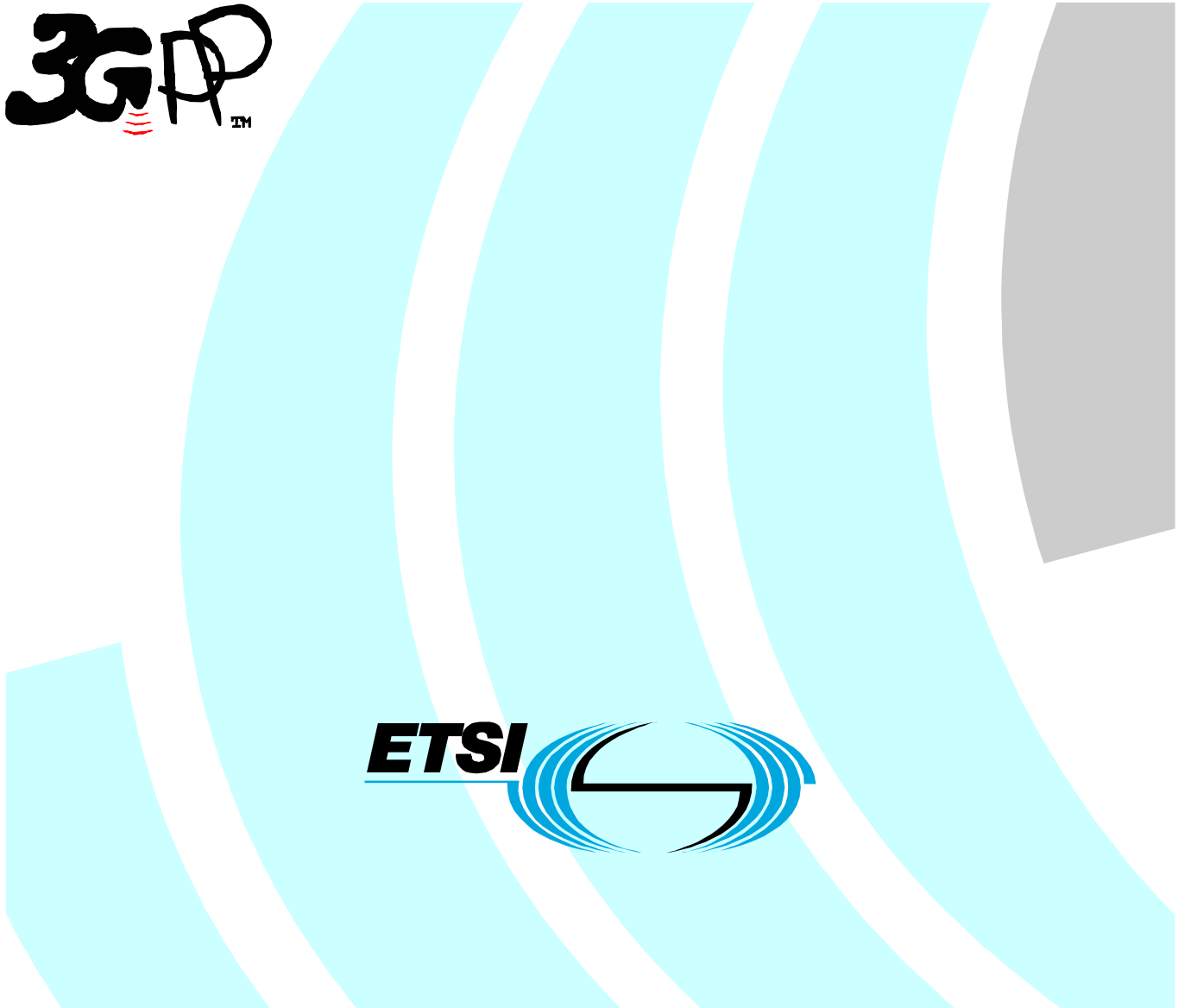
ETSI TS 132 111-4 V4.6.0 (2003-09)

Technical Specification

Universal Mobile Telecommunications System (UMTS);
Telecommunication management;
Fault Management;
Part 4: Alarm Integration Reference Point (IRP):
Common Management Information Protocol (CMIP)
solution set
(3GPP TS 32.111-4 version 4.6.0 Release 4)



Reference
RTS/TSGS-0532111-4v460

Keywords
UMTS

ETSI

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Foreword

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Contents

Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

The present document is part 4 of a multi-part deliverable covering the Telecommunication Management; Fault Management (FM), as identified below:

Part 1: "3G fault management requirements";

Part 2: "Alarm Integration Reference Point (IRP): Information Service (IS)";

Part 3: "Alarm Integration Reference Point (IRP): Common Object Request Broker Architecture (CORBA) Solution Set (SS)";

Part 4: "Alarm Integration Reference Point (IRP): Common Management Information Protocol (CMIP) Solution Set (SS)".

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1 Scope

The present document defines the alarm integration reference point for the CMIP solution set. In detail:

- clause 4 contains an introduction to some basic concepts of the CMIP interfaces;
- clause 5 contains the GDMO definitions for the Alarm Management over the CMIP interfaces;
- clause 6 contains the ASN.1 definitions supporting the GDMO definitions provided in clause 5.

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; Notification Integration Reference Point (IRP); Information Service (IS)".

[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 (IS)".

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

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

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions defined in 3GPP TS 32.111-1 [8] apply.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ASN.1	Abstract Syntax Notation number 1
CCITT	The International Telegraph and Telephone Consultative Committee
CM	Configuration Management
CMIP	Common Management Information Protocol
CMIS	Common Management Information Service
CMISE	Common Management Information Service Element
EFD	Event Forwarding Discriminator
EM	Element Manager
FTAM	File Transfer Access and Management
GDMO	Guidelines for the Definition of Managed Objects
IOC	Information Object Class
IRP	Integration Reference Point
Itf-N	Interface N (between NM and EM/NE)
ITU-T	International Telecommunication Union - Telecommunications
M	Mandatory
MOC	Managed Object Class
MOI	Managed Object Instance
NE	Network Element
NM	Network Manager
NMC	Network Management Centre
O	Optional
OS	Operations System
TMN	Telecommunications Management Network

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. 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 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] are used.

4.2 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], 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.

4.3 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] and ITU-T Recommendation Q.821 [7].

4.4 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.

4.5 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 allowing the NM operator to add a comment to one or several alarms (*setComment*);
- 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.

4.6 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 or NULL, all alarm notifications are forwarded to the Manager through this EFD, according to the value of the parameter *alarmAckState*.
    The filter is set by the Agent automatically in order to forward to 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.

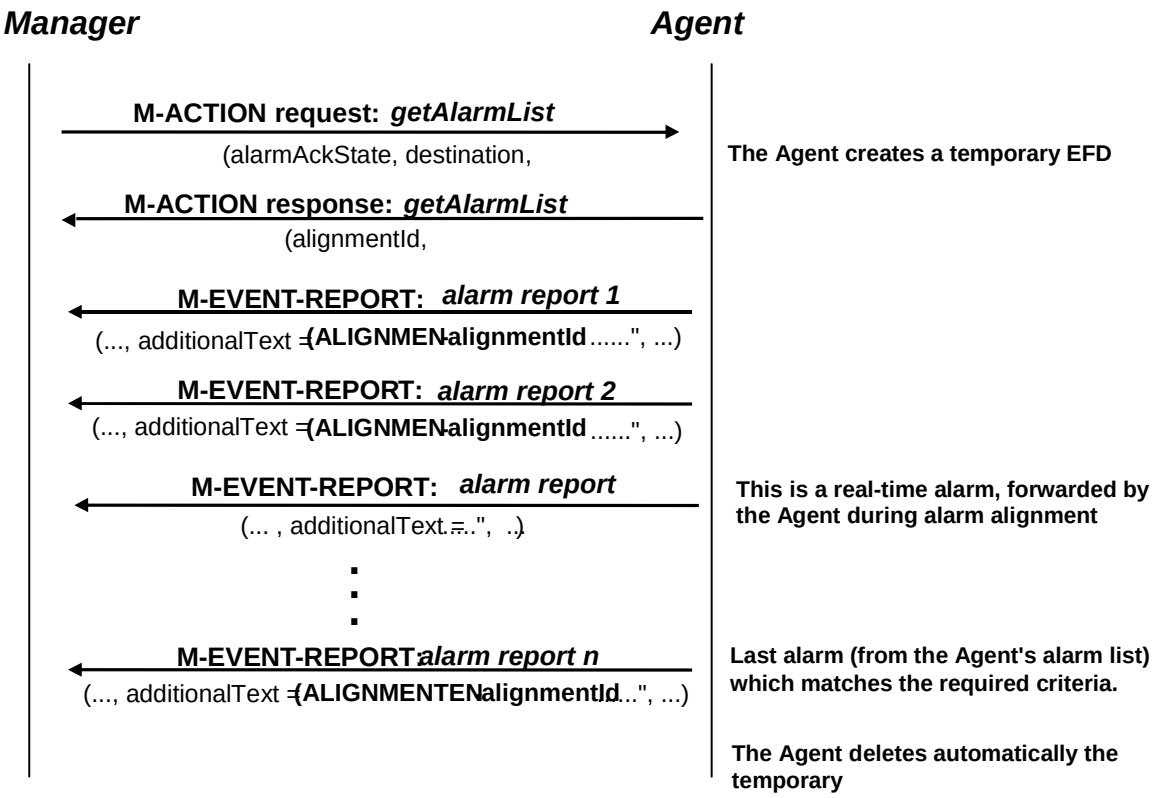

Figure 1: Alignment arrow diagram

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.

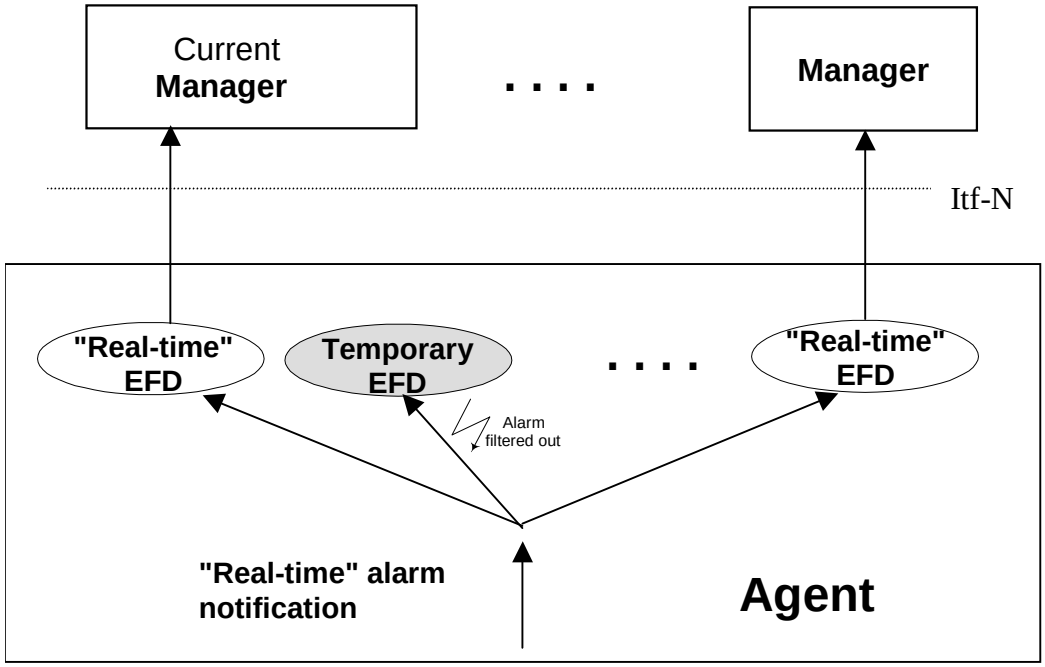

Figure 2: Treatment of "real time" alarms

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.

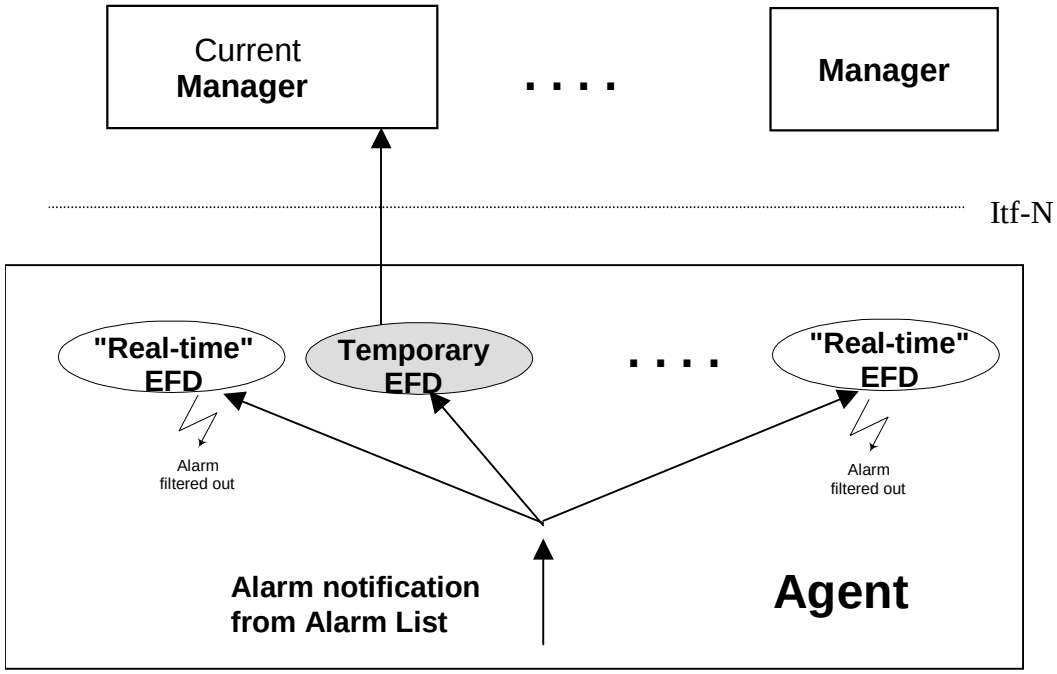

Figure 3: Treatment of "alignent" alarms

4.7 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.

4.7.1 Mapping of IOC and Interfaces

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].

4.7.2 Mapping of Interface/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

Interface/Operations of the Alarm IRP Information Services	GDMO Actions of CMIP Solution Set	Qualifier
AlarmIRPOperations_1/acknowledgeAlarms	acknowledgeAlarms	M
AlarmIRPOperations_1/getAlarmList	getAlarmList	M
AlarmIRPOperations_2/getAlarmCount	getAlarmCount	O
AlarmIRPOperations_3/unacknowledgeAlarms	unacknowledgeAlarms	O
AlarmIRPOperations_4/setComment	setComment	O
GenericIRPVersionOperation/getIRPVersion	getAlarmIRPVersion	M
GenericIRPProfileOperation/getNotificationProfile	getNotificationProfile	O
GenericIRPProfileOperation/getOperationProfile	getOperationProfile	O

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

4.7.3 Mapping of Parameters of each operation

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: Mapping of parameters of 'acknowledgementAlarms'

Operation parameters of Information Services	IN/OUT	CMIP equivalences	Qualifier
alarmInformationAndSeverityReferenceList	IN	AlarmReferenceList (note)	M
ackUserId	IN	ackUserId	M
ackSystemId	IN	ackSystemId	O
badAlarmInformationReferenceList	OUT	errorAlarmReferenceList	M
status	OUT	status	M
NOTE: Severity verification not required in CMIP solution set.			

Table 3: Mapping of Parameters of 'getAlarmCount'

Operation parameters of Information Services	IN/OUT	CMIP equivalents	Qualifier
filter	IN	filter	O
alarmAckState	IN	alarmAckState	O
criticalCount	OUT	criticalCount	M
majorCount	OUT	majorCount	M
minorCount	OUT	minorCount	M
warningCount	OUT	warningCount	M
indeterminateCount	OUT	indeterminateCount	M
clearedCount	OUT	clearedCount	M
status	OUT	status	M

Table 4: Mapping of Parameters of 'getAlarmList'

Operation parameters of Information Services	IN/OUT	CMIP equivalents	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: Mapping of Parameters of 'getAlarmIRPVersion'

Operation parameters of Information Services	IN/OUT	CMIP equivalents	Qualifier
versionNumberSet	OUT	versionNumberList	M
status	OUT	status	M

Table 6: Mapping of Parameters of 'getOperationProfile'

Operation parameters of the Information Services.	IN/OUT	CMIP Solution Set equivalences	Qualifier
irpVersion	IN	irpVersionNumber	M
operationNameProfile	OUT	operationNameProfile	M
operationParameterProfile	OUT	operationParameterProfile	M
status	OUT	status	M

Table 7: Mapping of Parameters of 'getNotificatioProfile'

Operation parameters of the Information Services.	IN/OUT	CMIP Solution Set equivalences	Qualifier
irpVersion	IN	irpVersionNumber	M
notificationNameProfile	OUT	notificationNameProfile	M
notificationParameterProfile	OUT	notificationParameterProfile	M
status	OUT	status	M

Table 8: Mapping of Parameters of 'setComment'

Operation parameters of Information Services	IN/OUT	CMIP equivalents	Qualifier
alarmInformationReferenceList	IN	alarmReferenceList	M
commentUserId	IN	commentUserId	M
commentSystemId	IN	commentSystemId	O
commentText	IN	commentText	M
badAlarmInformationReferenceList	OUT	badAlarmReferenceList	M
Status	OUT	status	M

Table 9: Mapping of Parameters of 'unacknowledgeAlarms'

Operation parameters of Information Services	IN/OUT	CMIP equivalents	Qualifier
alarmInformationReferenceList	IN	alarmReferenceList	M
ackUserId	IN	ackUserId	M
ackSystemId	IN	ackSystemId	O
badAlarmInformationReferenceList	OUT	errorAlarmReferenceList	M
status	OUT	status	M

4.7.4 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 10: Mapping of Notifications

Notifications of Information Services of the Alarm IRP	Equivalent Notifications of the CMIP solution set for the Alarm IRP		Qualifier
notifyNewAlarm	environmentalAlarm	ITU-T X.721 [4]	M
	equipmentAlarm	ITU-T X.721 [4]	
	qualityofServiceAlarm	ITU-T X.721 [4]	
	processingErrorAlarm	ITU-T X.721 [4]	
	communicationAlarm	ITU-T X.721 [4]	
notifyChangedAlarm	notifyClearedAlarm		O
	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]	
	communicationAlarm	ITU-T X.721 [4]	
notifyClearedAlarm	environmentalAlarm	ITU-T X.721 [4]	M
	equipmentAlarm	ITU-T X.721 [4]	
	qualityofServiceAlarm	ITU-T X.721 [4]	
	processingErrorAlarm	ITU-T X.721 [4]	
	communicationAlarm	ITU-T X.721 [4]	
notifyAckStateChanged	environmentalAlarm	ITU-T X.721 [4]	M
	equipmentAlarm	ITU-T X.721 [4]	
	qualityofServiceAlarm	ITU-T X.721 [4]	
	processingErrorAlarm	ITU-T X.721 [4]	
	communicationAlarm	ITU-T X.721 [4]	
notifyAlarmListRebuilt	notifyAlarmListRebuilt		M
notifyComments	environmentalAlarm	ITU-T X.721 [4]	O
	equipmentAlarm	ITU-T X.721 [4]	
	qualityofServiceAlarm	ITU-T X.721 [4]	
	processingErrorAlarm	ITU-T X.721 [4]	
	communicationsAlarm	ITU-T X.721 [4]	

4.7.5 Mapping of Parameters of each notification

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/ASN1 definitions.

In the following tables, for the notifications defined in 3GPP TS 32.111-2 [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 3GPP TS 32.111-2 [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 event type is equal to 'Communication Alarm' the notification communicationsAlarm is emitted;
- If the event type is equal to 'Processing Error Alarm' the notification processingErrorAlarm is emitted;
- If the event type is equal to 'Environmental Alarm' the notification environmentalAlarm is emitted;
- If the event type is equal to 'Quality of Service Alarm' the notification qualityofServiceAlarm is emitted;
- If the event type is equal to 'Equipment Alarm' the notification equipmentAlarm 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 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]) the notification identifier of the notification having reported the new alarm and, if required, the instance of the object having emitted this notification.

Table 11a: Mapping of Parameters of "notifyNewAlarm"

IS Parameter Name	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': notificationIdentifier	M
eventTime	M-EVENT REPORT parameter 'Event time'	M
systemDN	--	--
notificationType	M-EVENT REPORT parameter 'Event type'	M
probableCause	M-EVENT REPORT parameter 'Event information': probableCause	M
specificProblems	M-EVENT REPORT parameter 'Event information': specificProblems	O
perceivedSeverity	M-EVENT REPORT parameter 'Event information': perceivedSeverity	M
alarmType	The semantics of this parameter is conveyed by the notification type.	--
backedUpStatus	M-EVENT REPORT parameter 'Event information': backedUpStatus	O
backUpObject	M-EVENT REPORT parameter 'Event information': backUpObject	O
trendIndication	M-EVENT REPORT parameter 'Event information': trendIndication	O
thresholdInfo	M-EVENT REPORT parameter 'Event information': thresholdInfo	O
correlatedNotifications	M-EVENT REPORT parameter 'Event information': correlatedNotifications	O
stateChangeDefinition	M-EVENT REPORT parameter 'Event information': stateChangeDefinition	O
monitoredAttributes	M-EVENT REPORT parameter 'Event information': monitoredAttributes	O
proposedRepairActions	M-EVENT REPORT parameter 'Event information': proposedRepairActions	O
additionalText	M-EVENT REPORT parameter 'Event information': additionalText	O
additionalInformation	M-EVENT-REPORT parameter ‘Event information’ (AlarmInfo): additionalInformation	O
alarmId	--	--

Table 11b: Mapping of Parameters of "notifyClearedAlarm"

IS Parameter Name	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': notificationIdentifier	M
eventTime	M-EVENT REPORT parameter 'Event time'	M
systemDN	--	--
notificationType	M-EVENT REPORT parameter 'Event type'	M
probableCause	M-EVENT REPORT parameter 'Event information': probableCause	M
perceivedSeverity	M-EVENT REPORT parameter 'Event information': perceivedSeverity	M
alarmType	The semantics of this parameter is conveyed by the notification type.	--
correlatedNotifications	M-EVENT REPORT parameter 'Event information': correlatedNotifications	O
alarmId	M-EVENT REPORT parameter 'Event information': correlatedNotifications	M

Table 12: Mapping of Parameters of 'notifyAckStateChanged'

IS Parameter Name	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': notificationIdentifier	M
eventTime	M-EVENT REPORT parameter 'Event time'	M
systemDN	--	--
notificationType	M-EVENT REPORT parameter 'Event type'	M
probableCause	M-EVENT REPORT parameter 'Event information': probableCause	M
perceivedSeverity	M-EVENT REPORT parameter 'Event information': perceivedSeverity	M
alarmType	The semantics of this parameter is conveyed by the notification type.	--
alarmId	M-EVENT REPORT parameter 'Event information': correlatedNotifications	--
ackTime	M-EVENT REPORT parameter 'Event information': additionalInformation	M
ackState		M
ackUserId		M
ackSystemId		O

Table 13: Mapping of Parameters of 'notifyAlarmListRebuilt'

IS Parameter Name	CMIP SS Equivalent	Qualifier
objectclass	M-EVENT REPORT parameter 'Event information': rebuiltObjectClass	M
objectInstance	M-EVENT REPORT parameter 'Event information': rebuiltObjectInstance	M
notificationId	M-EVENT REPORT parameter 'Event information': notificationIdentifier	M
eventTime	M-EVENT REPORT parameter 'Event time'	M
systemDN	--	--
notificationType	M-EVENT REPORT parameter 'Event type'	M
reason	M-EVENT REPORT parameter 'Event information': reason	M

Table 14: Mapping of Parameters of '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’: 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’: probableCause	M
perceivedSeverity	M-EVENT REPORT parameter ‘Event information’: perceivedSeverity	M
comments	M-EVENT REPORT parameter ‘Event information’: additionalInformation: commentsParameter	M
alarmId	M-EVENT REPORT parameter ‘Event information’: correlatedNotifications	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";
REGISTERED AS {ts32-111AlarmObjectClass 1};
```

5.2 Packages

5.2.1 alarmControlBasicPackage

```
alarmControlBasicPackage PACKAGE
   BEHAVIOUR
      alarmControlBasicPackageBehaviour;
   ATTRIBUTES
      alarmControlId       GET,
      alarmsCountSummary   GET;
   ACTIONS
      getAlarmList;
   NOTIFICATIONS
      alarmListRebuilt;
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 'alarmListRebuilt' 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;
    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;
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
      getOperationProfile,
      getNotificationProfile;
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.";
```

5.3 Actions

5.3.1 acknowledgeAlarms (M)

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

acknowledgeAlarmsBehaviour BEHAVIOUR
DEFINED AS
   "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.GetAlarmCount;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.GetAlarmCountReply;
REGISTERED AS {ts32-111AlarmAction 2};
```

```
getAlarmCountBehaviour BEHAVIOUR
DEFINED AS
   "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 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 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 getNotificationProfile (O)

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

getNotificationProfileBehaviour BEHAVIOUR
DEFINED AS
   "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 getOperationProfile (O)

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

getOperationProfileBehaviour BEHAVIOUR
DEFINED AS
   "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.AckOrUnackAlarms;
   WITH REPLY SYNTAX
      TS32-111-4TypeModule.AckOrUnackAlarmsReply;
REGISTERED AS { ts32-111AlarmAction 8};

unacknowledgeAlarmsBehaviour BEHAVIOUR
DEFINED AS
   "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. ";
```

5.4 Notifications

5.4.1 notifyAlarmListRebuilt (M)

```
alarmListRebuilt NOTIFICATION
   BEHAVIOUR
      alarmListRebuiltBehaviour;
   WITH INFORMATION SYNTAX
      TS32-111-4TypeModule.AlarmListRebuiltInfo;
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).";
```

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 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 action(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
   }

AckOrUnackAlarms ::= SEQUENCE
   {
   alarmReferenceList      SET OF AlarmReference,   -- ITU-T X.721
   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
   }

AlarmListRebuiltInfo ::= SEQUENCE
   {
   notificationIdentifier      NotificationIdentifier,   -- ITU-T X.721
   rebuiltObjectClass          ObjectClass,
   rebuiltObjectInstance       ObjectInstance,
   reason                      ErrorCauses
   }

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)
   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

GetAlarmCount ::= 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

OperationList ::= SET OF OperationName

OperationName ::= GraphicString

ParameterList ::= SET OF ParameterName

ParameterListOfList ::= SET OF ParameterList

ParameterName ::= GraphicString

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

SetCommentReply ::= SEQUENCE
   {
   badAlarmReferenceList      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
```

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
Jun 2002	S_16	SP-020283	006	--	Correction of errors and ambiguities in the Parameter Mapping Tables and ASN.1 Definitions	4.2.0	4.3.0
Dec 2002	S_18	SP-020751	012	--	Add the additionalInformation parameter in notifyNewAlarms to the Alarm IRP CMIP SS (Alignment with IS in Rel-4 32111-2)	4.3.0	4.4.0
Mar 2003	S_19	SP-030063	015	--	Correction to Alarm Comments - alignment with 32.111-1	4.4.0	4.5.0
Sep 2003	S_21	SP-030416	021	--	Correction of syntax error in type SetComment	4.5.0	4.6.0

History

Document history		
V4.0.0	September 2001	Publication
V4.1.0	December 2001	Publication
V4.2.0	March 2002	Publication
V4.3.0	June 2002	Publication
V4.4.0	December 2002	Publication
V4.5.0	March 2003	Publication
V4.6.0	September 2003	Publication