
Ethernet in the First Mile Tutorial

IEEE 802 LMSC

Monday, July 8 2001

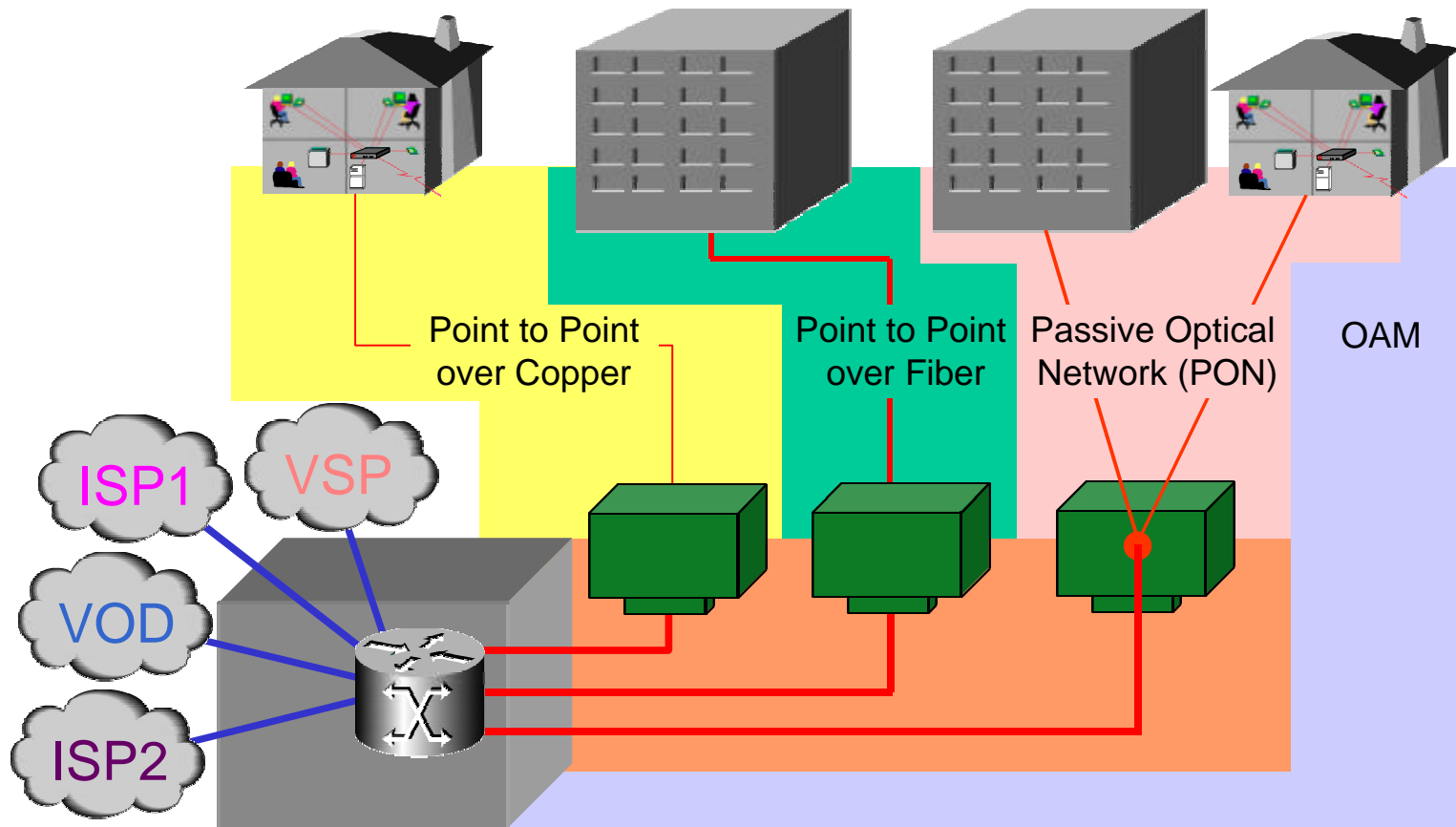
Portland, OR

**Ethernet in the First Mile
IEEE 802.3 Study Group**

Agenda

- Overview
- Terminology
- Objectives
- Project Authorization Request
- 5 Criteria
- Point to point fiber (P2P)
- Point to multi-point fiber (EPON)
- Point to point copper (Copper)
- Operations, Administration and Maintenance (OAM)
- Q&A

Overview



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Terminology

- MxU - Multi-Tenant/Dwelling/Company Unit
- FTTX - Fibre to the Exchange
- FTTC - Fibre to the Curb or Cabinet
- FTTB - Fibre to the Building
- FTTH - Fibre to the Home
- Downstream - Data to the subscriber
- Upstream - Data from the subscriber

Study Group Objectives

- Support subscriber access network topologies:
 - Point to multipoint on optical fiber
 - Point to point on optical fiber
 - Point to point on copper
- Provide a family of physical layer specifications:
 - 1000BASE-X extended temperature range optics
 - 1000BASE-X $\geq 10\text{km}$ over single SM fiber
 - PHY for PON, $\geq 10\text{km}$, 1000Mbps, SM fiber, $\geq 1:16$
 - PHY for single pair non-loaded voice grade copper distance $\geq 2500\text{ft}$ and speed $\geq 10\text{Mbps}$ aggregate
- Support far-end OAM for subscriber access networks:
 - Remote Failure Indication
 - Remote Loopback
 - Link Monitoring

Title

Standard for - Information technology - Telecommunications and
information exchange between systems - Local and
metropolitan area networks - Specific requirements - Part 3:
Carrier sense multiple access with collision detection
(CSMA/CD) access method and physical layer specifications -
**Media Access Control Parameters, Physical Layers and
Management Parameters for subscriber access networks**

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Scope

Define 802.3 Media Access Control (MAC) parameters and minimal augmentation of the MAC operation, physical layer specifications, and management parameters for the transfer of 802.3 format frames in subscriber access networks at operating speeds within the scope of the current IEEE Std 802.3 and approved new projects

Purpose

To expand the application of Ethernet to include subscriber access networks in order to provide a significant increase in performance while minimizing equipment, operation, and maintenance costs

Broad Market Potential

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

Residential and business subscriber access networks represent a new and very broad application space for Ethernet. The available market is estimated by third party analysts at greater than 40 million subscribers in the US and 150 million subscribers worldwide by 2005. The technology developed for access networks will have applications in other markets as well.

At the second EFM study group meeting, 121 individuals from 77 companies representing both vendors and users expressed their support for the project.

Ethernet equipment vendors and customers are able to achieve an optimal cost balance between the network infrastructure components and the attached stations.

Compatibility

- a) Conformance with 802 Overview and Architecture**
 - b) Conformance with 802.1D, 802.1Q, 802.1f**
 - c) Compatible managed object definitions**
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As a supplement to IEEE Std 802.3, the proposed project will remain in conformance with the 802 Overview and Architecture with the possible exception of the peer to peer key concept for Ethernet over PON.

As a supplement to IEEE Std 802.3, the proposed project will remain in conformance with 802.1D, 802.1Q and 802.1f, though extensions to these standards may be proposed as additional work items.

As a supplement to IEEE Std 802.3, the proposed project will follow the existing format and structure of 802.3 MIB definitions.

Distinct Identity

- a) Substantially different from other IEEE 802 standards.**
 - b) One unique solution per problem (not two solutions to a problem).**
 - c) Easy for the document reader to select the relevant specification.**
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There is no existing 802 standard or approved project appropriate for wire line access using the Ethernet access protocol and frame format, with the exception of certain combinations of operating speed and media defined in various supplements to IEEE Std 802.3. This project will expand that set to include new media.

While the proposed project includes a choice of physical media and operating speeds, it will specify only one solution for each media at a given operating speed range.

The proposed project will be formatted as a supplement to IEEE Std 802.3, making it easy for the document reader to select the EFM specification.

Technical Feasibility

- a) Demonstrated system feasibility.**
 - b) Proven technology, reasonable testing.**
 - c) Confidence in reliability.**
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Ethernet systems (comprising interface controllers, bridges, routers, management systems, and other devices) represent the most widely deployed networking technology in history. The proposed project will build on the vast array of Ethernet component and system design experience, and the broad knowledge base of Ethernet network operation.

The proposed project will, to the extent possible, re-use specifications developed by other standards bodies and develop new specifications in accordance with the rigorous standards of proof applied to 802.3 projects.

The reliability of Ethernet components and systems can be extrapolated in the target environments with a high degree of confidence.

Economic Feasibility

- a) Known cost factors, reliable data.**
 - b) Reasonable cost for performance.**
 - c) Consideration of installation costs.**
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The cost factors for Ethernet components and systems are well known. The proposed project may introduce new cost factors which can be quantified.

Ethernet consistently demonstrates the most attractive cost/performance ratio of any networking technology, at any operating speed. This fact is well established in the enterprise networking application space, and the goal of this project is to extend the same cost/performance advantage to the access application space.

Installation costs, as well as maintenance and operations costs, should be reduced when compared to competing technologies through a combination of higher manufacturing volume, broader competition, a broader labor pool, simpler configurations and a more optimal system architecture.

Summary

- *Ethernet in the First Mile is:*
 - The Final Frontier*
 - The bridge (router) over the digital divide*
 - The optimal subscriber access network*
 - Faster, simpler, better, more profitable*