Exhibit 1032

TSG-RAN Working Group 1 #21 ***R1-01-0972***
Torino, Italy, Aug. 27-31 2001

Source: InterDigital Comm. Corp.

Title: Simplified Illustration of the performance benefit of UE dependent CRC

Document for: Discussion

Introduction
Several companies have proposed or supported the use of the UE dependent CRC for HSDPA downlink signaling, in which the CRC is combined with the UE ID, and only the UE-dependent ID is transmitted over the air. Some members of the Working Group have been concerned that the technique has only imagined benefits.

This paper provides a quantitative illustration of the benefits of implict UE ID. Since the purpose is to be illustrative the analysis uses simplified assumptions.

The analysis will show that, for a given allocation of bits for the combined functions of UE ID and CRC, the UE dependent CRC provides better detection of errors for the case where the erroneous block is intended for the receiving UE.

Assumptions
To facilitate the discussion assume three alternative concepts, each using the same number of bits, e.g. 16, to support the combined UE ID and CRC.

1) UE ID length = CRC length= 16 bits; UE dependent CRC
2) UE ID length = CRC length = 8 bits; both are transmitted
3) UE ID length = 16 bits; no CRC

Note that concepts (1) and (3) support more UE IDs than concept (2).

Assume that the probability of bit error, given that the block is in error, = p, independent from bit to bit.
Note that $0.5 \geq p \geq 0$

Erroneous Cases
There are two cases of interest:

a) The transmission is not intended for the UE
b) The transmission is intended for the UE

Analysis of the cases
<u>Case (a), the transmission is not intended for the UE</u>

For concepts (1) , (2), and (3), the probability of false acceptance of the CRC (given that the burst is in error)= $1/2^{16}$

Each bit received has equal probability (i.e. 1/2) of matching the expected value.

<u>Case (b), the transmission is intended for the UE</u>
Given that the block is received in error,

For concept (1), the probability of acceptance = $1/2^{16}$
For concept (2), the probability of acceptance = $(1-p)^8/2^8$
For concept (3), the probability of acceptance = $(1-p)^{16}$

The performance of the three options is shown in figure 1. If the bit error probability = 0.5 for each of the bits of a failed block, then all concepts are equal in performance. As long as an incorrectly processed block has more correct bits than incorrect bits, then the UE dependent CRC has better error detection performance.

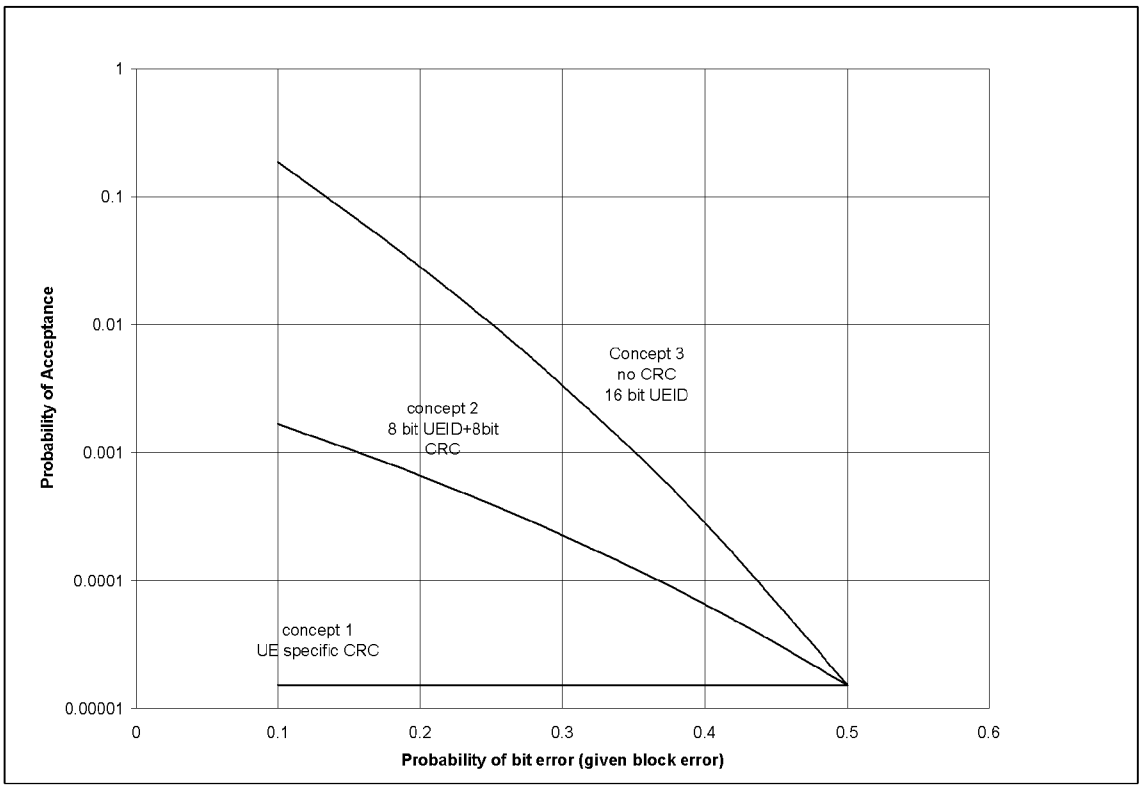

Figure 1 Probability of false acceptance versus conditional bit error probability for an erroneous block intended for the receiving UE

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Conclusion

Assuming the same number of bits is allocated for the combined functions of UE ID and CRC:

- The benefit of the UE specific CRC is in its improved protection in rejecting errors in blocks addressed to the receiving UE.

- In regard to protection against accepting blocks intended for other UEs, all of the approaches are equivilent.