



MEF 79 Draft (R2)

Address, Service Site, and Product Offering Qualification Management Requirements and Use Cases

June 2019

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Table of Contents

1	List of Contributing Members	6
2	Abstract.....	6
3	Release Notes	6
4	Terminology and Acronyms.....	7
5	Scope.....	10
6	Compliance Levels	11
7	Introduction.....	12
7.1	Pre-Requisites to Address, Service Site and POQ Operations	13
7.2	Address, Service Site and POQ Operation Example	13
8	Use Cases and Business Process Definitions.....	16
8.1	High Level Use Cases.....	16
8.2	Address, Service Site and POQ Use Cases.....	17
9	Operation Attributes	27
9.1	Geographic Address Retrieval and Validation Attributes	27
9.2	Service Site Retrieval Attributes	29
9.3	Register for POQ Notification Attributes (Use Case 5)	32
9.4	Create POQ (Use Case 6)	33
9.4.1	Buyer Request to Create POQ.....	33
9.4.2	Seller's Deferred Response to Create POQ.....	37
9.4.3	Seller's Immediate Response to Create POQ.....	38
9.5	Notification of POQ State Change (Use case 9).....	42
9.6	Retrieve POQ information (Use Case 7)	43
9.7	Retrieve POQ by Identifier (Use Case 8)	45
9.8	Specifying the Buyer ID and the Seller ID.....	47
9.9	Specifying Addresses	48
9.9.1	Support for Fielded or Formatted Addresses	48
9.9.2	Specifying Fielded Addresses	48
9.9.3	Specifying Formatted Addresses.....	51
9.9.4	Specifying Global Address References.....	52
9.9.5	Specifying Geographic Points.....	52
9.10	Specifying Service Site Locations	53
9.11	Specifying Contact Information	54
10	State Diagrams	54
10.1	Product Offering Qualification Process Flows.....	54
10.2	Product Offering Qualification Item Process Flow	56
11	References.....	58

List of Figures

Figure 1 – Service Topology across two networks	12
Figure 2 - Use Cases	17
Figure 3 - Product Offering Qualification Process Flow	55
Figure 4 - Product Offering Qualification Item Process Flow	57

List of Tables

Table 1 - Contributing Member Companies	6
Table 2 - Terminology and Abbreviations.....	10
Table 3 - Use Case Table	18
Table 4 - Validate Address	20
Table 5 - Retrieve Address by Identifier.....	21
Table 6 - Retrieve Service Site List	21
Table 7 - Retrieve Service Site by Identifier	22
Table 8 – Register for POQ Notifications.....	22
Table 9 - Create Product Offering Qualification	24
Table 10 - Retrieve POQ List	25
Table 11 - Retrieve POQ by Identifier.....	25
Table 12 – Notify of POQ State Change	26
Table 13 - Geographic Address Buyer Request Attributes.....	27
Table 14 - Geographic Address Seller Response Attributes.....	28
Table 15 – Service Site Buyer Request Attributes Use Case 3.....	30
Table 16 – Service Site Buyer Request Attributes Use Case 4.....	30
Table 17 - Service Site Seller Response Attributes Use Cases 3 and 4.....	31
Table 18 – Register for POQ Notification Buyer Attributes	32
Table 19 - Service Site Seller Response Attributes for Use Cases 5	33
Table 20 – Attributes for Buyer request to Create POQ.....	34
Table 21 – Buyer POQ Item Attributes	35
Table 22 - Product Relationship Attributes	37
Table 23 – Sellers Deferred Response to Create POQ	37
Table 24 – Seller Response to POQ Attributes.....	38
Table 25 - POQ Item Attributes for Seller Response	41
Table 26 – Alternate Product Proposal Attributes	42
Table 27 – Notification of POQ State Change Attributes.....	43
Table 28 – Retrieve POQ List attributes.....	44
Table 29 - Service Site Seller Response Attributes for Use Case 7.....	45
Table 30 – Retrieve POQ by Identifier attributes	45
Table 31 – Fielded Address Attributes	49
Table 32 – Sub-Unit Attributes.....	50
Table 33 - Formatted Address Attributes.....	51
Table 34 – Global Address Reference Attributes	52
Table 35 - Geographic Point Attributes	53
Table 36 – Service Site Location	53
Table 37 – Contact Information Attributes	54
Table 38 - Product Offering Qualification Process Flow Values	56
Table 39 – Product Offering Qualification Item State Values.....	57

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 attributes and processes needed to support Address, Service Site and Product Offering Qualification (POQ) operations across the Sonata Management Interface Reference Point (IRP). These processes allow the Service Provider, or “Buyer” to:

- Retrieve Address information including exact formats for Addresses known to the Seller
- Retrieve Service Site information including exact formats for Service Sites known to the Seller
- Determine whether it is feasible for the Seller to deliver a particular Product with a given configuration to a particular geographic location if applicable.

This document supports the requirements defined in [9] MEF 55, *LSO Reference Architecture*, March 2016 (Section 8.11 Partner Management for LSO) for partner interactions over the Sonata interface. Both Buyer and Seller will utilize information contained within this document.

3 Release Notes

The following issues have been deferred to a later release of this standard. They are not addressed in this document.

1. When specifying Fielded and Formatted Addresses, the requirements defining which attributes are mandatory is not aligned with those in MEF 57.1. This document represents the latest views on this topic but full agreement has not yet been reached.
2. A proposal was made to mandate the use of ISO country codes (rather than open text strings) in Fielded and Formatted Addresses. This is considered a technically better option but is not aligned to MEF 57.1 and full agreement has not yet been reached.
3. In MEF 57.1, the definitions for Address Line 1 and Address Line 2 in a Formatted Address both describe the street number, name etc. Line 2 just also includes sub-unit information. A proposal was made to make this more specific and prevent overlap. Agreement on this proposal was not reached.
4. In this version of the document, the only way of describing a location using a coordinate system is to specify a particular point using Latitude/Longitude data. This was done to align with MEF 57.1 and to keep things simple. However, there are known issues with this approach. For example, how does a Seller match to a particular point specified by a Buyer? If the Seller holds a point, the probability that it is exactly the same as the Buyer's is very low. So to match, they would have to allow some arbitrary maximum distance to consider it a match. If the Seller holds an array of points forming a polygon, then a match could be if the point is inside the polygon. However, there is no way in the current implementation for the Seller to pass this polygon back to the Buyer.
5. This version of the document changed considerably from the previous version. Although there has been strong consensus built with multiple parties participating, it was decided that to ensure robustness of the standard, we would initiate one more Call for Comments Ballot before initiating the letter ballot.

4 Terminology and Acronyms

This section defines the terms used in this document. In some 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 defined in the following documents are included in this document by reference, and are not repeated in the table below.

- MEF 10.4 *Subscriber Ethernet Service Attributes*, December 2018
- MEF 26.2, *EVC Ethernet Services Definitions – Phase 3*, August 2014
- MEF 50.1, *MEF Services Lifecycle Process Flows*, August 2017
- MEF 51.1, *Operator Ethernet Services Definitions*, December 2018
- MEF 55, *LSO Reference Architecture*, March 2016
- MEF 57.1, *Ethernet Ordering Technical Specification- Business Requirements and Use Cases*, December 2018

Term	Definition	Reference
Address	A way of specifying an absolute fixed location on earth using pre-established boundary and identifier information such as country, city, postal code and street information.	This document
Address Operation	An Operation involving validating or querying an Address.	This document
Carrier Ethernet Network (CEN)	A network from a Service Provider or network operator supporting the MEF service and architecture models.	MEF 12.1
Deferred Response	A Seller's response to a Buyer's request whereby the Seller immediately acknowledges that the request was received, and, over time, sends notifications to update the Buyer on the status and results of the request (assuming the Buyer has subscribed to receive the notifications). The Buyer can also poll the Seller for the results and status associated with the request.	This document
Fielded Address	A type of Address that has a discrete field and value for each type of boundary or identifier down to the lowest level of detail. For example, "street number" is one field, "street name" is another field, etc.	This document
Formatted Address	A type of Address that has discrete fields for each type of boundary or identifier with the exception of street and more specific location details, which are combined into a maximum of two strings based on local postal addressing conventions.	This document
Geocode	A set of coordinates (typically including latitude and longitude) that describes a particular location on earth.	This document
Global Address Reference	A globally unique identifier controlled by a generally accepted independent administrative authority that specifies a fixed location on earth.	This document
Immediate Response	A Seller's response to the Buyer whereby the Seller responds immediately with the results of the request or indicates that the request cannot be processed. The maximum time to provide an Immediate Response is for further study, but is expected to be less than 30 seconds.	This document
Operation	An interaction between the Buyer and Seller, potentially involving multiple back and forth transactions.	This document

Term	Definition	Reference
Product	One or more goods or services that is or may be sold to a Buyer by a Seller.	This document (Note this is a refinement to the definition of this term in MEF 50.1 [7])
Product Offering	The commercial and technical details of a Product sold by a Seller. A Product Offering defines all of the commercial terms and, through association with a particular Product Specification, defines all the technical attributes and behaviors of the Product. A Product Offering may constrain the allowable set of configurable technical attributes and/or behaviors specified in the associated Product Specification.	This document (Note this is a refinement to the definition of this term in MEF 50.1 [7])
Product Specification	A structured set of well-defined technical attributes and/or behaviors that are used to construct a Product Offering for sale to a market.	This document
POQ	Product Offering Qualification	This document
POQ Item	Product Offering Qualification Item	This document
Product Offering Qualification (POQ)	One or more POQ Items formulated into a request made by a Buyer to a Seller.	This document
Product Offering Qualification Item	An individual article included in a POQ that describes a Product of a particular type (Product Offering). The objective is to determine if it is feasible for the Seller to deliver this item as described and for the Seller to inform the Buyer of the estimated time interval to complete this delivery.	This document
Requesting Entity	The business organization that is acting on behalf of one or more Buyers. In the most common case, the Requesting Entity represents only one Buyer and these terms are then synonymous.	This document
Responding Entity	The business organization that is acting on behalf of one or more Sellers. In the most common case, the Responding Entity represents only one Seller and these terms are then synonymous.	This document

Term	Definition	Reference
Service Site	A fixed physical location at which a Product can be installed. Its location can be described either with geocodes (Lat/Long information) or by association with an Address or Global Address Reference. This association may include a Sub-address describing where within that Address or Global Address Reference, this particular Service Site is located.	This document
Service Site Operation	An Operation involving validating or querying Service Site information.	This document
Sub-address	A description of where a particular Service Site is located (or where a Service Site may be located in the future) within a location defined by an Address or Global Address Reference.	This document
Use Case	A Use Case is a means to capture the requirements of a system(s). A system may have several Use Cases that define different aspects of its behavior	OMG UML v2.5

Table 2 - Terminology and Abbreviations

5 Scope

This specification defines the requirements and Use Cases to allow a Buyer to perform the following functions across the Sonata Management Interface Reference Point (IRP):

- Retrieve Address information including exact formats for Addresses known to the Seller
- Retrieve Service Site information including exact formats for Service Sites known to the Seller
- Determine whether it is feasible for the Seller to deliver a particular Product with a given configuration to a particular geographic location if applicable.

These requirements and Use Cases are designed to be agnostic regarding the type of Product being delivered by the Seller to the Buyer. However, to control scope, only Products based on Access E-Line services as defined in MEF 51.1 [8] and Products based on UNIs as defined in MEF 10.4 [4] have been considered in this document. Ensuring the content of this document covers other types of Products is for further study.

There must be an authentication mechanism whereby a Seller can be assured who a Buyer is and vice-versa. There must also be authorization mechanisms in place to control what a particular Buyer or Seller is allowed to do and what information may be obtained. Further, audit trails likely need to be maintained specifying who initiated each relevant transaction. Defining a standard for these security related matters is for future study.

This specification will be the basis of requirements for the Information Model, Data Models and resulting APIs enabling automated operations across the Sonata IRP.

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 **OPTIONAL**) are labeled as [**Ox**] for optional.

7 Introduction

Figure 1 illustrates the service topology of an end-to-end carrier Ethernet service being provided to a Subscriber named SUB1 INC by a Service Provider named OPER1 INC. For this service, SUB1 INC is the Customer of OPER1 INC who is responsible to provide a service from UNI A to UNI B. In this case, however, OPER1's Carrier Ethernet Network (CEN) was not able to reach the location where UNI B is installed. To allow OPER1 INC to provide the end-to-end service, OPER1 INC has established an ENNI connecting the OPER1 CEN to the OPER2 CEN and an Access E-Line service has been established across the OPER2 CEN to reach the location of UNI B. With respect to the Access E-Line service, OPER1 INC is the Customer of OPER2 INC.

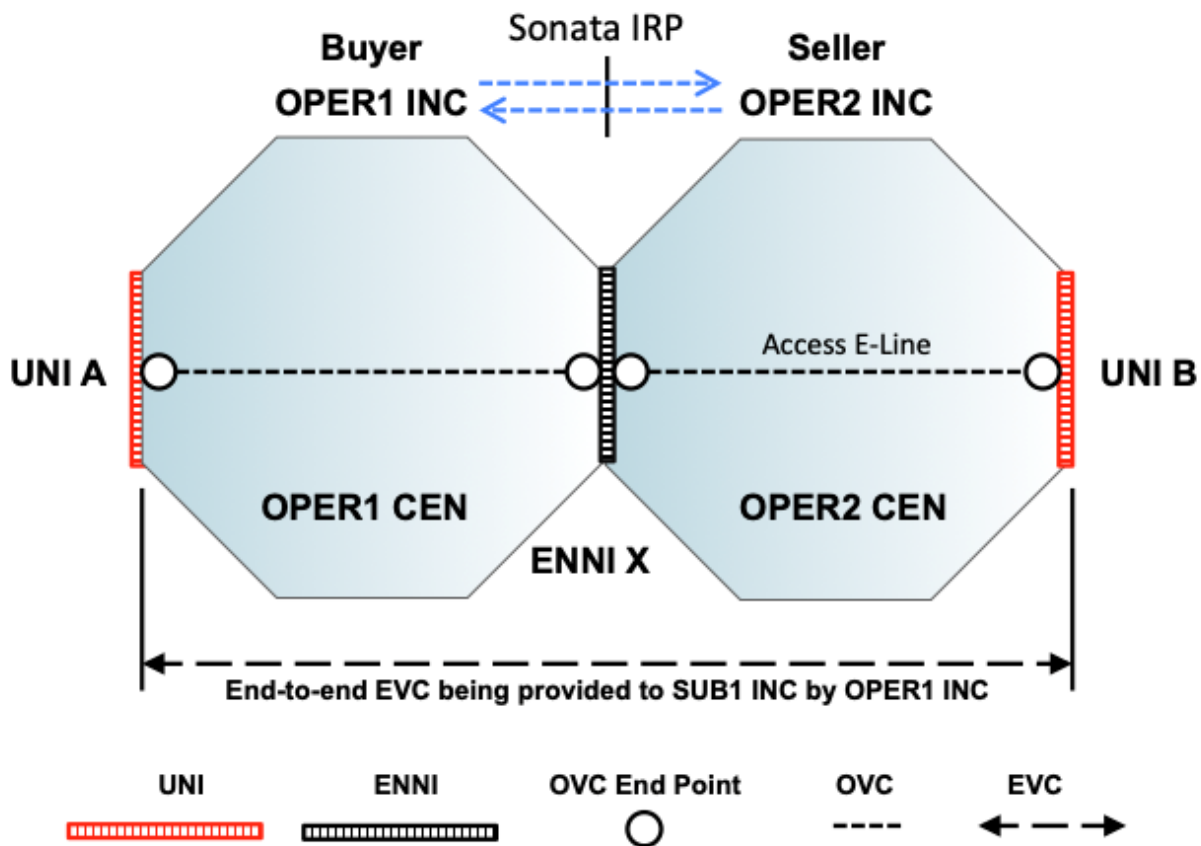


Figure 1 – Service Topology across two networks

Figure 1 also shows the Sonata Management Interface Reference Point (IRP) as defined in MEF 55 [9]. It is across this IRP that commercial transactions take place to deliver such a service. Since this document is focused on processes around setting up such a service, OPER1 INC is referred to as the Buyer and OPER2 INC is referred to as the Seller.

7.1 Pre-Requisites to Address, Service Site and POQ Operations

Prior to this Access E-Line Service being established, a number of activities would have been completed:

- OPER2 INC must have established a Product Specification for their Access E-Line and UNI Products. A Product Specification is a structured set of well-defined technical attributes and/or behaviors that are used to construct a Product Offering for sale to a market. To allow interoperability, OPER2 must use a Product Specification using the attributes and behaviors for an Access E-Line as defined in MEF 51.1 [8] and a UNI as defined in MEF 10.4 [4].
- OPER2 INC must have established their set of Product Offerings including at least one that is associated with their Access E-Line Product Specification and one that is associated with their UNI Product Specification. A Product Offering is defined as the commercial and technical details of a Product sold by a Seller. A Product Offering defines all of the commercial terms and, through association with a particular Product Specification, defines all the technical attributes and behaviors of the Product. A Product Offering may constrain the allowable set of configurable technical attributes and/or behaviors specified in the associated Product Specification.
- OPER1 INC and OPER2 INC must have established a commercial relationship. Typically, this involves OPER1 INC gaining a full understanding of OPER2 INC's Product Offerings as well as establishing a contract under which business is to be conducted.
- OPER1 INC and OPER2 INC must have established mechanisms to authenticate any Operations initiated by the other party and ensure that they are authorized for the request. For requests of all types, there is a business entity that is initiating an Operation (called a Requesting Entity) and a business entity that is responding to this request (called the Responding Entity). In the simplest case, the Requesting Entity is the Buyer (OPER1) and the Responding Entity is the Seller (OPER2). However, in some cases, the Requesting Entity may represent more than one Buyer and similarly, the Responding Entity may represent more than one Seller. These security mechanisms are outside the scope of this document but they must be established prior to initiating any Operations between the parties.
- To complete POQs on Products that connect to an ENNI, the ENNI X must be operational. Both parties must be aware of the ENNI's location and its technical attributes. In addition, an identifier must have been established for this ENNI that is unique to this Buyer/Seller combination. The processes and mechanisms used to establish the ENNI are outside the scope of this specification.
- As described in section 9.9, all Buyers and Sellers must support either Fielded Addresses or Formatted Addresses. As there is no mandatory common method, the Buyer and Seller need to negotiate, agree upon, and implement at least one of these methods.
- The Seller has communicated to the Buyer whether they support the Immediate Response pattern, the Deferred Response pattern, or both when handling POQ requests.
- The Buyer and Seller will have agreed whether POQ notifications are to be used or not.

7.2 Address, Service Site and POQ Operation Example

Once these pre-requisites are complete, the functions described in this specification may be invoked. For the service shown in Figure 1, the likely steps are:

- SUB1 INC has expressed interest in connectivity between two locations from OPER1 INC (in Figure 1, these are the locations of UNI A and UNI B). SUB1 INC specifies the location by one of the following mechanisms:
 - Providing Geocode information (i.e. Latitude, Longitude and potentially elevation). This mechanism is useful, for example, if UNI B is a cell site in an undeveloped rural area.
 - Providing a street Address. An Address is defined as a way of specifying an absolute fixed location on earth using pre-established boundary and identifier information such as country, city, postal code and street information. There are two types of Addresses:
 - A Fielded Address is an Address that has a discrete field and value for each type of boundary or identifier down to the lowest level of detail.
 - A Formatted Address is an Address that has discrete fields for each type of boundary or identifier with the exception of street and more specific location details, which are combined into a maximum of two strings based on local postal addressing conventions.
 - Providing a Global Address Reference. A Global Address Reference is defined as a globally unique identifier controlled by a generally accepted independent administrative authority that specifies a fixed location on earth.
- OPER1 INC determines that they can reach UNI A directly with their network but they cannot reach UNI B. They decide to consider OPER2 INC as a potential Seller who can provide an Access E-Line service from the pre-established ENNI X to UNI B.
- If OPER1 INC has an Address or a Global Address Reference for UNI B, they will likely validate the location with OPER2 INC because their information might not match exactly with location information held in OPER2 INC's databases. For example, OPER1 INC might be looking for "123 Bank Street" but OPER2 INC may hold "123 Bank St" in their database. To validate the location information, OPER1 INC initiates one or more Address Operations across the Sonata IRP to OPER2. The Seller's Address information is authoritative, so this Operation can be seen as the Buyer (OPER1 INC) sending Address criteria to the Seller (OPER2 INC) so that the Buyer can obtain the Seller's authoritative Address for UNI B.
- OPER1 INC determines any Service Site information known by OPER2 INC at that location by initiating one or more Service Site Operations. A Service Site is defined as a fixed physical location at which a Product can be installed. There are many cases: A particular location may not have any suitable places to install telecom equipment; it may have one place (e.g. a wiring closet in the basement); or it may have multiple places (e.g. a wiring closet in each suite of a multi-tenant building). Moreover, even if OPER2 INC is aware of the location, they may or may not hold any of this Service Site information at the time of OPER1 INC's request.
- OPER1 INC initiates one or more Product Offering Qualification Operations to determine if OPER2 INC can deliver a particular Product to the UNI B location. A Product Offering Qualification is defined as a grouping of POQ Items formulated into a request made by a Buyer to a Seller. A POQ Item is defined as an individual article included in a POQ that describes a Product of a particular type (Product Offering). The objective is to determine if the Seller can feasibly deliver this item as described and for the Seller to inform the Buyer of the estimated time interval to complete this delivery. In this case, the POQ would determine if the Seller can feasibly deliver a MEF UNI Product to the location for UNI B and a MEF Ac-

cess E-Line Product that has an OVC Endpoint at this UNI and an OVC Endpoint at ENNI X.

Other MEF specifications define, or will define, other functions across the Sonata Interface such as Product Quotations, Product Ordering and Product Inventory.

Section 8 describes the high level Use Cases and business processes for Address, Service Site and POQ management. Section 9 defines the attributes that are passed between the Buyer and Seller for each of these Use Cases. Some of the Operations may require state to be maintained by both the Buyer and the Seller as the Operation progresses. The required states are defined in section 10.

8 Use Cases and Business Process Definitions

8.1 High Level Use Cases

This section provides a set of business related Use Cases needed to support Address validation, Service Site queries, and Product Offering Qualifications (POQs). It expands on the serviceability process defined in MEF 50.1 [7] (Determine Party Pre-Order Feasibility process element in the Lead Response-to-Contract process flow).

It is assumed that all pre-requisites described in section 7.1, Pre-Requisites to Address, Service Site and POQ Operations, have been completed between the Buyer and Seller prior to these Use Cases being initiated.

The Buyer initiates all activity with a request to the Seller. There are two distinct patterns in how the Seller responds:

- The Seller responds immediately with the results of the request or they indicate they are unable to process the request. This is referred to as an Immediate Response. The maximum time to provide an Immediate Response is for further study, but is expected to be less than 30 seconds.
- The Seller immediately acknowledges that the request was received, and, over time, sends notifications to update the Buyer on the status and results of the request (assuming the Buyer has subscribed to receive the notifications). The time required to provide the acknowledgment is for further study, but is expected to be less than 30 seconds. The Buyer can also poll the Seller for the results and status associated with the request. This is referred to as a Deferred Response.

These Use Cases are designed to be “product-agnostic”, which means they are the same for any Product that Seller offers. However, for this version of the document, only two types of Product have been considered:

- A UNI Product which is based on a Product Specification that uses the UNI attributes and behaviors defined in MEF 10.4[4] and MEF 26.2 [6].
- An Access E-Line Product which is based on a Product Specification that uses the Access E-Line OVC and OVC Endpoint attributes and behaviors defined in MEF 51.1 [8]:

Ensuring these Use Cases are general enough to support other MEF services or Seller specific services is for further study.

8.2 Address, Service Site and POQ Use Cases

Figure 2 shows the Use Cases associated with Address, Service Sites and POQs. The Buyer initiates all Use Cases except for “Notify of POQ State Change”, which is the Deferred Response to a “Create Product Offering Qualification” request initiated by the Buyer.

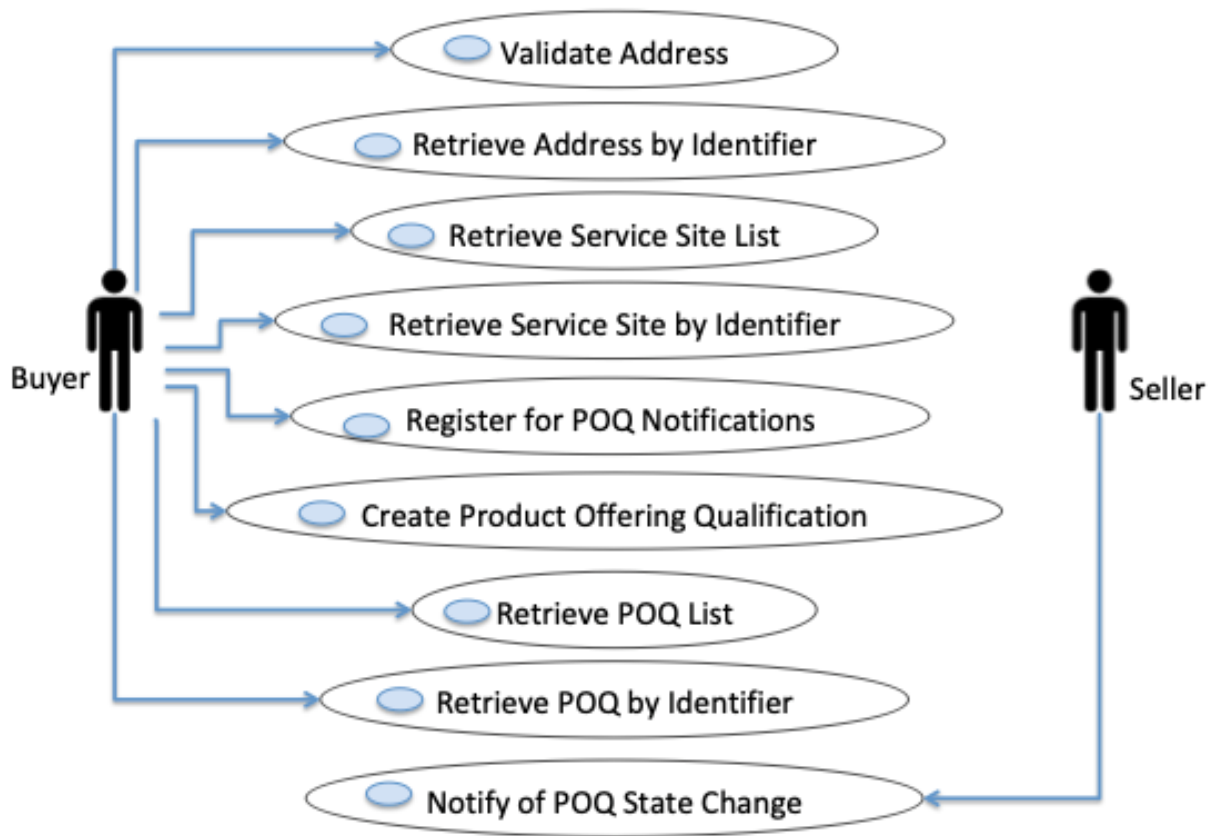


Figure 2 - Use Cases

Table 3 numbers these Use Cases and provides a brief description of each.

Use Case #	Use Case Name	Use Case Description
1	Validate Address	The Buyer sends Address information known to the Buyer to the Seller. The Seller responds with a list of Addresses known to the Seller that likely match the Address information sent by the Buyer. For each Address returned, the Seller should also provide an Address Identifier, which uniquely identifies this Address within the Seller.

2	Retrieve Address by Identifier	The Buyer requests the full details of a single Address based on an Address identifier that was previously provided by the Seller.
3	Retrieve Service Site List	The Buyer requests that the Seller provides a list of Service Sites known to the Seller based on a set of Service Site/Address filter criteria. For each Service Site returned, the Seller also provides a Service Site Identifier, which uniquely identifies this Service Site within the Seller.
4	Retrieve Service Site by Identifier	The Buyer requests the full details for a single Service Site based on a Service Site identifier that was previously provided by the Seller.
5	Register for POQ Notifications	A request initiated by the Buyer to instruct the Seller to send notifications of POQ state changes (see section 10) in the event the Seller uses the Deferred Response pattern to respond to a Create Product Offering Qualification request.
6	Create Product Offering Qualification	A request initiated by the Buyer to determine whether the Seller can feasibly deliver a particular Product (or Products), to a specific set of geographic locations (if applicable). The Seller also provides estimated time intervals to complete these deliveries.
7	Retrieve POQ List	The Buyer requests a summarized list of POQs (in any state; see section 10.1) from the Seller based on a set of POQ filter criteria. For each POQ returned, the Seller also provides a POQ Identifier that uniquely identifies this POQ within the Seller.
8	Retrieve POQ by Identifier	The Buyer requests the full details of a single Product Offering Qualification based on a POQ identifier.
9	Notify of POQ State Change	The Seller sends the following types of notifications to the Buyer who has subscribed to these notifications <ul style="list-style-type: none"> • POQ creation • POQ state change

Table 3 - Use Case Table

[R1] A Buyer **MUST** be able to initiate Use Cases 1 through 4 and 6 through 8 described in Table 3.

- [D1] For all Addresses that have not been validated, a Buyer **SHOULD** initiate a Validate Address request, to get the Seller's full details associated with this Address.
- [D2] For all Addresses that have been validated, the Buyer **SHOULD** use the Seller's Address Identifier to describe the location assuming the Seller has provided one.
- [D3] After validating an Address, a Buyer **SHOULD** initiate a Retrieve Service Site List request, obtain the Seller's Service Site Identifiers for all Service Sites of interest, and, assuming the Seller has returned a Service Site Identifier, use this Service Site Identifier for all subsequent Operations.
- [D4] Once the Buyer has obtained the Service Site list, then for all subsequent operations related to this Service Site, the Buyer **SHOULD** use the Seller's Service Site Identifier to reference this Service Site if the Seller has provided one.

Note that it will be common that a Seller does not return known Service Sites matching the Buyer's requirements. This does not imply that the Seller cannot deliver Products to this Address. The Buyer is free to initiate POQ requests using Address information in this case.

- [D5] A Buyer **SHOULD** be able to register with the Seller for POQ notifications as described in Use Case 5 in Table 3. Note that the alternative is for the Buyer to poll for the results using Use Case 7.
- [D6] A Seller **SHOULD** associate an Address Identifier to each unique Address of which they are aware.
- [R2] A Seller **MUST** be able to provide an Immediate Response to Use Cases 1, 3, 4, 5, 7 and 8 in Table 3.
- [CR1]<[D6] A Seller **MUST** be able to provide an Immediate Response to Use Case 2 in Table 3.
- [R3] A Seller **MUST** be able to provide a response to Use Case 6 (Create POQ) in Table 3. If the Seller is unable to provide an Immediate Response, the Seller **MUST** be able to provide a Deferred Response including initiating Notify of POQ State Changes to the Buyer (Use case 9).

The following tables define the details associated with each Use Case. Pre-requisites described in section 7.1, (Pre-Requisites to Address, Service Site and POQ Operations) apply to all Use Cases and are not repeated in the tables below. Only additional Pre-Conditions are listed.

Field	Description
Use Case Number	1
Use Case Name	Validate Address

Description	Validate a Fielded or Formatted Address of a given location.
Actors	Buyer/Seller
Pre-Conditions	None
Process Steps	<ol style="list-style-type: none"> 1. The Buyer sends a Validate Address request to the Seller specifying Address filter criteria (as understood by the Buyer) on the location the Buyer wishes to reach. 2. The Seller receives the request and attempts to match the Buyer's filter criteria with Address information known to the Seller. The determination of what is considered a match is at the Seller's discretion. 3. If the filter criteria match one or more Addresses known to the Seller, a positive response is returned with the Seller's Address information optionally including an Address Identifier (that is unique within this Seller) for each Address returned.
Post-Conditions	The Buyer has received the list of Addresses in the exact form known to the Seller for each Address.
Alternative Paths	<ol style="list-style-type: none"> 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 Seller cannot find a match to the given location, a negative response is returned to the Buyer. 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 likely elect to reinitiate the Address Validation request using more specific criteria to obtain a match.
Business Process	MEF 50.1 Lead-Response-to-Contract

Table 4 - Validate Address

Field	Description
Use Case Number	2
Use Case Name	Retrieve Address by Identifier
Description	The Buyer requests the details associated with a single Address based on an Address Identifier.
Actors	Buyer/ Seller
Pre-Conditions	Buyer knows the Address Identifier of the Address they wish to retrieve from the results of a previously executed Address Validation request.
Process Steps	<ol style="list-style-type: none"> 1. The Buyer sends a Retrieve Address by Identifier request to the Seller specifying the Address Identifier. 2. The Seller receives this request and returns Address information known to the Seller for this Address Identifier.
Post-Conditions	The Buyer has received the latest view of Address information known to the Seller that matches this Address Identifier.

Alternative Paths	<ol style="list-style-type: none"> 1. The Seller returns an error message if an error is encountered while processing that prevents the Seller from completing the request. 2. The Seller returns an error if an Address with the specified Address Identifier is not found in the Seller's records.
Business Process	MEF 50.1 Lead-Response-to-Contract

Table 5 - Retrieve Address by Identifier

Field	Description
Use Case Number	3
Use Case Name	Retrieve Service Site List
Description	The Buyer requests a list of Service Sites from the Seller based on Service Site/Address filter criteria.
Actor	Buyer/Seller
Pre-Conditions	The Buyer may have an Address Identifier from a previously executed Validate Address Operation and use this as a filter criteria, though this is not mandatory.
Process Steps	<ol style="list-style-type: none"> 1. The Buyer sends the Retrieve Service Site List to the Seller specifying the Service Site/Address filter criteria. 2. The Seller receives the request and attempts to match the Buyer's filter criteria with Service Site information known to the Seller. The determination of what is considered a match is at the Seller's discretion. 3. If the filter criteria match one or more Service Sites known to the Seller, a positive response is returned with the Seller's Service Site information including a Service Site Identifier (that is unique within this Seller) for each Service Site returned.
Post-Conditions	The Buyer has received the list of Service Sites known to the Seller including a Seller specified unique Service Site Identifier for each Service Site.
Alternative Paths	<ol style="list-style-type: none"> 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 Seller cannot find a match to the given location, a negative response is returned to the Buyer. 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 likely elect to reinitiate the Retrieve Service Site List request using more specific criteria to obtain a match.
Business Process	MEF 50.1 Lead-Response-to-Contract

Table 6 - Retrieve Service Site List

Field	Description
Use Case Number	4

Use Case Name	Retrieve Service Site by Identifier
Description	The Buyer requests the full detail associated with a single Service Site based on a Service Site Identifier.
Actors	Buyer/ Seller
Pre-Conditions	The Buyer knows the Service Site Identifier for the Service Site they wish to retrieve (typically from the results of a previously executed Retrieve Service Site List Operation).
Process Steps	<ol style="list-style-type: none"> 1. The Buyer sends the Retrieve Service Site by Identifier request to the Seller specifying the Service Site Identifier. 2. The Seller receives this request and returns all Service Site information known to the Seller for this Service Site Identifier.
Post-Conditions	The Buyer has received the latest view of Service Site information known to the Seller that matches this Service Site Identifier.
Alternative Paths	<ol style="list-style-type: none"> 1. The Seller returns an error message if an error is encountered while processing that prevents the Seller from completing the request. 2. The Seller returns an error if a Service Site with the specified Service Site Identifier is not found in the Seller's records.
Business Process	MEF 50.1 Lead-Response-to-Contract

Table 7 - Retrieve Service Site by Identifier

Field	Description
Use Case Number	5
Use Case Name	Register for POQ Notifications
Description	A request initiated by the Buyer to instruct the Seller to send notifications of POQ state changes (see section 10) in the event the Seller uses the Deferred Response pattern to respond to a Create Product Offering Qualification request.
Actors	Buyer/ Seller
Pre-Conditions	None.
Process Steps	<ol style="list-style-type: none"> 1. The Buyer sends the Register for POQ Notifications request to the Seller specifying the criteria of where to send such notifications. 2. The Seller receives this request, records where to send such notifications for this Buyer, and returns an acknowledgement to the Buyer.
Post-Conditions	The Seller is aware of where to send notifications of POQ state changes as described in Use Case 9 in Table 3.
Alternative Paths	<ol style="list-style-type: none"> 1. The Seller returns an error message if an error is encountered while processing that prevents the Seller from completing the request. 2. The Seller returns an error if they use the Immediate Response pattern when responding to Create Product Offering Qualification requests.
Business Process	MEF 50.1 Lead-Response-to-Contract

Table 8 – Register for POQ Notifications

Field	Description
Use Case Number	6
Use Case Name	Create Product Offering Qualification
Description	A request initiated by the Buyer to determine whether the Seller can feasibly deliver a particular Product (or Products), and where applicable to a specific set of geographic locations. The Seller also provides estimated time intervals to complete these deliveries.
Actors	Buyer/Seller
Pre-Conditions	The Buyer may know the Address Identifier and/or the Service Site Identifier (typically based on previously executed Validate Address or Retrieve Service Site List Operations) though this is not mandatory.
Process Steps	<ol style="list-style-type: none"> 1. The Buyer sends a Create Product Offering Qualification request to the Seller. This request contains one or more POQ Items, each of which specifies one of the Seller's Product Offerings (e.g. a UNI), the location in which it is to be installed if applicable (e.g. at Service Site identified by a particular Service Site Identifier), and/or associations with other Products if applicable (e.g. an Access E-Line Product connected to a particular UNI and ENNI). The Buyer also includes other information in the request such as expected response time. 2. If the Seller is using the Deferred Response pattern to respond to this POQ, they return an acknowledgement of the request as well as a unique POQ Identifier. At this point, this Use Case concludes while the Seller works to complete the POQ. 3. If the Seller is using the Immediate Response pattern to respond to this POQ, the Seller determines, for each POQ Item, if they can feasibly deliver the Product configuration requested. <ul style="list-style-type: none"> • If the Seller is highly confident they can service the request, they return a response with confidence = "GREEN". • If the Seller believes they can deliver the Product but is not highly confident, they return a response with confidence="YELLOW". In addition, if the Seller is highly confident that they can deliver one or more substitute Product configurations (e.g. of lower bandwidth), they may specify the details of these alternate Products. • If the Seller cannot service the request, they return a response with confidence = "RED". In addition, if the Seller is highly confident that they can deliver one or more substitute Product configurations (e.g. of lower bandwidth), they may specify the details of these alternate Products. <p>The Seller also returns a POQ Identifier, which is unique within this Seller.</p> <p>The Seller also returns a best-case time interval to deliver this Product upon receipt of an order.</p>

Post-Conditions	If the Seller provided an Immediate Response, the Buyer has received a response with a Product Offering Qualification and therefore knows if the Seller can fulfill the request. If the Seller is using the Deferred Response pattern, the Seller has acknowledged the POQ to the Buyer and the Buyer is aware of the unique POQ Identifier to be used in other Use Cases.
Alternative Paths	<ol style="list-style-type: none"> 1. The Seller returns an error message if an error is encountered that prevents the Seller from processing the request. 2. If, when using the Immediate Response pattern, there are any issues with the Product, Product Offering or Product Specification requested, an error is returned. 3. If, when using the Immediate Response pattern, there are any issues with the location specified, an error will be returned. 4. If, when using the Immediate Response pattern, there are any issues with related Products referenced in the POQ Item (e.g. If an Access E-Line is to terminate on a specified ENNI that does not exist or is not in an appropriate state), an error will be returned.
Business Process	MEF 50.1 Lead-Response-to-Contract

Table 9 - Create Product Offering Qualification

Field	Description
Use Case Number	7
Use Case Name	Retrieve POQ List
Description	The Buyer requests a summarized list of Product Offering Qualifications from the Seller based on POQ filter criteria.
Actors	Buyer/Seller
Pre-Conditions	Although it is not mandatory, this will typically only be executed after the Buyer has sent at least one Create Product Offering Qualification. Otherwise, the result will be empty.
Process Steps	<ol style="list-style-type: none"> 1. The Buyer sends a Retrieve POQ List request to the Seller specifying a set of filter criteria. 2. The Seller receives the request and attempts to match the Buyer's filter criteria with POQs known to the Seller. The determination of what is considered a match is at the Seller's discretion. 3. If the filter criteria match one or more POQs known to the Seller, a positive response is returned with the Seller's POQ information including a POQ Identifier (that is unique within this Seller) for each POQ returned.
Post-Conditions	The Buyer receives a list of Product Offering Qualifications that meet the filter.

Alternative Paths	<ol style="list-style-type: none"> 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 Seller finds no Product Offering Qualifications that meet the filter criteria, they reply to the Buyer indicating that 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 likely elect to reinitiate the Retrieve POQ List request using more specific criteria to obtain a match.
Business Process	MEF 50.1 Lead-Response-to-Contract

Table 10 - Retrieve POQ List

Field	Description
Use Case Number	8
Use Case Name	Retrieve POQ by Identifier
Description	The Buyer requests a single Product Offering Qualification based on a POQ identifier.
Actors	Buyer/ Seller
Pre-Conditions	The Buyer knows the Product Offering Qualification Identifier of the POQ they wish to retrieve as a result of having completed either the Create Product Offering Qualification Operation or the Retrieve POQ List Operation.
Process Steps	<ol style="list-style-type: none"> 1. The Buyer sends the Retrieve POQ by Identifier request to the Seller specifying the POQ Identifier. 2. The Seller receives the request and returns all POQ information for the POQ with this POQ Identifier.
Post-Conditions	The Buyer has the latest view of the Seller information related to the POQ with this POQ Identifier.
Alternative Paths	<ol style="list-style-type: none"> 1. The Seller returns an error message if an error is encountered that prevents the Seller from processing this request. 2. The Seller will return an error if the POQ with the specified POQ Identifier is not found in the Seller’s records.
Business Process	MEF 50.1 Lead-Response-to-Contract

Table 11 - Retrieve POQ by Identifier

Field	Description
Use Case Number	9
Use Case Name	Notify of POQ State Change
Description	The Seller sends notifications for POQ creation or POQ state change.
Actors	Seller/Buyer

Pre-Conditions	<ol style="list-style-type: none">1. A particular Seller responds to Create Product Offering Qualification requests using the Deferred Response pattern.2. A particular Buyer has subscribed to notifications from this Seller. Note that there may be multiple parties within the Buyer who have subscribed to receive these notifications.
Process Steps	The Seller sends the notification to the Buyer for any of the state changes to POQs or POQ Items using the POQ Identifier to uniquely reference this POQ and the combination of the POQ Identifier and POQ Item Identifier to reference this POQ Item.
Post-Conditions	The Buyer becomes aware of the change of state of the POQ. Typically, this will cause the Buyer to issue Retrieve POQ by Identifier requests to the Seller to obtain the results of this POQ.
Alternative Paths	None
Business Process	MEF 50.1 Lead-Response-to-Contract

Table 12 – Notify of POQ State Change

9 Operation Attributes

This section identifies the attributes passed between the Buyer and Seller for each of the Use Cases defined in Section 8. For each attribute, there is a description of the attribute, a type, and comments related to the attribute. In addition, the requirements defining which attributes are to be sent in the request and which attributes are to be sent in the response are specified.

To allow extensibility to other Product Offerings, attributes for the Product Specifications for MEF UNI and MEF Access E-Line Services are outside the scope of this document.

The columns in the table are as follows:

- Attribute** The name of the attribute.
- Description** A short description of the attribute.
- Type** The data type of this attribute (e.g. String, integer, etc.).

9.1 Geographic Address Retrieval and Validation Attributes

This section defines the attributes and associated requirements for Use Cases 1 and 2 as described in Table 3. Table 13 defines the attributes that may be sent by the Buyer to the Seller across the Sonata IRP for Operations involved in these Use Cases.

Attribute	Description	Type
Buyer ID	The unique name identifier of the organization that is acting as the Customer in this transaction. See Section 9.8 for requirements around the use of this attribute.	String
Seller ID	The unique identifier of the organization that is acting as the supplier in this transaction. See Section 9.8 for requirements around the use of this attribute.	String
Address Type	The type of Address used in this request.	A string that is one of: <ul style="list-style-type: none"> • FIELDDED_ADDRESS • FORMATTED_ADDRESS
Buyer Specified Address	The Address to be validated.	A Fielded Address as defined section 9.9.2.1 or a Formatted Address as defined in section 9.9.3.1.

Table 13 - Geographic Address Buyer Request Attributes

The requirements around specifying the Buyer ID and Seller ID attributes in Table 13 are described in section 9.8.

- [R4] The Buyer **MUST** specify the Address Type attribute defined in Table 13.
- [R5] If the Address Type is FIELDDED_ADDRESS, then for Use Case 1 (Validate Address) in Table 3, the Buyer **MUST** specify the Buyer Specified Address attribute using the “Unknown Address ID” method of a Fielded Address as described in section 9.9.2.1.
- [R6] If the Address Type is FIELDDED_ADDRESS, then for Use Case 2 (Retrieve Address by Identifier) in Table 3, the Buyer **MUST** specify the Buyer Speci-

fied Address attribute using the “Known Address ID” method of a Fielded Address as described in section 9.9.2.1.

- [R7] If the Address Type is FORMATTED_ADDRESS, then for Use Case 1 (Validate Address) in Table 3, the Buyer **MUST** specify the Buyer Specified Address attribute using the “Unknown Address ID” method of a Formatted Address as described in section 9.9.3.1.
- [R8] If the Address Type is FORMATTED_ADDRESS, then for Use Case 2 (Retrieve Address by Identifier) in Table 3, the Buyer **MUST** specify the Buyer Specified Address attribute using the “Known Address ID” method of a Formatted Address as described in section 9.9.3.1.

The Seller receives the request from the Buyer and attempts to match the Buyer’s criteria to Addresses that are known to the Seller. The definition of a “Match” is at the Seller’s discretion. Table 14 defines the attributes sent by the Seller to the Buyer in response to Use Cases 1 and 2 as defined in Table 3.

Attribute	Description	Type
Seller Response Code	A response identifier, indicating if the Seller was able to successfully fulfill the request. The detailed response options are for further study but include: Success, No Matching Addresses, and Too Many Records.	String
Seller Verified Addresses	An array of zero or more Addresses known to the Seller that are considered by the Seller to match the Buyer Specified Address.	A list of either Fielded Addresses as defined in section 9.9.2.2 or Formatted Addresses as defined in section 9.9.3.2.
Address Has Public Sites	For each Address returned, this attribute specifies if that Address contains Service Sites that are public such as Meet-Me-Rooms at an interconnect location or a shared telecom room in the basement of a multi-tenant building.	Boolean
Address Allows New Sites	For each Address returned, this attribute specifies if a Buyer must use one of the known existing Service Sites at this location for any Products delivered to this Address. For example, if a particular building owner mandated that all interconnects be done in a shared Public Meet-Me-Room, this attribute would be set to False for that Address.	Boolean

Table 14 - Geographic Address Seller Response Attributes

- [R9] The Seller **MUST** respond with the Seller Response Code indicating whether the response was successful and if not, the reason for the failure.
- [R10] If the Address Type in the request was FIELDDED_ADDRESS, any and all Seller Verified Addresses returned **MUST** be Fielded Addresses as specified in section 9.9.2.2.
- [R11] If the Address Type in the request was FORMATTED_ADDRESS, any and all Seller Verified Addresses returned **MUST** be Formatted Addresses as specified in section 9.9.3.2.

- [R12] If the Seller Response Code indicates success for Use Case 1 (Validate Address), the Seller **MUST** return one or more Seller Verified Addresses, all of which are considered potential matches to the Buyer Specified Address in the request.
- [R13] If the Seller Response Code indicates success for Use Case 2 (Retrieve Address by ID), the Seller **MUST** return exactly one Seller Verified Address that matches the Buyer Specified Address in the request.
- [R14] If the Seller Response Code does not indicate success, the Seller **MUST NOT** return any Seller Verified Addresses.
- [O1] The Seller **MAY** specify the “Address Has Public Sites” and “Address Allows New Sites” attributes for each Address returned.

9.2 Service Site Retrieval Attributes

This section defines the attributes and associated requirements for Use Cases 3 and 4 as described in in Table 3.

Table 15 defines the attributes that may be sent from the Buyer to the Seller across the Sonata IRP for Operations involved in Use Case 3 (Retrieve Service Site List) as defined in Table 3.

Attribute	Description	Type
Buyer ID	The unique identifier of the organization that is acting as the customer in this transaction. See Section 9.8 for requirements around the use of this attribute.	String
Seller ID	The unique identifier of the organization that is acting as the supplier in this transaction. See Section 9.8 for requirements around the use of this attribute.	String
Service Site Description	A textual description of the Service Site.	String
Service Site Name	A textual name commonly used by people to refer to this Service Site. For example, a particular Service Site in an interconnect facility could be commonly referred to as “Meet Me Room 1”	String
Service Site Company Name	The name of the company that is the administrative authority (e.g. controls access) for this Service Site. (For example, the building owner)	String
Service Site Customer Name	The name of the company that is the administrative authority for the space within this Service Site. (For example, the company leasing space in a multi-tenant building).	String
Service Site Contact	Identifies the name of the person or organization at the specific site location that is the local contact. This contact will primarily be used for gaining access to the site.	Contact information as defined in section 9.11.

Service Site Restriction Type	This defines whether a Service Site is public or private. “Public” means that the existence of this Service Site is public information. A meet-me-room in a hosted data center facility (where all interconnects between parties take place) is an example of a public Service Site. A shared facility in the basement of a multi-tenant business building where all interconnects between parties take place is another example of a public Service Site. “Private” means that the existence of this Service Site is on a need-to-know basis. A wiring closet set up inside a customer facility just to connect two parties is an example of a private Service Site.	String that is one of: <ul style="list-style-type: none"> • PUBLIC • PRIVATE
Service Site Location	A location describing where this Service Site is located.	Service Site Location as described in section 9.10.

Table 15 – Service Site Buyer Request Attributes Use Case 3

The following are the requirements on the Buyer when making the request for the Operation associated with Use Case 3 (Retrieve Service Site List). The requirements around specifying the Buyer ID and Seller ID attributes in Table 15 are described in section 9.8.

[R15] The Buyer **MUST** specify the Service Site Location attribute in Table 15 as defined in section 9.10.

[O2] The Buyer **MAY** specify any of the other attributes in Table 15 as criteria for this request.

Table 16 defines the attributes that may be sent from the Buyer to the Seller across the Sonata IRP for Operations involved in Use Case 4 (Retrieve Service Site by ID) as defined in Table 3.

Attribute	Description	Type
Buyer ID	The unique identifier of the organization that is acting as the customer in this transaction. See Section 9.8 for requirements around the use of this attribute.	String
Seller ID	The unique identifier of the organization that is acting as the supplier in this transaction. See Section 9.8 for requirements around the use of this attribute.	String
Service Site Identifier	Identifier of the Service Site unique within the Seller.	String

Table 16 – Service Site Buyer Request Attributes Use Case 4

The following are the requirements on the Buyer when making the request for the Operation associated with Use Case 4 (Retrieve Service Site by ID). The requirements around specifying the Buyer ID and Seller ID attributes in Table 16 are described in section 9.8.

[R16] The Buyer **MUST** specify the Service Site Identifier attribute in Table 16.

The Seller receives the request from the Buyer and attempts to match the Buyer’s criteria to Service Sites that are known to the Seller. The definition of a “Match” is at the Seller’s discretion.

Table 17 defines the Attributes sent in the Seller's response to Use Cases 3 and 4 as defined in Table 3.

Attribute	Description	Type
Seller Response Code	A response identifier, indicating if the Seller was able to successfully fulfill the request. The detailed response options are for further study but include: Success, No Matching Service Sites, Too Many Records and invalid Address.	String
The fields below are repeated for each Service Site returned		
Service Site Identifier	Identifier of the Service Site unique within the Seller.	String
Service Site Description	A textual description of the Service Site.	String
Service Site Name	A name commonly used by people to refer to this Service Site.	String
Service Site Company Name	The name of the company that is the administrative authority (e.g. controls access) for this Service Site. (For example, the building owner)	String
Service Site Customer Name	The name of the company that is the administrative authority for the space within this Service Site. (For example, the company leasing space in a multi-tenant building).	String
Service Site Contact	Identifies the name of the person or organization at the specific site location that is the local contact. This contact will primarily be used for gaining access to the site.	Contact information as defined in 9.11.
Service Site Restriction Type	This defines whether a Service Site is public or private. "Public" means that the existence of this Service Site is public information. A meet-me-room in a hosted data center facility (where all interconnects between parties take place) is an example of a public Service Site. A shared facility in the basement of a multi-tenant business building where all interconnects between parties take place is another example of a public Service Site. "Private" means that the existence of this Service Site is on a need-to-know basis. A wiring closet set up inside a customer facility just to connect two parties is an example of a private Service Site. For "Private" sites, the Seller does not return any information regarding the existence of this Service Site unless it has been established that this Buyer is authorized to obtain this information.	String that is one of: <ul style="list-style-type: none"> • PUBLIC • PRIVATE
Service Site Location Set	A set of location descriptions, each of which describes where this Service Site is located. It is important to note that this is a set because a particular Service Site might be described with multiple locations. For example, one Service Site might have two Fielded Addresses (for a building on the corner of two streets), two Formatted Addresses, and a Geographic Point.	A set of Service Site Locations as described in 9.10.

Table 17 - Service Site Seller Response Attributes Use Cases 3 and 4

- [R17] The Seller **MUST** respond with the Seller Response Code indicating whether the response was successful and if not, the reason for the failure.
- [R18] If the Seller Response Code indicates success for Use Case 3 (Retrieve Service Site List), the Seller **MUST** return one or more Service Sites, all of which are considered potential matches to the Buyer Specified Address in the request.
- [R19] If the Seller Response Code indicates success for Use Case 4 (Retrieve Service Site by ID), the Seller **MUST** return exactly one Service Site that matches the Buyer Specified Address in the request.
- [R20] If the Seller Response Code does not indicate success, the Seller **MUST NOT** return any Service Sites.
- [R21] For each Service Site returned, the Seller **MUST** specify the Service Site Identifier Attribute.
- [R22] For each Service Site returned, the Seller **MUST** specify at least one Service Site Location using either a Fielded Addresses or a Formatted Address (Based on the default agreed upon by this Buyer/Seller pair).
- [O3] For each Service Site returned, the Seller **MAY** specify any of the other fields in Table 17.

9.3 Register for POQ Notification Attributes (Use Case 5)

Table 18 defines the attributes that may be sent from the Buyer to the Seller across the Sonata IRP for the Register for POQ Notification Use Case (Use Case 5 as defined in Table 3).

Attribute	Description	Type
Buyer ID	The unique identifier of the organization that is acting as the customer in this transaction. See Section 9.8 for requirements around the use of this attribute.	String
Seller ID	The unique identifier of the organization that is acting as the supplier in this transaction. See Section 9.8 for requirements around the use of this attribute.	String
Return Address Information	The detailed information on the mechanism and address specifying where the Seller is to send any POQ Notifications. There can be multiple locations for one Buyer.	For Further Study
List of Notification Types	The types of notifications that the Buyer wishes to receive. Each item in the list is either CREATE (send notification when a new POQ is created) or POQ STATE CHANGE (send notification when there is a change to the state of the POQ or any POQ Item)	String
Action	Specification to Start Notifications or Stop Notifications	String that is one of: <ul style="list-style-type: none"> • START • STOP

Table 18 – Register for POQ Notification Buyer Attributes

The following are the requirements on the Buyer when making the request for the Operation associated with Use Case 5. The requirements around specifying the Buyer ID and Seller ID attributes in Table 15 are described in section 9.8.

- [R23] When making a POQ notification request, the Buyer **MUST** specify the Return Address Information and Action attributes shown in Table 18.

Table 19 defines the attributes that the Seller uses to respond to the POQ Notification Request Operation.

Attribute	Description	Type
Seller Response Code	A response identifier, indicating if the Seller was able to successfully fulfill the request. The detailed response options are for further study but include: Success, Not supported and Invalid Return Address Information.	String

Table 19 - Service Site Seller Response Attributes for Use Cases 5

- [R24] When responding to a POQ notification request, the Seller **MUST** specify the Seller Response Code attribute shown in Table 19.

9.4 Create POQ (Use Case 6)

9.4.1 Buyer Request to Create POQ

Table 20 defines the attributes that may be sent by the Buyer to the Seller across the Sonata IRP for Use Cases 6 as defined in Table 3. The Buyer requirements in formulating that request follow the table.

Attribute	Description	Type
Buyer Product Offering Qualification Attributes		
Buyer ID	The unique identifier of the organization that is acting as the customer in this transaction. See Section 9.8 for requirements around the use of this attribute.	String
Seller ID	The unique identifier of the organization that is acting as the supplier in this transaction. See Section 9.8 for requirements around the use of this attribute.	String
Project Identifier	An identifier that is used to group things that represent a unit of functionality that is important to a Buyer (unique for the Buyer). A Project can be used to relate multiple requests together such as POQ requests, Product Orders, etc..	String
Immediate Response Only	If this flag is set to True, the Buyer requires an Immediate Response to this request. If the Seller is unable to provide an Immediate Response, the Seller is to reply with an appropriate error.	Boolean

Provide Alternate	An indicator which when the value is "true" means that alternative solutions may be provided. If "true", the Seller may provide Product Alternatives in the response such as a Product with a lower bandwidth than requested. If "false" the Seller is to reply only with exact matches.	Boolean
Expected Response Date	The desired date by which a POQ response to the Product Offering Qualification request will be provided. If the Seller cannot meet the expected date, the Seller may choose to reject the request.	Date/Time
Buyer Contact Information	The contact information for the person or organization representing the Buyer that can answer questions related to this POQ request.	Contact information as defined in section 9.11.
Product Offering Qualification Items	The Product Offering Qualification is composed of product offering qualification items. This is the list of associated Product Offering Qualification items.	One or more Product Offering Qualification as defined in section 9.4.1.1.

Table 20 – Attributes for Buyer request to Create POQ

The requirements around specifying the Buyer ID and Seller ID attributes in Table 20 are described in section 9.8.

- [R25] The Buyer **MUST** specify the Immediate Response Only, Provide Alternate, Expected Response Date, and Buyer Contact Information attributes defined in Table 20 when initiating a Create POQ request.
- [R26] The Buyer **MUST** specify at least one Product Offering Qualification Item in the Create POQ request.
- [O4] The Buyer **MAY** specify the Project Identifier and Expected Response Date attributes in Table 20.

9.4.1.1 Buyer Specification of POQ Items

Table 21 defines the attributes that may be used by a Buyer to describe each POQ Item included in a POQ. The Buyer requirements to formulate this request follow the table.

Attribute	Description	Type
Buyer POQ Item Attributes		
Product Offering Qualification Item Identifier	An identifier for this POQ item, which is unique within this POQ.	String
POQ Activity	The activity associated with this POQ item. INSTALL means that this POQ Item being evaluated is a completely new deployment. CHANGE means that this is a change to an existing Product (e.g. to increase the bandwidth). DISCONNECT means this is an evaluation of feasibility of disconnecting an existing Product (e.g. may not be feasible to disconnect a UNI without first disconnecting attached Access E-Lines)	String that is one of: <ul style="list-style-type: none"> • INSTALL • CHANGE • DISCONNECT

Product Identifier	The identifier of an in-service Product that an activity is being performed on. This field is only populated if an activity is being performed on (e.g. CHANGE or DISCONNECT in POQ Activity attribute) an existing Product.	String
Product Offering Identifier	The identifier for a particular Product Offering associated with this POQ Item. This identifier is unique to the Seller and is established between the Buyer and Seller prior to issuing any POQ requests.	String
Product Specific Attributes	The technical attributes for the Product that would be delivered to fulfill this POQ Item. This essentially specifies the values for attributes defined in the Product Specification. The detail of the Product Specification is for further study.	For further study.
Product Relationships	A list of other POQ Items in this POQ or existing Products that are related to the Product that would be delivered to fulfill this POQ Item.	A list of Product Relationships as defined in section 9.4.1.2.
POQ Item Location Type	The method used to describe the location at which this POQ Item is installed or is to be installed if this POQ Item is to be installed at a particular location.	String that is one of: <ul style="list-style-type: none"> • SER-VICE_SITE_IDENTIFIER • FIELDLED_ADDRESS • FORMATTED_ADDRESS • GEOGRAPHIC_POINT • ADDRESS_REFERENCE
POQ Item Location	The detailed location at which this POQ Item is installed or is to be installed if this POQ Item is to be installed at a particular location.	A Service Site Identifier, a Fielded Address as defined in section 9.9.2, a Formatted Address as defined in 9.9.3, a Global Address Reference as described in 9.9.4 or a Geographic Point as defined in 9.9.5.
POQ Item Location Contact	The person to call to get access to this Service Site in case such access is required to complete the evaluation of this POQ Item.	Contact information as described in 9.11.

Table 21 – Buyer POQ Item Attributes

- [R27] The Buyer **MUST** specify the following attributes in Table 21: Product Offering Qualification Item Reference Number, and POQ Activity.
- [R28] If POQ Activity is INSTALL, the Buyer **MUST NOT** specify the Product Identifier attribute in Table 21.
- [R29] If POQ Activity is INSTALL, the Buyer **MUST** specify the Product Offering Identifier and Product Specific Attribute attributes in Table 21.
- [R30] If the POQ Activity is CHANGE or DISCONNECT, the Buyer **MUST** specify the Product Identifier attribute in Table 21.
- [R31] If the POQ Activity is DISCONNECT, the Buyer **MUST NOT** specify the following attributes in Table 21: Product Offering Identifier, Product Specif-

ic Attributes, Product Relationships, POQ Item Location Type, POQ Item Location and POQ Item Location Contact.

- [R32] If POQ Activity is CHANGE, the Buyer **MUST** specify the Product Offering Identifier and Product Specific Attribute attributes in Table 21.

Different Product Offerings have different requirements to allow Products of this type to be fully specified. These requirements are defined in the Product Specifications for these Product Offerings. For example, a UNI Product Offering might be defined to require the location where the UNI is to be installed but mandate that no other Products be related to it. By contrast, an Access E-Line Product Offering might be mandated not to have any locations associated with it, but to require that it be related to a particular UNI Product at one end and an ENNI Product at the other end. While how these requirements are defined in the Product Specification is outside the scope of this document, there are requirements that apply herein.

- [R33] If the Product Offering Identifier is specified and the Product Specification for that Product Offering mandates specifying a location for such Products, the Buyer **MUST** specify the POQ Item Location Type, POQ Item Location and POQ Item Location Contact attributes.
- [R34] If the Product Offering Identifier is specified and the Product Specification for that Product Offering mandates not specifying a location for such Products, the Buyer **MUST NOT** specify the POQ Item Location Type, POQ Item Location and POQ Item Location Contact attributes.
- [R35] If the Product Offering Identifier is specified and the Product Specification for that Product Offering mandates specifying a specific number or range (e.g. 0, 1, 1...N) of Product relationships for such Products, the Buyer **MUST** specify that number of Product relationships in Table 21.
- [R36] When specifying the POQ Item Location in Table 21, the method of doing so **MUST** match the POQ Item Location Type in Table 21.

Note that when specifying a location, the Seller must match to precisely one location. For this reason, success rates of POQs is significantly better if the Buyer uses Address Identifiers returned in Use Case 1 (Validate Address) or Site Identifiers that were returned in Use Cases 3 (Retrieve Service Site List).

9.4.1.2 *Specification of Product Relationships*

Table 22 defines the attributes used to specify a Product Relationship and the requirements for doing so follow this table.

Attribute	Description	Type
Related Item Type	Specifies whether this is a relationship to another POQ Item in this POQ or to an existing Product.	String that is one of: <ul style="list-style-type: none"> • POQ_ITEM • PRODUCT
Related Item Identifier	The Identifier of the related POQ item (unique within this POQ and assigned by the Buyer) or the Identifier of the existing Product (unique within this Seller).	String
Relationship Nature	Specifies the nature of relationship to the related POQ item. 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.

Table 22 - Product Relationship Attributes

[R37] A Buyer or Seller specifying a Product Relationship **MUST** specify all of the attributes in Table 22.

9.4.2 Seller's Deferred Response to Create POQ

Table 23 defines the attributes that the Seller uses to respond to the Buyer's Create POQ Request when the Seller intends to use the Deferred Response pattern to respond to this request.

Attribute	Description	Type
Seller Response Code	A response identifier, indicating if the Seller was able to successfully accept the POQ request. The detailed response options are for further study but include: Success and Failure.	String
POQ Identifier	The identifier of the Product Offering Qualification request that is unique within this Seller.	String

Table 23 – Sellers Deferred Response to Create POQ

[R38] When providing a Deferred Response to a POQ notification request, the Seller **MUST** specify the Seller Response Code attribute shown in Table 23.

[R39] If the Seller Response Code indicates success, the Seller **MUST** specify the POQ Identifier attribute in Table 23 in the response. Note that in this case, both the Buyer and the Seller are to represent the POQ state as IN_PROGRESS per section 10.1

[R40] If the Seller Response Code does not indicate success, the Seller **MUST NOT** specify the POQ Identifier attribute in Table 23 in the response.

9.4.3 Seller's Immediate Response to Create POQ

Table 24 defines the attributes sent by the Seller to the Buyer across the Sonata IRP as an immediate response to the Create POQ request (Use Case 6). These attributes are also used in Seller's response to Use Case 8 (See Section 9.7).

Attribute	Description	Type
Seller Product Offering Qualification Attributes		
Seller Response Code	A response identifier, indicating if the Seller was able to successfully complete the request. The detailed response options are for further study but include: Success and Failure. To clarify, "Success" implies completing the request regardless if the outcome is that there was insufficient information provided by the Buyer to complete the POQ, and regardless if the Seller is able to provide the requested Product(s).	String
POQ Identifier	The identifier of the Product Offering Qualification request that is unique within this Seller.	String
POQ State	The states used to convey the qualification status. This attribute is to be provided by the Seller on all response messages. The Seller is responsible for managing the qualification status. (Set by the Seller)	String that is one of: <ul style="list-style-type: none"> • READY • UNABLE_TO_PROVIDE • INSUFFICIENT_INFORMATION_PROVIDED
Seller Contact Information	The contact information for the person or organization who can answer questions related to this POQ request.	Contact information as defined in section 9.11.
Product Offering Qualification Items	The Product Offering Qualification is composed of Product Offering Qualification Items. This is the Seller's response to each of the POQ Items sent in the request.	One or more Product Offering Qualification Items as defined in section 9.4.3.1.

Table 24 – Seller Response to POQ Attributes

The following requirements apply to a Seller providing an Immediate Response to a POQ Create Request (Use Case 6).

- [R41] When providing an immediate response to a POQ create request, the Seller **MUST** specify the Seller Response Code attribute shown in Table 24.
- [R42] If the Seller Response Code indicates success, the Seller **MUST** specify the POQ Identifier attribute in Table 24 in the response.
- [R43] If the Seller Response Code indicates success, the Seller **MUST** specify the POQ State attribute in Table 24 in the response. For Use Case 6 (Create POQ), this **MUST** be either READY or INSUFFICIENT_INFORMATION_PROVIDED.
- [R44] If the Seller Response code indicates success and the POQ state indicates "READY", then for each POQ Item in the request, the Seller **MUST** specify the Product Offering Qualification Items attribute in Table 24 in the response

and all of those items must indicate a POQ Item State of READY (See section 9.4.3.1).

- [R45] If the Seller Response code indicates success and the POQ state indicates INSUFFICIENT_INFORMATION_PROVIDED, then for at least one of the POQ Items in the request, the Seller **MUST** specify the Product Offering Qualification Items attribute in Table 24 in the response that indicates a POQ Item State of INSUFFICIENT_INFORMATION_PROVIDED. In this case, the Seller **MUST** provide a response for each POQ Item in this POQ.
- [R46] If the Seller Response Code indicates success, the Seller **MUST** specify the Seller Contact Information attribute in Table 24 in the response.
- [R47] If the Seller Response Code does not indicate success, the Seller **MUST NOT** specify any of the following attributes in Table 24 in the response: POQ Identifier, POQ State, Seller Contact Information, and Product Offering Qualification Items.

9.4.3.1 Seller Specification of POQ Items

Table 25 defines the attributes sent by the Seller in response to each POQ Item in the Buyer request from Use case 6 in Table 3. These attributes are also used in Seller's response to Use Case 8 (See Section 9.7).

Attribute	Description	Type
Seller POQ Item Attributes		
Product Offering Qualification Item Identifier	An identifier for this POQ item, which is unique within this POQ.	String
POQ Item State	The state of the Seller's evaluation of the feasibility to deliver this POQ Item. Set by the Seller.	String that is one of: <ul style="list-style-type: none"> • READY • INSUFFICIENT_INFORMATION_PROVIDED • ABANDONED

POQ Confidence Level	<p>The level of confidence of the Seller to be able to service the request. Note that this response is only an evaluation of the technical feasibility of delivery independent of when the Product can be delivered.</p> <p>GREEN: The Seller has high confidence that this Product can be delivered typically because at least rights-of-way have been established to this location.</p> <p>YELLOW: The Seller believes they can deliver the Product but is not highly confident (typically it is near a location that can be served but rights-of-way have not been established all the way to this location). In addition, if the Seller is highly confident that they can deliver one or more substitute Product configurations (e.g. of lower bandwidth), they may specify the details of these alternate Products.</p> <p>RED: The Seller cannot deliver the Product as specified. Set by the Seller.</p>	<p>String that is one of</p> <ul style="list-style-type: none"> • GREEN • YELLOW • RED
Installation Interval Unit	The Unit for the Installation Interval Value.	<p>String that is one of</p> <ul style="list-style-type: none"> • CALENDAR_DAYS • CALENDAR_HOURS • CALENDAR_MINUTES • BUSINESS_DAYS • BUSINESS_HOURS • BUSINESS_MINUTES
Installation Interval Value	<p>The estimated minimum interval that would be required for the Seller to complete the delivery of this Product from the time the order is placed and any precedents have been completed (in units specified by Installation Interval Unit). As an example, consider a case where a POQ contained two POQ Items: One for a UNI and one for an Access E-Line between that UNI and an existing ENNI. Suppose further that the UNI will take a minimum of 20 business days to deliver, and once this is completed, the Access-Eline will take 2 business days to deliver. In this case, this attribute would have a value of 20 (with Unit of BUSINESS_DAYS) and the Access E-Line would have a value of 2 (with Unit attribute of BUSINESS_DAYS). It is the Buyer's responsibility to understand the delivery precedents and calculate that the total time to complete is 22 business days.</p>	Integer
Guaranteed Until Date	<p>The date until which the Seller guarantees the validity of these POQ results. If this attribute is populated, it informs the Buyer that this Seller guarantees they can honor this POQ Item request until the Date/Time specified. The detailed format of the Date/Time is for further study.</p>	Date/Time
Termination Error	<p>When the Seller can't process the POQ request, the Seller returns a text-based list of reasons here.</p>	String

Alternate Product Proposals	A list of one or more proposed alternative Products that the Seller is proposing to the Buyer. If a) the Buyer has set Provide Alternate to “True”; 2) the Seller has determined that the POQ Confidence Level for this item is “YELLOW” or “RED”; and 3) The Seller has alternate Products (e.g. similar but lower bandwidth) that may be adequate, then the Seller may return one or more Alternate Product Proposals.	List of Alternate Product Proposals as described in section 9.4.3.2.
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Table 25 - POQ Item Attributes for Seller Response

The following requirements apply to a Seller’s Immediate Response to the Create POQ request (Use Case 6). Each POQ Item in the Seller’s response corresponds to precisely one POQ Item in the Buyer’s request. The following requirements apply to each POQ Item.

- [R48] The Seller **MUST** specify the Product Offering Qualification Item Reference Number attribute in Table 25. This number **MUST** match precisely one of the Product Offering Qualification Item Reference Numbers provided by the Buyer in the request.
- [R49] The Seller **MUST** specify the State attribute in Table 25. For Use Case 6 (Create POQ), this **MUST** be READY, INSUFFICIENT_INFORMATION_PROVIDED or ABANDONED.
- [R50] If the State Attribute is INSUFFICIENT_INFORMATION_PROVIDED or ABANDONED, the Seller **MUST NOT** specify the following attributes in Table 25: POQ Confidence Level, Installation Interval Unit, Installation Interval Value, Guaranteed Until, and Alternate Product Proposals.
- [R51] If the State Attribute is INSUFFICIENT_INFORMATION_PROVIDED, the Seller **MUST** specify the Termination Error attribute in Table 25.
- [R52] If the State Attribute is READY, the Seller **MUST** specify the POQ Confidence Level from Table 25 in the response.
- [R53] If the State Attribute is READY, and the POQ Confidence Level attribute is GREEN or YELLOW, the Seller **MUST** specify the Installation Interval Unit, and Installation Interval Value attributes from Table 25 in the response.
- [O5] If the State Attribute is READY, then the Seller **MAY** specify the Guaranteed Until attribute from Table 25 in the response.
- [O6] If the Provide Alternate Attribute from the request indicates YES, and the State attribute in the response is READY and the POQ Confidence Level attribute in the response is YELLOW or RED, then the Seller **MAY** specify the Alternate Product Proposals attribute from Table 25 in the response.

9.4.3.2 Seller Specification of Alternate Product Proposals

Alternate Product Proposals represent other Products and solutions that the Seller is proposing to meet the needs of the Buyer. For example, the Buyer might be requesting a Product with 500Mb/s of bandwidth; but at this location, the Seller cannot deliver that Product but can deliver a Product using a similar Product Offering that supports 1GB/s.

A Seller may specify any number of Alternate Product Proposals in response to one POQ Item. Table 26 defines the attributes that allow a Seller to specify each of these Alternate Product Proposals. Requirements on how the Seller formulates this response follow the table.

Attribute	Description	Type
Alternate Product Proposal Identifier	A unique identifier for this Alternate Product Proposal assigned by the Seller.	String
Installation Interval Unit	The Unit for the Installation Interval Value for the interval to deliver the Alternate Product	String that is one of <ul style="list-style-type: none"> • CALENDAR_DAYS • CALENDAR_HOURS • CALENDAR_MINUTES • BUSINESS_DAYS • BUSINESS_HOURS • BUSINESS_MINUTES
Installation Interval Value	The estimated minimum interval that would be required for the Seller to complete the delivery of this Alternate Product from the time the order is placed (in units specified by Installation Interval Unit).	Integer
Eligible Product Offering	The Product Offering Identifier (unique within this seller associated with this alternate Product)	String
Product Specific Attributes	The technical attributes for the Product that would be delivered to fulfill this POQ Item. This essentially specifies the values for attributes defined in the Product Specification. The detail of the Product Specification is for further study.	For further study.

Table 26 – Alternate Product Proposal Attributes

[R54] The Seller **MUST** specify all the attributes in Table 26 for each Alternate Product Proposal that the Seller is proposing to the Buyer.

9.5 Notification of POQ State Change (Use case 9)

As discussed in section 8, when a Seller that uses the Deferred Response pattern they need to be able to provide autonomous notifications to the Buyer when any of the POQ Items or the POQ itself changes state. These notifications are sent only if the Buyer has registered for these notifications (section 9.3) and the Seller has responded to the Buyer's Create POQ request (section 9.4.1) with a Deferred Response (section 9.4.2). Then, any time one of these POQs or POQ Items changes state (see section 10), the Seller sends a notification to the Buyer with the attributes defined in Table 27.

Note that these notifications do not specify what has changed; only that a change has occurred. The Buyer receiving this notification would then need to issue a Request of POQ by Identifier request (section 9.6) to get the latest details associated with the POQ.

Attribute	Description	Type
POQ Identifier	The identifier for the POQ (unique within this Seller) that has changed state.	String
State Change Type	The type of State change that occurred. CREATE happens only once in the life of every POQ when it is first created. CHANGE happens any time a POQ changes state or any of the POQ Items associated with the POQ changes state.	String that is one of <ul style="list-style-type: none"> • CREATE • CHANGE

Table 27 – Notification of POQ State Change Attributes

- [R55] A Seller **MUST NOT** send POQ State Change Notifications to Buyers who have not registered to receive such notifications (section 9.3).
- [R56] A Seller **MUST** only send POQ State Change Notifications for POQs where the Seller has responded to the Buyer's Create POQ request (section 9.4.1) with a Deferred Response (section 9.4.2). In this case, the Seller **MUST** send a notification to all of the targets specified by the Buyer in their Register for POQ Notifications request (section 9.3) every time there is a change in state of either that POQ or any of the items associated with that POQ.

9.6 Retrieve POQ information (Use Case 7)

This section defines the attributes and associated requirements for Use Case 7 in Table 3.

Table 28 defines the attributes sent from the Buyer to the Seller across the Sonata IRP for Operations involved in Use Case 7 as defined in Table 3.

Attribute	Description	Type
Product Offering Qualification		
Buyer ID	The unique identifier of the organization that is acting as the customer in this transaction. See Section 9.8 for requirements around the use of this attribute.	String
Seller ID	The unique identifier of the organization that is acting as the supplier in this transaction. See Section 9.8 for requirements around the use of this attribute.	String
POQ State	The states used to convey the qualification status. The Buyer is requesting information on all POQs that are presently in this state.	String that is one of: <ul style="list-style-type: none"> • IN_PROGRESS • READY • UNABLE_TO_PROVIDE • INSUFFICIENT_INFORMATION_PROVIDED
From Requested Response Date	The “From” part of a date range associated with the Requested Response Date. The Buyer is requesting information on all POQs that have a Requested Response Date the same as or later than this attribute.	Date/Time
To Requested Response Date	The “To” part of a date range associated with the Requested Response Date. The Buyer is requesting information on all POQs that have a Requested Response Date the same as or earlier than this attribute.	Date/Time
Project Identifier	The Buyer is requesting information on all POQs that are associated with this Project Identifier. Project Identifiers are labels set by the Buyer when the POQ was created.	String

Table 28 – Retrieve POQ List attributes

The following are the requirements on the Buyer when making the request for the Operation associated with Use Case 7. The requirements around specifying the Buyer ID and Seller ID attributes in Table 28 are described in section 9.8.

- [O7] The Buyer **MAY** specify any of the attributes in Table 28 when formulating a Retrieve POQ List request (Use Case 7). In general, of course, the Buyer will be required to specify at least some of these attributes to avoid getting a Too Many Records response code.

Table 29 defines the attributes that the Seller uses to respond to the Retrieve POQ List request.

Attribute	Description	Type
Seller Response Code	A unique response identifier, indicating if the Seller was able to successfully fulfill the request. The detailed response options are for further study but include: Success, Failed, Too many Records or No Records Found.	String
List of POQ Identifiers	The list of POQ Identifiers (each of which is unique within the Seller) that match the criteria associated with the Buyer’s request.	String
POQ State	For each of the above POQ Identifiers, this is the current state of the POQ (per section 10.1)	String

Requested Response Date	For each of the above POQ Identifiers, this is the Requested Response Date specified by the Buyer in the Create POQ request.	Date/Time
Project Identifier	For each of the above POQ Identifiers, this is the Project Identifier specified by the Buyer in the Create POQ request.	String

Table 29 - Service Site Seller Response Attributes for Use Case 7

- [R57] When responding to a Retrieve POQ List request The Seller **MUST** specify the Seller Response Code attribute shown in Table 29.
- [R58] If the Seller Response Code indicates success, the Seller **MUST** specify at least one POQ Identifier in the List of POQ Identifiers attribute in Table 29.
- [R59] For each POQ Identifier returned, the Seller **MUST** specify the POQ State and the Requested Response Date for this POQ.
- [R60] For each POQ Identifier returned, if the Buyer specified a Project Identifier when the POQ was created, the Seller **MUST** specify this Project Identifier in the response.

9.7 Retrieve POQ by Identifier (Use Case 8)

Table 30 defines the attributes sent from the Buyer to the Seller across the Sonata IRP for Operations involved in Use Case 8 as defined in Table 3.

Attribute	Description	Type
Product Offering Qualification		
Buyer ID	The unique identifier of the organization that is acting as the customer in this transaction. See Section 9.8 for requirements around the use of this attribute.	String
Seller ID	The unique identifier of the organization that is acting as the supplier in this transaction. See Section 9.8 for requirements around the use of this attribute.	String
POQ Identifier	The identifier of the Product Offering Qualification request that is unique within this Seller.	String

Table 30 – Retrieve POQ by Identifier attributes

The following are the requirements on the Buyer when making the request for the Operation associated with Use Case 8. The requirements around specifying the Buyer ID and Seller ID attributes in Table 30 are described in section 9.8.

- [R61] The Buyer **MUST** specify the POQ Identifier attribute in Table 30 when formulating a Retrieve POQ by Identifier request (Use Case 8).

The attributes for the Seller's response to this request are the same as an Immediate Response to the Create POQ request (Use Case 6) (See Table 24). While the same attributes are used, the requirements differ.

The following requirements apply to a Seller formulating a response to a Retrieve POQ by Identifier request (Use Case 8).

- [R62] When responding to a Retrieve POQ by Identifier request, the Seller **MUST** specify the Seller Response Code attribute shown in Table 24.
- [R63] If the Seller Response Code indicates success, the Seller **MUST** specify the POQ Identifier attribute in Table 24 in the response.
- [R64] If the Seller Response Code indicates success, the Seller **MUST** specify the POQ State attribute in Table 24 in the response.
- [R65] If the Seller Response code indicates success and the POQ state indicates “READY”, then for each POQ Item in the request, the Seller **MUST** specify the Product Offering Qualification Items attribute in Table 24 in the response and all of those items must indicate a POQ Item State of READY (See section 9.4.3.1).
- [R66] If the Seller Response code indicates success and the POQ state indicates INSUFFICIENT_INFORMATION_PROVIDED, the Seller **MUST** provide a response for all POQ Items in the POQ (using the Product Offering Qualification Items attribute in Table 24) and at least one of those POQ Items **MUST** have a state of INSUFFICIENT_INFORMATION_PROVIDED.
- [R67] If the Seller Response code indicates success and the POQ state indicates IN_PROGRESS, then for each POQ Item in the request, the Seller **MUST** specify the Product Offering Qualification Items attribute in Table 24 in the response and all of those items must indicate a POQ Item State of READY or IN_PROGRESS (See section 9.4.3.1).
- [R68] If the Seller Response code indicates success and the POQ state indicates UNABLE_TO_PROVIDE, the Seller **MUST** specify any of the following attributes in Table 24 in the response: POQ Identifier, POQ State, and Product Offering Qualification Items.
- [R69] If the Seller Response Code indicates success, the Seller **MUST** specify the Seller Contact Information attribute in Table 24 in the response.
- [R70] If the Seller Response Code does not indicate success, the Seller **MUST NOT** specify any of the following attributes in Table 24 in the response: POQ Identifier, POQ State, Seller Contact Information, and Product Offering Qualification Items.

Each POQ Item in the Seller’s response corresponds to precisely one POQ Item in the Buyer’s request. The attributes for POQ Items in the Seller’s response to this request are the same as an Immediate Response to the Create POQ request (Use Case 6) (See Table 25). While the same attributes are used, the requirements differ.

The following requirements apply to a Seller specifying each POQ Item as part of a response to a Retrieve POQ by Identifier request (Use Case 8).

- [R71] The Seller **MUST** specify the Product Offering Qualification Item Reference Number attribute in Table 25. This number **MUST** match precisely one of the Product Offering Qualification Item Reference Numbers provided by the Buyer in the request.
- [R72] The Seller **MUST** specify the State attribute in Table 25.
- [R73] If the State Attribute is `INSUFFICIENT_INFORMATION_PROVIDED`, the Seller **MUST NOT** specify the following attributes in Table 25: POQ Confidence Level, Installation Interval Unit, Installation Interval Value, Guaranteed Until, and Alternate Product Proposals.
- [R74] If the State Attribute is `INSUFFICIENT_INFORMATION_PROVIDED`, the Seller **MUST** specify the Termination Error attribute in Table 25.
- [R75] If the State Attribute is `READY`, the Seller **MUST** specify the POQ Confidence Level from Table 25 in the response.
- [R76] If the State Attribute is `READY`, and the POQ Confidence Level attribute is `GREEN` or `YELLOW`, the Seller **MUST** specify the Installation Interval Unit, and Installation Interval Value attributes from Table 25 in the response.
- [O8] If the State Attribute is `READY`, then the Seller **MAY** specify the Guaranteed Until attribute from Table 25 in the response.
- [O9] If the State Attribute is `IN_PROGRESS` or `ABANDONED`, the Seller **MUST NOT** specify the following attributes in Table 25: POQ Confidence Level, Installation Interval Unit, Installation Interval Value, Guaranteed Until, Termination Error and Alternate Product Proposals.
- [O10] If the Provide Alternate Attribute from the request indicates `YES`, and the State attribute in the response is `READY` and the POQ Confidence Level attribute in the response is `YELLOW` or `RED`, then the Seller **MAY** specify the Alternate Product Proposals attribute from Table 25 in the response.

9.8 Specifying the Buyer ID and the Seller ID

For requests of all types, there is a business entity that is initiating an Operation (called a Requesting Entity) and a business entity that is responding to this request (called the Responding Entity). In the simplest case, the Requesting Entity is the Buyer and the Responding Entity is the Seller. However, in some cases, the Requesting 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 Requesting 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 Requesting Entity know a) the list of Buyers the Requesting Entity represents when interacting with this Responding Entity; and b) the list of Sellers that this Responding Entity represents to this Requesting Entity.

- [R77] If the Requesting 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 ID attribute.
- [R78] If the Requesting Entity represents precisely one Buyer with the Responding Entity, the request **MUST NOT** specify the Buyer ID attribute.
- [R79] If the Responding Entity represents more than one Seller to this Buyer, the request **MUST** specify the Seller with whom this request is associated by using the Seller ID attribute.
- [R80] If the Responding Entity represents precisely one Seller to this Buyer, the request **MUST NOT** specify the Seller ID attribute.

9.9 Specifying Addresses

Since the Seller has final authority of the exact format of all addresses and locations, when a Buyer is specifying an Address, they are really specifying the **criteria** for an address. The Seller uses this to match to their authoritative view of valid Addresses.

9.9.1 Support for Fielded or Formatted Addresses

- [R81] A Buyer **MUST** support at least one of Fielded Addresses or Formatted Addresses to describe locations.
- [R82] A Seller **MUST** support at least one of Fielded Addresses or Formatted Addresses to specify a location.
- [R83] If Fielded Addresses are supported by either a Buyer or a Seller, then all of the fields in Table 31 and Table 32 **MUST** be supported. Note that for any particular Address, only a subset of these fields may be populated.
- [R84] If Formatted Addresses are supported by either a Buyer or a Seller, then all of the fields in Table 33 **MUST** be supported. Note that for any particular Address, only a subset of these fields may be populated.

Note that any particular Buyer or Seller pair needs to choose at least one of these two options to allow them to interoperate and they must agree on a default between these two.

9.9.2 Specifying Fielded Addresses

MEF 57.1, *Ethernet Ordering Technical Specification- Business Requirements and Use Cases*, December 2018 [10] specifies and defines the attributes of both Fielded Addresses and Formatted Addresses. This specification adopts those same attributes, but adds one field to each; A Fielded Address Identifier to a Fielded Address, and a Formatted Address Identifier to a Format-

ted Address. In addition, Fielded Address in [10] has “Sub-Unit Type” and “Sub-Unit Number”. This has been changed to a list of “Sub-Unit Type” and “Sub-Unit Name” pairs. This allows more flexibility in describing the sub-unit. For example, a sub-unit could be described as being TOWER 17, SUITE 767, ROOM B.

For convenience, Table 31 and Table 32 provide a complete list of attributes of a Fielded Address.

Attribute	Description	Type
Fielded Address Identifier	Identifier of the Address that is unique within this Seller	String
Street Number	Number identifying a specific property on a public street. It may be combined with “Street Number Last” for ranged Addresses	String
Street Number Suffix	The first street number suffix (in a street number range) or the suffix for the street number if there is no range	String
Street Number Last	Last number in a range of street numbers allocated to an Address	String
Street Number Suffix Last	Last street number suffix for a ranged Address	String
Street Name	Name of the street or other street type	String
Street Type	The type of street (e.g., alley, avenue, boulevard, brae, crescent, drive, highway, lane, terrace, parade, place, tarn, way, wharf)	String
Street Suffix	A modifier denoting a relative direction.	String
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
City	City in which the Address is located.	String
Postal Code	Descriptor for a postal delivery area, used to speed and simplify the delivery of mail (also known as zip code)	String
Postal Code Extension	The four-digit extension used on an American postal code (optional four digits after the hyphen).	String
State Or Province	The State or Province in which the Address is located.	String
Country	Country in which the Address is located.	String
Sub Unit List	A list of Sub Units. This is a list to allow complex sub-unit information such as SUITE 42 ROOM A	Sub Unit Attributes as described in Table 32.
Level Type	Describes level types within a building (e.g., Floor)	String
Level Number	Used where a Level Type has been populated. This value may be a simple number or description, such as “Basement”.	String
Building Name	The well-known name of a building that is located at this Geographic Address (e.g. where there is one Address for a campus).	String
Private Street Number	Street number on a private street within the Geographic Address.	String
Private Street Name	Private streets internal to a property (e.g. a university) may have internal names that are not recorded by the land title office.	String

Table 31 – Fielded Address Attributes

Attribute	Description	Type
Sub Unit Type	The type of the sub unit (e.g. BERTH, FLAT, PIER, SUITE, SHOP, TOWER, UNIT, WHARF, ROOM).	String

Sub Unit Name	The name for the first Sub Unit (e.g. 42 or A)	String
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Table 32 – Sub-Unit Attributes

There are differences in how a Buyer specifies a Fielded Address versus how a Seller specifies a Fielded Address.

9.9.2.1 Specification of Fielded Addresses by Buyer

There are two ways in which a Buyer can specify a Fielded Address.

- Initially, a Buyer will not know the Seller’s unique Fielded Address Identifier for the Address. In this case, they use the “Unknown Address ID” method.
- After a successful Address Operation using the “Unknown Address ID” method, the Buyer may become aware of the Seller’s unique Fielded Address Identifier for the Address. In this case, they can use the “Known Address ID” method.

[R85] When a Buyer specifies a Fielded Address, the Buyer **MUST** either use the Unknown Address ID Method or the Known Address ID method.

[R86] If the Buyer is using the Unknown Address ID method to specify a Fielded Address, the Buyer **MUST NOT** specify the Fielded Address Identifier in Table 31.

[R87] If the Buyer is using the Unknown Address ID method to specify a Fielded Address, the Buyer **MUST** specify the following attributes in Table 31: Street Name, City, Postal Code and Country.

[O11] If the Buyer is using the Unknown Address ID method to specify a Fielded Address, the Buyer **MAY** specify any of the other attributes in Table 31 and Table 32.

[R88] If the Buyer is using the Known Address ID method to specify a Fielded Address, the Buyer **MUST** specify the Fielded Address Identifier in Table 31.

[R89] If the Buyer is using the Known Address ID method to specify a Fielded Address, the Buyer **MUST NOT** specify any of the other attributes in Table 31.

9.9.2.2 Specification of Fielded Addresses by Seller

[D7] When specifying a Fielded Address, the Seller **SHOULD** specify the Fielded Address Identifier in Table 31.

[R90] When specifying a Fielded Address, the Seller **MUST** specify the following attributes in Table 31: Street Name, Street Number, City, Postal Code and Country.

[O12] When specifying a Fielded Address, the Seller **MAY** specify any of the other attributes in Table 31 and Table 32.

9.9.3 Specifying Formatted Addresses

Table 33 provides a list of attributes of a Formatted Address.

Attribute	Description	Type
Formatted Address Identifier	Identifier of the Address that is unique within this Seller	String
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
City	City in which the Address is located.	String
Postal Code	Descriptor for a postal delivery area, used to speed and simplify the delivery of mail (also known as zipcode)	String
Postal Code Extension	The four-digit extension used on an American postal code (optional four digits after the hyphen).	String
State Or Province	The State or Province in which the Address is located.	String
Country	Country in which the Address is located.	String
Address Line 1	A formatted address line that contains a non-fielded street address.	String
Address Line 2	A formatted address line that contains a non-fielded street address, sub-address (e.g. Suite number), etc.	String

Table 33 - Formatted Address Attributes

There are differences in how a Buyer specifies a Formatted Address versus how a Seller specifies a Formatted Address.

9.9.3.1 Specification of Formatted Addresses by Buyer

There are two ways in which a Buyer can specify a Formatted Address.

- Initially, a Buyer will not know the Seller's unique Formatted Address Identifier for the Address. In this case, they use the "Unknown Address ID" method.
- After a successful Address Operation using the "Unknown Address ID" method, the Buyer may become aware of the Seller's unique Formatted Address Identifier for the Address. In this case, they can use the "Known Address ID" method.

[R91] When a Buyer specifies a Formatted Address, the Buyer **MUST** either use the Unknown Address ID Method or the Known Address ID method.

[R92] If the Buyer is using the Unknown Address ID method to specify a Formatted Address, the Buyer **MUST NOT** specify the Formatted Address Identifier in Table 33.

[R93] If the Buyer is using the Unknown Address ID method to specify a Formatted Address, the Buyer **MUST** specify the following attributes in Table 33: Address Line 1, and Country.

- [O13] If the Buyer is using the Unknown Address ID method to specify a Formatted Address, the Buyer **MAY** specify any of the other attributes in Table 33.
- [R94] If the Buyer is using the Known Address ID method to specify a Formatted Address, the Buyer **MUST** specify the Fielded Address Identifier in Table 33.
- [R95] If the Buyer is using the Known Address ID method to specify a Formatted Address, the Buyer **MUST NOT** specify any of the other attributes in Table 33.

9.9.3.2 Specification of Formatted Addresses by Seller

- [D8] When specifying a Formatted Address, the Seller **SHOULD** specify the Fielded Address Identifier in Table 33.
- [R96] When specifying a Formatted Address, the Seller **MUST** specify the following attributes in Table 33: Address Line 1, and Country.
- [O14] When specifying a Formatted Address, the Seller **MAY** specify any of the other attributes in Table 33.

9.9.4 Specifying Global Address References

Table 34 defines the Attributes used to specify a Global Address Reference.

Attribute	Description	Type
Administrative Authority	The organization that administers this Global Address Reference ensuring it is globally unique.	String
Global Address Reference ID	The globally unique reference to this Address.	String

Table 34 – Global Address Reference Attributes

- [R97] When specifying a Global Address Reference, the Buyer or Seller **MUST** specify all of the attributes in Table 34.

9.9.5 Specifying Geographic Points

Table 35 defines the Attributes used to specify a Geographic Point.

Attribute	Description	Type
Spatial Reference	A standardized coordinate-based local, regional or global system used to locate geographical entities.	String
Latitude	The latitude of the location using the format required by the Spatial Reference system.	String
Longitude	The longitude of the location using the format required by the Spatial Reference system.	String

Table 35 - Geographic Point Attributes

- [R98] When specifying a Geographic Point, the Buyer or Seller **MUST** specify all the attributes in Table 35.

9.10 Specifying Service Site Locations

Table 36 defines the attributes used to Specify Service Site Locations.

Attribute	Description	Type
Service Site Location Type	The method used to describe the location of this Service Site.	String that is one of: <ul style="list-style-type: none"> • FIELDDED_ADDRESS • FORMATTED_ADDRESS • GEOGRAPHIC_POINT • ADDRESS_REFERENCE
Service Site Location	The detailed location of this Service Site	A Fielded Address as defined in section 9.9.2, a Formatted Address as defined in 9.9.3, a Global Address Reference as described in 9.9.4 or a Geographic Point as defined in 9.9.5.

Table 36 – Service Site Location

The following requirements apply to both a Buyer and a Seller when specifying a Service Site Location.

- [R99] The Buyer or Seller **MUST** specify the Service Site Location Type attribute in Table 36.
- [R100] If the Service Site Location type is ADDRESS_REFERENCE, then the Buyer or Seller **MUST** specify the Service Site Location attribute in Table 36 using a Global Address Reference as defined in section 9.9.4.
- [R101] If the Service Site Location type is GEOGRAPHIC_POINT, then the Buyer or Seller **MUST** specify the Service Site Location attribute in Table 36 using a Geographic Point as defined in section 9.9.5.

9.10.1.1 Specification of Service Site Location by Buyer

- [R102] If the Service Site Location type is FIELDDED_ADDRESS, then the Buyer **MUST** specify the Service Site Location attribute in Table 36 using a Fielded Address as defined in section 9.9.2.1.
- [R103] If the Service Site Location type is FORMATTED_ADDRESS, then the Buyer **MUST** specify the Service Site Location attribute in Table 36 using a Formatted Address as defined in section 9.9.3.1.

9.10.1.2 Specification of Service Site Location by Seller

- [R104] If the Service Site Location type is `FIELDDED_ADDRESS`, then the Seller **MUST** specify the Service Site Location attribute in Table 36 using a Fielded Address as defined in section 9.9.2.2.
- [R105] If the Service Site Location type is `FORMATTED_ADDRESS`, then the Seller **MUST** specify the Service Site Location attribute in Table 36 using a Formatted Address as defined in section 9.9.3.2.

9.11 Specifying Contact Information

Table 37 defines the attributes used to specify Contact Information.

Attribute	Description	Type
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

Table 37 – Contact Information Attributes

- [R106] When specifying Contact Information, the Buyer or Seller **MUST** specify all the attributes in Table 37.

10 State Diagrams

10.1 Product Offering Qualification Process Flows

- [R107] If the Seller provides Immediate Responses, the Seller **MUST** support all states and their associated state transitions as specified in Figure 3 and Figure 4 except `IN_PROGRESS` and `UNABLE_TO_PROVIDE`.
- [R108] If the Seller provides Deferred Responses, the Seller **MUST** support all states and their associated state transitions as specified in Figure 3 and Figure 4.

The Product Offering Qualification process flow is shown below. The diagram captures various states that the POQ request goes through in its lifecycle. The specific states are managed by the Seller based on its processing and/or based on the Buyer's action. If the Buyer subscribes to Product Offering state change notifications, the Buyer will receive a notification every time the state changes.

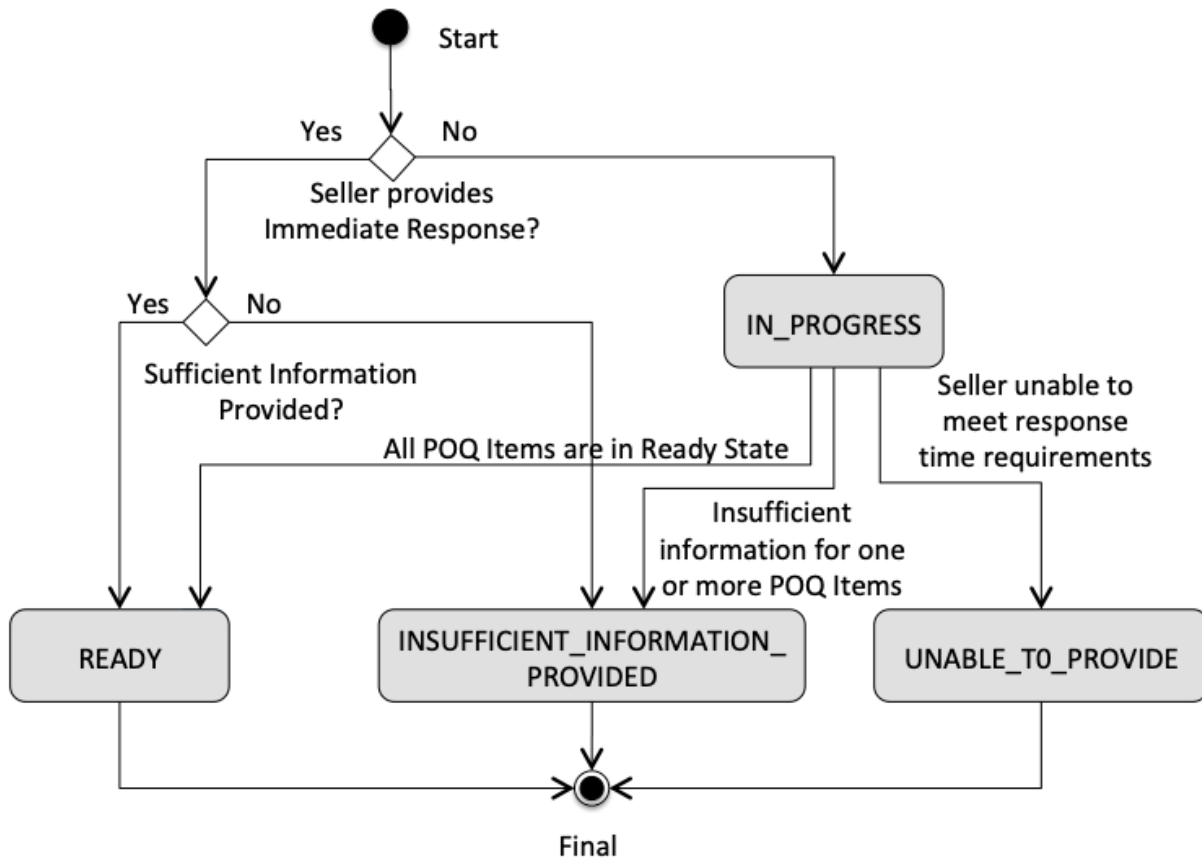


Figure 3 - Product Offering Qualification Process Flow

The definitions of the various states are as follows:

State	Description
IN_PROGRESS	The IN_PROGRESS state is when the POQ is currently in the hands of the Seller. When any POQ Item is in the IN_PROGRESS state, the whole POQ is in the IN_PROGRESS state.
READY	The READY state is where the Product Offering Qualification has been internally approved by the Seller and has either been sent to or is ready for the Buyer to retrieve. When all POQ Items are in the READY state, the overall POQ is in the READY state.
INSUFFICIENT_INFORMATION_PROVIDED	This state is achieved when a well-formed POQ request has been received, but there is insufficient information (e.g. Address information, Product information) to complete the POQ. When any POQ items are in this state, any that are not READY or in this state are ABANDONED and the overall POQ state is set to INSUFFICIENT_INFORMATION_PROVIDED.
UNABLE_TO_PROVIDE	This state is set when the Seller is unable to provide a Product Offering Qualification in the timeframe required by the Buyer (e.g. if an immediate response or a response date is set but cannot be met by the Seller).

Table 38 - Product Offering Qualification Process Flow Values

10.2 Product Offering Qualification Item Process Flow

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

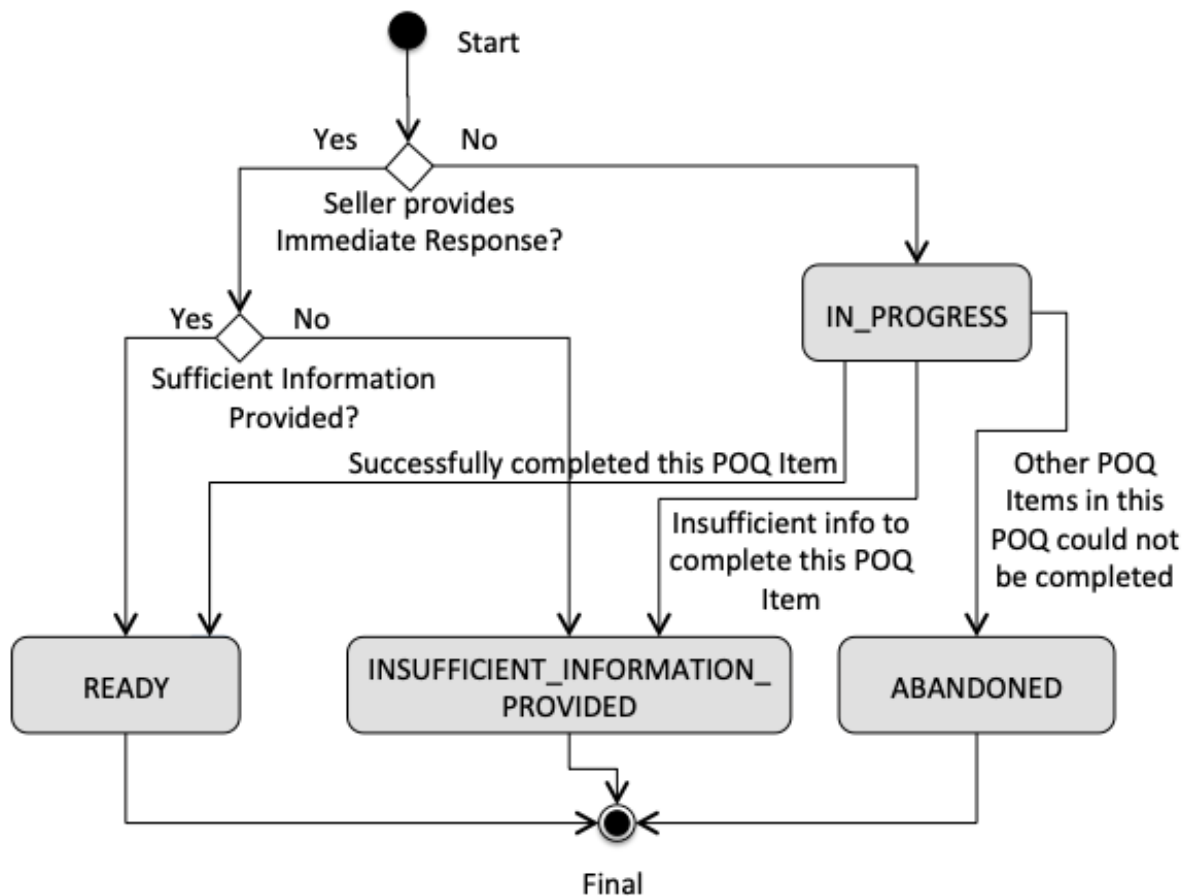


Figure 4 - Product Offering Qualification Item Process Flow

The definitions of the various Product Offering Qualification item states are as follows:

State	Description
IN_PROGRESS	The IN_PROGRESS state is when the POQ item is currently in the hands of the Seller. The POQ item is under construction and may need more information.
INSUFFICIENT_INFORMATION_PROVIDED	The information provided by the Buyer is insufficient for the Seller to provide a Product Offering Qualification for this item.
READY	The READY state is where the POQ item has been internally approved by the Seller.
ABANDONED	The ABANDONED state is applied to POQ items that are in an IN_PROGRESS state when the POQ is moved to a Final state other than READY.

Table 39 – Product Offering Qualification Item State Values

11 References

- [1] IETF RFC 2119, Key words for use in RFCs to Indicate Requirement Levels, March 1997
- [2] IETF RFC 8174, *Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words*, May 2017
- [3] MEF 4, *Carrier Ethernet Network Architecture Framework – Part 1: Generic Framework*, April 2004
- [4] MEF 10.4 *Subscriber Ethernet Service Attributes*, December 2018
- [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 Services Definitions*, December 2018
- [9] MEF 55, *LSO Reference Architecture*, March 2016
- [10] MEF 57.1, *Ethernet Ordering Technical Specification- Business Requirements and Use Cases*, December 2018
- [11] TMF645, *Service Qualification API REST Specification R16.0.1*, October 2016
- [12] TMF647, *Address API REST Specification R16.0.2*
- [13] TMF674, *Geographic Site API REST Specification R17.5.0*