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# Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- 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.



---

# 1 Scope

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

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## 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: "Telecommunication management; 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 ; Provisioning; ".
- [6] 3GPP TS 28.554: "Management and orchestration ; 5G end to end Key Performance Indicators (KPI)".
- [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".
- [15] 3GPP TS 32.158: "Management and orchestration; Design rules for REpresentational State Transfer (REST) Solution Sets (SS)".
- [16] 3GPP TS 32.302: "Telecommunication management; Configuration Management (CM); Notification Integration Reference Point (IRP); Information Service (IS)".

- [17] 3GPP TS 32.401: "Telecommunication management; Performance Management (PM); Concept and requirements".
- [18] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".
- [19] 3GPP TS 32.401: "Telecommunication management; Performance Measurement (PM); Concept and requirements".
- [20] ISO 8601:2004: "Data elements and interchange formats – Information interchange – Representation of dates and times".
- [21] Void.
- [22] Void.
- [23] Void.
- [24] Void.
- [25] 3GPP TS 32.300: "Telecommunication management; Configuration Management (CM); Name convention for Managed Objects".
- [26] W3C REC-xmlschema-0-20010502: "XML Schema Part 0: Primer".
- [27] W3C REC-xmlschema-1-20010502: "XML Schema Part 1: Structures".
- [28] W3C REC-xmlschema-2-20010502: "XML Schema Part 2: Datatypes".
- [29] W3C REC-xml-names-19990114: "Namespaces in XML".
- [30] Void.
- [31] 3GPP TS 32.111-2: "Telecommunication management; Fault Management; Part 2: Alarm Integration Reference Point (IRP): Information Service (IS)".
- [32] IETF RFC 6241 "Network Configuration Protocol (NETCONF)".
- [33] 3GPP TS 32.160 "Management and orchestration; Management service template".
- [34] IETF RFC 7950 "The YANG 1.1 Data Modeling Language".
- [35] OpenAPI: "OpenAPI 3.0.1 Specification", <https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.1.md>.
- [36] IETF RFC 6902: "JavaScript Object Notation (JSON) Patch".
- [37] IETF RFC 7396: "JSON Merge Patch".
- [38] 3GPP TS 32.422: "Telecommunication management; Subscriber and equipment trace; Trace control and configuration management".
- [39] 3GPP TS 32.423: "Telecommunication management; Subscriber and equipment trace; Trace data definition and management".
- [40] IETF RFC 6455: "The WebSocket Protocol".
- [41] IETF RFC 793: "Transmission Control Protocol".
- [42] 3GPP TS 28.550: "Management and orchestration; Performance assurance".
- [43] ITU-T Recommendation X.733 (02/92): "Information technology - Open Systems Interconnection - Systems Management: Alarm reporting function".
- [44] 3GPP TS 28.623: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".

- [45] Text Attribution: Creator: ONAP, under Creative Commons Attribution 4.0 International License, <https://creativecommons.org/licenses/by/4.0/>, URI to access the text: [https://github.com/onap/vnfrqts-requirements/blob/05f26fac2b941513a7d0e856b99fd8c61d688299/docs/Chapter8/ves7\\_1spec.rst#resource-structure](https://github.com/onap/vnfrqts-requirements/blob/05f26fac2b941513a7d0e856b99fd8c61d688299/docs/Chapter8/ves7_1spec.rst#resource-structure).

---

## 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].

**Matching-Criteria-Attributes:** See its definition in [31].

### 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].

FS	Fault Supervision
MnS	Management Service

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## 4 Overview

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

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5 Void

6 Void

7 Void

8 Void

9 Void

## 10 Void

## 11 Management services – Stage 2

### 11.1 Generic provisioning management service

#### 11.1.1 Operations and notifications

##### 11.1.1.1 createMOI operation

###### 11.1.1.1.1 Description

This operation is invoked by Generic Provisioning MnS consumer to request the Generic Provisioning MnS producer to create a Managed Object instance in the MIB maintained by Generic Provisioning MnS producer. This operation will create only one Managed Object instance.

The Generic Provisioning MnS 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 Generic Provisioning MnS 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 Generic Provisioning MnS 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 Generic Provisioning MnS producer defined default value, then that value will be used.

###### 11.1.1.1.2 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].
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 the default value set specified in the definition of the managed object's class.

###### 11.1.1.1.3 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)	

#### 11.1.1.1.4 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.

### 11.1.1.2 `getMOIAttributes` operation

#### 11.1.1.2.1 Definition

This operation is invoked by Generic Provisioning MnS consumer to request the retrieval of management information (Managed Object attribute names and values) from the MIB maintained by Generic Provisioning MnS producer. 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").

#### 11.1.1.2.2 Input Parameters

Name	Qualifier	Information Type	Comment
baseObjectInstance	M	DN	<p>This parameter specifies the base object instance.</p> <p>If the "scope" parameter is absent, then either only the base object or the complete subtree below and including the base object shall be selected. The default behaviour is protocol specific.</p>
scope	M	n/a	<p>This parameter specifies the scope. It is a structured parameter and consists of the sub-parameters "scopeType" and "scopeLevel". The scope describes which object instances are selected with respect to a base object instance. The base object instance needs to be specified using a dedicated attribute.</p>
> scopeType	M	ENUM { BASE_ONLY, BASE_ALL }	<p>If the optional "scopeLevel" parameter is not supported or absent, allowed values of "scopeType" are "BASE_ONLY" and "BASE_ALL".</p> <p>The value "BASE_ONLY" indicates only the base object is selected.</p> <p>The value "BASE_ALL" indicates the base object and all of its subordinate objects (incl. the leaf objects) are selected.</p> <p>This parameter is redundant and can be omitted when confirming only the protocol specific default behaviour.</p>
		ENUM { BASE_NTH_LEVEL, BASE_SUBTREE }	<p>If the "scopeLevel" parameter is supported and present, allowed values of "scopeType" are "BASE_NTH_LEVEL" and "BASE_SUBTREE".</p> <p>The value "BASE_NTH_LEVEL" indicates all objects on the level, which is specified by the "scopeLevel" parameter, below the base object are selected. The base object is at "scopeLevel" zero.</p> <p>The value "BASE_SUBTREE" indicates the base object and all of its subordinate objects down to and including the objects on the level, which is specified by the "scopeLevel" parameter, are selected. The base object is at "scopeLevel" zero.</p>
> scopeLevel	O	Integer	See definition of "scopeType" parameter.
filter	O	See Comment.	<p>This parameter defines filter criteria to be applied to the objects selected by the "baseObjectInstance", "scope" and "scopeLevel" parameters.</p> <p>The actual syntax and capabilities of the <i>filter</i> is SS specific. However, each SS should support a <i>filter</i> consisting of one or several assertions that may be grouped using the logical operators AND, OR and NOT.</p> <p>Each assertion is a logical expression of attribute existence, attribute value comparison ("equal to X, less than Y" etc.) and MO Class.</p>
attributeListIn	O	LIST OF attribute name.	<p>This parameter identifies the attributes to be returned by this operation. If the parameter is absent or empty all attributes shall be returned.</p>

### 11.1.1.2.3 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.

### 11.1.1.2.4 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.

## 11.1.1.3 modifyMOIAttributes operation

### 11.1.1.3.1 Description

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



#### 11.1.1.3.2 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 <code>filter</code> (when supplied) is to be applied. This is a full DN according to 3GPP TS 32.300 [5].
scopeType	M	See corresponding parameter in <code>getMOIAttributes</code> .	See corresponding parameter in <code>getMOIAttributes</code> .
scopeLevel	O	See corresponding parameter in <code>getMOIAttributes</code> .	See corresponding parameter in <code>getMOIAttributes</code> .
filter	O	See comment.	See corresponding parameter in <code>getMOIAttributes</code> .

modificationList	M	<p>LIST OF SEQUENCE &lt;attribute identifier, [attribute values], ENUM( replace, add values, remove values, set to default)&gt;</p> <p>See Comment for when attribute values are require and when they are optional.</p>	<p>This parameter contains a set of attribute modification specifications, each of which contains:</p> <p>1). attribute identifier: the identifier of the attribute whose value(s) is (are) to be modified.</p> <p>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.</p> <p>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:</p> <p>a) replace: the attribute value(s) specified shall be used to replace the current values(s) of the attribute;</p> <p>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.</p> <p>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;</p> <p>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.</p> <p>Note: Set is used here in the mathematical sense so that a set-valued attribute is an unordered set of unique values.</p> <p>The modify operator is optional, and if it is not specified, the replace operator shall be assumed.</p> <p>The modificationList parameter contains a single set of attribute modification specifications and this same set is applied to each MO instance to be modified.</p>
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## 11.1.1.3.3 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.

## 11.1.1.3.4 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.

## 11.1.1.4 deleteMOI operation

## 11.1.1.4.1 Description

This service operation is invoked by Generic Provisioning MnS consumer to request the deletion of one or more Managed Object instances in the MIB maintained by the Generic Provisioning MnS producer.

## 11.1.1.4.2 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 <i>filter</i> (when supplied) is to be applied. This is a full DN according to 3GPP TS 32.300 [5].
scopeType	O	See corresponding parameter in getMOIAttributes.	See corresponding parameter in getMOIAttributes.
scopeLevel	O	See corresponding parameter in getMOIAttributes.	See corresponding parameter in getMOIAttributes.
filter	O	See comment.	See corresponding parameter in getMOIAttributes.

## 11.1.1.4.3 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.

## 11.1.1.4.4 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.

11.1.1.5 Void

11.1.1.6 Void

## 11.1.1.7 Notification notifyMOICreation

## 11.1.1.7.1 Definition

This notification notifies the subscribed consumers that a new Managed Object Instance has been created.

#### 11.1.1.7.2 Input parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
objectClass	M	It shall carry the ManagedEntity class name.	It specifies the class name of the IOC. A network event has occurred in an instance of this class.
objectInstance	M	It shall carry the DN of the ManagedEntity.	It specifies a new instance of the above IOC in which the network event related to by carrying the Distinguished Name (DN) for the instance.
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 instance throughout the time that correlation is significant, it uniquely identifies the notification from other notifications generated by the subject MOI.
notificationType	M	It specifies the type of provisioning management services related notifications. The value "notifyMOICreation" shall be carried.	It specifies the type of notification.
eventTime	M	It indicates the MOICreation event time.	The semantics of Generalised Time specified by ITU-T[17] shall be used here.
systemDN	M	It shall carry the DN of management service providers.	-
correlatedNotifications	CM	It specifies a set of notifications that are correlated to the subject notification.	The condition is that the MnS producer support the correlation of notifications
additionalText	O	It can contain further information in text on the event of the ManagedEntity(s).	-
sourceIndicator	O	ENUM( Resource_operation, Management_operation, SON_operation,Unknown)	<p>This parameter, when present, indicates the source of the operation that led to the generation of this notification. It can have one of the following values:</p> <ol style="list-style-type: none"> <li>1. resource operation: The notification was generated in response to an internal operation of the resource;</li> <li>2. management operation: The notification was generated in response to a management operation applied across the managed object boundary external to the managed object;</li> <li>3. SON operation: The notification was generated as result of a SON (Self Organising Network) process like self-configuration, self-optimization, self-healing etc. .</li> <li>4. unknown: It is not possible to determine the source of the operation.</li> </ol> <p>Remark: A provisioning MnS provider may not in any case be aware that SON operation lead to the generation of this generation. In this case another value than SON_operation for sourceIndicator might be sent.</p>
attributeList	O	LIST OF SEQUENCE <AttributeName, AttributeValue>	The attributes (name/value pairs) of the created MOI.

### 11.1.1.7.3 Triggering event

#### 11.1.1.7.3.1 From-state

stateBeforeObjectCreation.

Assertion Name	Definition
stateBeforeObjectCreation	The number of instances of the IOC ManagedEntity is equal to N.

#### 11.1.1.7.3.2 To-state

stateAfterObjectCreation.

Assertion Name	Definition
stateAfterObjectCreation	The number of instances of the IOC ManagedEntity is equal to N + 1.

### 11.1.1.8 Notification `notifyMOIDeletion`

#### 11.1.1.8.1 Definition

This notification notifies the subscribed consumers that an existing Managed Object Instance has been deleted.



#### 11.1.1.8.2 Input parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
objectClass	M	It shall carry the ManagedEntity class name.	It specifies the class name of the IOC. A network event has occurred in an instance of this class.
objectInstance	M	It shall carry the DN of the ManagedEntity.	It specifies an existing instance of the above IOC in which the network event related to by carrying the Distinguished Name (DN) for the instance.
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 MOI.
notificationType	M	It specifies the type of provisioning management services related notifications. The value "notifyMOIDeletion" shall be carried.	It specifies the type of notification.
eventTime	M	It indicates the MOIDeletion event time.	The semantics of Generalised Time specified by ITU-T[17] shall be used here.
systemDN	M	It shall carry the DN of management service providers.	-
correlatedNotifications	CM	It specifies a set of notifications that are correlated to the subject notification.	The condition is that the MnS producer support the correlation of notifications
additionalText	O	It can contain further information in text on the event of the ManagedEntity(s).	-
sourceIndicator	O	ENUM( Resource_operation, Management_operation, SON_operation,Unknown)	<p>This parameter, when present, indicates the source of the operation that led to the generation of this notification. It can have one of the following values:</p> <ol style="list-style-type: none"> <li>1. resource operation: The notification was generated in response to an internal operation of the resource;</li> <li>2. management operation: The notification was generated in response to a management operation applied across the managed object boundary external to the managed object;</li> <li>3. SON operation: The notification was generated as result of a SON (Self Organising Network) process like self-configuration, self-optimization, self-healing etc. .</li> <li>4. unknown: It is not possible to determine the source of the operation.</li> </ol> <p>Remark: A provisioning MnS provider may not in any case be aware that SON operation lead to the generation of this generation. In this case another value than SON_operation for sourceIndicator might be sent.</p>
attributeList	O	LIST OF SEQUENCE <AttributeName, AttributeValue>	The attributes (name/value pairs) of the deleted MOI.

### 11.1.1.8.3 Triggering event

#### 11.1.1.8.3.1 From-state

stateBeforeObjectDeletion.

Assertion Name	Definition
stateBeforeObjectDeletion	The number of instances of the IOC ManagedEntity is equal to N.

#### 11.1.1.8.3.2 To-state

stateAfterObjectDeletion.

Assertion Name	Definition
stateAfterObjectDeletion	The number of instances of the IOC ManagedEntity is equal to N - 1.

### 11.1.1.9 Notification notifyMOIAttributeValueChanges

#### 11.1.1.9.1 Definition

This notification notifies the subscribed consumers that changes of one or several attributes of a Managed Object Instance in the NRM.

#### 11.1.1.9.2 Input parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
objectClass	M	It shall carry the ManagedEntity class name.	It specifies the class name of the IOC. A network event has occurred in an instance of this class.
objectInstance	M	It shall carry the DN of the ManagedEntity.	It specifies the existing instance of the above IOC in which the network event related to by carrying the Distinguished Name (DN) for the instance.
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.
notificationType	M	It specifies the type of provisioning management services related notifications. The value "notifyMOIAttributeValueChange" shall be carried.	It specifies the type of notification.
eventTime	M	It indicates the MOIAttributeValueChange event time.	The semantics of Generalised Time specified by ITU-T[17] shall be used here.
systemDN	M	It shall carry the DN of management service providers.	-
correlatedNotifications	CM	It specifies a set of notifications that are correlated to the subject notification.	The condition is that the MnS producer support the correlation of notifications
additionalText	O	It can contain further information in text on the event of the ManagedEntity(s).	-

sourceIndicator	O	ENUM( Resource_operation, Management_operation, SON_operation,Unknown)	This parameter, when present, indicates the source of the operation that led to the generation of this notification. It can have one of the following values: 1. resource operation: The notification was generated in response to an internal operation of the resource; 2. management operation: The notification was generated in response to a management operation applied across the managed object boundary external to the managed object; 3. SON operation: The notification was generated as result of a SON (Self Organising Network) process like self-configuration, self-optimization, self-healing etc. . 4. unknown: It is not possible to determine the source of the operation.  Remark: A provisioning MnS provider may not in any case be aware that SON operation lead to the generation of this generation. In this case another value than SON_operation for sourceIndicator might be sent.
attributeValueChange	M	LIST OF SEQUENCE <AttributeName, NewAttributeValue, CHOICE [NULL, OldAttributeValue]>	The changed attributes (name/value pairs) of the MOI (with both new and, optionally, old values).

### 11.1.1.9.3 Triggering event

#### 11.1.1.9.3.1 From-state

stateBeforeAttributeValueChange.

Assertion Name	Definition
stateBeforeAttributeValueChange	The subject attribute has a value at time T1.

#### 11.1.1.9.3.2 To-state

stateAfterAttributeValueChange.

Assertion Name	Definition
stateAfterAttributeValueChange	The subject attribute has been changed to a value other than the value at time T1.

### 11.1.1.10 Notification notifyEvent

#### 11.1.1.10.1 Definition

This notification notifies the consumer, who has a subscription receiving this type of notification, that certain network events has occurred with potential service impact, for example, system restart and system redundancy shift (backup).

This notification definition is generic in the sense that the specific types of network event are not defined.

#### 11.1.1.10.2 Input parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
objectClass	M	It carries the IOC of an instance where an alert occurs.	--
objectInstance	M	It carries the DN of an instance where an alert occurs.	--
notificationId	M	It carries the identifier for the subject notification.	See Note 1.
eventTime	M	It indicates the time of the event.	The semantics of Generalised Time specified by ITU-T [17] shall be used here.
systemDN	M	It carries the DN of producer of the notification.	--
notificationType	M	"notifyEvent"	--
specificProblem	M	It indicates a problem detected.	--
additionalText	O	It carries additional information.	--
additionalInformation	O	It carries additional information.	--
<p>NOTE 1: If consumer receives notifications from one producer, consumer can use the <code>notificationId</code> and the <code>objectInstance</code> to uniquely identify all received notifications.</p> <p>If consumer receives notifications from multiple producers and notifications of each <code>objectInstance</code> are reported to at most by one producer, consumer can use the <code>notificationId</code> and <code>objectInstance</code> to uniquely identify all received notifications.</p> <p>If consumer receives notifications from multiple producers and notifications of one or more <code>objectInstance(s)</code> are reported by two or more producers, consumer can use the <code>notificationId</code> together with <code>objectInstance</code> and the identity of producer (<code>systemDN</code>), to uniquely identify all received notifications. If the information <code>systemDN</code> is absent, consumer needs other means, which are outside the scope of this TS, to determine the identity of producer.</p> <p>How <code>notificationId</code> of notifications are re-used to correlate notifications is outside of the scope of this specification.</p>			

#### 11.1.1.11 Notification `notifyMOIChanges`

##### 11.1.1.11.1 Definition

This notification notifies subscribed MnS consumers that Managed Object Instances have been created or deleted, or that values of Managed Object Instance attributes have been replaced. This notification can report multiple updates that happened at the same time.

The MnS producer decides whether to send notifications of type `notifyMOICreation`, `notifyMOIDeletion` or `notifyMOIAttributesValueChange`, or a single `notifyMOIChanges` reporting all changes in a single notification. The MnS producer should take subscription information into account when deciding the notification types to be sent, and not try to send notifications that the MnS consumer did not subscribe to.

The notification header includes a `notificationId`. This identifier shall not be used in the parameter `correlatedNotifications` potentially carried in other notifications. The `notificationId` in `moIChanges` shall be used instead. This is because the latter notification id is associated to a single MOI only, whereas the former notification id can be associated to changes of multiple MOIs. The `correlatedNotifications` associates to a single MOI one or more notification ids identifying notifications reporting events for that MOI.

#### 11.1.1.11.2 Input parameters



Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
objectClass	M	See clause 11.1.1.7.2	This parameter specifies the class name of the local root in the MIB
objectInstance	M	See clause 11.1.1.7.2	This parameter specifies the instance of the local root in the MIB
notificationId	M	See clause 11.1.1.7.2	See clause 11.1.1.7.2
notificationType	M	const string "notifyMOIChanges"	See clause 11.1.1.7.2
eventTime	M	See clause 11.1.1.7.2	See clause 11.1.1.7.2
systemDN	M	See clause 11.1.1.7.2	See clause 11.1.1.7.2

mOIChanges	M	<p>SEQUENCE OF SET {  notificationId (M),  correlatedNotifications (O),  additionalText (O),  sourceIndicator (O),  path (M),  operation (M),  value (CM)  }</p>	<p>This parameter describes the NRM updates to be reported.</p> <p>The <code>notificationId</code> is an identifier of one MOI change.</p> <p>The <code>path</code> specifies the MOI created or deleted, or the MOI with replaced attribute values. The <code>path</code> may identify also parts of an attribute in case the attribute is a structured data type.</p> <p>The <code>operation</code> specifies the type of operation that has been applied to the MOI specified by the <code>path</code>. It can have the values "CREATE", "DELETE" and "REPLACE". "CREATE" and "DELETE" refers to a MOI creation or deletion, respectively. "REPLACE" refers to the replacement of a complete attribute value of an existing MOI, or parts thereof in case the attribute is a structured data type.</p> <p>When a MOI creation is reported, the <code>value</code> carries an (optional) complete MOI representation.</p> <p>When a MOI deletion is reported, the <code>value</code> carries an (optional) complete MOI representation.</p> <p>When the replacement of the value of one or more attributes of a MOI is reported, the <code>value</code> carries the MOI representation without the attributes not changed.</p> <p>When the replacement of the value of a part of an attribute is reported, the <code>value</code> carries the new value of that part.</p> <p>When arrays are modified (by e.g. adding an array item, removing an array item or replacing an array item) the complete array shall be included in <code>value</code>.</p> <p>The reported MOI changes is an ordered list, since the creation of parent objects needs to be reported before the creation of child objects, and, vice versa, the deletion of child objects needs to be reported before the deletion of parent objects.</p>
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## 11.1.2 Managed Information

### 11.1.2.1 ManagedEntity

#### 11.1.2.1.1 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 and notifications to represent an instance of an IOC defined in these NRMs.

## 11.2 Generic fault supervision management service

### 11.2.1 Operations and notifications

#### 11.2.1.1 Operation and notification of fault supervision data report management service

##### 11.2.1.1.1 subscribe

##### 11.2.1.1.1.1 Definition

A MnS consumer invokes this operation to establish subscription to receive network events via notifications, under the filter constraint specified in this operation.

##### 11.2.1.1.1.2 Input parameters

Parameter Name	S	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.	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.

##### 11.2.1.1.1.3 Output parameters

Parameter Name	S	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 = OperationSucceeded. If operation_failed_existing_subscription is true, status = OperationFailedExistingSubscription If operation_failed is true, status = OperationFailed.

## 11.2.1.1.1.4 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 ntfnNotificationCategorySet 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 ntfnNotificationCategorySet attribute of an ntfnSubscription which is involved in a subscription relationship with the NtfSubscriber identified by the managerReference input parameter.

## 11.2.1.1.1.5 Post-condition

subscriberPossiblyCreated AND subscriptionCreated.

Assertion Name	Definition
subscriberPossiblyCreated	An NtfSubscriber with an ntfnManagerReference 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: <ul style="list-style-type: none"> <li>- ntfnSubscriptionState attribute value has been set to "notSuspended";</li> <li>- ntfnTimeTick 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;</li> <li>- ntfnTimeTickTimer has been reset with the value of timeTick attribute;</li> <li>- ntfnFilter attribute value has been set to the value of the filter input parameter if present;</li> <li>- NtfSubscription is involved in a subscription relationship with the NtfSubscriber identified by the managerReference input parameter;</li> <li>- attribute ntfnNotificationCategorySet of NtfSubscription contains EITHER the notification categories identified by the notificationCategories input parameter that were not already contained in the ntfnNotificationCategorySet 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 ntfnNotificationCategorySet attribute of other subscriptions of the same NtfSubscriber identified by the managerReference input parameter.</li> </ul>

## 11.2.1.1.1.6 Exceptions

Name	Definition
operation_failed_existing_subscription	<b>Condition:</b> (notificationCategoriesNotAllSubscribed OR notificationCategoriesParameterAbsentAndNotAllSubscribed) not true <b>Returned Information:</b> The output parameter status <b>Exit state:</b> Entry State
operation_failed	<b>Condition:</b> Post-condition is false <b>Returned Information:</b> The output parameter status <b>Exit state:</b> Entry State

## 11.2.1.1.2 unsubscribe

## 11.2.1.1.2.1 Definition

A MnS consumer invokes this operation to cancel subscriptions. The MnS 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.

## 11.2.1.1.2.2 Input parameters

Parameter Name	S	Information Type / Legal Values	Comment
consumerReference	M	DN	It specifies the reference of the MnS 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.

## 11.2.1.1.2.3 Output parameters

Parameter Name	S	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.

## 11.2.1.1.2.4 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.

## 11.2.1.1.2.5 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.

## 11.2.1.1.2.6 Exceptions

Name	Definition
operation_failed	<b>Condition:</b> Pre-condition is false or post-condition is false <b>Returned Information:</b> The output parameter status <b>Exit state:</b> Entry State

## 11.2.1.1.3 getAlarmList

## 11.2.1.1.3.1 Definition

A MnS consumer invokes this operation to request the MnS producer 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 needs to have established a subscription via the subscribe operation.

## 11.2.1.1.3.2 Input parameters

Parameter Name	S	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 FaultSupervision MnS producer 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 11.1.2.3.3.1. 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 11.1.2.3.3.1. 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.			

## 11.2.1.1.3.3 Output parameters

**Table 11.2.1.1.3.3-1: Output parameters for the operation getAlarmList**

Parameter Name	S	Matching Information / Information Type / Legal Values	Comment
alarmInformationList	M	List of AlarmInformation.	<p>It carries the requested AlarmInformation instances.</p> <p>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.</p> <p>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.</p>
status	M	ENUM (OperationSucceeded, OperationFailed)	<p>If all the AlarmInformation are returned, status = OperationSucceeded. If operation is failed, status = OperationFailed.</p>

The following table defines an item of alarmInformationList.

Table 11.2.1.1.3.3-2: Definition of an item of alarmInformationList



Parameter name	S	Matching information	Comment
objectClass, objectInstance	M	MonitoredEntity.objectClass, MonitoredEntity.objectInstance	The MonitoredEntity is identified by the relation-AlarmObject-AlarmInformation.
notificationId	M	AlarmInformation.notificationId	
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.
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
systemDN	M	--	
alarmId	M	AlarmInformation.alarmId	
[objectClass], [objectInstance]	n/a	MonitoredEntity.objectClass, MonitoredEntity.objectInstance	Parameter identical to the first parameter in this list, shown here to clarify all elements of AlarmInformation are present
[notificationId]	n/a	AlarmInformation.notificationId	Parameter identical to the second parameter in this list, shown here to clarify all elements of AlarmInformation are present
alarmRaisedTime	M	AlarmInformation.alarmRaisedTime	
alarmChangedTime	O	AlarmInformation.alarmChangedTime	not applicable if the severity of related alarm was not changed
alarmClearedTime	M	AlarmInformation.alarmClearedTime	not applicable if related alarm was not cleared
alarmType	M	AlarmInformation.alarmType	
probableCause	M	AlarmInformation.probableCause	
specificProblem	O	AlarmInformation.specificProblem	
perceivedSeverity	M	AlarmInformation.perceivedSeverity	
backedUpStatus	O	AlarmInformation.backedUpStatus	not applicable if related alarm is a security alarm
backUpObject	O	MonitoredEntity.objectInstance	The MonitoredEntity is identified by relation-BackUpObject-AlarmInformation.  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
correlatedNotifications	O	The set of CorrelatedNotification instances related to this AlarmInformation.	
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	
rootCauseIndicator	O	AlarmInformation.rootCauseIndicator	
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
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
comments	M	The set of Comment instances related to this AlarmInformation.	Not applicable if the related alarm has no related comments

#### 11.2.1.1.3.4 Exceptions and constraints

Exception Name	Definition
operation_failed	<b>Condition:</b> Operation is failed <b>Returned Information:</b> The output parameter status <b>Exit state:</b> Entry State

#### 11.2.1.1.4 notifyNewAlarm

##### 11.2.1.1.4.1 Definition

This notification is generated by the MnS producer when a new AlarmInformation is added to the AlarmList. The notification parameters depend on the alarmType and are different for non-security and security alarms.

##### 11.2.1.1.4.2 Input parameters

The notifyNewAlarm notification is defined by Table 11.2.1.1.4.2-1, if the alarmType is equal to "Communications Alarm", "Processing Error Alarm", "Environmental Alarm". "Quality Of Service Alarm" or "Equipment Alarm".

Table 11.2.1.1.4.2-1: Input parameters for notifications related to non-security alarms

Parameter Name	Qualifier	Matching Information/ Information Type / Legal Values	Comment
objectClass	M	MonitoredEntity.objectClass	The MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation.
objectInstance	M	MonitoredEntity.objectInstance	The MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation.
notificationId	M	--	
notificationType	M	"notifyNewAlarm"	
eventTime	M	AlarmInformation.alarmRaisedTime	
systemDN	M	--	
alarmId	M	AlarmInformation.alarmId	
alarmType	M	AlarmInformation.alarmType	
probableCause	M	AlarmInformation.probableCause	
perceivedSeverity	M	AlarmInformation.perceivedSeverity	
specificProblem	O	AlarmInformation.specificProblem	
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	
correlatedNotifications	O	The CorrelatedNotification instances related to this AlarmInformation.	
stateChangeDefinition	O	AlarmInformation.stateChangeDefinition	
monitoredAttributes	O	AlarmInformation.monitoredAttributes	
proposedRepairActions	O	AlarmInformation.proposedRepairActions	
additionalText	O	AlarmInformation.additionalText	
additionalInformation	O	AlarmInformation.additionalInformation	
rootCauseIndicator	O	AlarmInformation.rootCauseIndicator	

## 11.2.1.1.4.2a Input parameters for notifications related to non-security alarms

The `notifyNewAlarm` notification is defined by Table 11.2.1.1.4.2a-1, if the `alarmType` is equal to "Integrity Violation", "Operational Violation", "Physical Violation", "Security Service or Mechanism Violation" or "Time Domain Violation".

**Table 11.2.1.1.4.2a-1: Input parameters for notifications related to security alarms**

Parameter Name	Qualifier	Matching Information/ Information Type / Legal Values	Comment
<code>objectClass</code>	M	<code>MonitoredEntity.objectClass</code>	The <code>MonitoredEntity</code> is identified by the relation- <code>AlarmedObject-AlarmInformation</code> of the new <code>AlarmInformation</code> .
<code>objectInstance</code>	M	<code>MonitoredEntity.objectInstance</code>	The <code>MonitoredEntity</code> is identified by the relation- <code>AlarmedObject-AlarmInformation</code> of the new <code>AlarmInformation</code> .
<code>notificationId</code>	M	--	
<code>notificationType</code>	M	" <code>notifyNewAlarm</code> "	
<code>eventTime</code>	M	<code>AlarmInformation.alarmRaisedTime</code>	
<code>systemDN</code>	M	--	
<code>alarmId</code>	M	<code>AlarmInformation.alarmId</code>	
<code>alarmType</code>	M	<code>AlarmInformation.alarmType</code>	
<code>probableCause</code>	M	<code>AlarmInformation.probableCause</code>	
<code>perceivedSeverity</code>	M	<code>AlarmInformation.perceivedSeverity</code>	
<code>correlatedNotifications</code>	O	The set of <code>CorrelatedNotification</code> related to this <code>AlarmInformation</code> .	
<code>additionalText</code>	O	<code>AlarmInformation.additionalText</code>	
<code>additionalInformation</code>	O	<code>AlarmInformation.additionalInformation</code>	
<code>rootCauseIndicator</code>	O	<code>AlarmInformation.rootCauseIndicator</code>	
<code>serviceUser</code>	M	<code>AlarmInformation.securityServiceUser</code>	This may contain no information if the identify of the service-user (requesting the service) is not known.
<code>serviceProvider</code>	M	<code>AlarmInformation.securityServiceProvider</code>	This shall always identify the service-provider receiving a service request, from <code>serviceUser</code> , that provokes the security alarm.
<code>securityAlarmDetector</code>	M	<code>AlarmInformation.securityAlarmDetector</code>	This may contain no information if the detector of the security alarm is the <code>serviceProvider</code> .

## 11.2.1.1.4.3 Triggering event

## 11.2.1.1.4.3.1 From-state

`noMatchedAlarm`.

Assertion Name	Definition
<code>noMatchedAlarm</code>	<code>AlarmList</code> does not contain an <code>AlarmInformation</code> 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- <code>AlarmObject-AlarmInformation</code> with the same <code>MonitoredEntity</code> as the one identified by the newly generated network alarm.

## 11.2.1.1.4.3.2 To-state

newAlarmInAlarmList.

Assertion Name	Definition
newAlarmInAlarmList	<p>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.</p> <p>The following attributes of the AlarmInformation shall be populated with information in the newly generated alarm: notificationId, alarmRaisedTime, alarmId, alarmType, , probableCause, perceivedSeverity.</p> <p>The following attributes of the same AlarmInformation shall be populated with information of 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.</p>

## 11.2.1.1.5 notifyChangedAlarm

## 11.2.1.1.5.1 Definition

This notification is generated by the MnS producer when the perceivedSeverity of an existing AlarmInformation changes (except to the value "CLEARED").

## 11.2.1.1.5.2 Input parameters

Parameter Name	S	Matching Information/ Information Type / Legal Values	Comment
objectClass	M	MonitoredEntity.objectClass	The MonitoredEntity is identified by the relation-AlarmObject-AlarmInformation.
objectInstance	M	MonitoredEntity.objectInstance	The MonitoredEntity is identified by the relation-AlarmObject-AlarmInformation.
notificationId	M	--	
notificationType	M	"notifyChangedAlarm"	
eventTime	M	AlarmInformation.alarmChangedTime	
systemDN	M	--	
alarmId	M	AlarmInformation.alarmId	
alarmType	M	AlarmInformation.alarmType	
probableCause	M	AlarmInformation.probableCause	
perceivedSeverity	M	AlarmInformation.perceivedSeverity	

## 11.2.1.1.5.3 Triggering event

## 11.2.1.1.5.3.1 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.

## 11.2.1.1.5.3.2 To-state

informationUpdate.

Assertion Name	Definition
informationUpdate	The AlarmInformation identified in alarmMatched in from-state has been updated according to the following rules: <ul style="list-style-type: none"><li>- notificationId is updated;</li><li>- alarmChangedTime is updated;</li><li>- perceivedSeverity is updated;</li><li>- ackTime, ackUserId and ackSystemId are updated to contain no information;</li><li>- ackState is updated to "unacknowledged";</li></ul>

## 11.2.1.1.6 notifyAlarmListRebuilt

## 11.2.1.1.6.1 Definition

This notification is generated by the MnS producer when the AlarmList has been completely or partially rebuilt.

## 11.2.1.1.6.2 Input parameters

Parameter Name	S	Legal type	Comment
objectClass	M	--	Identifies, together with the objectInstance parameter, the part of the alarm list that has been rebuilt.  If this parameter specifies the class of the instance carried in systemDN, then all AlarmInformation instances in the AlarmList may have been rebuilt.  If this parameter specifies some class represented by MonitoredEntity, then a subset of the AlarmInformation instances in the AlarmList may have been rebuilt.
objectInstance	M	--	Identifies, together with the objectClass parameter, the part of the alarm list that has been rebuilt.  If this parameter is equal to the instance carried in systemDN, then all AlarmInformation instances in the AlarmList may have been rebuilt.  If this parameter is equal to some instance represented by MonitoredEntity, then only AlarmInformation related to this instance and its descendants may have been rebuilt..
notificationId	M	--	--
notificationType	M	"notifyAlarmListRebuilt"	
eventTime	M	--	The time when the alarm list has been rebuilt.
systemDN	M	--	It identifies the DN of service providers.
reason	M	"System-NE communication error", "System restarts", "indeterminate". Other values can be added.	The reason why the system has rebuilt the AlarmList. This may carry different reasons than that carried by the immediate previous notifyPotentialFaultyAlarmList.
alarmListAlignmentRequirement	O	"alignmentRequired", "alignmentNotRequired".	It carries an enumeration of "alignmentRequired" and "alignmentNotRequired".

## 11.2.1.1.6.3 Triggering event

## 11.2.1.1.6.3.1 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.

## 11.2.1.1.6.3.2 To-state

alarmListRebuilt\_2.

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

## 11.2.1.1.7 notifyCorrelatedNotificationChanged

## 11.2.1.1.7.1 Definition

This notification is generated by the MnS producer when the set of CorrelatedNotification is created, updated or deleted.

## 11.2.1.1.7.2 Input parameters

Parameter Name	S	Matching Information/ Information Type / Legal Values	Comment
objectClass	M	MonitoredEntity.objectClass	The MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation.
objectInstance	M	MonitoredEntity.objectInstance	The MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation.
notificationId	M	--	
notificationType	M	"notifyCorrelatedNotificationChanged"	
eventTime	M	It carries the time when the CorrelatedNotification is created, updated or deleted.	
systemDN	M	--	
alarmId	M	AlarmInformation.alarmId	
correlatedNotifications	M	The CorrelatedNotification instances related to this AlarmInformation.	
rootCauseIndicator	O	AlarmInformation.rootCauseIndicator	

## 11.2.1.1.7.3 Triggering event

## 11.2.1.1.7.3.1 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.

## 11.2.1.1.7.3.2 To-state

alarmCorrelatedInfoUpdated.

Assertion Name	Definition
alarmCorrelatedInfoUpdated	The set of CorrelatedNotification network slice instances is created, updated or deleted.

## 11.2.1.1.8 getAlarmCount

## 11.2.1.1.8.1 Definition

A MnS consumer invokes this operation to get the number of alarms in the alarm list. The alarms are counted separately for each perceived severity level. An input parameter allows to control which alarms are counted.



## 11.2.1.1.8.2 Input parameters

Name	S	Information Type	Comment
filter	O	N/A	<p>It carries a filter constraint. The operation shall apply it when counting the AlarmInformation instances in AlarmList.</p> <p>Case when synchronous mode of operation is used for getAlarmList:</p> <p>(a) If this parameter is present, the operation shall count the AlarmInformation instances which satisfy both (a) this filter constraint and (b) the condition set by input parameter alarmAckState.</p> <p>(b) If this parameter is absent, the operation shall count all AlarmInformation instances that satisfy the condition set by input parameter alarmAckState.</p> <p>Case when asynchronous mode of operation is used for getAlarmList:</p> <p>(a) If this parameter is present, the operation shall count all AlarmInformation instances that satisfy this filter constraint and the condition set by input parameter alarmAckState.</p> <p>(b) If this parameter is absent, the operation shall count AlarmInformation instances that satisfy (a) the filter constraint currently active in the notification channel established between the authorized consumer and the service provider and (b) the condition set by input parameter alarmAckState.</p>
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 operation shall apply it on AlarmInformation instances in AlarmList when counting.

## 11.2.1.1.8.3 Output parameters

Name	S	Matching Information	Comment
criticalCount, majorCount, minorCount, warningCount, indeterminateCount, clearedCount	M	N/A	<p>They carry the number of AlarmInformation in AlarmList that has the following properties.</p> <p>Case when synchronous mode of operation is used:</p> <p>(a) The operation shall apply the constraints expressed in alarmAckState and filter to AlarmInformation instances when counting.</p> <p>Case when asynchronous mode of operation is used (i.e. this output parameter is conveyed via notifications):</p> <p>(a) If the filter parameter is present, the operation shall apply the constraint when counting. Furthermore, if the alarmAckState constraint is present, the operation shall apply that constraint as well. The filter constraint, if any, that is currently active in the notification channel is not used for the counting.</p> <p>(b) If the filter parameter is absent, the operation shall apply the filter constraint currently active in the notification channel when counting. If the alarmAckState constraint is present, the operation shall apply that constraint as well.</p>
status	M	ENUM (OperationSucceeded, OperationFailed)	<p>If allAlarmInformationCounted is true, status = OperationSucceeded.</p> <p>If operation_failed is true, status = OperationFailed.</p>

## 11.2.1.1.8.4 Pre-condition

There are no pre-conditions.

## 11.2.1.1.8.5 Post-condition

allAlarmInformationCounted.

Assertion Name	Definition
allAlarmInformationCounted	All AlarmInformation that satisfy the constraints expressed in input parameters filter and alarmAckState and are present in the AlarmList at the moment of this operation invocation are counted and the result returned. All AlarmInformation in AlarmList remains unchanged as the result of this operation.

## 11.2.1.1.8.6 Exceptions

Name	Definition
operation_failed	<b>Condition:</b> the pre-condition is false or the post-condition is true. <b>Returned Information:</b> The output parameter status. <b>Exit state:</b> Entry state.
filter_complexity_limit	<b>Condition:</b> Operation not performed because the filter parameter is too complex. <b>Returned Information:</b> The output parameter status. <b>Exit state:</b> Entry state.

## 11.2.1.1.9 setComment

## 11.2.1.1.9.1 Definition

A MnS consumer invokes this operation to set a comment in one or more AlarmInformation instances in AlarmList.

## 11.2.1.1.9.2 Input parameters

Name	S	Information Type	Comment
alarmInformationReferenceList	M	List of AlarmInformation.alarmId	It carries one or more identifiers identifying AlarmInformation instances in the AlarmList.
commentUserId	M	Comment.commentUserId	The Comment is identified by the relation-AlarmInformation-Comment.
commentSystemId	O	Comment.commentSystemId	The Comment is identified by the relation-AlarmInformation-Comment.
commentText	M	Comment.commentText	The Comment is identified by the relation-AlarmInformation-Comment.

## 11.2.1.1.9.3 Output Parameters

Name	Qualifier	Matching Information	Comment
badAlarmInformationReferenceList	M	List of pair of AlarmInformation.alarmId and the failure reason.	If allUpdated is true, it contains no information. If someUpdated is true, then it contains identifications of AlarmInformation that are not present in AlarmList or that they are present, but AlarmInformation.comments has not changed, in contrast to authorized consumer's request.
status	M	ENUM( Operation succeeded, Operation failed, Operation partially failed)	If allUpdated is true, then status = OperationSucceeded. If someUpdated is true, then status = OperationPartiallyFailed. If exception operationFailed is raised, then status = OperationFailed.

## 11.2.1.2 Fault supervision data control management service

### 11.2.1.2.1 acknowledgeAlarms

#### 11.2.1.2.1.1 Definition

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

When this operation is not supported, the MnS producer shall support acknowledging alarms.

#### 11.2.1.2.1.2 Input parameters

Parameter Name	S	Information Type / Legal Values	Comment
alarmInformationReferenceList	M	SET OF SEQUENCE { AlarmInformation.alarmId (M) AlarmInformation.perceivedSeverity (O) }	It identifies the alarms to be acknowledged. If an alarm id is qualified with an optional perceived severity, the alarm shall be acknowledged only when the perceived severity in the alarm list matches the perceived severity provided in the operation request.
ackUserId	M	AlarmInformation.ackUserId	The identifier of the user acknowledging the alarm.
ackSystemId	O	AlarmInformation.ackSystemId	The identifier of the system where the acknowledgement request was originated.

#### 11.2.1.2.1.3 Output parameters

Parameter Name	S	Matching Information / Information Type / Legal Values	Comment
badAlarmInformationReferenceList	M	SET OF SEQUENCE { AlarmInformation.alarmId (M) errorReason (M) }  errorReason ::= ENUM { UnknownAlarmId, AcknowledgmentFailed, WrongPerceivedSeverity }	If all alarms are acknowledged, it contains no information. If only some alarms are acknowledged, then it contains identifications of AlarmInformation that are  (a) present in input parameter AlarmInformationReferenceList but absent in the AlarmList (errorReason = UnknownAlarmId; or  (b) present in input parameter AlarmInformationReferenceList and present in the AlarmList but the Acknowledgement Information (see note below table) has not changed despite the consumer's request (errorReason = AcknowledgmentFailed); or  (c) present in input parameter AlarmInformationReferenceList and present in the AlarmList but the perceivedSeverity to be acknowledged has changed and/or is different in the AlarmList (ErrorReason = WrongPerceivedSeverity), applicable only if perceivedSeverity is provided.
status	M	ENUM { OperationSucceeded, OperationPartiallySucceeded, OperationFailed }	If all alarms acknowledged, then status = OperationSucceeded.  If some alarms are acknowledged, then status = OperationPartiallySucceeded.  If operation failed is true, then status = OperationFailed.

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

## 11.2.1.2.1.4 Exceptions and constraints

Exception Name	Definition
operation_failed	<b>Condition:</b> Operation is failed <b>Returned Information:</b> The output parameter status <b>Exit state:</b> Entry State

## 11.2.1.2.2 unacknowledgeAlarms

## 11.2.1.2.2.1 Definition

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

## 11.2.1.2.2.2 Input parameters

Parameter Name	S	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	The identifier of the user unacknowledged the alarm.
ackSystemId	O	AlarmInformation.ackSystemId	The identifier of the system where the acknowledgement request was originated.

## 11.2.1.2.2.3 Output parameters

Parameter Name	Support Qualifier	Matching Information / Information Type / Legal Values	Comment
badAlarmInformationReferenceList	M	SET OF SEQUENCE { AlarmInformation.alarmId (M) errorReason (M) }  errorReason ::= ENUM { UnknownAlarmId, AcknowledgmentFailed, WrongPerceivedSeverity, }	If all alarms are acknowledged, it contains no information.  If only some alarms are acknowledged, then it contains identifications of AlarmInformation that are  (a) present in input parameter AlarmInformationReferenceList but absent in the AlarmList (errorReason = UnknownAlarmId; or  (b) present in input parameter AlarmInformationReferenceList and present in the AlarmList but the Acknowledgement Information (see note below table) has not changed despite the consumer's request (errorReason = AcknowledgmentFailed); or  (c) present in input parameter AlarmInformationReferenceList and present in the AlarmList but the perceivedSeverity to be acknowledged has changed and/or is different in the Alarm List (ErrorReason = WrongPerceivedSeverity), applicable only if perceivedSeverity is provided.
status	M	ENUM { OperationSucceeded, OperationPartiallySucceeded, OperationFailed	If all alarms acknowledged, then status = OperationSucceeded.  If some alarms are acknowledged, then status = OperationPartiallySucceeded.  If operation failed is true, then status = OperationFailed.

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

## 11.2.1.2.2.4 Exceptions and constraints

Exception Name	Definition
Operation_failed	<b>Condition:</b> Operation is failed <b>Returned Information:</b> The output parameter status <b>Exit state:</b> Entry State

## 11.2.1.2.3 clearAlarms

## 11.2.1.2.3.1 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.

## 11.2.1.2.3.2 Input parameters

Parameter Name	S	Information Type / Legal Values	Comment
alarmInformationReferenceList	M	List of AlarmInformation.alarmId	It carries one or more identifiers identifying AlarmInformation instances in the AlarmList.
clearUserId	M	AlarmInformation.clearUserId	It identifies 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.

## 11.2.1.2.3.3 Output parameters

Parameter Name	S	Matching Information / Information Type / Legal Values	Comment
badAlarmInformationReferenceList	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.

## 11.2.1.2.3.4 Exceptions and constraints

Exception Name	Definition
operation_failed	<b>Condition:</b> Operation is failed <b>Returned Information:</b> The output parameter status <b>Exit state:</b> Entry State

## 11.2.1.2.4 notifyClearedAlarm

## 11.2.1.2.4.1 Definition

This notification is generated by the MnS producer when the perceivedSeverity of an existing AlarmInformation changes to "CLEARED".

## 11.2.1.2.4.2 Input parameters

Parameter Name	S	Matching Information/ Information Type / Legal Values	Comment
objectClass	M	MonitoredEntity.objectClass	
objectInstance	M	MonitoredEntity.objectInstance	
notificationId	M	--	
notificationType	M	"notifyClearedAlarm"	
eventTime	M	AlarmInformation.alarmClearedTime	
systemDN	M	--	
alarmId	M	AlarmInformation.alarmId	
alarmType	M	AlarmInformation.alarmType	
probableCause	M	AlarmInformation.probableCause	
perceivedSeverity	M	AlarmInformation.perceivedSeverity	Value shall be "CLEARED"
correlatedNotifications	O	The CorrelatedNotification instances related to this AlarmInformation.	This parameter contains references to other AlarmInformation instances whose perceivedSeverity levels are cleared as well. In this way, the perceivedSeverity level of multiple AlarmInformation instances can be cleared by one notification.
clearUserId	O	AlarmInformation.clearUserId	This parameter shall be present and contain valid information if the AlarmInformation is cleared by a clearAlarms operation request.
clearSystemId	O	AlarmInformation.clearSystemId	This parameter is present if clearUserId is present and if AlarmInformation.clearSystemId contains valid information.

## 11.2.1.2.4.3 Triggering event

## 11.2.1.2.4.3.1 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.

## 11.2.1.2.4.3.2 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, alarmClearedTime, perceivedSeverity (updated to CLEARED), alarmClearedUserId, alarmClearedSystemId.

## 11.2.1.2.5 notifyAckStateChanged

## 11.2.1.2.5.1 Definition

This notification is generated by the MnS producer when a the acknowledgement state of an alarm changes from "UNACKNOWLEDGED" to "ACKNOWLEDGED" or back from "ACKNOWLEDGED" to "UNACKNOWLEDGED".

## 11.2.1.2.5.2 Input parameters

Parameter Name	S	Matching Information/ Information Type / Legal Values	Comment
objectClass	M	MonitoredEntity.objectClass	
objectInstance	M	MonitoredEntity.objectInstance	
notificationId	M	--	
notificationType	M	"notifyAckStateChanged"	
eventTime	M	AlarmInformation.ackTime	
systemDN	M	--	
alarmId	M	AlarmInformation.alarmId	
alarmType	M	AlarmInformation.alarmType	
probableCause	M	AlarmInformation.probableCause	
perceivedSeverity	M	AlarmInformation.perceivedSeverity	
ackState	M	AlarmInformation.ackState	
ackUserId	M	AlarmInformation.ackUserId	The identifier of the user who acknowledged or unacknowledged the alarm.
ackSystemId	O	AlarmInformation.ackSystemId	The identifier of the system where the acknowledgement or unacknowledgement request was originated.

## 11.2.1.2.5.3 Triggering event

## 11.2.1.2.5.3.1 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) acknowledgeAlarms equivalent operation and a subsequent operation success return.
alarmInformationExists	The AlarmInformation exists in AlarmList.

## 11.2.1.2.5.3.2 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.

## 11.2.1.2.6 notifyComments

## 11.2.1.2.6.1 Definition

This notification is generated by the MnS producer when a Comment instance is added to an AlarmInformation instance in the AlarmList.



A MnS producer shall support this notification if it supports the operation `setComment`.

#### 11.2.1.2.6.2 Input parameters

Parameter Name	S	Matching Information/ Information Type / Legal Values	Comment
objectClass	M	MonitoredEntity.objectClass	
objectInstance	M	MonitoredEntity.objectInstance	
notificationId	M	--	
notificationType	M	"notifyComments"	
eventTime	M	Comment.commentTime	
systemDN	M	--	
alarmId	M	AlarmInformation.alarmId	
alarmType	M	AlarmInformation.alarmType	
probableCause	M	AlarmInformation.probableCause	
perceived Severity	M	AlarmInformation.perceivedSeverity	
comments	M	The Comment instances related to this AlarmInformation.	

#### 11.2.1.2.6.3 Trigger event

##### 11.2.1.2.6.3.1 From-state

`commentedByServiceprovider` OR `commentedByServiceprovider` AND `alarmInformationExists`.

Assertion Name	Definition
<code>commentedByServiceprovider</code>	Reception of a <code>setComment</code> operation and a subsequent operation success return.
<code>commentedByServiceprovider</code>	Reception of a local (non-standard) <code>setComment</code> equivalent operation and a subsequent operation success return.
<code>alarmInformationExists</code>	The AlarmInformation is in AlarmList.

##### 11.2.1.2.6.3.2 To-state

`commentInserted`.

Assertion Name	Definition
<code>commentInserted</code>	One Comment has been created and it is involved in a relationship with the AlarmInformation identified by from-state assertion <code>alarmInformationExists</code> . The following attributes of the newly created Comment instance shall be populated:  <code>commentTime</code> , <code>commentText</code> , <code>commentUserId</code> and <code>commentSystemId</code> .

#### 11.2.1.2.7 notifyPotentialFaultyAlarmList

##### 11.2.1.2.7.1 Definition

This notification is generated by the MnS producer when the MnS producer loses confidence in the integrity of its alarm list.

The MnS producer may then rebuild the faulty alarm list. When the alarm List is rebuilt or confidence in the existing alarm list is re-established the MnS producer may generate a `notifyAlarmListRebuilt` notification.

The parameters `objectClass` and `objectInstance` are used to specify if the complete alarm list is unreliable or only parts thereof.

The MnS consumer behaviour, on reception of this notifyPotentialFaultyAlarmList notification, is not specified. The authorized consumer behaviour is considered not essential for the specification of the interface itself. However, the following are recommended actions the uthorized consumer should take, in case it receives this notification.

- 1) The uthorized consumer should not perform any task requiring the integrity of the AlarmInformation identified as faulty or unreliable by the subject notification.
- 2) The uthorized consumer should not invoke operations that require integrity of the AlarmList such as getAlarmList., acknowledgeAlarms operations.

#### 11.2.1.2.7.2 Input parameters

Parameter Name	S	Matching Information/ Information Type / Legal Values	Comment
objectClass	M	It identifies the class of the instance identified by systemDN or the class of MonitoredEntity.	Identifies, together with the objectInstance parameter, the part of the alarm list that is not reliable.  If this paramter specifies the class of the instance carried in systemDN, then all AlarmInformation instances in the AlarmList may not be reliable.  If this parameter specifies some class represented by MonitoredEntity, then a subset of the AlarmInformation instances in the AlarmList is not reliable.
objectInstance	M	It identifies the instance identified by systemDN or an instance of MonitoredEntity.	Identifies, together with the objetClass parameter, the part of the alarm list that may not be reliable.  If this parameter is equal to the instance carried in systemDN, then all AlarmInformation instances in the AlarmList may not be reliable.  If this parameter is equal to some instance represented by MonitoredEntity, then only AlarmInformation related to this instance and its descendants may not be reliable.
notificationId	M	--	
notificationType	M	"notifyPotentialFaultyAlarmLi st"	
eventTime	M	--	Time when the MnS producer lost confidence in the integrity of the alarm list
systemDN	M	--	
reason	M	"serviceprovider-NE communication error", " serviceprovider restarts", "indeterminate". Other values can be added.	Reason why the MnS producer has to rebuild its AlarmList.

#### 11.2.1.2.7.3 Trigger event

##### 11.2.1.2.7.3.1 From-state

faultyAlarmListDetected.

Assertion Name	Definition
faultyAlarmListDetecte d	Service provider detects faults in part or whole of its AlarmList.

##### 11.2.1.2.7.3.2 To-state

faultyAlarmList

Assertion Name	Definition
faultyAlarmList	Service provider initiates the AlarmList rebuild process.

#### 11.2.1.2.8 notifyChangedAlarmGeneral

##### 11.2.1.2.8.1 Definition

This notification is generated by the MnS producer when one or more of the following attributes of an AlarmInformation instance in the AlarmList changes its value: backedUpStatus, backUpObject, trendIndication, thresholdInfo, stateChangeDefinition, monitoredAttributes, proposedRepairActions, additionalText, additionalInformation, serviceUser, serviceProvider or securityAlarmDetector.

The notification parameters depend on the alarmType and are different for non-security and security alarms.

##### 11.2.1.2.8.2 Input parameters for notifications related to non-security alarms

The notifyChangedAlarmGeneral notification is defined by Table 11.2.1.2.8.2-1, if the alarmType is equal to "Communications Alarm", "Processing Error Alarm", "Environmental Alarm". "Quality Of Service Alarm" or "Equipment Alarm".

**Table 11.2.1.2.8.2-1: Input parameters for notifications related to non-security alarms**

Parameter Name	S	Matching Information/ Information Type / Legal Values	Comment
objectClass	M	MonitoredEntity.objectClass	
objectInstance	M	MonitoredEntity.objectInstance	
notificationId	M	--	
notificationType	M	"notifyChangedAlarmGeneral"	
eventTime	M	AlarmInformation.alarmChangedTime	
systemDN	M	--	
alarmId	M	AlarmInformation.alarmId	
alarmType	M	AlarmInformation.alarmType	
probableCause	M	AlarmInformation.probableCause	
specificProblem	O	AlarmInformation.specificProblem	
correlatedNotifications	O	The set of CorrelatedNotification related to this AlarmInformation.	
backedUpStatus	O	AlarmInformation.backedUpStatus	
backUpObject	O	MonitoredEntity.objectInstance	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	
correlatedNotifications	O	Set of CorrelatedNotification related to this AlarmInformation.	
stateChangeDefinition	O	AlarmInformation.stateChange	
monitoredAttributes	O	AlarmInformation.monitoredAttributes	
proposedRepairActions	O	AlarmInformation.proposedRepairActions	
additionalText	O	AlarmInformation.additionalText	
additionalInformation	O	AlarmInformation.additionalInformation	
rootCauseIndicator	O	alarmInformation.rootCauseIndicator	
changedAlarmAttributes	M	LIST OF SEQUENCE <AttributeName, OldAttributeValue>	The changed alarm attributes (name/value pairs) (with old values).

##### 11.2.1.2.8.3 Input parameters for notifications related to security alarm

The notifyChangedAlarmGeneral notification is defined by Table 11.2.1.1.4.2a-1, if the alarmType is equal to "Integrity Violation", "Operational Violation", "Physical Violation", "Security Service or Mechanism Violation" or "Time Domain Violation".

Table 11.2.1.2.8.3-1: Input parameters for notifications related to security alarms

Parameter Name	S	Matching Information/ Information Type / Legal Values	Comment
objectClass	M	MonitoredEntity.objectClass	
objectInstance	M	MonitoredEntity.objectInstance	
notificationId	M	--	
notificationType	M	"notifyChangedAlarmGeneral".	
eventTime	M	AlarmInformation.alarmChanged Time	
systemDN	M	--	
alarmId	M	AlarmInformation.alarmId	
alarmType	M	AlarmInformation.alarmType	
probableCause	M	AlarmInformation.probableCause	
perceivedSeverity	M	AlarmInformation.perceivedSeverity	
correlatedNotifications	O	Set of CorrelatedNotification related to this AlarmInformation.	
additionalText	O	AlarmInformation.additionalText	
additionalInformation	O	AlarmInformation.additionalInformation	
rootCauseIndicator	O	alarmInformation.rootCauseIndicator	
serviceUser	M	AlarmInformation.serviceUser	This may contain no information if the identify of the service-user (requesting the service) is not known.
serviceProvider	M	AlarmInformation.serviceProvider	This shall always identify the service-provider receiving a service request, from serviceUser, that provokes the security alarm.
securityAlarmDetector	M	AlarmInformation.securityAlarm Detector	This may contain no information if the detector of the security alarm is the serviceProvider.
changedAlarmAttributes	M	LIST OF SEQUENCE <AttributeName, OldAttributeValue>	The changed alarm attributes (name/value pairs) (with old values).

## 11.2.1.2.8.4 Trigger event

## 11.2.1.2.8.4.1 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.
alarmChanged	The backedUpStatus, backUpObject, trendIndication, thresholdInfo, stateChangeDefinition, monitoredAttributes, proposedRepairActions, additionalText, additionalInformation, serviceUser, serviceProvider or securityAlarmDetector of the newly generated network alarm and of the matched AlarmInformation are different.

## 11.2.1.2.8.4.2 To-state

informationUpdate.

Assertion Name	Definition
informationUpdate	The AlarmInformation identified in alarmMatched in from-state has been updated according to the following rules: backedUpStatus, backUpObject, trendIndication, thresholdInfo, stateChangeDefinition, monitoredAttributes, proposedRepairActions, additionalText, additionalInformation, serviceUser, serviceProvider or securityAlarmDetector is updated; notificationId is updated; alarmChangedTime is updated; ackTime, ackUserId and ackSystemId are updated to contain no information; ackState is updated to "unacknowledged";

## 11.2.2 Managed information

### 11.2.2.1 Alarm information, alarm state change and Information Object Classes

#### 11.2.2.1.1 Imported information entities and local labels

None.

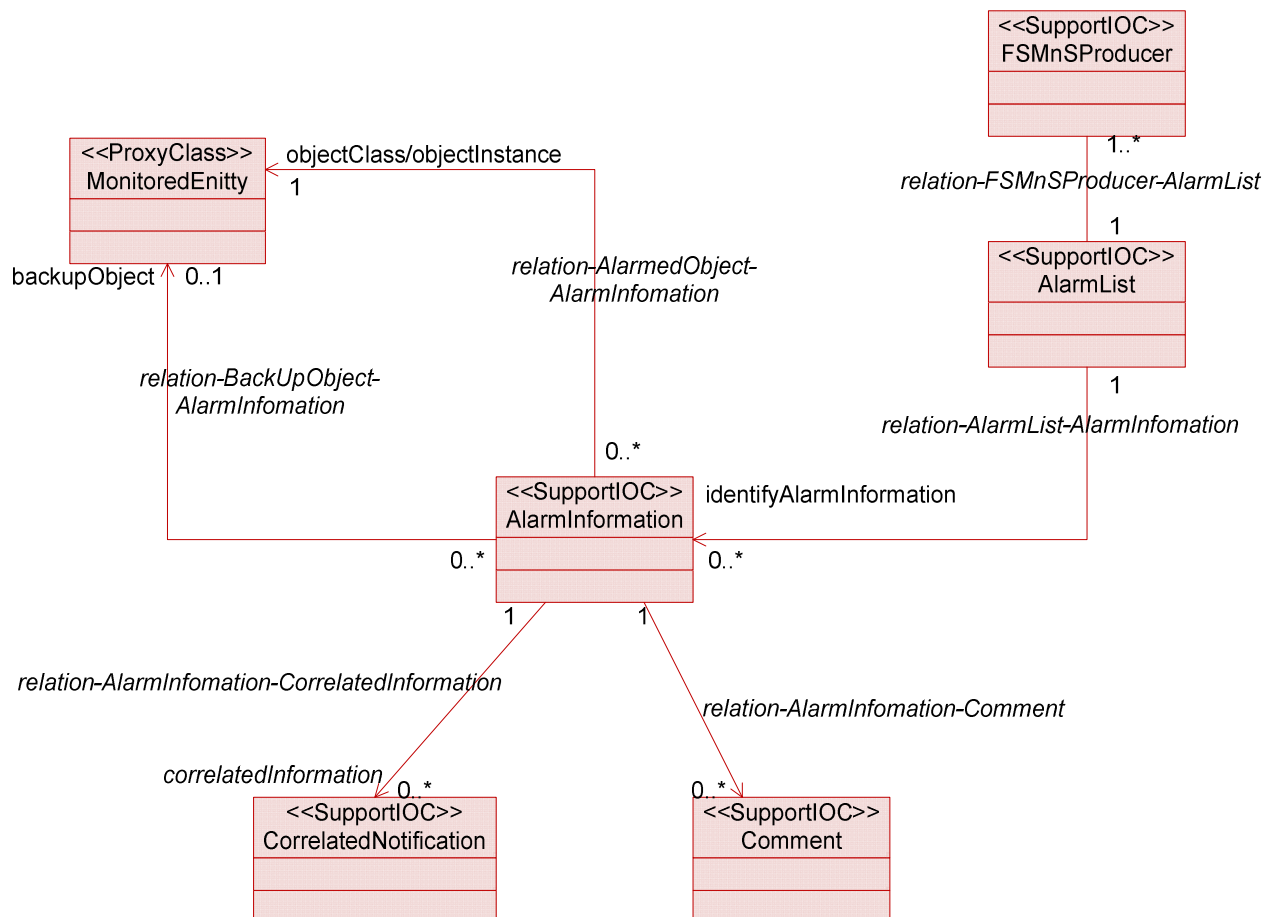
#### 11.2.2.1.2 Class diagram

##### 11.2.2.1.2.1 Introduction

This clause introduces the fault supervision related classes (i.e. IOCs, SupportIOCs). 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.

#### 11.2.2.1.2.2 Attributes and relationships



#### 11.2.2.1.3 Information Object Class Definitions

##### 11.2.2.1.3.1 AlarmInformation

###### 11.2.2.1.3.1.1 Definition

AlarmInformation contains information about alarm conditions of an alarmed MonitoredEntity.

A MnS producer is related to at most one AlarmList. The MnS producer assigns an identifier, called alarmId, to each AlarmInformation in the AlarmList. An alarmId unambiguously identifies one AlarmInformation in the AlarmList.

## 11.2.2.1.3.1.2 Attribute

Attribute name	S
alarmId	M
objectClass/objectInstance (attribute related to role)	M
notificationId	M
alarmRaisedTime	M
alarmChangedTime	O
alarmClearedTime	M
alarmType	M
probableCause	M
specificProblem	O
perceivedSeverity	M
backedUpStatus	O
backUpObject (attribute related to role)	O
trendIndication	O
thresholdInfo	O
correlatedNotifications (attribute related to role)	O
stateChangeDefinition	O
monitoredAttributes	O
proposedRepairActions	O
additionalText	O
additionalInformation	O(see note 3)
rootCauseIndicator	O
ackTime	M
ackUserId	M
ackSystemId	O
ackState	M
clearUserId	O (see note 1)
clearSystemId	O (see note 1)
serviceUser	O (see note 2)
serviceProvider	O (see note 2)
securityAlarmDetector	O (see note 2)
NOTE 1: These attributes and qualifiers are applicable only if the management service producer supports clearAlarms() (they are absent if clearAlarms() is not supported).	
NOTE 2: These attributes are supported if the management service producer emits notifyNewAlarm that carries security alarm information.	
NOTE 3: This attribute is optionally populated whenever vendor specific attributes are needed.	

## 11.2.2.1.3.1.3 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 FaultSupervision MnS producer because of the triggering event;
- Z is the notification to be emitted by FaultSupervision MnS producer because of the triggering event.

Note that acknowledgeAlarm^notifyAckStateChanged and the unacknowledgeAlarm^notifyAckStateChanged 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. 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 11.2.2.1.3.1.3-1 is used if it supports ^notifyChangedAlarm and Figure 11.2.2.1.3.1.3-2 is used if it does not support ^notifyChangedAlarm.

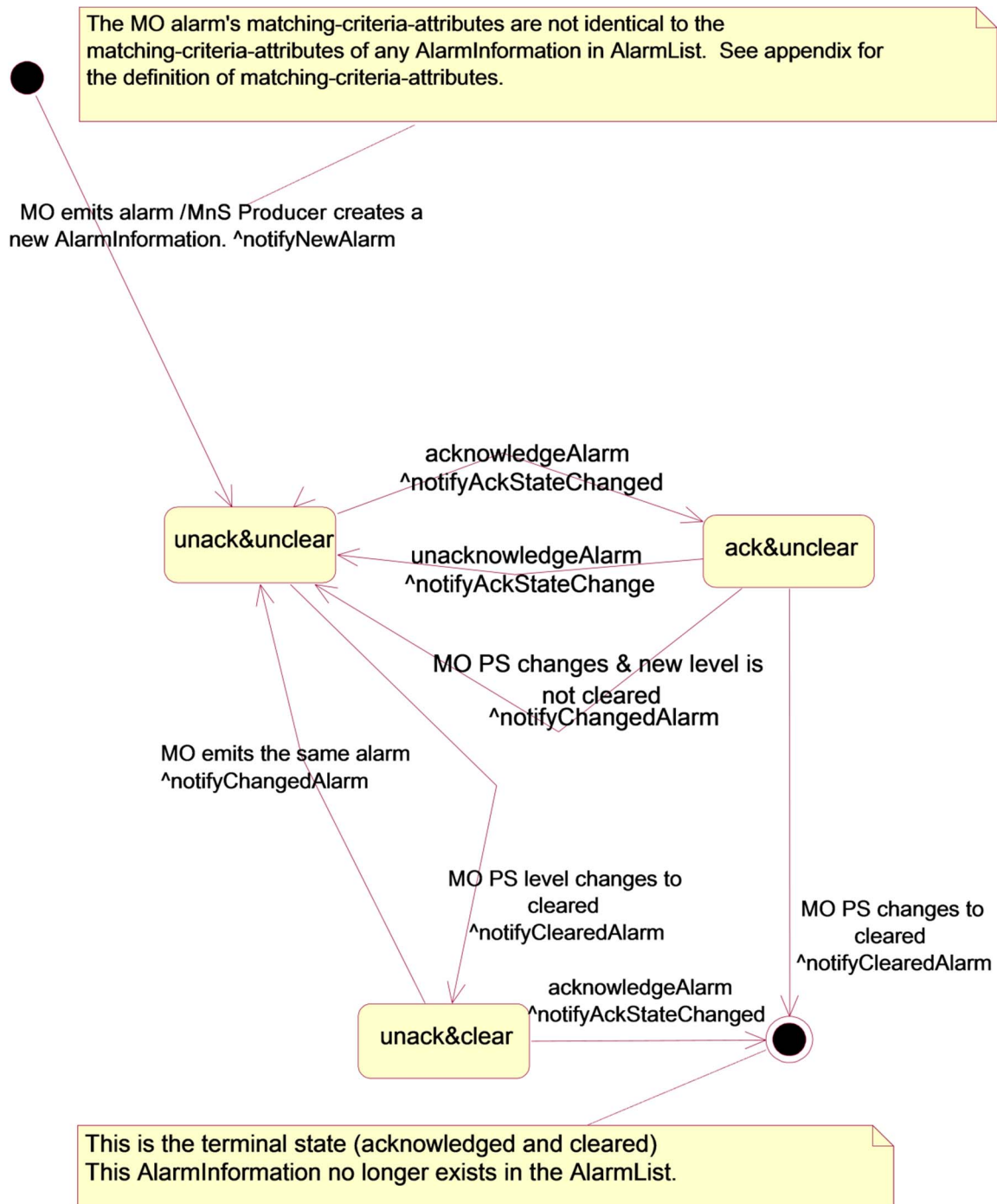


Figure 11.2.2.1.3.1.3-1 notifyChangedAlarm supported



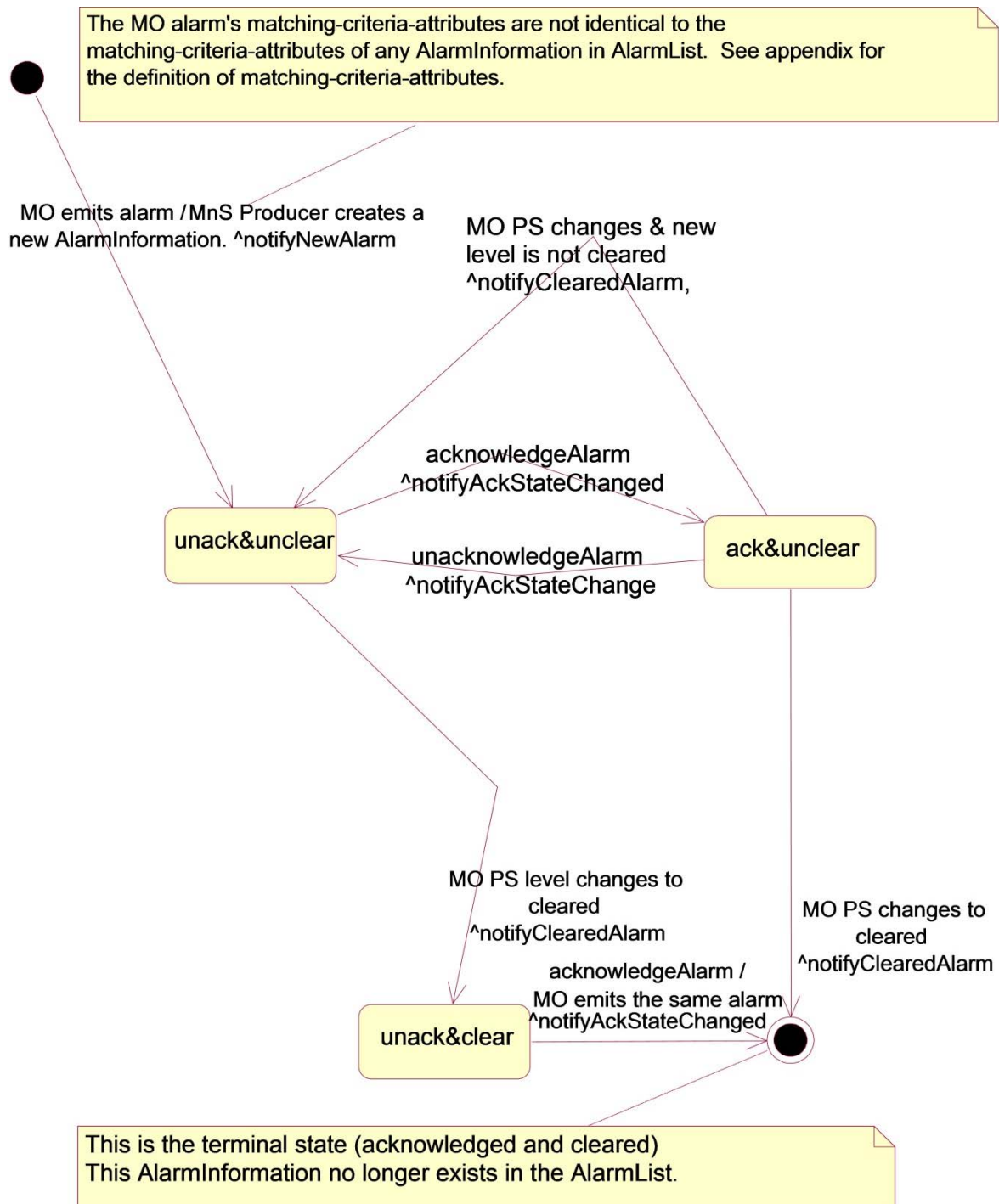


Figure 11.2.2.1.3.1.3-2 notifyChangedAlarm not supported

11.2.2.1.3.2 AlarmList

11.2.2.1.3.2.1 Definition

The MnS producer 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.

11.2.2.1.3.2.2 Attribute

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

## 11.2.2.1.3.3 FSMnSProducer

## 11.2.2.1.3.3.1 Definition

FSMnSProducer is the representation of the entity who provides the fault supervision management service(s) and contains the AlarmList.

## 11.2.2.1.3.3.2 Attribute

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

## 11.2.2.1.3.3.3 Notification Table

Name	S	Notes
notifyAlarmListRebuilt	M	
notifyPotentialFaultyAlarmList	O	.

## 11.2.2.1.3.4 Comment

## 11.2.2.1.3.4.1 Definition

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

## 11.2.2.1.3.4.2 Attribute

Attribute Name	S
commentTime	M
commentUserId	M
commentSystemId	O
commentText	M

## 11.2.2.1.3.5 CorrelatedNotification

## 11.2.2.1.3.5.1 Definition

The sourceObjectInstance attribute of CorrelatedNotification identifies one MonitoredEntity. For the 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 is not restricted to carrying alarm information only. 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.

## 11.2.2.1.3.5.2 Attribute

Attribute Name	S
sourceObjectInstance	M
notificationIdSet	M

## 11.2.2.1.3.6 MonitoredEntity

## 11.2.2.1.3.6.1 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.

## 11.2.2.1.3.6.2 Attribute

There is no attribute for this class.

#### 11.2.2.1.4 Information relationships definition

##### 11.2.2.1.4.1 relation-FSMnSProducer-AlarmList (M)

###### 11.2.2.1.4.1.1 Definition

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

###### 11.2.2.1.4.1.2 Role

There is no role defined for this relationship.

###### 11.2.2.1.4.1.3 Constraint

There is no constraint for this relationship.

##### 11.2.2.1.4.2 relation-AlarmList-AlarmInformation (M)

###### 11.2.2.1.4.2.1 Definition

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

###### 11.2.2.1.4.2.2 Role

Name	Definition
<code>identifyAlarmInformation</code>	It represents a capability to obtain the information contained in <code>AlarmInformation</code> .

###### 11.2.2.1.4.2.3 Constraint

Name	Definition
<code>inv_hasAlarmInformation1</code>	No <code>AlarmInformation</code> playing the role of the <code>AlarmInformation</code> shall have its <code>perceivedSeverity</code> = "cleared" and its <code>ackState</code> = "acknowledged".
<code>inv_hasAlarmInformation2</code>	The <code>alarmId</code> of all <code>AlarmInformation</code> instances playing the role of the <code>AlarmInformation</code> are distinct.

##### 11.2.2.1.4.3 relation-AlarmInformation-Comment (M)

###### 11.2.2.1.4.3.1 Definition

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

###### 11.2.2.1.4.3.2 Role

Name	Definition
<code>comment</code>	It represents a capability to obtain the information contained in <code>Comment</code> .

###### 11.2.2.1.4.3.3 Constraint

There is no constraint.

##### 11.2.2.1.4.4 relation-AlarmInformation-CorrelatedNotification (M)

###### 11.2.2.1.4.4.1 Definition

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

## 11.2.2.1.4.4.2 Role

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

## 11.2.1.4.4.3 Constraint

There is no constraint.

## 11.2.2.1.4.5 relation-AlarmedObject-AlarmInformation (M)

## 11.2.2.1.4.5.1 Definition

This represents the relationship between MonitoredEntity and AlarmInformation.

## 11.2.2.1.4.5.2 Role

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

## 11.2.2.1.4.5.3 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: alarmType, probableCause and specificProblem.

## 11.2.2.1.4.6 relation-backUpObject-AlarmInformation (O)

## 11.2.2.1.4.6.1 Definition

The relationship represents the relationship between AlarmInformation and the backUpObject.

## 11.2.2.1.4.6.2 Role

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

## 11.2.2.1.4.6.3 Constraint

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

11.2.2.1.5 Information attribute definition

11.2.2.1.5.1 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 date and 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 management service consumer would not change this date and time.	All values indicating valid date and time.
alarmClearedTime	It indicates the date and time when the alarm is cleared.	All values indicating valid date and time.
alarmType	<p>It indicates the type of alarm.</p> <p>Communications Alarm: An alarm of this type is associated with the procedure and/or process required conveying information from one point to another (ITU-T Recommendation X.733 [x]).</p> <p>Processing Error Alarm: An alarm of this type is associated with a software or processing fault (ITU T Recommendation X.733 [x]).</p> <p>Environmental Alarm: An alarm of this type is associated with a condition related to an enclosure in which the equipment resides (ITU-T Recommendation X.733 [x]).</p> <p>Quality of Service Alarm: An alarm of this type is associated with degradation in the quality of a service (ITU T Recommendation X.733 [x]).</p> <p>Equipment Alarm: An alarm of this type is associated with an equipment fault (ITU-T Recommendation X.733 [x]).</p> <p>Integrity Violation: An indication that information may have been illegally modified, inserted or deleted.</p> <p>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.</p> <p>Physical Violation: An indication that a physical resource has been violated in a way that suggests a security attack.</p> <p>Security Service or Mechanism Violation: An indication that a security attack has been detected by a security service or mechanism.</p> <p>Time Domain Violation: An indication that an event has occurred at an unexpected or prohibited time.</p>	
probableCause	It qualifies alarm and provides further information than alarmType. Probable causes are outside the scope of the present document.	
specificProblem	It provides further refinement to the probableCause. This attribute value shall be single-valued 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.

Name	Definition	Legal Values
perceivedSeverity	It indicates the relative level of urgency for operator attention.	Critical, Major, Minor, Warning, Indeterminate, Cleared: see ITU-T Recommendation X.733 [4]. The present document does not recommend the use of indeterminate.
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: <ul style="list-style-type: none"> <li>- The identifier of the monitored attribute whose value has crossed a threshold,</li> <li>- The threshold settings,</li> <li>- The observed value that have crossed a threshold, etc.</li> </ul> See definition in ITU-T Recommendation X.733 [4] clause 8.1.2.7. See also for information in TS 32.401 [19] clause 5.6.	
stateChangeDefinition	It indicates attribute value changes associated with the alarm for state attributes of the monitored entity (state transitions). The change is reported with the name of the state attribute, the new value and an optional old value. See definition in ITU-T Recommendation X.733 [4] clause 8.1.2.11.	
monitoredAttributes	It indicates attributes of the monitored entity and their values at the time the alarm occurred that are of interest for the alarm report. How these attributes are chosen is outside of the scope of the present document. See definition in ITU-T Recommendation X.733 [4] clause 8.1.2.11.	
proposedRepairActions	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]	
additionalText	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4].	N/A



Name	Definition	Legal Values
additionalInformation	<p>This attribute when present allows the inclusion of a set of vendor specific alarm information in the alarm.</p> <p>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.</p> <p>Any other uses of additional information on the alarm and its semantics is outside the scope of the present document</p>	<p>The additional information field is a list of one or more information parts.</p> <p>The present document allows the support of two such information parts to carry</p> <ul style="list-style-type: none"> <li>- vendor defined perceived severity</li> <li>- vendor defined alarm type</li> </ul> <p>using defined identification.</p> <p>Other vendor specific information parts are allowed by using vendor specific identifications.</p>
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.	boolean
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 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 an alarm.	<p>Acknowledged: the alarm has been acknowledged.</p> <p>Unacknowledged: the alarm has been unacknowledged or the alarm has never been acknowledged.</p>
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.	
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 "".
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 "".

Name	Definition	Legal Values
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.
sourceObjectInstance	It identifies one MonitoredEntity.	All values that carry the semantics of DN.
notificationIdSet	It carries one or more notification identifiers.	

#### 11.2.2.1.5.2 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 throughout the time that alarm correlation is significant. The algorithm by which alarm correlation is accomplished is outside the scope of the present document.

### 11.2.2.2 Subscription information, subscription state and Information Object Classes

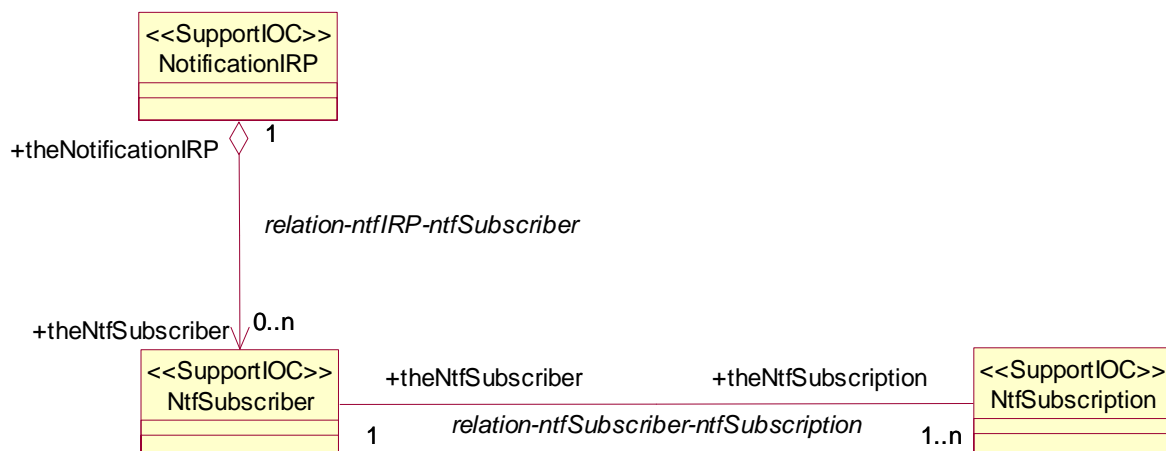
#### 11.2.2.2.1 Imported information entities and local labels

None.

#### 11.2.2.2.2 Class Diagram

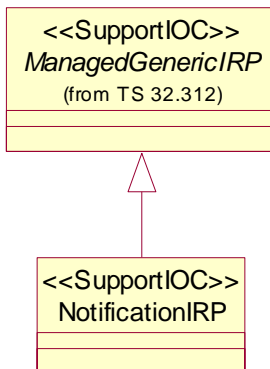
##### 11.2.2.2.2.1 Attributes and relationships

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



## 11.2.2.2.2.2 Inheritance

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



## 11.2.2.2.3 Information object classes definition

## 11.2.2.2.3.1 NtfSubscriber

## 11.2.2.2.3.1.1 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.

## 11.2.2.2.3.1.2 Attributes

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

## 11.2.2.2.3.2 NtfSubscription

## 11.2.2.2.3.2.1 Definition

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

## 11.2.2.2.3.2.2 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

## 11.2.2.2.3.2.3 Void

## 11.2.2.2.3.3 NotificationIRP

## 11.2.2.2.3.3.1 Definition

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

#### 11.2.2.2.4 Information relationship definitions

##### 11.2.2.2.4.1 relation-ntfSubscriber-ntfSubscription (M)

###### 11.2.2.2.4.1.1 Definition

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

###### 11.2.2.2.4.1.2 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

###### 11.2.2.2.4.1.3 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.

##### 11.2.2.2.4.2 relation-ntfIRP-ntfSubscriber (M)

###### 11.2.2.2.4.2.1 Definition

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

###### 11.2.2.2.4.2.2 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

###### 11.2.2.2.4.2.3 Constraints

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

### 11.2.2.2.5 Information attribute definitions

#### 11.2.2.2.5.0 Introduction

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

#### 11.2.2.2.5.1 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 <code>getSubscriptionStatus</code> (or <code>subscribe</code> ) 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 clause 3.1)	
ntfFilter	This attribute represents the filter of a subscription. The filter can be applied to parameters of notification header (see Notification management service producer interface) and to parameters of notifications defined as filterable to IMANAGEMENT service producer shall notify management service consumer if the event satisfies the filter constraint.	
ntfConsumerReference	This attribute contains the reference of a consumer. It uniquely identifies a subscriber	

#### 11.2.2.2.5.2 Constraints

- "ntfTimeTickTimer is lower.

## 11.3 Generic performance assurance management service

### 11.3.1 Operations and notifications

#### 11.3.1.1 Void

#### 11.3.1.2 Operation and notification of performance threshold monitoring service

##### 11.3.1.2.1 Notification `notifyThresholdCrossing` (M)

##### 11.3.1.2.1.1 Definition

This notification supports the threshold monitoring notification target to be notified when the performance threshold is crossed or reached.

## 11.3.1.2.1.2 Notification information

Parameter Name	Qualifier	Information Type	Comment
objectClass	M, Y	"ManagedElement" (see TS 28.622 [11]), or "performance threshold monitoring service"	It indicates the class, whose instance emitted this notification. The sender could be NF, or the performance threshold monitoring service producer.
objectInstance	M, Y	DN of the instance of the "ManagedElement", or the identifier of the performance threshold monitoring service producer	It identifies the instance of the sender of this notification. The sender could be NF, or the performance threshold monitoring service producer.
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	"notifyThresholdCrossing "	The type of notification, and it shall be assigned to "notifyThresholdCrossing" for this notification.
startOfMonitoringGP	M, Y	It indicates the start of the monitoring granularity period.	The semantics of Generalised Time specified by ITU-T shall be used here.
endOfMonitoringGP	M, Y	It indicates the end of the monitoring granularity period.	The semantics of Generalised Time specified by ITU-T shall be used here.
monitoredObjectInstance	M, Y	DN of the monitored object instance	The DN of the object instance for which the measurementTypeName reported by this notification is monitored.
thresholdLevel	M, Y	It indicates the level of the threshold which is crossed or reached.	
measurementTypeName	M, Y	The measurementType shall be in one of the following form: - "family.measurementName.subcounter" for monitoring the measurement types with subcounters defined. - "family.measurementName" for monitoring the measurement types without subcounters defined.	It indicates the name of the measurement type whose value has reached or crossed the threshold.
measurementValue	M, Y	The type of the measurementValue for the measurement type is specified in the performance measurement definition in TS 28.552 [18].	It indicates the value of the measurement type which has reached or crossed the threshold.
additionalText	O, N	It provides additional information for this notification.	It carries vendor-specific semantics not defined in the present document.

## 11.3.2 Managed information

### 11.3.2.1 Performance data file definition

#### 11.3.2.1.1 File generation and reporting

The performance data reporting related service producer generates the performance data 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 as the server while the consumer shall always act as the initiator (client) of file transfer actions:

- FTP;
- SFTP.

#### 11.3.2.1.2 Performance data file content description

Table 11.3.2.1.2-1 lists all the file content items. It also provides an explanation of the individual items.

**Table 11.3.2.1.2-1: 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.

File Content Item	Description
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.
measuredEntityUserName	This is the user definable name ("userLabel") defined for the measured entity 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.
measuredEntityDn	This is the Distinguished Name (DN) defined for the measured entity in 3GPP TS 32.300 [25]. It is unique across an operator's network. The string may be empty (i.e. string size =0) if the "measuredEntityDn" is not configured in the CM applications.
measuredEntitySoftwareVersion	This is the software version ("swVersion") defined for the measured entity 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.
measInfoId	This attribute associates a tag name with the set of measurements defined by a <i>measInfo</i> 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.
jobId	The "jobId" is an optional item represents the measurement job with which measurement result contained in the file is associated.
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.
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	In case the measEntity is a ManagedElement, the "measObjInstId" field contains the local distinguished name (LDN) of the measured object within the scope defined by the "measuredEntityDn" (see 3GPP TS 32.300 [25]). The concatenation of the "measuredEntityDn" and the "measObjInstId" yields the DN of the measured object. The "measObjInstId" is therefore empty if the "measuredEntityDn" already specifies completely the DN of the measured object, which is the case for all measurements specified on measured entity (e.g., NF) level. For example, if the measured object is a "ManagedElement" representing RNC "RNC-Gbg-1", then the "measuredEntityDn" will be for instance "DC=a1.companyNN.com,SubNetwork=1,IRPAgent=1,SubNetwork=CountryNN,MeContext=MEC-Gbg-1,ManagedElement=RNC-Gbg-1", and the "measObjInstId" will be empty. On the other hand, if the measured object is a "UtranCell" representing cell "Gbg-997" managed by that RNC, then the "measuredEntityDn" will be for instance the same as above, i.e. "DC=a1.companyNN.com,SubNetwork=1,IRPAgent=1,SubNetwork=CountryNN,MeContext=MEC-Gbg-1,ManagedElement=RNC-Gbg-1", and the "measObjInstId" will be for instance "RncFunction=RF-1,UtranCell=Gbg-997". The class of the "measObjInstId" is defined in item F of each measurement definition template. In case the measEntity is not a ManagedElement, the value of this attribute is empty (i.e. string size =0).
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. 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 [20]. 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 [20]. Based on the representation used, the timestamp shall refer to either UTC time or local time or local time with offset from UTC.

### 11.3.2.1.3 File naming convention

#### 11.3.2.1.3.1 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 (\_).

### 11.3.2.1.3.2 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.

#### 11.3.2.1.4 Void

## 11.4 Heartbeat

### 11.4.1 Operations and notifications

#### 11.4.1.1 Notification `notifyHeartbeat`

##### 11.4.1.1.1 Definition

This notification notifies the subscribed consumer(s) that the MnS producer heartbeat period has expired or that a MnS consumer requested the emission of an immediate heartbeat notification.

The emission of heartbeat notifications is controlled by the `HeartbeatControl` IOC (3GPP TS 28.622 [11]).

## 11.4.1.1.2 Input parameters

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
objectClass	M	It shall carry the ManagedEntity class name.HeartbeatControl.objectClass	It specifies the class name of the HeartbeatControl IOC.. A network event has occurred in an instance of this class.
objectInstance	M	It shall carry the DN of the ManagedEntity.HeartbeatControl.objectInstance	It specifies a new instance of the above IOC in which the network event related to by carrying the Distinguished Name (DN) for the instance.It specifies the DN of the HeartbeatControl instance controlling the emission of this notifyHeartbeat notification.
eventTime	M	It indicates the time at which the notification is emitted.	The semantics of Generalised Time specified by ITU-T [17] shall be used here.
notificationId	M	This is an identifier for the notification,	
systemDN	C	It shall carry the DN of management service producers.	-
heartbeatNtfPeriod	M	ManagedEntity.HeartbeatControl.heartbeatNtfPeriod	--The value of the ManagedEntity.heartbeatNtfPeriod

## 11.4.1.1.3 Triggering event

## 11.4.1.1.3.1 From-state

stateBeforeHeartbeatNotification1 OR stateBeforeHeartbeatNotification2.

Assertion Name	Definition
stateBeforeHeartbeatNotification1	The internal countdown timer of the MOI emitting the notifyHeartbeat notification has reached the value '0' (zero).
stateBeforeHeartbeatNotification2	The value of the attribute triggerHeartbeatNtf of the MOI emitting the notifyHeartbeat notification is TRUE.

## 11.4.1.1.3.2 To-state

stateAfterHeartbeatNotification1 OR stateAfterHeartbeatNotification2.

Assertion Name	Definition
stateAfterHeartbeatNotification1	If From-state is stateBeforeHeartbeatNotification1 then: the internal countdown timer of the MOI is reset to the value of its heartbeatNtfPeriod attribute.
stateAfterHeartbeatNotification2	If From-state is stateBeforeHeartbeatNotification2 then: the value of the internal countdown timer of the MOI is not affected.

## 11.5 Streaming data reporting service

### 11.5.1 Operations and notifications

#### 11.5.1.1 establishStreamingConnection operation (M)

##### 11.5.1.1.1 Definition

This operation enables the streaming data reporting producer to establish a connection to the streaming data reporting consumer (i.e. streaming target). The connection establishment includes the exchange of meta-data (producer informs consumer about its own identity and the nature of the data to be reported via streaming) phase and the actual connection (a data pipe for streaming) establishment.

Established connection supports stream multiplexing (one connection supports one or more reporting streams simultaneously).

Upon successful connection establishment, the consumer is aware of the producer's identity, the list of reporting streams and the nature of data being reported on each of the streams.

The established connection may be kept "alive" either by built-in functionality of the solution set or by periodic reporting of empty stream data.

## 11.5.1.1.2 Input parameters

Parameter Name	Qualifier	Information type	Comment
producerId	M	The identity of the producer requesting the connection establishment.	DN of the streaming data reporting MnS producer. If the producer is not modeled as 3GPP NRM MOI, an alternative identifier other than DN may be used.
streamInfoList	M	List of StreamInfo	<p>This parameter contains the list of meta-data about each reporting stream.</p> <p>For streaming trace reporting each StreamInfo includes:</p> <ul style="list-style-type: none"> <li>- StreamType carrying the value "TRACE";</li> <li>- SerializationFormat carrying the value "GPB" or "ASN1";</li> <li>- Trace Reference (see clause 5.6 of 3GPP TS 32.422 [38]) as stream identifier;</li> <li>- TraceJob (see clause X of 3GPP TS 28.622 [11]) providing the details about the configuration of the trace job for which the data is being reported.</li> </ul> <p>For streaming performance data reporting each StreamInfo includes:</p> <ul style="list-style-type: none"> <li>- StreamType carrying the value "PERFORMANCE";</li> <li>- SerializationFormat carrying the value "GPB" or "ASN1";</li> <li>- streamId globally unique stream identifier;</li> <li>- measObjDn: the DN of the measured object instance;</li> <li>- measTypes: an ordered list of measurement type or KPI whose measurement values or KPI result values are to be reported by the Performance Data Stream Units (see Annex C of TS 28.550 [42]) via this stream;</li> <li>- either: <ul style="list-style-type: none"> <li>- MeasurementReaderId DN of the MeasurementReader MOI (see clause 4.3.13 of 3GPP TS 28.622 [11]) for which the data is being reported;</li> </ul> </li> <li>- or: <ul style="list-style-type: none"> <li>- jobId globally unique identifier of a measurement job (see TS 28.550 [42]).</li> </ul> </li> </ul> <p>For streaming analytics reporting each StreamInfo includes:</p> <ul style="list-style-type: none"> <li>- StreamType carrying the value "ANALYTICS";</li> <li>- SerializationFormat carrying the value "GPB" or "ASN1";</li> <li>- streamId globally unique stream identifier;</li> <li>- AnalyticsInfo providing the details about the analytics activity for which the data is being reported.</li> </ul> <p>For proprietary data streaming reporting each StreamInfo includes:</p> <ul style="list-style-type: none"> <li>- StreamType carrying the value "PROPRIETARY";</li> <li>- streamId globally unique stream identifier;</li> <li>- VsDataContainer (see clause 4.3.9 of 3GPP TS 28.622 [11]) providing the details about the data being reported.</li> </ul>

## 11.5.1.1.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
connectionId	M	Identifier of the established streaming connection.	It identifies the established streaming connection. The format may have dependency on the solution set.
status	M	ENUM (Success, Failure)	An operation may fail because of a specified or unspecified reason.

## 11.5.1.1.4 Exceptions

Exception Name	Definition
unexpectedStreams	<b>Condition:</b> Some information in the list of <code>streamInfo</code> was unexpected by the MnS consumer. <b>Returned Information:</b> Name of the exception; status is set to "Failure".

## 11.5.1.2 terminateStreamingConnection operation (M)

## 11.5.1.2.1 Definition

This operation enables the streaming data reporting producer to terminate the connection to the streaming data reporting consumer (i.e. streaming target).

Upon successful termination of the streaming connection, the producer stops reporting data to the consumer on this connection.

## 11.5.1.2.2 Input parameters

Parameter Name	Qualifier	Information type	Comment
connectionId	M	See clause 11.5.1.1.3	It identifies the streaming connection being terminated. The format may have dependency on the solution set.

## 11.5.1.2.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
status	M	ENUM (Success, Failure)	An operation may fail because of a specified or unspecified reason.

## 11.5.1.2.4 Exceptions

Exception Name	Definition
unknownConnection	<b>Condition:</b> the <code>connectionId</code> is invalid. <b>Returned Information:</b> Name of the exception; status is set to "Failure".

## 11.5.1.3 reportStreamData operation (M)

## 11.5.1.3.1 Definition

This operation enables the streaming data reporting producer to send a unit of streaming data to the streaming data reporting consumer.

## 11.5.1.3.2 Input parameters

Parameter Name	Qualifier	Information type	Comment
connectionId	M	See clause 11.5.1.1.3	It identifies the streaming connection on which the reported data are being sent. The format may have dependency on the solution set.
streamingData	M	Unit of streaming data	This parameter contains the actual data (payload) being reported via stream. For streaming trace reporting each <code>streamingData</code> is encoded according to the format specified in the clause 5 of 3GPP TS 32.423 [39]. For streaming performance data reporting each <code>streamingData</code> is encoded according to the format specified in the Annex C of 3GPP TS 28.550 [42]. For proprietary data streaming reporting each <code>streamingData</code> is encoded according to the format specified in the product documentation.

## 11.5.1.3.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
status	M	ENUM (Success, Failure)	An operation may fail because of a specified or unspecified reason.

## 11.5.1.3.4 Exceptions

Exception Name	Definition

## 11.5.1.4 addStream operation (M)

## 11.5.1.4.1 Definition

This operation allows the producer to add one or more reporting streams to an already established streaming connection.



## 11.5.1.4.2 Input parameters

Parameter Name	Qualifier	Information type	Comment
connectionId	M	See clause 11.5.1.1.3	It identifies the streaming connection to which new reporting streams are being added. The format may have dependency on the solution set.
streamInfoList	M	List of StreamInfo	<p>This parameter contains the list of meta-data about each reporting stream being added to the already established connection.</p> <p>For streaming trace reporting each StreamInfo includes:</p> <ul style="list-style-type: none"> <li>- StreamType carrying the value "TRACE";</li> <li>- SerializationFormat carrying the value "GPB" or "ASN1";</li> <li>- Trace Reference (see clause 5.6 of 3GPP TS 32.422 [38]) as stream identifier;</li> <li>- TraceJob (see clause X of 3GPP TS 28.622 [11]) providing the details about the configuration of the trace job for which the data is being reported.</li> </ul> <p>For streaming performance data reporting each StreamInfo includes:</p> <ul style="list-style-type: none"> <li>- StreamType carrying the value "PERFORMANCE";</li> <li>- SerializationFormat carrying the value "GPB" or "ASN1";</li> <li>- streamId globally unique stream identifier;</li> <li>- measObjDn: the DN of the measured object instance;</li> <li>- measTypes: an ordered list of measurement type or KPI whose measurement values or KPI result values are to be reported by the Performance Data Stream Units (see Annex C of TS 28.550 [42]) via this stream;</li> <li>- either: <ul style="list-style-type: none"> <li>- MeasurementReaderId DN of the MeasurementReader MOI (see clause 4.3.13 of 3GPP TS 28.622 [11]) for which the data is being reported;</li> </ul> </li> <li>- or: <ul style="list-style-type: none"> <li>- jobId globally unique identifier of a measurement job (see TS 28.550 [42]).</li> </ul> </li> </ul> <p>For streaming analytics reporting each StreamInfo includes:</p> <ul style="list-style-type: none"> <li>- StreamType carrying the value "ANALYTICS";</li> <li>- SerializationFormat carrying the value "GPB" or "ASN1";</li> <li>- streamId globally unique stream identifier;</li> <li>- AnalyticsInfo providing the details about the analytics activity for which the data is being reported.</li> </ul> <p>For proprietary data streaming reporting each StreamInfo includes:</p> <ul style="list-style-type: none"> <li>- StreamType carrying the value "PROPRIETARY";</li> <li>- streamId globally unique stream identifier;</li> <li>- VsDataContainer (see clause 4.3.9 of 3GPP TS 28.622 [11]) providing the details about the data being reported.</li> </ul>

## 11.5.1.4.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
streamInfoList	M	List of StreamInfo	<p>This parameter contains the list of meta-data about each reporting stream that has been successfully added as a result of this operation.</p> <p>For streaming trace reporting each <code>StreamInfo</code> includes:</p> <ul style="list-style-type: none"> <li>- <code>StreamType</code> carrying the value "TRACE";</li> <li>- <code>SerializationFormat</code> carrying the value "GPB" or "ASN1";</li> <li>- Trace Reference (see clause 5.6 of 3GPP TS 32.422 [38]) as stream identifier;</li> <li>- <code>TraceJob</code> (see clause X of 3GPP TS 28.622 [11]) providing the details about the configuration of the trace job for which the data is being reported.</li> </ul> <p>For streaming performance data reporting each <code>StreamInfo</code> includes:</p> <ul style="list-style-type: none"> <li>- <code>StreamType</code> carrying the value "PERFORMANCE";</li> <li>- <code>SerializationFormat</code> carrying the value "GPB" or "ASN1";</li> <li>- <code>streamId</code> globally unique stream identifier;</li> <li>- <code>measObjDn</code>: the DN of the measured object instance;</li> <li>- <code>measTypes</code>: an ordered list of measurement type or KPI whose measurement values or KPI result values are to be reported by the Performance Data Stream Units (see Annex C of TS 28.550 [42]) via this stream;</li> <li>- either: <ul style="list-style-type: none"> <li>- <code>MeasurementReaderId</code> DN of the <code>MeasurementReader</code> MOI (see clause 4.3.13 of 3GPP TS 28.622 [11]) for which the data is being reported;</li> </ul> </li> <li>- or: <ul style="list-style-type: none"> <li>- <code>jobId</code> globally unique identifier of a measurement job (see TS 28.550 [42]).</li> </ul> </li> </ul> <p>For streaming analytics reporting each <code>StreamInfo</code> includes:</p> <ul style="list-style-type: none"> <li>- <code>StreamType</code> carrying the value "ANALYTICS";</li> <li>- <code>SerializationFormat</code> carrying the value "GPB" or "ASN1";</li> <li>- <code>streamId</code> globally unique stream identifier;</li> <li>- <code>AnalyticsInfo</code> providing the details about the analytics activity for which the data is being reported.</li> </ul> <p>For proprietary data streaming reporting each <code>StreamInfo</code> includes:</p> <ul style="list-style-type: none"> <li>- <code>StreamType</code> carrying the value "PROPRIETARY";</li> <li>- <code>streamId</code> globally unique stream identifier;</li> <li>- <code>VsDataContainer</code> (see clause 4.3.9 of 3GPP TS 28.622 [11]) providing the details about the data being reported.</li> </ul>
status	M	ENUM (Success, Failure, PartialSuccess)	An operation may fail because of a specified or unspecified reason.

## 11.5.1.4.4 Exceptions

Exception Name	Definition
duplicateStream	<p><b>Condition:</b> One or more of stream identifiers in the <code>streamInfoList</code> already exist on this connection.</p> <p><b>Returned Information:</b> Name of the exception; status is set to "Failure" or "PartialSuccess".</p>
unexpectedStreams	<p><b>Condition:</b> Some information in the list of <code>streamInfo</code> was unexpected by the MnS consumer.</p> <p><b>Returned Information:</b> Name of the exception; status is set to "Failure".</p>
unknownConnection	<p><b>Condition:</b> the <code>connectionId</code> is invalid.</p> <p><b>Returned Information:</b> Name of the exception; status is set to "Failure".</p>

### 11.5.1.5 deleteStream operation (M)

#### 11.5.1.5.1 Definition

This operation allows the producer to remove one or more reporting streams from an already established streaming connection.

#### 11.5.1.5.2 Input parameters

Parameter Name	Qualifier	Information type	Comment
connectionId	M	See clause 11.5.1.1.3	It identifies the streaming connection from which the reporting streams are being removed. The format may have dependency on the solution set.
streamIdList	M	List of stream identifiers	This parameter contains the list of identifiers for streams being removed from the already established connection. For streaming trace reporting Trace Reference (see clause 5.6 of 3GPP TS 32.422 [38]) is used as stream identifier. For streaming performance data reporting <code>streamId</code> globally unique stream identifier. For streaming analytics reporting <code>streamId</code> globally unique stream identifier. For proprietary data streaming reporting <code>streamId</code> globally unique stream identifier.

#### 11.5.1.5.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
status	M	ENUM (Success, Failure, PartialSuccess)	An operation may fail because of a specified or unspecified reason.

#### 11.5.1.5.4 Exceptions

Exception Name	Definition
unknownStreamId	<b>Condition:</b> One or more of stream identifiers in the <code>streamIdList</code> does not exist on this connection. <b>Returned Information:</b> Name of the exception; status is set to "Failure" or "PartialSuccess".
unknownConnection	<b>Condition:</b> the <code>connectionId</code> is invalid. <b>Returned Information:</b> Name of the exception; status is set to "Failure".

### 11.5.1.6 getConnectionInfo operation (M)

#### 11.5.1.6.1 Definition

This operation enables the streaming data reporting service producer to obtain information about one or more streaming connections.

#### 11.5.1.6.2 Input parameters

Parameter Name	Qualifier	Information type	Comment
connectionIdList	M	List of streaming connection identifiers	This parameter contains the list of streaming connection identifiers for which the stream information is to be returned. The empty list indicates the stream information for all connections are to be returned.

## 11.5.1.6.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
connectionInfoList	M	List of <connectionId, streamReporter, streamIdList> tuples	<p>This parameter contains the list of meta-data about each streaming connection requested by this operation. Each entry in this list is a tuple of connectionId, streamReporter and streamIdList.</p> <p>For streaming trace reporting:</p> <ul style="list-style-type: none"> <li>- streamReporter is the identity of the streaming data reporting MnS producer reporting data for this connectionId;</li> <li>- streamIdList is the list of Trace References (see clause 5.6 of 3GPP TS 32.422 [38]) used as stream identifiers.</li> </ul> <p>For streaming performance data reporting:</p> <ul style="list-style-type: none"> <li>- streamReporter is the identity of the streaming data reporting MnS producer reporting data for this connectionId;</li> <li>- streamIdList is the list of streamId globally unique stream identifiers.</li> </ul> <p>For streaming analytics reporting:</p> <ul style="list-style-type: none"> <li>- streamReporter is the identity of the streaming data reporting MnS producer reporting data for this connectionId;</li> <li>- streamIdList is the list of streamId globally unique stream identifiers.</li> </ul> <p>For streaming proprietary data reporting:</p> <ul style="list-style-type: none"> <li>- streamReporter is the identity of the streaming data reporting MnS producer reporting data for this connectionId;</li> <li>- streamIdList is the list of streamId globally unique stream identifiers.</li> </ul>
status	M	ENUM (Success, Failure, PartialSuccess)	An operation may fail because of a specified or unspecified reason.

## 11.5.1.6.4 Exceptions

Exception Name	Definition
unknownConnectionId	<p><b>Condition:</b> One or more of connection identifiers in the connectionIdList is not known to this MnS consumer.</p> <p><b>Returned Information:</b> Name of the exception; status is set to "Failure" or "PartialSuccess".</p>

## 11.5.1.7 getStreamInfo operation (M)

## 11.5.1.7.1 Definition

This operation enables the streaming data reporting service producer to obtain information about one or more reporting streams.

## 11.5.1.7.2 Input parameters

Parameter Name	Qualifier	Information type	Comment
streamIdList	M	List of stream identifiers	<p>This parameter contains the list of stream identifiers for which the stream information is to be returned.</p> <p>The empty list indicates the stream information for all streams are to be returned.</p> <p>For streaming trace reporting Trace Reference (see clause 5.6 of 3GPP TS 32.422 [38]) is used as stream identifier.</p> <p>For streaming performance data reporting <code>streamId</code> globally unique stream identifier.</p> <p>For streaming analytics reporting <code>streamId</code> globally unique stream identifier.</p> <p>For proprietary data streaming reporting <code>streamId</code> globally unique stream identifier.</p>

## 11.5.1.7.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
streamInfoSumList	M	List of <StreamInfo, StreamReporters> tuples	<p>This parameter contains the list of meta-data about each reporting stream requested by this operation. Each entry in this list is a tuple of StreamInfo and StreamReporters.</p> <p>For streaming trace reporting each StreamInfo includes:</p> <ul style="list-style-type: none"> <li>- StreamType carrying the value "TRACE";</li> <li>- SerializationFormat carrying the value "GPB" or "ASN1";</li> <li>- Trace Reference (see clause 5.6 of 3GPP TS 32.422 [38]) as stream identifier;</li> <li>- TraceJob (see clause X of 3GPP TS 28.622 [11]) providing the details about the configuration of the trace job for which the data is being reported.</li> </ul> <p>For streaming trace the StreamReporters is a list of the identities of the streaming data reporting MnS producer(s) reporting data for this Trace Reference to this MnS consumer.</p> <p>For streaming PM reporting each StreamInfo includes:</p> <ul style="list-style-type: none"> <li>- StreamType carrying the value "PERFORMANCE";</li> <li>- SerializationFormat carrying the value "GPB" or "ASN1";</li> <li>- streamId globally unique stream identifier;</li> <li>- measObjDn: the DN of the measured object instance;</li> <li>- measTypes: an ordered list of measurement type or KPI whose measurement values or KPI result values are to be reported by the Performance Data Stream Units (see Annex C of TS 28.550 [42]) via this stream;</li> <li>- either: <ul style="list-style-type: none"> <li>- MeasurementReaderId DN of the MeasurementReader MOI (see clause 4.3.13 of 3GPP TS 28.622 [11]) for which the data is being reported;</li> <li>- or:</li> <li>- jobId globally unique identifier of a measurement job (see TS 28.550 [42]).</li> </ul> </li> </ul> <p>For streaming performance data the StreamReporters is a list of the identities of the streaming data reporting MnS producer(s) reporting data for this streamId to this MnS consumer.</p> <p>For streaming analytics reporting each StreamInfo includes:</p> <ul style="list-style-type: none"> <li>- StreamType carrying the value "ANALYTICS";</li> <li>- SerializationFormat carrying the value "GPB" or "ASN1";</li> <li>- streamId globally unique stream identifier;</li> <li>- AnalyticsInfo providing the details about the analytics activity for which the data is being reported.</li> </ul> <p>For streaming analytics the StreamReporters is a list of the identities of the streaming data reporting MnS producer(s) reporting data for this streamId to this MnS consumer.</p> <p>For proprietary data streaming reporting each StreamInfo includes:</p> <ul style="list-style-type: none"> <li>- StreamType carrying the value "PROPRIETARY";</li> <li>- streamId globally unique stream identifier;</li> <li>- VsDataContainer (see clause 4.3.9 of 3GPP TS 28.622 [11]) providing the details about the data being reported.</li> </ul> <p>For proprietary data streaming the StreamReporters is a list of the identities of the streaming data reporting MnS producer(s) reporting data for this streamId to this MnS consumer.</p>
status	M	ENUM (Success, Failure, PartialSuccess)	An operation may fail because of a specified or unspecified reason.

#### 11.5.1.7.4 Exceptions

Exception Name	Definition
unknownStreamId	<b>Condition:</b> One or more of stream identifiers in the <code>streamIdList</code> is not known to this MnS consumer. <b>Returned Information:</b> Name of the exception; status is set to "Failure" or "PartialSuccess".

## 11.6 File data reporting service

### 11.6.1 Operations and notifications

#### 11.6.1.1 Notification `notifyFileReady` (M)

##### 11.6.1.1.1 Definition

This notification supports the authorized file data reporting service consumer to be notified about the readiness of the file data by the file data reporting service producer.

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

11.6.1.1.2            Notification information

Table 11.6.1.1.2-1: Notification Information



Parameter Name	Qualifier	Information Type	Comment
objectClass	M, Y	Type of the file data reporting related producer, e	It indicates the class, whose instance emitted this notification. The class indicates the type of the file data reporting service producer.
objectInstance	M, Y	Identifier of the file data reporting service producer	It identifies the file 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	<p>List of struct &lt;</p> <p>fileLocation, fileSize fileReadyTime fileExpirationTime fileCompression, fileFormat, &gt;.</p> <p>Each element is defined as following:</p> <ul style="list-style-type: none"> <li>- 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\Files\&lt;xxx&gt;" or <a href="http://nms.telecom_org.com/datastore/&lt;xxx&gt;">"http://nms.telecom_org.com/datastore/&lt;xxx&gt;"</a>, where &lt;xxx&gt; is the filename and the file naming convention is defined in Annex A.3.</li> <li>- fileSize: It identifies the size of the file. Its value is positive Integer (the unit is byte).</li> <li>- 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.</li> <li>- 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.</li> <li>- 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.</li> <li>- 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.</li> </ul>	It specifies the information of each available file.
additionalText	O, N	It provides additional information for this notification.	It carries vendor-specific semantics not defined in the present document.

## 11.6.1.2 Notification notifyFilePreparationError (M)

### 11.6.1.2.1 Definition

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

### 11.6.1.2.2 Notification information

Parameter Name	Qualifier	Information Type	Comment
objectClass	M, Y	See Table 11.6.1.1.2-1.	See Table 11.6.1.1.2-1.
objectInstance	M, Y	See Table 11.6.1.1.2-1.	See Table 11.6.1.1.2-1.
notificationId	M, N	See Table 11.6.1.1.2-1.	See Table 11.6.1.1.2-1.
eventTime	M, Y	See Table 11.6.1.1.2-1.	See Table 11.6.1.1.2-1.
notificationType	M, Y	"notifyFilePreparationError"	The type of notification, and it shall be assigned to "notifyFilePreparationError" for this notification.
fileInfoList	M, N	See Table 11.6.1.1.2-1.	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 file data preparation.	The detailed reason is given, including errorInPreparation hardDiskFull hardDiskFailure tooManyFiles collectionTimeOut incompleteTruncatedFile corruptedFile lowMemory dataNotAvailable
additionalText	O, N	See Table Table 11.6.1.1.2-1.	See Table 11.6.1.1.2-1.

## 11.6.1.3 Operation subscribe (M)

### 11.3.1.1.3.1 Definition

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

### 11.3.1.1.3.2 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 file data reporting 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 the file data reporting 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.

## 11.3.1.1.3.3 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 = OperationSucceeded. 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.

## 11.3.1.1.3.4 Exceptions

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

## 11.3.1.1.4 Operation unsubscribe (M)

## 11.3.1.1.4.1 Definition

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

The authorized file data reporting service 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.

## 11.3.1.1.4.2 Input parameters

Parameter Name	Qualifier	Information Type	Comment
consumerReference	M	It specifies the reference of the authorized file data reporting service 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.

## 11.3.1.1.4.3 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.

## 11.3.1.1.4.4 Exceptions

Name	Definition
operation_failed	<b>Condition:</b> the operation is failed <b>Returned Information:</b> The output parameter status

### 11.3.1.1.5 Operation `listAvailableFiles` (M)

#### 11.3.1.1.5.1 Definition

This operation allows the authorized file data reporting service consumer to list all or specified available data files stored in the file data reporting service producer.

The file data reporting 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").

#### 11.3.1.1.5.2 Input parameters

Parameter Name	Qualifier	Information type	Comment
<code>managementDataType</code>	M	It specifies the type of the management data stored in the file.	For performance data (including measurement data and KPI) files, the value is assigned to "PERFORMANCE". For trace data files, the value is assigned to "TRACE". For analytic data files, the value is assigned to "ANALYTICS". For proprietary data files, the value is assigned to "PROPRIETARY".
<code>beginTime</code>	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.
<code>endTime</code>	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.

#### 11.3.1.1.5.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
<code>fileInfoList</code>	M	See the <code>fileInfoList</code> defined in <code>notifyFileReady</code> notification (clause 11.3.1.1.1)	See the <code>fileInfoList</code> defined in <code>notifyFileReady</code> notification (clause 11.3.1.1.1)
<code>status</code>	M	ENUM (Success, Failure)	

#### 11.3.1.1.5.4 Exceptions

Exception Name	Definition
<code>invalidTimes</code>	<b>Condition:</b> Either <code>beginTime</code> or <code>endTime</code> is invalid. <b>Returned information:</b> output parameter status is set to Failure.

## 12 Management services – Stage 3

### 12.1 Generic provisioning management service

#### 12.1.1 RESTful HTTP-based solution set

##### 12.1.1.1 Mapping of operations

##### 12.1.1.1.1 Introduction

The IS operations are mapped to SS equivalents according to table 12.1.1.1.1-1.

**Table 12.1.1.1.1-1: Mapping of IS operations to SS equivalents**

IS operation	HTTP Method	Resource URI	SQ
createMOI	PUT	http://{URI-DN-prefix}/{root}/ProvMnS/{MnSVersion}/{LDN-first-part}/{className}={id}	M
getMOIAttributes	GET	http://{URI-DN-PREFIX}/{root}/ProvMnS/{MnSVersion}/{LDN-first-part}/{className}={id}	M
modifyMOIAttributes	PUT PATCH	http://{URI-DN-prefix}/{root}/ProvMnS/{MnSVersion}/{LDN-first-part}/{className}={id}	M
deleteMOI	DELETE	http://{URI-DN-prefix}/{root}/ProvMnS/{MnSVersion}/{LDN-first-part}/{className}={id}	M

##### 12.1.1.1.2 Operation "createMOI"

This operation creates a single resource representing a managed object instance.

**Table 12.1.1.1.2-1: Mapping of IS operation input parameters to SS equivalents (HTTP PUT)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
managedObjectClass	path	/ {className}={id}	className: string	M
managedObjectInstance			id: string	
attributeListIn	request body	data	resourcePut-RequestType	M

Note 1: Void.

**Table 12.1.1.1.2-2: Mapping of IS operation output parameters to SS equivalents (HTTP PUT)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
attributeListOut	response body	n/a	resourceCreation-ResponseType	M
status	response status codes	n/a	n/a	M
	response body	error	error-ResponseType	O

The message flow for creating a resource is as follows:

1. The Service Consumer sends a HTTP PUT request to the Service Provider.
  - The target URI identifies the location of the new resource to be created.

- The message body shall carry the complete representation of the resource to be created.
2. The Service Provider sends a HTTP PUT response to the Service Consumer.
    - On success, "201 Created" shall be returned. The Location header shall carry the URI of the new resource and the message body the complete representation of the new resource.
    - On failure, an appropriate error code shall be returned. The response message body may provide additional error information

#### 12.1.1.1.3 Operation "getMOIAttributes"

This operation retrieves one or multiple resources representing managed object instances.

**Table 12.1.1.1.3-1: Mapping of IS operation input parameters to SS equivalents (HTTP GET)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
baseObjectInstance	path	/ {className}={id}	className: string id: string	M
scope	query	scope	scope-QueryType style: form explode: true	M
filter	query	filter	filter-QueryType	O
attributeListIn	query	attributes	attributes-QueryType style: form explode: false	O
		fields	fields-QueryType style: form explode: false	O

The SS parameters "scope", "filter", "attributes" and "fields" are defined in TS 32.158 [15].

Note 1: Void.

Note 2: Void.

**Table 12.1.1.1.3-2: Mapping of IS operation output parameters to SS equivalents (HTTP GET)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
attributeListOut	response body	n/a	resourceRetrieval-ResponseType	M
status	response status codes	n/a	n/a	M
	response body	error	error-ResponseType	O

The message flow for retrieval of one or multiple resources is as follows:

1. The Service Consumer sends a HTTP GET request to the Service Provider.
  - The authority and path component of the target URI identify the base resource.
  - If present, the scope query parameter identifies other resources besides the base resource.
  - The filter query parameter is applied to the set of scoped resources. Only resources passing the filter criteria are targeted.
  - The attributes and fields query parameters identify the attributes and sub-attributes to be returned.
2. The Service Provider sends a HTTP GET response to the Service Consumer.

- On success, "200 OK" shall be returned. The response message body is constructed according to the hierarchical response construction method (TS 32.158 [15]).
- On failure, an appropriate error code shall be returned. The response message body shall provide additional error information

#### 12.1.1.1.4 Operation "modifyMOIAttributes"

##### 12.1.1.1.4.1 Mapping to HTTP PUT

HTTP PUT is used for a full update of a single resource.

**Table 12.1.1.1.4.1-1: Mapping of IS operation input parameters to SS equivalents (HTTP PUT)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
baseObjectInstance	path	/[{className}={id}]	className: string id: string	M
scope	n/a	n/a	n/a	n/a
filter	n/a	n/a	n/a	n/a
modificationList	request body	n/a	resourcePut-RequestType	M

The IS parameters "scope" and "filter" have no meaning when targeting a single resource with the target URI and are not mapped.

**Table 12.1.1.1.4.1-2: Mapping of IS operation output parameters to SS equivalents (HTTP PUT)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
attributeListOut	response body	n/a	resourceUpdate-ResponseType	O
status	response status codes	n/a	n/a	M
	response body	error	error-ResponseType	O

The message flow is as follows:

1. The Service Consumer sends a HTTP PUT request to the Service Provider.
  - The target URI identifies the target resource.
  - The message body shall contain the representation the target resource shall be replaced with.
2. The Service Provider sends a HTTP PUT response to the Service Consumer.
  - On success, "200 OK" or "204 No Content" shall be returned. In the former case the response carries the representation of the updated resource in the message body. In the latter case the response has no message body. A "200 OK" response including the representation of the updated resource shall be sent in case the updated representation of the resource is not identical to the representation received in the request.
  - On failure, an appropriate error code shall be returned. The response message body may provide additional error information.

##### 12.1.1.1.4.2 Mapping to HTTP PATCH

HTTP PATCH is used to create, update or delete one or multiple resources.

**Table 12.1.1.1.4.2-1: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
baseObjectInstance	path	/[{className}={id}]	className: string id: string	M
scope	n/a	n/a	n/a	n/a
filter	n/a	n/a	n/a	n/a
modificationList	request body	n/a	jsonMergePatch-RequestType 3gppJsonMergePatch-RequestType jsonPatch-RequestType 3gppJsonPatch-RequestType	M

The IS parameters "scope" and "filter" have no SS equivalents in the present document.

The following patch media types are available

- "application/merge-patch+json" (RFC 7396 [37])
- "application/3gpp-merge-patch+json" (TS 32.158 [15])
- "application/json-patch+json" (RFC 6902 [36])
- "application/3gpp-json-patch+json" (TS 32.158 [15])

**Table 12.1.1.1.4.2-2: Mapping of IS operation output parameters to SS equivalents (HTTP PATCH)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
attributeListOut	n/a	n/a	n/a	n/a
status	response status codes	n/a	n/a	M
	response body	error	error-ResponseType	O

The message flow for modification of one or multiple resources is as follows:

1. The Service Consumer sends a HTTP PATCH request to the Service Provider.
  - The path component of the target URI identifies the base resource.
  - The message body shall contain the patch document.
2. The Service Provider sends a HTTP PATCH response to the Service Consumer.
  - On success, "200 OK" or "204 No Content" shall be returned. When "200 OK" is returned the message body shall include a representation of the updated resources constructed according to the hierarchical response construction method (TS 32.158 [15]).
  - On failure, an appropriate error code shall be returned. The response message body may provide additional error information

Note 1: Void.

#### 12.1.1.1.5 Operation "deleteMOI"

This operation deletes one or multiple resources representing managed object instances.



**Table 12.1.1.1.5-1: Mapping of IS operation input parameters to SS equivalents (HTTP DELETE)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
baseObjectInstance	path	/ {className}={id}	className: string id: string	M
scope	query	scope	scope-QueryType style: form explode: true	M
filter	query	filter	filter-QueryType	O

Note 1: Void.

Note 2: Void.

**Table 12.1.1.1.5-2: Mapping of IS operation output parameters to SS equivalents (HTTP DELETE)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
deletionlist	response body	n/a	resourceDeletion-ResponseType	O
status	response status codes	n/a	n/a	M
	response body	error	error-ResponseType	O

The message flow for deletion of one or multiple resources is as follows:

1. The Service Consumer sends a HTTP DELETE request to the Service Provider.
  - The authority and path components of the target URI identify the base resource.
  - If present, the scope query parameter identifies other resources besides the base resource.
  - The filter query parameter may be applied to the set of scoped resources. Only resources passing the filter criteria are targeted.
2. The Service Provider sends a HTTP DELETE response to the Service Consumer.
  - On success, when no query parameters are present in the request and only one resource is deleted, "204 No Content" shall be returned. Otherwise, when query parameters are present in the request, "200 OK" shall be returned and the response message body shall carry the URIs of the deleted resources.
  - On failure, an appropriate error code shall be returned. The response message body shall provide additional error information

12.1.1.1.6        Void

12.1.1.1.7        Void

## 12.1.1.2        Mapping of notifications

### 12.1.1.2.1        Introduction

The IS notifications are mapped to SS equivalents according to table 12.1.1.2.1-1.

**Table 12.1.1.2.1-1: Mapping of IS notifications to SS equivalents**

IS notifications	HTTP Method	Resource URI	SQ
notifyMOICreation	POST	/notificationSink	M
notifyMOIDeletion	POST	/notificationSink	M
notifyMOIAttributeValueChange	POST	/notificationSink	M
notifyMOIChanges	POST	/notificationSink	M

#### 12.1.1.2.2 Notification "notifyMOICreation"

The IS notification parameters are mapped to SS equivalents according to table 12.1.1.2.2-1.

**Table 12.1.1.2.2-1: Mapping of IS notification input parameters to SS equivalents (HTTP POST)**

IS operation 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	M
correlatedNotifi- cations	request body	correlatedNotifications	array(correlatedNotification-Type)	O
additionalText	request body	additionalText	additionalText-Type	O
sourceIndicator	request body	sourceIndicator	sourceIndicator-Type	O
attributeList	request body	attributeList	map(anyValue)	O

#### 12.1.1.2.3 Notification "notifyMOIDeletion"

The IS notification parameters are mapped to SS equivalents according to table 12.1.1.2.3-1.

**Table 12.1.1.2.3-1: Mapping of IS notification input parameters to SS equivalents (HTTP POST)**

IS operation 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	M
correlatedNotifi- cations	request body	correlatedNotifications	array(correlatedNotification-Type)	O
additionalText	request body	additionalText	additionalText-Type	O
sourceIndicator	request body	sourceIndicator	sourceIndicator-Type	O
attributeList	request body	attributeList	map(anyValue)	O

#### 12.1.1.2.4 Notification "notifyMOIAttributeValueChange"

The IS notification parameters are mapped to SS equivalents according to table 12.1.1.2.4-1.

**Table 12.1.1.2.4-1: Mapping of IS notification input parameters to SS equivalents (HTTP POST)**

IS operation 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	notificationTyp-Type	M
eventTime	request body	eventTime	dateTime-Type	M
systemDN	request body	systemDN	systemDN-Type	M
correlatedNotifi- cations	request body	correlatedNotifications	array(correlatedNotification-Type)	O
additionalText	request body	additionalText	additionalText-Type	O
sourceIndicator	request body	sourceIndicator	sourceIndicator-Type	O
attributeListVal- ueChange	request body	attributeListValueChan- ge	map(array(anyValue))	M

### 12.1.1.2.5 Notification "notifyMOIChanges"

The IS notification parameters are mapped to SS equivalents according to table 12.1.1.2.5-1.

**Table 12.1.1.2.5-1: Mapping of IS notification input parameters to SS equivalents (HTTP POST)**

IS operation 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	notificationTyp-Type	M
eventTime	request body	eventTime	dateTime-Type	M
systemDN	request body	systemDN	systemDN-Type	M
mOIChanges	request body	mOIChanges	array(mOIChange-Type)	M

## 12.1.1.3 Resources

### 12.1.1.3.1 Resource structure

Figure 12.1.1.3.1-1 shows the resource structure of the Provisioning MnS.

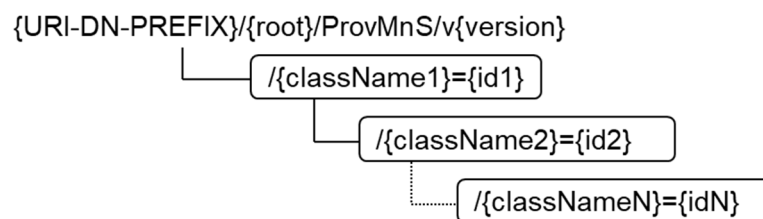
**Figure 12.1.1.3.1-1: Resource URI structure of the Provisioning MnS**

Table 12.1.1.3.1-1 provides an overview of the resources and applicable HTTP methods.

**Table 12.1.1.3.1-1: Resources and methods overview**

Resource name	Resource URI	HTTP method	Description
MOI	/{{className}}={id}	PUT	Creates a resource representing a managed object instance
MOI	/{{className}}={id}	GET	Retrieves one or multiple resources representing managed object instances
MOI	/{{className}}={id}	PATCH	Modifies one or multiple resources representing managed object instances
MOI	/{{className}}={id}	DELETE	Deletes one or multiple resources representing managed object instances
notificationSink	/notificationSink	POST	Sends notifications

### 12.1.1.3.2 Resource definitions

#### 12.1.1.3.2.1 Resource "/{{className}}={id}"

##### 12.1.1.3.2.1.1 Description

This resource represents a managed object instance.

##### 12.1.1.3.2.1.2 URI

Resource URI: http://{URI-DN-PREFIX}/{root}/ProvMnS/v1630/{LDN-first-part}

The resource URI variables are defined in the following table.

**Table 12.1.1.3.2.1.2-1: URI variables**

Name	Definition
URI-DN-prefix	See clause 4.4 of TS 32.158 [15]
root	See clause 4.4 of TS 32.158 [15]
LDN-first-part	See subclause 4.4 of TS 32.158 [15]
className	The class name of the resource to be targeted
id	The id of the resource to be targeted

##### 12.1.1.3.2.1.3 HTTP methods

##### 12.1.1.3.2.1.3.1 HTTP PUT

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

**Table 12.1.1.3.2.1.3.1-1: URI query parameters supported by the PUT method on this resource**

Name	Data type	Description	SQ
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 12.1.1.3.2.1.3.1-2: Data structures supported by the PUT request body on this resource**

Data type	Description	SQ
resourcePutRequestType	The resource representation of the resource to be created or replaced	M

**Table 12.1.1.3.2.1.3.1-3: Data structures supported by the PUT Response Body on this resource**

Data type	Response codes	Description	SQ
resourceUpdate-ResponseType	200 OK	<p>This status code shall be returned when the resource is replaced, and when the replaced resource representation is not identical to the resource representation in the request.</p> <p>This status code may be returned when the resource is updated and when the updated resource representation is identical to the resource representation in the request.</p> <p>The representation of the updated resource is returned in the response message body.</p>	M
resourceCreation-ResponseType	201 Created	<p>This status code shall be returned when the resource is created.</p> <p>The representation of the created resource is returned in the response message body.</p>	M
n/a	204 No Content	<p>This status code may be returned only when the replaced resource representation is identical to the representation in the request.</p> <p>The response has no message body.</p>	M
error-Type	4xx/5xx	Returned in case of an error	O

**12.1.1.3.2.1.3.2 HTTP GET**

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

**Table 12.1.1.3.2.1.3.2-1: URI query parameters supported by the GET method on this resource**

Name	Data type	Description	SQ
scope	scope-QueryType	This parameter extends the set of targeted resources beyond the base resource identified with the authority and path component of the URI.	M
filter	filter-QueryType	This parameter reduces the targeted set of resources by applying a filter to the scoped set of resource representations. Only resources representations for which the filter construct evaluates to "true" are targeted.	O
attributes	attributes-QueryType	This parameter specifies the attributes of the scoped resources that are returned. The value is a comma-separated list of attribute names.	O
fields	fields-QueryType	This parameter specifies the attribute fields of the scoped resources that are returned. The value is a comma-separated list of JSON pointers to the attribute fields.	O

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

**Table 12.1.1.3.2.1.3.2-2: Data structures supported by the GET request body on this resource**

Data type	Description	SQ

**Table 12.1.1.3.2.1.3.2-3: Data structures supported by the GET response body on this resource**

Data type	Response codes	Description	SQ
resourceRetrieval-ResponseType	200 OK	The resources identified in the request for retrieval are returned in the response message body. In case the attributes or fields query parameters are used, only the selected attributes or sub-attributes are returned. The response message body is constructed according to the hierarchical response construction method (TS 32.158 [15])	M
error-Type	4xx/5xx	Returned in case of an error	M

### 12.1.1.3.2.1.3.3 HTTP PATCH

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

**Table 12.1.1.3.2.1.3.3-1: URI query parameters supported by the PATCH method on this resource**

Name	Data type	Description	SQ
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 tables.

**Table 12.1.1.3.2.1.3.3-2: Data structures supported by the PATCH request body on this resource**

Data type	Description	SQ
jsonMergePatch-RequestType 3gppJsonMergePatch-RequestType jsonPatch-RequestType 3gppJsonPatch-RequestType	Describes the set of modifications to be applied to the targeted resources. The following patch media types are available: - "application/merge-patch+json" (RFC 7396 [37]) - "application/3gpp-merge-patch+json" (TS 32.158 [15]) - "application/json-patch+json" (RFC 6902 [36]) - "application/3gpp-json-patch+json" (TS 32.158 [15])	M

**Table 12.1.1.2.1.1.3.3-3: Data structures supported by the PATCH response body on this resource**

Data type	Response codes	Description	SQ
error-Type	4xx/5xx	Returned in case of an error	M

### 12.1.1.3.2.1.3.4 HTTP DELETE

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

**Table 12.1.1.3.2.1.3.4-1: URI query parameters supported by the DELETE method on this resource**

Name	Data type	Description	SQ
scope	scope-QueryType	This parameter extends the set of targeted resources beyond the base resource identified with the authority and path component of the URI.	M
filter	filter-QueryType	This parameter reduces the targeted set of resources by applying a filter to the scoped set of resource representations. Only resources representations for which the filter construct evaluates to "true" are targeted.	O

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

**Table 12.1.1.3.2.1.3.4-2: Data structures supported by the DELETE request body on this resource**

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

**Table 12.1.1.3.2.1.3.4-3: Data structures supported by the DELETE response body on this resource**

Data type	Response codes	Description	SQ
resourceDeletion-ResponseType	200 OK	This status code shall be returned, when query parameters are present in the request and one or multiple resources are deleted.  The URIs of the deleted resources are returned in the response message body.	M
n/a	204 No Content	This status code shall be returned, when no query parameters are present in the request and only one resource is deleted.  The message body is empty.	
error-Type	4xx/5xx	Returned in case of an error	M

12.1.1.3.2.2          Void

12.1.1.3.2.3          Void

12.1.1.4      Data type definitions

12.1.1.4.1      General

**Table 12.1.1.4.1-1: Data types defined in this specification**



Data type	Reference	Description
General types		
dateTime-Type	12.1.1.4.4.2	Date and time
long-Type	12.1.1.4.4.2	Long type
uri-Type	12.1.1.4.4.2	Type of an URI
<b>Types used in paths</b>		
className-PathType	12.1.1.4.4.2	Used in the path to identify a resource object
id-PathType	12.1.1.4.4.2	Used in the path to identify a resource object
<b>Types in query parts</b>		
attributes-QueryType	12.1.1.4.2.18	Used in the query part of HTTP GET to select the attributes of the scoped resource objects to be returned.
fields-QueryType	12.1.1.4.2.1	Used in the query part of HTTP GET to select the resource object properties (attributes) to be returned
filter-QueryType	12.1.1.4.2.2	Used in the query part of HTTP GET, HTTP PATCH and HTTP DELETE to filter scoped resource objects
scope-QueryType	12.1.1.4.2.3	Used in the query part of HTTP GET, HTTP PATCH and HTTP DELETE to extend the set of targeted resources beyond the base resource identified with the path component of the URI
<b>Types used in request bodies</b>		
resourcePut-RequestType	12.1.1.4.3.4	Used in the request body of HTTP PUT describing the resource to be created or updated
jsonMergePatch-RequestType	12.1.1.4.2.19	Used in the request body of HTTP PATCH describing the set of modifications to be applied to the targeted resources for the media type "application/merge-patch+json" (RFC 7396 [37])
jsonEnhancedMergePatch-RequestType	12.1.1.4.2.20	Used in the request body of HTTP PATCH describing the set of modifications to be applied to the targeted resources for the media type "application/3gpp-merge-patch+json" (TS 32.158 [15])
jsonPatch-RequestType	12.1.1.4.2.5	Used in the request body of HTTP PATCH describing the set of modifications to be applied to the targeted resources for the media type "application/json-patch+json" (RFC 6902 [36]).
3gppJsonPatch-RequestType	12.1.1.4.2.21	Used in the request body of HTTP PATCH describing the set of modifications to be applied to the targeted resources for the media type "application/3gpp-json-patch+json" (TS 32.158 [15])
<b>Types used in response bodies</b>		
error-ResponseType	12.1.1.4.2.6	
resourcePut-ResponseType	12.1.1.4.2.7	Used in the response body of HTTP PUT describing the resource created
resourceDeletion-ResponseType	12.1.1.4.2.8	Used in the response body of HTTP DELETE identifying the URIs of the deleted resources
resourceModification-ResponseType	12.1.1.4.2.9	Used in the response body of HTTP PATCH describing the set of modified resources
resourceRetrieval-ResponseType	12.1.1.4.2.10	Used in the response body of HTTP GET to return the resources identified in the request for retrieval, or the selected attributes in case the fields query parameter is used
<b>Types used for resources</b>		
resourceRepresentationType	12.1.1.4.2.11	Used for resource representations
<b>Types used in notifications</b>		
notifyMOICreation-NotifType	12.1.1.4.2.15	Used in the request body of HTTP POST for the notification type notifyMOICreation
notifyMOIDeletion-NotifType	12.1.1.4.2.16	Used in the request body of HTTP POST for the notification type notifyMOIDeletion
notifyMOIAttributeValueChange-NotifType	12.1.1.4.2.17	Used in the request body of HTTP POST for the notification type notifyMOIAttributeValueChange
notifyMOIChanges-NotifType	12.1.1.4.2.22	Used in the request body of HTTP POST for the notification type notifyMOIChanges
<b>Types referenced by the definitions above</b>		
additionalText-Type	12.1.1.4.4.2	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]
mOIChange-Type	12.1.1.4.3.4	Single MOI change reported by notifyMOIChanges
correlatedNotification-Type	12.1.1.4.3.2	Describes the correlated notifications of a single source

notificationId-Type	12.1.1.4.4.2	Notification identifier as defined in ITU-T Rec. X. 733 [4]
notificationType-Type	12.1.1.4.4.3	Notification type (notifyMOICreation, etc.)
sourceIndicator-Type	12.1.1.4.4.4	Indicates the source of the operation that led to the generation of the notification.
scopeType-Type	12.1.1.4.4.5	Scope type of a scope
scopeLevel-Type	12.1.1.4.4.2	Scope level of a scope
systemDN-Type	12.1.1.4.4.2	Type of the System DN
operation-Type	12.1.1.4.4.6	Enum with "create", "delete" and "replace"

#### 12.1.1.4.2 Query, message body and resource data types

##### 12.1.1.4.2.1 Type fields-QueryType

**Table 12.1.1.4.2.1-1: Definition of type fields-QueryType**

Type	Definition	Description
fields-QueryType	array(string)	Used in the query part of HTTP GET to select the resource object properties (attribute fields) to be returned

##### 12.1.1.4.2.2 Type filter-QueryType

**Table 12.1.1.4.2.2-1: Definition of type filter-QueryType**

Type	Definition	Description
filter-QueryType	string	Used in the query part of HTTP GET, and HTTP DELETE to filter scoped resource objects

##### 12.1.1.4.2.3 Type scope-QueryType

**Table 12.1.1.4.2.3-1: Definition of type scope-QueryType**

Type	Definition	Description
scope-QueryType	string	Used in the query part of HTTP GET, HTTP PATCH and HTTP DELETE to extend the set of targeted resources beyond the base resource identified with the path component of the URI

##### 12.1.1.4.2.4 Type resourcePut-RequestType

**Table 12.1.1.4.2.4-1: Definition of type resourcePut-RequestType**

Attribute name	Data type	Description	SQ
n/a	resourceRepresentation-Type	Key indicating the request body contains data.	M

##### 12.1.1.4.2.5 Type jsonPatch-RequestType

**Table 12.1.1.4.2.5-1: Definition of type jsonPatch-RequestType**

Attribute name	Data type	Description	SQ
n/a	object	Used in the request body of HTTP PATCH describing the set of modifications to be applied to the targeted resources for the media type "application/json-patch+json" (RFC 6902 [13]).	M

## 12.1.1.4.2.6 Type error-ResponseType

**Table 12.1.1.4.2.6-1: Definition of type error-ResponseType**

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

## 12.1.1.4.2.7 Type resourceCreation-ResponseType

**Table 12.1.1.4.2.7-1: Definition of type resourceCreation-ResponseType**

Attribute name	Data type	Description	SQ
n/a	resourceRepresentation-Type	Used in the response body of HTTP PUT describing the resource created	M

## 12.1.1.4.2.8 Type resourceDeletion-ResponseType

**Table 12.1.1.4.2.8-1: Definition of type resourceDeletion-ResponseType**

Attribute name	Data type	Description	SQ
n/a	array(uri-Type)	Used in the response body of HTTP DELETE identifying the URIs of the deleted resources	M

## 12.1.1.4.2.9 Type resourceModification-ResponseType

**Table 12.1.1.4.2.9-1: Definition of type resourceModification-ResponseType**

Attribute name	Data type	Description	SQ
n/a	resourceRepresentation-Type	Used in the response body of HTTP PATCH describing the set of modified resources	M

## 12.1.1.4.2.10 Type resourceRetrieval-ResponseType

**Table 12.1.1.4.2.10-1: Definition of type resourceRetrieval-ResponseType**

Attribute name	Data type	Description	SQ
n/a	resourceRepresentation-Type	Used in the response body of HTTP GET to return the resources identified in the request for retrieval.	M

## 12.1.1.4.2.11 Type resourceRepresentation-Type

**Table 12.1.1.4.2.11-1: Definition of type resourceRepresentation-Type**

Attribute name	Data type	Description	SQ
id	string	The id of the resource object	M
attributes	object	The attributes object whose members are the class attributes and values.	M
n/a	map(array(object))	Name contained objects	

This definition of "resourceRepresentation-Type" does not specify any attributes or specific name contained objects. Concrete resource representations with specific attributes and specific name contained objects are included in the NRM definitions. These concrete definitions should be used in implementations of the Provisioning MnS instead of this generic definition.

12.1.1.4.2.12 Void

12.1.1.4.2.13 Void

12.1.1.4.2.14 Void

12.1.1.4.2.15 Type notifyMOICreation-NotifType

**Table 12.1.1.4.2.15-1: Definition of type notifyMOICreation-NotifType**

Attribute name	Data type	Description	SQ
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 (notifyMOICreation)	M
eventTime	dateTime-Type	Event (MOI creation) occurrence time	M
systemDN	systemDN-Type	System DN	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
sourceIndicator	sourceIndicator-Type	Indicates the source of the operation that led to the generation of this notification.	O
attributeList	map(anyValue)	The attributes (name/value pairs) of the created MOI.	O

12.1.1.4.2.16 Type notifyMOIDeletion-NotifType

**Table 12.1.1.4.2.16-1: Definition of type notifyMOIDeletion-NotifType**

Attribute name	Data type	Description	SQ
ref	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 (notifyMOIDeletion)	M
eventTime	dateTime-Type	Event (MOI creation) occurrence time	M
systemDN	systemDN-Type	System DN	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
sourceIndicator	sourceIndicator-Type	Indicates the source of the operation that led to the generation of this notification.	O
attributeList	map(anyValue)	The attributes (name/value pairs) of the deleted MOI.	O

## 12.1.1.4.2.17 Type notifyMOIAttributeValueChanged-NotifType

**Table 12.1.1.4.2.17-1: Definition of type notifyMOIAttributeValueChanged-NotifType**

Attribute name	Data type	Description	SQ
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 (notifyMOIAttributeValueChanged)	M
eventTime	dateTime-Type	Event (MOI creation) occurrence time	M
systemDN	systemDN-Type	System DN	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
sourceIndicator	sourceIndicator-Type	Indicates the source of the operation that led to the generation of this notification.	O
attributeList	array(attributeNameValuePair-Type)	List with names of changed attributes, together with new value and optionally old value	O

## 12.1.1.4.2.18 Type attributes-QueryType

**Table 12.1.1.4.2.18-1: Definition of type filter-QueryType**

Type	Definition	Description
attributes-QueryType	array(string)	Used in the query part of HTTP GET to select the attributes of the scoped resource objects to be returned.

## 12.1.1.4.2.19 Type jsonMergePatch-RequestType

**Table 12.1.1.4.2.19-1: Definition of type jsonMergePatch-RequestType**

Attribute name	Data type	Description	SQ
n/a	resourceRepresentation-Type	Used in the request body of HTTP PATCH describing the set of modifications to be applied to the targeted resources for the media type "application/merge-patch+json" (RFC 7396 [37])	M

## 12.1.1.4.2.20 Type 3gppJsonMergePatch-RequestType

**Table 12.1.1.4.2.20-1: Definition of type jsonMergePatch-RequestType**

Attribute name	Data type	Description	SQ
n/a	resourceRepresentation-Type object	Used in the request body of HTTP PATCH describing the set of modifications to be applied to the targeted resources for the media type "application/3gpp-merge-patch+json" (TS 32.158 [15])	M

## 12.1.1.4.2.21 Type 3gppJsonPatch-RequestType

**Table 12.1.1.4.2.21-1: Definition of type 3gppJsonPatch-RequestType**

Attribute name	Data type	Description	SQ
n/a	array(object)	Used in the request body of HTTP PATCH describing the set of modifications to be applied to the targeted resources for the media type "application/3gpp-json-patch+json" (RFC 6902 [z]).	M

## 12.1.1.4.2.22 Type notifyMOIChanges-NotifType

**Table 12.1.1.4.2.22-1: Definition of type notifyMOIChanges-NotifType**

Attribute name	Data type	Description	SQ
href	uri-Type	URI of the local root in the MIB	M
notificationId	notificationId-Type	Notification identifier as defined in ITU-T Rec. X.733 [4].	M
notificationType	notificationType-Type	Notification type (notifyMOIChanges)	M
eventTime	dateTime-Type	Event (NRM updates) occurrence time	M
systemDN	systemDN-Type	System DN	M
moiChanges	array(moiChange-Type)	MOI changes to be reported	M

## 12.1.1.4.3 Referenced structured data types

## 12.1.1.4.3.1 Void

## 12.1.1.4.3.2 Type correlatedNotification-Type

**Table 12.1.1.4.3.2-1: 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

## 12.1.1.4.3.3 Type MOIChange-Type

**Table 12.1.1.4.3.3-1: Definition of type MOIChange-Type**

Attribute name	Data type	Description	SQ
notificationId	notificationId-Type	Notification identifier 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
sourceIndicator	sourceIndicator-Type	Indicates the source of the operation that led to the generation of this notification.	O
path	URI-Type	URI specifying the updated resource	M
operation	operation-Type	Operation associated to the reported change ("CREATE", "DELETE", "REPLACE")	M
value	object or array	For reporting resource creation or deletion, the optional complete resource representation. In this case the data type of value is an object. For reporting attribute value changes, the (optional) old values and (mandatory) new values. In this case the data type of value is an array with min. one and max. two items of type object.	CM

For a create and delete operation only the host and path components are present in the URI carried by "path" and identify the created or deleted resources. The "value" may optionally carry the complete resource representation of the created or deleted resource.

For a replace operation two cases need to be distinguished.

In the first case, values changes of complete attributes of a MOI are reported. Only the host and path components are present in the URI carried by "path". The "value" is an array of min. one and max. two items. If only one item is present it carries the new resource representation with the attributes not changed being absent. If two items are present in the array, the first item carries the old resource representation with the attributes not changed being absent, and the second item carries the new resource representation with the attributes not changed being absent. The order of items in the array carries semantics and shall therefore not be reversed.

In the second case, a value change of an attribute part is reported. Here the URI needs to carry besides the host and path components also the fragment component. The URI fragment is specified using JSON pointer in the URI fragment identifier representation as defined in clause 6 of RFC 6901 [w]. The context for JSON pointer is the updated resource. The "value" is an array of min. one and max. two items. If only one item is present it carries the new value of the attribute part. If two items are present in the array, the first item carries the old value of the attribute part, and the second item carries the new value of the attribute part. Hence also in this case the order of items in the array carries semantics and shall not be reversed.

## 12.1.1.4.4 Simple data types and enumerations

## 12.1.1.4.4.1 General

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

## 12.1.1.4.4.2 Simple data types

**Table 12.1.1.4.3.2-1: Simple data types**

Type name	Type definition	Description
dateTime-Type	string	Date and time with type: string and format:date-time [35]
long-Type	integer	Signed 64 bits with type: integer and format: int64 [35]
uri-Type	string	Type of a URI
className-PathType	string	Type used in the path component for the class name
subscriptionId-PathType	string	Used in the path component to identify a subscription
id-PathType	string	Type used in the path component for the id.
consumerReferenceId-QueryType	uri-Type	Used in the query part of HTTP DELETE on /subscriptions to delete all subscriptions made with a specific consumerReferenceId
additionalText-Type	string	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]
filter-Type	string	Filter of a subscription resource
notificationId-Type	long	Notification identifier as defined in ITU-T Rec. X. 733 [4]
scopeLevel-Type	integer	Scope level of a scope
systemDN-Type	string	Type of the System DN

## 12.1.1.4.4.3 Enumeration notificationType-Type

**Table 12.1.1.4.4.3-1: Enumeration notificationType-Type**

Enumeration value	Description
notifyMOICreation	Notification type is notifyMOICreation
notifyMOIDeletion	Notification type is notifyMOIDeletion
notifyMOIAttributeValueChange	Notification type is notifyMOIAttributeValueChange

## 12.1.1.4.4.4 Enumeration sourceIndicator-Type

**Table 12.1.1.4.4.4-1: Enumeration sourceIndicator-Type**

Enumeration value	Description
resourceOperation	The notification was generated in response to an internal operation of the resource.
managementOperation	The notification was generated in response to a management operation applied across the managed object boundary external to the managed object
sONOperation	The notification was generated as result of a SON (Self Organising Network) process like self-configuration, self-optimization, self-healing etc. .
unknown	It is not possible to determine the source of the operation.

## 12.1.1.4.4.5 Enumeration scopeType-Type

**Table 12.1.1.4.4.4.1-1: Enumeration scopeType-Type**

Enumeration value	Description
BASE_ONLY	Selects only the base resource. The "scopeLevel" parameter shall be absent or ignored if present.
BASE_ALL	Selects the base resource and all of its subordinate resources (incl. the leaf resources). The "scopeLevel" parameter shall be absent or ignored if present.
BASE_NTH_LEVEL	Selects all resources on the level, which is indicated by the "scopeLevel" parameter, below the base resource. The base resource is at "scopeLevel" zero.
BASE_SUBTREE	Selects the base resource and all of its subordinate resources down to and including the resources on the level indicated by the "scopeLevel" parameter. The base resource is at "scopeLevel" zero.



## 12.1.1.4.4.6 Enumeration operation-Type

**Table 12.1.1.4.4.6-1: Enumeration operation-Type**

Enumeration value	Description
CREATE	Create operation
DELETE	Delete operation
REPLACE	Replace operation

## 12.1.2 RESTful HTTP-based solution set for integration with ONAP VES API

## 12.1.2.1 Mapping of operations

NOTE: this mapping is not part of the present document.

## 12.1.2.2 Mapping of notifications

## 12.1.2.2.1 Introduction

## 12.1.2.2.1.1 General

The 3GPP IS notifications are mapped to SS equivalents according to table 12.1.2.2.1.1-1.

**Table 12.1.2.2.1.1-1: Mapping of 3GPP IS notifications to SS equivalents**

3GPP IS notifications	HTTP Method	Resource URI	SQ
notifyMOICreation	POST	/eventListener	M
notifyMOIDeletion	POST	/eventListener	M
notifyMOIAttributeValueChange	POST	/eventListener	M

## 12.1.2.2.1.2 Void

## 12.1.2.2.2 Notification notifyMOICreation

See clause 12.1.1.2.2..

## 12.1.2.2.3 Notification notifyMOIDeletion

See clause 12.1.1.2.3.

## 12.1.2.2.4 Notification notifyMOIAttributeValueChange

See clause 12.1.1.2.4.

## 12.1.2.3 Resources

## 12.1.2.3.1 Resource structure

Figure 12.1.2.3.1-1 shows the resource structure of the provisioning MnS in the context of its integration with VES Event Listener 7.1.1 [45].



**Figure 12.1.2.3.1-1: Resource URI structure of the provisioning MnS for integration with ONAP VES Event Listener 7.1.1 (Resource structure section) [45]**

Table 12.1.2.3.1-1 provides an overview of the resources and applicable HTTP methods.

**Table 12.1.2.3.1-1: Resources and methods overview**

Resource name	Resource URI	HTTP method	Description
eventListener	/eventListener	POST	Send notifications

12.1.2.3.2      Resource definitions

See Resource structure section in [45].

12.1.2.4      Data type definitions

See clause 12.1.1.4.

12.1.3      YANG/Netconf-based solution set

12.1.3.1      Mapping of operations

12.1.3.1.1      Introduction

The YANG/Netconf based solution set is based on the 3GPP TS 32.160 [33] clause 6.2 and the IETF RFC 6241 [32] including the Xpath capability.

NOTE: The clauses below omit namespaces for brevity. In NETCONF operations namespaces are included following [34]

12.1.3.1.2      Operation createMOI

The operation is mapped to a NETCONF <edit-config> operation, with XML elements representing the DN path to the MOI, the MOI itself, its id/key and its attributes.

The NETCONF operation attribute on the list representing the newly created MOI should be set to ‘create’.

The default-operation parameter of the <edit-config> operation should be set to none.

The IS operation parameters are mapped to SS equivalents according to table 12.1.3.1.2-1 and table 12.1.3.1.2-2.

**Table 12.1.3.1.2-1: Mapping from IS createMOI input parameters to SS equivalents**

IS operation parameter name	SS parameter name	SQ	Remark
managedObjectClass	config	M	XML element's name inside the <config> element.
managedObjectInstance	config	M	A sequence of embedded XML elements inside the <config> element. XML elements for all containing MOIs and their ids(keys) shall be included together with the XML elements representing the to be created MOI and its key.
attributeListIn	config	M	The key leaf, the "attributes container" and leaf, leaf-list or list entries of YANG models representing the attributes.

**Table 12.1.3.1.2-2: Mapping from IS createMOI output parameters to SS equivalents**

IS operation parameter name	SS parameter name	SQ	Remark
attributeListOut	no corresponding SS parameter	M	Not supported. (note 1)
status	-	M	OperationSucceeded if NETCONF rpc-reply contains <ok> element. OperationFailed if NETCONF-reply contains <rpc-error>.

NOTE 1: Successful Netconf <edit-config> operations only return an <ok> element. Therefore, the attributeListOut can be retrieved via a separate <get-config> operation.

### Examples

Create ManagedElement=myNode, GNBDFunction=1

```
<rpc message-id="101">
  <edit-config>
    <target>
      <running/>
    </target>
    <default-operation>none</default-operation>
    <config>
      < ManagedElement>
        <id>myNode</id>
        <GNBDFunction operation="create">
          <id>1</id>
          <attributes>
            <gNBIdLength>25</gNBIdLength>
            <gNBId>357</gNBId>
            <priorityLabel>1</priorityLabel>
            <gNBDUName>du-south-1</gNBDUName>
            <!-- other attributes --->
          </attributes>
        </GNBDFunction>
      </ManagedElement>
    </config>
  </edit-config>
</rpc>

<!-- createMO Response -->
<rpc-reply message-id="101" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <ok/>
</rpc-reply>
```

### 12.1.3.1.3 Operation getMOIAttributes

This IS operation is mapped to NETCONF <get> or <get-config> operation, depending on whether all configuration and state information is to be retrieved, or configuration data only. (In the next paragraphs only <get> operation is mentioned but <get-config> is always an alternative).

The IS operation parameters `baseObjectInstance`, `(3GPP-)filter`, `scope`, `level` and `attributeListIn` are all combined and mapped into the Netconf-filter element. The scopes `BASE_ONLY` and `BASE_ALL` can be mapped to both subtree and Xpath filtering. The scopes `BASE_NTH_LEVEL` and `BASE_SUBTREE` can only be mapped to Xpath filtering.

The IS operation parameters are mapped to SS equivalents according to table 12.1.3.1.3-1 and table 12.1.3.1.3-2.

**Table 12.1.3.1.3-1: Mapping of IS `getMOIAttributes` input parameters to SS equivalents**

IS operation parameter name	SS parameter name	SQ	Remark
<code>baseObjectInstance</code>	<code>filter</code>	M	Initial part of the filter element. For subtree filter this is a set of XML element representing lists containing MOIs together with the leafs representing key values for these MOIs from the root MOI (e.g. <code>ManagedElement</code> ) to the <code>baseObjectInstance</code> . For Xpath filter it is the initial parts of the Xpath expression representing the same information.
<code>scope</code>	<code>filter</code>	M	<code>BASE_ONLY</code> and <code>BASE_ALL</code> realized by the initial XML elements of the <code>&lt;get&gt;</code> operation. <code>BASE_SUBTREE</code> and <code>BASE_NTH_LEVEL</code> is encoded in the Xpath filter.
<code>level</code>	<code>filter</code>	M	Included in the Xpath filter, see examples. (If level is used Xpath filtering must be used).  For <code>BASE_SUBTREE</code> the levels number is transformed into a number of filter sub-expressions joined by the OR operator.  For <code>BASE_NTH_LEVEL</code> included in the Xpath expression as a sequence of <code>“*”</code> parts (descendant axis) The number of <code>“*”</code> correspond to the number of levels.
<code>filter</code>	<code>filter</code>	M	Netconf Subtree or Xpath filter
<code>attributeListIn</code>	<code>filter</code>	M	add the attributes to the subtree or Xpath filter

**Table 12.1.3.1.3-2: Mapping of IS `getMOIAttributes` output parameters to SS equivalents**

IS operation parameter name	SS parameter name	SQ	Remark
<code>managedObjectClass</code>	<code>data</code>	M	Can be extracted from the NETCONF <code>&lt;rpc-reply&gt;</code> <code>&lt;data&gt;</code> elements
<code>managedObjectInstance</code>	<code>data</code>	M	Can be extracted from the NETCONF <code>&lt;rpc-reply&gt;</code> <code>&lt;data&gt;</code> elements
<code>attributeListOut</code>	<code>data</code>	M	Can be extracted from the NETCONF <code>&lt;rpc-reply&gt;</code> <code>&lt;data&gt;</code> elements
<code>status</code>	<code>data</code>	M	<code>rpc-reply</code> or <code>rpc-error</code> indicates general status.

If scope is **BASE\_ONLY** the `<get>` shall be directed against the “attributes” container of the `baseObjectInstance`.

#### Example 1

A `getMOIAttributes` for base object `ManagedElement=myNode`, `scope = BASE_ONLY`, `filter=none`, `attributesListIn=empty` is mapped into the following `<get-config>` operation -

```
<rpc message-id="101"
  xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <get-config>
    <source>
      <running/>
    </source>
    <filter type="subtree">
      <ManagedElement>
        <id>myNode</id>
      </ManagedElement>
    </filter>
  </get-config>
</rpc>
```

```

    <attributes/>
  </ManagedElement>
</filter>
</get-config>
</rpc>

```

If scope is **BASE\_ALL** the <get> shall be directed against the list representing the baseObjectInstance.

### Example 2

A getMOIAttributes for base object ManagedElement=myNode, scope = BASE\_ALL, filter=, MeasurementControl.pMAAdministrativeState=UNLOCKED, attributesListIn=empty.

```

<rpc message-id="101"
  xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <get>
    <source>
      <running/>
    </source>
    <filter type="subtree">
      <ManagedElement>
        <id>myNode</id>
      <MeasurementControl>
        <pMAAdministrativeState>
          UNLOCKED
        </pMAAdministrativeState>
      </MeasurementControl>
    </ManagedElement>
    </filter>
  </get>
</rpc>

```

If scope is **BASE\_SUBTREE** the <get> shall be directed against the list representing the baseObjectInstance. The Xpath filter expression will need a sub-expression for each level joined by the OR operator.

### Example 3

A getMOIAttributes for base object ManagedElement=me1, scope = BASE\_SUBTREE, level=2, filter=none, attributesListIn=empty.

```

<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="101">
  <get>
    <source>
      <running/>
    </source>
    <filter type="xpath"
      select="/me3gpp:ManagedElement[id='me1']/attributes |
        /me3gpp:ManagedElement[id='me1']/*/*attributes |
        /me3gpp:ManagedElement[id='me1']/*/*/*attributes" />
    </get>
  </rpc>

```

If scope is **BASE\_NTH\_LEVEL** the <get> shall be directed against the list representing classes at the *Nth* level under the baseObjectInstance. The number of '\*' parts (descendant axis) will correspond to the number of levels.

### Example 4

A getMOIAttributes for base object ManagedElement=myNode, scope = BASE\_NTH\_LEVEL, level=2, filter=none, attributesListIn=empty.

```

<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="101">
  <get>
    <source>
      <running/>
    </source>

```

```

<filter type="xpath"
  select="/me3gpp:ManagedElement[id='me1']/**/attributes"/>
</get>
</rpc>

```

#### 12.1.3.1.4 Operation modifyMOIAttributes

This IS operation modifies one or multiple managed object instances. It is mapped to the NETCONF <edit-config> operation. The NETCONF <edit-config> operation can modify attributes in a given MOI or set of MOIs but only indirectly supports scope or filtered sets of MOIs that are part of the modifyMOIAttributes 3GPP operation specification. <edit-config> needs a config block, containing the explicit config changes to be made for each MOI.

The default-operation parameter should be set to none.

The Netconf operation attribute on the list representing modified MOI(s) should be set to create, replace or delete according to the ENUM in the modificationList.

The IS operation parameters are mapped to SS equivalents according to table 12.1.3.1.4-1 and table 12.1.3.1.4-2.

**Table 12.1.3.1.4-1: Mapping of IS modifyMOIAttributes input parameters to SS equivalents**

IS operation parameter name	SS parameter name	SQ	Remark
baseObjectInstance	config	M	A sequence of embedded XML elements inside the <config> element. XML elements for all containing MOIs and their ids(keys) shall be included together with the XML elements representing the to be modified MOI and its key.
scope	config	M	BASE_ONLY supported as default. Multiple MOIs can be specified in the same operation, emulating other scopes.
filter	config	M	Multiple MOIs can be specified in the same operation, emulating filtering.
modificationList	config	M	The "attributes container" and leaf, leaf-list or list entries representing the attributes.

**Table 12.1.3.1.4-2: Mapping of IS modifyMOIAttributes output parameters to SS equivalents**

IS operation parameter name	SS parameter name	SQ	Remark
modificationListOut	no corresponding SS parameter	M	Not supported. (note 1)
status	-	M	rpc-reply or rpc-error indicates general status. The following elements give detailed error information: <error-tag> <error-path>

Note 1: Successful Netconf <edit-config> operations only return an <ok> element. Therefore, the attributeListOut can be retrieved via a separate <get-config> operation.

#### 12.1.3.1.5 Operation deleteMOI

This IS operation deletes one or multiple managed object instances. It is mapped to the NETCONF <edit-config> operation. <edit-config> can delete one or more specific MOIs but only indirectly supports scope or filtered sets of MOIs that are part of the generic deleteMOI 3GPP operation specification. <edit-config> uses a config block, indicating the MOI(s) to be deleted.

The Netconf operation attribute on the list representing the baseObjectInstance should be set to delete or remove.

The default-operation parameter should be set to none.

The IS operation parameters are mapped to SS equivalents according to table 12.1.3.1.5-1 and table 12.1.3.1.5-2.

**Table 12.1.3.1.5-1: Mapping of IS deleteMOI input parameters to SS equivalents**

IS operation parameter name	SS parameter name	SQ	Remark
baseObjectInstance	config	M	A sequence of embedded XML elements inside the <config> element. XML elements for all containing MOIs and their ids(keys) shall be included together with the XML elements representing the to be deleted MOI and its key.
scope	config	M	BASE_ONLY supported as default. Multiple MOIs can be specified in the same operation, emulating other scopes.
filter	config	M	Multiple MOIs can be specified in the same operation, emulating filtering.

**Table 12.1.3.1.5-2: Mapping of IS deleteMOI output parameters to SS equivalents**

IS operation parameter name	SS parameter name	SQ	Remark
deletionList	no corresponding SS parameter	M	Not supported. (note 1)
status	-	M	rpc-reply or rpc-error indicates general status. The following elements give detailed error information: <error-tag> <error-path>

NOTE 1: Successful Netconf <edit-config> operations only return an <ok> element. Therefore, the deletionList can be retrieved via a separate <get-config> operation.

## 12.2 Generic fault supervision management service

### 12.2.1 RESTful HTTP-based solution set

#### 12.2.1.1 Mapping of operations

##### 12.2.1.1.1 Introduction

The IS operations are mapped to SS equivalents according to table 12.2.1.1.1-1.

**Table 12.2.1.1.1-1: Mapping of IS operations to SS equivalents**

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

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

### 12.2.1.1.2 Operation `getAlarmList`

The IS operation parameters are mapped to SS equivalents according to table 12.2.1.1.2-1 and table 12.2.1.1.2-2.

**Table 12.2.1.1.2-1: Mapping of IS operation input parameters to SS equivalents (HTTP GET)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
alarmAckState	query	alarmAckState	AlarmAckState-	O
baseObjectClass	query	baseObjectInstance	Dn	O
baseObjectInstance				
filter	query	filter	Filter	O

**Table 12.2.1.1.2-2: Mapping of IS operation output parameters to SS equivalents (HTTP GET)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
alarmInformationList	response body	n/a	map(NotificationHeader, AlarmRecord, comments(map(Comment)))	M
status	response status codes	n/a	n/a	M

The message flow is as follows:

- The MnS consumer sends a HTTP GET request to the MnS producer.
  - The URI identifies the ".../alarms" collection resource.
  - The querycomponent may contain three optional parameters: "alarmAckstate", "baseObjectInstance" and "filter". Absence of the query component means all alarms shall be returned.
  - The request message body shall be empty.
- The MnS producer sends a HTTP GET response to the MnS consumer.
  - On success "200 OK" shall be returned. The response message body shall contain the queried alarm records, the notification headers of the last "notifyNewAlarm", "notifyChangedAlarm" or "notifyClearedAlarm" notifications, which were sent related to the alarms, and the comments associated to the alarms.
  - On failure, an appropriate error code shall be returned. The response message body may carry additional error information.

### 12.2.1.1.3 Operation `getAlarmCount`

The IS operation parameters are mapped to SS equivalents according to table 12.2.1.1.3-1 and table 12.2.1.1.3-2.

**Table 12.2.1.1.3-1: Mapping of IS operation input parameters to SS equivalents (HTTP GET)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
alarmAckState	query	alarmAckState	AlarmAckState-	O
filter	query	filter	string	O



**Table 12.2.1.1.3-2: Mapping of IS operation output parameters to SS equivalents (HTTP GET)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
criticalCount, majorCount, minorCount, warningCount, indeterminateCount, clearedCount	response body	n/a	AlarmCount	M
status	response status codes	n/a	n/a	M

The message flow is as follows:

1. The MnS consumer sends a HTTP GET request to the MnS producer.
  - The URI identifies the ".../alarms/alarmsCount" collection resource.
  - The query component may contain two optional parameters: "alarmAckstate" and "filter". Absence of the query component means all alarms shall be counted.
  - The request message body shall be empty.
2. The MnS producer sends a HTTP GET response to the MnS 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".
  - On failure, an appropriate error code shall be returned. The response message body may carry additional error information.

#### 12.2.1.1.4 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 12.2.1.1.4-1 and table 12.2.1.1.4-2.

**Table 12.2.1.1.4-1: Mapping of IS operation input parameters to SS equivalents (HTTP POST)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
alarmInformationReferenceList	path	/alarms/{alarmId}/comment	string	M
commentUserId	request body	commentUserId	commentUserId	M
commentSystemId	request body	commentSystemId	commentSystemId	O
commentText	request body	commentText	commentText	M

**Table 12.2.1.1.4-2: Mapping of IS operation output parameters to SS equivalents (HTTP POST)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
badAlarmInformationReferenceList	response body	n/a	ErrorResponse	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 MnS consumer sends a HTTP POST request to the MnS producer.
  - The URI identifies the ".../alarms/{alarmId}/comment" alarm resource the comment shall be added to.

- The query component 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. .

2. The MnS producer sends a HTTP POST response to the MnS consumer.

- On success "201 Created " shall be returned. The response message body shall carry the representation of the created comment resource. The Location header shall be present and carry the URI of the created comment resource.
- On failure, an appropriate error code shall be returned. The response message body may carry additional error information.

The stage 3 solution does not support adding a comment to multiple alarms.

#### 12.2.1.1.5 Operation acknowledgeAlarms

In case a single alarm shall be acknowledged the IS operation parameters are mapped to SS equivalents according to table 12.2.1.1.5-1 and table 12.2.1.1.5-2.

**Table 12.2.1.1.5-1: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
alarmInformationAndSeverityReferenceList	path	/ {alarmId}	string	M
ackUserId	request body	ackUserId	AckUserId	M
ackSystemId	request body	ackSystemId	AckSystemId	O

The perceived severity is not mapped in the present document.

**Table 12.2.1.1.5-2: Mapping of IS operation output parameters to SS equivalents (HTTP PATCH)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
badAlarmInformationReferenceList	response body	n/a	errorResponse	M
status	response status codes	n/a	n/a	M

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

1. The MnS consumer sends a HTTP PATCH request to the MnS producer.

- The URI identifies the ".../alarms/{alarmId}" alarm resource to be acknowledged.
- The query component is absent..
- 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 "MergePatchAcknowledgeAlarms".

2. The MnS producer sends a HTTP PATCH response to the MnS 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 response message body may carry additional error information.

In case multiple alarms shall be acknowledged the IS operation parameters are mapped to SS equivalents according to table 12.2.1.1.5-3 and table 12.2.1.1.5-4.

**Table 12.2.1.1.5-3: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
alarmInformationAndSeverityReferenceList	path request body	/alarms alarmId (key in map)	n/a string	M M
ackUserId	request body	ackUserId	ackUserIdType	M
ackSystemId	request body	ackSystemId	ackSystemIdType	O

The perceived severity is not mapped in the present document.

**Table 12.2.1.1.5-4: Mapping of IS operation output parameters to SS equivalents (HTTP PATCH)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
badAlarmInformationReferenceList	response body	n/a	array(failedAlarm)	M
status	response status codes	n/a	n/a	M

The message flow for acknowledging multiple alarms is as follows:

1. The MnS consumer sends a HTTP PATCH request to the MnS producer.

- The URI identifies the ".../alarms" collection resource.
- The query component is absent..
- The request message body contains a merge patch document. The document shall patch the "ackState" and "ackUserId" property of the identified alarm resources, and may patch the "ackSystemId" property. The patch document is defined by "MergePatchAcknowledgeAlarms".

2. The MnS producer sends a HTTP PATCH response to the MnS 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.

#### 12.2.1.1.6 Operation unacknowledgeAlarms

In case a single alarm shall be unacknowledged the IS operation parameters are mapped to SS equivalents according to table 12.2.1.1.6-1 and table 12.2.1.1.6-2.

**Table 12.2.1.1.6-1: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
alarmInformationReferenceList	path	{alarmId}	string	M
ackUserId	request body	ackUserId	AckUserId	M
ackSystemId	request body	ackSystemId	AckSystemId	O

**Table 12.2.1.1.6-2: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
badAlarmInformationReferenceList	response body	n/a	errorResponse	M
status	response status codes	n/a	n/a	M

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

1. The MnS consumer sends a HTTP PATCH request to the MnS producer.

- The URI identifies the ".../alarms/{alarmId}" alarm resource to be acknowledged.
- The query component is absent.
- 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 "MergePatchAcknowledgeAlarms".

2. The MnS producer sends a HTTP PATCH response to the MnS 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 additional error information.

In case multiple alarms shall be unacknowledged the IS operation parameters are mapped to SS equivalents according to table 12.2.1.1.6-3 and table 12.2.1.1.6-4.

**Table 12.2.1.1.6-3: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
alarmInformationReferenceList	path	/alarms	n/a	M
	request body	alarmId (key in map)	string	M
ackUserId	request body	ackUserId	AckUserId	M
ackSystemId	request body	ackSystemId	AckSystemId	O

**Table 12.2.1.1.6-4: Mapping of IS operation output parameters to SS equivalents (HTTP PATCH)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	s
badAlarmInformationReferenceList	response body	error	array(failedAlarm)	M
status	response status codes	n/a	n/a	M

The message flow for unacknowledging multiple alarms is as follows:

1. The MnS consumer sends a HTTP PATCH request to the MnS producer.

- The URI identifies the ".../alarms" collection resource.
- The query component is absent.
- The request message body contains a merge patch document. The document shall patch the "ackState" and "ackUserId" property of the identified alarm resources, and may patch the "ackSystemId" property. The patch document is defined by "MergePatchAcknowledgeAlarms".

2. The MnS producer sends a HTTP PATCH response to the MnS 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.

#### 12.2.1.1.7 Operation clearAlarms

In case a single alarm shall be cleared the IS operation parameters are mapped to SS equivalents according to table 12.2.1.1.7-1 and table 12.2.1.1.7-2.

**Table 12.2.1.1.7-1: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
alarmInformationReferenceList	path	/alarmId	string	M
clearUserId	request body	clearUserId	ClearUserId	M
clearSystemId	request body	clearSystemId	ClearSystemId	O

**Table 12.2.1.1.7-2: Mapping of IS operation output parameters to SS equivalents (HTTP PATCH)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
badAlarmInformationReferenceList	response body	n/a	errorResponse	M
status	response status codes	n/a	n/a	M

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

1. The MnS consumer sends a HTTP PATCH request to the MnS producer.

- The URI identifies the ".../alarms/{alarmId}" alarm resource.
- The query component 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 "alarmRecord" object. The patch document is defined by "MergePatchClearAlarms".

2. The MnS producer sends a HTTP PATCH response to the MnS 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 "FailedAlarms-Response".

In case multiple alarms shall be cleared the IS operation parameters are mapped to SS equivalents according to table 12.2.1.1.7-3 and table 12.2.1.1.7-4.

**Table 12.2.1.1.7-3: Mapping of IS operation input parameters to SS equivalents (HTTP PATCH)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
alarmInformationReferenceList	path request body	/alarms alarmId (key in map)	n/a string	M M
clearUserId	request body	clearUserId	ClearUserId	M
clearSystemId	request body	clearSystemId	ClearSystemId	O

**Table 12.2.1.1.7-4: Mapping of IS operation output parameters to SS equivalents (HTTP PATCH)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
badAlarmInformationReferenceList	response body	n/a	array(failedAlarm)	M
status	response status codes	n/a	n/a	M

The message flow for clearing multiple alarms is as follows:

1. The MnS consumer sends a HTTP PATCH request to the MnS producer.

- The URI identifies the ".../alarms" collection resource.
- The query component 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 resources . The patch document is defined by "patchClearAlarms-RequestType".

2. The MnS producer sends a HTTP PATCH response to the MnS 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.

#### 12.2.1.1.8 Operation subscribe

The IS operation parameters are mapped to SS equivalents according to table 12.2.1.1.8-1 and table 12.2.1.1.8-2.

**Table 12.2.1.1.8-1: Mapping of IS operation input parameters to SS equivalents (HTTP POST)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
consumerReference	request body	consumerReference	Uri	M
timeTick	request body	timeTick	Long	O
filter	request body	filter	string	O

**Table 12.2.1.1.8-2: Mapping of IS operation output parameters to SS equivalents (HTTP POST)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
subscriptionId	Location header	n/a	Uri	M
status	response status code	n/a	n/a	M

The procedure for subscribing to notifications is as follows:

1. The MnS consumer sends a HTTP POST request to the MnS producer.

- The URI identifies the ".../subscriptions" collection resource.
- The query component shall be absent.
- The request message body shall carry a data structure of type "Subscription". This data structure contains filtering criteria and a consumer side URI to which the provider will subsequently send notifications about events that match the filter.

2. The MnS producer creates a new subscription for notifications related to fault management, and a resource that represents this subscription.

3. The MnS producer sends a HTTP POST response to the MnS consumer.

- On success "201 Created " shall be returned. The response message body shall carry the representation of the created subscription resource. The Location header shall be present and carry the URI of the created subscription resource.
- On failure, an appropriate error code shall be returned. The response message body may carry additional error information.

### 12.2.1.1.9 Operation unsubscribe

In case one subscription shall be cancelled the IS operation parameters are mapped to SS equivalents according to table 12.2.1.1.9-1 and table 12.2.1.1.9-2.

**Table 12.2.1.1.9-1: Mapping of IS operation input parameters to SS equivalents (HTTP DELETE)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	S
consumerReference	--	--	--	--
subscriptionId	path	/subscriptions/{subscriptionId}	string	M

**Table 12.2.1.1.9-2: Mapping of IS operation output parameters to SS equivalents (HTTP DELETE)**

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

The consumer reference is not mapped in the present document.

The procedure for unsubscribing from one subscription is as follows:

1. The MnS consumer sends a HTTP DELETE request to the MnS producer.

- The URI identifies the ".../subscriptions/{subscriptionId}" subscription resource.
- The querycomponent shall be absent.
- The request message body shall be empty.

2. The MnS producer sends a HTTP DELETE response to the MnS 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.

### 12.2.1.2 Mapping of notifications

#### 12.2.1.2.1 Introduction

The IS notifications are mapped to SS equivalents according to table 12.2.1.2.1-1.

**Table 12.2.1.2.1-1: 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
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#### 12.2.1.2.2 Notification notifyNewAlarm (non-security alarm)

The IS notification parameters are mapped to SS equivalents according to table 12.2.1.2.2-1.

**Table 12.2.1.2.2-1: Mapping of IS notification parameters to SS equivalents**

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type
objectClass, objectInstance	request body	href	Uri
notificationId	request body	notificationId	NotificationId
notificationType	request body	notificationType	NotificationType
eventTime	request body	eventTime	DateTime
systemDN	request body	systemDN	SystemDN
alarmId	request body	alarmId	AlarmId
alarmType	request body	alarmType	AlarmType
probableCause	request body	probableCause	probableCause-Type
specificProblem	request body	specificProblem	SpecificProblem
perceivedSeverity	request body	perceivedSeverity	perceivedSeverity-Type
correlatedNotifications	request body	correlatedNotifications	array(correlatedNotification-Type)
backedUpStatus	request body	backedUpStatus	boolean
backUpObject	request body	backUpObject	Dn
trendIndication	request body	trendIndication	TrendIndication
thresholdInfo	request body	thresholdInfo	ThresholdInfo
correlatedNotifications	request body	correlatedNotifications	array(CorrelatedNotification)
stateChangeDefinition	request body	stateChangeDefinition	AttributeValueChangeSet
monitoredAttributes	request body	monitoredAttributes	AttributeNameValuePairSet
proposedRepairActions	request body	proposedRepairActions	string
additionalText	request body	additionalText	string
additionalInformation	request body	additionalInformation	AttributeNameValuePairSet

#### 12.2.1.2.3 Notification notifyNewAlarm (security alarm)

The IS notification parameters are mapped to SS equivalents according to table 12.2.1.2.3-1.

**Table 12.2.1.2.3-1: Mapping of IS notification parameters to SS equivalents**

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type
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objectClass, objectInstance	request body	href	Uri
notificationId	request body	notificationId	NotificationId
notificationType	request body	notificationType	NotificationType
eventTime	request body	eventTime	DateTime
systemDN	request body	systemDN	SystemDN
alarmId	request body	alarmId	AlarmId
alarmType	request body	alarmType	AlarmType
probableCause	request body	probableCause	ProbableCause
perceivedSeverity	request body	perceivedSeverity	PerceivedSeverity
correlatedNotifications	request body	correlatedNotifications	array(CorrelatedNotification)
additionalText	request body	additionalText	string
additionalInformation	request body	additionalInformation	AttributeNameValuePairSet
rootCauseIndicator	request body	rootCauseIndicator	boolean
serviceUser	request body	serviceUser	string
serviceProvider	request body	serviceProvider	string
securityAlarmDetector	request body	securityAlarmDetector	string

#### 12.2.1.2.4 Notification notifyAckStateChanged

The IS notification parameters are mapped to SS equivalents according to table 12.2.1.2.4-1.

**Table 12.2.1.2.4-1: Mapping of IS notification parameters to SS equivalents**

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	S
objectClass, objectInstance	request body	href	Uri-	M
notificationId	request body	notificationId	NotificationId	M
notificationType	request body	notificationType	NotificationType-	M
eventTime	request body	eventTime	DdtTime-	M
systemDN	request body	systemDN	SystemDN	M
alarmId	request body	alarmId	AlarmId-	M
alarmType	request body	alarmType	AlarmType	M
probableCause	request body	probableCause	ProbableCause	M
perceivedSeverity	request body	perceivedSeverity	PerceivedSeverity	M
ackState	request body	ackState	AckState	M
ackUserId	request body	ackUserId	string	M
ackSystemId	request body	ackSystemId	string	O

#### 12.2.1.2.5 Notification notifyClearedAlarm

The IS notification parameters are mapped to SS equivalents according to table 12.2.1.2.5-1.

**Table 12.2.1.2.5-1: Mapping of IS notification parameters to SS equivalents**

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	S
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objectClass, objectInstance	request body	href	Uri-	M
notificationId	request body	notificationId	NotificationId-	M
notificationType	request body	notificationType	NotificationType	M
eventTime	request body	eventTime	DateTime	M
systemDN	request body	systemDN	SystemDN-	M
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	O
clearUserId	request body	clearUserId	string	O
clearSystemId	request body	clearSystemId	string	O

#### 12.2.1.2.6 Notification notifyAlarmListRebuilt

The IS notification parameters are mapped to SS equivalents according to table 12.2.1.2.6-1.

**Table 12.2.1.2.6-1: Mapping of IS notification parameters to SS equivalents**

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	S
objectClass, objectInstance	request body	href	Uri	M
notificationId	request body	notificationId	NotificationId	M
notificationType	request body	notificationType	NotificationType	M
eventTime	request body	eventTime	DateTime	M
systemDN	request body	systemDN	SystemDN	M
reason	request body	reason	string	M
alarmListAlignme ntRequirement	request body	alarmListAlignmentReq uirement	AlarmListAlignmentRequirement	O

#### 12.2.1.2.7 Notification notifyChangedAlarm

The IS notification parameters are mapped to SS equivalents according to table 12.2.1.2.7-1.

**Table 12.2.1.2.7-1: Mapping of IS notification parameters to SS equivalents**

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	S
objectClass, objectInstance	request body	href	Uri-e	M
notificationId	request body	notificationId	NotificationId	M
notificationType	request body	notificationType	NotificationType-	M
eventTime	request body	eventTime	DateTime	M
systemDN	request body	systemDN	SystemDN	M
alarmId	request body	alarmId	AlarmId	M
alarmType	request body	alarmType	AlarmType	M
probableCause	request body	probableCause	ProbableCause	M
perceivedSeverity	request body	perceivedSeverity	PerceivedSeverity	M

#### 12.2.1.2.8 Notification notifyComments

The IS notification parameters are mapped to SS equivalents according to table 12.2.1.2.8-1.

**Table 12.2.1.2.8-1: Mapping of IS notification parameters to SS equivalents**

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	S
objectClass, objectInstance	request body	href	Uri-e	M
notificationId	request body	notificationId	NotificationId	M

notificationType	request body	notificationType	NotificationType	M
eventTime	request body	eventTime	DateTime	M
systemDN	request body	systemDN	SystemDN	M
alarmId	request body	alarmId	AlarmId	M
alarmType	request body	alarmType	AlarmType	M
probableCause	request body	probableCause	ProbableCause	M
perceivedSeverity	request body	perceivedSeverity	PerceivedSeverity	M
comments	request body	comments	map(Comment)	M

### 12.2.1.2.9 Notification notifyPotentialFaultyAlarmList

The IS notification parameters are mapped to SS equivalents according to table 12.2.1.2.9-1.

**Table 12.2.1.2.9-1: Mapping of IS notification parameters to SS equivalents**

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	S
objectClass, objectInstance	request body	href	Uri	M
notificationId	request body	notificationId	NotificationId	M
notificationType	request body	notificationType	NotificationType	M
eventTime	request body	eventTime	DateTime	M
systemDN	request body	systemDN	SystemDN	M
reason	request body	reason	string	M

### 12.2.1.2.10 Notification notifyCorrelatedNotificationChanged

The IS notification parameters are mapped to SS equivalents according to table 12.2.1.2.10-1.

**Table 12.2.1.2.10-1: Mapping of IS notification parameters to SS equivalents**

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	S
objectClass, objectInstance	request body	href	Uri-	M
notificationId	request body	notificationId	NotificationId	M
notificationType	request body	notificationType	NotificationType	M
eventTime	request body	eventTime	DateTime	M
systemDN	request body	systemDN	SystemDN	M
alarmId	request body	alarmId	AlarmId	M
correlatedNotifications	request body	correlatedNotifications	array(CorrelatedNotification)	M
rootCauseIndicator	request body	rootCauseIndicator	boolean	O

### 12.2.1.2.11 Notification notifyChangedAlarmGeneral (non-security alarm)

The IS notification parameters are mapped to SS equivalents according to table 12.2.1.2.11-1.

**Table 12.2.1.2.11-1: Mapping of IS notification parameters to SS equivalents**

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	S
objectClass, objectInstance	request body	href	Uri-e	M
notificationId	request body	notificationId	NotificationId	M
notificationType	request body	notificationType	NotificationType	M
eventTime	request body	eventTime	DateTime	M
systemDN	request body	systemDN	SystemDN	M
alarmId	request body	alarmId	AlarmId	M
alarmType	request body	alarmType	AlarmType	M

probableCause	request body	probableCause	ProbableCause	M
specificProblem	request body	specificProblem	SpecificProblem	O
perceivedSeverity	request body	perceivedSeverity	PerceivedSeverity	M
backedUpStatus	request body	backedUpStatus	booleanbackedUpStatus	O
backUpObject	request body	backUpObject	Dn	O
trendIndication	request body	trendIndication	TrendIndication	O
thresholdInfo	request body	thresholdInfo	ThresholdInfo	O
correlatedNotifications	request body	correlatedNotifications	array(CorrelatedNotification-Type)	O
stateChangeDefinition	request body	stateChangeDefinition	AttributeValueChangeSet	O
monitoredAttributes	request body	monitoredAttributes	AttributeNameValuePairSet	O
proposedRepairActions	request body	proposedRepairActions	string	O
additionalText	request body	additionalText	string	O
additionalInformation	request body	additionalInformation	AttributeNameValuePairSet	O
rootCauseIndicator	request body	rootCauseIndicator	booleanr	O
changedAlarmAttributes	request body	changedAlarmAttributes	AttributeNameValuePairSet	M

#### 12.2.1.2.12 Notification notifyChangedAlarmGeneral (security alarm)

The IS notification parameters are mapped to SS equivalents according to table 12.2.1.2.12-1.

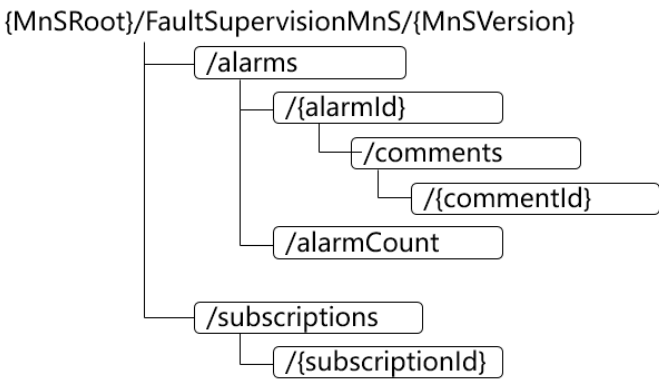
**Table 12.2.1.2.12-1: Mapping of IS notification parameters to SS equivalents**

IS notification parameter name	SS parameter location	SS parameter name	SS parameter type	S
objectClass, objectInstance	request body	href	Uri	M
notificationId	request body	notificationId	NotificationId	M
notificationType	request body	notificationType	NotificationType	M
eventTime	request body	eventTime	DateTime	M
systemDN	request body	systemDN	SystemDN	M
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)	O
additionalText	request body	additionalText	string	O
additionalInformation	request body	additionalInformation	AttributeNameValuePairSet	O
rootCauseIndicator	request body	rootCauseIndicator	boolean	O
serviceUser	request body	serviceUser	string	M
serviceProvider	request body	serviceProvider	string	M
securityAlarmDetector	request body	securityAlarmDetector	string	M
changedAlarmAttributes	request body	changedAlarmAttributes	AttributeNameValuePairSet	M

### 12.2.1.3 Resources

#### 12.2.1.3.1 Resource structure

Figure 12.2.1.3.1-1 shows the resource structure of the Fault Supervision MnS. The "alarms", "comments" and "subscriptions" resource are collection resources.



**Figure 12.2.1.3.1-1: Resource URI structure of the Fault Supervision MnS**

Table 12.2.1.3.1-1 provides an overview of the resources and applicable HTTP methods.

**Table 12.2.1.3.1-1: Resources and methods overview**

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

12.2.1.3.2            Resource definitions

12.2.1.3.2.1            Resource "/alarms"

12.2.1.3.2.1.1            Description

This resource represents a collection of alarms.

12.2.1.3.2.1.2            URI

Resource URI: {MnSRoot}/FaultSupervisionMnS/{MnSVersion}/alarms

The resource URI variables are defined in the following table.

**Table 12.2.1.3.2.1.2-1: URI variables**

Name	Definition
MnSRoot	See clause 4.4 of TS 32.158 [15]

12.2.1.3.2.1.3            HTTP methods

12.2.1.3.2.1.3.1            HTTP GET

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

**Table 12.2.1.3.2.1.3.1-1: URI query parameters supported by the GET method on this resource**

Name	Data type	Description	S
alarmAckState	AlarmAckState		O
href	Dn		O
filter	string		O

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

**Table 12.2.1.3.2.1.3.1-2: Data structures supported by the GET Request Body on this resource**

Data type	Description	S
n/a		

**Table 12.2.1.3.2.1.3.1-3: Data structures supported by the GET Response Body on this resource**

Data type	Response codes	Description	S
GetAlarmsResponse	200 OK	The alarms returned.	M
ErrorResponse	4xx/5xx	Returned in case of an error	O

12.2.1.3.2.1.3.2 Void

12.2.1.3.2.1.3.3 HTTP PATCH

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

**Table 12.2.1.3.2.1.3.3-1: URI query parameters supported by the PATCH method on this resource**

Name	Data type	Description	S
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 12.2.1.3.2.1.3.3-2: Data structures supported by the PATCH Request Body on this resource**

Data type	Description	S
map(MergePatchAcknowledgeAlarm)	Patch document for acknowledging one or multiple alarms	M
map(MergePatchClearAlarm)	Patch document for clearing one or multiple alarms	M

**Table 12.2.1.3.2.1.3.3-3: Data structures supported by the PATCH Response Body on this resource**

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

12.2.1.3.2.2 Resource "alarms/{alarmId}"

12.2.1.3.2.2.1 Description

This resource represents an alarm.

## 12.2.1.3.2.2.2 URI

Resource URI: {MnSRoot}/FaultSupervisionMnS/{MnSVersion}/alarms/{alarmId}

The resource URI variables are defined in the following table.

**Table 12.2.1.3.2.2.2-1: URI variables**

Name	Definition
MnSRoot	See clause 4.4 of TS 32.158 [15]
alarmId	String identifying an alarm

## 12.2.1.3.2.2.3 HTTP methods

## 12.2.1.3.2.2.3.1 HTTP PATCH

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

**Table 12.2.1.3.2.2.3.1-1: URI query parameters supported by the PATCH method on this resource**

Name	Data type	Description	S
n/a			

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

**Table 12.2.1.3.2.2.3.1-2: Data structures supported by the PATCH Request Body on this resource**

Data type	Description	S
MergePatchAcknowledgeAlarm	Patch document for acknowledging an alarm	M
MergePatchClearAlarm	Patch document for clearing an alarm	M

**Table 12.2.1.3.2.2.3.1-3: Data structures supported by the PATCH Response Body on this resource**

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

## 12.2.1.3.2.3 Resource "alarms/alarmCount"

## 12.2.1.3.2.3.1 Definition

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

## 12.2.1.3.2.3.2 URI

Resource URI: {MnSRoot}/FaultSupervisionMnS/{MnSVersion}/alarms/\$alarmCount

The resource URI variables are defined in table 12.2.1.3.2.3.2-1.

**Table 12.2.1.3.2.3.2-1: URI variables**

Name	Definition
MnSRoot	See clause 4.4 of TS 32.158 [15]

## 12.2.1.3.2.3.3 HTTP methods

## 12.2.1.3.2.3.3.1 GET

This method shall support the URI query parameters specified in table 12.2.1.3.2.3.3.1-1.

**Table 12.2.1.3.2.3.3.3-1: URI query parameters supported by the GET method on this resource**

Name	Data type	Description	S
alarmAckState	AlarmAckState	Allows to control which alarms are counted based on acknowledgement state	O
filter	string	Allows to control which alarms are counted based on a general filter applied to the alarm records.	O

This method shall support the request data structures specified in table 12.2.1.3.2.3.3.1-2 and the response data structures and response codes specified in table 12.2.1.3.2.3.3.1-3.

**Table 12.2.1.3.2.3.3.1-2: Data structures supported by the GET Request Body on this resource**

Data type	Description	S
n/a		

**Table 12.2.1.3.2.3.3.1-3: Data structures supported by the GET Response Body on this resource**

Data type	Response codes	Description	S
AlarmsCount	200 OK	The alarm count per severity level returned.	M
ErrorResponse	4xx/5xx	Returned in case of an error	O

## 12.2.1.3.2.4 Resource "alarms/{alarmId}/comments"

## 12.2.1.3.2.4.1 Definition

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

## 12.2.1.3.2.4.2 URI

Resource URI: {MnSRoot}/FaultSupervisionMnS/{MnSVersion}/alarms/{alarmId}/comments

The resource URI variables are defined in the following table.

**Table 12.2.1.3.2.4.2-1: URI variables**

Name	Definition
root	See clause 4.4 of TS 32.158 [15]
alarmId	Alarm identifier

## 12.2.1.3.2.4.3 HTTP methods

## 12.2.1.3.2.4.3.1 POST

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

**Table 12.2.1.3.2.4.3.1-1: URI query parameters supported by the POST method on this resource**

Name	Data type	Description	S
n/a			



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

**Table 12.2.1.3.2.4.3.1-2: Data structures supported by the POST Request Body on this resource**

Data type	Description	S
Comment	The representation of the comment to be added to an alarm.	M

**Table 12.2.1.3.2.4.3.1-3: Data structures supported by the POST Response Body on this resource**

Data type	Response codes	Description	S
Comment-ResponseType	201 Created	In case of success, the response body shall carry the representation of a comment. The "commentTime" shall be set by the MnS producer.	M
ErrorResponse	4xx/5xx	In case of failure, the response body shall be described by "ErrorResponse".	M

#### 12.2.1.3.2.5 Resource "{commentId}"

##### 12.2.1.3.2.5.1 Definition

This resource represents a comment attached to an alarm.

##### 12.2.1.3.2.5.2 URI

Resource URI: {MnSRoot}/FaultSupervisionMnS/{MnSVersion}/alarms/{alarmId}/comments/{commentId}

The resource URI variables are defined in the following table.

**Table 12.2.1.3.2.4.5-1: URI variables**

Name	Definition
MnSRoot	See clause 4.4 of TS 32.158 [15]
alarmed	Alarm identifier
commentId	Comment identifier

##### 12.2.1.3.2.5.3 HTTP methods

None.

#### 12.2.1.3.2.6 Resource "/subscriptions"

##### 12.2.1.3.2.6.1 Description

This resource is a container resource for individual subscriptions.

##### 12.2.1.3.2.6.2 URI

The resource URI is:

Resource URI: {MnSRoot}/FaultSupervisionMnS/{MnSVersion}/subscriptions

The resource URI variables are defined in the following table.

**Table 12.2.1.3.2.6.2-1: URI variables**

Name	Definition
root	See clause 4.4 of TS 32.158 [15]

12.2.1.3.2.6.3 HTTP methods

12.2.1.3.2.6.3.1 POST

This method shall support the URI query parameters specified in table 12.2.1.3.2.6.3.1-1.

**Table 12.2.1.3.2.6.3.1-1: URI query parameters supported by the POST method on this resource**

Name	Data type	Description	S
n/a			

This method shall support the request data structures specified in table 12.2.1.3.2.6.3.1-2 and the response data structures and response codes specified in table 12.2.1.3.2.6.3.1-3.

**Table 12.2.1.3.2.6.3.1-2: Data structures supported by the POST Request Body on this resource**

Data type	Description	S
Subscription	Details of the subscription to be created	M

**Table 12.2.1.3.2.6.3.1-3: Data structures supported by the POST Response Body on this resource**

Data type	Response codes	Description	S
Subscription	201 Created	In case of success the representation of the created subscription is returned.	M
ErrorResponse	4xx/5xx	In case of failure the error object is returned.	M

12.2.1.3.2.6.3.2 Void

12.2.1.3.2.7 Resource "/subscriptions/{subscriptionId}"

12.2.1.3.2.7.1 Description

This resource represents a subscription.

12.2.1.3.2.7.2 URI

The resource URI is:

Resource URI: {MnSRoot}/FaultSupervisionMnS/{MnSVersion}/subscriptions/{subscriptionId}

**Table 12.2.1.3.2.7.2-1: URI variables**

Name	Definition
MnSRoot	See clause 4.4 of TS 32.158 [15]
subscriptionId	Subscription identifier

12.2.1.3.2.7.3 HTTP methods

12.2.1.3.2.7.3.1 DELETE

This method shall support the URI query parameters specified in table 12.2.1.3.2.7.3.1-1.

**Table 12.2.1.3.2.7.3.1-1: URI query parameters supported by the DELETE method on this resource**

Name	Data type	Description	S
n/a			

This method shall support the request data structures specified in table 12.2.1.3.2.7.3.1-2 and the response data structures and response codes specified in table 12.2.1.3.2.7.3.1-3.

**Table 12.2.1.3.2.7.3.1-2: Data structures supported by the DELETE Request Body on this resource**

Data type	Description	S
n/a		

**Table 12.2.1.3.2.7.3.1-3: Data structures supported by the DELETE Response Body on this resource**

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

12.2.1.3.2.8 Resource "/notificationSink"

12.2.1.3.2.8.1 Description

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

12.2.1.3.2.8.2 URI

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

12.2.1.3.2.8.3 HTTP methods

12.2.1.3.2.8.3.1 POST

This method shall support the URI query parameters specified in table 12.2.1.3.2.8.3.1-1.

**Table 12.2.1.3.2.8.3.1-1: URI query parameters supported by the POST method on this resource**

Name	Data type	Description	S
n/a			

This method shall support the request data structures specified in table 12.2.1.3.2.8.3.1-2 and the response data structures and response codes specified in table 12.2.1.3.2.8.3.1-3.

**Table 12.2.1.3.2.8.3.1-2: Data structures supported by the POST Request Body on this resource**

Data type	Description	S
NotifyNewAlarm	Type in case a notifyNewAlarm notification is sent	M
NotifyNewSecurityAlarm-	Type in case a notifyNewSecurityAlarm notification is sent	M
NotifyAckStateChanged	Type in case a notifyAckStateChanged notification is sent	M
NotifyClearedAlarm	Type in case a notifyClearedAlarm notification is sent	M
NotifyAlarmListRebuilt	Type in case a notifyAlarmListRebuilt notification is sent	M
NotifyChangedAlarm	Type in case a notifyChangedAlarm notification is sent	M
NotifyComments	Type in case a notifyComments notification is sent	M
NotifyPotentialFaultyAlarmList	Type in case a notifyPotentialFaultyAlarmList notification is sent	M
NotifyCorrelatedNotificationChanged	Type in case a notifyCorrelatedNotificationChanged notification is sent	M
NotifyChangedAlarmGeneral	Type in case a notifyChangedAlarmGeneral notification is sent	M

**Table 12.2.1.3.2.8.3.1-3: Data structures supported by the POST Response Body on this resource**

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

## 12.2.1.4 Data type definitions

## 12.2.1.4.1 General

Table 12.2.1.4.1-1: Data types defined in the present document

Data type	Reference	Description
AlarmAckState	12.2.1.4.3.4	Used in the query part of HTTP GET on /alarms to discriminate alarms to be returned or counted
AlarmId	12.2.1.4.4.2	Alarm identifier, see clause 11.2.2.1.5.1
AlarmType	12.2.1.4.4.6	Alarm type as defined in ITU-T Rec. X. 733 [4]
ProbableCause	12.2.1.4.4.7	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]
PerceivedSeverity	12.2.1.4.4.9	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]
TrendIndication	12.2.1.4.4.10	Severity trend of the alarmed object as defined in ITU-T Rec. X. 733 [4]
ThresholdHysteresis	12.2.1.4.1a.1	Used in the definition of ThresholdInfo as defined in ITU-T Rec. X. 733 [4]
ThresholdLevelInd	12.2.1.4.1a.2	Used in the definition of ThresholdInfo as defined in ITU-T Rec. X. 733 [4]
ThresholdInfo	12.2.1.4.1a.3	Provides information for threshold crossing alarms as defined in ITU-T Rec. X. 733 [4]
CorrelatedNotification	12.2.1.4.1a.4	Describes the correlated notifications of a single source
AckState	12.2.1.4.4.4	Acknowledgement state, see clause 11.2.2.1.5.1
AlarmNotificationTypes	12.2.1.4.4.8	Alarm notification types (notifyNewAlarm, etc.)
AlarmListAlignmentRequirement	12.2.1.4.4.5	Indicating if alarm list alignment is required or not
AlarmRecord	12.2.1.4.1a.5	Representation of an alarm resource
AlarmCount	12.2.1.4.1a.6	Representation of an alarmCount resource
Comment	12.2.1.4.1a.7	Representation of a comment resource
Subscription	12.2.1.4.1a.8	Representation of a subscription resource
MergePatchAcknowledgeAlarm	12.2.1.4.1a.9	Used in the request message body of HTTP PATCH to acknowledge or unacknowledge an alarm
MergePatchClearAlarm	12.2.1.4.1a.10	Used in the request body of HTTP PATCH to clear an alarm
FailedAlarm	12.2.1.4.1a.11	Used in the response body of multiple HTTP methods to indicate error reasons per alarm id
NotifyNewAlarm	12.2.1.4.1a.12	Used in the request body of HTTP POST for the notification type notifyNewAlarm
NotifyNewSecAlarm	12.2.1.4.1a.13	Used in the request body of HTTP POST for the notification type notifyNewAlarm
NotifyClearedAlarm	12.2.1.4.1a.14	Used in the request body of HTTP POST for the notification type notifyClearedAlarm
NotifyChangedAlarm	12.2.1.4.1a.15	Used in the request body of HTTP POST for the notification type notifyChangedAlarm
NotifyChangedAlarmGeneral	12.2.1.4.1a.16	Used in the request body of HTTP POST for the notification type notifyChangedAlarmGeneral
NotifyChangedSecAlarmGeneral	12.2.1.4.1a.17	Used in the request body of HTTP POST for the notification type notifyChangedAlarmGeneral
NotifyCorrelatedNotificationChanged	12.2.1.4.1a.18	Used in the request body of HTTP POST for the notification type notifyCorrelatedNotificationChanged
NotifyAckStateChanged	12.2.1.4.1a.19	Used in the request body of HTTP POST for the notification type notifyAckStateChanged
NotifyComments	12.2.1.4.1a.20	Used in the request body of HTTP POST for the notification type notifyComments
NotifyPotentialFaultyAlarmList	12.2.1.4.1a.21	Used in the request body of HTTP POST for the notification type notifyPotentialFaultyAlarmList
NotifyAlarmListRebuilt	12.2.1.4.1a.22	Used in the request body of HTTP POST for the notification type notifyAlarmListRebuilt

**Table 12.2.1.4.1-2: Data types imported**

Data type	Reference	Description
DateTime	TS 28.623 [44]	Date and time
Float	TS 28.623 [44]	Float type
Long	TS 28.623 [44]	Long type
Dn	TS 28.623 [44]	DN type
SystemDN	TS 28.623 [44]	systemDN type
Uri	TS 28.623 [44]	URI type
AttributeNameValuePairSet	TS 28.623 [44]	Set of attribute name/value pairs
AttributeValueChangeSet	TS 28.623 [44]	Set of attribute names with their old and new values
Filter	TS 28.623 [44]	Filter type
NotificationId	TS 28.623 [44]	Notification identifier as defined in ITU-T Rec. X. 733 [4]
NotificationHeader	TS 28.623 [44]	Notification header
ErrorResponse	TS 28.623 [44]	Used in the response body of multiple HTTP methods in case of error

### 12.2.1.4.1a Structured data types

#### 12.2.1.4.1a.1 Type ThresholdHysteresis

**Table 12.2.1.4.1a.1-1: Definition of type ThresholdHysteresis**

Attribute name	Data type	Description	S
high	oneOf(integer, Float)	Higher value of a threshold with hysteresis, the integer type is used for counter thresholds and the float type for gauge thresholds.	M
low	Float	Lower value of a threshold with hysteresis, absent for counter thresholds.	O

#### 12.2.1.4.1a.2 Type ThresholdLevelInd

**Table 12.2.1.4.1a.2-1: Definition of type ThresholdLevelInd**

Attribute name (choice)	Data type	Description	S
up	ThresholdHysteresis	Indicates for counter and gauge thresholds that the threshold crossing occurred when going up.	M
down	ThresholdHysteresis	Indicates for gauge thresholds that the threshold crossing occurred when going down, absent for counter thresholds.	O

## 12.2.1.4.1a.3 Type ThresholdInfo

**Table 12.2.1.4.1a.3-1: Definition of type ThresholdInfo**

Attribute name	Data type	Description	S
observedMeasurement	string	The name of the monitored measurement that crossed the threshold and that caused the notification (Rec. ITU-T X. 733 [4]).	M
observedValue	oneOf(integer, Float)	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. The integer type is used for counters and the float type for gauges (Rec. ITU-T X. 733 [4]).	M
thresholdLevelInd	ThresholdLevelInd	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	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

## 12.2.1.4.1a.4 Type CorrelatedNotification

**Table 12.2.1.4.1a.4-1: Definition of type CorrelatedNotification**

Attribute name	Data type	Description	S
sourceObjectInstance	Dn	Source object instance of the notifications identified by notificationIds. The sourceObjectInstance shall be present if the sourceObjectInstance is not identical to the alarmed objectInstance of the alarmRecord	O
notificationIds	array(NotificationId)	Notification identifiers of notifications related to the sourceObjectInstance that are considered to be correlated to the alarmRecord	M

12.2.1.4.1a.5            Type AlarmRecord

**Table 12.2.1.4.1a.5-1: Definition of type AlarmRecord**



Attribute name	Data type	Description	S
alarmId	key(AlarmId)	Alarm identifier, see clause 11.2.2.1.5.1. The alarmId is used as key in alarm record maps.	M
objectInstance	Dn	Alarmed object instance	M
notificationId	NotificationId	Notification identifier of the last notifyNewAlarm, notifyChangedAlarm or notifyClearedAlarm	M
alarmRaisedTime	DateTime	Date and time the alarm was raised the first time, see clause 11.2.2.1.5.1	M
alarmChangedTime	DateTime	Date and time the perceived severity of the alarm changed the last time, see clause 11.2.2.1.5.1	O
alarmClearedTime	DateTime	Date and time the alarm was cleared, see clause 11.2.2.1.5.1	M
alarmType	AlarmType	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
probableCause	ProbableCause	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]	M
specificProblem	one of(string, integer)	Refinements to the probable cause of the alarm as defined in ITU-T Rec. X. 733 [4]	O
perceivedSeverity	PerceivedSeverity	Perceived severity of the alarm as defined in ITU-T Rec. X. 733 [4]	M
backedUpStatus	boolean	Indicating if the object emitting the alarm has been backed up as defined in ITU-T Recommendation X. 733 [4]	O
backUpObject	Dn	Backup object of the alarmed object as defined in ITU-T Rec. X. 733 [4]	O
trendIndication	TrendIndication	Severity trend of the alarmed object as defined in ITU-T Rec. X. 733 [4]	O
thresholdInfo	ThresholdInfo	Additional information for threshold crossing alarms as defined in ITU-T Rec. X. 733 [4]	O
correlatedNotifications	array(CorrelatedNotification)	Set of all notifications to which this notification is considered to be correlated as defined in ITU-T Rec. X. 733 [4]	O
stateChangeDefinition	AttributeValueChangeSet	State transition associated to an alarm as defined in ITU-T Rec. X. 733 [4]	O
monitoredAttributes	AttributeNameValuePairSet	Attributes of the alarmed managed object and their corresponding values at the time of the alarm as defined in ITU-T Rec. X. 733 [4].	O
proposedRepairActions	string	Proposed repair action, 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	string	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]	O
additionalInformation	AttributeNameValuePairSet	Allows the inclusion of a set of additional information in the event report as defined in ITU-T Rec. X. 733 [4]	O
rootCauseIndicator	boolean	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 11.2.2.1.5.1	O
ackTime	DateTime	Time when the alarm has been acknowledged or unacknowledged the last time, see clause 11.2.2.1.5.1	M
ackUserId	string	Identifier of a user acknowledging an alarm, see clause 11.2.2.1.5.1	M

ackSystemId	string	Identifier of a system acknowledging an alarm, see clause 11.2.2.1.5.1	O
ackState	AckState	Acknowledgement state, see clause 11.2.2.1.5.1	M
clearUserId	string	Identifier of a system clearing an alarm, see clause 10.2.2.1.5.1	O
clearSystemId	string	Identifier of a user clearing an alarm, see clause 11.2.2.1.5.1	O
serviceUser	string	Identifies the service-user whose request for service provided by the serviceProvider led to the generation of the security alarm, see clause 11.2.2.1.5.1	O
serviceProvider	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 11.2.2.1.5.1	O
securityAlarmDetector	string	Identity of the detector of the security alarm, see clause 11.2.2.1.5.1	O

## 12.2.1.4.1a.6 Type AlarmCount

**Table 12.2.1.4.1a.6-1: Definition of type AlarmCount**

Attribute name	Data type	Description	S
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

## 12.2.1.4.1a.7 Type Comment

**Table 12.2.1.4.1a.7-1: Definition of type Comment**

Attribute name	Data type	Description	S
commentTime	DateTime	Time when the comment has been added to the alarm.	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

## 12.2.1.4.1a.8 Type Subscription

**Table 12.2.1.4.1a.8-1: Definition of type Subscription**

Attribute name	Data type	Description	S
consumerReference	Uri	The URI of the endpoint to send the notification to (/notificationSink).	M
timeTick	Long	Time window within which the subscriber intends to subscribe again to confirm its subscription, see clause 11.2.2.2.5.1	O
filter	Filter	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

## 12.2.1.4.1a.9 Type MergePatchAcknowledgeAlarm

**Table 12.2.1.4.1a.9-1: Definition of type MergePatchAcknowledgeAlarm**

Attribute name	Data type	Description	S
ackUserId	string	User acknowledging an alarm	M
ackSystemId	string	System acknowledging an alarm	O
ackState	AckState	Indicates the ackState shall be set to "ACKNOWLEDGED" or "UNACKNOWLEDGED"	M

## 12.2.1.4.1a.10 Type MergePatchClearAlarm

**Table 12.2.1.4.1a.10-1: Definition of type MergePatchClearAlarm**

Attribute name	Data type	Description	S
clearUserId	clearUserId-Type	User clearing an alarm	M
clearSystemId	clearSystemId-Type	System clearing an alarm	O
perceivedSeverity	type string, enum "CLEARED"	Indicates the perceivedSeverity shall be set to "CLEARED"	M

## 12.2.1.4.1a.11 Type FailedAlarm

**Table 12.2.1.4.1a.11-1: Definition of type FailedAlarm**

Attribute name	Data type	Description	S
alarmId	AlarmId	Indicating the alarms for which the action on the alarm could not be performed	M
failureReason	string	Indicating the reason why the action could not be performed	M

## 12.2.1.4.1a.12 Type NotifyNewAlarm

**Table 12.2.1.4.1a.12-1: Definition of type NotifyNewAlarm**

Attribute name	Data type	Description	S
href	Uri	URI of the resource where the event (alarm) occurred	M
notificationId	NotificationId	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
notificationType	AlarmNotificationTypes	Notification type (notifyNewAlarm, etc.)	M
eventTime	DateTime	Event (alarm) occurrence time	M
systemDN	SystemDN	System DN	M
alarmId	AlarmId	Alarm identifier, see clause 11.2.2.1.5.1	M
alarmType	AlarmType	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
probableCause	ProbableCause	Probable cause of an alarm as defined in ITU-T Rec. X. 733 [4]	M
specificProblem	SpecificProblem	Identifies further refinements to the Probable cause of the alarm as defined in ITU-T Rec. X. 733 [4]	O
perceivedSeverity	PerceivedSeverity	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	M
backedUpStatus	boolean	Indicating if the object emitting the alarm has been backed up as defined in ITU-T Recommendation X. 733 [4]	O
backUpObject	Dn	Indicating the backup object of the alarmed object as defined in ITU-T Rec. X. 733 [4]	O
trendIndication	TrendIndication	Severity trend of the alarmed object as defined in ITU-T Rec. X. 733 [4]	O
thresholdInfo	ThresholdInfo	Provides additional information for threshold crossing alarms as defined in ITU-T Rec. X. 733 [4]	O
correlatedNotifications	array(CorrelatedNotification)	Set of all notifications to which this notification is considered to be correlated as defined in ITU-T Rec. X. 733 [4]	O
stateChangeDefinition	AttributeValueChangeSet	Indicates a state transition associated to an alarm as defined in ITU-T Rec. X. 733 [4]	O
monitoredAttributes	AttributeNameValuePairSet	Defines one or more attributes of the alarmed managed object and their corresponding values at the time of the alarm as defined in ITU-T Rec. X. 733 [4].	O
proposedRepairActions	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]	O
additionalText	string	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]	O
additionalInformation	AttributeNameValuePairSet	Allows the inclusion of a set of additional information in the event report as defined in ITU-T Rec. X. 733 [4]	O
rootCauseIndicator	boolean	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 11.2.2.1.5.1	O

## 12.2.1.4.1a.13 Type NotifyNewSecAlarm

**Table 12.2.1.4.1a.13-1: Definition of type NotifyNewSecAlarm**

Attribute name	Data type	Description	S
href	Uri	URI of the resource where the event (alarm) occurred	M
notificationId	NotificationId	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
notificationType	AlarmNotificationTypes	Notification type (notifyNewAlarm, etc.)	M
eventTime	DateTime	Event (alarm) occurrence time	M
systemDN	SystemDN	System DN	M
alarmId	AlarmId	Alarm identifier, see clause 11.2.2.1.5.1	M
alarmType	AlarmType	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
probableCause	ProbableCause	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]	M
perceivedSeverity	PerceivedSeverity	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	M
correlatedNotifications	array(CorrelatedNotification)	Set of all notifications to which this notification is considered to be correlated as defined in ITU-T Rec. X. 733 [4]	O
additionalText	string	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]	O
additionalInformation	AttributeNameValuePairSet	Allows the inclusion of a set of additional information in the event report as defined in ITU-T Rec. X. 733 [4]	O
rootCauseIndicator	boolean	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 11.2.2.1.5.1	O
serviceUser	string	Identifies the service-user whose request for service provided by the serviceProvider led to the generation of the security alarm, see clause 11.2.2.1.5.1	M
serviceProvider	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 11.2.2.1.5.1	M
securityAlarmDetector	string	Identity of the detector of the security alarm, see clause 11.2.2.1.5.1	M

## 12.2.1.4.1a.14 Type NotifyClearedAlarm

**Table 12.2.1.4.1a.14-1: Definition of type NotifyClearedAlarm**

Attribute name	Data type	Description	S
href	Uri	URI of the resource where the event (alarm) occurred	M
notificationId	NotificationId	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
notificationType	AlarmNotificationTypes	Notification type (notifyNewAlarm, etc.)	M
eventTime	DateTime	Event (alarm) occurrence time	M
systemDN	SystemDN	System DN	M
alarmId	AlarmId	Alarm identifier, see clause 11.2.2.1.5.1	M
alarmType	AlarmType	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
probableCause	ProbableCause	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]	M
perceivedSeverity	PerceivedSeverity	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	M
correlatedNotifications	array(correlatedNotification)	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 11.2.2.1.5.1	O
clearSystemId	string	Identifier of a system clearing an alarm, see clause 11.2.2.1.5.1	O

## 12.2.1.4.1a.15 Type NotifyChangedAlarm

**Table 12.2.1.1a.14.15-1: Definition of type NotifyChangedAlarm**

Attribute name	Data type	Description	S
href	Uri	URI of the resource where the event (alarm) occurred	M
notificationId	NotificationId	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
notificationType	AlarmNotificationTypes	Notification type (notifyNewAlarm, etc.)	M
eventTime	DateTime	Event (alarm) occurrence time	M
systemDN	SystemDN	System DN	M
alarmId	alarmId-Type	Alarm identifier, see clause 11.2.2.1.5.1	M
alarmType	alarmType-Type	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
probableCause	ProbableCause	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]	M
perceivedSeverity	PerceivedSeverity	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	M

## 12.2.1.4.1a.16 Type NotifyChangedAlarmGeneral

Table 12.2.1.4.1a.16-1: Definition of type NotifyChangedAlarmGeneral

Attribute name	Data type	Description	S
href	Uri	URI of the resource where the event (alarm) occurred	M
notificationId	NotificationId	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
notificationType	AlarmNotificationTypes	Notification type (notifyNewAlarm, etc.)	M
eventTime	DateTime	Event (alarm) occurrence time	M
systemDN	SystemDN	System DN	M
alarmId	AlarmId	Alarm identifier, see clause 11.2.2.1.5.1	M
alarmType	AlarmType	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
probableCause	ProbableCause	Probable cause of an alarm as defined in ITU-T Rec. X. 733 [4]	M
specificProblem	SpecificProblem	Identifies further refinements to the Probable cause of the alarm as defined in ITU-T Rec. X. 733 [4]	O
perceivedSeverity	PerceivedSeverity	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	M
backedUpStatus	boolean	Indicating if the object emitting the alarm has been backed up as defined in ITU-T Recommendation X. 733 [4]	O
backUpObject	Dn	Indicating the backup object of the alarmed object as defined in ITU-T Rec. X. 733 [4]	O
trendIndication	TrendIndication	Severity trend of the alarmed object as defined in ITU-T Rec. X. 733 [4]	O
thresholdInfo	ThresholdInfo	Provides additional information for threshold crossing alarms as defined in ITU-T Rec. X. 733 [4]	O
correlatedNotifications	array(CorrelatedNotification)	Set of all notifications to which this notification is considered to be correlated as defined in ITU-T Rec. X. 733 [4]	O
stateChangeDefinition	AttributeValueChangeSet	Indicates a state transition associated to an alarm as defined in ITU-T Rec. X. 733 [4]	O
monitoredAttributes	AttributeNameValuePairSet	Defines one or more attributes of the alarmed managed object and their corresponding values at the time of the alarm as defined in ITU-T Rec. X. 733 [4].	O
proposedRepairActions	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]	O
additionalText	string	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]	O
additionalInformation	AttributeNameValuePairSet	Allows the inclusion of a set of additional information in the event report as defined in ITU-T Rec. X. 733 [4]	O
rootCauseIndicator	boolean	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 11.2.2.1.5.1	O
changedAlarmAttributes	AttributeNameValuePairSet	Indicating the alarm attributes that have changed	M

## 12.2.1.4.1a.17 Type NotifyChangedSecAlarmGeneral

**Table 12.2.1.4.1a.17-1: Definition of type NotifyChangedSecAlarmGeneral**

Attribute name	Data type	Description	S
href	Uri	URI of the resource where the event (alarm) occurred	M
notificationId	NotificationId	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
notificationType	AlarmNotificationTypes	Notification type (notifyNewAlarm, etc.)	M
eventTime	DateTime	Event (alarm) occurrence time	M
systemDN	SystemDN	System DN	M
alarmId	AlarmId	Alarm identifier, see clause 11.2.2.1.5.1	M
alarmType	AlarmType	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
probableCause	ProbableCause	Probable cause of an alarm as defined in ITU-T Rec. X. 733 [4]	M
perceivedSeverity	PerceivedSeverity	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	M
correlatedNotifications	array(CorrelatedNotification)	Set of all notifications to which this notification is considered to be correlated as defined in ITU-T Rec. X. 733 [4]	O
additionalText	string	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]	O
additionalInformation	AttributeNameValuePairSet	Allows the inclusion of a set of additional information in the event report as defined in ITU-T Rec. X. 733 [4]	O
rootCauseIndicator	boolean	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 11.2.2.1.5.1	O
serviceUser	string	Identifies the service-user whose request for service provided by the serviceProvider led to the generation of the security alarm, see clause 11.2.2.1.5.1	M
serviceProvider	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 11.2.2.1.5.1	M
securityAlarmDetector	string	Identity of the detector of the security alarm, see clause 11.2.2.1.5.1	M
changedAlarmAttributes	AttributeNameValuePairSet	Indicating the alarm attributes that have changed	M

## 12.2.1.4.1a.18 Type NotifyCorrelatedNotificationChanged

**Table 12.2.1.4.1a.18-1: Definition of type NotifyCorrelatedNotificationChanged**

Attribute name	Data type	Description	S
href	Uri	URI of the resource where the event (alarm) occurred	M
notificationId	NotificationId	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
notificationType	AlarmNotificationTypes	Notification type (notifyNewAlarm, etc.)	M
eventTime	DateTime	Event (alarm) occurrence time	M
systemDN	SystemDN	System DN	M
alarmId	AlarmId	Alarm identifier, see clause 11.2.2.1.5.1	M
correlatedNotifications	array(CorrelatedNotification)	Set of all notifications to which this notification is considered to be correlated as defined in ITU-T Rec. X. 733 [4]	M
rootCauseIndicator	boolean	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 11.2.2.1.5.1	O



## 12.2.1.4.1a.19 Type NotifyAckStateChanged

**Table 12.2.1.4.1a.19-1: Definition of type NotifyAckStateChanged**

Attribute name	Data type	Description	S
href	Uri	URI of the resource where the event (alarm) occurred	M
notificationId	NotificationId	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
notificationType	AlarmNotificationTypes	Notification type (notifyNewAlarm, etc.)	M
eventTime	DateTime	Event (alarm) occurrence time	M
systemDN	SystemDN	System DN	M
alarmId	AlarmId	Alarm identifier, see clause 11.2.2.1.5.1	M
alarmType	AlarmType	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
probableCause	ProbableCause	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]	M
perceivedSeverity	PerceivedSeverity	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	M
ackState	string	Acknowledgement state, see clause 11.2.2.1.5.1	M
ackUserId	string	Identifier of a system acknowledging an alarm, see clause 11.2.2.1.5.1	M
ackSystemId	string	Identifier of a user acknowledging an alarm, see clause 11.2.2.1.5.1	O

## 12.2.1.4.1a.20 Type NotifyComments

**Table 12.2.1.4.1a.20-1: Definition of type NotifyComments**

Attribute name	Data type	Description	S
href	Uri	URI of the resource where the event (alarm) occurred	M
notificationId	NotificationId	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
notificationType	AlarmNotificationTypes	Notification type (notifyNewAlarm, etc.)	M
eventTime	DateTime	Event (alarm) occurrence time	M
systemDN	SystemDN	System DN	M
alarmId	AlarmId	Alarm identifier, see clause 11.2.2.1.5.1	M
alarmType	AlarmType	Alarm type as defined in ITU-T Rec. X. 733 [4]	M
probableCause	ProbableCause	Probable cause of an alarm as defined in ITU-T Rec. X.733 [4]	M
perceivedSeverity	PerceivedSeverity	Perceived severity of an alarm as defined in ITU-T Rec. X. 733 [4]	M
comments	map(Comment)	Set of all comments related to an alarm	M

## 12.2.1.4.1a.21 Type NotifyPotentialFaultyAlarmList

**Table 12.2.1.4.1a.21-1: Definition of type NotifyPotentialFaultyAlarmList**

Attribute name	Data type	Description	S
href	Uri	URI of the resource where the event (alarm) occurred	M
notificationId	NotificationId	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
notificationType	AlarmNotificationTypes	Notification type (notifyNewAlarm, etc.)	M
eventTime	DateTime	Event (alarm) occurrence time	M
systemDN	SystemDN	System DN	M
reason	string	Indicating the reason why the alarm list has to be rebuilt.	M

## 12.2.1.4.1a.22 Type NotifyAlarmListRebuilt

**Table 12.2.1.4.1a.22-1: Definition of type NotifyAlarmListRebuilt**

Attribute name	Data type	Description	S
href	Uri	URI of the resource where the event (alarm) occurred	M
notificationId	NotificationId	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
notificationType	AlarmNotificationTypes	Notification type (notifyNewAlarm, etc.)	M
eventTime	DateTime	Event (alarm) occurrence time	M
systemDN	SystemDN	System DN	M
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

## 12.2.1.4.2 Void

## 12.2.1.4.3 Void

## 12.2.1.4.4 Simple data types and enumerations

## 12.2.1.4.4.1 General

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

## 12.2.1.4.4.2 Simple data types

**Table 12.2.1.4.4.2-1: Simple data types**

Type name	Type definition	Description
AlarmId	string	Alarm identifier, see clause 11.2.2.1.5.1

## 12.2.1.4.4.3 Enumeration AlarmAckState

**Table 12.2.1.4.4.3-1: Enumeration AlarmAckState**

Enumeration value	Description
ALL_ALARMS	All alarms shall be returned or counted.
ALL_ACTIVE_ALARMS	All active alarms shall be returned or counted.
ALL_ACTIVE_AND_ACKNOWLEDGED_ALARMS	All active and acknowledged alarms shall be returned or counted.
ALL_ACTIVE_AND_UNACKNOWLEDGED_ALARMS	All active and unacknowledged alarms shall be returned or counted.
ALL_CLEARED_AND_ACKNOWLEDGED_ALARMS	All cleared and unacknowledged alarms shall be returned or counted.
ALL_UNACKNOWLEDGED_ALARMS	All unacknowledged alarms shall be returned or counted

## 12.2.1.4.4.4 Enumeration AckState

**Table 12.2.1.4.4.4-1: Enumeration ackState**

Enumeration value	Description
ACKNOWLEDGED	State acknowledged.
UNACKNOWLEDGED	State unacknowledged.

## 12.2.1.4.4.5 Enumeration AlarmListAlignmentRequirement

**Table 12.2.1.4.4.5-1: Enumeration AlarmListAlignmentRequirement**

Enumeration value	Description
ALIGNMENT_REQUIRED	Alarm list alignment is required
ALIGNMENT_NOT_REQUIRED	Alarm list alignment is not required

## 12.2.1.4.4.6 Enumeration AlarmType

**Table 12.2.1.4.4.6-1: Enumeration AlarmType**

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.

## 12.2.1.4.4.7 Enumeration ProbableCause

**Table 12.2.1.4.4.7-1: Enumeration ProbableCause**

Enumeration value	Description
PROBABLE_CAUSE_001	Generic probable cause string 001, mapping to a concrete probable cause is vendor specific
PROBABLE_CAUSE_002	Generic probable cause string 002, mapping to a concrete probable cause is vendor specific
PROBABLE_CAUSE_003	Generic probable cause string 003, mapping to a concrete probable cause is vendor specific
PROBABLE_CAUSE_004	Generic probable cause string 004, mapping to a concrete probable cause is vendor specific
PROBABLE_CAUSE_005	Generic probable cause string 005, mapping to a concrete probable cause is vendor specific

## 12.2.1.4.4.8 Enumeration AlarmNotificationType

**Table 12.2.1.4.4.8-1: Enumeration AlarmNotificationType**

Enumeration value	Description
notifyNewAlarm	Notification type is notifyNewAlarm
notifyNewSecurityAlarm	Notification type is notifyNewSecurityAlarm
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

## 12.2.1.4.4.9 Enumeration PerceivedSeverity

**Table 12.2.1.4.4.9-1: Enumeration PerceivedSeverity**

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]).

## 12.2.1.4.4.10 Enumeration TrendIndication

**Table 12.2.1.4.4.10-1: Enumeration TrendIndication**

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])

## 12.2.2 RESTful HTTP-based solution set for integration with ONAP VES API

### 12.2.2.1 Mapping of operations

NOTE: no use case has been specified by ONAP. Therefore this mapping is not part of the present document.

### 12.2.2.2 Mapping of notifications

#### 12.2.2.2.1 Introduction

##### 12.2.2.2.1.1 General

The 3GPP IS notifications are mapped to SS equivalents according to table 12.2.2.2.1.1-1.

**Table 12.2.2.2.1.1-1: Mapping of 3GPP IS notifications to SS equivalents**

3GPP IS notifications	HTTP Method	Resource URI	SQ
notifyNewAlarm	POST	/eventListener	M
notifyNewSecurityAlarm	POST	/eventListener	M
notifyAckStateChanged	POST	/eventListener	M
notifyClearedAlarm	POST	/eventListener	M
notifyAlarmListRebuilt	POST	/eventListener	M
notifyChangedAlarm	POST	/eventListener	M
notifyComments	POST	/eventListener	M
notifyPotentialFaultyAlarmList	POST	/eventListener	M
notifyCorrelatedNotificationChanged	POST	/eventListener	M
notifyChangedAlarmGeneral	POST	/eventListener	O

##### 12.2.2.2.1.2 Void

##### 12.2.2.2.2 Notification notifyNewAlarm

See clause 12.2.1.2.2.

##### 12.2.2.2.3 Notification notifyNewSecurityAlarm

See clause 12.2.1.2.3.

##### 12.2.2.2.4 Notification notifyAckStateChanged

See clause 12.2.1.2.4.

##### 12.2.2.2.5 Notification notifyClearedAlarm

See clause 12.2.1.2.5.

#### 12.2.2.2.6 Notification notifyAlarmListRebuilt

See clause 12.2.1.2.6.

#### 12.2.2.2.7 Notification notifyChangedAlarm

See clause 12.2.1.2.7.

#### 12.2.2.2.8 Notification notifyComments

See clause 12.2.1.2.8.

#### 12.2.2.2.9 Notification notifyPotentialFaultyAlarmList

See clause 12.2.1.2.9.

#### 12.2.2.2.10 Notification notifyCorrelatedNotificationChanged

See clause 12.2.1.2.10.

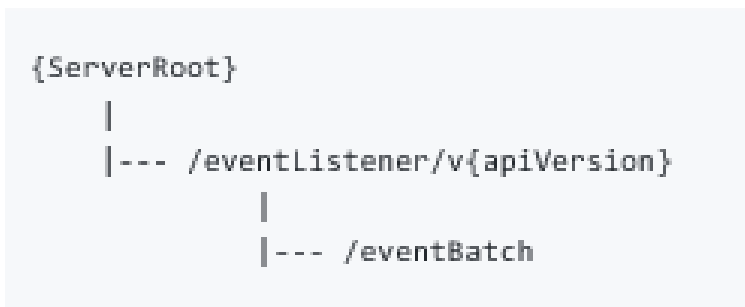
#### 12.2.2.2.11 Notification notifyChangedAlarmGeneral

See clause 12.2.1.2.11.

### 12.2.2.3 Resources

#### 12.2.2.3.1 Resource structure

Figure 12.2.2.3.1-1 shows the resource structure of the fault supervision data report MnS in the context of its integration with VES Event Listener 7.1.1 [45].



**Figure 12.2.2.3.1-1: Resource URI structure of the fault supervision data report MnS for integration with ONAP VES Event Listener 7.1.1 (Resource structure section) [45]**

Table 12.2.2.3.1-1 provides an overview of the resources and applicable HTTP methods.

**Table 12.2.2.3.1-1: Resources and methods overview**

Resource name	Resource URI	HTTP method	Description
eventListener	/eventListener	POST	Send notifications

#### 12.2.2.3.2 Resource definitions

See Resource structure section in [45].

#### 12.2.2.4 Data type definitions

See clause 12.2.1.4.

## 12.3 Generic performance assurance management service

### 12.3.1 RESTful HTTP-based solution set

#### 12.3.1.1 Void

#### 12.3.1.2 Performance threshold monitoring service

##### 12.3.1.2.1 Mapping of operations

None.

##### 12.3.1.2.2 Mapping of notifications

###### 12.3.1.2.2.1 Introduction

The IS notifications are mapped to SS equivalents according to table 12.3.1.2.2.1-1.

**Table 12.3.1.2.2.1-1: Mapping of IS notifications to SS equivalents**

IS notifications	HTTP Method	Resource URI	SQ
notifyThresholdCrossing	POST	/notificationSink	M

###### 12.3.1.2.2.2 Notification "notifyThresholdCrossing"

The IS notification parameters are mapped to SS equivalents according to table 12.3.1.2.2.2-1.

**Table 12.3.1.2.2.2-1: Mapping of IS notification input parameters to SS equivalents (HTTP POST)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
objectClass	request body	href	uri-Type	M
objectInstance				
notificationId	request body	notificationId	notificationId-Type	M
eventTime	request body	eventTime	dateTime-Type	M
notificationType	request body	notificationType	notificationType-Type	M
startOfMonitoringGP	request body	startOfMonitoringGP	dateTime-Type	M
endOfMonitoringGP	request body	endOfMonitoringGP	dateTime-Type	M
monitoredObjectInstance	request body	monitoredObjectInstance	uri-Type	
thresholdLevel	request body	thresholdLevel	thresholdLevel-Type	M
measurementTypeName	request body	measurementTypeName	measurementTypeName-Type	M
measurementValue	request body	measurementValue	measurementValue-Type	M
additionalText	request body	additionalText	additionalText-Type	O

## 12.3.1.2.3 Resources

## 12.3.1.2.3.1 Resource structure

Table 12.3.1.2.3.1-1 provides an overview of the resources and applicable HTTP methods.

**Table 12.3.1.2.3.1-1: Resources and methods overview**

Resource name	Resource URI	HTTP method	Description
notificationSink	/notificationSink	POST	Send notifications

## 12.3.1.2.3.2 Resource definitions

## 12.3.1.2.3.2.1 Resource "/notificationSink"

## 12.3.1.2.3.2.1.1 Description

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

## 12.3.1.2.3.2.1.2 URI

The resource URI is provided by the consumer when creating the threshold monitor (via the `monitoringNotifTarget` attribute of the `MOI ThresholdMonitor`, see 3GPP TS 28.622 [11]).

## 12.3.1.2.3.2.1.3 HTTP methods

## 12.3.1.2.3.2.1.3.1 POST

This method shall support the URI query parameters specified in table 12.3.1.2.3.2.1.3.1-1.

**Table 12.3.1.2.3.2.1.3.1-1: 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 12.3.1.2.3.2.1.3.1-2 and the response data structures and response codes specified in table 12.3.1.2.3.2.1.3.1-3.

**Table 12.3.1.2.3.2.1.3.1-2: Data structures supported by the POST Request Body on this resource**

Data type	Description	SQ
notifyThresholdCrossing-NotifType	Type in case a notifyThresholdCrossing notification is sent	M

**Table 12.3.1.2.3.2.1.3.1-3: 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-ResponseType	4xx/5xx	In case of failure the error object is returned.	M



## 12.3.1.2.4 Data type definitions

## 12.3.1.2.4.1 General

Table 12.3.1.2.4.1-1: Data types defined in this specification

Data type	Reference	Description
<b>General types</b>		
dateTime-Type	12.3.1.2.4.6.2	Data type of date and time.
uri-Type	12.3.1.2.4.6.2	The data type of a URI.
<b>Types used in paths</b>		
<b>Types used in query parts</b>		
<b>Types used in request bodies</b>		
<b>Types used in response bodies</b>		
error-ResponseType	12.3.1.2.4.4.3	Used in the response body describing the error.
<b>Types used for resources</b>		
<b>Types used in notifications</b>		
notifyThresholdCrossing-NotifType	12.3.1.2.4.4.5	Used in the request body of HTTP POST for the notification type notifyThresholdCrossing.
<b>Types referenced by the definitions above</b>		
notificationId-Type	12.3.1.2.4.6.2	Notification identifier as defined in ITU-T Rec. X. 733 [4]
notificationType-Type	12.3.1.2.4.6.3	Notification type (notifyThresholdCrossing, etc.)
thresholdLevel-Type	12.3.1.2.4.6.2	Threshold level type
measurementTypeName-Type	12.3.1.2.4.6.2	Measurement name defined in the performance measurements TS (e.g., TS 28.552 [18])
measurementValue-Type	12.3.1.2.4.6.2	Measurement value type
additionalText-Type	12.3.1.2.4.6.2	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]

Table 12.3.1.1.4.1-2: Data types imported

Data type	Reference	Description

## 12.3.1.2.4.2 Structured general data types

None.

## 12.3.1.2.4.3 Structured path data types

None.

## 12.3.1.2.4.4 Query, message body and resource data types

## 12.3.1.2.4.4.1 Type error-ResponseType

Table 12.3.1.2.4.4.1-1: Definition of type error-ResponseType

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

## 12.3.1.2.4.5 Referenced structured data types

## 12.3.1.2.4.5.1 Type notifyThresholdCrossing-NotifType

**Table 12.3.1.2.4.5-1: Definition of notifyThresholdCrossing-NotifType**

Attribute name	Data type	Description	SQ
header			
> href	uri-Type	URI of the resource indicating the performance threshold monitoring service	M
> notificationId	notificationId-Type	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
> notificationType	notificationType-Type	Notification type (notifyFileReady, etc.)	M
> eventTime	dateTime-Type	Event occurrence time (e.g., the file ready time)	M
body			
> startOfMonitoringGP	dateTime-Type	Time stamp of the start of monitoring GP	M
> endOfMonitoringGP	dateTime-Type	Time stamp of the end of monitoring GP	M
> monitoredObjectInstance	uri-Type	URI of the monitored object instance	M
> thresholdLevel	thresholdLevel-Type	Threshold level that has been reached or crossed	M
> measurementTypeName	measurementTypeName-Type	The measurement name whose value has reached or crossed the threshold	M
> measurementValue	measurementValue-Type	The measurement value that reached or crossed the threshold	M
> additionalText	additionalText-Type	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]	O

## 12.3.1.2.4.6 Simple data types and enumerations

## 12.3.1.2.4.6.1 General

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

## 12.3.1.2.4.6.2 Simple data types

**Table 12.3.1.2.4.6.2-1: Simple data types**

Type name	Type definition	Description
dateTime-Type	string	The data type for date and time in "date-time" format.
uri-Type	string	The type of a URI.
notificationId-Type	long	Notification identifier as defined in ITU-T Rec. X. 733 [4]
thresholdLevel-Type	integer	The type of threshold level.
measurementTypeName-Type	string	The measurement name defined in the performance measurements TS (e.g., TS 28.552 [18])
measurementValue-Type	string	The string converted from measurement value type defined in the performance measurements TS (e.g., TS 28.552 [18])
additionalText-Type	string	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]

## 12.3.1.2.4.6.3 Enumeration notificationType-Type

**Table 12.3.1.2.4.6.3-1: Enumeration notificationType-Type**

Enumeration value	Description
notifyThresholdCrossing	Notification type is notifyThresholdCrossing

## 12.3.2 XML file format definition

### 12.3.2.1 Introduction

This clause describes the format of performance data file. The XML file format definition is based on XML schema (see [26], [27], [28] and [29]).

### 12.3.2.2 Mapping table

Table 12.3.2.2-1 maps the file content items in the clause 11.3.2.1.2 to those used in the XML schema based file format definitions. XML tag attributes are useful where data values bind tightly to its parent element. They have been used where appropriate.

**Table 12.3.2.2-1: Mapping of File Content Items to XML tags**

File Content Item	XML schema based XML tag	Description
measDataCollection	measDataFile	
measFileHeader	fileHeader	
measData	measData	
measFileFooter	fileFooter	
fileFormatVersion	fileHeader fileFormatVersion	
senderName	fileSender senderName	
senderType	fileSender senderType	For the XML schema based XML format, XML attribute specification "senderType" may be absent in case the "senderType" is not configured in the sender.
vendorName	fileHeader vendorName	For the XML schema based XML format, XML attribute specification "vendorName" may be absent in case the "vendorName" is not configured in the sender.
collectionBeginTime	measData beginTime	
measuredEntityUserName	measEntity userLabel	For the XML schema based XML format, XML attribute specification "userLabel" may be absent in case the "nEUserName" is not configured in the CM applications.
measuredEntityDn	fileHeader dnPrefix and measuredEntity localDn	For the XML schema based XML format, the DN is split into the DN prefix and the Local DN (LDN) (see 3GPP TS 32.300 [25]). XML attribute specification "localDn" may be absent in case the LDN is not configured in the CM applications.
measuredEntitySoftwareVersion	measEntity swVersion	For the XML schema based XML format, XML attribute specification "swVersion" may be absent in case the "nESoftwareVersion" is not configured in the CM applications.
measInfo	measInfo	
measInfoId	measInfoId	
measTimeStamp	granPeriod endTime	
jobId	jobId	This item is optional.
granularityPeriod	granPeriod duration	For the XML schema based XML format, the value of XML attribute specification "duration" shall use the truncated representation "PTnS" (see [28]).
reportingPeriod	repPeriod duration	For the XML schema based XML format, the value of XML attribute specification "duration" shall use the truncated representation "PTnS" (see [28]).
measTypes	measTypes or measType	For the XML schema based XML format, depending on sender's choice for optional positioning presence, either XML element "measTypes" or XML elements "measType" will be used.
measValues	measValue	
measObjInstId	measValue measObjLdn	

File Content Item	XML schema based XML tag	Description
measResults	measResults or r	For the XML schema based XML format, depending on sender's choice for optional positioning presence, either XML element "measResults" or XML elements "r" will be used.
suspectFlag	suspect	
timeStamp	measData endTime	
There is no corresponding File Content Item.	measType p	An optional positioning XML attribute specification of XML element "measType" (XML schema based), used to identify a measurement type for the purpose of correlation to a result. The value of this XML attribute specification is expected to be a non-zero, non-negative integer value that is unique for each instance of XML element "measType" that is contained within the measurement data collection file.
There is no corresponding File Content Item.	r p	An optional positioning XML attribute specification of XML element "r", used to correlate a result to a measurement type. The value of this XML attribute specification should match the value of XML attribute specification "p" of the corresponding XML element "measType" (XML schema based).

### 12.3.2.3 XML schema

#### 11.3.2.3.1 Performance data file XML schema

The following XML schema measData.xsd is the schema for performance measurements data XML files:

```
<?xml version="1.0" encoding="UTF-8"?>
<!--
  3GPP TS 28.532 Measurements data XML file format definition
  data file XML schema
  measData.xsd
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:md="http://www.3gpp.org/ftp/specs/archive/28_series/28.532#measData"
  targetNamespace="http://www.3gpp.org/ftp/specs/archive/28_series/28.532#measData"
  elementFormDefault="qualified">
  <!-- Measurement collection data file root XML element -->
  <element name="measDataFile">
    <complexType>
      <sequence>
        <element name="fileHeader">
          <complexType>
            <sequence>
              <element name="fileSender">
                <complexType>
                  <attribute name="senderName" type="string" use="optional"/>
                  <attribute name="senderType" type="string" use="optional"/>
                </complexType>
              </element>
              <element name="measData">
                <complexType>
                  <attribute name="beginTime" type="dateTime" use="required"/>
                </complexType>
              </element>
            </sequence>
            <attribute name="fileFormatVersion" type="string" use="required"/>
            <attribute name="vendorName" type="string" use="optional"/>
            <attribute name="dnPrefix" type="string" use="optional"/>
          </complexType>
        </element>
        <element name="measData" minOccurs="0" maxOccurs="unbounded">
          <complexType>
            <sequence>
              <element name="measEntity">
                <complexType>
                  <attribute name="userLabel" type="string" use="optional"/>
                  <attribute name="localDn" type="string" use="optional"/>
                  <attribute name="swVersion" type="string" use="optional"/>
                </complexType>
              </element>
            </sequence>
          </complexType>
        </element>
      </sequence>
    </complexType>
  </element>
</schema>
```

```

        </complexType>
      </element>
      <element name="measInfo" minOccurs="0" maxOccurs="unbounded">
        <complexType>
          <sequence>
            <element name="job" minOccurs="0">
              <complexType>
                <attribute name="jobId" type="string"
use="required"/>
              </complexType>
            </element>
            <element name="granPeriod">
              <complexType>
                <attribute name="duration" type="duration"
use="required"/>
                <attribute name="endTime" type="dateTime"
use="required"/>
              </complexType>
            </element>
            <element name="repPeriod" minOccurs="0">
              <complexType>
                <attribute name="duration" type="duration"
use="required"/>
              </complexType>
            </element>
            <choice>
              <element name="measTypes">
                <simpleType>
                  <list itemType="Name"/>
                </simpleType>
              </element>
              <element name="measType" minOccurs="0"
maxOccurs="unbounded">
                <complexType>
                  <simpleContent>
                    <extension base="Name">
                      <attribute name="p"
type="positiveInteger" use="required"/>
                    </extension>
                  </simpleContent>
                </complexType>
              </element>
            </choice>
            <element name="measValue" minOccurs="0"
maxOccurs="unbounded">
              <complexType>
                <sequence>
                  <choice>
                    <element name="measResults">
                      <simpleType>
                        <list itemType="md:measResultType"/>
                      </simpleType>
                    </element>
                    <element name="r" minOccurs="0"
maxOccurs="unbounded">
                      <complexType>
                        <simpleContent>
                          <extension
base="md:measResultType">
                            <attribute name="p"
type="positiveInteger" use="required"/>
                          </extension>
                        </simpleContent>
                      </complexType>
                    </element>
                  </choice>
                  <element name="suspect" type="boolean"
minOccurs="0"/>
                </sequence>
                <attribute name="measObjLdn" type="string"
use="required"/>
              </complexType>
            </element>
          </sequence>
          <attribute name="measInfoId" type="string" use="optional"/>
        </complexType>
      </element>
    </sequence>

```

```

        </complexType>
      </element>
      <element name="fileFooter">
        <complexType>
          <sequence>
            <element name="measData">
              <complexType>
                <attribute name="endTime" type="dateTime" use="required"/>
              </complexType>
            </element>
          </sequence>
        </complexType>
      </element>
    </sequence>
  </complexType>
</element>
<simpleType name="measResultType">
  <union memberTypes="integer float string">
    <simpleType>
      <restriction base="string">
        <enumeration value="NULL"/>
      </restriction>
    </simpleType>
  </union>
</simpleType>
</schema>

```

### 12.3.2.3.2 Performance data file XML header

The following header shall be used in actual XML measurement result files:

```

<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl" href="measData.xsl"?>
<measDataFile
  xmlns=
"http://www.3gpp.org/ftp/specs/archive/28_series/28.532#measData"
>

```

## 12.4 Heartbeat

### 12.4.1 RESTful HTTP-based solution set

#### 12.4.1.1 Mapping of operations

N/A

#### 12.4.1.2 Mapping of notifications

##### 12.4.1.2.1 Introduction

The IS notifications are mapped to SS equivalents according to table 12.4.1.2.1-1.

**Table 12.4.1.2.1-1: Mapping of IS notifications to SS equivalents**

IS notifications	HTTP Method	Resource URI	SQ
notifyHeartbeat	POST	/notificationSink	M

##### 12.4.1.2.2 Notification "notifyHeartbeat"

The IS notification parameters are mapped to SS equivalents according to table 12.4.1.2.2-1.

**Table 12.4.1.2.2-1: Mapping of IS notification input parameters to SS equivalents (HTTP POST)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
objectClass objectInstance	request body	href	uri-Type	M
eventTime	request body	eventTime	dateTime-Type	M
notificationId	request body	notificationId	notificationId-Type	M
systemDN	request body	systemDN	systemDN-Type	O
notificationType	request body	notificationType	notificationType-Type	M
heartbeatPeriod	request body	heartbeatPeriod	heartbeatPeriod-Type	M

## 12.4.2 RESTful HTTP-based solution set for integration with ONAP VES API

NOTE: Void.

### 12.4.2.1 Mapping of operations

See clause 12.1.1.1.

### 12.4.2.2 Mapping of notifications

#### 12.4.2.2.1 Introduction

##### 12.4.2.2.1.1 General

The 3GPP IS heartbeat notifications are mapped to SS equivalents according to table 12.4.2.2.1.1-1.

**Table 12.4.2.2.1.1-1: Mapping of 3GPP IS notifications to SS equivalents**

3GPP IS notifications	HTTP Method	Resource URI	SQ
notifyHeartbeat	POST	/eventListener	M

##### 12.4.2.2.1.2 Notification parameter mapping principles

3GPP IS fault supervision alarm notification parameters are mapped to solution set equivalent as follows:

##### 12.4.2.2.2 Notification notifyHeartbeat

See clause 12.4.1.2.2.

## 12.5 Streaming data reporting service

### 12.5.1 RESTful HTTP-based solution set

#### 12.5.1.1 Mapping of operations

##### 12.5.1.1.1 Introduction

The IS operations are mapped to SS equivalents according to table 12.5.1.1.1-1.

**Table 12.5.1.1.1-1: Mapping of IS operations to SS equivalents**

IS operation	Method/frame	Resource/URI	Qualifier
establishStreamingConnection	HTTP POST (see NOTE)	/connections	M
	HTTP GET (Upgrade, see NOTE)	/connections/{connectionId}	M
terminateStreamingConnection	WebSocket Close frame sent (frame with opcode of 0x8), and WebSocket Close frame received (frame with opcode of 0x8 for successful case)	/connections/{connectionId}	M
reportStreamData	WebSocket Data frame sent (frame with opcode of 0x2)	/connections/{connectionId}	M
addStream	HTTP POST	/connections/{connectionId}/streams	M
deleteStream	HTTP DELETE	/connections/{connectionId}/streams	M
getConnectionInfo	HTTP GET	/connections	M
	HTTP GET	/connections/{connectionId}	M
getStreamInfo	HTTP GET	/connections/{connectionId}/streams	M
	HTTP GET	/connections/{connectionId}/streams/{streamId}	M
Note: the establishStreamingConnection is mapped to a HTTP POST operation followed by a HTTP GET operation. The HTTP POST operation is to provide the information in streamInfoList parameter to the consumer and receive the connectionId assigned by the consumer, while the HTTP GET (Upgrade) operation is to establish the WebSocket connection.			

### 12.5.1.1.2 Operation "establishStreamingConnection"

The IS operation parameters are mapped to SS equivalents according to the tables 12.5.1.1.2-1 through 12.5.1.1.2-4.

**Table 12.5.1.1.2-1: 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
producerId	request body	producerId	String	M
streamInfoList	request body	streamInfoList	array(streamInfo-Type)	M

**Table 12.5.1.1.2-2: 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
connectionId	location header	n/a	uri-Type	M
status	response status codes response body	n/a error	n/a error-ResponseType	M



**Table 12.5.1.1.2-3: Mapping of IS operation input parameters to SS equivalents (HTTP GET (Upgrade))**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
connectionId	Headers	Request-URI	String	n/a
--	HTTP-Version (Request-Line)	--	String (see Note 1)	M
--	Upgrade Header	--	Constant string: websocket	M
--	Connection Header	--	Constant string: Upgrade	M
--	Sec-WebSocket-Key Header	--	String (see Note 2)	M
--	Sec-WebSocket-Version Header	--	String (see Note 3)	M
--	See Note 4.			
NOTE 1: The HTTP version shall be not earlier than HTTP/1.1.				
NOTE 2: The valid value needs to be assigned according to WebSocket protocol (see IETF RFC 6455 [40]).				
NOTE 3: The valid value needs to be assigned according to WebSocket protocol (see IETF RFC 6455 [40]).				
NOTE 4: Other SS parameters (not listed in this table) independent from the Stage 2 may be used, according to the WebSocket protocol (see IETF RFC 6455 [40]).				

**Table 12.5.1.1.2-4: Mapping of IS operation output parameters to SS equivalents (HTTP GET (Upgrade))**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
connectionId	n/a	--	n/a	n/a
status	HTTP-Version (Response-Line)	--	String (see Note 1)	M
	Status-Code	--	String	
	response body	error	error-ResponseType	
--	Upgrade Header		Constant string: websocket	M
--	Connection Header	--	Constant string: Upgrade	M
	Sec-WebSocket-Accept Header	--	String (see Note 2)	M
--	See Note 3.			
NOTE 1: The HTTP version shall be not earlier than HTTP/1.1.				
NOTE 2: The valid value needs to be assigned according to WebSocket protocol (see IETF RFC 6455 [40]).				
NOTE 3: Other SS parameters (not listed in this table) independent from the Stage 2 may be used, according to the WebSocket protocol (see IETF RFC 6455 [40]).				

**Figure 12.5.1.1.2-1: Message flow for establishing a streaming connection**

The message flow for establishing a streaming connection illustrated on Figure 12.5.1.1.2-1 is as follows:

1. The performance data streaming service producer sends a HTTP POST request to the consumer.
  - The URI identifies the ".../connections" collection resource.
  - The request message body carries the information about the connecting producer identity via parameter "producerId" and about streams supported by the new connection via parameter "StreamInfoList".
2. The consumer sends a HTTP POST response to the producer.
  - On success "201 Posted" shall be returned with the identifier of a newly created ".../connections/{connectionId}" resource.
  - On failure, an appropriate error code shall be returned. The response message body may carry an error object.
3. If step 2 is successful, the performance data streaming service producer sends a HTTP GET (upgrade) request to the consumer to establish the WebSocket connection.
  - The URI identifies the ".../connections/{connectionId}" resource with the /secure/flag;
  - The HTTP-version in the Request-line indicates the HTTP version which is no earlier than HTTP/1.1;
  - The Upgrade header is with value "websocket";
  - The Connection header is with value "Upgrade";
  - The Sec-WebSocket-Key header is with a valid value according to IETF RFC 6455 [40].
  - The Sec-WebSocket-Version header is with a valid according to IETF RFC 6455 [40].
4. The consumer sends a HTTP GET (Upgrade) response to the producer.
  - On success, "101 Switching Protocols" shall be returned;
  - On failure, an appropriate error code shall be returned. The response message body may carry an error object.
  - The HTTP-version in the Response-line indicates the HTTP version which is no earlier than HTTP/1.1;
  - The Upgrade header is with value "websocket";
  - The Connection header is with value "Upgrade";
  - The Sec-WebSocket-Accept header is with a valid value according to IETF RFC 6455 [40].

#### 12.5.1.1.3 Operation "terminateStreamingConnection"

The IS operation parameters are mapped to SS equivalents according to the tables 12.5.1.1.3-1 and 12.5.1.1.3-2.

**Table 12.5.1.1.3-1: Mapping of IS operation input parameters to SS equivalents (WebSocket Close frame sent)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
connectionId	n/a	--	n/a	n/a
--	Opcode (see clause 5 of IETF RFC 6455 [40])	--	Constant value: 0x8	M

**Table 12.5.1.1.3-2: Mapping of IS operation output parameters to SS equivalents (WebSocket Close frame received)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
status	Opcode	--	For a successful operation, the Opcode is 0x8, and for an unsuccessful operation, the Opcode has a value other than 0x8 (see clause 5 of IETF RFC 6455 [40]).	M

#### 12.5.1.1.4 Operation "reportStreamData"

The IS operation parameters are mapped to SS equivalents according to the tables 12.5.1.1.4-1 and 12.5.1.1.4-2.

**Table 12.5.1.1.4-1: Mapping of IS operation input parameters to SS equivalents (WebSocket Data frame sent with Opcode of 0x2)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
connectionId	n/a	--	n/a	n/a
--	Opcode (see clause 5 of IETF RFC 6455 [40])	--	Constant value: 0x2 ("binary")	M
streamingData	Payload data	Streaming Trace Payload or streaming performance data payload or streaming analytics payload or proprietary data payload	See clause 5 of 3GPP TS 32.423 [39] for detailed definition of the Streaming Trace Payload format and Annex G of 3GPP TS 28.550 [40] for detailed definition of the streaming performance data payload format.	M

The protocol stack with Streaming Trace Payloads formatted as per clause 5 of 3GPP TS 32.423 [39] carried by WebSocket binary data frames (see clause 5.6 of IETF RFC 6455 [40]) is illustrated on Figure 12.5.1.1.4-1.

The protocol stack with streaming performance data payloads formatted as per Annex G of 3GPP TS 28.550 [42] carried by WebSocket binary data frames (see clause 5.6 of IETF RFC 6455 [40]) is illustrated on Figure 12.5.1.1.4-2.

**Table 12.5.1.1.4-2: Mapping of IS operation output parameters to SS equivalents**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	Qualifier
status	n/a	-- See Note 1.	n/a	n/a
NOTE 1: The delivery of WebSocket Data frame is taken care of by the underlying TCP (see IETF RFC 793 [41]) which provides reliable data transmission and ensures the data delivery. There is no mechanism at WebSocket protocol level to report the delivery status for WebSocket Data frame.				

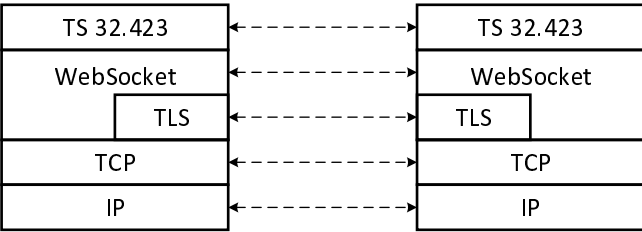


Figure 12.5.1.1.4-1: Protocol stack for streaming trace data reporting

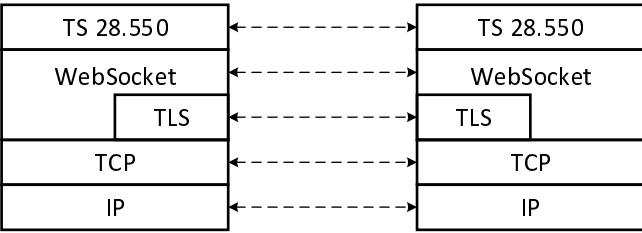


Figure 12.5.1.1.4-2: Protocol stack for streaming performance data reporting

12.5.1.1.5      Operation "addStream"

The IS operation parameters are mapped to SS equivalents according to the tables 12.5.1.1.5-1 and 12.5.1.1.5-2.

Table 12.5.1.1.5-1: 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
connectionId	Headers	Request-URI	String	n/a
streamInfoList	request body	streamInfoList	array(streamInfo-Type)	M

Table 12.5.1.1.5-2: 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
streamInfoList	response body	streamInfoList	array(streamInfo-Type)	M
status	response status codes response body	n/a error	n/a error-ResponseType	M

12.5.1.1.6      Operation "deleteStream"

The IS operation parameters are mapped to SS equivalents according to the tables 12.5.1.1.6-1 and 12.5.1.1.6-2.

Table 12.5.1.1.6-1: 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
connectionId	headers	Request-URI	String	n/a
streamIdList	path, query	/connections/{connectionId}/streams, streamIdList	array(streamId-Type)	M

**Table 12.5.1.1.6-2: 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 response body	n/a error	n/a error-ResponseType	M

### 12.5.1.1.7 Operation "getConnectionInfo"

The IS operation parameters are mapped to SS equivalents according to the tables 12.5.1.1.7-1 and 12.5.1.1.7-2.

**Table 12.5.1.1.7-1: 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
connectionId	headers	Request-URI	String	n/a
connectionIdList	path, query	/connections, /connections/{connectionId}	array(uri-Type)	M

**Table 12.5.1.1.7-2: 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
connectionInfoList	response body	connectionInfoList	array(uri-Type, streamReporter-Type, streamIdList-Type)	M
status	response status codes response body	n/a error	n/a error-ResponseType	M

### 12.5.1.1.8 Operation "getStreamInfo"

The IS operation parameters are mapped to SS equivalents according to the tables 12.5.1.1.8-1 and 12.5.1.1.8-2.

**Table 12.5.1.1.8-1: 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
connectionId	headers	Request-URI	String	n/a
streamIdList	path, query	/connections/{connectionId}/streams, streamIdList	array(streamId-Type)	M

**Table 12.5.1.1.8-2: 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
streamInfoSumList	response body	streamInfoSumList	array(streamInfo-Type, streamReporters-Type)	M
status	response status codes response body	n/a error	n/a error-ResponseType	M

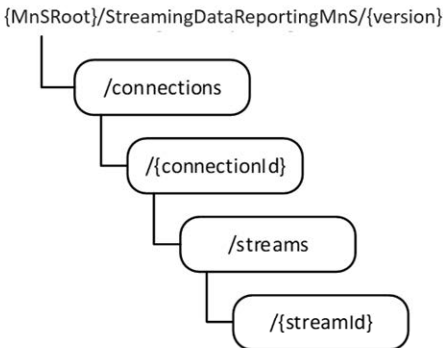
### 12.5.1.2 Mapping of notifications

Not applicable (no notifications defined in IS).

### 12.5.1.3 Resources

#### 12.5.1.3.1 Resources structure

Figure 12.5.1.3.1-1 shows the resource structure of the Streaming data reporting service.



**Figure 12.5.1.3.1-1: Resource URI structure of the Streaming data reporting service**

Table 12.5.1.3.1-1 provides an overview of the resources and applicable HTTP methods.

Resource name	Resource URI	HTTP method	Description
connections	/connections	POST	Inform consumer about reporting streams to be carried by the new connection and receive a new connection id.
		GET	Obtain information about connections
connection	/connections/{connectionId}	GET (Upgrade)	Establish WebSocket for a given connection
		GET	Obtain information about connection
		WebSocket 0x2	Send a unit of streaming data
		WebSocket 0x8	Terminate a WebSocket connection
streams	/connections/{connectionId}/streams	POST	Inform consumer about new reporting streams on an existing connection.
		DELETE	Remove reporting streams from an existing connection
		GET	Obtain information about streams
stream	/connections/{connectionId}/streams/{streamId}	GET	Obtain information about stream

#### 12.5.1.3.2 Resources definitions

##### 12.5.1.3.2.1 Resource "/connections"

###### 12.5.1.3.2.1.1 Description

This resource represents a collection of connections and can be used to establish new connections or to obtain information about existing connections.

###### 12.5.1.3.2.1.2 URI

The resource URI is: {MnSRoot}/StreamingDataReportingMnS/{version}/connections

This resource shall support the resource URI variables defined in the table 12.5.1.3.2.1.2-1.

**Table 12.5.1.3.2.1.2-1: URI variables**

Name	Definition
root	indicates the scheme ("http" or "https"), the host name and optional port, and an optional sequence of path segments that together represent a prefix path

## 12.5.1.3.2.1.3 HTTP methods

## 12.5.1.3.2.1.3.1 HTTP POST

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

**Table 12.5.1.3.2.1.3.1-1: URI query parameters supported by the POST method on this resource**

Name	Data type	Description	SQ
none supported			

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

**Table 12.5.1.3.2.1.3.1-2: Data structures supported by the POST request body on this resource**

Data type	Description	SQ
producerId	String representing the DN of the streaming data reporting MnS producer.	M
array(streamInfo-Type)	List of meta-data about each reporting stream. Where each reporting stream is represented by a streamInfo.	

**Table 12.5.1.3.2.1.3.1-3: Data structures supported by the POST Response Body on this resource**

Data type	Response codes	Description	SQ
error-ResponseType	4xx/5xx	Returned in case of an error	M
uri-Type	201 Posted	Connection identifier assigned by the MnS consumer	M

## 12.5.1.3.2.1.3.2 HTTP GET

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

**Table 12.5.1.3.2.1.3.2-1: URI query parameters supported by the GET method on this resource**

Name	Data type	Description	SQ
connectionIdList	array(uri-Type)	The list of connectionId for which the connection information is to be returned.	O

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

**Table 12.5.1.3.2.1.3.2-2: Data structures supported by the GET request body on this resource**

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

**Table 12.5.1.3.2.1.3.2-3: Data structures supported by the GET Response Body on this resource**

Data type	Response codes	Description	SQ
error-ResponseType	4xx/5xx	Returned in case of an error	M
array(uri-Type, streamReporter-Type, streamIdList-Type)	200 OK	In case of success the representation of the retrieved information is returned.	M
	202 Partially retrieved	In case of partial success the representation of the retrieved information is returned.	M

12.5.1.3.2.2 Resource `"/connections/{connectionId}"`

12.5.1.3.2.2.1 Description

This resource represents an individual connection and can be used for an "upgrade" to WebSocket as part of the connection establishment, or to obtain information about an existing connection, or to terminate an existing connection, or to send a unit of streaming data.

12.5.1.3.2.2.2 URI

The resource URI is: `{MnSRoot}/StreamingDataReportingMnS/{version}/connections/{connectionId}`

This resource shall support the resource URI variables defined in the table 12.5.1.3.2.2.2-1.

**Table 12.5.1.3.2.2.2-1: URI variables**

Name	Definition
root	See table 12.5.1.3.2.1.2-1
connectionId	Represents identifier of an individual connection assigned by the MnS consumer during connection establishment

12.5.1.3.2.2.3 HTTP methods

12.5.1.3.2.2.3.1 HTTP GET (Upgrade)

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

**Table 12.5.1.3.2.2.3.2-1: Header parameters supported by the GET request on this resource**

Name	Data type	Description	SQ
connectionId	uri-Type	To indicate the ID (URI) of the connection being upgraded to WebSocket	M
Upgrade	Upgrade-HeaderType	To indicate the HTTP GET operation is to upgrade the connection to WebSocket protocol	M
Connection	Connection-HeaderType	To indicate the HTTP GET operation is to upgrade the connection to another protocol	M
Sec-WebSocket-Key	Sec-WebSocket-Key-HeaderType	The Sec-WebSocket-Key needed for establishing the WebSocket connection.	M
Sec-WebSocket-Version	Sec-WebSocket-Version-HeaderType	The Sec-WebSocket-Version needed for establishing the WebSocket connection.	M

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

**Table 12.5.1.3.2.2.3.2-2: URI query parameters supported by the GET method on this resource**

Name	Data type	Description	SQ
none supported			



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

**Table 12.5.1.3.2.2.3.2-3: Data structures supported by the GET request body on this resource**

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

**Table 12.5.1.3.2.2.3.2-4: Header parameters supported by the GET response on this resource**

Name	Data type	Description	SQ
Upgrade	Upgrade-HeaderType	To indicate the HTTP GET operation is to upgrade the connection to WebSocket protocol	M
Connection	Connection-HeaderType	To indicate the HTTP GET operation is to upgrade the connection to another protocol	M
Sec-WebSocket-Accept	Sec-WebSocket-Accept-HeaderType	The Sec-WebSocket-Accept responded when establishing the WebSocket connection.	M

**Table 12.5.1.3.2.2.3.2-5: Data structures supported by the GET response body on this resource**

Data type	Response codes	Description	SQ
n/a	101 Switching Protocols	The status code indicating the connection has been successfully upgraded to WebSocket.	M
error-ResponseType	4xx/5xx	Returned in case of an error	M

#### 12.5.1.3.2.2.3.2 HTTP GET

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

**Table 12.5.1.3.2.1.3.2-1: URI query parameters supported by the GET method on this resource**

Name	Data type	Description	SQ
none supported			

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

**Table 12.5.1.3.2.1.3.2-2: Data structures supported by the GET request body on this resource**

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

**Table 12.5.1.3.2.1.3.2-3: Data structures supported by the GET Response Body on this resource**

Data type	Response codes	Description	SQ
error-ResponseType	4xx/5xx	Returned in case of an error	M
uri-Type	200 OK	In case of success the representation of the connectionId is returned.	M
streamReporter-Type	200 OK	In case of success the representation of the streamReporter is returned.	M
streamIdList-Type	200 OK	In case of success the representation of the streamIdList is returned.	M

12.5.1.3.2.3 Resource `"/connections/{connectionId}/streams"`

12.5.1.3.2.3.1 Description

This resource represents a collection of reporting streams on a particular connection and can be used to add a new reporting stream to an existing connection, or to remove a reporting stream from an existing connection, or to obtain information about reporting streams.

12.5.1.3.2.3.2 URI

The resource URI is: `{MnSR}/StreamingDataReportingMnS/{version}/connections/{connectionId}/streams`

This resource shall support the resource URI variables defined in the table 12.5.1.3.2.3.2-1.

**Table 12.5.1.3.2.3.2-1: URI variables**

Name	Definition
root	See table 12.5.1.3.2.1.2-1
connectionId	See table 12.5.1.3.2.2.2-1

12.5.1.3.2.3.3 HTTP methods

12.5.1.3.2.3.3.1 HTTP POST

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

**Table 12.5.1.3.2.3.3.1-1: URI query parameters supported by the POST method on this resource**

Name	Data type	Description	SQ
none supported			

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

**Table 12.5.1.3.2.3.3.1-2: Data structures supported by the POST request body on this resource**

Data type	Description	SQ
array(streamInfo-Type)	The resource representation of the set of information about streams to be posted.	M

**Table 12.5.1.3.2.3.3.1-3: Data structures supported by the POST Response Body on this resource**

Data type	Response codes	Description	SQ
array(streamInfo-Type)	201 Posted	In case of success the representation of the posted information about streams is returned.	M
	202 Partially posted	In case of partial success the representation of the posted information about streams is returned.	M
error-ResponseType	4xx/5xx	Returned in case of an error	M

12.5.1.3.2.3.3.2 HTTP DELETE

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

**Table 12.5.1.3.2.3.3.2-1: URI query parameters supported by the DELETE method on this resource**

Name	Data type	Description	SQ
streamIdList	array(streamId-Type)	The list of streamId for the stream(s) to be deleted.	M

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

**Table 12.5.1.3.2.3.3.2: Data structures supported by the DELETE request body on this resource**

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

**Table 12.5.1.3.2.3.3.2-3: 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	M
error-ResponseType	4xx/5xx	Returned in case of an error	M

#### 12.5.1.3.2.3.3.3 HTTP GET

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

**Table 12.5.1.3.2.3.3.3-1: URI query parameters supported by the GET method on this resource**

Name	Data type	Description	SQ
streamIdList	array(streamId-Type)	The list of streamId for which the stream information are to be returned.	O

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

**Table 12.5.1.3.2.3.3.3-2: Data structures supported by the GET request body on this resource**

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

**Table 12.5.1.3.2.3.3.3-3: Data structures supported by the GET Response Body on this resource**

Data type	Response codes	Description	SQ
array(streamInfo-Type, streamReporters-Type)	200 OK	In case of success the representation of the retrieved stream information is returned.	M
	202 Partially retrieved	In case of partial success the representation of the retrieved stream information is returned.	M
error-ResponseType	4xx/5xx	Returned in case of an error	M

#### 12.5.1.3.2.4 Resource "/connections/{connectionId}/streams/{streamId}"

##### 12.5.1.3.2.4.1 Description

This resource represents an individual reporting stream on an existing connection and can be used to obtain information about reporting stream.

## 12.5.1.3.2.4.2 URI

The resource URI is: {MnSR}/StreamingDataReportingMnS/{version}/connections/{connectionId}/streams/{streamId}

This resource shall support the resource URI variables defined in the table 12.5.1.3.2.4.2-1.

**Table 12.5.1.3.2.4.2-1: URI variables**

Name	Definition
root	See table 12.5.1.3.2.1.2-1
connectionId	See table 12.5.1.3.2.2.2-1
streamId	Represents identifier of an individual stream. For Streaming Trace reporting, the Trace Reference (see clause 5.6 of 3GPP TS 32.422 [38]) is used as stream identifier

## 12.5.1.3.2.4.3 HTTP methods

## 12.5.1.3.2.4.3.1 HTTP GET

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

**Table 12.5.1.3.2.4.3.1-1: URI query parameters supported by the GET method on this resource**

Name	Data type	Description	SQ
none supported			

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

**Table 12.5.1.3.2.4.3.1-2: Data structures supported by the GET request body on this resource**

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

**Table 12.5.1.3.2.4.3.1-3: Data structures supported by the GET Response Body on this resource**

Data type	Response codes	Description	SQ
streamInfo-Type	200 OK	In case of success the representation of the retrieved stream information is returned.	M
streamReporters-Type	200 OK	In case of success the representation of the retrieved stream reporters information is returned.	M
error-ResponseType	4xx/5xx	Returned in case of an error	M

## 12.5.1.4 Data type definitions

## 12.5.1.4.1 General

Table 12.5.1.4.1-1: Data types defined

Data type	Reference	Description
<b>General types</b>		
uri-Type	12.5.1.4.3	Used to represent a URI
<b>Types used in paths</b>		
connectionId-Type	12.5.1.4.3	Used to indicate the connection as a context of the operation
streamId-Type	12.5.1.4.3	Used to indicate the stream as a context of the operation
<b>Types used in headers</b>		
websocketHeaderConnection-Type	12.5.1.4.3	Header value for the upgrade request and response
websocketHeaderUpgrade-Type	12.5.1.4.3	Header value for the upgrade to WebSocket request and response
websocketHeader-Sec-WebSocket-Accept-Type	12.5.1.4.3	Header value for secure WebSocket response. Carries hash.
websocketHeader-Sec-WebSocket-Extensions-Type	12.5.1.4.3	Header value for secure WebSocket request. Carries protocol extensions.
websocketHeader-Sec-WebSocket-Key-Type	12.5.1.4.3	Header value for secure WebSocket request. Provides information to the server which is needed in order to confirm that the client is entitled to request an upgrade to WebSocket.
websocketHeader-Sec-WebSocket-Protocol-Type	12.5.1.4.3	Header value for secure WebSocket request. Carries a comma-separated list of subprotocol names, in the order of preference.
websocketHeader-Sec-WebSocket-Version-Type	12.5.1.4.3	Header value for secure WebSocket request and response. Carries the WebSocket protocol version to be used.
<b>Types used in query parts</b>		
connectionId-Type	12.5.1.4.3	Used to indicate the connection as a context of the operation
streamId-Type	12.5.1.4.3	Used to indicate the stream as a context of the operation
<b>Types used in request bodies</b>		
connectionRequest-Type	12.5.1.4.2.2	Used to carry the meta-data during connection establishment
streamInfo-Type	12.5.1.4.2.5	Reporting stream meta-data.
<b>Types used in response bodies</b>		
failedConnectionResponse-Type	12.5.1.4.2.4	Used to carry the details of a failed connection establishment
connectionInfo-Type	12.5.1.4.2.1	Used to carry connection meta-data
errorResponse-Type	12.5.1.4.2.3	Used to carry the details of an error
streamInfo-Type	12.5.1.4.2.5	Used to carry the stream meta-data
streamInfoWithReporters-Type	12.5.1.4.2.6	Used to carry the augmented stream meta-data
<b>Types used for resources</b>		
uri-Type	12.5.1.4.3	Used to represent resource URI
<b>Types referenced by the definitions above</b>		
systemDN-Type	12.5.1.4.3	Used to represent DN of the reporting entity
traceJob-Type	Generic NRM	Used to represent Trace configuration
producerId-Type	12.5.1.4.3	Used to identify the reporting entity
streamType-Type	12.5.1.4.3	Used to identify the type of a reporting stream
serializationFormat-Type	12.5.1.4.3	Used to identify serialization method
measObjDn-Type	12.5.1.4.3	Used to represent DN of the measured object instance
measTypes-Type	12.5.1.4.3	Used to represent an ordered list of measurement types or KPI
analyticsInfo-Type	12.5.1.4.3	Used to represents information about streamed analytics
vsDataContainer-Type	Generic NRM	Used to represent details about proprietary data

Table 12.5.1.4.1-2: Data types imported

Data type	Reference	Description
traceJob-Type	Generic NRM	Attributes container of the TraceJob IOC (see 3GPP TS 28.622 [11]).
vsDataContainer-Type	Generic NRM	Vendor specific data container (see 3GPP TS 28.622 [11]).

## 12.5.1.4.2 Query, message body and resource data types

## 12.5.1.4.2.1 Type connectionInfo-Type

**Table 12.5.1.4.2.1-1: Definition of type connectionInfo-Type**

Attribute name	Data type	Description	SQ
connection	connectionId-Type	Connection identifier	M
producer	producerId-Type	Producer identifier	M
streams	array(streamId-Type)	List of stream identifiers	M

## 12.5.1.4.2.2 Type connectionRequest-Type

**Table 12.5.1.4.2.2-1: Definition of type connectionRequest-Type**

Attribute name	Data type	Description	SQ
producer	producerId-Type	Producer identifier	M
streams	array(streamInfo-Type)	List of stream meta-data	M

## 12.5.1.4.2.3 Type errorResponse-Type

**Table 12.5.1.4.2.3-1: Definition of type errorResponse-Type**

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

## 12.5.1.4.2.4 Type failedConnectionResponse-Type

**Table 12.5.1.4.2.4-1: Definition of type failedConnectionResponse-Type**

Attribute name	Data type	Description	SQ
error	object	Key indicating the response body containing an error	M
> streamId	array(streamId-Type)	Attribute conveying the list of "problematic" stream IDs	M
> errorReason	string	Attribute allowing to convey error information in string format	

## 12.5.1.4.2.5 Type streamInfo-Type

**Table 12.5.1.4.2.5-1: Definition of type streamInfo-Type**

Attribute name	Data type	Description	SQ
streamId	streamId-Type	Stream identifier	M
streamType	streamType-Type	Enumerated stream type	M
serializationFormat	serializationFormat-Type	Enumerated serialization method	M
measObjDn	measObjDn-Type	DN of the measured object instance. Used for streaming performance data only.	CM
measTypes	measTypes-Type	Ordered list of measurement types or KPI. Used for streaming performance data only.	CM
analyticsInfo	analyticsInfo-Type	Information about streamed analytics. Used for streaming analytics only.	CM
vsDataContainer	vsDataContainer-Type	Details about proprietary data. Mandatory for proprietary data streaming only.	CM
traceInfo	traceJob-Type	Trace configuration. Used for streaming trace data reporting streams only.	CM

**Table 12.5.1.4.2.5-2: Attribute constraints**

Name	Definition
measObjDn (support qualifier)	Attribute shall be present for streaming performance data only.
measTypes (support qualifier)	Attribute shall be present for streaming performance data only.
analyticsInfo (support qualifier)	Attribute shall be present for streaming analytics only.
vsDataContainer (support qualifier)	Attribute shall be present for proprietary data streaming.
traceInfo (support qualifier)	Attribute shall be present for streaming trace data only.

#### 12.5.1.4.2.6 Type streamInfoWithReporters-Type

**Table 12.5.1.4.2.6-1: Definition of type streamInfoWithReporters-Type**

Attribute name	Data type	Description	SQ
streamInfo	streamInfo-Type	Stream meta-data	M
reporters	producerId-Type	List of entities reporting streaming data	M

#### 12.5.1.4.3 Simple data types and enumerations

##### 12.5.1.4.3.1 General

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

##### 12.5.1.4.3.2 Simple data types

**Table 12.5.1.4.3.2-1: Simple data types**

Type name	Type definition	Description
analyticsInfo-Type	string	Information about streamed analytics.
measObjDn-Type	DN	See 3GPP TS 32.300 [25]
measTypes-Type	string	See 3GPP TS 28.550 [42]
websocketHeaderConnection-Type	Constant string "Upgrade"	Header value for the upgrade request and response.
websocketHeaderUpgrade-Type	Constant string "websocket"	Header value for the upgrade to WebSocket request and response.
websocketHeader-Sec-WebSocket-Accept-Type	string	Header value for secure WebSocket response. Carries hash.
websocketHeader-Sec-WebSocket-Extensions-Type	string	Header value for secure WebSocket request. Carries protocol extensions.
websocketHeader-Sec-WebSocket-Key-Type	string	Header value for secure WebSocket request. Provides information to the server which is needed in order to confirm that the client is entitled to request an upgrade to WebSocket.
websocketHeader-Sec-WebSocket-Protocol-Type	string	Header value for secure WebSocket request. Carries a comma-separated list of subprotocol names, in the order of preference.
websocketHeader-Sec-WebSocket-Version-Type	string	Header value for secure WebSocket request and response. Carries the WebSocket protocol version to be used.
connectionId-Type	uri-Type	Used to indicate the connection as a context of the operation
producerId-Type	systemDN-Type	Used to identify the reporting entity
serializationFormat-Type	enum	Enumerated serialization method with values: "GPB", "ASN1"
streamId-Type	Trace Reference	See 3GPP TS 32.422 [38]
streamType-Type	enum	Enumerated stream type with values: "TRACE", "PERFORMANCE", "ANALYTICS", "PROPRIETARY"
systemDN-Type	DN	See 3GPP TS 32.300 [25]
uri-Type	string	Used to represent resource URI

## 12.6 File data reporting service

### 12.6.1 RESTful HTTP-based solution set

#### 12.6.1.1 Mapping of operations

##### 12.6.1.1.1 Introduction

The IS operations are mapped to SS equivalents according to table 12.6.1.1.1-1.

**Table 12.3.1.1.1-1: Mapping of IS operations to SS equivalents**

IS operation	HTTP Method	Resource URI	Qualifier
listAvailableFiles	GET	/Files	M
subscribe	POST	/subscriptions	M
unsubscribe	DELETE	/subscriptions	M
	DELETE	/subscriptions/{subscriptionId}	M

##### 12.6.1.1.2 Operation "listAvailableFiles"

The IS operation parameters are mapped to SS equivalents according to table 12.6.1.1.2-1 and table 12.6.1.1.2-2.

**Table 12.6.1.1.2-1: 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
managementDataType	query	managementDataType	managementDataT ype-Type	M
beginTime	query	beginTime	dateTime-Type	M
endTime	query	endTime	dateTime-Type	M

**Table 12.6.1.1.2-2: 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
fileInfoList	response body	n/a	fileInfoRetrieval- ResponseType	M
status	response status codes response body	n/a error	n/a error-ResponseType	M

The message flow is as follows:

- 1. The Service Consumer sends a HTTP GET request to the Service Provider.
  - The URI identifies the ".../Files" collection resource.
  - The query part may contain filter parameter. Absence of the query part means all available management data files 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 information of available files. The response format is defined by "fileInfoRetrieval-ResponseType".
  - On failure, an appropriate error code shall be returned. The response message body may carry an error object.



### 12.6.1.1.3 Operation "subscribe"

See clause 12.2.1.1.8, with the discrepancy that the subscribe operation in this clause is for file data reporting related notifications (i.e., `notifyFileReady` and `notifyFilePreparationError`).

### 12.6.1.1.4 Operation "unsubscribe"

See clause 12.2.1.1.9, with the discrepancy that the unsubscribe operation in this clause is for file data reporting related notifications (i.e., `notifyFileReady` and `notifyFilePreparationError`).

## 12.6.1.2 Mapping of notifications

### 12.6.1.2.1 Introduction

The IS notifications are mapped to SS equivalents according to table 12.6.1.2.1-1.

**Table 12.6.1.2.1-1: Mapping of IS notifications to SS equivalents**

IS notifications	HTTP Method	Resource URI	SQ
<code>notifyFileReady</code>	POST	/notificationSink	M
<code>notifyFilePreparationError</code>	POST	/notificationSink	M

### 12.6.1.2.1 Notification "notifyFileReady"

The IS notification parameters are mapped to SS equivalents according to table 12.6.1.2.1-1.

**Table 12.6.1.2.1-1: Mapping of IS notification input parameters to SS equivalents (HTTP POST)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
<code>objectClass</code>	request body	href	uri-Type	M
<code>objectInstance</code>				
<code>notificationId</code>	request body	<code>notificationId</code>	notificationId-Type	M
<code>eventTime</code>	request body	<code>eventTime</code>	dateTime-Type	M
<code>notificationType</code>	request body	<code>notificationType</code>	notificationType-Type	M
<code>fileInfoList</code>	request body	<code>fileInfoList</code>	array(fileInfo-Type)	M
<code>additionalText</code>	request body	<code>additionalText</code>	additionalText-Type	O

### 12.6.1.3.1 Notification "notifyFilePreparationError"

The IS notification parameters are mapped to SS equivalents according to table 12.6.1.3-1.

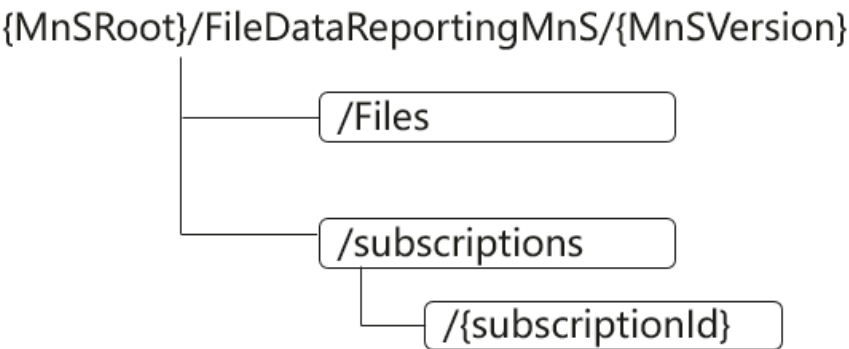
**Table 12.6.1.3.1-1: Mapping of IS notification input parameters to SS equivalents (HTTP POST)**

IS operation parameter name	SS parameter location	SS parameter name	SS parameter type	SQ
<code>objectClass</code>	request body	href	uri-Type	M
<code>objectInstance</code>				
<code>notificationId</code>	request body	<code>notificationId</code>	notificationId-Type	M
<code>eventTime</code>	request body	<code>eventTime</code>	dateTime-Type	M
<code>notificationType</code>	request body	<code>notificationType</code>	notificationType-Type	M
<code>fileInfoList</code>	request body	<code>fileInfoList</code>	array(fileInfo-Type)	M
<code>reason</code>	request body	<code>reason</code>	reason-Type	O
<code>additionalText</code>	request body	<code>additionalText</code>	additionalText-Type	O

12.6.1.3Resources

12.6.1.3.1Resource structure

Figure 12.6.1.3.1-1 shows the resource structure of the file data reporting service.



**Figure 12.6.1.3.1-1: Resource URI structure of the file data reporting service**

Table 12.6.1.3.1-2 provides an overview of the resources and applicable HTTP methods.

**Table 12.6.1.3.1-2: Resources and methods overview**

Resource name	Resource URI	HTTP method	Description
Files	/Files	GET	Retrieve the information of the available files
subscriptions	/subscriptions	POST	Create a subscription
subscriptions	/subscriptions	DELETE	Delete all subscriptions made with a consumerReferenceld
subscription	/subscriptions/{subscriptionId}	DELETE	Delete a single subscription
notificationSink	/notificationSink	POST	Send notifications

12.6.1.3.2Resource definitions

12.6.1.3.2.1Resource “/Files”

12.6.1.3.2.1.1Description

This resource represents the information about a collection of available files.

12.6.1.3.2.1.2URI

Resource URI = {MnSRoot}/FileDataReportingMnS/{MnSVersion}/Files

The resource URI variables a defined in the following table.

**Table 12.6.1.3.2.1.1-1: URI variables**

Name	Definition
MnSRoot	See clause 4.4 of TS 32.158 [15]

## 12.6.1.3.2.1.3 HTTP methods

## 12.6.1.3.2.1.3.1 HTTP GET

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

**Table 12.6.1.3.2.1.3.1-1: URI query parameters supported by the GET method on this resource**

Name	Data type	Description	SQ
managementDataType	managementDataType	To filter the available files based on the management data type.	M
beginTime	dateTime-Type	To filter the available files who became ready no later than this time stamp.	M
endTime	dateTime-Type	To filter the available files who became ready no earlier than this time stamp.	M

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

**Table 12.6.1.3.2.1.3.1-2: Data structures supported by the GET request body on this resource**

Data type	Description	SQ

**Table 12.6.1.3.2.1.3.1-3: Data structures supported by the GET response body on this resource**

Data type	Response codes	Description	SQ
fileInfoRetrieval-ResponseType	200 OK	The resource representation of the information about the available files retrieved.	M
error-ResponseType	4xx/5xx	Returned in case of an error	M

## 12.6.1.3.2.2 Resource "/subscriptions"

## 12.6.1.3.2.2.1 Description

This resource is a container resource for individual subscriptions.

## 12.6.1.3.2.2.2 URI

The resource URI is:

Resource URI: {MnSRoot}/FileDataReportingMnS/{MnSVersion}/subscriptions

The resource URI variables are defined in the following table.

**Table 12.6.1.3.3.2.2.2-1: URI variables**

Name	Definition
MnSRoot	See clause 4.4 of TS 32.158 [15]

## 12.6.1.3.2.2.3 HTTP methods

## 12.6.1.3.2.2.3.1 POST

This method shall support the URI query parameters specified in table 12.6.1.3.2.2.3.1-1.

**Table 12.6.1.3.2.2.3.1-1: 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 12.6.1.3.2.2.3.1-2 and the response data structures and response codes specified in table 12.6.1.3.2.2.3.1-3.

**Table 12.6.1.3.2.2.3.1-2: 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 12.6.1.3.2.2.3.1-3: 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-ResponseType	4xx/5xx	In case of failure the error object is returned.	M

#### 12.6.1.3.2.2.3.2 DELETE

This method shall support the URI query parameters specified in table 12.6.1.3.2.2.3.2-1.

**Table 12.6.1.3.2.2.3.2-1: URI query parameters supported by the DELETE method on this resource**

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

This method shall support the request data structures specified in table 12.6.1.3.2.2.3.2-2 and the response data structures and response codes specified in table 12.6.1.3.2.2.3.2-3.

**Table 12.6.1.3.2.2.3.2-2: Data structures supported by the DELETE Request Body on this resource**

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

**Table 12.6.1.3.2.2.3.2-3: 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-ResponseType	4xx/5xx	In case of failure the error object is returned.	M

#### 12.6.1.3.2.3 Resource "/subscriptions/{subscriptionId}"

##### 12.6.1.3.2.3.1 Description

This resource represents a subscription.

##### 12.6.1.3.2.3.2 URI

The resource URI is:

Resource URI: {MnSRoot}/FileDataReportingMnS/{MnSVersion}/subscriptions/{subscriptionId}

**Table 12.6.1.3.2.3.2-1: URI variables**

Name	Definition
MnSRoot	See clause 4.4 of TS 32.158 [15]
subscriptionId	Subscription identifier

#### 12.6.1.3.2.3.3 HTTP methods

##### 12.6.1.3.2.3.3.1 DELETE

This method shall support the URI query parameters specified in table 12.6.1.3.2.3.3-1.

**Table 12.6.1.3.2.3.3-1: 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 12.6.1.3.2.3.3-2 and the response data structures and response codes specified in table 12.6.1.3.2.3.3-3.

**Table 12.6.1.3.2.3.3-2: Data structures supported by the DELETE Request Body on this resource**

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

**Table 12.6.1.3.2.3.3-3: 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-ResponseType	4xx/5xx	In case of failure the error object is returned.	M

#### 12.6.1.3.2.4 Resource "/notificationSink"

##### 12.6.1.3.2.4.1 Description

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

##### 12.6.1.3.2.4.2 URI

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

##### 12.6.1.3.2.4.3 HTTP methods

##### 12.6.1.3.2.4.3.1 POST

This method shall support the URI query parameters specified in table 12.6.1.3.2.4.3.1-1.

**Table 12.6.1.3.2.4.3.1-1: 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 12.6.1.3.2.4.3.1-2 and the response data structures and response codes specified in table 12.6.1.3.2.4.3.1-3.

**Table 12.6.1.3.2.4.3.1-2: Data structures supported by the POST Request Body on this resource**

Data type	Description	SQ
notifyFileReady-NotifType	Type in case a notifyFileReady notification is sent	M
notifyFilePreparationError-NotifType	Type in case a notifyFilePreparationError notification is sent	M

**Table 12.6.1.3.2.4.3.1-3: 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-ResponseType	4xx/5xx	In case of failure the error object is returned.	M

## 12.6.1.4 Data type definitions

### 12.6.1.4.1 General

**Table 12.6.1.4.1-1: Data types defined in this specification**

Data type	Reference	Description
<b>General types</b>		
dateTime-Type	12.6.1.4.6.2	Data type of date and time.
uri-Type	12.6.1.4.6.2	The data type of a URI.
<b>Types used in paths</b>		
<b>Types used in query parts</b>		
managementDataType-Type	12.6.1.4.6.3	Used in listing the information of available files describing the management data type of the files.
consumerReferenceId-QueryType	12.6.1.4.6.2	Used in the query part of HTTP DELETE on /Subscriptions to delete all subscriptions made with a specific consumerReferenceId
<b>Types used in request bodies</b>		
subscription-RequestType	12.6.1.4.4.1	Used in the request body of HTTP POST on /subscriptions to create file data reporting notifications subscriptions.
<b>Types used in response bodies</b>		
fileInfoRetrieval-ResponseType	12.6.1.4.4.2	Used in the response body of HTTP GET describing the information of the listed files.
error-ResponseType	12.6.1.4.4.3	Used in the response body describing the error.
<b>Types used for resources</b>		
subscription-ResourceType	12.6.1.4.4.4	Representation of a subscription resource.
<b>Types used in notifications</b>		
notifyFileReady-NotifType	12.6.1.4.4.5	Used in the request body of HTTP POST for the notification type notifyFileReady.
notifyFilePreparationError-NotifType	12.6.1.4.4.6	Used in the request body of HTTP POST for the notification type notifyFilePreparationError.
<b>Types referenced by the definitions above</b>		
fileInfo-Type	12.6.1.4.5.1	Used for describing the file information.
notificationId-Type	12.6.1.4.6.2	Notification identifier as defined in ITU-T Rec. X. 733 [4]
notificationType-Type	12.6.1.4.6.2	Notification type (notifyFileReady, etc.)
additionalText-Type	12.6.1.4.6.2	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]
reason-Type	12.6.1.4.6.2	Used to describe the reason causing the file preparation error.

**Table 12.6.1.4.1-2: Data types imported**

Data type	Reference	Description

12.6.1.4.2            Structured general data types

None.

12.6.1.4.3            Structured path data types

None.

12.6.1.4.4            Query, message body and resource data types

12.6.1.4.4.1        Type subscription-RequestType

**Table 12.6.1.4.4.1-1: 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

12.6.1.4.4.2        Type fileInfoRetrieval-ResponseType

**Table 12.6.1.4.4.2-1: Definition of type fileInfoRetrieval-ResponseType**

Attribute name	Data type	Description	SQ
data	array(fileInfoType)	The information of the available files	M

12.6.1.4.4.3        Type error-ResponseType

**Table 12.6.1.4.4.3-1: Definition of type error-ResponseType**

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

12.6.1.4.4.4        Type subscription-ResourceType

**Table 12.6.1.4.4.4-1: 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 11.2.2.2.5.1	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

## 12.6.1.4.4.5 Type notifyFileReady-NotifType

**Table 12.6.1.4.4.5-1: Definition of type notifyFileReady-NotifType**

Attribute name	Data type	Description	SQ
header			
> href	uri-Type	URI of the resource indicating the file data reporting service	M
> notificationId	notificationId-Type	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
> notificationType	notificationType-Type	Notification type (notifyFileReady, etc.)	M
> eventTime	dateTime-Type	Event occurrence time (e.g., the file ready time)	M
body			
> fileInfoList	array(fileInfo-Type)	The information of the available files	M
> additionalText	additionalText-Type	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]	O

## 12.6.1.4.4.6 Type notifyFilePreparationError-NotifType

**Table 12.6.1.4.4.6-1: Definition of type notifyFilePreparationError-NotifType**

Attribute name	Data type	Description	SQ
header			
> href	uri-Type	URI of the resource indicating the file data reporting service	M
> notificationId	notificationId-Type	Notification identifier as defined in ITU-T Rec. X. 733 [4]	M
> notificationType	notificationType-Type	Notification type (notifyFileReady, etc.)	M
> eventTime	dateTime-Type	Event occurrence time (e.g., the file ready time)	M
body			
> fileInfoList	array(fileInfo-Type)	The information of the available files	M
> reason	reason-Type	The reason that caused the error of the file preparation.	
> additionalText	additionalText-Type	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]	O

## 12.6.1.4.5 Referenced structured data types

## 12.6.1.4.5.1 Type fileInfo-Type

**Table 12.6.1.4.5-1: Definition of fileInfo-Type**

Attribute name	Data type	Description	SQ
fileLocation	uri-Type	Used to indicate the location of the file.	M
fileSize	long-Type	The size of the file with positive Integer value (the unit is byte).	M
fileReadyTime	dateTime-Type	Indicates 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.	M
fileExpirationTime	dateTime-Type	Indicates the date and time beyond which the file may be deleted.	M
fileCompression	string	Identifies the name of the compression algorithm used for the file.	M
fileFormat	string	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.	M



## 12.6.1.4.6 Simple data types and enumerations

## 12.6.1.4.6.1 General

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

## 12.6.1.4.6.2 Simple data types

**Table 12.6.1.4.6.2-1: Simple data types**

Type name	Type definition	Description
dateTime-Type	string	The data type for date and time in "date-time" format.
uri-Type	string	The type of a URI.
consumerReferenceId-QueryType	uri-Type	Used in the query part of HTTP DELETE on /subscriptions to delete all subscriptions made with a specific consumerReferenceId.
filter-Type	string	Filter of a subscription resource.
notificationId-Type	long	Notification identifier as defined in ITU-T Rec. X. 733 [4]
additionalText-Type	string	Allows a free form text description to be reported as defined in ITU-T Rec. X. 733 [4]
reason-Type	string	The type for describing the reason that caused the file preparation error.

## 12.6.1.4.6.3 Enumeration managementDataType-Type

**Table 12.6.1.4.6.3-1: Enumeration managementDataType-Type**

Enumeration value	Description
PERFORMANCE	It indicates that the management data file type is "Performance data"
TRACE	It indicates that the management data file type is "Trace data"
ANALYTICS	It indicates that the management data file type is "Analytics data"
PROPRIETARY	It indicates that the management data file type is "Proprietary data"

## 12.6.1.4.6.4 Enumeration notificationType-Type

**Table 12.6.1.4.6.4-1: Enumeration notificationType-Type**

Enumeration value	Description
notifyFileReady	Notification type is notifyFileReady
notifyFilePreparationError	Notification type is notifyFilePreparationError

---

# Annex A (normative): OpenAPI specification

## A.0 Introduction

This clause describes the capabilities of the service in the structure of the OpenAPI Specification Version 3.0.1 [A9]. The OpenAPI definitions are provided in YAML or JSON format.

---

## A.1 Provisioning management service

### A.1.0 Introduction

Clause A.1.1 contains the OpenAPI definition of the provisioning MnS which includes the provisioning MnS operations and the provisioning MnS notifications.

Clause A.1.2 contains the JSON schema for the content of the generic provisioning MnS notifications when the consumer of these notifications supports the ONAP VES API. This content is sent as payload of VES events (see Annex B).

The content of the provisioning MnS notifications in both clause A.1.1 and clause A.1.2 is the same.

### A.1.1 Generic provisioning management service

```
openapi: 3.0.1
info:
  title: Provisioning MnS
  version: 16.4.0
  description: >-
    OAS 3.0.1 definition of the Provisioning MnS
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 28.532 V16.4.0; Generic management services
  url: http://www.3gpp.org/ftp/Specs/archive/28_series/28.532/
servers:
- url: 'http://{URI-DN-prefix}/{root}/ProvMnS/v1640/{LDN-first-part}'
  variables:
    URI-DN-prefix:
      description: See subclause 4.4 of TS 32.158
      default: example.com
    root:
      description: See subclause 4.4 of TS 32.158
      default: 3GPPManagement
    LDN-first-part:
      description: See subclause 4.4 of TS 32.158
      default: ''
paths:
  '/{className}={id}':
    parameters:
      - name: className
        in: path
        required: true
        schema:
          $ref: '#/components/schemas/className-PathType'
      - name: id
        in: path
        required: true
        schema:
          $ref: '#/components/schemas/id-PathType'
    put:
      summary: Replaces a complete single resource or creates it if it does not exist
      description: >-
```

With HTTP PUT a complete resource is replaced or created if it does not exist. The target resource is identified by the target URI.

```

requestBody:
  required: true
  content:
    application/json:
      schema:
        $ref: '#/components/schemas/resourcePut-RequestType'
responses:
  '200':
    description: >-
      Success case ("200 OK").
      This status code shall be returned when the resource is replaced, and
      when the replaced resource representation is not identical to the resource
      representation in the request.
      This status code may be returned when the resource is updated and when the
      updated resource representation is identical to the resource representation
      in the request.
      The representation of the updated resource is returned in the response
      message body.
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/resourceUpdate-ResponseType'
  '201':
    description: >-
      Success case ("201 Created").
      This status code shall be returned when the resource is created.
      The representation of the created resource is returned in the response
      message body.
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/resourceCreation-ResponseType'
  '204':
    description: >-
      Success case ("204 No Content").
      This status code may be returned only when the replaced resource
      representation is identical to the representation in the request.
      The response has no message body.
  default:
    description: Error case.
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/error-ResponseType'
callbacks:
  notifyMOICreation:
    '{request.body#/notificationRecipientAddress}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/notifyMOICreation-NotifType'
        responses:
          '204':
            description: >-
              Success case ("204 No Content").
              The notification is successfully delivered. The response
              has no message body.
          default:
            description: Error case.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/error-ResponseType'
  notifyMOIDeletion:
    '{request.body#/notificationRecipientAddress}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/notifyMOIDeletion-NotifType'
        responses:

```

```

    '204':
      description: >-
        Success case ("204 No Content").
        The notification is successfully delivered. The response
        has no message body.
      default:
        description: Error case.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/error-ResponseType'
  notifyMOIAttributeValueChanged:
    '{request.body#/notificationRecipientAddress}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/notifyMOIAttributeValueChanged-NotifType'
      responses:
        '204':
          description: >-
            Success case ("204 No Content").
            The notification is successfully delivered. The response
            has no message body.
          default:
            description: Error case.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/error-ResponseType'
  notifyMOIChanges:
    '{request.body#/notificationRecipientAddress}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/notifyMOIChanges-NotifType'
      responses:
        '204':
          description: >-
            Success case ("204 No Content").
            The notification is successfully delivered. The response
            has no message body.
          default:
            description: Error case.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/error-ResponseType'
get:
  summary: Reads one or multiple resources
  description: >-
    With HTTP GET resources are read. The resources to be retrieved are
    identified with the target URI. The attributes and fields parameter
    of the query components allow to select the resource properties to be returned.
  parameters:
    - name: scope
      in: query
      description: >-
        This parameter extends the set of targeted resources beyond the base
        resource identified with the path component of the URI. No scoping
        mechanism is specified in the present document.
      required: false
      schema:
        $ref: '#/components/schemas/scope-QueryType'
      style: form
      explode: true
    - name: filter
      in: query
      description: >-
        This parameter reduces the targeted set of resources by applying a
        filter to the scoped set of resource representations. Only resource
        representations for which the filter construct evaluates to "true"
        are targeted. No filter language is specified in the present

```

```

    document.
    required: false
    schema:
      $ref: '#/components/schemas/filter-QueryType'
  - name: attributes
    in: query
    description: >-
      This parameter specifies the attributes of the scoped resources that
      are returned.
    required: true
    schema:
      $ref: '#/components/schemas/attributes-QueryType'
    style: form
    explode: false
  - name: fields
    in: query
    description: >-
      This parameter specifies the attribute field of the scoped resources
      that are returned.
    required: false
    schema:
      $ref: '#/components/schemas/fields-QueryType'
    style: form
    explode: false
  responses:
    '200':
      description: >-
        Success case ("200 OK").
        The resources identified in the request for retrieval are returned
        in the response message body. In case the attributes or fields query
        parameters are used, only the selected attributes or sub-attributes are
        returned. The response message body is constructed according to the
        hierarchical response construction method (TS 32.158 [15]).
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/resourceRetrieval-ResponseType'
      default:
        description: Error case.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/error-ResponseType'
  patch:
    summary: Patches one or multiple resources
    description: >-
      With HTTP PATCH resources are created, updated or deleted. The resources
      to be modified are identified with the target URI (base resource) and
      the patch document included in the request message body.
    requestBody:
      description: >-
        The request body describes changes to be made to the target resources.
        The following patch media types are available
        - "application/merge-patch+json" (RFC 7396)
        - "application/3gpp-merge-patch+json" (TS 32.158)
        - "application/json-patch+json" (RFC 6902)
        - "application/3gpp-json-patch+json" (TS 32.158)
      required: true
      content:
        application/merge-patch+json:
          schema:
            $ref: '#/components/schemas/jsonMergePatch-RequestType'
        application/3gpp-merge-patch+json:
          schema:
            $ref: '#/components/schemas/3gppJsonMergePatch-RequestType'
        application/json-patch+json:
          schema:
            $ref: '#/components/schemas/jsonPatch-RequestType'
        application/3gpp-json-patch+json:
          schema:
            $ref: '#/components/schemas/3gppJsonPatch-RequestType'
    responses:
      '200':
        description: >-
          Success case ("200 OK").
          This status code is returned when the updated the resource representations
          shall be returned for some reason.
          The resource representations are returned in the response message body. The

```

```

    response message body is constructed according to the hierarchical response
    construction method (TS 32.158 [15])
  content:
    application/json:
      schema:
        $ref: '#/components/schemas/resourceUpdate-ResponseType'
  '204':
    description: >-
      Success case ("204 No Content").
      This status code is returned when there is no need to return the updated
      resource representations.
      The response message body is empty.
  default:
    description: Error case.
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/error-ResponseType'
delete:
  summary: Deletes one or multiple resources
  description: >-
    With HTTP DELETE resources are deleted. The resources to be deleted are
    identified with the target URI.
  parameters:
    - name: scope
      in: query
      description: >-
        This parameter extends the set of targeted resources beyond the base
        resource identified with the path component of the URI. No scoping
        mechanism is specified in the present document.
      required: false
      schema:
        $ref: '#/components/schemas/scope-QueryType'
    - name: filter
      in: query
      description: >-
        This parameter reduces the targeted set of resources by applying a
        filter to the scoped set of resource representations. Only resources
        representations for which the filter construct evaluates to "true"
        are returned. No filter language is specified in the present
        document.
      required: false
      schema:
        $ref: '#/components/schemas/filter-QueryType'
  responses:
    '200':
      description: >-
        Success case ("200 OK").
        This status code shall be returned, when query parameters are present in
        the request and one or multiple resources are deleted.
        The URIs of the deleted resources are returned in the response message body.
    '204':
      description: >-
        Success case ("204 No Content").
        This status code shall be returned, when no query parameters are present in
        the request and only one resource is deleted.
        The message body is empty.
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/resourceDeletion-ResponseType'
      default:
        description: Error case.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/error-ResponseType'
components:
  schemas:
    dateTime-Type:
      type: string
      format: date-time
    long-Type:
      type: integer
      format: int64
    uri-Type:
      type: string
    correlatedNotification-Type:

```

```
    type: object
  properties:
    source:
      $ref: '#/components/schemas/uri-Type'
    notificationIds:
      type: array
      items:
        $ref: '#/components/schemas/notificationId-Type'
  notificationId-Type:
    $ref: '#/components/schemas/long-Type'
  notificationType-Type:
    type: string
    enum:
      - notifyMOICreation
      - notifyMOIDeletion
      - notifyMOIAttributeValueChange
  systemDN-Type:
    type: string
  additionalText-Type:
    type: string
  sourceIndicator-Type:
    type: string
    enum:
      - resourceOperation
      - mangementOperation
      - sONOperation
      - unknown
  header-Type:
    type: object
    properties:
      href:
        $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'
    required:
      - href
      - notificationId
      - notificationType
      - eventTime
      - systemDN
  scopeType-Type:
    type: string
    enum:
      - BASE_ONLY
      - BASE_NTH_LEVEL
      - BASE_SUBTREE
      - BASE_ALL
  scopeLevel-Type:
    type: integer
  className-PathType:
    type: string
  id-PathType:
    type: string
  attributes-QueryType:
    type: array
    items:
      type: string
  fields-QueryType:
    type: array
    items:
      type: string
  filter-QueryType:
    type: string
  scope-QueryType:
    type: object
    properties:
      scopeType:
        $ref: '#/components/schemas/scopeType-Type'
      scopeLevel:
        $ref: '#/components/schemas/scopeLevel-Type'

resourcePut-RequestType:
```

```
$ref: '#/components/schemas/resourceRepresentation-Type'
jsonMergePatch-RequestType:
  $ref: '#/components/schemas/resourceRepresentation-Type'
3gppJsonMergePatch-RequestType:
  $ref: '#/components/schemas/resourceRepresentation-Type'
jsonPatch-RequestType:
  type: array
  items:
    type: object
3gppJsonPatch-RequestType:
  type: array
  items:
    type: object

error-ResponseType:
  type: object
  properties:
    error:
      type: object
      properties:
        errorInfo:
          type: string
resourceRetrieval-ResponseType:
  $ref: '#/components/schemas/resourceRepresentation-Type'
resourceCreation-ResponseType:
  $ref: '#/components/schemas/resourceRepresentation-Type'
resourceUpdate-ResponseType:
  $ref: '#/components/schemas/resourceRepresentation-Type'
resourceDeletion-ResponseType:
  type: array
  items:
    $ref: '#/components/schemas/uri-Type'

resourceRepresentation-Type:
  oneOf:
    - type: object
      properties:
        id:
          type: string
        attributes:
          type: object
        additionalProperties:
          type: array
          items:
            type: object
    - anyOf:
      - $ref: 'genericNrm.yaml#/components/schemas/resources-genericNrm'
      - $ref: 'nrNrm.yaml#/components/schemas/resources-nrNrm'
      - $ref: '5gcNrm.yaml#/components/schemas/resources-5gcNrm'
      - $ref: 'sliceNrm.yaml#/components/schemas/resources-sliceNrm'

mOICChange-Type:
  type: object
  properties:
    notificationId:
      $ref: '#/components/schemas/notificationId-Type'
    correlatedNotifications:
      type: array
      items:
        $ref: '#/components/schemas/correlatedNotification-Type'
    additionalText:
      $ref: '#/components/schemas/additionalText-Type'
    sourceIndicator:
      $ref: '#/components/schemas/sourceIndicator-Type'
    path:
      $ref: '#/components/schemas/uri-Type'
    operation:
      type: string
      enum:
        - CREATE
        - DELETE
        - REPLACE
    value:
      oneOf:
        - type: object
          additionalProperties:
            nullable: true
        - type: array
```



```
      items:
        type: object
      minItems: 1
      maxItems: 2

notifyMOICreation-NotifType:
  allOf:
    - $ref: '#/components/schemas/header-Type'
    - type: object
      properties:
        correlatedNotifications:
          type: array
          items:
            $ref: '#/components/schemas/correlatedNotification-Type'
        additionalText:
          $ref: '#/components/schemas/additionalText-Type'
        sourceIndicator:
          $ref: '#/components/schemas/sourceIndicator-Type'
        attributeList:
          type: object
          additionalProperties:
            nullable: true
notifyMOIDeletion-NotifType:
  allOf:
    - $ref: '#/components/schemas/header-Type'
    - type: object
      properties:
        correlatedNotifications:
          type: array
          items:
            $ref: '#/components/schemas/correlatedNotification-Type'
        additionalText:
          $ref: '#/components/schemas/additionalText-Type'
        sourceIndicator:
          $ref: '#/components/schemas/sourceIndicator-Type'
        attributeList:
          type: object
          additionalProperties: true
notifyMOIAttributeValueChange-NotifType:
  allOf:
    - $ref: '#/components/schemas/header-Type'
    - type: object
      properties:
        correlatedNotifications:
          type: array
          items:
            $ref: '#/components/schemas/correlatedNotification-Type'
        additionalText:
          $ref: '#/components/schemas/additionalText-Type'
        sourceIndicator:
          $ref: '#/components/schemas/sourceIndicator-Type'
        attributeValueChange:
          type: object
          additionalProperties:
            type: array
            minItems: 1
            maxItems: 2
            items:
              nullable: true
      required:
        - attributeValueChange
notifyMOIChanges-NotifType:
  allOf:
    - $ref: '#/components/schemas/header-Type'
    - type: object
      properties:
        mOIChanges:
          type: array
          items:
            $ref: '#/components/schemas/mOIChange-Type'
      required:
        - mOIChanges
```

## A.1.2 JSON schema of 'prov3gppFields' for integration with ONAP VES

```

{
  "prov3gppFields": {
    "description": "fields specific to 3GPP provisioning management service notifications for
integration with ONAP VES",
    "type": "object",
    "properties": {
      "prov3gppFieldsVersion": {
        "description": "version of the prov3gppFields block",
        "type": "string",
        "enum": ["16.1"]
      },
      "provisioningMnSNotifications": {
        "oneOf": [
          { "$ref": "#/definitions/notifyMOICreation-NotifType" },
          { "$ref": "#/definitions/notifyMOIDeletion-NotifType" },
          { "$ref": "#/definitions/notifyMOIAttributeValueChange-NotifType" }
        ]
      }
    ]
  },
  "definitions": {
    "notifyMOICreation-NotifType": {
      "description": "fields specific to 3GPP notification NotifyMOICreation",
      "type": "object",
      "properties": {
        "dN": {
          "$ref": "#/definitions/dN-Type"
        },
        "notificationType": {
          "$ref": "#/definitions/notificationType-Type"
        },
        "systemDN": {
          "$ref": "#/components/schemas/systemDN-Type"
        },
        "correlatedNotifications": {
          "type": "array",
          "items": {
            "$ref": "#/definitions/correlatedNotification-Type"
          }
        },
        "attributeList": {
          "type": "array",
          "items": {
            "$ref": "#/definitions/attributeNameValuePair-Type"
          }
        },
        "additionalText": {
          "$ref": "#/definitions/additionalText-Type"
        }
      }
    },
    "additionalProperties": false,
    "required": [ "dN", "notificationType", "systemDN" ],
    "notifyMOIDeletion-NotifType": {
      "description": "fields specific to 3GPP notification NotifyMOIDeletion",
      "type": "object",
      "properties": {
        "dN": {
          "$ref": "#/definitions/dN-Type"
        },
        "notificationType": {
          "$ref": "#/definitions/notificationType-Type"
        },
        "systemDN": {
          "$ref": "#/components/schemas/systemDN-Type"
        },
        "correlatedNotifications": {
          "type": "array",
          "items": {
            "$ref": "#/definitions/correlatedNotification-Type"
          }
        },
        "attributeList": {
          "type": "array",

```

```

        "items": {
          "$ref": "#/definitions/attributeNameValuePair-Type"
        },
      },
      "additionalText": {
        "$ref": "#/definitions/additionalText-Type"
      },
    },
    "additionalProperties": false,
    "required": [ "dN", "notificationType", "systemDN" ]
  },
  "notifyMOIAttributeValueChange-NotifType": {
    "description": "fields specific to 3GPP notification NotifyMOIAttributeValueChange",
    "type": "object",
    "properties": {
      "dN": {
        "$ref": "#/definitions/dN-Type"
      },
      "notificationType": {
        "$ref": "#/definitions/notificationType-Type"
      },
      "systemDN": {
        "$ref": "#/components/schemas/systemDN-Type"
      },
      "correlatedNotifications": {
        "type": "array",
        "items": {
          "$ref": "#/definitions/correlatedNotification-Type"
        }
      },
      "attributeValueChange": {
        "type": "array",
        "items": {
          "$ref": "#/definitions/attributeValueChange-Type"
        }
      },
      "additionalText": {
        "$ref": "#/definitions/additionalText-Type"
      }
    },
    "additionalProperties": false,
    "required": [ "dN", "notificationType", "systemDN", "attributeValueChange" ]
  },
  "dN-Type": {
    "type": "string"
  },
  "notificationType-Type": {
    "type": "string",
    "enum": [
      "notifyMOICreation",
      "notifyMOIDeletion",
      "notifyMOIAttributeValueChange"
    ]
  },
  "systemDN-Type": {
    "type": "string"
  },
  "correlatedNotification-Type": {
    "type": "object",
    "properties": {
      "source": {
        "$ref": "#/definitions/dN-Type"
      },
      "notificationIds": {
        "type": "array",
        "items": {
          "$ref": "#/definitions/notificationId-Type"
        }
      }
    }
  },
  "attributeValueChange-Type": {
    "type": "object",
    "properties": {
      "attributeName": {
        "type": "string"
      },
      "oldAttributeValue": {}
    }
  }

```

```

        "newAttributeValue": {}
    },
    "attributeNameValuePair-Type": {
        "type": "object",
        "properties": {
            "attributeName": {
                "type": "string"
            },
            "attributeValue": {}
        }
    },
    "additionalText-Type": {
        "type": "string"
    },
    "notificationId-Type": {
        "$ref": "#/components/schemas/long-Type"
    }
}
}
}

```

## A.2 Generic fault supervision management service

### A.2.0 Introduction

Clause A.2.1 contains the OpenAPI definition of the generic fault supervision MnS which includes the fault supervision MnS operations and the fault supervision MnS notifications.

Clause A.2.2 contains the JSON schema for the content of the generic fault supervision MnS notifications when the consumer of these notifications supports the ONAP VES API. This content is sent as payload of VES events (see Annex B).

The content of the fault supervision notifications in both clauses A.2.1 and A.2.2 is the same.

### A.2.1 OpenAPI document "faultMnS.yaml"

```

openapi: 3.0.1
info:
  title: Fault Supervision MnS
  version: 16.5.0
  description: >-
    OAS 3.0.1 definition of the Fault Supervision MnS
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 28.532 V16.5.0; Generic management services
  url: http://www.3gpp.org/ftp/Specs/archive/28_series/28.532/
servers:
  - url: '{MnSRoot}/FaultSupervisionMnS/{version}'
    variables:
      MnSRoot:
        description: See subclause 4.4.3 of TS 32.158
        default: http://example.com/3GPPManagement
      version:
        description: Version number of the OpenAPI definition
        default: XXX
paths:
  /alarms:
    get:
      summary: Retrieve multiple alarms
      description: >-
        Retrieves the alarms identified by alarmAckState, baseObjectInstance
        and filter.
      parameters:
        - name: alarmAckState
          in: query
          required: false
          schema:

```

```

    $ref: '#/components/schemas/AlarmAckState'
  - name: baseObjectInstance
    in: query
    required: false
    schema:
      $ref: 'comDefs.yaml#/components/schemas/Dn'
  - name: filter
    in: query
    required: false
    schema:
      $ref: 'comDefs.yaml#/components/schemas/Filter'
responses:
  '200':
    description: >-
      Success case ("200 OK").
      Returns the alarms identified in the request. The alarmId is the key
      of the map.
    content:
      application/json:
        schema:
          type: object
          additionalProperties:
            type: object
            allOf:
              - type: object
                properties:
                  lastNotificationHeader:
                    $ref: 'comDefs.yaml#/components/schemas/NotificationHeader'
              - $ref: '#/components/schemas/AlarmRecord'
              - type: object
                properties:
                  comments:
                    $ref: '#/components/schemas/Comments'
    default:
      description: Response in case of error.
      content:
        application/json:
          schema:
            $ref: 'comDefs.yaml#/components/schemas/ErrorResponse'
patch:
  summary: 'Clear, acknowledge or unacknowledge multiple alarms'
  description: >-
    Clears, acknowledges or unacknowledges multiple alarms using patch. Depending
    on which action is to be performed, different merge patch documents need
    to be used.
  requestBody:
    description: >-
      Patch documents for acknowledging and unacknowledging, or clearing multiple
      alarms. The keys in the map are the alarmIds to be patched.
    content:
      application/merge-patch+json:
        schema:
          oneOf:
            - type: object
              additionalProperties:
                $ref: '#/components/schemas/MergePatchAcknowledgeAlarm'
            - type: object
              additionalProperties:
                $ref: '#/components/schemas/MergePatchClearAlarm'
  responses:
    '204':
      description: >-
        Success case ("204 No content").
        The response message body is empty.
    default:
      description: Response in case of error.
      content:
        application/json:
          schema:
            type: array
            items:
              $ref: '#/components/schemas/FailedAlarm'
/alarms/alarmCount:
  get:
    summary: Get the alarm count per perceived severity
    parameters:
      - name: alarmAckState
        in: query

```

```

    required: false
    schema:
      $ref: '#/components/schemas/AlarmAckState'
  - name: filter
    in: query
    required: false
    schema:
      type: string
responses:
  '200':
    description: >-
      Success case ("200 OK").
      The alarm count per perceived severity is returned.
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/AlarmCount'
  default:
    description: Response in case of error. The error case needs rework.
    content:
      application/json:
        schema:
          $ref: 'comDefs.yaml#/components/schemas/ErrorResponse'
/alarms/{alarmId}:
  patch:
    summary: 'Clear, acknowledge or unacknowledge a single alarm'
    description: >-
      Clears, acknowledges or unacknowledges a single alarm by patching the alarm
      information. A conditional acknowledge request based on the perceived
      severity is not supported.
    parameters:
      - name: alarmId
        in: path
        description: Identifies the alarm to be patched.
        required: true
        schema:
          type: string
    requestBody:
      required: true
      content:
        application/merge-patch+json:
          schema:
            oneOf:
              - $ref: '#/components/schemas/MergePatchAcknowledgeAlarm'
              - $ref: '#/components/schemas/MergePatchClearAlarm'
    responses:
      '204':
        description: >-
          Success case (204 No content).
          The response message body is absent.
      default:
        description: Response in case of error.
        content:
          application/json:
            schema:
              $ref: 'comDefs.yaml#/components/schemas/ErrorResponse'
/alarms/{alarmId}/comments:
  post:
    summary: Add a comment to a single alarm
    description: >-
      Adds a comment to an alarm identified by alarmId. The id of the new comment
      is allocated by the producer.
    parameters:
      - name: alarmId
        in: path
        description: Identifies the alarm to which the comment shall be added.
        required: true
        schema:
          type: string
    requestBody:
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/Comment'
    responses:
      '201':
        description: >-

```

```

        Success case (201 Created).
        The representation of the newly created comment resource shall be returned.
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/Comment'
    headers:
      Location:
        description: URI of the newly created comment resource.
        required: true
        schema:
          type: string
    default:
      description: Error case.
      content:
        application/json:
          schema:
            $ref: 'comDefs.yaml#/components/schemas/ErrorResponse'

/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'
    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'
        headers:
          Location:
            description: URI of the newly created subscription resource
            required: true
            schema:
              type: string
        default:
          description: Error case.
          content:
            application/json:
              schema:
                $ref: 'comDefs.yaml#/components/schemas/ErrorResponse'
    callbacks:
      notifyNewAlarm:
        '{request.body#/consumerReference}':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    oneOf:
                      - $ref: '#/components/schemas/NotifyNewAlarm'
                      - $ref: '#/components/schemas/NotifyNewSecAlarm'
            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: 'comDefs.yaml#/components/schemas/ErrorResponse'
      notifyClearedAlarm:

```

```

    '{request.body#/consumerReference}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/NotifyClearedAlarm'
        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: 'comDefs.yaml#/components/schemas/ErrorResponse'
  notifyChangedAlarm:
    '{request.body#/consumerReference}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/NotifyChangedAlarm'
        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: 'comDefs.yaml#/components/schemas/ErrorResponse'
  notifyChangedAlarmGeneral:
    '{request.body#/consumerReference}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                oneOf:
                  - $ref: '#/components/schemas/NotifyChangedAlarmGeneral'
                  - $ref: '#/components/schemas/NotifyChangedSecAlarmGeneral'
        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: 'comDefs.yaml#/components/schemas/ErrorResponse'
  notifyCorrelatedNotificationChanged:
    '{request.body#/consumerReference}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/NotifyCorrelatedNotificationChanged'
        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: 'comDefs.yaml#/components/schemas/ErrorResponse'
  notifyAckStateChanged:
    '{request.body#/consumerReference}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/NotifyAckStateChanged'
        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: 'comDefs.yaml#/components/schemas/ErrorResponse'
  notifyComments:
    '{request.body#/consumerReference}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/NotifyComments'
        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: 'comDefs.yaml#/components/schemas/ErrorResponse'
  notifyPotentialFaultyAlarmList:
    '{request.body#/consumerReference}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/NotifyPotentialFaultyAlarmList'
        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: 'comDefs.yaml#/components/schemas/ErrorResponse'
  notifyAlarmListRebuilt:
    '{request.body#/consumerReference}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:
```

```

        $ref: '#/components/schemas/NotifyAlarmListRebuilt'
      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: 'comDefs.yaml#/components/schemas/ErrorResponse'
/subscriptions/{subscriptionId}:
  delete:
    summary: Delete a 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:
          type: string
    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: 'comDefs.yaml#/components/schemas/ErrorResponse'

components:
  schemas:

#---- Definition of AlarmRecord -----#

AlarmId:
  type: string
AlarmType:
  type: string
  enum:
    - COMMUNICATIONS_ALARM
    - QUALITY_OF_SERVICE_ALARM
    - PROCESSING_ERROR_ALARM
    - EQUIPMENT_ALARM
    - ENVIRONMENTAL_ALARM
    - INTEGRITY_VIOLATION
    - OPERATIONAL_VIOLATION
    - PHYSICAL_VIOLATION
    - SECURITY_SERVICE_OR_MECHANISM_VIOLATION
    - TIME_DOMAIN_VIOLATION
ProbableCause:
  description: >-
    The value of the probable cause may be a specific standardized string, or any
    vendor provided string. Probable cause strings are not standardized in the
    present document. They may be added in a future version. Up to then the
    mapping of the generic probable cause strings "PROBABLE_CAUSE_001" to
    "PROBABLE_CAUSE_005" is vendor specific.
    The value of the probable cause may also be an integer. The mapping of integer
    values to probable causes is vendor specific.
  oneOf:
    - anyOf:
        - type: string
          enum:
            - PROBABLE_CAUSE_001
            - PROBABLE_CAUSE_002
            - PROBABLE_CAUSE_003
            - PROBABLE_CAUSE_004
            - PROBABLE_CAUSE_005

```

```
- type: string
- type: integer
SpecificProblem:
  oneOf:
    - type: string
    - type: integer
PerceivedSeverity:
  type: string
  enum:
    - INDETERMINATE
    - CRITICAL
    - MAJOR
    - MINOR
    - WARNING
    - CLEARED
TrendIndication:
  type: string
  enum:
    - MORE_SEVERE
    - NO_CHANGE
    - LESS_SEVERE
ThresholdHysteresis:
  type: object
  required:
    - high
  properties:
    high:
      oneOf:
        - type: integer
        - $ref: 'comDefs.yaml#/components/schemas/Float'
    low:
      $ref: 'comDefs.yaml#/components/schemas/Float'
ThresholdLevelInd:
  type: object
  required:
    - up
  properties:
    up:
      $ref: '#/components/schemas/ThresholdHysteresis'
    low:
      $ref: '#/components/schemas/ThresholdHysteresis'
ThresholdInfo:
  type: object
  required:
    - observedMeasurement
    - observedValue
  properties:
    observedMeasurement:
      type: string
    observedValue:
      oneOf:
        - type: integer
        - $ref: 'comDefs.yaml#/components/schemas/Float'
    thresholdLevelInd:
      $ref: '#/components/schemas/ThresholdLevelInd'
    armTime:
      $ref: 'comDefs.yaml#/components/schemas/DateTime'
CorrelatedNotification:
  type: object
  required:
    - source
    - notificationId
  properties:
    sourceObjectInstance:
      $ref: 'comDefs.yaml#/components/schemas/Dn'
    notificationIds:
      type: array
      items:
        $ref: 'comDefs.yaml#/components/schemas/NotificationId'
CorrelatedNotifications:
  type: array
  items:
    $ref: '#/components/schemas/CorrelatedNotification'
AckState:
  type: string
  enum:
    - ACKNOWLEDGED
    - UNACKNOWLEDGED
```

```

AlarmRecord:
  description: >-
    The alarmId is not a property of an alarm record. It is used as key
    in the map of alarm records instead.
  type: object
  properties:
    # alarmId:
    # $ref: '#/components/schemas/AlarmId'
    objectInstance:
      $ref: 'comDefs.yaml#/components/schemas/Dn'
    notificationId:
      $ref: 'comDefs.yaml#/components/schemas/NotificationId'
    alarmRaisedTime:
      $ref: 'comDefs.yaml#/components/schemas/DateTime'
    alarmChangedTime:
      $ref: 'comDefs.yaml#/components/schemas/DateTime'
    alarmClearedTime:
      $ref: 'comDefs.yaml#/components/schemas/DateTime'
    alarmType:
      $ref: '#/components/schemas/AlarmType'
    probableCause:
      $ref: '#/components/schemas/ProbableCause'
    specificProblem:
      $ref: '#/components/schemas/SpecificProblem'
    perceivedSeverity:
      $ref: '#/components/schemas/PerceivedSeverity'
    backedUpStatus:
      type: boolean
    backUpObject:
      $ref: 'comDefs.yaml#/components/schemas/Dn'
    trendIndication:
      $ref: '#/components/schemas/TrendIndication'
    thresholdInfo:
      $ref: '#/components/schemas/ThresholdInfo'
    correlatedNotifications:
      $ref: '#/components/schemas/CorrelatedNotifications'
    stateChangeDefinition:
      $ref: 'comDefs.yaml#/components/schemas/AttributeValueChangeSet'
    monitoredAttributes:
      $ref: 'comDefs.yaml#/components/schemas/AttributeNameValuePairSet'
    proposedRepairActions:
      type: string
    additionalText:
      type: string
    additionalInformation:
      $ref: 'comDefs.yaml#/components/schemas/AttributeNameValuePairSet'

    rootCauseIndicator:
      type: boolean

    ackTime:
      $ref: 'comDefs.yaml#/components/schemas/DateTime'
    ackUserId:
      type: string
    ackSystemId:
      type: string
    ackState:
      $ref: '#/components/schemas/AckState'

    clearUserId:
      type: string
    clearSystemId:
      type: string
    serviceUser:
      type: string
    serviceProvider:
      type: string
    securityAlarmDetector:
      type: string

```

#---- Definition of alarm notifications -----#

```

AlarmNotificationType:
  type: string
  enum:
    - notifyNewAlarm
    - notifyChangedAlarm

```

```
- notifyChangedAlarmGeneral
- notifyAckStateChanged
- notifyCorrelatedNotificationChanged
- notifyComments
- notifyClearedAlarm
- notifyAlarmListRebuiltAlarm
- notifyPotentialFaultyAlarmList
AlarmListAlignmentRequirement:
  type: string
  enum:
    - ALIGNMENT_REQUIRED
    - ALIGNMENT_NOT_REQUIRED

NotifyNewAlarm:
  allOf:
    - $ref: 'comDefs.yaml#/components/schemas/NotificationHeader'
    - type: object
      required:
        - alarmId
        - alarmType
        - probableCause
        - perceivedSeverity
      properties:
        alarmId:
          $ref: '#/components/schemas/AlarmId'
        alarmType:
          $ref: '#/components/schemas/AlarmType'
        probableCause:
          $ref: '#/components/schemas/ProbableCause'
        specificProblem:
          $ref: '#/components/schemas/SpecificProblem'
        perceivedSeverity:
          $ref: '#/components/schemas/PerceivedSeverity'
        backedUpStatus:
          type: boolean
        backUpObject:
          $ref: 'comDefs.yaml#/components/schemas/Dn'
        trendIndication:
          $ref: '#/components/schemas/TrendIndication'
        thresholdInfo:
          $ref: '#/components/schemas/ThresholdInfo'
        correlatedNotifications:
          $ref: '#/components/schemas/CorrelatedNotifications'
        stateChangeDefinition:
          $ref: 'comDefs.yaml#/components/schemas/AttributeValueChangeSet'
        monitoredAttributes:
          $ref: 'comDefs.yaml#/components/schemas/AttributeNameValuePairSet'
        proposedRepairActions:
          type: string
        additionalText:
          type: string
        additionalInformation:
          $ref: 'comDefs.yaml#/components/schemas/AttributeNameValuePairSet'
        rootCauseIndicator:
          type: boolean

NotifyNewSecAlarm:
  allOf:
    - $ref: 'comDefs.yaml#/components/schemas/NotificationHeader'
    - type: object
      required:
        - alarmId
        - alarmType
        - probableCause
        - perceivedSeverity
        - serviceUser
        - serviceProvider
        - securityAlarmDetector
      properties:
        alarmId:
          $ref: '#/components/schemas/AlarmId'
        alarmType:
          $ref: '#/components/schemas/AlarmType'
        probableCause:
          $ref: '#/components/schemas/ProbableCause'
        perceivedSeverity:
          $ref: '#/components/schemas/PerceivedSeverity'
        correlatedNotifications:
          $ref: '#/components/schemas/CorrelatedNotifications'
```

```

    additionalText:
      type: string
    additionalInformation:
      $ref: 'comDefs.yaml#/components/schemas/AttributeNameValuePairSet'
    rootCauseIndicator:
      type: boolean
    serviceUser:
      type: string
    serviceProvider:
      type: string
    securityAlarmDetector:
      type: string
NotifyClearedAlarm:
  allOf:
    - $ref: 'comDefs.yaml#/components/schemas/NotificationHeader'
    - type: object
      required:
        - alarmId
        - alarmType
        - probableCause
        - perceivedSeverity
      properties:
        alarmId:
          $ref: '#/components/schemas/AlarmId'
        alarmType:
          $ref: '#/components/schemas/AlarmType'
        probableCause:
          $ref: '#/components/schemas/ProbableCause'
        perceivedSeverity:
          $ref: '#/components/schemas/PerceivedSeverity'
        correlatedNotifications:
          $ref: '#/components/schemas/CorrelatedNotifications'
        clearUserId:
          type: string
        clearSystemId:
          type: string
NotifyChangedAlarm:
  allOf:
    - $ref: 'comDefs.yaml#/components/schemas/NotificationHeader'
    - type: object
      required:
        - alarmId
        - alarmType
        - probableCause
        - perceivedSeverity
      properties:
        alarmId:
          $ref: '#/components/schemas/AlarmId'
        alarmType:
          $ref: '#/components/schemas/AlarmType'
        probableCause:
          $ref: '#/components/schemas/ProbableCause'
        perceivedSeverity:
          $ref: '#/components/schemas/PerceivedSeverity'
NotifyChangedAlarmGeneral:
  allOf:
    - $ref: 'comDefs.yaml#/components/schemas/NotificationHeader'
    - type: object
      required:
        - alarmId
        - alarmType
        - probableCause
        - perceivedSeverity
        - changedAlarmAttributes
      properties:
        alarmId:
          $ref: '#/components/schemas/AlarmId'
        alarmType:
          $ref: '#/components/schemas/AlarmType'
        probableCause:
          $ref: '#/components/schemas/ProbableCause'
        specificProblem:
          $ref: '#/components/schemas/SpecificProblem'
        perceivedSeverity:
          $ref: '#/components/schemas/PerceivedSeverity'
        correlatedNotifications:
          $ref: '#/components/schemas/CorrelatedNotifications'
        backedUpStatus:

```

```
    type: boolean
  backUpObject:
    $ref: 'comDefs.yaml#/components/schemas/Dn'
  trendIndication:
    $ref: '#/components/schemas/TrendIndication'
  thresholdInfo:
    $ref: '#/components/schemas/ThresholdInfo'
  stateChangeDefinition:
    $ref: 'comDefs.yaml#/components/schemas/AttributeValueChangeSet'
  monitoredAttributes:
    $ref: 'comDefs.yaml#/components/schemas/AttributeNameValuePairSet'
  proposedRepairActions:
    type: string
  additionalText:
    type: string
  additionalInformation:
    $ref: 'comDefs.yaml#/components/schemas/AttributeNameValuePairSet'
  rootCauseIndicator:
    type: boolean
  changedAlarmAttributes:
    $ref: 'comDefs.yaml#/components/schemas/AttributeNameValuePairSet'
NotifyChangedSecAlarmGeneral:
  allOf:
  - $ref: 'comDefs.yaml#/components/schemas/NotificationHeader'
  - type: object
    required:
    - alarmId
    - alarmType
    - probableCause
    - perceivedSeverity
    - serviceUser
    - serviceProvider
    - securityAlarmDetector
    - changedAlarmAttributes
  properties:
    alarmId:
      $ref: '#/components/schemas/AlarmId'
    alarmType:
      $ref: '#/components/schemas/AlarmType'
    probableCause:
      $ref: '#/components/schemas/ProbableCause'
    perceivedSeverity:
      $ref: '#/components/schemas/PerceivedSeverity'
    correlatedNotifications:
      $ref: '#/components/schemas/CorrelatedNotifications'
    additionalText:
      type: string
    additionalInformation:
      $ref: 'comDefs.yaml#/components/schemas/AttributeNameValuePairSet'
    rootCauseIndicator:
      type: boolean
    serviceUser:
      type: string
    serviceProvider:
      type: string
    securityAlarmDetector:
      type: string
    changedAlarmAttributes:
      $ref: 'comDefs.yaml#/components/schemas/AttributeNameValuePairSet'
NotifyCorrelatedNotificationChanged:
  allOf:
  - $ref: 'comDefs.yaml#/components/schemas/NotificationHeader'
  - type: object
    required:
    - alarmId
    - correlatedNotifications
  properties:
    alarmId:
      $ref: '#/components/schemas/AlarmId'
    correlatedNotifications:
      $ref: '#/components/schemas/CorrelatedNotifications'
    rootCauseIndicator:
      type: boolean
NotifyAckStateChanged:
  allOf:
  - $ref: 'comDefs.yaml#/components/schemas/NotificationHeader'
  - type: object
    required:
```

```

    - alarmId
    - alarmType
    - probableCause
    - perceivedSeverity
    - ackState
    - ackUserId
  properties:
    alarmId:
      $ref: '#/components/schemas/AlarmId'
    alarmType:
      $ref: '#/components/schemas/AlarmType'
    probableCause:
      $ref: '#/components/schemas/ProbableCause'
    perceivedSeverity:
      $ref: '#/components/schemas/PerceivedSeverity'
    ackState:
      $ref: '#/components/schemas/AckState'
    ackUserId:
      type: string
    ackSystemId:
      type: string
  NotifyComments:
    allOf:
      - $ref: 'comDefs.yaml#/components/schemas/NotificationHeader'
      - type: object
      required:
        - alarmId
        - alarmType
        - probableCause
        - perceivedSeverity
        - comments
      properties:
        alarmId:
          $ref: '#/components/schemas/AlarmId'
        alarmType:
          $ref: '#/components/schemas/AlarmType'
        probableCause:
          $ref: '#/components/schemas/ProbableCause'
        perceivedSeverity:
          $ref: '#/components/schemas/PerceivedSeverity'
        comments:
          $ref: '#/components/schemas/Comments'
  NotifyPotentialFaultyAlarmList:
    allOf:
      - $ref: 'comDefs.yaml#/components/schemas/NotificationHeader'
      - type: object
      required:
        - reason
      properties:
        reason:
          type: string
  NotifyAlarmListRebuilt:
    allOf:
      - $ref: 'comDefs.yaml#/components/schemas/NotificationHeader'
      - type: object
      required:
        - reason
      properties:
        reason:
          type: string
        alarmListAlignmentRequirement:
          $ref: '#/components/schemas/AlarmListAlignmentRequirement'

#---- Definition of query parameters -----#

AlarmAckState:
  type: string
  enum:
    - ALL_ALARMS
    - ALL_ACTIVE_ALARMS
    - ALL_ACTIVE_AND_ACKNOWLEDGED_ALARMS
    - ALL_ACTIVE_AND_UNACKNOWLEDGED_ALARMS
    - ALL_CLEARED_AND_UNACKNOWLEDGED_ALARMS
    - ALL_UNACKNOWLEDGED_ALARMS

#---- Definition of patch documents -----#

MergePatchAcknowledgeAlarm:

```



```
description: >-
  Patch document acknowledging or unacknowledging a single alarm. For
  acknowledging an alarm the value of ackState is ACKNOWLEDGED, for unacknowledging
  an alarm the value of ackState is UNACKNOWLEDGED.
type: object
required:
  - ackUserId
  - ackState
properties:
  ackUserId:
    type: string
  ackSystemId:
    type: string
  ackState:
    $ref: '#/components/schemas/AckState'
MergePatchClearAlarm:
description: Patch document for clearing a single alarm
type: object
required:
  - clearUserId
  - perceivedSeverity
properties:
  clearUserId:
    type: string
  clearSystemId:
    type: string
  perceivedSeverity:
    type: string
    enum:
      - CLEARED

#---- Definition of method responses -----#

FailedAlarm:
type: object
required:
  - alarmId
  - failureReason
properties:
  alarmId:
    $ref: '#/components/schemas/AlarmId'
  failureReason:
    type: string

#---- Definition of resources -----#

AlarmCount:
type: object
required:
  - criticalCount
  - majorCount
  - minorCount
  - warningCount
  - indeterminateCount
  - clearedCount
properties:
  criticalCount:
    type: integer
  majorCount:
    type: integer
  minorCount:
    type: integer
  warningCount:
    type: integer
  indeterminateCount:
    type: integer
  clearedCount:
    type: integer
Comment:
type: object
properties:
  commentTime:
    $ref: 'comDefs.yaml#/components/schemas/DateTime'
  commentUserId:
    type: string
  commentSystemId:
    type: string
  commentText:
```

```

    type: string
Comments:
  description: >-
    Collection of comments. The comment identifiers are allocated by the
    MnS producer and used as key in the map.
  type: object
  additionalProperties:
    $ref: '#/components/schemas/Comment'
Subscription:
  type: object
  properties:
    consumerReference:
      $ref: 'comDefs.yaml#/components/schemas/Uri'
    timeTick:
      $ref: 'comDefs.yaml#/components/schemas/Long'
    filter:
      $ref: 'comDefs.yaml#/components/schemas/Filter'

```

## A.2.2 JSON schema of 'fault3gppFields' for integration with ONAP VES

```

{
  "fault3gppFields": {
    "description": "fields specific to 3GPP fault supervision notifications for integration with
ONAP VES",
    "type": "object",
    "properties": {
      "fault3gppFieldsVersion": {
        "description": "version of the fault3gppFields block",
        "type": "string",
        "enum": ["16.x"]
      },
      "faultSupervisionNotifications": {
        "oneOf": [
          { "$ref": "#/definitions/notifyNewAlarm-NotifType" },
          { "$ref": "#/definitions/notifyNewSecurityAlarm-NotifType" },
          { "$ref": "#/definitions/notifyAckStateChanged-NotifType" },
          { "$ref": "#/definitions/notifyClearedAlarm-NotifType" },
          { "$ref": "#/definitions/notifyAlarmListRebuilt-NotifType" },
          { "$ref": "#/definitions/notifyChangedAlarm-NotifType" },
          { "$ref": "#/definitions/notifyComments-NotifType" },
          { "$ref": "#/definitions/notifyPotentialFaultyAlarmList-NotifType" },
          { "$ref": "#/definitions/notifyCorrelatedNotificationChanged-NotifType" },
          { "$ref": "#/definitions/notifyChangedAlarmGeneral-NotifType" }
        ]
      }
    }
  },
  "definitions": {
    "notifyNewAlarm-NotifType": {
      "description": "fields specific to 3GPP notification NotifyNewAlarm",
      "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"
            },
            "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": {
      "$ref": "#/components/schemas/rootCauseIndicator-Type"
    }
  }
},
{
  "notifyNewSecurityAlarm-NotifType": {
    "description": "fields specific to 3GPP notification NotifyNewSecurityAlarm",
    "type": "object",
    "properties": {
      "header": {
        "$ref": "#/components/schemas/header-Type"
      },
      "body": {
        "type": "object",
        "properties": {
          "alarmId": {
            "$ref": "#/components/schemas/alarmId-Type"
          },
          "alarmType": {
            "$ref": "#/components/schemas/alarmType-Type"
          },
          "probableCause": {
            "$ref": "#/components/schemas/probableCause-Type"
          },
          "specificProblem": {
            "$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": {
        "$ref": "#/components/schemas/securityAlarmDetector-Type"
    }
}
}],
{
    "notifyAckStateChanged-NotifType": {
        "description": "fields specific to 3GPP notification NotifyAckStateChanged",
        "type": "object",
        "properties": {
            "header": {
                "$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": {
                        "$ref": "#/components/schemas/ackSystemId-Type"
                    }
                }
            }
        }
    },
    "notifyClearedAlarm-NotifType": {
        "description": "fields specific to 3GPP notification NotifyClearedAlarm",
        "type": "object",
        "properties": {
            "header": {
                "$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"
    },
    "correlatedNotifications": {
      "type": "array",
      "items": {
        "$ref": "#/components/schemas/correlatedNotification-Type"
      }
    },
    "clearUserId": {
      "$ref": "#/components/schemas/clearUserId-Type"
    },
    "clearSystemId": {
      "$ref": "#/components/schemas/clearSystemId-Type"
    }
  }
},
"notifyAlarmListRebuilt-NotifType": {
  "description": "fields specific to 3GPP notification NotifyAlarmListRebuilt",
  "type": "object",
  "properties": {
    "header": {
      "$ref": "#/components/schemas/header-Type"
    },
    "body": {
      "type": "object",
      "properties": {
        "probableCause": {
          "$ref": "#/components/schemas/probableCause-Type"
        },
        "reason": {
          "$ref": "#/components/schemas/reason-Type"
        },
        "alarmListAlignmentRequirement": {
          "$ref": "#/components/schemas/alarmListAlignmentRequirement-Type"
        }
      }
    }
  }
},
"notifyChangedAlarm-NotifType": {
  "description": "fields specific to 3GPP notification NotifyChangedAlarm",
  "type": "object",
  "properties": {
    "header": {
      "$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"
        }
      }
    }
  }
},
"notifyComments-NotifType": {
  "description": "fields specific to 3GPP notification NotifyComments",
  "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"
        },
        "comments": {
          "type": "array",
          "items": {
            "$ref": "#/components/schemas/comment-ResourceType"
          }
        }
      }
    }
  },
  "notifyPotentialFaultyAlarmList-NotifType": {
    "description": "fields specific to 3GPP notification NotifyPotentialFaultyAlarmList",
    "type": "object",
    "properties": {
      "header": {
        "$ref": "#/components/schemas/header-Type"
      },
      "body": {
        "type": "object",
        "properties": {
          "reason": {
            "$ref": "#/components/schemas/reason-Type"
          }
        }
      }
    }
  },
  "notifyCorrelatedNotificationChanged-NotifType": {
    "description": "fields specific to 3GPP notification notifyCorrelatedNotificationChanged",
    "type": "object",
    "properties": {
      "header": {
        "$ref": "#/components/schemas/header-Type"
      },
      "body": {
        "type": "object",
        "properties": {
          "rootCauseIndicator": {
            "$ref": "#/components/schemas/rootCauseIndicator-Type"
          },
          "correlatedNotifications": {
            "type": "array",
            "items": {
              "$ref": "#/components/schemas/correlatedNotification-Type"
            }
          },
          "alarmId": {
            "$ref": "#/components/schemas/alarmId-Type"
          }
        }
      }
    }
  },
  "notifyChangedAlarmGeneral-NotifType": {
    "description": "fields specific to 3GPP notification notifyChangedAlarmGeneral",
    "type": "object",
    "properties": {
      "header": {
        "$ref": "#/components/schemas/header-Type"
      },
      "body": {
        "type": "object",

```

```

    "properties": {
      "alarmType": {
        "$ref": "#/components/schemas/alarmType-Type"
      },
      "alarmId": {
        "$ref": "#/components/schemas/alarmId-Type"
      },
      "probableCause": {
        "$ref": "#/components/schemas/probableCause-Type"
      },
      "perceivedSeverity": {
        "$ref": "#/components/schemas/perceivedSeverity-Type"
      },
      "rootCauseIndicator": {
        "$ref": "#/components/schemas/rootCauseIndicator-Type"
      },
      "specificProblem": {
        "$ref": "#/components/schemas/specificProblem-Type"
      },
      "correlatedNotifications": {
        "type": "array",
        "items": {
          "$ref": "#/components/schemas/correlatedNotification-Type"
        }
      },
      "backedUpStatus": {
        "$ref": "#/components/schemas/backedUpStatus-Type"
      },
      "trendIndication": {
        "$ref": "#/components/schemas/trendIndication-Type"
      },
      "thresholdInfo": {
        "$ref": "#/components/schemas/thresholdInfo-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": {
          "$ref": "#/components/schemas/attributeNameValuePair-Type"
        }
      },
      "changedAlarmAttributes": {
        "type": "array",
        "items": {
          "$ref": "#/components/schemas/attributeNameValuePair-Type"
        }
      },
      "backUpObject": {
        "$ref": "#/components/schemas/backUpObject-Type"
      }
    }
  },
  "header-Type": {
    "description": "Header used in notifications as notification header",
    "type": "object",
    "properties": {
      "uri": {
        "$ref": "#/components/schemas/uri-Type"
      }
    }
  },

```

```
"notificationId": {
  "$ref": "#/components/schemas/notificationId-Type"
},
"notificationType": {
  "$ref": "#/components/schemas/notificationType-Type"
},
"eventTime": {
  "$ref": "#/components/schemas/dateTime-Type"
}
},
"probableCause-Type": {
  "type": "string"
},
"perceivedSeverity-Type": {
  "type": "string",
  "enum": [
    "Critical",
    "Major",
    "Minor",
    "Warning",
    "Indeterminate",
    "Cleared"
  ]
},
"alarmType-Type": {
  "type": "string",
  "enum": [
    "Communications Alarm",
    "Processing Error Alarm",
    "Environmental Alarm",
    "Quality Of Service Alarm",
    "Equipment Alarm",
    "Integrity Violation",
    "Operational Violation",
    "Physical Violation",
    "Security Service or Mechanism Violation",
    "Time Domain Violation"
  ]
},
"correlatedNotification-Type": {
  "type": "object",
  "properties": {
    "source": {
      "$ref": "#/definitions/uri-Type"
    },
    "notificationIds": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/notificationId-Type"
      }
    }
  }
},
"ackState-Type": {
  "type": "string",
  "enum": [
    "acknowledged",
    "unacknowledged"
  ]
},
"ackUserId-Type": {
  "type": "string"
},
"ackSystemId-Type": {
  "type": "string"
},
"alarmId-Type": {
  "type": "string"
},
"specificProblem-Type": {
  "type": "string"
},
"rootCauseIndicator-Type": {
  "type": "boolean"
},
"backedUpStatus-Type": {
  "type": "boolean"
}
```



```
,
"backUpObject-Type": {
  "$ref": "#/definitions/uri-Type"
},
"trendIndication-Type": {
  "type": "string",
  "enum": [
    "More severe",
    "No change",
    "Less severe"
  ]
},
"thresholdInfo-Type": {
  "type": "object",
  "properties": {
    "attributeName": {
      "type": "string"
    },
    "observedValue": {
      "$ref": "#/definitions/float-Type"
    },
    "thresholdLevel": {
      "$ref": "#/definitions/thresholdLevel-Type"
    },
    "armTime": {
      "$ref": "#/definitions/dateTime-Type"
    }
  }
},
"thresholdLevel-Type": {
  "type": "object",
  "properties": {
    "indication": {
      "$ref": "#/definitions/indication-Type"
    },
    "low": {
      "$ref": "#/definitions/float-Type"
    },
    "high": {
      "$ref": "#/definitions/float-Type"
    }
  }
},
"dateTime-Type": {
  "type": "string",
  "format": "date-time"
},
"float-Type": {
  "type": "string",
  "format": "float"
},
"indication-Type": {
  "type": "string",
  "enum": [
    "Up",
    "Down"
  ]
},
"attributeValueChange-Type": {
  "type": "object",
  "properties": {
    "attributeName": {
      "type": "string"
    },
    "oldAttributeValue": {},
    "newAttributeValue": {}
  }
},
"attributeNameValuePair-Type": {
  "type": "object",
  "properties": {
    "attributeName": {
      "type": "string"
    },
    "attributeValue": {}
  }
},
"proposedRepairActions-Type": {
```

```

        "type": "string"
    },
    "additionalText-Type": {
        "type": "string"
    },
    "serviceProvider-Type": {
        "type": "string"
    },
    "serviceUser-Type": {
        "type": "string"
    },
    "securityAlarmDetector-Type": {
        "type": "string"
    },
    "clearSystemId-Type": {
        "type": "string"
    },
    "clearUserId-Type": {
        "type": "string"
    },
    "reason-Type": {
        "type": "string"
    },
    "comments-Type": {
        "type": "string"
    },
    "dN-Type": {
        "type": "string"
    },
    "systemDN-Type": {
        "type": "string"
    },
    "notificationType-Type": {
        "type": "string",
        "enum": [
            "notifyNewAlarm",
            "notifyNewSecurityAlarm",
            "notifyAckStateChanged",
            "notifyClearedAlarm",
            "notifyAlarmListRebuilt",
            "notifyChangedAlarm",
            "notifyComments",
            "notifyPotentialFaultyAlarmList",
            "notifyCorrelatedNotificationChanged",
            "notifyChangedAlarmGeneral"
        ]
    }
}
}
}
}

```

---

## A.3 Void

---

## A.4 Generic performance assurance management service

### A.4.1 Void

### A.4.2 Performance threshold monitoring service

openapi: 3.0.1  
info:

```
title: TS 28.532 Performance Threshold Monitoring Service
version: 16.4.0
description: OAS 3.0.1 specification of the Performance Threshold Monitoring Service
servers:
- url: 'http://{monitoringNotifTarget}'
  variables:
    monitoringNotifTarget:
      description: >-
        The open API server of the performance threshold monitoring service is
        located in the consumer side, see monitoringNotifTarget attribute of
        the IOC ThresholdMonitor defined in 3GPP TS 28.622 [11].
      default: example.com
paths:
  /notificationSink:
    post:
      summary: Send notifications about performance threshold crossing
      description: To send a notifyThresholdCrossing notification
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/notifyThresholdCrossing-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'
components:
  schemas:
    dateTime-Type:
      type: string
      format: date-time
    uri-Type:
      type: string
    long-Type:
      type: string
      format: long
    thresholdLevel-Type:
      type: integer
    measurementTypeName-Type:
      type: string
    measurementValue-Type:
      type: string
    additionalText-Type:
      type: string
    error-ResponseType:
      type: object
      properties:
        error:
          type: object
          properties:
            errorInfo:
              type: string
    header-Type:
      description: Header used in notifications as notification header
      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'
    notificationId-Type:
      $ref: '#/components/schemas/long-Type'
    notificationType-Type:
      type: string
      enum:
        - notifyThresholdCrossing
```

```

notifyThresholdCrossing-NotifType:
  type: object
  properties:
    header:
      $ref: '#/components/schemas/header-Type'
    body:
      type: object
      properties:
        startOfMonitoringGP:
          $ref: '#/components/schemas/dateTime-Type'
        endOfMonitoringGP:
          $ref: '#/components/schemas/dateTime-Type'
        monitoredObjectInstance:
          $ref: '#/components/schemas/uri-Type'
        thresholdLevel:
          $ref: '#/components/schemas/thresholdLevel-Type'
        measurementTypeName:
          $ref: '#/components/schemas/measurementTypeName-Type'
        measurementValue:
          $ref: '#/components/schemas/measurementValue-Type'
        additionalText:
          $ref: '#/components/schemas/additionalText-Type'

```

## A.5 Heartbeat

### A.5.0 Introduction

Clause A.5.1 contains the OpenAPI definition of the heartbeat management capability.

Clause A.5.2 contains the JSON schema for the content of the heartbeat management capability notifications when the consumer of these notifications supports the ONAP VES API. This content is sent as payload of VES events (see Annex B).

The content of the heartbeat notifications in both clauses A.5.1 and A.5.2 is the same.

### A.5.1 Document "heartbeatNtf.yaml"

```

openapi: 3.0.1
info:
  title: Heartbeat notification
  version: 16.3.0
  description: >-
    OAS 3.0.1 specification of the heartbeat notification
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 28.532 V16.3.0; Heartbeat notification
  url: http://www.3gpp.org/ftp/Specs/archive/28_series/28.6532/
paths: {}
components:
  schemas:
    heartbeatNtfPeriod-Type:
      type: integer
    notifyHeartbeat-NotifType:
      allOf:
        - $ref: 'provMnS.yaml#/components/schemas/header-Type'
        - type: object
          properties:
            heartbeatNtfPeriod:
              $ref: '#/components/schemas/heartbeatNtfPeriod-Type'

```

### A.5.2 Heartbeat for integration with ONAP VES

NOTE: Void.

```

{
  "heartbeat3gppFields": {
    "description": "fields specific to 3GPP heartbeat notifications for integration with ONAP VES",
    "type": "object",

```

```

    "properties": {
      "heartbeatFieldsVersion": {
        "description": "version of the heartbeat3gppFields block",
        "type": "string",
        "enum": ["16.x"]
      },
      "heartbeatNotifications": {
        "oneOf": [
          { "$ref": "#/definitions/notifyHeartbeat-NotifType" }
        ]
      }
    },
    "definitions": {
      "notifyHeartbeat-NotifType": {
        "description": "fields specific to 3GPP notification NotifyHeartbeat",
        "type": "object",
        "properties": {
          "header": {
            "$ref": "#/components/schemas/header-Type"
          },
          "body": {
            "type": "object",
            "properties": {
              "systemDN": {
                "$ref": "#/components/schemas/systemDN-Type"
              },
              "heartbeatPeriod": {
                "$ref": "#/definitions/heartbeatPeriod-Type"
              },
              "additionalProperties": false,
              "required": [ "heartbeatPeriod" ]
            },
            "dN-Type": {
              "type": "string"
            },
            "systemDN-Type": {
              "type": "string"
            },
            "triggerFlag-Type": {
              "type": "string",
              "enum": [
                "MnSConsumer",
                "HBMnSProvider"
              ]
            },
            "hBMnSConsumerRef-Type": {
              "type": "string"
            }
          }
        }
      },
      "header-Type": {
        "description": "Header used in notifications as notification header",
        "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"
          }
        }
      },
      "uri-Type": {
        "type": "string"
      },
      "notificationId-Type": {
        "$ref": "#/components/schemas/long-Type"
      },
      "notificationType-Type": {
        "type": "string",

```

```

    "enum": [
      "notifyHeartbeat"
    ],
  },
  "long-Type": {
    "type": "string",
    "format": "long"
  },
  "dateTime-Type": {
    "type": "string",
    "format": "date-time"
  }
}
}
}

```

## A.6 Streaming data reporting management service

### A.6.1 Introduction

Clause A.6.2 contains the OpenAPI specification of the Streaming data reporting MnS.

### A.6.2 OpenAPI document "streamingDataMnS.yaml"

```

openapi: 3.0.1
info:
  title: TS 28.532 Streaming data reporting service
  version: 16.5.0
  description: OAS 3.0.1 specification for the Streaming data reporting service (Streaming MnS)
servers:
  - url: '{MnSRoot}/StreamingDataReportingMnS/{version}'
    variables:
      MnSRoot:
        description: See subclause 4.4 of TS 32.158.
        default: https://example.com/3GPPManagement
      version:
        description: Indicates the current version of the specification
        default: 16.5.0
paths:
  '/connections':
    post:
      summary: Inform consumer about reporting streams to be carried by the new connection and
        receive a new connection id.
      description: Exchange of meta-data (producer informs consumer about its own identity and the
        nature of the data to be reported via streaming) phase of the connection establishment by streaming
        data reporting producer to the streaming data reporting consumer (i.e. streaming target).
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/connectionRequest-Type'
      responses:
        '201':
          description: Success case (201 Created).
          headers:
            Location:
              description: Location of the created connection resource.
              schema:
                $ref: '#/components/schemas/connectionId-Type'
          default:
            description: Error case.
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/failedConnectionResponse-Type'
    get:
      summary: Obtain information about connections.
      description: Enables the streaming data reporting service producer to obtain information about
        one or more streaming connections.

```

```

parameters:
  - name: connectionIdList
    in: query
    description: The list of connectionId for which the connection information is to be
returned.
    required: false
    schema:
      type: array
      items:
        $ref: '#/components/schemas/connectionId-Type'
responses:
  '200':
    description: Success case (200 OK). The resources identified in the request for retrieval
are returned in the response message body. In case the fields query parameter is used, the selected
resources are returned.
    content:
      application/json:
        schema:
          type: array
          items:
            $ref: '#/components/schemas/connectionInfo-Type'
  '202':
    description: Partial success case (202 Partially retrieved). Subset of the resources
identified in the request for retrieval are returned in the response message body.
    content:
      application/json:
        schema:
          type: array
          items:
            $ref: '#/components/schemas/connectionInfo-Type'
  default:
    description: Error case.
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/errorResponse-Type'
'/connections/{connectionId}':
  get:
    summary: Obtain information about a connection.
    description: Enables the streaming data reporting service producer to obtain information about
one streaming connection.
    parameters:
      - name: connectionId
        in: path
        description: Indicate the ID (URI) of the connection for which the information is being
retrieved
        required: true
        schema:
          $ref: '#/components/schemas/connectionId-Type'
      - name: Connection
        in: header
        schema:
          $ref: '#/components/schemas/websocketHeaderConnection-Type'
      - name: Sec-WebSocket-Extensions
        in: header
        schema:
          $ref: '#/components/schemas/websocketHeader-Sec-WebSocket-Extensions-Type'
      - name: Sec-WebSocket-Key
        in: header
        schema:
          $ref: '#/components/schemas/websocketHeader-Sec-WebSocket-Key-Type'
      - name: Sec-WebSocket-Protocol
        in: header
        schema:
          $ref: '#/components/schemas/websocketHeader-Sec-WebSocket-Protocol-Type'
      - name: Sec-WebSocket-Version
        in: header
        schema:
          $ref: '#/components/schemas/websocketHeader-Sec-WebSocket-Version-Type'
    responses:
      '101':
        description: Success case (101 Switching Protocols). The connection has been successfully
switched to WebSocket. The response message body is absent.
        headers:
          Upgrade:
            schema:
              $ref: '#/components/schemas/websocketHeaderUpgrade-Type'
          Connection:

```

```

        schema:
          $ref: '#/components/schemas/websocketHeaderConnection-Type'
      Sec-WebSocket-Accept:
        schema:
          $ref: '#/components/schemas/websocketHeader-Sec-WebSocket-Accept-Type'
    '200':
      description: Success case (200 OK). The resource identified in the request for retrieval
returned in the response message body.
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/connectionInfo-Type'
    default:
      description: Error case.
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/errorResponse-Type'
  '/connections/{connectionId}/streams':
    post:
      summary: Inform consumer about new reporting streams on an existing connection.
      description: Allows the producer to add one or more reporting streams to an already
established streaming connection.
      parameters:
        - name: connectionId
          in: path
          description: Indicate the ID (URI) of the connection for which the reporting stream
information is being added.
          required: true
          schema:
            $ref: '#/components/schemas/connectionId-Type'
      requestBody:
        required: true
        content:
          application/json:
            schema:
              type: array
              items:
                $ref: '#/components/schemas/streamInfo-Type'
      responses:
        '201':
          description: Success case (201 Posted).
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/streamInfo-Type'
        '202':
          description: Partial success case (202 Posted).
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/streamInfo-Type'
    default:
      description: Error case.
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/errorResponse-Type'
  delete:
      summary: Remove reporting streams from an existing connection
      description: Allows the producer to remove one or more reporting streams from an already
established streaming connection.
      parameters:
        - name: connectionId
          in: path
          description: Indicate the ID (URI) of the connection for which the reporting stream
information is being removed.
          required: true
          schema:
            $ref: '#/components/schemas/connectionId-Type'
        - name: streamIds
          in: query
          description: The list of streamId for the stream(s) to be deleted.
          required: true

```



```

    schema:
      type: array
      items:
        $ref: '#/components/schemas/streamId-Type'
  responses:
    '204':
      description: Success case (204 No Content). The stream information resource has been
deleted. The response message body is absent.
    default:
      description: Error case.
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/errorResponse-Type'
  get:
    summary: Obtain information about streams.
    description: Enables the streaming data reporting service producer to obtain information about
one or more reporting streams.
    parameters:
      - name: connectionId
        in: path
        description: Indicate the ID (URI) of the connection for which the information is being
retrieved
        required: true
        schema:
          $ref: '#/components/schemas/connectionId-Type'
      - name: streamIds
        in: query
        description: The list of streamId for which the stream information is to be retrieved.
        required: true
        schema:
          type: array
          items:
            $ref: '#/components/schemas/streamId-Type'
    responses:
      '200':
        description: Success case (200 OK).
        content:
          application/json:
            schema:
              type: array
              items:
                $ref: '#/components/schemas/streamInfoWithReporters-Type'
      '202':
        description: Partial success case (202 Partially retrieved).
        content:
          application/json:
            schema:
              type: array
              items:
                $ref: '#/components/schemas/streamInfoWithReporters-Type'
    default:
      description: Error case.
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/errorResponse-Type'
'/connections/{connectionId}/streams/{streamId}':
  get:
    summary: Obtain information about stream
    description: Enables the streaming data reporting service producer to obtain information about
a reporting stream.
    parameters:
      - name: connectionId
        in: path
        description: Indicate the ID (URI) of the connection for which the information is being
retrieved
        required: true
        schema:
          $ref: '#/components/schemas/connectionId-Type'
      - name: streamId
        in: path
        description: Indicate the ID of the reporting stream for which the information is being
retrieved
        required: true
        schema:
          $ref: '#/components/schemas/streamId-Type'
    responses:

```

```

    '200':
      description: Success case (200 OK).
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/streamInfoWithReporters-Type'
      default:
        description: Error case.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/errorResponse-Type'
components:
  schemas:
    analyticsInfo-Type:
      description: Information specific to analytics reporting.
      type: object
      properties:
        activityDetails:
          type: string
    connectionId-Type:
      $ref: '#/components/schemas/uri-Type'
    connectionInfo-Type:
      type: object
      properties:
        connection:
          $ref: '#/components/schemas/connectionId-Type'
        producer:
          $ref: '#/components/schemas/producerId-Type'
        streams:
          type: array
          items:
            $ref: '#/components/schemas/streamId-Type'
    connectionRequest-Type:
      type: object
      properties:
        producer:
          $ref: '#/components/schemas/producerId-Type'
        streams:
          type: array
          items:
            $ref: '#/components/schemas/streamInfo-Type'
    errorResponse-Type:
      type: object
      properties:
        error:
          type: object
          properties:
            errorInfo:
              type: string
    failedConnectionResponse-Type:
      type: object
      properties:
        error:
          type: array
          items:
            type: object
            properties:
              streamId:
                $ref: '#/components/schemas/streamId-Type'
              errorReason:
                type: string
    measObjDn-Type:
      description: DN of the measured object instance (see 3GPP TS 28.550)
      allOf:
        - $ref: '#/components/schemas/systemDN-Type'
    measTypes-Type:
      description: an ordered list of measurement type or KPI whose measurement values or KPI result
values are to be reported by the Performance Data Stream Units (see Annex C of TS 28.550) via this
stream
      type: array
      items:
        type: string
    performanceInfo-Type:
      description: Information specific to performance data reporting
      type: object
      properties:
        measObjDn:

```

```

    $ref: '#/components/schemas/measObjDn-Type'
  measTypes:
    $ref: '#/components/schemas/measTypes-Type'
  measurementReaderId:
    $ref: '#/components/schemas/systemDN-Type'
  jobId:
    type: string
  required:
    - measObjDn
    - measTypes
  producerId-Type:
    description: DN of the streaming data reporting MnS producer.
    allOf:
      - $ref: '#/components/schemas/systemDN-Type'
  serializationFormat-Type:
    type: string
    enum:
      - GPB
      - ASN1
  streamId-Type:
    description: globally unique stream identifier
    type: string
    example: '26F452550021'
  streamInfo-Type:
    description: Reporting stream meta-data.
    type: object
    properties:
      streamType:
        $ref: '#/components/schemas/streamType-Type'
      serializationFormat:
        $ref: '#/components/schemas/serializationFormat-Type'
      streamId:
        oneOf:
          - $ref: '#/components/schemas/streamId-Type'
          - $ref: '#/components/schemas/traceReference-Type'
      additionalInfo:
        oneOf:
          - $ref: '#/components/schemas/traceInfo-Type'
          - $ref: '#/components/schemas/performanceInfo-Type'
          - $ref: '#/components/schemas/analyticsInfo-Type'
          - $ref: '#/components/schemas/vsDataContainer-Type'
    required:
      - streamType
      - serializationFormat
      - streamId
  streamInfoWithReporters-Type:
    description: Reporting stream meta-data with added information about reporters.
    type: object
    properties:
      streamInfo:
        $ref: '#/components/schemas/streamInfo-Type'
      reporters:
        type: array
        items:
          $ref: '#/components/schemas/producerId-Type'
  systemDN-Type:
    description: See 3GPP TS 32.300 for details
    type: string
    example: 'SubNetwork=ABCNetwork,SubNetwork=MUC01,GNBDUFunction=XYZ0100'
  streamType-Type:
    type: string
    enum:
      - TRACE
      - PERFORMANCE
      - ANALYTICS
      - PROPRIETARY
  traceInfo-Type:
    description: Information specific to trace data reporting
    allOf:
      - $ref: 'genericNrm.yaml#/components/schemas/TraceJob-Attr'
  traceReference-Type:
    description: Trace Reference (see clause 5.6 of 3GPP TS 32.422) as stream identifier for
streaming trace data reporting
    type: string
    example: '4358070034D7'
  uri-Type:
    description: Resource URI
    type: string

```

```

vsDataContainer-Type:
  description: container for vendor specific data (see 3GPP TS 28.622)
  type: object
  properties:
    vsDataType:
      type: string
    vsData:
      type: string
    vsDataFormatVersion:
      type: string
websocketHeaderConnection-Type:
  description: Header value for the upgrade request and response.
  type: string
  enum:
    - Upgrade
websocketHeaderUpgrade-Type:
  description: Header value for the upgrade to WebSocket request and response.
  type: string
  enum:
    - websocket
websocketHeader-Sec-WebSocket-Accept-Type:
  description: Header value for secure WebSocket response. Carries hash.
  type: string
websocketHeader-Sec-WebSocket-Extensions-Type:
  description: Header value for secure WebSocket request. Carries protocol extensions.
  type: string
websocketHeader-Sec-WebSocket-Key-Type:
  description: Header value for secure WebSocket request. Provides information to the server
which is needed in order to confirm that the client is entitled to request an upgrade to WebSocket.
  type: string
websocketHeader-Sec-WebSocket-Protocol-Type:
  description: Header value for secure WebSocket request. Carries a comma-separated list of
subprotocol names, in the order of preference.
  type: string
websocketHeader-Sec-WebSocket-Version-Type:
  description: Header value for secure WebSocket request and response. Carries the WebSocket
protocol version to be used.
  type: string

```

---

## A.7 File data reporting management service

### A.7.1 Introduction

Clause A.7.2 contains the OpenAPI specification of the File data reporting MnS.

### A.7.2 OpenAPI document "FileDataReportingMnS.yaml"

```

openapi: 3.0.1
info:
  title: TS 28.532 File data reporting Service
  version: 16.5.0
  description: >-
    OAS 3.0.1 specification of the File data reporting Management Service © 2020,
    3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC). All
    rights reserved.
externalDocs:
  description: 3GPP TS 28.532 V16.5.0; Generic management services
  url: 'http://www.3gpp.org/ftp/Specs/archive/28_series/28.532/'
servers:
  - url: '{MnSRoot}/FileDataReportingMnS/{MnSversion}'
    variables:
      MnSRoot:
        description: See subclause 4.4 of TS 32.158
        default: http://example.com/3GPPManagement
      version:
        description: Indicates the current version of the specification
        default: 16.5.0
paths:
  /Files:
    get:

```

```

summary: Read resources of information of available files
description: With HTTP GET, resources of information of available files are read. The
resources to be read are identified with the path component (base resource) and the query component
(managementDataType, beginTime and endTime) of the URI. The fields query component allows to select
the resource properties to be returned.
parameters:
  - name: managementDataType
    in: query
    description: This parameter identifies the type of management data that the file contains
to select the resources from the collection resources identified with the path component of the URI.
    required: true
    schema:
      $ref: '#/components/schemas/managementDataType-Type'
  - name: beginTime
    in: query
    description: This parameter identifies the time stamp no later than which the file became
available to select the resources from the collection resources identified with the path component
of the URI.
    required: true
    schema:
      $ref: '#/components/schemas/dateTime-Type'
  - name: endTime
    in: query
    description: This parameter identifies the time stamp no earlier than which the file
became available to select the resources from the collection resources identified with the path
component of the URI.
    required: true
    schema:
      $ref: '#/components/schemas/dateTime-Type'
responses:
  '200':
    description: 'Success case ("200 OK"). The resources identified in the request for
retrieval are returned in the response message body. In case the fields query parameter is used, the
selected resources are returned.'
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/fileInfoRetrieval-ResponseType'
    default:
      description: Error case.
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/error-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:
  notifyFileReady:
    '{request.body#/consumerReference}':
      post:
        requestBody:
          required: true
          content:
            application/json:
              schema:

```

```

        $ref: '#/components/schemas/notifyFileReady-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'
      notifyFilePreparationError:
        '{request.body#/consumerReference}':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/notifyFilePreparationError-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'

      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:
    dateTime-Type:

```

```
    type: string
    format: date-Time
  uri-Type:
    type: string
  long-Type:
    type: string
    format: long
  additionalText-Type:
    type: string
  reason-Type:
    type: string
  fileInfoRetrieval-ResponseType:
    type: object
    properties:
      data:
        type: array
        items:
          $ref: '#/components/schemas/fileInfo-Type'
  fileInfo-Type:
    type: object
    properties:
      fileLocation:
        $ref: '#/components/schemas/uri-Type'
      fileSize:
        $ref: '#/components/schemas/long-Type'
      fileReadyTime:
        $ref: '#/components/schemas/dateTime-Type'
      fileExpirationTime:
        $ref: '#/components/schemas/dateTime-Type'
      fileCompression:
        type: string
      fileFormat:
        type: string
  error-ResponseType:
    type: object
    properties:
      error:
        type: object
        properties:
          errorInfo:
            type: string
  managementDataType-Type:
    type: string
    enum:
      - PERFORMANCE
      - TRACE
      - ANALYTICS
      - PROPRIETARY
  header-Type:
    description: Header used in notifications as notification header
    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'
  subscriptionId-PathType:
    type: string
  filter-Type:
    type: string
  notificationId-Type:
    $ref: '#/components/schemas/long-Type'
  notificationType-Type:
    type: string
    enum:
      - notifyFileReady
      - notifyFilePreparationError
  subscription-ResourceType:
    type: object
    properties:
      consumerReference:
        $ref: '#/components/schemas/uri-Type'
      timeTick:
        $ref: '#/components/schemas/long-Type'
```

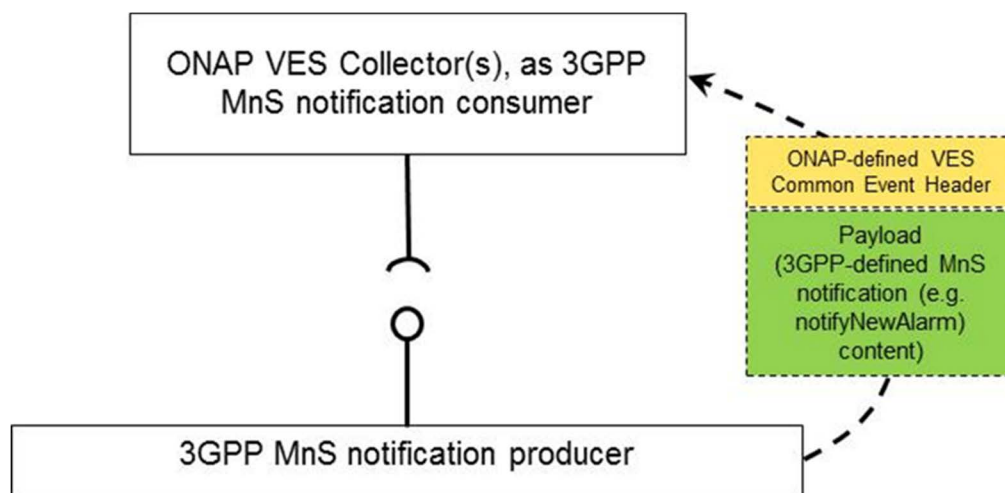
```
    filter:
      $ref: '#/components/schemas/filter-Type'
subscription-RequestType:
  type: object
  properties:
    data:
      $ref: '#/components/schemas/subscription-ResourceType'
subscription-ResponseType:
  type: object
  properties:
    data:
      $ref: '#/components/schemas/subscription-ResourceType'
consumerReferenceId-QueryType:
  $ref: '#/components/schemas/uri-Type'
notifyFileReady-NotifType:
  type: object
  properties:
    header:
      $ref: '#/components/schemas/header-Type'
    body:
      type: object
      properties:
        fileInfoList:
          type: array
          items:
            $ref: '#/components/schemas/fileInfo-Type'
        additionalText:
          $ref: '#/components/schemas/additionalText-Type'
notifyFilePreparationError-NotifType:
  type: object
  properties:
    header:
      $ref: '#/components/schemas/header-Type'
    body:
      type: object
      properties:
        fileInfoList:
          type: array
          items:
            $ref: '#/components/schemas/fileInfo-Type'
        reason:
          $ref: '#/components/schemas/reason-Type'
        additionalText:
          $ref: '#/components/schemas/additionalText-Type'
```



## Annex B (Informative): Guidelines for the integration of 3GPP MnS notifications with ONAP VES

In case the consumer of the 3GPP MnS notifications specified in the present document is an ONAP VES collector, the following guidelines are for the developer of the corresponding 3GPP MnS notification producer:

- The produced notification conforms to ONAP-defined VES specification;
- The VES Common Event Header fields are populated by the producer as follows:
  - The domain "stdDefined" is used,
  - The "stdDefinedNamespace" field value is the concatenation of "3GPP-" and the name of the 3GPP MnS which the 3GPP IS notification is part of. Based on the MnS names defined in the present version of this document, VES name space values corresponding to 3GPP MnS could be:
    - "3GPP-Provisioning",
    - "3GPP-FaultSupervision",
    - "3GPP-PerformanceAssurance",
    - "3GPP-Heartbeat",
    - "3GPP-Streaming".
  - How the other fields of the Common Event Header are populated is not in the scope of the present document;
- The payload part of the VES event specification conforms to definitions of clause A.1.2 (for provisioning MnS notifications), A.2.2 (for the fault supervision MnS notifications) and A.5.2 (for the heartbeat notifications) of the present document.



**Figure X-1. 3GPP MnS notifications consumed by ONAP VES Collector(s).**

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## Annex C (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2018-09	SA#81					Upgrade to change control version	15.0.0
2018-09	SA#81					EditHelp editorial fix	15.0.1
2018-12	SA#82	SP-181042	0002	1	F	Correction of references	15.1.0
2018-12	SA#82	SP-181042	0003	1	F	Align with 3GPP draft rules of the usage of must	15.1.0
2018-12	SA#82	SP-181042	0004	1	F	Correction of the numbering and title of figures and tables	15.1.0
2018-12	SA#82	SP-181042	0005	1	F	Remove unnecessary Editor's Note and figure	15.1.0
2018-12	SA#82	SP-181045	0006	1	F	Update Resource URI of alarmCount	15.1.0
2018-12	SA#82	SP-181045	0009	1	F	Change the name of IRPAgent and IRPManager	15.1.0
2018-12	SA#82	SP-181045	0010	1	F	Remove unnecessary import table and state diagram	15.1.0
2018-12	SA#82	SP-181045	0012	-	F	Correct the subscription resource related errors	15.1.0
2018-12	SA#82	SP-181043	0018	-	F	Add notifyNewSecurityAlarm to notification type	15.1.0
2018-12	SA#82	SP-181045	0020	1	F	Change alarmIRP to FaultSupervision MnS producer	15.1.0
2018-12	SA#82	SP-181042	0021	1	F	Add stage 2 definition for provisioning management service related notifications	15.1.0
2018-12	SA#82	SP-181042	0022	1	F	Correct stage 3 description of the Provisioning Management Service	15.1.0
2018-12	SA#82	SP-181045	0025	-	F	Correct erroneous reference to notification header	15.1.0
2019-03	SA#83	SP-190120	0029	1	F	Correction of references	15.2.0
2019-06	SA#84	SP-190372	0031	2	B	Add RESTful HTTP-based solution set of fault supervision for integration with ONAP VES	16.0.0
2019-06	SA#84	SP-190371	0038	1	B	Add performance threshold crossing notification	16.0.0
2019-09	SA#85	SP-190742	0038 A			Global reorganization, correcting operation names, notification parameter and wrong references	16.1.0
2019-12	SA#86	SP-191178	0055	1	B	RESTful CM notifications for integration with ONAP VES	16.2.0
2019-12	SA#86	SP-191219	0059	1	A	Corrections to provisioning MnS notification definitions (Stage 2)	16.2.0
2019-12	SA#86	SP-191219	0061	2	A	Correct fault supervision management service	16.2.0
2019-12	SA#86	SP-191159	0069	2	C	Make scoping and filtering optional in the ProvMnS	16.2.0
2019-12	SA#86	SP-191159	0071	2	F	Correct and update the RESTful HTTP-based solution set of provisioning	16.2.0
2019-12	SA#86	SP-191178	0073	2	B	Introduce Heartbeat	16.2.0
2019-12	SA#86	SP-191173	0075	1	A	Correct event time defn	16.2.0
2019-12	SA#86	SP-191166	0076	1	B	Add notifyEvent	16.2.0
2019-12	SA#86	SP-191159	0081	1	F	Correct schema to reflect location in the specifications	16.2.0
2019-12	SA#86	SP-191159	0082	-	F	Correct XML Schema for consistency and clarity	16.2.0
2020-03	SA#87E	SP-200174	0089	-	A	Add missing definition for matching-criteria-attributes	16.3.0
2020-03	SA#87E	SP-200166	0092	1	F	Clarify capability of ack alarms and filter constraint	16.3.0
2020-03	SA#87E	SP-200176	0094	1	F	Correction of MnS Stage 3 solution sets for integration with ONAP VES	16.3.0
2020-03	SA#87E	SP-200166	0096	-	F	Rapporteur clean up	16.3.0
2020-03	SA#87E	SP-200169	0098	1	B	YANG_Netconf Operations	16.3.0
2020-03	SA#87E	SP-200166	0101	1	F	Clarify and add numerous issues in the REST SS of the ProvMnS	16.3.0
2020-03	SA#87E	SP-200166	0103	2	F	Correct OpenAPI definition of the ProvMnS	16.3.0
2020-03	SA#87E	SP-200174	0104	-	A	Correct ackState attribute name	16.3.0
2020-03	SA#87E	SP-200169	0105	-	F	Correct Heartbeat	16.3.0
2020-06	SA#88-e	SP-200484	0100	2	B	Add summary CM notification to the ProvMnS	16.4.0
2020-06	SA#88-e	SP-200484	0102	1	F	Remove subscribe and unsubscribe operation from ProvMnS	16.4.0
2020-06	SA#88-e	SP-200484	0107	1	F	Void meaningless clauses 12.1.2.2.1.2 and 12.2.2.2.1.2	16.4.0
2020-06	SA#88-e	SP-200484	0111	-	F	Add missing callbacks for notifications to ProvMnS	16.4.0
2020-06	SA#88-e	SP-200484	0113	-	F	Remove attribute referenceObjectInstance which is not supported by solution set	16.4.0
2020-06	SA#88-e	SP-200485	0114	2	F	Update URI for generic fault supervision management service	16.4.0
2020-06	SA#88-e	SP-200485	0115	2	F	Update URI for performance data file reporting management service	16.4.0
2020-06	SA#88-e	SP-200484	0116	-	F	Remove data object from response types in the ProvMnS	16.4.0
2020-06	SA#88-e	SP-200483	0117	3	B	Add streaming trace data reporting service stage 2 definition	16.4.0
2020-06	SA#88-e	SP-200483	0118	2	B	Add streaming data reporting service stage 3 mapping of operations	16.4.0

2020-06	SA#88-e	SP-200483	0119	2	B	Add streaming data reporting service stage 3 resources	16.4.0
2020-06	SA#88-e	SP-200483	0120	2	B	Add streaming data reporting service stage 3 data types	16.4.0
2020-06	SA#88-e	SP-200483	0121	2	B	Add streaming data reporting service stage 3 OpenAPI definition	16.4.0
2020-06	SA#88-e	SP-200499	0123	-	A	Move XML file format from stage2 to stage3	16.4.0
2020-06	SA#88-e	SP-200485	0126	1	C	Update Fault Supervision MnS (stage 2)	16.4.0
2020-06	SA#88-e	SP-200485	0127	1	C	Update Fault Supervision MnS (REST SS)	16.4.0
2020-06	SA#88-e	SP-200485	0128	1	C	Update Fault Supervision MnS (OpenAPI definitions)	16.4.0
2020-06	SA#88-e	SP-200500	0133	-	F	Correction of ONAP references	16.4.0
2020-06	SA#88-e	SP-200611	0134	1	F	Convert JSON schema to YAML file for performance threshold monitoring service	16.4.0
2020-09	SA#89e	SP-200738	0135	-	F	Change stage2 definition for performance data file report MnS to generic file data report MnS	16.5.0
2020-09	SA#89e	SP-200738	0136	-	F	Change RESTFUL definition for performance data file report MnS to generic file data report MnS	16.5.0
2020-09	SA#89e	SP-200724	0137	-	F	Change openAPI definition for performance data file report MnS to generic file data report MnS	16.5.0
2020-09	SA#89e	SP-200737	0138	1	F	Clarification on Annex A.1, A.2 and A.5	16.5.0
2020-09	SA#89e	SP-200723	0139	-	F	Update URI for streamingDataReportingMnS to align with URI structure defined in 32.158	16.5.0
2020-09	SA#89e	SP-200736	0141	1	A	Correct the description for generic provisioning MnS	16.5.0
2020-09	SA#89e	SP-200724	0143	-	F	Correct various smaller errors (e.g. validation errors) in faultMnS.yaml (OpenAPI definitions)	16.5.0
2020-09	SA#89e	SP-200724	0144	-	F	Correct definition of ThresholdLevelInd (REST SS)	16.5.0
2020-09	SA#89e	SP-200737	0147	-	F	Remove unintended normative statement from informative clause	16.5.0
2020-09	SA#89e					Correction of clause numbering	16.5.1
2020-11						Cleanup of custom XML, watermarks, hidden text, etc.. no technical changes	16.5.2

# History

Document history		
V16.4.0	August 2020	Publication
V16.5.1	October 2020	Publication (withdrawn)
V16.5.2	November 2020	Publication