



## Working Draft 1.0

# Product Inventory Management Technical Specification Business Requirements and Use Cases

May 2018

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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.

Member Company

**Table 1 - Contributing Member Companies**

## 2 Abstract

This document represents the work done by the LSO Sonata Pre-Ordering team to identify the common product inventory attributes and processes needed to support inter-carrier retrieval of Product Inventory. This document supports the requirements defined in the MEF Lifecycle Service Orchestration (LSO) Reference Architecture and Framework (MEF 55, “LSO RA”) requirements for Inventory over the Sonata interface (Service Provider <-> Partner interactions). Information contained within this document will be utilized by both Buyer and Seller inventory systems for the development of automated API systems.

## 3 Terminology and Acronyms

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.

<b>Term</b>	<b>Definition</b>	<b>Reference</b>
Access E-Line	An E-Access Service, based on the O-Line Service definition.	MEF 51
Application Programming Interface (API)	In the context of Lifecycle Service Orchestration (LSO), API describes one of the Management Interface Reference Points based on the requirements specified in an Interface Profile, along with a data model, the protocol that defines operations on the data and the encoding format used to encode data according to the data model.	MEF 55
Buyer	Using MEF 55 terminology, a Buyer may be a Customer or a Service Provider who is buying from a Partner. For the purposes of this document, a Buyer is the Service Provider who is retrieving inventory from a Partner (aka, Seller).	MEF 57
Carrier Ethernet Network	A network from a Service Provider or network operator supporting the MEF service and architecture models.	MEF 12.1
Customer	A Customer is the organization purchasing, managing, and/or using Connectivity Services from a Service Provider. This may be an end-user business organization, mobile operator, or a partner network operator.	MEF 55
ENNI	A reference point representing the boundary between two Operator networks that are operated as separate administrative domains.	MEF 26.2
O-Line Service	A General OVC Service that uses a Point-to-Point OVC.	MEF 51
OVC Endpoint	A logical entity at a given External Interface that is associated with a distinct set of frames passing over that External Interface i.e., UNI, ENNI.	MEF 26.2
Partner	An organization providing Products and Services to the Service Provider (Buyer) to allow the Service Provider to instantiate and manage products external to the Service Provider domain.	MEF 55
Product Instance	Specific implementation of a Product Offering dedicated to the benefit of a party.	TMF GB922
Product Inventory	Product Inventory management software is a software system for tracking product inventory levels, orders, sales and deliveries. For the purposes of this document, it is the inventory managed by the Seller resulting from product orders.	This document
Product Offering	An externally facing representation of a Service and/or Resource procurable by the Customer.	TMF GB922

Term	Definition	Reference
Product Specification	A Product Specification describes the invariant properties (i.e., features) that a given set of Products MAY have. These properties provide the information needed to plan, construct, allocate, and/or retire the Services and Resources from the operator environment needed to deliver the Product.	This document
Seller	Using MEF 55 terminology, a Seller may be a Service Provider or a Partner who is providing products to a Buyer.	MEF 57
Service Provider	The organization providing Ethernet Service(s).	MEF 10.3
UNI	The physical demarcation point between the responsibility of the Service Provider and the responsibility of the Customer.	MEF 10.3

**Table 2 - Terminology and Abbreviations**

## 4 Scope

This specification defines the process for MEF Carrier Ethernet Product Inventory Management between a Partner/Access Provider (Seller) and Service Provider (Buyer). At this time this document is focused on Access E-Line services as defined in MEF 51. In the future this document will remove references to specific services. The requirements for Product Inventory Management will be developed following a UML process approach which includes, but is not limited to, Business Process Flows, Use Cases, Scenarios, Information Models, and State Machine Diagrams. This specification is limited to the business process requirements depicted as Use Cases and attribute definitions needed for Product Inventory Management. It will be the basis of requirements for a Product Inventory Data Model and API.

## 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 0, RFC 8174 0) 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.



## 6 Introduction

This specification defines the business requirements and process-related guidelines for the Product Inventory retrieval process over the Sonata interface. The Sonata interface is defined in MEF 55 as the Management Interface Reference Point supporting the management and operations interactions (e.g., ordering, billing, trouble management, etc.) between two network providers (e.g., Service Provider Domain and Partner Domain). The scope of this document is limited to interactions between these parties; within this document, they are referred to as the “Buyer” and the “Seller”.

It is assumed, for a product to exist in the Seller’s inventory system, that a Buyer has previously ordered the product. Changes to the product result from change orders being submitted. Products that get terminated are then removed from the Seller’s inventory system. The Buyer may retrieve any time of product inventory and not just Access E-Line as illustrated below. The characteristics of the product are found in an associated product specification.

As an example, the Buyer can query the product inventory for the following details which were created as a result of the product order.

1. *ACCESS E-Line* (corresponds to an OVC)
2. *UNI CE Endpoint* (corresponds to an OVC endpoint on a UNI)
3. *ENNI CE Endpoint* (corresponds to an OVC endpoint on an ENNI)
4. *UNI*
5. *ENNI*

To fully define the business interactions associated with inter-carrier inventory, this document is focused on the following key areas:

- [Product Inventory Use Cases](#) and Business Process Definitions
- [Product Inventory Attributes](#) supported in this document
- [State Diagrams](#) for Product Inventory

## 7 Requirements

R1: A Buyer MUST support the Buyer side of all [use cases](#) described in this specification.

R2: A Seller MUST support the Seller side of all use cases described in this specification.

R3 A Buyer's request MUST contain all product inventory [attributes](#) as specified in this specification as "requests" per use case.

R4: A Seller's response MUST contain all product inventory attributes as specified in this specification as "responses" per use case.

R5 The Seller MUST support all the states and their associated state transitions as specified in the product inventory [state machine](#).

## 8 Product Inventory Use Cases and Business Process Definitions

### 8.1 High-Level Use Cases

This section provides the complete set of Use Cases needed to support the Product Inventory retrieval of Ethernet Products and expands on the inventory process defined in MEF 50.1 (MEF Services Lifecycle Process Flows). These Use Cases are based on business process standards of interactivity between Buyers and Sellers of Ethernet Products. The specific attributes associated with each Use Case are defined in the section [Product Inventory Attributes](#). 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 the retrieval of any Product Inventory.

### 8.2 Product Inventory Use Cases

This section defines the use cases that support the retrieval of Product Inventory by a Buyer from a Seller's Inventory Management System.

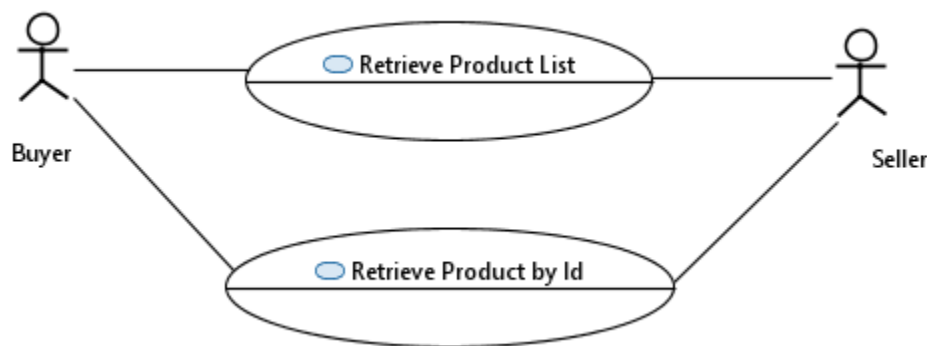


Figure 1 - Product Inventory Retrieval Use Cases

Use Case #	Use Case Name	Use Case Description
1	Retrieve Product List	The Buyer requests a list of Products from the Seller based on Product filter criteria.
2	Retrieve Product by Id	The Buyer requests a single Product based on a Product identifier.

**Table 3 - Use Case Table**

Note: Prior to order completion, the product is still in order processing stage and is not expected to be in the inventory. The inventory ID is not provided to the Buyer prior to order completion; it provides a complete Inventory record and is used by the Buyer as necessary.

This section defines the details for each Product Inventory use case.

Field	Description
Use Case Number	1
Use Case Name	Retrieve Product List
Description	The Buyer requests a list of Products from the Seller based on Product filter criteria.
Actors	Buyer/Seller
Pre-Conditions	<ol style="list-style-type: none"><li>1. The seller's product inventory database contains product instances.</li><li>2. The buyer knows which filtering attributes to specify. The filter includes the following attributes:<ul style="list-style-type: none"><li>• status</li><li>• productSpecId</li><li>• buyerProductId</li><li>• productOfferingId</li><li>• siteName</li><li>• siteCompanyName</li><li>• siteCustomerName</li><li>• relatedPartyRole</li><li>• place (id, type)</li></ul></li><li>3. The Buyer may also request to return product inventory starting at a specific index by specifying an "offset", or to limit the number of product instances returned by specifying a "limit".</li></ol>

Process Steps	<ol style="list-style-type: none"> <li>1. The seller receives the request and validates that the filter is well formulated.</li> <li>2. The seller determines if there are any product inventory instances that match the filter criteria.</li> <li>3. The seller returns a list of summarized product inventory instances. The summary data for each product instance includes: <ul style="list-style-type: none"> <li>• id</li> <li>• buyerProductId</li> <li>• startDate</li> <li>• status</li> <li>• productOfferingId</li> <li>• productSpecId</li> </ul> </li> </ol>
Post-Conditions	None
Alternative Paths	<ol style="list-style-type: none"> <li>1. The Seller will return an error message if an error is encountered. The Buyer may submit a new request.</li> <li>2. If the Buyer has specified an “offset”, or “limit”, only those product instances that correspond to the offset or limit will be returned.</li> <li>3. The Seller will return an empty list if there are no product inventory instances that meet the filter criteria.</li> </ol>
Business Process	MEF 50.1 Order-to-Delivery

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**Table 4 - Retrieve Product List**

Field	Description
Use Case Number	2
Use Case Name	Retrieve Product by Id
Description	The buyer retrieves a specific product instance based upon an identifier.
Actors	Buyer Seller
Pre-Conditions	<ol style="list-style-type: none"> <li>1. Buyer knows the identifier of the product inventory instance to be retrieved. The identifier is the Seller Provided ID (UNI/OVC/ENNI) as assigned during the ordering process.</li> </ol>
Process Steps	<ol style="list-style-type: none"> <li>1. The Seller receives the request and validates the identifier.</li> <li>2. The Seller determines if there is a product inventory instance that matches the identifier.</li> <li>3. The Seller returns the matching product inventory instance with all the attributes.</li> </ol>
Post-Conditions	None
Alternative Paths	<ol style="list-style-type: none"> <li>1. The Seller will return an error message if an error is encountered during processing.</li> <li>2. The Seller will return an error if the product inventory instance with the specified Seller provided identifier is not found.</li> </ol>
Business Process	MEF 50.1 Order-to-Delivery

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**Table 5 - Retrieve Product by Id**

## 9 Product Inventory Attributes

This section identifies the attributes needed for each of the inventory use cases defined above. The “Requirements” specified below are only defined in the context of Product Inventory; all characteristics of MEF-defined attributes should be referenced in the appropriate MEF Technical Specification document (MEF 26.1, MEF 26.2, MEF 10.3 and MEF 51 as examples).

It is important to note that this section defines the superset of all MEF-defined attributes needed to support Product Inventory for the Use Cases defined in this document. It is possible that individual Sellers may require additional attributes for their unique product offerings and the ability to extend the technical implementation of these requirements to allow for Buyer-Seller specific attributes should be accommodated but not mandated by the implementation design.

The Access E-Line related product specifications, which are not intended to be part of the Inventory API (which is product agnostic) are not defined here. They are accessible in the MEF GitHub [Product Specifications](#).

The columns in the table are as follows:

- **Attribute** The name of the attribute
- **Description** A short description of the attribute
- **Type** String, integer, enumerations, or reference to another entry in the table
- **Comments** Comments about the attribute
- **UC** The last two columns in the table represent use cases as defined in this specification, with each column having two entries, one for the “Req – Request” and one for the “Res – Response”. For each one there is an indication of whether the attribute may be present or not (Y|N), and whether it is mandatory or optional (M|O) when specified.
  - N=NO
  - Y=YES
  - M=MANDATORY
  - O=OPTIONAL

For example, for Product, the sellerProvidedId is listed as N | YM for UC1, which means it is not in the request, but is in the response and is mandatory. Similarly, for UC2, it is listed as YM | YM which means it is in both the request and the response and is mandatory in both.

Note: The requests are issued by the Buyer, and the responses are returned by the Seller.



Attributes	Description	Type	Comments	UC 1 Req   Res	UC 2 Req   Res
<b>Product</b>					
sellerProvidedId	Seller Provided ID (UNI/OVC/ENNI) as assigned during the ordering process	String	The identifier is created by the Seller when the product inventory instance is created	N   YM	YM   YM
buyerProductId	This identifier is optionally provided during the product ordering and stored for informative purpose in the seller inventory. It may be a Buyer's UNI ID or a Buyer's OVC ID	String	For any request to product update (done through product order), seller product id must be used.	YO   YO	N   YO
startDate	The date from which the product starts	DateTime	Defined by the Seller when the product is created.	N   YO	N   YM

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status	The state of the product in accordance with the product lifecycle.	Status Type	The Seller is responsible for managing the product lifecycle states.	YO   YM	N   YM
terminationDate	Termination date (commercial) is when the product has been terminated (when the disconnect in the product order has been processed).	DateTime	Timestamp of when the status changes to terminated.	N   N	N   YO
billingAccount	The Billing Account associated to the Product	Reference to a Billing Account	The billing account associated to the product provided at order time.	See Billing Account	
productOffering	The Product Offering associated to the Product	Reference to a Product Offering	The product offering associated to the product provided at order time.	See Product Offering	

relatedPartyRole	A set of Related Party Roles	Reference to a Related PartyRole	The related party roles associated to the product provided at order time.	See Related PartyRole	
place	The Place(s) associated to the Product.	Reference to a Place	The places associated to the product provided at order time.	See Place	
productRelationship	The product has a product relationship with other product(s).	Reference to a List of Related Products	This provides the means to show relationships between the products in the inventory.	See Product Relationship	
productSpec	The Product Specification associated to the Product	Reference to a Product Specification	The product specification that describes the characteristics of this product.	See Product Spec	
productOrderItem	The Product Order Item associated to the Product	Reference to a Product Order Item	The product order item of the associated product order that resulted in the creation of this product inventory instance.	See Product Order Item	
<b>Product Order Item</b>					<b>If present</b>
productOrderItemId	The Product Order Item identifier within the product order as identified in Product Order ID which affected the product inventory item.	String	This is a reference to the associated product order item.	N   N	N   YM



productOrderId	Identifies the product order id associated to the product order item	String		N   N	N   YM
<b>Product Offering</b>					<b>If present</b>
productOfferingId	A unique product offering identifier.	String	This identifier is provided by the seller and communicated to the buyer during the on-boarding process	YO   YO	N   YM
<b>Product Specification</b>					<b>If present</b>
productSpecId	A unique identifier of the product specification.	String	This is a reference to the associated product specification.	YO   YO	N   YM
<b>Related Party Role</b>					<b>If present</b>
id	A unique identifier of the related party role.	String	Established at the time of product ordering.	N   N	N   YO
role	The role of the related party.	String	These are roles such as “Implementation Contact” or “Technical Contact”.	N   N	N   YM
relatedParty	The related party associated to this role	Reference to a Related Party	Established at the time of product ordering.	N   N	N   YM
<b>Related Party</b>					<b>If present</b>

id	A unique identifier of the related party.	String	These are the related parties that were associated with the product order.	N   N	N   YM
name	Name of the related party.	String	Mandatory field provided at the time of the order.	N   N	N   YM
emailAddress	The email address of the related party.	String	Optional field provided at the time of the order.	N   N	N   YO
telephoneNumber	The telephone number of the related party.	String	Mandatory field provided at the time of the order.	N   N	N   YM
numberExtension	The telephone number extension of the related party.	String	Optional field provided at the time of the order.	N   N	N   YO
<b>Billing Account</b>					<b>If present</b>
id	The identifier of the billing account.	String	A reference to the billing account provided at the time the product was ordered.	N   N	N   YM
<b>Product Relationship</b>					<b>If present</b>

type	The type of relationship between products.	ProductRelationshipType	Indicates whether the type of relationship is "BUNDLED", "RELIES_ON", or "COMES_FROM"	N   N	N   YM
product	A reference to a product id.	Reference to a Product	The product to which another product is related.	N   N	N   YM
<b>Place</b>					<b>If present</b>
id	Unique identifier of the place.	String	This is an identifier that is common to all types of "places". The place is associated to the product at order time.	YO   N	N   YM
role	The role of the place.	String	Possible values are: "Billing Address", "UNI Site", or "ENNI Site".	N   N	N   YM
type	The type of place	String	This may be "Site", "FormattedAddress", "FieldedAddress", "ReferencedAddress", or "GeographicLocation".	YO   N	N   YM
<b>Formatted Address</b>					
"Place" attributes defined above.			A formatted address contains all the attributes of place.		
Other attributes			See all the attributes of a formatted address defined in MEF 57.	N   N	N   only if place type is FormattedAddress



Fielded Address					
"Place" attributes defined above.			A fielded address contains all the attributes of place.		
Other attributes			See all the attributes of a fielded address defined in MEF 57.	N   N	N   only if place type is FieldedAddress
Referenced Address					
"Place" attributes defined above.			A referenced address contains all the attributes of place.		
Other attributes			See all the attributes of a referenced address defined in MEF 57.	N   N	N   only if place type is ReferencedAddress
Geographic Location					
"Place" attributes defined above.			A geographic location contains all the attributes of place.		
Other attributes			See all the attributes of a geographic location defined in MEF 57.	N   N	N   only if place type is GeographicLocation
Site					

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"Place" attributes defined above.			A site contains all the attributes of place.		
Other attributes			See all the attributes of a site defined in MEF 57. For filtering in UC1, one can specify siteName, siteCompanyName, and siteCustomerName	YO   N	N   only if place type is Site

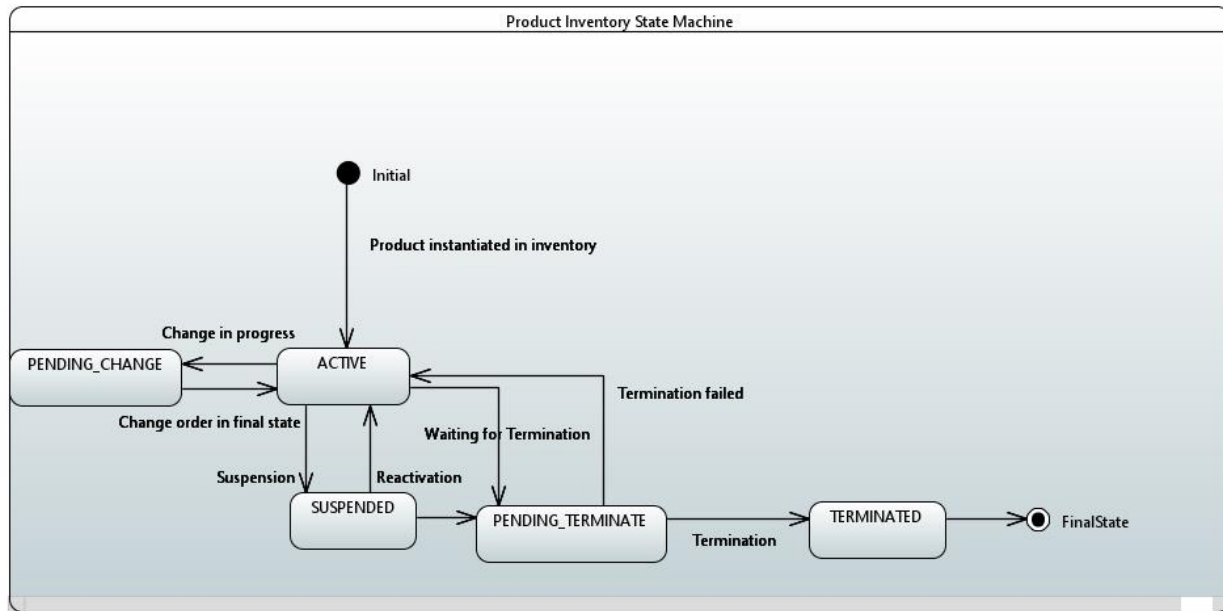
**Table 6 - Product Inventory Attributes**

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## 10 State Diagrams

### 10.1 Product Inventory State Machine

The Product Inventory state diagram is shown below. The state diagram captures various states that the Product goes through in its lifecycle. The specific states are managed by the Seller based on its processing and/or based on Buyer's action.



**Figure 2 - Product Inventory State Machine**

The definitions of the various states are as follows:

State	Description
ACTIVE	The product has been successfully installed or has transitioned from a PENDING_CHANGE, SUSPENDED, or PENDING_TERMINATE state.
PENDING_CHANGE	The product was previously ACTIVE and a product order to change the product is in progress.
SUSPENDED	A product has been successfully suspended.
PENDING_TERMINATE	The product is in the process of being terminated via a disconnect product order.
TERMINATED	The product has been successfully terminated via a disconnect product order.

**Table 7 - Product Inventory State Values**

## 11 References

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