UNH InterOperability Lab
10 Gigabit Ethernet Consortium

Our Experience, Insight, and Lessons Learned

Presented by Bob Noseworthy
10GEC Manager
About the IOL / 10GEC

• IOL:
  – Over 14 years experience
  – 100% Industry funded by >330 Memberships
  – 14 Technology Focused Consortia

• 10GEC:
  – 11 Members and growing
  – Testing 10GE Equipment since July’01
  – Involved with all 10GEA Hotstages & Tradeshows
  – Active with Standards effort since 1st meeting
What about Bob (About the speaker)

- 7 years experience at IOL
- M.S. Electrical Engineering
- Developed / performed testing for Ethernet from 10Megabit through 10Gigabit
- Involved in IEEE802.3 since 1st meeting of HSSG for Gigabit Ethernet
- FEA, GEA, and 10GEA involvement
Experience / Insight

Dave Dobbins of Telecom Ottawa said it best

• “Things We’ve Learned”
  – Don’t assume anything
  – Test, test, test, then test again
  – Proprietary isn’t good

(quoted with permission)
Experience / Insight

• A green light might guarantee you
  – 100Mbps, 1000Mbps, or even 10Gbps
• But what’s the BER? (Bit Error Ratio)
• Spec for 10GE is 1x10^{-12} BER
  – 1 error every 1.66 minutes
“Don’t assume anything”

• Products that seem to work today, may not work with future products.
  – History points to early solutions which later proved to be flawed / non-compliant to standard / non-interoperable
  – Fortunately today, multiple independently developed interoperable 10GE components exist

• The Price of InterOperability is Eternal Vigilance
  – Only by detailed testing can future problems be averted
  – Clear, Strong and Supported Standards are essential
“Test, test, test, then test again”

- **IEEE 802.3ae Clause 52**
  - Defines the 10GE Serial Optical Physical Layer
  - 43 pages, 26 devoted to T&M (60.5%)
- **Excerpt from 52.9.10.3:**
  - (The Stressed Receiver Conformance Test does) guarantee that a receiver meeting the requirements of this test will operate with the worst-case optical input.
Stressed Eye Test Results

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“Proprietary isn’t good”

- Need for verification at all networking layers:
  - Media
  - Physical Layer Signaling
  - Channel Coding (XAUI PCS / 64B/66B PCS)
  - Media Independent Interface Testing
    - XGMII, XGXS (XAUI), Xenpak, XPAC, etc
  - Local / Remote Fault Handling
  - Media Access Control (MAC)
  - MAC Control (Flow Control / PAUSE)
Experience / Insight

• To perform these tests, a multitude of products exist from:
  – Agilent, Circadiant, IneoQuest, Ixia, Lecroy, Spirent, Tektronix, Wavecrest & others

• In our experience, a niche set of knowledge intensive tests requiring custom tools are needed
  – Working with Xilinx to develop tools to enable XAUI PCS, 64B/66B PCS, & RS/Fault testing
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Lessons Learned

• Do not assume anything –
  – Obtaining/exceeding the BER spec on the physical channel/signaling is the significant challenge of 10GE

• For 10GE to work in the enterprise LAN
  – Multi-vendor ports across std. defined distances must ‘plug-and-play’ (not an engineered links)

• LAN User’s mindset with 10GE must be respectful
  – Exhibit great fiber care / management / cleaning
  – ER/EW links can literally burn the end of a dirty fiber
Lessons Learned

• Proprietary isn’t good –
  – Make sure your user needs are reflected through yourselves or your vendor’s representation in the Standardization process
  – OAM being defined now (within EFM effort)

• Remote / Local Fault – simple and easy (this isn’t Auto-Negotiation)
Lessons Learned

• Test, test, test, then test again
  – The need never ceases – IOL still tests 10Base-T!

• Next UNH IOL 10GEC Group Test Period is a multi-week event in January 2003.
  For info:
  – www.iol.unh.edu/consortiums/10gec