

TM Forum Specification

TMF637 Product Inventory Management API REST Specification

TMF637
Release 19.0.0
June 2019

| | |
|--|-------------------|
| Latest Update: TM Forum Release 19.0.0 | Member Evaluation |
| Version 4.0.0 | IPR Mode: RAND |

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Introduction

The following document is the specification of the REST API for Product Inventory Management. It includes the model definition as well as all available operations. Possible actions are creating, updating and retrieving Product.

The Product API provides a standardized mechanism to retrieve product inventory information. The API consists of a simple set of operations that interact with Inventory systems in a consistent manner. Usually, a product is created and modified consequently to product order but could be also 'directly' modified for administrative reason.

Product API manages product resource:

- A Product represents an instance of a product offering subscribed to by a party, such as a customer, the place where the product is in use, as well as configuration characteristics, such as assigned telephone numbers and internet addresses. The Product also tracks the services and/or resources through which the product is realized.

Product API performs the following operations on Product:

- Retrieval of a product or a collection of product depending on filter criteria
- Partial update of a product (including updating rules) (for administration purposes)
- Creation of a product (including default values and creation rules) (for administration purposes)
- Deletion of product (for administration purposes)
- Notification of events on product
 - Product creation
 - Product removal
 - Product status change
 - Product value change used to notify that any data in a product has just changed

The following assumptions were considered in the development of this document:

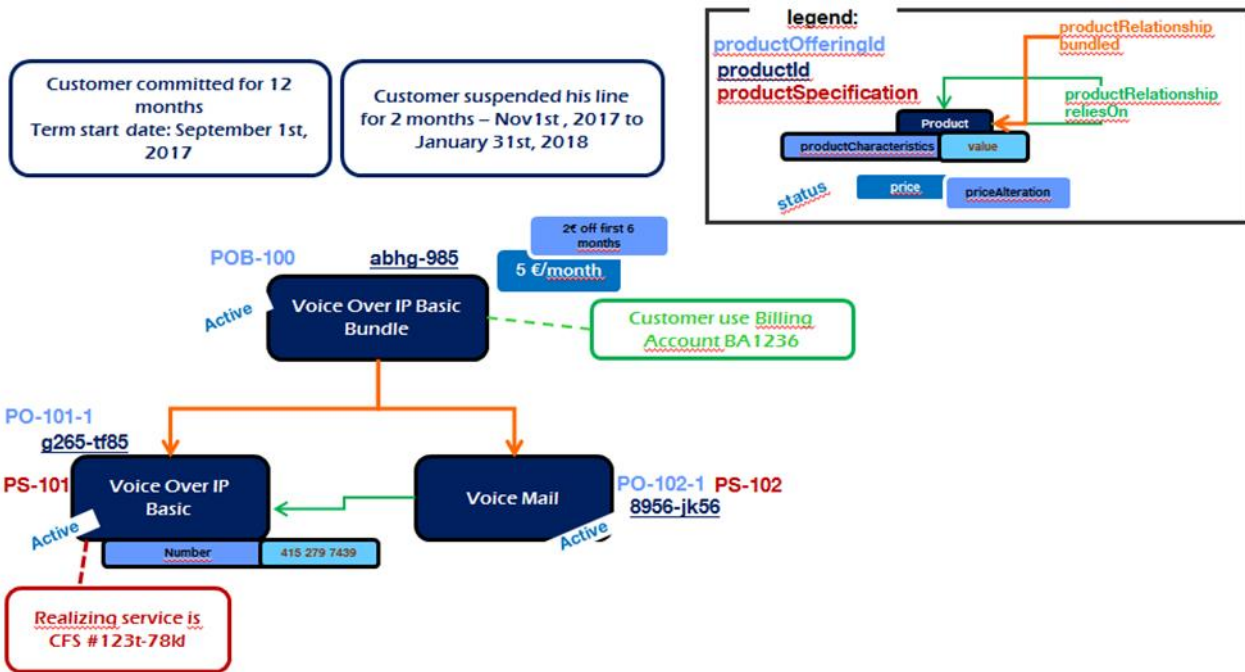
- The Product Inventory Management system has access to the commercial catalog system.
- Product Inventory creation and update should be consistently managed with architecture rules. This specification describe product operations but do not define usage UC.

Sample Use Cases

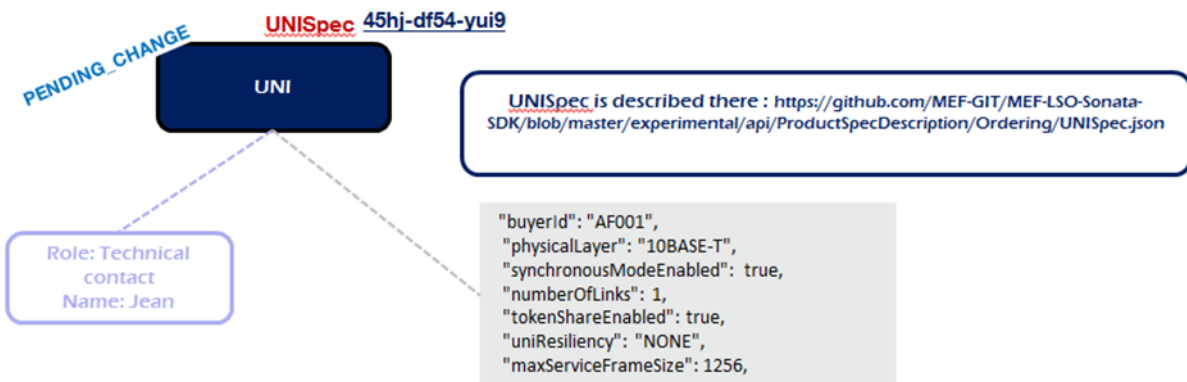
Reader will find example of use cases using Usage API in “Open Digital Business Scenarios and Use Cases” document.

In order to illustrate JSON we’ll use the 2 following examples. These examples are only for illustration purpose and they must not be considered as product modeling guideline.

Example 1 – Voice over bundle Basic bundle:



Example 2 : UNI Ethernet access



Support of polymorphism and extension patterns

Support of polymorphic collections and types and schema based extension is provided by means of a list of generic meta-attributes that we describe below. Polymorphism in collections occurs when entities inherit from base entities, for instance a `PhysicalProduct` and a `CloudProduct` inheriting properties from the abstract `Product` entity.

Generic support of polymorphism and pattern extensions is described in the TMF API Guidelines v3.0 Part 2 document.

The `@type` attribute provides a way to represent the actual class type of an entity. For example, within a list of `Product` instances some may be instances of `PhysicalProduct` where other could be instances of `CloudProduct`. The `@type` gives this information. All resources and sub-resources of this API have a `@type` attributes that can be provided when this is useful.

The `@referredType` can be used within reference entities (like for instance a `ProductRef` object) to explicitly denote the actual entity type of the referred class. Notice that in reference entities the `@type`, when used, denotes the class type of the reference itself, such as `PhysicalProductRef` or `CloudProductRef`, and not the class type of the referred object. However since reference classes are rarely sub-classed, `@type` is generally not useful in reference objects.

The `@schemaLocation` property can be used in resources to allow specifying user-defined properties of an Entity or to specify the expected *characteristics* of an entity.

The `@baseType` attribute gives a way to provide explicitly the base of class of a given resource that has been extended.

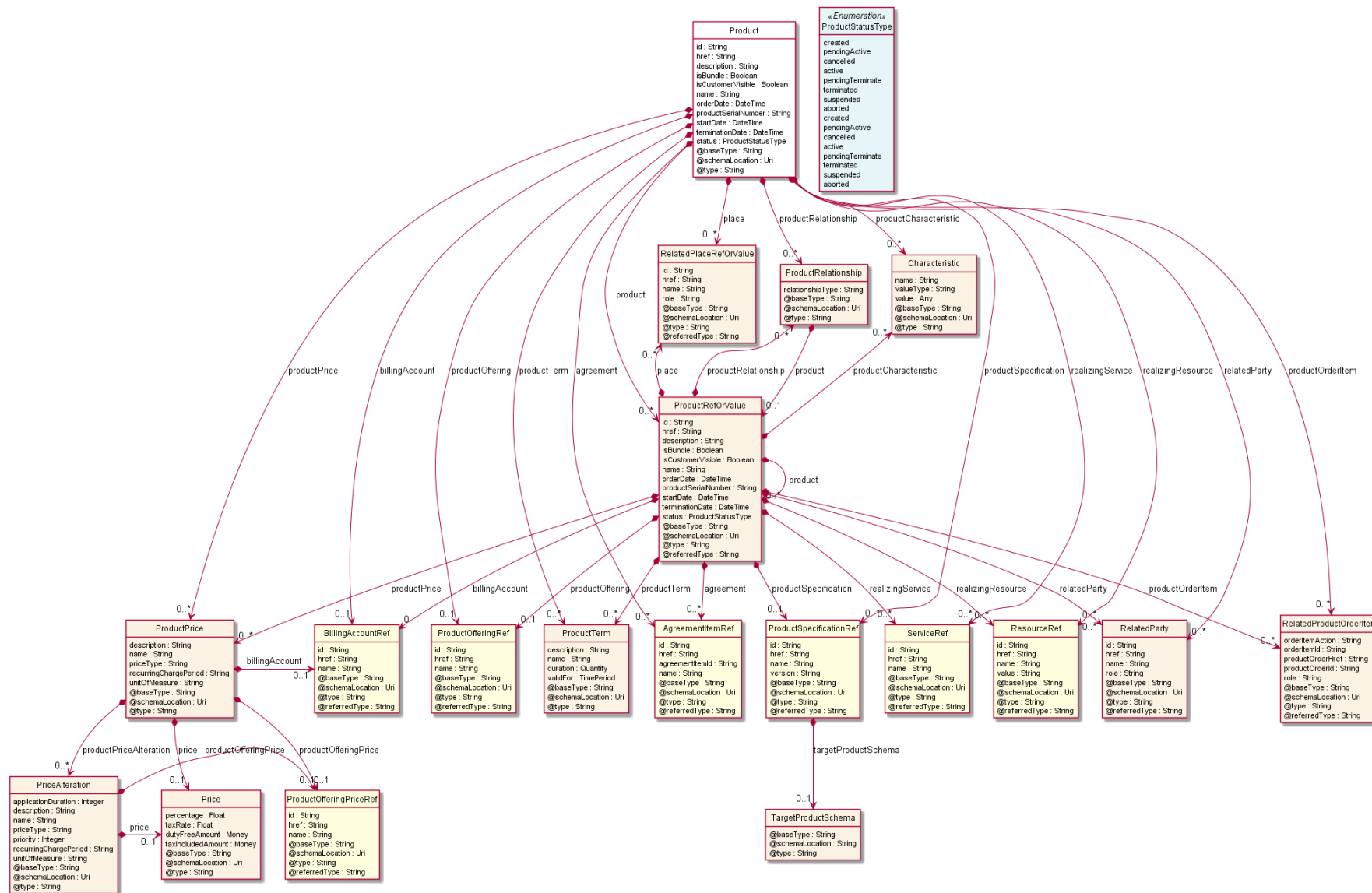
RESOURCE MODEL

Managed Entity and Task Resource Models

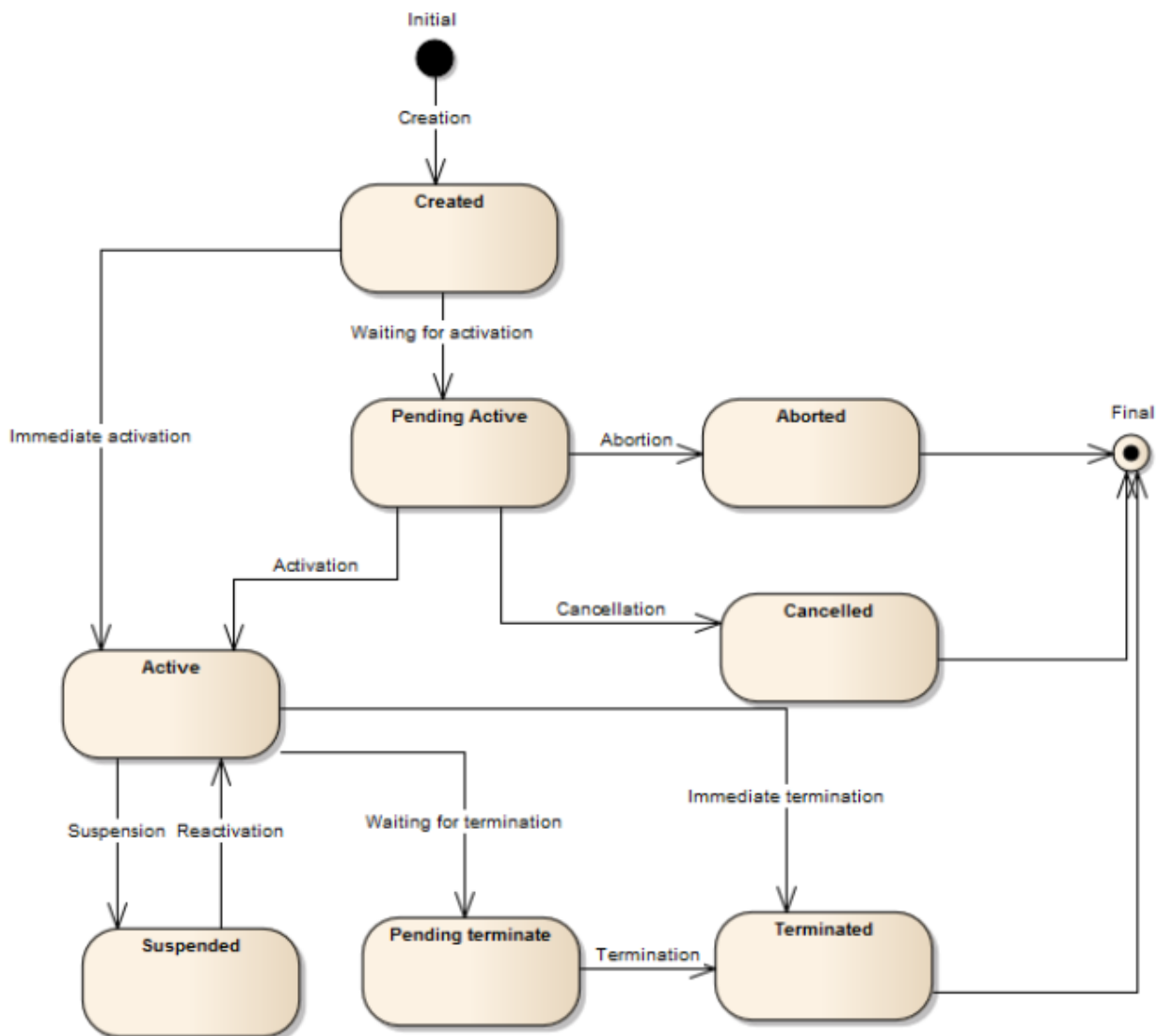
Product resource

A product offering procured by a customer or other interested party playing a party role. A product is realized as one or more service(s) and / or resource(s).

Resource model



Lifecycle



State definition:

| State | Definition |
|--------------------------|--|
| Created | The product instance has been created but not yet activated. |
| Pending Active | The product is in activation phase. Not yet active but it is in progress |
| Aborted | The product activation has been stopped by abnormal condition. There is probably an unexpected delivery issue. |
| Cancelled | The product activation has been cancelled – it could come from customer or provider. |
| Active | The product is live and running |
| Suspended | The product is suspended – it could be an outcome from a customer request or provider decision. |
| Pending Terminate | The product is still active but a termination process is in progress. It will soon be terminated. |

| | |
|-------------------|------------------------------------|
| Terminated | The product is not anymore active. |
|-------------------|------------------------------------|

Field descriptions

Product fields

| | |
|-------------------|---|
| agreement | A list of agreement item references (AgreementItemRef [*]). Agreement reference. An agreement represents a contract or arrangement, either written or verbal and sometimes enforceable by law, such as a service level agreement or a customer price agreement. An agreement involves a number of other business entities, such as products, services, and resources and/or their specifications. |
| billingAccount | A billing account reference (BillingAccountRef). A BillingAccount is a detailed description of a bill structure. |
| description | A string. Is the description of the product. It could be copied from the description of the Product Offering. |
| href | A string. Reference of the product. |
| id | A string. Unique identifier of the product. |
| isBundle | A boolean. If true, the product is a ProductBundle which is an instantiation of a BundledProductOffering. If false, the product is a ProductComponent which is an instantiation of a SimpleProductOffering. |
| isCustomerVisible | A boolean. If true, the product is visible by the customer. |
| name | A string. Name of the product. It could be the same as the name of the product offering. |
| orderDate | A date time (DateTime). Is the date when the product was ordered. |
| place | A list of related place ref or values (RelatedPlaceRefOrValue [*]). Related Entity reference. A related place defines a place described by reference or by value linked to a specific entity. The polymorphic attributes @type, @schemaLocation & @referredType are related to the place entity and not the RelatedPlaceRefOrValue class itself. |
| product | A list of product ref or values (ProductRefOrValue [*]). A product to be created defined by value or existing defined by reference. The polymorphic attributes @type, @schemaLocation & @referredType are related to the product entity and not the RelatedProductRefOrValue class itself. |

| | |
|-----------------------|---|
| productCharacteristic | A list of characteristics (Characteristic [*]). Describes a given characteristic of an object or entity through a name/value pair. |
| productOffering | A product offering reference (ProductOfferingRef). A product offering represents entities that are orderable from the provider of the catalog, this resource includes pricing information. |
| productOrderItem | A list of related product order items (RelatedProductOrderItem [*]). RelatedProductOrderItem (ProductOrder item) .The product order item which triggered product creation/change/termination. |
| productPrice | A list of product prices (ProductPrice [*]). An amount, usually of money, that represents the actual price paid by a Customer for a purchase, a rent or a lease of a Product. The price is valid for a defined period of time. |
| productRelationship | A list of product relationships (ProductRelationship [*]). Linked products to the one instantiate, such as [bundled] if the product is a bundle and you want to describe the bundled products inside this bundle; [reliesOn] if the product needs another already owned product to rely on (e.g. an option on an already owned mobile access product) [targets] or [isTargeted] (depending on the way of expressing the link) for any other kind of links that may be useful. |
| productSerialNumber | A string. Is the serial number for the product. This is typically applicable to tangible products e.g. Broadband Router. |
| productSpecification | A product specification reference (ProductSpecificationRef). A ProductSpecification is a detailed description of a tangible or intangible object made available externally in the form of a ProductOffering to customers or other parties playing a party role. |
| productTerm | A list of product terms (ProductTerm [*]). Description of a productTerm linked to this product. This represent a commitment with a duration. |
| realizingResource | A list of resource references (ResourceRef [*]). |
| realizingService | A list of service references (ServiceRef [*]). for when Service is used by other entities. |
| relatedParty | A list of related parties (RelatedParty [*]). Related Entity reference. A related party defines party or party role linked to a specific entity. |
| startDate | A date time (DateTime). Is the date from which the product starts. |
| status | A product status type (ProductStatusType). Is the lifecycle status of the product. |
| terminationDate | A date time (DateTime). Is the date when the product was terminated. |

Characteristic sub-resource

Describes a given characteristic of an object or entity through a name/value pair.

| | |
|-----------|---|
| name | A string. Name of the characteristic. |
| value | An any (Any). The value of the characteristic. |
| valueType | A string. Data type of the value of the characteristic. |

Money sub-resource

A base / value business entity used to represent money.

| | |
|-------|--|
| unit | A string. Currency (ISO4217 norm uses 3 letters to define the currency). |
| value | A float. A positive floating point number. |

Price sub-resource

Provides all amounts (tax included, duty free, tax rate), used currency and percentage to apply for Price Alteration.

| | |
|-------------------|---|
| dutyFreeAmount | A money (Money). All taxes excluded amount (expressed in the given currency). |
| percentage | A float. Percentage to apply for ProdOfferPriceAlteration. |
| taxIncludedAmount | A money (Money). All taxes included amount (expressed in the given currency). |
| taxRate | A float. Tax rate. |

PriceAlteration sub-resource

Is an amount, usually of money, that modifies the price charged for an order item.

| | |
|----------------------|--|
| applicationDuration | An integer. Duration during which the alteration applies on the order item price (for instance 2 months free of charge for the recurring charge). |
| description | A string. A narrative that explains in detail the semantics of this order item price alteration. |
| name | A string. Name of the order item price alteration. |
| price | A price (Price). Provides all amounts (tax included, duty free, tax rate), used currency and percentage to apply for Price Alteration. |
| priceType | A string. A category that describes the price such as recurring, one time and usage. |
| priority | An integer. Priority level for applying this alteration among all the defined alterations on the order item price. |
| productOfferingPrice | A product offering price reference (ProductOfferingPriceRef). ProductPriceOffering reference. An amount, usually of money, that is asked for or allowed when a ProductOffering is bought, rented, or leased. |

recurringChargePeriod A string. Could be month, week...

unitOfMeasure A string. Could be minutes, GB...

ProductPrice sub-resource

An amount, usually of money, that represents the actual price paid by a Customer for a purchase, a rent or a lease of a Product. The price is valid for a defined period of time.

billingAccount A billing account reference (BillingAccountRef). A BillingAccount is a detailed description of a bill structure.

description A string. A narrative that explains in detail the semantics of this product price.

name A string. A short descriptive name such as "Subscription price".

price A price (Price). Provides all amounts (tax included, duty free, tax rate), used currency and percentage to apply for Price Alteration.

priceType A string. A category that describes the price, such as recurring, discount, allowance, penalty, and so forth.

productOfferingPrice A product offering price reference (ProductOfferingPriceRef). ProductPriceOffering reference. An amount, usually of money, that is asked for or allowed when a ProductOffering is bought, rented, or leased.

productPriceAlteration A list of price alterations (PriceAlteration [*]). Is an amount, usually of money, that modifies the price charged for an order item.

recurringChargePeriod A string. Could be month, week...

unitOfMeasure A string. Could be minutes, GB...

ProductRefOrValue sub-resource

A product to be created defined by value or existing defined by reference. The polymorphic attributes @type, @schemaLocation & @referredType are related to the product entity and not the RelatedProductRefOrValue class itself.

@referredType A string. The actual type of the target instance when needed for disambiguation.

href A string. Reference of the product.

id A string. Unique identifier of the product.

name A string. Name of the product. It could be the same as the name of the product offering.

| | |
|-----------------------|---|
| description | A string. Is the description of the product. It could be copied from the description of the Product Offering. |
| href | A string. Reference of the product. |
| id | A string. Unique identifier of the product. |
| isBundle | A boolean. If true, the product is a ProductBundle which is an instantiation of a BundledProductOffering. If false, the product is a ProductComponent which is an instantiation of a SimpleProductOffering. |
| isCustomerVisible | A boolean. If true, the product is visible by the customer. |
| name | A string. Name of the product. It could be the same as the name of the product offering. |
| orderDate | A date time (DateTime). Is the date when the product was ordered. |
| productSerialNumber | A string. Is the serial number for the product. This is typically applicable to tangible products e.g. Broadband Router. |
| startDate | A date time (DateTime). Is the date from which the product starts. |
| terminationDate | A date time (DateTime). Is the date when the product was terminated. |
| agreement | A list of agreement item references (AgreementItemRef [*]). Agreement reference. An agreement represents a contract or arrangement, either written or verbal and sometimes enforceable by law, such as a service level agreement or a customer price agreement. An agreement involves a number of other business entities, such as products, services, and resources and/or their specifications. |
| billingAccount | A billing account reference (BillingAccountRef). A BillingAccount is a detailed description of a bill structure. |
| place | A list of related place ref or values (RelatedPlaceRefOrValue [*]). Related Entity reference. A related place defines a place described by reference or by value linked to a specific entity. The polymorphic attributes @type, @schemaLocation & @referredType are related to the place entity and not the RelatedPlaceRefOrValue class itself. |
| product | A list of product ref or values (ProductRefOrValue [*]). A product to be created defined by value or existing defined by reference. The polymorphic attributes @type, @schemaLocation & @referredType are related to the product entity and not the RelatedProductRefOrValue class itself. |
| productCharacteristic | A list of characteristics (Characteristic [*]). Describes a given characteristic of an object or entity through a name/value pair. |

| | |
|----------------------|---|
| productOffering | A product offering reference (ProductOfferingRef). A product offering represents entities that are orderable from the provider of the catalog, this resource includes pricing information. |
| productOrderItem | A list of related product order items (RelatedProductOrderItem [*]). RelatedProductOrderItem (ProductOrder item) .The product order item which triggered product creation/change/termination. |
| productPrice | A list of product prices (ProductPrice [*]). An amount, usually of money, that represents the actual price paid by a Customer for a purchase, a rent or a lease of a Product. The price is valid for a defined period of time. |
| productRelationship | A list of product relationships (ProductRelationship [*]). Linked products to the one instantiate, such as [bundled] if the product is a bundle and you want to describe the bundled products inside this bundle; [reliesOn] if the product needs another already owned product to rely on (e.g. an option on an already owned mobile access product) [targets] or [isTargeted] (depending on the way of expressing the link) for any other kind of links that may be useful. |
| productSpecification | A product specification reference (ProductSpecificationRef). A ProductSpecification is a detailed description of a tangible or intangible object made available externally in the form of a ProductOffering to customers or other parties playing a party role. |
| productTerm | A list of product terms (ProductTerm [*]). Description of a productTerm linked to this product. This represent a commitment with a duration. |
| realizingResource | A list of resource references (ResourceRef [*]). |
| realizingService | A list of service references (ServiceRef [*]). for when Service is used by other entities. |
| relatedParty | A list of related parties (RelatedParty [*]). Related Entity reference. A related party defines party or party role linked to a specific entity. |
| status | A product status type (ProductStatusType). Is the lifecycle status of the product. |

ProductRelationship sub-resource

Linked products to the one instantiate, such as [bundled] if the product is a bundle and you want to describe the bundled products inside this bundle; [reliesOn] if the product needs another already owned product to rely on (e.g. an option on an already owned mobile access product) [targets] or [isTargeted] (depending on the way of expressing the link) for any other kind of links that may be useful.

| | |
|---------|---|
| product | A product ref or value (ProductRefOrValue). A product to be created defined by value or existing defined by reference. The polymorphic attributes @type, @schemaLocation & @referredType are related to the product entity and not the RelatedProductRefOrValue class itself. |
|---------|---|

relationshipType A string. Type of the product relationship, such as [bundled] if the product is a bundle and you want to describe the bundled products inside this bundle; [reliesOn] if the product needs another already owned product to rely on (e.g. an option on an already owned mobile access product) [targets] or [isTargeted] (depending on the way of expressing the link) for any other kind of links that may be useful.

ProductTerm sub-resource

Description of a productTerm linked to this product. This represent a commitment with a duration.

description A string. Description of the productTerm.

duration A quantity (Quantity). Duration of the productTerm.

name A string. Name of the productTerm.

validFor A time period. productTerm validity period.

Quantity sub-resource

An amount in a given unit.

amount A float. Numeric value in a given unit.

units A string. Unit.

RelatedParty sub-resource

Related Entity reference. A related party defines party or party role linked to a specific entity.

@referredType A string. The actual type of the target instance when needed for disambiguation.

href A string. Reference of the related entity.

id A string. Unique identifier of a related entity.

name A string. Name of the related entity.

role A string. Role played by the related party.

RelatedPlaceRefOrValue sub-resource

Related Entity reference. A related place defines a place described by reference or by value linked to a specific entity. The polymorphic attributes @type, @schemaLocation & @referredType are related to the place entity and not the RelatedPlaceRefOrValue class itself.

@referredType A string. The actual type of the target instance when needed for disambiguation.

href A string. Unique reference of the place.

| | |
|------|---|
| id | A string. Unique identifier of the place. |
| name | A string. A user-friendly name for the place, such as [Paris Store], [London Store], [Main Home]. |
| href | A string. Unique reference of the place. |
| id | A string. Unique identifier of the place. |
| name | A string. A user-friendly name for the place, such as [Paris Store], [London Store], [Main Home]. |
| role | A string. |

RelatedProductOrderItem sub-resource

RelatedProductOrderItem (ProductOrder item) .The product order item which triggered product creation/change/termination.

| | |
|------------------|--|
| @referredType | A string. The actual type of the target instance when needed for disambiguation. |
| orderItemAction | A string. Action of the order item for this product. |
| orderItemId | A string. Identifier of the order item where the product was managed. |
| productOrderHref | A string. Reference of the related entity. |
| productOrderId | A string. Unique identifier of a related entity. |
| role | A string. role of the product order item for this product. |

TargetProductSchema sub-resource

The reference object to the schema and type of target product which is described by product specification.

| | |
|-----------------|---|
| @schemaLocation | A string. This field provides a link to the schema describing the target product. |
| @type | A string. Class type of the target product. |

AgreementItemRef relationship

Agreement reference. An agreement represents a contract or arrangement, either written or verbal and sometimes enforceable by law, such as a service level agreement or a customer price agreement. An agreement involves a number of other business entities, such as products, services, and resources and/or their specifications.

| | |
|---------------|--|
| @referredType | A string. The actual type of the target instance when needed for disambiguation. |
| href | A string. Reference of the related entity. |
| id | A string. Unique identifier of a related entity. |

| | |
|-----------------|--|
| name | A string. Name of the related entity. |
| agreementItemId | A string. Identifier of the agreement. |

BillingAccountRef relationship

BillingAccount reference. A BillingAccount is a detailed description of a bill structure.

| | |
|---------------|--|
| @referredType | A string. The actual type of the target instance when needed for disambiguation. |
| href | A string. Reference of the billing account. |
| id | A string. Unique identifier of the billing account. |
| name | A string. Name of the billing account. |

ProductOfferingPriceRef relationship

ProductPriceOffering reference. An amount, usually of money, that is asked for or allowed when a ProductOffering is bought, rented, or leased.

| | |
|---------------|--|
| @referredType | A string. The actual type of the target instance when needed for disambiguation. |
| href | A string. Reference of the related entity. |
| id | A string. Unique identifier of a related entity. |
| name | A string. Name of the related entity. |

ProductOfferingRef relationship

ProductOffering reference. A product offering represents entities that are orderable from the provider of the catalog, this resource includes pricing information.

| | |
|---------------|--|
| @referredType | A string. The actual type of the target instance when needed for disambiguation. |
| href | A string. Reference of the related entity. |
| id | A string. Unique identifier of a related entity. |
| name | A string. Name of the related entity. |

ProductSpecificationRef relationship

Product specification reference: A ProductSpecification is a detailed description of a tangible or intangible object made available externally in the form of a ProductOffering to customers or other parties playing a party role.

| | |
|---------------|--|
| @referredType | A string. The actual type of the target instance when needed for disambiguation. |
| href | A string. Reference of the related entity. |

| | |
|---------------------|--|
| id | A string. Unique identifier of a related entity. |
| name | A string. Name of the related entity. |
| targetProductSchema | A target product schema (TargetProductSchema). A target product schema reference. The reference object to the schema and type of target product which is described by product specification. |
| version | A string. Version of the product specification. |

ResourceRef relationship

| | |
|---------------|---|
| @referredType | A string. The actual type of the target instance when needed for disambiguation. |
| href | A string. Reference of the related entity. |
| id | A string. Unique identifier of a related entity. |
| name | A string. Name of the resource. |
| name | A string. Name of the resource. |
| value | A string. The resource value that can be used to identify a resource with a public key (e.g.: a tel nr, an msisdn). |

ServiceRef relationship

Service reference, for when Service is used by other entities.

| | |
|---------------|--|
| @referredType | A string. The actual type of the target instance when needed for disambiguation. |
| href | A string. Reference of the related entity. |
| id | A string. Unique identifier of a related entity. |
| name | A string. Name of the related entity. |

Json representation sample

We provide below the json representation of an example of a 'Product' resource object

```
[
  {
    "id": "g265-tf85",
    "href": "https://host:port/productInventoryManagement/v4/product/g265-tf85",
    "description": "product description",
    "isBundle": false,
    "isCustomerVisible": true,
    "name": "Voice Over IP Basic instance for Jean",
    "productSerialNumber": "N/A",
  }
]
```

```
"startDate": "2017-11-01T09:37:29.961Z",
"status": "active",
"@baseType": "Product",
"@type": "Product",
"@schemaLocation": "https://host:port/standardProduct.json",
"realizingService": [
  {
    "id": "123t-78k",
    "href": "https...",
    "role": "RealizingService",
    "@referredType": "Service"
  }
],
"productOffering": {
  "id": "PO-101-1",
  "href": "https...",
  "name": "Voice Over IP Basic",
  "@referredType": "ProductOffering"
},
"productOrderItem": [
  {
    "productOrderId": "1023-98gh",
    "productOrderHref": "https...",
    "orderItemId": "2",
    "orderItemAction": "add",
    "@referredType": "ProductOrder",
    "role": "Install order"
  },
  {
    "productOrderId": "df65-gh12",
    "productOrderHref": "https...",
    "orderItemId": "2",
    "orderItemAction": "change",
    "@referredType": "ProductOrder",
    "role": "change management order"
  },
  {
    "productOrderId": "5ghh-sd12",
    "productOrderHref": "https...",
    "orderItemId": "3",
    "orderItemAction": "change",
    "@referredType": "ProductOrder",
    "role": "change management order"
  }
],
"productCharacteristic": [
  {
    "name": "Number",
    "valueType": "string",
    "value": "415 279 7439"
  }
],
"relatedParty": [
  {
    "id": "45hj-8888",
```

```
    "href": "https...",
    "name": "Jean",
    "role": "User",
    "@referredType": "Individual"
  }
],
"productSpecification": {
  "id": "PS-101",
  "href": "https...",
  "@referredType": "ProductSpecification",
  "version": "1"
}
}
```

Notification Resource Models

5 notifications are defined for this API

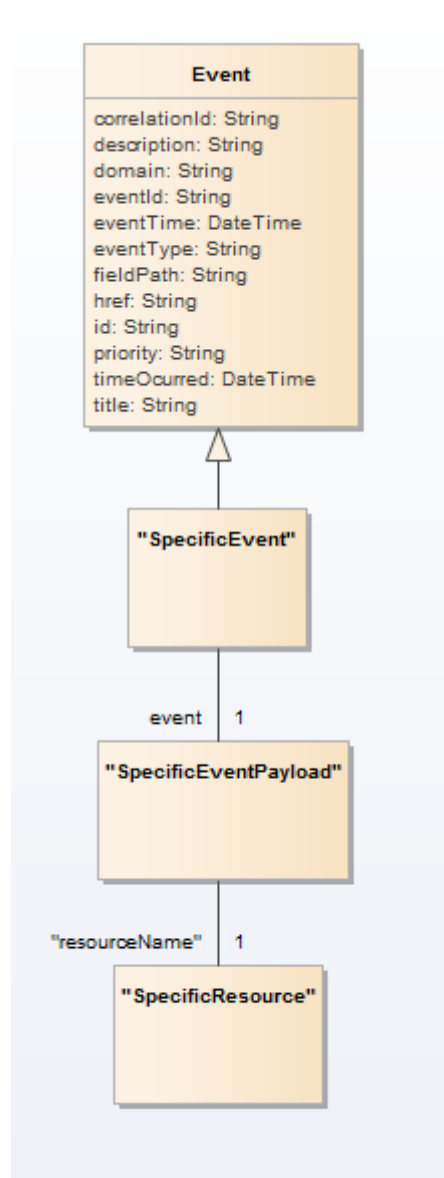
Notifications related to Product:

- ProductCreateEvent
- ProductAttributeValueChangeEvent
- ProductStateChangeEvent
- ProductBatchEvent
- ProductDeleteEvent

The notification structure for all notifications in this API follow the pattern depicted by the figure below.

A notification event resource (depicted by "SpecificEvent" placeholder) is a sub class of a generic Event structure containing at least an id of the event occurrence (eventId), an event timestamp (eventTime), and the name of the resource (eventType).

This notification structure owns an event payload structure ("SpecificEventPayload" placeholder) linked to the resource concerned by the notification using the resource name as access field ("resourceName" placeholder).



Product Create Event

Notification ProductCreateEvent case for resource Product

Json representation sample

We provide below the json representation of an example of a 'ProductCreateEvent' notification event object

```

{
  "eventId":"00001",
  "eventTime":"2015-11-16T16:42:25-04:00",
  "eventType":"ProductCreateEvent",
  "event": {
    "product":
      {-- SEE Product RESOURCE SAMPLE --}
  }
}

```

```
}
```

Product Attribute Value Change Event

Notification ProductAttributeValueChangeEvent case for resource Product

Json representation sample

We provide below the json representation of an example of a 'ProductAttributeValueChangeEvent' notification event object

```
{
  "eventId":"00001",
  "eventTime":"2015-11-16T16:42:25-04:00",
  "eventType":"ProductAttributeValueChangeEvent",
  "event": {
    "product" :
      {-- SEE Product RESOURCE SAMPLE --}
  }
}
```

Product State Change Event

Notification ProductStateChangeEvent case for resource Product

Json representation sample

We provide below the json representation of an example of a 'ProductStateChangeEvent' notification event object

```
{
  "eventId":"00001",
  "eventTime":"2015-11-16T16:42:25-04:00",
  "eventType":"ProductStateChangeEvent",
  "event": {
    "product" :
      {-- SEE Product RESOURCE SAMPLE --}
  }
}
```

Product Batch Event

Notification ProductBatchEvent case for resource Product

Json representation sample

We provide below the json representation of an example of a 'ProductBatchEvent' notification event object

```
{
  "eventId":"00001",
  "eventTime":"2015-11-16T16:42:25-04:00",
```



```
"eventType":"ProductBatchEvent",
"event": {
  "product" :
    [-- SEE Product RESOURCE SAMPLE --]
}
}
```

Product Delete Event

Notification ProductDeleteEvent case for resource Product

Json representation sample

We provide below the json representation of an example of a 'ProductDeleteEvent' notification event object

```
{
  "eventId":"00001",
  "eventTime":"2015-11-16T16:42:25-04:00",
  "eventType":"ProductDeleteEvent",
  "event": {
    "product" :
      [-- SEE Product RESOURCE SAMPLE --]
  }
}
```

API OPERATIONS

Only supported operations in this API are listed in this table:

| Operation on Entities | Uniform API Operation | Description |
|-----------------------------|-----------------------|--|
| Query Entities | GET Product | GET must be used to retrieve a representation of a resource. |
| Create Entity | POST Product | POST must be used to create a new resource |
| Partial Update of an Entity | PATCH Product | PATCH must be used to partially update a resource |
| Remove an Entity | DELETE Product | DELETE must be used to remove a resource |

Filtering and attribute selection rules are described in the TMF REST Design Guidelines.

Notifications are also described in a subsequent section.

Operations on Product

List products

GET `/product?fields=...&{filtering}`

Description

This operation list product entities.

Attribute selection is enabled for all first level attributes.

Filtering may be available depending on the compliance level supported by an implementation.

Usage Samples

Here's an example of a request for retrieving a list of product (not described in the UC part). The given criteria is the billing account id (BA1236).

Request

```
GET serverRoot/tmf-api/productManagement/v4/product?fields=id,href,status,orderDate,productOffering.id
,productOffering.name&status=suspended
Accept: application/json
```

Response

200

```
[
  {
    "id": "9ffg-ze56-ed51",
    "href": ".../productInventoryManagement/v4/product/9ffg-ze56-ed51",
    "status": "suspended",
    "orderDate": "2019-04-11T14:52:21.823Z",
    "productOffering": {
      "id": "sxcv-fg65",
      "name": "TMF 35 Bundle Plan"
    }
  },
  {
    "id": "7412",
    "href": ".../productInventoryManagement/v4/product/7412",
    "status": "suspended",
    "orderDate": "2019-04-18T14:21:31.325Z",
    "productOffering": {
      "id": "9d63-r8i9",
      "name": "TMF 45 Bundle Plan"
    }
  },
  {
    "id": "3214",
    "href": ".../productInventoryManagement/v4/product/3214",
    "status": "suspended",
    "orderDate": "2019-04-21T18:08:31.325Z",
    "productOffering": {
      "id": "sxcv-fg65",
      "name": "TMF 35 Bundle Plan"
    }
  },
  {
    "id": "6547",
    "href": ".../productInventoryManagement/v4/product/6547",
    "status": "suspended",
    "orderDate": "2019-04-29T10:48:28.325Z",
    "productOffering": {
      "id": "3bb2-e896",
      "name": "TMF 75 Bundle Plan"
    }
  }
]
```

]

Retrieve product

GET /product/{id}?fields=...&{filtering}

Description

This operation retrieves a product entity.

Attribute selection is enabled for all first level attributes.

Filtering on sub-resources may be available depending on the compliance level supported by an implementation.

Usage Samples

Here's an example of a request for retrieving a product for use case 1. The given criteria is the product id g265-tf85.

| Request |
|--|
| GET serverRoot/tmf-api/productManagement/v4/product/g265-tf85 Accept: application/json |
| Response |
| 200 { "id": "g265-tf85", "href": "https://host:port/productInventoryManagement/v4/product/g265-tf85", "description": "product description", "isBundle": false, "isCustomerVisible": true, "name": "Voice Over IP Basic instance for Jean", "productSerialNumber": "N/A", "startDate": "2017-11-01T09:37:29.961Z", "status": "Active", "@baseType": "Product", "@type": "Product", "@schemaLocation": "https://host:port/standardProduct.json", "realizingService": [{ "id": "123t-78k", "href": "https...", "role": "RelalizingService", "@referredType": "Service" }] } |

```
"productOffering": {
  "id": "PO-101-1",
  "href": "https...",
  "name": "Voice Over IP Basic",
  "@referredType": "ProductOffering"
},
"productOrder": [
  {
    "productOrderId": "1023-98gh",
    "productOrderHref": "https...",
    "orderItemId": "2",
    "orderItemAction": "add",
    "@referredType": "ProductOrder",
    "role": "Install order"
  },
  {
    "productOrderId": "df65-gh12",
    "productOrderHref": "https...",
    "orderItemId": "2",
    "orderItemAction": "change",
    "@referredType": "ProductOrder",
    "role": "change management order"
  },
  {
    "productOrderId": "5ghh-sd12",
    "productOrderHref": "https...",
    "orderItemId": "3",
    "orderItemAction": "change",
    "@referredType": "ProductOrder",
    "role": "change management order"
  }
],
"productCharacteristic": [
  {
    "name": "Number",
    "valueType": "string",
    "value": "415 279 7439"
  }
],
"relatedParty": [
  {
    "id": "45hj-8888",
    "href": "https...",
    "name": "Jean",
    "role": "User",
    "@referredType": "Individual"
  }
],
"productSpecification": {
  "id": "PS-101",
  "href": "https...",
  "@referredType": "ProductSpecification",
  "version": "1"
}
```

```
}

```

Here's an example of a request for retrieving a product for use case 2. The given criteria is the product.id 45hj-df54-yui9.

| Request |
|--|
| GET serverRoot/tmf-api/productManagement/v4/product/45hj-df54-yui9 Accept: application/json |
| Response |
| <pre>200 { "id": "45hj-df54-yui9", "href": "https...", "description": "UNI instance SPxxx", "name": "Name of the UNI", "startDate": "2018-03-16T09:37:29.961Z", "status": "active", "@baseType": "product", "@type": "MEFproduct", "productOrder": [{ "productOrderId": "ff45-kl36-hg44", "productOrderHref": "https....", "orderId": "1", "orderItemAction": "add", "@type": "ProductOrder" }, { "productOrderId": "as45-df65-gh12", "productOrderHref": "https...", "orderId": "1", "orderItemAction": "change", "@type": "ProductOrder" }], "relatedParty": [{ "name": "Jean", "role": "Technical Contact", "@referredType": "Individual", "@type": "RelatedParty" }, { "name": "Jennifer", "role": "Implementation Contact", </pre> |

```

    "@referredType": "Individual",
    "@type": "RelatedParty"
  },
  {
    "name": "Jesse",
    "role": "Site Contact",
    "@referredType": "Individual",
    "@type": "RelatedParty"
  }
],
"productSpecification": {
  "id": "UNISpec",
  "href": "https...",
  "version": "v2",
  "name": "UNI specification",
  "productTargetSchema": {
    "@type": "UNISpec",
    "@schemaLocation": "https://github.com/MEF-GIT/MEF-LSO-Sonata-
SDK/blob/master/experimental/api/ProductSpecDescription/Ordering/UNISpec.json",
    "buyerId": "AF001"
  }
},
"physicalLayer": "10BASE-T",
"synchronousModeEnabled": true,
"numberOfLinks": 1,
"tokenShareEnabled": true,
"uniResiliency": "NONE",
"maxServiceFrameSize": 1200,
"relatedPlace": [
  {
    "id": "4hhf9-rr54",
    "href": "https...",
    "name": "UNI Site for this customer",
    "role": "UNI Site",
    "@referredType": "geographicalSite",
    "@schemaLocation": "https...."
  }
]
}

```

Create product

POST /product

Description

This operation creates a product entity.

Mandatory and Non Mandatory Attributes

The following tables provide the list of mandatory and non mandatory attributes when creating a Product, including any possible rule conditions and applicable default values. Notice that it is up to an implementer to add additional mandatory attributes.

| Mandatory Attributes | Rule |
|----------------------|------|
| status | |

| Non Mandatory Attributes | Rule |
|--------------------------|-----------------------------|
| agreement | |
| billingAccount | |
| description | |
| isBundle | |
| isCustomerVisible | |
| name | |
| orderDate | |
| place | |
| product | |
| productCharacteristic | |
| productOffering | |
| productOrderItem | |
| productPrice | |
| productRelationship | |
| productSerialNumber | |
| productSpecification | |
| productTerm | |
| realizingResource | |
| realizingService | |
| relatedParty | |
| startDate | Must not be in POST Request |
| terminationDate | |

Additional Rules

The following table provides additional rules indicating mandatory fields in sub-resources or relationships when creating a Product resource.

| Context | Mandatory Sub-Attributes |
|----------------------|---------------------------|
| billingAccount | id |
| agreement | id |
| productOffering | id |
| relatedParty | id, @referredType |
| realizingService | id |
| realizingResource | id |
| productRelationship | relationshipType, product |
| productSpecification | id |
| relatedPlace | role, @referredType |

| | |
|------------------|----------------|
| productOrderItem | productOrderId |
| productPrice | priceType |

Usage Samples

Here's an example of a request for creating a product for use case 1 - the resulting product is g265-tf85.

Request

POST serverRoot/tmf-api/productManagement/v4/product

Content-Type: application/json

```
[
  {
    "description": "product description",
    "isBundle": false,
    "name": "Voice Over IP Basic instance for Jean",
    "@baseType": "Product",
    "@type": "Product",
    "@schemaLocation": "https://host:port/standardProduct.json",
    "productOffering": {
      "id": "PO-101-1",
      "name": "Voice Over IP Basic",
      "@referredType": "ProductOffering"
    },
    "productCharacteristic": [
      {
        "name": "Number",
        "valueType": "string",
        "value": "415 279 7439"
      }
    ],
    "relatedParty": [
      {
        "id": "45hj-8888",
        "name": "Jean",
        "role": "User",
        "@referredType": "Individual"
      }
    ],
    "productSpecification": {
      "id": "PS-101",
      "@referredType": "ProductSpecification",
      "version": "1"
    }
  }
]
```

Response

201

```
[
  {
    "id": "g265-tf85",
    "href": "https://host:port/productInventoryManagement/v4/product/g265-tf85",
    "description": "product description",
    "isBundle": false,
    "isCustomerVisible": true,
    "name": "Voice Over IP Basic instance for Jean",
    "productSerialNumber": "N/A",
    "startDate": "2017-11-01T09:37:29.961Z",
    "status": "created",
    "@baseType": "Product",
    "@type": "Product",
    "@schemaLocation": "https://host:port/standardProduct.json",
    "productOffering": {
      "id": "PO-101-1",
      "href": "https...",
      "name": "Voice Over IP Basic",
      "@referredType": "ProductOffering"
    },
    "productCharacteristic": [
      {
        "name": "Number",
        "valueType": "string",
        "value": "415 279 7439"
      }
    ],
    "relatedParty": [
      {
        "id": "45hj-8888",
        "href": "https...",
        "name": "Jean",
        "role": "User",
        "@referredType": "Individual"
      }
    ],
    "productSpecification": {
      "id": "PS-101",
      "href": "https...",
      "@referredType": "ProductSpecification",
      "version": "1"
    }
  }
]
```

Patch product**PATCH** /product/{id}

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Description

This operation allows partial updates of a product entity. Support of json/merge (<https://tools.ietf.org/html/rfc7386>) is mandatory, support of json/patch (<http://tools.ietf.org/html/rfc5789>) is optional.

Note: If the update operation yields to the creation of sub-resources or relationships, the same rules concerning mandatory sub-resource attributes and default value settings in the POST operation applies to the PATCH operation. Hence these tables are not repeated here.

Patchable and Non Patchable Attributes

The tables below provide the list of patchable and non patchable attributes, including constraint rules on their usage.

| Patchable Attributes | Rule |
|-----------------------|------|
| agreement | |
| billingAccount | |
| description | |
| isBundle | |
| isCustomerVisible | |
| name | |
| orderDate | |
| place | |
| product | |
| productCharacteristic | |
| productOffering | |
| productOrderItem | |
| productPrice | |
| productRelationship | |
| productSerialNumber | |
| productSpecification | |
| productTerm | |
| realizingResource | |
| realizingService | |
| relatedParty | |
| startDate | |
| status | |
| terminationDate | |

| Non Patchable Attributes | Rule |
|--------------------------|------|
| id | |
| href | |

Usage Samples

Here's an example of a request for updating a product for use case 2 using json-patch - Change value for max service frame size + implementation contact .

| Request |
|--|
| <pre>PATCH serverRoot/tmf-api/productManagement/v4/product/45hj-df54-yui9 Content-Type: application/json-patch+json [{ "op": "replace", "path": "/relatedParty/name?relatedParty.role=Implementation Contact", "value": "Pierre" }, { "op": "replace", "path": "/productSpecification/describing/maxServiceFrameSize", "value": 1200 }]</pre> |
| Response |
| <pre>200 [{ "id": "45hj-df54-yui9", "href": "https...", "description": "UNI instance SPxxx", "name": "Name of the UNI", "startDate": "2018-03-16T09:37:29.961Z", "status": "active", "@baseType": "Product", "@type": "MEFproduct", "productOrder": [{ "productOrderId": "ff45-kl36-hg44", "productOrderHref": "https...", "orderItemId": "1", "orderItemAction": "add", "@type": "ProductOrder" }, { "productOrderId": "as45-df65-gh12", "productOrderHref": "https...", "orderItemId": "1", "orderItemAction": "change", "@type": "ProductOrder" }] }],</pre> |

```
"relatedParty": [
  {
    "name": "Jean",
    "role": "Technical Contact",
    "@referredType": "Individual"
  },
  {
    "name": "Pierre",
    "role": "Implementation Contact",
    "@referredType": "Individual"
  },
  {
    "name": "Jesse",
    "role": "Site Contact",
    "@referredType": "Individual"
  }
],
"productSpecification": {
  "id": "UNISpec",
  "href": "https...",
  "version": "v2",
  "name": "UNI specification",
  "productTargetSchema": {
    "@type": "UNISpec",
    "@schemaLocation": "https://github.com/MEF-GIT/MEF-LSO-Sonata-
SDK/blob/master/experimental/api/ProductSpecDescription/Ordering/UNISpec.json",
    "buyerId": "AF001"
  }
},
"physicalLayer": "10BASE-T",
"synchronousModeEnabled": true,
"numberOfLinks": 1,
"tokenShareEnabled": true,
"uniResiliency": "NONE",
"maxServiceFrameSize": 1200,
"relatedPlace": [
  {
    "id": "4hhf9-rr54",
    "href": "https...",
    "name": "UNI Site for this customer",
    "role": "UNI Site",
    "@referredType": "GeographicalSite",
    "@schemaLocation": "https...."
  }
]
}
]
```

Here's an example of a request for updating a UNI product using merge-patch - Change value for max service frame size + site contact .

Request

PATCH serverRoot/tmf-api/productManagement/v4/product/45hj-df54-yui9
Content-Type: application/merge-patch+json

```
{
  "id": "45hj-df54-yui9",
  "relatedParty": [
    {
      "name": "Jean",
      "role": "Technical Contact",
      "@referredType": "Individual"
    },
    {
      "name": "Pierre",
      "role": "Implementation Contact",
      "@referredType": "Individual"
    },
    {
      "name": "Jean-Luc Tymen",
      "role": "Site Contact",
      "@referredType": "Individual"
    }
  ],
  "productSpecification": {
    "id": "UNISpec",
    "href": "https...",
    "version": "v2",
    "name": "UNI specification",
    "productTargetSchema": {
      "@type": "UNISpec",
      "@schemaLocation": "https://github.com/MEF-GIT/MEF-LSO-Sonata-
SDK/blob/master/experimental/api/ProductSpecDescription/Ordering/UNISpec.json",
      "buyerId": "AF001"
    }
  },
  "physicalLayer": "10BASE-T",
  "synchronousModeEnabled": true,
  "numberOfLinks": 1,
  "tokenShareEnabled": true,
  "uniResiliency": "NONE",
  "maxServiceFrameSize": 1400
}
```

Response

200

```
{
  "id": "45hj-df54-yui9",
  "href": "https...",
```

```

"description": "UNI instance SPxxx",
"name": "Name of the UNI",
"startDate": "2018-03-16T09:37:29.961Z",
"status": "active",
"@baseType": "product",
"@type": "MEFproduct",
"productOrder": [
  {
    "productOrderId": "ff45-kl36-hg44",
    "productOrderHref": "https...",
    "orderId": "1",
    "orderItemAction": "add",
    "@type": "ProductOrder"
  },
  {
    "productOrderId": "as45-df65-gh12",
    "productOrderHref": "https...",
    "orderId": "1",
    "orderItemAction": "change",
    "@type": "ProductOrder"
  }
],
"relatedParty": [
  {
    "name": "Jean",
    "role": "Technical Contact",
    "@referredType": "Individual",
    "@type": "RelatedParty"
  },
  {
    "name": "Jennifer",
    "role": "Implementation Contact",
    "@referredType": "Individual",
    "@type": "RelatedParty"
  },
  {
    "name": "Jean-Luc Tymen",
    "role": "Site Contact",
    "@referredType": "Individual",
    "@type": "RelatedParty"
  }
],
"productSpecification": {
  "id": "UNISpec",
  "href": "https...",
  "version": "v2",
  "name": "UNI specification",
  "productTargetSchema": {
    "@type": "UNISpec",
    "@schemaLocation": "https://github.com/MEF-GIT/MEF-LSO-Sonata-
SDK/blob/master/experimental/api/ProductSpecDescription/Ordering/UNISpec.json",
    "buyerId": "AF001"
  }
},
"physicalLayer": "10BASE-T",

```

```
"synchronousModeEnabled": true,
"numberOfLinks": 1,
"tokenShareEnabled": true,
"uniResiliency": "NONE",
"maxServiceFrameSize": 1400,
"relatedPlace": [
  {
    "id": "4hhf9-rr54",
    "href": "https...",
    "name": "UNI Site for this customer",
    "role": "UNI Site",
    "@referredType": "geographicalSite",
    "@schemaLocation": "https...."
  }
]
```

Delete product

DELETE /product/{id}

Description

This operation deletes a product entity.

Usage Samples

Here's an example of a request for deleting a product.

| |
|--|
| Request |
| DELETE serverRoot/tmf-api/productManagement/v4/product/g265-tf85 |
| Response |
| 204 |

API NOTIFICATIONS

For every single of operation on the entities use the following templates and provide sample REST notification POST calls.

It is assumed that the Pub/Sub uses the Register and UnRegister mechanisms described in the REST Guidelines reproduced below.

Register listener

POST /hub

Description

Sets the communication endpoint address the service instance must use to deliver information about its health state, execution state, failures and metrics. Subsequent POST calls will be rejected by the service if it does not support multiple listeners. In this case DELETE /api/hub/{id} must be called before an endpoint can be created again.

Behavior

Returns HTTP/1.1 status code 204 if the request was successful.

Returns HTTP/1.1 status code 409 if request is not successful.

Usage Samples

Here's an example of a request for registering a listener.

| Request |
|---|
| POST /api/hub Accept: application/json {"callback": "http://in.listener.com"} |
| Response |
| 201 Content-Type: application/json Location: /api/hub/42 {"id": "42", "callback": "http://in.listener.com", "query": null} |

Unregister listener

DELETE /hub/{id}

Description

Clears the communication endpoint address that was set by creating the Hub..

Behavior

Returns HTTP/1.1 status code 204 if the request was successful.

Returns HTTP/1.1 status code 404 if the resource is not found.

Usage Samples

Here's an example of a request for un-registering a listener.

| |
|--|
| Request |
| DELETE /api/hub/42 Accept: application/json |
| Response |
| 204 |

Publish Event to listener

POST /client/listener

Description

Clears the communication endpoint address that was set by creating the Hub.

Provides to a registered listener the description of the event that was raised. The /client/listener url is the callback url passed when registering the listener.

Behavior

Returns HTTP/1.1 status code 201 if the service is able to set the configuration.

Usage Samples

Here's an example of a notification received by the listener. In this example "EVENT TYPE" should be replaced by one of the notification types supported by this API (see Notification resources Models section) and EVENT BODY refers to the data structure of the given notification type.

| |
|--|
| Request |
| POST /client/listener Accept: application/json { "event": { EVENT BODY }, "eventType": "EVENT_TYPE" } |
| Response |
| 201 |

For detailed examples on the general TM Forum notification mechanism, see the TMF REST Design Guidelines.

Acknowledgements

VERSION History

| Release Number | Date | Release led by: | Description |
|----------------|------------|---|---|
| Release 1.0.0 | 04/15/2013 | Pierre Gauthier TM Forum pgauthier@tmforum.org | First Release of Draft Version of the Document. |
| Release 2.0.0 | 04/15/2016 | Pierre Gauthier TM Forum pgauthier@tmforum.org Mariano Belaunde Orange mariano.belaunde@orange.com | Generated from API Data Model.. |
| Release 3.0.0 | 05/15/2018 | Ludovic Robert Ludovic.robert@orange.com Pierre Gauthier TM Forum pgauthier@tmforum.org | Updated <ul style="list-style-type: none"> • to be aligned with Guideline 3.0 • to integrate change requests from MEF to integrate change requests from Amdocs, Telefonica, Vodafone & Orange |
| Release 4.0.0 | | Ludovic Robert Ludovic.robert@orange.com Pierre Gauthier TM Forum pgauthier@tmforum.org | Schema-driven API with polymorphism pattern Modify cardinality to BillingAccount Add link to productOrder Add link to productTerm Align productPrice with productOrder API |

Release History

| Release Number | Date | Release led by: | Description |
|----------------|------------|---|---|
| Release 16.5 | April 2017 | Mariano Belaunde Orange mariano.belaunde@orange.com Pierre Gauthier TM Forum pgauthier@tmforum.org | |
| Release 18.0 | 05/15/2018 | Ludovic Robert Orange ludovic.robert@orange.com Pierre Gauthier TM Forum pgauthier@tmforum.org | |
| Release 19.0 | | Ludovic Robert Orange ludovic.robert@orange.com Pierre Gauthier TM Forum pgauthier@tmforum.org | Version 4.0 of the API REST <i>Nota: the version 4.0 is assigned to all the APIs delivered in the release 19.0</i> |