

MEF

Introducing the Specifications of the MEF

MEF 36: Service OAM Performance Monitoring Definition of Managed Objects

October 2012

MEF Reference Presentations

- **Intention**

- These MEF reference presentations are intended to give general overviews of the MEF work and have been approved by the MEF Marketing Committee
- Further details on the topic are to be found in related specifications, technical overviews, white papers in the MEF public site Information Center:

<http://metroethernetforum.org/InformationCenter>

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Outline

- **Approved MEF Specifications**
- **This presentation**
- **About this Specification**
- **In Scope / Out of Scope**
- **Terminology, Concepts & Relationship to other standards**
- **Section Review**
 - Major topics
 - Minor topics
- **Examples/Use Cases**
- **Summary**

Approved MEF Specifications*

Specification	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 7.1	EMS-NMS Information Model Phase 2
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 11	User Network Interface (UNI) Requirements and Framework
MEF 12.1	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

*Current at time of publication. See MEF web site for official current list, minor updates and superseded work (such as MEF 1 and MEF 5)

Approved MEF Specifications

Specification	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 22.1	Mobile Backhaul Implementation Agreement Phase 2
MEF 23.1	Class of Service Implementation Agreement Phase 2
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 26.1	External Network Network Interface (ENNI) – Phase 2
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

Approved MEF Specifications

Specification	Description
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
MEF 34	Abstract Test Suite for Ethernet Access Services
MEF 35	Service OAM Performance Monitoring Implementation Agreement
MEF 36	Service OAM SNMP MIB for Performance Monitoring
MEF 37	Abstract Test Suite for ENNI
MEF 38	Service OAM Fault Management YANG Modules Technical Specification
MEF 39	Service OAM Performance Monitoring YANG Modules Technical Specifications

*Current at time of publication. See MEF web site for official current list, minor updates (such as MEF 31.0.1 amendment to this document) and superseded work (such as MEF 1 and MEF 5)

MEF Specification Overview

MEF 36 - Service OAM (SOAM) Performance Monitoring Definition of Managed Objects

Purpose

Specifies the Performance Monitoring (PM) Management Information Base (MIB) necessary to manage Service Operations, Administration, and Maintenance (OAM) implementations that satisfy the Service OAM requirements and framework specified by MEF 17, MEF 35, and the management objects specified in MEF 7.1, and the PM functions defined in ITU-T Y.1731 and IEEE 802.1ag.

Audience

Applicable to entire Metro Ethernet Market including Service Providers, Access Providers, equipment vendors, and EMS/NMS/OSS vendors to provision and monitor equipment that is MEF compatible.

Overview of MEF 36

About MEF 36

- **Purpose:**

- This presentation is an introduction to MEF 36 - Service OAM Performance Monitoring Definition of Managed Objects

- **Audience**

- Equipment Manufacturers building devices that will carry Carrier Ethernet Services
- Service Providers delivering Carrier Ethernet Services
- EMS/NMS/OSS tool vendors developing back office applications for managing Carrier Ethernet Services

- **Other Documents**

- Presentations of other MEF 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

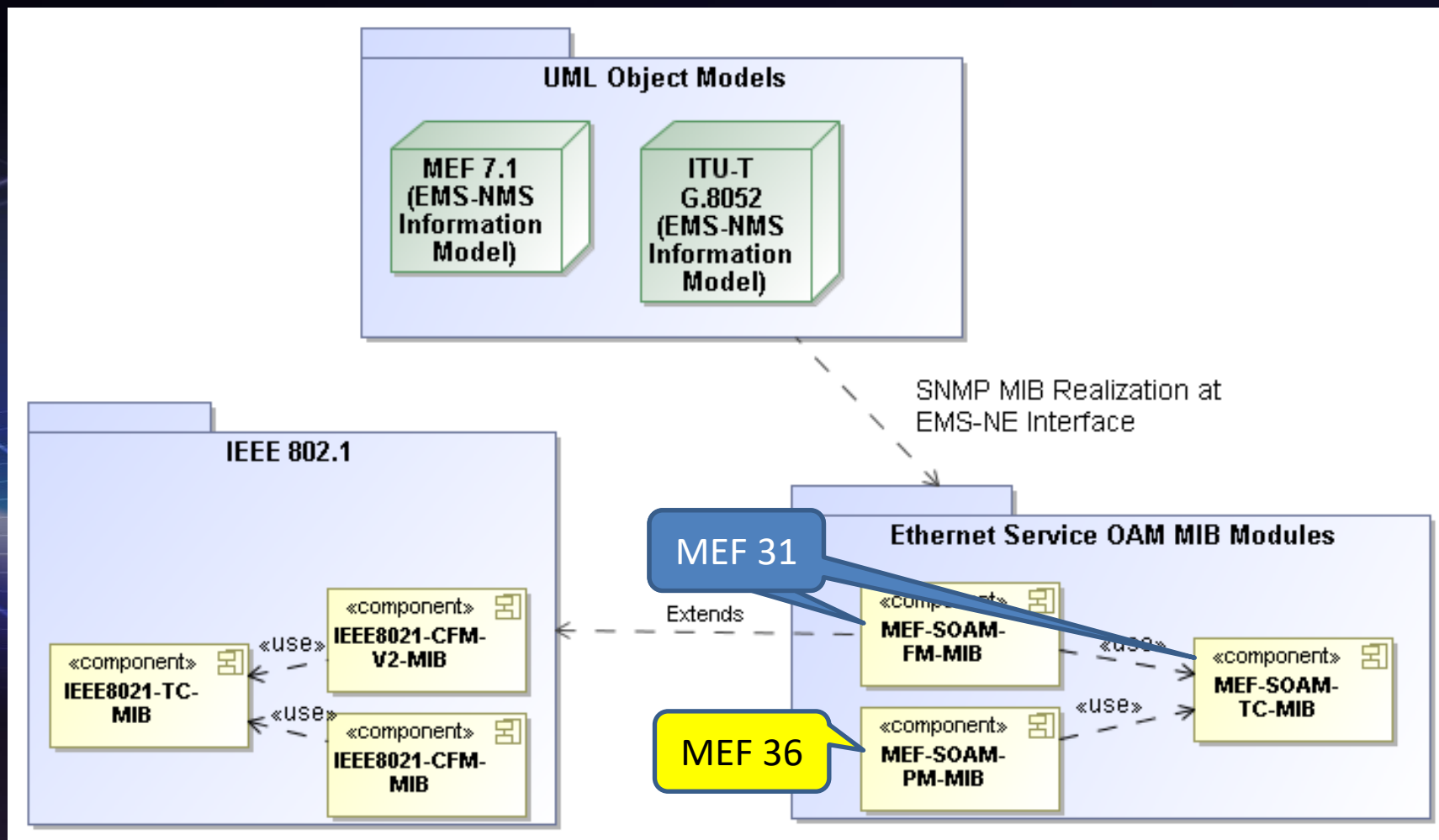
MEF 36 - In Scope/Out of Scope

- MEF 36 requirements are primarily driven by MEF 35 and leverage the OAM functions & managed objects defined by MEF 31, IEEE 802.1ag (CFM) and 802.1ap (MIB) and ITU-T Y.1731
- Managed objects to perform Loss Measurement, Delay Measurement, and support Threshold Crossing Alerts

Terminology and Concepts

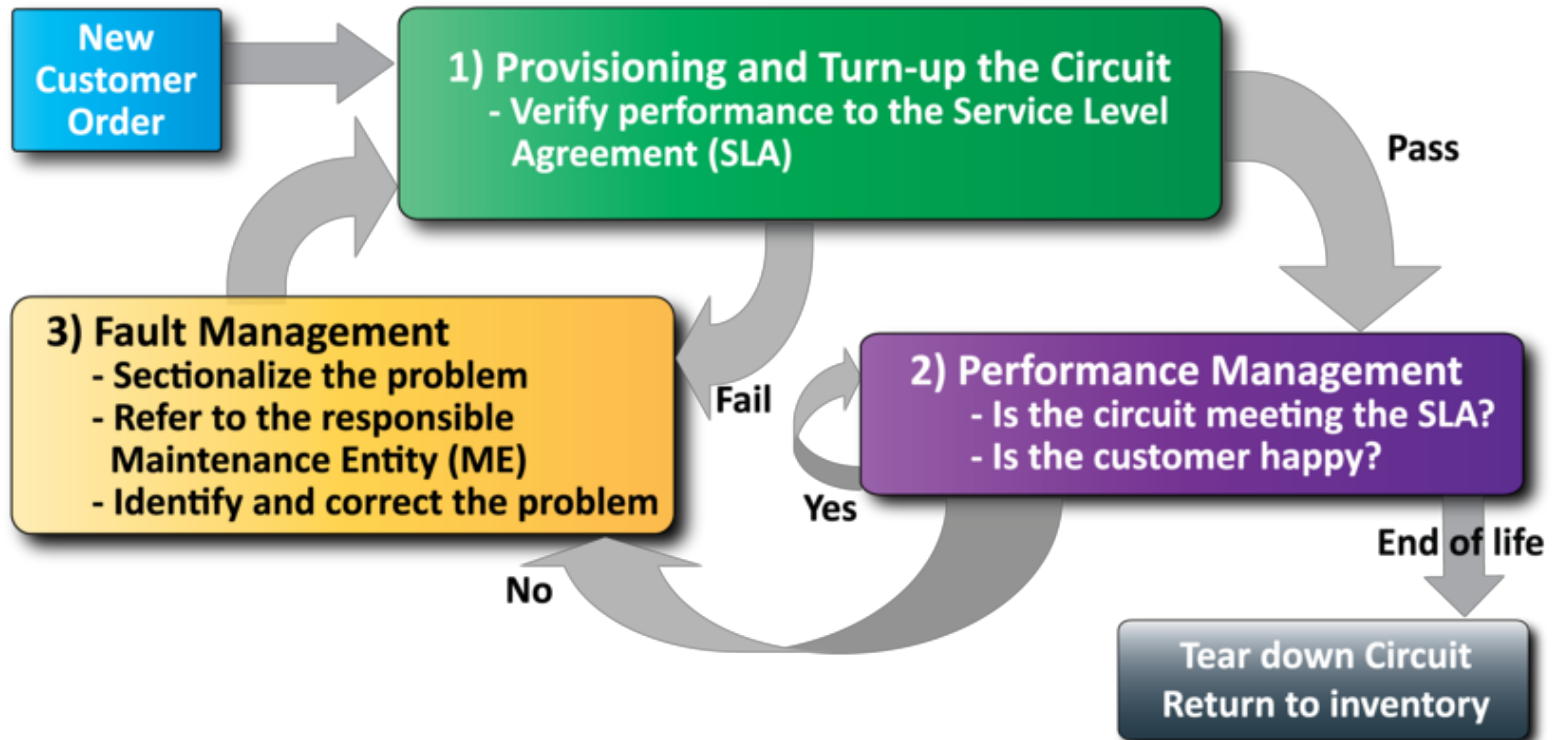
- **MEF 36 adheres to MEF 30 and MEF 35 terminology:**
 - Refer to MEF 30 for ME, MEG, MEP, MIP, CoS
 - Refer to MEF 35 for Single-Ended, Dual-Ended, one-way, two-way, PM Function, PM Session, PM Solution, PM Tool, Controller MEP, Responder MEP, Measurement Bin, and Measurement Interval
- **MEF 36 relies on MEF 31 for protocol specific terminology**
 - Simple Network Management Protocol (SNMP)
 - SNMP Manager
 - Management Information Model (MIB)
 - Element Management System (EMS)
 - Network Management System (NMS)
 - Operations Support System (OSS)

Relationship with other Specifications



MEF Service Lifecycle and SOAM

Network Management



Performance Management is use to monitor the service

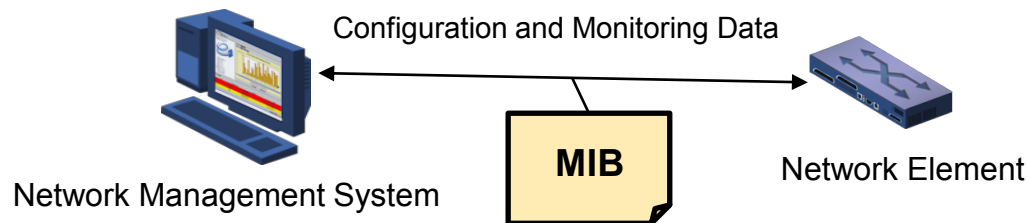
MEF Specification Section Review

Introducing MEF 36

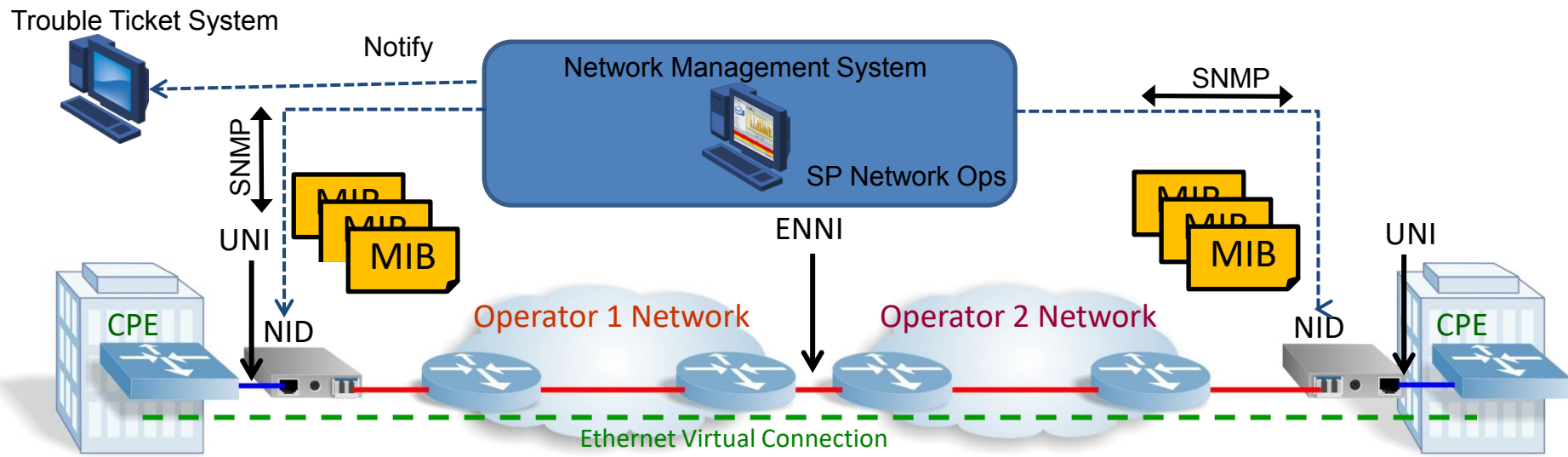
- **The presentation is broken into sections:**
 - Overview
 - Network Management Concepts/Topologies
 - Initial Configuration
 - OAM Functions
 - Loss Measurement
 - Delay Measurement
 - Threshold Configuration
 - Summary
 - Where to find additional information

What is a MIB?

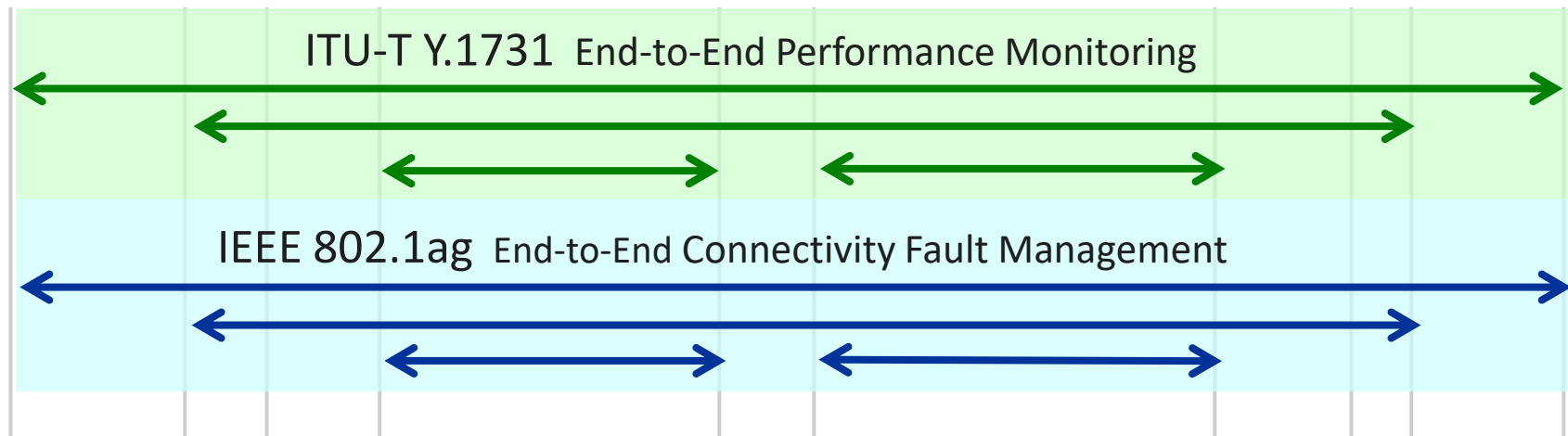
- A Management Information Base (MIB), or data model, is a collection of managed objects that can be used to provision or query a network device from a management system, such as a centrally located NMS (Network Management System).
- A MIB along with the management protocol, such as SNMPv2c, defines a standard network management interface for administration and maintenance of network elements.



Management Framework



Service OAM



SOAM PM MIB Components

- **MEF 36 uses some of the elements from the Connectivity Fault Management (CFM) MIBs specified in IEEE 802.1ag and IEEE 802.1ap**
- **The IEEE CFM MIB set includes**
 - IEEE8021-CFM-MIB
 - IEEE8021-CFM-V2-MIB
 - IEEE8021-TC-MIB
- **MEF 36 augments the CFM MIB set as follows**
 - MEF-SOAM-TC-MIB (From MEF 31)
 - MEF-SOAM-PM-MIB (MEF 36)

SOAM TC MIB Overview

- **MEF 31.0.1**
- **MEF-SOAM-TC-MIB defines a collection of Textual Conventions (common data types)**
 - AvailabilityType
 - ConnectivityStatusType
 - DataPatternType
 - DelayMeasurementBinType
 - IntervalTypeAisLck
 - MegIdType
 - MeasurementPeriodType
 - OperationTimeType
 - SessionType
 - StatusType
 - TestPatternType

SOAM PM MIB Overview

- **MEF-SOAM-PM-MIB defines the managed objects necessary to support SOAM PM functionality**

Loss Measurement

- Configuration
- Statistics
- Availability Statistics

Delay Measurement

- Configuration
- Bins
- Statistics

Threshold Crossing

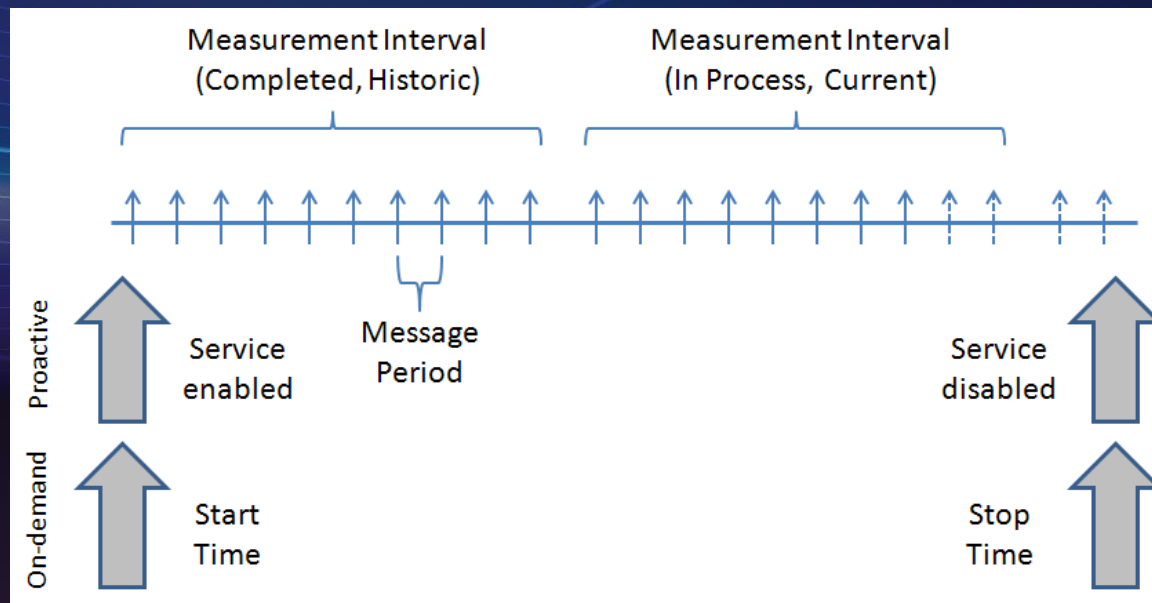
- Configuration
- Delay Measurement Thresholds
- Notifications

Terminology

- Single-Ended
 - A type of process where a MEP sends a measurement request and the peer MEP replies with the requested information so the originating MEP can calculate the measurement.
- Dual-Ended
 - A type of process where a MEP sends measurement information to a peer MEP that will perform the calculations.
- Proactive
 - OAM actions that are carried on continuously to permit timely reporting of fault and/or performance status
- On-Demand
 - OAM actions that are initiated via manual intervention for a limited time to carry out diagnostics.

Overview of the PM Process

- The PM Session is defined by the specific PM function (PM tool) being run along with the Start Time, Message Period (the blue up arrows below), Measurement Interval and Repetition Time (not shown)



Overview of PM Process

- **Start Time is the time that the PM Session begins**
 - Applicable to On-Demand sessions, no Proactive sessions
- **Stop Time is the time that the measurement ends**
 - Not applicable to Proactive
- **Message Period is the SOAM PDU transmission frequency**
- **Measurement Interval is the time period over which measurements are gathered**
- **Repetition Time is the time between the start times of the Measurement Intervals**

Initial SOAM Configuration

via 802.1ag/ap MIBs

- Before SOAM operations are instantiated by a NMS application, the following must be provisioned at each Network Element (NE) performing OAM Functions:
 - Maintenance Domain (MD)
 - Create entry in dot1agCfmMdTable
 - Maintenance Association (MA)/Maintenance Entity Group (MEG)
 - Create entry in dot1agCfmMaNetTable, ieee8021CfmMaCompTable, mefSoamNetCfgTable and mefSoamMegCfgTable
 - MEG End Point (MEP)
 - Create entry in dot1agCfmMepTable

MEP Setup

- **PM MIB Per MEP Objects**
 - The *mefSoamPmMepTable* augments the *dot1agCfmMepEntry*
 - The objects in this table are used to identify the index to use in the LM or DM table
 - The objects are also used to differentiate between Single-Ended and Dual-Ended Solutions

Loss Measurement Configuration Entries

- **The *mefSoamLmCfgTable* is used to provide the configuration information for the Loss Measurement PM Session**
 - This table uses the same indexes that the MEP configuration uses
 - *mefSoamLmCfgIndex* contains the specific LM session number on a MEP
- **There are eight categories of LM configuration options**
 - LM Session type, version, enable
 - LM Session PDU transmission frequency and Measurement Interval size
 - LM Session PDU composition and length
 - LM Session peer partner selection
 - LM Session start, stop, and repetition selection
 - LM Session availability configuration
 - LM Session status
 - LM Session history table clear

LM Statistics Tables

- **There are five tables that are used to report measurements**
 - *mefSoamLmMeasuredStatsTable*
 - Contains the information from that last received SOAM PDU
 - *mefSoamLmCurrentAvailStatsTable*
 - Contains the availability statistics for the current measurement interval
 - *mefSoamLmHistoryAvailStatsTable*
 - Contains the historical interval data that is copied from the current availability statistics table
 - *mefSoamLmCurrentStatsTable*
 - Contains the statistic counters for the current measurement interval
 - *mefSoamLmHistoryStatsTable*
 - Contains the historical interval data that is copied from the current statistics table

Loss Measurement Statistics

- Start Time
- Elapsed Time
- Suspect Flag
- Forward/Backward Availability High Loss/High Consecutive Loss
- Forward/Backward Availability/Unavailability indicators
- Forward/Backward Availability Min/Max/Avg FLR
- Forward/Backward Transmitted/Received Frames
- Forward/Backward Min/Max/Avg FLR (Frame Loss Ratio)
- SOAM PDUs sent/received

Delay Measurement Configuration Entries

- **The *mefSoamDmCfgTable* is used to provide the configuration information for the Delay Measurement PM Session**
 - This table uses the same indexes that the MEP configuration uses
 - *mefSoamDmCfgIndex* contains the specific DM session number on a MEP
- **There are eight categories of DM configuration options**
 - DM Session type, version, enable
 - DM Session PDU transmission frequency and Measurement Interval size
 - DM Session PDU composition and length
 - DM Session peer partner selection
 - DM Session start, stop, and repetition selection
 - DM Session status
 - DM Session measurement bin configuration
 - DM Session history table clear

Delay Measurement Bins

- A Measurement Bin is a counter that stores the number of delay measurements falling within a specified range, during a Measurement Interval.
- The configuration information for Measurement Bins is found in
 - mefSoamDmCfgMeasBinTable

DM Statistics Tables

- **There are five tables that are used to report measurements**
 - *mefSoamDmMeasuredStatsTable*
 - Contains the information from that last received SOAM PDU
 - *mefSoamDmCurrentStatsTable*
 - Contains the statistic counters for the current measurement interval
 - *mefSoamDmHistoryStatsTable*
 - Contains the history data that is copied from the current statistics table
 - *mefSoamDmCurrentStatsBinsTable*
 - Contains the statistic bin counters for the current measurement interval
 - *mefSoamDmHistoryStatsBinsTable*
 - Contains the history data that is copied from the current statistics bin table

Delay Measurement Statistics

- **Start Time**
- **Elapsed Time**
- **Suspect Flag**
- **Frame Delay**
 - TwoWay/Forward/Backward Min/Max/Avg
- **IFDV**
 - TwoWay/Forward/Backward Min/Max/Avg
- **Frame Delay Range**
 - TwoWay/Forward/Backward Max/Avg
- **SOAM PDUs sent/received**

Threshold

- **Used to notify the EMS using an SNMP notification when a specific performance parameter does not meet a specified boundary value**
- **Two Threshold configuration tables, one for DM and one for LM**
 - *mefSoamDmThresholdCfgTable*
 - *mefSoamLmThresholdCfgTable*
- **Threshold Above**
 - Used within a Measurement Interval
- **Threshold Set/Clear**
 - Uses information from the current and previous Measurement Interval

Thresholds

- **FLR**
 - Measured/Max/Avg, Forward/Backward
- **Consecutive High Loss**
 - Forward/Backward
- **High Loss**
 - Forward/Backward
- **Unavailable Count**
 - Forward/Backward
- **Availability Ratio**
 - Forward/Backward
- **Frame Delay**
 - Two-Way/Forward/Backward, Measured/Max/Avg
- **IFDV**
 - Two-Way/Forward/Backward, Measured/Max/Avg
- **Frame Delay Range**
 - Two-Way/Forward/Backward, Max/Avg

Notifications

- **There are a number of Notifications (TRAPS) that are defined to notify the EMS of various situations**
 - *mefSoamAvailabilityChangeAlarm*
 - Sent when the state of *mefSoamLmMeasuredStatsAvailForwardStatus* or *mefSoamLmMeasuredStatsAvailBackwardStatus* changes
 - *mefSoamLmSessionStartStopAlarm*
 - sent when the state of *mefSoamLmCfgSessionStatus* changes
 - *mefSoamDmSessionStartStopAlarm*
 - sent when the state of *mefSoamDmCfgSessionStatus* changes
 - *mefSoamPmThresholdCrossingAlarm*
 - sent if the a threshold crossing condition is met for a particular type

Summary MEF 36

- MEF 36 defines the managed objects for using an SNMP management interface for the MEF 35 Service OAM Performance Monitoring protocol
- MEF 36 enables MEF equipment providers to provide a standardized management interface for the SOAM Performance Monitoring functions:
 - Loss Measurement
 - Delay Measurement
 - Threshold Crossing Alerts

Final Word

- **Service OAM**
 - In the context of MEF 31, data models (MIBs) are defined that support service-level OAM in MENs
- **Next Actions (For Further Information)**
 - Read the full MEF 35 Performance Monitoring Implementation Agreement specification
 - Read the full MEF 36 specification
 - Read the full MEF 30 Fault Management Implementation Agreement specification
 - Read the full MEF 31 and MEF 31.0.1 specifications (note, review of MEF 17, MEF 7.1 and MEF 15 may also be helpful)
 - Understand the principal service OAM components and capabilities

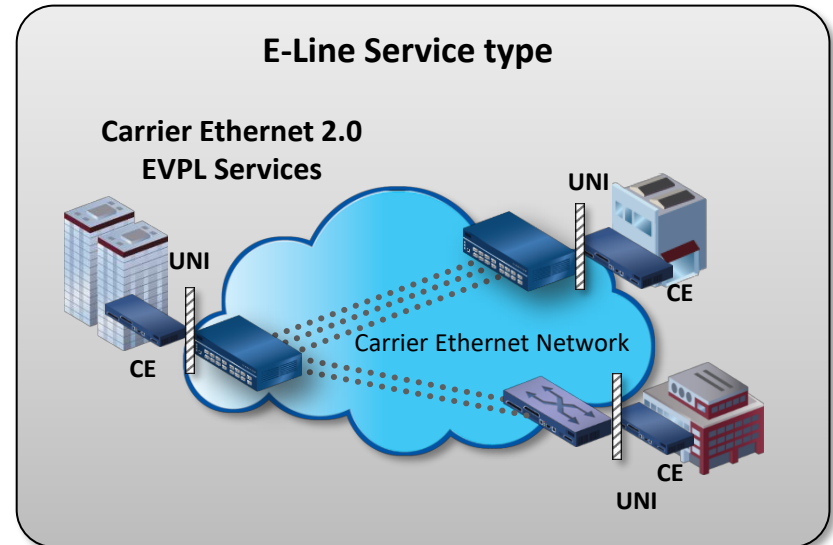
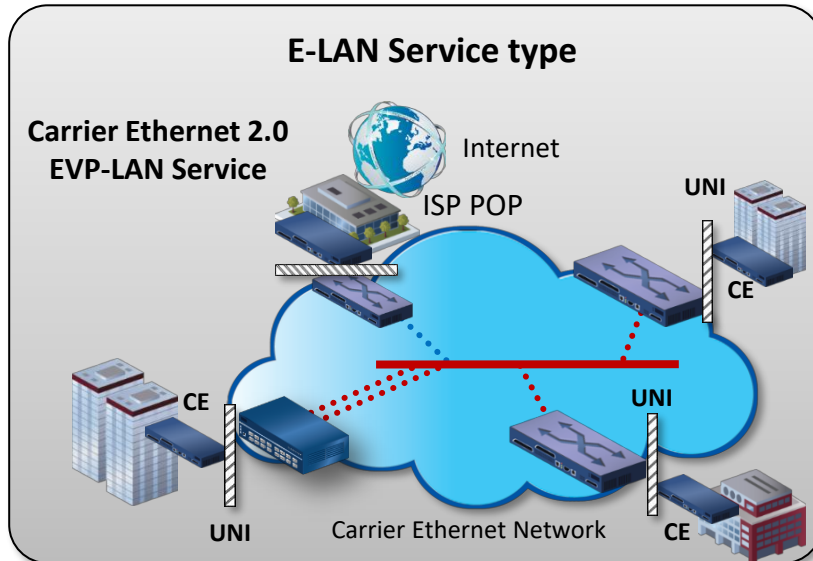
For Full Details ...

Please visit

www.metroethernetforum.org

Select Information Center on Left

Navigation to access the full specification and extracted MIB files



EVC: Ethernet Virtual Connection

UNI: User Network Interface. the physical demarcation point between the responsibility of the Service Provider and the responsibility of the End-User/Subscriber

CE Customer Equipment

MEF

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