Technical Specification

MEF 7.3

Carrier Ethernet Service Information Model

February 2017

Disclaimer

The information in this publication is freely available for reproduction and use by any recipient and is believed to be accurate as of its publication date. Such information is subject to change without notice and the MEF Forum is not responsible for any errors. MEF does not assume responsibility to update or correct any information in this publication. No representation or warranty, expressed or implied, is made by MEF concerning the completeness, accuracy, or applicability of any information contained herein and no liability of any kind shall be assumed by MEF as a result of reliance upon such information.

The information contained herein is intended to be used without modification by the recipient or user of this document. MEF is not responsible or liable for any modifications to this document made by any other party.

The receipt or any use of this document or its contents does not in any way create, by implication or otherwise:

a) any express or implied license or right to or under any patent, copyright, trademark or trade secret rights held or claimed by any MEF member company which are or may be associated with the ideas, techniques, concepts or expressions contained herein; nor

b) any warranty or representation that any MEF member companies will announce any product(s) and/or service(s) related thereto, or if such announcements are made, that such announced product(s) and/or service(s) embody any or all of the ideas, technologies, or concepts contained herein; nor

c) any form of relationship between any MEF member companies and the recipient or user of this document.

Implementation or use of specific MEF standards or recommendations and MEF specifications will be voluntary, and no member shall be obliged to implement them by virtue of participation in the MEF Forum. The MEF is a non-profit international organization to enable the development and worldwide adoption of agile, assured and orchestrated network services. The MEF does not, expressly or otherwise, endorse or promote any specific products or services.

Table of Contents

List of Figures

List of Tables

1 List of Contributing Members

The following members of the MEF participated in the development of this document and have requested to be included in this list.

Albis-elcon	Huawei
Centurylink	Omnitron
China Telecom	Overture
Ciena	RAD
Cisco	XO Communications

2 Abstract

This specification describes the MEF Carrier Ethernet Services Management Information Model. This model identifies and defines the information necessary to manage the Carrier Ethernet services as defined by the MEF, including EVC and OVC services. This model is intended to mediate between a product information model and a resource information models, roughly following the TMF SID. This model can be used as the basis for LEGATO Interface Profiles defining APIs for managing Carrier Ethernet services. This specification supersedes MEF 7.2.

This document normatively includes the content of the following files as if they were contained within this document:

- MEF7_3.di (October 26th, 2016)
- MEF7_3.docx (October 26th, 2016)
- MEF7_3.notation (October 26th, 2016)
- MEF7_3.uml (October 26th, 2016)

3 Terminology and Acronyms

This section defines the terms used in this document. In those cases where the normative definitions of terms are found in other documents the third column is used to provide the reference that is controlling.

Terms defined in MEF specifications MEF 6.2[1], MEF 10.3[2], MEF 10.3.1[3], MEF 10.3.2[4], MEF 26.2[5], MEF 35.1[6], MEF 45[7], and MEF 55[8] are included in this document by reference and, hence, not repeated in the table below.

Term	Definition	Source
EVC End Point*	A logical entity at a given UNI that is associated with a distinct set of frames passing over that UNI. This refers to MEF 10.3 defined EVC per UNI.	This document
UML	Unified Modeling Language	OMG UML, Infrastructure, Version 2.5
Service End Point	A logical entity at a given External Interface that is associated with a distinct set of frames passing over that External Interface, i.e., UNI or ENNI. The Service End Point represents the EVC End Point or the OVC End Point.	This document
SID	TM Forum Shared Information & Data Model	GB922 Information Framework (SID) – R15.5.0

Table 1 – Terminology and Acronyms

*Note: * - The OVC End Point is defined in MEF 26.2, therefore not listed in this table.*

4 Scope

The scope of this specification is a protocol neutral definition of the information, i.e., the attributes (or properties), of the service management objects for all MEF defined Carrier Ethernet services. This includes previous definitions in ITU-T Q.840.1[9] and adds more recent definition phases and newly defined services and attributes, including:

- EVC Service (MEF 6.2[1], MEF 10.3[2], MEF 10.3.1[3], MEF 10.3.2[4], MEF 45[6])
- OVC Service (MEF 26.2[5], MEF 45[6])

Previous phases of MEF service definitions are not addressed by this specification. However, functionality of older phases of service definitions may be accomodated where the MEF specification defines this (for example, MEF 10.3 Bandwidth Envelopes can be configured to be functionally equivalent to pre-10.3 Bandwidth Profiles).

The previous revisions of this specification were not limited to services management, some concepts that are not include in this specification are:

- vNID related Objects (vNID, RMI, RPE, etc.)
- Common OAM objects (MEG, ME, MEP, MIP, etc.)
- ELMI Management
- Fault Management Objects (CCM, loopback, LinkTrace, etc.)
- Performance Management Function Set (Data collection, threshold management, bulk data transfer, etc.)
- Flow Domain (Inherited from ITU-T Q.840.1[9])
- MAU Transport Port (Inherited from ITU-T Q.840.1[9])

This model follows the UML Modeling Guidelines defined by the MEF.

This specification covers the individual services corresponding to the services sold to the customers, i.e. as a product offering. For example, an EVC service is considered as a product offered by a service provider to its subscribers. An OVC service is viewed by an operator as a product offering to its customers, but it also can be viewed by the service provider as a "component service" of an EVC service. This document only covers the view of the operator.

The relationship to the resource information model which supports this services information model is not within the scope of this specification.

5 Introduction

This specification defines a common set of managed objects for the Service Orchestration functionality based on the Lifecycle Service Orchestration Management Reference Architecture (LSO RA) [8]. This Carrier Ethernet Services Management Information Model serves as the base model for interface profiles and data modeling for the LEGATO interface.

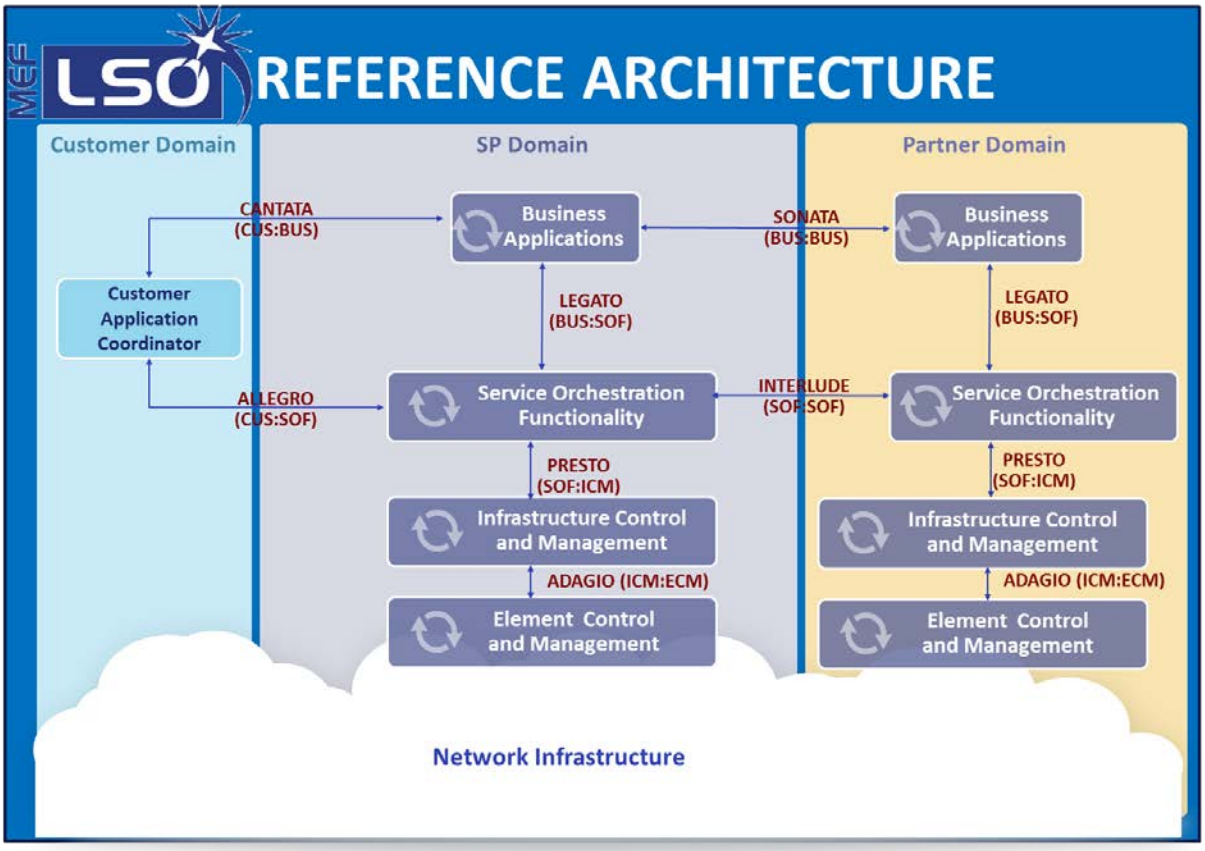

Figure 1 - LSO Reference Architecture

The following sections of this document include:

- Services Information Model Overview (Section 6) provides the overview of the object classes and relationships among the object classes for EVC and OVC services.

- Carrier Ethernet Services Information Model Classes (Section 7) lists all defined object classes and their attributes for:
    - Carrier Ethernet Services.
    - Carrier Ethernet Service End Points.
    - Carrier Ethernet External Interfaces.
    - Supporting object classes for the above three class categories.
- Type Definitions (Section 8) defines all data types and enumerations used for this information model.

6 Service Information Model Overview

The service information model consists of a set of object classes, their attributes and the relationships among them. The object classes defined in this document are modeled based on the services defined in the service related MEF Technical Specifications, for supporting Carrier Ethernet Services, i.e., the EVC Service and the OVC Service. In the following, Figure 2 and Figure 3 illustrate the overviews of object classes and their relationships for EVC and OVC Services respectively. To simplify the overview, some of the minor supporting classes are not shown in these figures.

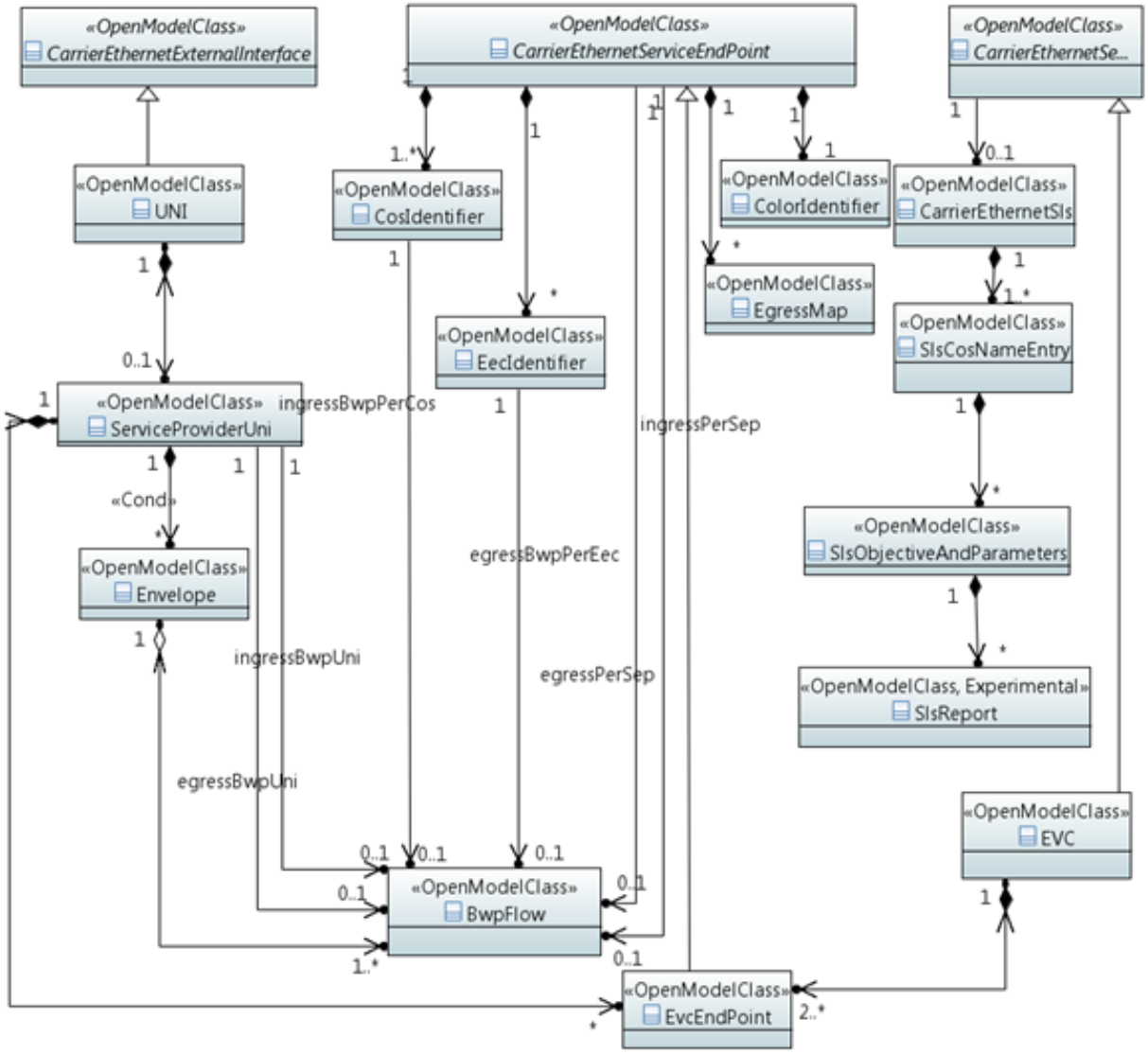

Figure 2 - EVC Service Overview

There are three top level classes, CarrierEthernetService (super class of EVC), CarrierEthernetServiceEndPoint (super class of EvcEndPoint) and CarrierEthernetExternalInterface (super class of UNI). An EVC is associated with 2 or more EvcEndPoint(s), which resides in UNI(s). All other classes are supporting classes for the top level classes and their subclasses.

- EVC (section 7.2) – a subclass of abstract class CarrierEthernetService (section 7.1), representing the EVC service. The CarrierEthernetSls, representing Carrier Ethernet

Service Specification (section 7.17), is the supporting class for EVC. Furthermore, the CarrierEthernetSls is associated with all PM related classes.

- EvcEndPoint (section 7.5) – a subclass of abstract class CarrierEthernetServiceEndPoint (section 7.4), representing the EVC End Point. The supporting classes for EvcEndPoint include CosIdentifier (section 7.11, representing Class of Service Identifier), EecIdentifier (section 7.12, representing Egress Equivalence Class Identifier), ColorIdentifier (section 7.13, representing Color Identifier), EgressMap (section 7.15, representing Egress Map), and BwpFlow (section 7.16.2, representing the Bandwidth Profile Flow).
- UNI (section 7.8) – a subclass of abstract class CarrierEthernetExternalInterface (section 7.7), representing UNI. The Bandwidth Profile related classes are associated with UNI via the ServiceProviderUni (section 7.8.1, representing the UNI attribute extension for UNI in Service Provider view).

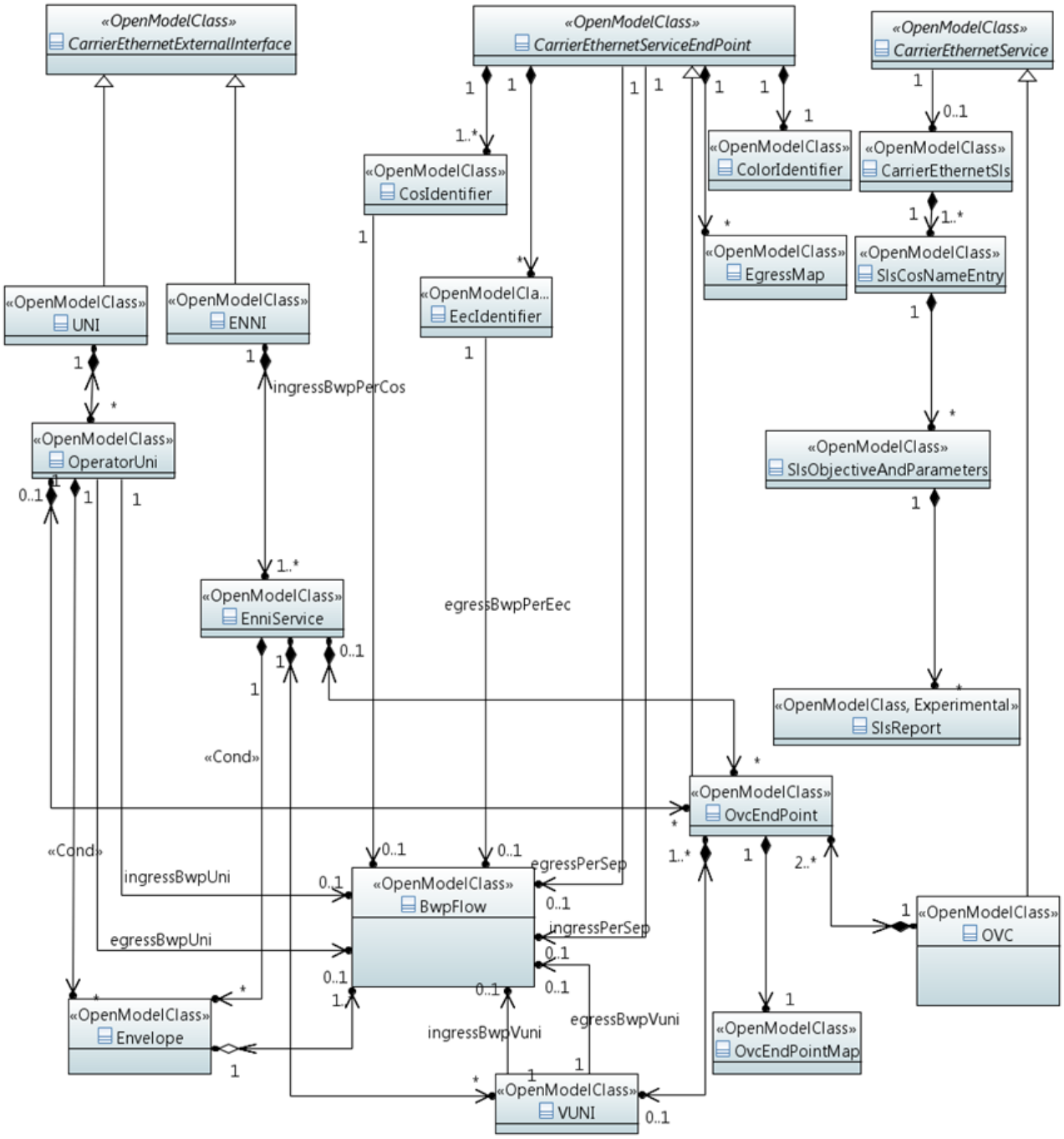

Figure 3 - OVC Service Overview

There are three top level classes, CarrierEthernetService (super class of OVC), CarrierEthernetServiceEndPoint (super class of OvcEndPoint) and CarrierEthernetExternalInterface (super class of UNI and ENNI). An OVC is associated with 2 or more OvcEndPoint(s), which resides either in UNI(s) or in ENNI(s). All other classes are supporting classes for the top level classes and their subclasses.

- OVC (section 7.3) – a subclass of abstract class CarrierEthernetService (section 7.1), representing the OVC service. The CarrierEthernetSls, representing Carrier Ethernet Service Specification (section 7.17), is the supporting class for OVC. Furthermore, the CarrierEthernetSls is associated with all PM related classes.
- OvcEndPoint (section 7.6) – a subclass of abstract class CarrierEthernetServiceEndPoint (section 7.4), representing the OVC End Point. The supporting classes for OvcEndPoint include CosIdentifier (section 7.11, representing Class of Service Identifier), EecIdentifier (section 7.12, representing Egress Equivalence Class Identifier), ColorIdentifier (section 7.13, representing Color Identifier), EgressMap (section 7.15, representing Egress Map), and BwpFlow (section 7.16.2, representing the Bandwidth Profile Flow).
- ENNI (section 7.9) – a subclass of abstract class CarrierEthernetExternalInterface (section 7.7), representing ENNI. The Bandwidth Profile related classes are associated with ENNI via the EnniService (section 7.9.1, representing ENNI Service Attributes).
- UNI (section 7.8) – a subclass of abstract class CarrierEthernetExternalInterface, representing UNI. The Bandwidth Profile related classes are associated with UNI via the OperatorUni (section 7.8.2, representing the UNI attribute extension for UNI in Operator view).

In addition, the class VUNI (section 7.10) is associated to ENNI via EnniService, OvcEndPoint, and BwpFlow.

The following sections provide the details of the object classes of Carrier Ethernet Services Management Information Model.

7 Carrier Ethernet Services Information Model Classes

Object classes are used to convey a static representation of an entity, including properties and attributes. In other words, object classes represent entities but are not used to define the operations acting on the entities.

In the following subsections, object classes are represented in figures as a box with a name compartment and an attributes compartment (Figure 4). For clarity, the list of attributes is omitted from the attributes compartment in some cases. The name compartment also shows stereotype for the class «OpenModelClass»

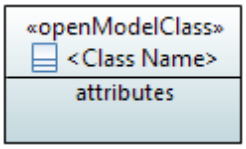

Figure 4 - Graphical Notations for Object Classes

UML defines the following object class properties:

- IsAbstract – Indicates if the object class can be instantiated or is just used for inheritance. This property is described in the class description (not explicitly listed as "IsAbstract" value).
- Is leaf – This property is not used in this document.
- Is active – This property is not used in this document.
- Visibility – This property is not used in this document.
- In addition, the following object class properties are added as stereotypes via profile(s):
    - objectCreationNotification – Defines whether an object creation notification has to be sent when the object instance is created. Only relevant in the Interface Profiles of the MEF Common Information Model. It is not part of the object class description in this document.
    - objectDeletionNotification – Defines whether an object deletion notification has to be sent when the object instance is deleted. Only relevant in the Interface Profiles of the MEF Common Information Model. It is not part of the object class description in this document.

- support – This property qualifies the support of the object class at the management interface (e.g., MANDATORY, OPTIONAL, CONDITIONAL MANDATORY, etc.). It is part of the object class description in this document.
- condition – This property contains the condition for the condition-related support qualifiers. This property is not used in this document since there is no conditional object classes defined in this document.

UML defines the following attribute properties:

- Is derived – This property is not used in this document.
- Is derived union – This property is not used in this document.
- Is leaf – This property is not used in this document.
- Is ordered - For a multi-valued multiplicity; this specifies whether the values in an instantiation of this attribute are sequentially ordered; default is false. It is not listed in the object class attribute tables in this document.
- Is read only - If true, the attribute may only be read, and not changed by the client. The default value is false. It is listed in the object class attribute tables in this document.
- Is static – This property is not used in this document.
- Is unique - For a multi-valued multiplicity, this specifies if the values of this attribute instance are unique (i.e., no duplicate attribute values); default is true. It is not listed in the object class attribute tables in this document.
- Visibility – This property is not used in this document.
- Type – This property provides the type definition of the attribute. It is listed in the object class attribute tables in this document.
- Multiplicity – This property defines the number of values the attribute can simultaneously have. * is a list attribute with 0, one or multiple values. It is listed in the object class attribute tables in this document.
- Default value – This property provides the value that the attribute has to start with in case the value is not provided during creation, or already defined because of a system state. In cases where a default value makes no sense, it is undefined. It is listed in the object class attribute tables in this document.

- Aggregation – This property specifies the type of the association when the attribute is from an association. It is shown in the associations in the class diagram figures but not listed in the object class attribute tables in this document.

- The following attribute properties are added as stereotypes via OpenModelAttribute profile:

    - partOfObjectKey - This property indicates if the attribute is part of the object key or not. It is not listed in the object class tables in this document.

    - AVC (attributeValueChangeNotification) – Only relevant in the Interface Profiles of the MEF Common Information Model. It is not listed in the object class tables in this document.

    - isInvariant – Identifies if the value of the attribute can be changed after it has been created. It is listed in the object class attribute tables in this document.

    - valueRange - Identifies the allowed values for the attribute. In this document, if the valueRange is not defined, the tables will list it as "no range constraint"

    - bitLength - This optional property defines the bit length of the attribute type. It is not listed in the object class attribute tables in this document.

    - Unsigned - This optional property indicates if the attribute type is unsigned (value = true) or signed (value = false). It is not listed in the object class attribute tables in this document.
    - encoding - This optional property defines the encoding of the attribute type. It is not listed in the object class attribute tables in this document.
    - counter - This optional property defines the counter type of the attribute type. It is not listed in the object class attribute tables in this document.
    - unit - This optional property contains a textual definition of the unit associated with the attribute value. It is listed in the object class attribute tables in this document when applicable.

    - support - This property qualifies the support of the attribute at the management interface. It is listed in the object class attribute tables in this document.

    - condition - This property contains the condition for the condition-related support qualifiers. It is listed in the object class attribute tables in this document.

- In addition, the following attribute property is added as stereotype via Reference profile:

    - reference – This property lists the source reference of the attribute, such as MEF 10.3, etc. It is listed in the object class attribute tables in this document

In the following sections, the attribute tables lists all the attributes defined for that class, including the attributed generated from the associations (attribute names start with "_"). The inherited attributes are referred to the super class attribute table(s).

When a section has a figure illustrating the object class and its associations with the other classes, if an attribute is shown both in the figure and the table, it is an owned attribute of that class. If an attribute is shown in the figure but not in the table, it is an inherited attribute.

7.1 Carrier Ethernet Service

This CarrierEthernetService object class represents the EVC service and the OVC service. It is an abstract class and the super class of EVC and OVC, containing all common attributes of EVC and OVC, including the common association with CarrierEthernetSls (representing Service Level Specification).

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
adminState	AdminState	UNLOCKED	1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: ITU-T X.731	This attribute denotes the administrative state of the EVC or the OVC service. The values supported are LOCKED and UNLOCKED. When set to UNLOCKED, the Carrier Ethernet Service (EVC or OVC) is enabled and ready to forward traffic. When set to LOCKED, the Carrier Ethernet Service (EVC or OVC) is disabled and will block (i.e., not forward) traffic.
operationalState	Operational State		1	R	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: ITU-T X.731	This attribute denotes the operational state of EVC or OVC, as working ENABLED or not working DISABLED.
serviceState	ServiceState		0..1	R	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: OPTIONAL Reference	This attribute denotes the service state of the EVC or the OVC service. The values supported are PENDING, ACTIVE and INACTIVE.
userLabel	String		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: OPTIONAL Reference • reference: ITU-T Q.840.1.	This attribute allows the user to define a user friendly description of the entity.
connectionType	Connection Type	POINT_TO_POINT	1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.1; MEF 26.2 section 12.2	This attribute denotes the connection type of EVC or OVC. The values are point to point, multipoint and rooted multipoint.

unicastFrameDelivery	FrameDelivery	UNCONDITIONALLY	1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.5; MEF 26.2 section 12.13	This attribute denotes the unicast frame delivery service.
multicastFrameDelivery	FrameDelivery	UNCONDITIONALLY	1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.5; MEF 26.2 section 12.13	This attribute denotes the multicast frame delivery service.
broadcastFrameDelivery	FrameDelivery	UNCONDITIONALLY	1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.5; MEF 26.2 section 12.13	This attribute denotes the broadcast frame delivery service.
ceVlanPcpPreservation	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.6.2; MEF 26.2 section 12.8	This attribute can be used to preserve the value of the CE-VLAN PCP field in VLAN Tagged Service Frames across an EVC or an OVC.
ceVlanDeiPreservation	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF26.2 section 12.9	This attribute can be used to preserve the value of the CE-VLAN DEI field in VLAN Tagged Service Frames across an EVC or an OVC.
cosNameList	String		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 12.12	This attribute presents the list of Class of Service Names. Each ingress EI Frame or ingress Service Frame is assigned a Class of Service Name via the frame's Class of Service Identifier. The Class of Service Name that is assigned to a frame indicates the performance objectives that apply to frame under appropriate conditions. It is defined in MEF 26.2 but not in MEF 10.3. To align EVC to OVC, this model includes it in the super class.
maxFrameSize	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: For EVC: >=1522. For OVC: >=1526. • unit: byte • support: MANDATORY Reference • reference: MEF 26.2 section 12.6 and MEF 10.3 section 8.9	This attributes denotes the maximum frame size in bytes. For EVC it is >=1522. For OVC it is >=1526.

_carrierEthernetSls	CarrierEthernetSls		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF10.3 section 8.8. MEF 26.2 section 12.13	This attribute presents the relationship between an EVC/OVC and a service level specification.

Table 2 – Attributes of CarrierEthernetService

7.2 EVC

The following diagram illustrates the object class of EVC with its attributes, including inherited attributes, and associations with the other object classes, including the inherited associations.

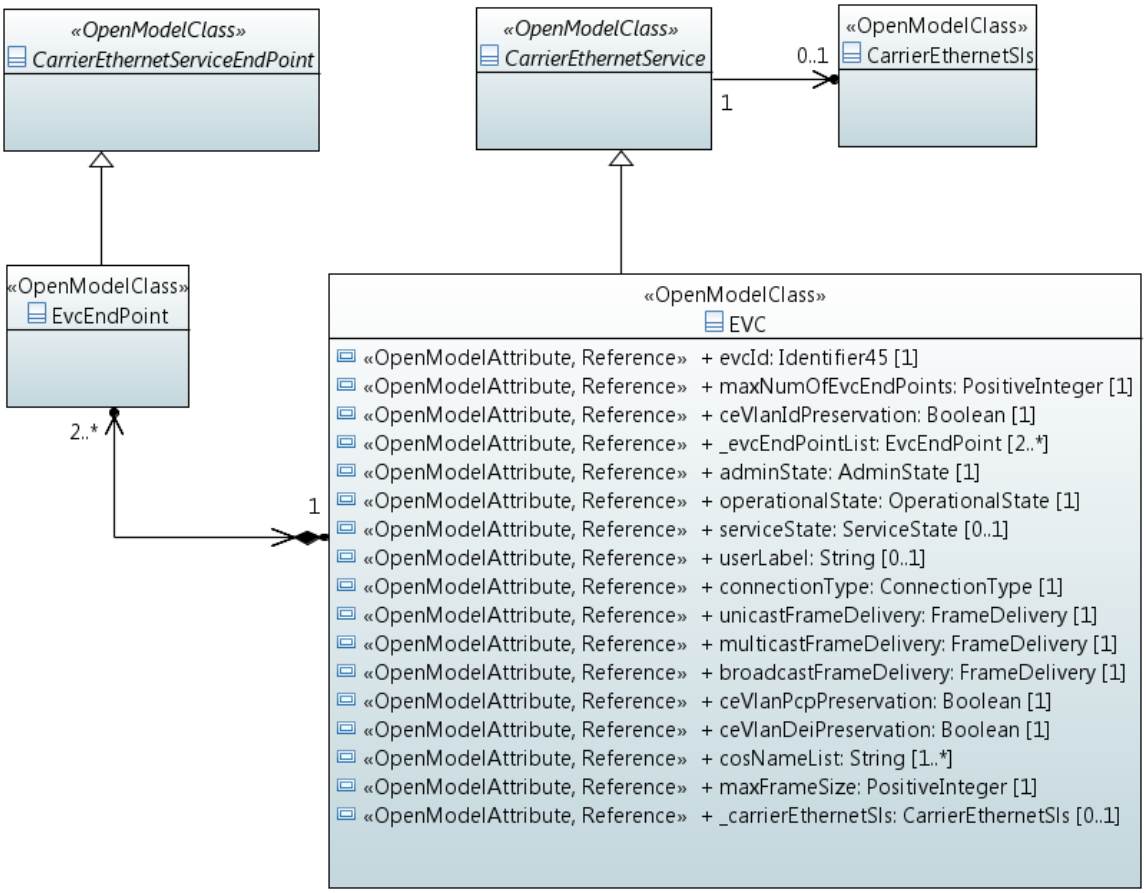

Figure 5 - EVC Class Diagram

The EVC is a subclass of CarrierEthernetService object class. It represents the MEF defined EVC service with all EVC service attributes, as well as its association with other object classes. It is associated with two or more EvcEndPoint(s), a CarrierEthernetSls (representing Service Level Specification), etc.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
evcId	Identifier45		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.2	The EVC ID is an arbitrary string administered by the Service Provider that is used to identify an EVC within the CEN.
maxNumOfEvcEndPoints	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: [2 ..*] • support: MANDATORY Reference • reference: MEF 10.3 section 8.4. MEF 10.3 addresses this as maximum number of UNIs. To be aligned with MEF 26.2, this is changed to maximum number of EvcEndPoints	This attribute specifies the maximum number of EVC End Points allowed for an EVC. Depending on the connectionType, the number is different. For point-to-point, the number is 2. For other connectionType, it is >=2.
ceVlanIdPreservation	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.6.1	Service Frame preservation is defined as preserving the CE-VLAN ID between ingress and egress UNIs.
_evcEndPointList	EvcEndPoint		2..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.3	This attributes is from the relationship between EVC and EVC End Point. In MEF 10.3, the relationship was between the EVC and UNIs. This model changes the relationship to align with MEF 26.2.

Table 3 – Attributes of EVC Class

Details of the inherited attributes refer to Table 2.

7.3 OVC

The following diagram illustrates the object class of OVC with its attributes, including inherited attributes, and associations with the other object classes, including the inherited associations.

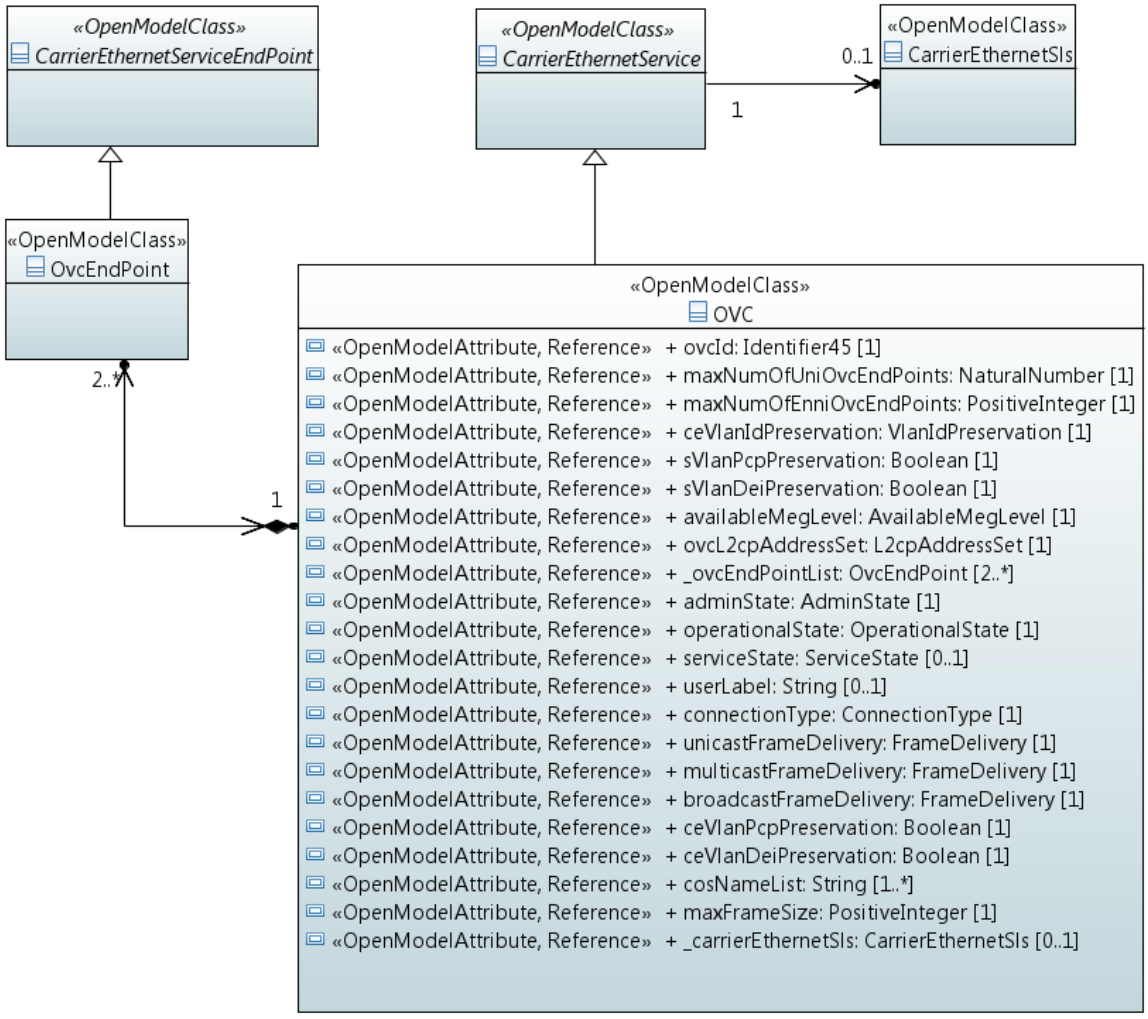

Figure 6 - OVC Class Diagram

The OVC is a subclass of CarrierEthernetService object class. It represents the MEF defined OVC service with all OVC service attributes, as well as its associations with other object classes. It is associated with two or more OvcEndPoint(s), a CarrierEthernetSls (representing Service Level Specification), etc.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description

ovcId	Identifier45		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 Section 12.1	The OVC Identifier is used to allow the SP/SO (Service Provider/Super Operator) and Operator to uniquely identify an OVC for operations purposes.
maxNumOfUniOvcEndPoints	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 12.4	This attribute denotes the upper bound on the number of OVC End Points that are at different UNIs that can be associated by an OVC.
maxNumOfEnniOvcEndPoints	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 12.5	This attribute denotes the Maximum Number of ENNI OVC End Points Service Attribute is an integer greater than or equal to 1. The value is the upper bound on the number of OVC End Points that can be associated by the OVC that are at ENNIs.
ceVlanIdPreservation	VlanIdPreservation		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 12.7	This attribute describes a relationship between the format of the VLAN ID and related fields values of the frame at one External Interface and the format and VLAN ID and related fields values of the corresponding frame at another External Interface. The value of OVC CE-VLAN ID Preservation Service Attribute can be one of PRESERVE, STRIP, or RETAIN.
sVlanPcpPreservation	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: reference: MEF 26.2 section 12.10	This attribute describes a relationship between the S-VLAN PCP value of a frame at one ENNI and the S-VLAN PCP of the corresponding frame at another ENNI supported by the Operator CEN where each ENNI has an OVC End Point that is associated by the OVC.
sVlanDeiPreservation	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 12.11	This attribute describes a relationship between the S-VLAN DEI value of a frame at one ENNI and the S-VLAN DEI of the corresponding frame at another ENNI supported by the Operator CEN where each ENNI has an OVC End Point that is associated by the OVC.
availableMegLevel	AvailableMegLevel		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 12.15	The value of the OVC Available MEG Level Service Attribute is an integer from 0 to 7 or None. It is the MEG Level that is one MEG Level higher than any MEG level reserved by the Operator for MEGs whose MEPs are contained entirely within the Operator's CEN. The value None indicates that SOAM EI Frames are not guaranteed to pass over this OVC at any MEG Level. If an integer value

						is specified, then SOAM EI Frames at or above that MEG Level are guaranteed to pass over the OVC. Note that the Operator can instantiate MEPs or MIPs at or above the value of the OVC Available MEG Level on EIs that bound the OVC, if requested by the SP/SO (Service Provider/Super Operator).
ovcL2cpAddressSet	L2cpAddress Set		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: reference: MEF 26.2 section 12.16	This attribute is the L2CP Address Set Service Attribute that is defined in MEF 45 when it is applied to the OVC.
_ovcEndPointList	OvcEndPoint		2..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 12.3	This attribute is a list of OVC End Point Identifiers. The list contains one OVC End Point Identifier value for each OVC End Point associated by the OVC.

Table 4 – Attributes of OVC Class

Details of the inherited attributes refer to Table 2.

7.4 Carrier Ethernet Service End Point

The CarrierEthernetServiceEndPoint represents the EVC End Point or the OVC End Point. This is an abstract class and the super class of EvcEndPoint and OvcEndPoint. It contains the common attributes of EvcEndPoint and OvcEndPoint, as well as all common associations with the other object classes, such as CosIdentifier(s), EecIdentifier(s), a ColorIdentifier, EgressMap(s), a CarrierEthernetService (i.e., EVC or OVC), etc.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
adminState	AdminState	UNLOCKED	1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: ITU-T X.731	This attribute denotes the administrative state of EVC End Point or OVC End Point. The values supported are LOCKED and UNLOCKED. When set to UNLOCKED, the Carrier Ethernet Service End Point (EVC End Point or OVC End Point) is enabled and ready to forward traffic. When set to LOCKED, the Carrier Ethernet Service End Point (EVC End Point or OVC End Point) is disabled and will block (i.e., not forward) traffic.

operationalState	OperationalState		1	R	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: ITU-T X.731	This attribute denotes the operational state of the EVC End Point or the OVC End Point, as working ENABLED or not working DISABLED.
userLabel	String		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: OPTIONAL Reference • reference: ITU-T Q.840.1.	This attribute allows the user to define a user friendly description of the entity.
cosMappingType	CosOrEecMappingType		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.2 and MEF 26.2 section 16.6	The Class of Service (CoS) is used to specify ingress Bandwidth Profiles. The CoS Mapping Type is one of SEP (Service End Point) based, PCP based or DSCP based.
eecMappingType	CosOrEecMappingType		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.4 and MEF 26.2 section 16.9	The Egress Equivalence Class (EEC) is used to specify Egress Bandwidth Profiles. The EEC Mapping Type is one of SEP (Service End Point) based, PCP based or DSCP based. When _eecIdentifierList attribute is empty, this attribute shall be unset. Otherwise it shall be set.
sourceMacAddressLimit	SourceMacAddressLimit		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.9 and MEF 26.2 section 16.15	This attribute limits the number of source MAC Addresses that can be used in ingress EI Frames mapped to the EVC End Point or the OVC End Point of all types over a time interval. When not present, the number of source MAC addresses is unlimited.
_egressMapList	EgressMap		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.8	This attribute represents the relationship between the EVC/OVC End Point and the Egress Map(s). This attribute is a set of mappings that determine the content of the S-Tag or C-Tag of an egress EI Frame. This is not defined in MEF 10.3 but future MEF 10.x may adapt this attribute.
_eecIdentifierList	EecIdentifier		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.4 and MEF 26.2 section 16.9	This attribute represents the relationship between the EVC/OVC End Point and the Egress Equivalence Class Identifier(s).
_colorIdentifier	ColorIdentifier		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.3 and MEF 26.2 section 16.7	This attribute represents the relationship between the EVC/OVC End Point and a Color Identifier.

_cosIdentifierList	CosIdentifier		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.2 and MEF 26.2 section 16.6	This attribute represents the relationship between the EVC/OVC End Point and the Class of Service Identifier(s).
_ingressBwpFlowPerSep	BwpFlow		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 12 and MEF 26.2 section 13.	This attribute denotes the relationship between an EVC/OVC End Point and the bandwidth profile flow. It describes ingress policing on all ingress EI Frames mapped to a given EVC/OVC End Point
_egressBwpFlowPerSep	BwpFlow		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 12 and MEF 26.2 section 13.	This attribute denotes the relationship between an EVC/OVC End Point and the bandwidth profile flow. It describes the length and arrival time characteristics of all egress EI Frames mapped to a given EVC/OVC End Point.

Table 5 – Attributes of CarrierEthernetServiceEndPoint

7.5 EVC End Point

The following diagram illustrates the object class of EvcEndPoint (representing EVC End Point) with its attributes and associations, including inherited attributes and associations.

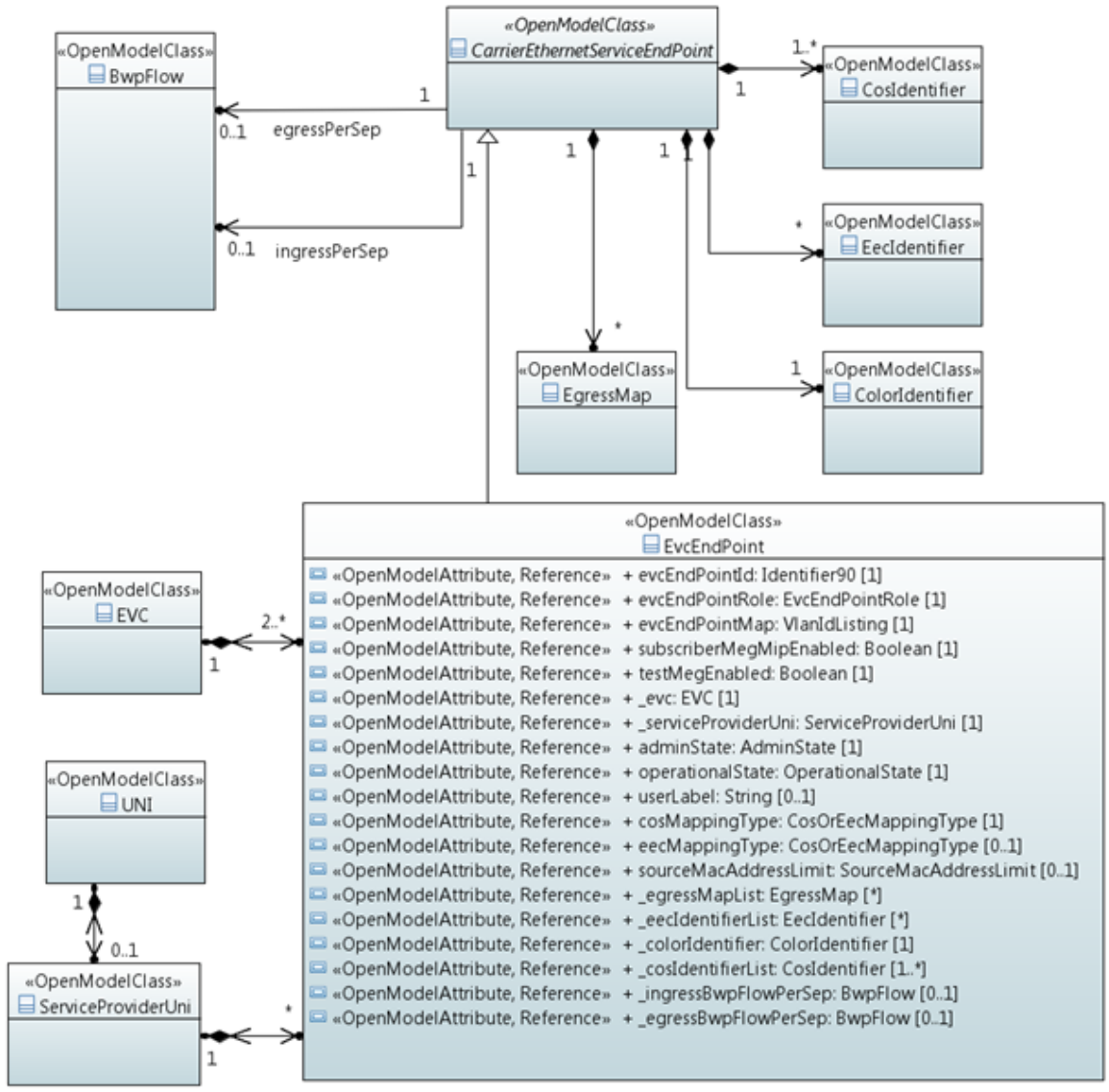

Figure 7 - EvcEndPoint Class Diagram

The EvcEndPoint is a subclass of CarrierEthernetServiceEndPoint. It represents the EVC End Point (EVC per UNI), provides all EVC End Point service attributes, as well as all associations with the other object classes, such as an EVC, a ServiceProviderUni, CosIdentifier(s), EecIdentifier(s), a ColorIdentifier, an EgressMap(s), etc.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description

evcEndPointId	Identifier90		1	R	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.1	This attribute name is adapted from MEF 26.2. MEF 10.3 uses UNI EVC ID. This is defined to be the concatenation of UNI ID and the EVC ID.
evcEndPointRole	EvcEndPoint Role		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.3	This attribute denotes the role of the EVC End Point for the EVC. The value is ROOT or LEAF. MEF 10.3 addresses the UNI Role in EVC attribute UNI List. This is changed so that the role is the attribute of EVC End Point, to be aligned to MEF 26.2.
evcEndPointMap	VlanIdListin g		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.10	This attribute provides the list of CE-VLAN IDs those map to the EVC. MEF 10.3 lists this attribute (CE-VLAN ID/EVC map) as UNI service attribute while MEF 26.2 decided to move this on as endpoint service attribute. Decided to move this one to endpoint to be consistent. MEF 45 allows this attribute to be elastic.
subscriberMegMipEnab led	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.11	This attribute denotes the Subscriber MEG MIP is enabled or not.
testMegEnabled	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.10	This attribute denotes the test MEG is enabled or not.
_serviceProviderUni	ServiceProvi derUni		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.1 and MEF 26.2 section 16.3.	This attribute represents the relationship between the EVC End Point and a Service Provider UNI.
_evc	EVC		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.	This attribute represents the relationship between the EVC End Point and an EVC.

Table 6 - Attributes of EvcEndPoint Class

Details of the inherited attributes refer to Table 5.

7.6 OVC End Point

The following diagram illustrates the object class of OvcEndPoint (representing OVC End Point) with its attributes and associations, including inherited attributes and associations.

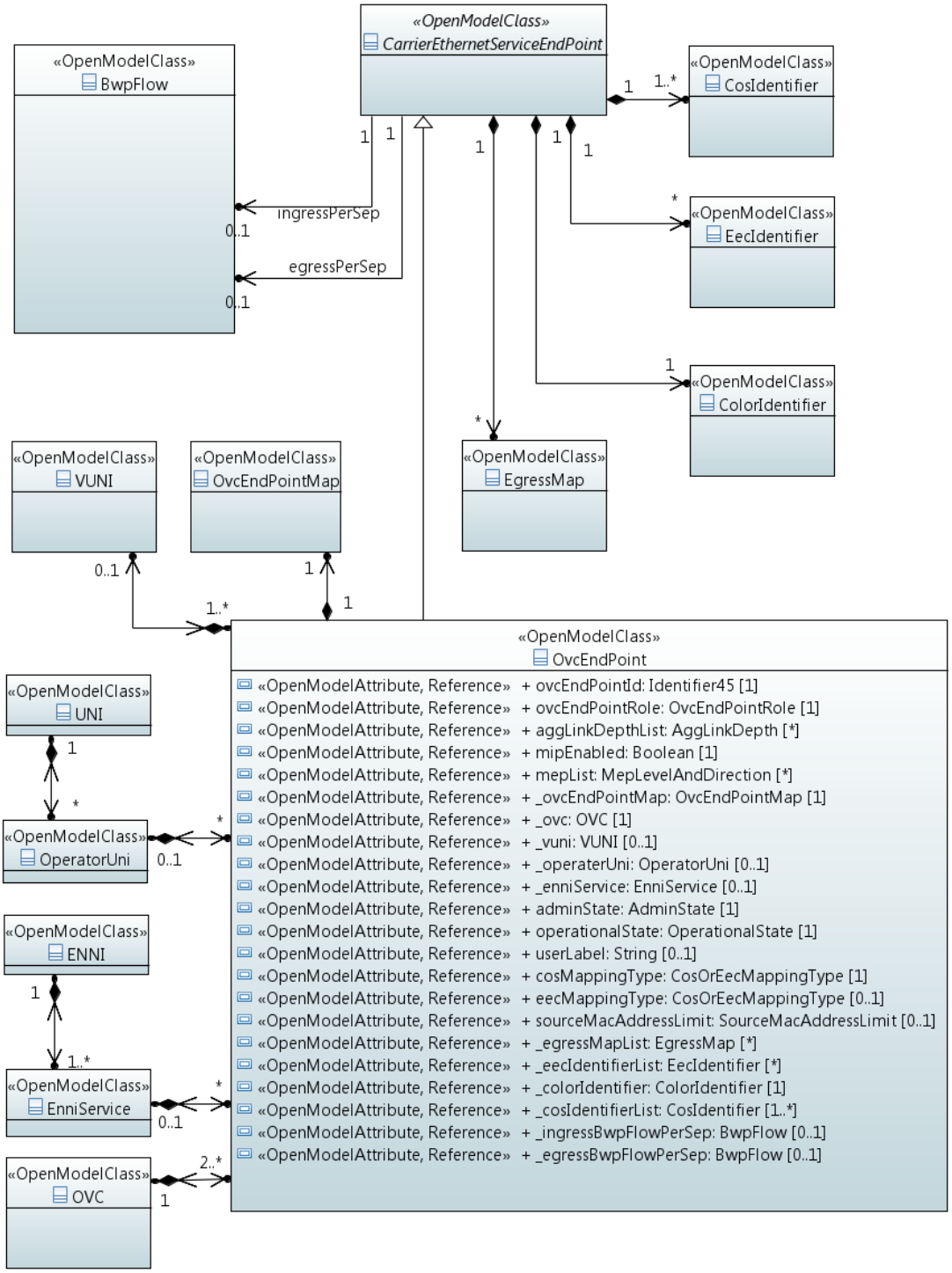

Figure 8 - OvcEndPoint Class Diagram

The OvcEndPoint is a subclass of CarrierEthernetServiceEndPoint. It represents the OVC End Point, provides all OVC End Point service attributes, as well as all associations with the other object classes, such as an OVC, an OperatorUni or an EnniService, CosIdentifier(s), EecIdentifier(s), EgressMap(s), an OvcEndPointMap, a ColorIdentifier, VUNI(s), etc.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
ovcEndPointId	Identifier45		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.1	This attribute is a string that is used to allow the SP/SO (Service Provider/Super Operator) and Operator to uniquely identify the OVC End Point for operations purposes.
ovcEndPointRole	OvcEndPointRole		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.4	This attribute denotes the role of the OVC End Point for the OVC. Its value is Root, Leaf, or Trunk.
aggLinkDepthList	AggLinkDepth		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.14	This attribute only applies to an OVC End Point at ENNI when the EI Link Aggregation has the value ALL_ACTIVE. This attribute value is a list of pairs of the form < S-VLAN ID, ,n> where the S-VLAN ID value that is contained in the value of the OVC End Point Map and n is an integer in the range 1 to the value of the EI Number of Links n specifies the number of links in the value of the EI Port Conversation ID to Aggregation Link Map for the VLAN ID value.
mipEnabled	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.16	This attribute denotes whether the MIP is enabled or not. When the value is TRUE, several parameter values, including the MEG Level, need to be determined as described in MEF 30.1. This Service Attribute is only applicable when the OVC End Point is at an ENNI and not in a VUNI.
mepList	MepLevelAndDirection		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.17	This attribute is a list of pairs, one for each MEP that is instantiated. Each pair is of the form <l,d> where l equals the MEG Level, and d is the direction for the MEP, either UP or DOWN.

_ovcEndPointMap	OvcEndPoint Map		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.5	This attribute represents the relationship between the OVC End Point and an OVC End Point Map.
_ovc	OVC		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 12.3.	This attribute represents the relationship between the OVC End Point and an OVC.
_vuni	VUNI		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: OPTIONAL Reference • reference: MEF 26.2 section 15.	This attribute represents the relationship between the OVC End Point and VUNI.
_uni	UNI		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.3.	This attribute represents the relationship between the OVC End Point and a UNI.
_enni	ENNI		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.3.	This attribute represents the relationship between the OVC End Point and an ENNI.
_enniService	EnniService		0..1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MER 26.2 section 13.	This attribute represents the relationship between the OVC End Point and an ENNI. Service

Table 7 - Attributes of OvcEndPoint Class

Details of the inherited attributes refer to Table 5.

7.7 Carrier Ethernet External Interface

This CarrierEthernetExternalInterface object class represents the Carrier Ethernet External Interface, i.e., the UNI and ENNI. It is an abstract class and the super class of UNI and ENNI.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description

adminState	AdminState	UNLOCKED	1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: ITU-T X.731	This attribute denotes the administrative state of the UNI or the ENNI. The values supported are LOCKED and UNLOCKED. When set to UNLOCKED, the Carrier Ethernet External Interface (UNI or ENNI) is enabled and ready to forward traffic. When set to LOCKED, the Carrier Ethernet External Interface (UNI or ENNI) is disabled and will block (i.e., not forward) traffic.
operationalState	OperationalState		1	R	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: ITU-T X.731	This attribute denotes the operational state of the UNI or the ENNI, as working ENABLED or not working DISABLED.
userLabel	String		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: OPTIONAL Reference • reference: ITU-T Q.840.1.	This attribute allows the user to define a user friendly description of the entity.
physicalLayerList	PhysicalLayer		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.2 and MEF 26.2 section 14.2	This attribute is a list of physical layers, one for each physical link implementing the UNI or ENNI. Different physical links can use different physical layers. The Physical Layer for each physical link implementing the UNI or ENNI MUST is one of the PHYs listed in IEEE Std 802.3 – 2012 but excluding 1000BASE-PX-D and 1000BASE-PX-U. This attribute is writable for possible addition or removal.
numberOfLinks	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.4 and MEF 26.2 section 14.4	This attribute specifies the number of links at the Carrier Ethernet External Interface (UNI or ENNI).
frameFormat	EthernetFrameFormat		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.6 and MEF 26.2 section 14.7	This attribute is an Ethernet frame format. It is an Ethernet frame and is defined to consist of the first bit of the Destination MAC Address through the last bit of the Frame Check Sequence. UNI frames use untagged or C-VLAN tagged, while ENNI Frames use S-VLAN tags.

linkAggregation	InterfaceResiliency		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3.2 (UNI Resiliency) and MEF 26.2 section 14.5	This attribute represents the Link Aggregation for a UNI or an ENNI. Its value is one of NONE, 2_LINK_ACTIVE_STANDBY, ALL_ACTIVE, or OTHER. In MEF 10.3 it is called UNI Resiliency. the value of ALL_ACTIVE is added in MEF 10.3.2.
portConvsIdToAggLinkMapList	ConversationIdToAggregationLinkMap		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3.2 and MEF 26.2 section 14.6	This attribute is applicable only when the UNI or ENNI resiliency attribute has the value of ALL_ACTIVE. Its value is a Port Conversation ID to Aggregation Link Map as defined in IEEE Std 802.1AX – 2014.
linkOamEnabled	Boolean	false	1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.16 and MEF 26.2 section 14.14	This attribute denotes the Link OAM is enabled or not at the UNI or the ENNI. When the value of the Link OAM attribute is TRUE, Link OAM must be run on all physical links in the UNI/ENNI.
lagLinkMegEnabled	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 14.16	This attribute denotes the Link Aggregation Link MEG enabled or not at the UNI or at the ENNI. When the value is TRUE, the Service Provider or the Operator must operate the LAG Link MEG on each link in the EI.

Table 8 – Attributes of CarrierEthernetExternalInterface

7.8 UNI

The following diagram illustrates the object class of UNI, along with specifications ServiceProviderUni and OperatorUni, with all their attributes and associations with the other object classes, including inherited attributes and associations.

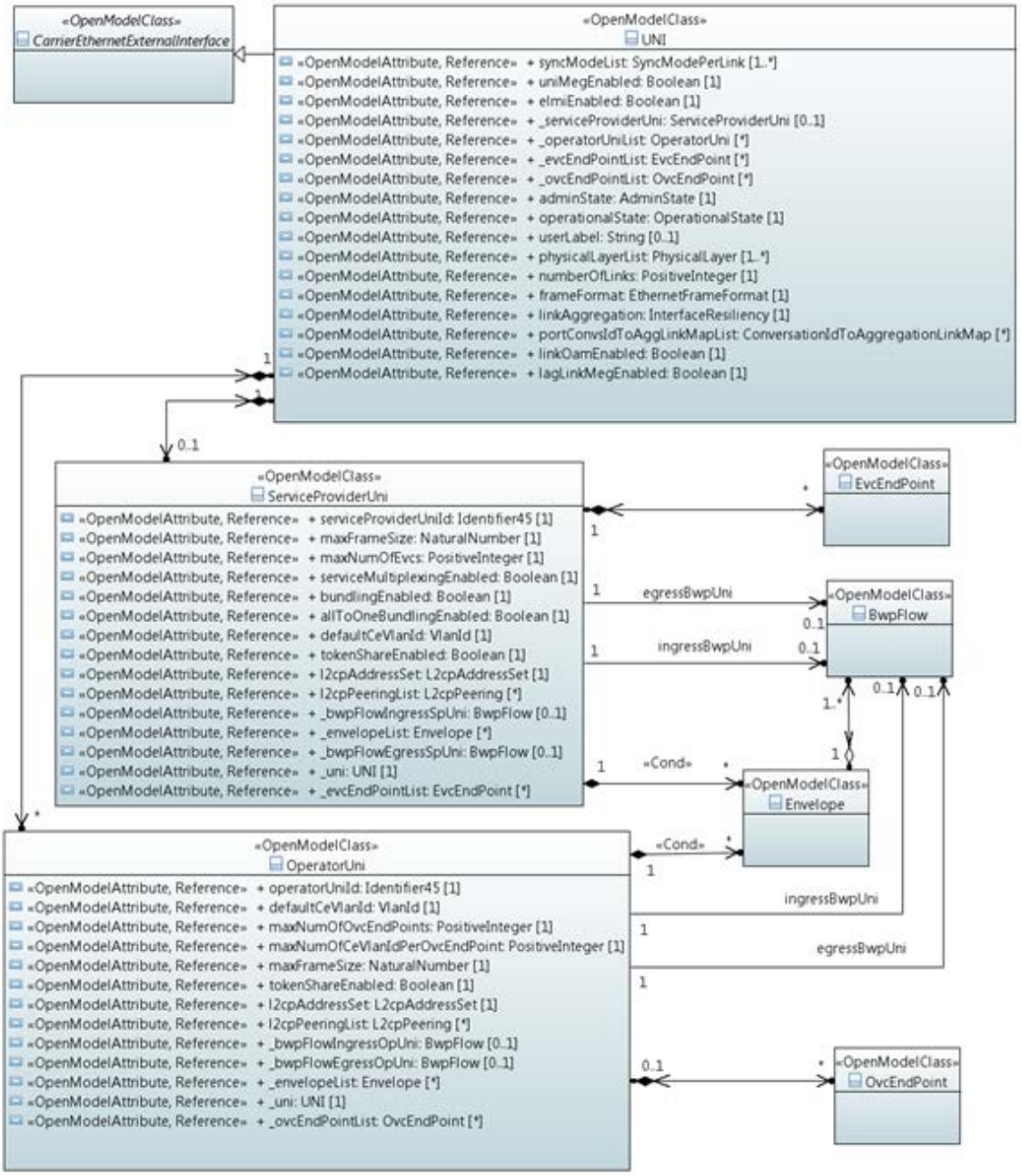

Figure 9 - UNI Class Diagram

The UNI object class is a subclass of CarrierEthernetExternalInterface object class. It represents the UNI. UNI may be managed by Service Provider or by Operator, for EVC services or for OVC services. Therefore an UNI may be associated with ServiceProviderUni and/or with OperatorUni (can be both but cannot be none) which consist of different attribute sets. The bandwidth profile parameters (Envelope(s), BwpFlow(s)) are associated with the UNI indirectly via the ServiceProviderUni and the OperatorUni.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
syncModeList	SyncModePerLink		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.3 and MEF 26.2 section 14.3	This attribute is a list with one item for each of the physical links. When the value of an item is "Enabled," the bits transmitted from the CEN to the CE on the physical link corresponding to the item can be used by the CE as a bit clock reference.
uniMegEnabled	Boolean	false	1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.17	This attribute denotes whether the UNI MEG is enabled or not.
elmiEnabled	Boolean	false	1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.18	This attribute denotes whether the ELMI is enabled or not.
_serviceProviderUni	ServiceProviderUni		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.	This attribute represents the relationship between the UNI and a ServiceProviderUni. A UNI has to be associated to at least one of the ServiceProviderUni or OperatorUni(s). It is possible to be associated to both.
_operatorUniList	OperatorUni		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 14.	This attribute represents the relationship between the UNI and an OperatorUni. A UNI has to be associated to at least one of the ServiceProviderUni or OperatorUni(s). It is possible to be associated to both.

_evcEndPointList	EvcEndPoint		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.1 and MEF 26.2 section 16.3.	This attribute represents the relationship between the UNI and a list of EVC End Points.
_ovcEndPointList	OvcEndPoint		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.3.	This attribute represents the relationship between the UNI and a list of OVC End Points.

Table 9 - Attributes of UNI Class

Details of the inherited attributes refer to Table 8.

7.8.1 Service Provider UNI

This ServiceProviderUni object class extends the UNI service attributes (or their values) that are applicable to EVC specifically for Service Provider service management. It is associated with Envelope(s), BwpFlow(s), EvcEndPoint(s), etc.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
serviceProviderUniId	Identifier45		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.1 and MEF 26.2 Table 54	The Service Provider UNI ID allows the SP(Service Provider)/SO (Super Operator) and Operators to uniquely identify the UNI for operations purposes.
maxFrameSize	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: >=1522 • unit: byte • support: MANDATORY Reference • reference: MEF 26.2 section 14.8, table 54 and MEF 10.3 section 9.7	This value limits the length of frames carried by an EVC that associates an EVC End Point. the value is less than or equal to the value agreed between the Service Provider and the Operator.
maxNumOfEvcs	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.11	This attribute limits the number of EVCs (therefore the EVC End Points) the UNI can support.

serviceMultiplexingEnabled	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.8	This attribute denotes whether the service multiplexing is enabled or not. When this attribute value is TRUE, there can be multiple EVCs at the UNI. This attribute can be TRUE only when All-to-one bundling is FALSE.
bundlingEnabled	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.12	This attribute denotes whether the bundling is enabled or not. When it is TRUE, it allows more than one CE-VLAN IDs mapped to an EVC at a UNI. It can be TRUE only when All to one bundling is FALSE.
allToOneBundlingEnabled	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.13	This attribute denotes whether the All-to-One bundling is enabled or not. When a UNI has All to One Bundling is TRUE, all CE-VLAN IDs MUST map to a single EVC at the UNI. This attribute can be TRUE only when Service Multiplexing and Bundling are FALSE.
defaultCeVlanId	VlanId		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.9	This attribute defines the CE-VLAN ID assigned to the untagged service frames and priority tagged service frames. MEF 10.3 named it untagged and priority tagged CE VLAN ID, while MEF 26.2 named it default CE VLAN ID. The value is usually the same.
tokenShareEnabled	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 12.1	This attribute denotes whether the token share is enabled or not. When the value is TRUE, at least one Envelope at the UNI must be able to have two or more Bandwidth Profiles mapped to it.
l2cpAddressSet	L2cpAddressSet		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 45	This attribute represents the L2CP Address Set. It specifies the subset of the Bridge Reserved Addresses that are filtered (i.e. L2CP Frames with this destination address are Peered or Discarded but not Passed) at a L2CP Decision Point.
l2cpPeeringList	L2cpPeering		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 45	This attribute represents the L2CP Peering defined in MEF 45 when applied to the UNI.
_bwpFlowIngressSpUni	BwpFlow		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.14	This attribute represents the relationship between the ServiceProviderUni and the ingress BwpFlow.

_bwpFlowEgressSpUni	BwpFlow		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9.15	This attribute represents the relationship between the ServiceProviderUni and the egress BwpFlow.
_envelopeList	Envelope		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 6.2 table 4	This attribute represents the relationship between the ServiceProviderUni and the Envelope(s).
_uni	UNI		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 9	This attribute represents the relationship between the ServiceProviderUni and the UNI.
_evcEndPointList	EvcEndPoint		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.1 and MEF 26.2 section 16.3.	This attribute represents the relationship between the Service Provider UNI and a list of EVC End Points.

Table 10 - Attributes of ServiceProviderUni Class

7.8.2 Operator UNI

This OperatorUni object class extends the UNI service attributes (or their values) that are applicable to OVC specifically for Operator service management. It is associated with Envelope(s), BwpFlow(s), OvcEndPoint(s), etc.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
operatorUniId	Identifier45		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 14.1	The Operator UNI ID allows the SP/SO (Service Provider/Super Operator) and Operator to uniquely identify the UNI for operations purposes.
defaultCeVlanId	VlanId		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 14.9	This attribute is the CE-VLAN ID assigned to untagged service frames and priority tagged service frames. MEF 10.3 named it untagged and priority tagged CE VLAN ID, while MEF 26.2 named it default CE VLAN ID.

maxNumOfOvcEndPoints	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 14.10	This attribute provides an upper bound on the number of OVC End Points that are associated by each OVC that the can support at the UNI.
maxNumOfCeVlanIdPerOvcEndPoint	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: [1..4094] • support: MANDATORY Reference • reference: MEF 26.2 section 14.11	This attribute specifies the largest number of CE- VLAN ID values that can map to an OVC End Point in an OVC End Point Map Service Attribute at the UNI.
maxFrameSize	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: >=1522 • unit: byte • support: MANDATORY Reference • reference: MEF 26.2 section 14.8	This value limits the length of frames carried by an OVC that associates an OVC End Point. This is agreed between the Service Provider and the Operator.
tokenShareEnabled	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 14.18	This attribute denotes whether the token share is enabled or not. When the value is TRUE, at least one Envelope at the UNI must be able to have two or more Bandwidth Profiles mapped to it.
l2cpAddressSet	L2cpAddressSet		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 14.20	This attribute specifies the subset of the Bridge Reserved Addresses that are filtered (i.e. L2CP Frames with this destination address are Peered or Discarded but not Passed) at a L2CP Decision Point.
l2cpPeeringList	L2cpPeering		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 14.21	This attribute represents the L2CP Peering defined in MEF 45 when applied to the UNI/ENNI.
_bwpFlowIngressOpUni	BwpFlow		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 14.12	This attribute represents the relationship between the OperatorUni and the ingress BwpFlow.

_bwpFlowEgressOpUni	BwpFlow		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 14.13	This attribute represents the relationship between the OperatorUni and the egress BwpFlow.
_envelopeList	Envelope		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 14.19.	This attribute represents the relationship between the OperatorUni and the Envelope(s).
_uni	UNI		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 14.1	This attribute represents the relationship between the OperatorUni and the UNI.
_ovcEndPointList	OvcEndPoint		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.3.	This attribute represents the relationship between the Operator UNI and a list of OVC End Points.

Table 11 - Attributes of OperatorUni Class

7.9 ENNI

The following diagram illustrates the object class of ENNI, along with EnniService (representing the ENNI Service Attributes), with their attributes, and associations with the other object classes, including inherited attributes and associations.

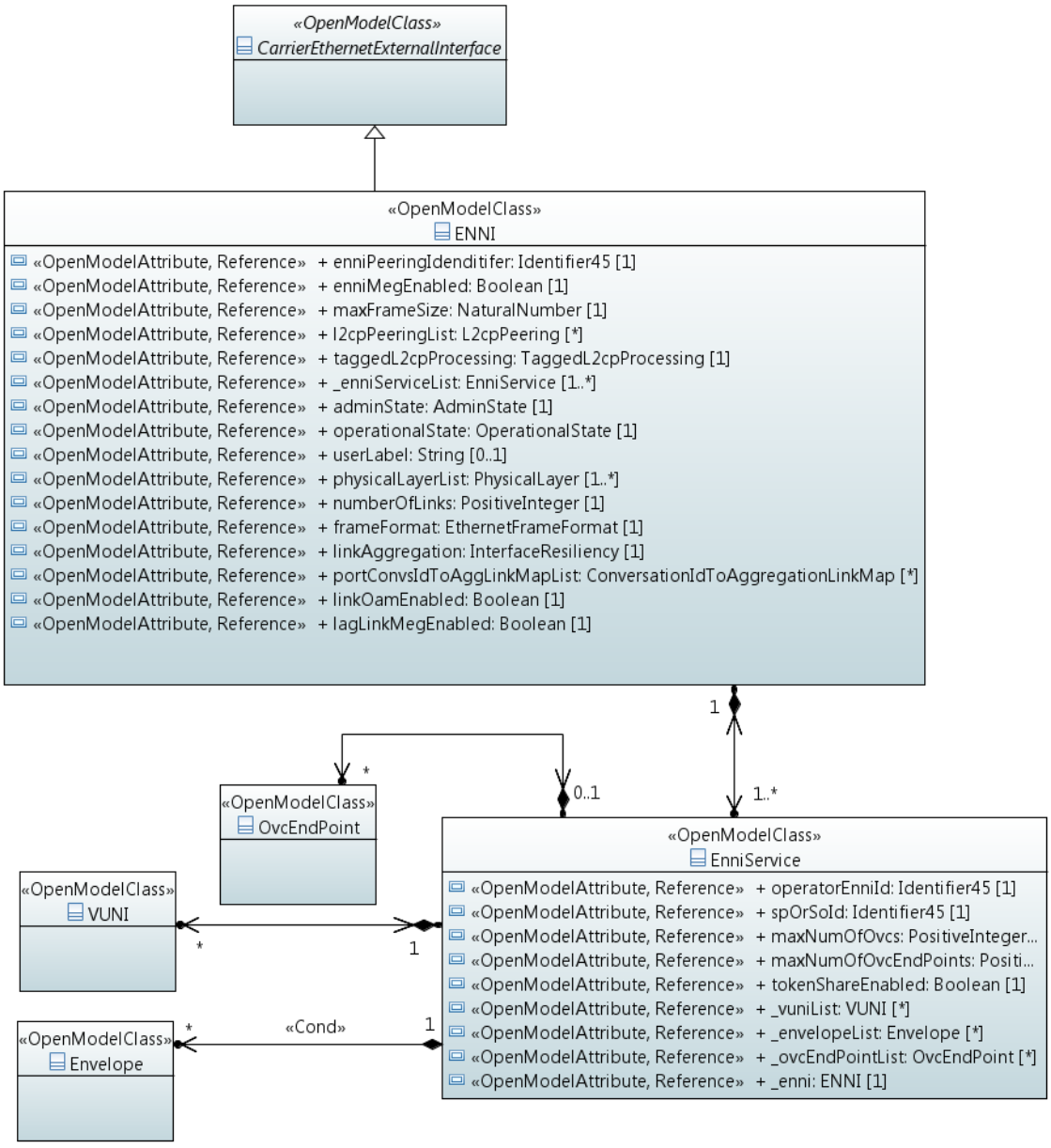

Figure 10 - ENNI Class Diagram

The ENNI object class is a subclass of CarrierEthernetExternalInterface object class. It represents the ENNI. The ENNI attributes consists of a set of common ENNI attributes, and

multiple sets of ENNI service attributes. Via EnniService, the ENNI is associated with Envelope(s), OvcEndPoint(s) and VUNI(s).

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
enniPeeringIdenditifer	Identifier45		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 9.1	The ENNI Peering Identifier is a string used to allow the Operators at the ENNI to uniquely identify the ENNI for operations purposes.
enniMegEnabled	Boolean	false	1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 9.7	This attribute denotes whether the ENNI MEG is enabled or not.
maxFrameSize	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: >=1526 • unit: byte • support: MANDATORY Reference • reference: MEF 26.2 section 10.3	This value limits the length of frames carried by an OVC that associates an OVC End Point at this ENNI in bytes. It is one of the ENNI Operator Multi-lateral attributes, which requires the CENs at the ENNI-N to agree on the values but may allow these values to be different.
l2cpPeeringList	L2cpPeering		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 10.1 and MEF 45 section 8.2	This attribute represents the L2CP Peering Service defined in MEF 45 section 8.2 when applied to the ENNI. It is one of the ENNI Operator Multi-lateral attributes, which requires the CENs at the ENNI-N to agree on the values but may allow these values to be different.
taggedL2cpProcessing	TaggedL2cpProcessing	802.1_COMPLIANT	1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 10.2 and MEF 45 section 8.3	This attribute represents the Tagged L2CP Processing defined in MEF 45 section 8.3 (802.1 compliant or 802.1 non-compliant. Desired to be 802.1 compliant). It is one of the ENNI Operator Multi-lateral attributes, which requires the CENs at the ENNI-N to agree on the values but may allow these values to be different.

_enniServiceList	EnniService		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 13	This attribute represents the relationship between the ENNI and the EnniService(s).

Table 12 - Attributes of ENNI Class

Details of the inherited attributes refer to Table 8.

7.9.1 ENNI Service

This EnniService object class represents a set of ENNI Service Attributes. For each instance of an ENNI, there may be multiple sets of ENNI Service Attributes. The value for each ENNI Service Attribute in a set for an Operator CEN (Carrier Ethernet Network) is specific to a SP/SO (Service Provider/Super Operator) that is using the ENNI. Each such value is agreed to by the SP/SO and the Operator. For a given SP/SO that is using the ENNI, a given ENNI Service Attribute can have an identical value for each Operator while another ENNI Service Attribute can have a different value for each Operator. It is associated with Envelope(s), BwpFlow(s), OvcEndPoint(s) and VUNI(s).

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
operatorEnniId	Identifier45		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 13.1	This attribute is an identifier for the ENNI intended for management purposes.
spOrSoId	Identifier45		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: this document	This attribute is an identifier for the SP (Service Provider) or SO (Super Operator) so that the set of the ENNI Service Attributes will be applied to the specified SP or SO.
maxNumOfOvcs	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 13.3	This attribute limits the number of OVCs that the Operator CEN can support at the ENNI.

maxNumOfOvcEndPoints	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 13.4	This attribute limits the number of OVC End Points that the Operator CEN can support at the ENNI for an OVC.
tokenShareEnabled	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 13.5	This attribute is an indication of the support of mapping more than one Bandwidth Profile Flow to an Envelope at the ENNI.
_vuniList	VUNI		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: OPTIONAL Reference • reference: MEF 26.2 section 15	This attribute represents the relationship between the EnniService and the VUNI(s).
_envelopeList	Envelope		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 13.6	This attribute represents the relationship between the EnniService and the Envelope(s).
_ovcEndPointList	OvcEndPoint		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MER 26.2 section 13.	This attribute represents the relationship between the ENNI Service and a list of OVC End Points. This list only contains OVC End Points at an ENNI that are not in a VUNI..
_enni	ENNI		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 13.1	This attribute represents the relationship between the ENNI Service and the ENNI.

Table 13 - Attributes of EnniService Class

7.10 VUNI

The following diagram illustrates the object class of VUNI with its attributes and associations with the other object classes.

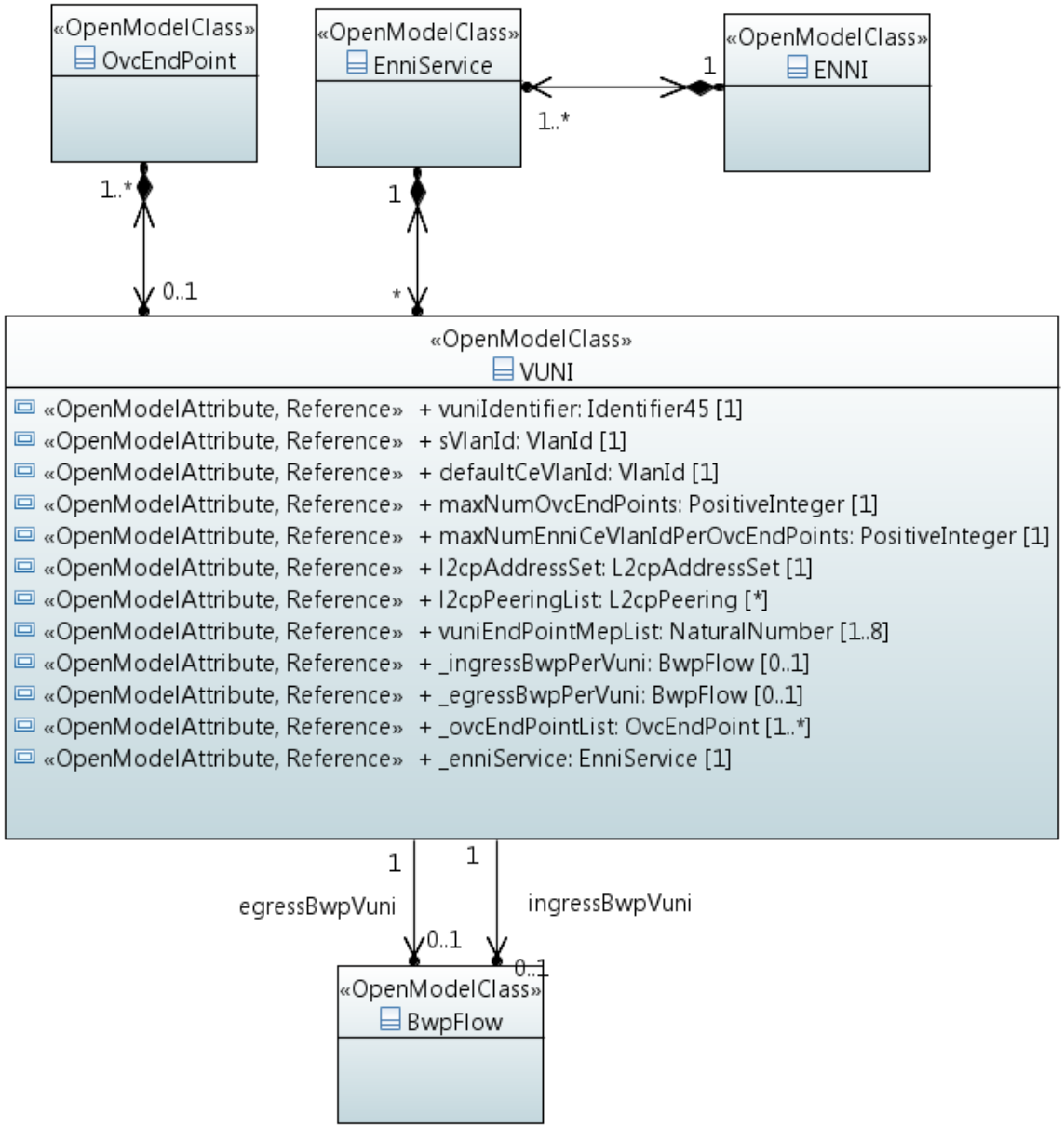

Figure 11 - VUNI Class Diagram

The VUNI object class represents the VUNI. It provides the MEF VUNI attributes, as well as the associations with the ENNI, the OVC End Point and the bandwidth profile parameters.

Applied stereotypes:

- OpenModelClass
  - support: OPTIONAL

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description

vuniIdentifier	Identifier45		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 15.1.1	This attribute allows the SP/SO (Service Provider/Super Operator)and the Operator to uniquely identify a VUNI for operations purposes.
sVlanId	VlanId		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 15.1.2	This attribute uniquely identifies the VUNI at the ENNI.
defaultCeVlanId	VlanId		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 15.1.3	This attribute is needed for the definition of the ENNI CE-VLAN ID for an ENNI Frame. The ENNI CE-VLAN ID is used in Form V of the OVC End Point Map Service Attribute at an ENNI. 0 for no C-TAG
maxNumOvcEndPoints	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 15.1.4	This attribute limits the number of OVC End Points that the ENNI can support.
maxNumEnniCeVlanIdPerOvcEndPoints	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: <=4094 • support: MANDATORY Reference • reference: MEF 26.2 section 15.1.5	This attribute limits the number of ENNI CE-VLAN ID values that can map to an OVC End Point in a value of the OVC End Point Map Service Attribute for an OVC End Point that is in the VUNI.
l2cpAddressSet	L2cpAddressSet		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 15.1.8. and MEF 45	This attribute specifies the subset of the Bridge Reserved Addresses that are filtered (i.e. L2CP Frames with this destination address are Peered or Discarded but not Passed) at a L2CP Decision Point.
l2cpPeeringList	L2cpPeering		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 15.1.9 and MEF 45	This attribute represents the L2CP Peering defined in MEF 45 when applied to the UNI/ENNI.
vuniEndPointMepList	NaturalNumber		1..8	RW	OpenModelAttribute • isInvariant: false • valueRange: [0..7] • support: MANDATORY Reference • reference: MEF 26.2 section 15.1.9	This attribute provides the list of MEG levels. The direction of the MEPs at a VUNI is always Down.

_egressBwpPerVuni	BwpFlow		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 15.1.7	This represents the relationship between the VUNI and the egress BwpFlow.
_ingressBwpPerVuni	BwpFlow		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 15.1.6	This represents the relationship between the VUNI and the ingress BwpFlow.
_ovcEndPointList	OvcEndPoint		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 15.1.4.	This represents the relationship between the VUNI and a list of OVC End Points.
_enniService	EnniService		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 15.	This represents the relationship between the VUNI and a set of ENNI Service attributes.

Table 14 - Attributes of VUNI Class

7.11 Class of Service Identifier

The following diagram illustrates the object class of CosIdentifier, along with the conditional packages SepCosIdPac, PcpCosIdPac and DscpCosIdPac, their attributes and associations with the other object classes.

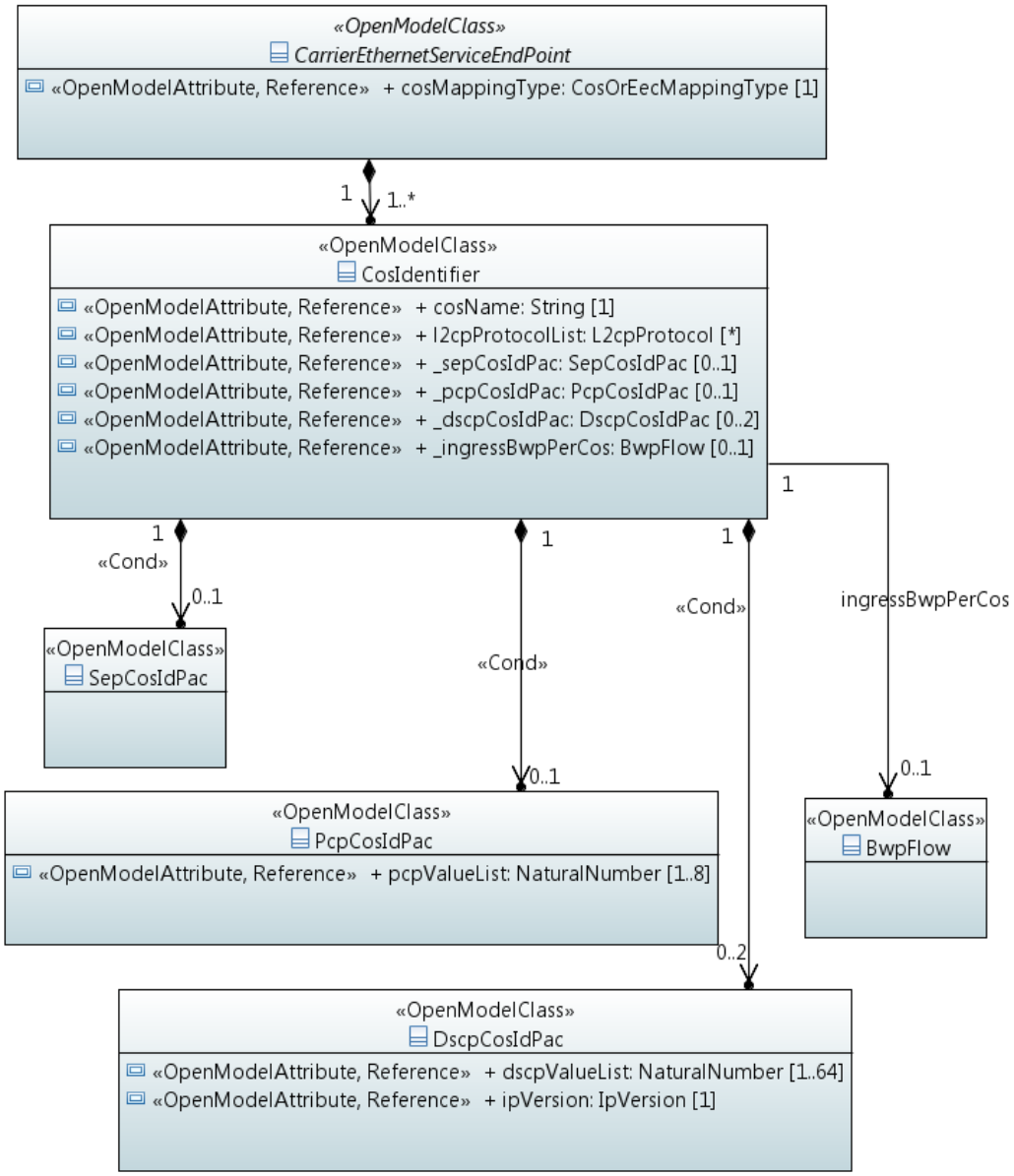

Figure 12 - CosIdentifier Class Diagram

The CosIdentifier object class represents the Class of Service Identifier. Each ingress EI Frame mapped to the given EVC/OVC End Point has a single Class of Service. The Class of Service can be determined from inspection of the content of the ingress EI Frame. It is associated with the SepCosIdPac, or the PcpCosIdPac, or the DscpCosIdPac (when the Class of Service

Identifier mapping type is Service End Point, or PCP values, or DSCP values respectively). EI Frames of L2CP protocols may be identified by a Class of Service Identifier, mapping to specific CoS Name.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
cosName	String		1	RW	OpenModelAttribute • isInvariant: false • valueRange: Must be listed in the cosNameList of the CarrierEthernetService. • support: MANDATORY Reference • reference: MEF 10.3 section 10.2 and MEF 26.2 section 16.6	This attribute denotes the Class of Service name that the CosIdentifier map to.
l2cpProtocolList	L2cpProtocol		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 45 section 6.2 and table 7	This attribute lists the L2CP Protocols that map to the Class of Service Name.
_sepCosIdPac	SepCosIdPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.2.1.1 and MEF 26.2 section 16.6	This attribute represents the relationship between the CosIdentifier and the SepCosIdPac when the cosMappingType of EvcEndPoint or OvcEndPoint is END_POINT and the cosName is not only for L2CP.
_pcpCosIdPac	PcpCosIdPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.2.1.2 and MEF 26.2 section 16.6	This attribute represents the relationship between the CosIdentifier and the PcpCosIdPac when the cosMappingType of EvcEndPoint or OvcEndPoint is PCP and the cosName is not only for L2CP.
_dscpCosIdPac	DscpCosIdPac		0..2	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.2.1.3 and MEF 26.2 section 16.6	This attribute represents the relationship between the CosIdentifier and the DespCosIdPac when the cosMappingType of EvcEndPoint or OvcEndPoint is DSCP and the cosName is not only for L2CP.
_ingressBwpPerCos	BwpFlow		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.6 and MEF 26.2 section 16.12.	This attribute represents the relationship between the CosIdentifier and the BwpFlow, for ingress bandwidth profile per CoS Name.

Table 15 - Attributes of CosIdentifier Class

7.11.1 Class of Service Identifier – EVC/OVC End Point

The SepCosIdPac represents the CoS Identifier that maps the EVC End Point or the OVC End Point to a Class of Service Name.

Applied stereotypes:

- OpenModelClass
- support: MANDATORY

The SepCosIdPac doesn't have any attributes. This model defines it as an object class just for clarity. When the cosMappingType of EvcEndPoint/OvcEndPoint is "END_POINT", all ingress Data EI Frames are mapped to a single Class of Service Name.

7.11.2 Class of Service Identifier - PCP Value List

The PcpCosIdPac object class represents CoS Identifier that maps a list of PCP values to a Class of Service Name. For an EVC End Point or an OVC End Point at UNI or in a VUNI, the PCP values are from C-Tag ingress EI frames. For an OVC End Point at an ENNI and not in a VUNI, the PCP values are from S-Tag of the ingress EI frames.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
pcpValueList	NaturalNumber		1..8	RW	OpenModelAttribute • isInvariant: false • valueRange: [0..7] • support: MANDATORY Reference • reference: MEF 10.3 section 10.2.1.2 and MEF 26.2 section 16.6	This attribute is a list of PCP values that map to the CoS Name.

Table 16 - Attributes of PcpCosIdPac Class

7.11.3 Class of Service Identifier - DSCP Value List

The DscpCosIdPac object class represents CoS Identifier that maps the IP DSCP values to the Class of Service Name(s). It can map a list of DSCP values to two different Class of Service Names, one for ingress EI Frames carrying an IPv4 packet and a different one for ingress EI Frames carrying an IPv6 packet. It also can map a list of DSCP values (both IPv4 and IPv6) to one Class of Service Name.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
dscpValueList	NaturalNumber		1..64	RW	OpenModelAttribute • isInvariant: false • valueRange: [0..63] • support: MANDATORY Reference • reference: MEF 10.3 section 10.2.1.3 and MEF 26.2 section 16.6	This attribute is a list of DSCP values that maps to a CoS Name.
ipVersion	IpVersion		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.2.1.3 and MEF 26.2 section 16.6	This attribute denotes the IP version for the DSCP. It can be IPV4, IPV6 or IPV4_AND_IPV6.

Table 17 - Attributes of DscpCosIdPac Class

7.12 Egress Equivalence Class Identifier

The following diagram illustrates the object class of EecIdentifier, along with the conditional packages SepEecIdPac, PcpEecIdPac and DscpEecIdPac, their attributes and associations with the other object classes.

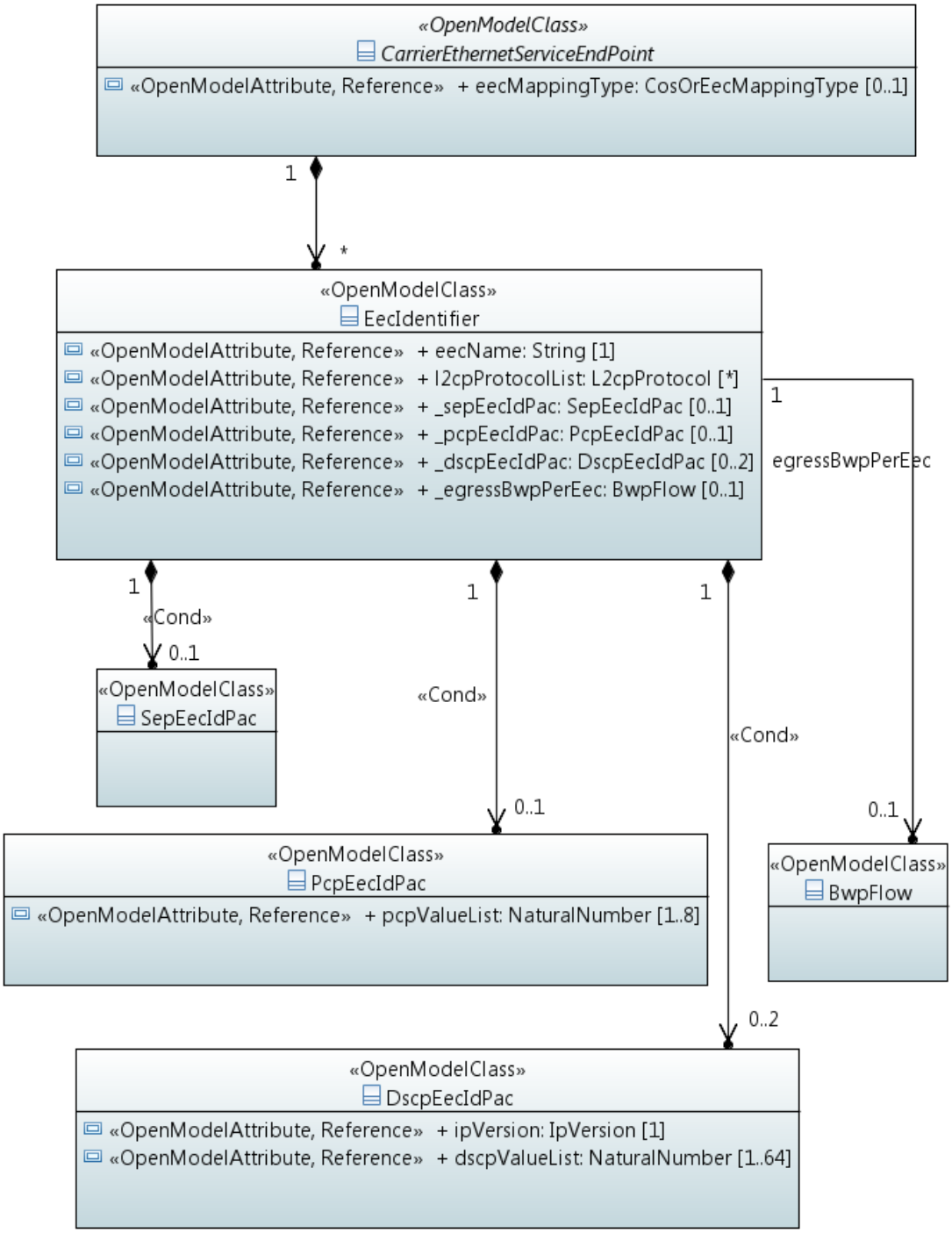

Figure 13 - EecIdentifier Class Diagram

The EecIdentifier object class represents the Egress Equivalence Class Identifier. Each egress EI Frame mapped to the given EVC/OVC End Point has a single Egress Equivalence Class. The Egress Equivalence Class can be determined from inspection of the content of the egress EI Frame. It is associated with the SepCosIdPac, or the PcpCosIdPac, or the DscpCosIdPac (representing mapping to EVC/OVC End Point, or PCP, or DSCP respectively). EI Frames of L2CP protocols may be identified by an Egress Equivalence Class Identifier, mapping to specific Egress Equivalence Class Name.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
eecName	String		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.4 and MEF 26.2 section 16.9	This attribute denotes the Egress Equivalence Class Name that the EecIdentifier maps to.
l2cpProtocolList	L2cpProtocol		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 45 section 6.2 and table 7	This attribute lists the L2CP Protocols that map to the Egress Equivalence Class Name.
_sepEecIdPac	SepEecIdPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.9	This attribute represents the relationship between the EecIdentifier and a SepEecIdPac when the eecMappingType of EvcEndPoint or OvcEndPoint is END_POINT and the eecName is not only for L2CP. This not addressed in MEF 10.3 but can be future consideration.
_pcpEecIdPac	PcpEecIdPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.2.1.3 and MEF 26.2 section 16.9	This attribute represents the relationship between the EecIdentifier and a PcpEecIdPac when the eecMappingType of EvcEndPoint or OvcEndPoint is PCP and the eecName is not only for L2CP.
_dscpEecIdPac	DscpEecIdPac		0..2	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.2.1.4 and MEF 26.2 section 16.9	This attribute represents the relationship between the EecIdentifier and a DscpEecIdPac when the eecMappingType of EvcEndPoint or OvcEndPoint is DSCP and the eecName is not only for L2CP.

_egressBwpPerEec	BwpFlow		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.8 and MEF 26.2 section 16.13.	This attribute represents the relationship between the EecIdentifier and the BwpFlow, for egress bandwidth profile per EEC Name.

Table 18 - Attributes of EecIdentifier Class

7.12.1 Egress Equivalence Class Identifier - EVC/OVC End Point

The SepEecIdPac represents the Egress Equivalence Class Identifier that maps the EVC End Point or the OVC End Point to an Egress Equivalence Class Name.

Applied stereotypes:

- OpenModelClass
- support: MANDATORY

The SepEecIdPac doesn't have any attributes. This model defines it as an object class just for clarity.

7.12.2 Egress Equivalence Class Identifier - PCP Value List

The PcpEecIdPac object class represents Egress Equivalence Class Identifier that maps a list of PCP values to Egress Equivalence Class Name. For an EVC End Point or an OVC End Point at UNI or in a VUNI, the PCP values are from C-Tag egress EI frames. For an OVC End Point at an ENNI and not in a VUNI, the PCP values are from S-Tag of the egress EI frames

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
pcpValueList	NaturalNumber		1..8	RW	OpenModelAttribute • isInvariant: false • valueRange: [0..7] • support: MANDATORY Reference • reference: MEF 10.3 section 10.2.1.3 and MEF 26.2 section 16.9	This attribute provides a list of PCP values that map to the Egress Equivalence Class Name.

Table 19 - Attributes of PcpEecIdPac Class

7.12.3 Egress Equivalence Class Identifier - DSCP Value List

The DscpEecIdPac object class represents Egress Equivalence Class Identifier that maps the IP DSCP values to the Egress Equivalence Class Name(s). It can map a list of DSCP values to two different Egress Equivalence Class Names, one for ingress EI Frames carrying an IPv4 packet

and a different one for ingress EI Frames carrying an IPv6 packet. It also can map a list of DSCP values (both IPv4 and IPv6 packets) to an Egress Equivalence Class Name.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
ipVersion	IpVersion		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.2.1.4 and MEF 26.2 section 16.9	This attribute specifies the IP version for the DSCP. It can be IPV4, IPV6 or IPV4_AND_IPV6.
dscpValueList	NaturalNumber		1..64	RW	OpenModelAttribute • isInvariant: false • valueRange: [0..63] • support: MANDATORY Reference • reference: MEF 10.3 section 10.2.1.4 and MEF 26.2 section 16.9	This attribute is a list of DSCP values that maps to the EEC Name.

Table 20 - Attributes of DscpEecIdPac Class

7.13 Color Identifier

The following diagram illustrates the object class of ColorIdentifier, along with the conditional packages SepColorIdPac, PcpColorIdPac, DeiColorIdPac, and DscpColorIdPac, with their attributes, and associations with the other object classes.

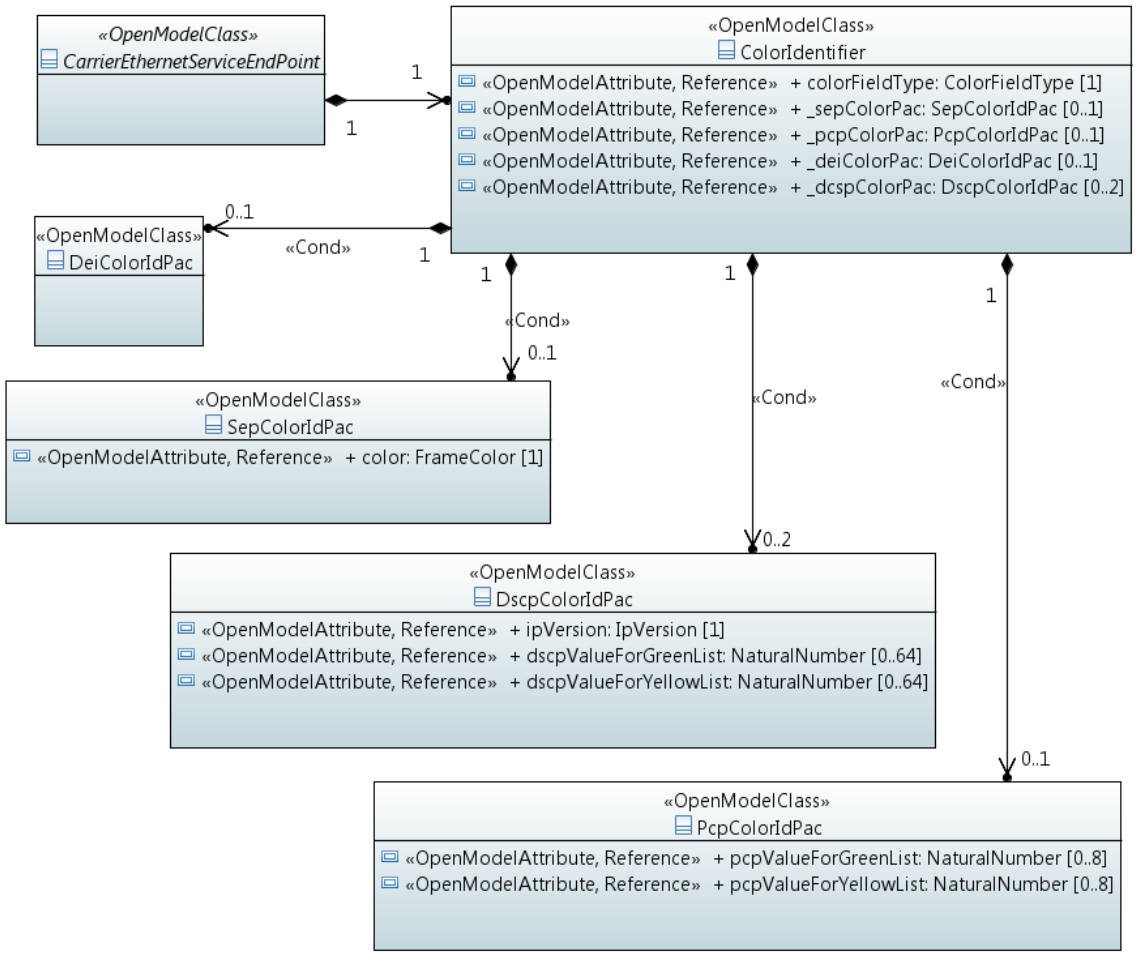

Figure 14 - ColorIdentifier Class Diagram

The ColorIdentifier object class represents the Color Identifier. The Color Identifier is a pair of the form <F, M> where F is a field in the ingress EI Frame and M is a mapping between each possible value of the field F and a Color. The ColorIdentifier object class is associated with CarrierEthernetServiceEndPoint (EvcEndPoint or OvcEndPoint), in addition to the different field F, such as SepColorIdPac, PcpColorIdPac, DeiColorIdPac, and DscpColorIdPac, etc.

Applied stereotypes:

- OpenModelClass

- support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
colorFieldType	ColorFieldType		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.3 and MEF 26.2 section 16.7	This attribute determines which conditional package (among EVC/OVC End Point, PCP, DEI or DSCP) to be used as the Color Identifier.
_sepColorPac	SepColorIdPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.3.1 and MEF 26.2 section 16.7.3	This attribute represents the relationship between the ColorIdentifier and the SepColorIdPac (representing the choice that maps EVC End Point or OVC End Point to Color).
_deiColorPac	DeiColorIdPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.3.2 and MEF 26.2 section 16.7.1&16.7.4	This attribute represents the relationship between the ColorIdentifier and the DeiColorIdPac (representing the choice that maps Vlan tag DEI to Color).
_pcpColorPac	PcpColorIdPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.3.3 and MEF 26.2 section 16.7.2&16.7.5	This attribute represents the relationship between the ColorIdentifier and the PcpColorIdPac (representing the choice that maps Vlan tag PCPs to Color).
_dcspColorPac	DscpColorIdPac		0..2	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.3.4 and MEF 26.2 section 16.7.6	This attribute represents the relationship between the ColorIdentifier and the DscpColorIdPac (representing the choice that maps DSCP values to Color).

Table 21 - Attributes of ColorIdentifier Class

7.13.1 Color Identifier - Mapping EVC/OVC End Point to Color

The SepColorIdPac represents the Color Identifier that maps to the EVC End Point or the OVC End Point to Color.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description

color	FrameColor		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.3.1 and MEF 26.2 section 16.7.3.	This attribute denotes the color of the EI frame, green or yellow.

Table 22 - Attributes of SepColorIdPac Class

7.13.2 Color Identifier - Mapping PCP to Color

The PcpColorIdPac object class represents the Color Identifier that maps vlan tag (S tag or C tag) PCP values to Color. For an EVC End Point or an OVC End Point at UNI or in a VUNI, the PCP values are from C-Tag ingress EI frames. For an OVC End Point at an ENNI and not in a VUNI, the PCP values are from S-Tag of the ingress EI frames.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
pcpValueForGreenList	NaturalNumber		0..8	RW	OpenModelAttribute • isInvariant: false • valueRange: [0..7] • support: MANDATORY Reference • reference: MEF 10.3 section 10.3.3 and MEF 26.2 section 16.7.2&16.7.5	This attribute provides a list PCP values map to the green ingress EI frames. The pcpValueForGreenList and the pcpValueForYellowList must disjoint and the union of the two lists must include all possible PCP values.
pcpValueForYellowList	NaturalNumber		0..8	RW	OpenModelAttribute • isInvariant: false • valueRange: [0..7] • support: MANDATORY Reference • reference: MEF 10.3 section 10.3.3 and MEF 26.2 section 16.7.2&16.7.5	This attribute provides a list PCP values map to the yellow ingress EI frames. The pcpValueForGreenList and the pcpValueForYellowList must disjoint and the union of the two lists must include all possible PCP values.

Table 23 - Attributes of PcpColorIdPac Class

7.13.3 Color Identifier – Mapping DEI to Color

The DeiColorIdPac object class represents the Color Identifier that maps the vlan tag (S tag or C tag) DEI value to Color, DEI=0 for green color and DEI=1 for yellow color. For an EVC End Point or an OVC End Point at UNI or in a VUNI, the DEI value is from C-Tag ingress EI frames. For an OVC End Point at an ENNI and not in a VUNI, the DEI value is from S-Tag of the ingress EI frames.

Applied stereotypes:

- OpenModelClass

- support: MANDATORY

The DeiColorIdPac doesn't have any attributes. This model defines it as an object class just for clarity.

7.13.4 Color Identifier - Mapping DSCP to Color

The DscpColorIdPac object class represents the Color Identifier that maps DSCP (IPv4 or IPv6) values to Color.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
ipVersion	IpVersion		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 10.3.4 and MEF 26.2 section 16.7.6	This attribute denotes which IP version is used. It can be IPV4, IPV6 or IPV4_AND_IPV6.
dscpValueForGreenList	NaturalNumber		0..64	RW	OpenModelAttribute • isInvariant: false • valueRange: [0..63] • support: MANDATORY Reference • reference: MEF 10.3 section 10.3.4 and MEF 26.2 section 16.7.6	This attribute provides a list DSCP values map to the green ingress EI frames. The dscpValueForGreenList and the dscpValueForYellowList must disjoint and the union of the two lists must include all possible DSCP values.
dscpValueForYellowList	NaturalNumber		0..64	RW	OpenModelAttribute • isInvariant: false • valueRange: [0..63] • support: MANDATORY Reference • reference: MEF 10.3 section 10.3.4 and MEF 26.2 section 16.7.6	This attribute provides a list DSCP values map to the yellow ingress EI frames. The dscpValueForGreenList and the dscpValueForYellowList must disjoint and the union of the two lists must include all possible DSCP values.

Table 24 - Attributes of DscpColorIdPac Class

7.14 OVC End Point Map

The following diagram illustrates the object class of OvcEndPointMap, along with the conditional packages OvcEndPointMapFormEPac, OvcEndPointMapFormUPac, OvcEndPointMapFormVPac, OvcEndPointMapFormTPac, with their attributes and associations with the other object classes.

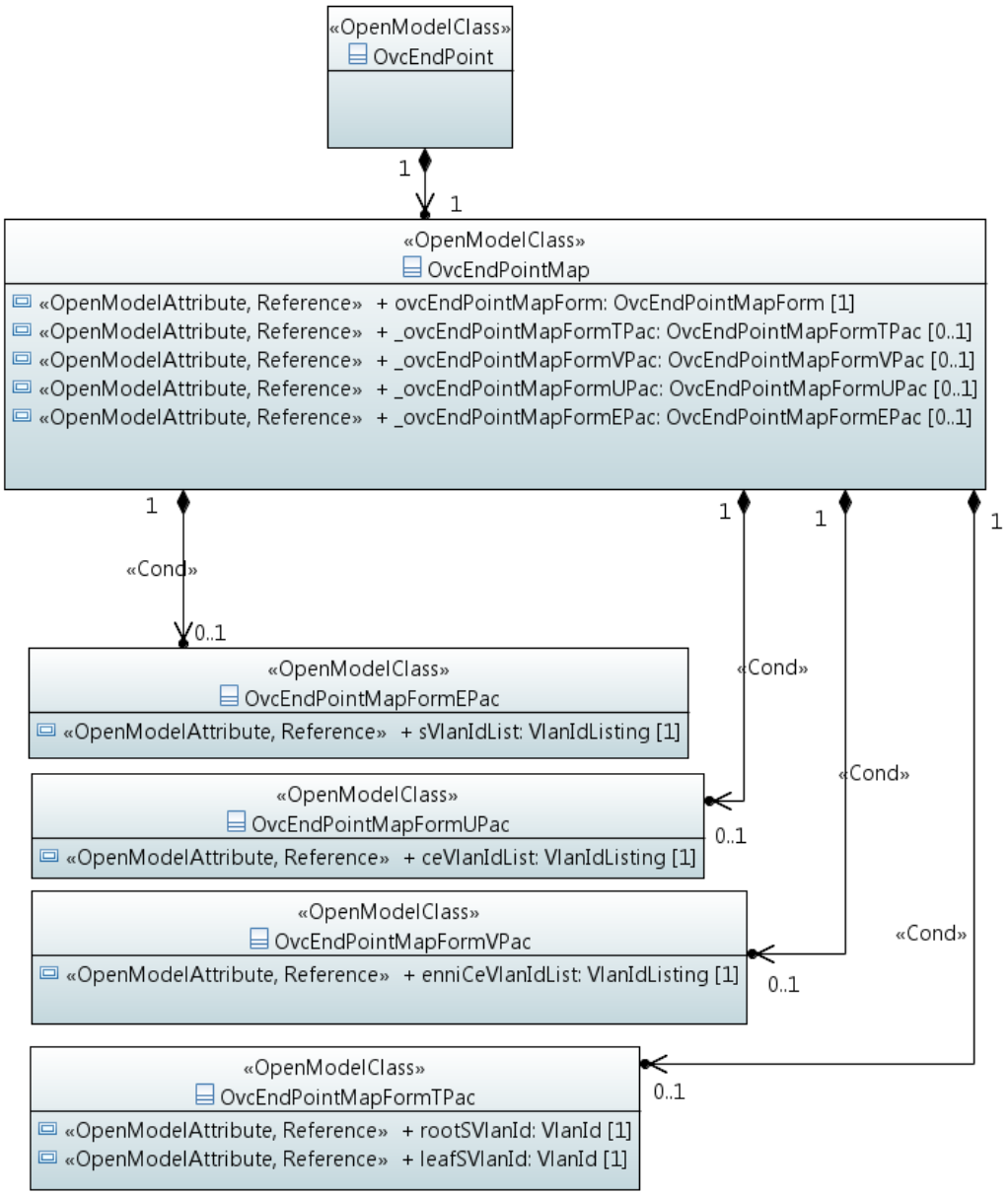

Figure 15 - OvcEndPointMap Class Diagram

The OvcEndPointMap object class represents the OVC End Point Map that specifies which EI Frames are mapped to the OVC End Point within an Operator CEN. The value of the OVC End

Point Map is used by a receiving Operator CEN to determine which OVC is to be used to handle the incoming EI Frame by identifying the OVC End Point. The value of the OVC End Point Map is used by a sending Operator to populate S-VLAN ID and/or C-VLAN ID fields for an egress EI frame that is mapped to the OVC End Point. The OvcEndPointMap object class is associated with the OvcEndPoint, in addition to the object classes that representing different forms of the OVC End Point Map, such as OvcEndPointMapFormEPac, OvcEndPointMapFormUPac, OvcEndPointMapFormVPac, OvcEndPointMapFormTPac, etc.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
ovcEndPointMapForm	OvcEndPointMapForm		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.5	This attribute determines which Form (among ENNI, Trunk, VUNI, and UNI) to apply to the OVC End Point Map.
_ovcEndPointMapFormTPac	OvcEndPointMapFormTPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.5.2	When the ovcEndPointMapForm value = FORM_T, apply the OVC End Point Map Form T (T for Trunk)
_ovcEndPointMapFormVPac	OvcEndPointMapFormVPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.5.3	When the ovcEndPointMapForm value = FORM_V, apply the OVC End Point Map Form V (V for VUNI).
_ovcEndPointMapFormUPac	OvcEndPointMapFormUPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.5.4	When the ovcEndPointMapForm value = FORM_U, apply the OVC End Point Map Form U (U for UNI) .
_ovcEndPointMapFormEPac	OvcEndPointMapFormEPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.5.1.	When the ovcEndPointMapForm value = FORM_E, apply the OVC End Point Map Form E (E for ENNI)

Table 25 - Attributes of OvcEndPointMap Class

7.14.1 OVC End Point Map Form E

The OvcEndPointMapFormEPac object class represents the OVC End Point Map Form E (E for ENNI) that consists of a list of one or more S-VLAN ID values. An S-Tagged ENNI Frame whose S-VLAN ID value matches an entry in the list maps to the OVC End Point.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
sVlanIdList	VlanIdListing		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.5.1	This attribute provides a list of S-VLAN IDs (including LIST, ALL, EXCEPT) for OVC End Point Map Form E.

Table 26 - Attributes of OvcEndPointMapFormEPac Class

7.14.2 OVC End Point Map Form T

The OvcEndPointMapFormTPac object class represents the OVC End Point Map Form T (T for Trunk) that consists of a pair of S-VLAN ID values, <r,l>. r is called the Root S-VLAN ID value and l is called the Leaf S-VLAN ID value. An S-Tagged ENNI Frame whose S-VLAN ID value matches one of the two S-VLAN ID values in the OVC End Point Map Form T maps to the OVC End Point.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
rootSVlanId	VlanId		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.5.2	This attribute denotes the root S-VLAN ID for OVC End Point Form T.
leafSVlanId	VlanId		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.5.2	This attribute denotes the leaf S-VLAN ID for OVC End Point Form T.

Table 27 - Attributes of OvcEndPointMapFormTPac Class

7.14.3 OVC End Point Map Form V

The OvcEndPointMapFormVPac object class represents the OVC End Point Map Form V (V for VUNI) that lists one or more ENNI CE-VLAN ID values. An S-Tagged ENNI Frame whose S-VLAN ID value matches the S-VLAN ID value specified in VUNI and whose ENNI CE-VLAN ID value matches one of the ENNI CE-VLAN ID values in the map, maps to the OVC End Point.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
enniCeVlanIdList	VlanIdListing		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.5.3	This attribute provides a list of CE-CLAN IDs at ENNI (including LIST, ALL, EXCEPT) for an OVC End Point Map Form V.

Table 28 - Attributes of OvcEndPointMapFormVPac Class

7.14.4 OVC End Point Map Form U

The OvcEndPointMapFormUPac object class represents the OVC End Point Map Form U (U for UNI). It is a list of one or more CE-VLAN ID values. A Service Frame is mapped to the OVC End Point if the CE-VLAN ID value of the Service Frame is in the list.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
ceVlanIdList	VlanIdListing		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.5.4	This attribute provides a list of CE-CVLAN IDs (including LIST, ALL, EXCEPT) for an OVC End Point Map form U.

Table 29 - Attributes of OvcEndPointMapFormUPac Class

7.15 Egress Map

The following diagram illustrates the object class of EgressMap (representing Egress Map), along with conditional packages CosNameToPcpPac, CosNameAndColorToDeiPac, CosNameAndColorToPcpPac, with their attributes, and associations with the other object classes.

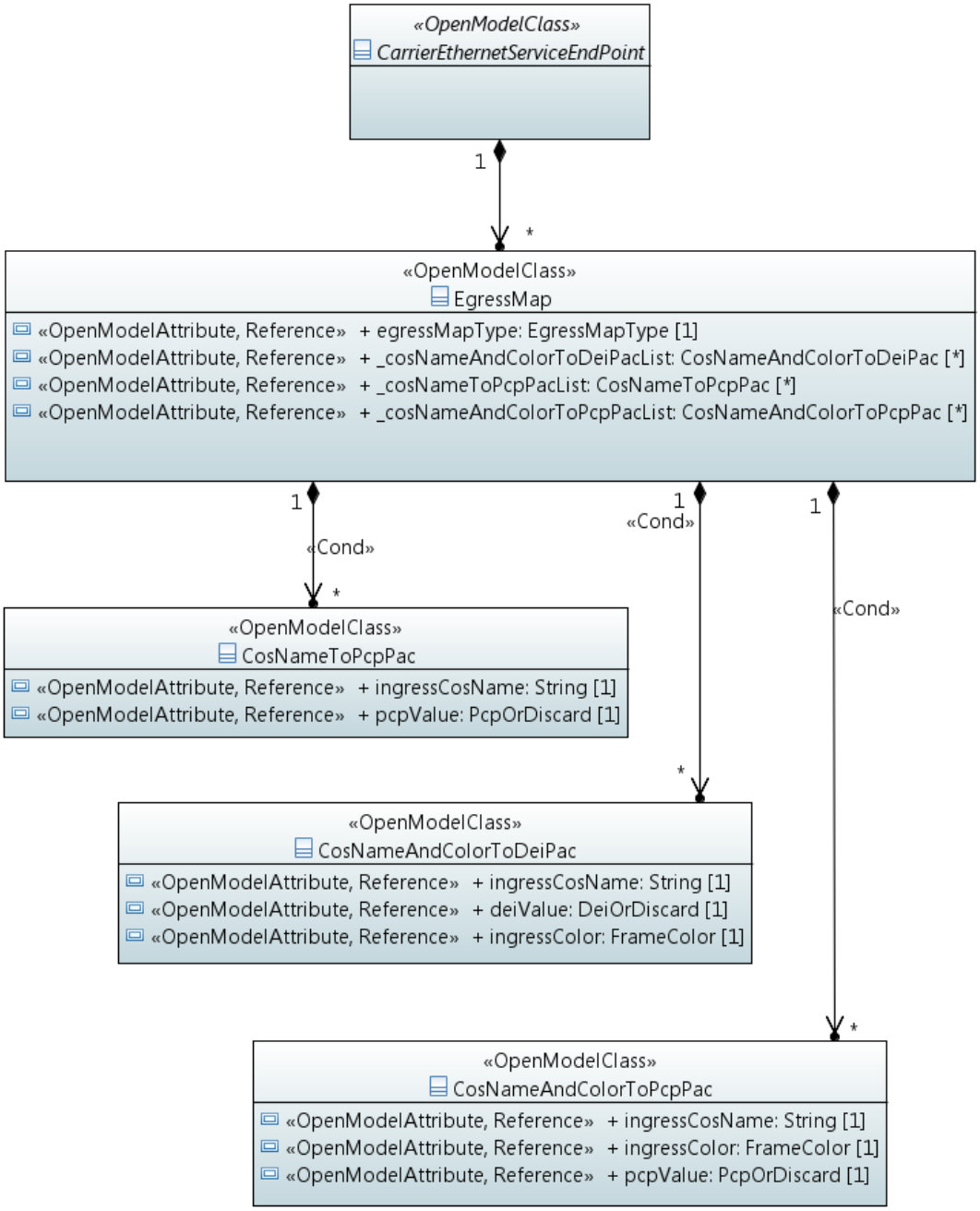

Figure 16 - EgressMap Class Diagram

The EgressMap object class represents the Egress Map that is a set of mappings that determine the content of the S-Tag or C-Tag of an egress EI Frame. It is associated with EvcEndPoint or OvcEndPoint.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
egressMapType	EgressMapType		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.8	This attribute determines which form to take to apply for egress frame color indication, among CoS name and Ingress Color to C-Tag PCP, or CoS name and Ingress Color to S-Tag PCP, or CoS Name and Ingress Color to C-Tag DEI, or CoS Name and Ingress Color to S-Tag DEI, or CoS Name to C-Tag PCP, or CoS Name to S-Tag PCP.
_cosNameAndColorToDeiPacList	CosNameAndColorToDeiPac		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 sections 16.8.2 & 16.8.5	This attribute represents the relationship between the EgressMap and the CosNameAndColorToDeiPac (representing the attribute set for using CoS Name and ingress color to egress DEI mapping).
_cosNameToPcpPacList	CosNameToPcpPac		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 sections 16.8.1 & 16.8.4	This attribute represents the relationship between the EgressMap and the CosNameToPcpPac (representing the attribute set for using CoS Name to egress PCP mapping).
_cosNameAndColorToPcpPacList	CosNameAndColorToPcpPac		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 sections 16.8.3 & 16.8.6	This attribute represents the relationship between the EgressMap and the CosNameAndColorToPcpPac (representing the attribute set for using CoS Name and ingress color to egress PCP mapping).

Table 30 - Attributes of EgressMap Class

7.15.1 Class of Service Name to PCP Egress Map

The CosNameToPcpPac object class represents the Egress Map that maps from CoS Name to PCP.

Applied stereotypes:

- OpenModelClass

- support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
ingressCosName	String		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.8.4	This attribute denotes the ingress CoS name.
pcpValue	PcpOrDiscard		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.8.4	This attribute denotes the egress frame PCP value, mapped from ingress CoS Name and ingress frame color.

Table 31 - Attributes of CosNameToPcpPac Class

7.15.2 Class of Service Name and Ingress Color to DEI Egress Map

The CosNameAndColorToDeiPac object class represents the Egress Map that maps from CoS Name and Ingress Color to DEI.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
ingressCosName	String		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.8.5	This attribute denotes the ingress CoS name.
ingressColor	FrameColor		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 sections 16.8.2 & 16.8.5	This attribute denotes the ingress frame color as one of the determined factor for Egress Map.
deiValue	DeiOrDiscard		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.8.5	This attribute denotes the egress frame DEI value, mapped from ingress CoS Name and ingress frame color.

Table 32 - Attributes of CosNameAndColorToDeiPac Class

7.15.3 Class of Service Name and Ingress Color to PCP Egress Map

The CosNameAndColorToPcpPac object class represents the Egress Map that maps from CoS Name and Ingress Color to PCP.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
ingressCosName	String		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.8.6	This attribute denotes the ingress CoS name.
ingressColor	FrameColor		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.8.6	This attribute denotes the ingress frame color as one of the determined factor for Egress Map.
pcpValue	PcpOrDiscard		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 16.8.6	This attribute denotes the egress frame PCP value, mapped from ingress CoS name and ingress frame color.

Table 33 - Attributes of CosNameAndColorToPcpPac Class

7.16 Bandwidth Profile

The following diagram illustrates the object classes representing Bandwidth Profile, including Envelope, BwpFlow (representing Bandwidth Profile Flow), with their attributes and associations with the other object classes.

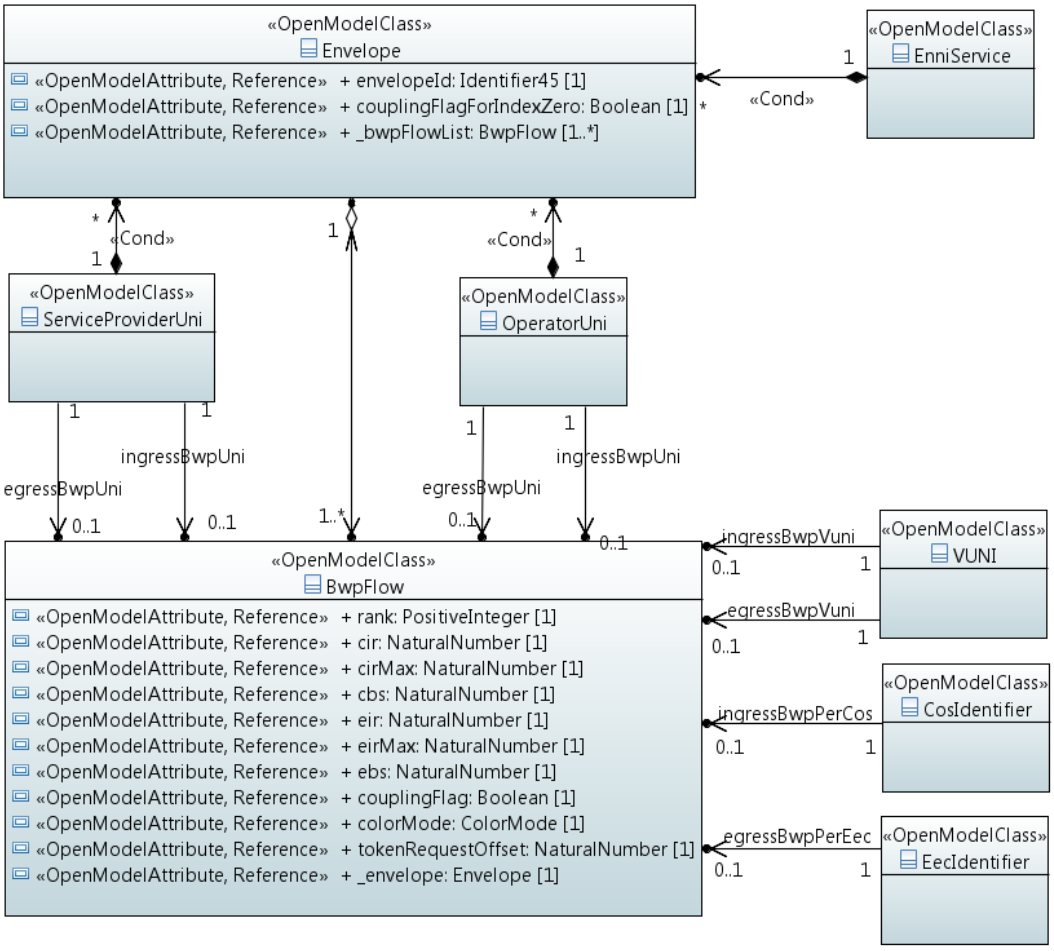

Figure 17 - Bandwidth Profile Class Diagram

7.16.1 Envelope

The Envelope object class represents the UNI/ENNI service attribute Envelope, which is a bandwidth profile parameter that consists of an envelope ID and an envelope coupling flag (0) that controls conversion of unused green tokens into yellow tokens in the bandwidth profile algorithm. The Envelope object class is associated with UNI (via OperatorUni or ServiceProviderUni), ENNI (via EnniService), and BwpFlow(s), etc.

Applied stereotypes:

- OpenModelClass

- support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
envelopeId	Identifier45		1	RW	OpenModelAttribute • isInvariant: true • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 12 and MEF 26.2 section 17.1.1	This attribute is a string that identifies the Envelope.
couplingFlagForIndexZero	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 12 and MEF 26.2 section 17.1.1	This attribute denotes the coupling flag for index zero. FALSE for NO and TRUE for YES (overflow Green tokens can be used as Yellow tokens)
_bwpFlowList	BwpFlow		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 6.2 section 8.2.1 and MEF 26.2 section 17.1.2.	

Table 34 - Attributes of Envelope Class

7.16.2 Bandwidth Profile Flow

The BwpFlow object class represents the Bandwidth Profile Flow which includes the bandwidth profile parameters such as CIR, CIR Max, EIR, EIR Max, CBS, EBS, Coupling Flag, Color Mode, etc. The BwpFlow object class is associated with OperatorUni, ServiceProviderUni, VUNI, CosIdentifier, EecIdentifier, and Envelope, etc.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
rank	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: <= number of flows in the Envelope. • support: MANDATORY Reference • reference: MEF 10.3 section 12.1 and MEF 26.2 section 17.1.2	This attribute denotes the rank of the bandwidth profile flow in the envelope.

cir	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: <= External Interface rate • unit: bits per second • support: MANDATORY Reference • reference: MEF 10.3 section 12.1 and MEF 26.2 section 17.1.2	This attribute denotes the Committed Information Rate that limits the average rate of frames that will be declared Green. In bits per second.
cirMax	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: <= External Interface rate • unit: bits per second • support: MANDATORY Reference • reference: MEF 10.3 section 12.1 and MEF 26.2 section 17.1.2	This attribute denotes the maximum Committed Information Rate that limits the rate of tokens added to the committed token bucket. In bits per second.
cbs	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • unit: byte • support: MANDATORY Reference • reference: MEF 10.3 section 12.1 and MEF 26.2 section 17.1.2	This attribute denotes the Committed Burst Size that limits the maximum number of bytes available for a burst of frames that will be declared Green, in bytes,
eir	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: <= External Interface rate • unit: bits per second • support: MANDATORY Reference • reference: MEF 10.3 section 12.1 and MEF 26.2 section 17.1.2	This attribute denotes the Excess Information Rate that limits the average rate of frames that will be declared Yellow, in bits per second.
eirMax	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • unit: bits per second • support: MANDATORY Reference • reference: MEF 10.3 section 12.1 and MEF 26.2 section 17.1.2	This attribute denotes the Maximum Excess Information Rate that Limits the rate of tokens added to the excess token bucket, in bits per second.
ebs	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • unit: byte • support: MANDATORY Reference • reference: MEF 10.3 section 12.1 and MEF 26.2 section 17.1.2	This attribute denotes the Excessive Burst Size that limits the maximum number of bytes available for a burst of frames that will be declared Yellow, in bytes.
couplingFlag	Boolean		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 12.1 and MEF 26.2 section 17.1.2	This attribute denotes the Coupling Flag that Determines if overflow Green tokens can be used as Yellow tokens. FALSE for 0 (overflow green tokens are discarded) and TRUE for 1 (overflow green tokens can be used as yellow tokens)

colorMode	ColorMode		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 12.1 and MEF 26.2 section 17.1.2	This attribute denotes the Color Mode that Indicates whether the Color Identifier of the frame is considered by the Bandwidth Profile Algorithm.
tokenRequestOffset	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 17.1.2	This attribute adjusts the number of tokens requested for each external interface frame.
_envelope	Envelope		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 6.2 section 8.2.2 and MEF 26.2 section 14.16.	This attribute represents the relationship between the BwpFlow and the Envelope, indicating which Envelope the BwpFlow belongs.

Table 35 - Attributes of BwpFlow Class

7.17 Service Level Specification and Performance Monitoring

The following diagram illustrates the object class of CarrierEthernetSls (representing Carrier Ethernet Service Level Specification), and SlsCosNameEntry (representing PM CoS Name Entry), with their attributes and association, including associations with other object classes.

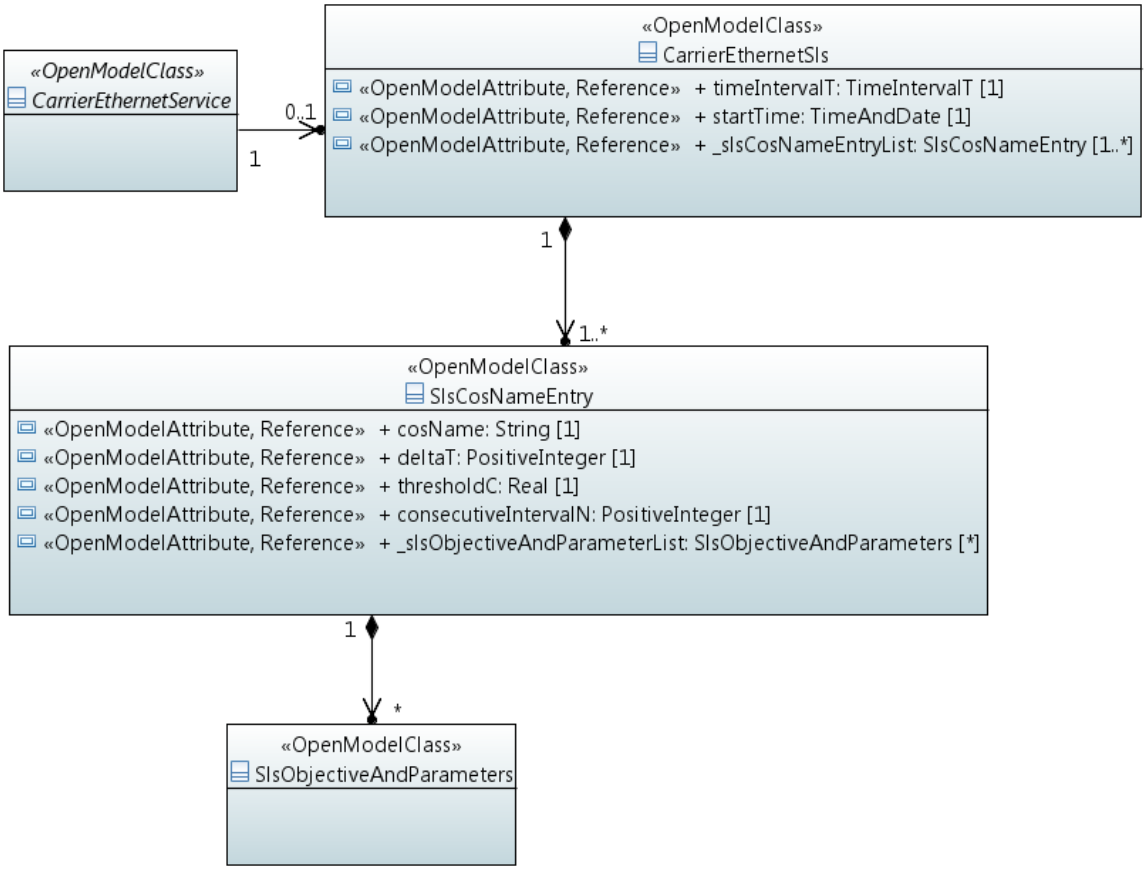

Figure 18 – Service Level Specification Class Diagram

7.17.1 Service Level Specification

The CarrierEthernetSls object class represents Carrier Ethernet Service Level Specification that provides a list of Performance Metrics where each item in the list includes the parameters and performance objective for the given Performance Metric. It is associated with EVC or OVC, and a list of SlsCosNameEntry(s).

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
timeIntervalT	TimeIntervalT		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8 and MEF 26.2 section 12.13.1.	This attribute sets the time interval to evaluate the performance for the SLS. All performances of this SLS use the same time interval T, which itself may not be constrained, e.g., 1 month.

startTime	TimeAndDate		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8 and MEF 26.2 section 12.13.1 (refer to interval time T)	This attribute represents the date and time for the start of the SLS. It is the beginning of the first Time Interval T.
_slsCosNameEntryList	SlsCosNameEntry		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8 and MEF 26.2 section 12.13.	This attribute represents the relationship between the CarrierEthernetSls and SlsCosNameEntry(s) representing CN (CoS Name) entries as lists of 4-tuples of the form <CoS Name, Δt, C, n> as defined in MEF 26.2 (MEF 10.3 covered the descriptions but not as this format).

Table 36 - Attributes of CarrierEthernetSls Class

7.17.2 SLS Class of Service Name Entry

The SlsCosNameEntry object class represents the CoS Name entry consisting a list of 4-tuples of the form <CoS Name, Δt, C, n>, where CoS Name as Class of Service Name, Δt as a small time interval, C as a threshold, and n to identify consecutive Δt for high loss interval. The SlsCosNameEntry object class is associated with EVC or OVC, and SlsObjectiveAndParameters.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
cosName	String		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 26.2 section 12.13.1.1.	This attribute denotes the Class of Service Name.
deltaT	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • unit: second • support: MANDATORY Reference • reference: MEF 10.3 section 8.8 and MEF 26.2 section 12.13.1.2	This attribute denotes the Δt, a time interval in seconds, much smaller than T (SLS time period). E.g., 10 seconds.
thresholdC	Real	0.5	1	RW	OpenModelAttribute • isInvariant: false • valueRange: A real number in the range of [0,1] • support: MANDATORY Reference • reference: MEF 10.3 section 8.8 and MEF 26.2 section 12.13.	This attribute denotes the threshold for PM, used to determine whether a given time interval delta t has high loss.

consecutiveIntervalN	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8 and MEF 26.2 section 12.13.	This attribute denotes n, used to identify how many consecutive Δt intervals must have high loss to trigger a change in Availability.
_slsObjectiveAndParameterList	SlsObjectiveAndParameters		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 sections 8.8.1-8.8.6, MEF 10.3.1 and MEF 26.2 sections 12.13.2-12.13.10.	This attribute represents the relationship between SlsCosNameEntry and a list of SlsObjectiveAndParameters.

Table 37 - Attributes of SlsCosNameEntry Class

7.17.3 SLS Objective and Parameters

The following diagram illustrates the object class of SlsObjectiveAndParameters (representing SLS objective and parameters for a performance metric), and SlsReport (experimental object class, representing SLS Report), with their attributes and associations, including associations with other classes.

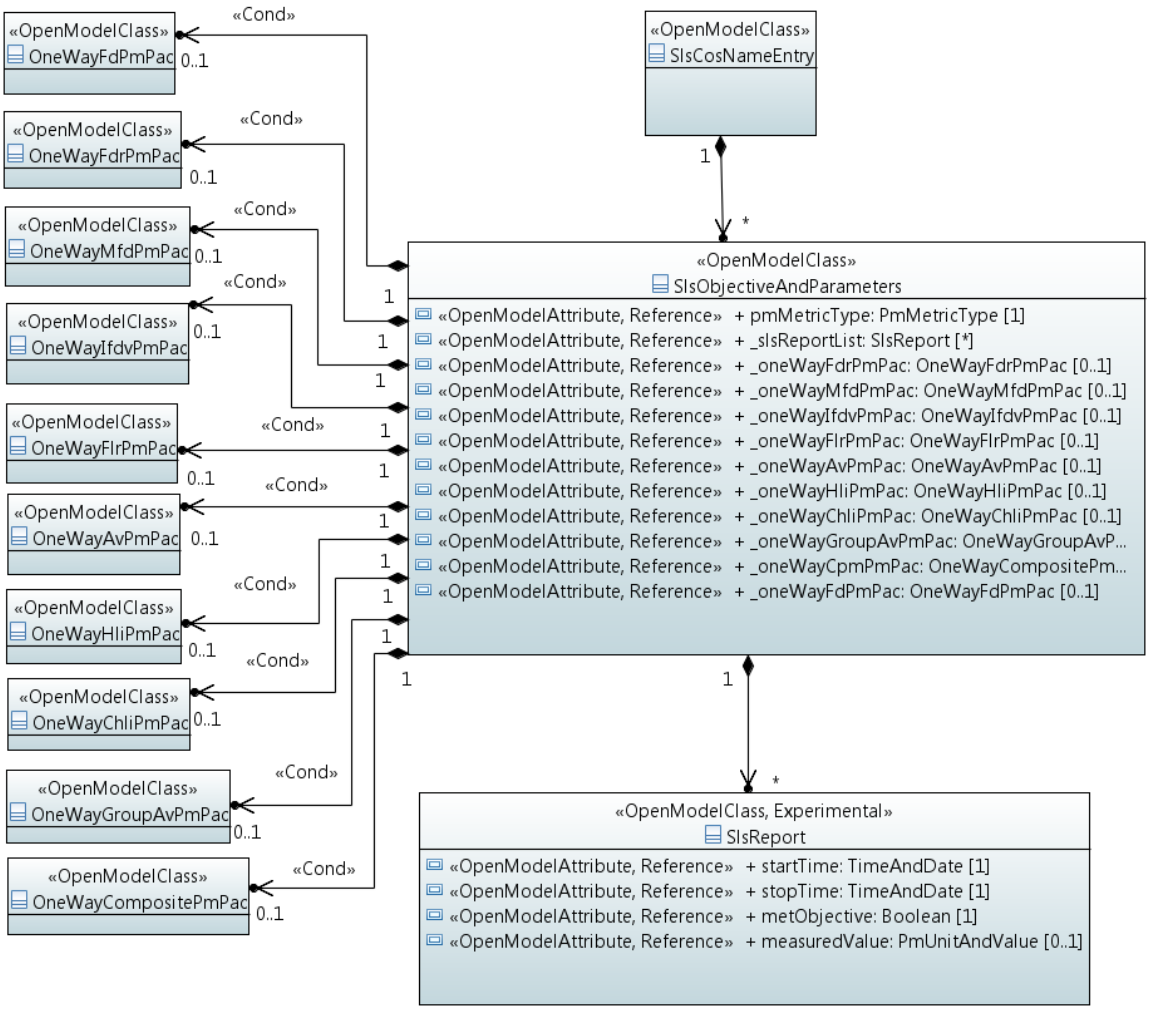

Figure 19 – SLS Objective And Parameters Class Diagram

The SlsObjectiveAndParameters object class leads to one of the Performance Metrics based on the pmMetricType (FD, FDR, MFD, IFDV, FLR, AV, HLI, CHLI, Group AV, or Composite). It is associated with SlsCosNameEntry, SlsReport(s), and conditional package classes OneWayFdPmPac, OneWayFdrPmPac, OneWayMfdPmPac, OneWayIfdvPmPac, OneWayFlrPmPac, OneWayAvPmPac, OneWayHliPmPac, OneWayChliPmPac, OneWayGroupAvPmPac, and OneWayCompositePmPac.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description

pmMetricType	PmMetricType		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 sections 8.8.1-8.8.6, MEF 10.3.1 and MEF 26.2 sections 12.13.2-12.13.10.	This attribute lists the type of PM Metric for selecting the PM Metric conditional package.
_slsReportList	SlsReport		0..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: OPTIONAL Reference • reference: MEF 35.1.	This attribute represents the relationship between the SlsObjectiveAndParameters and the SlsReport(s).
_oneWayFdrPmPac	OneWayFdrPmPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.1 and MEF 26.2 section 12.13.4.	This attribute represents the relationship between the SlsObjectiveAndParameters and the conditional package OneWayFdrPmPac (for One Way FDR Pm Metric).
_oneWayIfdvPmPac	OneWayIfdvPmPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.2 and MEF 26.2 section 12.13.5.	This attribute represents the relationship between the SlsObjectiveAndParameters and the conditional package OneWayIfdvPmPac (for One Way IFDV Pm Metric).
_oneWayFlrPmPac	OneWayFlrPmPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.3 and MEF 26.2 section 12.13.6.	This attribute represents the relationship between the SlsObjectiveAndParameters and the conditional package OneWayFlrPmPac (for One Way FLR Pm Metric).
_oneWayAvPmPac	OneWayAvPmPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.4 and MEF 26.2 section 12.13.7.	This attribute represents the relationship between the SlsObjectiveAndParameters and the conditional package OneWayAvPmPac (for One Way Availability Pm Metric).
_oneWayHliPmPac	OneWayHliPmPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.5 and MEF 26.2 section 12.13.8.	This attribute represents the relationship between the SlsObjectiveAndParameters and the conditional package OneWayHliPmPac (for One Way HLI Pm Metric).
_oneWayChliPmPac	OneWayChliPmPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.5 and MEF 26.2 section 12.13.9.	This attribute represents the relationship between the SlsObjectiveAndParameters and the conditional package OneWayChliPmPac (for One Way CHLI Pm Metric).

_oneWayGroupAvPmPac	OneWayGroupAvPmPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.6 and MEF 26.2 section 12.13.10.	This attribute represents the relationship between the SlsObjectiveAndParameters and the conditional package OneWayGroupAvPmPac (for One Way Group Availability Pm Metric).
_oneWayCpmPmPac	OneWayCompositePmPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: OPTIONAL Reference • reference: MEF 10.3.1.	This attribute represents the relationship between the SlsObjectiveAndParameters and the conditional package OneWayCompositePmPac (for One Way CPM Pm Metric).
_oneWayMfdPmPac	OneWayMfdPmPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.1 and MEF 26.2 section 12.13.3.	This attribute represents the relationship between the SlsObjectiveAndParameters and the conditional package OneWayMfdPmPac (for One Way MFD Pm Metric).
_oneWayFdPmPac	OneWayFdPmPac		0..1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.1 and MEF 26.2 section 12.13.2.	This attribute represents the relationship between the SlsObjectiveAndParameters and the conditional package OneWayFdPmPac (for One Way FD Pm Metric).

Table 38 - Attributes of SlsObjectiveAndParameters Class

7.17.4 SLS Report

The experimental SlsReport object class represents the collected and processed Performance result (or report) for a time period T. Some performance metrics may have percentage result and some may have value result.

Applied stereotypes:

- Experimental
- OpenModelClass
  - support: OPTIONAL

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
startTime	TimeAndDate		1	R	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 35.1 section 10.1.	this attribute denotes the start time of the time interval T.

stopTime	TimeAndDate		1	R	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 35.1 section 10.1.	this attributes denotes the stop time of the Time Interval T.
metObjective	Boolean		1	R	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference	This attribute denotes whether the PM Objective is met for this Time Interval T.
measuredValue	PmUnitAndValue		0..1	R	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: OPTIONAL Reference	This attribute is a pair of <Unit, Value> , e.g., the <Unit=PERCENT, value= 99.9> for 99.9%, or <Unit=MILLISECOND, Value=2> for 2 ms.

Table 39 - Attributes of SlsReport Class

7.17.5 Performance Metric Conditional Packages

The following diagram illustrates the conditional package PM Metrics classes OneWayFdPmPac, OneWayFdrPmPac, OneWayMfdPmPac, OneWayIfdvPmPac, OneWayFlrPmPac, OneWayAvPmPac, OneWayHliPmPac, OneWayChliPmPac, OneWayGroupAvPmPac, and OneWayCompositePmPac, with their attributes and associations with the other object classes.

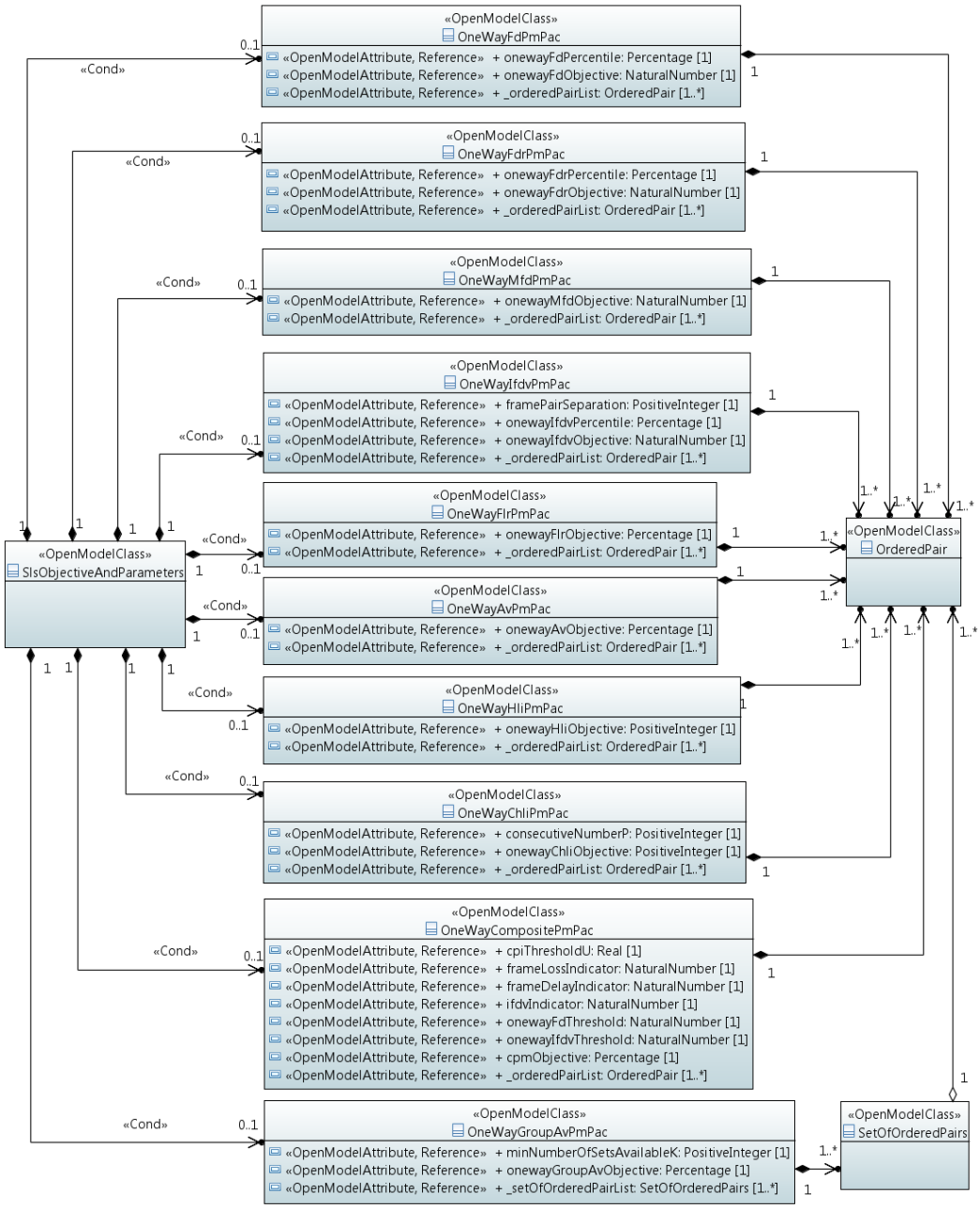

Figure 20 - Performance Metric Conditional Packages Class Diagram

7.17.5.1 One Way Frame Delay PM Conditional Package

The OneWayFdPmPac object class represents the One Way Frame Delay PM. It is associated with OrderedPair and SlsObjectiveAndParameters.

Applied stereotypes:

- OpenModelClass

- support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
onewayFdPercentile	Percentage		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.1 and MEF 26.2 section 12.13.2.	This attribute sets the one way frame delay percentile.
onewayFdObjective	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • unit: millisecond • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.1 and MEF 26.2 section 12.13.2.	This attribute sets the one way frame delay (in milliseconds) objective.
_orderedPairList	OrderedPair		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.1 and MEF 26.2 section 12.13.2.	This attributes associates this class with OrderedPair(s).

Table 40 - Attributes of OneWayFdPmPac Class

7.17.5.2 One Way Frame Delay Range PM Conditional Package

The OneWayFdrPmPac object class represents the One Way Frame Delay Variation PM (in milliseconds). It is associated with OrderedPair and SlsObjectiveAndParameters.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
onewayFdrPercentile	Percentage		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.1 and MEF 26.2 section 12.13.4.	This attribute sets the one way frame delay range percentile.
onewayFdrObjective	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • unit: millisecond • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.1 and MEF 26.2 section 12.13.4.	This attribute sets the one way frame delay range objective.

_orderedPairList	OrderedPair		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.1 and MEF 26.2 section 12.13.4.	This attributes associates this class with OrderedPair(s).

Table 41 - Attributes of OneWayFdrPmPac Class

7.17.5.3 One Way Mean Frame Delay PM Conditional Package

The OneWayMfdPmPac object class represents the One Way Mean Frame Delay PM (in milliseconds). It is associated with OrderedPair and SlsObjectiveAndParameters.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
onewayMfdObjective	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • unit: millisecond • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.1 and MEF 26.2 section 12.13.3.	This attribute sets the one way mean frame delay objective.
_orderedPairList	OrderedPair		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.1 and MEF 26.2 section 12.13.3.	This attributes associates this class with OrderedPair(s).

Table 42 - Attributes of OneWayMfdPmPac Class

7.17.5.4 One Way Inter Frame Delay Variation PM Conditional Package

The OneWayIfdvPmPac object class represents the One Way Frame Inter Frame Delay Variation PM (in milliseconds). It is associated with OrderedPair and SlsObjectiveAndParameters.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description

framePairSeparation	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • unit: millisecond • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.2 and MEF 26.2 section 12.13.5.	This attribute is the frame pair separation of the IFDV performance metric.
onewayIfdvPercentile	Percentage		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.2 and MEF 26.2 section 12.13.5.	This attribute sets the one way IFDV percentile
onewayIfdvObjective	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • unit: millisecond • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.2 and MEF 26.2 section 12.13.5.	This attribute sets the one way IFDV objective.
_orderedPairList	OrderedPair		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.2 and MEF 26.2 section 12.13.5.	This attributes associates this class with OrderedPair(s).

Table 43 - Attributes of OneWayIfdvPmPac Class

7.17.5.5 One Way Frame Loss Ratio PM Conditional Package

The OneWayFlrPmPac object class represents the One Way Frame Loss Ratio PM. It is associated with OrderedPair and SlsObjectiveAndParameters.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
onewayFlrObjective	Percentage		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.3 and MEF 26.2 section 12.13.6.	This attribute sets the one way frame loss ratio objective.
_orderedPairList	OrderedPair		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.1 and MEF 26.2 section 12.13.1.1.	This attributes associates this class with OrderedPair(s).

Table 44 - Attributes of OneWayFlrPmPac Class

7.17.5.6 One Way Availability PM Conditional Package

The OneWayAvPmPac object class represents the One Way Availability PM. It is associated with OrderedPair and SlsObjectiveAndParameters.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
onewayAvObjective	Percentage		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.4 and MEF 26.2 section 12.13.7.	This attribute sets the one way availability objective.
_orderedPairList	OrderedPair		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.4 and MEF 26.2 section 12.13.7.	This attributes associates this class with OrderedPair(s).

Table 45 - Attributes of OneWayAvPmPac Class

7.17.5.7 One Way High Loss Interval PM Conditional Package

The OneWayHliPmPac object class represents the One Way High Loss Interval PM. It is associated with OrderedPair and SlsObjectiveAndParameters.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
onewayHliObjective	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.5 and MEF 26.2 section 12.13.8.	This attribute sets the one way high loss interval objective.

_orderedPairList	OrderedPair		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.5 and MEF 26.2 section 12.13.8.	This attributes associates this class with OrderedPair(s).

Table 46 - Attributes of OneWayHliPmPac Class

7.17.5.8 One Way Consecutive High Loss Interval PM Conditional Package

The OneWayChliPmPac object class represents the One Way Consecutive High Loss Interval PM. It is associated with OrderedPair and SlsObjectiveAndParameters.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
consecutiveNumberP	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: < consecutiveIntervalN in SlsCosNameEntry • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.5 and MEF 26.2 section 12.13.9.	This attribute is the minimum integer number of Δt 's in the (sliding) window (with $0 < p < n$) to qualify as a CHLI.
onewayChliObjective	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.5 and MEF 26.2 section 12.13.9.	This attribute sets the one way consecutive high loss interval objective.
_orderedPairList	OrderedPair		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.5 and MEF 26.2 section 12.13.9.	This attributes associates this class with OrderedPair(s).

Table 47 - Attributes of OneWayChliPmPac Class

7.17.5.9 One Way Group Availability PM for Single EVC/OVC Conditional Package

The OneWayGroupAvPmPac object class represents the One Way Group Availability PM for a single EVC/OVC. It is associated with SetOfOrderedPairs and SlsObjectiveAndParameters.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
minNumberOfSetsAvailableK	PositiveInteger		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.6 and MEF 26.2 section 12.13.10.	This attribute is the minimum number of sets of ordered pairs (K) that have to be available for Group Availability PM.
onewayGroupAvObjective	Percentage		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.6 and MEF 26.2 section 12.13.10.	This attribute sets the one way group availability objective for a single EVC/OVC.
_setOfOrderedPairList	SetOfOrderedPairs		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8.6 and MEF 26.2 section 12.13.10.	This attributes associates this class with SetOfOrderedPairs(s).

Table 48 - Attributes of OneWayGroupAvPmPac Class

7.17.5.10 One Way Composite PM Conditional Package

The OneWayCompositePmPac object class represents the One Way Composite PM. It is associated with OrderedPair and SlsObjectiveAndParameters.

Applied stereotypes:

- OpenModelClass
  - support: OPTIONAL

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
cpiThresholdU	Real		1	RW	OpenModelAttribute • isInvariant: false • valueRange: [0,1] • support: MANDATORY Reference • reference: MEF 10.3.1.	This attribute is the cpi threshold of the composite performance metric.
frameLossIndicator	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: [0, 1] • support: MANDATORY Reference • reference: MEF 10.3.1.	This attribute is the frame loss indicator of the composite performance metric.

frameDelayIndicator	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: [0,1] • support: MANDATORY Reference • reference: MEF 10.3.1.	This attribute is the frame delay indicator of the composite performance metric.
ifdvIndicator	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: [0,1] • support: MANDATORY Reference • reference: MEF 10.3.1.	This attribute is the ifdv indicator of the composite performance metric.
onewayFdThreshold	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3.1.	This attribute is the one way frame delay threshold (in milliseconds) of the composite performance metric.
onewayIfdvThreshold	NaturalNumber		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3.1.	This attribute is the one way IFDV threshold (in milliseconds) of the composite performance metric.
cpmObjective	Percentage		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3.1.	This attribute sets the one way composite performance objective. Refer to MEF 10.3.1. MEF 26.2 doesn't include this.
_orderedPairList	OrderedPair		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3.1.	This attributes associates this class with OrderedPair(s).

Table 49 - Attributes of OneWayCompositePmPac Class

7.17.5.11 PM Ordered Pair of EVC/OVC End Points

The OrderedPair object class is an ordered pair of (EVC/OVC) end points for a specific PM, for one way direction. It is associated with a One Way PM conditional package (all PM conditional packages except Group Availability) and a pair of CarrierEthernetServiceEndPoint pairs (EVC End Points or OVC End Points, one as "from" and one as "to" for indication of "order" or direction).

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
_fromCarrierEthernetServiceEndPoint	CarrierEthernetServiceEndPoint		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8 and MEF 26.2 section 12.13.1.1.	This attribute represents the relationship between OrderedPair and a "from" CarrierEthernetServiceEndPoint (EVC End Point or OVC End Point).
_toCarrierEthernetServiceEndpoint	CarrierEthernetServiceEndPoint		1	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3 section 8.8 and MEF 26.2 section 12.13.1.1.	This attribute represents the relationship between OrderedPair and a "to" CarrierEthernetServiceEndPoint (EVC End Point or OVC End Point).

Table 50 - Attributes of OrderedPair Class

7.17.5.12 PM Set of Ordered Pairs

The SetOfOrderedPairs object class is a set of ordered pair sets of (EVC/OVC End Points for a Group Availability PM, for one way direction.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

Attribute Name	Type	Default	Multiplicity	Access	Stereotypes	Description
_orderedPairList	OrderedPair		1..*	RW	OpenModelAttribute • isInvariant: false • valueRange: no range constraint • support: MANDATORY Reference • reference: MEF 10.3.1.	This attribute denotes a set of ordered pairs.

Table 51 - Attributes of SetOfOrderedPairs Class

8 Type Definitions

The attributes of the object class all have types defined. Some types are primitives (from the UML tool's primitive packages or libraries), some are defined in other UML models, and some are defined by this model. The types defined by this model include:

- Data types (Section 8.1) consist of their structured properties (with their own types) used by object class attributes or by other data types.
- Enumerations (Section 8.2) list the enumeration literals used by object class attributes or by data types.

8.1 Data Types

This section lists all data type definitions for Carrier Ethernet Services Management Information Model object class attributes.

8.1.1 AggLinkDepth

This is a pair of <VLAN ID, link depth> indicating that a given VLAN ID maps to a given number of links in the Port Conversation ID to Aggregation Link Map.

Attribute Name	Type	Multiplicity	Properties	Description
vlanId	VlanId	1	valueRange: no range constraint	The ingress frame Vlan ID.
linkDepth	PositiveInteger	1	valueRange: no range constraint	The number of links for the aggregation link.

Table 52 - AggLinkDepth Data Type

8.1.2 ConversationIdToAggregationLinkMap

This is a Port Conversation ID to Aggregation Link Map as defined in IEEE Std 802.1AX – 2014.

Attribute Name	Type	Multiplicity	Properties	Description
conversationId	NaturalNumber	1	valueRange: [0..4094]	The conversation ID is a Vlan ID or 0 for untagged or priority tagged frame..
linkIdList	NaturalNumber	1..*	valueRange: no range constraint	The link ID of the aggregation link.

Table 53 - ConversationIdToAggregationLinkMap Data Type

8.1.3 Identifier45

Unique by network administrative domain, containing no more than 45 characters and non-null RFC Display String but not contain the characters 0x00 through 0x1f.

Attribute Name	Type	Multiplicity	Properties	Description
identifier45	String	1	valueRange: length <= 45 characters	non-null RFC2579 Display String but not contain the characters 0x00 through 0x1f.

Table 54 - Identifier45 Data Type

8.1.4 Identifier90

Unique by network administrative domain, containing no more than 90 characters and non-null RFC Display String but not contain the characters 0x00 through 0x1f.

Attribute Name	Type	Multiplicity	Properties	Description
identifier90	String	1	valueRange: length <= 90 characters	non-null RFC2579 Display String but not contain the characters 0x00 through 0x1f

Table 55 - Identifier90 Data Type

8.1.5 L2cpPeering

This is a list specifies the L2CP Protocol Identifier and the Destination Address in use by the protocol entity.

Attribute Name	Type	Multiplicity	Properties	Description
protocolId	L2cpProtocol	1	valueRange: no range constraint	This is a L2CP Protocol Identifier.
destinationAddress	NaturalNumber	1	valueRange: [0..2^48 -1]	This is a Mac Address.
linkIdList	PositiveInteger	0..*	valueRange: no range constraint	It is possible that a protocol (e.g. ESMC) could operate on some, but not all, of the physical links. When linkId is not listed, the protocol peering applies to all members of the aggregation link.

Table 56 - L2cpPeering Data Type

8.1.6 L2cpProtocol

This data type defines a L2CP protocol (LLC address type or EtherType) with possible subtype.

Attribute Name	Type	Multiplicity	Properties	Description
l2cpProtocolType	L2cpProtocolType	1	valueRange: no range constraint	This attribute specifies the type of L2CP protocol, i.e., LLC or EtherType.
llcAddressOrEtherType	NaturalNumber	1	valueRange: <=65535	This attribute specifies the LLC address or the EtherType value.
subType	NaturalNumber	0..1	valueRange: [0..65535]	This attribute specifies the subtype of the L2CP protocol.

Table 57 - L2cpProtocol Data Type

8.1.7 MepLevelAndDirection

This complex data type includes MEG LEVEL and MEP direction.

Attribute Name	Type	Multiplicity	Properties	Description
level	NaturalNumber	1	valueRange: [0..7]	This is the MEG level, value between 0..7.
direction	MepDirection	1	valueRange: no range constraint	This is MEP direction, UP or DOWN.

Table 58 - MepLevelAndDirection Data Type

8.1.8 NaturalNumber

An integer >=0

Attribute Name	Type	Multiplicity	Properties	Description
naturalNum	Integer	1	valueRange: >=0.	This is an integer >=0.

Table 59 - NaturalNumber Data Type

8.1.9 Percentage

Data type for percentage, 0%-100%.

Attribute Name	Type	Multiplicity	Properties	Description
percentage	Real	1	valueRange: [0..1]	This is a real number between 0 and 1.

Table 60 - Percentage Data Type

8.1.10 PhysicalLayerPerLink

A link may consist of one or more physical ports. This data type includes the link ID and the physical port associated to the link Id.

Attribute Name	Type	Multiplicity	Properties	Description
linkId	NaturalNumber	1	valueRange: no range constraint	This is the link ID.
physicalLayer	PhysicalLayer	1	valueRange: no range constraint	This is the physical layer. IEEE802.3 (2012) defined.

Table 61 - PhysicalLayerPerLink Data Type

8.1.11 PmUnitAndValue

This data type provides the pair of <unit, value> where the unit can be ms (for frame delay), number (for HLI), and value is the correspondent value for that unit.

Attribute Name	Type	Multiplicity	Properties	Description
pmUnit	PmUnit	1	valueRange: no range constraint	This attribute denotes the "unit", e.g., MILLISECOND, COUNT or PERCENT.
delayValue	Real	0..1	valueRange: no range constraint	This attribute denotes the delay value only when the PmUnit=SECOND. It is for FD, FDR, MFD, IFDV.

countValue	NaturalNumber	0..1	valueRange: no range constraint	This attribute denotes the count value only when the PmUnit=COUNT. It is for HLI and CHLI.
percentValue	Percentage	0..1	valueRange: no range constraint	This attribute denotes the percentage value only when the PmUnit=PERCENT. It is for FLR, AV, GROUP_AV and CPM.

Table 62 - PmUnitAndValue Data Type

8.1.12 PositiveInteger

An integer >0

Attribute Name	Type	Multiplicity	Properties	Description
positiveInt	Integer	1	valueRange: >0.	This attribute is an integer >0.

Table 63 - PositiveInteger Data Type

8.1.13 SourceMacAddressLimit

This limits the number of source MAC Addresses that can be used in ingress external interface frames mapped to the End Point of all types over a time interval.

Attribute Name	Type	Multiplicity	Properties	Description
limit	NaturalNumber	1	valueRange: no range constraint	This attribute denotes the maximum acceptable source MAC addresses.
timeInterval	NaturalNumber	1	valueRange: no range constraint	This attribute denotes the time interval in milliseconds.

Table 64 - SourceMacAddressLimit Data Type

8.1.14 SyncModePerLink

A link may consist of one or more physical ports. This data type includes the link ID and the sync mode of the physical port associated to the link Id.

Attribute Name	Type	Multiplicity	Properties	Description
linkId	NaturalNumber	1	valueRange: no range constraint	This is the link ID of the link in the Aggregation Link.
syncModeEnabled	Boolean	1	valueRange: no range constraint	This attribute denotes whether the Synchronous Mode is enabled (on the link with the Link ID).

Table 65 - SyncModePerLink Data Type

8.1.15 TimeAndDate

This data type is for Time and Date in UTC.

Attribute Name	Type	Multiplicity	Properties	Description

year	PositiveInteger	1	valueRange: no range constraint	This denotes the year.
month	PositiveInteger	1	valueRange: [1..12]	This denotes the month.
day	PositiveInteger	1	valueRange: [1..31]	This denotes the day.
hour	NaturalNumber	1	valueRange: [0..23]	This denotes the hour.
minute	NaturalNumber	1	valueRange: [0..59]	This denotes the minute.
second	NaturalNumber	1	valueRange: [0..60]	This denotes the second.

Table 66 - TimeAndDate Data Type

8.1.16 TimeIntervalT

Time interval T for PM. E.g., 1 month, 20 days, 2 weeks, etc.

Attribute Name	Type	Multiplicity	Properties	Description
unit	TimeIntervalUnit	1	valueRange: no range constraint	Month, week, day, hour, etc.
number	PositiveInteger	1	valueRange: no range constraint	This denotes the value (for the unit), e.g., 1 (month), 20 (day), etc.

Table 67 - VlanId Data Type

8.1.17 VlanId

This is for VLAN ID from 1 to 4094

Attribute Name	Type	Multiplicity	Properties	Description
vlanId	PositiveInteger	1	valueRange: [1..4094]	This is the Vlan ID value.

Table 68 - VlanId Data Type

8.1.18 VlanIdListing

The list VLAN IDs, either when type=LIST, or when type==EXCEPT (which means the VLAN IDs except the listed). When type=ALL, the vlanId list is not applicable.

Attribute Name	Type	Multiplicity	Properties	Description
type	VlanIdMappingType	1	valueRange: no range constraint	Can be LIST, or ALL, or EXCEPT.
vlanIdList	VlanId	0..*	valueRange: no range constraint	This is a list of Vlan IDs.

Table 69 - VlanIdListing Data Type

8.2 Enumerations

This section lists all enumeration definitions for Carrier Ethernet Services Management Information Model object class attributes.

8.2.1 AdminState

This enumeration is for Administrative states. Refer to ITU-T X.731[10].

- UNLOCKED
  The resource is administratively permitted to perform services for its users.
- LOCKED
  The resource is administratively prohibited from performing services for its users.

8.2.2 AvailableMegLevel

This enumeration is for available MEG level, can be either NONE or value 0..7. NONE indicates that SOAM EI Frames are not guaranteed to pass over at any MEG Level.

- NONE
  Indicates that SOAM EI Frames are not guaranteed to pass over this OVC at any MEG Level.
- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

8.2.3 ColorFieldType

This enumeration is for selecting which frame field being used for color indication.

- PCP
  Using PCP field to map to the color.
- DEI
  Using DEI field to map to the color.
- END_POINT
  Using EVC End Point or the OVC End Point to map to the color.
- DSCP
  Using DSCP field to map to the color.

8.2.4 ColorMode

This enumeration indicates whether the Color Identifier of the Service Frame is considered by the Bandwidth Profile Algorithm.

- COLOR_AWARE
- COLOR_BLIND

8.2.5 ConnectionType

This is for EVC or OVC connection types, including point to point, multi-point and rooted multi-point.

- POINT_TO_POINT
- MULTIPOINT
- ROOTED_MULTIPOINT

8.2.6 CosOrEecMappingType

This lists the Class of Service identifier type, or the Equivalence Class Identifier type.

- END_POINT
  Using EVC End Point or OVC End Point to map to the CoS Name as CoS ID.
- PCP
  Using PCP field to map to the CoS Name as CoS ID.
- DSCP
  Using DSCP field to map to the CoS Name as CoS ID.

8.2.7 DeiOrDiscard

This lists the DEI value for color or discard, used for Egress Map.

- DISCARD
  Discard the egress frame when the Egress Map determines based on CoS Name (and ingress Color).
- 0
  Set egress frame DEI field to be 0 when the Egress Map determines based on CoS Name (and ingress Color).
- 1
  Set egress frame DEI field to be 1 when the Egress Map determines based on CoS Name (and ingress Color).

8.2.8 EgressMapType

This lists the Egress Map types, either CoS Name to PCP, or CoS Name and Ingress Color to PCP, or CoS Name and Ingress Color to DEI for S-Tag or C-Tag.

- CN_C_TAG_PCP
  CoS Name to C-Tag PCP egress map type
- CC_C_TAG_PCP
  CoS Name and Color to C-Tag PCP egress map type
- CC_C_TAG_DEI
  CoS Name and Color to C-Tag DEI egress map type
- CN_S_TAG_PCP
  CoS Name to S-Tag PCP egress map type
- CC_S_TAG_PCP
  CoS Name and Color to S-Tag PCP egress map type
- CC_S_TAG_DEI
  CoS Name and Color to S-Tag DEI egress map type

8.2.9 EthernetFrameFormat

This is a single value read only attribute.

- ETHERNET

8.2.10 EvcEndPointRole

The value indicates how external interface frames mapped to the EVC End Point can be forwarded.

- ROOT
  EVC End Point has role of root for the EVC.
- LEAF
  EVC End Point has role of leaf for the EVC.

8.2.11 FrameColor

Frame color is either Green or Yellow.

- GREEN
- YELLOW

8.2.12 FrameDelivery

Service frame delivery defined in MEF 10.3. When the value is conditionally, the specific condition has to be addresses by the users. What conditions should be supported are not in the scope.

- DISCARD
  Frame must be discarded.
- CONDITIONALLY
  Frame will be delivered with specified condition.
- UNCONDITIONALLY
  Frame will be delivered unconditionally.

8.2.13 InterfaceResiliency

The method is for protection, if any, against a physical link failure. Refer to MEF 10.3.2[4] and MEF 26.2[5].

- NONE
- 2_LINK_ACTIVE_STANDBY
- ALL_ACTIVE
- OTHER

8.2.14 IpVersion

This enumeration lists the IP versions, including IPv4, IPv6 and both.

- IPV4
- IPV6
- IPV4_AND_IPV6

8.2.15 L2cpAddressSet

This lists the L2CP Address Set. Refer to MEF 45[6].

- CTA
  CE-Vlan Tag Aware

- CTB
  CE-Vlan Tag Blind
- CTB2
  CE-Vlan Tag Blind option 2

8.2.16 L2cpProtocolType

This lists the L2CP protocol types, either EtherType, or LLC Address.

- ETHERTYPE
  EtherType for L2CP, e.g., LLDP (0x88CC).
- LLC
  Logical Link Control sublayer address for L2CP, e.g., STP (0x42).

8.2.17 MepDirection

This is for MEP direction, either Down MEP or Up MEP.

- DOWN
- UP

8.2.18 OperationalState

This enumeration is for Operational states. Refer to ITU-T X.731[10].

- ENABLED
- DISABLED

8.2.19 OvcEndPointMapForm

The OVC End Point Map types, for ENNI (FORM E), for UNI (FORM U), for VUNI (FORM V), or for Trunk (FORM T).

- FORM_E
  OVC End Point Map for ENNI.
- FORM_V
  OVC End Point Map for VUNI.
- FORM_U
  OVC End Point Map for UNI.
- FORM_T
  OVC End Point Map for Trunk.

8.2.20 OvcEndPointRole

The value indicates how external interface frames mapped to the OVC End Point can be forwarded.

- ROOT
  OVC End Point has role of root for the OVC.
- LEAF
  OVC End Point has role of leaf for the OVC.
- TRUNK
  OVC End Point has role of trunk for the OVC.

8.2.21 PcpOrDiscard

This enumeration lists one of PCP values or DISCARD.

- DISCARD
- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

8.2.22 PhysicalLayer

IEEE802.3 (2012) defined list excluding 1000BASE-PX-D and 1000BASE-PX-U. NONE is added with further MEF 10.3 discussion, for supporting logical interfaces.

- 10BASE2
- 10BASE5
- 10BASE_F
- 10BASE_FB
- 10BASE_FL
- 10BASE_FP
- 10BASE_T
- 10BASE_TE
- 10BROAD36
- 10PASS_TS
- 100BASE_BX10
- 100BASE_FX
- 100BASE_LX10
- 100BASE_T
- 100BASE_T2
- 100BASE_T4
- 100BASE_TX
- 100BASE_X
- 1000BASE_BX10
- 1000BASE_CX
- 1000BASE_KX
- 1000BASE_LX
- 1000BASE_LX10
- 1000BASE_PX10
- 1000BASE_PX20
- 1000BASE_SX
- 1000BASE_T
- 1000BASE_X
- 10GBASE_CX4
- 10GBASE_E

- 10GBASE_ER
- 10GBASE_EW
- 10GBASE_KR
- 10GBASE_KX4
- 10GBASE_L
- 10GBASE_LR
- 10GBASE_LRM
- 10GBASE_LW
- 10GBASE_LX4
- 10GBASE_PR
- 10GBASE_PRX
- 10GBASE_R
- 10GBASE_S
- 10GBASE_SR
- 10GBASE_SW
- 10GBASE_T
- 10GBASE_W
- 10GBASE_X
- 100GBASE_R
- 100GBASE_CR10
- 100GBASE_ER4
- 100GBASE_LR4
- 100GBASE_SR10
- 40GBASE_R
- 40GBASE_CR4
- 40GBASE__FR
- 40GBASE_KR4
- 40GBASE_LR4
- 40GBASE_SR4
- 1BASE5
- 2BASE_TL
- 1G_EPON
- 10G_EPON
- 10_1G_EPON
- 10_10G_EPON
- OTHER
- NONE

8.2.23 PmMetricType

This enumeration provides the list of PM Metric types, including FD, MFD, FDR, IFDV, FLR, AV, HLI, CHLI, GROUP_AV, and CPM.

- FD

  Frame Delay Performance Metric.

- FDR
  Frame Delay Range Performance Metric.
- MFD
  Mean Frame Delay Performance Metric.
- IFDV
  Inter Frame Delay Variation Performance Metric.
- FLR
  Frame Loss Ratio Performance Metric.
- AV
  Availability Performance Metric.
- HLI
  High Loss Interval Performance Metric.
- CHLI
  Consecutive High Loss Interval Performance Metric.
- GROUP_AV
  Group Availability (for a single EVC/OVC) Performance Metric.
- CPM
  Composite Performance Metric. Refer to MEF 10.3.1[3].

8.2.24 PmUnit

PM Unit, used for pairing with Value in data type PmUnitAndValue.

- SECOND
  Measured Performance Metric in PM report as seconds, for FD, FDR, IFDV, and MFD.
- COUNT
  Measured Performance Metric in PM report as count number, for HLI and CHLI.
- PERCENT
  Measured Performance Metric in PM report as percentage, for FLR, Availability, Group Availability and Composite PM.

8.2.25 SVlanIdControl

This lists the S Vlan ID Control, either FULL or PARTIAL.

- FULL
  Operator can support only a single SP/SO at the ENNI.
- PARTIAL
  Operator can support only multiple SP/SO at the ENNI

8.2.26 ServiceState

This enumeration is for Service State.

- PENDING
- ACTIVE
- INACTIVE

8.2.27 TaggedL2cpProcessing

Either 802.1 compliant or not. Refer to MEF 45[6].

- 802.1_COMPLIANT
- 802.1_NON_COMPLIANT

8.2.28 TimeIntervalUnit

Time interval unit, e.g., month, day, week, hour, etc.

- YEAR
- MONTH
- WEEK
- DAY
- HOUR
- MINUTE
- SECOND

8.2.29 VlanIdMappingType

Vlan ID types, ALL for all vlan IDs, LIST for a list of Vlan IDs, EXCEPT for all Vlan IDs except the listed.

- ALL
  All Vlan IDs.
- EXCEPT
  All Vlan IDs except the listed.
- LIST
  List of Vlan IDs.

8.2.30 VlanIdPreservation

This is for Vlan ID Preservation. RETAIN covers only the direction from UNI to ENNI while PRESERVE covers both directions. Refer to MEF 26.2 [5] section 12.7.

- PRESERVE
  To achieve EVC CE-VLAN ID Preservation.
- RETAIN
  C-Tag, if present, is encapsulated with the C-Tag VLAN ID value retained.
- STRIP
  C-Tag is discarded.

8.2.31 VlanTag

This is for Vlan Tag type, i.e., S-tag or C-tag.

- S_TAG
- C_TAG

9 References

[1] MEF Technical Specification MEF 6.2, *Ethernet Services Definitions - Phase 3*, 2014

[2] MEF Technical Specification MEF 10.3, *Ethernet Services Attributes Phase 3*, October 2013.

[3] MEF Technical Specification MEF 10.3.1 *Composite Performance Metric (CPM) Amendment to MEF 10.3*, February 2015

[4] MEF Technical Specification MEF 10.3.2 *UNI Resiliency Enhancement Amendment to MEF 10.3*, October 2015

[5] MEF Technical Specification MEF 26.2, *External Network Network Interface (ENNI) and Operator Service Attributes*, 2016

[6] MEF Technical Specification MEF 35.1, *Service OAM Performance Monitoring Implementation Agreement*, May 2015

[7] MEF Technical Specification MEF 45, *Multi-CEN L2CP*, August 2014

[8] MEF Service Operation Specification MEF 55, *Lifecycle Service Orchestration Reference Architecture and Framework*, March 2016

[9] ITU-T Q.840.1 *Requirements and analysis for NMS-EMS management interface of Ethernet over Transport and Metro Ethernet Network,* 2007

[10] ITU-T X.731 *Information Technology – Open Systems Interconnection – Systems Management: State Management Function*, January 1992.