

802.3bj Draft 2.0 Comment #42

Frame error ratio definition

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Comment Type T *Comment Status* X

Clauses 92, 93 and 94 all contain a sentence similar to:
"For a complete Physical Layer, this specification is considered to be satisfied by a frame error ratio less than 1.7×10^{-10} for 64-octet frames with minimum inter-packet gap."

However, this text does not say where in the stack this FER is applied. A common place to do this would be the MAC/PLS service interface, but that is not appropriate as an FER of $1.7E-10$ at that point would lead to unacceptable MTTFFA. Most of the errored frames are expected to be marked as bad by the FEC and dropped by the PCS.

Wording that is being proposed in P802.3bm is equivalent to:
"frame error ratio less than 1.7×10^{-10} at the FEC service interface for 64-octet frames with minimum inter-packet gap when processed according to Clause 91."

Suggested Remedy

Define the interface that the FER applies to in Clauses 92, 93, and 94 as this cannot be the MAC/PLS service interface due to this causing an unacceptable MTTFFA.

Proposed Response *Response Status* ○

Background

- The concept of using frame error ratio (FER) in place of bit error ratio at the MAC/PLS interface was proposed in the following presentations:
 - brown_3bj_02_0912.pdf
 - cideciyan_3bj_01a_0912.pdf
- The reason was that the FEC output will be either all corrected (no errors) or bursts of all 80 64B/66B blocks being errored.
 - FER target was chosen to match the FER due to random bit errors with $1E-12$ BER.
- The interpretation of FER was ratio of transmitted frames not received correctly by MAC to total frames transmitted.
 - Consistent with Clause 55.

Problem

- The assumed FER definition is not consistent with other non-802.3 interpretations.
- RFC3133 defines FER as:
 - “The number of received frames that contain an error in the frame payload divided by the total number of transmitted frames in one direction of a single virtual connection.”
 - The error in a frame payload is generally a CRC error detected by the MAC.
- For the KP4/KR4/KP4 encoding, errors occur only when an FEC codeword is uncorrectable.
 - When testing with 64-octet MAC frames, the frame error ratio will have to be corrected by a factor of around 0.12, due to FEC error marking and PCS RX decoding process.
- Using the RFC definition with specified target of $1.7E-10$ would result in frame loss much higher than would occur in a system without FEC and a BER of $1E-12$.
 - To retain the same frame loss ratio as intended the FER target would have to be reduced to...
 - $1.7E-10 * 0.12 = 2.0E-11$.
- Deriving this relationship for each PHY is unique to combination of FEC codeword size and PCS decoding process.
 - This definition less obvious and is not generic.

Other References

- ITU-T Y.1731 defines Frame Loss Ratio (FLR) as:
 - “Frame Loss Ratio is defined as a ratio, expressed as a percentage, of the number of frames not delivered divided by the total number of frames during time interval T, where the number of frames not delivered is the difference between the number of frames arriving at the ingress ETH flow point and the number of frames delivered at the egress ETH flow point in a point-to-point ETH connection.”
- This definition is consistent with our intended definition except it does not consider the case where the FEC forwards an errored codeword without correction...
 - ...but this is a VERY rare event.

Potential Solutions

- Change “frame error ratio” to “frame loss ratio” and insert the definition.
 - Avoids clash with RFC definition of FER, aligns with ITU definition of FLR, and retains current number.
- Retain “frame error ratio” term but insert the definition.
 - Retains commonality with previous clauses and retains current number, but clashes with RFC definition of FER.
- Retain “frame error ratio” term, re-define to be consistent with RFC, provide new target number.
 - Inconsistent with other clauses, less generic, difficult to derive numbers, and requires new number.

Only the first two options should be considered.

Proposed solutions

- Option 1: Change “frame error ratio” to “frame loss ratio” and insert definition:
 - “For a complete Physical Layer, this specification is considered to be satisfied by a frame loss ratio (the number of transmitted frames not received as valid by the MAC divided by the total number of transmitted frames) of less than 1.7×10^{-10} for 64-octet frames with minimum inter-packet gap.”
- Option 2: Retain “frame error ratio” and insert definition:
 - “For a complete Physical Layer, this specification is considered to be satisfied by a frame error ratio (the number of transmitted frames not received as valid by the MAC divided by the total number of transmitted frames) of less than 1.7×10^{-10} for 64-octet frames with minimum inter-packet gap.”

New or altered text is underlined.

Discussion?