

## 10GBASE-T 5 Criteria

### 1. Broad Market Potential

- Broad set of applications
  - Multiple vendors, multiple users
  - Balanced cost, LAN vs. attached stations
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The past half decade has seen the continuing strong growth of network traffic encompassing the entire breadth of data communications, from the desktop to the WAN. At the same time, the speed and capacity of the elements making up the network have also grown at an impressive rate. The driving force has been the pervasive adoption of IT technology by enterprises and the many uses of the internet; the enabling factor has been the continuing advance in semiconductor technology resulting in ever increasing processing speed and abundant inexpensive data storage capacity. There is no indication that these trends are about to wane; if anything, they are likely to accelerate.

One result of these trends has been the steady migration of LAN speeds upward to 100 Mb/s (100BASE-TX) today, and an accelerating trend toward 1000 Mb/s (1000BASE-T). As with the previous Ethernet standards, a given user speed brings with it requirements for higher speeds at points of data aggregation.

During the same period, the density of computer devices (servers, switches, routers and storage modules) located in data centers has increased by orders of magnitude. These devices need to be interconnected at the highest speeds practicable

The cost of the computing devices at the desktop and in data centers continues to fall, due largely to improving silicon manufacturing efficiencies. These lowered station costs are best balanced by twisted pair copper media LANs.

Virtually all desktop applications and a substantial portion of the computer room interconnects since the early days of Ethernet operate on twisted pair copper wiring, demonstrating customer preference for this media whenever applicable. 10GBASE-T will continue this trend into the next generation of Ethernet.

## 2. Compatibility with IEEE Standard 802.3

- Conformance with CSMA/CD MAC, PLS
  - Conformance with 802.2
  - Conformance with 802 FR
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The proposed standard will conform to the full-duplex operating mode of the 802.3ae MAC. .

In a manner similar to the 100BASE-TX and 1000BASE-T standards, a new Physical Layer (PHY) will be defined for operation at 10G/s over structured copper cabling.

The Management Information Base (MIB) for 10GBASE-T will maintain compatibility with the current 802.3 MIB, allowing a consistent management model at all operating speeds.

Conformance with 802.2 is provided by the overlying 802.3ae MAC sub-layer.

The proposed standard will conform to the 802 Functional Requirements Document, with the possible exception of the Hamming distance.

### 3. Distinct Identity

- Substantially different from other 802.3 specs/solutions
  - Unique solution for problem
  - Easy for document reader to select relevant spec
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The proposed standard is a 10Gb/s upgrade for 802.3 users based on the 802.3 CSMA/CD MAC.

It is the only standard that will use horizontal structured twisted pair cabling as defined in ISO/IEC 11801, offering upgrade paths for present Ethernet users.

The proposed standard will be formatted as a new clause to the 802.3 standard.

#### 4. Technical Feasibility

- Demonstrated Feasibility
  - Proven Technology
  - Confidence in Reliability
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Presentations given to 802.3 have demonstrated the technical feasibility of 10Gb/s signaling using structured twisted pair cabling as defined by ISO/IEC 11801. It is anticipated that specifications within the ISO/IEC 11801 document may require some augmentation. Presentations of companies manufacturing copper cabling and connecting hardware have likewise confirmed that any required additional specifications or modifications are readily available.

The technology to be utilized in the realization of the 10GBASE-T PHY will rely heavily on previous 802.3 standards; 100BASE-TX, 100BASE-T2 and 1000BASE-T. It is recognized that the relevant technologies have greatly advanced at every level since the inception of work on the 1000BASE-T standard approximately six years ago.

The dramatic increase in silicon implementation parameters has been matched by the progress in the available modeling, simulation, design and verification tools. These tools have been used to develop channel models for 10GBASE-T which can be relied on to predict its performance in actual implementations. Based on this work, xx companies have verified the feasibility of the proposed standard.

The channel models have been supported by the measurement of the properties of cables and network hardware in both laboratory and field environments.

Further confidence in the validation process has been gained by the excellent field performance of 1000BASE-T standard devices, which were initially developed using similar but much less mature techniques than those currently in use.

## 5. Economic Feasibility

- Cost factors known, reliable data
- Reasonable cost for performance expected
- Total installation costs considered

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The implementation of the 10GBASE-T PHY device is estimated to require an approximate complexity level of  $x$  times the currently available four-channel 1000BASE-T chip. The experience curve of the semiconductor industry practically guarantees the future reduction of the size, and hence the cost, of implementation. In production, the 10GBASE-T PHY device is projected to meet the 3x cost versus 10x performance guidelines applied to previous advanced Ethernet standards.

The use of structured twisted pair cabling the standard also insures its economic feasibility.