

Agenda Item: 10

Source: InterDigital

Title: RACH/FACH MAC Header Channel Types Unification

Document for: Decision

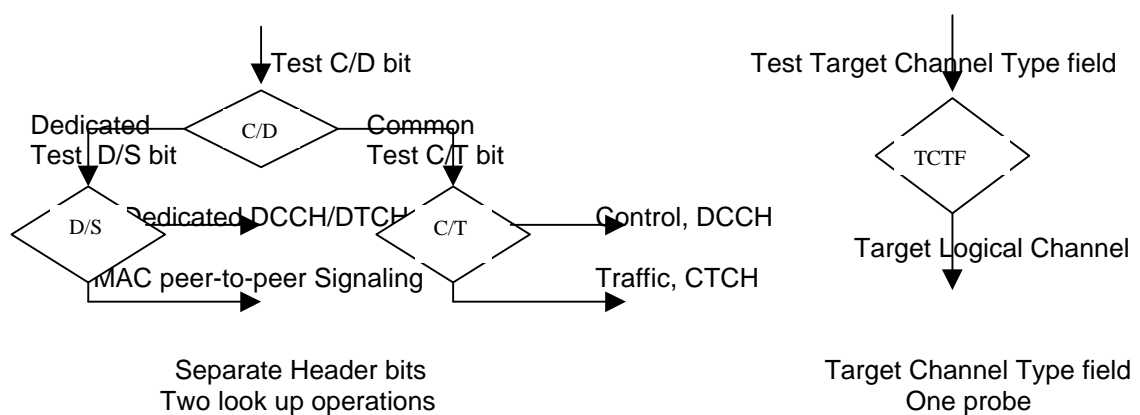
Introduction

The MAC Specification [1] defines the structure of MAC headers for dedicated and common channels (Section 9.2). It is our contention that the headers can be optimized to facilitate decoding by the receiving MAC entity and eliminate confusion. Our proposal is as follows:

- 1) Unify the C/D field in 9.2.1.2 and C/T field in 9.2.1.3 with the MAC peer to peer control channel signalling field D/S into a two-bit field. Rename it to "Target channel type field" (TCTF) of MAC PDU on RACH/FACH" and make it mandatory for all common transport channel routed MAC PDUs.
- 2) Eliminate Case D in Section 9.2.1.1 - MAC header for DCCH and DTCH.

Discussion

With the addition of CTCH and DSCH/USCH Control channel signaling passing through MAC-C entity, it is beneficial to unify the C/D, C/T and D/S fields into one so that the MAC-C can decide the target logical channel in just one lookup operation instead of two.



The proposed new combined field is the "Target Channel Type Field" (TCTF).

New Header Field Definitions

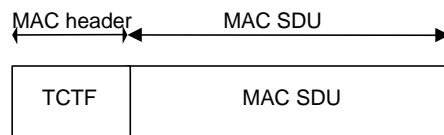
The target channel type field is defined as follows:

Value	Designation
00	CCCH
01	CTCH
10	DCCH or DTCH over RACH/FACH
11	MAC peer-to-peer over RACH/FACH

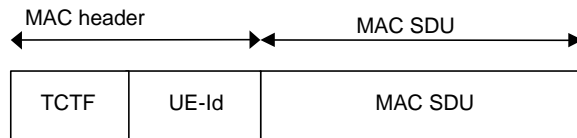
The definitions of the UE-Id and dedicated channel C/T fields are unchanged.

New Header Formats

For CTCH on RACH/FACH

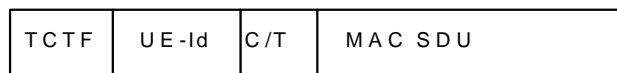


For CCCH or Control channel of Shared Channel Operation on RACH/FACH



For DTCH or DCCH mapped to RACH/FACH

With CCCH, CTCH and Control signaling going through MAC-C RACH/FACH, there will be no DTCH/DCCH case-d. So only the following new case-c is the only case for dedicated logical channels over RACH/FACH.



Change Request to TS 25.321

9.2.1 MAC Data PDU: Parameters of the MAC header

The following fields are defined for the MAC header:

- C/D field

The C/D field is a single-bit flag that provides identification of the logical channel class on FACH and RACH transport channels, i.e. whether it carries CCCH or dedicated logical channel information.

<u>C/D field</u>	<u>Designation</u>
1	CCCH
0	DCCH or DTCH

- Target Channel Type Field

The TCTF field is a double-bit flag that provides identification of the logical channel class on FACH and RACH transport channels, i.e. whether it carries CCCH or CTCH or dedicated channel information of shared channel control information.

<u>TCTF</u>	<u>Designation</u>
00	CCCH
01	CTCH
10	DCCH or DTCH over RACH/FACH
11	DSCH or USCH Control over RACH/FACH

Table 9.2.1.1: Coding of the Target Channel Type Field

- 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.

<u>C/T field</u> (e.g. 4 bits)	<u>Designation</u>
0000	Logical channel 1
0001	Logical channel 2
...	...
1111	Logical channel 16

Table 9.2.1.2: Structure of the C/T field

- UE-Id

The UE-Id field provides an identifier of the UE . The following types of UE-Id are currently defined:

s-RNTI , this UE Id is related to the serving RNC

c-RNTI, this UE Id is related to the controlling RNC.

In addition for UE's having a RRC connection the S-RNC identifier exist.

s-RNTI together with S-RNC identifier is used for URA update RRC connection reestablishment and UTRAN originated paging messages and there associated responses.

c-RNTI is used as a UE identifier in all other DCCH/DTCH common channel messages on the air interface.

Note: Whether or not other UE-Id types are needed is ffs.

9.2.1.1 MAC header for DTCH and DCCH

- DTCH or DCCH mapped to DCH, no multiplexing of dedicated channels on MAC:
No MAC header is required.
- DTCH or DCCH mapped to DCH, with multiplexing of dedicated channels on MAC:
C/T field is included in MAC header.
- DTCH or DCCH mapped to RACH/FACH:
TCTF field is included in the MAC header to differentiate dedicated from common logical channels and indicate MAC peer-to-peer signalling. C/T field is included if multiplexing on MAC is applied.
- ~~DTCH or DCCH mapped to RACH/FACH, where DTCH or DCCH are the only channels (ffs).
UE Id field is included in MAC header. C/T field is included if multiplexing on MAC is applied.~~
- DTCH or DCCH mapped to DSCH:
The MAC-PDU format for DSCH is left for further study.

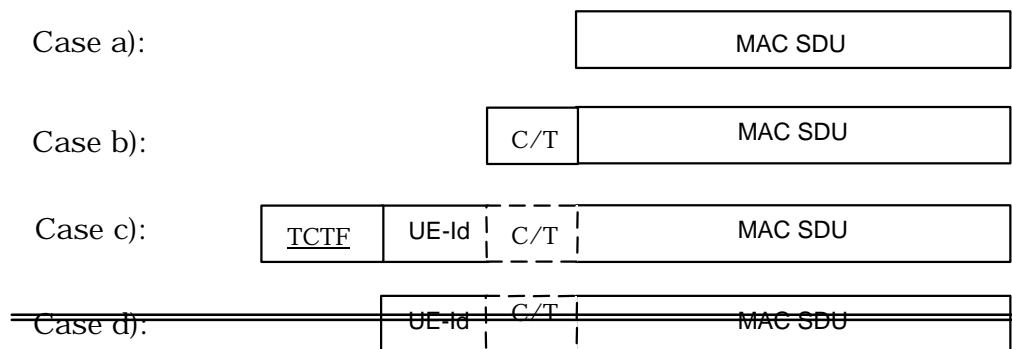


Figure 9.2.2.1: MAC Data PDU formats for DTCH and DCCH

9.2.1.2 MAC header for CCCH

Note: The concept for using UE Id on CCCH has to be reviewed

- a) CCCH mapped to RACH/FACH:
The TCTF field distinguishes between common/dedicated logical channels and CTCH/CTCH. UE-id field may be included in MAC header. Details of usage the UE-id field is ffs.
- ~~b) CCCH mapped to RACH/FACH, where CCCH is the only channel (ffs):
 UE id field may be included in the MAC header.~~

*Note: The usage of the MAC header for BCCH and PCCH is ffs.
 The address used for initial addressing is ffs, a possible solution may be to use a Random or CN related Identifier.*

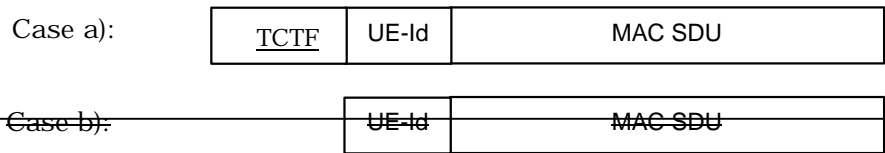


Figure 9.2.1.2.1 : MAC Data PDU formats for CCCH

9.2.1.3 MAC Header for CTCH

The MAC header for CTCH mapped to FACH is as shown in figure 9.2.1.3.1

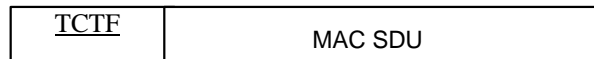


Figure 9.2.1.3.1 : MAC Data PDU format for CTCH

The TCTF field indicates whether data is mapped to common or dedicated channels, and whether it belongs to CCCH or CTCH. ~~C/D field indicates whether data is mapped to the common or dedicated logical channel.~~

~~C/T field indicates whether it belongs to CCCH or CTCH.~~ In case of CTCH, it identifies whether the message is SMS CB message or Schedule message.

References

- [1] TS 25.321 (V 2.1.0) MAC Protocol Specification