Optimizing the Investment in New Metro/Backhaul Infrastructure to Support an FTTx Evolution Project

Carsten Rossenhoevel
Managing Director
Agenda

- MEF Mission and Scope
- Membership and Status of the Forum

- Carrier Ethernet Attributes
  - Standardized Services
  - Scalability
  - Manageability

- Interoperability Status

- Current Projects
  - User-Network and Network-Network Interface
  - Mobile Backhaul
The Metro Ethernet Forum’s Mission

Accelerate the worldwide adoption of carrier-class Ethernet networks and services

1. Need and demand for a simple ubiquitous service
2. Requirement to scale network services to enable rapid deployment of applications
3. Availability of low cost, high bandwidth of Ethernet, beyond the LAN
4. Convergence of business, residential and mobile services
### MEF Membership (Part 1 of 2)

#### Equipment Vendors, Test Companies, Lab Members

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MEF Membership (Part 2 of 2)

Service Provider and Cable MSO Members

- AboveNet
- Alpheus Communications
- AT&T
- Belgacom
- Bell Canada
- Bright House Networks
- British Telecom
- Cable & Wireless
- Charter Communications
- China Telecom
- Cincinnati Bell
- Colt
- Comcast
- Cox Business
- Demand Broadband
- Embarq

- IPC
- KDDI R&D Laboratories
- KPN Telecom
- Level 3 Communications
- ntl: Telewest
- NTT Advanced Technology
- Optimum Lightpath
- Orange Business Services
- PCCW
- PT Inovação
- PT Prime
- Qwest Communications
- RCN Business Solutions
- Reliance Communications
- Shanghai Information Network

- Singapore Telecom
- Sprint
- Suddenlink
- Swisscom
- Symphony Communication
- TATA Communications
- Telecom Italia
- Telekom Malaysia
- Teliasonera AB
- Telus
- Time Warner Cable
- Time Warner Telecom
- T-Systems
- Uecomm
- Verizon Business
- XO Communications

... Now 148 Members
Carrier Ethernet Scope and Reach

- Internet information & Software apps
- HD TV, TVoD, VoD, Content Providers
- Host applications, Consolidated Servers
- Gaming, DR, ERP
- Voice/Vide Telephony

GLOBAL & NATIONAL
METRO
ACCESS

Carrier Ethernet wire-line and mobile backhaul with copper, fiber, cable, wireless access network delivery

- Enterprise Clients
- Small/Medium Business
- SoHo & Residential Triple-Play
- Mobile data/video
Ethernet is Everywhere

... Is there anything left to do?
Each Standards Body Has An Angle

Working inward from the edge

Working outward from the core

Making it work together
Specifications Timeline

MEF 4 Architecture
MEF 7 EMS-NMS
MEF 12 Architecture
MEF 16 ELMI

MEF 2 Protection
MEF 11 UNI Framework
MEF 15 Management
MEF 10.1 Service Attributes Phase 2

MEF 3 Circuit Emulation
MEF 10 Service Attributes Phase 1
MEF 13 UNI-IA
MEF 14 Traffic Management Test Suite

MEF 6 Service Definitions
MEF 8 Circuit Emulation
MEF 13 UNI-IA
MEF 14 Traffic Management Test Suite

MEF 9 Services Test Suite
MEF 13 UNI-IA
MEF 14 Traffic Management Test Suite

MEF 17 Service OAM
MEF 18 Circuit Emulation Services Test Suite

MEF 19 UNI Type 1 Test Suite

2001-3 2004 2005 2006 2007 2008

May 2008
Carrier Ethernet Is Great!

... But What Do We Mean By “Ethernet”?
“Ethernet” – Different Points of View

• Ethernet as a point-to-point link
  ▪ IEEE 802.3 view

• Ethernet as a packet switched network (PSN) infrastructure
  ▪ IEEE 802.1 (bridging) view
  ▪ ITU-T SG15 / SG13 managed Ethernet network view

• Ethernet as a service
  ▪ MEF view – user-to-user transfer of 802.3 frames over any transport layer
  ▪ Think E-Line, E-LAN and (soon) E-Tree
Carrier Ethernet – Service Provider View

• A set of interconnected network elements transporting Carrier Ethernet services for all users, locally & worldwide
• Carrier Ethernet services are carried over physical Ethernet networks and other legacy transport technologies
MEF has defined Carrier Ethernet as

- A ubiquitous, standardized, carrier-class Service and Network defined by five attributes that distinguish it from familiar LAN based Ethernet
Carrier Ethernet is a ubiquitous, standardized, carrier-class SERVICE defined by five attributes that distinguish Carrier Ethernet from familiar LAN based Ethernet.

Attribute 1: Standardized Services
Standards Enable Standardized Services

E-Line
Point-to-point EVC, Like Duplex Ethernet

E-LAN
Multipoint EVC, Like VLAN, Any-to-any

E-TREE
Point-to-multipoint, Like EPON Ethernet, Root-to-Leaf and Leaf-to-Root

(proposed)
The End Goal is Carrier Ethernet

Carrier Ethernet is a ubiquitous, standardized, carrier-class SERVICE defined by five attributes that distinguish Carrier Ethernet from familiar LAN based Ethernet.

Attribute 2: Scalability
Standards Enable Scalability

Carrier Ethernet supports identical services over many physical media
- Enterprise customers: Flexible business services
- Residential customers – Scalable Triple Play Services
- Mobile Carriers – Broadband data services (3G/4G/WiMax)

Easily upgradeable; backwards compatible

Several transport technologies add the notion of hierarchy to a Carrier Ethernet network (like MPLS, PBB/PBB-TE, MPLS-TP) – enable large numbers of customers in a Carrier Ethernet network.
Fiber-based Ethernet access offers more bandwidth/distance flexibility

- Multiple options for Ethernet in the First Mile and GE-PON available
- Requires an upgrade to metro and core networks
Carrier Ethernet is a ubiquitous, standardized, carrier-class SERVICE defined by five attributes that distinguish Carrier Ethernet from familiar LAN based Ethernet.

Attribute 3:
Service Management
Influence of OAM On Infrastructure Cost

- Ethernet vendors often advertise low investment (Capex) costs
- What about operational cost (Opex)?
  - Largest fraction of opex cost: Provisioning and troubleshooting
  - Carriers cannot afford to field service the FTTx components in the edge
- Ethernet OAM (IEEE 802.1ag) eliminates field service needs
- Can be deployed across different types of technologies used for Metro Ethernet Networks
- Also assists in fast fault detection and isolation (leads to reliability)
Standards Enable Service Management

- Performance Monitoring (ITU-T Y.1731)
- Service OAM (CFM, IEEE 802.1ag)
- Link OAM (EFM, IEEE 802.1ah)
- E-LMI (MEF 16)

MEP = Maintenance End Point  MIP = Maintenance Intermediate Point
Mobile Backhaul Interoperability Showcase

Ethernet Service OAM Interoperability

- Growing number of implementations
- Highly improved interoperability in the last 24 months
- 12+ vendors successfully tested at EANTC
Current Projects

(Excerpt)
Nobody has footprint everywhere. The interconnection of Carrier Ethernet networks is one of the last hurdles for ubiquitous Ethernet services.

Need a common language for peering.

E-NNI is a reference point representing the boundary between two Carrier Ethernet Networks, each in a different administrative domain.

Draft #4 is the latest version; many comments pending.
• Allows provider equipment to provision, configure and distribute EVC information and attributes to customer equipment.
• Allows customer equipment to retrieve EVC status and configuration information from service provider equipment.
• Adds fault management and protection functionalities beyond those specified in UNI Type 1.
• Letter Ballot passed last week (June 2008)
• Customers are used to bandwidth increasing – for the same price

• Bandwidth solutions must be augmented inexpensively to maintain revenues

Source: Light Reading
Carrier Ethernet for Mobile Backhaul

- Unlimited scalability and ubiquity
- Reliability with full SLA support and full OAM capabilities
- Smooth transition from legacy networks
  - Protects investment and seamlessly bridges from TDM to Ethernet over time
Ethernet Backhaul
IP DSLAM and 3G/3.5G Base-stations Backhaul

Central Office
Ethernet Switch

Ethernet Backhaul

Remote Office / Outdoor Cabinet
Remote IP DSLAM
Residential Customer

Central Office
Ethernet Switch

Ethernet Backhaul

Cellular Base Station
Ethernet
Thank You! – Questions?