
Source: SA5 (Telecom Management)
Title: 2 Rel-6 CR 32.412/3 Threshold alarm trigger - Align with TS 32.411
Document for: Approval
Agenda Item: 7.5.3

Doc-1 st -Level	Doc-2 nd -Level	Spec	CR	Rev	Phase	Subject	Cat	Ver-Cur	Wi
SP-040557	S5-046653	32.412	004	--	Rel-6	Align threshold alarm trigger to the definition in 32.411	F	6.1.0	OAM-PM
SP-040557	S5-046863	32.413	002	--	Rel-6	Align to latest PM IRP Information Service (IS) 32.412 version number	F	6.1.0	OAM-PM

CHANGE REQUEST

⌘ **32.412 CR 004** ⌘ rev - ⌘ Current version: **6.1.0** ⌘

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

Proposed change affects: | UICC apps ⌘ ME Radio Access Network Core Network

Title:	⌘ Align threshold alarm trigger to the definition in 32.411		
Source:	⌘ SA5 Ericsson (edwin.tse@ericsson.com , ulf.hubINETte@ericsson.com)		
Work item code:	⌘ OAM-PM	Date:	⌘ 02/07/2004
Category:	⌘ F	Release:	⌘ Rel-6
	Use <u>one</u> of the following categories: F (correction) A (corresponds to a correction in an earlier release) B (addition of feature), C (functional modification of feature) D (editorial modification) Detailed explanations of the above categories can be found in 3GPP TR 21.900 .		Use <u>one</u> of the following releases: 2 (GSM Phase 2) R96 (Release 1996) R97 (Release 1997) R98 (Release 1998) R99 (Release 1999) Rel-4 (Release 4) Rel-5 (Release 5) Rel-6 (Release 6)

Reason for change:	⌘ Threshold alarm trigger is not aligned with TS 32.411.
Summary of change:	⌘ Clarify the usage of threshold trigger condition throughout the TS.
Consequences if not approved:	⌘ Performance Management monitors may behave differently regarding generation of threshold alarm.

Clauses affected:	⌘ sub-clause 6.3.8, 6.3.10, 6.3.11, 6.4.5, 6.4.9, 6.5, 7.4.1, 7.4.2, Annex B.						
Other specs affected:	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; text-align: center;">Y</td> <td style="width: 20px; text-align: center;">N</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> </table> Other core specifications	Y	N	<input type="checkbox"/>	<input checked="" type="checkbox"/>	⌘	
Y	N						
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Y	N						
<input type="checkbox"/>	<input checked="" type="checkbox"/>						
Other comments:	⌘						

Change in Clause 6.3.8

6.3.8 Monitor

6.3.8.1 Definition

It represents a capability to determine the [\(a\)](#) threshold-crossing or [\(b\)](#) threshold-reaching and [the](#) threshold-clearing. This class is abstract in that it cannot be instantiated. The `ThresholdMonitor` inherits this class.

[It is the IRPAgent's choice to support \(a\) or \(b\) \(but not both\). The support is on an IRPAgent system wide basis and is not on a per threshold basis. The IRPAgent's behaviour regarding which approach \(i.e., \(a\) or \(b\) above\) to use, shall be the same for emitting alarms and for clearing alarms.](#)

The instances of a class derived from this abstract class shall emit `notifyObjectCreation` when they are first created; and shall emit a `notifyObjectDeletion` when deleted.

The instances of a class derived from this abstract class shall also emit `notifyNewAlarm`, `notifyChangedAlarm` and `notifyClearedAlarm` according to the rules specified in Annex B: Threshold Alarm Triggering Events. The `objectClass` and `objectInstance` parameter of these notifications carry the class and DN of the `ManagedEntity` whose `measurementType` is being monitored and whose threshold condition has been triggered.

6.3.8.2 Attribute

Attribute name	Visibility	Support Qualifier	Read Qualifier	Write Qualifier
<code>monitorId</code>	+	M	M	-
<code>monitorGranularityPeriod</code>	+	M	M	-
<code>eventType</code>	+	M	M	-
<code>probableCause</code>	+	M	M	-
<code>specificProblem</code>	+	M	M	-
<code>direction</code>	+	M	M	-

6.3.8.3 Notification

Notification name	Note
<code>notifyObjectCreation</code>	See clause 7.1 (class diagram).
<code>notifyObjectDeletion</code>	See clause 7.1 (class diagram).

End of change in Clause 6.3.8

Change in Clause 6.3.10, 6.3.11

6.3.10 ThresholdMonitor

6.3.10.1 Definition

In order to monitor the overall health of the network, the thresholds are set by the authorized users to generate network performance related alarms. The `ThresholdMonitor` contains the values of the threshold settings for the PM parameters. If the threshold is [\(a\)](#) crossed or [\(b\)](#) reached ([see 6.3.8.1 for clarification of the alternatives \(a\) and \(b\)](#)), a performance alarm will be emitted (see 3GPP TS 32.401 [7]). The name of the monitored measurementType is captured by `MeasuredAttribute.measurementTypeName` and the value of it is captured by `MeasurementReader.measurementResultValue`.

6.3.10.2 Attribute

Attribute name	Visibility	Support Qualifier	Read Qualifier	Write Qualifier
<code>thresholdMonitorStatus</code>	+	M	M	-

6.3.11 ThresholdLevel

6.3.11.1 Definition

It defines the thresholding criteria (via `ThresholdLevel.thresholdValue` and `ThresholdLevel.hysteresis`) for a measurementType. It also specifies the thresholdSeverity level (via `ThresholdLevel.thresholdSeverity`) carried in the alarm triggered by the [\(a\)](#) threshold crossing or [\(b\)](#) [threshold](#) reaching event. ([See 6.3.8.1 for clarification of the alternatives \(a\) and \(b\)](#)).

6.3.11.2 Attribute

Attribute name	Visibility	Support Qualifier	Read Qualifier	Write Qualifier
<code>thresholdValue</code>	+	M	M	-
<code>thresholdSeverity</code>	+	M	M	-
<code>hysteresis</code>	+	M	M	-

End of change in Clause 6.3.10, 6.3.11

Change in Clause 6.4.5

6.4.5 relation-measuredAttribute-managedEntity (M)

6.4.5.1 Definition

This represents the relationship between `MeasuredAttribute` and `ManagedEntity`.

6.4.5.2 Role

Name	Definition
theMeasuredAttribute	The <code>MeasuredAttribute</code> , when playing this role, reads the monitored measurement types of the related <code>ManagedEntity</code> instances. The names of measurement types are captured by the <code>MeasuredAttribute.MeasurementTypeName</code> . When playing this role, the <code>MeasuredAttribute</code> is aware of the class name and DN of the <code>ManagedEntity</code> .
theME	The <code>ManagedEntity</code> , when playing this role, represents the actual network resource instance under measurement or whose measurementTypes are being monitored for (a) threshold-crossing or (b) threshold-reaching and threshold-clearing. (See 6.3.8.1 for clarification of the alternatives (a) and (b)).

6.4.5.3 Constraint

Name	Definition
applyToSameObjectClass	The <code>MeasuredAttribute</code> , which playing the role of "theMeasuredAttribute", can monitor the thresholds of the measurementTypes of one or multiple managed object instances of the same managed object class, which playing the role of "theME".

End of change in Clause 6.4.5

Change in Clause 6.4.9

6.4.9 relation-measuredAttribute-thresholdLevels (M)

6.4.9.1 Definition

This represents the relationship between `MeasuredAttribute` and `ThresholdLevel`.

6.4.9.2 Role

Name	Definition
theMeasuredAttribute	The <code>MeasuredAttribute</code> , when playing this role, can have 1..4 <code>ThresholdLevel</code> associates with it to set the (a) threshold-crossing or (b) threshold reaching and the clearing criteria (i.e. <code>ThresholdLevel.thresholdValue</code> , <code>ThresholdLevel.hysteresis</code>) and associated <code>thresholdSeverity</code> (i.e. <code>ThresholdLevel.thresholdSeverity</code>) of the monitored <code>measurementType</code> . (see 6.3.8.1 for clarification of the alternatives (a) and (b))
theThresholdLevel	When playing this role, the <code>ThresholdLevel</code> captures the (a) threshold-crossing or (b) threshold-reaching and the threshold-clearing criteria and its associated <code>thresholdSeverity</code> level. (see 6.3.8.1 for clarification of the alternatives (a) and (b))

6.4.9.3 Constraint

Name	Definition
noMoreThanFourLevels	A <code>MeasuredAttribute</code> may have no more than four <code>ThresholdLevels</code> associated with it.

End of change in Clause 6.4.9

Change in Clause 6.5

6.5 Information attribute definition

6.5.1 Definition and legal values

Attribute Name	Definition	Legal Values
direction	<p>For some measurementType, the higher its thresholdValue, the higher is the thresholdSeverity. For others, the lower its thresholdValue, the higher is its thresholdSeverity. This attribute identifies if the measurementType is of the former (i.e. "Increasing") or latter type (i.e. "Decreasing"). If it is "Increasing", the threshold event is triggered when the value first equals or exceeds (when compared against the last read value) a threshold value. The threshold is said to be cleared when the measurementType value falls below (when compared against the last read value) one or more threshold values.</p> <p>If it is "Decreasing", the threshold event is triggered when the measurementType value first equals or falls below one or more threshold values. The threshold is said to be cleared when the measurementType value rises above the threshold value.</p> <p>See annex B (Threshold Related Performance Alarm Triggering Events) for details of the behaviour of multiple thresholds.</p>	Possible values are: "Increasing", "Decreasing"
eventType	It identifies the event type carried by the performance alarm.	The value is "Quality of Service Alarm". See 3GPP TS 32.111-2 [4].
hysteresis	<p>A threshold has a value. It can have a hysteresis. A threshold with a hysteresis has a threshold-high and a threshold-low value that are different from the threshold value.</p> <p>A hysteresis, therefore, defines the threshold-high and threshold-low levels within which the measurementType value is allowed to oscillate without triggering a <u>(a)</u> threshold-crossing or <u>(b)</u> threshold-reaching or <u>a</u> threshold-clearing condition. (See 6.3.8.1 for clarification of the alternatives (a) and (b))</p> <p>threshold-high = threshold + hysteresis threshold-low = threshold - hysteresis See annex B (Threshold Related Performance Alarm Triggering Events).</p>	Any positive value
jobGranularityPeriod	It specifies the period between two successive measurements.	<p>The value can be 5 minutes, 15 minutes, 30 minutes, 1 hours, 12 hours and 24 hours.</p> <p>The minimum granularity period is 5 minutes in most cases, but for some measurements it may only make sense to collect data in a larger granularity period.</p>
jobId	It identifies the MeasurementJob instance (and distinguishes it from all other existing and stopped MeasurementJob instances of the PMIRP Agent).	Any identifier except: <ol style="list-style-type: none"> 1. Those that identify MeasurementJob instances whose MeasurementJob.jobStatus (s) are Scheduled, Active, Suspended or Stopped; and 2. Those that appear in filenames of files ready for IRPManager

Attribute Name	Definition	Legal Values
		retrieval.
jobListId	It identifies the singleton MeasurementJobList of the PMIRP Agent.	Any identifier.
jobReportingPeriod	It specifies the period between two successive emissions of notifyFileReady or notifyFilePreparationError [10]. The two notifications are related to the same Job. See constraints reportTime in clause 6.5.2.	Its value should be one or multiple of jobGranularityPeriod.
jobSchedule	It specifies the detailed time frames during which the MeasurementJob. jobStatus = Active and its substate = Busy.	Its value is only one of the following, dailyScheduling or weeklyScheduling. The legal values for them refer to ITU-T Recommendation X.721 [3]. The legal values for them are as follows. dailyScheduling: { { intervalStart {hour 0, minute 0}, intervalEnd {hour 23, minute 59} } } weeklyScheduling: { { daysOfWeek '111111'B, intervalsOfDay dailyScheduling } }
jobStartTime	It specifies the begin time from which the MeasurementJob will be active.	All values that indicate valid timestamp.
jobStatus	It specifies the status of MeasurementJob.	Its value should be one of the following: Scheduled, Active, Suspended Stopped
jobStopTime	It specifies the end time after which the MeasurementJob will be stopped.	All values that indicate valid timestamp and it should be later than jobStartTime. It's not necessary that jobStartTime and jobStopTime specifies time within the same day. This attribute may carry the value "indefinitely".
measurementResultValue	It identifies the value of a measurement type.	Any valid measurement result value.
measurementTypeName	It identifies a name of one measurement type whose value is being collected and monitored.	Any valid measurement type name as defined by the measurement definition template in 3GPP TS 32.403 [14].
monitorGranularityPeriod	It specifies the period between two successive reading of the thresholdValue to determine (a) threshold-crossing or (b) threshold-reaching and threshold-clearing. (See 6.3.8.1 for clarification of the alternatives (a) and (b))	It can be 5 minutes, 15 minutes, 30 minutes, 1 hour, 12 hours or 24 hours. It has to be a multiple of the jobGranularityPeriod if the MeasurementJob monitoring the same measurementType exists.
monitorId	It identifies the ThresholdMonitor instance (and distinguishes it from all other existing ThresholdMonitor instances of the PMIRP Agent).	Any identifier except those that are currently used.
monitorListId	It identifies the singleton ThresholdMonitorList in the PMIRP Agent.	Any identifier.
probableCause	It identifies the probable cause (of the (a) threshold crossing or (b) threshold reaching) carried by the threshold crossing or reaching alarm. (See 6.3.8.1 for clarification of the alternatives (a) and (b))	"Threshold Crossed"
thresholdSeverity	It identifies the thresholdSeverity of the (a) threshold crossing or (b) threshold reaching event. (See 6.3.8.1 for clarification of the alternatives (a) and (b))	Warning, Minor, Major, Critical
specificProblem	It identifies the specific problem (causing the (a) threshold crossing or (b) threshold reaching) carried by the threshold crossing or reaching alarm. (See 6.3.8.1 for clarification of the alternatives (a) and (b))	Any valid specificProblem as defined by 3GPP TS 32.111-2 [4].
thresholdMonitorStatus	It specifies the current status of the	Active - ThresholdMonitor is

Attribute Name	Definition	Legal Values
	ThresholdMonitor.	working; Suspended - ThresholdMonitor is suspended.
thresholdValue	It defines the threshold value of the monitored measurementTypes. If the value is (a) crossed or (b) reached, the performance alarm shall be emitted depending on the value of the thresholdMonitorStatus. (See 6.3.8.1 for clarification of the alternatives (a) and (b))	If the monitored measurementType is of Gauge type, this thresholdValue shall be of the same type. If the monitored measurementType is of counter type, then this value should be expressed as a rate, i.e., the number of units of type of the monitored measurementType over unit of time. Note this rate is independent from the monitorGranularityPeriod. This means that changes in the monitorGranularityPeriod should not impact the rate used for threshold monitoring.

End of change in Clause 6.5

Change in Clause 7.4.1, 7.4.2

7.4.1 Operation createThresholdMonitor (M)

7.4.1.1 Definition

This operation supports IRPManager's request to create a ThresholdMonitor that defines the thresholds for some specific measurementTypes. If the threshold defined is [\(a\)](#) crossed or [\(b\)](#) reached, the related performance alarms will be emitted to subscribed IRPManager(s).

Two cases are allowed:

- One case only accepts threshold monitoring of measurementType(s) that are already under monitoring by an existing MeasurementJob. This kind of PMIRP will not monitor a measurementType for [\(a\)](#) threshold-crossing or [\(b\) threshold](#) reaching ~~or for~~ **and** clearing if that measurementType is not already subject to a MeasurementJob monitoring. This kind of PMIRP will only determine the [\(a\)](#) threshold crossing or [\(b\) threshold](#) reaching and clearing events when the related MeasurementJob(s) are in Active states. The IRPManager, when interacting with this kind of PMIRP, must first start a MeasurementJob to monitor the measurementTypes and then invoke this operation for the same measurementTypes.
- ~~—~~ The other case is that it can accept threshold monitoring of measurementType(s) regardless if they are already under monitoring by existing MeasurementJob(s).

[\(See 6.3.8.1 for clarification of the alternatives \(a\) and \(b\)\)](#)

7.4.1.2 Input parameters

Parameter Name	Qualifier	Information type	Comment
iOCName	M	ManagedEntity.objectClass	It specifies the ManagedEntity class name of the instances specified by iOCInstanceList.
iOCInstanceList	M	List of <ManagedEntity.objectInstance>	It specifies the DNs of ManagedEntity instances whose measurementTypes are to be monitored. At least, one instance shall be specified.
thresholdInfoList	M	List of < MeasuredAttribute.measurementTypeName, Monitor.probableCause, Monitor.specificProblem, Monitor.direction, thresholdPack > where thresholdPack is list of thresholdPackElement. The thresholdPackElement is STRUCT < ThresholdLevel.thresholdValue, ThresholdLevel.thresholdSeverity, ThresholdLevel.hysteresis, >	It specifies the thresholds to specific measurementTypes. See clause 6.5.1 (definition and legal values). The number of ThresholdLevel in thresholdLevelList must be 1, 2, 3 or 4.
monitorGranularityPeriod	M	Monitor.monitorGranularityPeriod	See clause 6.5.1 (definition and legal values).

7.4.1.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
monitorId	M	Monitor.monitorId.	It specifies the unique identifier of the ThresholdMonitor in the PMIRP Agent.
unsupportedList	M	List of < ManagedEntity.objectClass, ManagedEntity.objectInstance, MeasuredAttribute.measurementTypeName, reason >	To create a ThresholdMonitor, best-effort is required. This parameter identifies the unsupported but requested measurementType(s). The reason can be: (a) The PMIRP has trouble starting monitoring the threshold of this measurementType. (b) The measurementType is illegal. (c) The measurementType exists but it is not currently under monitoring by any MeasurementJob and that the PMIRP requires that it be under monitoring by MeasurementJob (before it can be monitored for thresholding). (d) Hysteresis is overlapped. This parameter is used only when the operation returns 'PartialSuccess'.
status	M	ENUM (Success,Failure, PartialSuccess)	An operation may fail because of a specified or unspecified reason.

7.4.1.4 Pre-condition

validGranularityPeriod AND someValidMeasurementType AND validDirection AND validNumberOfThresholdPackElements AND validOrderOfThresholdPackElements.

Assertion Name	Definition
validGranularityPeriod	The monitorGranularityPeriod is valid.
someValidMeasurementType	At least one requested measurementType can be monitored for thresholding.
validDirection	The direction is valid.
validNumberOfThresholdPackElements	If PMIRP supports multi-level thresholdSeverity, it is valid if the number of elements in thresholdPack is 1, 2, 3 or 4. If PMIRP does not support multi-level thresholdSeverity, it is valid if the number is 1.
validOrderOfThresholdPackElements	This assertion is applicable if PMIRP supports multi-level thresholdSeverity. It is valid if it satisfies the constraint defined by multiLevelSeverityOrder of clause 6.5.2 (constrains).

7.4.1.5 Post-condition

thresholdMonitorIsCreated AND notifyObjectCreationEmitted.

Assertion Name	Definition
thresholdMonitorIsCreated	The ThresholdMonitor identified by monitorId exists. And the performance alarm shall be emitted if the thresholds are (a) crossed or (b) reached and the thresholdMonitorStatus is "Active". (See 6.3.8.1 for clarification of the alternatives (a) and (b)) The ThresholdMonitor.thresholdMonitorStatus will be Active.
notifyObjectCreationEmitted.	The notifyObjectCreation is emitted to indicate the creation of a ThresholdMonitor.

7.4.1.6 Exceptions

Exception Name	Definition
invalidClassOrInstances	Condition: (validClassAndInstances) not verified. Returned information: output parameter status is set to 'Failure'. Exit state: Entry State.
invalidGranularityPeriod	Condition: (validGranularityPeriod) not verified. Returned Information: Name of the exception; status is set to 'Failure'. Exit state: Entry state.
noValidMeasurementType	Condition: (someValidMeasurementType) not verified. Returned information: output parameter status is set to 'Failure'. Exit state: Entry State.
invalidNumberOfThresholdPackElements	Condition: (validNumberOfThresholdPackElements) not verified. Returned information: output parameter status is set to 'Failure'. Exit state: Entry State.
invalidOrderOfThresholdPackElements	Condition: (validOrderOfThresholdPackElements) not verified. Returned information: output parameter status is set to 'Failure'. Exit state: Entry State.
invalidDirection	Condition: (validDirection) not verified. Returned information: output parameter status is set to 'Failure'. Exit state: Entry State.

7.4.2 Operation deleteThresholdMonitor (M)

7.4.2.1 Definition

This operation supports IRPManager's request to delete a specified ThresholdMonitor.

At the time of the removal, all outstanding (a) threshold-crossing or (b) [threshold](#) reaching alarms will stay (i.e. the FMIRP Agent's AlarmList will contain an AlarmInformation indicating (a) threshold-crossing or (b) [threshold](#) reaching). The IRPManager needs to use other means to remove the AlarmInformation in the FMIRP AlarmList. [\(See 6.3.8.1 for clarification of the alternatives \(a\) and \(b\)\)](#)

7.4.2.2 Input parameters

Parameter Name	Qualifier	Information type	Comment
monitorId	M	ThresholdMonitor.monitorId	It specifies the ThresholdMonitor to be stopped and removed.

7.4.2.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
status	M	ENUM (Success, Failure)	An operation may fail because of a specified or unspecified reason.

7.4.2.4 Pre-condition

thresholdMonitorExists.

Assertion Name	Definition
thresholdMonitorExists	ThresholdMonitor specified in the input parameters exists.

7.4.2.5 Post-condition

thresholdMonitorIsDeleted AND notifyObjectDeletionEmitted..

Assertion Name	Definition
thresholdMonitorIsDeleted	ThresholdMonitor identified by monitorId ceases to exist.
notifyObjectDeletionEmitted	The notifyObjectDeletion is emitted to indicate the deletion of a ThresholdMonitor.

7.4.2.6 Exceptions

Exception Name	Definition
unknownThresholdMonitor	Condition: (thresholdMonitorExists) not verified. Returned information: output parameter status is set to 'Failure'. Exit state: Entry State.

End of change in Clause 7.4.1, 7.4.2

Change in Annex B

Annex B (normative): Threshold related performance alarms Triggering Events

This annex defines the Triggering Events for the various performance alarms. The Triggering Events normally are defined by each notification type, such as `notifyChangedAlarm`, under the clause "Triggering Events". The Triggering Events related to thresholding are defined here collectively for ease of reference.

The Triggering Events are defined in a state transition table. The column labels (e.g. 0, 1, 2, 3 of table in clause B.1) denote the to-state while the row labels denote the from-state. The cell denotes the emission action.

There are two clauses. Clause B.1 defines the Triggering Events for `IRPAgent` that supports `notifyChangedAlarm`. Clause B.2 defines those for `IRPAgent` that does not support `notifyChangedAlarm`.

Clause B.3 provides samples of triggering events.

B.1 IRPAgent supporting `notifyChangedAlarm`

Table B.1

	To State-0	To State-1	To State-2	To State-3	To State-4
From State-0	no emission	1 <code>notifyNewAlarm</code>	1 <code>notifyNewAlarm</code>	1 <code>notifyNewAlarm</code>	1 <code>notifyNewAlarm</code>
From State-1	1 <code>notifyClearedAlarm</code>	no emission	1 <code>notifyChangedAlarm</code>	1 <code>notifyChangedAlarm</code>	1 <code>notifyChangedAlarm</code>
From State-2	1 <code>notifyClearedAlarm</code>	1 <code>notifyChangedAlarm</code>	no emission	1 <code>notifyChangedAlarm</code>	1 <code>notifyChangedAlarm</code>
From State-3	1 <code>notifyClearedAlarm</code>	1 <code>notifyChangedAlarm</code>	1 <code>notifyChangedAlarm</code>	no emission	1 <code>notifyChangedAlarm</code>
From State-4	1 <code>notifyClearedAlarm</code>	1 <code>notifyChangedAlarm</code>	1 <code>notifyChangedAlarm</code>	1 <code>notifyChangedAlarm</code>	no emission

The horizontal '0', '1', '2', '3' and '4' are the to-states indicating the current `measurementType` value with respect to the different threshold levels. Threshold levels are associated with severity level (`thresholdSeverity`). Higher threshold level associates with higher severity level (`thresholdSeverity`).

EXAMPLE: If `direction = 'Increasing'`, state-0 means the `measurementType` value is below all thresholds. State-2 means that the `measurementType` value is above threshold level 2 but below threshold level 3. If `direction = 'Decreasing'`, state-0 means the `measurementType` value is above all thresholds. State-2 means that the `measurementType` value is below threshold level 2 but above threshold level 3.

The vertical '0', '1', '2', '3' and '4' are the from-states indicating the last-read `measurementType` value with respect to the threshold levels.

A threshold has a value and may have a hysteresis. A threshold with hysteresis has a `threshold-high` value and a `threshold-low` value that are different from the threshold value. A threshold without hysteresis can be considered as a threshold whose `threshold-high` and `threshold-low` values are equal to the threshold value.

For the `direction = 'Increasing'`, the shaded cells indicate transitions caused by `measurementType` values (a) rising across or (b) reach one or more `threshold-high` values. The non-shaded cells indicate transition caused by `measurementType` values falling across one or more `threshold-low` values.

For the `direction = 'Decreasing'`, the shaded cells indicate transitions caused by `measurementType` values (a) falling across or (b) reach one or more `threshold-low` values. The non-shaded cells indicate transition caused by `measurementType` values rising across one or more `threshold-high` values.

Each cell indicates the performance alarm emission when from-state transits to to-state. The `notifyNewAlarm` and `notifyChangedAlarm` shall carry the severity level (`perceivedSeverity`) associated with the to-state (`thresholdSeverity`).

The `ThresholdMonitor` determines, at `monitorGP=X`, if a threshold has been (a) crossed or (b) reached by comparing the value read at `monitorGP==X` with the value read at `monitorGP==X-1`. In initial condition (i.e. when the `ThresholdMonitor` reads the value at `monitorGP=1`), the (hypothetical) value read at `monitorGP==X-1` is assumed to be at state-0.

[\(See 6.3.8.1 for clarification of the alternatives \(a\) and \(b\)\)](#)

B.2 IRPAgent not supporting notifyChangedAlarm

Table B.2

	To State-0	To State-1	To State-2	To State-3	To State-4
From State-0	no emission	1 <code>notifyNewAlarm</code>	1 <code>notifyNewAlarm</code>	1 <code>notifyNewAlarm</code>	1 <code>notifyNewAlarm</code>
From State-1	1 <code>notifyClearedAlarm</code>	no emission	1 <code>notifyClearedAlarm</code> 1 <code>notifyNewAlarm</code>	1 <code>notifyClearedAlarm</code> 1 <code>notifyNewAlarm</code>	1 <code>notifyClearedAlarm</code> 1 <code>notifyNewAlarm</code>
From State-2	1 <code>notifyClearedAlarm</code>	1 <code>notifyClearedAlarm</code> 1 <code>notifyNewAlarm</code>	no emission	1 <code>notifyClearedAlarm</code> 1 <code>notifyNewAlarm</code>	1 <code>notifyClearedAlarm</code> 1 <code>notifyNewAlarm</code>
From State-3	1 <code>notifyClearedAlarm</code>	1 <code>notifyClearedAlarm</code> 1 <code>notifyNewAlarm</code>	1 <code>notifyClearedAlarm</code> 1 <code>notifyNewAlarm</code>	no emission	1 <code>notifyClearedAlarm</code> 1 <code>notifyNewAlarm</code>
To State-4	1 <code>notifyClearedAlarm</code>	1 <code>notifyClearedAlarm</code> 1 <code>notifyNewAlarm</code>	1 <code>notifyClearedAlarm</code> 1 <code>notifyNewAlarm</code>	1 <code>notifyClearedAlarm</code> 1 <code>notifyNewAlarm</code>	no emission

The `Monitor` determines, at `monitorGP=X`, if a threshold has been crossed ~~or reached~~ by comparing the value read at `monitorGP ==X` with the value read at `monitorGP ==X-1`. In initial condition (i.e. when the `Monitor` reads the value at `monitorGP =1`), the (hypothetical) value read at `monitorGP ==X-1` is assumed to be at state-0.

B.3 Examples

B.3.1 Example 1

Figure B.1 illustrates multi-level `thresholdSeverity` thresholding behaviour. The horizontal axis indicates the time intervals specified by the `Monitor.monitorGranularityPeriod` (`monitorGP`). The vertical axis indicates the monitored `measurementType` values. The `measurementType` of this example is of type `gauge`. The `Monitor.direction` is set to "Increasing".

Further suppose that the `measurementType` is monitored for a (a) two-level-severity-threshold-crossings or (b) two-level-severity-threshold reaching. [\(See 6.3.8.1 for clarification of the alternatives \(a\) and \(b\)\)](#)

The threshold for the lower-level-severity is set to 3 with a hysteresis low and high levels set to 2 and 4 respectively (i.e. hysteresis value = 1). The `thresholdSeverity` level is `Minor`.

The threshold for the higher-level-severity is set to 7 with a hysteresis low and high levels set to 6 and 8 respectively (i.e. hysteresis value = 1). The `thresholdSeverity` level is `Major`.

The performance alarm triggering events are:

1. At `monitorGP` interval 3, trigger a `notifyNewAlarm` with `perceivedSeverity` (`ps`) = `Minor`.
2. At `monitorGP` interval 4, if the `IRPAgent` supports `notifyChangedAlarm`, trigger a `notifyChangedAlarm` with `ps` = `Major`; else a `notifyClearAlarm` and a `notifyNewAlarm` with `ps` = `Major`.

3. At monitorGP interval 8, if the IRPAgent supports notifyChangedAlarm, trigger a notifyChangedAlarm with ps = Minor; else a notifyClearAlarm and a notifyNewAlarm with ps = Minor.
4. At monitorGP interval 15, trigger a notifyClearedAlarm clearing the last emitted Minor alarm.

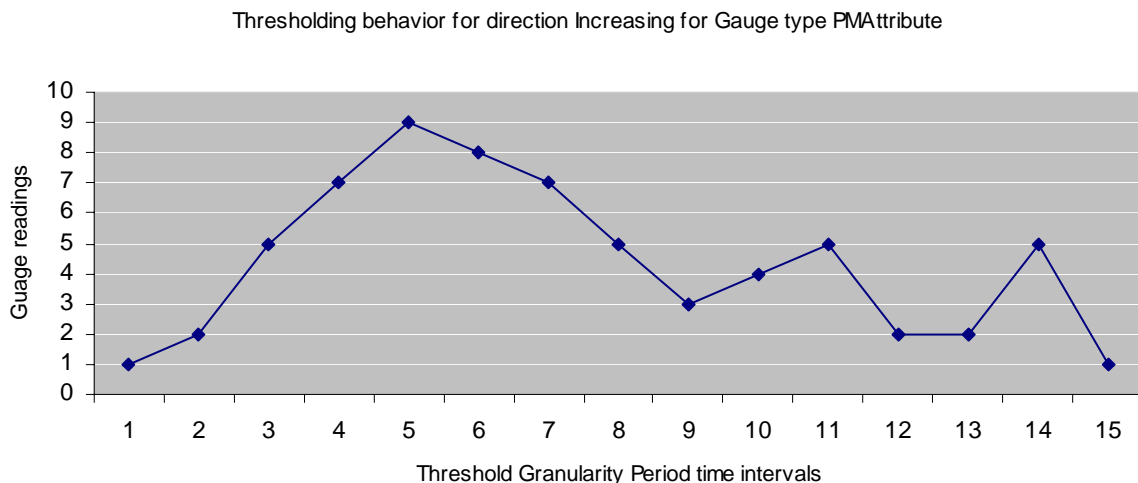


Figure B.1

B.3.2 Example 2

Figure B.2 illustrates another multi-level thresholdSeverity thresholding behaviour for IRPAgent supporting notifyChangedAlarm. The horizontal axis indicates the time intervals specified by the GP. The vertical axis indicates the monitored measurementType values. The measurementType of this example is of type gauge. The Monitor.direction is set to "Decreasing".

Further suppose that the measurementType is monitored for a two-level thresholdSeverity [\(a\)](#) threshold-crossings or [\(b\)](#) [threshold](#) reaching. [\(See 6.3.8.1 for clarification of the alternatives \(a\) and \(b\)\)](#)

The threshold for the major-level thresholdSeverity is set to 7 with a hysteresis high and low levels set to 6 and 8 respectively.

The threshold for the minor-level thresholdSeverity is set to 9 with a hysteresis high and low levels set to 8 and 10 respectively.

The performance alarm triggering events are:

1. At monitorGP interval 1, trigger a notifyNewAlarm with ps = Major. See table B.1 table for transition State-0 to State-2.
2. At monitorGP interval 5, trigger a notifyChangedAlarm with ps = Minor. See table B.1 for transition State-2 to State-1.
3. At monitorGP interval 8, trigger a notifyChangedAlarm with ps = Major. See table B.1 for transition State-1 to State-2.

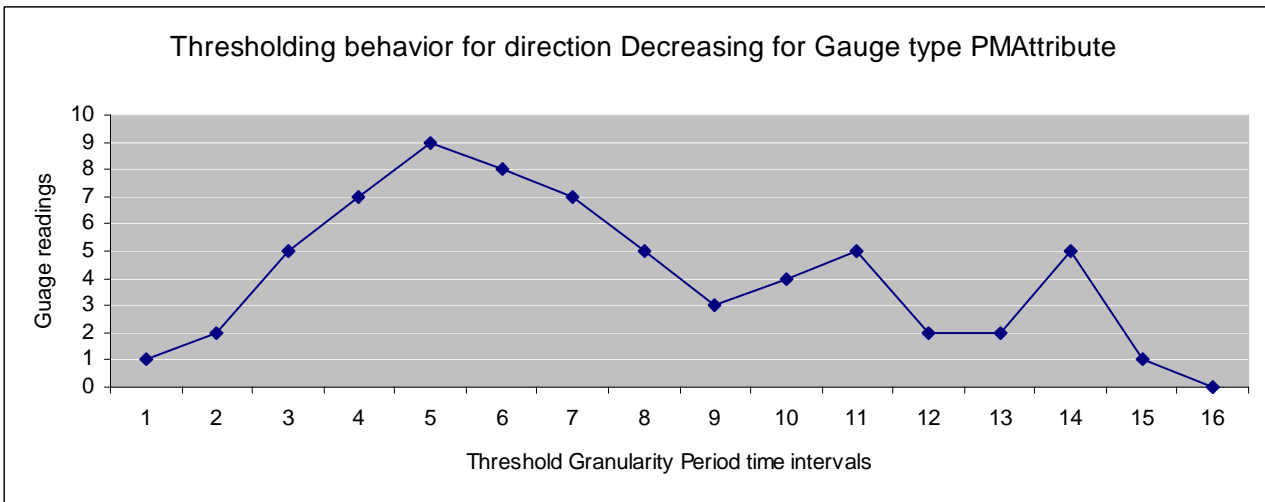


Figure B.2

B.3.3 Example 3

Figure B.3 illustrates a single-level thresholding behaviour. The horizontal axis indicates the time intervals specified by the monitorGP. The vertical axis indicates the monitored measurementType values. The measurementType of this example is of type gauge. The Monitor.direction is set to "Increasing".

The threshold is set to 4 with a hysteresis high and low levels set to 5 and 3 respectively. The thresholdSeverity level is Critical.

The performance alarm triggering events are:

1. At monitorGP interval 3, trigger a notifyNewAlarm with ps = Critical.
2. At monitorGP interval 11, trigger a notifyClearedAlarm with ps = Cleared.

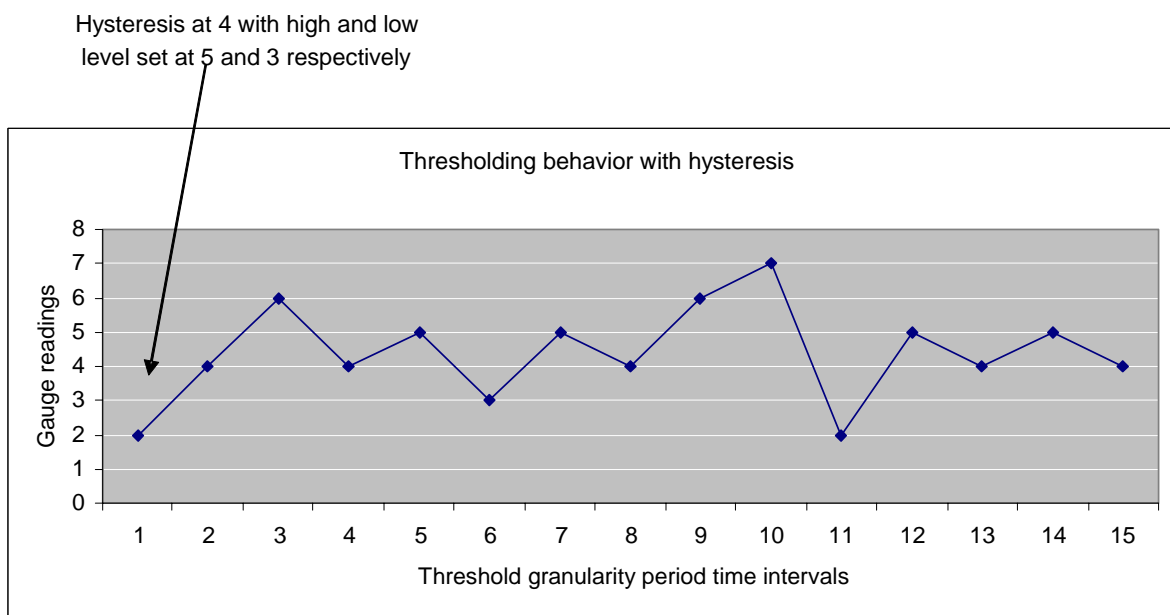


Figure B.3

End of change in Annex B
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Annex C (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
Jun 2003	S_20	SP-030295	--	--	Submitted to TSG SA#20 for Information	1.0.0	
Dec 2003	S_22	SP-030650	--	--	Submitted to TSG SA#22 for Approval	2.0.0	6.0.0
Jun 2004	S_24	SP-040272	001	--	Clarify and correct the specification of notifications of Monitor	6.0.0	6.1.0
Jun 2004	S_24	SP-040272	002	--	Add constraint that PM threshold hysteresis must be positive	6.0.0	6.1.0

CHANGE REQUEST

⌘ **32.413 CR 002** ⌘ rev - ⌘ Current version: **6.1.0** ⌘

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

Proposed change affects: | UICC apps ME Radio Access Network Core Network

Title:	⌘ Align to latest PM IRP Information Service (IS) 32.412 version number		
Source:	⌘ SA5 (MCC per SWGC#38bis plenary decision)		
Work item code:	⌘ OAM-PM	Date:	⌘ 20/08/2004
Category:	⌘ F	Release:	⌘ Rel-6
	Use <u>one</u> of the following categories: F (correction) A (corresponds to a correction in an earlier release) B (addition of feature), C (functional modification of feature) D (editorial modification) Detailed explanations of the above categories can be found in 3GPP TR 21.900 .		Use <u>one</u> of the following releases: 2 (GSM Phase 2) R96 (Release 1996) R97 (Release 1997) R98 (Release 1998) R99 (Release 1999) Rel-4 (Release 4) Rel-5 (Release 5) Rel-6 (Release 6)

Reason for change:	⌘ The CORBA Solution Set 32.413 needs to be aligned to latest applicable Performance Management (PM) Integration Reference Point (IRP): Information Service (IS) 32.412 version number.		
Summary of change:	⌘ Align the CORBA SS 32.413 to latest PM IRP IS 32.412 version number		
Consequences if not approved:	⌘ This Solution Set does not point to the latest applicable IS 32.412 version number. Potential source of mis-interpretations and confusion.		

Clauses affected:	⌘ 1 Scope										
Other specs affected:	<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 20px;">Y</td> <td style="width: 20px;">N</td> </tr> <tr> <td style="width: 20px;"> </td> <td style="width: 20px;">X</td> </tr> <tr> <td style="width: 20px;"> </td> <td style="width: 20px;">X</td> </tr> <tr> <td style="width: 20px;"> </td> <td style="width: 20px;">X</td> </tr> </table>	Y	N		X		X		X	Other core specifications Test specifications O&M Specifications	⌘
Y	N										
	X										
	X										
	X										
Other comments:	⌘ This Child CR should only be approved if its attached parent CR 32.412-610 in S5-046653 would 1 st be approved.										

How to create CRs using this form:

Change in clause 1 Scope

1 Scope

The present document specifies the Common Object Request Broker Architecture (CORBA) Solution Set (SS) for the IRP whose semantics is specified in PM (Performance Management) IRP: Information Service [7].

This Solution Set specification is related to 3GPP TS 32.412 V6.~~4~~².X.

**End of Change in clause 1 Scope
End of Document**

Annex B (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
Mar 2004	S_23	SP-040136	--	--	Submitted to TSG SA#23 for Approval	2.0.0	6.0.0
Jun 2004	S_24	SP-040273	001	--	Correction and enhancement of data type definitions in IDL files	6.0.0	6.1.0