TSG-RAN Working Group 3 meeting #7
France, Sofia Antipolis, 20th-24th September

TSGW3#7(99)C12

Agenda Item: **14.1, 14.2**

Source: **Ericsson**

Title: **User plane frame protocol headers**

Document for: **Decision**

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1. INTRODUCTION

During TSG-RAN WG3 #6, several decisions were made which effect the header of the data frames in the Iub FP. These decisions were:

- 8 bit CFN
- Separate CRC for the header
- Propagation delay estimation in RACH FP

For this WG3 meeting, Ericsson provided several other contributions related to (coding) aspects of the data frame header:

- Iub user plane support for long UE sleep modes [3]
- Granularity and range of propagation delay in RACH FP [4]
- Coding of paging indication information in the PCH frame protocol [5]
- CRC Lenghts in the frame protocol [6]

This contribution proposes new Iub/Iur FP headers which incorporate all the listed changes.

2. RATIONALE

2.1. Guidelines

The following guidelines were used while defining the new header structures:

1. The number of unused/padded bits in the header should be limited as much as possible in order to limit unnecessary overhead;

2. The payload shall start at an octet boundary. All fields should as much as possible be aligned to octet boudaries;

3. The CRC for the header should be located close to the header. This will facilitate easy and early detection of correct/incorrect frame headers without having to await the complete frame.

4. When deciding what information to put in the payload and what in the header, the general rule used is that:

   - Information which makes the frame unuseable in case of errors should be in the frame header;

   - Information which could still be handled usefully although errors may be present should be in the payload.

So e.g. TFI's need to be in the header since when erronuous, the payload can no longer be decoded. On the other hand, a quality estimate or CRC indicators can be in the payload since e.g. if no information is available from other RL's, the UTRAN can still use this information.

Note that there exists no difference in the level of protection that header or payload provide. Not a single bit error can be corrected.

5. During the life-time of a transport bearer, the header should have a fixed length. This in order to enable the verification of the header CRC after only having interpreted a minimum of header bits (1).

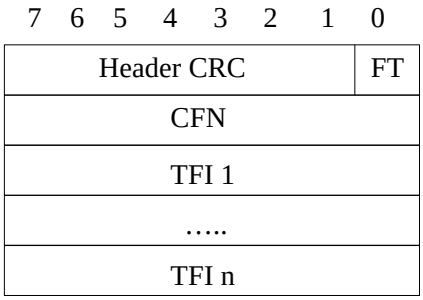
6. For CRC-machines, it is preferable if the data on which the CRC has to be calculated is a continuous stream in the message (no holes).

As a result of guidelines 1,2,3 and 6 it is proposed to have the frame header CRC placed in the first bits of the frame header. The header CRC should be calculated starting from the last bit in the first byte.

2.2. DCH FP data frame header

The following header structure is proposed:

UL/DL DCH FP data frame header

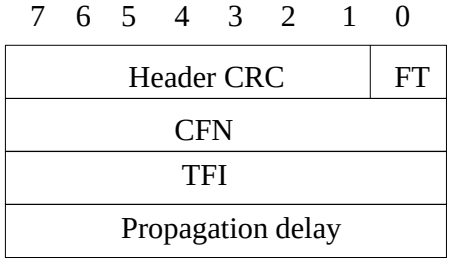


Note: Apart from the DCH TB's, the payload contains:
- One UL Quality estimate
- CRC indicators

2.3. RACH FP data frame header

The following header structure is proposed:

RACH FP data frame header

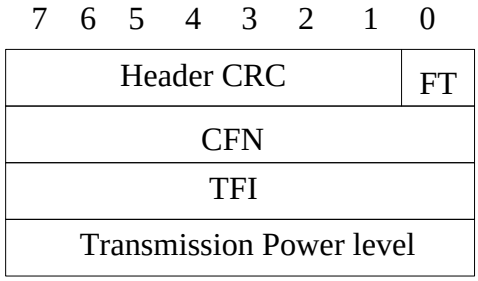


Note: Apart from the RACH TB's, the payload contains:
- CRC indicators

2.4. FACH FP data frame header

The following header structure is proposed:

FACH FP data frame header

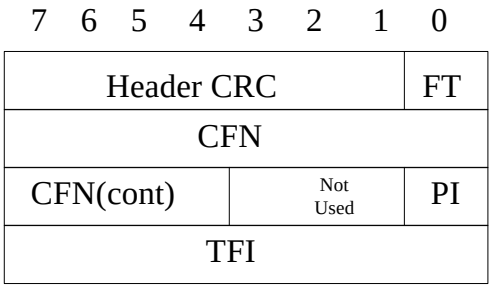


Note: The payload only contains the FACH TB's.

2.5. PCH FP data frame header

The following header structure is proposed:

PCH FP data frame header



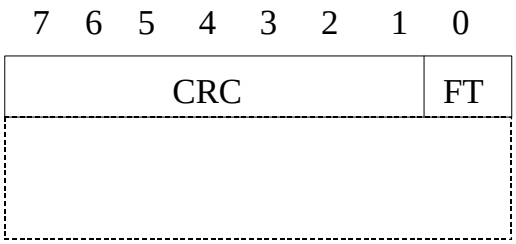
Note: Apart from the PCH TB's, the payload contains:

- Paging Indication Information

2.6. Control frames

Currently no header and payload are identified for control frames. The following structure is proposed:

Control frames



2.7. Implementation note (for information only)

With the above proposed frame structures, a receiver could execute the following steps when receiving a frame:

```
Check FT field for “data” or “control”;
IF (FT == “data”)
THEN
        IF (transport channel transported on transport bearer <> DCH)
        THEN
                Header length = length according to transport channel;
        ELSE
                Header length = length according to transport channel +
                                        correction for number of transport channels;
        END
        Compare header CRC located in first 7 bits with CRC calculated over bit 8 up to Header_length number of
        bits;
        IF (header CRC OK)
        THEN
                Continue with processing payload, assuming payload structure as indicated in the header;
        ELSE
                Discard complete data frame;
        END
ELSE   /* FT == “control” */
        Check frame CRC located in first 7 bits with CRC calculated over bit 8 up to full length of control frame;
        IF (CRC OK)
        THEN
                Continue with processing control frame;
        ELSE
                Discard complete control frame;
        END
END
```

3. PROPOSAL

It is proposed to update the current FP headers/payload in [1] and [2] in line with the proposals included in chapter 2.2-2.6 of this contribution.

4. REFERENCES

[1] TS 25.435 V0.4.1. TSG RAN: “UTRAN Iub user plane protocols for common transport channel data streams”

[2] TS 25.427 V0.4.1. TSG RAN: “UTRAN Iub/Iur Interface User Plane Protocols for DCH Data Streams”

[3] TSGR3(99) B66: “Iub user plane support for long UE sleep modes”

[4] TSGR3(99) B64: “Coding of propagation delay field in RACH FP”

[5] TSGR3(99) B67: “Coding of paging indication information in the PCH frame protocol”

[6] TSGR3(99) C10: “CRC Lenghts in the frame protocol”