

Alarm Handler

AlarmHandler is a Tango device server which creates one dynamic attribute for each alarm rule. The attribute allows to asynchronously notify clients interested in alarm changes, with the granularity of one alarm. In fact, every attribute representing an alarm can push events when its state changes. Clients can subscribe for the events of the alarm attributes they are interested into, or all the alarm attributes, and be notified asynchronously. Clients can be graphical user interfaces, notifiers, other AlarmHandlers or any TANGO device in general. The configuration of each alarm is saved in the Tango Database as attribute properties.

Configuration

Configuration uses both device and attribute properties.

Device properties

Device properties are for configurations that apply on the whole device.

Device Properties			
Name	Description	Type	Default Value
GroupNames	Labels for Group mask, first is for mask 0x00 so 'none' is the default label associated to it. Second label is associated to the mask 0x1, third to the mask 0x2, ... Only labels defined here can be used as group names in the alarm configuration.	String[]	none
SubscribeRetryPeriod	Change event retry subscription period in seconds. Every time this period expires AlarmHandler tries to re-subscript all faulty attributes	int	30
StatisticsTimeWindow	Time window to compute statistics in seconds. Frequency of events is computed using this period. Statistics are reset with the ResetStatistics command	int[]	60

Attribute properties

The following attribute properties are used to store alarm configuration. They are present for every attribute that has the same name as the alarm name. Some of these properties are mandatory others optional.

Attribute Properties		
Name	Description	Mandatory
tag	Alarm name (same as the attribute name)	Yes

formula	Alarm formula	Yes
on_delay	Delay in seconds before the alarm become active after the formula result change from false to true	No, default=0
off_delay	Delay in seconds before the alarm become inactive after the formula result change from true to false	No, default=0
priority	Severity of the alarm. 'fault', 'warning' and 'log' are allowed	Yes
silent_time	Time in minutes this alarm will be silenced or shelved with the Silence and Shelve commands. If -1 this alarm cannot be silenced nor shelved.	No, default=-1
group	One or more groups this alarm belong to. Possible groups are defined in the GroupNames device property. Multiple groups are specified concatenating with the ' ' character	Yes
message	Additional message carried with the alarm	Yes
on_command	Command executed when the alarm becomes active. Command argin as to DEV_VOID or DEV_STRING. In the second case the string "name=...;groups=...;msg=...;values=...;formula=..." is passed as argument	No, default=empty string
off_command	Command executed when the alarm becomes inactive. Command argin as to DEV_VOID or DEV_STRING. In the second case the string "name=...;groups=...;msg=...;values=...;formula=..." is passed as argument	No, default=empty string
enabled	If true alarm is enabled, otherwise it is set to the OOSRV - out of service alarm state	No, default=1

Formula syntax

Formula is an expression containing:

- attribute names as fqdn tango://host:port/name/of/dev/attr or just name/of/dev/attr
- attribute properties .quality, .alarm, .normal so that
 - name/of/dev/attr.quality returns the Tango quality (the integer value) of the attribute
 - name/of/dev/attr.alarm returns true if the attribute ==UNACK or ==ACK
 - name/of/dev/attr.normal returns true if the attribute ==NORM or ==RTNUN
- numbers as real (ex: 35, -23.5, ...) or hexadecimal (ex:0xaf, 0x1A, ...)
- strings as any character between an opening and a closing '
 - Tango states enum labels (ON, OFF, CLOSE, OPEN, INSERT, EXTRACT, MOVING, STANDBY, FAULT, INIT, RUNNING, ALARM, DISABLE, UNKNOWN)
 - Tango quality enum labels (ATTR_VALID, ATTR_INVALID, ATTR_WARNING, ATTR_ALARM, ATTR_CHANGING)
 - Alarm state enum labels (NORM, UNACK, ACKED, RTNUN, SHLVD, DSUPR, OOSRV)
- Binary operators in order of precedence: *, /, +, -, <<, >>, <=, >=, >, <, ==, !=, &, |, ^, &&, ||
- Unary operators !, -

- Functions with one argument $\text{abs}(x)$, $\text{sin}(x)$, $\text{cos}(x)$, $\text{quality}(x)$ with x a valid expression
- Functions with two argument $\text{min}(x,y)$, $\text{max}(x,y)$, $\text{pow}(x,y)$ with x and y valid expressions

Interface

Attributes

AlarmHandler Class Dynamic Attributes				
Name	Attr. type	R/W type	Data type	Description
AlarmState	Scalar	READ	DEV_ENUM Labels: NORM, UNACK, ACKED, RTNUN, SHLVD, DSUPR, OOSRV	Created one attribute for each alarm with the same name as the alarm name

AlarmHandler Class Attributes				
Name	Attr. type	R/W type	Data type	Description
audibleAlarm	Scalar	READ	DEV_BOOLEAN	True if there is at least one alarm that needs audible indication on the GUI
StatisticsResetTime	Scalar	READ	DEV_DOUBLE	Time elapsed in seconds since last ResetStatistics command
alarm	Spectrum	READ	DEV_STRING	List of tab-separated strings with alarm status kept temporarily for compatibility with legacy alarm GUI
normalAlarms	Spectrum	READ	DEV_STRING	List of alarms in normal state
unacknowledgedAlarms	Spectrum	READ	DEV_STRING	List of alarms in unacknowledged state
acknowledgedAlarms	Spectrum	READ	DEV_STRING	List of alarms in acknowledged state
unacknowledgedNormalAlarms	Spectrum	READ	DEV_STRING	List of alarms in unacknowledged normal state
shelvedAlarms	Spectrum	READ	DEV_STRING	List of alarms in shelved state
outOfServiceAlarms	Spectrum	READ	DEV_STRING	List of alarms in out of service state
silencedAlarms	Spectrum	READ	DEV_STRING	List of alarms in silenced state
listAlarms	Spectrum	READ	DEV_STRING	List of all alarms
frequencyAlarms	Spectrum	READ	DEV_DOUBLE	List of frequency of evaluation of all alarms

Commands

AlarmHandler Commands			
Name	Input Argument	Output Argument	Description
Ack	DEVVAR_STRING ARRAY	DEV_VOID	Acknowledge the list of alarms passed as input argument

Load	DEV_STRING	DEV_VOID	Load a new alarm as a string of concatenated “key=value;”. Possible keys are the same documented in the attribute properties
Modify	DEV_STRING	DEV_VOID	Modify an existing alarm. Input argument has the same syntax of the Load command
Remove	DEV_STRING	DEV_VOID	Remove completely an alarm. Its configuration is deleted from the attribute properties
Disable	DEV_STRING	DEV_VOID	Disable an alarm which name is passed as input argument. Its state change to OOSRV and enabled is set to 0 in the attribute properties. From OOSRV the alarm state can be changed only with the Enable command
Enable	DEV_STRING	DEV_VOID	Enable an alarm which name is passed as input argument. It has to be in the OOSRV or SHLVD state. Enabled is set to 1 in the attribute properties.
Shelve	DEVVAR_STRING ARRAY	DEV_VOID	Shelve = disable temporarily the list of alarms passed as input argument. Only alarms which have a silent_time property > 0 can be shelved. Their state is changed to SHLVD for the period specified as silent_time or until the Enable command is called.
Silence	DEVVAR_STRING ARRAY	DEV_VOID	Silence = disable temporarily the management of the audible condition of the list of alarms passed as input argument. Only alarms which have a silent_time property > 0 can be silenced. Their state continue to change following their normal behavior but they do not participate to the audibleAlarm evaluation for the period specified as silent_time or until the Enable command is called.
SearchAlarm	DEV_STRING	DEVVAR_STRING ARRAY	Returns the list of configured alarms matching in the name the filter string. Empty filter string or * cause the command to return the configuration of all alarms. Alarm configuration is returned as a “key=value;” concatenated string, the same syntax of the Load command.
GetAlarmInfo	DEV_STRING	DEVVAR_STRING ARRAY	Returns the complete status of the alarm which name is passed as input argument. The return value is an array “key=value;” strings. Keys are the ones described in the attribute properties plus: value=one of the alarm state enum labels attr_values=concatenation of “attrname=value;” of the last value of attributes evaluated in the formula quality=the tango quality exception=Reason:... Desc:... Origin:... shelved=true/false ack=ACK/NACK audible=true/false on_counter=how many times it evaluated consecutively true on_counter=how many times it evaluated

			consecutively false freq_counter=how many times is has been evaluated since last ResetStatistics silent_time_remaining=how many minutes till when it will come back from shelved or silenced
ResetStatistics	DEV_VOID	DEV_VOID	Reset frequency counters.
StopAudible	DEV_VOID	DEV_VOID	Reset audibleAlarm attribute
StopNew	DEV_VOID	DEV_VOID	Same as StopAudible, kept temporarily for compatibility with legacy alarm GUI

Alarm states

Alarm States					
Name	Value	Proccess condition	Alarm status	Acknowledge status	Description
NORM	0	Normal	Inactive	Acknowledged	Normal state
UNACK	1	Abnormal	Active	Unacknowledged	Alarm not acnowledged
ACKED	2	Abnormal	Active	Acknowledged	Alarm acknowledged
RTNUN	3	Normal	Inactive	Unacknowledged	Returned to normal but not acnowledged
SHLVD	4	Normal or Abnormal	Active or Inactive	Not applicable	Shelved: temporarily disabled with the Shelve command
DSUPR	5	Normal or Abnormal	Active or Inactive	Not applicable	Suppressed by design: not possible to evaluate to alarm because of formula conditions. Note: it is not possible to enter in this state in this AlarmHandler implementation
OOSRV	6	Normal or Abnormal	Active or Inactive	Not applicable	Out of service: manually disabled with the Disable command