Ethernet in the Metro

Status; Sevices; and the role of:

Metro Ethernet Forum

Agenda

- Ethernet in the Metro
- Metro Ethernet Services and Transport
- Critical Issues for Metro Ethernet
- MEF Overview

Ethernet in the Metro

What is Metro Ethernet?

A Metro Ethernet Network (MEN) offers Ethernet access and Ethernet based services across a MAN.

Some service providers have introduced a MEN-like technology for the Wide Area Network (WAN).

Why Ethernet in the Metro

- Packet traffic dominates
  - Overtaken voice as the dominant traffic type in networks worldwide
- Today packet traffic is transported over networks designed for voice
  - Inflexible
  - High cost to design, provision, operate and offer
- Rapid growth in sites demanding high speed access and flexible services
  - Service providers face a dilemma on how to meet demand and make a reasonable profit

Ethernet in the Metro

- Ethernet is the Media and interconnection interface of choice
  - mature, predictable, simple and well-understood data networking technology
- Ethernet is the ideal service provider demarc
  - It's the predominate choice of connectivity in the LAN
  - It's the lowest cost interface for end customers to connect to a data service
- Ethernet in the Metro
  - Most flexible means to offer service at the bandwidths customer demand
  - Significantly lowers Total Cost of Ownership, which benefits carriers and their customers

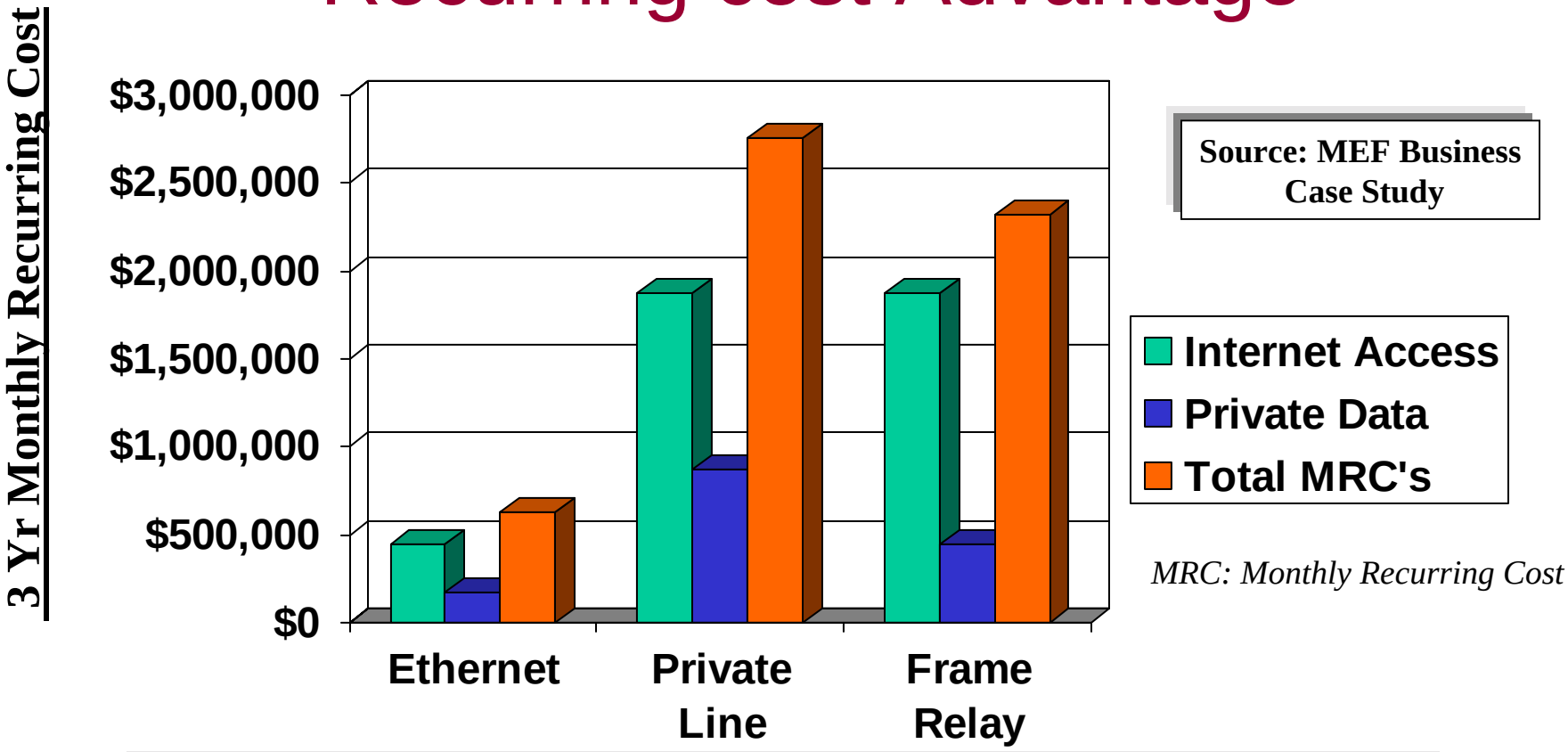
Market for Metro Ethernet

- Strong demand for metro Ethernet in APAC and Europe (RBC Capital Market)
- Metro Ethernet is a key growth area for RBOCs in 2003 and beyond (Solomon Smith Barney)
- RBOCs/PTTs: Testing Metro Ethernet in 2Q/3Q 02, deployment in 4Q02 and 2003 (RBC & Yankee)
- $4 billion metro Ethernet service revenue is to be realized in 2006 in North America (RHK, 2002)

Ethernet Services Advantages for End-Users

- Beats the other high bandwidth Alternatives
  - Uses Ethernet as service hand off rather than SONET
  - Avoids complex and costly CPE upgrades
  - Avoids the expense and complexity and risk of building it themselves with dark fiber
- Economical service with greatest flexibility
  - Lowest cost on a $ per Mbps basis than any other service
  - 1 Mbps – 1 Gbps service granularity
  - Capable of same day service upgrades
- Wide range of service options
  - Private line, to virtual private line and LAN extension services
  - Bet efforts to managed and protected service options

Ethernet Services – Recurring cost Advantage

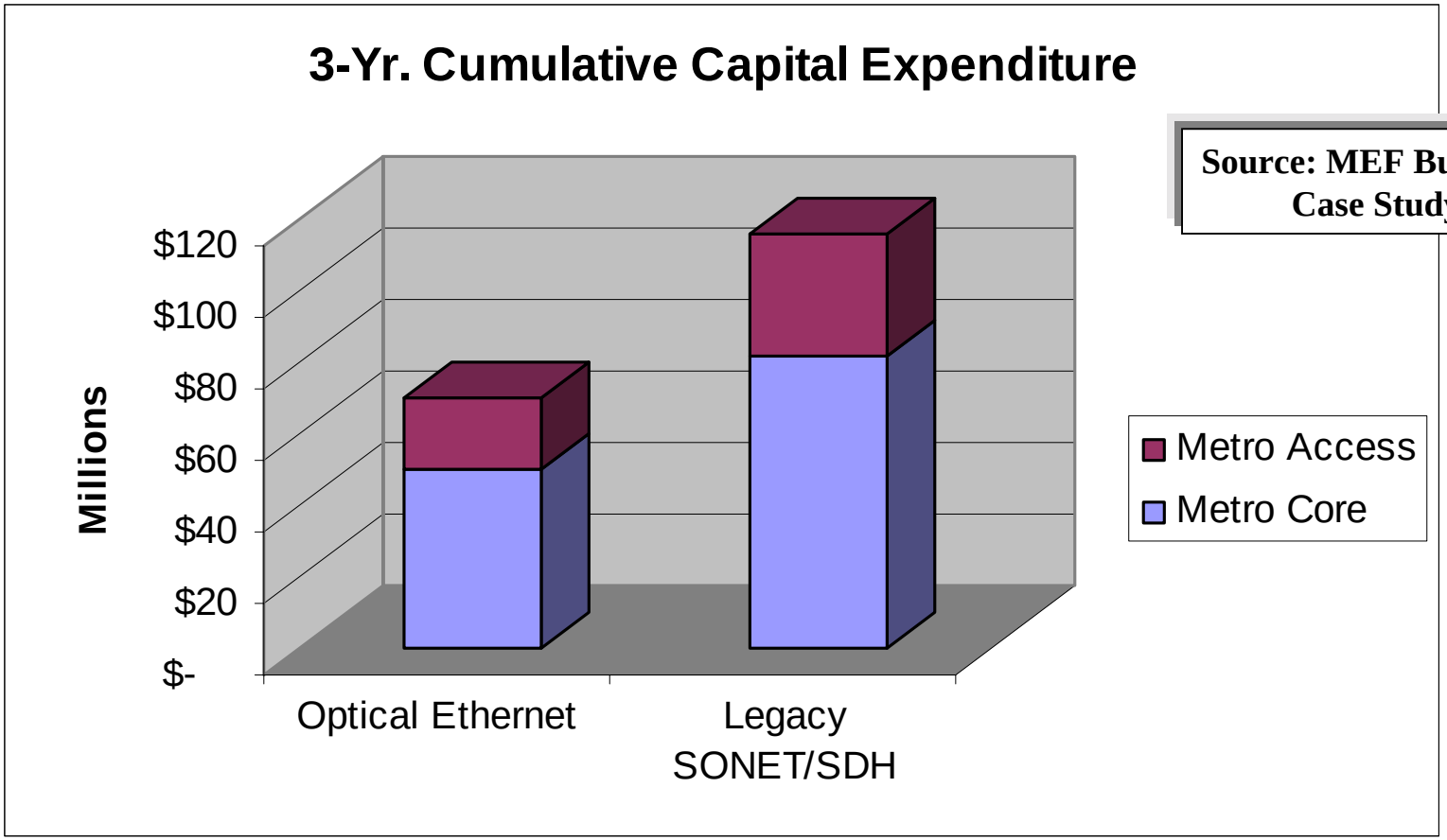


Ethernet Saves more than 50% over a 3 year period

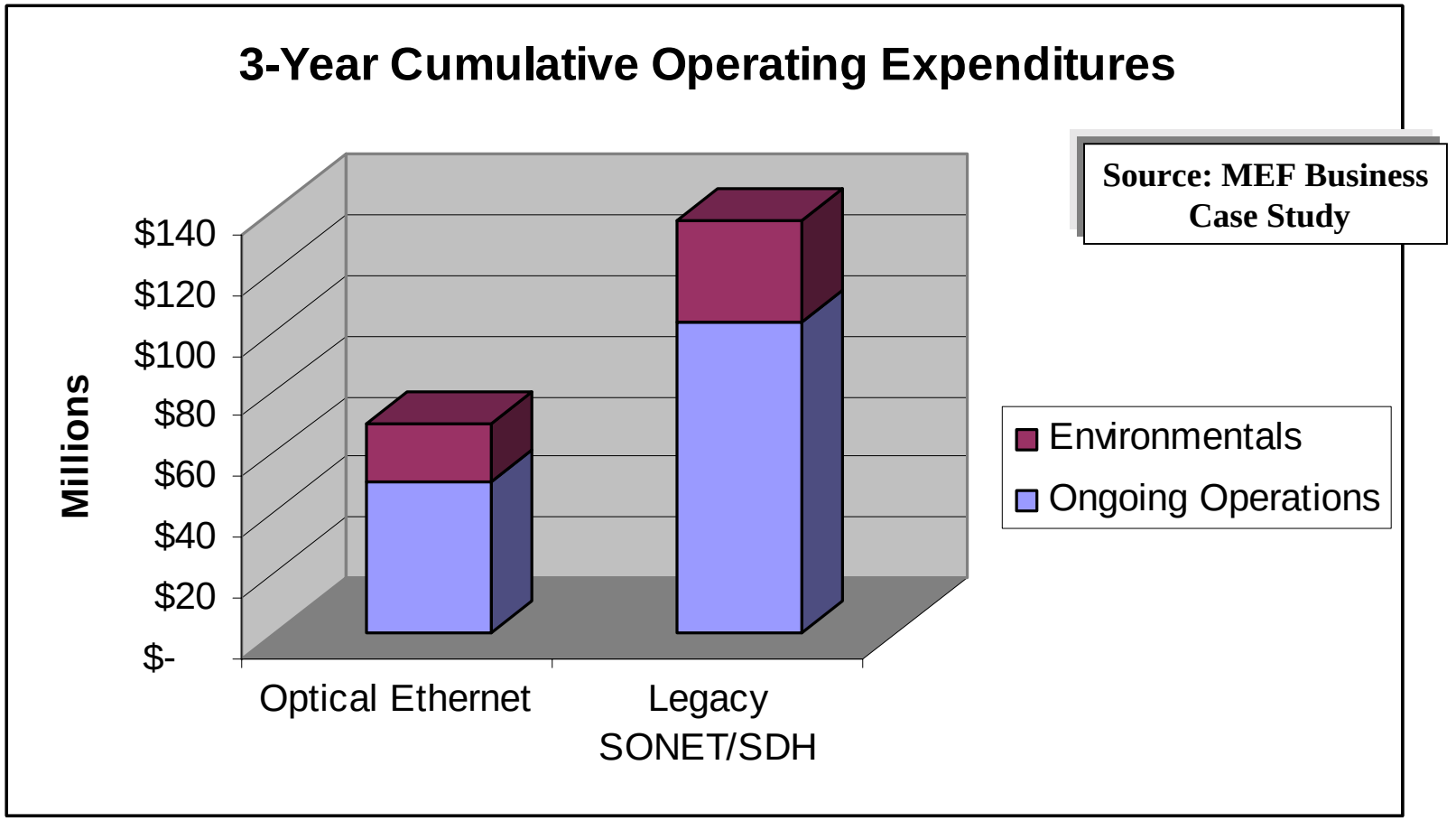
Ethernet Services Advantages for Providers

- Simple lower cost Network Design and scaling
  - Efficient data transport - eliminate over-provisioning
  - Avoiding complex mid-stream architectural transition to satisfy high bandwidth
- Economical service turn-up and scalability
  - Lower Cost Service demarc
  - Flexible services delivery: 1 Mbps – 1 Gbps
- Lower engineering and operational support
  - Reduced engineering and support cost
  - Simplified fault isolation and diagnostics
  - Dynamic, point-n-click service provisioning
- Faster time to Market with a lower TCO solution

Metro Ethernet Transport CapEx: More than 50% savings



Metro Ethernet transport OpEx: More than 50% savings



Critical Issues on Metro Ethernet

- Ethernet Service Definition…paving the way
  - Services and required attributes need to be defined
- Ethernet must evolve to a services bearing a carrier-class transport technology
  - Protection
  - QoS
  - OAM&P
  - SLAs

➢ Interoperable solutions need provided

Metro Ethernet Forum Overview

What is the MEF?

The Metro Ethernet Forum is a non-profit organization dedicated to accelerating the adoption of optical Ethernet as the technology of choice in metro networks worldwide.

The Forum is comprised of leading service providers, major incumbent local exchange carriers, top network equipment vendors and other prominent networking companies that share an interest in metro Ethernet. It has 80 members as of August, 2002.

Metro Ethernet Forum Mission

Accelerate adoption of optical Ethernet as the technology of choice in metro networks worldwide

MEF Key Objectives

- **Build consensus and unite** service providers, equipment vendors, end customers on optical Ethernet
- **Facilitate implementation** of optical Ethernet standards to allow delivery of *Ethernet services* and make *Ethernet-based metro transport networks carrier-class*
- **Enhance worldwide awareness** of the benefits of optical Ethernet services and Ethernet-based metro transport networks

MEF Priorities and Scope

- The primary priorities of the MEF are to define:
  - *a.* ***Ethernet Services*** for metro transport networks
    - Such services shall be delivered over native Ethernet-based Metro networks and could also be supported by other transport technologies.
  - *b.* ***Carrier-class Ethernet-based metro transport technologies*** *by s*pecifying *architecture, protocols and management* for Ethernet-based metro transport networks
- The secondary priorities of the MEF are (when deemed necessary) to define:
  - a. Work to be done by other organizations on other transport technologies
  - *b.* Non-Ethernet interfaces, if not defined by other organizations.

67 Members & Growing…

1 of 3

- Agere Systems
- Agilent Technologies, Inc.
- Alcate
- AMCC
- Appian Communications
- Atrica Inc.
- Avaya Communications
- AxON Link, Inc.
- BellSouth
- Ciena Corp.
- Cisco Systems
- Coriolis Networks
- Corrigent Systems
- CPLANE, Inc.
- Crosswave Communications
- Cypress Seminconductor
- Ericsson AB
- Extreme Networks
- France Telecom
- Fujitsu Networks Communications
- Hatteras Networks, Inc.
- Hewlett-Packard
- Hitachi America, Ltd
- Huawei Tech Company, Ltd.
- Industraail Technology Research Institute
- Internet Photonics, Inc.
- Juniper Networks
- KDDI R&D Laboratories, Inc.
- Lantern Communications, Inc.
- Lucent Technologies

* As of October, 2002

67 Members & Growing...

2 of 3

- Luminous Networks
- Lycium Networks
- Mahi Networks
- Mindspeed Technologies
- Native Networks
- NEC Corporation
- Nortel Networks
- NTT Advanced Technology Corporation
- Occam Networks
- PMC-Sierra
- Procket Networks
- Raza Microelectronics
- Redback Networks
- Riverstone Networks
- Salira Optical Network Systems
- SBC Technology
- Spirent Communications
- Sprint
- Sycamore Networks
- Telcordia Technologies
- Telesyn
- Tenor Networks
- Terabeam
- Texas Instruments
- TiMetra Inc.
- TippingPoint Technologies
- Tpack Networks
- Tropic Networks

*** As of October, 2002**

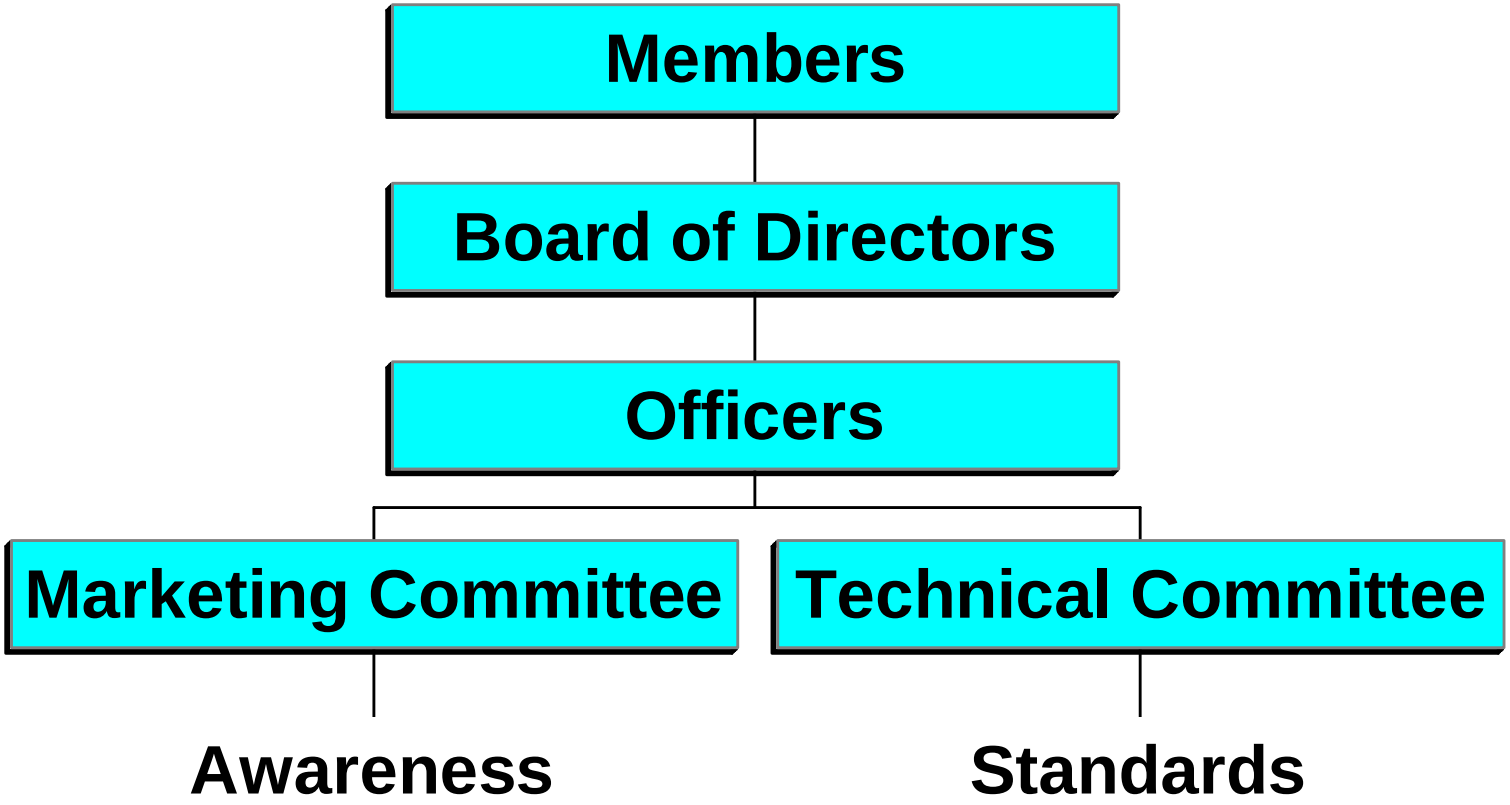
67 Members & Growing…

3 of 3

- **Vina Technologies**
- **Vivace Networks**
- **White Rock Networks**
- **Xebeo Communications, Inc.**
- **Xilinx, Inc.**
- **Zarlink Semiconductor**
- **ZTE Corporation**

*** As of October, 2002**

MEF Structure



Technical Sub-Committees*

- Architecture
  - Overall architecture and reference model
- Services
  - Service definition and requirements
- Transport/Protocols
  - Methods, procedures, protocols
- Management
  - OAM

*** As Currently Organized. Subject to Change**

MEF Key Agreements To Date

- Metro Ethernet Services Definition Draft 2.0
  - EVPL, EPLn, CES
- Metro Ethernet OAM Technical Specification Draft 2.0
  - SLA verification, status exchanges, connectivity verification & fault isolation
- Metro Ethernet User-Network Interface (UNI) Technical Specification Draft 1.0
  - Protocols and procedures at demarcation point
- Metro Ethernet MPLS Protection Implementation agreement Draft 1.0
  - Deliver sub-50 ms protection for metro Ethernet
- Ethernet over SONET/SDH Implementation Agreement Draft 1.0
  - Recommend existing standards for encapsulations & mechanism for rate mismatches

MEF Agreements To Date

- Ethernet Services Model Draft 3.0
- Traffic and Parameters for Ethernet Service SLS Draft 2.0
- Circuit Emulation Services (CES) Requirement Draft 1.0
- Metro Ethernet Protection Framework Draft 2.0 (Straw Ballot)
- Metro Ethernet QoS Framework Draft 2.0

MEF Agreements To Date

- Element Management System (EMS) Requirement Draft 1.0
- EMS/NMS Information Model Draft 2.0
- MEF Architecture Framework Technical Specification Draft 2.0
- UNI Requirement Draft 1.0
- Ethernet Interworking - Network Network Interface (EI-NNI) Draft 1.0
- Network Interworking – Network Network Interface (NI-NNI) Draft 1.0

Marketing Sub-Committees*

- Messaging/Collateral
  - Value propositions, collateral, whitepapers, press/analysts
- Events
  - Conferences, seminars, shows
- Economic Analysis
  - Return on Investment Modeling

*** As Currently Organized. Subject to Change**

MEF: Diverse Leadership

The MEF Board of Directors is comprised of representatives from:

- BellSouth
- France Telecom
- SBC
- Alcatel
- Agilent
- Atrica
- Extreme
- Nortel
- Procket

For more information about the MEF leadership please visit http://www.MetroEthernetForum.org/

Optical Ethernet for Metro

www.MetroEthernetForum.org