Technical Specification Group Services and System Aspects
Meeting #17, Biarritz, France, 9-12 September 2002

TSGS#17(02)0478

Source: **SA5 (Telecom Management)**

Title: **Rel-5 CRs 32.111-2/3 (Fault Management; Alarm Integration Reference Point)**

Document for: **Approval**

Agenda Item: **7.5.3**

Doc-1st-	Spec	CR	Rev	Phase	Subject	Cat	Version	Doc-	Workite	Relation
SP-020478	32.111-2	018	-	Rel-5	**Add security alarms support in Alarm IRP: IS**	B	5.0.0	S5-026731	OAM-NIM	**Parent CR**
SP-020478	32.111-3	021	-	Rel-5	**Add security alarms support in Alarm IRP: CORBA SS**	B	5.0.0	S5-026729	OAM-NIM	**Child CR**

3GPP TSG-SA5 (Telecom Management) **S5-026731**
Meeting #30, Tampere, Finland, August 2002

CR-Form-v5

CHANGE REQUEST

⌘ **32.111-2** **CR** **018** ⌘ **rev** **-** ⌘ Current version: **5.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network **X** Core Network **X**

Title:	⌘	Add security alarms support in Alarm IRP: IS
Source:	⌘	S5
Work item code:	⌘	OAM-NIM
Date:	⌘	23/08/2002
Category:	⌘	**B**
Release:	⌘	*REL-5*

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Security alarms can not be handled in the Alarm IRP
Summary of change:	⌘	Add a new notification structure to carry security alarm information. Update references; include event types and probable causes defined in ITU-T X.736.
Consequences if not approved:	⌘	Security alarms cannot be handled over Itf-N.

Clauses affected:	⌘	5.2.1, 5.3.1.2, 5.5.1, 6.8.1.1, 6.8.1.2, Table A.1, Table B.2, (new) Table B.3, (old) Table B.4
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	"Parent" CR of "Child" CR 32.111-3 (S5-026729)

5 Information Object Classes

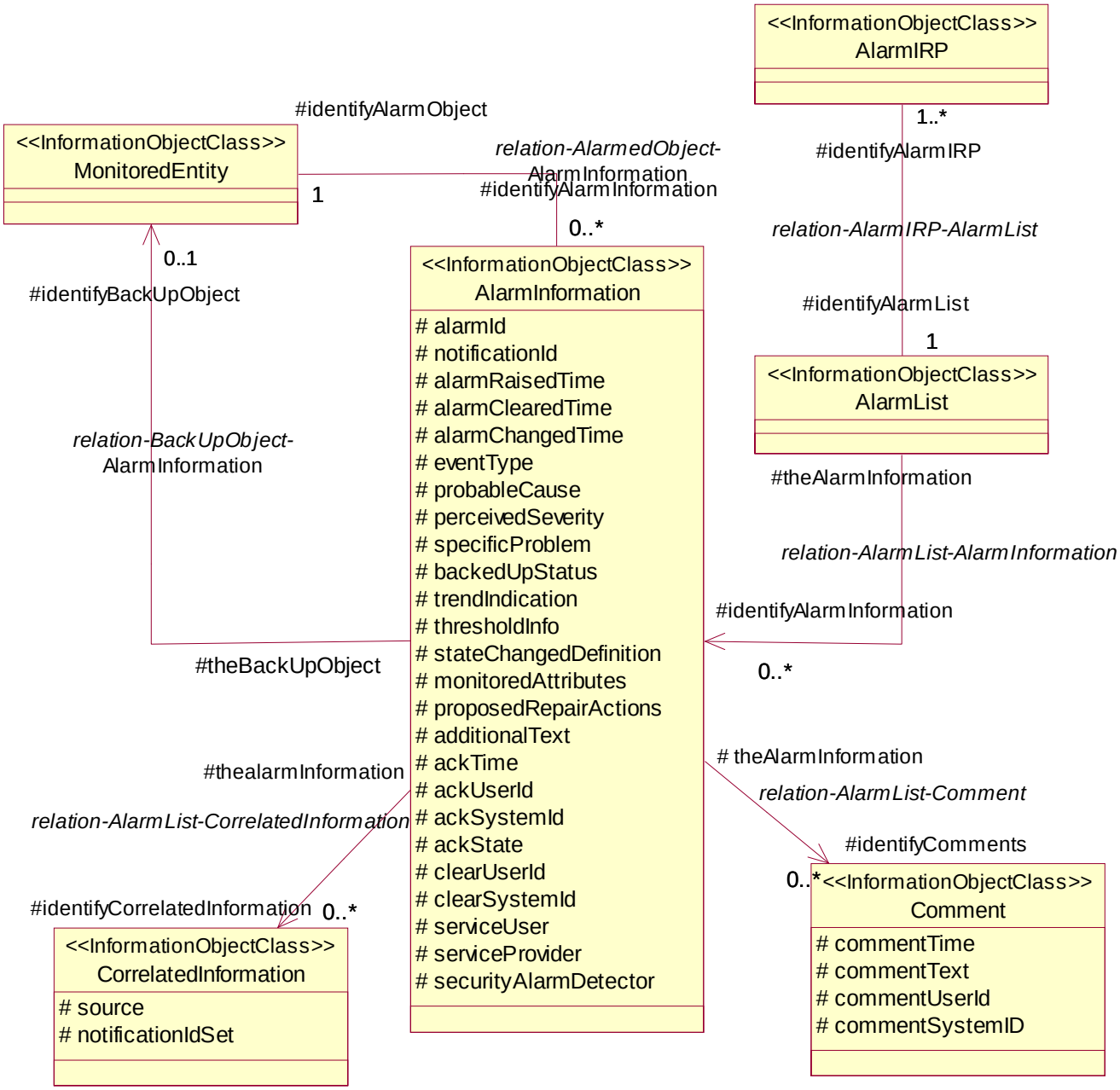
5.1 Information entities imported and local label

Label reference	Local label
32.302 [5], information object class, NotificationIRP	NotificationIRP
32.302 [5], interface, notificationIRPNotification	notificationIRPNotification
32.622 [10], information object class, IRPAgent	IRPAgent
32.622 [10], information object class, ManagedGenericIRP	ManagedGenericIRP

5.2 Class diagram

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

5.2.1 Attributes and relationships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AlarmIRP
1..*
#identifyAlarmIRP
relation-AlarmIRP-AlarmList
#identifyAlarmList
1
<<InformationObjectClass>>
AlarmList
#theAlarmInformation
relation-AlarmList-AlarmInformation
#identifyAlarmInformation
0..*
#identifyAlarmObject
<<InformationObjectClass>>
MonitoredEntity
1
relation-AlarmedObject-
AlarmInformation
#identifyAlarmInformation
0..*
<<InformationObjectClass>>
AlarmInformation
alarmId
notificationId
alarmRaisedTime
alarmClearedTime
alarmChangedTime
eventType
probableCause
perceivedSeverity
specificProblem
backedUpStatus
trendIndication
thresholdInfo
stateChangedDefinition
monitoredAttributes
proposedRepairActions
additionalText
ackTime
ackUserId
ackSystemId
ackState
clearUserId
clearSystemId
serviceUser
serviceProvider
securityAlarmDetector
0..1
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relation-BackUpObject-
AlarmInformation
#theBackUpObject
#thealarmInformation
relation-AlarmList-CorrelatedInformation
#identifyCorrelatedInformation
0..*
<<InformationObjectClass>>
CorrelatedInformation
source
notificationIdSet
theAlarmInformation
relation-AlarmList-Comment
#identifyComments
0..*
<<InformationObjectClass>>
Comment
commentTime
commentText
commentUserId
commentSystemID


<<InformationObjectClass>>
AlarmIRP
1..*
#identifyAlarmIRP
relation-AlarmIRP-AlarmList
#identifyAlarmList
1
<<InformationObjectClass>>
AlarmList
#theAlarmInformation
#identifyAlarmObject
<<InformationObjectClass>>
MonitoredEntity
1
relation-AlarmedObject-
AlarmInformation
#identifyAlarmInformation
0..*
0..1
#identifyBackUpObject
relation-BackUpObject-
AlarmInformation
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alarmId
notificationId
alarmRaisedTime
alarmClearedTime
alarmChangedTime
eventType
probableCause
perceivedSeverity
specificProblem
backedUpStatus
trendIndication
thresholdInfo
stateChangedDefinition
monitoredAttributes
proposedRepairActions
additionalText
ackTime
ackUserId
ackSystemId
ackState
clearUserId
clearSystemId
relation-AlarmList-AlarmInformation
#identifyAlarmInformation
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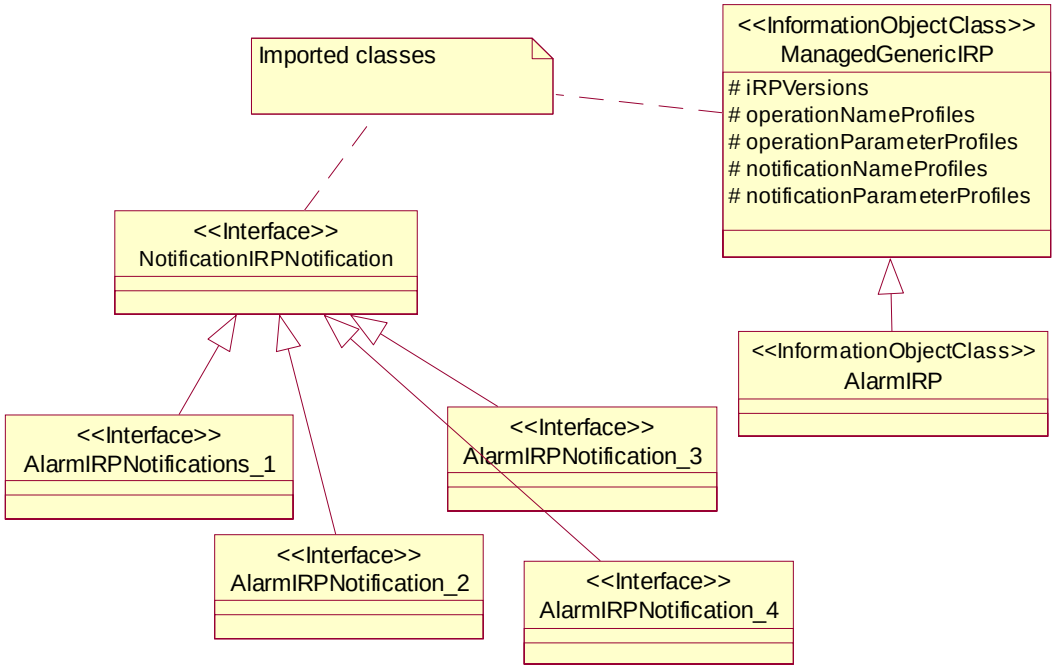
#theBackUpObject
#thealarmInformation
relation-AlarmList-CorrelatedInformation
theAlarmInformation
relation-AlarmList-Comment
#identifyComments
0..*
<<InformationObjectClass>>
Comment
commentTime
commentText
commentUserId
commentSystemID
#identifyCorrelatedInformation
0..*
<<InformationObjectClass>>
CorrelatedInformation
source
notificationIdSet

5.2.2 Inheritance



5.3 Information Object Class Definitions

5.3.13 AlarmInformation

5.3.1.1 Definition

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

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

5.3.1.2 Attribute

Attribute name	Support Qualifier
alarmId	M
notificationId (note 1)	M
alarmRaisedTime	M
alarmClearedTime	M
alarmChangedTime	O
eventType	M
probableCause	M
perceivedSeverity	M
specificProblem	O
backedUpStatus	O
trendIndication	O
thresholdInfo	O
stateChangedDefinition	O
monitoredAttributes	O
proposedRepairActions	O
additionalText	O
ackTime	M
ackUserId	M
ackSystemId	O
ackState	M
clearUserId	O (note 2)
clearSystemId	O (note 2)
serviceUser	O (note 3)
serviceProvider	O (note 3)
securityAlarmDetector	O (note 3)

Note 1: This attribute may be “retired/removed” in Release 5 when Log IRP is introduced. Its removal implies that information carried in this attribute is no longer made accessible to IRPManager via the `getAlarmList`().

Note 2: These attributes must be supported if the IRPAgent supports the clearAlarm().

Note 3: These attributes must be supported if the IRPAgent emits `notifyNewAlarm` that carries security alarm information.

5.3.1.3 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 IRP and is removed from the `AlarmList`.

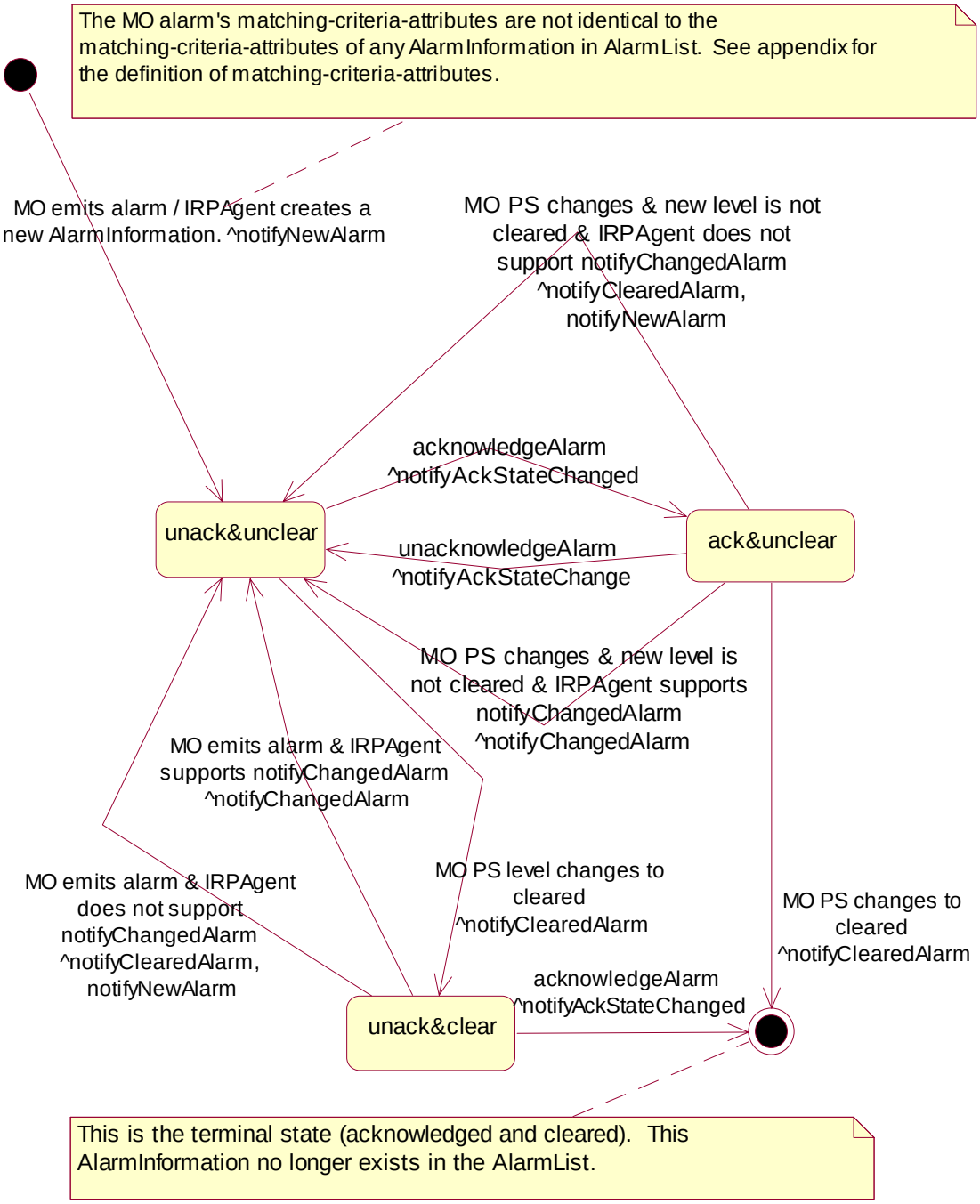
Note the state diagram uses “ X / Y ^ Z ” to label the arc that indicates state transition. The meanings of X, Y and Z are:

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

Note that `acknowledgeAlarm^notifyAckStateChanged` and the `unacknowledgeAlarm^notifyAckStateChange` refer to cases when the request of the `IRPManager` 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.

Note that “PS” used in the state diagram stands for “perceived severity”.


The MO alarm's matching-criteria-attributes are not identical to the matching-criteria-attributes of any AlarmInformation in AlarmList. See appendix for the definition of matching-criteria-attributes.
MO emits alarm / IRPAgent creates a new AlarmInformation. ^notifyNewAlarm
MO PS changes & new level is not cleared & IRPAgent does not support notifyChangedAlarm ^notifyClearedAlarm, notifyNewAlarm
acknowledgeAlarm ^notifyAckStateChanged
unack&unclear
unacknowledgeAlarm ^notifyAckStateChange
ack&unclear
MO PS changes & new level is not cleared & IRPAgent supports notifyChangedAlarm ^notifyChangedAlarm
MO emits alarm & IRPAgent supports notifyChangedAlarm ^notifyChangedAlarm
MO emits alarm & IRPAgent does not support notifyChangedAlarm ^notifyClearedAlarm, notifyNewAlarm
MO PS level changes to cleared ^notifyClearedAlarm
MO PS changes to cleared ^notifyClearedAlarm
acknowledgeAlarm ^notifyAckStateChanged
unack&clear
This is the terminal state (acknowledged and cleared). This AlarmInformation no longer exists in the AlarmList.

5.5 Information attribute definition

5.5.1 Definition and legal values

Name	Definition	Legal Values
alarmId	It identifies one AlarmInformation in the AlarmList.	
notification Id	It identifies the notification that carries the AlarmInformation.	
alarmRaised Time	It indicates the date and time when the alarm is first raised by the alarmed resource.	All values indicating valid time.
alarmChanged Time	It indicates the last date and time when the AlarmInformation is changed by the alarmed resource. Changes to AlarmInformation caused by invocations of the IRPManager would not change this date and time.	All values indicating valid time.
alarmCleared Time	It indicates the date and time when the alarm is Cleared.	All values indicating valid time.
eventType	It indicates the type of event. See Annex A for information on event type.	See Annex A.
probableCause	It qualifies alarm and provides further information than eventType. See Annex B for a complete listing.	See Annex B.
perceived Severity	It indicates the relative level of urgency for operator attention.	Critical, Major, Minor, Warning, Indeterminate, Cleared: see ITU-T Recommendation X.733 [2]. This IRP does not recommend the use of indeterminate.
specific Problem	It provides further qualification on the alarm than probableCause. This attribute value shall be single-value and of simple type such as integer or string. See definition in ITU-T Recommendation X.733 [2] clause 8.1.2.2.	Provided by vendor.
backedUp Status	It indicates if an object (the MonitoredEntity) has a back up. See definition in ITU-T Recommendation X.733 [2] clause 8.1.2.4.	All values that carry the semantics of backedUpStatus defined by ITU-T X.733 [2] clause 8.1.2.4.
trend Indication	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 [2] clause 8.1.2.6.
thresholdInfo	It indicates the direction of threshold crossing.	See definitions in ITU-T Recommendation X.733 [2] clause 8.1.2.7.
stateChange Definition	It indicates MO attribute value changes. See definition in ITU-T Recommendation X.733 [2] clause 8.1.2.10.	
monitored Attributes	It indicates MO attributes whose value changes are being monitored. See definition in ITU-T Recommendation X.733 [2] clause 8.1.2.11.	
proposed RepairActions	It indicates proposed repair actions. See definition in ITU-T Recommendation X.733 [2] clause 8.1.2.12.	
additional Text	It carries semantics that is outside the scope of this IRP specification. It may provide the identity of the NE (e.g. RNC, Node-B) from which the alarm has been originated. It corresponds to the “user label” attribute of the object class representing the NE in the Generic Network Resource Model [10]. It can contain further information on the alarm.	N/A

Name	Definition	Legal Values
ackTime	It identifies the time of last operation acknowledgeAlarms or unacknowledgeAlarms.	All values that indicate valid time that are later than that carried in alarmRaisedTime.
ackUserId	It identifies the last user who has change the Acknowledgement State via operation acknowledgeAlarms or unacknowledgeAlarms. 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 “”.	N/A
ackSystemId	It identifies the system in which IRPManager, that invokes the acknowledgeAlarms or unacknowledgeAlarms operation, runs.	N/A
ackState	It identifies the Acknowledgement State of the alarm.	Acknowledged: the alarm has been acknowledged. Unacknowledged: the alarm has been unacknowledged or the alarm has never been acknowledged.
commentTime	It carries the time when a comment is made via setComment operation.	
commentText	It carries the textual comment made via setComment operation.	
commentUserId	It carries the identification of the user who made the comment via setComment operation.	
commentSystemId	It carries the identification of the system in which the IRPManager runs. That IRPManager supports the user that made the comment.	
source	It identifies one MonitoredEntity.	All values that carry the semantics of DN.
notificationIdSet	It carries one or more notification identifiers.	
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.

5.5.2 Constraints

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

6 Interface Definition

6.87 Interface `AlarmIRPNotifications_1`

This specification does not specify methods for IRPManager to detect alarm loss. The use of `alarmId` to detect alarm loss is an arrangement made between `IRPAgent` and IRPManager. This arrangement is outside the scope of this

specification. For example, IRPAgent may use integer sequence (e.g. 1, 2, 3, 4, 5, …) as alarmId instances for its alarms. Based on this knowledge, IRPManager can detect alarm loss. This kind of arrangement may not be possible for all SS.

This specification does not specify how IRPAgent can determine if IRPManager has received alarms correctly. Not all SSs provide such capability.

This document does not specify methods for IRPManager and IRPAgent to recover alarm loss. The only mechanism recommended to deal with alarm loss is the use of getAlarmList operation. This document does not specify conditions under which IRPManager should invoke this operation.

6.87.1 notifyNewAlarm (M)

6.87.1.1 Definition

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

There are two tables for Input Parameters. If alarmType parameter indicates «Communications Alarm », « Processing Error Alarm », « Environmental Alarm ». « Quality Of Service Alarm » or « Equipment Alarm », the first table (6.8.1.2) shall be applicable for this notifyNewAlarm. If alarmType parameter indicates « Integrity Violation », « Operational Violation », « Physical Violation », « Security Violation » or « Time Domain Violation », the second table (6.8.1.2a) shall be applicable.

6.87.1.2 Input Parameters for notification not related to security alarm

Parameter Name	Qualifier	Matching Information	Comment
ObjectClass	M,F	MonitoredEntity.objectClass where the MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation.	
ObjectInstance	M,F	MonitoredEntity.objectInstance where the MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation.	
NotificationId	M	This carries the semantics of notification identifier.	
EventTime	M,F	AlarmInformation.alarmRaisedTime	
SystemDN	C,F	IRPAgent.systemDN where the IRPAgent is related to the AlarmIRP that is related to this AlarmList.	It carries the DN of the IRPAgent.
NotificationType	M,F	“notifyNewAlarm”.	
ProbableCause	M,F	AlarmInformation.probableCause	
PerceivedSeverity	M,F	AlarmInformation.perceivedSeverity	
AlarmType	M, F	AlarmInformation.eventType	The notification structure defined by this table is applicable if this parameter indicates «Communications Alarm », « Processing Error Alarm », « Environmental Alarm ». « Quality Of Service Alarm » or « Equipment Alarm ».
SpecificProblem	O	AlarmInformation.specificProblem	
correlatedNotifications	O	The set of CorrelatedNotification related to this AlarmInformation.	
BackedUpStatus	O	AlarmInformation.backedUpStatus	
BackUpObject	O	MonitoredEntity.objectInstance where the MonitoredEntity is identified by relation-BackUpObject-AlarmInformation of the new AlarmInformation.	It carries the DN of the back up object.
TrendIndication	O	AlarmInformation.trendIndication	
ThresholdInfo	O	AlarmInformation.thresholdInfo	
stateChangeDefinition	O	AlarmInformation.stateChange	
monitoredAttributes	O	AlarmInformation.monitoredAttributes	
proposedRepairActions	O	AlarmInformaton.proposedRepairActions	
AdditionalText	O	AlarmInformation.additionalText	
Alarmed	M	AlarmInformation.alarmId	

6.8.1.2a Input Parameters for notification related to security alarm

Parameter Name	Qualifier	Matching Information	Comment
ObjectClass	M,F	MonitoredEntity.objectClass where the MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation.	
ObjectInstance	M,F	MonitoredEntity.objectInstance where the MonitoredEntity is identified by the relation-AlarmedObject-AlarmInformation of the new AlarmInformation.	
NotificationId	M	This carries the semantics of notification identifier.	
EventTime	M,F	AlarmInformation.alarmRaisedTime	
SystemDN	C,F	IRPAgent.systemDN where the IRPAgent is related to the AlarmIRP that is related to this AlarmList.	It carries the DN of the IRPAgent.
NotificationType	M,F	"notifyNewAlarm".	
probableCause	M,F	AlarmInformation.probableCause	
perceivedSeverity	M,F	AlarmInformation.perceivedSeverity	
alarmType	M, F	AlarmInformation.eventType	The notification structure of this table is applicable if this parameter indicates « Integrity Violation », « Operational Violation », « Physical Violation », « Security Violation », « Time Domain Violation ».
correlatedNotifications	O	The set of CorrelatedNotification related to this AlarmInformation.	
additionalText	O	AlarmInformation.additionalText	
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.
alarmId	M	AlarmInformation.alarmId	

6.87.1.3 Triggering Event

6.87.1.3.1 From-state

`noMatchedAlarm.`

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

6.87.1.3.2 To-state

`newAlarmInAlarmList.`

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

Annex A (normative): Event Types

This appendix lists and explains event types used by this document.

Event type is defined in 3GPP TS 32.302 [5]. The table below lists some of the event types referred to in this document.

Notification IRP: Information Service [5] defines a parameter called `notificationType` that shall be present in all notification. This document defines a parameter called `alarmType` that shall be present in all notifications carrying alarm information. Examples of the `notificationType` are "notification of new alarm", "notification of AlarmList rebuilt", "notification of alarm cleared", etc. Examples of the `alarmType` are the event types defined in table below.

This document also defines an attribute of `AlarmInformation` called `eventType`. The mapping of this `eventType` (internal attribute and not visible to `IRPManager`) to `notificationType` or `alarmType` (both visible to `IRPManager`) is defined in relevant sections of this document. The choice of using "`eventType`" is to keep the list of attributes of `AlarmList` unchanged (compared to Release 99). One can replace this `eventType` with two attributes, called `notificationType` and `alarmType` so that mapping of these two attributes to the externally visible parameters of the same name will be straight-forward.

It is noted that the `AlarmInformation.eventType` can capture more information than the ITU-T defined event types [2]. One example is "notification of alarm list rebuilt".

It is noted that the mapping of the IS `notificationType` and `alarmType` to CMIP's event type or CORBA `event_name` or other fields are specified in the respective SS documents.

TableA.1: Event Types

Event Types	Explanation
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 [2]).
Processing Error Alarm	An alarm of this type is associated with a software or processing fault (ITU-T Recommendation X.733 [2]).
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 [2]).
Quality of Service Alarm	An alarm of this type is associated with degradation in the quality of a service (ITU-T Recommendation X.733 [2]).
Equipment Alarm	An alarm of this type is associated with an equipment fault (ITU-T Recommendation X.733 [2]).
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 violatde 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.

Annex B (normative): Probable Causes

This appendix lists probable causes and their corresponding event types.

Sources of these probable causes are ITU-T Recommendation M.3100 [11], ITU-T Recommendation X.721 [3], ITU-T Recommendation X.733 [2], ITU-T Recommendation X.736 [15] and GSM 12.11 [4].

The list may be extended in the future, e.g. with UMTS-specific probable causes.

Table B.1: Probable Causes from ITU-T Recommendation M.3100 [11]

M.3100 Probable cause	Event type
Indeterminate	Unknown
Alarm Indication Signal (AIS)	Communications
Call Setup Failure	Communications
Degraded Signal	Communications
Far End Receiver Failure (FERF)	Communications
Framing Error	Communications
Loss Of Frame (LOF)	Communications
Loss Of Pointer (LOP)	Communications
Loss Of Signal (LOS)	Communications
Payload Type Mismatch	Communications
Transmission Error	Communications
Remote Alarm Interface	Communications
Excessive Bit Error Rate (EBER)	Communications
Path Trace Mismatch	Communications
Unavailable	Communications
Signal Label Mismatch	Communications
Loss Of Multi Frame	Communications
Back Plane Failure	Equipment
Data Set Problem	Equipment
Equipment Identifier Duplication	Equipment
External IF Device Problem	Equipment
Line Card Problem	Equipment
Multiplexer Problem	Equipment
NE Identifier Duplication	Equipment
Power Problem	Equipment
Processor Problem	Equipment
Protection Path Failure	Equipment
Receiver Failure	Equipment
Replaceable Unit Missing	Equipment
Replaceable Unit Type Mismatch	Equipment
Synchronisation Source Mismatch	Equipment
Terminal Problem	Equipment
Timing Problem	Equipment
Transmitter Failure	Equipment
Trunk Card Problem	Equipment
Replaceable Unit Problem	Equipment
Air Compressor Failure	Environmental
Air Conditioning Failure	Environmental
Air Dryer Failure	Environmental
Battery Discharging	Environmental
Battery Failure	Environmental
Commercial Power Failure	Environmental
Cooling Fan Failure	Environmental
Engine Failure	Environmental
Fire Detector Failure	Environmental
Fuse Failure	Environmental
Generator Failure	Environmental
Low Battery Threshold	Environmental
Pump Failure	Environmental
Rectifier Failure	Environmental
Rectifier High Voltage	Environmental
Rectifier Low F Voltage	Environmental
Ventilation System Failure	Environmental
Enclosure Door Open	Environmental
Explosive Gas	Environmental
Fire	Environmental
Flood	Environmental
High Humidity	Environmental
High Temperature	Environmental
High Wind	Environmental
Ice Build Up	Environmental
Intrusion Detection	Environmental

M.3100 Probable cause	Event type
Low Fuel	Environmental
Low Humidity	Environmental
Low Cable Pressure	Environmental
Low Temperature	Environmental
Low Water	Environmental
Smoke	Environmental
Toxic Gas	Environmental
Storage Capacity Problem	Processing error
Memory Mismatch	Processing error
Corrupt Data	Processing error
Out Of CPU Cycles	Processing error
Software Environment Problem	Processing error
Software Download Failure	Processing error

Table B.2: Probable Causes from ITU-T Recommendation X.721 [3] / ITU-T Recommendation X.733 [2] / ITU-T Recommendation X.736 [15]

X.721/X.733/X.736 Probable Cause	Event type
Adapter Error	Equipment
Application Subsystem Failure	Processing error
Authentication Failure	Security Service or Mechanism Violation
Bandwidth Reduction	Quality of service
Breach of Confidentiality	Security Service or Mechanism Violation
Cable Tamper	Physical Violation
Call Establishment Error	Communications
Communication Protocol Error	Communications
Communication Subsystem Failure	Communications
Configuration or Customizing Error	Processing error
Congestion	Quality of service
Corrupt Data	Processing error
CPU Cycles Limit Exceeded	Processing error
Data Set or Modem Error	Equipment
Degraded Signal	Communications
Delayed Information	Time Domain Violation
Denial of Service	Operational Violation
DTE-DCE Interface Error	Communications
Duplicate Information	Integrity Violation
Enclosure Door Open	Environmental
Equipment Malfunction	Equipment
Excessive Vibration	Environmental
File Error	Processing error
Fire Detected	Environmental
Flood Detected	Environmental
Framing Error	Communications
Heating or Ventilation or Cooling System Problem	Environmental
Humidity Unacceptable	Environmental
Information Missing	Integrity Violation
Information Modification detected	Integrity Violation
Information out of Sequence	Integrity Violation
Input/Output Device Error	Equipment
Input Device Error	Equipment
Intrusion Detection	Physical Violation
Key Expired	Time Domain Violation
LAN Error	Communications
Leak Detection	Environmental
Local Node Transmission Error	Communications
Loss of Frame	Communications
Loss of Signal	Communications
Material Supply Exhausted	Environmental
Multiplexer Problem	Equipment
Non-Repudiation Failure	Security Service or Mechanism Violation
Out of Hours Activity	Time Domain Violation
Out of Memory	Processing error
Out of Service	Operational Violation
Output Device Error	Equipment
Performance Degraded	Quality of service
Power Problem	Equipment
Pressure Unacceptable	Environmental
Procedural Error	Operational Violation
Processor Problem	Equipment
Pump Failure	Environmental
Queue Size Exceeded	Quality of service
Receive Failure	Equipment
Receiver Failure	Equipment
Remote Node Transmission Error	Communications
Resource at or Nearing Capacity	Quality of service
Response Time Excessive	Quality of service

X.721/X.733/X.736 Probable Cause	Event type
Re-transmission Rate Excessive	Quality of service
Software Error	Processing error
Software Program Abnormally Terminated	Processing error
Software Program Error	Processing error
Storage Capacity Problem	Processing error
Temperature Unacceptable	Environmental
Threshold Crossed	Quality of service
Timing Problem	Equipment
Toxic Leak Detected	Environmental
Transmit Failure	Equipment
Transmitter Failure	Equipment
Unauthorised Access Attempt	Security Service or Mechanism Violation
Underlying Resource Unavailable	Processing error
Unexpected Information	Integrity Violation
Unspecified Reason	Operational Violation
Unspecified Reason	Physical Violation
Unspecified Reason	Security Service or Mechanism Violation
Version Mismatch	Processing error

Table B.3: Probable Causes from GSM 12.11 [4]

GSM 12.11 Probable Cause	Event Type
A-bis to BTS interface failure	Equipment
A-bis to TRX interface failure	Equipment
Antenna problem	Equipment
Battery breakdown	Equipment
Battery charging fault	Equipment
Clock synchronisation problem	Equipment
Combiner problem	Equipment
Disk problem	Equipment
Equipment failure	Equipment
Excessive receiver temperature	Equipment
Excessive transmitter output power	Equipment
Excessive transmitter temperature	Equipment
Frequency hopping degraded	Equipment
Frequency hopping failure	Equipment
Frequency redefinition failed	Equipment
Line interface failure	Equipment
Link failure	Equipment
Loss of synchronisation	Equipment
Lost redundancy	Equipment
Mains breakdown with battery back-up	Equipment
Mains breakdown without battery back-up	Equipment
Power supply failure	Equipment
Receiver antenna fault	Equipment
Receiver Failure	Equipment
Receiver multicoupler failure	Equipment
Reduced transmitter output power	Equipment
Signal quality evaluation fault	Equipment
Timeslot hardware failure	Equipment
Transceiver problem	Equipment
Transcoder problem	Equipment
Transcoder or rate adapter problem	Equipment
Transmitter antenna failure	Equipment
Transmitter antenna not adjusted	Equipment
Transmitter failure	Equipment
Transmitter low voltage or current	Equipment
Transmitter off frequency	Equipment
Database inconsistency	Processing error
File system call unsuccessful	Processing error
Input parameter out of range	Processing error
Invalid parameter	Processing error
Invalid pointer	Processing error
Message not expected	Processing error
Message not initialised	Processing error
Message out of sequence	Processing error
System call unsuccessful	Processing error
Timeout expired	Processing error
Variable out of range	Processing error
Watch dog timer expired	Processing error
Cooling system failure	Environmental
External equipment failure	Environmental
External power supply failure	Environmental
External transmission device failure	Environmental
Fan failure	Environmental
High humidity	Environmental
High temperature	Environmental
Intrusion detected	Environmental
Low humidity	Environmental
Low temperature	Environmental
Smoke detected	Environmental
Excessive Error Rate	Quality of service
Reduced alarm reporting	Quality of service
Reduced event reporting	Quality of service

GSM 12.11 Probable Cause	Event Type
Reduced logging capability	Quality of service
System resources overload	Quality of service
Broadcast channel failure	Communications
Connection establishment error	Communications
Invalid message received	Communications
Invalid MSU received	Communications
LAPD link protocol failure	Communications
Local alarm indication	Communications
Remote alarm indication	Communications
Routing failure	Communications
SS7 protocol failure	Communications
Transmission error	Communications

This tTable 20 identifies probable causes that are defined by more than one standard. This is for information only.

Table B.4: Duplicated Probable Causes

Duplicated Probable Cause	GSM 12.11	X.721 X.733	X.736	M.3100	Event Type
Call Establishment Failure (X.721/X.733) Call Setup Failure (M.3100)		X		X	Communications
Degraded Signal		X		X	Communications
Framing Error		X		X	Communications
Loss of Frame		X		X	Communications
Loss of Signal		X		X	Communications
Equipment Failure (GSM 12.11) Equipment Malfunction (X.721/X.733)	X	X			Equipment
Multiplexer Problem		X		X	Equipment
Power Problem		X		X	Equipment
Processor Problem		X		X	Equipment
Receiver Failure	X	X		X	Equipment
Timing Problem		X		X	Equipment
Transmitter Failure	X	X		X	Equipment
Enclosure Door Open		X		X	Environmental
Fan Failure (GSM 12.11) Cooling Fan Failure (M.3100)	X			X	Environmental
Fire Detected (X.721/X.733) Fire (M.3100)		X		X	Environmental
Flood Detected (X.721/X.733) Flood (M.3100)		X		X	Environmental
High Humidity	X			X	Environmental
High Temperature	X			X	Environmental
Intrusion Detected (GSM 12.11) Intrusion Detection (X.736/M.3100)	X		X	X	Environmental (GSM 12.11); Physical Violation (X.736/M.3100)
Low Humidity	X			X	Environmental
Low Temperature	X			X	Environmental
Pump Failure		X		X	Environmental
Smoke Detected (GSM 12.11) Smoke (M.3100)	X			X	Environmental
Storage Capacity Problem		X		X	Processing Error
Excessive Bit Error Rate (M.3100) Excessive Error Rate (GSM12.11)	X			X	
Corrupt Data		X		X	Processing Error

Annex D (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
Mar 2000	S_07	SP-000012	--	--	Approved at TSG SA #7 and placed under Change Control	2.0.0	3.0.0
Mar 2000	--	--	--	--	Cosmetic	3.0.0	3.0.1
Jun 2000	S_08	SP-000250	004	--	Split of TS - Part 2: Alarm Integration Reference Point (IRP): Information Service (IS)	3.0.1	3.1.0
Sep 2000	--	--	--	--	Cosmetic	3.1.0	3.1.1
Sep 2000	S_09	SP-000438	001	--	Correction of qualifier for SystemDN	3.1.1	3.2.0
Sep 2000	S_09	SP-000438	002	--	Addition of a missing constraint in acknowledgeAlarm operation	3.1.1	3.2.0
Dec 2000	S_10	SP-000520	003	--	Incorrect modifiable attributes	3.2.0	3.3.0
Dec 2000	S_10	SP-000520	004	--	Add acknowledgement information to getAlarmList result	3.2.0	3.3.0
Dec 2000	S_10	SP-000520	005	--	Identification of valid Event Types and Extended Event Types within Notifications	3.2.0	3.3.0
Dec 2000	S_10	SP-000520	006	--	A cleared Alarm shall be given perceived severity "Cleared" and nothing else	3.2.0	3.3.0
Dec 2000	S_10	SP-000520	007	--	Inconsistent behaviour for cleared not yet acknowledged alarms	3.2.0	3.3.0
Jun 2001	S_12	SP-010282	008	--	Alarm IRP: IS Rel4 - Addition of feature	3.3.1	4.0.0
Sep 2001	S_13	SP-010474	009	--	Definition of thresholdInfo in Alarm IRP: IS	4.0.0	4.1.0
Dec 2001	S_14	SP-010639	010	--	Correction of notifyChangedAlarm example #2	4.1.0	4.2.0
Dec 2001	S_14	SP-010639	011	--	Update of notificationId missing in To-state of notifyClearedAlarm	4.1.0	4.2.0
Mar 2002	S_15	SP-020028	012	--	Addition of "perceivedSeverity" as parameter to "acknowledgeAlarms operation" (IS)	4.2.0	4.3.0
Mar 2002	S_15	SP-020039	013	--	Addition of parameter in Alarm List Rebuilt notification	4.2.0	4.3.0
Mar 2002	S_15	SP-020039	014	--	Addition of new notification notifyPotentialFaultyAlarmList	4.2.0	4.3.0
Mar 2002	S_15	SP-020039	015	--	Additional trigger event for notifyAlarmListRebuilt	4.2.0	4.3.0
Mar 2002	S_15	--	--	--	Automatic upgrade to Rel-5 (no Rel-5 CR)	4.3.0	5.0.0

3GPP TSG-SA5 (Telecom Management) Meeting #30 **S5-026729**
Tampere, Finland, 19 – 23 August 2002

CR-Form-v7

CHANGE REQUEST

⌘ **32.111-3** **CR** **021** ⌘ **rev** **-** ⌘ Current version: **5.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ [ ] ME [ ] Radio Access Network [X] Core Network [X]

Title:	⌘	Add security alarms support in Alarm IRP: CORBA SS
Source:	⌘	S5
Work item code:	⌘	OAM-NIM
Date:	⌘	23/08/2002
Category:	⌘	**B**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	Security alarms can not be handled in the Alarm IRP
Summary of change:	⌘	Add a new notification structure to carry security alarm information. Update mapping tables to reflect new parameters to carry security alarms; Update references; update IDL to include event types and probable causes defined in ITU-T X.736.
Consequences if not approved:	⌘	Security alarms cannot be handled over Itf-N.

Clauses affected:	⌘	Section 5.3 Table 10; Table 10-A; Annex A

		Y	N		
Other specs affected:	⌘		X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	

Other comments:	⌘	"Child" CR of "Parent" CR 32.111-2 (S5-026731)

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm.
Below is a brief summary: …

5.3 Notification parameter mapping

Reference 3G TS 32.111-2 [6] defines semantics of parameters carried in notifications. The following tables indicate the mapping of these parameters to their OMG CORBA Structured Event (defined in OMG Notification Service [1]) equivalents. The composition of OMG Structured Event, as defined in the OMG Notification Service [1], is:

```
Header
      Fixed Header
           domain_name
           type_name
           event_name
      Variable Header
Body
      filterable_body_fields
      remaining_body
```

The following tables list all OMG Structured Event attributes in the second column. The first column identifies the Alarm IRP: IS [6] defined notification parameters.

Table 10: Mapping for `notifyNewAlarm` (to carry non-security-related alarms)

IS Parameters	OMG CORBA Structured Event attribute	Qualifier	Comment
There is no corresponding SS attribute.	domain_name		It carries the IRP document version number string. See sub-clause 3.3. It indicates the syntax and semantics of the Structured Event as defined by this specification.
notificationType	type_name	M	This is the NOTIFY_FM_NEW_ALARM of interface NotificationType of module AlarmIRPConstDefs.
alarmType	event_name	M	It identifies one of the following: communications alarm, processing error alarm, environmental alarm, quality of service alarm and equipment alarm. It is a string defined by interface AlarmType of module AlarmIRPConstDefs.
There is no corresponding SS attribute.	variable Header		
objectClass, objectInstance	One NV pair of filterable_ body_fields	M	NV stands for name-value pair. Order arrangement of NV pairs is not significant. The name of NV-pair is always encoded in string. Name of NV pair is the MANAGED_OBJECT_INSTANCE of interface AttributeNameValue of module NotificationIRPConstDefs. Value of NV pair is a string.
notification Id	One NV pair of filterable_ body_fields	M	Name of NV pair is the NOTIFICATION_ID of interface AttributeNameValue of module NotificationIRPConstDefs. Value of NV pair is a long.
eventTime	One NV pair of filterable_ body_fields	M	Name of NV pair is the EVENT_TIME of interface AttributeNameValue of module NotificationIRPConstDefs. Value of NV pair is a IRPTime of module ManagedGenericIRPConstDefs.
systemDN	One NV pair of filterable_ body_fields	M	Name of NV pair is the SYSTEM_DN of interface AttributeNameValue of module NotificationIRPConstDefs. Value of NV pair is a string.
probableCause	One NV pair of filterable_ body_fields	M	Name of NV pair is the PROBABLE_CAUSE of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is a short defined by interface ProbableCause of module AlarmIRPConstDefs.
perceivedSeverity	One NV pair of filterable_ body_fields	M	Name of NV pair is the PERCEIVED_SEVERITY of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is a short defined by interface PerceivedSeverity of module AlarmIRPConstDefs.
specificProblem	One NV pair of filterable_ body_fields	O	Name of NV pair is the SPECIFIC_PROBLEM of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is a string.
correlatedNotifications	One NV pair of filterable_ body_fields	O	Name of NV pair is the CORRELATED_NOTIFICATIONS of interface AttributeNameValue. Value of NV pair is a CorrelatedNotificationSetType of module AlarmIRPConstDefs.
backedUpStatus	One NV pair of filterable_ body_fields	O	Name of NV pair is the BACKED_UP_STATUS of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is a boolean BackedUpStatusType of module AlarmIRPConstDefs.
backUpObject	One NV pair of	O	Name of NV pair is the BACK_UP_OBJECT of interface

IS Parameters	OMG CORBA Structured Event attribute	Qualifier	Comment
	filterable_ body_fields		AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is a string carrying of DN of the back-up object. See 3G TS 32.300 [3] for the DN string representation.
trendIndication	One NV pair of filterable_ body_fields	O	Name of NV pair is the TREND_INDICATION of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is an enum TrendIndicationType of module AlarmIRPConstDefs.
thresholdInfo	One NV pair of filterable_ body_fields	O	Name of NV pair is the THRESHOLD_INFO of interface ParameterNameValue of module AlarmIRPConstDefs. Value of NV pair is a ThresholdInfoType of module AlarmIRPConstDefs.
stateChange Definition	One NV pair of filterable_ body_fields	O	Name of NV pair is the STATE_CHANGE_DEFINITION of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is an AttributeChangeSetType of module AlarmIRPConstDefs.
monitoredAttributes	One NV pair of filterable_ body_fields	O	Name of NV pair is the MONITORED_ATTRIBUTES of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is an AttributeSetType of module AlarmIRPConstDefs.
proposedRepairActions	One NV pair of filterable_ body_fields	O	Name of NV pair is the PROPOSED_REPAIR_ACTIONS of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is a string.
additionalText	One NV pair of filterable_ body_fields	O	Name of NV pair is the ADDITIONAL_TEXT of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is a string.
alarmId	One NV pair of filterable_ body_fields	M	Name of NV pair is the ALARM_ID of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is a string. If the string is a zero-length string or if this NV pair is absent, the default semantics is that alarmId is a concatenation of managedObjectInstance, eventType, probableCause and specificProblem, if present, of this Structured Event. Since probableCause is encoded as a short, it shall be converted into string before concatenation. The resultant string shall not contain spaces.
There is no corresponding IS attribute.	remaining_ body		

Table 10-A: Mapping for `notifyNewAlarm` (to carry security alarm)

IS Parameters	OMG CORBA Structured Event attribute	Qualifier	Comment
There is no corresponding SS attribute.	domain_name		It carries the IRP document version number string. See sub-clause 3.3. It indicates the syntax and semantics of the Structured Event as defined by this specification.
notificationType	type_name	M	This is the NOTIFY_FM_NEW_ALARM of interface NotificationType of module AlarmIRPConstDefs.
alarmType	event_name	M	It identifies one of the following: Integrity violation, operational violation, physical violation, security violation and time domain violation. It is a string defined by interface AlarmType of module

IS Parameters	OMG CORBA Structured Event attribute	Qualifier	Comment
			AlarmIRPConstDefs.
There is no corresponding SS attribute.	variable Header		
objectClass, objectInstance	One NV pair of filterable_ body_fields	M	NV stands for name-value pair. Order arrangement of NV pairs is not significant. The name of NV-pair is always encoded in string. Name of NV pair is the MANAGED_OBJECT_INSTANCE of interface AttributeNameValue of module NotificationIRPConstDefs. Value of NV pair is a string.
notification Id	One NV pair of filterable_ body_fields	M	Name of NV pair is the NOTIFICATION_ID of interface AttributeNameValue of module NotificationIRPConstDefs. Value of NV pair is a long.
eventTime	One NV pair of filterable_ body_fields	M	Name of NV pair is the EVENT_TIME of interface AttributeNameValue of module NotificationIRPConstDefs. Value of NV pair is a IRPTime of module ManagedGenericIRPConstDefs.
systemDN	One NV pair of filterable_ body_fields	M	Name of NV pair is the SYSTEM_DN of interface AttributeNameValue of module NotificationIRPConstDefs. Value of NV pair is a string.
probableCause	One NV pair of filterable_ body_fields	M	Name of NV pair is the PROBABLE_CAUSE of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is a short defined by interface ProbableCause of module AlarmIRPConstDefs.
perceivedSeverity	One NV pair of filterable_ body_fields	M	Name of NV pair is the PERCEIVED_SEVERITY of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is a short defined by interface PerceivedSeverity of module AlarmIRPConstDefs.
correlatedNotifications	One NV pair of filterable_ body_fields	O	Name of NV pair is the CORRELATED_NOTIFICATIONS of interface AttributeNameValue. Value of NV pair is a CorrelatedNotificationSetType of module AlarmIRPConstDefs.
additionalText	One NV pair of filterable_ body_fields	O	Name of NV pair is the ADDITIONAL_TEXT of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is a string.
alarmId	One NV pair of filterable_ body_fields	M	Name of NV pair is the ALARM_ID of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is a string. If the string is a zero-length string or if this NV pair is absent, the default semantics is that alarmId is a concatenation of managedObjectInstance, eventType, probableCause and specificProblem, if present, of this Structured Event. Since probableCause is encoded as a short, it shall be converted into string before concatenation. The resultant string shall not contain spaces.
serviceUser	One NV pair of filterable_ body_fields	M	Name of NV pair is the SERVICE_USER of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is a string.
serviceProvider	One NV pair of filterable_ body_fields	M	Name of NV pair is the SERVICE_PROVIDER of interface AttributeNameValue of module AlarmIRPConstDefs. Value of NV pair is a string.
securityAlarmDetector	One NV pair of filterable_ body_fields	M	Name of NV pair is the SECURITY_ALARM_DETECTOR of interface AttributeNameValue of module AlarmIRPConstDefs.

IS Parameters	OMG CORBA Structured Event attribute	Qualifier	Comment
			Value of NV pair is a string.
There is no corresponding IS attribute.	remaining_body		

• • •

Annex A (normative): IDL specification (file name “AlarmIRPConstDefs.idl”)

…

```
/*
   This block identifies the alarm types specified for this IRP version.
   These types carry the same semantics as the TMN ITU-T defined event
   types of the same name.
   Their encodings for this version of Alarm IRP are defined here.  Other IRP
   documents, or other versions of Alarm IRP, shall identify their own
   alarm types for their use.  They shall define their encodings
   as well.  Values defined here are unique among themselves.
   */
   interface AlarmType
   {
      const string COMMUNICATIONS_ALARM = "x1";
      const string PROCESSING_ERROR_ALARM = "x2";
      const string ENVIRONMENTAL_ALARM = "x3";
      const string QUALITY_OF_SERVICE_ALARM = "x4";
      const string EQUIPMENT_ALARM = "x5";
      const string INTEGRITY_VIOLATION = "x6";
      const string OPERATIONAL_ VIOLATION = "x7";
      const string PHYSICAL_VIOLATION = "x8";
      const string SECURITY_SERVICE_OR_MECHANISM_VIOLATION = "x9";
      const string TIME_DOMAIN_VIOLATION = "x10";
   };
```

…

```
      const short LAPD_LINK_PROTOCOL_FAILURE = 569;
      const short LOCAL_ALARM_INDICATION = 570;
      const short REMOTE_ALARM_INDICATION = 571;
      const short ROUTING_FAILURE = 572;
      const short SS7_PROTOCOL_FAILURE = 573;
      const short TRANSMISSION_FAILURE = 574;
      const short AUTHENTICATION_FAILURE= 575;
      const short BREACH_OF_CONFIDENTIALITY = 576;
      const short CABLE_TAMPER = 577;
      const short DELAYED_INFORMATION = 578;
      const short DENIAL_OF_SERVICE = 579;
      const short DUPLICATE_INFORMATION = 580;
      const short INFORMATION_MISSING = 581;
      const short INFORMATION_MODIFICATION_DETECTED = 582;
      const short INFORMATION_OUT_OF_SEQUENCE = 583;
      const short INTRUSION_DETECTION = 584;
      const short KEY_EXPIRED = 585;
      const short NON_REPUDIATION_FAILURE = 586;
      const short OUT_OF_HOURS_ACTIVITY = 587;
      const short OUT_OF_SERVICE = 588;
      const short PROCEDURAL_ERROR = 589;
      const short UNAUTHORISED_ACCESS_ATTEMPT = 590;
      const short UNEXPECTED_INFORMATION= 591;
      const short UNSPECIFIED_REASON = 592;

   };

   /*
   This block identifies the acknowledgement state of a reported alarm.
```

```
   */
   interface AckState
```

...