**3GPP TSG- Meeting # *rev004***

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **28.622** | **CR** | **0066** | **rev** | **-** | **Current version:** | **16.2.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **x** | Core Network | **x** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Add configurable FM. | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson Limited | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | eNRM | | | | |  | ***Date:*** | | | 2020-02-12 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The Configurable FM, i.e. using CRUD operation to implement the FM MnS support is missing. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add Configurable FM NRM fragment. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The Configurable FM support is missing. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 4.1, 6.2.1, 4.2.2, 4.3.x (new), 4.3.y (new), 4.3.z (new), 4.3.z1 (new), 4.4.1, 4.5. | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

***First Change***

# 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 TS 32.101: "Telecommunication management; Principles and high level requirements".

[2] 3GPP TS 32.102: "Telecommunication management; Architecture".

[3] 3GPP TS 32.302: "Telecommunication management; Configuration Management (CM); Notification Integration Reference Point (IRP): Information Service (IS)".

[4] 3GPP TS 32.150: "Telecommunication management; Integration Reference Point (IRP) Concept and Definitions".

[5] 3GPP TS 23.003: "Technical Specification Group Core Network and Terminals; Numbering, addressing and identification"

[6] 3GPP TS 32.532: " Telecommunication management; Software Management Integration Reference Point (IRP); Information Service (IS) "

[7] ITU-T Recommendation X.710 (1991): "Common Management Information Service Definition for CCITT Applications".

[8] TS 32.107: "Telecommunication management; Fixed Mobile Convergence (FMC) Federated Network Information Model (FNIM)"

[9] TS 28.620: "Telecommunication management; Fixed Mobile Convergence (FMC) Federated Network Information Model (FNIM) Umbrella Information Model (UIM)"

[10] TS 32.156: "Telecommunication management; Fixed Mobile Convergence (FMC) Model Repertoire"

[11] 3GPP TS 32.111-2: "Telecommunication management; Fault Management; Part 2: Alarm Integration Reference Point (IRP): Information Service (IS)".

[12] 3GPP TS 32.662: "Telecommunication management; Configuration Management (CM); Kernel CM Information Service (IS)".

[13] 3GPP TS 32.300: "Telecommunication management; Configuration Management (CM); Name convention for Managed Objects".

[14] 3GPP TS 32.600: "Telecommunication management; Configuration Management (CM); Concept and high-level requirements".

[15] ETSI GS NFV 003 V1.1.1: "Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV".

[16] ETSI GS NFV-IFA 008 v2.1.1: "Network Functions Virtualisation (NFV); Management and Orchestration; Ve-Vnfm reference point - Interface and Information Model Specification".

[17] ETSI GS NFV-IFA 015 v2.1.2: "Network Functions Virtualisation (NFV); Management and Orchestration; Report on NFV Information Model".

[18] ETSI ES 202 336-12 V1.1.1: "Environmental Engineering (EE); Monitoring and control interface for infrastructure equipment (power, cooling and building environment systems used in telecommunication networks); Part 12: ICT equipment power, energy and environmental parameters monitoring information model".

[19] ITU-T Recommendation X.731: "Information technology - Open Systems Interconnection - Systems Management: State management function".

[20] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

[21] 3GPP TS 28.625: "State Management Data Definition Integration Reference Point (IRP); Information Service (IS) ".

[22] 3GPP TS 23.501: "System Architecture for the 5G System".

[23] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[24] IETF RFC 791: "Internet Protocol".

[25] IETF RFC 2373: "IP Version 6 Addressing Architecture".

[26] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[x] 3GPP TS 28.532: "Management and orchestration; Generic management services".

***Next Change***

## 4.1 Imported information entities and local labels

|  |  |
| --- | --- |
| Label reference | Local label |
| 3GPP TS 32.111-2 [11], notification, notifyAckStateChanged | notifyAckStateChanged |
| 3GPP TS 32.662 [12], notification, notifyAttributeValueChanged | notifyAttributeValueChanged |
| 3GPP TS 32.111-2 [11], notification, notifyChangedAlarm | notifyChangedAlarm |
| 3GPP TS 32.111-2 [11], notification, notifyClearedAlarm | notifyClearedAlarm |
| 3GPP TS 32.111-2 [11], notification, notifyComments | notifyComments |
| 3GPP TS 32.111-2 [11], notification, notifyNewAlarm | notifyNewAlarm |
| 3GPP TS 32.662 [12], notification, notifyObjectCreation | notifyObjectCreation |
| 3GPP TS 32.662 [12], notification, notifyObjectDeletion | notifyObjectDeletion |
| 3GPP TS 32.111-2 [11], notification, notifyAlarmListRebuilt | notifyAlarmListRebuilt |
| 3GPP TS 32.111-2 [11], notification, notifyPotentialFaultyAlarmList | notifyPotentialFaultyAlarmList |
| 3GPP TS 32.532 [6], notification, notifyDownloadNESwStatusChanged | notifyDownloadNESwStatusChanged |
| 3GPP TS 32.532 [6], notification, notifyInstallNESwStatusChanged | notifyInstallNESwStatusChanged |
| 3GPP TS 32.532 [6], notification, notifyActivateNESwStatusChanged | notifyActivateNESwStatusChanged |
| 3GPP TS 28.620 [9], IOC, *Domain\_* | *Domain\_* |
| 3GPP TS 28.620 [9], IOC, *ManagedElement\_* | *ManagedElement\_* |
| 3GPP TS 28.620 [9], IOC, *Function\_* | *Function\_* |
| 3GPP TS 28.620 [9], IOC, *ManagementSystem\_* | *ManagementSystem\_* |
| 3GPP TS 28.620 [9], IOC, *TopologicalLink\_* | *TopologicalLink\_* |
| 3GPP TS 28.620 [9], IOC, *Top\_* | *Top\_* |
| 3GPP TS 28.532 [x], SupportIOC, AlarmInformation | AlarmInformation |

***Next Change***

## 6.2 Class diagram

### 6.2.1 Relationships

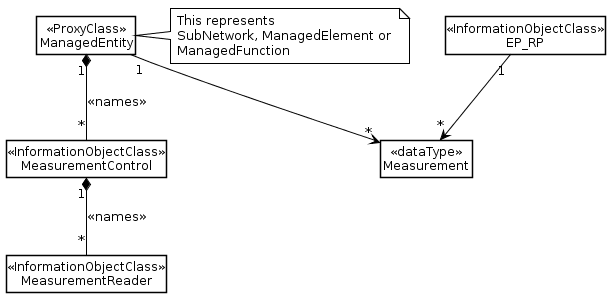


Figure 4.2.1-3: PM control NRM fragment

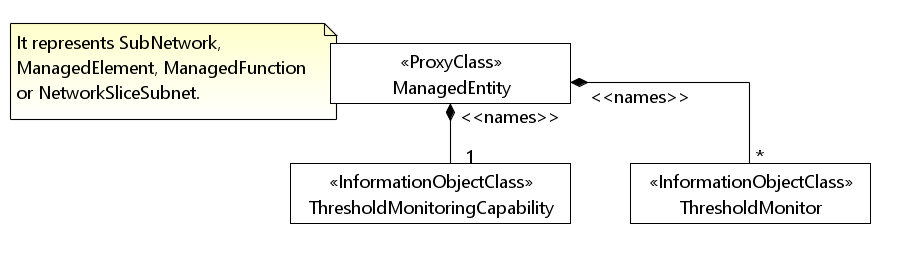


Figure 4.2.1-4: Measurement threshold monitoring NRM fragment

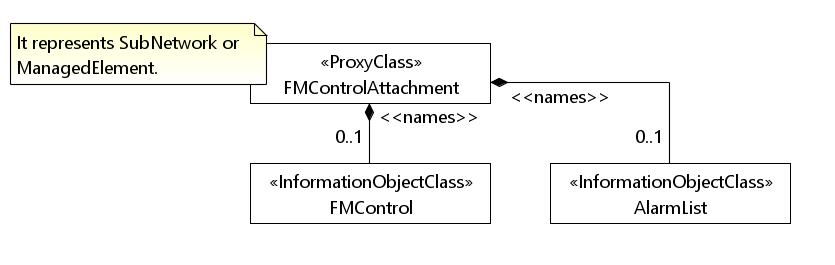


Figure 4.2.1-5: FM control NRM fragment

***Next Change***

### 4.2.2 Inheritance

This clause depicts the inheritance relationships.

The following figure shows the inheritance diagram.



Figure 4.2.2-1: Inheritance Hierarchy NRM fragment

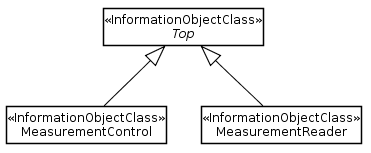


Figure 4.2.2-2: Inheritance PM control NRM fragment

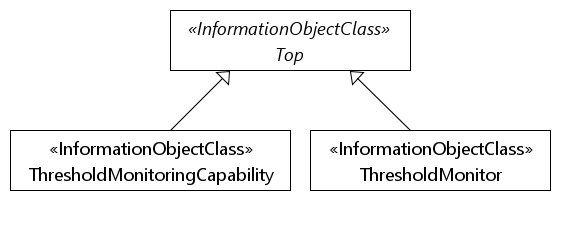


Figure 4.2.2-3: Measurement threshold monitoring NRM fragment

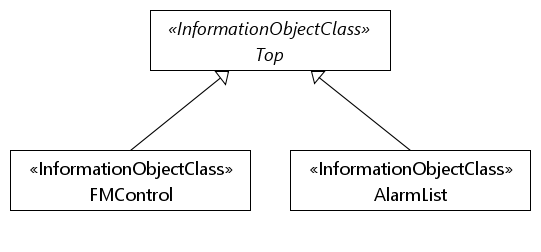


Figure 4.2.2-4: FM control NRM fragment

***Next Change***

### 4.3.23 Scope <<dataType>>

#### 4.3.23.1 Definition

The scope attribute has the data type Scope. 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.

#### 4.3.23.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute Name | Support Qualifier | isReadable | isWritable | isInvariant | isNotifyable |
| scopeType | M | T | T | F | F |
| scopeLevel | O | T | T | F | F |

#### 4.3.23.3 Attribute constraints

None.

#### 4.3.23.4 Notifications

The subclause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

### 4.3.x FMControlAttachment <<ProxyClass>>

#### 4.3.x.1 Definition

This represents an <<IOC>>SubNetwork or <<IOC>>ManagedElement.

#### 4.3.x.2 Attributes

See that defined in <<IOC>>SubNetwork or <<IOC>>ManagedElement.

#### 4.3.x.3 Attribute constraints

See that defined in <<IOC>>SubNetwork or <<IOC>>ManagedElement.

#### 4.3.x.4 Notifications

See respective IOCs.

### 4.3.y FMControl

#### 4.3.y.1 Definition

This IOC represents a capability to manage alarm records and alarm notifications. The alarm records and notifications managed are related to managed entities of the naming-tree whose top instance is one name-containing this FMControl.

The MnS producer, upon detection of an abnormal behaviour of its managed entities, would create or update an alarm record of the AlarmList. Consumer who has a subscription with NtfSubscriptionControl MnS would receive alarm notifications specified in subclause 11.2.1.1 of [x].

#### 4.3.y.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute Name** | **Support Qualifier** | **isReadable** | **isWritable** | **isInvariant** | **isNotifyable** |
| administrativeState | M | T | T | F | T |
| operationalState | M | T | F | F | T |
|  |  |  |  |  |  |

#### 4.3.y.3 Attribute constraints

None.

#### 4.3.y.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions or additions.

### 4.3.z AlarmList

#### 4.3.z.1 Definition

This represents the list of alarm records. The alarm records are related to managed entities of the naming-tree whose top instance is one name-containing this AlarmList.

The producer would create this AlarmList instance.

Over time, the producer may produce, say *n* notifications, for a particular alarmed object instance. The number of records in the AlarmList may not be *n*.

AlarmList shall hold, for the same alarmed object instance, only one record if and only if, the notifications carry identical values for eventType, probableCause and specificProblem. See the Matching-Criteria-Attributes definition in [x].

#### 4.3.z.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute Name** | **Support Qualifier** | **isReadable** | **isWritable** | **isInvariant** | **isNotifyable** |
| numOfAlarmRecords | M | T | F | F | F |
| lastModification | M | T | F | F | F |
| alarmRecordList | M | T | T | F | T |

#### 4.3.z.3 Attribute constraints

None

#### 4.3.z.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions or additions.

### 4.3.z1 AlarmRecord <<dataType>>

#### 4.3.z1.1 Definition

AlarmRecord contains alarm information of an alarmed entity of a name-tree whose top is FMControlAttachment.

One MonitoredEntity2 has at most one AlarmList. The producer assigns an identifier, called alarmId, to each AlarmRecord in the AlarmList. An alarmId unambiguously identifies one alarm record in the AlarmList.

The producer maintains one AlarmList containing currently active alarms i.e.:

1. Alarm record(s) whose perceivedSeverity is not CLEARED and;
2. Alarm record(s) whose perceivedSeverity is CLEARED and its ackState is not ACKNOWLEDGED.

The producer may remove alarm records that are not active alarms.

#### 4.3.z1.2 Attributes

This set is based on those defined at clause Table 11.2.1.1.3.3-2 of TS 28.532 [x].

Table 4.3.z1.2: Sub-elements of the alarmInformationList

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Support Qualifier** | **isReadable** | **isWritable** | **isInvariant** | **isNotifyable** | | | | |
| alarmType | M | T | F | T | F | | | | |
| objectClass/objectInstance | M | T | F | F | F | | | | |
| alarmId | M | T | F | F | F | | | | |
| alarmRaisedTime | M | T | F | F | T (note 5) | | | | |
| alarmChangedTime | O | T | F | F | T (note 6) | | | | |
| alarmClearedTime | M | T | F | F | T (note 7) | | | | |
| probableCause | M | T | F | T | F | | | | |
| perceivedSeverity | M | T | T (note 4) | F | T (note 6) | | | | |
| rootCauseIndicator | O | T | F | F | T (Note 6) | | | | |
| specificProblem | O | T | F | T | F | | | | |
| backedUpStatus | O | T | F | F | F | | | | |
| trendIndication | O | T | F | F | F | | | | |
| thresholdInfo | O | T | F | F | F | | | | |
| stateChangeDefinition | O | T | F | F | F | | | | |
| monitoredAttributes | O | T | F | F | F | | | | |
| proposedRepairActions | O | T | F | F | F | | | | |
| additionalText | O | T | F | F | F | | | | |
| additionalInformation | O (see note 3) | T | F | F | F | | | | |
| ackTime | M | T | F | F | F | | | | |
| ackUserId | M | T | F | F | F | | | | |
| ackSystemId | O | T | F | F | F | | | | |
| ackState | M | T | T | F | F | | | | |
| clearUserId | O (see note 1) | T | F | F | F | | | | |
| clearSystemId | O (see note 1) | T | F | F | F | | | | |
| serviceUser | O (see note 2) | T | F | F | F | | | | |
| serviceProvider | O (see note 2) | T | F | F | F | | | | |
| securityAlarmDetector | O (see note 2) | T | F | F | F | | | | |
| NOTE 1: These attributes and qualifiers are applicable only if producer supports consumer to set perceivedSeverity to CLEARED.  NOTE 2: These attributes are supported if the producer emits notifyNewAlarm that carries security alarm information.  NOTE 3: This attribute is supported to carry vendor specific information.  NOTE 4: This isWritable property is True only if producer supports consumer to set perceivedSeverity to CLEARED  NOTE 5: Emit notifyNewAlarm.  NOTE 6: Emit notifyChangedAlarm  NOTE 7: Emit notifyClearedAlarm | | | | | |  |  |  |  |

#### 4.3.z1.3 Attribute constraints

None.

#### 4.3.z1.4 Notifications

See subclause 4.5.1.***Next Change***

### 4.4.1 Attribute properties

## 4.4 Attribute definitions

### 4.4.1 Attribute properties

The following table defines the properties of attributes specified in the present document.

| Attribute Name | | Documentation and Allowed Values | | Properties | |
| --- | --- | --- | --- | --- | --- |
| heartbeatNtfPeriod | | This attribute specifies the periodicity of heartbeat notification emission. The value of zero has the special meaning of stopping the heartbeat notification emission.  Unit is in minutes.  AllowedValues: non-negative integers | | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: 0  isNullable: False | |
| triggerHeartbeatNtf | | Setting this attribute to TRUE triggers an immediate additional heartbeat notification emission. Setting the value to FALSE has no observable result.  The periodicity of notifyHeartbeat emission is not changed.  AllowedValues: TRUE, FALSE | | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False | |
| notificationRecipientAddress | | This attribute defines the address of the notification recipient. | | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False | |
| notificationTypes | | This attribute defines the types of notifications that are candidates for being forwarding to the notification recipient  If the notificationFilter attribute is not supported all candidate notifications are forwarded to the notification recipient, otherwise the candidate notifications are discriminated by the filter specified by the notificationFilter attribute. | | type: string  multiplicity: 1..\*  isOrdered: N/A  isUnique: N/A  defaultValue: NOne  isNullable: False | |
| notificationFilter | | This attribute defines a filter to be applied to candidate notifications identified by the notificationTypes attribute. Only notifications that pass the filter criteria are forwarded to the notification recipient. All other notifications are discarded.  The filter can be applied to any field of a notification. | | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False | |
| scope | | This attribute defines the scope. It is a structured parameter with the data type Scope. | | type: Scope  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False | |
| scopeType | | If the optional scopeLevel parameter is not supported or absent, allowed values of scopeType are BASE\_ONLY and BASE\_ALL.  The value BASE\_ONLY indicates only the base object is selected.  The value BASE\_ALL indicates the base object and all of its subordinate objects (incl. the leaf objects) are selected.  If the scopeLevel parameter is supported and present, allowed values of scopeType are BASE\_ALL, BASE\_ONLY, BASE\_NTH\_LEVEL and BASE\_SUBTREE.  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.  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. | | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False | |
| scopeLevel | | See definition of scopeType parameter. | | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False | |
| farEndEntity | | The value of this attribute shall be the Distinguished Name of the far end network entity to which the reference point is related.  As an example, with EP\_Iucs, if the instance of EP\_Iucs is contained by one RncFunction instance, the farEndEntity is the Distinguished Name of the MscServerFunction instance to which this Iucs reference point is related.  allowedValues: N/A | | type: DN  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: No  isNullable: False | |
| linkType | | This attribute defines the type of the link.  allowedValues: Signalling, Bearer, OAM&P, Other or multiple combinations of this type. | | type: String  multiplicity: 0..\*  isOrdered: False  isUnique: True  defaultValue: No  isNullable: False | |
| locationName | | The physical location of this entity (e.g. an address).  allowedValues: N/A | | type: String  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: No  isNullable: False | |
| monitoringGP | | This attribute defines the monitoring granularity period (in seconds).  allowedValues: see NOTE 5 | | type: Integer  multiplicity: 1  isOrdered: False  isUnique: True  defaultValue: No  isNullable: False | |
| monitoredIOCName | | It specifies one object class name for which the threshold monitor is created. When this attribute take effective, the threshold monitor is created for all of its instances in the name-containment tree whose top (tree) node is the IOC instance name-containing the subject <<IOC>>ThresholdMonitor instance containing this attribute.  This attribute takes effective when the monitoredObjectDNs contained by the same <<IOC>>ThresholdMonitor instance is empty.    allowedValues: The IOC names defined in the NRMs specifications. | | type: String  multiplicity: 1  isOrdered: False  isUnique: True  defaultValue: No  isNullable: False | |
| monitoringNotifTarget | | This identifies the target of the notifications when the monitored measurement crosses or reaches the threshold set by the subject threshold monitor.  allowedValues: N/A | | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True | |
| monitoredObjectDNs | | It specifies the object instance(s) for threshold monitoring.  This attribute monitoredIOCName contained by the same <<IOC>>ThresholdMonitor instance does not take effective when this attribute is not empty.  allowedValues: list of DN | | type: dataType  multiplicity: 1  isOrdered: False  isUnique: True  defaultValue: No default value  isNullable: False | |
| objectClass | | An attribute which captures the name of the class from which the object instance is an occurrence of.  allowedValues: N/A | | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: No default value  isNullable: False | |
| objectInstance | | An information which captures the Distinguished Name of any object.  allowedValues: N/A | | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: No default value  isNullable: False | |
| peeParametersList | | This attribute contains the parameter list for the control and monitoring of power, energy and environmental parameters of ManagedFunction instance(s). This list contains the following parameters:  - siteIdentification  - siteLatitude (optional)  - siteLongitude (optional)  - siteDescription  - equipmentType  - environmentType  - powerInterface  siteIdentification: The identification of the site where the ManagedFunction resides.  allowedValues: N/A  siteLatitude: The latitude of the site where the ManagedFunction instance resides, based on World Geodetic System (1984 version) global reference frame (WGS 84). Positive values correspond to the northern hemisphere. This attribute is optional in case of BTSFunction and RNCFunction instance(s).  allowedValues: -90.0000 to +90.0000  siteLongitude: The longitude of the site where the ManagedFunction instance resides, based on World Geodetic System (1984 version) global reference frame (WGS 84). Positive values correspond to degrees east of 0 degrees longitude. This attribute is optional in case of BTSFunction and RNCFunction instance(s).  allowedValues: -180.0000 to +180.0000  siteDescription: An operator defined description of the site where the ManagedFunction instance resides.  allowedValues: N/A  equipmentType: The type of equipment where the managedFunction instance resides.  allowedValues: see clause 4.4.1 of ETSI ES 202 336-12 [18].  environmentType: The type of environment where the managedFunction instance resides.  allowedValues: see clause 4.4.1 of ETSI ES 202 336-12 [18].  powerInterface: The type of power.  allowedValues: see clause 4.4.1 of ETSI ES 202 336-12 [18]. | | type: String  multiplicity: 0..\*  isOrdered: N/A  isUnique: True  defaultValue: No default value  isNullable: True | |
| priorityLabel | This is a label that consumer would assign a value on a concrete instance of the managed object. The management system takes the value of this attribute into account. The effect of this attribute value to the subject managed entity is not standardized | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: No default value  isNullable: False | |
| protocolVersion | | Versions(s) and additional descriptive information for the protocol(s) used for the associated communication link. Syntax and semantic is not specified.  allowedValues: N/A | | type: String  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: no default value  isNullable: False | |
| setOfMcc | | Set of Mobile Country Code (MCC). The MCC uniquely identifies the country of domicile of the mobile subscriber. MCC is part of the IMSI (TS 23.003 [5])  This list contains all the MCC values in subordinate object instances to this SubNetwork instance.  allowedValues: See clause 2.3 of TS 23.003 [5] for MCC allocation principles. | | type: Integer  multiplicity: 1..\*  isOrdered: False  isUnique: True  defaultValue: No default value  isNullable: False | |
| swVersion | | The software version of the ManagementNode or ManagedElement (this is used for determining which version of the vendor specific information is valid for the ManagementNode or ManagedElement).  allowedValues: N/A | | type: String  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: No default value  isNullable: False | |
| systemDN | | The Distinguished Name (DN) of IRPAgent (or consumer). Defined in 3GPP TS 32.300.  allowedValues: N/A | | type: DN  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: No default value  isNullable: False | |
| supportedMonitoringGPs | | The monitoring granularity periods (in seconds) supported by the producer for the monitored entities.  AllowedValues: see NOTE 5. | | type: integer  multiplicity: 1..\*  isOrdered: N/A  isUnique: N/A  defaultValue: No default value  isNullable: False | |
| thresholdInfoList | | It specifies the list of threshold information.  It is list of  <  measurementType,  direction,  thresholdPack  >,  where thresholdPack is list of  <  thresholdLevel,  thresholdValue,  hysteresis (optional)  >  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.  The direction can be 'Increasing' or ‘Decreasing' of the measurement values.  - If it is "Increasing", the threshold crossing notification is triggered when the measurement value equals or exceeds a thresholdValue.  - If it is "Decreasing", the threshold crossing notification is triggered when the measurement value equals or below a thresholdValue.  The thresholdLevel indicates the level for the threshold. See NOTE 6 for the supported threshold levels.  The hysteresis has a threshold‑high and a threshold‑low value that are different from the threshold value.  A hysteresis, therefore, defines the threshold-high and threshold-low levels within which the measurementType value is allowed to oscillate without triggering the threshold crossing notification.  AllowedValues: N/A | | type: dataType  multiplicity: 1s..\*  isOrdered: N/A  isUnique: N/A  defaultValue: No default value  isNullable: False | |
| userDefinedState | | An operator defined state for operator specific usage.  allowedValues: N/A | | type: String  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: No default value  isNullable: False | |
| userLabel | | A user-friendly (and user assignable) name of this object.  allowedValues: N/A | | type: String  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: No default value  isNullable: False | |
| vendorName | | The name of the vendor.  allowedValues: N/A | | type: String  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False | |
| vnfParametersList | | This attribute contains the parameter set of the VNF instance(s) corresponding to an NE. Each entry in the list contains:  - vnfInstanceId  - vnfdId (optional)  - flavourId (optional)  - autoScalable  vnfInstanceId: VNF instance identifier (vnfInstanceId, see section 9.4.2 of [16] and section B2.4.2.1.2.3 of [17]).  See Note 1.  vnfdId: Identifier of the VNFD on which the VNF instance is based, see section 9.4.2 of [16]. This attribute is optional.  Note: the value of this attribute is identical to that of the same attribute in clause 9.4.2 of ETSI GS NFV-IFA 008 [16].  flavourId: Identifier of the VNF Deployment Flavour applied to this VNF instance, see section 9.4.3 of [16]. This attribute is optional.  Note: the value of this attribute is identical to that of the same attribute in clause 9.4.3 of ETSI GS NFV-IFA 008 [16].  autoScalable: Indicator of whether the auto-scaling of this VNF instance is enabled or disabled. The type is Boolean.  See Note2.  The presence of this attribute indicates that the ManagedFunction represented by the MOI is a virtualized function.  See Note 3.  allowedValues: N/A  A string length of zero for vnfInstanceId means the VNF instance(s) corresponding to the MOI does not exist (e.g. has not been instantiated yet, has already been terminated). | | type: String  multiplicity: \*  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: True | |
| vsData | | Vendor specific attributes of the type vsDataType. The attribute definitions including constraints (value ranges, data types, etc.) are specified in a vendor specific data format file.  allowedValues: -- | | type: --  multiplicity: --  isOrdered: --  isUnique: --  defaultValue: --  isNullable: False | |
| vsDataFormatVersion | | Name of the data format file, including version.  allowedValues: N/A | | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: No  isNullable: False | |
| vsDataType | | Type of vendor specific data contained by this instance, e.g. relation specific algorithm parameters, cell specific parameters for power control or re-selection or a timer. The type itself is also vendor specific.  allowedValues: N/A | | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: No  isNullable: False | |
| pMAdministrativeState | | It indicates the administrative state of MeasurementControl. It describes the permission to use or prohibition against using the capability of MeasurementControl, imposed through the consumer of OAM services produced by MeasurementControl,  The measurement report production would begin when pMadministrativeState is UNLOCKED and pMoperationalState is ENABLED.  The meaning of these values is as defined in 3GPP TS 28.625 [21] and ITU-T X.731 [19].  allowedValues: "LOCKED", "SHUTTING DOWN", "UNLOCKED". | | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: “LOCKED”  isNullable: False | |
| pMOperationalState | | It indicates the operational state of MeasurementControl. It describes if the resource is physically installed and working.  allowedValues: “ENABLED”, “DISABLED”.  The meaning of these values is as defined in 3GPP TS 28.625 [21] and ITU-T X.731 [19]. | | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: No  allowedValues: N/A  isNullable: False | |
| managedObjectDNs | | It identifies the managed entities whose Measurements are required to be produced.  It identifies specific management entities say X, Y, Z . These are called the base.  In case the base is SubNetwork, it identifies all, including the base, managed entities that are subordinates, in the sense of name-containment, of the base.  In case the base is NetworkSliceSubnet, it identifies all, including the base, managed entities that has aggregation association relation with the base.  The identified entities are called a collection. TIt would mean Measurement types specified in attribute MeasurementReader.measurementTypes, are required to be produced if the member (of the collection) is capable of supporting the Measurement types.  allowedValues: N/A | | type: DN  multiplicity: \*  isOrdered: N/A  isUnique: True  defaultValue: No  isNullable: False | |
| managedObjectDNsBasic | | It identifies the managed entities whose Measurements are required to be produced.  It identifies specific managed entities (say X, Y, Z). It would mean Measurements type specified in MeasurementReader.measurementTypes, are required to be produced if X, Y, Z are capable of supporting the Measurement types.  If managedObjectDNs of the same MeasurementReader instance has valid information, the information of this attribute is ignored.  allowedValues: N/A | | type: DN  multiplicity: \*  isOrdered: N/A  isUnique: True  defaultValue: No  isNullable: False | |
| streamBasedGP | | It defines the frequency of producing and sending the Measurement to the consumer.  allowedValues: See Note 4. | | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False | |
| measurementsList | | It specifies a list of supported measurements and their GPs. A NULL value indicates there is no measurement supported.  allowedValues: N/A | | type: Measurements  multiplicity: \*  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: True | |
| measurementTypes | | It identifies one or more Measurement types. The Measurement type can be those specified in TS 28.552 [20], TS 32.404 [21] and can be those specified by other SDOs or can be vendor-specific.  allowedValues: N/A | | type: String  multiplicity: \*  isOrdered: N/A  isUnique: True  defaultValue: No  isNullable: False | |
| streamTarget | | This identifies the target of the notification carrying the content of the measurement report.  There are two delivery methods (i.e. file-based and stream-based) via which the consumer(s) can receive the Measurements. This attribute is used for the stream-based delivery method.  allowedValues: N/A | | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True | |
| gPs | | It identifies the supported GPs, see Note 4.  allowedValues: N/A | | type: Integer  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: No  isNullable: False | |
| nFServiceType | | The parameter defines the type of the managed NF service instance  allowedValues: See clause 7.2 of TS 23.501[22] | | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: No default value  isNullable: False | |
| operations | | This parameter defines set of operations supported by the managed NF service instance.  allowedValues: See TS 23.502[23] for supporting operations | | type: Operation  multiplicity: 1..\*  isOrdered: False  isUnique: False  defaultValue: No default value  isNullable: False | |
| Operation.name | | This parameter defines the name of the operation of the managed NF service instance.  allowedValues: N/A | | type: String  multiplicity: 1  isOrdered: False  isUnique: False  defaultValue: no default value  isNullable: True | |
| allowedNFTypes | | This parameter identifies the type of network functions allowed to access the operation of the managed NF service instance.  allowedValues: See TS 23.501[22] for NF types | | type: ENUM  multiplicity: 1..\*  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False | |
| operationSemantics | | This paramerter identifies the semantics type of the operation. See TS 23.502[23]  allowedValues: “Request/Response”, “Subscribe/Notify”. | | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False | |
| sAP | | This parameter specifies the service access point of the managed NF service instance.  allowedValues: N/A | | type: SAP  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: No default value  isNullable: False | |
| host | | This parameter specifies the host address of the managed NF service instance. It can be FQDN (See TS 23.003 [5]) or an IPv4 address (See RFC 791 [24]) or an IPv6 address (See RFC 2373 [25]).  allowedValues: N/A | | type: String  multiplicity: 1  isOrdered: False  isUnique: N/A  defaultValue: None  isNullable: False | |
| port | | This parameter specifies the transport port of the managed NF service instance.  allowedValues: 1 - 65535 | | type: Integer  multiplicity: 1  isOrdered: False  isUnique: False  defaultValue: None  isNullable: False | |
| ManagedNFService.operationalState | | This parameter indicates the operational state of the managed NF service instance. It describes whether the resource is physically installed and working.  allowedValues: "ENABLED", "DISABLED".  The meaning of these values is as defined in 3GPP TS 28.625 [21] and ITU-T X.731 [19]. | | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False | |
| ManagedNFService.administrativeState | | This parameter indicates the administrative state of the manaed object instance. It describes the permission to use or prohibition against using the instance, imposed through the management services.  allowedValues: “LOCKED”, “UNLOCKED”, SHUTTINGDOWN”  The meaning of these values is as defined in 3GPP TS 28.625 [21] and ITU-T X.731 [19]. | | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False | |
| ManagedNFService.usageStae | | This parameter indicates the usage state of the object instance. It describes whether the resource is actively in use at a specific instant, and if so, whether or not it has spare capacity for additional users at that instant.  allowedValues: "IDLE", "ACTIVE", "BUSY".  The meaning of these values is as defined in 3GPP TS 28.625 [21] and ITU-T X.731 [19]. | | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False | |
| registrationState | | This parameter defines the registration status of the managed NF service instance.  allowedValues: "Registered", "Deregistered". | | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: Deregistered  isNullable: False | |
| defaultFileBasedGP | | This is a property of the file-based delivery method. See definition of fileBasedGP. This value is ignored in case the property captured in MeasurementReader is in use. GP unit is in minute. | | Same as in fileBasedGP | |
| defaultFileReportingPeriod | | This is a property of the file-based delivery method. See definition of fileReportingGP. This value is ignored in case the property captured in MeasurementReader is in use. | | Same as in fileReportingPeriod | |
| defaultFileLocation | | This is a property of the file-based delivery method. See definition of fileLocation. This value is ignored in case the property captured in MeasurementReader is in use. | | Same as in fileLocation | |
| defaultStreamBasedGP | | This is a property of the stream-based delivery method. See definition of streamBasedGP. This value is ignored in case the property captured in MeasurementReader is in use. | | Same as in streamBasedGP | |
| defaultStreamTarget | | This is a property of the stream-based delivery method. See definition of streamTarget. This value is ignored in case the property captured in MeasurementReader is in use. | | Same as in  streamTarget | |
| fileBasedGP | | This defines the frequency of producing the measurement data. The measurement data would be produced immediately at the end of each fileBasedGP.A measurement report file contains multiple measurement data. GP unit is in minute.  allowedValues: See Note 4. | | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: No  isNullable: False | |
|  | |  | |  | |
| fileReportingPeriod | | This defines the frequency of producing the measurement report files, in fileLocation, that hold the measurement reports.  allowedValues: Its value is a multiple of fileBasedGP. | | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: No  isNullable: False | |
| fileLocation | | This is used for the file-based delivery method. It is the path to a location on either the producer’s file system or a URI to a network file location that is not part of the producer’s file system.  In case it points to a location on the producer’s file system, it is a relative path based on a vendor-specified root directory for measurement files.  The size of this fileLocation is decided by consumer and producer. The producer is expected to remove old files to make room for new files, when necessary.  allowedValues: Not applicable. | | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: No  isNullable: True | |
| FMControl.administrativeState | | The consumer sets this attribute to UNLOCKED instructing the producer to report and record alarm information. The consumer sets the attribute to LOCKED indicating detection, reporting and recording of alarm information are no longer needed.  allowedValues: LOCKED, UNLOCKED. | | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: LOCKED  isNullable: False | |
| FMControl.operationalState | | The producer sets this attribute to ENABLED, indicating that it has the resource and ability to record alarm in AlarmList and sending alarm notification to faultReportTarget (an attribute of NtfSubscriptionControl IOC); else, it sets the attribute to DISABLED.  allowedValues: ENABLED, DISABLED. | | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: DISABLED  isNullable: False | |
| alarmRecordList | | It contains a list of alarm information. It has the attributes defined at clause 11.2.2.1.3.1 AlarmInformation of TS 28.532 [x].  allowedValues: not applicable | | type: AlarmRecord  multiplicity: \*  isOrdered: N/A  isUnique: True  default value: NULL  isNullable: True | |
| numOfAlarmRecords | | It indicates the number of alarm records in the AlarmList.  allowedValues: 0 to x where x is vendor specific. | | type: integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: 0  isNullable: False | |
| lastModification | | It indicates the last time when an alarm record is modified.  allowedValues: all values indicating date and time. | | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: No  isNullable: False | |
|  | |  | |  | |
| NOTE 1: The value of this attribute is identical to that of the same attribute in clause 9.4.2 of ETSI GS NFV-IFA 008 [16].  NOTE 2: The value of this attribute is identical to that of the same attribute included in vnfConfigurableProperty in clause 9.4.2 of ETSI GS NFV-IFA 008 [16].  NOTE 3: The presence of the attribute vnfParametersList, whose vnfInstanceId with a string length of zero, in createMO operation can trigger the instantiation of the related VNF/VNFC instances.  NOTE 4: The GP defines the measurement data production rate. The supported rates are dependent on the capacity of the producer involved (e.g. the processing power of the producer, the complexity of the measurement type involved etc) and therefore, it cannot be standardized for all producers involved. The supported GPs reflects the agreement between producer and the consumer involved.  NOTE 5: The monitoring granularity period defines the measurements monitoring period. The supported monitoring periods are dependent on the capacity of the producer involved (e.g. the processing power of the producer, the complexity of the measurement type involved etc) and therefore, it cannot be standardized for all producers involved. The supported monitoring GPs reflect the agreement between producer and the consumer involved.  NOTE 6: The supported threshold levels are dependent on the capacity of the producer involved (e.g. the processing power of the producer, number of measurements being measured by the producer at the time, the complexity of the measurement type involved etc) and therefore, it cannot be standardized for all producers involved. The supported levels can only reflect the negotiated agreement between producer and the consumer involved. | | | | | |

### 4.4.2 Constraints

None

***Next Change***

## 4.5 Common notifications

### 4.5.1 Alarm notifications

This clause presents a list of notifications, defined in [11], that consumer can receive. The notification header attribute objectClass/objectInstance, defined in [3], would capture the DN of an instance of an IOC defined in this IRP specification.

| Name | Qualifier | Notes |
| --- | --- | --- |
| notifyAckStateChanged | See subclause 11.2.1.2 [x] |  |
| notifyChangedAlarm | See subclause 11.2.1.1 [x] |  |
| notifyClearedAlarm | See subclause 11.2.1.2 [x] |  |
| notifyNewAlarm | See subclause 11.2.1.1 [x] |  |
| notifyComments | See subclause 11.2.1.2 [x] |  |
| notifyAlarmListRebuilt | See subclause 11.2.1.1 [x] |  |
| notifyPotentialFaultyAlarmList | See subclause 11.2.1.2 [x] |  |
| notifyCorrelatedNotificationChanged | See subclause 11.2.1.1 [x] |  |
| notifyEvent | See subclause 11.2.1.1 [x] |  |

### 4.5.2 Configuration notifications

This clause presents a list of notifications, defined in [12], that consumer can receive. The notification header attribute objectClass/objectInstance, defined in [3], would capture the DN of an instance of an IOC defined in this IRP specification.

| Name | Qualifier | Notes |
| --- | --- | --- |
| notifyMOIAttributeValueChange | See subclause 11.1.1 [x] |  |
| notifyMOICreation | See subclause 11.1.1 [x] |  |
| notifyMOIDeletion | See subclause 11.1.1 [x] |  |

***End of Change***