International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Y.2618

(01/2018)

SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS, NEXT-GENERATION NETWORKS, INTERNET OF THINGS AND SMART CITIES

Next Generation Networks – Packet-based Networks

The M interface in public packet telecommunication data networks

Recommendation ITU-T Y.2618

International Telecommunication Union

ITU-T Y-SERIES RECOMMENDATIONS

GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS, NEXT-GENERATION NETWORKS, INTERNET OF THINGS AND SMART CITIES

GLOBAL INFORMATION INFRASTRUCTURE	
General	Y.100–Y.199
Services, applications and middleware	Y.200–Y.299
Network aspects	Y.300–Y.399
Interfaces and protocols	Y.400–Y.499
Numbering, addressing and naming	Y.500–Y.599
Operation, administration and maintenance	Y.600–Y.699
Security	Y.700–Y.799
Performances	Y.800–Y.899
INTERNET PROTOCOL ASPECTS	
General	Y.1000–Y.1099
Services and applications	Y.1100–Y.1199
Architecture, access, network capabilities and resource management	Y.1200–Y.1299
Transport	Y.1300–Y.1399
Interworking	Y.1400–Y.1499
Quality of service and network performance	Y.1500–Y.1599
Signalling	Y.1600–Y.1699
Operation, administration and maintenance	Y.1700–Y.1799
Charging	Y.1800–Y.1899
IPTV over NGN	Y.1900–Y.1999
NEXT GENERATION NETWORKS	
Frameworks and functional architecture models	Y.2000–Y.2099
Quality of Service and performance	Y.2100–Y.2199
Service aspects: Service capabilities and service architecture	Y.2200–Y.2249
Service aspects: Interoperability of services and networks in NGN	Y.2250–Y.2299
Enhancements to NGN	Y.2300–Y.2399
Network management	Y.2400–Y.2499
Network control architectures and protocols	Y.2500–Y.2599
Packet-based Networks	**Y.2600–Y.2699**
Security	Y.2700–Y.2799
Generalized mobility	Y.2800–Y.2899
Carrier grade open environment	Y.2900–Y.2999
FUTURE NETWORKS	Y.3000–Y.3499
CLOUD COMPUTING	Y.3500–Y.3999
INTERNET OF THINGS AND SMART CITIES AND COMMUNITIES	
General	Y.4000–Y.4049
Definitions and terminologies	Y.4050–Y.4099
Requirements and use cases	Y.4100–Y.4249
Infrastructure, connectivity and networks	Y.4250–Y.4399
Frameworks, architectures and protocols	Y.4400–Y.4549
Services, applications, computation and data processing	Y.4550–Y.4699
Management, control and performance	Y.4700–Y.4799
Identification and security	Y.4800–Y.4899
Evaluation and assessment	Y.4900–Y.4999

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

Recommendation ITU-T Y.2618

The M interface in public packet telecommunication data networks

Summary

As one hierarchical packet data network which can meet requirements of future packet based networks, the public packet telecommunication data network (PTDN) has a reference point, called the M interface, between the PTDN management entities and network elements. Recommendation ITU-T Y.2618 defines this interface, specifies common PTDN management functions and protocols and defines specific PTDN management functions related to a virtual packet network (VPN) and multicast service. Annex A of Recommendation ITU-T Y.2618 describes a management information model for VPN and multicast service management using the management interface specification methodology defined in Recommendation ITU-T M.3020.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T Y.2618	2018-01-13	13	11.1002/1000/13464

Keywords

M interface, management information model, multicast, PTDN, VPN.

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

FOREWORD

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

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

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

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

NOTE

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

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

INTELLECTUAL PROPERTY RIGHTS

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

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

Table of Contents

Recommendation ITU-T Y.2618

The M interface in public packet telecommunication data networks

1 Scope

This Recommendation defines the M interface and specifies generic public packet telecommunication data network (PTDN) management functions and related protocols on the M interface. Further, it defines the specific network service management functions and information model for the M interface of a PTDN.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T Y.2613] Recommendation ITU-T Y.2613 (2010), *General technical architecture for public packet telecommunication data network*.

[ITU-T Y.2615] Recommendation ITU-T Y.2615 (2012), *Routing mechanisms in public packet telecommunication data networks*.

[ITU-T M.3020] Recommendation ITU-T M.3020 (2017), *Management interface specification methodology*.

[ITU-T M.3160] Recommendation ITU-T M.3160 (2008), *Generic, protocol-neutral management information model*.

[ITU-T M.3400] Recommendation ITU-T M.3400 (2000), *TMN management functions*.

[ITU-T X.731] Recommendation ITU-T X.731 (1992), *Information technology – Open Systems Interconnection – Systems management: State management function*.

[ITU-T X.800] Recommendation ITU-T X.800 (1991), *Security architecture for Open Systems Interconnection for CCITT applications*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 network element [b-ITU-T Q.1741]: A discrete telecommunications entity, which can be managed over a specific interface.

3.1.2 network manager [b-ITU-T Q.1741]: Provides a package of end-user functions with the responsibility for the management of a network, mainly as supported by the EM(s) but it may also involve direct access to the network elements. All communication with the network is based on open and well-standardized interfaces supporting management of multi-vendor and multi-technology network elements.

3.1.3 public packet telecommunication data network (PTDN) [ITU-T Y.2613]: A packet data network designed for the NGN transport stratum, which should be secure, trustworthy, controllable, and manageable, and can meet all requirements described in [b-ITU-T Y.2601]. The PTDN is a hierarchical network, which can be subdivided into several network layers.

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 M interface: The interface between the network manager and public packet telecommunication data network (PTDN) network elements to provide the capability of managing, both physical and logical, PTDN devices, resources in core networks aggregation networks and access networks, and the services the PTDN provides.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ADT Address Translator
CMIP Common Management Information Protocol
ED Edge Device
ER Entity Relation
HTML Hypertext Markup Language
IOC Information Object Class
IP Internet Protocol
ME Management Entity
NE Network Element
NGN Network Generation Network
NM Network Manager
OAM Operation, Administration and Maintenance
PTDN Public packet Telecommunication Data Network
QoS Quality of Service
SNMP Simple Network Management Protocol
SR Service Router
VPN Virtual Packet Network

5 Conventions

None.

6 Introduction

As defined in [ITU-T Y.2613], a PTDN is a hierarchical network which consists of access networks, aggregation networks, and core networks. A PTDN provides virtual network service such as virtual packet network (VPN) and multicast services. Figure 6-1 illustrates the reference model of a PTDN by replacing manage entity (ME) with network manager (NM) in the reference model of the PTDN specified in [ITU-T Y.2613]. PTDN nodes, such as service routers (SRs) and edge devices (EDs), connect to one another by the R interface, end users or other networks (e.g., IP network, asynchronous

transfer mode (ATM) network) access the PTDN by the E interface, EDs register and query address mapping with address translator (ADT) by the T interface, and the PTDN NM communicates with PTDN nodes by the M interface. The M interface is the interface between the NM and PTDN network element (NE); it provides the capability of managing both physical and logical PTDN devices, resources in core network, aggregation network and access network, and services that the network provides.

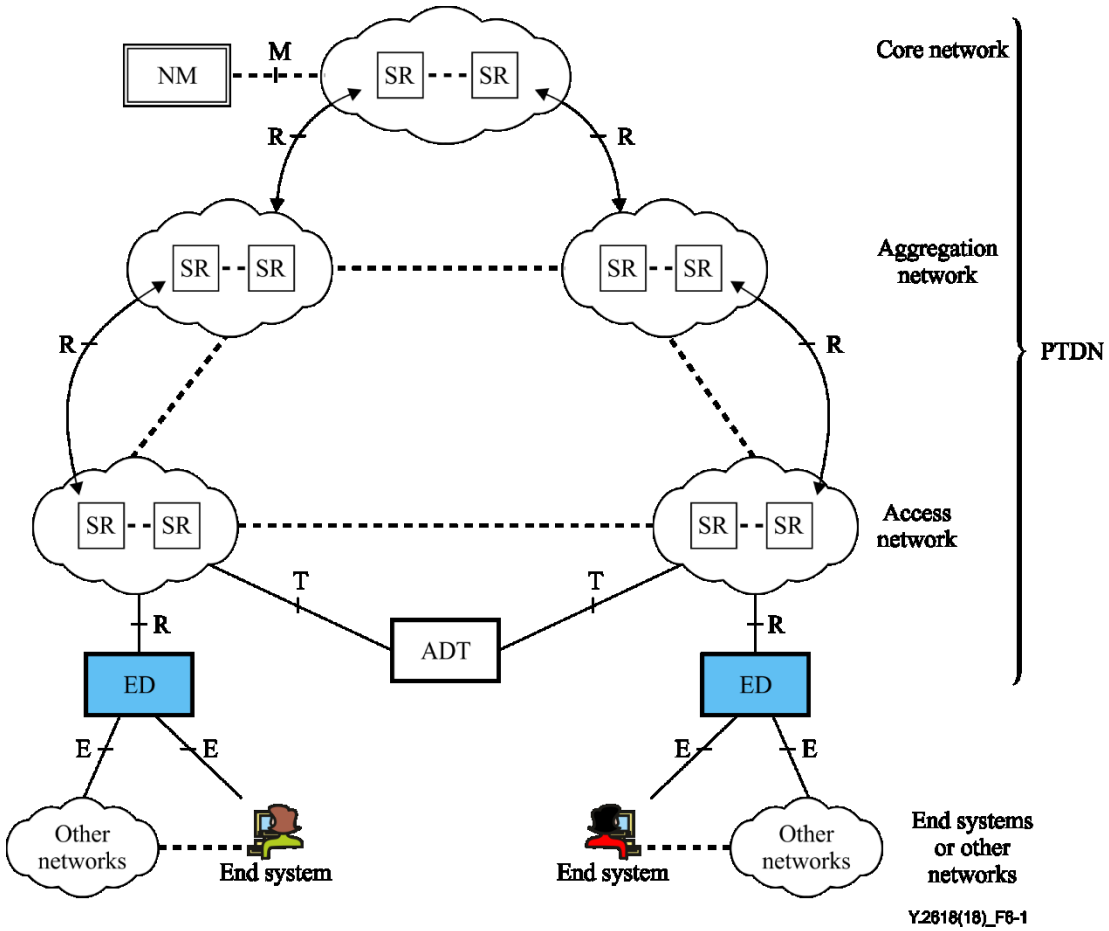

Figure 6-1 – M interface in PTDN

Management messages on the M interface are carried in the management plane of the PTDN. The messages method shall follow the definitions defined in [ITU-T Y.2613]. The M interface does not define new management protocols. A variety of existing management protocols, e.g., simple network management protocol (SNMP), common management information protocol (CMIP), hypertext markup language (HTML), may be used on the M interface. The PTDN defines a management information model to meet new PTDN network service management requirements. This management information model is described in Annex A.

7 PTDN management functions

The PTDN NM shall support at least four of management functions defined in [ITU-T M.3400], as follows:

1) configuration management;

2) performance management;

3) fault management;

4) security management.

The PTDN NM communicates with PTDN nodes through the M interface to collect management information from PTDN nodes to control and monitor their behaviour and status. The PTDN NMs' functions are based on functions of the M interface.

Functions on the M interface can be categorized as configuration management functions, performance management functions, fault management functions and security management functions. For specific PTDN services, i.e., VPN and multicast services, management functions are grouped into PTDN service management functions.

7.1 Configuration management functions

Configuration management functions on the M interface are used to help an NM initialize and configure network elements, deploy strategies on network elements and monitor network elements' status and the network topology.

Functions on the M interface shall include, but are not limited to:

- Provisioning

In addition to the necessary functions that bring PTDN network elements into operation, such as port/link configurations, other provisioning functions include:

– inquiry of PTDN nodes neighbour relationships;

  Based on the physical, direct connections between PTDN nodes, the NM can calculate the PTDN topology.

– inquiry/addition/deletion/modification of routing information;

  Through the M Interface, NM can query the routing information that may be calculated and deployed by dominant node, defined in [ITU-T Y.2615], and modify the entries of routing table in PTDN nodes and routing policies to NEs.

– NE(s) inventory query functions;

  NM can get a detailed list of resources contained in PTDN node.

- Status control and monitoring

The status control and monitoring functions include, but are not limited to:

– enabling/disabling/activating/deactivating status of network elements;

– enabling/disabling notification of status changes.

7.2 Performance management functions

Performance management provides functions to report the behaviour of PTDN network elements and the utilization of PTDN network resources by continuously collecting related statistical data to monitor and correct the behaviour of the network or network elements. It also aids in planning, provisioning, maintenance and the measurement of service quality.

The performance functions on the M Interface include, but are not limited to:

- Performance measurement management

The NM can create, delete, start, and stop performance measurement tasks of an NE through the M interface. The following performance measurement parameters shall be specified:

– network entities to be measured;

– performance metrics to be measured;

– corresponding measurement task parameters, such as time intervals, start time, stop time, etc.

- Threshold management

The NM can set, remove and modify performance metric threshold values in an NE through the M interface. The performance metrics can have thresholds such as in link utilization and VPN bandwidth utilization.

- Performance data inquiry

The NM can query performance data from an NE through the M interface. The performance data are results of measurement on a logical/physical network element.

- Alarm notification

When an NE detects that the measured performance data cross a pre-set threshold, it generates the corresponding alarm/event and notifies the NM.

7.3 Fault management functions

Fault management is a set of functions which enable the detection, isolation and correction of any abnormal operation of the PTDN network and its environment. The following fault management functions on the M interface shall include:

- Alarm monitoring

Once an NE detects that a failure or defect has occurred, it generates the corresponding alarms and notifies the NM. These alarms include out-of-service/in-service alarms concerning an NE, or a major part of an NE (e.g., link down/up alarm), and defect or quality decline alarms concerning the network or network service (e.g., VPN busy alarm).

- Alarm conditions management

The NM can enable/disable alarms notification or set alarm conditions.

7.4 Security management functions

On the M interface, security management functions include security communication services and some security event detections as follows:

- Security communication services provide the services defined in [ITU-T X.800] for authentication, access control, data confidentiality, data integrity and non-repudiation.
- Security event detection reports any security activities that may be interpreted as a security violation (e.g., unauthorized user, physical tampering with equipment).

7.5 Network service management functions

The network service management provides functions to manage and control PTDN network-layer VPN, multicast services. VPN management functions and multicast management functions are defined in clauses 8 and 9.

8 VPN management functions

The VPN management functions includes VPN establishment, VPN monitoring, VPN modification, VPN release and VPN user management.

8.1 VPN establishment

The M Interface provides two ways to establish a VPN:

1) Through management plane

   The NM deploys a VPN by communicating directly with all related nodes, and configures them one-by-one with planed resources and attributes through the M interface.

2) Through control plane

   The NM communicates with the VPN end nodes to start control signalling procedures to establish end-to-end VPN with planed resources and attributes.

When setting up a VPN, the following information shall be specified:

– VPN identification information;
– VPN description information;
– resource quotas;
– resource thresholds.

8.2 VPN monitoring

VPN monitoring provides the following objects to be monitored by the NM:

– VPN status (e.g., in-service, out-of-service, busy);
– VPN resources utilization.

8.3 VPN modification management

Using the M interface, the NM can modify the following aspects without taking the VPN out of service:

– resource quotas;
– resource thresholds.

8.4 VPN release management

The M interface provides two ways to release a VPN:

1) Through management plane

   The NM communicates directly with all related nodes, and controls them one-by-one to release the specified VPN resource.

2) Through control plane

   The NM communicates with the VPN end nodes to start control signalling procedures to release end-to-end VPN.

When releasing one VPN, the VPN identifier shall be included in management messages. A VPN's detailed information (e.g., VPN's description and operation logs) may be included to help PTDN nodes to determine and release that VPN's resources.

When a PTDN node receives a VPN release request through the M interface or from the control plane, it shall release the related resources. Furthermore, an ED should remove the mapping information with its VPN users as well. After all resources contained in the VPN are released, the NM releases the VPN identifier.

8.5 VPN user management

A VPN user is usually bound with one or more VPNs. A VPN can also serve more than one user. The VPN user management function is used to manage mapping between VPN users and VPNs.

The VPN user management functions include:

– add/remove VPN user to/from a VPN;

– manage the priority of users.

9 Multicast management functions

Multicast management functions include multicast establishment, multicast monitoring, multicast modification, multicast release and multicast user management.

9.1 Multicast establishment

The M interface provides two ways to establish a multicast tree:

1) Through management plane

   The NM communicates directly with all related nodes in the multicast tree, and configures them one-by-one with planed resources and attributes through the M interface.

2) Through control plane

   The NM communicates with the multicast tree's end nodes to start control signalling procedures to join the tree with planed resources and attributes.

When setting up the multicast tree, the following information is necessary to be initialized:

– multicast tree identification information;

– multicast tree description information;

– resource quotas;

– resource thresholds.

9.2 Multicast monitoring

Multicast monitor management offers the following information to network manager:

– multicast status (e.g., in-service, out-of-service, busy);

– multicast resources utilization.

9.3 Multicast modification

Using the M Interface, the NM can modify the following aspects without taking multicast out of service:

– adding/deleting a branch to/from a multicast tree;

– changing resource quotas;

– changing resource thresholds.

9.4 Multicast release

The M interface provides two ways to release a multicast tree:

1) Through management plane

   The NM communicates directly with all related nodes in a given multicast, and configures them one-by-one to release the specified multicast resources;

2) Through control plane

The NM communicates with the multicast end nodes to start control signalling procedures to release.

When releasing a multicast service, the multicast identifier shall be included in release management messages. This multicast's detail information (e.g., multicast's description and operation logs) may be included to help PTDN nodes to determine and release its resources.

When a PTDN node receives multicast release request through the M interface, or from control plane, it shall release the related resources. An ED shall remove the mapping information with its multicast users as well. After all resources contained in this multicast service are released, the NM releases this multicast identifier.

9.5 Multicast user management

Multicast user management function includes adding/removing users to/from candidate multicast user list. Only those who are listed in the user list can use a multicast tree to transmit their data.

10 Security considerations

As management information and actions play crucial roles in the PTDN, security techniques are recommended to be applied on the M interface to assure the safety of information exchanged between NM and NEs.

Annex A

Management information model for PTDN services

(This annex forms an integral part of this Recommendation.)

This annex describes management information model for PTDN VPN and multicast services on the M interface by using the management methodology defined in [ITU-T M.3020]. Network resources, represented by this model, are supported by physical or logical networks, which model may be implementation-dependent, the generic and protocol-neutral model can refer to [ITU-T M.3160].

A.1 Information object classes

Six information object classes (IOCs) are abstracted and defined for PTDN virtual network services, i.e., VPN and multicast services. They are:

1) VirtualNetwork;
2) VirtualPacketNetwork;
3) VirtualMulticastNetwork;
4) VirtualPort;
5) VirtualVPNPort;
6) VirtualMulticastPort;

A.1.1 Classes diagram

A.1.1.1 Inheritance

Inheritance diagrams give the inheritance hierarchy of IOCs. Figure A.1 illustrates the inheritance hierarchy of VirtualNetwork, VirtualPacketNetwork and VirtualMulticastNetwork in virtual network fragment. Figure A.2 illustrates the inheritance hierarchy of VirtualPort, VirtualVPNPort and VirtualMulticastPort in virtual port fragment.

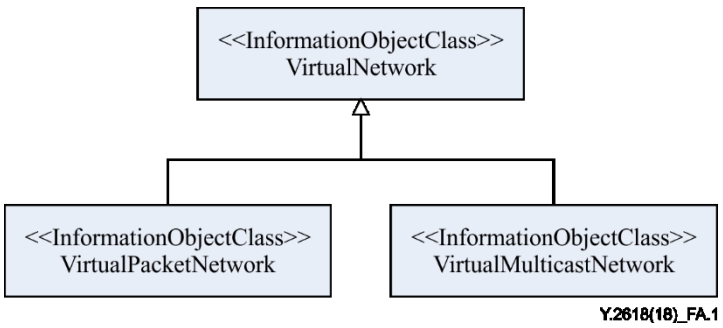

Figure A.1 – Inheritance diagram of virtual network fragment

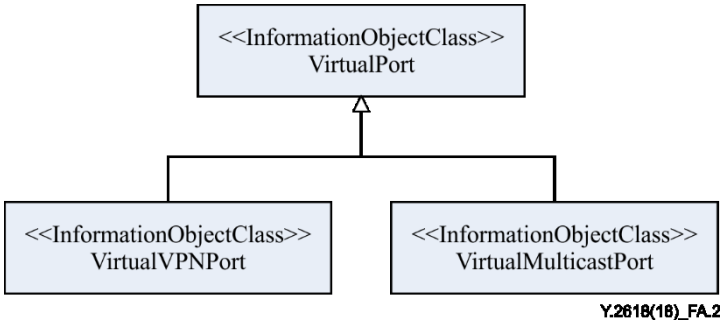

Figure A.2 – Inheritance diagram of virtual port fragment

A.1.1.2 Relationship

From the network level viewpoint, a PTDN virtual network is a logical collection of interconnected logical or physical ports. Figure A.3 shows the relationship between VirtualPacketNetwork, VirtualVPNPort in virtual packet network fragment where VirtualPacketPort may be supported by some other logical or physical termination points which IOC, TerminationPoint, can refer to [ITU-T M.3160].

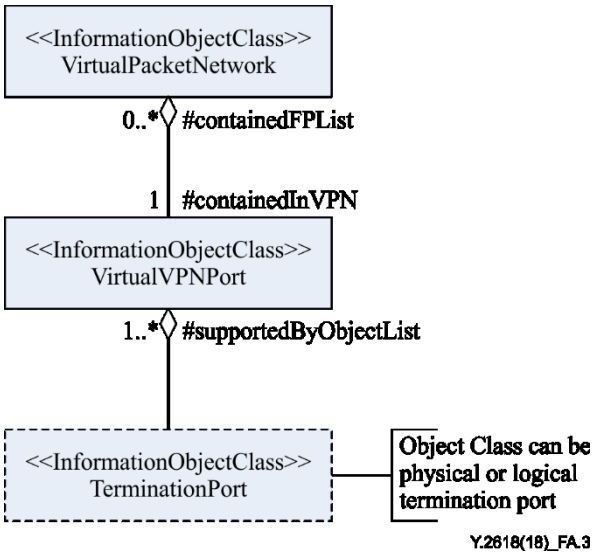

Figure A.3 – ER diagram of virtual packet network fragment

Figure A.4 shows the relationship between VirtualMultipleNetwork, VirtualMultiplePort in virtual packet network fragment where VirtualMultiplePort may be supported by some other logical or physical termination points which IOC, TerminationPoint, can refer to [ITU-T M.3160].

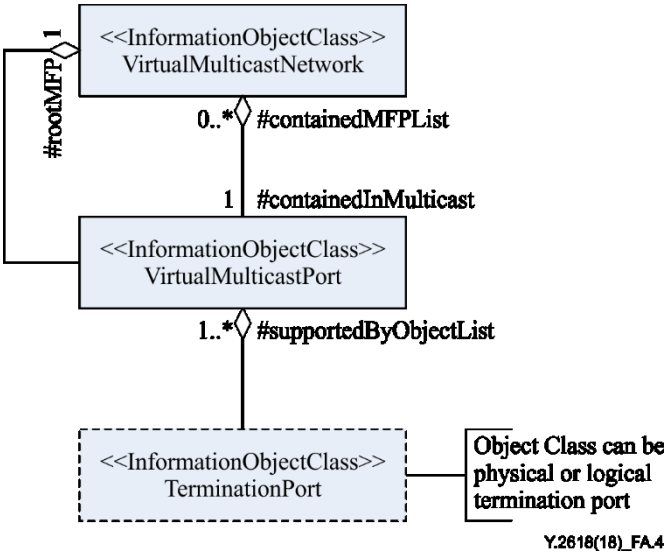

Figure A.4 – ER diagram of virtual multicast network fragment

A.1.2 Information object classes definition

A.1.2.1 VirtualNetwork

A.1.2.1.1 Definition

VirtualNetwork represents the logical collections of flow points that are available for the purpose of transferring information for specific virtual network. It has subclasses such as VirtualPacketNetwork and VirtualMulticastNetwork.

A.1.2.1.2 Attributes

Attributes and their manageable properties of VirtualNetwork are listed in Table A.1.

Table A.1 – VirtualNetwork attributes

Attribute name	Support qualifier	Read qualifier	Write qualifier	Create qualifier	Requirements IDs
administrativeState	O	M	M	M	
availabilityStatus	O	M	–	–	
containedAccessGroupList	O	M	M	M	
containedVPList	O	M	M	M	
operationalState	O	M	–	–	
usageState	O	M	–	–	
NOTE – O-optional; M-mandatory.					

A.1.2.1.3 Notifications

Notifications and their support qualifiers of VirtualNetwork are listed in Table A.2.

Table A.2 – VirtualNetwork notifications

Name	Qualifier	Notes
attributeValueChange	O	
objectCreation	M	
objectDeletion	M	
stateChange	O	
NOTE – O-optional; M-mandatory.		

A.1.2.2 VirtualPacketNetwork

A.1.2.2.1 Definition

VirtualPacketNetwork represents the logical collections of VPN flow points that are available for the purpose of transferring information. It is subclass of VirtualNetwork.

A.1.2.2.2 Attributes

Attributes and their manageable properties of VirtualPacketNetwork are listed in Table A.3.

Table A.3 – VirtualPacketNetwork attributes

Attribute name	Support qualifier	Read qualifier	Write qualifier	Create qualifier	Requirements IDs
vpnId	M	M	–	M	
NOTE – O-optional; M-mandatory.					

A.1.2.2.3 Notifications

Same as given in clause A.1.2.1, VirtualNetwork.

A.1.2.3 VirtualMulticastNetwork

A.1.2.3.1 Definition

VirtualMulticastNetwork represents the logical collections of flow points that are available for the purpose of transferring multicast information. It is subclass of VirtualNetwork.

A.1.2.3.2 Attributes

Attributes and their manageable properties of VirtualMulticastNetwork are listed in Table A.4.

Table A.4 – VirtualMulticastNetwork attributes

Attribute name	Support qualifier	Read qualifier	Write qualifier	Create qualifier	Requirements IDs
multicastId	M	M	–	M	
rootMVP	M	M	M	M	
containedMVPList	O	M	M	M	
NOTE – O-optional; M-mandatory.					

A.1.2.3.3 Notifications

Same as given in clause A.1.2.1, VirtualNetwork.

A.1.2.4 VirtualPort

A.1.2.4.1 Definition

This IOC represents the termination of a transport entity for VPN or multicast. This is an abstract class. It has subclasses.

A.1.2.4.2 Attributes

Attributes and their manageable properties of VirtualPort are listed in Table A.5.

Table A.5 – VirtualPort attributes

Attribute name	Support qualifier	Read qualifier	Write qualifier	Create qualifier	Requirements IDs
administrativeState	O	M	M	M	
availabilityStatus	O	M	–	–	
bandwidth	M	M	M	M	
operationalState	O	M	–	–	
supportedByObjectList	M	M	–	M	
threshold	M	M	M	M	
userLabel	O	M	M	M	
statictistic	M	M	–	–	
NOTE – O-optional; M-mandatory.					

A.1.2.4.3 Notifications

Notifications and their support qualifiers of VirtualPort are listed in Table A.6.

Table A.6 – VirtualPort notifications

Name	Qualifier	Notes
attributeValueChange	O	
objectCreation	M	
objectDeletion	M	
stateChange	M	
NOTE – O-optional; M-mandatory.		

A.1.2.5 VirtualVPNPort

A.1.2.5.1 Definition

This IOC represents the termination point for one VPN. It is subclass of VirtualPort.

A.1.2.5.2 Attributes

Attributes and their manageable properties of VirtualVPNPort are listed in Table A.7.

Table A.7 – VirtualVPNPort attributes

Attribute name	Support qualifier	Read qualifier	Write qualifier	Create qualifier	Requirements IDs
containedInVPN	M	M	–	M	
NOTE – O-optional; M-mandatory.					

A.1.2.5.3 Notifications

Same as given in clause A.1.2.4, VirtualPort.

A.1.2.6 VirtualMulticastPort

A.1.2.6.1 Definition

This IOC represents the termination point for multicast. Flow may be copied at this termination point if it has downstream flow points.

A.1.2.6.2 Attributes

Attributes and their manageable properties of VirtualMulticastPort are listed in Table A.8.

Table A.8 – VirtualMulticastPort attributes

Attribute name	Support qualifier	Read qualifier	Write qualifier	Create qualifier	Requirements IDs
containedInMulticast	M	M	–	M	
downstreamObjectList	M	M	M	M	
NOTE – O-optional; M-mandatory.					

A.1.2.6.3 Notifications

Same as given in clause A.1.2.4, VirtualPort.

A.1.3 Common information definition

A.1.3.1 Attributes

Common attributes are defined as follows.

Table A.9 – Attributes

administrativeState	AdministrativeState ::= ENUMERATED {
	locked,
	unlocked,
	shuttingDown
	}
		This attribute is to indicate the administrative state of the managed entity, which has three possible values: locked, unlocked, and shuttingDown. See [ITU-T X.731] for details.

availabilityStatus	AvailabilityStatus ::= SET OF INTEGER {
	inTest(0),
	failed(1),
	powerOff(2),
	offline(3),
	offDuty(4),
	dependency(5),
	degraded(6),
	notInstalled(7),
	logFull(8)
	}
		This attribute indicates the availability status of instances of the IOC.

Bandwidth	M3108-1-Bandwidth::= CHOICE {
	bitsPerSecond Number,
	kiloBitsPerSecond Number,
	megaBitsPerSecond Number,
	gigaBitsPerSecond Number,
	teraBitsPerSecond Number
	}
	Number ::= SEQUENCE OF SEQUENCE {
	ingress INTEGER,
	egress INTEGER
	}
		This attribute indicates bandwidth that instances support

containedAccessGroupList	ObjectList	This attribute defines the list of Access Group instances which are contained in a virtual network.
containedInMulticast	VirtualMulticastNetwork	This attribute defines the parent Virtual Multicast Network which contains the instance of the corresponding IOC.

Table A.9 – Attributes

containedInVPN	`VirtualPacketNetwork`	This attribute defines the parent Virtual Packet Network which contains the instance of the corresponding IOC.
containedVPList	`ObjectList`	This attribute is a list of pointers to Virtual Port instances that are contained in the Virtual Network instance.
containedMVPList	`ObjectList`	This attribute is a list of pointers to Virtual Multicast Port instances that are contained in the Virtual Network instance.
downstreamObjectList	`ObjectList`	This attribute is a list of pointers to downstream Virtual Port instances.
multicastId	`MulticastId  String(SIZE(0..128)`	This attribute is the identifier of an instance of this managed class

operationalState	`OperationalState ::= ENUMERATED {`
	`  enabled,`
	`  disabled`
	`}`
		This attribute is to indicate the operability of the managed entity, which has two possible values: disabled and enabled. See [ITU-T X.731] for details.

rootMFP	`VirtualMulticastPort`	This attribute is a pointer to root port for the Virtual Multicast Network instance.
statistics	`Statistics`	This attribute contains statistics of an instance of this managed class
supportedByObjectList	`ObjectList`	The Supported By Object List is an attribute type whose value identifies a set of object instances which are capable of directly affecting a given managed object. The object instances include both physical and logical objects. This attribute does not force internal details to be specified, but only the necessary level of detail required for management. If the object instances supporting the managed object are unknown to that object, then this attribute is an empty set.

threshold	`Threshold ::= CHOICE {`
	`  percent  Percent,`
	`  bandwidth  Bandwidth`
	`}`
	`Percent ::= SEQUENCE OF SEQUENCE {`
	`  ingress  INTEGER(0..100),`
	`  egress  INTEGER(0..100)`
	`}`
		This attribute defines the threshold of an instance of this managed class.

Table A.9 – Attributes

userLabel	`UserLabel`	The User Label attribute type assigns a user-friendly name to the associated object.
vpnId	`VpnId INTEGER(0..104875)`	This attribute is the identifier of an instance of this managed class

A.1.3.2 Notifications

Notifications are defined as follows.

Table A.10 – Notifications

attributeValueChange	`AttributeValueChangeInfo`	This notification type is used to report changes to the attribute such as addition or deletion of members to one or more set valued attributes, replacement of the value of one or more attributes and setting attribute values to their defaults.
objectCreation	`ObjectInfo`	This notification type is used to report the creation of a managed object to another open system.
objectDeletion	`ObjectInfo`	This notification type is used to report the deletion of a managed object to another open system.
stateChange	`StateChangeInfo`	This notification type is used to report the change in the value of one or more state attributes of a managed object that result through either internal operation of the managed object or through management operation.

Bibliography

[b-ITU-T Q.1741.7] Recommendation ITU-T Q.1741.7 (2011), *IMT-2000 references to Release 9 of GSM-evolved UMTS core network*.

[b-ITU-T Y.2601] Recommendation ITU-T Y.2601 (2006), *Fundamental characteristics and requirements of future packet based networks*.

[b-ITU-T Y.2611] Recommendation ITU-T Y.2611 (2006), *High-level architecture of future packet-based networks*.

[b-ITU-T Y.2612] Recommendation ITU-T Y.2612 (2006), *Generic requirements and framework of addressing, routing and forwarding in future, packet-based networks*.

[b-ITU-T Y.2614] Recommendation ITU-T Y.2614 (2011), *Network reliability in public telecommunication data networks*.

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series D	Tariff and accounting principles and international telecommunication/ICT economic and policy issues
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Environment and ICTs, climate change, e-waste, energy efficiency; construction, installation and protection of cables and other elements of outside plant
Series M	Telecommunication management, including TMN and network maintenance
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Telephone transmission quality, telephone installations, local line networks
Series Q	Switching and signalling, and associated measurements and tests
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks, open system communications and security
Series Y	**Global information infrastructure, Internet protocol aspects, next-generation networks, Internet of Things and smart cities**
Series Z	Languages and general software aspects for telecommunication systems

Printed in Switzerland
Geneva, 2018