



Draft Standard
MEF 127 Draft (R2)

Product Catalog Requirements and Use Cases

December 2023

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subject to change.**

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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.

Member Company

Table 1 - Contributing Member Companies

2 Abstract

This document identifies the common Use Cases and attributes needed to support the Product Catalog at the LSO Sonata/Cantata Interface Reference Point.

It supports the requirements defined in the MEF Lifecycle Service Orchestration (LSO) Reference Architecture and Framework (MEF 55.1.1, “LSO RA”) requirements for the Product Catalog between business applications of the Service Provider (Seller) and Customer Domain (Buyer). Information contained within this document will be utilized by both the Seller and Buyer for the development of automated Product Catalog API systems.

3 Release Notes

This document is a draft standard. As such, the contents of this document are subject to change.

4 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 MEF or external documents.

In addition, terms that are defined in MEF 10.4 [3], MEF 26.2 [4], MEF 50.1 [5], MEF 51.1 [6], and MEF 55.1.1 [7], MEF 57.2 [8], MEF 79 [9], MEF 80 [10], MEF 81 [11] are included in this document by reference and are not repeated in the table below.

Term	Definition	Reference
Business Function	In the context of this document, Business Function refers to Product Offering Qualification (POQ), Product Order, Quote and Inventory.	This document
DateTime	Date and time format.	ISO 8601 [14]
Notification	A message sent from the Seller to the Buyer to inform about an event that has occurred regarding a specific instance of a Product Catalog Element.	This document
Product	The realization of a Product Offering to create a single instance for a specific Buyer.	MEF 55.1.1 [7]
Product Catalog	Describes the Product Specifications and Product Offerings made available by a Seller to potential Buyers.	MEF 55.1.1 [7]
Product Category	A grouping of Product Offerings in logical containers defined by the Seller. A Product Category may contain other (sub)Product Categories and/or Product Offerings.	This document
Product Catalog Element	In the context of this document, this is a generic term used to refer to any of the Product Catalog entities: Product Category, Product Offering and Product Specification.	This document
Product Offering Contextual Target Schema	In the context of this document, a subschema of the Product Offering Specification that defines additional constraints on the Product-Specific Attributes for the purpose of generating and validating the request for a given Business Function and Product Action. Each combination of Business Function and Product Action may result in a different contextual schema.	This document
Product Offering Specification	In the context of this document, a subschema of the Product Specification defined by the Seller that restricts the possible values of the Product-Specific Attributes, relationships, and milestones to define the Product Offering.	This document

Term	Definition	Reference
Product Schema	In the context of this document, a schema (i.e., JSON) that defines all the attributes of a Product and their possible values. This may be the Product Specification Schema or a constraint subschema thereof.	This document
Product Specification	In the context of this document, a specification comprising the following, for use with MEF APIs: <ul style="list-style-type: none">• a set of schemas that define all of the attributes of a Product and their possible values• definition of relationships with other Products and/or locations	This document
Product-Agnostic Attribute	An attribute defined by an LSO Cantata/Sonata API which is independent of a Product Offering.	MEF 55.1.1 [7]
Product-Specific Attribute	A Service Attribute or a parameter thereof defined within a Product Specification.	MEF 55.1.1 [7]

Table 2 - Terminology

5 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.

A paragraph preceded by [**CRa**]< specifies a conditional mandatory requirement that **MUST** be followed if the condition(s) following the "<" have been met. For example, "[**CR1**]<[**D38**]" indicates that Conditional Mandatory Requirement 1 must be followed if Desirable Requirement 38 has been met. A paragraph preceded by [**CDb**]< specifies a Conditional Desirable Requirement that **SHOULD** be followed if the condition(s) following the "<" have been met. A paragraph preceded by [**COc**]< specifies a Conditional Optional Requirement that **MAY** be followed if the condition(s) following the "<" have been met.

6 Introduction

This document defines the business requirements and process-related guidelines for the Product Catalog over the Sonata/Cantata Interface Reference Point. The Sonata/Cantata Interface Reference Point is defined in MEF 55.1.1 [7] as the Management Interface Reference Point supporting the management and operations interactions (e.g., catalog, quoting, ordering, inventory, etc.) between the Service Provider (Seller) and Customer Domain (Buyer). The scope of this document is limited to interactions between these parties; within this document, they are referred to as the “Seller” and the “Buyer”.

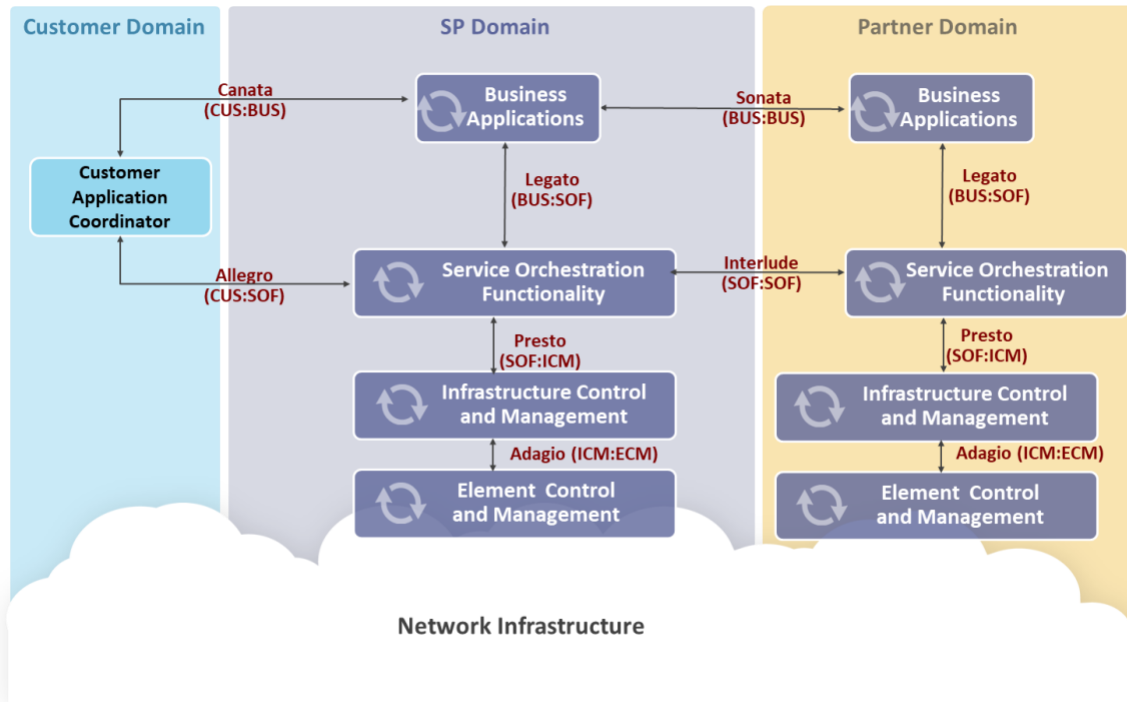


Figure 1 - LSO Reference Architecture Diagram

Figure 1 depicts the LSO Reference Architecture, per MEF 55.1.1 [7]. This document addresses the interactions between the business applications of the Buyer and Seller at the Sonata/Cantata Interface Reference Point required to support the MEF Product Catalog.

The associated “patterns” to the interactivity between the Buyer and Seller are as follows:

1. Whenever the Buyer submits a Product Catalog request, the Seller responds immediately with the results of the request.
2. The Seller sends notifications to inform the Buyer of any Product Catalog Element related changes (e.g. internal “admin” operations within the Seller Domain). The Buyer may then retrieve all relevant Product Catalog Elements at any time to obtain the current status and details.

To fully define the business interactions associated with the Product Catalog, this document is focused on the following key areas:

- Product Catalog Use Cases and Business Requirements
- Product Catalog Element Attributes supported in this document
- Notification of events that occur during the lifecycle of Product Catalog Elements
- Product Catalog Element Lifecycle State Diagrams

7 Key Concepts

This section provides an overview, along with some key concepts for using a Product Catalog in the overall Product Ordering process defined in MEF 50.1 [5].

Prior arrangements for Buyer authentication, security verification, and system interface requirements are not addressed within these use cases. All onboarding requirements must be defined and negotiated between the Buyer and Seller prior to applying the Product Catalog Use Cases defined in this document.

The Product Catalog is part of a broader End-to-End Sonata/Cantata flow. Figure 2 below shows a high-level diagram to get an overview of the entire Product Ordering process and Product Catalog position within it.

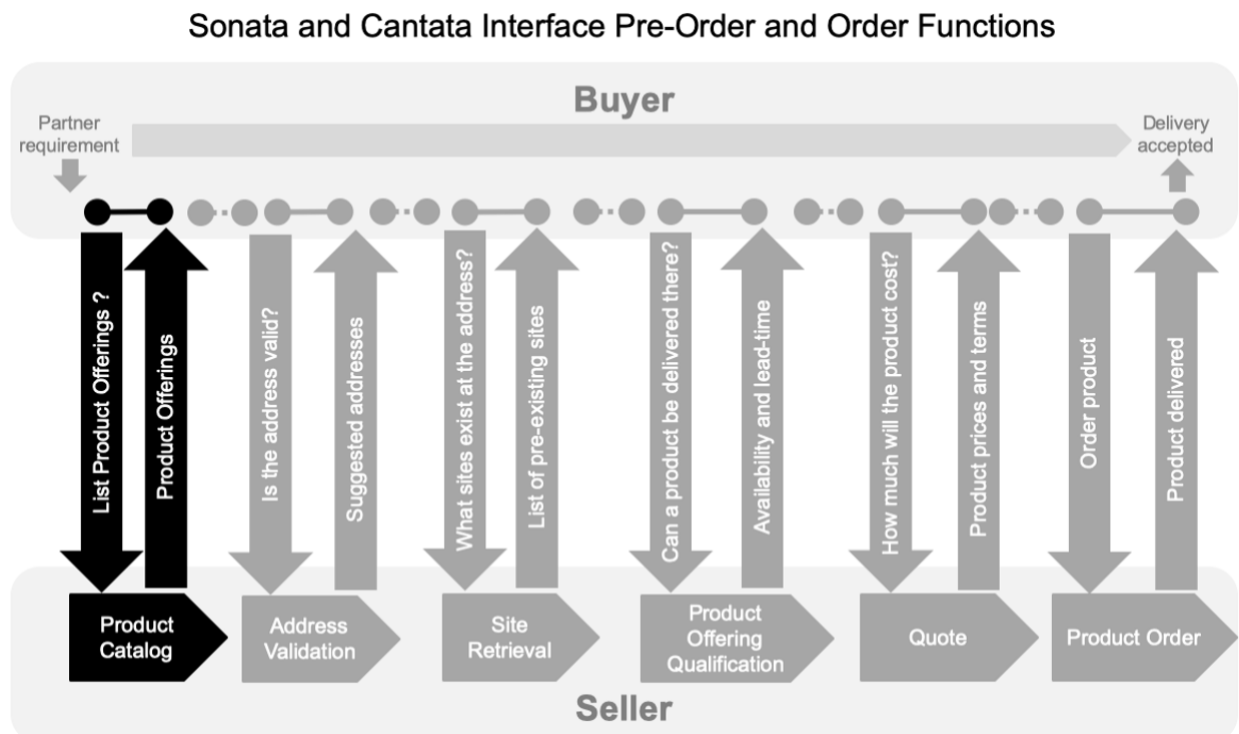


Figure 2 - Sonata and Cantata Interface Focus

Sonata and Cantata Interface Overview:

- **Product Catalog:** Allows the Buyer to retrieve Product Categories and Product Offering information, including Product Specification details from a Seller’s Product Catalog.
- **Address Validation:** Allows the Buyer to validate their address information for Places known to the Seller, including exact formats.
- **Site Retrieval** Allows the Buyer to retrieve Service Site information including exact formats for Service Sites known to the Seller.

- **Product Offering Qualification:** Enables the Buyer to determine whether it is feasible for the Seller to deliver a particular Product with a given configuration to a particular Place.
- **Quote:** Allows the Buyer to find out how much the installation of an instance of a Product Offering, an update to an existing Product, or a disconnect of an existing Product will cost.
- **Product Order:** Allows the Buyer to request the Seller to initiate and complete the fulfilment process of an installation of a Product Offering, an update to an existing Product, or a disconnect of an existing Product at the Place defined by the Buyer.

The LSO Cantata/Sonata APIs consists of product-agnostic and product-specific parts, as shown in Figure 3 below. The product-agnostic parts (which includes the Product-Agnostic Attributes) are defined in the POQ, Quote, Product Order, and Inventory API standards. The product-specific parts (which includes the Product-Specific Attributes) are defined in the product specification standards of the corresponding products (e.g., Access E-Line, Subscriber Ethernet, etc.).



Figure 3 - Sonata and Cantata API Structure

Since the Product Schemas generally do not specify which set of Product-Specific Attributes are required and since the set of valid configurations and supported values may vary across Sellers, Business Functions and Product Action, an API mechanism is required for the Seller and Buyer to exchange this information in an automated manner.

The Product Catalog API allows the Buyer to discover what Product Offerings the Seller provides and which Product-Specific Attribute configurations are supported. This information is important for automation of the MEF APIs during all the stages of Product Ordering process (POQ/Quote/Product Order/Inventory).

7.1 Product Catalog Elements

The Product Catalog's data model is comprised of the following key Product Catalog Elements:

- **Product Category:** A grouping of Product Offerings in logical containers defined by the Seller. A Product Category may contain other (sub)Product Categories and/or multiple Product Offerings.
- **Product Offering:** The commercial realization of a Product Specification achieved by defining Product Offering Terms and pricing, and specifying constraints on the possible values of the Product-Specific Attributes and relationships.
- **Product Specification:** A specification comprising the following, for use with MEF APIs:
 - a set of schemas that define all of the Product-Specific Attributes of a Product and their possible values
 - definition of relationships with other Products and/or locations

In summary, a Product Specification is the detailed definition of a Product, a Product Offering is the commercial realization of a Product Specification by the Seller, while the Product Categories allows for better organization and management of Product Offerings.

Note: The support of Product Offering pricing is out of scope for this release.

7.2 Product-Specific Attribute Classification

To streamline the number of Product-Specific Attributes that are required to be included in the API request and responses for the different Use Cases and Business Functions at the Sonata/Cantata IRP, the Buyer and Seller agree to assign each Product-Specific Attribute included in the Product Specification into one of three classifications. The classification for each Product-Specific Attribute may be different across Business Function, Product Action and Product Offering:

- **Mandatory** - Product-Specific Attributes that must be provided by the Buyer in a POQ/Quote/Product Order request and must be returned by the Seller for an Inventory request as specified in section 7.2.1
- **Optional** - Product-Specific Attributes that may be provided by the Buyer in a POQ/Quote/Product Order request and may be returned by the Seller for an Inventory request as specified in section 7.2.2
- **Fixed** - Product-Specific Attributes that are hard coded and may be specified by the Buyer in a POQ/Quote/Product Order request (subject to agreement between the Buyer and Seller) and may be returned by the Seller for an Inventory request (subject to agreement between the Buyer and Seller) as specified in section 7.2.3

As noted above, the classification may depend on:

- Business Function - a given Product-Specific Attribute may, for example, be classified as Fixed for the Create POQ request; while it may be considered as Mandatory for the Create Product Order request.
- Product Action - a given Product-Specific Attribute may, for example, be classified as Mandatory for the Create POQ request for an INSTALL of a new Product, while it may be classified as Fixed for the Create POQ request for a CHANGE of an installed Product.
- Product Offering - a given Product-Specific Attribute may, for example, be classified as Mandatory for the Create POQ request for a Product Offering (e.g., Premium Service), while it may be classified as Fixed for the Create POQ request for a different Product Offering (e.g., Basic Service). Note: these two Product Offerings could be based on the same Product Specification or different Product Specifications.

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

- [R1] The Seller and Buyer **MUST** agree, for each Product-Specific Attribute, whether the attribute is Mandatory, Optional or Fixed for each Business Function (POQ, Quote, Product Order) and Product Action (INSTALL, CHANGE) for a Product Offering.
- [R2] The Seller and Buyer **MUST** agree, for each Product-Specific Attribute, whether the attribute is Mandatory, Optional or Fixed for Inventory for a Product Offering.
- [R3] If, for a Product Offering, a Product-Specific Attribute is classified as Optional for any Business Function and, if applicable, Product Action, the Seller and Buyer **MUST** agree on a default value for the attribute.
- [R4] The Seller **MUST** reject an API request if the value for a Product-Specific Attribute requested by the Buyer is not a supported value for the applicable Product Offering.

7.2.1 Mandatory Product-Specific Attributes

- [R5] If a Product-Specific Attribute is agreed to be Mandatory for a Business Function (POQ, Quote, Product Order), Product Action (INSTALL, CHANGE), and Product Offering, then the Buyer **MUST** include a value for the attribute in the corresponding API request.
- [R6] If a Product-Specific Attribute is agreed to be Mandatory for Inventory for a Product Offering, then the Seller **MUST** include a value for the attribute in the corresponding API response.

- [R7] When the Seller receives a POQ, Quote or Product Order request in which any of the Mandatory Product-Specific Attributes are not included, the request **MUST** be rejected by the Seller.

7.2.2 Optional Product-Specific Attributes

- [O1] If a Product-Specific Attribute is agreed to be Optional for a Business Function (POQ, Quote, Product Order), Product Action (INSTALL, CHANGE), and Product Offering, then the Buyer **MAY** include a value for the attribute in the corresponding API request.
- [R8] The Seller **MUST** apply the agreed default value for an Optional Product-Specific Attribute if a value is not included by the Buyer in the corresponding API request.

Note: If no default value is defined by the Seller, then the default value is considered to be NULL.

- [R9] If a Product-Specific Attribute is agreed to be Optional for Inventory for a Product Offering, then the Seller **MUST** include a value for the attribute in the corresponding API response if the value is not the agreed default value.
- [O2] If a Product-Specific Attribute is agreed to be Optional for Inventory for a Product Offering, then the Seller **MAY** include a value for the attribute in the corresponding API response if the value has the agreed default value.

7.2.3 Fixed Product-Specific Attributes

A Product-Specific Attribute may be classified as Fixed for a Business Function, Product Action, and Product Offering when only one value is applicable for the Seller. This can be the case for example if:

- the Seller supports only a single value, or
- the value is derived from the value of one or more other Product-Specific Attributes, or
- the Seller specifies a single value in the Product Catalog for a specific Product Offering, or
- the Seller defines the value for one or more Product-Specific Attributes during Product fulfillment (e.g., VLAN ID) and provides it to the Buyer during the Product Order
- the Buyer and the Seller agree on a single value during onboarding

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

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

- [R10] The Buyer and Seller **MUST** agree on whether the Buyer can include Product-Specific Attributes that have been classified as Fixed in API requests for POQ, Quote and Product Order.
- [R11] If the Buyer and Seller agree that Product-Specific Attributes classified as Fixed cannot be included in API requests (see [R10]), the Buyer and Seller **MUST** agree on whether the Seller includes Product-Specific Attributes classified as Fixed in the corresponding API responses.
- [R12] If the Buyer and Seller agree that Product-Specific Attributes classified as Fixed cannot be included in an API request (see [R10]), the Seller **MUST** reject an API request from the Buyer if it includes a Product-Specific Attribute that has been classified as Fixed for the Business Function (POQ, Quote, Product Order), Product Action (INSTALL, CHANGE), and Product Offering.
- [R13] If the Buyer and Seller agree that Product-Specific Attributes classified as Fixed cannot be included in API requests (see [R10]), and if a Product-Specific Attribute is classified to be Fixed for Inventory for a Product Offering, then the Seller **MUST NOT** include a value for the Product-Specific Attribute in the Inventory API response.
- [R14] If the Buyer and Seller agree that Product-Specific Attributes classified as Fixed can be included in API requests (see [R10]), the Seller **MUST** reject an API request from the Buyer if it includes a Product-Specific Attribute that has been classified as Fixed for the Business Function (POQ, Quote, Product Order), Product Action (INSTALL, CHANGE), and Product Offering and includes a value that is different than the fixed value.
- [R15] If the Buyer and Seller agree that Product-Specific Attributes classified as Fixed can be included in API requests (see [R10]), and if a Product-Specific Attribute is agreed to be Fixed for Inventory for a Product Offering, then the Seller **MUST** include a value for the Product-Specific Attribute in the Inventory API responses.

7.3 Product Offering Schemas and Contextual Target Schemas

The Product Catalog defines the following schemas and subschemas to allow the Seller to define which Product-Specific Attributes are required or allowed to be included along with supported values in Buyer's API requests, and hence to allow the Buyer to automate the creation of the corresponding API requests for a given Seller.

- Source Product Specification Schema: The Product Schema as included in the Product Specification (e.g., MEF 125, *LSO Cantata and LSO Sonata Subscriber Ethernet Product Schemas and Developer Guide*)
- Product Offering Specification: a subschema of the Product Specification defined by the Seller that restricts the possible values of the Product-Specific Attributes, relationships, and milestones to define the Product Offering.

- Product Offering Contextual Target Schema: a subschema of the Product Offering Specification that defines additional constraints on the Product-Specific Attributes for the purpose of generating and validating the request for a given Business Function and Product Action.

Note: Each combination of Business Function and Product Action may result in a different contextual schema.

The relationship between the Source Product Specification Schema, Product Offering Specification and Product Offering Contextual Target Schema is shown in Figure 4 below.

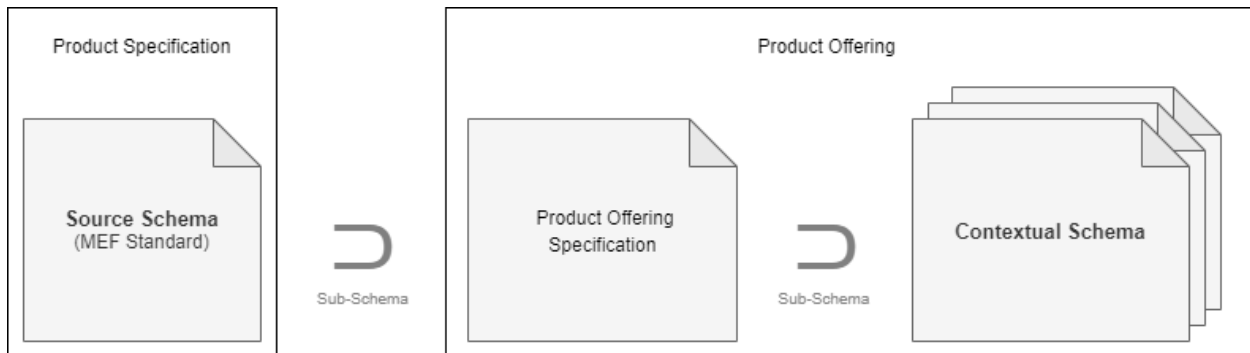


Figure 4 - Product Catalog Schema Relationships

8 Use Cases

This section describes the use cases and business requirements that support the Product Catalog between the Buyer and Seller.

- [R16]** An implementation of MEF Product Catalog API **MUST** support Use Cases 1 thru 6.
- [O3]** An implementation of MEF Product Catalog API **MAY** support Use Cases 7 and 8.

Use Case #	Use Case Name	Use Case Description	Reference Section
1	Retrieve Product Category List	The Buyer requests a list of Product Categories from the Seller that meet a set of filter criteria. The Seller returns a summarized list of Product Categories.	Section 8.1.2
2	Retrieve Product Category by Product Category Identifier	The Buyer requests detailed information about a single Product Category based on a Product Category Identifier.	Section 8.1.3
3	Retrieve Product Offering List	The Buyer requests a list of Product Offerings from the Seller that meet a set of filter criteria. The Seller returns a summarized list of Product Offerings.	Section 8.2.8
4	Retrieve Product Offering by Product Offering Identifier	The Buyer requests detailed information about a single Product Offering based on a Product Offering Identifier.	Section 8.2.9
5	Retrieve Product Specification List	The Buyer requests a list of Product Specifications from the Seller that meet a set of filter criteria. The Seller returns a summarized list of Product Specifications.	Section 8.3.5
6	Retrieve Product Specification by Product Specification Identifier	The Buyer requests detailed information about a single Product Specification based on a Product Specification Identifier.	Section 8.3.6
7	Register for Product Catalog Notifications	The Buyer subscribes to Product Catalog notifications.	Section 8.4.1

Use Case #	Use Case Name	Use Case Description	Reference Section
8	Send Product Catalog Notification	The Seller sends a Product Catalog Notification to the Buyer provided Recipient Information when a Product Catalog Event has occurred.	Section 8.4.2

Table 3 - Use Cases

8.1 Product Category Use Cases

Details for the Product Category attributes and the following Use Cases are defined in this section:

- Retrieve Product Category List
- Retrieve Product Category by Product Category Identifier

8.1.1 Product Category Attributes

The Product Category is a grouping of Product Offerings in logical containers defined by the Seller. A Product Category may contain other (sub)Product Categories and/or Product Offerings.

The Product Category attributes are defined in the table below. All attributes are set by the Seller.

Attribute	Description	Type	Comments
Product Category Identifier	Unique identifier (within the Seller domain) for the Product Category.	String	
Product Category Name	The name (unique within the Seller domain) of the Product Category.	String	
Product Category Description	Description of the Product Category.	String	
Product Category Last Update	The date and time the Product Category was created or most recently updated.	Date/Time	
Parent Category	Identifier referencing the parent Product Category of this Product Category.	Reference to Product Category	Note: This is empty for top-level Categories.
Sub Categories	A list of 0 to N Product Category Identifiers, to which this Product Category is a parent of.	List of Reference to Product Category (this table)	

Attribute	Description	Type	Comments
Product Offerings	A list of Product Offering Identifiers grouped within this Product Category.	List of Reference to Product Offering (see Table 5)	

Table 4 - Product Category Attributes

- [R17] If a Product Category has a Parent Category, then its Product Category Identifier **MUST** be in the Sub Categories of the referenced Product Category.
- [R18] If a Product Category has no Parent Category, then its Product Category Identifier **MUST NOT** be in the Sub Categories list for any Product Category.
- [R19] If a Product Category is specified in the Sub Categories of a Product Category A, then Product Category A **MUST** be the Parent Category of this Product Category.
- [R20] The Product Offerings attribute specified in Table 4 **MUST** list all Product Offerings that reference this Product Category.
- [R21] If any Product Category attribute listed in Table 4, excluding Sub Categories has changed, then Product Category Last Update **MUST** be set to reflect the most recent date the modification occurred.
- [R22] After a Product Category has been created, the Product Category Identifier in Table 4 **MUST** not be modified.

8.1.2 Retrieve Product Category List Use Case

The Buyer requests a list of Product Categories from the Seller that meet a set of filter criteria.

8.1.2.1 Use Case Process Steps

1. The Buyer sends the Retrieve Product Category List request to the Seller.

[O4] The Buyer request **MAY** contain none or more of the following filter criteria defined in Table 4:

- Product Category Name
- Product Category Last Update (range of dates)
- Parent Category (use empty to filter Product Categories with no parents)

2. The Seller receives the request and returns a summarized list of Product Categories.

[R23] The Seller response **MUST** include the following attributes defined in Table 4 for each Product Category that matches the Buyer’s filter criteria:

- Product Category Identifier
- Product Category Name
- Product Category Description
- Product Category Last Update

[R24] The Seller response **MUST** include the following attributes defined in Table 4 for each Product Category for which they are set:

- Parent Category
- Sub Categories
- Product Offerings

[R25] The Seller response **MUST NOT** include any attributes not defined in Table 4.

[R26] If no Product Categories match the filter criteria provided by the Buyer, the Seller **MUST** return a positive response with an empty list.

8.1.3 Retrieve Product Category by Product Category Identifier Use Case

The Buyer requests detailed information about a single Product Category based on a Product Category Identifier.

8.1.3.1 Use Case Process Steps

1. The Buyer sends the Retrieve Product Category by Product Category Identifier request to the Seller.

[R27] The Buyer request **MUST** include the following attribute defined in Table 4:

- Product Category Identifier

2. The Seller receives the request and returns details for the Product Category identified by the Product Category Identifier.

[R28] The Seller response **MUST** include the following attributes defined in Table 4:

- Product Category Identifier
- Product Category Name
- Product Category Description
- Product Category Last Update

[R29] The Seller response **MUST** include the following attributes defined in Table 4 if they are set:

- Parent Category
- Sub Categories
- Product Offerings

[R30] The Seller response **MUST NOT** include any attributes not defined in Table 4.

8.2 Product Offering Use Cases

Details for the Product Offering attributes and the following Use Cases are defined in this section:

- Retrieve Product Offering List
- Retrieve Product Offering by Product Offering Identifier

8.2.1 Product Offering Attributes

The Product Offering attributes are defined in the table below. All attributes are set by the Seller.

Attribute	Description	Type	Comments
Product Offering Identifier	Unique identifier (within the Seller domain) for the Product Offering.	String	Note: The Seller may choose to incorporate version information as part of the Offering Identifier.
Product Offering Name	The commercial name of the Product Offering.	String	
Product Offering Description	Description of the Product Offering.	String	
Product Offering Last Update	The date and time the Product Offering was created or most recently updated.	Date/Time	

Attribute	Description	Type	Comments
Product Offering State	The current lifecycle status of the Product Offering.	One of (see Table 18): <ul style="list-style-type: none"> • ANNOUNCED • END_OF_SALE • END_OF_SUPPORT • OBSOLETE • ON_HOLD • ORDERABLE • PILOT_BETA • REJECTED 	
Product Offering State Transitions	The list of Product Offering State transitions, including the date they are expected to occur or have occurred.	List of Product Offering State Transition (see Table 6)	
Product Offering State Reason	Provides complementary information on the reason why the Product Offering State is set to a particular value. For example, a description of "Supply Constraint of Chips" as why a Product Offering is on ON_HOLD.	String	
Standard Framework Agreement	The name of the Seller's standard offer arrangement (such as a framework agreement). The name is unique within the Seller domain.	String	This should be the name of the Seller's standard offer arrangement or framework agreement for this category of Product Offering (e.g., Commercial, Federal or Regulated) as used by the Seller in their official communication of the Product.

Attribute	Description	Type	Comments
Attachments	Complements the Product Offering description with presentation, video, pictures, etc.	List of Attachment attribute as defined in MEF 113 [12] Section 8.1.4	Note: The Seller should include all documents describing the Standard Framework Agreement as an Attachment.
Related Contact	Defines the contact info for the related contact of a Product Offering.	Related Contact attribute as defined in MEF 113 [12] Section 8.1.5	This would typically a Product Manager Contact.
Sales Channels	A list of names defined by the Seller which identify the different methods by which the Product Offering is made available to the Buyer for ordering.	List of Strings	<p>The different Sales Channels should be specified in the Standard Framework Agreement or provided during the onboarding process.</p> <p>For example: Reseller, Distribution, Direct Sales.</p> <p>Note: If Sales Channels is an empty list, it implies that the Product Offering is available in all Seller supported Sales Channels.</p>
Market Segments	The names of the market segments targeted for the Product Offering.	List of Strings	<p>The set of market segment names should be specified in the Standard Framework Agreement or provided during the onboarding process.</p> <p>For example: Wholesale, Federal, Financial.</p> <p>Note: If Market</p>

Attribute	Description	Type	Comments
			Segments is an empty list; it implies that the Product Offering is available in all Seller supported Market Segments
Regions	Areas where the products are offered by the Seller to potential Buyers.	List of Region (see Table 7)	Note: If Regions is an empty list, it implies that the Product Offering is available in all Seller supported Regions.
Product Offering Terms	Commitment durations under which a Product Offering is available to Buyers. For instance, a Product Offering can be made available with multiple commitment periods of 1, 2 or 3 year terms.	List of Product Offering Term (see Table 8)	
Product Offering Milestones	Allows constraining the milestones for the Product Offering.	List of Product Milestone (see Table 15)	
Product Offering Notes	A set of comments for additional information.	List of Note attribute as defined in MEF 57.2 [8] Section 8.14	
Product Offering Product Categories	A list of 0 or more Product Category Identifiers, with each referring to a Product Category in which this Product Offering is grouped together with other Product Offerings.	List of Reference to Product Category (see Table 4)	

Attribute	Description	Type	Comments
Product Specification	A Product Specification Identifier referencing the Product Specification the Product Offering is based on.	Reference to Product Specification (see Table 12)	
Product Offering Specification	A reference to or value of a subschema of the Source Product Specification that restricts the possible values of the Product-Specific Attributes, relationships, and milestones to define the Product Offering.	Reference to or value of a Product Schema	
Product Offering Product Relationships	Allows constraining the relationships between related Product Specifications.	List of Product Offering Product Relationship (see Table 9)	<p>As an example, an Access E-Line OVC references Operator UNI and ENNI Product Offerings.</p> <p>Note: this effectively constrains the relationship between related Product Offerings (since the relationship is inherited from the Product Specification).</p>

Attribute	Description	Type	Comments
Product Offering Place Relationships	Allows constraining the Place relationships for the Product Offering.	List of Product Offering Place Relationship (see Table 10)	
Product Offering Contextual Information	Defines additional constraints on the Product Offering Specification for the Product-Specific Attributes of a Product Offering for each Business Function and Product Action.	List of Product Offering Contextual Info (see Table 11)	

Table 5 - Product Offering Attributes

- [R31] If any Product Offering attribute listed in Table 5 has changed, then Product Offering Last Update **MUST** be set to reflect the most recent date the modification occurred.
- [R32] The Seller **MUST** create a new unique Product Offering Identifier and Product Offering if any of the following attributes listed in Table 5 have changed:
 - Product Offering Terms
 - Product Specification
 - Product Offering Specification
 - Product Offering Product Relationships
 - Product Offering Place Relationships
 - Product Offering Contextual Information
- [R33] If the Product Offering Contextual Information includes an entry for one Business Function or Product Action, then the Seller **MUST** provide a Product Offering Contextual Information entry in this list for every combination of Business Function and Product Action (as defined in Table 11) for the Product Offering.
- [R34] After a Product Offering has been created, the following attributes listed in Table 5 **MUST** not be modified:
 - Product Offering Identifier
 - Product Specification

8.2.2 Product Offering State Transition Attributes

The Product Offering State Transition attributes are defined in the table below.

Attribute	Description	Type	Comments
Transition Date	The Date and Time that the Transition Product Offering State is planned to occur or has occurred.	DateTime	
Transition Product Offering State	The lifecycle status of the Product Offering on the Transition Date.	One of (see Table 18): <ul style="list-style-type: none"> • ANNOUNCED • END_OF_SALE • END_OF_SUPPORT • OBSOLETE • ON_HOLD • ORDERABLE • PILOT_BETA • REJECTED 	

Table 6 - Product Offering State Transition Attributes

[R35] A Product Offering State Transition **MUST** contain the following attributes defined in Table 6:

- Transition Date
- Transition Product Offering State

8.2.3 Region Attributes

The Regions attributes are defined in the table below. All attributes are set by the Seller.

Attribute	Description	Type	Comments
Locality	An area of defined or undefined present boundaries within a local authority or other legislatively defined area, usually rural or semi-rural in nature.	String	Note: Should only be specified by a Seller for a Product Offering that is not available Country wide.
State Or Province	The State or Province the region is located.	String	Note: Should only be specified by a Seller for a Product Offering that not available Country wide.

Attribute	Description	Type	Comments
Country	The Country the region is located.	String	

Table 7 - Region Attributes

- [R36] When specifying a Region, the Seller **MUST** specify the Country attribute defined in Table 7.
- [R37] When specifying a Region, the Seller **MUST NOT** include any attributes not defined in Table 7.

8.2.4 Product Offering Term Attributes

A Product Offering Term is the commitment duration under which a Product Offering is available to Buyers. A Product Offering can have multiple Product Offering Terms, each with a different commitment period, for instance with a 1, 2 or 3 year duration.

The attributes are defined in the table below. All attributes are set by the Seller.

Attribute	Description	Type	Comments
Name	Unique name (within the Seller domain) of the Product Offering Term.	String	
Description	Description of the Product Offering Term.	String	
Duration	The commitment period of the Product Offering.	Duration attribute defined in MEF 57.2 [8] Section 8.21	
End of Term Action	The action the Seller will take once the term expires.	One of: <ul style="list-style-type: none"> • ROLL • AUTO_DISCONNECT • AUTO_RENEW 	<p>ROLL: The Term will continue on a rolling basis for the duration of the Roll Interval at the end of the term.</p> <p>AUTO_DISCONNECT: The Product Offering will be disconnected at the end of the term.</p> <p>AUTO_RENEW: The Product Offering will be automatically renewed for the Duration at the end of the term.</p>
Roll Interval	The recurring renewal period after the original term has expired.	Duration attribute defined in MEF 57.2 [8] Section 8.21	

Table 8 - Product Offering Term Attributes

[R38] A Product Offering Term **MUST** contain the following attributes defined in Table 8:

- Name
- Duration
- End of Term Action

[R39] A Product Offering Term **MUST** contain the Roll Interval defined in Table 8, if the End of Term Action is ROLL.

8.2.5 Product Offering Product Relationship Attributes

The Product Offering Product Relationship effectively allows constraining the relationship between related Product Offerings. Note: this will override the number of supported instances specified in the Product Specification Product Relationship attribute of any related Product Offerings based on the related Product Specification.

The attributes are defined in the table below. All attributes are set by the Seller.

Attribute	Description	Type	Comments
Related Product Specification Identifier	The Identifier of the associated Product Specification.	Reference	Note: the constraint is on the Product Specification level, which gets inherited by all related Product Offerings.
Relationship Type	Specifies the nature of the relationship between any related Product Offerings that are based on the related Product Specification.	String	This must be one of the relationship types as defined in the related Product Specification.
Min Cardinality	The minimum number of supported instances of any related Product Offering based on the related Product Specification.	Integer	
Max Cardinality	The maximum number of supported instances of any related Product Offering based on the related Product Specification.	Integer	

Table 9 - Product Offering Product Relationship Attributes

[R40] A Product Offering Product Relationship **MUST** contain the following attributes defined in Table 9:

- Related Product Offering Identifier
- Relationship Type
- Min Cardinality
- Max Cardinality

[R41] The Min Cardinality **MUST** be greater than or equal to the Min Cardinality of the Product Specification Product Relationship of the Product Offering's

Specification for the specified Related Product Specification Identifier and Relationship Type.

- [R42] The Max Cardinality **MUST** be less than or equal to the Max Cardinality of the Product Specification Product Relationship of the Product Offering’s Specification for the specified Related Product Specification Identifier and Relationship Type.

8.2.6 Product Offering Place Relationship Attributes

The Product Offering Place Relationship allows constraining the Place relationship for the Product Offering. Note: this will override the number of supported Places for the related Product Specification Place Relationship attribute of the Product Specification that the Product Offering is based on.

The attributes are defined in the table below. All attributes are set by the Seller.

Attribute	Description	Type	Comments
Place Relationship Role	Specifies the nature of the relationship between the Product Offering and Place.	String	For example, INSTALL_LOCATION.
Product Action	The Product Action for which the Place Relationship Role applies.	One of: <ul style="list-style-type: none"> INSTALL CHANGE ALL 	ALL: Applies for all supported Product Actions for a given Product Offering. DISCONNECT does not apply here, since the Product Order only includes a Product Identifier.
Min Cardinality	The minimum number of Places that must be included for the Product Offering for the given Place Relationship Role and Product Action.	Integer	
Max Cardinality	The maximum number of Places that may be included for the Product Offering for the given Place Relationship Role and Product Action.	Integer	

Table 10 - Product Offering Place Relationship Attributes

- [R43] A Product Specification Place Relationship **MUST** contain the following attributes defined in Table 10:

- Place Relationship Role
- Action
- Min Cardinality
- Max Cardinality

[R44] The Min Cardinality **MUST** be greater than or equal to the Min Cardinality of the Product Specification Place Relationship of the Product Offering’s Specification for the specified Place Relationship Role and Product Action.

[R45] The Max Cardinality **MUST** be less than or equal to the Max Cardinality of the Product Specification Place Relationship of the Product Offering’s Specification for the specified Place Relationship Role and Product Action.

8.2.7 Product Offering Contextual Info Attributes

The Product Offering Contextual Info Attribute defines the behavior of the Product-Specific Attributes for a Product for each Business Function and Product Action for a given Product Offering (see section 7.2).

The attributes are defined in the table below. All attributes are set by the Seller.

Attribute	Description	Type	Comments
Business Function	The Business Function for which the categorization applies.	One of: <ul style="list-style-type: none"> • POQ • QUOTE • PRODUCT_ORDER • PRODUCT_INVENTORY • ALL 	ALL: Applies for all supported Business Functions for a given Product Offering.
Product Action	The Product Action for which the categorization applies.	One of: <ul style="list-style-type: none"> • INSTALL • CHANGE • ALL 	<p>ALL: Applies for all supported Product Action for a given Product Offering.</p> <p>Note: The Product Action attribute does not apply for Business Function PRODUCT_INVENTORY.</p> <p>DISCONNECT does not apply here, since the Product Action only includes a Product Identifier.</p>

Attribute	Description	Type	Comments
Product Offering Contextual Target Schema	A subschema of the Product Offering Specification that defines additional constraints on the Product-Specific Attributes for the purpose of generating and validating the request for a given Business Function and Product Action.	Reference to or value of a Product Schema	

Table 11 - Product Offering Contextual Info Attributes

[R46] A Product Offering Contextual Info **MUST** contain the following attributes defined in Table 11:

- Business Function
- Product Offering Contextual Target Schema

[R47] A Product Offering Contextual Info **MUST** contain the Product Action if the Business Function is not `PRODUCT_INVENTORY`.

8.2.8 Retrieve Product Offering List Use Case

The Buyer requests a list of Product Offerings from the Seller that meet a set of filter criteria.

8.2.8.1 Use Case Process Steps

1. The Buyer sends the Retrieve Product Offering List request to the Seller.

[O5] The Buyer request **MAY** contain none or more of the following filter criteria defined in Table 5:

- Product Offering Name
- Product Offering Last Update (range of dates)
- Product Offering State

- Standard Framework Agreement
 - Sales Channel
 - Market Segment
 - Country (attribute of a Region)
 - Product Offering Product Category
 - Product Specification
2. The Seller receives this request and returns a summarized list of Product Offerings.
- [R48]** The Seller response **MUST** include the following attributes defined in Table 5 for each Product Offering that matches the Buyer’s filter criteria:
- Product Offering Identifier
 - Product Offering Name
 - Product Offering Last Update
 - Product Offering State
 - Standard Framework Agreement
 - Sales Channels
 - Market Segments
 - Regions
 - Product Offering Product Categories
- [R49]** When the Product Offering’s Sales Channel filter criteria is used, the Seller response **MUST** only include every Product Offering that has a matching Sales Channel.
- [R50]** A Product Offering with no Sales Channels **MUST** be considered as matching any Product Offering’s Sales Channel filter criteria.
- [R51]** When the Product Offering’s Market Segment filter criteria is used, the Seller response **MUST** only include every Product Offering that has a matching Market Segment.
- [R52]** A Product Offering with no Market Segments **MUST** be considered as matching any Product Offering’s Market Segment filter criteria.

- [R53] When the Product Offering's Country filter criteria is used, the Seller response **MUST** only include every Product Offering that has a matching Country within the Regions attribute.
- [R54] A Product Offering with no Regions **MUST** be considered as matching any Product Offering's Country filter criteria.
- [R55] The Seller response **MUST** include every Product Offering where the Product Offering Category Identifier filter criteria matches one of the Product Offering Product Categories of a Product Offering or one of the Sub Categories of the Product Offering Categories.
- [R56] The Seller response **MUST NOT** include any attributes not defined in Table 5.
- [R57] If no Product Offerings match the filter criteria provided by the Buyer, the Seller **MUST** return a positive response with an empty list.

8.2.9 Retrieve Product Offering by Product Offering Identifier Use Case

The Buyer requests detailed information about a single Product Offering based on a Product Offering Identifier.

8.2.9.1 Use Case Process Steps

1. The Buyer sends the Retrieve Product Offering by Product Offering Identifier request to the Seller.

[R58] The Buyer request **MUST** include the following attribute defined in Table 5:

- Product Offering Identifier

2. The Seller receives the request and returns details for the Product Offering with the Product Offering Identifier.

[R59] The Seller response **MUST** include the following attributes defined in Table 5:

- Product Offering Identifier
- Product Offering Name
- Product Offering Description
- Product Offering Last Update
- Product Offering State
- Product Specification

[R60] The Seller response **MUST** include the following optional attributes defined in Table 5, if they are set:

- Product Offering State Transitions
- Product Offering State Reason
- Standard Framework Agreement
- Attachments
- Related Contact
- Sales Channels
- Market Segments
- Regions
- Product Offering Terms
- Product Offering Milestones
- Product Offering Notes
- Product Offering Product Categories
- Product Offering Specification
- Product Offering Product Relationships
- Product Offering Place Relationships
- Product Offering Contextual Information

[R61] The Seller response **MUST NOT** include any attributes not defined in Table 5.

8.3 Product Specifications Use Cases

Details for the Product Specification attributes and the following Use Cases are defined in this section:

- Retrieve Product Specification List
- Retrieve Product Specification by Product Specification Identifier

8.3.1 Product Specification Attributes

The Product Specification attributes are defined in the table below. All attributes are set by the Seller.

Attribute	Description	Type	Comments
Product Specification Identifier	Unique identifier for the Product Specification.	String	For MEF standardized products, this should be the MEF assigned URN.
Product Specification Name	The name of the Product Specification.	String	
Product Specification Description	Description of the Product Specification.	String	
Product Specification Last Update	The date and time an attribute within this Product Specification was created or most recently updated.	Date/Time	
Product Specification State	The current lifecycle status of the Product Specification.	One of (see Table 19): <ul style="list-style-type: none"> • PUBLISHED • OBSOLETE 	
Product Specification Attachments	Complements the Product Specification Description (datasheets, manuals, pictures, videos, etc.).	List of Attachment attribute as defined in MEF 113 [12] Section 8.1.4	
Product Specification Product Relationships	Specifies the relationships between related Product Specifications.	List of Product Specification Product Relationship (see Table 13)	As an example, an Access E-Line OVC references an Operator UNI and ENNI Product Specifications.
Product Specification Place Relationships	Specifies the relationship between the Product Specification and Place.	List of Product Specification Place Relationship (see Table 14)	
Product Specification Milestones	Specifies the different stages of the Product Ordering.	List of Product Milestone (see Table 15)	

Attribute	Description	Type	Comments
Product Specification Notes	A set of comments for additional information.	List of Note as defined in MEF 57.2 [8] Section 8.14	
Source Product Specification Schema	A reference to or value of the Product Schema as included in the Product Specification.	Reference to or value of a Product Schema	

Table 12 - Product Specification Attributes

[R62] If any Product Specification attribute listed in Table 12 has changed, then Product Specification Last Update **MUST** be set to reflect the most recent date the modification occurred.

[R63] After a Product Specification has been created, the following attributes listed in Table 12 **MUST** not be modified:

- Product Specification Identifier
- Product Specification Product Relationships
- Product Specification Place Relationships
- Source Product Specification Schema

8.3.2 Product Specification Product Relationship Attributes

The Product Specification Product Relationship allows specifying the nature of the relationships and cardinality between related Product Specifications.

The attributes are defined in the table below. All attributes are set by the Seller.

Attribute	Description	Type	Comments
Related Product Specification Identifier	The Identifier of the associated Product Specification.	Reference	
Relationship Type	Specifies the nature of the relationship between the Product Specifications.	String	This must be one of the relationship types as defined in the Product Specification.
Min Cardinality	The minimum number of supported instances of Product Offerings based on the related Product Specification (as specified in the corresponding MEF Product Specification).	Integer	For example, as specified in the ‘Relationship Between Entities’ Section of MEF 106.

Attribute	Description	Type	Comments
Max Cardinality	The maximum number of supported instances of Product Offerings based on the related Product Specification (as specified in the corresponding MEF Product Specification).	Integer	If not specified, then there is no maximum number of instances of Product Offerings based on the related Product Specification.

Table 13 - Product Specification Product Relationship Attributes

[R64] A Product Specification Product Relationship **MUST** contain the following attributes defined in Table 13:

- Related Product Specification Identifier
- Relationship Type
- Min Cardinality

8.3.3 Product Specification Place Relationship Attributes

The Product Specification Place Relationship allows specifying the nature of the Place relationship and cardinality of supported Places for the Product Specification.

The attributes are defined in the table below. All attributes are set by the Seller.

Attribute	Description	Type	Comments
Place Relationship Role	Specifies the nature of the relationship between the Product Specification and Places.	String	For example, <code>INSTALL_LOCATION</code> .
Product Action	The Product Action for which the Place Relationship Role applies.	One of: <ul style="list-style-type: none"> • <code>INSTALL</code> • <code>CHANGE</code> • <code>ALL</code> 	<p>ALL: Applies for all supported Product Action for a given Product Offering.</p> <p>DISCONNECT does not apply here, since the Product Order only includes a Product Identifier.</p>
Min Cardinality	The minimum number of Places that must be included for the given Place Relationship Role and Product Action.	Integer	

Attribute	Description	Type	Comments
Max Cardinality	The maximum number of Places that may be included for the given Place Relationship Role and Product Action.	Integer	If not specified, then there is no maximum number of Places for the given Place Relationship Role and Action.

Table 14 - Product Specification Place Relationship Attributes

[R65] A Product Specification Place Relationship **MUST** contain the following attributes defined in Table 14:

- Place Relationship Role
- Action
- Min Cardinality

8.3.4 Product Milestone Attributes

The Product Milestone allows specifying the different stages of the Product provisioning process.

The attributes are defined in the table below. All attributes are set by the Seller.

Attribute	Description	Type	Comments
Milestone Name	The unique identifier of the milestone (as specified in the corresponding MEF Product Specification).	String	For example, AWAITING_ACCESS, ACCESS_DENIED.
Milestone Description	The explanation of what the milestone represents and when it occurs.	String	

Table 15 - Product Milestone Attributes

[R66] A Product Milestone Attributes **MUST** contain the following attributes defined in Table 15:

- Milestone Name
- Milestone Description

8.3.5 Retrieve Product Specification List Use Case

The Buyer requests a list of Product Specifications from the Seller that meet a set of filter criteria.

8.3.5.1 Use Case Process Steps

1. The Buyer sends the Retrieve Product Specification List request to the Seller.

[O6] The Buyer request **MAY** contain none or more of the following filter criteria defined in Table 12:

- Product Specification Name
- Product Specification Last Update (range of dates)
- Product Specification State

2. The Seller receives this request and returns a summarized list of Product Specifications.

[R67] The Seller response **MUST** include the following attributes defined in Table 12 for each Product Specification that matches the Buyer's filter criteria:

- Product Specification Identifier
- Product Specification Name
- Product Specification Last Update
- Product Specification State

[R68] The Seller response **MUST NOT** include any attributes not defined in Table 12.

[R69] If no Product Specifications match the filter criteria provided by the Buyer, the Seller **MUST** return a positive response with an empty list.

8.3.6 Retrieve Product Specification by Product Specification Identifier Use Case

The Buyer requests detailed information about a single Product Specification based on a Product Specification Identifier.

8.3.6.1 Use Case Process Steps

1. The Buyer sends the Retrieve Product Specification by Product Specification Identifier request to the Seller.

[R70] The Buyer request **MUST** include the following attribute defined in Table 12:

- Product Specification Identifier

2. The Seller receives the request and returns details for the Product Specification with the Product Specification Identifier.

[R71] The Seller response **MUST** include the following attributes defined in Table 12:

- Product Specification Identifier

- Product Specification Name
- Product Specification Description
- Product Specification Last Update
- Product Specification State
- Source Product Specification Schema

[R72] The Seller response **MUST** include the following optional attributes defined in Table 12, if they are set:

- Product Specification Attachments
- Product Specification Product Relationships
- Product Specification Place Relationships
- Product Specification Milestones
- Product Specification Notes

[R73] The Seller response **MUST NOT** include any attributes not defined in Table 12.

8.4 Product Catalog Notifications Use Cases

Details for Product Catalog Notifications attributes and the following Use Cases are defined in this section:

- Register for Product Catalog Notifications
- Send Product Catalog Notification

8.4.1 Register for Product Catalog Notifications Use Case

The Buyer requests to subscribe to or unsubscribe from Product Catalog notifications.

8.4.1.1 Use Case Process Steps

- The Buyer sends the Register for Product Catalog Notifications request to the Seller.

[R74] The Buyer request **MUST** contain the following:

Attribute	Value	Description
Notification Action	START	Start receiving Notifications.
	STOP	Stop receiving Notifications.
Notification Type	List of one or more of: PRODUCT_CATEGORY_CREATE PRODUCT_CATEGORY_UPDATE PRODUCT_CATEGORY_STATE_CHANGE PRODUCT_OFFERING_CREATE PRODUCT_OFFERING_UPDATE PRODUCT_OFFERING_STATE_CHANGE PRODUCT_SPECIFICATION_CREATE PRODUCT_SPECIFICATION_UPDATE PRODUCT_SPECIFICATION_STATE_CHANGE	The Notification Types the Buyer wishes to receive.
Recipient Information	Target Address	The API callback target.

Table 16 - Buyer Register for Product Catalog Notifications Attributes

- The Seller responds to the Buyer’s request with an acknowledgment.

[CO1]<[O3] If the Seller supports the Register for Product Catalog Notifications Use Case, the Seller **MUST** support all Notification Types.

[CO2]<[O3] If the Seller supports Product Catalog Notifications, the Seller **MUST** send a PRODUCT_xxx_CREATE Notification whenever a new corresponding Product Catalog Element has been created.

[CO3]<[O3] If the Seller supports Product Catalog Notifications, the Seller **MUST** send a PRODUCT_xxx_UPDATE Notification whenever the Seller has updated a corresponding Product Catalog Element.

[CO4]<[O3] If the Seller supports Product Catalog Notifications, the Seller **MUST** send a PRODUCT_xxx_STATE_CHANGE Notification whenever a state change has occurred for a corresponding Product Catalog Element.

[R75] The Seller **MUST** respond to the Buyer’s request to indicate that the request was accepted or rejected.

[R76] If the Seller does not support notifications, they **MUST** return an error message to the Buyer indicating that notifications are not supported.

8.4.2 Send Product Catalog Notifications Use Case

The Seller sends a Product Catalog Notification to the Buyer provided Target Address when the Buyer has registered for Product Catalog Notifications and a Product Catalog Event has occurred.

8.4.2.1 Use Case Process Steps

1. The Seller generates and sends Product Catalog Notifications to subscribed Buyers.

[R77] The Seller **MUST** send Product Catalog Notifications to Buyers for Notification Types for which the Buyer has registered.

[R78] The Seller notification **MUST** include the following attributes:

Attribute	Value	Comments
Notification Type	One of the following: PRODUCT_CATEGORY_CREATE PRODUCT_CATEGORY_UPDATE PRODUCT_CATEGORY_STATE_CHANGE PRODUCT_OFFERING_CREATE PRODUCT_OFFERING_UPDATE PRODUCT_OFFERING_STATE_CHANGE PRODUCT_SPECIFICATION_CREATE PRODUCT_SPECIFICATION_UPDATE PRODUCT_SPECIFICATION_STATE_CHANGE	Set by the Seller
Product Catalog Element Identifier	String	Set by the Seller

Table 17 - Seller Notification Attributes

[R79] The Seller **MUST** send Product Catalog Notifications for PILOT_BETA or REJECTED states only to Buyers that have been included in beta testing or during the pilot of a Product based on prior agreement between the Buyer and Seller.

2. The Buyer acknowledges the Notification received from the Seller.

[O7] If the Seller fails to receive an acknowledgement from the Buyer repeatedly, they Seller **MAY** mark the Target Address as bad and stop sending notifications.

9 Product Catalog State Machines

This section of the document defines the states within the Product Offering and Product Specification State Machines.

9.1 Product Offering State Machine

The Product Offering State Machine is shown in Figure 5 below. The diagram and state definitions are adapted and aligned with TMF620 [13] (Product Catalog Management API REST Specification) and captures the states that a Product Offering goes through in its lifecycle. The specific states are managed by the Seller.

- [R80]** The Seller **MUST** support all Product Offering States and the associated state transitions shown in Figure 5 and Table 18.

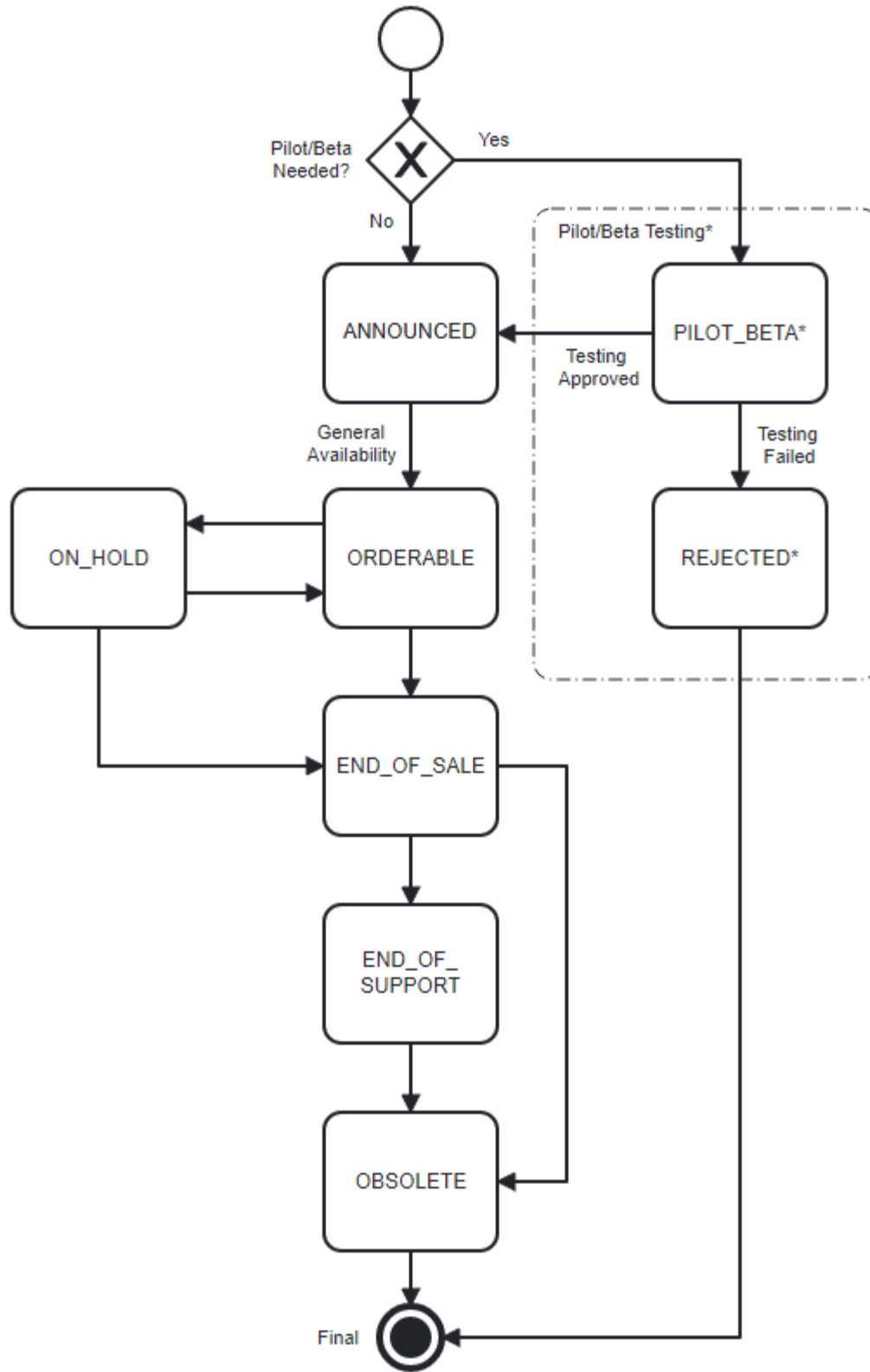


Figure 5 - Product Offering State Machine

The Product Offering States are defined in the table below.

State	Description
ANNOUNCED	A Product Offering has been defined in the Product Catalog for marketing purposes, but is not yet available for ordering.
END_OF_SALE	A new Product based on the Product Offering cannot be ordered by any Buyers, but Products may still be in use and may be changed or disconnected, and receive support.
END_OF_SUPPORT	When a Product Offering is in the END_OF_SALE state, it is no longer possible to Install new, nor Change any existing Products based on the Product Offering. The Buyer can still use Products based on the Product Offering as is without any support from the Seller (the only allowed action is DISCONNECT).
OBSOLETE	The Product Offering is only available in the Product Catalog for historical documentation reasons. No actions are allowed on Products based on these Product Offering. A Product Offering that is OBSOLETE may be removed at the Seller’s discretion from the Product Catalog. This is a final state.
ON_HOLD	<p>A Product Offering is ON_HOLD when the Seller decides to stop Buyers from ordering new Products based on the Product Offering (for example, due to supply constraints, product recall, legal reasons, etc.).</p> <p>The Product Offering can transition to either ORDERABLE when the constraints are lifted and the Buyer can order new Products again, or to END_OF_SALE, if the Seller decides to stop offering Products based on the Product Offering.</p> <p>The State ON_HOLD is an intermediate temporary state.</p>
ORDERABLE	When a Product Offering is in the ORDERABLE state, a Buyer can Install new Products, and change or disconnect any active Products based on the Product Offering.
PILOT_BETA*	A Product Offering in the PILOT_BETA state can only be used by a Buyer during a limited period of time for beta testing or during the pilot of a Product. Normally, only a limited set of Buyers will be given access to a Product Offering in this state.
REJECTED*	When the pilot testing period is ended by the Seller, they may decide whether the Product Offering becomes available for ordering; otherwise, the Product Offering transitions to the REJECTED state. This is a final state.

Table 18 - Product Offering States

*Note: Only applicable for select Buyers involved with pilot/beta testing.

[D1] The Seller **SHOULD** add a Product Offering Note describing the reasons for the condition when a Product Offering transitions to the ON_HOLD state.

[R81] The Seller **MUST NOT** remove a Product Offering from the Product Catalog unless the state is REJECTED or OBSOLETE.

9.2 Product Specification State Machine

The Product Specification State Machine is shown in Figure 6 below. The diagram and state definitions are adapted and aligned with TMF620 [13] (Product Catalog Management API REST Specification) and captures the states that a Product Specification goes through in its lifecycle. The specific states are managed by the Seller.

[R82] The Seller **MUST** support all Product Specification States and the associated state transitions shown in Figure 6 and Table 19.

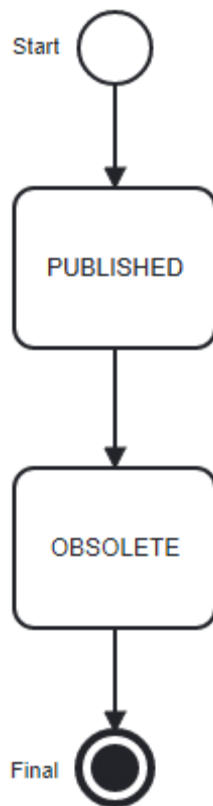


Figure 6 - Product Specification State Machine

The Product Specification States are defined in the table below.

State	Description
PUBLISHED	A Product Specification has been defined in the Product Catalog. Product Offerings based on the Product Specification may be available for ordering.
OBSOLETE	The Product Specification is only available in the Product Catalog for historical documentation reasons. There are no active Products on the Seller’s Network based on the Product Specification. A Product Specification that is OBSOLETE may be removed at the Seller’s discretion from the Product Catalog. This is a final state.

Table 19 - Product Specification States

- [R83]** A Product Specification **MUST NOT** be set to the OBSOLETE state unless all associated Product Offerings are in the OBSOLETE or REJECTED state.
- [R84]** The Seller **MUST NOT** remove a Product Specification from the Product Catalog unless the state is OBSOLETE.

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 Service Attributes*, December 2018
- [4] MEF 26.2, *External Network Network Interfaces (ENNI) and Operator Services Attributes*, August 2016
- [5] MEF 50.1, *MEF Services Lifecycle Process Flows*, August 2017
- [6] MEF 51.1, *Operator Services Definitions*, December 2018
- [7] MEF 55.1.1, *LSO Reference Architecture and Framework*, December 2023
- [8] MEF 57.2, *Product Order Management Requirements and Use Cases*, August 2022
- [9] MEF 79, *Address, Service Site, and Product Offering Qualification Management Requirements and Use Cases*, June 2019
- [10] MEF 80, *Quote Management Requirements and Use Cases*, May 2021
- [11] MEF 81, *Product Inventory Management Requirements and Use Cases*, November 2019
- [12] MEF 113, *Trouble Ticketing Requirements and Use Cases*, October 2022
- [13] TMF620 TM Forum, *TMF620 Product Catalog Management API REST Specification R19.0.0*, July 2019.
- [14] ISO 8601, *Data elements and interchange formats – Information interchange -- Representation of dates and times*, 2004

Appendix A Acknowledgements

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

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