Draft Standard

MEF 127 Draft (R1)

Product Catalog Requirements and Use Cases

June 2023

This draft represents MEF work in progress and is subject to change.

This draft document represents MEF work in progress; it has not achieved full MEF standardization and is subject to change. Changes are likely before this becomes a fully endorsed MEF Standard. The reader is strongly encouraged to keep this in mind and review the Release Notes (if applicable) when making a decision on adoption. Additionally, because this document has not been adopted as a Final Specification in accordance with MEF's Bylaws, Members are not obligated to license patent claims that are essential to implementation of this document under MEF's Bylaws.

Disclaimer

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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, "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, with various comments received in the second Call for Comments Ballot still to be addressed in the next revision of the document. As such, the contents of this document are subject to change. The areas that are expected to have changes in them are as follows:

- Additions to the Key Concepts section describing the Product Offering Specification, Product Offering Contextual Info and Product Offering Contextual Target Schema and how they are used

- Various editorial updates, along with some examples for clarity

- Product Offering Contextual Info

- Product Offering Contextual Target Schema

- Product Specification attributes and Use Cases

- Product Catalog Notifications

- Product Offering and Product Specification Process Flow

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 [7], MEF 57.2 [8], MEF 79 [10], MEF 80 [11], MEF 81 [12] 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 Product Inventory.	This document
Buyer	In the context of this document, denotes the organization acting as the customer in a transaction over a Sonata/Cantata Interface Reference Point.	MEF 80 [11]
DateTime	Date and time format.	ISO 8601 [15]
Notification	A message sent from the Seller to the Buyer to inform about an event that has occurred in regard to a specific instance of a Product Catalog resource.	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-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]
Product Specification	In the context of this document, a specification comprising the following, for use with MEF APIs: • 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

Term	Definition	Reference
Seller	In the context of this document, denotes the organization acting as the supplier in a transaction over a Sonata/Cantata Interface Reference Point.	MEF 80 [11]

Table 2 - Terminology

Abbreviation	Definition	Reference
CPE	Customer Premise Equipment	This document
POQ	Product Offering Qualification	MEF 79 [10]

Table 3 - Abbreviations

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**.**

Editor Note 2:   The following paragraph will be deleted if no conditional requirements are used in the document.

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 Numerical Prefix Conventions

Editor Note 3:   This section will be deleted if no numerical prefixes are used in the document.

This document uses the prefix notation to indicate multiplier values as shown in the table below.

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 4 - Numerical Prefix Conventions

7   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 [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".
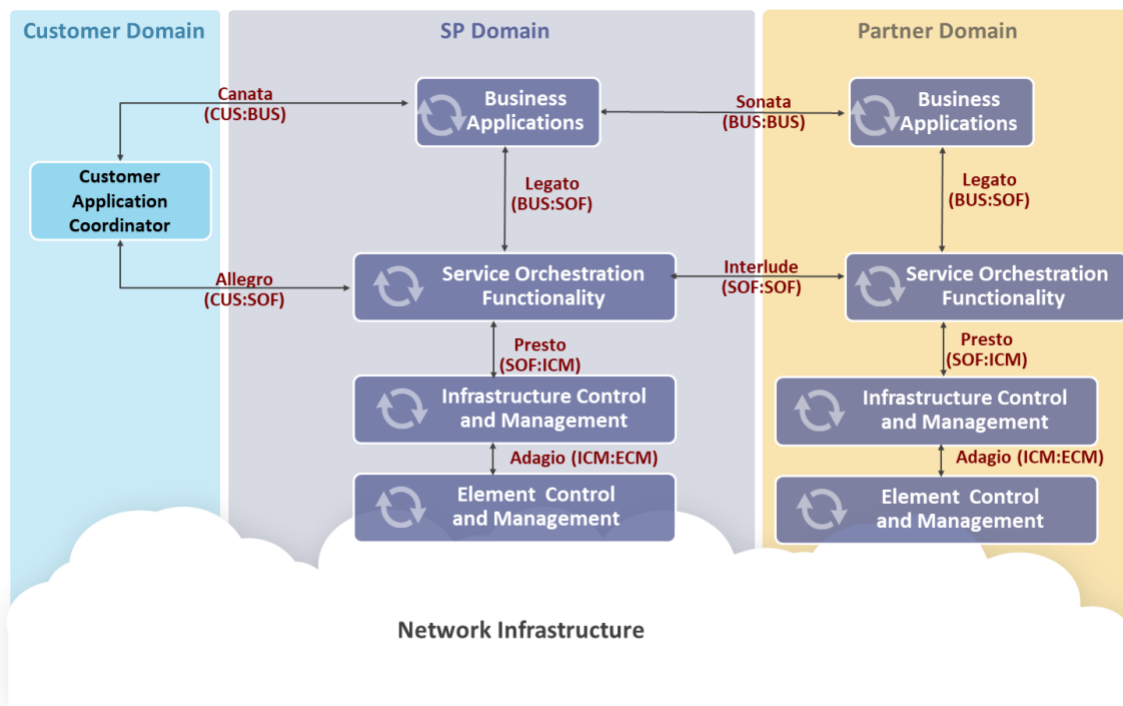
Figure 1 - LSO Reference Architecture Diagram

Figure 1 depicts the LSO Reference Architecture, per MEF 55.1 [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

8 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.
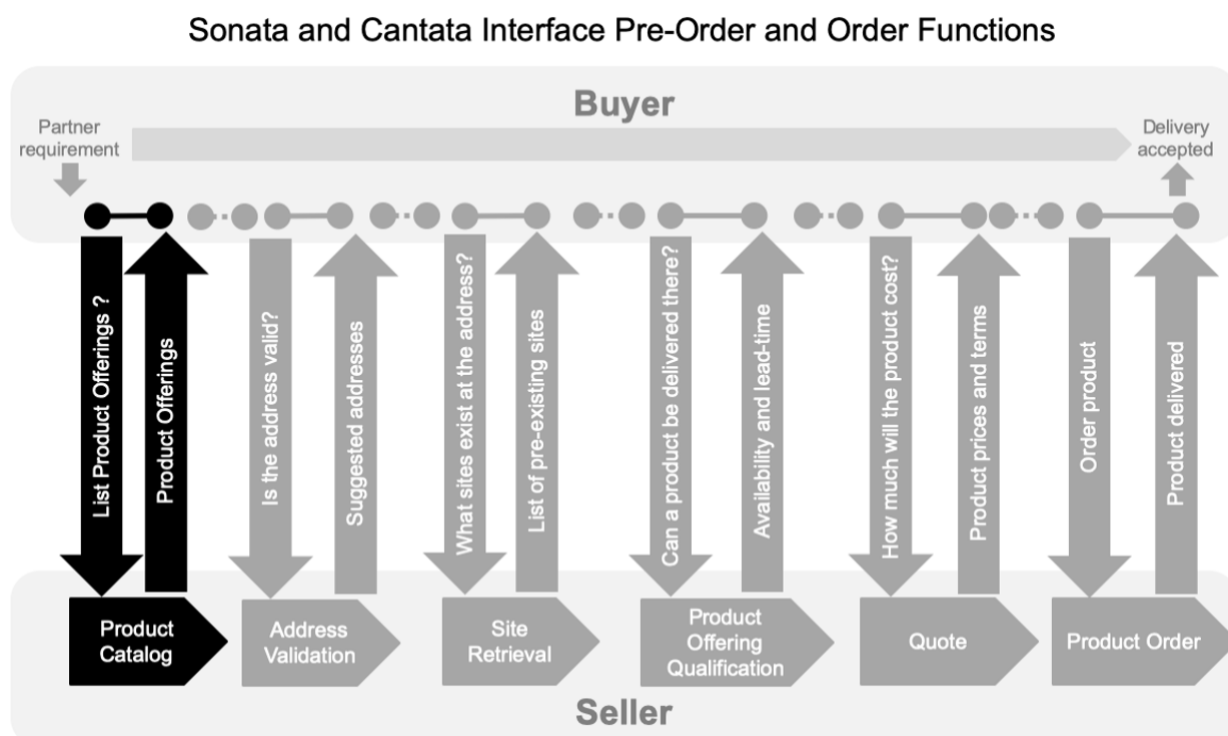
Figure 2 - Sonata and Cantata Interface Focus

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 Product Catalog functionality allows the Buyer to discover what Product Offerings the Seller provides and which Product Offering 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).

8.1   Product Catalog Elements

The Product Catalog is comprised of several key 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 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 At-tributes and relationships.

- Product Specification: A specification comprising the following, for use with MEF APIs:

  o a set of schemas that define all of the attributes of a Product and their possible values

  o definition of relationships with other Products and/or locations

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

8.2   Product-Specific Attribute Classification

To streamline the number of Product-Specific Attributes that are required to be included in the payload for the different Use Cases defined in 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 - 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 8.2.1

- Optional - 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 8.2.2

- Fixed - 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 8.2.3

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).

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.

8.2.1 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.

8.2.2   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.

[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.

8.2.3   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 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 corresponding 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 agreed-on 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.

9   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 Category entities.	Section 9.1.2
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 9.1.3
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 9.2.6
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 9.2.7
5	Retrieve Product Specification List	The Buyer request 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 9.3.3
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 9.3.4
7	Register for Product Catalog Notifications	The Buyer subscribes to Product Catalog notifications.	Section 9.4.1

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 9.4.2

Table 5 - Use Cases

9.1 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

9.1.1 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	
Product Category State	The current lifecycle status of the Product Category.	One of: • AVAILABLE • OBSOLETE	
Parent Category	Identifier referencing the Parent of this Product Category.	Reference to Product Category	Note: This is empty for top-level Categories.

Attribute	Description	Type	Comments
Sub Categories	A list of Product Category Identifiers, to which this Product Category is a parent of.	List of Reference to Product Category (this table)	
Product Offerings	A list of Product Offering Identifiers grouped within this Product Category.	List of Reference to Product Offering (see Table 7)	

Table 6 - 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 this Product Category **MUST** be included in the Sub Categories for Product Category A.

[R20] The Product Offerings attribute specified in Table 6 **MUST** list all Product Offerings that reference this Product Category.

[R21] If any Product Category attribute listed in Table 6, excluding Sub Categories and Product Offerings 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 following attributes listed in Table 6 **MUST** not be modified:

- Product Category Identifier
- Product Category Name

9.1.2 Retrieve Product Category List Use Case

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

9.1.2.1 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 6:

- Product Category Name

- Product Category Last Update (range of dates)

- Product Category State

- 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 6 for each Product Category that matches the Buyer's filter criteria:

   - Product Category Identifier

   - Product Category Name

   - Product Category Description

   - Product Category Last Update

   - Product Category State

   [R24]   The Seller response **MUST** include the following attributes defined in Table 6 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 6.

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

9.1.3   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.

9.1.3.1   *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 6:

   - 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 6:
>
> - Product Category Identifier
>
> - Product Category Name
>
> - Product Category Description
>
> - Product Category Last Update
>
> - Product Category State
>
> **[R29]** The Seller response **MUST** include the following attributes defined in Table 6 if they are set:
>
> - Parent Category
>
> - Sub Categories
>
> - Product Offerings
>
> **[R30]** The Seller response **MUST NOT** include any attributes not defined in Table 6.

9.2 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

9.2.1 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.

Attribute	Description	Type	Comments
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	
Product Offering State	The current lifecycle status of the Product Offering.	One of (see Table 17): • ACTIVE • END_OF_SALE • END_OF_SUPPORT • OBSOLETE • ON_HOLD • ORDERABLE • PILOT_BETA • REJECTED	
Upcoming Product Offering State Transitions	The list of planned Product Offering State transitions, including the date they are expected to occur.	List of Product Offering State Transition (see Table 8)	
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	

Attribute	Description	Type	Comments
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.
Attachments	Complements the Product Offering description with presentation, video, pictures, etc.	List of Attachment attribute as defined in MEF 113 [13] Section 8.1.4	Note: The Seller should include all documents describing the Standard Framework Agreement as an Attachment.
Related Contacts	Defines the contact info and role for the related contact of a Product Offering.	List of Related Contact attribute as defined in MEF 113 [13] Section 8.1.5	
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	The different Sales Channels should be specified in the Standard Framework Agreement or provided during the onboarding process. For example: Reseller, Distribution, Direct Sales. Note: If Sales Channels is an empty list, it implies that the Product Offering is available in all Seller supported Sales Channels.

Attribute	Description	Type	Comments
Market Segments	The names of the market segments targeted for the Product Offering.	List of Strings	The set of market segment names should be specified in the Standard Framework Agreement or provided during the onboarding process. For example: Wholesale, Federal, Financial. Note: If Market 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 9)	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 10)	
Product Offering Notes	A set of comments for additional information.	List of Note attribute as defined in MEF 57.2 [8] Section 8.14	

Attribute	Description	Type	Comments
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 6)	
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 schema that restricts the possible values, relationships, and milestones of the Product Specification Schema to define the Product Offering.	Reference to or value of a Product Offering Specific Schema	
Product Offering Contextual Information	Defines additional constraints on the Product Offering Specification for use with the Product Specific Attributes for a Product Offering for each Business Function and Product Action.	List of Product Offering Contextual Info (see Table 11)	

Table 7 - Product Offering Attributes

[R31] If any Product Offering attribute listed in Table 7 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 Product Offering Identifier for every new variant (or release) of a Product Offering.

[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 Category has been created, the following attributes listed in Table 6 **MUST** not be modified:

- Product Offering Identifier

- Product Specification

9.2.2 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 Upcoming Product Offering State transition is planned to occur.	DateTime	
Upcoming Product Offering State	The lifecycle status of the Product Offering on the planned Transition Date.	One of (see Table 17): • ACTIVE • END_OF_SALE • END_OF_SUPPORT • OBSOLETE • ON_HOLD • ORDERABLE • PILOT_BETA • REJECTED	

Table 8 - Product Offering State Transition Attributes

[R35] A Product Offering State Transition **MUST** contain the following attributes defined in Table 8:

- Transition Date

- Upcoming Product Offering State

9.2.3 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 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.
Country	The Country the region is located.	String	

Table 9 - Region Attributes

> **[R36]** When specifying a Region, the Seller **MUST** specify the Country attribute defined in Table 9.

> **[O5]** When specifying a Region, the Seller **MAY** specify any of the other attributes defined in Table 9.

9.2.4   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	

Attribute	Description	Type	Comments
End of Term Action	The action the Seller will take once the term expires.	One of: • ROLL • AUTO_DISCONNECT • AUTO_RENEW	ROLL: The Product Offering will continue on a rolling basis for the duration of the Roll Interval at the end of the term. AUTO_DISCONNECT: The Product Offering will be disconnected at the end of the term. AUTO_RENEW: The Product Offering will be automatically renewed for the Duration at the end of the term.
Roll Interval	The recurring renewal period after the original term has expired.	Duration attribute defined in MEF 57.2 [8] Section 8.21	

Table 10 - Product Offering Term Attributes

[R37]   A Product Offering Term **MUST** contain the following attributes defined in Table 10:

- Name

- Duration

- End of Term Action

[R38]   A Product Offering Term **MUST** contain the Roll Interval defined in Table 10, if the End of Term Action is ROLL.

9.2.5   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 8.2).

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: • 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: • INSTALL • CHANGE • ALL	ALL: Applies for all supported Product Action for a given Product Offering. Note: The Product Action attribute does not apply for Business Function PRODUCT_INVENTORY. DISCONNECT is not needed here, since the Product Action only includes a Product Identifier.
Product Offering Contextual Target Schema	Defines the constraints on the Product Offering Specification for generating and validation the payload for a given Business Function and Product Action.	Reference to a Product Offering Specific Schema	

Table 11 - Product Offering Contextual Info Attributes

[R39]   A Product Offering Contextual Info **MUST** contain the following attributes defined in Table 11:

- Business Function

- Product Action

- Product Offering Contextual Target Schema

9.2.6   Retrieve Product Offering List Use Case

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

9.2.6.1   Use Case Process Steps

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

   [O6]   The Buyer request **MAY** contain none or more of the following filter criteria defined in Table 7:

   - Product Offering Name

   - Product Offering Last Update (range of dates)

   - Product Offering State

   - Standard Framework Agreement

   - Sales Channel

   - Market Segment

   - Country (within a Region)

   - Product Offering Category

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

   [R40]   The Seller response **MUST** include the following attributes defined in Table 7 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

[R41] The Seller response **MUST** include every Product Offering where the Sales Channel filter criteria matches one of the Product Offering's Sales Channels or the Product Offering's Sales Channels is an empty list.

[R42] The Seller response **MUST** include every Product Offering where the Market Segment filter criteria matches one of the Product Offering's Market Segments or the Product Offering's Market Segments is an empty list.

[R43] The Seller response **MUST** include every Product Offering where the Country filter criteria matches one of the Product Offering's Regions or the Product Offering's Regions is an empty list.

[R44] The Seller response **MUST NOT** include any attributes not defined in Table 7.

[R45] If no Product Offerings match the filter criteria provided by the Buyer, the Seller MUST return a positive response with an empty list.

9.2.7 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.

9.2.7.1 Use Case Process Steps

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

    [R46] The Buyer request **MUST** include the following attribute defined in Table 7:

    - Product Offering Identifier

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

    [R47] The Seller response **MUST** include the following attributes defined in Table 7:

    - Product Offering Identifier

    - Product Offering Name

    - Product Offering Description

    - Product Offering Last Update

    - Product Offering State

    - Product Specification

[R48] The Seller response **MUST** include the following optional attributes defined in Table 7, if they are set:

- Upcoming Product Offering State Transitions

- Product Offering State Reason

- Standard Framework Agreement

- Attachments

- Related Contacts

- Sales Channels

- Market Segments

- Regions

- Product Offering Terms

- Product Offering Notes

- Product Offering Product Categories

- Product Offering Specification

- Product Offering Contextual Information

[R49] The Seller response **MUST NOT** include any attributes not defined in Table 7.

9.3 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

9.3.1 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 (within the Seller domain) for the Product Specification.	String	
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 the 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 17): • ACTIVE • END_OF_SALE • END_OF_SUPPORT • OBSOLETE • ON_HOLD • ORDERABLE • PILOT_BETA • REJECTED	
Brand	The manufacturer or trademark of the Product Specification if the Seller requires a CPE on the Buyer's premise.	String	
Product Number	An identifier assigned to the model or version of the CPE used in conjunction with the Brand (for example hardware SKU or software license key).	String	
Product Specification Attachments	Complements the Product Specification Description (datasheets, manuals, pictures, videos, etc.).	List of Attachment attribute as defined in MEF 113 [13] Section 8.1.4	This would only be expected to be used to provide additional information if there is a CPE required, for instance a link to the website of the CPE vendor.

Attribute	Description	Type	Comments
Product Specification Relationships	Specifies the nature of relationships among related Product Specifications.	List of Product Specification Relationship (see Table 13)	As an example, an Access E-Line OVC references an Operator UNI and ENNI Product Specifications.
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 the schema as included in the Product Specification.	Reference or value to a Product Schema	

Table 12 - Product Specification Attributes

[R50]   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.

9.3.2 Product Specification Relationship Attributes

The Product Specification Relationship allows specifying the nature of the relationships among 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	
Relationship Type	Specifies the nature of the relationships among the Product Specifications as specified in the Product Specification.	String	
Min Cardinality	The minimum number of instances of the Product Offering of the related Product Specification.	Integer	

Attribute	Description	Type	Comments
Max Cardinality	The maximum number of instances of the Product Offering of the related Product Specification.	Integer	There must be a way to specify that there is no maximum number of instances of the related Product Specifications.

Table 13 - Product Specification Relationship Attributes

[R51]　A Product Specification Relationship **MUST** contain the following attributes defined in Table 13:

- Related Product Specification Identifier

- Relationship Type

- Min Cardinality

- Max Cardinality

9.3.3　Retrieve Product Specification List Use Case

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

9.3.3.1　*Use Case Process Steps*

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

    [O7]　The Buyer request **MAY** contain none or more of the following filter criteria defined in Table 12:

    - Product Specification Last Update (range of dates)

    - Product Specification State

    - Brand

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

    [R52]　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

[R53] The Seller response **MUST NOT** include any attributes not defined in Table 12.

[R54] If no Product Specifications match the filter criteria provided by the Buyer, the Seller **MUST** return a positive response with an empty list.

9.3.4 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.

9.3.4.1 Use Case Process Steps

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

   [R55] 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.

   [R56] 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

   [R57] The Seller response **MUST** include the following optional attributes defined in Table 12, if they are set:

   - Brand
   - Product Number
   - Product Specification Attachments

- Product Specification Relationships

- Product Specification Notes

[R58] The Seller response **MUST NOT** include any attributes not defined in Table 12.

9.4 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

9.4.1 Register for Product Catalog Notifications Use Case

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

9.4.1.1 Use Case Process Steps

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

   [R59] 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 14 - Buyer Register for Product Catalog Notifications Attributes

2. 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 at least one Notification Type.

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

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

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

[R60] The Seller **MUST** respond to the Buyer's request to indicate that the request was accepted or rejected.

[R61] If the Seller does not support notifications, they **MUST** return an error message to the Buyer indicating that notifications are not supported.

9.4.2 Send Product Catalog Notifications Use Case

The Seller sends a Product Catalog Notification to the Buyer provided Recipient Information when a Product Catalog Event has occurred.

9.4.2.1 Use Case Process Steps

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

    [R62] The Seller Product Catalog Notifications **MUST** be sent to Buyers who have subscribed to the corresponding Notification Type.

    [R63] 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

Notification Identifier	String	Set by the Seller

Table 15 - Seller Notification Attributes

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

    [O8]   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.

10 Process Flows

This section of the document defines the process flows and states within the process flows.

10.1 Product Category Process Flow

The Product Category process flow is shown in Figure 3 below. The diagram and state definitions captures the states that a Product Category goes through in its lifecycle. The specific states and notifications are managed by the Seller.

> **[R64]** The Seller **MUST** support all Product Category States for a Product Category and the associated state transitions shown in Figure 3 and Table 16.
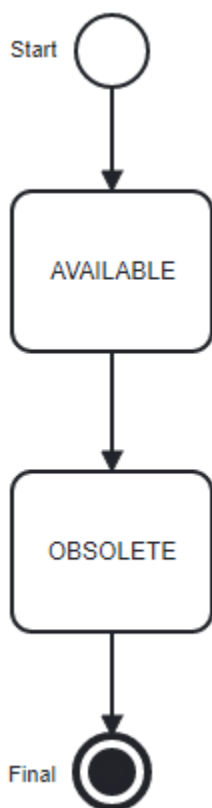

Figure 3 - Product Category Process Flow

The Product Category States are defined as follows:

State	Description
AVAILABLE	A Product Category is in the AVAILABLE state when it can be used by the Buyer to retrieve Product Offerings.
OBSOLETE	A Product Category is OBSOLETE when it can no longer be used by the Buyer to retrieve Product Offerings. The Product Category may be removed from the Product Catalog. This is a final state.

Table 16 - Product Category States

10.2 Product Offering and Product Specification Process Flow

The Product Offering and Product Specification process flow is shown in Figure 4 below. The diagram and state definitions are adapted and aligned with TMF620 [14] (Product Catalog Management API REST Specification) and captures the states that a Product Offering and Product Specification goes through in its lifecycle. The specific states and notifications are managed by the Seller.

[R65] The Seller **MUST** support all Product Offering and Product Specification States and the associated state transitions shown in Figure 4 and Table 17.
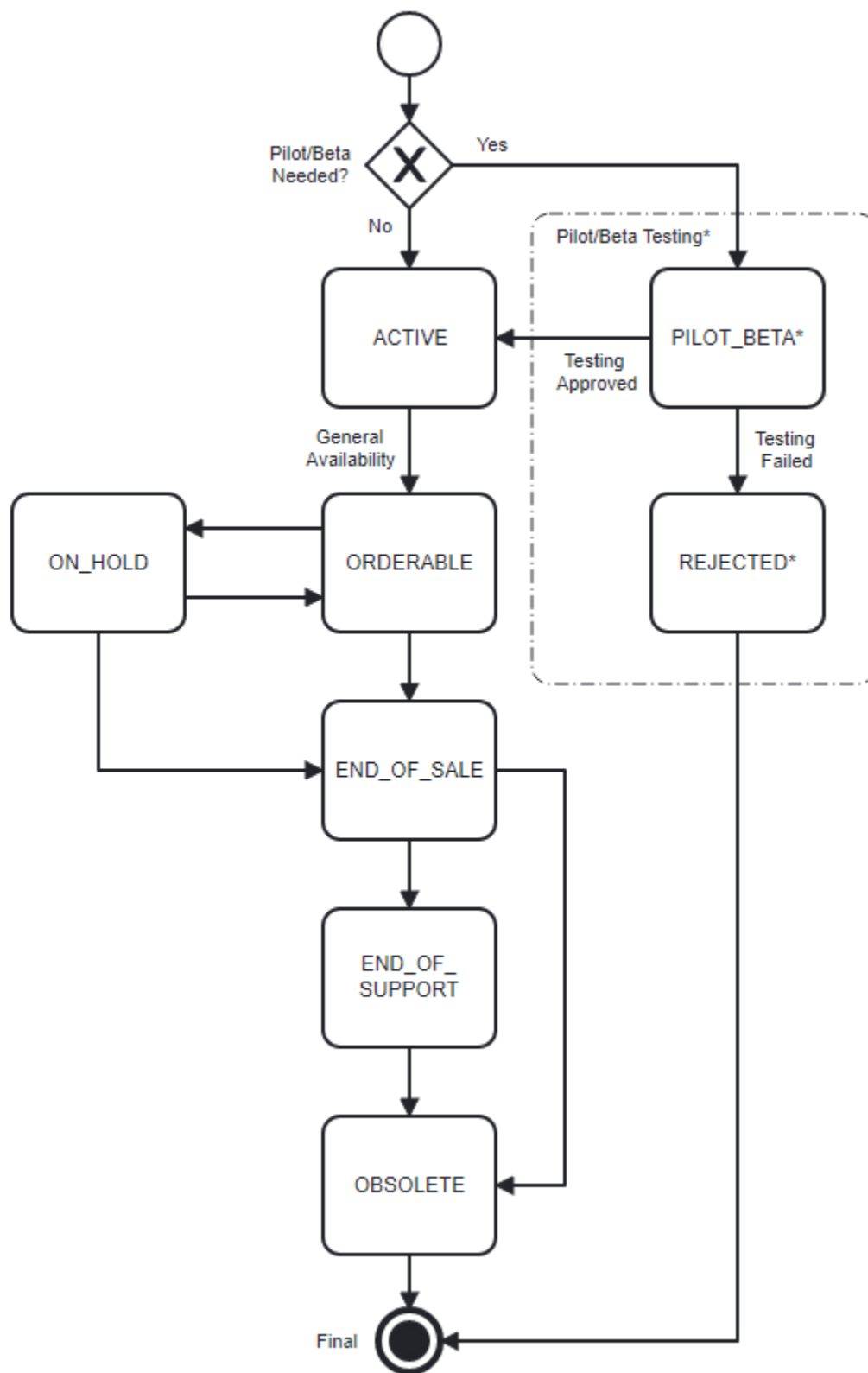
Figure 4 - Product Offering and Product Specification Process Flow

The Product Offering and Product Specification States are defined in the table below.

State	Description
ACTIVE	When a Product Offering or Product Specification has been defined and will be made available for ordering; however, it is not yet generally available.
END_OF_SALE	The END_OF_SALE state means the Product Offering or Product Specification cannot be Installed by any new or existing Buyers, but Buyers may still have Products in use and may Change or Disconnect it, and receive support.
END_OF_SUPPORT	When a Product Offering or Product Specification in the END_OF_SALE state is no longer supported, the state transitions to END_OF_SUPPORT. Any existing products can no longer be Changed, with the only Product Order action allowed is Disconnect.
OBSOLETE	After a Product Offering or Product Specification that is no longer available it transitions to OBSOLETE and may be removed at the Seller's discretion from the Product Catalog. This is a final state.
ON_HOLD	A Product Offering or Product Specification that has been ORDERABLE, but is currently not available for Buyers due to supply constraints, product recall or other issues preventing it to be offered.
ORDERABLE	A new Product Offering or Product Specification is in the ORDERABLE state when it is available for ordering by Buyers.
PILOT_BETA*	When a Product Offering or Product Specification starts Pilot/Beta testing, it starts in the PILOT_BETA state.
REJECTED*	When PILOT_BETA testing fails the Product Offering or Product Specification transitions to the REJECTED state. This is a final state.

Table 17 - Product Offering and Product Specification States

*Note: Only applicable for select Buyers involved with Pilot/Beta testing.

> **[O9]** A Seller **MAY** remove a Product Offering or Product Specification that is only in the OBSOLETE state from the Product Catalog.

> **[O10]** A Seller **MAY** remove a Product Offering or Product Specification that is in the REJECTED state from the Product Catalog.

11 References

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[13] MEF 113, *Trouble Ticketing Requirements and Use Cases*, October 2022

[14] TMF620 TM Forum, TMF620 Product Catalog Management API REST Specification R19.0.0, July 2019.

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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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