MPLS Working Group
Internet Draft
Intended status: Informational
Expires: September 2009

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March 3, 2009

A Thesaurus for the Terminology used in Multiprotocol Label Switching Transport Profile (MPLS-TP) drafts/RFCs and ITU-T's Transport Network Recommendations.

draft-helvoort-mpls-tp-rosetta-stone-00

Status of this Memo

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Abstract

MPLS-TP is based on a profile of the MPLS and PW procedures as specified in the MPLS-TE and (MS-)PW architectures developed by the IETF. The ITU-T has specified a Transport Network architecture.

This document provides a thesaurus for the interpretation of MPLS-TP terminology within the context of the ITU-T Transport Network recommendations.

It is important to note that MPLS-TP is applicable in a wider set of contexts than just Transport Networks. The definitions presented in this document do not provide exclusive nor complete interpretations of MPLS-TP concepts. This document simply allows the MPLS-TP terms to be applied within the Transport Network context.

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1. Introduction

Multiprotocol Label Switching - -
Transport Profile (MPLS-TP) has been
developed by the IETF to facilitate the Operation, Administration
and Management of Label Switched Paths (LSPs) in a Transport Network
environment as defined by the ITU-T.

The ITU-T has specified a Transport Network architecture for the transfer of signals from different technologies. This architecture forms the basis of many Recommendations within the ITU-T.

Because of the difference in historic background of MPLS, and inherently MPLS-TP (the Internet) and the Transport Network (ITU telecommunication Sector), the terminology used is different.

This document provides a thesaurus for the interpretation of ITU-T Transport Network terminology within the context of the MPLS-TP. This allows MPLS-TP documents to be generally understood by those familiar with MPLS RFCs. The definitions presented in this document do not provide exclusive or complete interpretations of the ITU-T Transport Network concepts.

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1.2. Abbreviations

ME Maintenance Entity

MEP Maintenance End Point

MIP Maintenance Intermediate Point

2. Terminology

Throughout this document, angle brackets ("<" and ">") are used to indicate that the term is used by both IETF and ITU-T but has a different definition. The bracketed term is the IETF term.

[editor: check all terms used that this applies to, TBD]

2.1. MPLS-TP Terminology Sources

MPLS-TP terminology is principally defined in [RFC....]. Other documents provide further key definitions including [RFC....], and [RFC....].

2.2. ITU-T Transport Network Terminology Sources

The ITU-T Transport Network is specified in a number of recommendations: generic functional architectures and requirements are specified in G.805 [ITU-T_G.805], G.806 [ITU-T_G.806], and G.872 [ITU-T_G.872]. G.8101 [ITU-T_G.8101] contains an overview of the Terms and Definitions for transport MPLS.

2.3. Common Terminology Sources

The work in this document builds on the shared view of MPLS requirements.

3. Thesaurus

From: draft-ietf-mpls-tp-requirements-04 [1]

3.1. Associated bidirectional path:

A path that supports traffic flow in both directions but which is constructed from a pair of unidirectional paths (one for each direction) which are associated with one another at the path's ingress/egress points. The forward and backward directions may or may not follow the same route (links and nodes) across the network.

3.2. Bidirectional path:

A path where the forward and backward directions follow the same route (links and nodes) across the network.

3.3. Concatenated Segment:

A serial-compound link connection as defined in G.805 [ITU-T_G.805]. A concatenated segment is a contiguous part of an LSP or multi-segment PW that comprises a set of segments and their interconnecting nodes in sequence.

3.4. Co-routed bidirectional path:

A bidirectional path where the forward and backward directions follow the same route (links and nodes) across its layer network.

3.5. Domain:

A domain represents a collection of entities (for example network elements) that are grouped for a particular purpose, examples of which are administrative and/or managerial responsibilities, trust relationships, addressing schemes, infrastructure capabilities, aggregation, survivability techniques, distributions of control functionality, etc. Examples of such domains include IGP areas and Autonomous Systems.

3.6. Layer network:

Layer network is defined in G.805 [ITU-T_G.805]. A layer network provides for the transfer of client information and independent operation of the client OAM. A Layer Network may be described in a service context as follows: one layer network may provide a (transport) service to higher client layer network and may, in turn, be a client to a lower layer network. A layer network is a logical construction somewhat independent of arrangement or composition of physical network elements. A particular physical network element may topologically belong to more than one layer network, depending on the actions it takes on the encapsulation(s) associated with the logical layers (e.g. the label stack), and thus could be modeled as multiple logical elements. A layer network may consist of zero or more sublayers. For additional explanation of how layer networks relate to the OSI concept of layering see Appendix I of Y.2611 [ITU-T_Y.2611].

3.7. Link:

A physical or logical connection between a pair of LSRs that are adjacent at the (sub)layer network under consideration. A link may carry zero, one or more LSPs or PWs. A packet entering a link will emerge with the same label stack entry values.

A link as defined in G.805 [ITU-T_G.805] is used to describe a fixed relationship between two ports.

3.8. Logical Ring:

An MPLS-TP logical ring is constructed from a set of LSRs and logical data links (such as MPLS-TP LSP tunnels or MSPL-TP pseudowires) and physical data links that form a ring topology.

3.9. Path:

See Transport path.

3.10. Physical Ring:

An MPLS-TP physical ring is constructed from a set of LSRs and physical data links that form a ring topology.

3.11. Ring Topology:

In an MPLS-TP ring topology each LSR is connected to exactly two other LSRs, each via a single point-to-point bidirectional MPLS-TP capable data link. A ring may also be constructed from only two LSRs where there are also exactly two links. Rings may be connected to other LSRs to form a larger network. Traffic originating or terminating outside the ring may be carried over the ring. Client network nodes (such as CEs) may be connected directly to an LSR in the ring.

3.12. Section:

A section is a server layer (which may be MPLS-TP or a different technology) which provides for encapsulation and OAM of a MPLS-TP transport path client layer. A section layer may provide for aggregation of multiple MPLS-TP clients. Note that G.805 [ITU-T_G.805] defines the section layer as one of the two layer networks in a transmission media layer network. The other layer network is the physical media layer network.

3.13. Segment:

A link connection as defined in G.805 [ITU-T_G.805]. A segment is the part of an LSP that traverses a single link or the part of a PW that traverses a single link (i.e. that connects a pair of adjacent {S|T}-PEs).

3.14. Service layer:

A layer network in which transport paths are used to carry a customer's (individual or bundled) service (may be point-to-point, point-to-multipoint or multipoint-to-multipoint services).

3.15. Span:

A span is synonymous with a link.

3.16. Sublayer:

Sublayer is defined in G.805 [ITU-T_G.805]. The distinction between a layer network and a sublayer is that a sublayer is not directly

accessible to clients outside of its encapsulating layer network and offers no direct transport service for a higher layer (client) network.

3.17. Tandem Connection:

A tandem connection is an arbitrary part of a transport path that can be monitored (via OAM) independently from the end-to-end monitoring (OAM). It may be a monitored segment, a monitored concatenated segment or any other monitored ordered sequence of contiguous hops and/or segments (and their interconnecting nodes) of a transport path.

3.18. Transport path:

A network connection as defined in G.805 [ITU-T_G.805]. In an MPLS-TP environment a transport path corresponds to an LSP or a PW.

3.19. Transport path layer:

A layer network which provides point-to-point or point-to-multipoint transport paths which are used to carry a higher (client) layer network or aggregates of higher (client) layer networks, for example the transport service layer. It provides for independent OAM (of the client OAM) in the transport of the clients.

3.20. Transport service layer:

A layer network in which transport paths are used to carry a customer's (individual or bundled) service (may be point-to-point, point-to-multipoint or multipoint-to-multipoint services).

3.21. Transmission media layer:

A layer network which provides sections (two-port point-to-point connections) to carry the aggregate of network transport path or network service layers on various physical media.

3.22. Unidirectional path:

A path that supports traffic flow in only one direction.

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from: draft-ietf-mpls-tp-oam-requirements-00 [2]

3.23. Failure:

[editor: this is not in [2] BUT added fro completeness]

The fault cause persisted long enough to consider the ability of an item to perform a required function to be terminated. The item may be considered as failed; a fault has now been detected. See also G.806 [ITU-T_.G.806].

3.24. Fault:

The inability of a function to perform a required action. This does not include an inability due to preventive maintenance, lack of external resources, or planned actions. See also G.806 [ITU-T_G.806].

3.25. Defect:

The situation for which density of anomalies has reached a level where the ability to perform a required function has been interrupted. Defects are used as input for PM, the control of consequent actions, and the determination of fault cause. See also G.806 [ITU-T_G.806].

3.26. MPLS Transport Profile (MPLS-TP):

The set of MPLS functions used to support packet transport services and network operations.

3.27. MPLS Section:

A network segment between two LSRs that are immediately adjacent at the MPLS layer.

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From: draft-ietf-mpls-tp-framework-00 [3]

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From: draft-gray-mpls-tp-nm-req-03 [4]

3.28. MPLS-TP NE:

A network element (NE) that supports MPLS-TP functions.

3.29. MPLS-TP network:

A network in which MPLS-TP NEs are deployed

3.30. Equipment Management Function (EMF):

The management functions within an NE. See G.7710 [ITU-T_G.7710].

3.31. Data Communication Network (DCN):

A network that supports Layer 1 (physical layer), Layer 2 (data-link layer), and Layer 3 (network layer) functionality for distributed management communications related to the management plane, for distributed signaling communications related to the control plane, and other operations communications (e.g., order-wire/voice communications, software downloads, etc.).

3.32. Communication Channel (CC):

A logical channel between network elements (NEs) that can be used - e.g. - for management plane application or control plane applications. The physical channel supporting the CC is technology specific. See [4] APPENDIX A

3.33. Embedded Communication Channel (ECC):

A logical operations channel between network elements (NEs) that can be utilized by multiple applications (e.g., management plane applications, control plane applications, etc.). The physical channel supporting the ECC is technology specific. An example of physical channels supporting the ECC is a DCC channel within SDH.

3.34. Management Communication Channel (MCC):

A CC dedicated for management plane communications.

3.35. Management Communication Network (MCN):

A DCN supporting management plane communication is referred to as a Management Communication Network (MCN).

3.36. Signaling Communication Channel (SCC):

A CC dedicated for control plane communications. The SCC may be used for GMPLS/ASON signaling and/or other control plane messages (e.g., routing messages).

3.37. Signaling Communication Network (SCN):

A DCN supporting control plane communication is referred to as a Signaling Communication Network (SCN).

3.38. Operations System (OS):

A system that performs the functions that support processing of information related to operations, administration, maintenance, and provisioning (OAM&P) for the networks, including surveillance and testing functions to support customer access maintenance.

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From: draft-busi-mpls-tp-oam-framework-00 [5]

MPLS Section: [editor: see 3.27]

OAM flow: to be added in a future revision of this document.

Tandem Connection: [editor: see 3.17]

3.39. Maintenance Entity

A Maintenance Entity can be viewed as the association of two (or more) Maintenance End Points (MEPs), that should be configured and managed in order to bound the OAM responsibilities of an OAM flow [editor: definition?] across a network or sub-network, i.e. a transport path or segment, in the specific layer network that is being monitored and managed.

A Maintenance Entity may be defined to monitor and manage bi-directional or unidirectional point-to-point connectivity or point-to-multipoint connectivity in an MPLS-TP layer network.

[editor: should the following be included?]

Therefore, in the context of MPLS-TP LSP or PW Maintenance Entity (defined below) LERs and T-PEs can be MEPs while LSRs and S-PEs can be MIPs. In the case of Tandem Connection Maintenance Entity (defined below), LSRs and S-PEs can be either MEPs or MIPs.

The following properties apply to all MPLS-TP MEs:

o OAM entities can be nested but not overlapped.

o Each OAM flow is associated to a unique Maintenance Entity.

o OAM packets are subject to the same forwarding treatment as the data traffic, but they are distinct from the data traffic.

3.40. Maintenance End Points (MEPs)

Maintenance End Points (MEPs) are the end points of a pre-configured (through the management or control planes) ME. MEPs are responsible for activating and controlling all of the OAM functionality for the ME. A MEP may initiate an OAM packet to be transferred to its corresponding MEP, or to an intermediate MIP that is part of the ME.

A MEP terminates all the OAM packets that it receives corresponding to its ME and does not forward them further along the path.

All OAM packets coming to a MEP source are tunnelled via label stacking and are not processed within the ME as they belong either to the client network layers or to an higher TCM level.

A MEP in a tandem connection is not coincident with the termination of the MPLS-TP transport path (LSP or PW), though it can monitor its connectivity (e.g. count packets). A MEP of an MPLS-TP network transport path is coincident with transport path termination and monitors its connectivity (e.g. count packets).

MPLS-TP MEP notifies a fault indication to the MPLS-TP client layer network.

3.41. Maintenance Intermediate Points (MIPs)

A Maintenance Intermediate Point (MIP) is a point between the two MEPs in an ME and is capable of responding to some OAM packets and forwarding all OAM packets while ensuring fate sharing with data plane packets. A MIP responds only to OAM packets that are sent on the ME it belongs to and that are addressed to the MIP, it does not initiate OAM messages.

3.42. Server MEPs

A server MEP is a MEP of an ME that is defined in a layer network below the MPLS-TP layer network being referenced. A server MEP coincides with either a MIP or a MEP in the client (MPLS-TP) layer network.

For example, a server MEP can be either:

. A termination point of a physical link (e.g. 802.3), an SDH VC or OTH ODU for the MPLS-TP Section layer network, defined in [5] section 3.1.;

. An MPLS-TP Section MEP for MPLS-TP LSPs, defined in [5] section 3.2.;

. An MPLS-TP LSP MEP for MPLS-TP PWs, defined in [5] section 3.4.;

. An MPLS-TP TCM MEP for higher-level TCMs, defined in [5] sections 3.3. and 3.5.

The server MEP can run appropriate OAM functions for fault detection, and notifies a fault indication to the MPLS-TP layer network.

[editor: the following are definitions from G.8101 which should be defined only if they will cause misunderstanding. It is not usefull to define them if the definition is the same in IETF and ITU-T, TBD]

===== ITU-T Rec. G.8101/Y.1355 (12/2006) =====

3.1 access point

3.2 adapted information

3.3 characteristic information

3.4 client/server relationship

3.5 connection

3.6 connection point

3.9 forward direction

3.12 link connection

3.13 matrix

3.14 network

3.15 network connection

3.16 network operator

3.17 port

3.18 reference point

3.19 service provider

3.20 subnetwork

3.21 subnetwork connection

3.22 termination connection point

3.23 trail

3.24 trail termination

3.25 trail termination point

3.26 transport

3.27 transport entity

3.28 transport processing function

3.29 unidirectional connection

3.30 unidirectional trail

3.31 Z layer

Transport MPLS (T-MPLS) Recommendations uses the following terms defined in ITU-T Rec. G.809:

3.33 access point

3.34 adaptation

3.35 adapted information

3.36 characteristic information

3.37 client/server relationship

3.50 network

3.52 port

3.53 reference point

3.56 traffic unit

3.57 transport

3.58 transport entity

Transport MPLS (T-MPLS) Recommendations uses the following term defined in ITU-T Rec. G.8010/Y.1306:

3.59 point-to-point Ethernet connection

Transport MPLS (T-MPLS) Recommendations uses the following terms defined in ITU-T Rec. Y.1711:

3.60 backward direction

3.62 client/server (relationship between layer networks)

3.63 failure

3.64 forward direction

3.65 user-plane

Transport MPLS (T-MPLS) Recommendations uses the following terms defined in ITU-T Rec. Y.1720:

3.66 1+1 protection

3.67 1:1 protection

3.68 bidirectional protection switching

3.69 bridge

3.71 extra traffic

3.72 failure

3.73 forced switch for working LSP

3.74 hold-off time

3.75 manual switch

3.76 MPLS protection domain

3.77 non-revertive protection switching

3.78 no request

3.79 packet 1+1 protection

3.80 path switch LSR

3.81 path merge LSR

3.82 protection LSP

3.83 protection switching

3.84 rerouting

3.85 revertive protection switching

3.86 selector

3.87 shared mesh protection

3.88 Shared Risk Group (SRG)

3.89 sink of the protection domain

3.90 source of the protection domain

3.91 unidirectional protection switching

3.92 wait to restore

3.93 wait to restore timer

3.94 working LSP

Transport MPLS (T-MPLS) Recommendations uses the following terms defined in ITU-T Rec. Y.1731:

3.95 in-service OAM

===== end of ITU-T Rec. G.8101/Y.1355 (12/2006) =====

4. Guidance on the Application of this Thesaurus

As discussed in the introduction to this document, this thesaurus is intended to bring the concepts and terms associated with MPLS-TP into the context of the ITU-T's Transport Network architecture. Thus, it should help those familiar with MPLS to see how they may use the features and functions of the Transport Network in order to meet the requirements of MPLS-TP.

This lexicography should not be used in order to obtain or derive definitive definitions of GMPLS terms. To obtain definitions of GMPLS terms that are applicable across all GMPLS architectural models, the reader should refer to the RFCs listed in the references sections of this document. [RFC3945] provides an overview of the GMPLS architecture and should be read first.

5. Management Considerations

The MPLS-TP based network requires management. The MPLS-TP specifications include considerable efforts to provide operator control and monitoring, as well as Operations and Management (OAM)functionality.

These concepts are, however, out of scope of this document.

6. Security Considerations

Security is also a significant requirement of MPLS-TP.

However, this informational document is intended only to provide a lexicography, and the security concerns are, therefore, out of scope.

7. IANA Considerations

To be incorporated in a future revision of this document

<<TBA>>

8. Acknowledgments

The authors would like to thank all members of the teams (the Joint Working Team, the MPLS Interoperability Design Team in IETF and the T-MPLS Ad Hoc Group in ITU-T) involved in the definition and specification of MPLS Transport Profile.

9. References

9.1. Normative References

[1] B. Niven-Jenkins, et al., ''MPLS-TP Requirements'', draft-ietf-mpls-mpls-tp-requirements, november 2008

[2] Vigoureux, M., Betts, M., Ward, D., "Requirements for OAM in MPLS Transport Networks", draft-vigoureux-mpls-tp-oam-requirements, november 2008

[3] Bocci, M., Bryant, S., "A Framework for MPLS in Transport Networks'', draft-ietf-mpls-tp-framework, november 2008

[4] Gray, E., Mansfield, S., et al., ''MPLS TP Network Management Requirements'', draft-gray-mpls-tp-nm-req, november 2008

[5] Busi, I., Niven-Jenkins, B., et al., ''MPLS-TP OAM Framework and Overview'', draft-busi-mpls-tp-oam-framework, november 2008

9.2. Informative References

For information on the availability of the following documents, please see http://www.itu.int

[6] [ITU-T_G.8101] ITU-T Recommendation G.8101/Y.1355 (12/2006), Terms and definitions for transport MPLS.

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

[8] [ITU-T_G.806] ITU-T Recommendation G.806 (03/2006), Characteristics of transport equipment - Description methodology and generic functionality.

[9] [ITU-T_Y.1711] ITU-T Recommendation Y.1711 (10/2005) Operation & Maintenance mechanism for MPLS networks.

[10] [ITU-T_Y.1720] ITU-T Recommendation Y.1720 (02/2008), Protection switching for MPLS networks.

[11] [ITU-T_Y.1731] ITU-T Recommendation Y.1731 (02/2008), OAM functions and mechanisms for Ethernet based networks.

[12] [ITU-T_G.872] ITU-T Recommendation G.872 (2001), Architecture of optical transport networks.

[13] [ITU-T_G.7710] ITU-T Recommendation G.7710 (),

[14] [ITU_Y.2611] ITU-T Recommendation Y.2611 (),

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