IEEE 802.3 Backplane Signaling Specification

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Overview

- Need to develop a methodology for selecting “fair” set of channel models to compare signaling approaches. Two parts are involved:
  - Channel selection
    - S21
    - Xtalk (FEXT and/or NEXT)
  - Comparison criterion
    - Compare apples to apples
    - Uniform report

Channel Selection: S21

- Model based approach often does not lead to truly realistic environment
  - Misses any reflections and interactions between reflections
- Need more than a mask
  - Unrealizable channels often fit within mask
  - Mask decides what can't be, not what can be
- Single measured trace is too limited
  - For any signaling approach I can pick a measured channel (or modeled) channel to make it win

Channel Selection: S21

- Need an ensemble of measured channels from a little worse than the mask to well above mask but with significant ripple
  - With 6 to 10 channels selected no method should find unfair favoritism (hopefully the best approach will shine)
  - Channel selection must be agreed upon by the group (blessed by channel ad hoc?)
  - Includes real interactions between loss and group delay ripple under a variety of conditions – trying to run corners across S-parameters

XTALK Selection

- Same as S21, need an ensemble of measured channels, but these should all be near edge of mask (less xtalk is always easier), thus fewer is probably OK.
  - Since only bad XTALK need be considered probably 2 to 4 measured responses is adequate (1 or 2 NEXT, 1 or 2 FEXT)
- How to include XTALK degradation in simulation? (2 ideas)
  - Run XTALK asynchronous to S21 so guarantee periodic worst case alignment. May not get worst case alignment. Needs long simulations.
  - Simulate each XTALK source independently (as seen by slicer), create a PDF for each XTALK source, convolve sources together (assumes independent sources, tail captures worst case alignment), statistically use this during SNR or BER simulation/computation.

Comparison Criterion Basic Thoughts

- Pure simulation for BER
  - Confidence intervals? (Not easy for non-Gaussian disturbance)
  - Repeatability? Good result = good seed?
  - BER is so low, long simulation times
- SNR
  - Different signaling methods need different amounts of SNR for a given BER, hard to agree on fair comparison
- Margin
  - How much disturbance can you add to hit a fixed (fairly high) BER
  - Shorter sims since BER is higher
  - Use DC disturbance so there is not a dependence on random nature of margining disturbance
    - Time offset from best timing spot
    - Voltage offset on slicer
    - Provides inherent sensitivity analysis beyond just a BER
- Recommend NOT including adaptation or CDR in comparison simulations, muddies basic issue
  - Do not want to pick a worse basic solution because of a better (proprietary) CDR or secret sauce in the adaptation
  - Set timing to “best” spot, set coefficients (infinite precision) to “best” values