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| **Purpose:** | Discussion | | | | | | | |
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| Please do not change the structure of this table, just insert the necessary information. | | | | | | | | |

This document contains the editor version of draft new Recommendation G.8052.1/Y.1346.1 “*Transport OAM Management Information/Data Models for Ethernet Transport Network Element*”.

**Document history:**

| **Version** | **Date** | **Description** |
| --- | --- | --- |
| 0.01 | WD09 (9/2017) Ottawa | Initial version created based in input contribution WD1214-21, and WD1214-18 and discussion result. |

Recommendation ITU-T G.8052.1/Y.1346.1

Transport OAM Management Information/Data Models for Ethernet Transport Network Element

Summary

<Mandatory>

Keywords

<Mandatory>

Introduction

<Optional – This clause should appear only if it contains information different from that in Scope and Summary>

# 1 Scope

This Recommendation specifies the management information model and data models for Ethernet Transport Network Element (NE) to support specific interface protocols and specific Management Control Continuum (MCC) functions. The information model is interface protocol neutral and specified using the Unified Modelling Language (UML). The information model of this Recommendation is derived through pruning and refactoring from the Recommendation G.7711/Y.1702 core information model and Recommendation G.8052/Y.1346 foundation Ethernet Transport NE information model. The data models are interface protocol specific and translated from the information model with the assistance of automated translation tooling. The specific interface protocols considered in this Recommendation include, but not limited to, NETCONF/YANG. The specific MCC functions covered by this Recommendation are the ITU-T defined Ethernet Operation, Administration, and Maintenance (OAM) functions, with the set of op codes assigned to the ITU-T and the corresponding OAM Protocol Data Units (PDU) and behaviours being specified in Recommendation G.8013/Y.1731 and the equipment characteristics in G.8021/Y.1341.

# 2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T G.7711] Recommendation ITU-T G.7711/Y.1702 (12/2016), *Title*.

[ITU-T G.8013] Recommendation ITU-T G.8013/Y.1731 (8/2015), *OAM functions and mechanisms for Ethernet-based networks*.

[ITU-T G.8021] Recommendation ITU-T G.8021/Y.1341 (11/2016), *Characteristics of Ethernet transport network equipment functional blocks*.

[ITU-T G.8052] Recommendation ITU-T G.8052/Y.1346 (11/2016), *Protocol-neutral management information model for the Ethernet Transport capable network element*.

[IEEE802.1Q] IEEE 802.1Q (2014), IEEE Standard for Local and metropolitan area networks – Bridges and Bridged Networks

# 3 Definitions

<Check in the ITU-T terms and definitions database at [www.itu.int/go/terminology-database](http://www.itu.int/go/terminology-database) whether the term has already been defined in another Recommendation. It would be more consistent to refer to such a definition rather than to redefine the term>

## 3.1 Terms defined elsewhere

<Normally, terms defined elsewhere will simply refer to the defining document. In certain cases, it may be desirable to quote the definition to allow for a stand-alone document>

This Recommendation uses the following terms defined elsewhere:

**3.1.1 <Term 1>** [Reference]: <optional quoted definition>.

**3.1.2 <Term 2>** [Reference]: <optional quoted definition>.

## 3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

**3.2.1 <Term 3>**: <definition>.

# 4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

MCC Management Control Continuum

NE Network Element

OAM Operation, Administration, Maintenance

PDU Protocol Data Unit

UML Unified Modelling Language

# 5 Conventions

<Mandatory clause. Describe any particular notation, style, presentation, etc. used within the Recommendation, if any. If none, write "None.">

# 6 Carrier Ethernet OAM Functions

This clause identifies the carrier Ethernet OAM functions that are modelled by the information model and data models of this Recommendation.

All the Ethernet OpCodes are owned by IEEE 802.1, with some subsets of the OpCodes have been assigned to ITU-T SG15, MEF, and IETF. The assignee SDOs are responsible for the PDU specification of their respective assigned OpCodes.

* CFM: IEEE 802.1: CCM
* LB/LT: IEEE 802.1: LBM/LBR, LTM/LTR
* Carrier: SG15: GNM/BNM, AIS, LCK, TST, APS, MCC/EDM, LMM/LMR,

1DM, DMM/DMR, EXM/EXR, VSM/VSR, CSF, 1SL, SLM/SLR

* Service: MEF: LLM/LLR, SAT
* Link: IETF: TRILL

Table 6-1 below provides a summary of the OpCode, OAM PDU type and applications, and their relevance with MEP and MIP.

**Table 6-1 Ethernet OAM PDU types and applications**

|  |  |  |  |
| --- | --- | --- | --- |
| OpCode value | OAM PDU type | OAM application | OpCode relevance for MEPs/MIPs |
| IEEE 802.1 defined | | | |
| 1 | CCM\* | CC (Continuity check),  Remote defect indication (RDI),  Dual-ended proactive Loss measurement (LM)  (fault 1s, pm 100ms, ps 3.33ms) | MEPs |
| 3 | LBM\* | Loopback (Unicast & Multicast) Message  Throughput | MEPs and MIPs (connectivity verification) |
| 2 | LBR\* | Loopback (Unicast & Multicast) Reply  Throughput | MEPs and MIPs (connectivity verification) |
| 5 | LTM | Link trace Message | MEPs and MIPs |
| 4 | LTR | Link trace Reply | MEPs and MIPs |
| 6 | RFM |  |  |
| 7 | SFM |  |  |
| ITU-T SG15 defined | | | |
| 32 | GNM |  | MEPs |
| 32-1 | BNM | Bandwidth notification Message | MEPs |
| 33 | AIS | Alarm indication signal (AIS) | MEPs |
| 35 | LCK | Locked signal | MEPs |
| 37 | TST | Test,  Throughput | MEPs |
| 39 | APS | Linear APS | Refer to [ITU-T G.8031] |
| 40 | APS | Ring APS | Refer to [ITU-T G.8032] |
| 41 | MCC | Maintenance communication channel | MEPs |
| 41-1 | EDM | Expected defect Message | MEPs |
| 43 | LMM | Single-ended proactive & on-demand LM | MEPs |
| 42 | LMR | Single-ended proactive & on-demand LM | MEPs |
| 45 | 1DM | Dual-ended Delay and Delay variation | MEPs |
| 47 | DMM | Single-ended Delay and Delay variation | MEPs |
| 46 | DMR | Throughput | MEPs |
| 49 | EXM | Experimental Message | Outside the scope of G.8013 |
| 48 | EXR | Experimental Reply | Outside the scope of G.8013 |
| 51 | VSM | Vendor-specific Message | Outside the scope of G.8013 |
| 50 | VSR | Vendor-specific Reply | Outside the scope of G.8013 |
| 52 | CSF | Client signal fail | MEPs |
| 53 | 1SL | Dual-ended Synthetic LM | MEPs |
| 55 | SLM | Single-ended Synthetic LM | MEPs |
| 54 | SLR | Single-ended Synthetic LM | MEPs |
| 34, 36, 38, 44, 60-63 | Reserved |  |  |
| MEF defined | | | |
| 56 | LLR | Latching Loopback Reply |  |
| 57 | LLM | Latching Loopback Message |  |
| 58 | SAT | Service activation test Control Protocol |  |
| 59 | SAT | Service activation test Control Message |  |
| IETF defined | | | |
| 64 | TRILL | Path Trace Reply |  |
| 65 | TRILL | Path Trace Message |  |
| 66 | TRILL | Multi-destination Tree Verification Reply |  |
| 67 | TRILL | Multi-destination Tree Verification Message |  |
| 68-59 | Reserved |  |  |

NOTE-1: The CCM PDU is multiple applications, namely Continuity Check (CC), Remote Defect Indication (RDI), and Loss measurement (LM) and each application requires different message rate (default rate for fault is 1 second, pm 100 msec, APS 3.33 msec.)

NOTE-2: There has been agreement among IEEE 802.1, MEF, and ITU-T SG15 that the assignee SDOs will also be responsible for the YANG model of their respective OAM. In ITU-T, the Carrier-Grade Ethernet OAM is specified in G.8013/Y.1731 with the functional model in G.8021 and Information model in G.8052.

NOTE-3: For some OAM PDUs, such as CCM and LBM/LBR, while the basic PDUs are defined in IEEE802.1, some of their usages are further defined in G.8013/Y.1731 and G.8021 to provide specific OAM application needs. For example, the LBM/LBR PDUs are used to provide the following OAM applications:

* LB\_Discover: To discover the MAC addresses of the other MEPs in the same MEG.
* LB\_Series: to send a series of N LB messages to a particular MEP/MIP and report back the total number of received LBR frames, as well as counts of specific errors
* LB\_Test: to send a series of LB messages carrying a test pattern to a particular MEP; and report back the total number of LBM frames sent, as well as the total number of LBR frames received.

The UML model of these OAM applications are defined in G.8052 and the corresponding pruned/refactored UML and YANG are defined in this Recommendation. The G.8052.1 YANG model augments the IEEE802.1Qcp base YANG model.

NOTE-4: OAM messages (and responses) are configured and processed at the MEP/MIP. Thus consistent model/view among the SDOs on MEP/MIP is critical, regardless of whether they have formal UML MEP/MIP model (such as SG15 in G.8052) or not (such as IEEE 802.1). The base YANG model of MEP/MIP is defined in IEEE802.1Q. It is used as the base for augmentation for the G.8052.1 YANG.

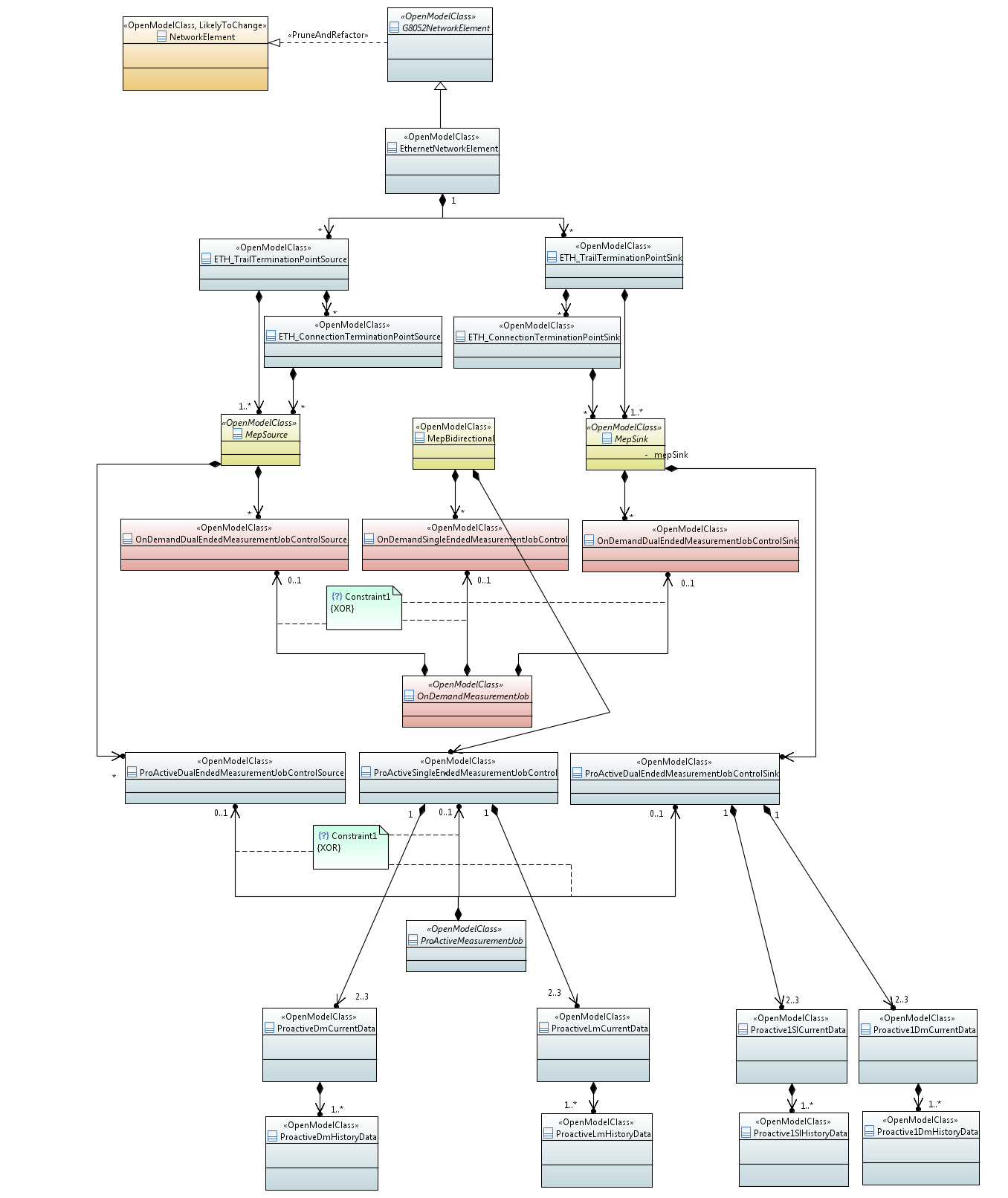
# 7 Carrier Ethernet OAM Information Model

This clause contains the UML information model of the carrier Ethernet OAM functions identified in Clause 6. This information model is derived through pruning and refactoring the Recommendation G.7711/Y.1702 core information model and Recommendation G.8052/Y.1346 foundation Ethernet Transport NE information model.

## 7.1 Required Object Classes

To manage the carrier Ethernet OAM functions identified in Clause 6, the following object classes are required:

* ETH\_TrailTerminationPoint/Bidirectional/Sink/Source *and the subordinate Pacs*
* ETH\_ConnectionTerminationPoint/Bidirectional/Sink/Source *and the subordinate Pacs*
* Mep/ Bidirectional/Sink/Source
* MipBidirectional
* ETH\_TrafficConditioning
* ETH\_TrafficShaping
* MepControl
* MipControl
* MeasurementJobControl
* OnDemandMeasurementJob
* OnDemandMeasurementJobControl
* OnDemandDualEndedMeasuremnetJobControlSink
* OnDemandDualEndedMeasuremnetJobControlSource
* OnDemandSingleEndedMeasurementJobControl
* ProActiveMeasurementJobControl
* ProActiveDualEndedMeasurementJobControlSink
* ProActiveDualEndedMeasurementJobControlSource
* ProActiveSingleEndedMeasurementJobControl
* CurrentData
* ProactiveDmCurrent/HistoryData
* ProactiveLmCurrentData/HistoryData
* Proactive1SlCurrentData/HistoryData
* Proactive1DmCurrentData/HistoryData
* ThresholdProfile



NOTE – This figure is also available on the ITU website [here](http://www.itu.int/itu-t/formal-language/itu-t/g/g8052/2016/Fig.7-22_Containment_Tree-Measurement_Job.PNG).

Figure 7-22/G.8052 – PM measurement job containment relationship

## 7.2 Required Attributes and Operations

This sub-clause identifies which of the attributes and operations of the clause 7.1 object classes should be pruned and which will remain.

<Editor Note: Additional subclauses and details are to be provided. >

### 7.2.1 ETH TP Attributes and Operations

### 7.2.2 MEP & MIP Attributes and Operations

In the right-hand column of the following table, we listed the remaining attributes and operations of the Mep, MepSink, MepSource, and MepBirectional object classes after pruning for G.8052.1. Some open questions are noted for discussion.

|  | **Object class in G.8052** | **Object class in G.8052.1** |
| --- | --- | --- |
| 1 |  | 1. Attributes localId, name, label, extension, operationalSate, administrativeState, administrativeControl, and lifecycleState are pruned. The attribute localId is redundant with the megIdentifier at the source. The other attributes (name, label, etc.) are defined in G.7711 to cover all possible use cases. In the case of G.8052.1 we don’t foresee any need of these attributes and thus these attributes are pruned. |
| 2 | C:\Users\hingk\AppData\Local\Microsoft\Windows\INetCache\Content.Word\MepSource (002).png | 1. The G.8052 Mep attribute localId, name, label, …, and lifecycle are pruned already and thus won’t be inherited by G.8052.1 MepSource.  2. The attribute adminState, mepMac, …., and lckPriority are required for G.8052.1 Mep (as identified inthe row above) and will be inherited by G.8052.1 MepSource, but don’t need to be listed here again. |
|  |  | 3. Open question for discussion at the meeting: The Loopback related operations (namely loopbackTest, loopbackTestTerminate, loopbackSeries, and loopbackDiscover) and linkTrace are OAM defined by IEEE and not by ITU-T. According to the agreement among ITU-T, MEF, and IEEE, the YANG model of the Loopback and Link related OAM will be defined by IEEE. On the other, the G.8052.1 UML model could be used in interfaces other than YANG. So, it seems make sense to still include these operations in G.8052.1 MepSourc and just don’t map them to YANG. Need agreement from the meeting. |
| 3 | C:\Users\hingk\AppData\Local\Microsoft\Windows\INetCache\Content.Word\MepSink (002).png | 1. The G.8052 Mep attribute, localId, name, label, …, and lifecycle are pruned already and thus won’t be inherited by G.8052.1 MepSink.  2. The attribute adminState, mepMac, …, and lckPriority are required for G.8052.1 Mep (as identified in the row above) and will be inherited by G.8052.1 MepSink, but don’t need to be listed here again. |
|  |  | 3. Open question for discussion at the meeting: The getSvdCcm operation is for the CCM OAM defined by IEEE and not by ITU-T. According to the agreement among ITU-T, MEF, and IEEE, the YANG model of the Loopback and Link related OAM will be the responsibility of IEEE. On the other, the G.8052.1 UML could be used in interfaces other than YANG. So, it seems make sense to still include these operations in G.8052.1 MepSink and just don’t map them to YANG. Need agreement from the meeting. |
| 4 | C:\Users\hingk\AppData\Local\Microsoft\Windows\INetCache\Content.Word\MepBidectional (002).png | 1. The protection related attributes (\_associatedRapsGrouRef and \_associatedSncpGroupRef) are not needed and thus pruned.  2. The Sink related attributes (peerMepRefList, …, 1DmPriority) and operatons (establishOnDemandDualEndedMeasurementJobSink, …, terminateProActiveMesuarementJob) are already included in G.8052.1 MepSink and thus will be inherited by G.8052.1 MepBidirectional, but don’t need to be listed again.  3. The Source related attributes (mepIdentifier, …, apsPriority) and operations (getCurrentDataValue, …, testInitiatorTerminate) are already include in G.8052.1 MepSource and thus will be inherited by G.8052.1 MepBidirectional, but don’t need to be listed again.  4. The Source related attributes localId, …, lifecycleState are already pruned for G.8052.1 Mep, so they won’t appear in G.8052.1 MepBidirectional. |
|  |  | 5. The G.8052 Mep attribute, localId, name, label, …, and lifecycle are pruned already and thus won’t be inherited by G.8052.1 Mepbidirectional.  6. The required attributes for G.8052.1 MepBidirectional are \_onDemandSingleEndedMeasurementJobControl and \_proactiveSingleEndedMeasurementJobControl. And the required operations are establishOnDemandSingleEndedMeasurementJob and establishProActiveSingleEndedMeasurementJob. |
| 5 |  | C:\Users\hingk\AppData\Local\Microsoft\Windows\INetCache\Content.Word\MIPBirdectional (002).png  1. The attributes name, label, extension, operationalSate, administrativeState, administrativeControl, and lifecycleState are pruned. They are defined in G.7711 to cover all possible use cases while in the case of G.8052.1 we don’t foresee any need of these attributes and thus are pruned. |

### 7.2.3 xxx Attributes and Operations

<Editor Note: Details are to be provided. >

## 7.3 UML model files

This sub-clause contains the UML model files developed using .the Papyrus open-source modelling tool.

<Editor Note: Details are to be provided. >

# 8 Carrier Ethernet OAM Data Models

This clause contains the interface-protocol-specific data models of the carrier Ethernet OAM functions identified in Clause 6. These data models are translated from the interface-protocol-neutral UML information specified in Clause 7.

<Editor Note: Details are to be provided. >

## 8.1 Carrier Ethernet OAM YANG Data Model

This clause contains the YANG data model of the carrier Ethernet OAM functions identified in Clause 6. This data models are translated, with the assistance of automated translation tooling, from the interface-protocol-neutral UML information specified in Clause 7.

<Editor Note: Details are to be provided. >

Annex A  
  
<Annex Title>

(This annex forms an integral part of this Recommendation.)

<Body of annex A>

Appendix I  
  
<Appendix Title>

(This appendix does not form an integral part of this Recommendation.)

<Body of appendix I>

Bibliography

[b-ITU-T X.yyy] Recommendation ITU-T X.yyy (date), *Title*.

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