

AlarmHandler @Elettra

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AlarmHandler ecosystem

DeviceServers

- **alarm-handler**
implement formulas, produce alarms
- **alarm-manager**
ease formula configuration exporting alarm parameters as attributes
- **alarm-notify**
subscribes for alarm attributes, handle phonebook, trigger notification commands
- **alarm-mail**
send emails
- hdb++-es
- hdb++-cm
handle alarm history

GUIs

- **alarm-ng-gui**
display alarms in CR, notify with sounds, show history, manage ack/enable/disable
- **alarm-manager-gui**
display, load, modify, remove alarm configuration
- eGiga
display history of alarms and attributes involved in formulas

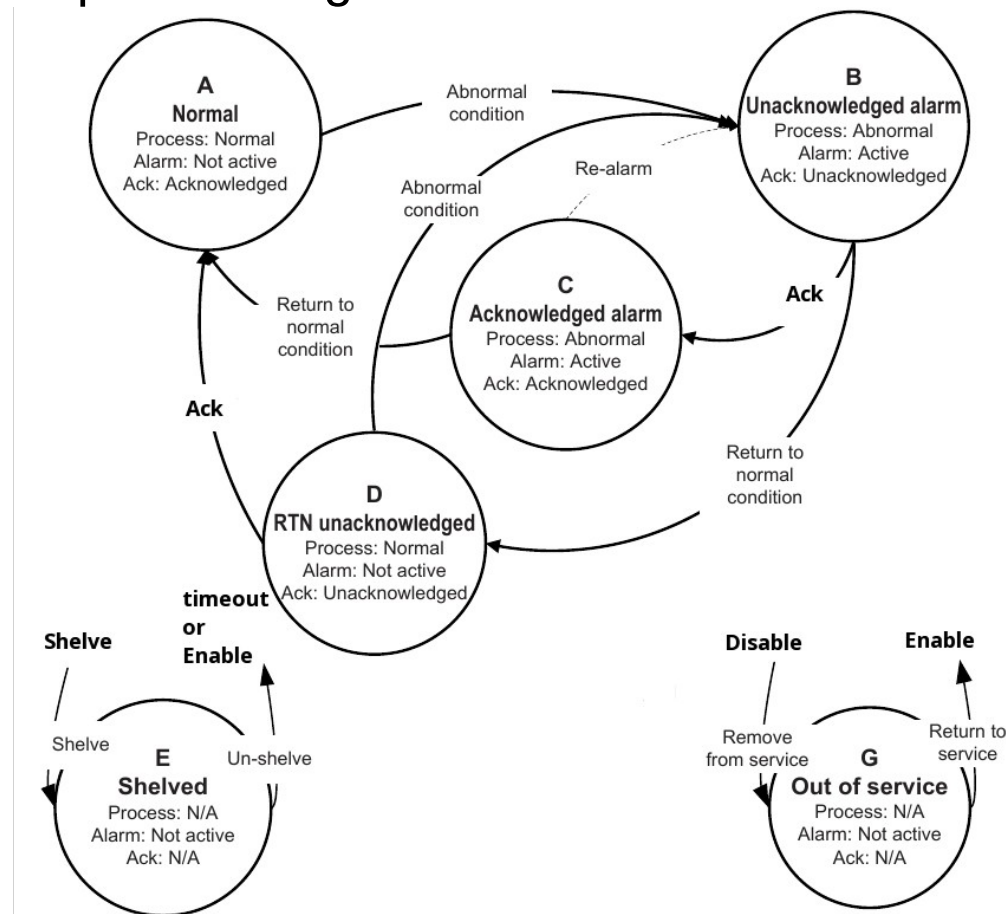
What are “Alarms”

- Each Alarm is an attribute of DevEnum type
- Alarm values are: NORM, UNACK, ACKED, RTNUN, SHLVD, DSUPR, OOSRV, ERROR (**IEC 62682**)
- Alarm attributes push change and archive events at each variation

NORM	Normal alarm state	Normal process condition	Acknowledged	Enabled
UNACK	Unacknowledged alarm state	Abnormal process condition	Unacknowledged	Enabled
ACKED	Acknowledged alarm state	Abnormal process condition	Acknowledged	Enabled
RTNUN	Returned to normal alarm state	Normal process condition	Unacknowledged	Enabled
SHLVD	Shelved state	Normal or abnormal process condition	Not applicable	Temporarily disabled
DSUPR	Suppressed by design state	Normal or abnormal process condition	Not applicable	Disabled
OOSRV	Out of service alarm state	Normal or abnormal process condition	Not applicable	Disabled

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Deployment in Elettra and Fermi

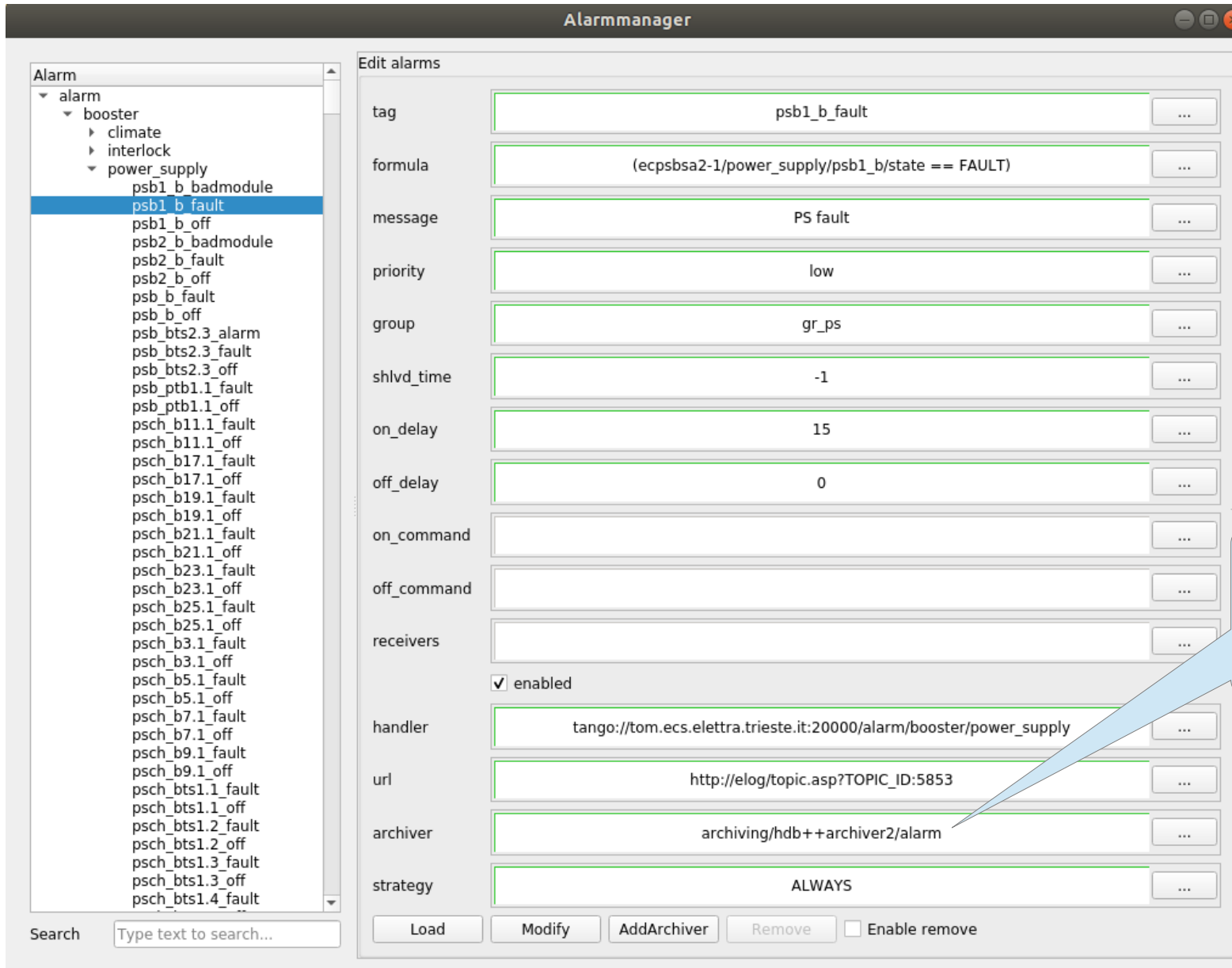
ELETTRA

- **26** alarm-handler devices
- **1224** alarm rules managed by Control Room GUI
- **7** alarm rules sending only email notifications

FERMI

- **22** alarm-handler devices
- **897** alarm rules managed by Control Room GUI
- **415** alarm rules sending only email notifications

AlarmHandler AlarmManager GUI



The screenshot shows the AlarmManager GUI with the following configuration for the 'psb1_b_fault' alarm:

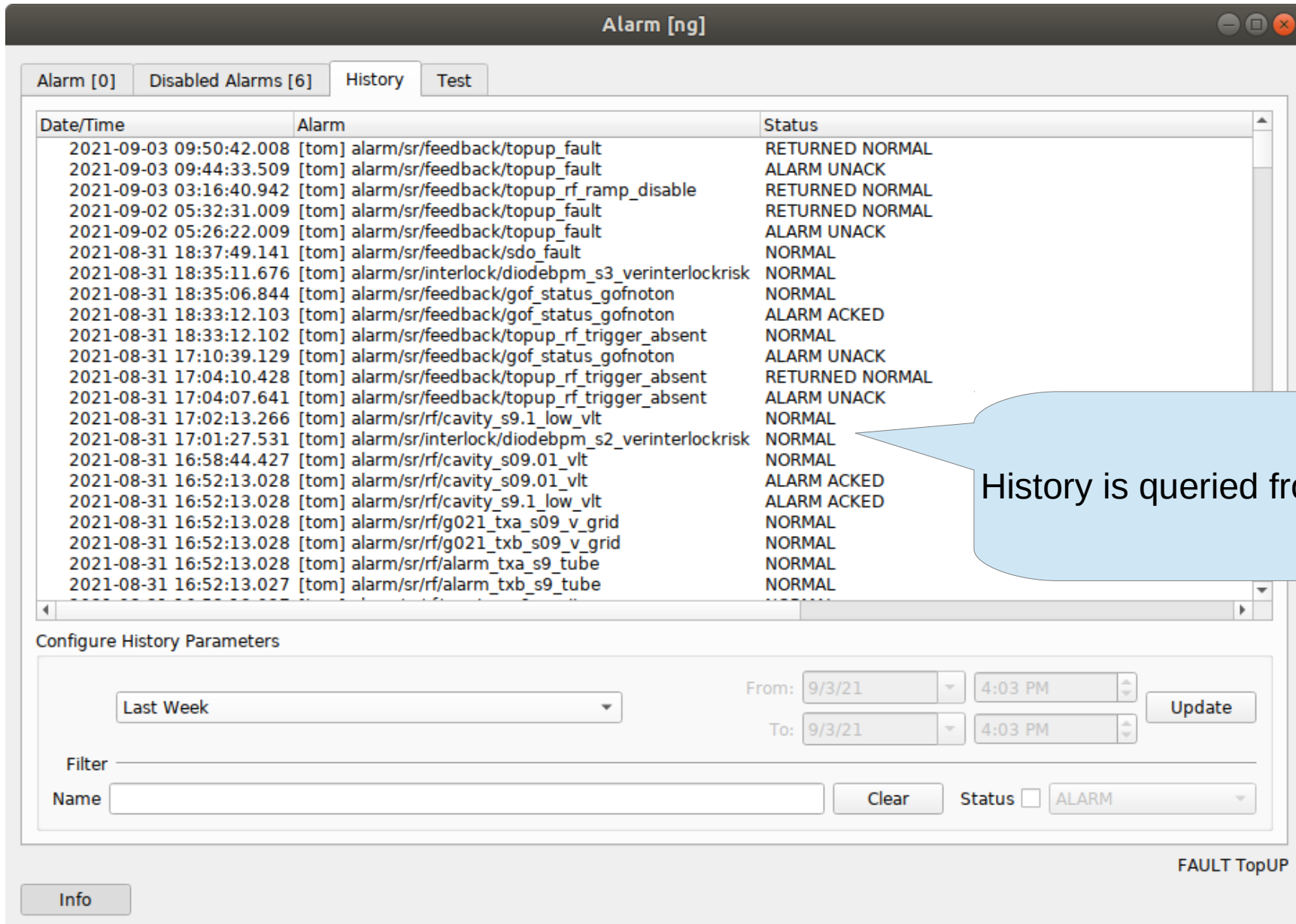
Field	Value
tag	psb1_b_fault
formula	(ecpsbsa2-1/power_supply/psb1_b/state == FAULT)
message	PS fault
priority	low
group	gr_ps
shlvd_time	-1
on_delay	15
off_delay	0
on_command	
off_command	
receivers	
enabled	<input checked="" type="checkbox"/>
handler	tango://tom.ecs.elettra.trieste.it:20000/alarm/booster/power_supply
url	http://elog/topic.asp?TOPIC_ID:5853
archiver	archiving/hdb++archiver2/alarm
strategy	ALWAYS

Buttons at the bottom: Load, Modify, AddArchiver, Remove, Enable remove

Configure archiving
of alarms from
AlarmManager GUI

AlarmHandler

Alarm-ng GUI



The screenshot shows the Alarm-ng GUI window titled "Alarm [ng]". It features a tabbed interface with "Alarm [0]", "Disabled Alarms [6]", "History", and "Test". The "History" tab is active, displaying a table of alarm events. Below the table is a "Configure History Parameters" section with a dropdown menu set to "Last Week", "From" and "To" time pickers both set to "9/3/21" at "4:03 PM", and a "Filter" section with a "Name" input field, a "Clear" button, a "Status" checkbox, and a dropdown menu set to "ALARM". An "Info" button is located at the bottom left, and "FAULT TopUP" is displayed at the bottom right.

Date/Time	Alarm	Status
2021-09-03 09:50:42.008	[tom] alarm/sr/feedback/topup_fault	RETURNED NORMAL
2021-09-03 09:44:33.509	[tom] alarm/sr/feedback/topup_fault	ALARM UNACK
2021-09-03 03:16:40.942	[tom] alarm/sr/feedback/topup_rf_ramp_disable	RETURNED NORMAL
2021-09-02 05:32:31.009	[tom] alarm/sr/feedback/topup_fault	RETURNED NORMAL
2021-09-02 05:26:22.009	[tom] alarm/sr/feedback/topup_fault	ALARM UNACK
2021-08-31 18:37:49.141	[tom] alarm/sr/feedback/sdo_fault	NORMAL
2021-08-31 18:35:11.676	[tom] alarm/sr/interlock/diodebpm_s3_verinterlockrisk	NORMAL
2021-08-31 18:35:06.844	[tom] alarm/sr/feedback/gof_status_gofnoton	NORMAL
2021-08-31 18:33:12.103	[tom] alarm/sr/feedback/gof_status_gofnoton	ALARM ACKED
2021-08-31 18:33:12.102	[tom] alarm/sr/feedback/topup_rf_trigger_absent	NORMAL
2021-08-31 17:10:39.129	[tom] alarm/sr/feedback/gof_status_gofnoton	ALARM UNACK
2021-08-31 17:04:10.428	[tom] alarm/sr/feedback/topup_rf_trigger_absent	RETURNED NORMAL
2021-08-31 17:04:07.641	[tom] alarm/sr/feedback/topup_rf_trigger_absent	ALARM UNACK
2021-08-31 17:02:13.266	[tom] alarm/sr/rf/cavity_s9.1_low_vlt	NORMAL
2021-08-31 17:01:27.531	[tom] alarm/sr/interlock/diodebpm_s2_verinterlockrisk	NORMAL
2021-08-31 16:58:44.427	[tom] alarm/sr/rf/cavity_s09.01_vlt	NORMAL
2021-08-31 16:52:13.028	[tom] alarm/sr/rf/cavity_s09.01_vlt	ALARM ACKED
2021-08-31 16:52:13.028	[tom] alarm/sr/rf/cavity_s9.1_low_vlt	ALARM ACKED
2021-08-31 16:52:13.028	[tom] alarm/sr/rf/g021_txa_s09_v_grid	NORMAL
2021-08-31 16:52:13.028	[tom] alarm/sr/rf/g021_txb_s09_v_grid	NORMAL
2021-08-31 16:52:13.028	[tom] alarm/sr/rf/alarm_txa_s9_tube	NORMAL
2021-08-31 16:52:13.027	[tom] alarm/sr/rf/alarm_txb_s9_tube	NORMAL

History is queried from HDB++

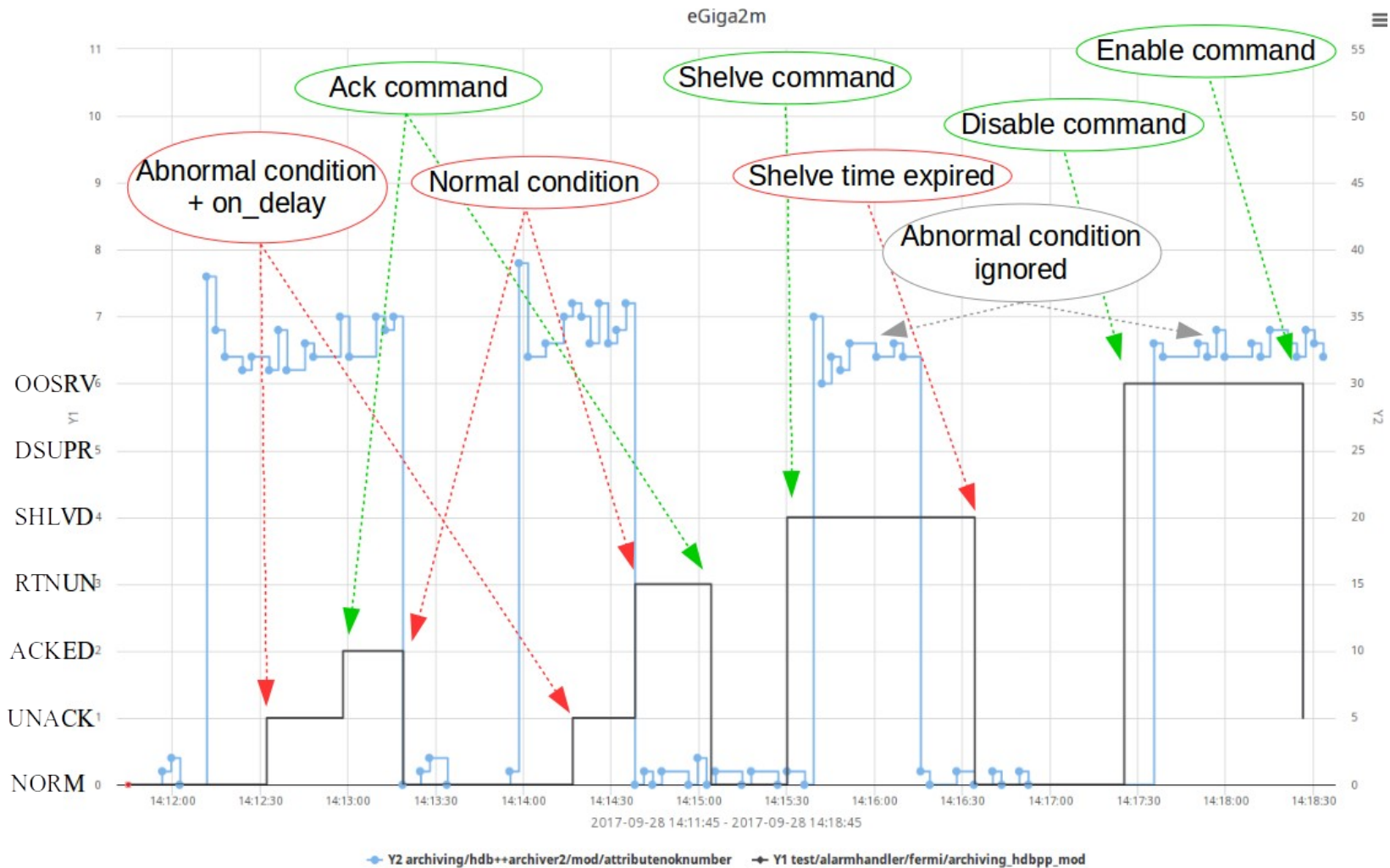


HDB++ - AlarmHandler



Correlate alarm state and attribute values with Egiga

tag=archiving_hdbb_mod;formula=(archiving/hdb++archiver/attributenoknumber > 0);on_delay=20



DevEnum support

- Numeric value is stored in att_scalar_devenum_ro
- Enum label value is stored in att_parameter only when it changes

```
CREATE TABLE `att_scalar_devenum_ro` (  
  `att_conf_id` int(10) unsigned NOT NULL,  
  `data_time` datetime(6) NOT NULL,  
  `recv_time` datetime(6) NOT NULL,  
  `value_r` smallint(6) DEFAULT NULL,  
  `quality` tinyint(1) DEFAULT NULL,  
  `att_error_desc_id` int(10) unsigned DEFAULT NULL,  
  PRIMARY KEY (`att_conf_id`, `data_time`)  
);
```

DevEnum support

- Numeric value is stored in att_scalar_devenum_ro
- Enum label value is stored in att_parameter only when it changes

```
CREATE TABLE `att_parameter` (  
  `att_conf_id` int(10) unsigned NOT NULL,  
  `recv_time` datetime(6) NOT NULL,  
  `label` varchar(255) NOT NULL DEFAULT '',  
  `unit` varchar(64) NOT NULL DEFAULT '',  
  `standard_unit` varchar(64) NOT NULL DEFAULT '1',  
  `display_unit` varchar(64) NOT NULL DEFAULT '',  
  `format` varchar(64) NOT NULL DEFAULT '',  
  `archive_rel_change` varchar(64) NOT NULL DEFAULT '',  
  `archive_abs_change` varchar(64) NOT NULL DEFAULT '',  
  `archive_period` varchar(64) NOT NULL DEFAULT '',  
  `description` varchar(1024) NOT NULL DEFAULT '',  
  `enum_labels` json NOT NULL,  
  PRIMARY KEY (`att_conf_id`, `recv_time`)  
);
```

HDB++ - AlarmHandler

DevEnum support

- Not possible to address JSON array element from a column value in MySql 5.7
- Egiga joins the two queries at application level
- alarm-ng-gui hardcodes labels in the query:

```
SELECT asd.data_time AS 'Date/Time', ac.att_name AS 'Alarm',  
COALESCE(  
  REPLACE(REPLACE(REPLACE(REPLACE(REPLACE(REPLACE(amd.value_r  
    , '0', 'NORMAL')  
    , '1', 'ALARM UNACK')  
    , '2', 'ALARM ACKED')  
    , '3', 'RETURNED NORMAL')  
    , '4', 'SHELVED')  
    , '6', 'DISABLED'), aed.error_desc) AS 'Status'  
FROM hdbpp.att_scalar_devenum_ro amd JOIN hdbpp.att_conf ac  
  ON amd.att_conf_id=ac.att_conf_id LEFT OUTER JOIN  
  att_error_desc aed  
  ON aed.att_error_desc_id=amd.att_error_desc_id  
WHERE ac.att_name in (SELECT att_name FROM hdbpp.att_conf  
WHERE att_name LIKE '%alarm/test/demo/%' ) AND  
  DATE(amd.data_time) > DATE_SUB(CURRENT_DATE(), INTERVAL 1  
  DAY) ORDER BY amd.data_time DESC;
```



HDB++ - AlarmHandler

Archiving of alarms on archiver status



The screenshot shows the 'Alarmmanager' application window. On the left, a tree view under 'Alarm' shows a hierarchy: 'alarm' > 'ecs' > 'archiving' > 'hdbppes_3hc_attributenoknumber'. The main area is titled 'Edit alarms' and contains the following configuration fields:

- tag: hdbppes_3hc_attributenoknumber
- formula: (archiving/hdb++archiver2/3hc/attributenoknumber>0)
- message: Errore archiviazione di almeno un attributo
- priority: high
- group: gr_scw
- shlvd_time: -1
- on_delay: 120
- off_delay: 0
- on_command: alarm/notify/email_ecs/sendalarmhdb
- off_command: alarm/notify/email_ecs/sendnormal
- receivers: (empty)
- enabled
- handler: tango://tom.ecs.elettra.trieste.it:20000/alarm/ecs/archiving
- url: (empty)
- archiver: archiving/hdb++archiver2/alarm
- strategy: ALWAYS

At the bottom, there are buttons for 'Load', 'Modify', 'AddArchiver', 'Remove', and a checkbox for 'Enable remove'. A search bar is located at the bottom left.

Configure alarms on hdb++es archiver status

Archive (with a different) hdb++es archiver

Questions ?