



10Gb/s on FDDI-grade MMF Cable

5 Criteria Discussion Slides

5 Criteria Review

- The following draft 5 criteria for the 10Gb/s on FDDI-grade multimode are provided for initial discussion purposes within the study group
- Modifications will be made as this draft is reviewed & comments taken and as presentations are discussed addressing the criteria and advancing the overall study group efforts
 - For example, certain assumptions were made in preparing this draft (such as the specified standard would be a new PMD for an existing PHY). As the study group effort progress and agreement on the scope and approach to be proposed are determined, applicable revisions will be made.
- 5 Criteria definitions taken from *IEEE Project 802 LAN MAN Standards Committee (LMSC) Policies and Procedures, July 25, 2003*
 - Broad Market Potential
 - Compatibility with IEEE Standard 802
 - Distinct Identity
 - Technical Feasibility
 - Economic Feasibility

Broad Market Potential

- Broad sets of applicability
- Multiple vendors and numerous users
- Balanced costs (LAN versus attached stations)

Current trends suggest the steady migration of LAN speeds from 100 Mb/s (100BASE-TX) today toward 1000 Mb/s (1000BASE-T). In particular, as the density of computer devices (desktops, servers, switches, routers and storage modules) located in enterprise networks and data centers increases, so will the demand for higher speeds at data aggregation points. A critical aggregation point is represented by the interconnection of distribution equipment within the building backbone cabling subsystem. Clearly there is a need for a low cost 10Gb/s solution that will utilize the installed base multimode fiber infrastructure.

Interest in 10Gb/s on FDDI-grade multimode fiber has been demonstrated by the attendance of more than 156 vendor and user representatives at CFI meeting at the November 2003 Plenary, and by the attendance & contributions received towards advancing a technical solution at the subsequent January Interim meeting. Forty (40) companies have indicated they will participate in the technical development of a standard for 10Gb/s on FDDI-grade multimode fiber. This level of commitment indicates that the standard will be supported by multiple vendors, and that there will be a wide variety of equipment available to support 10 gigabit speed applications on multimode fiber links.

Eventually exhibit similar cost balance as 802.3z (1000BASE-SX/LX) for LAN devices vs. attached stations.

Compatibility with IEEE Standard 802

- IEEE 802 defines a family of standards. All standards shall be in conformance with the IEEE 802.1 Architecture, Management and Interworking documents as follows: 802. Overview and Architecture, 802.1D, 802.1Q and parts of 802.1f. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with 802.
- Each standard in the IEEE 802 family of standards shall include a definition of managed objects which are compatible with systems management standards.

The proposed standard will conform to the full-duplex operating mode of the 802.3ae MAC. In a manner similar to the 1000BASE-SX/LX standards, a new Physical Medium Dependent (PMD) sublayer will be defined for operation at 10Gb/s over structured fiber cabling.

The proposed standard will conform to the requirements of IEEE Std 802-2001. Conformance with 802.1 and 802.2 is provided by the overlying 802.3ae MAC sub-layer.

The proposed standard will not support the OAM unidirectional mode specified in P802.3ah.

The Management Information Base (MIB) for the 10Gb/s on FDDI-grade multimode fiber PMD will maintain compatibility with the current 802.3 MIB, allowing a consistent management model at all operating speeds.

Distinct Identity

- Substantially different from other IEEE 802 standards
- One unique solution per problem (not two solutions to a problem)
- Easy for the document reader to select the relevant specification

The proposed standard is a 10Gb/s upgrade for 802.3 users based on the 802.3 CSMA/CD MAC.

It is the only economically viable standard with broad industry support that will use structured fiber cabling as defined in ISO/IEC 11801 (e.g. OM1), offering upgrade paths to 10Gb/s for present 1Gb/s Ethernet interfaces connected with fiber. A PMD was defined (10GBASE-LX4) to address this application as part of the 802.3ae effort, but it has not achieved the level of industry support to meet either the economical feasibility or the broad market potential required. The LX4 interface is not widely available, which is a key measure of being a viable solution. [note: additional material solicited to properly position LX4 with respect to this new PMD]

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

Technical Feasibility

- Demonstrated system feasibility
- Proven technology, reasonable testing
- Confidence in reliability

Presentations made to the 10Gb/s on FDDI-grade multimode fiber Study Group illustrate the technical feasibility of 10Gb/s signaling using structured fiber cabling as defined by ISO/IEC 11801. These presentations covered all aspects of feasibility including simulation and theoretical analysis based on known technology, specified cabling technology, and state of the art process technology; and demonstrated that there is sufficient channel capacity for the transmission of 10Gb/s.

The technology to be utilized in the realization of the 10Gb/s on FDDI-grade multimode fiber PMD will rely on the work of previous 802.3 standards and activities; both extension to the multimode efforts of 1000BASE-SX/LX, and the PMD is expected to leverage available 10GBASE-LR technology. It is recognized that the relevant technologies have greatly advanced at every level since the inception of work on the 1000BASE-SX/LX standard over six years ago and the original 802.3ae PMD work from 3 years ago.

This study group has received contributions from PHY, system and cabling vendors; end users; and industry/academic experts.

Economic Feasibility

- Known cost factors, reliable data
- Reasonable cost for performance
- Consideration of installation costs Demonstrated system feasibility

The implementation of a 10Gb/s on FDDI-grade multimode fiber PMD device is estimated to require an approximate complexity level of 3 - 4 times the currently available 1000BASE-SX/LX devices and be very similar to recently available 10GBASE-LR devices. The experience curve of the industry ensures the future reduction of the size and the cost of implementations. In production, the 10Gb/s on FDDI-grade multimode fiber PMD device is projected to meet the 3x cost versus 10x performance guidelines applied to previous advanced Ethernet standards.

The widespread use and low cost of installation of structured fiber cabling systems supports economic feasibility with regards to total cost of installation.