

# CONSIDERATIONS FOR OBJECTIVES IN NEXT-GEN BASE-T



Contribution to  
IEEE 802.3:  
NG-BASE-T Study  
Group  
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# OUTLINE

- Some of the things that have made BASE-T successful to date
- Why they matter
- Over-constrain the problem:
  - What we DON'T want to do
- Capture the important stuff:
  - What we NEED to do
- Proposed Objectives
- Goals / Lessons-learned
- Not Quite Ready for Prime Time

# WHAT HAS MADE BASE-T SUCCESSFUL TO DATE?

- **Plug-and-play**
  - Autoneg determines PHY capabilities
  - Next-gen infrastructure designed to support last-gen speeds
    - TIA/ISO operating principle
- **NO ENGINEERED LINKS**
  - Infrastructure is independent of equipment
  - Separate standards groups
  - Separate cost accounting and time for installation
- **Backwards compatibility to earlier speeds**
  - 4-pair copper
  - RJ-45 connectorization
  - Some speed always comes up!
- **Integration of components**
  - Silicon integrates multiple speed PHYs
  - Connector & MDI components have been common with legacy

# WHY THEY MATTER

- **Backwards Compatibility to Earlier Speeds (UNIQUE to BASE-T)**
  - Upgrade one end (e.g., one server) at a time
    - Don't have to buy a new server bank with each switch, etc.
  - Fallback in case of faults
    - Not perfect, but users prefer connectivity
  - Easy to configure, identifiable Ethernet (RJ-45 blessing and curse)
- **Plug-and-play: pre-lay the infrastructure, use it for last-gen**
  - Fertile ground ready for new equipment (nearly broke this in 10G)
  - Allows single-ended/server upgrade cycle, Viral deployment as needed
- **Avoiding Engineered Link design enables this**
  - Don't have to plumb wires with each connection
  - Independent connectivity
  - Reconfigurable cabling with standardized components
- **Integration of Components**
  - Support for all the above (took a while at 10G)

# OVER-CONSTRAINING: WHAT WE DON'T WANT TO DO

- Many of these come from “drinking the Kool-Aid”
  - “Reasonable” statements are often not true
  - Many of the issues with 10GBASE-T came from this
- Avoid leaving big, direction-changing issues unresolved
  - Don't avoid working reach objectives
  - Don't avoid working speed objectives
  - Don't avoid working backwards compatibility objectives
  - Don't avoid the role of legacy infrastructure
- BUT, avoid fractious arguments in the early stages
  - Connectors vs. adapter cords for backwards compatibility
  - Architectures for switching/cabling
    - Tiered vs. Flat?
    - Modular/Pods vs. Room/Row?
    - Segmented/Direct attach vs. Structured/Reconfigurable?
  - Overly restrictive application definitions
    - Is NGBASE-T for data centers only?
    - ***BUT: We need to understand the distribution of application opportunities!***

# CAPTURE THE IMPORTANT STUFF: WHAT WE NEED TO DO

- Determine broad objectives
  - Many things may or may not be objectives – it's a judgment call
  - Objectives should be fewer and broader than goals and design points
- Capture the things everyone assumes!
  - Fallback to prior speeds
  - Channel predictably supports legacy PHYs
  - Support for 802.3 MAC
  - Support for 802.3-style management
    - Usually not a specifically-stated objective
- Some obvious things require study group work to resolve
  - Obvious examples:
    - Speed supported
    - Distances and topologies supported

# PROPOSED OBJECTIVES (FROM ZIMMERMAN\_1\_0912.PDF)

- Support full duplex operation only
- Preserve the 802.3 / Ethernet frame format utilizing the 802.3 MAC
- Preserve minimum and maximum Frame Size of current 802.3 standard
- Support a BER better than or equal to  $10^{-12}$  at the MAC/PLS service interface
- Support Auto-Negotiation (Clause 28)
- Support local area networks using point-to-point links and structured cabling topologies
- Meet FCC Class A EMC requirements
- Support an optional Energy Efficient Ethernet mode



# GOALS AND LESSONS LEARNED (FUEL FOR POTENTIAL OBJECTIVES)

- **Lessons Learned** – these may or may not become objectives
  - Support data center row-level links and equipment rack links
    - And work on how to word this, and where it should be!
  - Support latency  $\ll$  10GBASE-T (is this a specific objective?)
  - Consider energy efficient Ethernet operation
  - Enable reduced power/cost 10 Gigabit transmission
- **Goals & considerations (Sometimes objectives, usually not)**
  - Even if their uses aren't immediate!
  - Consider powering over spans (will we want it someday?)
  - Consider high-density applications, and its impact on other objectives
  - Consider expansion to speeds beyond the first step (what next?)
- **ALL OF THESE REQUIRE WORK BY THE STUDY GROUP**

# NOT QUITE READY FOR PRIME-TIME (SG WORK TOPICS)

- These are NOT proposed as objectives *at this time* and may or may not ultimately become objectives
- Support a MAC data rate of **TBD** Gb/s
- Support operation over **N\_TBD**-connector structured (*at least*) 4-pair, twisted copper cabling for all supported distances and Classes
  - Support data center row-level links (and work on how to word this as a spec!)
- Support an end-to-end latency  $\ll$  10GBASE-T
- Compatible with 802.3at power over MDI
- Enable reduced power/cost 10 Gigabit transmission

**THANK YOU!**