TSG-RAN Working Group 1(Radio) meeting #5 ***TSGR1#5(99)565***
Cheju, Korea, 01 – 04 June 1999

Agenda Item:

Source: **Nokia**

Title: **Definition of encoding blocks for channel coding – text proposal**

Document for: **Decision**

Introduction

Currently the transfer point between convolutional coding and turbo coding is stated in the terms of bit rate. Turbo coding is employed for services using bit rates over 32 kbps, whereas convolutional coding is used for lower bit rates.

The understanding based on AdHoc 4 and AdHoc 5 discussions is that encoding is performed either on one or on several transport blocks. However, this is not clearly defined in the current specification text. Thus, there may be several transport blocks to be encoded by the channel coder within one interleaving period.

As an example, we can imagine a packet service with several PDUs of size 320 bits delivered to L1. Each one of these transport blocks has CRC bits added to it and then encoded separately. The total transport channel bit rate is Nx32 kbps, which suggest turbo encoding on each transport block based on the current specification. However, if only one packet is delivered to L1 (1x32 kbps), the use of convolutional coding is assumed. It would make sense to decide coding based on the largest coding unit size instead of having ambiguity.

Inconsistency in the use of encoding also appears when different frame sizes are considered. For example, even low bit rates such as 32 kbps have a big coding block size when long frames (80 ms) are employed. In this case, 8x320 bits = 2560 bits are to be encoded. Assigning the choice of encoding based on bit rate would mean that

1) 64 kbps with 10 ms frame (640 bits) would use turbo coding, BUT
2) 32 kbps with 80 ms frame (2560 bits) would use convolutional coding.

The longer coding unit size in particular would gain from turbo coding.

In [1] it is stated that turbo coding is not a very good choice for services that use blind rate detection (regardless of QoS). If blind rate detection can be assumed to be used for low bit rate dedicated channels in downlink, it can be argued that the definition of coding unit size makes a lot of sense.

Terminology for transport block coding

Previously in ARIB specification a clear nomenclature was used for transport block coding:

Coding unit: bits inputted to FEC encoder for a single FEC processing (except for tail bits).
Coding unit size: the number of bits in a coding unit.
Maximal coding unit size: coding unit size in static rate transmission, or coding unit size of the maximum rate in a variable rate transmission.

Conclusion

Since turbo encoding really brings its performance gain on longer encoding block lengths, it would make sense to define the transfer point in terms of bits. Furthermore, the usage of coding unit size reduces the ambiguity in selecting a coding scheme for a transport block. It is proposed to adopt the terminology used originally in ARIB. Text proposals for 25.212 and 25.222 are attached.

Text proposal for 25.212

Table 4-1. Error Correction Coding Parameters

Transport channel type (Maximal coding unit size)	Coding scheme (constraint length)	Coding rate
BCH	Convolutional code (K=9)	1/2
PCH		
FACH		
RACH		
DCH (equal to or less than 320 bits)		1/3 (1/2 in compressed mode using Method A*)
DCH (more than 320 bits)	Turbo code	

***See 4.4.2.1**

Text proposal for 25.222

Table 6.2.2-1 Error Correction Coding Parameters

Transport channel type (Maximal coding unit size)	Coding scheme (constraint length)	Coding rate
BCH	Convolutional code (K=9)	1/2
PCH		
FACH		
RACH		1/2, [2/3, 7/8] *<Editor's note: the values in square brackets have not yet been approved.>*
DCH (equal to or less than 320 bits)		1/2 or 1/3
DCH (more than 320 bits)	Turbo code (K=3)	

References

[1] Nokia, " Complexity of blind rate detection for AMR with turbo coding", TSGR1#5(99)566