

**TR-226**  
**XML Layered and Performance Parameters In Support  
of TR-169**

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## **Executive Summary**

The purpose of this Technical Report is to define a set of layered and performance parameters for an XML data model describing the management information transferred across an Element Management System (EMS) to Network Management System (NMS) interface in support of DSL to Ethernet aggregation in Access Nodes. In so doing, the goal is to leverage the Multi-Technology Network Management (MTNM) 3.5 requirements and propose enhancements to the Layered and Performance Parameters defined in the TeleManagement Forum (TMF).

## 1 Purpose and Scope

### 1.1 Purpose

The purpose of TR-226 is to identify/define a set of layered and performance parameters for an XML data model describing the TR-169 [2] management information transferred across an Element Management System (EMS) to Network Management System (NMS) interface in support of DSL to Ethernet aggregation in Access Nodes. The layered parameters are defined for specific layer rates (LRs), such as LR\_Ethernet, as specified in TMF513 SD1-17 [15]. TR-169 draws on the EMS-NMS management of DSL aggregation to Ethernet requirements defined in TR-101 [10], the TR-141 [11] Network Element (NE)-EMS information model, the DSL EMS-NMS interface requirements defined in TR-130 [3], and the ITU-T Rec. Q.840.1 [4] EMS-NMS information model requirements.

As Service Providers desire to offer new services faster and more cost-effective than ever before, the complexities of network and operations to support these new services requires inter-working between many different network equipment, technologies, and Network Management Systems (NMSs). The TeleManagement Forum (TMF) Multi-Technology Network Management (MTNM) 3.5 work is intended to be an enabler for this interworking. MTNM 3.5 has defined layered parameters for DSL and Ethernet in its Service Definition documents along with its supporting XML model components in MTOSI R2.0. In order to proceed with the definition of an XML model in support of DSL to Ethernet aggregation based on TR-101, TR-226 first compares the requirements in TR-169 with the MTNM 3.5 documents to determine any gaps that may exist between Broadband Forum and TeleManagement Forum requirements. Identification of the gaps will serve as the starting point for the definition of an XML model in the TeleManagement Forum.

### 1.2 Scope

TR-226 contains a mapping of TR-169 requirements to the TeleManagement Forum MTNM 3.5 requirements in order to identify a set of layered and performance parameters for consideration of inclusion in the TeleManagement Forum MTOSI Supporting Documentation. TR-226 is intended to pave the way for definition of a XML data model in the TeleManagement Forum that is consistent with Broadband Forum TRs such as TR-101, TR-141, and TR-169.

## 2 References and Terminology

### 2.1 Conventions

In this Technical Report, several words are used to signify the requirements of the specification. These words are always capitalized. More information can be found in RFC 2119 [1].

<b>MUST</b>	This word, or the term “REQUIRED”, means that the definition is an absolute requirement of the specification.
<b>MUST NOT</b>	This phrase means that the definition is an absolute prohibition of the specification.
<b>SHOULD</b>	This word, or the adjective “RECOMMENDED”, means that there could exist valid reasons in particular circumstances to ignore this item, but the full implications need to be understood and carefully weighed before choosing a different course.
<b>SHOULD NOT</b>	This phrase, or the phrase "NOT RECOMMENDED" means that there could exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications need to be understood and the case carefully weighed before implementing any behavior described with this label.
<b>MAY</b>	This word, or the adjective “OPTIONAL”, means that this item is one of an allowed set of alternatives. An implementation that does not include this option <b>MUST</b> be prepared to inter-operate with another implementation that does include the option.

### 2.2 References

The following references are of relevance to this Technical Report. At the time of publication, the editions indicated were valid. All references are subject to revision; users of this Technical Report are therefore encouraged to investigate the possibility of applying the most recent edition of the references listed below. A list of currently valid Broadband Forum Technical Reports is published at [www.broadband-forum.org](http://www.broadband-forum.org).

Document	Title	Source	Year
[1] RFC 2119	<i>Keywords for use in RFCs to Indicate Requirement Levels</i>	IETF	1997
[2] TR-169	<i>EMS to NMS Interface Requirements for Access Nodes Supporting TR-101</i>	Broadband Forum	2008
[3] TR-130	<i>xDSL EMS to NMS Interface Functional</i>	Broadband Forum	2006

	<i>Requirements</i>		
[4] Q.840.1	<i>Requirements and Analysis for NMS-EMS Management Interface of Ethernet over Transport and MetroEthernet Networks</i>	ITU-T	2007
[5] MEF 17	<i>Service OAM Requirements &amp; Framework – Phase 1</i>	MetroEthernet Forum	2007
[6] TMF 513 (Member Evaluation Version 3.1)	<i>Multi-Technology Network Management (MTNM) Business Agreement</i>	TeleManagement Forum	2007
[7] TMF 513 SD1-16	<i>Supporting Document: Layered Parameters</i>	TeleManagement Forum	2007
[8] TMF 513 SD1-28	<i>Supporting Document: Performance Parameters</i>	TeleManagement Forum	2007
[9] TMF608	<i>Multi-Technology Network Management (MTNM) Information Agreement</i>	TeleManagement Forum	2007
[10] TR-101	<i>Migration to Ethernet-based DSL Aggregation</i>	Broadband Forum	2006
[11] TR-141	<i>Protocol Independent Management Model for Access Nodes Supporting TR-101</i>	Broadband Forum	2007
[12] Y.1731	<i>OAM functions and mechanisms for Ethernet based networks</i>	ITU-T	2006
[13] TMF864_NRB_XML	<i>Network Resource Basic - DDP IIS</i>	TeleManagement Forum	2008
[14] TMF513 SD1-44	<i>Supporting Document: Connectionless Technology Management</i>	TeleManagement Forum	2007
[15] TMF513 SD1-17	<i>Supporting Document: Layer Rates</i>	TeleManagement Forum	2007
[16] MEF 7.1	<i>Phase 2 EMS-NMS Information Model</i>	MetroEthernet Forum	2009

## 2.3 Definitions

The following terminology is used throughout this Technical Report.

ATM	Asynchronous Transfer Mode. A connection-oriented high-speed communications protocol in which data is divided into 48 byte “cells” that can be individually switched and routed. Each cell is pre-appended with a 5 byte “header” containing an identifier of the connection of which the data is a part, along with quality of service parameters associated with the connection.
Customer	An entity to which the service provider provides network services.
C-Tag	The innermost VLAN tag as defined in IEEE 802.1ad.
C-VID	The VLAN ID value of some C-Tag.
EMS	Element Management System. This entity is typically provided by a network element supplier and capable of managing multiple network elements of that supplier. An EMS can communicate with one or more NE(s) on an individual or collective basis (e.g., individually to a switch or collectively to a SONET ring). An EMS can have some network management layer capabilities, particularly, when an EMS manages multiple types of NE(s) and/or NE(s) from multiple suppliers.
EVC	Ethernet Virtual Connection. An association of two or more UNIs (i.e., Access Node ports) that limits the exchange of frames to UNIs in the Ethernet Virtual Connection.
FPP	Flow Point Pool, representing an Ethernet UNI on a port
MEG	Maintenance Entity Group. Consists of Maintenance Entities which belong to the same service inside a common OAM domain. For a Point-to-Point EVC, a MEG contains a single ME. For a Multipoint-to-Multipoint EVC associating “n” UNIs, a MEG contains $n*(n-1)/2$ MEs.
MEP	MEG End Point. A MEP is a provisioned OAM reference point capable of initiating and terminating proactive OAM frames.
MIB	Management Information Base. A set of data elements and capabilities made available by a system to enable it to be managed.
MIP	MEG Intermediate Point. A MIP is a provisioned OAM reference point capable of reacting to diagnostic OAM frames initiated by MEPs. A MIP does not initiate proactive and diagnostic OAM frames.
Network	One or more subnetworks connected by network links, providing end-to-end service to one or more customers. Each subnetwork is administered by an EMS and the network is administered by a service provider.
NMS	An entity responsible for end-to-end management of a network composed of network elements from multiple suppliers. Instead of directly managing network elements, it relies upon the capabilities of the EMS(s). An NMS can interface with one or more Service

	Management Systems and can include some service management functionality. An NMS can also include some element management layer capabilities that allow it to manage individual NE(s) or it can contain only network management layer functionality to manage one or more EMS(s).
Port	An access point on an NE to which a link or a customer access link is attached.
Priority Tagged Frame	An Ethernet frame carrying a priority tag.
Subnetwork	A collection of one or more NE(s), interconnected by subnetwork links, with connectivity between any pair of NE(s) (i.e., the topology is a connected graph).
S-VID	The VLAN ID value of some S-Tag.
Untagged Frame	An Ethernet frame without any VLAN or priority tagging.
User-Side Bridge Port	This managed entity, defined in TR-141, is the collection of all managed objects that their scope is <u>only</u> a user-side bridge port (on a U-Interface). A UBP is a subclass of the Connectionless Port Termination Point (CPTP) object in MTNM 3.5.
VCI	Virtual Channel Identifier. An integer in each ATM cell header identifying the virtual channel of which the information in the cell is a part.
VLAN ID	Virtual LAN Identifier. The identity of the VLAN on an Ethernet port.
1:1 VLAN	Indicates a one-to-one mapping between user port and VLAN. The uniqueness of the mapping is maintained in the Access Node.
N:1 VLAN	Many-to-one mapping between user ports and VLAN. The user ports may be located in the same or different Access Nodes.
VPI	Virtual Path Identifier. An integer in each ATM cell header identifying the virtual path of which the information in the cell is a part.

## 2.4 Abbreviations

This Technical Report uses the following abbreviations.

CBS	Committed Burst Size
CCM	Continuity Check Message
CIR	Committed Information Rate
CoS	Class of Service
CPTP	Connectionless Port Termination Point
DDP	Document Delivery Package
EBR	Excess Burst Rate
EIR	Excess Information Rate

EMS	Element Management System
IETF	Internet Engineering Task Force
IIS	Interface Implementation Specifications
IP	Internet Protocol
LAN	Local Area Network
LR	Layer Rate
MAC	Media Access Control
ME	Maintenance Entity
MP	Maintenance Point
NE	Network Element
NMS	Network Management System
OAM	Operations, Administration, and Maintenance
PADT	PPPoE Active Discovery Terminate
PPP	Point-to-Point Protocol
PPPoE	PPP over Ethernet
PTP	Physical Termination Point
TMF	TeleManagement Forum
UNI	User-Network Interface
VLAN	Virtual LAN

### **3 Technical Report Impact**

#### **3.1 Energy Efficiency**

TR-226 has no impact on energy efficiency.

#### **3.2 IPv6**

TR-226 has no impact on IPv6 support and compatibility.

#### **3.3 Security**

There are no relevant security issues relating to TR-226.

#### 4 Mapping of TR-169 Requirements to MTNM 3.5

The TeleManagement Forum (TMF) is recognized as a key standards organization for the definition of multi-technology network management requirements and data models. DSL and Ethernet management requirements and data models produced by the Broadband Forum (BBF) need to build on the TMF's MTOSI Release 2.0 work when considering the EMS to NMS interface to help achieve industry compatability. TR-226 maps the TR-169 requirements with TMF MTNM 3.5 requirements. This will help enable:

- Future definition and development of protocol-specific models in the TeleManagement Forum and by Element Management System (EMS)/Network Management System (NMS) vendors.
- BBF specifications to be aligned with TMF specifications rather than superceding MTOSI Release 2.0 by identifying those deltas that need to be reflected in MTOSI in support of a TR-169 based EMS-NMS information model.

To this end, Table 1 provides a mapping between TR-169 requirements/parameter names and MTNM 3.5 parameter names. The specific document where the MTNM 3.5 parameter can be found along with the source standards document for the TR-169 requirement are also cited in Table 1.

R-01 An XML-based EMS-NMS interface supporting DSL-to-Ethernet aggregation MUST support the MTNM parameters identified in column C of Table 1.

Table 1 identifies several gaps between TR-169 and TMF MTNM 3.5. When a gap exists, the following note appears in the MTNM 3.5 Parameter Name cell "NO MAPPING TO TM FORUM SPECIFICATIONS – GAP." Gaps exist between the Broadband Forum and MTNM 3.5 requirements as summarized below.

- Ethernet Operations, Administration, and Maintenance (OAM) procedures and performance management parameters are being worked in bodies such as the MetroEthernet Forum. While significant progress is being made, more work is required. As such, MTNM 3.5 does not address Ethernet OAM.;
- MTNM 3.5 addresses point-to-point and multi-point VLANs;
- IP layer requirements have not been addressed in the MTNM 3.5 documents;
- MAC address filtering is not covered in MTNM 3.5;
- IGMP requirements are not covered in MTNM 3.5;
- TR-101 configuration of queues per user and network facing port are not covered in MTNM 3.5;
- TR-101 multicast VLAN performance monitoring counts have not been addressed in MTNM 3.5; and
- The TR-101 EtherType filter is not supported in MTNM 3.5.

**Table 1 – Requirements Mappings between TR-169 and TMF MTNM**

<b>TR-169 Requirement Number (A)</b>	<b>TR-169 Requirement/Parameter Name (B)</b>	<b>MTNM Parameter Name (C)</b>	<b>MTNM Document (D)</b>	<b>Source Standard (E)</b>
R-01	Acceptable Frame Types	“PortAcceptableFrameTypes”	SD1-16 [7]	IEEE 802.1Q, 12.10 IEEE 802.1ad
R-02	Create, Modify, Delete, and Retrieve Ethernet FPPs	Various Parameters Defined per CPTP	SD1-16	Q.840.1
R-03	FPP Type (UNI, E-NNI, or Unconfigured)	“Interface Type”	SD1-16	Q.840.1
R-04	Ethertype Filter (PPPoE, IPoE, ARP)	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-05	rootedMP and p2pVLAN filtering per UNI on source and destination MAC addresses	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	TR-101
R-06	Processing Decision for Layer 2 control protocols (Discard, Peer, Pass-to-EVC, Peer & Pass-to-EVC)	“Layer2ControlProtocolProcessingList”	SD1-16	Q.840.1
R-07	UNI User Label	CPTP Identifier	SD1-16	TR-130
R-08	UNI User Label - Type String	CPTP Identifier	SD1-16	TR-130
R-09	Maximum Number of Configured Flow	“MaxNumFDFrs”	SD1-16	Q.840.1

TR-169 Requirement Number (A)	TR-169 Requirement/Parameter Name (B)	MTNM Parameter Name (C)	MTNM Document (D)	Source Standard (E)
	Domain Fragments (FDFs)/EVCs per Ethernet FPP			
R-10	Describes if service multiplexing is enabled at the ETH UNI. Service multiplexing allows incoming frames to be mapped to multiple FDFs/EVCs based on CE VLAN ID. Must be set to FALSE if allToOneIndicator is set to true.	"ServiceMultiplexingIndicator"	SD1-16	Q.840.1
R-11	Bundling Indicator equals "yes" maps to SD1-16 "true" and "no" maps to "false".	"BundlingIndicator"	SD1-16	Q.840.1
R-12	If TR-169 "Bundling Indicator" equals "yes", CE-VLAN Id preservation is supported.	"UniCeVlanIdPreservation"	SD1-16	Q.840.1
R-13	Assignment of a bandwidth profile per FPP UNI	"TCProfile" (Traffic Conditioning Profile) per CPTP Id that defines the "IngressCIR", "IngressCBS", "IngressEIR", and	SD1-16	TR-101

<b>TR-169 Requirement Number (A)</b>	<b>TR-169 Requirement/Parameter Name (B)</b>	<b>MTNM Parameter Name (C)</b>	<b>MTNM Document (D)</b>	<b>Source Standard (E)</b>
		“IngressEBS”		
R-14	Assignment of a CE VLAN ID to all ingress traffic	“PVIDFrameTypes”	SD1-16	TR-101, Q.840.1
R-15	Assignment of a CE VLAN ID to all untagged traffic	“PVID”	SD1-16	TR-101, Q.840.1
R-16	VLAN Priority assigned to all ingress traffic per FPP UNI	“PortDefaultUserPriority”	SD1-16	Q.840.1
R-17	VLAN priority assigned to all untagged traffic per FPP UNI	“PortDefaultUserPriority” plus “PVIDFrameTypes”	SD1-16	Q.840.1
R-18	FPP UNI Identifier	CPTP Identifier	SD1-16	TR-101
R-19	Protocol Encapsulation Auto-Sensing Capability (On/Off) per FPP UNI	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	TR-101
R-20	Configuration of the Maximum Number of Source MAC Addresses Learned on a FPP UNI	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	TR-101
R-21	Enable/Disable of Layer 2 DHCP Relay Agent	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	TR-101
R-22	IP address assignment for static IP configuration	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	TR-101
R-23	Maximum of Simultaneous IP	NO MAPPING TO TM FORUM	None	TR-101

<b>TR-169 Requirement Number (A)</b>	<b>TR-169 Requirement/Parameter Name (B)</b>	<b>MTNM Parameter Name (C)</b>	<b>MTNM Document (D)</b>	<b>Source Standard (E)</b>
	Multicast Groups Configured per FPP UNI	SPECIFICATIONS - GAP		
R-24	Rate Limit in Packets/second of Ethernet OAM messages arriving on a FPP UNI	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-25	Enable/Disable Access Loop Characteristics per FPP UNI	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-26	Configure profiles for common characteristics across FPP UNIs and EVCs	TCProfile Object	SD1-28 [8]	Q.840.1
R-27	Committed Information Rate (CIR),	“IngressCIR”	SD1-16	MEF 10
	Committed Burst Size (CBS),	“IngressCBS”	SD1-16	MEF 10
	Excess Information Rate (EIR),	“IngressEIR”	SD1-16	MEF 10
	Excess Burst Size (EBS)	“IngressEBS”	SD1-16	MEF 10
R-28	Existence of an association between FPP UNI and ingress bandwidth profiles	Pointer to egress traffic descriptors in the UML CPTP object definition	TMF 513 [6]	Q.840.1
R-29	Pointer between Flow Point and	Pointers to ingress and egress traffic descriptors	TMF 513	Q.840.1

<b>TR-169 Requirement Number (A)</b>	<b>TR-169 Requirement/Parameter Name (B)</b>	<b>MTNM Parameter Name (C)</b>	<b>MTNM Document (D)</b>	<b>Source Standard (E)</b>
	ingress and egress bandwidth profiles	in the UML CTP object definition		
R-30	Pointer between FPP UNI and egress bandwidth profiles	Pointer to egress traffic descriptors in the UML CPTP object definition	TMF 513	Q.840.1
R-31	Unique naming identifier per FDFr/EVC	Defined in the UML CPTP object definition	TMF 513	Q.840.1
R-32	Configure VLAN as 1:1 (i.e., p2p) or rootedMP	p2p: referenced in SD1-44 requirements, not in SD1-44 model  rootedMP: NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	SD1-44 [14]  None	TR-101  TR-101
R-33	EVC Maximum Transmission Unit (MTU) Size	“MaximumFrameSize”	SD1-16	RFC 3636
R-34	Point-to-point EVC configured across an Ethernet Flow Domain with two endpoints	createAndActivateFDFr Operation	TMF608 [9]	Q.840.1
R-35	Rooted, multi-point EVC associated with more than two Ethernet Flow Points	createAndActivateFDFr Operation	TMF608	Q.840.1
R-36	See TR-169, R-35 with endpoints configured as FPP UNIs	createAndActivateFDFr Operation	TMF608	Q.840.1

<b>TR-169 Requirement Number (A)</b>	<b>TR-169 Requirement/Parameter Name (B)</b>	<b>MTNM Parameter Name (C)</b>	<b>MTNM Document (D)</b>	<b>Source Standard (E)</b>
R-37	Tear-down EVC in an Ethernet Flow Domain	deactivateAndDeleteFDfr Operation	TMF608	Q.840.1
R-38	VLAN translation table associated with each EVC to 1) if the C-Tag has to be replaced with an S-Tag, OR 2) if the C-VID has to be overwritten and the frame needs an S-tag attachment	“AddSTag” and “IVID” parameters	SD1-16	TR-101
R-39	Mark for each CE-VLAN Id in a given port’s VLAN membership list whether to forward “as is” or rewrite priority using an ingress to egress priority mapping	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	TR-101
R-40	Configuration of Ethernet Flow Points	CTP Identifier	SD1-16	Q.840.1
R-41	EVC User Label	CTP Identifier	SD1-16	Q.840.1
R-42	EVC User Label	CTP Identifier	SD1-16	Q.840.1 (TR-101 imposes a length restriction of 63 characters)
R-43	Configuring of per-EVC VLAN membership lists	“Traffic Mapping Table”	SD1-16	Q.840.1
R-44	Configuring of	“Traffic Mapping Table”	SD1-16	Q.840.1

<b>TR-169 Requirement Number (A)</b>	<b>TR-169 Requirement/Parameter Name (B)</b>	<b>MTNM Parameter Name (C)</b>	<b>MTNM Document (D)</b>	<b>Source Standard (E)</b>
	VLAN membership list per VLAN transparent LAN			
R-45	Configure S-Tag	“STagTranslationEnable” “AddSTag”	SD1-16	Q.840.1
R-46	For each CE-VLAN Id in a VLAN membership list, forward “as is” or rewrite priority using an ingress to egress priority mapping	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	TR-101
R-47	Ingress to egress priority mapping configurable per CE-VLAN Id	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	TR-101
R-48	Prevent forwarding traffic between UNIs, configured per S-VID	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	TR-101
R-49	S-VID configuration at a Flow Point	“STagTranslationEnable” “AddSTag”	SD1-16	Q.840.1
R-50	p2p VLANs: enable/disable MAC address learning on a per FPP	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-51	PPPoE Inactivity Timeout	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-52	Support queries for the Current Problem List per Ethernet Flow	NO MAPPING TO TM FORUM SPECIFICATIONS	None	TR-130

<b>TR-169 Requirement Number (A)</b>	<b>TR-169 Requirement/Parameter Name (B)</b>	<b>MTNM Parameter Name (C)</b>	<b>MTNM Document (D)</b>	<b>Source Standard (E)</b>
	Point			
R-53	Mapping multiple CE VLAN Ids to a single EVC	“Traffic Mapping Table”	SD1-16	Q.840.1
R-54	Setting the frame processing procedures associated with the list of Layer 2 control protocols per Flow Point	“Layer2ControlProtocolProcessingDisposition”	SD1-16	Q.840.1
R-55	Assigning a bandwidth profile per Flow Point	“TCProfile” (Traffic Conditioning Profile) defines the “IngressCIR”, “IngressCBS”, “IngressEIR”, and “IngressEBS”	SD1-16	Q.840.1
R-56	Assigning a bandwidth profile per CoS per Flow Point	“TCProfile” (Traffic Conditioning Profile) per CoS that defines the “IngressCIR”, “IngressCBS”, “IngressEIR”, and “IngressEBS”	SD1-16	Q.840.1
R-57	Flow Point Id where EVCs are terminated	“CTP Id”	SD1-16	Q.840.1
R-58	Handling (discard, forward, process) of IGMP messages on a user-facing port and/or per-VLAN basis	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-59	Per-VLAN assignment of transparent	NO MAPPING TO TM FORUM SPECIFICATIONS -	None	TR-101

<b>TR-169 Requirement Number (A)</b>	<b>TR-169 Requirement/Parameter Name (B)</b>	<b>MTNM Parameter Name (C)</b>	<b>MTNM Document (D)</b>	<b>Source Standard (E)</b>
	snooping or IGMP v3 snooping with proxy reporting	GAP		
R-60	IGMP No Match Behavior (Discard or forward)	NO MAPPING TO TM FORUM SPECIFICATION – GAP	None	TR-101
R-61	Access Node Discard Upstream Multicast Traffic per VLAN (true/false)	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-62	Upstream IGMP Messages Rate Limit (upstream)	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-63	IP multicast groups or ranges of multicast groups per multicast VLAN configurable based on source address or group address matching	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-64	IGMP default priority for remarking user-initiated IGMP messages configurable on a per-VLAN basis	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-65	Configure a VLAN priority value assigned to PPPoE Active Discovery	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101

<b>TR-169 Requirement Number (A)</b>	<b>TR-169 Requirement/Parameter Name (B)</b>	<b>MTNM Parameter Name (C)</b>	<b>MTNM Document (D)</b>	<b>Source Standard (E)</b>
	Terminate (PADT) packets			
R-66	Enabling of IP address spoofing	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-67	List of IP addresses per VLAN and FPP UNI	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-68	Filtering of downstream IP broadcast and multicast frames per VLAN	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	TR-101
R-69	Mapping of Ethernet priority field values and traffic classes	“TrafficMappingFrom_Table”	SD1-16	TR-101
R-70	AN Support at least 6 traffic classes for Ethernet frames	“TrafficMappingFrom_Table”	SD1-16	TR-101
R-71	Configuration of drop precedence within at least two traffic classes	“IngressColorMode”	SD1-16	TR-101
R-72	Enabling/Disabling of drop precedence based on DEI bit	“IngressColorMode”	SD1-16	TR-101
R-73	Associate ETY(s) to the FPP UNI	Single ETY -> PTP object Multiple ETYs (link aggregation) -> FTP objects	SD1-16	TR-130
R-74	Associate a specific physical card and circuit pack containing the MAU	PTP object	SD1-16	TR-130

<b>TR-169 Requirement Number (A)</b>	<b>TR-169 Requirement/Parameter Name (B)</b>	<b>MTNM Parameter Name (C)</b>	<b>MTNM Document (D)</b>	<b>Source Standard (E)</b>
R-75	Configuration of at least 4 queues per user facing port (FPP UNI), one per traffic class	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-76	Configuration of at least 6 queues per user facing port, one per traffic class	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-77	Configuration of at least 4 queues per network facing port, one per traffic class	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-78	Configuration of at least 6 queues per network facing port, one per traffic class	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-79	Scheduling of user and network facing queues according to strict priority among at least 4 queues	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-80	Scheduling of user facing and network facing queues based on their assigned priority and weight	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-81	Maximum size/depth for each user-facing and network-facing queue	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-82	Traffic	NO MAPPING TO TM	None	TR-101

<b>TR-169 Requirement Number (A)</b>	<b>TR-169 Requirement/Parameter Name (B)</b>	<b>MTNM Parameter Name (C)</b>	<b>MTNM Document (D)</b>	<b>Source Standard (E)</b>
	Classification to allow the AN to re-mark Ethernet priority bits based on 1) user-facing port, 2) Ethertype, 3) Received Ethernet priority bits, and 4) IP protocol ID (i.e., IGMP)	FORUM SPECIFICATIONS - GAP		
R-83	Mapping of Ethernet priority values to VPI/VCI for each ATM VC belonging to a UNI	PortDefaultUserPriority for Ethernet priority values  Explicit mapping to VPI/VCI values is not covered - NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	SD1-16  None	TR-101
R-84	Configuration of Peer Maintenance Endpoints (MEPs)	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	MEF 17 [5]
R-85	Turning off of Continuity Check Messages (CCMs) for the MEPs	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	MEF 17
R-86	Configuration of the ITU-T Y.1731 “Server MEP” function per user-facing port	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	Y.1731 [12]
R-87	Initiation of ETH Service OAM	NO MAPPING TO TM FORUM	None	MEF 17

<b>TR-169 Requirement Number (A)</b>	<b>TR-169 Requirement/Parameter Name (B)</b>	<b>MTNM Parameter Name (C)</b>	<b>MTNM Document (D)</b>	<b>Source Standard (E)</b>
	loopback tests	SPECIFICATIONS – GAP		
R-88	Link trace message on an EVC	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	ITU-T Rec. Y.1731
R-89	Number of currently active hosts, per VLAN, per multicast group	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	TR-101
R-90	Per FPP UNI, per multicast VLAN counts of: 1) Successful Joins, 2) Unsuccessful joins, 3) Leave Messages, General Queries to Users, 4) Specific Queries Sent to Users, 5) Invalid IGMP messages received.	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101
R-91	Per multicast VLAN counts of: 1) Active groups, 2) Joins sent to network, 3) Joins received from users, 4) Successful joins from users, 5) Unsuccessful joins from users, 6) Leave messages to network, 7)	NO MAPPING TO TM FORUM SPECIFICATIONS - GAP	None	TR-101

TR-169 Requirement Number (A)	TR-169 Requirement/Parameter Name (B)	MTNM Parameter Name (C)	MTNM Document (D)	Source Standard (E)
	leave messages from users, 8) General queries sent to users, 9) General queries received from network, 10) Specific queries sent to users, 11) Specific queries received from network, and 12) Invalid IGMP messages received			
R-92	Color Mode Boolean Variable (FALSE = "color-blind" mode)	"IngressColorMode"	SD1-16	MEF 10
R-93	Coupling Flag governs whether yellow frames will be admitted if unused bandwidth is available	"IngressCouplingFlag"	SD1-16	MEF 10
R-94	Indicates whether ETY MAU auto-negotiation is enabled	"MauAutoNegAdminState"	SD1-16	Q.840.1 RFC 3636
R-95	Creation of an Ethernet Service Profile Table	Ethernet Service Class profile table parameters: "delay<cos>", "jitter<cos>", "loss<cos>".	SD1-16	Q.840.1
R-96	Assignment of Service Class Profiles on a per-	Ethernet Service Class profile table parameters defined on a per CTP (i.e.,	SD1-16	Q.840.1

TR-169 Requirement Number (A)	TR-169 Requirement/Parameter Name (B)	MTNM Parameter Name (C)	MTNM Document (D)	Source Standard (E)
	EVC basis	EVC) basis: “delay<cos>”, “jitter<cos>”, “loss<cos>”.		
R-97	Egress Traffic Measurements: Green Frames,  Yellow Frames,  Green Octets,  Yellow Octets	“PMP_EGRESS_GREEN_FRAME_COUNT”  “PMP_EGRESS_YELLOW_FRAME_COUNT”  “PMP_EGRESS_GREEN_OCTET_COUNT”  “PMP_EGRESS_YELLOW_OCTET_COUNT”		MEF 15  MEF 15  MEF 15  MEF 15
R-98	Congestion Measurements Discards per FPP UNI, per COS per UNI, per EVC, and per COS per EVC:  Green Frames  Green Octets	Per Ethernet CPTP and CTP (also per COS)  “PMP_GREEN_FRAME_DISCARDS<cos>”  “PMP_GREEN_OCTET_DISCARDS<cos>”		MEF 15  MEF 15
R-99	Yellow Frames Discarded due to congestion on a per FPP UNI, per COS per UNI, per EVC, and per COS per EVC basis	Per Ethernet CPTP and CTP (also per COS)  “PMP_YELLOW_FRAME_DISCARDS”	SD1-28	MEF 15
R-99	Yellow Octets Discarded due to congestion on a	Per Ethernet CPTP and CTP (also per COS)		

<b>TR-169 Requirement Number (A)</b>	<b>TR-169 Requirement/Parameter Name (B)</b>	<b>MTNM Parameter Name (C)</b>	<b>MTNM Document (D)</b>	<b>Source Standard (E)</b>
	per FPP UNI, per COS per UNI, per EVC, and per COS per EVC basis	“PMP_YELLOW_OCTETS_DISCARDS”	SD1-28	MEF 15
R-100	Ethernet Stats Packets 65 to 127 Octets	PMP_PKTS65TO127OCTETS	SD1-28	RFC 2819
	Ethernet Stats Packets 128 to 255 Octets	PMP_PKTS128TO255OCTETS	SD1-28	RFC 2819
	Ethernet Stats Packets 256 to 511 Octets	PMP_PKTS256TO511OCTETS	SD1-28	RFC 2819
	Ethernet Stats Packets 512 to 1023 Octets	PMP_PKTS512TO1023OCTETS	SD1-28	RFC 2819
	Ethernet Stats Packets 1024 to 1518 Octets	PMP_PKTS1024TO1518OCTETS	SD1-28	RFC 2819
R-101	Undersized Frames	PMP_SUPKTS	SD1-28	RFC 2819 MEF 15
	Oversized Frames	PMP_FTLE	SD1-28	RFC 2819 MEF 15
	Fragmented Frames	PMP_SFRAGS	SD1-28	RFC 2819 MEF 15
	FCS and Alignment Errors	PMP_AE	SD1-28	RFC 2819 MEF 15
	Invalid CE-VLAN ID	PMP_INVALID_CE_VLAN-ID	SD1-28	RFC 2819 MEF 15

<b>TR-169 Requirement Number (A)</b>	<b>TR-169 Requirement/Parameter Name (B)</b>	<b>MTNM Parameter Name (C)</b>	<b>MTNM Document (D)</b>	<b>Source Standard (E)</b>
R-102	Octets Transmitted OK	PMP_OCTETS	SD1-28	RFC 2819 RFC 2863 MEF 15
	Unicast Frames Transmitted OK	PMP_UCASTPKTS	SD1-28	RFC 2819 RFC 2863 MEF 15
	Multicast Frames Transmitted OK	PMP_MULTICASTPKTS	SD1-28	RFC 2863 MEF 15
	Broadcast Frames Transmitted OK	PMP_BROADCASTPKTS	SD1-28	RFC 2863 MEF 15
	Octets Received OK	PMP_OCTETS	SD1-28	RFC2819 RFC 2863 MEF 15
	Unicast Frames Received OK	PMP_UCASTPKTS	SD1-28	RFC 2863
	Multicast Frames Received OK	PMP_MULTICASTPKTS	SD1-28	RFC 2863 MEF 15
	Broadcast Frames Received OK	PMP_BROADCASTPKTS	SD1-28	RFC 2863 MEF 15
R-103	Ingress Green Frames	PMP_INGRESS_GREEN_FRAME_COUNT	SD1-28	MEF 15
	Ingress Yellow Frames	PMP_INGRESS_YELLOW_FRAME_COUNT	SD1-28	MEF 15
	Ingress Red Frames	PMP_INGRESS_RED_FRAME_COUNT	SD1-28	MEF 15
	Ingress Green	PMP_INGRESS_GREEN	SD1-28	MEF 15

TR-169 Requirement Number (A)	TR-169 Requirement/Parameter Name (B)	MTNM Parameter Name (C)	MTNM Document (D)	Source Standard (E)
	Octets	_OCTET_COUNT		
	Ingress Yellow Octets	PMP_INGRESS_RED_OCTET_COUNT	SD1-28	MEF 15
	Ingress Red Octets	PMP_INGRESS_RED_OCTET_COUNT	SD1-28	MEF 15
R-104	Interface MAU Media Available State Exits	PMP_IF_MAU_MEDIA_AVAILABLE_STATE_EXITS	SD1-28	RFC 3636 MEF 15
	Interface MAU Jabbering State Enters	PMP_IF_MAU_JABBERING_STATE_ENTERS	SD1-28	RFC 3636 MEF 15
	Interface MAU False Carriers	PMP_IF_MAU_FALSE_CARRIERS	SD1-28	RFC 3636 MEF 15
R-105	OAM Performance Data per MEG:			
	Ratio of Frames Lost Per CoS	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	MEF 15
	Average Round Trip Frame Delay Per CoS	“PMP_FRAME_DELAY_ROUNDTRIP<cos>”	SD1-28	MEF 15
	Average One Way Frame Delay Per CoS	“PMP_FRAME_DELAY_ONEWAY<cos>”	SD1-28	MEF 15
	Average Round Trip Frame Delay Variation Per CoS	“PMP_FRAME_DELAY_VARIATION<cos>”	SD1-28	MEF 15
	Average One Way Frame	NO MAPPING TO TM FORUM	None	MEF 15

<b>TR-169 Requirement Number (A)</b>	<b>TR-169 Requirement/Parameter Name (B)</b>	<b>MTNM Parameter Name (C)</b>	<b>MTNM Document (D)</b>	<b>Source Standard (E)</b>
	Delay Variation Per CoS  Availability Performance	SPECIFICATIONS – GAP  NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	MEF 15
R-106	OAM Performance Data per Maintenance Point (MP)	NO MAPPING TO TM FORUM SPECIFICATIONS – GAP	None	MEF 15

## 5 Deltas for TR-169 Data Modeling in TMF MTOSI

### 5.1 Layered Parameters for Configuration

The TeleManagement Forum's approach to MTOSI XML data modeling was to define a set of layered parameters in TMF 513 SD1-16 and performance parameters in TMF 513 SD1-28. For layered parameters, each are given object names such as those listed in the column labeled "MTNM Parameter Name" in Table 1. But, the objects were not defined in detail in the TeleManagement Forum. Rather, TMF864\_NRB\_XML [13] defines the following element within the LayeredParameters.xsd. This element is intended as a placeholder for all Layered Parameters data types (e.g., Boolean, String, Enumerated, etc.)

```

</xsd:element>
<xsd:element name="parameterList" type="gen:NameAndValueStringListType"
minOccurs="0">
  <xsd:annotation>
    <xsd:documentation>
      <p>The list of transmission parameters as a generic pair of name and value
strings.</p>
    </xsd:documentation>
  </xsd:annotation>

```

Table 2 proposes additions to the Layered Parameters defined in TMF513 SD1-16 based on those requirements listed in Table 1 that state "NO MAPPING TO TELEMANAGEMENT FORUM SPECIFICATIONS – GAP." Table 2 is intended to be included within a future release of TMF513 SD1-16 without significant modification. Table 2 contains proposed parameter names, Layer Rates, MTNM object, legal value(s) for each parameter name, and comments/examples about the parameters, as necessary. TMF513 SD1-17 contains a list of layer rates identified in the Telemanagement Forum. Table 2 proposes the addition of two new Layer Rates called LR\_IP and LR\_PPPE, respectively, to cover the configuration of IP- and PPPE-specific parameters on a per-CPTP (i.e., Flow Point Pool UNI) and CTP (i.e., EVC) basis.

R-02 An XML-based EMS-NMS interface supporting DSL-to-Ethernet aggregation MUST support the Layered Parameters "Parameter Names" identified in column A of Table 2.

**Table 2 – Additional Layered Parameters Based on TR-101/TR-141/TR-169**

<b>ParameterName (A)</b>	<b>Layer Rate(s) (B)</b>	<b>Objects (C)</b>	<b>Legal Values (D)</b>	<b>Comment /Example (E)</b>
“EthertypeFilter”	LR_Ethernet	CPTP	hexadecimal values: “0x8863”, “0x8864”, “0x0800”, “0x0806”	PPPoE: “0x8863” and “0x8864” IPoE: 0x0800 ARP: 0x0806
“SourceMACAddr VLANFilter”	LR_Ethernet	CPTP	“rootedMP” “p2p”	
“DestMACAddr VlanFilter”	LR_Ethernet	CPTP	“rootedMP” “p2p”	
“CEVlanId AssignmentAll Ingress”	LR_Ethernet	CPTP	String containing an Integer value	
“ProtEncapAuto Sensing”	LR_Ethernet	CPTP	Boolean	On/off
“MaxSrcMAC AddrLearned”	LR_Ethernet	CPTP	String containing an Integer value	
“EnableL2DHCP RelayAgent”	LR_IP	CPTP	“enabled”, “disabled”	
“StaticIPAddr”	LR_IP	CPTP CTP	String	List of IP addresses associated with a given VLAN and FPP UNI
“MaxSimultIP MulticastGrps”	LR_IP	CPTP	String containing an Integer value	
“EthernetOAM Rate”	LR_Ethernet	CPTP	String containing an Integer value	Packets/second
“EnableAccess LoopChar”	LR_Ethernet	CPTP	“enabled”, “disabled”	
“VlanType”	LR_Ethernet	CTP	“p2p” “rootedMP”	
“VlanFrwdRewrite Priority”	LR_Ethernet	CTP	“forward as is” “rewrite”	Applicable for each CE-VLAN Id in a VLAN Membership

ParameterName (A)	Layer Rate(s) (B)	Objects (C)	Legal Values (D)	Comment /Example (E)
				List
“EnableMAC AddressLearning”	LR_Ethernet	CTP	“enabled”, “disabled”	Applicable for p2p VLANs
“Traffic Forwarding Prevention”	LR_Ethernet	CPTP	Boolean	
“PPPoE Inactivity Timeout”	LR_PPPoE	CTP	String containing an Integer value	
“CurrentProblem Type”	LR_Ethernet LR_IP	CPTP, CTP	Enumerated	
“IGMPMessage Handling”	LR_Ethernet	CPTP, CTP	“discard”, “forward”, “process”	
“Snooping”	LR_Ethernet	CTP	“transparentSnoo ping”, “IGMPv3Snoopi ngWithProyRep orting	Per VLAN
“ANDiscard UpstreamMulticast Traf”	LR_Ethernet	CTP	Boolean	Per VLAN
“IGMPNoMatch”	LR_Ethernet	CTP	“discard”, “forward”	
“UpstreamIGMP MessagesRate Limit”	LR_Ethernet	CTP	Integer	In units of messages per second
“IPMulticastGrp forSrcAddrMatch”	LR_Ethernet	CTP	String	For multicast VLANs
“IPMulticastGroup forGroupAddr Match”	LR_Ethernet	CTP	String	For multicast VLANs
“IGMPDefault Priority”	LR_Ethernet	CTP	String	Per VLAN
“VLANPriorityfor PADT”	LR_PPPoE	CTP	String	
“EnableIPAddr Spoofing”	LR_Ethernet	CPTP CTP	“enabled” “disabled”	
“IPAddrforStaticIP ”	LR_IP	CPTP, CTP	String	
“MaxTraffic Queues”	LR_Ethernet	CPTP	String containing an Integer value	Configure the number of Traffic Class Profiles per FPP

<b>ParameterName (A)</b>	<b>Layer Rate(s) (B)</b>	<b>Objects (C)</b>	<b>Legal Values (D)</b>	<b>Comment /Example (E)</b>
				UNI (minimum 4, maximum 6) and FPP NNI
“MaxQueueSize”	LR_Ethernet	CPTP	String containing an Integer value	For each FPP UNI and FPP NNI queue

## 5.2 Performance Parameters

Similar to the approach taken for configuration, the TeleManagement Forum defined a set of performance parameters in TMF 513 SD1-28 that can be used for XML data modeling purposes. Table 3 proposes additions to the Performance Parameters identified in TMF513 SD1-28 based on those requirements listed in Table 1 that state “NO MAPPING TO TELEMANAGEMENT FORUM SPECIFICATIONS – GAP.” Table 3 is intended to be included in a future release of TMF513 SD1-28 without significant modification. Table 3 contains proposed parameter names, a parameter description, the source standard for the particular parameter, and the corresponding layer rate.

R-03 An XML-based EMS-NMS interface supporting DSL-to-Ethernet aggregation MUST support the Performance Parameters “Parameter Names” identified in column A of Table 3.

**Table 3 – Additional Performance Parameters Based on TR-101/TR-141/TR-169**

<b>Parameter Name (A)</b>	<b>Description (B)</b>	<b>Source Standard (C)</b>	<b>Layer Rate (D)</b>
“PMP_FRAME_LOSS_RATIO<cos>”	Ratio of frames lost per CoS	MEF 7.1 [16] EthMegPerfDataSet: frameLossRatio	LR_Ethernet
“PMP_FRAME_DELAY_VARIATION_ONEWAY<cos>”	Average one way frame delay variation per CoS	MEF 7.1 EthMegPerfDataSet: interFrameDelayVariationOneWay	LR_Ethernet
“PMP_AVAILABILITY<cos>”	Availability performance	MEF 7.1 EthMegPerfDataSet:availability	LR_Ethernet
“PMP_OAM”	Count of incoming frames received at the MP	MEF 7.1 EthMpPerfDataSet:inOamFramesRx	LR_Ethernet

<b>Parameter Name (A)</b>	<b>Description (B)</b>	<b>Source Standard (C)</b>	<b>Layer Rate (D)</b>
	Count of outgoing frames sent from the MP	MEF 7.1 EthMpPerfDataSet: outOamFramesTx	LR_Ethernet

End of Broadband Forum Technical Report TR-226