

Source: Ericsson
Title: Proposal for WCDMA channel error pattern file format and error insertion device
Document for: Discussion and decision
Agenda Item:

1. Introduction

The error performance of the wideband coder in application E is specified and evaluated using error protection schemes from the UTRAN toolbox. Each error condition is defined using two error profiles, one FER profile (single indicator per frame) and one residual BER profile for the class B bits (bit-level residual error channel). Such error files are obtained off-line by WCDMA channel simulations. The WCDMA channel errors are to be applied to the wideband speech coder bits by using an error insertion device (EID).

This document proposes file formats for the FER and RBER channels as well as the functionality of an EID.

2. File formats of WCDMA channel error files

2.1. FER file format

The FER file needs to contain a flag for every speech frame indicating if the frame is erased or not. A frame is regarded as erased if there are bit errors in bit class A.

It is suggested that the FER file is a text file containing one digit for each frame separated by white spaces. A digit of '1' marks a frame erasure while a '0' indicates that the class A bits of the corresponding frame are correct.

2.2. RBER file format

The RBER file needs to contain a flag for every class B bit of each speech frame indicating if the bit is correct or not. According to [1], a 32 kbps mode of the wideband codec is assumed even though each candidate is free to choose a bit rate below that maximum rate. Requirements are defined with 25% and, respectively, 40% of the speech codec bits being class B bits. Thus, two different sets of RBER files need to exist assuming a number n_B of class B bits per frame, where $n_B = 160$ or 256 , respectively.

The RBER file format is proposed to be as follows. RBER files are binary containing n_B bytes per frame. Each byte corresponds to one class B speech codec bit, where a value of 1 indicates that the bit is to be corrupted while a value of 0 means that the bit remains unchanged. The bit error pattern for each frame is arranged in the same way as the speech codec bits frame. This means that the n^{th} byte of the error pattern frame corresponds to the n^{th} class B bit in the speech bit frame.

3. Functionality of the EID

3.1. General

The EID operates as a separate program on an input speech codec bit file and produces an output speech codec bit file. The format of these files is assumed to comply with G.192. Further input files to the EID are an FER file and an RBER file, which format complies with the above format definition. The EID provides the following command line parameters controlling its operation:

- **ActualClassA_bitnumber**
This parameter defines the number of class A bits of the speech coder. This parameter shall be set to either 75% or 60% of the total bit number per frame of the coder, depending on the condition to be checked.
- **MaxClassB_bitnumber**
This parameter defines the maximum number n_B of class B bits per frame as it is assumed during WCDMA channel error file generation. Thus, this parameter is to be set either to 160 or 256.
- **Channel_offset**
This parameter defines a time offset into the WCDMA channel error files. The time basis of this parameter is a frame of 20 ms.

3.2 Specific operation

The EID operates on frame basis. It reads speech codec bit frames of size as specified in the G.192 format sync header. It reads the FE flag and the RBER mask for the corresponding frame from the FER and, respectively, RBER files (possibly with channel offset). On each speech codec frame the following operation is applied:

- If FE flag set, then the first [ActualClassA_bitnumber] bits of the speech bit frame are set to zero.
- The class B bits of the frame are subjected to errors. The n^{th} class B bit is subjected to an error in dependency of the n^{th} byte of the RBER pattern. If the speech codec mode has a lower bit rate than 32 kbps such that it has a number m_B of class B bits which is less than n_B , then only the first m_B bytes of the RBER frame is applied and the remaining part is ignored.

4. Summary

This paper defines a frame format for FER and RBER error profiles for WCDMA channels, as well as an EID working on that frame format. Ericsson volunteers to provide the source (c-)code of an EID program with the described functionality.

References

- [1] AMR wideband performance requirements (WB-3)