

ETSI TS 132 122 V18.0.0 (2024-05)



**Digital cellular telecommunications system (Phase 2+) (GSM);
Universal Mobile Telecommunications System (UMTS);
LTE;
Telecommunication management;
Advanced Alarm Management (AAM)
Integration Reference Point (IRP): Information Service (IS)
(3GPP TS 32.122 version 18.0.0 Release 18)**



Reference

RTS/TSGS-0532122vi00

Keywords

GSM,LTE,UMTS

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° w061004871

Important notice

The present document can be downloaded from:

<https://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommitteeSupportStaff.aspx>

If you find a security vulnerability in the present document, please report it through our
Coordinated Vulnerability Disclosure Program:

<https://www.etsi.org/standards/coordinated-vulnerability-disclosure>

Notice of disclaimer & limitation of liability

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2024.
All rights reserved.

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

Legal Notice

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

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found under <https://webapp.etsi.org/key/queryform.asp>.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Contents

Intellectual Property Rights	2
Legal Notice	2
Modal verbs terminology.....	2
Foreword.....	5
Introduction	5
1 Scope	6
2 References	6
3 Definitions and abbreviations.....	7
3.1 Definitions	7
3.2 Abbreviations	7
4 System overview	8
4.1 System context	8
5 Information Object Classes	9
5.1 Imported information entities and local labels	9
5.2 Class diagram	9
5.2.1 Attributes and relationships	9
5.2.2 Inheritance	10
5.3 Information Object Class definitions.....	11
5.3.1 advancedAlarmManagementRule	11
5.3.1.1 Definition	11
5.3.1.1.1 General Definition.....	11
5.3.1.2 Attributes.....	11
5.3.2 advancedAlarmManagement IRP	11
5.3.2.1 Definition	11
5.4 Information relationships definition	12
5.4.1 relation- AdvancedAlarmManagementIRP-AdvancedAlarm ManagementRule (M).....	12
5.4.1.1 Definition	12
5.4.1.2 Roles	12
5.4.1.3 Constraints	12
5.5 Information attributes definition.....	12
5.5.1 Definitions and legal values.....	12
6 Interface Definition	13
6.1 Class diagram representing interfaces	13
6.2 AAMIRPOperation_1 Interface (M)	14
6.2.1 Scope	14
6.2.2 Operation activateAAMRule (M)	14
6.2.2.1 Definition	14
6.2.2.2 Input parameters.....	14
6.2.2.2.1 Generic Input parameters	14
6.2.2.2.2 Content of Input parameter aAMRuleParameterList depending on value of aAMRuleType	14
6.2.2.2.2.1 aAMRuleType = ThresholdRule	14
6.2.2.2.2.2 aAMRuleType = TransientRule	15
6.2.2.2.2.3 aAMRuleType = ToggleRule	15
6.2.2.2.2.4 aAMRuleType = vendorSpecificRule	15
6.2.2.3 Output parameters	15
6.2.2.4 Pre-condition.....	15
6.2.2.5 Post-condition	15
6.2.2.6 Exceptions.....	15
6.2.3 Operation getAAMRules (M).....	16
6.2.3.1 Definition	16

6.2.3.2	Input parameters.....	16
6.2.3.3	Output parameters.....	16
6.2.3.4	Pre-condition.....	16
6.2.3.5	Post-condition.....	16
6.2.3.6	Exceptions.....	16
6.2.4	Operation deactivateAAMRule (M).....	17
6.2.4.1	Definition.....	17
6.2.4.2	Input parameters.....	17
6.2.4.3	Output parameters.....	17
6.2.4.4	Pre-condition.....	17
6.2.4.5	Post-condition.....	17
6.2.4.6	Exceptions.....	17

Annex A (normative): Advanced Alarm Management Rules18

A.1	General.....	18
A.2	AAM Rules.....	20
A.2.1	Threshold Rule.....	20
A.2.1.1	Parameters.....	20
A.2.1.2	Criterion to determine alike alarm.....	20
A.2.1.3	Treatment of alike alarm.....	20
A.2.1.4	Relation to Log and AlarmList.....	20
A.2.1.5	Samples.....	21
A.2.1.6	Example for Use cases.....	21
A.2.2	Transient Rule.....	22
A.2.2.1	Parameters.....	22
A.2.2.2	Criterion to determine alike alarm.....	22
A.2.2.3	Treatment of alike alarm.....	22
A.2.2.4	Relation to Log and AlarmList.....	22
A.2.2.5	Samples.....	23
A.2.2.6	Example for Use cases.....	23
A.2.3	Toggle Rule.....	24
A.2.3.1	Parameters.....	24
A.2.3.2	Criterion to determine alike alarm.....	24
A.2.3.3	Treatment of alike alarm.....	24
A.2.3.4	Relation to Log and AlarmList.....	25
A.2.3.5	Samples.....	25
A.2.3.6	Example for Use cases.....	26
A.2.3.7	Exception Handling.....	26
A.2.4	Definition of vendor specific rule.....	27
A.3	Relation of Rule and Notification filter.....	28

Annex B (informative): Change history29

History.....	30
--------------	----

Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

Introduction

The present document is part of a TS-family covering the 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Telecommunication management; as identified below:

- 32.121: Advanced Alarm Management (AAM) Integration Reference Point (IRP): Requirements;
- 32.122: Advanced Alarm Management (AAM) Integration Reference Point (IRP): Information Service (IS);**
- 32.126: Advanced Alarm Management (AAM) Integration Reference Point (IRP); Solution Set (SS) definitions.

The Itf-N interface is built up by a number of IRPs and a related Name Convention, which realize the functional capabilities over this interface. The basic structure of the IRPs is defined in 3GPP TS 32.150 [1].

A single network fault may generate a large number of alarms over space and time. In a large and complex network, simultaneous network faults may occur, causing the network operator to be flooded with high volume of alarms. The high volume of alarms, typically the one received by an `IRPManager` via the `getAlarmList` or alarm notifications of Alarm IRP specification, greatly inhibits the operator ability to quickly identify and locate the responsible network faults. AAM IRP is intended to provide methods to improve this situation.

1 Scope

The purpose of Advanced Alarm Management (AAM) IRP is to define an interface through which an `IRPManager` can categorize alarm notifications.

The present document is the Information Service of AAM. It defines, for the purpose of categorizing alarm notifications, the information observable and controlled by management system's client and it also specifies the semantics of the interactions used to carry this information.

2 References

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

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

- [1] 3GPP TS 32.150: "Telecommunication management; Integration Reference Point (IRP) Concept and definitions".
- [2] 3GPP TS 32.102: "Telecommunication management; Architecture".
- [3] 3GPP TS 32.302: "Telecommunication management; Configuration Management (CM); Notification Integration Reference Point (IRP): Information Service (IS)".
- [4] 3GPP TS 32.121: "Telecommunication management; Advanced Alarm Management Reference Point (IRP): Requirements".
- [5] void.
- [6] 3GPP TS 32.622: "Telecommunication management; Configuration Management (CM); Generic network resources Integration Reference Point (IRP): Network Resource Model (NRM)".
- [7] 3GPP TS 32.312: "Telecommunication management; Generic Integration Reference Point (IRP) management; Information Service (IS)".
- [8] 3GPP TS 32.602: "Telecommunication management; Configuration Management (CM); Basic CM Integration Reference Point (IRP): Information Service (SS)".
- [9] 3GPP TS 32.662: "Telecommunication management; Configuration Management (CM); Kernel CM; Information service (IS)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

IRP: See 3GPP TS 32.150 [1].

IRPAgent: See 3GPP TS 32.150 [1].

IRPManager: See 3GPP TS 32.150 [1].

Alike Alarm: Two alarms are considered alike, if the corresponding alarm notifications are issued by the same object instance with the same `alarmType`, same `perceivedSeverity`, same `probableCause` and same `specificProblem` (if present).

Lower Edge of Time Window: The point in time which determines the begin of a time span.

Upper Edge of Time Window: The point in time which determines the end of a time span.

3.2 Abbreviations

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

AAM	Advanced Alarm Management
AAMRule	Advanced Alarm Management Rule
CM	Configuration Management
EM	Element Manager
IOC	Information Object Class
IRP	Integration Reference Point
IS	Information Service
Itf-N	Interface N
MIB	Management Information Base
NE	Network Element

4 System overview

4.1 System context

The general definition of the System Context for the present IRP is found in 3GPP TS 32.150 [1], clause 4.7.

In addition, the set of related IRP(s) relevant to the present IRP is shown in figures 4.1-1 and 4.1-2.

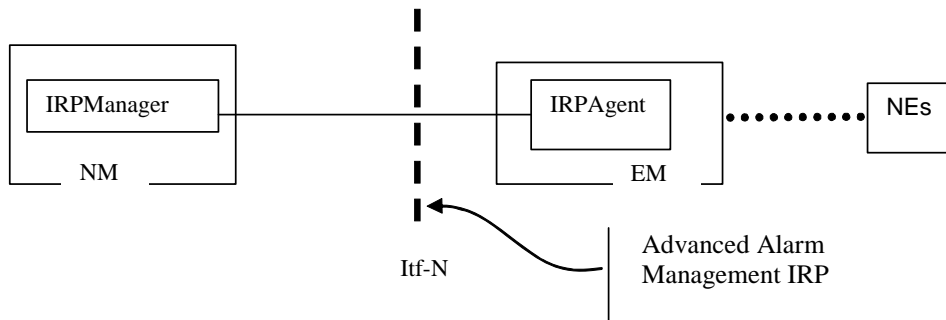


Figure 4.1-1: System Context A

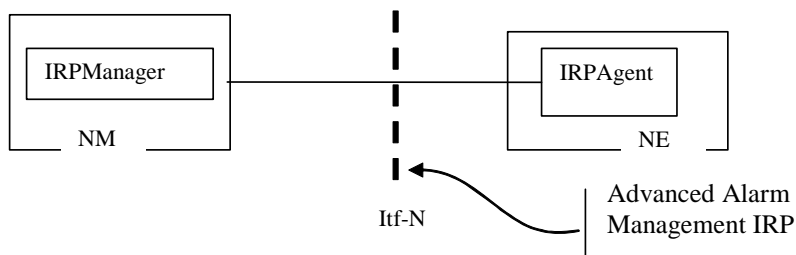


Figure 4.1-2: System Context B

5 Information Object Classes

5.1 Imported information entities and local labels

Label reference	Local label
3GPP TS 32.622 [6], information object class, Top	Top
3GPP TS 32.312 [7], information object class, managedGenericIRP	managedGenericIRP
3GPP TS 32.622 [6], information object class, IRPAgent	IRPAgent

5.2 Class diagram

5.2.1 Attributes and relationships

This clause depicts the set of IOCs that encapsulate information within the AAM IRP. The intent is to identify the information required for the AAM IRP implementation of its operations and notification emission.

This clause provides the overview of all Information Object Classes in UML.

Subsequent clauses provide more detailed specification of various aspects of these Information Object Classes.

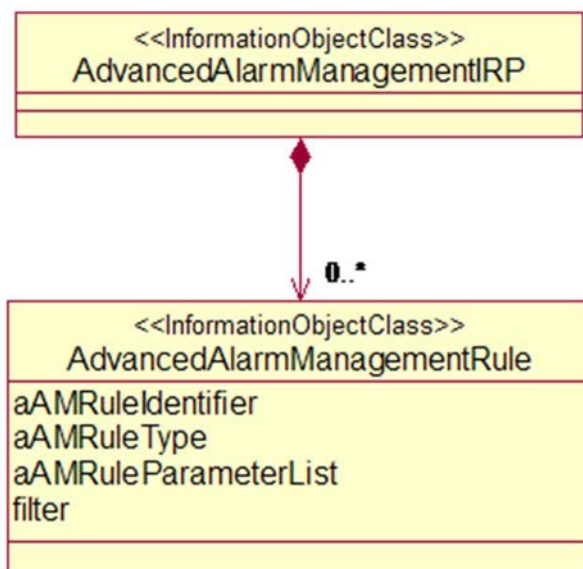


Figure 5.2.1-1: Class Diagram

5.2.2 Inheritance

This clause depicts the inheritance relationships that exist between Information Object Classes.

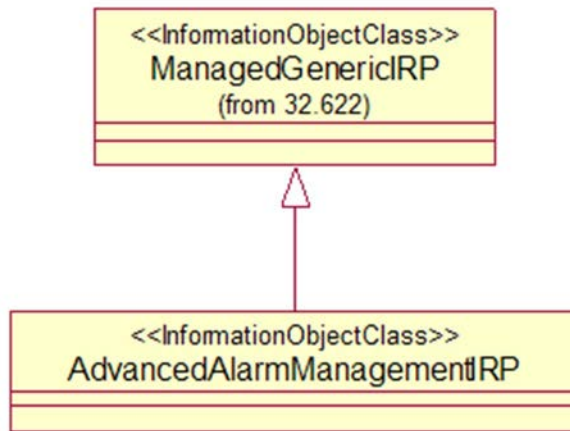


Figure 5.2.2-1: Inheritance Diagram

5.3 Information Object Class definitions

5.3.1 advancedAlarmManagementRule

5.3.1.1 Definition

5.3.1.1.1 General Definition

This information object represents an AAM Rule object instance.

An AdvancedAlarmManagementRule is fully identified by its distinguished name.

It inherits from IOC top.

An AAM Rule is a way for the IRPManager to define which alarms / alarm clearings deliver significant or insignificant information (significant seen with the eyes of the IRPManager) and to tell the IRPAgent not to send the insignificant alarms / alarm clearings.

AAMRules will not screen out all insignificant alarms/alarm clearings, but contribute to enable the network operator to reduce the number of reported alarms to a reasonable and manageable level.

The choice of rule/s may depend on the type of alarm, the environment, the time of day and many more.

To avoid screening of alarms which might be important for the network operator, the user of AAM rules should apply AAMrules with careful consideration and appropriate setting of parameters.

An AAM Rule instance is fully identified by its DNdistinguished name. A Rule instance carries, among other things, the identification of the Rule type called AdvancedAlarmManagementRuleType. Of these there exist the following:

- ThresholdRule
- TransientRule
- ToggleRule
- VendorSpecificRule

See Annex A for the description of the above Rules.

5.3.1.2 Attributes

Attribute name	Support Qualifier	Read Qualifier	Write Qualifier
advancedAlarmManagementRuleIdentifier	M	M	-
advancedAlarmManagementRuleType	M	M	-
advancedAlarmManagementRuleParameterList	M	M	-
filter	M	M	-

5.3.2 advancedAlarmManagementIRP

5.3.2.1 Definition

This information object represents an AAM IRP. It inherits from IOC managedGenericIRP.

5.4 Information relationships definition

5.4.1 relation- AdvancedAlarmManagementIRP-AdvancedAlarm ManagementRule (M)

5.4.1.1 Definition

This relationship defines the relationship between an AdvancedAlarmManagementIRP and an AdvancedAlarmManagementRule instance.

5.4.1.2 Roles

Name	Definition
theAdvancedAlarmManagementRule	This role represents an AAM Rule. It can be played by instances of IOC advancedAlarmingRule
theAdvancedAlarmManagementIRP	This role represents the AAM IRP which an IRPManager uses. It is played by instances of IOC advancedAlarm Management IRP

5.4.1.3 Constraints

None

5.5 Information attributes definition

This clause defines the semantics of the Attributes used in Information Object Classes.

5.5.1 Definitions and legal values

Attribute Name	Definition	Legal Values
advancedAlarmManagementRuleIdentifier	This attribute identifies uniquely an AAM Rule base object instance	String
advancedAlarmManagementRuleType	This attribute indicates the type of AAM Rule this instance represents.	String
advancedAlarmManagementRuleParameterList	This attribute identifies parameters and values of this AAM Rule	N/A

6 Interface Definition

6.1 Class diagram representing interfaces

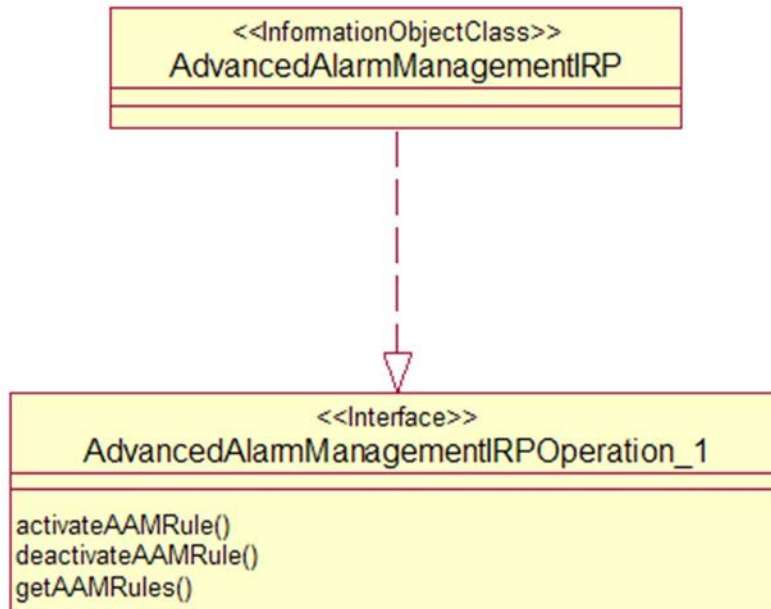


Figure 6.1-1: Class Diagram for AdvancedAlarmManagementIRPOperation_1 Interface

6.2 AAMIRPOperation_1 Interface (M)

6.2.1 Scope

This interface defines methods for the IRPManager to request the IRPAgent for alarm notifications of significant information (significant from the IRPManager's perspective).

The definition of insignificance is determined by the IRPManager. The choice of AAM Rule/s may depend on the type of alarm, the environment, the time of day and many more.

An implementation can claim compliance to this IRP if it supports at least one of the AAMRules, i.e. one of the operations defined in clause 6.2.2 up to and including clause 6.2.5, and the mandatory operations defined in this interface.

6.2.2 Operation activateAAMRule (M)

6.2.2.1 Definition

This operation allows the IRPManager to request the IRPAgent to activate an AAM rule.

6.2.2.2 Input parameters

6.2.2.2.1 Generic Input parameters

Parameter Name	Qualifier	Information type	Comment
aAMRuleType	M	N/A	This corresponds to attribute advancedAlarmManagementRuleType of advancedAlarmManagementRule (see 5.3.1.2) Values: ThresholdRule, TransientRule, ToggleRule, VendorSpecificRule
aAMRuleParameterList	M	N/A	This corresponds to attribute advancedAlarmManagementRuleParameterList of advancedAlarmManagementRule (see 5.3.1.2) Content depends on value of advancedAlarmManagementRuleType
filter	M	N/A	This corresponds to attribute filter of advancedAlarmManagementRule (see 5.3.1.2) Carries a filter constraint. It can e.g. comprise objectClass, objectInstance, alarmType, probableCause, perceivedSeverity, specificProblem.

6.2.2.2.2 Content of Input parameter aAMRuleParameterList depending on value of aAMRuleType

6.2.2.2.2.1 aAMRuleType = ThresholdRule

Parameter Name	Qualifier	Information type	Comment
alarmOccurrenceThreshold	M	N/A	value >0
slidingTimeWindow	M	N/A	Unit: minutes

6.2.2.2.1.2 aAMRuleType = TransientRule

Parameter Name	Qualifier	Information type	Comment
timeSpan	M	N/A	Unit: minutes

6.2.2.2.2.3 aAMRuleType = ToggleRule

Parameter Name	Qualifier	Information type	Comment
alarmOccurrenceThreshold	M	N/A	value>0
slidingTimeWindowTogglingStarted	M	N/A	Unit: minutes
slidingTimeWindowTogglingSettled	M	N/A	Unit: minutes

6.2.2.2.2.4 aAMRuleType = vendorSpecificRule

Parameter Name	Qualifier	Information type	Comment
vendor specific parameters	N/A	N/A	N/A

6.2.2.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
aAMRuleIdentifier	M	N/A	See §5.5.1
status	M	ENUM (Success, Failure, aAMRuleAlreadyActive)	

6.2.2.4 Pre-condition

AAMIsSupported

Assertion Name	Definition
aAMIsSupported	The AAM functionality is supported by the IRPAgent.

6.2.2.5 Post-condition

AAMRuleIsApplied

Assertion Name	Definition
aAMRuleIsApplied	The AAM rule is applied. For the consequences see the definitions in Annex A.

6.2.2.6 Exceptions

Name	Properties
operation_failed	Condition: the pre-condition is false or the post-condition is false. Returned Information: The output parameter status. Exit state: Entry state.

6.2.3 Operation `getAAMRules` (M)

6.2.3.1 Definition

This operation allows an IRPManager to request from the IRPAgent a list of activated AAMRules.

6.2.3.2 Input parameters

None

6.2.3.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
aAMRuleList	M	LIST of aAMRuleInstance { aAMRuleInstance LIST OF { aAMRuleIdentifier, aAMRuleType, aAMRuleParameterList, filter } aAMRuleType ENUM (thresholdRule, toggleRule, transientRule, vendorSpecificRule) aAMRuleParameterList: Content type depends on the value of aAMRuleType (see §6.2.2)	
Status	M	ENUM (Success, Failure)	If no rule is defined, an empty advancedAlarmManagementRuleList shall be delivered and status==Success.

6.2.3.4 Pre-condition

None

6.2.3.5 Post-condition

allActiveAdvanceAlarmManagementRulesAreDelivered

Assertion Name	Definition
allActiveAlarmManagementRulesAreDelivered	All active AAM rules are listed in the output.

6.2.3.6 Exceptions

Name	Properties
operation_failed	Condition: the pre-condition is false or the post-condition is false. Returned Information: The output parameter status. Exit state: Entry state.

6.2.4 Operation deactivateAAMRule (M)

6.2.4.1 Definition

This operation allows an IRPManager to request the IRPAgent to deactivate one or all activated AAMRules.

Deactivated rules are not visible for the IRPManager.

6.2.4.2 Input parameters

Parameter Name	Qualifier	Information type	Comment
advancedAlarmManagementRuleIdentifier	M	See 32.302 [3]	If this parameter contains no information, then all active AAM Rules shall be deactivated.

6.2.4.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
status	M	ENUM (Success, SpecifiedRuleNotExisting, Failure)	If input parameter advancedAlarmManagementRuleIdentifier is present and no such rule exists, then status==SpecifiedRuleNotExisting. If input parameter advancedAlarmManagementRuleIdentifier is not present and no rule is defined, then status==Success.

6.2.4.4 Pre-condition

None

6.2.4.5 Post-condition

allOrSpecifiedActiveAdvanceAlarmManagementRulesAreDeactivated

Assertion Name	Definition
allOrSpecifiedActiveAdvanceAlarmManagementRulesAreDeactivated	Depending on the input all or only the specified active AAM Rule are/is deactivated

6.2.4.6 Exceptions

Name	Properties
operation_failed	Condition: the pre-condition is false or the post-condition is false. Returned Information: The output parameter status. Exit state: Entry state.

Annex A (normative): Advanced Alarm Management Rules

A.1 General

It is not recommended to have several AAMRules applicable at one time for one event. However, if `YyyFunction` supports and allows it, then it is vendor specific which AAMRule is applied or not.

An AAMRule (called Rule hereafter) contains multiple elements.

The first element (subSection titled: Criterion to determine alike alarm) is a criterion used to determine if an alarm is classified as 'alike' or "not alike". If the alarm is not-alike, then the alarm is not subject to further scrutiny (processing) by the Rule, i.e. it would be processed as if there is no Rule in effect. The `IRPManager` specifies such criterion in an input parameter named `filter` in various relevant AAM operations.

The second element (subSection titled: Treatment of alike alarm) is the algorithm to determine if

- a) An alike alarm should be reported as one alarm (i.e. it is a significant alarm) or
- b) The alike alarm should be suppressed (i.e. it is an insignificant alarm).

When a significant alarm is identified, the algorithm also determines:

- a) The time when the `notifyNew/Changed/ClearedAlarm` of this significant alarm should be sent to `IRPManager` and
- b) The value of `alarmRaisedTime`, `alarmChangedTime` and `alarmClearedTime` parameters in the relevant `notifyNew/Changed/ClearedAlarm` of this significant alarm.

The third element (subSection titled: Relation to Log and `AlarmList`) specifies which alarms shall enter into `Log of LogIRP` and `AlarmList` of `AlarmIRP`.

Each of the following subsections defines a Rule using the three-element description outlined above.

For each Rule, illustration samples, using symbols shown below, are given (titled: Samples). The thick horizontal line indicates a time-line. The dotted double-arrow line indicates a time parameter, if applicable. The '?' box indicates the alarm under investigation. The left-edge of a box corresponds to the `alarmRaisedTime` while the right-edge corresponds to the `alarmClearedTime`. So, the horizontal span of a box indicates the alarm active time span.

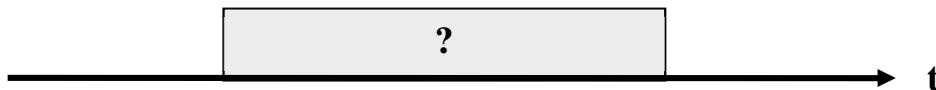


Figure A.1-1: Sample diagram notations

Sometimes, a shaded box is drawn below the time line as below. Such shaded box indicates the identification of a significant alarm (to be reported alarm).

The left-edge of the box indicates the time when the corresponding alarm notification is sent out. This emission time is not necessarily identical to the `alarmRaised/ChangedTime` within the alarm notification.

The right-edge of a box indicates the time when the corresponding alarm clearing notification is sent out. This emission time is not necessarily identical to the `alarmClearedTime` within the alarm notification.

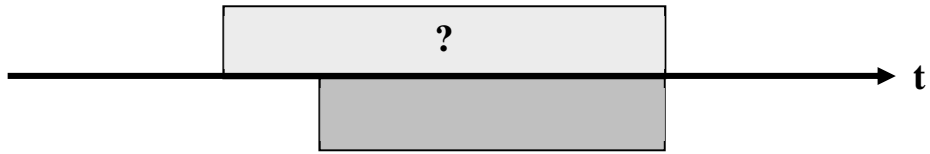


Figure A.1-2: Sample diagram notations

For each Rule, use cases are given (subSection titled: Example for Use cases).

For some Rules exception handling is defined (subSection titled: Exception Handling).

A.2 AAM Rules

A.2.1 Threshold Rule

A.2.1.1 Parameters

This Rule has three parameters, namely, the `alarmOccurrenceThreshold` (called N here), the `slidingTimeWindow` (called T here) and filter.

A.2.1.2 Criterion to determine alike alarm

The filter parameter carries values for `objectInstance`, `alarmType`, `perceivedSeverity`, `probableCause` and `specificProblem`. If the alarm under investigation (e.g. the box with a “?” in the sample below) carries the same values, then it is considered ‘alike’ otherwise, “not-alike”.

A.2.1.3 Treatment of alike alarm

Starting value for Lower Edge of Time Window is the activation time of the threshold rule.

Test an alike alarm.

When a new alarm matches the filter, then Lower and Upper Edge of Time Window and count are newly determined: Upper Edge of Time Window becomes the time of the new alarm.

Lower Edge of Time Window becomes either the time of the current Lower Edge of Time Window or the time of the new alarm minus the default size T of the time window, whichever of these two times is later.

The count is the number of alarms between Lower and Upper Edge of Time Window (including the new alarm).

If the count reaches the threshold N, then the alarm is considered as significant and the Lower Edge of Time Window becomes the time of the alarm.

For a not reported alarm no `notifyClearedAlarm` shall be sent.

`NotifyClearedAlarms` for alarms which were reported to the `IRPManager` before the activation of the threshold rule shall not be suppressed.

Table A.2.1.3-1 shows the emission times of the various related to a significant alarm.

Table A.2.1.3-1: Significant alarm emission time for Threshold Rule

Reported alarm types	Emission (to IRPManager) times of a reported alarm
<code>notifyNewAlarm</code>	Immediately after the <code>alarmRaisedTime</code> .
<code>notifyChangedAlarm</code>	Immediately after the <code>alarmChangedTime</code> .
<code>notifyClearedAlarm</code>	Immediately after the <code>alarmClearedTime</code>

Table A.2.1.3-2 shows the time related parameters in significant alarm.

Table A.2.1.3-2: Significant alarm time parameters for Threshold Rule

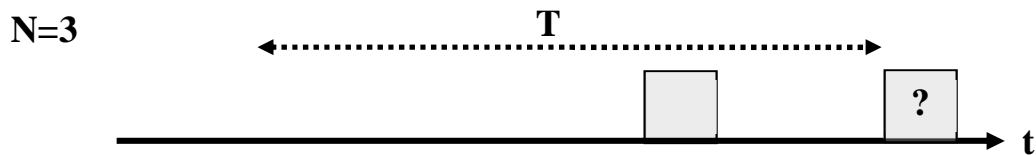
Parameters of the Reported alarm	Parameter values
<code>alarmRaisedTime</code>	Same value as that carried in the alike alarm.
<code>alarmChangedTime</code>	Same value as that carried in the alike alarm.
<code>notifyClearedTime</code>	Same value as that carried in the alike alarm.
<code>alarmId</code>	Same value as that carried in the alike alarm.

A.2.1.4

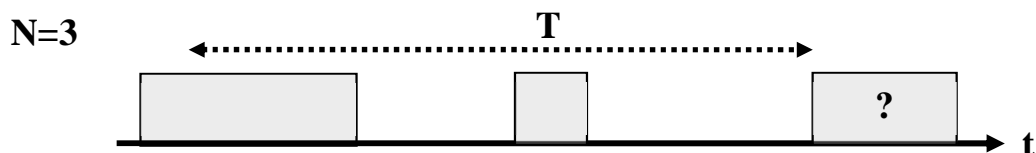
Relation to Log and AlarmList

The alike alarms enter the Log. The significant alarms enter the `AlarmList`.

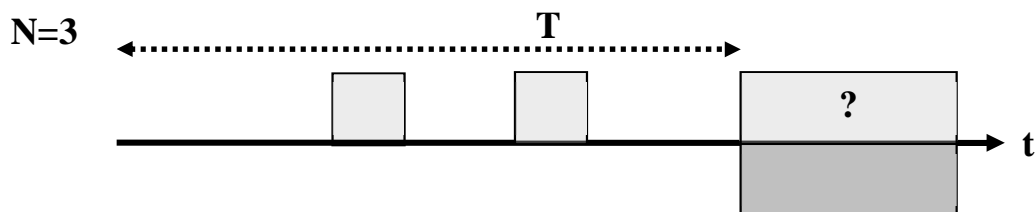
A.2.1.5 Samples



FigureA.2.1.5-1: Threshold Rule illustrations – insignificant alarm



FigureA.2.1.5-2: Threshold Rule illustrations – insignificant alarm



FigureA.2.1.5-3: Threshold Rule illustrations – significant alarm

A.2.1.6 Example for Use cases

The `thresholdRule` can be used to screen out alarms which are only important if they appear repeatedly, e.g. if an alarm which is self-healing comes back again and again,

A.2.2 Transient Rule

A.2.2.1 Parameters

This Rule has two parameters, namely, the `minutesAtLeastActive` (called T here) and `filter`.

A.2.2.2 Criterion to determine alike alarm

The `filter` parameter carries values for `objectInstance`, `alarmType`, `perceivedSeverity`, `probableCause` and `specificProblem`. If the alarm under investigation (e.g. the box with a '?' in the sample below) carries the identified parameters and having the same values, then it is considered 'alike' otherwise, "not-alike".

A.2.2.3 Treatment of alike alarm

Take an alike alarm. If its period is smaller than T, then it is an insignificant alarm; otherwise, it is a significant alarm. For a not reported alarm no `notifyClearedAlarm` shall be sent.

`NotifyClearedAlarms` for alarms which were reported to the `IRPManager` before the activation of the `transientRule` shall not be suppressed.

Table A.2.2.3-1 shows the emission times of the various related to significant alarm.

Table A.2.2.3-1: Significant alarm emission time re: Transient Rule

Reported alarm type	Emission (to <code>IRPManager</code>) times of an Reported alarm
<code>notifyNewAlarm</code>	Immediately after the <code>alarmRaisedTime</code> plus T.
<code>notifyChangedAlarm</code>	Immediately after the <code>alarmChangedTime</code> plus T.
<code>notifyClearedAlarm</code>	Immediately after the <code>alarmClearedTime</code>

Table A.2.2.3-2 shows the time related parameters in significant alarm.

Table A.2.2.3-2: Significant alarm time parameters re: Transient Rule

Parameters of the Reported alarm	Parameter values
<code>alarmRaisedTime</code>	Same value as that carried in the alike alarm.
<code>alarmChangedTime</code>	Same value as that carried in the alike alarm.
<code>notifyClearedTime</code>	Same value as that carried in the alike alarm
<code>alarmId</code>	Same value as that carried in the alike alarm.

A.2.2.4 Relation to Log and AlarmList

The alike alarms enter the Log. The significant alarms enter the `AlarmList`.

A.2.2.5 Samples

Here are two samples. One is a not-to-be reported alarm while the other is a significant alarm.

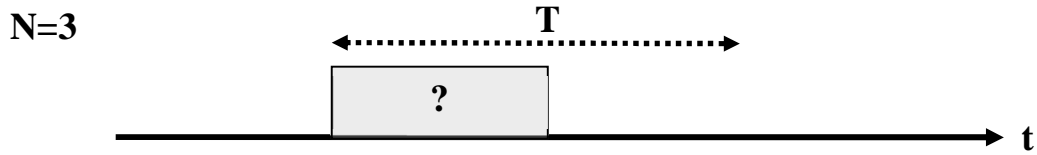


Figure A.2.2.5-1: TransientRule Illustrations – insignificant alarm

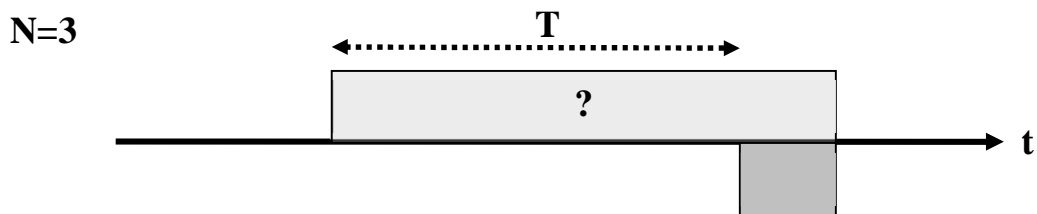


Figure A.2.2.5-2: TransientRule Illustrations – significant alarm

A.2.2.6 Example for Use cases

The transientRule can be used to screen out alarms which usually are of temporarily nature.

A.2.3 Toggle Rule

A.2.3.1 Parameters

This Rule has 4 parameters, namely, the filter, the alarmOccurrenceThreshold (called N here), the slidingTimeWindowTogglingStarted (called T1 here) and slidingTimeWindowTogglingSettled (called T2 here).

A.2.3.2 Criterion to determine alike alarm

The filter parameter carries values for objectInstance, alarmType, perceivedSeverity, probableCause and specificProblem. If the alarm under investigation (e.g. the box with a '?' in the sample below) carries the identified parameters and having the same values, then it is considered 'alike' otherwise, "not-alike".

A.2.3.3 Treatment of alike alarm

1. Starting values:

Starting value for Lower Edges of Time Windows for Toggling Started/Settled is the activation time of the toggle rule. Starting value for the count is zero.

At the beginning all alarms are "non-toggling"

2. To do when alike alarm was identified

When a notifyNew/Changed/ClearedAlarm event matches the filter, then Lower and Upper Edge of the Time Window TogglingStarted/Settled and count are newly determined:

2.1. Determine Time Window TogglingStarted

Upper Edge of Time Window TogglingStarted becomes the time of the event.

Lower Edge of Time Window TogglingStarted becomes the time of the event minus the size T1 of the time window.

2.2. Determination of "toggling" (via count)

The count is the number of alike alarms between Lower and Upper Edge of Time Window TogglingStarted (including the new alarm).

If the count is above or equal to the threshold N and the event was a notifyNewAlarm and the alarm was "non-toggling", then the notifyNewAlarm is sent and the alarm is considered as "toggling", with the consequence that further alike notifyNew/Changed/Alarm events are regarded as not significant, until the alarm is considered as "non-toggling" again.

2.3. Determine Time Window TogglingSettled

If the alarm is "non-toggling", then there is no need to determine Upper and Lower Edge of Time Window TogglingSettled.

If the alarm is "toggling", then:

Upper Edge of Time Window TogglingSettled becomes the time of the new event plus the size T2 of the Time Window TogglingSettled .

Lower Edge of Time Window TogglingSettled becomes the time of the new alarm .

3. Return to non-toggling

If the time reaches the Upper Edge of Time Window TogglingSettled, then the alarm is considered as "non-toggling", i.e. alike alarms are regarded as significant.

If the last event was a notifyChanged/ClearedAlarm, then the change to "non-toggling" triggers the emission of the related notification.

Table A.2.3.3-1 shows the emission times of the various related to significant alarm.

Table A.2.3.3-1: Significant alarm emission time re: Toggle Rule

Reported alarm types	Emission (to IRPManager) times of an Reported alarm
notifyNewAlarm	Immediately after the alarmRaisedTime
notifyChangedAlarm	Immediately after the alarmChangedTime [Remark: If the alarm is toggling state, then the notifyChangeAlarm is dropped (not significant).]
notifyClearedAlarm	Immediately after the alarmClearedTime+T2 of the last alike alarm , if alarmClearedTime is earlier than alarmRaisedTime+T2 or immediately after the alarmClearedTime of the last alike alarm, if this time is later than or equal to alarmRaisedTime+T2

Table A.2.3.3-2 shows the time related parameters in significant alarm.

Table A.2.3.3-2: Significant alarm time parameters re: Toggle Rule

Parameters of the Reported alarm	Parameter values
alarmRaisedTime	Same value as that carried in the alike alarm.
alarmChangedTime	Same value as that carried in the alike alarm.
notifyClearedTime	Same value as that carried in the last alike alarm.
alarmId	Same value as that carried by the first member of a sequence.

A.2.3.4 Relation to Log and AlarmList

The alike alarms enter the Log. The significant alarms enter the AlarmList.

A.2.3.5 Samples

The samples below use N=3.

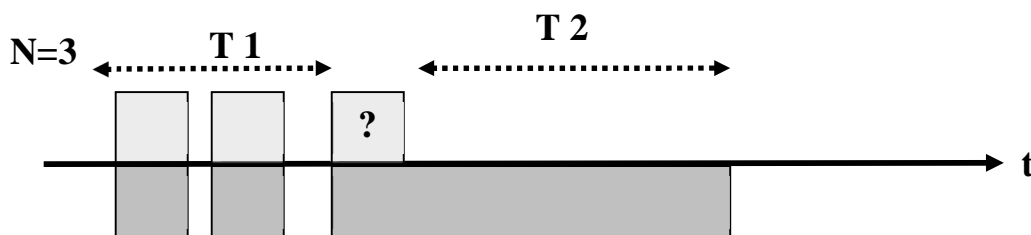


Figure A.2.3.5-1: Toggle Rule illustration 1

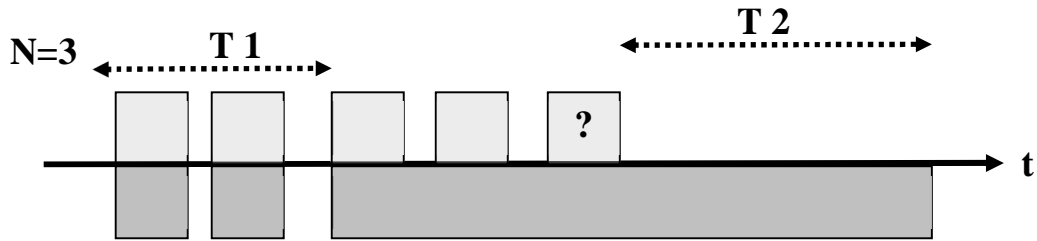


Figure A.2.3.5-2: Toggle Rule illustration 2

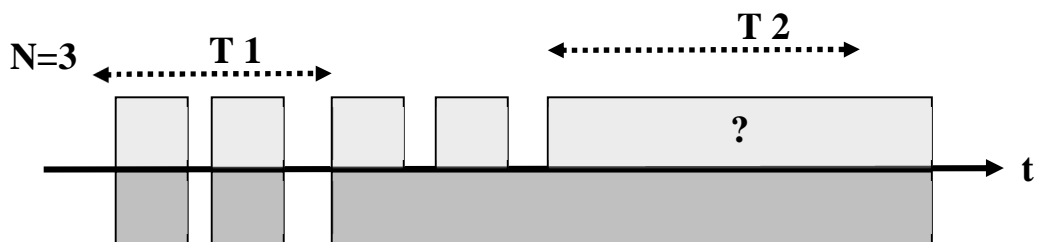


Figure A.2.3.5-3: Toggle Rule illustration 3

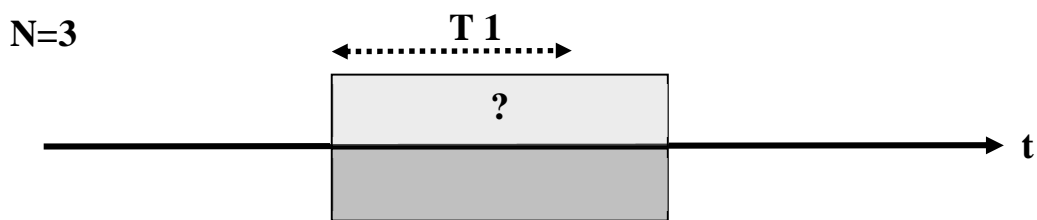


Figure A.2.3.5-4: Toggle Rule illustration 4

A.2.3.6 Example for Use cases

The toggleRule can be used to take some burden from alarm management for cases where an alarm comes and goes back and forth, e.g. because of some entity is in a swinging state.

A.2.3.7 Exception Handling

The Toggle Rule can potentially group multiple alike alarms together to form one significant alarm. If the process executing the Rule misses the alarm clearing time of one member of a group, then this can have the following consequences:

If a clearing of one of the alike alarms during the toggling state is missed (green box in Figure A.2.3.7-1), then the significant alarm would also not be cleared (pink box continuing the dark grey in the same figure). This can be avoided if the filter is set in a way that only alarms of one instance will pass it and if always the latest notifyClearedAlarms triggers the start of T2.

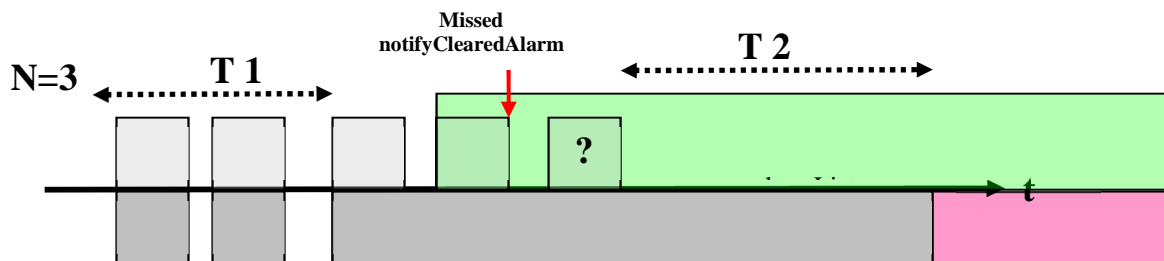


Figure A.2.3.7-1: Exception handling example

A.2.4 Definition of vendor specific rule

It is possible to implement vendor specific `AAMRules`. No specific definitions are supplied here.

A.3 Relation of Rule and Notification filter

This clause illustrates the relation between the AAM capabilities and the NotificationIRP and AlarmIRP.

The following diagram illustrates the case when AAM capabilities are not deployed. The "1, 2.. 6" indicates 6 alarms. They will be logged and they would appear in the AlarmList. The NotificationIRP supported a filter F1. The IRPManager, in this case, receives "1, 3" where '2, 4, 5, 6' were discarded because of Notification filter F1 is in effect.

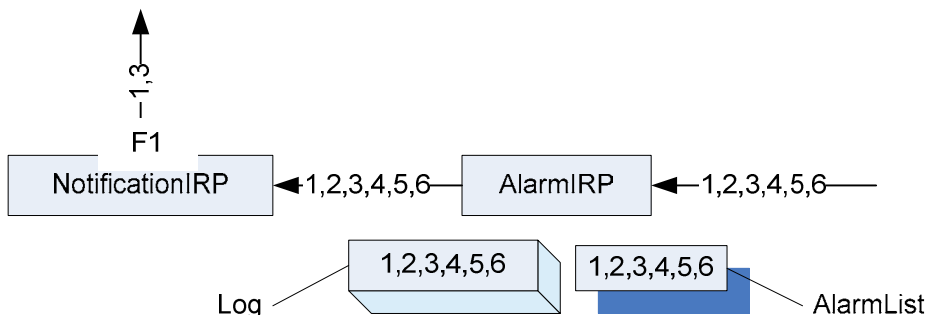
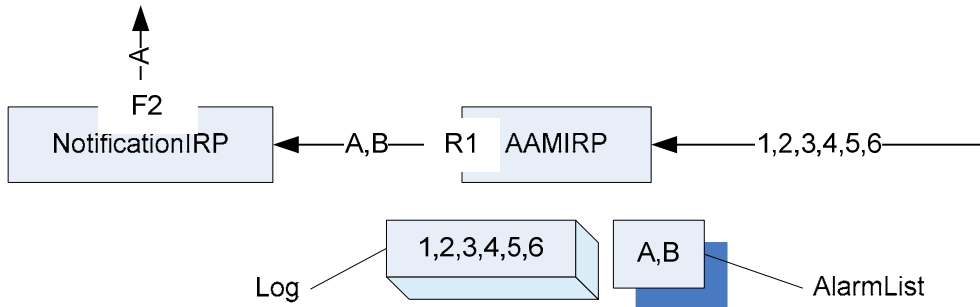


Figure A.3-1: Deployment without AAM capabilities

The following diagram illustrates the case when AAM capabilities are deployed. The "1, 2.. 6" indicates 6 alarms. They will be logged. Because of AAMRule R1 is in effect, the "1,2..6" result in two significant alarms, A and B. The A and B will appear in AlarmList. They will also be broadcasted to IRPManagers subject to NotificationIRP filter in effect. In the case below, the IRPManager would receive only A because Notification IRP filter F2 is in effect.



FigureA.3-2: Deployment with AAM capabilities

Annex B (informative): Change history

Change history								
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Cat	Old	New
Sep 2007	SA_37	SP-070616	--	--	Submitted to SA#37 for Information	--	1.0.0	
Mar 2008	SA_39	SP-080072	--	--	Submitted to SA#39 for Approval	--	2.0.0	8.0.0
Jun 2008	SA_40	SP-080329	0001	--	Clarify the assumed scenarios for AAM rules	F	8.0.0	8.1.0
Dec 2009	-	-	-	-	Update to Rel-9 version (MCC)	-	8.1.0	9.0.0
Mar 2011	-	-	-	-	Update to Rel-10 version (MCC)	-	9.0.0	10.0.0
Sep-2012	SA_57	SP-120645	0005	1	Clean-up of AAM IRP Information Service	D	10.0.0	11.0.0
2014-10	-	-	-	-	Update to Rel-12 version (MCC)		11.0.0	12.0.0
2016-01	-	-	-	-	Update to Rel-13 version (MCC)		12.0.0	13.0.0
2017-03	SA#75	-	-	-	Promotion to Release 14 without technical change		13.0.0	14.0.0

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2018-06						Update to Rel-15 version (MCC)	15.0.0
2020-07	-	-	-	-	-	Update to Rel-16 version (MCC)	16.0.0
2022-03	-	-	-	-	-	Update to Rel-17 version (MCC)	17.0.0
2024-04	-	-	-	-	-	Update to Rel-18 version (MCC)	18.0.0

History

Document history		
V18.0.0	May 2024	Publication