Technical Specification Group Services and System Aspects TSGS#22(03)0627
Meeting #22, Maui, USA, 15-18 December 2003

Source: SA5 (Telecom Management)

Title: 2 Rel-5 CR 32.111-4 (Fault Management; Alarm IRP CMIP solution set) : Various Corrections

Document for: Decision

Agenda Item: 7.5.3

Doc-1st-Level	Spec	CR	Ph	Subject	Cat	Ver-Cur	Doc-2nd-Level	WI
SP-030627	32.111-4	023	Rel-5	Add missing parts for the support of security alarms	F	5.6.0	S5-037258	OAM-NIM
SP-030627	32.111-4	024	Rel-5	Mapping completion of getAlarmList	F	5.6.0	S5-037276	OAM-NIM

CR-Form-v7

CHANGE REQUEST

⌘	**32.111-4**	**CR**	**023**	⌘ **rev**	**-**	⌘	Current version:	**5.6.0** ⌘

*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 missing parts for the support of security alarms
Source:	⌘	**SA5** (olaf.pollakowski@siemens.com)
Work item code:	⌘	OAM-NIM
Date:	⌘	21/11/2003
Category:	⌘	**F**
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:	⌘	As for the support of security alarms the GDMO definitions are incomplete, because they just refer to the normal alarm notifications and not to security alarm notifications.
Summary of change:	⌘	The security alarm notifications defined in ITU-T Rec. X.736 are added to the normal alarm notifications defined in ITU-T Rec. X.733.
Consequences if not approved:	⌘	The CMIP SS does not support security alarm notifications and is hence not aligned with the IS.

Clauses affected: ⌘ 2, 4, 5

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

Other comments: ⌘

Change in Clause 2

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] 3GPP TS 32.302: "Telecommunication management; Configuration Management (CM); Notification Integration Reference Point (IRP): Information service".

[2] ITU-T Recommendation X.710: "Information technology - Open Systems Interconnection - Common Management Information Service".

[3] ITU-T Recommendation X.711: "Information technology - Open Systems Interconnection - Common Management Information Protocol: Specification".

[4] ITU-T Recommendation X.721: "Information technology - Open Systems Interconnection - Structure of management information: Definition of management information".

[5] ITU-T Recommendation X.733: "Information technology - Open Systems Interconnection - Systems Management: Alarm reporting function".

[6] ITU-T Recommendation X.734: "Information technology - Open Systems Interconnection - Systems Management: Event report management function".

[7] ITU-T Recommendation Q.821: "Stage 2 and Stage 3 description for the Q3 interface - Alarm Surveillance".

[8] 3GPP TS 32.111-1: "Telecommunication management; Fault Management; Part 1: 3G fault management requirements".

[9] 3GPP TS 32.111-2: "Telecommunication management; Fault Management; Part 2: Alarm Integration Reference Point (IRP): Information service".

[10] 3GPP TS 32.304: "Telecommunication management; Configuration Management (CM); Notification Integration Reference Point (IRP): Common Management Information Protocol (CMIP) solution set ".

[11] 3GPP TS 32.312: "Telecommunication management; Generic Integration Reference Point (IRP) management; Information service".

[12] ITU-T Recommendation X.736: "Information technology - Open Systems Interconnection - Systems Management: Security alarm reporting function".

End of Change in Clause 2

Change in Clause 4 & 5

4 Basic aspects

The present document provides all the GDMO and ASN.1 definitions necessary to implement the Alarm IRP Information Service (3GPP TS 32.111-2 [9]) for the CMIP interface.

4.1 Architectural aspects

The Alarm IRP Information Service description is based on Information Object Classes (IOC), Relationships among IOC and Interfaces (used or implemented by IOC) which include Operations and/or Notifications.

In the present document, for the CMIP interfaces the IOC are modelled as GDMO "Managed Object Classes" (MOC) defined specifically for alarm management, the Operations are modelled as GDMO "Actions" of a MOC while the Notifications are modelled as GDMO "Notifications" included in MOCs that need to report events to the Manager. In more detail, the Notifications related to alarm management are included in a MOC defined in the present document while the Notifications defined for alarm reporting are not included in any MOC defined in the present document. They will be included in other MOCs defined in other CMIP Solution Set or in other CMIP Information Models.

Regarding the Notifications, the present document is based on the Notification IRP CMIP Solution Set (3GPP TS 32.304 [10]).

4.1.1 Reporting new alarms

In case of an alarm occurrence the Agent notifies all subscribed Managers that a new alarm has occurred and has been added into the alarm list of the Agent.

For this purpose the standardised alarm notifications defined in ITU-T Recommendations X.721 [4], ~~and~~ X.733 [5] and X.736 [12] are used.

4.1.2 Reporting changed alarms

Although in the Alarm IRP Information Service (3GPP TS 32.111-2 [9]) there is a notification specifically defined to report the event of alarm attribute changes, on the CMIP interfaces such events are reported according to ITU-T Recommendations X.721 [4], ~~and~~ X.733 [5] and X.736 [12], i.e. the original alarm is first cleared (by means of a clear alarm notification) and then a new alarm notification with the changed parameter values is generated by the Agent.

4.1.3 Reporting cleared alarms

On the CMIP interfaces the clearing of alarms is reported by the Agent to the Managers in accordance with the mechanisms defined in ITU-T Recommendation X.733 [5], X.736 [12] and ITU-T Recommendation Q.821 [7].

4.1.4 Acknowledgment of alarms

This clause relates to the co-operative alarm acknowledgment managed on Itf-N, which implies that the acknowledgment of alarms can be done on both NM and EM.

The acknowledgment of alarms is managed by means of the MOC `alarmControl`, which includes:

- one action to acknowledge alarms (*acknowledgeAlarms*);
- one action to unacknowledge alarms (*unacknowledgeAlarms*);
- ITU-T Recommendation X.721 [4] compliant Alarm Notification to inform Managers about changes of acknowledgment state.

In case an alarm is acknowledged by an operator or automatically by a management system, the `ackUserId, ackSystemId, ackState` and `ackTime` information is stored in the *additionalInformation* field of the alarm present in the alarm list.

4.1.5 Management of comments associated to alarms

This feature provides the NM and EM operators with the capability to add comments to an alarm and to share such information among all the OS (EM and NM) that are involved in the network management. This implies that a synchronisation of the comments between the EM and NM shall be possible. An OS shall have the capability to record more than one comment for each alarm.

The management of the comments associated to alarms is similar to the management of the acknowledgment of alarms and is achieved by means of the same MOC `alarmControl`. For the management of the comments, the MOC `alarmControl` includes

- one action (*setComment*) allowing the NM operator to add a comment to one or several alarms;
- ITU-T Recommendation X.721 [4] compliant alarm notifications to inform the IRPManagers about changes of alarm related comments. Such notifications are generated by the Agent towards all connected Managers either if the comment is made by an NM operator (i.e. after the completion of a previous *setComment* request) or if the comment is made by an EM operator.

4.1.6 Alignment of alarm conditions over the Itf-N

The IRP Manager is able to trigger the alarm conditions alignment using the Action *getAlarmList*

The following specifies the logical steps of the alignment procedure, by describing a possible implementation. Any other implementation showing the same behaviour on the Itf-N interface is compliant with the present document.

- The Manager sends to the Agent a *getAlarmList* request containing the following information:
  - *alarmAckState*, used to select the alarms from the Agent's alarm list for the current alignment (e.g. all active alarms).
  - *destination*, identifying the destination to which event reports that have passed the filter conditions are sent.
  - *filter*, this optional parameter defines the conditions an alarm notification shall fulfil in order to be forwarded to the Manager. It applies only for the current alignment request.
- After evaluation of the request, the Agent first generates an *alignmentId* value, which unambiguously identifies this alignment process. This value is used by the Manager to correlate alarm reports to the corresponding alignment requests, in case this Manager issues several alarm alignments in parallel.
  - The Agent creates a temporary Event Forwarding Discriminator (EFD) instance for the purpose of this alarm alignment, using the parameters *destination* and *filter* received in the request. If the *filter* parameter is absent in the alarm synchronisation request, all alarm notifications are forwarded to the Manager through this EFD, taking into account both the filter constraint currently active for the event reporting to the manager having invoked the synchronisation request andthe value of the parameter *alarmAckState*.
    The filter is set by the Agent automatically in order to forward only those alarm notifications containing, at the beginning of the field *additionalText*, either the string "(ALIGNMENT-<alignmentId>)" or the string "(ALIGNMENTEND-<alignmentId>)".
- The Agent sends back a *getAlarmList* response, which contains the *alignmentId* described above and the *status* information, indicating the result of the request. (see the message flow in Figure 1).
- The Agent scans now its alarm list. For every alarm, which matches the criteria defined by the *alarmAckState* parameter, the Agent inserts, at the beginning of the field *additionalText*, the string "(ALIGNMENT-<alignmentId>)". According to ITU-T Recommendation X.734 [6], the Agent forwards these alarm notifications towards all EFDs.
  In the last alarm of the list the Agent inserts the string "(ALIGNMENTEND-<alignmentId>)" to indicate the end of the alarm alignment.

NOTE: These alarm notifications can reach the current Manager only via the temporary EFD created for the current alignment. They are filtered out:

a) By all the EFD instances used for "real-time" alarm reporting, due to the presence of the sub-string "ALIGNMENT" in the field *additionalText* (see 3GPP TS 32.304 [10]).

b) By all temporary EFD instances possibly created for parallel alignments, due to the presence of the unambiguous sub-string "<alignmentId>" in the *additionalText* field.

- After sending the last alarm report (identified by the sub-string "ALIGNMENTEND" in the *additionalText),* the Agent automatically deletes the temporary EFD instance (see figure 1).

At the end of the alarm conditions alignment the acknowledgement state and the comments assigned to each alarm are implicitly synchronised between the IRPAgent and the IRPManager that has requested the alignment.

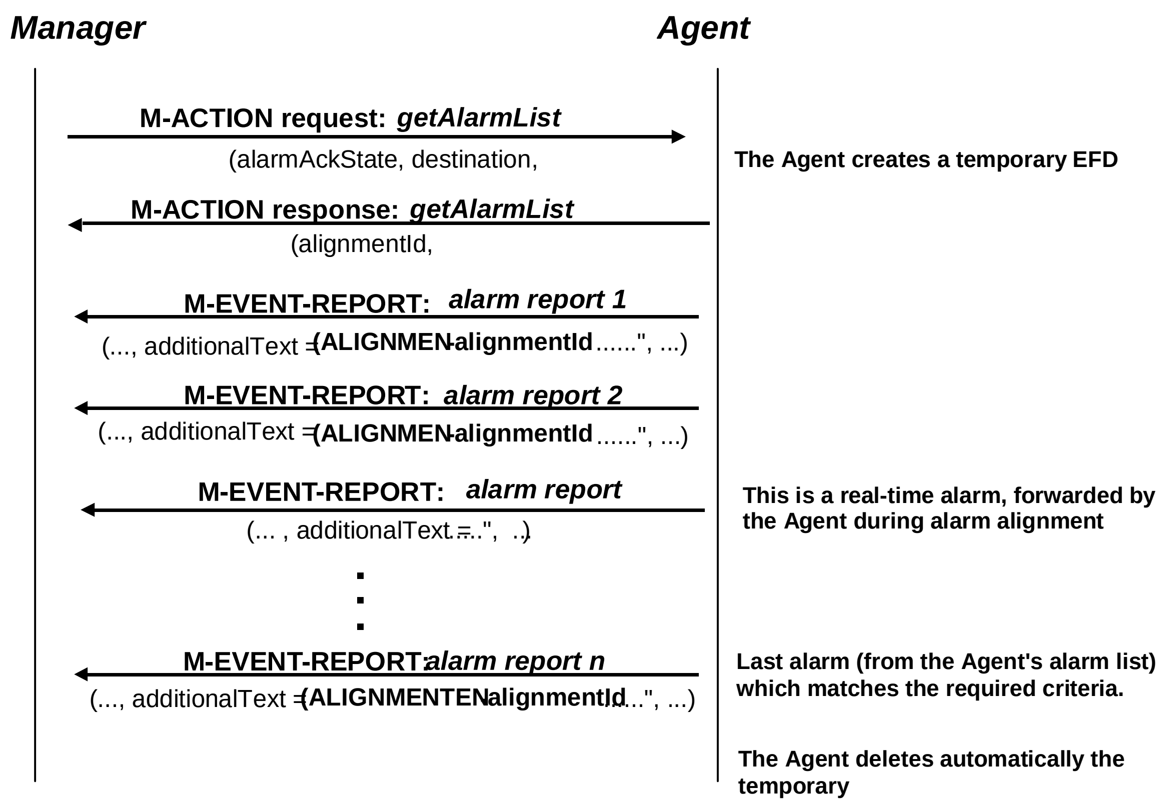

Manager
Agent
M-ACTION request: getAlarmList
(alarmAckState, destination,
The Agent creates a temporary EFD
M-ACTION response: getAlarmList
(alignmentId,
M-EVENT-REPORT: alarm report 1
(..., additionalText ="ALIGNMENT alignmentId ......", ...)
M-EVENT-REPORT: alarm report 2
(..., additionalText ="ALIGNMENT alignmentId ......", ...)
M-EVENT-REPORT: alarm report
(... , additionalText = "...", ...)
This is a real-time alarm, forwarded by the Agent during alarm alignment
M-EVENT-REPORT: alarm report n
(..., additionalText ="ALIGNMENTEND alignmentId ...", ...)
Last alarm (from the Agent's alarm list) which matches the required criteria.
The Agent deletes automatically the temporary

Figure 1: Alignment arrow diagram

Figure 2 shows the handling of a "real-time" alarm notification (occurred during the execution of the *getAlarmList* operation), which is forwarded by the Agent (according to ITU-T Recommendation X.734 [6]) to all currently available EFD instances. Dependent on the *discriminatorConstruct* setting of every EFD, such an alarm may or may not reach the related Manager. In any case, this alarm is filtered out by the temporary EFD assigned to the Manager, which triggered the *getAlarmList* request.

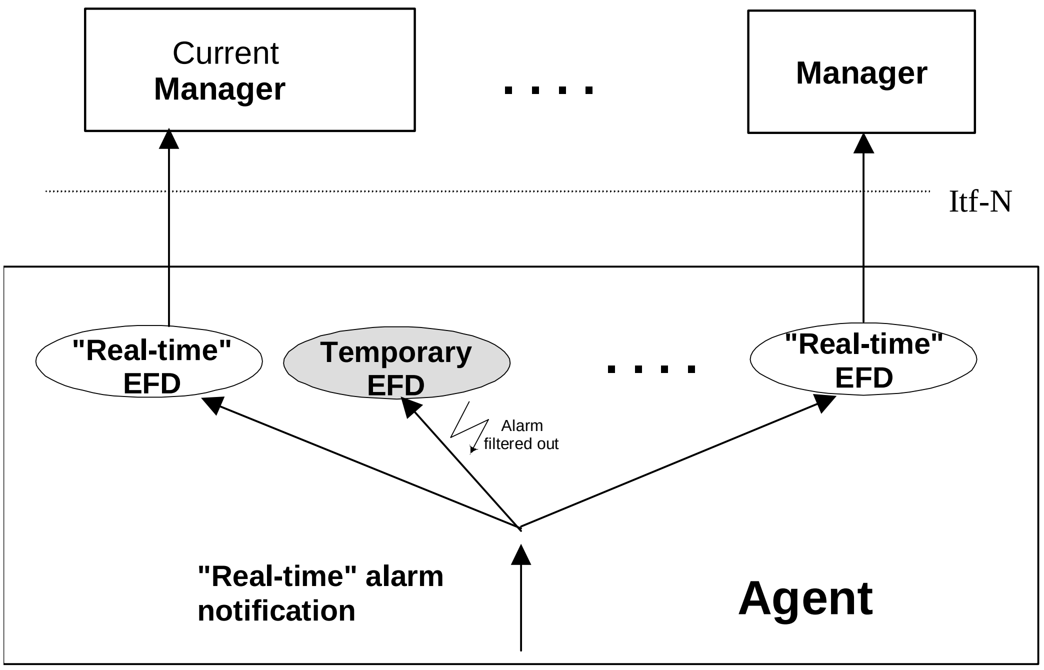


Figure 2: Treatment of "real time" alarms

Figure 3 shows the handling of an alarm notification from the alarm list, matching the criteria defined in the parameters *alarmAckState* of the *getAlarmList* request and forwarded by the Agent to all EFD instances as well. This alarm is filtered out by all EFD instances in charge of discrimination of "real-time" alarms and can reach only the Manager, which triggered the *getAlarmList* request, because it passes the temporary EFD instance assigned to this Manager.

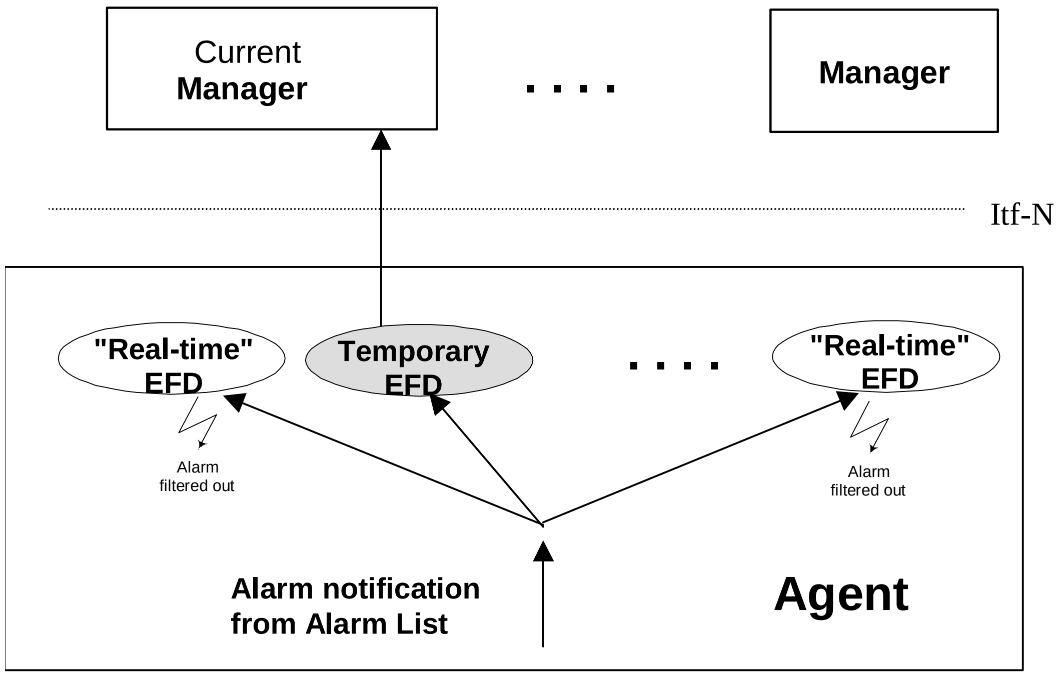


Figure 3: Treatment of "alignment" alarms

4.2 Mapping

The semantics of the Alarm IRP is defined in 3GPP TS 32.111-2 [9]. The definitions of the management information defined there are independent of any implementation technology and protocol. This clause maps these protocol-independent definitions onto the equivalences of the CMIP solution set of Alarm IRP.

4.2.1 Mapping of Information Object Classes

For this Alarm IRP CMIP Solution Sets, the Information Object Classes (IOC) and the Interfaces defined in 3GPP TS 32.111-2 [9] are mapped to a Managed Object Classes (MOC) named `alarmControl` which includes all the Attributes, Actions and Notifications necessary to model the management described in (3GPP TS 32.111-2 [9]).

4.2.2 Mapping of Operations

Table 1 maps the Interface/Operations defined in the IS of the Alarm IRP to their equivalents in the CMIP SS. The equivalents are qualified as Mandatory (M) or Optional (O).

Table 1: Mapping of Operations

IS Interface	IS Operation	CMIP SS Equivalent	Qualifier
AlarmIRPOperations_1	acknowledgeAlarms	CMISE M-ACTION service, ~~A~~action ~~T~~type: acknowledgeAlarms	M
	getAlarmList	CMISE M-ACTION service, action type: getAlarmList	M
AlarmIRPOperations_2	getAlarmCount	CMISE M-ACTION service, action type: getAlarmCount	O
AlarmIRPOperations_3	unacknowledgeAlarms	CMISE M-ACTION service, action type: unacknowledgeAlarms	O
AlarmIRPOperations_4	setComment	CMISE M-ACTION service, action type: setComment	O
AlarmIRPOperations_5	clearAlarms	CMISE M-ACTION service, action type: clearAlarms	O
GenericIRPVersionOperation	getIRPVersion	CMISE M-ACTION service, action type: getAlarmIRPVersion	M
GenericIRPProfileOperation	getNotificationProfile	CMISE M-ACTION service, action type: getAlarmIRPNotificationProfile	O
GenericIRPProfileOperation	getOperationProfile	CMISE M-ACTION service, action type: getAlarmIRPOperationProfile	O

NOTE: The Interfaces GenericIRPVersionOperation and GenericIRPProfileOperation are defined in 3GPP TS 32.312 [11].

4.2.3 Mapping of Operation Parameters

The tables in the following clauses show the parameters of each operations defined in the IS 3GPP TS 32.111-2 [9] and their equivalents in this CMIP SS.

The input parameters of the operations are mapped into "Action information" (see GDMO and ASN.1 definitions for more details).

The output parameters of the operations are mapped into "Action response" (see GDMO and ASN.1 definitions for more details).

Table 2: Parameter mapping of the operation *acknowledgeAlarms*

IS Parameter	IN/OUT	CMIP SS Equivalent	Qualifier
alarmInformationAndSeverityReferenceList	IN	M-ACTION parameter 'Action information' (AckOrUnackAlarmsInfo): alarmReferenceList (note)	M
alarmInformationAndSeverityReferenceList	IN	M-ACTION parameter 'Action information' (AckOrUnackAlarmsInfo): AlarmReferenceList (note)	M
ackUserId	IN	M-ACTION parameter 'Action information' (AckOrUnackAlarmsInfo): ackUserId	M
ackSystemId	IN	M-ACTION parameter 'Action information' (AckOrUnackAlarmsInfo): ackSystemId	O
badAlarmInformationReferenceList	OUT	M-ACTION parameter 'Action reply' (AckOrUnackAlarmsReply): errorAlarmReferenceList	M
status	OUT	M-ACTION parameter 'Action reply' (AckOrUnackAlarmsReply): status	M
NOTE: severity verification not required in CMIP solution set.			

Table 3: Parameter mapping of the operation *getAlarmCount*

IS Parameter	IN/OUT	CMIP SS Equivalent	Qualifier
filter	IN	M-ACTION parameter 'Action information' (GetAlarmCountInfo): filter	O
alarmAckState	IN	M-ACTION parameter 'Action information' (GetAlarmCountInfo): alarmAckState	O
criticalCount	OUT	M-ACTION parameter 'Action reply' (GetAlarmCountReply): criticalCount	M
majorCount	OUT	M-ACTION parameter 'Action reply' (GetAlarmCountReply): majorCount	M
minorCount	OUT	M-ACTION parameter 'Action reply' (GetAlarmCountReply): minorCount	M
warningCount	OUT	M-ACTION parameter 'Action reply' (GetAlarmCountReply): warningCount	M
indeterminateCount	OUT	M-ACTION parameter 'Action reply' (GetAlarmCountReply): indeterminateCount	M
clearedCount	OUT	M-ACTION parameter 'Action reply' (GetAlarmCountReply): clearedCount	M
status	OUT	M-ACTION parameter 'Action reply' (GetAlarmCountReply): status	M

Table 4: Parameter mapping of the operation *getAlarmList*

IS Parameter	IN/OUT	CMIP SS Equivalent	Qualifier
filter	IN	filter	O
alarmAckState	IN	alarmAckState	O
--		destination (input) - see note 1	M
alarmInformationList	OUT	(sequence of alarm notifications) (see subclause 4.5)	M
status	OUT	status	M
--		alignmentId (output) - see note 2	M
NOTE 1: Destination is a CMIP specific parameter and is determined by the Manager. NOTE 2: AlignmentId is a CMIP specific parameter and is determined by the Agent.			

Table 5: Parameter mapping of the operation *getAlarmIRPVersion*

IS Parameter	IN/OUT	CMIP SS Equivalent	Qualifier
versionNumberSet	OUT	M-ACTION parameter 'Action reply' (GetAlarmIRPVersionReply): versionNumberList	M
status	OUT	M-ACTION parameter 'Action reply' (GetAlarmIRPVersionReply): status	M

Table 6: Parameter mapping of the operation *getOperationProfile*

IS Parameter	IN/OUT	CMIP SS Equivalent	Qualifier
irpVersion	IN	M-ACTION parameter 'Action information': irpVersionNumber	M
operationNameProfile	OUT	M-ACTION parameter 'Action reply' (GetOperationProfileReply): operationNameProfile	M
operationParameterProfile	OUT	M-ACTION parameter 'Action reply' (GetOperationProfileReply): operationParameterProfile	M
status	OUT	M-ACTION parameter 'Action reply' (GetOperationProfileReply): status	M

Table 7: Parameter mapping of the operation *getNotificationProfile*

IS Parameter	IN/OUT	CMIP SS Equivalent	Qualifier
irpVersion	IN	M-ACTION parameter 'Action information': irpVersionNumber	M
notificationNameProfile	OUT	M-ACTION parameter 'Action reply' (GetNotificationProfileReply): notificationNameProfile	M
notificationParameterProfile	OUT	M-ACTION parameter 'Action reply' (GetNotificationProfileReply): notificationParameterProfile	M
status	OUT	M-ACTION parameter 'Action reply' (GetNotificationProfileReply): status	M

Table 8: Parameter mapping of the operation *setComment*

IS Parameter	IN/OUT	CMIP SS Equivalent	Qualifier
alarmInformationReferenceList	IN	M-ACTION parameter 'Action information' (SetCommentInfo): alarmReferenceList	M
commentUserId	IN	M-ACTION parameter 'Action information' (SetCommentInfo): commentUserId	M
commentSystemId	IN	M-ACTION parameter 'Action information' (SetCommentInfo): commentSystemId	O
commentText	IN	M-ACTION parameter 'Action information' (SetCommentInfo): commentText	M
badAlarmInformationReferenceList	OUT	M-ACTION parameter 'Action reply' (SetCommentReply): errorAlarmReferenceList	M
status	OUT	M-ACTION parameter 'Action reply' (SetCommentReply): status	M

Table 9: Parameter mapping of the operation *unacknowledgeAlarms*

IS Parameter	IN/OUT	CMIP SS Equivalent	Qualifier
alarmInformationReferenceList	IN	M-ACTION parameter 'Action information' (AckOrUnackAlarmsInfo): alarmReferenceList	M
ackUserId	IN	M-ACTION parameter 'Action information' (AckOrUnackAlarmsInfo): ackUserId	M
ackSystemId	IN	M-ACTION parameter 'Action information' (AckOrUnackAlarmsInfo): ackSystemId	O
badAlarmInformationReferenceList	OUT	M-ACTION parameter 'Action information' (AckOrUnackAlarmsReply): errorAlarmReferenceList	M
status	OUT	M-ACTION parameter 'Action information' (AckOrUnackAlarmsReply): status	M

Table 10: Parameter mapping of the operation *clearAlarms*

IS Parameter	IN/OUT	CMIP SS Equivalent	Qualifier
alarmInformationReferenceList	IN	M-ACTION parameter 'Action information' (ClearAlarmsInfo): alarmReferenceList	M
clearUserId	IN	M-ACTION parameter 'Action information' (ClearAlarmsInfo): clearUserId	M
clearSystemId	IN	M-ACTION parameter 'Action information' (ClearAlarmsInfo): clearSystemId	O
badAlarmInformationReferenceList	OUT	M-ACTION parameter 'Action reply' (ClearAlarmsReply): errorAlarmReferenceList	M
status	OUT	M-ACTION parameter 'Action reply' (ClearAlarmsReply): status	M

4.2.4 Mapping of Notifications

Table 10 maps the Notifications defined in the Information Service of the Alarm IRP to the equivalent Notifications of the CMIP solution set for the Alarm IRP. The CMIP Notifications are qualified as Mandatory (M) or Optional (O).

Table 11: Mapping of Notifications

IS Notifications~~ of Information Services of the Alarm IRP~~	**CMIP SS Equivalent ~~Notifications of the CMIP solution set for the Alarm IRP~~**	**Qualifier**
notifyNewAlarm	environmentalAlarm ITU-T X.721 [4] equipmentAlarm ITU-T X.721 [4] qualityofServiceAlarm ITU-T X.721 [4] processingErrorAlarm ITU-T X.721 [4] communicationsAlarm ITU-T X.721 [4] integrityViolation ITU-T X.721 [4] operationalViolation ITU-T X.721 [4] physicalViolation ITU-T X.721 [4] securityServiceOrMechanismViolation ITU-T X.721 [4] timeDomainViolation ITU-T X.721 [4]	M
notifyChangedAlarm	notifyClearedAlarm notifyNewAlarm which are in turn mapped into environmentalAlarm ITU-T X.721 [4] equipmentAlarm ITU-T X.721 [4] qualityofServiceAlarm ITU-T X.721 [4] processingErrorAlarm ITU-T X.721 [4] communicationsAlarm ITU-T X.721 [4] integrityViolation ITU-T X.721 [4] operationalViolation ITU-T X.721 [4] physicalViolation ITU-T X.721 [4] securityServiceOrMechanismViolation ITU-T X.721 [4] timeDomainViolation ITU-T X.721 [4]	O
notifyClearedAlarm	environmentalAlarm ITU-T X.721 [4] equipmentAlarm ITU-T X.721 [4] qualityofServiceAlarm ITU-T X.721 [4] processingErrorAlarm ITU-T X.721 [4] communicationsAlarm ITU-T X.721 [4] integrityViolation ITU-T X.721 [4] operationalViolation ITU-T X.721 [4] physicalViolation ITU-T X.721 [4] securityServiceOrMechanismViolation ITU-T X.721 [4] timeDomainViolation ITU-T X.721 [4]	M
notifyAckStateChanged	environmentalAlarm ITU-T X.721 [4] equipmentAlarm ITU-T X.721 [4] qualityofServiceAlarm ITU-T X.721 [4] processingErrorAlarm ITU-T X.721 [4] communicationsAlarm ITU-T X.721 [4] integrityViolation ITU-T X.721 [4] operationalViolation ITU-T X.721 [4] physicalViolation ITU-T X.721 [4] securityServiceOrMechanismViolation ITU-T X.721 [4] timeDomainViolation ITU-T X.721 [4]	M
notifyAlarmListRebuilt	notifyAlarmListRebuilt	M
notifyComments	environmentalAlarm ITU-T X.721 [4] equipmentAlarm ITU-T X.721 [4] qualityofServiceAlarm ITU-T X.721 [4] processingErrorAlarm ITU-T X.721 [4] communicationsAlarm ITU-T X.721 [4] integrityViolation ITU-T X.721 [4] operationalViolation ITU-T X.721 [4] physicalViolation ITU-T X.721 [4] securityServiceOrMechanismViolation ITU-T X.721 [4] timeDomainViolation ITU-T X.721 [4]	O
notifyPotentialFaultyAlarmList	notifyPotentialFaultyAlarmList	O

4.2.5 Mapping of Notification Parameters

In the CMIP Solution Set, all the notifications originated within the Agent are reported to the Managers by means of the CMISE "M-EVENT-REPORT" primitive, which is implemented by means of the "m-EventReport OPERATION" (see ITU-T Recommendations X.710 [2] and X.711 [3]). The argument of m-EventReport OPERATION is defined in ITU-T Recommendation X.711 [3] as follows:

```
EventReportArgument         ::= SEQUENCE {
        managedObjectClass          ObjectClass,
        managedObjectInstance       ObjectInstance,
        eventTime                   [5] IMPLICIT GeneralizedTime OPTIONAL,
        eventType                   EventTypeId,
        eventInfo                   [8] ANY DEFINED BY eventType OPTIONAL
        }
```

where eventInfo is further specified, for each specific notification, by means of specific GDMO/ASN.1 definitions.

In the following tables, for the notifications defined in [9], all parameters are mapped to their CMIP SS equivalents. Note that the parameter mapping for the notification notifyChangedAlarm is not given. This is because in the CMIP SS the notifications notifyClearedAlarm and notifyNewAlarm are emitted instead of the notification notifyChangedAlarm.

The IS parameter systemDN defined in [9] (Alarm IRP: Information Services) is conditional and not used in the CMIP SS.

The IS parameter *alarmType* has no direct CMIP SS equivalent. Instead the value of this parameter is reflected by the type of the emitted notification. More specifically:

- If the alarm type is equal to 'Communications Alarm' the notification *communicationsAlarm* is emitted;
- If the alarm type is equal to 'Processing Error Alarm' the notification *processingErrorAlarm* is emitted;
- If the alarm type is equal to 'Environmental Alarm' the notification *environmentalAlarm* is emitted;
- If the alarm type is equal to 'Quality of Service Alarm' the notification *qualityofServiceAlarm* is emitted;
- If the alarm type is equal to 'Equipment Alarm' the notification *equipmentAlarm* is emitted.
- If the alarm type is equal to 'Integrity Violation ' the notification *integrityViolation* is emitted.
- If the alarm type is equal to 'Operational Violation ' the notification *operationalViolation* is emitted.
- If the alarm type is equal to 'Physical Violation ' the notification *physicalViolation* is emitted.
- If the alarm type is equal to 'Security Violation ' the notification *securityServiceOrMechanismViolation* is emitted.
- If the alarm type is equal to 'Time Domain Violation ' the notification *timeDomainViolation* is emitted.

Also the IS parameter *alarmId* is not mapped directly to a parameter in the CMIP SS. This is not required because an alarm is identified unambiguously by the notification identifier of the notification reporting the alarm the first time and, if the notification identifier is not unique across the IRPAgent, by the instance of the managed object emitting this notification. Notifications referring to an alarm already reported (e.g. *notifyClearedAlarm*, *notifyAckStateChanged*, *notifyComments*) do so by specifying in the M-EVENT REPORT parameter 'Event information': *correlatedNotifications* (ITU-T Recommendations X.721 [4], ~~and~~ X.733 [5] and X.736 [12]) the notification identifier of the notification having reported the new alarm and, if required, the instance of the object having emitted this notification.

Most parameters are mapped to the M-EVENT report parameter 'Event information'. For the notifications *notifyNewAlarm*(when reporting alarms not related to security), *notifyClearedAlarm*, *notifyAckStateChanged* and *notifyComments* the syntax and semantics of this structured parameter are defined in ITU-T X.721 [4] by the ASN.1 definition *AlarmInfo*. In case *notifyNewAlarm* reports a security alarm, the 'Event information' parameter is described by *SecurityAlarmInfo*, defined in ITU-T X.721 [4] as well. For the other notifications (*notifyAlarmListRebuilt*, *notifyPotentialFaultyAlarmList*) the 'Event information' parameter is described by ASN.1 definitions defined in this document.

Table 12: Parameter mapping of the notification *notifyNewAlarm* for alarms not related to security

IS Parameter	CMIP SS Equivalent	Qualifier
objectclass	M-EVENT-REPORT parameter ‘Managed object class’	M
objectInstance	M-EVENT-REPORT parameter ‘Managed object instance’	M
notificationId	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): notificationIdentifier	M
eventTime	M-EVENT-REPORT parameter ‘Event time’	M
systemDN	This IS parameter is conditional and not used in the CMIP SS.	--
notificationType	M-EVENT-REPORT parameter ‘Event type’	M
probableCause	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): probableCause	M
specificProblems	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): specificProblems	O
perceivedSeverity	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): perceivedSeverity	M
alarmType	The semantics of this parameter is conveyed by the notification type.	--
backedUpStatus	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): backedUpStatus	O
backUpObject	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): backUpObject	O
trendIndication	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): trendIndication	O
thresholdInfo	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): thresholdInfo	O
correlatedNotifications	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): correlatedNotifications	O
stateChangeDefinition	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): stateChangeDefinition	O
monitoredAttributes	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): monitoredAttributes	O
proposedRepairActions	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): proposedRepairActions	O
additionalText	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): additionalText	O
alarmId	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): notificationIdentifier M-EVENT-REPORT parameter ‘Managed object instance’	M

Table 12a: Parameter mapping of the notification *notifyNewAlarm* for alarms related to security

IS Parameter	CMIP SS Equivalent	Qualifier
objectclass	M-EVENT-REPORT parameter ‘Managed object class’	M
objectInstance	M-EVENT-REPORT parameter ‘Managed object instance’	M
notificationId	M-EVENT-REPORT parameter ‘Event information’ (SecurityAlarmInfo): notificationIdentifier	M
eventTime	M-EVENT-REPORT parameter ‘Event time’	M
systemDN	This IS parameter is conditional and not used in the CMIP SS.	--
notificationType	M-EVENT-REPORT parameter ‘Event type’	M
probableCause	M-EVENT-REPORT parameter ‘Event information’ (SecurityAlarmInfo): securityAlarmCause	M
perceivedSeverity	M-EVENT-REPORT parameter ‘Event information’ (SecurityAlarmInfo): securityAlarmSeverity	M
alarmType	The semantics of this parameter is conveyed by the notification type.	--
correlatedNotifications	M-EVENT-REPORT parameter ‘Event information’ (SecurityAlarmInfo): correlatedNotifications	O
additionalText	M-EVENT-REPORT parameter ‘Event information’ (SecurityAlarmInfo): additionalText	O
serviceUser	serviceUser	M
serviceProvider	serviceProvider	M
securityAlarmDetector	securityAlarmDetector	M
alarmId	M-EVENT-REPORT parameter ‘Event information’ (SecurityAlarmInfo): notificationIdentifier M-EVENT-REPORT parameter ‘Managed object instance’	M

Table 13: Parameter mapping of the notification *notifyClearedAlarm*

IS Parameter	CMIP SS Equivalent	Qualifier
objectclass	M-EVENT-REPORT parameter 'Managed object class'	M
objectInstance	M-EVENT-REPORT parameter 'Managed object instance'	M
notificationId	M-EVENT-REPORT parameter 'Event information' (AlarmInfo): notificationIdentifier	M
eventTime	M-EVENT-REPORT parameter 'Event time'	M
systemDN	This IS parameter is conditional and not used in the CMIP SS.	--
notificationType	M-EVENT REPORT parameter 'Event type'	M
probableCause	M-EVENT-REPORT parameter 'Event information' (AlarmInfo): probableCause	M
perceivedSeverity	M-EVENT-REPORT parameter 'Event information' (AlarmInfo): perceivedSeverity	M
alarmType	The semantics of this parameter is conveyed by the notification type.	--
clearUserId	M-EVENT-REPORT parameter 'Event information' (AlarmInfo): additionalInformation: clearUserIdParameter	O
clearSystemId	M-EVENT-REPORT parameter 'Event information' (AlarmInfo): additionalInformation: clearSystemIdParameter	O
correlatedNotifications	M-EVENT-REPORT parameter 'Event information' (AlarmInfo): correlatedNotifications	O
alarmId	M-EVENT-REPORT parameter 'Event information' (AlarmInfo): correlatedNotifications	M

Table 14: Parameter mapping of the notification *notifyAckStateChanged*

IS Parameter	CMIP SS Equivalent	Qualifier
objectclass	M-EVENT-REPORT parameter 'Managed object class'	M
objectInstance	M-EVENT-REPORT parameter 'Managed object instance'	M
notificationId	M-EVENT-REPORT parameter 'Event information' (AlarmInfo): notificationIdentifier	M
eventTime	M-EVENT-REPORT parameter 'Event time'	M
systemDN	This IS parameter is conditional and not used in the CMIP SS.	--
notificationType	M-EVENT-REPORT parameter 'Event type'	M
probableCause	M-EVENT-REPORT parameter 'Event information' (AlarmInfo): probableCause	M
perceivedSeverity	M-EVENT-REPORT parameter 'Event information' (AlarmInfo): perceivedSeverity	M
alarmType	The semantics of this parameter is conveyed by the notification type.	--
alarmId	M-EVENT-REPORT parameter 'Event information' (AlarmInfo): correlatedNotifications	--
ackTime	M-EVENT-REPORT parameter 'Event information' (AlarmInfo): additionalInformation: ackTimeParameter	M
ackState	M-EVENT-REPORT parameter 'Event information' (AlarmInfo): additionalInformation: ackStateParameter	M
ackUserId	M-EVENT-REPORT parameter 'Event information' (AlarmInfo): additionalInformation: ackUserIdParameter	M
ackSystemId	M-EVENT-REPORT parameter 'Event information' (AlarmInfo): additionalInformation: ackSystemIdParameter	O

Table 15: Parameter mapping of the notification *notifyAlarmListRebuilt*

IS Parameter	CMIP SS Equivalent	Qualifier
objectclass	M-EVENT-REPORT parameter 'Event information' (NotifyAlarmListRebuiltInfo): rebuiltObjectClass	M
objectInstance	M-EVENT-REPORT parameter 'Event information' (NotifyAlarmListRebuiltInfo): rebuiltObjectInstance	M
notificationId	M-EVENT-REPORT parameter 'Event information' (NotifyAlarmListRebuiltInfo): notificationIdentifier	M
eventTime	M-EVENT-REPORT parameter 'Event time'	M
systemDN	This IS parameter is conditional and not used in the CMIP SS.	--
notificationType	M-EVENT-REPORT parameter 'Event type'	M
reason	M-EVENT-REPORT parameter 'Event information' (NotifyAlarmListRebuiltInfo): reason	M
AlarmListAlignment Requirement	M-EVENT-REPORT parameter 'Event information' (NotifyAlarmListRebuiltInfo): alarmListAlignmentRequirement (see note)	O
NOTE: This parameter shall be supported only, if the IRPAgent supports the notification `notifyPotentialFaultyAlarmList`.		

Table 16: Parameter mapping of the notification *notifyComments*

IS Parameter	CMIP SS Equivalent	Qualifier
objectClass	M-EVENT-REPORT parameter ‘Managed object class’	M
objectInstance	M-EVENT-REPORT parameter ‘Managed object instance’	M
notificationId	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): notificationIdentifier	M
eventTime	M-EVENT-REPORT parameter ‘Event time’	M
systemDN	This IS parameter is conditional and not used in the CMIP SS.	--
notificationType	M-EVENT-REPORT parameter ‘Event type’	M
alarmType	The semantics of this parameter is conveyed by the notification type.	M
probableCause	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): probableCause	M
perceivedSeverity	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): perceivedSeverity	M
comments	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): additionalInformation: commentsParameter	M
alarmId	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): correlatedNotifications	M

Table 17: Parameter mapping of the notification *notifyPotentialFaultyAlarmList*

IS Parameter	CMIP SS Equivalent	Qualifier
objectClass	M-EVENT-REPORT parameter 'Event information' (NotifyPotentialFaultyAlarmListInfo): potentialFaultyObjectClass	M
objectInstance	M-EVENT-REPORT parameter 'Event information' (NotifyPotentialFaultyAlarmListInfo): potentialFaultyObjectInstance	M
notificationId	M-EVENT-REPORT parameter 'Event information' (NotifyPotentialFaultyAlarmListInfo): notificationIdentifier	M
eventTime	M-EVENT-REPORT parameter 'Event time'	M
systemDN	This IS parameter is conditional and not used in the CMIP SS.	--
notificationType	M-EVENT-REPORT parameter: 'Event type'	M
reason	M-EVENT-REPORT parameter 'Event information' (NotifyPotentialFaultyAlarmListInfo): reason	M

5 GDMO definitions

5.1 Managed Object Classes

5.1.1 alarmControl

```
alarmControl MANAGED OBJECT CLASS
   DERIVED FROM
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":top;
   CHARACTERIZED BY
      alarmControlBasicPackage,
      alarmAcknowledgementPackage,
      alarmIRPVersionPackage;
   CONDITIONAL PACKAGES
      alarmCountPackage                      PRESENT IF   "an instance supports it",
      alarmCommentPackage                    PRESENT IF   "an instance supports it",
      alarmProfilePackage                    PRESENT IF   "an instance supports it",
      alarmUnacknowledgementPackage          PRESENT IF   "an instance supports it",
      alarmPotentialFaultyAlarmListPackage   PRESENT IF   "an instance supports it",
      alarmClearPackage                      PRESENT IF   "an instance supports it";
REGISTERED AS {ts32-111AlarmObjectClass 1};
```

5.2 Packages

5.2.1 alarmControlBasicPackage

```
alarmControlBasicPackage PACKAGE
   BEHAVIOUR
      alarmControlBasicPackageBehaviour;
   ATTRIBUTES
      alarmControlId       GET,
      alarmsCountSummary   GET;
   ACTIONS
      getAlarmList;
   NOTIFICATIONS
      notifyAlarmListRebuilt;
REGISTERED AS {ts32-111AlarmPackage 1};

alarmControlBasicPackageBehaviour BEHAVIOUR
DEFINED AS
   "The MOC alarmControl has been defined to provide information to the Manager about the currently
   alarms controlled by the Agent.
   An instance of the 'alarmControl' MOC is identified by the value of the attribute
   'alarmControlId'.
   The attribute 'alarmsCountSummary' provides a summary of the number of alarms managed in the
   Agent's alarm list (including the number of cleared but not yet acknowledged alarms).
   The action 'getAlarmList' is the means, for the Manager, to trigger an alarm alignment procedure
   in accordance with the parameter specified in the action request (this may be needed e.g. for
   first time alignment or after a link interruption between the Agent and the Manager). The alarm
   list is sent as a sequence of single alarm reports.
   The notification 'notifyAlarmListRebuilt' is sent by the Agent to the Manager to inform that the
   alarm list has changed. It is recommended that the Manager subsequently triggers an alarm
   alignment.";
```

5.2.2 alarmCountPackage

```
alarmCountPackage PACKAGE
   BEHAVIOUR
      alarmCountPackageBehaviour;
   ACTIONS
      getAlarmCount;
REGISTERED AS {ts32-111AlarmPackage 2};

alarmCountPackageBehaviour BEHAVIOUR
DEFINED AS
   "This package has been defined to allow the Managers to get information from the Agent about the
   number of alarms currently present in the alarm list.";
```

5.2.3 alarmAcknowledgementPackage

```
alarmAcknowledgementPackage PACKAGE
   BEHAVIOUR
      alarmAcknowledgementPackageBehaviour;
   ACTIONS
      acknowledgeAlarms;
   NOTIFICATIONS
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":communicationsAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":environmentalAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":equipmentAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":processingErrorAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":qualityofServiceAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": integrityViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": operationalViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": physicalViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": securityServiceOrMechanismViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": timeDomainViolation;
REGISTERED AS {ts32-111AlarmPackage 3};

alarmAcknowledgementPackageBehaviour BEHAVIOUR
DEFINED AS
   "This package has been defined to provide information to the Manager about the acknowledgement
   status of the alarms controlled by the Agent.
   The action 'acknowledgeAlarms' allows the NM operator to acknowledge one or several alarms
   previously sent by the Agent as alarm notifications.
   The ITU-T Recommendation X.721 [4] compliant alarm notifications are sent by the Agent to the
   Manager to inform that one alarm has been acknowledged. The acknowledgement related information
   is carried in the additionalInformation attribute.";
```

5.2.4 alarmUnacknowledgementPackage

```
alarmUnacknowledgementPackage PACKAGE
   BEHAVIOUR
      alarmUnacknowledgementPackageBehaviour;
   ACTIONS
      unacknowledgeAlarms;
   NOTIFICATIONS
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":communicationsAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":environmentalAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":equipmentAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":processingErrorAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":qualityofServiceAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": integrityViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": operationalViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": physicalViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": securityServiceOrMechanismViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": timeDomainViolation;;
REGISTERED AS {ts32-111AlarmPackage 4};

alarmUnacknowledgementPackageBehaviour BEHAVIOUR
DEFINED AS
   "This package has been defined to provide the Manager with the capability to un-acknowledge
   alarms.
   The action 'unacknowledgeAlarms' allows the NM operator to un-acknowledge one or several alarms
   previously acknowledged by him.
   The ITU-T Recommendation X.721 [4] compliant alarm notifications are sent by the Agent to the
   Manager to inform that one alarm has been unacknowledged. The acknowledgement related information
   is carried in the additionalInformation attribute.";
```

5.2.5 alarmCommentPackage

```
alarmCommentPackage PACKAGE
   BEHAVIOUR
      alarmCommentPackageBehaviour;
   ACTIONS
      setComment;
   NOTIFICATIONS
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": communicationsAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": environmentalAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": equipmentAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": processingErrorAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": qualityofServiceAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": integrityViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": operationalViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": physicalViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": securityServiceOrMechanismViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": timeDomainViolation;;
REGISTERED AS {ts32-111AlarmPackage 5};

alarmCommentPackageBehaviour BEHAVIOUR
DEFINED AS
   "This package has been defined to allow the management of comments related to alarms.
   The action setComment allows the IRPManager to add a comment to one or several alarms. Also the
   IRPAgent may add comments to alarms.
   ITU-T Recommendation X.721 [4] compliant alarm notifications are generated once a comment is
   added to an alarm. The information in all comments associated to an alarm is carried in the
   attribute additionalInformation.";
```

5.2.6 alarmIRPVersionPackage

```
alarmIRPVersionPackage PACKAGE
   BEHAVIOUR
      alarmIRPVersionPackageBehaviour;
   ATTRIBUTES
      supportedAlarmIRPVersions   GET;
   ACTIONS
      getAlarmIRPVersion;
REGISTERED AS {ts32-111AlarmPackage 6};

alarmIRPVersionPackageBehaviour BEHAVIOUR
DEFINED AS
   "This package has been defined to allow the Manager to get information about the Alarm IRP
   versions supported by the Agent.
   The attribute 'supportedAlarmIRPVersions' indicates all versions of the Alarm IRP currently
   supported by the Agent.
   The action 'getAlarmIRPVersion' may be invoked by the Manager to get information about the Alarm
   IRP versions supported by the Agent. Such Alarm IRP versions must compatible to each other. This
   means that the Manager may use any one of such Alarm IRP versions";
```

5.2.7 alarmProfilePackage

```
alarmProfilePackage PACKAGE
   BEHAVIOUR
      alarmProfilePackageBehaviour;
   ACTIONS
      getAlarmIRPOperationProfile,
      getAlarmIRPNotificationProfile;
REGISTERED AS {ts32-111AlarmPackage 7};

alarmProfilePackageBehaviour BEHAVIOUR
DEFINED AS
   "This package has been defined to allow the Manager to get detailed information about the profile
   of Alarm IRP.
   The action 'getOperationProfile' is invoked by the Manager to get detailed information about the
   operations supported by Alarm IRP.
   The action 'getNotificationProfile' is invoked by the Manager to get detailed information about
   the notifications supported by Alarm IRP.";
```

5.2.8 alarmPotentialFaultyAlarmListPackage

```
alarmPotentialFaultyAlarmListPackage PACKAGE
   BEHAVIOUR
      alarmPotentialFaultyAlarmListPackageBehaviour;
   NOTIFICATIONS
      notifyPotentialFaultyAlarmList;
REGISTERED AS {ts32-111AlarmPackage 8};

alarmPotentialFaultyAlarmListPackageBehaviour BEHAVIOUR
DEFINED AS
   "This package allows the IRPAgent to inform the IRPManager that the alarm list held by the
   IRPAgent might be faulty.";
```

5.2.9 alarmClearPackage

```
alarmClearPackage PACKAGE
```

```
   BEHAVIOUR
      alarmClearPackageBehaviour;
  ACTIONS
      clearAlarms;
REGISTERED AS {ts32-111AlarmPackage 9};

alarmClearPackageBehaviour BEHAVIOUR
DEFINED AS
   "This package allows the IRPManager to clear one or multiple alarms in the IRPAgent.";
```

5.2.10 x721AlarmNotificationsPackage

```
x721AlarmNotificationsPackage PACKAGE
   BEHAVIOUR
      x721AlarmNotificationsPackageBehaviour;
   NOTIFICATIONS
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":communicationsAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":environmentalAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":equipmentAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":processingErrorAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":qualityofServiceAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": integrityViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": operationalViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": physicalViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": securityServiceOrMechanismViolation,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": timeDomainViolation;
REGISTERED AS {ts32-111AlarmPackage 10};

x721AlarmNotificationsPackageBehaviour BEHAVIOUR
DEFINED AS
   "This package contains all alarm notifications defined in ITU-T X.721.";
```

5.3 Actions

5.3.1 acknowledgeAlarms (M)

```
acknowledgeAlarms ACTION
   BEHAVIOUR
      acknowledgeAlarmsBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.AckOrUnackAlarmsInfo;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.AckOrUnackAlarmsReply;
REGISTERED AS {ts32-111AlarmAction 1};

acknowledgeAlarmsBehaviour BEHAVIOUR
DEFINED AS
   "The behaviour of this functionality is defined within 32.111-2 – below provides an overview and
   CMIP specific semantics.
   This action is invoked by the Manager to indicate to the Agent that one or several alarms
   (previously sent by the Agent as alarm notifications) have to be acknowledged. In the action
   request the NM supplies the parameter ackUserId and ackSystemId. The other acknowledgement
   history parameters, i.e. alarm acknowledgement state (in this case acknowledged) and the
   acknowledgement time are set by the Agent itself.
   The 'Action information' field contains the following data:
      •  alarmReferenceList
         This parameter contains a set of MOI (Managed Object Instance) and notificationIdentifier.
         Each pair identifies unambiguously in the scope of the Agent an alarm (previously received
         by the NM) that have to be now acknowledged.  MOI can be absent if scope of uniqueness of
         notificationIdentifier is across the IRPAgent.
      •  ackUserId
         It contains the name of the operator who acknowledged the alarm or a generic name
         (dependent on the operational concept). It may have also the value NULL.
      •  ackSystemId
         It indicates the management system where the acknowledgment is triggered. It may have also
         the value NULL.
   The 'Action response' contains the following data:
      •  status
         This parameter contains the results of the NM acknowledgement action. Possible values:
         noError (0, all alarms found and ack state changed according to the manager request),
         ackPartlySuccessful (some alarms not found / not changeable, see next parameter), error
         (value indicates the reason why the complete operation failed).
      •  errorAlarmReferenceList
         This parameter (significant only if status = ackPartlySuccessful) contains the list of moi
         (managed object instance) and notificationIdentifier pairs of the alarms which could not be
         acknowledged and, for each alarm, also the reason of the error.";
```

5.3.2 getAlarmCount (O)

```
getAlarmCount ACTION
   BEHAVIOUR
      getAlarmCountBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.GetAlarmCountInfo;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.GetAlarmCountReply;
REGISTERED AS {ts32-111AlarmAction 2};

getAlarmCountBehaviour BEHAVIOUR
DEFINED AS
   "The behaviour of this functionality is defined within 32.111-2 – below provides an overview and
   CMIP specific semantics.
   The NM invokes this action to receive the number of available alarms in the Agent' alarm list
   according to the specification in the action request. The Manager may use this action to find out
   the number of alarms in the alarm list before invoking a synchronisation by means of the
   getAlarmList operation. The request is possible also before the Manager creates an own event
   forwarding discriminator instance within the Agent.
   The 'Action information' field contains the following data:
     •  alarmAckState
        Depending on this optional parameter value, the NM gets the number of alarms of each
        perceivedSeverity value according to the following possible choices:
           -  all alarms
           -  all active alarms (acknowledged or not yet acknowledged)
           -  all active and acknowledged alarms
           -  all active and unacknowledged alarms
           -  all cleared and unacknowledged alarms.
        If the parameter is absent, all alarms from the Agent's alarm list are taken into
        consideration.
     •  filter
        The handling of this optional parameter is as follows:
           -  if present and not NULL, it indicates a filter constraint which shall apply in the
              calculation of the results
           -  if its value is NULL, no filter shall be considered and the Agent shall return the
              number of all alarms according to the value of the parameter alarmAckState (see
              above)
           -  if absent, the handling depends on the availability of an event forwarding
              discriminator instance within the Agent. If this instance is valid, the filter
              construct of the event forwarding discriminator shall apply. If no EFD instance is
              available, the Agent shall return the number of all alarms according to the value of
              the above-mentioned parameter alarmAckState.
   The 'Action response' is composed of:
     •  The numbers of alarms for each perceivedSeverity value (if applicable).
     •  The parameter status containing the results of the NM action. Possible values: noError (0),
        error (the value indicates the reason of the error).";
```

5.3.3 getAlarmList (M)

```
getAlarmList ACTION
   BEHAVIOUR
      getAlarmListBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.GetAlarmList;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.GetAlarmListReply;
REGISTERED AS {ts32-111AlarmAction 3};

getAlarmListBehaviour BEHAVIOUR
DEFINED AS
```

```
   "This action starts an alarm alignment procedure between a NM and Agent, which takes into account
   the acknowledgment state of the alarms and a dedicated filter (valid only for the current
   request).
   The 'Action information' field contains the following data:
      •  alarmAckState
         Depending on this optional parameter value, the NM gets the alarm reports according to the
         following possible choices:
            -  all alarms
            -  all active alarms (acknowledged or not yet acknowledged)
            -  all active and acknowledged alarms
            -  all active and unacknowledged alarms
            -  all cleared and unacknowledged alarms.
         If the parameter is absent, all alarms from the Agent's alarm list are taken into
         consideration.
      •  destination
         This parameter identifies the destination to which the alarm reports that have passed the
         test conditions specified in the parameter 'filter' are sent. According to ITU-T
         Recommendation X.721 [4], if no destination is specified in the request, then the
         discriminator is created with the destination defaulted to the AE-Title of the invoker.
      •  filter
         The handling of this optional parameter (valid only for the current alignment request) is
         as follows:
            -  if present and not NULL, it indicates a filter constraint which shall apply in the
               forwarding of the alignment-related alarm reports
            -  if its value is NULL, no real filter shall be considered and the Manager receives the
               alarms according to the value of the parameter alarmAckState (see above).
   The 'Action response' contains the following data:
      •  alignmentId
         The parameter is defined by the Agent and identifies unambiguously the current alarm
         alignment procedure. It allows the Manager to distinguish between alarm reports sent as
         consequence of several own alignment requests triggered in parallel.
      •  status
         The parameter contains the results of the NM action. Possible values: noError (0), error
         (the value indicates the reason of the error).
         After the action response is forwarded to the NM, the Agent sends the alarm list as a
         sequence of single alarm notifications in accordance with the values of the request
         parameters. Every alarm notification contains all fields of the alarm stored in the alarm
         list. In particular:
      •  The field additionalText contains at the beginning a string to allow a Manager to recognise
         that this alarm report is sent due to a previous getAlarmList request. The structure of
         this string is:
            -  '(ALIGNMENT-alignmentId)' for every alarm report except the last one or
            -  '(ALIGNMENTEND-alignmentId)' for the last alarm report sent by the Agent due to the
               current getAlarmList request.
      •  If available, the data related to the acknowledgment history (i.e. ackState, ackTime,
         ackUserId, ackSystemId) are provided in the field additionalInformation.
         Further details about the implementation of this operation are provided in the
         'Introduction'.";
```

5.3.4 setComment (O)

```
setComment ACTION
   BEHAVIOUR
      setCommentBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.SetCommentInfo;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.SetCommentReply;
REGISTERED AS {ts32-111AlarmAction 4};

setCommentBehaviour BEHAVIOUR
DEFINED AS
   "The behaviour of this functionality is defined within 32.111-2 – below provides an overview and
   CMIP specific semantics.
   The NM invokes this action to associate a comment to one or more alarms.
   The 'Action information' field contains:
      •  alarmReferenceList
         Contains a list of alarm identifiers to which the comment must be associated.
      •  commentUserId
         Contains the identity of the NM User that invokes this operation.
      •  commentSystemId
         Contains the identity of the NM that invokes this operation.
      •  commentText
         Contains the text of the comment.
   The 'Action response' is composed of the following data:
      •  errorAlarmReferenceList
         List of pair of alarmId and failure reason.
      •  status
         It contains the results of the NM action. Possible values: actionSucceeded (0),
         actionPartiallyFailed (12) or another value indicating the reason of the error.";
```

5.3.5 getAlarmIRPVersion (M)

```
getAlarmIRPVersion ACTION
   BEHAVIOUR
      getAlarmIRPVersionBehaviour;
   MODE
      CONFIRMED;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.GetAlarmIRPVersionReply;
REGISTERED AS {ts32-111AlarmAction 5};

getAlarmIRPVersionBehaviour BEHAVIOUR
DEFINED AS
   "The behaviour of this functionality is defined within 32.111-2 – below provides an overview and
   CMIP specific semantics.
   The NM invokes this action to get information about the Alarm IRP versions supported by the
   Agent.
   The 'Action information' field contains no data.
   The 'Action response' is composed of the following data:
   •  versionNumbersList
      It defines a list of Alarm IRP versions supported by the Agent. A list containing no
      element, i.e. a NULL list means that the concerned Agent doesn't support any version of the
      Notification IRP.
   •  status
      It contains the results of the NM action. Possible values: noError (0), error (the value
      indicates the reason of the error).";
```

5.3.6 getAlarmIRPNotificationProfile (O)

```
getAlarmIRPNotificationProfile ACTION
   BEHAVIOUR
      getAlarmIRPNotificationProfileBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.IRPVersionNumber;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.GetNotificationProfileReply;
REGISTERED AS {ts32-111AlarmAction 6};

getAlarmIRPNotificationProfileBehaviour BEHAVIOUR
DEFINED AS
   "The behaviour of this functionality is defined within 32.111-2 – below provides an overview and
   CMIP specific semantics.
   A Manager invokes this action to enquiry about the notification profile (supported notifications
   and supported parameters) for this specific Alarm IRP version.
   The 'Action information' contains the following data:
   •  irpVersionNumber
      This mandatory parameter identifies the Alarm IRP version.
   The 'Action response' is composed of the following data:
   •  notificationNameProfile
      It contains a list of notification names, i.e. a NULL list means that the Alarm IRP doesn't
      support any notification.
   •  notificationParameterProfile.
      It contains a set of elements, each element corresponds to a notification name and is
      composed by a set of parameter names.
   •  status
      It contains the results of this action. Possible values: noError (0), error (the value
      indicates the reason of the error).";
```

5.3.7 getAlarmIRPOperationProfile (O)

```
getAlarmIRPOperationProfile ACTION
   BEHAVIOUR
      getAlarmIRPOperationProfileBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.IRPVersionNumber;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.GetOperationProfileReply;
REGISTERED AS {ts32-111AlarmAction 7};

getAlarmIRPOperationProfileBehaviour BEHAVIOUR
DEFINED AS
   "The behaviour of this functionality is defined within 32.111-2 – below provides an overview and
   CMIP specific semantics.
   A Manager invokes this action to enquiry about the operation profile (supported operations and
   supported parameters) for this specific Alarm IRP version.
   The 'Action information' contains the following data:
      •  irpVersionNumber
         This mandatory parameter identifies the Alarm IRP version.
   The 'Action response' is composed of the following data:
      •  operationNameProfile
         It contains a list of operation names.
      •  operationParameterProfile.
         It contains a set of elements, each element corresponds to an operation name and is
         composed by a set of parameter names.
      •  status
         It contains the results of this action. Possible values: noError (0), error (the value
         indicates the reason of the error).";
```

5.3.8 unacknowledgeAlarms (O)

```
unacknowledgeAlarms ACTION
   BEHAVIOUR
      unacknowledgeAlarmsBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.AckOrUnackAlarmsInfo;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.AckOrUnackAlarmsReply;
REGISTERED AS {ts32-111AlarmAction 8};

unacknowledgeAlarmsBehaviour BEHAVIOUR
DEFINED AS
   "The behaviour of this functionality is defined within 32.111-2 – below provides an overview and
   CMIP specific semantics.
   This action is used by the Manager to indicate to the Agent that one or several alarms
   (previously acknowledged) have to be unacknowledged. Subsequently the 'acknowledgement history'
   information of these alarms in the Agent's alarm list is completely removed (this operation may
   be used by operators in case of a previous acknowledgement by mistake).
   The 'Action information' field contains the following data:
      •  alarmReferenceList
         This parameter contains a set of MOI (Managed Object Instance) and notificationIdentifier
         pair. Each of them identifies unambiguously in the scope of the Agent an alarm (previously
         acknowledged by the NM) that have to be now unacknowledged. MOI can be absent if scope of
         uniqueness of notificationIdentifier is across the IRPAgent.
      •  ackUserId
         It contains the name of the operator who unacknowledged the alarm or a generic name
         (dependent on the operational concept). It may have also the value NULL. Note that only the
         user who previously acknowledged the alarm is allowed to un-acknowledge it later.
      •  ackSystemId
         It indicates the management system where the acknowledgment is triggered. It may have also
         the value NULL. Note that the un-acknowledgement is allowed only at the management system
         where previously the acknowledgement took place.
   The 'Action response' contains the following data:
      •  status
         This parameter contains the results of the NM un-acknowledgement action. Possible values:
         noError (0, all alarms found and ack state changed according to the manager request),
         unackPartlySuccessful (some alarms not found / not changeable, see next response
         parameter), error (value indicates the reason why the complete operation failed).
      •  errorAlarmReferenceList
         This parameter (significant only if status = unackPartlySuccessful) contains the list of
         MOI (Managed Object Instance) and notificationIdentifier pairs of the alarms which could
         not be unacknowledged and, for each alarm, also the reason of the error. MOI can be absent
         if scope of uniqueness of notificationIdentifier is across the IRPAgent. ";
```

5.3.9 clearAlarms (O)

```
clearAlarms ACTION
   BEHAVIOUR
      clearAlarmsBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.ClearAlarmsInfo;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.ClearAlarmsReply;
REGISTERED AS {ts32-111AlarmAction 9};

clearAlarmsBehaviour BEHAVIOUR
DEFINED AS
   "The behaviour of this functionality is defined within 32.111-2 – below provides an overview and
   CMIP specific semantics.
   This action is invoked by the IRPManager to clear manually one or multiple alarms.The M-ACTION
   request parameter 'Action information' ClearAlarmsInfo is composed of the following fields:
      •  alarmReferenceList
         This mandatory parameter identifies the alarms to be cleared. Each alarm is identified by
         the notification identifier of the notification that reported the alarm the first time and,
         if the notification identifier is not unique across the IRPAgent, by the instance of the
         managed object that emitted this notification.
      •  clearUserId
         This mandatory parameter identifies the user that has invoked the clearAlarms operation.
      •  clearSystemId
         This optional parameter identifies the system on which the IRPManager, where the
         clearAlarms operation has been invoked, is running. This parameter may be absent.
   The M-ACTION response parameter 'Action Reply' ClearAlarmsReply is composed of the following
   fields
      •  errorAlarmReferenceList
         This mandatory parameter identifies alarms that are specified in the alarmReferenceList,
         but which could not be cleared. The alarms are specified by the notification identifier of
         the notification that reported the alarm the first time and, if required, the instance of
         the managed object that emitted this notification. In addition to this, the parameter
         specifies for every alarm that could not be cleared the error reason. If all alarms
         specified in the alarmReferenceList exist and could be cleared, this parameter contains no
         information. If the operation failed completely due to a general error, this parameter is
         not significant.
      •  status
         This mandatory parameter provides informations about the result of the operation. If all
         alarms specified in the alarmReferenceList exist and are cleared, the value noError (0) is
         returned. If some alarms specified do not exist or could not be cleared, the value
         clearPartlySuccessful () is returned. In this case the parameter errorAlarmReferenceList
         provides additional information. If the operation failed completely due to a general error,
         this parameter returns the error reason.";
```

5.4 Notifications

5.4.1 notifyAlarmListRebuilt (M)

```
notifyAlarmListRebuilt NOTIFICATION
   BEHAVIOUR
      alarmListRebuiltBehaviour;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.NotifyAlarmListRebuiltInfo;
REGISTERED AS {ts32-111AlarmNotification 1};

alarmListRebuiltBehaviour BEHAVIOUR
DEFINED AS
   "This notification is used by the Agent to inform the NM that the alarm list has been rebuilt.
   The 'Event Information' field contains the following data:
      •  notificationIdentifier
         This ITU-T X.721 standardised parameter, together with MOI (Managed Object Instance),
         unambiguously identifies this notification.
      •  rebuiltObjectClass
         This parameter carries the IRPAgent MOC when the entire AlarmList has been rebuilt. It
         carries a different MOC when the AlarmList has been partially rebuilt.
      •  rebuiltObjectInstance
         This parameter carries DN of the IRPAgent when the entire AlarmList has been rebuilt. It
         carries the DN of another MOI when the AlarmList has been partially rebuilt  and only the
         MOIs subordinate of  this rebuilt MOI may be affected by this partial rebuilt.
      • reason
         The parameter indicates the reason for alarm list rebuilding (if applicable).
      • alarmListAlignmentRequirement
         This parameter indicates, if the IRPManager has to align its alarm list with the IRPAgent.
         Absence of this parameter means, that an alignment is required. ";
```

5.4.2 notifyPotentialFaultyAlarmList (O)

```
notifyPotentialFaultyAlarmList NOTIFICATION
   BEHAVIOUR
      notifyPotentialFaultyAlarmListBehaviour;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.NotifyPotentialFaultyAlarmListInfo;
REGISTERED AS {ts32-111AlarmNotification 3};

notifyPotentialFaultyAlarmListBehaviour BEHAVIOUR
DEFINED AS
   "This notification is used by the IRPAgent to inform the IRPManager that the IRPAgent has lost
   confidence in the integrity of its alarm list.
   The 'Event information' field contains the following data:
      • potentialFaultyObjectClass
        This parameter specifies together with the parameter potentialFaultyObjectInstance the
        unreliable alarm information instances in the alarm list.
        If this parameter carries the MOC of the IRPAgent, then the entire alarm list is
        unreliable.
        If this parameter carries the MOC of another MO, then only a part of the alarm list is
        unreliable. The mechanism for identifying the unreliable part is described below.
      • potentialFaultyObjectInstance
        This parameter specifies together with the parameter potentialFaultyObjectClass the
        unreliable alarm information instances in the alarm list.
        If potentialFaultyObjectClass carries the MOC of the IRPAgent, the this parameter carries
        the DN of the IRPAgent and the entire alarm list is unreliable.
        If potentialFaultyObjectClass carries the MOC of another MO, then this parameter carries
        the DN of an instance of this class. All alarm information instances representing alarms
        raised by this MOI and its subordinates may be unreliable in this case.
      • notificationIdentifier
        This parameter specifies the notification identifier (ITU-T X.733 [5]), which, together
        with the instance of the object emitting this notification, unambiguously identifies this
        notification.
      • reason
        This parameter specifies the reason why the IRPAgent has lost confidence in the integrity
        of its alarm list and needs to rebuild it.";
```

5.5 Attributes

5.5.1 alarmControlId

```
alarmControlId ATTRIBUTE
   WITH ATTRIBUTE SYNTAX
      TS32-111-4TypeModule.GeneralObjectId;
   MATCHES FOR
      EQUALITY;
   BEHAVIOUR
      alarmControlIdBehaviour;
REGISTERED AS {ts32-111AlarmAttribute 1};

alarmControlIdBehaviour BEHAVIOUR
DEFINED AS
   "This attribute names an instance of a 'alarmControl' object class.";
```

5.5.2 alarmsCountSummary

```
alarmsCountSummary ATTRIBUTE
   WITH ATTRIBUTE SYNTAX
      TS32-111-4TypeModule.AlarmsCountSummary;
   MATCHES FOR
      EQUALITY;
   BEHAVIOUR
      alarmsCountSummaryBehaviour;
REGISTERED AS {ts32-111AlarmAttribute 2};
```

```
alarmsCountSummaryBehaviour BEHAVIOUR
DEFINED AS
   "This attribute indicates a summary of number of alarms managed in the Agent's alarm list sorted
   according to the perceived severity (including the number of cleared but not yet acknowledged
   alarms). Additionally the number of all currently active alarms is provided.";
```

5.5.3 supportedAlarmIRPVersions

```
supportedAlarmIRPVersions ATTRIBUTE
   WITH ATTRIBUTE SYNTAX
      TS32-111-4TypeModule.SupportedAlarmIRPVersions;
   MATCHES FOR
      EQUALITY;
   BEHAVIOUR
      supportedAlarmIRPVersionsBehaviour;
REGISTERED AS {ts32-111AlarmAttribute 3};

supportedAlarmIRPVersionsBehaviour BEHAVIOUR
DEFINED AS
   "This attribute provides the information concerning the Alarm IRP versions currently supported by
   the Agent.";
```

5.6 Parameters

5.6.1 ackStateParameter

```
ackStateParameter PARAMETER
   CONTEXT
      TS32-111-4TypeModule.AlarmInfo.additionalInformation;
   WITH SYNTAX
      TS32-111-4TypeModule.AckState;
   BEHAVIOUR
      ackStateParameterBehaviour;
REGISTERED AS {ts32-111AlarmParameter 1};

ackStateParameterBehaviour BEHAVIOUR
DEFINED AS
   "This parameter models the optional additionalInformation field of the alarm notification. If
   present, it informs the NM about the current acknowledgement state of the present alarm.";
```

5.6.2 ackSystemIdParameter

```
ackSystemIdParameter PARAMETER
   CONTEXT
      TS32-111-4TypeModule.AlarmInfo.additionalInformation;
   WITH SYNTAX
      TS32-111-4TypeModule.SystemId;
   BEHAVIOUR
      ackSystemIdParameterBehaviour;
REGISTERED AS {ts32-111AlarmParameter 2};

ackSystemIdParameterBehaviour BEHAVIOUR
DEFINED AS
   "This parameter models the optional additionalInformation field of the alarm notification. If
   present, it informs the NM about the identifier of the management system where the present alarm
   has been acknowledged.";
```

5.6.3 ackTimeParameter

```
ackTimeParameter PARAMETER
   CONTEXT
      TS32-111-4TypeModule.AlarmInfo.additionalInformation;
   WITH SYNTAX
      TS32-111-4TypeModule.AckTime;
   BEHAVIOUR
      ackTimeParameterBehaviour;
REGISTERED AS {ts32-111AlarmParameter 3};

ackTimeParameterBehaviour BEHAVIOUR
DEFINED AS
```

```
   "This parameter models the optional additionalInformation field of the alarm notification. If
   present, it informs the NM about the time the present alarm has been acknowledged by the Agent.";
```

5.6.4 ackUserIdParameter

```
ackUserIdParameter PARAMETER
   CONTEXT
      TS32-111-4TypeModule .AlarmInfo.additionalInformation;
   WITH SYNTAX
      TS32-111-4TypeModule.UserId;
   BEHAVIOUR
      ackUserIdParameterBehaviour;
REGISTERED AS {ts32-111AlarmParameter 4};

ackUserIdParameterBehaviour BEHAVIOUR
DEFINED AS
   "This parameter models the optional additionalInformation field of the alarm notification. If
   present, it informs the NM about the identifier of the user who acknowledged the present alarm.";
```

5.6.5 clearUserIdParameter

```
clearUserIdParameter PARAMETER
   CONTEXT
      TS32-111-4TypeModule .AlarmInfo.additionalInformation;
   WITH SYNTAX
      TS32-111-4TypeModule.UserId;
   BEHAVIOUR
      clearUserIdParameterBehaviour;
REGISTERED AS {ts32-111AlarmParameter 5};

clearUserIdParameterBehaviour BEHAVIOUR
DEFINED AS
   "This parameter is carried by additionalInformation in the notification reporting the clearance
   of an alarm. It identifies the user that has invoked the clearAlarms operation, that has led to
   the clearance of the reported alarm clearance.";
```

5.6.6 clearSystemIdParameter

```
clearSystemIdParameter PARAMETER
   CONTEXT
      TS32-111-4TypeModule.AlarmInfo.additionalInformation;
   WITH SYNTAX
      TS32-111-4TypeModule.UserId;
   BEHAVIOUR
      clearSystemIdParameterBehaviour;
REGISTERED AS {ts32-111AlarmParameter 6};

clearSystemIdParameterBehaviour BEHAVIOUR
DEFINED AS
   "This parameter is carried by additionalInformation in the notification reporting the clearance
   of an alarm. It identifies the system on which the IRPManager, where the clearAlarms operation
   that has led to the clearance of the reported alarm, is running";
```

5.6.7 commentsParameter

```
commentsParameter PARAMETER
   CONTEXT
      TS32-111-4TypeModule.AlarmInfo.additionalInformation;
   WITH SYNTAX
      TS32-111-4TypeModule.AlarmComments;
   BEHAVIOUR
      commentsParameterBehaviour;
REGISTERED AS   {ts32-111AlarmParameter 7};


commentsParameterBehaviour BEHAVIOUR
DEFINED AS
   "This parameter is carried by the attribute additionalInformation in alarm notifications. If
   present, it informs the IRPManager about the comments assigned to an alarm. Every single comment
   includes the following data: commentText, commentTime, commentUserId and (optionally)
   commentSystemId.";
```

End of Change in Clause 4 & 5

End of Document

Annex A (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-000254	005	--	Split of TS - Part 4: Alarm Integration Reference Point (IRP): CMIP Solution Set (SS)	3.0.1	3.1.0
Sep 2000	--	--	--	--	cosmetic	3.1.0	3.1.1
Jun 2001	S_12	SP-010282	001	--	Alarm IRP: CMIP SS Rel4 - Addition of feature. As SA5 had not reviewed this part, it is submitted to SA#12 for Information only.	3.1.1	--
Sep 2001	S_13	SP-010470	001	1	Addition of features	3.1.1	4.0.0
Dec 2001	S_14	SP-010640	003	--	Change of qualifier for setComment and notifyComment	4.0.0	4.1.0
Dec 2001	S_14	SP-010640	004	--	Addition of missing parameter in notifyComments	4.0.0	4.1.0
Mar 2002	S_15	SP-020028	005	--	Addition of "perceivedSeverity" as parameter to "acknowledgeAlarms" operation (CMIP SS)	4.1.0	4.2.0
Mar 2002	S_15	--	--	--	Automatic upgrade to Rel-5 (no Rel-5 CR)	4.2.0	5.0.0
Jun 2002	S_16	SP-020283	007	--	Correction of errors and ambiguities in the Parameter Mapping Tables and ASN.1 Definitions	5.0.0	5.1.0
Jun 2002	S_16	SP-020284	008	--	Addition of the parameter alarmListAlignmentRequirement to the notification notifyAlarmListRebuilt in the CMIP SS (32.111-4)	5.0.0	5.1.0
Jun 2002	S_16	SP-020284	009	--	Adding the notification notifyPotentialFaultyAlarmList in the CMIP SS (32.111-4)	5.0.0	5.1.0
Jun 2002	S_16	SP-020284	010	--	Introduction of SS (32.111-4) to IS (32.111-2) relation and correction of Foreword	5.0.0	5.1.0
Sep 2002	S_17	SP-020480	011	--	Alignment with 32.111-2 on Alarm Clearance Functionality	5.1.0	5.2.0
Dec 2002	S_18	SP-020751	013	--	Add the additionalInformation parameter in notifyNewAlarms to the Alarm IRP CMIP SS (Alignment with Information Service in Rel-5 32111-2)	5.2.0	5.3.0
Dec 2002	S_18	SP-020753	014	--	Addition of Security Alarm Support to the Alarm IRP CMIP SS (Alignment with Information Service in Rel-5 32111-2)	5.2.0	5.3.0
Mar 2003	S_19	SP-030063	016	--	Correction to Alarm Comments- alignment with 32.111-1	5.3.0	5.4.0
Mar 2003	S_19	SP-030138	017	--	Add missing x721AlarmNotificationsPackage	5.3.0	5.4.0
Mar 2003	S_19	SP-030138	018	--	Corrections to GDMO and ASN.1 definitions in the Alarm IRP CMIP SS	5.3.0	5.4.0
Jun 2003	S_20	SP-030277	019	--	Correction of Compilation Errors	5.4.0	5.5.0
Jun 2003	S_20	SP-030277	020	--	Addition of missing reasons for the emission of notifyAlarmListRebuilt	5.4.0	5.5.0
Sep 2003	S_21	SP-030416	022	--	Correction of syntax error in type SetCommentInfo	5.5.0	5.6.0

3GPP TSG-SA5 (Telecom Management) **S5-037276**
Meeting #36, Shanghai, CHINA, 17 - 21 Nov 2003

CR-Form-v7

CHANGE REQUEST

⌘ **32.111-4 CR 024** ⌘ **rev** **-** ⌘ Current version: **5.6.0** ⌘

*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 ☒ Core Network ☒

Title: ⌘	Mapping completion of getAlarmList		
Source: ⌘	**SA5** (olaf.pollakowski@siemens.com)		
Work item code: ⌘	OAM-NIM	***Date:*** ⌘	21/11/2003
Category: ⌘	**F**	***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: ⌘	Currently the end of an alarm alignment process is indicated to the manager by adding the string "ALIGNMENTEND-<alignmentId>" at the beginning of the field *additionalText* of the last alarm notification. This method has several shortcomings • In case no alarm is identified by the invocation of *getAlarmList* it is not possible to indicate the end of the alarm alignment process. • The manager has to check for every received alarm notification whether this is the last one. The above problems can be solved by indicating the end of an alarm alignmnent process by a dedicated new notification.
Summary of change: ⌘	The notification *notifyAlarmAlignmentEnd* is added.
Consequences if not approved: ⌘	It is not possible to identify the end of an alarm alignment process in the special case that no alarms have to be synchronized.

Clauses affected: ⌘	4.1.6, 5, 6			
	Y	**N**		
Other specs affected: ⌘		X	Other core specifications	⌘
		X	Test specifications	
		X	O&M Specifications	
Other comments: ⌘				

Change in Clause 4.1.6

4.1.6 Alignment of alarm conditions over the Itf-N

The IRP Manager is able to trigger the alarm conditions alignment using the Action *getAlarmList*

The following specifies the logical steps of the alignment procedure, by describing a possible implementation. Any other implementation showing the same behaviour on the Itf-N interface is compliant with the present document.

- The Manager sends to the Agent a *getAlarmList* request containing the following information:
  - *alarmAckState*, used to select the alarms from the Agent's alarm list for the current alignment (e.g. all active alarms).
  - *destination*, identifying the destination to which event reports that have passed the filter conditions are sent.
  - *filter*, this optional parameter defines the conditions an alarm notification shall fulfil in order to be forwarded to the Manager. It applies only for the current alignment request.
- After evaluation of the request, the Agent first generates an *alignmentId* value, which unambiguously identifies this alignment process. This value is used by the Manager to correlate alarm reports to the corresponding alignment requests, in case this Manager issues several alarm alignments in parallel.
- The Agent creates a temporary Event Forwarding Discriminator (EFD) instance for the purpose of this alarm alignment, using the parameters *destination* and *filter* received in the request. If the *filter* parameter is absent in the alarm synchronisation request, all alarm notifications are forwarded to the Manager through this EFD, taking into account both the *filter* constraint currently active for the event reporting to the manager having invoked the synchronisation request and the value of the parameter *alarmAckState*.
  The filter is set by the Agent automatically in order to forward only those alarm notifications containing, at the beginning of the field *additionalText*, ~~either~~ the string "(ALIGNMENT-<alignmentId>)"~~or the string "(ALIGNMENTEND-<alignmentId>)"~~. The filter must also forward the notification *notifyAlarmAlignmentEnd* indicating the end of the alarm alignment process. The alarm alignment end notifications of other alignment processes shall be filtered out using the *alignmentId* carried by the event information parameter of *notifyAlarmAlignmentEnd.*
- The Agent sends back a *getAlarmList* response, which contains the *alignmentId* described above and the *status* information, indicating the result of the request. (see the message flow in Figure 1).
- The Agent scans now its alarm list. For every alarm, which matches the criteria defined by the *alarmAckState* parameter, the Agent inserts, at the beginning of the field *additionalText*, the string "(ALIGNMENT-<alignmentId>)". According to ITU-T Recommendation X.734 [6], the Agent forwards these alarm notifications towards all EFDs.
  ~~In the last alarm of the list the Agent inserts the string "(ALIGNMENTEND-<alignmentId>)" to indicate the end of the alarm alignment.~~

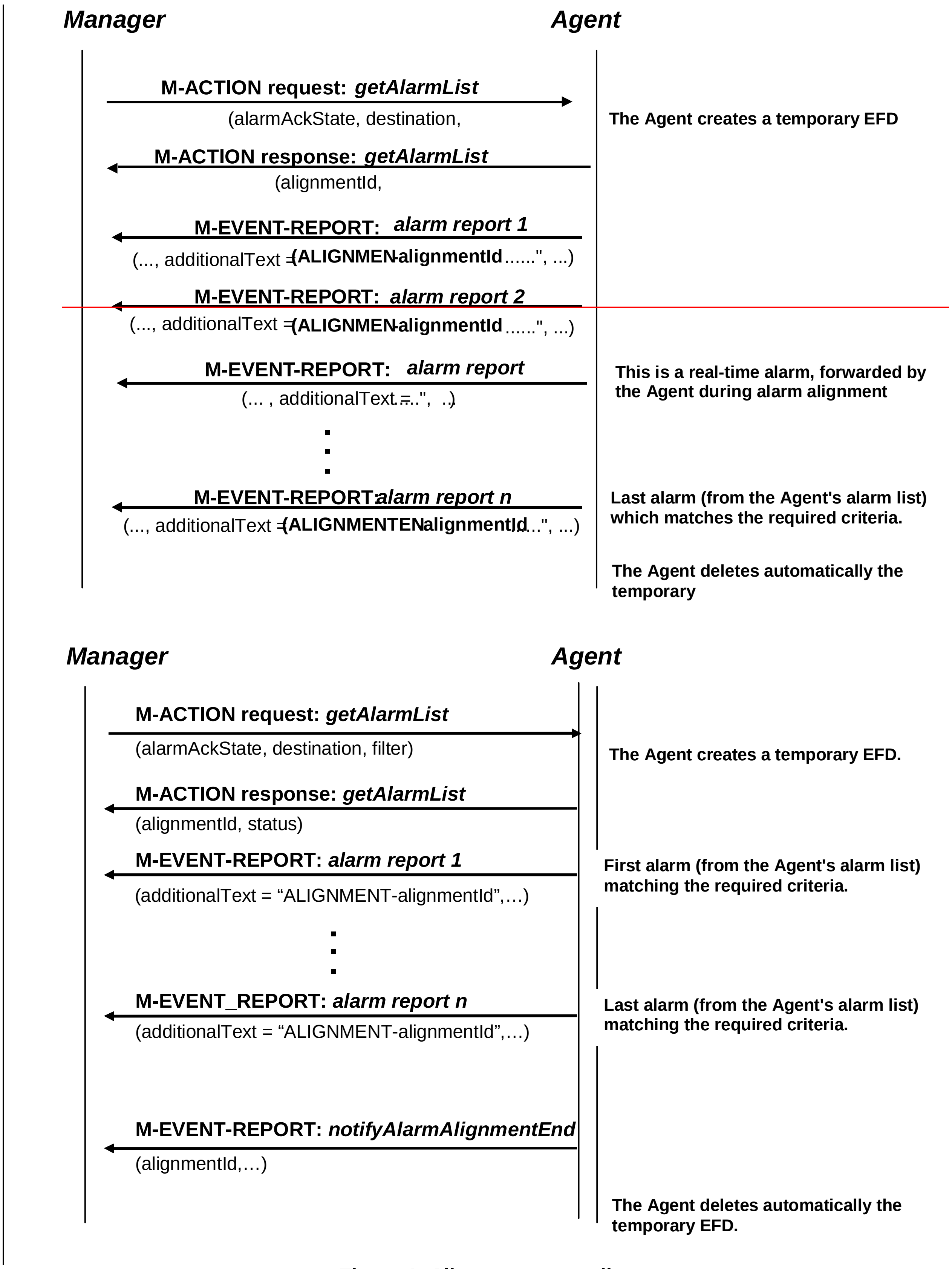
  NOTE: These alarm notifications can reach the current Manager only via the temporary EFD created for the current alignment. They are filtered out:

  a) By all the EFD instances used for "real-time" alarm reporting, due to the presence of the sub-string "ALIGNMENT" in the field *additionalText* (see 3GPP TS 32.304 [10]).

  b) By all temporary EFD instances possibly created for parallel alignments, due to the presence of the unambiguous sub-string "<alignmentId>" in the *additionalText* field.

- At the end of the alarm alignment process the Agent shall send the dedicated notification *notifyAlarmAlignmentEnd* in order to indicate the end of the current alignment process (unambiguously identified by the *alignmentId*). The temporary EFD of the current alarm alignment process shall forward only alarm alignment end notifications carrying in the event information field the *alignmnentId* of this alignment process. All other alarm alignment end notifications shall be filtered out.
- After sending the notification *notifyAlarmAlignmentEnd*~~the last alarm report (identified by the sub-string "ALIGNMENTEND" in the *additionalText*),~~ the Agent automatically deletes the temporary EFD instance (see figure 1).

At the end of the alarm conditions alignment the acknowledgement state and the comments assigned to each alarm are implicitly synchronised between the IRPAgent and the IRPManager that has requested the alignment.



Manager
Agent
M-ACTION request: getAlarmList
(alarmAckState, destination,
The Agent creates a temporary EFD
M-ACTION response: getAlarmList
(alignmentId,
M-EVENT-REPORT: alarm report 1
(..., additionalText = (ALIGNMENT-alignmentId......", ...)
M-EVENT-REPORT: alarm report 2
(..., additionalText = (ALIGNMENT-alignmentId......", ...)
M-EVENT-REPORT: alarm report
(... , additionalText =..", ...)
This is a real-time alarm, forwarded by the Agent during alarm alignment
M-EVENT-REPORT: alarm report n
(..., additionalText = (ALIGNMENTEN-alignmentId...", ...)
Last alarm (from the Agent's alarm list) which matches the required criteria.
The Agent deletes automatically the temporary
Manager
Agent
M-ACTION request: getAlarmList
(alarmAckState, destination, filter)
The Agent creates a temporary EFD.
M-ACTION response: getAlarmList
(alignmentId, status)
M-EVENT-REPORT: alarm report 1
(additionalText = "ALIGNMENT-alignmentId",…)
First alarm (from the Agent's alarm list) matching the required criteria.
M-EVENT_REPORT: alarm report n
(additionalText = "ALIGNMENT-alignmentId",…)
Last alarm (from the Agent's alarm list) matching the required criteria.
M-EVENT-REPORT: notifyAlarmAlignmentEnd
(alignmentId,…)
The Agent deletes automatically the temporary EFD.

Figure 1: Alignment arrow diagram

Figure 2 shows the handling of a "real-time" alarm notification (occurred during the execution of the *getAlarmList* operation), which is forwarded by the Agent (according to ITU-T Recommendation X.734 [6]) to all currently available EFD instances. Dependent on the *discriminatorConstruct* setting of every EFD, such an alarm may or may not reach the related Manager. In any case, this alarm is filtered out by the temporary EFD assigned to the Manager, which triggered the *getAlarmList* request.

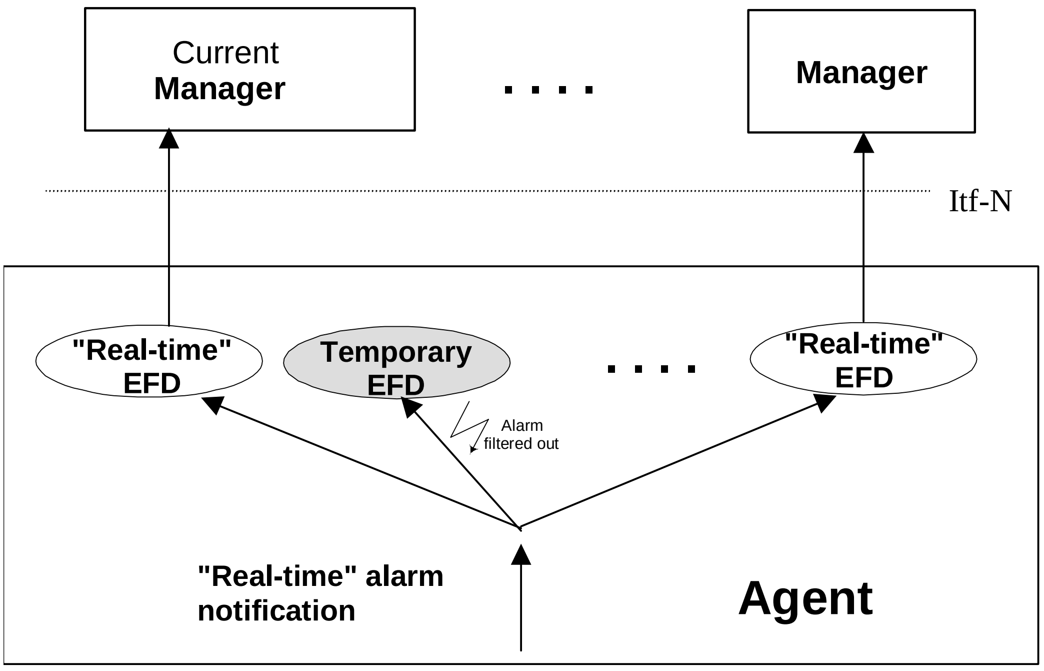


Figure 2: Treatment of "real time" alarms

Figure 3 shows the handling of an alarm notification from the alarm list, matching the criteria defined in the parameters *alarmAckState* of the *getAlarmList* request and forwarded by the Agent to all EFD instances as well. This alarm is filtered out by all EFD instances in charge of discrimination of "real-time" alarms and can reach only the Manager, which triggered the *getAlarmList* request, because it passes the temporary EFD instance assigned to this Manager.

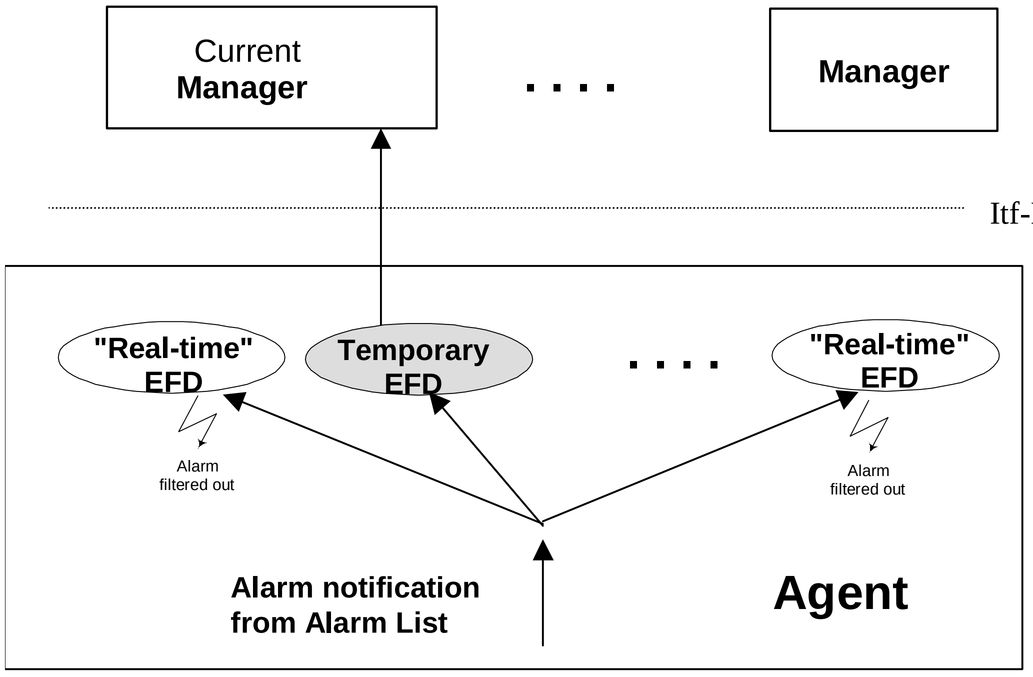


Figure 3: Treatment of "alignment" alarms

End of Change in Clause 4.1.6

End of Change in Clause 4.2.2

4.2.2 Mapping of Operations

Table 1 maps the Interface/Operations defined in the IS of the Alarm IRP to their equivalents in the CMIP SS. The equivalents are qualified as Mandatory (M) or Optional (O).

Table 1: Mapping of Operations

IS Interface	IS Operation	CMIP SS Equivalent	Qualifier
AlarmIRPOperations_1	acknowledgeAlarms	CMISE M-ACTION service, Action Type: acknowledgeAlarms	M
	getAlarmList	getAlarmList environmentalAlarm ITU-T X.721 [4] equipmentAlarm ITU-T X.721 [4] qualityofServiceAlarm ITU-T X.721 [4] processingErrorAlarm ITU-T X.721 [4] communicationsAlarm ITU-T X.721 [4] integrityViolation ITU-T X.721 [4] operationalViolation ITU-T X.721 [4] physicalViolation ITU-T X.721 [4] securityServiceOrMechanismViolation ITU-T X.721 [4] timeDomainViolation ITU-T X.721 [4] notifyAlarmAlignmentEnd	M
AlarmIRPOperations_2	getAlarmCount	getAlarmCount	O
AlarmIRPOperations_3	unacknowledgeAlarms	unacknowledgeAlarms	O
AlarmIRPOperations_4	setComment	setComment	O
AlarmIRPOperations_5	clearAlarms	clearAlarms	O
GenericIRPVersionOperation	getIRPVersion	getAlarmIRPVersion	M
GenericIRPProfileOperation	getNotificationProfile	getAlarmIRPNotificationProfile	O
GenericIRPProfileOperation	getOperationProfile	getAlarmIRPOperationProfile	O

NOTE: The Interfaces GenericIRPVersionOperation and GenericIRPProfileOperation are defined in 3GPP TS 32.312 [11].

End of End of Change in Clause 4.2.2

Change in Clause 5 & 6

5 GDMO definitions

5.1 Managed Object Classes

5.1.1 alarmControl

```
alarmControl MANAGED OBJECT CLASS
   DERIVED FROM
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":top;
   CHARACTERIZED BY
      alarmControlBasicPackage,
      alarmAcknowledgementPackage,
      alarmIRPVersionPackage;
   CONDITIONAL PACKAGES
      alarmCountPackage                      PRESENT IF   "an instance supports it",
      alarmCommentPackage                    PRESENT IF   "an instance supports it",
      alarmProfilePackage                    PRESENT IF   "an instance supports it",
      alarmUnacknowledgementPackage          PRESENT IF   "an instance supports it",
      alarmPotentialFaultyAlarmListPackage   PRESENT IF   "an instance supports it",
      alarmClearPackage                      PRESENT IF   "an instance supports it";
REGISTERED AS {ts32-111AlarmObjectClass 1};
```

5.2 Packages

5.2.1 alarmControlBasicPackage

```
alarmControlBasicPackage PACKAGE
   BEHAVIOUR
      alarmControlBasicPackageBehaviour;
   ATTRIBUTES
      alarmControlId       GET,
      alarmsCountSummary   GET;
   ACTIONS
      getAlarmList;
   NOTIFICATIONS
      notifyAlarmListRebuilt,~~;~~
      notifyAlarmAlignmentEnd;
REGISTERED AS {ts32-111AlarmPackage 1};

alarmControlBasicPackageBehaviour BEHAVIOUR
DEFINED AS
   "The MOC alarmControl has been defined to provide information to the Manager about the currently
   alarms controlled by the Agent.
   An instance of the 'alarmControl' MOC is identified by the value of the attribute
   'alarmControlId'.
   The attribute 'alarmsCountSummary' provides a summary of the number of alarms managed in the
   Agent's alarm list (including the number of cleared but not yet acknowledged alarms).
   The action 'getAlarmList' is the means, for the Manager, to trigger an alarm alignment procedure
   in accordance with the parameter specified in the action request (this may be needed e.g. for
   first time alignment or after a link interruption between the Agent and the Manager). The alarm
   list is sent as a sequence of single alarm reports.
   The notification 'notifyAlarmListRebuilt' is sent by the Agent to the Manager to inform that the
   alarm list has changed. It is recommended that the Manager subsequently triggers an alarm
   alignment.
   The notification 'notifyAlarmAlignmentEnd' is sent by the Agent to the Manager to inform that the
   alarm alignment process identified by the 'alignmentId' is completed.";
```

5.2.2 alarmCountPackage

```
alarmCountPackage PACKAGE
   BEHAVIOUR
      alarmCountPackageBehaviour;
   ACTIONS
      getAlarmCount;
REGISTERED AS {ts32-111AlarmPackage 2};

alarmCountPackageBehaviour BEHAVIOUR
```

```
DEFINED AS
   "This package has been defined to allow the Managers to get information from the Agent about the
   number of alarms currently present in the alarm list.";
```

5.2.3 alarmAcknowledgementPackage

```
alarmAcknowledgementPackage PACKAGE
   BEHAVIOUR
      alarmAcknowledgementPackageBehaviour;
   ACTIONS
      acknowledgeAlarms;
   NOTIFICATIONS
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":communicationsAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":environmentalAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":equipmentAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":processingErrorAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":qualityofServiceAlarm;
REGISTERED AS {ts32-111AlarmPackage 3};

alarmAcknowledgementPackageBehaviour BEHAVIOUR
DEFINED AS
   "This package has been defined to provide information to the Manager about the acknowledgement
   status of the alarms controlled by the Agent.
   The action 'acknowledgeAlarms' allows the NM operator to acknowledge one or several alarms
   previously sent by the Agent as alarm notifications.
   The ITU-T Recommendation X.721 [4] compliant alarm notifications are sent by the Agent to the
   Manager to inform that one alarm has been acknowledged. The acknowledgement related information
   is carried in the additionalInformation attribute.";
```

5.2.4 alarmUnacknowledgementPackage

```
alarmUnacknowledgementPackage PACKAGE
   BEHAVIOUR
      alarmUnacknowledgementPackageBehaviour;
   ACTIONS
      unacknowledgeAlarms;
   NOTIFICATIONS
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":communicationsAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":environmentalAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":equipmentAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":processingErrorAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":qualityofServiceAlarm;
REGISTERED AS {ts32-111AlarmPackage 4};

alarmUnacknowledgementPackageBehaviour BEHAVIOUR
DEFINED AS
   "This package has been defined to provide the Manager with the capability to un-acknowledge
   alarms.
   The action 'unacknowledgeAlarms' allows the NM operator to un-acknowledge one or several alarms
   previously acknowledged by him.
   The ITU-T Recommendation X.721 [4] compliant alarm notifications are sent by the Agent to the
   Manager to inform that one alarm has been unacknowledged. The acknowledgement related information
   is carried in the additionalInformation attribute.";
```

5.2.5 alarmCommentPackage

```
alarmCommentPackage PACKAGE
   BEHAVIOUR
      alarmCommentPackageBehaviour;
   ACTIONS
      setComment;
   NOTIFICATIONS
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": communicationsAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": environmentalAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": equipmentAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": processingErrorAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992": qualityofServiceAlarm;
REGISTERED AS {ts32-111AlarmPackage 5};

alarmCommentPackageBehaviour BEHAVIOUR
DEFINED AS
   "This package has been defined to allow the management of comments related to alarms.
   The action setComment allows the IRPManager to add a comment to one or several alarms. Also the
   IRPAgent may add comments to alarms.
   ITU-T Recommendation X.721 [4] compliant alarm notifications are generated once a comment is
   added to an alarm. The information in all comments associated to an alarm is carried in the
   attribute additionalInformation.";
```

5.2.6 alarmIRPVersionPackage

```
alarmIRPVersionPackage PACKAGE
   BEHAVIOUR
      alarmIRPVersionPackageBehaviour;
   ATTRIBUTES
      supportedAlarmIRPVersions   GET;
   ACTIONS
      getAlarmIRPVersion;
REGISTERED AS {ts32-111AlarmPackage 6};

alarmIRPVersionPackageBehaviour BEHAVIOUR
DEFINED AS
   "This package has been defined to allow the Manager to get information about the Alarm IRP
   versions supported by the Agent.
   The attribute 'supportedAlarmIRPVersions' indicates all versions of the Alarm IRP currently
   supported by the Agent.
   The action 'getAlarmIRPVersion' may be invoked by the Manager to get information about the Alarm
   IRP versions supported by the Agent. Such Alarm IRP versions must compatible to each other. This
   means that the Manager may use any one of such Alarm IRP versions";
```

5.2.7 alarmProfilePackage

```
alarmProfilePackage PACKAGE
   BEHAVIOUR
      alarmProfilePackageBehaviour;
   ACTIONS
      getAlarmIRPOperationProfile,
      getAlarmIRPNotificationProfile;
REGISTERED AS {ts32-111AlarmPackage 7};

alarmProfilePackageBehaviour BEHAVIOUR
DEFINED AS
   "This package has been defined to allow the Manager to get detailed information about the profile
   of Alarm IRP.
   The action 'getOperationProfile' is invoked by the Manager to get detailed information about the
   operations supported by Alarm IRP.
   The action 'getNotificationProfile' is invoked by the Manager to get detailed information about
   the notifications supported by Alarm IRP.";
```

5.2.8 alarmPotentialFaultyAlarmListPackage

```
alarmPotentialFaultyAlarmListPackage PACKAGE
   BEHAVIOUR
      alarmPotentialFaultyAlarmListPackageBehaviour;
   NOTIFICATIONS
      notifyPotentialFaultyAlarmList;
REGISTERED AS {ts32-111AlarmPackage 8};

alarmPotentialFaultyAlarmListPackageBehaviour BEHAVIOUR
DEFINED AS
   "This package allows the IRPAgent to inform the IRPManager that the alarm list held by the
   IRPAgent might be faulty.";
```

5.2.9 alarmClearPackage

```
alarmClearPackage PACKAGE
   BEHAVIOUR
      alarmClearPackageBehaviour;
  ACTIONS
      clearAlarms;
REGISTERED AS {ts32-111AlarmPackage 9};

alarmClearPackageBehaviour BEHAVIOUR
DEFINED AS
   "This package allows the IRPManager to clear one or multiple alarms in the IRPAgent.";
```

5.2.10 x721AlarmNotificationsPackage

```
x721AlarmNotificationsPackage PACKAGE
   BEHAVIOUR
      x721AlarmNotificationsPackageBehaviour;
   NOTIFICATIONS
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":communicationsAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":environmentalAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":equipmentAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":processingErrorAlarm,
      "Rec. X.721 | ISO/IEC 10165-2 : 1992":qualityofServiceAlarm;
REGISTERED AS {ts32-111AlarmPackage 10};

x721AlarmNotificationsPackageBehaviour BEHAVIOUR
DEFINED AS
   "This package contains all alarm notifications defined in ITU-T X.721.";
```

5.3 Actions

5.3.1 acknowledgeAlarms (M)

```
acknowledgeAlarms ACTION
   BEHAVIOUR
      acknowledgeAlarmsBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.AckOrUnackAlarmsInfo;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.AckOrUnackAlarmsReply;
REGISTERED AS {ts32-111AlarmAction 1};

acknowledgeAlarmsBehaviour BEHAVIOUR
DEFINED AS
   "The behaviour of this functionality is defined within 32.111-2 – below provides an overview and
   CMIP specific semantics.
   This action is invoked by the Manager to indicate to the Agent that one or several alarms
   (previously sent by the Agent as alarm notifications) have to be acknowledged. In the action
   request the NM supplies the parameter ackUserId and ackSystemId. The other acknowledgement
   history parameters, i.e. alarm acknowledgement state (in this case acknowledged) and the
   acknowledgement time are set by the Agent itself.
   The 'Action information' field contains the following data:
   •  alarmReferenceList
      This parameter contains a set of MOI (Managed Object Instance) and notificationIdentifier.
      Each pair identifies unambiguously in the scope of the Agent an alarm (previously received
      by the NM) that have to be now acknowledged.  MOI can be absent if scope of uniqueness of
      notificationIdentifier is across the IRPAgent.
   •  ackUserId
      It contains the name of the operator who acknowledged the alarm or a generic name
      (dependent on the operational concept). It may have also the value NULL.
   •  ackSystemId
      It indicates the management system where the acknowledgment is triggered. It may have also
      the value NULL.
   The 'Action response' contains the following data:
   •  status
      This parameter contains the results of the NM acknowledgement action. Possible values:
      noError (0, all alarms found and ack state changed according to the manager request),
      ackPartlySuccessful (some alarms not found / not changeable, see next parameter), error
      (value indicates the reason why the complete operation failed).
   •  errorAlarmReferenceList
      This parameter (significant only if status = ackPartlySuccessful) contains the list of moi
      (managed object instance) and notificationIdentifier pairs of the alarms which could not be
      acknowledged and, for each alarm, also the reason of the error.";
```

5.3.2 getAlarmCount (O)

```
getAlarmCount ACTION
   BEHAVIOUR
      getAlarmCountBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
```

```
      TS32-111-4TypeModule.GetAlarmCountInfo;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.GetAlarmCountReply;
REGISTERED AS {ts32-111AlarmAction 2};

getAlarmCountBehaviour BEHAVIOUR
DEFINED AS
   "The behaviour of this functionality is defined within 32.111-2 – below provides an overview and
   CMIP specific semantics.
   The NM invokes this action to receive the number of available alarms in the Agent' alarm list
   according to the specification in the action request. The Manager may use this action to find out
   the number of alarms in the alarm list before invoking a synchronisation by means of the
   getAlarmList operation. The request is possible also before the Manager creates an own event
   forwarding discriminator instance within the Agent.
   The 'Action information' field contains the following data:
      •  alarmAckState
         Depending on this optional parameter value, the NM gets the number of alarms of each
         perceivedSeverity value according to the following possible choices:
            -  all alarms
            -  all active alarms (acknowledged or not yet acknowledged)
            -  all active and acknowledged alarms
            -  all active and unacknowledged alarms
            -  all cleared and unacknowledged alarms.
         If the parameter is absent, all alarms from the Agent's alarm list are taken into
         consideration.
      •  filter
         The handling of this optional parameter is as follows:
            -  if present and not NULL, it indicates a filter constraint which shall apply in the
               calculation of the results
            -  if its value is NULL, no filter shall be considered and the Agent shall return the
               number of all alarms according to the value of the parameter alarmAckState (see
               above)
            -  if absent, the handling depends on the availability of an event forwarding
               discriminator instance within the Agent. If this instance is valid, the filter
               construct of the event forwarding discriminator shall apply. If no EFD instance is
               available, the Agent shall return the number of all alarms according to the value of
               the above-mentioned parameter alarmAckState.
   The 'Action response' is composed of:
      •  The numbers of alarms for each perceivedSeverity value (if applicable).
      •  The parameter status containing the results of the NM action. Possible values: noError (0),
         error (the value indicates the reason of the error).";
```

5.3.3 getAlarmList (M)

```
getAlarmList ACTION
   BEHAVIOUR
      getAlarmListBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.GetAlarmList;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.GetAlarmListReply;
REGISTERED AS {ts32-111AlarmAction 3};

getAlarmListBehaviour BEHAVIOUR
DEFINED AS
   "This action starts an alarm alignment procedure between a NM and Agent, which takes into account
   the acknowledgment state of the alarms and a dedicated filter (valid only for the current
   request).
   The 'Action information' field contains the following data:
      •  alarmAckState
         Depending on this optional parameter value, the NM gets the alarm reports according to the
         following possible choices:
            -  all alarms
            -  all active alarms (acknowledged or not yet acknowledged)
            -  all active and acknowledged alarms
            -  all active and unacknowledged alarms
            -  all cleared and unacknowledged alarms.
         If the parameter is absent, all alarms from the Agent's alarm list are taken into
         consideration.
      •  destination
         This parameter identifies the destination to which the alarm reports that have passed the
         test conditions specified in the parameter 'filter' are sent. According to ITU-T
         Recommendation X.721 [4], if no destination is specified in the request, then the
         discriminator is created with the destination defaulted to the AE-Title of the invoker.
      • filter
        The handling of this optional parameter (valid only for the current alignment request) is
        as follows:
          - if present and not NULL, it indicates a filter constraint which shall apply in the
            forwarding of the alignment-related alarm reports
          - if its value is NULL, no real filter shall be considered and the Manager receives the
            alarms according to the value of the parameter alarmAckState (see above).
   The 'Action response' contains the following data:
      • alignmentId
        The parameter is defined by the Agent and identifies unambiguously the current alarm
        alignment procedure. It allows the Manager to distinguish between alarm reports sent as
        consequence of several own alignment requests triggered in parallel.
      • status
        The parameter contains the results of the NM action. Possible values: noError (0), error
        (the value indicates the reason of the error).
        After the action response is forwarded to the NM, the Agent sends the alarm list as a
        sequence of single alarm notifications in accordance with the values of the request
        parameters. Every alarm notification contains all fields of the alarm stored in the alarm
        list. In particular:
      • The field additionalText contains at the beginning a string to allow a Manager to recognise
        that this alarm report is sent due to a previous getAlarmList request. The structure of
        this string is:
          - '(ALIGNMENT-alignmentId)' for every alarm report except the last one or
          - '(ALIGNMENTEND-alignmentId)' for the last alarm report sent by the Agent due to the
            current getAlarmList request.
      • If available, the data related to the acknowledgment history (i.e. ackState, ackTime,
        ackUserId, ackSystemId) are provided in the field additionalInformation.
        Further details about the implementation of this operation are provided in the
        'Introduction'.";
```

5.3.4 setComment (O)

```
setComment ACTION
   BEHAVIOUR
      setCommentBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.SetCommentInfo;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.SetCommentReply;
REGISTERED AS {ts32-111AlarmAction 4};

setCommentBehaviour BEHAVIOUR
DEFINED AS
   "The behaviour of this functionality is defined within 32.111-2 – below provides an overview and
   CMIP specific semantics.
   The NM invokes this action to associate a comment to one or more alarms.
   The 'Action information' field contains:
      • alarmReferenceList
        Contains a list of alarm identifiers to which the comment must be associated.
      • commentUserId
        Contains the identity of the NM User that invokes this operation.
      • commentSystemId
        Contains the identity of the NM that invokes this operation.
      • commentText
        Contains the text of the comment.
   The 'Action response' is composed of the following data:
      • errorAlarmReferenceList
        List of pair of alarmId and failure reason.
      • status
        It contains the results of the NM action. Possible values: actionSucceeded (0),
        actionPartiallyFailed (12) or another value indicating the reason of the error.";
```

5.3.5 getAlarmIRPVersion (M)

```
getAlarmIRPVersion ACTION
   BEHAVIOUR
      getAlarmIRPVersionBehaviour;
   MODE
      CONFIRMED;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.GetAlarmIRPVersionReply;
REGISTERED AS {ts32-111AlarmAction 5};
```

```
getAlarmIRPVersionBehaviour BEHAVIOUR
DEFINED AS
   "The behaviour of this functionality is defined within 32.111-2 – below provides an overview and
   CMIP specific semantics.
   The NM invokes this action to get information about the Alarm IRP versions supported by the
   Agent.
   The 'Action information' field contains no data.
   The 'Action response' is composed of the following data:
      •  versionNumbersList
         It defines a list of Alarm IRP versions supported by the Agent. A list containing no
         element, i.e. a NULL list means that the concerned Agent doesn't support any version of the
         Notification IRP.
      •  status
         It contains the results of the NM action. Possible values: noError (0), error (the value
         indicates the reason of the error).";
```

5.3.6 getAlarmIRPNotificationProfile (O)

```
getAlarmIRPNotificationProfile ACTION
   BEHAVIOUR
      getAlarmIRPNotificationProfileBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.IRPVersionNumber;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.GetNotificationProfileReply;
REGISTERED AS {ts32-111AlarmAction 6};

getAlarmIRPNotificationProfileBehaviour BEHAVIOUR
DEFINED AS
   "The behaviour of this functionality is defined within 32.111-2 – below provides an overview and
   CMIP specific semantics.
   A Manager invokes this action to enquiry about the notification profile (supported notifications
   and supported parameters) for this specific Alarm IRP version.
   The 'Action information' contains the following data:
      •  irpVersionNumber
         This mandatory parameter identifies the Alarm IRP version.
   The 'Action response' is composed of the following data:
      •  notificationNameProfile
         It contains a list of notification names, i.e. a NULL list means that the Alarm IRP doesn't
         support any notification.
      •  notificationParameterProfile.
         It contains a set of elements, each element corresponds to a notification name and is
         composed by a set of parameter names.
      •  status
         It contains the results of this action. Possible values: noError (0), error (the value
         indicates the reason of the error).";
```

5.3.7 getAlarmIRPOperationProfile (O)

```
getAlarmIRPOperationProfile ACTION
   BEHAVIOUR
      getAlarmIRPOperationProfileBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.IRPVersionNumber;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.GetOperationProfileReply;
REGISTERED AS {ts32-111AlarmAction 7};

getAlarmIRPOperationProfileBehaviour BEHAVIOUR
DEFINED AS
   "The behaviour of this functionality is defined within 32.111-2 – below provides an overview and
   CMIP specific semantics.
   A Manager invokes this action to enquiry about the operation profile (supported operations and
   supported parameters) for this specific Alarm IRP version.
   The 'Action information' contains the following data:
      •  irpVersionNumber
         This mandatory parameter identifies the Alarm IRP version.
   The 'Action response' is composed of the following data:
      •  operationNameProfile
```

It contains a list of operation names.

- *operationParameterProfile.*
  It contains a set of elements, each element corresponds to an operation name and is composed by a set of parameter names.
- *status*
  It contains the results of this action. Possible values: noError (0), error (the value indicates the reason of the error).";

5.3.8 unacknowledgeAlarms (O)

```
unacknowledgeAlarms **ACTION**
   BEHAVIOUR
      unacknowledgeAlarmsBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.AckOrUnackAlarmsInfo;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.AckOrUnackAlarmsReply;
REGISTERED AS {ts32-111AlarmAction 8};
```

unacknowledgeAlarmsBehaviour **BEHAVIOUR**
DEFINED AS

"The behaviour of this functionality is defined within 32.111-2 – below provides an overview and CMIP specific semantics.
This action is used by the Manager to indicate to the Agent that one or several alarms (previously acknowledged) have to be unacknowledged. Subsequently the 'acknowledgement history' information of these alarms in the Agent's alarm list is completely removed (this operation may be used by operators in case of a previous acknowledgement by mistake).
The 'Action information' field contains the following data:

- *alarmReferenceList*
  This parameter contains a set of MOI (Managed Object Instance) and *notificationIdentifier pair*. Each of them identifies unambiguously in the scope of the Agent an alarm (previously acknowledged by the NM) that have to be now unacknowledged. MOI can be absent if scope of uniqueness of notificationIdentifier is across the IRPAgent.
- *ackUserId*
  It contains the name of the operator who unacknowledged the alarm or a generic name (dependent on the operational concept). It may have also the value NULL. Note that only the user who previously acknowledged the alarm is allowed to un-acknowledge it later.
- *ackSystemId*
  It indicates the management system where the acknowledgment is triggered. It may have also the value NULL. Note that the un-acknowledgement is allowed only at the management system where previously the acknowledgement took place.

The 'Action response' contains the following data:

- *status*
  This parameter contains the results of the NM un-acknowledgement action. Possible values: noError (0, all alarms found and ack state changed according to the manager request), unackPartlySuccessful (some alarms not found / not changeable, see next response parameter), error (value indicates the reason why the complete operation failed).
- *errorAlarmReferenceList*
  This parameter (significant only if *status* = unackPartlySuccessful) contains the list of MOI (Managed Object Instance) and notificationIdentifier pairs of the alarms which could not be unacknowledged and, for each alarm, also the reason of the error. MOI can be absent if scope of uniqueness of notificationIdentifier is across the IRPAgent. ";

5.3.9 clearAlarms (O)

```
clearAlarms ACTION
   BEHAVIOUR
      clearAlarmsBehaviour;
   MODE
      CONFIRMED;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.ClearAlarmsInfo;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.ClearAlarmsReply;
REGISTERED AS {ts32-111AlarmAction 9};
```

clearAlarmsBehaviour **BEHAVIOUR**
DEFINED AS

"The behaviour of this functionality is defined within 32.111-2 – below provides an overview and CMIP specific semantics.
This action is invoked by the IRPManager to clear manually one or multiple alarms.The M-ACTION request parameter 'Action information' *ClearAlarmsInfo* is composed of the following fields:

```
      • alarmReferenceList
        This mandatory parameter identifies the alarms to be cleared. Each alarm is identified by
        the notification identifier of the notification that reported the alarm the first time and,
        if the notification identifier is not unique across the IRPAgent, by the instance of the
        managed object that emitted this notification.
      • clearUserId
        This mandatory parameter identifies the user that has invoked the clearAlarms operation.
      • clearSystemId
        This optional parameter identifies the system on which the IRPManager, where the
        clearAlarms operation has been invoked, is running. This parameter may be absent.
   The M-ACTION response parameter 'Action Reply' ClearAlarmsReply is composed of the following
   fields
      • errorAlarmReferenceList
        This mandatory parameter identifies alarms that are specified in the alarmReferenceList,
        but which could not be cleared. The alarms are specified by the notification identifier of
        the notification that reported the alarm the first time and, if required, the instance of
        the managed object that emitted this notification. In addition to this, the parameter
        specifies for every alarm that could not be cleared the error reason. If all alarms
        specified in the alarmReferenceList exist and could be cleared, this parameter contains no
        information. If the operation failed completely due to a general error, this parameter is
        not significant.
      • status
        This mandatory parameter provides informations about the result of the operation. If all
        alarms specified in the alarmReferenceList exist and are cleared, the value noError (0) is
        returned. If some alarms specified do not exist or could not be cleared, the value
        clearPartlySuccessful () is returned. In this case the parameter errorAlarmReferenceList
        provides additional information. If the operation failed completely due to a general error,
        this parameter returns the error reason.";
```

5.4 Notifications

5.4.1 notifyAlarmListRebuilt (M)

```
notifyAlarmListRebuilt NOTIFICATION
   BEHAVIOUR
      alarmListRebuiltBehaviour;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.NotifyAlarmListRebuiltInfo;
REGISTERED AS {ts32-111AlarmNotification 1};

alarmListRebuiltBehaviour BEHAVIOUR
DEFINED AS
   "This notification is used by the Agent to inform the NM that the alarm list has been rebuilt.
   The 'Event Information' field contains the following data:
      • notificationIdentifier
        This ITU-T X.721 standardised parameter, together with MOI (Managed Object Instance),
        unambiguously identifies this notification.
      • rebuiltObjectClass
        This parameter carries the IRPAgent MOC when the entire AlarmList has been rebuilt. It
        carries a different MOC when the AlarmList has been partially rebuilt.
      • rebuiltObjectInstance
        This parameter carries DN of the IRPAgent when the entire AlarmList has been rebuilt. It
        carries the DN of another MOI when the AlarmList has been partially rebuilt  and only the
        MOIs subordinate of  this rebuilt MOI may be affected by this partial rebuilt.
      • reason
        The parameter indicates the reason for alarm list rebuilding (if applicable).
      • alarmListAlignmentRequirement
        This parameter indicates, if the IRPManager has to align its alarm list with the IRPAgent.
        Absence of this parameter means, that an alignment is required. ";
```

5.4.2 notifyPotentialFaultyAlarmList (O)

```
notifyPotentialFaultyAlarmList NOTIFICATION
   BEHAVIOUR
      notifyPotentialFaultyAlarmListBehaviour;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.NotifyPotentialFaultyAlarmListInfo;
REGISTERED AS {ts32-111AlarmNotification 3};

notifyPotentialFaultyAlarmListBehaviour BEHAVIOUR
DEFINED AS
```

```
   "This notification is used by the IRPAgent to inform the IRPManager that the IRPAgent has lost
   confidence in the integrity of its alarm list.
   The 'Event information' field contains the following data:
      •  potentialFaultyObjectClass
         This parameter specifies together with the parameter potentialFaultyObjectInstance the
         unreliable alarm information instances in the alarm list.
         If this parameter carries the MOC of the IRPAgent, then the entire alarm list is
         unreliable.
         If this parameter carries the MOC of another MO, then only a part of the alarm list is
         unreliable. The mechanism for identifying the unreliable part is described below.
      •  potentialFaultyObjectInstance
         This parameter specifies together with the parameter potentialFaultyObjectClass the
         unreliable alarm information instances in the alarm list.
         If potentialFaultyObjectClass carries the MOC of the IRPAgent, the this parameter carries
         the DN of the IRPAgent and the entire alarm list is unreliable.
         If potentialFaultyObjectClass carries the MOC of another MO, then this parameter carries
         the DN of an instance of this class. All alarm information instances representing alarms
         raised by this MOI and its subordinates may be unreliable in this case.
      •  notificationIdentifier
         This parameter specifies the notification identifier (ITU-T X.733 [5]), which, together
         with the instance of the object emitting this notification, unambiguously identifies this
         notification.
      •  reason
         This parameter specifies the reason why the IRPAgent has lost confidence in the integrity
         of its alarm list and needs to rebuild it.";
```

5.4.3 notifyAlarmAlignmentEnd (M)

```
notifyAlarmAlignmentEnd NOTIFICATION
   BEHAVIOUR
      notifyAlarmAlignmentEndBehaviour;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.NotifyAlarmAlignmentEndInfo;
REGISTERED AS {ts32-111AlarmNotification 4};

notifyAlarmAlignmentEndBehaviour BEHAVIOUR
DEFINED AS
   "This notification is used by the Agent to inform the NM that the alarm alignment related to the
   current alignmentId value is completed.
   The 'Event Information' field contains the following data:
      •   notificationIdentifier
         This ITU-T X.721 standardised parameter, together with MOI (Managed Object Instance),
         unambiguously identifies this notification.
      •  alignmentId
         The parameter is defined by the Agent (in the getAlarmList response) and identifies
         unambiguously the current alarm alignment process. It allows the Manager to distinguish
         between alarm reports sent as consequence of several own alignment requests triggered in
         parallel."
```

5.5 Attributes

5.5.1 alarmControlId

```
alarmControlId ATTRIBUTE
   WITH ATTRIBUTE SYNTAX
      TS32-111-4TypeModule.GeneralObjectId;
   MATCHES FOR
      EQUALITY;
   BEHAVIOUR
      alarmControlIdBehaviour;
REGISTERED AS {ts32-111AlarmAttribute 1};

alarmControlIdBehaviour BEHAVIOUR
DEFINED AS
   "This attribute names an instance of a 'alarmControl' object class.";
```

5.5.2 alarmsCountSummary

```
alarmsCountSummary ATTRIBUTE
   WITH ATTRIBUTE SYNTAX
      TS32-111-4TypeModule.AlarmsCountSummary;
   MATCHES FOR
      EQUALITY;
   BEHAVIOUR
      alarmsCountSummaryBehaviour;
REGISTERED AS {ts32-111AlarmAttribute 2};

alarmsCountSummaryBehaviour BEHAVIOUR
DEFINED AS
   "This attribute indicates a summary of number of alarms managed in the Agent's alarm list sorted
   according to the perceived severity (including the number of cleared but not yet acknowledged
   alarms). Additionally the number of all currently active alarms is provided.";
```

5.5.3 supportedAlarmIRPVersions

```
supportedAlarmIRPVersions ATTRIBUTE
   WITH ATTRIBUTE SYNTAX
      TS32-111-4TypeModule.SupportedAlarmIRPVersions;
   MATCHES FOR
      EQUALITY;
   BEHAVIOUR
      supportedAlarmIRPVersionsBehaviour;
REGISTERED AS {ts32-111AlarmAttribute 3};

supportedAlarmIRPVersionsBehaviour BEHAVIOUR
DEFINED AS
   "This attribute provides the information concerning the Alarm IRP versions currently supported by
   the Agent.";
```

5.6 Parameters

5.6.1 ackStateParameter

```
ackStateParameter PARAMETER
   CONTEXT
      TS32-111-4TypeModule.AlarmInfo.additionalInformation;
   WITH SYNTAX
      TS32-111-4TypeModule.AckState;
   BEHAVIOUR
      ackStateParameterBehaviour;
REGISTERED AS {ts32-111AlarmParameter 1};

ackStateParameterBehaviour BEHAVIOUR
DEFINED AS
   "This parameter models the optional additionalInformation field of the alarm notification. If
   present, it informs the NM about the current acknowledgement state of the present alarm.";
```

5.6.2 ackSystemIdParameter

```
ackSystemIdParameter PARAMETER
   CONTEXT
      TS32-111-4TypeModule.AlarmInfo.additionalInformation;
   WITH SYNTAX
      TS32-111-4TypeModule.SystemId;
   BEHAVIOUR
      ackSystemIdParameterBehaviour;
REGISTERED AS {ts32-111AlarmParameter 2};

ackSystemIdParameterBehaviour BEHAVIOUR
DEFINED AS
   "This parameter models the optional additionalInformation field of the alarm notification. If
   present, it informs the NM about the identifier of the management system where the present alarm
   has been acknowledged.";
```

5.6.3 ackTimeParameter

```
ackTimeParameter PARAMETER
   CONTEXT
      TS32-111-4TypeModule.AlarmInfo.additionalInformation;
   WITH SYNTAX
      TS32-111-4TypeModule.AckTime;
   BEHAVIOUR
```

```
      ackTimeParameterBehaviour;
REGISTERED AS {ts32-111AlarmParameter 3};

ackTimeParameterBehaviour BEHAVIOUR
DEFINED AS
   "This parameter models the optional additionalInformation field of the alarm notification. If
   present, it informs the NM about the time the present alarm has been acknowledged by the Agent.";
```

5.6.4 ackUserIdParameter

```
ackUserIdParameter PARAMETER
   CONTEXT
      TS32-111-4TypeModule .AlarmInfo.additionalInformation;
   WITH SYNTAX
      TS32-111-4TypeModule.UserId;
   BEHAVIOUR
      ackUserIdParameterBehaviour;
REGISTERED AS {ts32-111AlarmParameter 4};

ackUserIdParameterBehaviour BEHAVIOUR
DEFINED AS
   "This parameter models the optional additionalInformation field of the alarm notification. If
   present, it informs the NM about the identifier of the user who acknowledged the present alarm.";
```

5.6.5 clearUserIdParameter

```
clearUserIdParameter PARAMETER
   CONTEXT
      TS32-111-4TypeModule .AlarmInfo.additionalInformation;
   WITH SYNTAX
      TS32-111-4TypeModule.UserId;
   BEHAVIOUR
      clearUserIdParameterBehaviour;
REGISTERED AS {ts32-111AlarmParameter 5};

clearUserIdParameterBehaviour BEHAVIOUR
DEFINED AS
   "This parameter is carried by additionalInformation in the notification reporting the clearance
   of an alarm. It identifies the user that has invoked the clearAlarms operation, that has led to
   the clearance of the reported alarm clearance.";
```

5.6.6 clearSystemIdParameter

```
clearSystemIdParameter PARAMETER
   CONTEXT
      TS32-111-4TypeModule.AlarmInfo.additionalInformation;
   WITH SYNTAX
      TS32-111-4TypeModule.UserId;
   BEHAVIOUR
      clearSystemIdParameterBehaviour;
REGISTERED AS {ts32-111AlarmParameter 6};

clearSystemIdParameterBehaviour BEHAVIOUR
DEFINED AS
   "This parameter is carried by additionalInformation in the notification reporting the clearance
   of an alarm. It identifies the system on which the IRPManager, where the clearAlarms operation
   that has led to the clearance of the reported alarm, is running";
```

5.6.7 commentsParameter

```
commentsParameter PARAMETER
   CONTEXT
      TS32-111-4TypeModule.AlarmInfo.additionalInformation;
   WITH SYNTAX
      TS32-111-4TypeModule.AlarmComments;
   BEHAVIOUR
      commentsParameterBehaviour;
REGISTERED AS   {ts32-111AlarmParameter 7};

commentsParameterBehaviour BEHAVIOUR
DEFINED AS
```

```
"This parameter is carried by the attribute additionalInformation in alarm notifications. If
present, it informs the IRPManager about the comments assigned to an alarm. Every single comment
includes the following data: commentText, commentTime, commentUserId and (optionally)
commentSystemId.";
```

6 ASN.1 definitions for Alarm IRP

```
TS32-111-4TypeModule {itu-t(0) identified-organization(4) etsi(0) mobileDomain(0) umts-Operation-
Maintenance(3) ts-32-111(111) part4(4) informationModel(0) asn1Module(2) version1(1)}

DEFINITIONS IMPLICIT TAGS ::=
BEGIN

--EXPORTS everything

IMPORTS

NotificationIdentifier, Destination, EventTime, ProbableCause, PerceivedSeverity
   FROM Attribute-ASN1Module {joint-iso-ccitt ms(9) smi(3) part2(2) asn1Module(2) 1}

AlarmInfo
   FROM Notification-ASN1Module {joint-iso-ccitt ms(9) smi(3) part2(2) asn1Module(2) 2}

CMISFilter, ObjectInstance, ObjectClass, EventTypeId
   FROM CMIP-1 {joint-iso-ccitt ms(9) cmip(1) modules(0) protocol(3)};

baseNodeUMTS                 OBJECT IDENTIFIER ::= {itu-t (0) identified-organization (4)
                                                     etsi (0) mobileDomain (0)
                                                     umts-Operation-Maintenance (3)}

ts32-111Prefix               OBJECT IDENTIFIER ::= {baseNodeUMTS ts-32-111(111)}
ts32-111Part4                OBJECT IDENTIFIER ::= {ts32-111Prefix part4(4)}
ts32-111-4InfoModel          OBJECT IDENTIFIER ::= {ts32-111Part4 informationModel(0)}

ts32-111AlarmObjectClass     OBJECT IDENTIFIER ::= {ts32-111-4InfoModel managedObjectClass(3)}
ts32-111AlarmPackage         OBJECT IDENTIFIER ::= {ts32-111-4InfoModel package(4)}
ts32-111AlarmParameter       OBJECT IDENTIFIER ::= {ts32-111-4InfoModel parameter(5)}
ts32-111AlarmAttribute       OBJECT IDENTIFIER ::= {ts32-111-4InfoModel attribute(7)}
ts32-111AlarmAction          OBJECT IDENTIFIER ::= {ts32-111-4InfoModel action(9)}
ts32-111AlarmNotification    OBJECT IDENTIFIER ::= {ts32-111-4InfoModel notification(10)}



-- Start of 3GPP SA5 own definitions

AckErrorList ::= SET OF ErrorInfo

AlarmReference ::= SEQUENCE
   {
   moi                          ObjectInstance OPTIONAL, -- absent if scope of uniquness of
                                                         -- notificationId is across IRPAgent
   notificationIdentifier       NotificationIdentifier
   }

AckOrUnackAlarmsInfo ::= SEQUENCE
   {
   alarmReferenceList           SET OF AlarmReference,
   ackUserId                    UserId,
   ackSystemId                  SystemId OPTIONAL
   }

AckOrUnackAlarmsReply ::= SEQUENCE
   {
   status                       ErrorCauses,
   errorAlarmReferenceList      AckErrorList
   }

AckState ::= ENUMERATED
   {
   acknowledged    (0),
   unacknowledged  (1)
   }

AckTime ::= GeneralizedTime

AlarmChoice ::= ENUMERATED
   {
   allAlarms                  (0),
   allActiveAlarms            (1),
   allActiveAndAckAlarms      (2),
   allActiveAndUnackAlarms    (3),
   allClearedAndUnackAlarms   (4),
   allUnackAlarms             (5)
   }

AlarmComments ::= SET OF SingleAlarmComment

AlarmsCountSummary ::= SEQUENCE
   {
   activeAlarmsCount       INTEGER,   -- this is the sum of criticalCount, majorCount,
                                      -- minorCount, warningCount and indeterminateCount
   criticalCount           INTEGER,
   majorCount              INTEGER,
   minorCount              INTEGER,
   warningCount            INTEGER,
   indeterminateCount      INTEGER,
   clearedCount            INTEGER
   }

AlarmListAlignmentRequirement ::= ENUMERATED
   {
   alignmentRequired      (0),   -- An alarm alignment is required.
   alignmentNotRequired   (1)    -- An alarm alignment is not required.
   }

ClearAlarmsInfo ::= SEQUENCE
   {
   alarmReferenceList      SET OF AlarmReference,
   clearUserId             UserId,
   clearSystemId           SystemId OPTIONAL
   }

ClearAlarmsReply ::= SEQUENCE
   {
   status                       ErrorCauses,
   errorAlarmReferenceList      ClearErrorList
   }

ClearErrorList ::= SET OF ErrorInfo

CommentText ::= GraphicString

CommentTime ::= GeneralizedTime

ErrorCauses ::= ENUMERATED
   {
   noError                          (0), -- operation / notification successfully performed
   wrongFilter                      (1), -- the value of the filter parameter is not valid
   wrongAlarmAckState               (2), -- the value of the alarmAckState parameter (e.g.
                                         -- getAlarmCount) is not valid
   ackPartlySuccessful              (3), -- acknowledgment request partly successful
   unackPartlySuccessful            (4), -- unacknowledgment request partly successful
   wrongAlarmReference              (5), -- alarm identifier used in the alarm reference list not
                                         -- found (e.g. in case of acknowledgement request)
   wrongAlarmReferenceList          (6), -- the alarm reference list (e.g. in case of
                                         -- acknowledgement request) is empty or completely wrong
   alarmAlreadyAck                  (7), -- alarm to be acknowledged is already in this state
   alarmAlreadyUnack                (8), -- alarm to be acknowledged is already in this state
   wrongUserId                      (9), -- the user identifier in the unacknowledgement operation
                                         -- is not the same as in the previous
                                         -- acknowledgementAlarms request
   wrongSystemId                   (10), -- the system identifier in the unacknowledgement
                                         -- operation is not the same as in the previous
                                         -- acknowledgementAlarms request
   alarmAckNotAllowed              (11), -- current management system not allowed to acknowledge the
                                         -- alarm (e.g. due to acknowledgement competence rules)
   setCommentPartlySuccessful      (12), -- the setComment action partly successful (e.g. some
                                         -- alarmId are not in the alarmList)
   clearAlarmsPartlySuccessful     (13), -- only some alarms to be cleared could be cleared
   clearAlarmsNotAllowed           (14), -- current management system not allowed to clear the alarm
   clearAlarmsAlarmAlreadyCleared  (15), -- alarm to be cleared is already cleared
   unspecifiedErrorReason         (255)  -- operation failed, specific error unknown
   }

ErrorInfo ::= SEQUENCE
   {
   moi                         ObjectInstance OPTIONAL,   -- absent if uniqueness of
```

```
                                                         -- notificationIdentifier is across
                                                         -- IRPAgent
   notificationIdentifier      NotificationIdentifier,    -- ITU-T X.721
   reason                      ErrorCauses
   }

GeneralObjectId ::= INTEGER

GetAlarmCountInfo ::= SEQUENCE
   {
   alarmAckState      AlarmChoice OPTIONAL,
   filter             CMISFilter OPTIONAL     -- ITU-T X.711
   }

GetAlarmCountReply ::= SEQUENCE
   {
   criticalCount           INTEGER,
   majorCount              INTEGER,
   minorCount              INTEGER,
   warningCount            INTEGER,
   indeterminateCount      INTEGER,
   clearedCount            INTEGER,
   status                  ErrorCauses
   }

GetAlarmIRPVersionReply ::= SEQUENCE
   {
   versionNumberList      SupportedAlarmIRPVersions,
   status                 ErrorCauses
  }

GetAlarmList ::= SEQUENCE
   {
   alarmAckState      AlarmChoice OPTIONAL,
   destination        Destination,            -- ITU-T X.721
   filter             CMISFilter OPTIONAL     -- ITU-T X.711
   }

GetAlarmListReply ::= SEQUENCE
   {
   alignmentId      INTEGER,
   status           ErrorCauses
   }

GetNotificationProfileReply ::= SEQUENCE
   {
   notificationNameProfile           NotificationList,
   notificationParameterProfile      ParameterListOfList,
   status                            ErrorCauses
   }

GetOperationProfileReply ::= SEQUENCE
   {
   operationNameProfile           OperationList,
   operationParameterProfile      ParameterListOfList,
   status                         ErrorCauses
   }

IRPVersionNumber ::= GraphicString

NotificationList ::= SET OF NotificationName

NotificationName ::= GraphicString

NotifyAlarmAlignmentEndInfo ::= SEQUENCE
   {
   notificationIdentifier      NotificationIdentifier,        -- ITU-T X.721
   alignmentId                 INTEGER
   }

NotifyAlarmListRebuiltInfo ::= SEQUENCE
   {
   notificationIdentifier             NotificationIdentifier,         -- ITU-T X.721
   rebuiltObjectClass                 ObjectClass,                    -- ITU-T X.721
   rebuiltObjectInstance              ObjectInstance,                 -- ITU-T X.721
   reason                             ReasonAlarmListRebuilt,
   alarmListAlignmentRequirement      AlarmListAlignmentRequirement OPTIONAL
   }
```

```
NotifyPotentialFaultyAlarmListInfo ::= SEQUENCE
   {
   potentialFaultyObjectClass         ObjectClass,                     -- ITU-T X.711
   potentialFaultyObjectInstance      ObjectInstance,                  -- ITU-T X.711
   notificationIdentifier             NotificationIdentifier,          -- ITU-T X.721
   reason                             ReasonPotentialFaultyAlarmList
   }

OperationList ::= SET OF OperationName

OperationName ::= GraphicString

ParameterList ::= SET OF ParameterName

ParameterListOfList ::= SET OF ParameterList

ParameterName ::= GraphicString

ReasonAlarmListRebuilt :: ENUMERATED
   {
   AgentNetworkEntityCommunicationError   (0),
   AgentRestart                           (1),
   Indeterminate                          (2)
   }

ReasonPotentialFaultyAlarmList ::= ENUMERATED
   {
   communicationErrorNEAgent   (0), -- A communication error between a NE and the agent has occured.
   agentRestart                (1), -- The agent has restarted and not yet updated its alarm list.
   indeterminate               (2)  -- The reasn could not be determined.
   }

SetCommentInfo ::= SEQUENCE
   {
   alarmReferenceList      SET OF AlarmReference,
   commentUserId           UserId,
   commentSystemId         [2] SystemId OPTIONAL,
   commentText             CommentText
   }

SetCommentReply ::= SEQUENCE
   {
   errorAlarmReferenceList      SET OF ErrorInfo,
   status                       ErrorCauses
   }

SingleAlarmComment ::= SEQUENCE
   {
   commentText          CommentText,
   commentTime          CommentTime,
   commentUserId        UserId,
   commentSystemId      SystemId OPTIONAL
   }

SystemId ::= GraphicString

SupportedAlarmIRPVersions ::= SET OF IRPVersionNumber

UserId ::= GraphicString

END -- of module TS32-111-4TypeModule
```

End of Change in Clause 5 & 6
End of Document

Annex A (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-000254	005	--	Split of TS - Part 4: Alarm Integration Reference Point (IRP): CMIP Solution Set (SS)	3.0.1	3.1.0
Sep 2000	--	--	--	--	cosmetic	3.1.0	3.1.1
Jun 2001	S_12	SP-010282	001	--	Alarm IRP: CMIP SS Rel4 - Addition of feature. As SA5 had not reviewed this part, it is submitted to SA#12 for Information only.	3.1.1	--
Sep 2001	S_13	SP-010470	001	1	Addition of features	3.1.1	4.0.0
Dec 2001	S_14	SP-010640	003	--	Change of qualifier for setComment and notifyComment	4.0.0	4.1.0
Dec 2001	S_14	SP-010640	004	--	Addition of missing parameter in notifyComments	4.0.0	4.1.0
Mar 2002	S_15	SP-020028	005	--	Addition of "perceivedSeverity" as parameter to "acknowledgeAlarms" operation (CMIP SS)	4.1.0	4.2.0
Mar 2002	S_15	--	--	--	Automatic upgrade to Rel-5 (no Rel-5 CR)	4.2.0	5.0.0
Jun 2002	S_16	SP-020283	007	--	Correction of errors and ambiguities in the Parameter Mapping Tables and ASN.1 Definitions	5.0.0	5.1.0
Jun 2002	S_16	SP-020284	008	--	Addition of the parameter alarmListAlignmentRequirement to the notification notifyAlarmListRebuilt in the CMIP SS (32.111-4)	5.0.0	5.1.0
Jun 2002	S_16	SP-020284	009	--	Adding the notification notifyPotentialFaultyAlarmList in the CMIP SS (32.111-4)	5.0.0	5.1.0
Jun 2002	S_16	SP-020284	010	--	Introduction of SS (32.111-4) to IS (32.111-2) relation and correction of Foreword	5.0.0	5.1.0
Sep 2002	S_17	SP-020480	011	--	Alignment with 32.111-2 on Alarm Clearance Functionality	5.1.0	5.2.0
Dec 2002	S_18	SP-020751	013	--	Add the additionalInformation parameter in notifyNewAlarms to the Alarm IRP CMIP SS (Alignment with Information Service in Rel-5 32111-2)	5.2.0	5.3.0
Dec 2002	S_18	SP-020753	014	--	Addition of Security Alarm Support to the Alarm IRP CMIP SS (Alignment with Information Service in Rel-5 32111-2)	5.2.0	5.3.0
Mar 2003	S_19	SP-030063	016	--	Correction to Alarm Comments- alignment with 32.111-1	5.3.0	5.4.0
Mar 2003	S_19	SP-030138	017	--	Add missing x721AlarmNotificationsPackage	5.3.0	5.4.0
Mar 2003	S_19	SP-030138	018	--	Corrections to GDMO and ASN.1 definitions in the Alarm IRP CMIP SS	5.3.0	5.4.0
Jun 2003	S_20	SP-030277	019	--	Correction of Compilation Errors	5.4.0	5.5.0
Jun 2003	S_20	SP-030277	020	--	Addition of missing reasons for the emission of notifyAlarmListRebuilt	5.4.0	5.5.0
Sep 2003	S_21	SP-030416	022	--	Correction of syntax error in type SetCommentInfo	5.5.0	5.6.0