Draft Standard

Mplify 179 Draft (R1)

Cloud Access Connection Product Attributes - Google Cloud Platform

June 2026

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Table of Contents

1 List of Contributing Members 1
2 Abstract 2
3 Terminology and Abbreviations 3
4 Compliance Levels 4
5 Document Conventions 5
5.1 Numerical Prefix Conventions 5
5.2 Notation Conventions 5
6 Cloud Access – Google Cloud Platform 6
6.1 Cloud Region 9
6.2 Bandwidth 9
6.3 Pairing Key 9
7 Cloud UNI 10
7.1 Common Product Attributes 11
7.1.1 Cloud VC Product Relationship Product Attribute 11
7.1.2 Cloud VC Milestones Product Attribute 12
7.1.3 Cloud VC Contacts Product Attribute 13
7.1.4 Cloud VC Installation Interval Product Attribute 13
7.1.5 Cloud VC Service Type Product Attribute 13
7.1.6 Cloud VC Requested Installation Date Product Attribute 13
8 Cloud Virtual Connection 14
8.1 Common Product Attributes 15
8.1.1 Cloud VC Product Relationship Product Attribute 16
8.1.2 Cloud VC Milestones Product Attribute 17
8.1.3 Cloud VC Contacts Product Attribute 18
8.1.4 Cloud VC Installation Interval Product Attribute 18
8.1.5 Cloud VC Service Type Product Attribute 18
8.1.6 Cloud VC Requested Installation Date Product Attribute 18
8.2 Cloud VC Maximum Frame Size Product Attribute 18
8.3 Cloud VC List of Class of Service Names Product Attribute 19
8.4 Cloud VC MAC Address Limit Product Attribute 20
9 Cloud VC End Point Product Attributes 21
9.1 Common Product Attributes 22
9.1.1 Product Relationship 23
9.1.2 Milestones 23
9.2 Cloud VC End Point Type Product Attribute 24
9.3 Cloud VC End Point Map Product Attribute 24
9.4 Cloud VC End Point Class of Service Map Product Attribute 25
9.5 Cloud VC End Point Control Protocol Handling Product Attribute 26
9.6 Cloud VC End Point Bandwidth Product Attribute 27
10 References 29

Appendix A (Informative) **30**
Appendix B Acknowledgements (Informative) **31**

List of Figures

Figure 1 – GCP API Configuration 6
Figure 2 – Logical Connectivity 7
Figure 3 – Google Partner Interconnect Overview 7
Figure 4 – Cloud VC Product Relationships 12
Figure 5 – Cloud VC Product Relationships 17

List of Tables

Table 1 – Terminology 3
Table 2 – Abbreviations 3
Table 3 – Numerical Prefix Conventions 5
Table 4 – Notation Conventions 5
Table 5 – Cloud Access Attribute Usage 9
Table 7 – Cloud VC and Common Product Attributes 10
Table 8 – Common Product Attributes and Relevance to Cloud VC 11
Table 9 – Order Milestones for Cloud VC Products 12
Table 10 – Cloud VC and Common Product Attributes 15
Table 11 – Common Product Attributes and Relevance to Cloud VC 16
Table 12 – Order Milestones for Cloud VC Products 17
Table 13 – Cloud VC Maximum Frame Size Parameters 19
Table 14 – Cloud VC End Point and Common Product Attributes 22
Table 15 – Common Product Attributes and Relevance to Cloud VC End Point 23
Table 16 – Milestones for Cloud VC End Point Products 23
Table 17 – Cloud VC End Point Type Parameters 24
Table 18 – End Point Map values for End Points at a UNI for Cloud VC Services 25
Table 19 – End Point Map values for End Points at an ENNI 25
Table 20 – Cloud VC End Point Class of Service Map Product Attribute Parameters 26
Table 21 – Cloud VC Control Handling Protocol Parameters 26
Table 22 – End Point Bandwidth Parameters 27

1 List of Contributing Members

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

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2 Abstract

This Mplify Standard defines a set of agreement points, referred to as Product Attributes, between a Buyer and a Seller that constitute the basis for the commercial interactions for a private Cloud Access Connection Service. The Product Attributes are defined in a relatively formal way since the goal of specifying this information is to allow automation of these business interactions using Mplify LSO APIs.

Each Cloud Service Provider has their own unique implementation of the Private Cloud Access Connection Attributes. This document will define the Product Attributes specific to the Google Cloud Platform (GCP).

3 Terminology and Abbreviations

This section defines the terms used in this document. In many cases, the normative definitions to terms are found in other documents. In these cases, the third column is used to provide the reference that is controlling, in other Mplify or external documents.

In addition, terms defined in the standards referenced below are included in this document by reference and are not repeated in the table below:

- MEF 10.4
- MEF 55.1
- MEF 55.1.1
- MEF 70.2
- Mplify 150
- Mplify 184

Term	Definition	Reference
Business Function	In the context of this document Business Functions refer to *Product Offering Qualification* (POQ), *Product Order Management*, *Quote Management*, *Address Validation,* and *Product Inventory*	This document
Guaranteed Bandwidth	The amount of bandwidth that the Buyer can use on a sustained basis with the expectation of very low packet loss which is contractually committed to the Buyer by the Seller.	This document
Product Attribute	Specific information that is exchanged and agreed to between the buyer and seller of a Product as part of a business transaction	This document

Table 1 – Terminology

Abbreviation	Definition	Reference
ENNI	External Network Network Interface	MEF 26.2
GCP	Google Cloud Platform	This document
SAI	Service Access Interface	Mplify 165

Table 2 – 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 [1], RFC 8174 [2]) 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 Document Conventions

5.1 Numerical Prefix Conventions

This document uses the prefix notation to indicate multiplier values as shown in Table 3.

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 3 – Numerical Prefix Conventions

5.2 Notation Conventions

The following table documents the Notation conventions used within this document.

Term	Symbol	Usage
Angle Brackets	< >	Surrounds n-tuples
Square Brackets	[ ]	Surrounds lists
Braces	{ }	Surrounds sets
Parenthesis	( )	Surrounds an acronym or example

Table 4 – Notation Conventions

6 Cloud Access – Google Cloud Platform

Access to the Google Cloud Platform (GCP) is made up of several parts including a Customer facing User Network Interface (UNI) or Service Access Interface (SAI), an External Network Network Interface (ENNI [4]) that faces Google, and an OVC that connects them together. The focus of this document is purely the ENNI that faces Google.

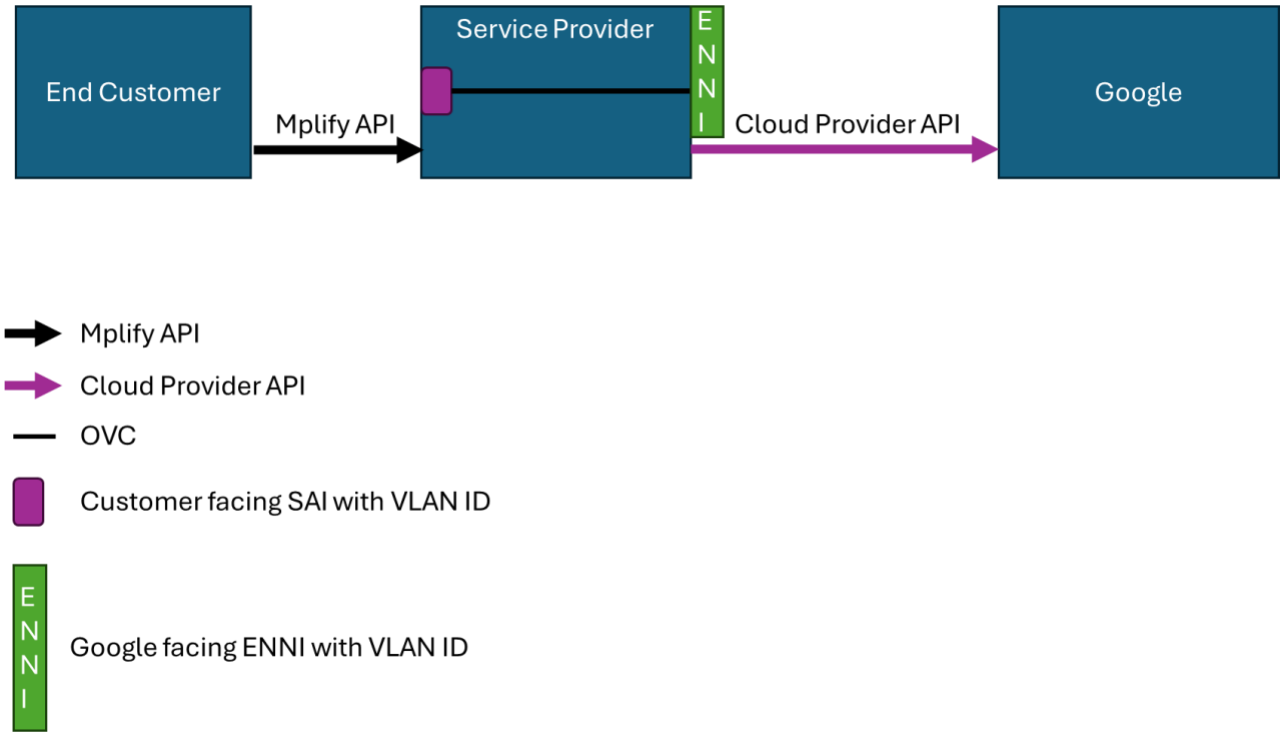

Figure 1 – GCP API Configuration

Figure 1 shows the End Customer to Google connection through the Service Provider. The ENNI is shown in green and contains the VLAN ID identified by Google to use for this ENNI. The remainder of the pieces that make up Google Cloud Platform (GCP) connectivity are a standard UNI and OVC. These are not addressed within this document.

The VLAN ID at the Google facing ENNI is assigned by Google and is not specified in the End Customer's Product Order to the Service Provider. This VLAN ID is identified by the Service Provider in an exchange of queries between the Service Provider and Google via the Cloud Provider API. This VLAN ID may or may not be used at the Customer facing SAI. This depends on the ability of the Service Provider to modify the VLAN ID. If this VLAN ID is set by Google and not modified within the Service Provider's network, it is communicated to the End Customer via the Mplify Product Order API.

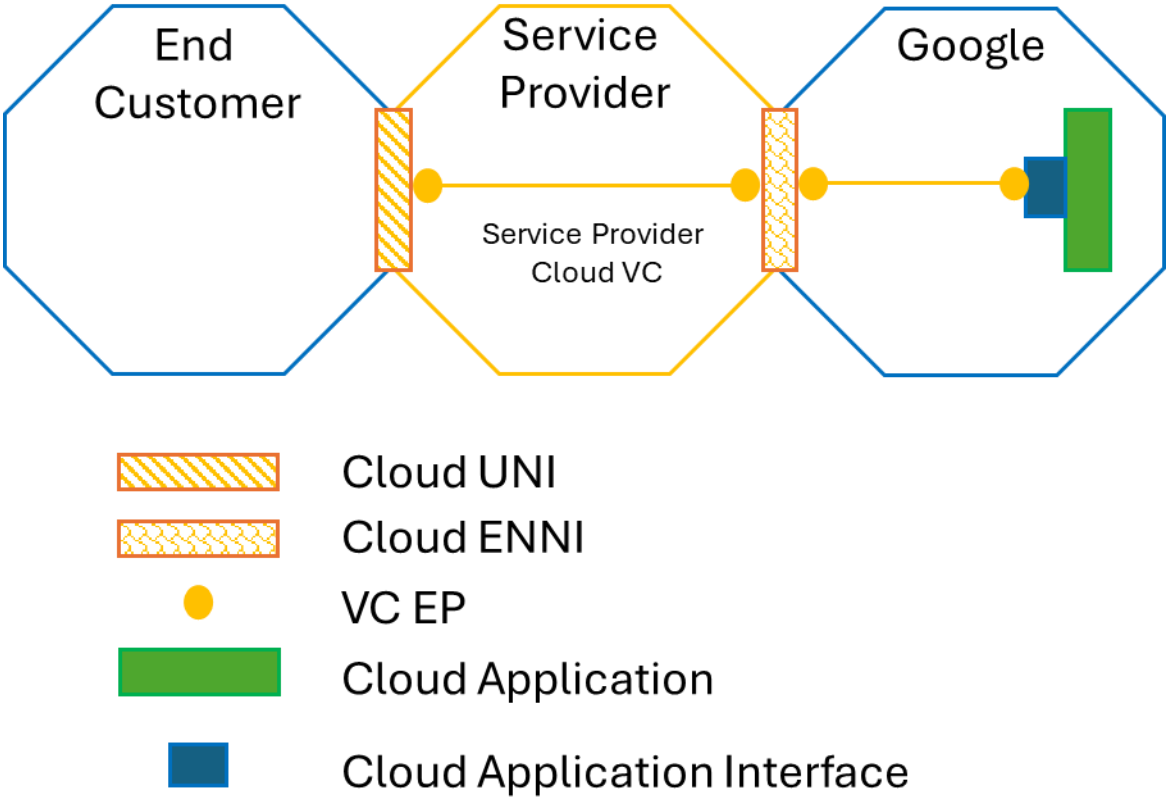

Figure 2 – Logical Connectivity

The focus of this document is the VLAN at the Cloud ENNI that connects to Google. The Cloud VC and Cloud UNI are standard offerings and are described in MEF 125 [8]. From a POQ, Quote, and Product Order perspective, the VLAN ID at the Cloud ENNI has a set of attributes that are unique to Google. This includes the Google Pairing Key that provides details on the Google Cloud Interconnect service and the connection between the Service Provider and Google. From a Mplify API perspective the only point of interest is the information that needs to be passed from the end customer or Buyer to the Service Provider or Seller. Any other attributes are beyond the scope of this document.

Figure 3 – Google Partner Interconnect Overview

Figure 3 shows a logical view of the Google Partner Interconnect Product connecting to a customer location. In this figure, there is a single customer location connecting to Google.

The following table reflects the purpose that each of the attributes is used for.

Product Attribute Name	POQ		Quote		Product Order		Inventory
	Buyer	Seller	Buyer	Seller	Buyer	Seller	Seller
Cloud Region	R	E	R	E	R	E	R
Bandwidth	R	E	R	E	R	E	R
Pairing Key	N/A	N/A	N/A	N/A	R	E	R

R = Required

E = Echoed

N/A = Not Applicable

Table 5 – Cloud Access Attribute Usage

6.1 Cloud Region

The Cloud Region defines the Google region where the Buyer wants to consume Google products. The region is defined by Google, and the Seller uses this information to determine which interconnection with Google is desired by the Buyer.

[R1] The Cloud Region **MUST** be provided for POQ, Quote, Product Order, and Inventory.

6.2 Bandwidth

Bandwidth describes the ordered symmetrical Bandwidth of the Product. This is described as an Information Rate.

[R2] Bandwidth **MUST** be provided for POQ, Quote, Product Order, and Inventory.

6.3 Pairing Key

The Pairing Key is used to ensure that the Service Provider connects to the correct Product on the Google side of the ENNI.

[R3] The Pairing Key **MUST** be provided for the Product Order.

The Pairing Key is not used for POQ, Quote, or Inventory.

7 Cloud UNI

A Cloud UNI is a type of Ethernet UNI. It provides an interface to the end customer in the connection between the customer and Google.

		POQ		Quote		Product Order		Inventory
Product Attribute ↓	**Type**	**Buyer**	**Seller**	**Buyer**	**Seller**	**Buyer**	**Seller**	**Seller**
Installation Place	Com							
Product Relationship	Com	R	E	R	E	R	E	R
Milestones	Com					R	E	R
Contacts	Com	R	R	R	R	R	R	R
Installation Interval	Com		R	R	E			
Requested Contract Term	Com			R	E	R	E	
Requested Installation Date	Com					R	E	
Demarcation Point	Com							
Cloud UNI List of Physical Links	UNI	R	E	R	E	R	E	R
Cloud UNI Link Aggregation	UNI	R	E	R	E	R	E	R
Cloud UNI Maximum Service Frame Size	UNI	R	E	R	E	R	E	R
Cloud UNI Ingress Bandwidth Profile per UNI	UNI	R	E	R	E	R	E	R
Cloud UNI Egress Bandwidth Profile per UNI	UNI	R	E	R	E	R	E	R

Table 6 – Cloud VC and Common Product Attributes

7.1 Common Product Attributes

Mplify 184 defines a set of Product Attributes that are common for all (or most) Products. **Table 10** lists these Common Product Attributes and their relevance to Cloud UNI Products. For the Common Product Attributes that are relevant to Cloud UNI Products there is a subsequent section discussing that Product Attribute.

Product Attribute	Relevance to Cloud UNI Products
Installation Place	A Cloud UNI Product is tied to the particular location where the Cloud UNI is installed.
Product Relationship	Yes
Milestones	Yes
Contacts	Yes, as specified in Mplify 184
Requested Lead Time	Yes, as specified in Mplify 184
Requested Contract Term	Yes, as specified in Mplify 184
Requested Installation Date	Yes
Demarcation Point	The Cloud UNI Product is terminated at the Demarcation Point.

Table 7 – Common Product Attributes and Relevance to Cloud VC

The following sections document any deviations or differences from Mplify 184 in relevant Common Product Attributes "as specified in Mplify 184" in **Table 7**.

7.1.1 Cloud VC Product Relationship Product Attribute

A fully configured and installed Cloud VC Product comprises the Cloud VC Product and two End Points. At least one ENNI End Point is required. The entity relationships are shown in **Figure 4**.

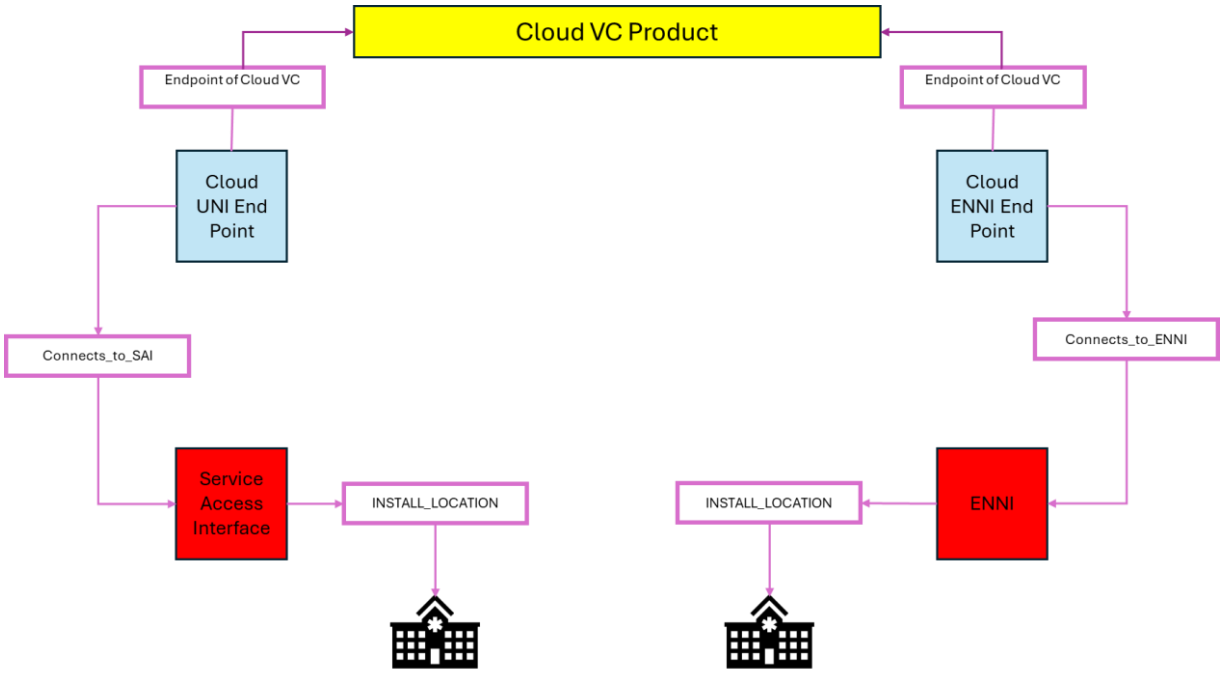

Figure 4 – Cloud VC Product Relationships

[R4] The Cloud VC Product Relationship **MUST** be provided for POQ, Quote, Product Order, and Product Inventory.

7.1.2 Cloud VC Milestones Product Attribute

The Product Order API allows for sending Product-Specific Product Order Item Milestone notifications to the Buyer on the status of a Product Order as a sequence of Milestones for that Product Order as they are achieved. A history track of milestones is also stored for each Product Order Item. Milestones can be defined both by the Product Attributes document and by the Service Provider to express business-specific process steps. The Milestones that are relevant to the Cloud VC Product are listed in **Table 8**.

Milestone Value	Additional Description
PLANNING_COMPLETE	
FIRM_DELIVERY_DATE_PROVIDED	
AWAITING_ACCESS	Awaiting Site Access Permission for end-to-end testing
ACCESS_DENIED	Site access denied for end-to-end testing
E2E_TESTING_SCHEDULED	
E2E_TESTING_COMPLETED	
E2E_TESTING_FAILED	

Table 8 – Order Milestones for Cloud VC Products

[R5] The Cloud VC Milestone Product Attribute **MUST** be provided for Product Order and Inventory.

7.1.3 Cloud VC Contacts Product Attribute

The Cloud VC Contacts Product Attribute is defined in Mplify 184 as a common attribute.

The Cloud VC Contacts Product Attribute is used by both Seller and Buyer to provide contacts for POQ, Quote, and Product Order and by the Seller for Inventory. The Seller Inventory contains both Seller and Buyer contacts.

[R6] The Cloud VC Contacts Product Attribute **MUST** be provided for POQ, Quote, Product Order, and Inventory.

7.1.4 Cloud VC Installation Interval Product Attribute

The Cloud VC Installation Interval Product Attribute is used to indicate the time to install a Product. It is defined in Mplify 184 as a common attribute.

[R7] The Cloud VC Installation Interval Product Attribute **MUST** be used by the Seller in their response to a POQ.

[R8] The Cloud VC Installation Interval Product Attribute **MUST** be used by the Buyer in the Quote.

7.1.5 Cloud VC Service Type Product Attribute

The Cloud VC Service Type Product Attribute is used to define the type of Cloud VC Product that is involved. It is defined in Mplify 184 as a common attribute.

[R9] The Cloud VC Service Type Product Attribute **MUST** be provided in the POQ, Quote, Product Order, and Inventory.

7.1.6 Cloud VC Requested Installation Date Product Attribute

For Cloud VCs this Product Attribute indicates the requested *activation* date. The requested installation (activation) date has to be after (or at the same time) as the requested installation dates for each of the Cloud End Points.

[R10] The Cloud VC Requested Installation Date Product attribute MUST be provided in the Product Order.

8 Cloud Virtual Connection

The Cloud Virtual Connection (Cloud VC) connects the Cloud ENNI with the Cloud UNI. The Cloud VC is shown in Figure 2. This section of the document describes the Cloud VC.

This section defines the Product Attributes for the Cloud VC Product. Details for each Product Attribute are included in the subsequent sub-sections.

The following table lists all of the Cloud VC Product Attributes including the Common Product Attributes and their applicability for each party (Buyer and Seller) to each of the Business Functions. The Applicability of the Common Product Attributes are specifically in the context of Cloud VC Products.

The possible values are:

- R – the Product Attribute is required to be provided by the party
- O – the Product Attribute is optional for the party
- E – the Seller must echo back the value specified by the Buyer
- Gray cell – not allowed

The Type column indicates whether the Product Attribute is a Common Product Attribute (Com) or a Cloud VC Product Attribute.

		POQ		Quote		Product Order		Inventory
Product Attribute ↓	**Type**	**Buyer**	**Seller**	**Buyer**	**Seller**	**Buyer**	**Seller**	**Seller**
Installation Place	Com							
Product Relationship	Com	R	E	R	E	R	E	R
Milestones	Com					R	E	R
Contacts	Com	R	R	R	R	R	R	R
Installation Interval	Com		R	R	E			
Requested Contract Term	Com			R	E	R	E	
Requested Installation Date	Com					R	E	
Demarcation Point	Com							
Service Type	CE	R	E	R	E	R	E	R
Maximum Frame Size	CE	O	E	O	E	O	E	R
List of Class of Service Names	CE	R	E	R	E	R	E	R
MAC Address Limit	CE	O	E	O	E	O	E	R

Table 9 – Cloud VC and Common Product Attributes

8.1 Common Product Attributes

Mplify 184 defines a set of Product Attributes that are common for all (or most) Products. **Table 10** lists these Common Product Attributes and their relevance to Cloud VC Products. For the Common Product Attributes that are relevant to Cloud VC Products there is a subsequent section discussing that Product Attribute.

Product Attribute	Relevance to Cloud VC Products
Installation Place	A Cloud VC Product is not tied to a particular location; it represents a transport mechanism connecting Cloud VC End Point Products (which are tied to particular locations). Therefore, this Product Attribute is not relevant.
Product Relationship	Yes
Milestones	Yes
Contacts	Yes, as specified in Mplify 184
Requested Lead Time	Yes, as specified in Mplify 184
Requested Contract Term	Yes, as specified in Mplify 184
Requested Installation Date	Yes
Demarcation Point	The Cloud VC Product, itself, does not have a physical instantiation, and hence does not have a Demarcation Point. Therefore, this Product Attribute is not relevant.

Table 10 – Common Product Attributes and Relevance to Cloud VC

The following sections document any deviations or differences from Mplify 184 in relevant Common Product Attributes "as specified in Mplify 184" in **Table 10**.

8.1.1 Cloud VC Product Relationship Product Attribute

A fully configured and installed Cloud VC Product comprises the Cloud VC Product and two or more End Points. The End Points are some combination of UNI and ENNI End Points. At least one ENNI End Point is required. The entity relationships are shown in **Figure 5**.

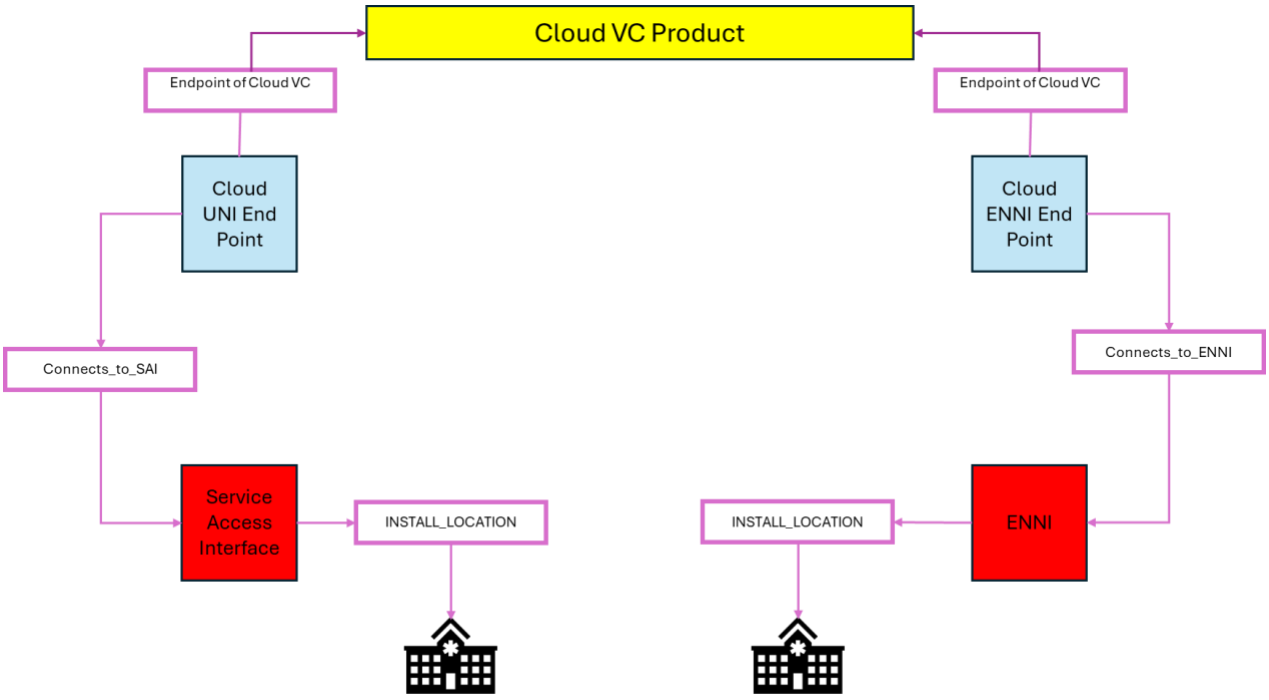

Figure 5 – Cloud VC Product Relationships

[R11] The Cloud VC Product Relationship Product Attribute **MUST** be provided fpr POQ, Quote, Product Order, and Inventory.

8.1.2 Cloud VC Milestones Product Attribute

The Product Order API allows for sending Product-Specific Product Order Item Milestone notifications to the Buyer on the status of a Product Order as a sequence of Milestones for that Product Order as they are achieved. A history track of milestones is also stored for each Product Order Item. Milestones can be defined both by the Product Attributes document and by the Service Provider to express business-specific process steps. The Milestones that are relevant to the Cloud VC Product are listed in **Table 11**.

Milestone Value	Additional Description
PLANNING_COMPLETE	
FIRM_DELIVERY_DATE_PROVIDED	
AWAITING_ACCESS	Awaiting Site Access Permission for end-to-end testing
ACCESS_DENIED	Site access denied for end-to-end testing
E2E_TESTING_SCHEDULED	
E2E_TESTING_COMPLETED	
E2E_TESTING_FAILED	

Table 11 – Order Milestones for Cloud VC Products

[R12] The Cloud VC Milestone Product Attribute **MUST** be provided for Product Order and Inventory.

8.1.3 Cloud VC Contacts Product Attribute

The Cloud VC Contacts Product Attribute is defined in Mplify 184 as a common attribute.

[R13] The Cloud VC Contacts Product Attribute **MUST** be provided for POQ, Quote, Product Order, and Inventory.

The Seller Inventory contains both Seller and Buyer contacts.

8.1.4 Cloud VC Installation Interval Product Attribute

The Cloud VC Installation Interval Product Attribute is used to indicate the time to install a Product. It is defined in Mplify 184 as a common attribute.

[R14] The Cloud VC Installation Interval Product attribute **MUST** be provided by the Seller for POQ.

[R15] The Cloud VC Installation Interval Product Attribute **MUST** be provided by the Buyer for Quote.

8.1.5 Cloud VC Service Type Product Attribute

The Cloud VC Service Type Product Attribute is used to define the type of Cloud VC Product that is involved. It is defined in Mplify 184 as a common attribute.

[R16] The Cloud VC Service Type Product attribute **MUST** be provided for the POQ, Quote, Product Order, and Inventory.

8.1.6 Cloud VC Requested Installation Date Product Attribute

For Cloud VCs this Product Attribute indicates the requested *activation* date. The requested installation (activation) date has to be after (or at the same time) as the requested installation dates for each of the Cloud End Points.

[R17] The Cloud VC Requested Installation Date Product attribute MUST be provided for Product Order.

8.2 Cloud VC Maximum Frame Size Product Attribute

The Cloud VC Maximum Frame Size Product Attribute, if included, allows the Buyer to indicate the size of the largest Ethernet frame that it wants the underlying Cloud Product to transport. MEF 10.4 requires that the value is at least 1522 bytes for a Subscriber Ethernet Service and MEF 26.2 requires that the value is at least 1526 bytes for an Operator Ethernet Service. Based on these, a value of 1526 bytes is recommended for Cloud VCs that connect to a Cloud ENNI.

Name	Description	Type
Maximum Frame Size	The size in bytes of the largest Ethernet frame that will be transported across the underlying Ethernet Service	Integer

Table 12 – Cloud VC Maximum Frame Size Parameters

[R18] Since the Cloud VC Product Attribute is categorized as an Operator Service, the value of the *Maximum Frame Size* parameter **MUST** be greater than or equal to 1526 bytes.

[R19] If the value of the Cloud VC Service Type Product Attribute is categorized as an Operator Service in **Table 12**, the value of the *Maximum Frame Size* parameter **MUST** meet the following two conditions:

- less than or equal to the value of the ENNI Maximum Frame Size across all ENNIs related to Cloud VC End Points that are related to the Cloud Product.
- less than or equal to *M+4*, where *M* is the smallest value of the Service Access Interface Maximum Frame Size for all Service Access Interfaces related to Cloud VC End Points that are related to the Cloud VC Product.

Note that IEEE Std 802.3-2022 section 3.2 defines a maximum value of 2000 bytes for the maximum frame size (an envelope frame). Mplify documents, in general, do not place a limit on this value and the use of so called "jumbo frames" is allowed.

[O1] The Cloud VC Maximum Frame Size Product attribute **MAY** be provided for POQ, Quote, and Product Order.

[R20] The Cloud VC Maximum Frame Size Product Attribute **MUST** be provided for Inventory.

8.3 Cloud VC List of Class of Service Names Product Attribute

The Cloud VC List of Class of Service Names Product Attribute is used to specify a list of Classes of Service Names that will be used by the Cloud VC Product. The Cloud VC End Point Class of Service Map Product Attribute is used to indicate how Ethernet Frames that arrive at a Cloud UNI or a Cloud ENNI are assigned a Class of Service Name.

Name	Description	Type
Class of Service Name List	A list of the names of the classes of service to be used by the Cloud VC Product.	A list of Identifier Strings

[R21] The *Class of Service Name List* parameter in the Cloud VC End Point Class of Service Product Attribute **MUST** contain at least one entry.

[R22] A given Class of Service Name **MUST NOT** appear more than once in the value of *Class of Service Name List*.

[R23] The Cloud VC List of Class of Service Names Product attribute **MUST** be provided for POQ, Quote, Product Order, and Inventory.

8.4 Cloud VC MAC Address Limit Product Attribute

The Seller's Network learns the Buyer's Ethernet MAC addresses for all multipoint Services. It is not necessary for the Seller's Network to learn MAC address for point-to-point Services (but may learn them, nonetheless).

The value of the Cloud VC MAC Address Limit Product Attribute, if included, indicates the maximum number of Ethernet MAC addresses the Seller's network will learn and maintain on behalf of the Buyer if the Seller has MAC address learning enabled for the Cloud VC Product. If the Seller is not limiting MAC address learning or MAC address learning is disabled, then this Product Attribute should not be included in any of the Buyer's requests.

Name	Description	Type
Maximum Number of MAC addresses	The maximum number of Ethernet MAC addresses that they Seller's network will learn on behalf of the Buyer.	An integer

Note that in MEF 10.4 and MEF 26.2 the MAC Address Limit is specified per EVC or OVC End Point. Common practice is that the value is the same at all Cloud VC End Points and this Product Attribute is consistent with that practice.

[O2] The Cloud VC MAC Address Limit Product Attribute **MAY** be provided for POQ, Quote, and Product Order.

[R24] The Cloud VC MAC Address Limit Product attribute **MUST** be provided for Inventory.

9 Cloud VC End Point Product Attributes

This section defines the Product Attributes for the Cloud VC End Point Product. Details for each Product Attribute are included in the subsequent sub-sections.

The following table lists all of the Cloud VC Product Attributes including the Common Product Attributes and their applicability for each party (Buyer and Seller) to each of the Business Functions. The Applicability of the Common Product Attributes are specifically in the context of Cloud VC End Point Products.

The possible values are:

- R – the Product Attribute is required to be provided by the party
- O – the Product Attribute is optional for the party
- E – the Seller must echo back the value specified by the Buyer
- Gray cell – not allowed

The Type column indicates whether the Product Attribute is a Common Product Attribute (Com) or a Cloud VC End Point Product Attribute (CVCEP).

		POQ		Quote		Product Order		Inventory
Product Attribute ↓	**Type**	**Buyer**	**Seller**	**Buyer**	**Seller**	**Buyer**	**Seller**	**Seller**
Installation Place	Com	R	E	R	E	R	E	R
Product Relationship	Com	R	E	R	E	R	E	R
Milestones	Com					R	E	R
Contacts	Com	R	R	R	R	R	R	R
Installation Interval	Com		R	R	E			
Requested Contract Term	Com			R	E	R	E	
Requested Installation Date	Com					R	E	
Demarcation Point	Com	O	O	O	O	O	O	O
Type	CVCEP	R	E	R	E	R	E	R
Map	CVCEP	R	E	R	E	R	E	R
Class of Service	CVCEP	R	E	R	E	R	E	R
Control Protocol Handling	CVCEP	R	E	R	E	E	E	R
Bandwidth	CVCEP	R	E	R	E	R	E	R

Table 13 – Cloud VC End Point and Common Product Attributes

9.1 Common Product Attributes

Mplify 184 defines a set of Product Attributes that are common for all (or most) Products. **Table 14** lists these Common Product Attributes and their relevance to Cloud VC Products. For the Common Product Attributes that are relevant to Cloud VC End Point Products there is a subsequent section discussing that Product Attribute.

Product Attribute	Relevance to Cloud VC Products
Installation Place	Yes, as specified in Mplify 184
Product Relationship	Yes
Milestones	Yes
Contacts	Yes, as specified in Mplify 184
Requested Lead Time	Yes, as specified in Mplify 184
Requested Contract Term	Yes, as specified in Mplify 184
Requested Installation Date	Yes, as specified in Mplify 184
Demarcation Point	Yes, as specified in Mplify 184

Table 14 – Common Product Attributes and Relevance to Cloud VC End Point

The following sections document any deviations or differences from Mplify 184 in relevant Common Product Attributes "as specified in Mplify 184" in **Table 14**.

9.1.1 Product Relationship

Section 8.1.1 describes the Product Relationships associated with all of the Cloud VC components.

[R25] The Product Relationship **MUST** be provided for POQ, Quote, Product Order, and Inventory.

9.1.2 Milestones

The Product Order API allows for sending Product-Specific Product Order Item Milestone notifications to the Buyer on the status of a Product Order as a sequence of Milestones for that Product Order as they are achieved. A history track of milestones is also stored for each Product Order Item. Milestones can be defined both by the Product Attributes document and by the Service Provider to express business-specific process steps. The Milestones that are relevant to the Cloud VC Product are listed in **Table 15**.

Milestone Value	Additional Description
SITE_SURVEY_SCHEDULED	
SITE_SURVEY_COMPLETE	
PLANNING_COMPLETE	
FIRM_DELIVERY_DATE_PROVIDED	
AWAITING_ACCESS	Awaiting Site Access Permission (for end-to-end test)
ACCESS_DENIED	Site Access Denied (for end-to-end test)

Table 15 – Milestones for Cloud VC End Point Products

[R26] Milestones **MUST** be provided as defined for Product Order and Inventory.

9.2 Cloud VC End Point Type Product Attribute

The value of the Cloud VC End Point ID Product Attribute specifies whether the End Point is located at a UNI or an ENNI.

Name	Description	Type
End Point Type	The type of Cloud VC End Point	One of: "UNI", "ENNI"

Table 16 – Cloud VC End Point Type Parameters

[R27] If the value of the Cloud VC Service Type Product Attribute is categorized as an Operator Service in **Table 14**, then the value of the *End Point Type* parameter at one Cloud VC End Point **MUST** be *UNI*.

[R28] If the value of the Cloud VC Service Type Product Attribute is categorized as an Operator Service in **Table 14**, then the value of the *End Point Type* parameter at one Cloud VC End Point **MUST** be *ENNI*.

[R29] The Cloud VC End Point Type Product attribute **MUST** be used in POQ, Quote, Product Order, and Inventory.

9.3 Cloud VC End Point Map Product Attribute

The value of the Cloud VC End Point Map Product Attribute specifies which Ethernet Frames that arrive at a UNI or ENNI are mapped to the Cloud VC Product at that End Point. The allowed values for this Product Attribute depend on the Service Type as specified in the Cloud VC Service Type Product Attribute and whether the Cloud VC End Point is at a UNI or an ENNI.

At a UNI, the complete set of map types is:

- *List* of one or more C-tag VLAN IDs in the range 1…4094
- *All* indicating all Ethernet Frames, Untagged, Priority Tagged, and VLAN Tagged
- *UT/PT* indicating (only) Untagged and Priority Tagged Frames
- *All-NP* indicating all Untagged and VLAN Tagged Frames i.e., not Priority Tagged[1]
- *UT* indicating only Untagged Frames

At an ENNI, the only allowed map type is *List* with a single S-tag VLAN ID in the range 1…4094[2].

[R30] If the value of the Cloud VC Service Type Product Attribute is categorized as an Operator Service, then the value of the Cloud VC End Point Map Product Attribute for an End Point located at a UNI **MUST** be as specified in **Table 17**.

[1] The values *All-NP* and *UT* are primarily intended for use by Cloud VC Products in which for at least one of the UNIs the access is via a Broadband interface. Some Broadband networks cannot process Priority Tagged Frames.
[2] By allowing only a single S-VLAN ID to be specified at the ENNI End Point, this document does not include support for Hairpin Switch (ref) or S-VLAN bundling (ref).

Name	Description	Type
End Point Map Type	The type of End Point Map	One of: “All”, “All-NP”, “List”, “UT/PT”, “UT”
End Point Map Value	The value of the End Point Map	If the value of the End Point Map Type is “List”, the value of this parameter is a list of one or more C-tag VLAN ID values in the range 1...4094. Otherwise not applicable.

Table 17 – End Point Map values for End Points at a UNI for Cloud VC Services

[R31] For a Cloud VC End Point located at an ENNI, the value of the Cloud VC End Point Map Product Attribute **MUST** be as shown in **Table 18**.

Name	Description	Type
End Point Map Type	The type of End Point Map	“List”
End Point Map Value	The value of the End Point Map	A single S-tag VLAN ID in the range 1...4094.

Table 18 – End Point Map values for End Points at an ENNI

[R32] The Cloud VC End Point Map Product attribute **MUST** be used for POQ, Quote, Product Order, and Inventory.

9.4 Cloud VC End Point Class of Service Map Product Attribute

The value of the Cloud VC End Point Class of Service Map Product Attribute indicates how Ethernet Frames that arrive at a Cloud VC End Point (at a UNI or an ENNI) are associated with a Class of Service Name. The first parameter in the value of this Product Attribute is the *Class of Service Identifier* which indicates which characteristic of the Ethernet Frames is used to assign the Class of Service Name. There are three possible values, *All*, *PCP*, and *DSCP*.

[R33] The Cloud VC End Point Class of Service Map Product Attribute **MUST** not be included in any request by the Buyer if the value of the Cloud VC List of Class of Service Names Product Attribute contains a single entry.

The value *All* for the *Class of Service Identifier* parameter means that all Ethernet Frames that arrive at the Cloud VC End Point are mapped to the same Class of Service Name. The value *PCP* for the *Class of Service Identifier* means that the value of the Priority Code Point in the VLAN tag is used to map Ethernet Frames to Class of Service Names. For an End Point at a UNI, the C-VLAN tag PCP is used and for an End Point at an ENNI, the S-VLAN tag PCP is used. The value *DSCP* for the *Class of Service Identifier* means that the IP Differentiated Services Code Point is used to map Ethernet Frames to Class of Service Names.

Name	Description	Type
Class of Service Identifier	The characteristic of an Ethernet Frame that is used to assign it to a Class of Service.	One of: "All", "PCP", "DSCP"
All Map	Specifies a Class of Service Name for all Ethernet Frames when the *Class of Service Identifier* is *All*.	A Class of Service Name.

Table 19 – Cloud VC End Point Class of Service Map Product Attribute Parameters

If the value of the *Class of Service Identifier* is *All*, then the value of the *All Map* parameter indicates which of the entries in the Cloud VC List of Class of Service Names Product Attribute is associated with all the Ethernet Frames that arrive at the Ethernet End Point. If the value of the *Class of Service Identifier* is PCP or DSCP, then the Seller specifies the mapping of Ethernet Frames to Class of Service Names consistent with the *Class of Service Identifier* value.

[R34] For a Cloud VC End Point located at an ENNI, the value of the *Class of Service Identifier* parameter **MUST NOT** be *DSCP*.

[R35] If the value of the *Class of Service Identifier* parameter is *All*, then the value of the *All Map* parameter **MUST** be one of the Class of Service Names specified in the value of the Cloud VC List of Class of Service Names Product Attribute.

[R36] The Cloud VC End Point Class of Service Map Product attribute MUST be used for POQ, Quote, Product Order, and Inventory.

9.5 Cloud VC End Point Control Protocol Handling Product Attribute

The value of this Product Attribute indicates how Layer 2 Control Frames are processed at a Cloud VC End Point located at a UNI for certain values of the Cloud VC Service Type Product Attribute.

This Product Attribute must be included for each Cloud VC End Point located at a UNI.

Name	Description	Type
L2CP All Map	How L2CP Frames are processed at Cloud VC End Points with "All" or "All-NP" C-VLAN IDs mapped.	One of: "CTB" or "CTB-2" or "Other"
L2CP Not All Map	How L2CP Frames are processed at Cloud VC End Points where not *All* or *All-NP* C-VLAN IDs are mapped.	One of "CTA" or "Other"

Table 20 – Cloud VC Control Handling Protocol Parameters

[R37] The value of the *L2CP All Map* parameter **MUST** be specified if and only if the value of the *End Point Map Type* parameter in the Cloud VC End Point Map Product Attribute is *All* or *All-NP*.

[R38] The value of the *L2CP Not All Map* parameter **MUST** be specified if and only if the value of the *End Point Map Type* parameter in the Cloud VC End Point Map Product Attribute not *All* or *All-NP*.

The values *CTA* and *CTB* for *L2CP Processing* indicates that Layer 2 Control Protocol Frames are handled in a manner that is consistent with IEEE Std 802.1Q. The value *CTB-2* for *L2CP Processing* indicates that a higher level of transparency for Layer 2 Control Protocol Frames is desired and some Layer 2 Control Protocol frames that would be peered or discarded according to IEEE Std 802.1Q are passed to the Service. Note that this can compromise the operation of some Layer 2 Control Protocols. See MEF 45.1 for a description of *CTA*, *CTB*, and *CTB-2* L2CP processing.

The value *Other* for *L2CP Processing* indicates that the Seller and the Buyer agree on an alternative handling for Layer 2 Control Frames. This might be the case, for example, if the UNI were delivered via a Broadband Access Network (see MEF 140).

Handling of Layer 2 Control Protocol frames at a Cloud VC End Point located at an ENNI is as described in MEF 45.1.

[R39] The Cloud VC Control Handling Protocol Parameters Product Attribute **MUST** be provided for POQ, Quote, Product Order, and Inventory.

9.6 Cloud VC End Point Bandwidth Product Attribute

The value of the Cloud VC End Point Bandwidth Product Attribute specifies the amount of bandwidth at the Cloud VC End Point requested by the Buyer. The Buyer requests a bandwidth limit for each Class of Service supported at the Cloud VC End Point (i.e., each Class of Service that has Ethernet Frames mapped to it as specified in the value of the Cloud VC End Point Class of Service Map Product Attribute).

Name	Description	Type
Bandwidth	Specification of the requested bandwidth for each Class of Service.	Non-empty list of 2-tuples, ⟨*CoS Name*, *Bandwidth*⟩ where *CoS Name* is an Identifier String and Bandwidth is a *Data Size*.

Table 21 – End Point Bandwidth Parameters

[R40] The value of *CoS Name* in any entry in the value of the Cloud VC End Point Bandwidth Product Attribute **MUST** be one of the Class of Service Names specified in the value of the Cloud VC List of Class of Service Names Product Attribute.

[R41] A CoS Name **MUST NOT** appear in more than one entry in the value of the Cloud VC End Point Bandwidth Product Attribute.

[R42] The Cloud VC End Point Bandwidth Product attribute **MUST** be provided for PQO, Quote, Product Order, and Inventory.

10 References

[1] IETF RFC 2119, *Key words for use in RFCs to Indicate Requirement Levels*, March 1997

[2] IETF RFC 8174, *Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words*, May 2017

[3] MEF 10.4, *Subscriber Ethernet Services*, December 2018

[4] MEF 26.2, External Network Network Interfaces and Operator Services Attributes, August, 2016

[5] MEF 55.1, *Lifecycle Service Orchestration (LSO): Reference Architecture and Framework*, January 2021

[6] MEF 55.1.1, *Amendment to MEF 551.: Reference Architecture and Framework – Terminology*, October 2023

[7] MEF 80, *Quote Management, Requirements and Use Cases*, July 2021

[8] MEF 125, *LSO Cantata and LSO Sonata Subscriber Ethernet Product Schemas and Developer Guide*, February 2023

[9] Mplify 150, *Installation Place and Service Site Management*, June 2025

Appendix A (Informative)

Appendix B Acknowledgements (Informative)

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

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