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 Protocol-neutral management information model for the MPLS-TP network element
Purpose: [Choose a purpose from the dropdown list]

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Abstract: The document contains the editor version of G.8152/Y.1375 “Protocol-neutral management information model for the MPLS-TP network element”. The document will be used for preparing the future Amendment or Revision of the Recommendation.

Document history:

Version	Date	Description
1.01	WD38 (2/2017) Beijing	Initial version created by taking the in-force (pre-published) G.8152 (12/2016) as the base and migrate the Open Model Profile 0.2.0 to {{O= v0.2.6, I= v0.0.2, P= v0.0.1}, i.e., {OpenModel Profile v0.2.6, InterfaceModel Profile v0.0.2, ProfileLifecycle Profile v0.0.1} <i>Model development environment</i> <ul style="list-style-type: none"> ▪ Eclipse: Mars.3 (4.5.3) ▪ Papyrus: 1.1.4.2 ▪ Model Profiles: <ul style="list-style-type: none"> ○ OpenModel Profile v0.2.6 ○ InterfaceModel Profile v0.0.2 ○ ProfileLifecycle Profile v0.0.1

Version	Date	Description
1.01.1	WD091014-34 (4/2017 Tokyo)	<p>Update clause 8, Appendix IV, and add bibliography for pointing to the software repository of the UML model files, profile files, and data dictionary.</p> <p>Update per WD091014-38 for clause 7.1.1.1 & 7.1.1.2</p> <ul style="list-style-type: none"> ▪ New Tables 7-2 and 7-3 (updated Tables from TD620/P) <ul style="list-style-type: none"> ○ <p><i>No update to the UML model.</i></p> <p><i>To do in June regarding the environment: Update the profile for all models together</i></p>
1.02	TD105/WP3 (6/2017) WD14-23 (6/2017)	<ul style="list-style-type: none"> – Migrate to Open Model Profile v0.2.11 – No change to the UML model – Per C146, re-instate Table 7-3 through 7-6 of TD620/P back into G.8152
1.03	WD1214-38 (9/2017 Ottawa)	<ul style="list-style-type: none"> – Re-organized the model profiles to be private (local) to the model project (as suggested by IISOMI) in a UmlProfiles folder
1.03.01	WD14-10 (12/2017) London TD176/3 (2/2018)	<ul style="list-style-type: none"> – Align body text with the in-force published version (12/2016) – Insert the PNG files of the UML diagrams so that they are available locally.
1.04	WD14-10 (2/2018) TD193R1/2 (2/2018)	<p>Updates:</p> <ul style="list-style-type: none"> – Up-version Papyrus and model profiles <ul style="list-style-type: none"> ○ Eclipse 4.7.2 (i.e. version Oxygen) ○ Papyrus 3.2.0, ○ OpenModel_Profile 0.2.13, ○ OpenInterfaceModel_Profile 0.8, ○ ProfileLifecycle_Profile 0.0.4, and ○ Gendoc v0.7.0 milestone 2 <p>To do:</p> <ul style="list-style-type: none"> – Align with G.7711 v3.0 – Align with G.8151 for CSF and MSRP

NOTE: For the editor draft of G.8152, a 2-field or 3-field version numbering convention is used.

- The first field indicates the public publication revision number.
- The second field indicates the editor version of the UML model (and base document). This field is incremented when the UML model, and thus the base document too, are updated.
- The third field is used to indicate only the base document is updated and there is no update to the UML model.

Document history prior to v1.0 (for editor information only):

Version	Document	Description
0.01	WD18 (06/2012)	<ul style="list-style-type: none">▪ Initial draft
0.02	WD18r1 (06/2012)	<ul style="list-style-type: none">▪ References to G.8010 replaced by references to G.8101▪ Versions of references updated▪ MIs have been updated based on the latest G.8121 contained in wd05r1 (06/2012)▪ The sentence providing the relationship to IETF has been added to the Summary and Scope sections; according to SG15 report R30▪ The Scope section has been updated based on cd120r1 (Ethernet virtual meetings)▪ Figure 6 1 updated according the editors instructions▪ Answers from Q9 regarding the open issues identified in the document have been addedInitial draft
0.03	WD12 (09/2012)	<ul style="list-style-type: none">▪ All revision marks from version 0.02 have been accepted▪ References to the modelling conventions and model artefact properties added▪ Enhanced the scope of the Recommendation to cover also G.8121.1 and G.8121.2▪ Tbd: Integrate the MI Grouping Packages proposed in C 2187
0.04	WD18 (07/2013)	<ul style="list-style-type: none">▪ All revision marks from version 0.03 have been accepted▪ High level class diagrams added in new section
0.05	WD05 (09/2013)	<p>This version is an update to TD91/3 (7/2013)</p> <ul style="list-style-type: none">▪ All revision marks from version 0.04 have been accepted▪ High level class diagrams for on-demand and pro-active measurements have been enhanced.
0.05r1	WD05r1 (09/2013)	<ul style="list-style-type: none">▪ Incorporate the new structure as proposed in WD13 (9/2013 Shenzhen)
0.06r1	WD05r2 (09/2013)	<ul style="list-style-type: none">▪ Incorporated new figures from model updated at Shenzhen meeting▪ Included new graphics in instructions for HTML file▪ Included zip file of v0.06 in HTML format▪ Included zip file of v0.06 in RSA format
0.06r2	WD05r (10/2013)	<ul style="list-style-type: none">▪ Fixed Diagrams
0.07	WD28 (10/2013) Nuremberg	<ul style="list-style-type: none">▪ Per WD16 discussion, description text for MEP and MEP bidirectional were updated▪ Add attributes to the MEP abstract class for the common MI signals of MTDe_TT_So and MTDe_TT_Sk▪ Import the M.3160 Managed Element and Termination Pont super classes▪ Replace the insertion of HTML file and Data Dictionary with hyper links

Version	Document	Description
0.08	TD140r1/ WP3 (4/2014)	<ul style="list-style-type: none"> ▪ Changes in version 0.07 accepted ▪ References section updated ▪ MEP and MIP compound function diagrams updated ▪ High Level TP Containment Class Diagram NOTE – This figure is also available from the ITU website here. ▪ Figure 6- updated ▪ TP Inheritance Class Diagram NOTE – This figure is also available from the ITU website here. ▪ Figure 6- updated ▪ Attributes added to MEP object classes and MEP Class Diagram NOTE – This figure is also available from the ITU website here. ▪ Figure 6- updated ▪ MI information in Table , Error! Reference source not found., Table 0-, Table 0-6, Table 7-6 updated based on G.8121 (11/2013) ▪ New Table 6- on Derived MI Groupings of the MPLS-TP functions added ▪ New NOTE – This figure is also available from the ITU website here. ▪ Figure 6- on Modelling of non-MPLS-TP server adaptation MI groupings added ▪ Modelling of SCC/MCC access added in new section 0 ▪ Table , Table and Table 0- enhanced with the MI from G.8121.1 and G.8121.2 ▪ GenericCurrentData object class from G.gim has been integrated to the model
0.09	WD12 (8/2014)	<ul style="list-style-type: none"> ▪ Added Data Dictionary

Version	Document	Description
0.10	TD247/3 (11/2014)	<ul style="list-style-type: none"> ▪ Update per editing instruction in Shanghai meeting report section 7.2, except WD16r1 clause 1.14 (MT TTP) <ul style="list-style-type: none"> ○ Figure 6-3: delete the operations enableGal and disableGal from MT_TTPBi. Reason: For Session and LSP the Gal is always enabled and should not be changed; for Channel (i.e. PW), Gal enable vs disable is indirectly determined by MI_CW_Enable, MI_CW_Enable = TRUE implies MI_Gal_Enable = True and MI_CW_Enable = FALSE implies MI_Gal_Enable = False, and therefore MI_Gal_Enable should not be changed independently. ○ Figure 6-6: change * to 0..1 for MIP Bi; change the operation getAllContainedMips to getContainedMip (double check with Bernd) ○ Add attribute CW_Enable to MT_TTP, applicable when MplsTpLayer=Channel, default=N/A (i.e. nullable) ○ Define MT_NE subclassed from M.3160 ME, with MEId=CC:ICC:NodeId ○ Update per WD20 proposals in WD06r1, WD15r1, WD16r1, WD19r1, and WD20, except WD16r1 on Data Dictionary 1.14 (MT_TTP) ▪ Per VM3 decision, incorporate CD03 to add tables in clauses 6.3.2 – 6.3.5 and update table in 6.3.6 ▪ Per VM3 decision, incorporate CD04 to add Table 7-1 in clause 7.1 on OAM supporting mechanism ▪ Add JPEG images of the respective UML diagrams next to the figures for the purpose easier viewing, i.e. the images/diagrams can be zoomed in/out independent of the document text. <p>To Do:</p> <ul style="list-style-type: none"> ▪ Resolve WD16r1(Shanghai) clause 1.14 (MT TTP): Need to resolve the list of existing attributes in the HTML and the list of attributes in WD16r1 comment ▪ Update according to editing/drafting instruction from the virtual meeting minute (CD01r5). ▪ Update Figures 5-6 and 5-7 (from EoT to MPLS-TP)

Version	Document	Description
0.11	TD247R1/3 (12/2014)	<p>Updated per C921</p> <ul style="list-style-type: none"> ▪ Add abbreviations <p>Updated per TD248/3 (VM meeting report)</p> <ul style="list-style-type: none"> ▪ In the model and Figure 6-8, move AdminState from MEP_So and MEP_Sk to the MEP abstract class ▪ Remove the default value for aisOamTool and lckOamTool from object classes MT_ConnectionTerminationPointSink and MaintenanceEntityGroupEndPointSink ▪ Remove sourceAddress parameter from the model establish[On-demand Proactive]1way measurement Job sink operation, test responder start, linkTraceResult of the MEP Sink object ▪ In the Data Dictionary 1.20.2.2.3 and 1.20.2.2.4, replace “on-demand” by “proactive” in the description ▪ MEP Sink MO, Operation establishProActive1WayMeasurementJobSink operation, output parameter measurementJob, change the data type from OnDemand1WayMeasurementJobControlSink to ProActive1WayMeasurementJobControlSink ▪ MEP Source object (1.22), operation testInitiatorStart (1.22.2.8), has input parameters per MTDe_TT_So_MI_1TH_Start (CoS,Length,Period) and no output parameters. The operation testInitiatorTerminate (1.22.2.9) have no input parameter, one output parameter per MTDe_TT_So_MI_1TH_Result (Sent). Note that the management system at the responder MEP should be informed (by OOB) about the value of this output parameter in order to calculate the throughput. ▪ MEP Sink object (1,21), operation testResponderStart (1.21.2.4) has no input parameter and no output parameter. The operation testResponderTerminate (1.21.2.5) has no input parameter, has output parameters per MTDe_TT_Sk_MI_1TH_Result (REC,CRC,BER,OO). Note that the management system at the responder MEP should be informed (by OOB) about the value of this output parameter in order to calculate the throughput. <p>Updated per editing instruction from discussion on C848</p> <ul style="list-style-type: none"> ▪ Updated Figure 6-5 for MEP and added Figure 6-6b (MIP with dot1 & dot2 subclasses) <p>Provide the links for the draft G.8152 v0.11 RSA file, Papyrus file, HTML file, and Data Dictionary file.</p> <p>To do:</p> <ul style="list-style-type: none"> ▪ To update Tables 7-2, 7-3, 7-4, and 7-5 ▪ Further modelling per discussion on C847
0.12	WD19 (3/2015) Ottawa	<p>Updates made:</p> <ul style="list-style-type: none"> ▪ Replaced the model files (RSA), HTML files, and DD files with the ones using the Open Model Profile in Clause 8 and Appendix III. <p>Note: The Papyrus model file not replaced yet</p>

Version	Document	Description
0.13	WD19r1 (3/2015) Ottawa TD374/3 (7/2015) Geneva	<p>Updates made:</p> <ul style="list-style-type: none"> ▪ Update clause 5.1 as proposed in WD08 with the modification that the Note will be below Figure 5-2. ▪ Reference G.8013 for single/dual-ended protocol and one/two way measurement
0.14	TD374r1/3	<p>Updates made:</p> <ul style="list-style-type: none"> ▪ Per C1442: change the default value for the protectionType attribute to 1_FOR_1_BIDIRECTIONAL_WITH_APC. This default value applies to both SNC and trail protection types of MPLS-TP linear PS. ▪ Re-factored 1way/2wayMeasurementJobControlSource/Sink to better indicate single/dual-ended and 1Way/2Way measurement: <ul style="list-style-type: none"> ○ MO: OnDemand[1Way→DualEnded]MeasurementJobControlSource/Sink ○ MO: OnDemand[2Way→SingleEnded]MeasurementJobControlSource/Sink ○ Operation: establishOnDemand [1Way→DualEnded]MeasurementJobSource/Sink ○ Operation: establishOnDemand [2Way→SingleEnded]MeasurementJobSource/Sink ○ Enumeration: 1WayOamType:1DM, 1SL, LM_CCM (i.e., add LM_CCM) ○ Enumeration: 2WayOamType:LM_LMM, DM, SL (i.e., remove LM_CCM) ○ Operation: establishProactive[1Way→DualEnded]MeasurementJobSource/SinkG8113Dot1/2 ○ Operation: establishProactive[2Way→SingleEnded]MeasurementJobSource/SinkG8113Dot1/2 ○ MO: ProActive[1Way→DualEnded]MeasurementJobControlSource/SinkG8113Dot1/2 ○ MO: ProActive [2Way→SingleEnded]MeasurementJobControlSource/SinkG8113Dot1/2 ○ And updated the corresponding description
0.15	WD15r1 (10/2015) Wuhan =TD514/3 (2/2016)	<p>Updates done</p> <ul style="list-style-type: none"> ▪ Migrate the model profile from Luna to the Mars version of Eclipse ▪ Note: Model G.8152 v0.15 = v0.14 + profile update <p>To-do</p> <ul style="list-style-type: none"> ▪ To generate the GenDoc Data Dictionary and replace the RSA Data Dictionary ▪ To drop the RSA HTML ▪ To update object class description for grouping attributes according to the transport processes ▪ To update the model per the discussion of WD06 for single/dual-ended measurement job control ▪ To complete the description of the object classes, attributes, operations, parameters, and data type <p>To do from v0.10:</p> <ul style="list-style-type: none"> ▪ Resolve WD16r1(Shanghai) clause 1.14 (MT TTP): Need to resolve the list of existing attributes in the HTML and the list of attributes in WD16r1 comment ▪ Update according to editing/drafting instruction from the virtual meeting minute (CD01r5). ▪ Update Figures 5-6 and 5-7 (from EoT to MPLS-TP) <p>To do from v0.11:</p> <ul style="list-style-type: none"> ▪ To update Tables 7-2, 7-3, 7-4, and 7-5 ▪ Further modelling per discussion on C847

Version	Document	Description
0.16	WD18 (2/2016) = TD514R1/ 3 (2/2016)	<p>Update</p> <ul style="list-style-type: none"> • Move to Papyrus 1.1.3 and based on OpenModelProfile 0.2.0 • Imported the core model from G.7711 v1.02 into G.8052 v1.10 • Normalized SN, SNC, PG to FD, FC, FcSwitch respectively. In particular the following object classes <ul style="list-style-type: none"> ○ MT_CrossConnection, MT_SubNetworkConnectionProtectionGroup • Generate the GenDoc Data Dictionary and replace the RSA Data Dictionary • Dropped the RSA HTML • Replaced the figures in clauses 6 and 7 for normalizing SN, SNC, PG to FD, FC, and FcSwitch <p>To do</p> <ul style="list-style-type: none"> • Update Figures 5-6 & 5-7 from <<ituClass>> to <<openModelClass>> • To do from v0.10: <ul style="list-style-type: none"> ○ Resolve WD16r1(Shanghai) clause 1.14 (MT TTP): Need to resolve the list of existing attributes in the HTML and the list of attributes in WD16r1 comment ○ Update according to editing/drafting instruction from the virtual meeting minute (CD01r5). ○ Update Figures 5-6 and 5-7 (from EoT to MPLS-TP) • To do from v0.11: <ul style="list-style-type: none"> ○ To update Tables 7-2, 7-3, 7-4, and 7-5 ○ Further modelling per discussion on C847 • To update object class description for grouping attributes according to the transport processes • To update the model per the discussion of WD06 for single/dual-ended measurement job control • To complete the description of the object classes, attributes, operations, parameters, and data type

Version	Document	Description
0.17	WD18 (9/2016) = TD620r1/P (9/2016) for consent	<p>Updates</p> <ul style="list-style-type: none"> - Accept all tracked changes - Removed galEnable from Mep - Moved adminState from Mep to MepSource - Define new attribute cvSeries in Mep without data type, inherited by MepSourceDotOne and MepSourceDotTwo, with CvSeriesDotOne and CvSeriesDotTwo data type respectively - Define new attribute and new operations: <ul style="list-style-type: none"> o Mep: 1ThOamTool, 1ThStart (), 1ThTerminate () o MepSourceDot1: 1ThStart (CoS,Pattern, Length,Period), 1ThTerminate (Send) o MepSinkDot1: 1ThStart (Pattern), 1ThTerminate (Rec, Crc, Ber, OO); number of received, Crc error, Ber error, out of order error o MepSourceDot2: 1ThStart (), 1ThTerminate () o MepSinkDot2: 1ThStart (), 1ThTerminate () - Deleted the operations having “?” as experimental, such as those in MepSource (linkTrace?, loopbackDiscover?, loopbackTest?, loopbackSeries?, loopbackTerminate?, testInitiatorStart?, and testInitiatorTeminate?) and MepSink (). - Removed the attributes from the MT TTP which are duplicated with those in the MEP. - Datatype 1WayOamType add values 1LM and 1SL - Marked all the measurement related classes as preliminary - Update clauses 3 and 4 per agreement on the C1929 discussion - In Figure 6-1, removed ODUkP-X-L_AP/MT per C2009 - Delete PhysicalSubsystem class - Add TP_Pac (from G.8052), being superclass of MT TTP - Deleted M.3160 - Editing instructions in TD613/3 (G.8152 virtual meeting) - Clone the Core model GlobalClass, LocalClass, and NetworkElement -

ITU-T

G.8152/Y.1375

TELECOMMUNICATION
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(12/2016)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA,
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Internet protocol aspects – Transport

**Protocol-neutral management information
model for the MPLS-TP network element**

Recommendation ITU-T G.8152/Y.1375

ITU-T G-SERIES RECOMMENDATIONS
TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

INTERNATIONAL TELEPHONE CONNECTIONS AND CIRCUITS	G.100–G.199
GENERAL CHARACTERISTICS COMMON TO ALL ANALOGUE CARRIER-TRANSMISSION SYSTEMS	G.200–G.299
INDIVIDUAL CHARACTERISTICS OF INTERNATIONAL CARRIER TELEPHONE SYSTEMS ON METALLIC LINES	G.300–G.399
GENERAL CHARACTERISTICS OF INTERNATIONAL CARRIER TELEPHONE SYSTEMS ON RADIO-RELAY OR SATELLITE LINKS AND INTERCONNECTION WITH METALLIC LINES	G.400–G.449
COORDINATION OF RADIOTELEPHONY AND LINE TELEPHONY	G.450–G.499
TRANSMISSION MEDIA AND OPTICAL SYSTEMS CHARACTERISTICS	G.600–G.699
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PACKET OVER TRANSPORT ASPECTS	G.8000–G.8999
Ethernet over Transport aspects	G.8000–G.8099
MPLS over Transport aspects	G.8100–G.8199
Synchronization, quality and availability targets	G.8200–G.8299
Service Management	G.8600–G.8699
ACCESS NETWORKS	G.9000–G.9999

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T G.8152/Y.1375

Protocol-neutral management information model for the MPLS-TP network element

Summary

Recommendation ITU-T G.8152/Y.1375 contains the protocol neutral unified modelling language (UML) model for multi-protocol label switching – transport profile (MPLS-TP) network element (NE) management.

This Recommendation provides a representation of the MPLS-TP technology using the methodologies that have been used for other transport technologies (e.g., SDH, OTN and Ethernet).

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T G.8152/Y.1375	2016-12-22	15	11.1002/1000/13104

Keywords

Information model, MPLS-TP, protocol-neutral, transport resource, UML.

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

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Introduction

This Recommendation contains the object classes for the MPLS-TP NE management. It includes the termination points (TP), maintenance entity group (MEG) end point (MEP), MEG intermediate point (MIP), traffic conditioning and shaping (TCS), loss measurement (LM), delay measurement (DM), and the general performance monitoring (PM) current data (CD) and history data (HD).

The TP, MEP, MIP, LM, DM, and TCS object classes support the configuration and fault management functions as specified in [ITU-T G.8151].

The MPLS-TP TPs are modelled as subclasses of the generic GlobalClass defined in [ITU-T G.7711] and extending the LTP and LP classes of [ITU-T G.7711].

The MPLS-TP general PM CD and HD object classes are modelled as subclasses of the generic current data and history data defined in [ITU-T Q.822].

The MPLS-TP general CD and HD object classes support only the quality of service (QoS) directly related PM parameters, i.e., severely errored second (SES) and unavailable second (UAS), for service level agreement (SLA) verification. The additional PM object classes for supporting loss measurement and delay measurement monitoring uses the general CD and HD object classes as super classes.

The object model defined in this Recommendation is protocol-neutral with respect to management protocols. The model could be used as the base for further defining the information model for any specific management protocol.

The model in this Recommendation has been specified using the open source UML modelling tool "Papyrus".

Protocol-neutral management information model for the MPLS-TP network element

1 Scope

This Recommendation provides a management-protocol-neutral information model for managing network elements in the MPLS-TP transport network as defined in [ITU-T G.8110.1]. It identifies the telecommunications management network (TMN) managed entities required for the management of MPLS-TP transport network elements. These entities are relevant to information exchanged across standardized interfaces defined in the [ITU-T M.3010] TMN architecture. The management protocol-neutral information model should be used as the base for defining management protocol-specific information models, for example XML (web service or Netconf/Yang) information model, common object request broker architecture (CORBA) interface definition language (IDL) model, and simple network management protocol (SNMP) management information base (MIB).

The information model defined in this Recommendation is an augmentation to the generic code model specified in [ITU-T G.7711] for managing Ethernet transport resources. The core information model defined in [ITU-T G.7711] can be used as the base for the extension of Ethernet-specific information models.

The specific mapping of the management protocol-neutral model into management-protocol-specific model is the decision of the management-protocol-specific solution design. For example, an object class defined in this Recommendation may be mapped into multiple tables in a SNMP MIB. Protocol-specific solutions and their mapping from the protocol-neutral model may be described in other Recommendations and is out of the scope of this Recommendation.

This Recommendation applies to MPLS-TP transport network elements and those systems in the TMN that manage such network elements. Functional capabilities of MPLS-TP transport equipment are defined in [ITU-T G.8121], [ITU-T G.8121.1], [ITU-T G.8121.2] and requirements of the management of MPLS-TP transport equipment are provided in [ITU-T G.7710] and [ITU-T G.8151]. The information model specified in this Recommendation applies to the element management system network element (EMS-NE interface, as shown in Figure 1-1, specifically for managing the MPLS-TP functional capabilities of the NE.

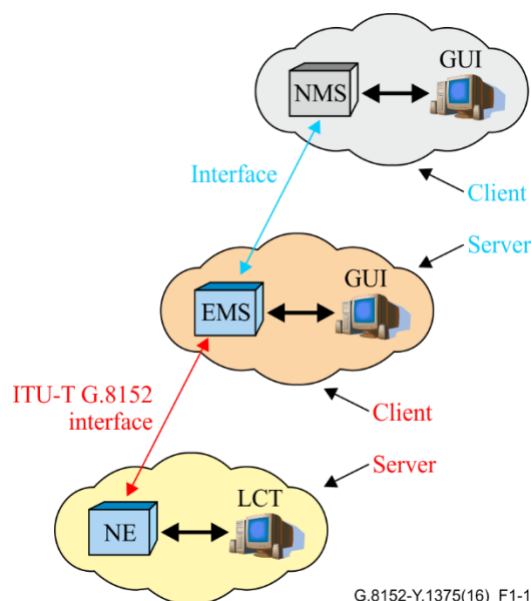


Figure 1-1 – Scope of ITU-T G.8152 Interface

The object classes defined in this Recommendation cover the areas of fault management, configuration management, and performance management.

There are several different perspectives from which management information may be defined for management purposes. The network element viewpoint is concerned with the information that is required to manage a network element. This refers to information required to manage the network element function and the physical aspects of the network element. This Recommendation addresses only the network element view of Ethernet transport network management.

The management-protocol-neutral information model specified in this Recommendation consists of a set of transport-technology-specific managed object classes, i.e., MPLS-TP-specific managed object classes. These MPLS-TP-specific managed object classes are inherited from the generic managed object classes defined in other ITU-T Recommendation such as [ITU-T M.3160], including managed element, termination point and its subclasses, subnetwork, and subnetwork connection. Because of object class inheritance, the MPLS-TP management information model also inherits the generic object management capabilities, such as object creation/deletion, notification of object creation/deletion, attribute value retrieval/modification, notification of attribute/state value change, scoped and filtered retrieval of object instances, and abortion of outstanding operations. The description of these generic object management capabilities is provided in other ITU-T Recommendations, such as the M.3700 series, and therefore is outside the scope of this Recommendation.

The object classes defined in this Recommendation cover the areas of fault management, configuration management, and performance management.

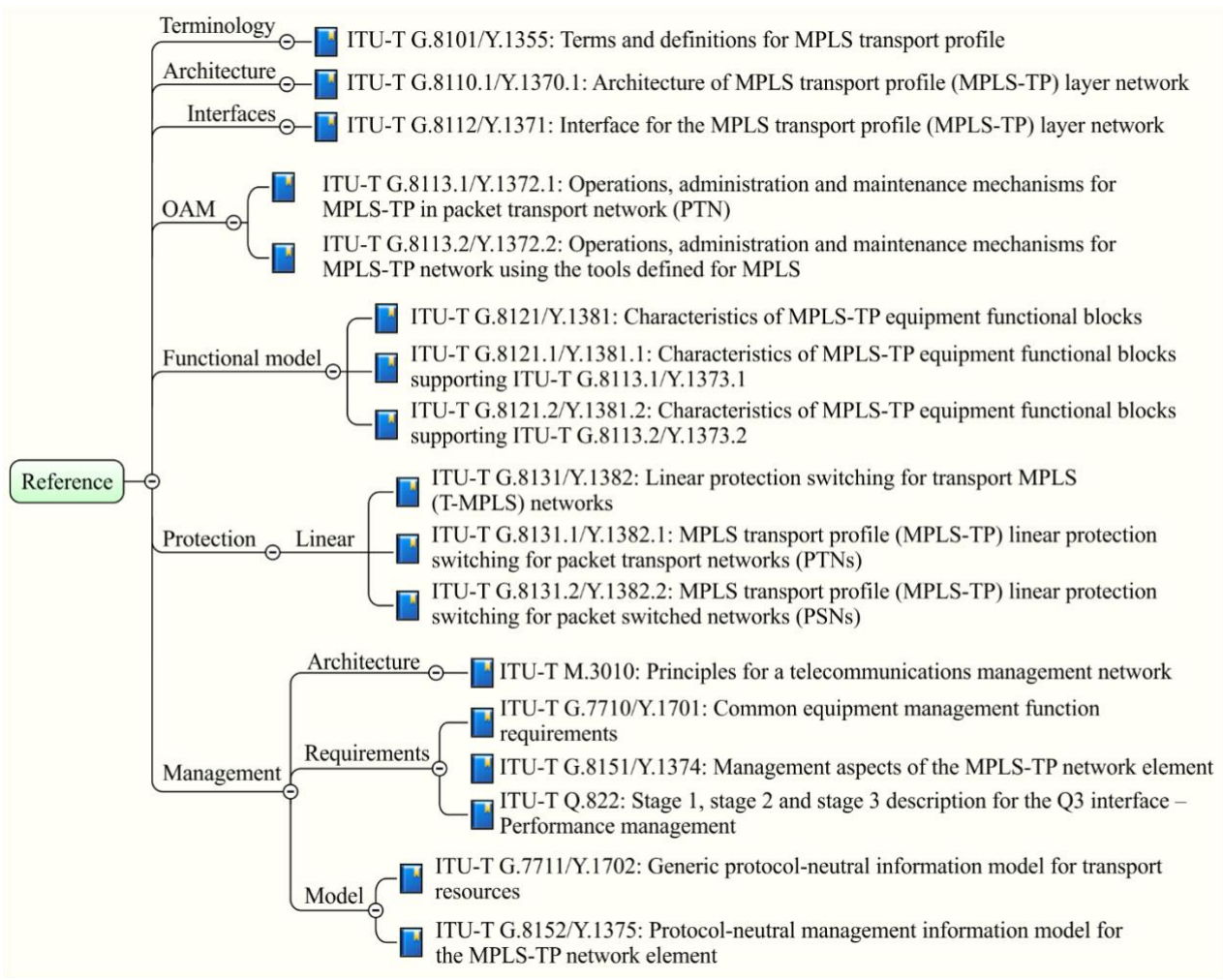
This Recommendation provides a representation of the MPLS-TP technology using the methodologies that have been used for other transport technologies (e.g., SDH, OTN and Ethernet).

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.7710] Recommendation ITU-T G.7710/Y.1701 (2012), *Common equipment management function requirements*, plus Amendment 1 (2016).
- [ITU-T G.7711] Recommendation ITU-T G.7711/Y.1702 (2016), *Generic protocol-neutral information model for transport resources*.
- [ITU-T G.8001] Recommendation ITU-T G.8001/Y.1354 (2016), *Terms and definitions for Ethernet frames over transport*.
- [ITU-T G.8052] Recommendation ITU-T G.8052/Y.1346 (2016), *Protocol-neutral management information model for the Ethernet transport capable network element*.
- [ITU-T G.8101] Recommendation ITU-T G.8101/Y.1355 (2015), *Terms and definitions for MPLS transport profile*.
- [ITU-T G.8110.1] Recommendation ITU-T G.8110.1/Y.1370.1 (2011), *Architecture of the Multi-Protocol Label Switching transport profile layer network*.
- [ITU-T G.8113.1] Recommendation ITU-T G.8113.1/Y.1372.1 (2016), *Operations, administration and maintenance mechanism for MPLS-TP in packet transport network*.

- [ITU-T G.8113.2] Recommendation ITU-T G.8113.2/Y.1372.2 (2015), *Operations, administration and maintenance mechanisms for MPLS-TP networks using the tools defined for MPLS.*
- [ITU-T G.8121] Recommendation ITU-T G.8121/Y.1381 (2016), *Characteristics of MPLS-TP equipment functional blocks.*
- [ITU-T G.8121.1] Recommendation ITU-T G.8121.1/Y.1381.1 (2016), *Characteristics of MPLS-TP equipment functional blocks supporting ITU-T G.8113.1/Y.1373.1 OAM mechanisms.*
- [ITU-T G.8121.2] Recommendation ITU-T G.8121.2/Y.1381.2 (2016), *Characteristics of MPLS-TP equipment functional blocks supporting ITU-T G.8113.2/Y.1373.2 OAM mechanisms.*
- [ITU-T G.8131] Recommendation ITU-T G.8131/Y.1382 (2014), *Linear protection switching for MPLS transport profile*, plus Amendment 1 (2016).
- [ITU-T G.8151] Recommendation ITU-T G.8151/Y.1374 (2015), *Management aspects of the MPLS-TP network element*, plus Amendment 1 (2016).
- [ITU-T M.3010] Recommendation ITU-T M.3010 (2000), *Principles for a telecommunications management network.*
- [ITU-T M.3160] Recommendation ITU-T M.3160 (2008), *Generic protocol-neutral management information model.*
- [ITU-T Q.822] Recommendation ITU-T Q.822 (1994), *Stage 1, stage 2 and stage 3 description for the Q3 interface – Performance management.*



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Figure 2-1 – Structure of references

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

- 3.1.1 **maintenance entity (ME):** [ITU-T G.8001]
- 3.1.2 **maintenance entity group (MEG):** [ITU-T G.8001]
- 3.1.3 **maintenance entity group end point (MEP) compound source function:** [ITU-T G.8001]
- 3.1.4 **maintenance entity group intermediate point (MIP) compound function:** [ITU-T G.8001]
- 3.1.5 **on-demand monitoring:** [ITU-T G.8001]
- 3.1.6 **proactive monitoring:** [ITU-T G.8001]
- 3.1.7 **dual-ended:** [ITU-T G.8001]
- 3.1.8 **one-way:** [ITU-T G.8001]
- 3.1.9 **single-ended:** [ITU-T G.8001]
- 3.1.10 **two-way:** [ITU-T G.8001]

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

1DM	One-way Delay Measurement
1DMo	On-demand one-way Delay Measurement
1DMp	Proactive one-way Delay Measurement
AIS	Alarm Indication Signal
APS	Automatic Protection Switching
CCM	Continuity Check Message
CD	Current Data
CORBA	Common Object Request Broker Architecture
CTP	Connection Termination Point
CW	Control Word
DEG	Degraded
DM	Delay Measurement
DMo	On-demand Delay Measurement
DMp	Proactive Delay Measurement
DP	Data Plane
ECC	Embedded Communication Channel
EMS	Element Management System
ETH	Ethernet MAC layer network
G-ACh	Generic Associated Channel
GAL	Generic Associated Channel (G-ACh) Label
GFP	Generic Framing Procedure
HD	History Data
IDL	Interface Definition Language
LCK	Locked
LM	Loss Measurement
LMo	On-demand Loss Measurement
LMp	Proactive Loss Measurement
LMR	Loss Measurement Reply
LOC	Loss of Continuity
LSP	Label Switched Path
LT	Link Trace
MAC	Medium Access Control

MCC	Management Communication Channel
ME	Maintenance Entity
MEG	Maintenance Entity Group
MEP	Maintenance entity group End Point
MI	Management Information
MIB	Management Information Base
MIP	Maintenance entity group Intermediate Point
MPLS	Multi-Protocol Label Switching
MPLS-TP	Multi-Protocol Label Switching – Transport Profile
MT	Multi-Protocol Label Switching – Transport Profile
MTD	MPLS-TP Diagnostic function
MTDi	MPLS-TP Diagnostic function within MTx MIP
MTS	MPLS-TP Section
NC	Network Connection
NCM	Network Connection Monitoring
NE	Network Element
OAM	Operation, Administration and Maintenance
PHB	Per Hop Behaviour
PM	Performance Monitoring
PRI	Priority
PSC	PHB Scheduling Class
QoS	Quality of Service
RDI	Remote Defect Indication
SCC	Signalling Communication Channel
SCC Type	Signalling Communication Channel Type
SES	Severely Errored Second
Sk	Sink
SLA	Service Level Agreement
SL	Synthetic Loss Measurement
SLp	Proactive Synthetic Loss Measurement
SLo	On-demand Synthetic Loss Measurement
SN	Sub-Network
SNC	Sub-Network Connection
SNCP	Sub-Network Connection Protection
SNMP	Simple Network Management Protocol
So	Source
SQ	Sequence

TC	Traffic Class
TCM	Tandem Connection Monitoring
TCS	Traffic Conditioning and Shaping
TH	Throughput
TMN	Telecommunications Management Network
TP	Termination Point
TSNUM	Tributary Slot Number
TT	Trail Termination
TTL	Time-To-Live
TTP	Trail Termination Point
UAS	Unavailable Second
UML	Unified Modelling Language

5 Conventions

5.1 Information modelling conventions

See clause 5.1 of [ITU-T G.7711].

5.1.1 UML modelling conventions

See clause 5.1 of [ITU-T G.7711].

5.1.2 Model Artefact Lifecycle Stereotypes conventions

See clause 5.2 of [ITU-T G.7711].

5.1.3 Forwarding entity terminology conventions

See clause 5.3 of [ITU-T G.7711].

5.1.4 Conditional package conventions

See clause 5.4 of [ITU-T G.7711].

5.1.5 Pictorial diagram conventions

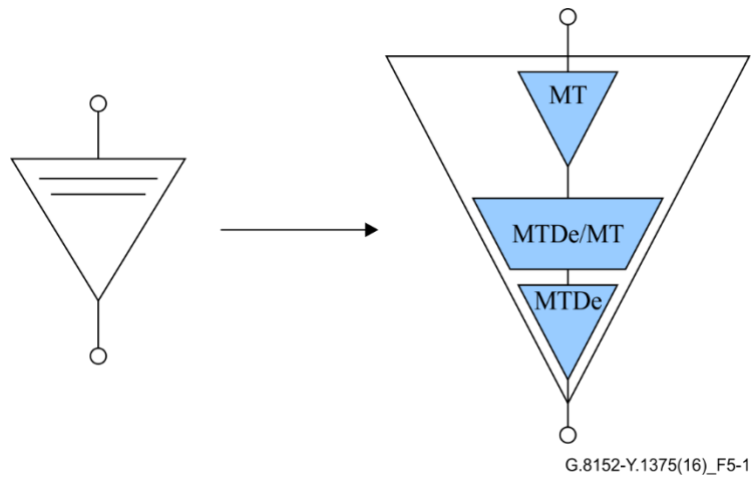
See clause 5.5 of [ITU-T G.7711].

5.2 Equipment function conventions

5.2.1 Maintenance entity group end point (MEP) [ITU-T G.8121]

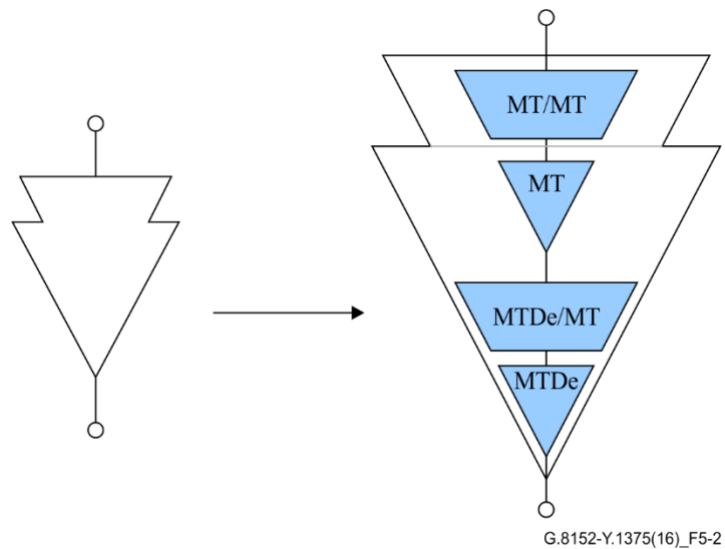
MEG end points (MEPs) terminate maintenance entities (MEs) which can span the end-to-end network connection or a portion of the network connection defined as a tandem connection.

The diagrammatic convention for network connection monitoring MEP (NCM MEP) compound functions is shown in Figure 5-1:



**Figure 5-1 – MT NCM MEP compound functions
(Same as Figure 9-39 of [ITU-T G.8121])**

The diagrammatic convention for tandem connection monitoring MEP (TCM MEP) compound functions is shown in Figure 5-2:

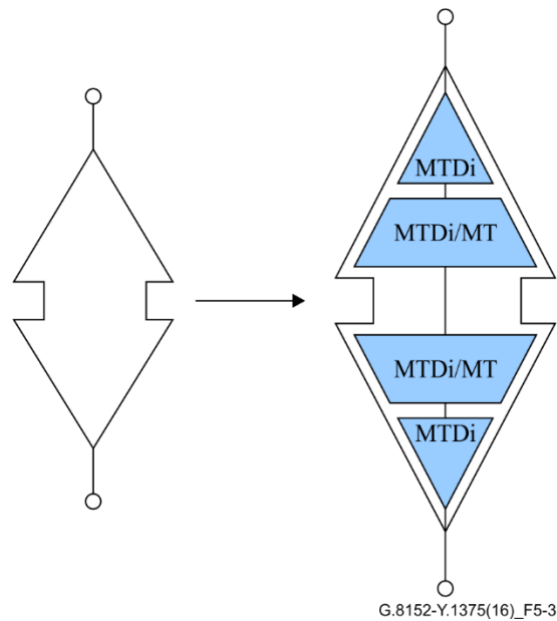


**Figure 5-2 – MT TCM MEP compound functions
(Same as Figure 9-40 of [ITU-T G.8121])**

NOTE – Unlike the Ethernet technology, the same MT/MT atomic function defined in [ITU-T G.8121] can be used either within the optional TCM MEP (i.e., not "stand alone") or at the layer boundary (i.e., "stand alone" and not be a part of a MEP), regardless of the number of client signals (even in case of only one signal when there is no multiplexing).

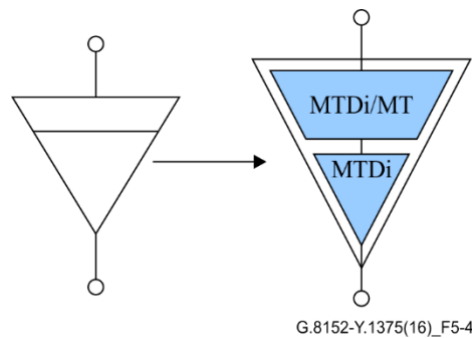
5.2.2 Maintenance entity group intermediate point (MIP) [ITU-T G.8121]

The diagrammatic convention for MIP compound functions is shown in Figure 5-3:



**Figure 5-3 – MT MIP compound functions
(Same as Figure 9-41 of [ITU-T G.8121])**

The diagrammatic convention for half MIP compound functions is shown in Figure 5-4:



**Figure 5-4 – MT half MIP compound functions
(Same as [Figure 9-42 of ITU-T G.8121])**

5.2.3 MEPs and MIPs along a Maintenance Entity

The diagrammatic convention for MEPs and MIPs along an individual ME as shown in Figure 5-5:

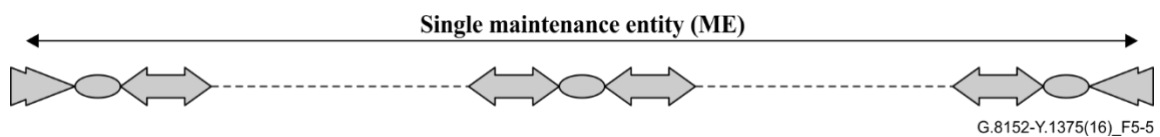


Figure 5-5 – MEPs and MIPs along a maintenance entity (ME)

Note that the ME can span the whole end-to-end network connection or a portion of it called a tandem connection.

5.3 Conventions defined in this Recommendation

This Recommendation uses the following conventions:

5.3.1 Colour code convention

The following "colour code" is used in this Recommendation:

Table 5-1 – Colour code convention

"colour code"	ITU-T G.8152 object class
	MaintenanceEntityGroupEndPoint
	MT_TrailTerminationPoint
	MT_ConnectionTerminationPoint
	OnDemandMeasurementJob
	ProActiveMeasurementJob
	MaintenanceJob
	TerminationPointPool
	specific highlighting
	not in scope

5.3.2 Modelling convention for adaptation functions

Every adaptation function has a MI_Active parameter. This is not modelled since it will always be active in the MPLS-TP technology.

5.3.2.1 MPLS-TP server adaptation modelling

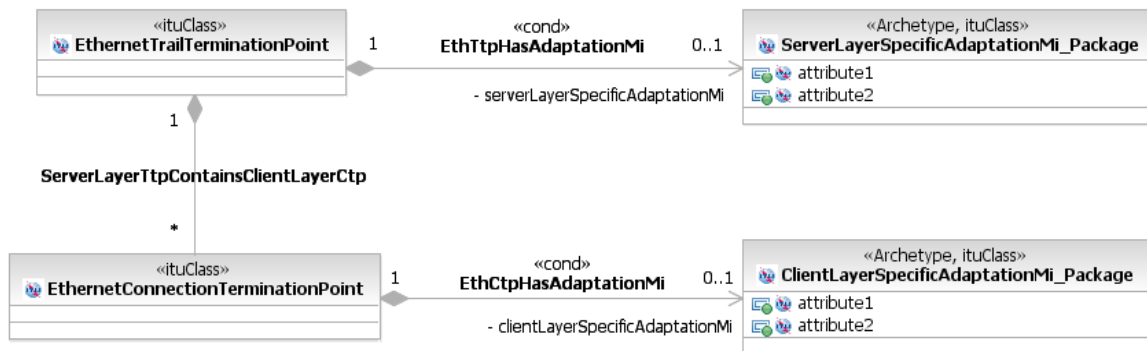


Figure 5-6 – Illustrative diagram for MPLS-TP server adaptation modelling

5.3.2.2 Non-MPLS-TP server adaptation modelling

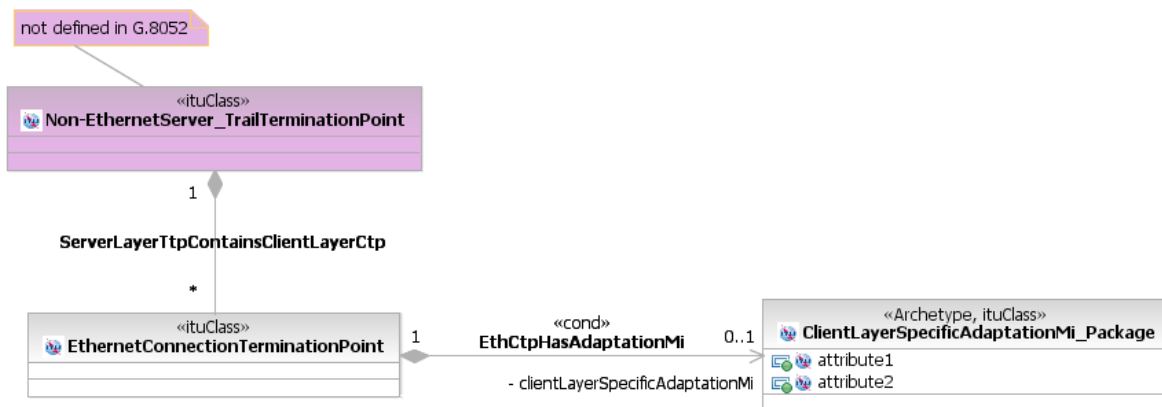
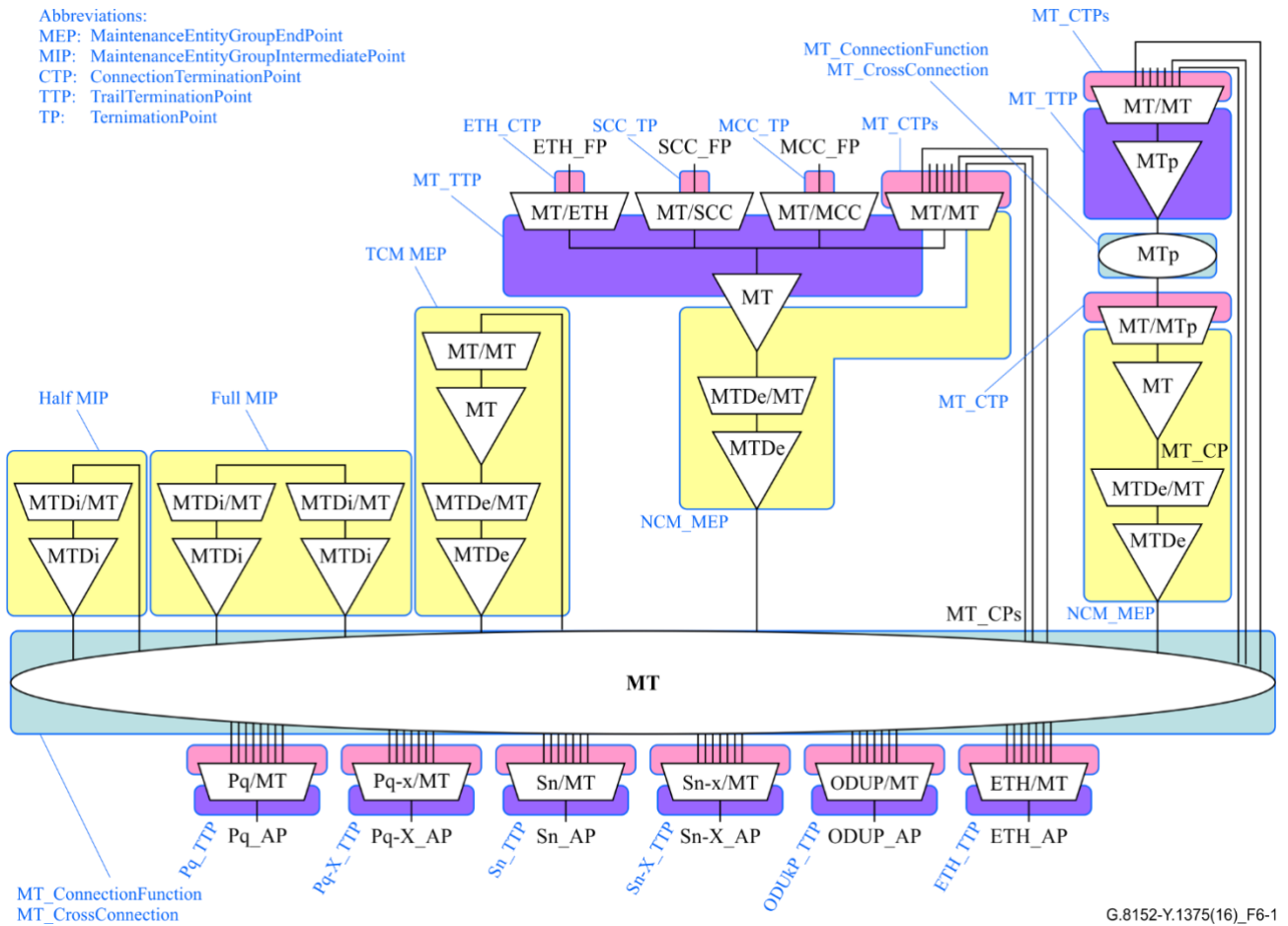


Figure 5-7 – Illustrative diagram for non-MPLS-TP server adaptation modelling

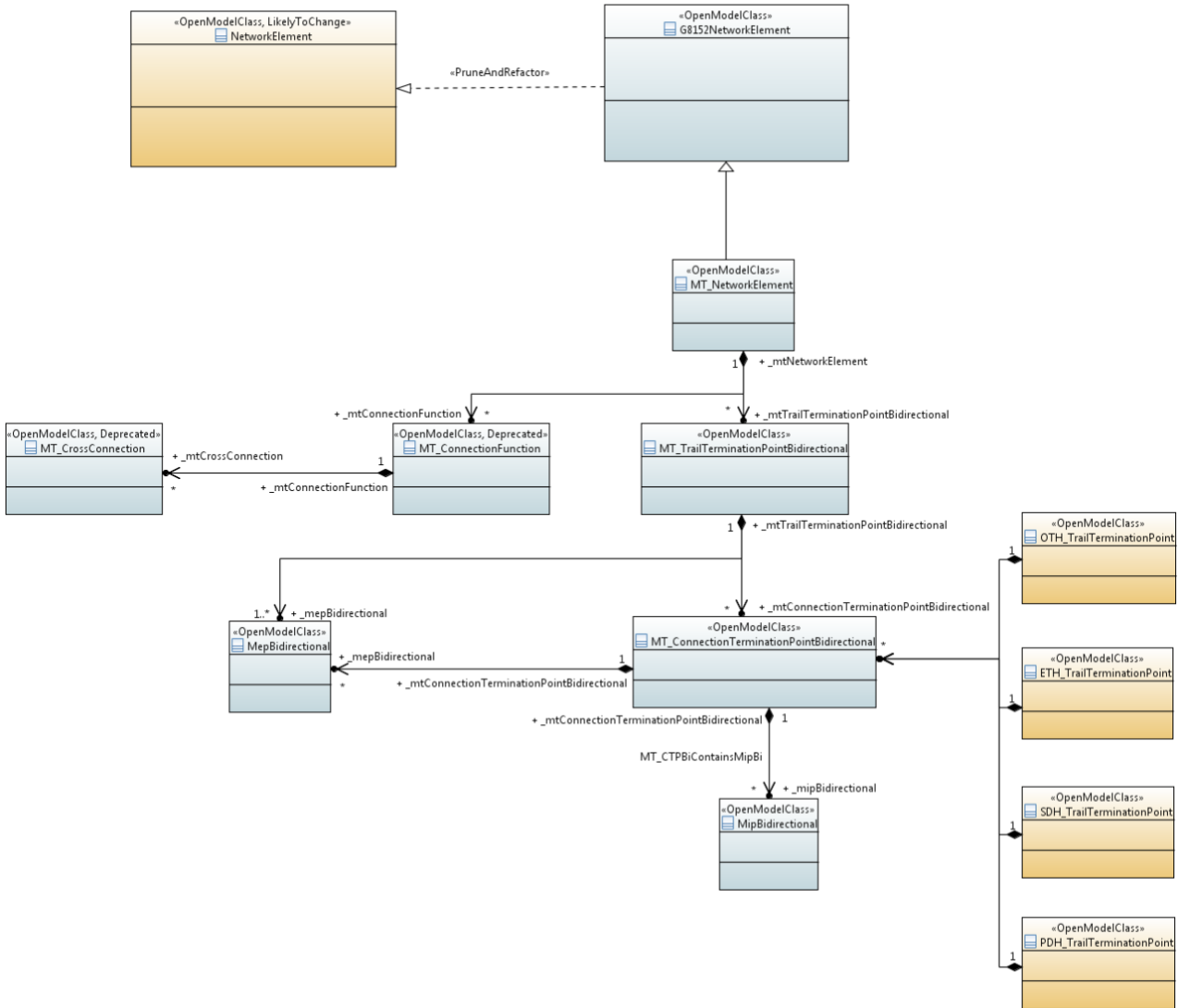
6 Overview of the model

Figure 6-1 below shows the mapping between the object classes and the MPLS-TP atomic functions based on Figure 1 of [ITU-T G.8121].



**Figure 6-1 – Overview of object class mapping to ITU-T G.8121 atomic functions
 (Based on Figure 1 of [ITU-T G.8121])**

Figure 6-2 below shows the containment relationship among the MPLS-TP object classes defined in this Recommendation. The containment relationship reflects the lifecycle dependency between object instances.



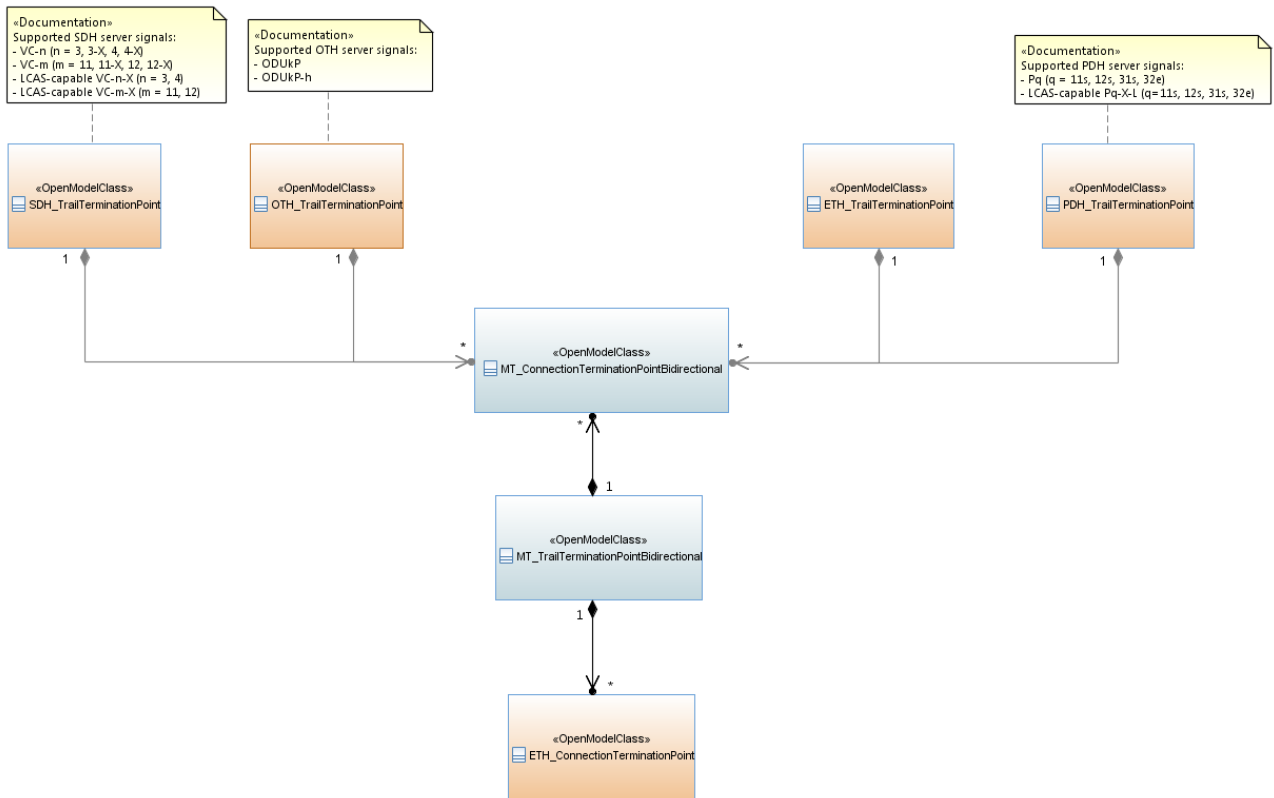
NOTE – This figure is also available from the ITU website [here](#).

Figure 6-2 – MPLS-TP object class containment relationship



Figure 6-3 below shows the relationship of the MPLS-TP object classes to the GlobalClass and LocalClass objects defined in the Recommendation [ITU-T G.7711] Core Model for inheriting the `uuid` or the `localIdList` attributes. See [ITU-T G.7711] Annex C for how the identifier attributes `uuid` and `localIdList` are used for identifying object instance.

6.1.1 High-level TP containment class diagram

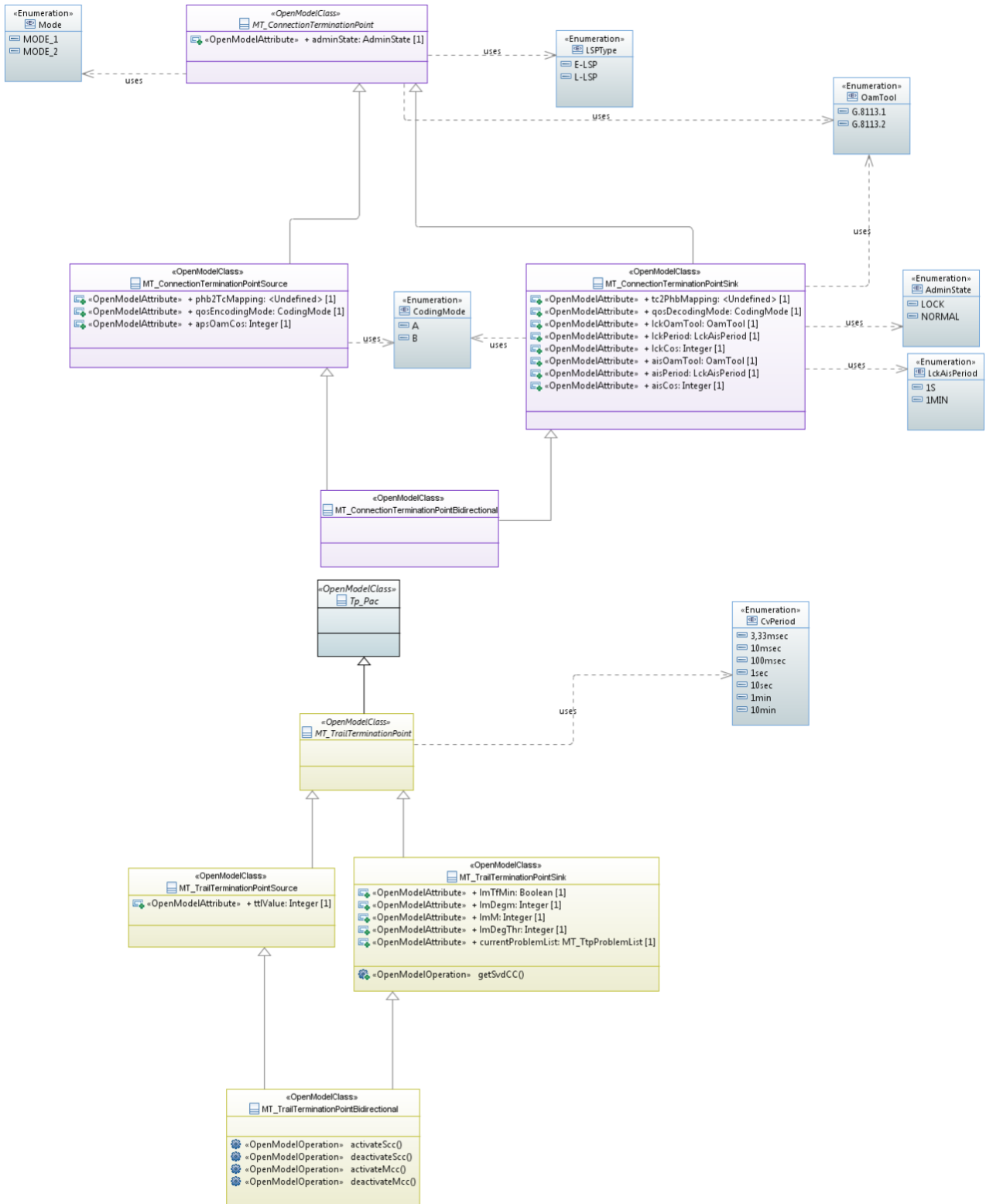


NOTE – This figure is also available from the ITU website [here](#).

Figure 6-4 – High-level TP containment class diagram

Fig.6-2_High_Level_TP_Containment_Cla

6.1.2 TP inheritance class diagram

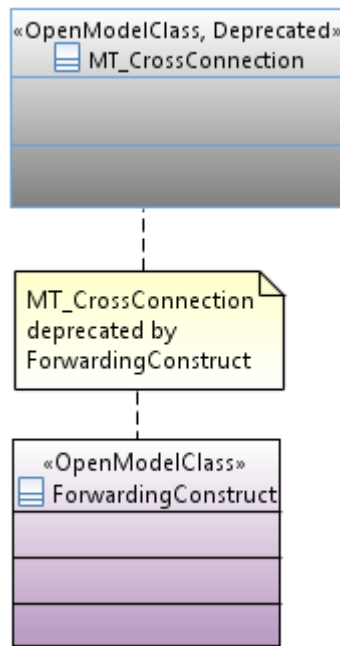


NOTE – This figure is also available from the ITU website [here](#).

Figure 6-5 – TP inheritance class diagram

Fig.6-3_TP_Inheritance_Class_Diagram.1

6.1.3 Connection fragment class diagram

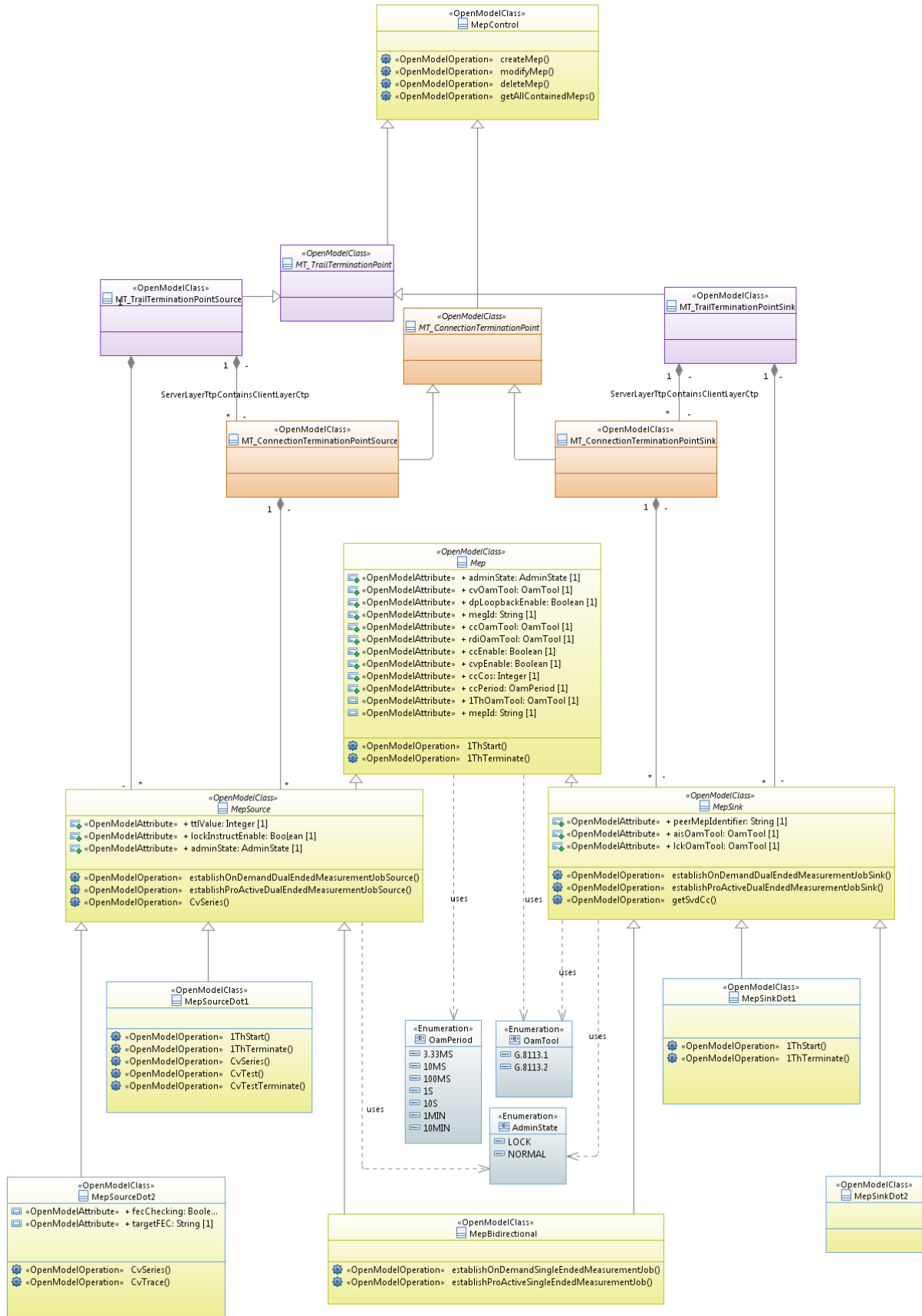


NOTE – This figure is also available from the ITU website [here](#).

Figure 6-6 – Connection fragment class diagram



6.1.4 MEP class diagram

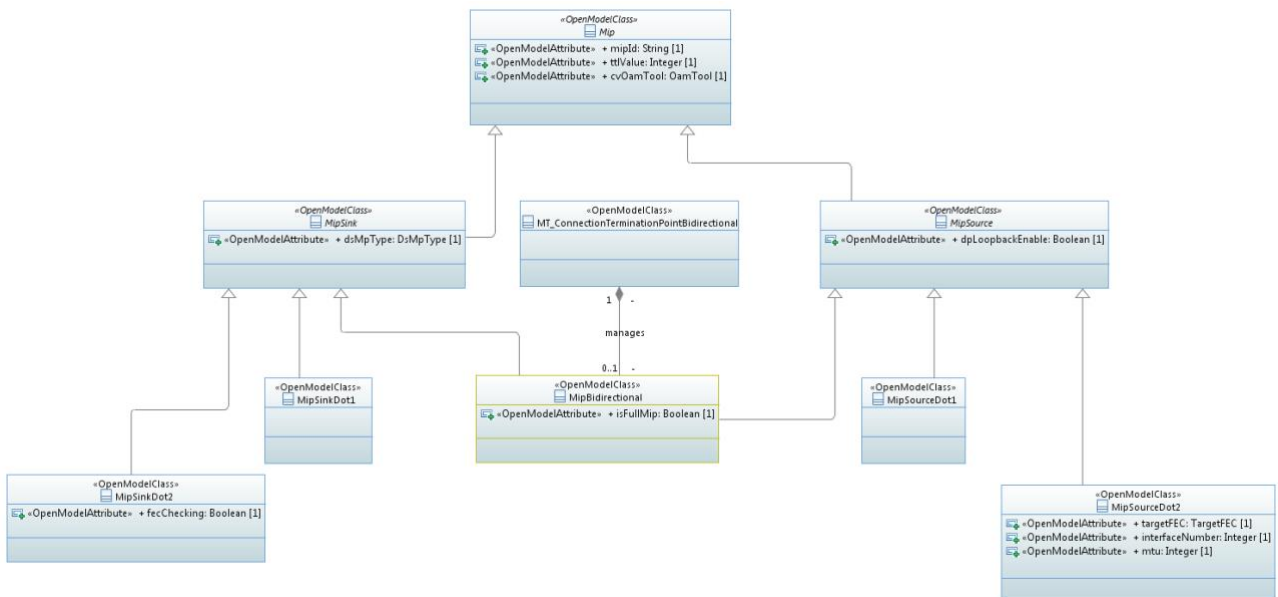


NOTE – This figure is also available from the ITU website [here](#).

Figure 6-7 – MEP class diagram

Fig. 6-5_MEP_Class_Diagram_incl_Main

6.1.5 MIP class diagram

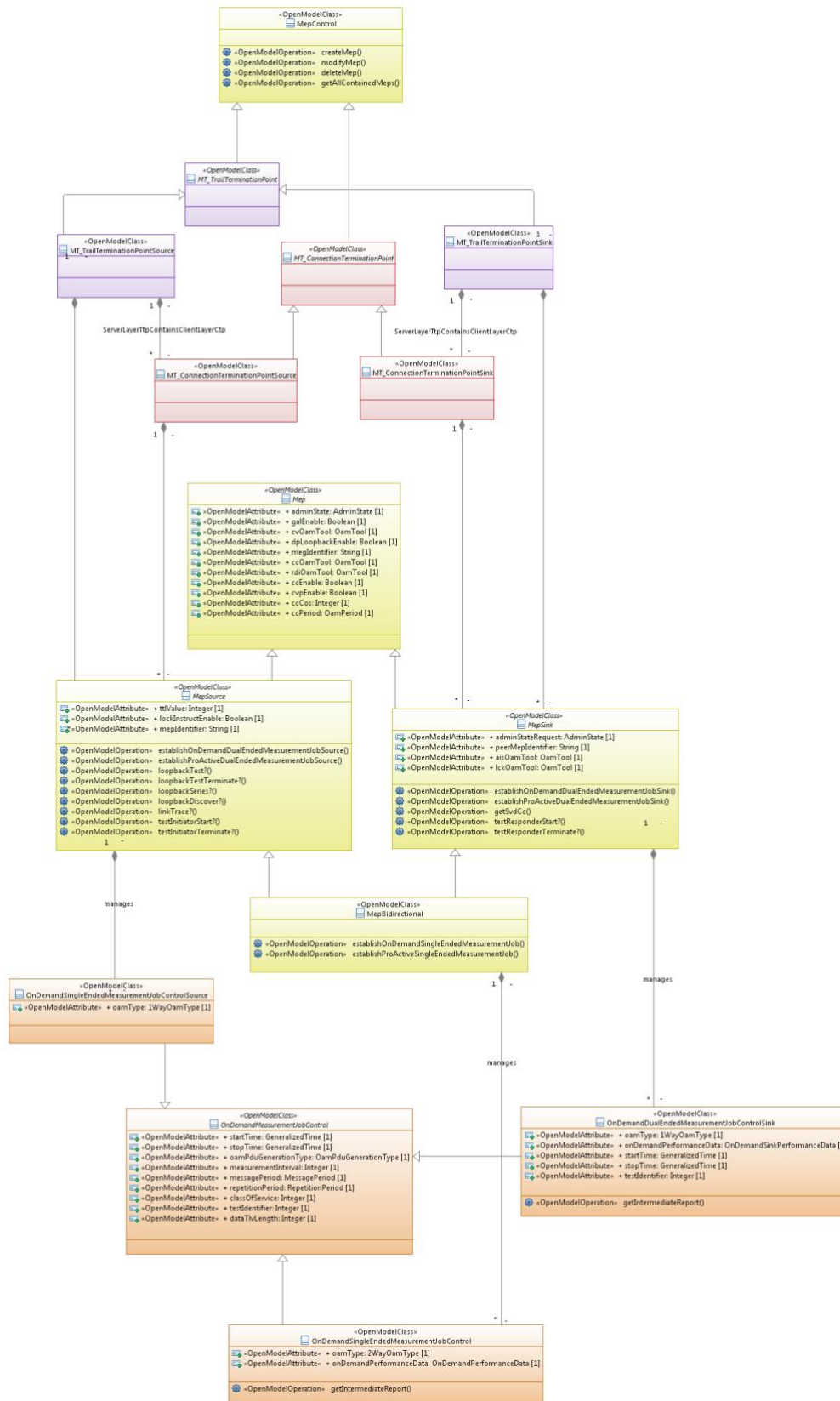


NOTE – This figure is also available from the ITU website [here](#).

Figure 6-8 – MIP and Dot1 & Dot2 class diagram

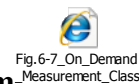
Fig.6-6a_MIP_Class_Diagram.PNG

6.1.6 On-demand measurement class diagram



NOTE – This figure is also available from the ITU website [here](#).

Figure 6-9 – On-demand measurement class diagram



6.2 MI grouping and mapping

This section lists (from [ITU-T G.8121]) all atomic functions together with their MI. It is structured according to the clause 9 of [ITU-T G.8121]:

Conventions used in the tables:

- Atomic functions having the same list of MI are grouped.
- Fault and performance MIs are not shown.
- MI of adaptation functions are identified as "client layer related" (blue) or "server layer related" (red).

6.2.1 MPLS-TP connection function (MT_C)

Table 6-1 – MI groupings of the MPLS-TP connection function

Symbol	Management information	Managed object class
MPLS-TP connection function		
	MI_MatrixControl <i>per matrix connection:</i> MI_ConnectionType MI_Return_CP_ID MI_ConnectionPortIds <i>per SNC pProtection group:</i> MI_PS_WorkingPortId MI_PS_ProtectionPortId MI_PS_ProtType MI_PS_OperType MI_PS_HoTime MI_PS_WTR MI_PS_ExtCMD MI_PS_BridgeType MI_PS_SD_Protection	

6.2.2 MPLS-TP termination function (MT_TT)

Table 6-2 – MI groupings of the MPLS-TP termination function

Symbol	Management information	Managed object class
MPLS-TP (MT) trail termination source function		
	MI_GAL_Enable MI_TTLVALUE MI_MEG_ID MI_MEP_ID MI_CC_OAM_Tool MI_RDI_OAM_Tool MI_CC_Enable MI_CVp_Enable MI_CC_CoS MI_CC_Period MI_LMp_OAM_Tool	

Table 6-2 – MI groupings of the MPLS-TP termination function

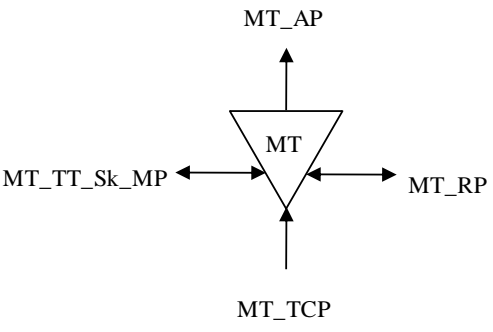
Symbol	Management information	Managed object class
	MI_LMp_Enable[i] MI_LMp_Period[i] MI_LMp_CoS[i] MI_DMp_OAM_Tool MI_DMp_Enable[i] MI_DMp_Period[i] MI_DMp_Test_ID[i] MI_DMp_CoS[i] MI_DMp_Length[i] MI_1DMp_OAM_Tool MI_1DMp_Enable[i] MI_1DMp_Period[i] MI_1DMp_Test_ID[i] MI_1DMp_Length[i] MI_1DMp_CoS[i] MI_SLp_OAM_Tool MI_SLp_Enable[i] MI_SLp_Period[i] MI_SLp_Test_ID[i] MI_SLp_Length[i] MT_TT_So_MI_SLp_CoS[i]	
G.8121.1 specific	MI_LMC_Enable	
G.8121.2 specific	MI_CCCV_Mode[i] MI_Local_Discr MI_DMp_CopyPad[i] MI_LMp_Test_ID[i] MI_LMp_LMType[1...MLMp] MI_LMp_CountBytes[i]	
MPLS-TP (MT) trail termination sink function		
	MI_GAL_Enable MI_MEG_ID MI_PeerMEP_ID MI_CC_OAM_Tool MI_RDI_OAM_Tool MI_CC_Enable MI_CVp_Enable MI_CC_Period MI_CC_CoS MI_Get_SvdCC MI_LMp_OAM_Tool MI_LMp_Enable[i] MI_LMp_CoS[i] MI_LM_DEGM MI_LM_M	

Table 6-2 – MI groupings of the MPLS-TP termination function

Symbol	Management information	Managed object class
	MI_LM_DEGTHR MI_LM_TFMIN MI_DMp_OAM_Tool MI_DMp_Enable[i] MI_DMp_CoS[i] MI_1DMp_OAM_Tool MI_1DMp_Enable[i] MI_1DMp_Test_ID[i] MI_SLp_OAM_Tool MI_SLp_Enable[i] MI_SLp_CoS[i] MI_AIS_OAM_Tool MI_LCK_OAM_Tool MI_1second	
G.8121.1 specific	MI_LMC_Enable	
G.8121.2 specific	MI_CCCV_Mode[i] MI_Remote_Discr[i] MI_PM_ClearError MI_PM_Responder_Enable	

6.2.3 MPLS-TP to MPLS-TP adaptation function (MT/MT_A)

Table 6-3 – MI Groupings of the MPLS-TP to MPLS-TP adaptation function

Symbol	Management information (blue: client layer related red: server layer related)	Managed object class
MPLS-TP to MPLS-TP adaptation source function		
	MI_Active MI_Admin_State MI_Label[i] MI_LSPTtype[i] MI_CoS[i] MI_PHB2TCMapping[i] MI_QoSEncodingMode[i] MI_Mode MI_LCK_Period[i] MI_LCK_CoS[i] MI_LCK_OAM_Tool[i] MI_GAL_Enable[i] (Note: should be MI_GAL_Enable set double (Server and client)?) MI_APS_CoS MI_APS_OAM_Tool	
MPLS-TP to MPLS-TP adaptation sink function		

Table 6-3 – MI Groupings of the MPLS-TP to MPLS-TP adaptation function

Symbol	Management information (blue: client layer related red: server layer related)	Managed object class
	<p>MI_Active MI_AdminState MI_Label[i] MI_LSPTType[i] MI_CoS[i] MI_TC2PHBMapping[i] MI_QoSDecodingMode[i] MI_Mode MI_AIS_Period[i] MI_AIS_CoS[i] MI_AIS_OAM_Tool[i] MI_LCK_Period[i] MI_LCK_CoS[i] MI_LCK_OAM_Tool[i] MI_APS_OAM_Tool MI_GAL_Enable [i] (Note: should be MI_GAL_Enable set double (Server and client)?)</p>	
G.8121.2 specific	MI_Local_Defect[i]	

6.2.4 MT diagnostic functions (MTDe and MTDi)

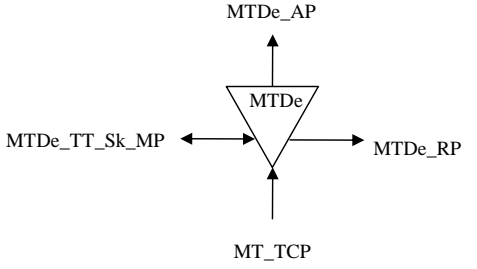
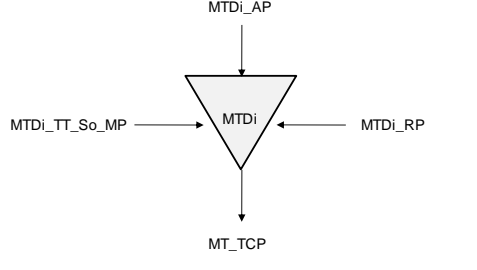
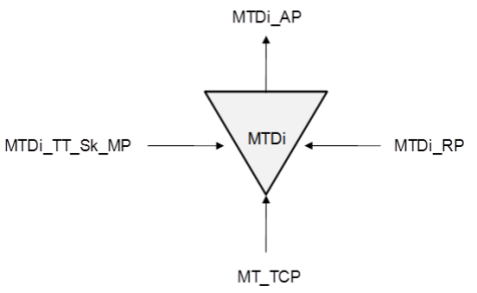
Table 6-4 – MI Groupings of the MT diagnostic functions

Symbol	Management information	Managed object class
MT diagnostic trail termination source function for MEP (MTDe_TT_So)		
	<p>MI_GAL_Enable MI_TTLVALUE MI_CV_OAM_Tool MI_CV_Series () MTDe_TT_So_MI_1TH_OAM_Tool MI_1TH_Start (CoS,Length,Period) MI_1TH_Terminate MI_LMo_OAM_Tool MI_LMo_Start(CoS,Period) [i] MI_LMo_Terminate[i] MI_DMo_OAM_Tool MI_DMo_Start (CoS,Test_ID,Length,Period)[i] MI_DMo_Terminate[i] MI_1DMo_OAM_Tool</p>	

Table 6-4 – MI Groupings of the MT diagnostic functions

Symbol	Management information	Managed object class
	MI_1DMo_Start(CoS,Test_ID,Length,Period)[i] MI_1DMo_Terminate[i] MI_SLo_OAM_Tool MI_SLo_Start (CoS,Test_ID,Length,Period)[i] MI_SLo_Terminate[i] MI_Admin_State MI_Lock_Instruct_Enable MI_DP_Loopback_Enable	
G.8121.1 specific	MI_MEP_ID MI_CV_Series (Target MEP/MIP ID, CoS, N, Length, Period) MI_CV_Test(CoS, Pattern, Length, Period)	
G.8121.2 specific	MI_CV_Series (Session_ID, Count, Period, CoS, Size, ValidateFEC, ValidateReverse, TargetFECStack) MI_CV_Trace (Session_ID, CoS, ValidateFEC, ValidateReverse, TargetFECStack) MI_FEC_Checking MI_Target_FEC MI_Iffnum MI_MTU MI_DMo_Start(CoS, Test_ID, Length, Period, CopyPad)[i] MI_LMo_Start(CoS, Test_ID, Period, LMType,CountBytes)[i] LMDMo_Start(CoS, Test_ID, Length, Period, LMType, CountBytes, CopyPad)[i] MI_LMDMo_Terminate [i] MI_LI_Period MI_LI_MEPID MI_LI_CoS	
MT diagnostic trail termination sink function for MEP (MTDe_TT_Sk)		

Table 6-4 – MI Groupings of the MT diagnostic functions

Symbol	Management information	Managed object class
	MI_GAL_Enable MI_CV_OAM_Tool MI_1TH_OAM_Tool MI_1TH_Start MI_1TH_Terminate MI_LMo_OAM_Tool MI_DMo_OAM_Tool MI_1DMo_OAM_Tool MI_1DMo_Start(Test_ID)[i] MI_1DMo_Terminate[i] MI_SLo_OAM_Tool MI_DP_Loopback_Enable	
G.8121.1 specific	MI_MEP_ID MI_1TH_Start(Period)	
G.8121.2 specific	MI_FEC_Checking PM_Responder_Enable	
MT diagnostic trail termination source function for MIP (MTDi_TT_So)		
	MI_GAL_Enable MI_TTLVALUE MI_MIP_ID MI_CV_OAM_Tool MI_DP_Loopback_Enable	
G.8121.2 specific	MI_Target_FEC MI_Iffnum MI_MTU	
MT diagnostic trail termination sink function for MIP (MTDi_TT_Sk)		
	MI_GAL_Enable MI_MIP_ID MI_CV_OAM_Tool MI_DP_Loopback_Enable	
G.8121.2 specific	MI_FEC_Checking	

6.2.5 MPLS-TP to non-MPLS-TP client adaptation functions

Table 6-5 – MI groupings of the MPLS-TP to non-MPLS-TP client adaptation functions

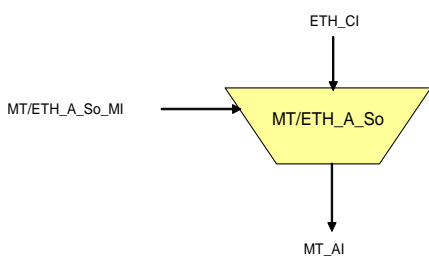
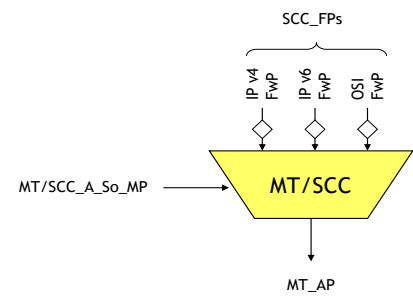
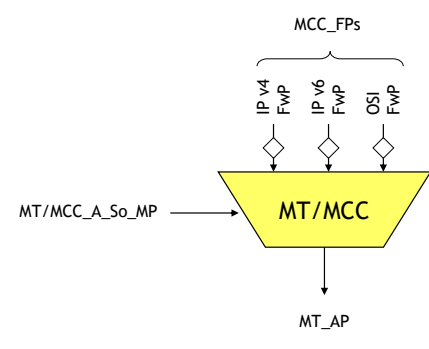
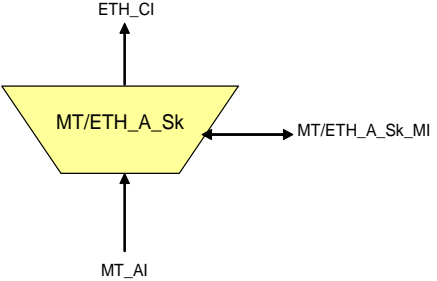
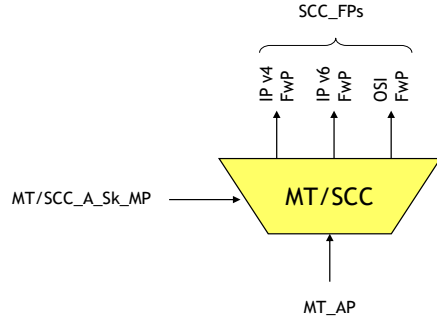
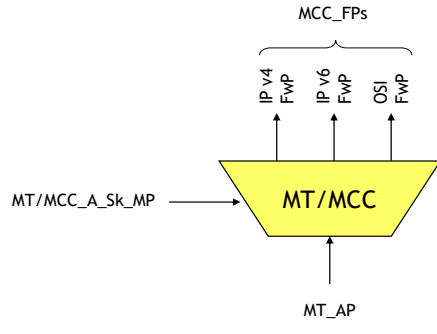
Symbol	Management information (blue: client layer related red: server layer related)	Managed object class
MPLS-TP to non-MPLS-TP client adaptation source functions		
	<ul style="list-style-type: none"> MI_AdminState MI_FCSEnable MI_CWEnable MI_SQUse MI_PRI2PSCMapping MI_MEP_MAC* MI_Client_MEL* MI_LCK_Period* MI_LCK_Pri* MI_MEL* * ETH OAM related 	
	<ul style="list-style-type: none"> MI_Active MI_ECC_CoS MI_GAL_Enable 	
	<ul style="list-style-type: none"> MI_Active MI_ECC_CoS MI_GAL_Enable 	
MPLS-TP to non-MPLS-TP client adaptation sink functions		

Table 6-5 – MI groupings of the MPLS-TP to non-MPLS-TP client adaptation functions

Symbol	Management information (blue: client layer related red: server layer related)	Managed object class
	<p>MI_Admin_State MI_LCK_Period * MI_LCK_Pri * MI_Client_MEL * MI_MEP_MAC * MI_AIS_Pri * MI_AIS_Period * MI_MEL MI_FCSEnable MI_CWEnable MI_SQUse MI_GAL_Enable MI_CoS2PRIMapping MI_PRI2PSCMapping MI_PSC2CoSMapping * ETH OAM related</p>	
	<p>MI_Active MI_GAL_Enable</p>	
	<p>MI_Active MI_GAL_Enable</p>	

6.2.6 Non-MPLS-TP server to MPLS-TP adaptation functions

Table 6-6 – MI groupings of the non-MPLS-TP server to MPLS-TP adaptation functions

Symbol	Management information (blue: client layer related red: server layer related)	Managed object class
Non-MPLS-TP server to MPLS-TP adaptation source functions		
	<p>MI_Active</p> <p>MI_SCCType (not in ETH/MT)</p> <p>MI_Etype (only in ETH/MT)</p> <p>MI_Label[1...M]</p> <p>MI_LSPTType[1...M]</p> <p>MI_CoS[1...M]</p> <p>MI_PHB2TCMapping[1...M]</p> <p>MI_QoSEncodingMode[1...M]</p> <p>MI_Mode[1...M]</p> <p>MI_GAL_Enable[1...M]</p> <p>Only in ODUkP-h/MT:</p> <p>MI_INCREASE</p> <p>MI_DECREASE</p> <p>MI_TSNUM</p> <p>MI_ODUflexRate</p>	
Non-MPLS-TP server to MPLS-TP adaptation sink functions		

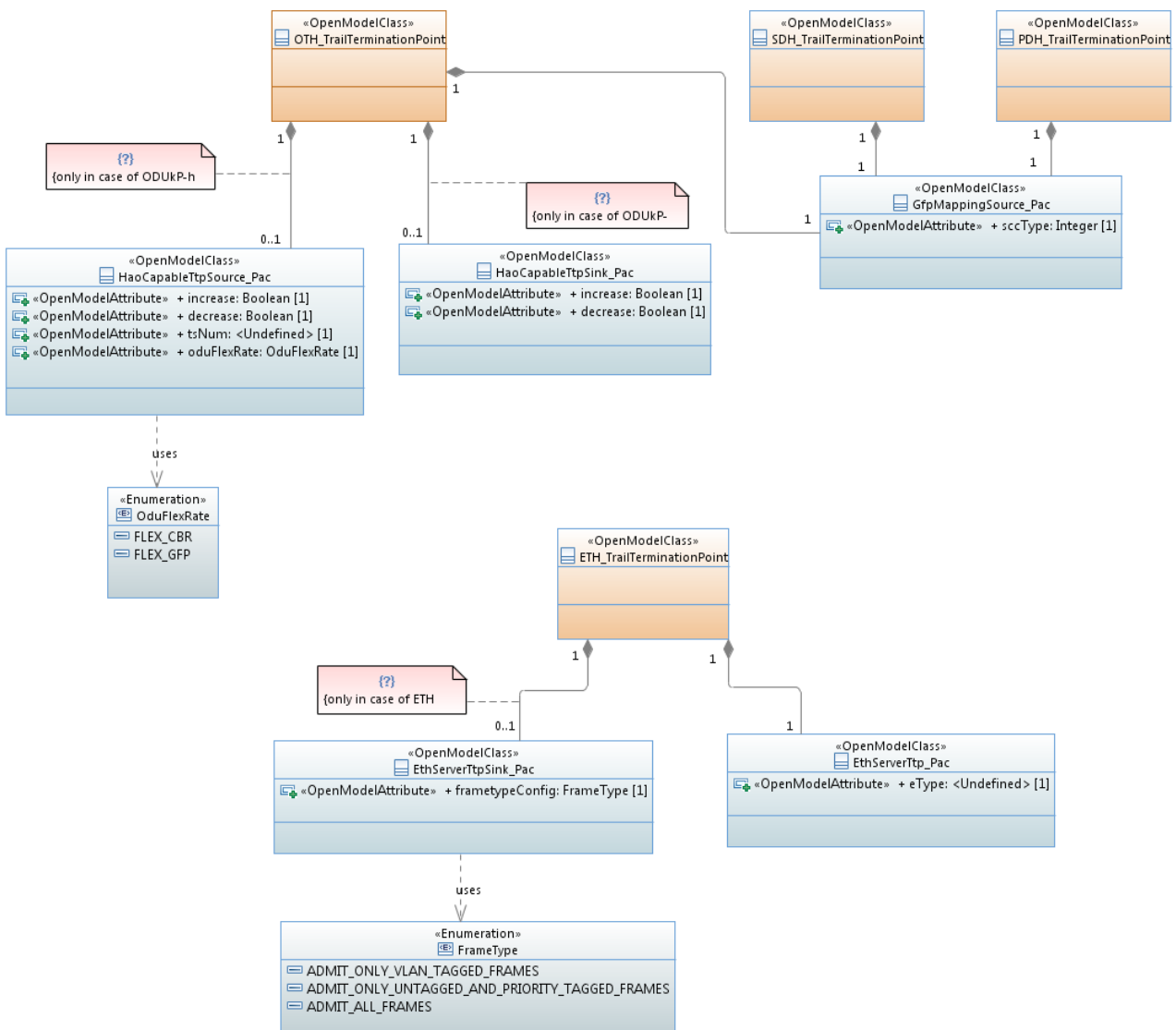
Table 6-6 – MI groupings of the non-MPLS-TP server to MPLS-TP adaptation functions

Symbol	Management information (blue: client layer related red: server layer related)	Managed object class
	<p>MI_Active MI_SCCType (not in ETH/MT) MI_Etype (only in ETH/MT) MI_Frame_Type_Config (only in ETH/MT) MI_Label[1...M] MI_LSPTType[1...M] MI_CoS[1...M] MI_TC2PHBMapping[1...M] MI_QoSDecodingMode[1...M] MI_Mode MI_LCK_Period[1...M] MI_LCK_CoS[1...M] MI_Admin_State MI_AIS_Period[1...M] MI_AIS_CoS[1...M] MI_GAL_Enable[1...M] MI_LCK_OAM_Tool [1...M] MI_AIS_OAM_Tool[1...M] Only in ODUkP-h/MT: MI_INCREASE MI_DECREASE MI_AcSL MI_AcEXI MI_LastInvalidUPI MI_cPLM MI_cLFD MI_cEXM MI_cUPM (not ETH/MT)</p>	
G.8121.2 specific	MI_Local_Defect[i]	

Based on the groupings above the following packages have been identified.

Table 6-7 – Derived MI groupings of the MPLS-TP functions

MI groupings	Package/Object class name
TTP MI source grouping	
MI_Active	
MI_INCREASE MI_DECREASE MI_TSNUM MI_ODUflexRate	HaoCapableTtpSource_Pac
TTP MI sink grouping	
MI_Active	
MI_Frame_Type_Config	EthServerTtpSink_Pac
MI_INCREASE MI_DECREASE	HaoCapableTtpSink_Pac
TTP MI grouping	
MI_SCCType	GfpMapping_Pac
MI_Etype	EthServerTtp_Pac
MT_CTP MI source grouping	
MI_PHB2TCMapping[1...M] MI_QoSEncodingMode[1...M] MI_APS_OAM_CoS[1...M]	MT_ConnectionTerminationPointSource
MT_CTP MI sink grouping	
MI_TC2PHBMapping[1...M] MI_QoSDecodingMode[1...M] MI_LCK_Period[1...M] MI_LCK_CoS[1...M] MI_Admin_State MI_AIS_Period[1...M] MI_AIS_CoS[1...M] MI_LCK_OAM_Tool [1...M] MI_AIS_OAM_Tool[1...M]	MT_ConnectionTerminationPointSink
MT_CTP MI grouping	
MI_Label[1...M] MI_LSPTType[1...M] MI_CoS[1...M] MI_Mode[1...M] MI_GAL_Enable[1...M] MI_APS_OAM_Tool[1...M]	MT_ConnectionTerminationPoint



NOTE – This figure is also available from the ITU website [here](#).

Fig.6-9. Modelling of non-MPLS-TP server

Figure 6-11 – Modelling of non-MPLS-TP server adaptation MI groupings

7 Modelling of MPLS-TP functions

7.1 OAM compound functions

OAM is done in the network by creating maintenance entities (ME). In multipoint services multiple MEs are grouped together forming a maintenance entities group (MEG); see definitions in clause 8 (MPLS-TP OAM Architecture) of [ITU-T G.8110.1].

Each MEG is terminated by a set of MEG end points (MEPs). It is also possible to perform OAM functions on a MEG by MEG intermediate points (MIPs) which allow a limited set of OAM functions along the MEs.

Table 7-1 – OAM capability support

OAM function		OAM mechanism	
Compound function	MEP	Network connection monitoring	
		Tandem connection monitoring	
	MIP		(on-demand) CV
	TCS		--
Proactive measurement	Loss measurement	1-way	CCM (G.8121.1)
		2-way	LM (G.8121, G.8121.2), <i>LMDM (G.8121.2)</i>
		1-way synthetic	--
		2-way synthetic	SLM (G.8121) LM (G.8121.2) <i>LMDM (G.8121.2)</i>
	Delay measurement	1-way	IDM (G.8121)
		2-way	DM (G.8121, G.8121.2) <i>LMDM (G.8121.2)</i>
On-demand measurement	Loss measurement	2-way	LM (G.8121, G.8121.2), LMDM (G.8121.2)
		1-way synthetic	--
		2-way synthetic	SLM (G.8121) LM (G.8121.2) <i>LMDM (G.8121.2)</i>
	Delay measurement	1-way	IDM (G.8121, G.8121.1)
		2-way	DM (G.8121, G.8121.1, G.8121.2) <i>LMDM (G.8121.2)</i>
	Maintenance	1-way throughput test	1TH (G.8121, G.8121.1)
		On-demand loop back	CV (G.8121, G.8121.1, G.8121.2)
		On-demand link trace	CV (G.8121) CV (G.8121.2)
	Proactive fault management	Continuity check and connectivity verification	
Remote defect indication		RDI (G.8121, G.8121.1, G.8121.2)	
Alarm indication signal		AIS (G.8121, G.8121.1, G.8121.2)	
Locked signal (Lock report)		LCK (G.8121, G.8121.1, G.8121.2)	
On-demand fault management	Connectivity verification		CV (G.8121, G.8121.1, G.8121.2)
	Lock instruction		LKI (G.8121.2)
	Automatic protection switching		APS (G.8121)
	Management communication channel/ Signalling communication channel		MCC/SCC (G.8121)

NOTE 1 – OAM mechanisms for MEP are all the OAMs defined in [ITU-T G.8121] series. (The exception is APS. NCM MEP does not support APS.)

NOTE 2 – OAM mechanism for MIP is (on-demand) CV only.

7.1.1 MEP compound function

There are two different types of MEP compound functions:

- mandatory NCM MEPs at the boundary of a layer network, monitoring a network connection
- optional TCM MEPs in the middle of a layer network, monitoring a tandem connection.

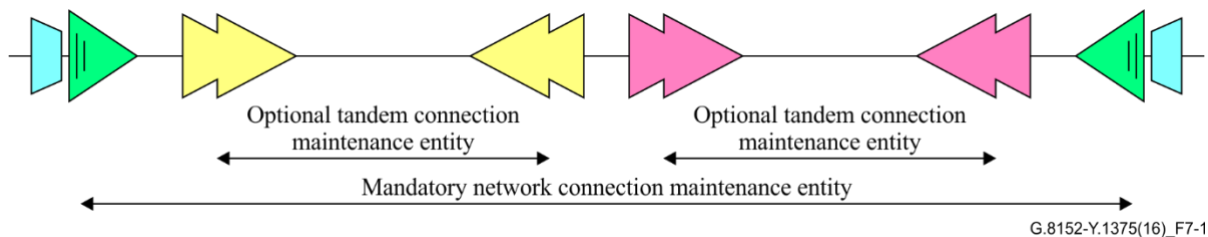


Figure 7-1 – Mandatory and optional MEPs

From management point of view a MEP has the following constraints:

- A MEP can be unidirectional or bidirectional; unidirectional MEPs have a limited set of OAM functionality.
- A MEP belongs to one, and only one, MEL. MEPs terminate MEGs and each MEG is associated to one MEL.
- A MEP is addressed by one, and only one, MAC address. The MAC address (or more precise the EUI-48) is bound to a physical subsystem and one physical subsystem can hold thousands of MEP functions, and all those MEP functions share in such case one MAC address.

The MEP compound function supports three applications which are organised in "jobs":

- On-demand measurement job.
- Proactive measurement job.
- Maintenance job.

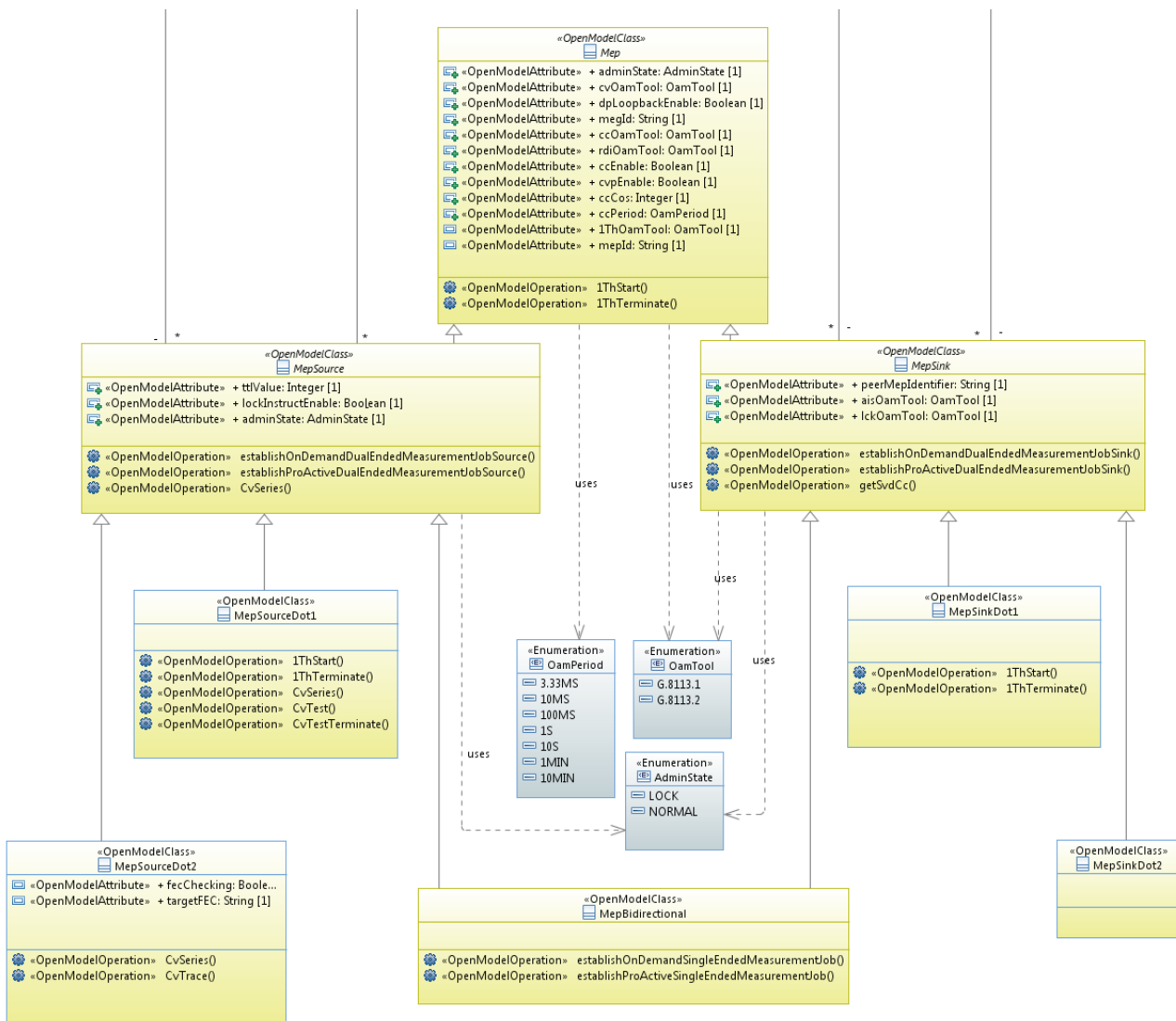


Figure 7-2 – MEP class diagram

Also see lower part of Figure 6-7.

NOTE – Figure 7-3 is later on divided into Figures 7-5, 7-7 and 7-9 below describing the individual segments of the MEP model.

The management information (MI) of the compound functions (defined in [ITU-T G.8121]) needs to be mapped to ITU-T G.8152/Y.1375 artefacts. The following sections list all the MIs defined for the MEP compound function in tables and associate them to applications (coloured background). The corresponding part of the model is shown below the table.

7.1.1.1 MEP on-demand diagnostic function

The MEP on-demand diagnostic function exists in NCM and TCM MEPs.

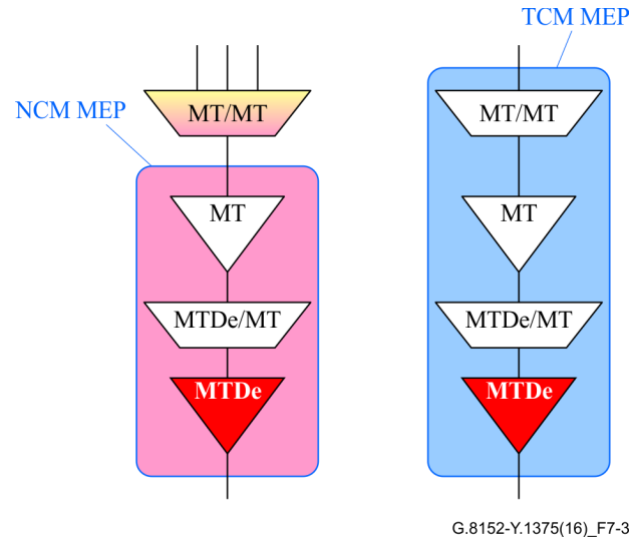


Figure 7-3 – MEP on-demand diagnostic function

[ITU-T G.8121/Y.1381] defines the following Management Information (MI) for on-demand measurements and maintenance:

Table 7-2 – On-demand measurement and Maintenance MI list

Functionality	G.8121 MTDe_TT_So_MI	G.8121 MTDe_TT_Sk_MI	G.8121.1 MTDe_TT_So_MI	G.8121.1 MTDe_TT_Sk_MI	G.8121.2 MTDe_TT_So_MI	G.8121.2 MTDe_TT_Sk_MI
General	GAL_Enable	GAL_Enable	GAL_Enable	GAL_Enable	GAL_Enable	GAL_Enable
	TTLVALUE		TTLVALUE			
			MEP_ID	MEP_ID		
2-way on-demand loss of frame measurement	LMO_OAM_Tool	LMO_OAM_Tool	LMO_OAM_Tool	LMO_OAM_Tool	LMO_OAM_Tool	LMO_OAM_Tool
	LMO_Start(CoS,Period)[1...M _{LMO}]		LMO_Start(CoS,Period)[1...M _{LMO}]		LMO_Start(CoS, Test_ID, Period, LMTType, CountBytes)[1...M _{LMO}]	

Functionality	G.8121 MTDe_TT_So_MI	G.8121 MTDe_TT_Sk_MI	G.8121.1 MTDe_TT_So_MI	G.8121.1 MTDe_TT_Sk_MI	G.8121.2 MTDe_TT_So_MI	G.8121.2 MTDe_TT_Sk_MI
	LMo_Intermediate_Request[1...M _{LMo}]		LMo_Intermediate_Request[1...M _{LMo}]		LMo_Intermediate_Request[1...M _{LMo}]	
	LMo_Terminate[1...M _{LMo}]		LMo_Terminate[1...M _{LMo}]		LMo_Terminate[1...M _{LMo}]	
	<i>LMo_Result(N_TF,N_LF,F_TF,F_LF)[1...M_{LMo}]</i>		<i>LMo_Result(N_TF,N_LF,F_TF,F_LF)[1...M_{LMo}]</i>		<i>LMo_Result(N_TF, N_LF, F_TF, F_LF)[1...M_{LMo}]</i>	
					<i>LMo_ReportError(Error)[1...M_{LMo}]</i>	
					<i>LMo_PeriodChanged[1...M_{LMo}]</i>	
1-way on-demand synthetic loss of frame measurement						
2-way on-demand synthetic loss of frame measurement	SLo_OAM_Tool	SLo_OAM_Tool				
	SLo_Start (CoS,Test_ID,Length,Period) [1...M _{SLo}]					
	SLo_Intermediate_Request[1...M _{SLo}]					
	SLo_Terminate[1...M _{SLo}]					
	<i>SLo_Result(N_TF,N_LF,F_TF,F_LF)[1...M_{SLo}]</i>					
1-way on-demand frame delay measurement	IDMo_OAM_Tool	IDMo_OAM_Tool	IDMo_OAM_Tool	IDMo_OAM_Tool		
	IDMo_Start (CoS,Test_ID,Length,Period) [1...M _{IDMo}]	IDMo_Start(Test_ID)[1...M _{IDMo}]	IDMo_Start (CoS,Length,Period)[1...M _{IDMo}]	IDMo_Start[1...M _{IDMo}]		
	IDMo_Terminate[1...M _{IDMo}]	IDMo_Terminate[1...M _{IDMo}]	IDMo_Terminate[1...M _{IDMo}]	IDMo_Terminate[1...M _{IDMo}]		
	DMo_OAM_Tool	DMo_OAM_Tool	DMo_OAM_Tool	DMo_OAM_Tool	DMo_OAM_Tool	DMo_OAM_Tool

Functionality	G.8121 MTDe_TT_So_MI	G.8121 MTDe_TT_Sk_MI	G.8121.1 MTDe_TT_So_MI	G.8121.1 MTDe_TT_Sk_MI	G.8121.2 MTDe_TT_So_MI	G.8121.2 MTDe_TT_Sk_MI
2-way on-demand frame delay measurement	DMo_Start (CoS,Test_ID,Length,Period) [1...M _{DMo}]		DMo_Start (CoS,Length,Period)[1...M _{DMo}]		DMo_Start(CoS, Test_ID, Length, Period, CopyPad)[1...M _{DMo}]	
	DMo_Intermediate_Request[1...M _{LMo}]		DMo_Intermediate_Request[1...M _{LMo}]		DMo_Intermediate_Request[1...M _{LMo}]	
	DMo_Terminate[1...M _{DMo}]		DMo_Terminate[1...M _{DMo}]		DMo_Terminate[1...M _{DMo}]	
	<i>DMo_Result(count,B_FD[],F_FD[],N_FD[])[1...M_{DMo}]</i>	<i>IDMo_Result(count,N_FD[])[1...M_{DMo}]</i>	<i>DMo_Result(count,B_FD[],F_FD[],N_FD[])[1...M_{DMo}]</i>		<i>DMo_Result(count, B_FD[], F_FD[], N_FD[])[1...M_{DMo}]</i>	
					<i>DMo_ReportError(Error) [1...M_{DMo}]</i>	
					<i>DMo_PeriodChanged [1...M_{DMo}]</i>	
2-way on-demand frame loss / frame delay measurement					LMO_OAM_Tool (Note1)	
					DMo_OAM_Tool (Note2)	
					LMDMo_Start(CoS, Test_ID, Length, Period, LMType, CountBytes, CopyPad)[1...M _{LMDMo}]	
					LMDMo_IntermediateReport [1...M _{LMDMo}]	
					LMDMo_Terminate [1...M _{LMDMo}]	
					<i>LMo_Result(N_TF, N_LF, F_TF, F_LF)[1...M_{LMo}]</i>	
				<i>DMo_Result(count, B_FD[], F_FD[], N_FD[])[1...M_{DMo}]</i>		
				<i>LMo_ReportError(Error) [1...M_{LMo}]</i>		
				<i>LMo_PeriodChanged [1...M_{LMo}]</i>		
	CV_OAM_Tool	CV_OAM_Tool	CV_OAM_Tool	CV_OAM_Tool	CV_OAM_Tool	CV_OAM_Tool

Functionality	G.8121 MTDe_TT_So_MI	G.8121 MTDe_TT_Sk_MI	G.8121.1 MTDe_TT_So_MI	G.8121.1 MTDe_TT_Sk_MI	G.8121.2 MTDe_TT_So_MI	G.8121.2 MTDe_TT_Sk_MI
On-demand loop back	CV_Series()		CV_Series (TTL,CoS,N,Length,Period)		CV_Series (Session_ID, Count, Period, CoS, Size, ValidateFEC, ValidateReverse, TargetFECStack)	
	<i>CV_Series_Result()</i>		<i>CV_Series_Result(REC,ERR,OO)</i>		FEC_Checking	FEC_Checking
					Target_FEC	FEC_Checking
					<i>CV_Series_Result(Session_ID, Rcv, OOO, FWErr, BWErr)</i>	
					<i>CV_FWErr(Session_ID, Seq, RC, SubRC, ErrTLV)</i>	
					<i>CV_BWErr(Session_ID, Seq, RC, SubRC, ErrTLV)</i>	
On-demand lock instruct	Admin_State	<i>Admin_State_Request</i>			Admin_State	<i>Admin_State_Request</i>
	Lock_Instruct_Enable				Lock_Instruct_Enable	
	LI_Period				LI_Period	
	LI_MEPID				LI_MEPID	
	LI_CoS				LI_CoS	
1-way on-demand throughput test	1TH_OAM_Tool	1TH_OAM_Tool	1TH_OAM_Tool	1TH_OAM_Tool		
	1TH_Start (CoS, Length, Period)	1TH_Start	1TH_Start (CoS, Pattern, Length, Period)	1TH_Start (Period)		
	1TH_Terminate	1TH_Terminate	1TH_Terminate	1TH_Terminate		
	<i>1TH_Result(Sent)</i>	<i>1TH_Result(REC,CRC,BER,OO)</i>	<i>1TH_Result(Sent)</i>	<i>1TH_Result(REC,CRC,BER,OO)</i>		
	CV_OAM_Tool	CV_OAM_Tool	CV_OAM_Tool	CV_OAM_Tool	CV_OAM_Tool	CV_OAM_Tool

Functionality	G.8121 MTDe_TT_So_MI	G.8121 MTDe_TT_Sk_MI	G.8121.1 MTDe_TT_So_MI	G.8121.1 MTDe_TT_Sk_MI	G.8121.2 MTDe_TT_So_MI	G.8121.2 MTDe_TT_Sk_MI
On-demand link trace					CV_Trace (Session_ID, CoS, ValidateFEC, ValidateReverse, TargetFECStack)	
					CV_Trace_Result (Session_ID, Result)	
					CV_FWErr(Session_ID, Seq, RC, SubRC, ErrTLV)	
					CV_BWErr(Session_ID, Seq, RC, SubRC, ErrTLV)	
On-demand test	CV_OAM_Tool	CV_OAM_Tool	CV_OAM_Tool	CV_OAM_Tool		
			CV_Test (CoS, Pattern, Length, Period)			
			CV_Terminate			
			CV_Test_Result(Sent, REC, REC, ERR, OO)			

7.1.1.2 MEP proactive measurement function

The MEP proactive measurement function exists in NCM and TCM MEPs.

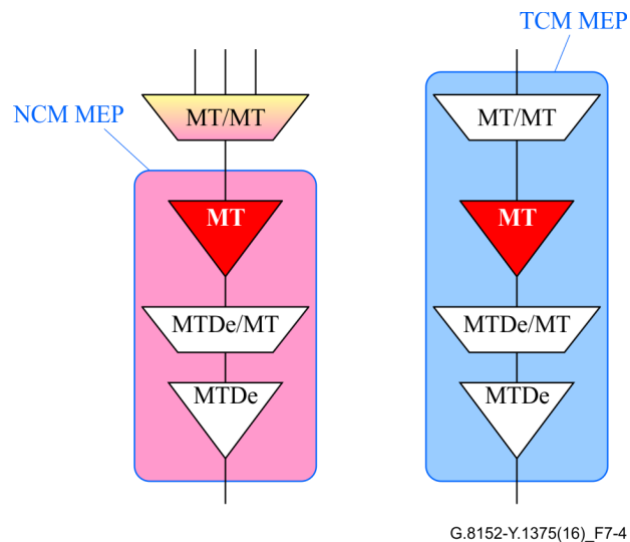


Figure 7-4 – MEP proactive measurement function

[ITU-T G.8121/Y.1381] defines the following Management Information (MI) for pro-active measurements:

Table 7-3 – Pro-active measurement MI list

Functionality	G.8121 MT_TT_So_MI	G.8121 MT_TT_Sk_MI	G.8121.1 MT_TT_So_MI	G.8121.1 MT_TT_Sk_MI	G.8121.2 MT_TT_So_MI	G.8121.2 MT_TT_Sk_MI
General	GAL_Enable	GAL_Enable	GAL_Enable	GAL_Enable	GAL_Enable	GAL_Enable
	TTLVALUE		TTLVALUE		TTLVALUE	
	MEG_ID	MEG_ID	MEG_ID	MEG_ID		
	MEP_ID	PeerMEP_ID	MEP_ID	PeerMEP_ID	MEP_ID	PeerMEP_ID
		AIS_OAM_Tool				
		LCK_OAM_Tool				
						PM_ClearError
						PM_Responder_Enable
	CC_OAM_Tool	CC_OAM_Tool	CC_OAM_Tool	CC_OAM_Tool	CC_OAM_Tool	CC_OAM_Tool

Functionality	G.8121 MT_TT_So_MI	G.8121 MT_TT_Sk_MI	G.8121.1 MT_TT_So_MI	G.8121.1 MT_TT_Sk_MI	G.8121.2 MT_TT_So_MI	G.8121.2 MT_TT_Sk_MI
Continuity check and Connectivity Verification	RDI_OAM_Tool	RDI_OAM_Tool	RDI_OAM_Tool	RDI_OAM_Tool	RDI_OAM_Tool	RDI_OAM_Tool
	CC_Enable (Note1)	CC_Enable (Note1)	CC_Enable (Note2)	CC_Enable	CC_Enable[1...M _{CCCV}]	
	CVp_Enable (Note1)	CVp_Enable (Note1)			CVp_Enable[1...M _{CCCV}]	
					CCCV_Mode[1...M _{CCCV}]	
	MEP_ID	PeerMEP_ID	MEP_ID	PeerMEP_ID	MEP_ID[1...M _{CCCV}]	PeerMEP_ID[1...M _{CCCV}]
	CC_CoS	CC_CoS	CC_CoS	CC_CoS	CC_CoS[1...M _{CCCV}]	CC_CoS[1...M _{CCCV}]
	CC_Period	CC_Period	CC_Period	CC_Period	CC_Period	CC_Period
		Get_SvdCC		Get_SvdCC		Get_SvdCC[1...M _{CCCV}]
		SvdCC		SvdCC		SvdCC
	<p><i>Note1 – MI_CC_Enable and MI_CVp_Enable are used to enable CC and CV functions respectively. The possible combinations are:</i></p> <ul style="list-style-type: none"> – no CC function and no CV function: MI_CC_Enable = false and MI_CVp_Enable = false – CC-only function: MI_CC_Enable = true and MI_CVp_Enable = false – CC and CV functions: MI_CC_Enable = true and MI_CVp_Enable = true <p><i>Note2 – MI_CVp_Enable defined in [ITU-T G.8121] is automatically configured true by setting MI_CC_Enable true.</i></p>					
1-way pro-active loss of frame measurement using CC	CC_OAM_Tool	CC_OAM_Tool	CC_OAM_Tool	CC_OAM_Tool		
	lLMp_Enable	lLMp_Enable	LMC_Enable	LMC_Enable		
			MEP_ID	PeerMEP_ID		
			CC_CoS	CC_CoS		
			CC_Period	CC_Period		
2-way pro-active loss of frame measurement	LMp_OAM_Tool	LMp_OAM_Tool	LMp_OAM_Tool	LMp_OAM_Tool	LMp_OAM_Tool	LMp_OAM_Tool
	LMp_Enable[1...M _{LMp}]	LMp_Enable[1... M _{LMp}]	LMp_Enable[1...M _{LMp}]	LMp_Enable[1... M _{LMp}]	LMp_Enable[1...M _{LMp}]	LMp_Enable[1... M _{LMp}]
	LMp_Period[1...M _{LMp}]		LMp_Period[1...M _{LMp}]		LMp_Period[1...M _{LMp}]	
	LMp_CoS[1...M _{LMp}]	LMp_CoS[1... M _{LMp}]	LMp_CoS[1...M _{LMp}]	LMp_CoS[1... M _{LMp}]	LMp_CoS[1...M _{LMp}]	

Functionality	G.8121 MT_TT_So_MI	G.8121 MT_TT_Sk_MI	G.8121.1 MT_TT_So_MI	G.8121.1 MT_TT_Sk_MI	G.8121.2 MT_TT_So_MI	G.8121.2 MT_TT_Sk_MI
					Lmp_Test_ID[1...M _{LMP}]	
					Lmp_LMType[1...M _{LMP}]	
					Lmp_CountBytes[1...M _{LMP}]	
					<i>Lmp_PeriodChanged[1...M_{LMp}]</i>	
						<i>Lmp_ReportError(Error)[1...M_{LMP}]</i>
		LM_DEGM		LM_DEGM		
		LM_M		LM_M		
		LM_DEGTHR		LM_DEGTHR		
		LM_TFMIN		LM_TFMIN		
1-way pro-active synthetic loss of frame measurement	1SLp_OAM_Tool	1SLp_OAM_Tool				
	1SLp_Enable[1...M _{1SLp}]	1SLp_Enable[1...M _{1SLp}]				
	1SLp_Period[1...M _{1SLp}]					
	1SLp_Test_ID[1...M _{1SLp}]	1SLp_Test_ID[1...M _{1SLp}]				
	1SLp_Length[1...M _{1SLp}]					
	1SLp_CoS[1...M _{1SLp}]					
2-way pro-active synthetic loss of frame measurement	SLp_OAM_Tool	SLp_OAM_Tool			(covered by DMp)	(covered by DMp)
	SLp_Enable[1...M _{SLp}]	SLp_Enable[1...M _{SLp}]				
	SLp_Period[1...M _{SLp}]					
	SLp_Test_ID[1...M _{SLp}]					
	SLp_Length[1...M _{SLp}]					
	SLp_CoS[1...M _{SLp}]	SLp_CoS[1...M _{SLp}]				
	1DMp_OAM_Tool	1DMp_OAM_Tool				

Functionality	G.8121 MT_TT_So_MI	G.8121 MT_TT_Sk_MI	G.8121.1 MT_TT_So_MI	G.8121.1 MT_TT_Sk_MI	G.8121.2 MT_TT_So_MI	G.8121.2 MT_TT_Sk_MI
1-way pro-active frame delay measurement	1DMp_Enable[1...M _{1DMp}]	1DMp_Enable[1...M _{1DMp}]				
	1DMp_Period[1...M _{1DMp}]					
	1DMp_Test_ID[1...M _{1DMp}]	1DMp_Test_ID[1...M _{1DMp}]				
	1DMp_Length[1...M _{1DMp}]					
	1DMp_CoS[1...M _{1DMp}]					
2-way pro-active frame delay measurement	Dmp_OAM_Tool	Dmp_OAM_Tool	Dmp_OAM_Tool	Dmp_OAM_Tool	Dmp_OAM_Tool	Dmp_OAM_Tool
	Dmp_Enable[1...M _{Dmp}]	Dmp_Enable[1... M _{Dmp}]	Dmp_Enable[1...M _{Dmp}]	Dmp_Enable[1... M _{Dmp}]	Dmp_Enable[1...M _{Dmp}]	Dmp_Enable[1... M _{Dmp}]
	Dmp_Period[1...M _{Dmp}]		Dmp_Period[1...M _{Dmp}]		Dmp_Period[1...M _{Dmp}]	
	Dmp_Test_ID[1...M _{Dmp}]		Dmp_Test_ID[1...M _{Dmp}]		Dmp_Test_ID[1...M _{Dmp}]	
	Dmp_CoS[1...M _{Dmp}]	Dmp_CoS[1... M _{Dmp}]	Dmp_CoS[1...M _{Dmp}]	Dmp_CoS[1... M _{Dmp}]	Dmp_CoS[1...M _{Dmp}]	
	Dmp_Length[1...M _{Dmp}]		Dmp_Length[1...M _{Dmp}]		Dmp_Length[1...M _{Dmp}]	
					Dmp_CopyPad[1...M _{Dmp}]	
					<i>Dmp_PeriodChanged[1...M_{Lmp}]</i>	
					<i>Dmp_ReportError(Error)[1...M_{Dmp}]</i>	
Fault cause list		cSSF cLCK cLOC cMMG cUNM cUNP cUNC cDEG cRDI		cSSF cLCK cLOC cMMG cUNM cUNP cUNC cDEG cRDI		cSSF cLCK cLOC[] cMMG cUNM cUNC cDEG cRDI
Performance primitive list		pN_LF[1...P] pN_TF[1...P] pF_LF[1...P]		pN_LF pN_TF pF_LF		pN_LF[1...P] pN_TF[1...P] pF_LF[1...P]

Functionality	G.8121 MT_TT_So_MI	G.8121 MT_TT_Sk_MI	G.8121.1 MT_TT_So_MI	G.8121.1 MT_TT_Sk_MI	G.8121.2 MT_TT_So_MI	G.8121.2 MT_TT_Sk_MI
		pF_TF[1...P] pF_DS pN_DS pB_FD[1...P] pB_FD[1...P] pN_FD[1...P] pN_FD[1...P] pF_FD[1...P] pF_FD[1...P]		pF_TF pF_DS pN_DS		pF_TF[1...P] pF_DS pN_DS pB_FD[1...P] pB_FD[1...P] pN_FD[1...P] pN_FD[1...P] pF_FD[1...P] pF_FD[1...P]

7.1.1.3 MEP configuration function

The MEP configuration function exists in NCM and TCM MEPs.

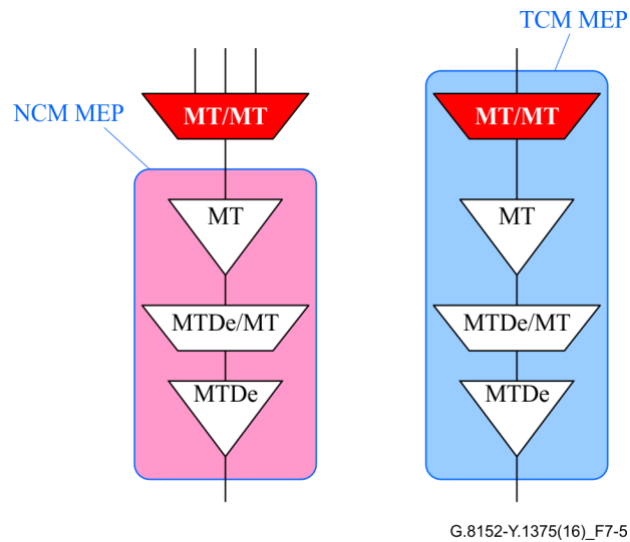


Figure 7-5 – MEP configuration function

[ITU-T G.8121/Y.1381] defines the following Management Information (MI) for configuring a MEP:

Table 0-4 – MEP configuration MI list

Functionality	G.8121 MT/MT_A_So_MI	G.8121 MT/MT_A_Sk_MI	G.8121.1 MT/MT_A_So_MI	G.8121.1 MT/MT_A_Sk_MI	G.8121.2 MT/MT_A_So_MI	G.8121.2 MT/MT_A_Sk_MI
General	GAL_Enable	GAL_Enable				
	TTLVALUE					
Lock	Admin_State	Admin_State				
	LCK_Period	LCK_Period				
	LCK_CoS	LCK_CoS				
	LCK_OAM_Tool	LCK_OAM_Tool				
Alarm indication signal (Note)	AIS_Period	AIS_Period			Local_Defect	
	AIS_CoS	AIS_CoS				
	AIS_OAM_Tool	AIS_OAM_Tool				
Client signal fail	CSF_Tool	CSF_Tool				
	CSF_Period					
	CSF_CoS					
	CSF_Enable					
	CSFrdifdiEnable	CSFrdifdiEnable				
		CSF_Reported				
Automatic protection switching	APS_OAM_Tool	APS_OAM_Tool				
	APS_CoS					

Note – MIs for AIS at Source are configured at Server MEP

7.1.2 MIP compound function

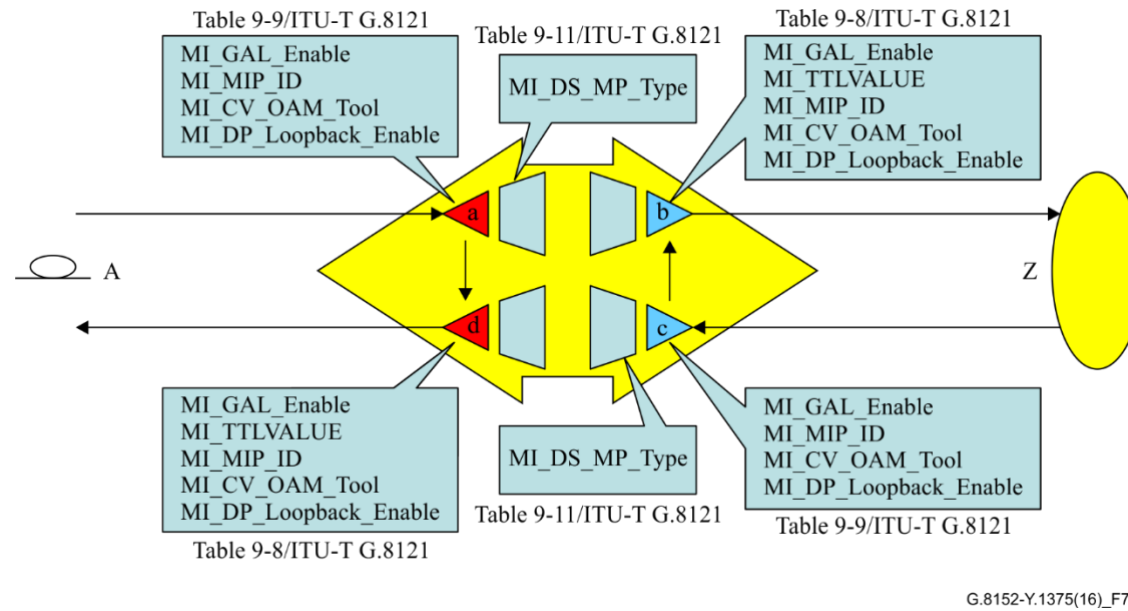


Figure 7-6 – MIP configuration parameters

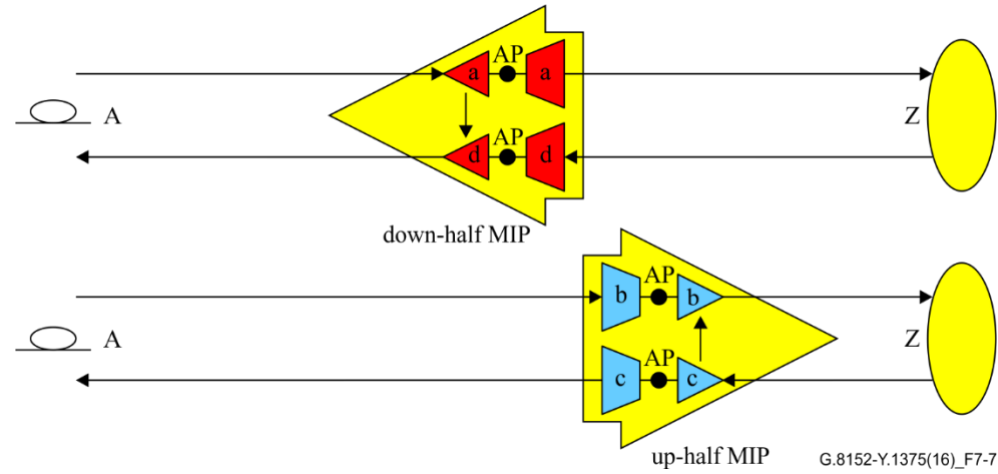


Figure 7-7 – "half MIP" compound function

The management information (MI) of the MIP compound function (defined in [ITU-T G.8121/Y.1381]) is mapped to the MipBidirectional object class.

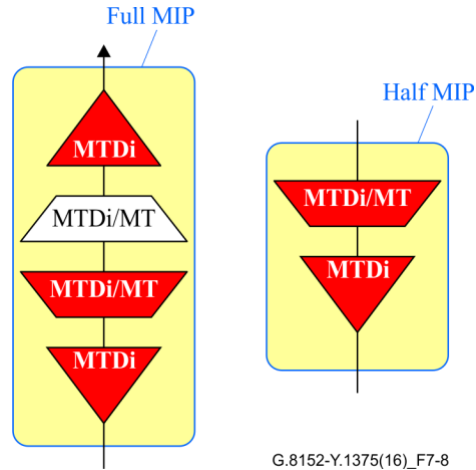


Figure 7-8 – MIP/half MIP configuration function

[ITU-T G.8121/Y.1381] defines the following Management Information (MI) for configuring a MIP:

Table 0-5 – MIP configuration MI list

Functionality	G.8121 MTDi_TT_So_MI	G.8121 MTDi_TT_Sk_MI	G.8121.1 MTDi_TT_So_MI	G.8121.1 MTDi_TT_Sk_MI	G.8121.2 MTDi_TT_So_MI	G.8121.2 MTDi_TT_Sk_MI
General	GAL_Enable	GAL_Enable				
	TTLVALUE					
	MIP_ID	MIP_ID				
		DS_MP_Type [Note]				
	[Note] DS_MP_type is configured at MTDi/MT_A_Sk					
On-demand CV	CV_OAM_Tool	CV_OAM_Tool			Target_FEC	

7.2 Fault management

FFS.

7.3 Performance monitoring

Performance monitoring allows measurement of different performance parameters like frame loss ratio, frame delay and frame delay variation.

7.3.1 Loss Measurement

The frame loss measurement (LM) provides performance data that is based on the lost frames between the ingress and the egress of a maintenance entity (ME); i.e., between two maintenance group end points (MEPs).

LM is restricted to MEGs which have only a single ME.

The following LM functions are defined:

- 2-way on-demand LM
- 1-way on-demand synthetic LM
- 2-way on-demand synthetic LM
- 2-way proactive LM
- 1-way proactive synthetic LM
- 2-way proactive synthetic LM.

The single-ended on-demand LM function is managed only at the source MEP. The sink MEP does not need any management.

The dual-ended pro-active LM function is managed at source and sink MEP.

7.3.2 Delay measurement

The frame delay measurement (DM) provides performance data that is based on the delay of the frames between the ingress and the egress of a maintenance entity (ME); i.e., between two maintenance group end points (MEPs).

The following DM functions are defined:

- 1-way on-demand DM
- 2-way (round-trip) on-demand DM.
- 1-way proactive DM
- 2-way (round-trip) proactive DM.

The 1-way DM function is started at the source MEP and enabled at the sink MEP.

The 2-way DM function is managed only at the source MEP. The sink MEP does not need any management.

7.4 MPLS-TP multiplexing

This clause maps the MPLS-TP multiplexing related MIs to the corresponding object classes.

The MPLS-TP multiplexing configuration function exists only in MT TTP and MT CTP.

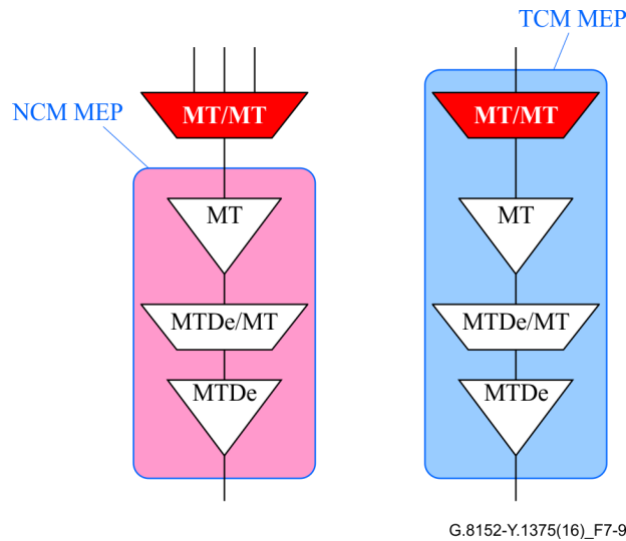


Figure 7-9 – MPLS-TP multiplexing configuration function

[ITU-T G.8121/Y.1381] defines the following Management Information (MI) for configuring the MPLS-TP multiplexing function:

Table 0-6 – Mapping of Multiplexing related MI to G.8152 artefacts

Functionality	G.8121 MT/MT_A_So_MI	G.8121 MT/MT_A_Sk_MI
TTP associated MI	Label[1...M]	Label[1...M]
	LSPTType[1...M]	LSPTType[1...M]
	CoS[1...M]	CoS[1...M]
	PHB2TCMapping[1...M]	TC2PHBMapping[1...M]
	QoSEncodingMode[1...M]	QoSDecodingMode[1...M]
	Mode	Mode
CTP associated MI		

7.5 Connection function

This clause maps the connection function related MIs to the corresponding object classes.

Table 7-6 – Mapping of connection function related MI to ITU-T G.8152 artefacts

Functionality	MT_C_MI	ITU-T G.8152
General connection management	Create_MC	
	Modify_MC	
	Delete_MC	
Individual connection point management	MT_C_MP per input and output connection point	
	<i>for further study</i>	
Individual connection management	MT_C_MP per matrix connection:	
	MT_C_MI_ConnectionType	

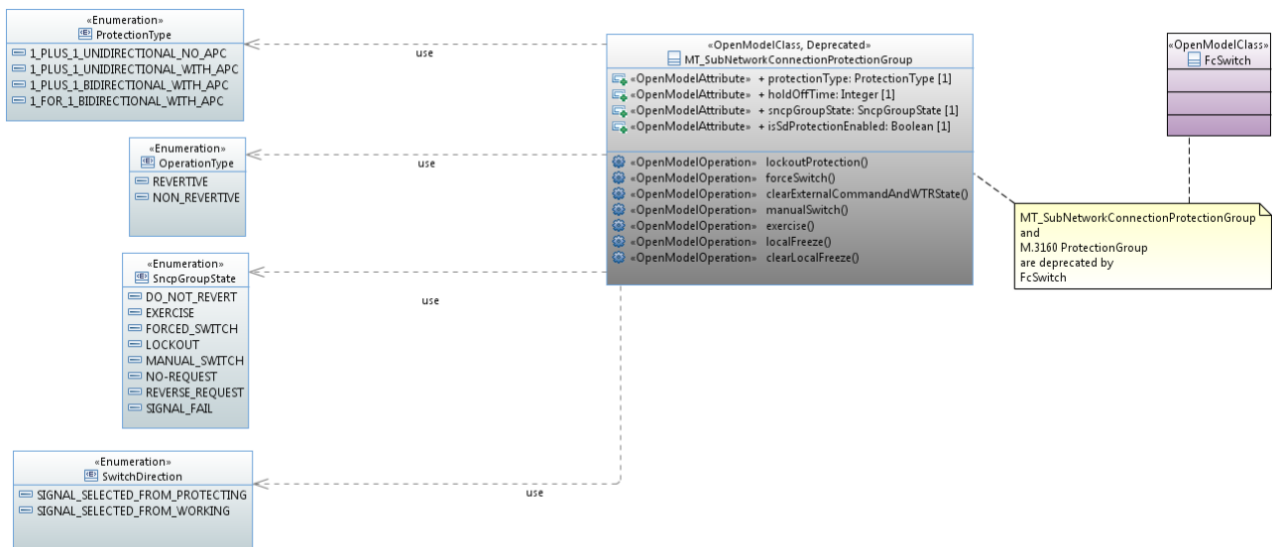
Table 7-6 – Mapping of connection function related MI to ITU-T G.8152 artefacts

Functionality	MT_C_MI	ITU-T G.8152
	MT_C_MI_Return_CP_ID	
	MT_C_MI_ConnectionPortIds	
SNCP configuration	MT_C_MP per SNC/S protection process:	
	<i>for further study</i>	

7.5.1 Linear protection function

The MPLS-TP linear protection function is defined in [ITU-T G.8131]. The related "Management Information" is listed in [ITU-T G.8121].

This function is modelled by the MT_SNCP_Group object class.



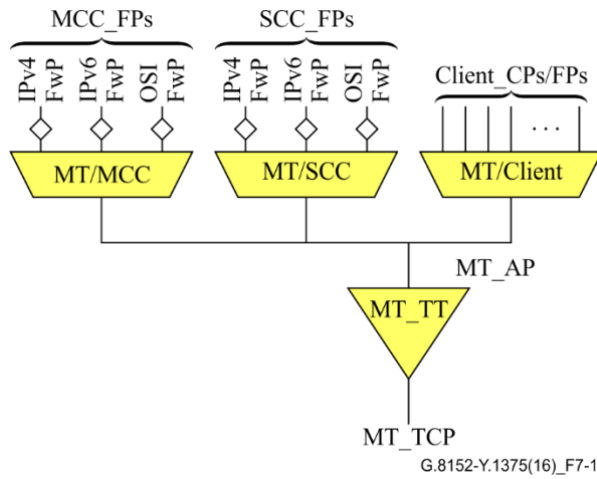
NOTE – This figure is also available from the ITU website [here](#).

Figure 7-10 – MPLS-TP linear protection



7.6 SCC/MCC access function

Signalling communication channel (SCC) and management communication channel (MCC) can be accessed when the containing LSP is terminated. Each channel is able to transport IPv4, IPv6 and OSI structured signals. The diamonds in Figure 7-11 represent traffic shaping and conditioning functions that may be needed to prevent the SCC/MCC forwarding points from exceeding their committed bandwidth in congestion situations.

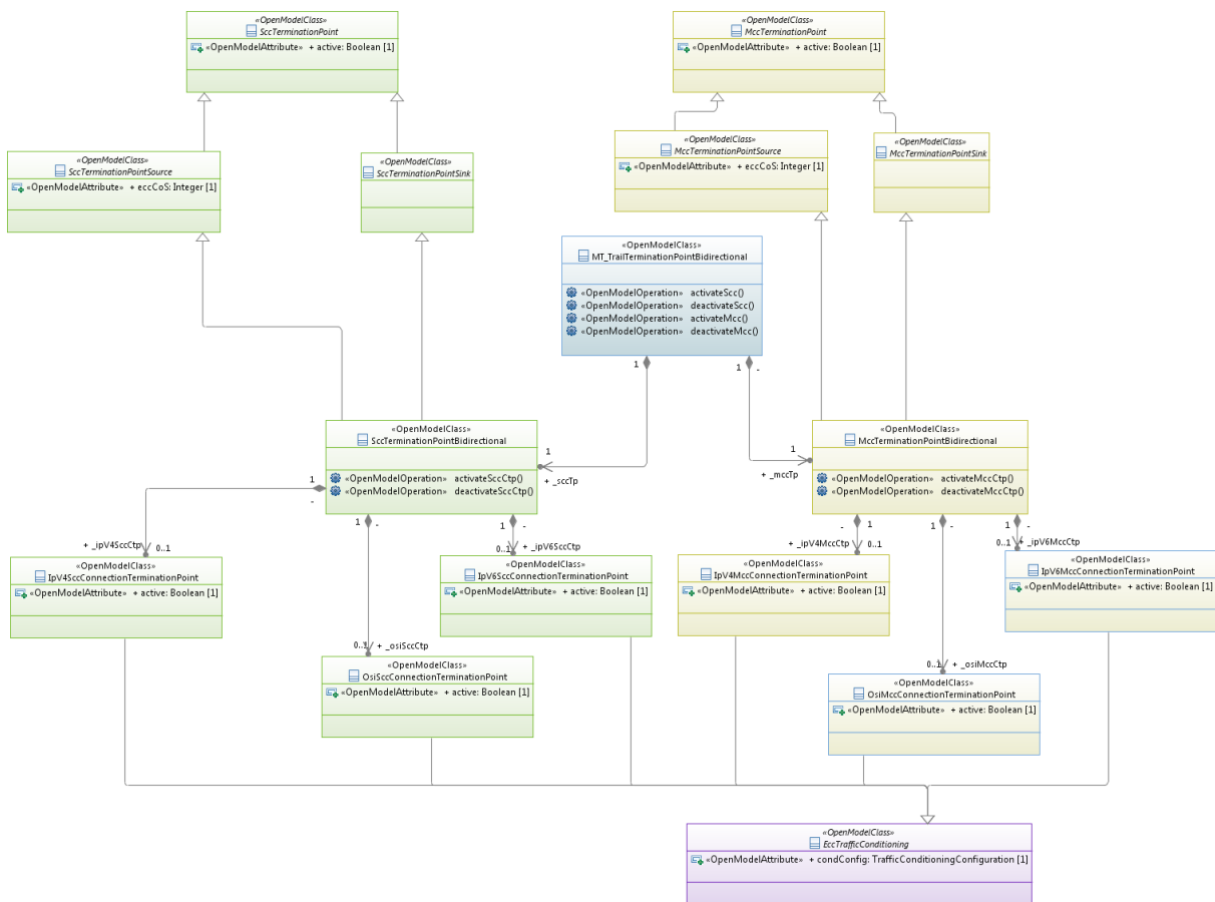


**Figure 7-11 – MT/SCC_A function, MT/MCC_A function, and MT/client_A function
(Copy from Figure 10-5 [ITU-T G.8121/Y.1382])**

SCC and MCC access are modelled using the same pattern. Only the bidirectional SCC/MCC termination point (TP) can be instantiated. Each termination point contains one connection termination point (CTP) for IPv4 access, one CTP for IPv6 access and one CTP for OSI access. These CTPs have the capability to shape and condition the communication signals.

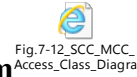
The management of the SCC/MCC access function has been added to the bidirectional MT TTP.

Figure 7-12 contains the related class diagram.



NOTE – This figure is also available from the ITU website [here](#).

Figure 7-12 – SCC/MCC access class diagram



8 UML model file

The ITU-T G.8152/Y.1375 UML model is contained in a repository website. The following links provide the pointers to the ITU-T G.8152/Y.1375 UML model files and supporting materials.

- [G.8152 v1.00 PAP-AR.zip \(Editor Note: Version and link to be updated\)](#)

This contains the ITU-T G.8152/Y.1375 model files, i.e., the .project, .di, .notation, and .uml files.

- [G.8152 v1.01 DD-AR.zip \(Editor Note: Version and link to be updated\)](#)

This is the data dictionary

- [G.7711 v2.00 PAP.zip \(Editor Note: Version and link to be updated\)](#)

This is the ITU-T G.7711 model files. In order to use the ITU-T G.8152/Y.1375 model, one also needs to install the ITU-T G.7711 base model and the Open Model Profile

To use the G.8152 model, one needs to also install the G.7711 Core model.

NOTE – The ITU-T G.8152/Y.1375 UML information model and the Open Model Profile are specified using the Papyrus open source modeling tool. In order to view and further extend or modify the information model, one will need to install the open source Eclipse software and the Papyrus tool, which are available at [b-Eclipse-Papyrus]. The installation guide for Eclipse and Papyrus can be found in [b-IISOMI-515].

Appendix I

UML model data dictionary

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

The data dictionary contains, in MS Word document format, the details of the OTN NE management-protocol-neutral information model, including the description and properties of the object classes and their attributes and operations. These details information are generated automatically by a Gendoc tool from the UML model.

The ITU-T G.8152/Y.1375 data dictionary is provided in the [G.8152 v1.00 DD.zip](#) file at the repository website mentioned in clause 8 above.

Appendix II

Mapping of ITU-T G.8121 atomic functions to ITU-T G.8152/Y.1375 model artefacts

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

This appendix provides further detailed mapping between the [ITU-T G.8121] atomic functions and the ITU-T G.8152/Y.1375 UML model artefacts. Note that in some cases a 1:1 mapping is not possible.

**Table II.1 – Mapping between ITU-T G.8121 Ethernet atomic functions
and UML model Artefacts**

[ITU-T G.8121] section	[ITU-T G.8121] atomic function	ITU-T G.8152/Y.1375 model artefact	Note

For further study.

Appendix III

UML modelling guidelines

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

See Annex A of [ITU-T G.7711].

Bibliography

- [b-Eclipse-Papyrus] Papyrus Eclipse UML Modelling Tool
<<https://www.eclipse.org/papyrus/>>
- [b-IISOMI-515] IISOMI-515_Papyrus-Guidelines.docx
<<https://community.opensourcesdn.org/wg/EAGLE/document/171>>

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