Introducing the Specifications of the MEF

An Overview of MEF 33
Ethernet Access Services Definitions

2012 March (updated Jan 7, 2015)

Agenda

- **Approved MEF Specifications**
- **This Presentation**
- **About these Specification**
- **Terminology, Concepts**
- **Section Review**
- **Examples/Use Cases**
- **Summary**

Approved MEF Specifications

REF	Description
MEF 2	Requirements and Framework for Ethernet Service Protection
MEF 3	Circuit Emulation Service Definitions, Framework and Requirements in Metro Ethernet Networks
MEF 4	Metro Ethernet Network Architecture Framework Part 1: Generic Framework
MEF 6.1	Metro Ethernet Services Definitions Phase 2
MEF 6.1.1	Layer 2 Control Protocol Handling Amendment to MEF 6.1
MEF 7.1	EMS-NMS Information Model
MEF 8	Implementation Agreement for the Emulation of PDH Circuits over Metro Ethernet Networks
MEF 9	Abstract Test Suite for Ethernet Services at the UNI
MEF 10.2	Ethernet Services Attributes Phase 2*
MEF 10.2.1	Performance Attributes Amendment to MEF 10.2
MEF 11	User Network Interface (UNI) Requirements and Framework
MEF 12	Metro Ethernet Network Architecture Framework Part 2: Ethernet Services Layer
MEF 13	User Network Interface (UNI) Type 1 Implementation Agreement
MEF 14	Abstract Test Suite for Traffic Management Phase 1
MEF 15	Requirements for Management of Metro Ethernet Phase 1 Network Elements
MEF 16	Ethernet Local Management Interface

* MEF 6.1 replaced MEF 6., MEF 7.1 replaced MEF 7, MEF 10.2.1 & MEF 10 .2 replaced MEF 10.1.1, MEF 10.1, MEF 10 which replaced MEF 1 and MEF 5.

MEF

Approved MEF Specifications

REF	Description
MEF 17	Service OAM Framework and Requirements
MEF 18	Abstract Test Suite for Circuit Emulation Services
MEF 19	Abstract Test Suite for UNI Type 1
MEF 20	User Network Interface (UNI) Type 2 Implementation Agreement
MEF 21	Abstract Test Suite for UNI Type 2 Part 1: Link OAM
MEF 22	Mobile Backhaul Implementation Agreement Phase 1
MEF 23	Class of Service Implementation Agreement Part 1
MEF 24	Abstract Test Suite for UNI Type 2 Part 2: E-LMI
MEF 25	Abstract Test Suite for UNI Type 2 Part 3: Service OAM
MEF 26	External Network Network Interface (ENNI) – Phase 1
MEF 27	Abstract Test Suite For UNI Type 2 Part 5: Enhanced UNI Attributes & Part 6: L2CP Handling
MEF 28	External Network Network Interface (ENNI) Support for UNI Tunnel Access and Virtual UNI
MEF 29	Ethernet Services Constructs
MEF 30	Service OAM Fault Management Implementation Agreement
MEF 31	Service OAM Fault Management Definition of Managed Objects
MEF 32	Requirements for Service Protection Across External Interfaces
MEF 33	Ethernet Access Services Definition

This Presentation

- **Purpose:**
  - Introduction to MEF 6.1, MEF 6.1.1, MEF 10.2 and MEF 10.2.1
  - Highlights of MEF 6.1 Services and Service Attributes.
  - This presentation does not cover examples of all Services and Service Attributes
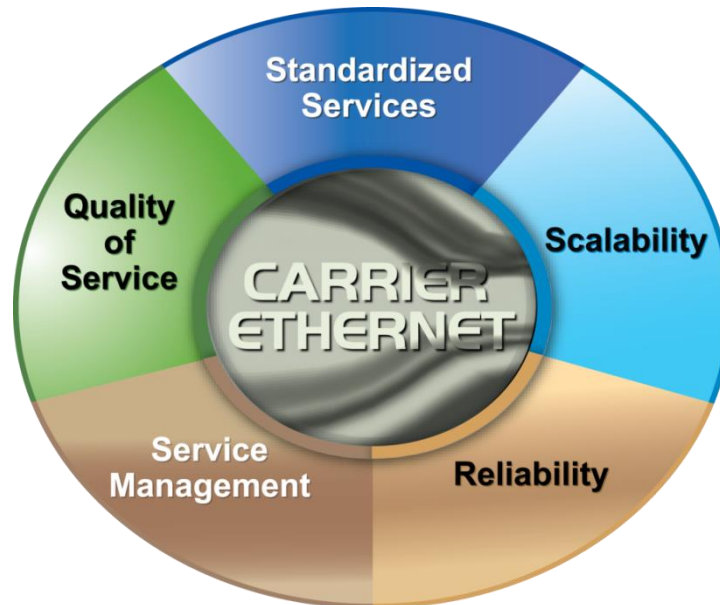
- **Audience**
  - Most importantly, Subscribers of Ethernet Services
  - Equipment Manufacturers supporting MEF 6.1 Services using Service Attributes defined in MEF 10.2 & MEF 10.2.1.
  - Service Providers supporting MEF 6.1 Services

- **Other Documents**
  - Presentations of the other specifications and an overview of all specifications is available on the MEF web site
  - Other materials such as white papers and case studies are also available

Provides foundational definitions and concepts for Metro Ethernet Services, service attributes and parameter requirements and as well as traffic classification, traffic profiles and related recommendations to deliver Carrier Ethernet Services.

Overview of MEF 33

MEF Specification Overview

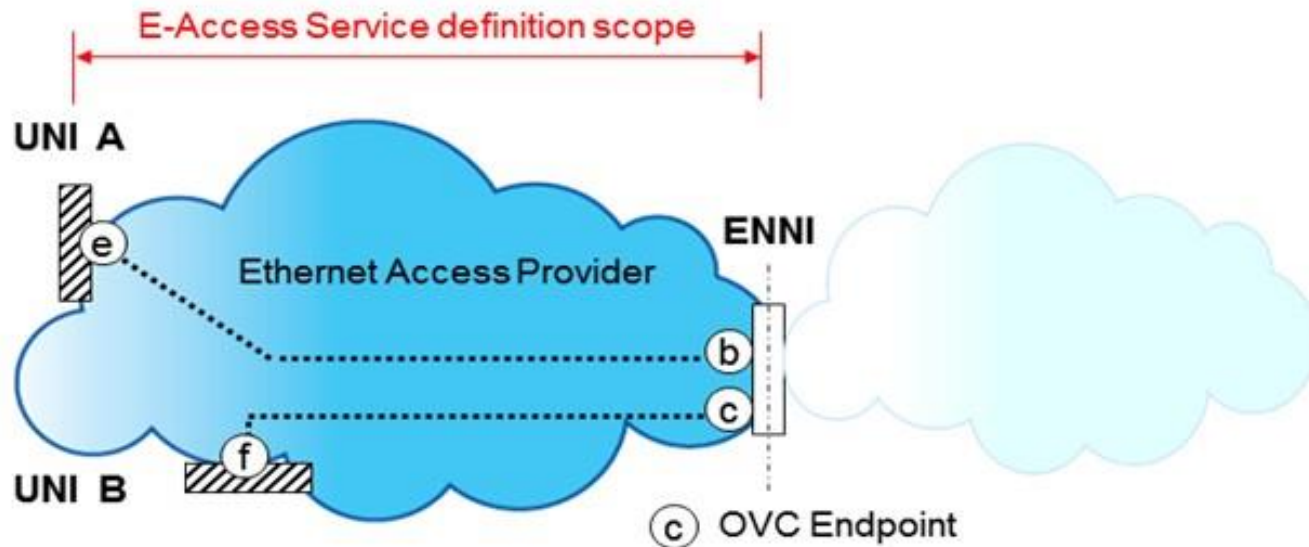| MEF 33	Ethernet Access Services Definitions
Purpose	Defines OVC-based Ethernet services in contrast to the EVC-based services defined in MEF 6.1 Technical Specification.
Audience	All, since they provide the fundamentals required to build devices and services that deliver Carrier Ethernet. For Enterprise users it gives the background to Service Level Specifications for Carrier Ethernet Services being offered by their Service Providers and helps to plan Ethernet Services as part of their overall network.

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Scope of MEF 33

Scope of MEF 33

- **Defines a new Ethernet Service Type, Ethernet Access, and corresponding OVC based Ethernet services between a UNI and An ENNI**
  - Ethernet access service offered by an Ethernet Access Provider
  - Ethernet Access Provider operates the access network to reach the Service Provider's out-of-franchise Subscriber locations as part of providing an end to end service to a Subscriber
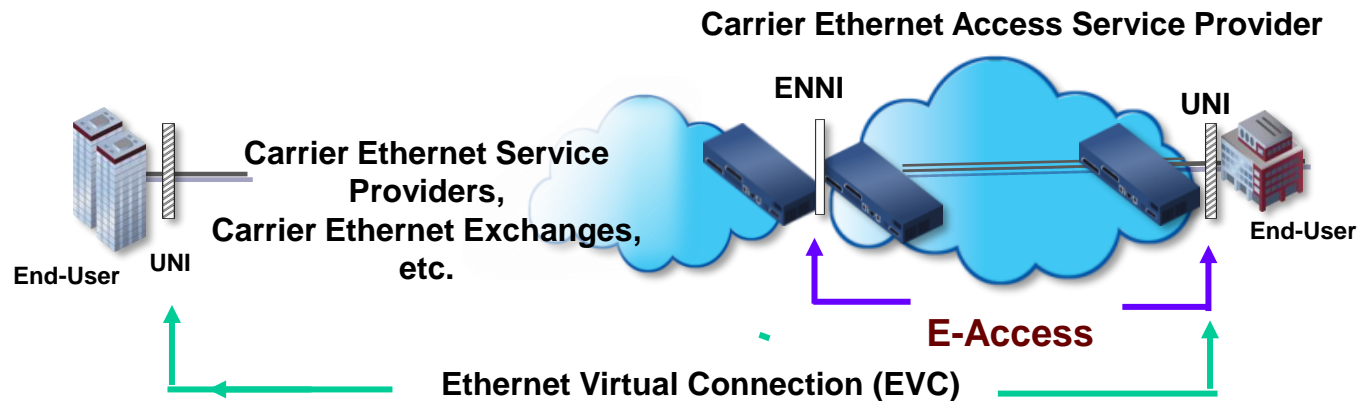
MEF Ethernet Access Services

- New **E-Access** Service Type is defined to normalize and accelerate provisioning
- New definitions for UNI-ENNI Carrier Ethernet Access Services
- Two most popular Services supported in first phase
- New MEF Certification follows new E-Access specification

Service Type	Port-Based Service (at the UNI)	VLAN-Aware Service (at the UNI)
E-Access	Access EPL Ethernet Private Line	Access EVPL Ethernet Virtual Private Line

2012

Carrier Ethernet Access Service Provider

ENNI   UNI

Carrier Ethernet Service Providers, Carrier Ethernet Exchanges, etc.

End-User   UNI   End-User
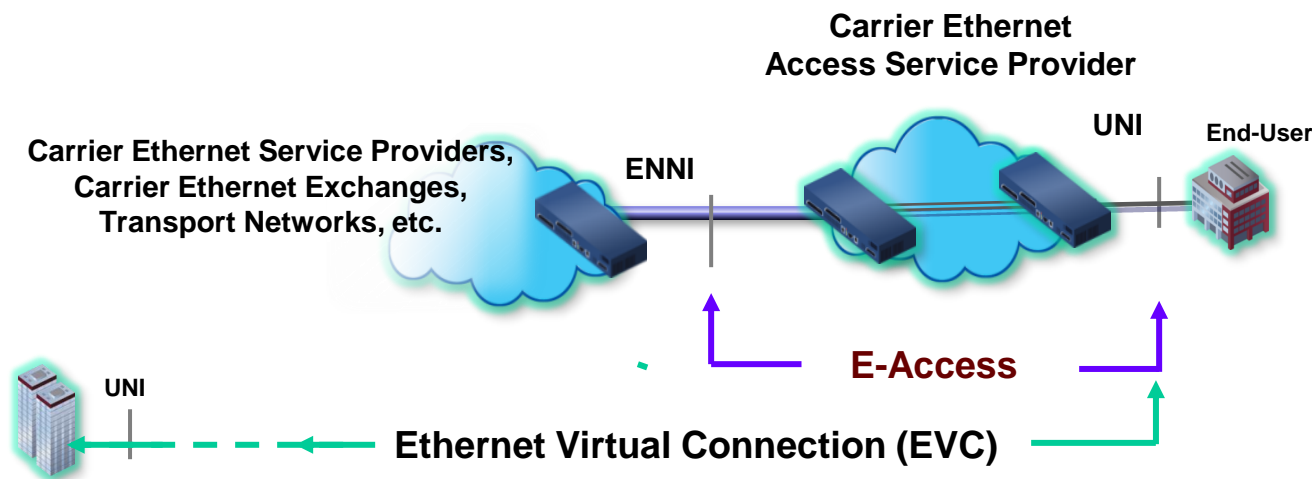
E-Access

Ethernet Virtual Connection (EVC)

Ethernet Access Services – Certification

- **Enhances Existing Program**:
  - From MEF9,&14 (UNI-UNI), MEF 21(UNI) for Carrier Ethernet Interconnect
  - Certified services provide trusted baseline for market adoption
  - Requirement in many RFPs, Cost savings and accelerates deployment
  - 47 service providers and 77 equipment manufacturers MEF-certified
- **New Certification for Ethernet Access Services***
  - Access EPL, Access EVPL, Functionality and Performance
 - MEF 9 and 14 UNI-UNI certification recommended but not prerequisite

Carrier Ethernet
Access Service Provider

Carrier Ethernet Service Providers,
Carrier Ethernet Exchanges,
Transport Networks, etc.

ENNI

UNI

End-User

E-Access

UNI

Ethernet Virtual Connection (EVC)

CARRIER ETHERNET
MEF
Certified Compliant

* Ethernet Services specification, Abstract Test Suite and Certification targeted mid 2012.
All specifications subject to change until approved.

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Terminology, Concepts & Relationship to other standards

Ethernet Service Definition Framework

- **Ethernet Service Definition Framework defined in MEF 6.1 provides a model for specifying Ethernet services**
- **Each Ethernet Service type has a set of Ethernet service attributes that define the service characteristics**
- **Parameters provide various options different service attributes**
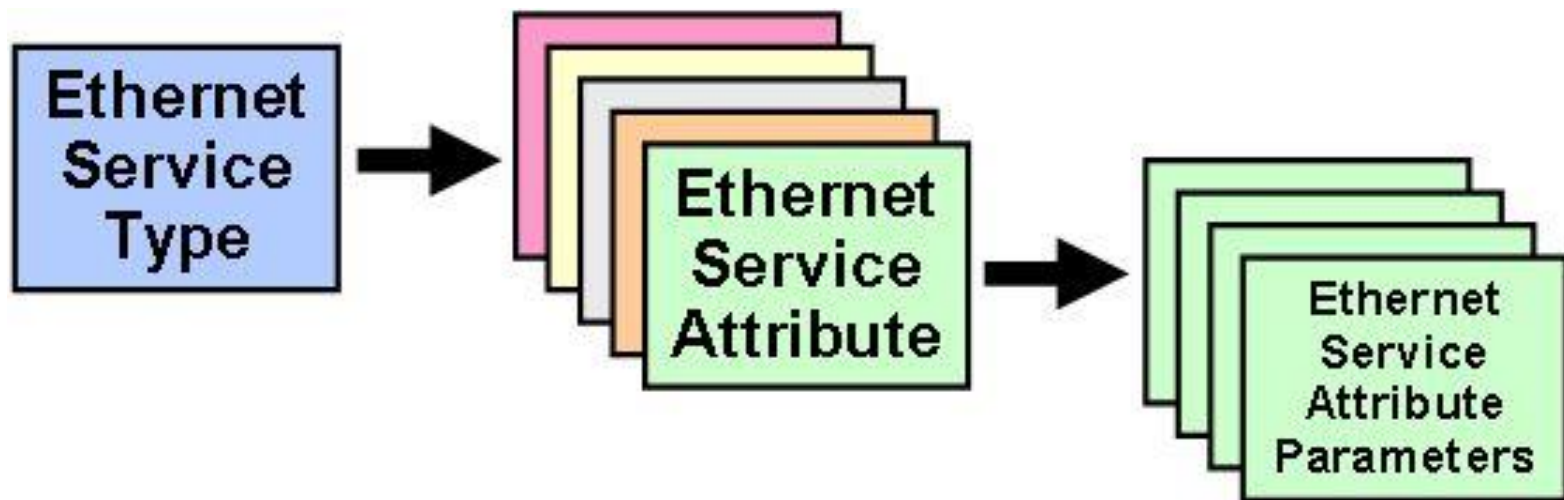
MEF 6.1 Ethernet Services Definitions Phase 2

Service Type	Port-Based (All-to-One Bundling)	VLAN-Based (Service Multiplexed)
E-Line (Point-to-Point EVC)	Ethernet Private Line (EPL)	Ethernet Virtual Private Line (EVPL)
E-LAN (multipoint-to-multipoint EVC)	Ethernet Private LAN (EP-LAN)	Ethernet Virtual Private LAN (EVP-LAN)
E-Tree (rooted multipoint EVC)	Ethernet Private Tree (EP-Tree)	Ethernet Virtual Private Tree (EVP-Tree)

MEF 6.1 Enhancements

- Defines a service type (E-Tree) in addition to those defined in MEF 6
- Adds four services – two each to E-LAN and E-Tree
- EPL with > 1 CoS
- Updates Service Attributes
- Updates L2CP Processing

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# Ethernet Service Classification and Definitions for Ethernet Access Services (UNI to ENNI)

Service Type	Port-Based Service (at the UNI)	VLAN-Aware Service (at the UNI)
E-Access	**Access Ethernet Private Line** (Access EPL)	**Access Ethernet Virtual Private Line** (Access EVPL)

- **Ethernet Access Services classified into two categories** (just like EVC-based services):

  - **Port-based at the UNI endpoint**
    - Single OVC Instance per UNI (dedicated UNI endpoint)

  - **VLAN-aware at the UNI endpoint**
    - Multiple OVC Instances per UNI endpoint (multiplexed UNI endpoint)

- **ENNI supports multiplexed Access EPLs or Access EVPLs**

Access EPL = Port-based P2P Ethernet access service

Access EVPL = VLAN-aware P2P Ethernet access service

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- **A Service Provider can use the Access EPL service from an Access Provider to deliver the port-based Ethernet services defined in MEF 6.1 and supported by the ENNI defined in MEF 26: Ethernet Private Line (EPL), and Ethernet Private LAN (EP-LAN).**
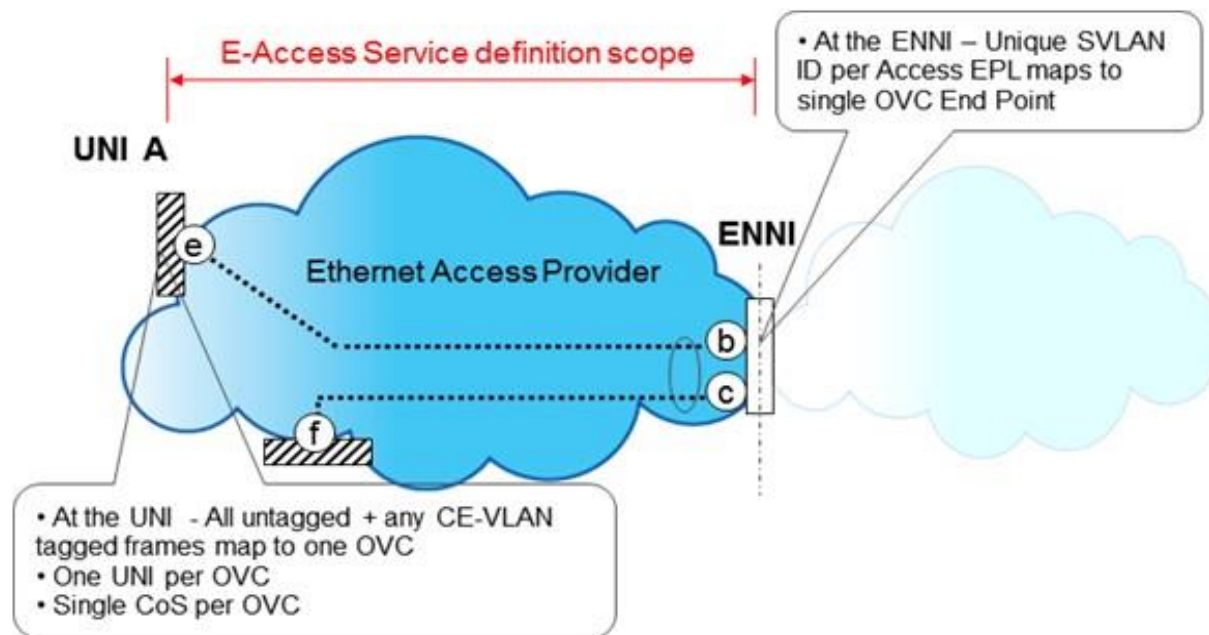
Structure and scope of Access EVPL service

- **Access EVPL a UNI can support multiple service instances, including a mix of Access and EVC Services**
- **OVC End Point map determines which CE-VLANs are mapped to OVCs or dropped**
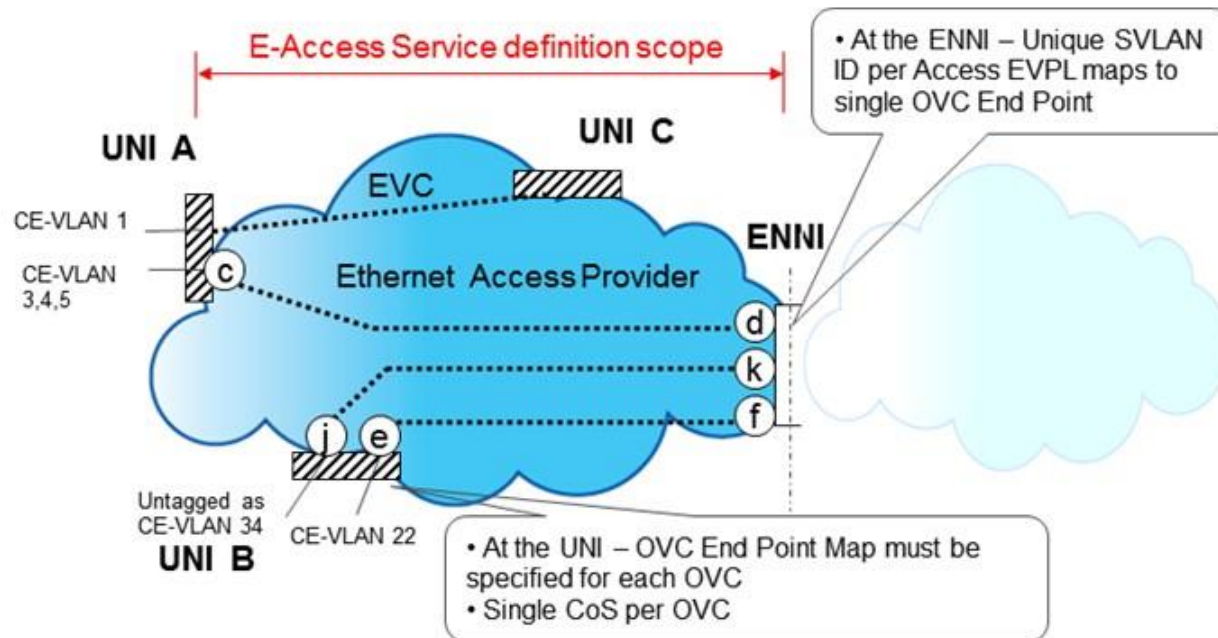
UNI Service Attributes

- ## An Access EPL, EVPL Service instance MUST assign UNI Service Attributes and values

  - UNI Identifier
  - Physical Medium
  - Speed
  - Mode
  - MAC Layer
  - UNI MTU Size
  - CE-VLAN ID for untagged and priority tagged Frames

  - Maximum number of OVCs per UNI
  - Maximum number of CE-VLAN IDs per OVC
  - Ingress Bandwidth Profile Per UNI
  - Egress Bandwidth Profile Per UNI

OVC per UNI Service Attributes

- **Service attributes for each instance of an OVC at a specific UNI may be viewed as OVC End Point per UNI service attributes**

  - **UNI OVC Identifier**
  - **OVC End Point Map**
  - **Class of Service Identifier for Service Frames**
  - **Ingress Bandwidth Profile Per OVC End Point at a UNI**

  - **Ingress Bandwidth Profile Per Class of Service Identifier at a UNI**
  - **Egress Bandwidth Profile Per OVC End Point at a UNI**
  - **Egress Bandwidth Profile Per Class of Service Identifier at a UNI**

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OVC Service Attributes

- **The following are OVC service attributes, parameters, and values for the Access EPL service which must assigned**

- OVC Identifier
- OVC Type
- OVC End Point List
- Maximum Number of UNI OVC End Points
- Maximum Number ENNI OVC End Points
- OVC Maximum Transmission Unit Size
- CE-VLAN ID Preservation
- CE-VLAN CoS ID Value Preservation
- S-VLAN ID Preservation
- S-VLAN CoS ID Value Preservation
- Color Forwarding
- Service Level Specification
- Unicast Frame Delivery
- Multicast Frame Delivery
- Broadcast Frame Delivery

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OVC End Point per ENNI Service Attributes

- **ENNI OVC End Point Service Attributes for Access EVPL Service.**

  - **OVC End Point Identifier**
  - **Class of Service Identifier for ENNI Frames**
  - **Ingress Bandwidth Profile Per OVC End Point**
  - **Ingress Bandwidth Profile Per**

  - **ENNI Class of Service Identifier**
  - **Egress Bandwidth Profile Per End Point**
  - **Egress Bandwidth Profile Per ENNI Class of Service Identifier**

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ENNI Service Attributes for the Access EVPL service

- **The Maximum Number of OVC End Points per OVC is required to be exactly 1 for Access EVPL as this service does not support "hairpin switching" of traffic**

- Operator ENNI Identifier
- Physical Layer
- Frame Format
- Number of Links
- Protection Mechanism

- ENNI Maximum Transmission Unit Size
- End Point Map
- Maximum Number of OVCs
- Maximum Number of OVC End Points per OVC

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# Service OAM Fault Management (SOAM-FM) Requirements

- **Enabling uniform behavior of SOAM-FM for the Access EPL and Access EVPL Services across all Access Providers (SOAM FM IA (MEF 30))**

- **Configurable to tunnel all SOAM frames at the default Test and Subscriber MEG levels as defined in the SOAM FM IA (MEF 30)**
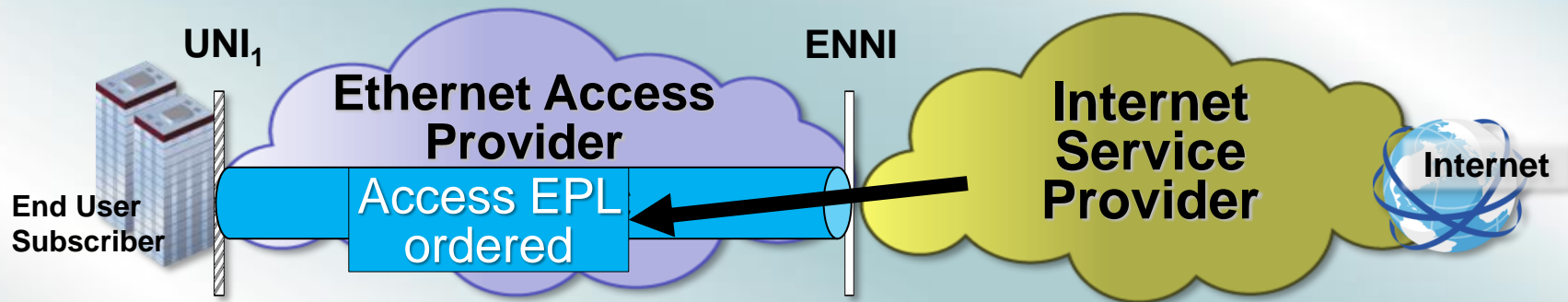
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E-Access Use Cases & Examples

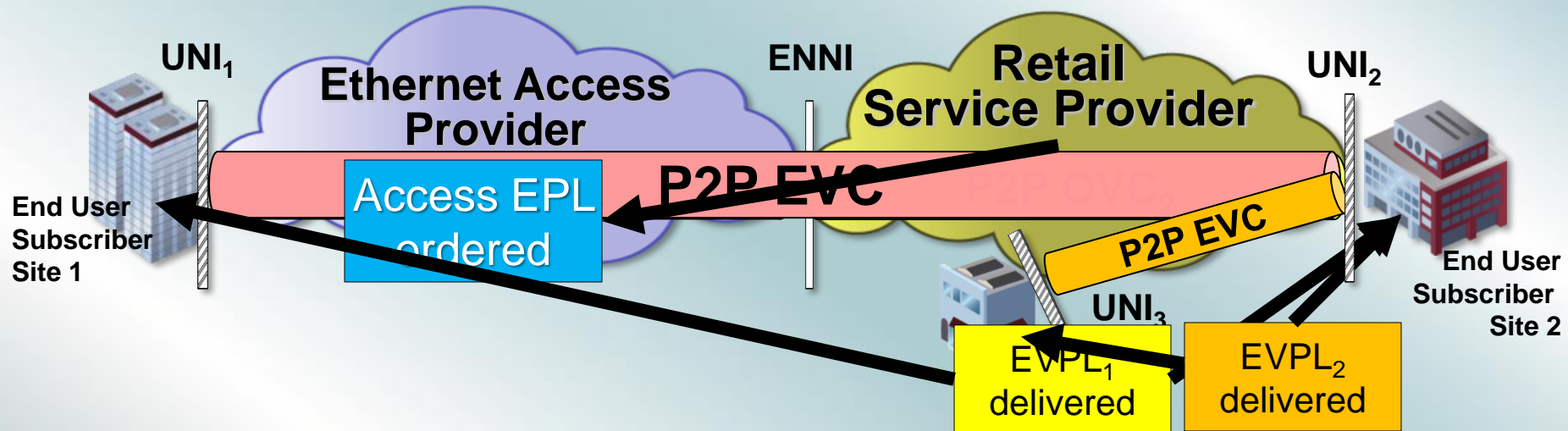# Ethernet Private Line (EPL) example that uses Access EPL
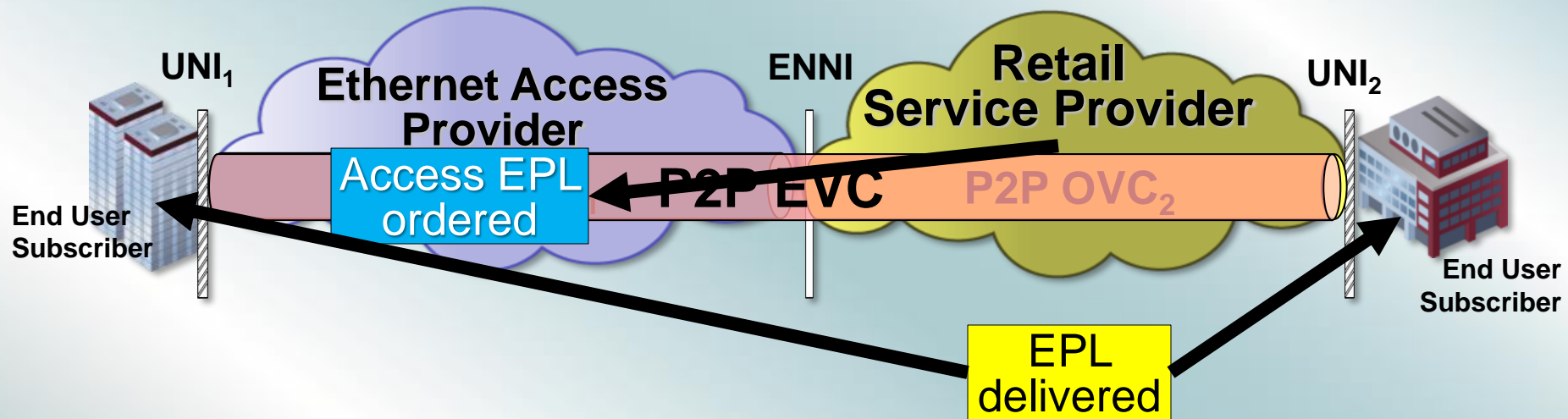
- **Retail Provider orders Access EPL from Ethernet Access Provider**
  – Access provider constructs OVC_1 between Subscriber UNI_1 and ENNI

- **Retail Service Provider constructs OVC**
  – OVC_2 between ENNI and Subscriber UNI_2

- **Retail Provider constructs EVC between subscriber locations**

- **Retail Service Provider delivers EPL to Subscriber**

MEF

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# Internet Access Service example using Access EPL

- **ISP orders Access EPL from Ethernet Access Provider**
  - Access provider constructs OVC between Subscriber UNI and ENNI

- **ISP delivers Internet Access Service**
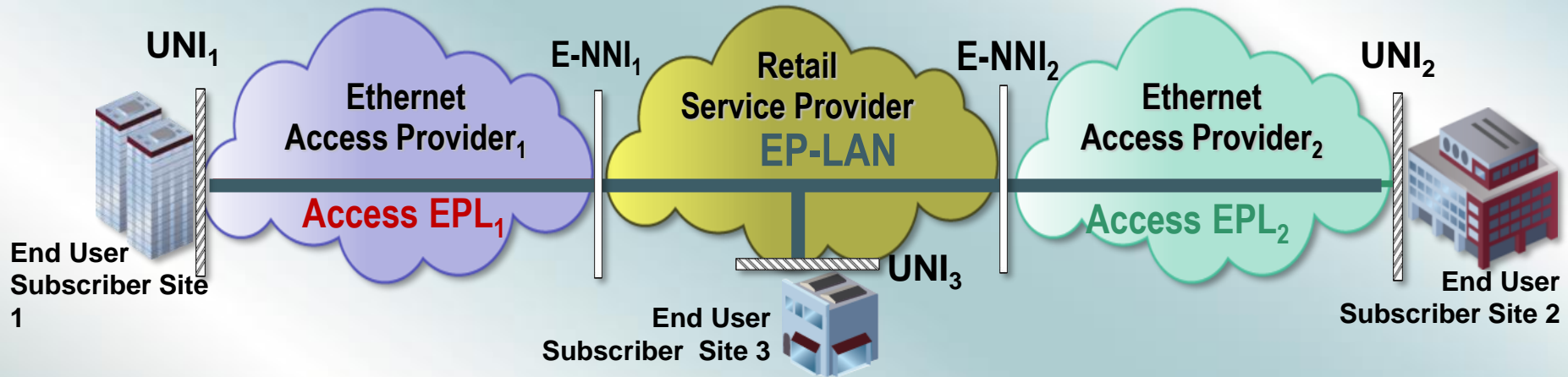
EVPL Example using Access EPL

- **Retail Provider orders Access EPL from Ethernet Access Provider**
  - Access Provider constructs OVC between Subscriber UNI_1 and ENNI

- **Retail Service Provider constructs OVC_2 between:**
  - ENNI and Subscriber UNI_2

- **Retail Provider constructs P2P EVC between subscriber sites 1 & 2**
  - Retail Provider delivers $EVPL_1$ to Subscriber

- **Subscriber adds new site and wants to connect to site 2**

- **Retail Provider constructs P2P EVC between subscriber sites 2 & 3**
  - Retail Service Provider delivers $EVPL_2$ to Subscriber

EVPL Example using Two Access EPLs
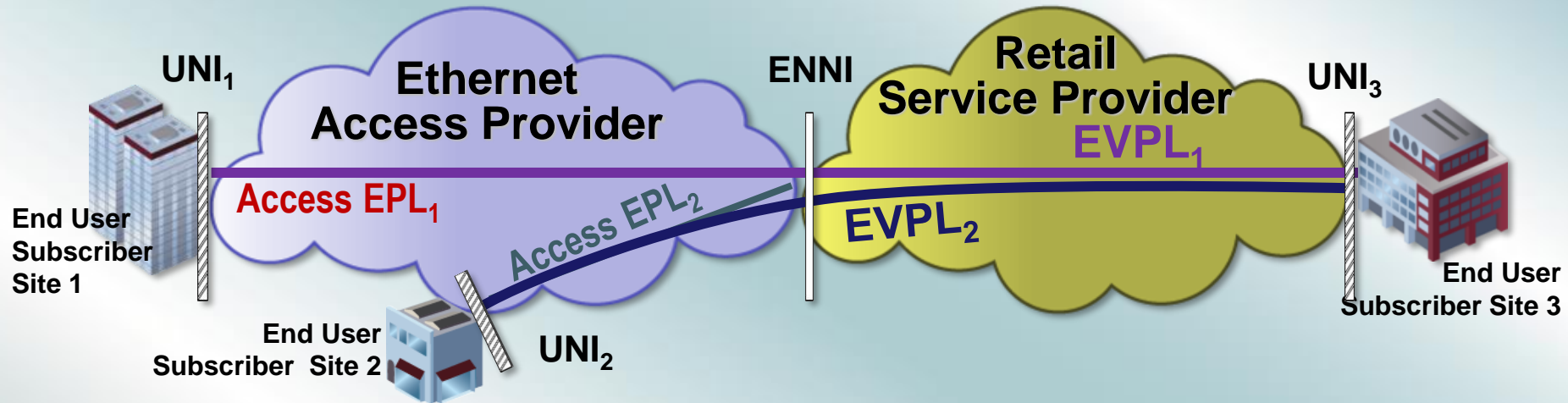
- **Retail Provider buys Access EPL_1 from Ethernet Access Provider**
  - To connect Subscriber Site 1 UNI_1 to ENNI
- **Retail Provider buys Access EPL_2 from Ethernet Access Provider**
  - To connect Subscriber Site 2 UNI_2 to ENNI
- **Retail Service Provider sells $EVPL_1$ to End User Subscriber**
  - To connect Subscriber Sites 1 and 3
- **Retail Service Provider sells $EVPL_2$ to End User Subscriber**
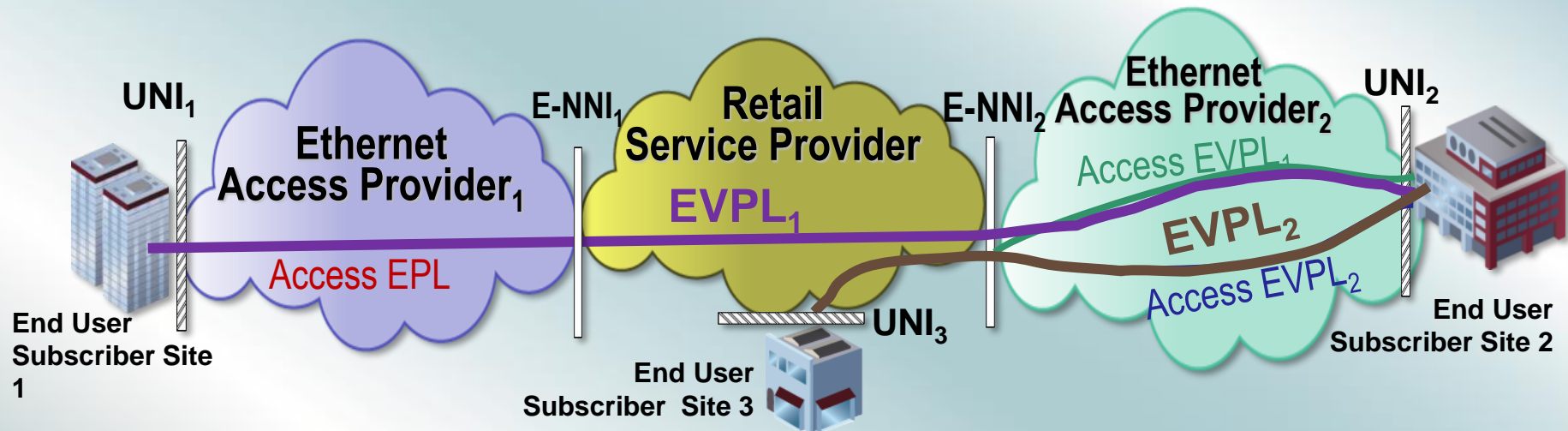 - To connect Subscriber Sites 2 and 3

EP-LAN Service example using 2 Access EPL tail circuits

- **Retail Provider buys Access EPL$_1$ Ethernet Access Provider$_1$**
  - To connect Subscriber Site 1 UNI$_1$ to ENNI$_1$

- **Retail Provider buys Access EPL$_2$ from Ethernet Access Provider$_2$**
  - To connect Subscriber Site 2 UNI$_2$ to ENNI$_2$

- **Retail Service Provider sells EP-LAN to Subscriber**
  - To connect Subscriber Sites 1, 2 and 3

Two off-net sites reached using Access EPLs

MEF

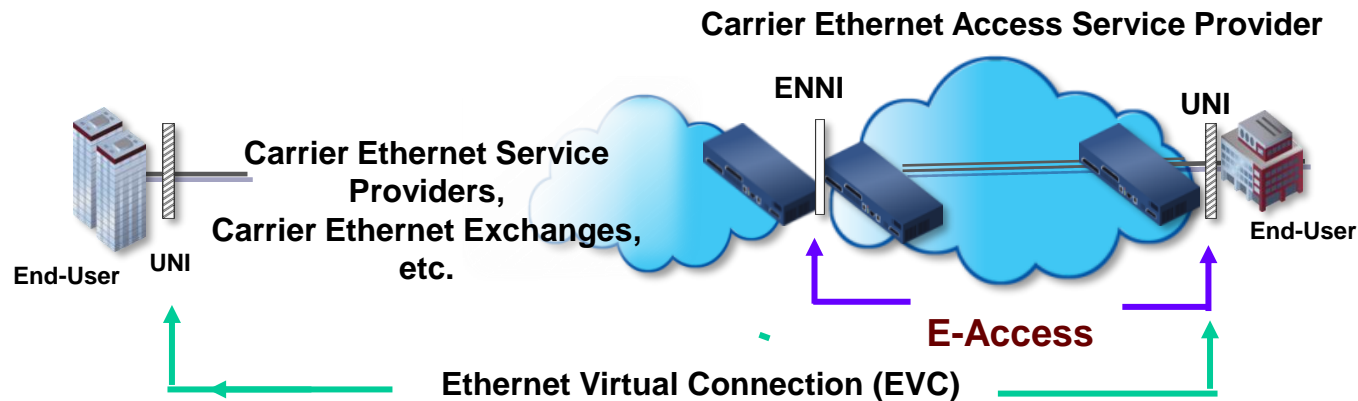# EVPL Example using 1 Access EPL and 2 Access EVPLs

- **Retail Provider buys Access EPL from Ethernet Access Provider$_1$**
  - To connect Subscriber Site 1 UNI$_1$ to ENNI$_1$
- **Retail Provider buys Access EVPL$_1$ from Ethernet Access Provider$_2$**
  - To connect Subscriber Site 2 UNI$_2$ to ENNI$_2$
- **Retail Service Provider delivers EVPL$_1$ to Subscriber**
  - To connect Subscriber Sites 1 UNI$_1$ and 2 UNI$_2$
- **Retail Provider buys Access EVPL$_2$ from Ethernet Access Provider$_2$**
  - To connect Subscriber Site 2 UNI$_2$ to ENNI$_2$
  - 2 OVCs multiplexed at UNI$_2$
- **Retail Service Provider delivers EVPL$_2$ to Subscriber**
  - To connect Subscriber Site 2 UNI$_2$ and Site 3 UNI$_3$

Technical Summary

- **EVCs can be composed of 2 or more OVCs**
  - If there is no ENNI, there are no OVCs

- **New E-Access Ethernet Service Type**
  - Category of services which provide connectivity between one or more UNIs and one ENNI
  - Targeting Wholesale Ethernet Access Services

- **Access EPL (Access Ethernet Private Line)**
  - Port-based P2P Ethernet Access Service Definition
    - Supporting 1 access service per UNI
  - Consists of 1 UNI and 1 ENNI

- **Access EVPL (Access Ethernet Virtual Private Line)**
  - VLAN-aware P2P Ethernet Access Service Definition
    - Supports multiple access services per UNI
  - Consists of 1 UNI and 1 ENNI

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Summary

- Establishes industry standard for **buying, selling, deploying** Ethernet Access Services
- Enables new providers to much more easily capitalize on wholesale Ethernet business opportunities
- Lowers costs and reduces time to market
- Key for local, regional and global adoption of Carrier Ethernet

Carrier Ethernet Access Service Provider

ENNI

UNI

Carrier Ethernet Service Providers, Carrier Ethernet Exchanges, etc.

End-User

UNI

End-User

E-Access

Ethernet Virtual Connection (EVC)

MEF

Accelerating Worldwide Adoption of Carrier-class Ethernet Networks and Services

www.MetroEthernetForum.org