TSG-RAN Working Group1 meeting #2
Yokohama 22-25, February 1999

TSGR1#2(99)087

Agenda Item: **8.3**

Source: **Ad Hoc #4**

Title: **Report from Ad Hoc #4: Transport Channel Multiplexing**

Document for:

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1. Introduction

In the previous WG1#1 meeting, the temporary Ad Hoc #4 was established to resolve the issues related to transport channel multiplexing scheme, which includes multiplexing of transport channels with same/different QoS, channel coding, channel interleaving, rate matching and physical channel segmentation.

On the topic of merging the major differences between ETSI specification [1] and ARIB specification [2], intensive discussions have already taken place via E-mail. In this document, the summary table, which includes the working assumptions and open issues on those discussions are shown; also the figures of merged transport channel multiplexing are shown. These table and figures refer to the multiplexing structures corresponding to the FDD mode. (Detailed structure corresponding to the TDD mode is FFS, therefore requires further discussion within WG1.)

2. Major differences and recommendations

Major differences and recommendations are shown in Table 1. Five items are noted, along with the respective working assumptions. Where necessary, open issues are also pointed out. And those issues should be resolved through continued discussions in WG1.

3. Merged figures of transport channel multiplexing chains

Figure 1 and figure 2 show merged transport channel multiplexing schemes. The two figures represent the working assumptions in the summary table, translated into figure form. It is recommended that these figures be incorporated into the next version of the S1.12 document.

References

[1] “UMTS XX.04 v0.7.0, UTRA FDD, multiplexing, channel coding and interleaving description,” ETSI
[2] “Volume 3 Ver. 1.0, Specification of Air-Interface for 3G Mobile System,” ARIB

Table 1 Summary of temporary Ad Hoc #4: Transport Channel Multiplexing.

	Major items	ETSI	ARIB	Discussions	Recommendations
1	Multiplexing of TrCHs with Same QoS before Channel Coding	Not support	Support	- This scheme would be useful for obtaining longer code blocks for turbo codes and would introduce extra flexibility. - This scheme was removed from the ETSI scheme since it could be done on layer 2. However, if layer 2 should perform this combining it will cause extra overhead that will decrease the gain of longer code blocks.	<Working Assumption> - ARIB scheme
2	Order of 1st Interleaving (Inter-frame Interleaving) and Rate Matching	1st Interleaving before Rate Matching	Rate Matching before 1st Interleaving	- "ETSI scheme is used for uplink to achieve multiplexing of TrCHs with different transmission time interval" and "ARIB scheme is used for downlink to avoid the problem with the barancing of different TrCHs" were proposed. - "Both schemes are used either for downlink or for uplink to " was also proposed. Here, the decision which multiplexing scheme is to be taken should be made by the UTRAN dependent on the combination of bearers during the establishment of each connection. - When having multiple options for each link, the negative effect it will have on complexity (both in BS and MS). - Additional options could be further investigated taking the following issues into account: Complexity impact, Complexity vs. Gain trade-off, Impact on other layers, Mandatory or Optional. - Additional option "a" may be advantageous for downlink, if puncturing is applied only to the transport format combination with the highest rate, to avoid code deterioration in all other cases. - Additional option "b" is advantageous if all bearers to be multiplexed exhibit the sama Transmission Time Interval.	<Working Assumptions> - ETSI scheme for uplink - ARIB scheme for downlink <Open Issues> - Additional options: a. ETSI scheme for downlink b. ARIB scheme for uplink

3	Physical Channel Segmentation	Physical Channel Segmentation after Multiplexing of TrCHs with Different QoS	Physical Channel Segmentation before Multiplexing of TrCHs with Different QoS	- This issue is tied to the choice of 2nd interleaving. - If the generation of the 2nd interleaving is not simple, it is desirable to specify (store) as few 2nd interleavers as possible. In such a case there would be a clear advantage in having the segmentation before the multiplexing since it reduces the number of different interleavers. - The assumed scheme should be verified after the choice of interleaver has been made - The same performance is expected regardless of the placement of Physical Channel Segmentation. - If physical channel segmentation is done before 2nd interleaving, there are no restrictions on the dynamic distribution of data onto several codes. - In ARIB scheme, if we want to distribute the data stream to different codes equally, it is necessary to adjust fraction bits and it is expected that such an adjustment rule would be a little complicated rule.	<Working Assumptions> - Merged scheme between ETSI and ARIB i.e. Physical channel segmentation after multiplexing of TrCHs with Different QoS and before 2nd interleaving.
4	Code Multiplexing	Support	Not support	- This scheme corresponds to having several parallel independent multiplexing chains. The different parallel codes may have different spreading factors and the layer 1 control is transmitted on each code independently. -The code multiplexing could be used in the downlink if different channels have different active sets. There may also be a need for it if a downlink shared channel is used. - The code multiplexing in downlink could therefore be kept as an item for further study. However, it should be clear that the time multiplexing is the default solution and code multiplexing should only be used in special cases (ex. when shared channel is multiplexed).	<Working Assumptions> - ARIB scheme for uplink <Open issues> - ETSI scheme for downlink

5	Physical Channel Mapping in Downlink	FFS	Fixed service position	- We use DTX in order to implement the fixed positions, for helping the blind rate detection algorithm. Then it is easier for the blind rate detection algorithm to know where to start looking for the rates. ~~- I agree that the DTX may not be absolutely needed in the DL in order to carry out blind rate detection. However, can someone point out the disadvantages with the DTX solution and the solution with fixed positions for each DL real-time services? I guess that one must anyway reserve full capacity for each real-time services.~~ - We are of the opinion that reasonable blind rate detection will only be possible if the positions of the TrCHs are fix in the frame. This puts some requirements on the multiplexing scheme, i.e. 1st interleaving after static rate matching and no dynamic rate matching. However, we do not see a problem supporting non-fix positions as well. This only means that less DTX will be used for these cases, which we do not view as a complex feature of the proposed multiplexing scheme. - By controlling the amount of DTX we can have either fixed or non-fixed service positions in the frame.	<Working assumptions> - For transport channels not relying on TFCI for rate detection (blind rate detection), the positions of the transport channels within the frame should be fixed. - For transport channels relying on TFCI for rate detection, the positions of the transport channels could be fixed or non-fixed. <Open issues> - The exact details on how to use non-fixed positions in the case with explicit rate signaling using TFCI. ~~<Working assumptions>~~ ~~- Both ARIB scheme and non-fixed service position are used for non-real time service~~ ~~- ARIB scheme is used for real time service~~ ~~<Open issues>~~ ~~- Non-fixed service position for real time service as additional option~~

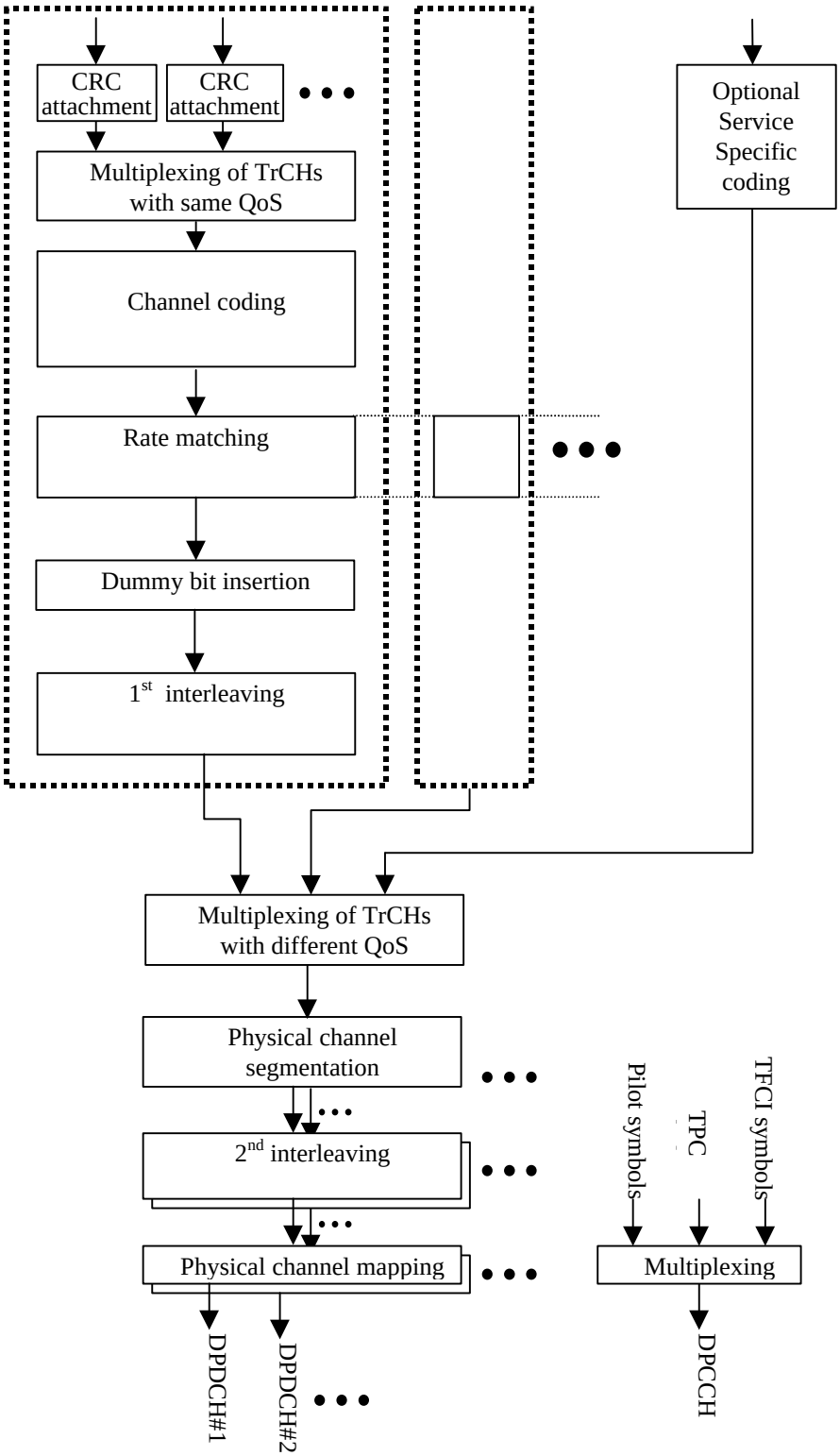

Figure 1 Transport channel multiplexing in downlink.

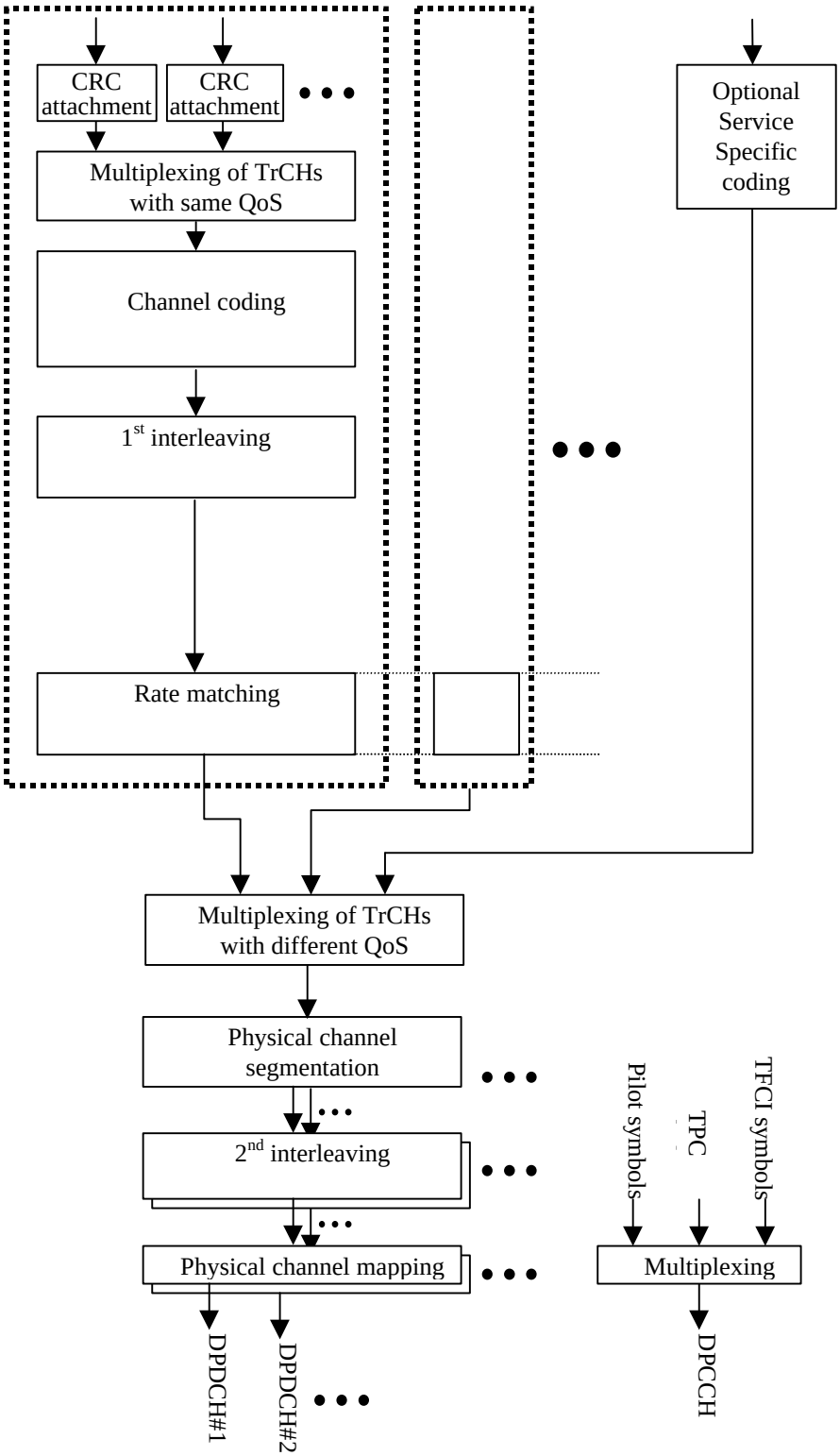

Figure 2 Transport channel multiplexing in uplink.