Feasibility Framework for Reduced Twisted Pair Gigabit Ethernet (RTPGE)

May, 2012

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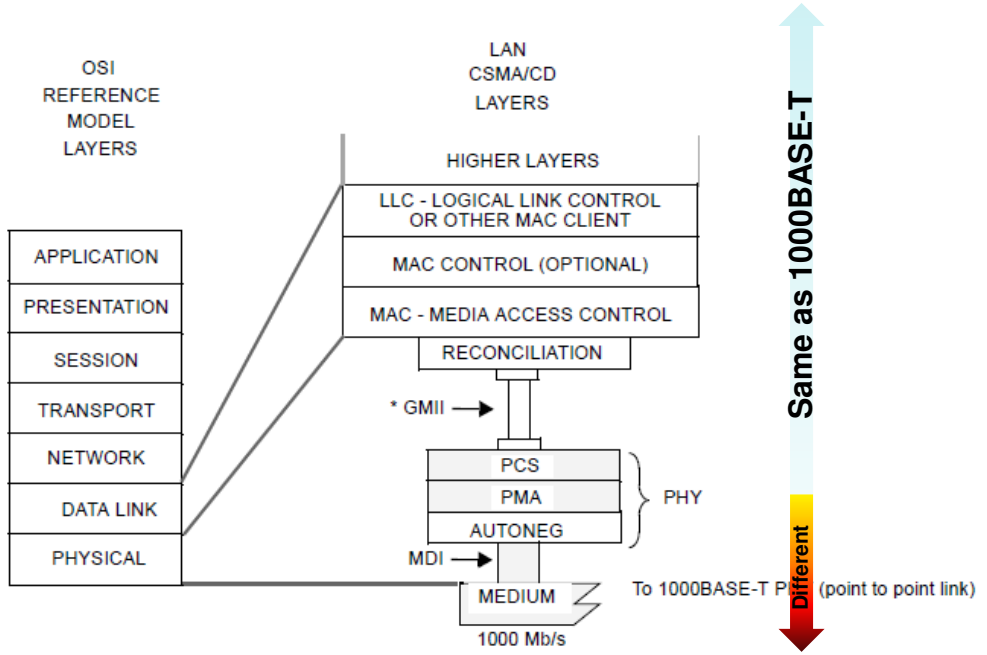
Other supporters are welcome …

Purpose of this presentation

- **Establish and agree on a framework to discuss Technical and Economic Feasibility**
- **To that effect this presentation will propose terms and a framework. This presentation *will not* propose a specific solution**

Where do we start with the system?

- Start with 1000BASE-T over 4Pair-Cat5e as baseline
- What is really different for RTPGE vs. 1000BASE-T?
  - Above the PHY: Same as 1000BASE-T from RS to MAC & above (e.g. switch)
  - PHY: A portion will be different. A portion the same
    - E.g. PCS will have similar complexity.
    - E.g. PMA will be different due to the definition of a new channel
    - TX/RX-AFE and DSP will change
  - Below the PHY: Different
    - MDI and medium (channel)



Thus, consider from the PHY downwards

Framework: Methodology

- Economic feasibility
  - List of all components and number of components per link partner pair
  - Cost relative to a baseline of 1000BASE-T over Cat 5e
  - Complexity can be assigned a percentage over a baseline subsystem
  - Savings (e.g. weight) can be assigned a percentage over baseline
- Technical feasibility
  - Line signaling (baud rate, modulation, PCS encoding/decoding, error correction, etc.)
  - Margin with respect to immunity
  - Emission properties
  - Receiver complexity
- Other factors
  - Cable
    - Weight: Can be incorporated into economic feasibility
    - Size: If a constraint can be considered separately (distance supported vs. IL vs. wire diameter)
  - EMC properties (radiated & conducted emissions / immunity)
  - Application assumptions
    - If underlying application requirements change the channel or the constrains, more than one set of comparisons may be needed. E.g. if industrial requirements differ from automotive.

Framework: Sample Relative Comparison to 1000BASE-T Baseline

- Components
  - PHY
    - PCS
    - PMA
      - TX
        - » AFE
        - » Digital
      - RX
        - » AFE
        - » DSP
    - Packaging
  - MDI / Channel
    - Magnetics
    - Connectors
    - Cable
    - PCB
- Other drivers
  - Cable harness weight
  - Latency, Link Acquisition Time
  - EMC properties
- Can be built out into a "link segment spreadsheet above comparison to 1000BASE-T" for a relative comparison

	1000BASE-T		3-Pair		2-Pair		1-Pair	
	Quantity	Complexity	Quantity	Complexity	Quantity	Complexity	Quantity	Complexity
PHY								
PCS	2	1	2		2		2	
PMA	2	1	2		2		2	
TX	2	1	2		2		2	
AFE	8	1	6		4		2	
Digital	8	1	6		4		2	
RX	4	1	3		2		2	
AFE	8	1	6		4		2	
DSP	8	1	6		4		2	
LATENCY	-	1	-		-		-	
LINK ACQ.	-	1	-		-		-	
MDI/Channel								
Magnetics	8-core	1						
Connectors	2	RJ45						
Cable	4	1						
PCB								
Weight		1						
TOTAL		1		1 * x%		1 * y%		1 * z%

Conclusions

- **Framework to discuss feasibility has to be established**
  - **Consider deltas from 1000BASE-T**
    - **Portions of PHY and below vs. MAC and above**
  - **Overall system cost and feasibility has to be considered**
    - **PHY, channel, weight, EMC**
- **Economic feasibility**
  - **Sample comparison chart shown**
  - **To be completed into "link segment spreadsheet comparison to 1000BASE-T" for a relative cost comparison**
    - **If additional application requirements impact above, multiple charts may be needed**
- **Technical Feasibility**
  - **In part dependent on the channel definition**
    - **Need to agree on some basic parameters of the channel**

Goal is to agree on a framework that allows for an "apples-to-apples" comparison across the various technology choices

Thank You!