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Summary

This Specification describes the Network View interface between an Ethernet Element Management System (EMS) and Network Management System (NMS) supporting Metro Ethernet Services Phase 1 and Phase 2 networks by providing the profile of management entities based on ITU-T Q.840.1. This specification also provides a mapping to the TMF’s MTNM 3.5 Ethernet model.

The requirements and analysis for the management interface between an Ethernet Element Management System (EMS) and Network Management System (NMS) are provided in ITU-T Q.840.1, using the TMN interface specification methodology described in M.3020. In Q.840.1, a network view of Metro Ethernet and EoT managed entities are modeled according to a protocol-neutral information modeling approach, and the UML use case descriptions, class diagrams and sequence diagrams are also provided for both the requirements and the analysis of this management interface. In addition this document draws upon service requirements identified in MEF, ITU-T, and IEEE documents identified in the reference section.

Specifically this document adds management support for Service OAM.
# Table of Contents

**Table of Figures**

<table>
<thead>
<tr>
<th>PAGE</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>vi</td>
<td>Scope</td>
</tr>
<tr>
<td>1</td>
<td>References</td>
</tr>
<tr>
<td>4</td>
<td>Terms and Definitions</td>
</tr>
<tr>
<td>4.1</td>
<td>DEFINITIONS IMPORTED FROM G809</td>
</tr>
<tr>
<td>4.2</td>
<td>DEFINITIONS IMPORTED FROM G809</td>
</tr>
<tr>
<td>4.3</td>
<td>DEFINITIONS IMPORTED FROM ITU-T G8010</td>
</tr>
<tr>
<td>4.4</td>
<td>DEFINITIONS IMPORTED FROM ITU-T G8011</td>
</tr>
<tr>
<td>4.5</td>
<td>DEFINITIONS IMPORTED FROM MEF 10.1</td>
</tr>
<tr>
<td>4.6</td>
<td>DEFINITIONS IMPORTED FROM ITU-T Y.1731</td>
</tr>
<tr>
<td>6</td>
<td>Abbreviations</td>
</tr>
<tr>
<td>9</td>
<td>General overview</td>
</tr>
<tr>
<td>11</td>
<td>NETWORK VIEW CONCEPTS</td>
</tr>
<tr>
<td>12</td>
<td>Network Layering</td>
</tr>
<tr>
<td>13</td>
<td>Partitioning</td>
</tr>
<tr>
<td>13</td>
<td>Topological Provisioning</td>
</tr>
<tr>
<td>14</td>
<td>Flow / Connection Management</td>
</tr>
<tr>
<td>14</td>
<td>Service View Concepts</td>
</tr>
<tr>
<td>15</td>
<td>Interface Requirements</td>
</tr>
<tr>
<td>15</td>
<td>Overview of Use Cases</td>
</tr>
<tr>
<td>20</td>
<td>Information Model Overview</td>
</tr>
<tr>
<td>20</td>
<td>COMMON MANAGEMENT FUNCTION SET</td>
</tr>
<tr>
<td>21</td>
<td>CLASS DIAGRAMS OF METRO ETHERNET SPECIFIC MANAGEMENT ENTITIES</td>
</tr>
<tr>
<td>27</td>
<td>Metro Ethernet Service Phase 2 EMS-NMS Interface Profile</td>
</tr>
<tr>
<td>27</td>
<td>CONVENTIONS</td>
</tr>
<tr>
<td>53</td>
<td>Ethernet Service OAM Object Definitions</td>
</tr>
<tr>
<td>53</td>
<td>Services OAM Use Cases</td>
</tr>
<tr>
<td>53</td>
<td>Fault Management</td>
</tr>
<tr>
<td>54</td>
<td>Performance Monitoring</td>
</tr>
<tr>
<td>55</td>
<td>Common OAM Objects</td>
</tr>
<tr>
<td>56</td>
<td>EthMe (Maintenance Entity)</td>
</tr>
<tr>
<td>57</td>
<td>EthMeg (Maintenance Entity Group)</td>
</tr>
<tr>
<td>61</td>
<td>EthMep (Maintenance End Point)</td>
</tr>
<tr>
<td>62</td>
<td>EthMip (Maintenance Intermediate Point)</td>
</tr>
<tr>
<td>63</td>
<td>EthMp (Maintenance Point)</td>
</tr>
<tr>
<td>65</td>
<td>EthMd (Maintenance Domain)</td>
</tr>
<tr>
<td>66</td>
<td>EthMepPeerInfo (MEP Peer Information)</td>
</tr>
<tr>
<td>68</td>
<td>Fault Management Objects</td>
</tr>
</tbody>
</table>

---

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# Phase 2 EMS-NMS Information Model Technical Specification

9.3.1 Continuity Check................................................................. 69  
9.3.2 Loopback.............................................................................. 74  
9.3.3 Link Trace .......................................................................... 80  
9.3.4 Signal Functions................................................................. 89  
9.4 PERFORMANCE MONITORING OBJECTS................................. 98  
9.4.1 Abstract Performance Monitoring Objects.............................. 99  
9.4.2 Loss Measurement.............................................................. 106  
9.4.3 Delay Measurement............................................................ 113  
9.4.4 Function Sets...................................................................... 123  

APPENDIX I Mapping of ITU-T Q.840.1 Objects to TMF MTNM 3.5 ............ 126  
APPENDIX II Informational: State Management Mapping............................. 133  
APPENDIX III Data Type Definitions.................................................. 134  
   III.1 Primitive............................................................................ 134  
   III.2 Enumeration ......................................................................... 135  
   III.3 Complex................................................................................ 139  
APPENDIX IV Protocol Specific SNMP MIB Object Mappings..................... 142
Table of Figures

Figure 5-1 Network-Level Management Architecture .......................................................... 10
Figure 5-2 ETH Layer Interfaces and Reference Points ......................................................... 11
Figure 5-3 ETH Port Management Example ...................................................................... 12
Figure 5-4 Connection Example ....................................................................................... 13
Figure 5-5 Topological Elements ..................................................................................... 13
Figure 5-6 Ethernet Discovery Function Set .................................................................... 14
Figure 5-7 – Ethernet Services Model [3] ..................................................................... 15
Figure 6-1 Common Management Function Set Overview ............................................... 15
Figure 6-2 Configuration Management Function Set .......................................................... 16
Figure 6-3 Performance Management Function Set ............................................................. 17
Figure 6-4 Fault Management Function Set .................................................................... 17
Figure 6-5 ETY Port Management Function Set ................................................................. 18
Figure 6-6 Ethernet Discovery Function Set .................................................................... 18
Figure 6-7 ETH Flow Point Pool Management ................................................................. 19
Figure 6-8 ELMI Profile Management ............................................................................ 19
Figure 6-9 ETH FDFr/EVC Management ...................................................................... 20
Figure 7-1/Q.840.1 Inheritance Diagram of Ethernet Managed Entities: Topology View ................................................................................................................. 22
Figure 7-2/Q.840.1 Inheritance Diagram of Ethernet Managed Entities: Connectivity View ................................................................................................................. 23
Figure 7-3/Q.840.1 Inheritance Diagram of Ethernet Managed Entities: Reference Data ................................................................................................................. 24
Figure 7-4/Q.840.1 Relationship Diagram of Ethernet Network View and Equipment View ............................................................................................................. 25
Figure 7-5/Q.840.1 Relationship Diagram of Ethernet Service Configuration Managed Entities ........................................................................................................ 26
Figure 9-1 EMS-NMS Information Model Approach ......................................................... 53
Figure 9-2 Fault Management Use Cases ........................................................................ 54
Figure 9-3 Common Service OAM Object Class Diagram .............................................. 55
Figure 9-4 Fault Management Class Diagram ................................................................ 56
Figure 9-5 Continuity Check Activity Diagram ................................................................. 69
Figure 9-6 Loopback Activity Diagram ........................................................................... 70
Figure 9-7 Link Trace Activity Diagram .......................................................................... 75
Figure 9-8 Locked Activity Diagram .............................................................................. 81
Figure 9-9 Test Activity Diagram .................................................................................... 89
Figure 9-10 Performance Monitoring Inheritance Class Diagram ................................... 90
Figure 9-11 Performance Monitoring Class Diagram ....................................................... 98
Figure 9-12 On-Demand Single-Ended Loss Measurement Activity Diagram ............... 107
Figure 9-13 On-Demand 2-Way Delay Measurement Activity Diagram ......................... 113
Figure 9-14 Proactive 2-Way Delay Measurement Activity Diagram ............................. 114

Table of Tables

Table 8-1 Table of Required Management Entities .......................................................... 28
Table 8-2 Table of Required Performance Data Sets ......................................................... 30
Table 8-3 Table of ITU-T Q.840.1 Management Entity Elements .................................. 31
Metro Ethernet Phase 2 EMS-NMS Interface

1 Scope

This Specification describes the Network View interface between an Ethernet Element Management System (EMS) and Network Management System (NMS) supporting Metro Ethernet Services Phase 1 and Phase 2 networks by providing the profile of management entities. Metro Ethernet Services attributes are defined in MEF-10.1. Appendix I of this specification provides a mapping to the TMF’s MTNM 3.5 Ethernet model. The EMS-NMS interface described here in this document supersedes MEF 7.

The requirements and analysis for the management interface between an Ethernet Element Management System (EMS) and Network Management System (NMS) are provided in ITU-T Q.840.1, using the TMN interface specification methodology described in M.3020. In Q.840.1, a network view of Metro Ethernet and EoT managed entities are modeled according to a protocol-neutral information modeling approach, and the UML use case descriptions. Class diagrams and sequence diagrams are also provided for both the requirements and the analysis of this management interface.

In this Specification, the EMS is an Operations System (OS) used to manage the individual network elements (NEs) supporting Metro Ethernet services as well as the networks between them. One or more EMSs may be deployed depending on the different supplier products and geographic distribution of the network elements in the network. The NMS represents an integrated management OS across different technologies and EMSs. The NMS communicates with EMS through the EMS-NMS Interface (i.e., Q Interface) to realize its management functions.

The management functions covered in this Specification include: configuration management, performance measurement and parameters management, and alarm reporting and testing in fault management. This Specification does not cover all aspects about Ethernet management, only those related to Metro Ethernet services management are addressed. In addition this document draws upon service requirements identified in MEF, ITU-T, and IEEE documents identified in the reference section.

2 References

The following references contain provisions which, through reference in this text, constitute provisions of this Specification. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Specification are therefore encouraged to investigate the possibility of applying the most recent edition of the references listed below.


[25] ITU-T Recommendation G.826, Error Performance Parameters and Objectives for International, Constant Bit Rate Digital Paths at or Above the Primary Rate.


[32] IEEE 802.3 (2005), *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*.


[37] IETF RFC 3635 (2003), *Definitions of Managed Objects for the Ethernet-like Interface Types*.

[38] IETF RFC 3636 (2003), *Definitions of Managed Objects for IEEE 802.3 Medium Attachment Units (MAUs)*.

[39] IETF RFC 4188 (2005), *Definitions of Managed Objects for Bridges*.


[41] IETF RFC 2674 (1999), *Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering and Virtual LAN Extensions*.


3 Terms and Definitions
This Specification uses the following terms.

3.1 Definitions Imported from G.805
The following terms from ITU-T Recommendation G.805 [23] are used in this Specification:
- Connection
- Connection point
- Link
- Termination connection point
- Trail
- Trail termination

3.2 Definitions Imported from G.809
The following terms from ITU-T Recommendation G.809 [24] are used in this Specification:
- Adaptation
- Characteristic information
- Client/server relationship
- Connectionless trail
- Flow
- Flow domain
- Flow domain flow
- Flow point
- Flow point pool
- Flow point pool link
- Flow termination
- Layer network
- Link flow
3.3 Definitions Imported from ITU-T G.8010

The following terms from ITU-T Recommendation G.8010 are used in this Specification:

- ETH Link
- Traffic Conditioning Function

3.4 Definitions Imported from ITU-T G.8011

The following terms from ITU-T Recommendation G.8011 are used in this Specification:

- Committed Information Rate (CIR)
- Ethernet Private Line (EPL)
- Ethernet Virtual Private Line (EVPL)
- Ethernet Private LAN (EPLAN)
- Ethernet Virtual Private LAN (EVPLAN)

3.5 Definitions Imported from MEF 10.1

The following terms from MEF 10.1 [3] and MEF 10.1.1 [45] are used in this Specification:

- All to One Bundling
- Bandwidth Profile
- Broadcast Service Frame
- CE-VLAN ID Preservation
- CE-VLAN ID/EVC Map
- CE-VLAN Tag
- CIR-compliant
- Circuit Emulation Service (CES)
- Class of Service (CoS)
- Color-aware
- Color-blind
- Committed Burst Size (CBS)
- Committed Information Rate (CIR)
- Customer Edge (CE)
- Dual Rate Bandwidth Profile
- Egress Frame
- EIR-compliant
- Ethernet Virtual Connection (EVC)
- Excess Burst Size (EBS)
- Excess Information Rate (EIR)
- Frame
- Frame Delay (FD)
- Frame Loss Ratio (FLR)
- Ingress Frame
- Inter-Frame Delay Variation (IFDV)
- Layer 2 Control Protocol Service Frame
- Layer 2 Control Protocol Tunneling
- Metro Ethernet Network (MEN)
- Multicast Service Frame
- Multipoint-to-Multipoint EVC
- Point-to-Point EVC
- Service Frame
- Service Level Agreement (SLA)
- Service Level Specification (SLS)
- Service Multiplexing
- Service Provider
- Single Rate Service
- Subscriber
- Unicast Service Frame
- User Network Interface (UNI)

3.6 Definitions Imported from ITU-T Y.1731
The following terms from ITU-T Recommendation Y.1731 are used in this Specification:
- On-Demand OAM
- Proactive OAM

4 Abbreviations
This Specification uses the following abbreviations:

1DM One-way Delay Measurement
AIS Alarm Indication Signal
APS Automatic Protection Switching
ASAP  Alarm Severity Assignment Profile
BER  Bit Error Rate
CBS  Committed Burst Size
CCM  Continuity Check Message
CE  Customer Edge
CES  Circuit Emulation Service
CI  Characteristic Information
CIR  Committed Information Rate
CM  Configuration Management
CoS  Class of Service
CRC  Cyclic Redundancy Check
CTP  Connection Termination Point
DM  Delay Measurement
DMM  Delay Measurement Message
DMR  Delay Measurement Reply
EBS  Excess Burst Size
EIR  Excess Information Rate
EMS  Element Management System
EoT  Ethernet over Transport
ETH  Ethernet MAC layer network
ETH-AIS  Ethernet Alarm Indication Signal function
ETH-CC  Ethernet Continuity Check function
ETH-DM  Ethernet Delay Measurement function
ETH-LCK  Ethernet Lock Signal function
ETH-LB  Ethernet Loopback function
ETH-LM  Ethernet Loss Measurement function
ETH-LT  Ethernet Link Trace function
ETH-RDI  Ethernet Remote Defect Indication function
ETH-Test  Ethernet Test function
ETYn  Ethernet physical layer network of order n
FCS  Frame Check Sequence
FD  Flow Domain
FDFr  Flow Domain Fragment
FDX  Full Duplex
FLR  Frame Loss Ratio
FM  Fault Management
FP  Flow Point
FPP  Flow Point Pool
FS  Function Set
FTP  Flow Termination Point
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GFP</td>
<td>Generic Framing Procedure</td>
</tr>
<tr>
<td>HDX</td>
<td>Half Duplex</td>
</tr>
<tr>
<td>ID</td>
<td>Identifier</td>
</tr>
<tr>
<td>IFDV</td>
<td>Inter-Frame Delay Variation</td>
</tr>
<tr>
<td>ITU-T</td>
<td>International Telecommunication Union – Telecommunication Standardization Sector</td>
</tr>
<tr>
<td>LAN</td>
<td>Local Area Network</td>
</tr>
<tr>
<td>LBM</td>
<td>Loopback Message</td>
</tr>
<tr>
<td>LBR</td>
<td>Loopback Reply Message</td>
</tr>
<tr>
<td>LCK</td>
<td>Locked</td>
</tr>
<tr>
<td>LMM</td>
<td>Loss Measurement Message</td>
</tr>
<tr>
<td>LMR</td>
<td>Loss Measurement Reply</td>
</tr>
<tr>
<td>LOC</td>
<td>Loss of Continuity</td>
</tr>
<tr>
<td>LTM</td>
<td>Link Trace Message</td>
</tr>
<tr>
<td>LTR</td>
<td>Link Trace Reply</td>
</tr>
<tr>
<td>MAC</td>
<td>Media Access Control</td>
</tr>
<tr>
<td>ME</td>
<td>Maintenance Entity</td>
</tr>
<tr>
<td>MEG</td>
<td>ME Group</td>
</tr>
<tr>
<td>MEN</td>
<td>Metro Ethernet Network</td>
</tr>
<tr>
<td>MEP</td>
<td>MEG End Point</td>
</tr>
<tr>
<td>MIB</td>
<td>Management Information Base</td>
</tr>
<tr>
<td>MIP</td>
<td>MEG Intermediate Point</td>
</tr>
<tr>
<td>MTTR</td>
<td>Mean Time To Restore</td>
</tr>
<tr>
<td>NE</td>
<td>Network Element</td>
</tr>
<tr>
<td>NMS</td>
<td>Network Management System</td>
</tr>
<tr>
<td>NNI</td>
<td>Network Node Interface</td>
</tr>
<tr>
<td>NT</td>
<td>Network Termination</td>
</tr>
<tr>
<td>OS</td>
<td>Operations System</td>
</tr>
<tr>
<td>OAM</td>
<td>Operation, Administration and Maintenance</td>
</tr>
<tr>
<td>P2P</td>
<td>Point to Point</td>
</tr>
<tr>
<td>P2MP</td>
<td>Point to Multi-Point</td>
</tr>
<tr>
<td>PDU</td>
<td>Protocol Data Unit</td>
</tr>
<tr>
<td>PHY</td>
<td>Physical Layer Entity</td>
</tr>
<tr>
<td>PM</td>
<td>Performance Management</td>
</tr>
<tr>
<td>QoS</td>
<td>Quality of Service</td>
</tr>
<tr>
<td>RDI</td>
<td>Remote Defect Indication</td>
</tr>
<tr>
<td>SLA</td>
<td>Service Level Agreement</td>
</tr>
<tr>
<td>SLS</td>
<td>Service Level Specification</td>
</tr>
<tr>
<td>SNC</td>
<td>Subnetwork Connection</td>
</tr>
<tr>
<td>STP</td>
<td>Spanning Tree Protocol</td>
</tr>
<tr>
<td>TCI</td>
<td>Tag Control Information</td>
</tr>
</tbody>
</table>
Phase 2 EMS-NMS Information Model Technical Specification

TLV Type, Length, and Value
TMN Telecommunication Management Network
TP Termination Point
TST Test PDU
TTL Time to Live
TTP Trail Termination Point
UML Unified Modeling Language
UNI User Network Interface
VID VLAN ID
VLAN Virtual Local Area Network
VPN Virtual Private Network
WAN Wide Area Network

5 General overview
In G.8010, two layer networks are defined in the EoT network architecture:
- Ethernet MAC (ETH) Layer Network
- Ethernet PHY (ETY) Layer Network

G.805/G.809 describe a client/server relationship where client layer link connections are supported by server layer trails. The ETH layer network characteristic information can be transported through ETH links supported by trails in the ETY layer network or other path layer networks (e.g., SDH VC-n, OTN ODUk, MPLS, ATM, etc.).

This specification focuses on identifying the EMS-NMS interface management objects to support what is considered to be the essential functionality of Metro Ethernet Network (MEN) network and service management at the ETH layer over dedicated/private or shared/virtual bandwidth provided by the transport layer (SDH/SONET, PDH, ATM, MPLS, OTH, ETY, etc.). The services supported by the EMS-NMS interfaces are identified in MEF 10.1.

MEF Services Phase 2 introduces the rooted multipoint connection type. In a Rooted-Multipoint EVC, one or more of the UNIs must be designated as a Root and each of the other UNIs must be designated as a Leaf. An ingress Service Frame mapped to the EVC at a Root UNI may be delivered to one or more of the other UNIs in the EVC. An ingress Service Frame mapped to the EVC at a Leaf UNI must not result in an egress Service Frame at another Leaf UNI but may result in an egress Service Frame at some or all of the Root UNIs.¹

The interface profile provided in this specification identifies the managed objects (i.e. logical UML objects) needed to support Metro Ethernet services. This interface profile will be used for creating protocol specific MIBs based on CORBA, SNMP, XML, etc. This logical model based interface profile has great value in that it provides a protocol independent way of representing the information required for managing Metro Ethernet services. The goal of this specification is to provide a set of management objects that can be used to develop protocol specific models in a semantically consistent fashion.

¹ Rooted multipoint EVC is defined in the MEF Services Phase 2 Services Attributes specification.
This specification addresses the following functional areas of Metro Ethernet network and service management:
- Ethernet (ETH) layer Flow Point Pool (e.g., UNI) configuration and provisioning;
- ETH layer configuration and provisioning (including flow domain (subnetwork) provisioning, and link provisioning);
- ETH layer network Flow Domain Fragment (i.e. EVC) management (including set-up/modification for ETH FDFrs);
- ETH layer fault management;
- ETH layer performance monitoring;
- Management of the MAU/ETY layers ports (i.e. trail terminations).

In the Network-Level Management Architecture (see Figure 5-1), the NMS Environment interfaces to a set of subtending Element Management Systems (EMSs) which, in turn, interfaces to the Metro Ethernet NEs within its span of control. In this architecture, the NMS Environment delegates the responsibility of managing the individual elements to the EMSs, and only manages the flow domains as presented by the EMSs. Thus the EMS exposes a network view to the NMS Environment. It is also important for the EMS to expose the equipment view, especially for fault management.

The EMS shown in Figure 5-1 is used to manage the individual network elements supporting Metro Ethernet and EoT technologies. One or more systems may be required depending on the different supplier products and geographic distribution of the elements in the network. The network layer management system represents an integrated management OS environment across potentially different technologies and supplier systems. Figure 5-1 shows the EMS-NMS interface (Q interface) addressed in this Specification.

![Figure 5-1 Network-Level Management Architecture](image)

The Ethernet Services Layer, also referred to as the ETH Layer, is the specific layer network within a Metro Ethernet Network (MEN) responsible for the instantiation of Ethernet MAC oriented connectivity services and the delivery of Ethernet PDUs presented across well-defined internal and external interfaces. The ETH Layer is responsible for all service-aware aspects associated with Ethernet MAC flows, including operations,
administration, maintenance and provisioning capabilities required to support Ethernet connectivity services. As per the MEF services model (MEF 10.1 [3]), the Service Frame presented by the ETH Layer external interfaces is expected to be an Ethernet unicast, multicast or broadcast frame conforming to the IEEE 802.3-2005 frame format [32].

Figure 5-2 shows the relationship between the MEN interfaces defined in the MEF Generic Architecture Framework (MEF 4 [1]) and the ETH Layer. From the perspective of the ETH Layer, only those components of the UNI/NNI related to Ethernet service-aware functions are relevant. From a functional modeling viewpoint, the Ethernet Services Layer Network consists of topological, transport and processing entities.

5.1 Network View Concepts
The Network View provides an abstraction of network resources allowing for flexibility in the management of the network. It provides a network layering abstraction, allowing multiple network technologies to be managed in an integrated fashion. The network view abstraction allows for the representation of a topological view of network resources, and the management of end-to-end connections or flows across the network. The network view abstraction resides at the Network Management Layer (NML) of TMN. The network view abstraction provides more service, flow, and connection oriented information than Element Management Layer (EML) and Element Layer (EL) nodal oriented management information models.

Network view models incorporate the concepts of layer networks, flow or subnetwork partitioning, topological view, and flow or connectivity view. These concepts allow the network view to provide an abstraction of the network being managed as an aggregate view of network resources.

A layer network domain (LND) represents an administration’s view of the network resources responsible for transporting a specific type of characteristic information (e.g., IP, ETH (layer 2), ETY (ETH PHY), MPLS, SONET/SDH).

The topological view represents the network structure and topology. This view describes the flow domains or subnetworks that make up the LND, and partitioning relationships of the
flow domains or subnetworks within the LND. Flow domains or subnetworks are connected and related through Links. Links represent capacity supported by an underlying (or server) LND.

The connectivity or transport view of the network view model describes the flows (connections) through an LND, and the supporting flows (connections) through the flow domains (subnetworks) and links. This view describes how flows traverse flow domains and their partitioned components. The relationships of the flows to the supporting underlying server LND are provided through the use of link connections. Flows (connections) describe how capacity and resources are assigned to support trails through an LND.

The layer network concept provides a separation of resources and capabilities that support the transport of specific types of characteristic information (e.g., IP packets and Ethernet frames). Flow domain partitioning allows a flow domain to be partitioned into component flow domains and the links that connect them.

<table>
<thead>
<tr>
<th><strong>Connection Oriented (G.805)</strong></th>
<th><strong>Connectionless (G.809)</strong></th>
<th><strong>Metro Ethernet / EoT Entity</strong></th>
</tr>
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<tbody>
<tr>
<td>Subnetwork</td>
<td>FlowDomain</td>
<td>ETH_Flow_Domain</td>
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<tr>
<td></td>
<td>(MatrixFlowDomain)</td>
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<td>LinkEnd</td>
<td>FPP</td>
<td>ETH_FPP</td>
</tr>
<tr>
<td></td>
<td>(FlowPointPool)</td>
<td></td>
</tr>
<tr>
<td>Link</td>
<td>FPPLink</td>
<td>ETH_FPP_Link</td>
</tr>
<tr>
<td>SNC (SubnetworkConnection)</td>
<td>FDFr</td>
<td>ETH_FDFr_EVC</td>
</tr>
<tr>
<td></td>
<td>(FlowDomainFragment)</td>
<td></td>
</tr>
<tr>
<td>Network CTP (Connection Termination Point)</td>
<td>FlowPoint</td>
<td>ETH_Flow_Point</td>
</tr>
<tr>
<td>Network TTP (Trail Termination Point)</td>
<td>FlowPoint</td>
<td>ETH_Flow_Point MAUTransportPort</td>
</tr>
</tbody>
</table>

### 5.1.1 Network Layering

Layer networks provide the logical separation of network resources that support transport for different types of characteristic information. An LND represents an administration’s view of the layer network responsible for transporting a specific type of characteristic information. Layer networks may use transport resources in other layer networks. That is, an LND may act as a client LND with respect to another LND that provides transport resources, the server LND. In Figure 5-3, the IP LND uses transport resources of the ETH LND. The ETH LND in turn uses the resources of the MPLS LND; the MPLS LND in turn uses the resources of the SONET/SDH LND, and the SONET/SDH LND utilizes the physical transport resources represented in the WDM LND.
Flows, connections, resources, and network topology can be managed and represented separately for each LND. However, relationships are made between LNDs that use the transport services of other LNDs. The concept of network layering is important for separating the management concerns of different network technologies and services.

5.1.2 Partitioning
Flow domains (subnetworks) are composed of flow domains (subnetworks) and links. Recursively, a flow domain (subnetwork) may be partitioned into sub-flow domains (subnetworks) and the links that connect them.

Partitioning is useful in describing various management criteria under which a carrier’s network might be divided. For example, the carrier’s network might be partitioned along the lines of the network operations center (NOC) responsible for each flow domain or subnetwork. Within each flow domain (subnetwork) representing a NOC, flow domains (subnetworks) could be partitioned to describe the resources that are managed by a specific element management system (EMS). Again within each EMS related flow domain (subnetwork), a flow domain (subnetwork) could be used to represent the resources of a specific set of network elements (e.g., bridge).

There are many ways flow domains and subnetworks can be partitioned. The partitions should represent the business needs of a specific management interface.

5.1.3 Topological Provisioning
Topological elements represent the logical topology or structure of the flow domain (subnetworks) within an LND. These elements include flow domains (subnetworks) and the
links that connect them.

The flow domain (or subnetwork) provides capacity for carrying characteristic information within an LND. Flow domains (subnetworks) can be partitioned into a set of component flow domains (subnetworks) and links. In addition to representing flow domains in its own administration as component flow domains, a carrier can represent an external carrier network as a component flow domain, allowing the carrier to maintain a complete topology including connected external networks.

![Figure 5-5 Topological Elements](image)

Flow domains can be used to represent: a carrier’s entire layer network; vendor-specific component flow domains of the carrier’s layer network; connected external carrier flow domains; and even “atomic” flow domains (matrix flow domains) that correspond to individual NEs (bridges).

A Link is a topological component that describes a fixed topological relationship between flow domains (subnetworks), along with the capacity supported by an underlying server LND trail. Links in the client LND are supported by trails in an underlying server LND.

The termination of a Link is called a Flow Point Pool (FPP) or Link End. The FPP or Link End describes configuration information associated with an interface, such as a UNI or NNI. The FPP or Link End is associated with the trail termination of the underlying server trail used to perform adaptation and transport of the characteristic information of the client LND.

### 5.1.4 Flow / Connection Management

Flow and connection elements are responsible for transporting characteristic information across the LND, across flow domains (subnetworks), and across Links.

A Flow Domain Fragment (FDFr) or Subnetwork Connection (SNC) (e.g., ETH Virtual Connection, ATM PVC, etc.) is a connection responsible for transporting characteristic information across a flow domain or subnetwork. If the flow domain (subnetwork) that the FDFr (SNC) traverses is partitioned, the FDFr (SNC) may be partitioned into its component FDFrs (SNCs).
A Subnetwork Connection is terminated at Connection Termination Points (CTPs). A Flow Domain Fragment is terminated at Flow Points (FPs). Because subnetworks may be partitioned, several Subnetwork Connection end-points may coincide at a single CTP. Likewise a single FP may represent the termination of several FDFRs from the same partitioned FDFr. The CTP (FP) represents the actual point of termination of both SNCs (FDFRs) and link connections.

5.1.5 Service View Concepts
The Ethernet Service View allows Subscribers to successfully plan and integrate Services into their overall networking infrastructure, allows suppliers of Customer Edge Equipment to implement capabilities into their products so that they can be used to successfully access Ethernet Services, and allows Service Providers to describe services in Service Level Specifications and provide such services at the User Network Interface (UNI).

The Ethernet Services are modeled from the point of view of the Subscriber’s equipment referred to as the Customer Edge (CE) that is used to access the service at the UNI into the Provider Edge (PE). Service Attributes represent the definition of Service Level Specification.

The technical definition of a service is in terms of what is visible at the Customer Edge (CE) including the UNI, which is the demarcation point between the Service Provider and the Subscriber and where the CE and the Metro Ethernet Network (MEN)/EoT exchange Service Frames. In the Service View there are no assumptions about the details of the Metro Ethernet Network/EoT (e.g., it may consist of a single switch or a combination of networks based on many different technologies).
6 Interface Requirements

6.1 Business Level Requirements

Q.840.1 only focuses on the management interface between NMS and EMS for Metro Ethernet and EoT, and the interface management functions associated with them. Through the interface, NMS can query and modify configuration information, and EMS can report changes in configuration, state changes, performance data, and fault information to NMS.

6.1.1 Overview of Use Cases

Figure 6-1 shows the Use Case Diagram of the common management function sets according to Q.827.1.

Figure 6-1 Common Management Function Set Overview

Figure 6-2 shows the functions involved in the Configuration management function set.
Figure 6-2 Configuration Management Function Set

The use case diagram for performance management function set according to Q.827.1 is found in Figure 6-3.
Figure 6-3 Performance Management Function Set

The use case diagram for Fault management function set based on Q.827.1 is shown in Figure 6-4.
Q.840.1 contains UML use case diagrams that summarize the functionality and interfaces of EMS. The detailed Use Cases descriptions may be found in Q.840.1.

**Figure 6-4 Fault Management Function Set**

**Figure 6-5 ETY Port Management Function Set**

**Figure 6-6 Ethernet Discovery Function Set**
Figure 6-7  ETH Flow Point Pool Management

Figure 6-8  ELMI Profile Management
7 Information Model Overview

This section provides the detailed analysis of the Metro Ethernet Service / EoT EMS-NMS management interface. In the following sub-section, the related managed entities and their relationships are fully analyzed, and the diagrams in these sub-sections illustrate the static or dynamic relationships of the managed entities.

7.1 Common Management Function Set

Figure 6-9 ETH FDFr/EVC Management

Figure 7-1/Q.827.1 – Inheritance diagram of common management
Figure 7-2/Q.827.1 – Containment diagram of common management

7.2 Class Diagrams of Metro Ethernet Specific Management Entities
Figure 7-1, Figure 7-2, and Figure 7-3 are the inheritance diagram from ITU-T Q.840.1 of the management entities providing the topology view, connectivity view, and reference data.
Figure 7-1/Q.840.1 Inheritance Diagram of Ethernet Managed Entities: Topology View
Figure 7-2/Q.840.1 Inheritance Diagram of Ethernet Managed Entities: Connectivity View
Figure 7-3/Q.840.1 Inheritance Diagram of Ethernet Managed Entities: Reference Data

Figure 7-4 and Figure 7-5 are the relationship diagrams (including containment) from Q.840.1 of the network view, equipment view, and the service configuration view.
Figure 7-4/Q.840.1 Relationship Diagram of Ethernet Network View and Equipment View
Figure 7-5/Q.840.1 Relationship Diagram of Ethernet Service Configuration Managed Entities
8  Metro Ethernet Service Phase 2 EMS-NMS Interface Profile

This section identifies the managed entities that apply to the Metro Ethernet Phase 2 EMS-NMS Interface along their source references. The requirements for a management interface supporting Metro Ethernet Services Phase 1 and Phase 2 are provided by the interface profile tables within this section. Table 8-1 identifies the management entities necessary to manage Phase 1 and Phase 2 Metro Ethernet Services. The performance data sets required in support of Metro Ethernet Services are described in Table 8-2. Table 8-3 describes the elements within each management entity that are required for each Phase 1 and Phase 2 Metro Ethernet Services, along with a mapping to the MEF’s original EMS-NMS interface describe in MEF 7.

8.1  Conventions

In this section, when specifying managed entities and their management operations, the following abbreviations are applied to indicate the modifier of attributes, notifications or operation parameters.

- M: Mandatory.
- O: Optional.
- C: Conditional.
- NA: Not applicable
In Table 8-1, each management entity is described as being Mandatory (denoted by M) or Optional (denoted by O) with respect to Phase 1 and Phase 2 MEF services in the Metro Ethernet EMS-NMS Interface.

<table>
<thead>
<tr>
<th>Management Entity</th>
<th>Reference</th>
<th>MEF 7.1 Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>ManagedElement</td>
<td>Defined in M.3100</td>
<td>O</td>
</tr>
<tr>
<td>Equipment</td>
<td>Defined in M.3100</td>
<td>O</td>
</tr>
<tr>
<td>EquipmentHolder</td>
<td>Defined in M.3100</td>
<td>O</td>
</tr>
<tr>
<td>CircuitPack</td>
<td>Defined in M.3100</td>
<td>O</td>
</tr>
<tr>
<td>Log</td>
<td>Defined in X.721</td>
<td>O</td>
</tr>
<tr>
<td>AlarmRecord</td>
<td>Defined in X.721</td>
<td>O</td>
</tr>
<tr>
<td>EMS</td>
<td>Defined in Q.827.1 Amd 1</td>
<td>M</td>
</tr>
<tr>
<td>Alarm Severity Assignment Profile</td>
<td>Defined in M.3100</td>
<td>O</td>
</tr>
<tr>
<td>ETH_Flow_Domain</td>
<td>Defined in Q.840.1</td>
<td>M</td>
</tr>
<tr>
<td>ETH_FPP (superclass)</td>
<td>Defined in Q.840.1</td>
<td>M (superclass)</td>
</tr>
<tr>
<td>ETH_FPP_UNI</td>
<td>Defined in Q.840.1</td>
<td>M</td>
</tr>
<tr>
<td>ETH_FPP_Link</td>
<td>Defined in Q.840.1</td>
<td>O</td>
</tr>
<tr>
<td>ETH_FDFr_EVC</td>
<td>Defined in Q.840.1</td>
<td>M</td>
</tr>
<tr>
<td>ETH_Flow_Point</td>
<td>Defined in Q.840.1</td>
<td>M</td>
</tr>
<tr>
<td>ETHBandwidthProfile</td>
<td>Defined in Q.840.1</td>
<td>M</td>
</tr>
<tr>
<td>ETHServiceClassProfile</td>
<td>Defined in Q.840.1</td>
<td>M</td>
</tr>
<tr>
<td>ETHCoSBandwidthMapping</td>
<td>Defined in Q.840.1</td>
<td>M</td>
</tr>
<tr>
<td>ETHPerformanceProfile</td>
<td>Defined in Q.840.1</td>
<td>O</td>
</tr>
<tr>
<td>ETHCoSPerformanceMapping</td>
<td>Defined in Q.840.1</td>
<td>O</td>
</tr>
<tr>
<td>ELMProfile</td>
<td>Defined in Q.840.1</td>
<td>NA</td>
</tr>
<tr>
<td>TransportPort</td>
<td>Defined in Q.840.1</td>
<td>C</td>
</tr>
<tr>
<td>MAU_TransportPort</td>
<td>Defined in Q.840.1</td>
<td>C</td>
</tr>
<tr>
<td>EthMe</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthMeg</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthMp</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthMep</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthMip</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthMd</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthMepPeerInfo</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthOamDmCfg</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthOamDmProactiveOneWayThreshold</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthOamDmProactiveTwoWayThreshold</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthOamLmCfg</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthOamLbCfg</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthOamLbStats</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------</td>
<td>---</td>
</tr>
<tr>
<td>EthOamCcCfg</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthOamCcStats</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthOamAisCfg</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthOamLtCfg</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthOamLtrStats</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthOamLckCfg</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthOamTestCfg</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>EthOamTestStats</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
</tbody>
</table>
In this specification, only the performance measurement parameters (grouped by performance data set) specific to Metro Ethernet services are provided. Required performance data sets for Phase 1 and Phase 2 Metro Ethernet Services are described in Table 8-2. Further information on performance management functionality can be found in section 7.3/Q.827.1. Within this logical model, Performance Data Sets simply describe the category of the performance information (the data set) along with the individual counters associated with the set. It is assumed that both current and historical counts will be made available across the EMS-NMS interface. For this logical model, the duration of the interval and amount of history to be stored are not specified. These must be specified for any management protocol specific interface and/or implementation agreement that makes use of this logical model.

Table 8-2 Table of Required Performance Data Sets

<table>
<thead>
<tr>
<th>Performance Data Set</th>
<th>Reference</th>
<th>MEF 7.1 Required</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Phase 1</td>
</tr>
<tr>
<td>ETH UNI Anomalies Performance Data Set</td>
<td>Defined in Q.840.1</td>
<td>M</td>
</tr>
<tr>
<td>ETH UNI Traffic Performance Data Set</td>
<td>Defined in Q.840.1</td>
<td>M</td>
</tr>
<tr>
<td>ETH Ingress Traffic Management Performance Data Set</td>
<td>Defined in Q.840.1</td>
<td>M</td>
</tr>
<tr>
<td>ETH Egress Traffic Management Performance Data Set</td>
<td>Defined in Q.840.1</td>
<td>M</td>
</tr>
<tr>
<td>ETH Congestion Discards Performance Data Set</td>
<td>Defined in Q.840.1</td>
<td>M</td>
</tr>
<tr>
<td>ETH ELMI Performance Data Set</td>
<td>Defined in Q.840.1</td>
<td>NA</td>
</tr>
<tr>
<td>MAU Termination Performance Data Set</td>
<td>Defined in Q.840.1</td>
<td>C</td>
</tr>
<tr>
<td>ETH Point-to-Point EVC MEG Performance Data Set (EthMegPerfDataSet)</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>ETH Maintenance Point Performance Data Set (EthMpPerfDataSet)</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>ETH MEG End Point Loss Measurement On-Demand Single-Ended Data Set (EthOamLmOnDemandSingleEndedStats)</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>ETH MEG End Point Delay Measurement On-Demand 2-Way Data Set (EthOamDmOnDemandTwoWayStats)</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>ETH MEG End Point Delay Measurement On-Demand 1-Way Data Set (EthOamDmOnDemandOneWayStats)</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>ETH MEG End Point Delay Measurement Proactive 1-Way Current Data Set (EthOamDmProactiveOneWayCurrentStats)</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>ETH MEG End Point Delay Measurement Proactive 2-Way Current Data Set (EthOamDmProactiveTwoWayCurrentStats)</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>ETH MEG End Point Delay Measurement Proactive 1-Way History Data Set (EthOamDmProactiveOneWayHistoryStats)</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
<tr>
<td>ETH MEG End Point Delay Measurement Proactive 2-Way History Data Set (EthOamDmProactiveTwoWayHistoryStats)</td>
<td>Defined in this Specification</td>
<td>C</td>
</tr>
</tbody>
</table>
Table 8-3 describes the applicability of specific management entity elements (e.g., the object class, attributes, relationships, methods, and notifications) to the Metro Ethernet EMS-NMS Interface. Each element of each management entity is identified as Mandatory (denoted by M), Optional (denoted by O), Conditional (denoted by C), or not applicable (denoted by NA). A brief description and notes are provided for each element, however full descriptions may be found in ITU-T Recommendation Q.840.1. The last column of this table provides a mapping of the element to the elements in the MEF's original EMS-NMS model defined in MEF 7. The EMS-NMS interface described here in this document supersedes MEF 7.

### Table 8-3 Table of ITU-T Q.840.1 Management Entity Elements

<table>
<thead>
<tr>
<th>ITU-T Q.840.1 Management Entity</th>
<th>Element Type</th>
<th>Element</th>
<th>MEF Required</th>
<th>Description/Notes (details in Q.840.1)</th>
<th>Original MEF7 Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETH_Flow_Domain</td>
<td>object</td>
<td>-</td>
<td>Phase 1: M</td>
<td>Used for establishing EVCs and</td>
<td>ETH_Flow_Domain</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td>representing network topology.</td>
<td></td>
</tr>
<tr>
<td>attribute</td>
<td>userLabel</td>
<td></td>
<td>Phase 1: M</td>
<td>Name of managing organization</td>
<td>userLabel</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>methods</td>
<td>setupPtToPtETH_FDFr_EVTWithFPPs</td>
<td>Phase 1: M</td>
<td>Establish point to point EVC</td>
<td>setupPtToPtETH_FDFr_EVTWithFPPs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>setupMultiToMultiETH_FDFr_EVTWithFPPs</td>
<td>Phase 1: M</td>
<td>Establish Multipoint EVC</td>
<td>setupMultiToMultiETH_FDFr_EVTWithFPPs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>setupRootedToMultiETH_FDFr_EVTWithFPPs</td>
<td>Phase 1: NA</td>
<td>Establish Rooted Multipoint EVC</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>releaseETH_FDFr_EVT</td>
<td>Phase 1: M</td>
<td>Release a previously established EVC</td>
<td>releaseETH_FDFr_EVT</td>
<td></td>
</tr>
<tr>
<td>relationships</td>
<td>Contained in EMS</td>
<td>Phase 1: M</td>
<td>EMS is the containing object for FD</td>
<td>In MEF7 FD is contained under LND</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contains</td>
<td></td>
<td>Phase 1: M</td>
<td>The EVCs within the flow domain</td>
<td>Contains ETH_FDFr_EVT</td>
</tr>
<tr>
<td></td>
<td>MISMATCH</td>
<td></td>
<td>Phase 1: NA</td>
<td>In Q.840.1 containment of these profiles are under EMS.</td>
<td>MEF 7 Contains ETHBandwidthProfile</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: NA</td>
<td>Contains ETH_FCosProfile</td>
<td></td>
</tr>
<tr>
<td>SupportingElements:</td>
<td>SupportedBy</td>
<td>Phase 1: O</td>
<td>May be associate FD with supporting</td>
<td>SupportingElements: SupportedBy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: O</td>
<td>Managed Elements and Circuit Packs</td>
<td></td>
</tr>
<tr>
<td>ETH_FPPs:</td>
<td>FlowDomainInterfaces</td>
<td>Phase 1: M</td>
<td>the ETH_FPPs (e.g., UNIs) that delineate</td>
<td>ETH_FPPs: FlowDomainInterfaces</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td>the Flow Domain</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP_Links:</td>
<td>MemberLinks</td>
<td>Phase 1: NA</td>
<td>Used to associate links within the</td>
<td>ETH_FPP_Links: MemberLinks</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: NA</td>
<td>parent FD</td>
<td></td>
</tr>
<tr>
<td>ETH_Flow_Domains:</td>
<td>FlowDomainMemberships</td>
<td>Phase 1: NA</td>
<td>Used to associate member FDs within</td>
<td>ETH_Flow_Domains: FlowDomainMemberships</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: NA</td>
<td>the parent FD</td>
<td></td>
</tr>
<tr>
<td>notifications</td>
<td>objectCreation</td>
<td>Phase 1: M</td>
<td>Used for discovery</td>
<td>objectCreation</td>
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</tr>
<tr>
<td>ITU-T Q.840.1 Management Entity</td>
<td>Element Type</td>
<td>Element</td>
<td>MEF Required</td>
<td>Description/Notes (details in Q.840.1)</td>
<td>Original MEF7 Element</td>
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<td>----------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>objectDeletion</td>
<td>Phase 1: M</td>
<td>Used for discovery</td>
<td>objectDeletion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>attributeValueChange</td>
<td>Phase 1: O</td>
<td>May be used to notify NMS of attribute changes.</td>
<td>attributeValueChange</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: O</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>stateChange</td>
<td>Phase 1: NA</td>
<td>Not used</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>object</td>
<td></td>
<td>Phase 1: M</td>
<td>Represents interfaces, e.g., MEF UNIs or E-NNIs, at the ETH Layer.</td>
<td>ETH_FPP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>attributes</td>
<td>fPPType</td>
<td>Phase 1: M</td>
<td>Indicates that the ETH_FPP is a UNI, SNI, E-NNI, or Unconfigured</td>
<td>fPPTYPE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>attributes</td>
<td>fPPSubType</td>
<td>Phase 1: O</td>
<td>For UNI set to: “MEF UNI Type 1”, or “MEF UNI Type 2”</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: O</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>totalBWCapacity</td>
<td>Phase 1: M</td>
<td>Total BW supported on the FPP</td>
<td>availableCapacity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>userLabel</td>
<td>Phase 1: M</td>
<td>A string that may be used for circuit identifier on the FPP</td>
<td>userLabel</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>ieee802dot3Address</td>
<td>Phase 1: M</td>
<td>IEEE 802.3 source address of any non FDFr/EVC specific frames that originate at this FPP</td>
<td>physAddress</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>operationalState</td>
<td>Phase 1: M</td>
<td>Indicates the current capability of the FPP to provide service. Values include: disabled, enabled.</td>
<td>operState</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>availabilityStatus</td>
<td>Phase 1: M</td>
<td>Values include: inTest, failed, powerOff, degraded, notInstalled</td>
<td>availabilityStatus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>administrativeState</td>
<td>Phase 1: M</td>
<td>The values include: locked or unlocked. In Locked state frame flow through the FPP is prohibited.</td>
<td>adminState</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ingressMaxAssignableBW</td>
<td>Phase 1: O</td>
<td>Maximum amount of BW assignable on the FPP (aggregation of links) in the Ingress direction</td>
<td>ingressMaxAssignablenBW</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: O</td>
<td></td>
<td></td>
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<td></td>
<td>egressMaxAssignableBW</td>
<td>Phase 1: O</td>
<td>Maximum amount of BW assignable on the FPP (aggregation of links) in the Egress</td>
<td>egressMaxAssignableBW</td>
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<td></td>
<td></td>
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<td>Phase 2: O</td>
<td></td>
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<tr>
<td>ITU-T Q.840.1 Management Entity</td>
<td>Element Type</td>
<td>Element</td>
<td>MEF Required</td>
<td>Description/Notes (details in Q.840.1)</td>
<td>Original MEF7 Element</td>
</tr>
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<td>-----------------------------------------</td>
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</tr>
<tr>
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<td></td>
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<td>Phase 1: O</td>
<td>Per CoS Maximum assignable BW on the interface in the Ingress direction.</td>
<td>NONE</td>
</tr>
<tr>
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<td></td>
<td>Phase 2: O</td>
<td>Per CoS Maximum assignable BW on the interface in the ingress direction.</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 1: M</td>
<td>Max number of EVCs that may be supported at the FPP.</td>
<td>maxNumEVCs</td>
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<td></td>
<td>Phase 2: M</td>
<td>Number of currently configured EVCs at the FPP</td>
<td>numConfiguredEVCs</td>
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<td>Phase 1: O</td>
<td>Max transmission unit size for the FPP</td>
<td>NONE</td>
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<td></td>
<td></td>
<td>Phase 2: M</td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
<td>relationships</td>
<td>Phase 1: M</td>
<td>EMS is the containing object for FPP</td>
<td>In MEF7 FPP is contained under LND</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>Phase 2: M</td>
<td>FPs terminating an EVC segment at the FPP</td>
<td>Contains ETH_Flow_Point</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 1: NA</td>
<td>Conditionally required if the FPP supports ELMI</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: C</td>
<td>May associate FPP with supporting Managed Elements and Circuit Packs</td>
<td>SupportingElements : SupportedBy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 1: O</td>
<td>Link that is terminated by the ETH_FPP optionally retrievable from the ETH_FPP</td>
<td>ETH_Link: FPPpoints</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: O</td>
<td>Relationship between the FPP and the supporting TRAN layer termination (could be ETH layer TTP for tunneling, a TransportPort, etc.)</td>
<td>ServerTTP : Client/Server or EthTunneling</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 1: M</td>
<td>FPP is one of the FPPs that delineate the associated FDs</td>
<td>ETH_Flow_Domains: FlowDomainInterfaces</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td>Ingress bandwidth profile for all service frames at the FPP in the ingress direction</td>
<td>ETHBandwidthProfile: IngressBwCharacterization</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 1: M</td>
<td>Ingress bandwidth profile for all service frames at the FPP in the ingress direction</td>
<td>ETHBandwidthProfile: EgressBwCharacterization</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td>In MEF7 this relationship is on the ETH_FPP_UNI object.</td>
<td>ETHBandwidthProfile: EgressBwCharacterization</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 1: M</td>
<td>In MEF7 this relationship is on the ETH_FPP_UNI object.</td>
<td>ETHBandwidthProfile: EgressBwCharacterization</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td>In MEF7 this relationship is on the ETH_FPP_UNI object.</td>
<td>ETHBandwidthProfile: EgressBwCharacterization</td>
</tr>
<tr>
<td>ITU-T Q.840.1 Management Entity</td>
<td>Element Type</td>
<td>Element</td>
<td>MEF Required</td>
<td>Description/Notes (details in Q.840.1)</td>
<td>Original MEF7 Element</td>
</tr>
<tr>
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</tr>
<tr>
<td></td>
<td>notifications</td>
<td>objectCreation</td>
<td>Phase 1: M Phase 2: M</td>
<td>Used for discovery</td>
<td>objectCreation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>objectDeletion</td>
<td>Phase 1: M Phase 2: M</td>
<td>Used for discovery</td>
<td>objectDeletion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>attributeValueChange</td>
<td>Phase 1: O Phase 2: O</td>
<td>May be used to notify NMS of attribute changes.</td>
<td>attributeValueChange</td>
</tr>
<tr>
<td></td>
<td></td>
<td>stateChange</td>
<td>Phase 1: M Phase 2: M</td>
<td>Indicates changes in administrative and operational state</td>
<td>NONE</td>
</tr>
<tr>
<td>ETH_FPP_UNI (Subclass of ETH_FPP. ETH_FPP_UNI inherits properties, including attributes from ETH_FPP)</td>
<td>object</td>
<td>-</td>
<td>Phase 1: M Phase 2: M</td>
<td>Subclass of ETH_FPP. Represent the UNIs that provide MEF UNI functionality.</td>
<td>ETH_FPP_UNI</td>
</tr>
<tr>
<td></td>
<td>attributes</td>
<td>uniIdentifier</td>
<td>Phase 1: M Phase 2: M</td>
<td>Describes the UNI within the scope of the service provider domain.</td>
<td>uniIdentifier</td>
</tr>
<tr>
<td></td>
<td></td>
<td>layer2ControlProtocolProcessingList</td>
<td>Phase 1: M Phase 2: M</td>
<td>Provide control protocol destination MAC address along with the processing alternative (Discard, Peer, Pass-to-FDFr /EVC, Peer &amp; Pass-to- FDFr/EVC)</td>
<td>layer2ControlProtocolProcessingList</td>
</tr>
<tr>
<td></td>
<td></td>
<td>serviceMuxingIndicator</td>
<td>Phase 1: M Phase 2: M</td>
<td>Describes if service multiplexing is enabled at the UNI</td>
<td>serviceMuxingIndicator</td>
</tr>
<tr>
<td></td>
<td>bundling</td>
<td>Phase 1: M Phase 2: M</td>
<td>three bundling options: yes, no and all-to-one</td>
<td>In MEF represented by both bundlingIndicator and allToOneIndicator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ingressVLANAssignmentAll</td>
<td>Phase 1: NA Phase 2: NA</td>
<td>Identifies VLAN-ID assigned to all ingress traffic</td>
<td>NONE: Not used for MEF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ingressVLANAssignmentUntagged</td>
<td>Phase 1: M Phase 2: M</td>
<td>Identifies VLAN-ID assigned to untagged and priority tagged ingress traffic</td>
<td>untaggedVLANAssignment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ingressVLANPriorityAssignmentAll</td>
<td>Phase 1: NA Phase 2: NA</td>
<td>Identifies the VLAN Priority assigned to all ingress traffic</td>
<td>NONE: Not used for MEF</td>
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<tr>
<td></td>
<td>ingressVLANPriorityAssignmentUntagged</td>
<td>Phase 1: NA Phase 2: NA</td>
<td>Identifies the VLAN Priority assigned to untagged ingress traffic</td>
<td>NONE: Not used for MEF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>unassignedCeVlanIDList</td>
<td>Phase 1: O Phase 2: O</td>
<td>List of unique values that are available for assignment as the</td>
<td>unassignedCeVlanIDList</td>
<td></td>
</tr>
<tr>
<td>ITU-T Q.840.1 Management Entity</td>
<td>Element Type</td>
<td>Element</td>
<td>MEF Required</td>
<td>Description/Notes (details in Q.840.1)</td>
<td>Original MEF7 Element</td>
</tr>
<tr>
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</tr>
<tr>
<td></td>
<td></td>
<td>nextAvailCeVlanID</td>
<td>Phase 1: M Phase 2: M</td>
<td>Next available unassigned CE-VLAN ID</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>alarmStatus</td>
<td>Phase 1: M Phase 2: M</td>
<td>Values for alarm status include: critical, major, minor, indeterminate, warning, pending, and cleared</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>relationships</td>
<td>Phase 1: M Phase 2: M</td>
<td>EMS is the containing object for UNI</td>
<td>In MEF7 UNI is contained under LND</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contains ETH_Flow_Point</td>
<td>Phase 1: M Phase 2: M</td>
<td>FPs terminating a EVC segment at the UNI</td>
<td>Contains ETH_Flow_Point</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contains ELMI Profile</td>
<td>Phase 1: NA Phase 2: C</td>
<td>Conditionally required if the UNI supports ELMI</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SupportingElements: SupportedBy</td>
<td>Phase 1: O Phase 2: O</td>
<td>May associate UNI with supporting Managed Elements and Circuit Packs</td>
<td>SupportingElements: SupportedBy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ETH_FPP_Link: FPPpoints</td>
<td>Phase 1: O Phase 2: O</td>
<td>Link that is terminated by the UNI optionally retrievable from the UNI object</td>
<td>ETH_Link: FPPpoints</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ServerTTP : Client/Server or EthTunneling</td>
<td>Phase 1: M Phase 2: M</td>
<td>Relationship between the UNI and the supporting TRAN layer termination (could be ETH layer TTP for tunneling, a TransportPort, etc.)</td>
<td>ServerTTP : Client/Server or EthTunneling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ETH_Flow_Domains: FlowDomainInterfaces</td>
<td>Phase 1: M Phase 2: M</td>
<td>UNI is one of the FPPs that delineate the associated FDs</td>
<td>ETH_Flow_Domains: FlowDomainInterfaces</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ETHBandwidthProfile: IngressBwCharacterization</td>
<td>Phase 1: M Phase 2: M</td>
<td>Ingress bandwidth profile for all service frames at the UNI in the ingress direction</td>
<td>ETHBandwidthProfile: IngressBwCharacterization</td>
</tr>
<tr>
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<td></td>
<td>ETHBandwidthProfile: EgressBwCharacterization</td>
<td>Phase 1: M Phase 2: M</td>
<td>Egress bandwidth profile for all service frames at the UNI in the ingress direction</td>
<td>ETHBandwidthProfile: EgressBwCharacterization</td>
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<td></td>
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<td>notifications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>objectCreation</td>
<td>Phase 1: M Phase 2: M</td>
<td>Used for discovery</td>
<td>objectCreation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>objectDeletion</td>
<td>Phase 1: M Phase 2: M</td>
<td>Used for discovery</td>
<td>objectDeletion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>attributeValueChange</td>
<td>Phase 1: O</td>
<td>May be used to notify</td>
<td>attributeValueChange</td>
</tr>
<tr>
<td>ITU-T Q.840.1 Management Entity</td>
<td>Element Type</td>
<td>Element</td>
<td>MEF Required</td>
<td>Description/Notes (details in Q.840.1)</td>
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<tr>
<td>ETH_FPP_Link</td>
<td>Object</td>
<td>-</td>
<td>Phase 2: O</td>
<td>NMS of attribute changes.</td>
<td>e</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 1: M</td>
<td>Indicates changes in administrative and</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Phase 2: M</td>
<td>operational state</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td>NONE</td>
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**attributes**

<table>
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<tr>
<th>ETH_FPP_Link</th>
<th>objectCreation</th>
<th>Phase 1: M</th>
<th>Phase 2: M</th>
<th>Used for discovery</th>
<th>objectCreation</th>
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<tr>
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<td>objectDeletion</td>
<td>Phase 1: M</td>
<td>Phase 2: M</td>
<td>Used for discovery</td>
<td>objectDeletion</td>
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<td>attributeValueChange</td>
<td>Phase 1: O</td>
<td>Phase 2: O</td>
<td>May be used to notify NMS of attribute changes.</td>
<td>attributeValueChange</td>
</tr>
<tr>
<td></td>
<td>stateChange</td>
<td>Phase 1: NA</td>
<td>Phase 2: NA</td>
<td>Not used</td>
<td>stateChange</td>
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**ETH_FDFr_EVC**

<table>
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<th>ETH_FDFr_EVC</th>
<th>objectCreation</th>
<th>Phase 1: M</th>
<th>Phase 2: M</th>
<th>Used for discovery</th>
<th>objectCreation</th>
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**attributes**

<table>
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<tr>
<th>ETH_FDFr_EVC</th>
<th>administrativeState</th>
<th>Phase 1: M</th>
<th>Phase 2: M</th>
<th>The values include: locked or unlocked. In Locked state frame flow through the FPP is prohibited.</th>
<th>adminState</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>operationalState</td>
<td>Phase 1: M</td>
<td>Phase 2: M</td>
<td>Indicates the current capability of the FPP to provide service.</td>
<td>operState</td>
</tr>
<tr>
<td>ITU-T Q.840.1 Management Entity</td>
<td>Element Type</td>
<td>Element</td>
<td>MEF Required</td>
<td>Description/Notes (details in Q.840.1)</td>
<td>Original MEF7 Element</td>
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<td>----------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>availabilityStatus</td>
<td>Phase 1: M Phase 2: M</td>
<td>Values include: disabled, enabled.</td>
<td>availabilityStatus</td>
</tr>
<tr>
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<td>protected</td>
<td>Phase 1: O Phase 2: O</td>
<td>Indicates if the EVC is protected or not at the ETH layer</td>
<td>eVCProtected</td>
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<tr>
<td></td>
<td></td>
<td>userLabel</td>
<td>Phase 1: M Phase 2: M</td>
<td>Provides additional information about the EVC, such as a circuit identifier</td>
<td>userLabel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IDFrEvcType</td>
<td>Phase 1: M Phase 2: M</td>
<td>mp2mp, p2p, or rootedMp</td>
<td>eVCType</td>
</tr>
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<td></td>
<td></td>
<td>IDFrEvcName</td>
<td>Phase 1: M Phase 2: M</td>
<td>Unique identifying value for the ETH Virtual Connection</td>
<td>ethEVCId</td>
</tr>
<tr>
<td></td>
<td></td>
<td>uniCeVlanIdPreservation</td>
<td>Phase 1: M Phase 2: M</td>
<td>Boolean that identifies an EVC where the CE VLAN IDs of egress frames are identical to the CE VLAN IDs of the corresponding ingress frames</td>
<td>uniCeVlanIdPreservation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>uniCeVlanCoSPreservation</td>
<td>Phase 1: M Phase 2: M</td>
<td>Boolean that identifies an EVC where the CE VLAN CoS user_priority bits of an egress frame is identical to the CE VLAN CoS user_priority bits of the corresponding ingress frame</td>
<td>uniCeVlanCoSPreservation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>maxUNIEndPoints</td>
<td>Phase 1: O Phase 2: M</td>
<td>The maximum number of UNI end points of the EVC</td>
<td>NONE</td>
</tr>
<tr>
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<td></td>
<td>mtuSize</td>
<td>Phase 1: O Phase 2: M</td>
<td>maximum transmission unit size for the EVC</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>methods</td>
<td></td>
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<tr>
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<td></td>
<td>addTPsToMultiETH_FDFr_EVCwithFPPs</td>
<td>Phase 1: M Phase 2: M</td>
<td>add endpoints to a multipoint EVC</td>
<td>addTPsToMultiETH_FDFr_EVCwithFPPs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>removeTPsFromMultiETH_FDFr_EVC</td>
<td>Phase 1: M Phase 2: M</td>
<td>remove endpoints from a multipoint EVC</td>
<td>removeTPsFromMultiETH_FDFr_EVC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>relationships</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>contained in ETH_Flow_Domain</td>
<td>Phase 1: M Phase 2: M</td>
<td>FD is the containing object for EVC</td>
<td>contained in ETH_Flow_Domain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ETH Flow Points</td>
<td>Phase 1: M</td>
<td>EVC is terminated by</td>
<td>ETH Flow Points</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>ITU-T Q.840.1 Management Entity</th>
<th>Element Type</th>
<th>Element</th>
<th>MEF Required</th>
<th>Description/Notes (details in Q.840.1)</th>
<th>Original MEF7 Element</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>EvcTerminating</td>
<td>Phase 2: M</td>
<td>two or more ETH_Flow_Points.</td>
<td>EvcTerminating</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ETH_FDFr_EVCs: FD Fragment</td>
<td>Phase 1: NA Phase 2: NA</td>
<td>EVC may be made up of component FD Fragments / EVCs</td>
<td>ETH_FDFr_EVCs: Composite/Component EVCs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ETHCoSPerformanceMappings: CoSPerfMappingCharacterization</td>
<td>Phase 1: O Phase 2: M</td>
<td>Relates performance for specific CoS</td>
<td>NONE</td>
</tr>
<tr>
<td>notifications</td>
<td></td>
<td>objectCreation</td>
<td>Phase 1: M Phase 2: M</td>
<td>Used for discovery</td>
<td>objectCreation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>objectDeletion</td>
<td>Phase 1: M Phase 2: M</td>
<td>Used for discovery</td>
<td>objectDeletion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>attributeValueChange</td>
<td>Phase 1: O Phase 2: O</td>
<td>May be used to notify NMS of attribute changes.</td>
<td>attributeValueChange</td>
</tr>
<tr>
<td></td>
<td></td>
<td>stateChange</td>
<td>Phase 1: M Phase 2: M</td>
<td>Indicates changes in administrative and operational state</td>
<td>stateChange</td>
</tr>
<tr>
<td></td>
<td></td>
<td>communicationsAlarm</td>
<td>Phase 1: O Phase 2: O</td>
<td>Used to indicate a protection reroute</td>
<td>communicationsAlarm</td>
</tr>
<tr>
<td>ETH_Flow_Point</td>
<td>object</td>
<td>-</td>
<td>Phase 1: M Phase 2: M</td>
<td>The termination of an EVC on a FPP. Created automatically as a result of a EVC setup request.</td>
<td>ETH_Flow_Point</td>
</tr>
<tr>
<td></td>
<td>attributes</td>
<td>administrativeState</td>
<td>Phase 1: O Phase 2: O</td>
<td>administrative state of a trail terminating ETH_Flow_Point The values include: locked or unlocked.</td>
<td>adminState</td>
</tr>
<tr>
<td></td>
<td></td>
<td>operationalState</td>
<td>Phase 1: M Phase 2: M</td>
<td>Indicates the current capability of the FPP to provide service. Values include: disabled, enabled.</td>
<td>operState</td>
</tr>
<tr>
<td></td>
<td></td>
<td>availabilityStatus</td>
<td>Phase 1: M Phase 2: M</td>
<td>Values include: inTest, failed,, degraded</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>alarmStatus</td>
<td>Phase 1: M Phase 2: M</td>
<td>Values for alarm status include: critical, major, minor, indeterminate, warning, pending, and cleared</td>
<td>alarmStatus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>currentProblemList</td>
<td>Phase 1: M Phase 2: M</td>
<td>Indicates problem probable cause with severity</td>
<td>currentProblemList</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ethCeVlanIDMapping</td>
<td>Phase 1: M Phase 2: M</td>
<td>List of unique values that map each CE-VLAN ID to at most one EVC. Special values</td>
<td>ethCeVlanIDMapping</td>
</tr>
<tr>
<td>ITU-T Q.840.1 Management Entity</td>
<td>Element Type</td>
<td>Element</td>
<td>MEF Required</td>
<td>Description/Notes (details in Q.840.1)</td>
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</tr>
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<tr>
<td></td>
<td></td>
<td>ethUNIEVCFDFrName</td>
<td>Phase 1: M  Phase 2: M</td>
<td>String administered by Service Provider used to identify an EVC at the UNI</td>
<td>ethUNIEVCID</td>
</tr>
<tr>
<td></td>
<td></td>
<td>layer2ControlProtocolProcessingList</td>
<td>Phase 1: M  Phase 2: M</td>
<td>describes Layer 2 control protocols, along disposition: discard or tunnel</td>
<td>layer2ControlProtocolDispositionList</td>
</tr>
<tr>
<td></td>
<td></td>
<td>unicastServiceFrameDelivery</td>
<td>Phase 1: M  Phase 2: M</td>
<td>Service frame delivery option for Unicast Service Frames: Discard, Deliver Unconditionally, or Deliver Conditionally</td>
<td>unicastServiceFrameDelivery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>multicastServiceFrameDelivery</td>
<td>Phase 1: M  Phase 2: M</td>
<td>Service frame delivery option for Multicast Service Frames: Discard, Deliver Unconditionally, or Deliver Conditionally</td>
<td>multicastServiceFrameDelivery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>broadcastServiceFrameDelivery</td>
<td>Phase 1: M  Phase 2: M</td>
<td>Service frame delivery option for Broadcast Service Frames: Discard, Deliver Unconditionally, or Deliver Conditionally</td>
<td>broadcastServiceFrameDelivery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>trailTerminating</td>
<td>Phase 1: M  Phase 2: M</td>
<td>If TRUE, describes Flow Point as a point where frame flow terminates and is adapted to APP layer. Otherwise shall be set to FALSE.</td>
<td>trailTerminating</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rootOrLeaf</td>
<td>Phase 1: NA  Phase 2: M</td>
<td>Indicates that the flow point is acting as either a root or leaf. If the type of EVC is Point-to-Point or Multipoint-to-Multipoint, then the UNI Type MUST equal “Root.”</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>relationships</td>
<td>Contained in ETH_FPP</td>
<td>FPP is the containing object for FPs</td>
<td>Contained in ETH_FPP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AlarmSeverityProfile : SeverityAssignment</td>
<td>Phase 1: O  Phase 2: O</td>
<td>to assign alarm severity to specific</td>
<td>AlarmSeverityProfile : SeverityAssignment</td>
</tr>
<tr>
<td>ITU-T Q.840.1 Management Entity</td>
<td>Element Type</td>
<td>Element</td>
<td>MEF Required</td>
<td>Description/Notes</td>
<td></td>
</tr>
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<td></td>
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<td></td>
<td>Original MEF7 Element</td>
<td></td>
</tr>
<tr>
<td>ETH_FDFr_EVC: EvcTerminating</td>
<td></td>
<td>Phase 1: M</td>
<td>EVC that is terminated by two or more Flow Points</td>
<td>ETH_FDFr_EVC: EvcTerminating</td>
<td></td>
</tr>
<tr>
<td>ETHCoSBandwidthMapping: CoSBWMappingCharacterization</td>
<td>Phase 1: M Phase 2: M</td>
<td>bandwidth for specific CoS in the ingress and egress direction</td>
<td>Combines ETHBandwidthProfiles: BandwidthCharacterization AND ETHCosProfiles: CosCharacterization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EAFProfiles: AdaptationCharacterization</td>
<td>Phase 1: O Phase 2: O</td>
<td>association with adaptation profiles</td>
<td>EAFProfiles: AdaptationCharacterization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APPLinkEnd : Client/Server</td>
<td>Phase 1: O Phase 2: O</td>
<td>association with an APP Layer Link End</td>
<td>APPLinkEnd : Client/Server</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETH_FPP_UNI: EthTunneling</td>
<td>Phase 1: O Phase 2: O</td>
<td>relationship between the ETH_FPP_UNI and the supporting TRAN (ETH layer trail termination for tunneling) layer termination point</td>
<td>ETH_FPP_UNI: EthTunneling</td>
<td></td>
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</tr>
<tr>
<td>objectCreation</td>
<td>Phase 1: M Phase 2: M</td>
<td>Used for discovery</td>
<td>objectCreation</td>
<td></td>
<td></td>
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<tr>
<td>objectDeletion</td>
<td>Phase 1: M Phase 2: M</td>
<td>Used for discovery</td>
<td>objectDeletion</td>
<td></td>
<td></td>
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<tr>
<td>attributeValueChange</td>
<td>Phase 1: O Phase 2: O</td>
<td>May be used to notify NMS of attribute changes.</td>
<td>attributeValueChange</td>
<td></td>
<td></td>
</tr>
<tr>
<td>stateChange</td>
<td>Phase 1: M Phase 2: M</td>
<td>Indicates changes in administrative and operational state</td>
<td>stateChange</td>
<td></td>
<td></td>
</tr>
<tr>
<td>communicationsAlarm</td>
<td>Phase 1: M Phase 2: M</td>
<td>Indicates an alarm condition</td>
<td>communicationsAlarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETHBandwidthProfile</td>
<td>object</td>
<td>-</td>
<td></td>
<td>ETHBandwidthProfile</td>
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<tr>
<td>attributes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bwCategoryIdentifier</td>
<td>Phase 1: M Phase 2: M</td>
<td>Identifies the specific Bandwidth Category</td>
<td>bwCategoryIdentifier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cir</td>
<td>Phase 1: M Phase 2: M</td>
<td>Committed Information Rate (CIR) in bits per second for one direction of an EVC</td>
<td>cir</td>
<td></td>
<td></td>
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<tr>
<td>cbs</td>
<td>Phase 1: M Phase 2: M</td>
<td>Committed Burst Size (CBS) in bytes for one direction of an EVC.</td>
<td>cbs</td>
<td></td>
<td></td>
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<tr>
<td>eir</td>
<td>Phase 1: M Phase 2: M</td>
<td>Excess Information Rate (EIR) in bits per second for one direction of an EVC.</td>
<td>eir</td>
<td></td>
<td></td>
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<tr>
<td>ITU-T Q.840.1 Management Entity</td>
<td>Element Type</td>
<td>Element</td>
<td>MEF Required</td>
<td>Description/Notes (details in Q.840.1)</td>
<td>Original MEF7 Element</td>
</tr>
<tr>
<td>---------------------------------</td>
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<td>--------------</td>
<td>-----------------------------------------</td>
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</tr>
<tr>
<td></td>
<td>ebs</td>
<td>Phase 1: M</td>
<td>Phase 2: M</td>
<td>Excess Burst Size (EBS) in bytes for one direction of an EVC.</td>
<td>ebs</td>
</tr>
<tr>
<td></td>
<td>colorMode</td>
<td>Phase 1: M</td>
<td>Phase 2: M</td>
<td>Color mode (CM) to be applied as “color-blind mode” or “color-aware mode”. TRUE or FALSE. A value of FALSE will indicate color blind mode is in effect</td>
<td>colorMode</td>
</tr>
<tr>
<td></td>
<td>couplingFlag</td>
<td>Phase 1: O</td>
<td>Phase 2: O</td>
<td>coupling flag (CF) attribute, describes if yellow frames will be admitted if unused bandwidth is available. When CF is set to FALSE, the volume of the yellow service frames admitted to the network cannot exceed EIR. When CF is set to TRUE, the volume of the yellow service frames admitted to the network is bounded by CIR + EIR depending on volume of the offered green Service Frames. In both cases the burst size of the yellow service frames admitted to the network is bounded by EBS</td>
<td>couplingFlag</td>
</tr>
<tr>
<td></td>
<td>relationships</td>
<td>contained in EMS</td>
<td>Phase 1: M</td>
<td>EMS is the containing object for ETHBandwidthProfile.</td>
<td>contained in ETH_Flow_Domain</td>
</tr>
<tr>
<td></td>
<td>ETH_FPPs: BandwidthCharacterization</td>
<td>Phase 1: M</td>
<td>Phase 2: M</td>
<td>Ingress bandwidth profiles that characterize FPPs in the ingress direction</td>
<td>ETH_FPP_UNIs: BandwidthCharacterization</td>
</tr>
<tr>
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<td>ETHCoSBandwidthMapping: ingressCoSBandwidthCharacterization</td>
<td>Phase 1: M</td>
<td>Phase 2: M</td>
<td>Mapping the ingress bandwidth profile to specific ETH service.</td>
<td>ETH_Flow_Points: BandwidthCharacterization Note: Q840.1 introduces COS BW mapping</td>
</tr>
<tr>
<td>ITU-T Q.840.1 Management Entity</td>
<td>Element Type</td>
<td>Element</td>
<td>MEF Required</td>
<td>Description/Notes (details in Q.840.1)</td>
<td>Original MEF7 Element</td>
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<td>---------------------------------</td>
<td>--------------</td>
<td>---------</td>
<td>--------------</td>
<td>----------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>ETHCoSBandwidthMapping: egressCoSBandwidthCharacterization</td>
<td>object</td>
<td>ETHCoSBandwidthMapping: egressCoSBandwidthCharacterization</td>
<td>Phase 1: NA Phase 2: M</td>
<td>Mapping the egress bandwidth profile to specific ETH service</td>
<td>NONE</td>
</tr>
<tr>
<td>objectCreation</td>
<td>Phase 1: M Phase 2: M</td>
<td>Used for discovery</td>
<td>objectCreation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>objectDeletion</td>
<td>Phase 1: M Phase 2: M</td>
<td>Used for discovery</td>
<td>objectDeletion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETHPerformanceProfile</td>
<td>Object</td>
<td>ETHPerformanceProfile</td>
<td>Phase 1: O Phase 2: M</td>
<td>specifies Class of Service (CoS) performance parameters for EVCs</td>
<td>ETHCosProfile</td>
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<tr>
<td>perfProfileID</td>
<td>Phase 1: M Phase 2: M</td>
<td>identifies the specific CoS Value described within this profile</td>
<td>cosIdentifier</td>
<td></td>
<td></td>
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<tr>
<td>cosFrameDelay</td>
<td>Phase 1: M Phase 2: M</td>
<td>Frame Delay objective for Service Frames, Frames</td>
<td>cosDelay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cosFrameDelayVariation</td>
<td>Phase 1: M Phase 2: M</td>
<td>Frame Delay Variation (FDV) objective for Service Frames</td>
<td>cosJitter</td>
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<td>cosFrameLossRatio</td>
<td>Phase 1: M Phase 2: M</td>
<td>Frame Loss Ratio objective for Service Frames</td>
<td>cosLoss</td>
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</tr>
<tr>
<td>cosAvailability</td>
<td>Phase 1: O Phase 2: M</td>
<td>Availability objective for the EVC.</td>
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<td></td>
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<tr>
<td>contained under EMS</td>
<td>Phase 1: M Phase 2: M</td>
<td>EMS is the containing object for ETHPerformanceProfile</td>
<td>contained in ETH_Flow_Domain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETHCoSPerformanceMapping: CoSPerformanceCharacterization</td>
<td>object</td>
<td>ETHCoSPerformanceMapping: CoSPerformanceCharacterization</td>
<td>Phase 1: M Phase 2: M</td>
<td>Mapping the performance profile to specific ETH services</td>
<td>ETH_Flow_Point: CoSCharacterization Q.840.1 introduces mapping object</td>
</tr>
<tr>
<td>objectCreation</td>
<td>Phase 1: M Phase 2: M</td>
<td>Used for discovery</td>
<td>objectCreation</td>
<td></td>
<td></td>
</tr>
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<td>objectDeletion</td>
<td>Phase 1: M Phase 2: M</td>
<td>Used for discovery</td>
<td>objectDeletion</td>
<td></td>
<td></td>
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<tr>
<td>ETHServiceClassProfile</td>
<td>object</td>
<td>ETHServiceClassProfile</td>
<td>Phase 1: M Phase 2: M</td>
<td>Profile of CoS, defines the way to classify ETH service and a definite CoS</td>
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<tr>
<td>serviceClassID</td>
<td>Phase 1: M Phase 2: M</td>
<td>the name of a service class instance</td>
<td>NONE</td>
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<tr>
<td>classifyType</td>
<td>Phase 1: M Phase 2: M</td>
<td>The characteristic type on which ETH services are classified, such as VLAN ID, VLAN Priority (defined in IEEE 802.1p), EVC</td>
<td>NONE</td>
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<td></td>
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<tr>
<td>ITU-T Q.840.1 Management Entity</td>
<td>Element Type</td>
<td>Element</td>
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<td>----------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Phase 2 EMS-NMS Information Model Technical Specification</td>
<td>classifyValue</td>
<td>Phase 1: M Phase 2: M</td>
<td>Lists the characteristic values corresponding to the above classifyType to identify a specific service class</td>
<td>NONE</td>
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</tr>
<tr>
<td></td>
<td>relationships</td>
<td>contained in EMS Phase 1: M Phase 2: M</td>
<td>EMS is the containing object for ETHServiceClassProfile</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ETHCoSBandwidthMapping: CoSCharacterization</td>
<td>Phase 1: M Phase 2: M</td>
<td>To characterize the CoS type at the bandwidth mapping</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
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<td>ETHCoSPerformanceMapping: CoSCharacterization</td>
<td>Phase 1: M Phase 2: M</td>
<td>To characterize the CoS type at the performance mapping</td>
<td>NONE</td>
<td></td>
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<tr>
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<td>ETHCoSBandwidthMapping</td>
<td>object</td>
<td>-</td>
<td>indicates the bandwidth of specified CoS</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td>ETHCoSBandwidthMapping</td>
<td>relationships</td>
<td>ETH_Flow_Points: CoSBWMappingCharacterization</td>
<td>ETH_Flow_Points where the bandwidth for specific CoS in the ingress and/or egress direction is applied</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td>ETHBandwidthProfile: ingressCoSBandwidthCharacterization</td>
<td>Phase 1: M Phase 2: M</td>
<td>Mapping the ingress bandwidth profile to specific ETH service.</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
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<td>ETHBandwidthProfile: egressCoSBandwidthCharacterization</td>
<td>Phase 1: NA Phase 2: M</td>
<td>Mapping the egress bandwidth profile to specific ETH service.</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
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<td>ETHServiceClassProfile: CoSCharacterization</td>
<td>Phase 1: M Phase 2: M</td>
<td>characterizes the CoS type at the bandwidth mapping</td>
<td>NONE</td>
<td></td>
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<tr>
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<td>ETHCoSPerformanceMapping</td>
<td>object</td>
<td>-</td>
<td>Associates expected service performances of specified CoS</td>
<td>NONE</td>
</tr>
<tr>
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<td></td>
<td>attributes</td>
<td>cosMappingID</td>
<td>Phase 1: O Phase 2: M</td>
<td>the name of a CoS</td>
</tr>
<tr>
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<td>----------------------------------------</td>
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</tr>
<tr>
<td>relationships</td>
<td>ETH_FDFr_EVC: CoSPerfMappingCharacterization</td>
<td>Phase 1: M, Phase 2: M</td>
<td>EVC where the performance for specific CoS is applied</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ETHPerformanceProfile: CoSPerformanceCharacterization</td>
<td>Phase 1: M, Phase 2: M</td>
<td>Mapping the performance profile to specific ETH services.</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ETHServiceClassProfile: CoSCharacterization</td>
<td>Phase 1: M, Phase 2: M</td>
<td>To characterizes the CoS type at the bandwidth mapping</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>notification</td>
<td>objectCreation</td>
<td>Phase 1: M, Phase 2: M</td>
<td>Used for discovery</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>objectDeletion</td>
<td>Phase 1: M, Phase 2: M</td>
<td>Used for discovery</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>attributeValueChange</td>
<td>Phase 1: O, Phase 2: O</td>
<td>May be used to notify NMS of attribute changes.</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>ELMIProfile</td>
<td>object</td>
<td>-</td>
<td>Phase 1: NA, Phase 2: C</td>
<td>Describes the ELMI attributes associated with the containing FPP. This managed entity is conditionally required if ELMI is supported.</td>
<td>NONE</td>
</tr>
<tr>
<td>attributes</td>
<td>elmiProfileId</td>
<td>Phase 1: NA, Phase 2: M</td>
<td>Identifies the specific ELMI Profile</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>elmiOperationalState</td>
<td>Phase 1: NA, Phase 2: M</td>
<td>Indicates the current capability of the ELMI mechanism on the FPP. Values include: disabled, enable</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>elmiAdministrativeState</td>
<td>Phase 1: NA, Phase 2: M</td>
<td>Values supported: Locked or Unlocked. In the Locked state the ELMI mechanism on the FPP is disabled</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>elmiProtocolVersion</td>
<td>Phase 1: NA, Phase 2: M</td>
<td>8-bit field that indicates the ELMI protocol version for the FPP (e.g., (0000 0001) indicates ELMI Version 1</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>elmiAsyncStatusEnabled</td>
<td>Phase 1: NA, Phase 2: M</td>
<td>Indicates whether or not the capability of the FPP to generate and send Asynchronous Status is enabled</td>
<td>NONE</td>
<td></td>
</tr>
</tbody>
</table>
### ITU-T Q.840.1 Management Entity

<table>
<thead>
<tr>
<th>Element Type</th>
<th>Element</th>
<th>MEF Required</th>
<th>Description/Notes (details in Q.840.1)</th>
<th>Original MEF7 Element</th>
</tr>
</thead>
</table>
|              | elmiMinAsyncMessageInterval | Phase 1: NA  
Phase 2: M | specify minimum time interval between asynchronous messages | NONE |
|              | elmiN393 | Phase 1: NA  
Phase 2: M | Threshold for the Count of Consecutive Errors. Used to determine if ELMI is operational or not | NONE |
|              | elmiT392 | Phase 1: NA  
Phase 2: M | Represents ELMI T392 Polling Verification Timer (PVT) limit. Value of 0 indicates that polling verification is disabled. | NONE |
|              | relationships contained in ETH_FPP and subclasses | Phase 1: NA  
Phase 2: M | FPP and subclasses (e.g., UNI) are the containing objects for ELMIProfile | NONE |
|              | notifications objectCreation | Phase 1: NA  
Phase 2: M | Used for discovery | NONE |
|              | objectDeletion | Phase 1: NA  
Phase 2: M | Used for discovery | NONE |
|              | attributeValueChange | Phase 1: NA  
Phase 2: O | May be used to notify NMS of attribute changes. | NONE |
|              | stateChange | Phase 1: NA  
Phase 2: M | Indicates changes in administrative and operational state | NONE |
|              | TransportPort object | - | Represents the underlying transport termination (e.g., DS3, SONET, SDH etc.). This object is conditionally required if the underlying server layer is not represented with another standards based object. | TransportPort |
|              | attributes characteristicInformationType | Phase 1: M  
Phase 2: M | Describes the transport type | characteristicInformationType |
|              | operationalState | Phase 1: M  
Phase 2: M | Denotes the operational state of the TransportPort as working “Enabled” or not-working “Disabled”. | operState |
|              | alarmStatus | Phase 1: M  
Phase 2: M | Indicates the occurrence of an abnormal condition. | alarmStatus |
<table>
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<th>Element Type</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>currentProblemList</td>
<td>Phase 1: M</td>
<td>Identifies the current existing problems (probable cause), with severity</td>
<td>currentProblemList</td>
</tr>
<tr>
<td></td>
<td></td>
<td>portId</td>
<td>Phase 1: M</td>
<td>Name of the port represented by the TransportPort. This attribute describes the Managed Element, Bay, Shelf, Drawer, Slot, and Port</td>
<td>portId</td>
</tr>
<tr>
<td></td>
<td></td>
<td>potentialCapacity</td>
<td>Phase 1: C</td>
<td>Bandwidth capacity that is supported by the TransportPort. This attribute is conditional, it is present if the TransportPort is a rate adaptive technology</td>
<td>potentialCapacity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>relationships</td>
<td>Phase 1: M</td>
<td>ManagedElement is the containing object for TransportPort In MEF7 contained in SupportingElement or LayerNetworkDomain</td>
<td>ManagedElement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AlarmSeverityProfile: SeverityAssignment</td>
<td>Phase 1: O</td>
<td>To assign alarm severity to specific alarms</td>
<td>AlarmSeverityProfile: SeverityAssignment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CircuitPack: PortAssociation</td>
<td>Phase 1: M</td>
<td>The CircuitPack that support the TransportPort</td>
<td>CircuitPack: PortAssociation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ClientFPP: Client/Server</td>
<td>Phase 1: M</td>
<td>Relationship between the TransportPort in the server layer and the FPP in the client layer</td>
<td>ClientFPP: Client/Server</td>
</tr>
<tr>
<td></td>
<td></td>
<td>notifications</td>
<td>Phase 1: M</td>
<td>Used for discovery</td>
<td>objectCreation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>objectDeletion</td>
<td>Phase 1: M</td>
<td>Used for discovery</td>
<td>objectDeletion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>attributeValueChange</td>
<td>Phase 1: O</td>
<td>May be used to notify NMS of attribute changes.</td>
<td>attributeValueChange</td>
</tr>
<tr>
<td></td>
<td></td>
<td>stateChange</td>
<td>Phase 1: M</td>
<td>Indicates changes in administrative and operational state</td>
<td>stateChange</td>
</tr>
<tr>
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</tbody>
</table>
|                                | communicationsAlarm | Phase 1: M  
Phase 2: M | Indicates an alarm condition | communicationsAlarm |                         |
| MAUTransportPort (Subclass of  | object       | Phase 1: C  
Phase 2: C | Generically represents the ETY Port and the underlying transport termination of the Ethernet Medium Attachment Unit  
This object is conditionally required if the underlying server layer is not represented with another standards based object. | MAUTransportPort |                         |
|                                 | attributes    | mauType | Phase 1: M  
Phase 2: M | Identifies the MAU type. An initial set of MAU types are defined in RFC-3636 | mauType |
|                                 |              | mauStatus | mauStatus from MEF7 is covered by the operationalState inherited from Transport Port | mauStatus |
|                                 |              | mauMediaAvailable | Phase 1: M  
Phase 2: M | Link integrity state of the MAU Transport Port. May take on values as describe in RFC-3636. | mauMediaAvailable |
|                                 |              | mauJabberState | Phase 1: M  
Phase 2: M | The jabbering state of the MAU. | mauJabberState |
|                                 |              | mauDefaultType | Phase 1: M  
Phase 2: M | Identifies the default administrative baseband MAU type | mauDefaultType |
|                                 |              | mauMode | Phase 1: M  
Phase 2: M | Full Duplex, or Auto negotiation | mode |
|                                 |              | mauAutoNegSupported | Phase 1: M  
Phase 2: M | Indicates whether or not auto-negotiation is supported on this MAU | mauAutoNegSupported |
|                                 |              | mauTypeList | Phase 1: M  
Phase 2: M | Identifies the set of possible IEEE 802.3 types of the MAU | mauTypeList |
|                                 |              | mauJackTypeList | Phase 1: M  
Phase 2: M | Identifies interface jack types that the MAU provides. | mauJackTypeList |
|                                 |              | mauAutoNegAdminState | Phase 1: M  
Phase 2: M | Allows the auto-negotiation function of the MAU to be enabled or disabled | mauAutoNegAdminState |
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<tr>
<td></td>
<td></td>
<td>mauAutoNegRemoteSignaling</td>
<td>Phase 1: M Phase 2: M</td>
<td>Indicates whether the remote end of the link is using auto-negotiation signalling.</td>
<td>mauAutoNegRemoteSignaling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mauAutoNegConfig</td>
<td>Phase 1: O Phase 2: O</td>
<td>Indicates the current status of the auto-negotiation process</td>
<td>mauAutoNegConfig</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mauAutoNegCapability</td>
<td>Phase 1: O Phase 2: O</td>
<td>Identifies the set of capabilities of the local auto-negotiation entity</td>
<td>mauAutoNegCapability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mauAutoNegCapAdvertised</td>
<td>Phase 1: O Phase 2: O</td>
<td>Identifies the set of capabilities advertised by the local auto-negotiation entity</td>
<td>mauAutoNegCapAdvertised</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mauAutoNegCapReceived</td>
<td>Phase 1: O Phase 2: O</td>
<td>Identifies the set of capabilities received from the remote auto-negotiation entity</td>
<td>mauAutoNegCapReceived</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mauAutoNegRemoteFaultAdvertised</td>
<td>Phase 1: O Phase 2: O</td>
<td>Identifies any local fault indications that this MAU has detected and will advertise at the next auto-negotiation interaction</td>
<td>mauAutoNegRemoteFaultAdvertised</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mauAutoNegRemoteFaultReceived</td>
<td>Phase 1: O Phase 2: O</td>
<td>Identifies any fault indications received from the far end of a link by the local auto-negotiation entity</td>
<td>mauAutoNegRemoteFaultReceived</td>
</tr>
<tr>
<td></td>
<td></td>
<td>methods</td>
<td>mauAutoNegRestart</td>
<td>Phase 1: O Phase 2: O</td>
<td>This method will force auto-negotiation to begin link renegotiation. Based on RFC-3636 ifMauAutoNegRestart</td>
</tr>
<tr>
<td></td>
<td></td>
<td>relationships</td>
<td>contained in ManagedElement or ETH_Flow_Domain</td>
<td>ManagedElement (or ETH_Flow_Domain) is the containing object for TransportPort</td>
<td>contained in ManagedElement or ETH_Flow_Domain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AlarmSeverityProfile: SeverityAssignment</td>
<td>Phase 1: O Phase 2: O</td>
<td>To assign alarm severity to specific alarms</td>
<td>AlarmSeverityProfile: SeverityAssignment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CircuitPack:</td>
<td>Phase 1: M</td>
<td>The CircuitPack that</td>
<td>SupportingElements</td>
</tr>
</tbody>
</table>

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<tr>
<td></td>
<td></td>
<td>PortAssociation</td>
<td>Phase 2: M</td>
<td>support the TransportPort</td>
<td>: SupportedBy, PortAssociation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ClientFPP: Client/Server</td>
<td>Phase 1: M Phase 2: M</td>
<td>Relationship between the TransportPort in the server layer and the FPP in the client layer</td>
<td>ClientFPP: Client/Server</td>
</tr>
<tr>
<td></td>
<td></td>
<td>notifications</td>
<td>Phase 1: M Phase 2: M</td>
<td>Used for discovery</td>
<td>objectCreation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>objectDeletion</td>
<td>Phase 1: M Phase 2: M</td>
<td>Used for discovery</td>
<td>objectDeletion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>attributeValueChange</td>
<td>Phase 1: O Phase 2: O</td>
<td>May be used to notify NMS of attribute changes.</td>
<td>attributeValueChange</td>
</tr>
<tr>
<td></td>
<td></td>
<td>stateChange</td>
<td>Phase 1: M Phase 2: M</td>
<td>Indicates changes in administrative and operational state</td>
<td>stateChange</td>
</tr>
<tr>
<td></td>
<td></td>
<td>communicationsAlarm</td>
<td>Phase 1: M Phase 2: M</td>
<td>Indicates an alarm condition</td>
<td>communicationsAlarm</td>
</tr>
<tr>
<td>ETH UNI Anomalies Performance Data Set</td>
<td>Performance data set</td>
<td>-</td>
<td>Phase 1: M Phase 2: M</td>
<td>The set of UNI abnormality measurements collected at each ETH_FPP_UNI</td>
<td>NONE</td>
</tr>
<tr>
<td>attribute</td>
<td>Undersized Frames</td>
<td>Phase 1: M Phase 2: M</td>
<td>Number of frames, where the frame size was smaller than 64 octets, received at the MEN from the UNI</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>Oversized Frames</td>
<td>Phase 1: M Phase 2: M</td>
<td>Number of oversized frames (frames greater than 1522 octets) received at the MEN from the UNI</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fragments</td>
<td>Phase 1: M Phase 2: M</td>
<td>Number of fragmented frames received at the MEN from the UNI</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCS and Alignment Errors</td>
<td>Phase 1: M Phase 2: M</td>
<td>Number of CRC and alignment errored frames received at the MEN from the UNI</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invalid CE-VLAN ID</td>
<td>Phase 1: M Phase 2: M</td>
<td>Number of frames received with an invalid CE-VLAN ID.</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETH UNI Traffic Performance Data Set</td>
<td>Performance data set</td>
<td>-</td>
<td>Phase 1: M Phase 2: M</td>
<td>The set of UNI traffic measurements collected at each ETH_FPP_UNI</td>
<td>NONE</td>
</tr>
<tr>
<td>attribute</td>
<td>Octets Transmitted OK</td>
<td>Phase 1: M Phase 2: M</td>
<td>Number of octets (not including IPG) that the MEN sent to the</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>ITU-T Q.840.1 Management Entity</td>
<td>Element Type</td>
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<td></td>
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<td>-------------------------------------------------</td>
<td>-----------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unicast Frames Transmitted OK</td>
<td>Phase 1: M  Phase 2: M  Number of Unicast Frames that the MEN sent to the UNI</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multicast Frames Transmitted OK</td>
<td>Phase 1: M  Phase 2: M  Number of Multicast Frames that the MEN sent to the UNI</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Broadcast Frames Transmitted OK</td>
<td>Phase 1: M  Phase 2: M  Number of Broadcast Frames that the MEN sent to the UNI</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Octets Received OK</td>
<td>Phase 1: M  Phase 2: M  Number of octets (not including IPG) that the UNI sent to the MEN</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unicast Frames Received OK</td>
<td>Phase 1: M  Phase 2: M  Number of Unicast Frames that the UNI sent to the MEN</td>
<td>NONE</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Multicast Frames Received OK</td>
<td>Phase 1: M  Phase 2: M  Number of Multicast Frames that the UNI sent to the MEN</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Broadcast Frames Received OK</td>
<td>Phase 1: M  Phase 2: M  Number of Broadcast Frames that the UNI sent to the MEN</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETH Ingress Traffic Management</td>
<td>Performance data set</td>
<td>Performance data set</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>attributes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ingressGreenFrameCount</td>
<td>Phase 1: M  Phase 2: M  The amount of green frames sent by the ingress UNI to the MEN</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ingressYellowFrameCount</td>
<td>Phase 1: O  Phase 2: O  The amount of yellow frames sent by the ingress UNI to the MEN</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ingressRedFrameCount</td>
<td>Phase 1: O  Phase 2: O  The amount of red (discarded) frames at the ingress UNI</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ingressGreenOctetCount</td>
<td>Phase 1: O  Phase 2: O  The amount of green octets sent by the ingress UNI to the MEN</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ingressYellowOctetCount</td>
<td>Phase 1: O  Phase 2: O  The amount of yellow octets sent by the ingress UNI to the MEN</td>
<td>NONE</td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>ETH Egress Traffic Management Performance Data Set</td>
<td>Performance data set</td>
<td>Phase 1: M Phase 2: M</td>
<td>The set of Egress Traffic Management performance measurements on a per entity (per UNI, per CoS per UNI, per EVC, or per CoS per EVC) basis for each entity that enforces traffic management at the Egress direction (MEN to CE).</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>attributes</td>
<td>egressGreenFrameCount</td>
<td>Phase 1: M Phase 2: M</td>
<td>The amount of green frames received by the egress UNI from the MEN.</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>egressYellowFrameCount</td>
<td>Phase 1: O Phase 2: O</td>
<td>The amount of yellow frames received by the egress UNI from the MEN</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>egressGreenOctetCount</td>
<td>Phase 1: O Phase 2: O</td>
<td>The amount of green octets received by the egress UNI from the MEN</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>egressYellowOctetCount</td>
<td>Phase 1: O Phase 2: O</td>
<td>The amount of yellow octets received by the egress UNI from the MEN</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>ETH Congestion Discards Performance Data Set</td>
<td>Performance data set</td>
<td>Phase 1: M Phase 2: M</td>
<td>The set of Congestion Discards performance measurements on a per congestible resource (e.g., per UNI, per CoS per UNI, per EVC, or per CoS per EVC) basis in both the ingress and egress direction</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>attributes</td>
<td>greenFrameDiscards</td>
<td>Phase 1: M Phase 2: M</td>
<td>The amount of green frames discarded due to congestion</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>yellowFrameDiscards</td>
<td>Phase 1: O Phase 2: O</td>
<td>The amount of yellow frames discarded due to congestion</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>greenOctetDiscards</td>
<td>Phase 1: M</td>
<td>The amount of green octets discarded due to congestion</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>ITU-T Q.840.1 Management Entity</td>
<td>Element Type</td>
<td>Element</td>
<td>MEF Required</td>
<td>Description/Notes (details in Q.840.1)</td>
<td>Original MEF7 Element</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------</td>
<td>---------</td>
<td>--------------</td>
<td>------------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>ETH ELMI Performance Data Set</td>
<td>Performance data set</td>
<td>-</td>
<td>Phase 1: NA Phase 2: O</td>
<td>The set of ELMI reliability and protocol error measurements collected at each ETH_FPP on which ELMI is supported and enabled</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td>attributes</td>
<td>sumofElmiReliabilityErrors</td>
<td>Phase 1: NA Phase 2: O</td>
<td>Thresholded sum of ELMI Reliability Errors on the FPP, including: Non-receipt of STATUS/STATUS ENQUIRY and Invalid Sequence Numbers</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sumofElmiProtocolErrors</td>
<td>Phase 1: NA Phase 2: O</td>
<td>Thresholded sum of ELMI Protocol Errors on the FPP, including: Protocol Version Errors, Message too shorts, Message type errors, Information element errors</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>elmiNonrcptStatusAndStatusEnquiryCount</td>
<td>Phase 1: NA Phase 2: O</td>
<td>Number of Non-receipt of STATUS/STATUS ENQUIRY events</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>elmiInvalidSeqNumCount</td>
<td>Phase 1: NA Phase 2: O</td>
<td>Number of Invalid Sequence Numbers events</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>elmiProtocolVersionCount</td>
<td>Phase 1: NA Phase 2: O</td>
<td>Number of ELMI Protocol Version Errors detected at the FPP</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>elmiTooShortCount</td>
<td>Phase 1: NA Phase 2: O</td>
<td>Number of ELMI Message Too Short Errors detected at the FPP</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>elmiMessageTypeErrorCount</td>
<td>Phase 1: NA Phase 2: O</td>
<td>Number of ELMI Message Type Errors detected at the FPP</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>elmiInfoElementErrorCount</td>
<td>Phase 1: NA Phase 2: O</td>
<td>Number of ELMI Information Element Errors (Information</td>
<td>NONE</td>
</tr>
<tr>
<td>ITU-T Q.840.1 Management Entity</td>
<td>Element Type</td>
<td>Element</td>
<td>MEF Required</td>
<td>Description/Notes (details in Q.840.1)</td>
<td>Original MEF7 Element</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------</td>
<td>---------</td>
<td>--------------</td>
<td>----------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>MAU Termination Performance Data Set</td>
<td>Performance data set</td>
<td>-</td>
<td>Phase 1: C Phase 2: C</td>
<td>Conditionally required if MauTransportPort is instantiated. The set of MAU Termination performance measurements for each Transport Layer Port that represents the underlying transport termination of the Ethernet Medium Attachment Unit.</td>
<td>NONE</td>
</tr>
<tr>
<td>attributes</td>
<td>tfMauMediaAvailableStateExits</td>
<td>Phase 1: M Phase 2: M</td>
<td>Number of time the MAU leaves the available state</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ifMauJabberingStateEnters</td>
<td>Phase 1: M Phase 2: M</td>
<td>Number of times the MAU enters the jabbering state</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ifMauFalseCarriers</td>
<td>Phase 1: M Phase 2: M</td>
<td>Number of false carrier events during idle</td>
<td>NONE</td>
<td></td>
</tr>
</tbody>
</table>

9 Ethernet Service OAM Object Definitions
This section defines a Service OAM information model based on the following inputs shown in the figure below.
The information model design is based on the Unified Modeling Language (UML) syntax. Use Case, Activity, and Class UML diagrams are used to present the model. In addition to the diagrams presented, detailed object tables are included to provide specifics on each object and its attributes, operations and associations/relationships.

9.1 Services OAM Use Cases
This section defines the high level Fault Management and Performance Monitoring Use Cases, based on the UML Use Case diagram syntax.

9.1.1 Fault Management

9.1.1.1 OAM FM Use Cases
9.1.2 Performance Monitoring

9.1.2.1 OAM PM Use Cases
9.2 Common OAM Objects

Figure 9-3 highlights the common Ethernet Service OAM objects and their relationships to objects defined in Q.840.1, X.721 and M.3100.

Figure 9-4 Common Service OAM Object Class Diagram

9.2.1 EthMe (Maintenance Entity)

Behavior:
This object represents the Maintenance Entity (Y.1731).
Point-to-Point MEs are typically involved in different OAM domains. These MEs correspond purely at the ETH Layer. A ME is essentially an association between two maintenance points within an OAM Domain; where each maintenance point corresponds to a provisioned reference point that requires management.

Subscriber OAM Domain consists of ME typed as “Subscriber”. Service Provider OAM Domain consists of ME typed as “EVC”. If UNI between Subscriber and Service Provider needs to be managed, a ME typed as “UNI” can be realized.

Instances of this managed object are created automatically by the EMS when ETH_FPPs or ETH_FDFr_EVCs...
are created. Instances of this managed object may be created and deleted by request of the EMS.

### Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>This attribute describes the ME type as “Subscriber”, “EVC”, “UNI”, or “NNI”.</td>
<td>MaintenanceEntityType</td>
<td>M, R/W</td>
<td></td>
</tr>
<tr>
<td>connectivityStatus</td>
<td>This attribute indicates if Service OAM frames can be exchanged between the MEPs of the ME in both directions. The value of partiallyActive is not supported.</td>
<td>ConnectivityStatusType</td>
<td>M, R</td>
<td></td>
</tr>
</tbody>
</table>

### Operations / Methods

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>create()</td>
<td>This operation provides the ability to dynamically create new instances of this object.</td>
</tr>
<tr>
<td>delete()</td>
<td>This operation provides the ability to dynamically delete existing instances of this object.</td>
</tr>
<tr>
<td>modify()</td>
<td>This operation provides the ability to dynamically update configurable attributes (e.g., attributes with read-write access) of existing instances of this object.</td>
</tr>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
</tbody>
</table>

### Relationships:

The EthMe object is contained under ETH_Flow_Domain defined in Q.840.1.

EthMe is associated with:

- **EthMp: MaintenanceEndPoints** – The Maintenance Points that initiate or terminate OAM flow with respect to the Maintenance Entity (GET, REPLACE, ADD, REMOVE)
- **EthMp: MaintenanceIntermediatePoints** – The Maintenance Points that react to diagnostic OAM frames with respect to the Maintenance Entity. (GET, REPLACE, ADD, REMOVE)
- **EthMeg: ComponentMaintenanceEntities** – The Maintenance Entities that belong to the same service inside a common OAM domain are associated with the same MEG (GET, REPLACE, ADD, REMOVE)

### Reportable Notifications:

<table>
<thead>
<tr>
<th>Name</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>objectCreation</td>
<td>O</td>
</tr>
<tr>
<td>objectDeletion</td>
<td>O</td>
</tr>
</tbody>
</table>

### 9.2.2 EthMeg (Maintenance Entity Group)

#### Behavior:

This object represents the Maintenance Entity Group (Y.1731) or Maintenance Association (802.1ag). A ME Group (MEG) consists of MEs which belong to the same service inside a common OAM domain.
For a Point-to-Point EVC, a MEG contains a single ME. For a Multipoint-to-Multipoint EVC associating 'n' UNIs, a MEG contains n*(n-1)/2 MEs.

Instances of this managed object are created automatically by the EMS when ETH_FPPs or ETH_FDFr_EVCs are created. Instances of this managed object may be created and deleted by request of the EMS.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>chassisId</td>
<td>This attribute indicates the Chassis ID to be sent in the Sender ID TLV for all MPs in this MEG. The format of this object is determined by the value of the ChassisIdSubtype attribute.</td>
<td>LldpChassisId</td>
<td></td>
<td>O, R/W</td>
</tr>
<tr>
<td>chassisIdSubtype</td>
<td>This attribute indicates the format of the Chassis ID to be sent in the Sender ID TLV for all MPs in this MEG. This value is meaningless if the ChassisId has a length of 0.</td>
<td>LldpChassisIdSubtype</td>
<td></td>
<td>O, R/W</td>
</tr>
<tr>
<td>connectivityStatus</td>
<td>This attribute indicates aggregate connectivity status of MEs in the MEG. The value of partiallyActive indicates at least one but not all of the MEs in the MEG have a connectivity status of inactive.</td>
<td>ConnectivityStatusType</td>
<td></td>
<td>M, R</td>
</tr>
<tr>
<td>connectivityStatusInterval</td>
<td>This attribute specifies a configurable time interval to detect a change in Connectivity Status. This attribute should be more than the network restoration time, which is dependent on the MEN technology (MEF 17 R2C). Units are milliseconds.</td>
<td>Integer</td>
<td></td>
<td>M, R/W</td>
</tr>
<tr>
<td>Attribute</td>
<td>Description</td>
<td>Type</td>
<td>Access</td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------</td>
<td>--------------</td>
<td></td>
</tr>
<tr>
<td>id</td>
<td>This attribute specifies the MEG ID (Y.1731) or MAID (802.1ag).</td>
<td>MegIdType</td>
<td>M, R/W</td>
<td></td>
</tr>
<tr>
<td><strong>includeInterfaceStatusTlv</strong></td>
<td>This attribute specifies if the Interface Status TLV (802.1ag) is included in OAM messages transmitted by MPs configured in this MEG.</td>
<td>Boolean</td>
<td>M, R/W</td>
<td></td>
</tr>
<tr>
<td><strong>includePortStatusTlv</strong></td>
<td>This attribute specifies if the Port Status TLV (802.1ag) is included in OAM messages transmitted by MPs configured in this MEG.</td>
<td>MegIdType</td>
<td>M, R/W</td>
<td></td>
</tr>
<tr>
<td><strong>includeSenderIdTlv</strong></td>
<td>This attribute specifies an enumerated value indicating what, if anything, is to be included in the Sender ID TLV (802.1ag) transmitted by MPs configured in this MEG.</td>
<td>SenderIdTlvPermissionType</td>
<td>sendIdNone</td>
<td>M, R/W</td>
</tr>
<tr>
<td>length</td>
<td>This attribute represents the MEG ID (Y.1731) or Short MA Name (802.1ag) length.</td>
<td>Integer</td>
<td>M, R/W</td>
<td></td>
</tr>
<tr>
<td>level</td>
<td>This attribute specifies the MEG Level used to distinguish between OAM frames belonging to different nested MEs. MEs belonging to the same MEG share a common MEG Level. Eight MEG Levels have been identified for the purposes of Ethernet OAM.</td>
<td>MegLevelType</td>
<td>M, R/W</td>
<td></td>
</tr>
<tr>
<td>format</td>
<td>This attribute represents the MEG ID (Y.1731) or Short MA Name (802.1ag) format.</td>
<td>MaintAssocNameFormat</td>
<td>M, R/W</td>
<td></td>
</tr>
</tbody>
</table>
### maintAssocShortName
This attribute specifies the short Maintenance Name (802.1ag). The type and format is specified by the format attribute. This attribute is meaningless if the format attribute has a value of 'iccBasedFormat'. This attribute has a length restriction of 1..45 octets.

<table>
<thead>
<tr>
<th>maintAssocShortName</th>
<th>HexBinary</th>
<th>C (M if format is based on 802.1ag MAID), R/W</th>
</tr>
</thead>
</table>

### perfTimeInterval
This attribute specifies the Timer interval 'T' as defined in MEF 10 (MEF 17 R5a and R5b). Units are milliseconds.

<table>
<thead>
<tr>
<th>perfTimeInterval</th>
<th>Integer</th>
<th>M, R/W</th>
</tr>
</thead>
</table>

### ccmInterval
This attribute specifies the ETH-CC and ETH-RDI transmission period in seconds. For Fault Management applications the default value is 1 second. For Performance Monitoring applications the default value is 100 ms. Note: CCM Interval is configured at the MEG, not the MEP, since all MEPs in a MEG are required to have the same CCM Interval.

<table>
<thead>
<tr>
<th>ccmInterval</th>
<th>IntervalType 1</th>
<th>M, R/W</th>
</tr>
</thead>
</table>

### peerMepInfoAgingTime
This attribute defines a period of time after which an instance in the EthMepPeerInfo object is removed unless the EthMepPeerInfo instance is updated by the MEP's connectivity status process. A value of zero indicates no aging will occur.

<table>
<thead>
<tr>
<th>peerMepInfoAgingTime</th>
<th>Integer 0</th>
<th>O, R/W</th>
</tr>
</thead>
</table>
Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>create()</td>
<td>This operation provides the ability to dynamically create new instances of this object.</td>
</tr>
<tr>
<td>delete()</td>
<td>This operation provides the ability to dynamically delete existing instances of this object.</td>
</tr>
<tr>
<td>modify()</td>
<td>This operation provides the ability to dynamically update configurable attributes (e.g., attributes with read-write access) of existing instances of this object.</td>
</tr>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
</tbody>
</table>

Relationships:

The **EthMeg** object is contained under **ETH_Flow_Domain** defined in Q.840.1.

EthMeg is associated with:

**EthMe: ComponentMaintenanceEntities** – The Maintenance Entities that belong to the same service inside a common OAM domain (GET, REPLACE, ADD, REMOVE)

**EthMp: RootMEP** – The Maintenance Points is the root of a multipoint MEG. (GET, REPLACE)

**ETHCoSPerformanceMapping: MegCoS** – Indicates the performance for specific CoS. (GET, REPLACE, ADD, REMOVE). This object is defined in Q.840.1.

Reportable Notifications:

<table>
<thead>
<tr>
<th></th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>objectCreation</td>
<td></td>
</tr>
<tr>
<td>objectDeletion</td>
<td></td>
</tr>
</tbody>
</table>

9.2.3 EthMep (Maintenance End Point)

**Behavior:**

This object represents a MEG End Point (MEP) which is a provisioned OAM reference point capable of initiating and terminating proactive OAM frames. A MEP is also capable of initiating and reacting to diagnostic OAM frames. Terminology is MEG End Point (Y.1731) or MA End Point (802.1ag).

Instances of this managed object are created automatically by the EMS when ETH_FPPs or ETH_Flow_Points are created. Instances of this managed object may be created and deleted by request of the EMS.

Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>multipointIndicator</td>
<td>This attribute specifies the MEP is acting as 'root' or 'leaf' for multipoint, or 'notMultipoint' if not multipoint.</td>
<td>MultipointIndicatorType</td>
<td>M, R</td>
<td></td>
</tr>
<tr>
<td>connectivityStatus</td>
<td>This attribute indicates the connectivity status for a MEP in an EVC MEs. An ‘active’ MEP Connectivity Status refers to the ability to exchange Service frames among all the UNIs of an EVC. A 'partiallyActive' MEP Connectivity Status refers to the ability to exchange Service frames among some but not all the UNIs of an EVC. An 'inactive' MEP Connectivity Status refers to the inability to exchange Service frames among any of the UNIs of an EVC.</td>
<td>ConnectivityStatusType</td>
<td>O, R/W</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>----------------------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>primaryVid</td>
<td>This attribute specifies an integer indicating the Primary VID of the MEP, always one of the VIDs assigned to the MEP's MA. The value 0 indicates that either the Primary VID is that of the MEP's MA, or that the MEP's MA is associated with no VID. The Integer range is 0..16777215.</td>
<td>Integer</td>
<td>M, R/W</td>
<td></td>
</tr>
</tbody>
</table>

**Operations / Methods:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>objectCreation</td>
<td></td>
</tr>
<tr>
<td>objectDeletion</td>
<td></td>
</tr>
</tbody>
</table>

**Relationships:**

The EthMep object is a generalization of the EthMp object.

The EthMep object is contained under the ETH_FPP object defined in Q.840.1.

**EthMep** is associated with:

- **EthMe: MaintenanceEndPoints** – The Maintenance Points that initiate or terminate OAM flow with respect to the Maintenance Entity (GET, REPLACE, ADD, REMOVE)
- **EthMepPeerInfo: Peer MEP List** – A list of statically configured or dynamically learned peer MEPs.

### 9.2.4 EthMip (Maintenance Intermediate Point)

**Behavior:**

This object represents a MEG Intermediate Point (MIP) which is a provisioned OAM reference point capable of reacting to diagnostic OAM frames initiated by MEPs. A MIP does not initiate proactive and diagnostic OAM frames.

Instances of this managed object are created automatically by the EMS when ETH_FPPs or ETH_Flow_Points are created. Instances of this managed object may be created and deleted by request of the EMS.
### 9.2.5 EthMp (Maintenance Point)

#### Behavior:
This object defines ETH Maintenance Points representing either a MEP or a MIP (via a subclass).

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifer</th>
</tr>
</thead>
<tbody>
<tr>
<td>administrativeState</td>
<td>This attribute specifies the administrative state of the EthMp. In the Locked state Service OAM frame flow through the EthMp is prohibited.</td>
<td>AdminStateType</td>
<td>M, R/W</td>
<td></td>
</tr>
<tr>
<td>alarmStatus</td>
<td>This attribute indicates the occurrence of an abnormal condition relating to a MEP. This attribute may also function as a summary indicator of alarm conditions associated with a specific resource. It is used to indicate the existence of an alarm condition, a pending alarm condition such as threshold situations, or (when used as a summary indicator) the highest severity of active alarm conditions. When used as a summary indicator, the order of severity (from highest to lowest) is: Critical, Major, Minor, Indeterminate, Warning, Pending and cleared.</td>
<td>AlarmStatus (From M.3100)</td>
<td>M, R</td>
<td></td>
</tr>
<tr>
<td>asapPtr</td>
<td>The alarm severity assignment profile associated with the EthMp to assign alarm severity to specific alarms.</td>
<td>AsapPtrType</td>
<td>M, R/W</td>
<td></td>
</tr>
<tr>
<td>availabilityStatus</td>
<td>This attribute indicates whether the EthMp is functioning properly.</td>
<td>AvailStatusType</td>
<td>O, R</td>
<td></td>
</tr>
<tr>
<td><strong>currentProblemList</strong></td>
<td>This attribute identifies the current existing problems associated with the EthMp.</td>
<td><strong>AlarmList</strong></td>
<td>M, R</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>--------------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td><strong>direction</strong></td>
<td>This attribute specifies the direction in which the Maintenance Association (MEP or MIP) faces on the bridge port. The value 'down' specifies the MP sends Continuity Check Messages away from the MAC Relay Entity. The value 'up' specifies the MP sends Continuity Check Messages towards the MAC Relay Entity. Refer to 802.1ag.</td>
<td><strong>MpDirectionType</strong></td>
<td>M, R/W</td>
<td></td>
</tr>
<tr>
<td><strong>id</strong></td>
<td>This attribute specifies the MEG ID as defined in Y.1731. A small integer, unique over a given Maintenance Association for identifying a specific MEP/MIP (802.1ag). None (i.e., 0 is used in 802.1ag) indicates that a MEP is not configured.</td>
<td><strong>MepIdType</strong></td>
<td>M, R/W</td>
<td></td>
</tr>
<tr>
<td><strong>macAddress</strong></td>
<td>This attribute indicates the MAC Address of the MP.</td>
<td><strong>MacAddress</strong></td>
<td>O, R</td>
<td></td>
</tr>
<tr>
<td><strong>operationalState</strong></td>
<td>This attribute indicates the operational state (current capability) of the EthMp. If the value is 'enabled' the MP is able to provide OAM capabilities.</td>
<td><strong>OperStateType</strong></td>
<td>M, R</td>
<td></td>
</tr>
<tr>
<td><strong>type</strong></td>
<td>This attribute indicates whether the MP is a MEP, MIP or none.</td>
<td><strong>MpType</strong></td>
<td>M, R</td>
<td></td>
</tr>
</tbody>
</table>

**Operations / Methods:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>create()</td>
<td>This operation provides the ability to dynamically create new instances of this object.</td>
</tr>
<tr>
<td>delete()</td>
<td>This operation provides the ability to dynamically delete existing instances of this object.</td>
</tr>
<tr>
<td>modify()</td>
<td>This operation provides the ability to dynamically update configurable attributes (e.g., attributes with read-write access) of existing instances of this object.</td>
</tr>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
</tbody>
</table>

**Relationships:**

The **EthMp** object is contained under the **ETH_Flow_Point** defined in Q.840.1.

EthMp is associated with:

**EthMe: MaintenanceEndPoints** – The Maintenance Points that initiate or terminate OAM flow with respect to the Maintenance Entity (GET, REPLACE, ADD, REMOVE)

**EthMe: MaintenanceIntermediatePoints** – The Maintenance Points that react to diagnostic OAM frames with respect to the Maintenance Entity. (GET, REPLACE, ADD, REMOVE)

**EthMeg: RootMEP** – The Maintenance Points is the root of a multipoint MEG. (GET, REPLACE)
AlarmSeverityAssignmentProfile (defined in M.3100): SeverityAssignment – The Maintenance Point may be associated with an alarm severity assignment profile in order to assign alarm severity to specific alarms. (GET, REPLACE)

AlarmStatus (defined in M.3100): HighestSeverityAlarm – Indicates the highest severity alarm that may be active on the Maintenance Point (GET, REPLACE)

AlarmRecord/Log (defined in X.721): currentProblemList – Contains a list of alarms, present within a Log, that may be active on the Maintenance Point (GET, REPLACE)

Reportable Notifications:

<table>
<thead>
<tr>
<th>Object Type</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>objectCreation</td>
<td>O</td>
</tr>
<tr>
<td>objectDeletion</td>
<td>O</td>
</tr>
<tr>
<td>stateChange</td>
<td>O</td>
</tr>
<tr>
<td>communicationsAlarm (ETH_AIS, ETH_RDI)</td>
<td>M</td>
</tr>
<tr>
<td>attributeValueChange</td>
<td>O</td>
</tr>
</tbody>
</table>

9.2.6 EthMd (Maintenance Domain)

Behavior:
This object represents the Maintenance Domain (802.1ag).

Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>maintDomainNameType</td>
<td>This attribute specifies the type and format of the Maintenance Domain Name.</td>
<td>MdNameType</td>
<td>charString</td>
<td>O, R/W</td>
</tr>
<tr>
<td>maintDomainLevel</td>
<td>This attribute specifies the Maintenance Domain Level (802.1ag). The default value is zero.</td>
<td>MdLevelType</td>
<td>0</td>
<td>O, R/W</td>
</tr>
<tr>
<td>maintDomainName</td>
<td>This attribute specifies the Maintenance Domain Name (802.1ag). The type and format is specified by the MaintDomainNameType attribute. This attribute has a length restriction of 1..43 octets. The default value is a charString &quot;DEFAULT&quot;. Each Maintenance Domain has unique name amongst all those used or available to a service provider or operator. It facilitates easy identification of administrative responsibility for each Maintenance Domain.</td>
<td>HexBinary</td>
<td></td>
<td>O, R/W</td>
</tr>
</tbody>
</table>

Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>create()</td>
<td>This operation provides the ability to dynamically create new instances of this object.</td>
</tr>
</tbody>
</table>
### delete()
This operation provides the ability to dynamically delete existing instances of this object.

### modify()
This operation provides the ability to dynamically update configurable attributes (e.g., attributes with read-write access) of existing instances of this object.

### retrieve()
This operation provides the ability to dynamically query attribute values of existing instances of this object.

### Relationships:
The EthMd object contains zero or more EthMeg object instances.

### Reportable Notifications:
- objectCreation
- objectDeletion

---

#### 9.2.7 EthMepPeerInfo (MEP Peer Information)

**Behavior:**
This object defines a set of attributes for storing the Maintenance End Points (MEP) identifiers or MAC addresses of the peer MEPs, as well as additional information a MEP learns about its peers. The peer MEPs may be dynamically learned or statically provisioned.

Ethernet Maintenance EndPoint (MEP) is a provisioned OAM reference point which is capable to initiate and terminate proactive/diagnostic OAM frames. For a Point-to-Point EVC, a single peer MEP is identified by (an instance of) this object, whereas for a Multipoint-to-Multipoint EVC associating many UNIs, one or more peer MEPs are identified by (one or more instances of) this object.

This object may be recursively used by other objects to get the peer MEP identifiers or MAC addresses of the remote MEPs. These other objects may pertain to functions such as ContinuityCheck (CC), Loopback (LBK), Linktrace (LTR), Delay Measurement (DM) etc.

Since MEPid is unique only within the Maintenance Association (having same MAID and MD level), it is required to qualify the MEPid with the MAid.

Multicast loopback (LBMs) can be used to dynamically discover the MAC address of the remote MEP(s) on a MEG. This discovery capability can have important applicability when the local and remote MEP(s) are under different administrative domains (e.g., on the UNI).

At least one instance of this object is created automatically by the EMS when EthMp object is created. Instances of this managed object may be created and deleted by request of the EMS.

### Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>id</td>
<td>This attribute specifies the MEG ID, as defined in Y.1731, of a remote peer MEP. The default value is zero.</td>
<td>MepIdType</td>
<td>0</td>
<td>M, R/W</td>
</tr>
<tr>
<td>macAddress</td>
<td>This attribute specifies the MAC Address, as defined in Y.1731, of a remote peer MEP.</td>
<td>MacAddress</td>
<td></td>
<td>M, R/W</td>
</tr>
<tr>
<td><strong>configurationType</strong></td>
<td>This attribute specifies the configuration type for this peer MEP instance. A Peer MEP may be dynamically learned using OAM functions or static configuration via the EMS.</td>
<td><strong>PeerMepCfgType</strong></td>
<td><strong>dynamic</strong></td>
<td><strong>O, R/W</strong></td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------</td>
<td>-------------------</td>
<td>-------------</td>
<td>--------------</td>
</tr>
<tr>
<td><strong>status</strong></td>
<td>This attribute indicates the status of the remote MEP to which this instance applies.</td>
<td><strong>RemoteMepStatusType</strong></td>
<td><strong>M, R/W</strong></td>
<td></td>
</tr>
<tr>
<td><strong>rdi</strong></td>
<td>This attribute indicates the state of the RDI bit in the last received CCM. A value of 'true' is returned for RDI=1. A value of 'false' is returned if no CCM has been received or RDI=0.</td>
<td><strong>Boolean</strong></td>
<td><strong>M, R/W</strong></td>
<td></td>
</tr>
<tr>
<td><strong>portStatusTlv</strong></td>
<td>This attribute indicates the Port Status TLV received in the last CCM from the remote MEP identified by this instance. The default value is returned if no CCM has been received or if the received CCM did not include a Port Status TLV.</td>
<td><strong>PortStatusTlvType</strong></td>
<td><strong>notIncluded</strong></td>
<td><strong>O, R/W</strong></td>
</tr>
<tr>
<td><strong>interfaceStatusTlv</strong></td>
<td>This attribute indicates the Interface Status TLV received in the last CCM from the remote MEP identified by this instance. The default value is returned if no CCM has been received or if the received CCM did not include an Interface Status TLV.</td>
<td><strong>InterfaceStatusTlvType</strong></td>
<td><strong>notIncluded</strong></td>
<td><strong>O, R/W</strong></td>
</tr>
<tr>
<td><strong>chassisIdSubtype</strong></td>
<td>This attribute indicates the format of the Chassis ID received in the Sender ID TLV in the last CCM received from the peer MEP indicated by this instance.</td>
<td><strong>LldpChassisIdType</strong></td>
<td><strong>O, R</strong></td>
<td></td>
</tr>
<tr>
<td><strong>chassisId</strong></td>
<td>This attribute indicates the Chassis ID received in the Sender ID TLV of the last CCM received from a peer MEP identified by this instance. The format of this object is determined by the value of the ChassisIdSubtype attribute.</td>
<td><strong>LldpChassisId</strong></td>
<td><strong>O, R</strong></td>
<td></td>
</tr>
<tr>
<td><strong>mgtAddrDomain</strong></td>
<td>This attribute indicates the TDomain that identifies the type and format of the related MgtAddr attribute, used to access the SNMP agent of the system transmitting the CCM. Received in the CCM Sender ID TLV from that system.</td>
<td><strong>TDomain</strong></td>
<td><strong>O, R</strong></td>
<td></td>
</tr>
</tbody>
</table>
mgtAddr | This attribute indicates the TAddress that can be used to access the SNMP agent of the system transmitting the CCM, received in the CCM Sender ID TLV from that system. If the related attribute MgtAddrDomain contains the value 'zeroDotZero', this attribute should return a zero-length OCTET STRING. | TAddress | O, R

<table>
<thead>
<tr>
<th>Operations / Methods:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>create()</td>
</tr>
<tr>
<td>delete()</td>
</tr>
<tr>
<td>modify()</td>
</tr>
<tr>
<td>retrieve()</td>
</tr>
</tbody>
</table>

Relationships:
EthMepPeerInfo is contained under the EthMep object.

Reportable Notifications:
- objectCreation: O
- objectDeletion: O

9.3 Fault Management Objects

The following diagram illustrates the Fault Management objects (UML classes) and their relationships as defined in this specification.
Figure 9-5 Fault Management Class Diagram

9.3.1 Continuity Check
Figure 9-6 Continuity Check Activity Diagram

9.3.1.1 EthOamCcCfg (Ethernet Continuity Check Configuration)

Behavior:
This object includes configuration attributes and operations for the proactive Ethernet OAM Fault Management and Performance Monitoring Continuity Check function (ETH-CC) as defined in Y.1731 and 802.1ag. ETH-CC can be used for the following applications:
- Used to detect loss of continuity between any pair of MEPs in a MEG.
- Used to detect unintended connectivity conditions and other defect conditions.
The OAM PDU used for ETH-CC and ETH-RDI information is CCM. This object is part of the Fault Identification and <PM?> OAM Use Cases.

This object also includes configuration attributes for the Ethernet OAM Fault Management Remote Defect Indication function (ETH-RDI as defined in Y.1731). ETH-RDI can be used for the following applications:
- Single-ended fault management: The receiving MEP detects an RDI defect condition, which gets correlated with other defect conditions in this MEP and may become a fault cause. The absence of received ETH-RDI information in a single MEP indicates the absence of defects in the entire MEG.
- Contribution to far-end performance monitoring: It reflects that there was a defect condition in the far-end which is used as an input to the performance monitoring process.

ETH-CC and ETH-RDI functions are only applicable to MEPs.

Instances of this managed object are created automatically by the EMS when EthMp is created. Instances of this managed object may also created and deleted by request of the EMS.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>enabled</td>
<td>This attribute specifies whether ETH-CC transmission is enabled. The value 'true' indicates ETH-CC transmission is enabled. The value 'false' indicates ETH-CC transmission is disabled.</td>
<td>Boolean</td>
<td>true</td>
<td>M, R/W</td>
</tr>
<tr>
<td>multicastEnabled</td>
<td>This attribute specifies whether a MEP uses unicast or multicast to send the ETH-CC messages (CCMs). A MEP can send ETH-CC messages to unicast or multicast MAC addresses. The value 'true' indicates multicast is enabled. The value 'false' indicates unicast is enabled.</td>
<td>Boolean</td>
<td>true</td>
<td>M, R/W</td>
</tr>
<tr>
<td>priority</td>
<td>This attribute specifies the priority of frames with ETH-CC and ETH-RDI information. By default, the frame with ETH-CC and ETH-RDI information is transmitted with the highest priority available to the data traffic.</td>
<td>PriorityType</td>
<td>O, R/W</td>
<td></td>
</tr>
</tbody>
</table>
### dropEligible

This attribute specifies the eligibility of frames with ETH-CC and ETH-RDI information to be discarded when congestion conditions are encountered. The value 'true' indicates frames are eligible to be discarded. The value 'false' indicates frames are not eligible to be discarded. This attribute may be constrained to read-only in some implementations.

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boolean</td>
<td>false</td>
<td>O, R/W</td>
</tr>
</tbody>
</table>

### lowestPriorityDefect

This attribute specifies the lowest priority defect that is allowed to generate a fault alarm.

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>LowestAlarmPriType</td>
<td>macRemErrXcon</td>
<td>M, R/W</td>
</tr>
</tbody>
</table>

### faultAlarmTime

This attribute specifies the time that defects must be present before a Fault Alarm is issued. The data type RelativeTime is constrained to 2.5 seconds through 10 seconds. The default value is 2.5 seconds.

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>RelativeTime</td>
<td>2.5 seconds</td>
<td>M, R/W</td>
</tr>
</tbody>
</table>

### faultAlarmResetTime

This attribute specifies the time that defects must be absent before resetting a Fault Alarm. The data type RelativeTime is constrained to 2.5 seconds through 10 seconds. The default value is 10 seconds.

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>RelativeTime</td>
<td>10 seconds</td>
<td>M, R/W</td>
</tr>
</tbody>
</table>

### Operations / Methods:

- **create()**: This operation provides the ability to dynamically create new instances of this object.
- **delete()**: This operation provides the ability to dynamically delete existing instances of this object.
- **retrieve()**: This operation provides the ability to dynamically query attribute values of existing instances of this object.
- **modify()**: This operation provides the ability to dynamically update configurable attributes (e.g., attributes with read-write access) of existing instances of this object.

### Relationships:

The EthOamCcCfg object is contained under the EthMp object.
**EthOamCcCfg** is associated with:

**EthMp: MaintenanceEndPoints** – Provides a pointer to a peerMp object instance that contains a list of peer MEP identifiers. This is only required when multicastEnabled is set to unicast (false).
**EthMeg: MaintenanceEntityGroup** – For the MEG ID and the MED Level at which the MEP exists.

<table>
<thead>
<tr>
<th>Reportable Notifications:</th>
</tr>
</thead>
<tbody>
<tr>
<td>objectCreation</td>
</tr>
<tr>
<td>objectDeletion</td>
</tr>
</tbody>
</table>

### 9.3.1.2 EthOamCcStats (Ethernet Continuity Check Statistics)

**Behavior:**
This object contains the counter and status attributes for the ETH-CC function.

Instances of this managed object are created automatically by the MEP when the ETH-CC operation is executed (e.g., an EMS enables EthOamCcCfg).

<table>
<thead>
<tr>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>numCcmOut</td>
</tr>
<tr>
<td>numCcmOutOfSequenceIn</td>
</tr>
<tr>
<td>portStatusTlv</td>
</tr>
<tr>
<td>interfaceStatusTlv</td>
</tr>
<tr>
<td>highestPriorityDefect</td>
</tr>
</tbody>
</table>
the defect named in the variable highestDefect

| highestDefect | An enumerated value indicating the highest priority defect among the variables xconCCMdefect, errorCCMdefect, someRMEPCCMdefect, someMACstatusDefect, and someRDIdefect, as limited by lowestPriorityDefect. | HighestDefectType | M, R |
| defectsPresent | See dot1agCfmMepDefects. Also add allRMEPsDead | MepDefectsBitMap | M, R |
| errorCcmLastFailure | This attribute indicates the last-received CCM that triggered an DefErrorCCM fault. | CcmLastFaultType | M, R |
| xconCcmLastFailure | This attribute indicates the last-received CCM that triggered a DefXconCCM fault. | CcmLastFaultType | M, R |

Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
</tbody>
</table>

Relationships:

The EthOamCcStats object is contained under the EthOamCcCf object.

Reportable Notifications:

| objectCreation | O |
| objectDeletion | O |

9.3.2 Loopback
Figure 9-7 Loopback Activity Diagram
9.3.2.1  EthOamLbCfg (Ethernet Loopback Configuration)

**Behavior:**
This object includes configuration attributes and operations for the on-demand Ethernet OAM Fault Management Loopback function (ETH-LB) as defined in Y.1731 and 802.1ag. ETH-LM can be used for the following applications:
- To verify bidirectional connectivity of a MEP with a MIP or a peer MEP.
- To perform a bidirectional in-service or out-of-service diagnostics test between a pair of peer MEPS. This includes verifying bandwidth throughput, detecting bit errors, etc.
The OAM PDU used for ETH-LB request information is LBM. The OAM PDU used for ETH-LB reply is LBR. Unicast frames carrying the LBM PDU are called Unicast LBM frames. Unicast frames carrying the LBR PDU are called Unicast LBR frames. Multicast frames carrying the LBM PDU are called Multicast LBM frames. Multicast frames carrying the LBR PDU are called Multicast LBR frames.
This object is part of the Fault Verification OAM Use Case. This functionality is similar to a 'ping'.

Instances of this managed object are created automatically by the EMS when EthMp is created. Instances of this managed object may also be created and deleted by request of the EMS.

**Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>multicastEnabled</td>
<td>This attribute specifies whether a MEP uses unicast or multicast to send the ETH-LM messages (LBM/LBR). A MEP can send ETH-LM messages to unicast or multicast MAC addresses. The value 'true' indicates multicast is enabled. The value 'false' indicates unicast is enabled.</td>
<td>Boolean</td>
<td>false</td>
<td>O, R/W</td>
</tr>
<tr>
<td>interval</td>
<td>This attribute specifies the period between LBM transmissions in a LB Session. For an LB Session, the period for LBM transmission is configurable in the range 0 (send the next LBM upon receipt of last LBR) and sixty seconds (60 s).</td>
<td>Integer</td>
<td>1</td>
<td>M, R/W</td>
</tr>
<tr>
<td>frameSize</td>
<td>This attribute specifies the LBM frame size. For an LB Session, the size of the LBM frame is configurable to any Ethernet frame size between 64 Bytes and the maximum transmission unit of the EVC. The inclusion of the Data TLV in a specific LBM is dependent on the frame size requested. Units are Bytes.</td>
<td>Integer</td>
<td>64</td>
<td>M, R/W</td>
</tr>
<tr>
<td>attribute</td>
<td>description</td>
<td>Priority Type</td>
<td>Access</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>priority</td>
<td>This attribute specifies the priority of Multicast or Unicast frames with ETH-LB request information. The default value of the CoS of a LBM frame MUST be the value which yields the lowest frame loss performance for this EVC.</td>
<td></td>
<td>M*, R/W (* Defined in Y.1731)</td>
<td></td>
</tr>
<tr>
<td>dropEligible</td>
<td>This attribute specifies the eligibility of frames with Unicast or Multicast ETH-LB information to be discarded when congestion conditions are encountered. The value 'true' indicates frames are eligible to be discarded. The value 'false' indicates frames are not eligible to be discarded.</td>
<td>Boolean</td>
<td>false</td>
<td></td>
</tr>
<tr>
<td>data</td>
<td>This attribute specifies an arbitrary element to include in the Data TLV, if the Data TLV is selected to be sent, whose length and contents are configurable at the MEP. The contents can be a test pattern and an optional checksum. Examples of test patterns include pseudo-random bit sequence, all '0' pattern, etc. For bidirectional diagnostic test application, configuration is required for a test signal generator and a test signal detector associated with the MEP. This size is constrained to 0 to 1500 octets. This attribute is optional and it's usage is currently not defined within the MEF.</td>
<td>TestPatternType</td>
<td>O, R/W</td>
<td></td>
</tr>
<tr>
<td>numLbmsToTx</td>
<td>This attribute specifies the number of LBM transmissions to perform in an LB session. This attribute is configurable in the range of 0 (repeated until aborted) through 3600.</td>
<td>Integer</td>
<td>M, R/W</td>
<td></td>
</tr>
</tbody>
</table>
### LbmMsgStatus

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>LbmMsgStatus</td>
<td>This attribute, if 'true', indicates another Loopback request message may be transmitted. This attribute is used as a thread locking flag to ensure only one EMS can initiate an LB Session. An EMS should verify this attribute is 'true' before triggering a Loopback request message. An EMS should set this attribute to 'false' to lock out other EMSs while it performs an LB Session. Once an EMS has completed an LB Session, it should set this attribute back to 'true'.</td>
<td>Boolean</td>
<td>true</td>
<td>M***, R/W (*** Defined in IEEE 802.1ag)</td>
</tr>
</tbody>
</table>

### Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>create()</td>
<td>This operation provides the ability to dynamically create new instances of this object.</td>
</tr>
<tr>
<td>delete()</td>
<td>This operation provides the ability to dynamically delete existing instances of this object.</td>
</tr>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
<tr>
<td>modify()</td>
<td>This operation provides the ability to dynamically update configurable attributes (e.g., attributes with read-write access) of existing instances of this object.</td>
</tr>
<tr>
<td>abortEthOamLb()</td>
<td>This operation provides the ability to abort a currently running on-demand ETH-LB function.</td>
</tr>
<tr>
<td>triggerEthOamLb()</td>
<td>This operation provides the ability to administratively trigger on-demand ETH-LB, based on the configured attributes as well as the NumLbms and MipMacAddr input parameters. The NumLbms input parameter specifies the number of LBMs to transmit. The MipMacAddr input parameter specifies a destination MIP MAC Address or NULL if the destination is a MEP. The default value for the number of LBM transmissions (NumLbms input parameter) in an LB session is 3. This operation blocks until the number of LBM messages, specified by NumLbms, has been transmitted.</td>
</tr>
</tbody>
</table>

### Operation Parameters:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>MipMacAddr</td>
<td>This input parameter specifies a destination MIP MAC Address. If the destination is a MEP, this parameter is not used (NULL) and the EthMepPeerInfo object is used instead.</td>
<td>MacAddress</td>
<td></td>
<td>in</td>
</tr>
<tr>
<td>NumLbms</td>
<td>This input parameter specifies the number of LBM messages this MEP should transmit. The default value is three.</td>
<td>Integer</td>
<td></td>
<td>in</td>
</tr>
<tr>
<td>LbmMsgResults</td>
<td>This return parameter indicates the result of the ETH-LB operation. A value of 'true' indicates Loopback message(s) will be (or has been) transmitted. A value of 'false' indicates Loopback message(s) will not be sent.</td>
<td>Boolean</td>
<td>out</td>
<td></td>
</tr>
</tbody>
</table>

**Relationships:**
The EthOamLbCfg object is contained under the EthMep object.

EthOamLbCfg is associated with:

- **EthMep: MaintenanceEndPoints** – For the unicast or multicast peer MEP MAC Address for which the loopback is performed.
- **EthMeg: MaintenanceEntityGroup** – For the MEG Level at which the MEP exists.

**Reportable Notifications:**

| objectCreation | M |
| objectDeletion | M |

### 9.3.2.2 EthOamLbStats (Ethernet Loopback Statistics)

**Behavior:**

This object contains the counter and status attributes for the ETH-LB function.

Instances of this managed object are created automatically by the MEP when the ETH-LB operation is executed (e.g., an EMS initiates an LB Session).

**Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>numLbrlnlnOrder</td>
<td>This attribute contains the count of the total number of valid, in order Loopback reply messages received.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
<tr>
<td>numLbrlnOutofOrder</td>
<td>This attribute contains the count of the total number of valid, out-of-order Loopback reply messages received.</td>
<td>Integer</td>
<td>0</td>
<td>M**, R</td>
</tr>
<tr>
<td>numLbrlnBadMdsu</td>
<td>This attribute contains the count of the total number of Loopback reply messages received whose mac_service_data_unit did not match (except for the OpCode) that of the corresponding Loopback request message.</td>
<td>Integer</td>
<td>0</td>
<td>M***, R</td>
</tr>
<tr>
<td>numLbmInCrcErrors</td>
<td>This attribute contains the count of the total number of LBR messages received with CRC errors. This attribute is only applicable when the LBM/LBR messages contain the Data TLV (Test Pattern).</td>
<td>Integer</td>
<td>0</td>
<td>M**, R</td>
</tr>
</tbody>
</table>
### numLbmInBerErrors
This attribute contains the count of the total number of LBR messages received with BERR errors. This attribute is only applicable when the LBM/LBR messages contain the Data TLV (Test Pattern). This counter is a subset of the numLbrlnBadMdsu counter and is included in that counter value.

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integer</td>
<td>0</td>
<td>M**, R (Defined in G.8021)</td>
</tr>
</tbody>
</table>

### numLbrOut
This attribute contains the count of the total number of Loopback reply messages transmitted.

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
</tbody>
</table>

### firstLbmTransId
This attribute indicates the transaction identifier of the first Loopback request message (to be) sent. This attribute has no meaning if the attribute lbmMsgResults has a value of 'false'.

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integer</td>
<td></td>
<td>M***, R (Defined in CFM MIB)</td>
</tr>
</tbody>
</table>

### nextLbmTransId
This attribute contains the next sequence number/transaction identifier to be sent in a Loopback message.

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integer</td>
<td></td>
<td>M***, R (Defined in CFM MIB)</td>
</tr>
</tbody>
</table>

### Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
</tbody>
</table>

### Relationships:
The **EthOamLbStats** object is contained under the **EthOamLbCfg** object.

### Reportable Notifications:

<table>
<thead>
<tr>
<th>Event</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>objectCreation</td>
<td>O</td>
</tr>
<tr>
<td>objectDeletion</td>
<td>O</td>
</tr>
</tbody>
</table>

### 9.3.3 Link Trace
Figure 9-8 Link Trace Activity Diagram
9.3.3.1 EthOamLtCfg (Ethernet Link Trace Configuration)

**Behavior:**
This object includes configuration attributes and operations for the on-demand Ethernet OAM Fault Management Link Trace function (ETH-LT) as defined in Y.1731 and 802.1ag. ETH-LT can be used for the following applications:
- Adjacent Relation Retrieval: Used to retrieve adjacency relationship between a MEP and a remote MEP or MIP. The result of running ETH-LT function is a sequence of MIPs from the source MEP until the target MIP or MEP, where each MIP and/or MEP is identified by its MAC address.
- Fault Localization: When a fault (e.g. a link and/or a device failure) or a forwarding plane loop occurs, the sequence of MIPs and/or MEP will likely be different from the expected one. Difference in the sequences provides information about the fault location.

The OAM PDU used for ETH-LT request information is LTM. The OAM PDU used for ETH-LT reply is LTR.

This object is part of the Fault Isolation OAM Use Case.

Instances of this managed object are created automatically by the EMS when EthMp is created. Instances of this managed object may also be created and deleted by request of the EMS.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>priority</td>
<td>This attribute specifies the priority of frames with ETH-LT request information.</td>
<td>PriorityType</td>
<td>M, R/W</td>
<td></td>
</tr>
<tr>
<td>dropEligible</td>
<td>This attribute specifies the eligibility of frames with ETH-LT information to be discarded when congestion conditions are encountered. The value 'true' indicates frames are eligible to be discarded. The value 'false' indicates frames are not eligible to be discarded. This attribute may be constrained to read-only in some implementations.</td>
<td>Boolean</td>
<td>false</td>
<td>O, R or R/W</td>
</tr>
<tr>
<td>ttl</td>
<td>This attribute allows the receiver to determine if frames with ETH-LT request information can be terminated. TTL is decremented every time frames with ETH-LT request information are relayed. Frames with ETH-LT request information with TTL&lt;=1 are not relayed.</td>
<td>byte</td>
<td>64</td>
<td>M, R/W</td>
</tr>
<tr>
<td>flags</td>
<td>This attribute specifies the flags field for LTMs transmitted by the MEP.</td>
<td>LtmFlagsType</td>
<td>useFdbOnly</td>
<td>M, R/W</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>Type</td>
<td>Access</td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>ItmMsgStatus</td>
<td>This attribute, if 'true', indicates another LinkTrace request message may be transmitted. This attribute is used as a thread locking flag to ensure only one EMS can initiate an LT Session. An EMS should verify this attribute is 'true' before triggering a Link Trace request message. An EMS should set this attribute to 'false' to lock out other EMSs while it performs an LT Session. Once an EMS has completed an LT Session, it should set this attribute back to 'true'.</td>
<td>Boolean</td>
<td>M, R/W</td>
<td></td>
</tr>
<tr>
<td>ItmEgressId</td>
<td>This attribute identifies the MEP Linktrace Initiator that is originating, or the Linktrace Responder that is forwarding, this LTM. This is composed of eight octets. The low-order six octets contain a 48-bit IEEE MAC address unique to the system in which the MEP Linktrace Initiator or Linktrace Responder resides. The high-order two octets contain a value sufficient to uniquely identify the MEP Linktrace Initiator or Linktrace Responder within that system. For most Bridges, the address of any MAC attached to the Bridge will suffice for the low-order six octets, and 0 for the high-order octets. In some situations, e.g., if multiple virtual Bridges utilizing emulated LANs are implemented in a single physical system, the high-order two octets can be used to differentiate among the transmitting entities.</td>
<td>HexBinary</td>
<td>M, R</td>
<td></td>
</tr>
<tr>
<td>lastLtmTransId</td>
<td>This attribute indicates the LTM transaction identifier of the last LTM transmitted.</td>
<td>Integer</td>
<td>M, R</td>
<td></td>
</tr>
<tr>
<td>nextLtmTransId</td>
<td>This attribute indicates the LTM transaction identifier/sequence number to be used in the next LTM transmitted.</td>
<td>Integer</td>
<td>M, R</td>
<td></td>
</tr>
<tr>
<td>numLtrInUnexp</td>
<td>This attribute indicates the total number of unexpected LTRs received.</td>
<td>Integer</td>
<td>M, R</td>
<td></td>
</tr>
</tbody>
</table>

### Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>create()</td>
<td>This operation provides the ability to dynamically create new instances of this object.</td>
</tr>
<tr>
<td>delete()</td>
<td>This operation provides the ability to dynamically delete existing instances of this object.</td>
</tr>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
<tr>
<td>modify()</td>
<td>This operation provides the ability to dynamically update configurable attributes (e.g., attributes with read-write access) of existing instances of this object.</td>
</tr>
<tr>
<td>abortEthOamLt()</td>
<td>This operation provides the ability to abort a currently running on-demand ETH-LT function.</td>
</tr>
<tr>
<td>triggerEthOamLt()</td>
<td>This operation provides the ability to administratively trigger on-demand ETH-LT, based on the configured attributes as well as the MipMacAddr input parameter. The MipMacAddr input parameter specifies a destination MIP MAC Address or NULL if the destination is a MEP. This operation blocks until the LT Session has completed.</td>
</tr>
</tbody>
</table>

### Operation Parameters:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>MipMacAddr</td>
<td>This input parameter specifies a destination MIP MAC Address. If the destination is a MEP, this parameter is not used (NULL) and the EthMepPeerInfo object is used instead.</td>
<td>MacAddress</td>
<td>in</td>
<td></td>
</tr>
<tr>
<td>LtmMsgResults</td>
<td>This return parameter indicates the result of the ETH-LT operation. A value of 'true' indicates Link Trace message(s) will be (or has been) transmitted. A value of 'false' indicates Link Trace message(s) will not be sent.</td>
<td>Boolean</td>
<td>out</td>
<td></td>
</tr>
</tbody>
</table>

### Relationships:
The \texttt{EthOamLtCfg} object is contained under the \texttt{EthMep} object.

\texttt{EthOamLtCfg} is associated with:
\begin{itemize}
  \item \texttt{EthMp: MaintenanceEndPoints} – For the target MEP MAC Address for which the linktrace is performed.
  \item \texttt{EthMeg: MaintenanceEntityGroup} – For the MEG Level at which the MEP exists.
\end{itemize}

<table>
<thead>
<tr>
<th>Reportable Notifications:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>objectCreation</td>
<td>M</td>
</tr>
<tr>
<td>objectDeletion</td>
<td>M</td>
</tr>
</tbody>
</table>

### 9.3.3.2 EthOamLtrStats (Ethernet Link Trace Response Statistics)

#### Behavior:
This object contains the LTR counter and status attributes for the ETH-LT function. Upon successfully initiating the transmission, the attributes lastLtmTransId and ltmEgressId from the EthOamLtCfg object return the information required to recover the results of the LTM from this object.

Instances of this managed object are created automatically by the MEP when the ETH-LT operation is executed (e.g., an EMS initiates an LT Session).

<table>
<thead>
<tr>
<th>Attributes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>ttl</td>
<td>This attribute indicates the TTL field value for a returned LTR.</td>
</tr>
<tr>
<td>forwarded</td>
<td>This attribute indicates if a LTM was forwarded by the responding MP, as returned in the 'FwdYes' flag of the flags field.</td>
</tr>
<tr>
<td>terminalMEP</td>
<td>This attribute indicates whether the forwarded LTM reached a MEP enclosing its MA, as returned in the Terminal MEP flag of the Flags field.</td>
</tr>
<tr>
<td>lastEgressIdTlv</td>
<td>This attribute contains the eight octet field holding the Last Egress Identifier returned in the LTR Egress Identifier TLV of the LTR. The Last Egress Identifier identifies the MEP Linktrace Initiator that originated, or the Linktrace Responder that forwarded, the LTM to which this LTR is the response. This is the same value as the Egress Identifier TLV of that LTM.</td>
</tr>
<tr>
<td>Attribute</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>nextEgressIdTlv</td>
<td>This attribute contains an eight octet field holding the Next Egress Identifier returned in the LTR Egress Identifier TLV of the LTR. The Next Egress Identifier Identifies the Linktrace Responder that transmitted this LTR, and can forward the LTM to the next hop. This is the same value as the Egress Identifier TLV of the forwarded LTM, if any. If the FwdYes bit of the Flags field is false, the contents of this field are undefined, i.e., any value can be transmitted, and the field is ignored by the receiver.</td>
</tr>
<tr>
<td>relay</td>
<td>This attribute contains the value returned in the Relay Action field.</td>
</tr>
<tr>
<td>chassisIdSubtype</td>
<td>This attribute specifies the format of the Chassis ID returned in the Sender ID TLV of the LTR, if any. This value is meaningless if the ChassisId has a length of 0.</td>
</tr>
<tr>
<td>chassisId</td>
<td>This attribute indicates the Chassis ID returned in the Sender ID TLV of the LTR, if any. The format of this object is determined by the value of the ChassisIdSubtype attribute.</td>
</tr>
<tr>
<td>mgtAddrDomain</td>
<td>This attribute indicates the TDomain that identifies the type and format of the related MgtAddr attribute, used to access the SNMP agent of the system transmitting the LTR. Received in the LTR Sender ID TLV from that system.</td>
</tr>
<tr>
<td>mgtAddr</td>
<td>This attribute indicates the TAddress that can be used to access the SNMP agent of the system transmitting the LTR, received in the LTR Sender ID TLV from that system. If the related attribute MgtAddrDomain contains the value 'zeroDotZero', this attribute should return a zero-length OCTET STRING.</td>
</tr>
<tr>
<td>Attribute</td>
<td>Description</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>ingressAction</td>
<td>This attribute indicates the value returned in the Ingress Action Field of the LTM. The value ingNoTlv indicates that no Reply Ingress TLV was returned in the LTM.</td>
</tr>
<tr>
<td>ingressMacAddr</td>
<td>This attribute indicates the MAC address returned in the ingress MAC address field. If the ingressAction attribute contains the value ingNoTlv, then the contents of this attribute are meaningless.</td>
</tr>
<tr>
<td>ingressPortIdSubtype</td>
<td>This attribute indicates the format of the Ingress Port ID. If the ingressAction attribute contains the value ingNoTlv, then the contents of this attribute are meaningless.</td>
</tr>
<tr>
<td>ingressPortId</td>
<td>This attribute indicates the Ingress Port ID. The format of this attribute is determined by the value of the ingressPortIdSubtype object. If the ingressAction attribute contains the value ingNoTlv, then the contents of this attribute are meaningless.</td>
</tr>
<tr>
<td>egressAction</td>
<td>This attribute indicates the value returned in the Egress Action Field of the LTM. The value egrNoTlv indicates that no Reply Egress TLV was returned in the LTM.</td>
</tr>
<tr>
<td>egressMacAddr</td>
<td>This attribute indicates the MAC address returned in the egress MAC address field. If the egressAction attribute contains the value egrNoTlv, then the contents of this attribute are meaningless.</td>
</tr>
<tr>
<td>egressPortIdSubtype</td>
<td>This attribute indicates the format of the egress Port ID. If the egressAction attribute contains the value egrNoTlv, then the contents of this attribute are meaningless.</td>
</tr>
<tr>
<td>egressPortId</td>
<td>This attribute contains the Egress Port ID. The format of this attribute is determined by the value of the egressPortIdSubtype attribute. If the egressAction attribute contains the value egrNoTlv, then the contents of this attribute are meaningless.</td>
</tr>
<tr>
<td>organizationSpecifcTlv</td>
<td>HexBinary</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>This attribute indicates all Organization specific TLVs returned in the LTR, if any. This attribute includes all octets including and following the TLV Length field of each TLV, concatenated together. This attribute is an octet string of zero length or includes a length of 4 to 1500 octets.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Operations / Methods:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
</tbody>
</table>

**Relationships:**

The EthOamLtrStats object is contained under the EthOamLtCfg object. There may exist zero or more (0..*) EthOamLtrStats object instances for each instance of the EthOamLtCfg object. EthOamLtrStats instances are associated to a particular EthOamLtCfg instance through the lastLtmTransId and ltmEgressId attributes.

**Reportable Notifications:**

<table>
<thead>
<tr>
<th>objectCreation</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>objectDeletion</td>
<td>O</td>
</tr>
</tbody>
</table>
9.3.4 Signal Functions

Figure 9-9 Locked Activity Diagram
9.3.4.1 ethOamAisCfg (Ethernet Alarm Indication Signal Configuration)

**Behavior:**
This object includes configuration attributes and operations for the proactive Ethernet OAM Fault Management Alarm Indication Signal function (ETH-AIS) as defined in Y.1731. ETH-LT can be used for the following applications:
- Used to suppress alarms following detection of defect conditions (e.g., signal fail conditions when ETH-CC is enabled or AIS condition or LCK condition when ETH-CC is disabled.)
The OAM PDU used for ETH-AIS information is AIS.
This object is part of the Fault Identification OAM Use Case. This function is only applicable to MEPs.

Instances of this managed object are created automatically by the EMS when EthMp is created. Instances of this managed object may also be created and deleted by request of the EMS.

**Attributes**
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>enabled</td>
<td>This attribute specifies whether ETH-AIS transmission is enabled. The value 'true' indicates ETH-AIS transmission is enabled. The value 'false' indicates ETH-AIS transmission is disabled.</td>
<td>Boolean</td>
<td>true</td>
<td>M, R/W</td>
</tr>
<tr>
<td>interval</td>
<td>This attribute specifies the ETH-AIS transmission period. The default value is 1 frame per second.</td>
<td>IntervalTypeAisLck</td>
<td>1 s</td>
<td>M, R/W</td>
</tr>
<tr>
<td>priority</td>
<td>This attribute specifies the priority of frames with ETH-AIS information. If ETH-AIS is supported, the default value for the CoS for AIS frame MUST be the value which yields the lowest frame loss performance for this EVC.</td>
<td>PriorityType</td>
<td></td>
<td>O, R/W</td>
</tr>
<tr>
<td>dropEligible</td>
<td>This attribute specifies the eligibility of frames with ETH-AIS information to be discarded when congestion conditions are encountered. The value 'true' indicates frames are eligible to be discarded. The value 'false' indicates frames are not eligible to be discarded. This attribute may be constrained to read-only in some implementations</td>
<td>Boolean</td>
<td>false</td>
<td>O, R/W</td>
</tr>
</tbody>
</table>

Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>create</td>
<td>This operation provides the ability to dynamically create new instances of this object.</td>
</tr>
<tr>
<td>delete</td>
<td>This operation provides the ability to dynamically delete existing instances of this object.</td>
</tr>
<tr>
<td>retrieve</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
<tr>
<td>modify</td>
<td>This operation provides the ability to dynamically update configurable attributes (e.g., attributes with read-write access) of existing instances of this object.</td>
</tr>
</tbody>
</table>

Relationships:

The **EthOamAisCfg** object is contained under the **EthMep** object.

**EthOamAisCfg** is associated with:

**EthMeg. MaintenanceEntityGroup** – For the MEG Level at which the MEP exists.

Reportable Notifications:

<table>
<thead>
<tr>
<th>objectCreation</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>objectDeletion</td>
<td>O</td>
</tr>
</tbody>
</table>
9.3.4.2 EthOamLckCfg (Ethernet Lock Signal Configuration)

**Behavior:**
This object includes configuration attributes and operations for the on-demand Ethernet OAM Fault Management Locked Signal function (ETH-LCK) as defined in Y.1731. ETH-LCK can be used for the following applications:
- Used to communicate the administratively locking of a MEP and consequential interruption of data traffic forwarding towards the MEP expecting this traffic. This allows a MEP receiving ETH-LCK frames to distinguish between defect conditions and an administrative locking action.
- Used by other OAM functions which require a MEP to be administratively locked, such as for out-of-service testing.

The OAM PDU used for ETH-LCK information is LCK.

This object is part of the Fault Identification, Verification and Isolation OAM Use Case. This function is only applicable to MEPs.

Instances of this managed object are created automatically by the EMS when EthMp is created. Instances of this managed object may also be created and deleted by request of the EMS.

**Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>interval</td>
<td>This attribute specifies the ETH-LCK transmission period. This attribute may be constrained to the same value as configured for the ETH-AIS transmission period in some implementations. The default value is 1 frame per second.</td>
<td>IntervalTypeAisLck</td>
<td>1 s</td>
<td>M, R/W</td>
</tr>
<tr>
<td>priority</td>
<td>This attribute specifies the priority of frames with ETH-LCK information.</td>
<td>PriorityType</td>
<td>O, R/W</td>
<td></td>
</tr>
<tr>
<td>dropEligible</td>
<td>This attribute specifies the eligibility of frames with ETH-LCK information to be discarded when congestion conditions are encountered. The value 'true' indicates frames are eligible to be discarded. The value 'false' indicates frames are not eligible to be discarded. This attribute may be constrained to read-only in some implementations.</td>
<td>Boolean</td>
<td>false</td>
<td>O, R</td>
</tr>
</tbody>
</table>

**Operations / Methods:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
create()  This operation provides the ability to dynamically create new instances of this object.

delete()  This operation provides the ability to dynamically delete existing instances of this object.

retrieve()  This operation provides the ability to dynamically query attribute values of existing instances of this object.

modify()  This operation provides the ability to dynamically update configurable attributes (e.g., attributes with read-write access) of existing instances of this object.

triggerEthOamLck()  This operation provides the ability to administratively lock or unlock, based on the lockFlag parameter, a MEP. If lockFlag is 'lock', the MEP will be administratively locked. If lockFlag is 'unlock', the MEP will be administratively unlocked if previously locked.

Operation Parameters:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>lockFlag</td>
<td>This input parameter specifies the locking state. If lockFlag is 'lock', the MEP will be administratively locked. If lockFlag is 'unlock', the MEP will be administratively unlocked if previously locked.</td>
<td>AdminStateType</td>
<td>None</td>
<td>in</td>
</tr>
</tbody>
</table>

Relationships:
The EthOamLckCfg object is contained under the EthMep object.

EthOamLckCfg is associated with:
EthMeg: MaintenanceEntityGroup – For the MEG Level at which the MEP exists.

Reportable Notifications:

<table>
<thead>
<tr>
<th>Event</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>lockEvent</td>
<td>O</td>
</tr>
<tr>
<td>unlockEvent</td>
<td>O</td>
</tr>
<tr>
<td>objectCreation</td>
<td>O</td>
</tr>
<tr>
<td>objectDeletion</td>
<td>O</td>
</tr>
</tbody>
</table>

9.3.4.3  EthOamTestCfg (Ethernet Test Signal Configuration)

Behavior:
This object includes configuration attributes and operations for the on-demand OAM Fault Management Test function (ETH-TEST) defined in Y.1731. The OAM PDU used for ETH-TEST information is TST. This object is part of the Perform Turn Up Testing and Baselining OAM Use Case. This function is only applicable to MEPs.

Instances of this managed object are created automatically by the EMS when EthMp is created. Instances of
this managed object may also be created and deleted by request of the EMS.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>interval</td>
<td>This attribute specifies the ETH-TEST transmission period in milliseconds. Range for this attribute is 1000-60,000 ms.</td>
<td>Integer</td>
<td>1000 ms</td>
<td>O, R/W</td>
</tr>
<tr>
<td>priority</td>
<td>This attribute specifies the priority of frames with ETH-TEST information.</td>
<td>PriorityType</td>
<td>O, R/W</td>
<td></td>
</tr>
<tr>
<td>dropEligible</td>
<td>This attribute specifies the eligibility of frames with ETH-TEST information to be discarded when congestion conditions are encountered. The value 'true' indicates frames are eligible to be discarded. The value 'false' indicates frames are not eligible to be discarded. This attribute may be constrained to read-only in some implementations.</td>
<td>Boolean</td>
<td>false</td>
<td>O, R</td>
</tr>
<tr>
<td>frameSize</td>
<td>This attribute specifies the TST frame size. Units are Bytes.</td>
<td>Integer</td>
<td>64</td>
<td>O, R/W</td>
</tr>
<tr>
<td>data</td>
<td>This attribute specifies an arbitrary element to include in the Data TLV, if the Data TLV is selected to be sent, whose length and contents are configurable at the MEP. The contents can be a test pattern and an optional checksum. Examples of test patterns include pseudo-random bit sequence, all ‘0’ pattern, etc. For bidirectional diagnostic test application, configuration is required for a test signal generator and a test signal detector associated with the MEP. This size is constrained to 0</td>
<td>TestPatternType</td>
<td>None</td>
<td>O, R/W</td>
</tr>
</tbody>
</table>
### Phase 2 EMS-NMS Information Model Technical Specification

<table>
<thead>
<tr>
<th><strong>scheduledStartDateAndTime</strong></th>
<th>This attribute specifies the scheduled start date/time to perform the on-demand ETH-TEST operations. The default value for this attribute is the current system date and time which represents an immediate time.</th>
<th><strong>DateAndTime</strong></th>
<th><strong>Current Date and Time</strong></th>
<th>O, R/W</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>scheduledStopDateAndTime</strong></td>
<td>This attribute specifies the scheduled stop date/time to perform on-demand ETH-TEST operations. The stop date/time value should be greater than or equal to the scheduled start date/time value.</td>
<td><strong>DateAndTime</strong></td>
<td><strong>None</strong></td>
<td>O, R/W</td>
</tr>
<tr>
<td><strong>relativeStartTime</strong></td>
<td>This attribute specifies the relative start time, from the current system time, to perform on-demand ETH-TEST. The default value for this attribute is zero, indicating the current system time, which represents an immediate start time.</td>
<td><strong>RelativeTime</strong></td>
<td><strong>Immediate</strong></td>
<td>O, R/W</td>
</tr>
<tr>
<td><strong>durationTime</strong></td>
<td>This attribute specifies the duration of the Locking. The duration time can be specified as forever (represented by a zero value) or as relative time (e.g., a given number of hours, minutes, and seconds from the start time). If the duration time is relative time, then the duration time should be equal to or greater than the frame transmission period.</td>
<td><strong>RelativeTime</strong></td>
<td><strong>None</strong></td>
<td>O, R/W</td>
</tr>
</tbody>
</table>

### Operations / Methods:

<table>
<thead>
<tr>
<th><strong>Name</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>create()</td>
<td>This operation provides the ability to dynamically create new instances of this object.</td>
</tr>
<tr>
<td>delete()</td>
<td>This operation provides the ability to dynamically delete existing instances of this object.</td>
</tr>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
</tbody>
</table>
modify()  
This operation provides the ability to dynamically update configurable attributes (e.g., attributes with read-write access) of existing instances of this object.

abortEthOamTest()  
This operation provides the ability to abort a currently running on-demand ETH-Test function.

triggerEthOamTest()  
This operation provides the ability to perform a diagnostic test operation, based on the isSignalRcvr parameter, on a MEP. If isSignalRcvr is 'true', the MEP will be acting in the Test Signal Receiver role. If isSignalRcvr is 'false', the MEP will be acting in the Test Signal Generator role. The useScheduledTime input parameter specifies whether to use a relative start time and duration or a scheduled start and stop time. A 'true' value indicates the scheduled start and stop time attributes will be used. A 'false' value indicates a relative start time and duration will be used.

Note: for out-of-service testing, the MEP should be locked first, using the EthOamLckCfg instance.

Operation Parameters:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>isSignalRcvr</td>
<td>This input parameter specifies whether the MEP should act as a Signal Generator or Receiver. A 'true' value indicates the operation is being performed for a MEP acting in a Test Signal Receiver role. A 'false' value indicates the operation is being performed for a MEP acting in a Test Signal Generator role.</td>
<td>Boolean</td>
<td>None</td>
<td>in</td>
</tr>
<tr>
<td>useScheduledTime</td>
<td>This input parameter specifies whether to use a relative start time and duration or a scheduled start and stop time. A 'true' value indicates the scheduled start and stop time attributes will be used. A 'false' value indicates a relative start time and duration will be used.</td>
<td>Boolean</td>
<td>False</td>
<td>in</td>
</tr>
</tbody>
</table>

Relationships:
The EthOamTestCfg object is contained under the EthMep object.

EthOamTestCfg is associated with:
EthMeg: MaintenanceEntityGroup – For the MEG Level at which the MEP exists.

Reportable Notifications:
objectCreation          | O
objectDeletion          | O

9.3.4.4 EthOamTestStats (Ethernet Test Signal Statistics)

Behavior:
This object contains the counter attributes for the ETH-Test function.

Instances of this managed object are created automatically by the Local MEP and Remote MEP when the...
ETH-Tst operation is executed (e.g. an EMS initiates a ETH-Test Session). This object is used to capture statistics for both the sending and receiving MEP.st of the EMS.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>numTstIn</td>
<td>This attribute contains the count of the total number of TST messages received. The count is incremented when a message is received with or without errors. This attribute is only applicable to the MEP receiving ETH-Test messages.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>numTstInOutOfOrder</td>
<td>This attribute contains the count of the total number of valid, out-of-order TST messages received. The count is incremented when the sequence number in the TST message received does not match the expected sequence number. This attribute is only applicable to the MEP receiving ETH-Test messages.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>numTstInCrcErrors</td>
<td>This attribute contains the count of the total number of TST messages received with CRC errors. This attribute is only applicable to the MEP receiving ETH-Test messages.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>numTstInBerErrors</td>
<td>This attribute contains the count of the total number of TST messages received with BER errors. The count is incremented when the bit pattern in the received TST message does not match the expected bit pattern. This attribute is only applicable to the MEP receiving ETH-Test messages.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>numTstOut</td>
<td>This attribute contains the count of the total number of TST messages transmitted. This attribute is only applicable to the MEP sending ETH-Test messages. (i.e. The MEP under Test)</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
</tbody>
</table>

**Operations / Methods:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
</tbody>
</table>

**Relationships:**

The `EthOamTestStats` object is contained under the `EthOamTestCfg` object.

**Reportable Notifications:**

| objectCreation | O |
| objectDeletion | O |

### 9.4 Performance Monitoring Objects

The following diagrams illustrate the Performance Monitoring objects (UML classes) and their associations as defined in this specification.

![UML Class Diagrams](image)

**Figure 9-11 Performance Monitoring Inheritance Class Diagram**
9.4.1 Abstract Performance Monitoring Objects
This section defines abstract PM objects which are used by LM and DM objects through generalization (inheritance)

9.4.1.1 EthOamDmProactiveOneWayStats

**Behavior:**
This object contains the counter and measurement attributes for one-way proactive ETH-DM function. This object is not applicable for the two-way proactive or on-demand ETH-DM functions.

**Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>elapsedTime</td>
<td>This attribute indicates the amount of time which has elapsed in the current interval.</td>
<td>RelativeTime</td>
<td></td>
<td>M, R</td>
</tr>
<tr>
<td>num1DmIn</td>
<td>This attribute contains the count of the total number of 1DM messages received.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
<tr>
<td>num1DmOut</td>
<td>This attribute contains the count of the total number of 1DM messages transmitted.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
</tbody>
</table>

**Operations / Methods:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
**Relationships:**
The `EthOamDmProactiveOneWayStats` object is an abstract object is a generalization of the `EthOamDmProactiveStats` object.

**Reportable Notifications:**

---

### 9.4.1.2 `EthOamDmProactiveStats`

**Behavior:**
This object includes measurement counters common to the proactive one-way and two-way ETH-DM operations. This object is not applicable for the on-demand ETH-DM functions.

**Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>suspectIntervalFlag</td>
<td>This attribute indicates if there is a discontinuity in the performance measurements conducted during the measurement interval. Conditions for discontinuity include, but are not limited to, the following: 1. Per section 10.1.6.1 of [ITU-T G.7710/Y.1701], the local time-of-day clock is adjusted by at least 10 seconds. 2. The conducting of performance measurements is halted before the current measurement interval is completed. 3. A local test, failure, or reconfiguration disrupts service on the EVC.</td>
<td>Boolean</td>
<td>FALSE</td>
<td>M, R</td>
</tr>
<tr>
<td>avgFarEndFrameDelay</td>
<td>This attribute indicates the average measured far-end Frame Delay.</td>
<td>Integer</td>
<td>M</td>
<td>(For two way needs clock synchronization), R</td>
</tr>
<tr>
<td>avgFarEndInterFrameDelayVariation</td>
<td>This attribute indicates the average measured far-end Inter-Frame Delay Variation.</td>
<td>Integer</td>
<td>O, R</td>
<td></td>
</tr>
<tr>
<td>maxFarEndFrameDelay</td>
<td>This attribute indicates the maximum</td>
<td>Integer</td>
<td>O</td>
<td>(with clock synchronization),</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
<td>Type</td>
<td>Default Value</td>
<td>Qualifier</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------------</td>
<td>---------------</td>
<td>-----------</td>
</tr>
<tr>
<td>maxFarEndInterFrameDelayVariation</td>
<td>This attribute indicates the maximum measured far-end Inter-Frame Delay Variation.</td>
<td>Integer</td>
<td>O, R</td>
<td></td>
</tr>
<tr>
<td>minFarEndFrameDelay</td>
<td>This attribute indicates the minimum measured far-end Frame Delay.</td>
<td>Integer</td>
<td>O (With clock synchronization), R</td>
<td></td>
</tr>
<tr>
<td>minFarEndInterFrameDelayVariation</td>
<td>This attribute indicates the minimum measured far-end Inter-Frame Delay Variation</td>
<td>Integer</td>
<td>O, R</td>
<td></td>
</tr>
</tbody>
</table>

**Operations / Methods:**

- **retrieve()**
  - This operation provides the ability to dynamically query attribute values of existing instances of this object.

- **reset()**
  - This operation provides the ability to dynamically reset (to zero) attribute values of existing instances of this object.

**Relationships:**

The EthOamDmProactiveStats object is an abstract object.

**Reportable Notifications:**

### 9.4.1.3 EthOamDmProactiveTwoWayStats

**Behavior:**

This object contains the counter and measurement attributes for two-way proactive ETH-DM function. This object is not applicable for the one-way proactive or on-demand ETH-DM functions.

**Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>elapsedTime</td>
<td>This attribute indicates the amount of time which has elapsed in the current interval.</td>
<td>RelativeTime</td>
<td></td>
<td>M, R</td>
</tr>
<tr>
<td>avgBidirectionalFrameDelay</td>
<td>This attribute indicates the average measured bidirectional Frame Delay.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
<tr>
<td>Attribute</td>
<td>Description</td>
<td>Type</td>
<td>Default</td>
<td>Allowed Values</td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------</td>
<td>---------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>avgBidirectionalInterFrameDelayVariation</td>
<td>This attribute indicates the average measured bidirectional Inter-Frame Delay Variation.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>avgNearEndFrameDelay</td>
<td>This attribute indicates the average measured near-end Frame Delay.</td>
<td>Integer</td>
<td>0</td>
<td>C (M with Clock Sync), R</td>
</tr>
<tr>
<td>avgNearEndInterFrameDelayVariation</td>
<td>This attribute indicates the average measured near-end Inter-Frame Delay Variation.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>maxBidirectionalFrameDelay</td>
<td>This attribute indicates the maximum measured bidirectional Frame Delay.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>maxBidirectionalInterFrameDelayVariation</td>
<td>This attribute indicates the maximum measured bidirectional Inter-Frame Delay Variation.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>maxNearEndFrameDelay</td>
<td>This attribute indicates the maximum measured near-end Frame Delay.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>maxNearEndInterFrameDelayVariation</td>
<td>This attribute indicates the maximum measured near-end Inter-Frame Delay Variation.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>Attribute Name</td>
<td>Description</td>
<td>Type</td>
<td>Value</td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td>-------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>minBidirectionalFrameDelay</td>
<td>This attribute indicates the minimum measured bidirectional Frame Delay.</td>
<td>Integer</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>minBidirectionalInterFrameDelayVariation</td>
<td>This attribute indicates the minimum measured bidirectional Inter-Frame Delay Variation.</td>
<td>Integer</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>minNearEndFrameDelay</td>
<td>This attribute indicates the minimum measured near-end Frame Delay.</td>
<td>Integer</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>minNearEndInterFrameDelayVariation</td>
<td>This attribute indicates the minimum measured near-end Inter-Frame Delay Variation.</td>
<td>Integer</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>numDmmOut</td>
<td>This attribute contains the count of the total number of DMM messages transmitted.</td>
<td>Integer</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>numDmrIn</td>
<td>This attribute contains the count of the total number of DMR reply messages received.</td>
<td>Integer</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**Operations / Methods:**

**Relationships:**

The EthOamDmProactiveTwoWayStats object is an abstract object is a generalization of the EthOamDmProactiveStats object.

**Reportable Notifications:**
9.4.1.4 EthOamPerfMonCfg

**Behaviour:**
This object includes configuration attributes and operations common to the ETH-DM and ETH-LM OAM operations.

**Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>dropEligible</td>
<td>This attribute specifies the eligibility of frames with Performance Monitoring OAM message information to be discarded when congestion conditions are encountered. The value 'true' indicates frames are eligible to be discarded. The value 'false' indicates frames are not eligible to be discarded. This attribute may be constrained to read-only in some implementations.</td>
<td>Boolean</td>
<td>false</td>
<td>M, R/W</td>
</tr>
<tr>
<td>durationTime</td>
<td>This attribute specifies the duration of the Delay Measurement PM Session. The duration time can be specified as forever (represented by a zero value) or as relative time (e.g., a given number of hours, minutes, and seconds from the start time). If the duration time is relative time, then the duration time should be equal to or greater than the frame transmission period of the PM function(s) comprising the PM Solution.</td>
<td>RelativeTime</td>
<td>forever</td>
<td>M, R/W</td>
</tr>
<tr>
<td>enabled</td>
<td>This attribute specifies whether proactive Performance Monitoring OAM message transmission (OAM PDUs as specified by the 'type' attribute) is enabled. The value 'true' indicates OAM message transmission is enabled. The value 'false' indicates OAM message transmission is disabled. This attribute has no meaning for on-demand Performance Monitoring.</td>
<td>Boolean</td>
<td>false</td>
<td>O, R/W</td>
</tr>
<tr>
<td>Attribute</td>
<td>Description</td>
<td>Type</td>
<td>Value</td>
<td>Access</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------</td>
<td>-------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>interval</td>
<td>This attribute specifies the Performance Monitoring OAM message transmission period in milliseconds. For Performance Monitoring applications the default value is 100 ms. For on-demand Performance Monitoring, this attribute would be a zero value as it is not applicable.</td>
<td>IntervalType</td>
<td>100</td>
<td>M, R/W</td>
</tr>
<tr>
<td>measurementInterval</td>
<td>This attribute specifies a measurement interval which is multiples of 5 minutes. Units are minutes.</td>
<td>Integer</td>
<td>15</td>
<td>M, R/W</td>
</tr>
<tr>
<td>priority</td>
<td>This attribute specifies the priority of frames with Performance Monitoring OAM message information. The value 'true' indicates frames are eligible to be discarded. The value 'false' indicates frames are not eligible to be discarded.</td>
<td>PriorityType</td>
<td>Highest allowed on the bridge port</td>
<td>M, R/W</td>
</tr>
<tr>
<td>relativeStartTime</td>
<td>This attribute specifies the relative start time, from the current system time, to perform on-demand ETH-DM. This attribute has no meaning for proactive ETH-DM. The default value for this attribute is zero, indicating the current system time, which represents an immediate start time.</td>
<td>RelativeTime</td>
<td>O</td>
<td>R/W</td>
</tr>
<tr>
<td>repetitionPeriod</td>
<td>This attribute specifies a configurable repetition periodicity time per instance of a Delay PM Solution. The repetition periodicity time can be specified as none or in relative time (e.g., every given number of hours, minutes, and seconds from the start time). If the duration time is forever, then the repetition periodicity time should be none. If the duration time is relative time and the repetition periodicity time is relative time, then the repetition periodicity time should be equal to or greater than the duration time. The default configured repetition periodicity time is none.</td>
<td>RelativeTime</td>
<td>None</td>
<td>M, R/W</td>
</tr>
</tbody>
</table>
### scheduledStartDateAndTime

This attribute specifies the scheduled start date/time to perform the on-demand Performance Monitoring OAM operations. This attribute has no meaning for proactive Performance Monitoring OAM operations. The default value for this attribute is the current system date and time.

<table>
<thead>
<tr>
<th>DateAndTime</th>
<th>Immediate</th>
<th>M, R/W</th>
</tr>
</thead>
</table>

### scheduledStopDateAndTime

This attribute specifies the scheduled stop date/time to perform on-demand Performance Monitoring OAM operations. This attribute has no meaning for proactive Performance Monitoring OAM operations. The stop date/time value should be greater than or equal to the scheduled start date/time value.

<table>
<thead>
<tr>
<th>DateAndTime</th>
<th>M, R/W</th>
</tr>
</thead>
</table>

### vlanPcp

This attribute specifies a configurable VLAN PCP for Performance Monitoring OAM message frame transmission. The default configured VLAN PCP should correspond to the CoS which yields the lowest frame delay performance for this EVC. This is not applicable if the MEG is untagged.

<table>
<thead>
<tr>
<th>Integer</th>
<th>M, R/W</th>
</tr>
</thead>
</table>

### Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>create()</td>
<td>This operation provides the ability to dynamically create new instances of this object.</td>
</tr>
<tr>
<td>delete()</td>
<td>This operation provides the ability to dynamically delete existing instances of this object.</td>
</tr>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
<tr>
<td>modify()</td>
<td>This operation provides the ability to dynamically update configurable attributes (e.g., attributes with read-write access) of existing instances of this object.</td>
</tr>
</tbody>
</table>

### Relationships:

The `EthOamPerfMonCfg` object is an abstract object.

### Reportable Notifications:

<table>
<thead>
<tr>
<th>9.4.2 Loss Measurement</th>
<th></th>
</tr>
</thead>
</table>
9.4.2.1 EthOamLmCfg (Ethernet Loss Measurement Configuration)

**Behavior:**

**Figure 9-13 On-Demand Single-Ended Loss Measurement Activity Diagram**
This object includes configuration attributes and operations for the single-ended on-demand and dual-ended proactive Performance Monitoring Frame Loss Measurement function (ETH-LM) defined in Y.1731. ETH-LM can be used for the following applications:
- Facilitates performing near-end and far-end frame loss measurements
- Facilitates determining unavailable time

The OAM PDU used for single-ended ETH-LM request is LMM. The OAM PDU used for single-ended ETH-LM reply is LMR. The OAM PDU used for dual-ended ETH-LM information is CCM, where the CCM transmission period is configured for the Performance Monitoring application.

This object is part of the Measure Frame Loss and Calculate Availability OAM Use Cases. This functionality is similar to a 'ping'. This function is only applicable to MEPs.

Instances of this managed object are created automatically by the EMS when EthMp is created. Instances of this managed object may also be created and deleted by request of the EMS.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>This attribute specifies whether single-ended on-demand or dual-ended proactive ETH-LM will be performed. If dual-ended ETH-LM is configured, the enabled attribute is used to enable or disable dual-ended ETH-LM. If single-ended ETH-LM is configured, the startTime and endTime attributes are used to trigger single-ended ETH-LM.</td>
<td>LossMeasType</td>
<td>singleEnded</td>
<td>M, R/W</td>
</tr>
<tr>
<td>availabilityNumConsecutiveFlrMeas</td>
<td>This attribute specifies a configurable number of consecutive FLR measurements to be used in evaluating the availability/unavailability status of an availability indicator per [MEF 10.1]. The number range of 1 through 10 is supported. This parameter is equivalent to the Availability parameter of 'n' as specified by [MEF 10.1].</td>
<td>Integer</td>
<td>10</td>
<td>M, R/W</td>
</tr>
</tbody>
</table>
### availabilityThreshold
This attribute specifies a configurable availability threshold to be used in evaluating the availability/unavailability status of an availability indicator per [MEF 10.1]. The availability threshold range of 0.00 through 1.00 is supported. The configured availability threshold is less than or equal to the configured unavailability threshold specified by [MEF 10.1 R71]. This parameter is equivalent to the Availability parameter of 'Ca' as specified by [MEF 10.1].

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
<th>M, R/W</th>
</tr>
</thead>
<tbody>
<tr>
<td>float</td>
<td>0.50</td>
<td>M, R/W</td>
</tr>
</tbody>
</table>

### unavailabilityThreshold
This attribute specifies a configurable unavailability threshold to be used in evaluating the availability/unavailability status of an availability indicator per [MEF 10.1]. The unavailability threshold range of 0.00 through 1.00 is supported. The configured unavailability threshold is greater than or equal to the configured availability threshold specified by [MEF 10.1 R70]. This parameter is equivalent to the Availability parameter of 'Cu' as specified by [MEF 10.1].

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
<th>M, R/W</th>
</tr>
</thead>
<tbody>
<tr>
<td>float</td>
<td>0.50</td>
<td>M, R/W</td>
</tr>
</tbody>
</table>

### Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>abortEthOamLm()</td>
<td>This operation provides the ability to abort a currently running or scheduled single-ended on-demand ETH-LM function. This operation is not applicable to dual-ended proactive ETH-LM.</td>
</tr>
</tbody>
</table>
triggerEthOamLm() This operation provides the ability to trigger single-ended on-demand or dual-ended proactive ETH-LM based on the configured values of type, start date/time, and end date/time. For the dual-ended proactive ETH-LM operation, the input parameter 'useScheduledTime' is ignored since it only applies for the single-ended on-demand ETH-LM operation. This operation blocks until the LM Session has completed.

Operation Parameters:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>useScheduledTime</td>
<td>This input parameter specifies whether to use a relative start time and duration or a scheduled start and stop time. A 'true' value indicates the scheduled start and stop time attributes will be used. A 'false' value indicates a relative start time and duration will be used. This parameter is not applicable for the dual-ended on-demand operation.</td>
<td>Boolean</td>
<td>FALSE</td>
<td>in</td>
</tr>
<tr>
<td>lmmMsgResults</td>
<td>This return parameter indicates the result of the ETH-LM operation. A value of 'true' indicates LMM message(s) will be (or has been) transmitted. A value of 'false' indicates LMM message(s) will not be sent.</td>
<td>Boolean</td>
<td></td>
<td>out</td>
</tr>
</tbody>
</table>

Relationships:

The EthOamLmCfg object is contained under the EthMep object and is a generalization of the EthOamPerfMonCfg object.

EthOamLmCfg is associated with:
EthMep: MaintenanceEndpoints – For the unicast peer MEP MAC Address for which the frame loss measurement is performed.
EthMeg: MaintenanceEntityGroup – For the MEG Level at which the MEP exists.

Reportable Notifications:

<table>
<thead>
<tr>
<th>Name</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>objectCreation</td>
<td></td>
</tr>
<tr>
<td>objectDeletion</td>
<td></td>
</tr>
</tbody>
</table>

9.4.2.2 EthOamLmOnDemandSingleEndedStats (Ethernet Loss Measurement On-Demand Single-Ended Statistics)
Behavior:
This object contains the counter attributes for the single-ended on-demand ETH-LT function. This object is not applicable for the dual-ended proactive ETH-LT function.

Instances of this managed object are created automatically by the MEP when the single-ended on-demand ETH-LT operation is executed.

Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>nearEndTotTransmittedFrames</td>
<td>This attribute contains the total number of near-end, or egress, data frames transmitted by this MEP.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
<tr>
<td>nearEndTotLostFrames</td>
<td>This attribute contains the total number of near-end, or ingress, data frames lost by this MEP.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
<tr>
<td>nearEndTotFrameLossRatio</td>
<td>This attribute contains the total near-end frame loss ratio calculated by this MEP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>nearEndMinFrameLossRatio</td>
<td>This attribute contains the minimum near-end frame loss ratio calculated by this MEP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>nearEndMaxFrameLossRatio</td>
<td>This attribute contains the maximum near-end frame loss ratio calculated by this MEP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>nearEndAvgFrameLossRatio</td>
<td>This attribute contains the average near-end frame loss ratio calculated by this MEP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>farEndTotTransmittedFrames</td>
<td>This attribute contains the total number of far-end, or ingress, data frames transmitted by this MEP.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
<tr>
<td>farEndTotLostFrames</td>
<td>This attribute contains the total number of far-end, or egress, data frames lost by this MEP.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
<tr>
<td>farEndTotFrameLossRatio</td>
<td>This attribute contains the total far-end frame loss ratio calculated by this MEP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>farEndMinFrameLossRatio</td>
<td>This attribute contains the minimum far-end frame loss ratio calculated by this MEP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>farEndMaxFrameLossRatio</td>
<td>This attribute contains the maximum far-end frame loss ratio calculated by this MEP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>farEndAvgFrameLossRatio</td>
<td>This attribute contains the average far-end frame loss ratio calculated by this MEP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>numLmmOut</td>
<td>This attribute contains the count of the total number of LMM frames transmitted.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
<tr>
<td>Attribute</td>
<td>Description</td>
<td>Type</td>
<td>Default</td>
<td>Access</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------</td>
<td>---------</td>
<td>--------</td>
</tr>
<tr>
<td>numLmmIn</td>
<td>This attribute contains the count of the total number of LMM frames received.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
<tr>
<td>numLmrIn</td>
<td>This attribute contains the count of the total number of LMR frames received.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
<tr>
<td>numLmrOut</td>
<td>This attribute contains the count of the total number of LMR frames transmitted.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
</tbody>
</table>

### Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>reset()</td>
<td>This operation provides the ability to dynamically reset (to zero) attribute values of existing instances of this object.</td>
</tr>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
</tbody>
</table>

### Relationships:

The `EthOamLmTotalSingleEndedStats` object is contained under the `EthOamLmCfg` object.

### Reportable Notifications:

<table>
<thead>
<tr>
<th>Event</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>objectCreation</td>
<td>O</td>
</tr>
<tr>
<td>objectDeletion</td>
<td>O</td>
</tr>
</tbody>
</table>
9.4.3 Delay Measurement

Figure 9-14 On-Demand 2-Way Delay Measurement Activity Diagram
9.4.3.1 EthOamDmCfg (Ethernet Delay Measurement Configuration)

Behavior:
This object includes configuration attributes and operations for the one-way and two-way on-demand and proactive Performance Monitoring Frame Delay Measurement function (ETH-DM) defined in Y.1731. ETH-DM can be used for the following applications:
- Facilitates performing frame delay measurements
- Facilitates performing inter-frame delay variation measurements

The OAM PDU used for one-way ETH-DM information is 1DM. The OAM PDU used for two-way ETH-DM request is DMM. The OAM PDU used for two-way ETH-DM replies is DMR.

This object is part of the Measure Frame Delay and Measure Inter-frame Delay Variation OAM Use Cases. This function is only applicable to MEPs.

The one-way ETH-DM function is initiated at the local MEP and enabled at the remote MEP.

The two-way ETH-DM function is managed only at the local MEP. The remote MEP does not need any management.

Instances of this managed object are created automatically by the EMS when EthMp is created. Instances of this managed object may also be created and deleted by request of the EMS.

### Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>clockSyncFlag</td>
<td>This attribute specifies whether the clocks for both end points are synchronized. This attribute controls whether one-way measurements are computed.</td>
<td>Boolean</td>
<td>FALSE</td>
<td>O, R/W</td>
</tr>
<tr>
<td>frameSize</td>
<td>This attribute specifies the frame size in octets. The range of frame sizes from 64 through 2000 octets, in 4 octet increments, is supported, and the range of frame sizes from 2004 through 9600 octets, in 4 octet increments, may be supported.</td>
<td>Integer</td>
<td>64</td>
<td>M, R/W</td>
</tr>
<tr>
<td>measBinThreshold</td>
<td>This attribute specifies the threshold for a measurement bin (excluding the first measurement bin). The measurement threshold for each measurement bin must be larger than the measurement threshold of the preceding measurement bin. The unit for a measurement threshold is microseconds (µs). The measurement threshold of the first measurement bin is fixed to 0µs. The default configured measurement threshold for a measurement bin should be an increment of 5000µs larger than the</td>
<td>BinThresholdType</td>
<td></td>
<td>M, R/W</td>
</tr>
</tbody>
</table>
### Measurement Threshold

<table>
<thead>
<tr>
<th>Measurement Threshold of the Preceding Measurement Bin</th>
</tr>
</thead>
<tbody>
<tr>
<td>measurement threshold of the preceding measurement bin.</td>
</tr>
</tbody>
</table>

### numMeasBinsPerFrameDelayInterval

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>numMeasBinsPerFrameDelayInterval</td>
<td>This attribute specifies the number of measurement bins per measurement interval for Frame Delay measurements. The valid range of values is 3..10 bins.</td>
<td>Integer</td>
<td>3</td>
<td>M, R/W</td>
</tr>
</tbody>
</table>

### numMeasBinsPerInterFrameDelayVariationInterval

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>numMeasBinsPerInterFrameDelayVariationInterval</td>
<td>This attribute specifies the number of measurement bins per measurement interval for Inter-Frame Delay Variation measurements. The valid range of values is 1..10 bins.</td>
<td>Integer</td>
<td>1</td>
<td>O, R/W</td>
</tr>
</tbody>
</table>

### type

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>Type</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>This attribute indicates the type of delay measurement to be performed.</td>
<td>DelayMeasType</td>
<td>M, R/W</td>
</tr>
</tbody>
</table>

### Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>abortEthOamDm()</td>
<td>This operation provides the ability to abort a currently running or scheduled ETH-DM function.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>triggerEthOamLm()</td>
<td>This operation provides the ability to trigger single-ended on-demand or dual-ended proactive ETH-LM based on the configured values of type, start date/time, and end date/time. For the dual-ended proactive ETH-LM operation, the input parameter 'useScheduledTime' is ignored since it only applies for the single-ended on-demand ETH-LM operation. This operation blocks until the LM Session has completed.</td>
</tr>
</tbody>
</table>

### Operation Parameters:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>abortEthOamDm()</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>triggerEthOamLm()</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
useScheduledTime | This input parameter specifies whether to use a relative start time and duration or a scheduled start and stop time. A 'true' value indicates the scheduled start and stop time attributes will be used. A 'false' value indicates a relative start time and duration will be used. This parameter is not applicable for the dual-ended on-demand operation. | Boolean | FALSE | in

dmMsgResults | This return parameter indicates the result of the one-way or two-way ETH-DM operation. A value of 'true' indicates 1DM/DMM message(s) will be (or has been) transmitted. A value of 'false' indicates 1DM/DMM message(s) will not be sent. | Boolean | out

Relationships:
The EthOamDmCfg object is contained under the EthMep object and is a generalization of the EthOamPerfMonCfg object.

EthOamDmCfg is associated with:
EthMep: MaintenanceEndPoints – For the peer MEP MAC Address for which the delay measurement is performed.
EthMeg: MaintenanceEntityGroup – For the MEG Level at which the MEP exists.

Reportable Notifications:
- objectCreation
- objectDeletion

9.4.3.2 EthOamDmOnDemandOneWayStats (Ethernet Delay Measurement On-Demand 1-Way Statistics)

Behavior:
This object contains the counter and measurement attributes for the one-way on-demand ETH-DM function. This object is not applicable for the two-way on-demand or proactive ETH-DM functions.

Instances of this managed object are created automatically by the MEP when the one-way on-demand ETH-DM operation is executed.

Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>frameDelay</td>
<td>This attribute indicates the measurement for Frame Delay. This measurement requires clock synchronization between the two end-points.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
</tbody>
</table>
### interFrameDelayVariation
This attribute indicates the measurement for Inter-Frame Delay. This measurement requires clock synchronization between the two end-points.

<table>
<thead>
<tr>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
</tbody>
</table>

### num1DmIn
This attribute contains the count of the total number of 1DM messages received.

<table>
<thead>
<tr>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
</tbody>
</table>

### num1DmOut
This attribute contains the count of the total number of 1DM messages transmitted.

<table>
<thead>
<tr>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
</tbody>
</table>

### Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>reset()</td>
<td>This operation provides the ability to dynamically reset (to zero) attribute values of existing instances of this object.</td>
</tr>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
</tbody>
</table>

### Relationships:
The EthOamDmOnDemandOneWayStats object is contained under the EthOamDmCfg object.

### Reportable Notifications:
- objectCreation: O
- objectDeletion: O

---

### 9.4.3.3 EthOamDmOnDemandTwoWayStats (Ethernet Delay Measurement On-Demand 2-Way Statistics)

#### Behavior:
This object contains the counter and measurement attributes for the two-way on-demand ETH-DM function. This object is not applicable for the one-way on-demand or proactive ETH-DM functions.

Instances of this managed object are created automatically by the MEP when the two-way on-demand ETH-DM operation is executed.

#### Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>bidirectionalFrameDelay</td>
<td>This attribute indicates the measured bidirectional frame delay.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
<tr>
<td>farEndFrameDelay</td>
<td>This attribute indicates the far-end measurement for Frame Delay. This measurement requires clock synchronization between the two end-points.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
<tr>
<td>nearEndFrameDelay</td>
<td>This attribute indicates the near-end measurement for Frame Delay. This measurement requires clock synchronization between the two end-points.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
<tr>
<td>numDmmOut</td>
<td>This attribute contains the count of the total number of DMM messages transmitted.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>---------</td>
<td>---</td>
<td>------</td>
</tr>
<tr>
<td>numDmrIn</td>
<td>This attribute contains the count of the total number of DMR reply messages received.</td>
<td>Integer</td>
<td>0</td>
<td>M, R</td>
</tr>
</tbody>
</table>

**Operations / Methods:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>reset()</td>
<td>This operation provides the ability to dynamically reset (to zero) attribute values of existing instances of this object.</td>
</tr>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
</tbody>
</table>

**Relationships:**

The EthOamDmOnDemandTwoWayStats object is contained under the EthOamDmCfg object.

**Reportable Notifications:**

- objectCreation: O
- objectDeletion: O

### 9.4.3.4 EthOamDmProactiveOneWayCurrentStats (Ethernet Delay Measurement Proactive 1-Way Current Statistics)

**Behavior:**

This object contains the counter and measurement attributes for the current interval for one-way proactive ETH-DM function. This object is not applicable for the two-way proactive or on-demand ETH-DM functions.

Instances of this managed object are created automatically by the MEP when the one-way proactive ETH-DM operation is executed.

**Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>binStats</td>
<td>This attribute specifies the bin measurements.</td>
<td>BinStatsType</td>
<td>0</td>
<td>M, R</td>
</tr>
</tbody>
</table>

**Operations / Methods**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>

**Relationships:**

The EthOamDmProactiveOneWayCurrentStats object is contained under the EthOamDmCfg object and is a generalization of the EthOamDmProactiveOneWayStats object.

**Reportable Notifications:**

- objectCreation: O
- objectDeletion: O

### 9.4.3.5 EthOamDmProactiveOneWayHistoryStats (Ethernet Delay Measurement Proactive 1-Way History Statistics)

**Behavior:**
This object contains the counter and measurement attributes for historical intervals for one-way proactive ETH-DM function. This object is not applicable for the two-way proactive or on-demand ETH-DM functions.

Instances of this managed object are created automatically by the MEP when the one-way proactive ETH-DM operation is executed and a current interval completes.

Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>binStats</td>
<td>This attribute specifies the bin measurements.</td>
<td>BinStatsType</td>
<td>M, R</td>
<td></td>
</tr>
<tr>
<td>granularityPeriod</td>
<td>This attribute indicates the time granularity of a measurement interval (e.g., 15 min, 24 hr).</td>
<td></td>
<td>M, R</td>
<td></td>
</tr>
<tr>
<td>intervalNumber</td>
<td>This attribute indicates which interval the measurements are applicable to. This attribute has a range of 1..32 to represent up to 32 historic intervals of measurement data.</td>
<td>Integer</td>
<td>M, R</td>
<td></td>
</tr>
<tr>
<td>timestamp</td>
<td>This attribute indicates the data/time of when the interval completed and is based on local time-of-day clock in UTC.</td>
<td>DateAndTime</td>
<td>M, R</td>
<td></td>
</tr>
</tbody>
</table>

Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>

Relationships:

The EthOamDmProactiveOneWayHistoryStats object is contained under the EthOamDmCfg object and is a generalization of the EthOamDmProactiveOneWayStats object.

Reportable Notifications:

- objectCreation: O
- objectDeletion: O

9.4.3.6 EthOamDmProactiveTwoWayCurrentStats (Ethernet Delay Measurement Proactive 2-Way Current Statistics)

Behavior:

This object contains the counter and measurement attributes for the current interval for two-way proactive ETH-DM function. This object is not applicable for the one-way proactive or on-demand ETH-DM functions.

Instances of this managed object are created automatically by the MEP when the two-way proactive ETH-DM operation is executed.

Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>binStats</td>
<td>This attribute specifies the bin measurements.</td>
<td>BinStatsType</td>
<td>M, R</td>
<td></td>
</tr>
</tbody>
</table>

Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
Relationships:
The `EthOamDmProactiveTwoWayCurrentStats` object is contained under the `EthOamDmCfg` object and is a generalization of the `EthOamDmProactiveTwoWayStats` object.

Reportable Notifications:
- objectCreation: O
- objectDeletion: O

9.4.3.7 `EthOamDmProactiveTwoWayHistoryStats` (Ethernet Delay Measurement Proactive 2-Way History Statistics)

Behavior:
This object contains the counter and measurement attributes for historical intervals for two-way proactive ETH-DM function. This object is not applicable for the one-way proactive or on-demand ETH-DM functions.

Instances of this managed object are created automatically by the MEP when the two-way proactive ETH-DM operation is executed and a current interval completes.

Attributes

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>binStats</td>
<td>This attribute specifies the bin measurements.</td>
<td>BinStatsType</td>
<td>M, R</td>
<td></td>
</tr>
<tr>
<td>granularityPeriod</td>
<td>This attribute indicates the time granularity of a measurement interval (e.g., 15 min, 24 hr).</td>
<td></td>
<td>M, R</td>
<td></td>
</tr>
<tr>
<td>intervalNumber</td>
<td>This attribute indicates which interval the measurements are applicable to. This attribute has a range of 1..32 to represent up to 32 historic intervals of measurement data.</td>
<td>Integer</td>
<td>M, R</td>
<td></td>
</tr>
<tr>
<td>timestamp</td>
<td>This attribute indicates the data/time of when the interval completed and is based on local time-of-day clock in UTC.</td>
<td>DateAndTime</td>
<td>M, R</td>
<td></td>
</tr>
</tbody>
</table>

Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>

Relationships:
The `EthOamDmProactiveTwoWayHistoryStats` object is contained under the `EthOamDmCfg` object and is a generalization of the `EthOamDmProactiveTwoWayStats` object.

Reportable Notifications:
- objectCreation: O
- objectDeletion: O

9.4.3.8 `EthOamDmProactiveTwoWayThreshold` (Ethernet Delay Measurement Proactive 2-Way Thresholds)

Behavior:
This object contains the list of two-way Delay Measurement threshold values for proactive Performance Monitoring.

Instances of this managed object are created automatically by the MEP when the MEP creates an instance of EthOamDmCfg.

<table>
<thead>
<tr>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>thresholdList</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operations / Methods:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relationships:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The EthOamDmProactiveTwoWayThreshold object has a one-to-one association with the EthOamDmCfg object.</td>
</tr>
</tbody>
</table>

Reportable Notifications:

| objectCreation | O |
| objectDeletion | O |

### 9.4.3.9 EthOamDmProactiveOneWayThreshold (Ethernet Delay Measurement Proactive 1-Way Thresholds)

**Behavior:**
This object contains the list of one-way Delay Measurement threshold values for proactive Performance Monitoring.

Instances of this managed object are created automatically by the MEP when the MEP creates an instance of EthOamDmCfg.

<table>
<thead>
<tr>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>thresholdList</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operations / Methods:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relationships:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The EthOamDmProactiveOneWayThreshold object has a one-to-one association with the EthOamDmCfg object.</td>
</tr>
</tbody>
</table>

Reportable Notifications:

| objectCreation | O |
| objectDeletion | O |
9.4.4 Function Sets

9.4.4.1 Additional Performance Management Function Sets
This section defines additional managed objects specific to Performance Management statistics. Within this logical model, Performance Data Sets simply describe the category of the performance information (the data set) along with the individual counters associated with the set. It is assumed that both current and historical counts will be made available across the EMS-NMS interface. For this logical model, the duration of the interval and amount of history to be stored are not specified. These must be specified for any management protocol specific interface and/or implementation agreement that makes use of this logical model.

9.4.4.2 EthMegPerfDataSet (ETH Point-to-Point EVC MEG Performance Data Set)

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>availability</td>
<td>This attribute indicates the Availability Performance which is the percentage of time within a specified time interval during which the service is available. Integer range is 0..100.</td>
<td>List (&lt;cos.&gt;, float) thresholded</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>frameDelayOneWay</td>
<td>This attribute indicates the average one way Frame Delay per CoS</td>
<td>List (&lt;cos.&gt;, Integer) thresholded (in ms)</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>frameDelayTwoWay</td>
<td>This attribute indicates the average round trip Frame Delay per CoS.</td>
<td>List (&lt;cos.&gt;, Integer) thresholded (in ms)</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>frameLossRatio</td>
<td>This attribute indicates the ratio of frames lost per CoS.</td>
<td>List (&lt;cos.&gt;, float) thresholded</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>interFrameDelayVariationOneWay</td>
<td>This attribute indicates the average one way Inter-Frame Delay Variation per CoS</td>
<td>List (&lt;cos.&gt;, Integer) thresholded (in ms)</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>Attribute</td>
<td>Description</td>
<td>Type</td>
<td>Default Value</td>
<td>Qualifier</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------</td>
<td>---------------</td>
<td>-----------</td>
</tr>
<tr>
<td>interFrameDelayVariationTwoWay</td>
<td>This attribute indicates the average round trip Inter-Frame Delay Variation per CoS</td>
<td>List</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>Operations / Methods:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>reset()</td>
<td>This operation provides the ability to dynamically reset (to zero) attribute values of existing instances of this object.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relationships:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The EthMegPerfDataSet object is associated with the EthMe object.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reportable Notifications:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>objectCreation</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>objectDeletion</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9.4.4.3 EthMpPerfDataSet (ETH Maintenance Point Performance Data Set)

**Behavior:**
This object contains the set of service OAM performance data to be collected for each Maintenance Point (MEP, MIP).

**Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Type</th>
<th>Default Value</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>inOamFramesDiscarded</td>
<td>This attribute indicates the count of incoming frames discarded at the MP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>inOamFramesRx</td>
<td>This attribute indicates the count of incoming frames received at the MP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>lossOfContinuityTimer</td>
<td>This attribute indicates the timer for loss of continuity at the MP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>oamInvalidTtlErrors</td>
<td>This attribute indicates count of Invalid TTL errors for the MP (MEP/MIP).</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>oamMismergeErrors</td>
<td>This attribute indicates the count of OAM Mismerge errors for the MP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>oamUnexpectedMegLevelErrors</td>
<td>This attribute indicates the count of unexpected MEG Level errors for the MP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>oamUnexpectedMepErrors</td>
<td>This attribute indicates the count of unexpected MEP ID errors for the MP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>oamUnexpectedPeriodErrors</td>
<td>This attribute indicates the count of Unexpected Period errors for the MP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>outOamFramesDiscarded</td>
<td>This attribute indicates the count of outgoing frames discarded at the MP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td><strong>outOamFramesTx</strong></td>
<td>This attribute indicates the count of outgoing frames sent from the MP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------------------------------------------</td>
<td>--------</td>
<td>---</td>
<td>-----</td>
</tr>
<tr>
<td><strong>sesErrors</strong></td>
<td>This attribute indicates count of Severely Errored Seconds (SES) for the MP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td><strong>totalOamFrameAnomalies</strong></td>
<td>This attribute indicates the total count of Mismatch, Unexpected MEP, Unexpected MEG Level, Unexpected Period, Sequence Errors, Invalid TTL errors for the MP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
<tr>
<td><strong>uasErrors</strong></td>
<td>This attribute indicates the count of Unavailable Seconds (UAS) for the MP.</td>
<td>Integer</td>
<td>0</td>
<td>O, R</td>
</tr>
</tbody>
</table>

### Operations / Methods:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>reset()</td>
<td>This operation provides the ability to dynamically reset (to zero) attribute values of existing instances of this object.</td>
</tr>
<tr>
<td>retrieve()</td>
<td>This operation provides the ability to dynamically query attribute values of existing instances of this object.</td>
</tr>
</tbody>
</table>

### Relationships:

The **EthMpPerfDataSet** object is associated with the **EthMp** object.

### Reportable Notifications:

- **objectCreation**
  - O
- **objectDeletion**
  - O
APPENDIX I
Mapping of ITU-T Q.840.1 Objects to TMF MTNM 3.5

The table in this appendix provides a mapping between the information model presented in ITU-T Q.840.1, the Ethernet Services EMS-NMS Information Model, and the MTN 3.5 Connectionless Network Model.

<table>
<thead>
<tr>
<th>Q.840.1 Object</th>
<th>Type</th>
<th>Q.840.1 Item</th>
<th>MTNM Object</th>
<th>MTNM Item</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETH_Flow_Domain</td>
<td>attribute</td>
<td>userLabel</td>
<td>FlowDomain</td>
<td>userLabel</td>
<td></td>
</tr>
<tr>
<td>ETH_Flow_Domain</td>
<td>operation</td>
<td>setupPtToPtETH_FDFr_EVCWithFPPs</td>
<td>FlowDomain</td>
<td>createFDFr</td>
<td></td>
</tr>
<tr>
<td>ETH_Flow_Domain</td>
<td>operation</td>
<td>setupMultiToMultiETH_FDFr_EVCwithFPPs</td>
<td>FlowDomain</td>
<td>createFDFr</td>
<td></td>
</tr>
<tr>
<td>ETH_Flow_Domain</td>
<td>operation</td>
<td>setupRootedToMultiETH_FDFr_EVCwithFPPs</td>
<td>FlowDomain</td>
<td>createFDFr</td>
<td></td>
</tr>
<tr>
<td>ETH_Flow_Domain</td>
<td>operation</td>
<td>releaseETH_FDFr_EVC</td>
<td>FlowDomain</td>
<td>deleteFDFr</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>fPPType</td>
<td>CPTP (TP)</td>
<td>PTP, FTP</td>
<td>InterfaceType</td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>fPPSubType</td>
<td>CPTP (TP)</td>
<td>PTP, FTP</td>
<td>InterfaceType</td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>totalBWCapacity</td>
<td>CPTP (TP)</td>
<td>Layered Parameters: AvailableCapacity</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>userLabel</td>
<td>CPTP (TP)</td>
<td>userLabel</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>ieee802dot3Address</td>
<td>CPTP (TP)</td>
<td>Layered Parameters: PhysAddress</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>operationalState</td>
<td>CPTP (TP)</td>
<td>Layered Parameters: ServiceState</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>availabilityStatus</td>
<td>CPTP (TP)</td>
<td>additionalInfo: “X.721::AvailabilityStatus”</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>administrativeState</td>
<td>CPTP (TP)</td>
<td>Layered Parameters: ServiceState</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>ingressMaxAssignableBW</td>
<td>CPTP (TP)</td>
<td>Layered Parameters: IngressMaxAssigna bleBW</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>egressMaxAssignableBW</td>
<td>CPTP (TP)</td>
<td>Layered Parameters: EgressMaxAssignabl eBW</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>ingressMaxAssignableCosBW</td>
<td>CPTP (TP)</td>
<td>Not Mappable</td>
<td>This optional attribute is not mapp ed</td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>egressMaxAssignableCosBW</td>
<td>CPTP (TP)</td>
<td>Not Mappable</td>
<td>This optional attribute is not mapp ed</td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>maxNumVirtualConnections</td>
<td>CPTP</td>
<td>Layered Parameters: MaxNumFDFrs</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>numConfiguredVirtualConnections</td>
<td>CPTP</td>
<td>Layered Parameters: NumConfiguredFDFrs</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>mtuSize</td>
<td>CPTP</td>
<td>MaximumFrameSize</td>
<td>MTU Size does not include header, while frame size does.</td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>alarmStatus</td>
<td>CPTP (TP)</td>
<td>additionalInfo: “M.3100::AlarmStatus”</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP</td>
<td>attribute</td>
<td>currentProblemList</td>
<td>CPTP (TP)</td>
<td>Get Active Alarms</td>
<td>Open TMF Issue</td>
</tr>
<tr>
<td>ETH_FPP_UNI</td>
<td>attribute</td>
<td>uniLabel</td>
<td>CPTP</td>
<td>CPTP Name</td>
<td></td>
</tr>
<tr>
<td>Q.840.1 Object</td>
<td>Type</td>
<td>Q.840.1 Item</td>
<td>MTNM Object</td>
<td>MTNM Item</td>
<td>Note</td>
</tr>
<tr>
<td>----------------</td>
<td>------</td>
<td>-------------</td>
<td>-------------</td>
<td>-----------</td>
<td>------</td>
</tr>
<tr>
<td>ETH_FPP_UNI</td>
<td>attribute</td>
<td>serviceMuxingIndicator</td>
<td>CPTP (TP)</td>
<td>Layered Parameters: ServiceMuxingIndicator</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP_UNI</td>
<td>attribute</td>
<td>bundling</td>
<td>CPTP (TP)</td>
<td>Layered Parameters: BundlingIndicator, AllToOneIndicator</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP_UNI</td>
<td>attribute</td>
<td>ingressVLANAssignmentAll</td>
<td>CPTP (TP)</td>
<td>Layered Parameters: PVID + PVIDFrameTypes</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP_UNI</td>
<td>attribute</td>
<td>ingressVLANAssignmentUntagged</td>
<td>CPTP (TP)</td>
<td>Layered Parameters: PVID + PVIDFrameTypes</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP_UNI</td>
<td>attribute</td>
<td>ingressVLANPriorityAssignmentAll</td>
<td>CPTP (TP)</td>
<td>PortDefaultUserPriority + PVIDFrameTypes</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP_UNI</td>
<td>attribute</td>
<td>ingressVLANPriorityAssignmentUntagged</td>
<td>CPTP (TP)</td>
<td>PortDefaultUserPriority + PVIDFrameTypes</td>
<td></td>
</tr>
<tr>
<td>ETH_FPP_UNI</td>
<td>attribute</td>
<td>unassignedCeVlanIDList</td>
<td>CPTP</td>
<td>Not Mappable</td>
<td>This optional attribute is not mapped</td>
</tr>
<tr>
<td>ETH_FPP_UNI</td>
<td>attribute</td>
<td>nextAvailableCeVlanID</td>
<td>CPTP</td>
<td>Not Mappable</td>
<td>This optional attribute is not mapped</td>
</tr>
<tr>
<td>ETH_Link</td>
<td>attribute</td>
<td>totalCapacity</td>
<td>CPTP</td>
<td>Layered Parameters: AvailableCapacity</td>
<td>Reflected on FPP (CPTP)</td>
</tr>
<tr>
<td>ETH_Link</td>
<td>attribute</td>
<td>userLabel</td>
<td>EncapsulationLayerLink</td>
<td>userLabel</td>
<td></td>
</tr>
<tr>
<td>ETH_Link</td>
<td>attribute</td>
<td>usageCost</td>
<td>CPTP</td>
<td>Layered Parameters: LinkUsageCost</td>
<td>Reflected on FPP (CPTP)</td>
</tr>
<tr>
<td>ETH_FDFr_EVC</td>
<td>attribute</td>
<td>administrativeState</td>
<td>FlowDomainFragment</td>
<td>Layered Parameters: ServiceState</td>
<td></td>
</tr>
<tr>
<td>ETH_FDFr_EVC</td>
<td>attribute</td>
<td>operationalState</td>
<td>FlowDomainFragment</td>
<td>Layered Parameters: ServiceState</td>
<td></td>
</tr>
<tr>
<td>ETH_FDFr_EVC</td>
<td>attribute</td>
<td>availabilityStatus</td>
<td>FlowDomainFragment</td>
<td>additionalInfo: &quot;X.721::AvailabilityStatus&quot;</td>
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**ETH UNI Anomalies Performance Data Set**

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<td>Performance measurement</td>
<td>Octets Transmitted OK</td>
</tr>
<tr>
<td>ETH UNI Traffic</td>
<td>Performance measurement</td>
<td>Unicast Frames Transmitted OK</td>
</tr>
<tr>
<td>ETH UNI Traffic</td>
<td>Performance measurement</td>
<td>Multicast Frames Transmitted OK</td>
</tr>
<tr>
<td>ETH UNI Traffic</td>
<td>Performance measurement</td>
<td>Broadcast Frames Transmitted OK</td>
</tr>
<tr>
<td>ETH UNI Traffic</td>
<td>Performance measurement</td>
<td>Octets Received OK</td>
</tr>
<tr>
<td>ETH UNI Traffic</td>
<td>Performance measurement</td>
<td>Unicast Frames Received OK</td>
</tr>
<tr>
<td>ETH UNI Traffic</td>
<td>Performance measurement</td>
<td>Multicast Frames Received OK</td>
</tr>
<tr>
<td>ETH UNI Traffic</td>
<td>Performance measurement</td>
<td>Broadcast Frames Received OK</td>
</tr>
<tr>
<td>ETH Ingress Traffic</td>
<td>Performance measurement</td>
<td>ingressGreenFrameCount</td>
</tr>
<tr>
<td>ETH Ingress Traffic</td>
<td>Performance measurement</td>
<td>ingressYellowFrameCount</td>
</tr>
<tr>
<td>ETH Ingress Traffic</td>
<td>Performance measurement</td>
<td>ingressRedFrameCount</td>
</tr>
<tr>
<td>ETH Ingress Traffic</td>
<td>Performance measurement</td>
<td>ingressGreenOctetCount</td>
</tr>
<tr>
<td>ETH Ingress Traffic</td>
<td>Performance measurement</td>
<td>ingressYellowOctetCount</td>
</tr>
<tr>
<td>ETH Ingress Traffic</td>
<td>Performance measurement</td>
<td>ingressRedOctetCount</td>
</tr>
<tr>
<td>ETH Egress Traffic</td>
<td>Performance measurement</td>
<td>egressGreenFrameCount</td>
</tr>
<tr>
<td>ETH Egress Traffic</td>
<td>Performance measurement</td>
<td>egressYellowFrameCount</td>
</tr>
<tr>
<td>ETH Egress Traffic</td>
<td>Performance measurement</td>
<td>egressGreenOctetCount</td>
</tr>
<tr>
<td>ETH Egress Traffic</td>
<td>Performance measurement</td>
<td>egressYellowOctetCount</td>
</tr>
<tr>
<td>ETH Congestion Discards</td>
<td>Performance measurement</td>
<td></td>
</tr>
<tr>
<td>Q.840.1 Object</td>
<td>Type</td>
<td>Q.840.1 Item</td>
</tr>
<tr>
<td>----------------</td>
<td>------</td>
<td>--------------</td>
</tr>
<tr>
<td>ETH Congestion Discards PerformanceDataSet</td>
<td>Performance measurement</td>
<td>greenFrameDiscards</td>
</tr>
<tr>
<td>ETH Congestion Discards PerformanceDataSet</td>
<td>Performance measurement</td>
<td>yellowFrameDiscards</td>
</tr>
<tr>
<td>ETH Congestion Discards PerformanceDataSet</td>
<td>Performance measurement</td>
<td>greenOctetDiscards</td>
</tr>
<tr>
<td>ETH Congestion Discards PerformanceDataSet</td>
<td>Performance measurement</td>
<td>yellowOctetDiscards</td>
</tr>
<tr>
<td>ETH ELMI Performance DataSet</td>
<td>Performance measurement</td>
<td>sumofElmiReliabilityErrors</td>
</tr>
<tr>
<td>ETH ELMI Performance DataSet</td>
<td>Performance measurement</td>
<td>sumofElmiProtocolErrors</td>
</tr>
<tr>
<td>ETH ELMI Performance DataSet</td>
<td>Performance measurement</td>
<td>elmiNonrcptStatusAndStatusEnquiryCount</td>
</tr>
<tr>
<td>ETH ELMI Performance DataSet</td>
<td>Performance measurement</td>
<td>elmiInvalidSeqNumCount</td>
</tr>
<tr>
<td>ETH ELMI Performance DataSet</td>
<td>Performance measurement</td>
<td>elmiProtocolVersionCount</td>
</tr>
<tr>
<td>ETH ELMI Performance DataSet</td>
<td>Performance measurement</td>
<td>elmiTooShortCount</td>
</tr>
<tr>
<td>ETH ELMI Performance DataSet</td>
<td>Performance measurement</td>
<td>elmiMessageTypeErrorCount</td>
</tr>
<tr>
<td>ETH ELMI Performance DataSet</td>
<td>Performance measurement</td>
<td>elmiInfoElementErrorCount</td>
</tr>
<tr>
<td>MAU Termination Performance DataSet</td>
<td>Performance measurement</td>
<td>ifMauMediaAvailableStatExits</td>
</tr>
<tr>
<td>MAU Termination Performance DataSet</td>
<td>Performance measurement</td>
<td>ifMauJabberingStateEnters</td>
</tr>
<tr>
<td>MAU Termination Performance DataSet</td>
<td>Performance measurement</td>
<td>ifMauFalseCarriers</td>
</tr>
</tbody>
</table>

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APPENDIX II
Informational: State Management Mapping

The logical MIB described in this document makes use of the state model from ITU-T X.731. To help in mapping operational state information from SNMP based models to the Q.840.1 EMS-NMS model, this appendix provides a mapping between the ifOperStatus from IETF RFC2863 and ITU-T X.731’s Operational State and Availability Status. The following table provides a mapping between the IETF RFC2863 ifOperStatus and ITU-T X.731 Operational State and the supplemental Availability Status. The Q.840.1 model uses the X.731 Operational State in cases where a “working” or “Enabled” / “not-working” or “Disabled” state is needed. In cases where, in addition to the “Enabled” / “Disabled” states, supplemental status information is needed, such as a “degraded” and/or an “in-test” state, X.731 Availability Status is used along with Operational State.

<table>
<thead>
<tr>
<th>IETF RFC2863 ifOperStatus</th>
<th>ITU-T X.731 Operational State</th>
<th>ITU-T X.731 Availability Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>up(1)</td>
<td>Enabled</td>
<td>---</td>
</tr>
<tr>
<td>down(2)</td>
<td>Disabled</td>
<td>Failed</td>
</tr>
<tr>
<td></td>
<td>Disabled</td>
<td>Power off</td>
</tr>
<tr>
<td></td>
<td>Disabled</td>
<td>Off-Line</td>
</tr>
<tr>
<td>testing(3)</td>
<td>Enabled</td>
<td>In Test</td>
</tr>
<tr>
<td>unknown(4)</td>
<td>Enabled</td>
<td>---</td>
</tr>
<tr>
<td>dormant(5)</td>
<td>Enabled or Disabled</td>
<td>Off Duty</td>
</tr>
<tr>
<td>notPresent(6)</td>
<td>Disabled</td>
<td>Not Installed</td>
</tr>
<tr>
<td>lowerLayerDown(7)</td>
<td>Disabled</td>
<td>Dependency</td>
</tr>
<tr>
<td></td>
<td>Enabled</td>
<td>Degraded</td>
</tr>
</tbody>
</table>

Also note that in Q.840.1 the ITU-T X.731 Administrative State (“locked” or “unlocked”) is used where a configurable administrative state needs to be reflected. The mapping between ITU-T X.731 Administrative State and IETF RFC2863 ifAdminStatus is direct for the “up” and “down” states. The RFC2863 ifAdminStatus of “up” is mapped to X.731 Administrative State of “unlocked”. The RFC2863 ifAdminStatus of “down” is mapped to the X.731 Administrative State of “locked”.

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# APPENDIX III
## Data Type Definitions

This Appendix defines a set of data types for use in defining the attributes within the managed objects.

### III.1 Primitive

<table>
<thead>
<tr>
<th>Data Type Name</th>
<th>Description</th>
<th>Base Type</th>
<th>Permitted Values</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>AsapPtrType</td>
<td>The data type for a pointer to Alarm Severity Assignment Profile as defined in M.3100</td>
<td></td>
<td></td>
<td>M.3100</td>
</tr>
<tr>
<td>CcmLastFaultType</td>
<td>This data type represents an octet string of length 1..1522 and indicates the last received CCM which triggered a fault.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HexBinary</td>
<td>This data type represents a string of octets. Equivalent to OCTET STRING in MIB syntax.</td>
<td>String</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LldpChassisId</td>
<td>This data type represents an octet string of length 1..255. Defined in IEEE 802.1 LLDP-MIB.</td>
<td></td>
<td></td>
<td>IEEE 802.1 LLDP-MIB</td>
</tr>
<tr>
<td>LldpPortId</td>
<td>This data type represents an octet string of length 1..255. Defined in IEEE 802.1 LLDP-MIB.</td>
<td></td>
<td></td>
<td>IEEE 802.1 LLDP-MIB</td>
</tr>
<tr>
<td>MacAddress</td>
<td>This data type represents an 802 MAC address of 6 octets represented in the canonical order defined by IEEE 802.1a.</td>
<td></td>
<td></td>
<td>RFC 2579</td>
</tr>
<tr>
<td>MdLevelType</td>
<td>This data type represents a MD Level (802.1ag) and is an unsigned byte with values 0 to 7. Higher numbers correspond to higher Maintenance Domains, those with the greatest physical reach, with the highest values for customers' CFM PDUs. Lower numbers correspond to lower Maintenance Domains, those with more limited physical reach, with the lowest values for CFM PDUs protecting single bridges or physical links.</td>
<td></td>
<td></td>
<td>IEEE 802.1ag</td>
</tr>
</tbody>
</table>
### MegIdType
This data type represents a MEGID (Y.1731) and is an octet string with length of 48 octets.

### MegLevelType
This data type represents a MEG Level (Y.1731) and is an unsigned byte with values 0 to 7.

### MepIdType
This data type represents a MEPID (Y.1731) and is a short integer (2 octets) of 13 bits with 3 leading zeros.

### PriorityType
This data type represents a frame priority and is represented as an integer in the range 0..7.

### Taddress
This data type denotes a transport service address and is represented by an octet string of length 1..255. Defined in RFC 2579.

### Tdomain
This data type denotes a kind of transport service and is represented by an Object Identifier. Defined in RFC 2579.

### III.2 Enumeration

<table>
<thead>
<tr>
<th>Data Type Name</th>
<th>Description</th>
<th>Base Type</th>
<th>Permitted Values</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>AdminStateType</td>
<td>Enumeration</td>
<td>Enumeration</td>
<td>lock, unlock</td>
<td></td>
</tr>
<tr>
<td>AlarmStatus</td>
<td>Alarm Status as defined in M.3100.</td>
<td>Enumeration</td>
<td>cleared, indeterminate, warning, minor, major, critical, pending</td>
<td>M.3100</td>
</tr>
<tr>
<td>AvailStatusType</td>
<td></td>
<td>Enumeration</td>
<td>notInstalled, inTest, failed, degraded</td>
<td></td>
</tr>
<tr>
<td>CfmEgressActionType</td>
<td></td>
<td>Enumeration</td>
<td>egrNoTlv, egrOk, egrDown, egrBlocked, egrVid</td>
<td>IEEE 802.1ag</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>-------------------------------------</td>
<td></td>
</tr>
<tr>
<td>CfmIngressActionType</td>
<td>Enumeration</td>
<td>ingNoTlv, ingOk, ingDown, ingBlocked, ingVid</td>
<td>IEEE 802.1ag</td>
<td></td>
</tr>
<tr>
<td>ConnectivityStatusType</td>
<td>Enumeration</td>
<td>active, partiallyActive, inactive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DelayMeasCounterType</td>
<td>This enumeration data type defines an enumerated list of Delay Measurement counter types. All counters are assumed to be two-way unless indicated otherwise.</td>
<td>15minAvgBiDirectionalFd, 15minMaxBiDirectionalFd, 15minAvgNearEndFd, 15minMaxNearEndFd, 15minAvgFarEndFd, 15minMaxFarEndFd, 24hrAvgBiDirectionalFd, 24hrMaxBiDirectionalFd, 24hrAvgNearEndFd, 24hrMaxNearEndFd, 24hrAvgFarEndFd, 24hrMaxFarEndFd, 24hrAvgFarEndFdOneWay, 24hrMaxFarEndFdOneWay, 24hrMaxNearEndFdOneWay, 24hrAvgNearEndFdOneWay, 24hrAvgFarEndFdOneWay, 24hrMaxFarEndFdOneWay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DelayMeasType</td>
<td>Enumeration</td>
<td>twoWayOnDemand, twoWayProactive, oneWayOnDemand, oneWayProactive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HighestDefectPriType</td>
<td>Description</td>
<td>Example Values</td>
<td>Standard</td>
<td>IEEE 802.1ag</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------</td>
<td>---------------</td>
<td>----------</td>
<td>---------------</td>
</tr>
<tr>
<td>HighestDefectType</td>
<td>This enumeration data type represents an enumerated value indicating the highest priority defect.</td>
<td>xconCCMdefect, errorCCMdefect, someRMEPCCMdefect, someMACstatusDefect, someREDIdefect</td>
<td>Enumeration</td>
<td>IEEE 802.1ag</td>
</tr>
<tr>
<td>InterfaceStatusTlvType</td>
<td>Enumeration</td>
<td>notincluded, up, down, testing, unknown, dormat, notPresent, lowerLayerDown</td>
<td>IEEE 802.1ag</td>
<td></td>
</tr>
<tr>
<td>IntervalType</td>
<td>This enumeration data type defines the CCM interval (transmission period).</td>
<td>3.33 ms, 10 ms, 0 ms, 100 ms, 1 sec, 10 sec, 1 min, 10 min</td>
<td>Enumeration</td>
<td>Y.1731</td>
</tr>
<tr>
<td>IntervalTypeAisLck</td>
<td>This enumeration data type defines the AIS/LCK interval (transmission period for a frame).</td>
<td>1 sec, 1 min</td>
<td>Enumeration</td>
<td>G.8021</td>
</tr>
</tbody>
</table>

HighestDefectPriType is an enumerated value, equal to the contents of the variable highestDefect indicating the highest-priority defect that has been present since the MEP Fault Notification Generator State Machine was last in the FNG_RESET state (802.1ag). The value 'none' is used for no defects so that additional higher priority values can be added, if needed, at a later time, and so that these values correspond with those in LowestAlarmPriType.
<table>
<thead>
<tr>
<th>LldpChassisIdSubtype</th>
<th>Defined in IEEE 802.1 LLDP-MIB.</th>
<th>Enumeration</th>
<th>chassisComponent, interfaceAlias, portComponent, macAddress, networkAddress, interfaceName, local</th>
<th>IEEE 802.1 LLDP-MIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>LldpPortIdSubtype</td>
<td>Defined in IEEE 802.1 LLDP-MIB.</td>
<td>Enumeration</td>
<td>interfaceAlias, portComponent, macAddress, networkAddress, interfaceName, agentCircuitId, local</td>
<td>IEEE 802.1 LLDP-MIB</td>
</tr>
<tr>
<td>LossMeasType</td>
<td></td>
<td>Enumeration</td>
<td>singleEnded, dualEnded</td>
<td></td>
</tr>
<tr>
<td>LowestAlarmPriType</td>
<td>This enumeration data type</td>
<td>Enumeration</td>
<td>allDef, macRemErrXcon, remErrXcon, errXcon, xcon, noXcon</td>
<td>IEEE 802.1ag</td>
</tr>
<tr>
<td>LtmFlagsType</td>
<td></td>
<td>Enumeration</td>
<td>useFdbOnly</td>
<td>IEEE 802.1ag</td>
</tr>
<tr>
<td>LtrRelayActionType</td>
<td></td>
<td>Enumeration</td>
<td>rlyHit, rlyFdb, rlyMpdb</td>
<td>IEEE 802.1ag</td>
</tr>
<tr>
<td>MaintAssocNameFormat</td>
<td>MEG ID Type/Format as defined in</td>
<td>Enumeration</td>
<td>primaryVid, charString, unsignedInt16, rfc2865VpnID, iccBasedFormat</td>
<td>Y.1731, IEEE 802.1ag</td>
</tr>
<tr>
<td>MaintenanceEntityTyp e</td>
<td></td>
<td>Enumeration</td>
<td>subscriber, evc, uni, nni</td>
<td></td>
</tr>
<tr>
<td>MdNameType</td>
<td>Maintenance Domain Name Type as</td>
<td>Enumeration</td>
<td>none, dnsLikeName, macAddressAndUInt, charString</td>
<td>IEEE 802.1ag</td>
</tr>
<tr>
<td>MepDefectsBitMap</td>
<td>A MEP can detect and report a</td>
<td>Enumeration</td>
<td>bDefRDICCM, bDefMACstatus, bDefRemoteCCM, bDefErrorCCM, bDefXconCCOM</td>
<td>IEEE 802.1ag</td>
</tr>
<tr>
<td>MpDirectionType</td>
<td></td>
<td>Enumeration</td>
<td>down, up</td>
<td></td>
</tr>
<tr>
<td>MpType</td>
<td></td>
<td>Enumeration</td>
<td>none, mep, mip</td>
<td></td>
</tr>
</tbody>
</table>
### III.3 Complex

#### Data Type: **AlarmList**

**Description**
This complex data type represents a set of AlarmRecord instances. AlarmRecord is defined in X.721.

**Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Base Type</th>
<th>Permitted Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>alarm</td>
<td>This attribute is an instance of an AlarmRecord.</td>
<td>AlarmRecord</td>
<td>See Data Type definition from X.721</td>
</tr>
<tr>
<td>id</td>
<td>This attribute represents a unique identifier for an alarm instance.</td>
<td>Integer</td>
<td>Any</td>
</tr>
</tbody>
</table>

#### Data Type: **BinStatsType**

**Description**
This complex data type represents a set of one or more bin number and bin count pairs.

**Attributes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Base Type</th>
<th>Permitted Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
<td>Base Type</td>
<td>Permitted Values</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----------</td>
<td>------------------</td>
</tr>
<tr>
<td>binNumber</td>
<td>This attribute indicates which bin the measurements are applicable to.</td>
<td>Integer</td>
<td>Any</td>
</tr>
<tr>
<td>binCount</td>
<td>This attribute indicates a 32-bit counter reflecting the number of measurements which fell within this measurement bin.</td>
<td>Integer</td>
<td>Any</td>
</tr>
</tbody>
</table>

**Data Type:**  BinThresholdType  
**Description**  
This complex data type represents a set of one or more bin threshold and bin number pairs.  
**Attributes**  
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Base Type</th>
<th>Permitted Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>binNumber</td>
<td>This attribute specifies the bin number for the configured threshold.</td>
<td>Integer</td>
<td>Any</td>
</tr>
<tr>
<td>threshold</td>
<td>This attribute specifies the bin threshold value for the specified bin number. Units are microseconds.</td>
<td>Integer</td>
<td>Any</td>
</tr>
</tbody>
</table>

**Data Type:**  DataAndTime  
**Description**  
This complex data type represents an abstract, or scheduled, date and time.  
**Attributes**  
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Base Type</th>
<th>Permitted Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>day</td>
<td>This attribute represents the day portion with a valid range of 0..7 where the value 0 indicates the current day, 1 represents Monday and 7 represents Sunday.</td>
<td>Integer</td>
<td>0..7</td>
</tr>
<tr>
<td>hour</td>
<td>This attribute represents the hours portion with a valid range of 0..24</td>
<td>Integer</td>
<td>0..24</td>
</tr>
<tr>
<td>minute</td>
<td>This attribute represents the minutes portion with a valid range of 0..59.</td>
<td>Integer</td>
<td>0..59</td>
</tr>
<tr>
<td>second</td>
<td>This attribute represents the seconds portion with a valid range of 0..59.</td>
<td>Integer</td>
<td>0..59</td>
</tr>
</tbody>
</table>

**Data Type:**  DelayMeasThresholdListType  
**Description**  
This complex data type defines a counter type with associated threshold values. This data type is used for defining both 1-way and 2-way Delay Measurement Counter types.  
**Attributes**  
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Base Type</th>
<th>Permitted Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>clearThreshold</td>
<td>This attribute indicates the value at which a given threshold will be cleared. This is not applicable for PM counters</td>
<td>Integer</td>
<td>Any</td>
</tr>
</tbody>
</table>
based on maximum thresholds.

<table>
<thead>
<tr>
<th>counterType</th>
<th>This attribute indicates the type of counter for which threshold value has been specified.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DelayMeasCounterType</td>
<td>See Data Type definition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>crossThreshold</th>
<th>This attribute indicates the value at which a threshold set alarm condition will be generated.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integer</td>
<td>Any</td>
</tr>
</tbody>
</table>

**Data Type:** Relative Time

**Description**
This complex data type is used to specify a duration of time, or relative time, in hours:minutes:seconds format. A value of zero indicates a duration of forever. An example value is 6:10:30 which represents a relative time of 6 hours, 10 minutes and 30 seconds.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Base Type</th>
<th>Permitted Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>hours</td>
<td>This attribute represents the hours portion of RelativeTime with a valid range of 0..24</td>
<td>Integer</td>
<td>0..24</td>
</tr>
<tr>
<td>minutes</td>
<td>This attribute represents the minutes portion of RelativeTime with a valid range of 0..59.</td>
<td>Integer</td>
<td>0..59</td>
</tr>
<tr>
<td>seconds</td>
<td>This attribute represents the seconds portion of RelativeTime with a valid range of 0..59.</td>
<td>Integer</td>
<td>0..59</td>
</tr>
</tbody>
</table>
## APPENDIX IV
### Protocol Specific SNMP MIB Object Mappings

This Appendix maps the objects and their attributes, as defined within this document, to IEEE SNMP MIB objects as defined in [42] and [49]. Performance Monitoring objects and attributes do not map to the IEEE SNMP MIBs and are therefore not included.

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   connectivityStatus
   primaryVid | dot1agCfmMepPrimaryVid |
   ieee8021CfmVlanPrimarySelector

   EthMip
   EthOamLckCfg
   interval
   priority
dropEeligible

   EthOamLbCfg
   multicastEnabled
   interval
   frameSize
   priority | dot1agCfmMepTransmitLbmVlanPriority |
   dropEeligible | dot1agCfmMepTransmitLbmVlanDropEnable |
   data | dot1agCfmMepTransmitLbmDataTlv |
   numLbmsToTx | dot1agCfmMepTransmitLbmMessages |
   lbmMsgStatus

   EthOamLbStats
   numLbrInInOrder | dot1agCfmMepLbrIn |
   numLbrInOutOfOrder | dot1agCfmMepLbrInOutOfOrder |
   numLbrInBadMsdu | dot1agCfmMepLbrBadMsdu |
   numLbrInCrcErrors
   numLbrInBerErrors
   numLbrOut | dot1agCfmMepLbrOut |
   firstLbmTransId
   nextLbmTransId | dot1agCfmMepNextLbmTransId |

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   interval
   priority
dropEeligible

   EthOamCcCfg
   enabled | dot1agCfmMepCcEnabled |
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