

# **Control System Studio Training - Alarm System Use**

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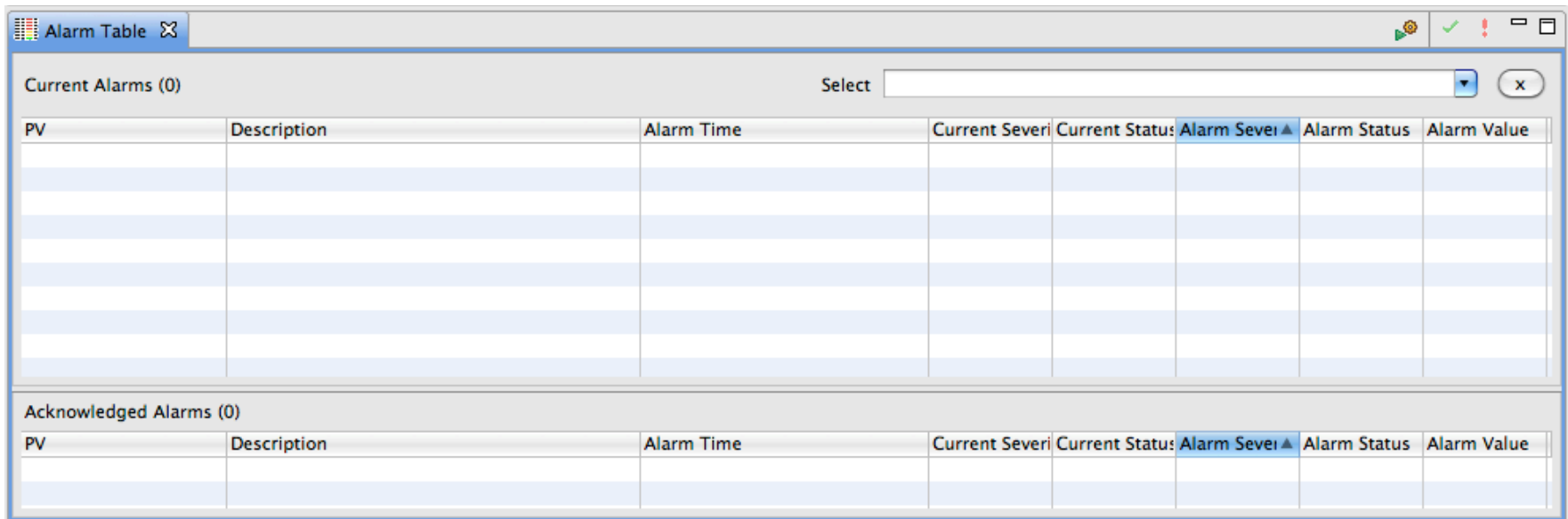
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# Operator Using the Alarm System

- Menu *CSS, Alarm, Alarm Table*
- Ideally: no alarms



The screenshot shows a software window titled "Alarm Table". It contains two sections: "Current Alarms (0)" and "Acknowledged Alarms (0)". Each section has a table with the following columns: PV, Description, Alarm Time, Current Severi, Current Status, Alarm Sever▲, Alarm Status, and Alarm Value. Both tables are currently empty.

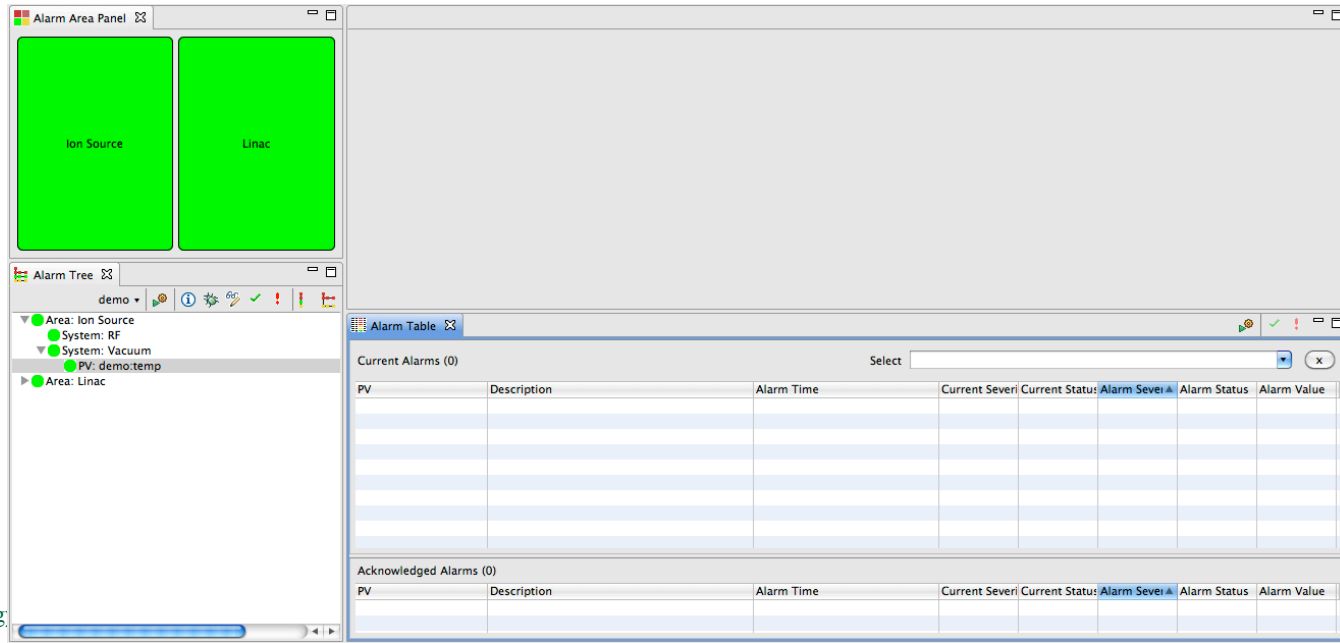
Current Alarms (0)							
PV	Description	Alarm Time	Current Severi	Current Status	Alarm Sever▲	Alarm Status	Alarm Value

Acknowledged Alarms (0)							
PV	Description	Alarm Time	Current Severi	Current Status	Alarm Sever▲	Alarm Status	Alarm Value

# Operator Looking at Alarm User Interface

- Other Alarm Views (Context Menu Alarm Perspective)
  - Alarm Tree: Displays all items monitored by the alarm server (with or without current alarm)
  - Area Panel: Overview of areas
- Still, all OK



# An Alarm Triggers!

Table shows what, when, ...

Alarm Table							
Current Alarms (1)							
				Select			
PV	Description	Alarm Time	Current Severi	Current Status	Alarm Severi ▲	Alarm Status	Alarm Value
demo:temp	Overtemperature	2011/08/29 16:48:32	MINOR	HIGH_ALARM	MINOR	HIGH_ALARM	31.0
Acknowledged Alarms (0)							
PV	Description	Alarm Time	Current Severi	Current Status	Alarm Severi ▲	Alarm Status	Alarm Value

Annunciator would say:

***“Minor alarm: Overtemperature”***

# 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 control room interface with three main panels:

- Alarm Area Panel:** Contains two large colored rectangles labeled "Ion Source" (yellow) and "Linac" (green).
- Alarm Tree:** A hierarchical tree view showing the following structure:
  - demo
    - 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:** A table showing current and acknowledged alarms.

**Current Alarms (1)**

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

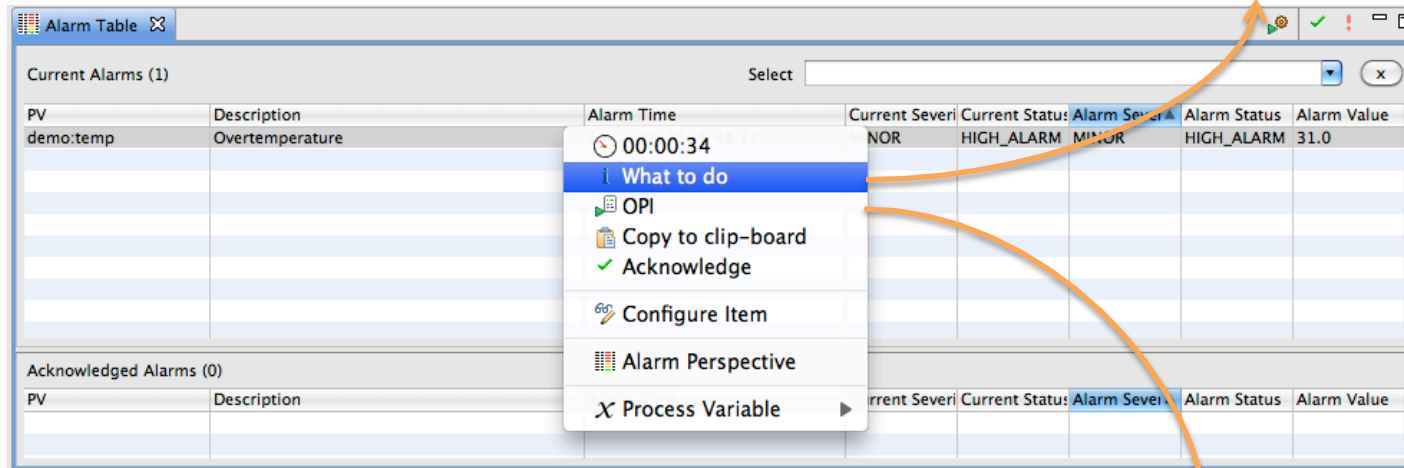
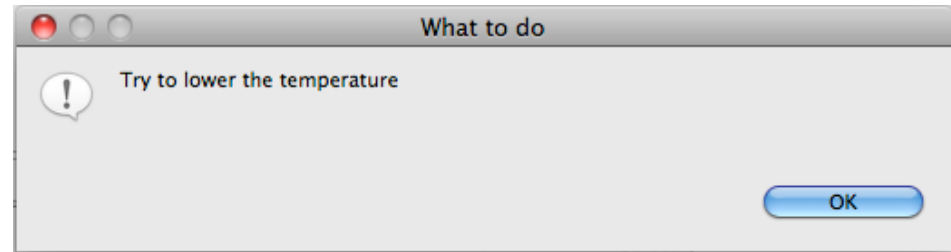
**Acknowledged Alarms (0)**

PV	Description	Alarm Time	Current Severi	Current Status	Alarm Severi	Alarm Status	Alarm Value

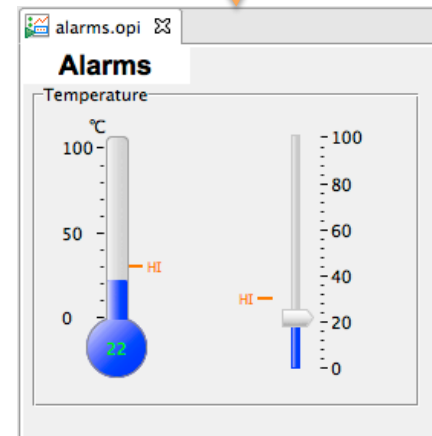
So there is a problem in the Ion Source Vacuum...

# Context menu of Alarm

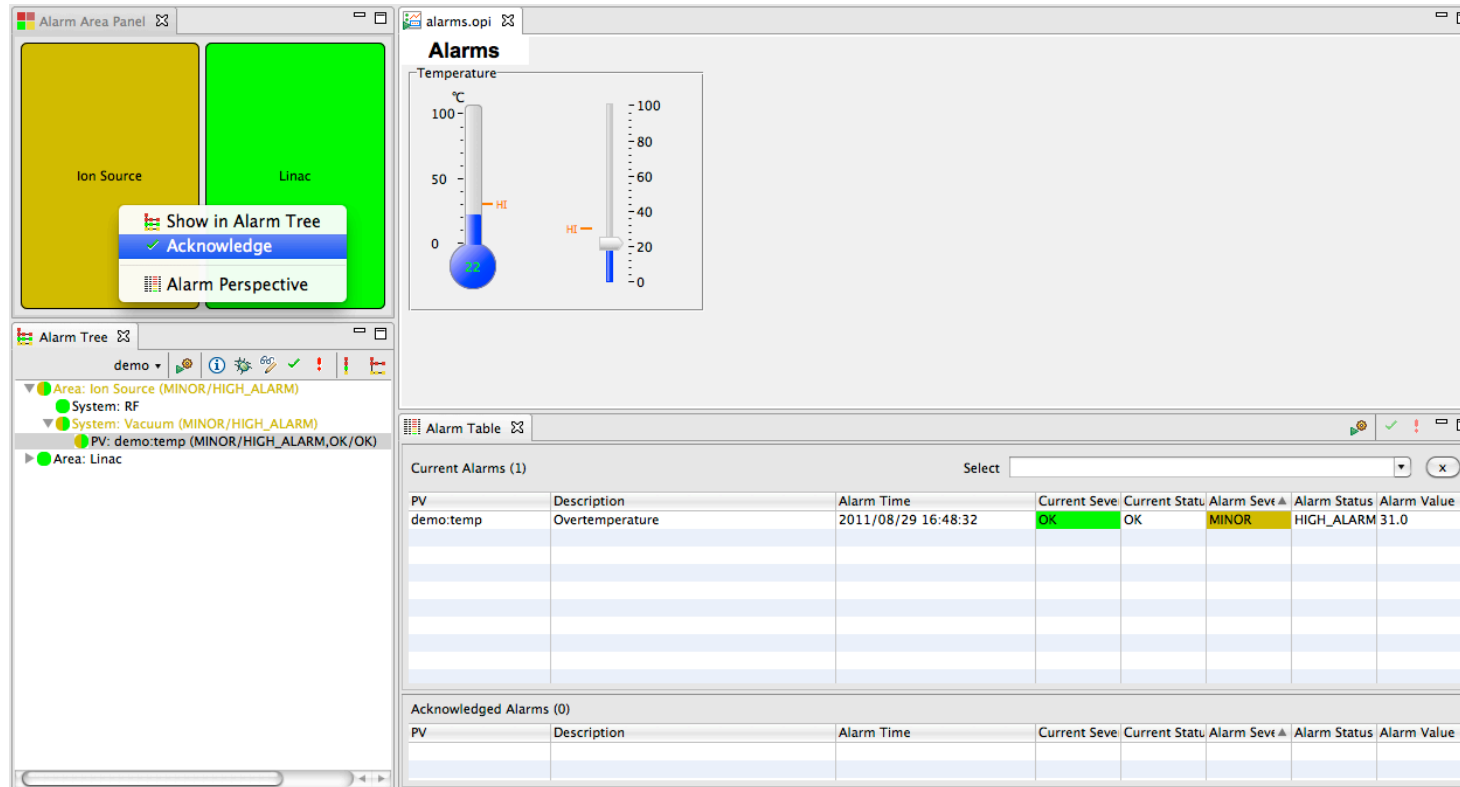
- Guidance



- Links to related OPIs

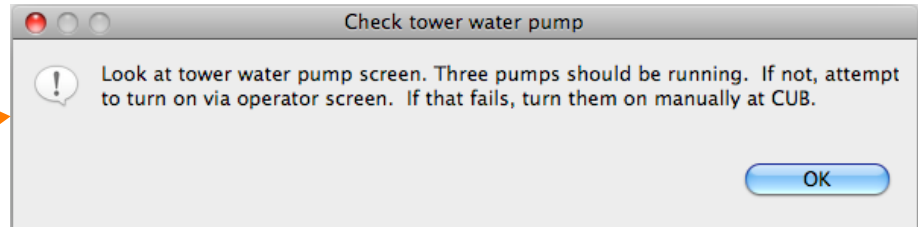
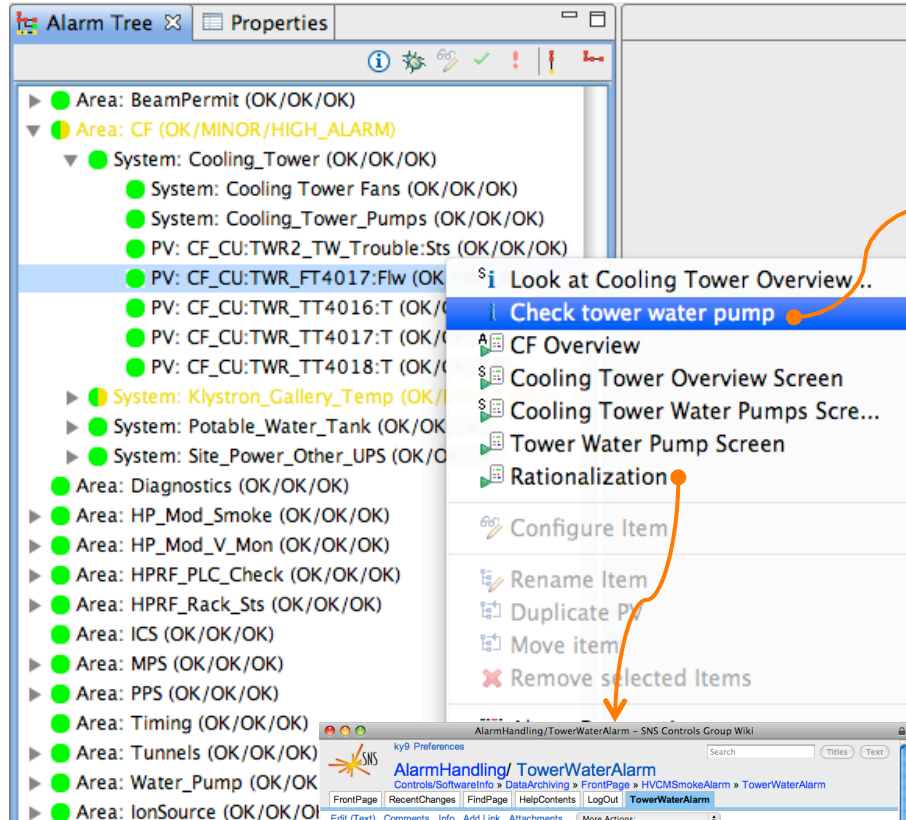


# The Problem is fixed, Alarm clears



- 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



- ✓ 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?

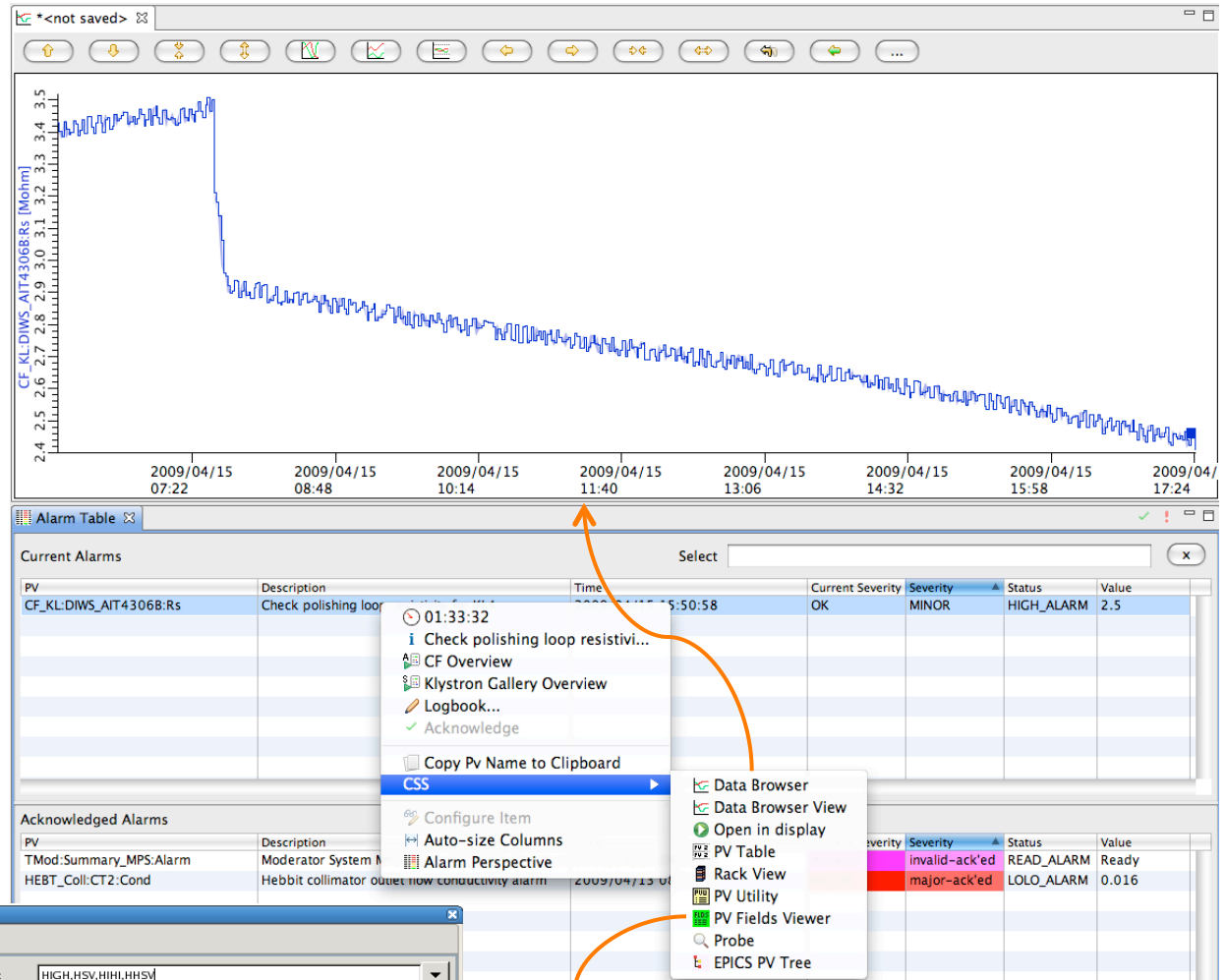
### Contacts

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



# Context Menus Connect the Tools

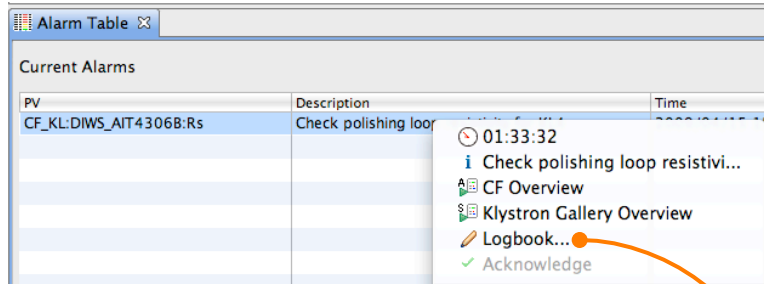
Send alarm  
PV to any  
other CSS  
PV tool



The screenshot shows the 'PV Fields Viewer' window for the PV 'CF\_KL-DIWS\_AIT4306B:Rs'. The fields are listed in a table with columns: Field, DBF Type, Value in File, and Live Value.

Field	DBF 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.

The screenshot shows a dialog box titled "Logbook Entry" with the subtitle "Create electronic logbook entry". Below the subtitle is the instruction "Enter name, password, maybe edit the alarm information". The form contains the following fields:

- 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.

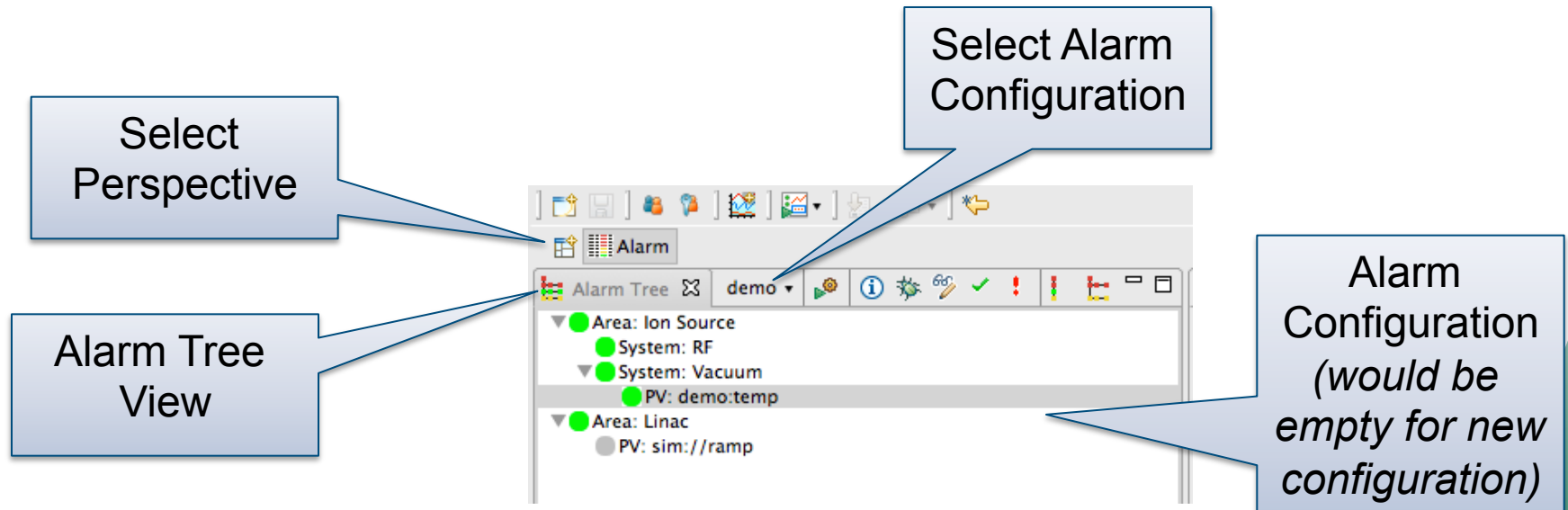
Check polishing loop resistivity for KL4  
PV: CF\_KL:DIWS\_AIT4306B:Rs  
Time: 2009/04/15 15:50:58.735057000 (Duration 01:14:23)  
Severity/Message: MINOR/HIGH\_ALARM  
Value: 2.5  
Current Severity: OK

At the bottom are "Cancel" and "OK" buttons.

- **Pluggable implementation**
- **Similar: EMail**

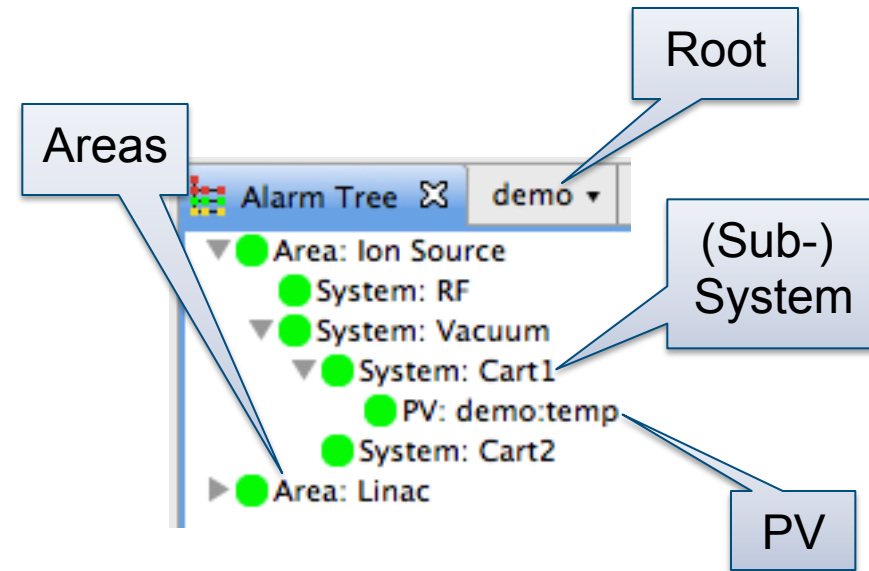
# Configuring the Alarm System

- Open Alarm Tree
  - a) Menu *CSS/Alarm/Alarm Tree*
  - b) Use *Alarm Perspective*
- Select alarm configuration

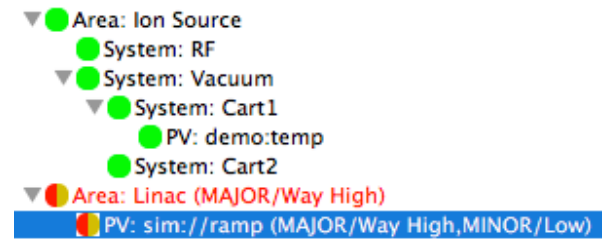


# Alarm Configuration Hierarchy

- **Root**
  - Name of the alarm configuration
- **Area**
  - Top-level elements
- **System**
  - Anything below 'Area'
  - Can have (Sub-)System below other System
- **PV**
  - Alarm trigger PV
  - Can be below Area or System



# Why Hierarchy?



## 1. Organization

- Easier to maintain than plain list of PVs

## 2. Help Operators Locate Alarm

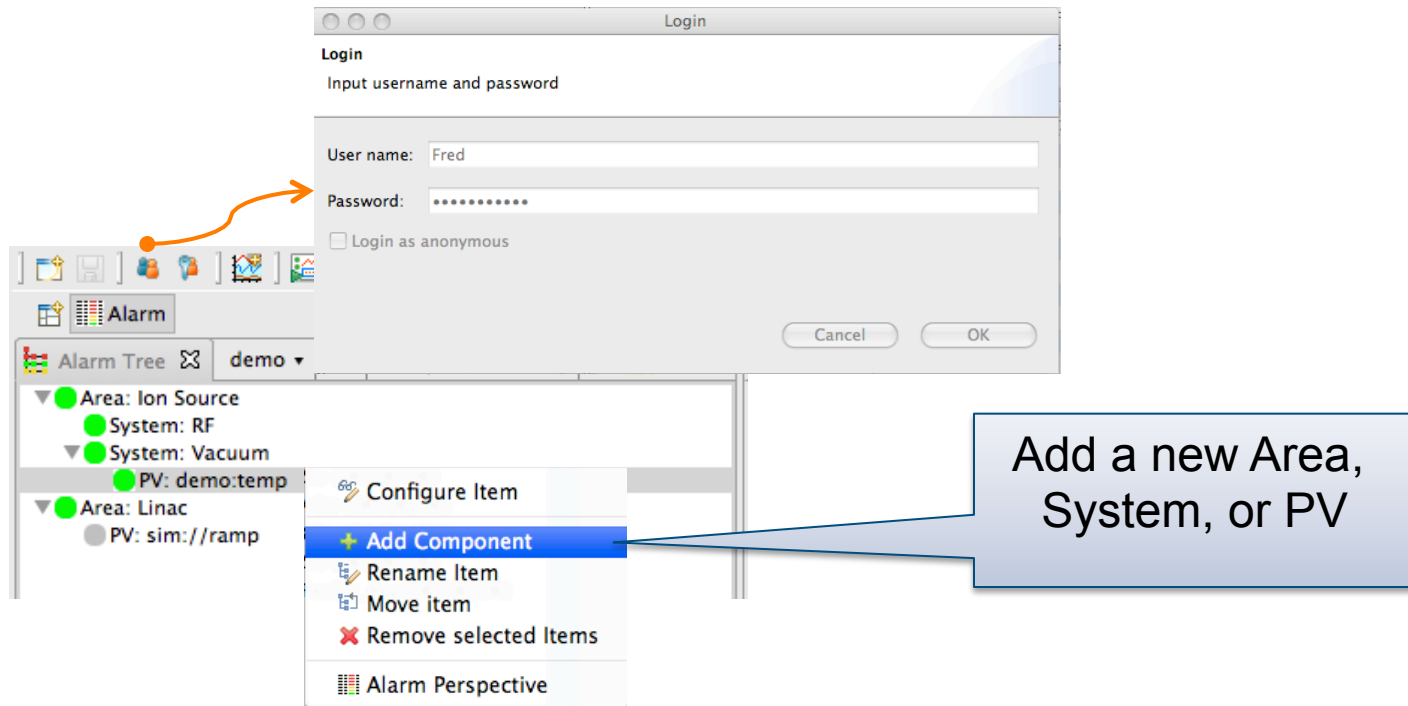
- Especially when there are many alarms, it can be useful to know **where** they are
- Use physical “Areas”, i.e. location along the machine!

## 3. Guidance, Related Displays

- Guidance for an Area or System will be displayed for **all Subsystems and PVs below that point** in the alarm configuration tree
- Examples:
  - General Ion Source contact information (phone numbers, ...)
  - Linac Overview display link

# Editing the Alarm Configuration

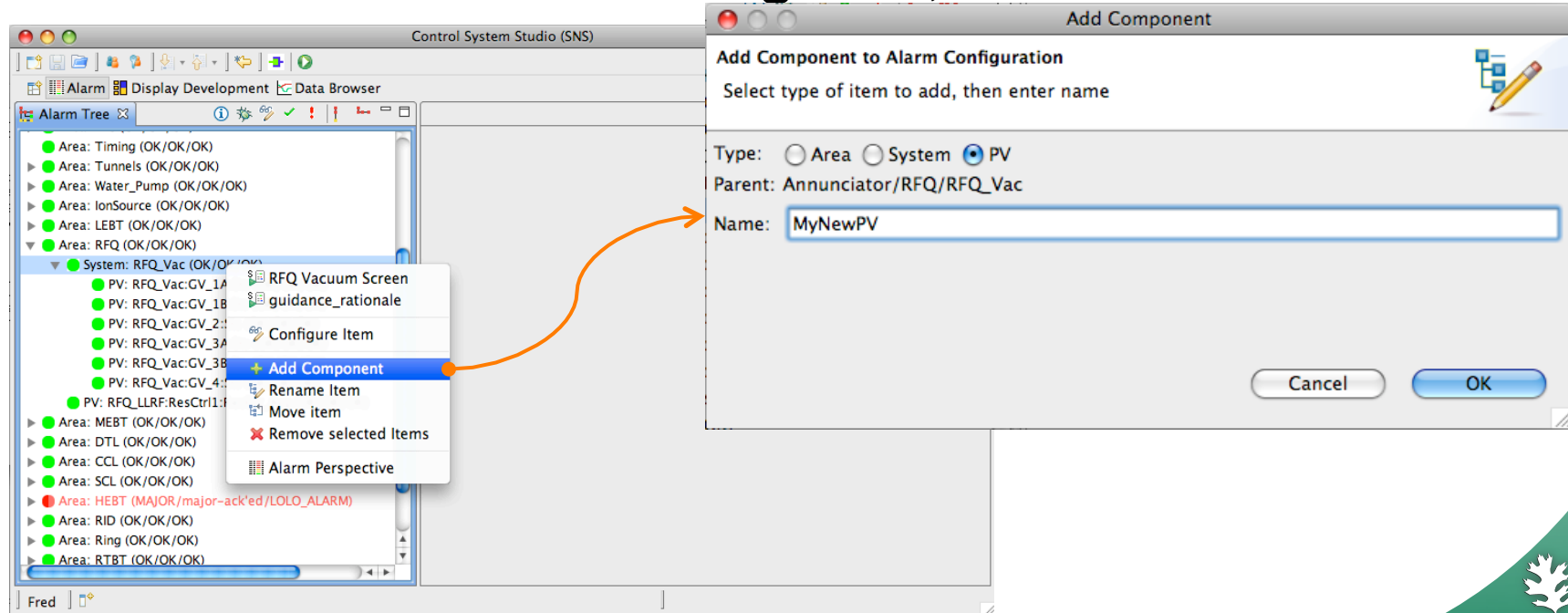
- Open Alarm Tree
- Log in
- Use Context Menu to add, edit, remove, ...



# Add PV or Subsystem

1. Right-click on 'parent'
2. "Add ..."
3. Check either Area, System or PV
4. Enter name

Online. No search for config files, no restarts.



# 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	<a href="https://ics-web.sns.ornl.gov/">https://ics-web.sns.ornl.gov/</a>
<Add>	<Add>

Commands:

Title	Command
<Add>	<Add>

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

Cancel OK

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
- PV: RFQ\_Vac:GV\_1B
- PV: RFQ\_Vac:GV\_2A
- PV: RFQ\_Vac:GV\_3A

RFQ Vacuum Screen

guidance\_rationale

Configure Item



# 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`

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<Add>	<Add>

Commands:

Title	Command
<Add>	<Add>

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

Cancel OK

Title: Check an

Details: Check LL error. Try to rec width as

## See online help for more details

# Exercise: Edit Alarm Configuration

- **Open Alarm Tree View**
- **Select the Alarm Configuration ( ‘root’ ) assigned to your team**
- **Add areas like “Front End”, “Linac”, “Target”**
- **Add Systems like “Vacuum”, “Cooling”**
- **Create simple BOY display that shows alarm trigger PVs and allows you to control them**
- **Add alarm trigger PVs to alarm configuration**
  - **Add some simple guidance like “Fix it”**
  - **Use path to your BOY \*.opi as Display Link**

# Exercise: Use Alarm Configuration

- **Switch to the Alarm Perspective**
  - Can do that from context menu of alarm tree
- **Use the display to trigger an alarm**
- **See how alarm is indicated in the table, tree, area panel**
  - Open the guidance, related display
  - Cause the alarm PV to stop alarming
  - Acknowledge the alarm

# General Alarm Server Behavior

- **Latch highest severity, or non-latching**
  - like ALH “ack. transient”
- **Annunciate**
- **Chatter filter ala ALH**
  - 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
- **When acknowledging MAJOR alarm, subsequent MINOR alarms not annunciated**
  - ALH would again blink/require ack’