

# MEF

## Introducing the Specifications of the Metro Ethernet Forum

### MEF 20: User Network Interface Type 2

With Testing Support via MEF 21 & MEF 24

# Approved MEF Specifications

- **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 7** 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 10.1** Ethernet Services Attributes Phase 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 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

# This Presentation

- **Purpose:**
  - This presentation is an introduction to MEF 20
- **Audience**
  - Equipment Manufacturers building devices that will carry Carrier Ethernet Services.
  - Useful for Service Providers architecting their systems
- **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

# Introducing MEF 20

- **The presentation covers**
  - MEF 20 Overview
    - Functionality and scope of MEF 20
  - UNI definition and architecture
  - Technical overview
    - MEF 20 technical details
    - Implementation options
  - Key Questions
    - Relationship to other specifications and standards
    - Implementation Agreement structure
    - Comparison with legacy solutions
  - Testing MEF 20 (using MEF 21 & MEF 24)
  - Summary

# MEF 20 UNI Type 2: Overview (In context of MEF 11)

- **MEF 11 introduced 3 types of UNI**
  - **UNI Type 1 (now defined in MEF 13), November 2005**
    - Service Provider and Customer manually configure the UNI-N and UNI-C for services
    - UNI Type 1.1 and 1.2 are defined
      - Type 1.1 : Non-multiplexed UNI for Services like EPL
      - Type 1.2 : Multiplexed UNI for Services like EVPL
  - **UNI Type 2 (now defined in MEF 20)**
    - An automated implementation model allowing UNI-C to retrieve EVC status and configuration information from UNI-N
    - Enhanced UNI attributes
    - Additional fault management and protection functionality
    - Backward compatibility with UNI Type 1
  - **UNI Type 3 (Possible future MEF Specification)**
    - Allows the UNI-C to request, signal and negotiate EVCs and its associated Service Attributes to the UNI-N. UNI
    - Type 3 is for further study.

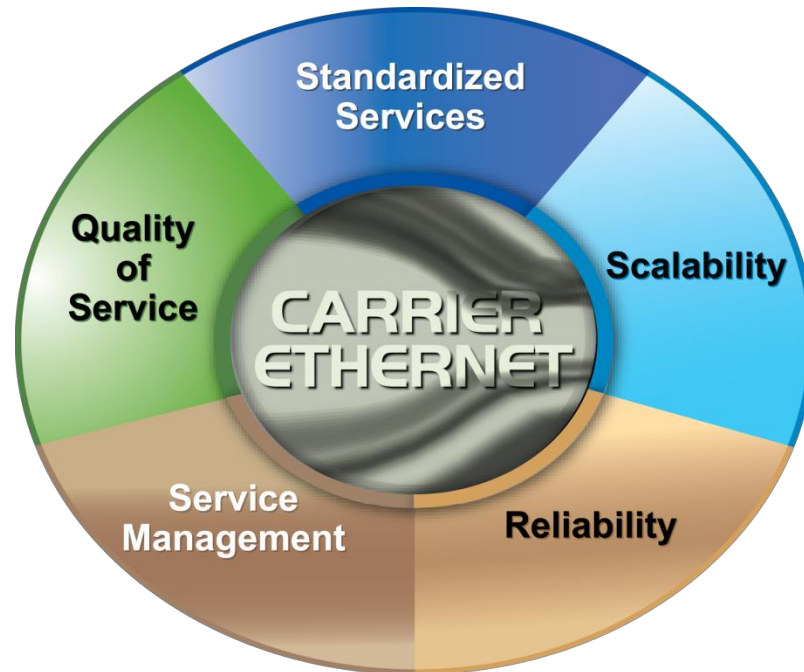
# Functionality and Scope of MEF 20

- **Ethernet Local Management Interface (E-LMI)**
  - Allows UNI-C to retrieve EVC status and service attributes from UNI-N as specified in MEF 16
- **Link OAM (Operation, Administration and Management)**
  - Allows customer and service provider to monitor and diagnose the UNI connectivity via Link OAM (link level)
- **Service OAM**
  - Allows customer and service provider to monitor and diagnose the UNI connectivity via Service OAM (end-to-end)
- **Protection**
  - Capability to protect UNI against port failure via Link Aggregation protocol
- **Enhanced UNI Attributes**
  - Such as bandwidth profile per egress UNI, Maximum Transfer Unit size, etc. as defined in MEF 10., MEF 6.1
- **L2CP Handling**
  - Governs the passing or filtering of Layer 2 control protocols to the Ethernet Virtual Connections

Details of each mandatory and optional element are to be found in the specification

# MEF 20 Enhances Carrier Ethernet Attributes

- Brings Carrier Ethernet to a new level by enabling new functionality to Carrier Ethernet attributes of scalability, service management, reliability, QoS and standardized services



## Carrier Ethernet growth challenges

- The success of Carrier Ethernet brings its own challenges, not the least of these is operational scalability
- Until now, MEF specifications have defined manual management process relying on manual or ad hoc processes. This cannot scale.

## MEF 20

- Introduces automated processes for managing services, fault monitoring and management enabling at UNI level
  - Carrier Ethernet networks to scale
  - Carrier Ethernet networks to operate at reduce cost and
  - Creation of a framework for the dynamic service provisioning that will leverage the inherent benefits of MEF-defined Carrier Ethernet services



# MEF Specifications Overview

<b>MEF 20</b> <b>User Network Interface (UNI) Type 2 Implementation Agreement</b>	
<b>Purpose</b>	Specifies MEF UNI characteristics and operation in which customer side of the UNI is automatically configured by the network side of the UNI allowing verification of SLA and UNI connectivity. Additional objectives include support for Ethernet OAM (802.3ah, 802.1ag) over the UNI. Required for support of ELM
<b>Audience</b>	Equipment Manufacturers building devices that will carry Carrier Ethernet Services. Useful for Service Providers architecting their systems.

Technical Committee    Architecture Area

<b>MEF 21/24</b> <b>Abstract Test Suite for UNI Type 2, Phase 1: Link OAM</b>	
<b>Purpose</b>	Provides the first of six possible test suites for UNI type 2 (MEF 20)
<b>Audience</b>	Equipment Manufacturers building devices that will carry Carrier Ethernet Services. Useful for Service Providers architecting their systems.

Technical Committee    Test and Measurement Area



## UNI Definitions



- **Background**

- The User Network Interface in the MEF Specifications is an abstract concept. On one side of this point the service provider has responsibility and on the other, the customer.
- As such, it appears in diagrams in various positions in both in the MEF Specifications and in presentations
- This can be the source of confusion

- **Purpose and Audience**

- For readers of the technical specifications and presentations, this short presentation provides clarity

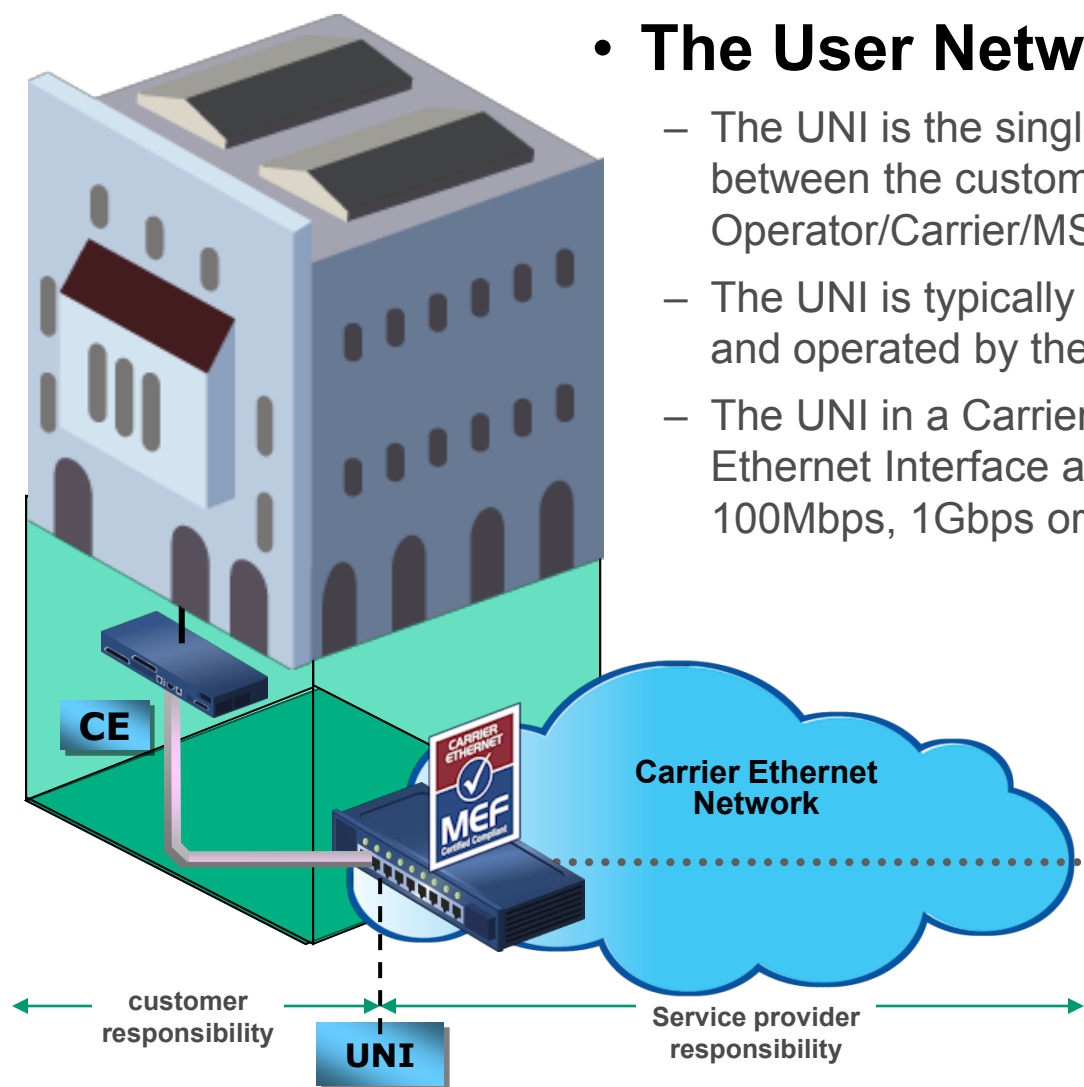
# Functionality and Scope of MEF 20

- **Ethernet Local Management Interface (E-LMI)**
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- **L2CP Handling**
  - Governs the passing or filtering of Layer 2 control protocols to the Ethernet Virtual Connections

# The MEF User Network Interface

## • The User Network Interface (UNI)

- The UNI is the single point that is the demarcation between the customer and the service provider/Cable Operator/Carrier/MSO
- The UNI is typically at a port on an active device owned and operated by the Service Provider
- The UNI in a Carrier Ethernet Network uses a physical Ethernet Interface at operating speeds 10Mbps, 100Mbps, 1Gbps or 10Gbps



• In this instance the UNI is located at the port of the service provider edge device located in the customer premises.

• The service provider “cloud” is shown terminating in the customer premises

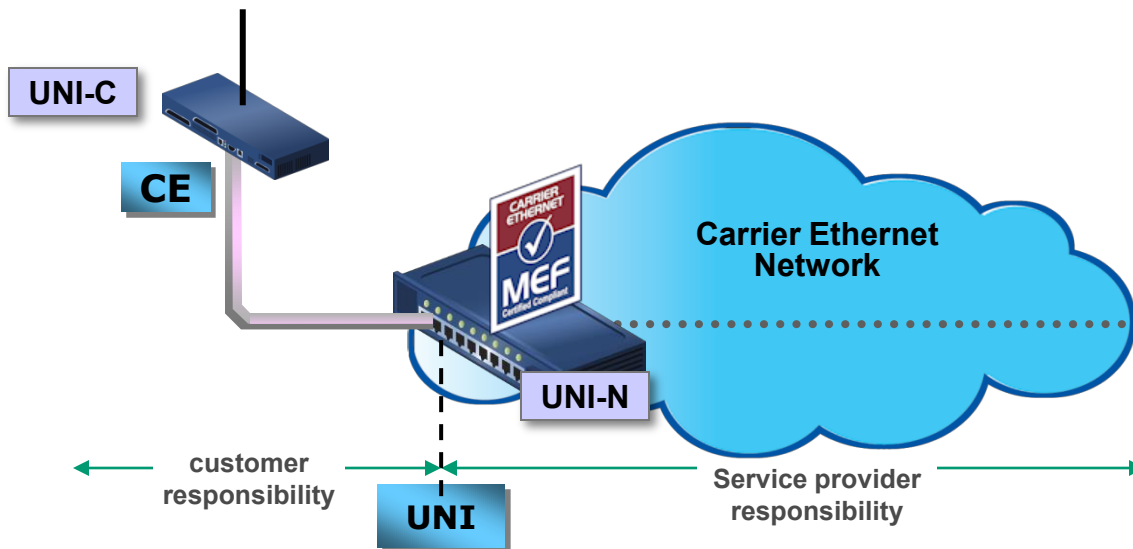
CE: Customer Equipment, UNI: User Network Interface.



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# Functional Elements of the UNI (1)

- There are two functional elements (typically\*) located in two connected devices situated on either side of the **UNI demarcation point**:
  - UNI-C: Executes the processes of the customer side
  - UNI-N: Executes the processes of the network side
- \* All the functions of the UNI-N and UNI-C need not be located in the same physical device as they may be located in several devices



CE: Customer Equipment, UNI: User Network Interface.

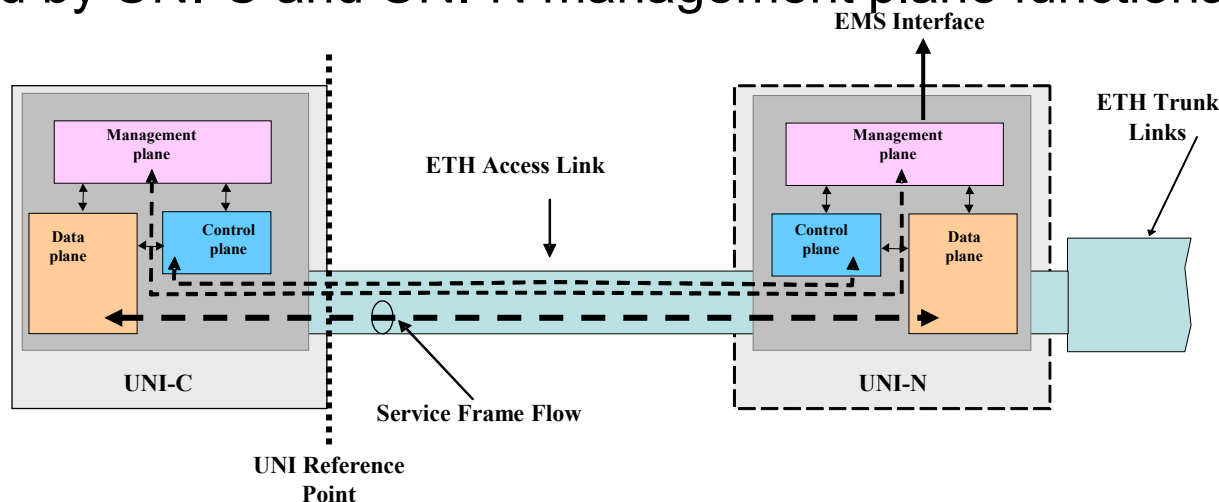


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# UNI-C and UNI-N Functional Elements (2)

## Relationship between service frames (user generated), control and Carrier Ethernet management frames

- Subscriber to Subscriber service frames (including Subscriber's data, control and management frames) are handled by UNI-C and UNI-N data plane functional elements
- Control frames between Subscriber and Service Provider are handled by UNI-C and UNI-N control plane functional elements
- Management frames between Subscriber and Service Provider are handled by UNI-C and UNI-N management plane functional elements

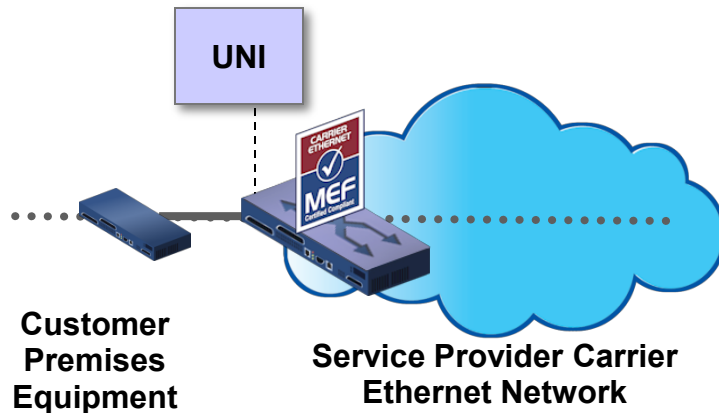


# How the UNI is shown in MEF Technical Specifications

Diagrams in the Specifications show the UNI in various positions.  
All three are valid but the first is by far the most likely to be seen in an operational network

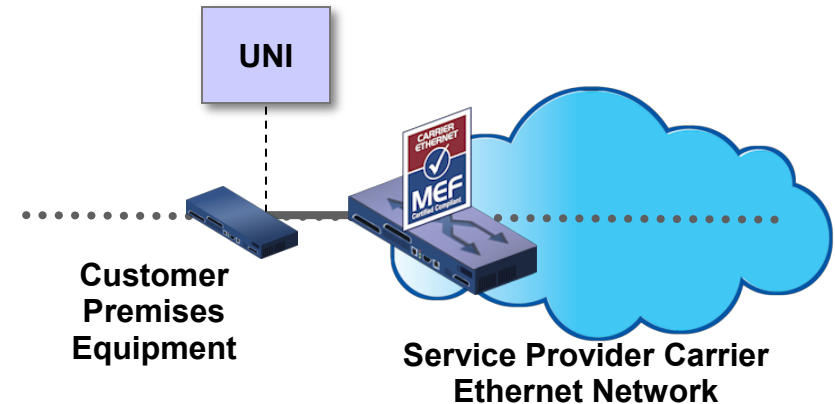
## 1. At the port of the service provider equipment

- *(The usual position in the customer premises or multi-tenant location)*



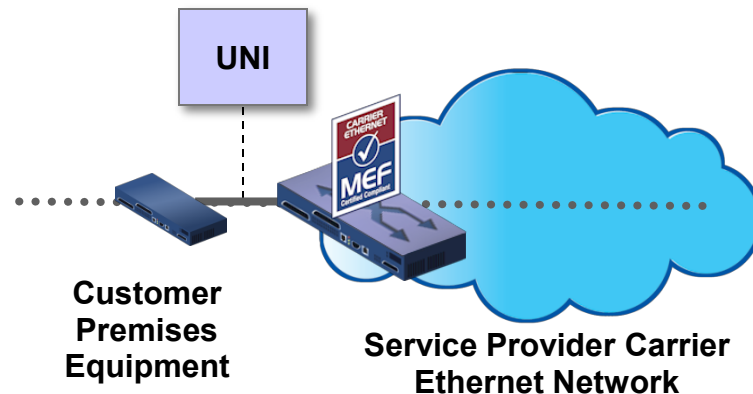
## 2. At the port of the customer's equipment

- *(Less typical although in theory the Service providers edge device need not be on the customer premises)*



## 3. In the middle of the wire between Customer and Service Provider

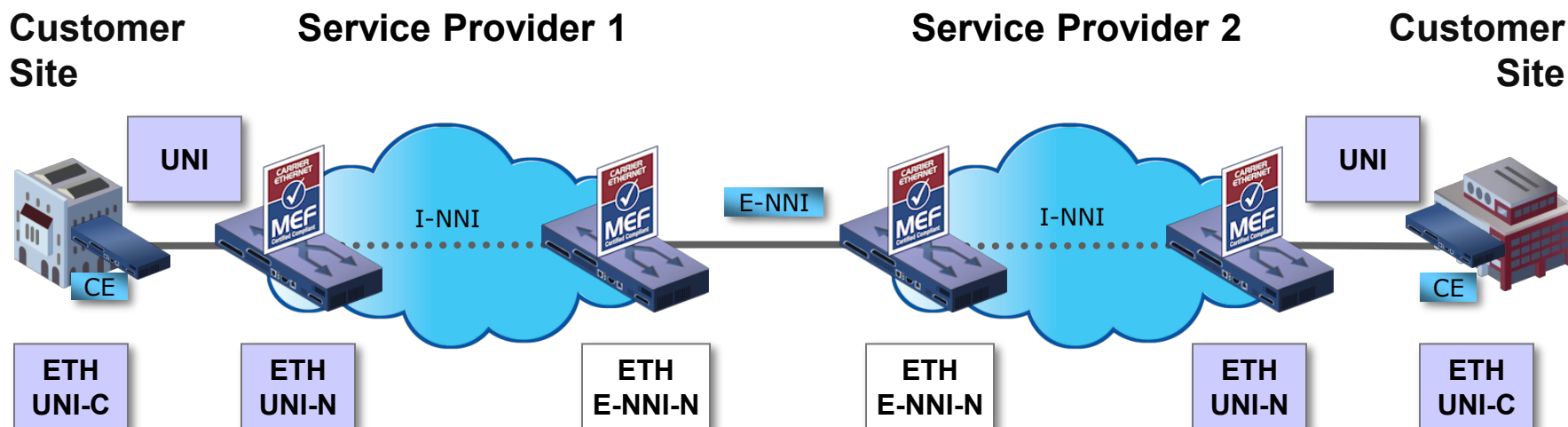
- *(This is only an abstract view)*





# Carrier Ethernet Architecture

This slide shows the UNI in the context of other Carrier Ethernet architectural elements



**UNI** User Network Interface

UNI-C UNI-customer side

UNI-N UNI-network side

**NNI** Network to Network Interface

E-NNI External NNI

I-NNI Internal NNI

The UNI is the physical demarcation point between the responsibility of the Service Provider and the responsibility of the Subscriber.



# MEF 20 Technical Overview



# MEF 20 in the context of MEF 13

- **MEF 13: UNI Type 1 Implementation Agreement**
  - Approved in November 2005
  - UNI Type 1.1 and 1.2 are defined
  - Type 1.1 : Non-multiplexed UNI for Services like EPL
  - Type 1.2 : Multiplexed UNI for Services like EVPL
  - S.P. and customer manually configure the UNI-N and UNI-C for services
- **MEF 20 extends this ...**

# Technical Details (1)

- **Ethernet Local Management Interface (E-LMI)**
  - Allows UNI-C to retrieve EVC status and service attributes from UNI-N as specified in MEF 16
- **Link OAM (Operation, Administration and Management)**
  - Allows customer and service provider to monitor and diagnose the UNI connectivity via Link OAM (link level)
  - Link OAM monitors UNI's Physical Layer operation and health and improves fault isolation.
  - Link OAM frames run between UNI-C and UNI-N.
- **Service OAM**
  - Allows customer and service provider to monitor and diagnose the UNI connectivity via Service OAM (end-to-end)
  - A small but useful, set of capabilities based on ITU-T Y.1731 and IEEE 802.1ag
  - Focused on fault management for the Maintenance Entity Groups crossing the UNI for all service types. A Maintenance Entity (ME) is a point-to-point relationship between two Maintenance Entity Points within a single Maintenance Entity Group

# Technical Details (2)

- **Protection**

- Capability to protect UNI against port failure via Link Aggregation protocol in various physical configurations

- **Enhanced UNI attributes introduced with MEF 6.1 and MEF 10.1**

- Bandwidth profile per UNI, per-EVC and per CoS ID egress bandwidth profiling of Committed Information Rate
- Maximum Transfer Unit size
- Handling of E-Tree (rooted multipoint) services

- **L2CP Handling**

- Pass to EVC
- Not pass to EVC (Filter)

# MEF 20 Implementation Options

**MEF 20** Specifies phased/alternate implementation. This allows quicker time to market and faster time to revenue for all concerned

## UNI Type 2.1

### Mandatory Features

- Backward comp. to UNI Type 1
- Service OAM
- Enhanced UNI attributes
- L2CP handling

### Optional Features

- Link OAM
- Protection
- E-LMI

## UNI Type 2.2

### Mandatory Features

- Backward comp. to UNI Type 1
- Service OAM
- Enhanced UNI attributes
- L2CP handling
- Link OAM
- Protection
- E-LMI

# Relationship to Other MEF and Industry Standards

Function	Source
MEF 20 Implementation Agreement is an enhancement to UNI Type 1	MEF13
Functionality includes capability for UNI-C to retrieve EVC status & configuration of service attributes from UNI-N via E-LMI	MEF16
Capability for customer and service provider to examine UNI connectivity via Link OAM	Clause 57 of IEEE 802.3
Capability for customer and service provider to examine UNI connectivity via Service OAM	ITU-T Y.1731 and IEEE 802.1ag
Capability to protect UNI against port failure via Link Aggregation	Clause 43 of IEEE 802.3

- **Why has the MEF undertaken the initiative?**

- This exactly in line with the MEF's mission to undertake work that helps accelerate the adoption of Carrier Ethernet and to use other existing standards wherever practical
- The MEF maintains standing liaisons with these industry standards bodies

# Implementation Agreement Structure

- **The Implementation Agreement**
- **Defines those elements that must be present and contains summaries of the concepts referred to in the previous slide**
  - UNI Type 2 Discovery & Configuration ensures the elements to be managed are present
  - The remaining sections handle the features of 2.1 and 2.2 options
  - Where appropriate, these sections describe each function present in the referenced standards (e.g. Management Entity Groups) stating which are mandatory and optional



# How Does MEF 20 Compare with Legacy Solutions?

- **Comparison**

- The addition of UNI type 2 functionality is comparable to baseline functionality of other legacy technologies

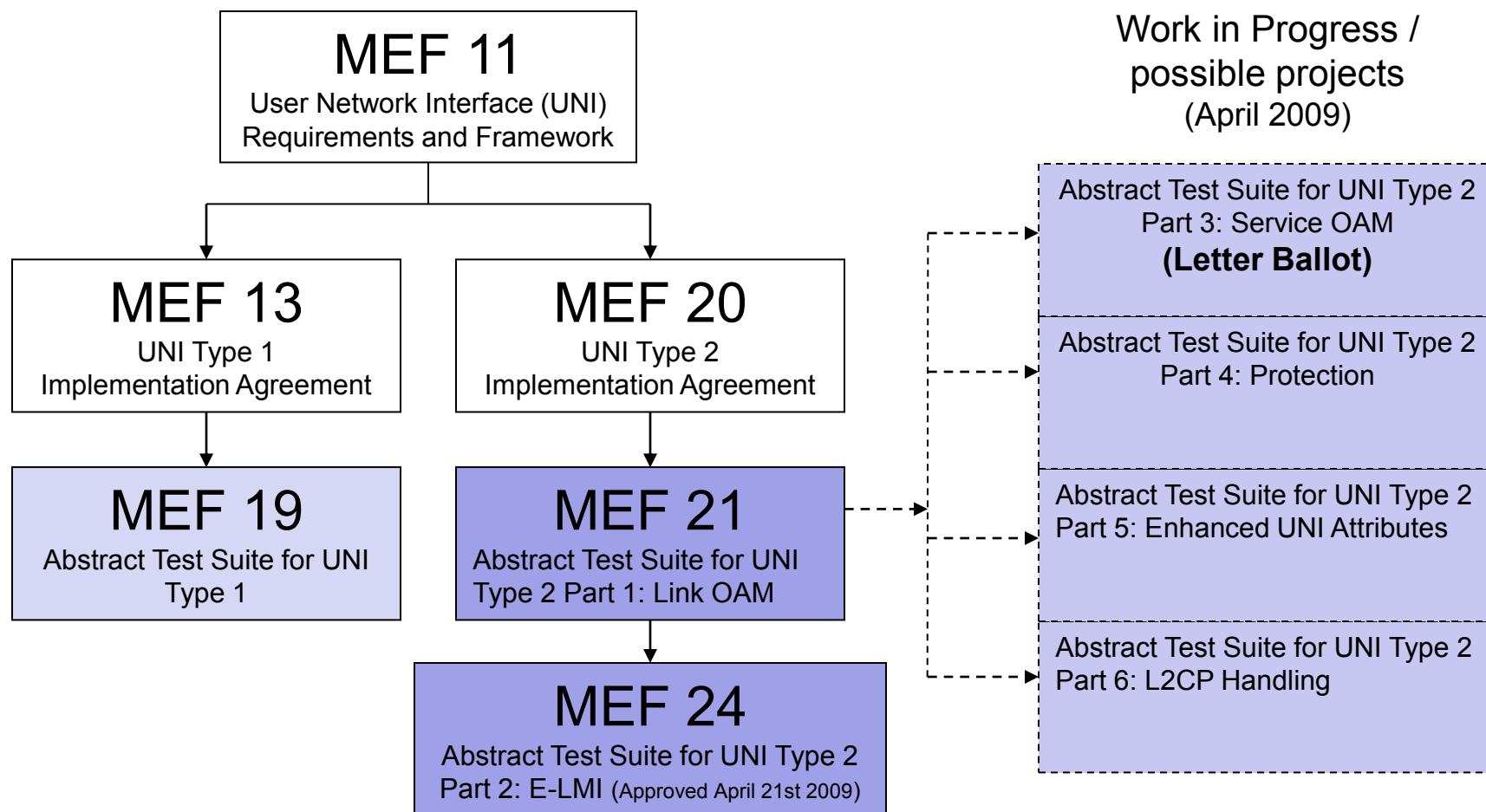
- **However ...**

- MEF 20 now enables the flexibility, service granularity and cost benefits of Carrier Ethernet not present in less flexible or lower bandwidth legacy solutions

# MEF

## **Brief introduction to Abstract Test Suite for UNI Type 2 (MEF 21 & MEF 24)**

# MEF 21/MEF 24: Testing UNI Type 2



- Further Test projects are in preparation
- E-NNI will leverage MEF 21 test cases
- MEF Certification will be decided in due course

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# MEF 21 Part 1 Scope

- **Covers test procedures for Link OAM described in the UNI Type 2 IA & clause 57 of IEEE 802.3-2005**
  - An overview of the different groups of requirements that compose Link OAM is provided as follows:
  - OAM Discovery process initiation and DTE reactions
  - Information OAMPDU exchange
  - Event Notification OAMPDU exchange
  - Variable Request & Response OAMPDU exchange
  - Loopback Control OAMPDU exchange and DTE reactions
  - Organization Specific OAMPDU exchange
- **Structure**
  - Test Configurations for UNI-C and UNI\_N
  - 140 Test Procedures for Link OAM

# MEF 24 Part 2 Scope

- **Covers test procedures based on a combination of requirements for E-LMI described in MEF 20 *User Network Interface (UNI) Type 2 Implementation Agreement* and in MEF 16 *Ethernet Local Management Interface*.**
  - An overview of the different groups of requirements that compose E-LMI is provided as follows:
    - E-LMI Framing Mechanisms
    - E-LMI Messages
    - E-LMI Procedures
    - E-LMI Impairments
- **Structure**
  - Test Configurations for UNI-C and E-LMI
  - 140 Test Procedures for UNI-N and E-LMI

- **Next Actions**

- Read the detailed MEF 20 Implementation Agreement
- Review MEF 21 and MEF 24 Abstract Test Suites available on the MEF web site

# MEF

*Accelerating Worldwide Adoption of  
Carrier-class Ethernet Networks and Services*

[www.MetroEthernetForum.org](http://www.MetroEthernetForum.org)