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Q3 INTERFACE

STAGE 2 AND STAGE 3 DESCRIPTION FOR THE Q3 INTERFACE – ALARM SURVEILLANCE

ITU-T Recommendation Q.821

(Previously "CCITT Recommendation")

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation Q.821 was prepared by the ITU-T Study Group XI (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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Summary

This Recommendation provides a Stage 2 and Stage 3 Description for the Q3 Interface in a Telecommunication Management Network. Its initial focus is Alarm Surveillance. Included in this Description are specifications of the functions, management information, services, functional units, and protocols related to Alarm Surveillance. Significant reuse of OSI Management specifications in the X.700-series Recommendations is described.

Because of the desirability for providing common TMN solutions, this Recommendation is expected to be applicable to other TMN or TMN-related interfaces.

STAGE 2 AND STAGE 3 DESCRIPTION FOR THE Q3 INTERFACE - ALARM SURVEILLANCE

(Helsinki, 1993)

1 Scope, purpose and application

1.1 Scope

This Recommendation is part of a series of Recommendations that specify the Q3 interface requirements for communication between an Operations System (OS) and a Network Element (NE), between an OS and a Mediation Device (MD), between an OS and a Q Adaptor (QA), and between OSs in a Telecommunication Management Network (TMN) [1]. The current issue of this Recommendation provides a Stage 2 and Stage 3 Description [19] for Alarm Surveillance to support the associated TMN management service component described in [3].

1.2 Purpose

Current telecommunications networks are populated by a large and increasing number of OSs and NEs supplied by different vendors. Both the number and variety of networks and services have grown, creating a diversity of management needs. This growth has resulted in the proliferation of unique communication interfaces between OSs and NEs. The telecommunications industry stands to benefit from the standardization of these interfaces, designed to achieve interoperability between a broad range of OSs and NE/QAs using MDs where appropriate, and between OSs.

The primary purpose of this Recommendation is to provide a set of application messages and associated support objects for the support of communication across Q3 interfaces. Because of the desirability of providing common TMN solutions, these messages and support objects are expected to be applicable to other TMN or TMN-related interfaces.

1.3 Application

The minimum service and protocol requirements at the Session and Presentation Layers, and the supporting Application Service Elements for two types of OAM services at the Application Layer, are defined in [2]. The messages defined in this Recommendation are part of the transaction-oriented type of OAM services as specified in [2]. These messages also require selected support object classes as defined in Annex A and in [9].

2 Definitions

The following terms are defined in this Recommendation:

alarm event: An instantaneous occurrence that changes at least one of the attributes of the alarm status of an object. This status change may be persistent or temporary, thus allowing for surveillance, monitoring, and performance measurement functionality, etc. Alarm events may or may not generate alarm reports; they may trigger other events or may be triggered by one or more other events.

alarm surveillance: A set of functions that enables the monitoring or interrogation (or both) of the telecommunications network concerning alarm-related events or conditions.

alarm status: A set of attributes that describes the alarms currently defined for an object, for example, Perceived Severity. The alarm status of an object is a subset of the global status of that object.

attribute: Information concerning a managed object used to describe (either in part or in whole) that managed object. This information consists of an attribute type and its corresponding attribute value (single-valued) or values (multi-valued).

attribute type: The component of an attribute that indicates the class of information given by that attribute.

attribute value: A particular instance of the class of information indicated by an attribute type.

event: An instantaneous occurrence that changes at least one of the attributes of the global status of an object. This status change may be persistent or temporary, thus allowing for surveillance, monitoring, and performance measurement functionality, etc. Events may or may not generate reports; they may be spontaneous or planned; they may trigger other events or may be triggered by one or more other events.

global status: The complete set of attributes necessary to describe an object at a particular time.

managed object class: An identified family of managed objects that share certain characteristics.

managed object instance: A particular managed object of a managed object class.

managed system: One or more application processes that act as agents for managed objects.

management domain: A collection of one or more management systems, and zero or more managed systems and management subdomains, that is administered by a single organization.

management subdomain: A management domain that is wholly located within a management domain.

managing (management) system: An application process within a management domain that effects monitoring and control functions on managed objects, management subdomains, or both. A management system may also communicate with its peers (that may be resident in other management domains).

object class: An identified family of objects that share certain characteristics.

object instance: A particular object of an object class.

This Recommendation also makes use of the following term defined in [4]:

application entity: The aspects of an application process pertinent to OSI.

This Recommendation also makes use of the following terms defined in [8]:

application association: A cooperative relationship between two application entities, formed by their exchange of application protocol control information through their use of presentation services.

application context: An explicitly identified set of application service elements, related options, and any other necessary information for the interworking of application entities on an application association.

3 Abbreviations

For the purpose of this Recommendation, the following abbreviations are used:

ASN.1	Abstract Syntax Notation One
CMIS	Common Management Information Service
CNF	Confirm
IND	Indication
MAPDU	Management Application Protocol Data Unit
MD	Mediation Device
NE	Network Element
OS	Operations System
OSI	Open Systems Interconnection
QA	Q Adaptor

RDN	Relative Distinguished Name
REQ	Request
RSP	Response
TMN	Telecommunications Management Network

4 Conventions

The definition of several Alarm Surveillance services in this Recommendation includes a table that lists the parameters of its primitives. For a given primitive, the presence of each parameter is described by one of the following values:

M	The parameter is mandatory
(=)	The value of the parameter is equal to the value of the parameter in the column to the left
U	Use of the parameter is a service-user option
----	The parameter is not present in the interaction
C	The parameter is conditionally present--the condition(s) are defined by the text that describes the parameter
P	Subject to the constraints imposed on the parameter by [20]

The service definitions in clause 6 are described using the service definition conventions specified in [14].

The parameters which are marked “P” in the service tables of this Recommendation are mapped directly onto the corresponding parameters of the CMIS service primitive, without changing the semantics or syntax of the parameters. The remaining parameters are used to construct a MAPDU.

Except for OS - OS communications, the term managing system refers to the OS and the term managed system refers to either a NE, QA, or a MD. NEs may be exchanges, signalling systems, or other network resources as specified in other Recommendations that reference this Recommendation. For OS - OS communications, one OS is the managing system while the other is the managed system.

5 Alarm Surveillance

5.1 Alarm Surveillance Functions

Alarm Surveillance functions are used to monitor or interrogate NEs (or both) about events or conditions. Event data is generated by an NE upon the detection of an abnormal condition. Examples of such events are detection of transmission data errors, the violation of a performance threshold, and the detection of faulty equipment. Event data can be reported at the time of occurrence, logged for future access, or both. An event may also cause further management actions within the NE that lead to the generation of other management data. In the functions described below, the term NE refers to any of the TMN Q3 entities described above that are acting in the managed system role.

The management information related to Alarm Surveillance whose semantics is described includes managed object classes, support object classes, and their associated attributes.

5.1.1 Alarm Reporting Functions

This subclause describes the Alarm Reporting functions provided by the services specified in this Recommendation. Table 1 gives a mapping between these functions and the (one or more) services that support each function.

TABLE 1/Q.821

Alarm Reporting Functions and Services

Function	Service
Report Alarm	Alarm Reporting
Route Alarm Report	Initiate Alarm Reporting Set Event Forwarding Discriminator
Request Alarm Report Route	Get Event Forwarding Discriminator
Condition Alarm Reporting	Initiate/Terminate Alarm Reporting Set Event Forwarding Discriminator
Request Alarm Report Control Condition	Get Event Forwarding Discriminator
Allow/Inhibit Alarm Reporting	Suspend/Resume Alarm Reporting
Request Alarm Report History	Alarm Report Retrieving
Delete Alarm Report History	Alarm Report Deleting

5.1.1.1 Report Alarm

NE notifies TMN of alarm information upon the occurrence of an alarm.

5.1.1.2 Route Alarm Report

TMN specifies to the NE the destination address(es) for a specified set of alarm reports.

5.1.1.3 Request Alarm Report Route

TMN requests NE to send the current assignment of the destination address(es) for a specified set of alarm reports; NE responds with the current assignment of destination address(es).

5.1.1.4 Condition Alarm Reporting

TMN instructs the NE to assign Event Forwarding Discriminator attributes as specified by the TMN.

5.1.1.5 Request Alarm Report Control Condition

TMN requests NE to send the current assignment of specified Event Forwarding Discriminator attributes; NE responds with the current assignment of the specified attributes.

5.1.1.6 Allow/Inhibit Alarm Reporting

TMN instructs the NE to allow/inhibit alarm reports to the TMN.

5.1.1.7 Request Alarm Report History

TMN requests the NE to send specified historical alarm information; NE responds with the specified information.

5.1.1.8 Delete Alarm Report History

TMN requests the NE to delete specified historical alarm information.

5.1.2 Alarm Summary Functions

This subclause describes the Alarm Summary functions provided by the services specified in this Recommendation. Table 2 gives a mapping between these functions and the (one or more) services that support each function.

TABLE 2/Q.821

Alarm Summary Functions and Services

Function	Service
Report Current Alarm Summary	Current Alarm Summary Reporting
Route Current Alarm Summary	Initiate/Set Management Operations Schedule
Request Current Alarm Summary Route	Get Management Operations Schedule
Schedule Current Alarm Summary	Initiate/Terminate/Set Current Alarm Summary Control Initiate/Terminate/Set Management Operations Schedule
Request Current Summary Schedule	Get Current Alarm Summary Control Get Management Operations Schedule
Allow/Inhibit Current Alarm Summary	Resume/Suspend Management Operations Schedule
Request Current Alarm Summary	Retrieve Current Alarm Summary

5.1.2.1 Report Current Alarm Summary

NE provides TMN (based on a pre-defined schedule) with a Current Alarm Summary.

5.1.2.2 Route Current Alarm Summary

TMN specifies to the NE the destination address(es) for a specified set of Current Alarm Summaries.

5.1.2.3 Request Current Alarm Summary Route

TMN requests NE to send the current assignment of the destination address(es) for a specified set of Current Alarm Summaries; NE responds with the current assignment of destination address(es).

5.1.2.4 Schedule Current Alarm Summary

TMN specifies a schedule for the NE to establish for the reporting of Current Alarm Summaries. The schedule information specifies what should be reported as well as when it should be reported.

5.1.2.5 Request Current Alarm Summary Schedule

TMN requests NE to send the current schedule information for Current Alarm Summary reporting; NE responds with the schedule information.

5.1.2.6 Allow/Inhibit Current Alarm Summary

TMN instructs NE to allow/inhibit reporting of the scheduled Current Alarm Summaries.

5.1.2.7 Request Current Alarm Summary

TMN requests the NE to send a Current Alarm Summary; NE responds with the summary.

5.1.3 Alarm Event Criteria Functions

This subclause describes the Alarm Event Criteria functions provided by the services specified in this Recommendation. Table 3 gives a mapping between these functions and the (one or more) services that support each function.

TABLE 3/Q.821

Alarm Event Criteria Functions and Services

Function	Service
Condition Alarm Event Criteria	Initiate/Terminate/Set Alarm Severity Assignment Profile
Request Alarm Event Criteria	Get Alarm Severity Assignment Profile

5.1.3.1 Condition Alarm Event Criteria

TMN instructs the NE to assign specified alarm attributes (e.g. thresholds, etc.) used by the NE to determine if an event is to be considered an alarm. This function is initially limited to alarm severity assignment.

5.1.3.2 Request Alarm Event Criteria

TMN requests NE to report the current assignments of specified attributes (e.g. thresholds, etc.) used to determine if an event is to be considered an alarm; NE responds with the current assignment of the requested attributes, modes, or thresholds. This function is initially limited to the alarm severity attribute.

5.1.4 Alarm Indication Management Functions

This subclause describes the Alarm Indication Management functions provided by the services specified in this Recommendation. Table 4 gives a mapping between these functions and the (one or more) services that support each function.

TABLE 4/Q.821

Alarm Indication Management Functions and Services

Function	Service
Inhibit/Allow Audible and Visual Alarm Indications	Inhibit/Allow Audible and Visual Local Alarms
Reset Audible Alarms	Reset Audible Alarms

5.1.4.1 Inhibit/Allow Audible and Visual Alarm Indications

TMN instructs the NE to inhibit/allow the operation of specified alarm indication/recording devices such as lamps, speakers, printers, etc.

5.1.4.2 Reset Audible Alarms

TMN instructs the NE to reset specified audible alarm indicator(s).

5.1.5 Log Control Functions

This subclause describes the Log Control functions provided by the services specified in this Recommendation. Table 5 gives a mapping between these functions and the (one or more) services that support each function.

TABLE 5/Q.821

Log Control Functions and Services

Function	Service
Inhibit/AllowLogging	Suspend/Resume Logging
Condition Logging	Initiate/Terminate Log Set Log
Request Log Condition	Get Log

5.1.5.1 Allow/Inhibit Logging

TMN instructs the NE to allow/inhibit logging of Log Records.

5.1.5.2 Condition Logging

TMN instructs the NE to assign Log attributes as specified by the TMN.

5.1.5.3 Request Log Condition

TMN requests NE to send the current assignment of specified Log attributes; NE responds with the current assignment of the specified attributes.

5.1.6 Other Alarm Surveillance Functional Information

Clauses 7 and 8 of [11], [12], and [15] are also applicable to this Recommendation.

5.2 Alarm Surveillance Management Information

This subclause describes the semantics of management information related to Alarm Surveillance.

5.2.1 Managed Object Classes

The Alarm Surveillance Services specified below are applicable to the managed object classes of an information model specified in any other Recommendation if the proper references to this Recommendation are made in the relevant managed object classes. In particular, these services are applicable to the managed object classes of the Generic Network Information Model [18].

5.2.2 Support Object Classes

The following support object classes (or their subclasses), defined in [9], support the Alarm Surveillance functions specified in this Recommendation:

- alarmRecord
- discriminator
- eventForwardingDiscriminator
- eventLogRecord
- log
- logRecord

The following support object classes (or their subclasses), defined in Annex A, [18], support the Alarm Surveillance functions specified in this Recommendation:

- alarmSeverityAssignmentProfile

The containment relationships between these support object classes is defined in Annex A, [18], and [9]; they are shown in Figure 1 using the Entity-Relationship notation as in [18].

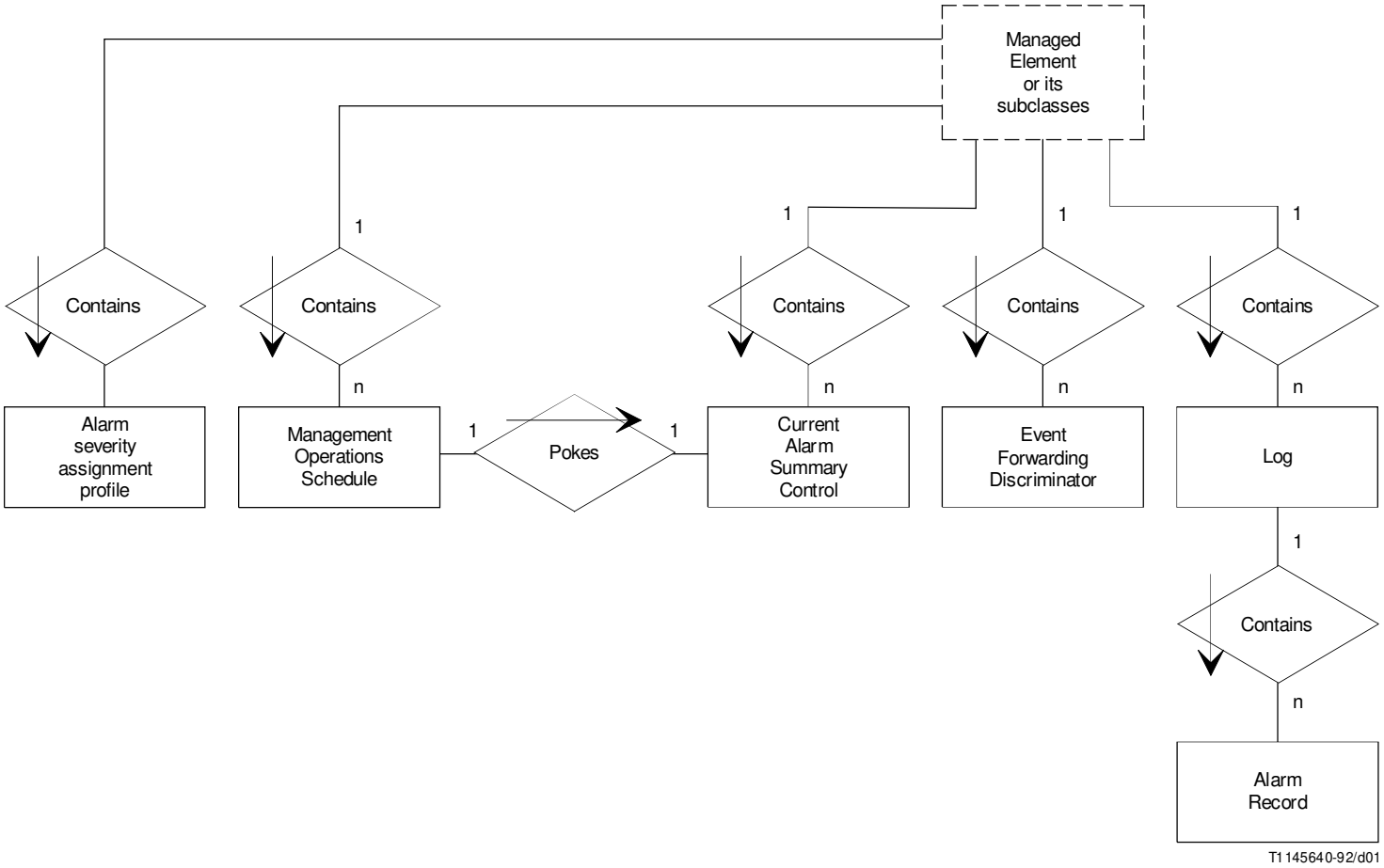


FIGURE 1/Q.821

Containment relationships between alarm surveillance support objects

5.2.2.1 Current Alarm Summary Control

The Current Alarm Summary Control object class is a class of support objects that provide the criteria for generation of current alarm summary reports. An object is included in a current alarm summary report if:

- the object is included in the Object List, (if the list is non-empty)
- the object has an Alarm Status that is present in the Alarm Status List (if the list is non-empty)
- the object has an alarm (or potential alarm) with a Perceived Severity and Probable Cause matching members of the Perceived Severity List (if non-empty) and Probable Cause List (if non-empty), respectively

If the Object List is empty then the criteria in the Current Alarm Summary Control are applied to all objects in the Managed System. If any of the other criteria are empty then they are not used in selecting objects that will appear in the current alarm summary report.

A single object may appear in a report multiple times if it has multiple outstanding alarm conditions that match the Perceived Severity List and Probable Cause List criteria.

This object class is a subclass of the Top object class.

The semantics of associated attributes are as follows:

a) *Current Alarm Summary Control Id*

The Current Alarm Summary Control Id is an attribute type whose distinguished value can be used as an Relative Distinguished Name (RDN) when naming an instance of the Current AlarmSummary Control managed object class.

b) *Alarm Status List*

The Alarm Status List attribute type describes criteria for inclusion in a current alarm summary report. The Alarm Status List consists of a set of possible Alarm Status. In order to be included in a current alarm summary report, an object shall have an Alarm Status that matches one of the states in the Alarm Status List.

If the Alarm Status List has null value, the Alarm Status of the objects in the Object List is not used as a criterion for inclusion in the current alarm summary report.

c) *Object List*

The Object List attribute type describes a set of object instances.

d) *Perceived Severity List*

The Perceived Severity List attribute type describes criteria for inclusion in a current alarm summary report. It consists of a set of possible Perceived Severities. In order to be included in a current alarm summary report, an object must have an outstanding alarm (or potential alarm) that has a Perceived Severity that matches one of the elements in the Perceived Severity List.

If the Perceived Severity List has null value, the Perceived Severity of the objects in the object list is not used as a criterion for inclusion in the current alarm summary report.

e) *Probable Cause List*

The Probable Cause List attribute type describes criteria for inclusion in a current alarm summary report, consisting of a set of possible Probable Causes. In order to be included in a current alarm summary report, an object must have an outstanding alarm (or potential alarm) that has a Probable Cause that matches one of the elements in the Probable Cause List.

If the Probable Cause List has a null value, the Probable Cause of the objects in the object list is not used as a criterion for inclusion in the current alarm summary report.

5.2.2.2 Management Operations Schedule

The Management Operations Schedule object class is a class of support objects that provide the ability to schedule a management service to occur periodically. The period is specified by an Interval, with the first occurrence of the service (coinciding with the start of the first interval) specified as the Begin Time. The end of the time span during which the service can occur is defined by the End Time.

The object(s) that will supply the service are defined by the Affected Object Class and Affected Object Instances (e.g. the Current Alarm Summary Control object when providing the Current Alarm Summary Reporting Service). The Destination Address specifies the destination of the service. The Administrative State is used to allow/inhibit the operation of the schedule. The Operational State describes whether the object is capable of performing its function(s).

This object class is a subclass of the Top object class.

The semantics of associated attributes are as follows:

a) *Administrative State*

The semantics of the Administrative State attribute type is described in [17].

b) *Affected Object Class*

The Affected Object Class attribute type identifies the object class affected by a scheduled management operation.

c) *Affected Object Instances*

The Affected Object Instances attribute type identifies the object instances on which a scheduled management operation will be performed.

d) *Begin Time*

The Begin Time attribute type indicates the starting time for a management function.

e) *Destination Address*

The Destination Address attribute type identifies the destination to which selected event reports will be sent. The Destination Address may be an application entity title or a group address. If no Destination Address is specified in the request, the address of the invoker is assumed.

f) *End Time*

The End Time attribute type indicates the termination time of a management function.

g) *Interval*

The Interval attribute type indicates the time between occurrences of a given activity described by an instance of the Management Operations Schedule object class. The interval can be specified in seconds, minutes, hours, or days.

h) *Operational State*

The semantics of the Operational State attribute type is described in [17].

i) *Schedule Id*

The Schedule Id is an attribute type whose distinguished value can be used as an RDN when naming an instance of the Management Operations Schedule object class.

5.3 Alarm Surveillance Service Definition

This subclause defines the services needed to support the alarm surveillance functions specified in 5.1. Alarm surveillance involves the reporting of alarms and alarm summaries, which are specialized forms of event reporting, and the logging of this information. As such, it can make use of three System Management Functions from OSI Management: Alarm Reporting [11], Event Report Management [12], and Log Control [15].

The mapping of the following services to the confirmed or unconfirmed mode of the supporting CMIS services, except where specified, is a local implementation issue and is not specified in this Recommendation.

The services defined to support the alarm surveillance functions specified in 5.1 have been grouped into several functional units to allow negotiation of their use on an association (during association establishment), and to allow referencing by other Recommendations. Functional unit negotiation shall be performed as described in [20]. The bit string defined in 5.4 shall be used to represent the alarm surveillance functional units. No TMN-specific user information is supplied during association release or aborts. Table 6 lists these functional units and their corresponding services.

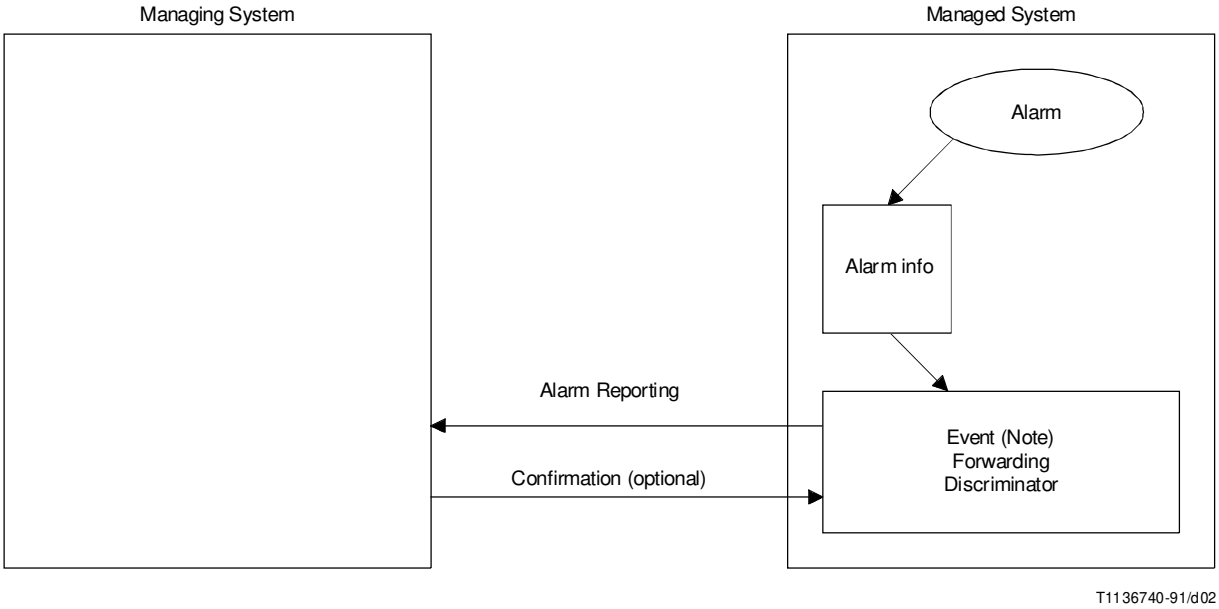
TABLE 6/Q.821

Alarm Surveillance FUs, Services, Object Classes, and Functions

Functional unit	Service(s)	Object class(es)	Function(s)
Kernel	Alarm Reporting	Event Forwarding Discriminator	Report Alarm
Basic Alarm Report Control	Suspend/Resume Alarm Reporting	Event Forwarding Discriminator	Inhibit/Allow Alarm Reporting
Enhanced Alarm Report Control	Initiate/Terminate Alarm Reporting Set/Get Event Forwarding Discriminator	Event Forwarding Discriminator	Condition alarm Reporting Route Alarm Report
Alarm Report Retrieval	Alarm Report Retrieving	Log Alarm Record	Request Alarm Report History
Alarm Report Deletion	Alarm Report Deleting	Log Alarm Record	Delete Alarm Report
Current Alarm Summary Reporting	Current Alarm Summary Reporting	Management Operations Schedule Current Alarm Summary Control	Report Current Alarm Summary
Basic Management Operations Scheduling	Suspend/Resume Management Operations Schedule	Management Operations Schedule	Inhibit/Allow Current Alarm Summary
Enhanced Management Operations Scheduling	Initiate/Terminate/ Set/Get Management Operations schedule	Management Operations Schedule	Schedule Current Alarm Summary Route Current Alarm Summary Request Current Alarm Summary Schedule Request Current Alarm Summary Route
Current Alarm Summary Reporting Control	Initiate/Terminate/ Set/Get Current Alarm Summary Control	Current Alarm Summary Control	Schedule Current Alarm Summary Request Current Alarm Summary Schedule
Current Alarm Summary Retrieval	Retrieve Current Alarm Summary	Current Alarm Summary Control	Request Current Alarm Summary
Alarm Event Criteria Management	Initiate/ Terminate/ Set/Get Alarm Severity Assignment Profile	Alarm Severity Assignment Profile	Condition Alarm Event Criteria Request Alarm Event Criteria
Alarm Indication Management	Inhibit/Allow Audible and Visual Local Alarms, Reset Audible Alarm	Managed Element or its subclasses	Inhibit/Allow Audible and Visual Local Alarms, Reset Audible Alarm
Basic Log Control	Suspend/Resume Logging	Log Alarm Record	Inhibit/Allow Logging
Enhanced Log Control	Initiate/ Terminate Log Set/Get Log	Log Alarm Record	Condition Logging Request Log Condition

5.3.1 Kernel Functional Unit

The Kernel functional unit contains only the Alarm Reporting service described below. Figure 2 shows the interactions between the managing and managed system for this functional unit. Note that the Event Forwarding Discriminator object shown in Figure 2 may be predefined.



NOTE – The services associated with the Event Forwarding Discriminator object class are not provided in this Functional Unit.

FIGURE 2/Q.821

Kernel FU

5.3.1.1 Alarm Reporting Service

The Alarm Reporting service allows a managed system to report the detection of an alarm condition for a managed object to its managing system(s). This service supports the Report Alarm function in 5.1.

For the service definition, see [11] except as qualified by the following text and the addition of three parameters:

a) The text reads as follows: An alarm report which contains a Perceived Severity parameter with a value of "cleared" and a Correlated Notifications parameter shall only indicate the clearing of those alarms whose Notification Identifiers are included in the set of Correlated Notifications. An alarm report which contains a Perceived Severity parameter with a value of "cleared", but no Correlated Notifications parameter, shall indicate the clearing of alarms based on the value of the Alarm Type, Probable Cause, and Specific Problems parameters.

b) The semantics of the three parameters follows below. Their definitions are found in Annex A.

The Log Record Id is a parameter to be included in the Additional Information parameter of the Alarm Reporting service. The distinguished value can be used as an RDN when naming an instance of the Log Record managed object class or any of its subclasses.

The Correlated Record Name is a parameter to be included in the Additional Information parameter of the Alarm Reporting service. The distinguished value can be used as an RDN when naming an instance of the Log Record managed object class or any of its subclasses. This parameter indicates that an Alarm Report about a managed object is related to a previous Alarm Report about a (possibly different) managed object. The value of this attribute identifies the record of the (previous) Alarm Report to which it is related. The Correlated Record Name parameter may or may not be used in conjunction with the Trend Indication attribute. The exact criteria to be used for correlation is beyond the scope of this Recommendation.

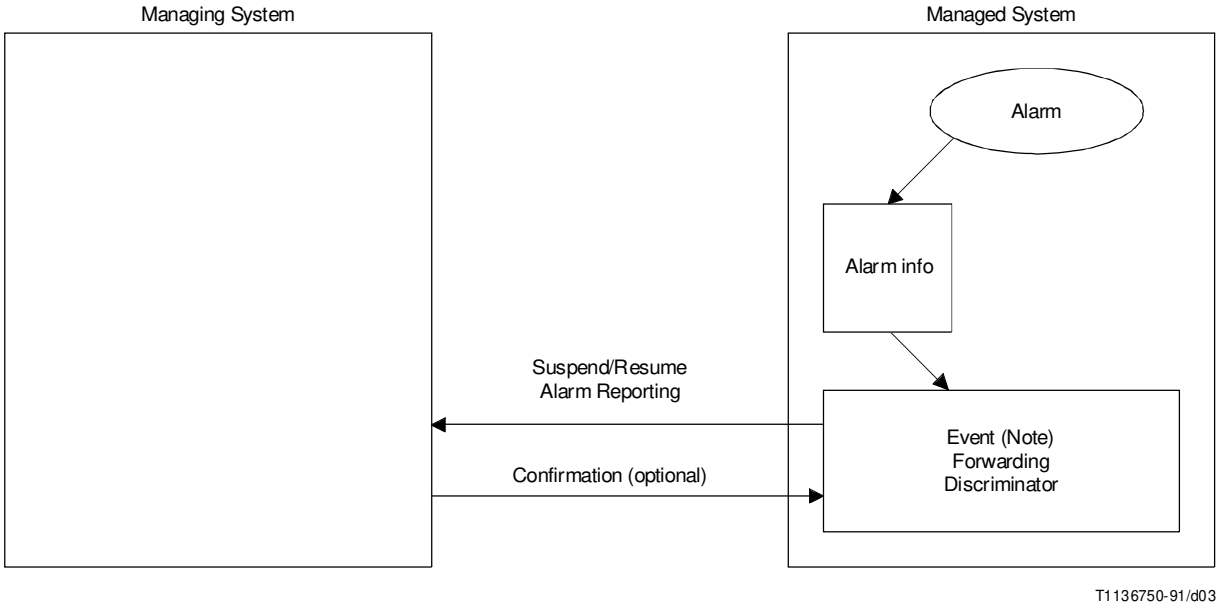
The Suspect Object List is a parameter to be included in the Additional Information parameter of the Alarm Reporting service. The Suspect Object List parameter identifies objects that may be responsible for an alarm condition. Each listed instance may optionally have a failure responsibility probability associated with it.

5.3.1.2 Other Services

The inclusion of other services in the kernel functional unit is for further study.

5.3.2 Basic Alarm Report Control Functional Unit

The Basic Alarm Report Control functional unit contains the Suspend Alarm Reporting service and the Resume Alarm Reporting service. Figure 3 shows the interactions between the managing and managed system for this functional unit. Note that the Event Forwarding Discriminator object shown in Figure 3 may be predefined. In such cases, only the administrative state attribute is modifiable by the managing system.



NOTE – Some services associated with the Event Forwarding Discriminator object class are not provided in this Functional Unit.

FIGURE 3/Q.821

Basic alarm report control FU

5.3.2.1 Suspend Alarm Reporting Service

The Suspend Alarm Reporting Service allows a managing system to inhibit the reporting of alarm information through an instance of the Event Forwarding Discriminator object class in a managed system. This service supports the Inhibit Alarm Reporting function identified in 5.1.

For the service definition, see [12] under Event Forwarding Discriminator Suspension.

5.3.2.2 Resume Alarm Reporting Service

The Resume Alarm Reporting Service allows a managing system to allow the reporting of alarm information through an existing instance of the Event Forwarding Discriminator object class in a managed system. This service supports the Allow Alarm Reporting function identified in 5.1.

For the service definition, see [12] under Event Forwarding Discriminator Resumption.

5.3.3 Enhanced Alarm Report Control Functional Unit

The Enhanced Alarm Report Control functional unit contains the Initiate Alarm Reporting service, the Terminate Alarm Reporting service, the Set Event Forwarding Discriminator service, and the Get Event Forwarding Discriminator service. Figure 4 shows the interactions between the managing and managed system for this functional unit.

If a bilateral agreement exists between two Alarm Reporting Service users, the Initiate and Terminate Alarm Reporting Services can be omitted. In this case, the Alarm Reporting Service starts automatically at system initialization.

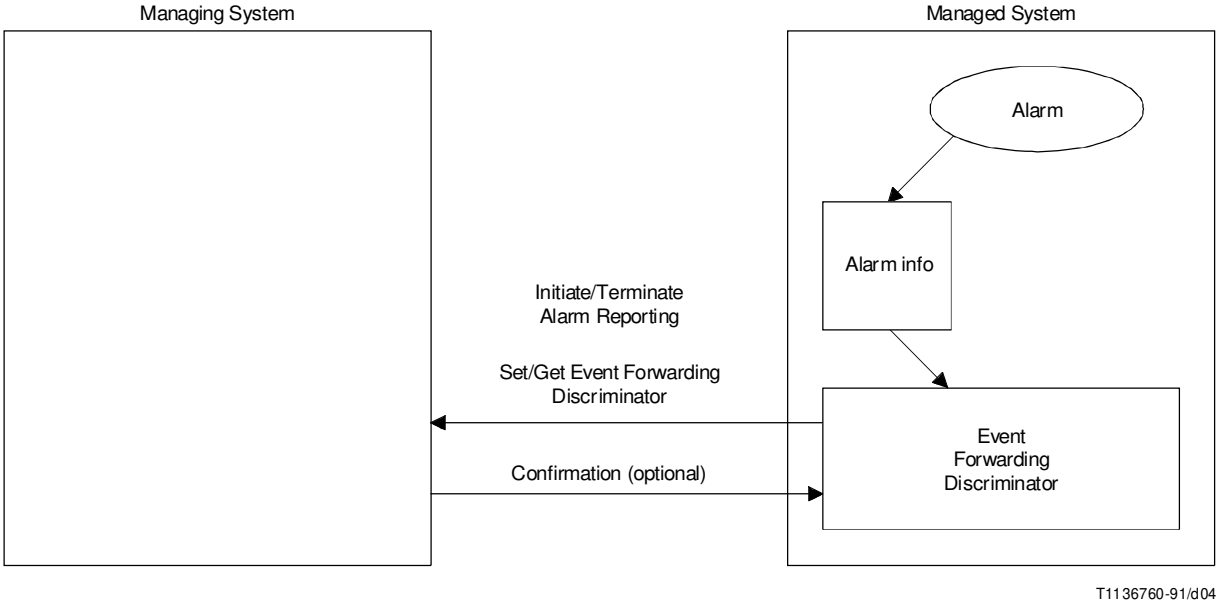


FIGURE 4/Q.821

Enhanced alarm report control FU

5.3.3.1 Initiate Alarm Reporting Service

The Initiate Alarm Reporting Service allows a managing system to create an instance of the Event Forwarding Discriminator object class in a managed system. This service supports the Condition Alarm Reporting and the Route Alarm functions identified in 5.1.

For the service definition, see [12] under Initiation of Event Report Forwarding.

5.3.3.2 Terminate Alarm Reporting Service

The Terminate Alarm Reporting Service allows a managing system to delete an instance of the Event Forwarding Discriminator object class in a managed system. This service supports the Condition Alarm Reporting function identified in 5.1.

For the service definition, see [12] under Termination of Event Report Forwarding.

5.3.3.3 Set Event Forwarding Discriminator Service

The Set Event Forwarding Discriminator service is a service that allows a managing system to set the attribute values of a specified instance of an Event Forwarding Discriminator object, thus allowing it to alter the criteria used to determine those alarms that are reported. This service supports the Condition Alarm Reporting and Route Alarm Report functions identified in 5.1.

For the service definition, see [12] under Event Forwarding Discriminator Modification.

5.3.3.4 Get Event Forwarding Discriminator Service

The Get Event Forwarding Discriminator service allows a managing system to retrieve the values of given attributes of a specified instance of an Event Forwarding Discriminator object. This service supports the Request Event Forwarding Discriminator Condition and Request Alarm Report Route functions identified in 5.1.

For the service definition, see [12] under Retrieval of Event Forwarding Discriminator Attributes.

5.3.4 Alarm Report Retrieval Functional Unit

The Alarm Report Retrieval functional unit contains only the Alarm Report Retrieving service described below. Figure 5 shows the interactions between the managing and managed system for this functional unit.

5.3.4.1 Alarm Report Retrieving Service

The Alarm Report Retrieving service is used to access the values of specified Alarm Record attributes. This service supports the Request Alarm Report History function identified in 5.1.

This service may be used to retrieve attribute values of a single Alarm Record by specifying the Alarm Record object class in the Base Object Class parameter. In this case, this service utilizes the PT-GET service and procedures defined in [16].

Alternatively, attributes for multiple Alarm Records may be retrieved by specifying the Log object class in the Base Object Class parameter and using the Scope and Filter parameters appropriately. This approach of course assumes the existence of one or more instances of the Log object class. Note that the multiple object selection functional unit of CMIS shall be selected to support the retrieval of attributes for multiple Alarm Records. For the service definition in this case, see [15] under Retrieval of Log Records.

5.3.4.2 Other Services

The inclusion of other services in the Alarm Retrieval functional unit is for further study.

5.3.5 Alarm Report Deletion Functional Unit

This functional unit contains only the Alarm Report Deleting service. Figure 6 shows the interaction between the managing and managed systems for this functional unit.

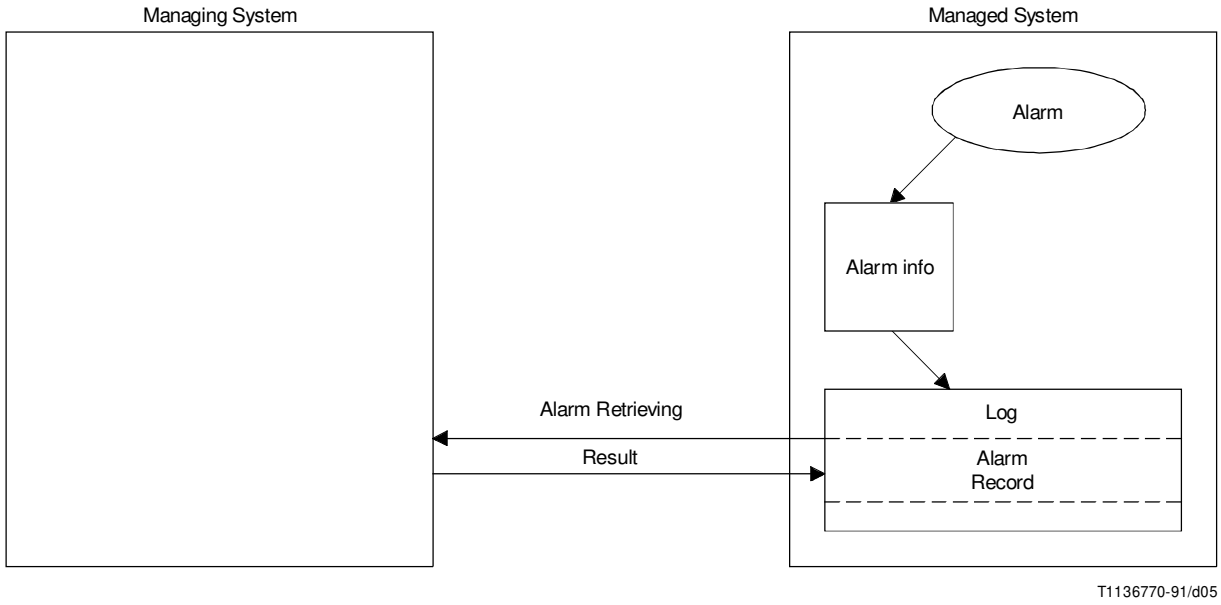


FIGURE 5/Q.821

Alarm retrieval FU

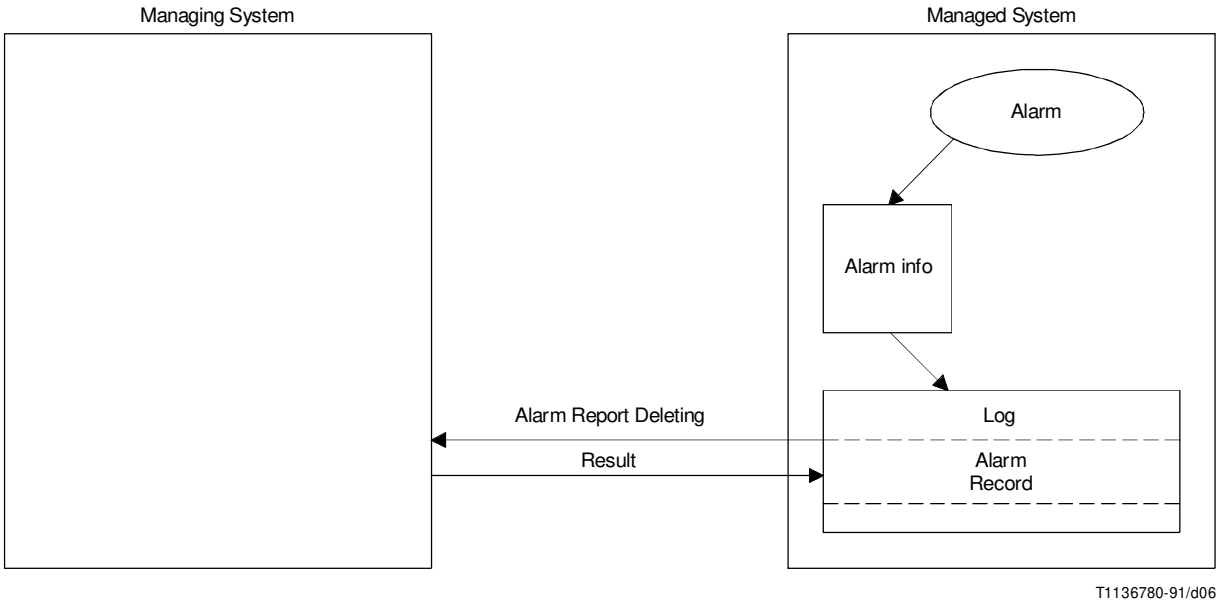


FIGURE 6/Q.821

Alarm report deletion FU

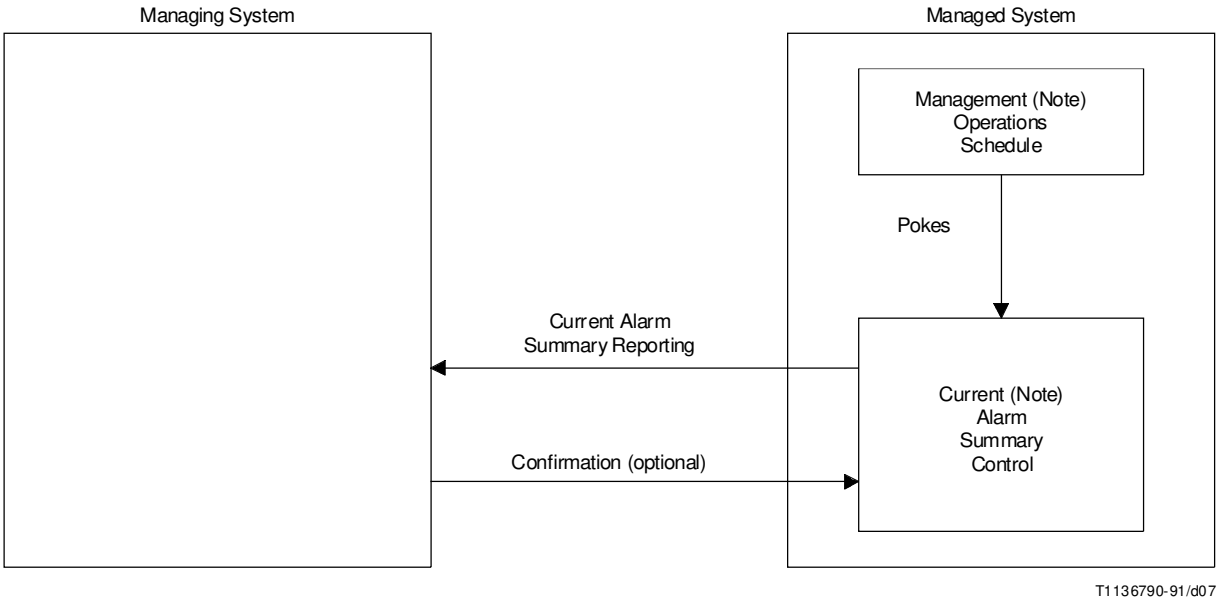
5.3.5.1 Alarm Report Deleting Service

The Alarm Report Deleting service is used to remove specific Alarm Records. This service supports the Delete Alarm Report function described in 5.1.

For the service definition, see [15] under Deletion of Log Records.

5.3.6 Current Alarm Summary Reporting Functional Unit

The Current Alarm Summary Reporting functional unit contains only the Current Alarm Summary Reporting service described below. Figure 7 shows the interactions between the managing and managed system for this functional unit. Note that the Management Operations Schedule and Current Alarm Summary Control objects shown in Figure 7 may be predefined. The Management Operations Schedule object shall be present (to provide a Destination Address) but need not be modifiable by the managing system.



NOTE – The services associated with the Management Operations Schedule and some of the services associated with the Current Alarm Summary Control object classes are not provided in this Functional Unit.

FIGURE 7/Q.821

Current alarm summary reporting FU

5.3.6.1 Current Alarm Summary Reporting Service

The Current Alarm Summary Reporting service allows a managed system to report a summary of the alarm conditions of specified managed objects to its managing system(s).

The Current Alarm Summary Reporting service is invoked when the Current Alarm Summary Control object pointed to by the Management Operations Schedule object (via the Affected Object Class and Affected Object Instance attributes) is poked. This service supports the Report Current Alarm Summary function identified in 5.1.

Table 7 lists the parameters for the Current Alarm Summary Reporting service.

TABLE 7/Q.821

Current Alarm Summary Reporting Service Parameters

Parameter name	Req/Ind	Rsp/Cnf
Invoke Identifier	P	P
Mode	P	–
Managed Object Class	P	P
Managed Object Instance	P	P
Event Type	M	C=
Event Time	P	–
Event Information		
Alarm Summary Data	M	–
Current Time	–	P
Event reply	–	C
Errors	–	P

The following parameters are defined for use in the Current Alarm Summary Reporting Service:

Invoke Identifier

See Invoke Identifier [6].

Mode

See Mode [6]. The values for this parameter are either confirmed or unconfirmed.

Managed Object Class

See Managed Object Class [6]. This parameter shall indicate the Current Alarm Summary Control object class.

Managed Object Instance

See Managed Object Instance [6].

Event Type

This parameter specifies the type of alarm being reported and shall therefore indicate the Current Alarm Summary Report. It may be included in the response if the Event Reply parameter is present in the response.

Event Time

See Event Time [6].

Alarm Summary Data

This parameter includes the results of an alarm summary report generation by a managed system. These results include multiple sequences of the following parameters:

- Object of Reference [9]
- Perceived Severity [9] (Optional)
- Alarm Status [9] (Optional)
- Probable Cause [9] (Optional)

Current Time

See Current Time [6].

Event Reply

See Event Reply [6]. The inclusion of this parameter in the response is conditional upon the successful receipt of the event report in the confirmed mode.

Errors

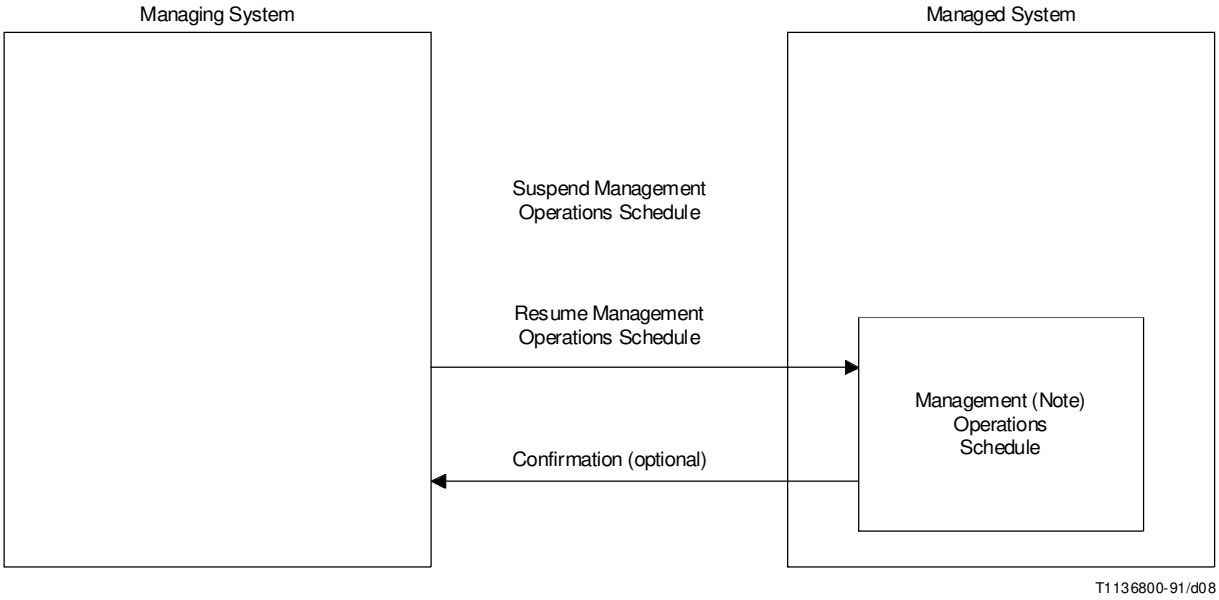
See Errors [6]. This parameter shall be included in a failure confirmation.

5.3.6.2 Other Services

The inclusion of other services in the Basic Current Alarm Summary Reporting functional unit is for further study.

5.3.7 Basic Management Operations Scheduling Functional Unit

The Basic Management Operations Scheduling functional unit contains the Suspend Management Operations Schedule service and the Resume Management Operations Schedule service. Figure 8 shows the interactions between the managing and managed system for this functional unit. Note that the Management Operations Schedule object shown in Figure 8 may be predefined. In such cases, only the Administrative State attribute is modifiable by the Managing System.



NOTE – Some services associated with the Management Operations Schedule object class are not provided in this Functional Unit.

FIGURE 8/Q.821

Basic management operations scheduling FU

5.3.7.1 Suspend Management Operations Schedule Service

The Suspend Management Operations Schedule Service allows a managing system to inhibit the scheduled operation of a service (such as the Current Alarm Summary Reporting service) triggered by an instance of the Management Operations Schedule object class in a managed system. This service utilizes the PT-SET service and procedures defined in [16]. This service supports the Inhibit Current Alarm Summary function identified in 5.1.

The semantics of the Management Operations Schedule attributes are defined in 5.2.

5.3.7.2 Resume Management Operations Schedule Service

The Resume Management Operations Schedule Service allows a managing system to resume the scheduled operation of a service (such as the Current Alarm Summary Reporting service) triggered by an instance of the Management Operations Schedule object class in a managed system. This service utilizes the PT-SET service and procedures defined in [16]. This service supports the Allow Current Alarm Summary function identified in 5.1.

The semantics of the Management Operations Schedule attributes are defined in 5.2.

5.3.8 Enhanced Management Operations Scheduling Functional Unit

The Enhanced Management Operations Scheduling functional unit contains the Initiate Management Operations Schedule service, the Terminate Management Operations Schedule service, the Set Management Operations Schedule service, and the Get Management Operations Schedule service. Figure 9 shows the interactions between the managing and managed system for this functional unit.

If a bilateral agreement exists between two error reporting service users, the Initiate and Terminate Management Operations Schedule services can be omitted. In this case, operation of the Management Operations Schedule starts automatically at system initialization.

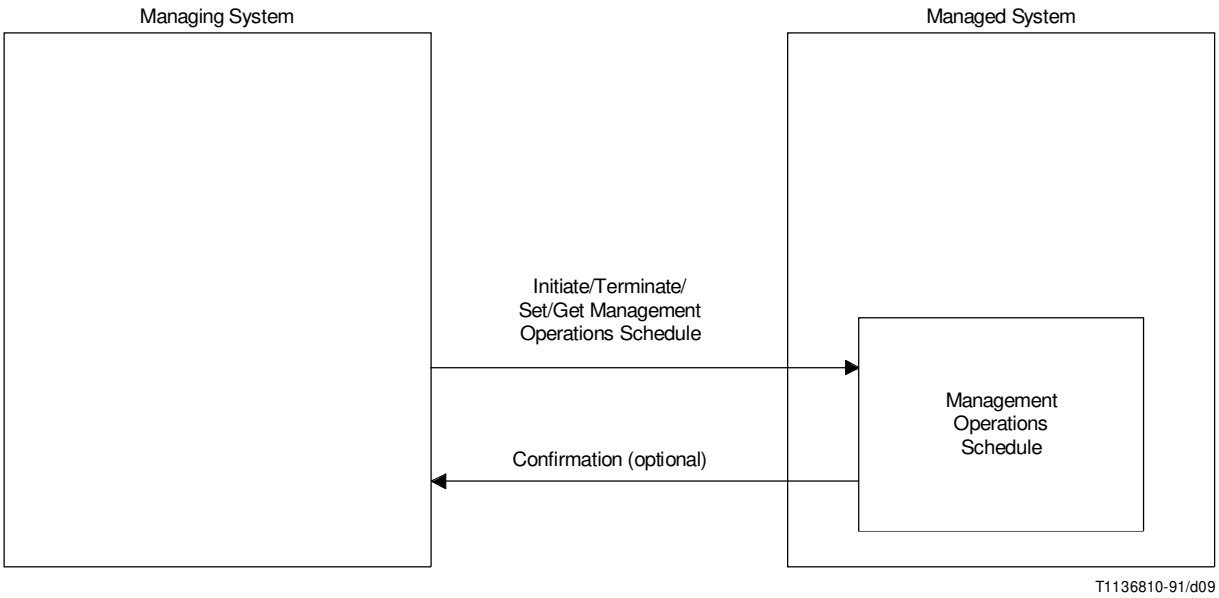


FIGURE 9/Q.821

Enhanced management operations scheduling FU

5.3.8.1 Initiate Management Operations Schedule Service

The Initiate Management Operations Schedule Service allows a managing system to create an instance of the Management Operations Schedule object class in a managed system. This service utilizes the PT-CREATE service and procedures defined in [16]. This service supports the Schedule Current Alarm Summary and Route Current Alarm Summary functions identified in 5.1.

The semantics of the Management Operations Schedule attributes are defined in 5.2.

5.3.8.2 Terminate Management Operations Schedule Service

The Terminate Management Operations Schedule Service allows a managing system to delete an instance of the Management Operations Schedule object class in a managed system. This service utilizes the PT-DELETE service and procedures defined in [16]. This service supports the Schedule Current Alarm Summary function identified in 5.1.

The semantics of the Management Operations Schedule attributes are defined in 5.2.

5.3.8.3 Set Management Operations Schedule Service

The Set Management Operations Schedule service is a confirmed service that allows a managing system to set the attribute values of a specified instance of a Management Operations Schedule object. This service utilizes the PT-SET service and procedures defined in [16]. This service supports the Schedule Current Alarm Summary and Route Current Alarm Summary functions identified in 5.1.

The semantics of the Management Operations Schedule attributes are defined in 5.2.

5.3.8.4 Get Management Operations Schedule Service

The Get Management Operations Schedule service allows a managing system to retrieve the values of given attributes of a specified instance of a Management Operations Schedule object. This service utilizes the PT-GET service and procedures defined in [16]. This service supports the Request Current Alarm Summary Schedule and Request Current Alarm Summary Route functions identified in 5.1.

The semantics of the Management Operations Schedule attributes are defined in 5.2.

5.3.9 Current Alarm Summary Reporting Control Functional Unit

The Current Alarm Summary Reporting Control functional unit contains the Initiate Current Alarm Summary Control service, the Terminate Current Alarm Summary Control service, the Set Current Alarm Summary Control service, and the Get Current Alarm Summary Control service. Figure 10 shows the interactions between the managing and managed system for this functional unit.

5.3.9.1 Initiate Current Alarm Summary Control Service

The Initiate Current Alarm Summary Control Service allows a managing system to create an instance of the Current Alarm Summary Control object class in a managed system. This service utilizes the PT-CREATE service and procedures defined in [16]. This service supports the Schedule Current Alarm Summary function identified in 5.1.

The semantics of the Current Alarm Summary Control attributes are defined in 5.2.

5.3.9.2 Terminate Current Alarm Summary Control Service

The Terminate Current Alarm Summary Control Service allows a managing system to delete an instance of the Current Alarm Summary Control object class in a managed system. This service utilizes the PT-DELETE service and procedures defined in [16]. This service supports the Schedule Current Alarm Summary function identified in 5.1.

The semantics of the Current Alarm Summary Control attributes are defined in 5.2.

5.3.9.3 Set Current Alarm Summary Control Service

The Set Current Alarm Summary Control service is a confirmed service that allows a managing system to set the attribute values of a specified instance of a Current Alarm Summary Control object. This service utilizes the PT-SET service and procedures defined in [16].

This service allows a managing system to alter the criteria used to select objects to be included in Current Alarm Summary reports. This service supports the Schedule Current Alarm Summary function identified in 5.1.

The semantics of the Current Alarm Summary Control attributes are defined in 5.2.

5.3.9.4 Get Current Alarm Summary Control Service

The Get Current Alarm Summary Control service allows a managing system to retrieve the values of given attributes of a specified instance of a Current Alarm Summary Control object. This service utilizes the PT-GET service and procedures defined in [16]. This service supports the Request Current Alarm Summary Schedule function identified in 5.1.

The semantics of the Current Alarm Summary Control attributes are defined in 5.2.

5.3.10 Current Alarm Summary Retrieval Functional Unit

The Current Alarm Summary Retrieval functional unit contains only the Retrieve Current Alarm Summary service described below. Figure 11 shows the interactions between the managing and managed system for this functional unit. Note that the Current Alarm Summary Control object shown in Figure 11 may be predefined. If this is the only Current Alarm Summary-related functional unit supported, the Current Alarm Summary Control object class shall be present but need not be modifiable by the managing system.

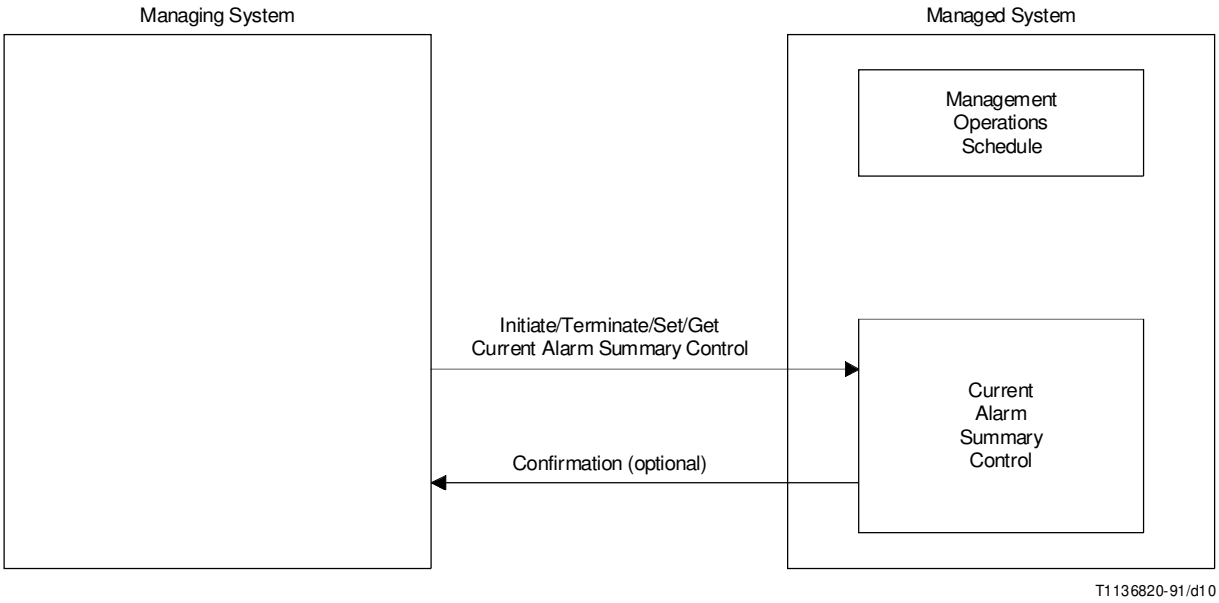
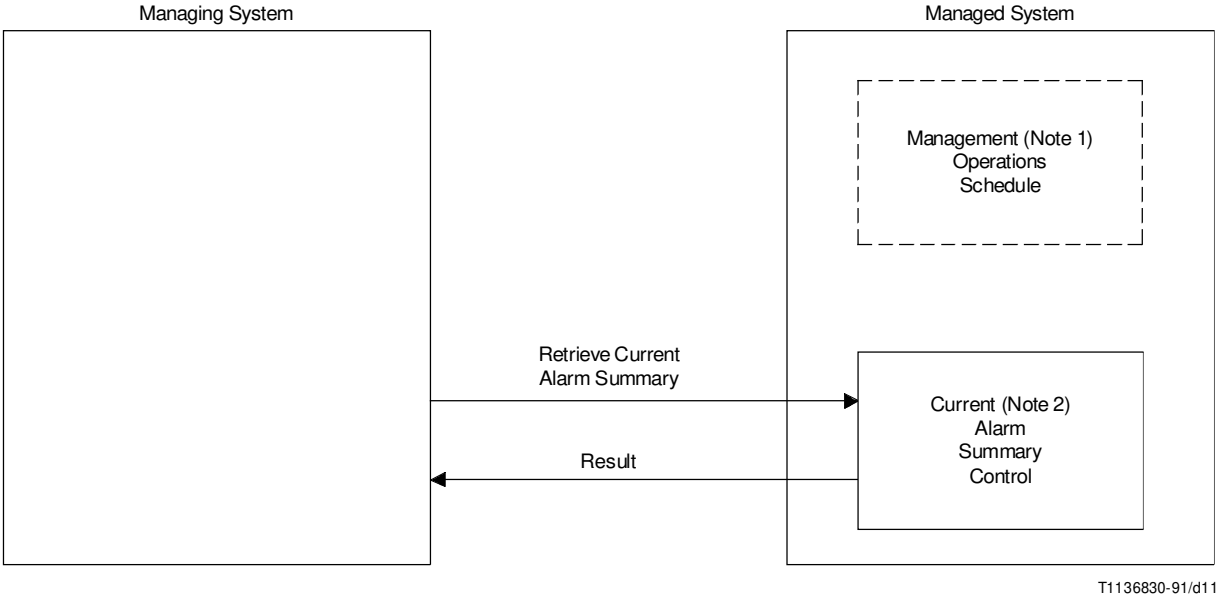


FIGURE 10/Q.821

Current alarm summary reporting control FU



NOTES

1 This object class is not required in the Functional Unit.

2 Some services associated with the Current Alarm Summary Control object class are not provided in this Functional Unit.

FIGURE 11/Q.821

Current alarm summary retrieval FU

5.3.10.1 Retrieve Current Alarm Summary Service

The Retrieve Current Alarm Summary service is used to request that a Current Alarm Summary report be sent from the managed system to the managing system. This service utilizes the CMIS M-ACTION service and procedures defined in [6]. It supports the Request Current Alarm Summary function identified in 5.1.

Table 8 shows the parameters used in the Retrieve Current Alarm Summary service.

TABLE 8/Q.821

Retrieve Current Alarm Summary Service Parameters

Parameter name	Req/Ind	Rsp/Cnf
Invoke Identifier	P	P
Linked Identifier [a)]	–	P
Mode	P	–
Base Object Class	P	–
Base Object Instance	P	–
Scope [a)]	P	–
Filter [a)]	P	–
Access Control	P	–
Managed Object Class	–	P
Managed Object Instance	–	P
Action Type	M	C=
Action Information		
Summary Contents	U	–
Current Time	–	P
Alarm Summary Data	–	C
Errors	–	P

a) Use of this parameter requires selection of the appropriate CMIS FU(s).

The following parameters are defined for use in the Alarm Retrieving Service:

Invoke Identifier

See Invoke Identifier [6].

Linked Identifier

See Linked Identifier [6]. If the Base Object Class references the Managed Element object class [18] or one of its subclasses, this parameter is included in the response when multiple replies (one for each Current Alarm Summary Control) are to be sent.

Mode

See Mode [6]. The value of this parameter shall be confirmed.

Base Object Class

See Base Object Class [6]. This parameter is used to indicate the Current Alarm Summary Control object class if desired summary report can be generated by a single instance of the Current Alarm Summary Control object class. If multiple replies are desired, this parameter indicates the Managed Element object class or one of its subclasses. The Scope and Filter parameters are used to select the Current Alarm Summary Control objects from which the alarm summary report is to be generated.

Base Object Instance

See Base Object Instance [6]. This parameter specifies the instance of the Managed Element object class or one of its subclasses or the Current Alarm Summary Control object class indicated by the Base Object Class parameter.

Scope

See Scope [6]. If multiple alarm summary reports are desired, this parameter is used to indicate that the 1st level (n=1) subordinates (Current Alarm Summary Control) of the base object class (Managed Element object class or one of its subclasses) is to be searched. This parameter is not applicable if the Current Alarm Summary Control object class is specified in the Base Object Class parameter.

Filter

See Filter [6]. If multiple alarm summary reports are desired, this parameter is used to indicate the criteria to be used when searching the Current Alarm Summary Control subordinates of the Managed Element object class or one of its subclasses. This parameter indicates the Current Alarm Summary Control object class and any other conditions desired to establish the selection criteria.

Access Control

See Access Control [6]. The use of this parameter is for further study.

Managed Object Class

See Managed Object Class [6]. This parameter indicates the Current Alarm Summary Control object class. It is included in success responses when multiple alarm summary reports are requested.

Managed Object Instance

See Managed Object Instance [6]. This parameter indicates the instance of the Current Alarm Summary Control object class for each response.

Action Type

See Action Type [6]. This parameter shall indicate the retrieve current alarm summary action type.

Summary Contents

This parameter is used to control the attributes that shall be included in the report. It may include any of the following:

- Perceived Severity [9]
- Alarm Status [9]
- Probable Cause [9]

Current Time

See Current Time [6].

Alarm Summary Data

This parameter includes the results of an alarm summary report generation by a managed system. These results include multiple sequences of the following parameters:

- Object Identifier [9]
- Perceived Severity [9] (Optional)
- Alarm Status [9] (Optional)
- Probable Cause [9] (Optional)

Errors

See Errors [6].

5.3.10.2 Other Services

The inclusion of other services in the Current Alarm Retrieval functional unit is for further study.

5.3.11 Alarm Event Criteria Management Functional Unit

The Alarm Event Criteria Management functional unit contains the Set Alarm Severity Assignment List and Get Alarm Severity Assignment List services. Figure 12 shows the interactions between the managing and managed system for this functional unit.

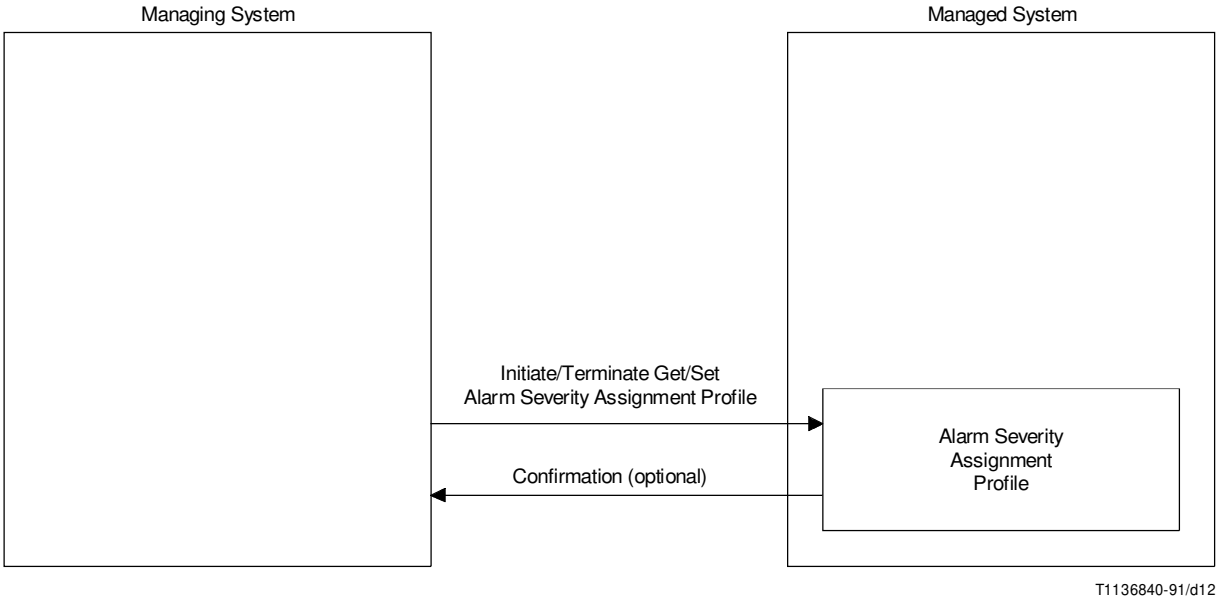


FIGURE 12/Q.821

Alarm event criteria management FU

5.3.11.1 Initiate Alarm Severity Assignment Profile Service

The Initiate Alarm Severity Assignment Profile service allows a managing system to create an instance of the Alarm Severity Assignment Profile object class in a managed system. This service utilizes the PT-CREATE service and procedures defined in [16]. This service supports the Condition Alarm Event Criteria function identified in 5.1.

The semantics of the Alarm Severity Assignment Profile attributes are defined in [18].

5.3.11.2 Terminate Alarm Severity Assignment Profile Service

The Terminate Alarm Severity Assignment Profile service allows a managing system to delete an instance of the Alarm Severity Assignment Profile object class in a managed system. This service utilizes the PT-DELETE service and procedures defined in [16]. This service supports the Condition Alarm Event Criteria function identified in 5.1.

The semantics of the Alarm Severity Assignment Profile attributes are defined in [18].

5.3.11.3 Set Alarm Severity Assignment Profile Service

The Set Alarm Severity Assignment Profile service allows a managing system to modify the alarm severity assignment list associated with the Alarm Severity Assignment Profile object instance. This service utilizes the PT-SET service and procedures defined in [16]. This service supports the Condition Alarm Event Criteria function identified in 5.1.

The semantics of the Alarm Severity Assignment Profile object class are described in [18].

5.3.11.4 Get Alarm Severity Assignment Profile Service

The Get Alarm Severity Assignment Profile service allows a managing system to retrieve the alarm severity assignment list associated with the Alarm Severity Assignment Profile object instance. This service utilizes the PT-GET service and procedures defined in [16]. This service supports the Request Alarm Event Criteria function identified in 5.1.

The semantics of the Alarm Severity Assignment Profile object class are described in [18].

5.3.12 Alarm Indication Management Functional Unit

The Alarm Indication Management functional unit contains the Inhibit Audible and Visual Local Alarms service, the Allow Audible and Visual Local Alarms service, and the Reset Audible Alarm service.

Figure 13 shows the interactions between the managing and managed system for this functional unit.

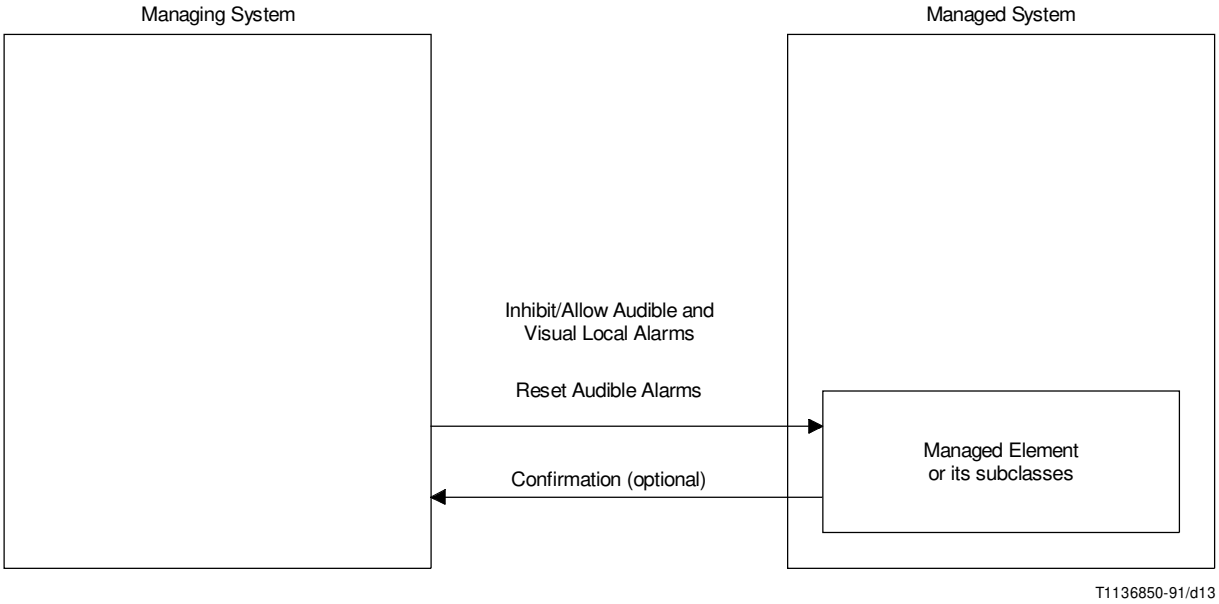


FIGURE 13/Q.821

Alarm indication management FU

5.3.12.1 Inhibit Audible and Visual Local Alarms Service

The Inhibit Audible and Visual Local Alarms service allows a managing system to disable audible and visual local alarms.

This service utilizes the CMIS M-ACTION service and procedures defined in [6]. This service supports the Inhibit Audible/Visual Alarm Indication function identified in 5.1.

Table 9 shows the parameters used in the Inhibit Audible and Visual Local Alarms Service.

TABLE 9/Q.821

Inhibit audible and Visual Local Alarms Service

Parameter name	Req/Ind	Rsp/Cnf
Invoke Identifier	P	P
Linked Identifier [a)]	–	P
Mode	P	–
Base Object Class	P	–
Base Object Instance	P	–
Scope [a)]	P	–
Access Control	P	–
Managed Object Class	–	P
Managed Object Instance	–	P
Action Type	M	C=
Current Time	–	P
Errors	–	P

a) Use of this parameter requires selection of the appropriate CMIS FU(s).

The following parameters are defined for use in the Inhibit Audible and Visual Local Alarms Service:

Invoke Identifier

See Invoke Identifier [6].

Linked Identifier

See Linked Identifier [6]. This parameter is included in the response when multiple actions (one for each object class instance) are requested.

Mode

See Mode [6].

Base Object Class

See Base Object Class [6]. This parameter identifies the Managed Element object class or one of its subclasses.

Base Object Instance

See Base Object Instance [6]. This parameter identifies an instance of the Managed Element or one of its subclasses.

Scope

See Scope [6]. If multiple actions are desired, this parameter is used to indicate that the appropriate level subordinates of the base object class (Managed Element object class or one of its subclasses).

Access Control

See Access Control [6]. The use of this parameter is for further study.

Managed Object Class

See Managed Object Class [6]. This parameter indicates the object class acted upon. It is included in success responses when multiple actions are requested.

Managed Object Instance

See Managed Object Instance [6]. This parameter indicates the instance of the object class acted upon. It is included in success responses when multiple actions are requested.

Action Type

See Action Type [6]. This parameter shall indicate the Inhibit Audible and Visual Local Alarms Service.

Current Time

See Current Time [6].

Errors

See Errors [6].

5.3.12.2 Allow Audible and Visual Local Alarms Service

The Allow Audible and Visual Local Alarms service allows a managing system to enable audible and visual local alarms to sound. This service utilizes the CMIS M-ACTION service and procedures defined in [6]. This service supports the Allow Audible/Visual Alarm Indication function identified in 5.1.

Table 10 shows the parameters used in the Allow Audible and Visual Local Alarms Service.

TABLE 10/Q.821

Allow Audible and Visual Local Alarms Service

Parameter name	Req/Ind	Rsp/Cnf
Invoke Identifier	P	P
Linked Identifier [a)]	–	P
Mode	P	–
Base Object Class	P	–
Base Object Instance	P	–
Scope [a)]	P	–
Access Control	P	–
Managed Object Class	–	P
Managed Object Instance	–	P
Action Type	M	C=
Current Time	–	P
Errors	–	P

a) Use of this parameter requires selection of the appropriate CMIS FU(s).

The following parameters are defined for use in the Allow Audible and Visual Local Alarms Service:

Invoke Identifier

See Invoke Identifier [6].

Linked Identifier

See Linked Identifier [6]. This parameter is included in the response when multiple actions (one for each object class instance) are requested.

Mode

See Mode [6].

Base Object Class

See Base Object Class [6]. This parameter identifies the Managed Element object class or one of its subclasses.

Base Object Instance

See Base Object Instance [6]. This parameter identifies an instance of the Managed Element or one of its subclasses.

Scope

See Scope [6]. If multiple actions are desired, this parameter is used to indicate that the appropriate level subordinates of the base object class (Managed Element object class or one of its subclasses).

Access Control

See Access Control [6]. The use of this parameter is for further study.

Managed Object Class

See Managed Object Class [6]. This parameter indicates the object class acted upon. It is included in success responses when multiple actions are requested.

Managed Object Instance

See Managed Object Instance [6]. This parameter indicates the instance of the object class acted upon. It is included in success responses when multiple actions are requested.

Action Type

See Action Type [6]. This parameter shall indicate the Allow Audible and Visual Local Alarms Service.

Current Time

See Current Time [6].

Errors

See Errors [6].

5.3.12.3 Reset Audible Alarms Service

The Reset Audible Alarms service allows a managing system to retire existing audible and visual local alarms without inhibiting them in the future. This service utilizes the CMIS M-ACTION service and procedures defined in [6]. This service supports the Reset Audible Alarms function identified in 5.1.

Table 11 shows the parameters used in the Reset Audible Alarm Service.

TABLE 11/Q.821

Reset Audible Alarms Service

Parameter name	Req/Ind	Rsp/Cnf
Invoke Identifier	P	P
Linked Identifier [a)]	–	P
Mode	P	–
Base Object Class	P	–
Base Object Instance	P	–
Scope [a)]	P	–
Access Control	P	–
Managed Object Class	–	P
Managed Object Instance	–	P
Action Type	M	C=
Current Time	–	P
Errors	–	P

a) Use of this parameter requires selection of the appropriate CMIS FU(s).

The following parameters are defined for use in the Reset Audible Alarms Service:

Invoke Identifier

See Invoke Identifier [6].

Linked Identifier

See Linked Identifier [6]. This parameter is included in the response when multiple actions (one for each object class instance) are requested.

Mode

See Mode [6].

Base Object Class

See Base Object Class [6]. This parameter identifies the Managed Element object class or one of its subclasses.

Base Object Instance

See Base Object Instance [6]. This parameter identifies an instance of the Managed Element or one of its subclasses.

Scope

See Scope [6]. If multiple actions are desired, this parameter is used to indicate that the appropriate level subordinates of the base object class (Managed Element object class or one of its subclasses).

Access Control

See Access Control [6]. The use of this parameter is for further study.

Managed Object Class

See Managed Object Class [6]. This parameter indicates the object class acted upon. It is included in success responses when multiple actions are requested.

Managed Object Instance

See Managed Object Instance [6]. This parameter indicates the instance of the object class acted upon. It is included in success responses when multiple actions are requested.

Action Type

See Action Type [6]. This parameter shall indicate the Reset Audible Alarms Service.

Current Time

See Current Time [6].

Errors

See Errors [6].

5.3.13 Basic Log Control Functional Unit

The Basic Log Control functional unit contains the Suspend Logging service and the Resume Logging service. Figure 14 shows the interactions between the managing and managed system for this functional unit. Note that the Log object shown in Figure 14 may either have a predefined Discriminator Construct, or the Discriminator Construct may be absent.

5.3.13.1 Suspend Logging Service

The Suspend Logging Service allows a managing system to inhibit the logging of Log Records. This service supports the Inhibit Logging function identified in 5.1.

For the service definition, see [15] under Suspension of Logging.

5.3.13.2 Resume Logging Service

The Resume Logging Service allows a managing system to resume the logging of Log Records. This service supports the Allow Logging function identified in 5.1.

For the service definition, see [15] under Resumption of Logging.

5.3.14 Enhanced Log Control Functional Unit

The Enhanced Log Control functional unit contains the Initiate Log service, the Terminate Log service, the Set Log service, and the Get Log service. Figure 15 shows the interactions between the managing and managed system for this functional unit. Note that the Log object shown in Figure 15 may either be predefined or be created using the Initiate Log service.

5.3.14.1 Initiate Log Service

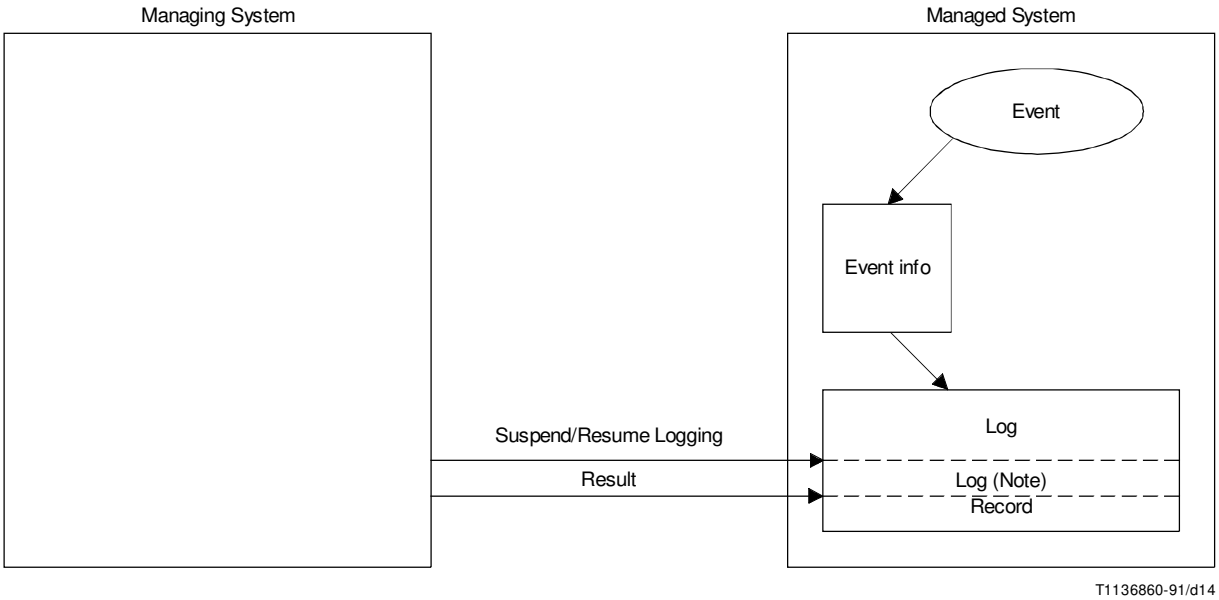
The Initiate Log Service allows a managing system to create an instance of the Log object class in a managed system. This service supports the Condition Logging function identified in 5.1.

For the service definition, see [15] under Initiation of Logging.

5.3.14.2 Terminate Log Service

The Terminate Log Service allows a managing system to delete an instance of the Log object class in a managed system. This service supports the Condition Logging function identified in 5.1.

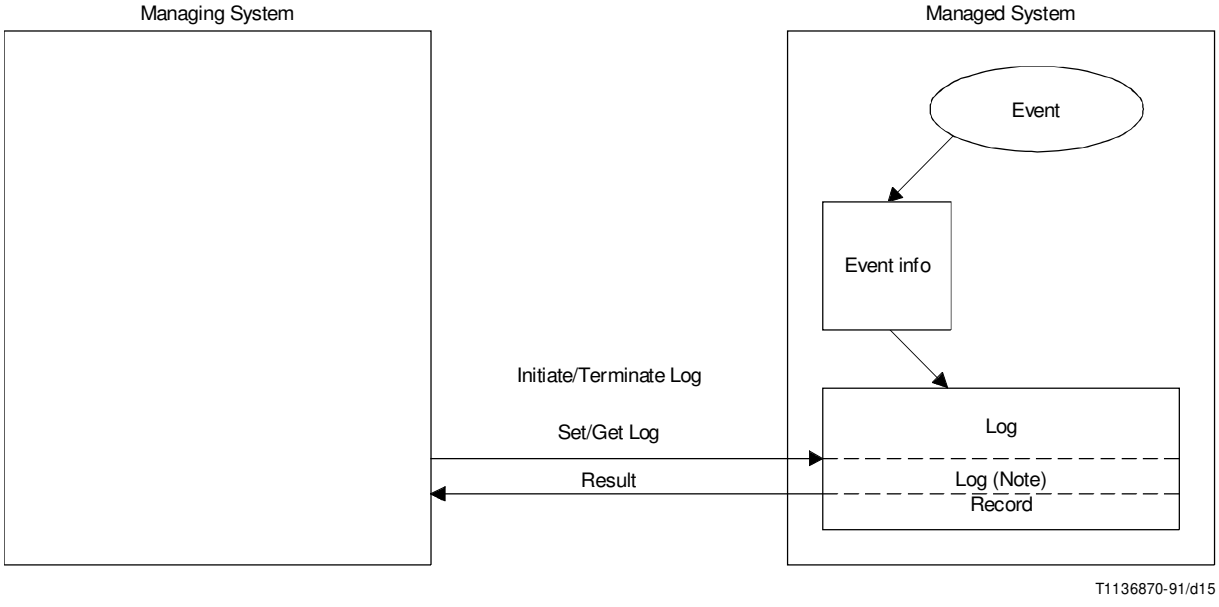
For the service definition, see [15] under Termination of Logging.



NOTE – Or subclasses of Log Record, such as Alarm Record.

FIGURE 14/Q.821

Basic log control FU



NOTE – Or subclasses of LOG Record, such as Alarm Record.

FIGURE 15/Q.821

Enhanced log control FU

5.3.14.3 Set Log Service

The Set Log service is a confirmed service that allows a managing system to set the attribute values of a specified instance of a Log object. This service supports the Condition Logging function identified in 5.1.

For the service definition, see [15] under Modification of Logging Attributes.

5.3.14.4 Get Log Service

The Get Log service allows a managing system to retrieve the values of given attributes of a specified instance of a Log object. This service supports the Request Log Condition function identified in 5.1.

For the service definition, see [15] under Retrieving Logging Attributes.

5.4 Alarm Surveillance Protocol Specification

5.4.1 Elements of procedure

Except for the services identified below, this specification makes use of the elements of procedure defined for the services described in 5.3.

The elements of procedure for the Current Alarm Summary Reporting service are identical to the elements of procedure found in 11.1.9 of [16].

The elements of procedure for the Retrieve Current Alarm Summary, the Inhibit/Allow Audible and Visual Local Alarms, and Reset Audible Alarm services are identical to the elements of procedure found in 11.1.8 of [16].

5.4.2 Abstract syntax

5.4.2.1 Managed objects

This specification references the following support objects whose ASN.1 value notation is specified in [9].

a) alarmRecord

b) discriminator

c) eventForwardingDiscriminator

d) eventLogRecord

e) log

f) logRecord

This specification references the following managed objects whose ASN.1 value notation are specified in [18].

a) alarmSeverityAssignmentProfile

b) managedElement

This specification references the following support objects whose ASN.1 value notation is specified in Annex A.

a) currentAlarmSummaryControl

b) managementOperationsSchedule

5.4.2.2 Attributes

This specification references the following attributes associated with the objects specified in 5.2 whose abstract syntax is defined in [9].

a) activeDestination

b) administrativeState

c) availabilityStatus

d) backUpDestinationList

e) backUpObject

f) backedUpStatus

g) capacityAlarmThreshold

h) confirmedMode

i) currentLogSize

j) destination

k) discriminatorConstruct

l) discriminatorId

m) eventType

n) intervalsOfDay

o) logFullAction

p) logId

q) logRecordId

r) loggingTime

s) managedObjectClass

t) managedObjectInstance

u) maxLogSize

v) monitoredAttributes

w) numberOfRecords

x) operationalState

y) perceivedSeverity

z) probableCause

aa) proposedRepairActions

bb) schedulerName

cc) specificProblems

dd) startTime

ee) stateChangeDefinition

ff) stopTime

gg) thresholdInfo

hh) trendIndication

ii) weekMask

This specification references the following attributes associated with the objects specified in 5.2 whose abstract syntax is defined in [18].

a) alarmSeverityAssignmentList

b) alarmSeverityAssignmentProfileId

c) managedElementId

The objects defined in this specification inherit attributes from Top as specified in [9]; these attributes are not repeated here.

This specification references the following attributes whose abstract syntax is defined in Annex A.

a) affectedObjectClass

b) affectedObjectInstances

c) alarmStatusList

d) beginTime

e) currentAlarmSummaryControlId

f) destinationAddress

g) endTime

h) interval

i) objectList

j) perceivedSeverityList

k) probableCauseList

l) scheduled

5.4.2.3 Notifications

This specification references the following events defined in [16].

a) attributeValueChangeNotification;

b) objectCreationNotification;

c) objectDeletionNotification

This specification references the following events defined in [17].

a) stateChangeNotification.

This specification references the following events defined in [11].

a) communicationsAlarm

b) equipmentAlarm

c) environmentalAlarm

d) processingErrorAlarm

e) qualityOfServiceAlarm

This specification references the following events defined in Annex A.

a) currentAlarmSummaryReport

5.4.2.4 Actions

This specification references the following actions defined in [18].

a) allowAudibleAndVisualLocalAlarms

b) inhibitAudibleAndVisualLocalAlarms

This specification references the following actions defined in Annex A.

a) retrieveCurrentAlarmSummary

b) resetAudibleAlarm

5.4.2.5 Parameters

This specification references the following parameters defined in Annex A.

a) correlatedRecordededNameParameter

b) logRecordIdParameter

c) suspectObjectNameParameter

5.4.2.6 Name Bindings

This specification references the following name bindings associated with the objects specified in Section 5.2 whose abstract syntax is defined in [18].

a) LogRecord-log

5.4.3 Negotiation of Functional Units

This specification assigns the following object identifier values

{ccitt(0) recommendation(0) q(17) q821(821) protocolSupport(1) functionalUnitPackage(1)}

as a value of the ASN.1 type FunctionalUnitPackageId defined in [20] to use for negotiating the following functional units:

0 kernel
1 alarm report retrieval
2 basic alarm report control
3 enhanced alarm report control
4 current alarm summary reporting
5 basic management operations scheduling
6 enhanced management operations scheduling
7 current alarm summary control
8 current alarm summary retrieval
9 basic log control
10 enhanced log control
11 alarm report deletion
12 alarm event criteria management
13 alarm indication management

where the number identifies the bit positions in the BIT STRING assigned to the functional units, and the names referencing the functional units as defined in 5.3.

Within the systems management application context, the mechanism for negotiating the functional units is described in [20].

NOTE – The requirement to negotiate functional units is specified by the application context.

6 Relationship with other documents

This specification uses the service defined in [17] for the notification of state changes, the services defined in [16] for the creation and deletion of managed objects, the retrieval of attributes, and the notification of object creation, object deletion, and attribute value changes, and the services defined in [11] for the reporting of alarms. Control of the reporting and logging services defined in this specification is provided by mechanisms specified in [12] and [15].

7 Conformance

There are two conformance classes: general conformance class and dependent conformance class. A system claiming to implement the elements of procedure for the services referenced by this specification shall comply with the requirements for either the general or the dependent conformance class as defined in the following clauses. The supplier of the implementation shall state the class to which the conformance is claimed.

7.1 General conformance class requirement

A system claiming general conformance shall support this Stage 2 and Stage 3 Description for all managed object classes that import the management information defined in this specification.

NOTE – This is applicable to all subclasses of the support object classes defined in this specification.

7.1.1 Static conformance

The system shall

a) support the role of manager or agent or both, with respect to the kernel and one or more of the functional units defined in Section 5.3.

b) support the transfer syntax derived from the encoding rules specified in [21] and named {joint-iso-ccitt asn1(1) basicEncoding(1)}, for the purpose of generating and interpreting the MAPDUs, defined by the abstract data types referenced in Sections 5.4.2.2, 5.4.2.3, 5.4.2.4, and 5.4.2.5 of this specification.

c) when acting in the agent role, support one or more instances of the following managed object classes if such object classes are required by the supported functional units:

- alarmRecord
- alarmSeverityAssignmentProfile
- currentAlarmSummaryControl
- eventForwardingDiscriminator
- log
- managementOperationsSchedule

7.1.2 Dynamic conformance

The system shall, in the role(s) for which conformance is claimed,

a) support the elements of procedure defined in

[16] for the PT-GET, PT-CREATE, PT-DELETE, PT-SET, Object creation reporting, Object deletion reporting and Attribute value change reporting services

[17] for the State change reporting service

[11] for the Alarm reporting service

7.2 Dependent conformance class requirement

7.2.1 Static conformance

The system shall

a) supply a system conformance statement which identifies the standardized use of this Stage 2 and Stage 3 Description

b) support the transfer syntax derived from the encoding rules specified in [21] and named {joint-iso-ccitt asn1(1) basicEncoding(1)}, for the purpose of generating and interpreting the MAPDUs, defined by the abstract data types referenced in 5.4.2.2, 5.4.2.3, 5.4.2.4, and 5.4.2.5 of this specification, as required by a standardized use of this Stage 2 and Stage 3 Description.

c) support one or more instances of the relevant managed object classes required by supported functional units when acting in the agent role.

7.2.2 Dynamic conformance

The system shall support the elements of procedure referenced by this specification as required by a standardized use of this Stage 2 and Stage 3 Description.

7.2.3 Conformance to support managed object definition

The Current Alarm Summary Control and Management Operations Schedule object classes supported by the open system shall comply with the behaviour specified in 5.2 and the syntax specified in Annex A of this specification.

The Log, Log Record, Event Log Record, Discriminator, Event forwarding Discriminator, and Alarm Record object classes supported by the open system shall comply with the behaviour and the syntax specified in [9].

The Managed Element object class and the Alarm Severity Assignment Profile or their subclasses supported by the open system shall comply with the behaviour and the syntax specified in [18] or the defining specification.

Annex A

Alarm surveillance definition of management information

(This annex forms an integral part of this Recommendation)

A.1 Generic Object Classes

A.1.1 Current Alarm Summary Control

The semantics of this managed object class are described in 5.2.2.1.

```
currentAlarmSummaryControl MANAGED OBJECT CLASS
  DERIVED FROM "Recommendation X.721:1992":top;
  CHARACTERIZED BY currentAlarmSummaryControlPkg PACKAGE
  BEHAVIOUR currentAlarmSummaryControlBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.2.2.1 --";;
  ATTRIBUTES
  currentAlarmSummaryControlId
  GET,
  alarmStatusList
  GET-REPLACE
  ADD-REMOVE,
  objectList
  GET-REPLACE
  ADD-REMOVE,
  perceivedSeverityList
  GET-REPLACE
  ADD-REMOVE,
  probableCauseList
  GET-REPLACE
  ADD-REMOVE;
  ACTIONS
  retrieveCurrentAlarmSummary;
  NOTIFICATIONS
  currentAlarmSummaryReport;;;

REGISTERED AS { q821ObjectClass 1 };
```

A.1.2 Management Operations Schedule

The semantics of this managed object class are described in 5.2.2.2.

```
managementOperationsSchedule MANAGED OBJECT CLASS
  DERIVED FROM "Recommendation X.721:1992":top;
  CHARACTERIZED BY managementOperationsSchedulePkg PACKAGE
  BEHAVIOUR managementOperationsScheduleBeh BEHAVIOUR
  DEFINED AS
"-- see 5.2.2.2 --";;
  ATTRIBUTES
  "Recommendation X.721:1992":administrativeState
  GET-REPLACE,
  affectedObjectClass
  GET-REPLACE,
  affectedObjectInstances
  GET-REPLACE,
  beginTime
  GET-REPLACE,
  -- first activation at begin time, if
  -- present, or else when schedule is created
  destinationAddress
  GET,
  endTime
  DEFAULT VALUE Q821-ASN1Module.
  managementOperationsScheduleEndTimeDefault
```

```
  GET-REPLACE,
  interval
  GET-REPLACE,
  scheduled
  GET ;;;
  CONDITIONAL PACKAGES
  managementOperationsScheduleOperationalStatePkg PACKAGE
  ATTRIBUTES
  "Recommendation X.721:1992":operationalState
  GET;
  REGISTERED AS { q821Package 1 };
  PRESENT IF "an instance supports it.";

REGISTERED AS { q821ObjectClass 2 };
```

A.2 Attributes

A.2.1 Affected Object Class

The semantics of this attribute are described in 5.2.2.2 b).

```
affectedObjectClass ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q821-ASN1Module.AffectedObjectClass;
  MATCHES FOR EQUALITY;
  BEHAVIOUR affectedObjectClassBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.2.2.2 b) --";;

REGISTERED AS { q821Attribute 1 };
```

A.2.2 Affected Object Instances

The semantics of this attribute are described in 5.2.2.2 c).

```
affectedObjectInstances ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q821-ASN1Module.ObjectList;
  MATCHES FOR EQUALITY;
  BEHAVIOUR affectedObjectInstancesBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.2.2.2 c) --";;

REGISTERED AS { q821Attribute 2 };
```

A.2.3 Alarm Status List

The semantics of this attribute are described in 5.2.2.1 b).

```
alarmStatusList ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q821-ASN1Module.AlarmStatusList;
  MATCHES FOR EQUALITY;
  BEHAVIOUR alarmStatusListBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.2.2.1 b) --";;

REGISTERED AS { q821Attribute 3 };
```

A.2.4 Begin Time

The semantics of this attribute are described in 5.2.2.2 d).

```
beginTime ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q821-ASN1Module.StartTime;
  MATCHES FOR EQUALITY;
  BEHAVIOUR beginTimeBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.2.2.2 d) --";;

REGISTERED AS { q821Attribute 4 };
```

A.2.5 Current Alarm Summary Control Id

The semantics of this attribute are described in 5.2.2.1 a).

```
currentAlarmSummaryControlId ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q821-ASN1Module.NameType;
  MATCHES FOR EQUALITY;
  BEHAVIOUR currentAlarmSummaryControlIdBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.2.2.1 a) --";;

REGISTERED AS { q821Attribute 5 };
```

A.2.6 Control

The semantics of this attribute are described in 5.2.2.2 e).

```
destinationAddress ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q821-ASN1Module.DestinationAddress;
  MATCHES FOR EQUALITY;
  BEHAVIOUR destinationAddressBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.2.2.2 e) --";;

REGISTERED AS { q821Attribute 6 };
```

A.2.7 End Time

The semantics of this attribute are described in 5.2.2.2 f).

```
endTime ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q821-ASN1Module.StopTime;
  MATCHES FOR EQUALITY;
  BEHAVIOUR endTimeBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.2.2.2 f) --";;

REGISTERED AS { q821Attribute 7 };
```

A.2.8 Interval

The semantics of this attribute are described in 5.2.2.2 g).

```
interval ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q821-ASN1Module.Interval;
  MATCHES FOR EQUALITY;
  BEHAVIOUR intervalBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.2.2.2 g) --";;

REGISTERED AS { q821Attribute 8 };
```

A.2.9 Object List

The semantics of this attribute are described in 5.2.2.1 c).

```
objectList ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q821-ASN1Module.ObjectList;
  MATCHES FOR EQUALITY;
  BEHAVIOUR objectListBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.2.2.1 c) --";;

REGISTERED AS { q821Attribute 9 };
```

A.2.10 Perceived Severity

The semantics of this attribute are described in 5.2.2.1 d).

```
perceivedSeverityList ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q821-ASN1Module.PerceivedSeverityList;
  MATCHES FOR EQUALITY;
  BEHAVIOUR perceivedSeverityListBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.2.2.1 d) --";;

REGISTERED AS { q821Attribute 10 };
```

A.2.11 Probable Cause List

The semantics of this attribute are described in 5.2.2.1 e).

```
probableCauseList ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q821-ASN1Module.ProbableCauseList;
  MATCHES FOR EQUALITY;
  BEHAVIOUR probableCauseListBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.2.2.1 e) --";;

REGISTERED AS { q821Attribute 11 };
```

A.2.12 Schedule Id

The semantics of this attribute are described in 5.2.2.2 i).

```
scheduleId ATTRIBUTE
  WITH ATTRIBUTE SYNTAX Q821-ASN1Module.NameType;
  MATCHES FOR EQUALITY;
  BEHAVIOUR scheduleIdBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.2.2.2 i) --";;

REGISTERED AS { q821Attribute 12 };
```

A.3 Name Bindings

A.3.1 Current Alarm Summary Control – Managed Element

```
currAlarmSumControl-managedElement NAME BINDING
  SUBORDINATE OBJECT CLASS currentAlarmSummaryControl;
  NAMED BY SUPERIOR OBJECT CLASS "Recommendation M.3100:1992":
  managedElement;
  WITH ATTRIBUTE currentAlarmSummaryControlId;
  CREATE;
  DELETE
  DELETES-CONTAINED-OBJECTS;

REGISTERED AS { q821NameBinding 1 };
```

A.3.2 Management Operations Schedule – Managed Element

```
managementOperationsSchedule-managedElement NAME BINDING
  SUBORDINATE OBJECT CLASS managementOperationsSchedule;
  NAMED BY SUPERIOR OBJECT CLASS "Recommendation M.3100:1992":
  managedElement;
  WITH ATTRIBUTE scheduleId;
  CREATE;
  DELETE
  DELETES-CONTAINED-OBJECTS;

REGISTERED AS { q821NameBinding 2 };
```

A.4 Notifications and Actions

A.4.1 Current Alarm Summary Report

The semantics of this notification are described in 5.3.6.1.

```
currentAlarmSummaryReport NOTIFICATION
  BEHAVIOUR currentAlarmSummaryReportBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.3.6.1 --";;
  WITH INFORMATION SYNTAX Q821-ASN1Module.AlarmSummaryData;

REGISTERED AS { q821Notification 1 };
```

A.4.2 Retrieve Current Alarm Summary

The semantics of this action are described in 5.3.10.1.

```
retrieveCurrentAlarmSummary ACTION
  BEHAVIOUR retrieveCurrentAlarmSummaryBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.3.10.1 --";;
  MODE CONFIRMED;
  WITH INFORMATION SYNTAX Q821-ASN1Module.SummaryContents;
  WITH REPLY SYNTAX Q821-ASN1Module.AlarmSummaryData;

REGISTERED AS { q821Action 1 };
```

A.4.3 Reset Audible Alarm

The semantics of this action are described in 5.3.12.3.

```
resetAudibleAlarm ACTION
  BEHAVIOUR resetAudibleAlarmBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.3.12.3 --";;

REGISTERED AS { q821Action 2 };
```

A.5 Parameters

A.5.1 Log Record Id Parameter

The semantics of this parameter are described in 5.3.1.1.

```
logRecordIdParameter   PARAMETER
  CONTEXT  EVENT-INFO;
  WITH  SYNTAX Q821-ASN1Module.LogRecordId;
  BEHAVIOUR logRecordIdBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.3.1.1 --";;

REGISTERED AS { q821Parameter 1 };
```

A.5.2 Correlated Record Name Parameter

The semantics of this parameter are described in 5.3.1.1.

```
correlatedRecordNameParameter   PARAMETER
  CONTEXT  EVENT-INFO;
  WITH  SYNTAX Q821-ASN1Module.CorrelatedRecordName;
  BEHAVIOUR correlatedRecordNameBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.3.1.1 --";;

REGISTERED AS { q821Parameter 2 };
```

A.5.3 Suspect Object List Parameter

The semantics of this parameter are described in 5.3.1.1.

```
suspectObjectListParameter   PARAMETER
  CONTEXT  EVENT-INFO;
  WITH  SYNTAX Q821-ASN1Module.SuspectObjectList;
  BEHAVIOUR suspectObjectListBeh BEHAVIOUR
  DEFINED AS
  "-- see 5.3.1.1 --";;

REGISTERED AS { q821Parameter 3 };
```

A.6 Abstract Syntax Definitions

This subclause specifies the ASN.1 syntax for the supporting productions identified in A.1 through A.5.

```
Q821-ASN1Module

{ ccitt(0) recommendation(0) q(17) q821(821) asn1Module(2) q821ASN1Module(0) }

DEFINITIONS ::= BEGIN
 -- EXPORTS everything

IMPORTS

BackedUpStatus, CorrelatedNotifications,ObservedValue,
PerceivedSeverity, ProbableCause, StartTime,
StopTime, TrendIndication, ThresholdInfo
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 }

AlarmStatus, NameType
FROM
ASN1DefinedTypeModule
{ ccitt(0) recommendation(0) m(13) gnm(3100) informationModel(0) asn1Module(2)
asn1DefinedTypesModule(0) }

Attribute, AttributeId, ObjectInstance
FROM
CMIP-1 { joint-iso-ccitt ms(9) cmip(1) modules(0) protocol(3) }

AE-title
FROM
ACSE-1 { joint-iso-ccitt association-control(2) abstract-syntax(1) apdus(0) version(1) }
-- Note that the syntax of AE-title to be used is from CCITT Rec. X.227|ISO 8650 corrigendum and not "ANY"

DistinguishedName
FROM
InformationFramework { joint-iso-ccitt ds(5) modules(1) informationFramework(1) }
;

q821InformationModel OBJECT IDENTIFIER ::= { ccitt(0) recommendation(0)
q(17) q821(821) informationMode(0) }

q821 StandardSpecificExtension OBJECT IDENTIFIER ::= { q821InformationModel
standardSpecificExtension(0) }

q821ObjectClass OBJECT IDENTIFIER ::= { q821InformationModel
managedObjectClass(3) }

q821Package OBJECT IDENTIFIER ::= { q821InformationModel package(4) }

q821Parameter OBJECT IDENTIFIER ::= { q821InformationModel parameter(5) }

q821NameBinding OBJECT IDENTIFIER ::= { q821InformationModel namebinding(6) }
```

```
q821Attribute OBJECT IDENTIFIER ::= { q821InformationModel attribute(7) }

q821AttributeGroup OBJECT IDENTIFIER ::= { q821InformationModel attributeGroup(8) }

q821Action OBJECT IDENTIFIER ::= { q821InformationModel action(9) }

q821Notification OBJECT IDENTIFIER ::= { q821InformationModel notification(10) }

managementOperationsScheduleEndTimeDefault StopTime ::= continual : NULL

AffectedObjectClass ::= OBJECT IDENTIFIER

AlarmStatusList ::= SET OF AlarmStatus

AlarmSummaryData ::= SEQUENCE OF ObjectAlarmSummary

AlarmSummaryInfo ::= SEQUENCE { perceivedSeverity [0] PerceivedSeverity OPTIONAL,
  alarmStatus [1] AlarmStatus OPTIONAL,
  probableCause [2] ProbableCause OPTIONAL }

CorrelatedRecordName ::= ObjectInstance

CountInterval ::= SEQUENCE {
  count     INTEGER,
  startTime    GeneralizedTime,
  window     TimeInterval }

CountWindow ::= SEQUENCE {
  count   INTEGER,
  window   TimeInterval }

DestinationAddress ::= CHOICE { singleAddress AE-title,
  groupAddress GraphicString }

Interval ::= CHOICE { days [0] INTEGER,
  hours [1] INTEGER,
  minutes [2] INTEGER,
  seconds [3] INTEGER }

GaugeParameters ::= CHOICE {
  up   [1] SEQUENCE { high ObservedValue, low ObservedValue },
  down [2] SEQUENCE { high ObservedValue, low ObservedValue }}

LogRecordId ::= NumericName

NotificationId ::= INTEGER

NumericName ::= INTEGER

ObjectAlarmSummary ::= SEQUENCE{ objectOfReference ObjectOfReference,
  SEQUENCE OF AlarmSummaryInfo }

ObjectList ::= SET OF ObjectListChoice

ObjectListChoice ::= CHOICE { singleObject [1] ObjectInstance,
  rangeOfObjects [2] RangeOfObjects }

-- The rangeOfObjects may be used to specify a group
-- of objects which are named in a contiguous manner
-- without having to specify each instance explicitly.
-- This mechanism may only be used to specify object
-- instances which use INTEGER as the final RDN of their DN.
-- To use this mechanism, the DN of the superior object and a range
-- of INTEGERs is specified. Each INTEGER in the range can be concatenated
-- with the DN of the superior object to form the DN of an indicated object.

ObjectOfReference ::= ObjectInstance

PerceivedSeverityList ::= SET OF PerceivedSeverity

ProbableCauseList ::= SET OF ProbableCause

ProblemData ::=  SEQUENCE { identifier  [0] OBJECT IDENTIFIER,
  significance [1] BOOLEAN DEFAULT FALSE,
  information [2] ANY DEFINED BY identifier }
```

```
RangeOfObjects ::= SEQUENCE {
  superiorObjectName   ObjectInstance,
  terminalRDNRange     TerminalRDNRange }

StatusChange ::=  SET OF SEQUENCE { StatusAttributeID OBJECT IDENTIFIER,
  oldStatusValue [1] ANY DEFINED BY StatusAttributeID OPTIONAL,
  newStatusValue [2] ANY DEFINED BY StatusAttributeID }

SummaryContents ::= BIT STRING { includePerceivedSeverity(0),
  includeAlarmStatus(1),
  includeProbableCause(2) }

SuspectObject ::= SEQUENCE { suspectObjectClass OBJECT IDENTIFIER,
  suspectObjectInstance ObjectInstance,
  failureProbability INTEGER 0..100 OPTIONAL  --in the range 1 ..100-- }

SuspectObjectList ::= SET OF SuspectObject

TerminalRDNRange ::= SEQUENCE {
  attributeId     OBJECT IDENTIFIER,
  firstObjectInRange     INTEGER,
  lastObjectInRange      INTEGER }

Threshold ::= CHOICE {
  absoluteCount [0] INTEGER,
  countOverFixedTimeInterval [1] CountInterval,
  countOverSlidingWindow [2] CountWindow,
  valueAndDuration [3] ValueDuration,
  absoluteValue [4] REAL,
  guage [5] GaugeParameters }

TimeInterval ::= SEQUENCE {
  day [0]  INTEGER (0..31) DEFAULT 0,
  hour [1]  INTEGER (0..23) DEFAULT 0,
  minute [2]  INTEGER (0..59) DEFAULT 0,
  second [3]  INTEGER (0..59) DEFAULT 0,
  msec [4]  INTEGER (0..999) DEFAULT 0 }
-- TimeInterval shall be non-zero

ValueDuration ::= SEQUENCE {
  value REAL,
  duration TimeInterval }
-- the following is the bit string to be used when specifying
-- the functional units for alarm surveillance

AlarmSurveillanceFunctionalUnits ::= BIT STRING { as-kernel(0),
as-alarm-retrieval(1),
as-basic-arc(2),
as-enhanced-arc(3),
as-cur-alm-sum-reporting(4),
as-basic-mos(5),
as-enhanced-mos(6),
as-cur-alm-sum-control(7),
as-cur-alm-sum-retrieval(8),
as-basic-log-control(9),
as-enhanced-log-control(10),
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