Introducing the Specifications of the MEF

MEF 35: Service OAM Performance Monitoring Implementation Agreement

July 2012
Outline

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  – Maintenance Entities
• PM Solutions
• PM Considerations
• Summary
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*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 See MEF web site for official current list, minor updates and superseded work (such as MEF 1 and MEF 5)
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MEF 35 Specification Overview

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<th>MEF 35</th>
<th>Service OAM Performance Monitoring Implementation Agreement</th>
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<tr>
<td><strong>Purpose</strong></td>
<td>An Implementation Agreement (IA) which provides for Service Operations, Administration, and Maintenance (SOAM) that satisfies and extends the Performance Monitoring (PM) framework and requirements described in MEF 17.</td>
</tr>
<tr>
<td><strong>Audience</strong></td>
<td>All, since it provides the fundamentals required to deliver Carrier Ethernet services.</td>
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About MEF 35

• **Purpose:**
  – This presentation is an introduction to MEF 35 – Service OAM Performance Monitoring Implementation Agreement

• **Audience**
  – Vendors building devices supporting OAM functions for Carrier Ethernet Services
  – Service Providers delivering Carrier Ethernet Services

• **Other Documents**
  – MEF 17 – Service OAM Framework and Requirements
  – MEF 30 – Service OAM Fault Management Implementation Agreement
• **MEF 17 provides the framework**
  – Relevant for Subscribers (customers), Operators and Service Providers
• **Fault Management IA (MEF 30)**
  – FM of MEF Services
  – Specifies profile of protocols defined in IEEE 802.1ag and ITU-T Y.1731
  – Provides basic SOAM architecture and requirements for each of the recommended MEGs
• **Performance Management IA (MEF 35)**
  – PM of MEF Services
  – Specifies profile of protocols defined in ITU-T Y.1731
• **Related Work**
  – MIBs (SNMP) for FM and PM covered in MEF 31 and MEF 36
Performance management is a critical part of a circuit’s lifecycle
MEF 35 Specification Section Review
Introducing MEF 35

• The presentation is organized into the following sections:
  – Overview
    • Maintenance Entities
  – PM Solutions
  – PM Considerations
Performance Monitoring

• Based on ITU-T Y.1731
• Protocols or Performance Monitoring
  mechanisms
  – Frame Delay
  – Frame Delay Range
  – Inter-Frame Delay Variation
  – Frame Loss Ratio
  – Availability
Hierarchical OAM Domains

Hierarchical maintenance domains bind OAM flows & OAM responsibilities
Terminology and Concepts

• MEF 35 builds upon MEF 17 and MEF 30 defined SOAM components including:
  – Maintenance Entity (ME)
  – Maintenance Entity Group (MEG)
  – MEG End Point (MEP)
  – MEG Intermediate Point (MIP)
  – MEG Level
  – MEG Class of Service (CoS)

• MEF 30 and MEF 35 are based on terminology found in ITU Y.1731
This is the complete set of default MEG levels
Not all MEG levels are required in every application
## Key Maintenance Entity Groups (MEGs)

<table>
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<tr>
<th>MEG</th>
<th>Suggested Use</th>
<th>Default Direction for MEPs</th>
<th>Default MEG Level</th>
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<td>Subscriber MEG</td>
<td>Subscriber monitoring of an Ethernet service</td>
<td>Up or Down</td>
<td>6</td>
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<tr>
<td>Test MEG</td>
<td>Service Provider isolation of subscriber reported problems</td>
<td>Down</td>
<td>5</td>
</tr>
<tr>
<td>EVC MEG</td>
<td>Service Provider monitoring of provided service</td>
<td>Up</td>
<td>4</td>
</tr>
<tr>
<td>Service Provider</td>
<td>Service Provider Monitoring of Service Provider network</td>
<td>Up</td>
<td>3</td>
</tr>
<tr>
<td>MEG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operator MEG</td>
<td>Network Operator monitoring of their portion of a network</td>
<td>Up</td>
<td>2</td>
</tr>
<tr>
<td>UNI MEG</td>
<td>Service Provider monitoring of a UNI</td>
<td>Down</td>
<td>1</td>
</tr>
<tr>
<td>ENNI MEG</td>
<td>Network Operators' monitoring of an ENNI</td>
<td>Down</td>
<td>1</td>
</tr>
</tbody>
</table>
• **Up MEPs are positioned toward the MAC Relay**
  – Processes the OAM traffic that comes through the MAC Relay
• **Down MEPs are positioned toward the LAN**
  – Processes traffic that enters the Switch from the LAN
MEG End Point – MEP

• SOAM points associated with a single MEG level (and a single Maintenance Domain)
• Can generate and respond to SOAM protocols
• Up MEPs are oriented toward the MAC Relay (non-filled triangle)
• Down MEPs are oriented toward the network (filled triangle)
MEG End Point (MEP) Orientation

- **Down MEP** - is a MEP residing in a Bridge that receives SOAM PDUs from, and transmits them towards, the direction of the LAN. Note that in the MEF service model, the LAN is a transmission facility in the egress direction, rather than towards the Bridge Relay Entity.
- **Up MEP** - is a MEP residing in a Bridge that transmits SOAM PDUs towards, and receives them from, the direction of the Bridge Relay Entity. Note that in the MEF service model, the Bridge Relay Entity itself is out of scope.
- A given MEG can be terminated by either Up or Down MEPs.
- Up MEPs are the most commonly used MEP and are recommended for the following MEG levels: EVC, Service Provider, Operator and optionally the Subscriber.
MEG Intermediate Point – MIP

- SOAM points associated with a single MEG level (and a single Maintenance Domain)
- Can respond to SOAM protocols, but cannot generate requests
- Defined to be located at External Interfaces such as ENNIs (or UNIs). In practice can also be used in additional internal operator locations where monitoring is desired
PM Sessions
PM Solution Components

- SOAM PM IA
  - Focused on the Network Element Layer
- A PM Solution is made up of one or more PM Functions

Focus of the SOAM PM IA
PM Solutions

• There are three PM Solutions defined, each with different characteristics
• A PM Solution uses PM Functions which use the PM tools defined in ITU-T Y.1731

<table>
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<tr>
<th>PM Solution</th>
<th>MEG Type(s)</th>
<th>Measurement Technique for Loss</th>
<th>PM Function(s)</th>
<th>Mandatory or Optional</th>
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<td>point-to-point multipoint</td>
<td>Synthetic Testing</td>
<td>Single-Ended Delay Single-Ended Synthetic Loss</td>
<td>Mandatory</td>
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<tr>
<td>PM-2</td>
<td>point-to-point multipoint</td>
<td>n/a</td>
<td>Dual-Ended Delay</td>
<td>Optional</td>
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<tr>
<td>PM-3</td>
<td>point-to-point</td>
<td>Counting Service Frames</td>
<td>Single-Ended Service Loss</td>
<td>Optional</td>
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<th>PM Function</th>
<th>ITU-T PM Tool</th>
<th>ITU-T PDU(s)</th>
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<td>Single-Ended Delay</td>
<td>ITU-T Two-way ETH-DM</td>
<td>DMM/DMR</td>
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<tr>
<td>Dual-Ended Delay</td>
<td>ITU-T One-way ETH-DM</td>
<td>1DM</td>
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<td>Single-Ended Synthetic Loss</td>
<td>ITU-T Single-Ended ETH-SLM</td>
<td>SLM/SLR</td>
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Single-Ended Functions

Single-Ended ETH-xM PM tool;
uses SOAM PM PDUs: DMM/DMR, LMM/LMR, SLM/SLR

This can be used to produce measurements for the following metrics:

- One-way FD (forward and backward)
- One-way IFDV (forward and backward)
- One-way FDR (forward and backward)
- Two-way FD
- Two-way IFDV
- Two-way FDR
- One-way FLR (forward and backward), using LMM/LMR
- One-way FLR (forward and backward), using SLM/SLR
Dual-Ended Functions

Dual-Ended Function initiated at A (and optionally at B)

A

Dual-Ended ETH-xM PM tool; uses PDU: 1DM

B

This can be used to produce metrics for:

• One-way FD (forward)
• One-way IFDV (forward)
• One-way FDR (forward)
PM Solutions

• **PM-1**
  – Single-Ended Point-to-Point or Multipoint Delay and Synthetic Loss
  – Single-Ended functions send messages from a Controller MEP to a Responder MEP which responds back to the Controller MEP
  – Metrics Collected
    • One-way Frame Delay
    • One-way Mean Frame Delay
    • One-way Frame Delay Range
    • Inter-Frame Delay Variation
    • One-way Frame Loss Ratio
    • Availability for an EVC or OVC
    • Resiliency-related metrics for EVC or OVC
PM Solutions (continued)

• **PM-2**
  – Dual-Ended Point-to-Point or Multipoint Delay
  – Dual-Ended functions send measurements from a Controller MEP to a Sink MEP where the calculations are made
  – Metrics Collected
    • One-way Frame Delay
    • One-way Mean Frame Delay
    • One-way Frame Delay Range
    • Inter-Frame Delay Variation

• **PM-3**
  – Single-Ended Service Loss Measurement
  – This solution uses the service traffic instead of synthetic traffic
  – Metrics Collected
    • One-way Frame Loss Ratio
PM-1 Example
Single-Ended Synthetic Loss Measurement

- **SLM Message created at the Controller MEP (at MEP-A)**
  - TestID is in the PDU to differentiate
  - Source MEP ID
  - Value of local counter (at MEP-A) containing the number of SLM messages sent
- **SLR Message is created at the Responder MEP (at MEP-B)**
  - Received counts are copied
  - Local counter of received SLM messages are sent back to the Controller MEP
- **Frame Loss is calculated at the Controller MEP**
Related Specifications

- MEF 35 section 6 lists a full list of related MEF specifications
- MEF 30 SOAM FM
- MEF 31 SOAM FM MIB
- MEF 36 SOAM PM MIB
- ITU-T Y.1731
- MEF 17 SOAM requirements and frameworks phase 1
- MEF 12.1 Carrier Ethernet Network Architecture Part 2 – ETH Service Layer
Final Word

• **Service OAM**
  – In the context of MEF 35, mechanisms are defined that support service-level OAM in MENs.

• **Next Actions**
  – Read the MEF 35 specification
  – Read the MEF 30 specification
  – Read IEEE 802.1Q-2011 clauses 18, 19, 29, 21, and 22
  – Read ITU-T Y.1731
  – Review of MEF 17, MEF 10 and MEF 15 may also be helpful
  – Understand the principal service OAM components and capabilities
  – Review also MEF 36, MEF 31 and MEF 12.1 specification
For Full Details ... Please visit [www.metroethernetforum.org](http://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
Accelerating Worldwide Adoption of Carrier-class Ethernet Networks and Services

www.MetroEthernetForum.org