25GBASE-T Technical Feasibility and Power

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January 2015

Supporters

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Technical Feasibility

- 25GBASE-T builds on well known technology deployed in the field for 10GBASE-T and being developed for 40GBASE-T
- 25GBASE-T could use the same 2-connector ISO Class I/Class II or TIA Category 8 channels currently defined in Draft 1.1.1 of IEEE P802.3bq
- Presentations in 802.3bq have shown technical feasibility at 40GBASE-T using 10GBASE-T based signaling at 3.2GHz symbol rate, one alternative is to run the same signaling at 2.0GHz symbol rate
- Technical approaches well understood from 10GBASE-T and 802.3bq:
  - Reuse of 10GBASE-T technology provides well-known models for feasible implementation
  - PHY channel models to 2GHz developed in 802.3bq allow estimation of PHY transmitter, receiver & cancellation parameters, SNR margins, including key blocks for managing power

Feasibility Comparison

Parameter	10GBASE-T (ref- Cl55)	40GBASE-T (ref- Cl 98d1.0)	25GBASE-T (example)
Channel	100m, Cl 55.7 (e.g., Cat6a)	30m, Cl 98.7d1.0 (e.g., Cat 8)	30m, Cl 98.7d1.0 (e.g., Cat 8)
Baud (MHz)	800	3200	2000 (example)
RX_ENOB (bits)	9.5-10	7.8	6.5-7.5
Channel IL (dB, Nyquist)	46.9	29.4	22.6
Channel round trip (baud)	880	1056	660
Echo Cancellation (dB)	55	47 (-6dB) to 55	43 (-12dB) to 55
NEXT Cancellation (dB)	40	34 (-6dB) to 40	28 (-12dB) to 40
FEXT Cancellation (dB)	25	22 (-3dB) to 25	19 (-6dB) to 25
Relative SNR Margins (dB)	0 (ref)	+2.7dB to 0.2 dB	+8.7dB to +4dB

Better than existing projects on most parameters

One First Order Power model

- Analog power:
  - RX front end proportional to clock rate (x2.5), with reductions due to reduced ENOB (up to ~2.5 equivalent bits less):
    - Net included as ADC power factor: ~$f_{baud}x2^{ENOB}$ is < .36/1.57 = 0.23
  - DAC drive power reduced by 4.2 dB launch power reduction (0.38 power)
  - Clock generation unrelated to AFE (30% of total, no power scaling)
  - Weighted average is 50% of 10GBASE-T AFE power
- Digital power – proportional to:
  - Clock rate (x2.5)
  - Channel delay length (30m) = x 2.5 * 0.3 = 0.75
  - Net is 2.5*0.75 = x1.875
  - Reduced cancellation accuracy is a bonus, but minor & highly architecture dependent
- if 10G is 50% analog/50% digital: **25GBASE-T is 1.1875x 10G**!
  - 21 % analog, 79% digital – lots of room for improvement

- ***Realistic Range: 1.3 to 2X 10GBASE-T power, for 2.5X the bit rate***