TM Forum Specification

Performance Threshold API - REST Specification

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NOTICE

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INTRODUCTION

The following document is the specification of the REST API for the threshold management. It includes the model definition as well as all available operations.

Performance Threshold Management is about identifying exceptional behavior of monitored performance indicators. Threshold Management is built as an additional layer on top of standard Performance Monitoring. A PM Producing application that is already producing indicators is asked to set a Threshold over a Performance Indicator and raise an alarm when this Threshold is crossed. When the indicator returns to its normal behavior an alarm clear alarm event is sent.

Possible actions are:

- creating, retrieving, modifying and deleting threshold rules
- creating, retrieving, modifying and deleting thresholds
- creating, retrieving, modifying and deleting thresholdjobs.

The Performance Thresholding API provides a standardized client interface to Service and Resource Performance Management Systems for manipulating (create/update/delete) threshold/violation/exception rules. It enables alarms/notifications on exceptions and scheduling of threshold/violation/exception evaluation.

 Examples of Performance Thresholding API originators (clients) include resource performance monitoring applications and resource performance analysis applications. As part of the HIP platform the Capability delivery assurance will be exposing the API for Platform capability consumers. The API will also be used by the Platform Capability manager for capability delivery assurance.

The API supports the ability to define a Threshold as a set of rules that determine when to raise an alarm and when to clear it for various severity levels. Correspondingly, for each rule used for raising alarms, the expected alarm fields of the Threshold Crossing Alarm (TCA) can be set over the interface. The API will support Performance Thresholds creation deletion and query.

SAMPLE USE CASES

A Thresholding mechanism is a significant tool to identify exceptional behaviour at different management layers, at network level, service level and even customer level. It is assumed that a Performance Management system is deployed to collect and calculate measurements (e.g. Counters, KPIs, KQIs) that have significance to various departments of the Service Operator: Operations, Engineering, Marketing, Customer Care, etc. Performance Management systems are sometimes limited to a specific domain or technology and sometimes much wider serving multiple domains, multiple technologies and multiple management layers.

In many typical scenarios, there is a need of management systems to get the information on exceptional behaviour as reflected in values of KPIs. This may be needed as a tool to identify lack of network resources (e.g. Bandwidth, CPU, transport links) to realize an insufficient Quality of Service or even bad customer experience.

As shown in the diagram below, a management system that requires the information on exceptional behaviour of KPIs is typically requesting this information from the Performance management system that collects the relevant counters or calculates the KPIs. Using the Threshold management system will define the threshold defines the threshold and whenever the threshold is crossed the Performance management system will send a threshold crossing alarm using the standard TM Forum Alarm management API. Other consequences (not just alarms) may also be defined in a textual format.

Figure 1 - Threshold Management Use Case

A threshold is defined and executed in the target Performance management system in three steps:

1. Defining a threshold rule
2. Defining a threshold
3. Defining a threshold job that will execute the threshold witha s cope of monitored objects (resources, services, and customers) at a specific schedule

The Threshold Rule is the heart of this interface. It allows to define logic that determines when to alert on exceptional values of KPIs and on return to normal conditions. The Thresholding API supports two kinds of thresholds:

- Simple Thresholds – defined explicitly by a set of attributes
- Threshold algorithms – a case where the threshold is actually an algorithm to be executed with parameters

The simple threshold rules provide support for simple cases such as comparing a value of a KPI to a constant, but it can also support more interesting options such as checking ranges of values or counting events in a particular time interval and more.

It is also possible to define an action that will be triggered when a threshold rule is valid. In most cases the action will be raising or clearing a threshold crossing alarm (using the Alarm management interface). In other cases a generic kind of an action, described by a text or a URL can be defined.

The Threshold resource packs a set of threshold rules to single logic (with an "OR" condition among them) such that hysteresis or multi-range thresholds can be supported.

The Threshold Job is the operational entity to execute a threshold (a set of threshold rules). As part of the definition of a Threshold Job, a scope of monitored objects is provided and a schedule for the threshold evaluation is determined.

The API allows to create, update and delete threshold rules, thresholds and threshold jobs. Threshold jobs can be suspended and resumed as part of their lifecycle.

RESOURCE MODEL

Managed Entity and Task Resource Models

Example of the JSON representation of a Threshold:

```
{
  "id": "374",
  "href" : "http://api/threshold/374",
  "description": "Number odf Dropped Packets too high",
  "name": "DroppedPacketsHigh",
  "thresholdRule": [
    {
      "href": "http://api/thresholdrule/1919",
      "id": "1919",
       "name: "DroppedPacketsHighRule"
    }
  ]
}
```

Threshold attributes description:

Field	Mandatory/Optional	Description
Id	M	Unique identifier of the threshold
href	M	A reference to the threshold
description	O	A description of the threshold
name	M	A word, term, or phrase by which a Performance threshold is known and distinguished from other thresholds.
thresholdRule	M	A Performance Threshold contains a set of Performance threshold rules of different conditions (Raise, Clear) and different severities.

Example of the JSON representation of a Threshold Rule of type "SimpleThresholdRule" :

```
{
  "id": 1920,
  "thresholdRuleName": "DropPacketsHighRule",
  "href": "http://api/thresholdrule/1920",
  "@type": "simpleThresholdRule",
  "Measurement": {
  "id": "",
    "name": "DroppedPacketsPPS",
    "href": "",
    "description": "The number of dropped packets per second",
    "measurementType": "Traffic",
```

```
      "measurementUnit": "packets per second",
      "collectionType": "COUNTER",
      "measurementFormula": ""
    },
      "conformanceTargetUpper": 300,
      "conformanceTargetLower": 0,
      "conformanceComparatorUpper": GT,
      "conformanceComparatorLower": 0,
      "conformancePeriod": {
        "startDateTime": "",
        "endDateTime": ""
      }
      "tolerancePeriod": {
        "startDateTime": "",
        "endDateTime": ""
      },
      "thresholdTarget": 0,
      "gracePeriods": 0,

      "genericperformanceConsequence": [
      {
        "name": "",
        "Description": "",
        "prescribedAction": ""
      }
    ],
    "performanceAlarmSpecification": {
      "perfAlarmSpecSeverity": "MAJOR",
      "perfeAlarmProbableCause": "Threshold Crossed",
      "perfAlarmSpecAlarmType": "",
      "perfAlarmSpecSpecificProblem": "",
      "perfAlarmSpecAdditionalText": "Dropped Packets per second are over the limit"
},
    "perfAlarmSpecThresholdCrossingDescription": "Dropped Packets per second are over
the limit ",
    "thresholdRuleCondition": "Raise",
    "thresholdRuleSeverity": "MAJOR"
        }

}
```

Example of the JSON representation of a Threshold Rule of type
"AlgorithmThresholdRule" :

```
{
  "id": 1920,
  "thresholdRuleName": "DropPacketsHighRule",
   "@type": "algorithmThresholdRule ",
  "href": "http://api/thresholdrule/1920",
```

```
  "Measurement": {
  "id": "",
    "name": "DroppedPacketsPPS",
    "href": "",
    "description": "The number of dropped packets per second",
    "measurementType": "Traffic",
    "measurementUnit": "packets per second",
    "collectionType": "COUNTER",
    "measurementFormula": ""
  },
   "algorithmRef": ""http://api/thresholdrulealgoritm/7000"",
   "algorithmParams": [
      {
        "name": "sensitivity",
        "value": "0.2"
      }
    ],

  "genericperformanceConsequence": [
    {
      "name": "",
      "Description": "",
      "prescribedAction": ""
    }
  ],
  "performanceAlarmSpecification": {
    "perfAlarmSpecSeverity": "MAJOR",
    "perfeAlarmProbableCause": "Threshold Crossed",
    "perfAlarmSpecAlarmType": "",
    "perfAlarmSpecSpecificProblem": "",
    "perfAlarmSpecAdditionalText": "Dropped Packets per second are over the limit"
},
  "perfAlarmSpecThresholdCrossingDescription": "Dropped Packets per second are over
the limit ",
  "thresholdRuleCondition": "Raise",
  "thresholdRuleSeverity": "MAJOR"
      }

}
```

Threshold Rule attributes description:

Field	Mandatory/ Optional	Description
Id	M	Unique identifier of the threshold rule
thresholdRuleName	M	A word, term, or phrase by which a Performance threshold rule is known and distinguished from other threshold rules.
Href	M	A reference to the threshold rule
Measurement	O	A counter/KPI to be used by the threshold rule
Id	M	Unique identifier of the measurement
Name	M	A word, term, or phrase by which a measurement is known and distinguished from other measurements.
Href	M	A reference to the measurement
Description	O	A description of the measurement
measurementType	O	A category of the measurement (different SDOs may be using different categories)
measurementUnit	O	The unit of the measurement (e.g. second, bytes, Celsius, etc.)
collectionType	O	This attribute indicates different forms in which the measurement data can be captured (please see details below)
measurementFormula	O	A formula that is used to calculate a measurement (a string)
simpleThresholdRule		A threshold rule that is based on explicit definition of attributes that represent a Boolean expression
conformanceTargetUpper	O	A value used to determine if the Performance threshold is crossed or ceased to be crossed, serving as an upper value
conformanceTargetLower	O	A value used to determine if the Performance threshold is crossed or ceased to be crossed, serving as an lower value
conformanceComparatorUpper	O	An operator that when applied on a value (of conformanceTargetUpper) specifies whether a Performance threshold rule is crossed or ceased to be crossed.
conformanceComparatorLower	O	An operator that when applied on a value (of conformanceTargetLower) specifies whether a Performance threshold rule is crossed or ceased to be crossed.
conformancePeriod	O	An interval of time during which the ConformanceTarget must be measured
thresholdTarget	O	A percent that is used to specify when a warning should be used that indicates a Performance threshold is in danger of not being met.
tolerancePeriod	O	An interval of time over which the toleranceTarget is acceptable before a Performance threshold Consequence is initiated.
gracePeriods	O	The number of times an objective can remain un-updated in reference to the conformancePeriod without a Performance threshold Consequence being initiated.

algorithmThresholdRule	O	A threshold rule that is a reference to an algorithm
algorithmRef	O	
algorithmParams	O	A name value pair for the algorithm's parameters
genericPerformanceConsequence	O	A threshold crossing or a threshold ceased to be crossing results in a Performance consequence.
Name	M	A word, term, or phrase by which a Consequence is known and distinguished from other measurements
Description	O	A description of a Consequence
PrescribedAction	M	The suggested action
performanceAlarmSpecification	O	The specification of how to populate the alarm fields when generating a threshold crossing alarm.
perfAlamSpecSeverity	M	A value for the Severity attribute as part of a threshold crossing alarm definition.
perfAlamProbableCause	M	A value for the ProbableCause attribute as part of a threshold crossing alarm definition.
perfAlarmSpecAlarmType	O	A value for the AlarmType attribute as part of a threshold crossing alarm definition.
perfAlarmSpecSpecificProblem	O	A value for the SpecificProblem attribute as part of a threshold crossing alarm definition
perfAlarmSpecAdditionalText	O	A value for the AdditionalText attribute as part of a threshold crossing alarm definition.
perfAlarmSpecThresholdCrossing Description	O	A specific description of the threshold crossing (intended to be populated e under the alarm under CrossedThreshold structure).
thresholdRuleCondition	M	A concrete threshold may have two possible values: \"Raise\" - a threshold was crossed or \"Clear\" - a threshold ceased crossing.
thresholdRuleSeverity	M	A threshold can be generated in different severity levels. A crossing for each level may require a different condition and possibly trigger a different consequence. The supported severity levels are equivalent to the possible severity level of alarms.

Collection Types

Following are the possible values of Collection Type:

- COUNTER - This Collection Method is defined using a variable whose value can only be incremented and which is reset at the beginning of each granularity period to well defined value (usually "0").
- CUMULATIVE - This Collection Method is defined using a variable whose value can only be incremented and which wraps around on reaching maximum possible value that the variable can attain.
- GAUGE - This Collection Method is defined using a dynamic variable whose value can be incremented or decremented, and which may be reset at the beginning of a granularity period or recording interval (multiple consecutive granularity periods).

- DISCRETE_EVENT - A collection method (using a set of appropriate data containers) where data related to a particular event type is captured and every nth event is registered, where n ≥ 1. The captured information is reset at the beginning of each granularity period.
- STATUS_INSPECTION - This Collection Method uses a mechanism for high frequency samplings of internal counters at predefined rates and captured using appropriate data type. The captured information is reset at the beginning of each granularity period.

Alarm/Threshold Severities

Following are the possible values of Alarm/Threshold Severities:

- CRITICAL
- MAJOR
- MINOR
- WARNING
- INTERMEDIATE

Conformance Operators

Following are the possible values of the supported operators:

- GT – Greater than
- GE – Greater or equal
- EQ - Equal
- NEQ – Not Equal
- LE – Less or Equal

Example of the JSON representation of a Threshold Job. In this case the schedule definition is of type weeklyScheduledefinition.

```
{
    "id": "900",
    "href": "http://api/thresholdjob/900"
    "granularity": " G_30MN",
    "jobPriority": 0,
    "executionState": "Active",
    "performanceThreshold": 374,
    "scheduleDefinition": {
            "scheduleDefinitionStartTime": "2017-08-31T20:12:37.285Z",
            "scheduleDefinitionEndTime": "2018-08-31T20:12:37.285Z",
            "scheduleDefinitionHoursRange": "string",
            "@type" = "weeklyScheduledefinition",
            "daysOfWeekRecurrence ": [
```

```
        "Monday","Tuesady", Wednesday", "Thursday", "Friday"
      ],

      "excludedDates": [
        "2017-12-31"
      ]
    },
    "monitoredObjectsCriteria": [
      {
            "monitoredObjectInstances": "",
            "monitoredObjectClass": "Router Interface",
            "monitoredObjectFilter": ""
      }
  ]
}
```

Threshold job attributes description:

Field	Mandatory/ Optional	Description
Id	M	The identifier of the threshold job
Href	M	A reference to the threshold job
Granularity	O	The rate of evaluating the threshold (i.e. the execution of the threshold job)
creationTime	M	The threshold job creation time
lastModifiedTime	M	The time when the threshold job was last modified
jobPriority	O	The priority of the management job. The target system is using it to prioritize jobs.
executionState	M	The execution state of the threshold job. It is used to indicate a failure in the execution of the job.
performanceThreshold	M	The Performance threshold to be executed by the job.
scheduleDefinition	O	The schedule definition for running the threshold job
scheduleDefinitionStartTime	M	The Start time of the Schedule Definition
scheduleDefinitionEndTime	O	The Endtime of the Schedule Definition. If the attribute is empty the Schedule run forever, not having a time constraint.
recurringFrequency	M	A recurring frequency to run a job within day that is included in schedule definition, for example: every 5 minutes, 15 minute, 30 minutes, 1 hour.
scheduleDefinitionHoursRange	O	A list of time ranges within a specific day that the schedule will

			be active on, for example 08:00-12:00, 16:00-19:00.
WeeklyScheduleDefinition	O		The weekly schedule is used to define a schedule that is based on the days of the week, e.g. a schedule that will be active only on Monday and Tuesday.
daysOfWeekRecurrence	O		The list of days of week when the weekly schedule definition is active on: e.g. Monday, Tuesday, Wednesday.
MonthlyScheduleDaysofMonthDefinition	O		The monthly schedule by days of month is used to define a schedule that is based on specifying which days of month are requited, e.g. the10th, 20th, 30th of each month.
daysOfMonthRecurrence			The list of days of month when the monthly schedule definition is active on, e.g. 10th , 15th , 20th.
MonthlyScheduleDaysofWeekDefinition	O		The monthly schedule by days of week is used to define a monthly schedule based on the sequence of week in a month and the days, e.g. Monday of the 1st week each month.
daysOdMonthRecurrence	O		The list of days within a week of month when the monthly schedule definition is active on, e.g. Monday, Tuesday of the week that is specified in the recurringDaySequence attribute.
recurringDaySequence	O		A week of month when the monthly schedule definition is active on, 1-5 or last week of the month. This works in conjunction with the daysOfWeekRecurrence attribute.
DateScheduleDefinition	O		The date schedule is used to define a schedule that is based on specific dates, such as December 31st 2015, Feberaury 28th 2013
scheduledDates			The list of dates when the date schedule definition is active on, e.g.November 1st 2022.
excludedDates	O		A list of specific dates that should be excluded from the Schedule Definition.
monitoredObjectsCriteria	M		Monitored objects are specified by the MonitoredObjectsCriteria.
monitoredObjectInstnaces	O		A list of object identifiers for specifying what monitored objects need to be referencenced.
monitoredObjectClass	O		A monitored object class for specifying the set of instances that are referenced
mointoredObjectFilter	O		A filter that can be used in conjunction with the monitored object class for specifying the set of instances that are referenced

Granularity

Following are the possible values of Granularity:

- G_1M – 1 Minute
- G_5M – 5 Minutes
- G_15M – 15 minutes
- G_30M – 30 minutes
- G_1H – 1 hour
- G_24H – 24 hours
- G_1M – 1 month
- G_1Y – 1 year
- NA – not available

Execution State

Following are the possible values of Execution States:

- Active – The job is active
- Suspended – The job is suspended
- Failed – The job is not active due to a failure
- Completed – The job has complted sucessfully, but no longer active

Figure 2 - Jobs Execution State Machine

UML MODEL

The UML model of the Threshold Interface is shown in the diagram below.

API OPERATION FOR THRESHOLDS

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
Complete Update of an Entity	PUT Resource	PUT must be used to completely update a resource identified by its resource URI
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.

Threshold Operations

Uniform API Operation	Mandatory/Optional	Comments
POST /threshold	M	Create a new threshold
PATCH /threshold/{thresholdId}	O	Modify a threshold
DELETE/threshold/{thresholdId}	M	DELETE a threshold, always by identifier
GET /threshold/{thresholdId}	M	GET an threshold by identifier
GET /threshold	O	GET an threshold by a filter

Threshold Rule Operations

Uniform API Operation	Mandatory/Optional	Comments
POST /thresholdRule	M	Create a new threshold rule
PATCH /threshold/{thresholdRuleId}	O	Modify a threshold rule
DELETE/threshold/{thresholdRuleId}	M	DELETE a threshold rule, always by identifier
GET /threshold/{thresholdRuleId}	M	GET a threshold rule by identifier
GET /thresholdRule	O	GET threshold rules by a filter

Threshold Job Operation

Uniform API Operation	Mandatory/Optional	Comments
POST /thresholdJob	M	Create a new threshold job
PATCH /threshold/{thresholdJobId}	O	Modify a threshold job
DELETE/thresholdJob/{thresholdJobId}	M	DELETE a threshold job, always by identifier
GET /thresholdJob/{thresholJobId}	M	GET a threshold job by identifier
GET /thresholdJob	O	GET threshold jobs by a filter
POST /suspendThresholdJob	O	Suspend a threshold job
POST /resumeThresholdJob	O	Resume a threshold job

Notifications

Uniform API Operation	Mandatory/Optional	Comments
POST /threshldCreateNotification	M	Notify on a new threshold
POST /thresholdClearedNotification	M	Notify on a cleared threshold
POST /thresholdChangeNotification	O	Notify on a change in a threshold

Uniform API Operation	Mandatory/Optional	Comments
POST /threshldRuleCreateNotification	M	Notify on a new threshold rule
POST /thresholdRuleClearedNotification	M	Notify on a cleared threshold rule
POST /thresholdRuleChangeNotification	O	Notify on a change in a threshold rule
POST /threshldJobCreateNotification	M	Notify on a new threshold job
POST /thresholdJobClearedNotification	M	Notify on a cleared threshold job
POST /thresholdJobChangeNotification	O	Notify on a change in a threshold job
POST /thresholdJobSuspendNotification	O	Notify on a suspension of a threshold job
POST /thresholdJobResumeNotification	O	Notify on a resumption of a threshold job

POST /API/THRESOLD

The POST /threshold operation is used to create a new threshold at the target Performance management system.

Behavior:

- Return status codes
    - 20OK - the request was successful
    - 400 Bad Request – error

The mandatory/optional attributes are specified in the table below.

Field	Mandatory/ Optional	Rule
description	O	
name	M	
thresholdRule	M	

REQUEST

POST /api/threshold
Content-Type: application/json
 	
{
  "description": "Too many Dropped Packets per interface",
  "name": "DroppedPacketsHigh",
  "thresholdRule": [
    {
      "href": "http://api/thresholdrule/1919",
      "id": "1919"
    }
  ]
}

RESPONSE
201 Content-Type: application/json {   "id": "374",

```
  "href" : "http://api/threshold/374",
  "description": "string",
  "name": "DroppedPacketsHigh",
  "thresholdRule": [
    {
      "href": "http://api/thresholdrule/1919",
      "id": "1919",
       "name: ""
    }
  ]
}
```

PATCH /API/THRESHOLD/{THRESHOLDID}

The PATCH /threshold operation is used to modify an existing threshold at the target Performance management system.

Behavior:

- Return status codes
    - 201 Created - the request was successful
    - 400 Bad Request – error

The patchable attributes are specified in the table below.

Field	Patchable	Rule
Id	N	
href	N	
description	Y	
name	Y	
thresholdRule	Y	

In the example below, the threshold the patch command is used to modify the description of the threshold and the attached threshold rule.

REQUEST

PATCH /api/threshold/374
Content-Type: application/json
{
  "id": 374,
  "description": " Too many Dropped Packets per Router interface",
  "thresholdRule": [
   {
      "href": "http://api/thresholdrule/1920",
      "id": "1920"
   }
  ]
}

RESPONSE
201 Content-Type: application/json

```
{
  "id": "374",
  "href" : "http://api/threshold/374",
  "description": "Too many Dropped Packets per Router interface ",
  "name": "DroppedPacketsHigh ",
  "thresholdRule": [
    {
      "href": "http://api/thresholdrule/1920",
      "id": "1920"
    }
  ]
}
```

DELETE /API/THRESHOLD/{THRESHOLDID}

The PATCH /threshold operation is used to delete an existing threshold at the target management system.

Behavior:

- Return status codes
  - 201 Created - the request was successful
  - 400 Bad Request - error

REQUEST
delete /api/threshold/374 Content-Type: application/json
RESPONSE
200

GET /API/THRESHOLD/{THRESHOLDID)

The GET /alarm operation is used to ..

Behavior:

- Return status codes
    - 201 Created - the request was successful
    - 400 Bad Request - error

REQUEST

Get /api/threshold/374
Content-Type: application/json

RESPONSE

```
200
Content-Type: application/json

{
  "id": 374,
  "href" : "http://api/threshold/374",
  "description": "Too many Dropped Packets per Router interface ",
  "name": "DroppedPacketsHigh ",
  "thresholdRule": [
    {
      "href": "http://api/thresholdrule/1920",
      "id": "1920"
    }
  ]
}
```

GET /API/THRESHOLD

The GET /api/threshold operation is used to get thresholds by filter.

Behavior:

- Return status codes
  - 201 Created - the request was successful
  - 400 Bad Request - error

REQUEST
Get /api/threshold?name= DroppedPacketsHigh Accept: application/json

RESPONSE

200
Content-Type: application/json
 	
{
  "id": 374,
 	
  "href" : "http://api/threshold/374",
 	
  "description": "Too many Dropped Packets per Router interface ",
 	
  "name": "DroppedPacketsHigh ",
 	
  "thresholdRule": [
 	
   {
 	
    "href": "http://api/thresholdrule/1920",
 	
    "id": "1920"
 	
   }
 	
  ]
 	
}

POST /API/THRESOLDRULE

The POST /thresholdrule operation is used to create a new threshold rule at the target Performance management system.

<u>Behavior:</u>

- Return status codes
    - 200 OK - the request was successful
    - 400 Bad Request – error

The mandatory/optional attributes are specified in the table below.

Field	Mandatory/ Optional	Rule
Id	M	Unique identifier of the threshold rule, maybe supplied to be used by the target system. If not supplied, the target system will generate it
thresholdRuleName	M	
Measurement	O	
Id	M	
Name	M	
Href	M	
Description	O	
measurementType	O	
measurementUnit	O	
collectionType	O	
measurementFormula	O	
@Type	M	Either "simpleThresholdRule" or "algorithmThresholdRule"
simpleThresholdRule (subclass)		Not an actual attribute .The grouped attributes below belong to this subclass
conformanceTargetUpper	O	When populated should be used with conformanceComparatorUpper
conformanceTargetLower	O	When populated should be used with conformanceComparatorLower
conformanceComparatorUpper	O	
conformanceComparatorLower	O	
conformancePeriod	O	
thresholdTarget	O	
tolerancePeriod	O	
gracePeriods	O	
algorithmThresholdRule (subclass)	O	Not an actual attribute .The grouped attributes below belong to this subclass
algorithmRef	O	
algorithmParams	O	
genericPerformanceConsequence	O	
Name	M	
Description	O	
PrescribedAction	M	
performanceAlarmSpecification	O	
perfAlamSpecSeverity	M	
perfAlamProbableCause	M	
perfAlarmSpecAlarmType	O	
perfAlarmSpecSpecificProblem	O	

perfAlarmSpecAdditionalText	O	
perfAlarmSpecThresholdCrossing Description	O	
thresholdRuleCondition	M	
thresholdRuleSeverity	M	

REQUEST

POST /api/thresholdrule/

Content-type: application/json

```
{
  "thresholdRuleName": "DropPacketsHighRule",
  "@type": "simpleThresholdRule",
  "Measurement": {
    "id": "",
    "name": "DroppedPacketsPPS",
    "href": "",
    "description": "The number of dropped packets per second",
    "measurementType": "Traffic",
    "measurementUnit": "packets per second",
    "collectionType": "COUNTER",
    "measurementFormula": ""
  },
  "conformanceTargetUpper": 300,
  "conformanceTargetLower": 0,
  "conformanceComparatorUpper": GT,
  "conformanceComparatorLower": 0,
  "conformancePeriod": {
    "startDateTime": "",
    "endDateTime": ""
  },
  "tolerancePeriod": {
    "startDateTime": "",
    "endDateTime": ""
  },
  "thresholdTarget": 0,
  "gracePeriods": 0
  "genericperformanceConsequence": [
```

```
  {
    "name": "",
    "Description": "",
    "prescribedAction": ""
  },
 "performanceAlarmSpecification": {
  "perfAlarmSpecSeverity": "MAJOR",
  "perfeAlarmProbableCause": "Threshold Crossed",
  "perfAlarmSpecAlarmType": "",
  "perfAlarmSpecSpecificProblem": "",
  "perfAlarmSpecAdditionalText": "Dropped Packets per second are over the limit"
 },
 "perfAlarmSpecThresholdCrossingDescription": " Dropped Packets per second are over the limit ",
 "thresholdRuleCondition": "Raise",
 "thresholdRuleSeverity": "MAJOR"
}
```

RESPONSE

```
201
Content-Type: application/json

{
  "id": 1920,
  "thresholdRuleName": "DropPacketsHighRule",
  "@type": "simpleThresholdRule",

  "href": "http://api/thresholdrule/1920",
  "Measurement": {
        "id": "",
        "name": "DroppedPacketsPPS",
        "href": "",
        "description": "The number of dropped packets per second",
        "measurementType": "Traffic",
        "measurementUnit": "packets per second",
        "collectionType": "COUNTER",
        "measurementFormula": ""
  },
  "conformanceTargetUpper": 300,
  "conformanceTargetLower": 0,
```

```
  "conformanceComparatorUpper": GT,

  "conformanceComparatorLower": 0,

  "conformancePeriod": {

   "startDateTime": "",

   "endDateTime": ""

  },

  "tolerancePeriod": {

   "startDateTime": "",

   "endDateTime": ""

  },

  "thresholdTarget": 0,

  "gracePeriods": 0,

  "genericperformanceConsequence": [

    {

      "name": "",

      "Description": "",

      "prescribedAction": ""

    }

  ],

  "performanceAlarmSpecification": {

    "perfAlarmSpecSeverity": "MAJOR",

    "perfeAlarmProbableCause": "Threshold Crossed",

    "perfAlarmSpecAlarmType": "",

    "perfAlarmSpecSpecificProblem": "",

    "perfAlarmSpecAdditionalText": "Dropped Packets per second are over the
limit"

    },

   "perfAlarmSpecThresholdCrossingDescription": " Dropped Packets per second are
over the limit ",

  "thresholdRuleCondition": "Raise",

  "thresholdRuleSeverity": "MAJOR"
}
}
```

PATCH /API/THRESOLDRULE/{THRESHOLDRULEID}

The PATCH /api/thresholdrule operation is used to modify an existing threshold rule at the target management system.

Behavior:

- Return status codes
    - 201 Created - the request was successful
    - 400 Bad Request – error

The patchable attributes are specified in the table below.

Field	Patchable	Rule
id	N	
href	N	
thresholdRuleName	Y	
Measurement	Y	
Id	N	
Name	N	
Href	N	
Description	N	
measurementType	N	
measurementUnit	N	
collectionType	N	
measurementFormula	N	
@Type	Y	
simpleThresholdRule		Not an actual attribute .The grouped attributes below belong to this subclass
conformanceTargetUpper	Y	
conformanceTargetLower	Y	
conformanceComparatorUpper	Y	
conformanceComparatorLower	Y	
conformancePeriod	Y	
thresholdTarget	Y	
tolerancePeriod	Y	
gracePeriods	Y	
algorithmThresholdRule	Y	Not an actual attribute .The grouped attributes below belong to this subclass
algorithmRef	Y	
algorithmParams	Y	
genericPerformanceConsequence	Y	
Name	Y	
Description	Y	
PrescribedAction	Y	
performanceAlarmSpecification	Y	
perfAlamSpecSeverity	Y	
perfAlamProbableCause	Y	
perfAlarmSpecAlarmType	Y	
perfAlarmSpecSpecificProblem	Y	
perfAlarmSpecAdditionalText	Y	
perfAlarmSpecThresholdCrossingDescription	Y	
thresholdRuleCondition	Y	
thresholdRuleSeverity	Y	

In the example below, the definition of the alarm to generate is being changed.

REQUEST

```
PATCH /api/thresholdrule/1920
Content-type: application/merge-patch+json
{
    "performanceAlarmSpecification": {
    "perfAlarmSpecSeverity": "CRITICAL",
    "perfeAlarmProbableCause": "Threshold Crossed",
    "perfAlarmSpecAlarmType": "",
    "perfAlarmSpecSpecificProblem": "",
    "perfAlarmSpecAdditionalText": "Dropped Packets per second are over the
limit"  },
  "perfAlarmSpecThresholdCrossingDescription": " Dropped Packets per second are
over the limit ",
  }
}
```

RESPONSE

```
201
Content-Type: application/json

{
  "id": 1920,
  "thresholdRuleName": "DropPacketsHighRule",
  "@type": "simpleThresholdRule",

  "href": "http://api/thresholdrule/1920",
  "Measurement": {
        "id": "",
        "name": "DroppedPacketsPPS",
        "href": "",
        "description": "The number of dropped packets per second",
        "measurementType": "Traffic",
        "measurementUnit": "packets per second",
        "collectionType": "COUNTER",
        "measurementFormula": ""
  },
  "conformanceTargetUpper": 300,
```

```
  "conformanceTargetLower": 0,

  "conformanceComparatorUpper": GT,

  "conformanceComparatorLower": 0,

  "conformancePeriod": {

   "startDateTime": "",

   "endDateTime": ""

  }

  "tolerancePeriod": {

   "startDateTime": "",

   "endDateTime": ""

  },

  "thresholdTarget": 0,

  "gracePeriods": 0

  "genericperformanceConsequence": [

    {

      "name": "",

      "Description": "",

      "prescribedAction": ""

    }

  ],

  "performanceAlarmSpecification": {

    "perfAlarmSpecSeverity": "CRITICAL",

    "perfeAlarmProbableCause": "Threshold Crossed",

    "perfAlarmSpecAlarmType": "",

    "perfAlarmSpecSpecificProblem": "",

    "perfAlarmSpecAdditionalText": "Dropped Packets per second are over the
limit"

     },

  "perfAlarmSpecThresholdCrossingDescription": " Dropped Packets per second are
over the limit ",

  "thresholdRuleCondition": "Raise",

  "thresholdRuleSeverity": "CRITICAL"
}
}
```

DELETE /API/THRESOLDRULE/{THRESHOLDRULEID}

The DELETE /api/thresholdrule operation is used to delete an existing threshold rule at the target management system.

Behavior:

- Return status codes
    - 201 Created - the request was successful
    - 400 Bad Request - error

REQUEST
DELETE /api/thresholdrule/1920
RESPONSE
200

GET /API/THRESHOLDRULE/{THRESHOLDRULEID)

The GET /api/thresholdrule operation is used to get the details of athreshold rule by the identifier.

Behavior:

- Return status codes
    - 201 Created - the request was successful
    - 400 Bad Request - error

REQUEST
GET /api/thresholdrule/1920 Accept: application/json

RESPONSE

```
201
Content-Type: application/json

{
  "id": 1920,
  "thresholdRuleName": "DropPacketsHighRule",
  "@type": "simpleThresholdRule",
  "href": "http://api/thresholdrule/1920",
  "Measurement": {
        "id": "",
        "name": "DroppedPacketsPPS",
        "href": "",
        "description": "The number of dropped packets per second",
        "measurementType": "Traffic",
        "measurementUnit": "packets per second",
        "collectionType": "COUNTER",
        "measurementFormula": ""
  },
  "conformanceTargetUpper": 300,
  "conformanceTargetLower": 0,
  "conformanceComparatorUpper": GT,
  "conformanceComparatorLower": 0,
  "conformancePeriod": {
    "startDateTime": "",
            "endDateTime": ""
```

```
  },
  "tolerancePeriod": {
   "startDateTime": "",
   "endDateTime": ""
  },
  "thresholdTarget": 0,
  "gracePeriods": 0,
  "genericperformanceConsequence": [
    {
      "name": "",
      "Description": "",
      "prescribedAction": ""
    }
  ],
  "performanceAlarmSpecification": {
    "perfAlarmSpecSeverity": "CRITICAL",
    "perfeAlarmProbableCause": "Threshold Crossed",
    "perfAlarmSpecAlarmType": "",
    "perfAlarmSpecSpecificProblem": "",
    "perfAlarmSpecAdditionalText": "Dropped Packets per second are over the
limit"
     },
  "perfAlarmSpecThresholdCrossingDescription": " Dropped Packets per second are
over the limit ",
  "thresholdRuleCondition": "Raise",
  "thresholdRuleSeverity": "CRITICAL"
}
}
```

GET /API/THRESHOLDRULE

The GET /api/thresholdrule operation is used to get a threshold rule by filter.

Behavior:

- Return status codes
  - 201 Created - the request was successful
  - 400 Bad Request - error

REQUEST

```
GET
/api/thresholdrule/fields=id,thresholdRulename,href,Measurement&thresholdRuleSeverity=CRITICA
L
Accept: application/json
```

RESPONSE

```
200
Content-Type: application/json
{
   "id": 1920,
   "thresholdRuleName": "DropPacketsHighRule",
    "@type": "simpleThresholdRule",
   "href": "http://api/thresholdrule/1920",
   "Measurement": {
          "id": "",
          "name": "DroppedPacketsPPS",
          "href": "",
          "description": "The number of dropped packets per second",
          "measurementType": "Traffic",
          "measurementUnit": "packets per second",
          "collectionType": "COUNTER",
          "measurementFormula": ""
   },
   "conformanceTargetUpper": 300,
   "conformanceTargetLower": 0,
   "conformanceComparatorUpper": GT,
   "conformanceComparatorLower": 0,
   "conformancePeriod": {
     "startDateTime": "",
     "endDateTime": "",
    }
   "tolerancePeriod": {
     "startDateTime": "",
     "endDateTime": ""
   },
   "thresholdTarget": 0,
   "gracePeriods": 0,
   "genericperformanceConsequence": [
      {
```

```
      "name": "",
      "Description": "",
      "prescribedAction": ""
    }
  ],
  "performanceAlarmSpecification": {
    "perfAlarmSpecSeverity": "CRITICAL",
    "perfeAlarmProbableCause": "Threshold Crossed",
    "perfAlarmSpecAlarmType": "",
    "perfAlarmSpecSpecificProblem": "",
    "perfAlarmSpecAdditionalText": "Dropped Packets per second are over the
limit"
    },
  "perfAlarmSpecThresholdCrossingDescription": " Dropped Packets per second are
over the limit ",
  "thresholdRuleCondition": "Raise",
  "thresholdRuleSeverity": "CRITICAL"
}
}
```

POST /API/THRESOLDJOB

The POST /api/thresholdjob operation is used to create a new threshold job at the target Performance management system.

Behavior:

- Return status codes
  - 200 OK - the request was successful
  - 400 Bad Request – error

The mandatory/optional attributes are specified in the table below.

Field	Mandatory/ Optional	Rule
Granularity	O	If not specified, the measurement collection granularity should be used
jobPriority	O	
performanceThreshold	O	
scheduleDefinition	O	
scheduleDefinitionStartTime	O	
scheduleDefinitionEndTime	O	
recurringFrequency	O	
scheduleDefinitionHoursRange	O	
@type	M	Possible values are any of the subclasses below
WeeklyScheduleDefinition	O	Not an actual attribute .The grouped attributes below belong to this subclass
daysOfWeekRecurrence	O	
MonthlyScheduleDaysofMonthDefinition	O	Not an actual attribute .The grouped attributes below belong to this subclass
daysOfMonthRecurrence		
MonthlyScheduleDaysofWeekDefinition	O	Not an actual attribute .The grouped attributes below belong to this subclass
daysOdMonthRecurrence	O	
recurringDaySequence	O	
DateScheduleDefinition	O	Not an actual attribute .The grouped attributes below belong to this subclass
scheduledDates		
excludedDates	O	
monitoredObjectsCriteria	O	
monitoredObjectInstnaces	O	
monitoredObjectClass	O	
mointoredObjectFilter	O	

REQUEST

```
POST /api/thresholdjob/
Content-type: application/json
{
 "granularity": " G_30MN",
  "jobPriority": 0,
 "performanceThreshold": 374,
 "scheduleDefinition": {
         "scheduleDefinitionStartTime": "2017-08-31T20:12:37.285Z",
         "scheduleDefinitionEndTime": "2018-08-31T20:12:37.285Z",
         "scheduleDefinitionHoursRange": "",
         "@type" = "weeklyScheduledefinition",
         daysOfWeekRecurrence":    "Monday", "Tuesday", "Wednesday", "Thursday", "Friday"
            "excludedDates": [
            "2017-12-31"
             ]
         },
  "monitoredObjectsCriteria": [
  {
    "monitoredObjectInstances": "",
    "monitoredObjectClass": "Router Interface",
    "monitoredObjectFilter": ""
  }
 ]
}
```

RESPONSE

```
200
Content-Type: application/json

{
  "id": "900",
  "href": "http://api/thresholdjob/900"
  "granularity": " G_30MN",
   "jobPriority": 0,
   "executionState": "Active",
   "performanceThreshold": 374,
   "scheduleDefinition": {
```

```
    "scheduleDefinitionStartTime": "2017-08-31T20:12:37.285Z",

    "scheduleDefinitionEndTime": "2018-08-31T20:12:37.285Z",

    "scheduleDefinitionHoursRange": "",

    "@type" = "weeklyScheduledefinition",

    daysOfWeekRecurrence":    "Monday", "Tuesday", "Wednesday", "Thursday", "Friday"

    "excludedDates": [

    "2017-12-31"

     ],

   "monitoredObjectsCriteria": [

    {

      "monitoredObjectInstances": "",

      "monitoredObjectClass": "Router Interface",

      "monitoredObjectFilter": ""

    }

  ]
}
```

PATCH /API/THRESOLDJOB/{THRESHOLDJOBID}

The PATCH /api/thresholdjob operation is used to modify an existing threshold job at the target Performance management system.

Behavior:

- Return status codes
    - 201 Created - the request was successful
    - 400 Bad Request – error

The patchable attributes are specified in the table below.

Field	Patchable	Rule
id	N	
href	N	
Granularity	Y	
jobPriority	Y	
performanceThreshold	Y	
scheduleDefinition	Y	
scheduleDefinitionStartTime	Y	
scheduleDefinitionEndTime	Y	
recurringFrequency	Y	
scheduleDefinitionHoursRange	Y	
@type	Y	Possible values are any of the subclasses below
WeeklyScheduleDefinition	Y	Not an actual attribute .The grouped attributes below belong to this subclass
daysOfWeekRecurrence	Y	
MonthlyScheduleDaysofMonthDefinition	Y	Not an actual attribute .The grouped attributes below belong to this subclass
daysOfMonthRecurrence		
MonthlyScheduleDaysofWeekDefinition	Y	Not an actual attribute .The grouped attributes below belong to this subclass
daysOdMonthRecurrence	Y	
recurringDaySequence	Y	
DateScheduleDefinition	Y	Not an actual attribute .The grouped attributes below belong to this subclass
scheduledDates	Y	
excludedDates	Y	
monitoredObjectsCriteria	Y	
monitoredObjectInstnaces	Y	
monitoredObjectClass	Y	
mointoredObjectFilter	Y	

In the example below, the schedule definition is changed, such that the threshold job will run every 5 days, instead of running on week days.

REQUEST

```
PATCH /api/thresholdjob/900
Content-type: application/merge-patch+json


{
  "scheduleDefinition": {
   "@type" = "monthlyScheduleDaysOfMonthDefinition,
   " daysOfMonthRecurrence ": [
      "5", "10", "15", "20", "25", "30"
    ],
    "excludedDates": [
      "2017-12-31"
    ]
  },
}
```

RESPONSE

```
201
Content-Type: application/json

{
  "id": "900",
  "href": "http://api/thresholdjob/900"
  "granularity": " G_30MN",
  "jobPriority": 0,
  "executionState": "Active",
  "performanceThreshold": 374,
  "scheduleDefinition": {
   "scheduleDefinitionStartTime": "2017-08-31T20:12:37.285Z",
   "scheduleDefinitionEndTime": "2018-08-31T20:12:37.285Z",
   "scheduleDefinitionHoursRange": "",
   "@type" = "monthlyScheduleDaysOfMonthDefinition",
     "daysOfMonthRecurrence ": [
```

```
     "5", "10", "15", "20", "25", "30"
      ],
      "excludedDates": [
       "2017-12-31"
      ]
   },
  "monitoredObjectsCriteria": [
   {
     "monitoredObjectInstances": "",
     "monitoredObjectClass": "Router Interface",
     "monitoredObjectFilter": ""
   }
  ]
}
```

DELETE /API/THRESOLDJOB/{THRESHOLDJOBID}

The DELETE /api/thresholdjob operation is used to delete an existing threshold job in the target Performance management system.

<u>Behavior:</u>

- Return status codes
    - o 201 Created - the request was successful
    - o 400 Bad Request - error

REQUEST
DELETE /api/thresholdjob/900
RESPONSE
200

GET /API/THRESHOLDJOB//{THRESHOLDJOBID)

The GET /thresholdjob operation is used to get the details of a threshold by its identifier.

Behavior:

- Return status codes
  - o 201 Created - the request was successful
  - o 400 Bad Request - error

REQUEST

GET /api/thresholdjob/900
Accept: application/json

RESPONSE

```
201
Content-Type: application/json

{
  "id": "900",
  "href": "http://api/thresholdjob/900"
  "granularity": " G_30MN",
   "jobPriority": 0,
   "executionState": "Active",
   "performanceThreshold": 374,
   "scheduleDefinition": {
    "scheduleDefinitionStartTime": "2017-08-31T20:12:37.285Z",
    "scheduleDefinitionEndTime": "2018-08-31T20:12:37.285Z",
    "scheduleDefinitionHoursRange": "",
    "@type" = "monthlyScheduleDaysOfMonthDefinition",
     " daysOfMonthRecurrence ": [
       "5", "10", "15", "20", "25", "30"
     ],
      "excludedDates": [
      "2017-12-31"
    ]
  },
  "monitoredObjectsCriteria": [
    {
```

```
      "monitoredObjectInstances": "",

      "monitoredObjectClass": "Router Interface",

      "monitoredObjectFilter": ""

   }

  ]
}
```

GET /API/THRESHOLDJOB

The GET /api/thresholdjob operation is used to get the details of required threshold jobs by a filter.

In the example below, the request is to retrieve the id and href attributes of all threshold jobs that were created after August 31st 2017 at 20:00.

Behavior:

- Return status codes
    - 201 Created - the request was successful
    - 400 Bad Request - error

REQUEST
GET /api/thresholdjob/fields=id,href,Measurement& lastModifiedTime.gt="2017-08-31T20:00:00.000Z" Accept: application/json

RESPONSE

200
Content-Type: application/json
 	
[
    {
      "id": "20",
      "http://api/thresholdjob/20": "string",
    },
    {
      "id": "23",
      "href": " http://api/thresholdjob/23",
    }
]

POST /API//{THRESHOLDJOBID}/SUSPEND

The POST /api/thresholdJob/{id}/suspend operation is used to suspend the execution of a threshold job at the target Performance management system.

Behavior:

- Return status codes
  - 201 Created - the request was successful
  - 400 Bad Request - error

REQUEST
POST /api/thresholdJob/20/suspend Content-Type: application/json
RESPONSE
200

POST /API/{THRESHOLDJOBID}RESUME

The POST /api/threshold/{id}/Resume operation is used to resume the execution of a threshold job at the target Performance management system.

Behavior:

- Return status codes
    - 201 Created - the request was successful
    - 400 Bad Request - error

REQUEST
POST /api/ thresholdJob/20/resume Content-Type: application/json
RESPONSE
200

API NOTIFICATION FOR THRESHOLDS

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.

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.

REQUEST
DELETE /api/hub/{id} Accept: application/json

RESPONSE
204

PUBLISH {EVENTTYPE} POST /LISTENER

Description:

Provide the Event description

Behavior:

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

REQUEST

POST /client/listener
Accept: application/json
 	
{
    "eventType": "EventType",
    "eventTime": "2014-09-27T05:46:25.0Z",
    "eventId": "1562231",
    "event":
    {
  EVENT BODY
    }
}

RESPONSE
201 Content-Type: application/json

Example see TMF REST Design Guidelines.

THRESHOLDCREATE NOTIFICATION

Example of the JSON representation of thresholdcreate Notification:

```
POST /client/listener

Accept: application/json

{

      "eventType": "ThresholdCreateNotification",

      "eventTime": "2017-09-27T05:46:25.0Z",

      "eventId": "1562231",

      "event":

      {

            "threshold":

            {

                  "id": "374",

                  "href" : "http://api/threshold/374",

                  "description": "Number odf Dropped Packets too high",

                  "name": "DroppedPacketsHigh",

                  "thresholdRule": [

                    {

                       "href": "http://api/thresholdrule/1919",

                       "id": "1919",

                        "name: "DroppedPacketsHighRule"

                    }

                  ]

            }

      }

}
```

THRESHOLDCHANGE NOTIFICATION

Example of the JSON representation of thresholdchange Notification:

```
POST /client/listener

Accept: application/json

{

      "eventType": "ThresholdChangeNotification",

      "eventTime": "2017-09-27T05:46:25.0Z",

      "eventId": "1562233",

      "event":

      {

            "threshold":

            {

                  "id": "374",

                  "href" : "http://api/threshold/374",

                  "description": "Number odf Dropped Packets too high",

                  "name": "DroppedPacketsHigh",

                  "thresholdRule": [

                    {

                      "href": "http://api/thresholdrule/1919",

                      "id": "1919",

                       "name: "DroppedPacketsHighRule"

                    }

                  ]

            }

      }

}
```

THRESHOLDDELETE NOTIFICATION

Example of the JSON representation of thresholdDelete Notification:

```
POST /client/listener

Accept: application/json

{

      "eventType": "ThresholdDeleteNotification",

      "eventTime": "2017-09-27T05:46:25.0Z",

      "eventId": "1562235",

      "event":

      {

            "threshold":

            {

                  "id": "374",

                  "href" : "http://api/threshold/374",

                  "description": "Number odf Dropped Packets too high",

                  "name": "DroppedPacketsHigh",

                  "thresholdRule": [

                    {

                       "href": "http://api/thresholdrule/1919",

                       "id": "1919",

                        "name: "DroppedPacketsHighRule"

                    }

                  ]

            }

      }

}
```

THRESHOLDRULECREATE NOTIFICATION

Example of the JSON representation of thresholdRuleCreate Notification:

```
POST /client/listener

Accept: application/json

{

      "eventType": "ThresholdRuleCreateNotification",

      "eventTime": "2017-09-27T05:46:25.0Z",

      "eventId": "1562239",

      "event":

      {

            "thresholdRule":

            {

              "id": 1920,

              "thresholdRuleName": "DropPacketsHighRule",

              "href": "http://api/thresholdrule/1920",

              "Measurement": {

                    "id": "",

                    "name": "DroppedPacketsPPS",

                    "href": "",

                    "description": "The number of dropped packets per second",

                    "measurementType": "Traffic",

                    "measurementUnit": "packets per second",

                    "collectionType": "COUNTER",

                    "measurementFormula": ""

              },

              "@type": "simpleThresholdRule",

               "conformanceTargetUpper": 300,

              "conformanceTargetLower": 0,

              "conformanceComparatorUpper": GT,

              "conformanceComparatorLower": 0,

              "conformancePeriod": {

               "startDateTime": "",

               "endDateTime": ""

              },
```

```json
            "tolerancePeriod": {
             "startDateTime": "",
             "endDateTime": ""
            },
            "thresholdTarget": 0,
            "gracePeriods": 0,
           "genericperformanceConsequence": [
             {
               "name": "",
               "Description": "",
               "prescribedAction": ""
             }
           ],
           "performanceAlarmSpecification": {
             "perfAlarmSpecSeverity": "CRITICAL",
             "perfeAlarmProbableCause": "Threshold Crossed",
             "perfAlarmSpecAlarmType": "",
             "perfAlarmSpecSpecificProblem": "",
             "perfAlarmSpecAdditionalText": "Dropped Packets per second are
      over the limit"
              },
           "perfAlarmSpecThresholdCrossingDescription": " Dropped Packets
      per second are over the limit ",
             "thresholdRuleCondition": "Raise",
             "thresholdRuleSeverity": "CRITICAL"
           }
       }
    }
}
```

THRESHOLDRULECHANGE NOTIFICATION

Example of the JSON representation of thresholdRuleChange Notification:

```
POST /client/listener

Accept: application/json

{

      "eventType": "ThresholdRuleChangeNotification",

      "eventTime": "2017-09-27T05:46:25.0Z",

      "eventId": "1562239",

      "event":

      {

              "thresholdRule":

              {

                "id": 1920,

                "thresholdRuleName": "DropPacketsHighRule",

                "href": "http://api/thresholdrule/1920",

                "Measurement": {

                        "id": "",

                        "name": "DroppedPacketsPPS",

                        "href": "",

                        "description": "The number of dropped packets per second",

                        "measurementType": "Traffic",

                        "measurementUnit": "packets per second",

                        "collectionType": "COUNTER",

                        "measurementFormula": ""

                },

                "@type": "simpleThresholdRule",

                 "conformanceTargetUpper": 300,

                "conformanceTargetLower": 0,

                "conformanceComparatorUpper": GT,

                "conformanceComparatorLower": 0,

                "conformancePeriod": {

                 "startDateTime": "",

                 "endDateTime": ""

                },
```

```
            "tolerancePeriod": {
              "startDateTime": "",
              "endDateTime": ""
            },
            "thresholdTarget": 0,
            "gracePeriods": 0,
            "genericperformanceConsequence": [
              {
                "name": "",
                "Description": "",
                "prescribedAction": ""
              }
            ],
            "performanceAlarmSpecification": {
              "perfAlarmSpecSeverity": "CRITICAL",
              "perfeAlarmProbableCause": "Threshold Crossed",
              "perfAlarmSpecAlarmType": "",
              "perfAlarmSpecSpecificProblem": "",
              "perfAlarmSpecAdditionalText": "Dropped Packets per second are
      over the limit"
              },
            "perfAlarmSpecThresholdCrossingDescription": " Dropped Packets
      per second are over the limit ",
              "thresholdRuleCondition": "Raise",
              "thresholdRuleSeverity": "CRITICAL"
            }
        }
      }
}
```

THRESHOLDRULEDELETE NOTIFICATION

Example of the JSON representation of thresholdRuleDelete Notification:

```
POST /client/listener

Accept: application/json

{

      "eventType": "ThresholdRuleDeleteNotification",

      "eventTime": "2017-09-27T05:46:25.0Z",

      "eventId": "1562239",

      "event":

      {

              "thresholdRule":

              {

                "id": 1920,
                "thresholdRuleName": "DropPacketsHighRule",
                "href": "http://api/thresholdrule/1920",
                "Measurement": {
                        "id": "",
                        "name": "DroppedPacketsPPS",
                        "href": "",
                        "description": "The number of dropped packets per second",
                        "measurementType": "Traffic",
                        "measurementUnit": "packets per second",
                        "collectionType": "COUNTER",
                        "measurementFormula": ""
                },
                "@type": "simpleThresholdRule",
                "conformanceTargetUpper": 300,
                "conformanceTargetLower": 0,
                "conformanceComparatorUpper": GT,
                "conformanceComparatorLower": 0,
                "conformancePeriod": {
                 "startDateTime": "",
                 "endDateTime": ""
                },
```

```
            "tolerancePeriod": {
              "startDateTime": "",
              "endDateTime": ""
            },
            "thresholdTarget": 0,
            "gracePeriods": 0,
            "genericperformanceConsequence": [
              {
                "name": "",
                "Description": "",
                "prescribedAction": ""
              }
            ],
            "performanceAlarmSpecification": {
              "perfAlarmSpecSeverity": "CRITICAL",
              "perfeAlarmProbableCause": "Threshold Crossed",
              "perfAlarmSpecAlarmType": "",
              "perfAlarmSpecSpecificProblem": "",
              "perfAlarmSpecAdditionalText": "Dropped Packets per second are
        over the limit"
              },
            "perfAlarmSpecThresholdCrossingDescription": " Dropped Packets
        per second are over the limit ",
              "thresholdRuleCondition": "Raise",
              "thresholdRuleSeverity": "CRITICAL"
            }
        }
      }
    }
}
```
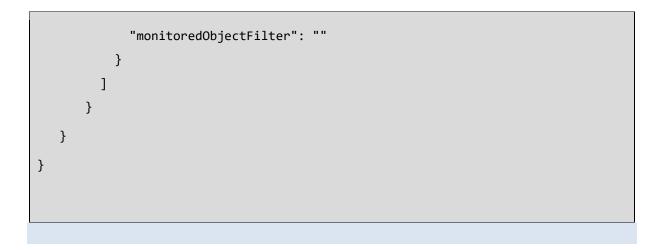
THRESHOLDJOBCREATE NOTIFICATION

Example of the JSON representation of thresholdJobCreate Notification:

```
POST /client/listener

Accept: application/json

{

      "eventType": "ThresholdJobCreateNotification",

      "eventTime": "2017-09-27T05:46:25.0Z",

      "eventId": "1562239",

      "event":

      {

            "thresholdJob":

            {

              "id": "900",

              "href": "http://api/thresholdjob/900"

              "granularity": " G_30MN",

               "jobPriority": 0,

               "executionState": "Active",

               "performanceThreshold": 374,

               "scheduleDefinition": {

               "scheduleDefinitionStartTime": "2017-08-31T20:12:37.285Z",

               "scheduleDefinitionEndTime": "2018-08-31T20:12:37.285Z",

               "scheduleDefinitionHoursRange": "",

               "@type" = "monthlyScheduleDaysOfMonthDefinition",

                "daysOfMonthRecurrence ": [

                         "5", "10", "15", "20", "25", "30"

                 ],     "

                 "excludedDates": [

                  "2017-12-31"

                 ]

          },

         "monitoredObjectsCriteria": [

           {

              "monitoredObjectInstances": "",

              "monitoredObjectClass": "Router Interface",
```

```
            "monitoredObjectFilter": ""
          }
        ]
      }
    }
}
```
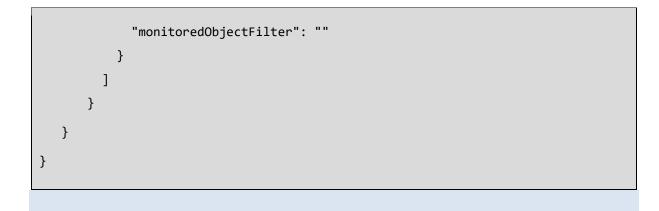
THRESHOLDJOBCHANGE NOTIFICATION

Example of the JSON representation of thresholdJobChange Notification:

```
POST /client/listener

Accept: application/json

{

      "eventType": "ThresholdJobChangeNotification",

      "eventTime": "2017-09-27T05:46:25.0Z",

      "eventId": "1562241",

      "event":

      {

            " thresholdJob":

            {

              "id": "900",
              "href": "http://api/thresholdjob/900"
              "granularity": " G_30MN",
               "jobPriority": 0,
               "executionState": "Active",
               "performanceThreshold": 374,
               "scheduleDefinition": {
               "scheduleDefinitionStartTime": "2017-08-31T20:12:37.285Z",
               "scheduleDefinitionEndTime": "2018-08-31T20:12:37.285Z",
               "scheduleDefinitionHoursRange": "",
               "@type" = "monthlyScheduleDaysOfMonthDefinition",
                "daysOfMonthRecurrence": [
                   "5", "10", "15", "20", "25", "30"
                ],
                "excludedDates": [
                  "2017-12-31"
                ]
         },
        "monitoredObjectsCriteria": [
          {
             "monitoredObjectInstances": "",
             "monitoredObjectClass": "Router Interface",
```

```
            "monitoredObjectFilter": ""
        }
      ]
    }
  }
}
```
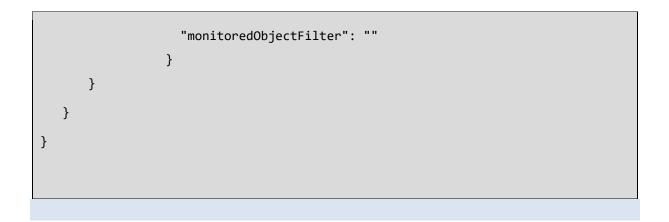
THRESHOLDJOBDELETE NOTIFICATION

Example of the JSON representation of thresholdJobDelete Notification:

```
POST /client/listener

Accept: application/json

{
      "eventType": "ThresholdJobDeleteNotification",

      "eventTime": "2017-09-27T05:46:25.0Z",

      "eventId": "1562245",

      "event":

      {

            " thresholdJob":

            {

              "id": "900",
              "href": "http://api/thresholdjob/900"
              "granularity": " G_30MN",
               "jobPriority": 0,
               "executionState": "Active",
               "performanceThreshold": 374,
               "scheduleDefinition": {
               "scheduleDefinitionStartTime": "2017-08-31T20:12:37.285Z",
               "scheduleDefinitionEndTime": "2018-08-31T20:12:37.285Z",
               "scheduleDefinitionHoursRange": "",
               "@type" = "monthlyScheduleDaysOfMonthDefinition",
                " daysOfMonthRecurrence": [
                   "5", "10", "15", "20", "25", "30"
                ],
                "excludedDates": [
                  "2017-12-31"
                ]
              },
            "monitoredObjectsCriteria": [
              {
                 "monitoredObjectInstances": "",
                 "monitoredObjectClass": "Router Interface",
```

```
                "monitoredObjectFilter": ""
            }
        }
    }
}
```

THRESHOLDJOBSUSPEND NOTIFICATION

Example of the JSON representation of thresholdJobSuspend Notification:

```
POST /client/listener

Accept: application/json

{

      "eventType": "ThresholdJobSuspendNotification",

      "eventTime": "2017-09-27T05:46:25.0Z",

      "eventId": "1562241",

      "event":

      {

            " thresholdJob":

            {

              "id": "900",
              "href": "http://api/thresholdjob/900"
               "jobPriority": 0,
               "executionState": "Suspended",

            }

      }

}
```

THRESHOLDJOBRESUME NOTIFICATION

Example of the JSON representation of thresholdJobResume Notification:

```
POST /client/listener

Accept: application/json

{

      "eventType": "ThresholdJobResumeNotification",

      "eventTime": "2017-09-27T05:46:25.0Z",

      "eventId": "1562241",

      "event":

      {

            " thresholdJob":

            {

              "id": "900",

              "href": "http://api/thresholdjob/900"

               "jobPriority": 0,

               "executionState": "Active",

            }

      }

}
```

ACKNOWLEDGEMENTS

Release Number	Date Modified	Modified By	Description of Changes
17.0.0	31th August 2017	Yuval Stein TEOCO yuval.stein@teoco.com Bozidar Pasagic Bell bozidar.pasagic@bell.ca Pierre Gauthier TM Forum pgauthier@tmforum.org	
Release 17.0.1 Version 1.0.1	04-Dec-2017	Adrienne Walcott TM Forum awalcott@tmforum.org	Updated to reflect TM Forum Approved Status

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