



Technical Specification

MEF 39

Service OAM Performance Monitoring YANG Module

April 2012

Disclaimer

The information in this publication is freely available for reproduction and use by any recipient and is believed to be accurate as of its publication date. Such information is subject to change without notice and the Metro Ethernet Forum (MEF) is not responsible for any errors. The MEF does not assume responsibility to update or correct any information in this publication. No representation or warranty, expressed or implied, is made by the MEF concerning the completeness, accuracy, or applicability of any information contained herein and no liability of any kind shall be assumed by the MEF as a result of reliance upon such information.

The information contained herein is intended to be used without modification by the recipient or user of this document. The MEF is not responsible or liable for any modifications to this document made by any other party.

The receipt or any use of this document or its contents does not in any way create, by implication or otherwise:

any express or implied license or right to or under any patent, copyright, trademark or trade secret rights held or claimed by any MEF member company which are or may be associated with the ideas, techniques, concepts or expressions contained herein; nor

any warranty or representation that any MEF member companies will announce any product(s) and/or service(s) related thereto, or if such announcements are made, that such announced product(s) and/or service(s) embody any or all of the ideas, technologies, or concepts contained herein; nor

any form of relationship between any MEF member companies and the recipient or user of this document.

Implementation or use of specific Metro Ethernet standards or recommendations and MEF specifications will be voluntary, and no company shall be obliged to implement them by virtue of participation in the Metro Ethernet Forum. The MEF is a non-profit international organization accelerating industry cooperation on Metro Ethernet technology. The MEF does not, expressly or otherwise, endorse or promote any specific products or services.

© The Metro Ethernet Forum 2012. All Rights Reserved.

Table of Contents

| | | |
|-----|---------------------------------------|----|
| 1. | Abstract..... | 1 |
| 2. | Terminology and Acronyms..... | 1 |
| 3. | Scope..... | 3 |
| 4. | Compliance Levels | 3 |
| 5. | Introduction..... | 4 |
| 5.1 | The Basic Need..... | 4 |
| 5.2 | The General Structure..... | 4 |
| 5.3 | The Foundational Elements | 5 |
| 6. | SOAM YANG PM Overview | 6 |
| 6.1 | Type Definitions | 6 |
| 6.2 | Groupings | 7 |
| 6.3 | Data definitions..... | 8 |
| 6.4 | RPCs | 10 |
| 6.5 | Notifications | 10 |
| 7. | SOAM PM YANG Requirements..... | 11 |
| 8. | SOAM PM YANG MODULE..... | 13 |
| 9. | References..... | 78 |

List of Figures

| | |
|---|---|
| Figure 2 – Relationship between MEF and ITU-T specifications, the YANG language and MEF CFM and SOAM (PM and FM) modules | 6 |
| Figure 3 - Extensions to the CFM Module | 9 |

List of Tables

| | |
|----------------------------|---|
| Table 1 – Terminology..... | 3 |
|----------------------------|---|

1. Abstract

This document specifies the Performance Monitoring (PM) YANG Module necessary to implement the Service Operations, Administration, and Maintenance (OAM) that satisfies the Service OAM requirements and framework specified by MEF 17 [9], the Service OAM Performance Monitoring requirements as specified by SOAM-PM [13], and the Service OAM management objects as specified by MEF 7.1 [6] and ITU-T Q.840.1 [18] which are applicable to Performance Monitoring functions. One MEF document, the SOAM PM MIB [14] and one non-MEF documents serve as the baseline documents for this work: ITU-T Y.1731 [19]. YANG [26] is the data modeling language used to model configuration and state data manipulated by the NETCONF protocol [25], and NETCONF notifications on the Network Element (NE).

2. Terminology and Acronyms

| Term | Definition | Source |
|----------|--|----------------------|
| AIS | Alarm Indication Signal | ITU-T Y.1731 [19] |
| API | Application Programming Interface | |
| BSS | Business Support System | |
| CoS | Class of Service | MEF 10.2.1 [7] |
| CFM | Connectivity Fault Management | IEEE Std 802.1Q [20] |
| EMS | Element Management System | MEF 7.1 [6] |
| ENNI | External Network-to-Network Interface | MEF 4 [5] |
| ETH-AIS | Ethernet Alarm Indication Signal function | ITU-T Y.1731 [19] |
| ETH-CC | Ethernet Continuity Check function | ITU-T Y.1731 [19] |
| ETH-LB | Ethernet Loopback function | ITU-T Y.1731 [19] |
| ETH-LCK | Ethernet Lock signal function | ITU-T Y.1731 [19] |
| ETH-LT | Ethernet Linktrace function | ITU-T Y.1731 [19] |
| ETH-RDI | Ethernet Remote Defect Indication function | ITU-T Y.1731 [19] |
| ETH-Test | Ethernet Test function | ITU-T Y.1731 [19] |
| EVC | Ethernet Virtual Connection | MEF 10.2.1 [7] |
| FM | Fault Management | MEF 17 [9] |
| IEEE | Institute of Electrical and Electronics Engineers | |
| IETF | Internet Engineering Task Force | |
| ITU-T | International Telecommunication Union - Telecommunication Standardization Bureau | |
| LAN | Local Area Network | MEF 4 [5] |
| LCK | Locked, used in reference to LCK PDUs | ITU-T Y.1731 [19] |
| LBM | Loopback Message | IEEE Std 802.1Q [20] |
| LBR | Loopback Reply | IEEE Std 802.1Q [20] |
| LTM | Linktrace Message | IEEE Std 802.1Q [20] |
| LTR | Linktrace Reply | IEEE Std 802.1Q [20] |
| MAC | Media Access Control | IEEE Std 802.3 [21] |
| MA | Maintenance Association (equivalent to a MEG) | IEEE Std 802.1Q [20] |
| MAID | Maintenance Association Identifier (equivalent to a MEG ID) | IEEE Std 802.1Q [20] |

| Term | Definition | Source |
|----------------|--|--|
| MD | Maintenance Domain (equivalent to a OAM Domain in MEF 17) | IEEE Std 802.1Q [20] |
| MD Level | Maintenance Domain Level (equivalent to a MEG level) | IEEE Std 802.1Q [20] |
| ME | Maintenance Entity | IEEE Std 802.1Q [20] |
| MEF | Metro Ethernet Forum | |
| MEG | Maintenance Entity Group (equivalent to a MA) | ITU-T Y.1731 [19] |
| MEG ID | Maintenance Entity Group Identifier. Equivalent to Maintenance Association Identifier (MAID). | ITU-T Y.1731 [19] |
| MEG Level | Maintenance Entity Group Level (equivalent to MD Level) | ITU-T Y.1731 [19] |
| MEN | Metro Ethernet Network | MEF 4 [5] |
| MEP | Maintenance Association End Point or MEG End Point | IEEE Std 802.1Q [20], ITU-T Y.1731 [19] |
| MIB | Management Information Base | RFC 2578 [2] |
| MIP | Maintenance Domain Intermediate Point or MEG Intermediate Point | IEEE Std 802.1Q [20], ITU-T Y.1731 [19] |
| MP | Maintenance Point. One of either a MEP or a MIP. | IEEE Std 802.1Q [20] |
| MTU | Maximum Transmission Unit | MEF 10.2.1 [7] |
| NE | Network Element | MEF 4 [5] |
| NETCONF | The Network Configuration Protocol | IETF RFC 6241 [25] |
| NETCONF Client | A NETCONF entity that invokes protocol operations on a NETCONF server. In addition, a client can subscribe to receive notifications from a server. | IETF RFC 6241 |
| NETCONF Server | A NETCONF entity that executes protocol operations invoked by a NETCONF client. In addition, a server can send notifications to a client. | IETF RFC 6241 |
| NNI | Network-to-Network Interface | MEF 4 [5] |
| NMS | Network Management System | MEF 7.1 [6] |
| OAM | Operations, Administration, and Maintenance | MEF 17 [9] |
| OSS | Operations Support System | ITU-T Y.1731 [19] |
| OVC | Operator Virtual Connection | MEF 26 [10] |
| PDU | Protocol Data Unit | IEEE Std 802.1Q [20] |
| RDI | Remote Defect Indication | IEEE Std 802.1Q [20] |
| RFC | Request for Comment | |
| RPC | Remote Procedure Call | |
| SOAM | Service OAM | MEF 17 [9] |
| SOAM PDU | Service OAM frame, or Protocol Data Unit. Specifically, those PDUs defined in [IEEE 802.1Q], [ITU-T Y.1731], or MEF specifications. | SOAM-FM [11] |
| Service Frame | An Ethernet frame transmitted across the UNI toward the Service Provider or an Ethernet frame transmitted across the UNI toward the Subscriber | MEF 10.2.1 [7] |
| SNMP | Simple Network Management Protocol | RFC 1157 |

| Term | Definition | Source |
|-------------------|---|-------------------------------|
| SNMP Agent | An SNMP entity containing one or more command responder and/or notification originator applications (along with their associated SNMP engine). Typically implemented in an NE. | RFC 3411 [3] |
| SNMP Manager | An SNMP entity containing one or more command generator and/or notification receiver applications (along with their associated SNMP engine). Typically implemented in an EMS or NMS. | RFC 3411 [3] |
| Synthetic Traffic | SOAM traffic which emulates service traffic in order to measure the performance experience. Delay measurements use synthetic traffic, because user traffic does not contain standardized timestamp fields. | SOAM-PM [13] |
| TC | Textual Conventions | RFC 4181 [4] |
| TLV | Type Length Value, a method of encoding Objects | |
| TST | Test PDU | ITU-T Y.1731 [19] |
| UML | Unified Modeling Language | Object Management Group (OMG) |
| UTC | Coordinated Universal Time | SOAM-PM [13] |
| UNI | User-to-Network Interface | MEF 4 [5] |
| VID | VLAN Identifier | IEEE Std 802.1Q [20] |
| VLAN | Virtual LAN | IEEE Std 802.1Q [20] |
| YANG | A Data Modeling Language for NETCONF | IETF RFC 6020 [26] |

Table 1 – Terminology

3. Scope

The scope of this document is to provide the YANG modules that supports the Service OAM (SOAM) Performance Monitoring functions that have been defined in MEF 17 [9], the SOAM-PM [13], and MEF 7.1 [6], the *EMS-NMS Information Model*.

This document includes YANG definitions that support the Performance Management functionality as defined by IEEE 802.1ag [22], ITU-T Y.1731 [19] and the enhanced functionality as defined by the SOAM-PM [13] and implemented via the SOAM PM MIB [14].

The primary purpose of this document is to provide a mechanism to enhance interoperability between equipment/software vendors and Service Providers and/or Operators. This document provides the Metro Ethernet Forum (MEF) SOAM PM functionality within the Metro Ethernet Networks (MEN) via the industry standard YANG modeling language.

4. Compliance Levels

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [1]. All key words must be in upper case, bold text.

5. Introduction

5.1 The Basic Need

One of the aspects of defining Metro Ethernet Networks (MEN) is the need to ensure the compatibility between equipment/software vendors and equipment operators in order to facilitate interoperability in local, metro, national, and international networks. One of the common ways to do this is through a common management interface using publically available or enterprise specific NETCONF YANG Modules.

NETCONF is an IETF network management protocol defining a simple mechanism through which a device can be managed, configuration data information can be retrieved, and new configuration data can be uploaded and manipulated. YANG is a data modeling language to define the structure, syntax and semantics of data that can be used for NETCONF operations, including configuration, state data, RPCs and notifications. This allows the device to expose a full, formal Application Programming Interface (API). Applications can use this API to send and receive full and partial configuration data sets. NETCONF uses an Extensible Markup Language (XML)-based data encoding for the configuration data as well as the protocol messages.

The NETCONF protocol standard is defined in a set of RFCs. The base protocol is defined in RFC 6241 - *Network Configuration Protocol (NETCONF)* and the mandatory transport mapping is defined in RFC 6242 - *Using the NETCONF Protocol over Secure Shell (SSH)*. A list of additional transport mappings and extensions to the protocol is maintained by the NETCONF Working Group in the IETF.

The YANG language standard is defined by the IETF in a set of RFCs, primary of which are RFC 6020 *YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)* [26] and RFC 6087 *Guidelines for Authors and Reviewers of YANG Data Model Documents* [27].

5.2 The General Structure

A generalized system model is shown by Figure 1 that illustrates the relationship between the OSS/BSS, NMS, EMS, and Network Elements (NE). The primary focus of this specification defines the interaction between the EMS and the NE via NETCONF using the YANG modules defined in this specification.

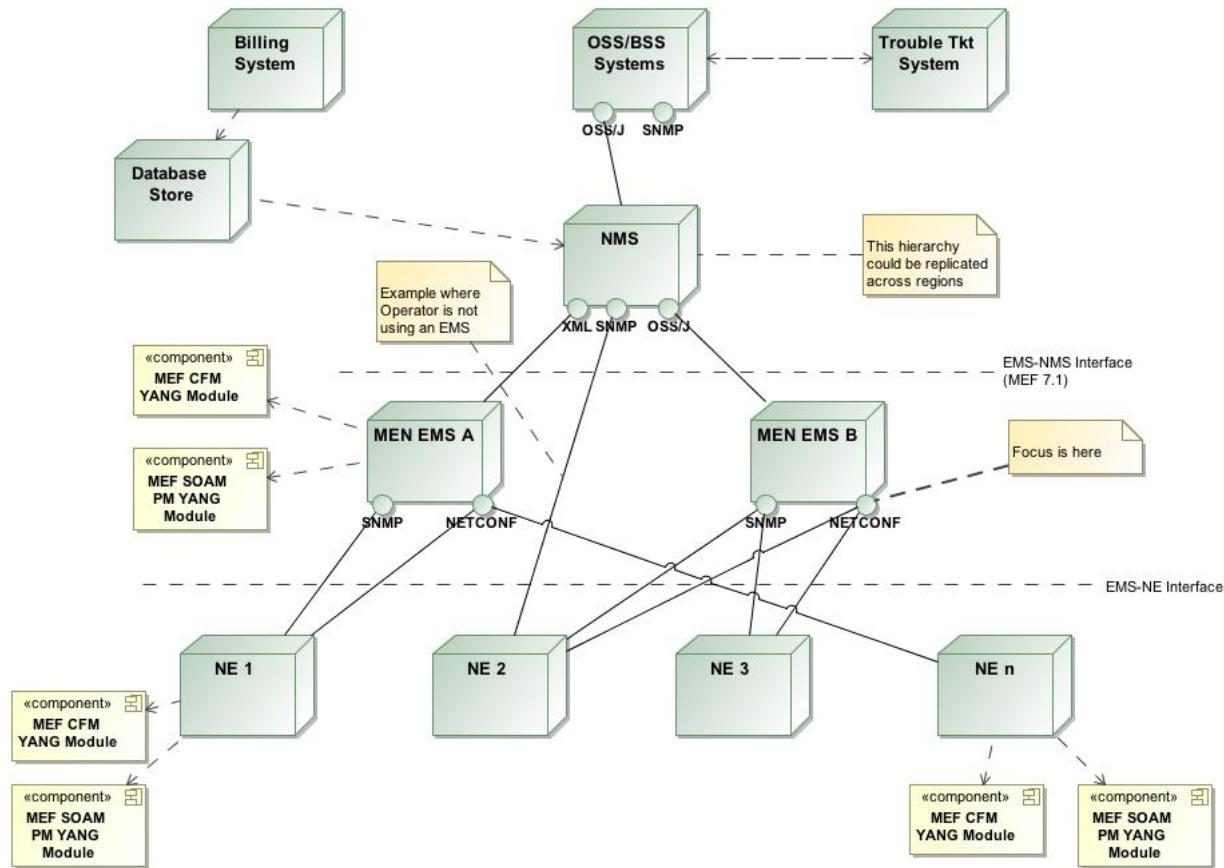


Figure 1 – Generalized OSS/BSS-NMS-EMS-NE Model

5.3 The Foundational Elements

MEF 10.2.1 [7] describes the Ethernet Service Attributes at the UNI reference point including the performance attributes of Frame Delay (FD), Inter-Frame Delay Variation (IFDV), Frame Loss Ratio (FLR), and Availability Performance.

MEF 17 [9] provides the Service OAM requirements and framework. It defines the OAM components and Service OAM requirements.

SOAM-PM [13] further defines the aspects of Service OAM requirements that deal with Performance Monitoring (PM) and their extensions as needed to support MEF SOAM PM requirements.

SOAM-PM builds upon two existing documents: Connectivity Fault Management as defined in IEEE 802.1Q [20] and extended in ITU-T Y.1731 [19].

SOAM-PM MIB [14] provides the baseline for the SOAM-PM objects.

Service OAM Performance Monitoring objects that provide the baseline for objects defined in this specification are found in MEF 7.1 [6].

MEF 7.1 draws heavily upon the models defined in ITU-T Q.840.1 [18].

The relationship between the various documents and the PM YANG modules presented in this specification is illustrated by Figure 2. The UML models found in MEF 7.1, Q.840.1, and G.8052 provide a baseline for the SOAM YANG modules along with a number of the tables and objects in the IEEE CFM MIBs, the MEF-SOAM-FM and MEF-SOAM-TC MIBs as realized in the *mef-cfm*, *mef-soam-fm* and *mef-soam-pm* YANG modules.

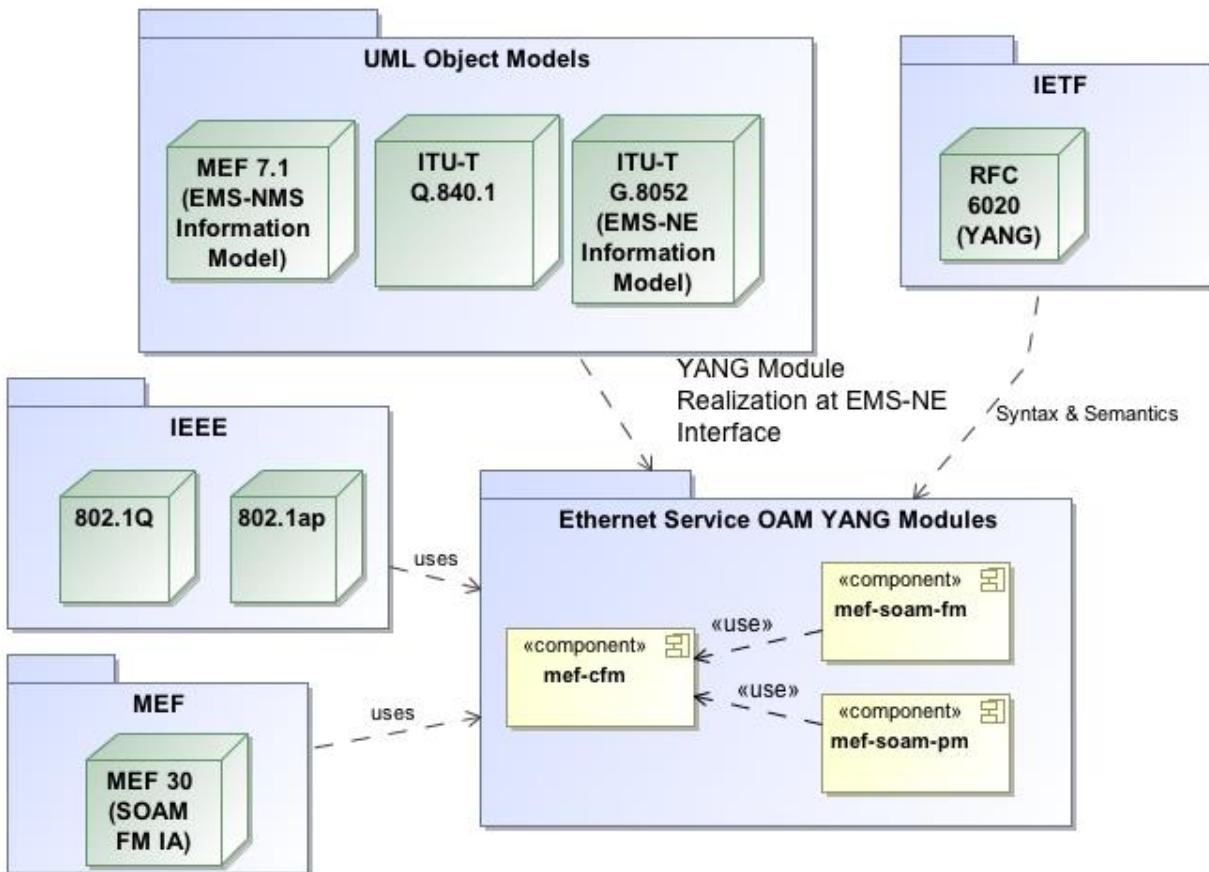


Figure 2 – Relationship between MEF and ITU-T specifications, the YANG language and MEF CFM and SOAM (PM and FM) modules

6. SOAM YANG PM Overview

The YANG PM Module implements the objects and functions found in MEF SOAM PM IA [13], and various objects and tables from MEF-SOAM-PM-MIB [14], and MEF-SOAM-TC-MIB [12].

6.1 Type Definitions

Type definitions define derived types from base types using the *typedef* statement. A base type can be either a built-in type or a derived type, allowing a hierarchy of derived types.

The *typedef* statement is described in RFC6020 section 7.3.

The following type definitions are defined within the SOAM PM YANG Module and are used locally in the SOAM PM YANG module.

- **suspect-status-type** – This boolean data type indicates whether the measurement interval has been marked as suspect
- **performance-monitoring-interval-type** – This integer data type indicates the transmission time between the SOAM PM frames for session
- **test-pattern-type** – This enumeration data type indicates the type of test pattern to be sent in an OAM PDU Data TLV
- **session-status-type** – Indicates the measurement instance is active.
- **availability-type** – Indicates the availability is not known, for instance because insufficient time has passed to make an availability calculation, the time has been excluded because of a maintenance interval, or because availability measurement is not enabled
- **measurement-bin-type** – This enumeration data type indicates whether the bin number is for Frame Delay, Inter-Frame Delay Variation or Frame Delay Range.

6.2 Groupings

Groupings are reusable collections of nodes using the **grouping** statement. Groupings of definitions are instantiated using the **uses** statement.

The **grouping** and **uses** statements are defined in RFC6020 sections 7.11, and 7.12 respectively.

The following groupings are defined for SOAM PM YANG Module and are used throughout the PM module.

- **remote-mep-group** – This grouping includes objects which identify a remote MEP
- **measurement-timing-group** – This grouping includes objects used for proactive and on-demand scheduling of PM measurement sessions
- **loss-measurement-configuration-group** – This grouping includes configuration objects for the Frame Loss Measurement functions
- **loss-availability-stats-group** – This grouping includes availability statistics objects for a SOAM Loss Measurement session
- **loss-measurement-stats-group** – This grouping includes statistics objects for a SOAM Loss Measurement session
- **delay-measurement-configuration-group** – This grouping includes configuration objects for the Delay Measurement functions
- **delay-measurement-stats-group** – This grouping includes statistics objects for a SOAM Delay Measurement session
- **delay-measurement-bins-content-group** – This grouping contains result measurement bin objects for a SOAM Delay Measurement session

- **delay-measurement-bins-group** – This grouping contains the specific bin objects for a SOAM Delay Measurement session

6.3 Data definitions

This section contains descriptions of the data definitions for SOAM PM. Data definitions defines new data nodes in the data tree.

The Figure 3 below describes the extensions to the CFM module provided by SOAM PM. The content of the PM module is depicted as boxes with dotted borders, extending existing certain CFM data definitions (e.g. MEP Augments) and adding new data definitions (e.g. Loss Measurement) to the tree.

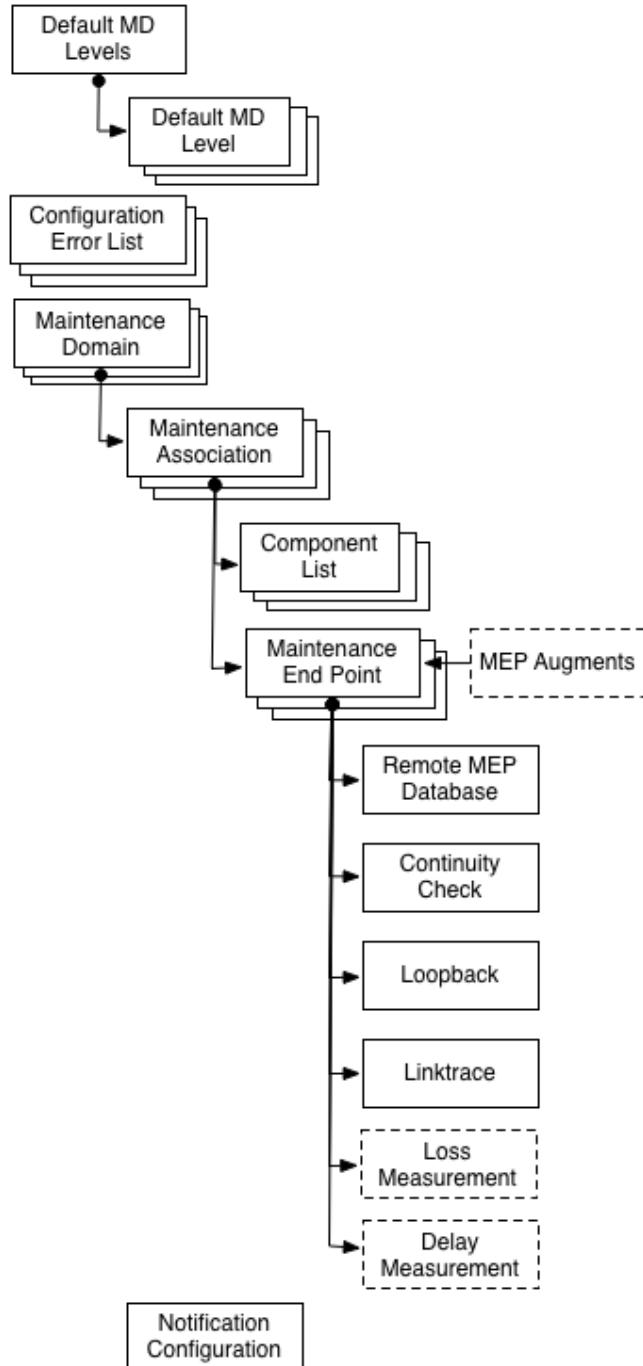


Figure 3 - Extensions to the CFM Module

The list entries below describes the informal name of all grouped definitions in bold text, e.g. **Augment of CFM Maintenance Association (MA)/MEG**. The list entries also include a description of the relative location of the data definition in the SOAM FM module tree.

- **Augment of CFM Maintenance End Point (MEP)** – A set of data definitions augmenting the CFM MEP with parameters related to SOAM PM, specifically with regards to the role of the MEP in PM tests.

- **Augment of CFM Maintenance End Point (MEP)** – A set of data definitions augmenting the CFM MEP with parameters related to SOAM PM, specifically with regards to Loss Measurement
- **Augment of CFM Maintenance End Point (MEP)** – A set of data definitions augmenting the CFM MEP with parameters related to SOAM PM, specifically with regards to Delay Measurements

6.4 RPCs

Custom NETCONF RPCs are defined using the *rpc* statement. An RPC has a name and defines an optional set of input data using the the *input* statement, and a set of optional return values using the *output* statement.

The *rpc* statement is defined in RFC6020 section 7.13.

The following RPCs are defined within the SOAM PM YANG Module and are used by clients to perform specific tasks.

- **create-loss-measurement** – This RPC creates a new loss measurement session associated with a specific MEP. The output parameter provides the ID of the newly created loss measurement session.
- **abort-loss-measurement** – This RPC aborts a current loss measurement session with a specific session ID on a specific MEP
- **clear-loss-history-stats** – This RPC clears the loss measurement history data associated with a specific session ID on a specific MEP
- **create-delay-measurement** – This RPC creates a new delay measurement session associated with a specific MEP. The output parameter provides the ID of the newly created delay measurement session.
- **abort-delay-measurement** – This RPC aborts a current delay measurement session with a specific session ID on a specific MEP
- **clear-delay-history-stats** – This RPC clears the delay measurement history data associated with a specific session ID on a specific MEP

6.5 Notifications

Custom NETCONF notifications are defined using the *notification* statement. A notification can contain arbitrary data defined in the YANG module.

The *notification* statement is defined in RFC6020 section 7.14.

The NETCONF notifications feature provides filtering capabilities allowing subscribers to filter out events based on event content. This features makes the configuration to suppress specific notifications as defined in e.g. the *mefSoamPmNotificationCfgAlarmEnable* object in the MEF-SOAM-PM-MIB redundant.

The following notifications are defined within the SOAM PM YANG Module.

- **availability-change-alarm** - This notification is generated when the state of measured-*availability-forward-status* or *measured-availability-backward-status* associated with a specific loss-measurement session changes on a MEP. This notification carries the following data definitions:
 - The ID of the affected MEP
 - The ID of the loss measurement session
 - Availability forward and backward
 - Last transition time for forward and backward availability
 - Forward and backward unavailable and available status
- **loss-session-start-stop-alarm** - This notification is generated when the state of session-status changes for a specific loss-measurement session. This notification carries the following data definitions:
 - The ID of the affected MEP
 - The ID of the loss measurement session
 - Session Status
- **delay-session-start-stop-alarm** - This notification is generated when the state of session-status changes for a specific delay-measurement session. This notification carries the following data definitions:
 - The ID of the affected MEP
 - The ID of the delay measurement session
 - Session Status
- **threshold-crossing-alarm** - This notification is generated if any of the criteria for above-alarm, set-alarm, or clear-alarm are met. This notification carries the following data definitions:
 - The ID of the affected MEP
 - The ID of the loss or delay measurement session
 - The notification crossing type
 - The threshold ID and associated configured and measure value
 - The current value of the suspect flag

7. SOAM PM YANG Requirements

The SOAM PM YANG module defines the managed objects necessary to support SOAM PM functionality. Its primary point of reference are the SOAM-PM Implementation Agreement [13] and the SOAM-PM MIB [14]

- [R1] Type definitions, groupings, data definitions, RPCs and notifications in the SOAM PM YANG module **SHALL** be supported for devices that are compliant with SOAM PM YANG functionality except the following:
- [D1] Data definitions and RPCs related to single ended responder **SHOULD** be supported for devices that are compliant with SOAM PM YANG functionality
- [D2] Data definitions and RPCs related to Loss Measurement Test TLV, availability, alignment, and number consecutive High FLR **SHOULD** be supported for devices that are compliant with SOAM PM YANG functionality

- [D3] Data definitions and RPCs related to Availability and Availability History Statistics **SHOULD** be supported for devices that are compliant with SOAM PM YANG functionality
- [D4] Data definitions and RPCs related to Loss Measurement Current and History Statistics **SHOULD** be supported for devices that are compliant with SOAM PM YANG functionality
- [D5] Data definitions and RPCs related to Delay Measurement Test TLV, Source Mac address, align measurement offset, and Inter Frame Delay Variation offset **SHOULD** be supported for devices that are compliant with SOAM PM YANG functionality
- [D6] Data definitions and RPCs related to Delay Measurement Current and History Statistics **SHOULD** be supported for devices that are compliant with SOAM PM YANG functionality
- [D7] Data definitions and RPCs related to thresholds for forward delay, two way delay and frame delay range **SHOULD** be supported for devices that are compliant with SOAM PM YANG functionality

8. SOAM PM YANG MODULE

```

module mef-soam-pm {
    namespace "http://metroethernetforum.org/ns/yang/mef-soam-pm";
    prefix mef-soam-pm;

    import mef-cfm {
        prefix cfm;
        revision-date 2012-04-16;
    }

    import ietf-yang-types {
        prefix yang;
        revision-date 2010-09-24;
    }

    organization "Metro Ethernet Forum";
    contact
        "Web URL: http://metroethernetforum.org/
         E-mail: mibs@metroethernetforum.org
         Postal: Metro Ethernet Forum
                  6033 W. Century Boulevard, Suite 830
                  Los Angeles, CA 90045
                  U.S.A.
         Phone: +1 310-642-2800
         Fax: +1 310-642-2808";

    description
        "This YANG module contains the management data definitions for the
         management of Ethernet Services Operations, Administration and
         Maintenance for Performance Monitoring and extends the Connectivity
         Fault Management (CFM) YANG modules.

    Reference Overview:
        A number of base documents have been used to create the
        SOAM PM YANG Module.
        The following are the abbreviations for the baseline documents:
        [802.1q] refers to IEEE 802.1Q-2011 'IEEE Standard for Local and
        metropolitan area networks --Media Access Control (MAC)
        Bridges and Virtual Bridged Local Area Networks, August 2011
        [MEF SOAM PM IA] refers to 'Service OAM Performance Monitoring
        Implementation Agreement', January 2012
        [MEF SOAM PM MIB] refers to 'Service OAM Performance Monitoring
        Definition of Managed Objects', January 2012
        [Y.1731] refers to ITU-T Y.1731 'OAM functions and mechanisms
        for Ethernet based networks', July 2011";

    revision 2012-04-16 {
        description
            "Initial revision";
        reference
            "Service OAM Performance Monitoring YANG Module (MEF XX), April 2012";
    }

    //
    // Type definitions related to MEF SOAM PM
    //

    typedef suspect-status-type {
        type boolean;
        description
            "This boolean data type indicates whether the measurement interval

```

has been marked as suspect.

The object is set to false at the start of a measurement interval. It is set to true when there is a discontinuity in the performance measurements during the measurement interval. Conditions for a discontinuity include, but are not limited to the following:

```
 1 - The local time-of-day clock is adjusted by at least 10
      seconds
  2 - The conducting of a performance measurement is halted before
      the current measurement interval is completed
  3 - A local test, failure, or reconfiguration that disrupts
      service";
reference
  "[MEF SOAM PM IA] R39, R40, 41 and R42";
}

typedef performance-monitoring-interval-type {
  type uint32 {
    range "3..3600000";
  }
  units ms;
  description
    "This integer data type indicates the transmission time between the
     SOAM PM frames for session, in ms.";
}
typedef test-pattern-type {
  type enumeration {
    enum null-signal-without-crc-32 {
      description
        "This test pattern is a Null signal without CRC-32.";
    }
    enum null-signal-with-crc-32 {
      description
        "This test pattern is a Null signal with CRC-32.";
    }
    enum prbs-2311-without-crc-32 {
      description "This test pattern is a PRBS 2^31-1 without CRC-32.";
    }
    enum prbs-2311-with-crc-32 {
      description "This test pattern is a PRBS 2^31-1 with CRC-32.";
    }
  }
  description
    "This enumeration data type indicates the type of test pattern to be sent
     in an OAM PDU Data TLV.";
  reference
    "MEF-SOAM-TC-MIB.MefSoamTcTestPatternType";
}

typedef session-status-type {
  type enumeration {
    enum active {
      description
        "Indicates the measurement instance is active.";
    }
    enum not-active {
      description
        "Indicates the measurement instance is not active.";
    }
  }
}
```

```
description
  "This enumeration data type defines the status of PM session of a MEP.";
reference
  "MEF-SOAM-TC-MIB.MefSoamTcStatusType";
}

typedef availability-type {
  type enumeration {
    enum available {
      description
        "Indicates the MEP is available.";
    }
    enum unavailable {
      description
        "Indicates the MEP is unavailable.";
    }
    enum unknown {
      description
        "Indicates the availability is not known, for instance because
          insufficient time has passed to make an availability
          calculation, the time has been excluded because of a
          maintenance interval, or because availability measurement is
          not enabled.";
    }
  }
}

description
  "This enumeration data type defines the availability of a session,
  measured by a loss measurement session.";
reference
  "MEF-SOAM-TC-MIB.MefSoamTcAvailabilityType";
}

typedef measurement-bin-type {
  type enumeration {
    enum two-way-frame-delay {
      description
        "Indicates a measurement bin for two-way Frame Delay.";
    }
    enum forward-frame-delay {
      description
        "Indicates a measurement bin for one-way Frame Delay in the forward
          direction.";
    }
    enum backward-frame-delay {
      description
        "Indicates a measurement bin for one-way Frame Delay in the backward
          direction.";
    }
    enum two-way-inter-frame-delay-variation {
      description
        "Indicates a measurement bin for two-way Inter-frame Delay
          Variation.";
    }
    enum forward-inter-frame-delay-variation {
      description
        "Indicates a measurement bin for one-way Inter-frame Delay
          Variation in the forward direction.";
    }
    enum backward-inter-frame-delay-variation {
      description
        "Indicates a measurement bin for one-way Inter-frame Delay Variation
          in the backward direction.";
    }
  }
}
```

```
enum two-way-frame-delay-range {
    description
        "Indicates a measurement bin for two-way Frame Delay Range.";
}
enum forward-frame-delay-range {
    description
        "Indicates a measurement bin for one-way Frame Delay Range in the
         forward direction.";
}
enum backward-frame-delay-range {
    description
        "Indicates a measurement bin for one-way Frame Delay Range in the
         backward direction.";
}
}

description
    "This enumeration data type indicates whether the bin number is for Frame
     Delay, Inter-Frame Delay Variation or Frame Delay Range.";
reference
    "MEF-SOAM-TC-MIB.MefSoamTcDelayMeasurementBinType";
}

//  

// Groupings related to MEF SOAM PM  

//  

grouping remote-mep-group {
    description
        "This grouping includes objects which identify a remote MEP.";
    choice remote-mep {
        mandatory true;
        description
            "The remote MEP can be identified by either a MAC address or a MEP ID";
        case mac-address {
            leaf mac-address {
                type yang:mac-address;
                description
                    "The Target MAC Address Field to be transmitted: A unicast
                     destination MAC address.

                    This object is only valid for the entity transmitting the
                     SOAM Loss and Delay Measurement frames and is ignored by
                     the entity receiving SOAM Loss and Delay Measurement
                     frames.";
            }
        }
        case mep-id {
            leaf mep-id {
                type string;
                description
                    "The Maintenance Association End Point Identifier of another MEP in
                     the same Maintenance Association to which the SOAM Loss or Delay
                     Measurement frame is to be sent.

                    This object is only valid for the entity transmitting the
                     SOAM Loss Measurement or Delay Measurement frames and is
                     ignored by the entity receiving SOAM Loss Measurement or
                     Delay Measurement frames.";
            }
        }
    }
}
```

```
}

grouping measurement-timing-group {
    description
        "This grouping includes objects used for proactive and on-demand
         scheduling of PM measurement sessions.";

    container start-time {
        description
            "This container defines the session start time";

        choice start-time {
            mandatory true;
            description
                "Measurement session start time can be immediate, relative or
                 absolute.";

            container immediate {
                presence "Start the measurement session immediately.";

                description
                    "This object specifies the start time to be immediately at the time
                     of session creation.";
            }

            leaf relative {
                type yang:timeticks;

                description
                    "This object 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.";
            }

            leaf absolute {
                type yang:date-and-time;

                description
                    "This object 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.";
            }
        }
    }

    container stop-time {
        description
            "This container defines the session stop time";

        choice stop-time {
            mandatory true;
            description
                "Measurement session stop time can be none, relative or
                 absolute.";

            container none {
                presence "Never end the measurement session.";

                description
                    "This object specifies the measurement session to never end.";
            }

            leaf relative {
                type yang:timeticks;
```

```
mandatory true;

description
  "This object 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";
}

leaf absolute {
  type yang:date-and-time;

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

leaf repetition-period {
  type yang:timeticks;
  default 0;

  description
    "This object specifies a configurable repetition time between
Measurement Intervals in a Measurement session in hundredths of a
second.

If the value is less than or equal to one Measurement Interval
there is no time gap between the end of one Measurement
Interval and the start of a new Measurement Interval. This is
the normal usage case.

If the value is greater than one Measurement Interval there is
time gap between the end of one Measurement Interval and the
start of the next Measurement Interval.";
  reference
    "[MEF SOAM PM IA] R18, D3, R19, R20";
}
}

grouping loss-measurement-configuration-group {
  description
    "This grouping includes configuration objects for the Frame Loss
Measurement function defined in [Y.1731] and [MEF SOAM PM IA].";
  reference
    "MEF-SOAM-PM-MIB.mefSoamLmCfgTable, [Y.1731] and [MEF SOAM PM IA]";

leaf measurement-type {
  type enumeration {
    enum lmm {
      description
        "LMM SOAM PDU generated and received LMR responses tracked.";
    }
  }
}
```

```
enum slm {
    description
        "SLM SOAM PDU generated and received SLR responses tracked.";
}
enum ccm {
    description
        "CCM SOAM PDU generated and received CCM PDUs tracked.";
}
default slm;

description
    "This object specifies what type of Loss Measurement will be
     performed.";
reference
    "MEF-SOAM-PM-MIB.mefSoamLmCfgType";
}

leaf version {
    type enumeration {
        enum Y.1731-2008 {
            description
                "Indicates the PDU formats defined in Y.1731-2008";
        }
        enum Y.1731-2011 {
            description
                "Indicates the PDU formats defined in Y.1731-2011.";
        }
    }
    default Y.1731-2008;
}

description
    "This object indicates the version of the PDUs used to perform Loss
     Measurement.

    The exact PDUs to use are specified by this object in
     combination with measurement-type.";
reference
    "MEF-SOAM-PM-MIB.mefSoamLmCfgVersion";
}

leaf enabled-counters {
    type bits {
        bit forward-transmitted-frames;
        bit forward-received-frames;
        bit forward-min-flr;
        bit forward-max-flr;
        bit forward-average-flr;
        bit backward-transmitted-frames;
        bit backward-received-frames;
        bit backward-min-flr;
        bit backward-max-flr;
        bit backward-average-flr;
        bit soam-pdus-sent;
        bit soam-pdus-received;
        bit availability-forward-high-loss;
        bit availability-forward-consecutive-high-loss;
        bit availability-forward-available;
        bit availability-forward-unavailable;
        bit availability-forward-min-flr;
        bit availability-forward-max-flr;
        bit availability-forward-average-flr;
        bit availability-backward-high-loss;
        bit availability-backward-consecutive-high-loss;
    }
}
```

```
bit availability-backward-available;
bit available-backward-unavailable;
bit available-backward-min-flr;
bit available-backward-max-flr;
bit available-backward-average-flr;
bit measured-stats-forward-measured-flr;
bit measured-stats-backward-measured-flr;
bit measured-stats-availability-forward-status;
bit measured-stats-availability-backward-status;
}
default " ";

description
"A vector of bits that indicates the type of SOAM LM counters found in
the current-stats and history-stats that are enabled.

A present bit enables the specific SOAM LM counter. A not present
bit disables the SOAM LM counter.

If a particular SOAM LM counter is not supported the BIT value
is not present.

Not all SOAM LM counters are supported for all SOAM LM types. ";
reference
"MEF-SOAM-PM-MIB.mefSoamLmCfgMeasurementEnable";
}

leaf message-period {
    type performance-monitoring-interval-type;
    units ms;
    default 1000;

description
"This object specifies the interval between Loss Measurement OAM message
transmission. For Loss Measurement monitoring applications the
default value is 1 sec.

This object is not applicable if measurement-type is set to
'ccm' and is ignored for that Loss Measurement Type.";
reference
"MEF-SOAM-PM-MIB.mefSoamLmCfgMessagePeriod";
}

leaf priority {
    type cfm:priority-type;
    mandatory true;

description
"This object specifies the priority of frames with Performance
Monitoring OAM message information.";
reference
"MEF-SOAM-PM-MIB.mefSoamLmCfgPriority";
}

leaf frame-size {
    type uint32 {
        range "64 .. 9600";
    }
    units bytes;
    default 64;

description
"This object specifies the Loss Measurement frame size between 64 bytes
and the maximum transmission unit of the EVC.
```

The range of frame sizes from 64 through 2000 octets need to be supported, and the range of frame sizes from 2001 through 9600 octets is suggested be supported.

The adjustment to the frame size of the standard frame size is accomplished by the addition of a Data or Test TLV. A Data or Test TLV is only added to the frame if the frame size is greater than 64 bytes.";

```
reference
  "MEF-SOAM-PM-MIB.mefSoamLmCfgFrameSize";
}

leaf data-pattern {
  type enumeration {
    enum zeroes {
      description
        "Indicates the Data TLV contains all zeros.";
    }
    enum ones {
      description
        "Indicates the Data TLV contains all ones.";
    }
  }
  default zeroes;

  description
    "This object specifies the LM data pattern included in a Data TLV when
     the size of the LM frame is determined by the frame-size object
     and test-tlv-included is 'false'.

     If the frame size object does not define the LM frame size or
     test-tlv-included is 'true' the value of this object is ignored.";
  reference
    "MEF-SOAM-PM-MIB.mefSoamLmCfgDataPattern";
}

leaf test-tlv-included {
  type boolean;
  default false;

  description
    "This object indicates whether a Test TLV or Data TLV is included when
     the size of the LM frame is determined by the
     frame-size object.

     A value of 'true' indicates that the Test TLV is to be
     included. A value of 'false' indicates that the Data TLV is to
     be included.

     If the frame-size object does not define the LM frame size the
     value of this object is ignored.";
  reference
    "MEF-SOAM-PM-MIB.mefSoamLmCfgTestTlvIncluded";
}

leaf test-tlv-pattern {
  type test-pattern-type;
  default null-signal-without-crc-32;

  description
    "This object specifies the type of test pattern to be sent in the LM
     frame Test TLV when the size of LM PDU is determined by the
     frame-size object and test-tlv-included is 'true'. If the frame
```

```
size object does not define the LM frame size or
test-tlv-included is 'false' the value of this object is
ignored.";
reference
"MEF-SOAM-PM-MIB.mefSoamLmCfgTestTlvPattern";
}

leaf measurement-interval {
    type uint32 {
        range "1..525600";
    }
    units minutes;
    default 15;

    description
        "This object specifies the Measurement Interval for FLR statistics, in
         minutes.

        A Measurement Interval of 15 minutes needs to be supported,
         other intervals may be supported.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamLmCfgMeasurementInterval";
}

leaf number-intervals-stored {
    type uint32 {
        range "2..1000";
    }
    default 32;
    description
        "This object specifies the number of completed measurement intervals to
         store in the history statistic table.

        At least 32 completed measurement intervals are to be
         stored. 96 measurement intervals are recommended to be stored.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamLmCfgNumIntervalsStored";
}

leaf align-measurement-intervals {
    type boolean;
    default true;

    description
        "This object specifies whether the measurement intervals for the Loss
         Measurement session are aligned with a zero offset to real
         time.

        The value 'true' indicates that each Measurement Interval
         starts at a time which is aligned to NE time source hour if the
         interval is a factor of an hour, i.e. 60min/15min = 4. For
         instance, a measurement time interval of 15 minutes would
         stop/start the measurement interval at 0, 15, 30, and 45
         minutes of an hour. A measurement interval of 7 minutes would
         not align to the hour since 7 minutes is NOT a factor of an
         hour, i.e. 60min/7min = 8.6, and the behavior is the same as
         if the object is set to 'false'.

        The value 'false' indicates that each Measurement Interval
         starts at a time which is indicated by repetition-period.

        One side effect of the usage of this parameter is that if the
         value is true and the repetition-period is not a factor of an
         hour then the start of the next Measurement Interval will be
         delayed by the remainder of the division of the repetition-period
         by the hour length (e.g. 7min/15min = 0.4666666666666667).
```

```
    delayed until the next factor of an hour.";  
    reference  
      "MEF-SOAM-PM-MIB.mefSoamLmCfgAlignMeasurementIntervals";  
  }  
  
leaf align-measurement-offset {  
  type uint32 {  
    range "0..525600";  
  }  
  units minutes;  
  default 0;  
  
  description  
    "This object specifies the offset in minutes from the time of day value  
     if align-measurement-intervals is 'true' and the repetition  
     time is a factor of 60 minutes. If not, the value of this  
     object is ignored.  
  
     If the Measurement Interval is 15 minutes and  
     align-measurement-intervals is true and if this object was set  
     to 5 minutes, the Measurement Intervals would start at 5, 20,  
     35, 50 minutes past each hour."  
    reference  
      "MEF-SOAM-PM-MIB.mefSoamLmCfgAlignMeasurementOffset";  
}  
  
leaf availability-measurement-interval {  
  type uint32 {  
    range "1..525600";  
  }  
  units minutes;  
  default 15;  
  
  description  
    "This object specifies the availability measurement interval in minutes.  
  
     A measurement interval of 15 minutes is to be supported, other  
     intervals can be supported."  
  reference  
    "MEF-SOAM-PM-MIB.mefSoamLmCfgAvailabilityMeasurementInterval";  
}  
leaf availability-number-consecutive-flr-measurements {  
  type uint32 {  
    range "1..1000000";  
  }  
  default 10;  
  
  description  
    "This object specifies a configurable number of consecutive loss  
     measurement PDUs to be used in evaluating the  
     availability/unavailability status of each availability  
     indicator per MEF 10.2.1. Loss Measurement PDUs (LMMs, CCMs or  
     SLMs) are sent regularly with a period defined by  
     message-period. Therefore, this object, when multiplied by  
     message-period, is equivalent to the Availability parameter of  
     'delta_t' as specified by MEF 10.2.1.  
  
    If the measurement-type is lmm or ccm, this object defines the  
    number of LMM or CCM PDUs transmitted during each 'delta_t'  
    period. The Availability flr for a given 'delta_t' can be  
    calculated based on the counters in the last LMM/R or CCM  
    during this 'delta_t' and the last LMM/R or CCM in the previous  
    'delta_t'.  

```

If the measurement-type is slm, this object defines the number of SLM PDUs transmitted during each 'delta_t' period. The Availability flr for a given 'delta_t' is calculated based on the number of those SLM PDUs that are lost.

If the measurement-type is lmm or ccm, the number range of 1 through 10 must be supported. The number range of 10 through 1000000 may be supported, but is not mandatory.

If the measurement-type is slm, the number range of 10 through 100 must be supported. The number range of 100 through 1000000 may be supported, but is not mandatory.";

reference
"MEF-SOAM-PM-MIB.mefSoamLmCfgAvailabilityNumConsecutiveMeasPdus";
}

leaf availability-flr-threshold {
type uint32 {
range "0..100000";
}
units milli-percent;
default 50000;

description
"This object specifies a configurable availability threshold to be used in evaluating the availability/unavailability status of an availability indicator per MEF 10.2.1. The availability threshold range of 0.00 (0) through 1.00 (100000) is supported. This parameter is equivalent to the Availability parameter of 'C' as specified by MEF 10.2.1.
Units are in milli-percent, where 1 indicates 0.001 percent.";

reference
"MEF-SOAM-PM-MIB.mefSoamLmCfgAvailabilityFlrThreshold";
}

leaf availability-number-consecutive-intervals {
type uint32 {
range "1..1000";
}
default 10;

description
"This object specifies a configurable number of consecutive availability indicators to be used to determine a change in the availability status as indicated by MEF 10.2.1. This parameter is equivalent to the Availability parameter of 'n' as specified by MEF 10.2.1.
The number range of 1 through 10 must be supported. The number range of 1 through 1000 may be supported, but is not mandatory.";

reference
"MEF-SOAM-PM-MIB.mefSoamLmCfgAvailabilityNumConsecutiveIntervals";
}

leaf availability-number-consecutive-high-flr {
type uint32 {
range "1..1000";
}
default 5;

description
"This object specifies a configurable number of consecutive availability indicators to be used for assessing CHLI. This parameter is equivalent to the Resiliency parameter of 'p' as specified by

MEF 10.2.1.

Availability-consecutive-high-flr must be strictly less than availability-number-consecutive-intervals. If not, the count of high loss intervals over time, and the count of consecutive high loss levels, is disabled.

```
    The number range of 1 through 10 must be supported. The number
    range of 1 through 1000 may be supported, but is not mandatory.";
```

reference
"MEF-SOAM-PM-MIB.mefSoamLmCfgAvailabilityNumConsecutiveHighFlr";
}

leaf session-type {
 type enumeration {
 enum proactive {
 description
 "The current session is 'proactive'";
 }
 enum on-demand {
 description
 "The current session is 'on-demand'";
 }
 }
}

description
"This object indicates whether the current session is defined to be
'proactive' or 'on-demand'.";
reference
"[MEF SOAM IA] R3";
}

list thresholds {
 key id;
 description
 "This list contains the list of Loss Measurement configuration threshold
 values for LM Performance Monitoring.

 The main purpose of the threshold configuration list is to
 configure threshold alarm notifications indicating that a
 specific performance metric is not being met.";

leaf id {
 type uint32;
 description
 "The index of the threshold number for the specific LM threshold
 entry.

 An index value of '1' needs to be supported. Other index
 values can also be supported.";

}

leaf enabled-thresholds {
 type bits {
 bit measured-flr-forward;
 bit max-flr-forward;
 bit average-flr-forward;
 bit measured-flr-backward;
 bit max-flr-backward;
 bit average-flr-backward;
 bit forward-high-loss;
 bit forward-consecutive-high-loss;
 bit backward-high-loss;
 bit backward-consecutive-high-loss;

```
bit forward-unavailable-count;
bit forward-available-ratio;
bit backward-unavailable-count;
bit backward-available-ratio;
}
default "";
description
"A vector of bits that indicates the type of SOAM LM thresholds
notifications that are enabled.

A present bit enables the specific SOAM LM threshold
notification and when the specific counter is enabled and
the threshold is crossed a notification is generated.

A not present bit disables the specific SOAM LM threshold
notification.

If a particular SOAM LM threshold is not supported the BIT
value is not present.";
}

leaf measured-flr-forward {
    type uint32 {
        range "0..100000";
    }
    units milli-percent;
    default 100000;

    description
        "This object is used to set the measured forward frame loss ratio
        threshold value that will be used to determine if a threshold
        notification is generated.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamLmThresholdCfgMeasuredFlrForwardThreshold";
}

leaf max-flr-forward {
    type uint32 {
        range "0..100000";
    }
    units milli-percent;
    default 100000;

    description
        "This object is used to set the maximum forward frame loss ratio
        threshold value that will be used to determine if a threshold
        notification is generated.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamLmThresholdCfgMaxFlrForwardThreshold";
}

leaf average-flr-forward {
    type uint32 {
        range "0..100000";
    }
    units milli-percent;
    default 100000;

    description
        "This object is used to set the average forward frame loss ratio
        threshold value that will be used to determine if a threshold
        notification is generated.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamLmThresholdCfgAvgFlrForwardThreshold";
```

```
}

leaf measured-flr-backward {
    type uint32 {
        range "0..100000";
    }
    units milli-percent;
    default 100000;

    description
        "This object is used to set the measured backward frame loss ratio
         threshold value that will be used to determine if a threshold
         notification is generated.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamLmThresholdCfgMeasuredFlrBackwardThreshold";
}

leaf max-flr-backward {
    type uint32 {
        range "0..100000";
    }
    units milli-percent;
    default 100000;

    description
        "This object is used to set the maximum backward frame loss ratio
         threshold value that will be used to determine if a threshold
         notification is generated.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamLmThresholdCfgMaxFlrBackwardThreshold";
}

leaf average-flr-backward {
    type uint32 {
        range "0..100000";
    }
    units milli-percent;
    default 100000;

    description
        "This object is used to set the average backward frame loss ratio
         threshold value that will be used to determine if a threshold
         notification is generated.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamLmThresholdCfgAvgFlrBackwardThreshold";
}

leaf forward-high-loss {
    type uint32;
    default 2147483647;

    description
        "This object is used to set the forward high loss threshold value that
         will be used to determine if a threshold notification is
         generated.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamLmThresholdCfgForwardHighLossThreshold";
}

leaf forward-consecutive-high-loss {
    type uint32;
    default 2147483647;

    description
        "This object is used to set the consecutive forward high loss
         threshold value that will be used to determine if a threshold
```

```
    notification is generated.";  
    reference  
      "MEF-SOAM-PM-MIB." +  
      "mefSoamLmThresholdCfgForwardConsecutiveHighLossThreshold";  
  }  
leaf backward-high-loss {  
  type uint32;  
  default 2147483647;  
  
  description  
    "This object is used to set the backward high loss threshold value  
     that will be used to determine if a threshold notification is  
     generated.";  
  reference  
    "MEF-SOAM-PM-MIB.mefSoamLmThresholdCfgBackwardHighLossThreshold";  
}  
leaf backward-consecutive-high-loss {  
  type uint32;  
  default 2147483647;  
  
  description  
    "This object is used to set the consecutive backward high loss  
     threshold value that will be used to determine if a threshold  
     notification is generated.";  
  reference  
    "MEF-SOAM-PM-MIB." +  
    "mefSoamLmThresholdCfgBackwardConsecutiveHighLossThreshold";  
}  
  
leaf forward-unavailable-count {  
  type uint32;  
  default 2147483647;  
  
  description  
    "This object is used to set the forward unavailability threshold value  
     that will be used to determine if a threshold notification is  
     generated.";  
  reference  
    "MEF-SOAM-PM-MIB.mefSoamLmThresholdCfgForwardUnavailCountThreshold";  
}  
  
leaf forward-available-ratio {  
  type uint32 {  
    range "0..100000";  
  }  
  units milli-percent;  
  default 0;  
  
  description  
    "This object is used to set the forward availability/total time ratio  
     threshold value that will be used to determine if a  
     threshold notification is generated if the ratio drops below  
     the configured value.  
  
    The ratio value is expressed as a percent with a value of 0  
    (ra-tio 0.00) through 100000 (ratio 1.00)  
  
    Units are in milli-percent, where 1 indicates 0.001 percent.";  
  reference  
    "MEF-SOAM-PM-MIB.mefSoamLmThresholdCfgForwardAvailRatioThreshold";  
}  
  
leaf backward-unavailable-count {  
  type uint32;
```

```

default 2147483647;
description
  "This object is used to set the backward unavailability threshold
   value that will be used to determine if a threshold notification is
   generated.";
reference
  "MEF-SOAM-PM-MIB.mefSoamLmThresholdCfgBackwardUnavailCountThreshold";
}

leaf backward-available-ratio {
  type uint32 {
    range "0..100000";
  }
  units milli-percent;
  default 0;

  description
    "This object is used to set the backward availability/total time ratio
     threshold value that will be used to determine if a
     threshold notification is generated if the ratio drops below
     the configured value.

    The ratio value is expressed as a percent with a value of 0
    (ratio 0.00) through 100000 (ratio 1.00)

    Units are in milli-percent, where 1 indicates 0.001 percent.";
  reference
    "MEF-SOAM-PM-MIB.mefSoamLmThresholdCfgBackwardAvailRatioThreshold";
}
}

grouping loss-availability-stats-group {
  description
    "This grouping includes availability statistics objects for a SOAM Loss
     Measurement session.";

  leaf suspect-status {
    type suspect-status-type;
    description
      "This object indicates whether the Measurement Interval has been marked
       as suspect.

       The object is set to false at the start of a measurement
       interval. It is set to true when there is a discontinuity in
       the performance measurements during the Measurement Interval.
       Conditions for a discontinuity include, but are not limited to
       the following:

       1 - The local time-of-day clock is adjusted by at least 10 seconds
       2 - The conducting of a performance measurement is halted before the
           current Measurement Interval is completed
       3 - A local test, failure, or reconfiguration that disrupts service";
  }

  leaf forward-high-loss {
    type yang:gauge32;

    description
      "This object is the number of high loss intervals (HLI) over time in the
       forward direction.

       The value starts at 0 and increments for every HLI that occurs.
       This parameter is equivalent to 'L Sub T' found in MEF 10.2.1.";
```

```
reference
  "MEF-SOAM-PM-MIB.mefSoamLmCurrentAvailStatsForwardHighLoss";
}

leaf backward-high-loss {
  type yang:gauge32;

  description
    "This object is the number of high loss intervals (HLI) over time in the
     backward direction.

    The value starts at 0 and increments for every HLI that occurs.
    This parameter is equivalent to 'L Sub T' found in MEF 10.2.1.";

  reference
    "MEF-SOAM-PM-MIB.mefSoamLmCurrentAvailStatsBackwardHighLoss";
}

leaf forward-consecutive-high-loss {
  type yang:gauge32;

  description
    "This object is the number of consecutive high loss intervals (CHLI)
     over time in the forward direction.

    The value starts at 0 and increments for every HLI that occurs.
    This parameter is equivalent to 'B Sub T' found in MEF 10.2.1.";

  reference
    "MEF-SOAM-PM-MIB.mefSoamLmCurrentAvailStatsForwardConsecutiveHighLoss";
}

leaf backward-consecutive-high-loss {
  type yang:gauge32;

  description
    "This object is the number of consecutive high loss intervals (CHLI)
     over time in the backward direction.

    The value starts at 0 and increments for every HLI that occurs.
    This parameter is equivalent to 'B Sub T' found in MEF 10.2.1.";

  reference
    "MEF-SOAM-PM-MIB.mefSoamLmCurrentAvailStatsBackwardConsecutiveHighLoss";
}

leaf forward-available {
  type yang:gauge32;

  description
    "This object contains the number of availability indicators during a
     small time interval evaluated as available (low frame loss) in
     the forward direction by this MEP during this measurement
     interval.";

  reference
    "MEF-SOAM-PM-MIB.mefSoamLmCurrentAvailStatsForwardAvailable";
}

leaf backward-available {
  type yang:gauge32;

  description
    "This object contains the number of availability indicators during a
     small time interval evaluated as available (low frame loss) in
     the backward direction by this MEP during this measurement
     interval.";

  reference
```

```
"MEF-SOAM-PM-MIB.mefSoamLmCurrentAvailStatsBackwardAvailable";
}
leaf forward-unavailable {
    type yang:gauge32;

    description
        "This object contains the number of availability indicators during a
         small time interval evaluated as unavailable (high frame loss)
         in the forward direction by this MEP during this measurement
         interval.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamLmCurrentAvailStatsForwardUnavailable";
}
leaf backward-unavailable {
    type yang:gauge32;

    description
        "This object contains the number of availability indicators during a
         small time interval evaluated as unavailable (high frame loss)
         in the backward direction by this MEP during this measurement
         interval.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamLmCurrentAvailStatsBackwardUnavailable";
}

leaf forward-min-frame-loss-ratio {
    type uint32 {
        range "0..100000";
    }
    units milli-percent;

    description
        "This object contains the minimum one-way availability flr in the
         forward direction, from among the set of availability flr values
         calculated by the MEP in this Measurement Interval. There is
         one availability flr value for each 'delta_t' time period
         within the Measurement Interval, as specified in MEF 10.2.1.

        The flr value is a ratio that is expressed as a percent with a
         value of 0 (ratio 0.00) through 100000 (ratio 1.00).

        Units are in milli-percent, where 1 indicates 0.001 percent.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamLmCurrentAvailStatsForwardMinFlr";
}

leaf forward-max-frame-loss-ratio {
    type uint32 {
        range "0..100000";
    }
    units milli-percent;

    description
        "This object contains the maximum one-way availability flr in the
         forward direction, from among the set of availability flr
         values calculated by the MEP in this Measurement Interval.
         There is one availability flr value for each 'delta_t' time
         period within the Measurement Interval, as specified in MEF
         10.2.1.

        The flr value is a ratio that is expressed as a percent with a
         value of 0 (ratio 0.00) through 100000 (ratio 1.00).

        Units are in milli-percent, where 1 indicates 0.001 percent.;"
```

```
reference
  "MEF-SOAM-PM-MIB.mefSoamLmCurrentAvailStatsForwardMaxFlr";
}

leaf forward-average-frame-loss-ratio {
  type uint32 {
    range "0..100000";
  }
  units milli-percent;

description
  "This object contains the average one-way availability flr in the
  for-ward direction, from among the set of availability flr
  values calculated by the MEP in this Measurement Interval.
  There is one availability flr value for each 'delta_t' time
  period within the Measurement Interval, as specified in MEF
  10.2.1.

  The flr value is a ratio that is expressed as a percent with a
  value of 0 (ratio 0.00) through 100000 (ratio 1.00).

  Units are in milli-percent, where 1 indicates 0.001 percent.";

reference
  "MEF-SOAM-PM-MIB.mefSoamLmCurrentAvailStatsForwardAvgFlr";
}

leaf backward-min-frame-loss-ratio {
  type uint32 {
    range "0..100000";
  }
  units milli-percent;

description
  "This object contains the minimum one-way availability flr in the
  backward direction, from among the set of availability flr
  values calculated by the MEP in this Measurement Interval.
  There is one availability flr value for each 'delta_t' time
  period within the Measurement Interval, as specified in MEF
  10.2.1.

  The flr value is a ratio that is expressed as a percent with a
  value of 0 (ratio 0.00) through 100000 (ratio 1.00).

  Units are in milli-percent, where 1 indicates 0.001 percent.";

reference
  "MEF-SOAM-PM-MIB.mefSoamLmCurrentAvailStatsBackwardMinFlr";
}

leaf backward-max-frame-loss-ratio {
  type uint32 {
    range "0..100000";
  }
  units milli-percent;

description
  "This object contains the maximum one-way availability flr in the
  backward direction, from among the set of availability flr
  values calculated by the MEP in this Measurement Interval.
  There is one availability flr value for each 'delta_t' time
  period within the Measurement Interval, as specified in MEF
  10.2.1.

  The flr value is a ratio that is expressed as a percent with a
  value of 0 (ratio 0.00) through 100000 (ratio 1.00).
```

```

    Units are in milli-percent, where 1 indicates 0.001 percent.";
reference
  "MEF-SOAM-PM-MIB.mefSoamLmCurrentAvailStatsBackwardMaxFlr";
}

leaf backward-average-frame-loss-ratio {
  type uint32 {
    range "0..100000";
  }
  units milli-percent;

description
  "This object contains the average one-way availability flr in the
backward direction, from among the set of availability flr
values calculated by the MEP in this Measurement Interval.
There is one availability flr value for each 'delta_t' time
period within the Measurement Interval, as specified in MEF
10.2.1.

The flr value is a ratio that is expressed as a percent with a
value of 0 (ratio 0.00) through 100000 (ratio 1.00).

Units are in milli-percent, where 1 indicates 0.001 percent.";
reference
  "MEF-SOAM-PM-MIB.mefSoamLmCurrentAvailStatsBackwardAvgFlr";
}
}

grouping loss-measurement-stats-group {
  description
    "This grouping includes statistics objects for a SOAM Loss Measurement
session./";

leaf suspect-status {
  type suspect-status-type;

description
  "Whether the Measurement Interval has been marked as suspect.

The object is set to false at the start of a measurement
interval. It is set to true when there is a discontinuity in
the performance measurements during the Measurement Interval.
Conditions for a discontinuity include, but are not limited to
the following:

  1 - The local time-of-day clock is adjusted by at least 10 seconds
  2 - The conducting of a performance measurement is halted before the
      current Measurement Interval is completed
  3 - A local test, failure, or reconfiguration that disrupts service";
reference
  "MEF-SOAM-PM-MIB.mefSoamLmCurrentStatsSuspect";
}

leaf forward-transmitted-frames {
  type yang:gauge32;
  mandatory true;

description
  "This object contains the number of frames transmitted in the forward
direction by this MEP.

For a PM Session of types lmm or ccm this includes Ethernet
Service Frames and SOAM PDUs that are in a higher MEG level

```

only.

```
For a PM Session of type slm this includes the count of SOAM
ETH-SLM frames only.";
reference
  "MEF-SOAM-PM-MIB.mefSoamLmCurrentStatsForwardTransmittedFrames";
}

leaf forward-received-frames {
  type yang:gauge32;
  mandatory true;

  description
    "This object contains the number of frames received in the forward
     direction by this MEP.

  For a PM Session of types lmm or ccm this includes Ethernet
  Service Frames and SOAM PDUs that are in a higher MEG level only.

  For a PM Session of type slm this includes the count of SOAM
  ETH-SLM frames only.";
reference
  "MEF-SOAM-PM-MIB.mefSoamLmCurrentStatsForwardReceivedFrames";
}

leaf forward-min-frame-loss-ratio {
  type uint32 {
    range "0..100000";
  }
  units milli-percent;

  description
    "This object contains the minimum one-way frame loss ratio in the
     forward direction calculated by this MEP for this Measurement
     Interval. The FLR value is a ratio that is expressed as a
     percent with a value of 0 (ratio 0.00) through 100000 (ratio
     1.00).

    Units are in milli-percent, where 1 indicates 0.001 percent.";
reference
  "MEF-SOAM-PM-MIB.mefSoamLmCurrentStatsForwardMinFlr";
}

leaf forward-max-frame-loss-ratio {
  type uint32 {
    range "0..100000";
  }
  units milli-percent;

  description
    "This object contains the maximum one-way frame loss ratio in the
     forward direction calculated by this MEP for this Measurement
     Interval. The FLR value is a ratio that is expressed as a
     percent with a value of 0 (ratio 0.00) through 100000 (ratio
     1.00).

    Units are in milli-percent, where 1 indicates 0.001 percent.";
reference
  "MEF-SOAM-PM-MIB.mefSoamLmCurrentStatsForwardMaxFlr";
}

leaf forward-average-frame-loss-ratio {
  type uint32 {
    range "0..100000";
```

```
}

units milli-percent;

description
  "This object contains the average one-way frame loss ratio in the
  forward direction calculated by this MEP for this Measurement
  Interval. The FLR value is a ratio that is expressed as a
  percent with a value of 0 (ratio 0.00) through 100000 (ratio
  1.00)."

  Units are in milli-percent, where 1 indicates 0.001 percent.";
reference
  "MEF-SOAM-PM-MIB.mefSoamLmCurrentStatsForwardAvgFlr";
}

leaf backward-transmitted-frames {
  type yang:gauge32;
  mandatory true;

description
  "This object contains the number of frames transmitted in the backward
  direction by this MEP.

  For a PM Session of type lmm or ccm this includes Ethernet
  Service Frames and SOAM PDUs that are in a higher MEG level
  only.

  For a PM Session of type slm this includes the count of SOAM
  ETH-SLM frames only.";
reference
  "MEF-SOAM-PM-MIB.mefSoamLmCurrentStatsBackwardTransmittedFrames";
}

leaf backward-received-frames {
  type yang:gauge32;
  mandatory true;

description
  "This object contains the number of frames received in the backward
  direction by this MEP.

  For a PM Session of type lmm this includes Ethernet Service
  Frames and SOAM PDUs that are in a higher MEG level only.

  For a PM Session of type slm this includes the count of SOAM
  ETH-SLM frames only.";
reference
  "MEF-SOAM-PM-MIB.mefSoamLmCurrentStatsBackwardReceivedFrames";
}

leaf backward-min-frame-loss-ratio {
  type uint32 {
    range "0..100000";
  }
  units milli-percent;

description
  "This object contains the minimum one-way frame loss ratio in the
  backward direction calculated by this MEP for this Measurement
  Interval. The FLR value is a ratio that is expressed as a
  percent with a value of 0 (ratio 0.00) through 100000 (ratio
  1.00)."

  Units are in milli-percent, where 1 indicates 0.001 percent.";
```

```
reference
    "MEF-SOAM-PM-MIB.mefSoamLmCurrentStatsBackwardMinFlr";
}

leaf backward-max-frame-loss-ratio {
    type uint32 {
        range "0..100000";
    }
    units milli-percent;

description
    "This object contains the maximum one-way frame loss ratio in the
     backward direction calculated by this MEP for this Measurement
     Interval. The FLR value is a ratio that is expressed as a
     percent with a value of 0 (ratio 0.00) through 100000 (ratio
     1.00).

    Units are in milli-percent, where 1 indicates 0.001 percent.";
reference
    "MEF-SOAM-PM-MIB.mefSoamLmCurrentStatsBackwardMaxFlr";
}

leaf backward-average-frame-loss-ratio {
    type uint32 {
        range "0..100000";
    }
    units milli-percent;

description
    "This object contains the average one-way frame loss ratio in the
     backward direction calculated by this MEP for this Measurement
     Interval. The FLR value is a ratio that is expressed as a
     percent with a value of 0 (ratio 0.00) through 100000 (ratio
     1.00).

    Units are in milli-percent, where 1 indicates 0.001 percent.";
reference
    "MEF-SOAM-PM-MIB.mefSoamLmCurrentStatsBackwardAvgFlr";
}

leaf soam-pdus-sent {
    type yang:gauge32;
    description
        "This object contains the count of the number of SOAM PDUs sent during
         this Measurement Interval.

        This object applies when type is lmm, slm or ccm. It indicates
        the number of LMM, CCM, or SLM SOAM frames transmitted.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamLmCurrentStatsSoamPdusSent";
}

leaf soam-pdus-received {
    type yang:gauge32;

    description
        "This object contains the count of the number of SOAM PDUs received
         in this Measurement Interval.

        This object applies when type is lmm, slm, or ccm. This object
        indicates the number of LMR, CCM, or SLR SOAM frames received.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamLmCurrentStatsSoamPdusReceived";
}
```

```
}

grouping delay-measurement-configuration-group {
    description
        "This grouping includes configuration objects for the Delay Measurement
         function defined in [Y.1731] and [MEF SOAM PM IA].";
    reference
        "MEF-SOAM-PM-MIB.mefSoamDmCfgTable, [Y.1731], and [MEF SOAM PM IA].";

leaf measurement-type {
    type enumeration {
        enum dmm {
            description
                "DMM SOAM PDU generated, DMR responses received (one-way or two-way
                 measurements).";
        }
        enum dm1-transmitted {
            description
                "1DM SOAM PDU generated (one-way measurements are made by the
                 receiver).";
        }
        enum dm1-received {
            description
                "1DM SOAM PDU received and tracked (one-way measurements).";
        }
    }
    mandatory true;

    description
        "This object indicates what type of Delay Measurement is to be
         performed.

        The exact PDUs to use are specified by this object in
        combination with version.";
}

leaf version {
    type enumeration {
        enum Y.1731-2008 {
            description
                "Indicates the PDU formats defined in Y.1731-2008.";
        }
        enum Y.1731-2011 {
            description
                "Indicates the PDU formats defined in Y.1731-2011.";
        }
    }
    default Y.1731-2008;

    description
        "This object indicates the version of the PDUs used to perform Delay
         Measurement.

        The exact PDUs to use are specified by this object in
        combination with measurement-type.";
    reference
        "[Y.1731]";
}

leaf measurement-enable {
    type bits {
        bit soam-pdus-sent;
        bit soam-pdus-received;
        bit frame-delay-two-way-bins;
```

```

bit frame-delay-two-way-min;
bit frame-delay-two-way-max;
bit frame-delay-two-way-average;
bit frame-delay-forward-bins;
bit frame-delay-forward-min;
bit frame-delay-forward-max;
bit frame-delay-forward-average;
bit frame-delay-backward-bins;
bit frame-delay-backward-min;
bit frame-delay-backward-max;
bit frame-delay-backward-average;
bit inter-frame-delay-variation-forward-bins;
bit inter-frame-delay-variation-forward-min;
bit inter-frame-delay-variation-forward-max;
bit inter-frame-delay-variation-forward-average;
bit inter-frame-delay-variation-backward-bins;
bit inter-frame-delay-variation-backward-min;
bit inter-frame-delay-variation-backward-max;
bit inter-frame-delay-variation-backward-average;
bit inter-frame-delay-variation-two-way-bins;
bit inter-frame-delay-variation-two-way-min;
bit inter-frame-delay-variation-two-way-max;
bit inter-frame-delay-variation-two-way-average;
bit frame-delay-range-forward-bins;
bit frame-delay-range-forward-max;
bit frame-delay-range-forward-average;
bit frame-delay-range-backward-bins;
bit frame-delay-range-backward-max;
bit frame-delay-range-backward-average;
bit frame-delay-range-two-way-bins;
bit frame-delay-range-two-way-max;
bit frame-delay-range-two-way-average;
bit measured-stats-frame-delay-two-way;
bit measured-stats-frame-delay-forward;
bit measured-stats-frame-delay-backward;
bit measured-stats-inter-frame-delay-variation-two-way;
bit measured-stats-inter-frame-delay-variation-forward;
bit measured-stats-inter-frame-delay-variation-backward;
}
default " ";

description
"A vector of bits that indicates the type of SOAM DM counters that
are enabled.

A present bit enables the specific SOAM DM counter.

A not present bit disables the SOAM DM counter.

If a particular SOAM DM counter is not supported the BIT value
is not present.

Not all SOAM DM counters are supported for all SOAM DM types.";

}

leaf message-period {
  type performance-monitoring-interval-type;
  default 100;

  description
  "This object specifies the interval between Delay Measurement OAM
  message transmission. For Delay Measurement monitoring applications,
  the default value is 100ms.";
}

```

```
leaf priority {
    type cfm:priority-type;
    mandatory true;

    description
        "This object specifies the priority of frames with Performance
         Monitoring OAM message information.";
}

leaf frame-size {
    type uint32 {
        range "64 .. 9600";
    }
    default 64;

    description
        "This object specifies the Delay Measurement frame size between 64 bytes
         and the maximum transmission unit of the EVC.

        The range of frame sizes from 64 through 2000 octets need to be
        supported, and the range of frame sizes from 2001 through 9600
        octets is suggested to be supported.

        The adjustment to the frame size of the standard frame size is
        accomplished by the addition of a Data or Test TLV. A Data or
        Test TLV is only added to the frame if the frame size is
        greater than 64 bytes.";
}

leaf data-pattern {
    type enumeration {
        enum zeroes {
            description "Indicates the Data TLV contains all zeros.";
        }
        enum ones {
            description "Indicates the Data TLV contains all ones.";
        }
    }
    default zeroes;

    description
        "This object specifies the DM data pattern included in a Data TLV when
         the size of the DM frame is determined by the frame-size object
         and test-tlv-included is 'false'. If the frame size object
         does not define the DM frame size or test-tlv-included is
         'true' the value of this object is ignored.";
}

leaf test-tlv-included {
    type boolean;
    default false;

    description
        "Indicates whether a Test TLV or Data TLV is included when the size of
         the LBM frame is determined by the frame-size leaf.

        A value of 'true' indicates that the Test TLV is to be
         included.

        A value of 'false' indicates that the Data TLV is to be
         included.";

    reference
        "[Y.1731] 9.3";
}
```

```
}
```

```
leaf test-tlv-pattern {
    type test-pattern-type;
    default null-signal-without-crc-32;

    description
        "This object specifies the type of test pattern to be sent in the DM
         frame Test TLV when the size of DM PDU is determined by the
         frame-size object and test-tlv-included is 'true'. If the frame
         size object does not define the DM frame size or
         test-tlv-included is 'false' the value of this object can be
         ignored.";
}
```

```
leaf measurement-interval {
    type uint32 {
        range "1..1440";
    }
    units minutes;
    default 15;

    description
        "This object specifies a Measurement Interval in minutes.

        A Measurement Interval 15 minutes needs to be supported, other
        intervals may be supported.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamDmCfgMeasurementInterval";
}
```

```
leaf number-intervals-stored {
    type uint32 {
        range "2..1000";
    }
    default 32;

    description
        "This object specifies the number of completed measurement intervals to
         store in the history statistic table.

        At least 32 completed measurement intervals are to be
        stored. 96 measurement intervals are recommended to be stored.";
}
```

```
leaf align-measurement-intervals {
    type boolean;
    default true;

    description
        "This object specifies whether the Measurement Intervals for the Delay
         Measurement session are aligned with a zero offset to real
         time.

        The value 'true' indicates that each Measurement Interval
        starts at a time which is aligned to NE time source hour, if
        the repetition time (or the Measurement Interval, if the
        repetition time is 0) is a factor of an hour, i.e. 60min/15min
        = 4. For instance, a Measurement Interval/Repetition Time of 15
        minutes would stop/start the Measurement Interval at 0, 15, 30,
        and 45 minutes of an hour. A Measurement Interval/Repetition
        Time of 7 minutes would not align to the hour since 7 minutes
        is NOT a factor of an hour, i.e. 60min/7min = 8.6. In this
        case the behavior is the same as if the object is set to
        false.";
```

```
'false'.
```

The value 'false' indicates that the first Measurement Interval starts at an arbitrary time and each subsequent Measurement Interval starts at a time which is determined by repetition-time.";

```
}
```

```
leaf align-measurement-offset {
```

```
    type uint32 {
```

```
        range "0..525600";
```

```
    }
```

```
    units minutes;
```

```
    default 0;
```

```
    description
```

```
        "This object specifies the offset in minutes from the time of day value if align-measurement-intervals is 'true' and the repetition time is a factor of 60 minutes. If not, the value of this object is ignored.
```

If the Measurement Interval is 15 minutes and align-measurement-intervals is true and if this object was set to 5 minutes, the Measurement Intervals would start at 5, 20, 35, 50 minutes past each hour.";

```
}
```

```
leaf bins-per-fd-interval {
```

```
    type uint32 {
```

```
        range "2..100";
```

```
    }
```

```
    default 3;
```

```
    description
```

```
        "This object specifies the number of measurement bins per Measurement Interval for Frame Delay measurements.
```

At least 3 bins are to be supported; at least 10 bins are recommended to be supported.";

```
}
```

```
leaf bins-per-ifdv-interval {
```

```
    type uint32 {
```

```
        range "2..100";
```

```
    }
```

```
    default 2;
```

```
    description
```

```
        "This object specifies the number of measurement bins per Measurement Interval for Inter-Frame Delay Variation measurements.
```

The minimum number of measurement bins to be supported is 2. The desired number of measurements bins to be supported is 10.";

```
}
```

```
leaf ifdv-selection-offset {
```

```
    type yang:gauge32 {
```

```
        range "1..100";
```

```
    }
```

```
    default 1;
```

```
    description
```

```
        "This object specifies the selection offset for Inter-Frame Delay
```

```

Variation measurements. If this value is set to n, then the
IFDV is calculated by taking the difference in frame delay
between frame F and frame (F+n).";
reference
  "MEF-SOAM-PM-MIB.mefSoamDmCfgInterFrameDelayVariationSelectionOffset";
}

leaf bins-per-fdr-interval {
  type uint32;
  default 2;

  description
    "This object specifies the number of measurement bins per Measurement
     Interval for Frame Delay Range measurements.";
  reference
    "[MEF SOAM PM IA] R31, D15, R32, D16
     MEF-SOAM-PM-MIB.mefSoamDmCfgNumMeasBinsPerFrameDelayRangeInterval";
}

leaf session-type {
  type enumeration {
    enum proactive {
      description
        "The current session is 'proactive'";
    }
    enum on-demand {
      description
        "The current session is 'on-demand'";
    }
  }
  mandatory true;

  description
    "This object indicates whether the current session is defined to be
     'proactive' or 'on-demand'.";
  reference
    "[MEF SOAM IA] R3";
}

list thresholds {
  key id;
  description
    "This list contains the Delay Measurement threshold configuration values
     for DM Performance Monitoring.

    The main purpose of the threshold configuration list is to
     configure threshold alarm notifications indicating that a
     specific performance metric is not being met.";

  leaf id {
    type uint32 {
      range "1..2147483647";
    }

    description
      "The index of the threshold number for the specific DM threshold
       entry.

      An index value of '1' is to be supported. Other index values
       can be supported.";
  }

  leaf enabled-thresholds {
    type bits {

```

```

bit measured-frame-delay-two-way;
bit max-frame-delay-two-way;
bit average-frame-delay-two-way;
bit measured-inter-frame-delay-variation-two-way;
bit max-inter-frame-delay-variation-two-way;
bit average-inter-frame-delay-variation-two-way;
bit max-frame-delay-range-two-way;
bit average-frame-delay-range-two-way;
bit measured-frame-delay-forward;
bit max-frame-delay-forward;
bit average-frame-delay-forward;
bit measured-inter-frame-delay-variation-forward;
bit max-inter-frame-delay-variation-forward;
bit average-inter-frame-delay-variation-forward;
bit max-frame-delay-range-forward;
bit average-frame-delay-range-forward;
bit measured-frame-delay-backward;
bit max-frame-delay-backward;
bit average-frame-delay-backward;
bit measured-inter-frame-delay-variation-backward;
bit max-inter-frame-delay-variation-backward;
bit average-inter-frame-delay-variation-backward;
bit max-frame-delay-range-backward;
bit average-frame-delay-range-backward;
}
default " ";

description
"A vector of bits that indicates the type of SOAM DM threshold
notifications that are enabled.

A present bit enables the specific SOAM DM threshold
notification and when the specific counter is enabled and the
threshold is crossed a notification is generated.

A not present bit disables the specific SOAM DM threshold
notification.

If a particular SOAM DM threshold is not supported the BIT
value is not present.";

reference
"MEF-SOAM-PM-MIB.mefSoamDmThresholdCfgEnable";
}

leaf measured-frame-delay-two-way {
    type yang:gauge32;
    units microseconds;
    default 2147483647;

    description
        "This object is used to set the measurement two-way delay threshold
        value that will be used to determine if a threshold
        notification is generated.";

    reference
        "MEF-SOAM-PM-MIB." +
        "mefSoamDmThresholdCfgMeasuredFrameDelayTwoWayThreshold";
}

leaf max-frame-delay-two-way {
    type yang:gauge32;
    units microseconds;
    default 2147483647;

    description

```

```
"This object is used to set the maximum two-way delay threshold value
that will be used to determine if a threshold notification is
generated.";
reference
"MEF-SOAM-PM-MIB.mefSoamDmThresholdCfgMaxFrameDelayTwoWayThreshold";
}

leaf average-frame-delay-two-way {
    type yang:gauge32;
    units microseconds;
    default 2147483647;

    description
        "This object is used to set the average two-way delay threshold value
        that will be used to determine if a threshold notification is
        generated.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamDmThresholdCfgAvgFrameDelayTwoWayThreshold";
}

leaf measured-inter-frame-delay-variation-two-way {
    type yang:gauge32;
    units microseconds;
    default 2147483647;

    description
        "This object is used to set the measurement two-way IFDV threshold
        value that will be used to determine if a threshold notification is
        generated.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamDmThresholdCfgMeasuredIfdvTwoWayThreshold";
}

leaf max-inter-frame-delay-variation-two-way {
    type yang:gauge32;
    units microseconds;
    default 2147483647;

    description
        "This object is used to set the maximum two-way IFDV threshold value
        that will be used to determine if a threshold notification is
        generated.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamDmThresholdCfgMaxIfdvTwoWayThreshold";
}

leaf average-inter-frame-delay-variation-two-way {
    type yang:gauge32;
    units microseconds;
    default 2147483647;

    description
        "This object is used to set the average two-way IFDV threshold value
        that will be used to determine if a threshold notification is
        generated.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamDmThresholdCfgAvgIfdvTwoWayThreshold";
}

leaf max-frame-delay-range-two-way {
    type yang:gauge32;
    units microseconds;
    default 2147483647;

    description
```

```
"This object is used to set the maximum two-way Frame Delay Range
threshold value that will be used to determine if a threshold
notification is generated.";
reference
"MEF-SOAM-PM-MIB." +
"mefSoamDmThresholdCfgMaxFrameDelayRangeTwoWayThreshold";
}
leaf average-frame-delay-range-two-way {
    type yang:gauge32;
    units microseconds;
    default 2147483647;

    description
        "This object is used to set the average two-way Frame Delay Range
        threshold value that will be used to determine if a threshold
        notification is generated.";
    reference
        "MEF-SOAM-PM-MIB." +
        "mefSoamDmThresholdCfgAvgFrameDelayRangeTwoWayThreshold";
}
leaf measured-frame-delay-forward {
    type yang:gauge32;
    units microseconds;
    default 2147483647;

    description
        "This object is used to set the measurement forward delay threshold
        value that will be used to determine if a threshold
        notification is generated.";
    reference
        "MEF-SOAM-PM-MIB." +
        "mefSoamDmThresholdCfgMeasuredFrameDelayForwardThreshold";
}

leaf max-frame-delay-forward {
    type yang:gauge32;
    units microseconds;
    default 2147483647;

    description
        "This object is used to set the maximum forward delay threshold value
        that will be used to determine if a threshold notification is
        generated.";
    reference
        "MEF-SOAM-PM-MIB." +
        "mefSoamDmThresholdCfgMaxFrameDelayForwardThreshold";
}

leaf average-frame-delay-forward {
    type yang:gauge32;
    units microseconds;
    default 2147483647;

    description
        "This object is used to set the average forward delay threshold value
        that will be used to determine if a threshold notification is
        generated.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamDmThresholdCfgAvgFrameDelayForwardThreshold";
}

leaf measured-inter-frame-delay-variation-forward {
    type yang:gauge32;
    units microseconds;
```

```
default 2147483647;

description
  "This object is used to set the measurement IFDV threshold value that
   will be used to determine if a threshold notification is
   generated.";
reference
  "MEF-SOAM-PM-MIB.mefSoamDmThresholdCfgMeasuredIfdvForwardThreshold";
}

leaf max-inter-frame-delay-variation-forward {
  type yang:gauge32;
  units microseconds;
  default 2147483647;

  description
    "This object is used to set the maximum IFDV threshold value that will
     be used to determine if a threshold notification is generated.";
  reference
    "MEF-SOAM-PM-MIB.mefSoamDmThresholdCfgMaxIfdvForwardThreshold";
}

leaf average-inter-frame-delay-variation-forward {
  type yang:gauge32;
  units microseconds;
  default 2147483647;

  description
    "This object is used to set the average IFDV threshold value that will
     be used to determine if a threshold notification is generated.";
  reference
    "MEF-SOAM-PM-MIB.mefSoamDmThresholdCfgAvgIfdvForwardThreshold";
}

leaf max-frame-delay-range-forward {
  type yang:gauge32;
  units microseconds;
  default 2147483647;

  description
    "This object is used to set the maximum Frame Delay Range threshold
     value that will be used to determine if a threshold
     notification is generated.";
  reference
    "MEF-SOAM-PM-MIB." +
    "mefSoamDmThresholdCfgMaxFrameDelayRangeForwardThreshold";
}

leaf average-frame-delay-range-forward {
  type yang:gauge32;
  units microseconds;
  default 2147483647;

  description
    "This object is used to set the average Frame Delay Range threshold
     value that will be used to determine if a threshold
     notification is generated.";
  reference
    "MEF-SOAM-PM-MIB." +
    "mefSoamDmThresholdCfgAvgFrameDelayRangeForwardThreshold";
}

leaf measured-frame-delay-backward {
  type yang:gauge32;
```

```
units microseconds;
default 2147483647;

description
  "This object is used to set the measurement backward delay threshold
   value that will be used to determine if a threshold
   notification is generated.";
reference
  "MEF-SOAM-PM-MIB." +
  "mefSoamDmThresholdCfgMeasuredFrameDelayBackwardThreshold";
}

leaf max-frame-delay-backward {
  type yang:gauge32;
  units microseconds;
  default 2147483647;

  description
    "This object is used to set the maximum backward delay threshold value
     that will be used to determine if a threshold notification is
     generated.";
  reference
    "MEF-SOAM-PM-MIB.mefSoamDmThresholdCfgMaxFrameDelayBackwardThreshold";
}

leaf average-frame-delay-backward {
  type yang:gauge32;
  units microseconds;
  default 2147483647;

  description
    "This object is used to set the average backward delay threshold value
     that will be used to determine if a threshold notification is
     generated.";
  reference
    "MEF-SOAM-PM-MIB.mefSoamDmThresholdCfgAvgFrameDelayBackwardThreshold";
}

leaf measured-inter-frame-delay-variation-backward {
  type yang:gauge32;
  units microseconds;
  default 2147483647;

  description
    "This object is used to set the measurement backward IFDV thresh-old
     value that will be used to determine if a threshold
     notification is generated.";
  reference
    "MEF-SOAM-PM-MIB.mefSoamDmThresholdCfgMeasuredIfdvBackwardThreshold";
}

leaf max-inter-frame-delay-variation-backward {
  type yang:gauge32;
  units microseconds;
  default 2147483647;
  description
    "This object is used to set the maximum backward IFDV threshold value
     that will be used to determine if a threshold notification is
     generated.";
  reference
    "MEF-SOAM-PM-MIB.mefSoamDmThresholdCfgMaxIfdvBackwardThreshold";
}

leaf average-inter-frame-delay-variation-backward {
```

```
type yang:gauge32;
units microseconds;
default 2147483647;
description
  "This object is used to set the average backward IFDV threshold value
   that will be used to determine if a threshold notification
   is generated.";
reference
  "MEF-SOAM-PM-MIB.mefSoamDmThresholdCfgAvgIfdvBackwardThreshold";
}
leaf max-frame-delay-range-backward {
  type yang:gauge32;
  units microseconds;
  default 2147483647;

  description
    "This object is used to set the maximum backward Frame Delay Range
     threshold value that will be used to determine if a threshold
     notification is generated.";
  reference
    "MEF-SOAM-PM-MIB." +
    "mefSoamDmThresholdCfgMaxFrameDelayRangeBackwardThreshold";
}

leaf average-frame-delay-range-backward {
  type yang:gauge32;
  units microseconds;
  default 2147483647;

  description
    "This object is used to set the average backward Frame Delay Range
     threshold value that will be used to determine if a threshold
     notification is generated.";
  reference
    "MEF-SOAM-PM-MIB." +
    "mefSoamDmThresholdCfgAvgFrameDelayRangeBackwardThreshold";
}

grouping delay-measurement-stats-group {
  description
    "This grouping includes statistics objects for a SOAM Delay Measurement
     session.";

  leaf suspect-status {
    type suspect-status-type;
    description
      "Whether the Measurement Interval has been marked as suspect.

      The object is to be set to false at the start of a measurement
      interval. It is set to true when there is a discontinuity in
      the performance measurements during the Measurement Interval.
      Conditions for a discontinuity include, but are not limited to
      the following:

      1 - The local time-of-day clock is adjusted by at least 10 seconds
      2 - The conducting of a performance measurement is halted before the
          current Measurement Interval is completed
      3 - A local test, failure, or reconfiguration that disrupts service";
  }

  leaf frame-delay-two-way-min {
    type yang:gauge32;
```

```
units microseconds;

description
  "This object contains the minimum two-way frame delay calculated by this
  MEP for this Measurement Interval.

  This object is undefined if measurement-type is dm1-transmitted
  or dm1-received.";
}

leaf frame-delay-two-way-max {
  type yang:gauge32;
  units microseconds;

  description
    "This object contains the maximum two-way frame delay calculated by this
    MEP for this Measurement Interval.

    This object is undefined if measurement-type is dm1DmTx or
    dm1-received.";
}

leaf frame-delay-two-way-average {
  type yang:gauge32;
  units microseconds;

  description
    "This object contains the average two-way frame delay calculated by this
    MEP for this Measurement Interval.

    This object is undefined if measurement-type is dm1-transmitted or
    dm1-received.";
}

leaf frame-delay-forward-min {
  type yang:gauge32;
  units microseconds;

  description
    "This object contains the minimum one-way frame delay in the forward
    direction calculated by this MEP for this Measurement
    Interval. The value of this object may not be accurate in the
    absence of sufficiently precise clock synchronization.

    This object is undefined if measurement-type is dm1-transmitted.";
}

leaf frame-delay-forward-max {
  type yang:gauge32;
  units microseconds;

  description
    "This object contains the maximum one-way frame delay in the forward
    direction calculated by this MEP for this Measurement
    Interval. The value of this object may not be accurate in the
    absence of sufficiently precise clock synchronization.

    This object is undefined if measurement-type is dm1-transmitted.";
}

leaf frame-delay-forward-average {
  type yang:gauge32;
  units microseconds;

  description
```

"This object contains the average one-way frame delay in the forward direction calculated by this MEP for this Measurement Interval. The value of this object may not be accurate in the absence of sufficiently precise clock synchronization.

This object is undefined if measurement-type is dm1-transmitted.";

}

leaf frame-delay-backward-min {
 type yang:gauge32;
 units microseconds;

description
 "This object contains the minimum one-way frame delay in the backward direction calculated by this MEP for this Measurement Interval. The value of this object may not be accurate in the absence of sufficiently precise clock synchronization.

This object is undefined if measurement-type is dm1-transmitted or dm1-received.";

}

leaf frame-delay-backward-max {
 type yang:gauge32;
 units microseconds;

description
 "This object contains the maximum one-way frame delay in the backward direction calculated by this MEP for this Measurement Interval. The value of this object may not be accurate in the absence of sufficiently precise clock synchronization.

This object is undefined if measurement-type is dm1-transmitted or dm1-received.";

}

leaf frame-delay-backward-average {
 type yang:gauge32;
 units microseconds;

description
 "This object contains the average one-way frame delay in the backward direction calculated by this MEP for this Measurement Interval. The value of this object may not be accurate in the absence of sufficiently precise clock synchronization.

This object is undefined if measurement-type is dm1-transmitted or dm1-received.";

}

leaf inter-frame-delay-variation-forward-min {
 type yang:gauge32;
 units microseconds;
 description
 "This object contains the minimum one-way inter-frame delay interval in the forward direction calculated by this MEP for this Measurement Interval.

The value of this object is undefined when measurement-type is dm1-transmitted.";

}

leaf inter-frame-delay-variation-forward-max {
 type yang:gauge32;

```
units microseconds;

description
  "This object contains the maximum one-way inter-frame delay interval in
   the forward direction calculated by this MEP for this
   Measurement Interval.

  The value of this object is undefined when measurement-type is
  dml-transmitted.";
}

leaf inter-frame-delay-variation-forward-average {
  type yang:gauge32;
  units microseconds;

  description
    "This object contains the average one-way inter-frame delay interval in
     the forward direction calculated by this MEP for this
     Measurement Interval.

    The value of this object is undefined when measurement-type is
    dml-transmitted.";
}

leaf inter-frame-delay-variation-backward-min {
  type yang:gauge32;
  units microseconds;

  description
    "This object contains the minimum one-way inter-frame delay interval in
     the backward direction calculated by this MEP for this
     Measurement Interval.

    The value of this object is undefined when measurement-type is
    dml-transmitted or dml-received.";
}

leaf inter-frame-delay-variation-backward-max {
  type yang:gauge32;
  units microseconds;

  description
    "This object contains the maximum one-way inter-frame delay interval in
     the backward direction calculated by this MEP for this
     Measurement Interval.

    The value of this object is undefined when measurement-type is
    dml-transmitted or dml-received.";
}

leaf inter-frame-delay-variation-backward-average {
  type yang:gauge32;
  units microseconds;

  description
    "This object contains the average one-way inter-frame delay interval in
     the backward direction calculated by this MEP for this
     Measurement Interval.

    The value of this object is undefined when measurement-type is
    dml-transmitted or dml-received.";
}

leaf inter-frame-delay-variation-two-way-min {
```

```
type yang:gauge32;
units microseconds;

description
  "This object contains the minimum two-way inter-frame delay interval
calculated by this MEP for this Measurement Interval.

  The value of this object is undefined when measurement-type is
dml-transmitted or dml-received.";
}

leaf inter-frame-delay-variation-two-way-max {
  type yang:gauge32;
  units microseconds;

  description
    "This object contains the maximum two-way inter-frame delay interval
calculated by this MEP for this Measurement Interval.

    The value of this object is undefined when measurement-type is
dml-transmitted or dml-received.";
}

leaf inter-frame-delay-variation-two-way-average {
  type yang:gauge32;
  units microseconds;

  description
    "This object contains the average two-way inter-frame delay interval
calculated by this MEP for this Measurement Interval.

    The value of this object is undefined when measurement-type is
dml-transmitted or dml-received.";
}

leaf frame-delay-range-forward-max {
  type yang:gauge32;
  units microseconds;

  description
    "This object contains the maximum one-way Frame Delay Range in the
forward direction calculated by this MEP for this Measurement
Interval.

    The value of this object is undefined when measurement-type is
dml-transmitted.";
}

leaf frame-delay-range-forward-average {
  type yang:gauge32;
  units microseconds;

  description
    "This object contains the average one-way Frame Delay Range in the
forward direction calculated by this MEP for this Measurement
Interval.

    The value of this object is undefined when measurement-type is
dml-transmitted.";
}

leaf frame-delay-range-backward-max {
  type yang:gauge32;
  units microseconds;
```

```
description
  "This object contains the maximum one-way Frame Delay Range in the
  backward direction calculated by this MEP for this Measurement
  Interval.

  The value of this object is undefined when measurement-type is
  dml-transmitted or dml-received.";
}

leaf frame-delay-range-backward-average {
  type yang:gauge32;
  units microseconds;

  description
    "This object contains the average one-way Frame Delay Range in the
    backward direction calculated by this MEP for this Measurement
    Interval.

    The value of this object is undefined when measurement-type is
    dml-transmitted or dml-received.";
}

leaf frame-delay-range-two-way-max {
  type yang:gauge32;
  units microseconds;

  description
    "This object contains the maximum two-way Frame Delay Range calculated
    by this MEP for this Measurement Interval.

    The value of this object is undefined when measurement-type is
    dml-transmitted or dml-received.";
}

leaf frame-delay-range-two-way-average {
  type yang:gauge32;
  units microseconds;

  description
    "This object contains the average two-way Frame Delay Range calculated
    by this MEP for this Measurement Interval.

    The value of this object is undefined when measurement-type is
    dml-transmitted or dml-received.";
}

leaf soam-pdus-sent {
  type yang:gauge32;

  description
    "This object contains the count of the number of SOAM PDUs sent during
    this Measurement Interval.

    This object applies when measurement-type is dmm or
    dml-transmitted and is undefined if measurement-type is
    dml-received. It indicates the number of DMM or 1DM SOAM frames
    transmitted.";
}

leaf soam-pdus-received {
  type yang:gauge32;
  description
    "This object contains the count of the number of SOAM PDUs received in
    this Measurement Interval.
```

```
This object indicates the number of DMR and 1DM SOAM frames
received. This object applies when measurement-type is dmm or
dm1-received and is undefined if measurement-type is
dm1-transmitted.";
}

}

grouping delay-measurement-bins-content-group {
    description
        "This grouping contains result measurement bin objects for a SOAM Delay
         Measurement session.";

    leaf type {
        type measurement-bin-type;

        description
            "This object specifies whether the bin number is for Frame De-lay,
             Inter-Frame Delay Variation or Frame Delay Range.";
    }

    leaf number {
        type uint32;

        description
            "This object specifies the bin number for the configured boundary. The
             first bin has bin number 1.";
    }

    leaf lower-bound {
        type yang:gauge32;
        units microseconds;

        description
            "This object specifies the lower boundary for a measurement bin. The
             upper boundary is defined by the next bin value or infinite for
             the last bin defined. The measurement boundary for each
             measurement bin is to be larger than the measurement boundary
             of the preceding measurement bin. By default, the next bin is
             set to 5000us larger than the lower bin boundary.

The values in a bin boundary object represents the time range
used to segregate delay data into the appropriate statistical
data bin. For five bins with default values, each bin has the
following time range:

bin 1 =      0, range is 0us
bin 2 =  5000, range is 5,000us
bin 3 = 10000, range is 10,000us
bin 4 = 15000, range is 15,000us
bin 5 = 20000, range is 20,000us

The first bin boundary (number set to 1) always contains the
value of 0. Attempting to write a non-zero value to this bin
will result in an error.";
    }

    leaf counter {
        type yang:gauge32;
        config false;

        description
            "This object contains the count of the number of completed measurements
             initiated in this Measurement Interval whose value falls within
```

```
the range specified for this bin (that is, greater than or
equal to the measurement boundary for the bin, and (unless the
bin is the last bin) less than the measurement boundary for the
following bin.";
reference
    "MEF-SOAM-PM-MIB.mefSoamDmCurrentStatsBinsCounter";
}
}

grouping delay-measurement-bins-group {
    description
        "This grouping contains the top-level structure for the three types of
measurements (frame delay, inter frame delay variation, and frame
delay range)";

container bins {
    description
        "This container defines the bins content for FD, IFDR, and FDR
sessions.';

list frame-delay {
    key "type number";
    uses delay-measurement-bins-content-group;

    description
        "Data definitions related to frame delay bins content.";
}

list inter-frame-delay-variation {
    key "type number";
    uses delay-measurement-bins-content-group;

    description
        "Data definitions related to inter frame delay bins content.";
}

list frame-delay-range {
    key "type number";
    uses delay-measurement-bins-content-group;

    description
        "Data definitions related to frame delay range bins content.";
}

}

}

// 
// Augments into CFM related to MEF SOAM PM
//

augment "/cfm:maintenance-domain/cfm:maintenance-association" +
    "/cfm:maintenance-association-end-point" {
description
    "This set of data definitions extends the MEG End Point (as described in
Y.1731) or Maintenance End Point (as described in 802.1q) defined
in the MEF CFM module (MEF-CFM), specifically with regards to the
role of the MEP in PM tests.';

leaf loss-single-ended-responder {
    type boolean;
    default true;

    description
        "This object specifies whether the Loss Measurement (LMM) single-ended
```

Responder is enabled.

The value 'true' indicates the single-ended Loss Measurement Responder is enabled and if a LMM message is received a LMR will be sent in re-ply.

The value 'false' indicates the single-ended Loss Measurement Responder is disabled. If a LMM message is received no response will be sent and the message will be discarded.

This object needs to be persistent upon reboot or restart of a device.

```
A MEP can be both a single-ended Responder and Controller
simultaneously.";
reference
"MEF-SOAM-PM-MIB.mefSoamPmMepLmSingleEndedResponder";
}

leaf synthetic-loss-single-ended-responder {
    type boolean;
    default true;

    description
        "This object specifies whether the Synthetic Loss Measurement (SLM)
single-ended Responder is enabled.

The value 'true' indicates the single-ended SLM Responder is
enabled and if a SLM message is received a SLR will be sent in
reply.

The value 'false' indicates the single-ended SLM Responder is
disabled. If a SLM message is received no response
will be sent and the message will be discarded.

This object needs to be persistent upon reboot or restart of a
device.

A MEP can be both a single-ended Responder and Controller
simultaneously.";
reference
"MEF-SOAM-PM-MIB.mefSoamPmMepSlmSingleEndedResponder";
}
```

```
leaf delay-single-ended-responder {
    type boolean;
    default true;

    description
        "This object specifies whether the Delay Measurement (DMM) single ended
Responder is enabled.

The value 'true' indicates the single-ended Delay Measurement
Responder is enabled and if a DMM message is received a DMR
will be sent in re-ply.

The value 'false' indicates the single-ended Delay Measurement
Responder is disabled. If a DMM message is received no
response will be sent and the message will be discarded.

This object needs to be persistent upon reboot or restart of a
device.

A MEP can be both a single-ended Responder and Controller
```

```
    simultaneously.";
    reference
      "MEF-SOAM-PM-MIB.mefSoamPmMepDmSingleEndedResponder";
  }
}

augment "/cfm:maintenance-domain/cfm:maintenance-association" +
  "/cfm:maintenance-association-end-point" {
  description
    "This set of data definitions extends the MEG End Point (as described
     Y.1731) or Maintenance End Point (as described in 802.1q) defined
     in the MEF CFM module (MEF-CFM), specifically with regards to
     Loss Measurement.";

  container loss-measurements {
    description
      "This container contains a collection of data definitions re-lated to
       Loss Measurements./";

    list loss-measurement {
      key session-id;
      config false;
      description
        "A list of Loss Measurement PM Sessions where each in-stance is uniquely
         identified by an id attribute./";

      leaf session-id {
        type uint32;

        description
          "This object uniquely identifies a scheduled measurement. It is
           automatically generated by the server on creation of a new
           measurement./";
      }

      leaf session-status {
        type session-status-type;
        config false;

        description
          "This object indicates the current status of the LM session. A value
           of 'active' indicates the current LM session is active,
           i.e. the current time lies between the start time and the
           stop time, and enabled is true. A value of 'not-active'
           indicates the current LM session is not active, i.e. it has
           not started yet, has stopped upon reaching the stop time,
           or is disabled./";
      }

      uses loss-measurement-configuration-group;
      uses remote-mep-group;
      uses measurement-timing-group;

      leaf measured-forward-flr {
        type yang:gauge32 {
          range "0..100000";
        }
        units milli-percent;

        description
          "This object contains the Frame Loss Ratio in the forward direction
           calculated by this MEP from the last received SOAM PDU. The
           FLR value is a ratio that is expressed as a percent with a
           value of 0 (ratio 0.00) through 100000 (ratio 1.00)."
      }
    }
  }
}
```

```
    Units are in milli-percent, where 1 indicates 0.001
    per-cent.";
  reference
    "MEF-SOAM-PM-MIB.mefSoamLmMeasuredStatsForwardFlr";
}

leaf measured-backward-flr {
  type yang:gauge32 {
    range "0..100000";
  }
  units milli-percent;

  description
    "This object contains the Frame Loss Ratio in the backward direction
     calculated by this MEP from the last received SOAM PDU. The
     FLR value is a ratio that is expressed as a percent with a
     value of 0 (ratio 0.00) through 100000 (ratio 1.00)."

  Units are in milli-percent, where 1 indicates 0.001
  percent.";
  reference
    "MEF-SOAM-PM-MIB.mefSoamLmMeasuredStatsBackwardFlr";
}

leaf measured-availability-forward-status {
  type availability-type;

  description
    "This object indicates the availability status (the outcome of the
     last availability indicator) in the forward direction based upon
     the last received SOAM PDU.";
  reference
    "MEF-SOAM-PM-MIB.mefSoamLmMeasuredStatsAvailForwardStatus";
}

leaf measured-availability-backward-status {
  type availability-type;

  description
    "This object indicates the availability status (the outcome of the
     last availability indicator) in the backward direction based
     upon the last received SOAM PDU.";
  reference
    "MEF-SOAM-PM-MIB.mefSoamLmMeasuredStatsAvailBackwardStatus";
}

leaf measured-forward-last-transition-time {
  type yang:date-and-time;
  description
    "This object indicates the time of the last transition between
     available and unavailable in the forward direction.

    If there have been no transitions since the Loss
    Measurement Session was started, this is set to 0.";
  reference
    "MEF-SOAM-PM-MIB." +
    "mefSoamLmMeasuredStatsAvailForwardLastTransitionTime";
}

leaf measured-backward-last-transition-time {
  type yang:date-and-time;
  description
    "This object indicates the time of the last transition between
```

available and unavailable in the backward direction.

```
    If there have been no transitions since the Loss Measurement
    Session was started, this is set to 0.";
reference
    "MEF-SOAM-PM-MIB." +
    "mefSoamLmMeasuredStatsAvailBackwardLastTransitionTime";
}

container current-availability-stats {
    description
        "This container contains the current results for a SOAM Loss
        Measurement session for availability statistics gathered during the
        interval indicated by availability-measurement-interval.";

    leaf id {
        type uint32;
        description
            "The index for the current availability Measurement Interval for
            this PM session. This value will become the value for id of the
            history-availability-stats list once the Measurement
            Interval is completed. The duration of the Measurement
            Interval is specified by availability-measurement-interval.";
    }

    leaf start-time {
        type yang:date-and-time;
        mandatory true;

        description
            "The time that the current Measurement Interval started.";
    }

    leaf elapsed-time {
        type uint32 {
            range "0..2147483647";
        }
        mandatory true;

        description
            "The time that the current Measurement Interval has been running,
            in 0.01 seconds.";
    }

    uses loss-availability-stats-group;
}

container current-measurement-stats {
    description
        "This container contains the results for the current Measurement
        Interval in a SOAM Loss Measurement session gathered during
        the interval indicated by measurement-interval.";

    leaf id {
        type uint32;

        description
            "The index for the current Measurement Interval for this PM
            session. This value will become the value for id of the
            history-measurement-stats list once the Measurement
            Interval is completed.";
    }

    leaf start-time {
        type yang:date-and-time;
```

```
mandatory true;

description
    "The time that the current Measurement Interval started.";
}

leaf elapsed-time {
    type uint32 {
        range "0..2147483647";
    }
    mandatory true;

description
    "The time that the current Measurement Interval has been running,
     in 0.01 seconds.";
}

uses loss-measurement-stats-group;
}

list history-availability-stats {
    key id;
    description
        "This list contains the results for availability history Measurement
         Intervals in a SOAM Loss Measurement session.";

leaf id {
    type uint32;
    description
        "The index for the availability Measurement Interval within this
         PM session.";
}

leaf end-time {
    type yang:date-and-time;
    mandatory true;

description
    "The time that the Measurement Interval ended.";
}

leaf elapsed-time {
    type uint32 {
        range "0..2147483647";
    }
    mandatory true;

description
    "The length of time that the Measurement Interval ran for,
     in 0.01 seconds.";
}

uses loss-availability-stats-group;
}

list history-measurement-stats {
    key id;
    description
        "This list contains the results for history Measurement
         Intervals in a SOAM Loss Measurement session.";

leaf id {
    type uint32;
```

```
description
    "The index for the Measurement Interval within this
     PM session.";
}

leaf end-time {
    type yang:date-and-time;
    mandatory true;

    description
        "The time that the Measurement Interval ended.";
}

leaf elapsed-time {
    type uint32 {
        range "0..2147483647";
    }
    mandatory true;

    description
        "The length of time that the Measurement Interval ran for,
         in 0.01 seconds.";
}

uses loss-measurement-stats-group;
}
}
}
}

augment "/cfm:maintenance-domain/cfm:maintenance-association" +
"/cfm:maintenance-association-end-point" {
description
    "This set of data definitions extends the MEG End Point (as described in
     Y.1731) or Maintenance End Point (as described in 802.1q)
     defined in the MEF CFM module (MEF-CFM), specifically with
     regards to Delay Measurement.";

container delay-measurements {
    description
        "This container contains a collection of data definitions related to
         Delay Measurements.";

list delay-measurement {
    key id;
    config false;
    description
        "A list of Delay Measurement PM Sessions where each instance is
         uniquely identified by an id attribute.";

    leaf id {
        type string;

        description
            "This object uniquely identifies a scheduled measurement. It is
             automatically generated by the server on creation of a new
             measurement.";
    }

    leaf session-status {
        type session-status-type;
        config false;

        description

```

```
"This object indicates the current status of the DM session. A value
of 'active' indicates the current DM session is active,
i.e. the current time lies between the start time and the
stop time, and enabled is true. A value of 'not-active'
indicates the current DM session is not active, i.e. it has
not started yet, has stopped upon reaching the stop time,
or is disabled.";
}

uses delay-measurement-configuration-group;
uses remote-mep-group;
uses measurement-timing-group;

leaf source-mac-address {
    type yang:mac-address;

    description
        "The Source MAC Address Field of the received SOAM DM session PDUs.

        If measurement-type is dml-received this object indicates
        the source address of the dml-transmitted DM session.

        This object is only valid for measurement-type set to
        dml-received. It is ignored for measurement-type set to dmm
        or dml-transmitted.";
}

leaf frame-delay-two-way {
    type yang:gauge32;
    units microseconds;
    description
        "This object contains the two-way frame delay calculated by this MEP
        from the last received SOAM PDU.

        This object is undefined is measurement-type is
        dml-transmitted or dml-received.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamDmMeasuredStatsFrameDelayTwoWay";
}

leaf frame-delay-forward {
    type yang:gauge32;
    units microseconds;
    description
        "This object contains the frame delay in the forward direction
        calculated by this MEP from the last received SOAM PDU. The value
        of this object may not be accurate in the absence of
        sufficiently precise clock synchronization.

        This object is undefined is measurement-type is
        dml-transmitted.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamDmMeasuredStatsFrameDelayForward";
}

leaf frame-delay-backward {
    type yang:gauge32;
    units microseconds;

    description
        "This object contains the frame delay in the backward direction
        calculated by this MEP from the last received SOAM PDU. The
        value of this object may not be accurate in the absence of
        sufficiently precise clock synchronization.
```

```
This object is undefined is measurement-type is
dml-transmitted or dml-received.";
reference
"MEF-SOAM-PM-MIB.mefSoamDmMeasuredStatsFrameDelayBackward";
}

leaf inter-frame-delay-variation-two-way {
    type yang:gauge32;
    units microseconds;

    description
    "This object contains the last two-way inter-frame delay interval
     calculated by this MEP.

    The value of this object is undefined when measurement-type
     is dml-transmitted or dml-received.";
reference
"MEF-SOAM-PM-MIB.mefSoamDmMeasuredStatsIfdvTwoWay";
}

leaf inter-frame-delay-variation-forward {
    type yang:gauge32;
    units microseconds;

    description
    "This object contains the last one-way inter-frame delay interval in
     the forward direction calculated by this MEP.

    The value of this object is undefined when measurement-type
     is dml-transmitted.";
reference
"MEF-SOAM-PM-MIB.mefSoamDmMeasuredStatsIfdvForward";
}

leaf inter-frame-delay-variation-backward {
    type yang:gauge32;
    units microseconds;

    description
    "This object contains the last one-way inter-frame delay interval in
     the backward direction calculated by this MEP.

    The value of this object is undefined when measurement-type
     is dml-transmitted or dml-received.";
reference
"MEF-SOAM-PM-MIB.mefSoamDmMeasuredStatsIfdvBackward";
}

container current-stats {
    description
    "This container contains the results for the current Measurement
     Interval in a SOAM Delay Measurement session gathered
     during the interval indicated by measurement-interval.";

    leaf start-time {
        type yang:date-and-time;
        mandatory true;

        description
        "The time that the current Measurement Interval started.";
    }

    leaf elapsed-time {
```

```
type uint32 {
    range "0..2147483647";
}
mandatory true;

description
"The time that the current Measurement Interval has been running,
in 0.01 seconds.";
}

uses delay-measurement-stats-group;
uses delay-measurement-bins-group;
}

list history-stats {
key id;
description
"This list contains the results for history Measurement Intervals in
a SOAM Delay Measurement session.";

leaf id {
    type uint32;

    description
    "The identifier for the Measurement Interval within this
    PM session.";
}

leaf end-time {
    type yang:date-and-time;
    mandatory true;

    description
    "The time that the Measurement Interval ended.";
}

leaf elapsed-time {
    type uint32 {
        range "0..2147483647";
    }
    mandatory true;

    description
    "The length of time that the Measurement Interval ran for, in 0.01
    seconds.";
}

uses delay-measurement-stats-group;
uses delay-measurement-bins-group;
}
}

}

// RPCs related to MEF SOAM PM
//

rpc create-loss-measurement {
description
"Schedule a one-way and two-way on-demand and proactive performance
monitoring loss measurements on a specific MEP.

A list entry associated with the newly created session will be
```

created in the loss-measurements container and the assigned session identifier will be returned in the output parameter.";

```
input {
    uses loss-measurement-configuration-group;
    uses remote-mep-group;
    uses measurement-timing-group;
}

output {
    leaf session-id {
        type uint32;
        mandatory true;

        description
            "The session identifier of the newly created loss measurement session.";
    }
}
}

rpc abort-loss-measurement {
    description
        "Abort a currently running or scheduled single-ended on-demand ETH-LM function. This operation is not applicable to dual-ended proactive ETH-LM./";

    input {
        leaf maintenance-domain-id {
            type string;

            description
                "The ID of a Maintenance Domain of the MEP on which the measurement session should be aborted";
        }

        leaf maintenance-association-id {
            type string;

            description
                "The ID of a Maintenance Association of the MEP on which the measurement session should be aborted";
        }

        leaf mep-id {
            type cfm:mep-id-type;
            mandatory true;

            description
                "The ID of the MEP on which a measurement session should be aborted";
        }

        leaf session-id {
            type uint32;
            mandatory true;

            description
                "The session ID of the measurement session to be aborted.";
        }
    }
}

rpc clear-loss-history-stats {
```

```
description
  "Clear the Loss Measurement history list (history-availability-stats and
   history-measurement-stats) for a specific session. All instance
   data is deleted.";

input {
  leaf maintenance-domain-id {
    type string;

    description
      "The ID of a Maintenance Domain of the MEP on which the loss
       measurement history should be cleared";
  }

  leaf maintenance-association-id {
    type string;

    description
      "The ID of a Maintenance Association of the MEP on which the loss
       measurement history should be cleared";
  }

  leaf mep-id {
    type cfm:mep-id-type;
    mandatory true;

    description
      "The ID of the MEP on which the loss measurement history should be
       cleared.";
  }

  leaf session-id {
    type uint32;
    mandatory true;

    description
      "The session ID of the loss measurement session of which the loss
       measurement history should be cleared";
  }
}

rpc create-delay-measurement {
  description
    "Schedule one-way and two-way on-demand and proactive performance
     monitoring frame delay measurements on a specific MEP.

    A list entry associated with the newly created session will be
    created in the delay-measurements container and the assigned
    session identifier will be returned in the output parameter.";

  input {
    uses delay-measurement-configuration-group;
    uses remote-mep-group;
    uses measurement-timing-group;
  }

  output {
    leaf session-id {
      type uint32;
      mandatory true;

      description
        "The session identifier of the newly created delay measurement
         "
    }
  }
}
```

```
        session.";  
    }  
}  
}  
  
rpc abort-delay-measurement {  
    description  
        "Abort a pre-scheduled instances of performance monitoring";  
  
    input {  
        leaf maintenance-domain-id {  
            type string;  
  
            description  
                "The ID of a Maintenance Domain of the MEP on which a measurement  
                session should be aborted";  
        }  
  
        leaf maintenance-association-id {  
            type string;  
  
            description  
                "The ID of a Maintenance Association of the MEP on which a measurement  
                session should be aborted";  
        }  
        leaf mep-id {  
            type cfm:mep-id-type;  
            mandatory true;  
  
            description  
                "The ID of the MEP on which a measurement session should be aborted";  
        }  
  
        leaf session-id {  
            type uint32;  
            mandatory true;  
  
            description  
                "The session ID of the measurement session to be aborted.";  
        }  
    }  
}  
  
rpc clear-delay-history-stats {  
    description  
        "Clear the Delay Measurement history list (history-stats) for a specific  
        session. All instance data is deleted.";  
  
    input {  
        leaf maintenance-domain-id {  
            type string;  
  
            description  
                "The ID of a Maintenance Domain of the MEP on which the loss  
                measurement history should be cleared";  
        }  
  
        leaf maintenance-association-id {  
            type string;  
  
            description  
                "The ID of a Maintenance Association of the MEP on which the  
                loss measurement history should be cleared";  
        }  
    }  
}
```

```
leaf mep-id {
    type cfm:mep-id-type;
    mandatory true;

    description
        "The ID of the MEP on which the loss measurement history should be
         cleared.";
}

leaf session-id {
    type uint32;
    mandatory true;

    description
        "The session ID of the loss measurement session of which the loss
         measurement history should be cleared";
}

}

//  

// Notifications related to MEF SOAM PM  

//  

notification availability-change-alarm {
    description
        "An availability-change-alarm notification is sent when the state of
         measured-availability-forward-status or
         measured-availability-backward-status associated with a specific
         loss-measurement session changes.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamAvailabilityChangeAlarm";

leaf maintenance-domain-id {
    type string;

    description
        "The ID of a Maintenance Domain of the MEP on which the availability
         change alarm is present";
}

leaf maintenance-association-id {
    type string;

    description
        "The ID of a Maintenance Association of the MEP on which the availability
         change alarm is present";
}

leaf mep-id {
    type cfm:mep-id-type;
    mandatory true;

    description
        "A reference to the specific MEP on which the availability change alarm
         is present";
}

leaf session-id {
    type uint32;
    mandatory true;

    description
        "A reference to the loss-measurement session in which the availability
```

```
    change alarm occurred.";
}

leaf measured-availability-forward-status {
    type availability-type;

    description
        "The current value of measured-availability-forward-status of the
         referenced loss-measurement session.";
}

leaf measured-availability-backward-status {
    type availability-type;

    description
        "The current value of measured-availability-backward-status of the
         referenced loss-measurement session.";
}

leaf measured-forward-last-transition-time {
    type yang:date-and-time;

    description
        "The current value of measured-forward-last-transition-time of the
         referenced loss-measurement session.";
}

leaf measured-backward-last-transition-time {
    type yang:date-and-time;

    description
        "The current value of measured-backward-last-transition-time of the
         referenced loss-measurement session.";
}

leaf forward-available {
    type yang:gauge32;

    description
        "The current value of forward-available of the referenced
         loss-measurement session.";
}

leaf backward-available {
    type yang:gauge32;

    description
        "The current value of backward-available of the referenced
         loss-measurement session.";
}

leaf forward-unavailable {
    type yang:gauge32;

    description
        "The current value of forward-unavailable of the referenced
         loss-measurement session.";
}

leaf backward-unavailable {
    type yang:gauge32;

    description
        "The current value of backward-unavailable of the referenced
         loss-measurement session.";
```

```
        loss-measurement session.";  
    }  
}  
  
notification loss-session-start-stop-alarm {  
    description  
        "A loss-session-start-stop-alarm notification is sent when the state of  
        session-status changes for a specific loss-measurement session.";  
    reference  
        "MEF-SOAM-PM-MIB.mefSoamLmSessionStartStopAlarm";  
  
    leaf maintenance-domain-id {  
        type string;  
  
        description  
            "The ID of a Maintenance Domain of the MEP on which the loss session  
            state change alarm is present";  
    }  
  
    leaf maintenance-association-id {  
        type string;  
  
        description  
            "The ID of a Maintenance Association of the MEP on which the loss  
            session state change alarm is present";  
    }  
  
    leaf mep-id {  
        type cfm:mep-id-type;  
        mandatory true;  
  
        description  
            "A reference to the specific MEP on which the loss session state  
            change alarm occurred.";  
    }  
  
    leaf session-id {  
        type uint32;  
        mandatory true;  
  
        description  
            "A reference to the loss-measurement session in which the loss session  
            state change alarm occurred.";  
    }  
  
    leaf session-status {  
        type session-status-type;  
  
        description  
            "The current value of session-status of the referenced loss-measurement  
            session.";  
    }  
}  
  
notification delay-session-start-stop-alarm {  
    description  
        "A delay-session-start-stop-alarm notification is sent when the state of  
        session-status changes for a specific delay-measurement session.";  
    reference  
        "MEF-SOAM-PM-MIB.mefSoamDmSessionStartStopAlarm";  
  
    leaf maintenance-domain-id {  
        type string;
```

```
description
  "The ID of a Maintenance Domain of the MEP on which the delay
  session state change alarm is present";
}

leaf maintenance-association-id {
  type string;

  description
    "The ID of a Maintenance Association of the MEP on which the delay
    session state change alarm is present";
}

leaf mep-id {
  type cfm:mep-id-type;
  mandatory true;

  description
    "A reference to the specific MEP on which the delay session state
    change alarm occurred.";
}

leaf session-id {
  type uint32;
  mandatory true;

  description
    "A reference to the delay-measurement session in which the delay session
    state change alarm occurred.";
}

leaf session-status {
  type session-status-type;
  description
    "The current value of session-status of the referenced delay-measurement
    session.";
}
}

notification threshold-crossing-alarm {
  description
    "A threshold-crossing-alarm notification is sent if the following
    conditions are met for a particular type.

    For an above-alarm five conditions need to be met:
    - measurement of the parameter is enabled via enabled-thresholds
      for a LM or a DM crossing; and
    - the parameter threshold is configured in the thresholds list
      for an LM or DM session.
    - the threshold crossing type of threshold-above-alarm is
      enabled in alarm-enable; and
    - the measured value of the parameter exceeds the value
      configured in the thresholds list for an LM or DM crossing
      entry for a type of threshold-above-alarm.
    - no previous threshold-crossing-alarm notifications with type
      above-alarm have been sent relating to the same threshold and
      the same parameter, during this measurement interval.

    For a set-alarm five conditions need to be met:
    - measurement of the parameter is enabled via measurement-enable
      for a LM or a DM crossing; and
    - the parameter threshold is configured in the thresholds list
      for an LM or DM session.
    - the threshold crossing type of threshold-set-clear-alarm is
      enabled in alarm-enable; and
    - the measured value of the parameter exceeds the value
      configured in the thresholds list for an LM or DM crossing
      entry for a type of threshold-set-clear-alarm.
    - no previous threshold-crossing-alarm notifications with type
      set-alarm have been sent relating to the same threshold and
      the same parameter, during this measurement interval.
  "
}
```

- enabled in alarm-enable; and
- the measured value of the parameter exceeds the value configured in the thresholds list for an LM or DM crossing entry for a type of threshold-set-clear-alarm.
- no previous threshold-crossing-alarm notifications with type threshold-set-clear have been sent relating to the same threshold and the same parameter, during this measurement interval.

For a clear-alarm five conditions need to be met:

- measurement of the parameter is enabled via enabled-thresholds for a LM or a DM crossing; and
- the parameter threshold is configured in the thresholds list for an LM or DM session.
- the threshold crossing type of threshold-set-clear-alarm is enabled in alarm-enable; and
- no previous threshold-crossing-alarm notifications with type threshold-set-clear have been sent relating to the same threshold and the same parameter, during this measurement interval.

In the case of thresholds applied to a maximum or average measurement counter, the previous measured value is the value of the counter at the end of the preceding measurement interval.

In the case of thresholds applied to the last measured value, it is the previous measured value.

An agent is not to generate more than one threshold-crossing-alarm of a given type per LM or DM session as specified by alarm-interval. A 'notification-event' is the transmission of a single notification to a list of notification destinations.

If additional threshold crossing events occur within the alarm-interval period, then notification generation for these changes are suppressed by the agent until the current alarm interval expires. At the end of an alarm interval period, one notification-event is generated if any threshold crossing events occurred since the start of the alarm interval period. In such a case, another alarm interval period is started right away.";

reference

"MEF-SOAM-PM-MIB.mefSoamPmThresholdCrossingAlarm";

```

leaf maintenance-domain-id {
    type string;

    description
        "The ID of a Maintenance Domain of the MEP on which the threshold
        crossing alarm occurred";
}

leaf maintenance-association-id {
    type string;

    description
        "The ID of a Maintenance Association of the MEP on which the threshold
        crossing alarm occurred";
}
leaf mep-id {
    type cfm:mep-id-type;
    mandatory true;

    description

```

```
"A reference to the specific MEP on which the threshold crossing alarm
occurred.";
```

```
}
```

```
container measurement-id {
    description
        "This container describes the measurement ID for a loss or delay
measurement.";
```

```
choice measurement-id {
    mandatory true;
    description
        "The measurement ID can reference either a loss or a delay measurement
session.";
```

```
leaf loss-measurement-session-id {
    type uint32;

    description
        "The session identifier for the loss-measurement session affected by
the notification.";
```

```
}
```

```
leaf delay-measurement-session-id {
    type uint32;

    description
        "The session identifier for the delay-measurement session affected
by the notification.";
```

```
}
```

```
}
```

```
leaf notification-crossing-type {
    type enumeration {
        enum above-alarm {
            description
                "Indicates that the crossing type alarm was an above threshold.";
        }
        enum set-alarm {
            description
                "Indicates that the crossing type alarm was a set threshold.";
        }
        enum clear-alarm {
            description
                "Indicates that the crossing type alarm was a clear threshold.";
        }
    }
    description
        "This object indicates the crossing type that caused the generation of
the notification.";
    reference
        "MEF-SOAM-PM-MIB.mefSoamPmNotificationObjCrossingType";
}
```

```
leaf threshold-id {
    type enumeration {
        enum measured-flr-forward {
            description
                "Indicates the measured Frame Loss Ratio forward threshold generated
the notification.";
        }
        enum max-flr-forward {
            description
```

```
"Indicates the maximum Frame Loss Ration forward threshold generated
the notification.";
}
enum average-flr-forward {
    description
        "Indicates the average Frame Loss Ratio forward threshold generated
        the notification.";
}
enum measured-flr-backward {
    description
        "Indicates the measured Frame Loss Ratio backward threshold
        generated the notification.";
}
enum max-flr-backward {
    description
        "Indicates the maximum Frame Loss Ratio backward threshold generated
        the notification.";
}
enum forward-high-loss {
    description
        "Indicates the forward High Loss threshold generated the
        notification.";
}
enum forward-consecutive-high-loss {
    description
        "Indicates the forward Consecutive High Loss threshold generated the
        notification.";
}
enum backward-high-loss {
    description
        "Indicates the backward High Loss threshold generated the
        notification.";
}
enum backward-consecutive-high-loss {
    description
        "Indicates the backward Consecutive High Loss threshold generated the
        notification.";
}
enum forward-unavailable-count {
    description
        "Indicates the forward Unavailable count threshold generated the
        notification.";
}
enum forward-available-ratio {
    description
        "Indicates the forward Available ration threshold generated the
        notification.";
}
enum backward-unavailable-count {
    description
        "Indicates the backward Unavailable count threshold generated the
        notification.";
}
enum backward-available-ratio {
    description
        "Indicates the backward Available ratio threshold generated the
        notification.";
}
enum measured-frame-delay-two-way {
    description
        "Indicates the measured Frame Delay two-way threshold generated
        the notification.";
}
enum max-frame-delay-two-way {
```

```
description
    "Indicates the maximum Frame Delay two-way threshold generated the
     notification.";
}
enum average-frame-delay-two-way {
    description
        "Indicates the average Frame Delay two-way threshold generated the
         notification.";
}
enum measured-inter-frame-delay-variation-two-way {
    description
        "Indicates the measured IFDV two-way threshold generated the
         notification.";
}
enum max-inter-frame-delay-variation-two-way {
    description
        "Indicates the maximum IFDV two-way threshold generated the
         notification.";
}
enum average-inter-frame-delay-variation-two-way {
    description
        "Indicates the average IFDV two-way threshold generated the
         notification.";
}
enum max-frame-delay-range-two-way {
    description
        "Indicates the maximum Frame Delay Range two-way threshold generated
         the notification.";
}
enum average-frame-delay-range-two-way {
    description
        "Indicates the average Frame Delay Range two-way threshold generated
         the notification.";
}
enum measured-frame-delay-forward {
    description
        "Indicates the measured Frame Delay forward threshold generated the
         notification.";
}
enum max-frame-delay-forward {
    description
        "Indicates the maximum Frame Delay forward threshold generated the
         notification.";
}
enum average-frame-delay-forward {
    description
        "Indicates the average Frame Delay forward threshold generated the
         notification.";
}
enum measured-inter-frame-delay-variation-forward {
    description
        "Indicates the measured IFDV forward threshold generated the
         notification.";
}
enum max-inter-frame-delay-variation-forward {
    description
        "Indicates the maximum IFDV forward threshold generated the
         notification.";
}
enum average-inter-frame-delay-variation-forward {
    description
        "Indicates the average IFDV forward threshold generated the
         notification.";
}
```

```
enum max-frame-delay-range-forward {
    description
        "Indicates the maximum Frame Delay Range forward threshold generated
         the notification.";
}
enum average-frame-delay-range-forward {
    description
        "Indicates the average Frame Delay Range forward threshold generated
         the notification.";
}
enum measured-frame-delay-backward {
    description
        "Indicates the measured Frame Delay backward threshold generated the
         notification.";
}
enum max-frame-delay-backward {
    description
        "Indicates the maximum Frame Delay backward threshold generated the
         notification.";
}
enum average-frame-delay-backward-threshold {
    description
        "Indicates the average Frame Delay backward threshold generated the
         notification.";
}
enum measured-inter-frame-delay-variation-backward {
    description
        "Indicates the measured IFDV backward threshold generated the
         notification.";
}
enum max-inter-frame-delay-variation-backward {
    description
        "Indicates the maximum IFDV backward threshold generated the
         notification.";
}
enum average-inter-frame-delay-variation-backward {
    description
        "Indicates the average IFDV backward threshold generated the
         notification.";
}
enum max-frame-delay-range-backward {
    description
        "Indicates the maximum Frame Delay Range backward threshold
         generated the notification.";
}
enum average-frame-delay-range-backward {
    description
        "Indicates the average Frame Delay Range backward threshold
         generated the notification.";
}
}

description
    "This object identifies the threshold that caused the generation of the
     notification.";
reference
    "MEF-SOAM-PM-MIB.mefSoamPmNotificationObjThresholdId";
}

leaf threshold-config-value {
    type uint32;

    description
        "The configured threshold value of the object that caused the generation
```

```
    of the notification.";  
    reference  
        "MEF-SOAM-PM-MIB.mefSoamPmNotificationObjThresholdConfig";  
    }  
  
leaf measured-value {  
    type uint32;  
  
    description  
        "The measured value of the object at the time of the generation of the  
        notification.";  
    reference  
        "MEF-SOAM-PM-MIB.mefSoamPmNotificationObjThresholdValue";  
    }  
  
leaf suspect {  
    type suspect-status-type;  
  
    description  
        "The suspect flag for the current measurement interval in which the  
        notification was generated.";  
    reference  
        "MEF-SOAM-PM-MIB.mefSoamPmNotificationObjSuspect";  
    }  
}  
}
```

9. References

- [1] Bradner, S., *Key words for use in RFCs to Indicate Requirement Levels*, RFC 2119, March 1997. (Normative)
- [2] McCloghrie, K., et al., *Structure of Management Information Version 2 (SMIV2)*, RFC 2578, April 1999.
- [3] Harrington, D, et al, *An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks*, RFC 3411, December 2002.
- [4] Heard, C., *Guidelines for Authors and Reviewers of MIB Documents*, RFC 4181, September, 2005.
- [5] Metro Ethernet Forum, MEF 4, *Metro Ethernet Network Architecture Framework - Part 1: Generic Framework*, May 2004.
- [6] Metro Ethernet Forum, MEF 7.1, *Phase 2 EMS-NMS Information Model*, October 2009.
- [7] Metro Ethernet Forum, MEF 10.2.1, *Ethernet Services Attributes Phase 2*, January 2011.
- [8] Metro Ethernet Forum, MEF 15, *Requirements for Management of Metro Ethernet Phase 1 Network Elements*, November 2005.
- [9] Metro Ethernet Forum, MEF 17, *Service OAM Requirements & Framework – Phase 1*, April 2007.
- [10] Metro Ethernet Forum, MEF 26, *External Network Network Interface (ENNI) - Phase 1*, January 2010
- [11] Metro Ethernet Forum, MEF 30, *Service OAM Fault Management Implementation Agreement*, January 2011
- [12] Metro Ethernet Forum, MEF 31, *Service OAM Fault Management Definition of Managed Objects*, January 2011
- [13] Metro Ethernet Forum, MEF xx, *Service OAM Performance Monitoring Implementation Agreement*, January 2012
- [14] Metro Ethernet Forum, MEF xx, *Service OAM Performance Monitoring Definition of Managed Objects*, January 2012
- [15] International Telecommunication Union, Recommendation G.8011/Y.1307, *Ethernet over Transport – Ethernet services framework*, August 2004.
- [16] International Telecommunication Union, Recommendation G.8021/Y.1341, *Characteristics of Ethernet transport network equipment functional blocks*, December 2011.
- [17] International Telecommunication Union, Recommendation G.8051/Y.1345, *Management aspects of the Ethernet-over-Transport (EoT) capable network element*, October 2007.

- [18] International Telecommunication Union, Recommendation Q.840.1, *Requirements and Analysis for NMS-EMS Management Interface of Ethernet over Transport and Metro Ethernet Network*, March 2007
- [19] International Telecommunication Union, Recommendation Y.1731, *OAM functions and mechanisms for Ethernet based Networks*, July 2011.
- [20] IEEE Std 802.1Q-2011, *IEEE Standard for Local and metropolitan area networks Virtual Bridged Local Area Networks*, August 2011
- [21] IEEE Std 802.3-2008, *IEEE Standard for 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*, 26 December 2008.
- [22] IEEE Std 802.1ap-2008, *IEEE Standard for Local and metropolitan area networks - Virtual Bridged Local Area Networks Amendment 8: Management Information Base (MIB) Definitions for VLAN Bridges*, March 2009
- [23] International Organization for Standardization, *International Standard 8824 Information processing systems - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1)*, December, 1987.
- [24] Lam, K., et al., *Network Management Requirements for MPLS-based Transport Networks*, RFC 5951, September 2010.
- [25] Enns, R., *NETCONF Configuration Protocol*, RFC 6241, June 2011
- [26] Björklund, M., et al., *YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)*, RFC 6020, October 2010
- [27] Bierman, A., *Guidelines for Authors and Reviewers of YANG Data Model Documents*, RFC 6087, January 2011