TM Forum Specification

Service Quality Management API User Guide

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NOTICE

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Introduction

The following document is the Service Quality Management REST API Specification.

As the Digital Economy emerges, the Digital Service Providers, Consumers and Developers are striving to take advantage of Open Digital Eco-system to create, manage and support new Digital Services.
In this context, the ability to deliver consistent digital services experience across the Eco-system between different enterprises is considered table-stakes. This focus on digital service delivery and quality has positioned Service Quality Management at the center of Digital Operations.

Gathering data from multiple and heterogeneous data sources across the eco-system, combining them into meaningful service quality metrics is the core activity of a Service Quality Management application to assess the quality as perceived by the consumer.

Once the measurements are available, they must be watched against contracted service level to ensure consistent delivery as committed to in Service Level Agreements (SLA). The Service Quality Management API defines a standard interface designed to simplify the integration task of an SQM application with different partners and respective Digital Operations Centers. This API follows the RESTful design principles.

Through this API, any Enterprise is able to access a Service Quality Management application and extract Service Level Specifications and associated Service Level Objectives (SLO) and their thresholds. They can monitor violation of these thresholds and generate trending reports over a period of time and send threshold crossing alarms so that when service quality degrades and a contracted Service Level Agreement (or one of its constituents) is at risk, appropriate actions can be performed.

SAMPLE USE CASES

Examples of use cases using Service Quality Management API is as following

The Use Case Id, UC_TMF_ServiceQualityManagement_0001 is for the Service Quality Monitoring function. The next use case is UC_TMF_ServiceQualityManagement_0002 for Service Quality Reporting function.

Sample Use Cases

Use Case Id	UC_TMF_ServiceQualityManagement_0001
Use Case Name	Service Quality Monitoring
Summary	The SQM API enables Clients within external or internal systems to access the Service Quality Management Application and monitor the quality of specified services against their SLOs
Actor(s)	Clients' resident external and internal to the Enterprise as described in figure 3 are acting as the Consumer. SQM Application is the actor acting as the Producer.
Pre-Conditions	a) SLAs between Enterprise and Service Provider have been agreed and defined, which represents contractual agreement between parties for quality of specific services b) OLAs (Operations Level Agreements) between Customer Care Operations and Service Management Center of the Service Provider should be agreed and defined, which represents agreement between Departments for quality of specific services c) SLOs representing actual thresholds to be monitored have been defined d) SLOs have been mapped to Key Quality Indicators for the services monitored by the Service Quality Management application
Begins When	When all pre-conditions have been met and agreed period of monitoring between the Client and Service Quality Management Application starts
Description	This functionality enables the Client of Service Quality Management Application to Create/Query/Delete Service Level Agreements, its items, Service Level Specifications and Service Level Objectives AND Register for notifications when defined Service Level Objectives are at breach and the contracted SLA or OLA is at risk. These notifications trigger appropriate actions for resolution.
Ends When	In case of termination of contract or agreement and there is no need for monitoring or the agreed period for monitoring has come

	to an end
Post-Conditions	<u>In case of no breach of Service Level Objectives:</u> 1. The Client continues to monitor in an ongoing basis 2. Occasionally the client may update and modify the SLAs/SLOs or introduce new services. <u>In case of breach of Service Level Objectives:</u> 1. Notifications are sent to the Client system to ensure preventive measures can be taken and ensure there is no impact to Business and if there is any loss then it can be minimized. 2. Notifications are sent to the Service Provider systems so Root Cause Analysis can be performed, and corrective action triggered for resolution.
Exceptions	1. In case of regular maintenance or system upgrades there may be planned outages that are part of agreed breach of SLOs and generated notifications should be ignored. There should be exception raised with the Client and suggest the notification is misleading 'Ignore Notifications for this period, due to Routine Maintenance' 3. In case the mandatory details are invalid then an 'Invalid input' exception shall be raised along with the details of validation failure and thus the operation is not fulfilled 4. In case the authentication of the Requesting Client is not validated by the Service Quality Management application then an 'Access Denied' exception shall be raised, and the operation is not fulfilled 5. If the SQM Application is unable to accomplish the operation, due to a lack of internal resources then an 'Unable To Execute' exception shall be raised, and the operation is not fulfilled. 6. If the SQM Application is unable to accomplish the operation, due to any other internal error, then an 'Internal Error' exception shall be raised, and the operation is not fulfilled.

Use Case Id	UC_TMF_ServiceQualityManagement_0002
Use Case Name	Service Quality Reporting
Summary	The SQM API enables Clients to define and schedule the delivery of Service Quality Reports.
Actor(s)	Clients' resident external and internal to the Enterprise as described in figure 3 are acting as the Consumer. SQM Application is the actor acting as the Producer.
Pre-Conditions	a) SLAs between Enterprise and Service Provider have been

	agreed and defined, which represents contractual agreement between parties for quality of specific services b) OLAs (Operations Level Agreements) between Customer Care Operations and Service Management Center of the Service Provider should be agreed and defined, which represents agreement between Departments for quality of specific services c) SLOs representing actual thresholds to be monitored have been defined d) SLOs have been mapped to Key Quality Indicators for the services monitored by the Service Quality Management application e) Data must have been collected and stored for Service Quality and easily accessible to generate the reports
Begins When	When all pre-conditions have been met and the Client desires to build different types of reports for a specific period
Description	SQM API allows a client of the API to trigger the generation of Service Quality Reports, containing information to track how the various Service Level Agreement Items as well as the Service Level Objectives have been delivered over time and there are any observable trends. The reports can be scheduled defining the sample period and the reporting period, as well as other attributes such as the format of the report, how it should be delivered, etc.
Ends When	In case of success: The Client has received the Reports for the specified period In case of failure: The Client has not received the Reports for the specified period
Post-Conditions	
Exceptions	1. In case of regular maintenance or system upgrades there may be planned outages that are part of agreed breach of SLOs and generated reports for that period should be ignored. There should be exception raised with the Client and suggest the data is misleading 'Ignore Reports during this period, due to Routine Maintenance' 2. In case the mandatory details are invalid then an 'Invalid input' exception shall be raised along with the details of validation failure and thus the operation is not fulfilled 3. In case the authentication of the Requesting Client is not validated by the Service Quality Management application then an 'Access Denied' exception shall be raised, and the operation is not fulfilled 4. If the SQM Application is unable to accomplish the operation,

	due to a lack of internal resources then an 'Unable To Execute' exception shall be raised, and the operation is not fulfilled. 5. If the SQM Application is unable to accomplish the operation, due to any other internal error, then an 'Internal Error' exception shall be raised, and the operation is not fulfilled.

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 VPNServiceLevelSpecification inheriting properties from the ServiceLevelSpecification entity.

Generic support of polymorphism and pattern extensions is described in the TMF API Design Guidelines.

The @type attribute provides a way to represent the actual class type of an entity. 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 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, 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.

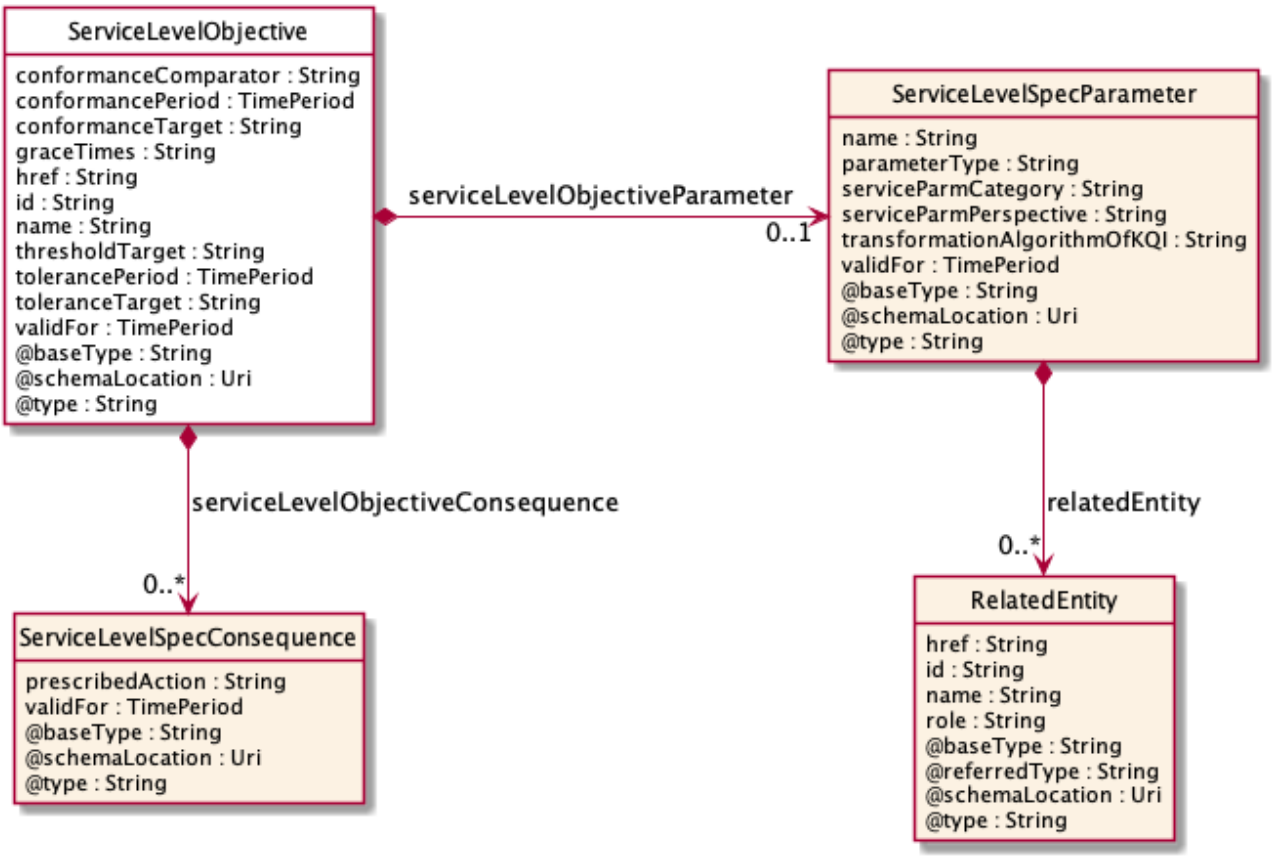
RESOURCE MODEL

Managed Entity and Task Resource Models

Service Level Objective resource

Service level objectives are defined in terms of parameters and metrics, thresholds, and tolerances associated with the parameters.

Resource model



Field descriptions

ServiceLevelObjective fields

conformanceComparator	A string. An operator that specifies whether a Service Level Objective is violated above or below the conformanceTarget.

conformancePeriod	A time period. An interval of time during which the Conformance Target must be measured.
conformanceTarget	A string. A value used to determine if Service Level Objective is met. The data type should be adjusted case by case.
graceTimes	A string. The number of times an objective can remain un-updated without a violation of a Service Level Agreement in reference to a measurement period and/or Service Level Agreement reporting period.
href	A string. The hyperlink to access a service level objective.
id	A string. The identifier of a service level objectives.
name	A string. The name of the service level objectives.
serviceLevelObjectiveConsequence	A list of service level spec consequences (ServiceLevelSpecConsequence [*]). A list of consequences for this objective.
serviceLevelObjectiveParameter	A service level spec parameter (ServiceLevelSpecParameter). A parameter for this objective.
thresholdTarget	A string. A value that used to specify when a warning should be used that indicates an objective is danger of not being met. Notice, the data type should be adjusted case by case.
tolerancePeriod	A time period. A value that specifies the allowable time variation of a conformance.
toleranceTarget	A string. A value that specifies the allowable variation of a conformance Target. The data type should be adjusted case by case.
validFor	A time period. A valid duration of a thing.

RelatedEntity sub-resource

A reference to an entity, where the type of the entity is not known in advance.

@referredType	A string. The actual type of the target instance when needed for disambiguation.
name	A string. Name of the related entity.
href	A string. Hyperlink reference.
id	A string. unique identifier.
@baseType	A string. When sub-classing, this defines the super-class.
@schemaLocation	An uri (Uri). A URI to a JSON-Schema file that defines additional attributes and relationships.
@type	A string. When sub-classing, this defines the sub-class Extensible name.
role	A string. The role of an entity.

ServiceLevelSpecConsequence sub-resource

Some consequences for the provider of the Service are resulted when the service level objective does not meet.

prescribedAction	A string. Recommended remedy for a violated Service Level Objective. This could be a hyperlink to the recommended action.
validFor	A time period. A valid duration of a thing.

ServiceLevelSpecParameter sub-resource

Service Level Specification parameters can be one of two types. A Key Quality Indicator (KQI) provides a measurement of a specific aspect of the performance of a Product (i.e., Product Specification, Product Offering, or Product) or a Service (i.e., Service Specification or Service).

name	A string. The name of the parameter.
parameterType	A string. Types of Service Level Specification parameters are KQI or KPI.
relatedEntity	A list of related entities (RelatedEntity [*]). A list of entities related to this parameter.
serviceParmCategory	A string. A string that specifies whether the Service Level Specification Parameter is technology specific, service specific, or technology/service independent.
serviceParmPerspective	A string. A string that specifies whether the Service Level Specification

	Parameter represents a single user instance parameter or a parameter that represents an aggregation.
transformationAlgorithmOfKQI	A string. The description of a logical step-by-step procedure used to calculate the value of a KQI.
validFor	A time period. A valid duration of a thing.

Json representation sample

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

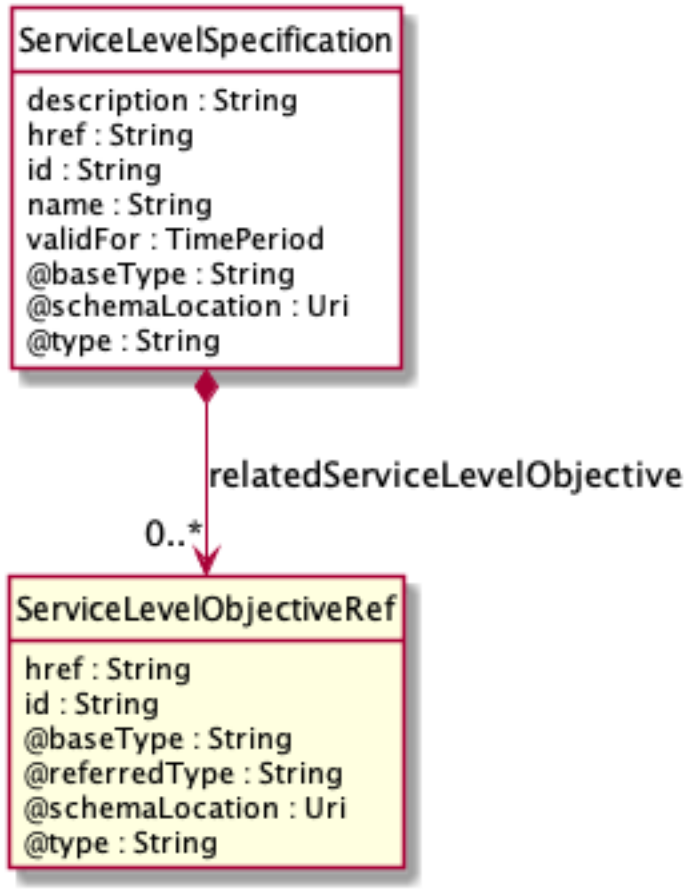

```
{
  "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3112",
  "id": "3112",
  "conformanceCompartor": ">",
  "conformanceTargarget": "32",
  "conformancePeriod": {
    "endDateTime": "2021-03-00T00:00:00+01:00",
    "startDateTime": "2020-03-00T00:00:00+01:00"
  },
  "graceTimes": "3",
  "name": "Upload bandwidth",
  "thresholdTarget": "28",
  "toleranceTarget": "5",
  "tolerancePeriod": {
    "endDateTime": "20:00:00",
    "startDateTime": "06:00:00"
  },
  "serviceLevelObjectiveParameter": {
    "name": "bandwidth",
    "serviceParmCategory": "service specific",
    "serviceParmPerspective": "aggregation",
    "transformationAlgorithmOfKQI": "KeepTheSame",
    "type": "KPI",
    "validFor": {
      "endDateTime": "2021-03-00T00:00:00+01:00",
      "startDateTime": "2020-03-00T00:00:00+01:00"
    },
    "relatedEntity": [
      {
        "id": "1988",
        "href": "https://host:port/ServiceInventory/service/1988",
        "name": "vCPE",
        "role": "CPE",
        "@referredType": "CPE"
      },
      {
        "id": "2988",
        "href": "https://host:port/ServiceInventory/service/2988",
```

```
            "name": "GPON",
            "role": "access",
            "@referredType": "AccessService"
          }
        ]
      },
      "serviceLevelObjectiveConsquence": [
        {
          "prescribedAction": "https://service.com/vCPEBandwithAction",
          "validFor": {
            "endDateTime": "2021-03-00T00:00:00+01:00",
            "startDateTime": "2020-03-00T00:00:00+01:00"
          }
        },
        {
          "prescribedAction": "https://service.com/AccessBandwithAction",
          "validFor": {
            "endDateTime": "2021-03-00T00:00:00+01:00",
            "startDateTime": "2020-03-00T00:00:00+01:00"
          }
        }
      ]
}
```


Service Level Specification resource

A Service Level Specification represents a pre-defined or negotiated set of Service Level Objectives. In addition, certain consequences are associated with not meeting the Service Level Objectives. Service Level Agreements are expressed in terms of Service Level Specifications.

Resource model



Field descriptions

ServiceLevelSpecification fields

description	A string. A brief introduction of a service level specification.
href	A string. The hyperlink to access a service level specification.
id	A string. The identifier to a service level specification.
name	A string. The name of Service Level Specification.
relatedServiceLevelObjective	A list of service level objective references (ServiceLevelObjectiveRef [*]). A list of objectives related to this service level specification.
validFor	A time period. A valid duration of a thing.

ServiceLevelObjectiveRef relationship

A set of Service Level Objectives that are contained in the Service Level Specification.

@referredType	A string. The actual type of the target instance when needed for disambiguation.
href	A string. The hyperlink to access a service level object.
id	A string. The identifier of a service level object.

Json representation sample

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


```
{
   "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelSpecification/1112",
   "id": "1112",
   "description": "Maximum download/upload speed service level",
   "name": "Access bandwidth",
   "validFor": {
      "endDateTime": "2021-05-00T00:00:00+01:00",
      "startDateTime": "2020-03-00T00:00:00+01:00"
   },
   "relatedServiceLevelObjective": [
      {
         "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3112",
         "id": "3112"
      },
      {
         "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3113",
         "id": "3113"
      }
   ]
}
```

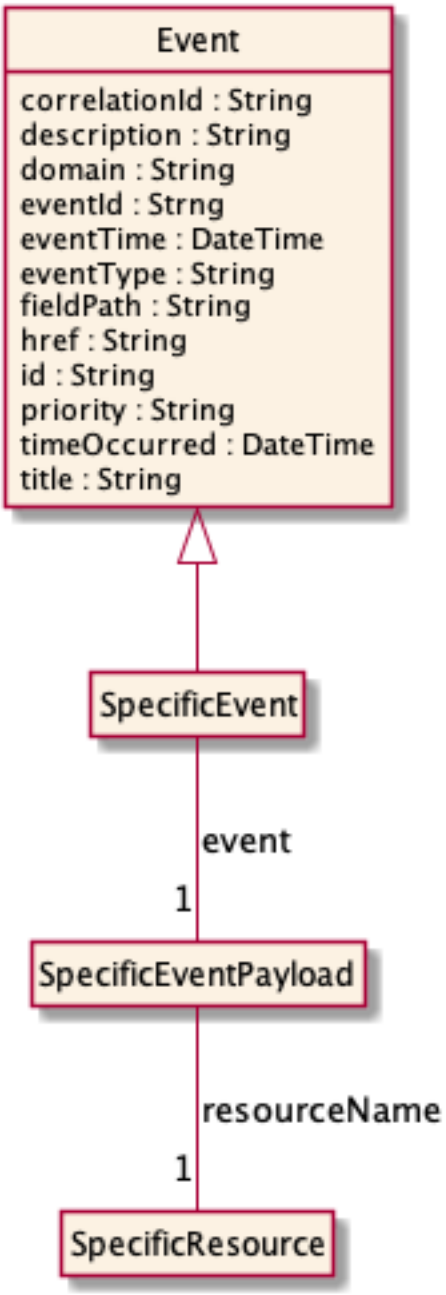

Notification Resource Models

6 notifications are defined for this API

Notifications related to ServiceLevelObjective:
- ServiceLevelObjectiveCreateEvent
- ServiceLevelObjectiveAttributeValueChangeEvent
- ServiceLevelObjectiveDeleteEvent

Notifications related to ServiceLevelSpecification:
- ServiceLevelSpecificationCreateEvent
- ServiceLevelSpecificationAttributeValueChangeEvent
- ServiceLevelSpecificationDeleteEvent

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).



Service Level Objective Create Event

Notification ServiceLevelObjectiveCreateEvent case for resource ServiceLevelObjective

Json representation sample

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

```
{
   "eventId":"00001",
   "eventTime":"2015-11-16T16:42:25-04:00",
   "eventType":"ServiceLevelObjectiveCreateEvent",
    "event": {
      "serviceLevelObjective" :
         {-- SEE ServiceLevelObjective RESOURCE SAMPLE --}
   }
}
```

Service Level Objective Attribute Value Change Event

Notification ServiceLevelObjectiveAttributeValueChangeEvent case for resource ServiceLevelObjective

Json representation sample

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

```
{
   "eventId":"00001",
   "eventTime":"2015-11-16T16:42:25-04:00",
   "eventType":"ServiceLevelObjectiveAttributeValueChangeEvent",
    "event": {
      "serviceLevelObjective" :
         {-- SEE ServiceLevelObjective RESOURCE SAMPLE --}
   }
}
```

Service Level Objective Delete Event

Notification ServiceLevelObjectiveDeleteEvent case for resource ServiceLevelObjective

Json representation sample

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

```
{
  "eventId":"00001",
  "eventTime":"2015-11-16T16:42:25-04:00",
  "eventType":"ServiceLevelObjectiveDeleteEvent",
   "event": {
     "serviceLevelObjective" :
       {-- SEE ServiceLevelObjective RESOURCE SAMPLE --}
  }
}
```

Service Level Specification Create Event

Notification ServiceLevelSpecificationCreateEvent case for resource ServiceLevelSpecification

Json representation sample

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

```
{
  "eventId":"00001",
  "eventTime":"2015-11-16T16:42:25-04:00",
  "eventType":"ServiceLevelSpecificationCreateEvent",
   "event": {
     "serviceLevelSpecification" :
       {-- SEE ServiceLevelSpecification RESOURCE SAMPLE --}
  }
}
```

Service Level Specification Attribute Value Change Event

Notification ServiceLevelSpecificationAttributeValueChangeEvent case for resource ServiceLevelSpecification

Json representation sample

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

```
{
  "eventId":"00001",
  "eventTime":"2015-11-16T16:42:25-04:00",
  "eventType":"ServiceLevelSpecificationAttributeValueChangeEvent",
   "event": {
     "serviceLevelSpecification" :
       {-- SEE ServiceLevelSpecification RESOURCE SAMPLE --}
```

```
   }
}
```

Service Level Specification Delete Event

Notification ServiceLevelSpecificationDeleteEvent case for resource ServiceLevelSpecification

Json representation sample

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

```
{
   "eventId":"00001",
   "eventTime":"2015-11-16T16:42:25-04:00",
   "eventType":"ServiceLevelSpecificationDeleteEvent",
    "event": {
      "serviceLevelSpecification" :
         {-- SEE ServiceLevelSpecification RESOURCE SAMPLE --}
   }
}
```

API OPERATIONS

Remember the following Uniform Contract:

Operation on Entities	Uniform API Operation	Description
Query Entities	GET Resource	GET must be used to retrieve a representation of a resource.
Create Entity	POST Resource	POST must be used to create a new resource
Partial Update of an Entity	PATCH Resource	PATCH must be used to partially update a resource
Remove an Entity	DELETE Resource	DELETE must be used to remove a resource
Execute an Action on an Entity	POST on TASK Resource	POST must be used to execute Task Resources
Other Request Methods	POST on TASK Resource	GET and POST must not be used to tunnel other request methods.

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

Notifications are also described in a subsequent section.

Operations on Service Level Objective

List service level objectives

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

Description

This operation list service level objective 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 multiple service level objectives.

Request

```
GET /tmf-api/serviceQualityManagement/v4/serviceLevelObjective?status=inprogress
Accept: application/json
```

Response

```
200

[
  {
    "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3112",
    "id": "3112",
    "conformanceComparator": ">",
    "conformanceTarget": "32",
    "conformancePeriod": {
      "endDateTime": "2021-03-00T00:00:00+01:00",
      "startDateTime": "2020-03-00T00:00:00+01:00"
    },
    "graceTimes": "3",
    "name": "Upload bandwidth",
    "thresholdTarget": "28",
    "toleranceTarget": "5",
    "tolerancePeriod": {
      "endDateTime": "20:00:00",
      "startDateTime": "06:00:00"
    },
    "serviceLevelObjectiveParameter": {
      "name": "speed",
      "serviceParmCategory": "technology specific",
      "serviceParmPerspective": " single user instance parameter",
      "transformationAlgorithmOfKQI": "KeepTheSame",
      "type": "KPI",
      "validFor": {
```

```
          "endDateTime": "2021-03-00T00:00:00+01:00",
          "startDateTime": "2020-03-00T00:00:00+01:00"
        },
        "relatedEntity": [
          {
            "id": "1988",
            "href": "https://host:port/ServiceInventory/service/1988",
            "name": "vCPE",
            "role": "CPE",
            "@referredType": "CPE"
          },
          {
            "id": "2988",
            "href": "https://host:port/ServiceInventory/service/2988",
            "name": "GPON",
            "role": "access",
            "@referredType": "AccessService"
          }
        ]
      },
      "serviceLevelObjectiveConsequence": [
        {
          "prescribedAction": "https://service.com/vCPEBandwithAction",
          "validFor": {
            "endDateTime": "2021-03-00T00:00:00+01:00",
            "startDateTime": "2020-03-00T00:00:00+01:00"
          }
        },
        {
          "prescribedAction": "https://service.com/AccessBandwithAction",
          "validFor": {
            "endDateTime": "2021-03-00T00:00:00+01:00",
            "startDateTime": "2020-03-00T00:00:00+01:00"
          }
        }
      ]
    },
    {
      "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/4112",
      "id": "4112",
      "conformanceComparator": "<",
      "conformanceTarget": "20",
      "conformancePeriod": {
        "endDateTime": "2021-03-00T00:00:00+01:00",
        "startDateTime": "2020-03-00T00:00:00+01:00"
      },
      "graceTimes": "3",
      "name": "Jitter",
      "thresholdTarget": "18",
      "toleranceTarget": "15",
```

```
    "tolerancePeriod": {
      "endDateTime": "20:00:00",
      "startDateTime": "06:00:00"
    },
    "serviceLevelObjectiveParameter": {
      "name": "speed",
      "serviceParmCategory": "technology specific",
      "serviceParmPerspective": " single user instance parameter",
      "transformationAlgorithmOfKQI": "KeepTheSame",
      "type": "KPI",
      "validFor": {
        "endDateTime": "2021-03-00T00:00:00+01:00",
        "startDateTime": "2020-03-00T00:00:00+01:00"
      },
      "relatedEntity": [
        {
          "id": "2988",
          "href": "https://host:port/ServiceInventory/service/2988",
          "name": "GPON",
          "role": "access",
          "@referredType": "AccessService"
        }
      ]
    },
    "serviceLevelObjectiveConsequence": [
      {
        "prescribedAction": "https://service.com/jitterAction",
        "validFor": {
          "endDateTime": "2021-03-00T00:00:00+01:00",
          "startDateTime": "2020-03-00T00:00:00+01:00"
        }
      }
    ]
  }
]
```


Retrieve service level objective

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

Description

This operation retrieves a service level objective 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 specific service level objective.

Request

```
GET /tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3830
Accept: application/json
```

Response

```
200

{
  "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3112",
  "id": "3112",
  "conformanceComparator": ">",
  "conformanceTarget": "32",
  "conformancePeriod": {
    "endDateTime": "2021-03-00T00:00:00+01:00",
    "startDateTime": "2020-03-00T00:00:00+01:00"
  },
  "graceTimes": "3",
  "name": "Upload bandwidth",
  "thresholdTarget": "28",
  "toleranceTarget": "5",
  "tolerancePeriod": {
    "endDateTime": "20:00:00",
    "startDateTime": "06:00:00"
  },
  "serviceLevelObjectiveParameter": {
    "name": "bandwidth",
    "serviceParmCategory": "service specific",
    "serviceParmPerspective": "aggregation",
    "transformationAlgorithmOfKQI": "KeepTheSame",
    "type": "KPI",
    "validFor": {
      "endDateTime": "2021-03-00T00:00:00+01:00",
      "startDateTime": "2020-03-00T00:00:00+01:00"
    },
    "relatedEntity": [
      {
        "id": "1988",
        "href": "https://host:port/ServiceInventory/service/1988",
```

```
            "name": "vCPE",
            "role": "CPE",
            "@referredType": "CPE"
          },
          {
            "id": "2988",
            "href": "https://host:port/ServiceInventory/service/2988",
            "name": "GPON",
            "role": "access",
            "@referredType": "AccessService"
          }
        ]
    },
    "serviceLevelObjectiveConsequence": [
        {
          "prescribedAction": "https://service.com/vCPEBandwithAction",
          "validFor": {
            "endDateTime": "2021-03-00T00:00:00+01:00",
            "startDateTime": "2020-03-00T00:00:00+01:00"
          }
        },
        {
          "prescribedAction": "https://service.com/AccessBandwithAction",
          "validFor": {
            "endDateTime": "2021-03-00T00:00:00+01:00",
            "startDateTime": "2020-03-00T00:00:00+01:00"
          }
        }
    ]
}
```


Create service level objective

`POST /serviceLevelObjective`

Description

This operation creates a service level objective entity.

Mandatory and Non Mandatory Attributes

The following tables provide the list of mandatory and non mandatory attributes when creating a ServiceLevelObjective, 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
conformanceComparator	

Mandatory Attributes	Rule
conformanceTarget	
serviceLevelObjectiveParameter	

Non Mandatory Attributes	Rule
conformancePeriod	
graceTimes	
name	
serviceLevelObjectiveConsequence	
thresholdTarget	
tolerancePeriod	
toleranceTarget	
validFor	

Usage Samples

Here's an example of a request for creating a service level objectve.

Request

```
POST /tmf-api/serviceQualityManagement/v4/serviceLevelObjective
Content-Type: application/json

{
   "conformanceComparator": ">",
   "conformanceTarget": "32",
   "conformancePeriod": {
      "endDateTime": "2021-03-00T00:00:00+01:00",
      "startDateTime": "2020-03-00T00:00:00+01:00"
   },
   "graceTimes": "3",
   "name": "Upload bandwidth",
   "thresholdTarget": "28",
   "toleranceTarget": "5",
   "tolerancePeriod": {
      "endDateTime": "20:00:00",
      "startDateTime": "06:00:00"
   },
   "serviceLevelObjectiveParameter": {
      "name": "speed",
      "serviceParmCategory": "technology specific",
      "serviceParmPerspective": " single user instance parameter",
      "transformationAlgorithmOfKQI": "KeepTheSame",
      "type": "KPI",
      "validFor": {
```

```
        "endDateTime": "2021-03-00T00:00:00+01:00",
        "startDateTime": "2020-03-00T00:00:00+01:00"
      },
      "relatedEntity": [
        {
          "id": "1988",
          "href": "https://host:port/ServiceInventory/service/1988",
          "name": "vCPE",
          "role": "CPE",
          "@referredType": "CPE"
        },
        {
          "id": "2988",
          "href": "https://host:port/ServiceInventory/service/2988",
          "name": "GPON",
          "role": "access",
          "@referredType": "AccessService"
        }
      ]
    },
    "serviceLevelObjectiveConsequence": [
      {
        "prescribedAction": "https://service.com/vCPEBandwithAction",
        "validFor": {
          "endDateTime": "2021-03-00T00:00:00+01:00",
          "startDateTime": "2020-03-00T00:00:00+01:00"
        }
      },
      {
        "prescribedAction": "https://service.com/AccessBandwithAction",
        "validFor": {
          "endDateTime": "2021-03-00T00:00:00+01:00",
          "startDateTime": "2020-03-00T00:00:00+01:00"
        }
      }
    ]
}
```


Response

201


```
{
  "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3112",
  "id": "3112",
  "conformanceComparator": ">",
  "conformanceTarget": "32",
  "conformancePeriod": {
```

```
    "endDateTime": "2021-03-00T00:00:00+01:00",
    "startDateTime": "2020-03-00T00:00:00+01:00"
  },
  "graceTimes": "3",
  "name": "Upload bandwidth",
  "thresholdTarget": "28",
  "toleranceTarget": "5",
  "tolerancePeriod": {
    "endDateTime": "20:00:00",
    "startDateTime": "06:00:00"
  },
  "serviceLevelObjectiveParameter": {
    "name": "speed",
    "serviceParmCategory": "technology specific",
    "serviceParmPerspective": " single user instance parameter",
    "transformationAlgorithmOfKQI": "KeepTheSame",
    "type": "KPI",
    "validFor": {
      "endDateTime": "2021-03-00T00:00:00+01:00",
      "startDateTime": "2020-03-00T00:00:00+01:00"
    },
    "relatedEntity": [
      {
        "id": "1988",
        "href": "https://host:port/ServiceInventory/service/1988",
        "name": "vCPE",
        "role": "CPE",
        "@referredType": "CPE"
      },
      {
        "id": "2988",
        "href": "https://host:port/ServiceInventory/service/2988",
        "name": "GPON",
        "role": "access",
        "@referredType": "AccessService"
      }
    ]
  },
  "serviceLevelObjectiveConsequence": [
    {
      "prescribedAction": "https://service.com/vCPEBandwithAction",
      "validFor": {
        "endDateTime": "2021-03-00T00:00:00+01:00",
        "startDateTime": "2020-03-00T00:00:00+01:00"
      }
    },
    {
      "prescribedAction": "https://service.com/AccessBandwithAction",
      "validFor": {
        "endDateTime": "2021-03-00T00:00:00+01:00",
```

```
            "startDateTime": "2020-03-00T00:00:00+01:00"
          }
        }
    ]
}
```

Here's an example of a request for creating a servive level objective.

Request

```
POST /tmf-api/serviceQualityManagement/v4/serviceLevelObjective
Content-Type: application/json

{
   "conformanceComparator": "<",
   "conformanceTarget": "20",
   "conformancePeriod": {
      "endDateTime": "2021-03-00T00:00:00+01:00",
      "startDateTime": "2020-03-00T00:00:00+01:00"
   },
   "graceTimes": "3",
   "name": "Jitter",
   "thresholdTarget": "18",
   "toleranceTarget": "15",
   "tolerancePeriod": {
      "endDateTime": "20:00:00",
      "startDateTime": "06:00:00"
   },
   "serviceLevelObjectiveParameter": {
      "name": "speed",
      "serviceParmCategory": "technology specific",
      "serviceParmPerspective": " single user instance parameter",
      "transformationAlgorithmOfKQI": "KeepTheSame",
      "type": "KPI",
      "validFor": {
         "endDateTime": "2021-03-00T00:00:00+01:00",
         "startDateTime": "2020-03-00T00:00:00+01:00"
      },
      "relatedEntity": [
         {
            "id": "2988",
            "href": "https://host:port/ServiceInventory/service/2988",
            "name": "GPON",
            "role": "access",
            "@referredType": "AccessService"
         }
      ]
   },
```

```
  "serviceLevelObjectiveConsequence": [
    {
      "prescribedAction": "https://service.com/jitterAction",
      "validFor": {
        "endDateTime": "2021-03-00T00:00:00+01:00",
        "startDateTime": "2020-03-00T00:00:00+01:00"
      }
    }
  ]
}
```

Response

201


```
{
  "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/4112",
  "id": "4112",
  "conformanceComparator": "<",
  "conformanceTarget": "20",
  "conformancePeriod": {
    "endDateTime": "2021-03-00T00:00:00+01:00",
    "startDateTime": "2020-03-00T00:00:00+01:00"
  },
  "graceTimes": "3",
  "name": "Jitter",
  "thresholdTarget": "18",
  "toleranceTarget": "15",
  "tolerancePeriod": {
    "endDateTime": "20:00:00",
    "startDateTime": "06:00:00"
  },
  "serviceLevelObjectiveParameter": {
    "name": "speed",
    "serviceParmCategory": "technology specific",
    "serviceParmPerspective": " single user instance parameter",
    "transformationAlgorithmOfKQI": "KeepTheSame",
    "type": "KPI",
    "validFor": {
      "endDateTime": "2021-03-00T00:00:00+01:00",
      "startDateTime": "2020-03-00T00:00:00+01:00"
    },
    "relatedEntity": [
      {
        "id": "2988",
        "href": "https://host:port/ServiceInventory/service/2988",
        "name": "GPON",
        "role": "access",
```

```
            "@referredType": "AccessService"
          }
        ]
    },
    "serviceLevelObjectiveConsequence": [
      {
        "prescribedAction": "https://service.com/jitterAction",
        "validFor": {
          "endDateTime": "2021-03-00T00:00:00+01:00",
          "startDateTime": "2020-03-00T00:00:00+01:00"
        }
      }
    ]
}
```


Patch service level objective

PATCH /serviceLevelObjective/{id}

Description

This operation allows partial updates of a service level objective 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
conformanceComparator	
conformancePeriod	
conformanceTarget	
graceTimes	
name	
serviceLevelObjectiveConsequence	
serviceLevelObjectiveParameter	
thresholdTarget	
tolerancePeriod	
toleranceTarget	

Non Patchable Attributes	Rule
href	
id	
validFor	

Usage Samples

Here's an example of a request for updating a service level objective.

Request

```
PATCH /tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3830
Content-Type: application/merge-patch+json

{
   "conformanceComparator": ">",
   "conformanceTarget": "32",
   "conformancePeriod": {
      "endDateTime": "2021-03-00T00:00:00+01:00",
      "startDateTime": "2020-03-00T00:00:00+01:00"
   },
   "graceTimes": "3",
   "name": "Upload bandwidth",
   "thresholdTarget": "28",
   "toleranceTarget": "5",
   "serviceLevelObjectiveConsequence": [
      {
         "prescribedAction": "https://service.com/vCPEBandwithAction",
         "validFor": {
            "endDateTime": "2021-03-00T00:00:00+01:00",
            "startDateTime": "2020-03-00T00:00:00+01:00"
         }
      },
      {
         "prescribedAction": "https://service.com/AccessBandwithAction",
         "validFor": {
            "endDateTime": "2021-03-00T00:00:00+01:00",
            "startDateTime": "2020-03-00T00:00:00+01:00"
         }
      }
   ]
}
```

Response

200


```
{
  "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3112",
  "id": "3112",
  "conformanceComparator": ">",
  "conformanceTarget": "32",
  "conformancePeriod": {
    "endDateTime": "2021-03-00T00:00:00+01:00",
    "startDateTime": "2020-03-00T00:00:00+01:00"
  },
  "graceTimes": "3",
  "name": "Upload bandwidth",
  "thresholdTarget": "28",
  "toleranceTarget": "5",
  "serviceLevelObjectiveConsequence": [
    {
      "prescribedAction": "https://service.com/vCPEBandwithAction",
      "validFor": {
        "endDateTime": "2021-03-00T00:00:00+01:00",
        "startDateTime": "2020-03-00T00:00:00+01:00"
      }
    },
    {
      "prescribedAction": "https://service.com/AccessBandwithAction",
      "validFor": {
        "endDateTime": "2021-03-00T00:00:00+01:00",
        "startDateTime": "2020-03-00T00:00:00+01:00"
      }
    }
  ]
}
```


Delete service level objective

`DELETE /serviceLevelObjective/{id}`

Description

This operation deletes a service level objective entity.

Usage Samples

Here's an example of a request for deleting a service level objective.

Request
DELETE /tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3830
Response
204

Operations on Service Level Specification

List service level specifications

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

Description

This operation list service level specification 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 multiple service level specifications.

Request
GET /tmf-api/serviceQualityManagement/v4/serviceLevelSpecification?status=inprogress Accept: application/json
Response
200 { "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelSpecification/1112", "id": "1112", "description": "Maximum download/upload speed service level",

```
  "name": "Access bandwidth",
  "validFor": {
    "endDateTime": "2021-05-00T00:00:00+01:00",
    "startDateTime": "2020-03-00T00:00:00+01:00"
  },
  "relatedServiceLevelObjective": [
    {
      "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3112",
      "id": "3112"
    },
    {
      "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3113",
      "id": "3113"
    }
  ]
}
```


Retrieve service level specification

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

Description

This operation retrieves a service level specification 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 specific service level specification.

Request
GET /tmf-api/serviceQualityManagement/v4/serviceLevelSpecification/3830 Accept: application/json
Response
200

```
{
   "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelSpecification/1112",
   "id": "1112",
   "description": "Maximum download/upload speed service level",
   "name": "Access bandwidth",
   "validFor": {
      "endDateTime": "2021-05-00T00:00:00+01:00",
      "startDateTime": "2020-03-00T00:00:00+01:00"
   },
   "relatedServiceLevelObjective": [
      {
         "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3112",
         "id": "3112"
      },
      {
         "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3113",
         "id": "3113"
      }
   ]
}
```


Create service level specification

`POST /serviceLevelSpecification`

Description

This operation creates a service level specification entity.

Mandatory and Non Mandatory Attributes

The following tables provide the list of mandatory and non mandatory attributes when creating a ServiceLevelSpecification, 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
name	
relatedServiceLevelObjective	

Non Mandatory Attributes	Rule
description	
validFor	

Usage Samples

Here's an example of a request for creating a service level objectve.

Request

```
POST /tmf-api/serviceQualityManagement/v4/serviceLevelSpecification
Content-Type: application/json

{
   "description": "Maximum download/upload speed service level",
   "name": "Access bandwidth",
   "validFor": {
      "endDateTime": "2021-05-00T00:00:00+01:00",
      "startDateTime": "2020-03-00T00:00:00+01:00"
   },
   "relatedServiceLevelObjective": [
      {
         "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3112",
         "id": "3112"
      },
      {
         "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3113",
         "id": "3113"
      }
   ]
}
```

Response

```
201

{
   "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelSpecification/1112",
   "id": "1112",
   "description": "Maximum download/upload speed service level",
   "name": "Access bandwidth",
   "validFor": {
      "endDateTime": "2021-05-00T00:00:00+01:00",
      "startDateTime": "2020-03-00T00:00:00+01:00"
   },
   "relatedServiceLevelObjective": [
      {
         "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3112",
         "id": "3112"
      },
      {
         "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3113",
         "id": "3113"
```

```
    }
  ]
}
```

Patch service level specification

PATCH /serviceLevelSpecification/{id}

Description

This operation allows partial updates of a service level specification 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
description	
name	
relatedServiceLevelObjective	

Non Patchable Attributes	Rule
href	
id	
validFor	

Usage Samples

Here's an example of a request for updating a service level specification.

Request

```
PATCH /tmf-api/serviceQualityManagement/v4/serviceLevelSpecification/3830
Content-Type: application/merge-patch+json
```

```
{
  "name": "SpeedRequirement",
  "relatedServiceLevelObjective": [
    {
      "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3112",
      "id": "3112"
    },
    {
      "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3113",
      "id": "3113"
    }
  ]
}
```


Response

200


```
{
  "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelSpecification/1112",
  "id": "1112",
  "description": "Maximum download/upload speed service level",
  "name": "SpeedRequirement",
  "validFor": {
    "endDateTime": "2021-05-00T00:00:00+01:00",
    "startDateTime": "2020-03-00T00:00:00+01:00"
  },
  "relatedServiceLevelObjective": [
    {
      "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3112",
      "id": "3112"
    },
    {
      "href": "https://host:port/tmf-api/serviceQualityManagement/v4/serviceLevelObjective/3113",
      "id": "3113"
    }
  ]
}
```


Delete service level specification

`DELETE /serviceLevelSpecification/{id}`

Description

This operation deletes a service level specification entity.

Usage Samples

Here's an example of a request for deleting a service level specification.

Request
DELETE /tmf-api/serviceQualityManagement/v4/serviceLevelSpecification/3830
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	04/15/2017	Pierre Gauthier TM Forum pgauthier@tmforum.org Mariano Belaunde Orange Labs	First Release of the Document.
Release 2.0	11/06/2018	Mariano Belaunde Orange Labs	Alignment with Guidelines 3.0
Version 4.0.0	03-Apr-2020	Knut Johannessen Telenor	New version based on new schema aligned with V4

Release History

Release Number	Date	Release led by:	Description
Pre-production	03-Apr-2020	Knut Johannessen Telenor	New version based on new schema aligned with V4

Contributors to Document
