User Interface Capabilities for Control Systems

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**Based on the work of
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PAC, May 2009

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Existing Accelerator Control System UI

- **… for EPICS**
  - **primarily for Linux/X11**

- **Many disjoint tools**
  - **Different developers**
  - **Inconsistent Look**
  - **Static layout**
  - **Online help?**
  - **Data exchange: at best copy/paste PV names**
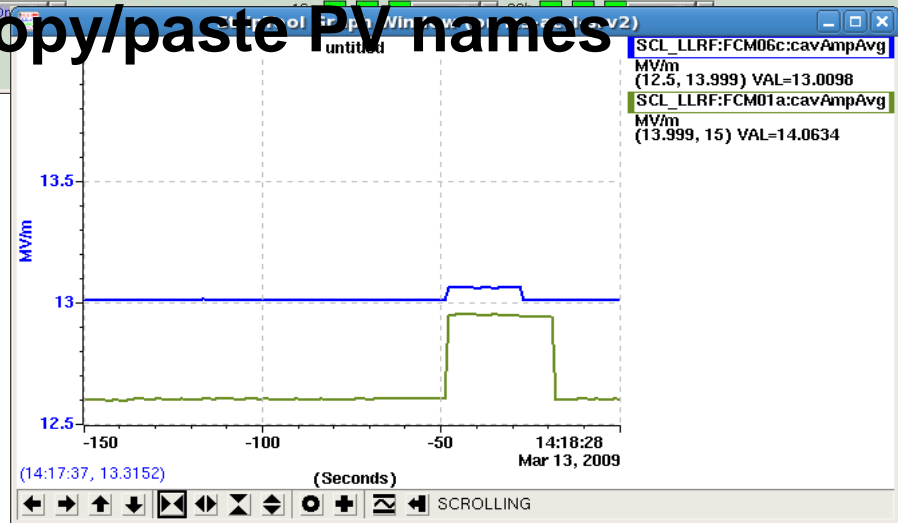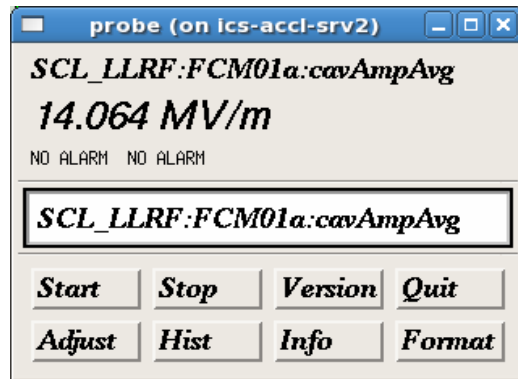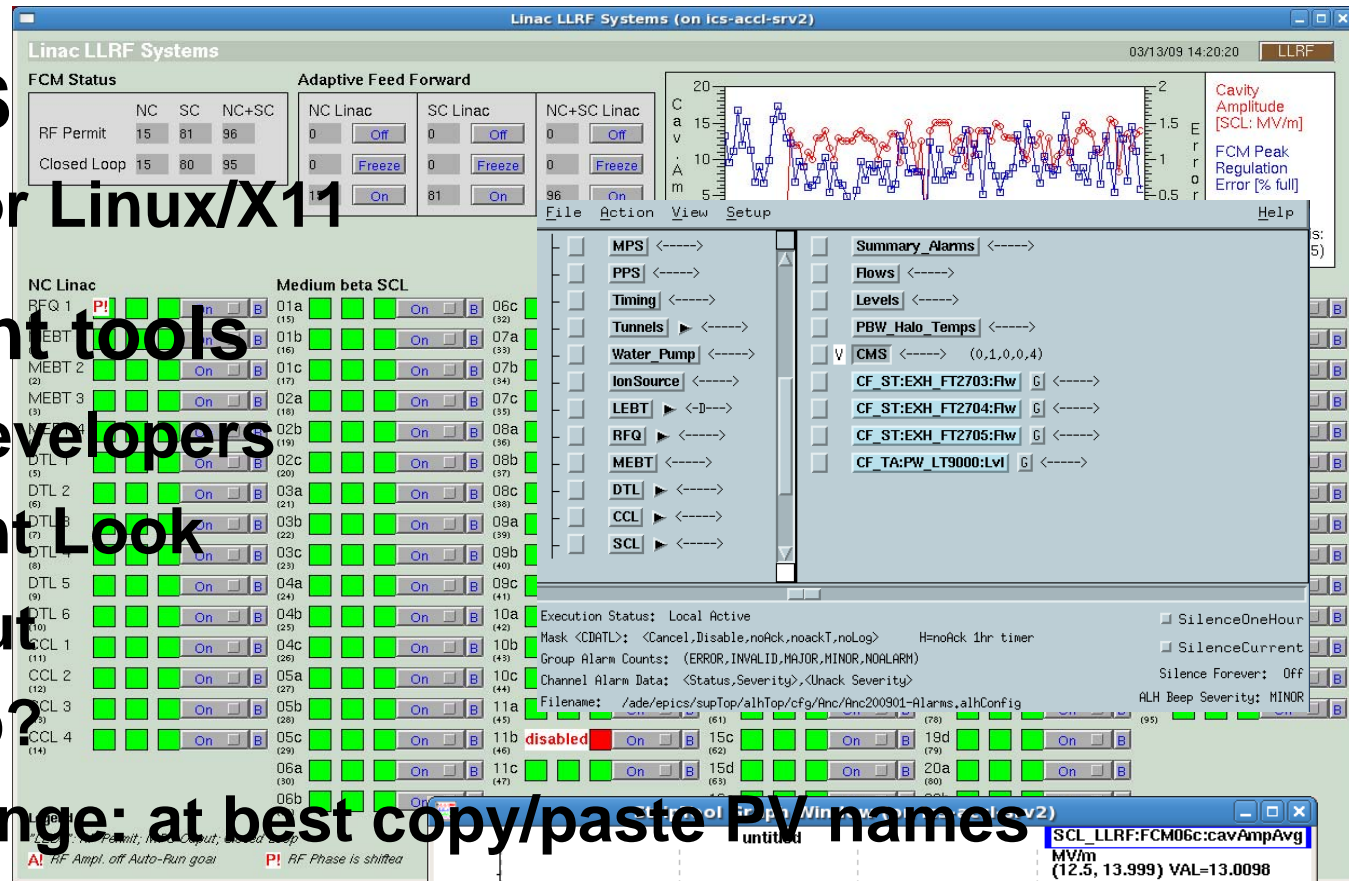
User Experience Elsewhere

- **Multi-purpose tools**
  - **MS Office, Web Browser**

- **Easy data exchange**
  - **Email Spreadsheet, save-as-HTML, …**

- **Everything "clickable" and configurable**

- **Online help, tool-tips, "wizards"**

- **Links to related information**

Control System UI Trends

- **Localized use of LabVIEW, Matlab, Qt, Web technology**

- **Growing number of sharable Java code**
  - **Individual Applications**
    - **Control Panel Editor for DOOCS, TINE, TANGO (http://jddd.desy.de)**
  - **Toolkits**
    - **XAL for rapid Physics Application Development (http://www.ornl.gov/~t6p/Main/XAL.html)**
  - **Integrated Framework**
    - **Control System Studio (http://css.desy.de, http://ics-web.sns.ornl.gov/css)**

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Java

- **Advantages**
  - **Portability (MS Windows, Linux, Mac OS X)**
  - **Truly outstanding free IDEs (Eclipse, Netbeans, …)**

- **However…**
  - **How to run?**
    - **Scripts to set CLASSPATH & run java**
    - **Somewhat differs from native application (task bar icon, name in process list)**
  - **Can still end up with disjoint applications**

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Eclipse Java Framework

- **Plugin JARs**
  - **CLASSPATH management**

- **Launcher**
  - **Native to Operating System**
  - **On-demand plugin dependency loading**

- **Extension Points**
  - **Define and document APIs**
  - **Dynamically locate implementations**

- **Rich Client Platform (RCP)**
  - **Workbench**
    - **Multi-document UI, File browser, Online help, Preferences, …**
  - **Almost everything offers extension points**
    - **Menus, file type associations, views, …**

Plugin A
Java Code,
online help, …

Extension Point

Implementation

Plugin B
Java Code,
preference settings, …

http://www.eclipse.org

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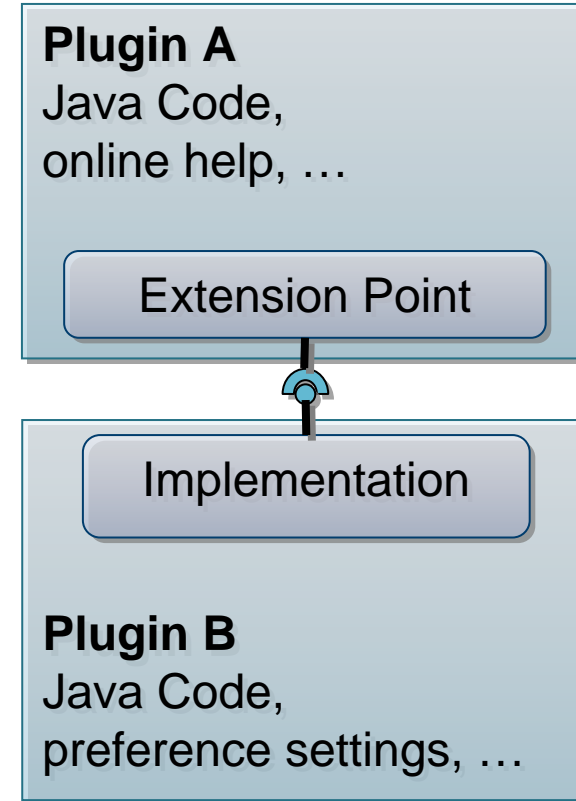
Control System Studio = RCP +

- **Data types for Control System**
  - **PV Name**
  - **Value with Timestamp, …**

- **Extension points for**
  - **live PV access to e.g. EPICS**
  - **historic data from various archives**
  - **writing to site-specific Logbook**
  - **authentication and authorization via e.g. LDAP**

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Simple CSS Tools

- **Probe**
  - **Current value of a PV**

- **EPICS PV Tree**
  - **Trace PV links**

- **Little things**
  - **Resize**
  - **Scrollbars**
  - **Drop-downs keep previous entries**
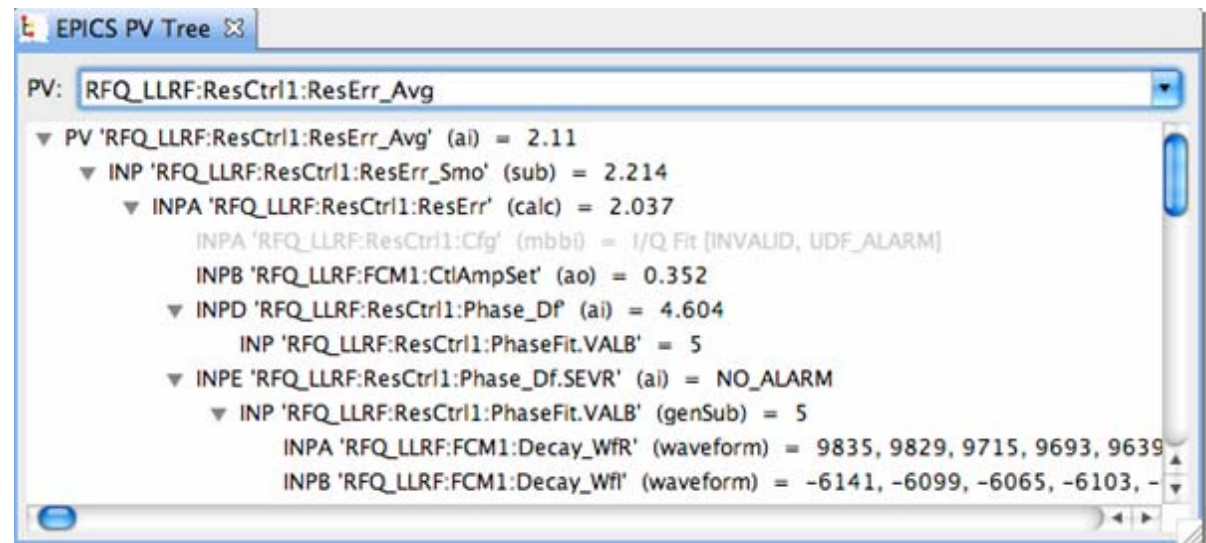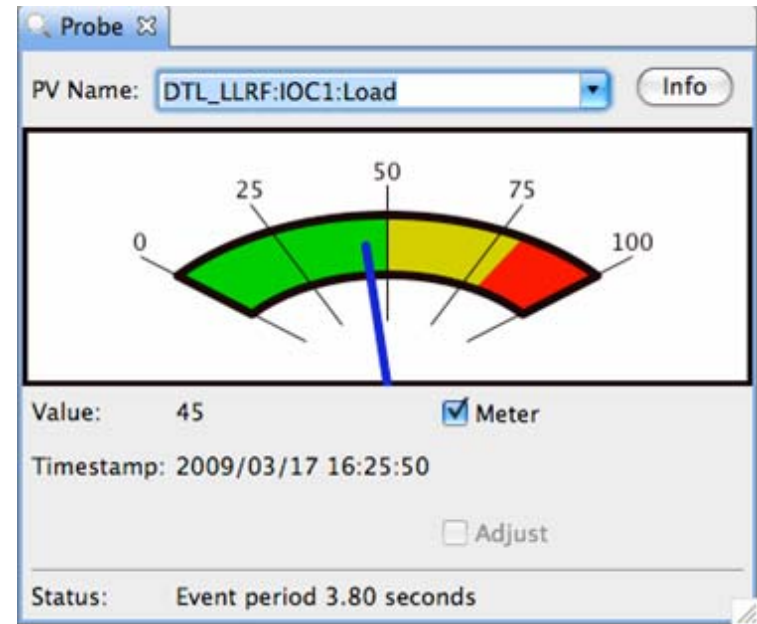
Eclipse Benefits: Localization

- **IDE helps to localize texts**

- **Runtime follows operating system settings**

- **CSS Translations**
  - **All: (US) English**
  - **Most: German**
  - **Few: French, Chinese**
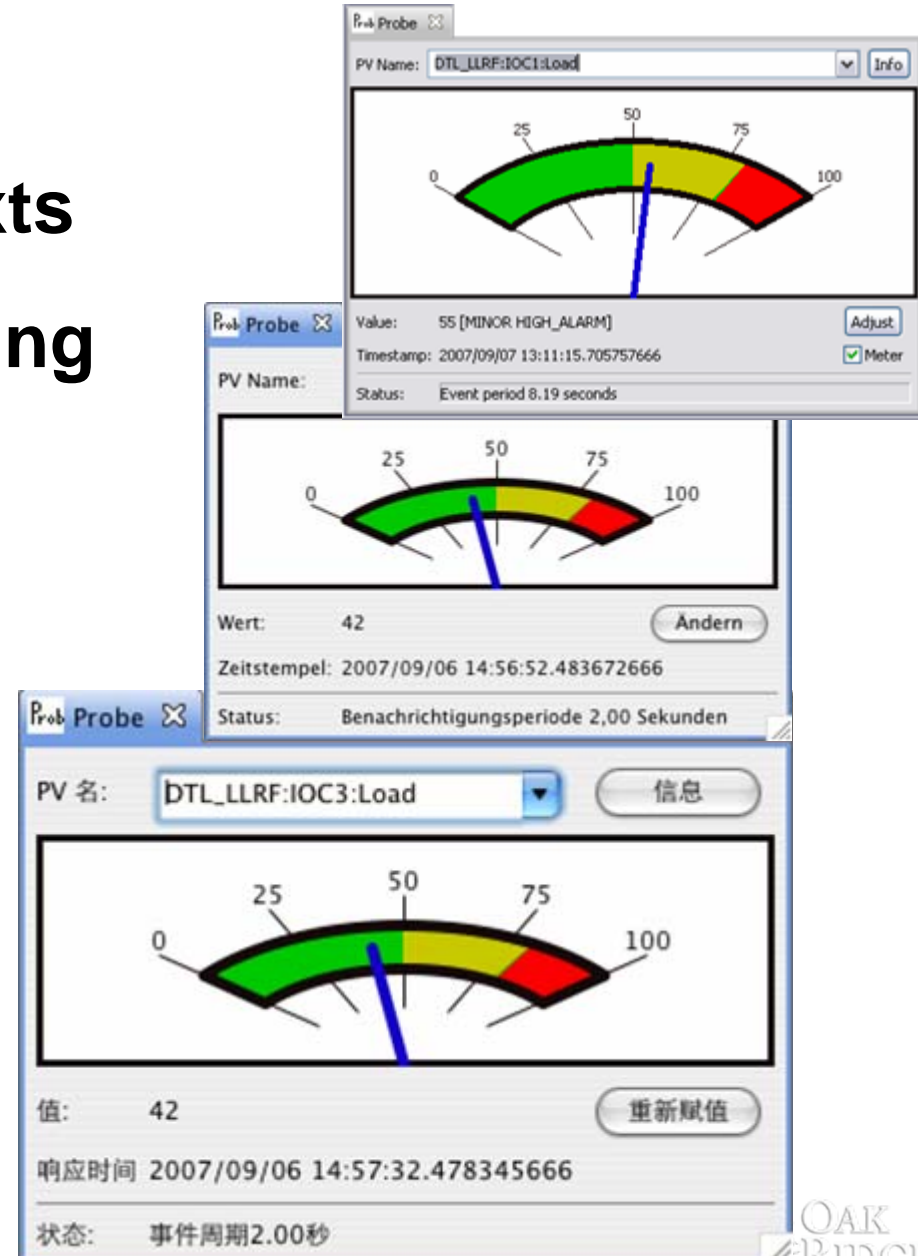
Data Browser

Plot 'live' and historic data over time
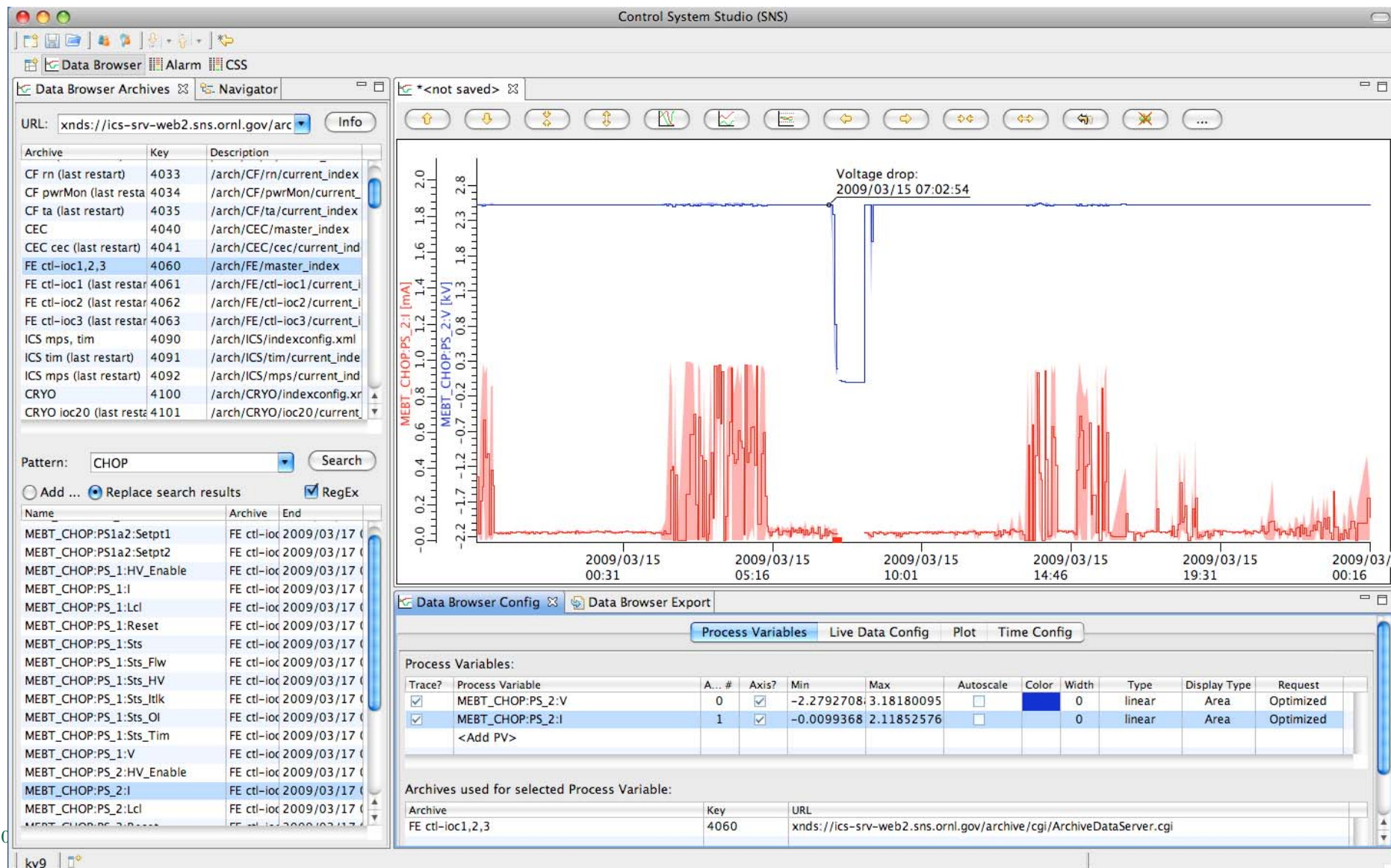
SNS Alarm System

Tabular or Tree view

CSS PV Exchange

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

- **Facilitated by Eclipse mechanism**
  - **Tools don't know each other; no manual configuration**

Alarm Table ➔ Data Browser

Inspect history of PV, annotate

... ➔ **Data Browser** ➔ **E-Log**

After inspecting alarm PV's history, post commented plot to E-Log
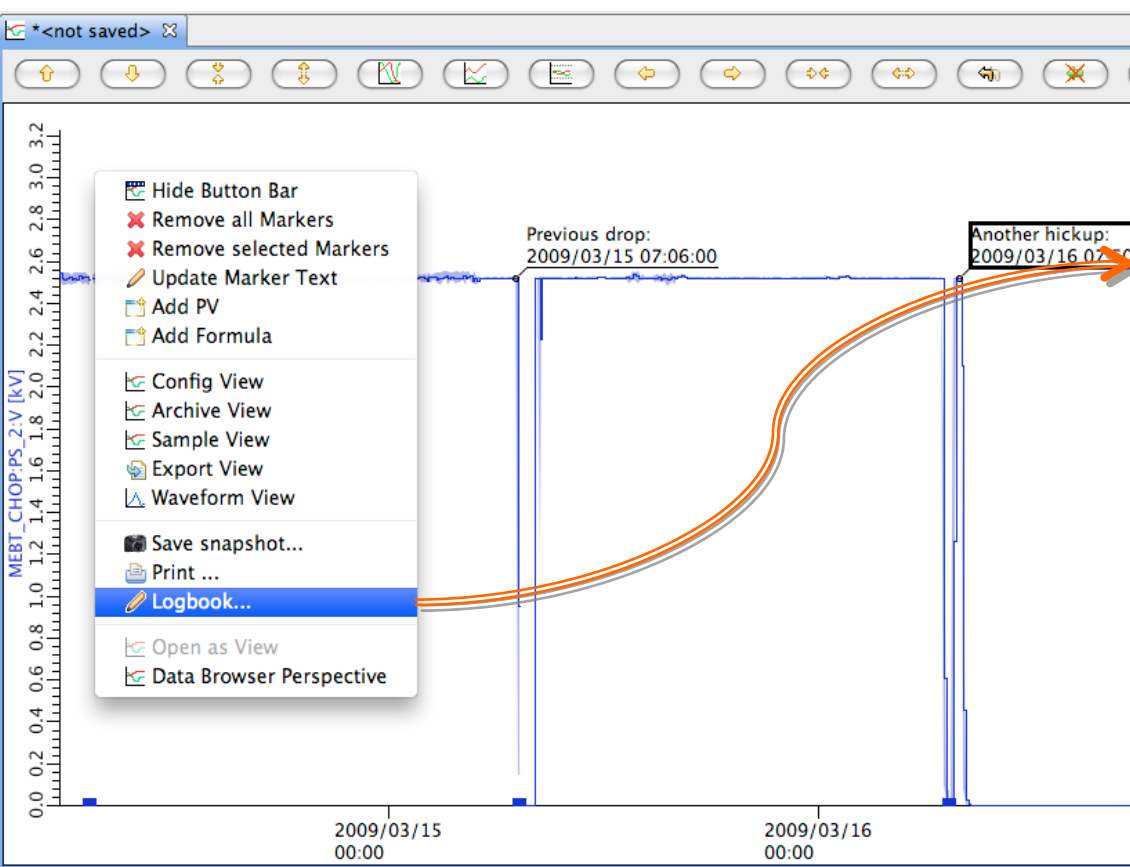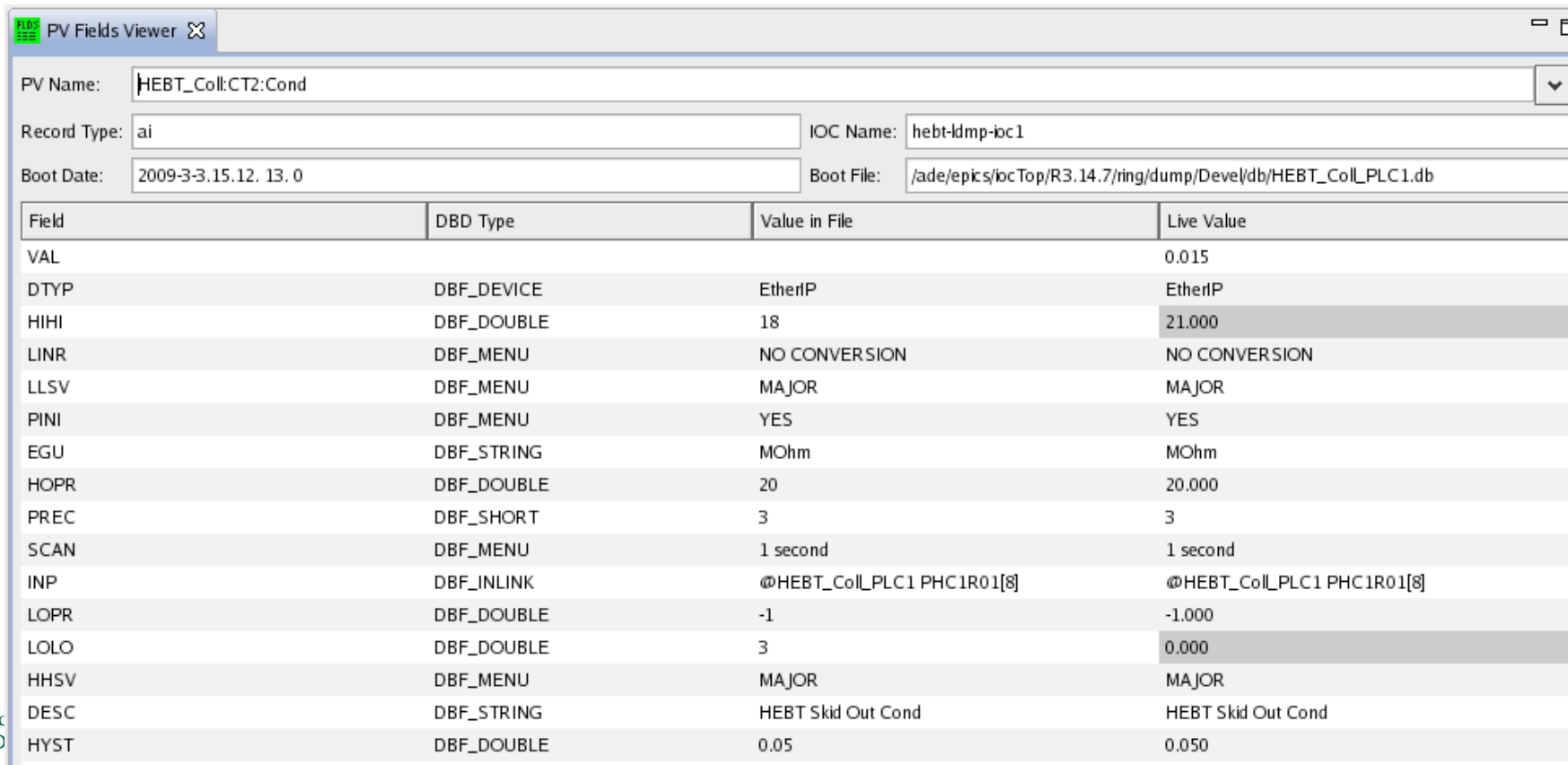
Site-specific Tools?

- **PV Utility**
  - **Detailed configuration info for a PV**
    - **@SNS: Info in Oracle, live data from EPICS**
  - **Uses plugin to provide that info from e.g. site-specific RDB or LDAP or Device Server or …**

FLDS PV Fields Viewer ⊠			— ⊟
PV Name:	HEBT_Coll:CT2:Cond		⌄

Record Type:	ai	IOC Name:	hebt-ldmp-ioc1
Boot Date:	2009-3-3.15.12. 13. 0	Boot File:	/ade/epics/iocTop/R3.14.7/ring/dump/Devel/db/HEBT_Coll_PLC1.db

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

Synoptic Display

- **Operator Panel Editor & Runtime**
  - **All common widgets**
  - **Alignment, Layers**

- **Supports multiple PV types**

- **Every widget aspect can be 'dynamic'**
  - **Change displayed value, color, position, size, font, … based on PV**

Integrated Help, Preferences

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

Alarm State Diagram for Latched PV
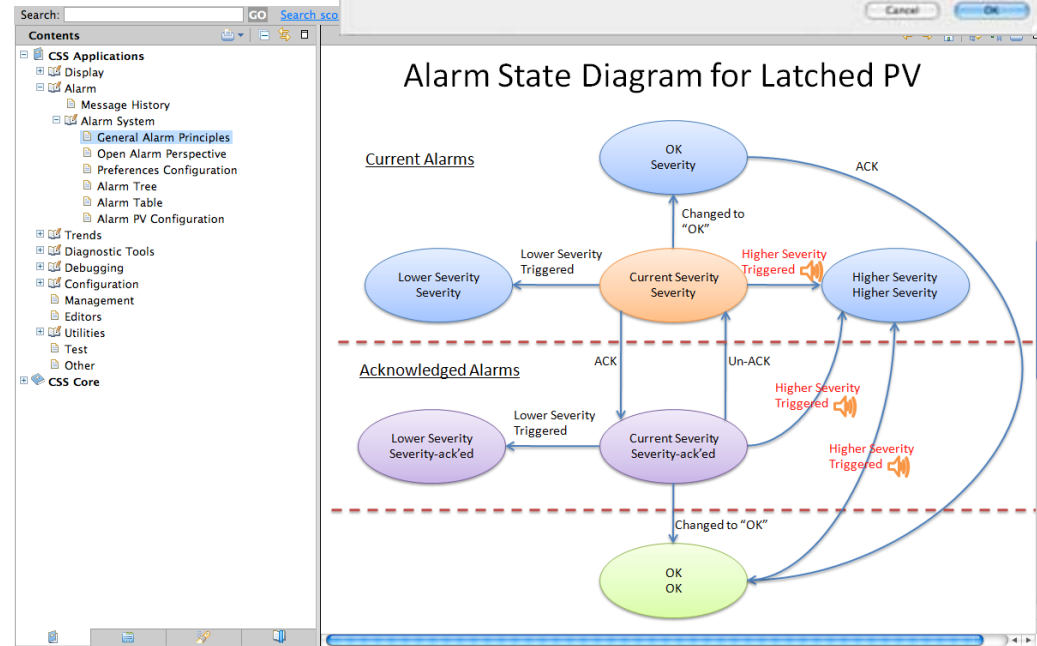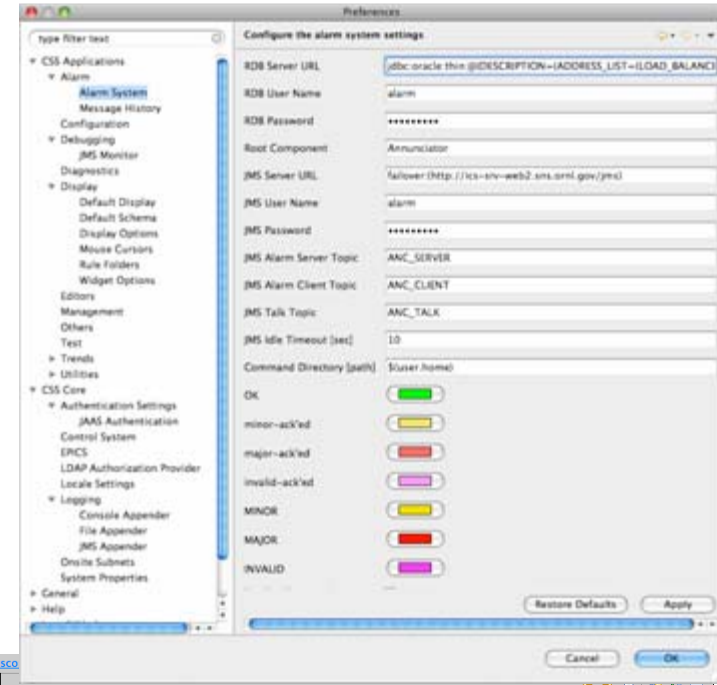
Eclipse Benefit: Flexible Layout

- **Panels can be closed, reopened, repositioned**

- **Multiple Perspectives**
  - **Name, Save, Restore**

- **Multiple document instances share same configuration panels**
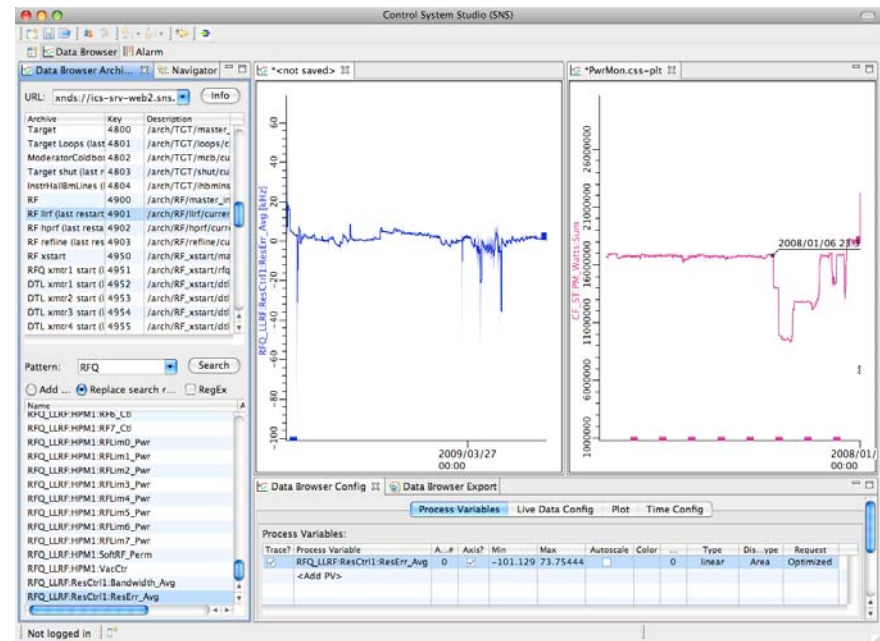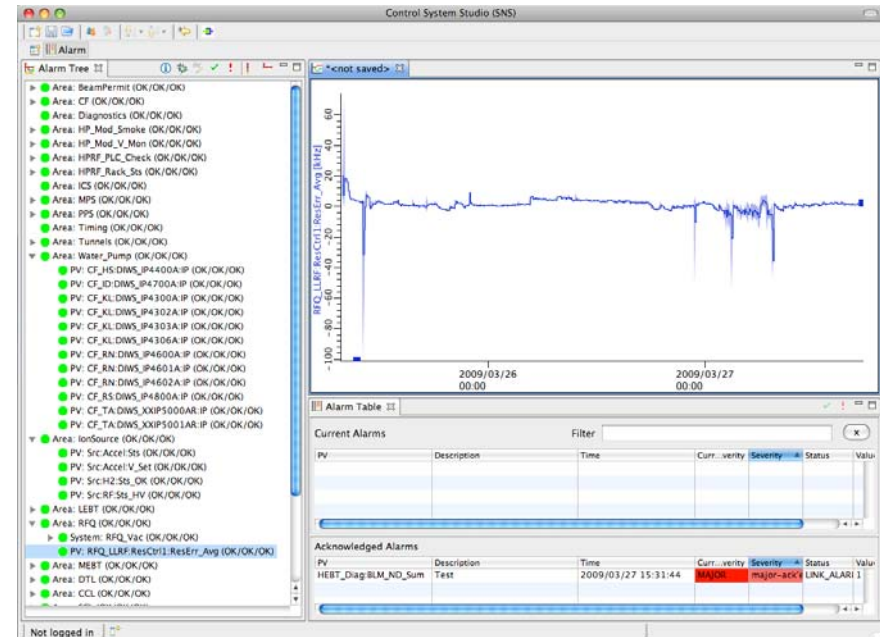
Site-Specific Packaging

- **Pick applications of interest**

- **Select/add support for your**
  - **Data sources**
  - **Authentication**
  - **Authorization**

- **Add custom "welcome" screen**

What about the Web?

- **Only needs browser:**
  - **Google Mail, Documents**
  - **Canadian Light Source Remote Access**

- **Speed?**
  - **EPICS Web-CA web browser plugin for direct access to control system protocol (but: no longer pure HTTP)**
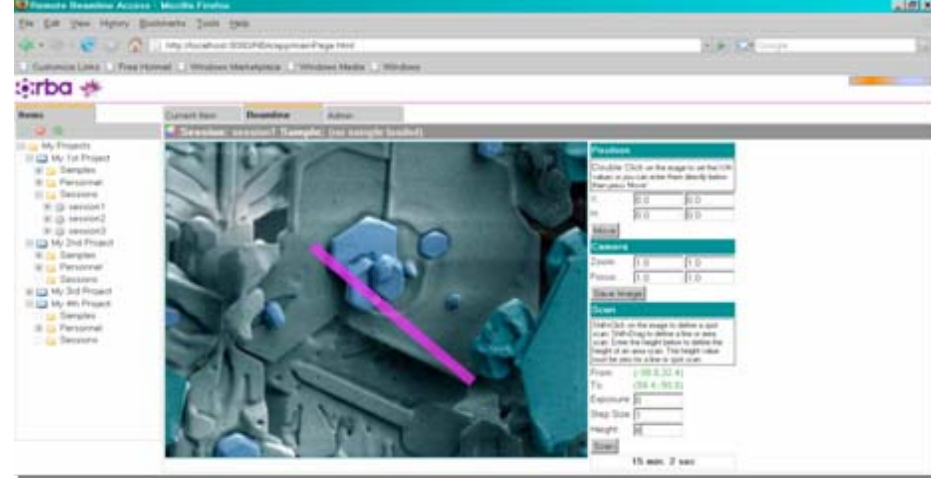
- **JavaScript + Style Sheets + Server-side apps?**
  - **Google Web Toolkit, Eclipse Rich Ajax Platform (RAP) might allow both rich clients and web applications from single-source Java**

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UI Trends Conclusion

- **Java provides OS portability**

- **Frameworks like Eclipse & CSS go beyond standalone, one-off applications**
  - **Turn generic and site-specific applications into homogeneous tool**

- **Challenge: Code beyond "works for me, now"**
  - **Externalize strings**
  - **Plan for extensibility**

- **Next Frontier: The Web**

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