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LSO Sonata Internet Access Product Schemas and Developer Guide

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1 List of Contributing Members

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

Editor Note 1: This list will be finalized before Letter Ballot. Any member that comments in at least one CfC is eligible to be included by opting in before the Letter Ballot is initiated. Note it is the MEF member that is listed here (typically a company or organization), not their individual representatives.

2 Abstract

The MEF Standard consisting of this schema guide and its associated software artifacts (JSON Schemas) defines and describes the product-specific information used in LSO Cantata and LSO Sonata APIs for a set of Business Functions - specifically, Product Offering Qualification, Quote, Product Ordering, and Product Inventory - for Basic and Advanced Internet Access product. The document starts with an overview of LSO Cantata, LSO Sonata, and the Internet Access services. It then provides a basic information model for the MEF Internet Access Service Attributes. The final sections describe the Data Model focused on the JSON Schemas associated with this specification.

This document can be thought of as a user's guide for the Internet Access Data Model and the schemas provided that embody the Data Model. MEF Services are described by a set of Service Attributes. Each Service Attribute describes an aspect of the service that is agreed upon between the provider and the user of the service. The document that describes the Service Attributes for Internet Access Services is MEF 61.1 [3]. The Basic and Advanced services are specified in MEF 69.1 [4] based on the Service Attributes defined in MEF 61.1.

MEF 61.1 specifies Service Attributes to describe the various components that compose a Basic Internet Access service and Advanced Internet Access. This document defines a data model that includes these Service Attributes respectively and also lists the Service Attributes that are not included in the data model and the reason why each is not included or modified.

3 Terminology and Abbreviations

This section defines the terms used in this document. In many cases, the normative definitions of 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. If the reference includes an asterisk (*), the definition has been adapted from the original.

Term	Definition	Reference
Advanced Internet Access Service	A Subscriber Internet Access service that is typically delivered to business locations and designed for reliability and monitoring.	MEF 69.1 [4]
Basic Internet Access Service	A Subscriber Internet Access service that is typically delivered to Subscriber dwellings, and designed for low-cost, ease of use.	MEF 69.1 [4]
Business Applications	The Service Provider functionality supporting Business Management Layer functionality (e.g., product catalog, order management, billing, relationship management, etc.)	MEF 55.1 [5]
BUS	See *Business Applications*	MEF 55.1 [5]
Business Functions	In the context of this document, Business Functions refer to *Product Offering Qualification (POQ)*, *Order Management*, *Quote Management*, and *Inventory Management*.	This Document
Buyer	For this document, a Buyer is the Service Provider who is ordering from an Operator (aka, Seller).	MEF 57.2* [6]
Cantata	The Management Interface Reference Point that provides a Customer Application Coordinator (including enterprise Customers) with capabilities to support the operations interactions with the Service Provider's Business Applications for a portion of the Service Provider service capabilities related to the Customer's Products and Services	MEF 55.1 [5]
Data Model	A representation of concepts of interest to an environment in a form that is dependent on data repository, data definition language, query language, implementation language, and/or protocol (typically, but not necessarily, all five).	MEF 78.1 [7]
Information Model	A representation of concepts of interest to an environment in a form that is independent of data repository, data definition language, query language, implementation language, and protocol	MEF 78.1 [7]
Inventory	Product Inventory	MEF 81 [9]

Term	Definition	Reference
Milestone	An event that occurs during the fulfillment process that indicates a significant step in the process has been completed	This document
Order	One or more Product Order Items formulated into a fulfillment request made by a Buyer to a Seller.	This document (derived from MEF 57.2)
Product	One or more goods or services that is or may be sold to a Buyer by a Seller.	MEF 79 [8]
Product Offering	The commercial and technical details of a Product sold by a Seller. A Product Offering defines all the commercial terms and, through association with a particular Product Specification, defines all of 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.	MEF 79 [8]
Product Order Item	An individual item included in a Product Order that describes the action to be taken on a Product or Product Offering by the Seller. The objective is for the Seller to complete the fulfillment process of this Product or Product Offering at the place defined by the Buyer.	This document
Product Inventory	The inventory managed by the Seller resulting from Order completion.	MEF 81 [9]
Product Specification	A Product Specification defines the template or detailed description from which Product Offerings can be defined.	MEF 79 [8]
POQ	Product Offering Qualification	MEF 79 [8]
Product Offering Qualification	One or more Product Offering Qualification Items formulated into a requirement made by a Buyer to a Seller.	MEF 79 [8]
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.	MEF 79 [8]
Quote	One or more Quote Items formulated into a request for pricing of a Product or Product Offering made by a Buyer to a Seller.	This document
Quote Item	An individual item included in a Quote that describes the Buyer's interest in a price from the Seller for a Product or Product Offering. The objective is to determine the charges and timeframe for the Seller to deliver this item as described by the Buyer.	This document
Seller	For this document, a Seller is the Operator who is providing the product to the Buyer.	MEF 57.2* [6]

Term	Definition	Reference
Service Attribute	Specific information that is agreed upon between the provider and the user of the service, that describes some aspect of the service behavior or capability.	MEF 61.1 [3]
Service Provider	In the context of this document, a Service Provider is an Ethernet Service Provider. In this document, we use Service Provider to include Super Operator as specified in MEF 26.2 (also referred to as SP/SO).	This Document
Sonata	The Management Interface Reference Point supporting the management and operations interactions (e.g., ordering, billing, trouble management, etc.) between two network providers (e.g., Service Provider Domain and Partner Domain).	MEF 55.1 [5]
Subscriber	In the context of this document, a Subscriber is an Ethernet Subscriber.	This Document
UNI	The demarcation point between the responsibility of the Service Provider and the responsibility of the Subscriber. In this document, “User Network Interface” should be read as meaning “IP User Network Interface”.	MEF 61.1 [3]

315 **Table 1 Terminology and Abbreviations**

316

4 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, RFC 8174**Błąd! Nie można odnaleźć źródła odwołania.**) 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**.**

5 Introduction

LSO Cantata provides a programmatic interface for establishing (quoting, ordering, etc.) products between Service Provider (Seller) and Customer (Buyer). This API is hierarchically structured. The outer-most structure includes information relating to the access method (e.g., REST), next is information relating to the function being requested (e.g., Product Order Qualification or Quote, etc.) and the inner-most structure contains information relating to the specific product, in this specification Basic or Advanced Internet Access.

Internet Access is a Subscriber IP Service that connects the Subscriber to the Internet. The Service Attributes that are agreed to between the parties are defined in MEF 61.1 [3][3]. The Service definition for Basic and Advanced Internet Access which is, in effect, a set of constraints on the values of the Service Attributes, is provided in MEF 69.1 [4].

This specification is accompanied by a Data Model for the Internet Access components instantiated as a set of JSON schemas that can be used within the Cantata API to perform Product Order Qualification, Quotation, Order, and request an Inventory for the Internet Access Product consisting of:

- IPVC, including exactly one End Point
- IP UNI
- IP UNI Access Link

The document contains the following sections:

- An overview of LSO Sonata (section 6)
- An overview of the Internet Access Service (section 7)
- Data Model Design Principles (section 8)
- Order Milestones (section 9)
- An abbreviated Information Model for Internet Access and explanation of the organization of the Service Attributes in MEF 61.1 (section 10)
- Organization of the data model for Internet Access (section 11)
- The relationship between the entities in the service (section 12)

These sections are followed by three sections that contain tables that describe the details of the data model. The tables include information about each class and a list of properties in each class. For each property, the JSON Name, description, data type, details about allowed values, and, in

some cases, some additional information about relationships between Service Attributes are provided.

- Section 13 contains the details of the Service Attributes for IPVC, IPVC End Point, IP UNI, and IP UNI Access Link
- Section 15 contains all of the common classes and types referenced by the Service Attributes
- Section 0 lists the Service Attributes that are not included in the data models

6 Overview of LSO Cantata and LSO Sonata

MEF 55.1 [5] describes the Reference Architecture for Lifecycle Service Orchestration (LSO) of MEF-defined services. MEF 55.1 defines seven LSO Interface Reference Points (see Figure 1) that are abstract interconnection points between different entities—either within the Service Provider domain (intra-domain) or between Service Provider and other business entities (inter-domain). One of these LSO Reference Points is LSO Cantata which defines the abstract interconnection point between a Subscriber (Buyer) and a Service Provider (Seller) and another is LSO Sonata which defines the abstract interconnection point between a Service Provider (Buyer) and an Operator (Seller). It is at these Interface Reference Points – LSO Cantata and LSO Sonata – that the Buyer and the Seller interact to orchestrate business transactions for the different Business Functions. Examples of inter-provider Business Functions include address qualification, product offering qualification, quote, ordering, trouble ticketing, and billing/settlement management.

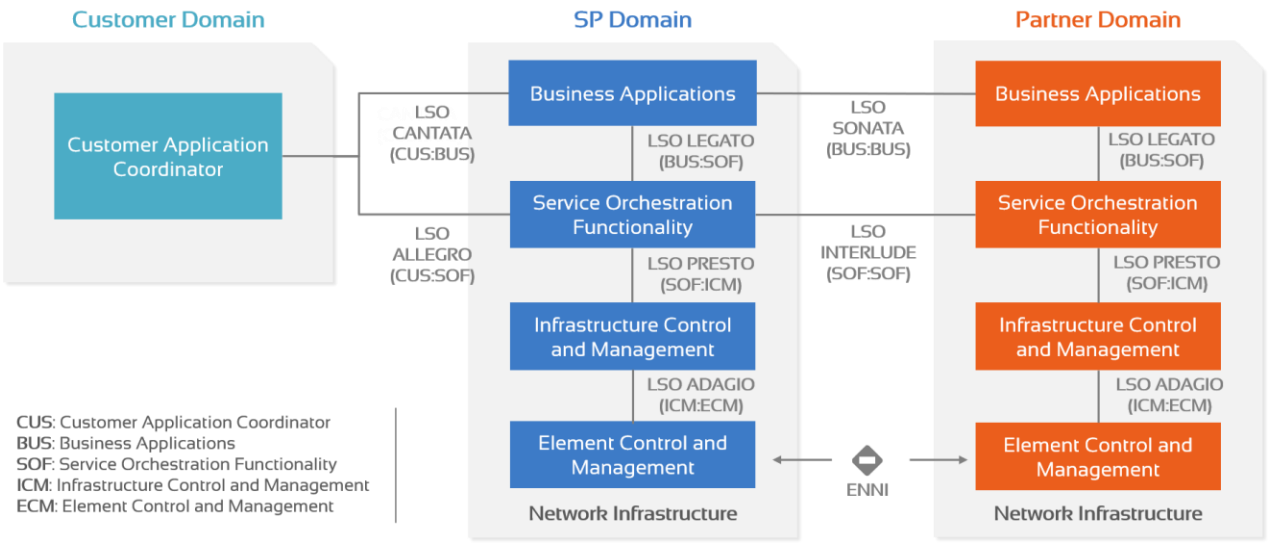
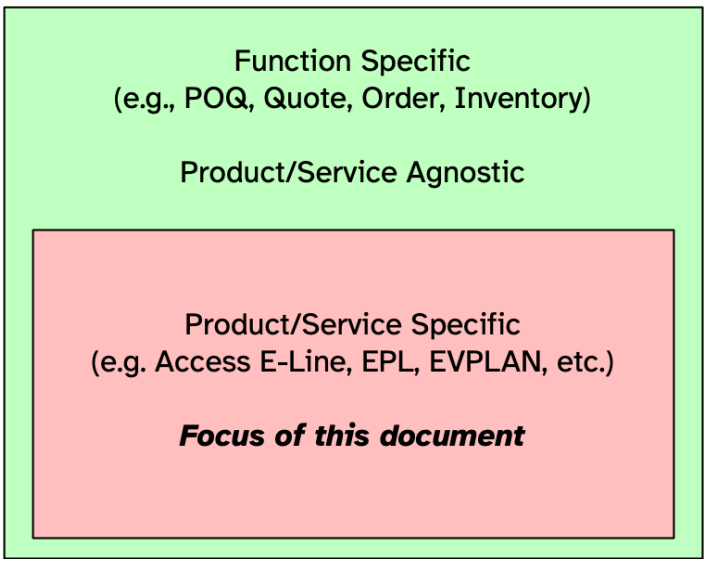


Figure 1 LSO Cantata and LSO Sonata Reference Diagram

The mutual access to Business Functionalities is automated via APIs at the LSO Cantata and LSO Sonata Interface Reference Points which are standardized by MEF as LSO Cantata and LSO Sonata APIs, and which are made available by MEF in a series of releases of the LSO Cantata SDK and LSO Sonata SDK.

The LSO Cantata and LSO Sonata APIs comprise two parts—a product-agnostic API and a set of product-specific data models, as shown in Figure 2.



386

387 **Figure 2 LSO Cantata and LSO Sonata API Structure**

388 This document describes the product-specific data model for a MEF Internet Access service as
389 defined in MEF 61.1 [4].

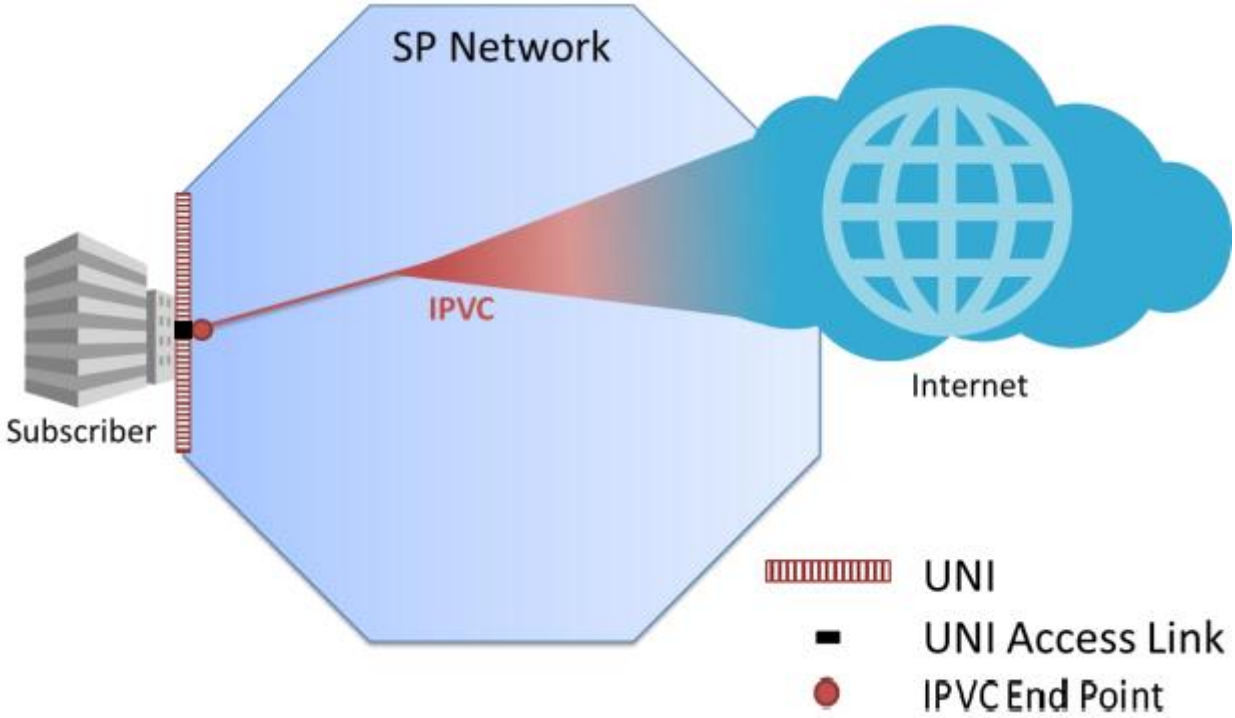
390

7 Overview of Internet Access Services

This specification describes a data model for MEF-defined Internet Access Services. Internet Access Services is a Subscriber IP Service which means it is provided to an end-user (the Subscriber) by a Service Provider. A Subscriber can be an enterprise, a mobile operator, an IT system integrator, a government department, etc. An Internet access service provides the Subscriber with connectivity to the global Internet. In this case, the Service Provider is acting as an Internet Service Provider.

Internet Access is composed of 4 main building blocks:

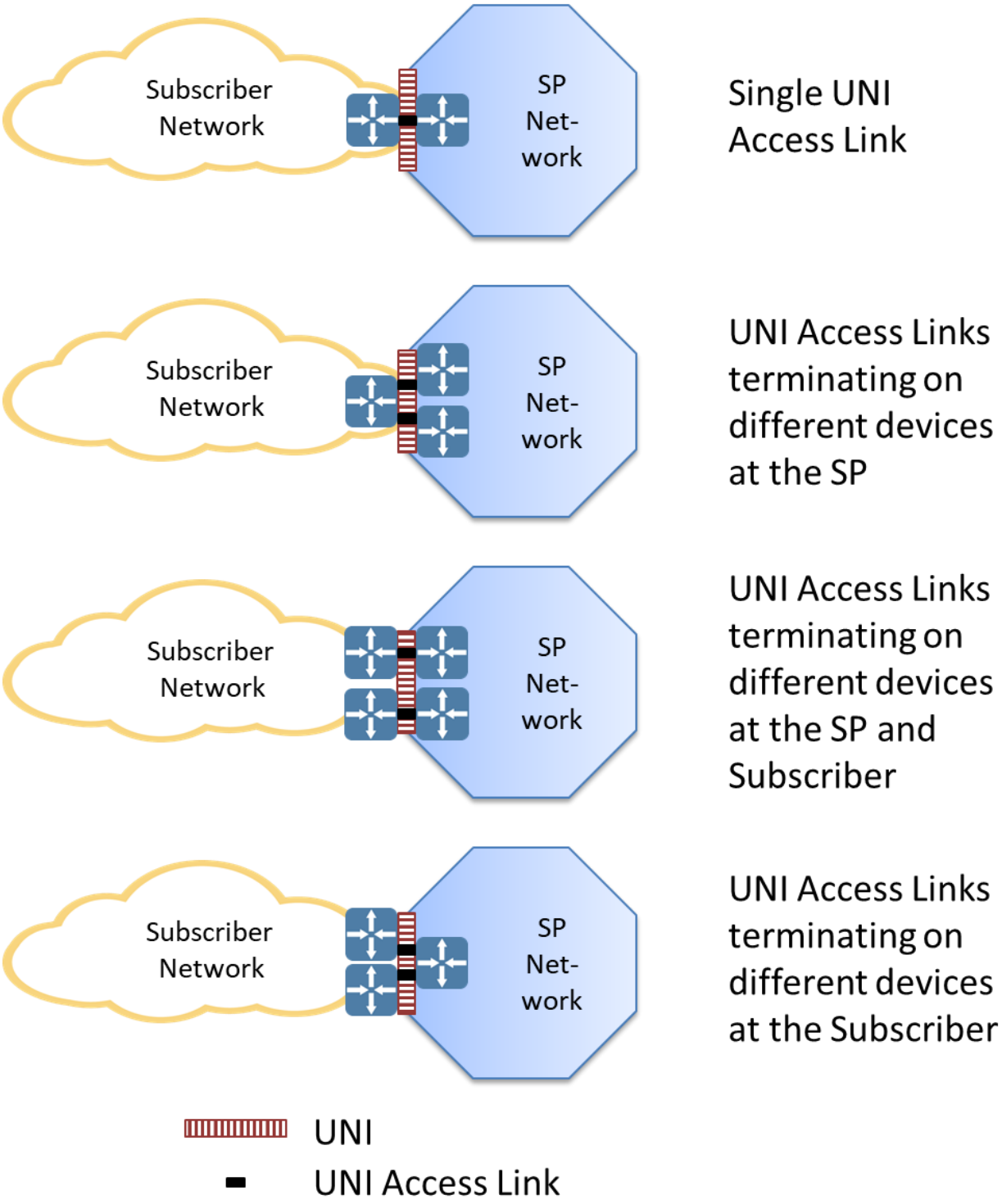
- IPVC: An IP Service is formed of an IP Virtual Connection (IPVC) that links together IPVC End Points at External Interfaces (EI) (or IPVC End Point and "the Internet" as in the Internet access case).
- IPVC End Point: A logical entity at an External Interface, to which a subset of packets that traverse the EI is mapped.
- UNI - A User Network Interface (UNI), the demarcation point between the responsibility of the SP and the responsibility of the Subscriber. Note that a given UNI always relates to a single SP and a single Subscriber.
- UNI Access Link: An individual connection between the Subscriber and the SP that forms part of a UNI



409

410 **Figure 3 Internet Access Service - concept [3]**

411 Subscribers' perception of Internet access is that it allows general access to a range of content
412 available on the Internet. The content can be served from within the SP Network, or typically
413 from outside of it. There is no strict boundary between the IPVC that provide access o the
414 Internet, and the Internet itself (as shown in the figure above). The IPVC thus has only one IPVC
415 End Point at the UNI that connects to the Subscriber but does not have one that would connect it
416 to the Internet.



417

418 **Figure 4 Examples of UNI Access Links in a Single UNI [3]**

419

Two types of Internet Access can be offered: Basic and Advanced. The possible values for certain Service Attributes differ between these two types. Basic Internet Access is typically delivered to Subscriber dwellings. It may be offered to small/medium businesses. Its service characteristics typically include:

- plug-and-play ease of use
- low-cost
- For IPv4, a few (or shared) publicly routed addresses

Advanced Internet Access is typically delivered to business locations. Its service characteristics include:

- redundancy features
- dynamic routing protocol support (e.g., BGP [1] routing)
- options for Subscriber-supplied IP addressing
- proactive monitoring to support a Service Level Specification (SLS)

8 Data Model Design Principles and Assumptions

The design for the Internet Access data model is based on following assumptions:

- None of the Service Attributes included in the schemas are coded as "Required".
- Each Seller will divide all Service Attributes included in the schemas into one of three categories for each Business Function:
    - Mandatory - attributes that must be provided by the Buyer in a POQ/Quote/Order request(see section 8.1)
    - Optional - attributes that may be provided by the Buyer in a POQ/Quote/Order request (see section 8.2)
    - Fixed - attributes that are hardcoded by the Seller and may not be specified by the Buyer in a POQ/Quote/Order request (see section 8.3)

[R1] The Seller and Buyer **MUST** agree, for each Service Attribute, whether the Service Attribute is mandatory, optional, or fixed for each Business Function for a given Product Offering.

The Service Attribute categorization can be defined and negotiated during the onboarding process or defined in a Product Catalog.

[R2] If a Service Attribute is categorized as optional for a Business Function for a Product Offering, the Seller and Buyer **MUST** agree on the default value for the Service Attribute.

The categorization may depend on:

- Business Function - a given Service Attribute may, for example, be classified by the Seller as Fixed for the Create POQ request; while it may be considered as Mandatory by the Seller for the Create Product Order request.
- Product Action - a given Service Attribute may, for example, be classified as Mandatory by the Seller for the Create POQ request for an INSTALL of a new product, while it may be considered as Fixed for the Create POQ request for a MODIFY of an installed Product.
- Product Offering - a given Service Attribute may, for example, be classified as Mandatory by the Seller for the Create POQ request for a Product Offering (e.g., Premium Service), while it may be considered as Fixed for the Create POQ request for a different Product Offering (e.g., Basic Service).

[R3] The Seller **MUST** reject an API request if the value for a Service Attribute requested by the Buyer is not a supported value for a Business Function, Product Action, and Product Offering.

The Internet Access data model supports both INSTALL and CHANGE actions for POQ, Quote, and Order. Note that the DISCONNECT action does not require support from the data model.

The Internet Access data model supports the RETRIEVE action for Inventory.

The location and physical layer of a UNI cannot be changed once it is ordered; instead, this is handled as an installation (UNI at a new location) and a disconnect (UNI at a previous location), as there is often a requirement for a smooth transition with minimum downtime.

8.1 Mandatory Service Attributes

[R4] If a Service Attribute is agreed to be Mandatory for a Business Function, Product Action, and Product Offering, then the Buyer **MUST** include a value for the Service Attribute in the corresponding API request.

[R5] When the Seller receives a request in which any of the Mandatory Service Attributes are not included, the request **MUST** be rejected by the Seller

8.2 Optional Service Attributes

[O1] If a Service Attribute is agreed to be Optional for a Business Function, Product Action, and Product Offering, then the Buyer **MAY** include a value for the Service Attribute in the corresponding API request.

[R6] The Seller **MUST** apply the agreed default value for an Optional Service Attribute if a value is not included by the Buyer in an API request.

8.3 Fixed Service Attributes

A Service Attribute is considered Fixed for a Business Function, Product Action, and Product Offering when only one value is applicable. This can be the case for example if:

- the Seller supports only a single value, or
- the value is derived from the value of one or more other Service Attributes or parameters, or
- the Seller specifies a single value in the Product Catalog for this Product Offering, or
- the Buyer and the Seller agree on a single value during Onboarding

494 The Seller applies the one applicable value for every request for which the Service Attribute is
495 categorized as Fixed.

496 **[R7]** The Buyer **MUST NOT** submit an API request to the Seller which has a
497 value other than the one applicable value for a Service Attribute that has been
498 categorized as Fixed for the Business Function, Product Action, and Product
499 Offering.

500 **[R8]** The Seller **MUST** reject any API request from the Buyer if it has a value
501 other than the one applicable value for a Service Attribute that has been
502 categorized as Fixed for the Business Function, Product Action, and Product
503 Offering.

504

9 Order Milestones

The Service Provider (Seller) can provide Product-Specific Product Order Item Milestone notifications to the Buyer on the status of an Order as a sequence of Milestones for that Order as they are achieved. For ordering an Internet Access Service (IPVC and UNI) the following milestones are commonly used (a Service Provider may support some or all these milestones and not all milestones are applicable for all orders):

Milestone Value	Description	Applies To
SITE_SURVEY_SCHEDULED	Site Survey Scheduled	UNI
SITE_SURVEY_COMPLETE	Site Survey Complete	UNI
PLANNING_COMPLETE	Planning Complete	UNI, IPVC
FIRM_DELIVERY_DATE_PROVIDED	Firm Delivery Date Provided	UNI, IPVC
AWAITING_MUNICIPAL_APPROVAL	Awaiting Municipal Approval	UNI
MUNICIPAL_APPROVAL_GRANTED	Municipal Approval Granted	UNI
AWAITING_LANDLORD_APPROVAL	Awaiting Landlord Approval	UNI
LANDLORD_APPROVAL_GRANTED	Landlord Approval Granted	UNI
CONSTRUCTION_STARTED	Construction Started	UNI
CONSTRUCTION_COMPLETED	Construction Completed	UNI
AWAITING_ACCESS	Awaiting Site Access Permission (for end-to-end test)	UNI, IPVC
ACCESS_DENIED	Site Access Denied (for end-to-end test). Issue is to be resolved with the Buyer and access may be re-attempted.	UNI, IPVC
AWAITING_WIRING	Awaiting Installation of Inside Wiring by Landlord	UNI
WIRING_COMPLETE	Installation of Inside Wiring by Landlord Complete	UNI
EQUIPMENT_DISPATCHED	Equipment Dispatched	UNI
EQUIPMENT_DELIVERED	Equipment Delivered	UNI
EQUIPMENT_INSTALLED	Equipment Installed	UNI
E2E_TESTING_SCHEDULED	End-to-End Testing Scheduled	IPVC
E2E_TESTING_COMPLETED	End-to-End Testing Completed	IPVC
E2E_TESTING_FAILED	End-to-End Testing Failed. Issue is to be resolved and testing may be re-attempted.	IPVC

Table 2 Order Milestones for Access-E-Line

512 The Milestone Value in the first column of Table 2 is included in *ProductOrderItem.milestone*
513 and *ProductOrderEventPayload.milestoneName* in the Product Order API (see MEF 123 [11]).

10 Information Model for Internet Access Product Data Model

Internet Access Services are composed of four primary classes of objects: IPVC, IPVC End Point, UNI, and UNI Access Link.

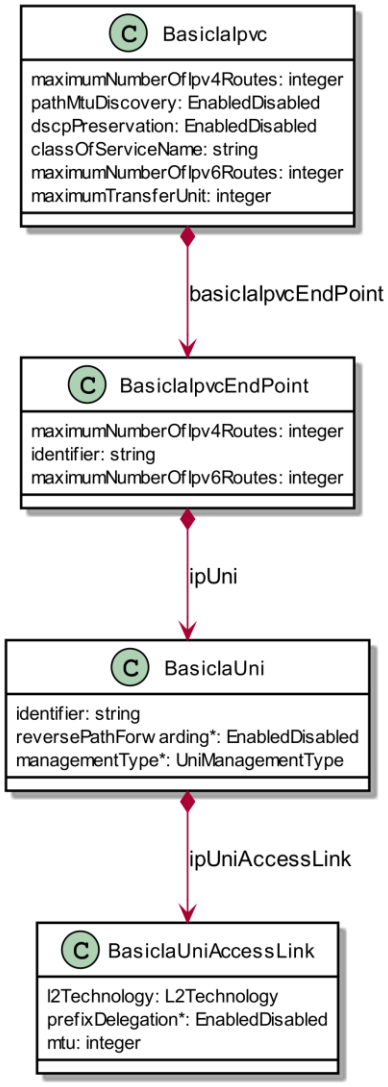


Figure 5 Relations between primary classes

The figure above presents the relations between the main classes in Basic IA (Internet Access) example. The IPVC has exactly one IPVC EndPoint. The IPVC EndPoint points to exactly one IP Uni, and the IP Uni has IP Uni Access Links (exactly 1 in the case of Basic IA). The cardinality of relations and the way they are modeled differ between Basic and Advanced versions, mainly because of the fact that Basic IA is modeled as a single product, and in

Advanced IA the IPVC, IP Uni, and IP Uni Access Link are separately orderable products. The details are explained in the following chapters.

10.1 Organization of Service Attributes

The data model of Basic and Advanced IA is based on Service Attributes defined in MEF 61.1 [3] and implements Service Definition Requirements as specified in MEF 69.1, Section 9 [4]. These requirements result in Basic and Advanced versions being a subset of Service Attributes defined in MEF 61.1 thus the classes do not extend their super classes in a data modeling sense and the super classes are not present nor referred to in the schemas. Figure 6 presents the Internet Access superclasses with their Basic and Advanced flavors (note that there is no actual inheritance)

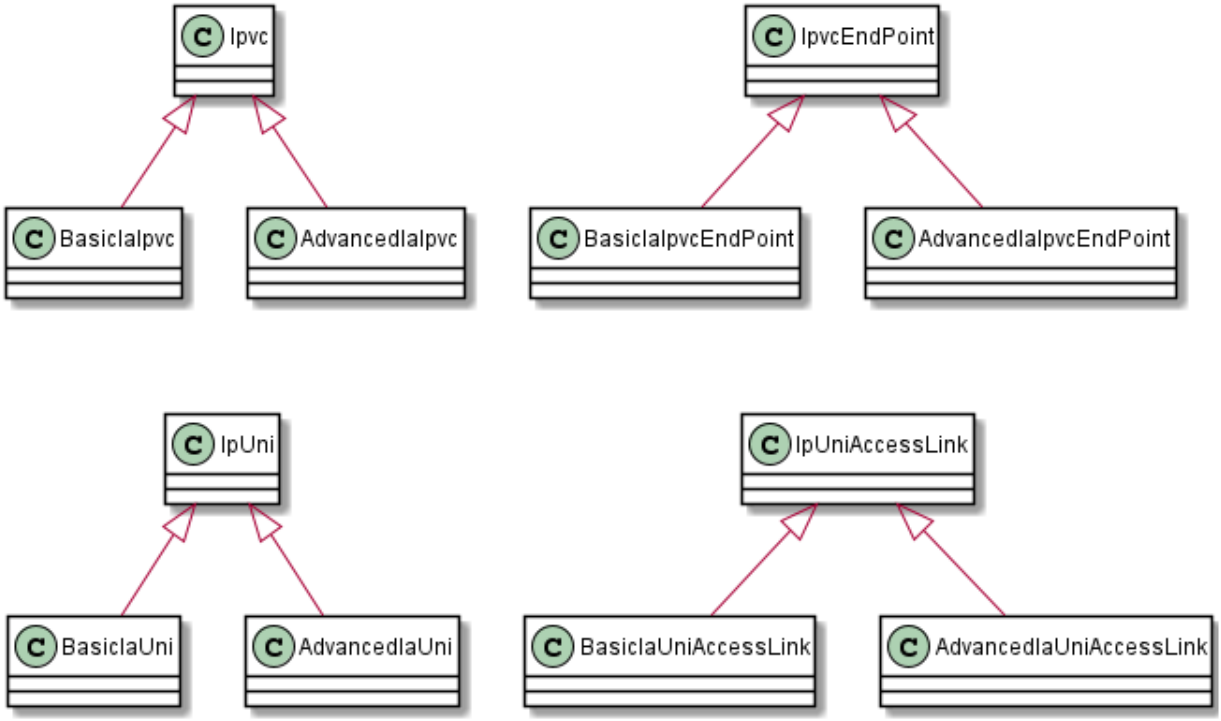


Figure 6 Internet Access Super classes

11 Data Models for Internet Access Product

The data models for the Internet Access product configuration are expressed as a set of JSON schemas based on JSON schema draft 7 [1] and encoded in YAML. These schemas accompany this document. This section explains the organization and structure of these schemas.

11.1 Organization and Structure of the Schemas

The schemas are organized into a file structure as shown in Figure 7.

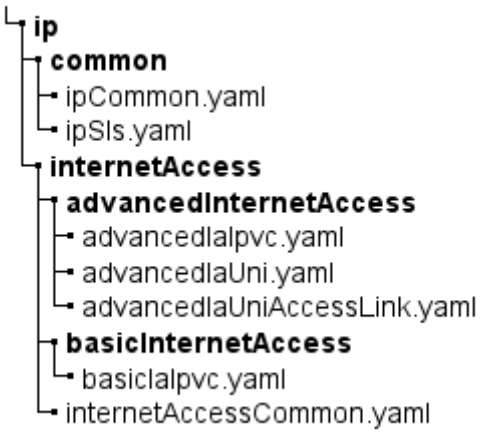


Figure 7 Schema Files Organization

Basic and Advanced IA schemas are put into their directories. Each directory contains one file per separately manageable product (which means the whole structure can be managed by a single POQ, Quote, or Product Order Item). In the case of the Basic IA – all components are manageable as a single product. In the case of Advanced IA, AdvancedIaIpvc, AdvancedIaUni, and AdvacedIaUniAccessLink are considered separate products thus ordering a full configuration would require providing 3 separate Product Order Items in the request.

There are 3 files that provide common classes that are shared with multiple products:

- ip/common/ipCommon.yaml – provides classes shared among all IP products
- ip/common/ipSls.yaml – same as above, but containing classes related to IP Service Level Specification, grouped in ipSls.yaml for convenience.
- ip/common/internetAccess/internetAccessCommon.yaml – files shared only by variants of Internet Access products.

These common classes are referenced in the relevant product component schema files. For example the `AdvancedIaIpvc.reservedPrefixes` attribute specified in advancedIaIpvc.yaml file refers to common `Ipv4Ipv6Prefixes` definition:

```
  reservedPrefixes:
    description: >-
      Reference MEF 61.1 Section 10.14 IPVC Reserved Prefixes Service Attribute.
      For Advanced Internet Access the prefixes must be either empty, or free
      from any public address pre-fixes. (Reference MEF 69.1 Section 9.1 [R14])
    $ref: "../../common/ipCommon.yaml#/definitions/Ipv4Ipv6Prefixes"
```

On a CHANGE request a single Service Attribute cannot be changed. The Buyer must send a full product configuration including all Mandatory Service Attributes (section 8.1) and all Optional Service Attributes (section 8.2) that were previously specified by the Buyer (in an INSTALL request or previous CHANGE request). Any Optional Service Attributes that are not specified in a CHANGE request are reset to their default value.

[R9] The Product Inventory for a product **MUST** include all Service Attributes that are categorized as Mandatory (see [R1]).

[R10] The Product Inventory for a product **MUST** include all Service Attributes that are categorized as Optional (see [R1]).

[O2] The Product Inventory for a product **MAY** contain Service Attributes that are categorized as Fixed (see [R1]).

Including Service Attributes in the Inventory as specified in the previous requirements facilitates the CHANGE action. The Buyer can RETRIEVE the current values for the Service Attributes and make the desired changes and submit the CHANGE request.

11.2 Additional Details

This section includes an explanation of some additional conventions for the schema structure as well as some additional attributes that have been added to facilitate product specification for some common edge cases.

11.2.1 Naming Conventions

In the schemas, class and type names are UpperCamelCase and Service Attribute/property names are lowerCamelCase.

11.2.2 Ipvc End Point Service Attributes

Ipvc End Points are not separately orderable items. They are part of the Ipvc. The Ipvc End Points are the repositories for Ipvc Service Attributes that can be different at each External

Interface (UNI or ENNI) whereas the Ipvc Service Attributes have the same value at every point in the Ipvc. The Internet Access information model requires the Ipvc to include exactly one Ipvc End Point of type UNI hence there are explicit single attributes: `basicIaIpvcEndPoint` and `advancedIaIpvcEndPoint` respectively.

Internet Access allows this simplified coding since it has exactly one End Point and exactly of type UNI. In the general case of a service that allows an arbitrary number of End Points (e.g., a multipoint service) or where the external interface types are not predetermined, the Ipvc properties might include an array of Ipvc End Points rather than one pre-defined End Point.

Note that one of the Ipvc End Point Service Attributes is IPVC End Point EI Type ([3] section 11.2) which can be “UNI” or “ENNI”. Since this information is implicit, this Service Attribute is not included in the schema for Internet Access, but likely would be included for other IP Services.

12 Relationships Between Entities

This section describes the constraints and relationships between the components of a product that are managed separately (i.e. they are carried by separate items of POQ, Quote, or Order requests). As stated before, this concerns only the Advanced IA.

The use case for Advanced IA is based on purchasing the AdvancedIaIpvc, AdvancedIaUni and an AdvancedIaUniAccessLink

The relationship between separately managed products is captured in the product-agnostic part of the POQ, Quote, and Order APIs. The values in the Relationship Type column in the table below are used in the *relationshipType* field of the *ProductRelationship*, *QualificationItemRelationship*, *QuoteItemRelationship*, and *OrderItemRelationship* types. Specification of the UNI is mandatory at INSTALL and CHANGE of the product.

The final column notes that during POQ and Quote, a list of references might be provided or not. The list denotes that a range of the related objects is provided to choose from.

Product	Product Relationship Role	INSTALL	CHANGE	Target Product Specification	Multiple Allowed at POQ and Quote?
Advanced Internet Access IPVC	CONNECTS_TO_UNI	Mandatory	Mandatory	Advanced Internet Access UNI	No
Advanced Internet Access UNI Access Link	CONNECTS_TO_UNI	Mandatory	Mandatory	Advanced Internet Access UNI	No

Table 3 Product Relationship Roles

[R11] For an Advanced Internet Access IPVC or Advnced Internet Access UNI Access Link products, the Relationship Type field of the Product Relationship, POQ Item Relationship, Quote Item Relationship and Order Item Relationship types **MUST** contain the value shown in the Relationship Type column in Table 3.

[R12] For POQ, Quote and Order, the relationship to a UNI **MUST** be specified for every INSTALL of, or CHANGE to, an Advanced Internet Access IPVC or Advnced Internet Access UNI Access Link products,.

[R13] For an Advanced Internet Access IPVC or Advnced Internet Access UNI Access Link products, the relationship to a UNI **MUST** reference an

628 Advanced Internet Access UNI product or an equivalent POQ Item, Quote
629 Item, or Order Item.

630 **[R14]** For a CHANGE to an Advanced Internet Access IPVC or Advnced Internet
631 Access UNI Access Link products the relationship to the UNI **MUST NOT**
632 be changed from the value present in the Product Inventory.

633 Note that [R14] indicates that once Advanced Internet Access Ipvc or Advnced Internet Access
634 Uni Access Link products is associated with an Advanced Internet Access UNI, it cannot be
635 associated with a different Operator UNI.

636 The UNI is the location oriented product component that builds the Internet Access. In case of
637 Basic Internet Access the UNI product is part of the whole product definition, thus it is the Basic
638 Internet Access product that need to have the relationship to the location. In advanced case, the
639 UNI may be included in the same order as the Advanced Internet Access IPVC or Advnced
640 Internet Access UNI Access Link. The UNI is associated with a specific INSTALL_LOCATION
641 and as noted below, it is required at INSTALL and CHANGE and once a UNI is associated with
642 a specific location, the INSTALL_LOCATION cannot be changed. The install location is
643 captured in the product-agnostic part of the POQ, Quote and Order APIs. The value in the Place
644 Relationship Role column in the table below is used in the *role* field of the
645 *RelatedPlaceRefOrValue* type.

Product	Place Relationship Role	INSTALL	CHANGE
Basic Internet Access	INSTALL_LOCATION	Mandatory	Mandatory
Advanced Internet Access UNI	INSTALL_LOCATION	Mandatory	Mandatory

646 **Table Place Relationship Role**

647 **[R15]** For Basic Internet Access or Advanced Internet Access UNI products, the
648 Role field (*role*) of the Related Place (*RelatedPlaceRefOrValue)* type **MUST**
649 contain the INSTALL_LOCATION value shown in the Place Relationship
650 Role column in Table .

651 **[R16]** For POQ, Quote, and Order, the Related Place (*RelatedPlaceRefOrValue)*
652 **MUST** be specified for every INSTALL of, or CHANGE to, an Operator
653 UNI.

654 **[R17]** For a CHANGE to a Basic Internet Access or Advanced Internet Access UNI
655 products the Related Place **MUST NOT** be changed from the value present in
656 the Product Inventory.

657

13 Basic and Advanced Service Attributes requirements

There are several Service Attributes defined by MEF 61.1 that MEF 69.1 puts additional requirements when applying to Basic or Advanced Internet Access definition. This results in some attributes differing from their original definition or missing from the Product Schema specified by this document.

These variations are presented for both Basic and Advanced versions, side by side in Tables below (all numbered requirements come from MEF 69.1 and thus the document number is not mentioned each time):

Service Attribute	Basic Internet Access (BasicIaIpvc)	Advanced Internet Access (AdvancedIaIpvc)
IPVC Topology	**Not present** [R4] For an Internet Access Service, IPVC Topology MUST be *Cloud Access*	
IPVC End Point List	[R5] For an Internet Access Service, IPVC End Point List MUST have exactly one entry.	
	Single attribute instead of a list: BasicIaIpvc.basicIaIpvcEndPoint	**Not Present.** The reference between the AdvancedIaIpvc and the AdvancedIaUni products is managed by the product agnostic envelope (see section 12)
IPVC Packet Delivery	**Not present.** [R6] For a Basic Internet Access Service, IPVC Packet Delivery MUST be *Standard Routing.*	Note: Redundancy for Advanced Internet Access Service is for further study.
IPVC DSCP Preservation	[D3] For an Internet Access Service, IPVC DSCP Preservation SHOULD be Disabled. **Requirement stated in attribute's description.**	
IPVC List of Class of Service Names	[R7] For an Internet Access Service, IPVC List of Class of Service Names MUST have exactly one entry **Single attribute instead of a list: *classOfServiceName***	
IPVC Fragmentation	**Not present.** [R8] For an Internet Access Service, IPVC Fragmentation MUST be Enabled. Note: Fragmentation is necessary for an Internet Access Service as the Subscriber has no control over the size of packets received from the Internet. IPVC Fragmentation Enabled ensures the ISP will not discard any packets destined to the Subscriber that ex-ceed the allowable IPVC MTU size.	

Service Attribute	Basic Internet Access (BasicIaIpvc)	Advanced Internet Access (AdvancedIaIpvc)
IPVC Cloud Cloud Type	**Not present.** [R9] For an Internet Access Service, IPVC Cloud. Cloud Type MUST be *Internet Access.*	
IPVC Cloud Cloud Ingress Class of Service Map	[R10] For an Internet Access Service, Cloud Ingress Class of Service Map (F, M, D), map M MUST be empty. **Internet Access specific *IaIngressClassOfServiceMap* introduced without the *ingressClassOf-ServiceMapping* attribute (the "M" part of the Service Map)**	
IPVC Cloud Cloud Ingress Class of Service Map	[R11]For an Internet Access Service, Cloud Ingress Class of Service Map (F, M, D), default CoS name, D, MUST NOT be *Discard*. Note that the combination of [R7], [R10] and [R11], mean that all IP Packets received from the Internet are mapped to a single Class of Service Name. **Requirement stated in attribute's description.**	
IPVC Cloud Cloud DNS Service	[R12] For a Basic Internet Access Service, Cloud DNS MUST NOT be *None*. **Requirement stated in attribute's description.**	For an Advanced Internet Access Service, a value of None for Cloud DNS is not precluded.
IPVC Cloud Cloud DNS Service	[R13] For an Internet Access Service, if the Cloud DNS parameter of the IPVC Cloud Service Attribute is Static, the associated list of DNS Servers MUST have at least one entry. **Requirement stated in attribute's description.** [D4] For an Internet Access Service, if the Cloud DNS parameter of the IPVC Cloud Service Attribute is Static, the associated list of DNS Servers SHOULD contain at least two DNS servers.	
IPVC Reserved Prefixes	[R14] For an Internet Access Service, IPVC Reserved Pre-fixes MUST be either empty, or free from any public address prefixes. **Requirement stated in attribute's description.**	

666 **Table 4 IPVC Service Attributes requirements**

667

Service Attribute	Basic Internet Access (BasicIaIpvcEndPoint)	Advanced Internet Access (AdvancedIaIpvcEndPoint)

Service Attribute	Basic Internet Access (BasicIaIpvcEndPoint)	Advanced Internet Access (AdvancedIaIpvcEndPoint)
IPVC EP EI	**Not present. BasicIaUni is a composite of BasicIaIpvcEndPoint** [R15] For a Basic Internet Access Service, the UNI Identifier specified in the IPVC EP EI Service Attribute **MUST NOT** exist in the IPVC EP EI Service Attribute of any other IP Service.	**Not Present.** The reference between the AdvancedIaIpvcEndpoint and the AdvancedIaUni products is managed by the product agnostic envelope (see section 12)
IPVC EP Role	**Not present.** [R16] For an Internet Access Service, IPVC EP Role MUST be *Root*.	
IPVC EP Ingress Class of Service Map	[R17] For an Internet Access Service, IPVC EP Ingress Class of Service Map (F, M, D), map M MUST be empty. **Internet Access specific *IaIngressClassOfServiceMap* introduced without the *ingressClassOf-ServiceMapping* attribute (the "M" part of the Service Map)**	
IPVC EP Ingress Class of Service Map	[R18] For an Internet Access Service, IPVC Ingress EP Class of Service Map (F, M, D), default CoS name, D, MUST NOT be Discard. **Requirement stated in attribute's description.** Note that the combination of [R7], [R17] and [R18], mean that all Ingress IP Packets for the Internet Access Service are mapped to a single Class of Service Name.	
IPVC EP Ingress Band-width Profile Envelope	[D5] For a Basic Internet Access Service, the IPVC EP Ingress Bandwidth Profile Envelope SHOULD be *None*. **Requirement stated in attribute's description.**	--
IPVC EP Egress Band-width Profile Envelope	[D6] For a Basic Internet Access Service, the IPVC EP Egress Bandwidth Profile Envelope SHOULD be *None*. **Requirement stated in attribute's description** Note that [D5], [D6], [D12] and [D13] constrain Basic Internet Access Service to allow only one ingress and/or egress Band-width Profile at the UNI. This defines the simple nature of this Basic Internet Access service, in that it is incapable of support-ing additional Connectivity Services across the same UNI.	--
IPVC EP Prefix Mapping	**Not present.** [R19] For a Basic Internet Access Service, the IPVC EP Prefix Mapping MUST be Empty.	--

668 **Table 5 IPVC End Point Service Attributes requirements**

669

Service Attribute	Basic Internet Access (BasicIaUni)	Advanced Internet Access (AdvancedIaUni)
UNI List of UNI Access Links Service Attribute	[R20] At a UNI with an IPVC EP for a Basic Internet Ac-cess Service, the UNI List of UNI Access Links MUST contain exactly one entry. ***ipUniAccessLink* – single attribute instead of a list.**	--
UNI Ingress Bandwidth Profile Envelope	[D7] At a UNI with an IPVC EP for a Basic Internet Access Service, if the UNI Ingress Bandwidth Profile Envelope is not None, it SHOULD have Bandwidth Profile Flows that contain all Ingress IP Data Packets at the UNI that are mapped to any of a given set of IPVC EPs (as defined in MEF 61.1 [8] Table 28). **Requirement stated in attribute's description**	--
UNI Egress Bandwidth Profile Envelope	[D8] At a UNI with an IPVC EP for a Basic Internet Ac-cess Service, if the UNI Egress Bandwidth Profile En-velope is not None, it SHOULD have Bandwidth Pro-file Flows that contain all Egress IP Data Packets at the UNI that are mapped to any of a given set of IPVC EPs (as defined in MEF 61.1 [8] Table 28). **Requirement stated in attribute's description**	--
UNI List of Control Protocols	[D9] At a UNI with an IPVC EP for an Internet Access Service, if the UNI has at least one UNI Access Link where the UNI Access Link IPv4 Connection Ad-dressing is not None, the UNI List of Control Proto-cols SHOULD include ICMP with a list of applicable ISP IP addresses. [D10] At a UNI with an IPVC EP for an Internet Access Service with at least one UNI Access Link where the UNI Access Link IPv6 Connection Addressing is not None, the UNI List of Control Protocols SHOULD include ICMPv6 with a list of applicable SP IP addresses. **Requirements stated in the attribute's description**	
UNI Routing Protocols	**Not present.** [R21] At a UNI with an IPVC EP for a Basic Internet Access Service, the UNI Routing Protocols list MUST be empty.	
UNI Reverse Path For-warding	[D11] At a UNI with an IPVC EP for an Internet Access Service, UNI Reverse Path Forwarding SHOULD be Enabled. **Requirement stated in the attribute's description**	

670 **Table 6 IP UNI Service Attributes requirements**

Service Attribute	Basic Internet Access (BasicIaUniAccessLink)	Advanced Internet Access (AdvancedIaUniAccessLink)
UNI Access Link IPv4 Connection Addressing	[R23] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, UNI Access Link IPv4 Connection Addressing MUST be DHCP or None. **BasicIaUniIpv4ConnectionAddressing does not have the *ipv4AddressType* attribute, as if set it MUST be *DHCP***	[R22] At a UNI Access Link in a UNI with an IPVC EP for an Advanced Internet Access Service, UNI Access Link IPv4 Connection Addressing MUST be Static or None. **AdvancedIaUniIpv4ConnectionAddressing does not have the *ipv4AddressType* attribute, as if set it MUST be *Static***
UNI Access Link IPv4 Connection Addressing	[R24] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, if the UNI Access Link IPv4 Connection Addressing is DHCP, the UNI Access Link IPv4 Connection Addressing Secondary Subnet List parameter MUST be empty. ***BasicIaUniIpv4ConnectionAddressing* does not have the *ipv4SecondarySubnetList* attribute.**	--
UNI Access Link IPv4 Connection Addressing	[R25] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, if the UNI Access Link IPv4 Connection Addressing is DHCP, the UNI Access Link IPv4 Connection Addressing Primary Subnet parameter MUST contain only a single Service Provider IPv4 Address. **Requirement stated in the attribute's description**	--
UNI Access Link IPv6 Connection Addressing	[R27] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, UNI Access Link IPv6 Connection Addressing MUST be DHCP or SLAAC or None. **BasicIaUniIpv6ConnectionAddressing: *ipv6AddressType* attribute only contains possible values: *DHCP, SLAAC***	[R26] At a UNI Access Link in a UNI with an IPVC EP for an Advanced Internet Access Service, UNI Access Link IPv6 Connection Addressing MUST be Static or None. **AdvancedIaUniIpv6ConnectionAddressing does not have the *ipv6AddressType* attribute, as if set it MUST be *Static***
UNI Access Link IPv6 Connection Addressing	[R28] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, if the UNI Access Link IPv6 Connection Addressing is DHCP or SLAAC, the UNI Access Link IPv6 Connection Ad-dress Subnet List parameter MUST contain a single entry. **BasicIaUniIpv6ConnectionAddressing: *ipv6Subnet* is a single attribute instead of a list**	--

Service Attribute	Basic Internet Access (BasicIaUniAccessLink)	Advanced Internet Access (AdvancedIaUniAccessLink)
UNI Access Link IPv6 Connection Addressing	[R29] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, if the UNI Access Link IPv6 Connection Addressing is DHCP or SLAAC, the UNI Access Link IPv6 Connection Ad-dressing Subnet List parameter MUST contain only a single Service Provider IPv6 Address. **Requirement stated in the attribute's description**	--
UNI Access Link DHCP Relay	**Not present.** [R30] If at a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, where the UNI contains only a single IP Service, the UNI Access Link DHCP Relay MUST be empty.	--
UNI Access Link BFD	**Not present.** [R31] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, UNI Access Link BFD MUST be *None*.	--
UNI Access Link Ingress Bandwidth Profile Envelope	[D12] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, UNI Access Link Ingress Bandwidth Profile Envelope SHOULD be *None*. **Requirement stated in the attribute's description**	--
UNI Access Link Egress Bandwidth Profile Envelope	[D13] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, UNI Access Link Egress Bandwidth Profile Envelope SHOULD be *None*. **Requirement stated in the attribute's description**	--
UNI Access Link Re-served VRIDs Service Attribute	[D14] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, UNI Access Link Reserved VRIDs Service Attribute SHOULD be None.	--

671 **Table 7 IP UNI Access Link Service Attributes requirements**

672

14 Internet Access Service Attributes

The Service Attributes are listed in groups:

- Basic Internet Access:
  - BasicIaIpvc
  - BasicIaIpvcEndPoint
  - BasicIaUni
  - BasicIaUniAccessLink
- Advanced Internet Access:
  - AdvancedIaIpvc
  - AdvancedIaIpvcEndPoint
  - AdvancedIaUni
  - AdvancedIaUniAccessLink

Not all MEF 61.1 Service Attributes are included in the data models. The Service Attributes that are not included are also listed in section 13. Some Service Attributes are not included because they are included in the Product Independent information portion of the API (e.g., many of the Identifiers), and some Service Attributes are not included because they are constants in the context of Internet Access (i.e., can only have one possible value) or are simple attributes instead of lists because the cardinality is restricted to 1.

The following tables are organized by schema file. The first part (in blue) specifies the filename and the list of classes included in the file. Following that, for each class, there is a class description (white background) followed by a list of properties in the class (yellow background) and, in some cases, validation notes (light red background).

14.1 Basic Internet Access

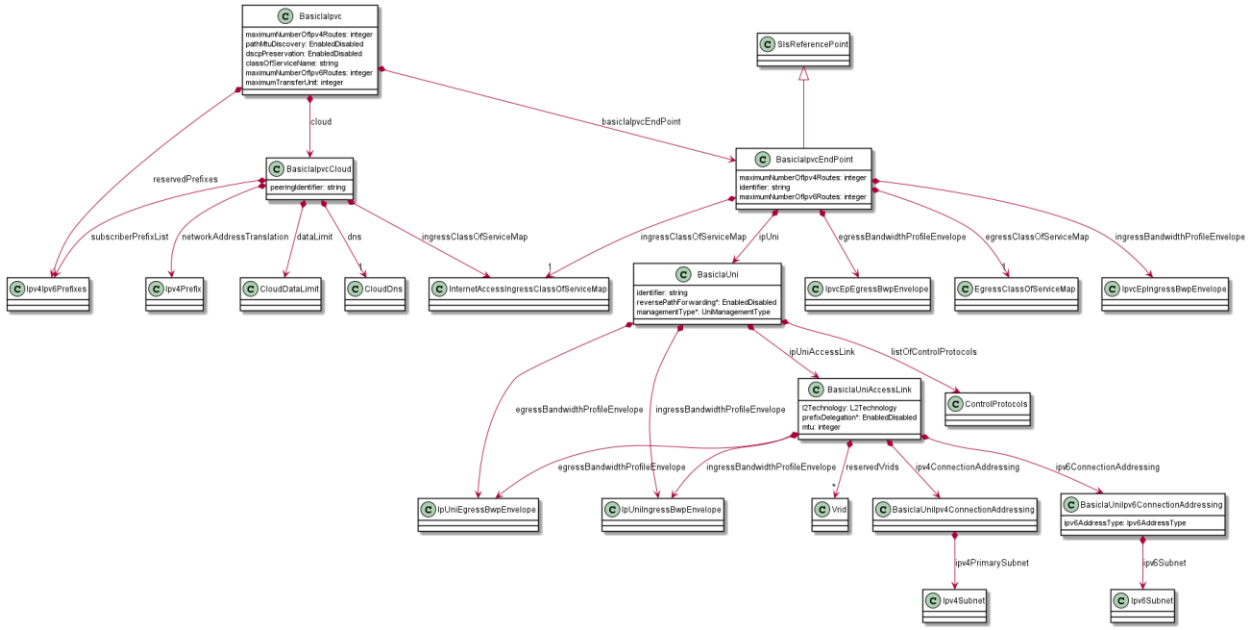


Figure 8 Basic Internet Access Service Attributes

Figure 8 presents the class diagram of classes present in the basicIaIpvc.yaml file. Note that all empty classes on it are only to show the type of the relation attributes while maintaining the readability of the diagram. Their detailed model will be described later.

- Schema file:
  - \ip\internetAccess\basicInternetAccess\basicIaIpvc.yaml
- Specified Product:
  - BasicIaIpvc
- Includes classes:
  - BasicIaIpvcEndPoint
  - BasicIaUni
  - BasicIaUniAccessLink
  - BasicIaIpvcCloud
  - BasicIaUniIpv4ConnectionAddressing
  - BasicIaUniIpv6ConnectionAddressing

14.1.1 BasicIaIpvc

The Basic Internet Access IPVC is a MEF 69.1 defined version of MEF 61.1 IPVC. Reference MEF 69.1 Section 9.1 Internet Access IPVC Requirements.

Name	Type	Description
cloud	BasicIaIpvcCloud	Reference MEF 61.1 Section 10.13 IPVC Cloud Service Attribute. The absence of this attribute corresponds to a value of "None".
maximumNumberOfIpv4Routes	integer	Maximum number of IPv4 routes supported by the service as a whole. Absence of this attribute corresponds to a value of "Unlimited". Reference MEF 61.1 Section 10.5 IPVC Maximum Number of IPv4 Routes Service Attribute.
pathMtuDiscovery	EnabledDisabled	Indicates whether the Path MTU Discovery is supported for the IPVC. Reference MEF 61.1 Section 10.11 IPVC Path MTU Discovery Service Attribute.
dscpPreservation	EnabledDisabled	Indicates where the SP or Operator is allowed to modify the value of the IP DS field in the IP header of the Subscriber's traffic as it traverses the IPVC. Reference MEF 61.1 Section 10.7 IPVC DSCP Preservation Service Attribute. MEF 69.1 [D3] For an Internet Access Service, IPVC DSCP Preservation SHOULD be Disabled.
reservedPrefixes	Ipv4Ipv6Prefixes	Reference MEF 61.1 Section 10.14 IPVC Reserved Prefixes Service Attribute. For Advanced Internet Access the prefixes must be either empty, or free from any public address prefixes. (Reference MEF 69.1 Section 9.1 [R14])
basicIaIpvcEndPoint	BasicIaIpvcEndPoint	Basic IPVC End Point. Reference MEF 61.1 Section 10.3 IPVC End Point List Service Attribute. This is narrowed to multiplicity = 1 and to BasicIaIpvcEndPoint type. Reference MEF 69.1 Section 9.1 [R5] AdvancedIaIpvc
classOfServiceName	string	The Class of Service Name supported by the IPVC. Reference MEF 61.1 Section 10.8 IPVC List of Class of Service Names Service Attribute. This is "listOfClassOfServiceNames" attribute narrowed to single ref per Reference MEF 69.1 Section 9.1 [R7]
maximumNumberOfIpv6Routes	integer	Maximum number of IPv6 routes supported by the service as a whole. Absence of this attribute corresponds to a value of "Unlimited". Reference MEF 61.1 Section 10.6 IPVC Maximum Number of IPv6 Routes Service Attribute.
maximumTransferUnit	integer	Indicates the maximum size (in octets) of an IP packet that can traverse the IPVC without fragmentation. Reference MEF 61.1 Section 10.10 IPVC MTU Service Attribute.

715 **Table 8 BasicIaIpvc**

716 ### 14.1.2 BasicIaIpvcEndPoint

717 The Basic Internet Access IPVC End Point is a MEF 69.1 defined version of MEF 61.1 IPVC End Point.
718 Reference MEF 69.1 Section 9.2 Internet Access IPVC End Point Requirements.

Name	Type	Description
maximumNumberOfIpv4Routes	integer	Maximum number of IPv4 routes supported by this IPVC End Point. Reference MEF 61.1 Section 11.7 IPVC EP Maximum Number of IPv4 Routes Service Attribute. Absence of this attribute corresponds to a value of "Unlimited".
identifier	string	A unique identifier for the IPVC End Point for management purposes. Reference MEF 61.1 Section 11.1 IPVC EP Identifier Service Attribute.
ipUni	BasicIaUni	Indicates where the SP or Operator is allowed to modify the value of the IP DS field in the IP header of the Subscriber's traffic as it traverses the IPVC. Reference MEF 61.1 Section 10.7 IPVC DSCP Preservation Service Attribute.
egressBandwidthProfileEnvelope	IpvcEpEgressBwpEnvelope	Egress Bandwidth Profile Envelope for the IPVC End Point. The absence of this attribute corresponds to a value of "None". Reference MEF 61.1 Section 11.12 IPVC EP Egress Bandwidth Profile Envelope Service Attribute. Reference MEF 69.1 Section 9.2. [D6] For a Basic Internet Access Service, the egressBandwidthProfileEnvelope SHOULD be empty.
egressClassOfServiceMap	EgressClassOfServiceMap	Specification of how egress packets are mapped to CoS Name. Reference MEF 61.1 Section 11.10 IPVC EP Egress Class of Service Map Service Attribute.
maximumNumberOfIpv6Routes	integer	Maximum number of IPv6 routes supported by this IPVC End Point. Reference MEF 61.1 Section 11.8 IPVC EP Maximum Number of IPv6 Routes Service Attribute. Absence of this attribute corresponds to a value of "Unlimited".
ingressClassOfServiceMap	IaIngressClassOfServiceMap	Specification of how ingress packets are mapped to CoS Name. Reference MEF 61.1 Section 11.9 IPVC EP Ingress Class of Service Map Service Attribute.
ingressBandwidthProfileEnvelope	IpvcEpIngressBwpEnvelope	Ingress Bandwidth Profile Envelope for the IPVC End Point. The absence of this attribute corresponds to a value of "None". Reference MEF 61.1 Section 11.11 IPVC EP Ingress Bandwidth Profile Envelope Service Attribute. Reference MEF 69.1 Section 9.2. [D5] For a Basic Internet Access Service, the ingressBandwidthProfileEnvelope SHOULD be empty.

719 **Table 9 BasicIaIpvcEndPoint**

720 ### 14.1.3 BasicIaUni

721 The Basic Internet Access UNI is a MEF 69.1 defined version of MEF 61.1 UNI. Reference MEF 69.1
722 Section 9.3 Internet Access UNI Requirements.

723

Name	Type	Description
identifier	string	Unique identifier for the Basic Internet Access UNI for management purposes. Reference MEF 61.1 Section 13.1 UNI Access Link Identifier Service Attribute.
ipUniAccessLink	BasicIaUniAccessLink	Reference to IP UNI Access Link(s). Reference MEF 61.1 Section 12.3 UNI List of UNI Access Links Service Attribute.
reversePathForwarding	EnabledDisabled	Indicates whether Reverse Path Forwarding checks are used by the SP at the UNI. Reference MEF 61.1 Section 12.8 UNI Reverse Path Forwarding Service Attribute. [D11] At a UNI with an IPVC EP for an Internet Access Service, reversePathForwarding SHOULD be ENABLED. Reference MEF 69.1 Section 9.3 Internet Access UNI Requirements.
egressBandwidthProfileEnvelope	IpUniEgressBwpEnvelope	Attribute used for an egress UNI Bandwidth Profile. Reference MEF 61.1 Section 12.5 UNI Egress Bandwidth Profile Envelope Service Attribute. Absence of this attribute corresponds to a value of "None". [D8] At a UNI with an IPVC EP for a Basic Internet Ac-cess Service, if the UNI Egress Bandwidth Profile Envelope is not None, it SHOULD have Bandwidth Profile Flows that contain all Egress IP Data Packets at the UNI that are mapped to any of a given set of IPVC EPs (as defined in MEF 61.1 [8] Table 28). Reference MEF 69.1 Section 9.3 Internet Access UNI Requirements.
listOfControlProtocols	ControlProtocol[]	Indication of IP Control Protocols that are not forwarded transparently by the SP. Reference MEF 61.1 Section 12.6 UNI List of Control Protocols Service Attribute. Absence of this attribute corresponds to a value of "None". [D9] At a UNI with an IPVC EP for an Internet Access Service, if the UNI has at least one UNI Access Link where the UNI Access Lin IPv4 Connection Addressing is not None, the UNI List of Control Protocols SHOULD include ICMP with a list of applicable ISP IP addresses. [D10] At a UNI with an IPVC EP for an Internet Access Service with at least one UNI Access Link where the UNI Access Link IPv6 Connection Addressing is not None, the UNI List of Control Protocols SHOULD include ICMPv6 with a list of applicable SP IP addresses. Reference MEF 69.1 Section 9.3 Internet Access UNI Requirements.
ingressBandwidthProfileEnvelope	IpUniIngressBwpEnvelope	Attribute used for an ingress UNI Bandwidth Profile. Reference MEF 61.1 Section 12.4 UNI Ingress Bandwidth Profile Envelope Service Attribute. Absence of this attribute corresponds to a value of "None". [D7] At a UNI with an IPVC EP for a Basic Internet Access Service, if the UNI Ingress Bandwidth Profile Envelope is not None, it SHOULD have Bandwidth Profile Flows that contain all Ingress IP Data Packets at the UNI that are mapped to any of a given set of IPVC EPs (as defined in MEF 61.1 [8] Table 28). Reference MEF 69.1 Section 9.3 Internet Access UNI Requirements.
managementType	UniManagementType	Attribute indicating whether the CE is the responsibility of the Subscriber or the Service Provider. Reference MEF 61.1 Section 12.2 UNI Management Type Service Attribute.

724 **Table 10 BasicIaUni**

725 ### 14.1.4 BasicIaUniAccessLink

726 An individual connection between the Subscriber and the SP that forms part of a UNI. Reference MEF
727 61.1[1] Section 7.3 UNIs and UNI Access Link.

Name	Type	Description
reservedVrids	Vrid[]	List of VRRP (Virtual Router Redundancy Protocol) VRIDs (Virtual Router Identifier) reserved for use by the SP or Operator. Reference MEF 61.1 Section 13.12 UNI Access Link Reserved VRIDs Service Attribute. [D14] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, UNI Access Link Reserved VRIDs Service Access UNI Access Link Service Attributes Requirements Attribute SHOULD be None. Note - The use of VRRP by the ISP is discouraged in the Basic Internet Access Service, as it requires coordination of VRID resources between the Subscriber and ISP, which compromises the simplicity and plug-and-play nature of this service type. Reference MEF 69.1 Section 9.4 Internet
ipv4ConnectionAddressing	BasicIaUniIpv4ConnectionAddressing	ipv4ConnectionAddressing.uniAccessLinkIpv4AddressType MUST be DHCP or None. Reference MEF 69.1 Section 9.4 Subscriber Internet Access Service: UNI Access Link Requirements [R23]. If ipv4ConnectionAddressing.uniAccessLinkIpv4AddressType is DHCP, the UNI Access Link IPv4 Connection Addressing Primary Subnet parameter MUST contain only a single Service Provider IPv4 Address. Reference MEF 69.1[1] Section 9.4 Subscriber Internet Access Service: UNI Access Link Requirements [R25].
ipv6ConnectionAddressing	BasicIaUniIpv6ConnectionAddressing	[R27] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, UNI Access Link IPv6 Connection Addressing MUST be DHCP or SLAAC or None. Reference MEF 69.1[1] Section 9.4 Subscriber Internet Access Service: UNI Access Link Requirements.
prefixDelegation	EnabledDisabled	Indicates whether DHCP Prefix delegation is enabled. Reference MEF 61.1 Section 13.7 UNI Access Link Prefix Delegation Service Attribute.
egressBandwidthProfileEnvelope	IpUniEgressBwpEnvelope	Egress Bandwidth Profile Envelope for the UNI Access Link. Reference MEF 61.1 Section 13.11 UNI Access Link Egress Bandwidth Profile Envelope Service Attribute. Absence of this attribute corresponds to a value of "None". [D13] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, UNI Access Link Egress Bandwidth Profile Envelope SHOULD be None. Reference MEF 69.1 Section 9.4 Internet Access UNI Access Link Service Attributes Requirements
ingressBandwidthProfileEnvelope	IpUniIngressBwpEnvelope	Ingress Bandwidth Profile Envelope for the UNI Access Link. Reference MEF 61.1 Section 13.10 UNI Access Link Ingress Bandwidth Profile Envelope Service Attribute. Absence of this attribute corresponds to a value of "None". [D12] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, UNI Access Link Ingress Bandwidth Profile Envelope SHOULD be None. Reference MEF 69.1 Section 9.4 Internet Access UNI Access Link Service Attributes Requirements
mtu	integer	Maximum size, in octets of an IP Packet that can traverse the UNI Access Link. Reference MEF 61.1 Section 13.9 UNI Access Link IP MTU Service Attribute.

728 **Table 11 BasicIaUniAccessLink**

14.1.5 BasicIaIpvcCloud

The IPVC Cloud Service Attribute is a set of parameters describing the access connectivity to the cloud service. Reference MEF 61.1 Section 10.13 IPVC Cloud Service Attribute. The absence of this attribute corresponds to a value of "None".

Name	Type	Description
networkAddressTranslation	Ipv4Prefix	Specifies whether Network Address Translation is used, and if so the IPv4 Prefix. If not selected, then Disabled. Reference MEF 61.1 Section 10.13.4 Cloud Network Address Translation.
dataLimit	CloudDataLimit	Limit on the amount of Data traffic sent to/received from the cloud service. Unlimited or a 4-tupe (scdl, Tcdl, ucdl, dcdl). If not provided, then Unlimited. Reference MEF 61.1 Section 10.13.3 Cloud Data Limit.
dns	CloudDns	Specifies whether and how DNS is provided for the service. Reference MEF 61.1 Section 10.13.5 Cloud DNS Service.
subscriberPrefixList	Ipv4Ipv6Prefixes	List of Public IP Prefixes used in the Subscriber Network. Reference MEF 61.1 Section 10.13.6 Cloud Subscriber Prefix List.
ingressClassOfServiceMap	IaIngressClassOfServiceMap	Specification of how ingress packets are mapped to different CoS Names. Reference MEF 61.1 Section 10.13.2 Cloud Ingress Class of Service Map.

Table 12 BasicIaIpvcCloud

14.1.6 BasicIaUniIpv4ConnectionAddressing

UniIpv4ConnectionAddressing is a data type representing how IPv4 addresses are allocated to the devices on the UNI Access Link. Reference MEF 61 Section 13.4 UNI Access Link IPv4 Connection Addressing Service Attribute. [R23] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, UNI Access Link IPv4 Connection Addressing MUST be DHCP or None. [R25] If IPv4 Connection Addressing is DHCP, the UNI Access Link IPv4 Connection Addressing Primary Subnet parameter MUST contain only a single Service Provider IPv4 Address. Reference MEF 69.1[1] Section 9.4 Subscriber Internet Access Service: UNI Access Link Requirements.

Name	Type	Description
ipv4PrimarySubnet	Ipv4Subnet	Primary IPv4 Subnet. Includes IPv4 Prefix and Service Provider IPv4 Addresses.

Table 13 BasicIaUniIpv4ConnectionAddressing

14.1.7 BasicIaUniIpv6ConnectionAddressing

UniIpv6ConnectionAddressing is a data type representing how IPv6 addresses are allocated to the devices on the UNI Access Link. Reference MEF 61 Section 13.5 UNI Access Link IPv6 Connection Addressing Service Attribute. [R27] At a UNI Access Link in a UNI with an IPVC EP for a Basic Internet Access Service, UNI Access Link IPv6 Connection Addressing MUST be DHCP or SLAAC or None. Reference MEF 69.1[1] Section 9.4 Subscriber Internet Access Service: UNI Access Link Requirements.

Name	Type	Description
ipv6AddressType	Ipv6AddressType	Basic Internet Access IPv6 Connection Address mechanism.
ipv6Subnet	Ipv6Subnet	IPv6 Subnet

Table 14 BasicIaUniIpv6ConnectionAddressing

14.2 Advanced Internet Access

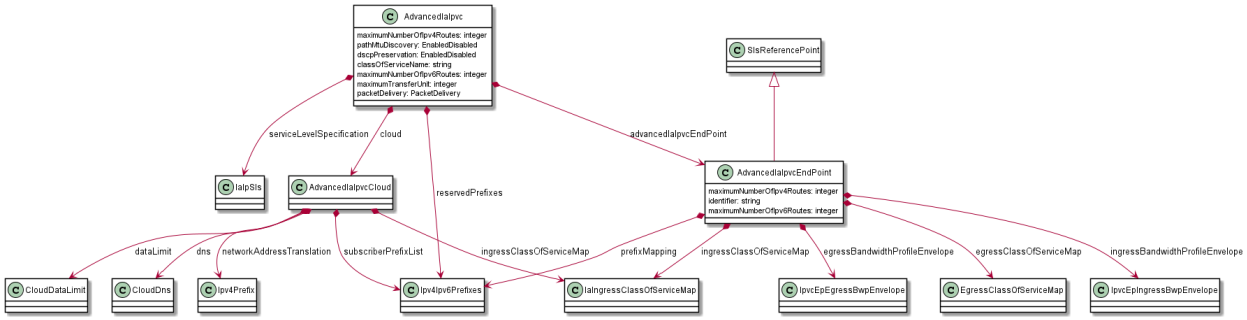


Figure 9 AdvancedIaIpvc

14.2.1 Advanced Internet Access IPVC

- Schema file:
  - \ip\internetAccess\advancedInternetAccess\advancedIaIpvc.yaml
- Specified Product:
  - AdvancedIaIpvc
- Includes classes:
  - AdvancedIaIpvcEndPoint
  - AdvancedIaIpvcCloud

14.2.1.1 AdvancedIaIpvc

The Advanced Internet Access IPVC is a MEF 69.1 defined version of MEF 61.1 IPVC. Reference MEF 69.1 Section 9.1 Internet Access IPVC Requirements.

Name	Type	Description
cloud	AdvancedIaIpvcCloud	Reference MEF 61.1 Section 10.13 IPVC Cloud Service Attribute. The absence of this attribute corresponds to a value of "None".
maximumNumberOfIpv4Routes	integer	Maximum number of IPv4 routes supported by the service as a whole. Absence of this attribute corresponds to a value of "Unlimited". Reference MEF 61.1 Section 10.5 IPVC Maximum Number of IPv4 Routes Service Attribute.
pathMtuDiscovery	EnabledDisabled	Indicates whether the Path MTU Discovery is supported for the IPVC. Reference MEF 61.1 Section 10.11 IPVC Path MTU Discovery Service Attribute.
dscpPreservation	EnabledDisabled	Indicates where the SP or Operator is allowed to modify the value of the IP DS field in the IP header of the Subscriber's traffic as it traverses the IPVC. Reference MEF 61.1 Section 10.7 IPVC DSCP Preservation Service Attribute. The value SHOULD be set to DISABLED. Reference MEF 69.1 Section 9.1 [D3]
serviceLevelSpecification	IaIpSls	The set of performance objectives for CoS Name in the IPVC. The absence of this attribute corresponds to a value of "None". Reference MEF 61.1 Section 10.9 IPVC Service Level Specification Service Attribute.
reservedPrefixes	Ipv4Ipv6Prefixes	Reference MEF 61.1 Section 10.14 IPVC Reserved Prefixes Service Attribute. For Advanced Internet Access the prefixes must be either empty, or free from any public address pre-fixes. (Reference MEF 69.1 Section 9.1 [R14])
classOfServiceName	string	The Class of Service Name supported by the IPVC. Reference MEF 61.1 Section 10.8 IPVC List of Class of Service Names Service Attribute. This is "listOfClassOfServiceNames" attribute narrowed to single ref per Reference MEF 69.1 Section 9.1 [R7]
advancedIaIpvcEndPoint	AdvancedIaIpvcEndPoint	Advanced IPVC End Point. Reference MEF 61.1 Section 10.3 IPVC End Point List Service Attribute. This is narrowed to multiplicity = 1 and to AdvancedIaIpvcEndPoint type. Reference MEF 69.1 Section 9.1 [R5] AdvancedIaIpvc
maximumNumberOfIpv6Routes	integer	Maximum number of IPv6 routes supported by the service as a whole. Absence of this attribute corresponds to a value of "Unlimited". Reference MEF 61.1 Section 10.6 IPVC Maximum Number of IPv6 Routes Service Attribute.
maximumTransferUnit	integer	Indicates the maximum size (in octets) of an IP packet that can traverse the IPVC without fragmentation. Reference MEF 61.1 Section 10.10 IPVC MTU Service Attribute.
packetDelivery	PacketDelivery	Indicates whether packets are delivered per standard IP routing behavior or by some other means. Reference MEF 61.1 Section 10.4 IPVC Packet Delivery Service Attribute.

765 **Table 15 AdvancedIaIpvc**

766 ### *14.2.1.2 AdvancedIaIpvcEndPoint*

767 The Advanced Internet Access IPVC End Point is a MEF 69.1 defined version of MEF 61.1 IPVC End Point.
768 Reference MEF 69.1 Section 9.2 Internet Access IPVC End Point Requirements.

769 Inherits from: - SlsReferencePoint

Name	Type	Description
maximumNumberOfIpv4Routes	integer	Maximum number of IPv4 routes supported by this IPVC End Point. Reference MEF 61.1 Section 11.7 IPVC EP Maximum Number of IPv4 Routes Service Attribute. Absence of this attribute corresponds to a value of "Unlimited".
identifier	string	A unique identifier for the IPVC End Point for management purposes. Reference MEF 61.1 Section 11.1 IPVC EP Identifier Service Attribute.
prefixMapping	Ipv4Ipv6Prefixes	Indicates which IP Prefixes can send and receive traffic to/from the IPVC. Reference MEF 61.1 Section 11.5 IPVC EP Prefix Mapping Service Attribute.
egressBandwidthProfileEnvelope	IpvcEpEgressBwpEnvelope	Egress Bandwidth Profile Envelope for the IPVC End Point. The absence of this attribute corresponds to a value of "None". Reference MEF 61.1 Section 11.12 IPVC EP Egress Bandwidth Profile Envelope Service Attribute.
egressClassOfServiceMap	EgressClassOfServiceMap	Specification of how egress packets are mapped to CoS Name. Reference MEF 61.1 Section 11.10 IPVC EP Egress Class of Service Map Service Attribute.
maximumNumberOfIpv6Routes	integer	Maximum number of IPv6 routes supported by this IPVC End Point. Reference MEF 61.1 Section 11.8 IPVC EP Maximum Number of IPv6 Routes Service Attribute. Absence of this attribute corresponds to a value of "Unlimited".
ingressClassOfServiceMap	IaIngressClassOfServiceMap	Specification of how ingress packets are mapped to CoS Name. Reference MEF 61.1 Section 11.9 IPVC EP Ingress Class of Service Map Service Attribute.
ingressBandwidthProfileEnvelope	IpvcEpIngressBwpEnvelope	Ingress Bandwidth Profile Envelope for the IPVC End Point. The absence of this attribute corresponds to a value of "None". Reference MEF 61.1 Section 11.11 IPVC EP Ingress Bandwidth Profile Envelope Service Attribute.

770 **Table 16 AdvancedIaIpvcEndPoint**

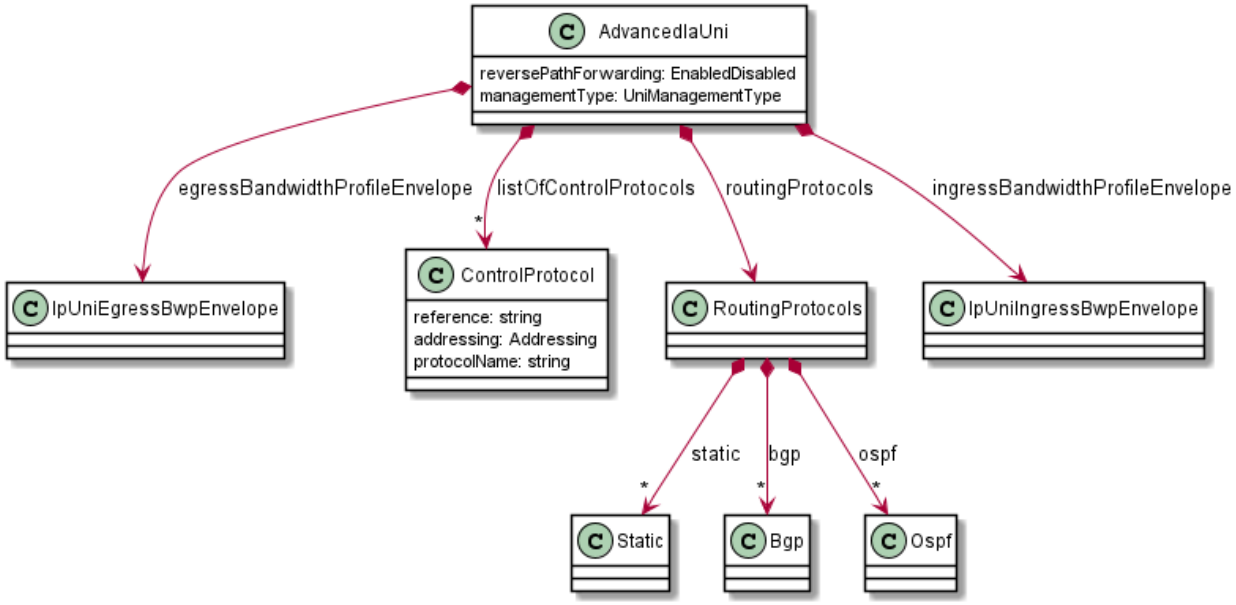
771 ### *14.2.1.3 AdvancedIaIpvcCloud*

772 Reference MEF 61.1 Section 10.13 IPVC Cloud Service Attribute. The absence of this attribute
773 corresponds to a value of "None".

Name	Type	Description
networkAddressTranslation	Ipv4Prefix	Specifies whether Network Address Translation is used, and if so the IPv4 Prefix. If not selected, then Disabled. Reference MEF 61.1 Section 10.13.4 Cloud Network Address Translation.
dataLimit	CloudDataLimit	Limit on the amount of Data traffic sent to/received from the cloud service. Unlimited or a 4-tupe (scdl, Tcdl, ucdl, dcdl). If not provided, then Unlimited. Reference MEF 61.1 Section 10.13.3 Cloud Data Limit.
dns	CloudDns	Specifies whether and how DNS is provided for the service. Reference MEF 61.1 Section 10.13.5 Cloud DNS Service.
subscriberPrefixList	Ipv4Ipv6Prefixes	List of Public IP Prefixes used in the Subscriber Network. Reference MEF 61.1 Section 10.13.6 Cloud Subscriber Prefix List.
ingressClassOfServiceMap	IaIngressClassOfServiceMap	Specification of how ingress packets are mapped to different CoS Names. Reference MEF 61.1 Section 10.13.2 Cloud Ingress Class of Service Map.

774 **Table 17 AdvancedIaIpvcCloud**

775 ### 14.2.2 Advanced Internet Access UNI



776

777 **Figure 10 AdvancedIaUni**

778 • Schema file:
779 ○ \ip\internetAccess\advancedInternetAccess\advancedIaUni.yaml
780 • Specified Product:
781 ○ AdvancedIaUni

14.2.2.1 AdvancedIaUni

The Advanced Internet Access UNI is a MEF 69.1 defined version of MEF 61.1 UNI. Reference MEF 69.x Section 8.3 Internet Access UNI Requirements.

Name	Type	Description
reversePathForwarding	EnabledDisabled	Indicates whether Reverse Path Forwarding checks are used by the SP at the UNI. Reference MEF 61.1 Section 12.8 UNI Reverse Path Forwarding Service Attribute. [D11] At a UNI with an IPVC EP for an Internet Access Service, reversePathForwarding SHOULD be ENABLED. Reference MEF 69.1 Section 9.3 Internet Access UNI Requirements.
egressBandwidthProfileEnvelope	IpUniEgressBwpEnvelope	Attribute used for an egress UNI Bandwidth Profile. Reference MEF 61.1 Section 12.5 UNI Egress Bandwidth Profile Envelope Service Attribute. Absence of this attribute corresponds to a value of "None".
listOfControlProtocols	ControlProtocol[]	Indication of IP Control Protocols that are not forwarded transparently by the SP. Reference MEF 61.1 Section 12.6 UNI List of Control Protocols Service Attribute. Absence of this attribute corresponds to a value of "None". [D9] At a UNI with an IPVC EP for an Internet Access Service, if the UNI has at least one UNI Access Link where the UNI Access Lin IPv4 Connection Addressing is not None, the UNI List of Control Protocols SHOULD include ICMP with a list of applicable ISP IP addresses. [D10] At a UNI with an IPVC EP for an Internet Access Service with at least one UNI Access Link where the UNI Access Link IPv6 Connection Addressing is not None, the UNI List of Control Protocols SHOULD include ICMPv6 with a list of applicable SP IP addresses. Reference MEF 69.1 Section 9.3 Internet Access UNI Requirements.
routingProtocols	RoutingProtocols	List of Routing Protocols used across the UNI. Reference MEF 61.1 Section 12.7 UNI Routing Protocols Service Attribute. Absence of this attribute corresponds to a value of "None".
ingressBandwidthProfileEnvelope	IpUniIngressBwpEnvelope	Attribute used for an ingress UNI Bandwidth Profile. Reference MEF 61.1 Section 12.4 UNI Ingress Bandwidth Profile Envelope Service Attribute. Absence of this attribute corresponds to a value of "None".
managementType	UniManagementType	Attribute indicating whether the CE is the responsibility of the Subscriber or the Service Provider. Reference MEF 61.1 Section 12.2 UNI Management Type Service Attribute.

Table 18 AdvancedIaUni

14.2.3 Advanced Internet Access UNI Access Link

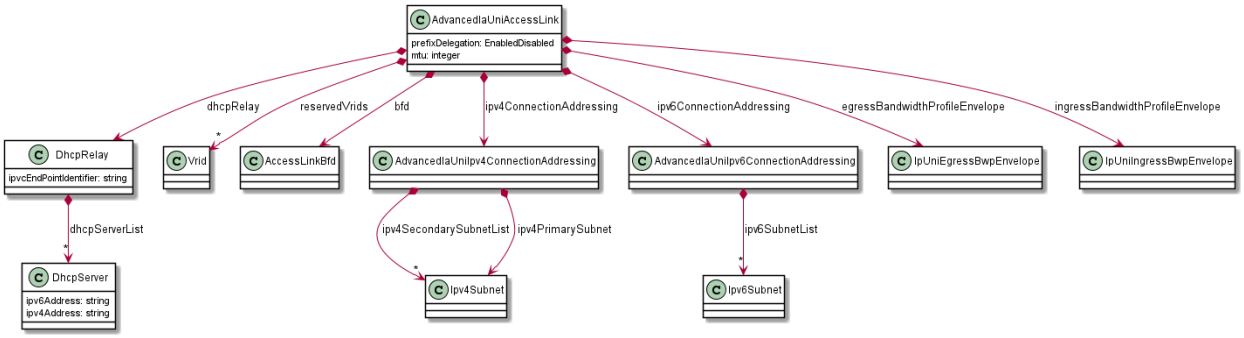


Figure 11 AdvancedIaUniAccessLink

- Schema file:
  - \ip\internetAccess\advancedInternetAccess\advancedIaUniAccessLink.yaml
- Specified Product:
  - AdvancedIaUniAccessLink
- Includes classes:
  - AdvancedIaUniIpv4ConnectionAddressing
  - AdvancedIaUniIpv6ConnectionAddressing

14.2.3.1 AdvancedIaUniAccessLink

The Advanced Internet Access UNI Access Link is a MEF 69.1 defined version of MEF 61.1 UNI Access Link. Reference MEF 69.1 Section 9.4 Internet Access UNI Access Link Requirements.

Name	Type	Description
dhcpRelay	DhcpRelay	Indicates whether DHCP Relay functionality is enabled. Reference MEF 61.1 Section 13.6 UNI Access Link DHCP Relay Service Attribute. Absence of this attribute corresponds to a value of "Disabled".
reservedVrids	Vrid[]	List of VRRP (Virtual Router Redundancy Protocol) VRIDs (Virtual Router Identifier) reserved for use by the SP or Operator. Reference MEF 61.1 Section 13.12 UNI Access Link Reserved VRIDs Service Attribute.
bfd	AccessLinkBfd	Indication of whether BFD is used on the IpServicesExternalInterfaceLink. Reference MEF 61.1 Section 16.5 ENNI Link BFD Attribute and MEF 61.1 Section 13.8 UNI Access Link BFD Service Attribute.
ipv4ConnectionAddressing	AdvancedIaUniIpv4ConnectionAddressing	IPv4 Connection Addressing. Reference MEF 61.1 Section 13.4 UNI Access Link IPv4 Connection Addressing Service Attribute. Absence of this attribute corresponds to a value of "None".
ipv6ConnectionAddressing	AdvancedIaUniIpv6ConnectionAddressing	IPv6 Connection Addressing. Reference MEF 61.1 Section 13.5 UNI Access Link IPv6 Connection Addressing Service Attribute. Absence of this attribute corresponds to a value of "None".
prefixDelegation	EnabledDisabled	Indicates whether DHCP Prefix delegation is enabled. Reference MEF 61.1 Section 13.7 UNI Access Link Prefix Delegation Service Attribute.
egressBandwidthProfileEnvelope	IpUniEgressBwpEnvelope	Egress Bandwidth Profile Envelope for the UNI Access Link. Reference MEF 61.1 Section 13.11 UNI Access Link Egress Bandwidth Profile Envelope Service Attribute. Absence of this attribute corresponds to a value of "None".
ingressBandwidthProfileEnvelope	IpUniIngressBwpEnvelope	Ingress Bandwidth Profile Envelope for the UNI Access Link. Reference MEF 61.1 Section 13.10 UNI Access Link Ingress Bandwidth Profile Envelope Service Attribute. Absence of this attribute corresponds to a value of "None".
mtu	integer	Maximum size, in octets of an IP Packet that can traverse the UNI Access Link. Reference MEF 61.1 Section 13.9 UNI Access Link IP MTU Service Attribute.

Table 19 AdvancedIaUniAccessLink

14.2.3.2 AdvancedIaUniIpv4ConnectionAddressing

UniIpv4ConnectionAddressing is a data type representing how IPv4 addresses are allocated to the devices on the UNI Access Link. Reference MEF 61 Section 13.4 UNI Access Link IPv4 Connection Addressing Service Attribute. [R22] At a UNI Access Link in a UNI with an IPVC EP for an Advanced Internet Access Service, UNI Access Link IPv4 Connection Addressing MUST be Static or None. Reference MEF 69.1 Section 9.4 Internet

Name	Type	Description
ipv4SecondarySubnetList	Ipv4Subnet[]	Secondary IPv4 Subnet List. Includes IPv4 Prefix and Service Provider IPv4 Addresses.
ipv4PrimarySubnet	Ipv4Subnet	Primary IPv4 Subnet. Includes IPv4 Prefix and Service Provider IPv4 Addresses.

808 **Table 20 AdvancedIaUniIpv4ConnectionAddressing**

809 *14.2.3.3 AdvancedIaUniIpv6ConnectionAddressing*

810 UniIpv6ConnectionAddressing is a data type representing how IPv6 addresses are allocated to the
811 devices on the UNI Access Link. Reference MEF 61 Section 13.5 UNI Access Link IPv6 Connection
812 Addressing Service Attribute. [R26] At a UNI Access Link in a UNI with an IPVC EP for an Advanced
813 Internet Access Service, UNI Access Link IPv6 Connection Addressing MUST be Static or None. Reference
814 MEF 69.1 Section 9.4 Internet

Name	Type	Description
ipv6SubnetList	Ipv6Subnet[]	Ipv6 Subnet

815 **Table 21 AdvancedIaUniIpv6ConnectionAddressing**

15 Common Classes and Types

This section is structure like the previous section but focuses on common classes and types used by the Service Attributes. Most of these are structured to support a variety of Carrier Ethernet Services and hence have filenames that are prefixed with "Carrier Ethernet". This means that several of them include options and values that aren't appropriate for some services such as, in this case Access E-Line. Whenever that situation arises the details are included in the description and/or validation notes for the specific Access E-Line Service Attribute and, if appropriate, in the common class.

15.1 Internet Access Common

15.1.1 Addressing

Enumeration representing the Address type for the Control Protocols data type.

Contains Enumeration Literals:

- SP_OPERATOR_ADDRESSES:
  - If the addressing information is SP/Operator Addresses, then Ingress IP Packets for the specified protocol that have a multicast or broadcast destination address, or a unicast destination address that is reachable within the SP's or Operator's network, are considered to be IP Control Protocol Packets, and Egress IP Packets for the specified protocol that have a source address that is reachable within the SP's or Operator's network are considered to be IP Control Protocol Packets.
- ANY:
  - If the addressing information is Any, then all IP Packets for the specified protocol that cross the UNI are considered to be IP Control Protocol Packets.

15.1.2 ControlProtocol

Data type representing Control Protocols. Each entry consists of a 3-tuple containing the protocol name, addressing information (either SP/Operator Addresses or Any) and one or more references. Reference MEF 61.1 Section 12.6 UNI List of Control Protocols Service Attribute

Name	Type	Description
reference	string[]	Protocol reference.
addressing	Addressing	Enumeration representing the addressing.
protocolName	string	Protocol name.

Table 22 ControlProtocol

15.1.3 CloudDataLimit

Specifies an absolute limit on the amount of data the Subscriber can transmit to, or receive from, the cloud service in a given time period. It is either Unlimited or a 4-tuple (scdl, tcdl, ucdl, dcdl). Reference MEF 61.1 Section 10.13.3 Cloud Data Limit.

Name	Type	Description
duration	TimeDuration	Specifies a duration. Together with the start time, it describes a service of contiguous time intervals, starting at the specified start time and each lasting for the specified duration.
download	integer	An integer indicating a limit, in octets, on the amount of IP traffic received from the cloud service that can be delivered to the Subscriber during each time interval described by startTime and duration.
upload	integer	An integer indicating a limit, in octets, on the amount of IP traffic that can be transmitted towards the cloud service during each time interval described by startTime and duration.
startTime	date-time	Specifies a start time.

Table 23 CloudDataLimit

15.1.4 CloudDns

Data type representing a Domain Name System. Reference MEF 69.1 Section 9.1 [R13] For an Internet Access Service, if the Cloud DNS parameter of the IPVC Cloud Service Attribute is STATIC, the associated list of DNS Servers MUST have at least one entry. [D4] For an Internet Access Service, if the Cloud DNS parameter of the IPVC Cloud Service Attribute is STATIC, the associated list of DNS Servers SHOULD contain at least two DNS servers.

Name	Type	Description
dnsType	DnsType	Domain Name System type.
dnsServerIpv6List	string[]	DNS server list an IPv6 addresses
dnsServerIpv4List	string[]	DNS server list an IPv4 addresses

Table 24 CloudDns

15.1.5 DhcpRelay

Dynamic Host Configuration Protocol (DHCP) Relay functionality is useful when the Subscriber uses DHCP (per RFC 2131[15] and RFC 8415[24]) in the Subscriber Network but does not want to place a DHCP server (or possibly a pair of redundant DHCP servers) in each part of the network.

Name	Type	Description
dhcpServerList	DhcpServer[]	Non-empty list of IP addresses for DHCP Servers belonging to the Subscriber. Reference MEF 61.1 Section 13.6 UNI Access Link DHCP Relay Server Attribute.
ipvcEndPointIdentifier	string	IPVC identifier as described in MEF 61.1 Section 11.1.

Table 25 DhcpRelay

15.1.6 DhcpServer

Data type representing a DHCP Server

Name	Type	Description
ipv6Address	string	DHCP Server IPv6 address.
ipv4Address	string	DHCP Server IPv4 address.

Table 26 DhcpServer

15.1.7 DnsType

Enumeration representing the different types of DNS.

Contains Enumeration Literals:

- DHCP:
  - If DNS type is Dynamic Host Configuration Protocol, the SP provides DNS server addresses via DHCP at each UNI.
- PPP:
  - If DNS type is Point to Point Protocol, the SP provides DNS service addresses via PPP at each UNI.
- STATIC:
  - If DNS type is Static, the DNS server addresses are listed explicitly.
- SLAAC:
  - If DNS type is StateLess Address Auto Configuration, the SP provides DNS server addresses via SLAAC Router Advertisement options (per RFC 8106**Błąd! Nie można odnaleźć źródła odwołania.**).

15.1.8 DscpMapping

IP DSCP mapping of CoS name to DSCP value

Name	Type	Description
ipds	integer	DSCP value
cosName	string	Class of Service name

Table 27 DscpMapping

15.1.9 EgressClassOfServiceMap

Pair of values (D,P). D specifies how to set the DS field in Egress IP Data Packets based on CoS Name. It is either None, or a mapping from CoS Names to DSCP values. P specifies how to set the PCP field in VLAN Tagged Ethernet Frames containing Egress IP Data Packets based on CoS Name. It is either None, or a mapping from CoS Names to PCP values. Reference MEF 61.1 Section 11.10 IPVC EP Egress Class of Service Map Service Attribute.

Name	Type	Description
dscpMapping	DscpMapping[]	Reference to CoS to IP DSCP mapping.
pcpMapping	PcpMapping[]	Reference to CoS to Ethernet PCP mapping.

888 **Table 28 EgressClassOfServiceMap**

889 ### 15.1.10 EndPointIdentifierAndCosName

890 Data type representing IPVC End Point Identifier and CoS name use for Bandwidth Profiles.

Name	Type	Description
ipvcEndPointIdentifier	string	IPVC End Point Identifier for an IPVC End Point located at the UNI.
cosName	string	Class of Service Name.

891 **Table 29 EndPointIdentifierAndCosName**

892 ### 15.1.11 HeaderFieldTypes

893 HeaderFieldTypes is an enumeration for fields defined in MEF 61.1**Błąd! Nie można odnaleźć źródła**
894 **odwołania.** Section 10.13.2 Cloud Ingress Class of Service Map.

895 Contains Enumeration Literals:

896 • SOURCE_IP_ADDRESS:
897 ○ Field type Source IP Address.
898 • DESTINATION_IP_ADDRESS:
899 ○ Field type Destination IP Address.
900 • L4_PROTOCOL:
901 ○ Field type Layer 4 Protocol.
902 • SOURCE_L4_PORT:
903 ○ Field type Source Layer 4 Port.
904 • DESTINATION_L4_PORT:
905 ○ Field type Destination Layer 4 Port.
906 • ETHERNET_PCP:
907 ○ Field type Ethernet PCP.
908 • IP_DS:
909 ○ Field type IP Differentiated Service.

15.1.12 IaIngressClassOfServiceMap

Name	Type	Description
defaultCosName	string	Default Class of Service Name. Reference MEF 61.1 Section 10.13.2 Cloud Ingress Class of Service Map and Section 11.9 IPVC EP Ingress Class of Service Map Service Attribute. Reference MEF 69.1 Section 9.1 [R11], [R18] For an Internet Access Service, Cloud Ingress Class of Service Map (F, M, D), default CoS name, D, MUST NOT be Discard.
headerFieldTypes	HeaderFieldTypes[]	Is a list of one or more fields in the packet header that are used to determine the CoS Name. Reference MEF 61.1 Section 10.13.2 Cloud Ingress Class of Service Map.

Table 30 IaIngressClassOfServiceMap

15.1.13 PacketDelivery

For each Ingress IP Data Packet that is mapped to one of the IPVC EPs for the IPVC it takes one of two values. STANDARD_ROUTING or POLICY-BASED_ROUTING.

Packet Delivery enumeration.

Contains Enumeration Literals:

- STANDARD_ROUTING:
  - If the IPVC Packet Delivery is Standard Routing, the egress UNI and UNI Access Link or egress ENNI and ENNI Link are generally selected by examining the destination IP address in the packet and matching it to an IP Prefix reachable via the IPVC EP at the egress EI – in other words, by normal IP routing.
- POLICY_BASED_ROUTING:
  - The behavior and requirements when the IPVC Packet Delivery Service Attribute is set to Policy-Based Routing are deferred to a future revision of this specification (MEF 61.1)

15.1.14 PcpMapping

Ethernet PCP mapping of CoS name to PCP value

Name	Type	Description
ethernetPcp	integer	PCP value
cosName	string	Class of Service name

Table 31 PcpMapping

15.1.15 RoutingProtocols

Data type to support routing protocols and associated parameters that are used to exchange IP routes across the UNI. The value is a list of protocols (possibly empty), where each entry consists of the protocol name (one of Static, OSPF or BGP) the type of routes that will be exchanged (one of IPv4 or IPv6 or Both) and set of additional parameters as specified. Reference MEF 61.1 Section 12.7 UNI Routing Protocols Service Attributes.

Name	Type	Description
static	Static[]	Reference to Static routing
bgp	Bgp[]	Reference to BGP routing
ospf	Ospf[]	Reference to OSPF routing.

Table 32 RoutingProtocols

15.1.16 UniManagementType

Enumeration representing the UNI Management Type options. Reference MEF 61.1**Błąd! Nie można odnaleźć źródła odwołania.** Section 12.2 UNI Management Type Service Attribute.

Contains Enumeration Literals:

- SUBSCRIBER_MANAGED:
  - Enumeration indicating the CE is the responsibility of the Subscriber.
- PROVIDER_MANAGED:
  - Enumeration indicating the CE is the responsibility of the Service Provider.

15.1.17 Vrid

VRID (Virtual Router ID) as defined in RFC 5798[29] is a number between 1 and 255

15.2 Common Classes

15.2.1 EnabledDisabled

Enumeration for supporting an Enabled and Disabled state.

Contains Enumeration Literals:

- ENABLED: Enabled state.
- DISABLED: Disabled state.

15.2.2 InformationRate

A value and a unit of measure that specifies an Information Rate.

Name	Type	Description
irValue	number	The value in the information rate. For example if the information rate is 70 kbps this element is 70.
irUnits	IrUnits	The unit of measure for the Information Rate. For example if the Information Rate is 70KBPS this element is KBPS. Note that the values are decimal values. 1 KBPS is 1000 bits per second and 1MBPS is 1,000,000 bits per second.

Table 33 InformationRate

15.2.3 Ipv4Ipv6Prefixes

IPv4 and IPv6 prefix lists. Includes subnet addresses and prefix length.

Name	Type	Description
listOfIpv4ReservedPrefixes	Ipv4Prefix[]	List of IPv4 prefixes.
listOfIpv6ReservedPrefixes	Ipv6Prefix[]	List of IPv6 prefixes.

Table 34 Ipv4Ipv6Prefixes

15.2.4 Ipv4Prefix

Data type representing IPv4 address prefix and mask length between 0 and 31 bits.

Name	Type	Description
prefixLength	integer	IPv4 address prefix. Length 0-31.
ipv4Address	string	IPv4 address.

Table 35 Ipv4Prefix

15.2.5 Ipv4Subnet

Ipv4Subnet is a data type representing an IPv4 subnet logical partition of an IP network. Included is list of Service Provider IPv4 addresses.

Name	Type	Description
serviceProviderIpv4Addresses	string[]	List of Service Provider IPv4 addresses.
ipv4Prefix	Ipv4Prefix	IPv4 address prefix (IPv4 address prefix and mask length between 0 and 31 in bits).

Table 36 Ipv4Subnet

15.2.6 Ipv6Prefix

Data type representing IPv6 address prefix and mask length between 0 and 127 in bits.

Name	Type	Description
prefixLength	integer	IPv6 address prefix. Length 0-127.
ipv6Address	string	IPv6 address.

Table 37 Ipv6Prefix

15.2.7 Ipv6Subnet

IPv6Subnet is a data type representing an IPv6 subnet logical partition of an IP network. Included is list of Service Provider IPv6 addresses.

Name	Type	Description
serviceProviderIpv6Addresses	string[]	List of IPv6 Service Provider addresses.
ipv6Prefix	Ipv6Prefix	IPv6 Prefix (IPv6 address prefix and mask length between 0 and 127 in bits).

970 **Table 38 Ipv6Subnet**

971 #### 15.2.7.1 IrUnits

972 The unit of measure for the Information Rate. For example if the Information Rate is 70KBPS this
973 elementis KBPS. Note that the values are decimal values. 1 KBPS is 1000 bits per second and 1MBPS is
974 1,000,000 bits per second.

975 • BPS:
976 ○ Bits per second.
977 • KBPS:
978 ○ Kilobits per second.
979 • MBPS:
980 ○ Megabits per second.
981 • GBPS:
982 ○ Gigabits per second.
983 • TBPS:
984 ○ Terabits per second.
985 • PBPS:
986 ○ Petabits per second.
987 • EBPS:
988 ○ Exabits per second.
989 • ZBPS:
990 ○ Zettabits per second.
991 • YBPS:
992 ○ Yottabits per second.

993 ### 15.2.8 PeeringAddress

994 Peering Addresses. Connection Addresses, or Loopbacks plus a list of pairs of IP addresses. Reference
995 MEF 61.1 Section 12.7.3 BGP.

Name	Type	Description
connectionAddress	EnabledDisabled	If the Peering Addresses parameter is Connection Addresses, a separate BGP peering session is established over each UNI Access Link, using the primary IPv4 addresses in the UNI Access Link IPv4 Connection Addressing Service Attribute (section 13.4) or the first IPv6 addresses in the UNI Access Link IPv6 Connection Addressing Service Attribute (section 13.5), as indicated by the Connection Address Family parameter.
serviceProviderLoopback	string	Service Provider IP Loopback address.
loopbacks	EnabledDisabled	If the Peering Addresses parameter is Loopbacks, a list of pairs of IP addresses is additionally specified, each pair containing the Subscriber's loopback address and the SP's or Operator's loopback address. A single BGP peering session is established for each pair of addresses.
subscriberLoopback	string	Subscriber IP Loopback address.

Table 39 PeeringAddress

15.2.9 Percentage

This is a number of percent - a floating point number between 0 and 100.

15.2.10 TimeDuration

This class is used to describe durations expressed as a 2-tuple, (value, units). The units from from nanoseconds to years.

Name	Type	Description
timeDurationValue	integer	The value of the duration. For example, if the duration is 20 ms, this element is 20.
timeDurationUnits	TimeDurationUnits	The unit of measure in the duration. For example, if an interval is 2ms, this element is MS.

Table 40 TimeDuration

15.2.11 TimeDurationUnits

The unit of measure in the duration. For example, if an interval is 2ms, this element is MS. type: string

Value
NS
US
MS
SEC
MIN
HOUR
DAY
WEEK
MONTH
YEAR

Table 41 TimeDurationUnits

15.3 BFD

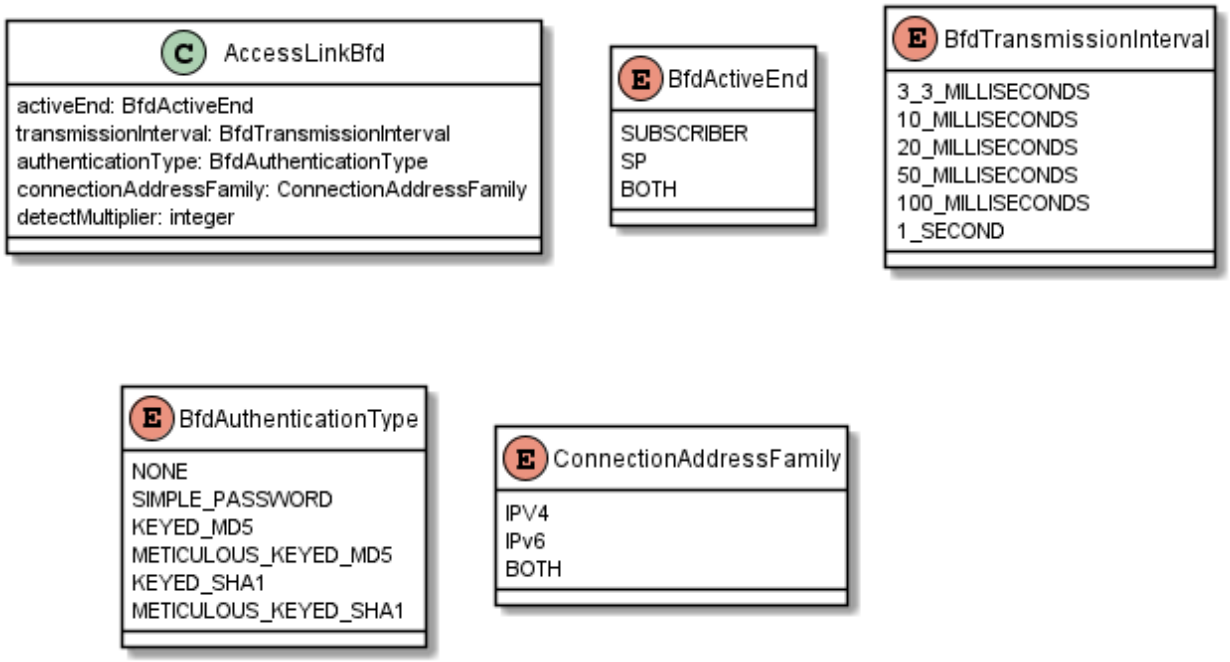


Figure 12 AccessLinkBfd

15.3.1 AccessLinkBfd

The Access Link BFD Service Attribute indicates whether Bidirectional Forwarding Detection (BFD) is enabled on the UNI Access Link. Reference MEF 61.1[1] Section 13.8 UNI Access Link BFD Service Attribute and Section 16.5 ENNI Link BFD Attribute.

Name	Type	Description
activeEnd	BfdActiveEnd	BFD Active End. At least one end of BFD session has to have an active role, meaning that it sends out asynchronous control messages regardless of whether it has received any. Reference MEF 61.1 Section 13.8 UNI Access Link BFD Service Attribute.
transmissionInterval	BfdTransmissionInterval	BFD allows for asymmetrical operation, where packets can be sent a different interval in each direction, and a different detect multiplier can be used. For simplicity, this specification mandates symmetrical operation. Units are in milliseconds. Reference MEF 61.1 Section 13.8 UNI Access Link BFD Service Attribute and Section 16.5 ENNI Link BFD Attribute.
authenticationType	BfdAuthenticationType	BFD Authentication as describer in RFC 5880. Reference MEF 61.1 Section 13.8 UNI Access Link BFD Service Attribute and Section 16.5 ENNI Link BFD Attribute.
connectionAddressFamily	ConnectionAddressFamily	The Connection Address Family parameter specifies whether the session is established over IPv4 or IPv6 or whether two separate sessions are established using IPv4 and IPv6. Reference MEF 61.1 Section 13.8 UNI Access Link BFD Service Attribute and Section 16.5 ENNI Link BFD Attribute.
detectMultiplier	integer	BFD Detect multiple as an Integer. Reference MEF 61.1 Section 13.8 UNI Access Link BFD Service Attribute and Section 16.5 ENNI Link BFD Attribute.

Table 42 AccessLinkBfd

15.3.2 BfdActiveEnd

At least one end of the BFD session must have an active role, meaning that it sends out asynchronous control messages regardless of whether it has received any. This enumeration represents the values that can be set for the BFD Active End. Reference MEF 61.1 Section 13.8 UNI Access Link BFD Service Attribute [R171] and [R172].

Contains Enumeration Literals:

- SUBSCRIBER:
  - Subscriber takes active BFD role.
- SP:
  - Service Provider takes active BFD role.
- BOTH:
  - Subscriber and Service Provider take active BFD role.

15.3.3 BfdAuthenticationType

UNI Access Link BFD authentication type. When Authentication is NOT NONE, RFC5880**Błąd! Nie można odnaleźć źródła odwołania.** Section 6.7 Authentication mechanisms are used.

Contains Enumeration Literals:

- NONE:
  - No BFD authentication.
- SIMPLE_PASSWORD:
  - Simple Password Authentication is the most straightforward (and weakest) form of authentication. In this method of authentication one or more Passwords (with corresponding Key IDs) are configured in each system and one of these Password/ID pairs is carried in each BFD Control packet. The receiving system accepts the packet if the Password and Key ID matches one of the Password/ID pairs configured in that system. Reference IETF RFC5880 Section 6.7.2.
- KEYED_MD5:
  - The Keyed MD5 and Meticulous Key MD5 Authentication mechanisms are very similar to those used in other protocols. In these methods of authentication, one or more security keys (with corresponding key IDs) are configured in each system. Reference RFC5880 Section 6.7.3 Keyed MD5 and Meticulous Keyed MD5 Authentication.
- METICULOUS_KEYED_MD5:
  - The Keyed MD5 and Meticulous Key MD5 Authentication mechanisms are very similar to those used in other protocols. In these methods of authentication, one or more security keys (with corresponding key IDs) are configured in each system. Reference RFC5880 Section 6.7.3 Keyed MD5 and Meticulous Keyed MD5 Authentication.
- KEYED_SHA1:
  - The Keyed SHA1 and Meticulous Key SHA1 Authentication mechanisms are very similar to those used in other protocols. In these methods of authentication, one or more secret keys (with corresponding key IDs) are configured in each system. Reference RFC5880 Section 6.7.4 Keyed SHA1 and Meticulous Keyed SHA1 Authentication.
- METICULOUS_KEYED_SHA1:
  - The Keyed SHA1 and Meticulous Key SHA1 Authentication mechanisms are very similar to those used in other protocols. In these methods of authentication, one or more secret keys (with corresponding key IDs) are configured in each system. Reference RFC5880 Section 6.7.4 Keyed SHA1 and Meticulous Keyed SHA1 Authentication.

15.3.4 BfdTransmissionInterval

RFC 7419 specifies a set of common intervals which are used to ensure interoperability.

Contains Enumeration Literals:

- 3_3_MILLISECONDS:
  - 3.3 milliseconds
- 10_MILLISECONDS:
  - 10 milliseconds
- 20_MILLISECONDS:
  - 20 milliseconds
- 50_MILLISECONDS:
  - 50 milliseconds
- 100_MILLISECONDS:
- 1_SECOND:
  - 1 second

15.4 BGP

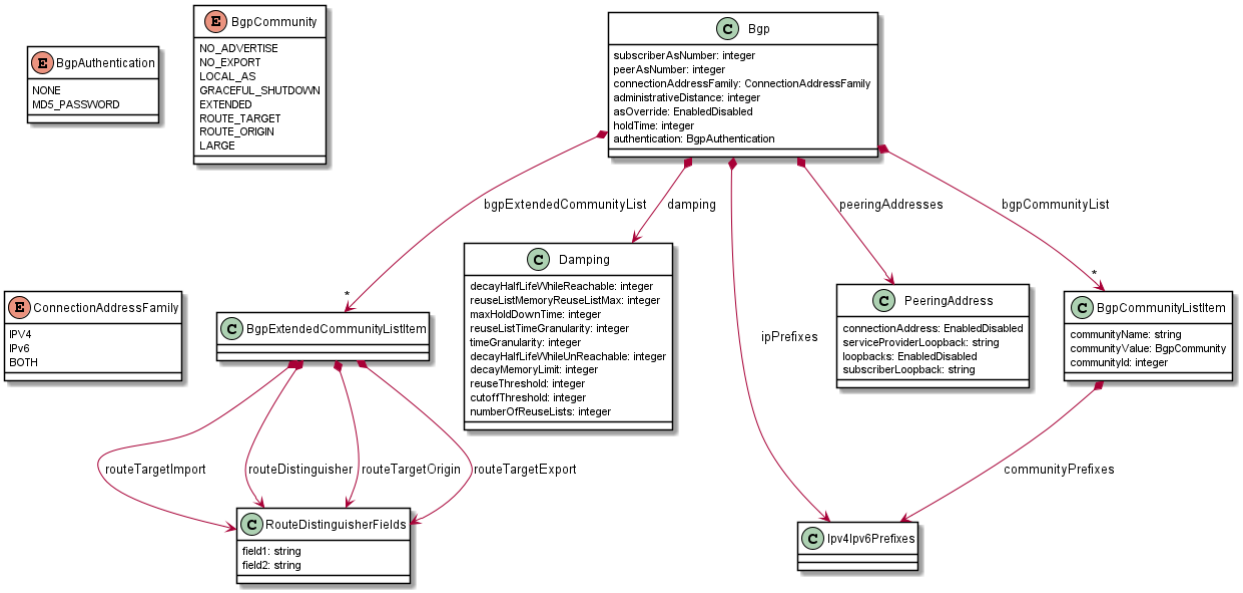


Figure 13 Bgp

15.4.1 Bgp

When an entry in the UNI Routing Protocol is for BGP, BGP as specified in RFC 4271 [2] is used across the UNI to exchange information. Reference MEF 61.1 Section 12.7.3 BGP.

Name	Type	Description
subscriberAsNumber	integer	BGP Subscriber Autonomous System number.
peerAsNumber	integer	BGP Peer Autonomous System Number.
bgpExtendedCommunityList	BgpExtendedCommunityListItem[]	Mechanism for labeling information carried in BGP-4. Provide enhancement over existing BGP Community Attribute an extended range, the addition of type field.
connectionAddressFamily	ConnectionAddressFamily	Connection Address Family (IPv4 or IPv6).
damping	Damping	Route flap damping. When the Damping parameter is NONE, the attribute is not set. When not NONE a single set of parameters described in Section 4.3 of RFC 2430 MUST be agreed.
ipPrefixes	Ipv4Ipv6Prefixes	IPv4/IPv6 Prefixes that are advertised using BGP.
administrativeDistance	integer	BGP Administrative Distance.
asOverride	EnabledDisabled	Autonomous System Override.
holdTime	integer	Hold time in seconds. Indicates the agreed Hold Time used for BGP sessions. The possible values are 0 or an integer in the range 3-65535.
peeringAddresses	PeeringAddress	Peering Addresses.
authentication	BgpAuthentication	BGP Authentication (None or MD5 plus a password).
bgpCommunityList	BgpCommunityListItem[]	Used to control which routers are accepted, preferred, distributed, or advertised.

Table 43 Bgp

15.4.2 BgpAuthentication

BGP Authentication options as an enumeration. Contains Enumeration Literals:

- NONE:
  - No authentication for BGP.
- MD5_PASSWORD:
  - BGP Authentication is MD5 plus a password.

15.4.3 BgpCommunity

Set of BGP Community enumerations.

- NO_ADVERTISE:
  - When a No-Advertise community is attached to a route, the BGP speaker won't advertise the route to any internal or external BGP peers.
- NO_EXPORT:
  - When a No-Export community is attached to a route, the router won't advertise the route to external peers--only to internal peers.
- LOCAL_AS:

- To avoid any BGP routing loops, there is an important rule regarding the internal BGP neighbors: an IBGP neighbor cannot advertise a route to an IBGP neighbor if it received that route from another IBGP neighbor.

- GRACEFUL_SHUTDOWN:
  - The Graceful SHUTDOWN (65535:0) community is used to smoothly shut down paths a router might use when its peer router is about to be intentionally shut down.
- EXTENDED:
  - An Extended community is an 8-byte value that is divided into two main sections: An extended community has three fields: type, administrator, assigned number (type:administrator:assigned-number). Based on the value of the high-order byte in the Type field, the administrator field can be an AS or an IP address.

- ROUTE_TARGET:
  - The Route Target community is used in MPLS VPN environments to separate two customers routing tables.
- ROUTE_ORIGIN:
  - In an MPLS VPN environment, the route origin community is used to identify where routes originated from, so that readvertisement back to that site is avoided.
- LARGE:
  - A Large community is a 12-byte BGP community that was developed when the 4-byte AS began to be allocated. Since each of the standard or extended communities use 2-byte values for the AS, a 4-byte AS would not fit into the standard 2-byte value.

15.4.4 BgpCommunityListItem

Bgp Community List Item

Name	Type	Description
communityPrefixes	Ipv4Ipv6Prefixes	The prefixes that the BGP Community contains
communityName	string	The name of BGP Community.
communityValue	BgpCommunity	BGP Community value.
communityId	integer	Unique identifier for BGP Community.

Table 44 BgpCommunityListItem

15.4.5 BgpExtendedCommunityListItem

BGP Extended Community List Item

Name	Type	Description
routeTargetImport	RouteDistinguisherFields	BGP Community value.
routeDistinguisher	RouteDistinguisherFields	The prefixes that the BGP Community contains
routeTargetOrigin	RouteDistinguisherFields	BGP Community value.
routeTargetExport	RouteDistinguisherFields	BGP Community value.

Table 45 BgpExtendedCommunityListItem

15.4.6 ConnectionAddressFamily

Specifies whether the session is established over IPv4 or IPv6 or whether two separate sessions are established using IPv4 and IPv6.

Contains Enumeration Literals:

- IPV4:
  - IPv4 is used for establishing the BFD session.
- IPV6:
  - IPv6 is used for establishing the BFD session.
- BOTH:
  - IPv4 and IPv6 are used for establishing the BFD session.

15.4.7 Damping

Damping parameters as defined in RFC 2439 BGP Route Flap Damping, Section 4.2

Name	Type	Description
decayHalfLifeWhileReachable	integer	This value is the time duration in seconds during which the accumulated stability figure of merit will be reduced by half if the route if considered reachable (whether suppressed or not).
reuseListMemoryReuseListMax	integer	This is the time (in seconds) value corresponding to the last reuse list. This may be the maximum value of T-hold for all parameter sets of may be configured.
maxHoldDownTime	integer	This value is the maximum time a route can be suppressed no matter how unstable it has been prior to this period of stability. In seconds.
reuseListTimeGranularity	integer	This is the time (in seconds) interval between evaluations of the reuse lists. Each reuse lists corresponds to an additional time increment.
timeGranularity	integer	This is the time granularity in seconds used to perform all decay computations.
decayHalfLifeWhileUnReachable	integer	This value is the time duration in seconds during which the accumulated stability figure of merit will be reduced by half if the route if considered unreachable. If not specified or set to zero, no decay will occur while a route remains unreachable.
decayMemoryLimit	integer	This is the maximum time (in seconds) that any memory of previous instability will be retained given that the route's state remains unchanged, whether reachable or unreachable. This parameter is generally used to determine array sizes.
reuseThreshold	integer	This value is expressed as a number of route withdrawals. It is the value below which a suppressed route will now be used again.
cutoffThreshold	integer	This value is expressed as a number of route withdrawals. It is the value above which a route advertisement will be suppressed.
numberOfReuseLists	integer	This is the number of reuse lists. It may be determined from reuse-list-max or set explicitly.

1136 **Table 46 Damping**

1137 15.4.8 RouteDistinguisherFields

1138 BGP Route Distinguisher with two fields.

Name	Type	Description
field1	string	Route Distinguisher field 1.
field2	string	Route Distinguisher field 2.

1139 **Table 47 RouteDistinguisherFields**

15.5 IP Bandwidth Profile and Bandwidth Profile Envelope

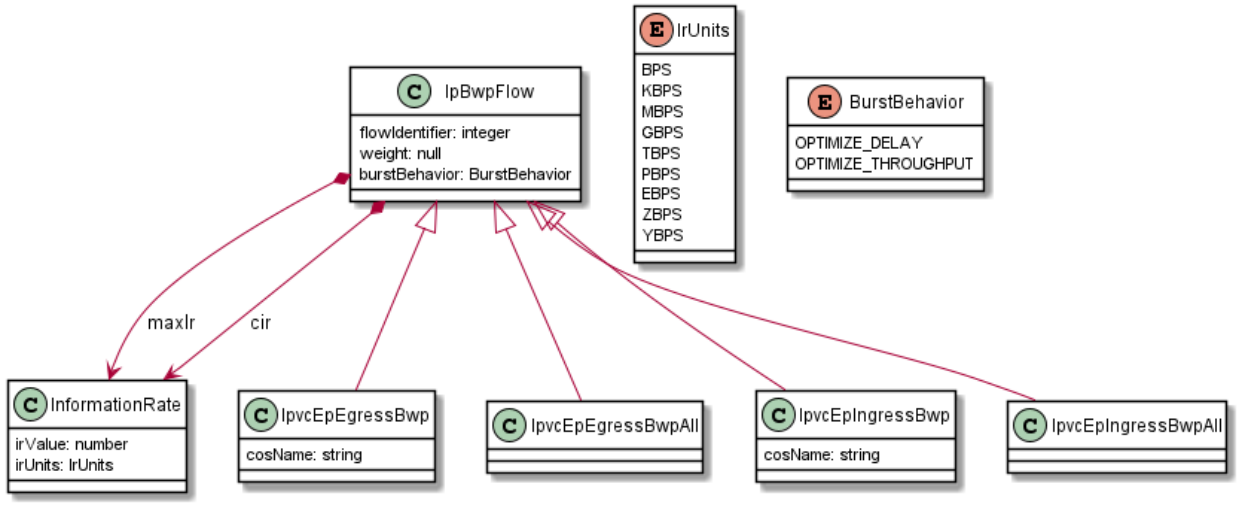


Figure 14 IpBwpFlow

15.5.1 BurstBehavior

Enumeration used to select the Bandwidth Profile Flow Burst Behavior attribute. Reference MEF 61.1 [3] Section 17.3 Table 29 Bandwidth Profile Parameters for a Bandwidth Profile Flow.

Contains Enumeration Literals:

- OPTIMIZE_DELAY:
  - Enumeration representing the Burst Behavior of optimization of delay.
- OPTIMIZE_THROUGHPUT:
  - Enumeration representing the Burst Behavior of optimization of throughput.

15.5.2 IpBwpEnvelope

A BWP Envelope is a list of Bandwidth Profile Flows, plus additional parameters for the BWP as a whole. A BWP Envelope is a set of one or more BWP Flows that are associated such that the amount of traffic for one flow can affect the amount that is permitted for another flow. Reference MEF 61.1 Section 17.3 Bandwidth Profile Envelopes.

Name	Type	Description
tE	integer	The Envelope IR Time in milliseconds. This is the time period over which average Information Rates are calculated and thus it limits the size of a burst. Reference MEF 61.1 Section 17.3 Bandwidth Profile Envelopes.
maxIrE	InformationRate	The Envelope Maximum Information Rate in bits per second. This is the limit on the total aggregate information rate of traffic across all BWP Flows in the Envelope. Reference MEF 61.1 Section 17.3 Bandwidth Profile Envelopes.

Table 48 IpBwpEnvelope

15.5.3 IpBwpFlow

A Bandwidth Profile Flow is a stream of IP Packets meeting certain criteria. The criteria than can be used depends on which BWP Envelope the BWP Flow is a part of. Reference MEF 61.1 Section 17.2 Bandwidth Profile Flows.

Name	Type	Description
maxIr	InformationRate	Identifier for Maximum Information Rate in bits per second. Limit on the average information rate of IP Packets for this BWP Flow. Reference MEF 61.1 Table 29 - Bandwidth Profile Parameters for a Bandwidth Profile Flow.
flowIdentifier	integer	Identifier for the BWP Flow within the BWP Envelope. Unique integer between 1 and n where n is the number of BWP Flows in the BWP Envelope. Reference MEF 61.1 Table 29 - Bandwidth Profile Parameters for a Bandwidth Profile Flow.
weight		Identifier for Weight as an integer greater than or equal to 0. Relative weight for this BWP Flow compared to other BWP Flows in the BWP Envelope. Reference MEF 61.1 Table 29 - Bandwidth Profile Parameters for a Bandwidth Profile Flow.
burstBehavior	BurstBehavior	Identifier for Burst Behavior either Optimize-Delay or Optimize-Throughput. Whether the SP is requested to optimize the delay characteristic of this flow, or the throughput. Reference MEF 61.1 Table 29 - Bandwidth Profile Parameters for a Bandwidth Profile Flow.
cir	InformationRate	Identifier for Committed Information Rate in bits per second. Average information rate of IP Packets that is committed to this BWP Flow. Reference MEF 61.1 Table 29 - Bandwidth Profile Parameters for a Bandwidth Profile Flow.

Table 49 IpBwpFlow

15.6 UNI Ingress Bandwidth Profile Envelope

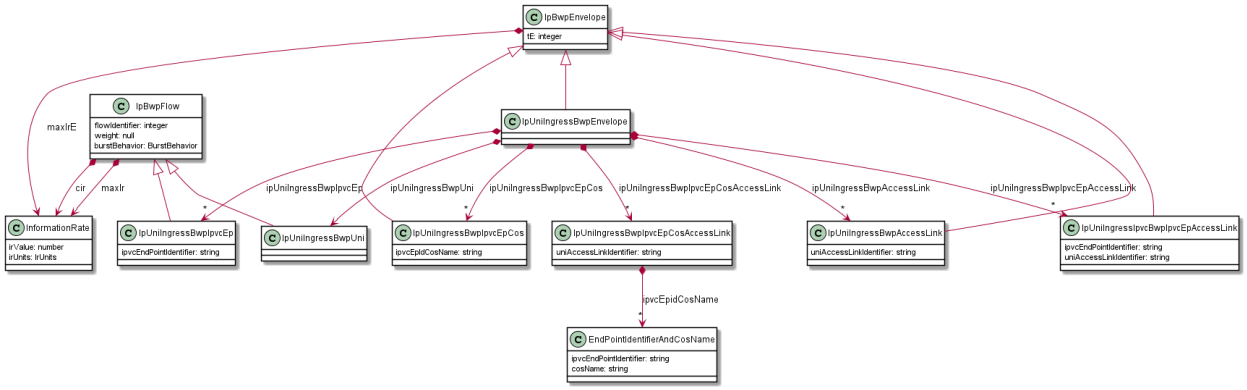


Figure 15 IpUniIngressBwpEnvelope

15.6.1 IpUniIngressBwpAccessLink

All Ingress IP Data Packets at the UNI that are received over one of a give set of UNI Access Links. Reference MEF 61.1 Section 12.4 UNI Ingress BWP Envelope.

Name	Type	Description
uniAccessLinkIdentifier	string[]	UNI Access Link Identifier.

Table 50 IpUniIngressBwpAccessLink

15.6.2 IpUniIngressBwpEnvelope

A single Bandwidth Profile Envelope consisting of parameters and Bandwidth Profile Flow specifications. If specified, the BWP Envelope is used for an ingress Bandwidth Profile. The BWP Flows can be defined per UNI, per IPVC EP, per UNI Access Link, per CosName, etc. Reference MEF 61.1 Section 12.4 UNI Ingress Bandwidth Profile Envelope Service Attribute.

Name	Type	Description
ipUniIngressBwpUni	IpUniIngressBwpUni	All Ingress IP Data Packets at the UNI. Reference MEF 61.1 Section 12.4 UNI Ingress BWP Envelope.
ipUniIngressBwpIpvcEpCosAccessLink	IpUniIngressBwpIpvcEpCosAccessLink[]	All Ingress IP Data Packets at the UNI that are received over one of a given set of UNI Access Links, and that are mapped to the any of a given set of (IPVC EP, Cos Name) pairs. Reference MEF 61.1 Section 12.4 UNI Ingress BWP Envelope.
ipUniIngressBwpIpvcEp	IpUniIngressBwpIpvcEp[]	All Ingress IP Data Packets at the UNI that are mapped to any of a given set of IPVC EPs. Reference MEF 61.1 Section 12.4 UNI Ingress BWP Envelope.
ipUniIngressBwpIpvcEpCos	IpUniIngressBwpIpvcEpCos[]	All Ingress IP Data Packets at the UNI that are mapped to any of a given set of (IPVC, EP, CoS Name) pairs. Reference MEF 61.1 Section 12.4 UNI Ingress BWP Envelope.
ipUniIngressBwpAccessLink	IpUniIngressBwpAccessLink[]	All Ingress IP Data Packets at the UNI that are mapped to any of a given set of (IPVC, EP, CoS Name) pairs. Reference MEF 61.1 Section 12.4 UNI Ingress BWP Envelope.
ipUniIngressBwpIpvcEpAccessLink	IpUniIngressIpvcBwpIpvcEpAccessLink[]	All Ingress IP Data Packets at the UNI that are received over one of a give set of UNI Access Links. Reference MEF 61.1 Section 12.4 UNI Ingress BWP Envelope.

Table 51 IpUniIngressBwpEnvelope

15.6.3 IpUniIngressBwpIpvcEp

All Ingress IP Data Packets at the UNI that are mapped to any of a given set of IPVC EPs. Reference MEF 61.1 Section 12.4 UNI Ingress BWP Envelope.

Name	Type	Description
ipvcEndPointIdentifier	string[]	IPVC End Point Identifier for an IPVC End Point located at the UNI.

Table 52 IpUniIngressBwpIpvcEp

15.6.4 IpUniIngressBwpIpvcEpCos

All Ingress IP Data Packets at the UNI that are mapped to any of a given set of (IPVC, EP, CoS Name) pairs. Reference MEF 61.1 Section 12.4 UNI Ingress BWP Envelope.

Name	Type	Description
ipvcEpIdCosName	string[]	IPVC End Point and CoS Identifier. Reference MEF 61.1 Table 28.

Table 53 IpUniIngressBwpIpvcEpCos

15.6.5 IpUniIngressBwpIpvcEpCosAccessLink

All Ingress IP Data Packets at the UNI that are received over one of a given set of UNI Access Links,and that are mapped to the any of a given set of (IPVC EP, Cos Name) pairs. Reference MEF 61.1 Section 12.4 UNI Ingress BWP Envelope.

Name	Type	Description
ipvcEpidCosName	EndPointIdentifierAndCosName[]	IPVC End Point and CoS Identifier. Reference MEF 61.1 Table 28.
uniAccessLinkIdentifier	string[]	UNI Access Link Identifier.

Table 54 IpUniIngressBwpIpvcEpCosAccessLink

15.6.6 IpUniIngressBwpUni

All Ingress IP Data Packets at the UNI. Reference MEF 61.1 Section 12.4 UNI Ingress BWP Envelope.

15.6.7 IpUniIngressIpvcBwpIpvcEpAccessLink

All Ingress IP Data Packets at the UNI that are received over one of a give set of UNI Access Links. Reference MEF 61.1 Section 12.4 UNI Ingress BWP Envelope.

Name	Type	Description
ipvcEndPointIdentifier	string[]	IPVC End Point Identifier
uniAccessLinkIdentifier	string[]	UNI Access Link Identifier.

Table 55 IpUniIngressIpvcBwpIpvcEpAccessLink

15.7 UNI Egress Bandwidth Profile Envelope

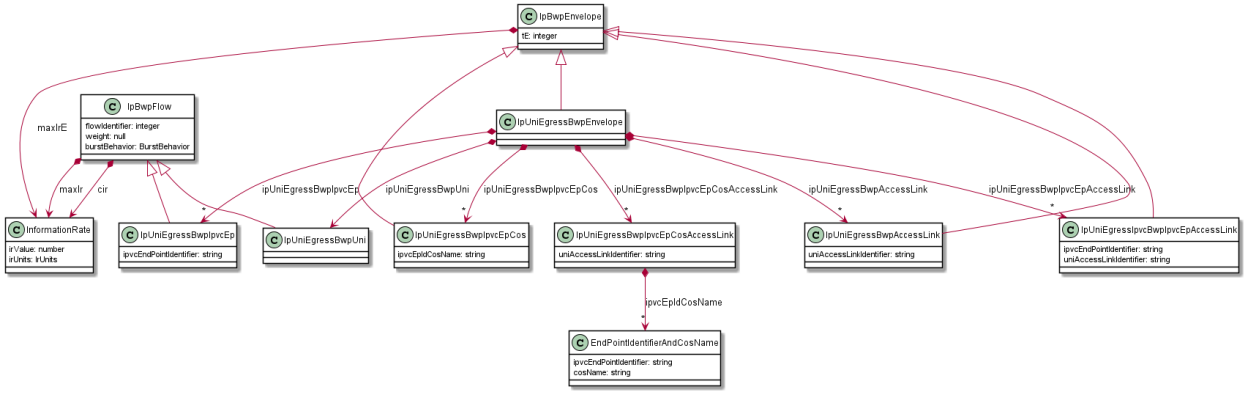


Figure 16 IpUniEgressBwpEnvelope

15.7.1 IpUniEgressBwpAccessLink

All Ingress IP Data Packets at the UNI that are received over one of a give set of UNI Access Links. Reference MEF 61.1 Section 12.5 UNI Egress BWP Envelope.

Name	Type	Description
uniAccessLinkIdentifier	string[]	UNI Access Link Identifier.

Table 56 IpUniEgressBwpAccessLink

15.7.2 IpUniEgressBwpEnvelope

A single Bandwidth Profile Envelope consisting of parameters and Bandwidth Profile Flow specifications. If specified, the BWP Envelope is used for an egress Bandwidth Profile. The BWP Flows can be defined per UNI, per IPVC EP, per UNI Access Link, per CosName, etc. Reference MEF 61.1 Section 12.5 UNI Egress Bandwidth Profile Envelope Service Attribute.

Name	Type	Description
ipUniEgressBwpUni	IpUniEgressBwpUni	All Egress IP Data Packets at the UNI. Reference MEF 61.1 Section 12.5 UNI Egress BWP Envelope.
ipUniEgressBwpAccessLink	IpUniEgressBwpAccessLink[]	All Egress IP Data Packets at the UNI that are mapped to any of a given set of (IPVC, EP, CoS Name) pairs. Reference MEF 61.1 Section 12.5 UNI Egress BWP Envelope.
ipUniEgressBwpIpvcEpCos	IpUniEgressBwpIpvcEpCos[]	All Egress IP Data Packets at the UNI that are mapped to any of a given set of (IPVC, EP, CoS Name) pairs. Reference MEF 61.1 Section 12.5 UNI Egress BWP Envelope.
ipUniEgressBwpIpvcEpCosAccessLink	IpUniEgressBwpIpvcEpCosAccessLink[]	All Egress IP Data Packets at the UNI that are received over one of a given set of UNI Access Links, and that are mapped to the any of a given set of (IPVC EP, Cos Name) pairs. Reference MEF 61.1 Section 12.5 UNI Egress BWP Envelope.

ipUniEgressBwpIpvcEp	IpUniEgressBwpIpvcEp[]	All Egress IP Data Packets at the UNI that are mapped to any of a given set of IPVC EPs. Reference MEF 61.1 Section 12.5 UNI Egress BWP Envelope.
ipUniEgressBwpIpvcEpAccessLink	IpUniEgressIpvcBwpIpvcEpAccessLink[]	All Egress IP Data Packets at the UNI that are received over one of a give set of UNI Access Links. Reference MEF 61.1 Section 12.5 UNI Egress BWP Envelope.

Table 57 IpUniEgressBwpEnvelope

15.7.3 IpUniEgressBwpIpvcEp

All Ingress IP Data Packets at the UNI that are mapped to any of a given set of IPVC EPs. Reference MEF 61.1 Section 12.5 UNI Egress BWP Envelope.

Name	Type	Description
ipvcEndPointIdentifier	string[]	IPVC End Point Identifier for an IPVC End Point located at the UNI.

Table 58 IpUniEgressBwpIpvcEp

15.7.4 IpUniEgressBwpIpvcEpCos

All Ingress IP Data Packets at the UNI that are mapped to any of a given set of (IPVC, EP, CoS Name) pairs. Reference MEF 61.1 Section 12.5 UNI Egress BWP Envelope.

Name	Type	Description
ipvcEpIdCosName	string[]	IPVC End Point and CoS Identifier. Reference MEF 61.1 Table 28.

Table 59 IpUniEgressBwpIpvcEpCos

15.7.5 IpUniEgressBwpIpvcEpCosAccessLink

All Ingress IP Data Packets at the UNI that are received over one of a given set of UNI Access Links,and that are mapped to the any of a given set of (IPVC EP, Cos Name) pairs. Reference MEF 61.1 Section 12.4 UNI Ingress BWP Envelope.

Name	Type	Description
ipvcEpIdCosName	EndPointIdentifierAndCosName[]	IPVC End Point and CoS Identifier. Reference MEF 61.1 Table 28.
uniAccessLinkIdentifier	string[]	UNI Access Link Identifier.

Table 60 IpUniEgressBwpIpvcEpCosAccessLink

15.7.6 IpUniEgressBwpUni

All Ingress IP Data Packets at the UNI. Reference MEF 61.1 Section 12.5 UNI Egress BWP Envelope.

15.7.7 IpUniEgressIpvcBwpIpvcEpAccessLink

All Ingress IP Data Packets at the UNI that are received over one of a give set of UNI Access Links. Reference MEF 61.1 Section 12.4 UNI Ingress BWP Envelope.

Name	Type	Description
ipvcEndPointIdentifier	string[]	IPVC End Point Identifier
uniAccessLinkIdentifier	string[]	UNI Access Link Identifier.

Table 61 IpUniEgressIpvcBwpIpvcEpAccessLink

15.8 IPVC End Point Ingress Bandwidth Profile Envelope

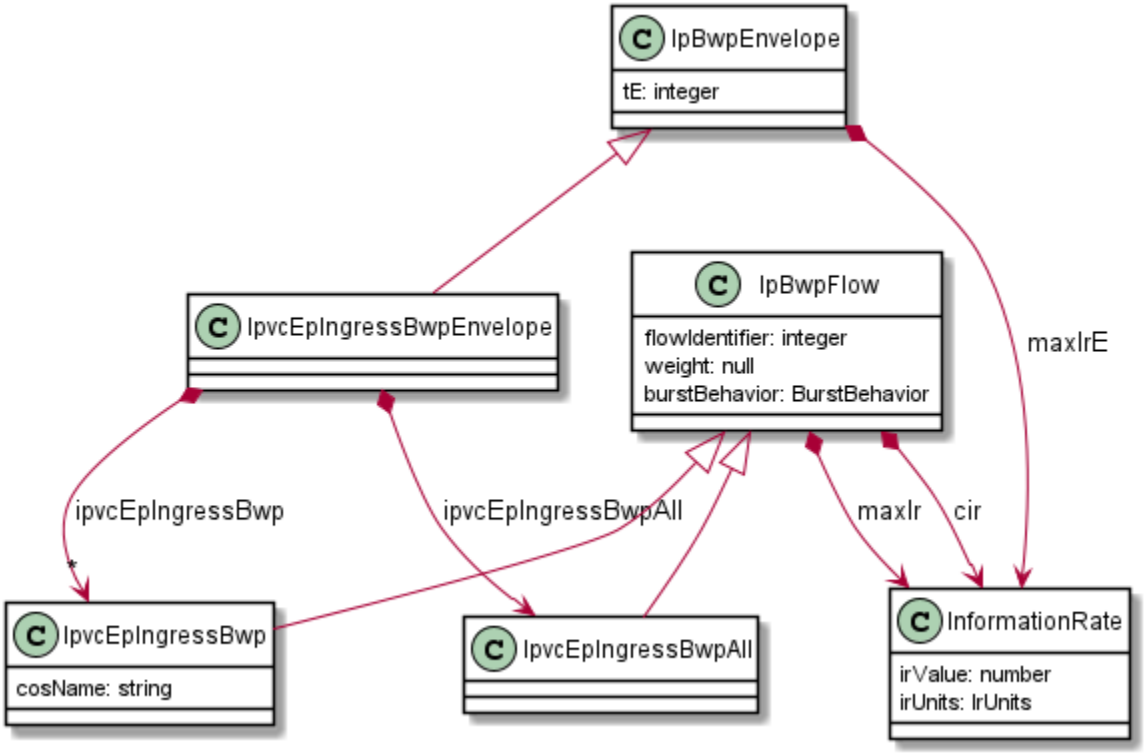


Figure 17 IpvcEpIngressBwpEnvelope

15.8.1 IpvcEpIngressBwp

An Ingress Bandwidth for and IPVC End Point with an associated Class of Service identifier.

Name	Type	Description
cosName	string[]	Class of Service name.

Table 62 IpvcEpIngressBwp

15.8.2 IpvcEpIngressBwpAll

A single Bandwidth Profile Envelope consisting of parameters and Bandwidth Profile specification applied to all ingress IP Packets. Reference MEF 61.1**Błąd! Nie można odnaleźć źródła odwołania.** Section 11.11. NOTE: No attributes are needed.

15.8.3 IpvcEpIngressBwpEnvelope

A single Bandwidth Profile Envelope consisting of parameters and Bandwidth Profile specifications. An Ingress Bandwidth Profile Envelope can be specified for one of a UNI, a UNI Access Link and ENNI Link or an IPVC End Point. Reference MEF 61.1 Section 11.11 IPVC EP Ingress Bandwidth Profile Envelope Service Attribute.

Name	Type	Description
ipvcEpIngressBwp	IpvcEpIngressBwp[]	Pointer to IpvcEpBwp
ipvcEpIngressBwpAll	IpvcEpIngressBwpAll	Pointer to IpvcEpBwpAll

Table 63 IpvcEpIngressBwpEnvelope

15.9 IPVC End Point Ingress Bandwidth Profile Envelope

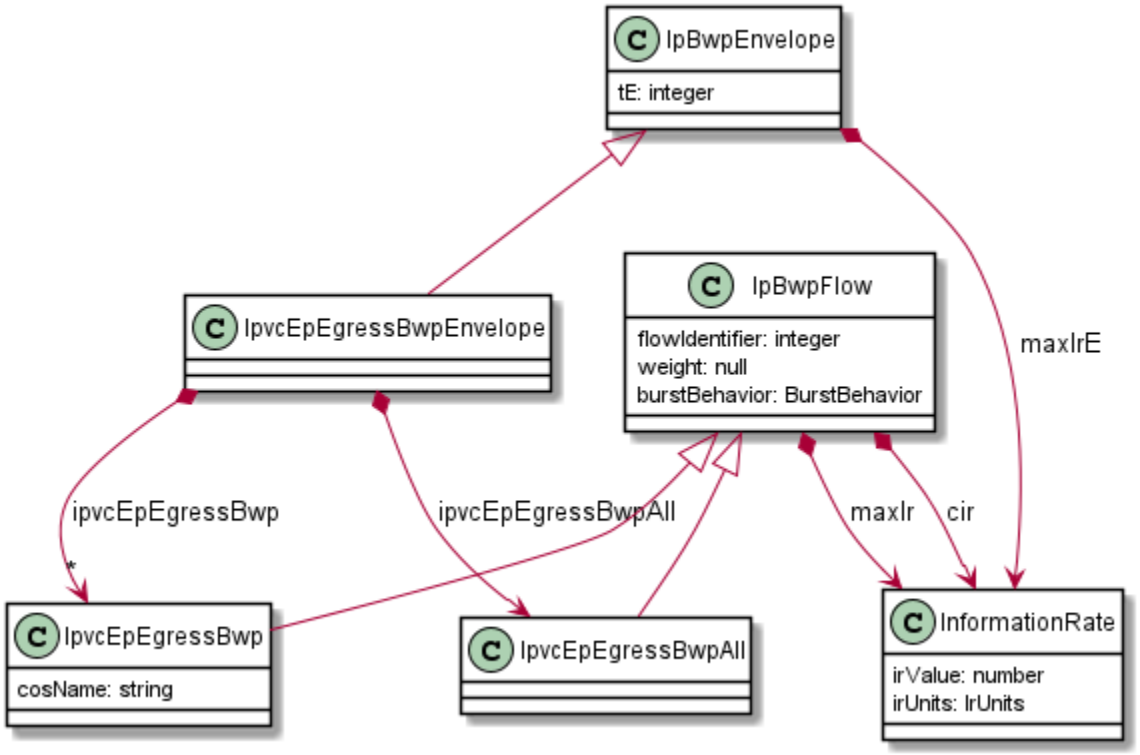


Figure 18 IpvcEpEgressBwpEnvelope

15.9.1 IpvcEpEgressBwp

An Egress Bandwidth for and IPVC End Point with an associated Class of Service identifier.

Name	Type	Description
cosName	string[]	Class of Service name.

Table 64 IpvcEpEgressBwp

15.9.2 IpvcEpEgressBwpAll

All Egress IP Data Packets at the IPVC End Point. Reference MEF 61.1[1] Section 11.12.
NOTE: No attributes are needed.

15.9.3 IpvcEpEgressBwpEnvelope

A single Bandwidth Profile Envelope consisting of parameters and Bandwidth Profile specifications. An Egress Bandwidth Profile Envelope can be specified for one of a UNI, a UNI Access Link and ENNI Link or an IPVC End Point. Reference MEF 61.1 Section 11.11 IPVC EP Egress Bandwidth Profile Envelope Service Attribute.

Name	Type	Description
ipvcEpEgressBwp	IpvcEpEgressBwp[]	Pointer to IpvcEpBwp
ipvcEpEgressBwpAll	IpvcEpEgressBwpAll	Pointer to IpvcEpBwpAll

Table 65 IpvcEpEgressBwpEnvelope

15.10 IP SLS

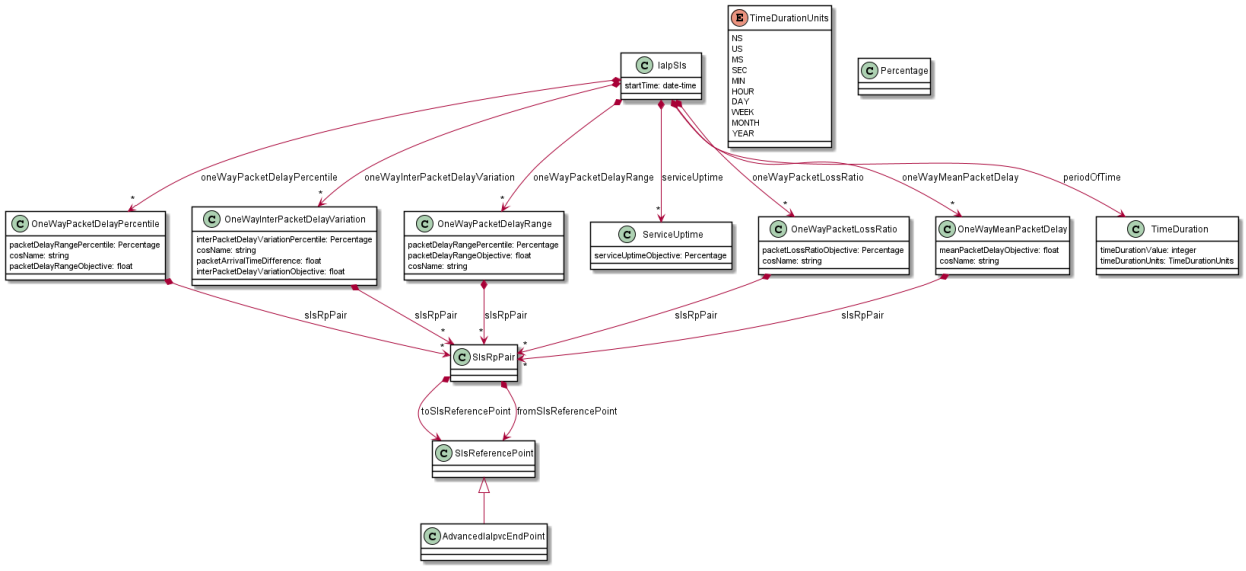


Figure 19 IaIpSls

15.10.1 IaIpSls

The IPVC Service Level Specification (SLS) describes the performance objectives for the performance of conformant IP Data Packets that flow over the IPVC. The IPVC Service Level Specification Attribute is either None, or a four-tuple of the form (s,T,E,L) where s is the start time, T is a period of time, E is a set of SLS entries and L is a set of the CoS Name and number of other parameters specific to the Performance Metric. Reference MEF 61.1 Section 10.9 IPVC Service Level Specification Service Attribute.

Name	Type	Description
oneWayPacketDelayPercentile	OneWayPacketDelayPercentile[]	One-way Packet Delay Percentile metric.
oneWayInterPacketDelayVariation	OneWayInterPacketDelayVariation[]	One-way Inter-Packet Delay Variation metric.
oneWayPacketDelayRange	OneWayPacketDelayRange[]	One-way Packet Delay Range metric.
serviceUptime	ServiceUptime[]	Service uptime metric.
oneWayPacketLossRatio	OneWayPacketLossRatio[]	One-way Packet Loss Ratio metric.
oneWayMeanPacketDelay	OneWayMeanPacketDelay[]	One-way Mean Packet Delay metric.
startTime	date-time	Start time of IP SLS.
periodOfTime	TimeDuration	Period of time over which IP SLS is measured.

Table 66 IaIpSls

15.10.2 OneWayInterPacketDelayVariation

The One-way Inter-Packet Delay Variation Performance Metric is the maximum, over all the ordered pairs of SLS-RPs in a given set S, of the vth percentile of differences between the one-way packet delays of Qualified Packets that arrive at time separated by a given interval tau, for a given ordered pair of SLS-RPs, a given CoS Name, and a given time period Tk. Reference MEF 61.1 Section 10.9.6 One-way Inter-Packet Delay Variation Performance Metric.

Name	Type	Description
slsRpPair	SlsRpPair[]	Set of ordered SLS-RP pairs. Reference MEF 61.1 Section 10.9.5 One-way Mean Packet Delay Performance Metric, Table-5.
interPacketDelayVariationPercentile	Percentage	Inter-Packet Delay Variation Percentile. Reference MEF 61.1 Section 10.9.6 One-way Inter-Packet Delay Variation Performance Metric, Table 6.
cosName	string	One of the values in the IPVC List of Class of Service Names Service Attribute. Reference MEF 61.1 Section 10.9.6 One-way Inter-Packet Delay Variation Performance Metric, Table-6.
packetArrivalTimeDifference	number	Difference in the time of arrival of packets. Reference MEF 61.1 Section 10.9.6 One-way Inter-Packet Delay Variation Performance Metric, Table 6.
interPacketDelayVariationObjective	number	Inter-Packet Delay Variation Objective. Reference MEF 61.1 Section 10.9.6 One-way Inter-Packet Delay Variation Performance Metric, Table 6.

Table 67 OneWayInterPacketDelayVariation

15.10.3 OneWayMeanPacketDelay

The One-way Mean Packet Delay Performance Metric is the maximum, over all the ordered pairs of SLS-RPs in a given set S, of the arithmetic mean of one-way packet delay for Qualified Packets for a given ordered pair of SLS-RPs, a given CoS Name, and a given time period Tk. Reference MEF 61.1 Section 10.9.5 One-way Mean Packet Delay Performance Metric.

Name	Type	Description
slsRpPair	SlsRpPair[]	Set of ordered SLS-RP pairs. Reference MEF 61.1 Section 10.9.5 One-way Mean Packet Delay Performance Metric, Table-5.
meanPacketDelayObjective	number	Mean Packet Delay Objective. Reference MEF 61.1 Section 10.9.5 One-way Mean Packet Delay Performance Metric, Table-5.
cosName	string	One of the values in the IPVC List of Class of Service Names Service Attribute. Reference MEF 61.1 Section 10.9.5 One-way Mean Packet Delay Performance Metric, Table-5.

Table 68 OneWayMeanPacketDelay

15.10.4 OneWayPacketDelayPercentile

The One-way Packet Delay Percentile Performance Metric is the maximum, over all the order pairs of SLS-RPs in a given set S, of the pth percentile of one-way packet delay for Qualified Packets for a given order pair of SLS-RPs, a given CoS Name and a given time period Tk. Reference MEF 61.1 Section 10.9.4 One-way Packet Delay Percentile Performance Metric.

Name	Type	Description
slsRpPair	SlsRpPair[]	Set of ordered SLS-RP pairs. Reference MEF 61.1 Section 10.9.5 One-way Mean Packet Delay Performance Metric, Table-5.
packetDelayRangePercentile	Percentage	Packet Delay Range Percentile. Reference MEF 61.1 Section 10.9.7 One-way Packet Delay Range Performance Metric, Table 7.
cosName	string	One of the values in the IPVC List of Class of Service Names Service Attribute. Reference MEF 61.1 Section 10.9.4 One-way Packet Delay Percentile Performance Metric, Table-4.
packetDelayRangeObjective	number	Packet Delay Objective. Reference MEF 61.1 Section 10.9.4 One-way Packet Delay Percentile Performance Metric, Table-4.

Table 69 OneWayPacketDelayPercentile

15.10.5 OneWayPacketDelayRange

The One-way Packet Delay Range Performance Metric is the maximum, over all the ordered pairs of SLS-RPs in a given set S, of the difference between the rth percentile of one-way packet delay and the minimum one-way packet delay, for Qualified Packets for a given ordered pair of SLS-RPs, a given CoS Name, and a given time period Tk. Reference MEF 61.1 Section 10.9.7 One-way Packet Delay Range Performance Metric.

Name	Type	Description
slsRpPair	SlsRpPair[]	Set of ordered SLS-RP pairs. Reference MEF 61.1 Section 10.9.5 One-way Mean Packet Delay Performance Metric, Table-5.
packetDelayRangePercentile	Percentage	Packet Delay Range Percentile. Reference MEF 61.1 Section 10.9.7 One-way Packet Delay Range Performance Metric, Table 7.
packetDelayRangeObjective	number	Packet Delay Range Objective. Reference MEF 61.1 Section 10.9.7 One-way Packet Delay Range Performance Metric, Table 7.
cosName	string	One of the values in the IPVC List of Class of Service Names Service Attribute. Reference MEF 61.1 Section 10.9.7 One-way Mean Packet Delay Performance Metric, Table-7.

Table 70 OneWayPacketDelayRange

15.10.6 OneWayPacketLossRatio

The One-way Packet Loss Ratio Performance Metric is the maximum, over the ordered pairs of SLS-RPs in a given set S, of the ratio of lost packets to transmitted packets for a given ordered pair of SLS-RPs, a given CoS Name and a given time period Tk. Reference MEF 61.1 Section 10.9.8 One-way Packet Loss Ratio Performance Metric.

Name	Type	Description
packetLossRatioObjective	Percentage	Packet Loss Ratio Objective. Reference MEF 61.1 Section 10.9.8 One-way Packet Loss Ratio Performance Metric, Table 8.
slsRpPair	SlsRpPair[]	Set of ordered SLS-RP pairs. Reference MEF 61.1 Section 10.9.5 One-way Mean Packet Delay Performance Metric, Table-5.
cosName	string	One of the values in the IPVC List of Class of Service Names Service Attribute. Reference MEF 61.1 Section 10.9.8 One-way Packet Loss Ratio Performance Metric, Table-8.

Table 71 OneWayPacketLossRatio

15.10.7 ServiceUptime

The Service Uptime Performance Metric is the proportion of time, during a given time period Tk, that the service is working from the perspective of the Subscriber (for a Subscriber IP Service) or the perspective of the SP/SO (for an Operator IP Service), excluding any pre-agreed exceptions, for example maintenance intervals. Reference MEF 61.1[1] Section 10.9 Service Uptime Performance Metric..

Name	Type	Description
serviceUptimeObjective	Percentage	Service Uptime Objective. Reference MEF 61.1 Section 10.9.9 Service Uptime Performance Metric, Table 9.

Table 72 ServiceUptime

15.10.8 SlsReferencePoint

SlsReferencePoint is an abstract data type that can be subclassed to IpvcEndPoint and Location. Reference MEF 61.1 Section 10.9.1 SLS Reference Points.

15.10.9 SlsRpPair

Service Level Specification Reference Point Pair. In a multipoint or rooted multipoint IPVC, performance objectives are ideally specified as applying between pairs of IPVC EPs - in other words, they apply to the performance that IP Data Packets experience as they flow from one EI to another. The SlsRpPair is a representation of this association. Reference MEF 61.1 Section 10.9.1

Name	Type	Description
toSlsReferencePoint	SlsReferencePoint	Pointer to the "to" SLS Reference Point.
fromSlsReferencePoint	SlsReferencePoint	Pointer to the "from" SLS Reference Point.

Table 73 SlsRpPair

15.11 OSPF

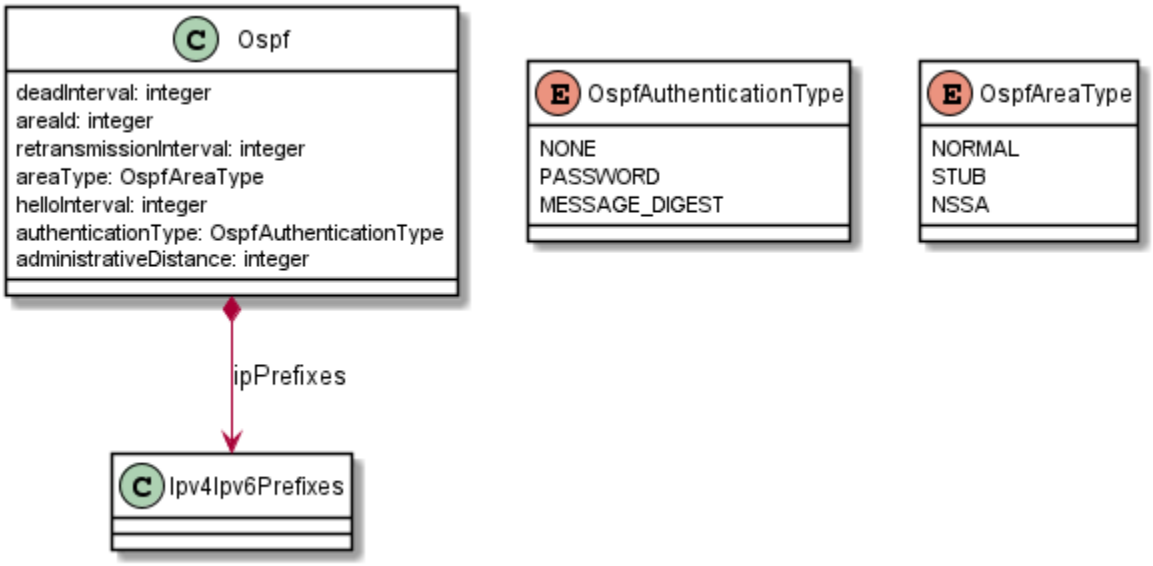


Figure 20 OSPF

15.11.1 Ospf

When an entry in the UNI Routing Protocols is for OSPF, OSPF as specified in RFC 2328 (for IPv4) and/or RFC 5340 (for IPv6) is used across each UNI Access Link to exchange routing information. Reference MEF 61.1 Section 12.7.2 OSPF.

Name	Type	Description
deadInterval	integer	Dead interval (0-429496295, in seconds)
areaId	integer	Area ID (0-429967295), normally expressed as an IPv4 address.
retransmissionInterval	integer	Retransmit interval (integer greater than 0, in seconds)
areaType	OspfAreaType	OSPF Area Type enumeration.
helloInterval	integer	Hello interval (0-65535, in seconds)
authenticationType	OspfAuthenticationType	OSPF Authentication Type.
ipPrefixes	Ipv4Ipv6Prefixes	IPv4/IPv6 Prefixes that are advertised using OSPF.
administrativeDistance	integer	Administrative distance (integer greater than 0)

Table 74 Ospf

15.11.2 OspfAreaType

OSPF Area Type enumeration as defined in RFC-3101.

Contains Enumeration Literals:

- NORMAL:
  - The area is not a STUB or NSSA.
- STUB: Stub Area.
- NSSA: Not-so-Stubby Area.

15.11.3 OspfAuthenticationType

OSPF Authentication Type enumeration.

Contains Enumeration Literals:

- NONE:
  - This is the default method and means that no authentication is used for OSPF.
- PASSWORD:
  - It is also known as "authentication with unencrypted text", because the password in the update is sent as unencrypted text over the network.
- MESSAGE_DIGEST:
  - The password is never exchanged between peers. Instead, it is calculated using the MD5 algorithm.

15.12 Static routing

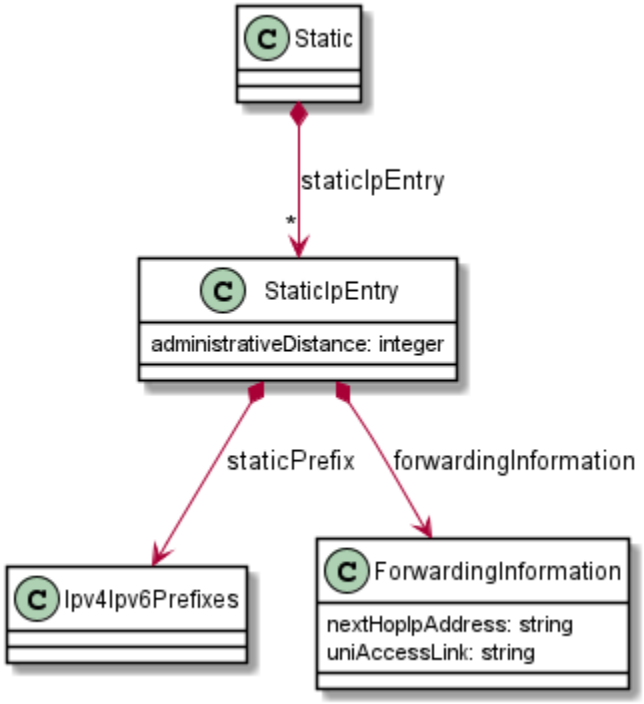


Figure 21 Static

15.12.1 ForwardingInformation

Forwarding information, consisting of either a nexthop IP address in the Subscriber Network (if the access medium is multipoint capable, e.g., Ethernet), or a specific UNI Access Link (if the access medium is strictly point-to-point, e.g., HDLC, PPP over DSL).

Name	Type	Description
nextHopIpAddress	string	Next hop IP address.
uniAccessLink	string	UNI Access Link unique identifier.

Table 75 ForwardingInformation

15.12.2 Static

When an entry in the UNI Routing Protocols list is for Static, the IP Prefixes used in the Subscriber Network that are reachable via this UNI are specified as additional parameters in the entry. These are known as Static IP Prefixes. Reference MEF 61.1 Section 12.7.1 Static.

Name	Type	Description
staticIpEntry	StaticIpEntry[]	Static IP address entry.

Table 76 Static

15.12.3 StaticIpEntry

StaticIpEntry data type including IPv4/IPv6 prefixes, forwarding information and administrative distance.

Name	Type	Description
staticPrefix	Ipv4Ipv6Prefixes	Static IP prefix either IPv4 or IPv6.
administrativeDistance	integer	Administrative distance, an integer > 0.
forwardingInformation	ForwardingInformation	Forwarding information with either Next Hop IP address or UNI Access Link identifier.

Table 77 StaticIpEntry

16 References

[1] IETF JSON Schema draft 7, *JSON Schema: A Media Type for Describing JSON Documents* and associated documents, by Austin Wright and Henry Andrews, March 2018. Copyright © 2018 IETF Trust and the persons identified as the document authors. All rights reserved.

[2] IETF RFC 4271, *A Border Gateway Protocol 4 (BGP-4),* by Dr. Yakov Rekhter, January 2006. Copyright © The Internet Society (2006). All Rights Reserved.

[3] MEF 61.1, IP Service Attributes, May 2019

[4] MEF 69.1, Subscriber IP Service Definitions, February 2022

[5] MEF 55.1, Lifecycle Service Orchestration (LSO): Reference Architecture and Framework, January 2021

[6] MEF 57.2, Draft Release 4 Product Order Management Requirements and Use Cases, May 2022

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