**3GPP TSG- Meeting #**

**, , -**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network | **X** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** | SA5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Reuirement REQ-FAILURE\_PRED\_MDA-03 in TS 28.104 specifies: "MDA capability for failure prediction shall be able to provide the analytics output including predictions of potential service failures, as well as the possible recommendation options."  A solution for this requirement needs to be added. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | A solution for the requirement is added. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The requirement would have no solution. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

|  |
| --- |
| **First modification** |

##### 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 MnS producer 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. | It carries the requested AlarmInformation instances.  Case when synchronous mode of operation is used:  (a) The MnS producer shall apply the constraints expressed in alarmAckState and filter to AlarmInformation instances when constructing this output parameter.  Case when asynchronous mode of operation is used (i.e. this output parameter is conveyed via notifications):  (a) If the filter parameter is present, theMnS producer shall apply the constraint when constructing this output parameter. Furthermore, if the alarmAckState constraint is present, the MnS producer 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 MnS producer shall apply the filter constraint currently active in the notification channel when constructing this output parameter. If the alarmAckState constraint is present, the MnS producer shall apply that constraint as well. |
| status | M | ENUM (OperationSucceeded, OperationFailed) | If all the AlarmInformation are returned, status = OperationSucceeded.  If operation is failed, status = OperationFailed. |

The following table 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-AlarmedObject-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 | Parmeter identical to the first parameter in this list, shown here to clarify all elements of AlarmInformation are present |
| [notificationId] | n/a | AlarmInformation.notificationId | Parmeter 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 |
| predictedAlarmRaisedTime | CM | AlarmInformation.predictedAlarmRaisedTime |  |
| predictedAlarmClearedTime | CO | AlarmInformation.predictedAlarmClearedTime |  |
| predictionProbability | CO | AlarmInformation.predictionProbability |  |
| predictedAlarm | CM | AlarmInformation.predictedAlarm |  |

11.2.1.1.3.3a Parameter constraints

|  |  |
| --- | --- |
| Name | Definition |
| predictedAlarmRaisedTime (support qualifier) | This parmeter shall be supported, when alarm prediction is supported. |
| predictedAlarmClearedTime (support qualifier) | This parameter should be supported, when alarm prediction is supported. |
| predictionProbability (support qualifier) | This parameter should be supported, when alarm prediction is supported. |
| predictedAlarm (support qualifier) | This parameter shall be supported, when alarm prediction is supported. |

###### 11.2.1.1.3.4 Exceptions and constraints

| Exception Name | Definition |
| --- | --- |
| operation\_failed | **Condition:** Operation is failed  **Returned Information:** The output parameter status  **Exit state:** Entry State |

|  |
| --- |
| **Next modification** |

##### 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 | S | 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 | AlarmInformaton.proposedRepairActions |  |
| additionalText | O | AlarmInformation.additionalText |  |
| additionalInformation | O | AlarmInformation.additionalInformation |  |
| rootCauseIndicator | O | AlarmInformation.rootCauseIndicator |  |
| predictedAlarmRaisedTime | CM | AlarmInformation.predictedAlarmRaisedTime | This parameter shall be present for predicted alarms and absent for real alarms. |
| predictedAlarmClearedTime | CO | AlarmInformation.predictedAlarmClearedTime | This parameter should be present for real alarms and predicted alarms. |
| predictionProbability | CO | AlarmInformation.predictionProbability | This parameter should be present for real alarms in case "predictedAlarmClearedTime" is present, and predicted alarms. |
| predictedAlarm | CM | AlarmInformation.predictedAlarm | This parameter shall be present for predicted alarms and absent for real alarms. |

11.2.1.1.4.2a Parameter constraints

|  |  |
| --- | --- |
| Name | Definition |
| predictedAlarmRaisedTime (support qualifier) | This parmeter shall be supported, when alarm prediction is supported. |
| predictedAlarmClearedTime (support qualifier) | This parameter should be supported, when alarm prediction is supported. |
| predictionProbability (support qualifier) | This parameter should be supported, when alarm prediction is supported. |
| predictedAlarm (support qualifier) | This parameter shall be supported, when alarm prediction is supported. |

###### 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 | S | 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 |  |
| correlatedNotifications | O | The set of CorrelatedNotification related to this AlarmInformation. |  |
| additionalText | O | AlarmInformation.additionalText |  |
| additionalInformation | O | AlarmInformation.additionalInformation |  |
| rootCauseIndicator | O | AlarmIngormation.rootCauseIndicator |  |
| serviceUser | M | AlarmInformation.securityServiceUser | This may contain no information if the identify of the service-user (requesting the service) is not known. |
| serviceProvider | M | AlarmInformation.securityServiceProvider | This shall always identify the service-provider receiving a service request, from serviceUser, that provokes the security alarm. |
| securityAlarmDetector | M | AlarmInformation.securityAlarmDetector | This may contain no information if the detector of the security alarm is the serviceProvider. |

###### 11.2.1.1.4.3 Triggering event

11.2.1.1.4.3.1 From-state

noMatchedAlarm.

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

11.2.1.1.4.3.2 To-state

newAlarmInAlarmList.

|  |  |
| --- | --- |
| Assertion Name | Definition |
| newAlarmInAlarmList | AlarmList contains an AlarmInformation holding information conveyed by the newly generated network alarm. This AlarmInformation is involved in relation-AlarmObject-AlarmInformation with the same MonitoredEntity as the one identified by the newly generated network alarm.  The following attributes of the AlarmInformation shall be populated with information in the newly generated alarm:  notificationId, alarmRaisedTime, alarmId, alarmType, , probableCause, perceivedSeverity.  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. |

|  |
| --- |
| **Next modification** |

##### 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-AlarmedObject-AlarmInformation. |
| objectInstance | M | MonitoredEntity.objectInstance | The MonitoredEntity is identified by the relation-AlarmedObject-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 |  |
| predictedAlarm | CM | AlarmInformation.predictedAlarm | This parameter shall be present for predicted alarms and absent for real alarms. |

11.2.1.1.5.2a Parameter constraints

|  |  |
| --- | --- |
| Name | Definition |
| predictedAlarm (support qualifier) | This parameter shall be supported, when alarm prediction is supported. |

###### 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:  - notificationId is updated;  - alarmChangedTime is updated;  - perceivedSeverity is updated;  - ackTime, ackUserId and ackSystemId are updated to contain no information;  - ackState is updated to "unacknowledged"; |

|  |
| --- |
| **Next modification** |

##### 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.probablaCause |  |
| 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. |
| predictedAlarm | CM | AlarmInformation.predictedAlarm | This parameter shall be present for predicted alarms and absent for real alarms. |

11.2.1.2.4.2a Parameter constraints

|  |  |
| --- | --- |
| Name | Definition |
| predictedAlarm (support qualifier) | This parameter shall be supported, when alarm prediction is supported. |

###### 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. |

|  |
| --- |
| **Next modification** |

##### 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. |
| predictedAlarm | CM | AlarmInformation.predictedAlarm | This parameter shall be present for predicted alarms and absent for real alarms. |

11.2.1.2.4.2a Parameter constraints

|  |  |
| --- | --- |
| Name | Definition |
| predictedAlarm (support qualifier) | This attribute shall be supported, when alarm prediction is supported. |

###### 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) acknowlegeAlarms 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. |

|  |
| --- |
| **Next modification** |

##### 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. |  |
| predictedAlarm | CM | AlarmInformation.predictedAlarm | This parameter shall be present for predicted alarms and absent for real alarms. |

11.2.1.2.6.2a Parameter constraints

|  |  |
| --- | --- |
| Name | Definition |
| predictedAlarm (support qualifier) | This attribute shall be supported, when alarm prediction is supported. |

###### 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 |
| commentedByServiceprovider | Reception of a setComment operation and a subsequent operation success return. |
| commentedByServiceprovider | Reception of a local (non-standard) setComment equivalent operation and a subsequent operation success return. |
| alarmInformationExists | The AlarmInformation is in AlarmList. |

11.2.1.2.6.3.2 To-state

commentInserted.

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

|  |
| --- |
| **Next modification** |

##### 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: perceivedSeverity, backedUpStatus, backUpObject, trendIndication, thresholdInfo, stateChangeDefinition, monitoredAttributes, proposedRepairActions, additionalText, additionalInformation, serviceUser, serviceProvider, securityAlarmDetector, predictedAlarmClearedTime, predictedAlarmRaisedTime, predictionProbability, predictedAlarm. From the attributes listed above, only those that changed value shall be included in the notification.

This notification shall be emitted when a predicted alarm becomes a real alarm. The "predictedAlarm" attribute shall be contained in the " changedAlarmAttributes" parameter and be equal to "FALSE".

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 | O | AlarmInformation.probableCause |  |
| specificProblem | O | AlarmInformation.specificProblem |  |
| perceivedSeverity | O | AlarmInformation.perceivedSeverity |  |
| 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 | AlarmInformaton.proposedRepairActions |  |
| additionalText | O | AlarmInformation.additionalText |  |
| additionalInformation | O | AlarmInformation.additionalInformation |  |
| rootCauseIndicator | O | alarmInformation.rootCauseIndicator |  |
| changedAlarmAttributes | O | 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.alarmChangedTime |  |
| systemDN | M | -- |  |
| alarmId | M | AlarmInformation.alarmId |  |
| alarmType | M | AlarmInformation.alarmType |  |
| probableCause | O | AlarmInformation.probableCause |  |
| perceivedSeverity | O | 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.securityAlarmDetector | This may contain no information if the detector of the security alarm is the serviceProvider. |
| changedAlarmAttributes | O | 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 | One or more of perceivedSeverity, 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: perceivedSeverity, 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"; |

|  |
| --- |
| **Next modification** |

### 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.

*Editor's note: It should be possible to have a dedicated AlarmList for alarm predictions. This would requitre to relax the cardinality from FSMnSProducer to "AlarmList" from "1" to at least "2".*

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) |
| predictedAlarmRaisedTime | CM |
| predictedAlarmClearedTime | CO |
| predictionProbability | CO |
| predictedAlarm | CM |
| 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. | |

11.2.2.1.3.1.2 Attribute cobstraints

|  |  |
| --- | --- |
| Name | Definition |
| predictedAlarmRaisedTime (support qualifier) | This attribute shall be supported, when alarm prediction is supported. |
| predictedAlarmClearedTime (support qualifier) | This attribute should be supported, when alarm prediction is supported. |
| predictionProbability (support qualifier) | This attribute should be supported, when alarm prediction is supported. |
| predictedAlarm (support qualifier) | This attribute shall be supported, when alarm prediction is supported. |

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

Predicted alarms obey the same states and state transitions as depicted in Figure 11.2.2.1.3.1.3-1 and Figure 11.2.2.1.3.1.3-2. Additionally and independent from these states, predicted alarms may experience a state transition from a predicted alarm ("predictedAlarm=TRUE") to a real alarm ("predictedAlarm=FALSE") as depicted by Figure 11.2.2.1.3.1.3-3.

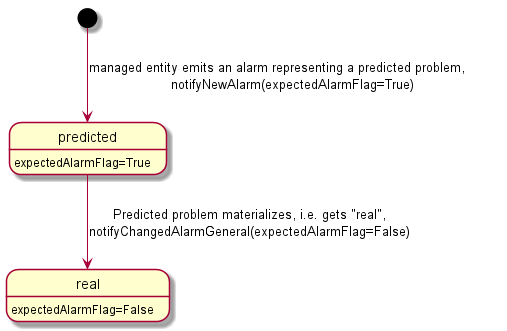


Figure 11.2.2.1.3.1.3-3 Additional state transitions of predicted alarms

Note: "expectedAlarmFlag" needs to be changed to "pedictedAlarm" in the figure above.

###### 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.

|  |
| --- |
| **Next modification** |

##### 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.  For predicted alarms, it indicates the date and time when the predicted alarm is raised by the alarm prediction function. Note this is not the date and time when the alarm is predicted to occur. | 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.  For predicted alarms, it indicates the last date and time when the AlarmInformation is changed by the alarm prediction function. | 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 | It indicates the type of alarm.  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 [4]).  Processing Error Alarm:  An alarm of this type is associated with a software or processing fault (ITU T Recommendation X.733 [4]).  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 [4]).  Quality of Service Alarm:  An alarm of this type is associated with degradation in the quality of a service (ITU T Recommendation X.733 [4]).  Equipment Alarm:  An alarm of this type is associated with an equipment fault (ITU-T Recommendation 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. |  |
| 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. |
| 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:  - The identifier of the monitored attribute whose value has crossed a threshold,  - The threshold settings,  - The observed value that have crossed a threshold, etc.  See definition in ITU-T Recommendation X.733 [4] clause 8.1.2.7. See also for information in TS 32.401 [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 |
| additionalInformation | This attribute when present allows the inclusion of a set of vendor specific alarm information in the alarm.  A specific condition for this optional population is when an alarm presented by the Management System (e.g. via the user interface) has different values of perceived severity, and / or alarm type, compared with the values presented to the Itf-N.  Any other uses of additional information on the alarm and its semantics is outside the scope of the present document | The additional information field is a list of one or more information parts.  The present document allows the support of two such information parts to carry  - vendor defined perceived severity  - vendor defined alarm type  using defined identification.  Other vendor specific information parts are allowed by using vendor specific identifications. |
| 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. | Acknowledged: the alarm has been acknowledged.  Unacknowledged: the alarm has been unacknowledged or the alarm has never been acknowledged. |
| commentTime | It carries the time when the comment has been added to the alarm. |  |
| commentText | It carries the textual comment. |  |
| commentUserId | It carries the identification of the user who made the comment. |  |
| commentSystemId | It carries the identification of the system (Management System) from which the comment is made. That system supports the user that made the comment. |  |
| 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 “”. |
| 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. |  |
| predictedAlarmRaisedTime | The predicted time when the related alarm will be raised. The attribute shall be present in "AlarmInformation" related to predicted alarms.  This is a time in future. When a predicted alarm does not become a real alarm at the predictated alarm raised time, the alarm shall be cleared by the system, i.e. the perceived severity shall be set to "CLEARED". In addition, the "predictedAlarmRaisedTime" attribute shall be removed from the larm list " to avoid a time in the past is shown as the predicted alarm raised time. | All values indicating valid date and time. |
| predictedAlarmClearedTime | The predicted time when the related alarm will be cleared.  The attribute should be present in "AlarmInformation" related to predicted alarms and real alarms for the case that alarm prediction is supported.  This is normally a time in future. When the alarm is not cleared at the predicted time, the system should remove the attribute from "AlarmInformation" to avoid a time in the past is shown as the predicted alarm cleared time. | All values indicating valid date and time. |
| predictionProbability | Probabaility that the predictaed alarm will be raised in percent. | Integer from 1..100 |
| predictedAlarm | Indicating whether the related alarm is a predicated alarm or a real alarm. When a predicted alarm becomes a real alarm, the attribute changes from "TRUE" to "FALSE". | TRUE, FALSE |

###### 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. |

|  |
| --- |
| **End of modifications** |