

Control System Studio Training - Alarm System Setup

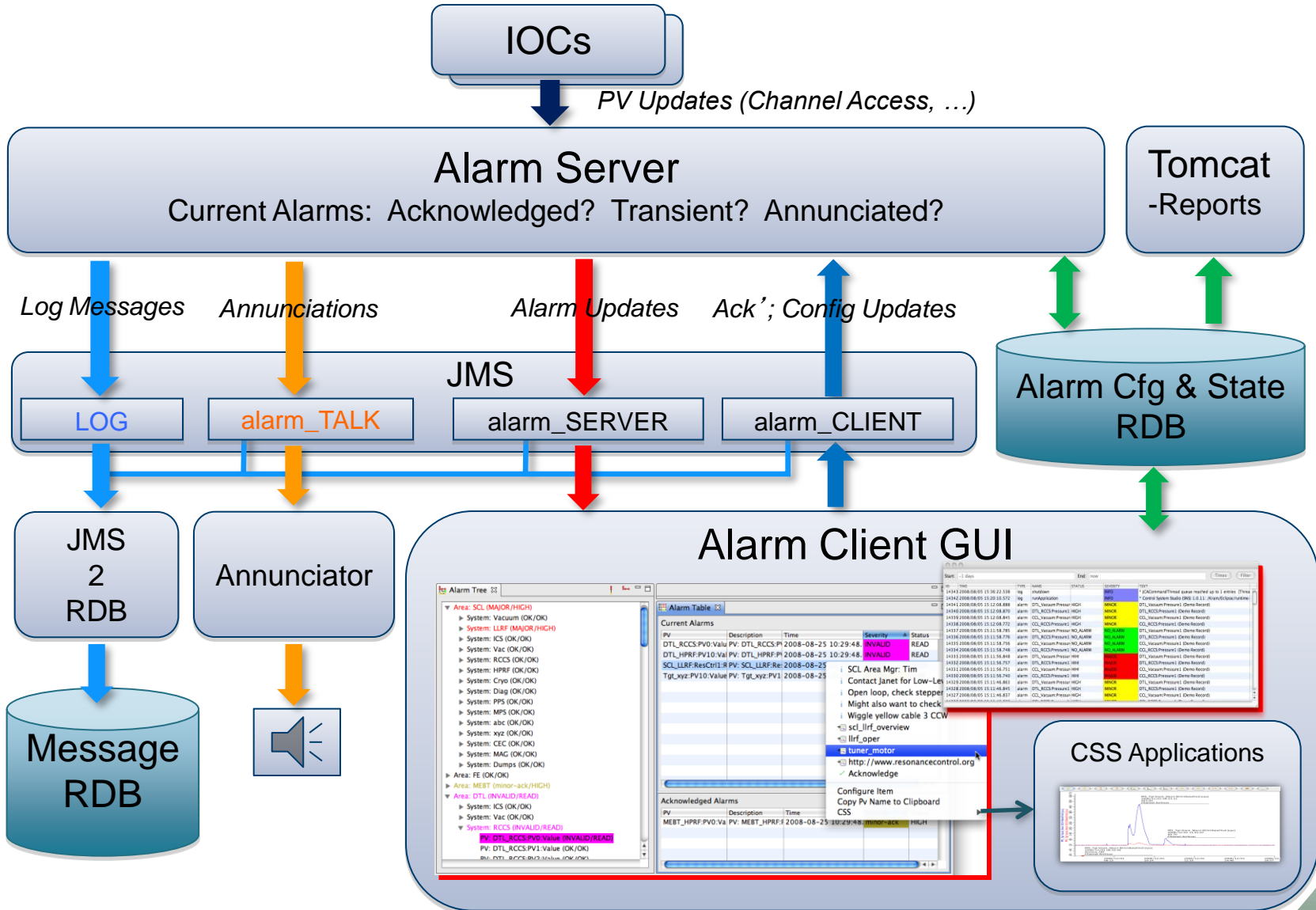
Kay Kasemir

ORNL/SNS

kasemirk@ornl.gov

2012, April at SLAC

Alarm System Overview



Initial Setup similar to archive system

- 1. Prepare RDB**
- 2. Run JMS Server**
- 3. Create and import initial configuration**
- 4. Run Alarm Server**
- 5. Create CSS product with**
 - Authentication, Authorization
 - Alarm client GUI
- 6. View & edit in CSS**

Prepare RDB

Plugin `org.csstudio.alarm.beast`,
folder `dbd/`:

Copy/paste the commands for the following
from `MYSQL_USER.sql` and `ALARM_MYSQL.sql`
into a `mysql` shell:

1. Create “alarm” user with password “\$alarm”
2. Allow “report” user to read alarm tables
3. Create “alarm” data base
4. Create tables, insert some demo data

Create initial configuration

- **Minimum XML File**

```
<config name="demo">
</config>
```

- **More elaborate Example**

```
<config name="demo">
  <component name="Simulated">
    <pv name="sim://ramp">
      <description>Ramp</description>
      <latching>true</latching>
      <annunciating>true</annunciating>
    </pv>
  </component>
  <component name="Heater Demo">
    <pv name="demo1:heat_V">
      <description>Heater at maximum</description>
      <latching>>false</latching>
      <annunciating>true</annunciating>
    </pv>
  </component>
</config>
```

Either one can then be edited from CSS GUI

settings.ini for alarm tools

Add to settings.ini:

```
# Alarm RDB (Config Tool, Alarm Server)
org.csstudio.alarm.beast/rdb_url=jdbc:mysql://localhost/alarm
org.csstudio.alarm.beast/rdb_user=alarm
org.csstudio.alarm.beast/rdb_password=$alarm
org.csstudio.alarm.beast/rdb_schema=

# JMS Connection
org.csstudio.alarm.beast/jms_url=failover:(tcp://localhost:61616)

# Specify alarm configuration (root element)
org.csstudio.alarm.beast/root_component=demo

# Annunciator
org.csstudio.alarm.beast.annunciator/jms_url=failover:(tcp://localhost:61616)
org.csstudio.alarm.beast.annunciator/jms_topic=demo_TALK

# Channel Access (Alarm Server and Archive Engine)
org.csstudio.platform.libs.epics/addr_list=127.0.0.1
```

Import XML Configuration

Alarm Config Tool:

```
AlarmConfigTool -pluginCustomization /path/to/settings.ini \  
-root demo -file demo.xml -import
```

- 'root' :

Database can contain multiple alarm configuration trees, identified by name of root element

- Consistency check:

Name of `<config name="demo">` and command-line argument `-root demo` must match

Java Message Server, JMS

- **Specifically: Apache ActiveMQ**

- **Start**

```
cd [activemq_install_dir]
```

```
bin/activemq start
```

- **CheckL**

```
Netstat -an | fgrep 61616
```

- **URL for CSS clients**

```
failover:(tcp://localhost:61616)
```


Run Alarm Server

Start:

```
AlarmServer -pluginCustomization /path/to/settings.ini \  
            -root demo
```

Monitor:

- **Primarily just use CSS Alarm GUI**
- **Console output**
- **Send 'debug' message from CSS Alarm Tree**
- **org.csstudio.debugging.jmsmonitor**

Stop:

Kill the process (Ctrl-C)

CSS Auth & Auth

- **Editing alarms requires**
 - **Authentication: Log in**
 - **Authorization: Being allowed to edit**
- **Can even be required to acknowledge alarms**

- **Could use LDAP, Kerberos,**
 - **See chapter in <http://cs-studio.sourceforge.net/docbook/>**

Dummy Authentication

- **Include plugins in CSS product:**

```
org.csstudio.platform.jaasAuthentication  
org.csstudio.platform.jaasAuthentication.ui
```

- **Configure like this in plugin_customization.ini of CSS product:**

```
# Select 'Dummy' JAAS Authentication  
org.csstudio.platform.jaasAuthentication/jaas_config_source=File  
org.csstudio.platform.jaasAuthentication/jaas_config_file_entry=Dummy
```

Now any user and password will work

- **Except user name “fail”, which can be used for tests**

Dummy Authorization

- **Include plugin in CSS product:**
`org.csstudio.sns.dummyAuthorization`
 - and include only this *authorization* plugin!

Now any user and password will work

- **Still needs to log on, though, but any user name and password will be accepted**

Add Alarm GUI to CSS

- Add alarm GUI plugins to CSS product

- org.csstudio.alarm.beast

- org.csstudio.alarm.beast.annunciator

To hear alarms

- org.csstudio.alarm.beast.ui

- org.csstudio.alarm.beast.ui.alarmtable

Most
important

- org.csstudio.alarm.beast.ui.alarmtree

- org.csstudio.alarm.beast.ui.areapanel

Nice

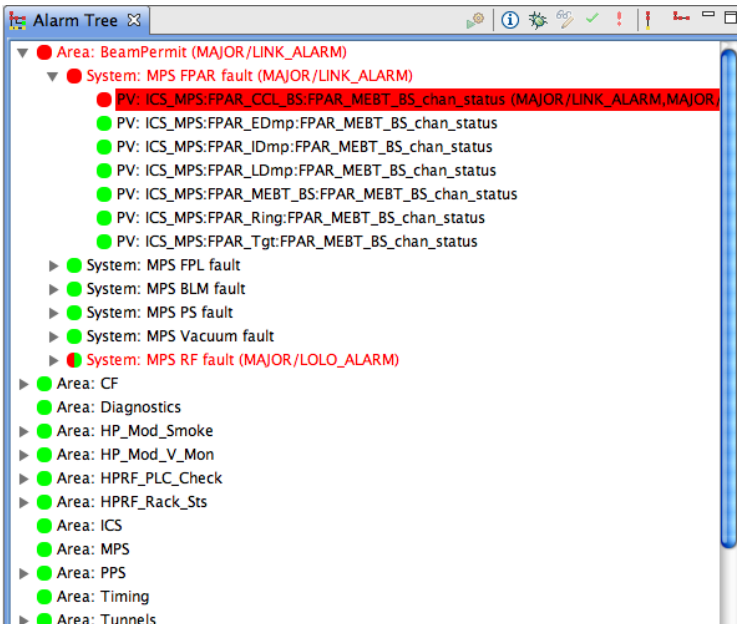
- org.csstudio.utility.speech

- plugin_customization.ini of CSS product:

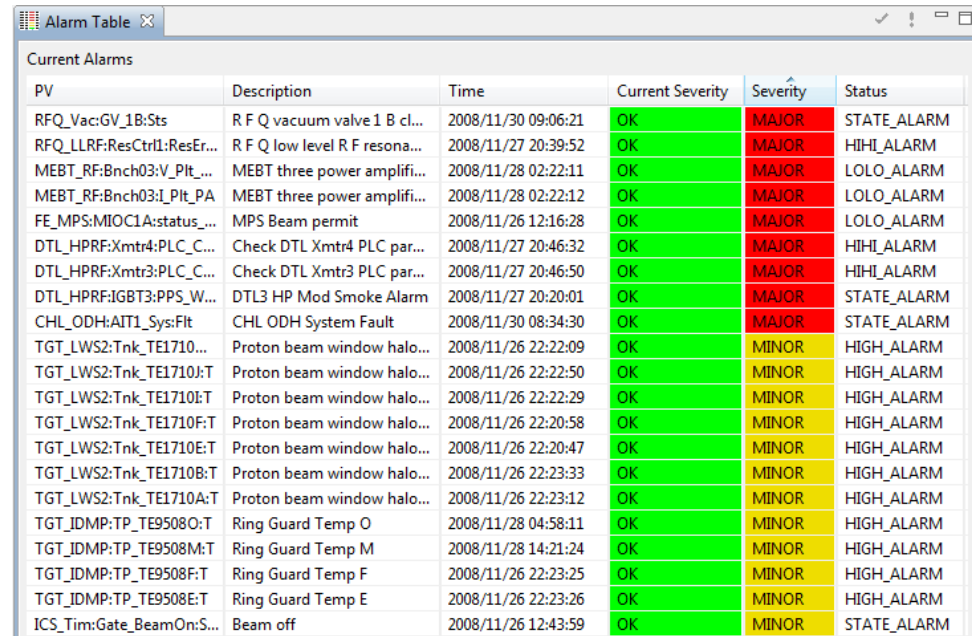
Same org.csstudio.alarm.beast/* settings as used by Alarm Server (settings.ini)

Use CSS Alarm Tree, Alarm Table, ...

- Open Menu CSS/Alarm/...
 - Alarm Tree, Table, Annunciator, Area Panel
- In alarm tree, use context menu to add to configuration
 - After log in



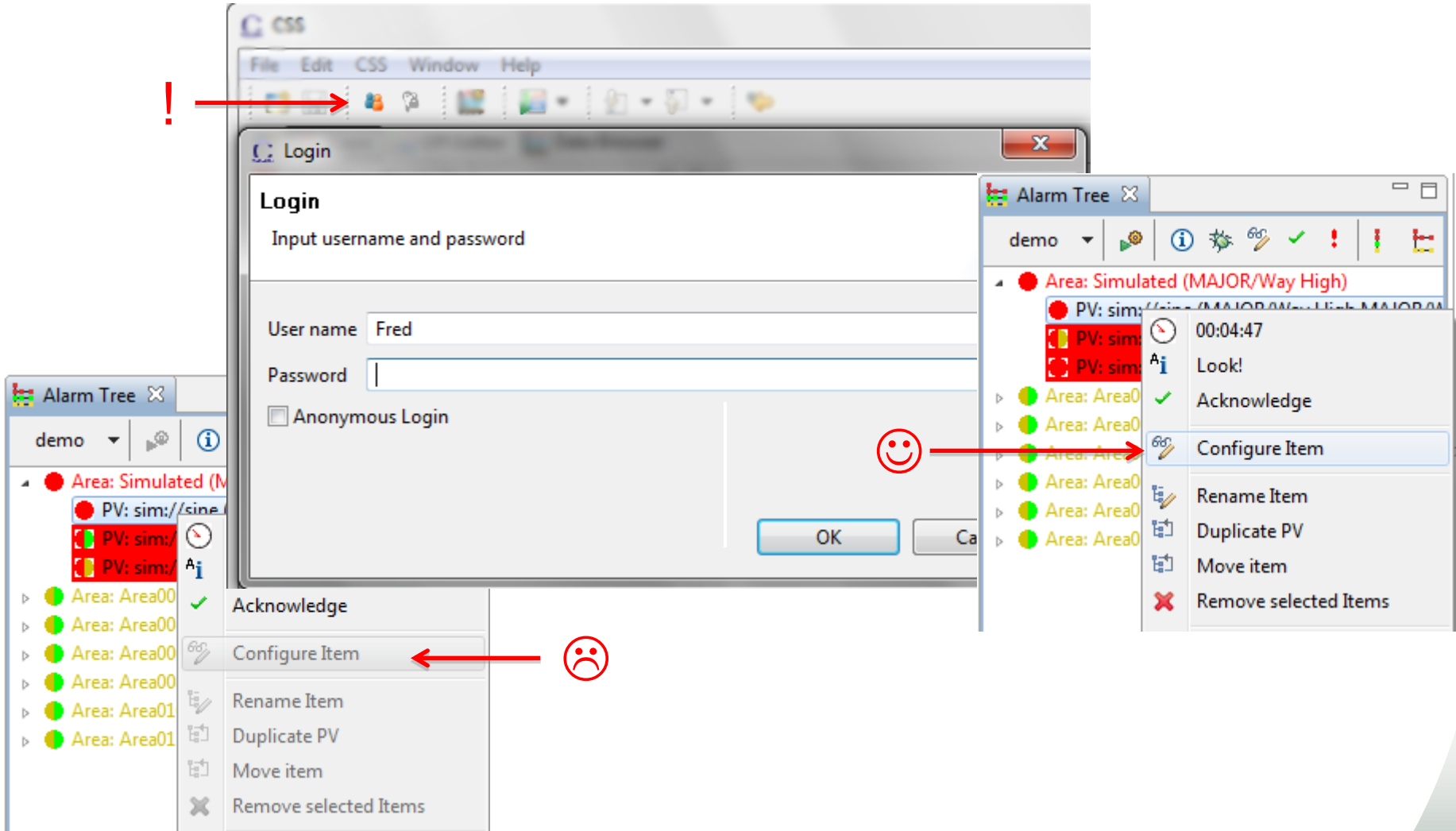
The Alarm Tree window displays a hierarchical structure of alarms. The root node is 'Area: BeamPermit (MAJOR/LINK_ALARM)'. Underneath, there is a 'System: MPS FPAR fault (MAJOR/LINK_ALARM)' which is expanded to show several 'PV' (Process Variable) nodes, all with a green status icon. Below these are several 'System' nodes with green status icons, including 'MPS FPL fault', 'MPS BLM fault', 'MPS PS fault', and 'MPS Vacuum fault'. At the bottom, there is a 'System: MPS RF fault (MAJOR/LOLO_ALARM)' and a list of 'Area' nodes, each with a green status icon, including 'Diagnostics', 'HP_Mod_Smoke', 'HP_Mod_V_Mon', 'HPRF_PLC_Check', 'HPRF_Rack_Sts', 'ICS', 'MPS', 'PPS', 'Timing', and 'Tunnels'.



The Alarm Table window displays a list of current alarms. The table has the following columns: PV, Description, Time, Current Severity, Severity, and Status. The 'Current Severity' column shows 'OK' in green, while the 'Severity' column shows 'MAJOR' in red and 'MINOR' in yellow. The 'Status' column shows 'STATE_ALARM', 'HIHI_ALARM', and 'LOLO_ALARM'.

PV	Description	Time	Current Severity	Severity	Status
RFQ_Vac:GV_1B:Sts	R F Q vacuum valve 1 B cl...	2008/11/30 09:06:21	OK	MAJOR	STATE_ALARM
RFQ_LLRf:ResCtrl:ResEr...	R F Q low level R F resona...	2008/11/27 20:39:52	OK	MAJOR	HIHI_ALARM
MEBT_RF:Bnch03:V_Plt_...	MEBT three power ampli...	2008/11/28 02:22:11	OK	MAJOR	LOLO_ALARM
MEBT_RF:Bnch03:L_Plt_PA	MEBT three power ampli...	2008/11/28 02:22:12	OK	MAJOR	LOLO_ALARM
FE_MPS:MIOCI1A:status_...	MPS Beam permit	2008/11/26 12:16:28	OK	MAJOR	LOLO_ALARM
DTL_HPRF:Xmtr4:PLC_C...	Check DTL Xmtr4 PLC par...	2008/11/27 20:46:32	OK	MAJOR	HIHI_ALARM
DTL_HPRF:Xmtr3:PLC_C...	Check DTL Xmtr3 PLC par...	2008/11/27 20:46:50	OK	MAJOR	HIHI_ALARM
DTL_HPRF:IGBT3:PPS_W...	DTL3 HP Mod Smoke Alarm	2008/11/27 20:20:01	OK	MAJOR	STATE_ALARM
CHL_ODH:AIT1_Sys:Flt	CHL ODH System Fault	2008/11/30 08:34:30	OK	MAJOR	STATE_ALARM
TGT_LWS2:Tnk_TE1710:...	Proton beam window halo...	2008/11/26 22:22:09	OK	MINOR	HIGH_ALARM
TGT_LWS2:Tnk_TE1710J:T	Proton beam window halo...	2008/11/26 22:22:50	OK	MINOR	HIGH_ALARM
TGT_LWS2:Tnk_TE1710I:T	Proton beam window halo...	2008/11/26 22:22:29	OK	MINOR	HIGH_ALARM
TGT_LWS2:Tnk_TE1710F:T	Proton beam window halo...	2008/11/26 22:20:58	OK	MINOR	HIGH_ALARM
TGT_LWS2:Tnk_TE1710E:T	Proton beam window halo...	2008/11/26 22:20:47	OK	MINOR	HIGH_ALARM
TGT_LWS2:Tnk_TE1710B:T	Proton beam window halo...	2008/11/26 22:23:33	OK	MINOR	HIGH_ALARM
TGT_LWS2:Tnk_TE1710A:T	Proton beam window halo...	2008/11/26 22:23:12	OK	MINOR	HIGH_ALARM
TGT_IDMP:TP_TE9508O:T	Ring Guard Temp O	2008/11/28 04:58:11	OK	MINOR	HIGH_ALARM
TGT_IDMP:TP_TE9508M:T	Ring Guard Temp M	2008/11/28 14:21:24	OK	MINOR	HIGH_ALARM
TGT_IDMP:TP_TE9508F:T	Ring Guard Temp F	2008/11/26 22:23:25	OK	MINOR	HIGH_ALARM
TGT_IDMP:TP_TE9508E:T	Ring Guard Temp E	2008/11/26 22:23:26	OK	MINOR	HIGH_ALARM
ICS_Tim:Gate_BeamOn:S...	Beam off	2008/11/26 12:43:59	OK	MINOR	STATE_ALARM

Authorization Required



Only authorized users can change the configuration

PV Configuration

Full Path to PV in Alarm Tree

Description:
Also used for
Annunciation

Guidance:
Simple Title &
Detail that should
help operators
handle the alarm

Display Link Options:
/CSS/path/to/display.opi
<http://www.google.com>
<https://some.host.org>
scriptname arg1 arg2

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=1 FCM-RFQ
RFQ Chiller	startedm Cool
Rationalization	https://ics-web.sns.ornl.gov/wiki/AlarmHa
<Add>	<Add>

Commands:

Title	Command
<Add>	<Add>

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

Cancel OK

Title: Check an
Details: Check LLRF
error.
Try to rec
width as

See online help for more details

An Alarm Triggers...

Some operators prefer just the Alarm Table, others also like to look at Area Panel or Tree View

The screenshot displays a software interface for monitoring and managing alarms. It is divided into several sections:

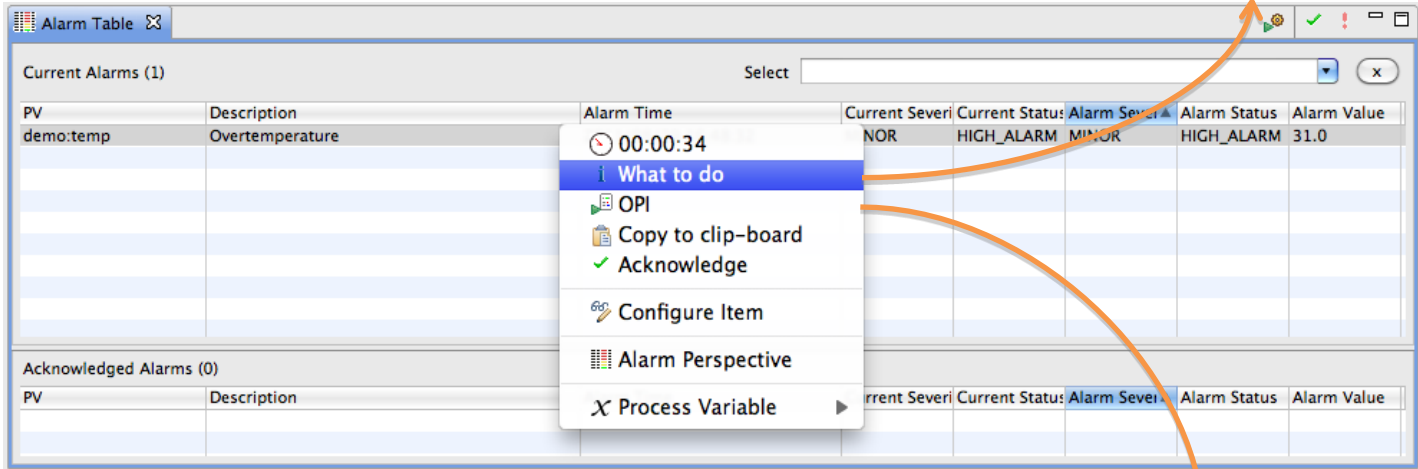
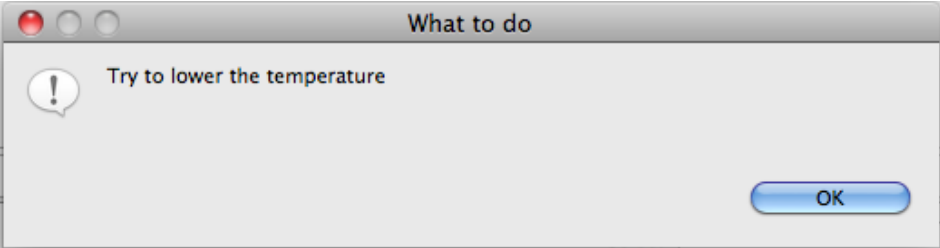
- Alarm Area Panel:** Located at the top left, it contains two large colored rectangles representing different areas: a yellow one labeled "Ion Source" and a green one labeled "Linac".
- Alarm Tree:** Located below the Area Panel, it shows a hierarchical tree structure of the system. The tree is expanded to show:
 - Area: Ion Source (MINOR/HIGH_ALARM)
 - System: RF
 - System: Vacuum (MINOR/HIGH_ALARM)
 - PV: demo:temp (MINOR/HIGH_ALARM, MINOR/HIGH_ALARM)
 - Area: Linac
- Alarm Table:** Located at the bottom right, it displays a table of current and acknowledged alarms. The "Current Alarms (1)" section shows one active alarm:

PV	Description	Alarm Time	Current Severi	Current Status	Alarm Seve	Alarm Status	Alarm Value
demo:temp	Overtemperature	2011/08/29 16:48:32	MINOR	HIGH_ALARM	MINOR	HIGH_ALARM	31.0

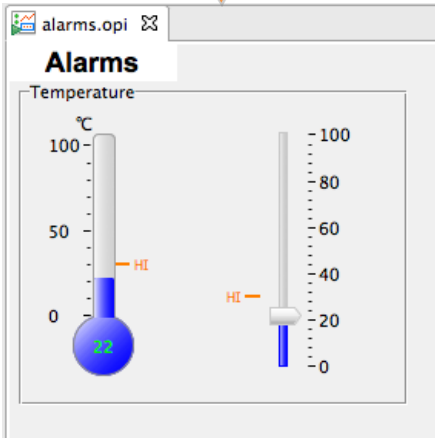
The "Acknowledged Alarms (0)" section is currently empty.

Context menu of Alarm

- **Guidance**



- **Links to related OPIs**



The Problem is fixed, Alarm clears

The screenshot displays a software interface for alarm management. On the left, there are two panels: 'Alarm Area Panel' with 'Ion Source' and 'Linac' buttons, and 'Alarm Tree' showing a hierarchy of areas and systems. The 'Alarms' panel shows a temperature gauge with a red 'HI' indicator. The 'Alarm Table' shows a table of current alarms.

PV	Description	Alarm Time	Current Seve	Current Statu	Alarm Seve	Alarm Status	Alarm Value
demo.temp	Overtemperature	2011/08/29 16:48:32	OK	OK	MINOR	HIGH_ALARM	31.0

- By default, the alarm system latches alarms
 - “Current” severity of PV is **OK**, but **MINOR** alarm is remembered until alarm is **✓ Acknowledged**

Guidance, Related Displays, Commands

Alarm Tree

- 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)
 - PV: CF_CU:TWR_TT4016:T (OK/OK/OK)
 - 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)

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

- ✓ Basic Text
- ✓ Open EDM/OPI screen
- ✓ Open web page
- ✓ Run ext. command

Hierarchical:
Including info of parent entries

Merges Guidance etc. from all selected alarms

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 (5500gpm) 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.

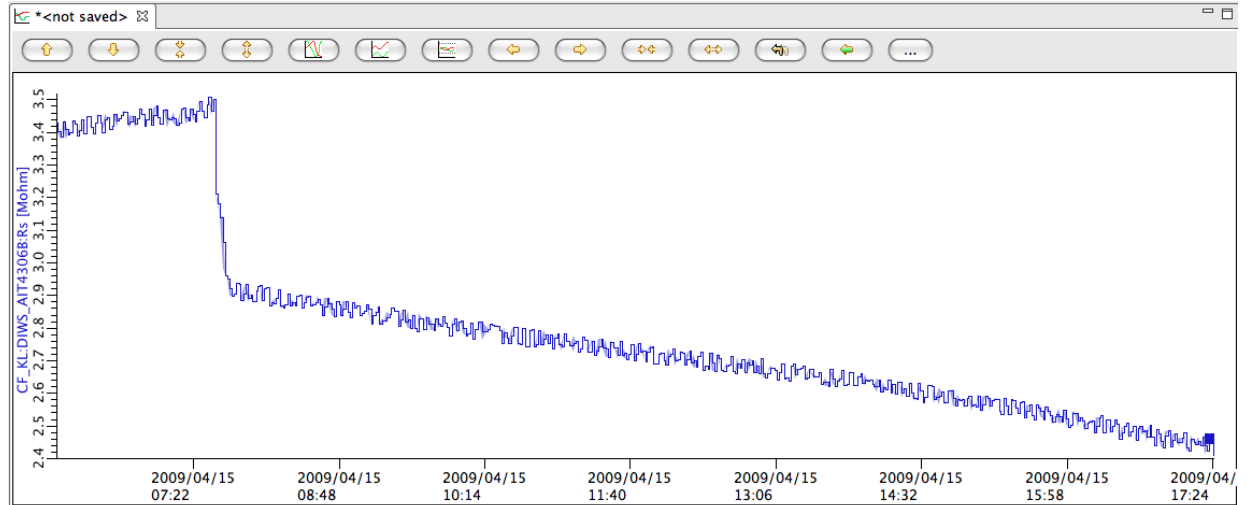
TODO: Response time depends on beam power. How should this be factored into response?

Contacts

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

CSS Context Menus Connect the Tools

Send alarm
PV to any
other CSS
PV tool



Alarm Table

PV	Description	Time	Current Severity	Severity	Status	Value
CF_KL-DIWS_AIT4306B:Rs	Check polishing loop	2009/04/15 08:50:58	OK	MINOR	HIGH_ALARM	2.5

Context Menu for CF_KL-DIWS_AIT4306B:Rs:

- 01:33:32
- Check polishing loop resistivi...
- CF Overview
- Klystron Gallery Overview
- Logbook...
- Acknowledge
- Copy Pv Name to Clipboard
- CSS
- Configure Item
- Auto-size Columns
- Alarm Perspective

Other Context Menu:

- Data Browser
- Data Browser View
- Open in display
- PV Table
- Rack View
- PV Utility
- PV Fields Viewer
- Probe
- EPICS PV Tree

Severity	Severity	Status	Value
invalid-ack'ed	invalid-ack'ed	READ_ALARM	Ready
major-ack'ed	major-ack'ed	LOLO_ALARM	0.016

PV Fields Viewer

PV Name Filter: CF_KL-DIWS_AIT4306B:Rs

Field: HIGH,HSV,HIHI,HHSV

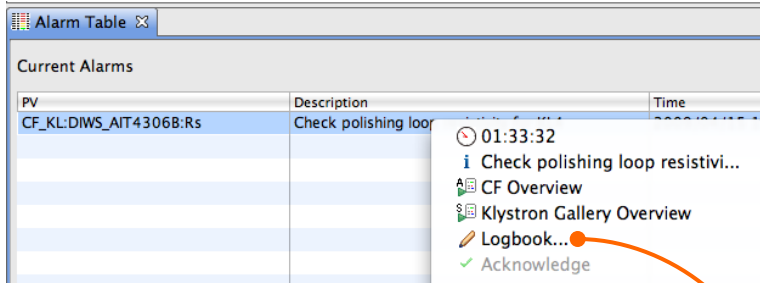
CF_KL-DIWS_AIT4306B:Rs

Record Type: ai

Boot Date: February 05, 2009 at 10:10 am

Field	DBD Type	Value in File	Live Value
HHSV	DBF_MENU	MAJOR	MAJOR
HIGH	DBF_DOUBLE	2.5	2.5
HIHI	DBF_DOUBLE	3.0	3.0
HSV	DBF_MENU	MINOR	MINOR

E-Log Entries



- **“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:

- **Pluggable implementation, not limited to Oracle-based SNS ELog**