BER Objective for Next-Gen Enterprise Access BASE-T

Nov. 24, 2014

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(Formerly) Proposed BER Objective

- Support a BER better than or equal to 10^{-10} at the MAC/PLS service interface (or the frame loss ratio equivalent)
  - Driven to be similar to Gigabit Ethernet
  - Primarily to keep test time short
- This contribution considers the context of the BER objective with historical models and experience with 10GBASE-T

BASE-T PHYs have generally follow the Fiber Objectives

Speed	BER Objective
1G (including BASE-T)	≤ 10^{-10}
10G (including BASE-T)	≤ 10^{-12}
40G (including BASE-T)	≤ 10^{-12}
100G (no BASE-T yet!)	≤ 10^{-12}
400G (no BASE-T yet!)	≤ 10^{-13}
1000BASE-T1	≤ 10^{-10}
Exception: 100 Mbps 100BASE-T4 100BASE-TX 100BASE-T1	(no explicit FX BER objective) ≤ 10^{-8} ≤ 10^{-9} ≤ 10^{-10}

One Reason Why – Test time

Speed	Time for 1X bits / 5X bits
≤ 10^{-10} at 100M(100BASE-T1)	100 sec / 8.3 minutes
≤ 10^{-10} at 1Gb/s	10 sec / 1.7 minutes
≤ 10^{-12} at 10G	100 sec / 8.3 minutes
≤ 10^{-12} at 40G	25 sec / 2.1 minutes
≤ 10^{-12} at 100G	10 sec / 1.7 minutes
≤ 10^{-13} at 400G	25 sec / 2.1 minutes
≤ 10^{-10} at 2.5Gb/s	4 sec / 0.3 minutes
≤ 10^{-10} at 5Gb/s	2 sec / 0.17 minutes
≤ 10^{-12} at 2.5Gb/s	400 sec / 33 minutes
≤ 10^{-12} at 5G	200 sec / 17 minutes

Experience from 10GBASE-T

- BER/time not a major factor in cost
  - PHY BER vs. SNR curve is very steep
- Low noise events caused by transients can dominate
  - Tend to occur on human time scales
  - Externally induced events not proportional to bit times
    - EMI
    - Baseline effects
    - Vibration
- Capturing minutes of time balances utility with test complexity

Discussion

- Times for 1e-12 BER are not too long, longer than 10GBASE-T
- Intermediate times (e.g., 1e-11 BER) are shorter than 10GBASE-T
- Test times for 1e-10 BER may be too short to capture transient events on human time scales.
  - Consider revised recommendation

Revised Recommendation

- Support a BER better than or equal to 10^{-12} at the MAC/PLS service interface (or the frame loss ratio equivalent)