

AlarmHandler

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What's new

- Deployed in Elettra and Fermi control systems. All legacy alarms migrated to the new system
- alarm-manager device developed
- new GUI developed
- Bugs fixed
- Moved to Elettra gitlab:
<https://gitlab.elettra.eu/cs/ds/alarm-handler>
- Moved to cmake build system
- Added build and functional tests in gitlab CI pipeline

Deployment in Elettra and Fermi

- Migration from legacy alarm system
 - 2 legacy alarm devices in Elettra and 1 in Fermi
 - Legacy alarm names: domain/family/member/name
 - alarm-handler alarms are attributes, device name is part of alarm name
- Ex. *ecpsbsa2-1/power_supply/psb1_b/fault* converted to
device=*alarm/booster/power_supply*, alarm=*psb1_b_fault*

ELETTRA

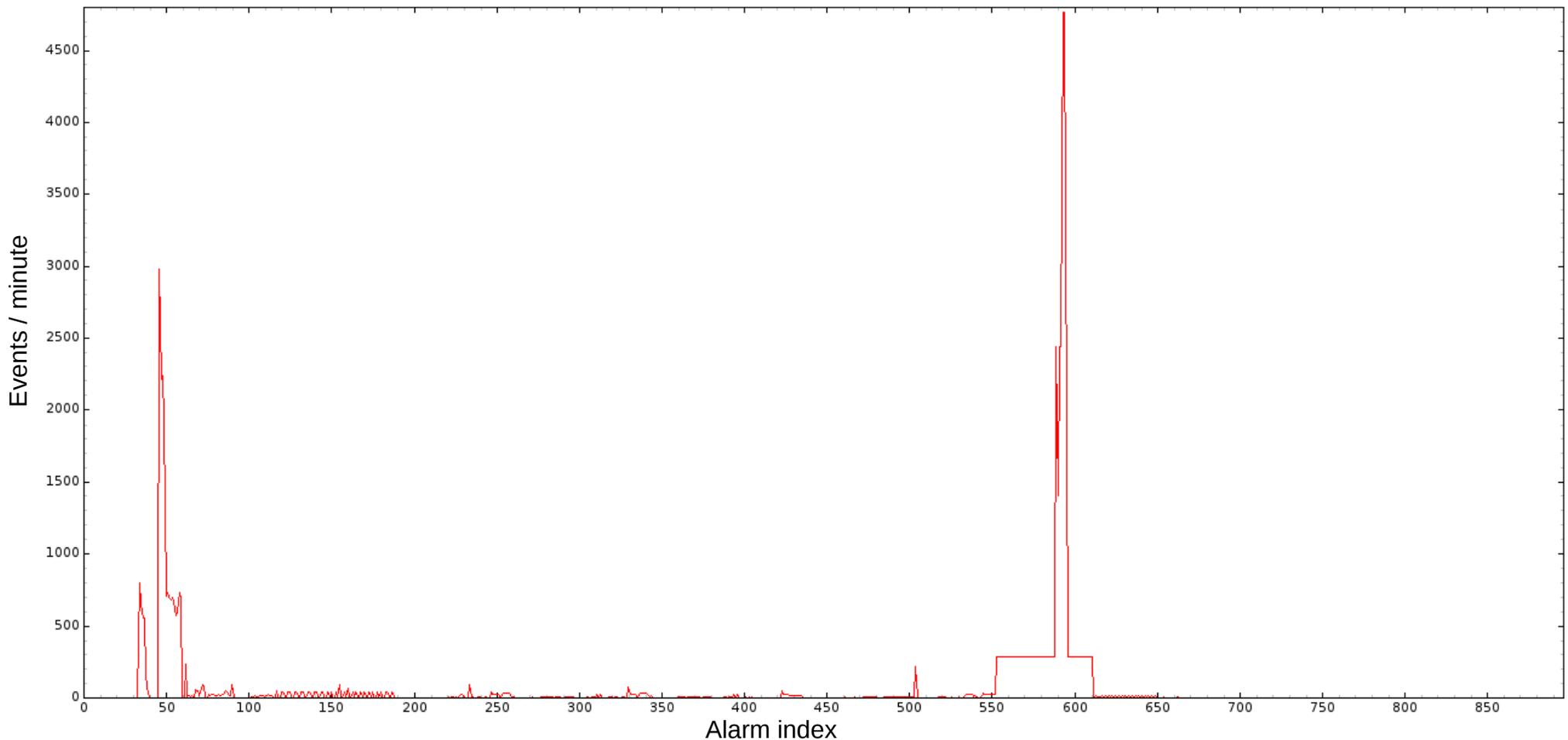
- **26** alarm-handler devices
- **1224** alarm rules managed by Control Room GUI
- **7** alarm rules sending only email notifications

FERMI

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

Deployment in Elettra and Fermi

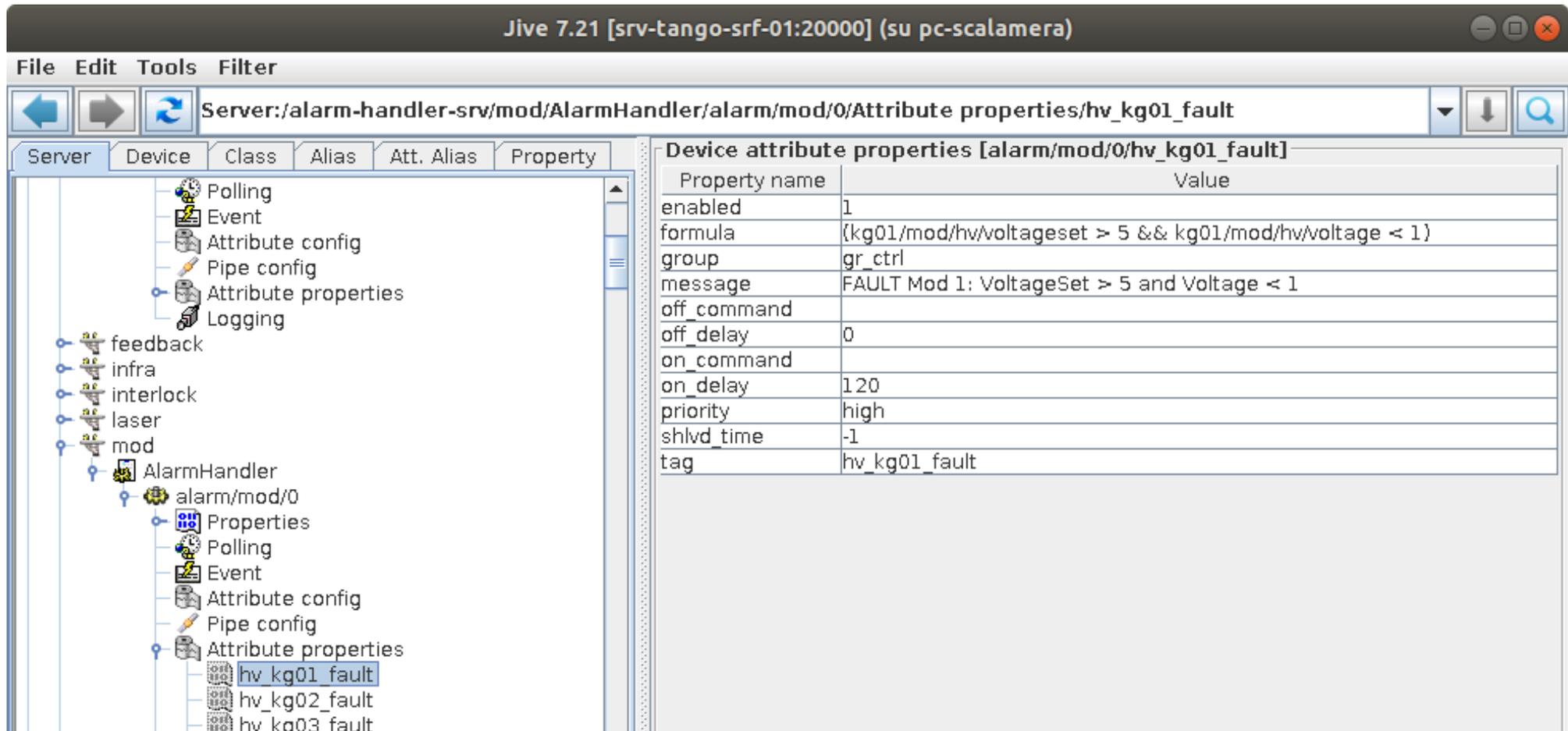
- Fermi: around 60000 formula evaluated per minute
- Elettra: around 23000 formula evaluated per minute





alarms are configured in attribute properties

- One property per alarm property
- Can be modified offline
- ReLoadAll command (or restart/init of the device) to be reloaded
- Online loading/modification through Load/Modify commands



The screenshot shows the Jive 7.21 interface for configuring an alarm property. The window title is "Jive 7.21 [srv-tango-srf-01:20000] (su pc-scalamera)". The main window displays the configuration for the "hv_kg01_fault" property under the path "Server:/alarm-handler-srv/mod/AlarmHandler/alarm/mod/0/Attribute properties/hv_kg01_fault".

The left pane shows a tree view of the configuration structure, with "hv_kg01_fault" selected under "Attribute properties".

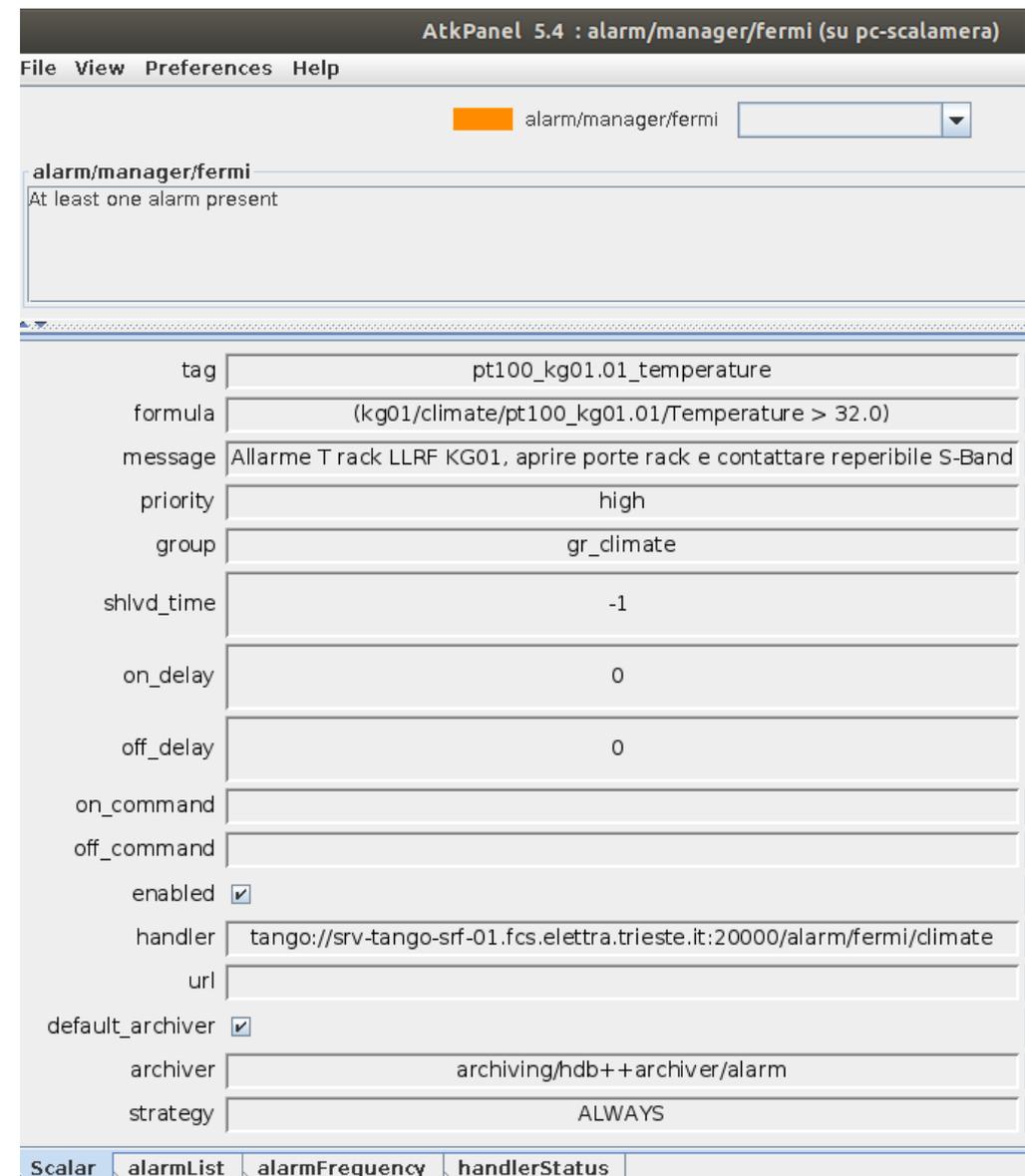
The right pane displays the "Device attribute properties [alarm/mod/0/hv_kg01_fault]" table:

| Property name | Value |
|---------------|---|
| enabled | 1 |
| formula | {kg01/mod/hv/voltageset > 5 && kg01/mod/hv/voltage < 1} |
| group | gr_ctrl |
| message | FAULT Mod 1: VoltageSet > 5 and Voltage < 1 |
| off_command | |
| off_delay | 0 |
| on_command | |
| on_delay | 120 |
| priority | high |
| shlvd_time | -1 |
| tag | hv_kg01_fault |

AlarmManager

Purpose:

- Collect state/statistics from several AlarmHandlers
- Simplify configuration:
 - Allows to browse and configure alarm properties as attributes
 - Makes it possible to move an alarm from one handler device to another
 - Makes it possible to configure archiving in HDB++



| | |
|------------------|--|
| tag | pt100_kg01.01_temperature |
| formula | (kg01/climate/pt100_kg01.01/Temperature > 32.0) |
| message | Allarme T rack LLRF KG01, aprire porte rack e contattare reperibile S-Band |
| priority | high |
| group | gr_climate |
| shlvd_time | -1 |
| on_delay | 0 |
| off_delay | 0 |
| on_command | |
| off_command | |
| enabled | <input checked="" type="checkbox"/> |
| handler | tango://srv-tango-srf-01.fcs.elettra.trieste.it:20000/alarm/fermi/climate |
| url | |
| default_archiver | <input checked="" type="checkbox"/> |
| archiver | archiving/hdb++archiver/alarm |
| strategy | ALWAYS |

AlarmHandler

Alarm-ng GUI

- QT interface based on Cumbia libraries
- Takes the list of alarm-handler devices from Tango free properties
- Displays active alarms, disabled alarms, alarm history
- Displays detailed information (configuration, current attribute values and statistics) of active alarms
- Notifies and displays communication errors toward alarm-handlers as alarms

AlarmHandler

Alarm-ng GUI

Alarm [ng]

Alarm [0] Disabled Alarms [6] History Test

| Date/Time | Alarm | Status | Ack | Level | Sil. min. | Device | Message |
|--------------------------|------------------------|--------|------|--------|-----------|-----------------------|-----------------------------------|
| Fri Aug 27 15:28:28 2021 | 3hc cold box valve | ALARM | ACK | high | -1 | alarm/sr/3hc | 3HC: cold box valve aperture < 5. |
| Fri Aug 27 15:28:28 2021 | 3hc lcv705_closed | ALARM | ACK | high | -1 | alarm/sr/3hc | 3HC: valvola LCV705 chiusa. |
| Fri Aug 27 15:28:28 2021 | hel3hc_s11_turb1_fault | ALARM | ACK | high | -1 | alarm/sr/3hc | helial 3hc: helial turbine fault. |
| Fri Aug 27 15:28:28 2021 | hel3hc_s11_turb2_fault | ALARM | ACK | high | -1 | alarm/sr/3hc | helial 3hc: helial turbine fault. |
| Fri Aug 27 15:27:59 2021 | pscew_s4_ps_fault | ALARM | ACK | low | -1 | alarm/sr/power_supply | alimentatore bobine correzione |
| Fri Sep 3 09:50:42 2021 | topup_fault | NORMAL | NACK | lowest | -1 | alarm/sr/feedback | FAULT TopUP |
| Fri Sep 3 03:16:40 2021 | topup_rf_ramp_disable | NORMAL | NACK | lowest | 0 | alarm/sr/feedback | TopUp ON but RF ramp disabled |

tag 3hc_cold_box_valve
state ACKED
message "3HC: cold box valve aperture < 5."
url
formula (sr/devmapper/3hc/lcv705 < 5)
values sr/devmapper/3hc/lcv705: 0
quality ATTR_VALID
enabled 1
shelved 0
ack 1
audible 0
counter 157
freq_counter 45
on_delay 0
off_delay 0
priority high
shlvd_time -1
shlvd_end -1
group gr_3hc
on_command

3HC: cold box valve aperture < 5.

Info Stop Beep Acknowledge All

Different colors for different priorities

Collects alarms from many handler devices

Detailed information and current attribute values

AlarmHandler

Alarm-ng GUI

Alarm [ng]

Alarm [0] Disabled Alarms [4] History Test

| Date/Time | Alarm | Status | Ack | Level | Sil. min. | Device | Message |
|-------------------------|------------------------------|--------|------|--------|-----------|--------------------------|--------------------------------------|
| Fri Sep 3 10:36:16 2021 | vgsrg_pfe_f01.01_alarm | ALARM | ACK | high | 0 | alarm/fermi/vacuum | Pressione troppo alta su I0 monit... |
| Thu Sep 2 15:04:33 2021 | linkstabilizer_kgsp.01_fault | ALARM | ACK | high | -1 | alarm/fermi/timing | Mod Spare: LinkStabilizer FAULT |
| Thu Sep 2 15:04:26 2021 | fvlv_mbd_fel01.01_closed | ALARM | ACK | high | -1 | alarm/fermi/vacuum | FAST VALVE is not open |
| Thu Sep 2 15:04:26 2021 | fvlv_mbd_fel02.01_closed | ALARM | ACK | high | -1 | alarm/fermi/vacuum | FAST VALVE is not open |
| Thu Sep 2 15:04:09 2021 | pstrmcw_fel01.02_fault | ALARM | ACK | high | -1 | alarm/fermi/power_supply | PS fault |
| Thu Sep 2 15:03:52 2021 | pdu_rc_kg03_01_temperature | ERROR | ACK | high | 0 | alarm/fermi/pdu | Event exception for'kg/pdu/pdu-r... |
| Fri Sep 3 15:56:26 2021 | mscr_f_alarm | NORMAL | NACK | medium | -1 | alarm/fermi/diagnostics | Maximum number of camera rea... |

| | |
|--------------|---|
| tag | pdu_rc_kg03_01_temperature |
| state | ERROR |
| message | "Temperature out of range" |
| url | |
| formula | ((kg/pdu/pdu-rc-kg03-01/temperature < 20.0 kg/pdu/pdu-rc-kg03-01/temperature > 29.0) && kg/pdu/pdu-rc-kg03-01/temperature>0 && 0) |
| values | Desc: "Event exception for'kg/pdu/pdu-rc-kg03-01/temperature' error=cannot extract, no data in DeviceAttribute object " Origin: "FORCED_EVAL" Reason: "FORMULA_ERROR" |
| quality | ATTR_INVALID |
| enabled | 1 |
| shelved | 0 |
| ack | 1 |
| audible | 0 |
| counter | 0 |
| freq_counter | 0 |
| on_delay | 600 |
| off_delay | 0 |
| priority | high |
| shlvd_time | 60 |
| shlvd_end | 0 |
| group | gr_climate |
| on_command | |
| off_command | |

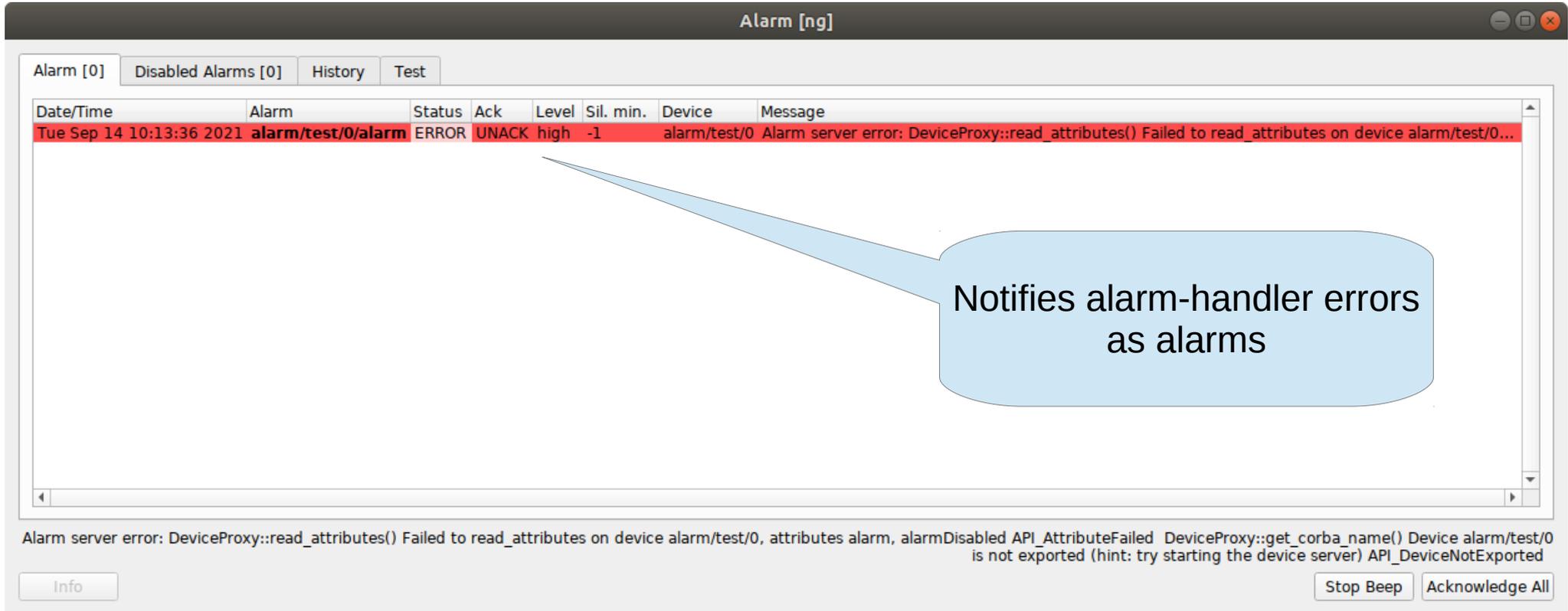
FAST VALVE is not open
Stop Beep Acknowledge All

Notifies Tango Errors as alarms

Tango Exception displayed in the values field

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 [0]", "History", and "Test". The "Alarm [0]" tab is active, displaying a table with the following data:

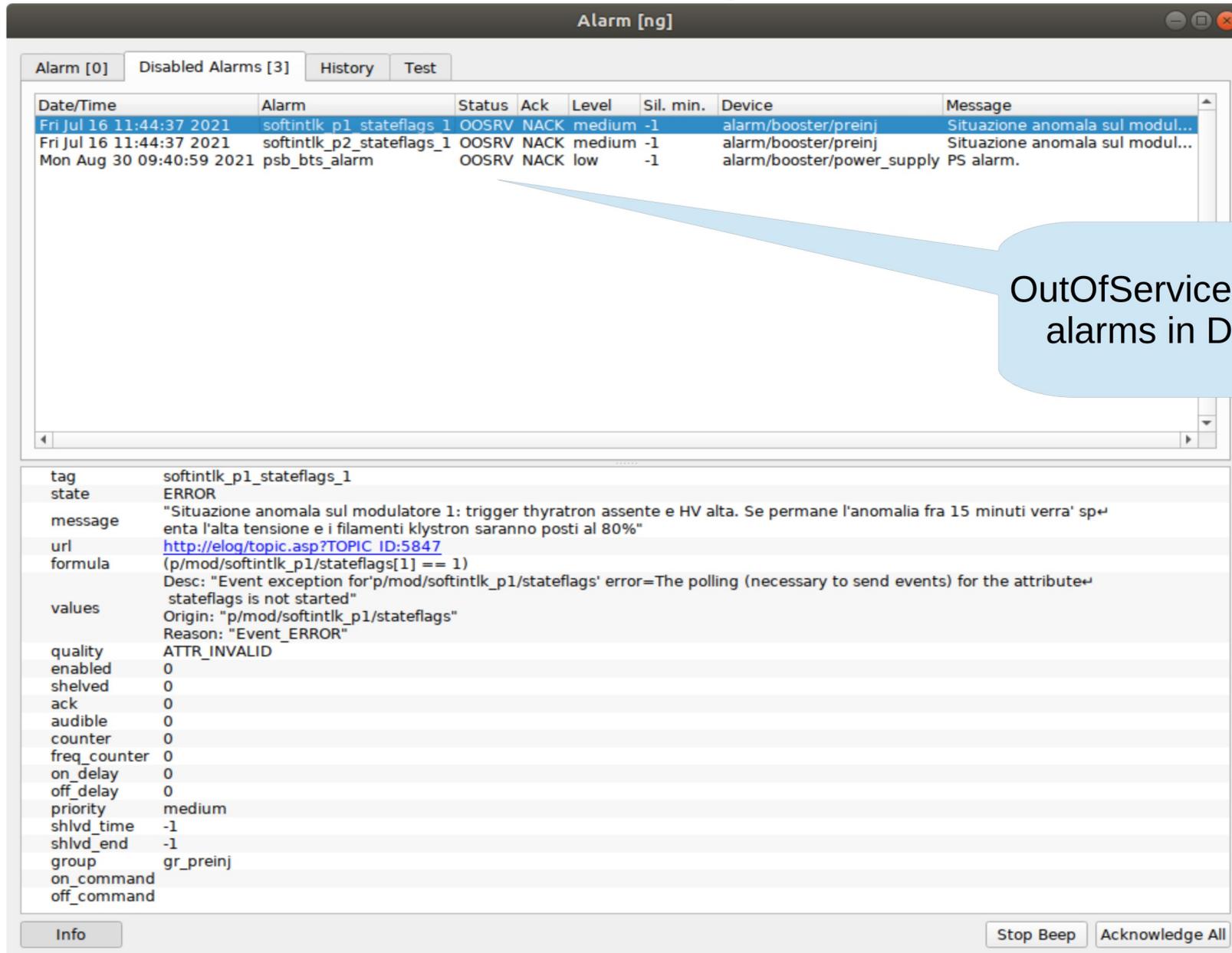
| Date/Time | Alarm | Status | Ack | Level | Sil. min. | Device | Message |
|--------------------------|--------------------|--------|-------|-------|-----------|--------------|--|
| Tue Sep 14 10:13:36 2021 | alarm/test/0/alarm | ERROR | UNACK | high | -1 | alarm/test/0 | Alarm server error: DeviceProxy::read_attributes() Failed to read_attributes on device alarm/test/0... |

A blue callout box points to the error message in the table, containing the text: "Notifies alarm-handler errors as alarms".

At the bottom of the window, there is a detailed error message: "Alarm server error: DeviceProxy::read_attributes() Failed to read_attributes on device alarm/test/0, attributes alarm, alarmDisabled API_AttributeFailed DeviceProxy::get_corba_name() Device alarm/test/0 is not exported (hint: try starting the device server) API_DeviceNotExported". Below this message are buttons for "Info", "Stop Beep", and "Acknowledge All".

AlarmHandler

Alarm-ng GUI



The screenshot shows the AlarmHandler Alarm-ng GUI. At the top, there are tabs for 'Alarm [0]', 'Disabled Alarms [3]', 'History', and 'Test'. The 'Alarm [0]' tab is active, displaying a table of active alarms. Below the table, there is a detailed view of a selected alarm.

| Date/Time | Alarm | Status | Ack | Level | Sil. min. | Device | Message |
|--------------------------|---------------------------|--------|------|--------|-----------|----------------------------|---------------------------------|
| Fri Jul 16 11:44:37 2021 | softintlk_p1_stateflags_1 | OOSRV | NACK | medium | -1 | alarm/booster/preinj | Situazione anomala sul modul... |
| Fri Jul 16 11:44:37 2021 | softintlk_p2_stateflags_1 | OOSRV | NACK | medium | -1 | alarm/booster/preinj | Situazione anomala sul modul... |
| Mon Aug 30 09:40:59 2021 | psb_bts_alarm | OOSRV | NACK | low | -1 | alarm/booster/power_supply | PS alarm. |

| | |
|--------------|---|
| tag | softintlk_p1_stateflags_1 |
| state | ERROR |
| message | "Situazione anomala sul modulatore 1: trigger thyatron assente e HV alta. Se permane l'anomalia fra 15 minuti verra' sp... |
| url | http://elog/topic.asp?TOPIC_ID:5847 |
| formula | (p/mod/softintlk_p1/stateflags[1] == 1) Desc: "Event exception for 'p/mod/softintlk_p1/stateflags' error=The polling (necessary to send events) for the attribute... |
| values | Origin: "p/mod/softintlk_p1/stateflags" Reason: "Event_ERROR" |
| quality | ATTR_INVALID |
| enabled | 0 |
| shelved | 0 |
| ack | 0 |
| audible | 0 |
| counter | 0 |
| freq_counter | 0 |
| on_delay | 0 |
| off_delay | 0 |
| priority | medium |
| shlvd_time | -1 |
| shlvd_end | -1 |
| group | gr_preinj |
| on_command | |
| off_command | |

At the bottom of the GUI, there are buttons for 'Info', 'Stop Beep', and 'Acknowledge All'.

OutOfService and Shelved
alarms in Disabled tab

AlarmHandler

Alarm-ng GUI

Alarm [ng]
⏪ ⏩ ✖

Alarm [0]
Disabled Alarms [6]
History
Test

| 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 |

Configure History Parameters

Last Week ▼

Filter

Name

From:

To:

Status

FAULT TopUP

History is queried from HDB++

AlarmHandler Gitlab CI

Docker images from SKA

Build stage:
Build alarm handler and
test device using CMake

Test stage:
- runs Tango DB
- configures devices with
Dsconfig
- runs devices
- performs tests with
PyTango scripts

```
image:
  name: nexus.engageska-portugal.pt/ska-docker/tango-dsconfig

stages:
  - build
  - test

build_job:
  stage: build
  script:
    - mkdir build && cd build
    - cmake -DBUILD_TESTS=ON ..
    - make
  artifacts:
    paths:
      - build/alarm-handler-srv
      - build/bin/testdevice-srv
    expire_in: 1 week

test_load_job:
  stage: test
  script:
    - sleep 10
    - /usr/local/bin/DataBasesd 2 -ORBEndPoint giop:tcp::10000 &
    - sleep 10
    - exit_code=2
    - json2tango -w -a -u ./test/ah_config.json || exit_code=$?
    - if [ ${exit_code} -ne 2 ]; then echo "Tango DB configuration failed!" ; else echo "Tang
    - ./build/alarm-handler-srv 01 &
    - ./build/bin/testdevice-srv 01 &
    - sleep 5
    - python ./test/load-alarm-conf.py --device=alarm/handler/01 --load="tag=test0;formula=(a
    - sleep 1
    - python ./test/check-alarm-conf.py --device=alarm/handler/01 --alarm="tag=test0;formula=
  needs: ["build_job"]
  services:
    - name: nexus.engageska-portugal.pt/ska-docker/tango-db
      alias: tangodb
```

Gitlab CI considerations

- Gitlab runner installed in Docker and Docker executor used
- At the moment the only possible link between stages are artifacts (build results)
- No memory between stages (Docker restarted)
- Tango DB not persistent, unless mounting external volumes
- Need to prepare complete setup at each test stage
- There are requests from the gitlab community to run different stages in the same docker if the same image is used
 - but discussions ongoing since almost 4 years (issues #17497, #118599, ...) :-)
- Publish our own dockers to avoid building with missing dependencies at each test
 - desiderata

AlarmHandler

What's next

- GUI: right click launches specific GUIs for the attributes in the formula, if it exists, otherwise it launches ATKPanel
- GUI: develop a GUI for alarm-manager
- Alarm-manager: add to HDB++ every attribute in the formula when loading new alarm
- PANIC: to have alarm-handler in PANIC, some issues to be solved, to display PyAlarm with alarm-ng GUI some work needed (full support of alarmSummary attribute, etc.)

Questions ?