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650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

Editor's NOTE:

1. The title of TS "management services" is to be revisited.
2. Whether to keep the sections "Generic provisioning services, Generic fault supervision management service, Generic performance assurance management service" in this specification is to be revisited.
3. Whether to define the "notification subscription" and "file reporting" as generic management service (i.e., applicable but not specific to Provisioning, FS and PA services) in this specification is to be revisited.

1 Scope

The present document specifies the stage 2 and stage 3 of generic management services for mobile network.

2 References

- The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 28.526: "Life Cycle Management (LCM) for mobile networks that include virtualized network functions; Procedures".

[3] 3GPP TS 28.541: "Management and orchestration ; 5G Network Resource Model (NRM); Stage 2 and stage3".

[4] ITU-T Recommendation X.733 (02/92): "Information technology - Open Systems Interconnection - Systems Management: Alarm reporting function".

[5] 3GPP TS 28.531: "Management and orchestration of networks and network slicing; Provisioning; Stage 1".

[6] 3GPP TS 28.554: "Management and orchestration of networks and network slicing; 5G End to end Key Performance Indicators (KPI), performance measurements and assurance data".

[7] 3GPP TS 22.261: "Technical Specification Group Services and System Aspects; Service requirements for the 5G system; Stage 1".

[8] 3GPP TS 23.501: "Technical Specification Group Services and System Aspects; System Architecture for the 5G System; Stage 2".

[9] 3GPP TS 23.003: "Technical Specification Group Core Network and Terminals; Numbering, addressing and identification".

[10] ETSI GS NFV-IFA 013 V2.4.1 (2018-02) "Network Function Virtualization (NFV); Management and Orchestration; Os-Ma-nfvo Reference Point - Interface and Information Model Specification".

[11] 3GPP TS 28.622: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

[12] ETSI GS NFV-IFA 015 (V2.4.1): "Network Function Virtualisation (NFV); Management and Orchestration; Report on NFV Information Model".

[13] 3GPP TS 28.533: "Management and orchestration; Architecture framework"

[14] ITU-T Recommendation X.734 (1992): "Information technology - Open Systems Interconnection - Systems management: Event report management function".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

4 Overview

The generic management services concept follows the management service concepts as defined in TS 28.533 [13].

5 Generic provisioning management service

5.1 Operations and notifications

5.1.1 `createMOI` operation

5.1.1.1 Description

This operation is invoked by `createMOI` operation service consumer to request the `createMOI` operation service provider to create a Managed Object instance in the MIB maintained by the `createMOI` operation service provider. This operation will create only one Managed Object instance.

The `createMOI` service consumer supplies the values of all attributes that are supported, i.e. a) attributes whose Support Qualifier is M and b) attributes whose Support Qualifier is O. The special cases are:

1) If the attribute has a default value specified. In such case, if the `createMOI` service consumer supplies a value, the supplied value is used; otherwise, the default value is used.

2) If the attribute is specified as capable of carrying a null value or carrying no information. In such case, if the `createMOI` service consumer supplies a (non-null) value, the supplied value is used; otherwise, the null value is used.

3) If the attribute does not have a default value specified and is specified as incapable of carrying null value and incapable of carrying no information, if there is a `createMOI` service provider defined default value, then that value will be used.

5.1.1.2 Input parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
managedObjectClass	M	class	This parameter specifies the class of the new managed object instance.
managedObjectInstance	M	DN	This parameter specifies the instance of the managed object that is to be created and registered. This is a full DN according to 3GPP TS 32.300 [5].
referenceObjectInstance	O	SS dependant	This parameter may have a null value. When this parameter is supplied, it must specify an existing instance of a managed object, called the reference object, of the same class as the new object to be created. Attribute values associated with the reference object instance are assigned to the attributes of the new managed object, except for those specified by the attributeListIn parameter.
attributeListIn	M	LIST OF SEQUENCE< attribute name, attribute value>	This parameter may have a null value. When this parameter is supplied, it contains a list of name/value pairs specifying attribute identifiers and their values to be assigned to the new managed object. These values override the values for the corresponding attributes derived from either the reference object (if the referenceObjectInstance parameter is supplied) or the default value set specified in the definition of the managed object's class.

5.1.1.3 Output parameters

Parameter name	Support Qualifier	Matching Information / Legal Values	Comment
attributeListOut	M	LIST OF SEQUENCE< attribute name, attribute value>	This list of name/value pairs contains the attributes of the new managed object and the actual value assigned to each.
status	M	ENUM (OperationSucceeded, OperationFailed)	

5.1.1.4 Results

In case of success, the ManagedEntity instance has been created with the supplied DN. In case of failure, indication of the failure is provided in the Output parameters.

5.1.2 getMOIAttributes operation

5.1.2.1 Definition

This operation is invoked by getMOIAttributes operation service consumer to request the retrieval of management information (Managed Object attribute names and values) from the MIB maintained by

`getMOIAttributes` operation service provider. One or several Managed Objects may be retrieved - based on the containment hierarchy.

A SS may choose to split this operation in several operations (e.g. operations to get "handlers" or "iterators" to Managed Objects fulfilling the `scope`/`filter` criteria and other operations to retrieve attribute names/values from these "handlers").

5.1.2.2 Input Parameters

Name	Qualifier	Information Type	Comment
`baseObjectInstance`	M	DN	The MO instance that is to be used as the starting point for the selection of managed objects to which the `filter` (when supplied) is to be applied. This is a full DN according to 3GPP TS 32.300 [5].
`scope`	M	SEQUENCE < ENUM { BASE_ONLY, BASE_NTH_LEVEL, BASE_SUBTREE, BASE_ALL}, Level> Note: the Level contains valid information if BASE_NTH_LEVEL or BASE_SUBTREE is used.	This parameter defines how many levels of the containment hierarchy to select for the `filter`. The selection starts from the base object given by the `baseObjectInstance` parameter. Its level is considered to be at zero. The levels of selection that may be performed are: • BASE_ONLY: select the base object value of Level is ignored; • BASE_NTH_LEVEL: select all *n*th level (indicated by the value of Level) subordinate objects; • BASE_SUBTREE: select the base object and all of its subordinates down to and including the *n*th level; • BASE_ALL: select the base object and all of its subordinates; value of Level is ignored.
`filter`	M	See Comment.	This parameter defines a `filter` test to be applied to the selected (see `scope`) MOs. If the `filter` is empty, all selected MOs are used. The actual syntax and capabilities of the `filter` is SS specific. However, each SS should support a `filter` consisting of one or several assertions that may be grouped using the logical operators AND, OR and NOT. Each assertion is a logical expression of attribute existence, attribute value comparison ("equal to X, less than Y" etc.) and MO Class.
`attributeListIn`	M	LIST OF attribute name.	This parameter identifies the attributes to be returned by this operation. An empty list means "Return all attributes".

5.1.2.3 Output Parameters

Name	Qualifier	Matching Information	Comment
`managedObjectClass`	M	`ManagedEntity` class	For each returned MO: The class of the MO.
`managedObjectInstance`	M	`ManagedEntity` DN	For each returned MO: The name of the MO. This is a full DN according to 3GPP TS 32.300 [5].
`attributeListOut`	M	LIST OF SEQUENCE< attribute name, attribute value >	For each returned MO: A list of name/value pairs for MO.
`status`	M	ENUM (OperationSucceeded, OperationFailed)	An operation may fail because of a specified or unspecified reason.

5.1.2.4 Results

In case of success, all of the `ManagedEntity` instances selected for retrieval are returned. In case of failure, a specified or unspecified reason may be provided in the Output parameters.

5.1.3 `modifyMOIAttributes` operation

5.1.3.1 Description

This service operation is invoked by `modifyMOIAttributes` operation service consumer to request the modification of one or more Managed Object instances from `modifyMOIAttributes` operation service producer. Attributes of one or several Managed Objects may be modified.

5.1.3.2 Input parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
baseObjectInstance	M	DN	The MO instance that is to be used as the starting point for the selection of managed objects to which the filter (when supplied) is to be applied. This is a full DN according to 3GPP TS 32.300 [5].
scope	M	See corresponding parameter in getMOIAttributes.	See corresponding parameter in getMOIAttributes.
filter	M	See comment.	See corresponding parameter in getMOIAttributes.
modificationList	M	LIST OF SEQUENCE <attribute identifier, [attribute values], ENUM(replace, add values, remove values, set to default)> See Comment for when attribute values are require and when they are optional.	This parameter contains a set of attribute modification specifications, each of which contains: 1). attribute identifier: the identifier of the attribute whose value(s) is (are) to be modified. 2). attribute value: the value(s) to be used in the modification of the attribute. The use of this parameter is defined by the modify operator. This parameter is optional when the set to default modify operator is specified and if supplied, shall be ignored. 3). modify operator: the way in which the attribute values(s) (if supplied) is(are) to be applied to the attribute. The possible operators are: a) replace: the attribute value(s) specified shall be used to replace the current values(s) of the attribute; b) add values: the attribute values(s) specified shall be added to the current value(s) of the attribute. This operator shall only be applied to a set-valued attribute and shall perform a set union (in the mathematical sense) between the current values(s) of the attribute and the attribute value(s) specified. Value(s) specified in the attribute value parameter which is(are) already in the current values of the attribute shall not cause an error to be returned. c) remove values: the attribute value(s) specified shall be removed from the current values(s) of the attribute. This operator shall only be applied to a set-valued attribute and shall perform a set difference (in the mathematical sense) between the current value(s) of the attribute and the attribute values(s) specified. Value(s) specified in the attribute value parameter which is(are) not in the current value(s) of the attribute shall not cause an error to be returned; d) set to default: when this operator is applied to a single-valued attribute, the value of the attribute shall be set to its default value. When this operator is applied to a set–valued attribute, the value(s) of the attribute shall be set to their default value(s) and only as many values as defined by the default shall be assigned. If there is no default value defined, an error shall be returned. Note: Set is used here in the mathematical sense so that a set-valued attribute is an unordered set of unique values. The modify operator is optional, and if it is not specified, the replace operator shall be assumed. The modificationList parameter contains a single set of attribute modification specifications and this same set is applied to each MO instance to be modified.

5.1.3.3 Output parameters

Parameter name	Support Qualifier	Matching Information / Legal Values	Comment
modificationListOut	M	LIST OF SEQUENCE< ManagedEntity DN, ManagedEntity class, LIST OF SEQUENCE< attribute name, attribute value >>	This parameter will provide for each managed object instance the full DN of the managed object instance, the managedObjectClass, and a list of name/value pairs with the values of all the attributes of the modified managed object instance after modification. The form of this information is SS dependant and may be provided in one or many data structures.
status	M	ENUM (OperationSucceeded, OperationFailed, OperationPartiallySucceeded)	An operation may fail because of a specified or unspecified reason and no attributes have been updated. The operation is only successful if all specified attributes of all selected objects are actually modified. Otherwise, the operation is partially successful.

In lieu of a synchronization parameter, best effort synchronization will apply; that is, all managed objects selected for this operation will perform the operation if possible regardless of whether some managed objects fail to perform it.

5.1.3.4 Results

In case of success, all of the ManagedEntity instances selected for modification are modified. In case of failure, a specified or unspecified reason may be provided in the Output parameters.

5.1.4 deleteMOI operation

5.1.4.1 Description

This service operation is invoked by deleteMOI operation service consumer to request the deletion of one or more Managed Object instances in the MIB maintained by the deleteMOI operation service provider.

5.1.4.2 Input parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
baseObjectInstance	M	DN	The MO instance that is to be used as the starting point for the selection of managed objects to which the filter (when supplied) is to be applied. This is a full DN according to 3GPP TS 32.300 [5].
scope	M	See corresponding parameter in getMOIAttributes.	See corresponding parameter in getMOIAttributes.
filter	M	See comment.	See corresponding parameter in getMOIAttributes.

5.1.4.3 Output parameters

Parameter name	Support Qualifier	Matching Information / Legal Values	Comment
deletionList	M	LIST OF SEQUENCE< ManagedEntity DN, ManagedEntity class name>	If the base object alone is specified, then this parameter is optional; otherwise it contains a list of managedObjectInstance/managedObjectClass pairs identifying the managed objects deleted.
status	M	ENUM (OperationSucceeded, OperationFailed, OperationPartiallySucceeded)	An operation may fail because of a specified or unspecified reason. The operation is partially successful if some, but not all, objects selected to be deleted are actually deleted.

In lieu of a synchronization parameter, best effort synchronization will apply; that is, all managed objects selected for this operation will perform the operation if possible regardless of whether some managed objects fail to perform it.

5.1.4.4 Results

In case of success, all of the `ManagedEntity` instances selected for deletion are deleted. In case of failure, a specified or unspecified reason may be provided in the Output parameters.

5.1.5 subscribe operation

5.1.5.1 Definition

The authorized management service consumer invokes this operation to establish subscription to receive network events via notifications, under the filter constraint specified in this operation.

5.1.5.2 Input Parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
consumerReference	M	ntfManagerReference	It specifies the reference of the authorized consumer to which notifications shall be sent.
timeTick	O	ntfTimeTick The value is in unit of whole minute.	It specifies the value of a timer held for the subject management service consumer. This value is Integer greater or equal to 15, OR special infinite value A special infinite value is assumed when parameter is absent or present but equal to zero.
Filter	O	This Attribute represents the filter of a subscription. The filter can be applied to parameters of notifications defined as filterable.	It specifies a filter constraint that service provider shall use to filter notification. If this parameter is absent, then no filter constraint shall be applied.

5.1.5.3 Output Parameters

Parameter Name	Support Qualifier	Matching Information / Information Type / Legal Values	Comment
subscriptionId	M	ntfSubscriptionId.	It holds an identity of this subscription.
Status	M	ENUM (OperationSucceeded, OperationFailedExistingSubscription, OperationFailed)	If subscription is created, status = OperationSuceeded. If operation is failed, the reason may be specified.

5.1.6 unSubscribe operation

5.1.6.1 Definition

The authorized consumer invokes this operation to cancel subscriptions. The authorized consumer can cancel one subscription made with a consumerReference by providing the corresponding subscriptionId or all subscriptions made with the same consumerReference by leaving the subscriptionId parameter absent.

5.1.6.2 Input Parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
consumerReference	M	This attribute contains the reference of a manager. It uniquely identifies a subscriber	It specifies the reference of the authorized consumer to which notifications shall be sent.
subscriptionId	O	A unique identifier that is SS dependent.	It holds a subscriptionId carried as the output parameter in the subscribe operation.

5.1.6.3 Output Parameters

Parameter Name	Support Qualifier	Matching Information / Information Type / Legal Values	Comment
Status	M	ENUM (OperationSucceeded, OperationFailed)	If subscription is deleted, status = OperationSucceeded. If operation is failed, status = OperationFailed.

5.2 Managed Information

5.2.1 `ManagedEntity`

5.2.1.1 Definition

The ProxyClass `ManagedEntity` represents the role that can be played by an instance of an IOC defined in NRMs, e.g. Generic NRM, NR and NG-RAN NRM, or 5GC NRM. `ManagedEntity` is used in the specification of provisioning operations to represent an instance of an IOC defined in these NRMs.

6 Generic fault supervision management service

6.1 Operations and notifications

6.1.1 Operation and notification of fault supervision data report management service

6.1.1.1 `subscribe`

6.1.1.1.1 Definition

The authorized management service consumer invokes this operation to establish subscription to receive network events via notifications, under the filter constraint specified in this operation.

6.1.1.1.2 Input Parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
consumerReference	M	NtfSubscriber.ntfManagerReference	It specifies the reference of the authorized consumer to which notifications shall be sent.
timeTick	O	NtfSubscription.ntfTimeTick	It specifies the value of a timer held for the subject management service consumer. The value is in unit of whole minute. A special infinite value is assumed when parameter is absent or present but equal to zero.
filter	O	This Attribute represents the filter of a subscription. The filter can be applied to parameters of notifications defined as filterable.	It specifies a filter constraint that service provider shall use to filter notification of the alarms. If this parameter is absent, then no filter constraint shall be applied.

6.1.1.1.3 Output Parameters

Parameter Name	Support Qualifier	Matching Information / Information Type / Legal Values	Comment
subscriptionId	M	NtfSubscription.ntfSubscriptionId.	It holds an unambiguous identity of this subscription.
status	M	ENUM (OperationSucceeded, OperationFailedExistingSubscription, OperationFailed)	If subscriptionCreated is true, status = OperationSuceeded. If operation_failed_existing_subscription is true, status = OperationFailedExistingSubscription If operation_failed is true, status = OperationFailed.

6.1.1.1.4 Pre-condition

notificationCategoriesNotAllSubscribed OR notificationCategoriesParameterAbsentAndNotAllSubscribed.

Assertion Name	Definition
notificationCategoriesNotAllSubscribed	At least one notificationCategory identified in the notificationCategories input parameter is supported by management service producer and is not a member of the ntfNotificationCategorySet attribute of an NtfSubscription which is involved in a subscription relationship with the NtfSubscriber identified by the managerReference input parameter.
notificationCategoriesParameterAbsentAndNotAllSubscribed	The notificationCategories input parameter is absent and at least one notificationCategory supported by management service producer is not a member of the ntfNotificationCategorySet attribute of an ntfSsubscription which is involved in a subscription relationship with the NtfSubscriber identified by the managerReference input parameter.

6.1.1.1.5 Post-condition

subscriberPossiblyCreated AND subscriptionCreated.

Assertion Name	Definition
subscriberPossiblyCreated	An NtfSubscriber with an ntfManagerReference attribute equal to the value of the managerReference input parameter is involved in a subscriptionRegistration relationship.
subscriptionCreated	An NtfSubscription has been created according to the following rules: - ntfSubscriptionState attribute value has been set to "notSuspended"; - ntfTimeTick attribute value has been set to the value of the timeTick input parameter if This value was higher or equal to 15, or set to 15 if this parameter value was between 1 and 15, or set to a special infinite value if the parameter value was lower or equal to 0 or if parameter was absent; - ntfTimeTickTimer has been reset with the value of timeTick attribute; - ntfFilter attribute value has been set to the value of the filter input parameter if present; - NtfSubscription is involved in a subscription relationship with the NtfSubscriber identified by the managerReference input parameter; - attribute ntfNotificationCategorySet of NtfSubscription contains EITHER the notification categories identified by the notificationCategories input parameter that were not already contained in the ntfNotificationCategorySet attribute of other NtfSubscription of the same NtfSubscriber identified by the managerReference input parameter OR if notificationCategories input parameter is absent, all notification categories supported by management service producer that were not already contained in the ntfNotificationCategorySet attribute of other subscriptions of the same NtfSubscriber identified by the managerReference input parameter.

6.1.1.1.6 Exceptions

Name	Definition
operation_failed_existing_subscription	**Condition:** (notificationCategoriesNotAllSubscribed OR notificationCategoriesParameterAbsentAndNotAllSubscribed) not true **Returned Information:** The output parameter status **Exit state:** Entry State
Operation_failed	**Condition:** Post-condition is false **Returned Information:** The output parameter status **Exit state:** Entry State

6.1.1.2 unsubscribe

6.1.1.2.1 Definition

The authorized consumer invokes this operation to cancel subscriptions. The authorized consumer can cancel one subscription made with a consumerReference by providing the corresponding subscriptionId or all subscriptions made with the same consumerReference by leaving the subscriptionId parameter absent.

6.1.1.2.2 Input Parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
consumerReference	M	DN	It specifies the reference of the authorized consumer to which notifications shall be sent.
subscriptionId	O	A unique identifier that is SS dependent.	It holds a subscriptionId carried as the output parameter in the subscribe operation.

6.1.1.2.3 Output Parameters

Parameter Name	Support Qualifier	Matching Information / Information Type / Legal Values	Comment
status	M	ENUM (OperationSucceeded, OperationFailed)	If (subscriptionDeleted OR allSubscriptionDeleted) is true, status = OperationSucceeded. If operation_failed is true, status = OperationFailed.

6.1.1.2.4 Pre-condition

validSubscriptionId&ManagerReference OR SubscriptionIdAbsent&ValidManagerReference.

Assertion Name	Definition
validSubscriptionId&ManagerReference	The NtfSubscription identified by subscriptionId input parameter is involved in a subscription relationship with the NtfSubscriber identified by the managerReference input parameter.
SubscriptionIdAbsent&ValidManagerReference	The subscriptionId input parameter is absent and the NtfSubscriber identified by the managerReference input parameter exists.

6.1.1.2.5 Post-condition

subscriptionDeleted OR allSubscriptionDeleted.

Assertion Name	Definition
subscriptionDeleted	The NtfSubscription identified by subscriptionId input parameter is no more involved in a subscription relationship with the NtfSubscriber identified by the managerReference input parameter and has been deleted. If this NtfSubscriber has no more NtfSubscription, it is deleted as well.
allSubscriptionDeleted	"In the case subscriptionId input parameter was absent, the NtfSubscriber identified by the managerReference input parameter is no more involved in any subscription relationship and is deleted, the corresponding NtfSubscription have been deleted as well.

6.1.1.2.6 Exceptions

Name	Definition
Operation_failed	**Condition:** Pre-condition is false or post-condition is false **Returned Information:** The output parameter status **Exit state:** Entry State

6.1.1.3 `getAlarmList`

6.1.1.3.1 Definition

The authorized consumer invokes this operation to request the service provider to provide either the complete list of `AlarmInformation` instances in the `AlarmList` or only a part of this list (partial alarm alignment).

The parameters `baseObjectClass` and `baseObjectInstance` are used to identify the part of the alarm list to be returned. If they are absent, then the complete alarm list shall be provided (full alarm alignment). If they identify a particular class instance, then only a) the `AlarmInformation` instances related to this class instance and b) the `AlarmInformation` instances related to the subordinate class instances of this class instance shall be provided (partial alarm alignment). An instance-a is said to be subordinate to instance-b if the DN of the latter is part of the DN of the former.

There are two modes of operation. One mode is synchronous. In this mode, the list of `AlarmInformation instances` in `AlarmList` is returned synchronously with the operation. The other mode is asynchronous. In this mode, the list of `AlarmInformation` instances is returned via alarm notifications. In asynchronous mode of operation, the only information returned synchronously is the status of the operation. A method allowing to abort an ongoing alarm alignment process shall be available in the asynchronous mode. The mode of operation to be used is determined by means outside the scope of specification. To use asynchronous mode, the authorized consumer must have established a subscription via the `subscribe` operation.

6.1.1.3.2 Input Parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
alarmAckState	O	ENUM (all alarms, all active alarms, all active and acknowledged alarms, all active and unacknowledged, all Cleared and unacknowledged alarms, all unacknowledged)	It carries a constraint. The `AlarmIRP` shall apply it on AlarmInformation instances in AlarmList when constructing its output parameter AlarmInformationList.
baseObjectClass	O, see note 1	This parameter is either absent or carries the object class of a certain class.	See how this attribute is used to support full alarm alignment and partial alarm alignment in 5.2.3.3.1. See note 2.
baseObjectInstance	O, see note 1	This parameter is either absent or carries the DN of a certain class instance.	See how this attribute is used to support full alarm alignment and partial alarm alignment in 5.2.3.3.1. See note 2.
filter	O	N/A	It carries a filter constraint. If the `filter` is present, the service provider shall apply it on `AlarmInformation` instances in `AlarmList` when constructing its output parameter `AlarmInformationList`. If the `filter` is not present, all of the `AlarmInformation` instances included by the scope are selected.
NOTE 1: If the notification `notifyAlarmListRebuilt` supports indicating that only a part of the alarm list has been rebuilt then the operation `getAlarmList` shall support partial alarm alignment. NOTE 2: The legal values of the parameters `baseObjectClass` and `baseObjectInstance` are restricted to those carried by the parameters `baseObjectClass` and `baseObjectInstance` in the recent `notifyAlarmListRebuilt` notifications. The timeline for "recent" is vendor-specific.			

6.1.1.3.3 Output Parameters

Parameter Name	Support Qualifier	Matching Information / Information Type / Legal Values	Comment
alarmInformationList	M	List of AlarmInformation.	It carries the requested `AlarmInformation` instances. Case when synchronous mode of operation is used: (a) The service provider shall apply the constraints expressed in alarmAckState and filter to AlarmInformation instances when constructing this output parameter. Case when asynchronous mode of operation is used (i.e. this output parameter is conveyed via notifications): (a) If the filter parameter is present, the service provider shall apply the constraint when constructing this output parameter. Furthermore, if the alarmAckState constraint is present, the service provider shall apply that constraint as well. The filter constraint, if any, that is currently active in the notification channel is not used for the construction of this output parameter. (b) If the filter parameter is absent, the service provider shall apply the filter constraint currently active in the notification channel when constructing this output parameter. If the alarmAckState constraint is present, the service provider shall apply that constraint as well.
status	M	ENUM (OperationSucceeded, OperationFailed)	If all the AlarmInformation are returned, status = OperationSucceeded. If operation is failed, status = OperationFailed.

The following table lists the set of sub-elements of the alarmInformationList attribute, and alarmInformationList forms a list of such sets.

Name	Qualifier	Matching Information	Comment
notificationType	M	"notifyNewAlarm" or "notifyChangedAlarm" or "notifyClearedAlarm"	The parameter carries • notifyNewAlarm in case the alarm has not yet changed and has not yet been cleared. • notifyChangedAlarm in case the alarm has changed but has not yet been cleared. • notifyClearedAlarm in case the alarm has been cleared but not yet acknowledged.
alarmType	M	AlarmInformation.eventType	This parameter indicates "Communications Alarm", "Processing Error Alarm", "Environmental Alarm". "Quality Of Service Alarm" or "Equipment Alarm" for non-security-related alarms. It indicates "Integrity Violation", "Operational Violation", "Physical Violation", "Security Service or Mechanism Violation" or "Time Domain Violation" for security alarms.
objectClass, objectInstance	M	MonitoredEntity.objectClass where the MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation. MonitoredEntity.objectInstance where the MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation.	
notificationId	M	This carries the semantics of notification identifier.	
eventTime	O	AlarmInformation.alarmRaisedTime or AlarmInformation.alarmChangedTime or AlarmInformation.alarmClearedTime	The parameter carries the - alarmRaisedTime in case notificationType carries notifyNewAlarm - alarmChangedTime in case notificationType carries notifyChangedAlarm - alarmClearedTime in case notificationType carries notifyClearedAlarm The availability and accuracy of time carried by the time parameters in individual entries of the list (i.e. eventTime, alarmRaisedTime, alarmClearedTime and ackTime) shall be "best effort". Reason: An Management System is not required to persistently store these times or other alarm information (as in case of synchronization information may be provided by the NE), while also some NE's do not keep these times (and a later attempt to retrieve the alarm data from the NEs will not deliver these time data).
systemDN	C	See usage of this attribute in Notification header - see [x1].	Presence dependent on solution set. See usage of this attribute in Notification header - see [x1].
alarmId	M	AlarmInformation.alarmId	

alarmRaisedTime	M	AlarmInformation.alarmRaisedTime	The availability and accuracy of time carried by the time parameters in individual entries of the list (i.e. eventTime, alarmRaisedTime, alarmClearedTime and ackTime) shall be "best effort". Reason: A Management System is not required to persistently store these times or other alarm information (as in case of synchronization information may be provided by the NE), while also some NE's do not keep these times (and a later attempt to retrieve the alarm data from the NEs will not deliver these time data).
alarmChangedTime	O	AlarmInformation.alarmChangedTime	not applicable if the severity of related alarm was not changed The availability and accuracy of time carried by the time parameters in individual entries of the list (i.e. eventTime, alarmRaisedTime, alarmChangedTime, alarmClearedTime and ackTime) shall be "best effort". Reason: A Management System is not required to persistently store these times or other alarm information (as in case of synchronization information may be provided by the NE), while also some NE's do not keep these times (and a later attempt to retrieve the alarm data from the NEs will not deliver these time data).
alarmClearedTime	M	AlarmInformation.alarmClearedTime	not applicable if related alarm was not cleared The availability and accuracy of time carried by the time parameters in individual entries of the list (i.e. eventTime, alarmRaisedTime, alarmClearedTime and ackTime) shall be "best effort". Reason: A Management System is not required to persistently store these times or other alarm information (as in case of synchronization information may be provided by the NE), while also some NE's do not keep these times (and a later attempt to retrieve the alarm data from the NEs will not deliver these time data).
probableCause	M	AlarmInformation.probableCause	
perceivedSeverity	M	AlarmInformation.perceivedSeverity	
rootCauseIndicator	O	AlarmInformation.rootCauseIndicator	
specificProblem	O	AlarmInformation.specificProblem	
backedUpStatus	O	AlarmInformation.backedUpStatus	not applicable if related alarm is a security alarm
trendIndication	O	AlarmInformation.trendIndication	not applicable if related alarm is a security alarm
thresholdInfo	O	AlarmInformation.thresholdInfo	not applicable if related alarm is a security alarm
stateChangeDefinition	O	AlarmInformation.stateChange	not applicable if related alarm is a security alarm
monitoredAttributes	O	AlarmInformation.monitoredAttributes	not applicable if related alarm is a security alarm
proposedRepairActions	O	AlarmInformation.proposedRepairActions	not applicable if related alarm is a security alarm
additionalText	O	AlarmInformation.additionalText	
additionalInformation	O	AlarmInformation.additionalInformation	

ackTime	M	AlarmInformation.ackTime	not applicable if related alarm was not acknowledged nor unacknowledged The availability and accuracy of time carried by the time parameters in individual entries of the list (i.e. eventTime, alarmRaisedTime, alarmClearedTime and ackTime) shall be "best effort". Reason: A Management System is not required to persistently store these times or other alarm information (as in case of synchronization information may be provided by the NE), while also some NE's do not keep these times (and a later attempt to retrieve the alarm data from the NEs will not deliver these time data).
ackUserId	M	AlarmInformation.ackUserId	not applicable if related alarm was not acknowledged nor unacknowledged
ackSystemId	O	AlarmInformation.ackSystemId	not applicable if related alarm was not acknowledged nor unacknowledged
ackState	M	AlarmInformation.ackState	not applicable if related alarm was not acknowledged nor unacknowledged
clearUserId	O	AlarmInformation.clearUserId	not applicable if related alarm was not cleared
clearSystemId	O	AlarmInformation.clearSystemId	not applicable if related alarm was not cleared
backUpObject	O	MonitoredEntity.objectInstance where the MonitoredEntity is identified by relation-BackUpObject-AlarmInformation of the new AlarmInformation.	not applicable if related alarm is a security alarm
correlatedNotifications	O	The set of CorrelatedNotification related to this AlarmInformation.	
comments	M	The set of Comment instances involved in a relationship with this AlarmInformation.	not applicable if the related alarm has no appended comments
serviceUser	M	AlarmInformation.serviceUser	not applicable if related alarm is not a security alarm
serviceProvider	M	AlarmInformation.serviceProvider	not applicable if related alarm is not a security alarm
securityAlarmDetector	M	AlarmInformation.securityAlarmDetector	not applicable if related alarm is not a security alarm

6.1.1.3.4 Exceptions and Constraints

Exception Name	Definition
Operation_failed	**Condition:** Operation is failed **Returned Information:** The output parameter status **Exit state:** Entry State

6.1.1.4 notifyNewAlarm

6.1.1.4.1 Definition

A new `AlarmInformation` has been added in the `AlarmList`. The subscribed consumers are notified of this fact if the added `AlarmInformation` satisfies the current filter constraint of their subscription.

6.1.1.4.2 Input Parameters

There are two tables for Input Parameters. If alarmType parameter indicates "Communications Alarm", "Processing Error Alarm", "Environmental Alarm". "Quality Of Service Alarm" or "Equipment Alarm", the first table (see Table 6.1.1.4.2.1) shall be applicable for this notifyNewAlarm. If alarmType parameter indicates "Integrity Violation", "Operational Violation", "Physical Violation", "Security Service or Mechanism Violation" or "Time Domain Violation", the second table (see Table 6.1.1.4.2.2) shall be applicable.

Table 6.1.1.4.2.1: Input Parameters for notification related to Non-security alarm

Parameter Name	Qualifier	Matching Information/ Information Type / Legal Values	Comment
objectClass	M	MonitoredEntity.objectClass It shall carry the MonitoredEntity class name.	The MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation.
objectInstance	M	MonitoredEntity.objectInstance It shall carry the Distinguished Name (DN) of the instance of MonitoredEntity class.	The MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation.
notificationId	M	This is an identifier for the notification, which may be used to correlate notifications. The identifier of the notification shall be chosen to be unique across all notifications of a particular managed object throughout the time that correlation is significant, it uniquely identifies the notification from other notifications generated by the subject Information Object.	
eventTime	M	AlarmInformation.alarmRaisedTime	
systemDN	C	It shall carry the DN of service providers.	
notificationType	M	"notifyNewAlarm".	
probableCause	M	AlarmInformation.probableCause	
perceivedSeverity	M	AlarmInformation.perceivedSeverity	
rootCauseIndicator	O	It indicates that this `AlarmInformation` is the root cause of the events captured by the notifications whose identifiers are in the related `CorrelatedNotification` instances.	"Yes", "No"
alarmType	M	AlarmInformation.eventType	The notification structure defined by this table is applicable if this parameter indicates "Communications Alarm", "Processing Error Alarm", "Environmental Alarm". "Quality Of Service Alarm" or "Equipment Alarm".
specificProblem	O	AlarmInformation.specificProblem	
correlatedNotifications	O	The set of CorrelatedNotification related to this AlarmInformation.	
backedUpStatus	O	AlarmInformation.backedUpStatus	
backUpObject	O	MonitoredEntity.objectInstance It carries the DN of the back up object.	The object is identified by relation-BackUpObject-AlarmInformation of the new AlarmInformation.
trendIndication	O	AlarmInformation.trendIndication	
thresholdInfo	O	AlarmInformation.thresholdInfo	
stateChangeDefinition	O	AlarmInformation.stateChangeDefinition	
monitoredAttributes	O	AlarmInformation.monitoredAttributes	
proposedRepairActions	O	AlarmInformaton.proposedRepairActions	
additionalText	O	AlarmInformation.additionalText	
additionalInformation	O	AlarmInformation.additionalInformation	
alarmId	M	AlarmInformation.alarmId	
NOTE: MonitoredEntity represents objects that can have an alarmed state.			

Table 6.1.1.4.2.2: Input Parameters for notification related to security alarm

Parameter Name	Qualifier	Matching Information/ Information Type / Legal Values	Comment
objectClass	M	MonitoredEntity.objectClass It shall carry the MonitoredEntity class name.	The MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation.
objectInstance	M	MonitoredEntity.objectInstance It shall carry the Distinguished Name (DN) of the instance of MonitoredEntity class.	The MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation.
notificationId	M	This is an identifier for the notification, which may be used to correlate notifications. The identifier of the notification shall be chosen to be unique across all notifications of a particular managed object throughout the time that correlation is significant, it uniquely identifies the notification from other notifications generated by the subject Information Object.	
eventTime	M	AlarmInformation.alarmRaisedTime	
systemDN	C	It shall carry the DN of service providers.	
notificationType	M	"notifyNewAlarm".	
probableCause	M	AlarmInformation.probableCause	
perceivedSeverity	M	AlarmInformation.perceivedSeverity	
rootCauseIndicator	O	It indicates that this `AlarmInformation` is the root cause of the events captured by the notifications whose identifiers are in the related `CorrelatedNotification` instances.	"Yes", "No"
alarmType	M	AlarmInformation.eventType	The notification structure of this table is applicable if this parameter indicates "Integrity Violation", "Operational Violation", "Physical Violation", "Security Service or Mechanism Violation", "Time Domain Violation".
correlatedNotifications	O	The set of CorrelatedNotification related to this AlarmInformation.	
additionalText	O	AlarmInformation.additionalText	
additionalInformation	O	AlarmInformation.additionalInformation	
serviceUser	M	AlarmInformation.securityServiceUser	This may contain no information if the identify of the service-user (requesting the service) is not known.
serviceProvider	M	AlarmInformation.securityServiceProvider	This shall always identify the service-provider receiving a service request, from serviceUser, that provokes the security alarm.
securityAlarmDetector	M	AlarmInformation.securityAlarmDetector	This may contain no information if the detector of the security alarm is the serviceProvider.
alarmId	M	AlarmInformation.alarmId	
NOTE: MonitoredEntity represents objects that can have an alarmed state.			

6.1.1.4.3 Triggering event

6.1.1.4.3.1 From-state

noMatchedAlarm.

Assertion Name	Definition
noMatchedAlarm	AlarmList does not contain an AlarmInformation that has the following properties: Its matching-criteria-attributes values are identical to that of the newly generated network alarm and it is involved in relation-AlarmObject-AlarmInformation with the same MonitoredEntity as the one identified by the newly generated network alarm.

6.1.1.4.3.2 To-state

newAlarmInAlarmList.

Assertion Name	Definition
newAlarmInAlarmList	AlarmList contains an AlarmInformation holding information conveyed by the newly generated network alarm. This AlarmInformation is involved in relation-AlarmObject-AlarmInformation with the same MonitoredEntity as the one identified by the newly generated network alarm. The following attributes of the AlarmInformation shall be populated with information in the newly generated alarm. alarmId, notificationId, alarmRaisedTime, eventType, probableCause, perceivedSeverity. The following attributes of the same AlarmInformation shall be populated with information in the newly generated alarm if the information is present (in the newly generated alarm) and if the attribute is supported: specificProblem, backedUpStatus, trendIndication, thresholdInfo, stateChangeDefinition, monitoredAttributes, proposedRepairActions, additionalText, additionalInformation.

6.1.1.5 notifyChangedAlarm

6.1.1.5.1 Definition

The subscribed consumer is notified regarding changes in AlarmInformation in AlarmList. This notification is only triggered by a change in perceivedSeverity attribute value (except to the value "Cleared"). The AlarmInformation carried in the notification shall satisfy the current filter constraint of the consumer's subscription.

The notification shall contain all parameters that are filterable and are present in the original (related) notifyNewAlarm notification.

6.1.1.5.2 Input Parameters

Parameter Name	Qualifier	Matching Information/ Information Type / Legal Values	Comment
objectClass	M	MonitoredEntity.objectClass It shall carry the MonitoredEntity class name.	The MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation.
objectInstance	M	MonitoredEntity.objectInstance It shall carry the Distinguished Name (DN) of the instance of MonitoredEntity class.	The MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation.
notificationId	M	This is an identifier for the notification, which may be used to correlate notifications. The identifier of the notification shall be chosen to be unique across all notifications of a particular managed object throughout the time that correlation is significant, it uniquely identifies the notification from other notifications generated by the subject Information Object.	
eventTime	M	AlarmInformation.alarmRaisedTime	
systemDN	C	It shall carry the DN of service providers.	
notificationType	M	"notifyChangedAlarm"	
probableCause	M	AlarmInformation.probableCause	
perceivedSeverity	M	AlarmInformation.perceivedSeverity	
alarmType	M	AlarmInformation.eventType	
alarmId	M	AlarmInformation.alarmId	
NOTE: MonitoredEntity represents objects that can have an alarmed state.			

6.1.1.5.3 Triggering event

6.1.1.5.3.1 From-state

alarmMatched AND alarmNotCleared AND alarmChanged.

Assertion Name	Definition
alarmMatched	The matching-criteria-attributes of the newly generated network alarm has values that are identical (matches) with ones in one AlarmInformation in AlarmList.
alarmNotCleared	The perceivedSeverity of the newly generated network alarm is not Cleared.
alarmChanged	The perceivedSeverity of the newly generated network alarm and of the matched AlarmInformation are different.

6.1.1.5.3.2 To-state

`informationUpdate.`

Assertion Name	Definition
informationUpdate	• The AlarmInformation identified in alarmMatched in from-state has been updated according to the following rules: perceivedSeverity is updated; • notificationId is updated; • alarmChangedTime is updated; • ackTime, ackUserId and ackSystemId are updated to contain no information; • ackState is updated to "unacknowledged";

6.1.1.6 `notifyAlarmListRebuilt`

6.1.1.6.1 Definition

This interface supports notifying the alarm list rebuilding information if part or all of `AlarmList` has been rebuilt.

6.1.1.6.2 Input Parameters

Parameter Name	Qualifier	Legal type	Comment
objectClass	M	--	It identifies the object class that changed state.
objectInstance	M	--	It identifies the object instance that changed state.
notificationId	M	--	It identifies the notification that carries the AlarmInformation.
eventTime	M	--	It identifies the last time when the event occurred.
notificationType	M	"notifyAlarmListRebuilt".	
Reason	M	"System-NE communication error", "System restarts", "indeterminate". Other values can be added.	It carries the reason why the system has rebuilt the AlarmList. This may carry different reasons than that carried by the immediate previous notifyPotentialFaultyAlarmList.

6.1.1.6.3 Triggering event

6.1.1.6.3.1 From-state

`alarmListRebuilt_0 OR alarmListRebuilt_1.`

Assertion Name	Definition
alarmListRebuilt_0	Provider has cold-started, initialized, re-initialized or rebooted and it has initiated procedure to rebuild its AlarmList.
alarmListRebuilt_1	Provider loses confidence in part or whole of its AlarmList. Provider has initiated procedure to repair its AlarmList.

6.1.1.6.3.2 To-state

`alarmListRebuilt_2.`

Assertion Name	Definition
alarmListRebuilt_2	Provider rebuilds the whole or part of AlarmList.

6.1.1.7 `notifyCorrelatedNotificationChanged`

6.1.1.7.1 Definition

The set of `CorrelatedNotification` has been created, updated or removed. The subscribed consumers are notified of this fact if the changes satisfy the current filter constraint of their subscription.

6.1.1.7.2 Input Parameters

Parameter Name	Qualifier	Matching Information/ Information Type / Legal Values	Comment
objectClass	M	MonitoredEntity.objectClass It shall carry the MonitoredEntity class name.	The MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation.
objectInstance	M	MonitoredEntity.objectInstance It shall carry the Distinguished Name (DN) of the instance of MonitoredEntity class.	The MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation.
notificationId	M	This is an identifier for the notification, which may be used to correlate notifications. The identifier of the notification shall be chosen to be unique across all notifications of a particular managed object throughout the time that correlation is significant, it uniquely identifies the notification from other notifications generated by the subject Information Object.	
eventTime	M	It carries the time when the CorrelatedNotification is added.	
systemDN	C	It shall carry the DN of service providers.	
notificationType	M	"notifyCorrelatedNotificationChanged"	
correlatedNotifications	M	The set of CorrelatedNotification related to this AlarmInformation.	
alarmId	M	AlarmInformation.alarmId	
rootCauseIndicator	O	AlarmInformation.rootCauseIndicator	
NOTE: MonitoredEntity represents objects that can have an alarmed state.			

6.1.1.7.3 Triggering event

6.1.1.7.3.1 From-state

`newAlarmCorrelationInfoIsAvailable AND alarmInformationExists.`

Assertion Name	Definition
newAlarmCorrelationInfoIsAvailable	New alarm correlation information is available but not yet conveyed to any consumer.
alarmInformationExists	The AlarmInformation is in AlarmList.

6.1.1.7.3.2 To-state

`alarmCorrelatedInfoUpdated`.

Assertion Name	Definition
alarmCorrelatedInfoUpdated	The set of `CorrelatedNotification` network slice instances has been created, updated or removed.

6.1.2 Fault supervision data control management service

6.1.2.1 `acknowledgeAlarms`

6.1.2.1.1 Definition

The authorized consumer invokes this operation to acknowledge one or more alarms.

6.1.2.1.2 Input Parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
alarmInformationReferenceList	M	List of `AlarmInformation.alarmId and AlarmInformation.perceivedSeverity`	It carries one or more identifiers identifying `AlarmInformation` instances in `AlarmList, including optionally the perceivedSeverity of the AlarmInformation instance that is going to be acknowledged.` alarmInformationReferenceList `{alarmId - Mandatory; perceivedSeverity - Optional }`
ackUserId	M	`AlarmInformation.ackUserId`	It identities the user acknowledging the alarm.
ackSystemId	O	`AlarmInformation.ackSystemId`	It identifies the authorized consumer. It may be absent implying that the consumer does not wish this information be kept in `AlarmInformation` in `AlarmList`.

6.1.2.1.3 Output Parameters

Parameter Name	Support Qualifier	Matching Information / Information Type / Legal Values	Comment
badAlarm Information ReferenceList	M	List of pair of `AlarmInformation.alarmId,` ENUM (UnknownAlarmId, AcknowledgmentFailed, WrongPerceivedSeverity) and additional failure reason.	If `all alarms are acknowledged`, it contains no information. If `some alarms are acknowledged`, then it contains identifications of `AlarmInformation` that are (a) present in input parameter `AlarmInformationReferenceList` but are absent in the `AlarmList = UnknownAlarmId;` or (b) present in input parameter `AlarmInformationReferenceList` and are present in the AlarmList but the Acknowledgement Information (see note below table) has not changed, in contrast to `the consumer`'s request = AcknowledgmentFailed; or (c) present in input parameter `AlarmInformationReferenceList` and are present in the AlarmList but the `perceivedSeverity` to be acknowledged has changed and/or is different within the Alarm List = WrongPerceivedSeverity (applicable only if perceivedSeverity was provided).
status	M	ENUM (OperationSucceeded, OperationFailed, OperationPartiallySucceeded)	If some alarms are acknowledged, status = OperationPartiallySuceeded. If all alarms acknowledged, status = OperationSucceeded. If operation is failed is true, status = OperationFailed.

NOTE: Acknowledgement Information is defined as the information contained in `AlarmInformation.`ackTime, `AlarmInformation.`ackUserId, AlarmInformaton.ackSystemId, `AlarmInformation.`ackState.

6.1.2.1.4 Exceptions and Constraints

Exception Name	Definition
Operation_failed	**Condition:** Operation is failed **Returned Information:** The output parameter status **Exit state:** Entry State

6.1.2.2 unacknowledgeAlarms

6.1.2.2.1 Definition

The authorized consumer invokes this operation to remove acknowledgement information kept in one or more `AlarmInformation` instances.

6.1.2.2.2 Input Parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
alarmInformationReferenceList	M	List of AlarmInformation.alarmId	It carries one or more identifiers identifying AlarmInformation in AlarmList.
ackUserId	M	AlarmInformation.ackUserId	It identities the user that invokes this operation.
ackSystemId	O	AlarmInformation.ackSystemId	It identifies the authorized consumer.

6.1.2.2.3 Output Parameters

Parameter Name	Support Qualifier	Matching Information / Information Type / Legal Values	Comment
badAlarmInformationReferenceList	M	List of pair of AlarmInformation.alarmId and the failure reason.	If all alarms are unacknowledged, it contains no information. If some alarms are unacknowledged, then it contains identifications of AlarmInformation that are (a) present in input parameter AlarmInformationReferenceList but are absent in the AlarmList; or (b) present in input parameter AlarmInformationReferenceList and are present in the AlarmList but the Acknowledgement Information (see note below table) has not changed, in contrast to consumer's request.
status	M	ENUM (OperationSucceeded, OperationFailed, OperationPartiallySucceeded)	If some alarms are unacknowledged, status = OperationPartiallySucceeded. If all alarms are unacknowledged, status = OperationSucceeded. If operationfisailed, status = OperationFailed.

NOTE: Acknowledgement Information is defined as the information contained in `AlarmInformation.`ackTime, `AlarmInformation.`ackUserId, AlarmInformaton.ackSystemId, `AlarmInformation.`ackState.

6.1.2.2.4 Exceptions and Constraints

Exception Name	Definition
Operation_failed	**Condition:** Operation is failed **Returned Information:** The output parameter status **Exit state:** Entry State

6.1.2.3 clearAlarms

6.1.2.3.1 Definition

The authorized consumer invokes this operation to clear one or more `AlarmInformation` instances in AlarmList. For example, this operation can be used to support the manual clearing of the ADMC (automatic detection and manual clearing, see also 3GPP TS 32.111-1 [3]) alarms.

6.1.2.3.2 Input Parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
alarmInformation ReferenceList	M	List of AlarmInformation.alarmId	It carries one or more identifiers identifying AlarmInformation instances in the AlarmList.
clearUserId	M	AlarmInformation.clearUserId	It identities the user clearing the alarm.
clearSystemId	O	AlarmInformation.clearSystemId	It identifies the authorized consumer. It may be absent implying that consumer does not wish this information be known to the service provider.

6.1.2.3.3 Output Parameters

Parameter Name	Support Qualifier	Matching Information / Information Type / Legal Values	Comment
badAlarmInformation ReferenceList	M	List of pair of AlarmInformation.alarmId and the failure reason.	If all alarms are cleared, it contains no information. If some alarms are cleared, then it contains identifications of AlarmInformation that are not present in AlarmList or that are present in AlarmList but remain unchanged, in contrast to consumer's request.
Status	M	ENUM(OperationSucceeded, OperationFailed, OperationPartiallySucceeded)	If all alarms are cleared, then status = OperationSucceeded. If some alarms are cleared, then status = OperationPartiallySucceeded. If operation is failed, then status = OperationFailed.

6.1.2.3.4 Exceptions and Constraints

Exception Name	Definition
Operation_failed	**Condition:** Operation is failed **Returned Information:** The output parameter status **Exit state:** Entry State

6.1.2.4 `notifyClearedAlarm`

6.1.2.4.1 Definition

This interface notifies the alarm clearing information if it satisfies filter constraint in `AlarmInformation`. The notification shall satisfy all filter constraint and notify in the `notifyNewAlarmNotification`.

6.1.2.4.2 Input Parameters

Parameter Name	Qualifier	Legal type	Comment
objectClass	M	--	It identifies the object class whose perceived severity level is cleared.
objectInstance	M	--	It identifies the object instance whose perceived severity level is cleared.
notificationId	M	--	It identifies the notification that carries the AlarmInformation.
eventTime	M	--	It identifies the last time when the event occurred.
notificationType	M	"notifyClearedAlarm"	
probableCause	M	--	
perceivedSeverity	M	--	Its value shall indicate Cleared.
alarmType	M	--	
correlated Notifications	O	The set of CorrelatedNotification related to this AlarmInformation.	It contains references to other AlarmInformation instances whose perceivedSeverity levels are Cleared as well. In this way, perceivedSeverity level of multiple AlarmInformation instances can be Cleared by one notification.
clearUserId	O	--	It carries the identity of the user who invokes the clearAlarms operation.
clearSystemId	O	--	It carries the identity of the authorized consumer.
alarmId	M	--	It identifies one AlarmInformation in the AlarmList.

6.1.2.4.3 Triggering event

6.1.2.4.3.1 From-state

`alarmMatchedAndCleared OR clearedByProvider.`

Assertion Name	Definition
alarmMatchedAndCleared	The matching-criteria-attributes of the newly generated network alarm have values that are identical (matched) with ones in one AlarmInformation in AlarmList and the perceivedSeverity of the matched AlarmInformation is not Cleared AND The perceivedSeverity of the newly generated network alarm is cleared.
clearedByProvider	Reception of a valid clearAlarms operation that identifies the subject AlarmInformation instances. This triggering event shall occur regardless of the perceivedSeverity state of the identified AlarmInformation instances.

6.1.2.4.3.2 To-state

`alarmInformationCleared_1 OR alarmInformationCleared_2.`

Assertion Name	Definition
alarmInformationCleared_1	Case if From-state is alarmMatchedAndCleared: The following attributes of the subject `AlarmInformation` are updated: `notificationId`, `perceivedSeverity` (updated to `Cleared`), `alarmClearedTime`.
alarmInformationCleared_2	Case if From-state is clearedByProvider: The following attributes of the subject AlarmInformation are updated: notificationId, perceivedSeverity (updated to Cleared), alarmClearedTime, alarmClearedUserId, alarmClearedSystemId.

6.1.2.5 `notifyAckStateChanged`

6.1.2.5.1 Definition

This interface indicates two types of `AckStateChanged` alarm, which are acknowledged alarm and unacknowledged alarm respectively. The capability of acknowledging alarms is vendor defined.

The relative state change information of these two types of alarm has been referred to `stateChangeDefinition` as specific attributes of `AlarmInformation`. The notification shall satisfy all filter constraint and notify in the `notifyNewAlarmNotification`.

6.1.2.5.2 Input Parameters

These parameters are filters for the interfaces.

Parameter Name	Qualifier	Legal type	Comment
objectClass	M	--	It identifies the object class that changed state.
objectInstance	M	--	It identifies the object instance that changed state.
notificationId	M	--	It identifies the notification that carries the AlarmInformation.
eventTime	M	--	It identifies the last time when the event occurred.
notificationType	M	"notifyAckStateChanged".	
probableCause	M	--	It qualifies alarm and provides further information than eventType.
perceivedSeverity	M	--	It indicates the relative level of urgency for operator attention.
alarmType	M	--	The notification structure defined by this table is applicable if this parameter indicates "Communications Alarm", "Processing Error Alarm", "Environmental Alarm". "Quality Of Service Alarm" or "Equipment Alarm".
alarmId	M	--	It identifies one AlarmInformation in the AlarmList.
ackState	M	--	It identifies the Acknowledgement State of the alarm.
ackUserId	M	--	It identifies the last user who has changed the Acknowledgement State.
ackSystemId	O	--	It identifies the system (the authorized consumer) that last changed the ackState of an alarm, i.e. acknowledged or unacknowledged the alarm.

6.1.2.5.3 Triggering event

6.1.2.5.3.1 From-state

`ackedByConsumer OR ackedByProvider AND alarmInformationExists.`

Assertion Name	Definition
ackedByConsumer	Reception of an acknowledgeAlarms operation and a subsequent operation success return.
ackedByProvider	Reception of a local (non-standard) acknowlegeAlarms equivalent operation and a subsequent operation success return.
alarmInformationExists	The AlarmInformation exists in AlarmList.

6.1.2.5.3.2 To-state

`alarmAckStateHasChanged.`

Assertion Name	Definition
alarmAckStateHasChanged	The AlarmInformation.ackState of the AlarmInformation identified by from-state assertion alarmInformationExists have been updated. Specifically, the following attributes of the subject AlarmInformation are updated: -- notificationId, ackTime, ackUserId, ackState, ackSystemId.

6.2 Managed information

6.2.1 Alarm information, alarm state change and Information Object Classes

6.2.1.1 Imported information entities and local labels

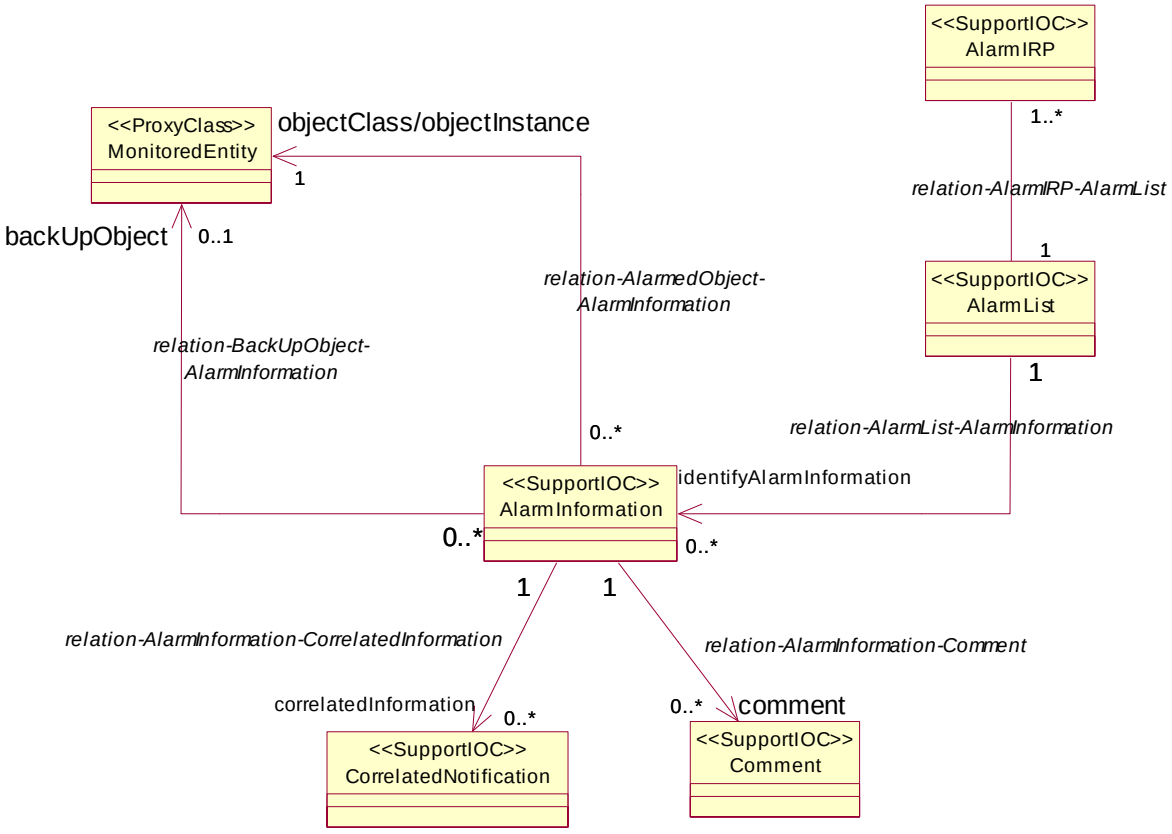
Label reference	Local label
32.302 [x3], SupportIOC, NotificationIRP	NotificationIRP
32.302 [x3], interface, notificationIRPNotification	NotificationIRPNotification
32.312 [x4], SupportIOC, ManagedGenericIRP	ManagedGenericIRP

6.2.1.2 Class diagram

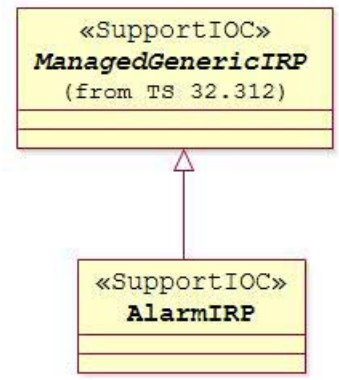
6.2.1.2.1 Introduction

This clause introduces the set of classes (i.e. IOCs, SupportIOCs) that encapsulate information within the `AlarmIRP`. The intent is to identify the information required for the Fault management service implementation of its operations and notification emission. This clause provides the overview of all support object classes in UML. Subsequent clauses provide more detailed specification of various aspects of these support object classes.

6.2.1.2.2 Attributes and relationships



6.2.1.2.3 Inheritance



6.2.1.3 Information Object Class Definitions

6.2.1.3.1 AlarmInformation

6.2.1.3.1.1 Definition

`AlarmInformation` contains information about alarm condition of an alarmed `MonitoredEntity`.

One `AlarmIRP` is related to at most one `AlarmList`. The `management service producer` or its related AlarmIRP or the related `AlarmList` assigns an identifier, called `alarmId`, to each `AlarmInformation` in the `AlarmList`. An `alarmId` unambiguously identifies one `AlarmInformation` in the `AlarmList`.

6.2.1.3.1.2 Attribute

Attribute name	Support Qualifier
alarmId	M
notificationId	M
alarmRaisedTime	M
alarmClearedTime	M
alarmChangedTime	O
eventType	M
probableCause	M
perceivedSeverity	M
rootCauseIndicator	O
specificProblem	O
backedUpStatus	O
trendIndication	O
thresholdInfo	O
stateChangeDefinition	O
monitoredAttributes	O
proposedRepairActions	O
additionalText	O
additionalInformation	O(see note 4)
ackTime	M
ackUserId	M
ackSystemId	O
ackState	M
clearUserId	O (see note 2)
clearSystemId	O (see note 2)
serviceUser	O (see note 3)
serviceProvider	O (see note 3)
securityAlarmDetector	O (see note 3)

NOTE 1: Void.
NOTE 2: These attributes and qualifiers are applicable only if the management service producer supports clearAlarms() (they are absent if clearAlarms() is not supported).
NOTE 3: These attributes must be supported if the management service producer emits `notifyNewAlarm` that carries security alarm information.
NOTE 4: This attribute is optionally populated whenever vendor specific attributes are needed.
A specific condition for this optional population is when an alarm presented by the Management system (e.g. Management system user interface) has different values of perceived severity, and / or alarm type, compared with the values presented to the Itf-N.

6.2.1.3.1.3 State diagram

Alarms have states. The alarm state information is captured in `AlarmInformation` in `AlarmList`.

The solid circle icon represents the `Start State`. The double circle icon represents the `End State`. In this state, the alarm is `Cleared` and acknowledged. The AlarmInformation shall not be accessible via the Service interface and is removed from the `AlarmList`.

Note the state diagram uses " X / Y ^ Z " to label the arc that indicates state transition. The meanings of X, Y and Z are:

- X identifies the triggering event

- Y identifies the action of AlarmIRP because of the triggering event
- Z is the notification to be emitted by AlarmIRP because of the triggering event

Note that acknowledgeAlarm^notifyAckStateChanged and the unacknowledgeAlarm^notifyAckStateChange refer to cases when the request of the management service consumer is successful for the AlarmInformation concerned. They do not refer to the cases when the request is a failure since in the failure cases, no state transition would occur.

Note that, to reduce cluttering to the diagram, the setComment^notifyComment is not included in the figure [x]. One transition should be applied from unack&unclear to itself. Similarly, another transition should be applied from ack&unclear to itself. Another one is from unack&clear to itself.

"PS" used in the state diagram stands for "perceived severity".

Figure A is used if it supports ^notifyChangedAlarm and Figure B is used if it does not support ^notifyChangedAlarm.

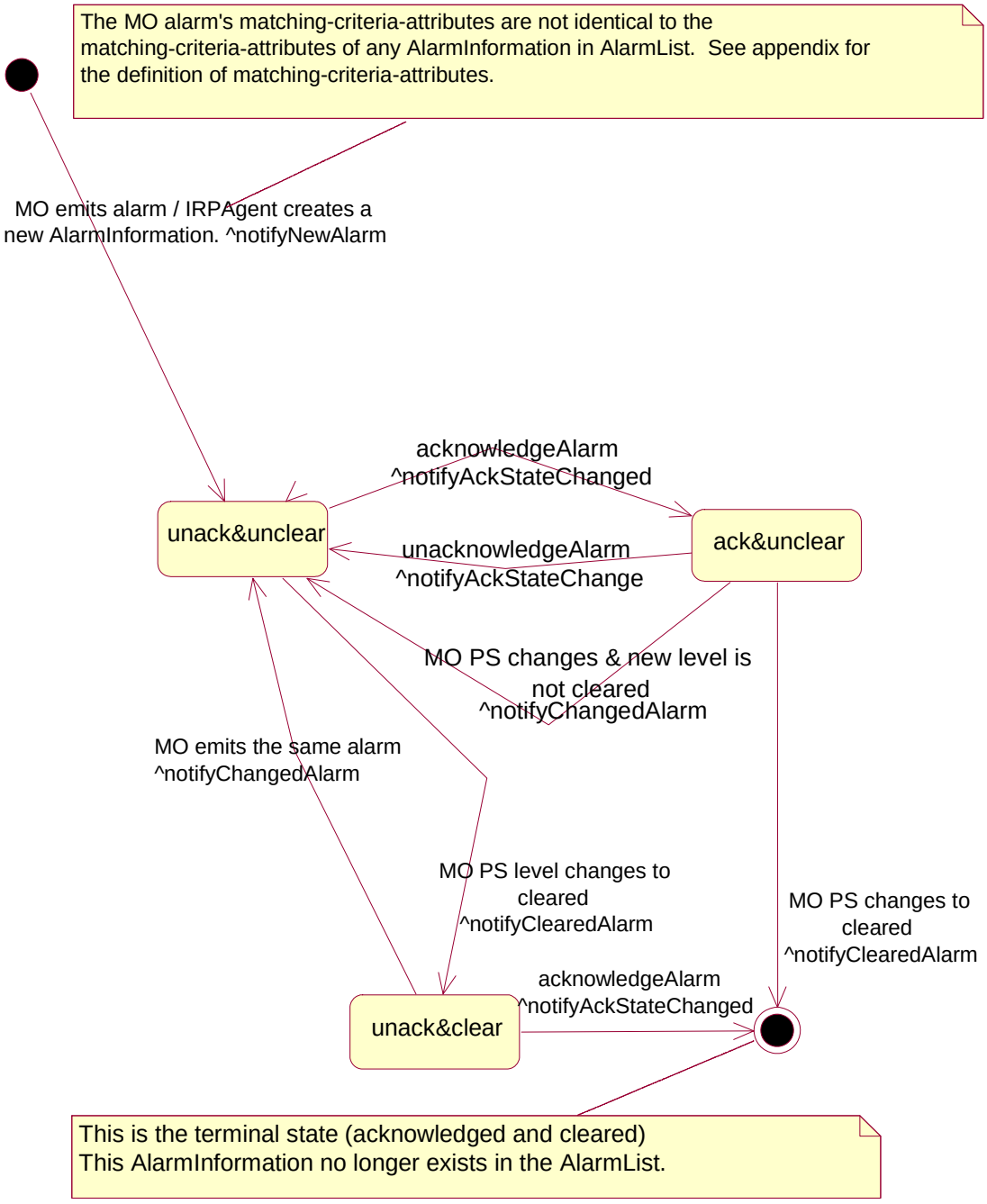


Figure A. ^notifyChangedAlarm supported

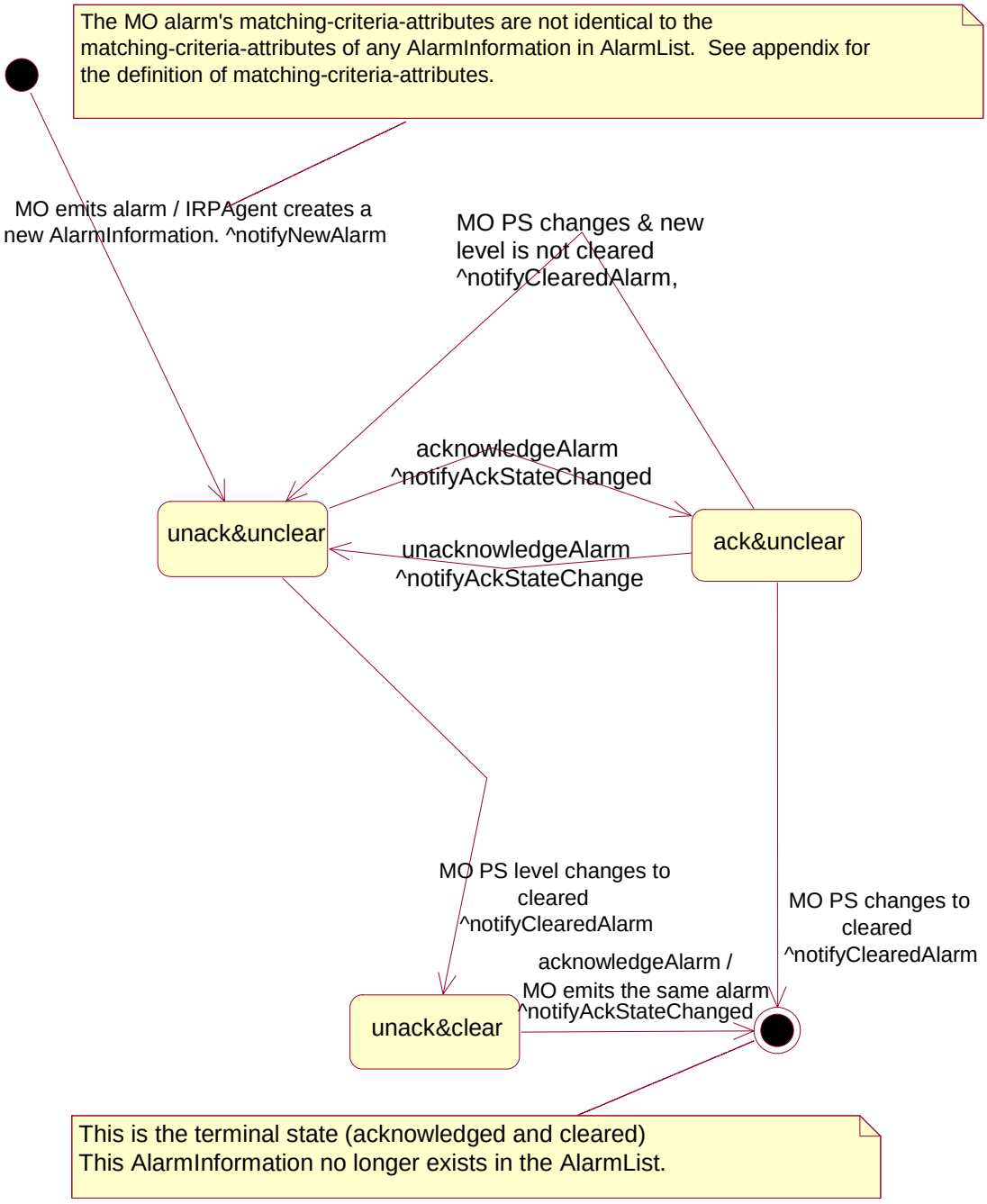


Figure B. ^notifyChangedAlarm not supported

6.2.1.3.2 `AlarmList`

6.2.1.3.2.1 Definition

`AlarmIRP` maintains an `AlarmList` that contains currently active alarms (i.e. `AlarmInformation` whose `perceivedSeverity` is not `Cleared`) and alarms that are `Cleared` but not yet acknowledged.

6.2.1.3.2.2 Attribute

There is no additional attribute defined for this class besides those inherited.

6.2.1.3.3 AlarmIRP

6.2.1.3.3.1 Definition

AlarmIRP is the representation of the alarm management capabilities specified by the present document. This class inherits from ManagedGenericIRP class specified in 3GPP TS 32.312 [x4].

6.2.1.3.3.2 Attribute

There is no additional attribute defined for this class besides those inherited.

6.2.1.3.3.3 Notification Table

Name	Qualifier	Notes
notifyAlarmListRebuilt	M	
notifyPotentialFaultyAlarmList	O	.

6.2.1.3.4 Comment

6.2.1.3.4.1 Definition

Comment contains commentary and associated information such as the time when the commentary is made.

6.2.1.3.4.2 Attribute

Attribute Name	Support Qualifier
commentTime	M
commentText	M
commentUserId	M
commentSystemId	O

6.2.1.3.5 CorrelatedNotification

6.2.1.3.5.1 Definition

It identifies one MonitoredEntity. For that MonitoredEntity identified, a set of notification identifiers is also identified. One or more CorrelatedNotification instances can be related to an AlarmInformation. In this case, the information of the AlarmInformation is said to be correlated to information carried in the notifications identified by the CorrelatedNotification instances. See further definition of correlated notification in ITU-T Recommendation X.733 [4], clause 8.1.2.9.

The notification identified by the CorrelatedNotification, as defined in ITU-T and used here, can carry all types of information and not restricted to carrying alarm information only (see TS 32.302 [x3]). For example, a notification, identified by the CorrelatedNotification, can indicate a managed instance attribute value change. In this case, the information of the AlarmInformation is said to be correlated to the managed instance attribute value change event.

The meaning of correlation is dependent on the type of notification itself. See the comment column of the correlatedNotification input parameter for each type of notification, such as notifyNewAlarm.

Notification carries AlarmInformation. The AlarmInformation instances referred to by the correlatedNotification may or may not exist in the AlarmList. For example, the AlarmInformation carried by the identified notification may have been acknowledged and Cleared and therefore, no longer exist in the AlarmList.

6.2.1.3.5.2 Attribute

Attribute Name	Support Qualifier
source	M
notificationIdSet	M

6.2.1.3.6 MonitoredEntity

6.2.1.3.6.1 Definition

It represents classes that can have an alarmed state. The types of classes that can have alarmed state are:

a) All classes whose Notification Tables include alarm notifications.

b) VSE subclass of 3GPP defined classes and VSE defined classes that can have alarmed state.

The `objectClass` and `objectInstance` of this class identifies an instance of this class. The `AlarmInformation` uses this information in two places. In one place, the information is used to identify the instance that is in alarmed state. In another place, the information is used to identify an instance that can be used as the back up network resource for the instance that is in alarmed state.

6.2.1.3.6.2 Attribute

There is no attribute for this class.

6.2.1.4 Information relationships definition

6.2.1.4.1 relation-AlarmIRP-AlarmList (M)

6.2.1.4.1.1 Definition

This represents the relationship between `AlarmIRP` and `AlarmList`.

6.2.1.4.1.2 Role

There is no role defined for this relationship.

6.2.1.4.1.3 Constraint

There is no constraint for this relationship.

6.2.1.4.2 relation-AlarmList-AlarmInformation (M)

6.2.1.4.2.1 Definition

This represents the relationship between `AlarmList` and `AlarmInformation.`

6.2.1.4.2.2 Role

Name	Definition
identifyAlarmInformation	It represents a capability to obtain the information contained in AlarmInformation.

6.2.1.4.2.3 Constraint

Name	Definition
inv_ hasAlarmInformation1	No AlarmInformation playing the role of theAlarmInformation shall have its perceivedSeverity = "cleared" and its ackState = "acknowledged".
inv_ hasAlarmInformation2	The alarmId of all AlarmInformation instances playing the role of theAlarmInformation are distinct.

6.2.1.4.3 relation-AlarmInformation-Comment (M)

6.2.1.4.3.1 Definition

This represents the relationship between `AlarmInformation` and `Comment.`

6.2.1.4.3.2 Role

Name	Definition
comment	It represents a capability to obtain the information contained in Comment.

6.2.1.4.3.3 Constraint

There is no constraint.

6.2.1.4.4 relation-AlarmInformation-CorrelatedNotification (M)

6.2.1.4.4.1 Definition

This represents the relationship between `AlarmInformation` and `CorrelatedNotification.`

6.2.1.4.4.2 Role

Name	Definition
correlatedNotification	It represents a capability to obtain the information contained in CorrelatedNotification.

6.2.1.4.4.3 Constraint

There is no constraint.

6.2.1.4.5 relation-AlarmedObject-AlarmInformation (M)

6.2.1.4.5.1 Definition

This represents the relationship between `MonitoredEntity` and `AlarmInformation`.

6.2.1.4.5.2 Role

Name	Definition
objectClass/objectInstance	It represents the capability to obtain the identification, in terms of objectClass and objectInstance, of alarmed network resource.

6.2.1.4.5.3 Constraint

Name	Definition
inv_relation-AI-ME	All AlarmInformation involved in this relationship with the same MonitoredEntity shall have at least one different value in the following attributes: eventType, probableCause and specificProblem.

6.2.1.4.6 relation-backUpObject-AlarmInformation (O)

6.2.1.4.6.1 Definition

The relationship represents the relationship between `AlarmInformation` and the `backUpObject`.

6.2.1.4.6.2 Role

Name	Definition
backUpObject	It represents a capability to obtain the identification, in terms of objectClass and objectInstance, of the backUpObject.

6.2.1.4.6.3 Constraint

Name	Definition
inv_identifyBackUpObject	This relationship is present if and only if the AlarmInformation.backedUpStatus attribute is present and is indicating true.

6.2.1.5 Information attribute definition

6.2.1.5.1 Definition and legal values

Name	Definition	Legal Values
alarmId	It identifies one AlarmInformation in the AlarmList.	
notificationId	It identifies the notification that carries the AlarmInformation.	
alarmRaisedTime	It indicates the date and time when the alarm is first raised by the alarmed resource.	All values indicating valid time.
alarmChangedTime	It indicates the last date and time when the AlarmInformation is changed by the alarmed resource. Changes to AlarmInformation caused by invocations of the IRPManager would not change this date and time.	All values indicating valid time.
alarmClearedTime	It indicates the date and time when the alarm is Cleared.	All values indicating valid time.
eventType	It indicates the type of event. See Annex A for information on event type.	See Annex A.
probableCause	It qualifies alarm and provides further information than eventType. See Annex B for a complete listing.	See Annex B.
perceivedSeverity	It indicates the relative level of urgency for operator attention.	Critical, Major, Minor, Warning, Indeterminate, Cleared: see ITU-T Recommendation X.733 [4]. This IRP does not recommend the use of indeterminate.
specificProblem	It provides further qualification on the alarm than probableCause. This attribute value shall be single-value and of simple type such as integer or string. See definition in ITU-T Recommendation X.733 [4] clause 8.1.2.2.	Provided by vendor.
backedUpStatus	It indicates if an object (the MonitoredEntity) has a back up. See definition in ITU-T Recommendation X.733 [4] clause 8.1.2.4.	All values that carry the semantics of backedUpStatus defined by ITU-T X.733 [4] clause 8.1.2.4.
trendIndication	It indicates if some observed condition is getting better, worse, or not changing.	"Less severe", "no change", "more severe": see definition in ITU-T Recommendation X.733 [4] clause 8.1.2.6.
thresholdInfo	It indicates the crossed threshold information such as: • The identifier of the monitored attribute whose value has crossed a threshold, • The threshold settings, • The observed value that have crossed a threshold, etc. See definition in ITU-T Recommendation X.733 [4] clause 8.1.2.7. See also for information in TS 32.401 [4] subclause 5.6.	
stateChangeDefinition	It indicates MO attribute value changes. See definition in ITU-T Recommendation X.733 [4] clause 8.1.2.10.	
monitoredAttributes	It indicates MO attributes whose value changes are being monitored. See definition in ITU-T Recommendation X.733 [4] clause 8.1.2.11.	
proposedRepairActions	It indicates proposed repair actions. See definition in ITU-T Recommendation X.733 [4] clause 8.1.2.12.	
additionalText	It carries semantics that is outside the scope of this management service specification. It may provide the identity of the NE (e.g. RNC, Node-B) from which the alarm has been originated. It corresponds to the "user label" attribute of the object class representing the NE in the Generic Network Resource Model [x6]. It can contain further information on the alarm.	N/A

Name	Definition	Legal Values
additionalInformation	This attribute when present allows the inclusion of a set of vendor specific alarm information in the alarm. A specific condition for this optional population is when an alarm presented by the Management System (e.g. via the user interface) has different values of perceived severity, and / or alarm type, compared with the values presented to the Itf-N. Any other uses of additional information on the alarm and its semantics is outside the scope of the present document	The additional information field is a list of one or more information parts. The present document allows the support of two such information parts to carry • vendor defined perceived severity • vendor defined alarm type using defined identification. Other vendor specific information parts are allowed by using vendor specific identifications.
ackTime	It identifies the time when the alarm has been acknowledged or unacknowledged the last time, i.e. it registers the time when ackState changes.	All values that indicate valid time that are later than that carried in alarmRaisedTime.
ackUserId	It identifies the last user who has changed the Acknowledgement State.	It can be used to identify the human operator such as "John Smith" or it can identify a group, such as "Team Six", or it can contain no information such as "".
ackSystemId	It identifies the system (Management System) that last changed the ackState of an alarm, i.e. acknowledged or unacknowledged the alarm.	It can be used to identify the system, such as "system 6" or it can contain no information such as "".
ackState	It identifies the Acknowledgement State of the alarm.	Acknowledged: the alarm has been acknowledged. Unacknowledged: the alarm has been unacknowledged or the alarm has never been acknowledged.
commentTime	It carries the time when the comment has been added to the alarm.	
commentText	It carries the textual comment.	
commentUserId	It carries the identification of the user who made the comment.	
commentSystemId	It carries the identification of the system (Management System) from which the comment is made. That system supports the user that made the comment.	
rootCauseIndicator	It indicates that this AlarmInformation is the root cause of the events captured by the notifications whose identifiers are in the related CorrelatedNotification instances.	"Yes", "No"
source	It identifies one MonitoredEntity.	All values that carry the semantics of DN.
notificationIdSet	It carries one or more notification identifiers.	
clearUserId	It carries the identity of the user who invokes the clearAlarms operation.	It can be used to identify the human operator such as "John Smith" or it can identify a group, such as "Team Six", or it can contain no information such as "".

Name	Definition	Legal Values
clearSystemId	It carries the identity of the system in consuming the fault management service. That management service consumer supports the user who invokes the clearAlarms().	It can be used to identify the system, such as "system 6" or it can contain no information such as "".
serviceUser	It identifies the service-user whose request for service provided by the serviceProvider led to the generation of the security alarm.	This attribute may carry no information if the server user is not identifiable.
serviceProvider	It identifies the service-provider whose service is requested by the serviceUser and the service request provokes the generation of the security alarm.	
securityAlarmDetector	It carries the identity of the detector of the security alarm.	This attribute may carry no information if the security alarm detector is not identifiable.

6.2.1.5.2 Constraints

Name	Definition
inv_alarmChangedTime	Time indicated shall be later than that carried in alarmRaisedTime.
inv_alarmClearedTime	Time indicated shall be later than that carried in alarmRaisedTime.
inv_ackTime	Time indicated shall be later than that carried in alarmRaisedTime.
inv_notificationId	NotificationIds shall be chosen to be unique across all notifications of a particular Managed Object (representing the NE) throughout the time that alarm correlation is significant. The algorithm by which alarm correlation is accomplished is outside the scope of this IRP.

6.2.2 Subscription information, subscription state and Information Object Classes

6.2.2.1 Imported information entities and local labels

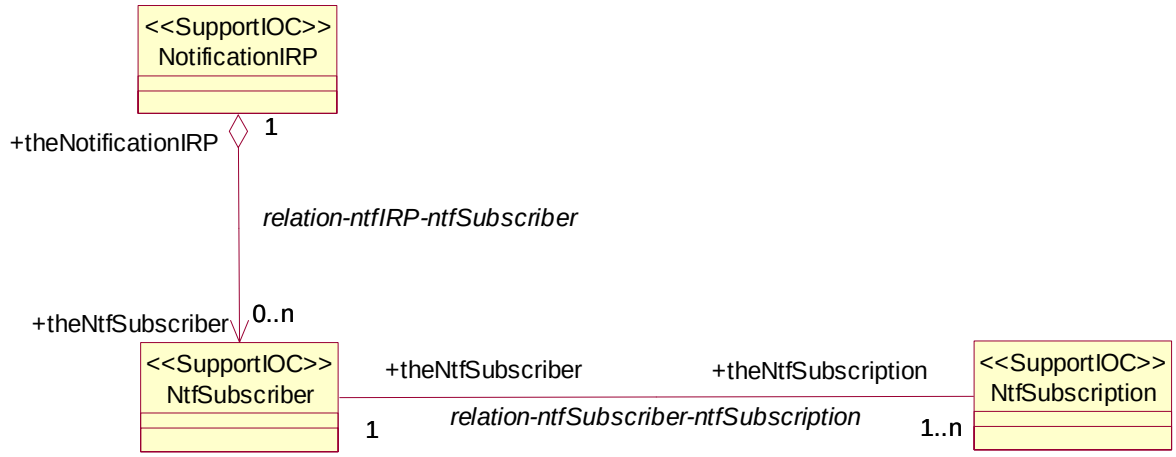
Label reference	Local label
3GPP TS 32.312 [10], Support IOC, ManagedGenericIRP	ManagedGenericIRP

6.2.2.2 Class Diagram

6.2.2.2.1 Attributes and relationships

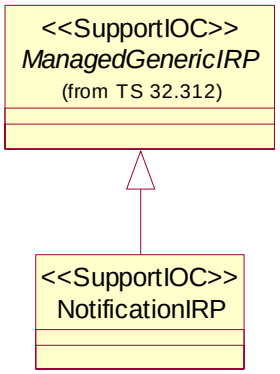
This subclause depicts the set of Support IOCs that encapsulate information within the notification IRP. The intent is to identify the information required for the notification IRP implementation of its operations and notification emission.

This subclause provides the overview of all Support IOCs in UML. Subsequent subclauses provide more detailed specification of various aspects of these Support IOCs.



6.2.2.2.2 Inheritance

This subclause depicts the inheritance relationships that exist between Support IOCs.



6.2.2.3 Information object classes definition

6.2.2.3.1 NtfSubscriber

6.2.2.3.1.1 Definition

This Support IOC represents a Subscriber from a notification perspective: a subscriber is fully identified by a management service consumer reference. A management service consumer using multiple management service consumer reference attributes to subscribe will result in multiple NtfSubscriber instances.

6.2.2.3.1.2 Attributes

Attribute name	Support Qualifier	Read Qualifier	Write Qualifier
ntfConsumerReference	M	M	M

6.2.2.3.2 NtfSubscription

6.2.2.3.2.1 Definition

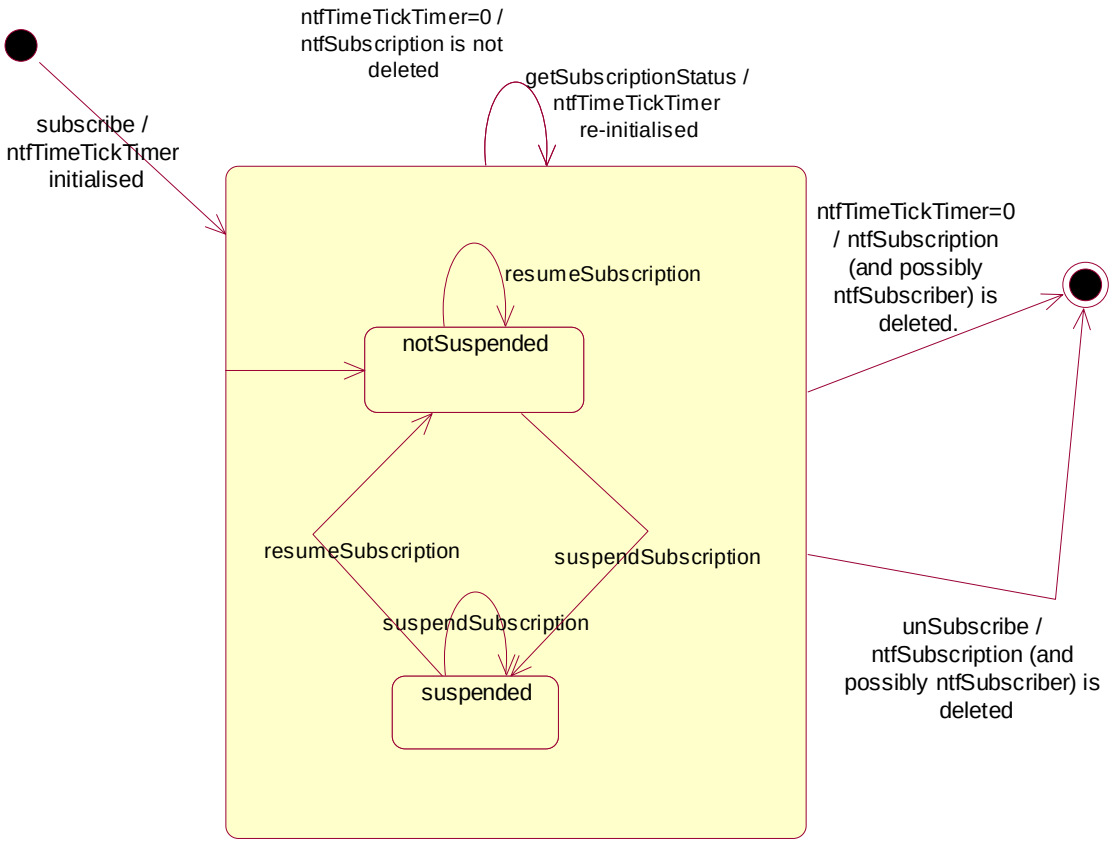
This Support IOC represents a subscription that has been requested by a management service consumer and created.

6.2.2.3.2.2 Attributes

Attribute name	Support Qualifier	Read Qualifier	Write Qualifier
ntfSubscriptionId	M	M	-
ntfSubscriptionState	M	M	M
ntfTimeTick	M	M	M
ntfTimeTickTimer	M	-	-
ntfNotificationCategorySet	M	M	M
ntfFilter	M	M	M

6.2.2.3.2.3 State diagram

The diagram below depicts states that can be supported by an NtfSubscription.



Notification management service can lose the list of `consumerReference` that identifies current management service consumers under subscription. Under this condition, management service producer is incapable of sending events to the affected subscriber(s).

This Notification management service recommends that management service consumer should invoke the `getSubscriptionStatus` operation periodically to confirm that management service producer still has the management service consumer's reference in its list. In case getSubscriptionStatus returns the exception operation_failed, management service consumer should assume that management service producer has lost the consumers' reference.

The present document does not recommend the frequency management service consumer should use to invoke `getSubscriptionStatus` operation.

6.2.2.3.3 NotificationIRP

6.2.2.3.3.1 Definition

This Support IOC represents a notification IRP. It inherits from Support IOC ManagedGenericIRP.

6.2.2.4 Information relationship definitions

6.2.2.4.1 relation-ntfSubscriber-ntfSubscription (M)

6.2.2.4.1.1 Definition

This relationship defines the relationship between a NtfSubscriber and its current subscriptions.

6.2.2.4.1.2 Roles

Name	Definition
theNtfSubscriber	This role represents the one who has subscribed. It can be played by instances of Support IOC NtfSubscriber
theNtfSubscription	This role represents the subscriptions which were made and not unsubscribed. It can be played by instances of Support IOC NtfSubscription

6.2.2.4.1.3 Constraints

Name	Definition
inv_notificationCategoriesAllDistinct	The notification categories contained in the ntfNotificationCategorySet attribute of NtfSubscription playing the role theNtfSubscription are all distinct from each other.

6.2.2.4.2 relation-ntfIRP-ntfSubscriber (M)

6.2.2.4.2.1 Definition

This relationship defines the relationship between the NotificationIRP and the current subscribers of notifications.

6.2.2.4.2.2 Roles

Name	Definition
theNtfSubscriber	This role represents the entities to which IRPAgent will notify events. It is played by instances of Support IOC NtfSubscriber
theNotificationIRP	This role represents the NotificationIRP to which an IRPManager has subscribed. It is played by instances of Support IOC NotificationIRP

6.2.2.4.2.3 Constraints

Name	Definition
inv_uniqueManagerReference	All NtfSubscriber involved in the subscriptionRegistration relationship are distinguished from each other by their ntfManagerReference Attribute.

6.2.2.5 Information attribute definitions

6.2.2.5.0 Introduction

This subclause defines the semantics of the Attributes used in Support IOCs.

6.2.2.5.1 Definitions and legal values

Attribute Name	Definition	Legal Values
ntfSubscriptionId	It identifies uniquely a subscription	N/A
ntfSubscriptionState	It indicates the activation state of a subscription	"suspended": the subscription is suspended "notSuspended": the subscription is active
ntfTimeTick	This attribute represents the initial value of ntfTimeTickTimer. It is in unit of whole minute. This value defines a time window within which management service consumer intends to invoke getSubscriptionStatus (or subscribe) operation to confirm its subscription. A special value indicates infinity which is such that timer will never expire and management service producer needs other means to decide when to delete resources allocated to the management service consumer	Integer greater or equal to 15, OR special infinite value
ntfTimeTickTimer	This attribute represents the current value of a timer	integer greater or equal to zero
ntfNotificationCategorySet	This attribute represents a set of notification categories (see also Definition of notification category in subclause 3.1)	
ntfFilter	This attribute represents the filter of a subscription. The filter can be applied to parameters of notification header (see Notificationmaanagement service producer interface) and to parameters of notifications defined as filterable to IManagement service producer shall notifymanagement service consumer if the event satisfies the filter constraint.	
ntfConsumerReference	This attribute contains the reference of a consumer. It uniquely identifies a subscriber	

6.2.2.5.2 Constraints

- "ntfTimeTickTimer is lower

7 Generic performance assurance management service

7.1 Operations and notifications

7.1.1 Operation and notification of performance data file report management service

7.1.1.1 Notification notifyFileReady (M)

7.1.1.1.1 Definition

This notification supports the authorized consumer to be notified about the readiness of the performance data file (see annex A for the performance data file definition) by the performance data reporting related service producer.

After the performance data file has been prepared ready for the consumer(s), the performance data reporting related service producer emits the notification to the subject consumer(s) who have subscribed to this notification.

7.1.1.1.2 Notification information

Parameter Name	Qualifier	Information Type	Comment
objectClass	M, Y	Type of the performance data reporting related producer, e.g., "NFPerformanceDataReportingServiceProducer", "NSSIPerformanceDataReportingServiceProducer", "NSIPerformanceDataReportingServiceProducer", "NWPerformanceDataReportingServiceProducer" or "NF".	It indicates the class, whose instance emitted this notification. The class indicates the type of the performance data reporting related service producer.
objectInstance	M, Y	Identifier of the performance data reporting related service producer	It identifies the performance data reporting related service producer, who actually emitted the notification.
notificationId	M, N	This is an identifier of the notification, which may be used to correlate notifications.	The unique identifier of the notification across all notifications sent by a particular management service producer throughout the time that correlation is significant. How identifiers of notifications are re-used to correlate notifications is outside of the scope of the present document.
eventTime	M, Y	It indicates the event occurrence time.	The semantics of Generalised Time specified by ITU-T shall be used here.
notificationType	M, Y	"notifyFileReady "	The type of notification, and it shall be assigned to "notifyFileReady" for this notification.
fileInfoList	M, N	List of struct < fileLocation, fileSize fileReadyTime fileExpirationTime fileCompression, fileFormat, >. Each element is defined as following: - fileLocation: It identifies the location of the file. The location may be a directory path or a URL. E.g.: "\\202.112.101.1\D:\user\performanceFiles\<xxx>" or "ftp://nms.telecom_org.com/datastore/<xxx>, where <xxx> is the filename and the file naming convention is defined in Annex A.3. - fileSize: It identifies the size of the file. Its value is positive Integer (the unit is byte). - fileReadyTime: It identifies the date and time when the file was last closed and made available in the management service producer and the file content will not be changed. - fileExpirationTime: It identifies the date and time beyond which the file may be deleted. It shall not be empty and shall be later than fileReadyTime. - fileCompression: It identifies the name of the compression algorithm used for the file. An empty fileCompression means that there is no compression on the file. Choice of compression algorithm is vendor-specific but is encouraged to use industrial standard algorithm such as GZIP. - fileFormat: It identifies the encoding technique used by the file. Its value should indicate the version of the file format specification plus to indicate if "ASN1" or "XML-schema" is used.	It specifies the information of each available file.

Parameter Name	Qualifier	Information Type	Comment
additionalText	O, N	It provides additional information for this notification.	It carries vendor-specific semantics not defined in the present document.

7.1.1.2 Notification notifyFilePreparationError (M)

7.1.1.2.1 Definition

This notification supports the authorized consumer to be notified about the occurrence of an error during the preparation of the performance data file by the performance data reporting related service producer. When such error occurs, the management service producer emits the notification to the authorized consumer(s) who have subscribed to this notification when the reporting period arrives.

7.1.1.2.2 Notification information

Parameter Name	Qualifier	Information Type	Comment
objectClass	M, Y	See Table 7.1.1.1.2.	See Table 7.1.1.1.2.
objectInstance	M, Y	See Table 7.1.1.1.2.	See Table 7.1.1.1.2.
notificationId	M, N	See Table 7.1.1.1.2.	See Table 7.1.1.1.2.
eventTime	M, Y	See Table 7.1.1.1.2.	See Table 7.1.1.1.2.
notificationType	M, Y	"notifyFilePreparationError"	The type of notification, and it shall be assigned to "notifyFilePreparationError" for this notification.
fileInfoList	M, N	See Table 7.1.1.1.2.	If file is kept, this parameter identifies the file whose preparation provoked an error. If file is not generated, this parameter is empty.
reason	M, N	It specifies the reason of the error occurred during the performance data file preparation.	The detailed reason is given, including - errorInPreparation - hardDiskFull - hardDiskFailure - tooManyFiles - collectionTimeOut - incompleteTruncatedFile - corruptedFile - lowMemory - dataNotAvailable
additionalText	O, N	See Table 7.1.1.1.2.	See Table 7.1.1.1.2.

7.1.1.3 Operation subscribe (M)

7.1.1.3.1 Definition

This operation enables the authorized consumer to subscribe to the notification(s) related to the services provided by the management service producer.

7.1.1.3.2 Input parameters

Parameter Name	Qualifier	Information Type	Comment
consumerReference	M	It specifies the reference of the consumer to which the notifications shall be sent.	The format of the reference may have dependency on the solution set.
timeTick	O	It specifies the value of a timer the subscription is hold by the management service producer for the subject consumer. The value is in unit of whole minute.	A special infinite value is assumed when parameter is absent or present but equal to zero.
Filter	O	It specifies a filter constraint that management service producer shall use to filter notification(s). Filter constraint grammar is solution set dependent	If this parameter is absent, then no filter constraint shall be applied.

7.1.1.3.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
subscriptionId	M	An unambiguous identity of this subscription.	
status	M	ENUM (OperationSucceeded, OperationFailedExistingSubscription, OperationFailed)	If subscription is successfully created, status = OperationSuceeded. If subscription is not created because it is duplicated or conflict with existing subscription(s), status = OperationFailedExistingSubscription If the operation is failed for any other reason than being duplicated or conflict with existing subscription(s), status = OperationFailed.

7.1.1.3.4 Exceptions

Name	Definition
operation_failed_existing_subscription	**Condition:** The subscription is duplicated or conflict with existing subscription(s) **Returned Information:** The output parameter status
Operation_failed	**Condition:** The operation is failed for any other reason than being duplicated or conflict with subscription(s) **Returned Information:** The output parameter status

7.1.1.4 Operation unsubscribe (M)

7.1.1.4.1 Definition

This operation enables the authorized consumer cancel subscription(s) at a management service producer.

The consumer can cancel one subscription made with a consumerReference by providing the corresponding subscriptionId or all subscriptions made with the same consumerReference by leaving the subscriptionId parameter absent.

7.1.1.4.2 Input parameters

Parameter Name	Qualifier	Information Type	Comment
consumerReference	M	It specifies the reference of the consumer whose subscription(s) are to be cancelled.	The format of the reference may have dependency on the solution set.
subscriptionId	O	It holds a subscriptionId carried as the output parameter in the subscribe operation.	If this parameter is absent, all subscriptions made with the same consumerReference shall be cancelled.

7.1.1.4.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
Status	M	ENUM (OperationSucceeded, OperationFailed)	If subscription(s) as identified in the input parameter are cancelled, status = OperationSucceeded. If the operation is failed, status = OperationFailed.

7.1.1.4.4 Exceptions

Name	Definition
Operation_failed	**Condition:** the operation is failed **Returned Information:** The output parameter status

7.1.1.5 Operation `listAvailableFiles` (M)

7.1.1.5.1 Definition

This operation allows the consumer to list all or specified available management data files stored in the performance data reporting related service producer.

The performance data reporting related service producer shall only provide the information about the available management data files that are created for the subject consumer.

A Solution Set may choose to split this operation in several operations (e.g. operations to get "iterator" which fulfil the criteria and other operations to retrieve the detailed information of the files from the "iterator").

7.1.1.5.2 Input parameters

Parameter Name	Qualifier	Information type	Comment
`managementDataType`	M	It specifies the type of the management data stored in the file. For performance data files, the value is assigned to "PM".	
`beginTime`	M	The consumer requests to list information about the available file(s) whose ready time(s) are later or equal to this time. This parameter is expressed in UTC time.	This parameter indicates date and time. If this parameter is empty, no restriction on begin time is applied on the file ready time.
`endTime`	M	The consumer requests to list information about the available file(s) whose ready time(s) are earlier than this time. This parameter is expressed in UTC time.	This parameter indicates date and time. If this parameter is empty, no restriction on end time is applied on the file ready time.

7.1.1.5.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
`fileInfoList`	M	See the `fileInfoList` defined in notifyFileReady notification (clause 7.1.1.1)	See the `fileInfoList` defined in notifyFileReady notification (clause 7.1.1.1)
`Status`	M	ENUM (Success, Failure)	

7.1.1.5.4 Exceptions

Exception Name	Definition
`invalidTimes`	**Condition:** Either `beginTime` or `endTime` is invalid. **Returned information:** output parameter status is set to Failure.

7.2 Managed information

7.2.1 Performance data file definition

7.2.1.1 File generation and reporting

The measurement job control related service producer (e.g., NF measurement job control service producer, NSSI measurement job control service producer, NSI measurement job control service producer or network measurement job control service producer) provides the measurement results (i.e., the value of the measurement type(s)) to the performance data reporting related service producer, and the performance data reporting related service producer generates the performance date file(s) for the consumer(s) and emits the "notifyFileReady" or "notifyFilePreparationError" notifications to the subject consumer(s) who have subscribed to these notifications.

How the measurement job control related service producer provides the measurement results to the performance data reporting related service producer is out of scope of the present specification.

The performance data reporting related service producer shall be able to allow the consumer to access the file using the following file transfer protocols, and the performance data reporting related service producer shall always act server while the consumer shall always act as the initiator (client) of file transfer actions:

- FTP;
- SFTP.

7.2.1.2 Performance data file content description

Table A.2 lists all the file content items. It also provides an explanation of the individual items.

Table A.2: File Content Description

File Content Item	Description
measDataCollection	This is the top-level tag, which identifies the file as a collection of measurement data. The file content is made up of a header ("measFileHeader"), the collection of measurement result items ("measData"), and a measurement file footer ("measFileFooter").
measFileHeader	This is the measurement result file header to be inserted in each file. It includes a version indicator, the name, type and vendor name of the sending service producer, and a time stamp ("collectionBeginTime").
measData	The "measData" construct represents the sequence of zero or more measurement result items contained in the file. It can be empty in case no measurement data can be provided. The individual "measData" elements can appear in any order. Each "measData" element contains the identifier of the measured entity ("measuredEntityId") and the list of measurement results pertaining to that measured entity ("measInfo").
measFileFooter	The measurement result file footer to be inserted in each file. It includes a time stamp, which refers to the end of the overall measurement collection interval that is covered by the collected measurement results being stored in this file.
fileFormatVersion	This parameter identifies the file format version applied by the sender. The format version defined in the present document shall be the abridged number and version of this 3GPP document (see below). The abridged number and version of a 3GPP document is constructed from its version specific full reference "3GPP […] (yyyy-mm)" by: - removing the leading "3GPP TS" - removing everything including and after the version third digit, representing editorial only changes, together with its preceding dot character - from the resulting string, removing leading and trailing white space, replacing every multi character white space by a single space character and changing the case of all characters to uppercase.
senderName	The senderName uniquely identifies performance data reporting related service producer that assembled this measurement file.
senderType	This is a user configurable identifier of the type of performance data reporting related service producer that generated the file, e.g. NF performance data reporting service producer, or NSI performance data reporting service producer. The string may be empty (i.e. string size =0) in case the "senderType" is not configured in the sender.
vendorName	The "vendorName" identifies the vendor of the performance data reporting related service producer that provided the measurement file. The string may be empty (i.e. string size =0) if the "vendorName" is not configured in the sender.
collectionBeginTime	The "collectionBeginTime" is a time stamp that refers to the start of the first measurement collection interval (granularity period) that is covered by the collected measurement results that are stored in this file.
measuredEntityId	The unique identification of the measured entity (such as NF, NSSI, NSI, PLMN) in the 3GPP system. The string may be empty (i.e. string size =0) if the "measuredEntityId" is not configured in the CM applications.
measuredEntityUserName	This is the user definable name ("userLabel") defined for the measured object in 3GPP TS 28.622 [11]. The string may be empty (i.e. string size =0) if the "measuredEntityUserName" is not configured in the CM applications.
measuredEntitySoftwareVersion	This is the software version ("`swVersion`") defined for the measured object in 3GPP TS 28.622 [11]. This is an optional parameter which allows post-processing systems to take care of vendor specific measurements modified between software versions.
measInfo	The sequence of measurements, values and related information. It includes a list of measurement types ("measTypes") and the corresponding results ("measValues"), together with the time stamp ("measTimeStamp") and granularity period ("granularityPeriod") pertaining to these measurements.

File Content Item	Description
measInfoId	This attribute associates a tag name with the set of measurements defined by a *measInfo* property. This is an optional parameter that may be used to assign unique names to categories of measurements grouped together by measInfo elements. It allows parsing tools to easily isolate measurement sets by name.
measTimeStamp	Time stamp referring to the end of the granularity period.
jobIdList	The "jobIdList" represents the measurement job(s) with which measurement result contained in the file is associated. There may be multiple job ids in case one file is supporting multiple measurement jobs created by different consumers respectively.
granularityPeriod	Granularity period of the measurement(s) in seconds.
reportingPeriod	Reporting period of the measurement(s) in seconds.
measTypes	This is the list of measurement types for which the following, analogous list of measurement values ("measValues") pertains. The measurement types for NR and NG-RAN are specified in TS 28.552 [2], the measurement types for 5GC are specified in TS 28.553 [3], and the measurement types for 5G network/sub-network and NSI/NSSI are specified in TS 28.554 [4].
measValues	This parameter contains the list of measurement results for the resource being measured, e.g. trunk, cell. It includes an identifier of the resource ("measObjInstId"), the list of measurement result values ("measResults") and a flag that indicates whether the data is reliable ("suspectFlag").
measObjInstId	The "measObjInstId" field contains the full distinguished name (DN) of the measured object.
measResults	This parameter contains the sequence of result values for the observed measurement types. The "measResults" sequence shall have the same number of elements, which follow the same order as the measTypes sequence. Normal values are INTEGERs and REALs. The NULL value is reserved to indicate that the measurement item is not applicable or could not be retrieved for the object instance.
suspectFlag	Used as an indication of quality of the scanned data. FALSE in the case of reliable data, TRUE if not reliable. The default value is "FALSE", in case the suspect flag has its default value it may be omitted.
timestamp	This tag carries the time stamp that refers to the end of the measurement collection interval (granularity period) that is covered by the collected measurement results that are stored in this file. The minimum required information within timestamp is year, month, day, hour, minute, and second.

The measInfo contains the sequence of measurements, values and related information, in a table-oriented structure.

The representation of all timestamps in PM files shall follow the representations allowed by the ISO 8601 [10].
The precise format for timestamp representation shall be determined by the technology used for encoding the PM file (e.g. ASN.1, XML DTD, and XML Schema). The choice of technology should ensure that this representation is derived from ISO 8601 [10]. Based on the representation used, the timestamp shall refer to either UTC time or local time or local time with offset from UTC.

7.2.1.3 File naming convention

7.2.1.3.1 Generic file naming convention

The following generic convention shall be applied for naming the files containing different management data:

<managementData_type><file_ready_date>< file_ready_time><file_expiration_delta_time>
[<specificData_extension>][<separator><RC>]

1) The managementData_type field is the type of the management data contained in the file, the value of managementData_type field including:

   "PM" for performance data files,

2) The file_ready_date field is of the form YYYYMMDD, where:

   - YYYY is the year in four-digit notation;
   - MM is the month in two digit notation (01 - 12);
   - DD is the day in two digit notation (01 - 31).

   The file_ready_date is the date when the file was last closed and made available for upload and the file content will not be changed.

3) The file_ready_time field is of the form HHMMshhmm, where:

   - HH is the two digit hour of the day (local time), based on 24 hour clock (00 - 23);
   - MM is the two digit minute of the hour (local time, 00 - 59);
   - s is the sign of the local time differential from UTC (+ or -), in case the time differential to UTC is 0 then the sign may be arbitrarily set to "+" or "-";
   - hh is the two digit number of hours of the local time differential from UTC (00 - 23);
   - mm is the two digit number of minutes of the local time differential from UTC (00 - 59).

   The file_ready_time is the time when the file was last closed and made available for upload and the file content will not be changed.

4) To reduce length of the file name, the file_expiration_delta_time field could be a delta time interval from file ready time. The unit is hour.

5) The specificData_extension field is used to extend the extra file naming convention for a specific type of management data.

6) The RC parameter is a running count, starting with the value of "1", and shall be appended only if the filename is not unique, i.e. more than one file is generated and all other parameters of the file name are identical.

7) The separator field is "_-_", which is an underscore character (_), followed by a minus character (-), followed by an underscore character (_).

7.2.1.3.2 Performance data file specific extension

The following convention defined as <specificData_extension> of the generic file naming convention (as defined annex A.3.1) shall be applied for performance data file naming:

<Type><Startdate>.<Starttime>-[<Enddate>.]<Endtime>[_-<jobIdList>][_<UniqueId>][_-_<RC>]

1) The Type field indicates if the file contains measurement results for single or multiple measured objects and/or granularity periods where:

   - "A" means single measured object, single granularity period (this is used when granularity period is equal to reporting period);
   - "B" indicates multiple measured objects, single granularity period (this is used when granularity period is equal to reporting period);
   - "C" signifies single measured object, multiple granularity periods (this is used when reporting period is multiples of the granularity period and will contain multiple measurement reports);
   - "D" stands for multiple measured objects, multiple granularity periods (this is used when reporting period is multiples of the granularity period and will contain multiple measurement reports).

2) The Startdate field indicates the date when the granularity period began if the Type field is set to A or B. If the Type field is either "C" or "D" then Startdate contains the date when the first granularity period of the measurement results contained in the file started. The Startdate field is of the form YYYYMMDD, where:

   - YYYY is the year in four-digit notation;
   - MM is the month in two digit notation (01 - 12);
   - DD is the day in two-digit notation (01 - 31).

3) The Starttime field indicates the time when the granularity period began if the Type field is set to A or B. If the Type field is either "C" or "D" then Starttime contains the time when the first granularity period of the measurement results contained in the file began. The Starttime field is of the form HHMMshhmm, where:

   - HH is the two-digit hour of the day (local time), based on 24-hour clock (00 - 23);

- MM is the two digit minute of the hour (local time), possible values are 00, 05, 10, 15, 20, 25, 30, 35, 40, 45, 50, and 55;
- s is the sign of the local time differential from UTC (+ or -), in case the time differential to UTC is 0 then the sign may be arbitrarily set to "+" or "-";
- hh is the two-digit number of hours of the local time differential from UTC (00-23);
- mm is the two digit number of minutes of the local time differential from UTC (00-59).

4) The Enddate field shall only be included if the Type field is set to "C" or "D", i.e. measurement results for multiple granularity periods are contained in the file. It identifies the date when the last granularity period of these measurements ended, and its structure corresponds to the Startdate field.

5) The Endtime field indicates the time when the granularity period ended if the Type field is set to A or B. If the Type field is either "C" or "D" then Endtime contains the time when the last granularity period of the measurement results contained in the file ended. Its structure corresponds to the Starttime field, however, the allowed values for the minute of the hour are 05, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, and 00.

6) UniqueId. This is the DN of the measured NF, NSI, NSSI, or network/subnetwork, as defined in annex A.2 (e.g. a measObjInstId). The field may be omitted only if the distinguishedName is not available from the CM applications.

7) The RC parameter is a running count, starting with the value of "1", and shall be appended only if the filename is otherwise not unique, i.e. more than one file is generated and all other parameters of the file name are identical. Therefore it may only be used by the EM, since the described situation cannot occur with NE generated files. Note that the delimiter for this field, _-_, is an underscore character (_), followed by a minus character (-), followed by an underscore character (_).

8) jobIdList indicates the measurement job id(s) that the performance data file is associated with.

Some examples describing file-naming convention:

1) file name: A20000626.2315+0200-2330+0200_gNBId,
meaning: file produced for gNB <gNBId> on June 26, 2000, granularity period 15 minutes from 23:15 local to 23:30 local, with a time differential of +2 hours against UTC.

2) file name: B20021224.1700-1130-1705-1130_-job10_S-NSSAI,
meaning: file containing results for multiple measured objects, generated for measurement job job10, produced for NSI <S-NSSAI> on December 24, 2002, granularity period 5 minutes from 17:00 local to 17:05 local, with a time differential of –11:30 hours against UTC.

3) file name: D20050907.1030+0000-20050909.1500+0000_SubnetworkId_-_2,
meaning: file containing results subnetwork <SubnetworkId>, start of first granularity period 07 September 2005, 10:30 local, end of last granularity period 09 September 2005, 15:00 local, with a time differential of 0 against UTC. This is the second file for this subnetwork/granularity period combination.

4) file name: C20050907.1030+0000-20050909.1500+0000_gNBId,
meaning: file produced for the gNB <gNBId>, start of first granularity period 07 September 2005, 10:30 local, end of last granularity period 09 September 2005, 15:00 local, with a time differential of 0 against UTC.

8 RESTful HTTP-based solution set of provisioning

8.1 Mapping of operations

8.1.1 Introduction

Table 6.1.1-1: Mapping of IS operations to SS equivalents

IS operation	HTTP Method	Resource URI	Qualifier
createMOI	PUT	ObjectManagement/{DN}	M
getMOIAttributes	GET	ObjectManagement/{DN}	M
modifyMOIAttributes	PATCH	ObjectManagement/{DN}	M
deleteMOI	DELETE	ObjectManagement/{DN}	M
subscribe	POST	/subscriptions	M
unSubscribe	DELETE	/subscriptions/{subscriptionId}	M
notifyProvisioning	POST	provisioningNotifications	M

8.1.2 Operation <createMOI>

This operation is to create a Managed Object instance in the MIB maintained by the service provider.

Table 8.1.2-1: Mapping of IS operation input parameters to SS equivalents (HTTP PUT)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
managedObjectClass	path	href	type: string, format: uri	M
managedObjectInstance	path	href	type: string, format: uri	M
attributeListIn	request body	attributeListIn	LIST OF SEQUENCE< attribute name, attribute value >	O

Table 8.1.2-2: Mapping of IS operation output parameters to SS equivalents (HTTP PUT)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
attributeListOut	response body	attributeListOut	LIST OF SEQUENCE< attribute name, attribute value >	M
status	response status codes	n/a	n/a	M
n/a	response body	href	type:string, format: uri	M

8.1.3 Operation <getMOIAttributes>

This operation is to retrieve management information (Managed Object attribute names and values) from the MIB maintained by the service provider.

Table 8.1.3-1: Mapping of IS operation input parameters to SS equivalents (HTTP GET)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
baseObjectInstance	path	href	type: string, format: uri	M
scope	n/a	n/a	n/a	M
filter	query	filter	string	M
attributeListIn	query	attributeListIn	string	M

Table 8.1.3-2: Mapping of IS operation output parameters to SS equivalents (HTTP GET)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
attributeListOut	response body	attributeListOut	LIST OF SEQUENCE< attribute name, attribute value >	M
status	response status codes	n/a	n/a	M
n/a	response body	href	Type:string, format: uri	M

8.1.4 Operation <modifyMOIAttributes>

This operation is to modify a Managed Object instance.

Table 8.1.4-1: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
baseObjectInstance	path	href	type: string, format: uri	M
scope	n/a	n/a	n/a	M
filter	n/a	n/a	n/a	M
modificationList	request body	attributeListIn	LIST OF SEQUENCE <attribute identifier, [attribute values], ENUM(replace, add values, remove values, set to default)>	M

Table 8.1.4-2: Mapping of IS operation output parameters to SS equivalents (HTTP PATCH)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
attributeListOut	response body	attributeListOut	LIST OF SEQUENCE< attribute name, attribute value >	M
status	response status codes	n/a	n/a	M
n/a	response body	href	Type:string, format: uri	M

8.1.5 Operation <deleteMOI>

This operation is to delete a Managed Object instance in the MIB maintained by the service provider.

Table 8.1.5-1: Mapping of IS operation input parameters to SS equivalents (HTTP DELETE)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
baseObjectInstance	path	href	type: string, format: uri	M
Scope	n/a	n/a	n/a	M
Filter	n/a	n/a	n/a	M

Table 8.1.5-2: Mapping of IS operation output parameters to SS equivalents (HTTP DELETE)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
status	response status codes	n/a	n/a	M

8.1.6 Operation <notifyProvisoning>

This operation is to send provisioning related notifications (i.e. notifyMOICreation, notifyMOIDeletion, notifyMOIAttributeValueChange) to subscriber.

Table 8.1.6-1: Mapping of IS operation input parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
notificationId	request body	notificationId	string	M
notificationType	request body	notificationType	string	M
subscriptionId	request body	subscriptionId	string	O
eventTime	request body	eventTime	string	M
systemDN	request body	systemDN	string	M
correlatedNotifications	request body	correlatedNotifications	string	O
objectClass	request body	objectClass	String	M
objectInstances	request body	objectInstanceInfos	ObjectInstanceInfo	M
additionalText	request body	additionalText	additionalText	O

Table 8.1.6-2: Mapping of IS operation out parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
n/a	response status codes	n/a	n/a	M

8.1.7 Operation `subscribe`

The authorized management service consumer invokes this operation to establish subscription to receive network events via notifications, under the filter constraint specified in this operation.

Table 8.1.7-1: Mapping of IS operation input parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
consumerReference	request body	callbackUri	type: string,format:url	M
timeTick	request body	timeTick	Integar	O
filter	request body	filter	filter-QueryType	O

Table 8.1.7-2: Mapping of IS operation out parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
subscriptionId	Response body	subscriptionId	string	M
status	response status codes	n/a	n/a	M

8.1.8 Operation `unSubscribe`

In case a single subscription shall be cancelled the IS operation parameters are mapped to SS equivalents according to table X.1.3-1 and table X.1.3-2.

Table 8.1.8-1: Mapping of IS operation input parameters to SS equivalents (HTTP DELETE)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
consumerReference	n/a	n/a	n/a	n/a
subscriptionId	path	/{subscriptionId}	string	M

Table 8.1.8-2: Mapping of IS operation out parameters to SS equivalents (HTTP DELETE)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
status	response status codes	n/a	n/a	M

NOTE: For the case multiple subscription (i.e. all subscriptions made with the same consumerReference) shall be cancelled is not addressed in the present document.

8.2 Resources

8.2.1 Resource definitions

8.2.1.1 Resource MOI

8.2.1.1.1 Description

An MOI is an instance of a Managed Object Class (MOC) representing the management aspects of a Network Resource. Its representation is a technology specific software object.

8.2.1.1.2 URI

URI = http://{URI authority}/ObjectManagement/{DN}

The URI authority is defined by the service provider.

8.2.1.1.3 HTTP methods

8.2.1.1.3.1 <PUT>

This method shall support the request parameters specified in table 8.2.2.1.3.1-1.

Table 8.1.2.1.1.3.1-1: Parameters supported by <PUT> request body on this resource

Name	Data type	P	Cardinality	Description
attributeListIn	LIST OF SEQUENCE< attribute name, attribute value>	M		This parameter may have a null value. When this parameter is supplied, it contains a list of name/value pairs to be assigned to the new MO.

This method shall support the response parameters specified in table 8.2.2.1.3.1-2.

Table 8.2.1.1.3.1-2: Response parameters supported by <PUT> response body on this resource

Name	Data type	P	Cardinality	Description
Href	type: string, format: uri	M		HTTP reference to an MOI resource.
attributeListOut	LIST OF SEQUENCE< attribute name, attribute value>	M		For each returned MO: A list of name/value pairs for MO.
Status	HTTP response code	M		HTTP response code 200 indicates "OperationSucceeded". All other HTTP response codes indicate "OperationFailed".

8.2.1.1.3.2 <GET>

This method shall support the URI query parameters specified in table 8.2.1.1.3.2-1.

Table 8.2.1.1.3.2-1: URI query parameters supported by the <GET> Query on this resource

Name	Data type	P	Cardinality	Description
filter	string	M		This parameter defines a `filter` test to be applied to the selected MOI(s)
attributeListIn	string	M		This parameter identifies the attributes to be returned by this operation. An empty list means "Return all attributes".

This method does not support any request parameters.

This method shall support the response parameters specified in table 8.2.1.1.3.2-2.

Table 8.2.1.1.3.2-1: Response parameters supported by the <GET> response body on this resource

Name	Data type	P	Cardinality	Description
`href`	type: string, format: uri	M		HTTP reference to an MOI resource.
`attributeListOut`	LIST OF SEQUENCE< attribute name, attribute value >	M		For each returned MO: A list of name/value pairs for MO.
`status`	HTTP response code	M		HTTP response code 200 indicates "OperationSucceeded". All other HTTP response codes indicate "OperationFailed".

8.2.1.1.3.3 <PATCH>

This method shall support the parameters specified in table 8.2.1.1.3.3-1.

Table 8.1.2.1.1.3.3-1: Parameters supported by the <PATCH> request body on this resource

Name	Data type	P	Cardinality	Description
`attributeListIn`	LIST OF SEQUENCE< attribute name, attribute value, ENUM(replace, add values, remove values, set to default)>	M		This parameter contains a list of attribute name/value pairs to be modified. Note: The modify operator (the allowed values are replace, add values, remove values, set to default) is optional, and if it is not specified, the replace operator shall be assumed.

This method shall support the response parameters specified in table 8.2.1.1.3.3-2.

Table 8.1.2.1.1.3.3-2: Response parameters supported by the <PATCH> response body on this resource

Name	Data type	P	Cardinality	Description
`href`	type: string, format: uri	M		HTTP reference to an MOI resource.
`attributeListOut`	LIST OF SEQUENCE< attribute name, attribute value >	M		For each returned MO: A list of name/value pairs for MO returns only updated fields, the consumer could know which fields were updated in the provider.
`status`	HTTP response code	M		HTTP response code 200 indicates "OperationSucceeded". All other HTTP response codes indicate "OperationFailed".

8.2.1.1.3.4 <DELETE>

This method does not support any input parameters.

This method shall support the response parameters specified in table 8.2.1.1.3.4-2.

Table 8.1.2.1.1.3.4-2: Response parameters supported by the <DELETE> response body on this resource

Name	Data type	P	Cardinality	Description
status	HTTP response code	M		HTTP response code 204 indicates "OperationSucceeded". All other HTTP response codes indicate "OperationFailed".

8.2.1.2 Resource provisioningNotifications

8.2.1.2.1 Description

This resource represents set of provisioning related notifications (i.e. notifyMOICreation, notifyMOIDeletion, notifyMOIAttributeValueChange).

8.2.1.2.2 URI

Resource URI: {{URI authority}/provisioningNotifications

The resource URI {URI authority}/provisioningNotifications is carried in the corresponding subscribe operation as callBackUri for provisioning related notificauions (i.e. notifyMOICreation, notifyMOIDeletion, notifyMOIAttributeValueChange).

The URI authority is defined by the service provider.

8.2.1.2.3 HTTP methods

8.2.1.2.3.1 <POST>

The POST method creates a new notification.

This method shall support the request data structures, and the response data structures and response codes specified in the following tables.

Table 8.2.1.2.3.1-1: Data structures supported by the POST Request Body on this resource

Name	Data type	P	Cardinality	Description
notificationId	String	M	1	This is an identifier for the notification, which may be used to correlate notifications, it uniquely identifies the notification from other notifications generated by the subject Information Object.
notificationType	String	M	1	It specifies the type of provisioning management services related notifications. One of the following notification type shall be carried: -"notifyMOICreation" -"notifyMOIDeletion", -"notifyMOIAttributeValueChange"
subscriptionId	String	O	0..1	This is an identifier for corresponding subscription which related to the notification.
eventTime	String	M	1	The semantics of Generalised Time specified by ITU-T [14] shall be used here.
systemDN	String	M	1	It shall carry the DN of management service providers.
correlatedNotifications	String	O	0..N	A set of notifications that are correlated to the subject notification. .
objectClass	String	M	1	It specifies the ManagedEntity class name.
objectInstanceInfos	ObjectInstanceInfo	M	1..N	It specifies the object instances in which the network event related to by carrying the DN for each object instance and if needed, a list of name/value pairs specifying attribute identifiers and their values to be assigned to the managed object instance.
additionalText	String	O	0.1	It can contain further information in text on the event of the MOI.

Table 8.2.1.2.3.1-2: Data structures supported by the POST Response Body on this resource

Name	Data type	P	Cardinality	Description
`status`	HTTP response code	M	1	In case of success, return HTTP response code 201 indicates "Created". In case of failed, return Error code.

8.2.1.3 Resource "/subscriptions"

8.2.1.3.1 Description

This resource represents collects of subscriptions.

8.2.1.3.2 URI

Resource URI: {URI authority}/ ObjectManagement/subscriptions

The URI authority is defined by the service provider.

8.2.1.3.3 HTTP methods

8.2.1.3.3.1 POST

The POST method creates a new subscription.

This method shall support the request data structures, and the response data structures and response codes specified in the following tables.

Table 8.2.1.3.3.1-1: Data structures supported by the POST Request Body on this resource

Name	DATATYPE	P	Cardinality	Description
filter	filter-QueryType	O	0.1	Filter settings for this subscription, to define the subset of all notifications this subscription relates to. A particular notification is sent to the subscriber if the filter matches, or if there is no filter. This parameter specifies the set of <attribute name, attribute value> defined in corresponding notification.
timeTick	Integar	O	0.1	It specifies the value of a timer held for the subject management service consumer. The value is in unit of whole minute. A special infinite value is assumed when parameter is absent or present but equal to zero.
callbackUri	Type:string, format: URI	M	1	The URI of the endpoint to send the notification to.

Table 8.2.1.3.3.1-2: Data structures supported by the POST Request Body on this resource

Name	DATATYPE	P	Cardinality	Description
n/a	response status codes	M	1	In case of success, return HTTP response code 201 CREATED In case of failed, return Error code.
subscriptionId	string	M	1	In case of success, the subscription should be returned

8.2.1.4 Resource "/{subscriptionId}"

8.2.1.4.1 Description

This resource represents a subscription.

8.2.1.4.2 URI

Resource URI: {URI authority}/ObjectManagement/subscriptions/{subscriptionId }

The URI authority is defined by the service provider.

8.2.1.4.3 HTTP methods

8.2.1.4.3.1 DELETE

The DELETE method delete a subscription.

This method shall support the request data structures, and the response data structures and response codes specified in the following tables.

Table 8.2.1.4.3.1-1: Data structures supported by the DELETE Request Body on this resource

Data type	DATATYPE	P	Cardinality	Description
n/a	n/a	n/a	n/a	n/a

Table 8.2.1.4.3.1-2: Data structures supported by the POST Request Body on this resource

Name	DATATYPE	P	Cardinality	Description
n/a	response status codes	M	1	In case of success, return HTTP response code 204 NO CONTENT In case of failed, return Error code.

8.3 Data type definitions

8.3.1 Type <ObjectInstanceInfo>

Table 8.3.1-1: Definition of type < ObjectInstanceInfo >

Attribute name	Data type	P	Cardinality	Description
ObjectInstanceDN	type:string, format: DN	M	1	It specifies the DN of the MOI.
ObjectInstanceUri	type:string, format: uri	M	1	It specifies the URI of the MOI.
AttributesList	List of Sequence of <attribute name, attribute value>	O	1	It specifies partial or all attributes (name/value pairs) of the MOI.

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9.1 Mapping of operations

9.1.1 Introduction

The IS operations are mapped to SS equivalents according to table 9.1.1-1.

Table 9.1.1-1: Mapping of IS operations to SS equivalents

IS operations	HTTP Method	Resource URI	Qualifier
getAlarmList	GET	/alarms	M
getAlarmCount	GET	/alarms/$alarmsCount	O
setComment	POST	/alarms	O
	POST	/alarms/{alarmId}/comment	O
acknowledgeAlarms	PATCH	/alarms or /alarms/{alarmId}	M
unacknowledgeAlarms	PATCH	/alarms	M
	PATCH	/alarms/{alarmId}	M
clearAlarms	PATCH	/alarms	M
	PATCH	/alarms/{alarmId}	M
subscribe	POST	/subscriptions	M
unsubscribe	DELETE	/subscriptions	M
	DELETE	/subscriptions/{subscriptionId}	M

The mapping of IS operation parameters to SS equivalents is specified in the following subclauses.

9.1.2 Operation `getAlarmList`

The IS operation parameters are mapped to SS equivalents according to table 9.1.2-1 and table 9.1.2-2.

Table 9.1.2-1: Mapping of IS operation input parameters to SS equivalents (HTTP GET)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
alarmAckState	query	alarmAckState	alarmAckState-QueryType	O
baseObjectClass baseObjectInstance	query	href	href-QueryType	O
filter	query	filter	filter-QueryType	O

Table 9.1.2-2: Mapping of IS operation output parameters to SS equivalents (HTTP GET)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
alarmInformationList	response body	n/a	alarms-ResponseType	M
status	response status codes	n/a	n/a	M

The message flow is as follows:

1. The Service Consumer sends a HTTP GET request to the Service Provider.

   The URI identifies the "…/alarms" collection resource.

   The query part may contain three optional parameters: "alarmAckstate", "href" and "filter". Absence of the query part means all alarms shall be returned.

   The request message body shall be empty.

2. The Service Provider sends a HTTP GET response to the Service Consumer.

   On success "200 OK" shall be returned. The response message body shall carry the returned alarms. The response format is defined by "alarms-ResponseType ".

   On failure, an appropriate error code shall be returned. The response message body may carry an error object.

9.1.3 Operation `getAlarmCount`

The IS operation parameters are mapped to SS equivalents according to table 9.1.3-1 and table 9.1.3-2.

Table 9.1.3-1: Mapping of IS operation input parameters to SS equivalents (HTTP GET)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
alarmAckState	query	alarmAckState	alarmAckState-QueryType	O
filter	query	filter	filter-QueryType	O

Table 9.1.3-2: Mapping of IS operation output parameters to SS equivalents (HTTP GET)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
criticalCount, majorCount, minorCount, warningCount, indeterminateCount, clearedCount	response body	n/a	alarmsCount-ResponseType	M
status	response status codes	n/a	n/a	M

The message flow is as follows:

1. The Service Consumer sends a HTTP GET request to the Service Provider.

   The URI identifies the "…/alarms/$alarmsCount" collection resource.

   The query part may contain two optional parameters: "alarmAckstate" and "filter". Absence of the query part means all alarms shall be counted.

   The request message body shall be empty.

2. The Service Provider sends a HTTP GET response to the Service Consumer.

   On success "200 OK" shall be returned. The response message body shall carry the alarm count for all perceived severity values. The response format is defined by "alarmsCount-ResponseType ".

   On failure, an appropriate error code shall be returned. The response message body may carry an error object.

9.1.4 Operation `setComment`

In case a comment shall be added to a single alarm the IS operation parameters are mapped to SS equivalents according to table 9.1.4-1 and table 9.1.4-2.

Table 9.1.4-1: Mapping of IS operation input parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
alarmInformationReferenceList	path	/alarms/{alarmId}/comment	alarmId-PathType	M
commentUserId	request body	commentUserId	commentUserIdType	M
commentSystemId	request body	commentSystemId	commentSystemIdType	O
commentText	request body	commentText	commentText-Type	M

Table 9.1.4-2: Mapping of IS operation output parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
badAlarmInformationReferenceList	response body	error	failedAlarms-ResponseType	M
status	response status codes	n/a	n/a	M

The message flow for adding a comment to a single alarm is as follows:

1. The Service Consumer sends a HTTP POST request to the Service Provider.

   The URI identifies the "…/alarms/{alarmId}/comment" alarm resource the comment shall be added to.

   The query part shall be absent.

The request message body shall contain a JSON object with "commentUserId" and "commentText" properties. In addition to that the request object may contain the "commentSystemId" property. The request body format is defined by "comment-RequestType".

2. The Service Provider sends a HTTP POST response to the Service Consumer.

   On success "201 Created " shall be returned. The response message body shall carry the representation of the created comment resource.

   On failure, an appropriate error code shall be returned. The response message body shall return the alarmId that did not exist or were identifying an alarm to which the comment could not be added, together with the failure reason. The JSON document carried in the response shall comply to the "failedAlarms" schema.

In case a comment shall be added to multiple alarms the IS operation parameters are mapped to SS equivalents according to table 9.1.4-3 and table 9.1.4-4.

Table 9.1.4-3: Mapping of IS operation input parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
alarmInformationReferenceList	path query	/alarms alarmId	n/a alarmIdList-QueryType	M M
commentUserId	request body	commentUserId	commentUserId-Type	M
commentSystemId	request body	commentSystemId	commentSystemId-Type	O
commentText	request body	commentText	commentText-Type	M

Table 9.1.4-4: Mapping of IS operation output parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
badAlarmInformationReferenceList	response body	error	failedAlarms-ResponseType	M
status	response status codes	n/a	n/a	M

The message flow for adding a comment to multiple alarms is as follows:

1. The Service Consumer sends a HTTP POST request to the Service Provider.

   The URI identifies the "…/alarms" alarm collection resource.

   The query part identifies the alarm resources of the collection the comment shall be added to, for "example "…/alarms?alarmId=5&alarmId=7c".

   The request message body shall contain a JSON object with "commentUserId" and "commentText" properties. In addition to that the request object may contain the "commentSystemId" property. The request body format is defined by "commentData-Type".

2. The Service Provider sends a HTTP GET response to the Service Consumer.

   On success "201 Created " shall be returned. The response message body shall carry the representation of the created comment resource.

   On failure, an appropriate error code shall be returned. The response message body shall return the alarmId that did not exist or were identifying an alarm to which the comment could not be added, together with the failure reason. The JSON document carried in the response shall comply to the "failedAlarms-Type" schema.

9.1.5 Operation `acknowledgeAlarms`

In case a single alarm shall be acknowledged the IS operation parameters are mapped to SS equivalents according to table 9.1.5-1 and table 9.1.5-2.

Table 9.1.5-1: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
alarmInformationAndSeverityReferenceList	path query	/{alarmId} perceivedSeverity	alarmId-PathType perceivedSeverity-QueryType	M O
ackUserId	request body	ackUserId	ackUserId-Type	M
ackSystemId	request body	ackSystemId	ackSystemId-Type	O

Table 9.1.5-2: Mapping of IS operation output parameters to SS equivalents (HTTP PATCH)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
badAlarmInformationReferenceList	response body	error	failedAlarms-ResponseType	M
status	response status codes	n/a	n/a	M

The message flow for acknowledging a single alarm is as follows:

1. The Service Consumer sends a HTTP PATCH request to the Service Provider.

   The URI identifies the "…/alarms/{alarmId}" alarm resource to be acknowledged.

   The query part shall carry the "perceivedSeverity" parameter with the value of the alarm to be acknowledged.

   The request message body contains a merge patch document. The document shall patch the "ackState" and "ackUserId" property of the identified alarm resource, and may patch the "ackSystemId" property. The patch document is defined by "patchAcknowledgeAlarms-Type".

2. The Service Provider sends a HTTP PATCH response to the Service Consumer.

   On success "204 No Content" shall be returned. The response message body shall be empty.

   On failure, an appropriate error code shall be returned. The response message body shall return the alarmId, together with failure reason. The JSON document carried in the response shall comply to the "failedAlarms-Type" schema.

In case multiple alarms shall be acknowledged the IS operation parameters are mapped to SS equivalents according to table 9.1.5-3 and table 9.1.5-4.

Table 9.1.5-3: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
alarmInformationAndSeverity ReferenceList	path query	/alarms alarmId	n/a alarmIdAndPerceivedSeverityList-QueryType	M M
ackUserId	request body	ackUserId	ackUserIdType	M
ackSystemId	request body	ackSystemId	ackSystemIdType	O

Table 9.1.5-4: Mapping of IS operation output parameters to SS equivalents (HTTP PATCH)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
badAlarmInformationReferenceList	response body	errorn	failedAlarms-ResponseType	M
status	response status codes	n/a	n/a	M

The message flow for acknowledging multiple alarms is as follows:

1. The Service Consumer sends a HTTP PATCH request to the Service Provider.

   The URI identifies the "…/alarms" collection resource.

   The query part identifies the alarm resources of the collection to be acknowledged, for "example "…/alarms?alarmId=5&alarmId=7c".

   The request message body contains a merge patch document. The document shall patch the "ackState" and "ackUserId" property of the identified alarm resources, and my patch the "ackSystemId" property. The patch document is defined by "patchAcknowledgeAlarms-RequestType".

2. The Service Provider sends a HTTP PATCH response to the Service Consumer.

   On success "200 OK" shall be returned. The response message body shall be empty.

   On failure, an appropriate error code shall be returned. The response message body shall return a list with the alarmId's that did not exist or were identifying alarms that could not be acknowledged, together with the failure reasons. The JSON document carried in the response shall comply to the "failedAlarms-Response Type" schema.

9.1.6 Operation unacknowledgeAlarms

In case a single alarm shall be unacknowledged the IS operation parameters are mapped to SS equivalents according to table 9.1.6-1 and table 9.1.6-2.

Table 9.1.6-1: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
alarmInformationReferenceList	path	/{alarmId}	alramId-QueryType	M
ackUserId	request body	ackUserId	ackUserId-Type	M
ackSystemId	request body	ackSystemId	ackSystemId-Type	O

Table 9.1.6-2: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
badAlarmInformationReferenceList	response body	errorn	failedAlarms-ResponseType	M
status	response status codes	n/a	n/a	M

The message flow for unacknowledging a single alarm is as follows:

1. The Service Consumer sends a HTTP PATCH request to the Service Provider.

   The URI identifies the "…/alarms/{alarmId}" alarm resource to be acknowledged.

   The request message body contains a merge patch document. The document shall patch the "ackState" and "ackUserId" property of the identified alarm resource, and may patch the "ackSystemId" property. The patch document is defined by "patchAcknowledgeAlarms-RequestType".

2. The Service Provider sends a HTTP PATCH response to the Service Consumer.

   On success "204 No Content" shall be returned. The response message body shall be empty.

   On failure, an appropriate error code shall be returned. The response message body shall return the alarmId, together with failure reason. The JSON document carried in the response shall comply to the "failedAlarms-ResponseType" schema.

In case multiple alarms shall be unacknowledged the IS operation parameters are mapped to SS equivalents according to table 9.1.6-3 and table 9.1.6-4.

Table 9.1.6-3: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
alarmInformationReferenceList	path query	/alarms alarmId	n/a alarmId-QueryType	M M
ackUserId	request body	ackUserId	ackUserId-Type	M
ackSystemId	request body	ackSystemId	ackSystemId-Type	O

Table 9.1.6-4: Mapping of IS operation output parameters to SS equivalents (HTTP PATCH)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
badAlarmInformationReferenceList	response body	error	failedAlarms-ResponseType	M
status	response status codes	n/a	n/a	M

The message flow for unacknowledging multiple alarms is as follows:

1. The Service Consumer sends a HTTP PATCH request to the Service Provider.

   The URI identifies the "…/alarms" collection resource.

   The query part identifies the alarm resources of the collection to be unacknowledged, for "example "…/alarms?alarmId=5&alarmId=7c".

   The request message body contains a merge patch document. The document shall patch the "ackState" and "ackUserId" property of the identified alarm resources, and my patch the "ackSystemId" property. The patch document is defined by "patchAcknowledgeAlarms-RequestType".

2. The Service Provider sends a HTTP PATCH response to the Service Consumer.

   On success "200 OK" shall be returned. The response message body shall be empty.

   On failure, an appropriate error code shall be returned. The response message body shall return a list with the alarmId's that did not exist or were identifying alarms that could not be unacknowledged, together with the failure reasons. The JSON document carried in the response shall comply to the "failedAlarms-Response Type" schema.

9.1.7 Operation `clearAlarms`

In case a single alarm shall be cleared the IS operation parameters are mapped to SS equivalents according to table 9.1.7-1 and table 9.1.7-2.

Table 9.1.7-1: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
alarmInformationReferenceList	path	/{alarmId}	alarmId-QueryType	M
clearUserId	request body	clearUserId	clearUserId-Type	M
clearSystemId	request body	clearSystemId	clearSystemId-Type	O

Table 9.1.7-2: Mapping of IS operation output parameters to SS equivalents (HTTP PATCH)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
badAlarmInformationReferenceList	response body	n/a	failedAlarms-ResponseType	M
status	response status codes	n/a	n/a	M

The message flow for clearing a single alarm is as follows:

1. The Service Consumer sends a HTTP PATCH request to the Service Provider.

   The URI identifies the "…/alarms/{alarmId}" alarm resource.

   The query part is absent.

   The request message body contains a merge patch document. The document shall patch the "clearUserId" property, may patch the "clearSystemId" property and shall patch the "perceivedSeverity" property of the identified alarm resource represented by an "alarmInformation" object. The patch document is defined by "patchClearAlarms-RequestType".

2. The Service Provider sends a HTTP PATCH response to the Service Consumer.

   On success "204 No content" shall be returned. The response message body shall be empty.

   On failure, an appropriate error code shall be returned. The response message body shall return the alarmId that did not exist or was identifying an alarm that could not be cleared together with a failure reason. The JSON document carried in the response shall comply to the "failedAlarms-ResponseType" schema.

In case multiple alarms shall be cleared the IS operation parameters are mapped to SS equivalents according to table 9.1.7-3 and table 9.1.7-4.

Table 9.1.7-3: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
alarmInformationReferenceList	path query	/alarms alarmId	n/a alarmId-QueryType	M M
clearUserId	request body	clearUserId	clearUserId-Type	M
clearSystemId	request body	clearSystemId	clearSystemId-Type	O

Table 9.1.7-4: Mapping of IS operation output parameters to SS equivalents (HTTP PATCH)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
badAlarmInformationReferenceList	response body	error	failedAlarms-ResponseType	M
status	response status codes	n/a	n/a	M

The message flow for clearing multiple alarms is as follows:

1. The Service Consumer sends a HTTP PATCH request to the Service Provider.

   The URI identifies the "…/alarms" collection resource.

   The query part identifies the alarm resources of the collection for alarms to be cleared, for "example "…/alarms?alarmId=5&alarmId=7c".

   The request message body contains a merge patch document. The document shall patch the "clearUserId" property, may patch the "clearSystemId" property and shall patch the "perceivedSeverity" property of the identified alarm resources represented by "alarmInformation" objects. The patch document is defined by "patchClearAlarms-RequsetType".

2. The Service Provider sends a HTTP PATCH response to the Service Consumer.

   On success "200 OK" shall be returned. The response message body shall be empty.

   On failure, an appropriate error code shall be returned. The response message body shall return a list with the alarmId's that did not exist or were identifying alarms that could not be cleared, together with the failure reasons. The JSON document carried in the response shall comply to the "failedAlarms-ResponseType" schema.

9.1.8 Operation subscribe

The IS operation parameters are mapped to SS equivalents according to table 9.1.8-1 and table 9.1.8-2.

Table 9.1.8-1: Mapping of IS operation input parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
consumerReference	request body	consumerReference	uri-Type	M
timeTick	request body	timeTick	long-Type	O
filter	request body	filter	filter-Type	O

Table 9.1.8-2: Mapping of IS operation output parameters to SS equivalents (HTTP POST)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
subscriptionId	Location header	n/a	uri-Type	M
status	response status code	n/a	n/a	M

The procedure for subscribing to notifications is as follows:

1) The Service Consumer (notification subscriber) sends a HTTP POST request to the Service Provider.

   The URI identifies the "…/subscriptions" collection resource.

   The query part shall be absent. The request message body shall carry a data structure of type "subscriptionRequestType". This data structure contains filtering criteria and a client side URI to which the provider will subsequently send notifications about events that match the filter.

2) The Service Provider creates a new subscription for notifications related to fault management, and a resource that represents this subscription.

3) The Service Provider sends a HTTP POST response to the Service Consumer.

   The Location header shall carry the URI of the created subscription resource. The successful subscription shall be returned with "201 Created". The message body carries the representation of the created subscription resource. On failure, the appropriate error code shall be returned. The response massage body may provide additional error information.

9.1.9 Operation unsubscribe

In case one subscription shall be cancelled the IS operation parameters are mapped to SS equivalents according to table 5.1.9-1 and table 5.1.9-2.

Table 5.1.9-1: Mapping of IS operation input parameters to SS equivalents (HTTP DELETE)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
consumerReference	--	--	--	--
subscriptionId	path	/subscriptions/{subscriptionId}	n/a	M

Table 5.1.9-2: Mapping of IS operation output parameters to SS equivalents (HTTP DELETE)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
status	response status codes	n/a	n/a	M

The procedure for unsubscribing from one specific subscription is as follows:

1. The Service Consumer (notification subscriber) sends a HTTP DELETE request to the Service Provider.

   The URI identifies the "…/subscriptions/{subscriptionId}" subscription resource.

The query part shall be absent.

The request message body shall be empty.

2. The Service Provider sends a HTTP DELETE response to the Service Consumer.

On success "204 No Content" shall be returned. The response message body shall be empty.

On failure, an appropriate error code shall be returned. The response message body may carry an error object.

In case all subscriptions made with a specific consumerReference shall be cancelled the IS operation parameters are mapped to SS equivalents according to table 5.1.9-3and table 5.1.9-4.

Table 5.1.9-3: Mapping of IS operation input parameters to SS equivalents (HTTP DELETE)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
consumerReference	query	consumerReference	uri-Type	M
subscriptionId	--	--	--	--

Table 5.1.9-4: Mapping of IS operation output parameters to SS equivalents (HTTP DELETE)

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
status	response status codes	n/a	n/a	M

The procedure for unsubscribing from all subscription made with a specific consumerReference is as follows:

1) The Service Consumer (notification subscriber) sends a HTTP DELETE request to the Service Provider.

The URI identifies the "…/subscriptions" collection resource.

The query part identifies the consumer whose subscriptions shall be deleted, for "example "…/subscriptions?consumerReference= example.com/notificationSink".

The request message body shall be empty.

2) The Service Provider sends a HTTP DELETE response to the Service Consumer.

On success "204 No Content" shall be returned. The response message body shall be empty.

On failure, an appropriate error code shall be returned. The response message body may carry an error object.

9.2 Mapping of notifications

9.2.1 Introduction

The IS notifications are mapped to SS equivalents according to table 9.2.1-1.

Table 9.2.1-1: Mapping of IS notifications to SS equivalents

IS operations	HTTP Method	Resource URI	SQ
notifyNewAlarm	POST	/notificationSink	M
notifyNewSecurityAlarm	POST	/notificationSink	M
notifyAckStateChanged	POST	/notificationSink	M
notifyClearedAlarm	POST	/notificationSink	M
notifyAlarmListRebuilt	POST	/notificationSink	M
notifyChangedAlarm	POST	/notificationSink	M
notifyComments	POST	/notificationSink	M
notifyPotentialFaultyAlarmList	POST	/notificationSink	M
notifyCorrelatedNotificationChanged	POST	/notificationSink	M
notifyChangedAlarmGeneral	POST	/notificationSink	O

9.2.2 Notification notifyNewAlarm

The IS notification parameters are mapped to SS equivalents according to table 9.2.2-1.

Table 9.2.2-1: Mapping of IS notification parameters to SS equivalents

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
objectClass, objectInstance	request body	href	uri-Type	M
notificationId	request body	notificationId	notificationId-Type	M
notificationType	request body	notificationType	notificationType-Type	M
eventTime	request body	eventTime	dateTime-Type	M
systemDN	request body	systemDN	systemDN-Type	C
probableCause	request body	probableCause	probableCause-Type	M
perceivedSeverity	request body	perceivedSeverity	perceivedSeverity-Type	M
rootCauseIndicator	request body	rootCauseIndicator	rootCauseIndicator-Type	O
alarmType	request body	alarmType	alarmType-Type	M
specificProblem	request body	specificProblem	specificProblem-Type	O
correlatedNotifications	request body	correlatedNotifications	array(correlatedNotification-Type)	O
backedUpStatus	request body	backedUpStatus	backedUpStatus-Type	O
backUpObject	request body	backUpObject	backUpObject-Type	O
trendIndication	request body	trendIndication	trendIndication-Type	O
thresholdInfo	request body	thresholdInfo	thresholdInfo-Type	O
stateChangeDefinition	request body	stateChangeDefinition	array(attributeValueChange-Type)	O
monitoredAttributes	request body	monitoredAttributes	array(attributeNameValuePair-Type)	O
proposedRepairActions	request body	proposedRepairActions	proposedRepairActions-Type	O
additionalText	request body	additionalText	additionalText-Type	O
additionalInformation	request body	additionalInformation	array(attributeNameValuePair-Type)	O
alarmId	request body	alarmId	alarmId-Type	O

9.2.3 Notification notifyNewSecurityAlarm

The IS notification parameters are mapped to SS equivalents according to table 9.2.3-1.

Table 9.2.3-1: Mapping of IS notification parameters to SS equivalents

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
objectClass, objectInstance	request body	href	uri-Type	M
notificationId	request body	notificationId	notificationId-Type	M
notificationType	request body	notificationType	notificationType-Type	M
eventTime	request body	eventTime	dateTime-Type	M
systemDN	request body	systemDN	systemDN-Type	C
probableCause	request body	probableCause	probableCause-Type	M
perceivedSeverity	request body	perceivedSeverity	perceivedSeverity-Type	M
rootCauseIndicator	request body	rootCauseIndicator	rootCauseIndicator-Type	O
alarmType	request body	alarmType	alarmType-Type	M
correlatedNotifications	request body	correlatedNotifications	array(correlatedNotification-Type)	O
additionalText	request body	additionalText	additionalText-Type	O
additionalInformation	request body	additionalInformation	array(attributeNameValuePair-Type)	O
alarmId	request body	alarmId	alarmId-Type	O
serviceUser	request body	serviceUser	serviceUser-Type	M
serviceProvider	request body	serviceProvider	serviceProvider-Type	M
securityAlarmDetector	request body	securityAlarmDetector	securityAlarmDetector-Type	M

9.2.4 Notification notifyAckStateChanged

The IS notification parameters are mapped to SS equivalents according to table 9.2.4-1.

Table 9.2.4-1: Mapping of IS notification parameters to SS equivalents

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
objectClass, objectInstance	request body	href	uri-Type	M
notificationId	request body	notificationId	notificationId-Type	M
notificationType	request body	notificationType	notificationType-Type	M
eventTime	request body	eventTime	dateTime-Type	M
systemDN	request body	systemDN	systemDN-Type	C
alarmId	request body	alarmId	alarmId-Type	M
alarmType	request body	alarmType	alarmType-Type	M
probableCause	request body	probableCause	probableCause-Type	M
perceivedSeverity	request body	perceivedSeverity	perceivedSeverity-Type	M
ackState	request body	ackState	ackState-Type	M
ackUserId	request body	ackUserId	ackUserId-Type	M
ackSystemId	request body	ackSystemId	ackSystemId-Type	O

9.2.5 Notification notifyClearedAlarm

The IS notification parameters are mapped to SS equivalents according to table 9.2.5-1.

Table 9.2.5-1: Mapping of IS notification parameters to SS equivalents

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
objectClass, objectInstance	request body	href	uri-Type	M
notificationId	request body	notificationId	notificationId-Type	M
notificationType	request body	notificationType	notificationType-Type	M
eventTime	request body	eventTime	dateTime-Type	M
systemDN	request body	systemDN	systemDN-Type	C
alarmId	request body	alarmId	alarmId	M
alarmType	request body	alarmType	alarmType	M
probableCause	request body	probableCause	probableCause	M
perceivedSeverity	request body	perceivedSeverity	perceivedSeverity	M
correlatedNotifications	request body	correlatedNotifications	array(correlatedNotification-Type)	O
clearUserId	request body	clearUserId	clearUserId	O
clearSystemId	request body	clearSystemId	clearSystemId	O

9.2.6 Notification notifyAlarmListRebuilt

The IS notification parameters are mapped to SS equivalents according to table 9.2.6-1.

Table 9.2.6-1: Mapping of IS notification parameters to SS equivalents

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
objectClass, objectInstance	request body	href	uri-Type	M
notificationId	request body	notificationId	notificationId-Type	M
notificationType	request body	notificationType	notificationType-Type	M
eventTime	request body	eventTime	dateTime-Type	M
systemDN	request body	systemDN	systemDN-Type	C
reason	request body	reason	reason-Type	M
alarmListAlignmentRequirement	request body	alarmListAlignmentRequirement	alarmListAlignmentRequirement-Type	O

9.2.7 Notification notifyChangedAlarm

The IS notification parameters are mapped to SS equivalents according to table 9.2.7-1.

Table 9.2.7-1: Mapping of IS notification parameters to SS equivalents

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
objectClass, objectInstance	request body	href	uri-Type	M
notificationId	request body	notificationId	notificationId-Type	M
notificationType	request body	notificationType	notificationType-Type	M
eventTime	request body	eventTime	dateTime-Type	M
systemDN	request body	systemDN	systemDN-Type	C
alarmId	request body	alarmId	alarmId-Type	M
alarmType	request body	alarmType	alarmType-Type	M
probableCause	request body	probableCause	probableCause-Type	M
perceivedSeverity	request body	perceivedSeverity	perceivedSeverity-Type	M

9.2.8 Notification notifyComments

The IS notification parameters are mapped to SS equivalents according to table 9.2.8-1.

Table 9.2.8-1: Mapping of IS notification parameters to SS equivalents

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
objectClass, objectInstance	request body	href	uri-Type	M
notificationId	request body	notificationId	notificationId-Type	M
notificationType	request body	notificationType	notificationType-Type	M
eventTime	request body	eventTime	dateTime-Type	M
systemDN	request body	systemDN	systemDN-Type	C
alarmId	request body	alarmId	alarmId-Type	M
alarmType	request body	alarmType	alarmType-Type	M
probableCause	request body	probableCause	probableCause-Type	M
perceivedSeverity	request body	perceivedSeverity	perceivedSeverity-Type	M
comments	request body	comments	array(comment-ResourceType)	M

9.2.9 Notification notifyPotentialFaultyAlarmList

The IS notification parameters are mapped to SS equivalents according to table 9.2.9-1.

Table 9.2.9-1: Mapping of IS notification parameters to SS equivalents

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
objectClass, objectInstance	request body	href	uri-Type	M
notificationId	request body	notificationId	notificationId-Type	M
notificationType	request body	notificationType	notificationType-Type	M
eventTime	request body	eventTime	dateTime-Type	M
systemDN	request body	systemDN	systemDN-Type	C
reason	request body	reason	Reason-Type	M

9.2.10 Notification notifyCorrelatedNotificationChanged

The IS notification parameters are mapped to SS equivalents according to table 9.2.10-1.

Table 9.2.10-1: Mapping of IS notification parameters to SS equivalents

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
objectClass, objectInstance	request body	href	uri-Type	M
notificationId	request body	notificationId	notificationId-Type	M
notificationType	request body	notificationType	notificationType-Type	M
eventTime	request body	eventTime	dateTime-Type	M
systemDN	request body	systemDN	systemDN-Type	C

alarmId	request body	alarmId	alarmId-Type	M
correlatedNotifications	request body	correlatedNotifications	array(correlatedNotification-Type)	M
rootCauseIndicator	request body	rootCauseIndicator	rootCauseIndicator-Type	O

9.2.11 Notification notifyChangedAlarmGeneral

The IS notification parameters are mapped to SS equivalents according to table 9.2.11-1.

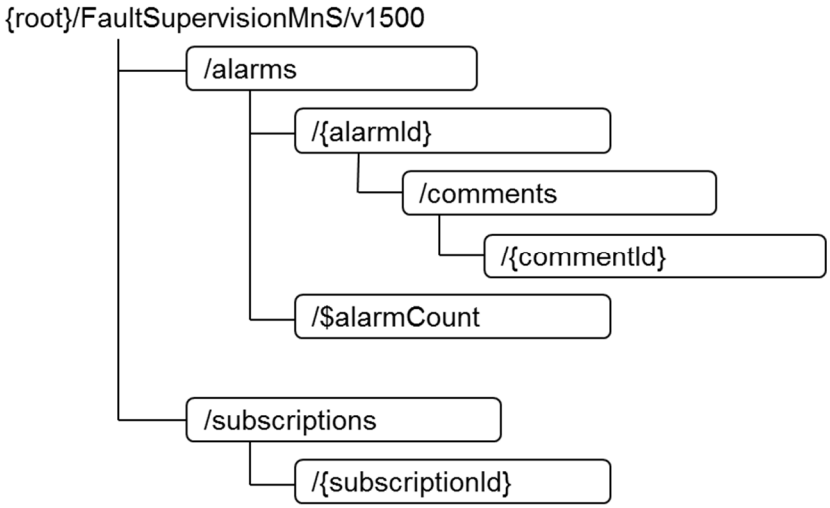
Table 9.2.11-1: Mapping of IS notification parameters to SS equivalents

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
objectClass, objectInstance	request body	href	uri-Type	M
notificationId	request body	notificationId	notificationId-Type	M
notificationType	request body	notificationType	notificationType-Type	M
eventTime	request body	eventTime	dateTime-Type	M
systemDN	request body	systemDN	systemDN-Type	C
alarmId	request body	alarmId	alarmId-Type	M
alarmType	request body	alarmType	alarmType-Type	M
probableCause	request body	probableCause		M
specificProblem	request body	specificProblem	specificProblem-Type	O
perceivedSeverity	request body	perceivedSeverity	perceivedSeverity-Type	M
backedUpStatus	request body	backedUpStatus	backedUpStatus-Type	O
backUpObject	request body	backUpObject	backUpObject-Type	O
trendIndication	request body	trendIndication	trendIndication-Type	O
thresholdInfo	request body	thresholdInfo	thresholdInfo-Type	O
correlatedNotifications	request body	correlatedNotifications	array(correlatedNotification-Type)	O
stateChangeDefinition	request body	stateChangeDefinition	array(attributeValueChange-Type)	O
monitoredAttributes	request body	monitoredAttributes	array(attributeNameValuePair-Type)	O
proposedRepairActions	request body	proposedRepairActions	proposedRepairActions-Type	O
additionalText	request body	additionalText	additionalText-Type	O
additionalInformation	request body	additionalInformation	array(attributeNameValuePair-Type)	O
rootCauseIndicator	request body	rootCauseIndicator	rootCauseIndicator-Type	O
changedAlarmAttributes	request body	changedAlarmAttributes	array(attributeNameValuePair-Type)	M

9.3 Resources

9.3.1 Resource structure

Figure 9.3.1-1 shows the resource structure of the Fault Supervision MnS. The "alarms","comments" and "subscriptions" resource are collection resources.



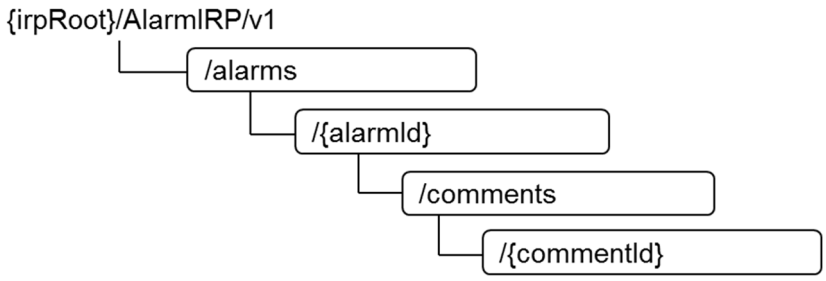


Figure 9.3.1-1: Resource URI structure of the Fault MnS

Table 9.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 9.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Description
alarms	/alarms	GET	Retrieve all alarms or a filtered subset
		POST	Add a comment to multiple alarms
		PATCH	Clear, acknowledge or unacknowledge multiple alarms
alarm	/alarms/{alarmId}	PATCH	Clear, acknowledge or unacknowledge a single alarms
		POST	Add a comment to a single alarm
$alarmCount	/alarms/$alarmCount	GET	Retrieve the alarm count per perceived severity
subscriptions	/subscriptions	POST	Create a subscription
subscriptions	/subscriptions	DELETE	Delete all subscriptions made with a consumerReferenceId
subscription	/subscriptions/{subscriptionId}	DELETE	Delete a single subscription
notificationSink	/notificationSink	POST	Send notifications

9.3.2 Resource definitions

9.3.2.1 Resource "/alarms"

9.3.2.1.1 Description

This resource represents a collection of alarms.

9.3.2.1.2 URI

Resource URI: {DN_prefix_authority_part}/{DN_prefix_remainder}/FaultMnS/v1500/alarms

The resource URI variables a defined in the following table.

Table 9.3.2.1.2-1: URI variables

Name	Definition
DN_prefix_authority_part	See subclause 4.4 of TS 32.158 [?]
DN_prefix_remainder	See subclause 4.4 of TS 32.158 [?]

9.3.2.1.3 HTTP methods

9.3.2.1.3.1 HTTP GET

This method shall support the URI query parameters specified in the following table.

Table 9.3.2.1.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	Description	Qualifier
alarmAckState	alarmAckState-QueryType		O
href	uri-Type		O
filter	filter-QueryType		O

This method shall support the request data structures, the response data structures and response codes specified in the following table.

Table 9.3.2.1.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	Description	Qualifier
n/a	n/a	n/a

Table 9.3.2.1.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	Response codes	Description	Qualifier
alarms-Type	200 OK	The alarms returned.	M
error-Type	4xx/5xx	Returned in case of an error	O

9.3.2.1.3.2 HTTP POST

This method shall support the URI query parameters specified in the following table.

Table 9.3.2.1.3.2-1: URI query parameters supported by the POST method on this resource

Name	Data type	Description	Qualifier
alarmIdList	Array of strings	Identifies the alarms the POST method shall be applied to.	O

This method shall support the request data structures, the response data structures and response codes specified in the following table.

Table 9.3.2.1.3.2-2: Data structures supported by the POST Request Body on this resource

Data type	Description	Qualifier
comment-Type	JSON schema for the representation of a comment resource.	M

Table 9.3.2.1.3.2-3: Data structures supported by the POST Response Body on this resource

Data type	Response codes	Description	Qualifier
n/a	204 No Content	In case of success, the response body shall be empty.	M
failedAlarms-ResponseType	4xx/5xx	In case of failure, the response body shall carry a JSON object described by the "failedAlarms-Type" format.	M

9.3.2.1.3.3 HTTP PATCH

This method shall support the URI query parameters specified in the following table.

Table 9.3.2.1.3.3-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	Description	Qualifier
alarmIds	array (alarmId-Type)	Identifies the alarms the PATCH shall be applied to	M

This method shall support the request data structures, the response data structures and response codes specified in the following table.

Table 9.3.2.1.3.3-2: Data structures supported by the PATCH Request Body on this resource

Data type	Description	Qualifier
patchAcknowledgeAlarms-Type	Patch document for acknowledging one or multiple alarms	M
patchClearAlarms-Type	Patch document for clearing one or multiple alarms	M

Table 9.3.2.1.3.3-3: Data structures supported by the PATCH Response Body on this resource

Data type	Response codes	Description	Qualifier
n/a	204 No Content	In case of success the response body shall be empty.	M
failedAlarms-ResponseType	4xx/5xx	In case of failure, the response body shall carry a JSON object described by the "failedAlarms-Type" format.	M

9.3.2.2 Resource " alarms /{alarmId}"

9.3.2.2.1 Description

This resource represents an alarm.

9.3.2.2.2 URI

Resource URI: {DN_prefix_authority_part}/{DN_prefix_remainder}/FaultMnS/v1500/alarms/{alarmId}

The resource URI variables a defined in the following table.

Table 9.3.2.2.2-1: URI variables

Name	Definition
DN_prefix_authority_part	See subclause 4.4 of TS 32.158 [?]
DN_prefix_remainder	See subclause 4.4 of TS 32.158 [?]
alarmId	String identifying an alarm

9.3.2.2.3 HTTP methods

9.3.2.2.3.1 HTTP PATCH

This method shall support the URI query parameters specified in the following table.

Table 9.3.2.2.3.1-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	Description	Qualifier
n/a	n/a	n/a	n/a

This method shall support the request data structures, the response data structures and response codes specified in the following table.

Table 9.3.2.2.3.1-2: Data structures supported by the PATCH Request Body on this resource

Data type	Description	Qualifier
patchAcknowledgeAlarms-Type	Patch document for acknowledging an alarm	M
patchClearAlarms-Type	Patch document for clearing an alarm	M

Table 9.3.2.2.3.1-3: Data structures supported by the PATCH Response Body on this resource

Data type	Response codes	Description	Qualifier
n/a	200 OK	In case of success the response body shall be empty.	
failedAlarms-ResponseType	4xx/5xx	In case of failure, the response body shall carry a JSON object described by the "failedAlarms-Type" format.	

9.3.2.3 Resource "alarms/$alarmCount"

9.3.2.3.1 Definition

This resource holds metadata about the /alarms collection resource like the alarm count per perceived severity.

9.3.2.3.2 URI

Resource URI: {DN_prefix_authority_part}/{DN_prefix_remainder}/FaultMnS/v1500/alarms/{alarmId}/comments

The resource URI variables are defined in table 9.3.2.3.2-1.

Table 9.3.2.3.2-1: URI variables

Name	Definition
DN_prefix_authority_part	See subclause 4.4 of TS 32.158 [?]
DN_prefix_remainder	See subclause 4.4 of TS 32.158 [?]

9.3.2.3.3 HTTP methods

9.3.2.3.3.1 GET

This method shall support the URI query parameters specified in table 9.3.2.3.3.1-1.

Table 9.3.2.3.3.3-1: URI query parameters supported by the GET method on this resource

Name	Data type	Description	SQ
n/a			

This method shall support the request data structures specified in table 9.3.2.3.3.1-2 and the response data structures and response codes specified in table 9.3.2.3.3.1-3.

Table 9.3.2.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	Description	SQ

Table 9.3.2.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	Response codes	Description	SQ
alarmsCount-Type	200 OK	The alarm count per severity level returned.	M
error-Type	4xx/5xx	Returned in case of an error	O

9.3.2.4 Resource "alarms/{alarmId}/comments"

9.3.2.4.1 Definition

This resource is a collection resource for comments attached to an alarm.

9.3.2.4.2 URI

Resource URI: {DN_prefix_authority_part}/{DN_prefix_remainder}/FaultMnS/v1500/alarms/{alarmId}/comments

The resource URI variables are defined in the following table.

Table 9.3.2.4.2-1: URI variables

Name	Definition
DN_prefix_authority_part	See subclause 4.4 of TS 32.158 [?]
DN_prefix_remainder	See subclause 4.4 of TS 32.158 [?]
alarmed	Alarm identifier

9.3.2.4.3 HTTP methods

9.3.2.4.3.1 POST

This method shall support the URI query parameters specified in the following table.

Table 9.3.2.4.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	Description	Qualifier
n/a			

This method shall support the request data structures, and the response data structures and response codes specified in the following tables.

Table 9.3.2.4.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	Description	Qualifier
comment-RequestType	The representation of the comment to be added to an alarm.	M

Table 9.3.2.4.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	Response codes	Description	SQ
comment-ResponseType	201 Created	In case of success, the response body shall be described by the "comment-ResponseType" format. The commentTime property shall carry the value set by the server.	M
failedAlarms-ResponseType	4xx/5xx	In case of failure, the response body shall be described by the "failedAlarms-ResponseType" format.	M

9.3.2.5 Resource "/{commentId}"

9.3.2.5.1 Definition

This resource represents a comment attached to an alarm.

9.3.2.5.2 URI

Resource URI:
{DN_prefix_authority_part}/{DN_prefix_remainder}/FaultMnS/v1500/alarms/{alarmId}/comments/{commentId}

The resource URI variables are defined in the following table.

Table 9.3.2.4.5-1: URI variables

Name	Definition
DN_prefix_authority_part	See subclause 4.4 of TS 32.158 [?]
DN_prefix_remainder	See subclause 4.4 of TS 32.158 [?]
alarmed	Alarm identifier
commentId	Comment identifier

9.3.2.5.3 HTTP methods

None.

9.3.2.6 Resource "/subscription"

9.3.2.6.1 Description

This resource is a container resource for individual subscriptions.

9.3.2.6.2 URI

The resource URI is:

Resource URI: {DN_prefix_authority_part}/{DN_prefix_remainder}/FaultMnS/v1500/

9.3.2.6.3 HTTP methods

9.3.2.6.3.1 POST

This method shall support the URI query parameters specified in table 9.3.2.6.3.1-1.

Table 9.3.2.6.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	Description	Qualifier
n/a	n/a	n/a	n/a

This method shall support the request data structures specified in table 9.3.2.6.3.1-2 and the response data structures and response codes specified in table 9.3.2.6.3.1-3.

Table 9.3.2.6.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	Description	SQ
subscription-RequestType	Details of the subscription to be created	M

Table 9.3.2.6.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	Response codes	Description	SQ
subscription-ResponseType	201 Created	In case of success the representation of the created subscription is returned.	M
error-Type	4xx/5xx	In case of failure the error object is returned.	M

9.3.2.6.3.2 DELETE

This method shall support the URI query parameters specified in table 9.3.2.6.3.2-1.

Table 9.3.2.6.3.2-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	Description	Qualifier
consumerReferenceId	consumerReferenceId-QueryType	Identifies the consumer whose subscriptions shall be deleted	M

This method shall support the request data structures specified in table 9.3.2.6.3.2-2 and the response data structures and response codes specified in table 9.3.2.6.3.2-3.

Table 9.3.2.6.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	Description	SQ
n/a	n/a	n/a

Table 9.3.2.5.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	Response codes	Description	SQ
n/a	204 No Content	In case of success no message body is returned	n/a
error-Type	4xx/5xx	In case of failure the error object is returned.	M

9.3.2.7 Resource "/subscriptions/{subscriptionId}"

9.3.2.7.1 Description

This resource represents a subscription.

9.3.2.7.2 URI

The resource URI is:

Resource URI: {DN_prefix_authority_part}/{DN_prefix_remainder}/FaultMnS/v1500/ subscriptions/{subscriptionId}

Table 9.3.2.7.2-1: URI variables

Name	Definition
DN_prefix_authority_part	See subclause 4.4 of TS 32.158 [?]
DN_prefix_remainder	See subclause 4.4 of TS 32.158 [?]
subscriptionId	Subscription identifier

9.3.2.7.3 HTTP methods

9.3.2.7.3.1 DELETE

This method shall support the URI query parameters specified in table 9.3.2.7.3.1-1.

Table 9.3.2.6.3.1-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	Description	Qualifier
n/a	n/a	n/a	n/a

This method shall support the request data structures specified in table 9.3.2.7.3.1-2 and the response data structures and response codes specified in table 9.3.2.7.3.1-3.

Table 9.3.2.7.3.1-2: Data structures supported by the DELETE Request Body on this resource

Data type	Description	SQ
n/a	n/a	n/a

Table 9.3.2.7.3.1-3: Data structures supported by the DELETE Response Body on this resource

Data type	Response codes	Description	SQ
n/a	204 No Content	In case of success no message body is returned	M
error-Type	4xx/5xx	In case of failure the error object is returned.	M

9.3.2.8 Resource "/notificationSink"

9.3.2.8.1 Description

This resource represents a resource to which notifications are sent to.

9.3.2.8.2 URI

The resource URI is provided by the notification subscriber when creating the subscription.

9.3.2.8.3 HTTP methods

9.3.2.8.3.1 POST

This method shall support the URI query parameters specified in table 9.3.2.8.3.1-1.

Table 9.3.2.8.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	Description	Qualifier
n/a	n/a	n/a	n/a

This method shall support the request data structures specified in table 9.3.2.8.3.1-2 and the response data structures and response codes specified in table 9.3.2.8.3.1-3.

Table 9.3.2.8.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	Description	SQ
notifyNewAlarm-NotifType	Type in case a notifyNewAlarm notification is sent	M
notifyNewSecurityAlarm-NotifType	Type in case a notifyNewSecurityAlarm notification is sent	M
notifyAckStateChanged-NotifType	Type in case a notifyAckStateChanged notification is sent	M
notifyClearedAlarm-NotifType	Type in case a notifyClearedAlarm notification is sent	M
notifyAlarmListRebuilt-NotifType	Type in case a notifyAlarmListRebuilt notification is sent	M
notifyChangedAlarm-NotifType	Type in case a notifyChangedAlarm notification is sent	M
notifyComments-NotifType	Type in case a notifyComments notification is sent	M
notifyPotentialFaultyAlarmList-NotifType	Type in case a notifyPotentialFaultyAlarmList notification is sent	M
notifyCorrelatedNotificationChanged-NotifType	Type in case a notifyCorrelatedNotificationChanged notification is sent	M
notifyChangedAlarmGeneral-NotifType	Type in case a notifyChangedAlarmGeneral notification is sent	M

Table 9.3.2.8.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	Response codes	Description	SQ
n/a	204 No Content	In case of success no message body is returned	M
error-Type	4xx/5xx	In case of failure the error object is returned.	M

9.4 Data type definitions

9.4.1 General

Table 9.4.1-1: Data types defined in the present document

Data type	Reference	Description
General types		
dateTime-Type		Date and time
float-Type		Float type
long-Type		Long type
uri-Type		Type of an URI
Types used in paths		
alarmId-PathType		Used in the path to identify an alarm resource
subscriptionId-PathType		Used in the path to identify a subscription resource
Types in query parts		
alarmIdAndPerceivedSeverityList-QueryType	9.4.2.1	Used in the query part of HTTP PATCH on /alarms to identify the alarms to be acknowledged
alarmIdList-QueryType	9.4.2.2	Used in the query part of HTTP POST on /alarms to identify the alarms a comment shall be added to and in HTTP PATCH on /alarms to identify the alarms to be cleared or unacknowledged
alarmAckState-QueryType	9.4.4.4	Used in the query part of HTTP GET on /alarms to discriminate alarms to be returned or counted
consumerReferenceId-QueryType	9.4.4.2	Used in the query part of HTTP DELETE on /Subscriptions to delete all subscriptions made with a specific consumerReferenceId
filter-QueryType	9.4.4.2	Used in the query part of HTTP GET on /alarms to discriminate alarms to be returned or counted
href-QueryType	9.4.4.2	Used in the query part of HTTP GET on /alarms to identify the base object of the tree for partial alarm alignment
perceivedSeverity-QueryType	9.4.2.3	Used in the query part in HTTP POST on /alarms/{alarmId} when acknowledging an alarm to indicate the perceived severity the alarm to acknowledge shall have, otherwise the alarm shall not be acknowledged
Types used in request bodies		
comment-RequestType	9.4.2.4	Used in the request body of HTTP POST on /alarms describing the representation of a comment to be added to multiple alarms, or in the request body of HTTP POST on /alarms/{alarmId} describing the representation of a comment to be added to a single alarm
patchAcknowledgeAlarms-RequestType	9.4.2.5	Used in the request message body of HTTP PATCH to acknowledge alarms
patchUnacknowledgeAlarms-RequestType	9.4.2.6	Used in the request message body of HTTP PATCH to unacknowledge alarms
patchClearAlarms-RequestType	9.4.2.7	Used in the request body of HTTP PATCH to clear alarms
subscription-RequestType	9.4.2.8	Used in the request body of HTTP POST on /subscriptions to create alarm notification subscriptions
Types used in response bodies		
alarms-ResponseType	9.4.2.9	Used in the response body of HTTP GET on /alarms to return complete alarm information
alarmsCount-ResponseType	9.4.2.10	Used in the response body of HTTP GET on /alarms to return alarm counts per perceived severity
comment-ResponseType	9.4.2.11	Used in the response body of HTTP POST on /alarms describing the representation of a comment added to multiple alarms, or in the response body of HTTP POST on /alarms/{alarmId} describing the representation of a comment added to a single alarm
error-ResponseType	9.4.2.12	Used in the response body of multiple HTTP methods on multiple resources in case of error
failedAlarms-ResponseType	9.4.2.13	Used in the response body of multiple HTTP methods to indicate error reasons per alarm id
subscription-ResponseType	9.4.2.14	Used in the response body of HTTP POST on /subscriptions to create alarm notification subscriptions
Types used for resources		
alarm-ResourceType	9.4.2.15	Representation of an alarm resource
comment-ResourceType	9.4.2.16	Representation of a comment resource
subscription-ResourceType	9.4.2.17	Representation of a subscription resource
Types used in notifications		
notifyNewAlarm-NotifType	9.4.2.18	Used in the request body of HTTP POST for the notification type notifyNewAlarm
notifyAckStateChanged-NotifType	9.4.2.19	Used in the request body of HTTP POST for the notification type notifyAckStateChanged

notifyClearedAlarm-NotifType	9.4.2.20	Used in the request body of HTTP POST for the notification type notifyClearedAlarm
notifyAlarmListRebuilt-NotifType	9.4.2.21	Used in the request body of HTTP POST for the notification type notifyAlarmListRebuilt
notifyChangedAlarm-NotifType	9.4.2.22	Used in the request body of HTTP POST for the notification type notifyChangedAlarm
notifyComments-NotifType	9.4.2.23	Used in the request body of HTTP POST for the notification type notifyComments
notifyPotentialFaultyAlarmList-NotifType	9.4.2.24	Used in the request body of HTTP POST for the notification type notifyPotentialFaultyAlarmList
notifyCorrelatedNotificationChanged-NotifType	9.4.2.25	Used in the request body of HTTP POST for the notification type notifyCorrelatedNotificationChanged
notifyChangedAlarmGeneralNotifType	9.4.2.26	Used in the request body of HTTP POST for the notification type notifyChangedAlarmGeneral
Types referenced by the definitions above		
ackState-Type	9.4.4.4	Acknowledgement state, see clause 6.2.1.5.1
ackSystemId-Type	9.4.4.2	Identifier of a system acknowledging an alarm, see clause 6.2.1.5.1
ackUserId-Type	9.4.4.2	Identifier of a user acknowledging an alarm, see clause 6.2.1.5.1
additionalText-Type	9.4.4.2	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]
alarmId-Type	9.4.4.2	Alarm identifier, see clause 6.2.1.5.1
alarmIdAndPerceivedSeverity-Type	9.4.3.1	
alarmListAlignmentRequirement-Type	9.4.4.5	Indicating if alarm list alignment is required or not
alarmsCountType	9.4.3.2	
alarmType-Type	9.4.4.6	Alarm type as defined in ITU-T Rec. X. 733 [4]
attributeNameValuePair-Type	9.4.3.3	Attribute name and attribute value pair
attributeValueChange-Type	9.4.3.4	Attribute name with its old value and new value
backedUpStatus-Type	9.4.4.2	Indicating if the object emitting the alarm has been backed up as defined in ITU-T Rec. X. 733 [4]
backUpObject-Type	9.4.4.2	Indicating the backup object of the alarmed object as defined in ITU-T Rec. X. 733 [4]
clearSystemId-Type	9.4.4.2	Identifier of a system clearing an alarm, see clause 6.2.1.5.1
clearUserId-Type	9.4.4.2	Identifier of a user clearing an alarm, see clause 6.2.1.5.1
correlatedNotification-Type	9.4.3.5	Describes the correlated notifications of a single source
filter-Type	9.4.4.2	Filter of a subscription resource
header-Type	9.4.3.6	Notification header
indicationType	9.4.4.7	
notificationId-Type	9.4.4.2	Notification identifier as defined in ITU-T Rec. X. 733 [4]
notificationType-Type	9.4.4.8	Notification type (notifyNewAlarm, etc.)
perceivedSeverity-Type	9.4.4.9	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]
probableCause-Type	9.4.4.2	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]
proposedRepairActions-Type	9.4.4.2	Used if the cause is known and the system being managed can suggest one or more solutions to fix the problem causing the alarm as defined in ITU-T Rec. X. 733 [4]
reason-Type	9.4.4.2	Indicating in notifyPotentialFaultyAlarmList the reason why the alarm list has to be rebuilt and in notifyAlarmListRebuilt the reason why the alarm list has been rebuilt
rootCauseIndicator-Type	9.4.4.2	Indicates if this event is the root cause of the events captured by the notifications whose identifiers are in the related correlatedNotifications attribute, see clause 6.2.1.5.1
securityAlarmDetector-Type	9.4.4.2	Identity of the detector of the security alarm, see clause 6.2.1.5.1
serviceProvider-Type	9.4.4.2	Identifies the service-provider whose service is requested by the serviceUser and the service request provokes the generation of the security alarm, see clause 6.2.1.5.1
serviceUser-Type	9.4.4.2	Identifies the service-user whose request for service provided by the serviceProvider led to the generation of the security alarm, see clause 6.2.1.5.1
specificProblem-Type	9.4.4.2	Identifies further refinements to the Probable cause of the alarm as defined in ITU-T Rec. X. 733 [4]
systemDN-Type	9.4.4.2	System DN
thresholdInfo-Type	9.4.3.7	Provides additional information for threshold crossing alarms as defined in ITU-T Rec. X. 733 [4]

thresholdLevel-Type	9.4.3.8	Used in the definition of thresholdInfo-Type as defined in ITU-T Rec. X. 733 [4]
trendIndication-Type	9.4.4.10	Severity trend of the alarmed object as defined in ITU-T Rec. X. 733 [4]

Table 9.4.1-2: Data types imported

Data type	Reference	Description

9.4.2 Query, message body and resource data types

9.4.2.1 Type alarmIdAndPerceivedSeverityList-QueryType

Table 9.4.2.1-1: Definition of type alarmIdAndPerceivedSeverityList-QueryType

Type	Definition	Description
alarmIdAndPerceivedSeverityList-QueryType	array(alarmIdAndPerceivedSeverity-Type)	Used in the query part of HTTP PATCH on /alarms to identify the alarms to be acknowledged

9.4.2.2 Type alarmIdList-QueryType

Table 9.4.2.1-1: Definition of type alarmIdList-QueryType

Type	Definition	Description
alarmIdList-QueryType	array(alarmId-Type)	Used in the query part of HTTP POST on /alarms to identify the alarms a comment shall be added to and in HTTP PATCH on /alarms to identify the alarms to be cleared or unacknowledged

9.4.2.3 Type perceivedSeverity-QueryType

Table 9.4.2.3-1: Definition of type perceivedSeverity-QueryType

Type	Definition	Description
perceivedSeverity-QueryType	perceivedSeverity-Type	Used in the query part in HTTP POST on /alarms/{alarmId} when acknowledging an alarm to indicate the perceived severity the alarm to acknowledge shall have, otherwise the alarm shall not be acknowledged

9.4.2.4 Type comment-RequestType

Table 9.4.2.4-1: Definition of type comment-RequestType

Attribute name	Data type	Description	SQ
data	comment-ResourceType	Used in the request body of HTTP POST on /alarms describing the representation of a comment to be added to multiple alarms, or in the request body of HTTP POST on /alarms/{alarmId} describing the representation of a comment to be added to a single alarm.	M

9.4.2.5 Type patchAcknowledgeAlarms-RequestType

Table 9.4.2.5-1: Definition of type patchAcknowledgeAlarms-RequestType

Attribute name	Data type	Description	SQ
ackUserId	ackUserId-Type	User acknowledging one or multiple alarms	M
ackSystemId	ackSystemId-Type	System acknowledging one or multiple alarms	O
ackState	type string, enum acknowledged	Indicates the ackState shall be set to acknowledged	M

9.4.2.6 Type patchUnacknowledgeAlarms-RequestType

Table 9.4.2.6-1: Definition of type patchUnacknowledgeAlarms-RequestType

Attribute name	Data type	Description	SQ
ackUserId	ackUserId-Type	User acknowledging one or multiple alarms	M
ackSystemId	ackSystemId-Type	System acknowledging one or multiple alarms	O
ackState	type string, enum acknowledged	Indicates the ackState shall be set to unacknowledged	M

9.4.2.7 Type patchClearAlarms-RequestType

Table 9.4.2.7-1: Definition of type patchClearAlarms-RequestType

Attribute name	Data type	Description	SQ
clearUserId	clearUserId-Type	User clearing one or multiple alarms	M
clearSystemId	clearSystemId-Type	System clearing one or multiple alarms	O
perceivedSeverity	type string, enum cleared	Indicates the perceivedSeverity shall be set to cleared	M

9.4.2.8 Type subscription-RequestType

Table 9.4.2.8-1: Definition of type subscription-RequestType

Attribute name	Data type	Description	SQ
data	subscription-ResourceType	Used in the request body of HTTP POST on /subscriptions describing the representation of the subscription to be created	M

9.4.2.9 Type alarms-ResponseType

Table 9.4.2.9-1: Definition of type alarms-ResponseType

Attribute name	Data type	Description	SQ
data	array(alarm-ResourceType)	Used in the response body of HTTP GET on /alarms to return complete alarm information	M

9.4.2.10 Type alarmsCount-ResponseType

Table 9.4.2.10-1: Definition of type alarmsCount-ResponseType

Attribute name	Data type	Description	SQ
data	alarmsCount-Type		M

9.4.2.11 Type comment-ResponseType

Table 9.4.2.11-1: Definition of type comment-ResponseType

Attribute name	Data type	Description	SQ
data	comment-ResourceType	Used in the response body of HTTP POST on /alarms describing the representation of a comment added to multiple alarms, or in the response body of HTTP POST on /alarms/{alarmId} describing the representation of a comment added to a single alarm.	M

9.4.2.12 Type error-ResponseType

Table 9.4.2.12-1: Definition of type error-ResponseType

Attribute name	Data type	Description	SQ
error	object	Key indicating the response body contains error information	M
> errorInfo	string	Attribute allowing to convey error information in string format	M

9.4.2.13 Type failedAlarms-ResponseType

Table 9.4.2.13-1: Definition of type failedAlarms-ResponseType

Attribute name	Data type	Description	SQ
error	object	Key indicating the response body contains error information	M
> alarmId	alarmId-Type	Indicating the alarms for which the action on the alarm could not be performed	M
> errorReason	string	Indicating the reason why the action could not be performed	M

9.4.2.14 Type subscription-ResponseType

Table 9.4.2.14-1: Definition of type subscription-ResponseType

Attribute name	Data type	Description	SQ
data	subscription-ResourceType	Used in the response body of HTTP POST on /subscriptions describing the representation of the created subscription	M

9.4.2.15 Type alarm-ResourceType

Table 9.4.2.15-1: Definition of type alarm-ResourceType

Attribute name	Data type	Description	SQ
header	header-Type	See clause ?	M
body	object		M
> alarmId	alarmId-Type	Alarm identifier, see clause 6.2.1.5.1	M
> alarmType	alarmType-Type	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
> alarmRaisedTime	dateTime-Type	Date and time when the alarm is first raised by the alarmed resource, see clause 6.2.1.5.1	M
> alarmChangedTime	dateTime-Type	Last date and time when the alarm resource is changed by the alarmed resource, see clause 6.2.1.5.1	O
> alarmClearedTime	dateTime-Type	Date and time when the alarm is cleared, see clause 6.2.1.5.1	M
> probableCause	probableCause-Type	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]	M
> specificProblem	specificProblem-Type	Identifies further refinements to the Probable cause of the alarm as defined in ITU-T Rec. X. 733 [4]	O
> perceivedSeverity	perceivedSeverity-Type	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	M
> backedUpStatus	backedUpStatus-Type	Indicating if the object emitting the alarm has been backed up as defined in ITU-T Recommendation X. 733 [4]	O
> backUpObject	backUpObject-Type	Indicating the backup object of the alarmed object as defined in ITU-T Rec. X. 733 [4]	O
> trendIndication	trendIndication-Type	Severity trend of the alarmed object as defined in ITU-T Rec. X. 733 [4]	O
> thresholdInfo	thresholdInfo-Type	Provides additional information for threshold crossing alarms as defined in ITU-T Rec. X. 733 [4]	O
> correlatedNotifications	array(correlatedNotification-Type)	Set of all notifications to which this notification is considered to be correlated as defined in ITU-T Rec. X. 733 [4]	O
> stateChangeDefinition	array(attributeValueChange-Type)	Indicates a state transition associated to an alarm as defined in ITU-T Rec. X. 733 [4]	O
> monitoredAttributes	array(attributeNameValuePair-Type)	Defines one or more attributes of the alarmed manged object and their corresponding values at the time of the alarm as defined in ITU-T Rec. X. 733 [4].	O
> proposedRepairActions	proposedRepairActions-Type	Used if the cause is known and the system being managed can suggest one or more solutions to fix the problem causing the alarm as defined in ITU-T Rec. X. 733 [4]	O
> additionalText	additionalText-Type	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]	O
> additionalInformation	array(attributeNameValuePair-Type)	Allows the inclusion of a set of additional information in the event report as defined in ITU-T Rec. X. 733 [4]	O
> rootCauseIndicator	rootCauseIndicator-Type	Indicates if this event is the root cause of the events captured by the notifications whose identifiers are in the related correlatedNotifications attribute, see clause 6.2.1.5.1	O
> comments	array(comment-ResourceType)	Set of all comments related to an alarm	M
> ackTime	dateTime-Type	Time when the alarm has been acknowledged or unacknowledged the last time, see clause 6.2.1.5.1	M

> ackUserId	ackUserId-Type	Identifier of a user acknowledging an alarm, see clause 6.2.1.5.1	M
> ackSystemId	ackSystemId-Type	Identifier of a system acknowledging an alarm, see clause 6.2.1.5.1	O
> ackstate	ackstate-Type	Acknowledgement state, see clause 6.2.1.5.1	M
> clearUserId	clearUserId-Type	Identifier of a system clearing an alarm, see clause 6.2.1.5.1	O
> clearSystemId	clearSystemId-Type	Identifier of a user clearing an alarm, see clause 6.2.1.5.1	O
> serviceUser	serviceUser-Type	Identifies the service-user whose request for service provided by the serviceProvider led to the generation of the security alarm, see clause 6.2.1.5.1	M
> serviceProvider	serviceProvider-Type	Identifies the service-provider whose service is requested by the serviceUser and the service request provokes the generation of the security alarm, see clause 6.2.1.5.1	M
> securityAlarmDetector	securityAlarmDetector-Type	Identity of the detector of the security alarm, see clause 6.2.1.5.1	M

9.4.2.16 Type comment-ResourceType

Table 9.4.2.16-1: Definition of type comment-ResourceType

Attribute name	Data type	Description	SQ
commentTime	dateTime-Type	Time when the comment has been added to the alarm. Attribute is nullable.	M
commentText	string	Comment in text form	M
commentUserId	string	Identifier of the user who makes the comment	M
commentSystemId	string	Identifier of the system which makes the comment	O

9.4.2.17 Type subscription-ResourceType

Table 9.4.2.17-1: Definition of type subscription-ResourceType

Attribute name	Data type	Description	SQ
consumerReference	uri-Type	The URI of the endpoint to send the notification to (/notificationSink).	M
timeTick	long-Type	Time window within which the subscriber intends to subscribe again to confirm its subscription, see clause 6.2.2.5.1	O
filter	filter-Type	Filter settings for this subscription, to define the subset of all notifications this subscription relates to. A notification is sent to the subscriber if the filter matches, or if there is no filter.	O

9.4.2.18 Type notifyNewAlarm-NotifType

Table 9.4.2.18-1: Definition of type notifyNewAlarm-NotifType

Attribute name	Data type	Description	SQ
header			
> href	uri-Type	URI of the resource where the event (alarm) occurred	M
> notificationId	notificationId-Type	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
> notificationType	notificationType-Type	Notification type (notifyNewAlarm, etc.)	M
> eventTime	dateTime-Type	Event (alarm) occurrence time	M
> systemDN	systemDN-Type	System DN	C
body			
> alarmId	alarmId-Type	Alarm identifier, see clause 6.2.1.5.1	M
> alarmType	alarmType-Type	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
> probableCause	probableCause-Type	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]	M
> specificProblem	specificProblem-Type	Identifies further refinements to the Probable cause of the alarm as defined in ITU-T Rec. X. 733 [4]	O
> perceivedSeverity	perceivedSeverity-Type	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	M
> backedUpStatus	backedUpStatus-Type	Indicating if the object emitting the alarm has been backed up as defined in ITU-T Recommendation X. 733 [4]	O
> backUpObject	backUpObject-Type	Indicating the backup object of the alarmed object as defined in ITU-T Rec. X. 733 [4]	O
> trendIndication	trendIndication-Type	Severity trend of the alarmed object as defined in ITU-T Rec. X. 733 [4]	O
> thresholdInfo	thresholdInfo-Type	Provides additional information for threshold crossing alarms as defined in ITU-T Rec. X. 733 [4]	O
> correlatedNotifications	array(correlatedNotification-Type)	Set of all notifications to which this notification is considered to be correlated as defined in ITU-T Rec. X. 733 [4]	O
> stateChangeDefinition	array(attributeValueChange-Type)	Indicates a state transition associated to an alarm as defined in ITU-T Rec. X. 733 [4]	O
> monitoredAttributes	array(attributeNameValuePair-Type)	Defines one or more attributes of the alarmed manged object and their corresponding values at the time of the alarm as defined in ITU-T Rec. X. 733 [4].	O
> proposedRepairActions	proposedRepairActions-Type	Used if the cause is known and the system being managed can suggest one or more solutions to fix the problem causing the alarm as defined in ITU-T Rec. X. 733 [4]	O
> additionalText	additionalText-Type	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]	O
> additionalInformation	array(attributeNameValuePair-Type)	Allows the inclusion of a set of additional information in the event report as defined in ITU-T Rec. X. 733 [4]	O
> rootCauseIndicator	rootCauseIndicator-Type	Indicates if this event is the root cause of the events captured by the notifications whose identifiers are in the related correlatedNotifications attribute, see clause 6.2.1.5.1	O

9.4.2.19 Type notifyNewSecurityAlarm-NotifType

Table 9.4.2.19-1: Definition of type notifyNewAlarm-NotifType

Attribute name	Data type	Description	SQ
header			
> href	uri-Type	URI of the resource where the event (alarm) occurred	M
> notificationId	notificationId-Type	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
> notificationType	notificationType-Type	Notification type (notifyNewAlarm, etc.)	M
> eventTime	dateTime-Type	Event (alarm) occurrence time	M
> systemDN	systemDN-Type	System DN	C
body			
> alarmId	alarmId-Type	Alarm identifier, see clause 6.2.1.5.1	M
> alarmType	alarmType-Type	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
> probableCause	probableCause-Type	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]	M
> perceivedSeverity	perceivedSeverity-Type	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	M
> correlatedNotifications	array(correlatedNotification-Type)	Set of all notifications to which this notification is considered to be correlated as defined in ITU-T Rec. X. 733 [4]	O
> additionalText	additionalText-Type	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]	O
> additionalInformation	array(attributeNameValuePair-Type)	Allows the inclusion of a set of additional information in the event report as defined in ITU-T Rec. X. 733 [4]	O
> rootCauseIndicator	rootCauseIndicator-Type	Indicates if this event is the root cause of the events captured by the notifications whose identifiers are in the related correlatedNotifications attribute, see clause 6.2.1.5.1	O
> serviceUser	serviceUser-Type	Identifies the service-user whose request for service provided by the serviceProvider led to the generation of the security alarm, see clause 6.2.1.5.1	M
> serviceProvider	serviceProvider-Type	Identifies the service-provider whose service is requested by the serviceUser and the service request provokes the generation of the security alarm, see clause 6.2.1.5.1	M
> securityAlarmDetector	securityAlarmDetector-Type	Identity of the detector of the security alarm, see clause 6.2.1.5.1	M

9.4.2.19 notifyAckStateChanged-NotifType

Table 9.4.2.19-1: Definition of type notifyAckStateChanged-NotifType

Attribute name	Data type	Description	SQ
header			
> href	uri-Type	URI of the resource where the event (alarm) occurred	M
> notificationId	notificationId-Type	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
> notificationType	notificationType-Type	Notification type (notifyNewAlarm, etc.)	M
> eventTime	dateTime-Type	Event (alarm) occurrence time	M
> systemDN	systemDN-Type	System DN	C
body			
> alarmId	alarmId-Type	Alarm identifier, see clause 6.2.1.5.1	M
> alarmType	alarmType-Type	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
> probableCause	probableCause-Type	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]	M
> perceivedSeverity	perceivedSeverity-Type	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	M
> ackState	ackState-Type	Acknowledgement state, see clause 6.2.1.5.1	M
> ackUserId	ackUserId-Type	Identifier of a system acknowledging an alarm, see clause 6.2.1.5.1	M
> ackSystemId	ackSystemId-Type	Identifier of a user acknowledging an alarm, see clause 6.2.1.5.1	O

9.4.2.20 notifyClearedAlarm-NotifType

Table 9.4.2.20-1: Definition of type notifyClearedAlarm-NotifType

Attribute name	Data type	Description	SQ
header			
> href	uri-Type	URI of the resource where the event (alarm) occurred	M
> notificationId	notificationId-Type	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
> notificationType	notificationType-Type	Notification type (notifyNewAlarm, etc.)	M
> eventTime	dateTime-Type	Event (alarm) occurrence time	M
> systemDN	systemDN-Type	System DN	C
body			
> alarmId	alarmId-Type	Alarm identifier, see clause 6.2.1.5.1	M
> alarmType	alarmType-Type	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
> probableCause	probableCause-Type	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]	M
> perceivedSeverity	perceivedSeverity-Type	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	M
> correlated Notifications	array(correlatedNotification-Type)	Set of all notifications to which this notification is considered to be correlated as defined in ITU-T Rec. X. 733 [4]	O
> clearUserId	string	Identifier of a user clearing an alarm, see clause 6.2.1.5.1	O
> clearSystemId	string	Identifier of a system clearing an alarm, see clause 6.2.1.5.1	O

9.4.2.21 notifyAlarmListRebuilt-NotifType

Table 9.4.2.21-1: Definition of type notifyAlarmListRebuilt-NotifType

Attribute name	Data type	Description	SQ
header			
> href	uri-Type	URI of the resource where the event (alarm) occurred	M
> notificationId	notificationId-Type	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
> notificationType	notificationType-Type	Notification type (notifyNewAlarm, etc.)	M
> eventTime	dateTime-Type	Event (alarm) occurrence time	M
> systemDN	systemDN-Type	System DN	C
body			
> reason	string	Indicating the reason why the alarm list has been rebuilt	M
> alarmListAlignmentRequirement	alarmListAlignmentRequirement-Type	Indicating if alarm list alignment is required or not	O

9.4.2.22 notifyChangedAlarm-NotifType

Table 9.4.2.22-1: Definition of type notifyChangedAlarm-NotifType

Attribute name	Data type	Description	SQ
header			
> href	uri-Type	URI of the resource where the event (alarm) occurred	M
> notificationId	notificationId-Type	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
> notificationType	notificationType-Type	Notification type (notifyNewAlarm, etc.)	M
> eventTime	dateTime-Type	Event (alarm) occurrence time	M
> systemDN	systemDN-Type	System DN	C
body			
> alarmId	alarmId-Type	Alarm identifier, see clause 6.2.1.5.1	M
> alarmType	alarmType-Type	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
> probableCause	probableCause-Type	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]	M
> perceivedSeverity	perceivedSeverity-Type	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	M
> correlated Notifications	array(correlatedNotification-Type)	Set of all notifications to which this notification is considered to be correlated as defined in ITU-T Rec. X. 733 [4]	O

9.4.2.23 notifyComments-NotifType

Table 9.4.2.23-1: Definition of type notifyComments-NotifType

Attribute name	Data type	Description	SQ
header			
> href	uri-Type	URI of the resource where the event (alarm) occurred	M
> notificationId	notificationId-Type	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
> notificationType	notificationType-Type	Notification type (notifyNewAlarm, etc.)	M
> eventTime	dateTime-Type	Event (alarm) occurrence time	M
> systemDN	systemDN-Type	System DN	C
body			
> alarmId	alarmId-Type	Alarm identifier, see clause 6.2.1.5.1	M
> alarmType	alarmType-Type	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
> probableCause	probableCause-Type	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]	M
> perceivedSeverity	perceivedSeverity-Type	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	M
> comments	array(comment-ResourceType)	Set of all comments related to an alarm	M

9.4.2.24 notifyPotentialFaultyAlarmList-NotifType

Table 9.4.2.24-1: Definition of type notifyPotentialFaultyAlarmList-NotifType

Attribute name	Data type	Description	SQ
header			
> href	uri-Type	URI of the resource where the event (alarm) occurred	M
> notificationId	notificationId-Type	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
> notificationType	notificationType-Type	Notification type (notifyNewAlarm, etc.)	M
> eventTime	dateTime-Type	Event (alarm) occurrence time	M
> systemDN	systemDN-Type	System DN	C
body			
> reason	string	Indicating the reason why the alarm list has to be rebuilt.	M

9.4.2.25 notifyCorrelatedNotificationChanged-NotifType

Table 9.4.2.25-1: Definition of type notifyCorrelatedNotificationChanged-NotifType

Attribute name	Data type	Description	SQ
header			
> href	uri-Type	URI of the resource where the event (alarm) occurred	M
> notificationId	notificationId-Type	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
> notificationType	notificationType-Type	Notification type (notifyNewAlarm, etc.)	M
> eventTime	dateTime-Type	Event (alarm) occurrence time	M
> systemDN	systemDN-Type	System DN	C
body			
> alarmId	alarmId-Type	Alarm identifier, see clause 6.2.1.5.1	M
> correlated Notifications	array(correlatedNotification-Type)	Set of all notifications to which this notification is considered to be correlated as defined in ITU-T Rec. X. 733 [4]	O
> rootCauseIndicator	rootCauseIndicator-Type	Indicates if this event is the root cause of the events captured by the notifications whose identifiers are in the related correlatedNotifications attribute, see clause 6.2.1.5.1	O

9.4.2.26 notifyChangedAlarmGeneralNotifType

Table 9.4.2.26-1: Definition of type notifyChangedAlarmGeneralNotifType

Attribute name	Data type	Description	SQ
header			
> href	uri-Type	URI of the resource where the event (alarm) occurred	M
> notificationId	notificationId-Type	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
> notificationType	notificationType-Type	Notification type (notifyNewAlarm, etc.)	M
> eventTime	dateTime-Type	Event (alarm) occurrence time	M
> systemDN	systemDN-Type	System DN	C
body			
> alarmId	alarmId-Type	Alarm identifier, see clause 6.2.1.5.1	M
> alarmType	alarmType-Type	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
> probableCause	probableCause-Type	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]	M
> specificProblem	specificProblem-Type	Identifies further refinements to the Probable cause of the alarm as defined in ITU-T Rec. X. 733 [4]	M
> perceivedSeverity	perceivedSeverity-Type	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	O
> backedUpStatus	backedUpStatus-Type	Indicating if the object emitting the alarm has been backed up as defined in ITU-T Recommendation X. 733 [4]	O
> backUpObject	backUpObject-Type	Indicating the backup object of the alarmed object as defined in ITU-T Rec. X. 733 [4]	O
> trendIndication	trendIndication-Type	Severity trend of the alarmed object as defined in ITU-T Rec. X. 733 [4]	O
> thresholdInfo	thresholdInfo-Type	Provides additional information for threshold crossing alarms as defined in ITU-T Rec. X. 733 [4]	O
> correlatedNotifications	array(correlatedNotification-Type)	Set of all notifications to which this notification is considered to be correlated as defined in ITU-T Rec. X. 733 [4]	O
> stateChangeDefinition	array(attributeValueChange-Type)	Indicates a state transition associated to an alarm as defined in ITU-T Rec. X. 733 [4]	O
> monitoredAttributes	array(attributeNameValuePair-Type)	Defines one or more attributes of the alarmed manged object and their corresponding values at the time of the alarm as defined in ITU-T Rec. X. 733 [4].	O
> proposedRepairActions	proposedRepairActions-Type	Used if the cause is known and the system being managed can suggest one or more solutions to fix the problem causing the alarm as defined in ITU-T Rec. X. 733 [4]	O
> additionalText	additionalText-Type	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]	O
> additionalInformation	array(attributeNameValuePair-Type)	Allows the inclusion of a set of additional information in the event report as defined in ITU-T Rec. X. 733 [4]	O
> rootCauseIndicator	rootCauseIndicator-Type	Indicates if this event is the root cause of the events captured by the notifications whose identifiers are in the related correlatedNotifications attribute, see clause 6.2.1.5.1	O
> changedAlarmAttributes	array(attributeNameValuePair-Type)	Indicating the alarm attributes that have changed	M

9.4.3 Referenced structured data types

9.4.3.1 Type alarmIdAndPerceivedSeverity-Type

Table 9.4.3.1-1: Definition of type alarmIdAndPerceivedSeverity-Type

Attribute name	Data type	Description	SQ
alarmId	alarmId-Type	Alarm identifier	M
perceivedSeverity	perceivedSeverity-Type	Perceived severity	O

9.4.3.2 Type alarmsCount-Type

Table 9.4.3.2-1: Definition of type alarmsCount-Type

Attribute name	Data type	Description	SQ
criticalCount	integer	Number of alarms with perceived severity equal to critical	M
majorCount	integer	Number of alarms with perceived severity equal to major	M
minorCount	integer	Number of alarms with perceived severity equal to minor	M
warningCount	integer	Number of alarms with perceived severity equal to warning	M
indeterminateCount	integer	Number of alarms with perceived severity equal to indeterminate	M
clearedCount	integer	Number of alarms with perceived severity equal to cleared	M

9.4.3.3 Type attributeNameValuePair-Type

Table 9.4.3.3-1: Definition of type attributeNameValuePair-Type

Attribute name	Data type	Description	SQ
attributeName	string	Name of the attribute	M
attributeValue	anyType	Value of the attribute, can be any type	M

9.4.3.4 Type attributeValueChange-Type

Table 9.4.3.4-1: Definition of type attributeValueChangeType-Type

Attribute name	Data type	Description	SQ
attributeName	string	Name of the attribute	M
oldAttributeValue	anyType	Old value of the attribute, can be any type	M
newAttributeValue	anyType	New value of the attribute, can be any type	M

9.4.3.5 Type correlatedNotification-Type

Table 9.4.3.5-1: Definition of type correlatedNotification-Type

Attribute name	Data type	Description	SQ
source	uri-Type	Source of the correlated notifications	M
notificationIds	array(notificationId-Type)	Notification identifiers of correlated notifications of that source	M

9.4.3.6 Type header-Type

Table 9.4.3.6-1: Definition of type header-Type

Attribute name	Data type	Description	SQ
uri	uri-Type	URI of the resource where the event (alarm) occurred	M
notificationId	notificationId-Type	Notification identifier as defined in ITU-T Rec. X. 733 [4]	O
notificationType	notificationType-Type	Notification type (notifyNewAlarm, etc.)	M
eventTime	dateTime-Type	Event (alarm) occurrence time	M
systemDN	systemDN-Type	System DN	C

9.4.3.7 Type thresholdInfo-Type

Table 9.4.3.7-1: Definition of type thresholdInfo-Type

Attribute name	Data type	Description	SQ
attributeName	string	The name of the threshold attribute that caused the notification (Rec. ITU-T X. 733 [4]).	M
observedValue	float-Type	The value of the gauge or counter which crossed the threshold. This may be different from the threshold value if, for example, the gauge may only take on discrete values. (Rec. ITU-T X. 733 [4]).	M
thresholdLevel	thresholdLevel-Type	In the case of a gauge the threshold level specifies a pair of threshold values, the first being the value of the crossed threshold and the second, its corresponding hysteresis; in the case of a counter the threshold level specifies only the threshold value (Rec. ITU-T X. 733 [4]).	O
armTime	dateTime-Type	For a gauge threshold, the time at which the threshold was last re-armed, namely the time after the previous threshold crossing at which the hysteresis value of the threshold was exceeded thus again permitting generation of notifications when the threshold is crossed. For a counter threshold, the later of the time at which the threshold offset was last applied, or the time at which the counter was last initialized (for resettable counters) (Rec. ITU-T X. 733 [4]).	O

9.4.3.8 Type thresholdLevel-Type

Table 9.4.3.8-1: Definition of type thresholdLevel-Type

Attribute name	Data type	Description	SQ
indication	indication-Type	Indicates if the hysterics values high and low apply to increasing gauges ("Up") or decreasing gauges ("Down"). For counters only the value "Up" is permitted.	M
high	float	Higher value of the hysterics when the event is triggered	M
low	float	Lower value of the hysteresis when the event is cleared	O

9.4.4 Simple data types and enumerations

9.4.4.1 General

This subclause defines simple data types and enumerations that are used by the data structures defined in the previous subclauses.

9.4.4.2 Simple data types

Table 9.4.3.2-1: Simple data types

Type name	Type definition	Description
alarmId-PathType	string	Used in the path to identify an alarm??
subscriptionId-PathType	string	
filter-QueryType	string	Used in the query part of HTTP GET on /alarms to discriminate alarms to be returned or counted
href-QueryType	string	Used in the query part of HTTP GET on /alarms to identify the base object of the tree for partial alarm alignment
consumerReferenceId-QueryType	uri-Type	Used in the query part of HTTP DELETE on /subscriptions to delate all subscriptions made with a specific consumerReferenceId
ackSystemId-Type	string	Identifier of the system that acknowledged or unacknowledged an alarm
ackUserId-Type	string	Identifier of the user that acknowledged or unacknowledged an alarm
additionalText-Type	string	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]
alarmId-Type	string	Alarm identifier, see clause 6.2.1.5.1
backedUpStatus-Type	boolean	Indicating if the object emitting the alarm has been backed up as defined in ITU-T Rec. X. 733 [4]
backUpObject-Type	uri-Type	Indicating the backup object of the alarmed object as defined in ITU-T Rec. X. 733 [4]
clearSystemId-Type	string	Identifier of a system clearing an alarm, see clause 6.2.1.5.1
clearUserId-Type	string	Identifier of a user clearing an alarm, see clause 6.2.1.5.1
filter-Type	string	Filter of a subscription resource
notificationId-Type	long	Notification identifier as defined in ITU-T Rec. X. 733 [4]
probableCause-Type	string	Probable cause of an alarm as defined in ITU-T Rec. X. 733 [4]
proposedRepairActions-Type	string	Used if the cause is known and the system being managed can suggest one or more solutions to fix the problem causing the alarm as defined in ITU-T Rec. X. 733 [4]
reason-Type	string	Indicating in notifyPotentialFaultyAlarmList the reason why the alarm list has to be rebuilt and in notifyAlarmListRebuilt the reason why the alarm list has been rebuilt
rootCauseIndicator-Type	boolean	Root cause indicator see
securityAlarmDetector-Type	string	Identity of the detector of the security alarm, see clause 6.2.1.5.1
serviceProvider-Type	string	Identifies the service-provider whose service is requested by the serviceUser and the service request provokes the generation of the security alarm, see clause 6.2.1.5.1
serviceUser-Type	string	Identifies the service-user whose request for service provided by the serviceProvider led to the generation of the security alarm, see clause 6.2.1.5.1
specificProblem-Type	string	Specific problem of an alarm as defined in ITU-T Rec. X. 733 [4]
systemDN-Type	string	Type of the System DN

9.4.4.3 Enumeration alarmAckState-QueryType

This type is used in the query part of HTTP GET on /alarms to discriminate alarms to be returned or counted.

Table 9.4.4.3-1: Enumeration alarmAckState-QueryType

Enumeration value	Description
allAlarms	All alarms shall be returned or counted.
allActiveAlarms	All active alarms shall be returned or counted.
allActiveAndAcknowledgedAlarms	All active and acknowledged alarms shall be returned or counted.
allActiveAndUnacknowledgedAlarms	All active and unacknowledged alarms shall be returned or counted.
allClearedAndUnacknowledgedAlarms	All cleared and unacknowledged alarms shall be returned or counted.
allUnacknowledgedAlarms	All unacknowledged alarms shall be returned or counted

9.4.4.4 Enumeration ackState-Type

Table 9.4.4.4-1: Enumeration ackState-Type

Enumeration value	Description
acknowledged	State acknowledged.
unacknowledged	State unacknowledged.

9.4.4.5 Enumeration alarmListAlignmentRequirement-Type

Table 9.4.4.5-1: Enumeration alarmListAlignmentRequirement-Type

Enumeration value	Description
Alignment Required	Alarm list alignment is required
Alignment Not Required	Alarm list alignment is not required

9.4.4.6 Enumeration alarmType-Type

Table 9.4.4.6-1: Enumeration alarmType-Type

Enumeration value	Description
Communications Alarm	An alarm of this type is principally associated with the procedures and/or processes required to convey information from one point to another (Rec. ITU-T X. 733 [4]).
Processing Error Alarm	An alarm of this type is principally associated with a software or processing fault (Rec. ITU-T X. 733 [4]).
Environmental Alarm	An alarm of this type is principally associated with a condition relating to an enclosure in which the equipment resides (Rec. ITU-T X. 733 [4]).
Quality Of Service Alarm	An alarm of this type is principally associated with a degradation in the quality of a service (Rec. ITU-T X. 733 [4]).
Equipment Alarm	An alarm of this type is principally associated with an equipment fault (Rec. ITU-T X. 733 [4]).
Integrity Violation	An indication that information may have been illegally modified, inserted or deleted.
Operational Violation	An indication that the provision of the requested service was not possible due to the unavailability, malfunction or incorrect invocation of the service.
Physical Violation	An indication that a physical resource has been violated in a way that suggests a security attack.
Security Service or Mechanism Violation	An indication that a security attack has been detected by a security service or mechanism.
Time Domain Violation	An indication that an event has occurred at an unexpected or prohibited time.

9.4.4.7 Enumeration indication-Type

Table 9.4.4.7-1: Enumeration indication-Type

Enumeration value	Description
Up	Indicates if the hysteris values high and low apply to increasing gauges
Down	Indicates if the hysteris values high and low apply to decreasing gauges

9.4.4.8 Enumeration notificationType-Type

Table 9.4.4.8-1: Enumeration notificationType-Type

Enumeration value	Description
notifyNewAlarm	Notification type is notifyNewAlarm
notifyAckStateChanged	Notification type is notifyAckStateChanged
notifyClearedAlarm	Notification type is notifyClearedAlarm
notifyAlarmListRebuiltAlarm	Notification type is notifyAlarmListRebuiltAlarm
notifyChangedAlarm	Notification type is notifyChangedAlarm
notifyComments	Notification type is notifyComments
notifyPotentialFaultyAlarmList	Notification type is notifyPotentialFaultyAlarmList
notifyCorrelatedNotificationChanged	Notification type is notifyCorrelatedNotificationChanged
notifyChangedAlarmGeneral	Notification type is notifyChangedAlarmGeneral

9.4.4.9 Enumeration perceivedSeverity-Type

Table 9.4.4.9-1: Enumeration perceivedSeverity-Type

Enumeration value	Description
Critical	The Critical severity level indicates that a service affecting condition has occurred and an immediate corrective action is required (Rec. ITU-T X. 733 [4]).
Major	The Major severity level indicates that a service affecting condition has developed and an urgent corrective action is required (Rec. ITU-T X. 733 [4]).
Minor	The Minor severity level indicates the existence of a non-service affecting fault condition and that corrective action should be taken in order to prevent a more serious (for example, service affecting) fault (Rec. ITU-T X. 733 [4]).
Warning	The Warning severity level indicates the detection of a potential or impending service affecting fault, before any significant effects have been felt (Rec. ITU-T X. 733 [4]).
Indeterminate	The Indeterminate severity level indicates that the severity level cannot be determined (Rec. ITU-T X. 733 [4]).
Cleared	The Cleared severity level indicates the clearing of one or more previously reported alarms (Rec. ITU-T X. 733 [4]).

9.4.4.10 Enumeration trendIndication-Type

Table 9.4.4.10-1: Enumeration trendIndication-Type

Enumeration value	Description
More Severe	Severity trend of the alarmed object is more severe (Rec. ITU-T X.733 [4])
No change	Severity trend of the alarmed object is no change (Rec. ITU-T X.733 [4])
Less severe	Severity trend of the alarmed object is less severe (Rec. ITU-T X.733 [4])

Annex A (normative): OpenAPI specification

This clause describes the capabilities of the service in the structure of the OpenAPI Specification Version 3.0.1 [A9]. The OpenAPI document is represented in the JSON format option.

```
{
  "openapi": "3.0.0",
  "info": {
    "title": "TS 28.532 Fault Supervision Management Service",
    "version": "15.0.0",
    "description": "OAS 3.0.0 specification for the Fault Management Service (Fault MnS)"
  },
  "servers": [
    {
      "url": "http://{DN_prefix_authority_part}/{DN_prefix_remainder}/FaultMnS/v1500",
      "variables": {
        "DN_prefix_authority_part": {
          "description": "See subclause 4.4 of TS 32.158",
          "default": "example.com"
        },
        "DN_prefix_remainder": {
          "description": "See subclause 4.4 of TS 32.158",
          "default": ""
        }
      }
    }
  ],
  "paths": {
    "/alarms": {
      "get": {
        "summary": "Retrieve alarms",
        "description": "Retrieve the alarms identified by alarmAckState, href and filter.",
        "parameters": [
          {
            "name": "alarmAckState",
            "in": "query",
            "required": false,
            "schema": {
              "$ref": "#/components/schemas/alarmAckState-QueryType"
            }
          },
          {
            "name": "href",
            "in": "query",
            "required": false,
            "schema": {
              "$ref": "#/components/schemas/href-QueryType"
            }
          },
          {
            "name": "filter",
            "in": "query",
            "required": false,
            "schema": {
              "$ref": "#/components/schemas/filter-QueryType"
            }
          }
        ],
        "responses": {
          "200": {
            "description": "Success case (\"200 OK\"). Returns the alarms identified in the
request.",
            "content": {
              "application/json": {
                "schema": {
                  "$ref": "#/components/schemas/alarms-ResponseType"
                }
              }
            }
          },
          "default": {
            "description": "Response in case of error.",
            "content": {
              "application/json": {
```

```
                "schema": {
                  "$ref": "#/components/schemas/error-ResponseType"
                }
              }
            }
          }
        }
      },
      "post": {
        "summary": "Add a comment to multiple alarms",
        "description": "Add a comment to multiple alarms",
        "parameters": [
          {
            "name": "alarmId",
            "in": "query",
            "description": "Identifies the alarms to which the comment shall be added",
            "required": true,
            "schema": {
              "$ref": "#/components/schemas/alarmIdList-QueryType"
            }
          }
        ],
        "requestBody": {
          "required": true,
          "content": {
            "application/json": {
              "schema": {
                "$ref": "#/components/schemas/comment-RequestType"
              }
            }
          }
        },
        "responses": {
          "201": {
            "description": "Success case. The representation of the newly created comment resource
shall be returned.",
            "content": {
              "application/json": {
                "schema": {
                  "$ref": "#/components/schemas/comment-ResponseType"
                }
              }
            }
          },
          "default": {
            "description": "Error case.",
            "content": {
              "application/json": {
                "schema": {
                  "$ref": "#/components/schemas/failedAlarms-ResponseType"
                }
              }
            }
          }
        }
      },
      "patch": {
        "summary": "Clear, acknowledge or unacknowledge multiple alarms",
        "description": "tba",
        "parameters": [
          {
            "name": "alarmId",
            "in": "query",
            "description": "Identifies the alarms to be patched. The type shall be",
            "required": true,
            "schema": {
              "oneOf": [
                {
                  "$ref": "#/components/schemas/alarmIdList-QueryType"
                },
                {
                  "$ref": "#/components/schemas/alarmIdAndPerceivedSeverityList-QueryType"
                }
              ]
            }
          }
        ],
        "requestBody": {
```

```
          "description": "Patch document",
          "content": {
            "application/json": {
              "schema": {
                "oneOf": [
                  {
                    "$ref": "#/components/schemas/patchAcknowledgeAlarms-RequestType"
                  },
                  {
                    "$ref": "#/components/schemas/patchUnacknowledgeAlarms-RequestType"
                  },
                  {
                    "$ref": "#/components/schemas/patchClearAlarms-RequestType"
                  }
                ]
              }
            }
          }
        },
        "responses": {
          "204": {
            "description": "In case of success, the response body shall be empty."
          },
          "default": {
            "description": "Response in case of error.",
            "content": {
              "application/json": {
                "schema": {
                  "$ref": "#/components/schemas/failedAlarms-ResponseType"
                }
              }
            }
          }
        }
      }
    },
    "/alarms/$alarmsCount": {
      "get": {
        "summary": "Get the alarm count per perceived severity",
        "parameters": [
          {
            "name": "alarmAckState",
            "in": "query",
            "required": false,
            "schema": {
              "$ref": "#/components/schemas/alarmAckState-QueryType"
            }
          },
          {
            "name": "filter",
            "in": "query",
            "required": false,
            "schema": {
              "$ref": "#/components/schemas/filter-QueryType"
            }
          }
        ],
        "responses": {
          "200": {
            "description": "Success case (\"200 OK\"). The alarm count per perceived severity is
returned"
          },
          "default": {
            "description": "Response in case of error. The error case needs rework.",
            "content": {
              "application/json": {
                "schema": {
                  "$ref": "#/components/schemas/alarmsCount-ResponseType"
                }
              }
            }
          }
        }
      }
    },
    "/alarms/{alarmId}": {
      "patch": {
        "summary": "Clear, acknowledge or unacknowledge a single alarm",
```

```
        "description": "Clear, acknowledge or uncknowldege a single alarm by patching the alarm
information",
        "parameters": [
          {
            "name": "alarmId",
            "in": "path",
            "description": "Identifies the alarm to be patched.",
            "required": true,
            "schema": {
              "$ref": "#/components/schemas/alarmId-PathType"
            }
          },
          {
            "name": "perceivedSeverity",
            "description": "This parameter may be present when acknowledging an alarm. For other
patch actions it shall be absent.",
            "in": "query",
            "required": false,
            "schema": {
              "$ref": "#/components/schemas/perceivedSeverity-QueryType"
            }
          }
        ],
        "requestBody": {
          "required": true,
          "content": {
            "application/merge-patch+json": {
              "schema": {
                "oneOf": [
                  {
                    "$ref": "#/components/schemas/patchAcknowledgeAlarms-RequestType"
                  },
                  {
                    "$ref": "#/components/schemas/patchUnacknowledgeAlarms-RequestType"
                  },
                  {
                    "$ref": "#/components/schemas/patchClearAlarms-RequestType"
                  }
                ]
              }
            }
          }
        },
        "responses": {
          "200": {
            "description": "Response in case of success."
          },
          "default": {
            "description": "Response in case of error. The error case needs rework.",
            "content": {
              "application/json": {
                "schema": {
                  "$ref": "#/components/schemas/failedAlarms-ResponseType"
                }
              }
            }
          }
        }
      }
    },
    "/alarms/{alarmId}/comments": {
      "post": {
        "summary": "Add a comment to a single alarm",
        "description": "Add a comment to an alarm identified by alarmId.",
        "parameters": [
          {
            "name": "alarmId",
            "in": "path",
            "description": "Identifies the alarm to which the comment shall be added.",
            "required": true,
            "schema": {
              "$ref": "#/components/schemas/alarmId-PathType"
            }
          }
        ],
        "requestBody": {
          "required": true,
          "content": {
```

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            "application/json": {
              "schema": {
                "$ref": "#/components/schemas/comment-RequestType"
              }
            }
          }
        },
        "responses": {
          "201": {
            "description": "Success case. The representation of the newly created comment resource
shall be returned.",
            "content": {
              "application/json": {
                "schema": {
                  "$ref": "#/components/schemas/comment-ResponseType"
                }
              }
            }
          },
          "default": {
            "description": "Error case.",
            "content": {
              "application/json": {
                "schema": {
                  "$ref": "#/components/schemas/failedAlarms-ResponseType"
                }
              }
            }
          }
        }
      }
    },
    "/subscriptions": {
      "post": {
        "summary": "Create a subscription",
        "description": "To create a subscription the representation of the subscription is POSTed on
the /subscriptions collection resource.",
        "requestBody": {
          "required": true,
          "content": {
            "application/json": {
              "schema": {
                "$ref": "#/components/schemas/subscription-RequestType"
              }
            }
          }
        },
        "responses": {
          "201": {
            "description": "Success case (\"201 Created\"). The representation of the newly created
subscription resource shall be returned.",
            "content": {
              "application/json": {
                "schema": {
                  "$ref": "#/components/schemas/subscription-ResponseType"
                }
              }
            }
          },
          "default": {
            "description": "Error case.",
            "content": {
              "application/json": {
                "schema": {
                  "$ref": "#/components/schemas/error-ResponseType"
                }
              }
            }
          }
        },
        "callbacks": {
          "notifyNewAlarm": {
            "{request.body#/consumerReference}": {
              "post": {
                "requestBody": {
                  "required": true,
                  "content": {
                    "application/json": {
```

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                    "schema": {
                      "$ref": "#/components/schemas/notifyNewAlarm-NotifType"
                    }
                  }
                }
              },
              "responses": {
                "204": {
                  "description": "Success case (\"204 No Content\"). The notification is
successfully delivered. The response message body is absent."
                },
                "default": {
                  "description": "Error case.",
                  "content": {
                    "application/json": {
                      "schema": {
                        "$ref": "#/components/schemas/error-ResponseType"
                      }
                    }
                  }
                }
              }
            }
          },
          "notifyNewSecurityAlarm": {
            "{request.body#/consumerReference}": {
              "post": {
                "requestBody": {
                  "required": true,
                  "content": {
                    "application/json": {
                      "schema": {
                        "$ref": "#/components/schemas/notifyNewSecurityAlarm-NotifType"
                      }
                    }
                  }
                },
                "responses": {
                  "204": {
                    "description": "Success case (\"204 No Content\"). The notification is
successfully delivered. The response message body is absent."
                  },
                  "default": {
                    "description": "Error case.",
                    "content": {
                      "application/json": {
                        "schema": {
                          "$ref": "#/components/schemas/error-ResponseType"
                        }
                      }
                    }
                  }
                }
              }
            }
          },
          "notifyAckStateChanged": {
            "{request.body#/consumerReference}": {
              "post": {
                "requestBody": {
                  "required": true,
                  "content": {
                    "application/json": {
                      "schema": {
                        "$ref": "#/components/schemas/notifyAckStateChanged-NotifType"
                      }
                    }
                  }
                },
                "responses": {
                  "204": {
                    "description": "Success case (\"204 No Content\"). The notification is
successfully delivered. The response message body is absent."
                  },
                  "default": {
                    "description": "Error case.",
                    "content": {
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                    "application/json": {
                      "schema": {
                        "$ref": "#/components/schemas/error-ResponseType"
                      }
                    }
                  }
                }
              }
            }
          }
        },
        "notifyClearedAlarm": {
          "{request.body#/consumerReference}": {
            "post": {
              "requestBody": {
                "required": true,
                "content": {
                  "application/json": {
                    "schema": {
                      "$ref": "#/components/schemas/notifyClearedAlarm-NotifType"
                    }
                  }
                }
              },
              "responses": {
                "204": {
                  "description": "Success case (\"204 No Content\"). The notification is
successfully delivered. The response message body is absent."
                },
                "default": {
                  "description": "Error case.",
                  "content": {
                    "application/json": {
                      "schema": {
                        "$ref": "#/components/schemas/error-ResponseType"
                      }
                    }
                  }
                }
              }
            }
          }
        },
        "notifyAlarmListRebuilt": {
          "{request.body#/consumerReference}": {
            "post": {
              "requestBody": {
                "required": true,
                "content": {
                  "application/json": {
                    "schema": {
                      "$ref": "#/components/schemas/notifyAlarmListRebuilt-NotifType"
                    }
                  }
                }
              },
              "responses": {
                "204": {
                  "description": "Success case (\"204 No Content\"). The notification is
successfully delivered. The response message body is absent."
                },
                "default": {
                  "description": "Error case.",
                  "content": {
                    "application/json": {
                      "schema": {
                        "$ref": "#/components/schemas/error-ResponseType"
                      }
                    }
                  }
                }
              }
            }
          }
        },
        "notifyChangedAlarm": {
          "{request.body#/consumerReference}": {
            "post": {
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                "requestBody": {
                  "required": true,
                  "content": {
                    "application/json": {
                      "schema": {
                        "$ref": "#/components/schemas/notifyChangedAlarm-NotifType"
                      }
                    }
                  }
                },
                "responses": {
                  "204": {
                    "description": "Success case (\"204 No Content\"). The notification is
successfully delivered. The response message body is absent."
                  },
                  "default": {
                    "description": "Error case.",
                    "content": {
                      "application/json": {
                        "schema": {
                          "$ref": "#/components/schemas/error-ResponseType"
                        }
                      }
                    }
                  }
                }
              }
            }
          },
          "notifyComments": {
            "{request.body#/consumerReference}": {
              "post": {
                "requestBody": {
                  "required": true,
                  "content": {
                    "application/json": {
                      "schema": {
                        "$ref": "#/components/schemas/notifyComments-NotifType"
                      }
                    }
                  }
                },
                "responses": {
                  "204": {
                    "description": "Success case (\"204 No Content\"). The notification is
successfully delivered. The response message body is absent."
                  },
                  "default": {
                    "description": "Error case.",
                    "content": {
                      "application/json": {
                        "schema": {
                          "$ref": "#/components/schemas/error-ResponseType"
                        }
                      }
                    }
                  }
                }
              }
            }
          },
          "notifyPotentialFaultyAlarmList": {
            "{request.body#/consumerReference}": {
              "post": {
                "requestBody": {
                  "required": true,
                  "content": {
                    "application/json": {
                      "schema": {
                        "$ref": "#/components/schemas/notifyPotentialFaultyAlarmList-NotifType"
                      }
                    }
                  }
                },
                "responses": {
                  "204": {
                    "description": "Success case (\"204 No Content\"). The notification is
successfully delivered. The response message body is absent."
```

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                },
                "default": {
                  "description": "Error case.",
                  "content": {
                    "application/json": {
                      "schema": {
                        "$ref": "#/components/schemas/error-ResponseType"
                      }
                    }
                  }
                }
              }
            }
          }
        },
        "notifyCorrelatedNotificationChanged": {
          "{request.body#/consumerReference}": {
            "post": {
              "requestBody": {
                "required": true,
                "content": {
                  "application/json": {
                    "schema": {
                      "$ref": "#/components/schemas/notifyCorrelatedNotificationChanged-NotifType"
                    }
                  }
                }
              },
              "responses": {
                "204": {
                  "description": "Success case (\"204 No Content\"). The notification is
successfully delivered. The response message body is absent."
                },
                "default": {
                  "description": "Error case.",
                  "content": {
                    "application/json": {
                      "schema": {
                        "$ref": "#/components/schemas/error-ResponseType"
                      }
                    }
                  }
                }
              }
            }
          }
        },
        "notifyChangedAlarmGeneral": {
          "{request.body#/consumerReference}": {
            "post": {
              "requestBody": {
                "required": true,
                "content": {
                  "application/json": {
                    "schema": {
                      "$ref": "#/components/schemas/notifyChangedAlarmGeneral-NotifType"
                    }
                  }
                }
              },
              "responses": {
                "204": {
                  "description": "Success case (\"204 No Content\"). The notification is
successfully delivered. The response message body is absent."
                },
                "default": {
                  "description": "Error case.",
                  "content": {
                    "application/json": {
                      "schema": {
                        "$ref": "#/components/schemas/error-ResponseType"
                      }
                    }
                  }
                }
              }
            }
          }
        }
```

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          }
        }
      },
      "delete": {
        "summary": "Delete all subscriptions made with a specific consumerReferenceId",
        "description": "The subscriptions are deleted by deleting the corresponding subscription
resources. The resources to be deleted are identified with the path component of the URI pointing to
the /subscription collection resource and filtering on the consumerReferenceId provided in the query
part.",
        "parameters": [
          {
            "name": "consumerReferenceId",
            "in": "query",
            "description": "Identifies the subscriptions to be deleted.",
            "required": true,
            "schema": {
              "$ref": "#/components/schemas/consumerReferenceId-QueryType"
            }
          }
        ],
        "responses": {
          "204": {
            "description": "Success case (\"204 No Content\"). The subscription resources have been
deleted. The response message body is absent."
          },
          "default": {
            "description": "Error case.",
            "content": {
              "application/json": {
                "schema": {
                  "$ref": "#/components/schemas/error-ResponseType"
                }
              }
            }
          }
        }
      }
    },
    "/subscriptions/{subscriptionId}": {
      "delete": {
        "summary": "Delete a single subscription",
        "description": "The subscription is deleted by deleting the corresponding subscription
resource. The resource to be deleted is identified with the path component of the URI.",
        "parameters": [
          {
            "name": "subscriptionId",
            "in": "path",
            "description": "Identifies the subscription to be deleted.",
            "required": true,
            "schema": {
              "$ref": "#/components/schemas/subscriptionId-PathType"
            }
          }
        ],
        "responses": {
          "204": {
            "description": "Success case (\"204 No Content\"). The subscription resource has been
deleted. The response message body is absent."
          },
          "default": {
            "description": "Error case.",
            "content": {
              "application/json": {
                "schema": {
                  "$ref": "#/components/schemas/error-ResponseType"
                }
              }
            }
          }
        }
      }
    }
  },
  "components": {
    "schemas": {
      "attributeNameValuePair-Type": {
        "type": "object",
        "properties": {
```

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          "attributeName": {
            "type": "string"
          },
          "attributeValue": {}
        }
      },
      "dateTime-Type": {
        "type": "string",
        "format": "date-Time"
      },
      "float-Type": {
        "type": "string",
        "format": "float"
      },
      "long-Type": {
        "type": "string",
        "format": "long"
      },
      "uri-Type": {
        "type": "string"
      },
      "header-Type": {
        "description": "Header used in notifications as notification header and as header in the
alarm resource",
        "type": "object",
        "properties": {
          "uri": {
            "$ref": "#/components/schemas/uri-Type"
          },
          "notificationId": {
            "$ref": "#/components/schemas/notificationId-Type"
          },
          "notificationType": {
            "$ref": "#/components/schemas/notificationType-Type"
          },
          "eventTime": {
            "$ref": "#/components/schemas/dateTime-Type"
          },
          "systemDN": {
            "$ref": "#/components/schemas/systemDN-Type"
          }
        }
      },
      "alarmId-PathType": {
        "type": "string"
      },
      "subscriptionId-PathType": {
        "type": "string"
      },
      "alarmAckState-QueryType": {
        "type": "string",
        "enum": [
          "allAlarms",
          "allActiveAlarms",
          "allActiveAndAcknowledgedAlarms",
          "allActiveAndUnacknowledgedAlarms",
          "allClearedAndUnacknowledgedAlarms",
          "allUnacknowledgedAlarms"
        ]
      },
      "consumerReferenceId-QueryType": {
        "$ref": "#/components/schemas/uri-Type"
      },
      "filter-QueryType": {
        "type": "string"
      },
      "href-QueryType": {
        "type": "string"
      },
      "alarmIdList-QueryType": {
        "type": "array",
        "items": {
          "$ref": "#/components/schemas/alarmId-Type"
        }
      },
      "alarmIdAndPerceivedSeverityList-QueryType": {
        "type": "array",
        "items": {
```

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      "$ref": "#/components/schemas/alarmIdAndPerceivedSeverity-Type"
    }
  },
  "perceivedSeverity-QueryType": {
    "$ref": "#/components/schemas/perceivedSeverity-Type"
  },
  "comment-RequestType": {
    "type": "object",
    "properties": {
      "data": {
        "$ref": "#/components/schemas/comment-ResourceType"
      }
    }
  },
  "patchAcknowledgeAlarms-RequestType": {
    "description": "Used to patch alarm attributes to acknowledge one or multiple alarm",
    "type": "object",
    "properties": {
      "ackUserId": {
        "$ref": "#/components/schemas/ackUserId-Type"
      },
      "ackSystemId": {
        "$ref": "#/components/schemas/ackSystemId-Type"
      },
      "ackstate": {
        "type": "string",
        "enum": [
          "acknowledged"
        ]
      }
    }
  },
  "patchUnacknowledgeAlarms-RequestType": {
    "description": "Used to patch alarm attributes to unacknowledge one or multiple alarm",
    "type": "object",
    "properties": {
      "ackUserId": {
        "$ref": "#/components/schemas/ackUserId-Type"
      },
      "ackSystemId": {
        "$ref": "#/components/schemas/ackSystemId-Type"
      },
      "ackstate": {
        "type": "string",
        "enum": [
          "unacknowledged"
        ]
      }
    }
  },
  "patchClearAlarms-RequestType": {
    "description": "Used to patch the attributes related to clear",
    "type": "object",
    "properties": {
      "clearUserId": {
        "$ref": "#/components/schemas/clearUserId-Type"
      },
      "clearSystemId": {
        "$ref": "#/components/schemas/clearSystemId-Type"
      },
      "perceivedSeverity": {
        "type": "string",
        "enum": [
          "cleared"
        ]
      }
    }
  },
  "subscription-RequestType": {
    "type": "object",
    "properties": {
      "data": {
        "$ref": "#/components/schemas/subscription-ResourceType"
      }
    }
  },
  "alarms-ResponseType": {
    "type": "object",
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    "properties": {
      "data": {
        "type": "array",
        "items": {
          "$ref": "#/components/schemas/alarm-ResourceType"
        }
      }
    }
  },
  "alarmsCount-ResponseType": {
    "type": "object",
    "properties": {
      "data": {
        "$ref": "#/components/schemas/alarmsCount-Type"
      }
    }
  },
  "comment-ResponseType": {
    "type": "object",
    "properties": {
      "data": {
        "$ref": "#/components/schemas/comment-ResourceType"
      }
    }
  },
  "error-ResponseType": {
    "type": "object",
    "properties": {
      "error": {
        "type": "object",
        "properties": {
          "errorInfo": {
            "type": "string"
          }
        }
      }
    }
  },
  "failedAlarms-ResponseType": {
    "type": "object",
    "properties": {
      "error": {
        "type": "array",
        "items": {
          "type": "object",
          "properties": {
            "alarmId": {
              "$ref": "#/components/schemas/alarmId-Type"
            },
            "errorReason": {
              "type": "string"
            }
          }
        }
      }
    }
  },
  "subscription-ResponseType": {
    "type": "object",
    "properties": {
      "data": {
        "$ref": "#/components/schemas/subscription-ResourceType"
      }
    }
  },
  "notifyNewAlarm-NotifType": {
    "type": "object",
    "properties": {
      "header": {
        "$ref": "#/components/schemas/header-Type"
      },
      "body": {
        "type": "object",
        "properties": {
          "alarmId": {
            "$ref": "#/components/schemas/alarmId-Type"
          },
          "alarmType": {
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            "$ref": "#/components/schemas/alarmType-Type"
          },
          "probableCause": {
            "$ref": "#/components/schemas/probableCause-Type"
          },
          "specificProblem": {
            "$ref": "#/components/schemas/specificProblem-Type"
          },
          "perceivedSeverity": {
            "$ref": "#/components/schemas/perceivedSeverity-Type"
          },
          "backedUpStatus": {
            "$ref": "#/components/schemas/backedUpStatus-Type"
          },
          "backUpObject": {
            "$ref": "#/components/schemas/backUpObject-Type"
          },
          "trendIndication": {
            "$ref": "#/components/schemas/trendIndication-Type"
          },
          "thresholdInfo": {
            "$ref": "#/components/schemas/thresholdInfo-Type"
          },
          "correlatedNotifications": {
            "type": "array",
            "items": {
              "$ref": "#/components/schemas/correlatedNotification-Type"
            }
          },
          "stateChangeDefinition": {
            "type": "array",
            "items": {
              "$ref": "#/components/schemas/attributeValueChange-Type"
            }
          },
          "monitoredAttributes": {
            "type": "array",
            "items": {
              "$ref": "#/components/schemas/attributeNameValuePair-Type"
            }
          },
          "proposedRepairActions": {
            "$ref": "#/components/schemas/proposedRepairActions-Type"
          },
          "additionalText": {
            "$ref": "#/components/schemas/additionalText-Type"
          },
          "additionalInformation": {
            "type": "array",
            "items": {
              "$ref": "#/components/schemas/attributeNameValuePair-Type"
            }
          },
          "rootCauseIndicator": {
            "$ref": "#/components/schemas/rootCauseIndicator-Type"
          }
        }
      }
    }
  },
  "notifyNewSecurityAlarm-NotifType": {
    "type": "object",
    "properties": {
      "header": {
        "$ref": "#/components/schemas/header-Type"
      },
      "body": {
        "type": "object",
        "properties": {
          "alarmId": {
            "$ref": "#/components/schemas/alarmId-Type"
          },
          "alarmType": {
            "$ref": "#/components/schemas/alarmType-Type"
          },
          "probableCause": {
            "$ref": "#/components/schemas/probableCause-Type"
          },
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          "specificProblem": {
            "$ref": "#/components/schemas/specificProblem-Type"
          },
          "perceivedSeverity": {
            "$ref": "#/components/schemas/perceivedSeverity-Type"
          },
          "correlatedNotifications": {
            "type": "array",
            "items": {
              "$ref": "#/components/schemas/correlatedNotification-Type"
            }
          },
          "additionalText": {
            "$ref": "#/components/schemas/additionalText-Type"
          },
          "additionalInformation": {
            "type": "array",
            "items": {
              "$ref": "#/components/schemas/attributeNameValuePair-Type"
            }
          },
          "rootCauseIndicator": {
            "$ref": "#/components/schemas/rootCauseIndicator-Type"
          },
          "serviceUser": {
            "$ref": "#/components/schemas/serviceUser-Type"
          },
          "serviceProvider": {
            "$ref": "#/components/schemas/serviceProvider-Type"
          },
          "securityAlarmDetector": {
            "$ref": "#/components/schemas/securityAlarmDetector-Type"
          }
        }
      }
    }
  },
  "notifyAckStateChanged-NotifType": {
    "type": "object",
    "properties": {
      "header": {
        "$ref": "#/components/schemas/header-Type"
      },
      "body": {
        "type": "object",
        "properties": {
          "alarmId": {
            "$ref": "#/components/schemas/alarmId-Type"
          },
          "alarmType": {
            "$ref": "#/components/schemas/alarmType-Type"
          },
          "probableCause": {
            "$ref": "#/components/schemas/probableCause-Type"
          },
          "perceivedSeverity": {
            "$ref": "#/components/schemas/perceivedSeverity-Type"
          },
          "ackstate": {
            "$ref": "#/components/schemas/ackState-Type"
          },
          "ackUserId": {
            "$ref": "#/components/schemas/ackUserId-Type"
          },
          "ackSystemId": {
            "$ref": "#/components/schemas/ackSystemId-Type"
          }
        }
      }
    }
  },
  "notifyClearedAlarm-NotifType": {
    "type": "object",
    "properties": {
      "header": {
        "$ref": "#/components/schemas/header-Type"
      },
      "body": {
```

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        "type": "object",
        "properties": {
          "alarmId": {
            "$ref": "#/components/schemas/alarmId-Type"
          },
          "alarmType": {
            "$ref": "#/components/schemas/alarmType-Type"
          },
          "probableCause": {
            "$ref": "#/components/schemas/probableCause-Type"
          },
          "perceivedSeverity": {
            "$ref": "#/components/schemas/perceivedSeverity-Type"
          },
          "correlatedNotifications": {
            "type": "array",
            "items": {
              "$ref": "#/components/schemas/correlatedNotification-Type"
            }
          },
          "clearUserId": {
            "$ref": "#/components/schemas/clearUserId-Type"
          },
          "clearSystemId": {
            "$ref": "#/components/schemas/clearSystemId-Type"
          }
        }
      }
    }
  },
  "notifyAlarmListRebuilt-NotifType": {
    "type": "object",
    "properties": {
      "header": {
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      "body": {
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          "reason": {
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          "alarmListAlignmentRequirement": {
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          "alarmType": {
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          "probableCause": {
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          "perceivedSeverity": {
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    }
  },
  "notifyComments-NotifType": {
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          "probableCause": {
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          "perceivedSeverity": {
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          "comments": {
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            "items": {
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            }
          }
        }
      }
    }
  },
  "notifyPotentialFaultyAlarmList-NotifType": {
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    "properties": {
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        "properties": {
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      }
    }
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  "notifyCorrelatedNotificationChanged-NotifType": {
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          "correlatedNotifications": {
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            "items": {
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            }
          },
          "alarmId": {
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          }
        }
      }
    }
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          },
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          "specificProblem": {
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          "trendIndication": {
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          "thresholdInfo": {
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          "monitoredAttributes": {
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          },
          "additionalInformation": {
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    "properties": {
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    "alarmChangedTime": {
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    "alarmClearedTime": {
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    },
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    "ackSystemId": {
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    },
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          "items": {
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        "serviceProvider": {
          "$ref": "#/components/schemas/serviceProvider-Type"
        },
        "securityAlarmDetector": {
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        }
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    }
  }
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    }
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    "filter": {
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    "unacknowledged"
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},
"ackUserId-Type": {
  "type": "string"
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"additionalText-Type": {
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    "perceivedSeverity": {
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    }
  }
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"alarmListAlignmentRequirement-Type": {
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    "Alignment Not Required"
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    "warningCount": {
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    "indeterminateCount": {
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    "clearedCount": {
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    }
  }
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    "Processing Error Alarm",
    "Environmental Alarm",
    "Quality Of Service Alarm",
    "Equipment Alarm",
    "Integrity Violation",
    "Operational Violation",
    "Physical Violation",
    "Security Service or Mechanism Violation",
    "Time Domain Violation"
  ]
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    "newAttributeValue": {}
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"backedUpStatus-Type": {
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},
"commentSystemId-Type": {
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"correlatedNotification-Type": {
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  "enum": [
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    "Down"
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"notificationId-Type": {
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  "enum": [
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    "notifyAckStateChanged",
    "notifyClearedAlarm",
    "notifyAlarmListRebuiltAlarm",
    "notifyChangedAlarm",
    "notifyComments",
    "notifyPotentialFaultyAlarmList",
    "notifyCorrelatedNotificationChanged",
    "notifyChangedAlarmGeneral"
  ]
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"perceivedSeverity-Type": {
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    "Major",
    "Minor",
    "Warning",
    "Indeterminate",
    "Cleared"
  ]
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"probableCause-Type": {
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"proposedRepairActions-Type": {
  "type": "string"
},
"reason-Type": {
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},
"rootCauseIndicator-Type": {
  "type": "boolean"
},
"securityAlarmDetector-Type": {
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      },
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          },
          "high": {
            "$ref": "#/components/schemas/float-Type"
          }
        }
      },
      "trendIndication-Type": {
        "type": "string",
        "enum": [
          "More severe",
          "No change",
          "Less severe"
        ]
      }
    }
  }
}
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Annex B (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2018-07	OAM&P SWG virtual meeting on 5G restructured specifications #2	S5V-182012				First draft	0.1.0
2018-08	SA5#120	S5-185582					0.5.0
2018-08	SA5#120	S5-185127 S5‑185527 S5-185528 S5‑185535 S5‑185146 S5‑185602 S5‑185597 S5‑185598 S5‑185538				Update according to the meeting agreement in SA5#120: - S5-185127 pCR TS 28.xyz createMOI clarification - S5‑185527 pCR 28.xyz Add common subscribe management service - S5-185528 pCR 28.xyz Add specification level requirements for provisioning - S5‑185535 pCR 28.xyz Add RESTful HTTP-based solution set of notifyprovisioning - S5‑185146 pCR 28.xyz Update Restful HTTP-based solution set of provisioning - S5‑185602 pCR 28.xyz Add stage 3 content for fault supervision - S5‑185597 pCR 28.xyz Add RESTful HTTP-based solution set of common subscribe and unsubscribe - S5‑185598 pCR 28.xyz Change AlarmIRP to FaultSupervisionFunction - S5‑185538 pCR TS 28.xyz replace notificationIRP with notificationFunction - Editorial changes. - Update filter related "List of sequence" to "filter-QueryType"	0.6.0
2018-09	SA#81	SP-180799				Presented for information and approval	1.0.0
2018-09	SA#81					Upgrade to change control version	15.0.0
2018-09	SA#81					EditHelp editorial fix	15.0.1

History

Document history		
V15.0.1	October 2018	Publication