



Working Draft
MEF W101 v0.2

**LSO Legato Carrier Ethernet Service Schemas
and Developer Guide**

December 2022

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Table of Contents

53		
54	1	List of Contributing Members1
55	2	Abstract.....2
56	3	Terminology and Abbreviations3
57	4	Compliance Levels.....5
58	5	Numerical Prefixes6
59	6	Introduction7
60	7	Overview of LSO Legato9
61	8	Overview of Carrier Ethernet Services Model11
62	9	Overview of Subscriber Carrier Ethernet Services12
63	10	Overview of Operator Carrier Ethernet Services13
64	11	Subscriber and Operator Carrier Ethernet Service Super classes14
65	11.1	CarrierEthernetExternalInterface 14
66	11.2	CarrierEthernetServiceEndPoint 14
67	11.3	CarrierEthernetService 15
68	12	Data Model Design Principles and Assumptions16
69	12.1	Mandatory Service-Specific Attributes 17
70	12.2	Optional Service-Specific Attributes..... 17
71	12.3	Fixed Service-Specific Attributes 17
72	13	Data Models for Carrier Ethernet Services19
73	13.1	Organization and Structure of the Schemas 19
74	13.2	Additional Details 20
75	13.3	Naming Conventions 20
76	14	Relationships Between Entities21
77	14.1	Subscriber Ethernet Services Relationships Between Entities 21
78	14.2	Operator Ethernet Services Relationships Between Entities 24
79	15	Carrier Ethernet Super-classes30
80	15.1	CarrierEthernetExternalInterface 30
81	15.2	CarrierEthernetUni 33
82	15.3	CarrierEthernetService 34



83	15.4	CarrierEthernetServiceEndPoint	37
84	16	Subscriber Carrier Ethernet Services Data Model	40
85	16.1	CarrierEthernetSubscriberUni	40
86	16.2	CarrierEthernetEvcEndPoint.....	41
87	16.3	CarrierEthernetEvc	43
88	17	Operator Carrier Ethernet Services Data Model	45
89	17.1	CarrierEthernetEnni.....	45
90	17.2	CarrierEthernetEnniService	46
91	17.3	CarrierEthernetOvcEndPoint	47
92	17.4	CarrierEthernetOperatorUni	49
93	17.5	CarrierEthernetVuni	51
94	17.6	CarrierEthernetOvc.....	53
95	18	Common Classes and Types.....	55
96	18.1	AdminState	55
97	18.2	AggLinkDepth	55
98	18.3	AvailableMegLevel.....	55
99	18.4	BwpFlow	56
100	18.5	ConnectionType.....	58
101	18.6	ConversationIdToAggregationLinkMap.....	58
102	18.7	ColorFieldType.....	58
103	18.8	ColorIdentifier	59
104	18.9	ColorMode.....	60
105	18.10	CosIdentifier	60
106	18.11	CosMap.....	61
107	18.12	CosMappingType	62
108	18.13	CosNameAndColorToDeiPac	62
109	18.14	CosNameAndColorToPcpPac.....	63
110	18.15	CosNameToPcpPac.....	63
111	18.16	DataSize	64



112	18.17 DeiColorIdPac	64
113	18.18 DeiOrDiscard.....	64
114	18.19 DscpColorIdPac.....	65
115	18.20 DscpCosIdPac.....	65
116	18.21 DscpEeclPac.....	66
117	18.22 EeclIdentifier	66
118	18.23 EecMap.....	67
119	18.24 EecMappingType	68
120	18.25 Envelope	68
121	18.26 EthernetFrameFormat.....	68
122	18.27 EvcEpEgressMap.....	69
123	18.28 EvcEndPointRole.....	69
124	18.29 FrameColor	69
125	18.30 FrameDelivery	70
126	18.31 Identifier45	70
127	18.32 InformationRate	70
128	18.33 IpVersion.....	70
129	18.34 L2cpAddressSet	71
130	18.35 L2cpPeering	71
131	18.36 L2cpProtocol.....	71
132	18.37 L2cpProtocolType	72
133	18.38 MepDirection.....	72
134	18.39 MepLevelAndDirection.....	72
135	18.40 OperationalState	73
136	18.41 OvcEndPointRole	73
137	18.42 OvcEpEgressMap	73
138	18.43 OvcEpEgressMapType	74
139	18.44 PcpColorIdPac.....	75
140	18.45 PcpCosIdPac.....	76



141	18.46 PcpEecIdPac.....	76
142	18.47 PcpOrDiscard	76
143	18.48 PcpOrUntagged	77
144	18.49 PhysicalLayer	77
145	18.50 PositiveInteger.....	77
146	18.51 SepColorIdPac.....	77
147	18.52 SepCosIdPac.....	78
148	18.53 SourceMacAddressLimit.....	78
149	18.54 SyncModePerLink	78
150	18.55 TaggedL2cpProcessing.....	79
151	18.56 TimeIntervalT.....	79
152	18.57 TimeIntervalUnit.....	79
153	18.58 VlanId.....	79
154	18.59 VlanIdListing	80
155	18.60 VlanIdListOrUntag	80
156	18.61 VlanIdMappingType	80
157	18.62 VlanIdMappingTypeOrUntag.....	81
158	18.63 VlanIdPreservation	81
159	19 Carrier Ethernet Service Level Specification (SLS)	83
160	19.1 CarrierEthernetSls	83
161	19.2 SlsCosNameEntry.....	84
162	19.3 OneWayFrameDelayPmMetric.....	85
163	19.4 OneWayMeanFrameDelayPmMetric	86
164	19.5 OneWayFrameDelayRangePmMetric.....	86
165	19.6 OneWayInterFrameDelayVariationPmMetric	87
166	19.7 OneWayFrameLossRatioPmMetric	87
167	19.8 OneWayAvailabilityPmMetric	88
168	19.9 OneWayHighLossIntervalsPmMetric.....	88
169	19.10 OneWayConsecutiveHighLossIntervalsPmMetric	89



19.11	OneWayCompositePmMetric.....	89
19.12	OneWayGroupAvailabilityPmMetric	90
19.13	OrderedPair	91
19.14	SetOfOrderedPairs.....	91
20	References.....	92
Appendix A	Usage examples (Informative).....	93
A.1	High-level Flow	93
A.2	Integration of Service Specification into the Service Order API.....	94
A.3	Action: Add	95
A.3.1	Use Case 1: Service Order	96
A.4	Action: Modify	97
A.4.1	Use Case 2: Service Order: Bandwidth change	97
A.4.2	Use Case 3: Service Order: VLAN change at the Subscriber UNI	97
A.5	Action: Delete	97
A.5.1	Use Case 4: Service Order: Delete Subscriber UNI(s), EVC and associated EVC End Points ..	97
A.5.2	Use Case 5: Move Subscriber UNI to a different Location	97

List of Figures

Figure 1-LSO Reference Diagram	9
Figure 2-LSO Legato API Structure	10
Figure 3-Carrier Ethernet Service Model Overview	11
Figure 4-Subscriber Ethernet Service Model	12
Figure 5-Operator Ethernet Service Model	13
Figure 6-Carrier Ethernet Services Superclasses-CarrierEthernetExternalInterface Model.....	14
Figure 7-Carrier Ethernet Services Superclasses-CarrierEthernetServiceEndPoint Model	15
Figure 8-Carrier Ethernet Services Superclasses-CarrierEthernetService Model	15
Figure 9-Schema Files Organization.....	19
Figure 10-Subscriber Carrier Ethernet Service Order API Associations	21
Figure 11-Subscriber Carrier Ethernet Service Relationships	24



199	Figure 12-Operator Carrier Ethernet Service Order API Associations	25
200	Figure 13-Operator Carrier Ethernet Access Services Relationships	28
201	Figure 14-Operator Carrier Ethernet Transit Services Relationships.....	29
202	Figure 15-Carrier Ethernet SLS.....	83
203	Figure 16-Legato End-to-End Function Flow.....	93
204	Figure 17-The Extension Pattern: Subscriber Carrier Ethernet	94
205	Figure 18-The Extension Pattern: Operator Carrier Ethernet.....	95
206	Figure 19-Service Order with Carrier Ethernet Example	95
207	Figure 20-UC1: Service Order Request	96
208	Figure 21-UC1: Service Order Response	96
209	Figure 22-UC1: Service Order Sequence Diagram	96
210	Figure 23-UC1: Setup Diagram.....	96
211		
212		

List of Tables

213	
214	Table 1-Terminology and Abbreviations..... 4
215	Table 2-Numerical Prefix Conventions 6
216	Table 3-Subscriber Carrier Ethernet Service Relationship Roles 22
217	Table 4-Subscriber Carrier Ethernet Place Relationship Role 22
218	Table 5-Operator Carrier Ethernet Service Relationship Roles 26
219	Table 6-Operator Carrier Ethernet Place Relationship Role 26
220	Table 7-CarrierEthernetExternalInterface Attributes 32
221	Table 8-CarrierEthernetUni Attributes 34
222	Table 9-CarrierEthernetService Attributes 37
223	Table 10-CarrierEthernetServiceEndPoint Attributes..... 39
224	Table 11-CarrierEthernetSubscriberUni Attributes 41
225	Table 12-CarrierEthernetEvcEndPoint Attributes 43
226	Table 13-CarrierEthernetEvc Attributes..... 44
227	Table 14-CarrierEthernetEnni Attributes..... 46
228	Table 15-CarrierEthernetEnniService Attributes 47
229	Table 16-CarrierEthernetOvcEndPoint Attributes 49
230	Table 17-CarrierEthernetOperatorUni Attributes..... 50
231	Table 18-CarrierEthernetVuni Attributes..... 53
232	Table 19-CarrierEthernetOvc Attributes..... 54
233	Table 20-AggLinkDepth Attributes..... 55
234	Table 21-BwpFlow Attributes 58
235	Table 22-ConversationIdToAggregationLinkMap Attributes 58
236	Table 23-ColorIdentifier Attributes..... 60
237	Table 24-CosIdentifier Attributes 61
238	Table 25-CosMap Attributes 62
239	Table 26-CosNameAndColorToDeiPac Attributes..... 63
240	Table 27-CosNameAndColorToPcpPac Attributes 63
241	Table 28-CosNameToPcpPac Attributes 63



242	Table 29-DataSize Attributes	64
243	Table 30-DscpColorIdPac Attributes	65
244	Table 31-DscpCosIdPac Attributes	66
245	Table 32-DscpEecIdPac Attributes	66
246	Table 33-EecIdentifier Attributes	67
247	Table 34-EecMap Attributes	67
248	Table 35-Envelope Attributes	68
249	Table 36-EvcEpEgressMap Attributes	69
250	Table 37-InformationRate Attributes	70
251	Table 38-L2cpPeering Attributes	71
252	Table 39-L2cpProtocol Attributes	72
253	Table 40-MepLevelAndDirection Attributes	73
254	Table 41-OvcEpEgressMap Attributes	74
255	Table 42-PcpColorIdPac Attributes	75
256	Table 43-PcpCosIdPac Attributes	76
257	Table 44-PcpEecIdPac Attributes	76
258	Table 45-SepColorIdPac Attributes	78
259	Table 46-SourceMacAddressLimit Attributes	78
260	Table 47-SyncModePerLinkAttributes	79
261	Table 48-TimeIntervalT Attributes	79
262	Table 50-VlanIdListing Attributes	80
263	Table 51-VlanIdListOrUntag Attributes	80
264	Table 52-CarrierEthernetSIs Attributes	84
265	Table 53-SIsCosNameEntry Attributes	85
266	Table 54-OneWayFrameDelayPmMetric Attributes	86
267	Table 55-OneWayMeanFrameDelayPmMetric Attributes	86
268	Table 56-OneWayFrameDelayRangePmMetric Attributes	87
269	Table 57-OneWayInterFrameDelayVariationPmMetric Attributes	87
270	Table 58-OneWayFrameLossRatioPmMetric Attributes	88



271	Table 59-OneWayAvailabilityPmMetric Attributes.....	88
272	Table 60-OneWayHighLossIntervalsPmMetric Attributes	88
273	Table 61-OneWayConsecutiveHighLossIntervalsPmMetric Attributes	89
274	Table 62-OneWayCompositePmMetric Attributes.....	90
275	Table 63-OneWayGroupAvailabilityPmMetric Attributes	91
276	Table 64-OrderedPairs Attributes.....	91
277	Table 65-SetOfOrderedPairs Attributes.....	91
278		

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.

Editor Note 1: This list will be finalized before Letter Ballot. Any member that comments in at least one CfC is eligible to be included by opting in before the Letter Ballot is initiated. Note it is the MEF member that is listed here (typically a company or organization), not their individual representatives.

2 Abstract

This MEF Standard consisting of this Developer Guide and its associated software artifacts (JSON/YAML Schemas) defines and describes the service-specific payload for the LSO Legato API for a set of Service Functions – specifically, Service Order and Service Inventory, for Subscriber Ethernet and Operator Ethernet Services. The document starts with an overview of LSO Legato and Subscriber and Operator Ethernet Services. It then provides a basic information model for the MEF Ethernet Service Attributes. The final sections describe the Data Model focused on the JSON/YAML Schemas associated with this specification.

This document can be thought of as a developer's guide for the Subscriber and Operator Ethernet Services Data Model and the schemas provided that embody the Data Model. MEF Services are described by a set of Service Attributes. Each Service Attribute describes an aspect of the service that is agreed between the provider and the user of the service. The document that describes the Service Attributes for Subscriber Ethernet Services is MEF 10.4 [6] and Operator Ethernet Services is MEF 26.2 [8]. The corresponding Information Model representing these resources and attributes is MEF 7.4 [5].

This Standard normatively incorporates the following files by reference as if they were part of this document, from GitHub repository https://github.com/MEF-GIT/MEF-LSO/tree/develop_ce/schema/serviceSchema/ce.

3 Terminology and Abbreviations

This section defines the terms used in this document. In many cases, the normative definitions of terms are found in other documents. In these cases, the third column is used to provide the reference that is controlling, in other MEF or external documents. If the reference includes an asterisk (*), the definition has been adapted from the original.

Term	Definition	Reference
Business Applications	The Service Provider functionality supporting Business Management Layer functionality (e.g., product catalog, order management, billing, relationship management, etc.)	MEF 55.1 [9]
BUS	See Business Applications	MEF 55.1 [9]
CEN	Carrier Ethernet Network	MEF 12.2 [7]
Carrier Ethernet Network	A network from a Service Provider or network Operator supporting the MEF service and architecture models.	MEF 12.2 [7]
Data Model	A representation of concepts of interest to an environment in a form that is dependent on data repository, data definition language, query language, implementation language, and/or protocol (typically, but not necessarily, all five).	IETF RFC 3444 [3]
ENNI	External Network Network Interface	MEF 26.2 [8]
External Network Network Interface	A reference point representing the boundary between two Operator Carrier Ethernet Networks that are operated as separate administrative domains.	MEF 26.2 [8]
Ethernet Service	A connectivity service that carries Ethernet Frames irrespective of the underlying technology and that is specified using Service Attributes as defined in an MEF Specification.	MEF 10.4 [6]

Term	Definition	Reference
Information Model	A representation of concepts of interest to an environment in a form that is independent of data repository, data definition language, query language, implementation language, and protocol.	IETF RFC 3444 [3]
Order	One or more Service Order Items formulated into a fulfillment request made by a Client to a Server.	This document (derived from MEF 57.2)
Service Provider	In the context of this document, a Service Provider is an Ethernet Service Provider. In this document, we use Service Provider to include Super Operator as specified in MEF 26.2 (also referred to as SP/SO).	This Document
Subscriber Ethernet Service	In the context of this document, an Ethernet Service conforming to one of the six Subscriber Ethernet Services defined in MEF 6.3.	This Document

Table 1-Terminology and Abbreviations

4 Compliance Levels

The key words "**MUST**", "**MUST NOT**", "**REQUIRED**", "**SHALL**", "**SHALL NOT**", "**SHOULD**", "**SHOULD NOT**", "**RECOMMENDED**", "**NOT RECOMMENDED**", "**MAY**", and "**OPTIONAL**" in this document are to be interpreted as described in BCP 14 (RFC 2119 [2], RFC 8174 [4]) when, and only when, they appear in all capitals, as shown here. All key words must be in bold text.

Items that are **REQUIRED** (contain the words **MUST** or **MUST NOT**) are labeled as **[Rx]** for required. Items that are **RECOMMENDED** (contain the words **SHOULD** or **SHOULD NOT**) are labeled as **[Dx]** for desirable.

Items that are **OPTIONAL** (contain the words **MAY** or **OPTIONAL**) are labeled as **[Ox]** for optional.

5 Numerical Prefixes

This document uses the prefix notation to indicate multiplier values as shown in Table 2-Numerical Prefix Conventions.

Decimal		Binary	
Symbol	Value	Symbol	Value
k	10^3	Ki	2^{10}
M	10^6	Mi	2^{20}
G	10^9	Gi	2^{30}
T	10^{12}	Ti	2^{40}
P	10^{15}	Pi	2^{50}
E	10^{18}	Ei	2^{60}
Z	10^{21}	Zi	2^{70}
Y	10^{24}	Yi	2^{80}

Table 2-Numerical Prefix Conventions

6 Introduction

LSO Legato provides a programmatic interface for establishing automated exchange of information (i.e., Service Order, Service Inventory) between a Business Application and Service Orchestration Function. These APIs are hierarchically structure. The outer-most structure includes information relating to the access method (e.g., REST), next is information relating to the function being requested (e.g., Service Order or Inventory, etc.) and the inner-most structure contains information relating to the specific service, for example Carrier Ethernet Service.

The specific types of Ethernet Services are Subscriber and Operator Ethernet Services. Subscriber Ethernet Services are requested between a Customer and a Service Provider or a Service Provider and a Partner. Operator Ethernet Services are requested between a Service Provider (SP) and a Partner. The Service Attributes for Subscriber and Operator Ethernet Services are defined in MEF 10.4 [6] and MEF 26.2 [8] respectively. The corresponding Information Model that is used as a reference for JSON/YAML Subscriber and Operator Ethernet Services schema development is MEF 7.4 [5].

This specification is accompanied by a Data Model for Subscriber and Operator IP Services instantiated as a set of JSON/YAML schemas that can be used within the Legato API to perform Service Order, and request an Inventory for the Subscriber and Operator IP Services consisting of:

The Data Model for Subscriber Ethernet Services includes resource representations for:

- EVC: An EVC is an association of two or more EVC End Points (EVC EPs).
- EVC End Point: An EVC End Point is a construct at a UNI that selects a subset of the Service Frames that pass over the UNI. An EVC End Point represents the logical attachment of an EVC to a UNI.
- Subscriber UNI: A construct that represents the Ethernet User Network Interface demarcation point between the responsibility of the Service Provider and the responsibility of the Subscriber.

The Data Model for Operator Ethernet Services includes resource representations for:

- OVC: The Operator Virtual Connection is the building block for constructing an EVC spanning multiple Operator CENs. An OVC is an association of OVC End Points.
- OVC End Point: A logical entity at a given External Interface that is associated with a distinct set of frames passing over that External Interface. An OVC End Point represents the logical attachment of an OVC to an External Interface (a UNI or ENNI).
- Operator UNI: UNI used in Operator Ethernet Service solution where attributes are agreed to by the Service Provider/Super Operator and the Operator.
- Virtual UNI: An instantiation in one Operator CEN of functions that perform a portion of the Service Attributes observable at a UNI supported by a different Operator CEN.

- ENNI: A reference point representing the boundary between two or more Operator CENs that are operated as separate administrative domains.
- ENNI Service: A construct that represents the ENNI Service Attributes for an ENNI used by a particular SP/SO. For each instance of an ENNI, there can be multiple sets of ENNI Service Attributes.

The document contains the following sections:

An overview of LSO Legato (Section 7)

An overview of Ethernet Services Model (Section 8)

An overview of Subscriber Ethernet Services (Section 9)

An overview of Operator Ethernet Services (Section 10)

Subscriber and Operator Service Superclasses (Section 11)

Data Model Design Principles and Assumptions (Section 12)

Data Modes for Carrier Ethernet Services (Section 13)

Relationship between the Entities (Section 14)

Subscriber Ethernet Service Data Model (Section 15)

Operator Ethernet Service Data Model (Section 16)

Common Classes and Types (Section 17)

Carrier Ethernet Bandwidth Profile and Bandwidth Profile Envelope (Section 18)

Carrier Ethernet SLS (Section 19)

7 Overview of LSO Legato

MEF 55.1 [9] describes the Reference Architecture for Lifecycle Service Orchestration (LSO) of MEF-defined connectivity services. MEF 55.1 [9] defines seven LSO Reference Points that are abstract interconnection points between different domains - either within the service provider domain (intra-domain) or between service provider and other business entities (inter-domain). One of these LSO Reference Points is LSO Legato which defines the abstract boundary point between a Service Provider's or Partner's Business Application (BA) and Service Orchestration Functionality (SOF) for providing connectivity services provisioning.

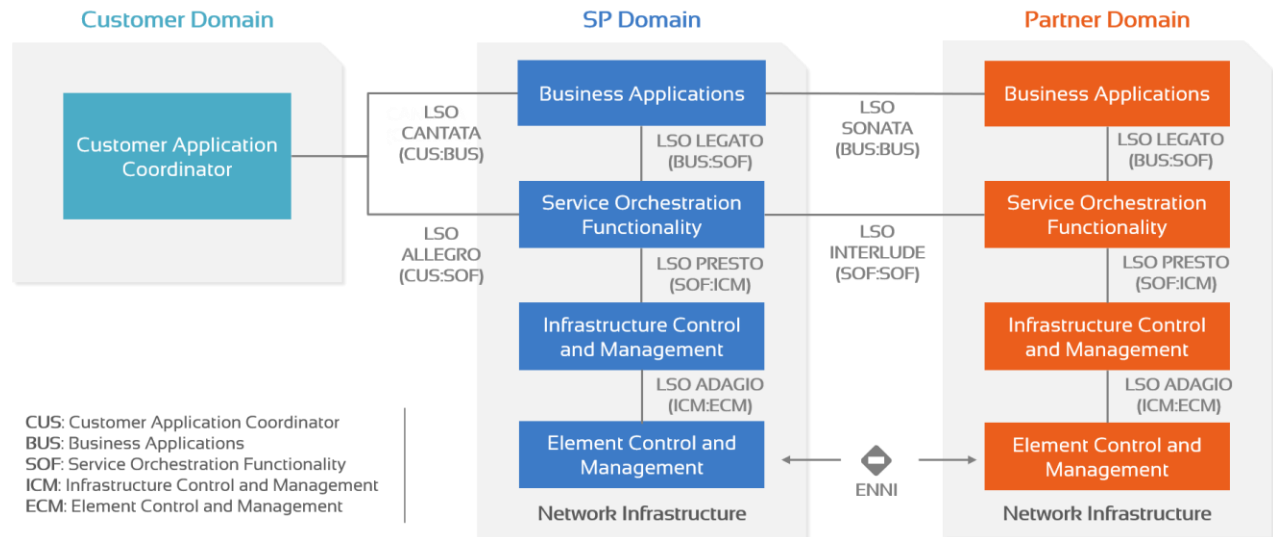


Figure 1-LSO Reference Diagram

The access to automated service provisioning functionality is provided using the Service Provisioning API at LSO Legato. LSO Legato provides a suite of APIs for ordering, inventory, etc. which are standardized by MEF as LSO Legato APIs, and which are made available by MEF in a series of releases of the LSO Legato SDK.

The LSO Legato APIs comprise two parts: one is the service-independent functionality, or Basic API Structure, and the second is the service-specific payload, or Information Payload, as shown in diagram below.

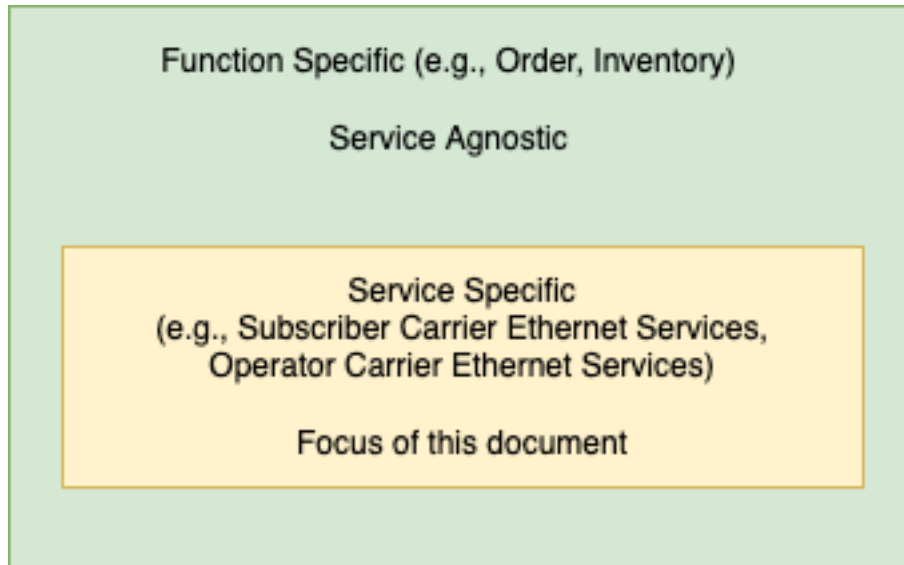


Figure 2-LSO Legato API Structure

This document defines the service-specific payload, shown as YAML/JSON Data Model in the figure above, specifically for a MEF 3.0 Subscriber and Operator Ethernet Services as defined in MEF 10.4 [6] and MEF 26.2 [8] respectively. Both Subscriber Ethernet and Operator Ethernet Information Models are defined in MEF 7.4 [5]. The envelope resources of the API and association to specific payload resources will be discussed in detail later in this document.

8 Overview of Carrier Ethernet Services Model

The Ethernet Services model has nine main classes, CarrierEthernetEvc, CarrierEthernetEvcEndPoint, CarrierEthernetSubscriberUni, CarrierEthernetOvc, CarrierEthernetOvcEndPoint, CarrierEthernetOperatorUni, CarrierEthernetEnni, CarrierEthernetEnniService and CarrierEthernetVuni. An Ethernet Service is defined as either a Subscriber Ethernet Service or an Operator Ethernet Service.

A Carrier Ethernet Service Model supports Subscriber and Operator Carrier Ethernet Services. Figure 3 shows the entire Carrier Ethernet Service Model including classes used for both Subscriber and Operator Carrier Ethernet Services. Further details for both Service types will be provided in this document Figure 3-Carrier Ethernet Service Model Overview

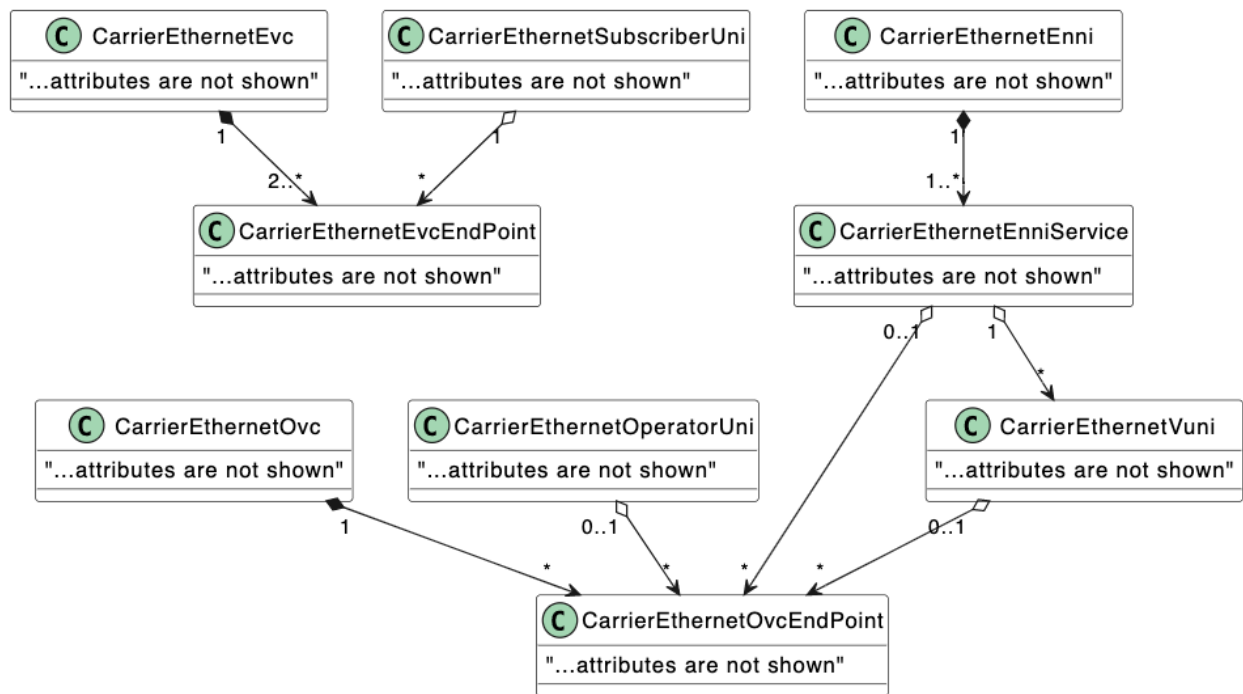


Figure 3-Carrier Ethernet Service Model Overview

9 Overview of Subscriber Carrier Ethernet Services

This specification describes a data model for MEF-defined Subscriber Carrier Ethernet Services. A Subscriber Carrier Ethernet Service is an Ethernet Service that is provided by a Service Provider to Subscribers between two or more UNIs (CarrierEthernetSubscriberUnis).

The main objects to support Subscriber Carrier Ethernet Services are CarrierEthernetSvc, CarrierEthernetSvcEndPoint and CarrierEthernetSubscriberUni. The subsequent sub-sections provide background on the set of objects that are associated with a Subscriber Ethernet Service as described in MEF 10.4 [6] and MEF 7.4 [5].

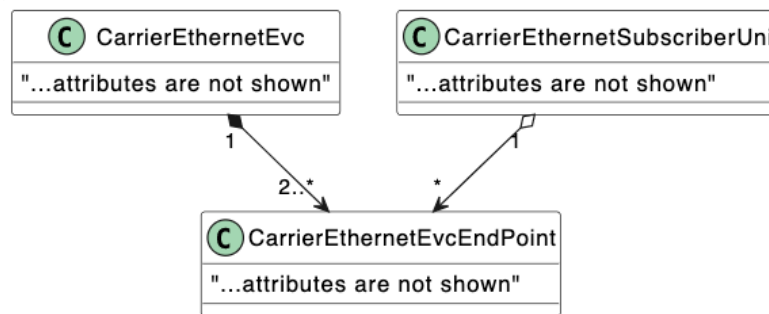


Figure 4-Subscriber Ethernet Service Model

10 Overview of Operator Carrier Ethernet Services

This specification describes a data model for MEF-defined Operator Carrier Ethernet Services. An Operator Carrier Ethernet Service is an Ethernet Service that is supported in the case where all Subscriber UNIs are not supported within the Service Provider's network.

The Operator Ethernet Services are supported with the following objects: CarrierEthernetEnni, CarrierEthernetEnniService, CarrierEthernetOvc, CarrierEthernetOperatorUni, CarrierEthernetOvcEndPoint and CarrierEthernetVuni as specified in MEF 26.2 [8] and MEF 7.4 [5].

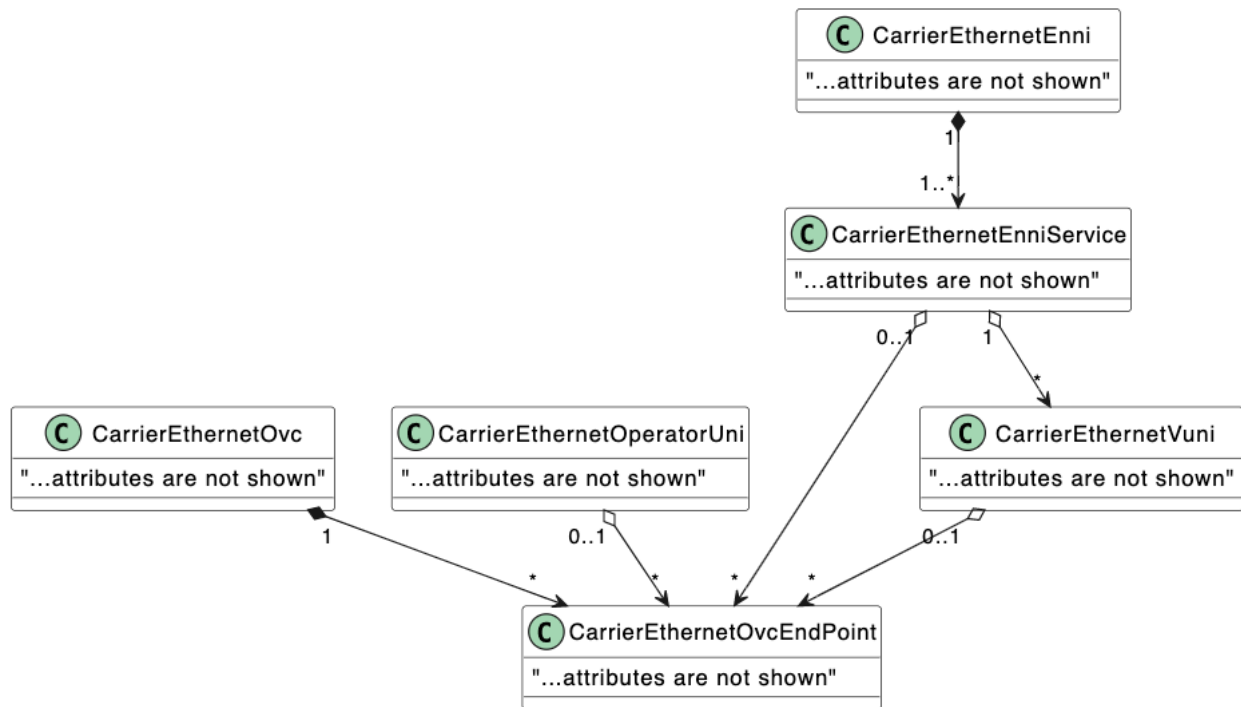


Figure 5-Operator Ethernet Service Model

11 Subscriber and Operator Carrier Ethernet Service Super classes

Several of the Subscriber and Operator main classes are sub-classed from a parent class that holds common attributes that are used by similar classes in the Carrier Ethernet Services model. The superclass objects are CarrierEthernetExternalInterface, CarrierEthernetServiceEndPoint and CarrierEthernetService.

11.1 CarrierEthernetExternalInterface

The CarrierEthernetExternalInterface represents the physical or virtual Ethernet interface used for Ethernet services. This is an abstract class and the superclass. It contains the common attributes of ENNI, Subscriber UNI and Operator UNI.

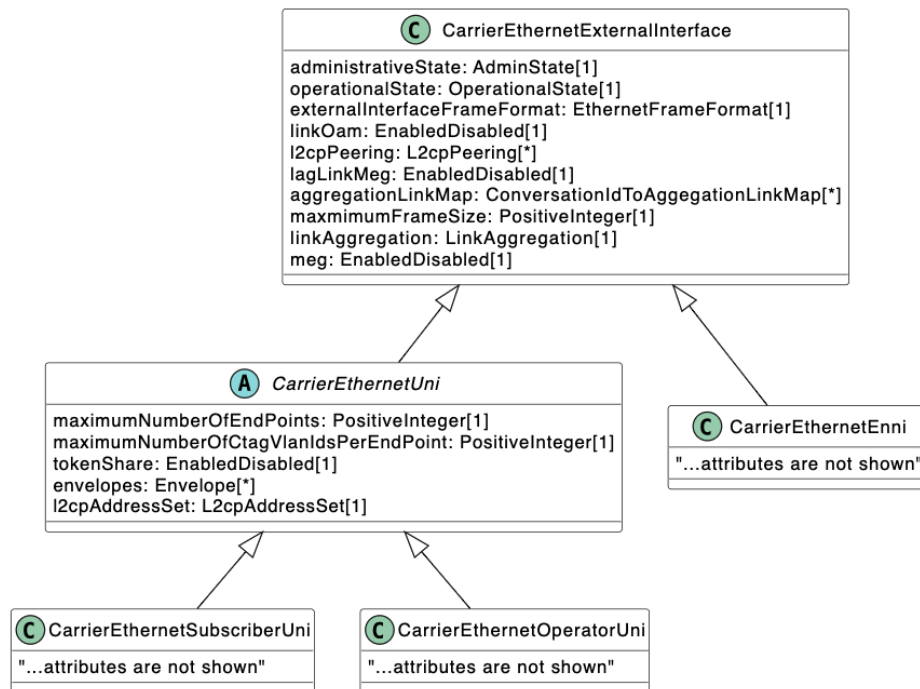


Figure 6-Carrier Ethernet Services Superclasses-CarrierEthernetExternalInterface Model

11.2 CarrierEthernetServiceEndPoint

The CarrierEthernetServiceEndPoint represents the EVC End Point or the OVC End Point. This is an abstract class and the superclass of CarrierEthernetEvcEndPoint and OvcEndPoint. It contains the common attributes of CarrierEthernetEvcEndPoint and OvcEndPoint.

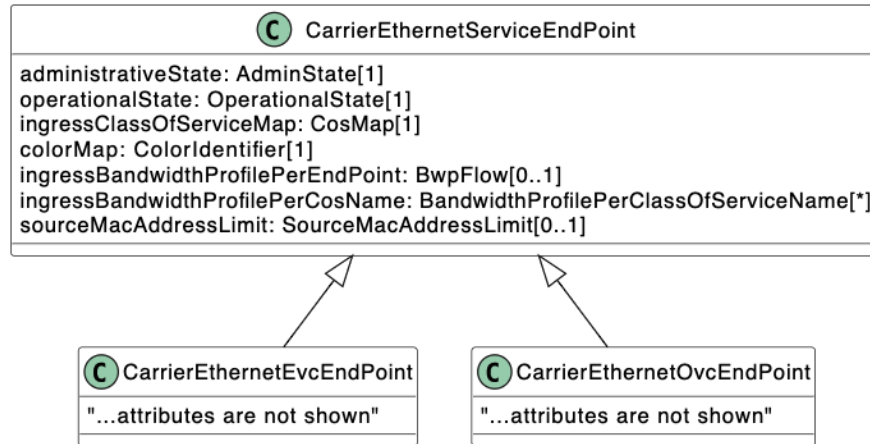


Figure 7-Carrier Ethernet Services Superclasses-CarrierEthernetServiceEndPoint Model

11.3 CarrierEthernetService

The CarrierEthernetService represents the EVC or the OVC. This is an abstract class and the superclass of EVC and OVC. It contains the common attributes of EVC and OVC.

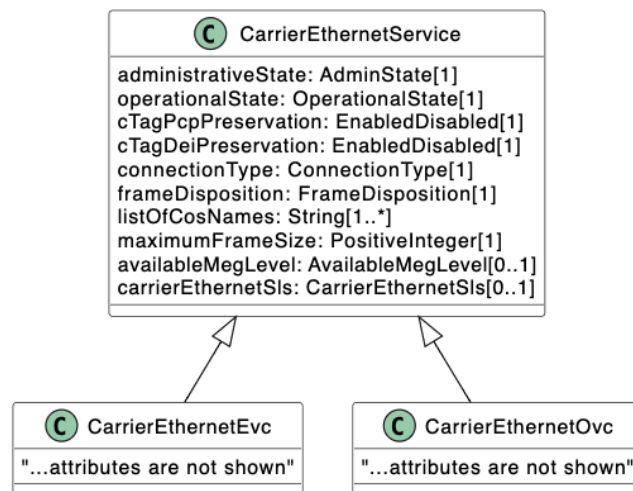


Figure 8-Carrier Ethernet Services Superclasses-CarrierEthernetService Model

12 Data Model Design Principles and Assumptions

A Service Attribute for a Service can have a value that is a simple datatype such as an integer or string (or list of simple datatypes) or a value that is an object with multiple properties or a composition of objects. Within this document each simple value (integer, string, Boolean, etc.) is referred to as a Service-Specific Attribute. A Service-Specific Attribute could be a Service Attribute (in the case where the Service Attribute itself has a simple type) or it could be a parameter within a Service Attribute (if the Service Attribute is a structured object or a composition of such objects). The classification for each Service-Specific Attribute may be different across Service Function, Service Action, and Service Offering.

- **Mandatory** – attributes that must be provided by the Client in a Service Order request or must be returned by the SOF for an Inventory request as specified in Section 12.1.
- **Optional** – attributes that may be provided by the Client in a Service Order request and may be returned by the SOF for an Inventory request as specified in Section 12.2.
- **Fixed** – attributes that are hard coded and may be specified by the Client in a Service Order request and may be returned by the SOF for an Inventory request as specified in Section 12.3.

As noted above, the classification may depend on:

Service Function – a given Service-Specific Attribute may, for example, be classified as Fixed for the Create Service Order request; while it may be classified as Mandatory for the Create Service Order request.

Service Action – a given Service-Specific Attribute may, for example, be classified as Mandatory for the Create Service Order request for an INSTALL of a new service, while it may be classified as Fixed for the Create Service Order request for a CHANGE of an installed Service.

Service Offering – a given Service-Specific Attribute may, for example, be classified as Mandatory for Create Service Order request for Service Order (e.g., Premium Service), while it may be classified as Fixed for the Create Service Order request for a different Service Order (e.g., Basic Service).

The Service-Specific Attribute classification can be defined and negotiated during the onboarding process or defined in a Service Catalog.

[R1] The SOF and Client **MUST** agree, for each Service-Specific Attribute, whether the attribute is Mandatory, Optional, or Fixed for each Service Function (Service Order) and Service Action (INSTALL, CHANGE) for a Service Offering.

[R2] The SOF and Client **MUST** agree, for each Service-Specific Attribute, whether the attribute is Mandatory, Optional, or Fixed for Inventory for a Service Offering.

[R3] If, for a Service Offering, a Service-Specific Attribute is classified as Optional for any Service Function, and if applicable, Service Action, the SOF and the Client **MUST** agree on the default value for the attribute.

- [R4] The SOF **MUST** reject and API request if the value for a Service-Specific Attribute requested by the Client is not a supported value for the applicable Service Offering.

The Carrier Ethernet Service data model supports both INSTALL and CHANGE actions for Service Order for EVC, OVC, Subscriber UNI, Operator UNI, ENNI Service and associated End Points. The Carrier Ethernet data model supports the RETRIEVE action for Inventory for all Service Order components.

The location and physical layer of a UNI or ENNI cannot be changed once it is ordered; instead, this is handled as an installation (UNI or ENNI at new location) and disconnect (UNI or ENNI at previous location), as there is often a requirement for a smooth transition with minimum downtime.

12.1 Mandatory Service-Specific Attributes

- [R5] If a Service-Specific Attribute is agreed to be Mandatory for a Service Function (Service Order) and Service Action (INSTALL, CHANGE), then the Client **MUST** include a value for the Service Attribute in the corresponding API request.

- [R6] If a Service-Specific Attribute is agreed to be Mandatory for Inventory, then the SOF **MUST** include a value for the attribute in the corresponding API response.

- [R7] When the SOF receives a Service Order request in which any of the Mandatory Service-Specific Attributes are not included, the request **MUST** be rejected by the SOF.

12.2 Optional Service-Specific Attributes

- [O1] If a Service-Specific Attribute is agreed to be Optional for a Service Function (Service Order) and Service Action (INSTALL, CHANGE), then the Client **MAY** include a value for the attribute in the corresponding API request.

- [R8] The SOF **MUST** apply the agreed default value for an Optional Service-Specific Attribute if a value is not included by the Client in the corresponding API request.

- [R9] If a Service-Specific Attribute is agreed to be Optional for Inventory, then the SOF **MUST** include a value for the attribute in the corresponding API response if the value is not the agreed default value.

- [O2] If a Service-Specific Attribute is agreed to be Optional for Inventory, then the SOF **MAY** include a value for the attribute in the corresponding API response if the value is the agreed default value.

12.3 Fixed Service-Specific Attributes

A Service-Specific Attribute may be classified a Fixed for a Service Function and Service Action when only one value is applicable for the SOF. This can be the case for example if:

- the SOF supports only a single value, or
- the value is derived by the SOF from the value of one more other Service-Specific Attributes, or
- the SOF specifies a single value in the Service Catalog for a specific Service Offering, or
- the Client and SOF agree on a single value during onboarding.

Since these are Service-Specific Attributes, each value must still be agreed in some way between the Client and the SOF, which implies that even in the first two cases, the SOF must make the Client aware of what the value is or how it is derived, before the Client places an order. How this is done is outside the scope of this document.

The SOF applies the one applicable value for every request for which the Service-Specific Attribute is classified as Fixed.

[R10] The Client and SOF **MUST** agree on whether the Client can include Service-Specific Attributes that have been classified as Fixed in API requests for Service Order.

[R11] If the Client and SOF agree that Service-Specific Attributes classified as Fixed cannot be included in API requests (see [R10]), the Client and SOF **MUST** agree on whether the SOF includes Service-Specific Attributes classified as Fixed in the corresponding API responses.

[R12] If the Client and SOF agree that Service-Specific Attributes classified as Fixed cannot be included in the API requests (see [R10]), the SOF **MUST** reject an API request from the Client if it includes Service-Specific Attributes that has been classified as Fixed for the Service Function (Service Order), and Service Action (INSTALL, CHANGE).

[R13] If the Client and SOF agree that the Service-Specific Attributes classified as Fixed cannot be included in the API requests (see [R10]), and if a Service-Specific Attribute that has been classified as Fixed for Inventory, then the SOF **MUST NOT** include a value for a Service-Specific Attribute in the Inventory API response.

[R14] If the Client and SOF agree that Service-Specific Attributes classified as Fixed can be included in API requests (see [R10]), the SOF **MUST** reject an API request from the Client if it includes a Service-Specific Attribute that has been classified as Fixed for the Service Function (Service Order) or Service Action (INSTALL, CHANGE) and includes a value that is different than the agreed-on fixed value.

[R15] If the Client and SOF agree that the Service-Specific Attributes classified as Fixed can be included in API requests (see [R10]), and if a Service-Specific Attribute is classified to be Fixed for Inventory for a Service Offering, then the SOF **MUST** include a value for the Service-Specific Attribute in the Inventory API responses.

13 Data Models for Carrier Ethernet Services

The data models for the Carrier Ethernet Services configuration in the Legato API are expressed as a set of JSON schemas based on JSON schema draft 7 and encoded in YAML. These schemas accompany this document. This section explains the organization and structure of these schemas.

13.1 Organization and Structure of the Schemas

The schemas are organized into a file structure as shown in Figure 9.

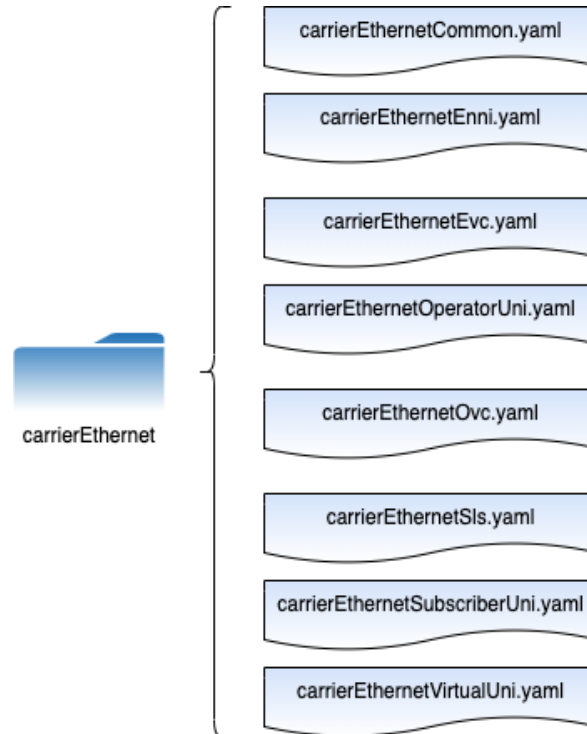


Figure 9-Schema Files Organization

Both Subscriber and Operator Ethernet Service schemas are provided in the same directory. There is 1 file that provide common resources that are shared with Subscriber and Operator Carrier Ethernet services. For example, carrierEthernetEvc.yaml file includes:

- carrierEthernet/carrierEthernetCommon.yaml – provides resource shared among all Carrier Ethernet services.

These common resources are referenced in the relevant service component schema files. For example:

allOf:

\$ref: 'carrierEthernetCommon.yaml#/definitions/CarrierEthernetService'

The *carrierEthernetCommon* YAML file contains resources that are common across Subscriber and Operator Carrier Ethernet service components as well as several utility resources and types.

On a CHANGE request a single Service-Specific Attribute cannot be changed. The Client must send a full-service configuration including all Mandatory Service-Specific Attributes (Section 12.1) and all Optional Service Attributes (Section 12.2) that were previously specified by the Client (in an INSTALL request or previous CHANGE request). Any Optional Service-Specific Attributes that are not specified in a CHANGE request are reset to their default value.

[R16] The Service Inventory for a service **MUST** include all Service Attributes that are categorized as Mandatory.

[R17] The Service Inventory for a service **MUST** include all Service Attributes that are categorized as Optional.

[O3] The Service Inventory for a service **MAY** contain Service Attributes that are categorized as Fixed.

Including Service Attributes in the Inventory as specified in the previous requirements facilitates the CHANGE action. The Buyer can RETRIEVE the current values for the Service Attributes and make the desired changes and submit the CHANGE request.

13.2 Additional Details

This section includes an explanation of some additional conventions for the schema structure as well as some additional attributes that have been added to facilitate service specification for some common edge cases.

13.3 Naming Conventions

In the schemas, resource and type names are UpperCamelCase and Service Attribute property names are lowerCamelCase.

14 Relationships Between Entities

This section describes the constraints and relationships between the primary Service Order Items for both Subscriber and Operator Ethernet Services. There are specific Service Order Items for both Subscriber and Operator Ethernet Services that are described in respective sections below.

14.1 Subscriber Ethernet Services Relationships Between Entities

This section description the constraints and relationships between the three primary Service Order Items (EVC, EVC End Point, and Subscriber UNI) for Subscriber Ethernet Services.

The Subscriber Ethernet Service is associated with exactly one EVC (with appropriate Service Attribute values), but depends on two other services, EVC End Points and two or more Subscriber UNIs. The relationship between the EVC (CarrierEthernetEvc) and the associated EVC End Points (CarrierEthernetEvcEndPoint) and EVC End Points and Subscriber UNI (CarrierEthernetSubscriberUni) are captured in the service-agnostics part of the Service Order API.

A Service Order is composed of one or more Service Order Items. This is supported in the service-agnostic part of the Service Order API. The service-specific payload (Carrier Ethernet Services) is where the main components are supported as part of Carrier Ethernet Service Schemas. Each Service Order Item is then associated with a service-specific orderable component (i.e., EVC) which is within the payload.

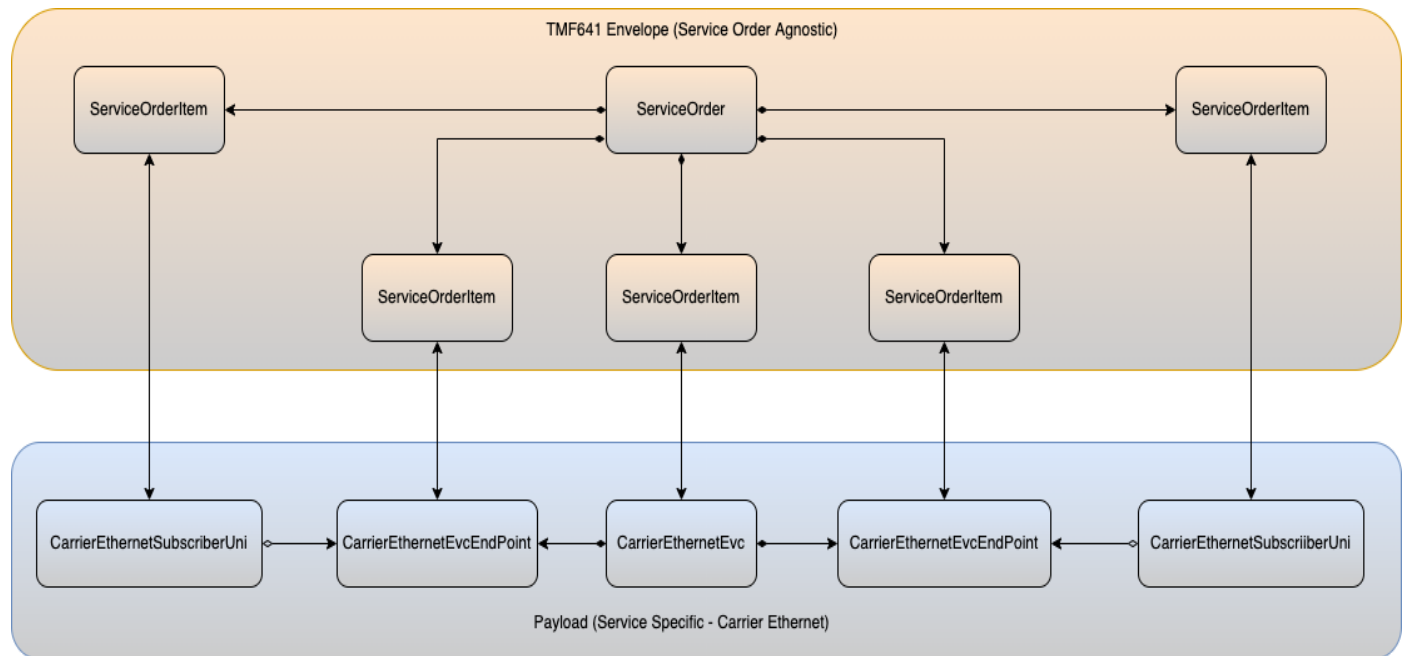


Figure 10-Subscriber Carrier Ethernet Service Order API Associations

The relationships between each of the Service Order Items for Subscriber Carrier Ethernet Services are shown in Table 5. The values in the Relationship Type column are used in the *relationshipType* field of the

OrderItemRelationship types. Specification of Subscriber UNI and EVC are mandatory at INSTALL and CHANGE of the service.

Source Service Resource	Relationship Type	Cardinality	Target Service Resource
CarrierEthernetEvcEndPoint	ENDPOINT_OF_EVC (E_LAN)	2.. *	CarrierEthernetEvc
CarrierEthernetEvcEndPoint	ROOT_ENDPOINT_OF_EVC (E_TREE)	2.. *	CarrierEthernetEvc
CarrierEthernetEvcEndPoint	LEAF_ENDPOINT_OF_EVC (E_TREE)	1	CarrierEthernetEvc
CarrierEthernetEvcEndPoint	A_END_ENDPOINT_OF_EVC (E_LINE)	1	CarrierEthernetEvc
CarrierEthernetEvcEndPoint	Z_END_ENDPOINT_OF_EVC (E_LINE)	1	CarrierEthernetEvc
CarrierEthernetEvcEndPoint	CONNECTS_TO_UNI	1	CarrierEthernetSubscriberUni

Table 3-Subscriber Carrier Ethernet Service Relationship Roles

[R18] For a Subscriber Carrier Ethernet Service, the Relationship Type field of the Service Relationship Order Item Relationship types **MUST** contain the value shown in the Relationship Type column in Table 3. **Błąd! Nie można odnaleźć źródła odwołania.**

[R19] For Service Order, the relationship to a Subscriber UNI **MUST** be specified for every INSTALL of, or CHANGE to, a Subscriber Ethernet Service.

[R20] For a Subscriber Carrier Ethernet Service, the relationship to an EVC **MUST** reference an EVC Service Order Item.

[R21] For a CHANGE to Subscriber Carrier Ethernet Service the relationship to the Subscriber UNI **MUST NOT** be changed from the value present in the Service Inventory.

The Subscriber UNI and EVC End Point are included with the EVC for a Subscriber Carrier Ethernet Service Order. The Subscriber UNI is associated with a specific INSTALL_LOCATION and is required at INSTALL and CHANGE. Once a Subscriber UNI is associated with a specific location, the INSTALL_LOCATION cannot be changed. The install location is captured in the service-agnostic part of the Service Order API. The value in the Place Relationship Role column in the table below is used in the role field of the *RelatedPlaceRefOrValue* type.

Service Resource	Place Relationship Role	INSTALL	CHANGE
CarrierEthernetSubscriberUni	INSTALL_LOCATION	Mandatory	Mandatory

Table 4-Subscriber Carrier Ethernet Place Relationship Role

- 633 **[R22]** For a Subscriber Carrier Ethernet Service, the Role field (*role*) of the Related Place
634 (*RelatedPlaceRefOrValue*) type **MUST** contain one of the values shown in the Place
635 Relationship Role column in Table 4.
- 636 **[R23]** For Service Order, the Related Place (*RelatedPlaceRefOrValue*) **MUST** be specified for
637 every INSTALL of, or CHANGE to, a Subscriber UNI.
- 638 **[R24]** For a CHANGE to a Subscriber UNI the Related Place **MUST NOT** be changed from the
639 value present in the Service Inventory.
- 640 Changing the Subscriber UNI Location is not supported for a Subscriber UNI. The value included in a
641 CHANGE request must be identical to the value in the Inventory. The relationships applicable to
642 Subscriber Ethernet Services are show in the following diagram:

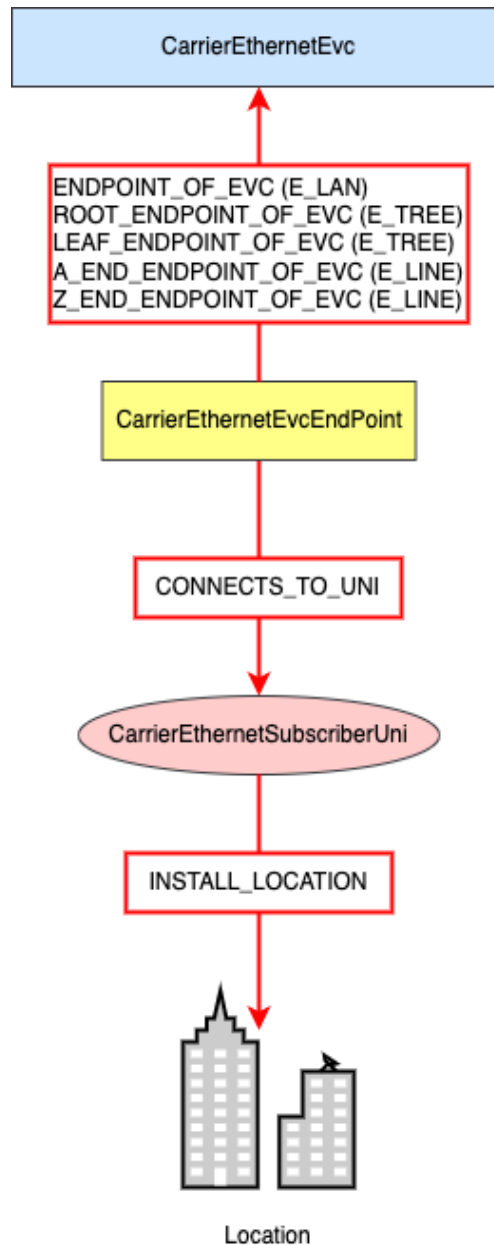


Figure 11-Subscriber Carrier Ethernet Service Relationships

14.2 Operator Ethernet Services Relationships Between Entities

This section describes the constraints and relationships between the four primary Service Order Items (OVC, OVC End Point, ENNI Service and Operator UNI) for Operator Ethernet Services.

The Operator Ethernet Service is associated with exactly one OVC (with appropriate Service Attribute values), but depends on two other services, OVC End Points, Operator UNI and ENNI Service. The relationship between the OVC (CarrierEthernetOvc) and the associated OVC End Points

(CarrierEthernetOvcEndPoints) and OVC End Points and Operator UNI (CarrierEthernetOperatorUni) and EnniService are captured in the service-agnostics part of the Service Order API.

A Service Order is composed of one or more Service Order Items. This is supported in the service-agnostic part of the Service Order API. The service-specific payload (Carrier Ethernet Services) is where the main components are supported as part of Carrier Ethernet Service Schemas. Each Service Order Item is then associated with a service-specific orderable component (i.e., OVC) which is within the payload.

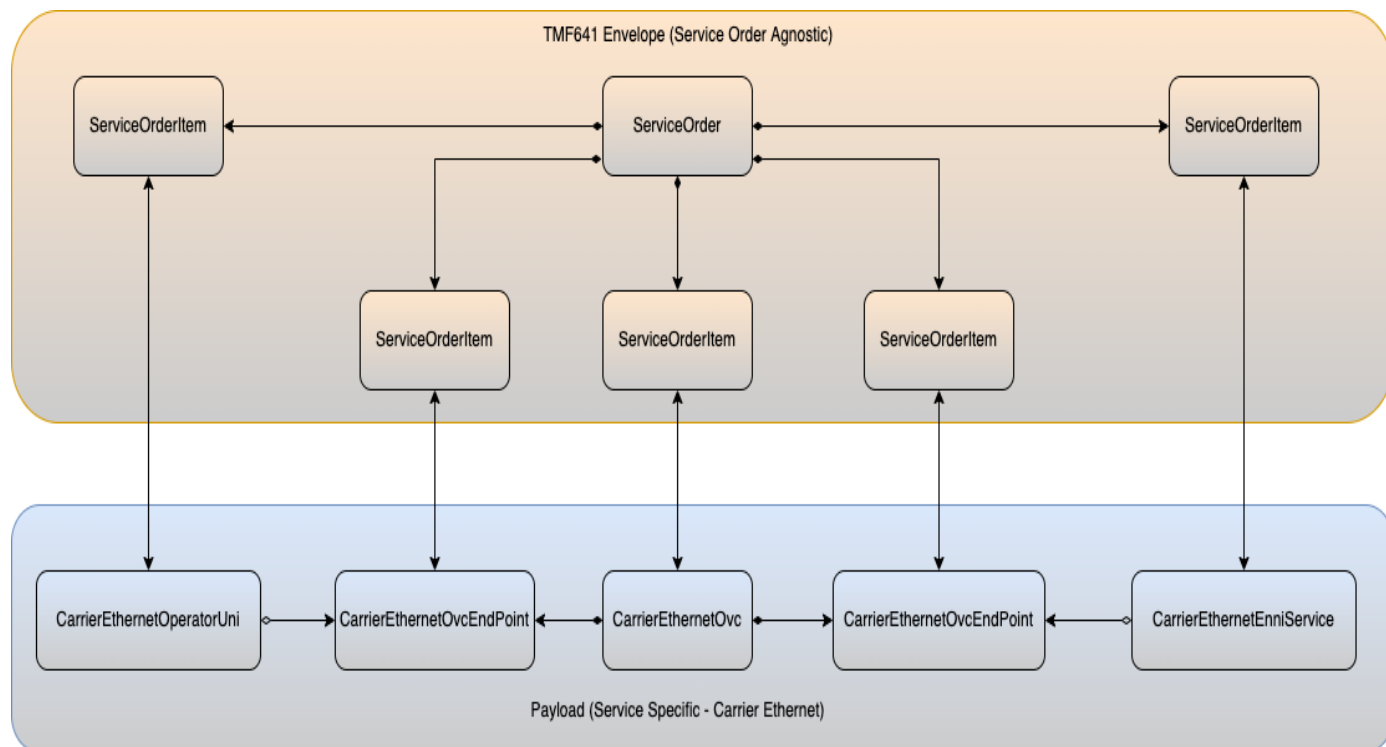


Figure 12-Operator Carrier Ethernet Service Order API Associations

The relationships between each of the Service Order Items for Operator Carrier Ethernet Services are shown in Table 5. The values in the Relationship Type column are used in the *relationshipType* field of the *OrderItemRelationship* types. Specification of Operator UNI, OVC and ENNI Service are mandatory at INSTALL and CHANGE of the service.

Source Service Resource	Relationship Type	Cardinality	Target Service Resource
CarrierEthernetOvcEndPoint	UNI_ENDPOINT_OF_OVC	1.. *	CarrierEthernetOvc
CarrierEthernetOvcEndPoint	ENNI_ENDPOINT_OF_OVC	1.. *	CarrierEthernetOvc
CarrierEthernetOvcEndPoint	CONNECTS_TO_OPERATOR_UNI	1	CarrierEthernetOperatorUni
CarrierEthernetOvcEndPoint	CONNECTS_TO_ENNI	1	CarrierEthernetEnniService

Table 5-Operator Carrier Ethernet Service Relationship Roles

- [R25]** For an Operator Carrier Ethernet Service, the Relationship Type field of the Service Relationship Order Item Relationship types **MUST** contain the value shown in the Relationship Type column in Table 5. **Błąd! Nie można odnaleźć źródła odwołania.**
- [R26]** For Service Order, the relationship to an Operator UNI **MUST** be specified for every INSTALL of, or CHANGE to, an Operator Ethernet Service.
- [R27]** For Service Order, the relationship to an ENNI Service **MUST** be specified for every INSTALL of, or CHANGE to, an Operator Ethernet Service.
- [R28]** For an Operator Carrier Ethernet Service, the relationship to an OVC **MUST** reference an OVC Service Order Item.
- [R29]** For a CHANGE to Operator Carrier Ethernet Service the relationship to the Operator UNI **MUST NOT** be changed from the value present in the Service Inventory.
- [R30]** For a CHANGE to Operator Carrier Ethernet Service the relationship to the ENNI Service **MUST NOT** be changed from the value present in the Service Inventory.

The Operator UNI, ENNI Service and OVC End Points are included with the OVC for an Operator Access Carrier Ethernet Service Order. The Operator UNI is associated with a specific INSTALL_LOCATION and is required at INSTALL and CHANGE. The ENNI Service is associated with a specific INSTALL_LOCATION. Once an Operator UNI is associated with a specific location, the INSTALL_LOCATION cannot be changed. Once an ENNI Service is associated with a specific location, the INSTALL_LOCATION cannot be changed. The install location is captured in the service-agnostic part of the Service Order API. The value in the Place Relationship Role column in the table below is used in the role field of the *RelatedPlaceRefOrValue* type.

The ENNI Services and OVC End Points are included with the OVC for an Operator Transit Carrier Ethernet Service Order. Each ENNI Service is associated with a specific INSTALL_LOCATION and required at INSTALL and CHANGE. The set of ENNI Services are each associated with a specific INSTALL_LOCATION. Once an ENNI Service is associated with a specific location, the INSTALL_LOCATION cannot be changed. The install location is captured in the service-agnostic part of the Service Order API. The value in the Place Relationship Role column in the table below is used in the role field of the *RelatedPlaceRefOrValue* type.

Service Resource	Place Relationship Role	INSTALL	CHANGE
CarrierEthernetOperatorUni	INSTALL_LOCATION	Mandatory	Mandatory
CarrierEthernetEnniService	INSTALL_LOCATION	Mandatory	Mandatory

Table 6-Operator Carrier Ethernet Place Relationship Role

[R31] For a Operator Carrier Ethernet service, the Role filed (*role*) of the Related Place (*RelatedPlaceRefOrValue*) type **MUST** contain one of the values show in the Place Relationship Role column in Table 6.

[R32] For Service Order, the Related Place (*RelatedPlaceRefOrValue*) **MUST** be specified for every INSTALL of, or CHANGE to, an Operator UNI.

[R33] For Service Order, the Related Place (*RelatedPlaceRefOrValue*) **MUST** be specified for every INSTALL of, or CHANGE to, an ENNI Service.

[R34] For a CHANGE to an Operator UNI the Related Place **MUST NOT** be changed from the value present in the Service Inventory.

[R35] For a CHANGE to an ENNI Service the Related Place **MUST NOT** be changed from the value present in the Service Inventory.

Changing the Operator UNI Location is not supported for an Operator UNI. The value included in a CHANGE request must be identical to the value in the Inventory. Changing the ENNI Service Location is not supported for an ENNI Service. The value included in a CHANGE request must be identical to the value in the Inventory. The relationships applicable to Operator Access and Transit Carrier Ethernet Services are show in the following diagrams:

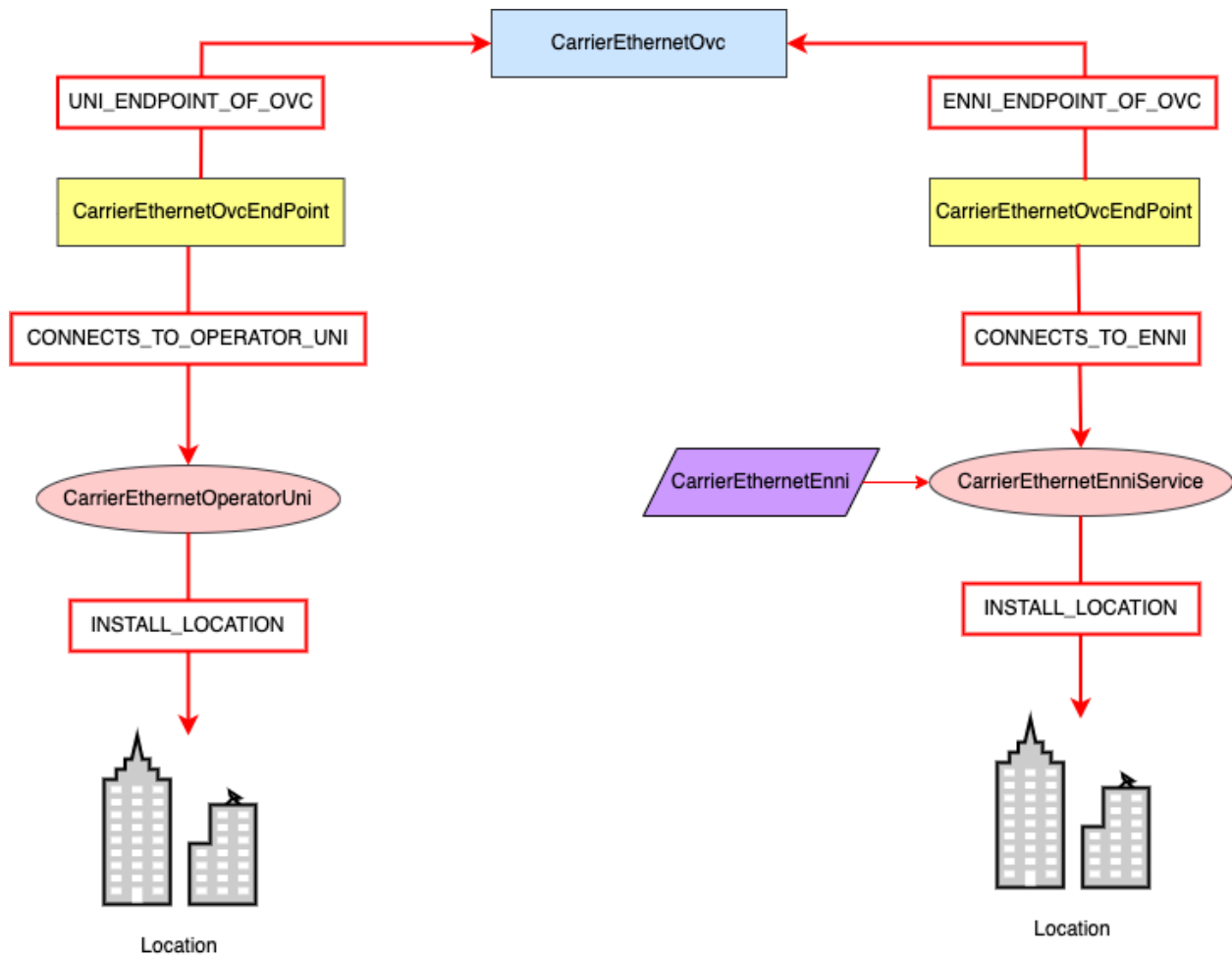


Figure 13-Operator Carrier Ethernet Access Services Relationships

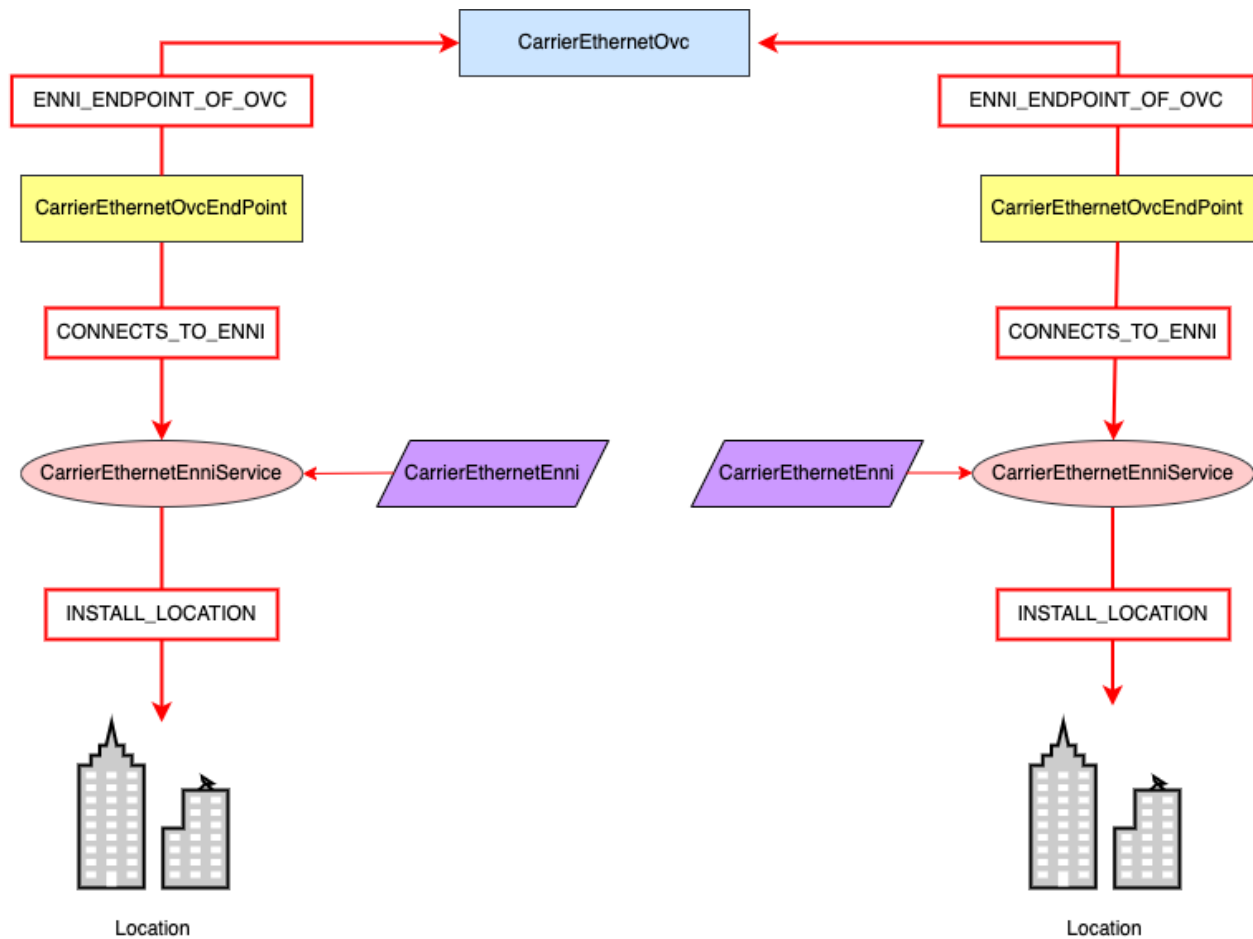


Figure 14-Operator Carrier Ethernet Transit Services Relationships

15 Carrier Ethernet Super-classes

The following section defines the set of superclasses that are used by the Carrier Ethernet data models. The superclass resources are CarrierEthernetExternalInterface, CarrierEthernetServiceEndPoint, CarrierEthernetService and CarrierEthernetUni. These are superclasses for CarrierEthernetEnni, CarrierEthernetSubscriberUni, CarrierEthernetOperatorUni, CarrierEthernetSvcEndPoint, CarrierEthernetOvcEndPoint, CarrierEthernetSvc and CarrierEthernetOvc. The data model encoding uses the 'all-of' directive when inheriting a superclass.

15.1 CarrierEthernetExternalInterface

The CarrierEthernetExternalInterface represents the physical or virtual Ethernet interface used for Ethernet services. This is an abstract class and the superclass. It contains the common attributes of ENNI, Subscriber UNI and Operator UNI.

Schema File Name: ip/carrierEthernetExternalInterface.yaml			
Attribute Name	Type	Multiplicity	Description
administrativeState	AdminState	1	This attribute denotes the administrative state of Subscriber UNI, Operator UNI or ENNI. The values supported are LOCKED and UNLOCKED. When set to UNLOCKED, the Carrier Ethernet External Interface (Subscriber UNI, Operator UNI or ENNI) is enabled and ready to forward traffic. When set to LOCKED, the Carrier Ethernet External Interface is disabled and will block (i.e., not forward) traffic. Reference MEF-Types.
operationalState	OperationalState	1	This attribute denotes the operational state of the Carrier Ethernet Interface (Subscriber UNI, Operator UNI, ENNI), as working ENABLED or not working DISABLED. Reference MEF-Types.

Schema File Name: ip/carrierEthernetExternalInterface.yaml			
Attribute Name	Type	Multiplicity	Description
externalInterfaceFrameFormat	EthernetFrameFormat	1	Specifies the allowed formats of External Interface Frames (i.e., Service Frames at a UNI or ENNI Frames at an ENNI). Reference MEF 10.4 Section 9.7 Subscriber UNI Service Frame Format Service Attribute and MEF 26.2 Section 14.7 Operator UNI Service Frame Format Service Attribute.
linkOam	EnabledDisabled	1	Controls when and how Link OAM per IEEE Std 802.3-2015 is run on the physical links in the External Interface. Reference MEF 10.4 Section 9.13 Subscriber UNI Link OAM Service Attribute, MEF 26.2 Section 9.9 ENNI Link OAM Common Attribute and MEF 26.2 Section 14.14 Operator UNI Link OAM Service Attribute.
l2cpPeering	L2cpPeering	0..*	Specifies the Layer 2 Control Protocols that are peered at the EI, as described in MEF 45.1. Reference MEF 10.4 Section 9.17 Subscriber UNI L2CP Peering Service Attribute, MEF 26.2 Section 10.1 ENNI L2CP Peering Multilateral Attribute. L2CP Peering applied to UNI and MEF 26.2 Section 14.21 Operator UNI L2CP Peering Service Attribute.
lagLinkMeg	EnabledDisabled	1	Indicates whether a LAG link MEG is instantiated on each physical link in the EI, if the EI has more than one physical link. Reference MEF 10.4 Section 9.15 Subscriber UNI LAG Link MEG Service Attribute, MEF 26.2 Section 9.8 ENNI LAG Link MEG Common Attribute and MEF 26.2 Section 14.16 Operator UNI LAG Link MEG Service Attribute.

Schema File Name: ip/carrierEthernetExternalInterface.yaml			
Attribute Name	Type	Multiplicity	Description
meg	EnabledDisabled	1	Indicates whether a MEP is instantiated at the EI for the UNI MEG or ENNI MEG. Reference MEF 10.4 Section 9.14 Subscriber UNI MEG Service Attribute, MEF 26.2 Section 9.7 ENNI MEG Common Attribute and MEF 26.2 Section 14.15 Operator UNI MEG Service Attribute.
aggregationLinkMap	ConversationIdToAggregationLinkMap	0..*	A mapping of Port Conversation IDs (i.e., VLAN IDs) to physical links, if there are multiple physical links in the EI and the link aggregation is All-Active. Reference MEF 10.4 Section 9.6 Subscriber UNI Port Conversation ID to Aggregation Link Map Service Attribute, MEF 26.2 Section 9.6 ENNI Port Conversation ID to Aggregation Link Map Common Attribute and MEF 26.2 Section 14.6 Operator UNI Port Conversation ID to Aggregation Link Map Service Attribute.
maximumFrameSize	PositiveInteger	1	Specifies the maximum size of EI Frames that can be transmitted across EI. Reference MEF 10.4 Section 9.8 Subscriber UNI Maximum Service Frame Size Service Attribute, MEF 26.2 Section 14.8 Operator UNI Maximum Service Frame Size Service Attribute and MEF 26.2 Section 10.3 ENNI Maximum Frame Size Multilateral Attribute.
linkAggregation	LinkAggregation	1	The method for protection against a physical link failure, if the EI has more than one physical link. Reference MEF 10.4 Section 9.5 Subscriber UNI Link Aggregation Service Attribute, MEF 26.2 Section 9.5 ENNI Link Aggregation Common Attribute and MEF 26.2 Section 14.5 Operator UNI Link Aggregation Service Attribute.

Table 7-CarrierEthernetExternalInterface Attributes

15.2 CarrierEthernetUni

The UNI represents the Physical Interface used for Ethernet services with common attributes. This is an abstract class and the super class. It contains the common attributes of Operator UNI and Subscriber UNI.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Inherits from CarrierEthernetExternalInterface.yaml			
Attribute Name	Type	Multiplicity	Description
maximumNumberOfEndPoints	PositiveInteger	1	An integer greater than or equal to 1 that limits the number of EVC/OVC End Points that can be located at the Subscriber UNI or Operator UNI. Reference MEF 10.4 Section 9.9 Subscriber UNI Maximum Number of EVC EPs Service Attribute and MEF 26.2 Section 14.10 Operator UNI Maximum Number of OVC End Points Service Attribute.
maximumNumberOfCtagVlanIdsPerEndPoint	PositiveInteger	1	An integer greater than or equal to 1 that limits the number of C-Tag VLAN IDs that can map to each EVC/OVC End Point. Reference MEF 10.4 Section 9.10 Subscriber UNI Maximum Number of C-Tag VLAN IDs per EVC EP Service Attribute and MEF 26.2 Section 14.11 Operator UNI Maximum Number of CE-VLAN IDs per OVC End Point Service Attribute.
tokenShare	EnabledDisabled	1	An attribute that indicates whether Bandwidth Profile Envelopes containing more than one Bandwidth Profile Flow are supported by the Service Provider at the Subscriber UNI or Operator UNI. Reference MEF 10.4 Section 9.11 Subscriber UNI Token Share Service Attribute or MEF 26.2 Section 14.18 Operator UNI Token Share Service Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Inherits from CarrierEthernetExternalInterface.yaml			
Attribute Name	Type	Multiplicity	Description
envelopes	Envelope	0..*	The Envelopes and Envelope Coupling Flag values to which Bandwidth Profile Flows can be mapped. Reference MEF 10.4 Section 9.12 Subscriber UNI Envelopes Service Attribute and MEF 26.2 Section 14.19 Operator UNI Envelopes Service Attribute.
l2cpAddressSet	L2cpAddressSet	1	L2CP Address Set Service Attribute is defined in MEF 45.1. Reference MEF 10.4 Section 9.16 Subscriber UNI L2CP Address Set Service Attribute and MEF 26.2 Section 14.20 Operator UNI L2CP Address Set Service Attribute.

Table 8-CarrierEthernetUni Attributes

15.3 CarrierEthernetService

The CarrierEthernetService represents the EVC or the OVC. This is an abstract class and the superclass of EVC and OVC. It contains the common attributes of EVC and OVC.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
administrativeState	AdminState	1	This attribute denotes the administrative state of EVC or OVC. 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. Reference MEF-Types.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
operationalState	OperationalState	1	This attribute denotes the operational state of the EVC or the OVC, as working ENABLED or not working DISABLED.
cTagPcpPreservation	EnabledDisabled	1	Whether the value of the PCP field in the C-Tag in Ingress EI Frames is preserved when the Egress EI Frame also has a C-Tag. Reference MEF 26.2 Section 12.8 OVC CE-VLAN PCP Preservation Service Attribute and MEF 10.4 Section 8.5 EVC C-Tag PCP Preservation Service Attribute.
cTagDeiPreservation	EnabledDisabled	1	Whether the value of the DEI field in the C-Tag in Ingress Frames is preserved when the Egress EI Frame also has C-Tag. Reference MEF 26.2 Section 12.9 OVC CE-VLAN ID DEI Preservation Service Attribute and MEF 10.4 Section 8.6 EVC C-Tag DEI Preservation Service Attribute.
carrierEthernetSls	CarrierEthernetSls	0..1	Technical details of the service level in terms of Performance Objectives, agreed between the Service Provider and the Subscriber or between Service Provider and the Operator as part of the Service Level Agreement. A given SLS might contain 0,1 or more Performance Objectives for each Performance Metric. Reference MEF 10.4 Section 8.8 EVC Service Level Specification Service Attribute and MEF 26.2 Section 12.13 OVC Service Level Specification Service Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
connectionType	ConnectionType	1	Indicates the roles of OVC/EVC Endpoints associated with OVC/EVC. Point-to-Point, Multipoint-to-Multipoint, or Rooted-Multipoint. Reference MEF 10.4 Section 8.3 EVC Type Service Attribute and MEF 26.2 Section 12.2 OVC Type Service Attribute.
frameDisposition	FrameDisposition	1	Indicates whether unicast, multicast and broadcast EI Frames are delivered unconditionally to other EIs, delivered conditionally or discarded. Reference MEF 10.4 Section 8.4 EVC Data Service Frame Disposition Service Attribute and MEF 26.2 Section 12.14 OVC Frame Delivery Service Attribute.
listOfCosNames	String	1..*	Used to specify all the Class of Service Names supported by an EVC or OVC. Reference MEF 10.4 Section 8.7 EVC List of Class of Service Names Service Attribute and MEF 26.2 Section 12.12 OVC List of Class of Service Names Service Attribute.
maximumFrameSize	PositiveInteger	1	Maximum size of EI frames that can be carried over the EVC or OVC. Reference MEF 10.4 Section 8.10 EVC Maximum Service Frame Size Service Attribute and MEF 26.2 Section 12.6 OVC Maximum Frame Size Service Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
availableMegLevel	AvailableMegLevel	0..1	<p>The lowest MEG level for which SOAM Frames are not peered or discarded by the SP or Operator. If this attribute is not present there is no such level (that is, SOAM frames are all MEG levels may be peered or discarded by the SP or Operator). Reference MEF 10.4 Section</p> <p>8.11 EVC Available MEG Level Service Attribute and MEF 26.2 Section 12.15 OVC Available MEF Level Service Attribute.</p>

Table 9-CarrierEthernetService Attributes

15.4 CarrierEthernetServiceEndPoint

The CarrierEthernetServiceEndPoint represents the EVC End Point or the OVC End Point. This is an abstract class and the superclass of CarrierEthernetEvcEndPoint and OvcEndPoint. It contains the common attributes of CarrierEthernetEvcEndPoint and OvcEndPoint.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
administrativeState	AdminState	1	<p>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. Reference MEF-Types.</p>
operationalState	OperationalState	1	<p>This attribute denotes the operational state of the EVC End Point or the OVC End Point, as working ENABLED or not working DISABLED.</p>

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
ingressClassOfServiceMap	CosMap	1	The value is a triple of the form <F, M, P> where F is protocol field in the ingress EI Frame, M is a map that maps each possible value of the field F and absence of the field F to a Class of Service Name and P is a map of Layer 2 Control Protocol types as determined by the Protocol Identifier. NOTE: The value of F cannot be S-Tag PCP at an EVC End Point. Reference MEF 26.2 Section 16.6 OVC End Point Class of Service Identifier Service Attribute and MEF 10.4 Section 10.5 EVC EP Ingress Class of Service Map Service Attribute.
colorMap	ColorIdentifier	1	The mechanism by which the Color of an EI Frame is determined from context of the EI Frame for an OVC or EVC End Point. Attribute is a pair of the form <F,M> where: * F specifies which protocol field in the EI Frame is used to identify the color, * M is a map that can be used to assign Color to each Ingress EI Frame. Reference MEF 10.4 Section 10.6 EVC EP Color Map Service Attribute. Reference MEF 26.2 Section 16.7 OVC End Point Color Identifier Service Attribute.
ingressBandwidthProfilePerEndPoint	BwpFlow	0..1	Bandwidth Profile Flow parameters for all ingress EI Frames mapped to the OVC End Point or EVC End Point. Reference MEF 26.2 Section 16.10 Ingress Bandwidth Profile per OVC End Point Service Attribute. Reference MEF 10.4 Section 10.8 EVC EP Ingress Bandwidth Profile Service Attribute. The absence of this attribute corresponds to a Service Attribute of None.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
ingressBandwidthProfilePerCosName	BandwidthProfilePerClassOfServiceName	0..*	For each CoS Name listed, Bandwidth Profile Flow parameters for all ingress EI Frames mapped to that CoS Name at the EVC End Point or OVC End Point. Reference MEF 26.2 Section 16.12 Ingress Bandwidth Profile per Class of Service Name Service and MEF 10.4 Section 10.9 EVC EP Class of Service Name Ingress Bandwidth Profile Service Attribute.
sourceAddressMacLimit	SourceMacAddressLimit	0..1	Specifies a limit on the number of different Source MAC address for which ingress EI Frames at this EVC End Point or OVC End Point will be delivered. The absence of this attribute corresponds to a Service Attribute value of None. Reference MEF 10.4 Section 10.12 EVC EP Source MAC Address Limit Service Attribute and MEF 26.2 Section 16.15 OVC End Point Source MAC Address Limit Service Attribute.

743

Table 10-CarrierEthernetServiceEndPoint Attributes

16 Subscriber Carrier Ethernet Services Data Model

The following section provides a detailed data model for the Subscriber Carrier Ethernet Services. Each resource and corresponding attributes are represented. The three main resources for the Subscriber Carrier Ethernet Model are Subscriber UNI, EVC End Point and EVC. These main resources are subclassed from a set of superclasses. The superclasses are CarrierEtherExternalInterface, CarrierEthernetServiceEndPoint, CarrierEthernetService and CarrierEthernetUni. The Service Resources and corresponding Attributes based on the following Resources:

- CarrierEthernetSubscriberUni (inherits from CarrierEthernetUni and CarrierEthernetExternalInterface)
- CarrierEthernetEvcEndPoint (inherits from CarrierEthernetServiceEndPoint)
- CarrierEthernetEvc (inherits from CarrierEthernetService)

16.1 CarrierEthernetSubscriberUni

This resource represents the Ethernet User Network Interface demarcation point between the responsibility of the Service Provider and the responsibility of the Subscriber. Reference MEF 10.4 Section 9. Subscriber UNI Service Attributes.

NOTE: CarrierEthernetSubscriberUni inherits from CarrierEthernetExternalInterface.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetSubscriberUni.yaml			
urn:mef:iso:spec:legato:CarrierEthernetSubscriberUni:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
identifier	Identifier45	1	String that is used to allow the Subscriber and Service Provider to uniquely identify the UNI for operations purposes. Reference MEF 10.4 Section 9.1 Subscriber UNI ID Service Attribute.
instantiation	Instantiation	1	The value is either Physical or Virtual. Reference MEF 10.4 Section 9.2 Subscriber UNI Instantiation Service Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetSubscriberUni.yaml			
urn:mef:iso:spec:legato:CarrierEthernetSubscriberUni:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
virtualFrameMap	VirtualFrameMap	0..1	A map for virtual frame mapping. The absence of this attribute corresponds to a Service Attribute value of Not Applicable. Reference MEF 10.4 Section 9.3 Subscriber UNI Virtual Frame Map Service Attribute.
listOfPhyLinks	SubscriberUniPhysicalLinks	0..*	A list of 4-tuples of the form <id,pl,fs,pt>, with one list item for each physical link. The value of id is an identifier for the physical link. The value of pl specifies a physical layer. fs indicates if synchronous Ethernet is used on the physical link corresponding to the 4-tuple and has the value either Enable or Disabled. The value pt indicates if the Precision Time Protocol is used on the physical link corresponding to the 4-tuple and has the value either Enabled or Disabled. The absence of this attribute corresponds to a Service Attribute value of Not Applicable. Reference MEF 10.4 Section 9.4 Subscriber UNI List of Physical Links Service Attribute.

Table 11-CarrierEthernetSubscriberUni Attributes

16.2 CarrierEthernetSvcEndPoint

A CarrierEthernetSvcEndPoint is a construct at a UNI that selects a subset of the Service Frames that pass over the UNI. A CarrierEthernetSvcEndPoint represents the logical attachment of an EVC to a UNI. Reference MEF 10.4 Section 10 EVC EP Service Attributes.

NOTE: CarrierEthernetSvcEndPoint inherits from CarrierEthernetServiceEndPoint.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetSvcEndPoint.yaml urn:mef:iso:spec:legato:CarrierEthernetSvcEndPoint:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
identifier	Identifier45	1	A string that is used to allow the Subscriber and Service Provider to uniquely identify the CarrierEthernetSvcEndPoint for operations purposes. Reference MEF 10.4 Section 10.1 EVC EP ID Service Attribute.
role	SvcEndPointRole	1	Indicates how Service Frames mapped to the EVC End Point can be forwarded. Reference MEF 10.4 Section 10.3 EVC EP Role Service Attribute.
svcEndPointMap	VlanIdListOrUntag	1	The value of this attribute is one of List, All or UT/PT. The information that determines which Service Frames are mapped to the EVC End Point. Reference MEF 10.4 Section 10.4 EVC EP Map Service Attribute.
egressMap	SvcEpEgressMap	0..*	Attribute is a map of the form <Corresponding Ingress Service Frame Class of Service Name, Corresponding Ingress Service Frame Color> to either <Egress Service Frame C-Tag PCP value, Egress Service Frame C-Tag DEI value> or Discard. Reference MEF 10.4 Section 10.7 EVC EP Egress Map Service Attribute.
egressBandwidthProfilePerEndPoint	EgressBwpFlow	0..1	Attribute used to limit the rate of all Egress Service Frames mapped to an EVC EP at a UNI. Reference MEF 10.4 Section 10.10 EVC EP Egress Bandwidth Profile Service Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetEvcEndPoint.yaml			
urn:mef:iso:spec:legato:CarrierEthernetEvcEndPoint:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
egressBandwidthProfilePerCosName	ClassOfServiceEgressBandwidthProfile	0..*	Used to limit the rate of all Egress Service Frames with a given Class of Service Name, as determined at the ingress UNI for each frame per the EVC EP Ingress Class of Service Map Service Attribute. Reference MEF 10.4 Section 10.11 EVC EP Class of Service Name Egress Bandwidth Profile Service Attribute.
subscriberMegMip	MegLevel	0..1	Integer in the range 0-7 that indicates the MEG Level of a Subscriber MEG MIP. Reference MEF 10.4 Section 10.13 EVC EP Subscriber MEG MIP Service Attribute. The absence of this attribute corresponds to a Service Attribute value of None.

Table 12-CarrierEthernetEvcEndPoint Attributes

16.3 CarrierEthernetEvc

An EVC is an association of two or more EVC End Points (EVC EPs). Reference MEF 10.4 Section 7.8 Ethernet Virtual Connection, EVC End Point and EVC EP Map Service Attribute.

NOTE: CarrierEthernetEvc inherits from CarrierEthernetService.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetEvc.yaml			
urn:mef:iso:spec:legato:CarrierEthernetEvc:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
identifier	Identifier45	1	Used to identify an EVC within the SP Network. Reference MEF 10.4 Section 8.1 EVC ID Service Attribute.

Table 13-CarrierEthernetEvc Attributes

17 Operator Carrier Ethernet Services Data Model

The following section provides a detailed data model for the Operator Carrier Ethernet Services. Each resource and corresponding attributes are represented. The seven main resources for the Operator Carrier Ethernet Model are Operator UNI, OVC End Point, ENNI Service, ENNI, ENNI Common, VUNI and OVC. Several main resources are subclassed from a set of superclasses. The superclasses are CarrierEtherExternalInterface, CarrierEthernetServiceEndPoint, CarrierEthernetService and CarrierEthernetUni. The Service Resources and corresponding Attributes based on the following Resources:

- CarrierEthernetOperatorUni (inherits from CarrierEthernetUni and CarrierEthernetExternalInterface)
- CarrierEthernetOvcEndPoint (inherits from CarrierEthernetServiceEndPoint)
- CarrierEthernetOvc (inherits from CarrierEthernetService)
- CarrierEthernetEnni (inherits from CarrierEthernetExternalInterface)
- CarrierEthernetEnniService
- CarrierEthernetCommon
- CarrierEthernetVirtualUni

17.1 CarrierEthernetEnni

The ENNI is a reference point representing the boundary between two or more Operator CENs that are operated as separate administrative domains. The class represents the ENNI attributes that are agreed between the operators on either side of the ENNI, in addition to certain other Service Provider/Operators as described in MEF 26.2 [3]. The CarrierEthernetEnni object will likely be used mostly for querying as part of an inventory request. It is likely that the instantiation and activation of the CarrierEthernetEnni will be done by both parties during a network activation phase and not as part of service activation.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetEnni.yaml			
urn:mef:iso:spec:legato:CarrierEthernetEnni:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
peeringIdentifier	Identifier45	1	An identifier for the ENNI intended for operations purposes by the interconnecting Operators at the ENNI. Reference MEF 26.2 Section 9.1 ENNI Peering Identifier Common Attribute.
numberOfLinks	PositiveInteger	1	The number of physical links in the ENNI. Reference MEF 26.2 Section 9.4 ENNI Number of Links Common Attribute.
physicalLayer	PhysicalLayer	1..*	The physical layer of each of the links supporting the ENNI. Reference MEF 26.1 Section 9.2 ENNI Physical Layer Common Attribute.
taggedL2cpFrameProcessing	TaggedL2cpProcessing	1	Specifies the processing behavior for tagged Layer 2 Control Protocols. Reference MEF 26.2 Section 10.2 ENNI Tagged L2CP Frame Processing Multilateral Attribute.

Table 14-CarrierEthernetEnni Attributes

17.2 CarrierEthernetEnniService

This class represents the ENNI Service Attributes for an ENNI used by a particular SP/SO. For each instance of an ENNI, there can be multiple sets of ENNI Service Attributes. The value for each ENNI Service Attribute in a set for an Operator CEN is specific to a SP/SO that is using the ENNI. Reference MEF 26.2 Section 13 ENNI Service Attributes.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetEnniService.yaml			
urn:mef:iso:spec:legato:CarrierEthernetEnniService:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
operatorEnniIdentifier	Identifier45	1	An identifier for the ENNI intended for management purposes. Reference MEF 26.2 Section 13.1 Operator ENNI Identifier Service Attribute.
sVlanIdControl	SVlanIdControl	1	The degree to which a SP/SO can use S-VLAN IDs to map to OVC End Points. Reference MEF 26.2 Section 13.2 S-VLAN ID Control Service Attribute.
maximumNumberOfOvcs	PositiveInteger	1	The maximum number of OVCs that the Operator CEN can support at the ENNI. Reference MEF 26.2 Section 13.3 Maximum Number of OVCs Service Attribute.
maximumNumbeOfOvcEndPointsPerOvc	PositiveInteger	1	The maximum number of OVC End Points that the Operator CEN can support at the ENNI for an OVC. Reference MEF 26.2 Section 13.4 Maximum Number of OVC End Points per OVC Service Attribute.
tokenShare	EnabledDisabled	1	An indication of the support of mapping more than one Bandwidth Profile Flow to an Envelope at the ENNI. Reference MEF 26.2 Section 13.5 ENNI Token Share Service Attribute.
envelopes	Envelope	0..*	The Envelopes and corresponding Envelope Coupling Flag value to which Bandwidth Profile Flows can be mapped. Reference MEF 26.2 Section 13.6 ENNI Envelopes Service Attribute.

Table 15-CarrierEthernetEnniService Attributes

17.3 CarrierEthernetOvcEndPoint

This class represents an OVC End Point which is a logical entity at a given External Interface that is associated with a distinct set of frames passing over that External Interface. Reference MEF 26.2 Section 16 OVC End Point Service Attributes.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetOvcEndPoint.yaml			
urn:mef:iso:spec:legato:CarrierEthernetOvcEndPoint:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
identifier	Identifier45	1	An identifier for the OVC End Point intended for operating purposes. Reference MEF 26.2 Section 16.1 OVC End Point Identifier Service Attribute.
role	OvcEndPointRole	1	Indicates how EI Frames mapped to the OVC End Point can be forwarded. Reference MEF 26.2 Section 16.4 OVC End Point Role Service Attribute.
endPointMap	OvcEndPointMap	1	The information that determines which EI Frames are mapped to the OVC End Point. Reference MEF 26.2 Section 16.5 OVC End Point Map Service Attribute.
egressMap	OvcEpEgressMap	0..*	The specification of the content of the S-Tag and/or C-Tag PCP value and DEI value for egress EI Frames. Reference MEF 26.2 Section 16.8 OVC End Point Egress Map Service Attribute.
egressEquivalenceClassIdentifier	EecMap	1	The mechanism that allows an Egress Equivalence Class Name to be determined for an egress EI Frame. Reference MEF 26.2 Section 16.9 OVC End Point Egress Equivalence Class Identifier Service Attribute.
egressBandwidthProfilePerEndPoint	BwpFlow	0..1	Bandwidth Profile Flow parameters for all egress EI Frames mapped to the OVC End Point Reference MEF 26.2 Section 16.11 Egress Bandwidth Profile per OVC End Point Service Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetOvcEndPoint.yaml			
urn:mef:iso:spec:legato:CarrierEthernetOvcEndPoint:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
egressBandwidthProfilePerEec	BandwidthProfilePerEquivalenceClassName	0..*	For each EEC Name listed, Bandwidth Profile Flow parameters, for all egress EI Frames mapped to that EEC Name at the OVC End Point. Reference MEF 26.2 Section 16.13 Egress Bandwidth Profile per Egress Equivalence Class Name Service Attribute.
aggregationLinkDepth	AggLinkDepth	0..1	The number of ENNI links that can carry ENNI Frames for each S-VLAN ID mapped to the OVC End Point. Reference MEF 26.2 Section 16.14 OVC End Point Aggregation Link Depth Service Attribute.
maintenanceIntermediatePoint	EnabledDisabled	1	The indication of the instantiation of a MIP. Reference MEF 26.2 Section 16.16 OVC End Point MIP Service Attribute.
maintenanceEndPointList	MepLevelAndDirection	0..*	The MEPs enable for the OVC End Point. Reference MEF 26.2 Section 16.17 OVC End Point Maintenance End Point List Service Attribute.

Table 16-CarrierEthernetOvcEndPoint Attributes

17.4 CarrierEthernetOperatorUni

This class represents the Operator UNI Service Attributes that are agreed on by the SP/SO and the Operator for each UNI.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetOperatorUni.yaml			
urn:mef:iso:spec:legato:CarrierEthernetOperatorUni:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
identifier	Identifier45	1	An identifier for the UNI intended for management purposes. Reference MEF 26.2 Section 14.1 Operator UNI Identifier Service Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetOperatorUni.yaml			
urn:mef:iso:spec:legato:CarrierEthernetOperatorUni:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
synchronousMode	SyncModePerLink	1..*	The specification of which physical links can be used as a frequency synchronization reference. Reference MEF 26.2 Section 14.3 Operator UNI Synchronous Mode Service Attribute.
physicalLayer	PhysicalLayer	1..*	The physical layer of each of the links supporting the Operator UNI. Reference MEF 26.2 Section 14.2 Operator UNI Physical Layer Service Attribute.
numberOfLinks	PositiveInteger	1	The number of physical links at the UNI. Reference MEF 26.2 Section 14.4 Operator UNI Number of Links Service Attribute.
defaultCeVlanId	VlanId	1	The CE-VLAN ID value for untagged and priority tagged Service Frames. Reference MEF 26.2 Section 14.9 Operator UNI Default CE-VLAN ID Service Attribute.
ingressBandwidthProfile	BwpFlow	0..1	A Bandwidth Profile Flow for all ingress Frames at the UNI. Reference MEF 26.2 Section 14.12 Operator UNI Ingress Bandwidth Profile per UNI Service Attribute. The absence of this attribute corresponds to a Service Attribute value of Disabled.
egressBandwidthProfile	BwpFlow	0..1	A Bandwidth Profile Flow for all egress Frames at the UNI. Reference MEF 26.2 Section 14.13 Operator UNI Egress Bandwidth Profile per UNI Service Attribute. The absence of this attribute corresponds to a Service Attribute value of Disabled.
elmi	EnabledDisabled	1	The indication of support of E-LMI. Reference MEF 26.2 Section 14.17 Operator UNI E-LMI Service Attribute.

Table 17-CarrierEthernetOperatorUni Attributes

17.5 CarrierEthernetVuni

This class represents a Virtual UNI (VUNI) instantiated at an ENNI. Reference MEF 26.2 Section 15 Virtual UNI (VUNI), Feeder OVC, and Remote UNI (RUNI).

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetVirtualUni.yaml			
urn:mef:iso:spec:legato:CarrierEthernetVirtualUni:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
administrativeState	AdminState	1	This attribute denotes the administrative state of Virtual UNI. The values supported are LOCKED and UNLOCKED. When set to UNLOCKED, the Carrier Ethernet Virtual UNI is enabled and ready to forward traffic. When set to LOCKED, the Carrier Ethernet Virtual UNI is disabled and will block (i.e., not forward) traffic. Reference MEF-Types.
operationalState	OperationalState	1	This attribute denotes the operational state of the Carrier Ethernet Virtual UNI as working ENABLED or not working DISABLED. Reference MEF-Types.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetVirtualUni.yaml			
urn:mef:iso:spec:legato:CarrierEthernetVirtualUni:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
identifier	Identifier45	1	An identifier for the instance of the VUNI intended for operations purposes. Reference MEF 26.2 Section 15.1.1 VUNI Identifier Service Attribute.
sVlanId	VlanId	1	A value that allows mapping ENNI Frames to OVC End Points in the VUNI. Reference MEF 26.2 Section 15.1.2 VUNI S-VLAN ID Service Attribute.
defaultEnniCeVlanId	VlanId	1	The ENNI CE-VLAN ID value for ENNI Frames with no C-Tag or a C-Tag whose VLAN ID value is 0. MEF 26.2 Section 15.1.3 VUNI Default ENNI CE-VLAN ID Service Attribute.
maximumNumberOfOvcEndPoints	PositiveInteger	1	The maximum number of OVC End Points that can be in the VUNI. Reference MEF 26.2 Section 15.1.4 VUNI Maximum Number of OVC End Points Service Attribute.
maximumNumberOfEnniCeVlanIdsPerOvcEndPoint	PositiveInteger	1	The maximum number of ENNI CE-VLAN ID values that can be mapped to an OVC End Point that is in the VUNI. Reference MEF 26.2 Section 15.1.5 VUNI Maximum Number of ENNI CE-VLAN IDs per OVC End Point Service Attribute.
ingressBandwidthProfile	BwpFlow	0..1	A Bandwidth Profile Flow for all ingress Frames mapped to the VUNI. Reference MEF 26.2 Section 15.1.6 VUNI Ingress Bandwidth Profile Service Attribute.
egressBandwidthProfile	BwpFlow	0..1	A Bandwidth Profile Flow for all egress Frames mapped to the VUNI. Reference MEF 26.2 Section 15.1.7 VUNI Egress Bandwidth Profile Service Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetVirtualUni.yaml			
urn:mef:iso:spec:legato:CarrierEthernetVirtualUni:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
l2cpAddressSet	L2cpAddressSet	1	L2CP Address Set applied to VUNI. Reference MEF 26.2 Section 15.1.8 VUNI L2CP Address Set Service Attribute.
l2cpPeering	L2cpPeering	0..*	L2CP Peering applied to VUNI. Reference MEF 26.2 Section 15.1.9 VUNI L2CP Peering Service Attribute.
mepList	MepLevelAndDirection	0..*	The indication of the instantiation of a MEP. A list with each item specifying the MEG Level. Reference MEF 26.2 Section 15.1.10 VUNI Maintenance End Point List Service Attribute.

Table 18-CarrierEthernetVuni Attributes

17.6 CarrierEthernetOvc

This class represents an Operator Virtual Connection (OVC). Reference MEF 26.2 Section 8.8 Operator Virtual Connection.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetOvc.yaml			
urn:mef:iso:spec:legato:CarrierEthernetOvc:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
identifier	Identifier45	1	An identifier for the OVC intended for management purposes. Reference MEF 26.2 Section 12.1 OVC Identifier Service Attribute.
ovcType	ConnectionType	1	This is for EVC or OVC connection types, including point to point, multi-point and rooted multi-point. Reference MEF 26.2 Section 12.2 OVC Type Service Attribute and MEF 10.4 Section 8.3 EVC Type Service Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetOvc.yaml			
urn:mef:iso:spec:legato:CarrierEthernetOvc:v0.0.1:all			
Attribute Name	Type	Multiplicity	Description
maximumNumberOfUniOvcEndPoints	NaturalNumber	1	The bound on the number of OVC End Points at different UNIs that can be associated by the OVC. Reference MEF 26.2 Section 12.4 Maximum Number of UNI OVC End Points Service Attribute.
maximumNumberOfEnniOvcEndPoints	PositiveInteger	1	The bound on the number of OVC End Points at ENNIs that be associated by the OVC. Reference MEF 26.2 Section 12.5 Maximum Number of ENNI OVC End Points Service Attribute.
ceVlanIdPreservation	VlanIdPreservation	1	Indicates the relationship between the presence and value of the C-tag VLAN ID in Ingress EI Frames and the presence and value of the C-tag VLAN ID in corresponding Egress EI Frames. Reference MEF 26.2 Section 12.7 OVC CE-VLAN ID Preservation Service Attribute.
sVlanPcpPreservation	EnabledDisabled	1	A relationship between the S-VLAN PCP value of a frame at one ENNI and the S-VLAN PCP value of the corresponding frame at another ENNI. Reference MEF 26.2 Section 12.10 OVC S-VLAN PCP Preservation Service Attribute.
sVlanDeiPreservation	EnabledDisabled	1	A relationship between the S-VLAN DEI value of a frame at one ENNI and the S-VLAN DEI value of the corresponding frame at another ENNI. Reference MEF 26.2 Section 12.10 OVC S-VLAN PCP Preservation Service Attribute.
l2cpAddressSet	L2cpAddressSet	1	The subset of the Bridge Reserved Addresses that are Peered or Discarded. Reference MEF 26.2 Section 12.16 OVC L2CP Address Set Service Attribute.

Table 19-CarrierEthernetOvc Attributes

844

18 Common Classes and Types

This section is structure like the previous section but focuses on common classes and types used by the Service Attributes. Most of these are structured to support a variety of Carrier Ethernet Services. This section details the data types and enumerations that are used by the Carrier Ethernet Service model.

18.1 AdminState

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

Contains Enumeration Literals:

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

18.2 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.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
vlanId	VlanId	1	Ingress frame VLAN ID.
linkDepth	PositiveInteger	1	The number of links for the aggregation link.

Table 20-AggLinkDepth Attributes

18.3 AvailableMegLevel

This enumeration is for available MEG level, with value 0-7. NONE indicates that SOAM EI Frames are not guaranteed to pass over at any MEF level. Reference MEF 10.4 Section 8.11 EVC Available MEG Level and MEF 26.2 Section 12.15 OVC Available MEG Level Service Attribute.

Contains Enumeration Literals:

- 0-7:
 - MEG Level 0-7

18.4 BwpFlow

The BwpFlow object class represents the Bandwidth Profile Flow which includes the bandwidth profile parameters such as CIR, CIRmax, EIR, EIRmax, CBS, EBS, Coupling Flag, Color Mode, etc. The BwpFlow is associated with one of CarrierEthernetOperatorUni, CarrierEthernetSubscriberUni, CarrierEthernetVuni, BandwidthProfilePerClassOfServiceName, BandwidthProfilePerEecName; and with Envelope. Reference MEF 10.4 Section 12 Bandwidth Profiles and MEF 26.2 Section 17 Bandwidth Profiles.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
envelope	Envelope	1	Identifies the Envelope that the Bandwidth Profile Flow belongs to.
cbs	NaturalNumber	1	Attribute represents Committed Burst Size. Limits by how much, and for how long, the amount of traffic declared Green for this Bandwidth Profile Flow in the short term can exceed the committed bandwidth made available to this Bandwidth Profile Flow over the long term in bytes.
cir	NaturalNumber	1	Attribute represents Committed Information Rate. When added to unused committed bandwidth* provided from higher-ranked Bandwidth Profile Flows (depending on the value of CF for the higher-ranked Bandwidth Profile Flows), limits the average rate in bits per second at which Service Frames for this Bandwidth Profile Flow can be declared Green.
cirMax	NaturalNumber	1	Attribute represents Maximum Committed Information Rate. Limits the average rate in bits per second at which Service Frames for this Bandwidth Profile Flow can be declared Green (regardless of unused committed bandwidth* from higher-ranked Bandwidth Profile Flows).
colorMode	ColorMode	1	Attribute represents color mode. Indicates whether Service Frames for this Bandwidth Profile Flow that are identified as Yellow on input to the Bandwidth Profile Algorithm can be declared Green or not.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
couplingFlag	Boolean	1	Attribute represents coupling flag. Determines whether unused committed bandwidth for this Bandwidth Profile Flow is made available as excess bandwidth for this Bandwidth Profile Flow or as committed bandwidth for the next lower-ranked Bandwidth Profile Flow. 0/FALSE means overflow green tokens are used as green tokens in the next lowest BWP Flow in the Envelope. 1/TRUE means they are used as yellow tokens for this BWP Flow.
ebs	NaturalNumber	1	Attribute represents Excess Burst Size. Limits by how much, and for how long, the amount of traffic declared Yellow for this Bandwidth Profile Flow in the short term can exceed the excess bandwidth made available to this Bandwidth Profile Flow over the long term.
eir	NaturalNumber	1	Attribute represents Excess Information Rate. When added to unused excess bandwidth from higher-ranked Bandwidth Profile Flows, and to unused committed bandwidth* (depending on the value of CF for this Bandwidth Profile Flow and CF^0 for the Envelope), limits the average rate in bits per second at which Service Frames for this Bandwidth Profile Flow can be declared Yellow.
eirMax	NaturalNumber	1	Attribute represents Maximum Excess Information Rate. Limits the average rate in bits per second at which Service Frames for this Bandwidth Profile Flow can be declared Yellow (regardless of unused excess bandwidth from higher-ranked Bandwidth Profile Flows or unused committed bandwidth).
envelopeRank	PositiveInteger	1	This attribute denotes the rank of the bandwidth profile flow in the envelope.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
tokenRequestOffset	Integer	1	Attribute represents Token Request Offset. Adjusts the bandwidth consumed by each Service Frame in the Bandwidth Profile Flow relative to the length of the Service Frame.

Table 21-BwpFlow Attributes

18.5 ConnectionType

This enumeration indicates the roles of OVC/EVC Endpoints associated with OVC/EVC. Point-to-Point, Multipoint-to-Multipoint, or Rooted-Multipoint. Reference MEF 10.4 Section 8.3 EVC Type Service Attribute and MEF 26.2 Section 12.2 OVC Type Service Attribute.

- MULTIPOINT:
- POINT_TO_POINT:
- ROOTED_MULTIPPOINT

18.6 ConversationIdToAggregationLinkMap

This is a Port Conversation ID to Aggregation Link Map as defined in IEEE Std 802.1AX-2014. Reference MEF 10.4 Section 9.6 Subscriber UNI Port Conversation ID to Aggregation Link Map Service Attribute and MEF 26.2 Section 9.6 ENNI Port Conversation ID to Aggregation Link Map Common Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
conversationId	NaturalNumber	1..*	The conversation ID is a Vlan ID or 0 for untagged or priority tagged frames.
linkNumberIdList	PositiveInteger	1..*	The link number ID of the aggregation link.

Table 22-ConversationIdToAggregationLinkMap Attributes

18.7 ColorFieldType

This enumeration is for selecting which frame field is being used for color indication. Reference MEF 10.4 Section 10.6 EVC EP Color Map Service Attribute and MEF 26.2 Section 16.7 OVC End Point Color Identifier Service Attribute.

- DEI:

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

18.8 ColorIdentifier

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. When the OVC End Point is at an ENNI but not in a VUNI the value of F is either S-Tag DEI or S-Tag PCP, and hence the DeiColorIdPac and PcpColorIdPac refer to the value of the S-Tag DEI and PCP fields. When the OVC End Point is in a VUNI or at a UNI, the value of F MUST be is one of OVC End Point, C-Tag DEI, PCP or DSCP, and hence the DeiColorIdPac and PcpColorIdPac refer to the value of the C-Tag DEI and PCP fields. Reference MEF 10.4 Section 10.6 EVC EP Color Map Service Attribute and MEF 26.2 Section 16.7 OVC End Point Color Identifier Service Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
dscpColorIdPac	DscpColorIdPac	0..2	This attribute represents the relationship between the ColorIdentifier and the DscpColorIdPac (representing the choice that maps DSCP values to Color).
deiColorIdPac	DeiColorIdPac	0..1	This attribute represents the relationship between the ColorIdentifier and the DeiColorIdPac (representing the choice that maps VLAN tag DEI to Color).

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
pcpColorIdPac	PcpColorIdPac	0..1	This attribute represents the relationship between the ColorIdentifier and the PcpColorIdPac (represents the relationship between the ColorIdentifier and the PcpColorIdPac (representing the choice that maps VLAN tag PCPs to Color).
sepColorIdPac	SepColorIdPac	0..1	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).
colorFieldType	ColorFieldType	1	This attribute determines which conditional package (among EVC/OVC End Point, PCP, DEI or DSCP) to be used as the Color Identifier.

Table 23-ColorIdentifier Attributes

18.9 ColorMode

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

- COLOR_AWARE:
- COLOR_BLIND:

18.10 CosIdentifier

The CosIdentifier 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). In the case of PCP, when an OVC End Point is at an ENNI but not in a VUNI, the PcpCosIdPac refers to the value of the S-Tag PCP field. When an OVC End Point is at a UNI or in a VUNI, or for any EVC End Point, the PcpCosIdPac refers to the value of the C-Tag PCP field. EI Frames of L2CP protocols may be identified by a Class of Service Identifier, mapping to specified CoS Name. Reference MEF 10.4 Section 10.5 EVC EP Ingress Class of Service Map Service Attribute and MEF 26.2 Section 16.6 OVC End Point Class of Service Identifier Service Attribute.

931

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
cosName	String	1	This attribute denotes the Class of Service name that the CosIdentifiers map to.
l2cpProtocolList	L2cpProtocol	0..*	This attribute lists the L2CP protocols that map to the Class of Service name.
sepCosIdPac	SepCosIdPac	0..1	This attribute represents the relationship between the CosName and the SepCosIdPac when the cosMappingType in CosMap is END_POINT and the cosName is not only for L2CP.
pcpCosIdPac	PcpCosIdPac	0..1	This attribute represents the relationship between the CosName and the PcpCosIdPac when cosMappingType in CosMap is PCP and the cosName is not only for L2CP.
dscpCosIdPac	DscpCosIdPac	0..2	This attribute represents the relationship between the CosName and the DscpCosIdPac when the cosMappingType in CosMap is DSCP and the cosName is not only for L2CP.

932

Table 24-CosIdentifier Attributes

18.11 CosMap

The CoS Map represents the mapping from fields in an Ingress EI Frame to a CoS Name. The map can be based on the EVC or OVC End Point, the S-Tag or C-Tag PCP value, or the DSCP field if the EI Frame is carrying an IP Packet. Reference MEF 10.4 Section 10.5 EVC EP Ingress Class of Service Map Service Attribute and MEF 26.2 Section 16.6 OVC End Point Class of Service Identifier Service Attribute.

938

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
cosMappingType	CosMappingType	1	This attribute identifies which field is used for the CoS Mapping.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
cosMapping	CosIdentifier	1..*	This attribute is a list of mappings, one per CoS Name. Each entry identifies the Cos IDs that map to the specified CoS Name.

Table 25-CosMap Attributes

18.12 CosMappingType

This enumeration is for selecting which frame field is being used in the Class of Service Map. Reference MEF 10.4 Section 10.5 EVC EP Ingress Class of Service Map Service Attribute and MEF 26.2 Section 16.6 OVC End Point Class of Service Identifier Service Attribute.

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

18.13 CosNameAndColorToDeiPac

The CosNameAndColorToDeiPac represents the Egress Map that maps from CoS Name and Ingress Color to DEI. Reference MEF 26.2 Section 16.8.2 OVC End Point Egress Map Service Attribute Form CC->S-Tag DEI and Section 16.8.5 OVC End Point Egress Map Form CC->C-Tag DEI.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
deiValue	DeiOrDiscard	1	This attribute denotes the egress frame DEI value, mapped from ingress CoS Name and ingress frame color.
ingressColor	FrameColor	1	This attribute denotes the ingress frame color as one of the determined factors for Egress Map.
ingressCosName	String	1	This attribute denotes the ingress CoS name.

Table 26-CosNameAndColorToDeiPac Attributes

18.14 CosNameAndColorToPcpPac

The CosNameAndColorToPcpPac represents the Egress Map that maps from CoS Name and Ingress Color to PCP. Reference MEF 26.2 Section 16.8.3 OVC End Point Egress Map Service Attribute Form CC->S-Tag PCP and 16.8.6 OVC End Point Egress Map Form CC->C-Tag PCP.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
pcpValue	PcpOrDiscard	1	This attribute denotes the egress frame PCP value, mapped from ingress CoS Name and ingress frame color.
ingressColor	FrameColor	1	This attribute denotes the ingress frame color as one of the determined factors for Egress Map.
ingressCosName	String	1	This attribute denotes the ingress CoS name.

Table 27-CosNameAndColorToPcpPac Attributes

18.15 CosNameToPcpPac

The CosNameToPcpPac represents the Egress Map that maps from CoS Name to PCP. Reference MEF 26.2 Section 16.8.1 OVC End Point Egress Map Service Attribute Form CN->S-Tag PCP and Section 16.8.4 OVC End Point Egress Map Form CN->C-Tag PCP.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
pcpValue	PcpOrDiscard	1	This attribute denotes the egress frame PCP value, mapped from ingress CoS Name.
ingressCosName	String	1	This attribute denotes the ingress CoS name.

Table 28-CosNameToPcpPac Attributes

18.16 DataSize

A value and a unit of measure that specifies a data size for example for a buffer or a burst size.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
dataSizeValue	Integer	1	The value in the data size. For example, if a burst size is 40 KBYTES, this element is 40.
dataSizeUnits	String	1	The unit of measure in the data size. For example, if a burst size is 40 KBYTES, this element is KBYTES. Note that the units indicate binary values, e.g., KBYTES is 1024 bytes.

Table 29-DataSize Attributes

18.17 DeiColorIdPac

This 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 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 or the ingress EI frames. NOTE: This is an object with no attributes. Reference MEF 26.2 Sections 16.7.1 OVC End Point Color Identifier Service Attribute with F=S-Tag DEI, 16.7.4.1 OVC End Point Color Identifier Service Attribute with F=C-Tag DEI and MEF 10.4 Section 10.6.2 EVC EP Color Map Service Attribute with F=C-Tag DEI.

18.18 DeiOrDiscard

This enumeration lists the DEI value for color or discard and is used for Egress Map.

- 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).
- DISCARD:

- Discard the egress frame when the Egress Map determines based on CoS Name (and Ingress Color).

18.19 DscpColorIdPac

This represents the Color Identifier that maps DSCP (IPv4 or IPv6) values to Color. Reference MEF 26.2 Section 16.7.6 OVC End Point Color Identifier Service Attribute with F=DSCP and MEF 10.4 Section 10.6.4 EVC EP Color Map Service Attribute with F=DSCP.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
dscpValueForGreenList	NaturalNumber	0..64	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	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.
ipVersion	IpVersion	1	This attribute denotes which IP version is used. It can be IPV4, IPV6 or IPV4_AND_IPV6.

Table 30-DscpColorIdPac Attributes

18.20 DscpCosIdPac

This represents the IP DSCP values that map to a given Class of Service Name (specified in CosIdentifier), for either EI Frames carrying IPv4 Packets, IPv6 Packets, or both. Reference MEF 10.4 Section 10.5.1.3 EVC EP Ingress Class of Service Map Service Attribute Based on Internet Protocol and MEF 26.2 Section 16.6.2.1.3 OVC End Point Class of Service Identifier Service Attribute for Ingress Data EI Frames Based on Internet Protocol.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
ipVersion	IpVersion	1	This attribute denotes the IP version for the DSCP. It can be IPv4, IPv6 or IPv4_AND_IPv6.
dscpValueList	DscpValue	1..*	This attribute is a list of DSCP values that maps to a CoS Name. If NO_IP_PACKET is included here, the ipVersion must be IPV4_AND_IPV6.

Table 31-DscpCosIdPac Attributes

18.21 DscpEecIdPac

This represents the IP DSCP values that map to a given Egress Equivalence Class Name (specified in EecIdentifier), for either EI Frames carrying IPv4 Packets, IPv6 Packets, or both. Reference MEF 26.2 Section 16.9.2.1.2 OVC End Point Egress Equivalence Class Identifier Service Attribute for Egress Data EI Frames Based on Internet Protocol.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
dscpValueList	DscpValue	1..*	This attribute is a list of DSCP values that maps to the EEC Name. If NO_IP_PACKET is included here, the ipVersion must be IPV4_AND-IPV6.
ipVersion	IpVersion	1	This attribute specifies the IP version for the DSCP. It can be IPV4 IPV6 or IPV4_AND_IPV6.

Table 32-DscpEecIdPac Attributes

18.22 EecIdentifier

The EecIdentifier represents the Egress Equivalence Class Identifier. Each egress EI Frame mapped to the given 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 PcpEecIdPac, or the DscpEecIdPac representing mapping to S-Tag PCP, C-Tag 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. It is possible to have only a single Egress Equivalence Class Name. For an OVC End Point at an ENNI that is not in a VUNI, pcpEecIdPac refers to the value of the S-Tag PCP field. For an OVC End Point at a UNI or in a VUNI, pcpEecIdPac refers to the value of the C-Tag PCP field. Reference MEF 26.2 Section 16.9 OVC End Point Egress Equivalence Class Identifier Service Attribute.

1023

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
dscpEecIdPac	DscpEecIdPac	0..2	This attribute represents the relationship between the EecIdentifier and a DscpEecIdPac if the eecMappingType in EecMap is DSCP and the eecName is not only for L2CP.
pcpEecIdPac	PcpEecIdPac	0..1	This attribute represents the relationship between the EecIdentifier and a PcpEecIdPac if the eecMappingType in EecMap is PCP and the eecName is not only for L2CP.
eecName	String	1	This attribute denotes the Egress Equivalence Class Name that the EecIdentifier maps to.
l2cpProtocolList	L2cpProtocol	0..*	This attribute lists the L2CP protocols that map to the Egress Equivalence Class Name.

1024

Table 33-EecIdentifier Attributes

18.23 EecMap

The Egress Equivalence Class Map represents the mapping from fields in an Egress EI Frame to an Egress Equivalence Class Name. The map can be based on the S-Tag or C-Tag PCP value, or the DSCP field if the EI Frame is carrying an IP Packet. Reference MEF 26.2 Section 16.9 OVC End Point Egress Equivalence Class Identifier Service Attribute.

1030

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
eecMappingType	EecMappingType	1	This attribute identifies which field is used for the EEC Mapping.
eecMapping	EecIdentifier	1..*	This attribute is a list of mappings, one per EEC Name. Each entry identifies the EEC IDs that map to the specified EEC Name.

1031

Table 34-EecMap Attributes

18.24 EecMappingType

This enumeration is for selecting which frame field being used in the Egress Equivalence Class Map. Reference MEF 26.2 Section 16.9 OVC End Point Egress Equivalence Class Identifier Service Attribute.

- DSCP:
 - Using DSCP field to map to the EEC Name.
- PCP:
 - Using PCP field to map to the EEC Name.

18.25 Envelope

This represents the UNI or ENNI Envelopes service attribute. Each Envelope consists of an Envelope ID and Envelope Coupling Flag. Defined in MEF-Common. Reference MEF 10.4 Section 12.1.1 Envelope Parameters and MEF 26.2 Section 17.1.1 Envelope Parameters.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
bwpList	BwpFlow	1..*	List of Bandwidth Profile Flows.
couplingFlagForIndexZero	Boolean	1	This attribute denotes the coupling flag for index zero. FALSE for 0 (overflow Green tokens are discarded) and TRUE for 1 (overflow Green tokens can be used as Yellow tokens).
envelopeId	Identifier45	1	The attribute is a string that identifies the Envelope.

Table 35-Envelope Attributes

18.26 EthernetFrameFormat

This is a single value read only attribute. Reference MEF 10.4 Section 9.7 Subscriber UNI Service Frame Format Service Attribute and MEF 26.2 Section 14.7 Operator UNI Service Frame Format Service Attribute.

- ETHERNET:
 - Ethernet MAC Frame conforming to Clause 3 of IEEE 802.3-2012.

18.27 EvcEpEgressMap

Represents an entry in the Egress Map that maps the Cos Name and Color assigned to an ingress Service Frame to the PCP and DEI values to set in the C-Tag of an egress Service Frame. It is associated with EVC End Point. Reference MEF 10.4 Section 10.7 EVC End Point Egress Map Service Attribute.

Schema File Name: urn:mef:lso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
cosName	String	1	The CoS Name assigned to the Service Frame at the ingress UNI.
color	FrameColor	1	The Color assigned to the Service Frame at the ingress UNI.
pcp	PcpOrDiscard	1	The PCP value to set in the C-tag of the egress Service Frame.
dei	DeiOrDiscard	1	The DEI value to set in the C-tag of the egress Service Frame.

Table 36-EvcEpEgressMap Attributes

18.28 EvcEndPointRole

This enumeration is indicating how external interface frames mapped to the EVC End Point can be forwarded. Reference MEF 10.4 Section 10.3 EVC EP Role Service Attribute:

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

18.29 FrameColor

This enumeration lists the Frame Color of either Green or Yellow.

- GREEN:
- YELLOW:

18.30 FrameDelivery

When the value is conditionally, the specific condition must be addressed by the users. What conditions should be supported are not in the scope. Reference MEF 10.4 Section 8.4 EVC Data Service Frame Disposition Service Attribute and MEF 26.2 Section 12.14.1 OVC Frame Disposition.

- CONDITIONALLY:
 - Frame will be delivered with specified condition.

- DISCARD:

Frame must be discarded.

- UNCONDITIONALLY:
 - Frame will be delivered unconditionally.

18.31 Identifier45

Data type attribute 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.

18.32 InformationRate

A value and a unit of measure that specifies an Information Rate.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
irValue	number	1	The value in the information rate. For example, if the information rate is 70 kbps this element is 70.
irUnits	string	1	The Color assigned to the Service Frame at the ingress UNI.

Table 37-InformationRate Attributes

18.33 IpVersion

This enumeration lists the IP versions.

- IPv4
- IPv6

18.34 L2cpAddressSet

Enumeration listing the L2CP Address Set. Reference MEF 45.1 Section 8.1 L2CP Address Set Service Attribute.

Contains Enumeration Literals:

- CTA:
 - CE-Vlan Tag Aware, for VLAN-based services where the CE-VLAN ID is used to map a frame to a service.
- CTB:
 - C-VLAN Tag Blind (CTB), for Port-based services where the CE-VLAN ID is not used to map a frame to a service.
- CTB2:
 - C-VLAN Tag Blind Option 2 (CTB-2), for point-to-point Port-based services that support the EPL Option 2 L2CP processing.

18.35 L2cpPeering

This is a list that specifies the L2CP Protocol Identifier and the Destination Address in use by the protocol entity. Reference MEF 45.1 Section 8.2 L2CP Peering Service Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
destinationAddress	NaturalNumber	1	Destination address for which frames will be peered.
linkIdList	Identifier45	0..*	Identifiers for the links on which the specified protocol will be peered. If no links are specified, the protocol is peered on all links.
protocolId	L2cpProtocol	1	Protocol ID for which frames will be peered.

Table 38-L2cpPeering Attributes

18.36 L2cpProtocol

This datatype defines a L2CP protocol (LLC address type or EtherType) with possible subtype. Reference MEF 45.1 Section 8.2 L2CP Peering Service Attribute.

1110

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
L2cpProtocol	L2cpProtocolType	1	This attribute specifies the type of L2CP protocol (i.e., LLC or EtherType).
llcAddressOrEtherType	NaturalNumber	1	This attribute specifies the LLC address or the EtherType value.
subType	NaturalNumber	0..1	This attribute specifies the subtype of the L2CP protocol.

1111

Table 39-L2cpProtocol Attributes

1112 18.37 L2cpProtocolType

1113 This lists the L2CP protocol types, either EtherType or LLC Address. Reference MEF 45.1 Section 8.2 L2CP
1114 Peering Service Attribute.

1115

1116 Contains Enumeration Literals:

- 1117 • ETHERTYPE:
 - 1118 ○ EtherType for L2CP, e.g., LLDP (0x88CC).
- 1119 • LLC:
 - 1120 ○ Logical Link Control sublayer address for L2CP, e.g., STP (0x42).

1121 18.38 MepDirection

1122 This lists the enumerations for MEP direction.

1123 Contains Enumeration Literals:

- 1124 • DOWN:
- 1125 • UP

1126 18.39 MepLevelAndDirection

1127 This datatype defines the MEG Level and MEP direction. Reference MEF 26.2 Section 16.17 OVC End Point
1128 Maintenance End Point List Service Attribute.

1129

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
direction	MepDirection	1	This is MEP direction, UP or DOWN.
level	NaturalNumber	1	This is the MEG level, value between 0..7.

Table 40-MepLevelAndDirection Attributes

18.40 OperationalState

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

Contains Enumeration Literals:

- DISABLED:
 - The resource is operationally disabled.
- ENABLED:
 - The resource is operationally enabled.

18.41 OvcEndPointRole

This enumeration is indicating how external interface frames mapped to the OVC End Point can be forwarded. Reference MEF 26.2 Section 16.4 OVC End Point Role Service Attribute.

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

18.42 OvcEpEgressMap

Represents the Egress 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 OVC End Point. Reference MEF 26.2 Section 16.8 OVC End Point Egress Map Service Attribute.

1151

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
egressMapType	OvcEgressMapType	1	This attribute determines which form to take to apply 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 to C-Tag PCP or CoS Name to S-Tag PCP.
cosNameAndColorToDeiPacList	CosNameAndColorToDeiPac	0..*	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).
cosNameAndColorToPcpPacList	CosNameAndColorToPcpPac	0..*	This attribute represents the relationship between the EgressMap and CosNameAndColorToPcpPac (representing the attribute set for using CoS Name and ingress color to egress PCP mapping).
cosNameToPcpPacList	CosNameToPcpPac	0..*	This attribute represents the relationship between the EgressMap and the CosNameToPcpPac (representing the attribute set for using CoS Name to egress PCP mapping).

1152

Table 41-OvcEpEgressMap Attributes

1153 18.43 OvcEpEgressMapType

1154 This lists the Egress Map types, either CoS Name to PCP, or CoS Name and Ingress Color to PCP, or CoS
1155 Name and Ingress Color to DEI for S-Tag or C-Tag. Reference MEF 26.2 Section 16.8 OVC End Point Egress
1156 Map Service Attribute.

- 1157 • CC_C_TAG_DEI:
 - 1158 ○ CoS Name and Color to C-Tag DEI egress map type.
- 1159 • CC_C_TAG_PCP:

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

18.44 PcpColorIdPac

Represents Color Identifier that maps VLAN Tag (S-Tag or C-Tag) PCP values to Color. For an EVC End Point or 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. Reference MEF 26.2 Section 16.7 OVC End Point Color Identifier and MEF 10.4 Section 10.6 EVC EP Color Map Service Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
pcpValueForGreenList	NaturalNumber	0..8	This attribute provides a list PCP values map to 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	This attribute provides a list PCP values map to 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 42-PcpColorIdPac Attributes

18.45 PcpCosIdPac

The PcpCosIdPac object class represents the PCP values that map to a given Class of Service Name (specified in CosIdentifier). For an EVC End Point, or an OVC End Point at UNI or in a VUNI, the PCP values are from the C-Tag in the ingress EI frames. For an OVC End Point at an ENNI and not in a VUNI, the PCP values are from the S-Tag in the ingress EI frames. Reference MEF 10.4 Section 10.5.1.2 EVC EP Ingress Class of Service Map Service Attribute Based on Priority Code Point Field and MEF 26.2 Section 16.6.2.1.2 OVC End Point Class of Service Identifier Service Attribute for Ingress Data EI Frames Based on C-Tag Priority Code Point.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
pcpValueList	PcpOrUntagged	1..*	This attribute is a list of PCP values that map to the CoS Name.

Table 43-PcpCosIdPac Attributes

18.46 PcpEeclDpac

This represents the PCP values that map to a given Egress Equivalence Class Name (specified in EeclIdentifier). For an OVC End Point at UNI or in a VUNI, the PCP values are from the C-Tag in the egress EI frames. For an OVC End Point at an ENNI and not in a VUNI, the PCP values are from the S-Tag in the egress EI frames. Reference MEF 26.2 Section 16.9.1.1 OVC End Point Egress Equivalence Class Identifier Service Attribute for Egress Data ENNI Frames Mapped to an OVC End Point at an ENNI that is not a VUNI.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
pcpValueList	PcpOrUntagged	1..*	This attribute provides a list of PCP values that map to Egress Equivalence Class Name.

Table 44-PcpEeclDpac Attributes

18.47 PcpOrDiscard

This enumeration lists the one of PCP values or DISCARD.

- 0:
- 1:
- 2:

- 1200 • 3:
- 1201 • 4:
- 1202 • 5:
- 1203 • 6:
- 1204 • 7:
- 1205 • DISCARD:

1206 **18.48 PcpOrUntagged**

1207 This enumeration lists the one of PCP values or UNTAGGED.

- 1208 • 0:
- 1209 • 1:
- 1210 • 2:
- 1211 • 3:
- 1212 • 4:
- 1213 • 5:
- 1214 • 6:
- 1215 • 7:
- 1216 • UNTAGGED: The EI Frame does not contain a C-Tag.

1217 **18.49 PhysicalLayer**

1218 An enumeration of all the physical layers specified in IEEE 802.3-2018[15] except for those relating to
1219 PON. Reference MEF 26.2 Section 9.2 ENNI Physical Layer Common Attribute and MEF 10.4 Section 9.4
1220 Subscriber UNI List of Physical Links Service Attribute.

1221 **18.50 PositiveInteger**

1222 Data type with single attribute, positive integer, which is an Integer > 0.

1223 **18.51 SepColorIdPac**

1224 Represents the Color Identifier that maps to the EVC End Point or the OVC End Point to Color.

1225

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
color	FrameColor	1	This attribute denotes the color of the EI frame, green or yellow.

Table 45-SepColorIdPac Attributes

18.52 SepCosIdPac

Represents the CoS Identifier that maps the EVC End Point or the OVC End Point to a Class of Service Name. NOTE: This object does not have attributes. Reference MEF 26.2 Section 16.6.2 OVC End Point Class of Service Identifier Service Attribute for an OVC End Point in a VUNI or at a UNI and MEF 10.4 Section 10.5.1.1 EVC EP Ingress Class of Service Map Attribute Based on EVC EP.

18.53 SourceMacAddressLimit

This limits the number of source MAC addresses that can be used in ingress external interface frame mapped to the End Point of all types over a time interval. Reference MEF 26.2 Section 16.15 OVC End Point Source MAC Address Limit Service Attribute and MEF 10.4 Section 10.12 EVC EP Source MAC Address Limit Service Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
limit	NaturalNumber	1	This attribute denotes the maximum acceptable source MAC addresses.
interval	NaturalNumber	1	This attribute denotes the time interval in milliseconds.

Table 46-SourceMacAddressLimit Attributes

18.54 SyncModePerLink

A link may consist of one or more physical ports. This data type includes the link ID and sync mode of the physical port associated to the link id. Reference MEF 26.4 Section 14.2 Operator UNI Physical Layer Service Attribute.

Attribute Name	Type	Multiplicity	Description
syncModeEnabled	Boolean	1	This attribute denotes whether the Synchronous Mode is enabled on the link with the Link ID.

Table 47-SyncModePerLinkAttributes

18.55 TaggedL2cpProcessing

Enumeration representing either 802.1 compliant or not compliant. Reference MEF 45.1 Section 8.3 ENNI Tagged L2CP Frame Processing Multilateral Attribute.

- 802_1_COMPLIANT:
- 802_1_NON_COMPLIANT:

18.56 TimeIntervalT

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

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
number	PostitiveInteger	1	This denotes the value (for the unit), e.g., 1 (month), 20 (day), etc.
unit	TimeIntervalUnit	1	Month, week, day, hour, etc.

Table 48-TimeIntervalT Attributes

18.57 TimeIntervalUnit

This enumeration represents time interval unit, e.g., month, day, week, hour, etc.

Contains Enumeration Literals:

- DAY:
- MONTH:
- WEEK:
- YEAR:

18.58 VlanId

Data type with single attribute, vlanId which is defined as a PostiveInteger. Value 1 to 4094. Reference MEF 10.4 Section 10.4 EVC EP Map Service Attribute and MEF 26.2 Section 14.9 Operator UNI Default CE-VLAN ID Service Attribute.

18.59 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 VLAN ID list is not applicable. Reference MEF 26.2 Section 16.5 OVC End Point Map Service Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
type	VlanIdMappingType	1	Can be LIST, or ALL, or EXCEPT.
vlanIdList	VlanId	0..*	This is a list of VLAN IDs.

Table 49-VlanIdListing Attributes

18.60 VlanIdListOrUntag

VLAN ID types, ALL for all VLAN IDs, LIST for a list of VLAN IDs, EXCEPT for all VLAN IDs except the listed, UNTAGGED to indicate that untagged and priority-tagged frames are mapped to this end point. Reference MEF 10.4 Section 10.4 EVC EP Map Service Attribute.

Schema File Name: urn:mef:iso:spec:legato:carrierEthernetCommon.yaml			
Attribute Name	Type	Multiplicity	Description
type	VlanIdMappingTypeOrUntag	1	Can be LIST, or ALL, or EXCEPT or UNTAGGED.
vlanIdList	VlanId	0..*	This is a list of VLAN IDs.

Table 50-VlanIdListOrUntag Attributes

18.61 VlanIdMappingType

Enumeration for VLAN ID types, ALL for all VLAN IDs, LIST for a list of VLAN IDs, EXCEPT for all VLAN IDs except the listed:

- ALL:

- 1282 ○ All VLAN IDs.
- 1283 • EXCEPT:
- 1284 ○ All VLAN IDs except the listed.
- 1285 • LIST:
- 1286 ○ List of VLAN IDs.

1287 **18.62 VlanIdMappingTypeOrUntag**

1288

1289 Enumeration for VLAN ID types, ALL for all VLAN IDs, LIST for a list of VLAN IDs, EXCEPT for all VLAN IDs
1290 except the listed, UNTAGGED to indicate untagged and priority-tagged frames are mapped to this end
1291 point.:

- 1292 • ALL:
- 1293 ○ All VLAN IDs.
- 1294 • EXCEPT:
- 1295 ○ All VLAN IDs except the listed.
- 1296 • LIST:
- 1297 ○ List of VLAN IDs.
- 1298 • UNTAGGED:
- 1299 ○ Untagged and priority-tagged frames.

1300 **18.63 VlanIdPreservation**

1301

1302 Enumeration for VLAN ID Preservation. Reference MEF 26.2 Section 12.7 OVC CE-VLAN ID Preservation
1303 Service Attribute.

1304

- 1305 • PRESERVE:
- 1306 ○ To achieve EVC CE-VLAN Preservation.
- 1307 • RETAIN:
- 1308 ○ C-Tag, if present, is encapsulated with the C-Tag VLAN ID value retained.
- 1309 • STRIP:

1310

- C-Tag is discarded.

19 Carrier Ethernet Service Level Specification (SLS)

The following section provides the details of the Carrier Ethernet Service Level Specification (SLS). Both the OVC and EVC services use the SLS model with association between Ordered Pairs or OVC(EVC) End Points. Reference MEF 10.4 [6] Section 8.8 EVC Service Level Specification Service Attribute and MEF 26.2 [8] Section 12.13 OVC Service Level Specification Service Attribute.

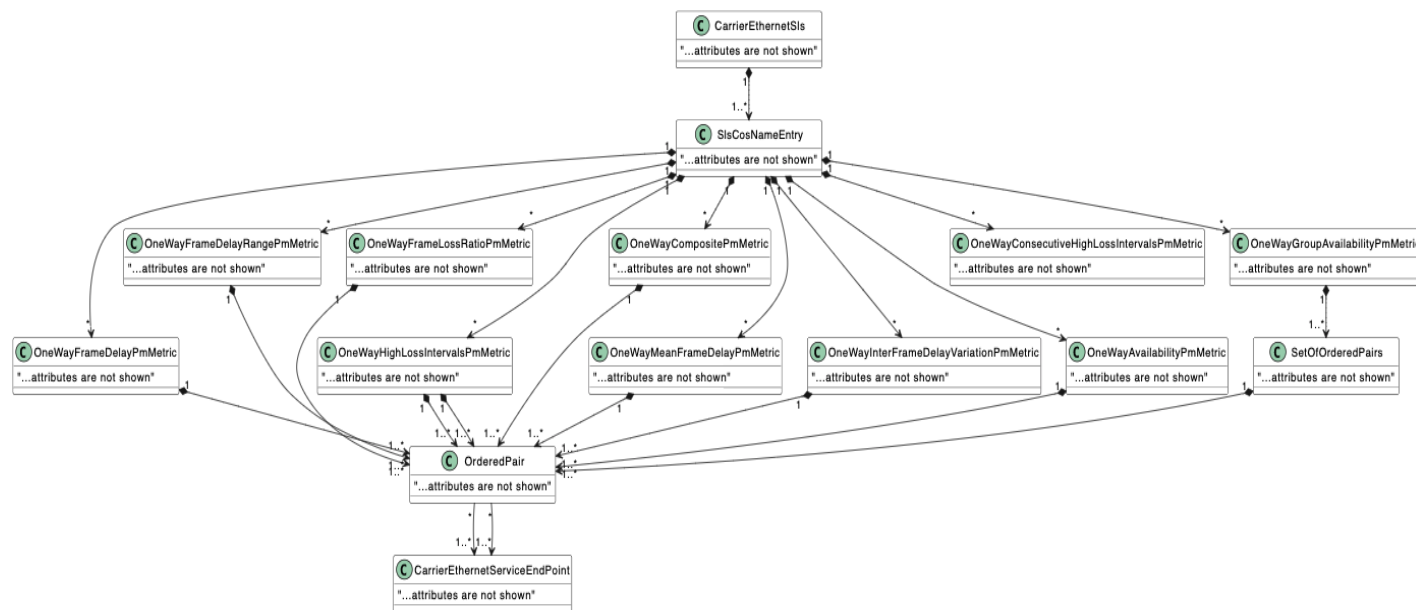


Figure 15-Carrier Ethernet SLS

19.1 CarrierEthernetSls

Data type that 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). Reference MEF 10.4 [6] Section 8.8 EVC Service Specification Service Attribute and MEF 26.2 [8] Section 12.13 OVC Service Level Specification Service Attribute.

Attribute Name	Type	Multiplicity	Description
timeInterval	TimeIntervalT	1	This attribute sets the time interval over which to evaluate the performance for the SLS.
startTime	String format:date-time	1	This attribute represents the date and time for the start of the SLS. It is the beginning of the first Time Interval, T.

sIsCosNameEntry	SIsCosNameEntry	1..*	Pointer to SIsCosNameEntry.

Table 51-CarrierEthernetSIs Attributes

19.2 SIsCosNameEntry

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

Attribute Name	Type	Multiplicity	Description
cosName	String	1	This attribute denotes the Class of Service Name.
deltaT	PositiveInteger	1	This attribute denotes the delta_t, a time interval in seconds, much smaller than T (SLS time period), e.g., 10 seconds.
thresholdC	Real	1	This attribute denotes the threshold for FLR used to determine whether a given time interval delta t has high loss.
consecutiveIntervalN	PositiveInteger	1	This attribute denotes n, used to identify how many consecutive delta t intervals must have high loss to trigger a change in Availability.
oneWayFrameDelayPmMetric	OneWayFrameDelayPmMetric	0..*	Pointer to One-way Frame Delay Performance Management Metric.
oneWayInterFrameDelayVariationPmMetric	OneWayInterFrameDelayVariationPmMetric	0..*	Pointer to One-way Inter-Frame Delay Variation Performance Management Metric.

oneWayMeanFrameDelayPmMetric	OneWayMeanFrameDelayPmMetric	0..*	Pointer to One-way Mean Frame Delay Performance Management Metric.
oneWayFrameDelayRangePmMetric	OneWayFrameDelayRangePmMetric	0..*	Pointer to One-way Frame Delay Range Performance Management Metric.
oneWayFrameLossRatioPmMetric	OneWayFrameLossRatioPmMetric	0..*	Pointer to One-way Frame Loss Ratio Performance Management Metric.
oneWayAvailabilityPmMetric	OneWayAvailabilityPmMetric	0..*	Pointer to One-way Availability Performance Management Metric.
oneWayHighLossIntervalPmMetric	OneWayHighLossIntervalPmMetric	0..*	Pointer to One-way High Loss Interval Performance Management Metric.
oneWayConsecutiveHighLossIntervalPmMetric	OneWayConsecutiveHighLossIntervalPmMetric	0..*	Pointer to One-way Consecutive High Loss Interval Performance Management Metric.
oneWayCompositePmMetric	OneWayCompositePmMetric	0..*	Pointer to One-way Composite Performance Management Metric.
oneWayGroupAvailabilityPmMetric	OneWayGroupAvailabilityPmMetric	0..*	Pointer to One-way Group Availability Performance Management Metric.

Table 52-SlsCosNameEntry Attributes

19.3 OneWayFrameDelayPmMetric

Data type representing One-way Frame Delay Performance Metric. Reference MEF 10.4 [6] Section 8.8.2 One-way Frame Delay Performance Metric and MEF 26.2 [8] Section 12.13.2 One-way Frame Delay Performance Metric.

Attribute Name	Type	Multiplicity	Description
orderedPairList	OrderedPair	1..*	A non-empty subset of the ordered pairs of OVC/EVC End Points.

oneWayFdPercentile	Percentage	1	A percentage in (0,100] for Frame Delay metric.
oneWayFdObjective	Time	1	Performance Objective in time units > 0 for Frame Delay metric.

Table 53-OneWayFrameDelayPmMetric Attributes

19.4 OneWayMeanFrameDelayPmMetric

Data type representing One-way Mean Frame Delay Performance Metric. Reference MEF 10.4 [6] Section 8.8.3 One-way Mean Frame Delay Performance Metric and MEF 26.2 [8] Section 12.13.3 One-way Mean Frame Delay Performance Metric.

Attribute Name	Type	Multiplicity	Description
orderedPairList	OrderedPair	1..*	A non-empty subset of the ordered pairs of OVC/EVC End Points.
oneWayMfdObjective	Time	1	Performance Objective in time units.

Table 54-OneWayMeanFrameDelayPmMetric Attributes

19.5 OneWayFrameDelayRangePmMetric

Data type representing One-way Frame Delay Range Performance Metric. Reference MEF 10.4 [6]Section 8.8.4 One-way Frame Delay Range Performance Metric and MEF 26.2 [8] Section 12.13.4 One-way Frame Delay Range Performance Metric.

Attribute Name	Type	Multiplicity	Description
orderedPairList	OrderedPair	1..*	A non-empty subset of the ordered pairs of OVC/EVC End Points.
oneWayFdrPercentile	Percentage	1	A percentage in (0,100].

oneWayFdrObjective	Time	1	Performance Objective in time units > 0.

Table 55-OneWayFrameDelayRangePmMetric Attributes

19.6 OneWayInterFrameDelayVariationPmMetric

Data type representing One-way Inter-Frame Delay Performance Metric. Reference MEF 10.4 [6]Section 8.8.5 One-way Inter-Frame Delay Performance Metric and MEF 26.2 [8] Section 12.13.5 One-way Inter-Frame Delay Performance Metric.

Attribute Name	Type	Multiplicity	Description
orderedPairList	OrderedPair	1..*	A non-empty subset of the ordered pairs of OVC/EVC End Points.
timeDuration	Time	1	A time duration in time units.
oneWaylfdvPercentile	Percentage	1	A percentage in (0,100].
oneWaylfdvObjective	Time	1	Performance Objective in time units > 0.

Table 56-OneWayInterFrameDelayVariationPmMetric Attributes

19.7 OneWayFrameLossRatioPmMetric

Data type representing One-way Frame Loss Ratio Performance Metric. Reference MEF 10.4 [6]Section 8.8.6 One-way Frame Loss Ratio Performance Metric and MEF 26.2 [8] Section 12.13.6 One-way Frame Loss Performance Metric.

Attribute Name	Type	Multiplicity	Description
orderedPairList	OrderedPair	1..*	A non-empty subset of the ordered pairs of OVC/EVC End Points.

oneWayFlrObjective	Percentage	1	Performance Objective expressed as a percentage.
--------------------	------------	---	--

Table 57-OneWayFrameLossRatioPmMetric Attributes

19.8 OneWayAvailabilityPmMetric

Data type representing One-way Availability Performance Metric. Reference MEF 10.4 [6] Section 8.8.7 One-way Availability Performance Metric and MEF 26.2 [8] Section 12.13.7 One-way Availability Performance Metric.

Attribute Name	Type	Multiplicity	Description
orderedPairList	OrderedPair	1..*	A non-empty subset of the ordered pairs of OVC/EVC End Points.
oneWayAvailabilityObjective	Percentage	1	One-way Availability Performance Objective expressed as a percentage.

Table 58-OneWayAvailabilityPmMetric Attributes

19.9 OneWayHighLossIntervalsPmMetric

Data type representing One-way High Loss Intervals Performance Metric. Reference MEF 10.4 [6] Section 8.8.8 One-way High Loss Performance Metric and MEF 26.2 [8] Section 12.13.8 One-way High Loss Intervals Performance Metric.

Attribute Name	Type	Multiplicity	Description
orderedPairList	OrderedPair	1..*	A non-empty subset of the ordered pairs of OVC/EVC End Points.
oneWayHighLossIntervalsObjective	Integer	1	Performance Objective expressed as a non-negative integer.

Table 59-OneWayHighLossIntervalsPmMetric Attributes

19.10 OneWayConsecutiveHighLossIntervalsPmMetric

Data type representing One-way Consecutive High Loss Intervals Performance Metric. Reference MEF 10.4 [6] Section 8.8.9 One-way Consecutive High Loss Intervals Performance Metric and MEF 26.2 [8] Section 12.13.9 One-way Consecutive High Loss Intervals Performance Metric.

Attribute Name	Type	Multiplicity	Description
orderedPairList	OrderedPair	1..*	A non-empty subset of the ordered pairs of OVC/EVC End Points.
consecutiveNumberP	Integer	1	The number of high loss intervals that constitute a consecutive high loss interval.
oneWayChliObjective	Integer	1	Performance Objective expressed as a non-negative integer.

Table 60-OneWayConsecutiveHighLossIntervalsPmMetric Attributes

19.11 OneWayCompositePmMetric

Data type representing One-way Composite Performance Metric. Reference MEF 10.4 [6] Section 8.8.10 One-way Composite Performance Metric.

Attribute Name	Type	Multiplicity	Description
orderedPairList	OrderedPair	1..*	A non-empty subset of the ordered pairs of OVC/EVC End Points.
compositePerformanceIndicatorThreshold	number	1	Composite Performance Indicator threshold which if exceeded suggests an unacceptable time interval.
compositeFrameLoss	Integer	1	Composite indicator for One-way Frame Loss equal to 0 or 1.

compositeFrameDelay	Integer	1	Composite indicator for One-way Frame Delay equal to 0 or 1.
compositeFrameDelay Variation	Integer	1	Composite indicator for One-way Frame Delay Variation equal to 0 or 1.
oneWayFdThreshold	Time	1	Composite One-way Frame Delay threshold in time units.
oneWayIfdvThreshold	Time	1	One-way Frame Delay Variation threshold in time units.
cpmObjective	Percentage	1	Composite Performance Objective as a percentage.

Table 61-OneWayCompositePmMetric Attributes

19.12 OneWayGroupAvailabilityPmMetric

Data type representing One-way Group Availability Performance Metric. Reference MEF 10.4 [6]Section 8.8.11 One-way Group Availability Performance Metric and MEF 26.2 [8] Section 12.13.10 One-way Group Availability Performance Metric.

Attribute Name	Type	Multiplicity	Description
setOfOrderedPairList	SetOfOrderedPairs	1..*	Non-empty subsets of ordered EP pairs.
oneWayGroupAvObjective	Percentage	1	Performance Objective expressed as percentage.
minimumNumberOfSetsAvailableK	PostiveInteger	1	Specified number of sets of ordered EVC End Point Pair available during characterized percentage of time of measurement.

Table 62-OneWayGroupAvailabilityPmMetric Attributes**19.13 OrderedPair**

The OrderedPair data type is an ordered pair of EVC/OVC End Points for a specific performance metric for one-way direction. It is associated with one-way performance metrics and a pair of CarrierEthernetServiceEndPoints.

Attribute Name	Type	Multiplicity	Description
toCarrierEthernetServiceEndPoint	CarrierEthernetServiceEndPoint	1	Pointer to the to CarrierEthernetServiceEndPoint in Ordered Pair.
fromCarrierEthernetServiceEndPoint	CarrierEthernetServiceEndPoint	1	Pointer to the from CarrierEthernetServiceEndPoint in Ordered Pair.

Table 63-OrderedPairs Attributes**19.14 SetOfOrderedPairs**

Data type representing a set of Ordered Pairs.

Attribute Name	Type	Multiplicity	Description
orderedPairList	OrderedPair	1..*	Attribute denotes a set of Ordered Pairs.

Table 64-SetOfOrderedPairs Attributes

20 References

- [1] IETF JSON Schema draft 7, *JSON Schema: A Media Type for Describing JSON Documents* and associated documents, by Austin Wright and Henry Andrews, March 2018. Copyright © 2018 IETF Trust and the persons identified as the document authors. All rights reserved.
- [2] IETF RFC 2119, *Key words for use in RFCs to Indicate Requirement Levels*, by Scott Bradner, March 1997
- [3] IETF RFC 3444, *On the Difference between Information Models and Data Models*, January 2003
- [4] IETF RFC 8174, *Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words*, by Barry Leiba, May 2017. Copyright © IETF Trust and the persons identified as the document authors (2017). All Rights Reserved
- [5] MEF 7.4, *Carrier Ethernet Services Information Model*, December 2020
- [6] MEF 10.4, *Subscriber Ethernet Service Attributes*, December 2018
- [7] MEF 12.2, *Carrier Ethernet Network Architecture Framework Part 2: Ethernet Services Layer*, May 2014.
- [8] MEF 26.2, *External Network Network Interfaces (ENNI) and Operator Service Attributes*, August 2016
- [9] MEF 55.1, *Lifecycle Service Orchestration (LSO): Reference Architecture and Framework*, January 2021

Appendix A Usage examples (Informative)

This appendix aims to provide an extensive set of examples to cover:

- Different Service Order configuration variants,
- Basic Service Order API walkthrough to order a Carrier Ethernet Service,
- Common modifications,
- Deletion of a Service

The examples are delivered in two forms:

- As part of this document – to allow comments and rich explanation.
- As a Postman collection – for ease of use in testing.

A.1 High-level Flow

The Legato Interface Reference Point is formed from a set of APIs that service different functions in the end-to-end flow. Figure 16 shows all the functions and their sequence.

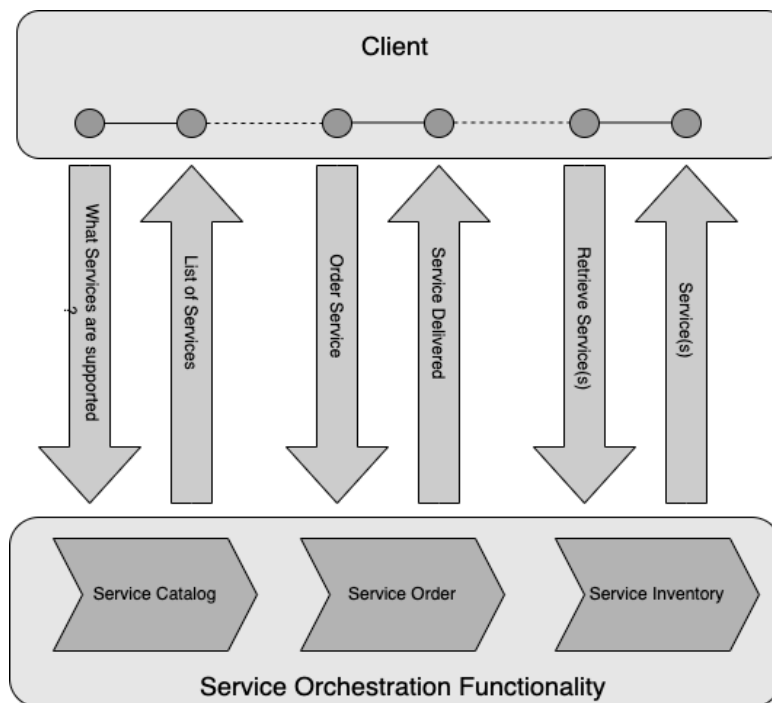


Figure 16-Legato End-to-End Function Flow

Service Catalog – allows the Client to query SOF for available Services as well as what attributes are fixed and/or elastics with values/ranges.

Service Order – allows the Client to request the SOF to initiate and complete the fulfillment process of installation of a Service Offering, an update to an existing Service, or a disconnect of an existing Service.

Service Inventory – allows the Client to retrieve information about existing Service instances from the SOF's Service Inventory.

All the above-mentioned APIs are provided in the SDK together with accompanying Developer Guides. Please refer to those documents for more details and examples of functional APIs.

A.2 Integration of Service Specification into the Service Order API

The Service Order API is service-agnostic in the meaning that they serve as an interaction between the Client and the Server (SOF) and they do not contain any service-specific information in their specifications. To pass the service-specific information, an extension pattern is used. This applies to any of the Legato Service APIs that carry service-specific information: Service Catalog, Service Order and Service Inventory.

The extension hosting type in the API data model is `MefServiceConfiguration`. The `@type` attribute of that type must be set of a value that uniquely identifies the service specification. See Figure 17 and Figure 18. A unique identifier for MEF standard service specifications is in URN format and is assigned by MEF. This identifier is provided as root schema `$id` and in service specification documentation. In this case, this will be in format of examples below:

- `urn:mef:iso:spec:legato:CarrierEthernetSubscriberUni:v0.0.1:all`
- `urn:mef:iso:spec:legato:CarrierEthernetEvcEndPoint:v.0.0.1:all`
- `urn:mef:iso:spec:legato:CarrierEthernetEvc:v.0.0.1:all`

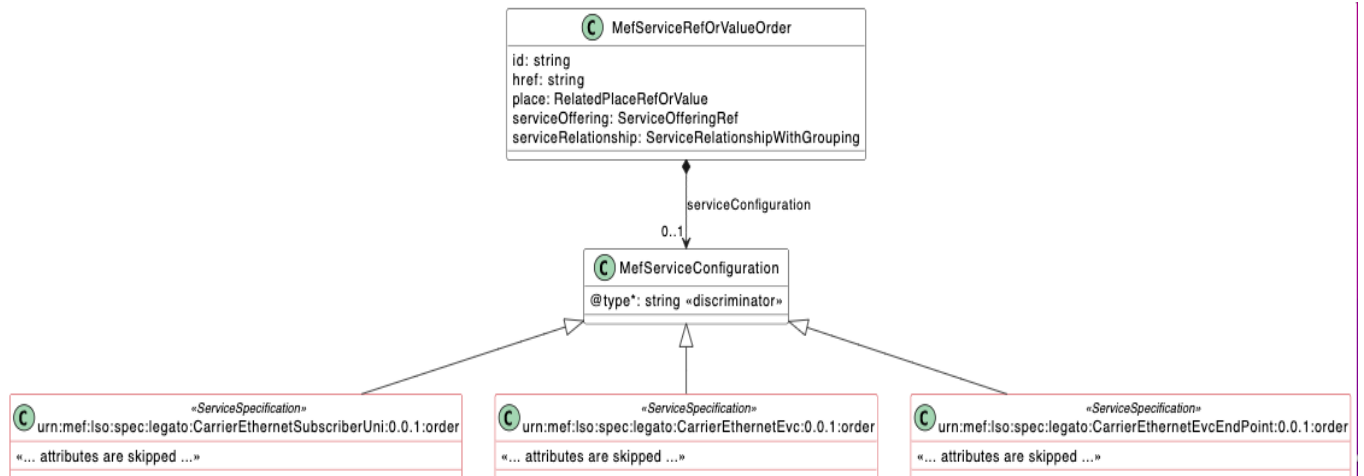


Figure 17-The Extension Pattern: Subscriber Carrier Ethernet

- 1462 • urn:mef:iso:spec:legato:CarrierEthernetOperatorUni:v0.0.1:all
- 1463 • urn:mef:iso:spec:legato:CarrierEthernetOvcEndPoint:v.0.0.1:all
- 1464 • urn:mef:iso:spec:legato:CarrierEthernetOvc:v.0.0.1:all
- 1465 • urn:mef:iso:spec:legato:CarrierEthernetEnniService:v.0.0.1:all
- 1466

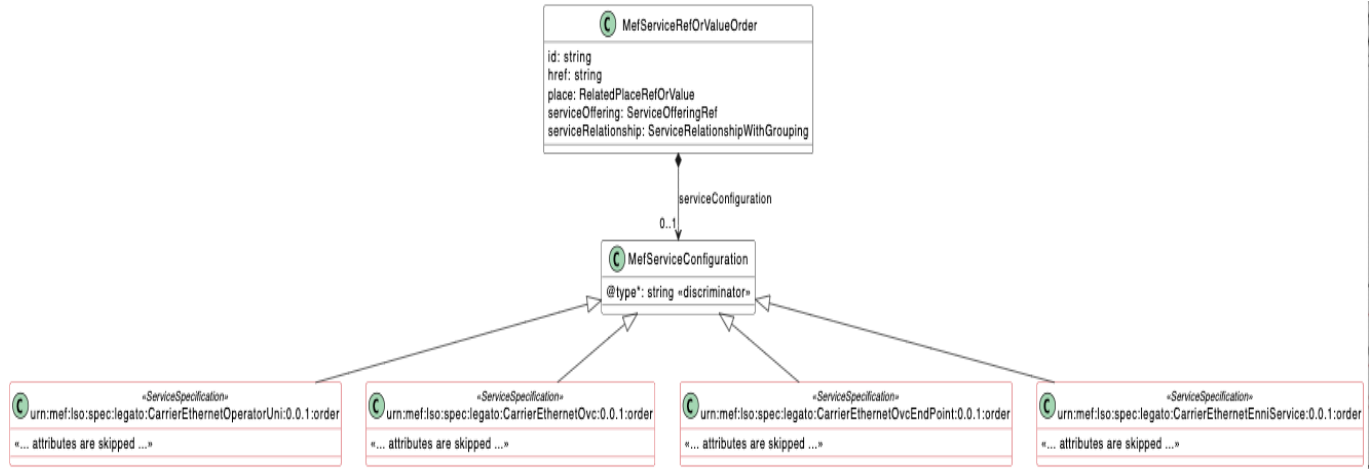


Figure 18-The Extension Pattern: Operator Carrier Ethernet

Use of non-MEF standard service definitions is allowed. In such a case the schema identifier must be agreed upon between the Client and the SOF.

Service specifications are provided as JSON/YAML schemas without the MefServiceConfiguration context. Service-specific attributes are introduced via the MefServiceRefOrValue (defined by the Client). This entity has the serviceConfiguration attribute of type MefServiceConfiguration which is used as an extension point for service-specific attributes. The example result of such a binding in a request payload may look like this for Service Order.

Editor Note 2: JSON Example

Figure 19-Service Order with Carrier Ethernet Example

A.3 Action: Add

This section guides through all the steps of Legato Service Order API that is needed to be performed to successfully order a Subscriber UNI service.

NOTE: SOF is free to mandate some of these steps.

NOTE: As the examples of steps in many cases will replicate the service-specific information, in some of the snippets some parts of it will be omitted for better readability.

There are rules for all request items for creation requests (Service Order):

- `item.action` must be set to add
- `item.service.id` must not be provided
- `service.serviceConfiguration` must contain all desired configurations

A.3.1 Use Case 1: Service Order

Editor Note 3: Service Order Request diagram

Figure 20-UC1: Service Order Request

Editor Note 4: Service Order Response diagram

Figure 21-UC1: Service Order Response

Editor Note 5: Service Order Sequence Diagram

Figure 22-UC1: Service Order Sequence Diagram

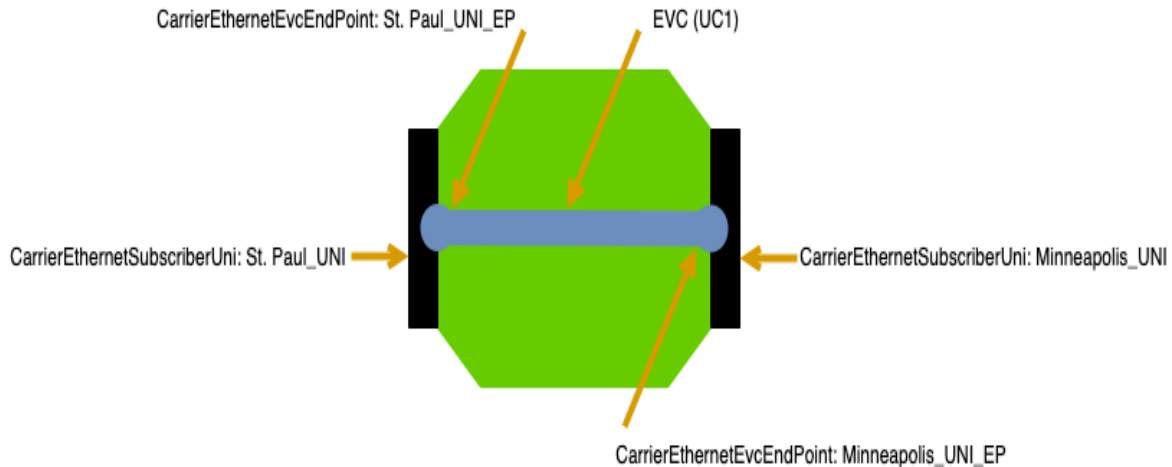


Figure 23-UC1: Setup Diagram

This setup involves:

- Creation of the Subscriber UNI(s):
 - place: Minneapolis (Location)
 - place: St. Paul (Location)
- Creation of the EVC:

- Create of EVC End Points:

A.4 Action: Modify

The mechanism of building a modification request for both envelope and payload for all steps are practically the same as for the create request.

The differences are in the following common rules (Service Order):

- `item.action` must be set to `modify`
- `item.service.id` of the service to be updated must be provided
- `service.serviceConfiguration` must contain all desired configuration (not only the updated values)
- `service.serviceOffering` must not be changed

A.4.1 Use Case 2: Service Order: Bandwidth change

The following use case is for a bandwidth change to a Subscriber Ethernet Service. The change is made only for the attributes of the Subscriber Ethernet Service, so requests contain two items (both Subscriber Carrier Ethernet UNIs). The change is made by updating the `eir.ir`

A.4.2 Use Case 3: Service Order: VLAN change at the Subscriber UNI

A.5 Action: Delete

A.5.1 Use Case 4: Service Order: Delete Subscriber UNI(s), EVC and associated EVC End Points

A.5.2 Use Case 5: Move Subscriber UNI to a different Location