

Best Ever Alarm System Toolkit

Kay Kasemir,

Xihui Chen,

Katia Danilova,

SNS/ORNL

kasemirk@ornl.gov

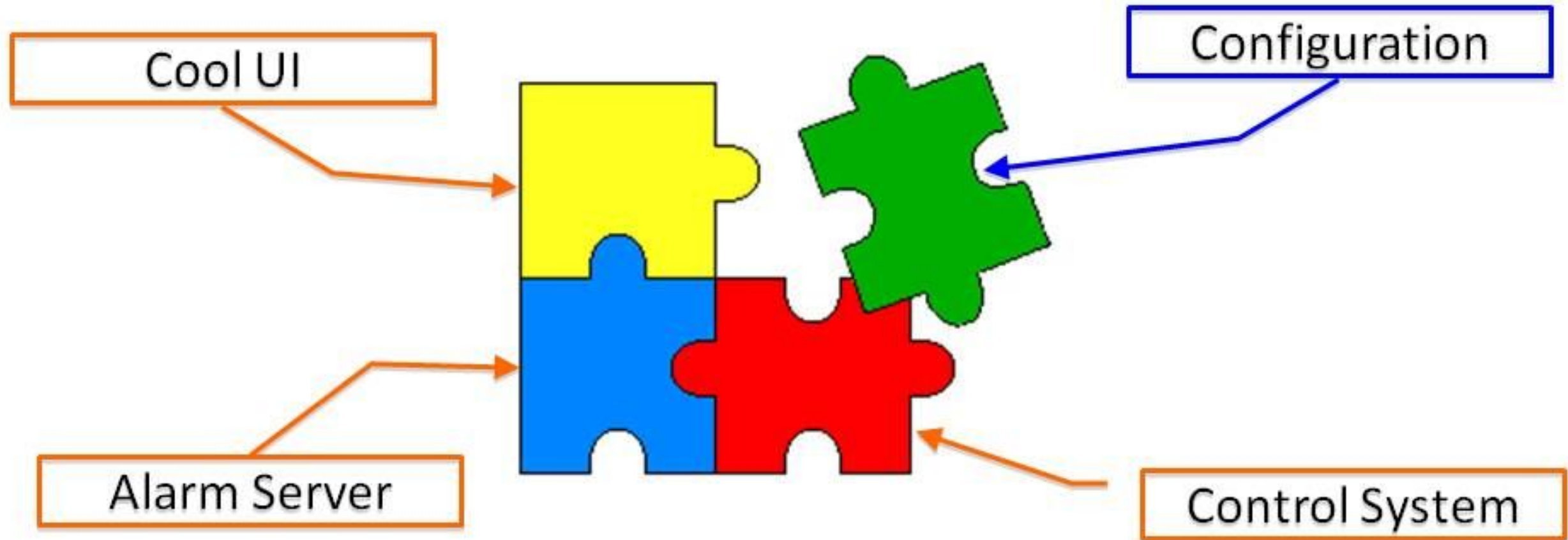
ICALEPCS 2009,

Kobe, Japan,

Oct 2009

The word "BEAST" is written in a large, bold, red font with a yellow outline and a slight 3D effect. The letters are slightly slanted and have a textured, brush-like appearance.

Alarm System Components

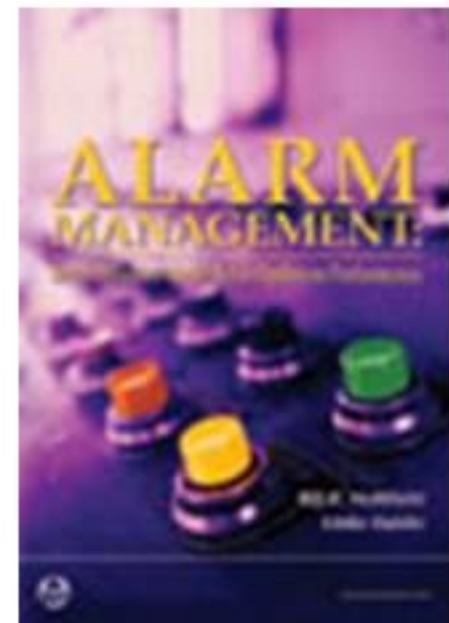


This talk: Alarm System Technology

See also:

"Alarms Philosophy", Karen White (this conference)

B. Hollifield, E. Habibi, "Alarm Management: Seven Effective Methods for Optimum Performance", ISA, 2007



Previous Attempts at SNS, Inspiration

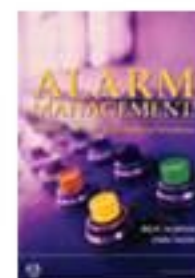
EPICS “ALH”, Generated soft-IOCs and EDM screens

- Old technology
- Static UI layout
- N clicks to see (some of the) active alarms
- **Configuration** changes were hard (so config. was left in bad shape)

DESY Alarm System

Matthias Clausen, “Alarm Management System”, PCaPAC, Oct 2008, Slovenia and “Managing Alarms ... the CSS Way”, this conference

- ✓ Modern technology, linked into Control System Studio
- Different infrastructure: LDAP vs. RDB
- How does a PV turn into an alarm?



Ideas from “Alarm Management: ...” book

- Need multiple views of alarms
- Alarms must have guidance, links to related displays
- Need tools to monitor alarm rate, stale alarms, ...
to continually improve **configuration**

New End-User View: Alarm Table

Acknowledge one or multiple alarms

- Select by PV or description
- BNL/RHIC type un-ack'

Sort by column

All current alarms

- active
- ack'ed

Optional: Voice Annunciation



Current Alarms						
PV	Description	Time	Current Seve	Severity ▲	Status	Value
ICS_MPS:FPAR_CCL_BS:FP: *	mps fault	2009/04/15 16:22:50	MAJOR	MAJOR	LINK_ALARM	0
CF_KL:DIWS_AIT4306B:Rs	Check polishing loop resistivity for KL4	2009/04/15 15:50:58	OK	MINOR	HIGH_ALAR	2.5

Acknowledged Alarms						
PV	Description	Time	Current Seve	Severity ▲	Status	Value
TMod.Summary_MPS:Alarm	Moderator System MPS Trip or PLC	2009/04/13 08:19:02	INVALID	invalid-ack'ed	READ_ALARM	Ready
HEBT_Coll:CT2:Cond	Hebbit collimator outlet flow conduct	2009/04/13 08:19:02	MAJOR	inaprack'ed	LOLO_ALARM	0.016

Another View: Alarm Tree

See complete configuration

- Active, ack'ed, inactive, disabled

Hierarchical

- Optionally only show active alarms
- Ack'/Un-ack' PVs or sub-tree

Users choose to display table and/or tree

The screenshot displays a software window titled "Alarm Tree". The interface shows a hierarchical tree of alarm categories and specific points. The tree is organized as follows:

- Area: BeamPermit (MAJOR/MAJOR/LINK_ALARM)
 - System: MPS FPAR fault (MAJOR/MAJOR/LINK_ALARM)
 - System: MPS FPL fault (OK/OK/OK)
 - PV: FE_MPS:MIOC1A:status_sum
 - PV: ICS_Tim:Gate_BeamOn:Switch
- Area: CF (OK/MINOR/HIGH_ALARM)
 - System: Cooling_Tower (OK/OK/OK)
 - System: Ksystem_Gallery_Temp (OK/MINOR/HIGH_ALARM)
 - PV: CF_KL:AHU_MT2153B:M (OK/OK/OK)
 - PV: CF_KL:AHU_TT2150A:T (OK/OK/OK)
 - PV: CF_KL:AHU_TT2151A:T (OK/OK/OK)
 - PV: CF_KL:AHU_TT2152A:T (OK/OK/OK)
 - PV: CF_KL:AHU_TT2153A:T (OK/OK/OK)
 - PV: CF_KL:AHU_TT2154A:T (OK/OK/OK)
 - PV: CF_KL:DIWS_AIT4300A:Rs (OK/OK/OK)
 - PV: CF_KL:DIWS_AIT4300B:Rs (OK/OK/OK)
 - PV: CF_KL:DIWS_AIT4302A:Rs (OK/OK/OK)
 - PV: CF_KL:DIWS_AIT4302B:Rs (OK/OK/OK)
 - PV: CF_KL:DIWS_AIT4303A:Rs (OK/OK/OK)
 - PV: CF_KL:DIWS_AIT4303B:Rs (OK/OK/Disabled)
 - PV: CF_KL:DIWS_AIT4306A:Rs (OK/OK/OK)
 - PV: CF_KL:DIWS_AIT4306B:Rs (OK/MINOR/HIGH_ALARM)**
 - PV: CF_KL:DIWS_PT4303B:suction (OK/OK/OK)
 - PV: CF_KL:DIWS_PT4303C:disch (OK/OK/OK)
 - PV: CF_KL:DIWS_TT4300A:T (OK/OK/OK)
 - PV: CF_KL:DIWS_TT4302A:T (OK/OK/OK)
 - PV: CF_KL:DIWS_TT4303A:T (OK/OK/OK)
 - PV: CF_KL:DIWS_TT4306A:T (OK/OK/OK)
 - PV: CF_KL:PKL02VFDB_SFlow:Sts (OK/OK/OK)
 - System: Potable_Water_Tank (OK/OK/OK)
 - System: Site_Power_Other_UPS (OK/OK/OK)
- Area: Diagnostic s (OK/OK/OK)
- Area: HP_Mod_Smoke (OK/OK/OK)
- Area: HP_Mod_V_Mon (OK/OK/OK)

The status of each alarm is indicated by a colored circle: red for MAJOR, yellow for MINOR, and green for OK. The selected alarm, "PV: CF_KL:DIWS_AIT4306B:Rs", is highlighted in yellow.

At the bottom of the window, there is a status bar that reads "Not logged in" and a small icon.

Guidance, Related Displays

Alarm Tree Properties

- Area: BeamPermit (OK/OK/OK)
- Area: CF (OK/MINOR/HIGH_ALARM)
 - System: Cooling_Tower (OK/OK/OK)
 - System: Cooling Tower Fans (OK/OK/OK)
 - System: Cooling_Tower_Pumps (OK/OK/OK)
 - PV: CF_CU:TWR2_TW_Trouble:Sts (OK/OK/OK)
 - PV: CF_CU:TWR_FT4017:Flw (OK/OK/OK) **Look at Cooling Tower Overview...**
 - PV: CF_CU:TWR_TT4016:T (OK/OK/OK) **Check tower water pump**
 - PV: CF_CU:TWR_TT4017:T (OK/OK/OK)
 - PV: CF_CU:TWR_TT4018:T (OK/OK/OK)
 - System: Klystron_Gallery_Temp (OK/OK/OK)
 - System: Potable_Water_Tank (OK/OK/OK)
 - System: Site_Power_Other_UPS (OK/OK/OK)
- Area: Diagnostics (OK/OK/OK)
- Area: HP_Mod_Smoke (OK/OK/OK)
- Area: HP_Mod_V_Mon (OK/OK/OK)
- Area: HPRF_PLC_Check (OK/OK/OK)
- Area: HPRF_Rack_Sts (OK/OK/OK)
- Area: ICS (OK/OK/OK)
- Area: MPS (OK/OK/OK)
- Area: PPS (OK/OK/OK)
- Area: Timing (OK/OK/OK)
- Area: Tunnels (OK/OK/OK)
- Area: Water_Pump (OK/OK/OK)
- Area: IonSource (OK/OK/OK)

Context Menu:

- Look at Cooling Tower Overview...
- Check tower water pump**
- CF Overview
- Cooling Tower Overview Screen
- Cooling Tower Water Pumps Scre...
- Tower Water Pump Screen
- Rationalization
- Configure Item
- Rename Item
- Duplicate P...
- Move item
- Remove selected items

Alarm PV: CF_CU:TWR2_TW_Trouble:Sts

Purpose of Alarm

Indicates insufficient tower water problem, either flow or elevated temperature or pump failure. Flow (5000gpm) and temperature limits are fixed in the PLC. For changes see contacts listed below.

Operator Guidance

Look at tower water pump screen. There should be 3 pumps running. If not, attempt turn-on via operator screen. If that fails, turn them on manually at CUB. If all fails, call contacts listed below.

Failure Consequence

MAJOR consequence: Beam will be off for 12 hours, cold box will trip, ...
TODO: List the top 3 critical items and response times in each case to avoid shutdown.

Operator Response Time Available

Usually less than 5 minutes in order to prevent further temperature increase.
TODO: Response time depends on beam power. How should this be factored into response?

Contacts

Water System Mechanical Engineers: Greg Iby, Jerry Ferguson Control System Contact: Frank Brantley

Check tower water pump

Look at tower water pump screen. Three pumps should be running. If not, attempt to turn on via operator screen. If that fails, turn them on manually at CUB.

OK

- ✓ View Guidance Texts
- ✓ Start related displays (EDM)
- ✓ Open Web pages
- ✓ Run ext. commands

Hierarchical:
Including info of parent entries

Merges Guidance etc. from all selected alarms

CSS Integration: Alarm → Data Browser

1. Context menu: Alarm Duration, Guidance, Displays, ...
2. Select Data Browser for PV in alarm
3. View history, annotate

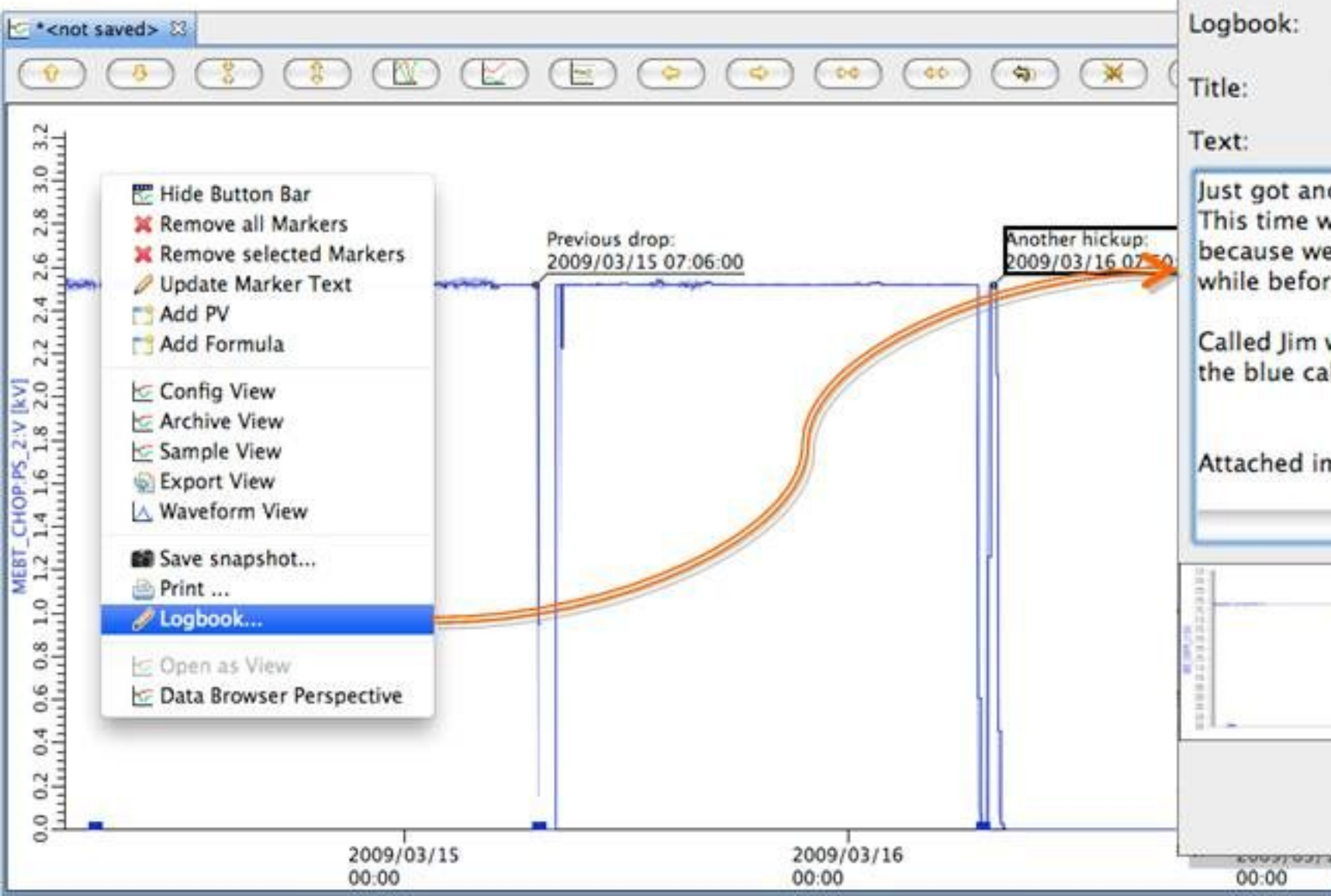
The screenshot displays a control room interface with three main components:

- Alarm Tree (Left):** A hierarchical list of areas and processes. The 'Area: MEBT (MAJOR/MAJOR/LOLO_ALARM)' is highlighted in red. Below it, 'PV: Rfq_Vac:Pump2:Pressure (OK/MAJOR/HIGH_ALARM)' is highlighted in red.
- Data Browser (Top Right):** A plot showing the voltage of 'MEBT_CHOP:PS_2:V [kV]' over time. The plot shows a step change from 2.1 kV to 2.8 kV on 2009/03/15. A context menu is open over the plot, with 'Data Browser' selected. Annotations include 'Previous drop: 2009/03/15 07:02:54' and 'Another hiccup: 2009/03/16 07:55:42'. A circled '3' points to the plot area.
- Alarm Table (Bottom):** A table of current and acknowledged alarms. The 'Current Alarms' section is highlighted. A context menu is open over the table, with 'Data Browser' selected. A circled '1' points to the table, and a circled '2' points to the 'Data Browser' option in the menu.

PV	Description	Time	Current	Severity	Status	Value
RFQ_Vac:Pump2:Pressure	Demo pump 2	2009/03/17 16:48:10	OK	MAJOR	HIHI_ALARM	9.0
RFQ_Vac:Pump6:Pressure	Demo pump 6	2009/03/17 16:48:08	OK	MINOR	HIGH_ALARM	5.0
RFQ_Vac:Pump5:Pressure	Demo pump 5	2009/03/17 16:48:08	OK	MINOR	HIGH_ALARM	5.0
RFQ_Vac:Pump4:Pressure	Demo pump 4	2009/03/17 16:48:08	OK	MINOR	HIGH_ALARM	5.0
RFQ_Vac:Pump3:Pressure	Demo pump 3	2009/03/17 16:48:08	OK	MINOR	HIGH_ALARM	5.0
FE_MPS:MIOC1A:status_sum	MPS Beam permit	2009/03/17 16:46:28	MAJOR	MAJOR	LOLO_ALARM	2
ICS_Tim:Gate_BeamOn:Switch	Beam awf	2009/03/17 16:46:27	MINOR	MINOR	STATE_ALARM	Shift
CF_KL:DIWS_AIT4303B:Rs	CF_KL:DIWS_AIT4303B:Rs	2009/03/17 16:10:06	MINOR	MINOR	HIGH_ALARM	18.5
MEBT_CHOP:PS_2:V	mebbit chopper power supply one voltage fault		MAJOR	MAJOR	LOLO_ALARM	0.00

Data Browser → Electronic Logbook

After inspecting alarm PV's history, post commented plot to E-Log



Logbook Entry

Create electronic logbook entry

Enter user, password, maybe edit text.
Snapshot of current plot will be attached.

User name: Fred

Password:

Logbook: Electrical Systems

Title: Data Browser Snapshot

Text:

Just got another chopper trip.
This time was different, though,
because we did this and not that,
while before we tried that and not this.

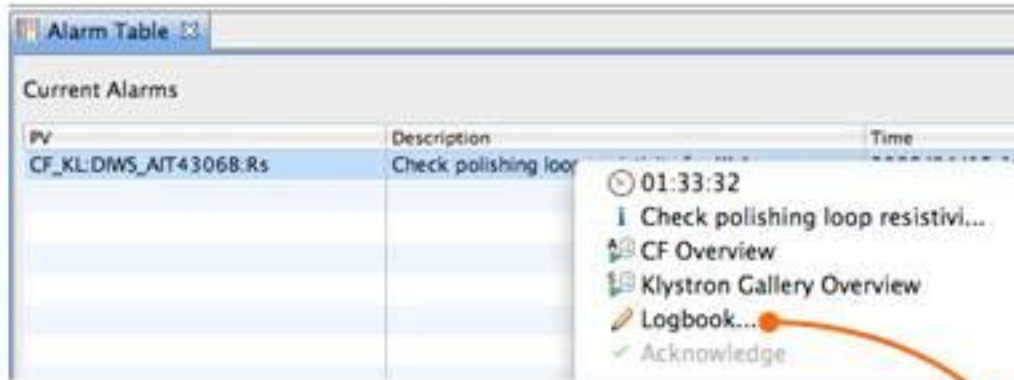
Called Jim who suggested to wiggle
the blue cable before resetting

Attached image was created by Data Browser

Attached Image...

Cancel OK

Directly from Alarm to E-Log

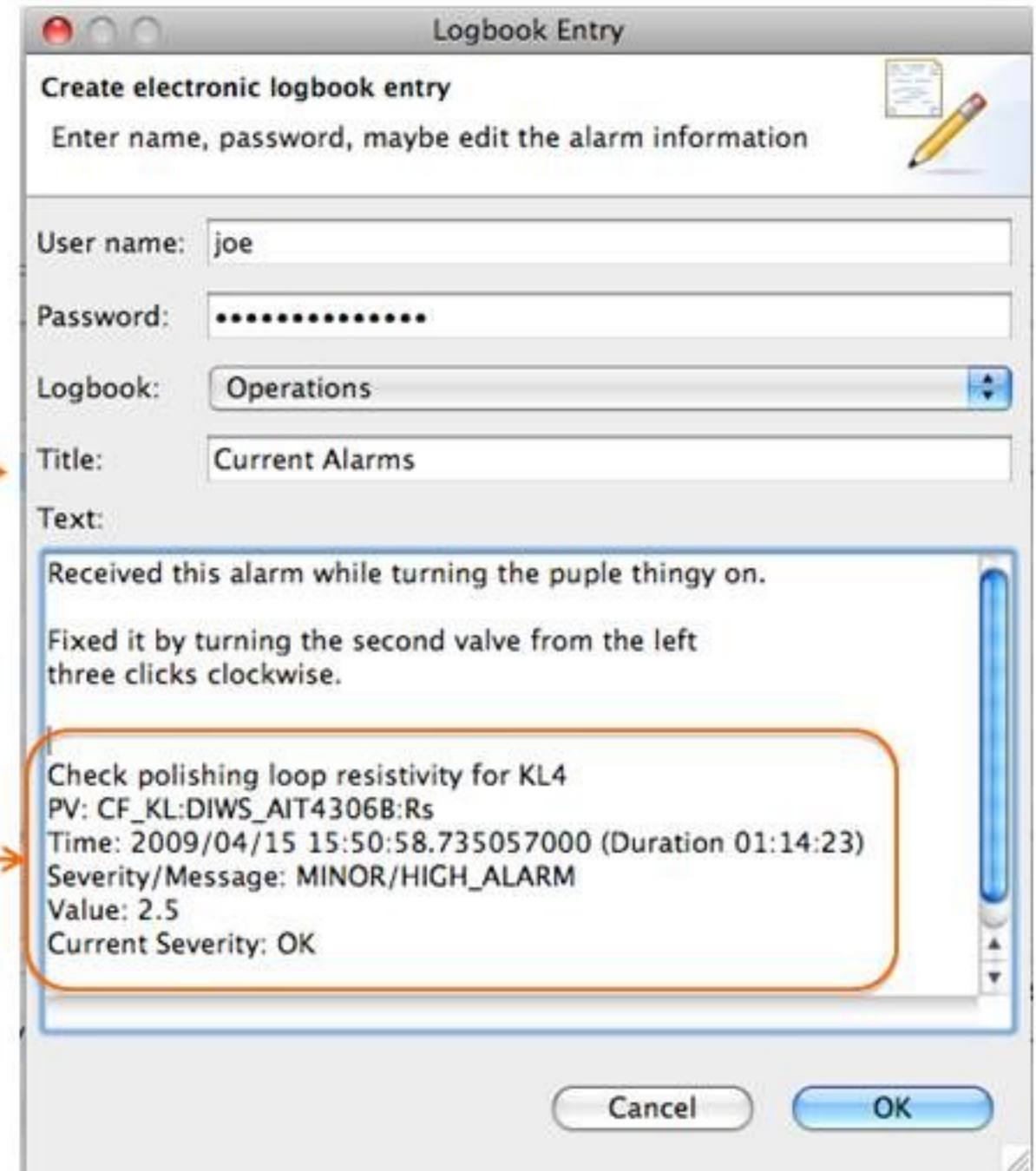


PV	Description	Time
CF_KL:DIWS_AIT4306B:Rs	Check polishing loop	01:33:32

Context menu for the selected alarm:

- 01:33:32
- Check polishing loop resistivi...
- CF Overview
- Klystron Gallery Overview
- Logbook...
- Acknowledge

- **“Logbook”**
from context menu
creates text w/
basic info about
selected alarms.
Edit, submit.



Create electronic logbook entry
Enter name, password, maybe edit the alarm information

User name:

Password:

Logbook:

Title:

Text:

Received this alarm while turning the puple thingy on.
Fixed it by turning the second valve from the left
three clicks clockwise.

Check polishing loop resistivity for KL4
PV: CF_KL:DIWS_AIT4306B:Rs
Time: 2009/04/15 15:50:58.735057000 (Duration 01:14:23)
Severity/Message: MINOR/HIGH_ALARM
Value: 2.5
Current Severity: OK

Online Configuration Changes

.. may require Authentication/Authorization (LDAP)

☑ Log in/out while CSS is running

The image displays a control system interface with a central login dialog box and two side-by-side views of the Alarm Tree.

Login Dialog: A window titled "Login" with the instruction "Input username and password". It contains fields for "User name:" (filled with "Fred") and "Password:" (masked with dots). There is a checkbox for "Login as anonymous" and "Cancel" and "OK" buttons.

Left Alarm Tree View: Shows a tree structure with areas like "Area: IonSource (OK/OK/OK)", "Area: LEBT (OK/OK/OK)", and "Area: RFQ (OK/OK/OK)". A context menu is open over the "System: RFQ_Vac" node, listing options: "RFQ Vacuum Screen", "guidance_rationale", "Configure Item", "Add Component", "Rename Item", "Move item", and "Remove selected Items". The "Add Component" option is highlighted. A status bar at the bottom left shows "Not logged in".

Right Alarm Tree View: Shows a similar tree structure. The "Add Component" option in the context menu is highlighted. A status bar at the bottom center shows the user name "Fred".

Orange arrows indicate the flow of information: from the "Add Component" option in the left view to the login dialog, and from the "OK" button in the login dialog to the right view.

Configure PV

- Again online
- Especially useful for operators to update guidance and related screens.

Alarm Item Configuration

Item: Annunciator/RFQ/RFQ_LLRF:ResCtrl1:ResErr_Avg
Configure guidance, related displays, ...

Description: Elevated R F Q resonance error

Alarm Delay [seconds]: 0

Alarm Count [within delay]: 0

Behavior: Enabled Latch Annunciate

Enabling Filter:

Guidance:

Title	Detail
Check and fix resonance error	Check LLRF measurement of cavity residency error.
<Add>	<Add>

Displays:

Title	Command
RFQ LLRF	startedm -m S=RFQ,N=1,TN=
RFQ Chiller	startedm Cool
Rationalization	https://ics-web.sns.ornl.gov/w
<Add>	<Add>

Commands:

Title	Command
<Add>	<Add>

ID: 621 Last configured: 2009/04/14 16:46:17

Edit Row Data

Title: Check and fix resonance error

Details: Check LLRF measurement of cavity resonance error.
Try to reduce error by adjusting LLRF pulse width as per the Daily Order.

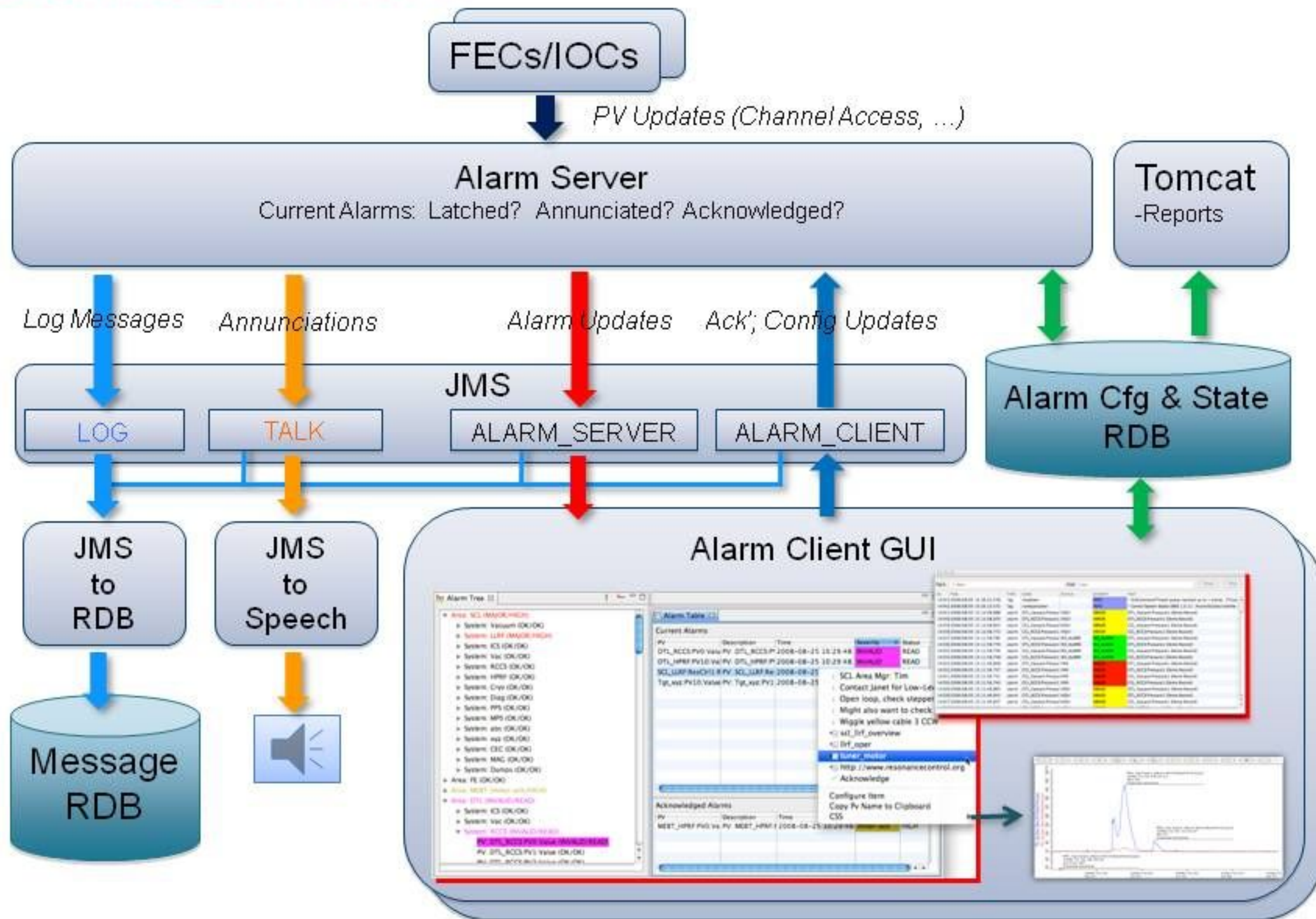
Cancel OK

Area: RFQ (OK/OK/OK)

System: RFQ_Vac (OK/OK/OK)

- PV: RFQ_Vac:GV_1A RFQ Vacuum Screen
- PV: RFQ_Vac:GV_1B guidance_rationale
- PV: RFQ_Vac:GV_2: Configure Item
- PV: RFQ_Vac:GV_3A

Technical View

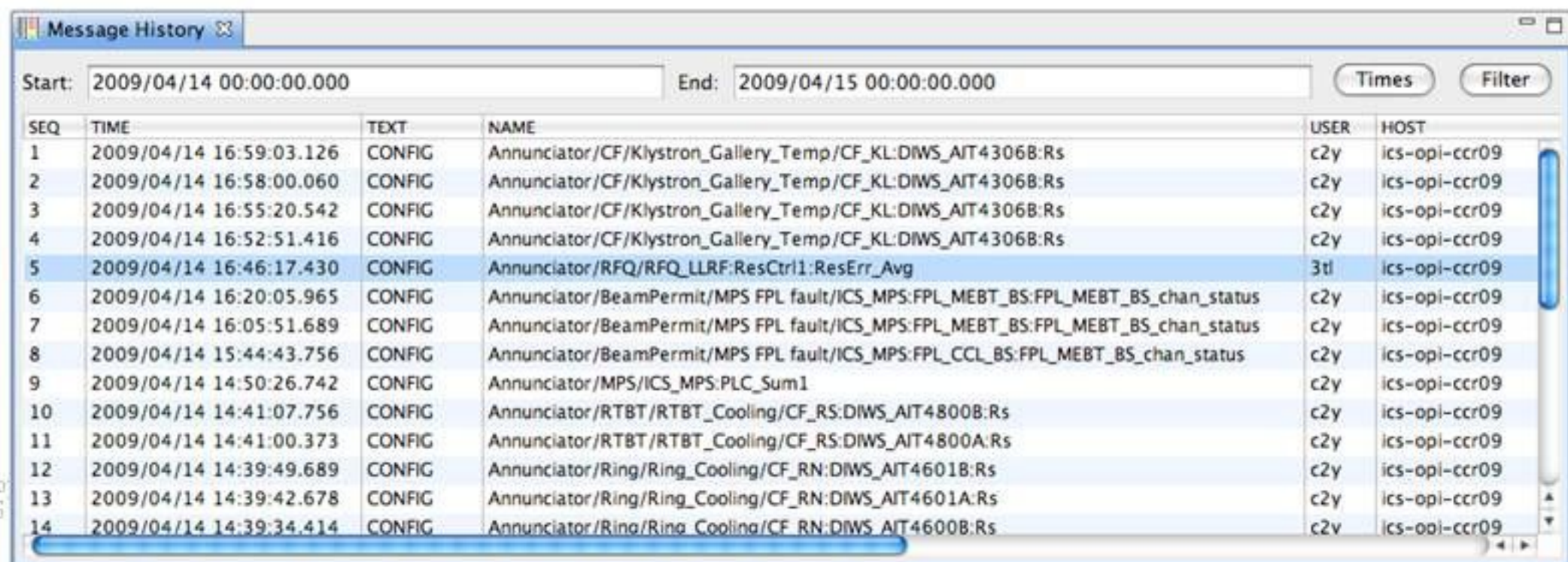


Alarm Server Options

- **Latch highest severity, require acknowledgement?**
- **Annunciate?**
- **Chatter filter**
 - Alarm only if severity persists some minimum time
 - .. or alarm happens $\geq N$ times within period
- **Optional formula-based alarm enablement:**
 - Enable if “(pv_x > 5 && pv_y < 7) || pv_z==1”
 - ... but we prefer to move that logic into IOC
- **“Maintenance Mode”**: Invalid PVs don’t annunciate, automatically acknowledged

Logging

- ..into generic CSS log also used for error/warn/info/debug messages
- Alarm Server: State transitions, Annunciations
- Alarm GUI: Ack/Un-Ack requests, Config changes
- Generic Message History Viewer
 - Example w/ Filter on TEXT=CONFIG



The screenshot shows a window titled "Message History" with a table of messages. The table has columns for SEQ, TIME, TEXT, NAME, USER, and HOST. The messages are filtered by TEXT=CONFIG. The start and end dates are 2009/04/14 00:00:00.000 and 2009/04/15 00:00:00.000 respectively. There are buttons for "Times" and "Filter".

SEQ	TIME	TEXT	NAME	USER	HOST
1	2009/04/14 16:59:03.126	CONFIG	Annunciator/CF/Klystron_Gallery_Temp/CF_KL:DIWS_AIT4306B:Rs	c2y	ics-opi-ccr09
2	2009/04/14 16:58:00.060	CONFIG	Annunciator/CF/Klystron_Gallery_Temp/CF_KL:DIWS_AIT4306B:Rs	c2y	ics-opi-ccr09
3	2009/04/14 16:55:20.542	CONFIG	Annunciator/CF/Klystron_Gallery_Temp/CF_KL:DIWS_AIT4306B:Rs	c2y	ics-opi-ccr09
4	2009/04/14 16:52:51.416	CONFIG	Annunciator/CF/Klystron_Gallery_Temp/CF_KL:DIWS_AIT4306B:Rs	c2y	ics-opi-ccr09
5	2009/04/14 16:46:17.430	CONFIG	Annunciator/RFQ/RFQ_LLRF:ResCtrl1:ResErr_Avg	3tl	ics-opi-ccr09
6	2009/04/14 16:20:05.965	CONFIG	Annunciator/BeamPermit/MPS FPL fault/ICS_MPS:FPL_MEBT_BS:FPL_MEBT_BS_chan_status	c2y	ics-opi-ccr09
7	2009/04/14 16:05:51.689	CONFIG	Annunciator/BeamPermit/MPS FPL fault/ICS_MPS:FPL_MEBT_BS:FPL_MEBT_BS_chan_status	c2y	ics-opi-ccr09
8	2009/04/14 15:44:43.756	CONFIG	Annunciator/BeamPermit/MPS FPL fault/ICS_MPS:FPL_CCL_BS:FPL_MEBT_BS_chan_status	c2y	ics-opi-ccr09
9	2009/04/14 14:50:26.742	CONFIG	Annunciator/MPS/ICS_MPS:PLC_Sum1	c2y	ics-opi-ccr09
10	2009/04/14 14:41:07.756	CONFIG	Annunciator/RTBT/RTBT_Cooling/CF_RS:DIWS_AIT4800B:Rs	c2y	ics-opi-ccr09
11	2009/04/14 14:41:00.373	CONFIG	Annunciator/RTBT/RTBT_Cooling/CF_RS:DIWS_AIT4800A:Rs	c2y	ics-opi-ccr09
12	2009/04/14 14:39:49.689	CONFIG	Annunciator/Ring/Ring_Cooling/CF_RN:DIWS_AIT4601B:Rs	c2y	ics-opi-ccr09
13	2009/04/14 14:39:42.678	CONFIG	Annunciator/Ring/Ring_Cooling/CF_RN:DIWS_AIT4601A:Rs	c2y	ics-opi-ccr09
14	2009/04/14 14:39:34.414	CONFIG	Annunciator/Ring/Ring_Cooling/CF_RN:DIWS_AIT4600B:Rs	c2y	ics-opi-ccr09

Logging: Get timeline

Filter on TYPE, PV

Message History

Start: 2009/04/12 07:00 End: 2009/04/12 20:31

TIME	TYPE	TEXT	SEVERITY	USER
2009/04/12 08:31:38.020	talk	MAJOR alarm: mps fault	MAJOR	alarms
2009/04/12 08:31:29.292	talk	MAJOR alarm: Check S C L 15 Modulator voltage	MAJOR	alarms
2009/04/12 08:31:28.207	talk	MAJOR alarm: S C L 15 modulator in standby	MAJOR	alarms

Select filter criteria:
Which Property should contain what value?

Property: NAME Matching Value: %SCL_HPRF:Mod15:V_Mon%

Property: (no filter) Matching Value:

Property: (no filter) Matching Value:

Property: (no filter) Matching Value:

Property: (no filter) Matching Value:

Value patterns support SQL wildcards '%', '_'

Cancel OK

Message History

Start: -5 day End: now

6. All OK

Times Filter

TIME	DELTA	TYPE	TEXT	NAME	STATUS	SEVERITY	CURRENT_SEVERITY	USER	APPLI..ON-ID	HOST
2009/04/12 20:30:29.522	00:00:00.039	alarm	STATE	SCL_HPRF:Mod15:V_Mon	OK	OK	OK	alarms	AlarmServer	ics-srv-sc
2009/04/12 20:30:29.483	08:16:59	alarm	ACK	SCL_HPRF:Mod15:V_Mon				accl-oper	CSS	ics-opi-co
2009/04/12 12:13:30.319	00:01:42	alarm	STATE	SCL_HPRF:Mod15:V_Mon	LOW_ALARM	MAJOR	OK	alarms	AlarmServer	ics-srv-sc
2009/04/12 12:11:47.332	01:03:08	alarm	STATE	SCL_HPRF:Mod15:V_Mon	LOW_ALARM	MAJOR	MAJOR	alarms	AlarmServer	ics-srv-sc
2009/04/12 11:08:38.729	00:02:06	alarm	STATE	SCL_HPRF:Mod15:V_Mon	LOW_ALARM	MAJOR	OK	alarms	AlarmServer	ics-srv-sc
2009/04/12 11:06:32.713	02:31:01	alarm	STATE	SCL_HPRF:Mod15:V_Mon	LOW_ALARM	MAJOR	MAJOR	alarms	AlarmServer	ics-srv-sc
2009/04/12 08:35:31.364	00:04:02	alarm	STATE	SCL_HPRF:Mod15:V_Mon	LOW_ALARM	MAJOR	OK	alarms	AlarmServer	ics-srv-sc
2009/04/12 08:31:29.283	01:15:20	alarm	STATE	SCL_HPRF:Mod15:V_Mon	LOW_ALARM	MAJOR	MAJOR	alarms	AlarmServer	ics-srv-sc
2009/04/12 07:16:09.109	00:00:00.014	alarm	STATE	SCL_HPRF:Mod15:V_Mon	OK	OK	OK	alarms	AlarmServer	ics-srv-sc

3. Alarm Server announces

2. Alarm Server latches alarm

1. PV triggers, clears, triggers again

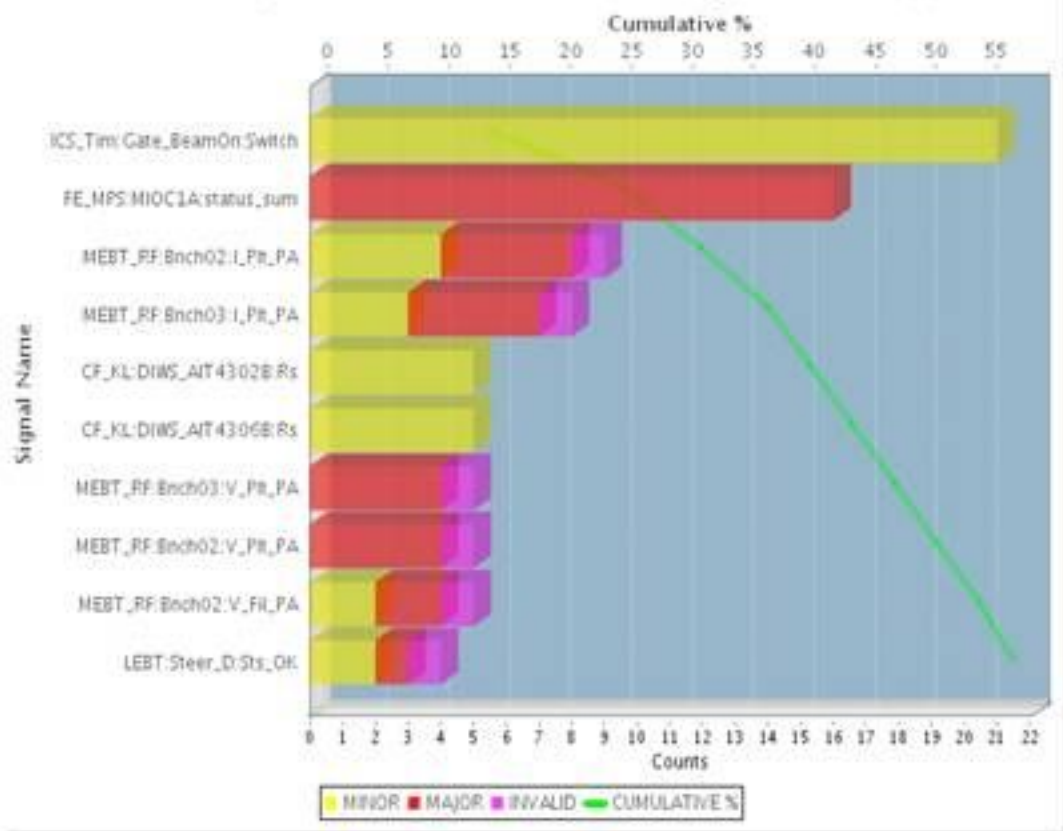
5. Ack'ed by operator

4. Problem fixed

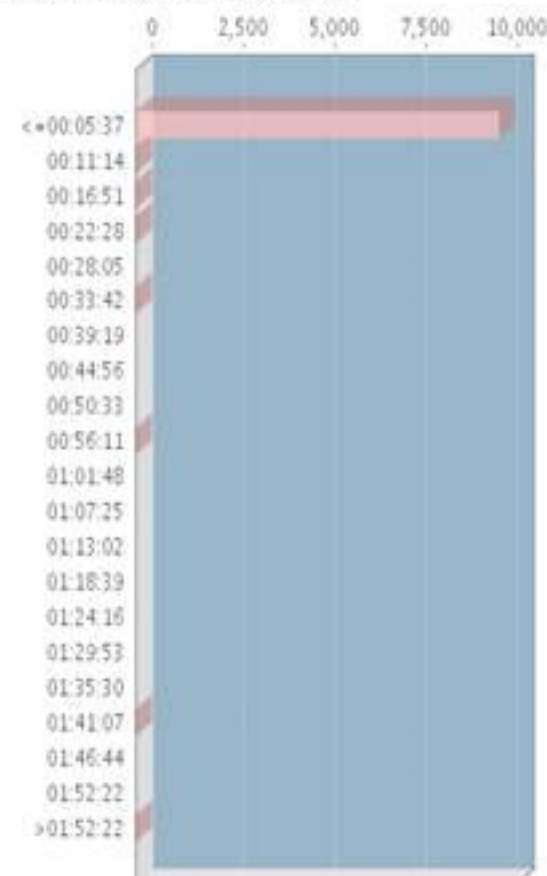
Numerous Web Reports

Statistics based on CURRENT SEVERITY:

Pattern: %, 17-Mar-2009 00:00 for 0 days 24 hours (-)



Alarms duration frequency (hh:mm:ss)



Within selected time period:
at start: OK
at end: OK

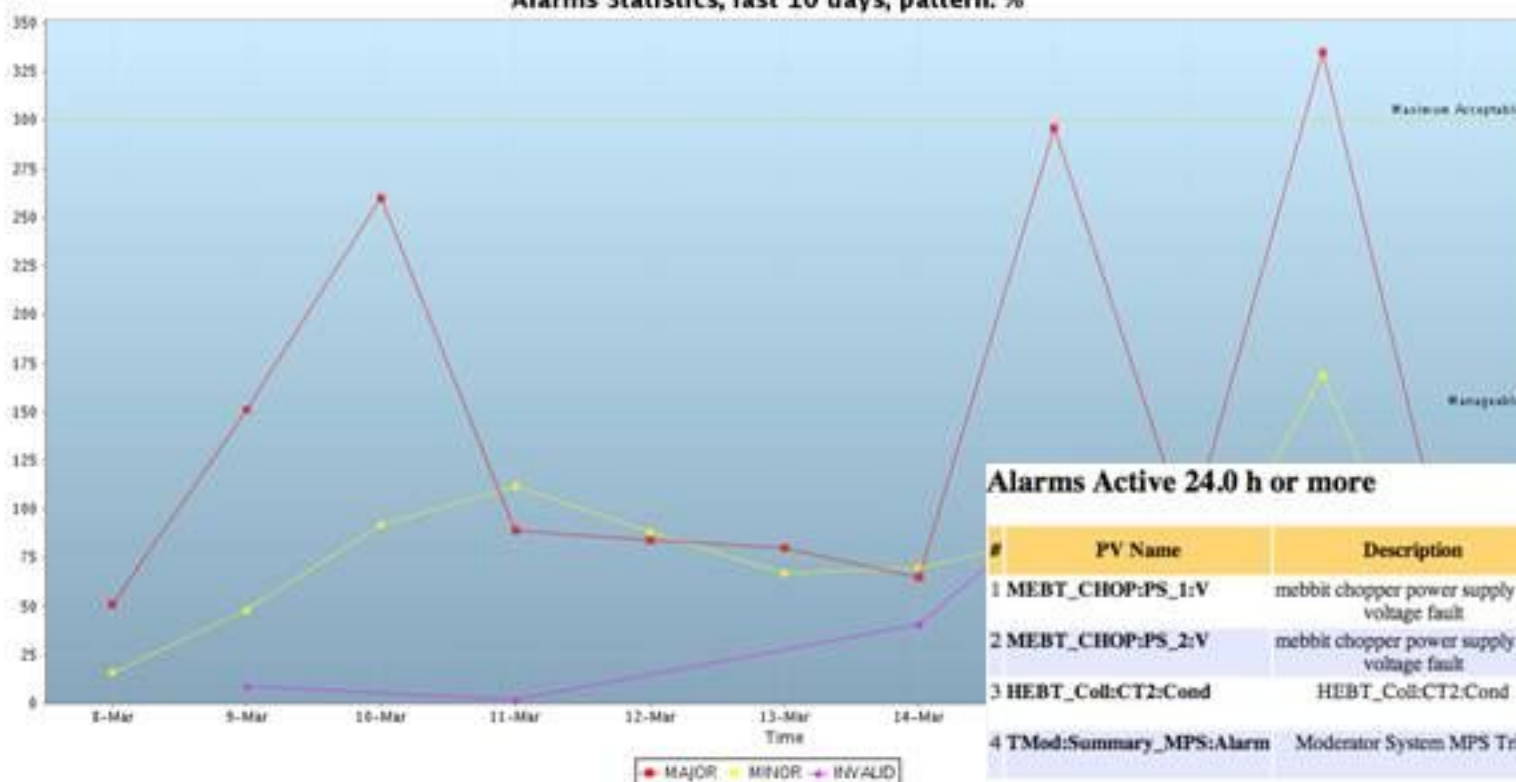
Total alarms: 9967
Total time in alarmed state: 23:04:59

Severity counts:
MAJOR: 9967
MINOR: 0
INVALID: 0
ERROR: 0

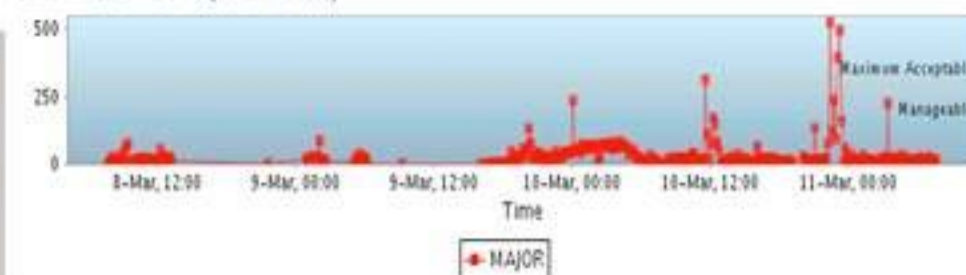
Alarm durations (hh:mm:ss):
Minimum: 00:00:00 (less than 1 sec)
Maximum: 06:29:55
Average: 00:56:11
Most frequent: 00:00:00 (less than 1 sec)

Extreme durations:
Less than 1 sec: 5505
More than 12 hours: 0

Alarms Statistics, last 10 days, pattern: %



Alarms on time line (10 min slices)



Alarms Active 24.0 h or more

#	PV Name	Description	Path	Alarm Time	...Duration [HH:MM:SS]	Severity	Alarm Message	Current Severity
1	MEBT_CHOP:PS_1:V	mebbit chopper power supply one voltage fault	/Annunciator/MEBT	2009-03-16 13:17:35	42:58:57	MAJOR_ACK	LOLO_ALARM	MAJOR
2	MEBT_CHOP:PS_2:V	mebbit chopper power supply two voltage fault	/Annunciator/MEBT	2009-03-16 13:17:35	42:58:57	MAJOR_ACK	LOLO_ALARM	MAJOR
3	HEBT_Col:CT2:Cond	HEBT_Col:CT2:Cond	/Annunciator/HEBT/HEBT_Cooling	2009-03-14 20:22:50	83:53:42	INVALID_ACK	READ_ALARM	MAJOR
4	TMod:Summary_MPS:Alarm	Moderator System MPS Trip	/Annunciator/Target/CMS	2009-02-07 09:25:09	934:51:23	INVALID_ACK	READ_ALARM	INVALID

Summary

- **Tools won't produce a good configuration, but help to improve it**
 - Most frequent alarms?
 - Alarm 'noise'?
- **BEAST operational at SNS since Feb'09**
 - Started with previous ALH setup
 - ~300, no guidance, no related displays
 - Now ~400, all with guidance, rel. displays, links to operational procedures
 - Alarm Server stable through IOC reboots, online configuration changes, Oracle updates
- **Alarm GUI is 'best ever' for SNS**