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Purpose: Discussion

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Keywords: G.8052.1

Abstract: 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”, v0.13.

Document history:

Version	Date	Description
0.01	WD1214-09 (9/2017) Ottawa	Initial version created based in input contribution WD1214-21, and WD1214-18 and discussion result.

Version	Date	Description
0.02	WD08 (12/2017) London TD173/3 (2/2018)	• Added to clause 7.2.2. a model sketch for the pruned/refactored MEP per the WD14-15 and WD14-29 • Add to clause 7.2.1 on ETP TP pruning • Add clauses 7.2.3 and 7.2.4 for pro-active and on-demand measurement jobs pruning • To do: o To normalize the on-demand and proactive measurement jobs o To normalize the TTP & CTP classes as LTP o To transform the operations into attributes o To prune LAG and Traffic conditioning/shaping as they are considered out of the scope of G.8052.1
0.03	WD09 (1/2018) TD173R1/2 (1/2018)	Updates • Add Summary • Add keywords • Per C467, add sentence in the Scope section for the relationship to the IEEE 802.1 defined CFM OAM functions and YANG modules • Per C467, in clause 8.1, reference ONF TR-531 • Up version the modeling tool and profiles o Eclipse 4.7.2 (i.e. version Oxygen) o Papyrus 3.2.0, o OpenModel_Profile 0.2.13, o OpenInterfaceModel_Profile 0.8, o ProfileLifecycle_Profile 0.0.4, and o Gendoc v0.7.0 milestone 2 To do • Align with G.7711 v3.0 • Per input from IEEE P802.1Qcx & P802.1Qcp, update clauses 7 and 8.1 (Done)
0.04	WD38 (5/2018) Nanjing	Updates • Added new clause 7.1.2 to capture the discussion result of WD1214-22r1, including the preferred EthMepOamSpec and EthMipOamSpec augmentation option #6.
0.05	WD45 (8/2018)	Updates • Accepted all the previous changes • Add text in clause 6 to introduce the material of Clause 7 • Consolidate the text in Clause 7 • Align the UML model with the IEEE p802.1Qcx CFM YANG re-engineered UML cd06r3_BZ__PapyrusIeeeCfmOxygenWorkspace_180703.zip

Version	Date	Description
0.06	C1118 (10/2018) TD328/3 (10/2018)	Updates • Accepted all the previous changes • Align the UML model with the IEEE p802.1Qcx CFM YANG re-engineered UML cd06r5_BZ__PapyrusIeeeCfmOxygenWorkspace_180918.zip • Figure 7-9 updated to augment IEEE CfmOperation with EthOperationSpec, which ExtendComposite EthMepInterface and EthMipInterface • To do: – Complete the rationale table – Provide the translated YANG
0.07draft	CD06 (11/18/2018)	Updates • Augment the 2018.11.16 CFM UML cd05_PapyrusIeeeCfmOxygenWorkspace_181116.zip. (See cd03_minutes_2018.11.19.docx for the changes made in the 2018.11.16 CFM UML)
	CD06r1 (12/17/2018)	Updates • Augmented the 2018.11.20 CFM UML, which has new diagram for MIP • Obsolete EtyTtpBi/Si/SoPac • Remove EtyTtpBi/Si/SoPac and ETY TTP Bi/Si/So from G.8052.1_v0.07-model_EthMepOamSpec.png and Figure 7-2.B • Prune/refactor the attributes for ETH CTP and ETH TTP
	CD06r2 (1/14/2019)	Updates section 7.2.2.2 and the UML model • Prune/refactor the attributes of Mep/MepSink/MepSource/MepBidirectional into the Eth[Ais/Lck/CsfSi/CsfSo/Bw/Aps/Raps/Alarm]Pac
0.07	WD17 (1/25/2019)	Updates • Accepted the changes per editing instruction from the meeting agreement
0.08 draft	CD06r3 (2/18/2019)	Updates • Sync up the CFM UML with the latest (2018.12.18) version • Prune/refactor the attributes of MipBidirectional and RapsCapableHalfMipBidirectional (see Table 7-2 and Figure 7-2.D) • Prune the operations (see Table 7-3 and Figure 7-2.E)
0.08 draft	WD30 (4/8/2019)	Updates • Update to v0.07 (Wuhan) per CD06r3 from the eMeeting • Correct typo in Table 7-3 for “mepSo_testInitiatorTerminate”

Version	Date	Description
0.08	WD16 (4/8/2019 TD375/3 (7/2019)	Updates • Changed the EthXxxPac into ethXxx attributes with datatype EthXxx TO DO • MIP and Tp

0.09	CD06r4 (5/20/2019)
	WD14-16 (7/2019)
	TD375R1/3 (7/2019)
		Updates
		• Up version the modeling tool and profiles
		  ○ Eclipse 4.7.2 (i.e. version Oxygen)
		  ○ Papyrus 3.2.0,
		  ○ OpenModel_Profile 0.2.13 → 0.2.17
		  ○ OpenInterfaceModel_Profile 0.8 → 0.0.10
		  ○ ProfileLifecycle_Profile 0.0.4, and
		  ○ Gendoc v0.7.0 milestone 2
		• Change Spec classes to abstract per UML modeling guidelines (5.4.2.3)
		• Change strictComposite to regular composite
		• Define the G.8052.1 measurement job control, current data, history data classes, which prune/refactor the G.8052 measurement job control, current data, history data classes
		TO DO:
		• Update the TP part of the model according to the proposal in C1423, which was agreed by the 7/2019 Geneva meeting
		• Move the CSF attributes to MEP as a Pac.
		• Move the pruning/refactoring analysis tables to appendix.

0.10	CD06r5 (9/2019)
	WD14-11 (9/19)
	WD14-11r1 (9/19)
		Updates
		• Sync up with the latest CFM YANG (2019.07.16 in cd04r4_ieee802-dot1q-cfm_2019.07.16) and re-engineered UML (cd05r5). Updated/new figures in clause 7.1 (Figures 7-1.A through 7-1.K).
		• Update the TP part of the model according to the proposal in C1423, which was agreed by the 7/2019 Geneva meeting.
		  – EthernetTpSpec augments IEEE 802.1Q bridge port, instead of IETF Interface. *No need to import the reengineered IETF Interface UML*.
		  – EthernetTpSpec is an empty class, i.e., no attribute of the G.8052 ETH TP classes are needed for augmenting the bridge port (Per the analysis of C1423. See TD388/PLEN section 3.6.9.3)
		  – Move AlarmSeverityAssignmentProfile from EthernetTpSpec to EthMepOamSpec
		• Move the CSF attributes from TP to MEP. Note that ethCsf is already in EthMepOamSpec since v0.09
		• Move the pruning/refactoring analysis tables to Appendix II.
		• Augment the IEEE 802.1Q Actions interface class with G.8052 ETH OAM operations

Version	Date	Description

0.11	WD1214-59r1 (10/2019)	Updates:
		• Up-versioned modeling tool and profiles
		  ○ Eclipse 4.9.0 (i.e., 2018.09)
		  ○ Papyrus 4.1.0
		  ○ OpenModel_Profile 0.2.17
		  ○ OpenInterfaceModel_Profile 0.0.10
		  ○ ProfileLifecycle_Profile 0.0.4
		  ○ Gendoc v0.7.2
		• Per WD1214-06 (10/2019) for Clause 7.2.2.3 to augment the UML MaintenanceDomain class with EthMipSpec, which contains the pruned G.8052 regular MIP
		• The RAPS capable MIP is deleted. It should belong to G.8052.2
		• Clause 7.2.1 to list the G.8052.1 specific artefacts
		• Clause 7.3 to attach the updated Papyrus model files

Version	Date	Description
0.12	TD521/3 (1/2020)	Update • UML v0.12: Augment the IEEE 802.1Qcx 2019.10.15 CFM-YANG re-engineered UML (i.e., augment the cd05r7 UML) • Create a new diagram G.8052.1-EthPmThresholding to show the relationship between the current data object class and ThresholdProfile • Complete the undefined attributes (namely elaspseTime, scannerId (now currentDataId), granularityPeriod) of the Current Data object class. • Per Seoul meeting agreement, delete RapsCapableHalfMipBidirectional object class, ethRaps attribute of EthMepOamSpec, EthRaps datatype, and _rapsCapableHalfMipBidirectional attribute of the EthMipSpec class from G.8052.1. These artifacts will be considered by G.8052.2. • Per Seoul meeting agreement, rename MipBidirectional to Mip since Mip is always bidirectional • In the ProActiveSingleEndedMeasurementJobControl class, refactor the navigable attribute _proActiveCcmSinkAttributeList and the referenced DegradedDetection class into a regular attribute degDetection and datatype DegDetection. • Enhance the G.8052 granularity periods (15_min, 24_hour, Less_Than_15_minu) to {unit, value} • Correct/refactor G.8052: for the input parameter of the operation abortOnDemandMeasurementJob, change the data type from Name to OnDemandMeasuremetenJob • Create new class diagram (Fig7-2.D) to illustrate the refactoring of the history data object classes • Create new class diagram (Fig7-2.G) to illustrate the control of measurement jobs • Cleaning-up: o In the EthernetTpSpec object class: Delete the deprecated EtySiPac, EtySoPac, EtyTtpBiPac o In the EthMepAction interface class: delete the deprecated operations (many) o In EthMepOamSpec object class: Delete the deprecated pointer attributes, which points to the EthXxxPacs o In the EthMepAction interface class: Delete the deprecated operations o In ProactiveLmHistoryData: Delete the erroneous Enumeration1 • New Appendix III for client/server scenarios • New Appendix IV for mapping of IEEE 802.1Qcx CFM and G.8013 parameters •

Version	Date	Description
0.13	TD521R1/3 (2/2020)	Updates: • Make EthMepOamSpec as the root element • Change the following Enum's "Is Leaf" property to "true" o AlarmSeverityCode, CsfConfig, OamPduGenerationType, OamPeriod, • In the ThresholdProfile object class, change the navigable attribute _associatedCurrentDataList to non-navigable • Change the names of the datatype 1LmThresholdValues and 1DmThresholdValues to OneLmThresholdValues to OneDmThresholdValues To do: • Also make EthMipSpec and EthernetTpSpec as root element. Mapping Tool (xmi2yang) issue: 1. The mapping tool doesn't map Interface class into container or list. Thus, it doesn't have thing for augmenting. 2. Also, operation should be mapped into action, not rpc. 3. The re-engineered CFM uml has the (extra) "interface" containing the actions, but in the CFM yang, the actions (transmit-loopback, transmit-linktrace) are contained directly in Mep.

Recommendation ITU-T G.8052.1/Y.1346.1

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

Summary

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. These OAM functions complement the IEEE 802.1 defined Connectivity Fault Management (CFM) functions; and the YANG module defined in this Recommendation augments the IEEE 802.1Qcx CFM YANG module.

Keywords

CFM, Connectivity Fault Management, Ethernet, Information model, OAM, protocol-neutral, Transport Ethernet, transport resource, UML, YANG.

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. These OAM functions complement the IEEE 802.1 defined Connectivity Fault Management (CFM) functions; and the YANG module defined in this Recommendation augments the IEEE 802.1Qcx CFM YANG module.

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 (3/2018), Generic protocol-neutral information model for transport resources.

[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 (6/2018), *Characteristics of Ethernet transport network equipment functional blocks*.

[ITU-T G.8052] Recommendation ITU-T G.8052/Y.1346 (~~11/2016~~12/2018), *Protocol-neutral management information model for the Ethernet Transport capable network element*.

[IEEE802.1Q] IEEE 802.1Q (~~2014~~2018), IEEE Standard for Local and metropolitan area networks – Bridges and Bridged Networks

3 Definitions

3.1 Terms defined elsewhere

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:

CFM	Connectivity Fault Management
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 by IEEE 802.1 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	Generic notification Message	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 supports 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.

The Carrier Ethernet OAM functions covered in this Recommendation complements the IEEE 802.1 defined Connectivity Fault Management (CFM) functions.

The UML information model for the Carrier Ethernet OAM is defined in Clause 7 below.

The YANG module for the Carrier Ethernet OAM is contained in Clause 8.1 below. This YANG module is translated from the Carrier Ethernet OAM UML information model and will augment the IEEE 802.1Qcx CFM YANG module.

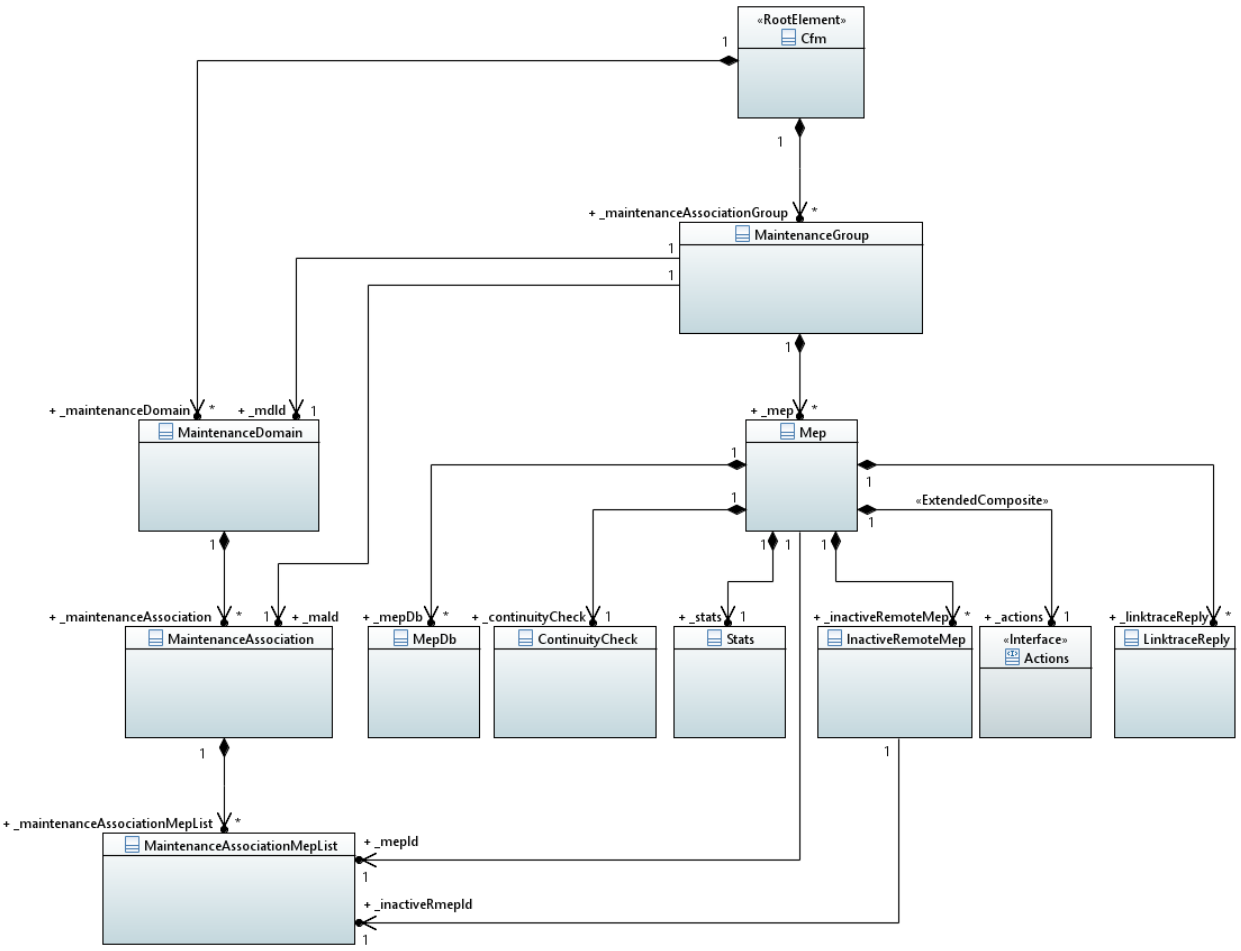
To ensure the seamless augmentation of the Carrier Ethernet OAM YANG to the IEEE 802.1Qcx CFM YANG, the CMF YANG has been re-engineered into UML form to assist the modelling (pruning & refactoring of the G.8052 UML). The re-engineered UML is contained in Clause 7.1 below.

7 Carrier Ethernet OAM Information Model

7.1 IEEE CFM YANG-Re-engineered UML

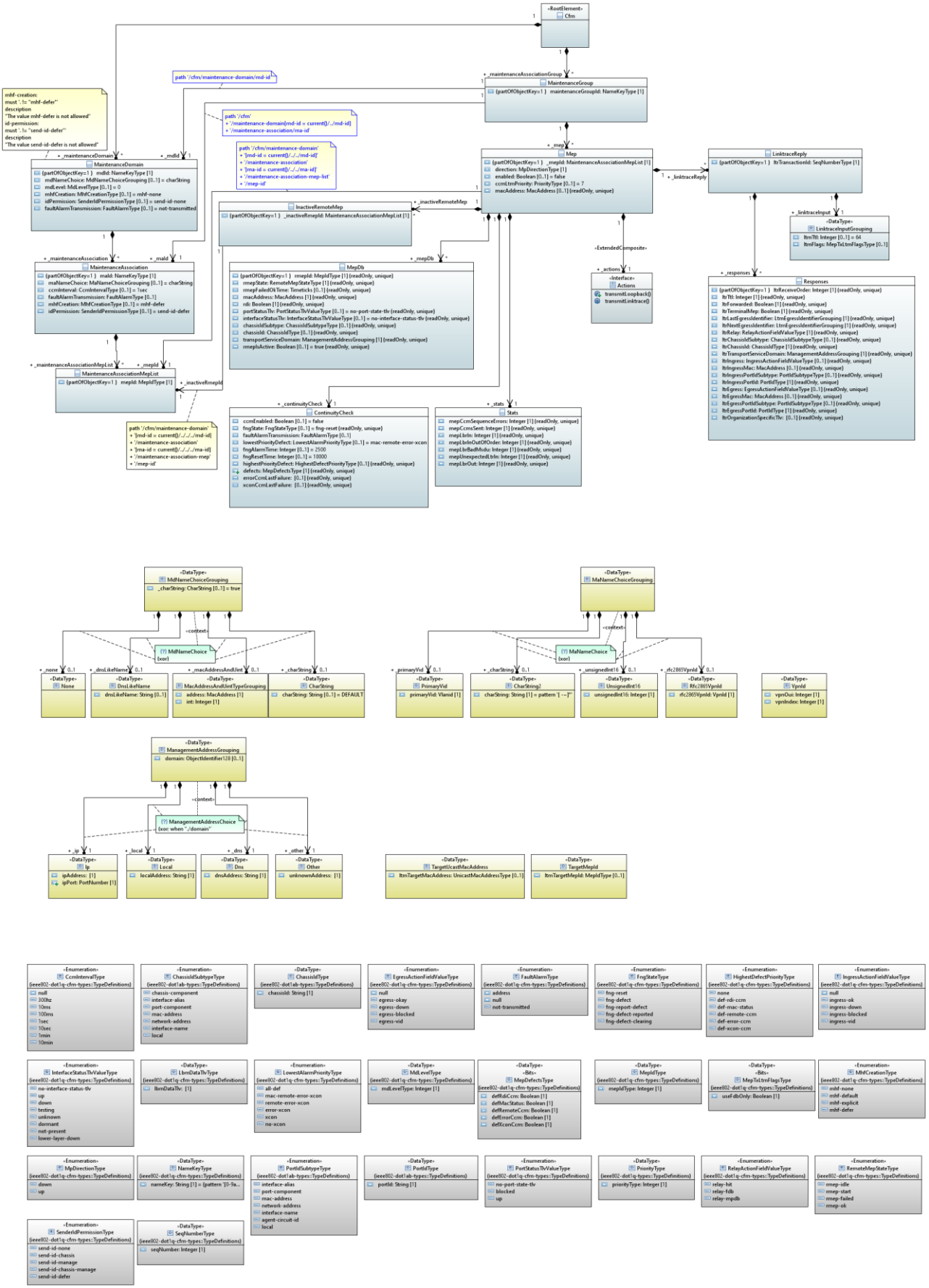
To assist the Carrier Ethernet OAM UML pruning & refactoring and to ensure that the translated Carrier Ethernet OAM YANG can augment seamlessly the IEEE 802.1Qcx CFM YANG, the CFM YANG has been manually re-engineered into UML form. Contained in Appendix I is the IEEE 802.1Q CFM YANG module and the corresponding re-engineered CFM UML model.

Provided below are the UML diagrams extracted from the re-engineered CFM UML model.



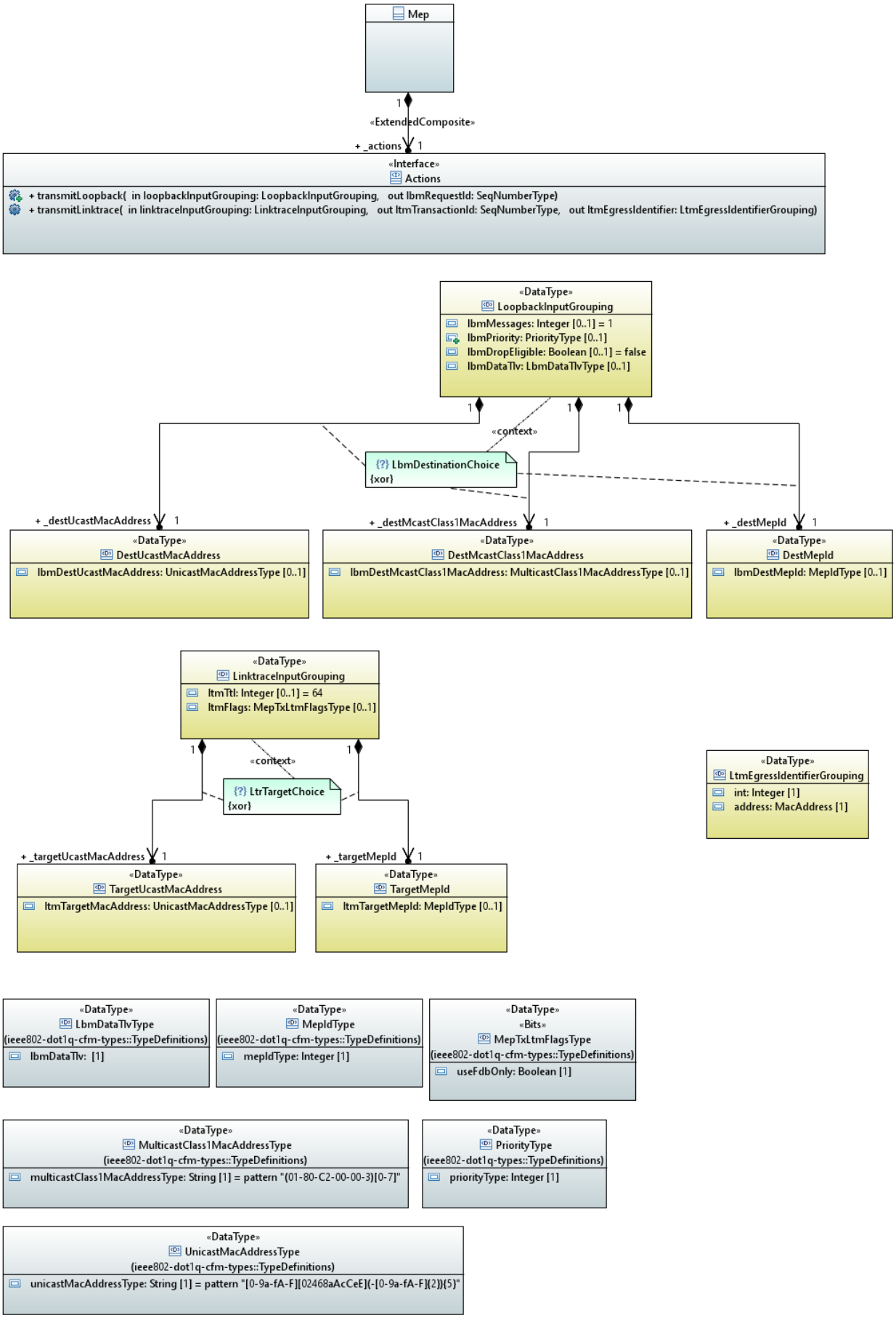
ieee802-dot1q-cfm_F
ig7-1.A_High-Level.pr

Figure 7-1.A – IEEE 802.1Qcx CFM model (2019.10.15) – High Level Structure



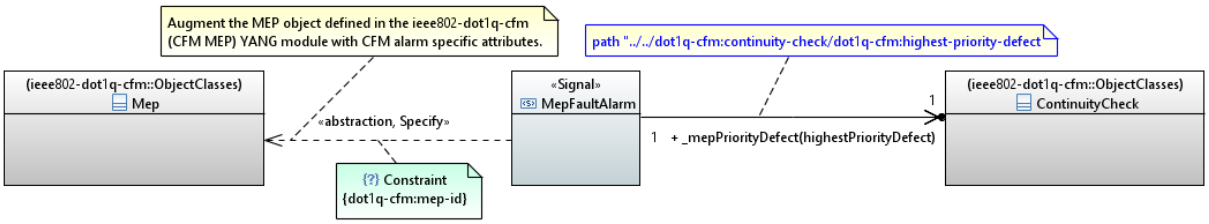
ieee802-dot1q-cfm_Fig7-1.B_Details.png

Figure 7-1.B – IEEE 802.1Qcx CFM model (2019.10.15) – Details


Mep
1
«ExtendedComposite»
+ _actions 1
«Interface»
Actions
+ transmitLoopback(in loopbackInputGrouping: LoopbackInputGrouping, out lbmRequestId: SeqNumberType)
+ transmitLinktrace(in linktraceInputGrouping: LinktraceInputGrouping, out ltmTransactionId: SeqNumberType, out ltmEgressIdentifier: LtmEgressIdentifierGrouping)
«DataType»
LoopbackInputGrouping
lbmMessages: Integer [0..1] = 1
lbmPriority: PriorityType [0..1]
lbmDropEligible: Boolean [0..1] = false
lbmDataTlv: LbmDataTlvType [0..1]
«context»
{?} LbmDestinationChoice
{xor}
+ _destUcastMacAddress 1
«DataType»
DestUcastMacAddress
lbmDestUcastMacAddress: UnicastMacAddressType [0..1]
+ _destMcastClass1MacAddress 1
«DataType»
DestMcastClass1MacAddress
lbmDestMcastClass1MacAddress: MulticastClass1MacAddressType [0..1]
+ _destMepId 1
«DataType»
DestMepId
lbmDestMepId: MepIdType [0..1]
«DataType»
LinktraceInputGrouping
ltmTtl: Integer [0..1] = 64
ltmFlags: MepTxLtmFlagsType [0..1]
«context»
{?} LtrTargetChoice
{xor}
«DataType»
LtmEgressIdentifierGrouping
int: Integer [1]
address: MacAddress [1]
+ _targetUcastMacAddress 1
«DataType»
TargetUcastMacAddress
ltmTargetMacAddress: UnicastMacAddressType [0..1]
+ _targetMepId 1
«DataType»
TargetMepId
ltmTargetMepId: MepIdType [0..1]
«DataType»
LbmDataTlvType
(ieee802-dot1q-cfm-types::TypeDefinitions)
lbmDataTlv: [1]
«DataType»
MepIdType
(ieee802-dot1q-cfm-types::TypeDefinitions)
mepIdType: Integer [1]
«DataType»
«Bits»
MepTxLtmFlagsType
(ieee802-dot1q-cfm-types::TypeDefinitions)
useFdbOnly: Boolean [1]
«DataType»
MulticastClass1MacAddressType
(ieee802-dot1q-cfm-types::TypeDefinitions)
multicastClass1MacAddressType: String [1] = pattern "(01-80-C2-00-00-3)[0-7]"
«DataType»
PriorityType
(ieee802-dot1q-types::TypeDefinitions)
priorityType: Integer [1]
«DataType»
UnicastMacAddressType
(ieee802-dot1q-cfm-types::TypeDefinitions)
unicastMacAddressType: String [1] = pattern "[0-9a-fA-F][02468aAcCeE](-[0-9a-fA-F]{2}){5}"

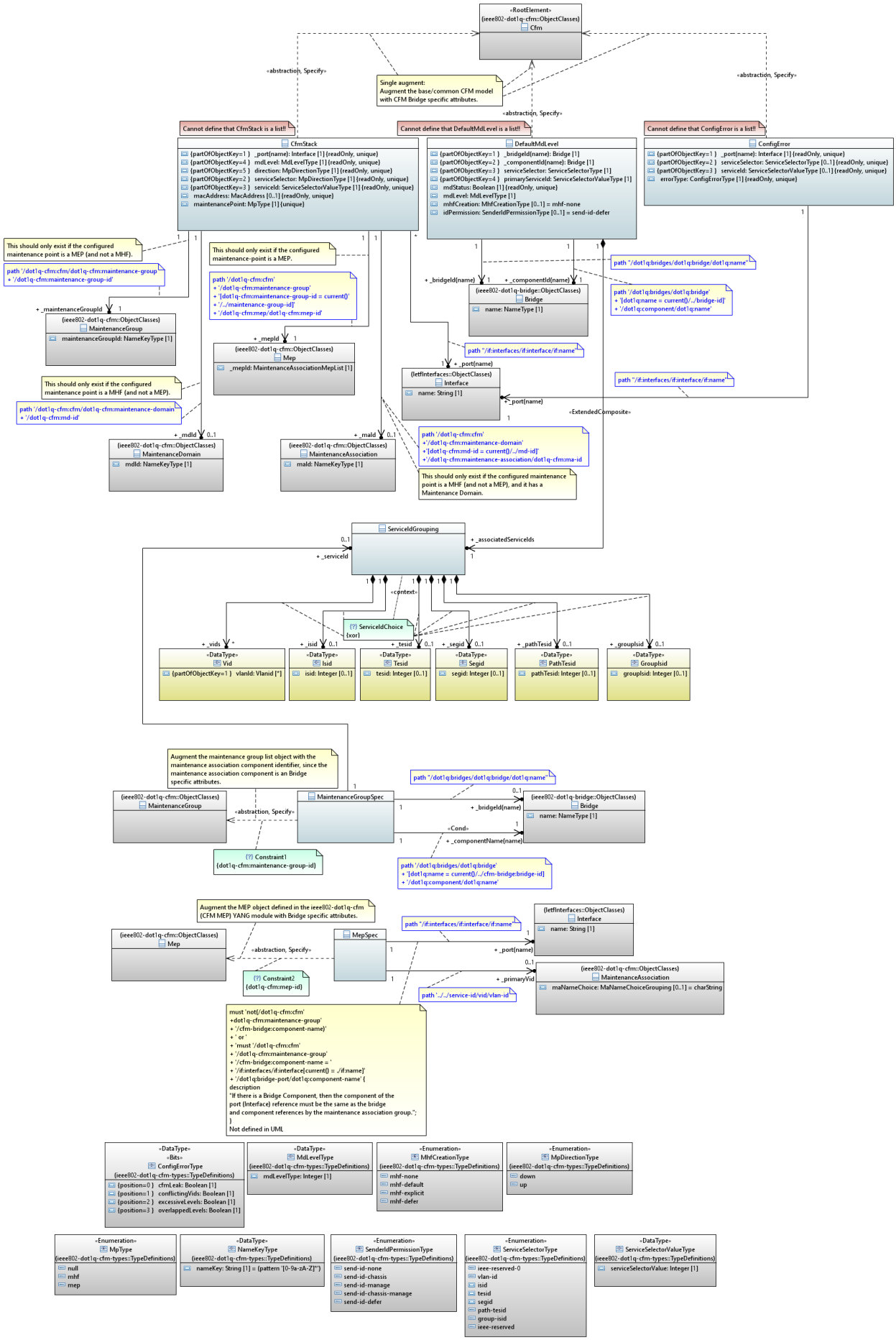
ieee802-dot1q-cfm_Fig7-1.C_Actions.png

Figure 7-1.C – IEEE 802.1Qcx CFM model (2019.10.16) – Actions



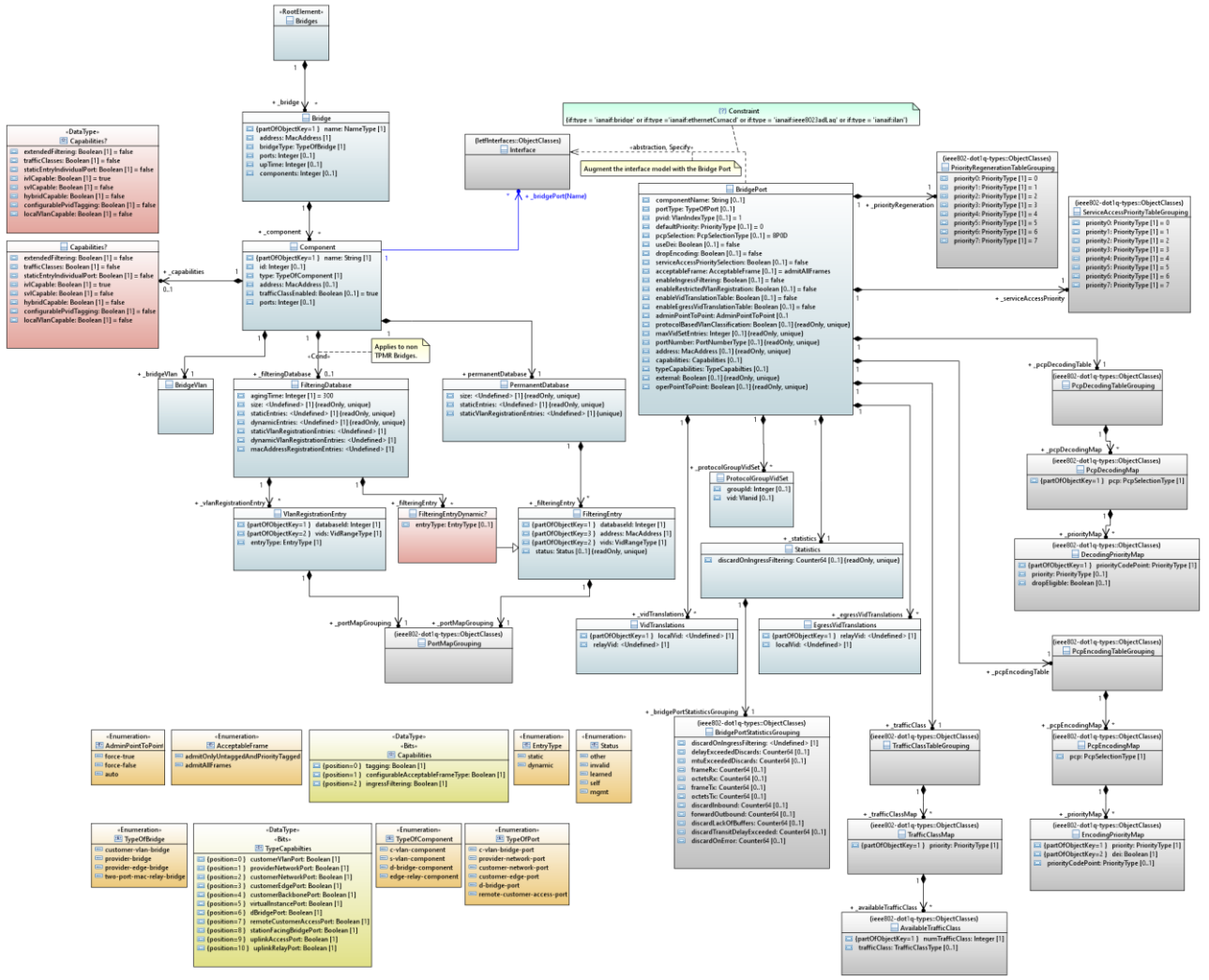
ieee802-dot1q-cfm-alarm_Fig7-1.D_Alarms

Figure 7-1.D – IEEE 802.1Qcx CFM model (2019.10.16) – Alarm


«RootElement»
(ieee802-dot1q-cfm::ObjectClasses)
Cfm
«abstraction, Specify»
Single augment:
Augment the base/common CFM model with CFM Bridge specific attributes.
Cannot define that CfmStack is a list!!
Cannot define that DefaultMdLevel is a list!!
Cannot define that ConfigError is a list!!
CfmStack
{partOfObjectKey=1 } _portName): Interface [1] {readOnly, unique}
{partOfObjectKey=4 } mdLevel: MdLevelType [1] {readOnly, unique}
{partOfObjectKey=5 } direction: MpDirectionType [1] {readOnly, unique}
{partOfObjectKey=2 } serviceSelector: MpDirectionType [1] {readOnly, unique}
{partOfObjectKey=3 } serviceId: ServiceSelectorValueType [1] {readOnly, unique}
macAddress: MacAddress [0..1] {readOnly, unique}
maintenancePoint: MpType [1] {unique}
DefaultMdLevel
{partOfObjectKey=1 } _bridgeId(name): Bridge [1]
{partOfObjectKey=2 } _componentId(name): Bridge [1]
{partOfObjectKey=3 } serviceSelector: ServiceSelectorType [1]
{partOfObjectKey=4 } primaryServiceId: ServiceSelectorValueType [1]
mdStatus: Boolean [1] {readOnly, unique}
mdLevel: MdLevelType [1]
mhfCreation: MhfCreationType [0..1] = mhf-none
idPermission: SenderIdPermissionType [0..1] = send-id-defer
ConfigError
{partOfObjectKey=1 } _portName): Interface [1] {readOnly, unique}
{partOfObjectKey=2 } serviceSelector: ServiceSelectorType [0..1] {readOnly, unique}
{partOfObjectKey=3 } serviceId: ServiceSelectorValueType [0..1] {readOnly, unique}
errorType: ConfigErrorType [1] {readOnly, unique}
This should only exist if the configured maintenance point is a MEP (and not a MHF).
path '/dot1q-cfm:cfm/dot1q-cfm:maintenance-group + '/dot1q-cfm:maintenance-group-id'
This should only exist if the configured maintenance-point is a MEP.
path '/dot1q-cfm:cfm' + '/dot1q-cfm:maintenance-group' + '[dot1q-cfm:maintenance-group-id = current()' + '/../maintenance-group-id]' + '/dot1q-cfm:mep/dot1q-cfm:mep-id'
path "/dot1q:bridges/dot1q:bridge/dot1q:name"
path "/dot1q:bridges/dot1q:bridge' + '[dot1q:name = current()/../bridge-id]' + '/dot1q:component/dot1q:name'
+ _maintenanceGroupId
(ieee802-dot1q-cfm::ObjectClasses)
MaintenanceGroup
maintenanceGroupId: NameKeyType [1]
+ _mepId
(ieee802-dot1q-cfm::ObjectClasses)
Mep
_mepId: MaintenanceAssociationMepList [1]
+ _bridgeId(name)
+ _componentId(name)
(ieee802-dot1q-bridge::ObjectClasses)
Bridge
name: NameType [1]
path "/if:interfaces/if:interface/if:name"
+ _port(name)
(ietfInterfaces::ObjectClasses)
Interface
name: String [1]
This should only exist if the configured maintenance point is a MHF (and not a MEP).
path '/dot1q-cfm:cfm/dot1q-cfm:maintenance-domain + '/dot1q-cfm:md-id'
+ _mdId
(ieee802-dot1q-cfm::ObjectClasses)
MaintenanceDomain
mdId: NameKeyType [1]
+ _mald
(ieee802-dot1q-cfm::ObjectClasses)
MaintenanceAssociation
mald: NameKeyType [1]
path '/dot1q-cfm:cfm' + '/dot1q-cfm:maintenance-domain' + '[dot1q-cfm:md-id = current()/../md-id]' + '/dot1q-cfm:maintenance-association/dot1q-cfm:ma-id
This should only exist if the configured maintenance point is a MHF (and not a MEP), and it has a Maintenance Domain.
«ExtendedComposite»
ServiceIdGrouping
+ _serviceId
+ _associatedServiceIds
«context»
{?} ServiceIdChoice
{xor}
«DataType»
Vid
{partOfObjectKey=1 } vlanId: Vlanid [*]
«DataType»
Isid
isid: Integer [0..1]
«DataType»
Tesid
tesid: Integer [0..1]
«DataType»
Segid
segid: Integer [0..1]
«DataType»
PathTesid
pathTesid: Integer [0..1]
«DataType»
GroupIsid
groupIsid: Integer [0..1]
Augment the maintenance group list object with the maintenance association component identifier, since the maintenance association component is an Bridge specific attributes.
(ieee802-dot1q-cfm::ObjectClasses)
MaintenanceGroup
MaintenanceGroupSpec
«abstraction, Specify»
«Cond»
{?} Constraint1
{dot1q-cfm:maintenance-group-id}
Augment the MEP object defined in the ieee802-dot1q-cfm (CFM MEP) YANG module with Bridge specific attributes.
(ieee802-dot1q-cfm::ObjectClasses)
Mep
MepSpec
{?} Constraint2
{dot1q-cfm:mep-id}
+ _primaryVid
path '../../service-id/vid/vlan-id'
(ieee802-dot1q-cfm::ObjectClasses)
MaintenanceAssociation
maNameChoice: MaNameChoiceGrouping [0..1] = charString
must 'not(/dot1q-cfm:cfm' +dot1q-cfm:maintenance-group' + '/cfm-bridge:component-name)' + ' or ' + 'must '/dot1q-cfm:cfm' + '/dot1q-cfm:maintenance-group' + '/cfm-bridge:component-name = ' + '/if:interfaces/if:interface[current() = ../if:name]' + '/dot1q:bridge-port/dot1q:component-name' { description "If there is a Bridge Component, then the component of the port (Interface) reference must be the same as the bridge and component references by the maintenance association group."; } Not defined in UML
«DataType»
«Bits»
ConfigErrorType
(ieee802-dot1q-cfm-types::TypeDefinitions)
{position=0 } cfmLeak: Boolean [1]
{position=1 } conflictingVids: Boolean [1]
{position=2 } excessiveLevels: Boolean [1]
{position=3 } overlappedLevels: Boolean [1]
«DataType»
MdLevelType
(ieee802-dot1q-cfm-types::TypeDefinitions)
mdLevelType: Integer [1]
«Enumeration»
MhfCreationType
(ieee802-dot1q-cfm-types::TypeDefinitions)
mhf-none
mhf-default
mhf-explicit
mhf-defer
«Enumeration»
MpDirectionType
(ieee802-dot1q-cfm-types::TypeDefinitions)
down
up
«Enumeration»
MpType
(ieee802-dot1q-cfm-types::TypeDefinitions)
null
mhf
mep
«DataType»
NameKeyType
(ieee802-dot1q-cfm-types::TypeDefinitions)
nameKey: String [1] = (pattern '[0-9a-zA-Z]*')
«Enumeration»
SenderIdPermissionType
(ieee802-dot1q-cfm-types::TypeDefinitions)
send-id-none
send-id-chassis
send-id-manage
send-id-chassis-manage
send-id-defer
«Enumeration»
ServiceSelectorType
(ieee802-dot1q-cfm-types::TypeDefinitions)
ieee-reserved-0
vlan-id
isid
tesid
segid
path-tesid
group-isid
ieee-reserved
«DataType»
ServiceSelectorValueType
(ieee802-dot1q-cfm-types::TypeDefinitions)
serviceSelectorValue: Integer [1]

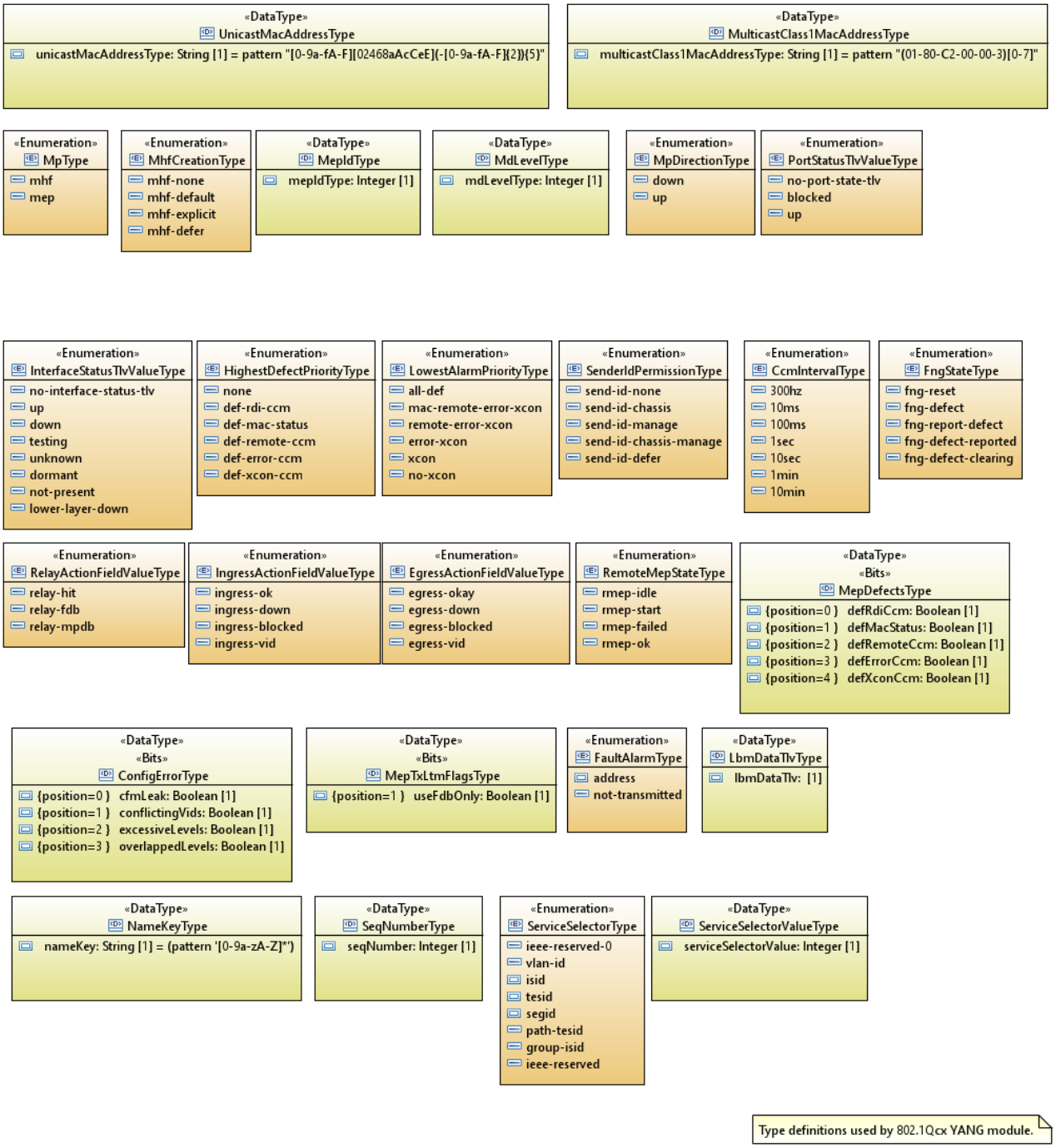
ieee802-dot1q-cfm-b
ridge_Fig7-1.E_CFM-B

Figure 7-1.E – IEEE 802.1Qcx CFM model (2019.10.16) – CFM Bridge



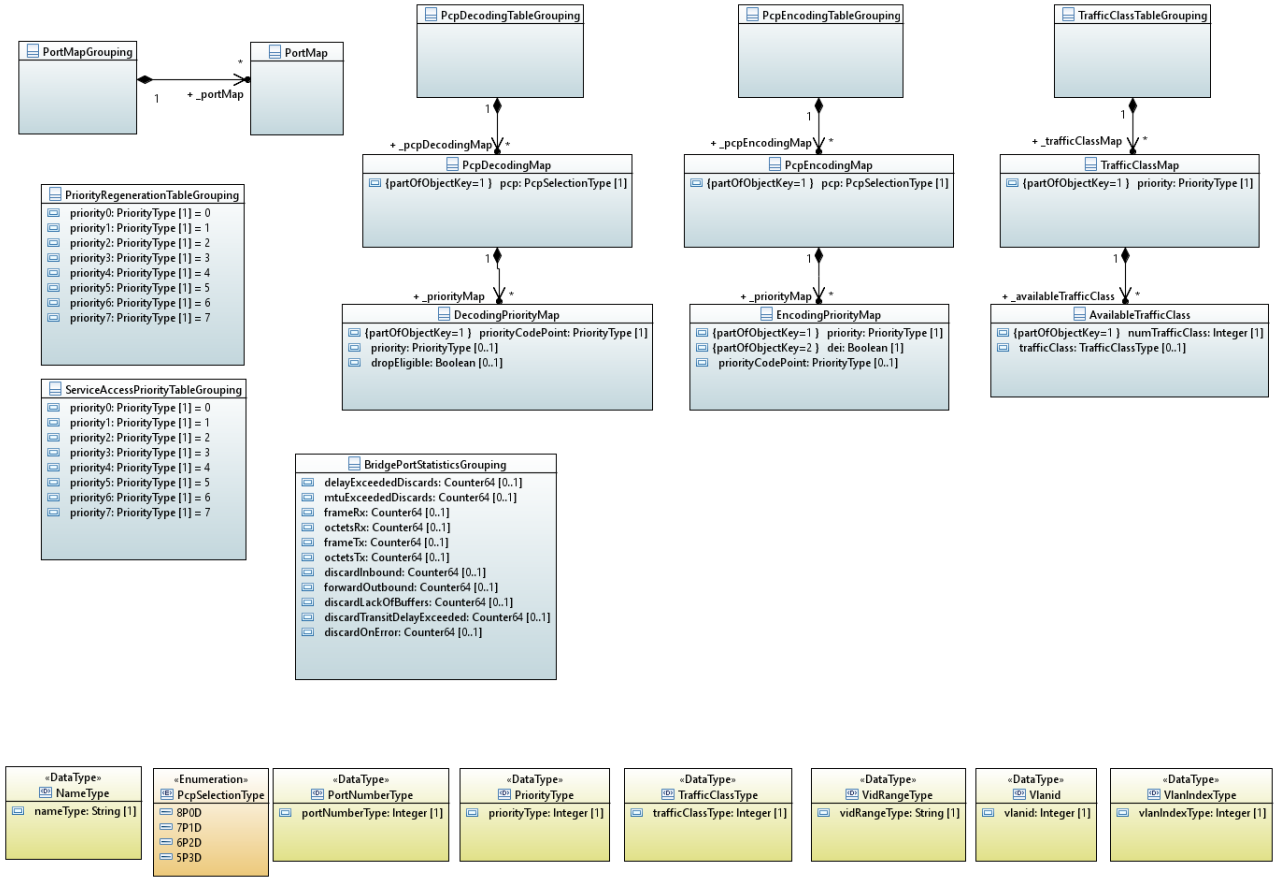
ieee802-dot1q-bridg
e_Fig7-1.F_802.1Q-Bri

Figure 7-1.F – IEEE 802.1Q Bridge model (2019.10.16) – Bridge



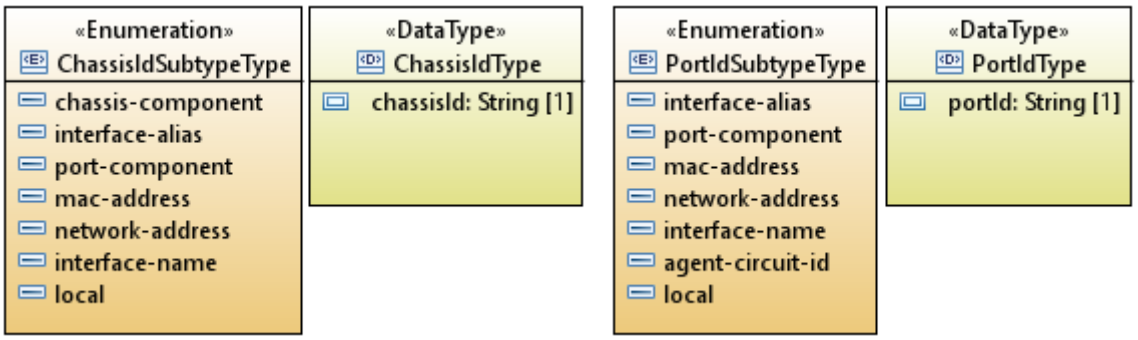
ieee802-dot1q-cfm-t
ypes_Fig7-1.G_CFM-T

Figure 7-1.G – IEEE 802.1Qcx CFM model (2019.10.16) – CFM Data types



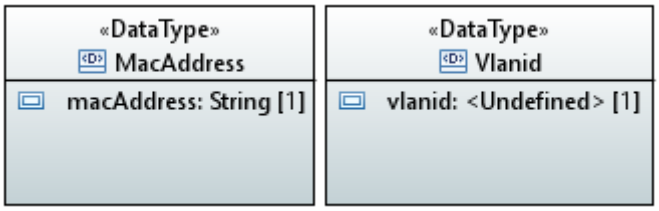
ieee802-dot1q-types
_Fig7-1.H_802.1Q-Typ

Figure 7-1.H – IEEE 802.1Q model (2019.10.16) – 802.1Q Data types



ieee802-dot1ab-type
s_Fig7-1.I_802.1AB-Ty

Figure 7-1.I – IEEE 802.1Q model (2019.10.16) – 802.1AB Data types



ieee802-types_Fig7-1
.J_802-types.png

Figure 7-1.J – IEEE 802 model (2019.10.16) – 802 Data types

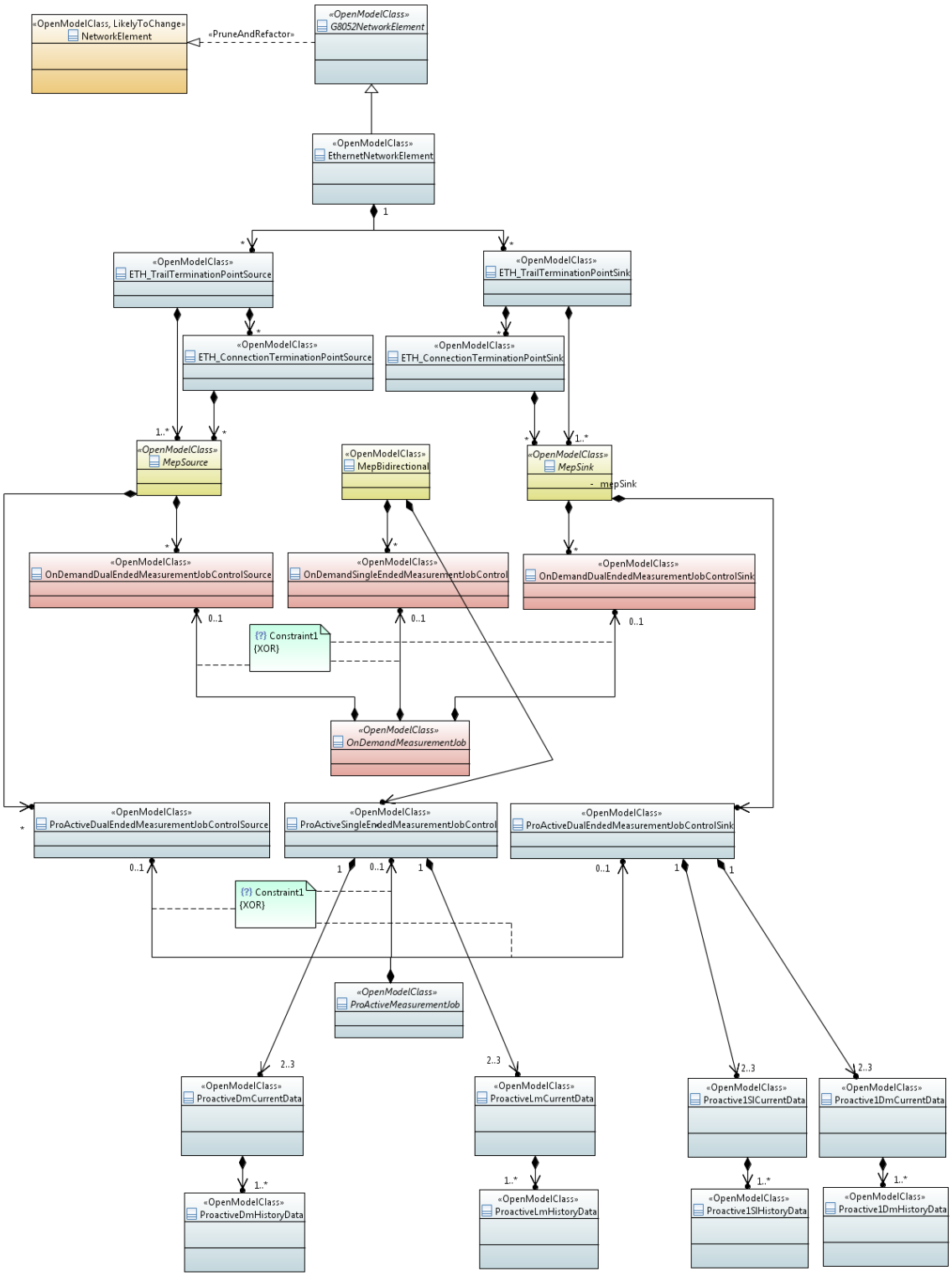
7.2 Carrier Ethernet OAM UML

This sub-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.

7.2.1 Base Object Classes Considered

To manage the carrier Ethernet OAM functions identified in Clause 6, the following G.8052 object classes are considered for pruning/refactoring:

- ETH_TrailTerminationPoint/Bidirectional/Sink/Source *and the subordinate Pacs*
- ETH_ConnectionTerminationPoint/Bidirectional/Sink/Source *and the subordinate Pacs*
- Mep/ Bidirectional/Sink/Source
- MipBidirectional
- MepControl
- MipControl
- MeasurementJobControl
- OnDemandMeasurementJob
- OnDemandMeasurementJobControl
- OnDemandDualEndedMeasuremnetJobControlSink
- OnDemandDualEndedMeasuremnetJobControlSource
- OnDemandSingleEndedMeasurementJobControl
- ProActiveMeasurementJobControl
- ProActiveDualEndedMeasurementJobControlSink
- ProActiveDualEndedMeasurementJobControlSource
- ProActiveSingleEndedMeasurementJobControl
- CurrentData/HistoryData
- ProactiveDmCurrent/HistoryData
- ProactiveLmCurrentData/HistoryData
- Proactive1SlCurrentData/HistoryData
- Proactive1DmCurrentData/HistoryData
- ThresholdProfile



NOTE – This figure is also available on the ITU website here.

Figure 7-2.A Required Object Class for Ethernet OAM

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

Besides the above identified G.8052 object classes, addition object classes, data types, and interface class are defined for G.8052.1 specifically enable augmenting to the IEEE 802.1Q CFM base model. Listed below are these G.8052.1 artefacts

- Object classes and Pacs
  - EthernetTpSpec
  - EthMepOamSpec
    - EthMeaJobPac
      - ProActiveDualEndedMeaJob
        - ProActiveDualEndedMeasurementJobControlSink
          - Proactive1DmCurrentData, Proactive1DmHistoryData
          - Proactive1SlCurrentData, Proactive1SlHistoryData
        - ProActiveDualEndedMeasurementJobControlSource
      - OnDemandDualEndedMeaJob
        - OnDemandDualEndedMeasurementJobControlSink
        - OnDemandDualEndedMeasurementJobControlSource
      - ProActiveSingleEndedMeaJob
        - ProActiveSingleEndedMeasurementJobControl
          - ProactiveLmCurrentData, ProactiveLmHistoryData
          - ProactiveDmCurrentData, ProactiveDmHistoryData
      - OnDemandSingleEndedMeaJob
        - OnDemandSingleEndedMeasurementJobControl
    - AlarmSeverityAssignmentProfile
  - EthMipSpec
    - MipBidirectional
    - RapsCapableHalfMipBidirectional
- Datatypes
  - EthAis
  - EthLck
  - EthCsf
    - EthCsfSource
    - EthCsfSink
  - EthBw
  - EthAps
  - EthRaps
  - EthMepAlarm
- Interface class
  - EthMepAction

7.2.2 Augmentation to IEEE CFM re-engineered UML

This clause shows how the above G.8052 base object classes are pruned/refactored to produce the G.8052.1 specific artefacts and augment to the CFM re-engineered UML.

7.2.2.1 Termination Points

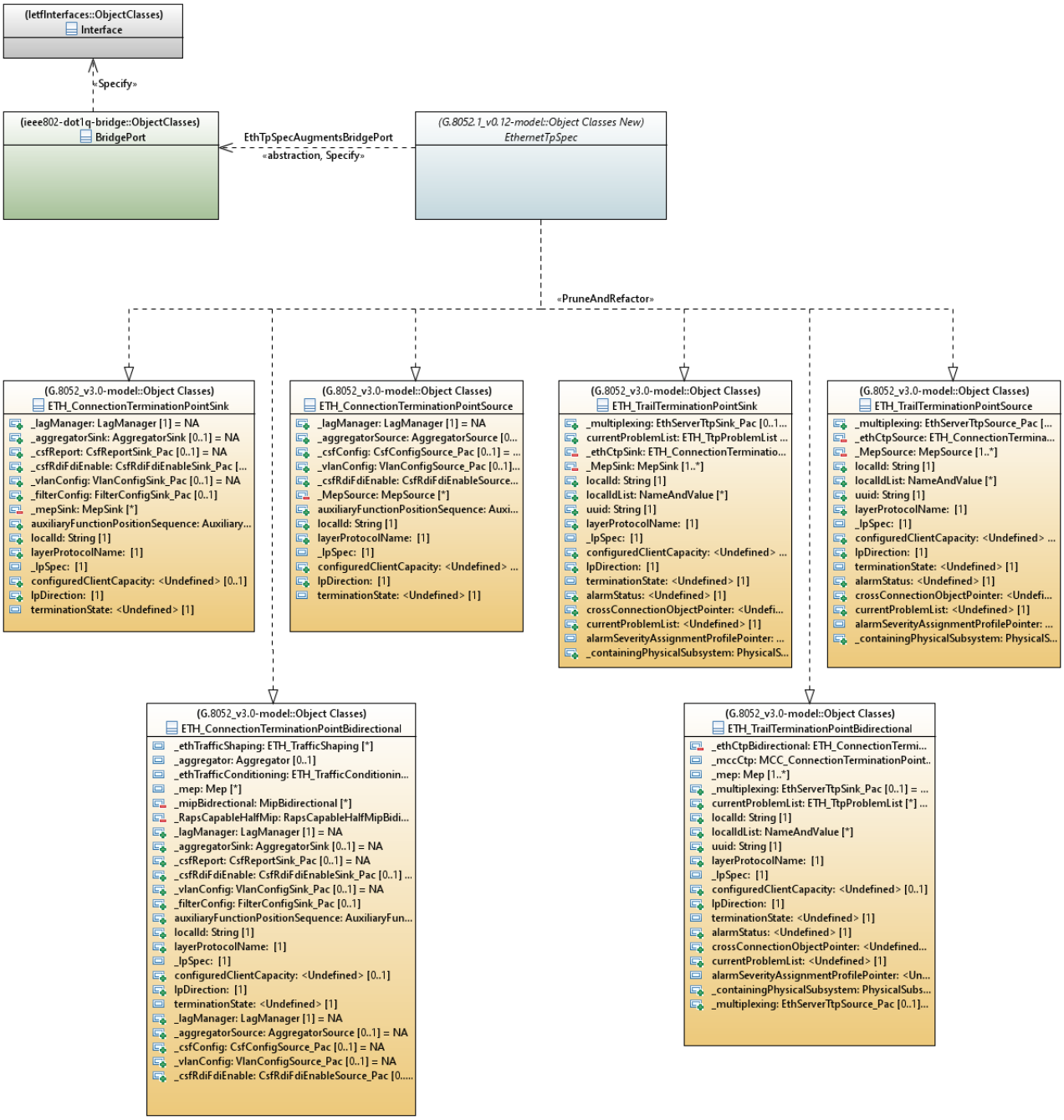
~~The IETF Interface object class is augmented with the G.8052.1 EthernetTpSpec object class, which contains the EthCtpSiPac, EthCtpSoPac, EthCtpBiPac, EthTtpSiPac, EthTtpSoPac, EthTtpBiPac,~~

~~EtySiPac, EtySoPac, and EtyBiPac. These Pac object classes are pruned & refactored from the corresponding G.8052 object classes as shown in Figure 7-6 below.~~

The Ieee802-dot1q-bridgePort object class models the touch point for augmentation. It represents the IEEE 802.1Q bridge port YANG node. The purpose of this object is for the IEEE 802.1Q bridge port YANG node to be augmented with the necessary G.8052 ETH termination point-specific properties. These necessary properties are collectively modelled by using the G.8052.1 EthernetTpSpec object class.

Figure 7-2.A below shows the bridge port augmentation structure.

G.8052.1_v0.10-model_Fig7-2.A-TP.png



G.8052.1_v0.12-model_Fig7-2.A_TP.png

Figure 7-2.A – Bridge Port augmentation for ETH TP properties

The attributes of EthernetTpSpec represent the necessary ETH TP properties for augmentation. The needed properties are identified through pruning & refactoring from the attributes of the G.8052 ETH TTP and CTP object classes.

Table II-1 of Appendix II contains the analysis of the attributes of the G.8052 ETH TP object classes on whether they should be retained/refactored or pruned for G.8052.1 and also the rationale of doing so.

Note that after the pruning/refactoring analysis, it has been determined that no attributes of the G.8052 ETH TP object classes are needed for augmenting the IEEE 802.1Q bridge port because the IEEE 802.1Q bridge port has the necessary properties. Therefore, the G.8052.1 EthernetTpSpec is basically an empty class. However, even the EthernetTpSpec is currently an empty class, it is still kept in the model to allow future extension.

7.2.2.2 MEP and Measurement Jobs

The Mep object class of the re-engineered CFM UML is the touch point for ETH MEP OAM augmentation. It represents the IEEE 802.1Q mep YANG node. The IEEE 802.1Q Mep UML class is augmented with the G.8052.1 EthMepOam Spec.

Figure 7-2.B below shows the MEP OAM augmentation structure, which is organized according to the MEP OAM functions (OpCode per se). This organization is preferred over the ~~option~~ alternative which organize~~sd~~ according to MEP Bi/Sink/Source.

The IEEE 802.1 Mep object class is augmented with the G.8052.1 EthMepOamSpec object class, which contains the G.8052.1 EthMeaJobPac~~,~~ and ~~has~~ the ~~various~~ following OAM attributes~~, namely~~

- ethAis
- ethLck
- ethCsf
- ethAps
- ethBw
- ethRaps
- ethAlarm
- _alarmSeverityAssignmentProfile

These G.8052.1 OAM attributes are defined through pruning/refactoring from the G.8052 Mep, MepSink, MepSource, and MepBidirectional classes, as shown in Table II-2 of Appendix II.

The G.8052.1 EthMeaJobPac contains the G.8052.1 measurement job classes, namely

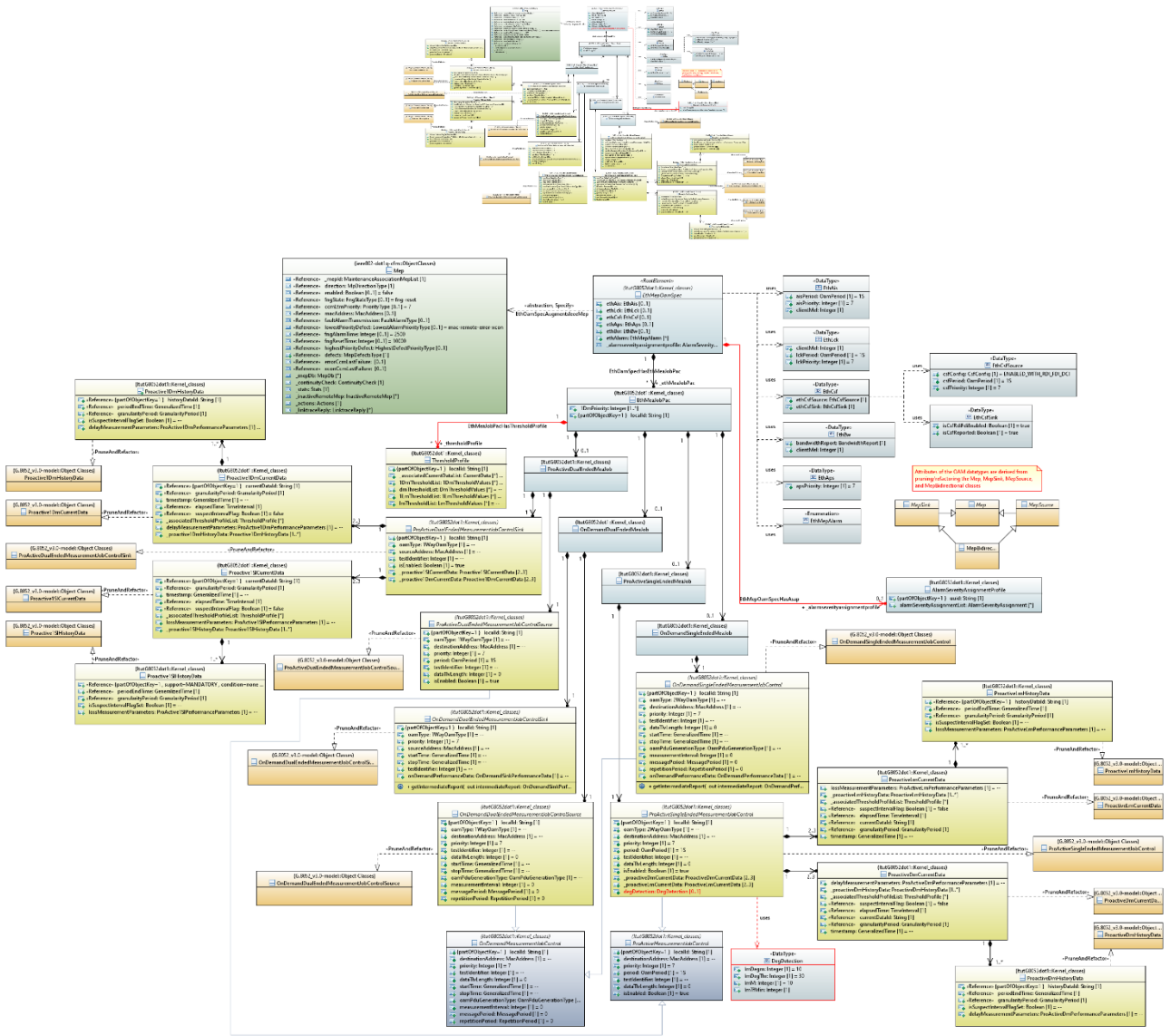
- ProActiveDualEndedMeaJob
- OnDemanDualEndedMeaJob
- ProActiveSingleEndedMeaJob
- OnDemanSingleEndedMeaJob

These G.8052.1 measuremnet job classes contain the corresponding relevant G.8052 measurement job control classes and measurement current/history data classes with the hierarchy as summarized below~~follow~~:

- ProActiveDualEndedMeaJob,
  - ProActiveDualEndedMeasurementJobControlSink
    - Proactive1DMCurrentData
      - Proactive1DMHistoryData
    - Proactive1SlCurrentData
      - Proactive1SlHistoryData
  - ProActiveDualEndedMeasurementJobControlSource
- OnDemanDualEndedMeaJob,

    - OnDemandDualEndedMeasurementJobControlSink
    - OnDemandDualEndedMeasurementJobControlSource
- ProActiveSingleEndedMeaJob, and
    - ProActiveSingleEndedMeasurementJobControl
        - ProactiveLmCurrentData
            - ProactiveLmHistoryData
        - ProactiveDmCurrentData
            - ProactiveDmHistoryData
- OnDemanSingleEndedMeaJob
    - OnDemandSingleEndedMeasurementJobControl

These G.8052 measurement job control classes and measurement current/history data classes are used in G.8052.1 as they are without necessary pruning/refactoring.

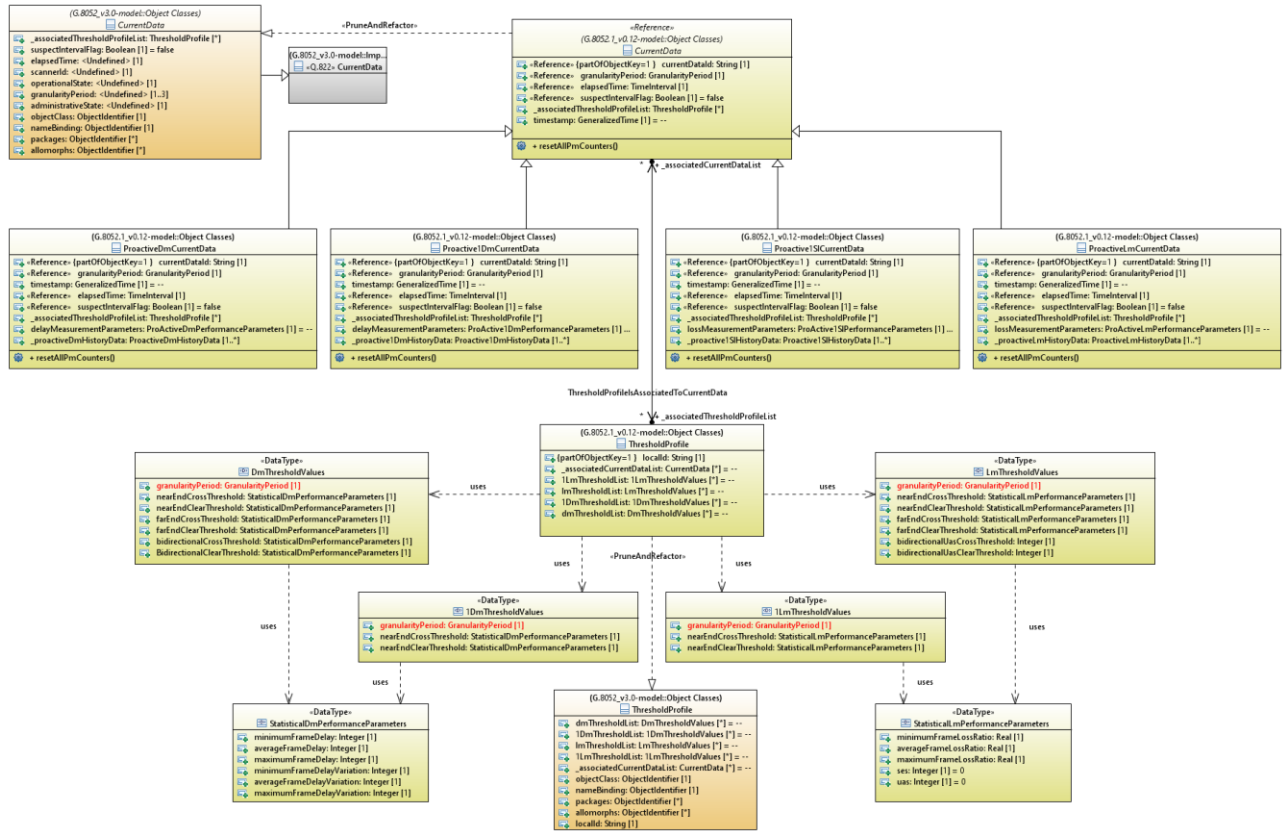


G.8052.1_v0.12-mode
l_Fig7-2.B_EthMepOa

Figure 7-2.B – CMF MEP augmentation with ETH MEP OAM

Table II-2 of Appendix II contains the analysis of the attributes of the G.8052 ETH OAM object classes on whether they should be retained/refactored or pruned for G.8052.1 and also the rationale of doing so.

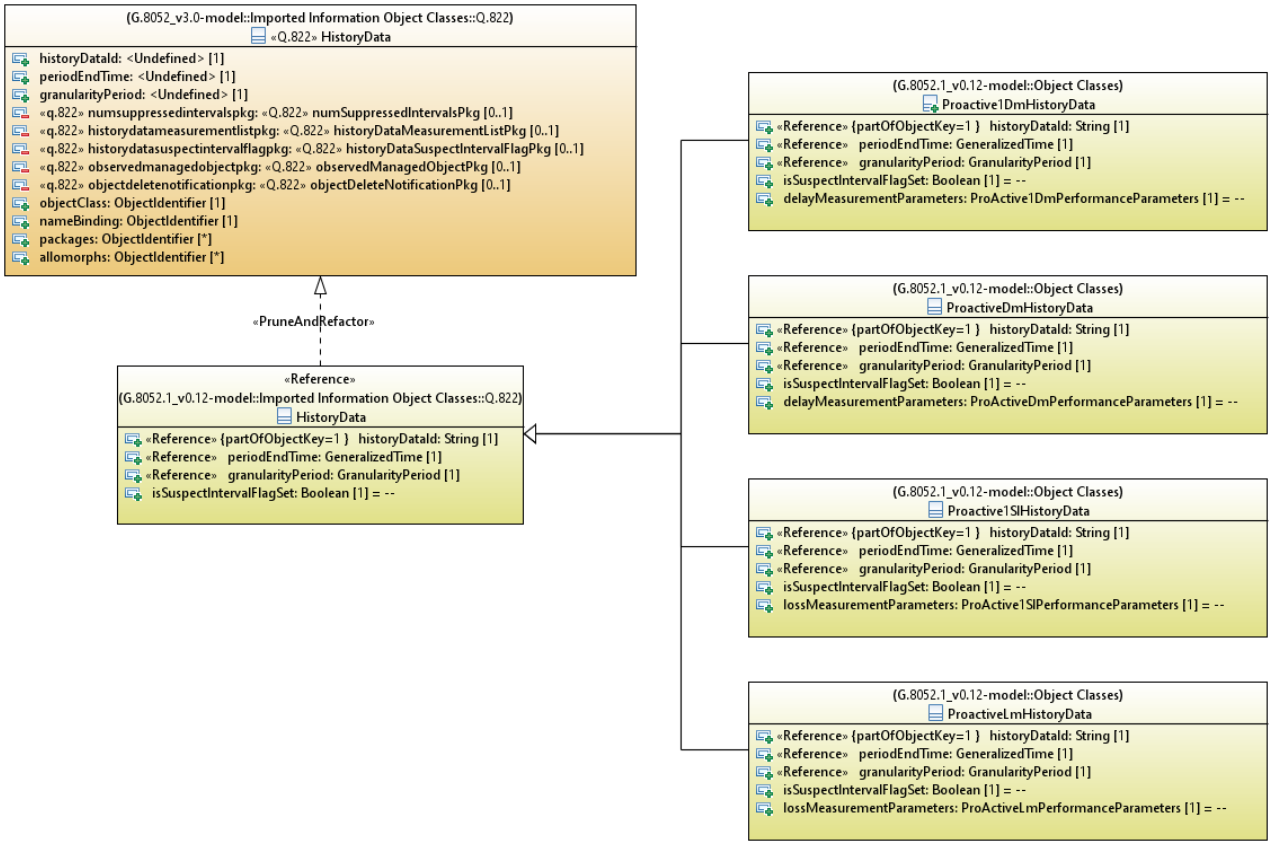
Figure 7-2.C below shows the ETH CurrentData and ThresholdProfile object classes for ETH performance monitoring measurement thresholding.



G.8052.1_v0.12-model_Fig7-2.C_CD-TH.png

Figure 7-2.C – ETH performance monitoring measurement thresholding

Figure 7-2.D below shows the pruning and refactoring of the G.8052 HistoryData to derive the ETH CMF HistorytData and subclasses.



G.8052.1_v0.12-model_Fig7-2.D_EthHistoryI

Figure 7-2.D – ETH performance monitoring history data

7.2.2.3 MIP

~~<<Editor Note>> In the latest CFM YANG (2019.07.16) module, the MIP node is no longer there. Need to reconsider whether need/how to augment the CFM YANG with ETH MIP properties. What is the touch/anchor point?~~

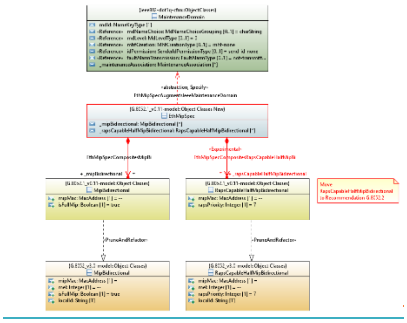
~~Augment the IEEE 802.1 Mip object class with the G.8052.1 EthMipOamSpec object class, which contains the G.8052.1 EthMipPac and EthMipRapsCapablePac, which in turn are pruned & refactored from the G.8052 MipBidirectional and RapsCapableHalfMipBidirectional object classes; as shown in Figure 7-2.C below~~.

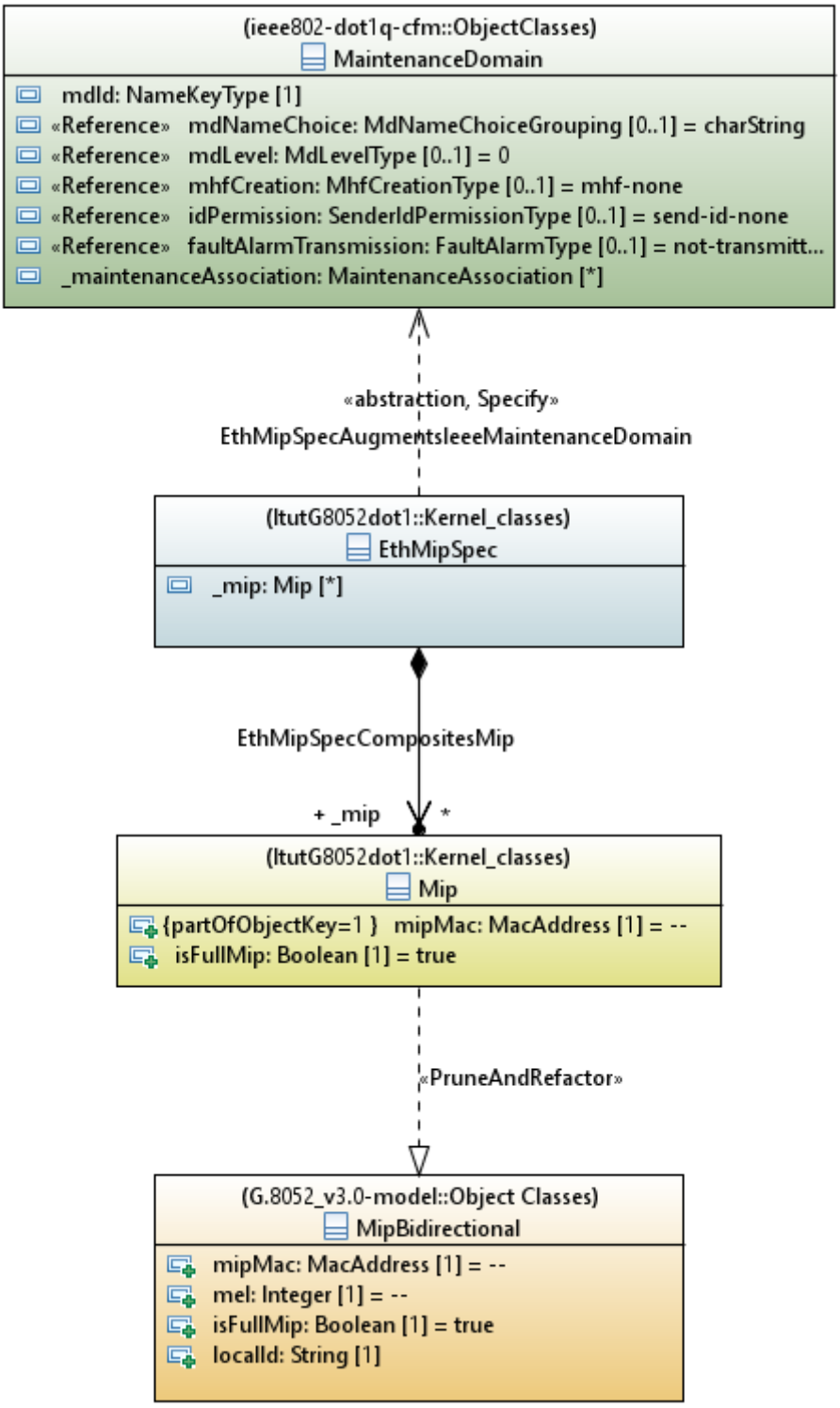
Augment the Cfm object class of the IEEE 802.1Qcx CFM YANG re-engineered UML with the EthMipSpec class.

The EthMipSpec instance contains zero or more instances of MipBidirectional, which is pruned from the G.8052 MipBirectional.

The EthMipSpec instance contains zero or more instances of RapsCapableHalfMipBidirectional, which is pruned from the G.8052 RapsCapableHalfMipBirectional.

Figure 7-2.~~C~~ E below shows the ~~A~~augmentation of CFM with ~~is organized according to the MIP OAM functions, i.e., whether the MIP is a~~the regular MIP and/or RAPS capable MIP.





G.8052.1_v0.12-model_Fig7-2.E_EthMip.png

Figure 7-2.E – ETH MIP ~~OAM~~ augmentation & pruning/refactoring

7.2.2.4 Operations

The Actions UML interface class of the re-engineered CFM UML model is the touch point for ETH MEP OAM operation augmentation. The Actions interface class contains the IEEE 802.1Q YANG transmit Loopback and transmit Link Trace operations. The IEEE 802.1Q Actions interface is augmented with the G.8052.1 EthOperationSpec for the carrier Ethernet OAM operations.

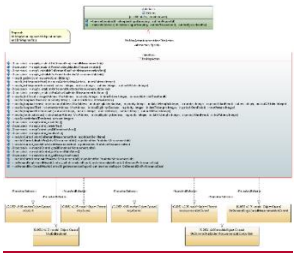
The EthOperationSpec class consists of the EthMepInterface and EthMipInterface UML interface classes.

Figure 7-2.~~D~~F below shows the operation augmentation structure.

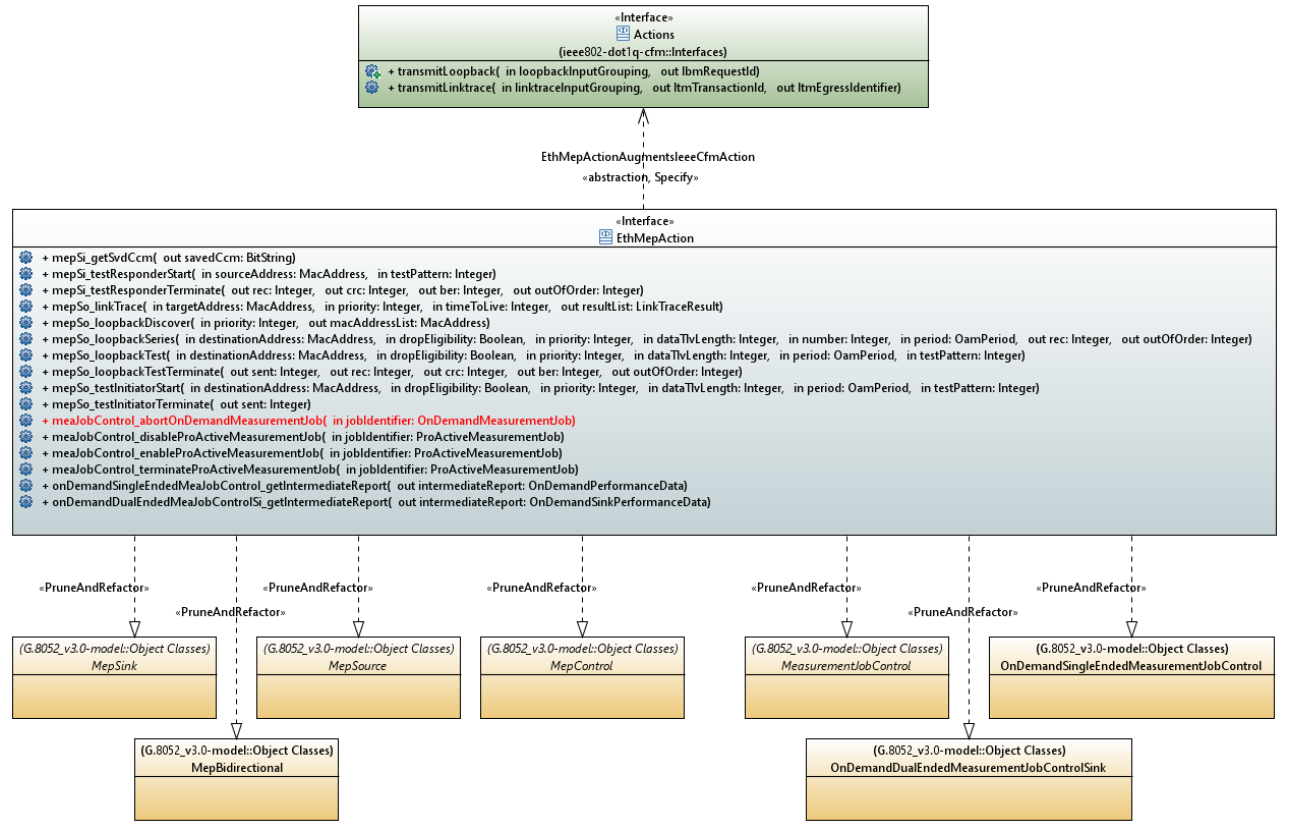
The EthMepInterface interface class consists of operations that are pruned/refactored ~~Move the operations~~ from the G.8052 MepBidirectional, MepSink, MepSource, MepControl, MeasurementJobControl, OnDemandSingleEndedMeasurementJobControl, and OnDemandDualEndedMeasurementJobControlSink object classes ~~into a single new G.8052.1 UML Interface EthMepInterface~~.

The EthMipInterface interface consists of operations that are pruned/refactored ~~Move the operations~~ from the G.8052 MipControl object class ~~into a single new G.8052.1 UML Interface EthMipInterface~~. ~~The operations are either pruned or retained.~~

Table II-3 of Appendix II contains the analysis of the G.8052 ETH operations on whether they should be retained/refactored or pruned for G.8052.1 and also the rationale of doing so.

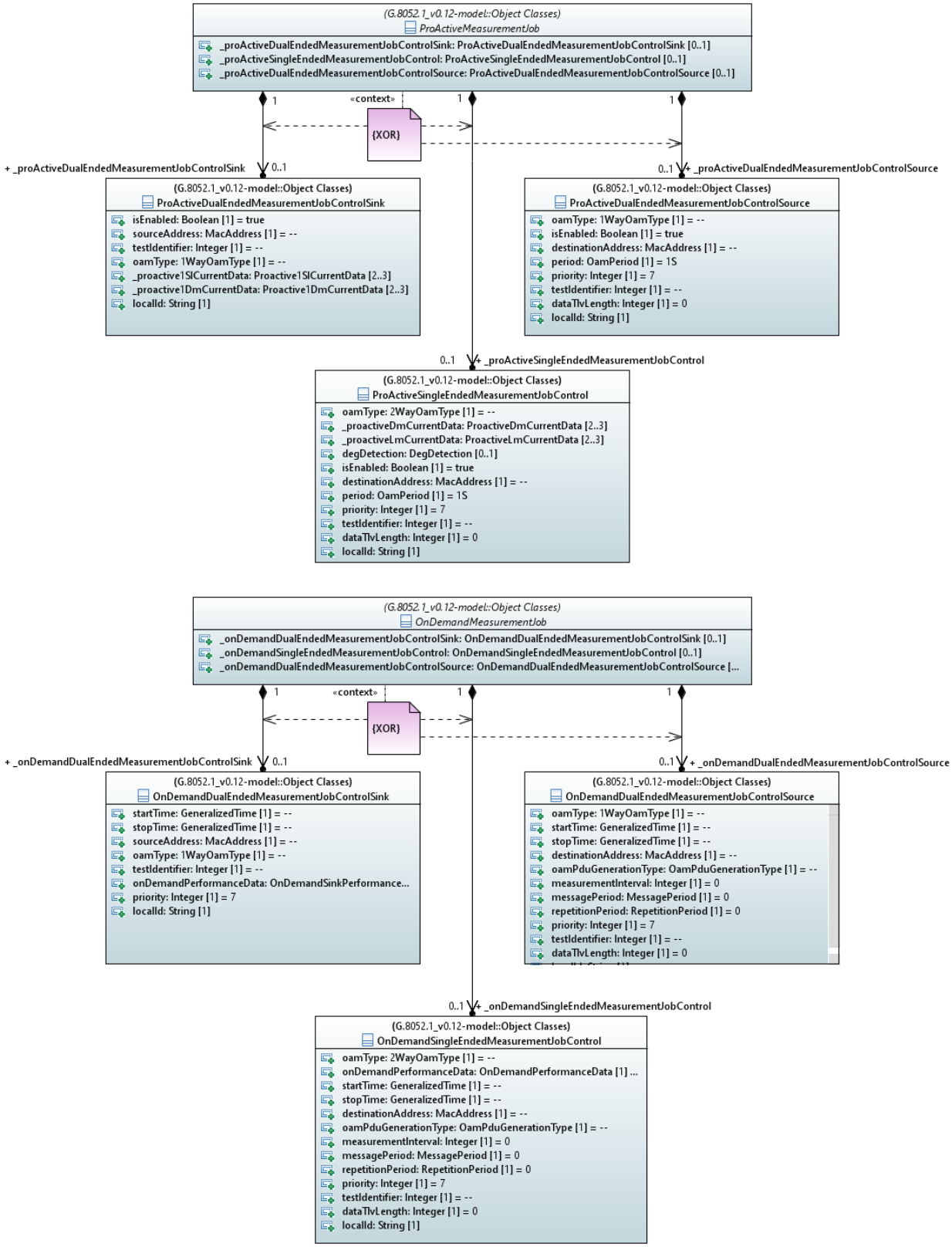


G.8052.1_v0.10-model_Operation-augment



G.8052.1_v0.12-mode
l_Fig7-2.F_Operations.

Figure 7-2.F – Operation pruning/refactoring



G.8052.1_v0.12-mode
l_Fig7-2.G_MeaJobCo

Figure 7-2.G – Measurement Job Control

7.3 UML model files

This sub-clause contains the uml file of the G.8052.1 UML model developed using the Papyrus open-source modelling tool.

The uml file is available at https://www.itu.int/ifa/t/2017/sg15/exchange/wp3/q14/G.8052.1/G.8052.1_current/ in the uml zip file.

Read the read-me.txt file.

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.

8.1 Carrier Ethernet OAM YANG Data Model

This clause contains the G.8052.1 YANG data model.

The YANG file is available at https://www.itu.int/ifa/t/2017/sg15/exchange/wp3/q14/G.8052.1/G.8052.1_current/ in the yang zip file.

Read the read-me.txt file.

The G.8052.1 YANG model is translated, from the interface-protocol-neutral UML information provided in Clause 7.3. The translation is done with the assistance of the Open Source translation tooling xmi2yang, which is developed according to the [b-ONF TR-531] Mapping Guidelines,

The G.8052.1 YANG module is for augmenting/extending the IEEE 802.1Qcx CFM YANG module to support the G.8013/Y.1731 OAM functionalities. The IEEE 802.1Qcx YANG data model for CFM is available in Clause 48 of IEEE 802.1Qcx, which includes the YANG data modules in Clause 48.6.

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Editor note: See the

- Temporary link: https://github.com/YangModels/yang/tree/master/standard/ieee/draft/802.1/Qcx
- Eventual link: https://github.com/YangModels/yang/tree/master/standard/ieee/published/802.1

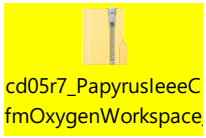
**/>

Appendix I IEEE 802.1Q CFM YANG Re-engineered UML

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

The UML re-engineered from the IEEE 802.1Q YANG module

- Attached is the zip file that contains the entire workspace of the UML model re-engineered from the IEEE p802.1Qcx YANG module



Appendix II Analysis of G.8052 attributes & operations for G.8052.1

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

This appendix summarized the analysis and disposition of the attributes and operations of the base G.8052 model on whether they should be retained, refactored or pruned for G.8052.1, and the rationale of doing so.

Table II-1 Ethernet TTP and CTP Pruning/Refactoring

Source artifact	P&R	Rationale
Inherited by ETH_ConnectionTerminationPoint/Sink/Source/Bidirectional		
G8052LocalClass::localId	pruned	Not needed for YANG augmentations
G8052LayerProtocol::layerProtocolName	pruned	The object class already indicates it is ETH CTP
G8052LayerProtocol::_lpSpec	pruned	No Spec is needed so far.
G8052LayerProtocol::configuredClientCapacity	pruned	Not needed. This attribute is from the core model LayerProtocol. The client LTP association should provide all necessary detail hence this attribute is questionable, even in the core model.
G8052LayerProtocol::lpDirection	pruned	Not needed. Already have explicit Bi/Sink/Source object class instances (although in most case is Bidirectional), so no need for the attribute lpDirection (which is Bi/Si/So/UndefinedOrUnknown)
G8052LayerProtocol::terminationState	pruned	Indicates whether the layer is terminated and if so how. For ETH CTP, it is not terminated.
ETH_ConnectionTerminationPoint		
auxiliaryFunctionPositionSequence	pruned	*[Editor's Note: Check how the positions (i.e., the relative order) all the MEP, MIP and TCS objects which are associated with a CTP are modelled in IEEE P802.1Qcx YANG model]* Although TCS is not needed in OAM, the relative position of the TCM MEPs and MIPs still need to be specified. See Figure 6-11/G.8052.
ETH_ConnectionTerminationPointSink		

_lagManager	pruned	LAG is out of scope of G.8052.1
_aggregatorSink	pruned	LAG is out of scope of G.8052.1
_csfReport	pruned	Out of scope of G.8052.1
_csfRdiFdiEnable	pruned	
_vlanConfig	pruned	Assume VLAN configuration has been covered/handled by the base IEEE Bridge and CFM models.
_filterConfig	pruned	Assume VLAN configuration has been covered/handled by the base IEEE Bridge and CFM models.
_mepSink [Note 1]	pruned	Assume there is association between the TP and the MP in the IEEE CFM model.
ETH_ConnectionTerminationPointSource		
_lagManager	pruned	LAG is out of scope of G.8052.1
_aggregatorSource	pruned	LAG is out of scope of G.8052.1
_csfConfig	pruned	Out of scope of G.8052.1
_csfRdiFdiEnable	pruned	
_vlanConfig	pruned	Assume VLAN configuration has been covered/handled by the base IEEE Bridge and CFM models. <Need confirmation from IEEE>
_MepSource [Note 1]	pruned	Assume there is association between the TP and the MP in the IEEE CFM model. <Need confirmation from IEEE>
ETH_ConnectionTerminationPointBidirectional		
_aggregator	pruned	LAG is out of scope of G.8052.1
_ethTrafficConditioning	pruned	Traffic Conditioning is out of scope of G.8052.1
_ethTrafficShaping	pruned	Traffic Shaping is out of scope of G.8052.1
_mep [Note 1]	pruned	Assume there is association between the TP and the MP in the IEEE CFM model. <Need confirmation from IEEE>
_mipBidirectional [Note 1]	pruned	Assume there is association between the TP and the MP in the IEEE CFM model. <Need confirmation from IEEE>

_RapsCapableHalfMip [Note 1]	pruned	RAPS is out of scope of G.8052.1
Inherited by ETH_TrailTerminationPoint/Sink/Source/Bidirectional		
G8052LocalClass::localId	pruned	Not needed for YANG augmentations
G8052GlobalClass::localIdList	pruned	This is not needed
G8052GlobalClass::uuid	pruned	Not needed for YANG augmentations
G8052LayerProtocol::layerProtocolName	pruned	The object class already indicates it is ETH TTP
G8052LayerProtocol::_lpSpec	pruned	No Spec is needed so far.
G8052LayerProtocol::configuredClientCapacity	pruned	Not needed. This attribute is from the core model LayerProtocol. The client LTP association should provide all necessary detail hence this attribute is questionable, even in the core model.
G8052LayerProtocol::lpDirection	pruned	Not needed. Already have explicit Bi/Sink/Source object class instances (although in most case is Bidirectional), so no need for the attribute lpDirection (which is Bi/Si/So/UndefiedOrUnknown).
G8052LayerProtocol::terminationState	pruned	Not needed. ETH TTP is terminated.
Pacs::Tp_Pac::alarmStatus	Refactored	Refactored into MEP object class
Pacs::Tp_Pac::crossConnectionObjectPointer	pruned	Not needed
Pacs::Tp_Pac::currentProblemList	Refactored	Refactored into MEP object class
Pacs::Tp_Pac::alarmSeverityAssignmentProfilePointer	Refactored	Refactored into MEP object class
Pacs::Tp_Pac::_containingPhysicalSubsystem	pruned	Assume configuration (assignment) of TPs belonging to a MacAddress is not in the scope of G.8052.1
ETH_TrailTerminationPointSink		
_multiplexing _multiplexing:EthServerTtpSink_Pac:	pruned	Assume configuration of the server layer (i.e. ETHx) related function of ETHx/ETH-m_A_Sk (defined in 9.3.3/G.8021) is not in the scope of G.8052.1

currentProblemList	Refactored	Refactored into MEP object class
_ethCtpSink	pruned	Assume not in the scope of G.8052.1
_ethCtpSink	pruned	Assume not in the scope of G.8052.1
ETH_TrailTerminationPointSource		
_multiplexing	pruned	Assume configuration of the server layer (i.e. ETHx) related function of ETHx/ETH-m_A_So (defined in 9.3.3/G.8021) is not in the scope of G.8052.1
_ethCtpSource	pruned	Assume not in the scope of G.8052.1
_MepSource	pruned	Assume there is association between the TP and the MP in the IEEE CFM model.
ETH_TrailTerminationPointBidirectional		
_ethCtpBidirectional	pruned	Assume not in the scope of G.8052.1
_mccCtp	pruned	Assume not in the scope of G.8052.1
_mep	pruned	Assume there is association between the TP and the MP in the IEEE CFM model.

Table II-2 Ethernet MEP Classes Pruning/Refactoring

Source artifact	P&R	Rationale
G8052LocalClass::localId	pruned	Available in IEEE::Mep
MEP		
Mep::adminState	pruned	Available in IEEE::Mep::adminState
Mep::mepMac	pruned	Available in IEEE::Mep::macAddress
Mep::mel	pruned	Available in IEEE::MaintenanceDomain::mdLevel
Mep::clientMel	refactored	Moved to (refactored into) to the datatype EthAis, EthLck, EthBw
Mep::megIdentifier	pruned	Available in IEEE::MaintenanceGroup::maintenanceGroupId

Mep::isCcEnabled	pruned	Available in IEEE::ContinuityCheck::ccmEnabled
Mep::ccPeriod	pruned	Available in IEEE::MaintenanceAssociation::ccmInterval
Mep::ccPriority	pruned	Available in IEEE Note: there is no ccm priority, although there is IEEE::Mep::ccmLtmPriority
Mep::lckPeriod	refactored	Moved to (refactored into) to datatype EthLck
Mep::lckPriority	refactored	Moved to (refactored into) to datatype EthLck
MEP Sink		
MepSink::peerMepRefList	pruned	Note: Seems indirectly from Mep through the association to MaintenanceAssociationMepList to the peer Mep; but the cardinality is only 1
MepSink::aisPeriod	refactored	Moved to (refactored into) to datatype EthAis
MepSink::aisPriority	refactored	Moved to (refactored into) to datatype EthAis
MepSink::isCsfReported	refactored	Moved to (refactored into) to datatype EthCsf
MepSink::isCsfRdiFdiEnabled	refactored	Moved to (refactored into) to datatype EthCsf
MepSink::currentProblemList	refactored	Moved to (refactored into) to datatype EthMepAlarm
MepSink::bandwidthReport	refactored	Moved to (refactored into) to datatype EthBw
MepSink::1DmPriority	EthMeaJobPac	Moved to (refactored into) to EthMeaJobPac <<Editor Note: Need to re-exam this attribute in G.8052>>
MepSink::_onDemandDualEndedMeasurementJobControlSink	pruned	G.8052.1 augments the IEEE::Mep using the Spec model approach. The model structure is now difference from G.8052. So the navigable attributes from the Mep/MepSink/MepSource/Mep Bidirectional are no longer applicable.

MepSink::_proactiveDualEndedMeasurementJobControlSink	pruned	G.8052.1 augments the IEEE::Mep using the Spec model approach. The model structure is now difference from G.8052. So the navigable attributes from the Mep/MepSink/MepSource/Mep Bidirectional are no longer applicable.
MEP Source		
MepSource::mepIdentifier	pruned	Available in IEEE::Mep::_mepId
MepSource::csfConfig	refactored	Moved to (refactored into) to datatype EthCsf
MepSource::csfPeriod	refactored	Moved to (refactored into) to datatype EthCsf
MepSource::csfPriority	refactored	Moved to (refactored into) to datatype EthCsf
MepSource::apsPriority	refactored	Moved to (refactored into) to datatype EthAps
MepSource::_proactiveDualEndedMeasurementJobControlSource	pruned	G.8052.1 augments the IEEE::Mep using the Spec model approach. The model structure is now difference from G.8052. So the navigable attributes from the Mep/MepSink/MepSource/Mep Bidirectional are no longer applicable.
MepSource::_onDemandMeasurementJobControlSource	pruned	G.8052.1 augments the IEEE::Mep using the Spec model approach. The model structure is now difference from G.8052. So the navigable attributes from the Mep/MepSink/MepSource/Mep Bidirectional are no longer applicable.
MEP Bidirectional		
MepBidirectional::_associatedRapsGroupRef	pruned	G.8052.1 augments the IEEE::Mep using the Spec model approach. The model structure is now difference from G.8052. So the navigable attributes from the Mep/MepSink/MepSource/Mep Bidirectional are no longer applicable.
MepBidirectional::_associatedSncpGroupRef	pruned	G.8052.1 augments the IEEE::Mep using the Spec

		model approach. The model structure is now difference from G.8052. So the navigable attributes from the Mep/MepSink/MepSource/Mep Bidirectional are no longer applicable.
MepBidirectional::_onDemandSingleEndedMeasurementJobControl	pruned	G.8052.1 augments the IEEE::Mep using the Spec model approach. The model structure is now difference from G.8052. So the navigable attributes from the Mep/MepSink/MepSource/Mep Bidirectional are no longer applicable.
MepBidirectional::_proactiveSingleEndedMeasurementJobControl	pruned	G.8052.1 augments the IEEE::Mep using the Spec model approach. The model structure is now difference from G.8052. So the navigable attributes from the Mep/MepSink/MepSource/Mep Bidirectional are no longer applicable.

Table II-x Ethernet MIP Classes Pruning/Refactoring

Source artifact	To be pruned or moved to	Rationale
MIP Bidirectional		
MipBidirectional::mipMac	retained	Not in IEEE::Mip. Moved (re-factored) to EthMipPac
MipBidirectional::mel	pruned	The IEEE MIP has attribute mdLevel. An ITU-T MEG is equivalent to an IEEE MD which contains only one IEEE MA.
MipBidirectional::isFullMip	retained ?	Not in IEEE::Mip. Moved (re-factored) to EthMipPac
G8052LocalClass::localId	retained	Not in IEEE::Mip. Moved (re-factored) to EthMipPac
Raps Capable Half MIP Bidirectional		
RapsCapableHalfMipBidirectional::mipMac	retained	Not in IEEE::Mip.

		Moved (re-factored) to EthMipRapsCapablePac
RapsCapableHalfMipBidirectional::mel	pruned	The IEEE MIP has attribute mdLevel. An ITU-T MEG is equivalent to an IEEE MD which contains only one IEEE MA
RapsCapableHalfMipBidirectional::rapsPriority	retained	Not in IEEE::Mip. Moved (re-factored) to EthMipRapsCapablePac
G8052LocalClass::localId	retained	Not in IEEE::Mip. Moved (re-factored) to EthMipPac

Table III-3 Ethernet Operations Pruning/Refactoring

Source artifact	P&R	Rationale
EthMepInterface		
mepBi_establishOnDemandSingleEndedMeasurementJob	pruned	Achieved via object creation of an instance of OnDemandSingleEndedMeaJob and a subtending OnDemandSingleEndedMeasurementJobControl instance
mepBi_establishProActiveSingleEndedMeasurementJob	pruned	Achieved via object creation of an instance of ProActiveSingleEndedMeasurementJob and a subtending ProActiveSingleEndedMeasurementJobControl instance
mepSi_establishOnDemandDualEndedMeasurementJobSink	pruned	Achieved via object creation of an instance of OnDemandDualEndedMeasurementJob and a subtending OnDemandDualEndedMeasurementJobControlSink instance
mepSi_establishProActiveDualEndedMeasurementJobSink	pruned	Achieved via object creation of an instance of ProActiveDualEndedMeasurementJob and a subtending ProActiveDualEndedMeasurementJobControlSink instance
mepSi_getSvdCcm	retained	No equivalence in IEEE CFM
mepSi_testResponderStart	retained	No equivalence in IEEE CFM. TST is ITU-T OAM
mepSi_testResponderTerminate	retained	No equivalence in IEEE CFM.

		TST is ITU-T OAM
mepSo_establishOnDemandDualEndedMeasurementJobSource	pruned	Achieved via object creation of an instance of OnDemandDualEndedMeasurementJob and a subtending OnDemandDualEndedMeasurementJobControlSource instance
mepSo_establishProActiveDualEndedMeasurementJobSource	pruned	Achieved via object creation of an instance of ProActiveDualEndedMeasurementJob and a subtending ProActiveDualEndedMeasurementJobControlSource instance
mepSo_linkTrace	?	Need discussion. CFM and G.8013 LT parameters are not the same.
mepSo_loopbackDiscover	retained	No equivalence in IEEE CFM. LB Discover is ITU-T OAM
mepSo_loopbackSeries	retained	No equivalence in IEEE CFM. LB Series is ITU-T OAM
mepSo_loopbackTest	retained	No equivalence in IEEE CFM. LB Test is ITU-T OAM
mepSo_loopbackTestTerminate	retained	No equivalence in IEEE CFM. LB Test is ITU-T OAM
mepSo_testInitiatorStart	retained	No equivalence in IEEE CFM. TST is ITU-T OAM
mepSo_testInitiatorTerminate	retained	No equivalence in IEEE CFM. TST is ITU-T OAM
mepControl_createMep	pruned	Achieved via object creation of an instance of Mep
mepControl_deleteMep	pruned	Achieved via object deletion of an instance of Mep
mepControl_getAllContainedMeps	pruned	Achieved via retrieval of all object instances of Mep
mepControl_modifyMep	pruned	Achieved via object modification of an instance of Mep
meaJobControl_abortOnDemandMeasurementJob	retained	No equivalence in IEEE CFM. Measurement is ITU-T OAM
meaJobControl_disableProActiveMeasurementJob	retained	No equivalence in IEEE CFM. Measurement is ITU-T OAM
meaJobControl_enableProActiveMeasurementJob	retained	No equivalence in IEEE CFM.

		Measurement is ITU-T OAM
meaJobControl_getAllContainedMeasurementJobs	pruned	Achieved via retrieval of all contained measurement job object instances
meaJobControl_getCurrentDataValues	pruned	Achieved via retrieval of CurrentData object instances.
meaJobControl_getHistoryDataValues	pruned	Achieved via retrieval of HistoryData object instances.
meaJobControl_terminateProActiveMeasurementJob	retained	No equivalence in IEEE CFM. Measurement is ITU-T OAM
onDemandSingleEndedMeaJobControl_getIntermediateReport	retained	No equivalence in IEEE CFM. Measurement is ITU-T OAM
onDemandDualEndedMeaJobControlSi_getIntermediateReport	retained	No equivalence in IEEE CFM. Measurement is ITU-T OAM
EthMipInterface		
mipControl_createMip	pruned	Achieved via object creation of an instance of Mip
mipControl_createRapsCapableMip	pruned	Achieved via object creation of an instance of RAPS Capable Mip
mipControl_deleteMip	pruned	Achieved via object deletion of an instance of Mip
mipControl_getAllContainedMips	pruned	Achieved via retrieval of all contained instances of Mip

Appendix III Client and Server Implementation Compatibility

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

Client and server implementation scenarios.

	IEEE client ieee yang	ITU client ieee yang + itu yang
IEEE server ieee yang	A **ieee yang**	C **ieee yang**
ITU server ieee yang + itu yang	B **ieee yang** *Note*: • The client will only configure the ieee yang • The itu yang will be ignored by the client	D **ieee yang + itu yang**

Appendix IV Mapping of the IEEE 802.1Qcx CFM and G.8013 parameters

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

This appendix analyses and summarizes the comparison and mapping between the IEEE 802.1Qcx CFM parameters (i.e., the leaf nodes) and G.8021 parameters (i.e., MI signal values).

ieee802-dot1q-cfm.yang	G.8021 parameter
cfm/maintenance-group/mep/mep-db/**rmep-failed-ok-time**: ro mandatory	Not supported in ITU-T. Need to agree on what value the ITU-T server to put into this leaf when encoding the value (to indicate it is not supported).
cfm/maintenance-group/mep/mep-db/**mac-address**: ro mandatory	Not supported in ITU-T. Need to …
cfm/maintenance-group/mep/mep-db/**port-status-tlv**: ro optional	Not supported in ITU-T. It is optional. Not support is fine.
cfm/maintenance-group/mep/mep-db/**interface-status-tlv**: ro optional	Not supported in ITU-T. It is optional. Not support is fine
cfm/maintenance-group/mep/continuity-check/**defect**: *5 bits*: def-rdi-ccm, def-mac-status, def-remote-ccm, def-error-ccm, def-xcon-ccm	– No cDEG, no cUNPr – xcon-ccm is composition of cUNL and cMMG – error-ccm is composition of cUNP and cUNM Proposal solution: – define an itu-defects leaf, with typedef .., and describe the relationship of some of the bits with the 802.1 mep-defect-type
cfm/maintenance-group/mep/action: transmit-loopback/**input: loopback-input-grouping: case dest-mep-id**	Case dest-mep-id is not supported.
cfm/maintenance-group/mep/action: transmit-loopback/**output: leaf lbm-request-id**	To check and verify whether this is Transaction ID/Sequence Number (see Figure 9.3-1/G.8013)
cfm/maintenance-group/mep/action: transmit-linktrace/**input: linktrace-input-grouping: case target-mep-id**	Case target-mep-id is not supported? To check and verify whether this is TargetMAC Address (see Figure 9.5-1/G.8013)
cfm/maintenance-group/mep/action: transmit-linktrace/**input: linktrace-input-grouping: leaf ltm-flags**	To check and verify whether this is Flags (see Figure 9.5-1/G.8013)
cfm/maintenance-group/mep/action: transmit-linktrace/**output: ltm-transaction-id**	To check and verify whether this is Transaction ID (see Figure 9.5-1/G.8013)

cfm/maintenance-group/mep/action: transmit-linktrace/**output: ltm-egress-identifier**	To check and verify whether this is Egress Identifier (see Figure 9.5-3/G.8013)
cfm/maintenance-group/mep/linktrace-reply/responses/**ltr-receive-order**	This SHOULD be a stamp assigned by the Linktrace initiator to the received LTR frame, not a field inside the LTR frame. This SHOULD belong to G.8021 (the process at the sink function of the initiator MEP), instead of G.8013. Currently G.8021 bundles all of the LTR results into a single "Results" parameter, it doesn't say how the different responses are distinguished within this. This will require update to G.8021.
cfm/maintenance-group/mep/linktrace-reply/responses/**ltr-forwarded**	To check and verify whether this is the FwdYes flag (see figure 9.6-2 of G.8013)
cfm/maintenance-group/mep/linktrace-reply/responses/**ltr-terminal-mep**	To check and verify whether this is the TerminalMEP flag (see figure 9.6-2 of G.8013)
cfm/maintenance-group/mep/linktrace-reply/responses/**ltr-relay**	To check and verify whether this is the RelayAction field (see figure 9.6-1 of G.8013)

Bibliography

[b-ONF TR-531] ONF TR-531_*UML-YANG Mapping Guidelines* (https://3vf60mmveq1g8vzn48q2o71a-wpengine.netdna-ssl.com/wp-content/uploads/2014/10/TR-531_UML-YANG_Mapping_Guidelines_v1.0.pdf)

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