



Tango Alarms

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- ⑥ *Alarm*: asynchronous notification that some event happened or that a given state has been reached
- ⑥ *Alarm system*: a complex that allows for creating, configuring and managing alarms
- ⑥ The *Alarm Collector*: an alarm system developed for the Tango Control System framework

Requirements

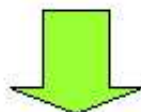
- ⑥ Easily configurable at runtime without restarting the system
- ⑥ Support for complex alarm rules based on arbitrary formula (logical and binary operators, basic mathematical functions)
- ⑥ Flexible enough to carry some additional info (message/action)
- ⑥ Consistent between multiple clients (centralized data management)
- ⑥ Example alarm formula:
 - △ ((sr/pscid/s1.1/state != ON) && (sr/carid/s1.1/stat & 0x40))
 - △ ((abs(sr/psch/s1.1/curr) > 10.0) || (sr/psch/s1.1/state != ON))

The Alarm Collector

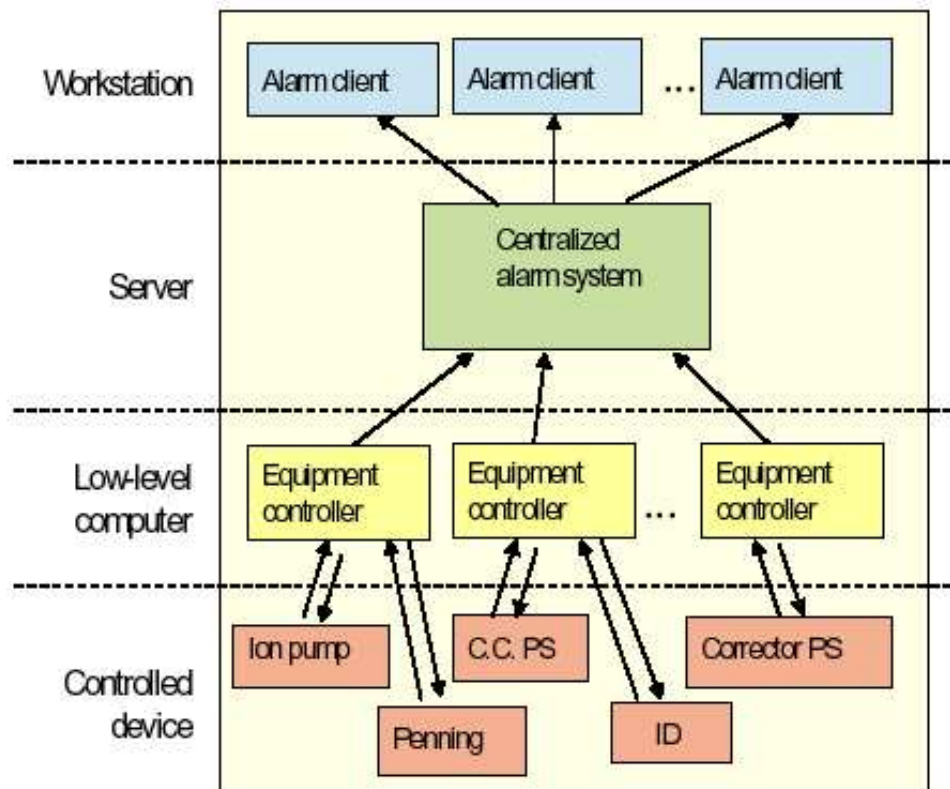
- ⑥ The core of the alarm system is a special TANGO device server based on a double client/server architecture: as a client gathers input values from TANGO devices and as a server provides alarm notifications
- ⑥ Relies on the TANGO event system to collect input values as well as to provide alarm notifications
 - △ no provision to work without events
 - △ increased efficiency, responsiveness and lower network load
- ⑥ Manages the alarm system current status in a centralized manner
 - △ configuration of the alarm system in the database
 - △ information consistency between multiple clients
 - △ methods for adding and removing alarms keep system and database coherent

System architecture

Alarm rules based on input values from multiple computers of the control system are required



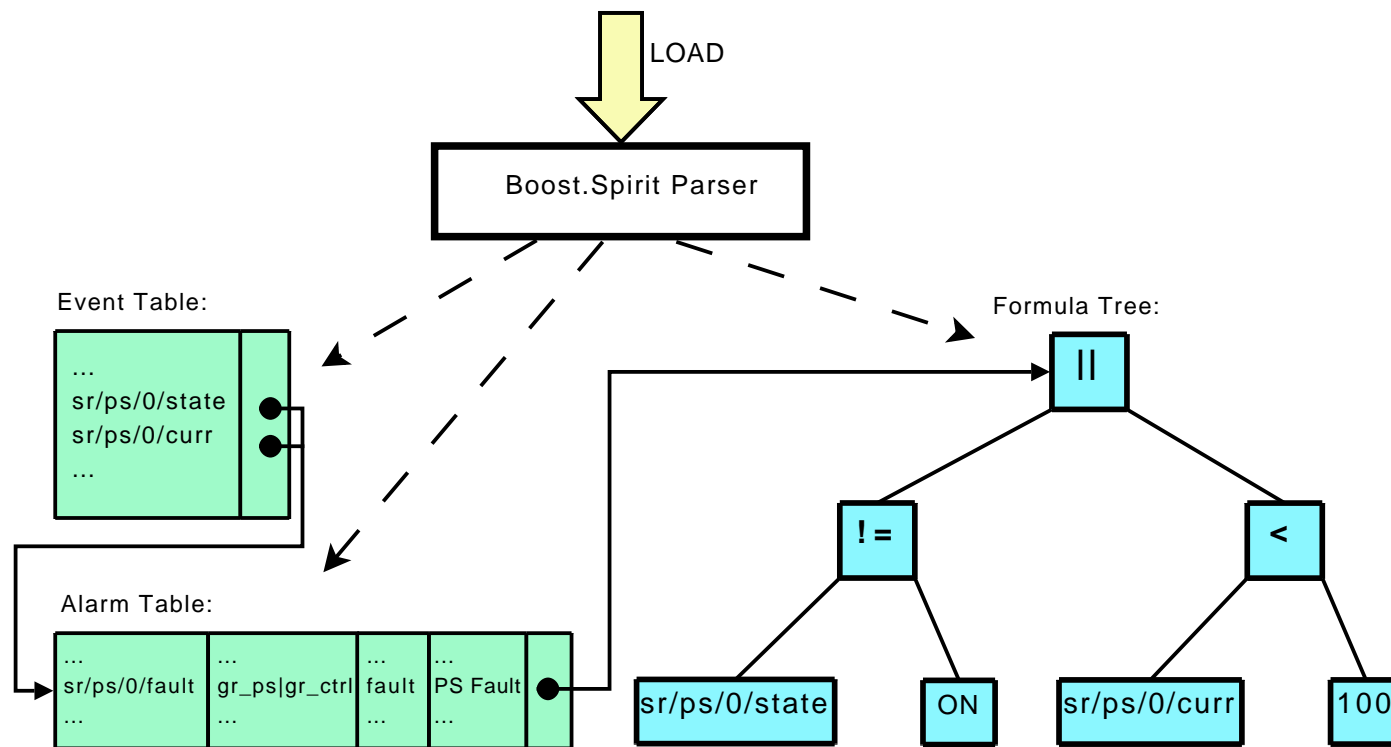
A centralized system satisfies this requirement in a simple and effective manner



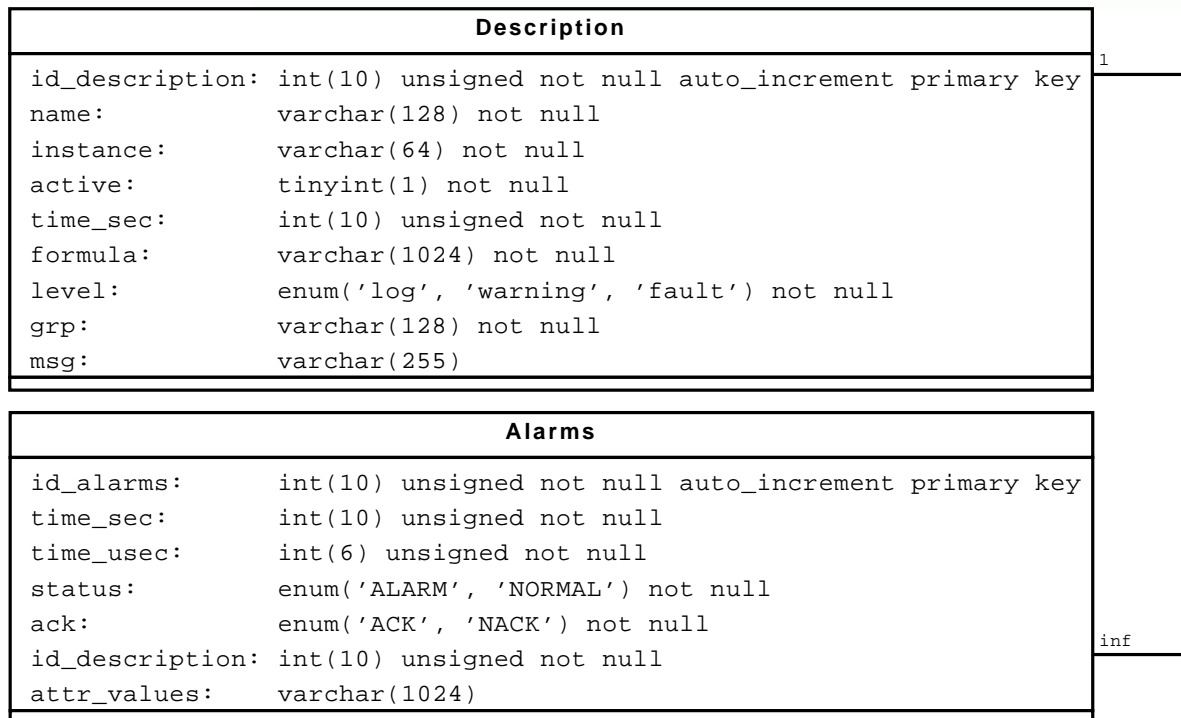
- ⑥ New scanner/parser engine: Boost.Spirit
 - △ OO framework that enables a target grammar to be written exclusively in C++
- ⑥ Per-alarm alarm severity level: LOG, WARNING, FAULT
- ⑥ Per-alarm configurable group[s] as Tango device property
- ⑥ Per-alarm event counter
- ⑥ Support for vector attributes
- ⑥ Alarm rules configuration: centralized MySQL database
- ⑥ Alarm logging: centralized MySQL database (all alarm servers/instances log to the same DB)

Example:

"sr/ps/0/fault ((sr/ps/0/state != ON) || (sr/ps/0/curr < 100)) fault gr_ps|gr_ctrl "PS Fault"



Formula is parsed only once, then is evaluated the built AST (Abstract Syntax Tree)



Example:

id_description:	name:	instance:	active:	time_sec:	formula:	level:	grp:	msg:
7	sr/ps/0/fault	alarm_1	1	1234567890	((sr/ps/0/state!=ON) ((sr/ps/0/curr < 100)))	fault	gr_ps gr_ctrl	PS Fault
id_alarms:	time_sec:	time_usec:	status:	ack:	id_description:	attr_values:		
14	1239876540	654321	ALARM	NACK	7	sr/ps/0/state=ON; sr/ps/0/curr=76;		
15	1239876553	123654	NORMAL	NACK	7	sr/ps/0/state=ON; sr/ps/0/curr=100		
16	1239876742	321456	NORMAL	ACK	7			

Alarm panel

booster/alarm/1 (on bambam)

Alarms InternalErrors Filter History

Date/time	microsecs	Alarm	Status	Ack	Count	Level	Group	Message
Tue Apr 15 03:43:37 2008	268970	b/power_supply/psb_b/fault	NORMAL	NACK	0	fault	gr_ps	
Mon Apr 14 00:22:40 2008	157599	bts/power_supply/psq_bts1.5/fault	NORMAL	NACK	0	fault	gr_ps	
Mon Apr 14 00:23:09 2008	919410	bts/power_supply/psq_bts2.3/fault	NORMAL	NACK	0	fault	gr_ps	
Mon Apr 14 00:23:14 2008	28721	bts/power_supply/psq_bts2.5/fault	NORMAL	NACK	0	fault	gr_ps	
Mon Apr 14 22:09:30 2008	40253	bts/power_supply/psq_bts2.4/fault	NORMAL	NACK	0	fault	gr_ps	
Mon Apr 14 22:10:01 2008	65846	bts/power_supply/psq_bts1.6/fault	NORMAL	NACK	0	fault	gr_ps	
Mon Apr 14 22:10:01 2008	298566	bts/power_supply/psq_bts2.2/fault	NORMAL	NACK	0	fault	gr_ps	

Stop Sound Acknowledge Acknowledge All

alarm/test/1 (on hyo)

Alarms InternalErrors Filter History

Date/time	microsecs	Alarm	Status	Ack	Count	Level	Group	Message
Wed Apr 16 15:20:10 2008	691320	alarm/testevent/0/test	ALARM	NACK	1	log	gr_ctrl	Message1
Wed Apr 16 15:20:10 2008	691320	alarm/testevent/0/test2	NORMAL	NACK	0	log	gr_ctrl	

Stop Sound Acknowledge Acknowledge All

Open "issues" and improvements

- ⑥ Polling device/instance issue: event failures
- ⑥ Subscribe event on dead device server (Tango 6.1.1 OK!)
- ⑥ Unique per-event subscribe per device server (i.e you cannot subscribe the same event in two instances of a device server)
- ⑥ No provision to work without events
- ⑥ Integrated notification/exec engine