

# Control System Studio

- CSS -

## Overview

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# What is CSS?

## a) To End Users:

- Integrated control system user interface



## b) To Developers:

- A Collaboration
- An Architecture
- A Toolkit

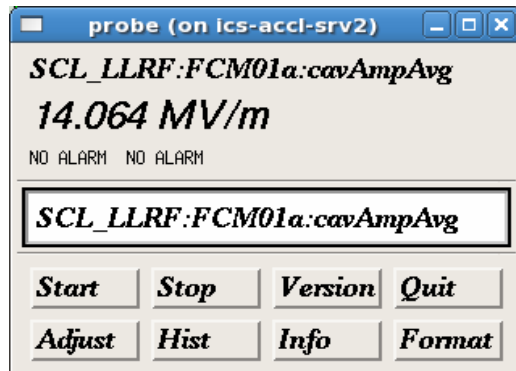
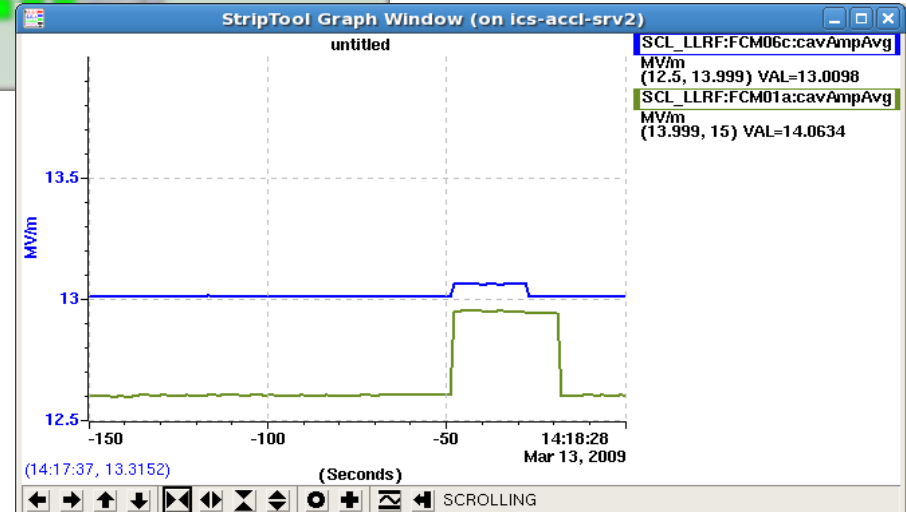
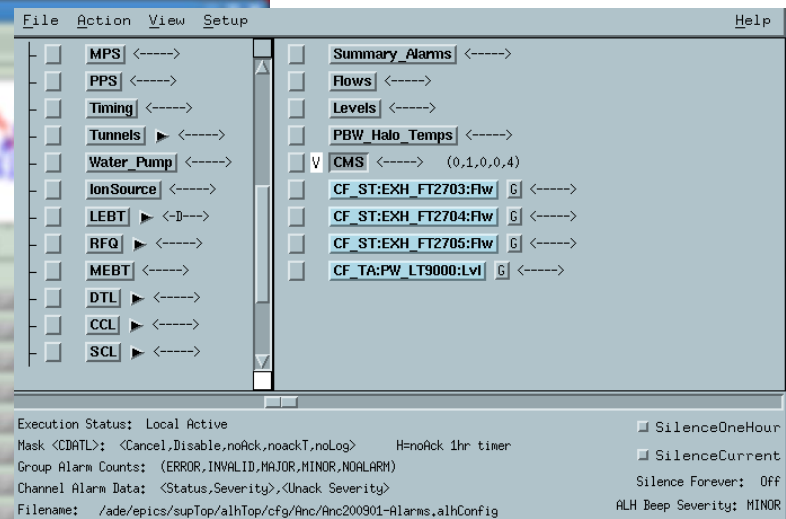


<http://www.wendolene.co.uk/Pictures/Happy.jpg>

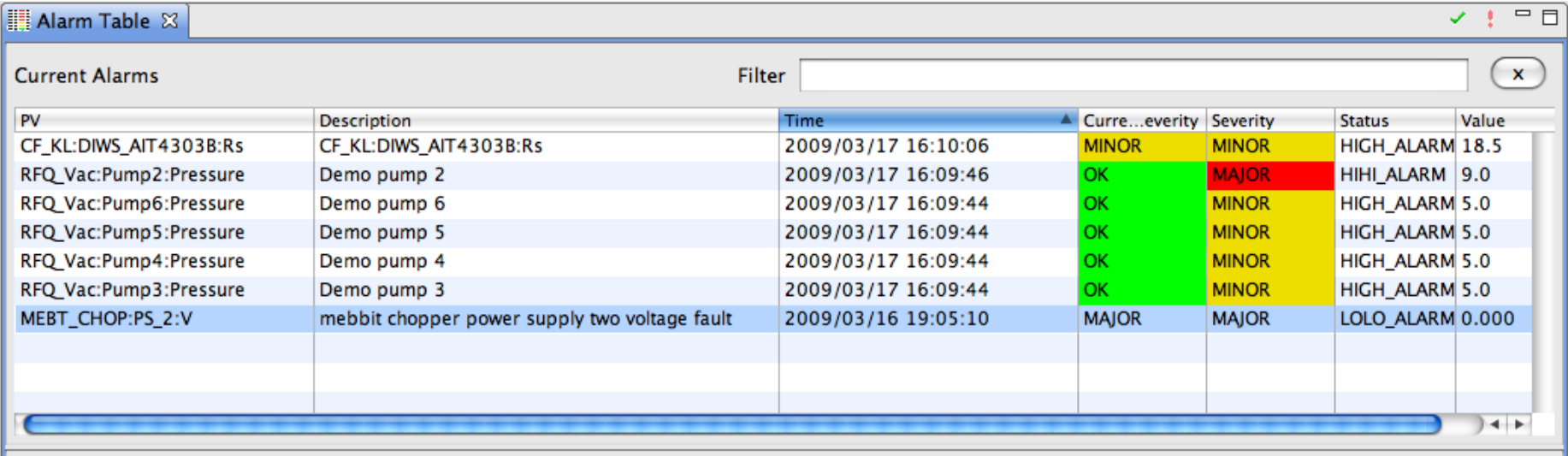
<http://www.citytowninfo.com/images/education-articles/how-to-become-a-software-engineer-2.jpg>

# Original EPICS Operator Interface

- primarily for Linux/X11
- Many disjoint tools
  - Static layout
  - Inconsistent Look
  - Online help?
  - Data exchange: at best copy/paste PV names



# Example Work Flow: React to Alarm



The screenshot shows a software window titled "Alarm Table" with a search filter and a table of current alarms. The table has seven columns: PV, Description, Time, Current severity, Severity, Status, and Value. The data is as follows:

PV	Description	Time	Current severity	Severity	Status	Value
CF_KL:DIWS_AIT4303B:Rs	CF_KL:DIWS_AIT4303B:Rs	2009/03/17 16:10:06	MINOR	MINOR	HIGH_ALARM	18.5
RFQ_Vac:Pump2:Pressure	Demo pump 2	2009/03/17 16:09:46	OK	MAJOR	HIHI_ALARM	9.0
RFQ_Vac:Pump6:Pressure	Demo pump 6	2009/03/17 16:09:44	OK	MINOR	HIGH_ALARM	5.0
RFQ_Vac:Pump5:Pressure	Demo pump 5	2009/03/17 16:09:44	OK	MINOR	HIGH_ALARM	5.0
RFQ_Vac:Pump4:Pressure	Demo pump 4	2009/03/17 16:09:44	OK	MINOR	HIGH_ALARM	5.0
RFQ_Vac:Pump3:Pressure	Demo pump 3	2009/03/17 16:09:44	OK	MINOR	HIGH_ALARM	5.0
MEBT_CHOP:PS_2:V	mebbit chopper power supply two voltage fault	2009/03/16 19:05:10	MAJOR	MAJOR	LOLO_ALARM	0.000

**CSS includes an alarm system.**

**Operator notices an alarm...**

# Example Work Flow: React to Alarm..

The screenshot shows a software interface with two main sections: 'Current Alarms' and 'Acknowledged Alarms'. The 'Current Alarms' section contains a table with columns for PV, Description, Time, Current Severity, Severity, Status, and Value. The 'Acknowledged Alarms' section contains a similar table. A context menu is open over the 'MEBT\_CHOP:PS\_2:V' alarm in the 'Current Alarms' section. The menu items are: 21:44:56, Check MEBT PS 2 Chopper, MEBT Chopper PS 2 Screen, Logbook..., Acknowledge, Copy Pv Name to Clipboard, CSS, Configure Item, Auto-size Columns, Alarm Perspective, Data Browser, Data Browser View, PV Table, Rack View, PV Utility, PV Fields Viewer, Probe, and EPICS PV Tree.

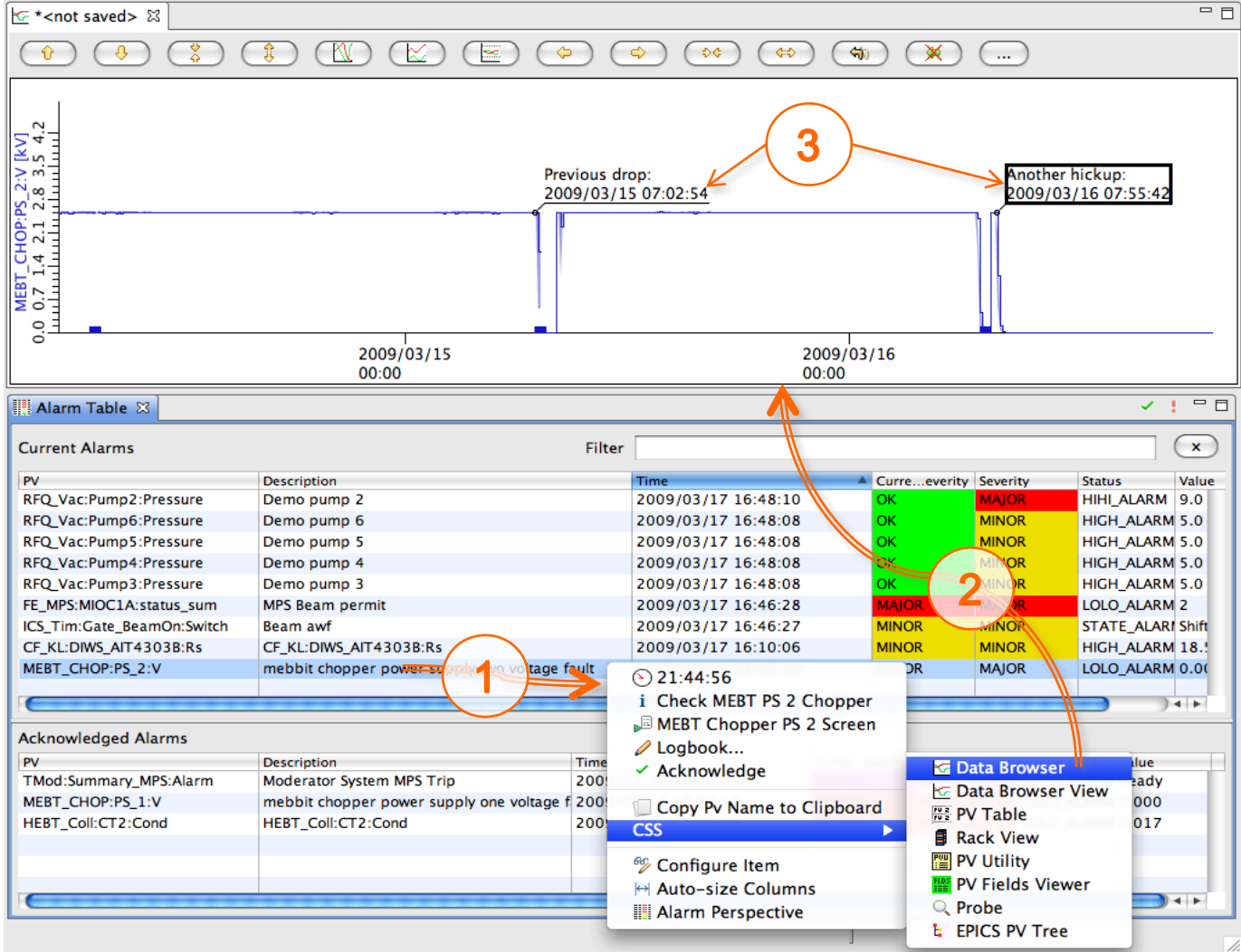
PV	Description	Time	Current Severity	Severity	Status	Value
RFQ_Vac:Pump2:Pressure	Demo pump 2	2009/03/17 16:48:10	OK	MAJOR	HIHI_ALARM	9.0
RFQ_Vac:Pump6:Pressure	Demo pump 6	2009/03/17 16:48:08	OK	MINOR	HIGH_ALARM	5.0
RFQ_Vac:Pump5:Pressure	Demo pump 5	2009/03/17 16:48:08	OK	MINOR	HIGH_ALARM	5.0
RFQ_Vac:Pump4:Pressure	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 two voltage fault		MAJOR	MAJOR	LOLO_ALARM	0.00

PV	Description	Time
TMod:Summary_MPS:Alarm	Moderator System MPS Trip	2009/03/17 16:48:08
MEBT_CHOP:PS_1:V	mebbit chopper power supply one voltage fault	2009/03/17 16:48:08
HEBT_Coll:CT2:Cond	HEBT_Coll:CT2:Cond	2009/03/17 16:48:08

Context menu of alarm...

("right click")

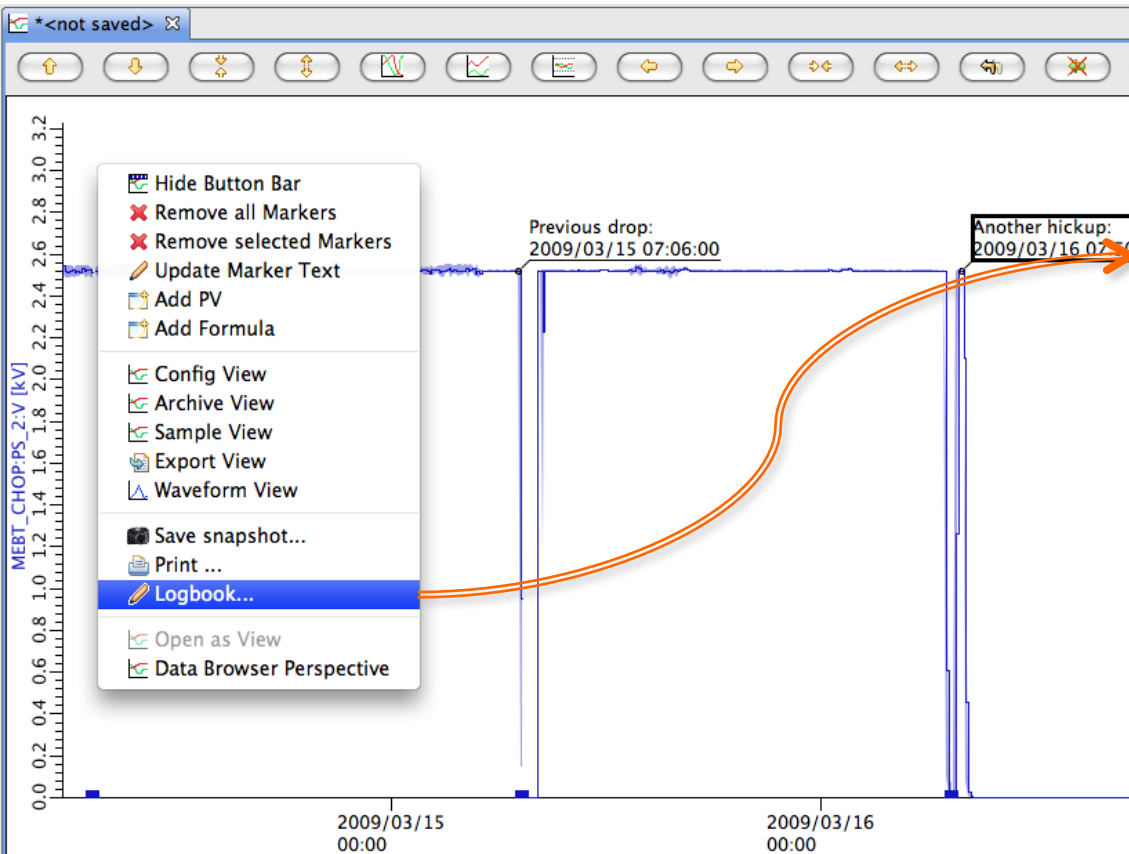
# Example Work Flow: React to Alarm...



Inspect history of PV, annotate, ...

# Finally: Data Browser → E-Log


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



The figure shows a 'Logbook Entry' dialog box. The dialog contains the following fields and text:

- Create electronic logbook entry** (with a pencil icon)
- 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... (with a placeholder image)
- Buttons: Cancel, OK

# A Collaboration

- Started 2006 between **DESY** and **SNS**
  - Joined by CLS, APS, **BNL**, , Diamond, ..., KEK/J-PARC?
- [https:// sourceforge .net/apps/trac/cs-studio/wiki](https://sourceforge.net/apps/trac/cs-studio/wiki)
  - Code repository, Wiki, Mailing lists
- Growing presence at **EPICS** meetings
  - Benefits from Eclipse community:



**Participants from ~30 countries**





# A Control System Architecture

- Portable environment (Windows, Linux, OS X)
- Excellent (free!) development tools



- Extensible bundling: Plug-Ins, Extension points, Registry
- Rich Client Platform (RCP) for windows, menus, online help, preferences, online update, ...


# CSS: A Software Toolkit

- **It's BIG**
  - Repository: ~ 1.500.000 lines of Java Code
- **Structured**
  - 70 'core' plugins, about 300 total
  - About 40% of code is comments and formatting
- **You pick what you need**
  - SNS uses ~300.000 (20%)







Perl cloc tool on July 2011 cs-studio3.0 repo and SNS source snapshot, excluding zip files

# CSS Plugin Examples

- **Library Plug-Ins**

- Control system data types (PV, Sample, ...), Life data access, Historic Data Access, Logbook , E-Mail, Authentication, Authorization, ...
- Extension Points
  - Life data: Channel Access, Simulated, Local PVs
  - Historic Data: XML-RPC, RDB, ...
  - Authentication: Kerberos, LDAP, ...

- **Application Plug-Ins**

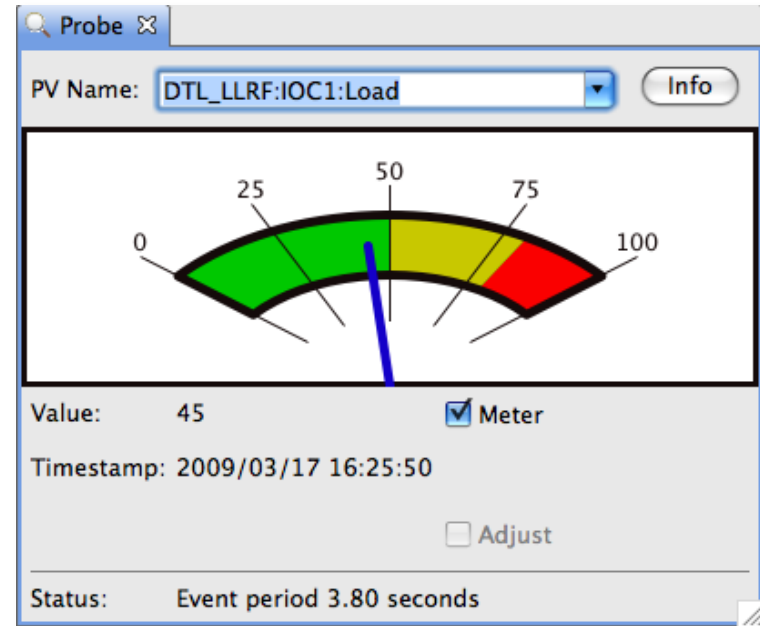
- Strip-Chart: Data Browser 
- OPI: SDS, BOY 
- Alarms: NAMS, BEAST 
- Archive: DESY Archive, BEAUTY
- Utilities: Probe, Clock , PV Tree , Psychiatrist 

List of plugins: <http://cs-studio.sourceforge.net/plugins.html>

# Basic CSS Tools

## Probe

- Current value of a PV

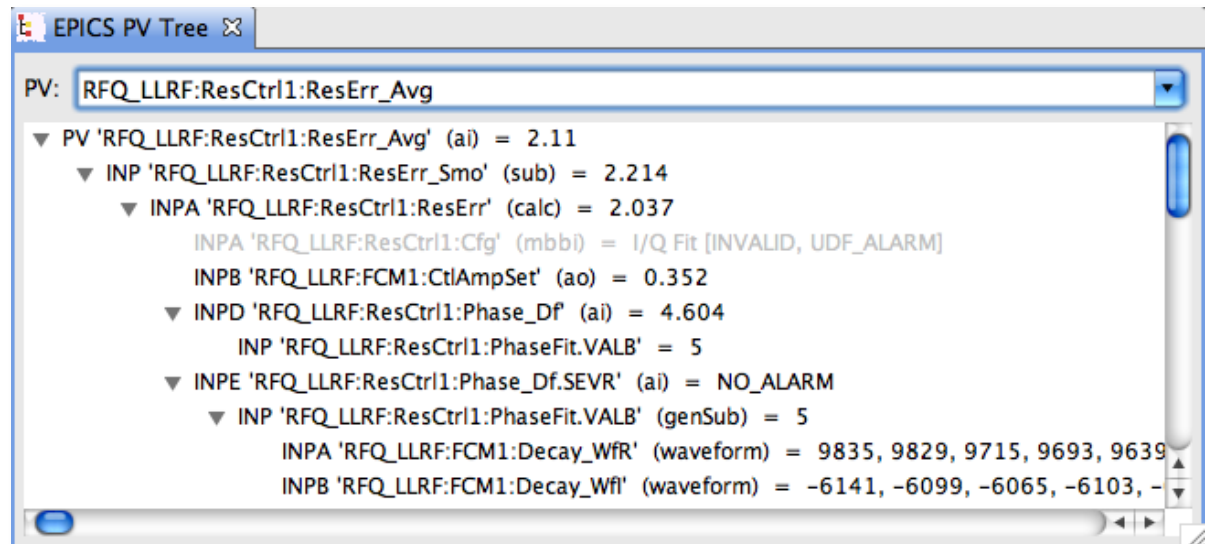


## EPICS PV Tree

- Trace PV links

## Both:

- ✓ Resize
- ✓ Drop-downs keep previous entries



# Localization

## CSS Translations

- All: (US) English
- Most: German
- Few: French, Chinese

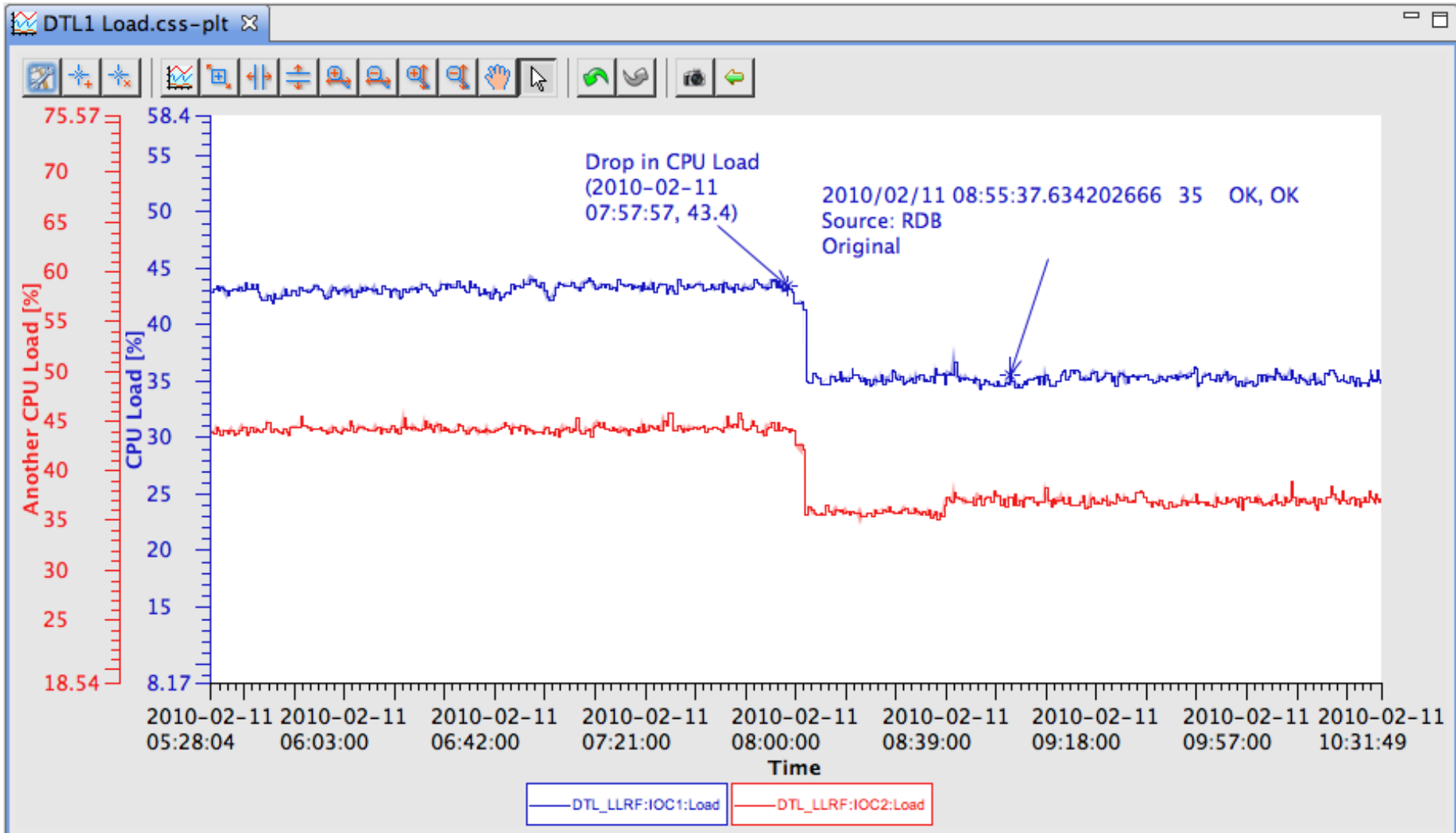
Could be 日本!

The image displays three overlapping screenshots of a 'Prob Probe' monitoring interface, demonstrating localization into different languages:

- Top Screenshot (English):** Shows a gauge for 'DTL\_LLRF:IOC1:Load' with a value of 55. The gauge has segments for 0-25 (green), 25-50 (yellow), 50-75 (orange), and 75-100 (red). The needle points to 55. Text includes 'Value: 55 [MINOR HIGH\_ALARM]', 'Timestamp: 2007/09/07 13:11:15.705757666', and 'Status: Event period 8.19 seconds'. Buttons for 'Adjust' and 'Meter' are visible.
- Middle Screenshot (German):** Shows the same gauge for 'DTL\_LLRF:IOC3:Load' with a value of 42. The needle points to 42. Text includes 'Wert: 42', 'Zeitstempel: 2007/09/06 14:56:52.483672666', and 'Status: Benachrichtigungsperiode 2,00 Sekunden'. Buttons for 'Andern' and 'Benachrichtigungsperiode 2,00 Sekunden' are visible.
- Bottom Screenshot (Chinese):** Shows the same gauge for 'DTL\_LLRF:IOC3:Load' with a value of 42. The needle points to 42. Text includes 'PV 名: DTL\_LLRF:IOC3:Load', '值: 42', '响应时间 2007/09/06 14:57:32.478345666', and '状态: 事件周期2.00秒'. Buttons for '信息' and '重新赋值' are visible.

# Data Browser

## Plot 'live' and historic data over time



# Data Browser

## Archive search, Plot Configuration

Archive Search | Navigator

URL: jdbc:oracle:thin:@(DES... Info

Name	Description	Key
rdb	Oracle	1

Pattern: DTL\_LLRF:IOC\*:Loac Search

Add...  Replace search results  Reg.Exp.

PV Name	Name
DTL_LLRF:IOC1:Load	rdb
DTL_LLRF:IOC2:Load	rdb
DTL_LLRF:IOC3:Load	rdb
DTL_LLRF:IOC4:Load	rdb
DTL_LLRF:IOC5:Load	rdb
DTL_LLRF:IOC6:Load	rdb

DTL1 Load.css-plt

Drop in CPU Load (2010-02-11 07:57:57, 43.4)

2010/02/11 08:55:37.634202666 35 OK, OK Source: RDB Original

Another CPU Load [%] CPU Load [%]

Time

DTL\_LLRF:IOC1:Load DTL\_LLRF:IOC2:Load

Properties | Export Samples

Traces Time Axis Value Axes Misc.

Trace	Item (PV, Formula)	Display Name	Color	Scan Period	Buffer Size	Line Width	Axis	Trace Type	Request
Show	DTL_LLRF:IOC1:Load	DTL_LLRF:IOC1:Load	Blue	0.0	100	0	CPU Load	Area	Optimized
Show	DTL_LLRF:IOC2:Load	DTL_LLRF:IOC2:Load	Red	0.0	100	0	Another CF Area	Area	Optimized

Archive Data Sources

Name	Key	URL
RDB	1	jdbc:oracle:thin:@(DESCRIPTION=(ADDRESS_LIST=(LOAD_BALANCE=OFF)(ADDRESS=(PR
- All -	1	xnds://ics-srv-web2.sns.ornl.gov/archive/cgi/ArchiveDataServer.cgi
- All - (last restart)	2	xnds://ics-srv-web2.sns.ornl.gov/archive/cgi/ArchiveDataServer.cgi

# Alarm System (BEAST)

Tabular or Tree view, voice annunciations, ...

The screenshot displays the BEAST Alarm System interface. On the left is the 'Alarm Tree' view, showing a hierarchical structure of areas and points. On the right is the 'Alarm Table' view, which is currently showing 'Current Alarms'. A 'Filter' box is located above the table. Below the table is a section for 'Acknowledged Alarms'. Three callout boxes provide additional information: 'Select by Name, Description' points to the table headers, 'Sort by Time, Severity, ...' points to the table rows, and 'Acknowledge' points to a checkmark icon in the top right corner of the table window.

**Alarm Tree**

- Area: BeamPermit (MAJOR/major-ack'ed/LOLO\_ALARM)
  - PV: FE\_MPS:MIOC1A:status\_sum (MAJOR/major-ack'ed)
  - PV: ICS\_Tim:Gate\_BeamOn:Switch (MINOR/minor-ack'ed)
- Area: CF (MINOR/MINOR/HIGH\_ALARM)
- 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)
- Area: LEBT (OK/OK/OK)
- Area: RFQ (OK/OK/OK)
- Area: MEBT (MAJOR/MAJOR/LOLO\_ALARM)
- Area: DTL (OK/OK/OK)
- Area: CCL (OK/OK/OK)
- Area: SCL (OK/OK/OK)
- Area: HEBT (MAJOR/major-ack'ed/LOLO\_ALARM)
- Area: RID (OK/OK/OK)
- Area: Ring (OK/OK/OK)
- Area: RTBT (OK/OK/OK)
- Area: Target (INVALID/invalid-ack'ed/READ\_ALARM)
- Area: Test (OK/MAJOR/HIHI\_ALARM)
  - System: LLRF (OK/OK/OK)
  - PV: Instr\_BmLn:XXSTATE5216A:Sts (OK/OK/OK)
  - PV: RFQ\_Vac:Pump2:Pressure (OK/MAJOR/HIHI\_ALARM)
  - PV: RFQ\_Vac:Pump3:Pressure (OK/MINOR/HIGH\_ALARM)
  - PV: RFQ\_Vac:Pump4:Pressure (OK/MINOR/HIGH\_ALARM)
  - PV: RFQ\_Vac:Pump5:Pressure (OK/MINOR/HIGH\_ALARM)
  - PV: RFQ\_Vac:Pump6:Pressure (OK/MINOR/HIGH\_ALARM)

**Alarm Table**

Current Alarms

PV	Description	Time	Current Severity	Severity	Status	Value
CF_KL:DIWS_AIT4303B:Rs	CF_KL:DIWS_AIT4303B:Rs	2009/03/17 16:10:06	MINOR	MINOR	HIGH_ALARM	18.5
RFQ_Vac:Pump2:Pressure	Demo pump 2	2009/03/17 16:09:46	OK	MAJOR	HIHI_ALARM	9.0
RFQ_Vac:Pump6:Pressure	Demo pump 6	2009/03/17 16:09:44	OK	MINOR	HIGH_ALARM	5.0
RFQ_Vac:Pump5:Pressure	Demo pump 5	2009/03/17 16:09:44	OK	MINOR	HIGH_ALARM	5.0
RFQ_Vac:Pump4:Pressure	Demo pump 4	2009/03/17 16:09:44	OK	MINOR	HIGH_ALARM	5.0
RFQ_Vac:Pump3:Pressure	Demo pump 3	2009/03/17 16:09:44	OK	MINOR	HIGH_ALARM	5.0
MEBT_CHOP:PS_2:V	mebbit chopper power supply two voltage fault	2009/03/16 19:05:10	MAJOR	MAJOR	LOLO_ALARM	0.000

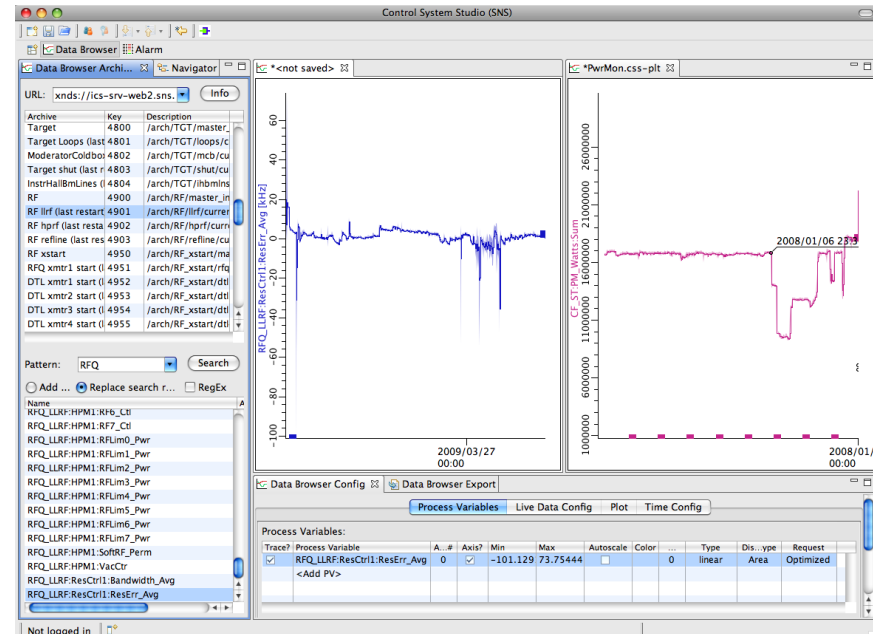
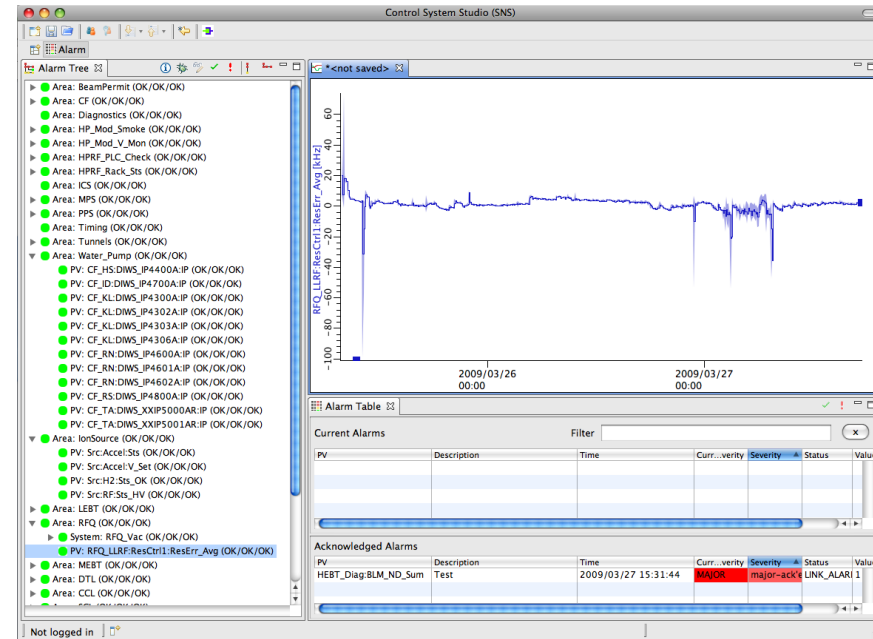
Acknowledged Alarms

PV	Description	Time	Current Severity	Severity	Status	Value
TMod:Summary_MPS:Alarm	Moderator System MPS Trip	2009/03/16 19:05:09	INVALID	invalid-ack'ed	READ_ALARM	Ready
MEBT_CHOP:PS_1:V	mebbit chopper power supply one voltage fault	2009/03/16 19:05:10	MAJOR	major-ack'ed	LOLO_ALARM	0.000
HEBT_Coll:CT2:Cond	HEBT_Coll:CT2:Cond	2009/03/16 19:05:10	MAJOR	major-ack'ed	LOLO_ALARM	0.017
FE_MPS:MIOC1A:status_sum	MPS Beam permit	2009/03/17 16:05:00	MAJOR	major-ack'ed	LOLO_ALARM	2
ICS_Tim:Gate_BeamOn:Switch	Beam awf	2009/03/17 16:04:59	MINOR	minor-ack'ed	STATE_ALARM	Shifted



# Flexible Layout

- Panels can be closed, reopened, repositioned
- Multiple Perspectives
  - Name, Save, Restore
- Multiple document instances share same configuration panels



# CSS PV Exchange

- PV in *any* CSS Tool
  - Context Menu → Select other PV Tools
  - Opens other tool with that PV

The screenshot shows the 'Alarm Table' window with the following data:

PV	Description	Time	Curre...everity	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 two voltage fault		DR	MAJOR	LOLO_ALARM	0.00

PV	Description	Time
TMod:Summary_MPS:Alarm	Moderator System MPS Trip	2009/03/17 16:48:10
MEBT_CHOP:PS_1:V	mebbit chopper power supply one voltage fault	2009/03/17 16:48:10
HEBT_Coll:CT2:Cond	HEBT_Coll:CT2:Cond	2009/03/17 16:48:10

# PV Fields Viewer

PV Fields Viewer

PV Name:

Record Type:  IOC Name:

Boot Date:  Boot File:

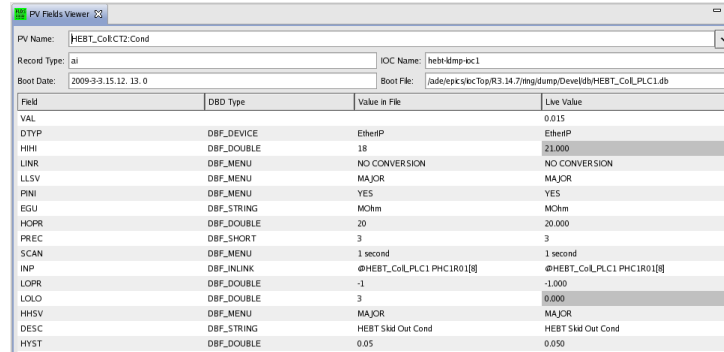
Field	DBD Type	Value in File	Live Value
VAL			0.015
DTYP	DBF_DEVICE	EtherIP	EtherIP
HIHI	DBF_DOUBLE	18	21.000
LINR	DBF_MENU	NO CONVERSION	NO CONVERSION
LLSV	DBF_MENU	MAJOR	MAJOR
PINI	DBF_MENU	YES	YES
EGU	DBF_STRING	MOhm	MOhm
HOPR	DBF_DOUBLE	20	20.000
PREC	DBF_SHORT	3	3
SCAN	DBF_MENU	1 second	1 second
INP	DBF_INLINK	@HEBT_Coll_PLC1 PHC1R01[8]	@HEBT_Coll_PLC1 PHC1R01[8]
LOPR	DBF_DOUBLE	-1	-1.000
LOLO	DBF_DOUBLE	3	0.000
HHSV	DBF_MENU	MAJOR	MAJOR
DESC	DBF_STRING	HEBT Skid Out Cond	HEBT Skid Out Cond
HYST	DBF_DOUBLE	0.05	0.050

## Detailed configuration info for a PV

@SNS: Info in Oracle, live data from EPICS

# PV Fields Viewer: Site-Specific?

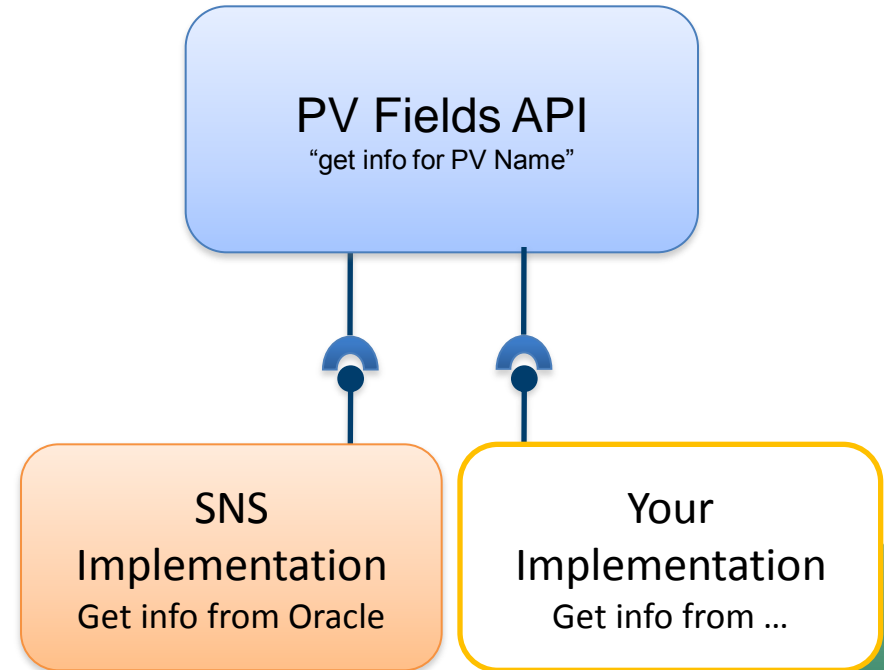
Fine, but how would I benefit from an SNS-specific tool?



Field	DBD Type	Value in File	Live Value
VAL			0.015
DTYP	DBF_DEVICE	EtherIP	EtherIP
HIHI	DBF_DOUBLE	18	21.000
LINR	DBF_MENU	NO CONVERSION	NO CONVERSION
LLSV	DBF_MENU	MAJOR	MAJOR
FINI	DBF_MENU	YES	YES
EGU	DBF_STRING	MChm	MChm
HCJR	DBF_DOUBLE	20	20.000
PREC	DBF_SHORT	3	3
SCAN	DBF_MENU	1 second	1 second
INP	DBF_INLNK	@HEBT_CoL_PLC1 PHC1R0 [0]	@HEBT_CoL_PLC1 PHC1R0 [0]
LOPR	DBF_DOUBLE	-1	-1.000
LOLO	DBF_DOUBLE	3	0.000
HHSV	DBF_MENU	MAJOR	MAJOR
DESC	DBF_STRING	HEBT Skid Out Cond	HEBT Skid Out Cond
HYST	DBF_DOUBLE	0.05	0.050

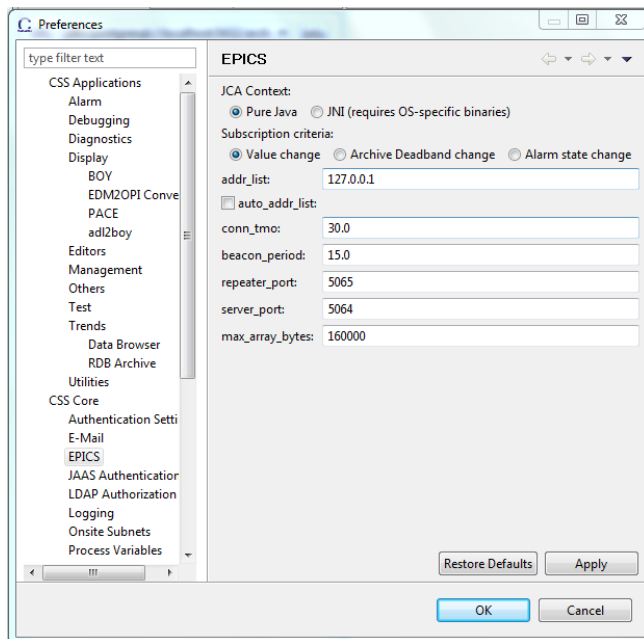
It's "Pluggable"!

You can provide the glue code to your EPICS config in RDB, LDAP, text files



# Integrated Help, Preferences

- Uniform access to settings, searchable help
  - Applications
  - Support Libraries
    - Logging
    - Control System access

A screenshot of the 'Help - Csx' application window. The left pane shows a tree view of help topics, with 'EPICS Library' selected under 'CSS Core'. The main pane displays the 'EPICS Library' page, which includes a description of the ChannelAccess (CA) client library and a 'Preferences' section. The 'Preferences' section lists two main items to configure: 'JCA Context' and 'addr\_list and auto\_addr\_list'. The 'JCA Context' section notes that the pure Java version is the default. The 'addr\_list and auto\_addr\_list' section explains how to configure IP addresses for IOCs on a gateway or in another subnet. A note at the bottom states that changes require a restart of the application.

Search:  Go [Scope](#): All topics

**Content**

- CSS Applications
  - Display
    - PACE Editor
    - EDM2OPI Converter
    - RDB Table Editor
    - adl2Boy - Converter
    - PV Table
    - Best OPI Yet (BOY)
    - Alarm
  - Trends
    - Data Browser
  - Diagnostic Tools
    - Debugging
    - Management
    - Editors
  - Utilities
    - Test
    - Other
- CSS Core
  - User Interface
  - Preferences
  - EPICS Library
  - E-Mail
  - Process Variables
- SNS CSS
  - SNS CSS Overview

[CSS Core >](#)

## EPICS Library

This provides the ChannelAccess (CA) client library for accessing Process Variables on EPICS IOCs via the network.

### Preferences

There are two main items to configure:

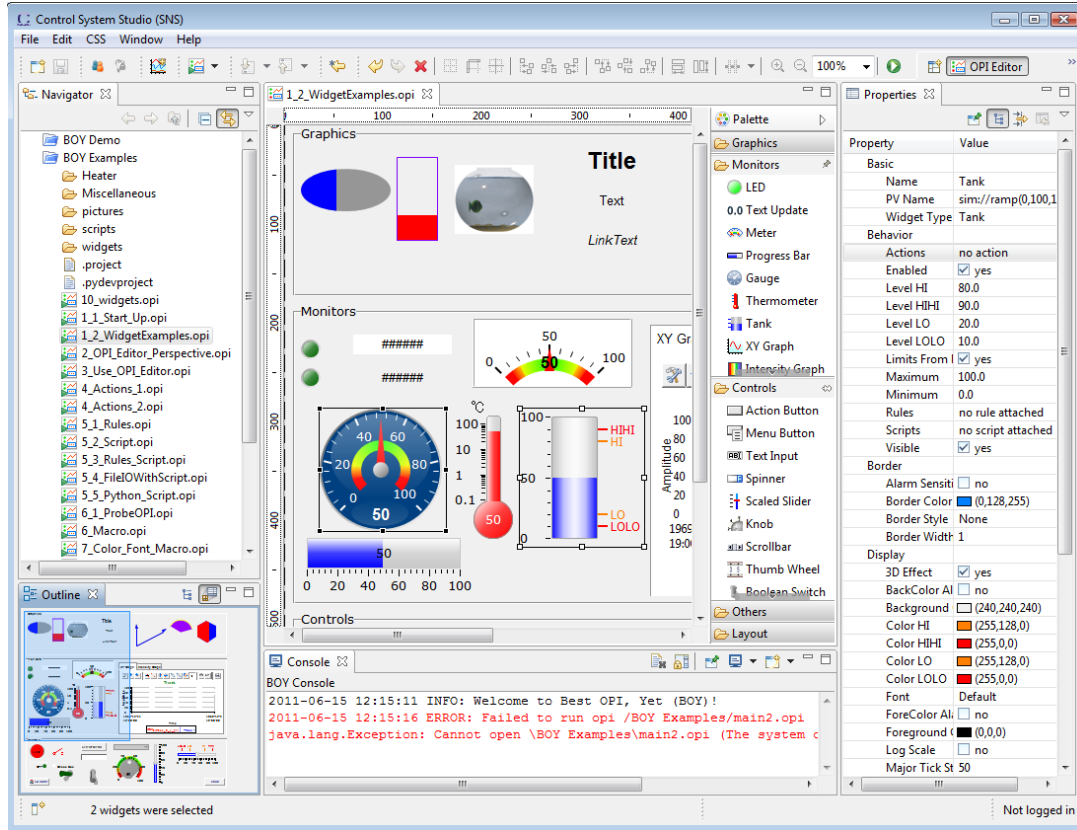
- **JCA Context:**  
There is a pure Java as well as a JNI implementation available. The pure Java version is the default because it is easier to install and should work "out of the box", while the JNI implementation might provide maximum compatibility with existing EPICS installations.
- **addr\_list and auto\_addr\_list**  
If all CA servers (IOCs) are on the same subnet as the computer running the CSS application, you can stay with the default: Empty addr\_list, using auto\_addr\_list. Otherwise, if you need to access PVs on a gateway or in another subnet, list the IP addresses of IOCs or IOC subnets in the addr\_list, and un-check the auto\_addr\_list. For details on this as well as the remaining settings, refer to the EPICS Channel Access reference manual.

Note that changes require a restart of the application, they do not take effect at runtime!

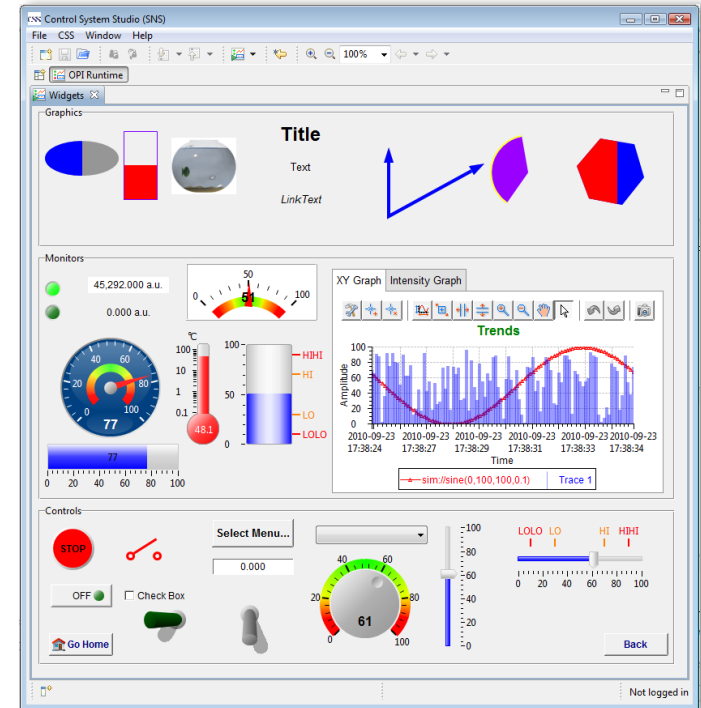
### Default Settings

# BOY – Best OPI, Yet

## Operator Interface Editor



## Runtime



Similar to EDM, MEDM, SDS, DM2K, but possibly better

# OPI Editor

Control System Studio (SNS)

File Edit CSS Window Help

100%

OPI Editor

1\_2\_WidgetExamples.opi

Graphics

Monitors

Controls

Properties

Property Value

Property	Value
<b>Basic</b>	
Name	Tank
PV Name	sim://ramp(0,100,1
Widget Type	Tank
<b>Behavior</b>	
Actions	no action
Enabled	<input checked="" type="checkbox"/> yes
Level HI	80.0
Level HIHI	90.0
Level LO	20.0
Level LOLO	10.0
Limits From I	<input checked="" type="checkbox"/> yes
Maximum	100.0
Minimum	0.0
Rules	no rule attached
Scripts	no script attached
Visible	<input checked="" type="checkbox"/> yes
<b>Border</b>	
Alarm Sensiti	<input type="checkbox"/> no
Border Color	(0,128,255)
Border Style	None
Border Width	1
<b>Display</b>	
3D Effect	<input checked="" type="checkbox"/> yes
BackColor Al	<input type="checkbox"/> no
Background	(240,240,240)
Color HI	(255,128,0)
Color HIHI	(255,0,0)
Color LO	(255,128,0)
Color LOLO	(255,0,0)
Font	Default
ForeColor Al	<input type="checkbox"/> no
Foreground	(0,0,0)
Log Scale	<input type="checkbox"/> no
Major Tick St	50

BOY Console

```

2011-06-15 12:15:11 INFO: Welcome to Best OPI, Yet (BOY)!
2011-06-15 12:15:16 ERROR: Failed to run opi /BOY Examples/main2.opi
java.lang.Exception: Cannot open \BOY Examples\main2.opi (The system c
  
```

2 widgets were selected

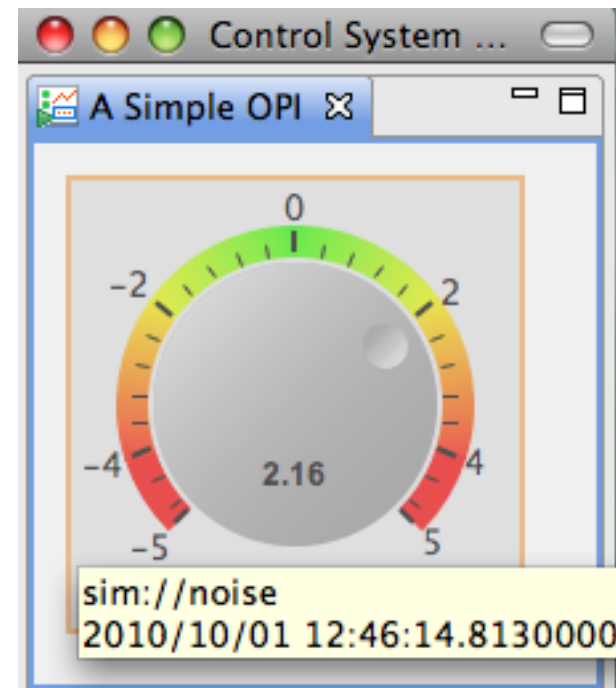
Not logged in

# Simple Things are Easy

1. Drag a widget, e.g. Knob, from palette to editor
2. Enter the PV name in Properties view
3. Click the “Run”  button to execute!

## What you will get

- ✓ PV *value* as text and via knob position
- ✓ PV *severity* reflected in border color
- ✓ PV *name* and *value* shown in tool-tip
- ✓ PV's *display limits* set the knob's default range
- ✓ Indicate 'disconnected' state via a pink border
- ✓ Widget will be greyed-out if read-only





# Editing Features

## Add Widgets

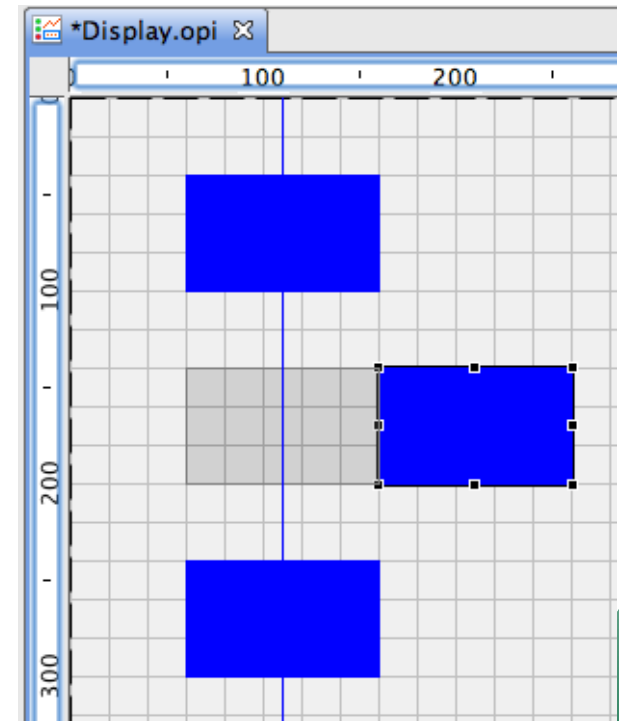
- Drag & Drop from Palette
- Copy/paste, Ctrl+Drag existing widgets to duplicate



- Snap to grid, guideline, other widgets
- Align, distribute

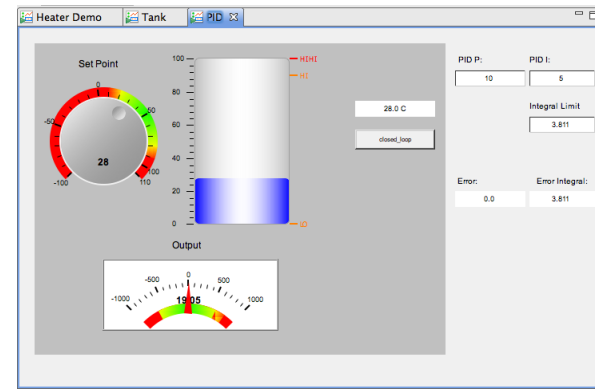
## Select multiple widgets to

- Edit common properties
- Adjust size or move around

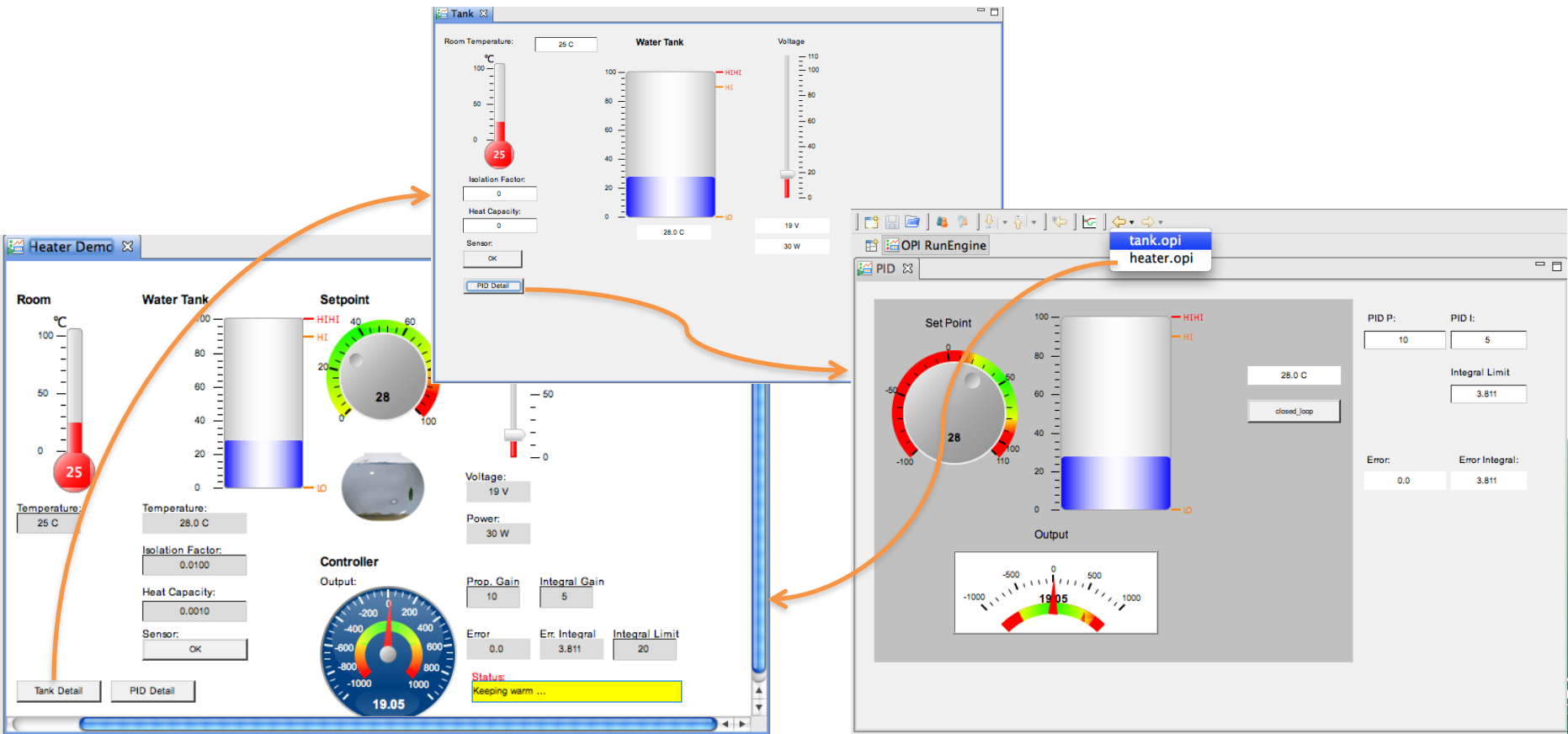


# Screen Navigation

- Idea: Minimize number of open screens.
- Similar to **Web Browser** links:
  - Default: Related displays replace the current display.
  - Optional open in 'tabs' or new window
  - Allow previous/next navigation over display history

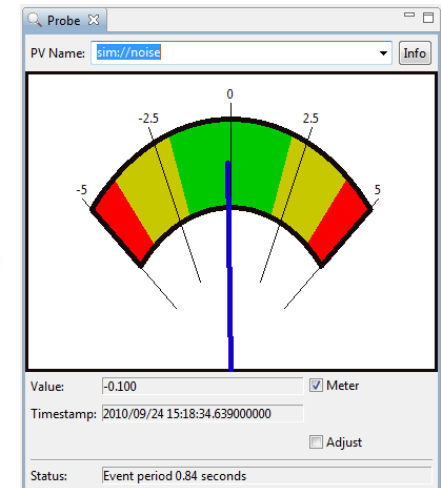
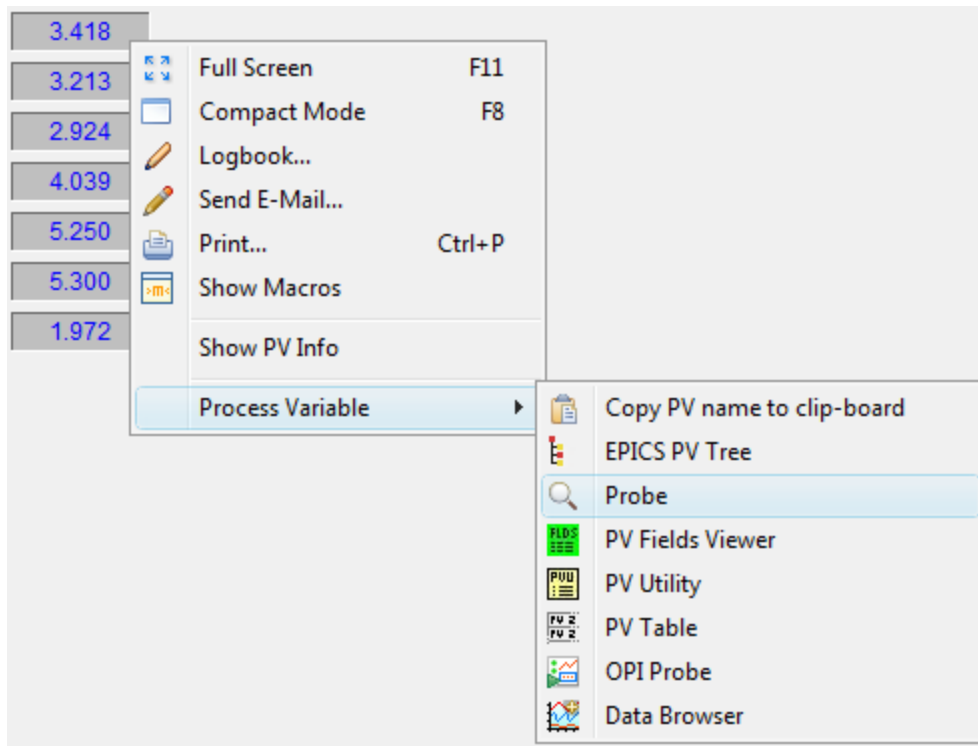


Displays in 'Tabs'



# Send PV name to other CSS tools

Use common CSS Process Variable context menu to send PV name to other CSS tools



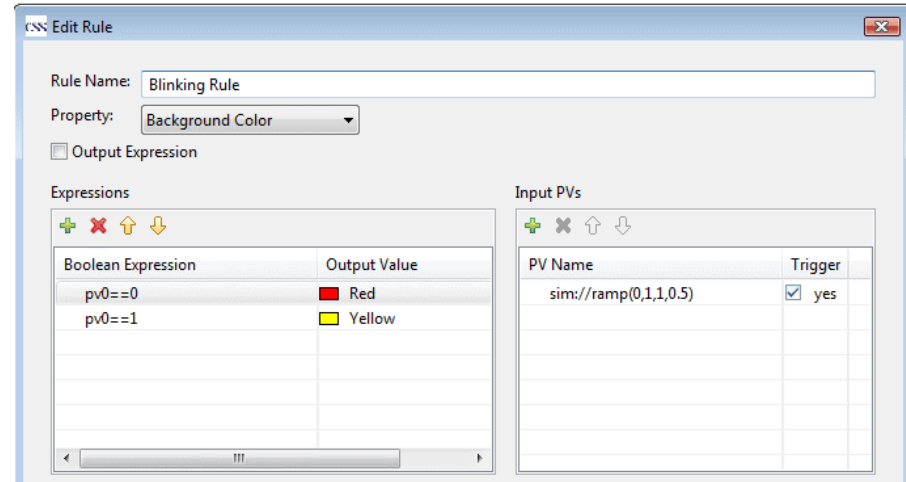
# Rules, Scripts

## Rules create dynamic displays

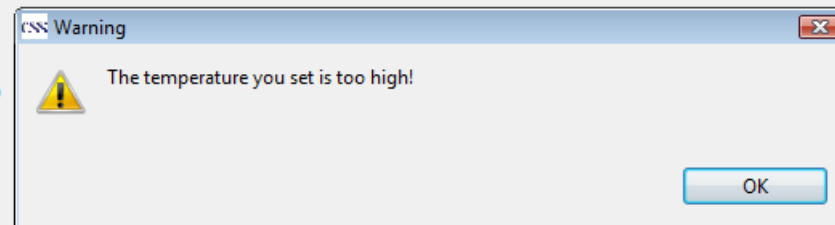
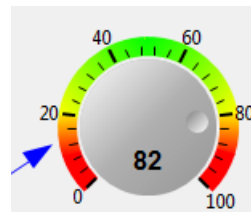
- Easy: PV  $\rightarrow$  Widget Property

## Scripts can do “anything”

- Read PVs, change widget properties, open dialog, ...
- JavaScript or Python (Jython)



```
KnobValueDialog.js
1 importPackage(Packages.org.eclipse.jface.dialogs);
2 importPackage(Packages.org.csstudio.opibuilder.scriptUtil);
3
4 var flagName = "popped";
5
6 if(widgetController.getExternalObject(flagName) == null){
7     widgetController.setExternalObject(flagName, false);
8 }
9
10 var b = widgetController.getExternalObject(flagName);
11
12 if(PVUtil.getDouble(pvArray[0]) > 80){
13     if(b == false){
14         widgetController.setExternalObject(flagName, true);
15         MessageDialog.openWarning(
16             null, "Warning", "The temperature you set is too high!");
17     }
18 }else if(b == true){
19     widgetController.setExternalObject(flagName, false);
20 }
21 }
```



# SNS Examples

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OPI Runtime

Test Bench ReadBack Test

## SNS Timing Receiver Test Bench

Card A (0x0) Card B (0x080000)

Board Info

Board ID	SNS Timing Receiver VME Board V2325	Board Rev	-	Base Address	0x0
Firmware Version	FW v 0.xxx Date 02 24 2011	Board SN	0x0	Geog Address	0x8

	Event # 0-255	Delay Turns 0-65535	Delay 1/64th Turn 0-63	Delay Time us	Pulse Width 1/64th Turn 0-262143	Pulse Width Time us	Enable Output	Inverted Output	1 Shot Enable Output	Manual Fire
CH1	1	2	3	0000.000	4	0000.000	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CH2	5	6	7	0000.000	8	0000.000	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CH3	9	10	11	0000.000	12	0000.000	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CH4	0	0	0	0000.000	0	0000.000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
CH5	0	0	0	0000.000	0	0000.000	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CH6	0	0	0	0000.000	0	0000.000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
CH7	0	0	0	0000.000	0	0000.000	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
CH8	3	0	0	0000.000	0	0000.000	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ScratchPad

ScratchPad 0xC8	0xCFA71	0xCFA6D	Auto Test
ScratchPad 0xCC	0xCFA71	0xCFA6D	
ScratchPad 0xD0	0xCFA71	0xCFA6D	
ScratchPad 0xD4	0xCFA71	0xCFA6D	

Grouping Container

Temp Limit Set	55.0
Temperature	25.38 C

Write Data to Arbitrary Address

Offset Address	0xC8	0xC8	Data at Offset Address:
Data to Write	0xCE263	0xCFA6D	31:24    23:16    15:8    7:0

Not logged in

# SNS Examples

- Top-level displays created by operators

## SNS Operations

**Power on Target**  
**954.41 kW**

05/26/10 11:18:16

Ramp/Beam On	Beam Gate	Avg Current	Max Current	Rep Rate
50 774	850	21.8 mA	43.7 mA	59.9 Hz

PW On Flavor 1 I-Dump Charge

Linac RF Status	44	1.8E-7 C	
RFQ	1 2 3 4	1 2 3 4 5 6	1 2 3 4
RF	1 2 3 4	RF M3 M5	M1 M2 M3 M4
RF	X1 X2 X3 X4	X5 X6	X1 X2 X3 X4

XMTR	Modulator	Cavities											
01	01	01a	01b	01c	02a	02b	02c	03a	03b	03c	04a	04b	04c

## SNS Central Control Room

05/26/10 10:37:56

**Beam Image at Foil**

**774 Bunches**    **Energy 925 MeV**

**Rep Rate**    **Beam To Target**

59.9 Hz    Target

**Power on Target**

**952 kW**

**Primary Shutter Status**

USANS	NOMAD	BASIS
SNAP	Magnetism	Liquids
CNCS	EQ-SANS	VULCAN
8	CORELLI	10
POWGEN	MaNDi	TOPAZ
FNPB	HYSPEC	NSE
VISION	SEQUOIA	ARCS

**12-Hour Beam Power On Target**

**Beam Size at Target**

**Horizontal**    **42.81 mm**

**Vertical**    **25.36 mm**

**Power on Target**  
**952 kW**

07b 07c

10c 11a

13c 13d

16a 16b

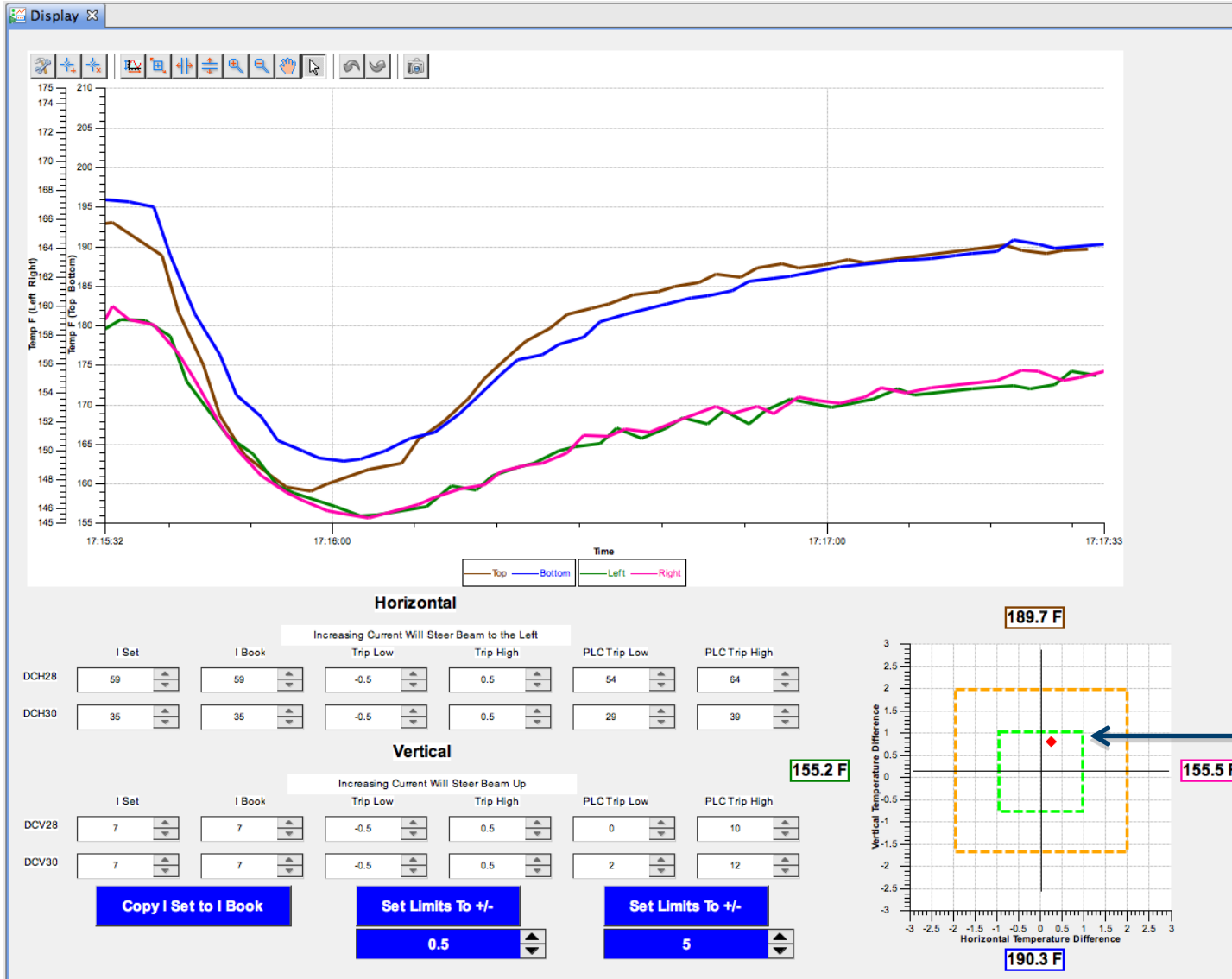
18c 18d

21a 21b

23c 23d

Legend: Gate, Forward Power, Reflected Power, Antenna Current

# SNS "Steering" Tool



Try to get spot into the green, at least into orange

# Two Views of CSS

## Developer

- Understands Toolkit, Architecture, Java, Eclipse
- Installs CSS in control room
- Offers CSS download for local office users
- Extends CSS for local needs



## End User

- Uses CSS



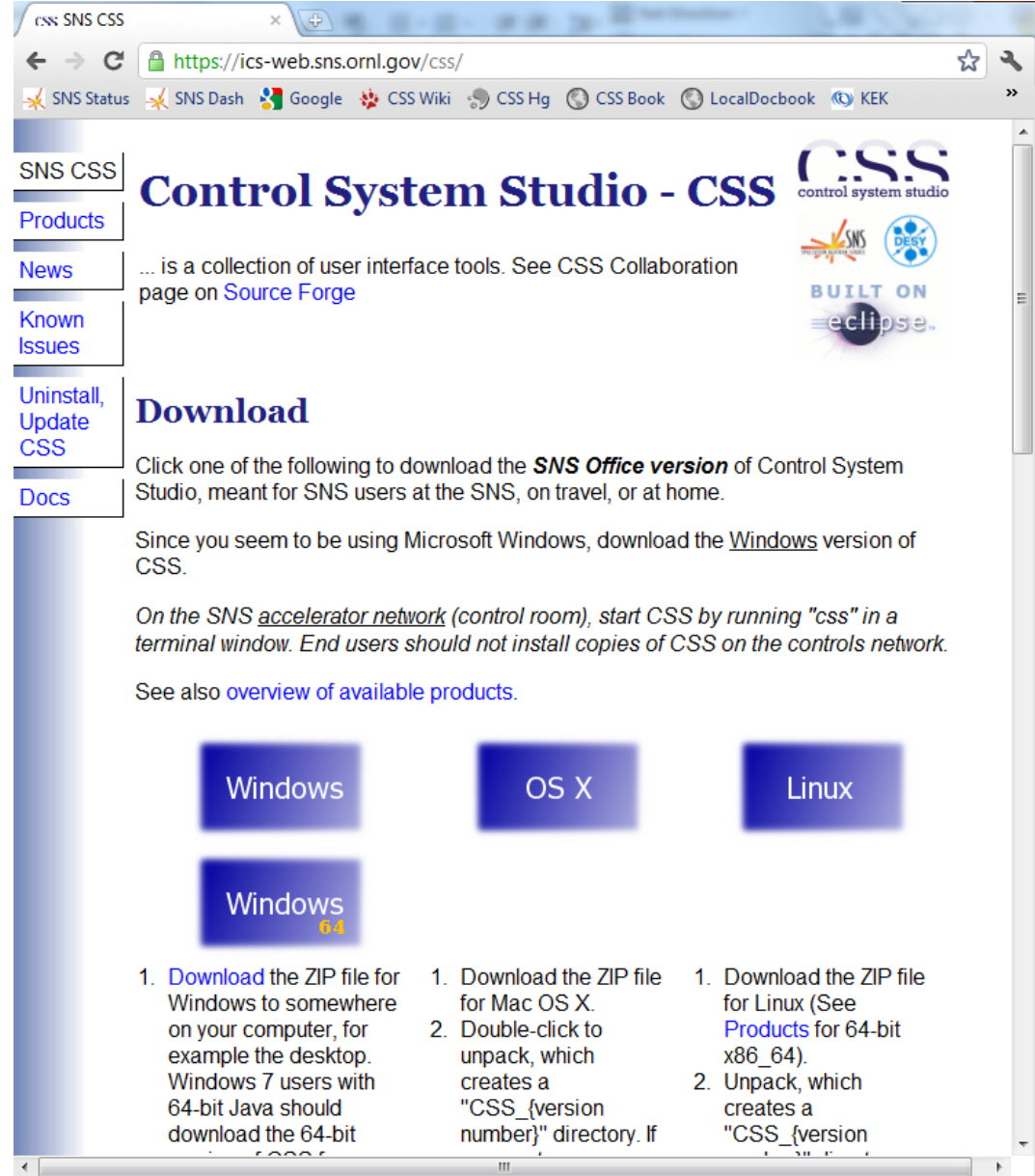
<http://www.citytowninfo.com/images/education-articles/how-to-become-a-software-engineer-2.jpg>

<http://www.wendolene.co.uk/Pictures/Happy.jpg>



# Hardest Part: Starting Site-Specific Setup

1. Decide which parts of SNS you need
2. Web site: Initial download



The screenshot shows a web browser window displaying the SNS CSS website. The address bar shows the URL <https://ics-web.sns.ornl.gov/css/>. The page title is "Control System Studio - CSS". The main content area is titled "Download" and provides instructions for downloading the SNS Office version of Control System Studio. It includes three buttons for "Windows", "OS X", and "Linux". Below each button, there are numbered steps for downloading and installing the software. The "Windows" button is highlighted, and its corresponding instructions are visible below it.

SNS CSS

Products

News

Known Issues

Uninstall, Update CSS

Docs

## Control System Studio - CSS

control system studio

... is a collection of user interface tools. See CSS Collaboration page on [Source Forge](#)

### Download

Click one of the following to download the **SNS Office version** of Control System Studio, meant for SNS users at the SNS, on travel, or at home.

Since you seem to be using Microsoft Windows, download the [Windows](#) version of CSS.

*On the SNS [accelerator network](#) (control room), start CSS by running "css" in a terminal window. End users should not install copies of CSS on the controls network.*

See also [overview of available products](#).

Windows

OS X

Linux

Windows 64

1. [Download](#) the ZIP file for Windows to somewhere on your computer, for example the desktop. Windows 7 users with 64-bit Java should download the 64-bit
1. Download the ZIP file for Mac OS X.  
2. Double-click to unpack, which creates a "CSS\_{version number}" directory. If
1. Download the ZIP file for Linux (See [Products](#) for 64-bit x86\_64).  
2. Unpack, which creates a "CSS\_{version

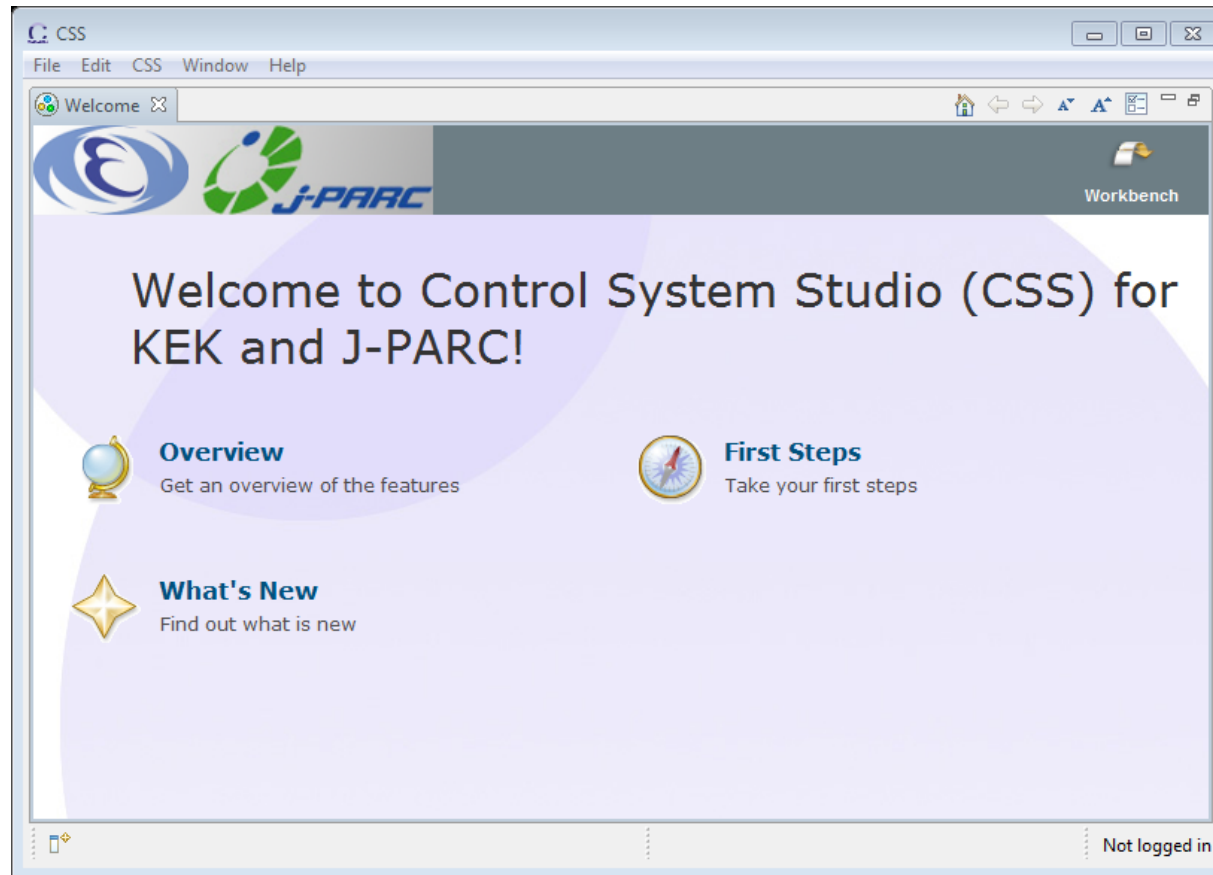
# ... Site-Specific Setup

1. Select..

2. Web site

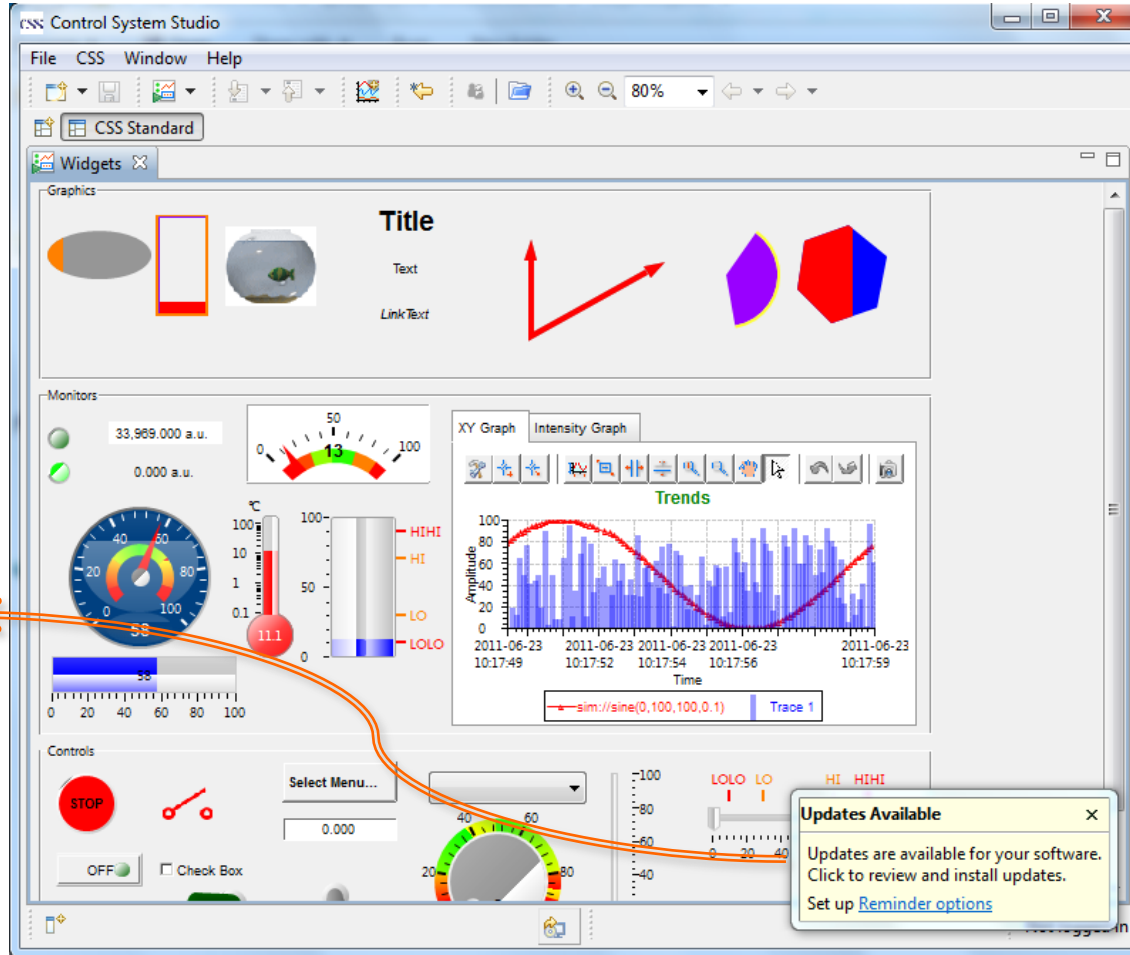
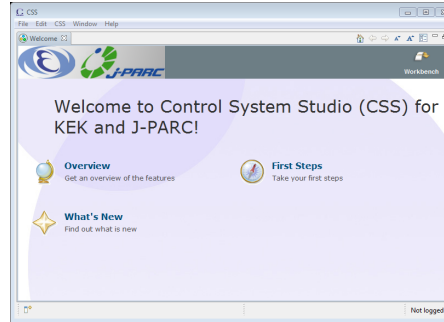
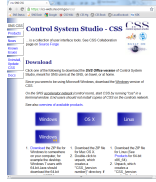


3. Product:  
Tools and  
settings  
for your users  
at your site



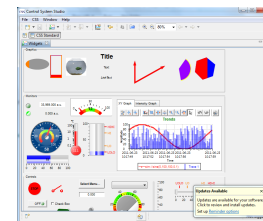
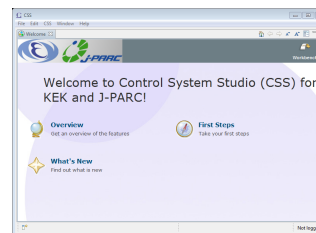
# ... Site-Specific Setup

1. Select
2. Web site
3. Product for your site
4. Automated updates



# Need Site-Specific Setup

**Developer:  
Select,...  
automated updates**



**End User: Happy**



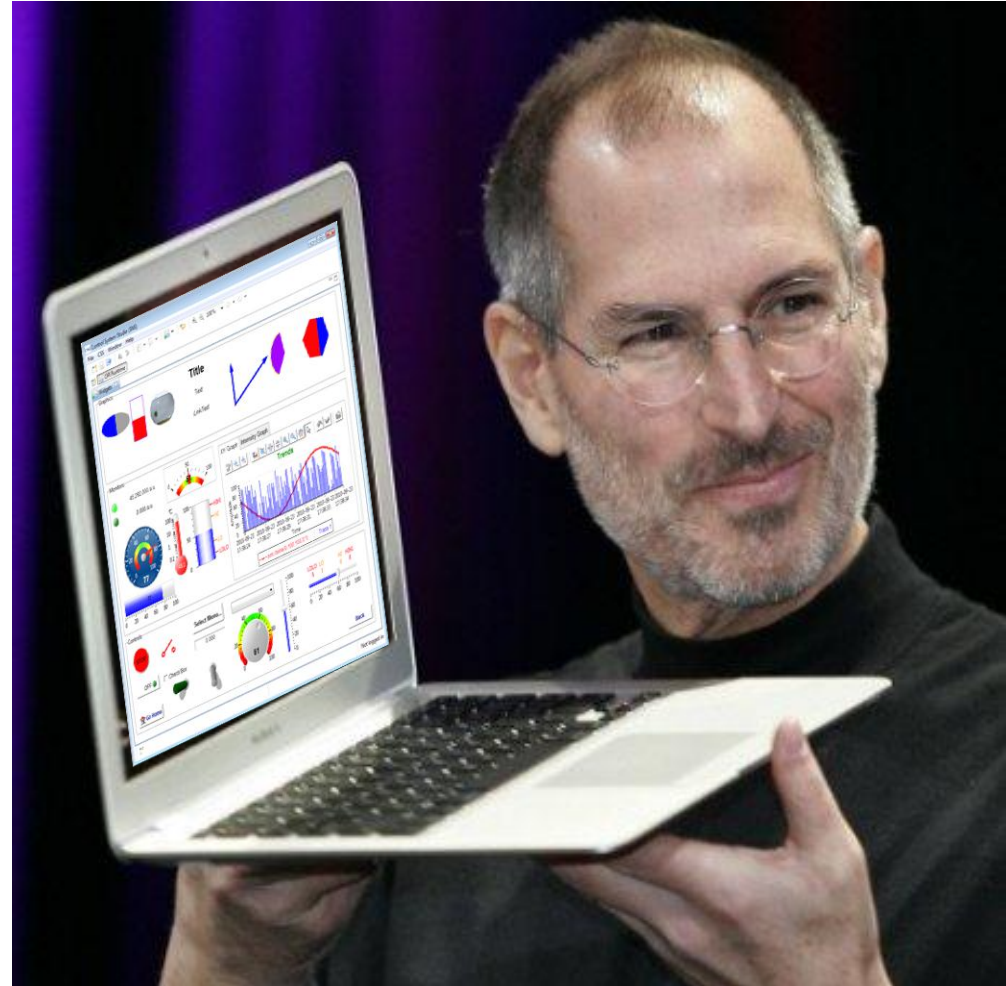
**Steep Learning Curve for  
Developers**

- ... but also many Books, online Tutorials
- Invest to learn it, and you'll like it

# So What is CSS?

Various control-system tools combined into a consistent product

Excellent for end-users!



Based on  
<http://buzzynews.com/wp-content/uploads/2008/01/steve-jobs-presente-le-mac-book-air-lordinateur-portable-le-plus-fin-du-monde.jpg>

# Links

- **CSS**

- <http://cs-studio.sourceforge.net/>
- <http://sourceforge.net/apps/trac/cs-studio>

- **Eclipse**

- <http://www.eclipse.org/>

- **Similar projects, Beam Line Data Acquisition**

**GDA: Diamond Light Source, UK**

<http://www.opengda.org/>

**GumTree: ANSTO, Australia**

<http://docs.codehaus.org/display/GUMTREE/Home>