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Introduction

This document provides Draft revised Recommendation ITU-T G.8151/Y.1374 (for Consent, June 2017), base on TD636/3 (Sept 2016).

Document history:

Version	Date	Description
2.01	WD22 (03/2015, Ottawa)	▪ Re-add the APS related MI signals in Table 8-4 ▪ Rename ODCV to CV ▪ Removed APS related MI signals from Srv/MT_A, since it was agreed to remove in Shanghai meeting (09/2014) in Q10 ▪ Add MI signals of intermediate request for LMo, DMo, Slo, and 1DMo ▪ In align with G.8121 (wd11r1), following MI signals are added or updated in Table 8-1: - Add MT_TT_ {So/Sk}_1SLp - Add MT_TT_ {So/Sk}_MI_1LMp_Enable - Removed MT_TT_ {So/Sk}_LMC_Enable from Table 8-1.1 - Add [1…M] to MT_TT_ {So/Sk}_{LMp/DMp/1DMp/1SLp}_OAM_Tool
2.02	June/July 2015, Geneva	▪ Use the pre-bublised version of G.8151 as base document, with TSB editing instruction considered. ▪ Cooperated with draft Amendment 1 (For consent)
2.03	WD16 (10/ 2015, Wuhan) =TD/3 (2/2016)	▪ Updated clause 8.7 in align with G.8121 (TD399/3). Management functions for MT_C reporting and those for MTp_C are added. ▪
2.04	WD17(02/2016, Geneva) = TD513r1/3 (02/2016)	▪ Added cFOP related MI signals for Fault Cause Persistency function in Table 7-1, Alarm Reporting Control function in Table 7-2, Operational State function in Table 7-3 to align with G.8121.
2.05	WD17(09/2016, Geneva) = TD636/3 (09/2016) =TDxxx/p (06/2017)	▪ Due to the deletion of LCAS-capable ODU*k* to MPLS-TP Adaptation function in G.8121 (per C.2009, Intel), Both Fault Management functions in clause 7 and MIs that are related to ODUkP-X-L/MT_A in clause 8 are removed.

Draft revised Recommendation ITU-T G.8151/Y.1374

Management aspects of the MPLS-TP network element

Summary

Recommendation ITU-T G.8151/Y.1374 addresses management aspects of the MPLS Transport Profile (MPLS-TP) capable network element containing transport functions of one or more of the layer networks of the MPLS-TP network. The management of the MPLS-TP layer networks is separable from that of its client layer networks so that the same means of management can be used regardless of the client. The management functions for fault management, configuration management, performance monitoring, and security management are specified.

The 2011 Revision of this Recommendation aligns with the MPLS-TP architecture and requirements jointly developed by IETF and ITU-T and provides the specification for managing MPLS-TP NEs that support the OAM protocol neutral equipment functionality as defined in Recommendation ITU-T G.8121/Y.1381.

Draft revised Recommendation ITU-T G.8151/Y.1374

Management aspects of the MPLS-TP network element

1 Scope

This Recommendation addresses management aspects of the MPLS Transport Profile (MPLS-TP) capable network element containing transport functions of one or more of the layer networks of the MPLS-TP network. The management of the MPLS-TP layer networks is separable from that of its client layer networks so that the same means of management can be used regardless of the client. In this version of the Recommendation, fault management, configuration management, performance management, and security management are specified. Accounting management is for further study.

The generic requirements for managing transport network elements are specified in [ITU-T G.7710/Y.1701] and the requirements for the management of equipment used in networks supporting an MPLS Transport Profile (MPLS-TP) are specified in [b-IETF RFC 5951]. This Recommendation specifies the requirements for managing the following MPLS-TP specific equipment functional blocks, which are defined in [ITU-T G.8121/Y.1381]:

- MPLS-TP layer connection function,
- MPLS-TP layer trail termination functions,
- MPLS-TP server to MPLS-TP client adaptation functions,
- MPLS-TP server to Ethernet client adaptation functions.
- SDH server to MPLS-TP client adaptation functions,
- PDH server to MPLS-TP client adaptation functions,
- OTN sever to MPLS-TP client adaptation functions,
- ETH sever to MPLS-TP client adaptation functions.

The management of the adaptation of other clients and servers with respect to MPLS-TP is for further study.

This Recommendation also describes the management network organizational model for communication between an element management layer (EML) Operations System and the MPLS-TP equipment management function within an MPLS-TP network element.

The architecture described in this Recommendation for the management of MPLS-TP transport networks is based upon the following considerations:

- The management view of network element functional elements should be uniform whether those elements form part of an inter-domain interface or part of an intra-domain interface. Those properties necessary to form such a uniform management view are to be included in this Recommendation.
- MPLS-TP layer network entities (MTLNE) refer to trail termination, adaptation and connection functions as described in [ITU-T G.8110.1/Y.1370.1],
- a network element may only contain MPLS-TP layer network entities,
- a network element may contain both MPLS-TP layer network entities (MTLNE) and client layer network entities (CLNE),
- client layer entities are managed as part of their own logical domain (e.g. Ethernet management network),

– CLNE and MTLNE may or may not share a common message communication function (MCF) and management application function (MAF) depending on application,

– CLNE and MTLNE may or may not share the same agent,

– Server layer network entities (SLNE) and MTLNE may or may not share the same agent.

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[YT1]

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; all 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.707] Recommendation ITU-T G.707 (2007), *Network node interface for the synchronous digital hierarchy (SDH)*

[ITU-T G.709] Recommendation ITU-T G.709 (2012), *Interfaces for the optical transport network*

[ITU-T G.805] Recommendation ITU-T G.805 (2000), *Generic functional architecture of transport networks*.

[ITU-T G.806] Recommendation ITU-T G.806 (2012), *Characteristics of transport equipment – Description methodology and generic functionality*

[ITU-T G.7041/Y.1303] Recommendation ITU-T G.7041/Y.1303 (2008), *Generic framing procedure (GFP)*

[ITU-T G.7044/Y.1344] Recommendation ITU-T G.7044/Y.1344 (2011), Hitless adjustment of ODUflex(GFP)

[ITU-T G.7710/Y.1701] Recommendation ITU-T G.7710/Y.1701 (2012), *Common equipment management function requirements*, plus Corrigendum 1 (2009)

[ITU-T G.7712/Y.1703] Recommendation ITU-T G.7712/Y.1703 (2010), *Architecture and specification of data communication network*

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

[ITU-T G.8110.1/Y.1370.1] Recommendation ITU-T G.8110.1/Y.1370.1 (2011), *Architecture of MPLS Transport Profile (MPLS-TP) layer network*

[ITU-T G.8113.1/Y.1371.1] Recommendation ITU-T G.8113.1/Y.1371.1 (2015), *Operations, administration and maintenance mechanism for MPLS-TP in packet transport networks*

[ITU-T G.8113.2/Y.1372.2] Recommendation ITU-T G.8113.2 (2015), Operations, administration and maintenance mechanisms for MPLS-TP networks using the tools defined for MPLS.

[ITU-T G.8121/Y.1381] Recommendation ITU-T G.8121/Y.1381 (2015~~3~~), *Characteristics of MPLS Transport Profile (MPLS-TP) equipment functional blocks*

[ITU-T G.8121.1/Y.1381.1] Recommendation ITU-T G.8121.1/Y.1381.1 (2015~~3~~), *Characteristics of MPLS Transport Profile (MPLS-TP) equipment functional blocks supporting G.8113.1/Y.1372.1 OAM mechanisms*

[ITU-T G.8121.2/Y.1381.2] Recommendation ITU-T G.8121.2/Y.1381.2 (2015~~3~~), *Characteristics of MPLS Transport Profile (MPLS-TP) equipment functional blocks supporting G.8113.2/Y.1372.2 OAM mechanisms*

[ITU-T M.20] Recommendation ITU-T M.20 (1992), *Maintenance philosophy for telecommunication networks*.

[ITU-T M.3010] Recommendation ITU-T M.3010 (2000) and Amendments, *Principles for a telecommunications management network*

[ITU-T M.3013] Recommendation ITU-T M.3013 (2000), *Considerations for a telecommunications management network*.

[ITU-T M.3100] Recommendation ITU-T M.3100 (2005), *Generic network information model*.

[ITU-T X.700] Recommendation ITU-T X.700 (1992), *Management framework for Open Systems Interconnection (OSI) For CCITT Applications*.

[ITU-T X.701] Recommendation ITU-T X.701 (1997), *Information technology – Open Systems Interconnection – Systems management overview*.

[ITU-T X.733] Recommendation ITU-T X.733 (1992) and Amendments, *Information technology – Open Systems Interconnection – Systems Management: Alarm reporting function*.

[ITU-T X.735] Recommendation ITU-T X.735 (1992) and Amendments, Information technology – *Open Systems Interconnection – Systems management: Log control function*.

[ITU-T Y.1563] Recommendation ITU-T Y.1563 (2009), *Ethernet frame transfer and availability performance.*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 Local Craft Terminal: [ITU-T G.7710/Y.1701]

3.1.2 Management Application Function (MAF): [ITU-T G.7710/Y.1701]

3.1.3 Data Communication Network (DCN): [ITU-T G.7712/Y.1703]

3.1.4 Atomic Function (AF): [ITU-T G.806]

3.1.5 Management Point (MP): [ITU-T G.806]

3.1.6 Network Element (NE): [ITU-T M.3010]

3.1.7 Network Element Function (NEF): [ITU-T M.3010]

3.1.8 Operations System (OS): [ITU-T M.3010]

3.1.9 Q-Interface: [ITU-T M.3010]

3.1.10 Workstation Function (WF): [ITU-T M.3010]

3.1.11 Message Communication Function (MCF): [ITU-T M.3013]

3.1.12 Alarm reporting: [ITU-T M.3100]

3.1.13 Alarm Reporting Control (ARC): [ITU-T M.3100]

3.1.14 Managed entity: [ITU-T M.3100]

3.1.15 Management interface: [ITU-T M.3100]

3.1.16 Persistence interval: [ITU-T M.3100]

3.1.17 Operations System (OS): [ITU-T M.3100]

3.1.18 Operations System Function (OSF): [ITU-T M.3100]

3.1.19 Qualified problem: [ITU-T M.3100]

~~**3.1.20** Reset threshold report: [ITU-T M.3100]~~

~~**3.1.21** Threshold report: [ITU-T M.3100]~~

3.1.2~~0~~2 Timed interval: [ITU-T M.3100]

3.1.2~~1~~3 Managed Object (MO): [ITU-T X.700]

3.1.2~~2~~4 Agent: [ITU-T X.701]

3.1.2~~3~~5 Manager: [ITU-T X.701]

3.1.2~~4~~6 Managed Object Class (MOC): [ITU-T X.701]

3.2 Terms defined in this Recommendation

This Recommendation defines or specializes the following terms:

3.2.1 MPLS-TP Management Network (MT.MN): An MPLS-TP Management Network is a subset of a TMN that is responsible for managing those parts of a network element that contain MPLS-TP layer network entities. A MT.MN may be subdivided into a set of MPLS-TP Management SubNetworks.

3.2.2 MPLS-TP Management SubNetwork (MT.MSN): An MPLS-TP Management SubNetwork (MT.MSN) consists of a set of separate Embedded Control Channels (ECC) and associated intra-site data communication links which are interconnected to form a Data Communications Network (DCN) within any given MPLS-TP transport topology. For MPLS-TP, the physical channel supporting the ECC is the MPLS-TP Management Communication Channel (MCC) as defined in [ITU-T G.7712/Y.1703]. A MT.MSN represents a MPLS-TP specific Local Communication Network (LCN) portion of a network operator's overall Data Communication Network or TMN.

3.2.3 MPLS-TP Network Element (MT.NE): That part of a network element that contains entities from one or more MPLS-TP layer networks. A MT.NE may therefore be a standalone physical entity or a subset of a network element. It supports at least Network Element Functions (NEF) and may also support an Operations System Function (OSF). It contains Managed Objects (MO), a Message Communication Function (MCF) and a Management Application Function (MAF). The functions of a MT.NE may be contained within an NE that also supports other layer networks. These layer network entities are considered to be managed separately from MPLS-TP entities. As such they are not part of the MT.MN or MT.MSN.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations:

1SL	one-way synthetic loss [YT21]
AcSL	Accepted Signal Label
AF	Atomic Function
AIS	Alarm Indication Signal
ALM	ALarM reporting
ARC	Alarm Reporting Control
CLNE	Client Layer Network Entity
CP	Connection Point
CtrlP	Control Plane
DCN	Data Communication Network
ECC	Embedded Communication Channel
EMF	Equipment Management Function
FCAPS	Fault Management, Configuration Management, Account Management, Performance Management and Security Management
FFS	For Further Study
GNE	Gateway Network Element
IP	Internet Protocol
ITU-T	International Telecommunication Union – Telecommunication Standardization Sector
LAN	Local Area Network
LCN	Local Communication Network
LCT	Local Craft Terminal
MAF	Management Application Function
MCC	Management Communication Channel
MCF	Message Communication Function
MD	Mediation Device
MF	Mediation Function

MI	Management Information
MIB	Management Information Base
MN	Management Network
MO	Managed Object
MOC	Managed Object Class
MP	Management Point
MgmtP	Management Plane
MPLS	Multi-Protocol Label Switching
MPLS-TP	MPLS Transport Profile
MSN	Management SubNetwork
MT.C	MPLS-TP Channel layer [NOTE: Equivalent to MPLS-TP Transport service layer]
MT.MN	MPLS-TP MN
MT.MSN	MPLS-TP MSN
MT.NE	MPLS-TP NE
MT.P	MPLS-TP Path layer
MT.S	MPLS-TP Section layer
MTM-n	MPLS-TP Transport Module layer n
NALM	No ALaRm reporting
NALM-CD	No ALaRm reporting, Count Down
NALM-NR	No ALaRm reporting, Not Ready
NALM-QI	No ALaRm reporting, Qualified Inhibit
NALM-TI	No ALaRm reporting, Timed Inhibit
NE	Network Element
NEF	Network Element Function
NEL	Network Element Layer
OAM	Operations, Administration, Maintenance
OAM&P	Operations, Administration, Maintenance and Provisioning
OS	Operations System
OSF	Operations System Function
OSI	Open Systems Interconnection
PMC	Performance Monitoring Clock
QoS	Quality of Service
SCC	Signalling Communication Channel
SLNE	Server Layer Network Entity
RTC	Real Time Clock

RTR	Reset Threshold Report
TCM	Tandem Connection Monitoring
TMN	Telecommunication Management Network
TR	Threshold Report
WAN	Wide Area Network
WS	WorkStation
WTR	Wait To Restore

5 Conventions

In this Recommendation, MT.MN stands for MPLS-TP Management Network, MT.MSN for MPLS-TP Management Subnetwork, MT.NE for MPLS-TP NE, MT.C for MPLS-TP Channel layer, MT.P for MPLS-TP Path layer, and MT.S for MPLS-TP Section layer.

6 MPLS-TP management architecture

See [ITU-T G.7710] section 6 for the generic architecture for managing transport equipment. MPLS-TP specific management architecture is described below.

6.1 MPLS-TP network management architecture

The transport layer network architecture of MPLS-TP are described in [ITU-T G.8110.1/Y.1370.1]. The management of the MPLS-TP layer networks is separable from that of its client layer networks so that the same means of management can be used regardless of the client.

6.1.1 Relationship between TMN, MT.MN and MT.MSN

The MPLS-TP Management Network (MT.MN) may be partitioned into MPLS-TP Management SubNetworks (MT.MSNs). The inter-relationship between a management network, its subnetworks and a TMN as generically described in section 6 of [ITU-T G.7710/Y.1701] is applicable to MPLS-TP.

6.1.2 Access to the MT.MSN

See [ITU-T G.7710/Y.1701] section 6.1.2 for the generic requirements.

6.1.3 MT.MSN requirements

See [ITU-T G.7710/Y.1701] section 6.1.3 for the generic requirements.

In addition all MT.NEs must support Message Communication Functions (MCFs). The MCF of an MT.NE initiates/terminates (in the sense of the lower protocol layers), forwards, or otherwise processes management messages over MCCs, or over other DCN interfaces. In addition:

- All MT.NEs are required to terminate the MT.S-MCCs. In OSI terms, this means that each NE must be able to perform the functions of an end system.
- MT.NEs may also be required to forward management messages between ports according to routing control information held in the MT.NE. In OSI terms, this means that some MT.NEs may be required to perform the functions of an intermediate system.
- In addition to supporting interfaces for the MT.S-MCC, a MT.NE may also be required to support other DCN interfaces, which may include MT.P-MCCs or MT.C-MCCs or an Ethernet DCN interface.

The use of the MT.P-MCCs and MT.C-MCCs for management communications is within the scope of this Recommendation.

6.1.4 MT.MSN Data Communication Network

Refer to [ITU-T G.7710/Y.1701] section 6.1.4 for the generic requirements.

6.1.4.1 Management Communication Channel

The MT.MN supports three Management Communication Channels (MCCs):

1) MT.S-MCC (MCC_S)

2) MT.P-MCC (MCC_P)

3) MT.C-MCC (MCC_C)

The general MT.S-, MT.P-, and MT.C-MCCs are described in [ITU-T G.7712/Y.1703].

Figure 6-1 illustrates a network scenario consisting of two operators. Operator B provides an MT.P Service to operator A (i.e. Operator B transports the MT.P signal that begins and ends Operator A's domain). According to [ITU-T G.8110.1/Y.1370.1], the MCC_P and the MCC_C signals passed transparently through Operator B's network.

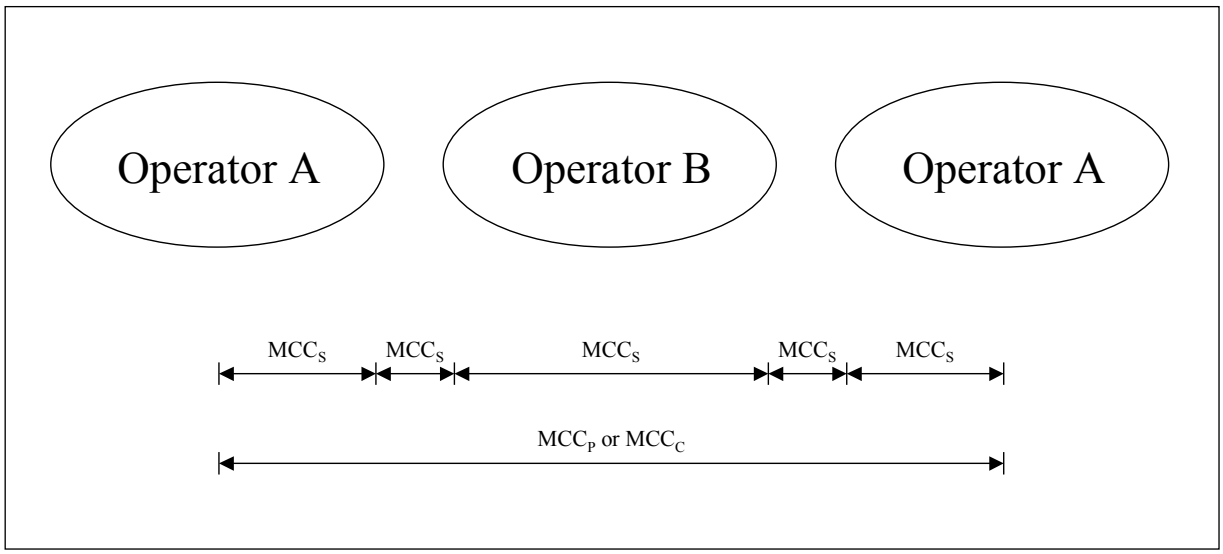


Figure 6-1/G.8151/Y.1374 – MCC scenarios

The physical layer is terminated in every network element and its related adaptation function provides the MT.S signals as well as the MCC_S. Hence, the MCC_S cannot cross administrative domains. In Figure 6-1, Figure 6-2, and Figure 6-3 illustrate scenarios where the MCC_P and MCC_C are transported transparently though Operator B's domain (the Operator B network elements are not shown in Figure 6-2 and Figure 6-3). In these scenarios it is possible that Operator B may use the MCC_S within its own domain for the management of its domain.

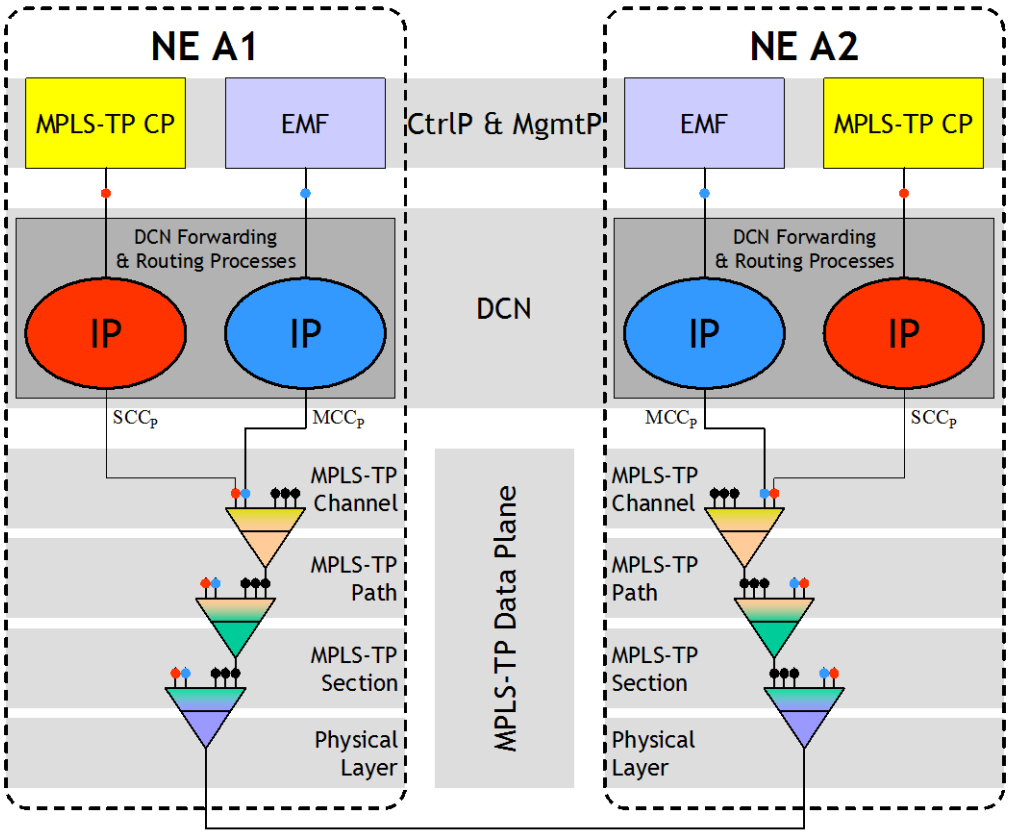


Figure 6-2/G.8151/Y.1374 – MCC$_P$ Scenario Example 1

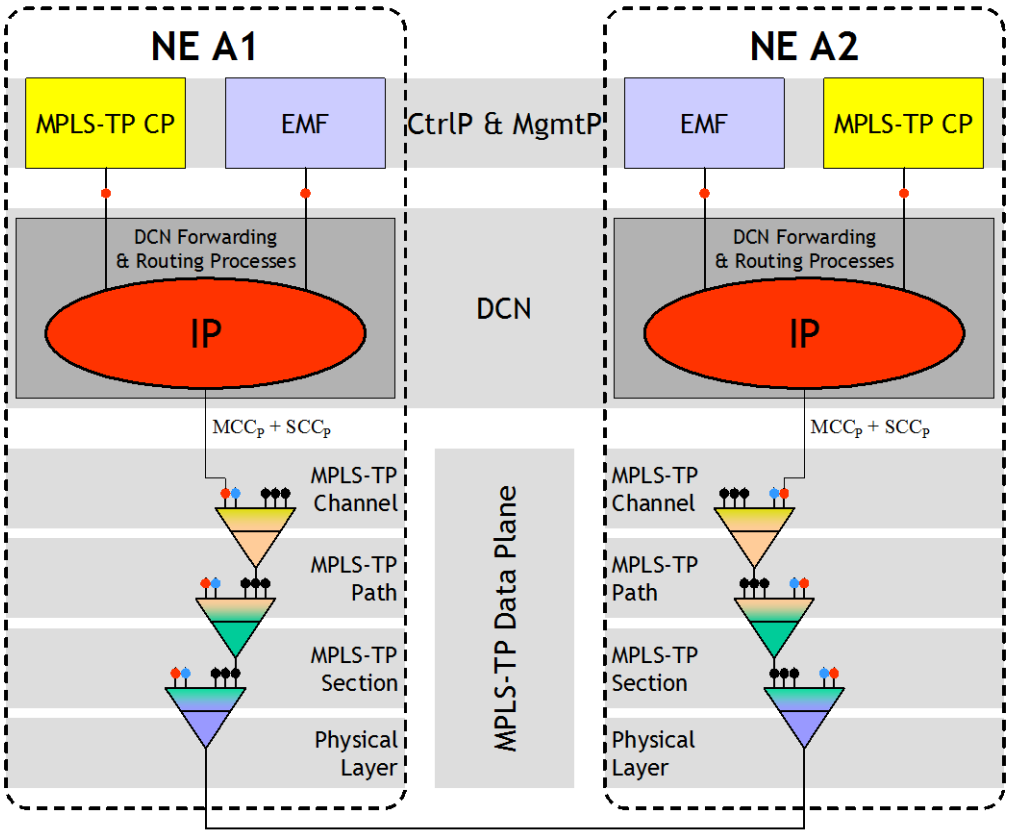


Figure 6-3/G.8151/Y.1374 – MCC$_P$ Scenario Example 2

6.1.4.2 MCC physical characteristics

The MT.S-, MT.C- and MT.P-MCCs are logical elements within the MPLS-TP Transport Module (MTM-n). The MCC provides general management communications between two MPLS-TP network elements with access to the MT.S, MT.P, and MT.C characteristic information respectively. The MT.S-, MT.P-, or MT.C-MCC is provided by the MPLS-TP OAM function at section, path, or channel layer as described in [ITU-T G.7712/Y.1703] or by any other ECC of the MPLS-TP transport network.

The MT.S Management Communication Channel (MCC$_S$) shall operate as a single message channel between MT.S termination points. The bit rate of the MCC$_S$ shall be configurable.

The MT.P Management Communication Channel (MCC$_P$) shall operate as a single message channel between any network elements that terminate the MT.P layer. The MCC$_P$ is transported transparently through MT.NEs that only terminates the MT.S layer and forwards the MT.P signal. The bit rate of the MCC$_P$ shall be configurable.

The MT.C Management Communication Channel (MCC$_C$) shall operate as a single message channel between any network elements that terminate the MT.C layer. The MCC$_C$ is transported transparently through MT.NEs that only terminates the MT.S layer or the MT.S and MT.P layers and forwards the MT.C signal. The bit rate of the MCC$_C$ shall be configurable..

6.1.4.3 MCC data link layer protocol

The MCC data link protocols for management applications are under study for [ITU-T G.7712/Y.1703].

6.1.5 Management of DCN

See [ITU-T G.7710/Y.1701] section 6.1.5 for the generic requirements.

6.1.6 Remote log-in

See [ITU-T G.7710/Y.1701] section 6.1.6 for the generic requirements.

6.1.7 Relationship between technology domains

See [ITU-T G.7710/Y.1701] section 6.1.7 for the generic requirements.

6.2 MPLS-TP equipment management architecture

This section provides an overview of the minimum functions which are required to support inter-vendor/network communications and single-ended maintenance of MT.NEs within an MSN, or between communicating peer MT.NEs across a network interface. Single-ended maintenance is the ability to access remotely located MT.NEs to perform maintenance functions (see the Performance Management Applications, section 10.1 of [ITU-T G.7710/Y.1701]).

It should be noted that the management functions have been categorized according to the classifications given in [ITU-T X.700].

Detailed specifications of the management functions, in terms of managed objects classes, attributes and message specification are for further study.

The MPLS-TP Equipment Management Function (EMF) (see Figure 6-4) provides the means through which the MPLS-TP Network Element Function (NEF) is managed by an internal or external manager. If a Network Element (NE) contains an internal manager, this manager will be part of the MPLS-TP EMF.

The MPLS-TP EMF interacts with the other atomic functions (refer to [ITU-T G.8121/Y.1381]) by exchanging information across the MP reference points. See [ITU-T G.806] and [ITU-T G.8121/Y.1381] for more information on Atomic Functions and on MPs. The MPLS-TP EMF contains a number of functions that provide a data reduction mechanism on the information received across the MP reference points. The outputs of these functions are available to the agent via the network element resources and Management Application Functions (MAF) which represent this information as managed objects.

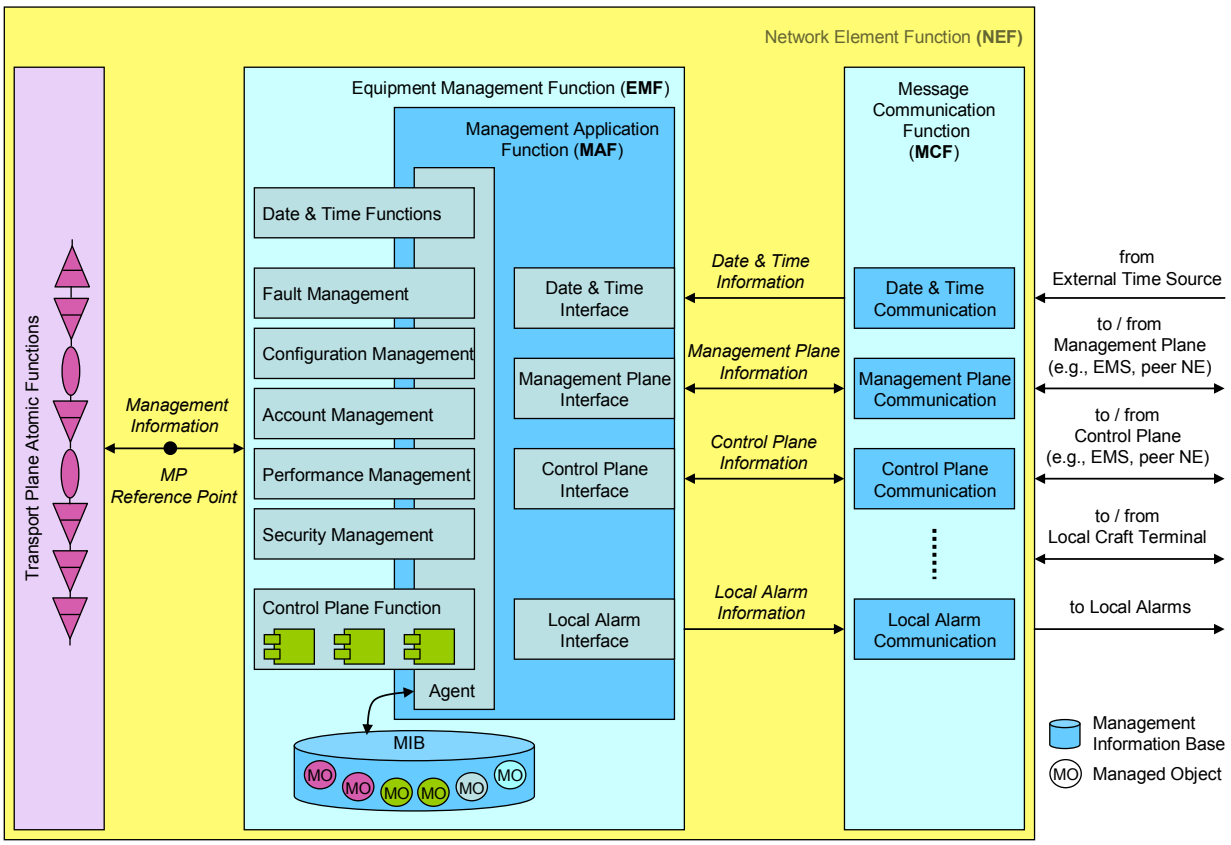


Figure 6.4/G.8151/Y.1374 –MPLS-TP Equipment Management Function

Network element resources provide event processing and storage. The MAF processes the information provided to and by the NE resources. The agent converts this information to management messages and responds to management messages from the manager by performing the appropriate operations on the managed objects.

This information to and from the agent is passed ~~across the V reference point~~ to the Message Communication Function (MCF).

6.3 Information flows over Management Points (MP)

The information flows described in this clause are functional. The existence of these information flows in the equipment will depend on the functionality provided by the MPLS-TP NE and the options selected.

The information flow over the MP reference points that arises from anomalies and defects detected in the atomic functions is described in specific details for each atomic function in [ITU-T G.8121/Y.1381].

The information flow over the MP reference points that arises from provisioning and reporting data is described in specific details for each atomic function in [ITU-T G.8121/Y.1381]. The information listed under the Input columns in the tables in clauses 9, 10, and 11 of [ITU-T G.8121/Y.1381], [ITU-T G.8121.1/Y.1381.1], and [ITU-T G.8121.2/Y.1381.2] refers to the provisioning data that is passed from the MPLS-TP EMF to the atomic functions. The information listed under the Output column of those tables refers to the reports passed to the MPLS-TP EMF from the atomic functions.

7 Fault (maintenance) Management

Fault Management is a set of functions which enables the detection, isolation and correction of abnormal operation of the telecommunication network and its environment. It provides facilities for the performance of the maintenance phases from [ITU-T M.20]. The quality assurance measurements for fault management include component measurements for reliability, availability and survivability.

7.1 Fault Management Applications

See [ITU-T G.7710/Y.1701] for a description of the basic Fault Management applications.

7.1.1 Supervision

The supervision process describes the way in which the actual occurrence of a disturbance or fault is analyzed with the purpose of providing an appropriate indication of performance and/or detected fault condition to maintenance personnel. The supervision philosophy is based on the concepts underlying the functional model of [ITU-T G.805], [ITU-T G.8110.1/Y.1370.1], and the Alarm Reporting Function of [ITU-T X.733].

The five basic supervision categories are related to transmission, quality of service, processing, equipment, and environment. These supervision processes are able to declare fault causes, which need further validation before the appropriate alarm is reported. See [ITU-T G.7710/Y.1701] for additional discussion of these categories.

The MT.NE shall indicate to the OS when a Termination Point is no longer able to supervise the signal (e.g. implementing equipment has a fault or loss of power).

7.1.1.1 Transmission Supervision

See clause 7.1.1.1 of [ITU-T G.7710/Y.1701] for a description of transmission supervision.

For MT.NE, the defects that must be monitored for the purpose of transmission supervision are defined in clause 6.1/G.8121.

The atomic function associated failure conditions are listed in clause 7.2.1.

7.1.1.2 Quality of Service Supervision

See [ITU-T G.7710/Y.1701] for a description of quality of service supervision.

7.1.1.3 Processing Supervision

See [ITU-T G.7710/Y.1701] for a description of processing supervision.

7.1.1.4 Hardware Supervision

See [ITU-T G.7710/Y.1701] for a description of equipment supervision.

7.1.1.5 Environment Supervision

See [ITU-T G.7710/Y.1701] for a description of environmental supervision.

7.1.2 Validation

See [ITU-T G.7710/Y.1701] for a description of fault cause validation.

7.1.3 Alarm Handling

7.1.3.1 Severity Assignment

See [ITU-T G.7710/Y.1701] for a description of severity categories.

7.1.3.2 Alarm Reporting Control

Alarm Reporting Control (ARC) provides an automatic in-service provisioning capability.

The following ARC states may be specified for a managed entity:

ALM ALarM reporting; Alarm reporting is turned on.

NALM No ALarM reporting; Alarm reporting is turned off.

NALM-CD No ALarM reporting, CountDown; This is a substate of NALM-QI and performs the persistence timing countdown function when the managed entity is qualified problem free.

NALM-NR No ALarM reporting, NotReady; This is a substate of NALM-QI and performs a wait function until the managed entity is qualified problem free.

NALM-QI No ALarM reporting, Qualified Inhibit; Alarm reporting is turned off until the managed entity is qualified problem free for a specified persistence interval.

NALM-TI No ALarM reporting, Timed Inhibit; Alarm Reporting is turned off for a specified timed interval.

Alarm reporting may be turned off (using NALM, NALM-TI, or NALM-QI) on a per-managed entity basis to allow sufficient time for customer testing and other maintenance activities in an "alarm free" state. Once a managed entity is ready, alarm reporting is automatically turned on (to ALM). The managed entity may be automatically turned on either by using NALM-TI or NALM-QI and allowing the resource to transition out automatically, or by invoking first the NALM state from an EMS and when maintenance activity is done, invoking the ALM state. This later automation is carried out by the EMS. For further details relating to ARC, see [ITU-T M.3100].

7.1.3.3 Reportable Failures

See [ITU-T G.7710/Y.1701] for a description of reportable failures.

7.1.3.4 Alarm Reporting

Alarm surveillance is concerned with the detection and reporting of relevant events and conditions which occur in the network. In a network, events and conditions detected within the equipment and incoming signals should be reportable. In addition, a number of events external to the equipment should also be reportable. Alarms are indications that are automatically generated by an NE as a result of the declaration of a failure. The OS shall have the ability to define which events and conditions generate autonomous reports, and which shall be reported on request.

The following alarm-related functions shall be supported:

1. Autonomous reporting of alarms;
2. Request for reporting of all alarms;
3. Reporting of all alarms;
4. Allow or inhibit of autonomous alarm reporting;
5. Reporting on request status of allow or inhibit alarm reporting;

6. Reporting of protection switch events.

7.1.3.4.1 Local Reporting

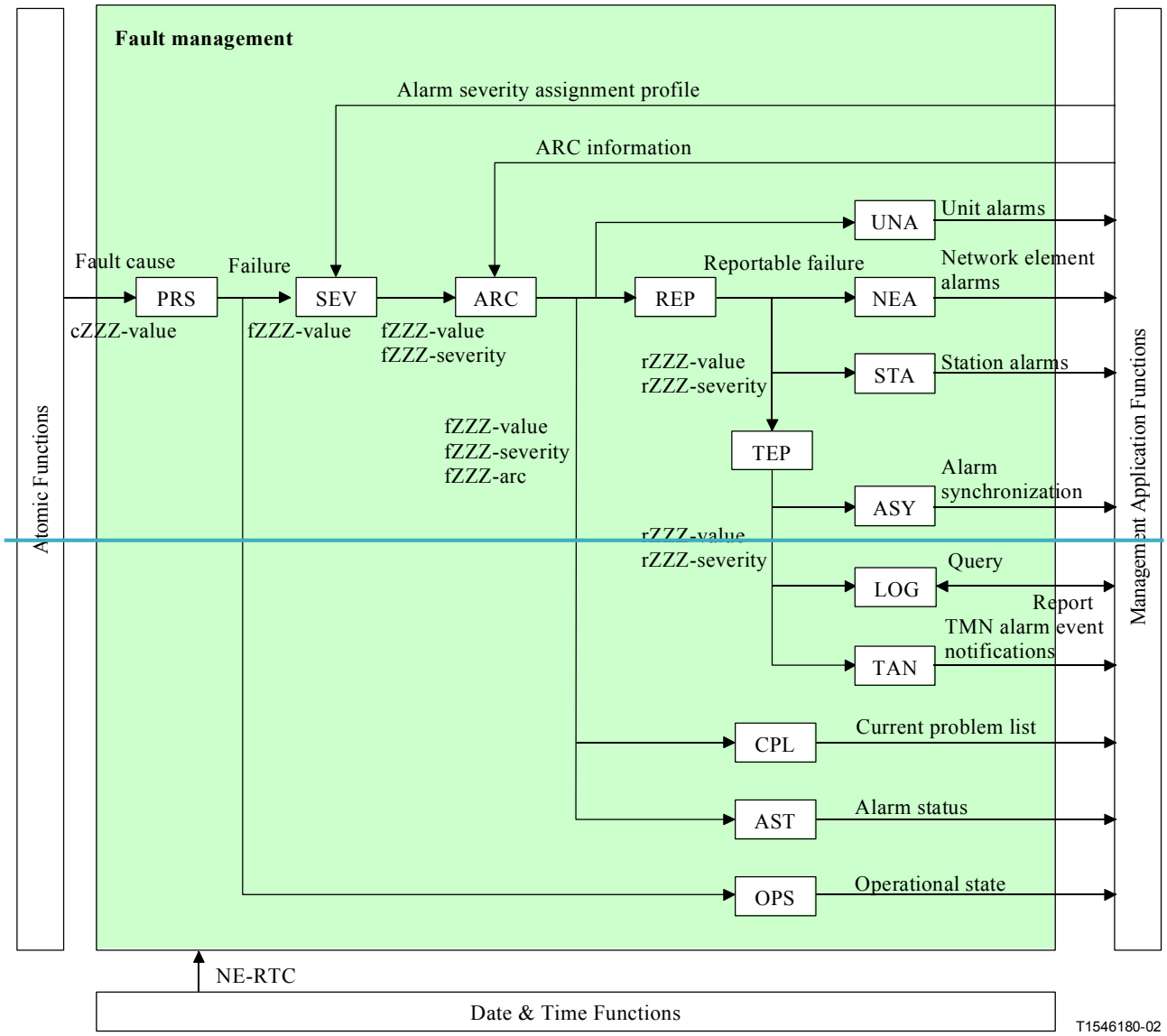
See [ITU-T G.7710/Y.1701] for a description of local reporting.

7.1.3.4.2 TMN Reporting

See [ITU-T G.7710/Y.1701] for a description of TMN reporting.

7.2 Fault Management functions

Figure 7-1 contains the functional model of Fault Management inside the MPLS-TP EMF. This model is consistent with the alarm flow functional model, specified in [ITU-T M.3100]. It must be noted that it does not address configuration aspects relating to Fault Management, the full ARC functional model, nor does it define where all possible event report parameters get assigned. Figure 7-1 is intended only to illustrate which well-known functions are impacted by ARC, and which are not, and to provide a generalized alarm flow view.


Fault management
Alarm severity assignment profile
ARC information
Atomic Functions
Management Application Functions
Fault cause
Failure
Reportable failure
PRS
SEV
ARC
REP
UNA
NEA
STA
TEP
ASY
LOG
TAN
CPL
AST
OPS
Unit alarms
Network element alarms
Station alarms
Alarm synchronization
Query
Report
TMN alarm event notifications
Current problem list
Alarm status
Operational state
cZZZ-value
fZZZ-value
fZZZ-value
fZZZ-severity
rZZZ-value
rZZZ-severity
fZZZ-value
fZZZ-severity
fZZZ-arc
rZZZ-value
rZZZ-severity
NE-RTC
Date & Time Functions
T1546180-02

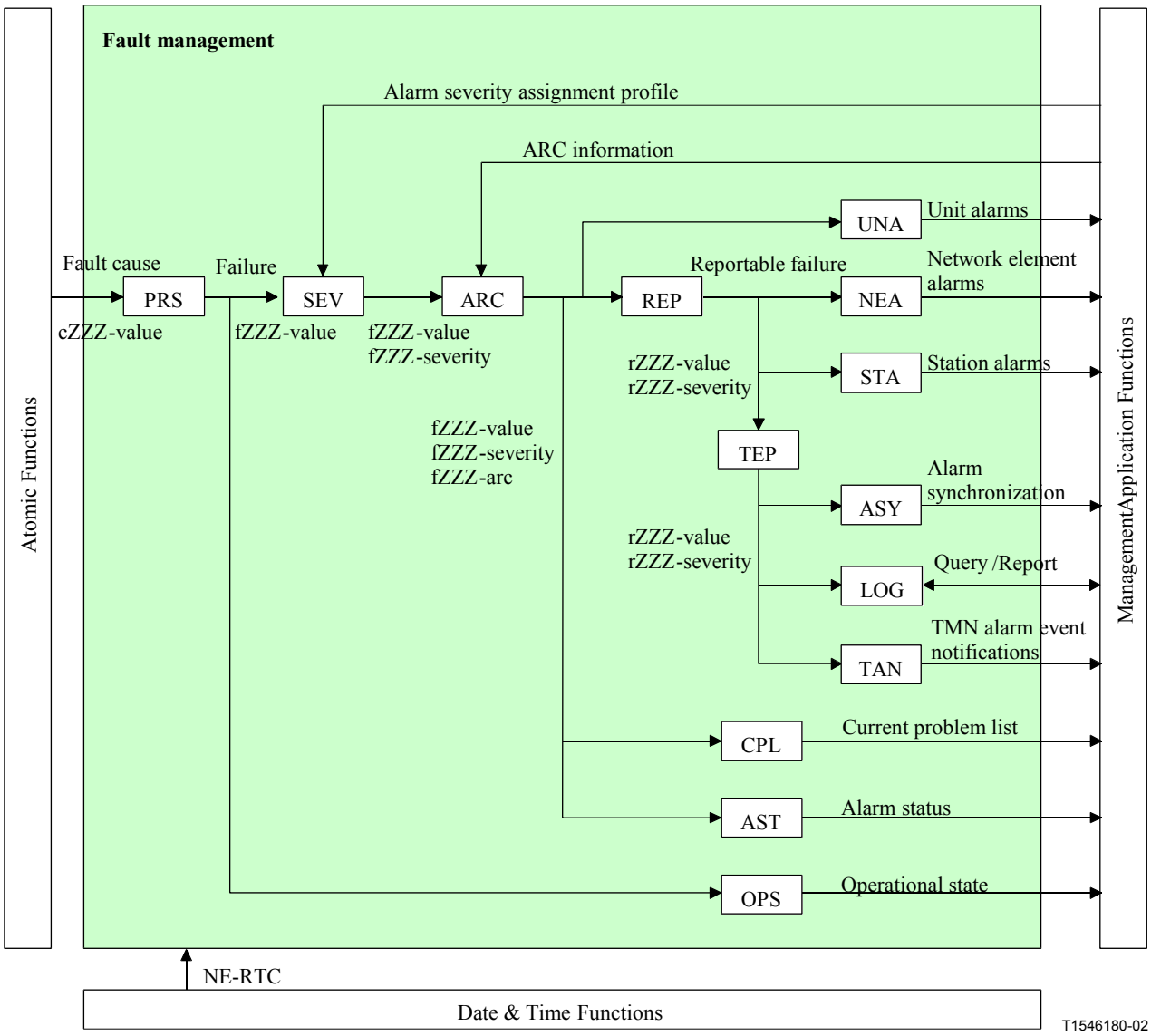


Figure 7-1/G.8151/Y.1374– Fault management within the MPLS-TP NEF

7.2.1 Fault Cause Persistency function – PRS

The defect correlations provide a data reduction mechanism on the fault and performance monitoring primitives' information presented at the MP reference points.

The equipment management function within the network element performs a persistency check on the fault causes (that are reported across the MP reference points) before it declares a fault cause a failure. In addition to the transmission failures, hardware failures with signal transfer interruption are also reported at the input of the fault cause function for further processing. See Figure 7-2.

Symbol

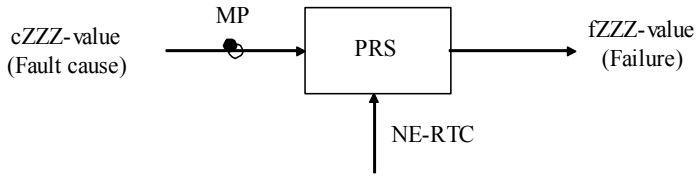


Figure 7-2/G.8151/Y.1374– Fault Cause Persistency function

For MT.NE that supports the following functions specified in [ITU-T G.8121/Y.1381], the EMF PRS process shall support the persistency check for the fault causes listed in Table 7-1.

Inputs and outputs

Table 7-1/G.8151/Y.1374– Inputs/outputs for the fault cause persistency function

Atomic Function (G.8121)	**Input**	**Output**
MT_C	cFOP-PMb cFOP-PMc cFOP-CM cFOP-NR cFOP-TO	fFOP-PMb fFOP-PMc fFOP-CM fFOP-NR fFOP-TO
MTp_C	cFOP-PMb cFOP-PMc cFOP-CM cFOP-NR cFOP-TO	fFOP-PMb fFOP-PMc fFOP-CM fFOP-NR fFOP-TO
MT_TT_Sk	cSSF cLCK cLOC cMMG cUNM cUNP cUNC cDEG cRDI	fSSF fLCK fLOC fMMG fUNM fUNP fUNC fDEG fRDI
Sn/MT_A_Sk	cPLM cLFD cEXM cUPM	fPLM fLFD fEXM fUPM
Sn-X-L/MT_A_Sk	cPLM cLFD cEXM cUPM	fPLM fLFD fEXM fUPM
Sm/MT_A_Sk	cPLM cLFD cEXM cUPM	fPLM fLFD fEXM fUPM

Atomic Function (G.8121)	**Input**	**Output**
Sm-X-L/MT_A_Sk	cPLM cLFD cEXM cUPM	fPLM fLFD fEXM fUPM
Pq/MT_A_Sk	cPLM cLFD cEXM cUPM	fPLM fLFD fEXM fUPM
Pq-X-L/MT_A_Sk	cPLM cLFD cEXM cUPM	fPLM fLFD fEXM fUPM
ODUkP/MT_A_Sk	cPLM cLFD cEXM cUPM	fPLM fLFD fEXM fUPM
~~ODUkP-X-L/MT_A_Sk~~	~~cVcPLM~~ ~~cLFD~~ ~~cEXM~~ ~~cUPM~~	~~fVcPLM~~ ~~fLFD~~ ~~fEXM~~ ~~fUPM~~
ODUkP-h/MT_A_Sk	cPLM cLFD cEXM cUPM	fPLM fLFD fEXM fUPM

See [ITU-T G.7710] for the mapping of failure (fXXX) to the generic probable cause to be used in alarm reporting.

Process

The equipment management function within the network element performs a persistency check on the fault causes before it declares a fault cause a failure.

A transmission failure (fXXX) shall be declared if the fault cause persists continuously for 2.5 ± 0.5 s. The failure shall be cleared if the fault cause is absent continuously for 10 ± 0.5 s.

The specific set of failures associated with each atomic function is listed in Table 7-1.

The failure declaration and clearing shall be time stamped. The time-stamp shall indicate the time at which the fault cause is activated at the input of the fault cause persistency (i.e. defect-to-failure integration) function, and the time at which the fault cause is deactivated at the input of the fault cause persistency function.

7.2.2 Severity Assignment function – SEV

See [ITU-T G.7710/Y.1701] for a description of the severity assignment function.

7.2.3 Alarm Reporting Control function – ARC

The Alarm Report Control (ARC) function allows a Management System to control the alarm reporting on a managed entity basis as defined in [ITU-T M.3100].

The alarms that can be controlled with this function are defined for each atomic function in [ITU-T G.8121/Y.1381].

The following ARC states may be specified for a managed entity:

ALM ALarM reporting; Alarm reporting is turned on.

NALM No ALarM reporting; Alarm reporting is turned off.

NALM-CD No ALarM reporting, CountDown; This is a substate of NALM-QI and performs the persistence timing countdown function when the managed entity is qualified problem free.

NALM-NR No ALarM reporting, NotReady; This is a substate of NALM-QI and performs a wait function until the managed entity is qualified problem free.

NALM-QI No ALarM reporting, Qualified Inhibit; Alarm reporting is turned off until the managed entity is qualified problem free for a specified persistence interval.

NALM-TI No ALarM reporting, Timed Inhibit; Alarm Reporting is turned off for a specified timed interval.

The ALM state is required for all managed entities that can detect alarms.

In addition at least one of the states: NALM, NALM-TI, or NALM-QI must be supported.

If NALM-QI is supported, then NALM-NR is required and NALM-CD is optional.

For MT.NE that supports the following functions specified in [ITU-T G.8121/Y.1381], the EMF ARC process shall support the ARC function for the failures listed in Table 7-2.

Table 7-2/G.8151/Y.1374– ARC specifications for MPLS-TP

Atomic Function	Qualified Problems	QoS Reporting	Default State Value
MT_C	fFOP-PMb fFOP-PMc fFOP-CM fFOP-NR fFOP-TO	FFS	ALM
MTp_C	fFOP-PMb fFOP-PMc fFOP-CM fFOP-NR fFOP-TO	FFS	ALM
MT_TT_Sk	fSSF fLCK fLOC fMMG fUNM fUNP fUNC fDEG fRDI	FFS	ALM
Sn/MT_A_Sk	fPLM fLFD	FFS	ALM

Atomic Function	Qualified Problems	QoS Reporting	Default State Value
	fEXM fUPM		
Sn-X-L/MT_A_Sk	fPLM fLFD fEXM fUPM	FFS	ALM
Sm/MT_A_Sk	fPLM fLFD fEXM fUPM	FFS	ALM
Sm-X-L/MT_A_Sk	fPLM fLFD fEXM fUPM	FFS	ALM
Pq/MT_A_Sk	fPLM fLFD fEXM fUPM	FFS	ALM
Pq-X-L/MT_A_Sk	fPLM fLFD fEXM fUPM	FFS	ALM
ODUkP/MT_A_Sk	fPLM fLFD fEXM fUPM	FFS	ALM
~~ODUkP-X-L/MT_A_Sk~~	~~fVcPLM~~ ~~fLFD~~ ~~fEXM~~ ~~fUPM~~	~~FFS~~	~~ALM~~
ODUkP-h/MT_A_Sk	fPLM fLFD fEXM fUPM	For further study	ALM

7.2.4 Reportable Failure function – REP

See [ITU-T G.7710/Y.1701] for a description of the reportable failure function.

7.2.5 Unit Alarms function – UNA

See [ITU-T G.7710/Y.1701] for a description of the unit alarms function.

7.2.6 Network Element Alarms function – NEA

See [ITU-T G.7710/Y.1701] for a description of the network element alarms function.

7.2.7 Station Alarms function – STA

See [ITU-T G.7710/Y.1701] for a description of the station alarms function.

7.2.8 TMN Event Pre-processing function – TEP

See [ITU-T G.7710/Y.1701] for a description of the TMN event pre-processing function.

7.2.9 Alarm Synchronization function – ASY

See [ITU-T G.7710/Y.1701] for a description of the alarm synchronization function.

7.2.10 Logging function – LOG

Alarm history management is concerned with the recording of alarms. Historical data shall be stored in registers in the NE. Each register contains all the parameters of an alarm message.

Registers shall be readable on demand or periodically. The OS can define the operating mode of the registers as wrapping or stop when full. The OS may also flush the registers or stop recording at any time.

NOTE – Wrapping is the deletion of the earliest record to allow a new record when a register is full. Flushing is the removal of all records in the register. See [ITU-T X.735] for additional details.

See [ITU-T G.7710/Y.1701] for a description of the logging function.

7.2.11 TMN Alarm Event Notification function – TAN

See [ITU-T G.7710/Y.1701] for a description of the TMN alarm event notification function.

7.2.12 Current Problem List function – CPL

See [ITU-T G.7710/Y.1701] for a description of the current problem list function

7.2.13 Alarm Status function – AST

See [ITU-T G.7710/Y.1701] for a description of the alarm status function.

7.2.14 Operational State function – OPS

See [ITU-T G.7710/Y.1701] for a description of the operational state function.

For MT.NE that supports the following functions specified in [ITU-T G.8121/Y.1381], the EMF OPS process shall support the failures listed in Table 7-3, which lists the failures that could influence the operational state of the related objects.

Table 7-3/G.8151/Y.1374– Operational State Function Input and Output Signals for MPLS-TP

Atomic Function	Failure input (fZZZ-value)	Operational State output (Enabled/Disabled)
MT_C	fFOP-PMb fFOP-PMc fFOP-CM fFOP-NR fFOP-TO	Enabled Enabled Enabled Enabled Enabled
MTp_C	fFOP-PMb fFOP-PMc	Enabled Enabled

	fFOP-CM fFOP-NR fFOP-TO	Enabled Enabled Enabled
MT_TT_Sk	fSSF fLCK fLOC fMMG fUNM fUNP fUNC fDEG fRDI	Enabled Enabled Enabled Enabled Enabled Enabled Enabled Enabled Enabled
Sn/MT_A_Sk	fPLM fLFD fEXM fUPM	Enabled Enabled Enabled Enabled
Sn-X-L/MT_A_Sk	fPLM fLFD fEXM fUPM	Enabled Enabled Enabled Enabled
Sm/MT_A_Sk	fPLM fLFD fEXM fUPM	Enabled Enabled Enabled Enabled
Sm-X-L/MT_A_Sk	fPLM fLFD fEXM fUPM	Enabled Enabled Enabled Enabled
Pq/MT_A_Sk	fPLM fLFD fEXM fUPM	Enabled Enabled Enabled Enabled
Pq-X-L/MT_A_Sk	fPLM fLFD fEXM fUPM	Enabled Enabled Enabled Enabled
ODUkP/MT_A_Sk	fPLM fLFD fEXM fUPM	Enabled Enabled Enabled Enabled
~~ODUkP-X-L/MT_A_Sk~~	~~fVcPLM~~ ~~fLFD~~ ~~fEXM~~ ~~fUPM~~	~~Enabled~~ ~~Enabled~~ ~~Enabled~~ ~~Enabled~~
ODUkP-h/MT_A_Sk	fPLM fLFD fEXM fUPM	Enabled Enabled Enabled Enabled

7.2.15 External Events

For further study

8 Configuration management

See [ITU-T G.7710/Y.1701] for the generic requirements for configuration management. MPLS-TP specific specifications, if needed, are explicitly described.

8.1 Hardware

See [ITU-T G.7710/Y.1701] for a description of hardware management.

8.2 Software

See [ITU-T G.7710/Y.1701] for a description of software management.

8.3 Protection Switching

See [ITU-T G.7710/Y.1701] for a description of the generic management requirements for protection switching. The MPLS-TP specific management requirements will be provided after the protection switching process is defined in G.8121.

8.4 Trail Termination

See [ITU-T G.7710/Y.1701] for a description of trail termination management.

This function allows a user to provision and monitor the operation of the MPLS-TP Trail Termination process.

The MI signals listed in the table(s) of this subclause are communicated between the EMF and the MPLS-TP Trail Termination process across the management point within the MT.NE.

For MT.NE that supports the MT_TT function specified in [ITU-T G.8121/Y.1381], the EMF shall support the following management functions for the MI listed in Table 8-1:

- Provisioning the trail termination management information
- Retrieving the trail termination management information
- Notifying the changes of the trail termination management information
- Receiving the monitored trail termination management information

Table[YT3] **8-1/G.8151/Y.1374 – Provisioning and reporting for termination functions**

MI Signal	Value Range	Default Value
MT_TT_So Provisioning		
MT_TT_So_MI_GAL_Enable	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study. ▪

MI Signal	Value Range	Default Value
MT_TT_So_MI_TTLVALUE	0..255	255
MT_TT_So_MI_MEG_ID	String; values are OAM protocol-specific	Note-1
MT_TT_So_MI_MEP_ID	String; values are OAM protocol-specific	Note-1
MT_TT_So_MI_CC_OAM_Tool	G.8113.1, G.8113.2	N/A
MT_TT_So_MI_RDI_OAM_Tool	G.8113.1, G.8113.2	N/A
MT_TT_So_MI_CC_Enable	true, false	false
MT_TT_So_MI_CVp_Enable	true, false Note: The combination of MT_TT_So_MI_CC_Enable =false and MT_TT_So_MI_CVp_Enable=true is not allowed.	false
MT_TT_So_MI_CC_CoS	0, 1, 2, 3, 4, 5, 6, 7	7
MT_TT_So_MI_CC_Period	3.33 msec, 10 msec, 100 msec, 1sec, 10 sec, 1 min, 10 min	100 msec
MT_TT_So_MI_1LMp_Enable	true, false	false
MT_TT_So_MI_LMp_OAM_Tool[1... M_{LMp}]	G.8113.1, G.8113.2	N/A
MT_TT_So_MI_LMp_Enable[1... M_{LMp}]	true, false	false
MT_TT_So_MI_LMp_Period[1... M_{LMp}]	100ms, 1s, 10s	100ms
MT_TT_So_MI_LMp_CoS[1... M_{LMp}]	0, 1, 2, 3, 4, 5, 6, 7	--
MT_TT_So_MI_DMp_OAM_Tool[1... M_{DMp}]	G.8113.1, G.8113.2	N/A
MT_TT_So_MI_DMp_Enable[1... M_{DMp}]	true, false	false
MT_TT_So_MI_DMp_Period[1... M_{DMp}]	100ms, 1s, 10s	100ms
MT_TT_So_MI_DMp_Test_ID[1... M_{DMp}]	-- (Note 2)	--
MT_TT_So_MI_DMp_CoS[1... M_{DMp}]	0, 1, 2, 3, 4, 5, 6, 7	--
MT_TT_So_MI_DMp_Length[1... M_{DMp}]	Non-negative integer representing number of bytes for the length of the padding TLV.	0
MT_TT_So_MI_1DMp_OAM_Tool[1... M_{1DMp}]	G.8113.1, G.8113.2	N/A
MT_TT_So_MI_1DMp_Enable[1... M_{1DMp}]	true, false	false
MT_TT_So_MI_1DMp_Period[1... M_{1DMp}]	100ms, 1s, 10s	100ms
MT_TT_So_MI_1DMp_Test_ID[1... M_{1DMp}]	-- (Note 2)	--
MT_TT_So_MI_1DMp_CoS[1... M_{1DMp}]	0, 1, 2, 3, 4, 5, 6, 7	--
MT_TT_So_MI_1DMp_Length[1... M_{1DMp}]	Non-negative integer representing number of bytes for the length of the padding TLV.	0

MI Signal	Value Range	Default Value
MT_TT_So_MI_SLp_OAM_Tool[1... M_{SLp}]	G.8113.1, G.8113.2	N/A
MT_TT_So_MI_SLp_Enable[1... M_{SLp}]	true, false	false
MT_TT_So_MI_SLp_Period[1... M_{SLp}]	100ms, 1s, 10s	100ms
MT_TT_So_MI_SLp_Test_ID[1... M_{SLp}]	-- (Note 2)	--
MT_TT_So_MI_SLp_CoS[1... M_{SLp}]	0, 1, 2, 3, 4, 5, 6, 7	--
MT_TT_So_MI_SLp_Length[1... M_{SLp}]	Non-negative integer representing number of bytes for the length of the padding TLV.	0
MT_TT_So_MI_1SLp_OAM_Tool[1...M_{1SLp}]	G.8113.1, G.8113.2	N/A
MT_TT_So_MI_1SLp_Enable[1...M_{1SLp}]	true, false	false
MT_TT_So_MI_1SLp_Period[1...M_{1SLp}]	100ms, 1s, 10s	100ms
MT_TT_So_MI_1SLp_CoS[1...$M1_{1SLp}$]	0, 1, 2, 3, 4, 5, 6, 7	--
MT_TT_So_MI_1SLp_Test_ID[1...M_{1SLp}]	-- (Note 2)	--
MT_TT_So_MI_1SLp_Length[1...M_{1SLp}]	Non-negative integer representing number of bytes for the length of the padding TLV.	0
MT_TT_Sk Provisioning		
MT_TT_Sk_MI_GAL_Enable	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study.
MT_TT_Sk_MI_MEG_ID	String; values are OAM protocol-specific	Note-2
MT_TT_Sk_MI_ PeerMEP_ID	String; values are OAM protocol-specific	Empty list
MT_TT_Sk_MI_CC_OAM_Tool	G.8113.1, G.8113.2	N/A
MT_TT_Sk_MI_RDI_OAM_Tool	G.8113.1, G.8113.2	N/A
MT_TT_Sk_MI_CC_Enable	true, false	false
MT_TT_Sk_MI_CVp_Enable	true, false Note: The combination of MT_TT_Sk_MI_CC_Enable =false and MT_TT_Sk_MI_CVp_Enable=true is not allowed.	false
MT_TT_Sk_MI_CC_Period	3.33 msec, 10 msec, 100 msec, 1sec, 10 sec, 1 min, 10 min	100 msec
MT_TT_Sk_MI_CC_CoS	0, 1, 2, 3, 4, 5, 6, 7	7

MI Signal	Value Range	Default Value
MT_TT_Sk_MI_1LMp_Enable	true, false	false
MT_TT_Sk_MI_Get_SvdCC	Last received CC frame(s) that caused defect	--
MT_TT_Sk_MI_LMp_OAM_Tool[1... M_{LMp}]	G.8113.1, G.8113.2	N/A
MT_TT_Sk_MI_LMp_Enable[1... M_{LMp}]	true, false	false
MT_TT_Sk_MI_LMp_CoS[1... M_{LMp}]	0, 1, 2, 3, 4, 5, 6, 7	--
MT_TT_Sk_MI_LM_DEGM	2-10; See Table 7-1/G.806	10
MT_TT_Sk_MI_LM_M	2-10	10
MT_TT_Sk_MI_LM_DEGTHR	0% .. 100%; See Table 7-1/G.806	30%
MT_TT_Sk_MI_LM_TFMIN	FFS	FFS
MT_TT_Sk_MI_1second	--	--
MT_TT_Sk_MI_DMp_OAM_Tool[1... M_{DMp}]	G.8113.1, G.8113.2	N/A
MT_TT_Sk_MI_DMp_Enable[1… M_{DMp}]	true, false	false
MT_TT_Sk_MI_DMp_CoS[1… M_{DMp}]	0, 1, 2, 3, 4, 5, 6, 7	--
MT_TT_Sk_MI_1DMp_OAM_Tool[1... M_{1DMp}]	G.8113.1, G.8113.2	N/A
MT_TT_Sk_MI_1DMp_Enable[1...M_{1DMp}]	true, false	false
MT_TT_Sk_MI_1DMp_Test_ID[1...M_{1DMp}]	-- (Note 2)	--
MT_TT_Sk_MI_SLp_OAM_Tool[1… M_{SLp}]	G.8113.1, G.8113.2	N/A
MT_TT_Sk_MI_SLp_Enable[1… M_{SLp}]	true, false	false
MT_TT_Sk_MI_SLp_CoS[1… M_{SLp}]	0, 1, 2, 3, 4, 5, 6, 7	--
MT_TT_Sk_MI_1SLp_OAM_Tool[YT4]	G.8113.1, G.8113.2	N/A
MT_TT_Sk_MI_1SLp_Enable[1… M_{1SLp}]	true, false	false
MT_TT_Sk_MI_1SLp_Test_ID[1… M_{1SLp}]	-- (Note 2)	--
MT_TT_Sk_MI_AIS_OAM_Tool	G.8113.1, G.8113.2	N/A
MT_TT_Sk_MI_LCK_OAM_Tool	G.8113.1, G.8113.2	N/A
MT_TT_Sk Reporting		
MT_TT_Sk_MI_SvdCC	Last received CC packet(s) that causes the defect	--

Note-1: A value must be provided at provisioning.

Nore-2: The Test ID field is optional when this proactive measurement tool is used.

8.4.1 Trail Termination – G.8121.1 Specific

For MT.NE that supports the MT_TT function specified in [ITU-T G.8121.1/Y.1381.1], there[YT5] is no additional MI to be managed beyond those listed in Table 8-2 above.~~the EMF shall in addition support the management of the MIs listed in Table 8-1.1:~~

~~**Table 8-1.1/G.8151/Y.1374 – Provisioning and reporting for termination functions**~~

~~MI Signal~~	~~Value Range~~	~~Default Value~~
~~MT_TT_So Provisioning~~		
~~MT_TT_So_MI_LMC_Enable~~	~~true, false~~	~~false~~
~~MT_TT_Sk Provisioning~~		
~~MT_TT_Sk_MI_LMC_Enable~~	~~true, false~~	~~false~~

Note: In [ITU-T G.8121.1/Y1381.1], MI_LMC_Enable and MI_LML_Enable are used to mean MI_1LMp_Enable and MI_LMp_Enable as described in [ITU-T G.8121/Y.1381].

8.4.2 Trail Termination – G.8121.2 Specific

For MT.NE that supports the MT_TT function specified in [ITU-T G.8121.2/Y.1381.2], the EMF shall in addition support the management of the MIs listed in Table 8-1.2:

Table 8-1.2/G.8151/Y.1374 – Provisioning and reporting for termination functions

MI Signal	Value Range	Default Value
MT_TT_So Provisioning		
MT_TT_So_MI_CCCV_Mode[]	Coord, Src, Sink	Coord
MT_TT_So_MI_Local_Discr[]	32-bit value	0
MT_TT_So Reporting		
MT_TT_So_MI_DMp_PeriodChanged[1...MDMp]	true, false	false
MT_TT_So_MI_LMp_PeriodChanged[1...MLMp]	true, false	false
MT_TT_Sk Provisioning		
MT_TT_Sk_MI_CCCV_Mode[]	Coord, Src, Sink	Coord
MT_TT_Sk_MI_Remote_Discr[]	32-bit value	0
MT_TT_Sk_MI_PeerMEPID[]		
MT_TT_Sk_MI_DMp_CopyPad[1...MDMp]	0,128	0
MT_TT_Sk_MI_LMp_LMType[1...MLMp]	ILM, DLM	
MT_TT_Sk_MI_LMp_CountBytes[1...MLMp]	true, false	true
MT_TT_Sk_MI_PM_ClearError	- -	- -
MT_TT_Sk_MI_PM_Responder_Enable	true, false	true
MT_TT_Sk Reporting		

MI Signal	Value Range	Default Value
MT_TT_Sk_MI_DMp_ReportError(Error)[1... MDMp]	true, false	false
MT_TT_Sk_MI_LMp_ReportError(Error)[1... MLMp]	true, false	false

~~Note 1: A value must be provided at provisioning.~~

8.5 Adaptation

See section 8.5 of [ITU-T G.7710/Y.1701] for a description of adaptation management.

An Access Point that has multiple adaptation functions connected to it, thereby allowing different clients to be transported via the server signal, requires a mechanism for the selection of the active client.

This function allows a user to provision and monitor the operation of the MPLS-TP Adaptation processes.

The MI signals listed in the following table are communicated between the EMF and the Adaptation processes across the management point within the MPLS-TP NE.

For MT.NE that supports the adaptation functions specified in [ITU-T G.8121/Y.1381], the EMF shall support the following management functions for the MI listed in Table 8-2 below:

- Provisioning the flow forwarding management information
- Retrieving the flow forwarding management information
- Notifying the changes of the flow forwarding management information

Table[YT6] 8-2/G.8151/Y.1374 – Provisioning and reporting for adaptation functions

MI Signal	Value Range	Default Value
MT/MT_A_So Provisioning		
MT/MT_A_So_MI_Admin_State	LCK, Normal	Normal
MT/MT_A_So_MI_Label [1…M]	16 to (2**20)-1	Note-2
MT/MT_A_So_MI_LSPType[1…M]	E-LSP, L-LSP	Note-1
MT/MT_A_So_MI_CoS[1…M]	Note-1	Note-1
MT/MT_A_So_MI_PHB2EXPMapping[1…M]	Note-1	Note-1
MT/MT_A_So_MI_QoSEncodingMode[1…M]	A, B (Note-4)	Note-2
MT/MT_A_So_MI_Mode	Mode 1, Mode 2	Mode 1
MT/MT_A_So_MI_LCK_OAM_Tool[1...M]	G.8113.1, G.8113.2	N/A
MT/MT_A_So_MI_LCK_Period[1…M]	1 s, 1 min	1 s
MT/MT_A_So_MI_LCK_CoS[1…M]	0..7	7
MT/MT_A_So_MI_APS_OAM_Tool[1...M]	FFS	FFS
MT/MT_A_So_MI_APS_CoS[1...M]	0..7	7
MT/MT_A_So_MI_GAL_Enable[1...M]	true, false	Note: MI_GAL_Enable must be set to true on LSPs

MI Signal	Value Range	Default Value
		and sections and to false on PWs. Setting it to true for PWs is for further study
MT/MT_A_Sk Provisioning		
MT/MT_A_Sk_MI_Admin_State	LCK, Normal	Normal
MT/MT_A_Sk_MI_Label [1…M]	16 to (2**20)-1	Note-2
MT/MT_A_Sk_MI_LSPType[1…M]	E-LSP, L-LSP	Note-1
MT/MT_A_Sk_MI_CoS[1…M]	Note-1	Note-1
MT/MT_A_Sk_MI_ TC2PHBMapping[1…M]	Note-1	Note-1
MT/MT_A_Sk_MI_QoSDecodingMode[1…M]	A, B	Note-2
MT/MT_A_Sk_MI_Mode	Mode 1, Mode 2	Mode 1
MT/MT_A_Sk_MI_AIS_OAM_Tool[1...M]	G.8113.1, G.8113.2	N/A
MT/MT_A_Sk_MI_AIS_Period[1...M]	1 s, 1 min	1 s
MT/MT_A_Sk_MI_AIS_CoS[1...M]	0..7	7
MT/MT_A_Sk_MI_LCK_OAM_Tool[1...M]	G.8113.1, G.8113.2	N/A
MT/MT_A_Sk_MI_LCK_Period[1...M]	1 s, 1 min	1 s
MT/MT_A_Sk_MI_LCK_CoS[1...M]	0..7	7
MT/MT_A_Sk_MI_APS_OAM_Tool[1...M]	FFS	FFS
MT/MT_A_Sk_MI_GAL_Enable [1...M]	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study
MTDi/MT_A_Sk Provisioning		
MTDi/MT_A_Sk_MI_DS_MP_Type Note: This MI should be properly configured by the EMF on the basis of the MPLS-TP connection configuration within the node but not exposed to the operator as a configuration parameter in the NE/EMS management interface. See G.8121 clause 9.4.2.2.2 and its Appendix I for examples of configuration of this MI.	MEP, MIP	--
MT/ETH_A_So Provisioning		
MT/ETH_A_So_MI_Admin_State	LCK, Normal	Normal
MT/ETH_A_So_MI_FCSEnable	true, false	true
MT/ETH_A_So_MI_CWEnable	true, false	true
MT/ETH_A_So_MI_SQUse	true, false	false
MT/ETH_A_So_MI_PRI2CoSMapping	Note-1	Note-1

MI Signal	Value Range	Default Value
MT/ETH_A_So_MI_MEP_MAC* (Note-3)	6 byte Unicast MAC address	--
MT/ETH_A_So_MI_Client_MEL* (Note-3)	0..7	7
MT/ETH_A_So_MI_LCK_Period* (Note-3)	1 s, 1 min	1 s
MT/ETH_A_So_MI_LCK_Pri* (Note-3)	0..7	7
MT/ETH_A_So_MI_MEL* (Note-3)	0..7	7
MT/ETH_A_Sk Provisioning		
MT/ETH_A_Sk_MI_FCSEnable	true, false	true
MT/ETH_A_Sk_MI_CWEnable	true, false	false
MT/ETH_A_Sk_MI_SQUse	true, false	false
MT/ETH_A_Sk_MI_GAL_Enable	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study
MT/ETH_A_Sk_MI_CoS2PRIMapping	Note-1	Note-1
MT/ETH_A_Sk_MI_MEL* (Note-3~~: * ETH OAM related~~)	0..7	7
MT/ETH_A_Sk_MI_Admin_State	LCK, Normal	Normal
MT/ETH_A_Sk_MI_LCK_Period * (Note-3)	1 s, 1 min	1 s
MT/ETH_A_Sk_MI_LCK_Pri * (Note-3)	0..7	7
MT/ETH_A_Sk_MI_Client_MEL * (Note-3)	0..7	7
MT/ETH_A_Sk_MI_MEP_MAC * (Note-3)	6 byte Unicast MAC address	--
MT/ETH_A_Sk_MI_AIS_Pri * (Note-3)	0..7	7
MT/ETH_A_Sk_MI_AIS_Period * (Note-3)	1 s, 1 min	1 s
MT/SCC_A_So Provisioning		
MT/SCC_A_So_MI_Active	true, false	true
MT/SCC_A_So_MI_ECC_CoS	0..7	7
MT/SCC_A_So_MI_GAL_Enable	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study
MT/SCC_A_Sk Provisioning		
MT/SCC_A_Sk_MI_Active	true, false	true
MT/SCC_A_Sk_GAL_Enable	true, false	Note:

MI Signal	Value Range	Default Value
		MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study
MT/MCC_A_So Provisioning		
MT/MCC_A_So_MI_Active	true, false	true
MT/MCC_A_So_MI_ECC_CoS	0..7	7
MT/MCC_A_So_MI_GAL_enable	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study
MT/MCC_A_Sk Provisioning		
MT/MCC_A_Sk_MI_Active	true, false	true
MT/MCC_A_Sk_MI_GAL_Enable	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study
Sn/MT_A_So Provisioning		
Sn/MT_A_So_MI_SCCType	0..255	32
Sn/MT_A_So_MI_Label[1…M]	16 to (2**20)-1	Note-2
Sn/MT_A_So_MI_LSPType[1…M]	E-LSP, L-LSP	--
Sn/MT_A_So_MI_CoS[1…M]	0..7	--
Sn/MT_A_So_PHB2TCMapping[1…M]	Note-1	--
Sn/MT_A_So_MI_QoSEncodingMode[1…M]	A, B	--
Sn/MT_A_So_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
Sn/MT_A_Sk Provisioning		
Sn/MT_A_Sk_MI_SCCType	0..255	32
Sn/MT_A_Sk_MI_Label[1…M]	16 to (2**20)-1	Note-2
Sn/MT_A_Sk_MI_LSPType[1…M]	E-LSP, L-LSP	Note-1
Sn/MT_A_Sk_MI_CoS[1…M]	Note-1	Note-1
Sn/MT_A_Sk_MI_TC2PHBMapping[1…M]	Note-1	Note-1
Sn/MT_A_Sk_MI_QoSDecodingMode[1…M]	A, B	Note-1
Sn/MT_A_Sk_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
Sn/MT_A_Sk_MI _LCK_Period[1…M]	1 s, 1 min	1 s
Sn/MT_A_Sk_MI _LCK_CoS[1…M]	0..7	--

MI Signal	Value Range	Default Value
8.5.1.1.1.1.1.1.1 Sn/MT_A_Sk_MI _LCK_OAM_Tool [1…M]	8.5.1.1.1.1.1.1.2 G.8113.1, G.8113.2	8.5.1.1.1.1.1.1.3 N/A
Sn/MT_A_Sk_MI _Admin_State	LCK, Normal	Normal
Sn/MT_A_Sk_MI _AIS_Period[1…M]	1 s, 1 min	1 s
Sn/MT_A_Sk_MI _AIS_CoS[1…M]	0..7	--
Sn/MT_A_Sk_MI _AIS_OAM_Tool[1…M]	G.8113.1, G.8113.2	N/A
~~Sn/MT_A_Sk_MI _APS_CoS[1…M]~~	~~0..7~~	~~--~~
~~Sn/MT_A_Sk_MI _APS_OAM_Tool[1…M]~~	~~FFS~~	~~FFS~~
Sn/MT_A_Sk_MI _GAL_enable[1…M]	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study
Sn/MT_A_Sk Reporting		
Sn/MT_A_Sk_MI_AcSL (see Table 9-11 of G.707)	0..255	--
Sn/MT_A_Sk_MI_AcEXI (see Table 6-2 of G.7041)	0..15	--
Sn/MT_A_Sk_MI_LastValidUPI (see Table 6-3 of G.7041)	0..255	--
Sn-X-L/MT_A_So Provisioning		
Sn-X-L/MT_A_So_MI_SCCType (See Table 6-3 of G.7041)	0..255	32
Sn-X-L/MT_A_So_MI_Label[1…M]	16 to (2**20)-1	Note-2
Sn-X-L/MT_A_So_MI_LSPType[1…M]	E-LSP, L-LSP	--
Sn-X-L/MT_A_So_MI_CoS[1…M]	0..7	Note-1
Sn-X-L/MT_A_So_PHB2TCMapping[1…M]	Note-1	Note-1
Sn-X-L/MT_A_So_MI_QoSEncodingMode[1…M]	A, B	Note-1
Sn-X-L/MT_A_So_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
Sn-X-L/MT_A_Sk Provisioning		
Sn-X-L/MT_A_Sk_MI_SCCType (See Table 6-3 of G.7041)	0..255	32
Sn-X-L/MT_A_Sk_MI_Label[1…M]	16 to (2**20)-1	Note-2
Sn-X-L/MT_A_Sk_MI_LSPType[1…M]	E-LSP, L-LSP	--
Sn-X-L/MT_A_Sk_MI_CoS[1…M]	0..7	Note-1
Sn-X-L/MT_A_Sk_MI_TC2PHBMapping[1…M]	Note-1	Note-1
Sn-X-L/MT_A_Sk_MI_QoSDecodingMode[1…M]	A, B	Note-1
Sn-X-L/MT_A_Sk_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
Sn-X-L/MT_A_Sk_MI _LCK_Period[1…M]	1 s, 1 min	1 s

MI Signal	Value Range	Default Value
Sn-X-L/MT_A_Sk_MI _LCK_CoS[1…M]	0..7	--
Sn-X-L/MT_A_Sk_MI _LCK_OAM_Tool [1…M]	G.8113.1, G.8113.2	N/A
Sn-X-L/MT_A_Sk_MI _Admin_State	LCK, Normal	Normal
Sn-X-L/MT_A_Sk_MI _AIS_Period[1…M]	1 s, 1 min	1 s
Sn-X-L/MT_A_Sk_MI _AIS_CoS[1…M]	0..7	--
Sn-X-L/MT_A_Sk_MI _AIS_OAM_Tool [1…M]	G.8113.1, G.8113.2	N/A
~~Sn-X-L/MT_A_Sk_MI _APS_OAM_Tool[1…M]~~	~~FFS~~	~~FFS~~
Sn-X-L /MT_A_Sk_MI _GAL_Enable [1…M]	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study
Sn-X-L/MT_A_Sk Reporting		
Sn-X-L/MT_A_Sk_MI_AcSL (see Table 9-11 of G.707)	0..255	--
Sn-X-L/MT_A_Sk_MI_AcEXI (see Table 6-2 of G.7041)	0..15	--
Sn-X-L/MT_A_Sk_MI_LastValidUPI (see Table 6-3 of G.7041)	0..255	--
Sm/MT_A_So Provisioning		
Sm/MT_A_So_MI_SCCType	0..255	32
Sm/MT_A_So_MI_Label[1…M]	16 to (2**20)-1	Note-2
Sm/MT_A_So_MI_LSPType[1…M]	E-LSP, L-LSP	--
Sm/MT_A_So_MI_CoS[1…M]	0..7	--
Sm/MT_A_So_PHB2TCMapping[1…M]	Note-1	Note-1
Sm/MT_A_So_MI_QoSEncodingMode[1…M]	A, B	Note-1
Sm/MT_A_So_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
Sm/MT_A_Sk Provisioning		
Sm/MT_A_Sk_MI_SCCType	0..255	32
Sm/MT_A_Sk_MI_Label[1…M]	16 to (2**20)-1	Note-2
Sm/MT_A_Sk_MI_LSPType[1…M]	E-LSP, L-LSP	---
Sm/MT_A_Sk_MI_CoS[1…M]	0..7	--
Sm/MT_A_Sk_MI_TC2PHBMapping[1…M]	Note-1	Note-1
Sm/MT_A_Sk_MI_QoSDecodingMode[1…M]	A, B	Note-1
Sm/MT_A_Sk_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
Sm/MT_A_Sk_MI _LCK_Period[1…M]	1 s, 1 min	1 s
Sm/MT_A_Sk_MI _LCK_CoS[1…M]	0..7	--
Sm/MT_A_Sk_MI _LCK_OAM_Tool [1…M]	G.8113.1, G.8113.2	N/A
Sm/MT_A_Sk_MI _Admin_State	LCK, Normal	Normal

MI Signal	Value Range	Default Value
Sm/MT_A_Sk_MI _AIS_Period[1…M]	1 s, 1 min	1 s
Sm/MT_A_Sk_MI _AIS_CoS[1…M]	0..7	--
Sm/MT_A_Sk_MI _AIS_OAM_Tool[1…M]	G.8113.1, G.8113.2	N/A
~~Sm/MT_A_Sk_MI _APS_OAM_Tool[1…M]~~	~~FFS~~	~~FFS~~
Sm/MT_A_Sk_MI _GAL_Enable[1…M]	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study
Sm/MT_A_Sk Reporting		
Sm/MT_A_Sk_MI_AcSL (see Table 9-12 and Table 9-13 of G.707)	0..255	--
Sm/MT_A_Sk_MI_AcEXI (see Table 6-2 of G.7041)	0..15	--
Sm/MT_A_Sk_MI_LastValidUPI (see Table 6-3 of G.7041)	0..255	--
Sm-X-L/MT_A_So Provisioning		
Sm-X-L/MT_A_So_MI_SCCType	0..255	32
Sm-X-L/MT_A_So_MI_Label[1…M]	16 to (2**20)-1	Note-2
Sm-X-L/MT_A_So_MI_LSPType[1…M]	E-LSP, L-LSP	--
Sm-X-L/MT_A_So_MI_CoS[1…M]	0..7	--
Sm-X-L/MT_A_So_PHB2TCMapping[1…M]	Note-1	Note-1
Sm-X-L/MT_A_So_MI_QoSEncodingMode[1…M]	A, B	Note-1
Sm-X-L/MT_A_So_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
Sm-X-L/MT_A_Sk Provisioning		
Sm-X-L/MT_A_Sk_MI_SCCType	0..255	32
Sm-X-L/MT_A_Sk_MI_Label[1…M]	16 to (2**20)-1	Note-2
Sm-X-L/MT_A_Sk_MI_LSPType[1…M]	E-LSP, L-LSP	--
Sm-X-L/MT_A_Sk_MI_CoS[1…M]	0..7	--
Sm-X-L/MT_A_Sk_MI_TC2PHBMapping[1…M]	Note-1	Note-1
Sm-X-L/MT_A_Sk_MI_QoSDecodingMode[1…M]	A, B	Note-1
Sm-X-L/MT_A_Sk_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
Sm-X-L/MT_A_Sk_MI _LCK_Period[1…M]	1 s, 1 min	1 s
Sm-X-L/MT_A_Sk_MI _LCK_CoS[1…M]	0..7	--
Sm-X-L/MT_A_Sk_MI _LCK_OAM_Tool [1…M]	G.8113.1, G.8113.2	N/A
Sm-X-L/MT_A_Sk_MI _Admin_State	LCK, Normal	Normal
Sm-X-L/MT_A_Sk_MI _AIS_Period[1…M]	1 s, 1 min	1 s
Sn-X-L/MT_A_Sk_MI _AIS_CoS[1…M]	0..7	--
Sm-X-L/MT_A_Sk_MI _AIS_OAM_Tool [1…M]	G.8113.1, G.8113.2	N/A

MI Signal	Value Range	Default Value
~~Sm-X-L/MT_A_Sk_MI _APS_OAM_Tool[1…M]~~	~~FFS~~	~~FFS~~
Sm-X-L/MT_A_Sk_MI _GAL_Enable[1…M]	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study
Sm-X-L/MT_A_Sk Reporting		
Sm-X-L/MT_A_Sk_MI_AcSL	0..255	--
Sm-X-L/MT_A_Sk_MI_AcEXI	0..15	--
Sm-X-L/MT_A_Sk_MI_LastValidUPI	0..255	--
Pq/MT_A_So Provisioning		
Pq/MT_A_So_MI_SCCType	0..255	32
Pq/MT_A_So_MI_Label[1…M]	16 to (2**20)-1	Note-2
Pq/MT_A_So_MI_LSPType[1…M]	E-LSP, L-LSP	--
Pq/MT_A_So_MI_CoS[1…M]	0..7	--
Pq/MT_A_So_PHB2TCMapping[1…M]	Note-1	Note-1
Pq/MT_A_So_MI_QoSEncodingMode[1…M]	A, B	Note-1
Pq/MT_A_So_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
Pq/MT_A_Sk Provisioning		
Pq/MT_A_Sk_MI_SCCType	0..255	32
Pq/MT_A_Sk_MI_Label[1…M]	16 to (2**20)-1	Note-2
Pq/MT_A_Sk_MI_LSPType[1…M]	E-LSP, L-LSP	--
Pq/MT_A_Sk_MI_CoS[1…M]	0..7	--
Pq/MT_A_Sk_MI_TC2PHBMapping[1…M]	Note-1	Note-1
Pq/MT_A_Sk_MI_QoSDecodingMode[1…M]	A, B	Note-1
Pq/MT_A_Sk_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
Pq/MT_A_Sk_MI _LCK_Period[1…M]	1 s, 1 min	1 s
Pq/MT_A_Sk_MI _LCK_CoS[1…M]	0..7	--
Pq/MT _A_Sk_MI _LCK_Tool[1…M]	G.8113.1, G.8113.2	N/A
Pq/MT_A_Sk_MI _Admin_State	LCK, Normal	Normal
Pq/MT_A_Sk_MI _AIS_Period[1…M]	1 s, 1 min	1 s
Pq/MT_A_Sk_MI _AIS_CoS[1…M]	0..7	--
Pq/MT _A_Sk_MI _AIS_Tool[1…M]	G.8113.1, G.8113.2	N/A
~~Pq/MT_A_Sk_MI _APS_OAM_Tool[1…M]~~	~~FFS~~	~~FFS~~
Pq/MT _A_Sk_MI _GAL_Enable [1…M]	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to

MI Signal	Value Range	Default Value
		false on PWs. Setting it to true for PWs is for further study
Pq/MT_A_Sk Reporting		
Pq/MT_A_Sk_MI_AcSL (see Clause 2.1.2 of G.832)	0..7	--
Pq/MT_A_Sk_MI_AcEXI (see Table 6-2 of G.7041)	0..15	--
Pq/MT_A_Sk_MI_LastValidUPI (see Table 6-3 of G.7041)	0..255	--
Pq-X-L/MT_A_So Provisioning		
Pq-X-L/MT_A_So_MI_SCCType	0..255	32
Pq-X-L/MT_A_So_MI_Label[1…M]	16 to (2**20)-1	Note-2
Pq-X-L/MT_A_So_MI_LSPType[1…M]	E-LSP, L-LSP	--
Pq-X-L/MT_A_So_MI_CoS[1…M]	o..7	--
Pq-X-L/MT_A_So_PHB2TCMapping[1…M]	Note-1	Note-1
Pq-X-L/MT_A_So_MI_QoSEncodingMode[1…M]	A, B	Note-1
Pq-X-L /MT_A_So_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
Pq-X-L/MT_A_Sk Provisioning		
Pq-X-L/MT_A_Sk_MI_SCCType	0..255	32
Pq-X-L/MT_A_Sk_MI_Label[1…M]	16 to (2**20)-1	Note-2
Pq-X-L/MT_A_Sk_MI_LSPType[1…M]	E-LSP, L-LSP	--
Pq-X-L/MT_A_Sk_MI_CoS[1…M]	0..7	--
Pq-X-L/MT_A_Sk_MI_TC2PHBMapping[1…M]	Note-1	Note-1
Pq-X-L/MT_A_Sk_MI_QoSDecodingMode[1…M]	A, B	Note-1
Pq-X-L/MT_A_Sk_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
Pq-X-L/MT_A_Sk_MI _LCK_Period[1…M]	1 s, 1 min	1 s
Pq-X-L/MT_A_Sk_MI _LCK_CoS[1…M]	0..7	--
Pq-X-L/MT _A_Sk_MI _LCK_Tool[1…M]	G.8113.1, G.8113.2	N/A
Pq-X-L/MT_A_Sk_MI _Admin_State	LCK, Normal	Normal
Pq-X-L/MT_A_Sk_MI _AIS_Period[1…M]	1 s, 1 min	1 s
Pq-X-LMT_A_Sk_MI _AIS_CoS[1…M]	0..7	--
Pq-X-L/MT _A_Sk_MI _AIS_Tool[1…M]	G.8113.1, G.8113.2	N/A
~~Pq-X-L/MT_A_Sk_MI _APS_OAM_Tool[1…M]~~	~~FFS~~	~~FFS~~
Pq-X-L//MT _A_Sk_MI _GAL_Enable[1…M]	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study
Pq-X-L/MT_A_Sk Reporting		
Pq-X-L/MT_A_Sk_MI_AcSL	0..7	--

MI Signal	Value Range	Default Value
Pq-X-L/MT_A_Sk_MI_AcEXI	0..15	--
Pq-X-L/MT_A_Sk_MI_LastValidUPI	0..255	--
ODUkP/MT_A_So Provisioning		
ODUkP/MT_A_So_MI_Active	true, false	false
ODUkP/MT_A_So_MI_SCCType	0..255	32
ODUkP/MT_A_So_MI_Label[1…M]	16 to (2**20)-1	Note-2
ODUkP/MT_A_So_MI_LSPType[1…M]	E-LSP, L-LSP	--
ODUkP/MT_A_So_MI_CoS[1…M]	0..7	--
ODUkP/MT_A_So_PHB2TCMapping[1…M]	Note-1	Note-1
ODUkP/MT_A_So_MI_QoSEncodingMode[1…M]	A, B	Note-1
ODUkP/MT_A_So_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
ODUkP/MT_A_Sk Provisioning		
ODUkP/MT_A_Sk_MI_Active	true, false	false
ODUkP/MT_A_Sk_MI_SCCType	0..255	32
ODUkP/MT_A_Sk_MI_Label[1…M]	16 to (2**20)-1	Note-2
ODUkP/MT_A_Sk_MI_LSPType[1…M]	E-LSP, L-LSP	--
ODUkP/MT_A_Sk_MI_CoS[1…M]	0..7	--
ODUkP/MT_A_Sk_MI_TC2PHBMapping[1…M]	Note-1	Note-1
ODUkP/MT_A_Sk_MI_QoSDecodingMode[1…M]	A, B	Note-1
ODUkP/MT_A_So_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
ODUkP/MT_A_Sk_MI _LCK_Period[1…M]	1 s, 1 min	1 s
ODUkP/MT_A_Sk_MI _LCK_CoS[1…M]	0..7	--
ODUkP/MT _A_Sk_MI _LCK_Tool[1…M]	G.8113.1, G.8113.2	N/A
ODUkP/MT_A_Sk_MI _Admin_State	LCK, Normal	Normal
ODUkP/MT_A_Sk_MI _AIS_Period[1…M]	1 s, 1 min	1 s
ODUkP/MT_A_Sk_MI _AIS_CoS[1…M]	0..7	--
ODUkP/MT _A_Sk_MI _AIS_Tool[1…M]	G.8113.1, G.8113.2	N/A
~~ODUkP /MT_A_Sk_MI _APS_OAM_Tool[1…M]~~	~~FFS~~	~~FFS~~
ODUkP/MT _A_Sk_MI _GAL_Enable[1…M]	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study
ODUkP/MT_A_Sk Reporting		
ODUkP/MT_A_Sk_MI_AcPT (see Table 15-8 of G.709)	0..255	--
ODUkP/MT_A_Sk_MI_AcEXI (see Table 6-2 of G.7041)	0..15	--

MI Signal	Value Range	Default Value
ODUkP/MT_A_Sk_MI_LastValidUPI (see Table 6-3 of G.7041)	0..255	--
~~ODUkP-X-L/MT_A_So Provisioning~~		
~~ODUkP-X-L/MT_A_So_MI_Active~~	~~true, false~~	~~false~~
~~ODUkP-X-L/MT_A_So_MI_SCCType~~	~~0..255~~	~~32~~
~~ODUkP-X-L/MT_A_So_MI_Label[1…M]~~	~~16 to (2**20)-1~~	~~Note 2~~
~~ODUkP-X-L/MT_A_So_MI_LSPType[1…M]~~	~~E-LSP, L-LSP~~	~~--~~
~~ODUkP-X-L/MT_A_So_MI_CoS[1…M]~~	~~0..7~~	~~--~~
~~ODUkP-X-L/MT_A_So_PHB2TCMapping[1…M]~~	~~Note 1~~	~~Note 1~~
~~ODUkP-X-L/MT_A_So_MI_QoSEncodingMode[1…M]~~	~~A, B~~	~~Note 1~~
~~ODUkP-X-L/MT_A_So_MI_Mode[1…M]~~	~~Mode 1, Mode 2~~	~~Mode 1~~
~~ODUkP-X-L/MT_A_Sk Provisioning~~		
~~ODUkP-X-L/MT_A_Sk_MI_Active~~	~~true, false~~	~~false~~
~~ODUkP-X-L/MT_A_Sk_MI_SCCType~~	~~0..255~~	~~32~~
~~ODUkP-X-L/MT_A_Sk_MI_Label[1…M]~~	~~16 to (2**20)-1~~	~~Note 2~~
~~ODUkP-X-L/MT_A_Sk_MI_LSPType[1…M]~~	~~E-LSP, L-LSP~~	~~--~~
~~ODUkP-X-L/MT_A_Sk_MI_CoS[1…M]~~	~~0..7~~	~~--~~
~~ODUkP-X-L/MT_A_Sk_MI_TC2PHBMapping[1…M]~~	~~Note 1~~	~~Note 1~~
~~ODUkP-X-L/MT_A_Sk_MI_QoSDecodingMode[1…M]~~	~~A, B~~	~~Note 1~~
~~ODUkP-X-L/MT_A_Sk_MI_Mode[1…M]~~	~~Mode 1, Mode 2~~	~~Mode 1~~
~~ODUkP-X-L/MT_A_Sk_MI_LCK_Period[1…M]~~	~~1 s, 1 min~~	~~1 s~~
~~ODUkP-X-L/MT_A_Sk_MI_LCK_CoS[1…M]~~	~~0..7~~	~~--~~
~~ODUkP-X-L/MT_A_Sk_MI_LCK_Tool[1…M]~~	~~G.8113.1, G.8113.2~~	~~N/A~~
~~ODUkP-X-L/MT_A_Sk_MI_Admin_State~~	~~LCK, Normal~~	~~Normal~~
~~ODUkP-X-L/MT_A_Sk_MI_AIS_Period[1…M]~~	~~1 s, 1 min~~	~~1 s~~
~~ODUkP-X-L/MT_A_Sk_MI_AIS_CoS[1…M]~~	~~0..7~~	~~--~~
~~ODUkP-X-L/MT_A_Sk_MI_AIS_Tool[1…M]~~	~~G.8113.1, G.8113.2~~	~~N/A~~
~~ODUkP-X-L/MT_A_Sk_MI_APS_OAM_Tool[1…M]~~	~~FFS~~	~~FFS~~
~~ODUkP-X-L/MT_A_Sk_MI_GAL_Enable[1…M]~~	~~true, false~~	~~Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study~~
~~ODUkP-X-L/MT_A_Sk Reporting~~		
~~ODUkP-X-L/MT_A_Sk_MI_AcVcPT (see Table 15-8 of G.709)~~	~~0..255~~	~~--~~

MI Signal	Value Range	Default Value
~~ODUkP-X-L/MT_A_Sk_MI_AcEXI (see Table 6-2 of G.7041)~~	~~0..15~~	~~--~~
~~ODUkP-X-L/MT_A_Sk_MI_LastValidUPI (see Table 6-3 of G.7041)~~	~~0..255~~	~~--~~
ODUkP-h/MT_A_So provisioning		
ODUkP-h/MT_A_So_MI_Active	true, false	false
ODUkP-h/MT_A_So_MI_SCCType	0..255	32
ODUkP-h/MT_A_So_MI_Label[1…M]	16 to (2**20)-1	Note-2
ODUkP-h/MT_A_So_MI_LSPType[1…M]	E-LSP, L-LSP	--
ODUkP-h/MT_A_So_MI_CoS[1…M]	0..7	--
ODUkP-h/MT_A_So_PHB2TCMapping[1…M]	Note-1	--
ODUkP-h/MT_A_So_MI_QoSEncodingMode[1…M]	A, B	--
ODUkP-h/MT_A_So_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
ODUkP-h/MT_A_So_MI _GAL_Enable[1…M]	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study.
~~ODUkP-h/MT_A_So_MI _APS_OAM_CoS[1…M]~~	~~0..7~~	~~7~~
~~ODUkP-h/MT_A_So_MI _APS_OAM_Tool[1…M]~~	~~G.8113.1, G.8113.2~~	~~N/A~~
ODUkP-h/MT_A_So_MI_INCREASE	true, false	false
ODUkP-h/MT _A_So_MI_DECREASE	true, false	false
ODUkP-h/MT_A_So_MI_TSNUM	According to [ITU-T G.7044]	Not applicable
ODUkP-h/MT_A_So_MI_ODUflexRate	FlexCBR, FlexGFP	N/A
ODUkP-h/MT_A_So reporting		
ODUkP-h/MT_A_So_MI_ADJSTATE	According to [ITU-T G.7044]	Not applicable
ODUkP-h/MT_A_Sk provisioning		
ODUkP-h/MT_A_Sk_MI_Active	true, false	false
ODUkP-h /MT_A_Sk_MI_SCCType	true, false	false
ODUkP-h /MT_A_Sk_MI_Label[1…M]	0..255	32
ODUkP-h /MT_A_Sk_MI_LSPType[1…M]	16 to (2**20)-1	Note-2
ODUkP-h /MT_A_Sk_MI_CoS[1…M]	E-LSP, L-LSP	--
ODUkP-h /MT_A_Sk_MI_TC2PHBMapping[1…M]	0..7	--
ODUkP-h /MT_A_Sk_MI_QoSDecodingMode[1…M]	Note-1	--
ODUkP/MT_A_Sk_MI_Mode[1…M]	A, B	--
ODUkP-h /MT _A_Sk_MI _LCK_Period[1…M]	1 s, 1 min	1 s
ODUkP-h /MT _A_Sk_MI _LCK_CoS[1…M]	0..7	7

MI Signal	Value Range	Default Value
ODUkP-h /MT _A_Sk_MI _LCK_Tool[1…M]	G.8113.1, G.8113.2	N/A
ODUkP-h /MT _A_Sk_MI _Admin_State	LCK, Normal	Normal
ODUkP-h /MT _A_Sk_MI _AIS_Period[1…M]	1 s, 1 min	1 s
ODUkP-h /MT _A_Sk_MI _AIS_CoS[1…M]	0..7	7
ODUkP-h /MT _A_Sk_MI _AIS_Tool[1…M]	G.8113.1, G.8113.2	N/A
ODUkP-h /MT _A_Sk_MI _GAL_Enable[1…M]	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study.
~~ODUkP-h /MT_A_Sk_MI _APS_OAM_Tool[1…M]~~	~~G.8113.1, G.8113.2~~	~~N/A~~
ODUkP-h/MT_A_Sk_MI_INCREASE	true, false	false
ODUkP-h/MT_A_Sk_MI_DECREASE	true, false	false
ODUkP-h/MT_A_Sk reporting		
ODUkP-h/MT_A_Sk_MI_AcPT	According to [ITU-T G.709]	Not applicable
ODUkP-h/MT_A_Sk_MI_AcEXI	According to [ITU-T G.709]	Not applicable
ODUkP-h/MT_A_Sk_MI_LastValidUPI	According to [ITU-T G.709]	Not applicable
ETH/MT_A_So Provisioning		
ETH/MT_A_So_MI_Label[1…M]	16 to (2**20)-1	Note-2
ETH/MT_A_So_MI_LSPType[1…M]	E-LSP, L-LSP	Note-1
ETH/MT_A_So_MI_CoS[1…M]	Note-1	Note-1
ETH/MT_A_So_PHB2TCMapping[1…M]	Note-1	Note-1
ETH/MT_A_So_MI_QoSEncodingMode[1…M]	A, B	Note-2
ETH/MT_A_So_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
ETH/MT_A_So_MI_Etype		
ETH/MT_A_Sk Provisioning		
ETH/MT_A_Sk_MI_Label[1…M]	16 to (2**20)-1	Note-2
ETH/MT_A_Sk_MI_LSPType[1…M]	E-LSP, L-LSP	--
ETH/MT_A_Sk_MI_CoS[1…M]	0..7	--
ETH/MT_A_Sk_MI_TC2PHBMapping[1…M]	Note-1	Note-1
ETH/MT_A_Sk_MI_QoSDecodingMode[1…M]	A, B	Note-1
ETH/MT_A_Sk_MI_Mode[1…M]	Mode 1, Mode 2	Mode 1
ETH/MT_A_Sk_MI _LCK_Enable[1…M]	true, false	true
ETH/MT_A_Sk_MI _LCK_Period[1…M]	1 s, 1 min	1 s
ETH/MT_A_Sk_MI _LCK_CoS[1…M]	0..7	7
ETH/MT_A_Sk_MI _LCK_OAM_Tool[1…M]	G.8113.1, G.8113.2	N/A

MI Signal	Value Range	Default Value
ETH/MT_A_Sk_MI _Admin_State	LCK, Normal	Normal
ETH/MT_A_Sk_MI _AIS_Enable[1…M]	true, false	true
ETH/MT_A_Sk_MI _AIS_Period[1…M]	1 s, 1 min	1 s
ETH/MT_A_Sk_MI _AIS_CoS[1…M]	0..7	7
ETH/MT_A_Sk_MI _AIS_OAM_Tool[1…M]	G.8113.1, G.8113.2	N/A
~~ETH/MT_A_Sk_MI _APS_CoS[1…M]~~	~~0..7~~	~~7~~
~~ETH/MT_A_Sk_MI _APS_OAM_Tool[1…M]~~	~~FFS~~	~~FFS~~

Note-1: According to [ITU-T G.8121/Y.1381]

Note-2: A value must be provided at provisioning.

Note-3: * indicates ETH OAM related.

Note-4: See Clause 8.2.1 of G.8121 for the semantic of A and B.

8.5.1 Adaptation – G.8121.1 Specific

For MT.NE that supports the adaptation functions specified in [ITU-T G.8121.1/Y.1381.1], there is no additional MI to be managed beyond those listed in Table 8-2 above.

8.5.2 Adaptation – G.8121.2 Specific

For MT.NE that supports the adaptation functions specified in [ITU-T G.8121.2/Y.1381.2], the EMF shall in addition support the management of the MIs listed in Table 8-2.2 below.

Table 8-2.2/G.8151/Y.1374 – Provisioning and reporting for adaptation functions

MI Signal	Value Range	Default Value
MT/MT_A_Sk Provisioning		
MT/MT_A_Sk_MI_Local_Defect	true, false	false
Sn/MT_A_Sk Provisioning		
Sn/MT_A_Sk_MI_Local_Defect	true, false	false
Sn-X-L/MT_A_Sk Provisioning		
Sn-X-L/MT_A_Sk_MI_Local_Defect	true, false	false
Sm/MT_A_Sk Provisioning		
Sm/MT_A_Sk_MI_Local_Defect	true, false	false
Sm-X-L/MT_A_Sk Provisioning		
Sm-X-L/MT_A_Sk_MI_Local_Defect	true, false	false
Pq/MT_A_Sk Provisioning		
Pq/MT_A_Sk_MI_Local_Defect	true, false	false
Pq-X-L/MT_A_Sk Provisioning		
Pq-X-L/MT_A_Sk_MI_Local_Defect	true, false	false
ODUkP/MT_A_Sk Provisioning		
ODUkP/MT_A_Sk_MI_Local_Defect	true, false	false

MI Signal	Value Range	Default Value
~~ODUkP_X_L/MT_A_Sk Provisioning~~		
~~ODUkP_X_L/MT_A_Sk_MI_Local_Defect~~	~~true, false~~	~~false~~
ODUkP-h/MT_A_Sk provisioning		
ODUkP-h/MT_A_Sk_MI_Local_Defect	true, false	false
ETH/MT_A_Sk Provisioning		
ETH/MT_A_Sk_MI_Local_Defect	true, false	false

8.6 Diagnostic

This section provides the requirements for the management of the MT Diagnostic Trail Termination Functions (MTDe_TT)

For MT.NE that supports the MTDe_TT function specified in [ITU-T G.8121/Y.1381], the EMF shall support the following management functions for the MIs listed in Table 8-3 below:

- Provisioning the trail termination management information
- Retrieving the trail termination management information
- Notifying the changes of the trail termination management information
- Receiving the monitored trail termination management information

Table 8-3 G.8151/Y.1374 – Provisioning and reporting for diagnostic trail termination function

MI Signal	Value Range	Default Value
MTDe_TT_So Provisioning		
MTDe_TT_So_MI_GAL_Enable	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study
MTDe_TT_So_MI_TTLVALUE	0..255	255
MTDe_TT_So_MI_CV_OAM_Tool	G.8113.1, G.8113.2	N/A
MTDe_TT_So_MI_CV_Series ()	See Tables 8-3.1 and 8-3.2 for the respective parameters and values	See Tables 8-3.1 and 8-3.2 for the respective parameters and values
MTDe_TT_So_MI_1TH_OAM_Tool	G.8113.1, G.8113.2	N/A
MTDe_TT_So_MI_1TH_Start(CoS, Pattern, Length,Period) Note: Pattern is G.8121.1 specific	CoS: 0..7	Default value of Length: 0

MI Signal	Value Range	Default Value
	Length: 0..L. Note: The value of L depends on implementation, e.g. may be 2^32. Patterns, Period: For further study	
MTDe_TT_So_MI_1TH_Terminate	--	--
MTDe_TT_So_MI_LMo_OAM_Tool	G.8113.1, G.8113.2	N/A
MTDe_TT_So_MI_LMo_Start(CoS,Period)[1...M_{LMo}]	CoS: 0..7 Period: 100ms, 1s, 10s	
MTDe[YT7]_TT_So_MI_LMo_Intermediate_Request[1...M_{LMo}]	--	--
MTDe_TT_So_MI_LMo_Terminate[1...M_{LMo}]	--	--
MTDe_TT_So_MI_DMo_OAM_Tool	G.8113.1, G.8113.2	N/A
MTDe_TT_So_MI_DMo_Start(CoS,Test_ID, Length,Period)[1...M_{DMo}]	CoS: 0..7 Test_ID: (Note 2) Length: 0..L. Note: The value of L depends on implementation, e.g. may be 2^32. Period: 1s, 10 s, 1 min	Default value of Length: 0 Default value of Period: 1 min
MTDe_TT_So_MI_DMo_Terminate[1...M_{DMo}]	--	--
MTDe_TT_So_MI_1DMo_OAM_Tool	G.8113.1, G.8113.2	N/A
MTDe_TT_So_MI_1DMo_Start(CoS,Test_ID,Length,Period)[1...M_{1DMo}]	CoS: 0..7 Test_ID: (Note 2) Length: 0..L. Note: The value of L depends on implementation, e.g. may be 2^32. Period: 100ms, 1s, 10s	Default value of Length: 0
MTDe[YT8]_TT_So_MI_DMo_Intermediate_Request[1...M_{LMo}]	--	--
MTDe_TT_So_MI_1DMo_Terminate[1...M_{1DMo}]	--	--
MTDe_TT_So_MI_SLo_OAM_Tool	G.8113.1, G.8113.2	N/A
MTDe_TT_So_MI_SLo_Start(CoS,Test_ID,Length,Period)[1...M_{SLo}]	CoS: 0..7 Test_ID: (Note 2) Length: 0..L. Note: The value of L depends on implementation, e.g. may be 2^32. Period: 0.1 ms, 0.5 ms, 1 ms, 3.3 ms, 10 ms, 100 ms	Default value of Length: 0 Default value of Period: 10 ms
MTDe[YT9]_TT_So_MI_SLo_Intermediate_Request[1...M_{LMo}]	--	--
MTDe_TT_So_MI_SLo_Terminate[1...M_{SLo}]	--	
MTDe_TT_So_MI_Admin_State	LCK, Normal	Normal
MTDe_TT_So_MI_Lock_Instruct_Enable	true, false	true
MTDe_TT_So_MI_DP_Loopback_Enable	true, false	false

MI Signal	Value Range	Default Value
MTDe_TT_So Reporting		
MTDe_TT_So_MI_CV_Series_Result()	See Tables 8-3.1 and 8-3.2 for the respective parameters and values	See Tables 8-3.1 and 8-3.2 for the respective parameters and values
MTDe_TT_So_MI_1TH_Result(Sent)	--	--
MTDe_TT_So_MI_LMo_Result(N_TF,N_LF,F_TF,F_LF)[1...M_{LMo}]	--	--
MTDe_TT_So_MI_DMo_Result(count,B_FD[], F_FD[],N_FD[])[1...M_{DMo}]	--	--
MTDe_TT_So_MI_SLo_Result(N_TF,N_LF,F_TF,F_LF)[1...M_{SLo}]	--	--
MTDe_TT_Sk Provisioning		
MTDe_TT_Sk_MI_GAL_Enable	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study.
~~MTDe~~[YT10]~~_TT_Sk_MI_MEG_ID~~	~~String; values are OAM protocol-specific~~	~~Note 1~~
~~MTDe_TT_Sk_MI_PeerMEP_ID~~	~~String; values are OAM protocol-specific~~	~~Note 1~~
MTDe_TT_Sk_MI_CV_OAM_Tool	G.8113.1, G.8113.2	N/A
	~~G~~[YT11]~~.8113.1, G.8113.2~~	~~N/A~~
	~~G.8113.1, G.8113.2~~	~~N/A~~
MTDe_TT_Sk_MI_1TH_OAM_Tool	G.8113.1, G.8113.2	N/A
MTDe_TT_Sk_MI_1TH_Start(Pattern, Length, Period) Note: Pattern, Length, and Period are G.8121.1 specific	FFS	
MTDe_TT_Sk_MI_1TH_Terminate	--	--
MTDe_TT_Sk_MI_LMo_OAM_Tool	G.8113.1, G.8113.2	N/A
MTDe_TT_Sk_MI_DMo_OAM_Tool	G.8113.1, G.8113.2	N/A
MTDe_TT_Sk_MI_1DMo_OAM_Tool	G.8113.1, G.8113.2	N/A
MTDe_TT_Sk_MI_1DMo_Start(Cos, Test_ID)[1...M_{1DMo}]	-- (Note 2)	--
MTDe_TT_Sk_MI_1DMo_Terminate[1...M_{1DMo}]	--	--

MI Signal	Value Range	Default Value
MTDe_TT_Sk_MI_SLo_OAM_Tool	G.8113.1, G.8113.2	N/A
MTDe_TT_Sk_MI_DP_Loopback_Enable	true, false	false
MTDe_TT_Sk Reporting		
MTDe_TT_Sk_MI_1TH_Result(REC,CRC, BER,OO)	--	--
MTDe[YT12]_TT_Sk_MI_1DMo_Intermediate_Request[1...M_{LMo}]	--	--
MTDe_TT_Sk_MI_1DMo_Result(count,N_FD[])[1...M_{DMo}]]	--	--
MTDe_TT_Sk_MI_Admin_State_Request	Trigger to LCK, Trigger to Normal	--
MTDi_TT_So Provisioning		
MTDi_TT_So_MI_GAL_Enable	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study.
MTDi_TT_So_MI_TTLVALUE	0..255	255
MTDi_TT_So_MI_MIP_ID	String; values are OAM protocol-specific	Note 1
MTDi_TT_So_MI_CV_OAM_Tool	G.8113.1, G.8113.2	N/A
MTDi_TT_So_MI_DP_Loopback_Enable	true, false	false
MTDi_TT_Sk Provisioning		
MTDi_TT_Sk_MI_GAL_Enable	true, false	Note: MI_GAL_Enable must be set to true on LSPs and sections and to false on PWs. Setting it to true for PWs is for further study.
MTDi_TT_Sk_MI_MIP_ID	String; values are OAM protocol-specific	Note 1
MTDi_TT_Sk_MI_CV_OAM_Tool	G.8113.1, G.8113.2	N/A
MTDi_TT_Sk_MI_DP_Loopback_Enable	true, false	false

Note-1: A value must be provided at provisioning.

Nore-2: The Test ID field is optional when this proactive measurement tool is used.

8.6.1 Diagnostic – G.8121.1 Specific

For MT.NE that supports the MTDe_TT function specified in [ITU-T G.8121.1/Y.1381.1], the EMF shall in addition support the management of the MIs listed in Table 8-3.1 below.

Table 8-3.1/G.8151/Y.1374 – Provisioning and reporting for termination functions

MI Signal	Value Range	Default Value
MTDe_TT_So Provisioning		
MTDe_TT_So_MI_CV_Series(CoS, N,Length,Period)	TTL: 0..255 CoS: 0..7 N: 1..n. Note: The value of n depends on implemenation, e.g. may be 2^32. Length: 0..L. Note: The value of L depends on implementation, e.g. may be 2^32. Period: 5..10 sec.	Default value of N: 3 Default value of Length: 0 Default value of Period: 5 sec.
MTDe_TT_So_MI_CV_Test(CoS, Pattern, Length,Period)	See [ITU-T G.8121.1]	
MTDe_TT_So Reporting		
MTDe_TT_So_MI_CV_Test_Result(Sent, REC, REC,ERR,OO)	See [ITU-T G.8121.1]	
MTDe_TT_So_MI_CV_Series_Result(REC,ERR,OO)	FFS	
MTDe_TT_Sk Provisioning		
MTDe_TT_Sk_MI_ MEP_ID	See [ITU-T G.8121.1]	

8.6.2 Diagnostic – G.8121.2 Specific

For MT.NE that supports the MT_TT function specified in [ITU-T G.8121.2/Y.1381.2], the EMF shall in addition support the management of the MIs listed in Table 8-3.2 below:

Table 8-3.2/G.8151/Y.1374 – Provisioning and reporting for termination functions

MI Signal	Value Range	Default Value
MTDe_TT_So Provisioning		
MTDe_TT_So_MI_Target_FEC	See [ITU-T G.8121.2]	--
~~MTDe~~[YT13]~~_TT_So_MI_Ifnum~~	~~See [ITU-T G.8121.2]~~	~~--~~
~~MTDe_TT_So_MI_MTU~~	~~See [ITU-T G.8121.2]~~	~~--~~
MTDe_TT_So_MI_CV_Series (Session_ID, Counter, Period, CoS, Size, ValidateFEC, ValidatieReverce, TargetFECStack)	CoS : 0..7 To be defined for other parameters	8.10 CoS : 7 8.11 To be defined for other parameters
MTDe_TT_So_MI_~~OD~~CV_Trace(Session_ID, CoS, ValidateFEC, ValicateReverce, TargetFECStack)	CoS : 0..7 To be defined for other parameters	CoS : 7 To be defined for other parameters
MTDe_TT_So_MI_FEC_Checking	true, false	true
MTDe_TT_So[K14]_MI_DMo_Start(CoS, Test_ID, Length, Period, CopyPad)[1...M_{DMo}] [Note 1]	CoS: 0..7 Length: 0..L. Note: The value of L depends on implementation, e.g. may be 2^32. Period: 1s, 10 s, 1 min CopyPad: true, false Test_ID: non-negative integer	
MTDe_TT_So_MI_LMo_Start(CoS, Test_ID, Period, LMType, CountBytes)[1...MLMo] [Note 1]	CoS: 0..7 Period: 1s, 10 s, 1 min LMType: ILM, DLM CountBytes: true, false Test_ID: non-negative integer	
MTDe_TT_So_MI_LMDMo_Start(CoS, Test_ID, Length, Period, LMType, CountBytes, CopyPad)[1...MLMDMo]	CoS: 0..7 Length: 0..L. Period: 1s, 10 s, 1 min LMType: ILM, DLM CountBytes: true, false CopyPad: true, false Test_ID: non-negative integer	
MTDe_TT_So_MI_LMDMo_Terminate[1...M_{LMDMo}]	--	
MTDe_TT_So_MI_LI_Period	1, 255	1
MTDe_TT_So_MI_LI_MEPID	0..255	255
MTDe_TT_So_MI_LI_CoS	0, 1, 2, 3, 4, 5, 6, 7	7
MTDe_TT_So Reporting		
MTDe_TT_So_MI_CV_Series_Result(Session_ID, Rev, CoS, OOO, FWErr, BWErr)	To be defined	-

MI Signal	Value Range	Default Value
MTDe_TT_So_MI_ ~~OD~~[K15]CV_Trace_Result (Session_ID, Result)	To be defined	-
MTDe_TT_So_MI_ ~~OD~~CV_BWErr(Session _ID, Seq, RC, SubRC, ErrTLV)	To be defined	-
MTDe_TT_So_MI_ ~~OD~~CV_BWErr(Session _ID, Seq, RC, SubRC, ErrTLV)	To be defined	-
MTDe_TT_So_MI_DMo_ReportError(Error) [1...M_{DMo}]	true, false	
MTDe_TT_So_MI_DMo_PeriodChanged [1...M_{DMo}]	true, false	
MTDe_TT_So_MI_LMo_ReportError(Error) [1...M_{LMo}]	true, false	
MTDe_TT_So_MI_LMo_PeriodChanged [1...M_{LMo}]	true, false	
MTDe_TT_Sk Provisioning		
MTDe_TT_Sk_MI_PM_Responder_Enable	true, false	False
MTDe_TT_Sk_MI_FEC_Checking	true, false	true
MTDe_TT_Sk Reporting		
MTDi_TT_So Provisioning		
MTDi_TT_So_MI_Target_FEC	See [ITU-T G.8121.2]	--
MTDi_TT_So_MI_Ifnum	See [ITU-T G.8121.2]	--
MTDi_TT_So_MI_MTU	See [ITU-T G.8121.2]	--
MTDi_TT_Sk Provisioning		
MTDi_TT_Sk_MI_FEC_Checking	See [ITU-T G.8121.2]	--

[Note 1] These MI signals are defined in MTDe_TT_So in G.8121 and G.8121.2 does not use These MI signals as defined in Table 8-3 in this Recommendation.

8.7 Connection

See section 8.6 of [ITU-T G.7710/Y.1701] for a description of connection management.

This function allows a user to provision the operation of a MPLS-TP Connection process.

The MI signals listed in this subclause are communicated from the EMF to the Connection process through the management point.

For MT.NE that supports the MT_C and MTp_C functions specified in [ITU-T G.8121/Y.1381], the EMF shall support the following management functions for the MIs listed in Table 8-4 below:

– Provisioning the trail termination management information

– Retrieving the trail termination management information

Notifying the changes of the trail termination management information

Table 8-4/G.8151/Y.1374 – Provisioning and reporting for connection functions

MI Signal	Value Range	Default Value
MT_C Provisioning (Per matrix connection)		
MT_C_MI_ConnectionType	Protected, unprotected	unprotected
MT_C_MI_Return_CP_ID	NULL (for unidirectional), or the Connection point (CP) identifier (for bidirectional)	--
MT_C_MI_ConnectionPortIds	Set of connection point identifiers	--
MT_C Provisioning		
MT_C_MI_MatrixControl	Connect, disconnect	Not applicable
MT_C Provisioning (Per protection process)		
MT_C_MI_PS_WorkingPortId	(Note)	(Note)
MT_C_MI_PS_ProtectionPortId	(Note)	(Note)
MT_C_MI_PS_ProtType	(Note)	(Note)
MT_C_MI_PS_OperType	(Note)	(Note)
MT_C_MI_PS_HoTime	(Note)	(Note)
MT_C_MI_PS_WTR	(Note)	(Note)
MT_C_MI_PS_ExtCMD	(Note)	(Note)
MT_C_MI_PS_SD_Protection	disabled, enabled	disabled
~~MT_C Reporting (Per protection process)~~		
~~MT_C_MI_cFOP-PMb~~	~~true, false~~	~~false~~
~~MT_C_MI_cFOP-PMc~~	~~true, false~~	~~false~~
~~MT_C_MI_cFOP-PMc~~	~~true, false~~	~~false~~
~~MT_C_MI_cFOP-NR~~	~~true, false~~	~~false~~
~~MT_C_MI_cFOP-TO~~	~~true, false~~	~~false~~
MTp_C Provisioning (Per protection process)		
MT_C_MI_PS_WorkingPortId	(Note)	(Note)
MT_C_MI_PS_ProtectionPortId	(Note)	(Note)

MI Signal	Value Range	Default Value
MT_C_MI_PS_ProtType	(Note)	(Note)
MT_C_MI_PS_OperType	(Note)	(Note)
MT_C_MI_PS_HoTime	(Note)	(Note)
MT_C_MI_PS_WTR	(Note)	(Note)
MT_C_MI_PS_ExtCMD	(Note)	(Note)
MT_C_MI_PS_SD_Protection	disabled, enabled	disabled
~~MTp_C Reporting (Per protection process)~~		
~~MT_C_MI_cFOP-PMb~~	~~true, false~~	~~false~~
~~MT_C_MI_cFOP-PMc~~	~~true, false~~	~~false~~
~~MT_C_MI_cFOP-PMc~~	~~true, false~~	~~false~~
~~MT_C_MI_cFOP-NR~~	~~true, false~~	~~false~~
~~MT_C_MI_cFOP-TO~~	~~true, false~~	~~false~~
Note: According to [ITU-T G.8121/Y.1381]		

8.7.1 Connection – G.8121.1 Specific

For MT.NE that supports the MT_C functions specified in [ITU-T G.8121.1/Y.1381.1], there is no additional MI to be managed beyond those listed in Table 8-4 above.

8.7.2 Connection – G.8121.2 Specific

For MT.NE that supports the MT_C functions specified in [ITU-T G.8121.2/Y.1381.2], there is no additional MI to be managed beyond those listed in Table 8-2 above.

8.8 DEG Thresholds

For further study

8.9 XXX_Reported

See section 8.8 of [ITU-T G.7710/Y.1701] for a description of XXX_Reported management.

8.10 Alarm Severity

See section 8.9 of [ITU-T G.7710/Y.1701] for a description of alarm severity.

8.11 Alarm Reporting Control (ARC)

See section 8.10 of [ITU-T G.7710/Y.1701] for a description of alarm report control.

8.12 PM Thresholds

For further study

8.13 TCM Activation

For further study

8.14 Date & Time

The Date and Time Functions within the MPLS-TP EMF comprise the local Real Time Clock (RTC) function and the Performance Monitoring Clock (PMC) function. The Message Communication Function within the MPLS-TP NEF shall be capable of setting the local Real Time Clock function.

The date and time values are incremented by a free running local clock, or by an external timing source. The FCAPS functions need date and time information, e.g. to time stamp event reports. They obtain this information from the Date & Time Function.

8.14.1 Date & Time Applications

Section 8.13.1 of [ITU-T G.7710/Y.1701] identifies three Date & Time applications. These are:

– Time stamping

– Performance Monitoring Clock signals

– Activity scheduling

The MPLS-TP NEF functional requirements for these applications are specified in the following subsections.

8.14.1.1 Time-stamping

See section 8.13.1.1 of [ITU-T G.7710/Y.1701] for a description of the time-stamping application.

8.14.1.2 Performance Monitoring Clock Signals

See section 8.13.1.2 of [ITU-T G.7710/Y.1701] for a description of the PMC signals.

8.14.1.3 Activity Scheduling

See section 8.13.1.3 of [ITU-T G.7710/Y.1701] for a description of the activity scheduling.

8.14.2 Date & Time Functions

There are three Date & Time functions defined. The local Real Time Clock (RTC) function is required for time stamping and activity scheduling. The Local Real Time Clock alignment function is required for aligning the clock with an External Time Reference. The Performance Monitoring Clock (PMC) function, in addition to RTC, is typical for digital counter measurements.

8.14.2.1 Local Real Time Clock Function

The local Real Time Clock function is specified in section 8.13.2.1 of [ITU-T G.7710/Y.1701].

8.14.2.2 Local Real Time Clock alignment function with External Time Reference

The Local Real Time Clock alignment function with External Time Reference is specified in section 8.13.2.2 of [ITU-T G.7710/Y.1701].

8.14.2.3 Performance Monitoring Clock Function

The Performance Monitoring Clock function is specified in section 8.13.2.3 of [ITU-T G.7710/Y.1701].

9 Accounting Management

For further study

10 Performance Management

See [ITU-T G.7710/Y.1701] Clause 10 for the generic requirements for performance management. MPLS-TP specific management requirements are described below.

10.1 Performance management applications

See [ITU-T G.7710/Y.1701] Clause 10.1 for the generic description for performance management applications.

10.2 Performance monitoring functions

See [ITU-T G.7710/Y.1701] Clause 10.2 for generic requirements of performance monitoring functions.

The following are MPLS-TP specific performance management requirements:

1) PM measurements are managed at TTPs and CTPs (i.e., MEPs/MIPs are created and deleted)
2) One MEP has to be created per TTP if that has to be supervised
3) Two kinds of measurement jobs have to be supported (ProActive, OnDemand)
4) ProActive measurement jobs are managed at MEPs (establish, disable, enable, terminate)
5) OnDemand measurement jobs are managed at MEPs (establish, modify, abort)
6) On-Demand measurements can be done using four different OAM PDU generation mechanisms: single instance, repetitive instance, single series, and repetitive series. To describe these mechanisms, the following terms are used:
   - OAM PDU Generation Type:

     Generation pattern of the on-demand OAM message

     Valid types are: single instance, repetitive instance, single series, and repetitive series.
   - Message Period (x)

     Frequency of the OAM message generation within a series

     Note that a value of zero (i.e. x = 0) means that only one OAM message per measurement interval is generated.
   - Measurement Interval (y)

     Defines discrete non overlapping periods of time during which measurements are performed (i.e. OAM messages are generated) and reports are gathered at the end of the measurement intervals.

     Note that a value of zero means a degenerated measurement interval with a single OAM message and the report is sent as immediately as possible.
   - Repetition Period (z)

     Defines the time between the start of two measurement intervals

     This IS applicable for the repetitive instance type and MAY be applicable for the repetitive series type.

Note that a value of zero means not applicable (NA). This is for the cases of single instance, single series, or repetitive series without extra gap in between the measurement intervals (i.e. also as known as continuous series).

– Start Time

Define the start of the on-demand session

– Stop Time

Define the stop of the on-demand session

– Session Duration

Stop Time – Start Time.

Note that session duration is not a configuration parameter. That is, it is not needed in the configuration.

The four on-demand measurements are illustrative in Figure 10-1/G.8051.

Note that in the repetitive series case, if the repetition period z = y + x, or the value is not provisioned, then there is no extra gap between the end of the measurement interval and the start of the new measurement interval. This pattern is also known as the continuous series cases. The repetition period (z) is needed if there is extra gap between the measurement intervals.

7) It shall be possible to configure the following on-demand measurement parameters (including the default values)

a) OAM PDU Generation Type; default = repetitive instance

b) Start Time; default = current time

c) Stop Time; default = current time + 1 hour

d) OAM Message Period; default = 0

e) Measurement Interval; default = 0

e) Repetition Period; default = 0

8) Parallel measurement jobs, one per priority, can be established

9) Performance data is stored in registers associated to the measurement job

10) On-Demand measurement jobs are automatically terminated after (last) report is sent

11) Threshold profiles are managed at the Managed Element (create, modify, delete)

12) It shall be possible to retrieve the following configuration information:

a) All existing MEPs/MIPs within a TP (TTP or CTP)

b) All existing measurement jobs within a MEP

c) All existing threshold profiles within a network element

d) All threshold settings within a Proactive PM measurement job

13) It shall be possible to retrieve all Proactive PM measurement current and history performance data within a MEP

14) It shall be possible to request intermediate reports on an on-demand PM measurement job of "single series" and “repetitive series” types

15) It shall be possible to request an autonomous continuous reporting of Performance data from all Proactive PM measurement jobs within a MEP (i.e., automatic "push" of the measured PM data)

16) On-demand loss measurement can be measured by directly counting the data traffic or can be inferred by counting the synthetic traffic. If on-demand loss measurement is supported, for each Measurement Interval, the MPLS-TP NE should:

– Receive from the transport plane the measurements (i.e., N_TF, N_LF, F_TF, F_LF) at the end of each Measurement Interval.

  Note that according to the definition of near-end and far-end frame loss in clause 8.1/Y.1731, for a MEP, N_TF and N_LF refer to the transmitted and lost ingress frames while F_TF and F_LF refer to the transmitted and lost egress frames.

  Note that 1SL can provide only near-end measurement (i.e., N_TF, N_LF).

– Store the measurements (TN_TF, TN_LF, TF_TF, TF_LF) and calculate the FLRs (TN_FLR=TN_LF/TN_TF, TF_FLR=TF_LF/TF_TF). The measurements and FLRs shall be reported to the management system.

– At the instruction of the management system, the NE shall be able to request from the transport plane the intermediate (i.e. before the end of the Measurement Interval) measurements, calculate the intermediate FLRs, and report the intermediate results (TN_TF, TN_LF, TN_FLR, TF_TF, TF_LF, TF_FLR) to the management system.

NOTE – An on-demand LM or DM session could be a single series of OAM messages or a single instance of OAM message. A single instance OAM could be considered as a special case of a single series OAM.

17) Proactive loss measurement can be measured by directly counting the data traffic or can be inferred by counting the synthetic traffic. If proactive loss measurement is supported, for each loss measurement session the MPLS-TP NE should:

– Receive from the transport plane the measurements (i.e., pN_TF, pN_LF, pF_TF, pF_LF) for each OAM period.

  Note that 1SL can support only near-end measurement (i.e., N_TF, N_LF).

– Calculate the FLRs (N_FLR=pN_LF/pN_TF, F_FLR=pF-LF/pF_TF) for each OAM period; store the temporal minimum, average, and maximum statistics (mN_FLR, aN_FLR, xN_FLR, mF_FLR, aF_FLR, xF_FLR) in the current 15-minute and 24-hour registers. The stored statistics shall be available for retrieval by the management system.

– The FLR measurements of a monitored entity measured during an SES shall be included in the computation of its FLR statistics, unless the SES is part of the unavailable time period. Note: This is in line with the definition made in Note 1 of section 1 in [ITU-T Y.1563].

– At the maturity of the current 15-minute and 24-hour periods, the statistics in the current registers shall move to the history registers and then reset the current registers to zeros. See detailed requirements in [ITU-T G.7710].

18) If on-demand 1-way DM is supported, for each on-demand 1-way DM Measurement Interval, the MPLS-TP NE should:

– Receive from the transport plane the array of near-end measurements (count, N_FD[]) at the end of each Measurement Interval.

– Store the measurements, compute the corresponding array of N_FDV[] and report the near-end measurements (count, N_FD[], N_FDV[]) to the management system.

– At the instruction of the management system, the NE shall be able to request from the transport plane the intermediate measurements, calculate the intermediate N_FDV[],

and report the intermediate results (count, N_FD[], N_FDV[]) to the management system.

19) If proactive 1-way DM is supported, for each proactive 1-way DM session the MPLS-TP NE should:

- Receive from the transport plane the near-end measurements (pN_FD, pN_FDV)for each OAM period.
- Store the temporal minimum, average, and maximum (N_FD, N_FDV) in the current 15-minute and 24-hour registers. The stored statistics shall be available for retrieval by the management system.
- At the maturity of the current 15-minute and 24-hour periods, the statistics in the current registers shall move to the history registers and then reset the current registers to zeros. See detailed requirements in [ITU-T G.7710].

20) If on-demand 2-way DM is supported, for each on-demand 2-way DM Measurement Interval, the MPLS-TP NE should:

- Receive from the transport plane the array of near-end, far-end, and bidirectional measurements (count, N_FD[], F_FD[], B_FD[]) at the end of each Measurement Interval.
- Store the measurements, compute the corresponding array of FDV[], and report the Near-end, Far-end, and Bidirectional (2-way) measurements (count, N_FD[], F_FD[], B_FD[]; N_FDV[], F_FDV[], B_FDV[]) to the management system.
- At the instruction of the management system, the NE shall be able to request from the transport plane the intermediate measurements, calculate the intermediate FDV[], and report the intermediate results (count, N_FD[], F_FD[], B_FD[]; N_FDV[], F_FDV[], B_FDV[]) to the management system.

21) If proactive 2-way DM is supported, for each proactive 2-way DM session the MPLS-TP NE should:

- Receive from the transport plane the near-end, far-end, and bidirectional measurements (N_FD, F_FD, B_FD; N_FDV, F_FDV, B_FDV) for each OAM period.
- Store the temporal minimum, average, and maximum for each type of the measurements (N_FD, F_FD, B_FD; N_FDV, F_FDV, B_FDV) for the current 15-minute and 24-hour registers. The stored statistics shall be available for retrieval by the management system.
- At the maturity of the current 15-minute and 24-hour periods, the statistics in the current registers shall move to the history registers and then reset current registers to zeros. See detailed requirements in [ITU-T G.7710].

22) The MPLS-TP NE should support the ability to configure for the start and stop at the respondent-end MEP of a single-ended measurement session.

MPLS-TP NE shall provide the following PM management information (see Table 10-1).

Table 10-1/G.8151/Y.1374 – PM Management Information

PM Management Information	G.8121 Function
MT_TT_Sk_MI_pN_LF MT_TT_Sk_MI_pN_TF MT_TT_Sk_MI_pF_LF MT_TT_Sk_MI_pF_TF MT_TT_Sk_MI_pF_DS MT_TT_Sk_MI_pN_DS MT_TT_Sk_MI_pB_FD MT_TT_Sk_MI_pB_FDV MT_TT_Sk_MI_pN_FD MT_TT_Sk_MI_pN_FDV MT_TT_Sk_MI_pF_FD MT_TT_Sk_MI_pF_FDV	MT_TT_Sk
MT/ETH_A_Sk_MI_pFCSErrors	MT/ETH_A_Sk

The EMF shall support the following functions:

– Notifying of the PM management information

11 Security management

See [ITU-T G.7710/Y.1701] for a description of security management.

Bibliography

The following is a list of non-normative references used by this Recommendation. These documents are used as supplementary information to assist the understanding of this Recommendation. Therefore, conformance to these documents is not necessary.

[b-IETF RFC 5951] IETF RFC 5951 (2010), MPLS-TP Network Management Requirements

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