Req is used to request for setup, release and configuration of a logical channel, e.g. RNTI allocation, switching the connection between logical channels and transport channels, TFCS update or scheduling priority of logical channel.

CMAC-MEASUREMENT-Req/Ind:

- CMAC-MEASUREMENT-Req is used by RRC to request MAC to perform measurements, e.g. traffic volume measurements;

- CMAC-MEASUREMENT-Ind is used to notify RRC of the measurement result.

CMAC-STATUS-Ind:

- CMAC-STATUS-Ind primitive notifies RRC of status information.

8.3.2 Parameters

See TS 25.331 for a detailed description of the UE, RB and TrCH information elements.

a) UE information elements
S-RNTI
SRNC identity
C-RNTI
Activation time

b) RB information elements
RB multiplexing info (Transport channel identity, Logical channel identity, MAC logical channel priority)

c) TrCH information elements
Transport Format Combination Set

d) Measurement information elements
Mode (~~p~~Periodical, ~~e~~Event ~~-t~~ Trigger~~ed or both~~)
Reporting Quantity identifiers
Time interval to take an average or a variance (applicable when Average or Variance is Reporting Quantity)
Reporting Interval (applicable when mode is Periodical)
Upper and Lower Thresholds, TH_U and TH_L (applicable when mode is Event Trigger)
~~TH_U~~
~~TH_L~~
~~Measurement quantity identifiers~~
~~Report Interval~~

e) Measurement result
Mode
Reporting Quantity~~ies~~
Event ID, ~~(~~4a or 4b (applicable when mode is Event Trigger)

f) Status info
when set to value ""transmission unsuccessful"" this parameter indicates to RRC that transmission of a TM RLC PDU failed (due to e.g. Maximum number of preamble ramping cycles reached for RACH in FDD), when set to value "transmission successful" this parameter indicates to RRC that the requested TM RLC PDU(s) has been submitted for transmission by the physical layer..

g) RACH transmission control elements
Set of ASC parameters (identifier for PRACH partitions, persistence values)
Maximum number of preamble ramping cycles M_{max}
Minimum and maximum number of time units between two preamble ramping cycles, N_{BO1min} and N_{BO1max}

h) Ciphering elements
Ciphering mode
Ciphering key
Ciphering sequence number

i) CPCH transmission control elements
CPCH persistency value, P for each Transport Format
Maximum number of preamble ramping cycles $N_{\_access\_fails}$
NF_max (Maximum number of frames for CPCH transmission for each Transport Format)
N_EOT (Number of EOT for release of CPCH transmission)
Backoff control timer parameters
Transport Format Set
Initial Priority Delays
Channel Assignment Active indication

11.1 Traffic volume measurement for dynamic radio bearer control

Dynamic radio bearer control is performed in RRC, based on the traffic volume measurement reported by MAC. Traffic volume information is gathered and measured in MAC layer and the result is reported from MAC layer to RRC layer.

Traffic volume measurement~~monitoring~~ procedure in MAC is shown in figure 11.1.1. MAC receives RLC PDUs together with ~~information of RLC transmission buffer.~~ BOs (Buffer Occupancies) from RLC entities, and may multiplex these RLC PDUs. If the reporting mode is Event Trigger, ~~Every TTI,~~ MAC compares for each TTI ~~the amount of data~~ ~~corresponding to a Transport Channel~~ Transport Channel Traffic Volume (equivalent to total sum of BOs for logical channels mapped onto a transport channel) with the thresholds set by RRC. If the value is out of range, MAC reports measurement result (i.e. BO, Average of BO, and Variance of BO) of each RB~~indicates the measurement reports on traffic volume status~~ to RRC. If the reporting mode is Periodical, MAC reports measurement result of each RB to RRC at the end of each Reporting Interval. The Reporting Interval is set by RRC. Thereby, RRC can be informed the traffic volume status of each logical and transport channel, and therefore can take proper action for new radio bearer configuration accordingly.

RRC requests MAC measurement report with the primitive CMAC-Measure-REQ including following parameters.

Measurement information elements.

- Mode
  Indicates whether the report should be ~~p~~Periodical, or e~~E~~vent ~~-t~~ Trigger~~ed~~

- Reporting Quantity identifiers
  Indicates what should be reported to RRC layer
  For each RB, BO (optional), Average of BO (optional), or Variance of BO(optional)

- Time interval to take an average or a variance (applicable when Average or Variance is Reporting Quantity)
  Indicates time interval to take an average or a variance of BO
  ~~The UE shall store the BO at least once each TTI.~~ The calculation of average and variance of BO shall be based on ~~at least~~ one sample of BO per 10ms~~TTI~~ during the~~is~~ time interval given in this information element. All samples taken in the time interval shall have equal weight in the calculation.

- Reporting Interval (applicable when mode is Periodical)
  Indicates the time interval of periodical report

- Upper and Lower Thresholds, TH_U and TH_L (applicable when mode is Event Trigger)

  - TH_U : Upper threshold value for each transport channel, used when Event ID = 4a

  - TH_L : Lower threshold value for each transport channel, used when Event ID = 4b

- ~~TH_U (If Event ID = 4a, then Reporting Threshold is Upper Threshold.)~~
  ~~Upper threshold value for every transport channel, applicable when mode is event-triggered~~

- ~~TH_L (If Event ID = 4b, then Reporting Threshold is Lower Threshold.)~~
  ~~Lower threshold value for every transport channel, applicable when mode is event-triggered~~

- ~~Measurement quantity identifiers~~
  ~~Indicates what should be reported to RRC layer~~
  ~~For each RB, Buffer Occupancy (mandatory), Variance (optional), or Average (optional)~~

- ~~Report Interval~~
  ~~Indicates the report interval, applicable when report mode is periodic~~

MAC receives RLC PDUs with the primitive MAC-Data-REQ including following parameters.

- Data (RLC PDU)

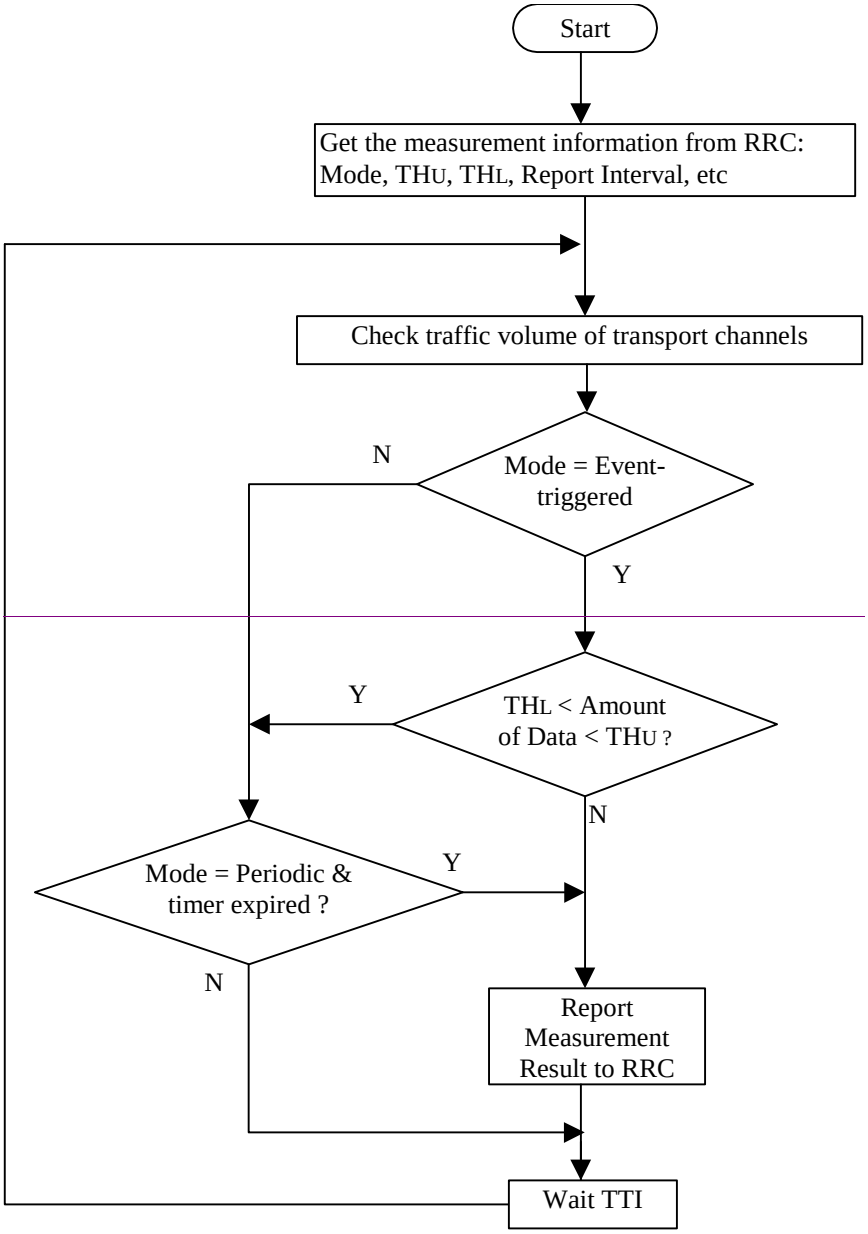
- Buffer Occupancy (BO)
  The parameter Buffer Occupancy (BO) indicates for each logical channel the amount of data in number of bytes that is ~~currently queued~~available for transmission ~~(or~~and retransmission~~)~~ in RLC layer. When MAC is connected to an AM RLC entity, control PDUs to be transmitted and RLC PDUs outside the RLC Tx window shall also be included in the BO. RLC PDUs that have been transmitted but not negatively acknowledged by the peer entity shall not be included in the BO.

MAC receives measurement information elements with the primitive CMAC-Measure-REQ that includes parameters such as Mode, Reporting Quantity identifiers, Time interval to take an average or a variance, Reporting Interval, and TH_U and TH_L~~report interval, and TH_L and TH_U~~ for each transport channel. Whenever MAC receives RLC PDUs from different RLC entities, it is notified by RLC amount of data queued in RLC transmission and retransmission buffer. If the mode is ~~e~~Event~~t~~ Trigger~~ed~~, MAC compares ~~the amount of data to be transmitted on a transport channel~~ Transport Channel Traffic Volume with threshold values passed by RRC, $TH_{L}{}_{U}$ and $TH_{U}{}_{L}$. In case that the measured value is out of range, MAC reports measurement result of each RB to RRC. ~~the status of result of comparison and status of each RB to RRC.~~ On the other hand, if the mode is ~~p~~Periodical, MAC reports measurement result to RRC periodically. Measurement result can contain average and variance as well as amount of data for each RB as follows.

Measurement result.

- Mode
  Periodical, or ~~e~~Event~~t~~ Trigger~~ed~~
- Reporting Quantity
  For each RB, B~~uffer~~ O~~ccupancy~~ (~~mandatory~~optional), ~~Variance~~Average of BO (optional), and ~~Average~~Variance of BO (optional)
- Event ID (applicable when mode is Event Trigger)
  Indicates overflow or underflow for each transport channel~~, applicable when mode is event-triggered~~
  - Event 4a: ~~RLC buffer payload~~Transport Channel Traffic Volume exceeds an absolute threshold
  - Event 4b: ~~RLC buffer payload~~Transport Channel Traffic Volume becomes smaller than an absolute threshold

When RRC receives the measurement result of each RB, RRC shall convert the values BO, Average of BO, and Variance of BO to the quantized values RLC Buffer Payload, Average of RLC Buffer Payload, and Variance of RLC Buffer Payload, respectively.


Start
Get the measurement information from RRC: Mode, THU, THL, Report Interval, etc
Check traffic volume of transport channels
Mode = Event-triggered
N
Y
THL < Amount of Data < THU ?
Y
N
Mode = Periodic & timer expired ?
Y
N
Report Measurement Result to RRC
Wait TTI

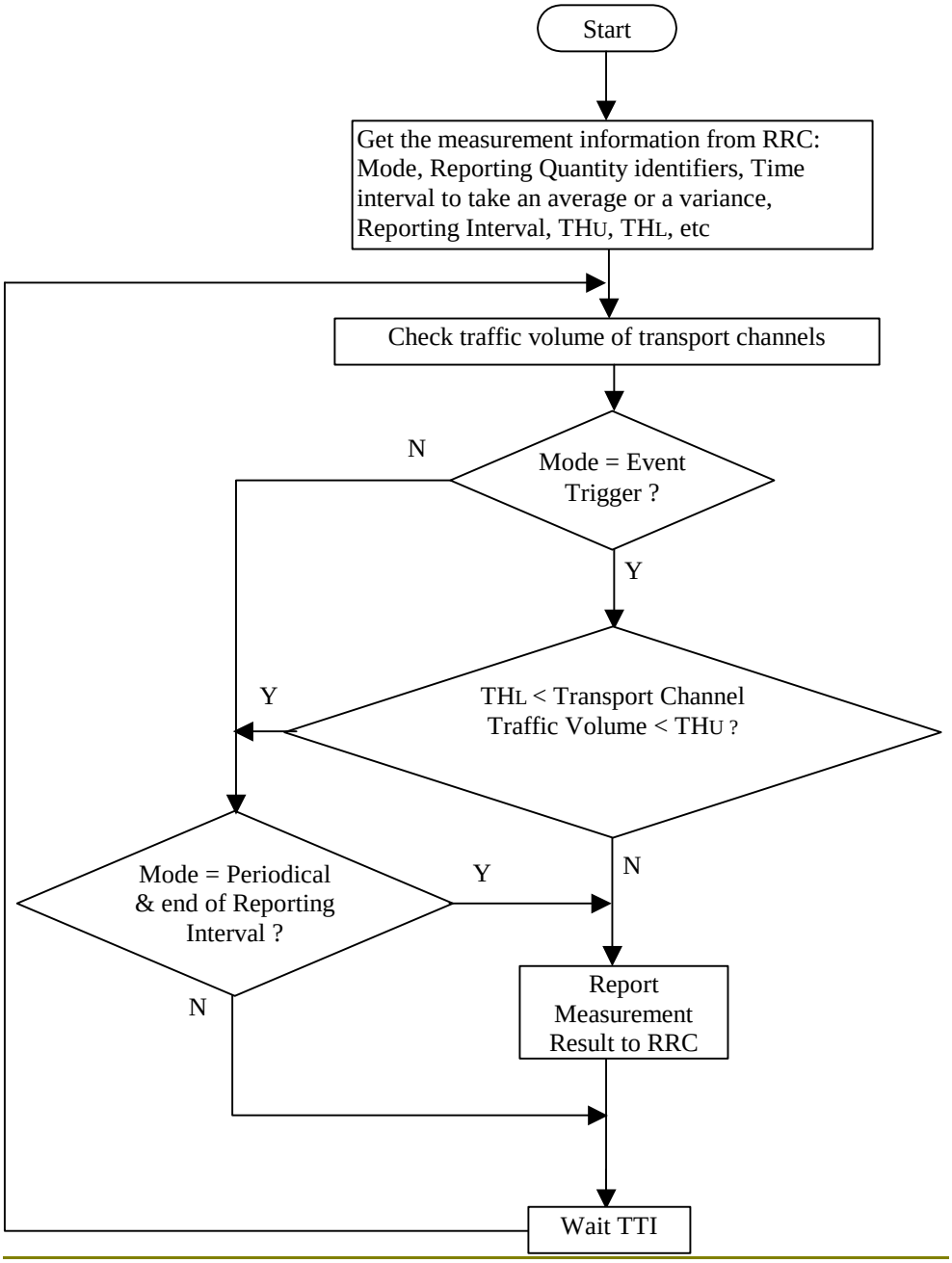


Figure 11.1.1: Traffic volume measurement/report procedure in MAC

3GPP TSG-RAN2 Meeting #19 ***R2-010607***
Sophia Antipolis, France, 19 - 23 February 2001

CR-Form-v3

CHANGE REQUEST

⌘ **25.321** **CR** **070** ⌘ rev **r1** ⌘ Current version: **3.6.0** ⌘

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

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

Title:	⌘	Clarification on parameters of the primitives
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	***Date:*** ⌘ February 20, 2001
Category:	⌘ **F**	***Release:*** ⌘ R99

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
REL-4 *(Release 4)*
REL-5 *(Release 5)*

Reason for change:	⌘	1. In the tables of the primitives between MAC and other layers, the parameters for primitive types Request and Indication are mixed up, so that it is not clear to distinguish the parameters between the two types. 2. The parameter 'Number of transmitted RLC PDUs' is used to indicate to the RLC layer at the receiver and may cause confusion. 3. The parameter 'RAB information elements' of CMAC-CONFIG-Req should be 'RB information elements' to align with TS 25.331 subclause 10.3.4. 4. The parameter 'TX status' is not aligned within the specification.
Summary of change:	⌘	1. Distribute the parameters into corresponding primitive types and align with RLC's format of primitives. 2. Change the name of the mentioned parameters.
Consequences if not approved:	⌘	1. The primitive tables in the specification are not clear. 2. The specification is not aligned with TS 25.331.

Clauses affected:	⌘	8.2.1, 8.2.2, 8.3.1
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

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

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

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

8 Elements for layer-to-layer communication

The interaction between the MAC layer and other layers are described in terms of primitives where the primitives represent the logical exchange of information and control between the MAC layer and other layers. The primitives shall not specify or constrain implementations. The MAC is connected to layer 1, RLC and RRC. The following subclauses describe the primitives between these layers.

8.1 Primitives between layers 1 and 2

The primitives are described in [3].

8.2 Primitives between MAC and RLC

8.2.1 Primitives

The primitives between MAC layer and RLC layer are shown in table 8.2.1.1.

Table 8.2.1.1: Primitives between MAC layer and RLC layer

~~Generic Name~~	~~Type~~				~~Parameters~~
	~~Request~~	~~Indication~~	~~Response~~	~~Confirm~~	
~~MAC-DATA~~	~~X~~	~~X~~			~~Data, Number of transmitted RLC PDUs, BO, UE-ID type indicator, TD (note)~~
~~MAC-STATUS~~		~~X~~	~~X~~		~~No_PDU, PDU_Size, BO, Tx_status~~
~~NOTE: TDD only.~~					

Generic Name	**Parameter**			
	Request	**Indication**	**Response**	**Confirm**
MAC-DATA	Data, BO, UE-ID type indicator	Data, ~~Number of submitted RLC PDUs~~No_TB, TD (note)		
MAC-STATUS		No_PDU, PDU_Size, TX status	BO	
NOTE: TDD only.				

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 for each logical channel the rate at which it may transfer data to MAC. Parameters are the number of PDUs that can be transferred in each transmission time interval and the PDU size; it is possible that MAC would use this primitive to indicate that it expects the current buffer occupancy of the addressed logical channel in order to provide for optimised TFC selection on transport channels with long transmission time interval. At the UE, MAC-STATUS-Ind primitive is also used to indicate from MAC to RLC that MAC has requested data transmission by PHY (i.e. PHY-

DATA-REQ has been submitted, see Fig. 11.2.2.1), or that transmission of an RLC PDU on RACH or CPCH has failed due to exceeded preamble ramping cycle counter.

- MAC-STATUS-Resp primitive 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 or to indicate the current buffer occupancy to MAC.

8.2.2 Parameters

a) Data:

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

b) Number of ~~transmitted~~ ~~submitted~~ ~~RLC PDUs~~ transmitted transport blocks (No_TB) ~~(indication only)~~:

- indicates the number of ~~RLC PDUs transmitted~~ ~~submitted to RLC~~ transport blocks transmitted by the peer entity within the transmission time interval, based on the TFI value.

c) Buffer Occupancy (BO):

- the parameter Buffer Occupancy (BO) indicates for each logical channel 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.

g) UE-ID Type Indicator:

- indicates the UE-ID type to be included on MAC for a DCCH when it is mapped onto a common transport channel (i.e. FACH, RACH or CPCH).

h) ~~TX_Status~~TX status:

- when set to value "transmission unsuccessful" this parameter indicates to RLC that transmission of an RLC PDU failed in the previous Transmission Time Interval, when set to value "transmission successful" this parameter indicates to RLC that the requested RLC PDU(s) has been submitted for transmission by the physical layer.

8.3 Primitives between MAC and RRC

8.3.1 Primitives

The primitives between MAC and RRC are shown in table 8.3.1.1.

Table 8.3.1.1: Primitives between MAC sub-layer and RRC

Generic Name	Type				Parameters
	Request	Indication	Response	Confirm	
CMAC-CONFIG	X				UE information elements RAB information elements TrCH information elements RACH transmission control elements Ciphering elements CPCH transmission control elements
CMAC-MEASUREMENT	X	X			Measurement information elements (for Request), Measurement result (for Indication)
CMAC-STATUS		X			Status info.

Generic Name	Parameter			
	Request	Indication	Response	Confirm
CMAC-CONFIG	UE information elements, RB information elements, TrCH information elements, RACH transmission control elements, Ciphering elements, CPCH transmission control elements			
CMAC-MEASUREMENT	Measurement information elements	Measurement result		
CMAC-STATUS		Status info		

CMAC-CONFIG-Req:

- CMAC-CONFIG-Req is used to request for setup, release and configuration of a logical channel, e.g. RNTI allocation, switching the connection between logical channels and transport channels, TFCS update or scheduling priority of logical channel.

CMAC-MEASUREMENT-Req/Ind:

- CMAC-MEASUREMENT-Req is used by RRC to request MAC to perform measurements, e.g. traffic volume measurements;

- CMAC-MEASUREMENT-Ind is used to notify RRC of the measurement result.

CMAC-STATUS-Ind:

- CMAC-STATUS-Ind primitive notifies RRC of status information.