MEF 81 Draft (R2)

Product Inventory Management
Requirements and Use Cases

June 2019

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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 identifies 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 [9]) 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   Release Notes

This document has the following Release Notes:

1. Commercial and Contract Attributes are not included. These will be added once finalized in MEF 80 [12].

4 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.

In addition, terms that are defined in MEF 10.3 [4], MEF 12.1 [5], MEF 26.2 [6], MEF 51.1 [8], MEF 55 [9], MEF 57.1 [10], and MEF 79 [11] are included in this document by reference and are not repeated in the table below.

Term	Definition	Reference
Product Inventory	Product Inventory is the inventory managed by the Seller resulting from Product order completion.	This document

Table 2 - Terminology and Abbreviations

5 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 51.1 [8]. In the future, this document will remove references to specific services. The requirements for Product Inventory, include, but are not limited to, Business Process Flows, Use Cases, Scenarios, Attributes, 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 Information Model, Data Model and API.

6 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 **OP-TIONAL**) are labeled as **[Ox]** for optional**.**

7 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 [9] 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".

Readers of this document are assumed to be familiar with MEF 57.1[10], MEF 79 [11], and MEF 80 [12]. Concepts, terms, and attributes explained in those documents are not explained within this document.

It is assumed, for a Product to exist in the Seller's Product Inventory, that a Buyer has previously ordered the Product and the Seller has fulfilled the Product Order. Additions and changes to a Product in the Product Inventory are the result of orders being fulfilled except for Contact changes as shown in 9.2 which are changed via some method agreed to by the Buyer and Seller. Products that are terminated might be removed from the Seller's inventory system or shown in the disconnected state at the Seller's discretion. The Buyer may retrieve any Product from the Product Inventory using the method described within this document. Product Identifiers of related Products are delivered as part of the response to the Inventory query.

As an example, the Buyer can query the Product Inventory for the following details, which were created as a result of the Product order being fulfilled.

1. *ACCESS E-Line* (corresponds to an OVC)
2. *UNI*
3. *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 shown in section 8

- Product Inventory Attributes supported in this document shown in section 9

- State Diagrams for Product Inventory shown in section 10

    [R1]   All orders that have been completed via automated or other methods **MUST** be provided when queried.

8 Product Inventory Use Cases and Business Process Definitions

This section describes the Product Inventory Use Cases and the business processes between Buyers and Sellers. The Use Cases needed to support the Product Inventory retrieval of Products and expands on the inventory process defined in MEF 50.1 [7]. These Use Cases are based on

business process standards of interactivity between Buyers and Sellers. The specific attributes associated with each Use Case are defined in section 9. 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. The Buyer is only allowed access to Product Inventory that they either act as the Buyer or Agent for the Buyer on. Methods used to limit access to specific Buyer personnel are beyond the scope of this document.

8.1   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 filter criteria.
2	Retrieve Product by Identifier	The Buyer requests the details associated with 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 Product Identifier might not be 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 filter criteria.
Actors	Buyer/Seller
Pre-Conditions	1. The Seller's Product Inventory database contains Products.

Process Steps	1. The Buyer submits a query specifying the filter criteria to the Seller. 2. The Seller receives the request and validates that the filter criteria is valid. 3. The Seller determines if there are any Products that match the filter criteria. 4. The Seller returns a list of summarized Products.
Post-Conditions	The Buyer has the requested information
Alternative Paths	1. The Seller returns an error message if an error is encountered while processing that prevents the Seller from completing the request. 2. If the query does not find any matching records, then the Seller will respond with an indication of this result. 3. If the Seller finds too many matches (the definition of "too many" is at the Seller's discretion), the response indicates this condition and no results are returned. In this case, the Buyer would need to reinitiate the Retrieve Product List request using more specific criteria to obtain a match.
Business Process	MEF 50.1 Order-to-Delivery

Table 4 - Retrieve Product List

[R2]　　　　The Buyer **MUST** support Use Case 1.

[R3]　　　　The Seller **MUST** support Use Case 1.

Field	Description
Use Case Number	2
Use Case Name	Retrieve Product by Identifier
Description	The Buyer retrieves the details associated with the Product that matches the specified Identifier.
Actors	Buyer, Seller
Pre-Conditions	1. Buyer knows the identifier of the Product to be retrieved. The identifier is the Seller Identifier (UNI/OVC/ENNI) as assigned by the Seller during the ordering process.
Process Steps	1. The Buyer submits a request based on the Seller Product Identifier 2. The Seller receives the request and validates the identifier. 3. The Seller returns the matching Product with all the attributes.
Post-Conditions	The Buyer has the information requested
Alternative Paths	1. The Seller will return an error message if an error is encountered during processing. 2. The Seller will return an error if the Product with the specific Product Identifier is not found.
Business Process	MEF 50.1 Order-to-Delivery

Table 5 - Retrieve Product by Identifier

[R4]   The Buyer **MUST** support Use Case 2.

[R5]   The Seller **MUST** support Use Case 2.

9   Product Inventory Operation Attributes

This section identifies the attributes needed for each of the inventory use cases defined above. 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.

The columns in the tables 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

9.1   Retrieve Product List

This section contains the Service Attributes and requirements for Use Case 1.

Attribute	Description	Type	Comments
Buyer	The unique name of the organization that is acting as the customer in this transaction.	String	See Buyer/Seller section
Seller	The unique name of the organization that is acting as the supplier in this transaction.	String	
Initial Order Completion Date	The date that the Product Order that created this Product was completed per MEF 57.1.	Date/Time Range	This date is the initial install date for the Product. A range of Date/Time is included in the query.
Last Order Update Date	The date that the latest Product Order affecting this Product was completed per MEF 57.1.	Date/Time Range	This date is when the latest order is completed for the Product. A range of Date/Time is included in the query.
Status	The state of the Product in accordance with the Product lifecycle shown in the state machine in section 10.	Enumeration Active Pending_Change Suspended Pending_Terminate Terminated	The Seller is responsible for managing the Product lifecycle states.
Product Specification ID	The identifier of the Product Specification	String	
Product Offering ID	The identifier of the Product Offering	String	
Billing Account	The Billing Account associated with the Product	Reference to a Billing Account	The current billing account associated with the Product provided at order time.
Service Site Identifier (Geographical Site ID)	The identifier of this Service Site	String	Unique between Buyer and Seller

Attribute	Description	Type	Comments
Related Product ID	The identifier of Related Product(s)	String	This criteria allows retrieving all Product records with a Product Relationship to a specified Product. E.g. All Products related to Product with ID 5
Product Order Identifier	Identifies the Product Order. Associated with the Product	String	This identifier is provided by the Seller and communicated to the Buyer during the order process. This ID is unique within the Seller.
Buyer Product ID	The identifier of the Buyer Product	String	This is specified and maintained by the Buyer

Table 6 Inventory Buyer Query Attributes

[R6]   The Buyer **MUST** be able to perform this Query without any filter criteria.

[O1]   The Buyer **MAY** specify any of the filter criteria shown in Table 6 in their Inventory Query.

The Seller receives the query from the Buyer and attempts to match the Buyer's filter criteria to Product Identifiers that are known the Seller. The definition of a "Match" is at the Seller's discretion. The Seller returns a list of all Product Identifiers that match the Buyer's filter criteria as described in Use Case 1 in Table 4.

Attribute	Description	Type	Comments
Buyer	The unique name of the organization that is acting as the customer in this transaction.	String	
Seller	The unique name of the organization that is acting as the supplier in this transaction.	String	

Seller Product Identifier	Product Identifier (UNI/OVC/ENNI) as assigned during the ordering process	String	The identifier is established by the Seller and required to create the Product Inventory record. Examples could be a Service Identifier, OVC Identifier, UNI Identifier, or ENNI Identifier.
Status	The state of the Product in accordance with the Product lifecycle shown in the state machine in section 10.	Enumeration Active Pending_Change Suspended Pending_Terminate Terminated	The Seller is responsible for managing the Product lifecycle states.
Initial Order Completion Date	The date that the Product Order that created this Product was completed per MEF 57.1.	Date/Time Range	This date is the initial install date for the Product. A range of Date/Time is included in the query.
Product Offering ID	The identifier of the Product Offering	String	
Product Specification ID	The identifier of the Product Specification	String	
Buyer Product ID	The identifier of the Buyer Product	String	This is specified and maintained by the Buyer

Table 7 Product Inventory Query Seller Response

[R7]   The Seller **MUST** return with a response with a list of the Products and associated information shown in Table 7 that match the Buyer's filter criteria.

[O2]   The Seller **MAY** place a limit on the length of the list returned.

[O3]   If the Query exceeds that length, the Seller **MAY** return an error indicating that the list is too long.

9.2   Retrieve Product Details by Product Identifier

If the Buyer knows the Seller's Product Identifier they can query the Seller's Product Inventory based on this identifier as shown in Use Case 2 in Table 5.

Attribute	Description	Type	Comments
Product Identifier	Product Identifier (UNI/OVC/ENNI) as assigned during the ordering process	String	The identifier is established by the Seller and required to create the Product Inventory record. Examples could be a Service Identifier, OVC Identifier, UNI Identifier, or ENNI Identifier.

Table 8 Product Inventory Product Identifier Buyer Query

[R8]   The Buyer's Query **MUST** provide the Seller Product Identifier.

The Seller receives the Buyer's Product Identifier query and determines if there is a match to the Product Identifier in the Inventory. The definition of a "Match" is at the Seller's discretion. The Seller returns detailed Service Attributes of the Product Identifier that matches the Buyer's filter criteria as described in Use Case 2 in Table 5.

Attribute	Description	Type	Comments
Buyer	The unique name of the organization that is acting as the customer in this transaction.	String	
Seller	The unique name of the organization that is acting as the supplier in this transaction.	String	
Product			
Seller Product Identifier	Product Identifier (UNI/OVC/ENNI) as assigned during the ordering process	String	The identifier is established by the Seller and required to create the Product Inventory record. Examples could be a Service Identifier, OVC Identifier, UNI Identifier, or ENNI Identifier.
Product	The product that is associated to the Seller Product Identifier	Reference to a Product	

Attribute	Description	Type	Comments
Status	The state of the Product in accordance with the Product lifecycle shown in the state machine in section 10.	Enumeration Active Pending_Change Suspended Pending_Terminate Terminated	The Seller is responsible for managing the Product lifecycle states.
Buyer Product Identifier	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 Identifier or a Buyer's OVC Identifier	String	For any request to Product update (done through Product order), Seller Product Identifier must be used.
Initial Order Completion Date	The date that the Product Order that created this Product was completed per MEF 57.1.	Date/Time Range	This date is the initial install date for the Product.
Last Order Update Date	The date that the latest Product Order affecting this Product was completed per MEF 57.1.	Date/Time Range	This date is when the latest order is completed for the Product.
Termination Date	The date that the Product Order changing the status to Terminated was completed per MEF 57.1.	Date/Time Range	
Site			
Service Site Identifier	The identifier of this Service Site	String	Unique between Buyer and Seller
Service Site Reference	Reference to the Service Site	Reference	
Service Site Name	Name of the Service Site	String	
Product Offering			
Product Offering Identifier	A unique identifier of the Product Offering.	String	This is a reference to the associate Product Offering.

Attribute	Description	Type	Comments
Product Specification			
Product Specification Identifier	A unique identifier of the Product Specification.	String	This is a reference to the associated Product Specification. Details of the Product Specification are outside the scope of this document.
Product Relationship			
Relationship Nature	Specifies the nature of relationship to the related product. The nature of required relationships vary for Products of different types. For example, a UNI or ENNI Product may not have any relationships, but an Access E-Line may have two mandatory relationships (related to the UNI on one end and the ENNI on the other). More complex Products such as multipoint IP or Firewall Products may have more complex relationships. As a result, the allowed and mandatory Relationship Nature values are defined in the Product Specification.	String that is one of the relationship types specified in the Product Specification.	
Seller Product Identifier	Product Identifier (UNI/OVC/ENNI) as assigned during the ordering process	String	The identifier is established by the Seller and required to create the Product Inventory record. Examples could be a Service Identifier, OVC Identifier, UNI Identifier, or ENNI Identifier.
Buyer Product Identifier	This identifier is optionally provided during the Product order-	String	For any request to Product update (done through Product order),

Attribute	Description	Type	Comments
	ing and stored for informative purpose in the Seller inventory. It may be a Buyer's UNI Identifier or a Buyer's OVC Identifier		Seller Product Identifier must be used.
Billing Account			
Billing Account Identifier	The identifier of the billing account.	String	A reference to the billing account provided at the time the Product was ordered.
Related Party			
Contact Role	The Role of the Contact	Enumeration Buyer Assurance Technical Contact Seller Assurance Technical Contact Seller Commercial Contact Seller SLA Management Contact Buyer Commercial Contact Buyer SLA Management Contact	Roles are described in Table 9.
Contact Name	The person or organization to be contacted.	String	
Contact Phone Number	The telephone number for this contact.	String	
Contact Phone Number Extension	The telephone number extension for this contact.	String	
Contact email Address	The email address for this contact.	String	
Product Order			
Product Order Identifier	Identifies the Product Order. Associated with the Product	String	This identifier is provided by the Seller and communicated to the Buyer during the order process. This ID is unique within the Seller.
Product Order Item	The Product Order Item associated with the Product	Reference to one or more Product Order Items	The Product Order Item of the associated Product order that resulted

Attribute	Description	Type	Comments
			in the creation of this Product.
Product Order Item Identifier	Identifies the Product Order Item. One or more Product Order Items exist within a Product Order.	String	This is a reference to the associated Product Order Item assigned by the Seller and communicated to the Buyer during the order process. This ID is unique within this order.
Product Price			
Price Type	Indicates if the price is for recurring or non-recurring charges.	Enumeration • Recurring • Non-recurring	Set by the Seller
Recurring Change Period	Charge period for recurring charge	Enumeration • DAY • WEEK • MONTH • YEAR	
Price Name	Name of the price.	String	Set by the Seller
Price Description	Description of the price.	String	Set by the Seller
Price			
Pre-Tax Value	The price value	Float	
Price Unit	Currency (ISO4217 norm uses 3 letters to define the currency	String	

Table 9 Seller Product Identifier Inventory Response

[R9]   The Seller **MUST** reply to the Buyer's Product Identifier query with the Service Attributes shown in Table 9.

[R10]   The Seller **MUST** provide contact information as shown in Table 9.

The Contact Roles are defined as shown below. The method used to update these contacts in the Seller's Inventory system is assumed to be agreed to between the Buyer and Seller and is outside the scope of this document.

Contract Role	Description
Assurance Technical Contact	Operational contact such as Network Operations Center (NOC) for each party.
Commercial Contact	Contact for commercial issues like billing, contract extensions, etc. for each party.

SLA Management Contact	Contact for SLA related issues, lifecycle reports, etc. for each party.

Table 10 Contact Role Definitions

9.3   Specifying the Buyer and the Seller

For queries of all types, there is a business entity that is initiating an Operation (called a Sending Entity) and a business entity that is responding to this request (called the Responding Entity). In the simplest case, the Sending Entity is the Buyer and the Responding Entity is the Seller. However, in some cases, the Sending Entity may represent more than one Buyer and similarly, the Responding Entity may represent more than one Seller.

While it is outside the scope of this specification, it is assumed that the Sending Entity and the Responding Entity are aware of each other and can authenticate requests initiated by the other party. It is further assumed that both the Buying Entity and the Sending Entity know a) the list of Buyers the Sending Entity represents when interacting with this Responding Entity; and b) the list of Sellers that this Responding Entity represents to this Sending Entity.

> **[R11]**   If the Sending Entity has the authority to represent more than one Buyer with the Responding Entity, the request **MUST** specify the Buyer being represented in this request using the Buyer attribute.

> **[R12]**   If the Sending Entity represents precisely one Buyer with the Responding Entity, the request **MUST NOT** specify the Buyer attribute.

> **[R13]**   If the Responding Entity represents more than one Seller to this Buyer, the request **MUST** specify the Seller that is responding by using the Seller attribute.

> **[R14]**   If the Responding Entity represents precisely one Seller to this Buyer, the request **MUST NOT** specify the Seller attribute.

10 State Diagrams

10.1   Product Inventory Process Flow

 The Product Inventory process flow is shown below. The 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.
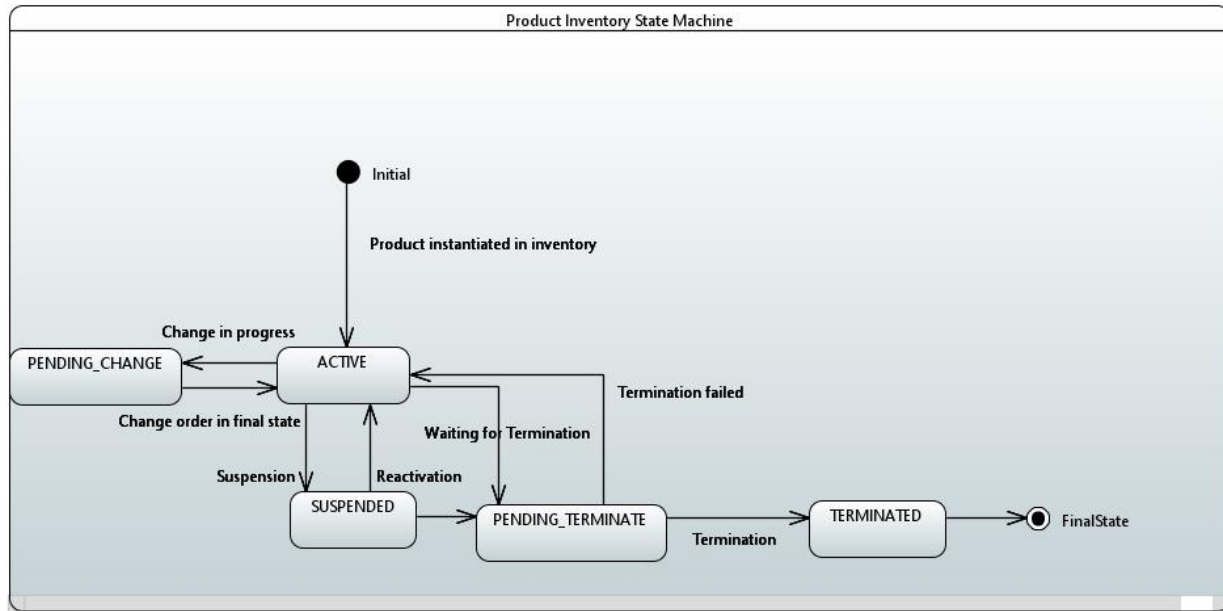
Figure 2 - Product Inventory Process Flow

[R15] The Seller's Sonata Inventory interface **MUST** support the state machine shown in Figure 2.

The definitions of the various states are as follows:

State	Description
ACTIVE	The Product Order has been successfully completed and the Product Order and associated Product Order Items are in the Inventory.
PENDING_CHANGE	The Product has a Product Order to change the Product that is in progress.
SUSPENDED	A Product has been successfully suspended. Products are placed into suspended state as a result of non-payment of bill and removed from suspended state after payment.
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 11 - Product Inventory State Values

[R16] The Seller's Sonata Inventory interface **MUST** support the states shown in Table 11.

11 References

[1]   Internet Engineering Task Force RFC 2119, *Key words for use in RFCs to Indicate Requirement Levels*, March 1997

[2]   Internet Engineering Task Force RFC 8174, *Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words*, May 2017

[3]   MEF 4, *Carrier Ethernet Network Architecture Framework – Part 1: Generic Framework*, April 2004.

[4]   MEF 10.3, *Ethernet Service Attributes Phase 3*, October 2013.

[5]   MEF 12.1, *Carrier Ethernet Network Architecture Framework Part 2: Ethernet Services Layer - Base Elements*, April 2010

[6]   MEF 26.2, *EVC Ethernet Services Definitions – Phase 3*, August 2014.

[7]   MEF 50.1, *MEF Services Lifecycle Process Flows*, August 2017.

[8]   MEF 51.1, *Operator Ethernet Service Definitions*, December 2018.

[9]   MEF 55, *Lifecycle Service Orchestration (LSO): Reference Architecture and Framework*, March 2016

[10] MEF 57.1, *Ethernet Ordering Technical Specification – Business Requirements and Use Cases*, December 2018

[11] MEF 79, *Address, Site, and Product Offering Qualification Management Requirements and Use Cases*, February 2019

[12] MEF 80, *Quote Management Requirements and Use Cases*, June 2019

[13] TMF637 TM Forum, *Product Inventory Management API REST Specification sR16.5.1*, April 2017.

[14] TMF GB922, *Inventory Framework (SID) R15.5.1*, April 2016