

Teledyne LeCroy

Protocol Solutions Group
Ethernet Test & Measurement
“Paving the Road”



TELEDYNE LECROY
Everywhereyoulook™

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Test & Measurement – Universal Considerations

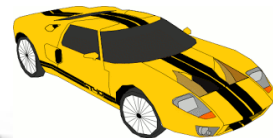
- **Common to all stages of Development, Deployment, and Support**
 - What issue(s) are we trying to understand and correct?
 - When and How does the issue manifest?
 - Is the issue reproducible?
 - Can root cause be definitively determined?
 - What are the curative measures?
 - Can you test the 'fix'?

Ethernet Test & Measurement Today

- **The “Road” has remained fairly even and unchanged**
- **Minor Imperfections ‘accepted’ as normal and unremarkable**
- **Software Tools the de facto ‘go to’ in debug and diagnosis**
 - Factory and Third Party FMU’s
 - Open Source options (ex. Wire Shark)
- **Home Grown Tools**
 - Typical in development, don’t see the public light of day
- **Trial and Error**
 - Plug and Pray
- **Bottom line: It’s been a “Roll your Own” Mentality**

The High Speed ENET “Highway”

- **The ‘Road’ is being repaved for Higher Speed Traffic**
 - NRZ to PAM4 – 50GE Single Serdes
 - 1/10/25/40/50/100GE Today and 2.5/5/200/400/800GE
- **The ‘minor’ imperfections are damaging to traffic flow**
 - Auto-Negotiation, Training, FEC,
- **Software utilities, taps, traditional tools not enough**
 - What’s really on the “line”?
- **Home Grown tools questioned in the “Make or Buy” analysis**
- **Trial and Error too costly (\$\$s and Time)**
- **Bottom Line: “Roll your own” is no longer viable**



Test & Measurement – Navigating the New Road

- **Updated and New Tools for the PHY**
- **High Speed Real Time and/or Sampling Scopes**
 - Up to 100GHz Today!
- **Specialized Traffic Generation Capabilities Supporting:**
 - Physical Coding Sublayer – 8b/10b, 64b/66b, 256b/257b encoding
 - Enhanced Auto-Negotiation, Training Sequences
- **New Line Rate analysis capabilities supporting:**
 - “Pass Through” tapping
 - Bit-level Capture
- **The “Road” must be “smart”**
 - Protocol is inherent in the physical layer!



Test & Measurement – Testing New Cars on the New Road

- **With the New “Road” Come New “Cars” and “Passengers”**
 - New, Bigger, Faster, and More Densely Packed Cars
 - IPV6, Jumbo and Super Jumbo Frames
- **The “Tool Chest” of Analysis**
 - Characterization Utilities
 - OTS and Proprietary Software
 - Protocol Analyzers
 - Intelligent Line Rate “Sniffing” tools – Purpose Built
- **Interoperability Testing**
 - The “NTSB” of Ethernet Ecosystem

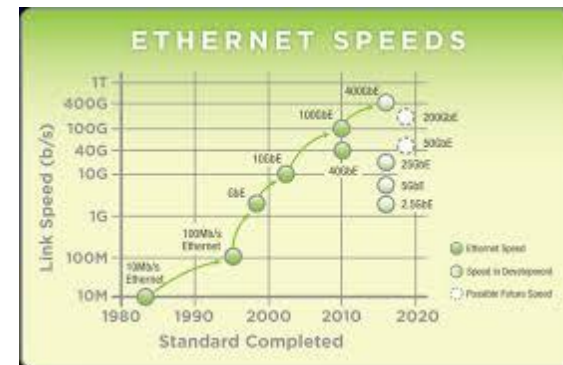


Test & Measurement – “Traditional” Storage Considerations

- **Ethernet Evolution as *The* Storage Fabric**
 - 6G, 12G, and soon 24G SAS Drives
 - Flash Memory Arrays
- **Protocols, Protocols, Protocols**
 - Legacy Storage
 - iSCSI, FCoE, NFS, Hadoop,
 - New RDMA Based Protocols
 - iWARP, Infiniband, iSER, NVMe over Fabric!
- **The End Goal is the Near Lossless Transport of Data**
 - An Ethernet SAN backbone to rival FC

Test & Measurement – Ready for the Road Ahead

- **EA Participation in Standards Committees**
 - Alliance Members Active Involvement in All Workgroups
- **Consortium and Industry Group Cooperation**
 - Alliances and SIGs share the common goal – Rapid Deployment
- **Anticipation of Upcoming Speeds**
 - Teams Architecting High-Speed Capable Solutions
 - Physical Layer tools working in concert with Protocol and Software Utilities
 - 6 “Speed Bumps” in the next 3 Years!
 - It took 27 years to evolve the first 6 Speeds!
- **Power Over Ethernet**



Test & Measurement – Summary Considerations

- **Prepare for Today's Development and Tomorrows Support Needs**
 - Tool decisions, T&M Partner alliances should be made with a forward looking support considerations
- **The “Silver Bullet” is an Elusive Myth**
 - The Test Community is working together as no one company has it “all”
- **T&M Vendors are the Industry's Bellwether**
 - T&M Tools are Evolving as Rapidly as the Specs, often the “First to Market” to enable the development ecosystem
- **The EA Test and Measurement Community Commitment**
 - The Member Companies are committed to enablement and support of the Ethernet Evolution!

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