

Agenda Item:

Source: **Nokia**

Title: **Definition and text proposal for CCTrCH**

Document for: **Decision**

1. Introduction

There has been lively discussion in e-mail reflector about the definitions of Coded Composite Transport Channel (CCTrCH), code multiplexing and multiple radio links. The purpose of this contribution is to clarify the meaning of above mentioned terms. A definition for CCTrCH is proposed to be added to 25.212 and it is also proposed that only term CCTrCH is used to describe above mentioned terms. A clarifying picture about the DSCH associated with DCH is proposed to be added to 25.212.

2. Current definitions of CCTrCH, code multiplexing and multiple radio links

2.1 CCTrCH

Currently there is no definition of the CCTrCH in 25.212 [1].

The S2.02 [2] has a definition for CCTrCH: "The single output data stream from the coding and multiplexing unit is denoted *Coded Composite Transport Channel (CCTrCH)*." From Figure 2 (UL) it can be seen that one control channel is associated with one CCTrCH.

If e.g., two CCTrCH's are used then also two control channels are used.

2.2 Code multiplexing

In 25.212 [1] code multiplexing is defined that it corresponds having several parallel multiplexing chains as in Fig. 4-1 (25.212), resulting in several data stream, each mapped to one or several physical channels.

If e.g., two separate multiplexing chains are used then also two control channels are used.

2.3 Multiple radio link

Currently there is no definition of the Multiple radio link in 25.212 [1].

From ARIB Vol.3 Ver. 1.0 [3]: “A Radio Link is a bi-directional connection between a terminal and BS sector. Each RL is comprised of all the channels that are associated with the same physical layer control channel (DPCCH).”

If e.g., two radio links are used then also two control channels are used.

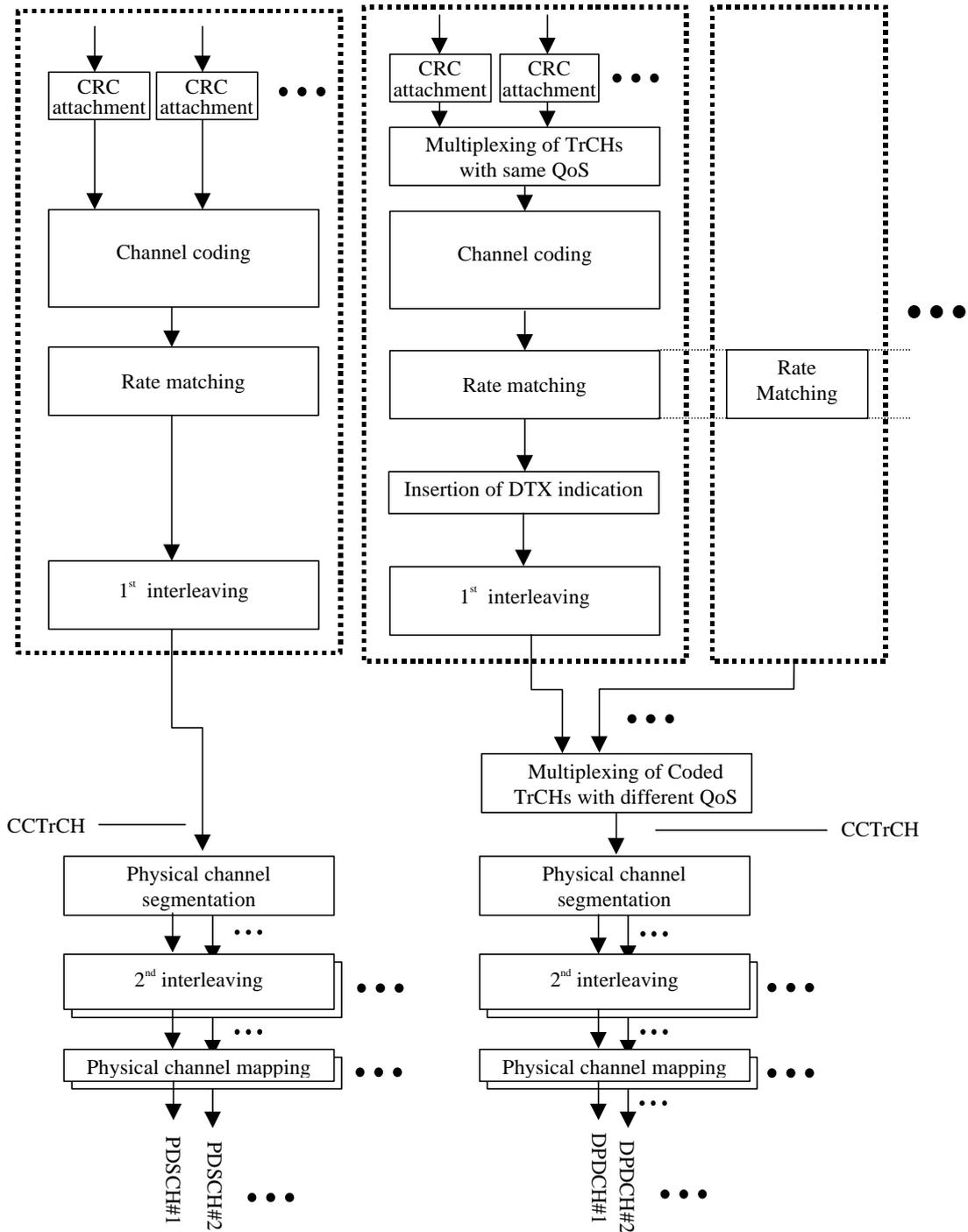
3. Proposed definition for CCTrCH

We propose that only CCTrCH definition is used instead of all three: CCTrCH, code multiplexing and multiple radio link. The following CCTrCH definition is proposed to be added to 25.212, chapter 4.2:

"The single output data stream from the "multiplexing of Coded TrCHs with different QoS" unit is denoted *Coded Composite Transport Channel (CCTrCH)*. A CCTrCH can be mapped to one or several physical channels. Two different CCTrCHs cannot be mapped to the same physical channel. "

4. DSCH associated with the DCH

The following picture describing transport channel multiplexing for DSCH associated with DCH is proposed to be added to 25.212. In this case only one control channel would be used (one TFCI and TPC).



5. Text proposals

4. Multiplexing, channel coding and interleaving

4.1 General

Data stream from/to MAC and higher layers (Transport block / Transport block set) is encoded/decoded to offer transport services over the radio transmission link. Channel coding scheme is a combination of error detection, error correcting, rate matching, interleaving and transport channels mapping onto/splitting from physical channels.

4.2 Transport-channel coding/multiplexing

Data arrives to the coding/multiplexing unit in form of transport block sets, once every transmission time interval. The transmission time interval is transport-channel specific from the set { 10 ms, 20 ms, 40 ms, 80 ms}.

Two or more services having different Quality of Service (QoS) requirements are multiplexed into one or more physical channels using a physical channel segmentation unit. Rate matching is used to adjust the channel symbol rates (i.e., symbol rate after physical channel segmentation) to an optimum level, where minimum QoS requirement of each service is fulfilled with the same channel symbol energy. The rate matching uses the algorithm described in section **Error! Reference source not found-4.2.4**.

<Editor's note: According to the Ad Hoc 4 result, ETSI scheme is used for uplink to achieve multiplexing of TrCHs with different transmission time interval. ARIB scheme is used for downlink to avoid the problem with the balancing of different TrCHs.>

The coding/multiplexing steps for uplink and ~~for~~ downlink DCHs are shown in Figure 4-1 ~~Figure 4-1~~ and Figure 4-2 ~~Figure 4-2~~ respectively. The coding/multiplexing steps for DSCH associated with DSCH is shown in Figure 4-3.

The single output data stream from the "multiplexing of Coded TrCHs with different QoS" unit is denoted Coded Composite Transport Channel (CCTrCH). A CCTrCH can be mapped to one or several physical channels. Two different CCTrCHs cannot be mapped to the same physical channel.

When DSCH is associated with DCH two CCTrCHs is used, but only one control channel is used.

The following coding/multiplexing steps can be identified:

- Add CRC to each transport block

<Editor's note: It should still be possible to code transport channels with same QoS separately. Combining several transport blocks from one or different transport channels before coding is a study item in Ad Hoc 5. Hence, a new name could perhaps be introduced for the block saying multiplexing of transport channels with the same QoS.>

- Possibility to multiplex transport channels with same QoS before coding.
- Channel coding
- Rate matching
- Insertion of discontinuous transmission (DTX) indication bits.
- Interleaving (two steps)
- Multiplexing of transport channels with different QoS
- Physical channel segmentation
- Mapping to physical channels

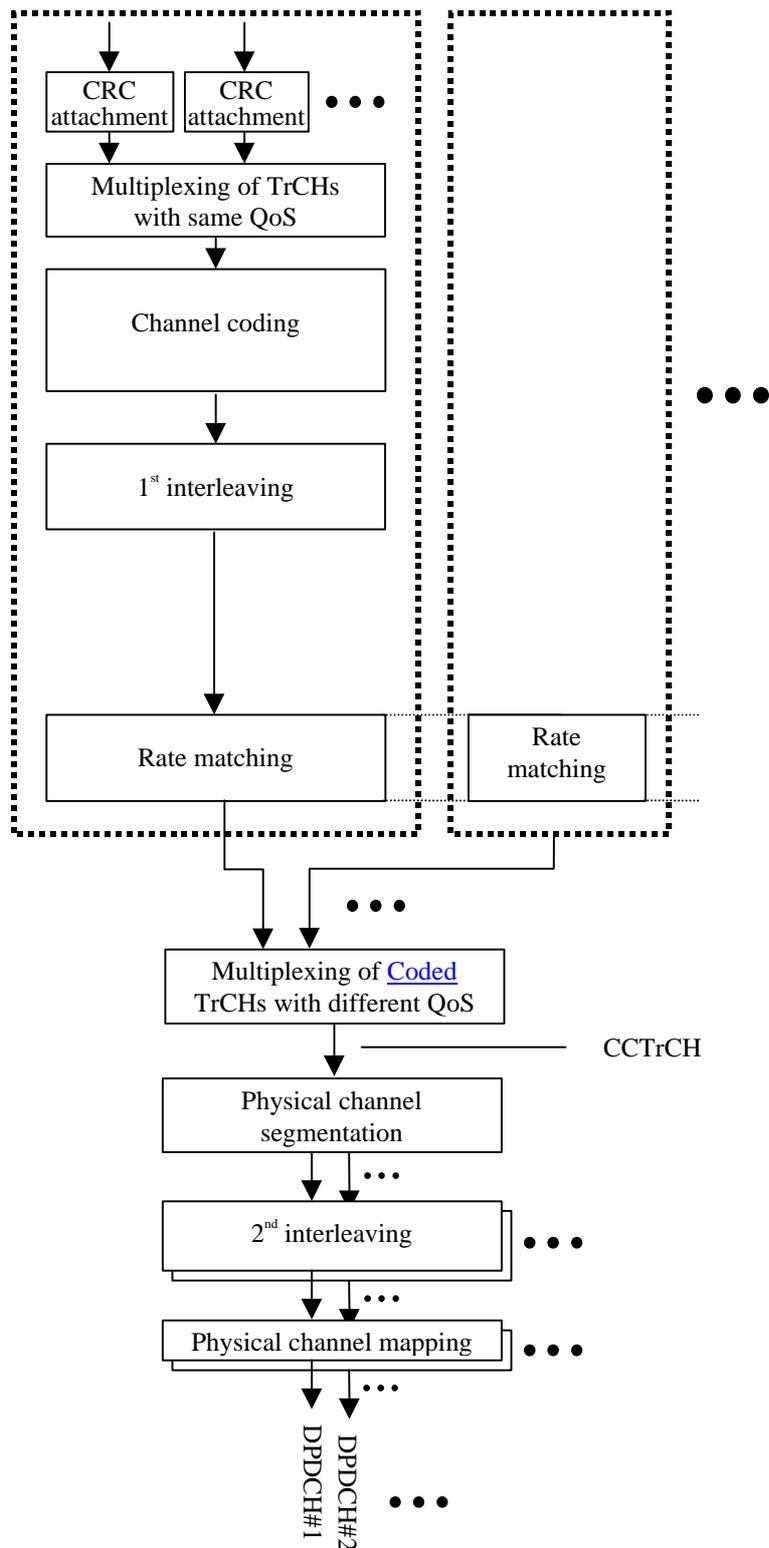


Figure 04-1. Transport channel multiplexing structure for uplink DCH.

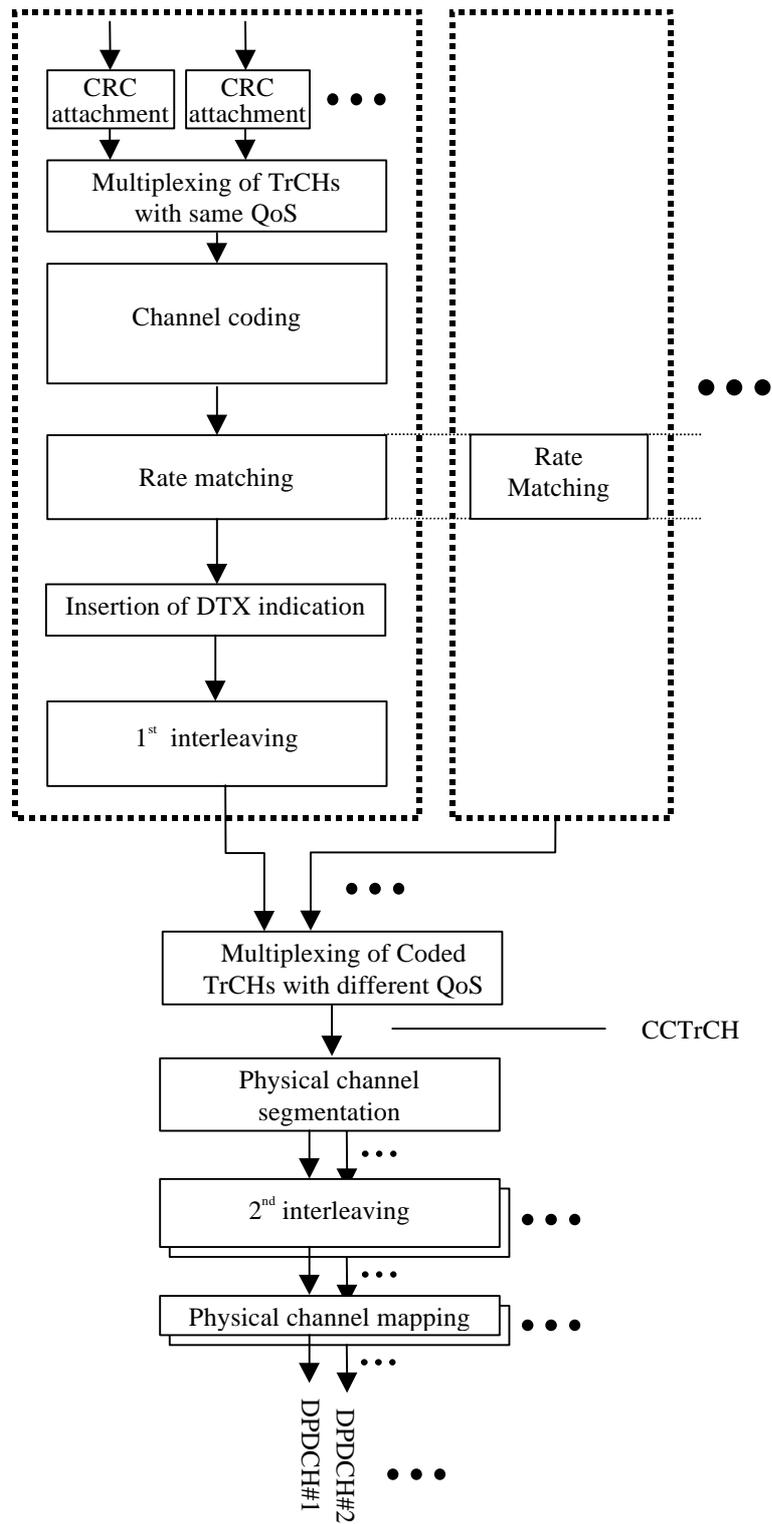


Figure 04-2. Transport channel multiplexing structure for downlink DCH.

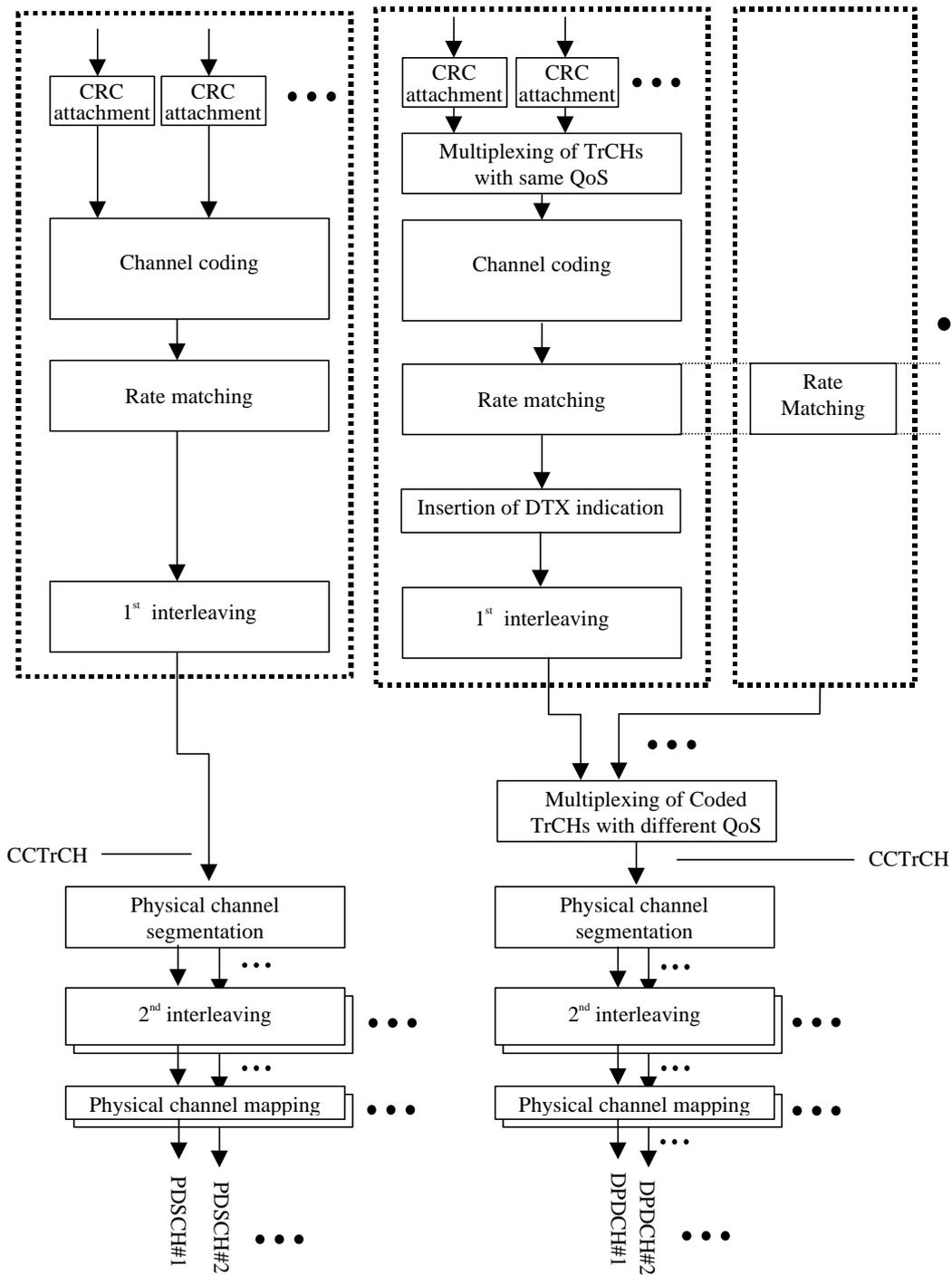


Figure 4-3. Transport channel multiplexing structure for DSCH associated with DCH.

<Editor's note: Code multiplexing is not used in uplink as a working assumption ~~according to the results of Ad-Hoc4 in WG1.~~ For downlink is FFS.>

~~Primarily, transport channels are multiplexed as described above, i.e. into one data stream mapped on one or several physical channels. However, an alternative way of multiplexing services is to use code multiplexing, which corresponds to having several parallel multiplexing chains as in Figure 4-1, resulting in several data stream, each mapped to one or several physical channels. This code multiplexing is used only for downlink DSCHs. For the other transport channels including downlink DCHs, the code multiplexing shall not be used.~~

6. References

- [1] 25.212 V1.0.0 "Multiplexing and channel coding (FDD)"
- [2] S2.02 V0.3.0 "Services provided by the Physical Layer"
- [3] ARIB Vol. 3 V1.0 "Specifications of Air-Interface for 3G Mobile System"