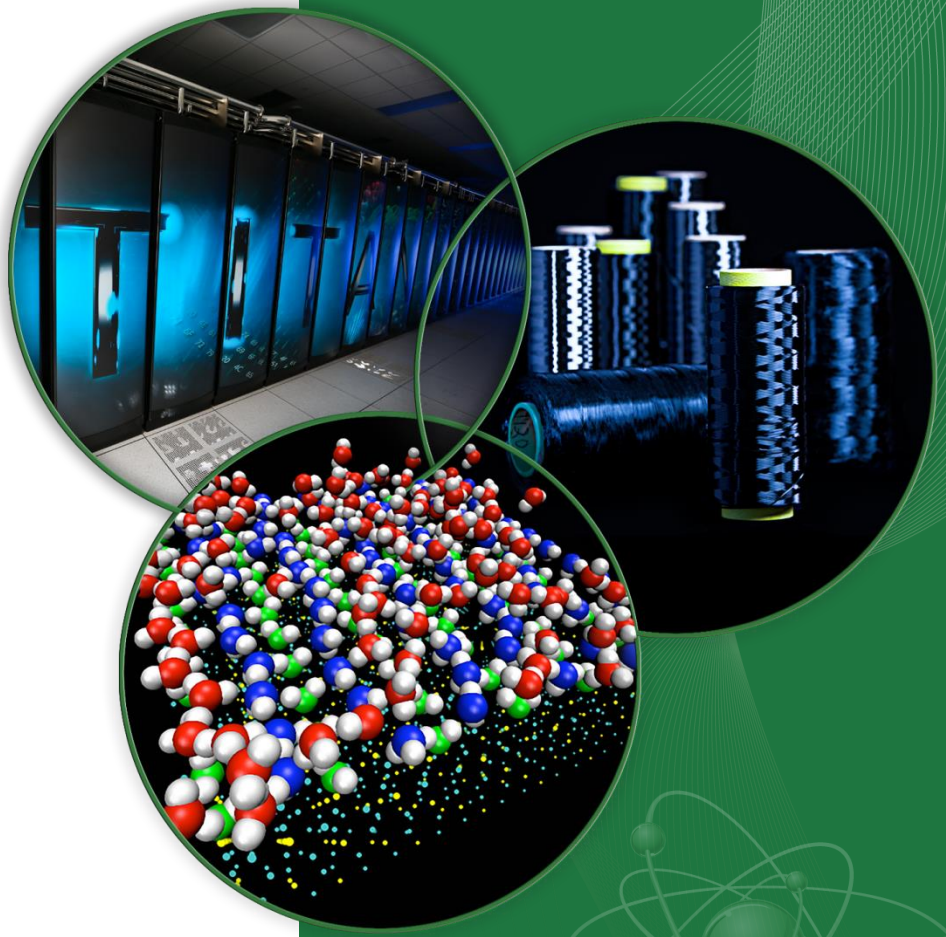
Control System Studio: BOY



Kay Kasemir

ORNL/SNS

kasemirk@ornl.gov

A lot of material from Nadine Utzel, ITER and BOY online help by Xihui Chen, SNS

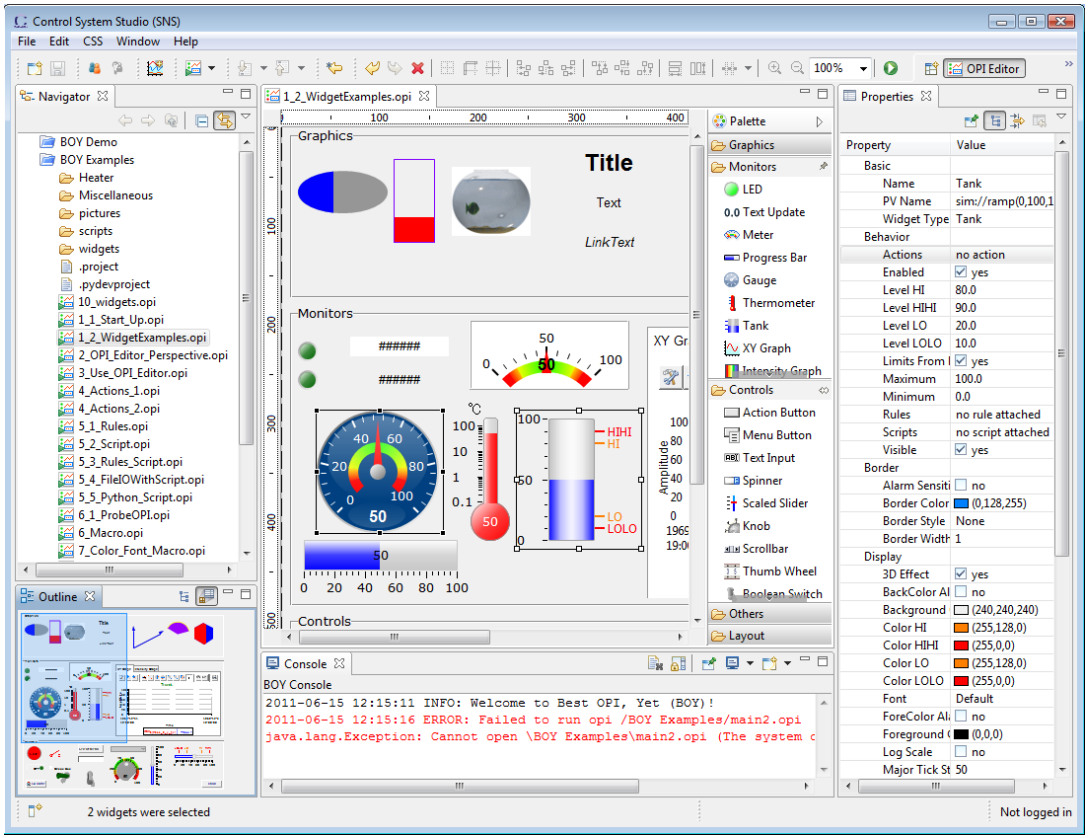
June 2014

ORNL is managed by UT-Battelle
for the US Department of Energy

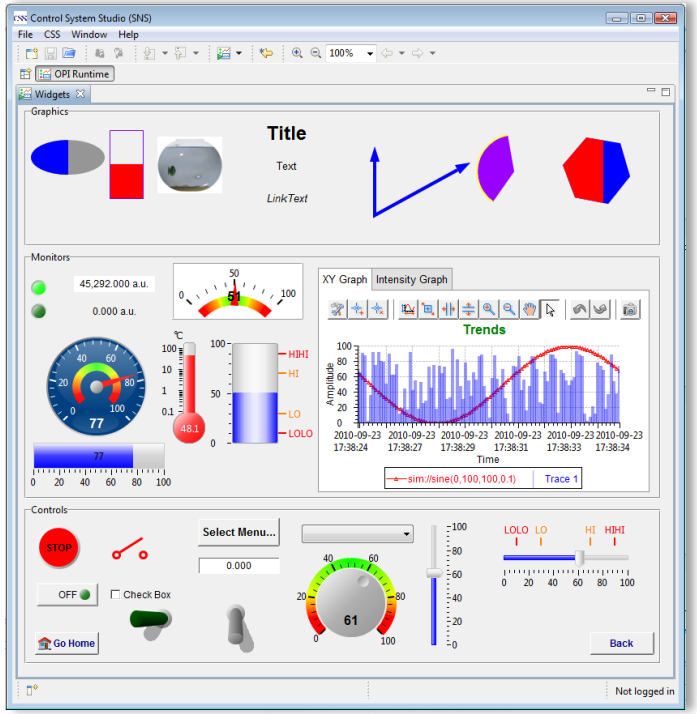
OAK RIDGE National Laboratory

BOY – Best OPI, Yet

Operator Interface Editor

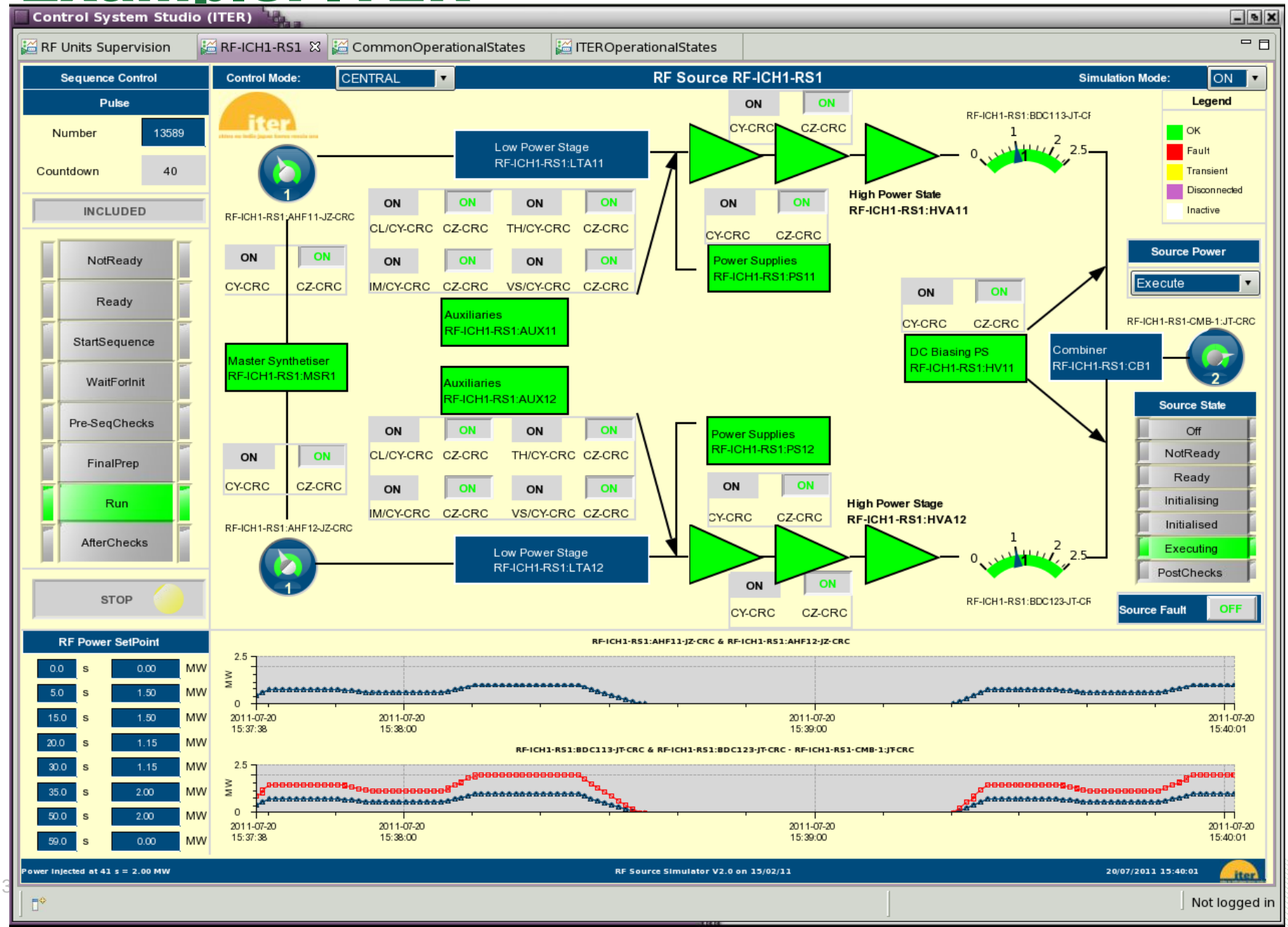


Runtime



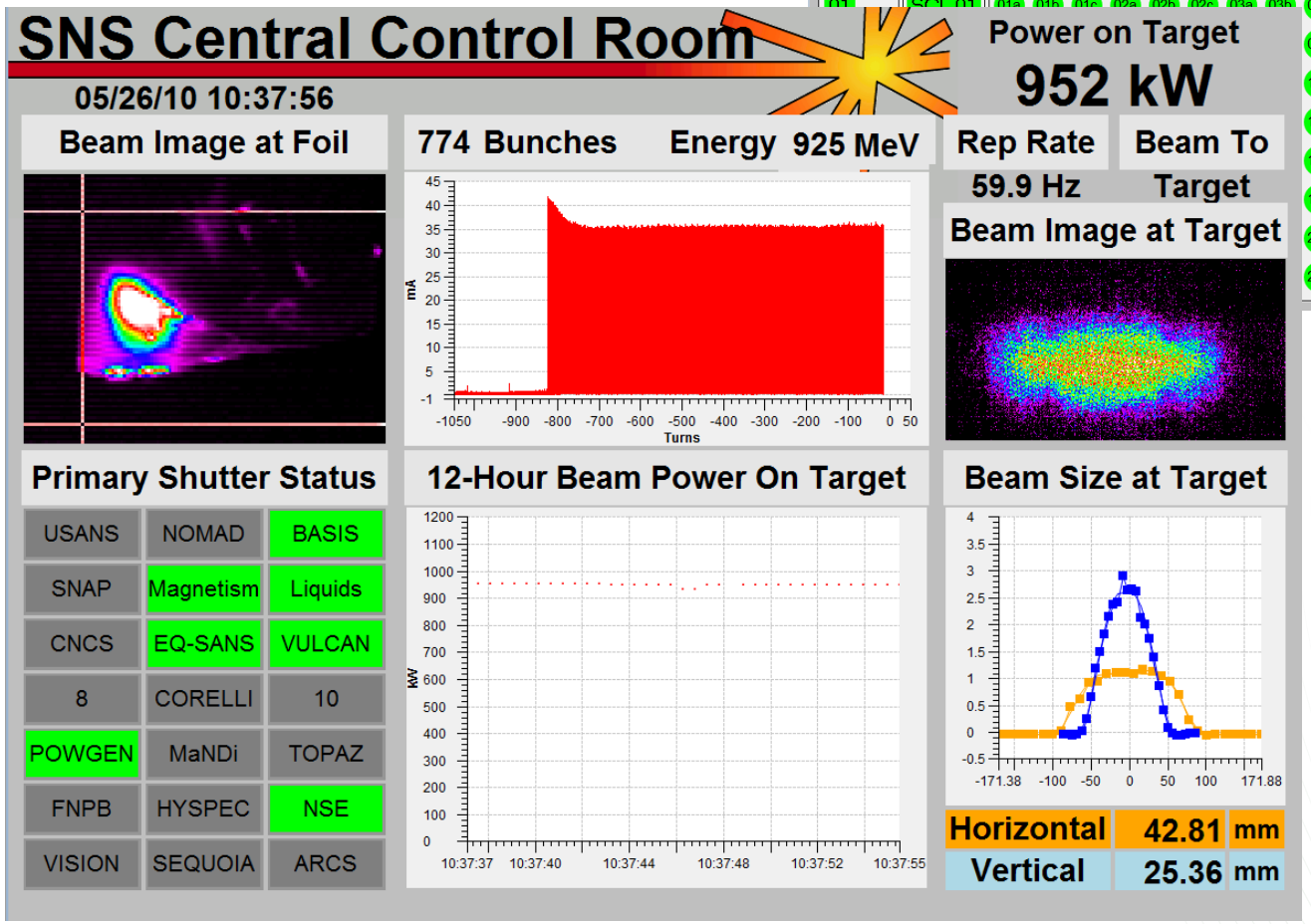
OAK RIDGE National Laboratory

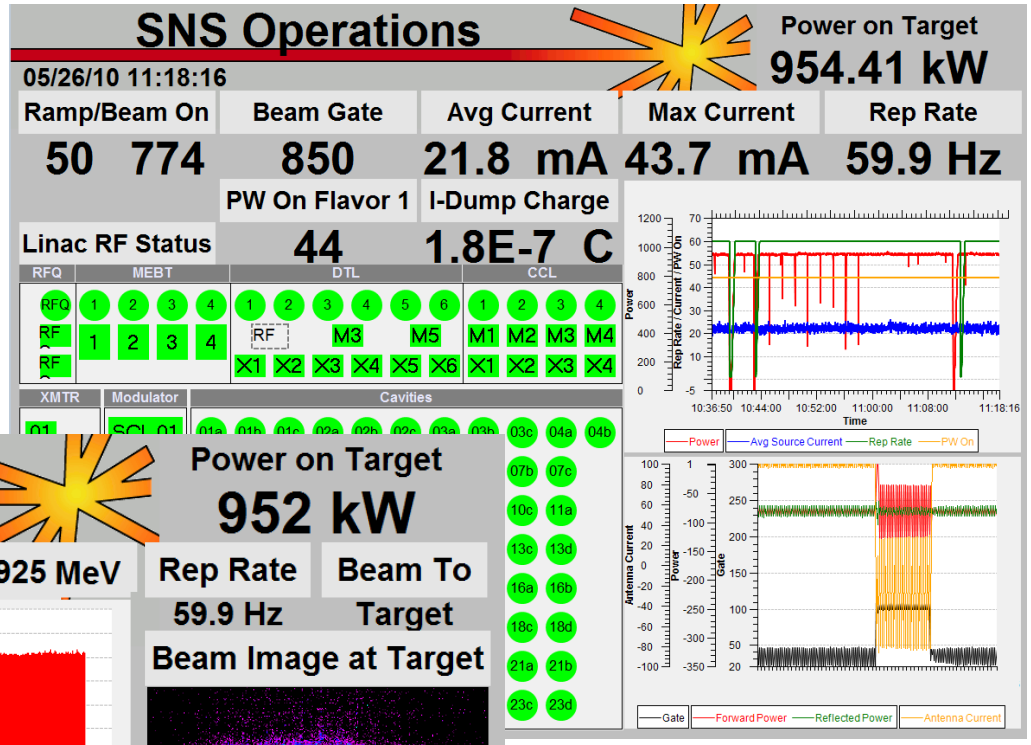
Example: ITER



Examples: SNS

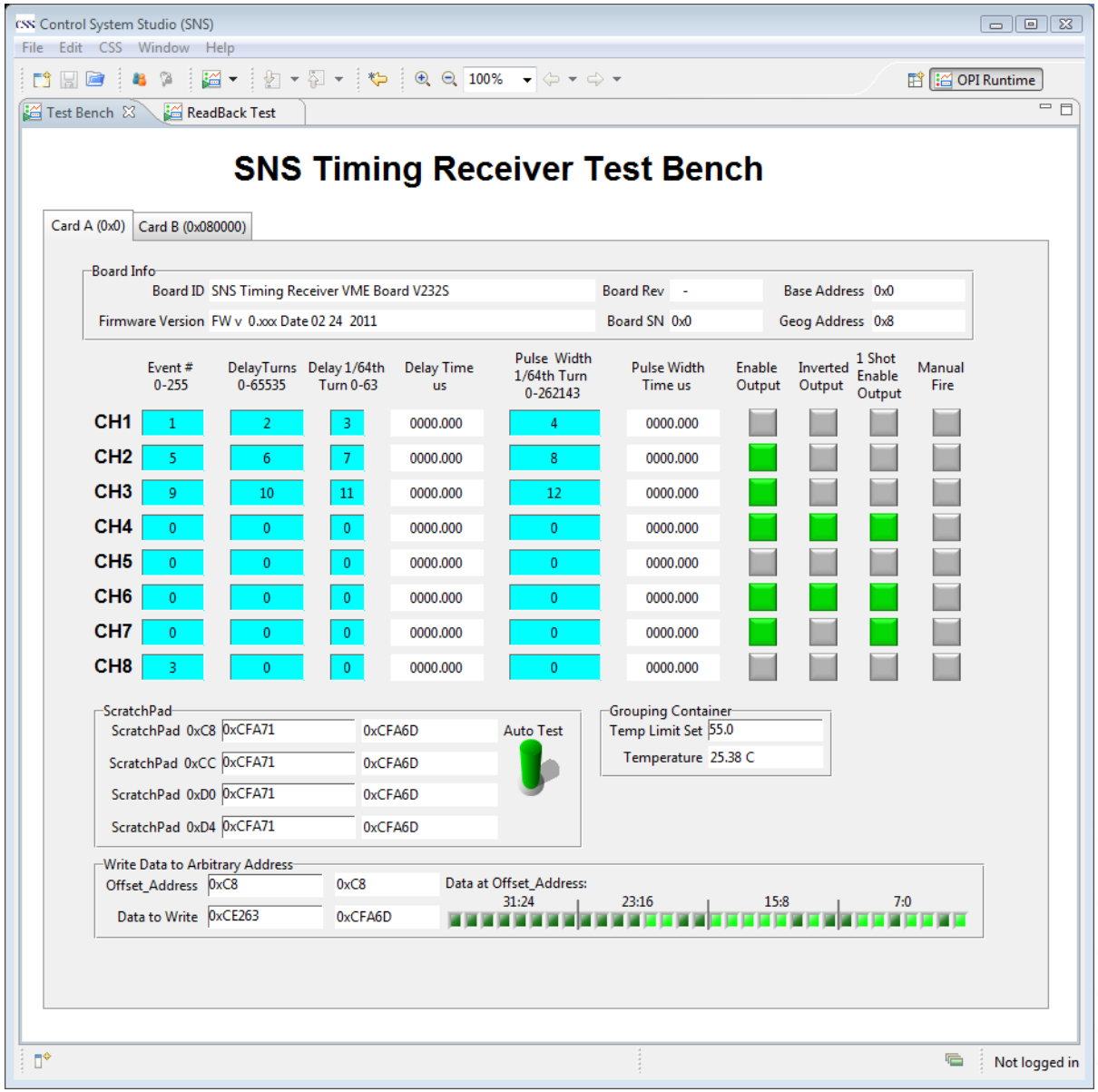
- Top-level displays





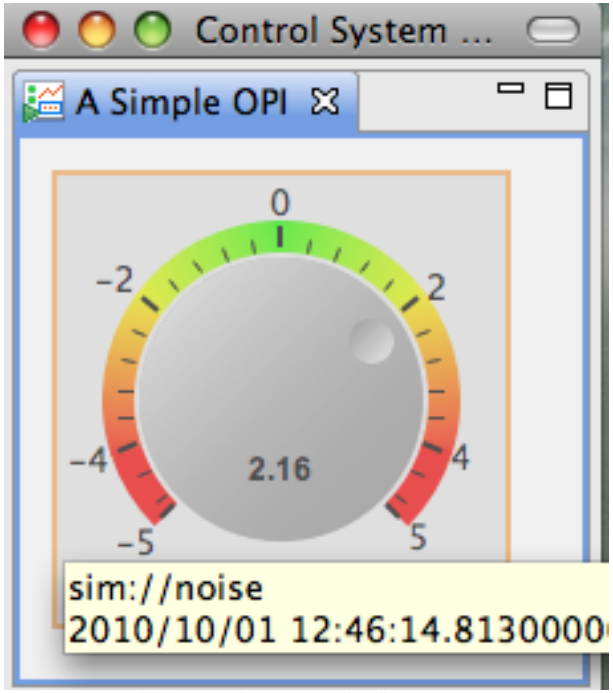
OAK RIDGE National Laboratory
Tim Southern, Nick Luciano

Examples: SNS



Main Idea: 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!

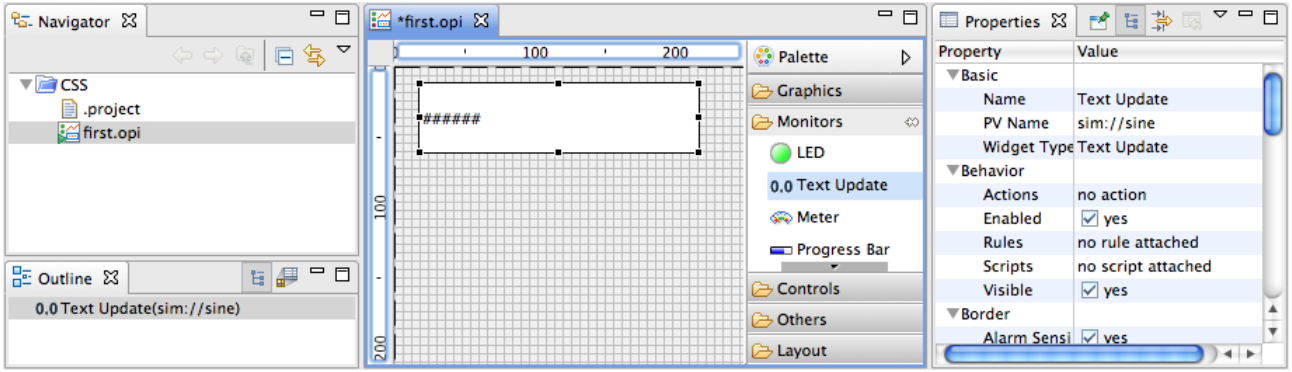


What you will get

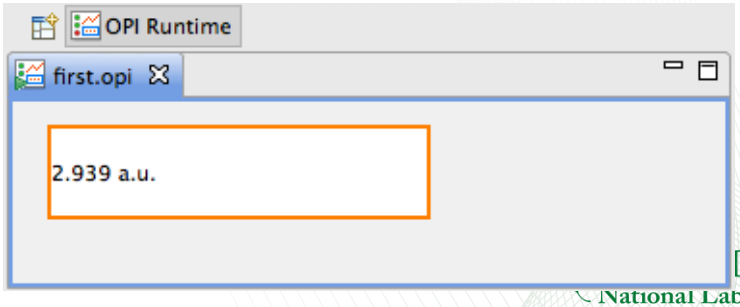
- ✓ PV *value* as text and via knob position
- ✓ PV *severity* reflected in border color
- ✓ PV *name* and *value* shown in tool-tip
- ✓ PV *display limits* set the knob's default range
- ✓ Indication of 'disconnected' state via a pink border
- ✓ Widget will be greyed-out if read-only

First Display

- Menu *CSS*,
  - *Display*, *OPI Editor Perspective*
  - *Display*, Install *OPI Examples*
- Navigator Context menu on CSS: *New*, *OPI File*, call it “first.opi”
  - *Or* Menu *File*, *New*, *BOY*, *OPI File*



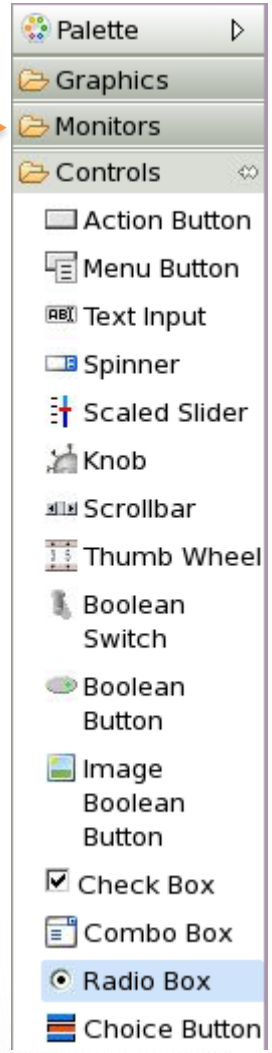
- Locate in Palette: *Monitors*, *Text Update*
  - ‘Drag’ *Text Update* onto display grid
  - Move widget around, resize
- Locate *Properties* View
  - Enter *PV Name* “sim://sine”
- Press Run button in Toolbar

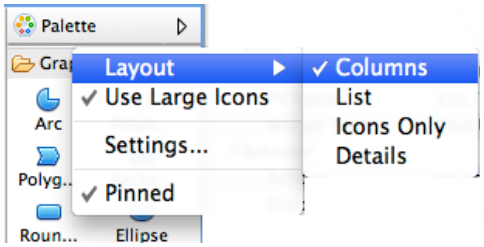


Widget Palette Hints

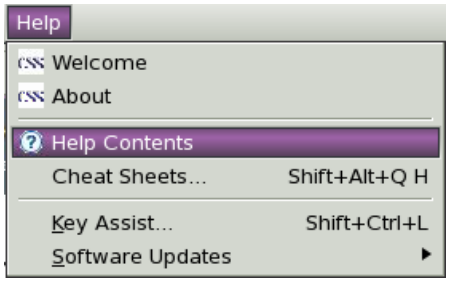
Many widgets, hard to see them all

- Scroll
- Click on section header
- Try the ‘pins’
- Header Context menu offers *Columns* mode to display Widgets as small icons in columns



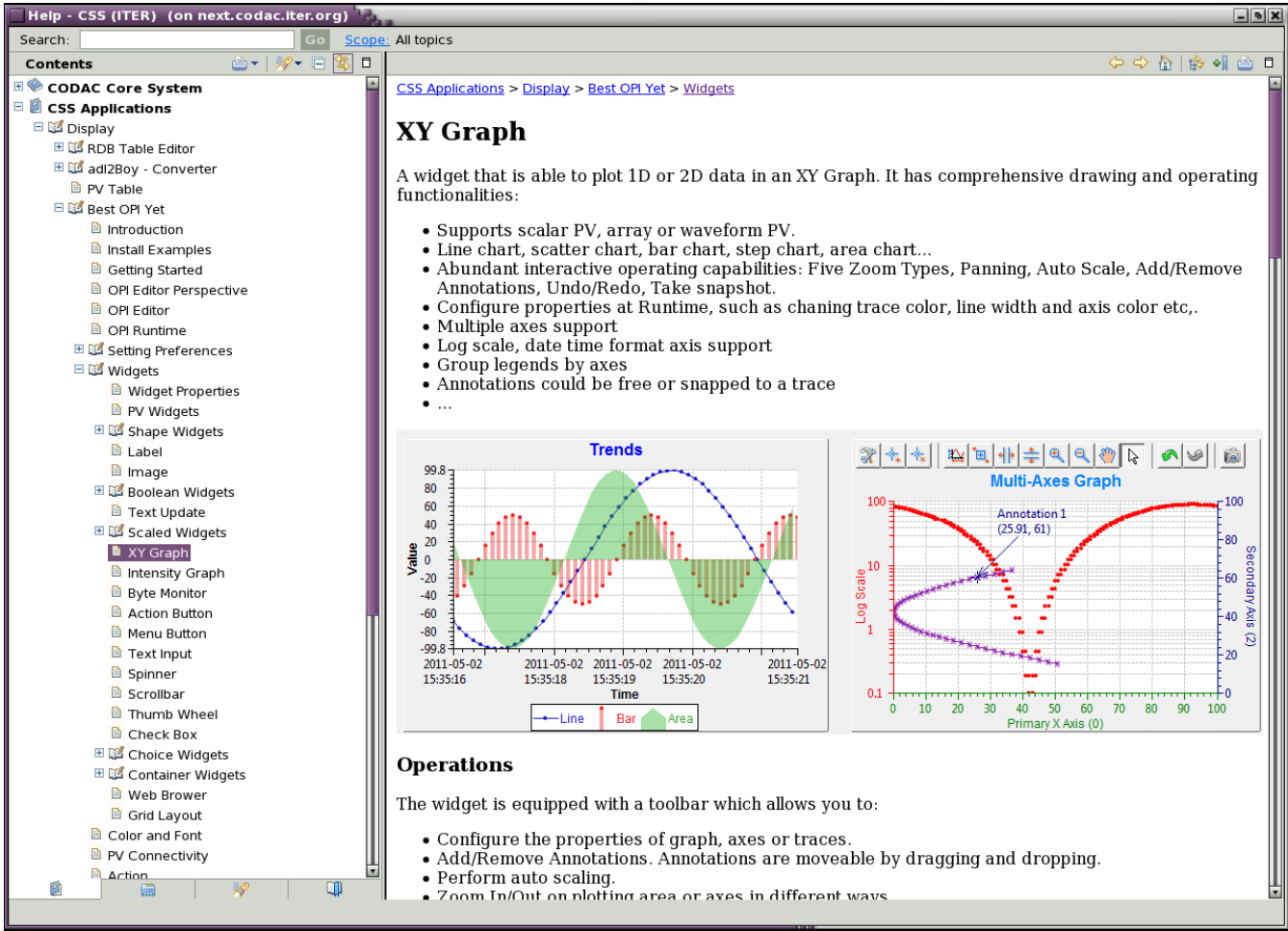


View Online Help



Find

- CSS Core, Process Variables
- CSS Applications, Display, BOY, Widgets



PV Names

- `ca://some_pv_name`
  - EPICS Channel Access PV
- `some_pv_name`
  - Typically same, since “ca://” is the default
- `sim://sine`
  - Simulated PV. Read online help for details
- `loc://x(4)`
  - Local PV. Read online help for details
- `pva://x`
  - EPICS V4 pvAccess

Formula Support

```
='some_pv_name' * 2
```

- Start with '='
- Enclose PV names in single quotes

```
=3.14
```

- Formula with constant value (replaces previous 'const:\\3.14')

```
="I like CS-Studio"
```

- Enclose strings in double quotes

```
loc://x(4)
```

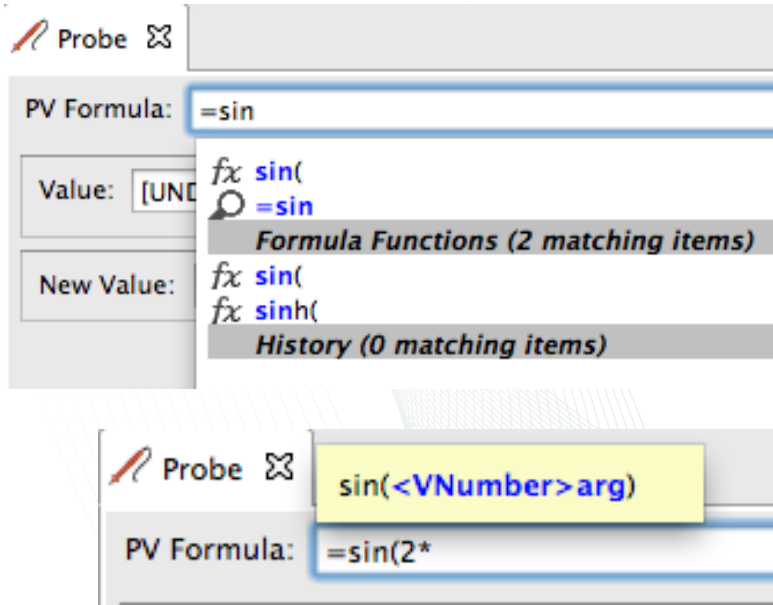
- Local PV. Read online help for details

Check online help,

see CSS/Debugging/Formula,

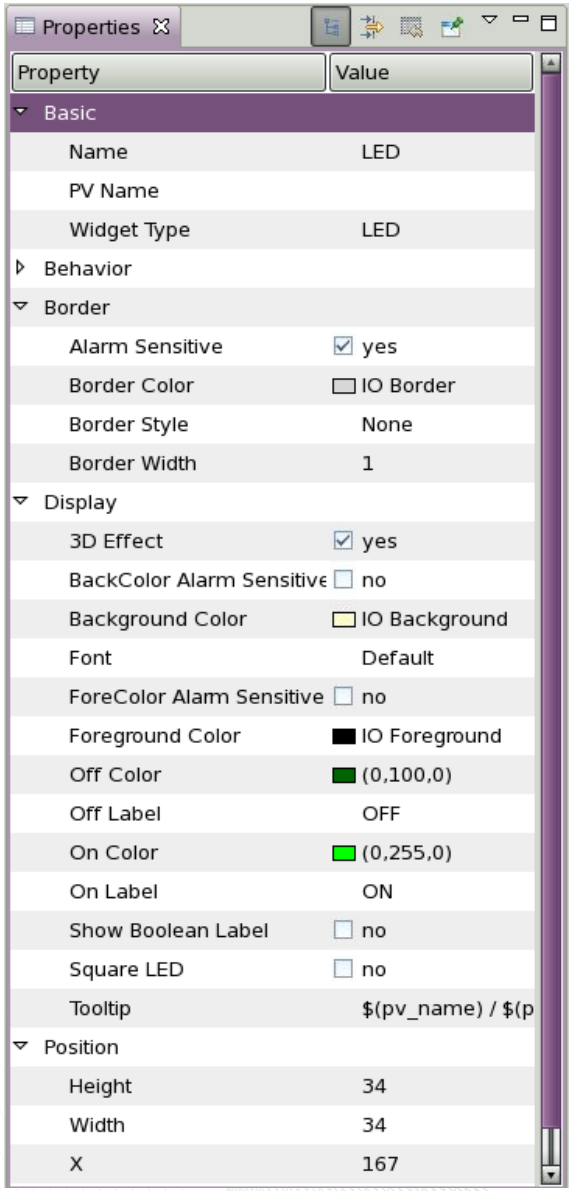
note auto-completion hints.

Beware:
Don't use formulas for conversions that should happen on the IOC!



Widget Properties

- Widgets are configured by setting Properties in the *Properties* view
- Common Properties:
  - Name
  - Position*
  - Background color
  - Border
- Widgets that read/write PVs:
  - Basic: PV Name
  - Border: Alarm Sensitive
  - Behavior: Limits from PV



* Position can also be modified by moving or resizing the widget in the editor, or via Toolbar buttons to align etc.

Extend First Display

- Locate in Palette: *Controls*, *Knob*
- Drag *Knob* onto display
- Move *Knob* around, resize
- Locate Property *PV Name* for Knob
- Enter “sim://sine”
- Create another *Knob*:
  - PV Name = “loc://test”,
  - “Increment” = 0.1
  - “Limits from PV” = no
- Run

- Note how the “sim://sine” Knob is really read-only, but you can change the “loc://test” PV via the Knob

Exercise: Editing Features

Add, duplicate Widgets in various ways

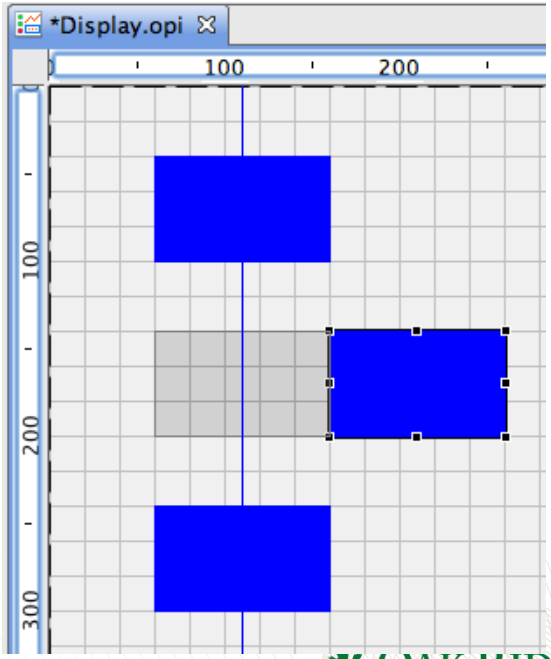
- Drag & Drop from Palette
- Copy/paste, Ctrl+Drag existing widgets to duplicate

•Arrange them on the display

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

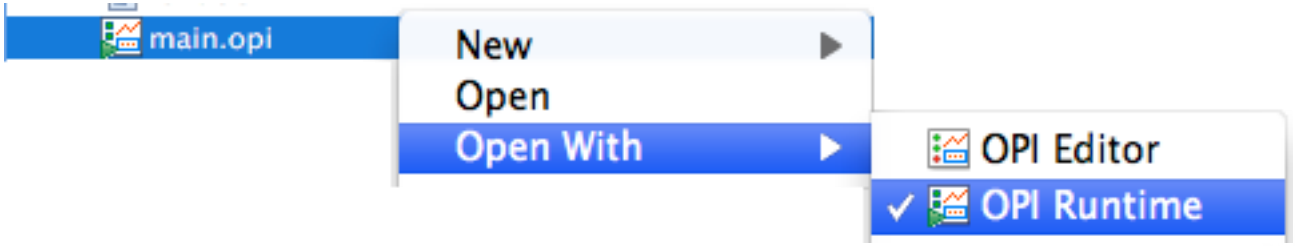
Select multiple widgets to

- Edit common properties
- Adjust size or move around



OPI Files: Run or Edit?

- Default: Double-click on *.opi in Navigator opens in “OPI Runtime”, i.e. executes the display
- Context menu allows to select
  a) Editor to edit?
  b) Runtime to execute?



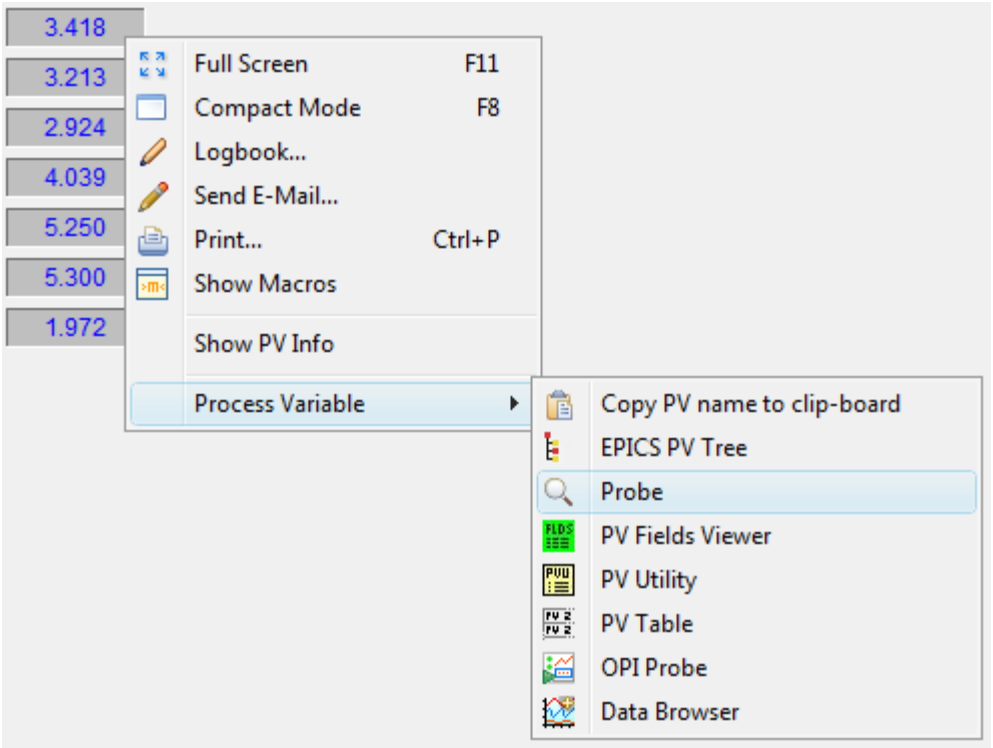
- Once you select “Editor”, that will become the double-click default
  - Select “Runtime” once to restore previous default

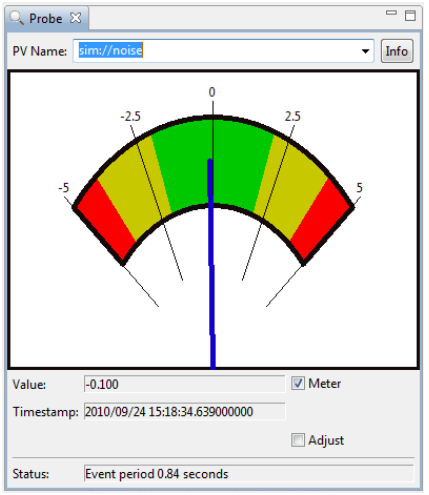
Exercise: Edit vs. Runtime Mode

- Close all CSS Editors (Menu *File*, *Close All*)
- In the Navigator, double-click on the first.opi that you created before
  - Does it open in the Editor or Runtime?
- In the Navigator, open the Context Menu on first.opi and select Open With, OPI Editor.
  - Close first.opi, now double-click the file in the Navigator. Does it open in the Editor?
- In the Navigator, open the Context Menu on first.opi and select Open With, OPI Runtime.
  - Close first.opi, now double-click the file in the Navigator. Does it open in the Runtime?

Exercise: Send PV to other CSS tools

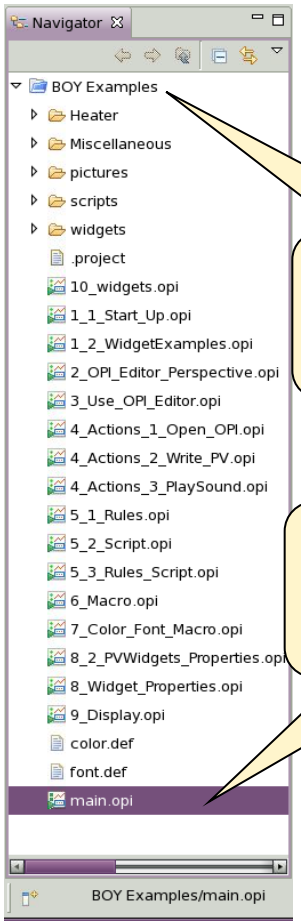
- Run the OPI that you created
- Use CSS Process Variable context menu on a widget that displays a PV to open Probe





Example Displays

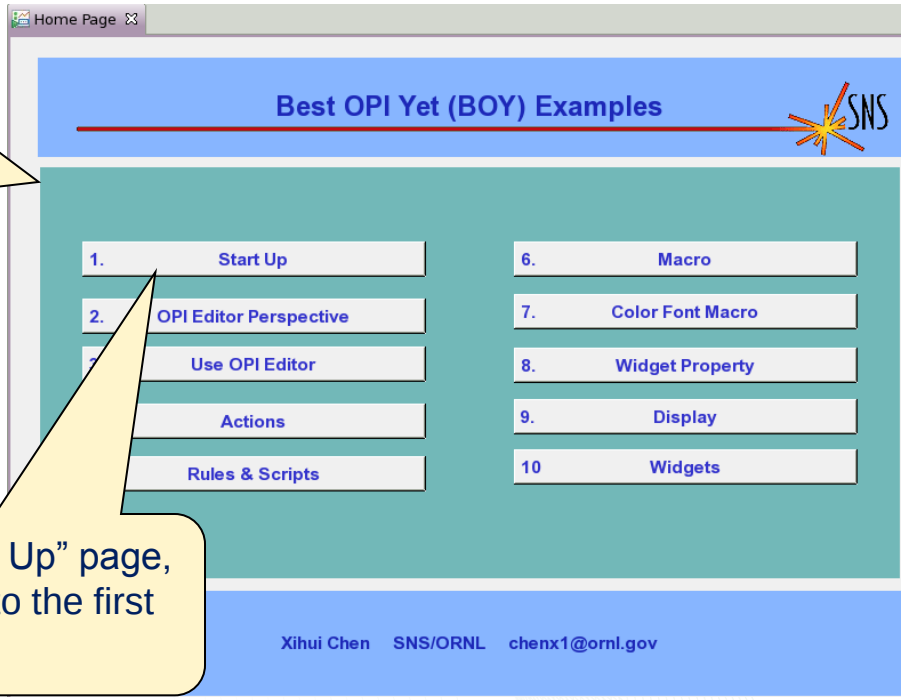
- Installed via Menu *CSS*, *Display*, *Install OPI Examples*



Note new project named BOY Examples

Double-click on main.opi file to open

Explore the examples

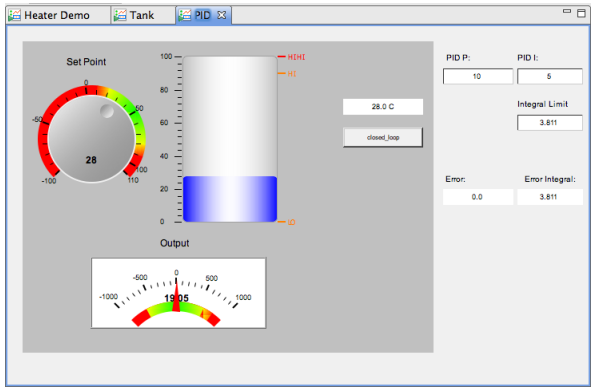


Check the “Start Up” page, which is similar to the first two exercises

Remember: You can *Open With*, .. *Editor* to see implementation

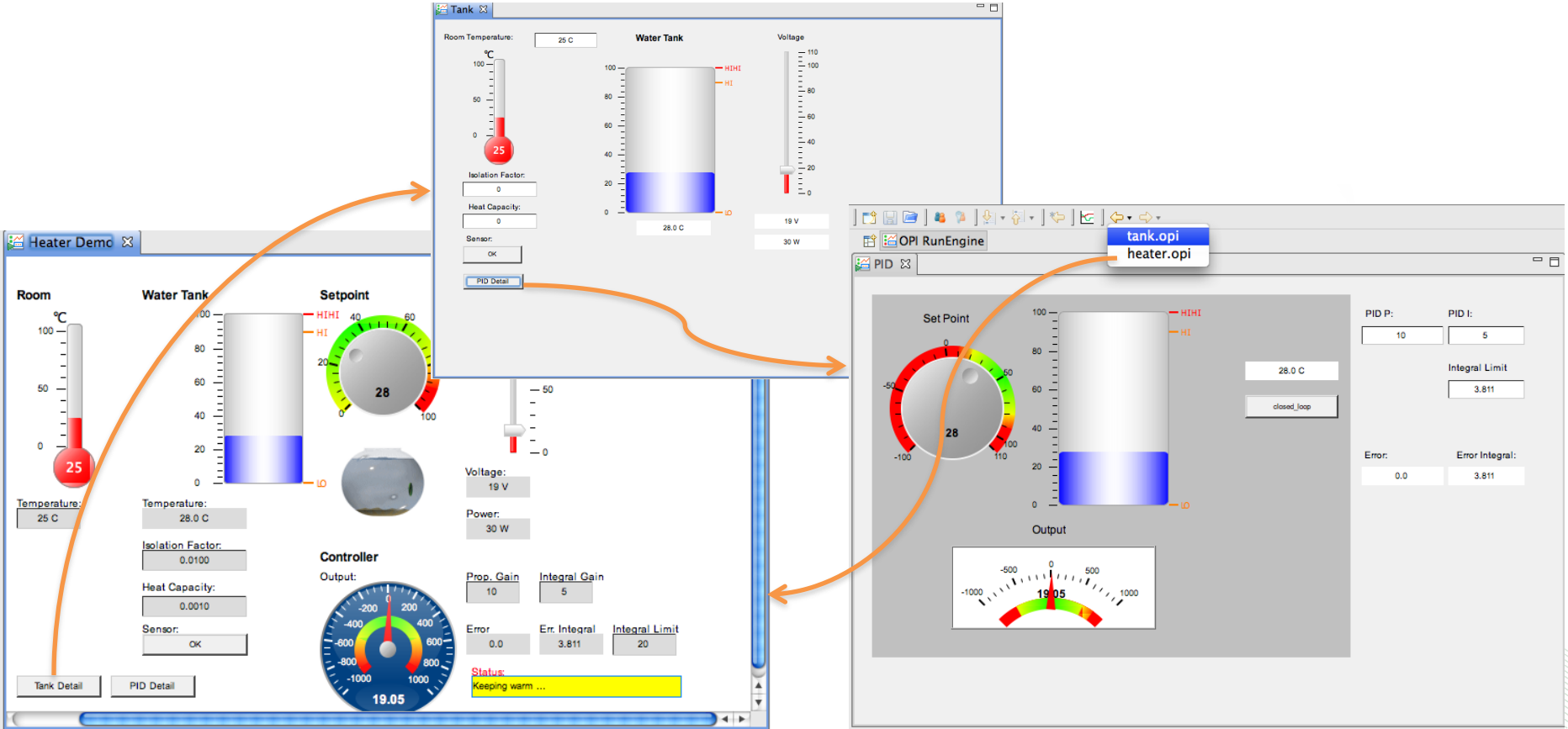
Exercise: Screen Navigation

- Similar to hyperlinks in a Web Browser:
  - Default: Linked display replaces the current display.
  - Zoom in/out, go “back” via toolbar:
  - Use context menu to open in ‘tabs’ or new Window



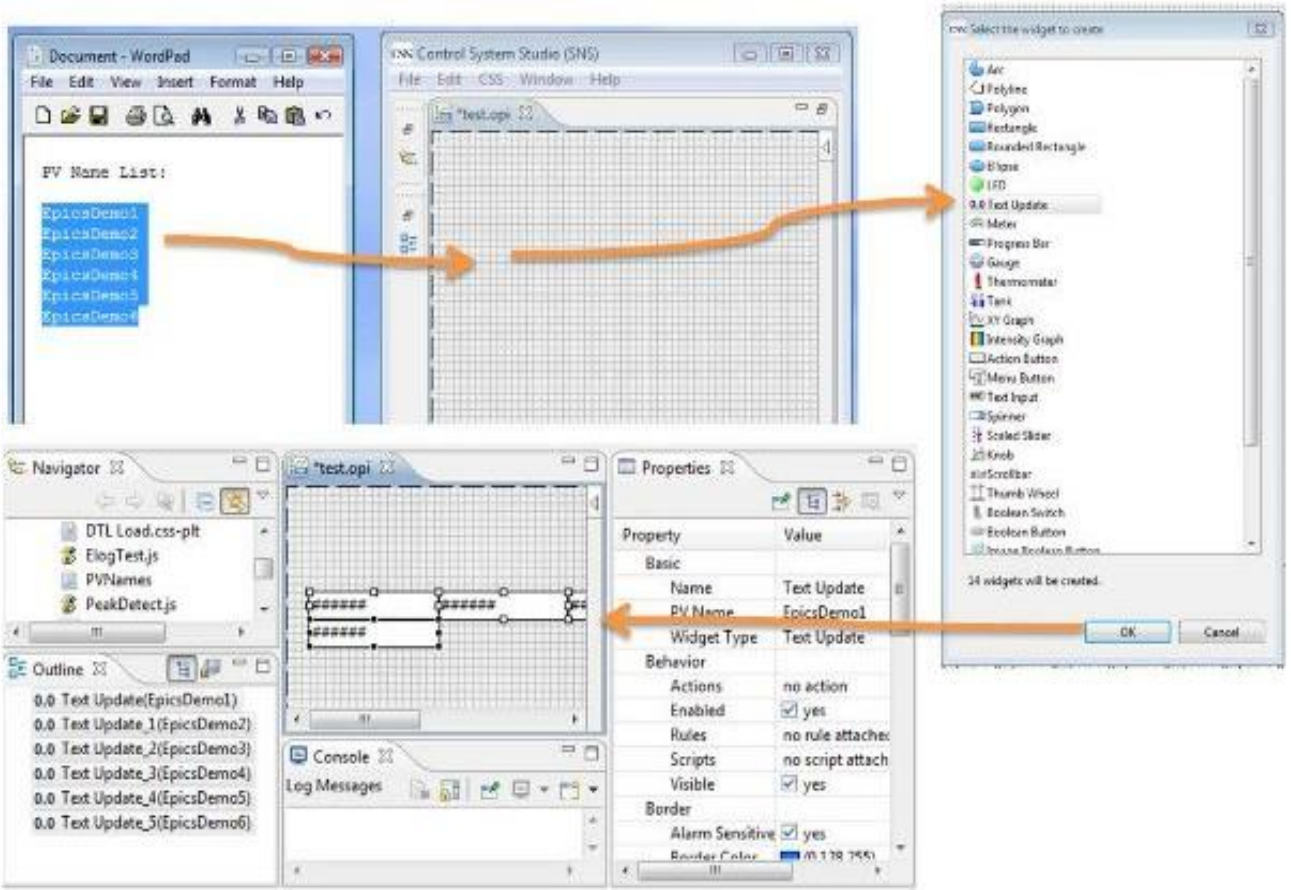
OPIs in ‘Tabs’

Try with OPI Examples: Open in tab, … Window



Hint: Drop PV Names

- Assume you have some text document with a list of PVs
- How to quickly create a display with Text Update widgets for these PVs?
  - Just drag the names into the display
  - Will be prompted for the type of widget



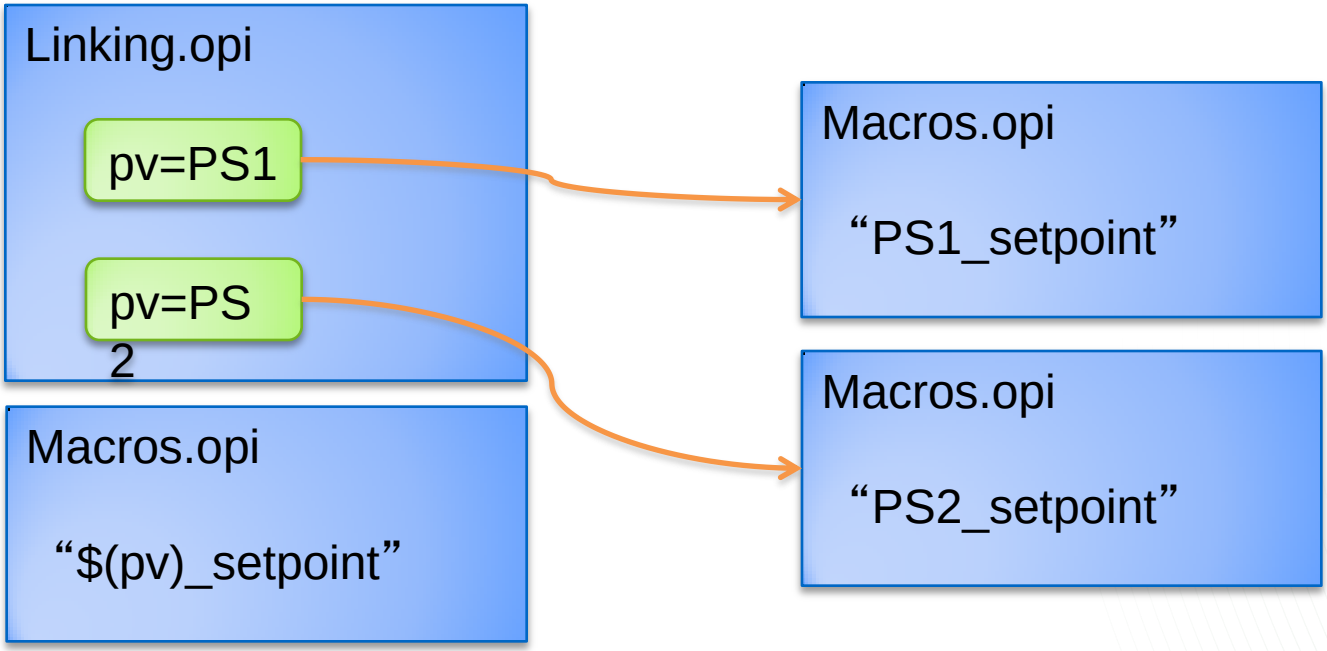
Macros

Usage: $(macro) or ${macro}

- Wherever you enter a widget property
- Most often used for (partial) PV name:
  - $(pv)_setpoint
  - $(pv)_readback

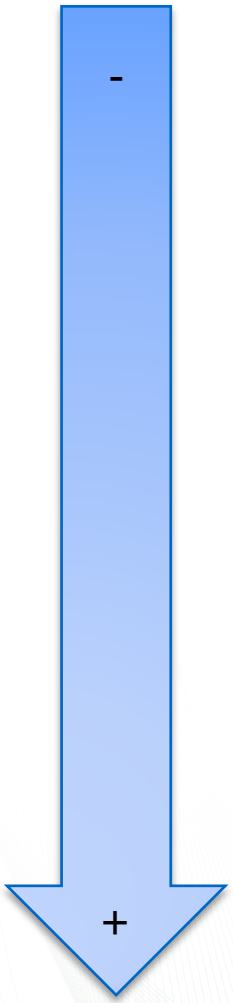
Such a display can then be invoked with

pv="PowerSupply1" or "PowerSupply2"



Macro Definition

- Predefined Macros: Widget properties, see online help for name mapping
  - Property “X”: Macro $(x)
  - Property “Name”: Macro $(pv_name)
  - Automatic: Macro $(pv_value)
    - See default for the “Tool Tip” property
- User-defined:
  1. BOY Runtime Preference Setting (-pluginCustomization ….)
  2. User Preference settings (CSS, Pref…, ..App.., Display, BOY, OPI Runtime)
  3. Macro parameter of Action that opens the *.opi file
  4. Display *.opi file property “Macros”
  5. Grouping/Linking/Tabbed Container that wraps the widgets

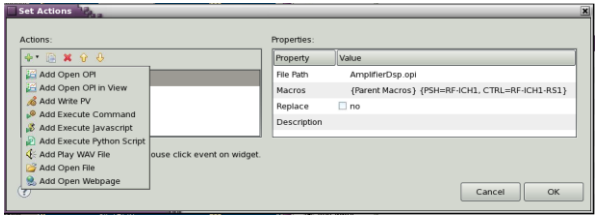


Priority

Example:
Macro parameter of *Action* will override *Preference* settings.

Exercise: Linking Displays with Macros

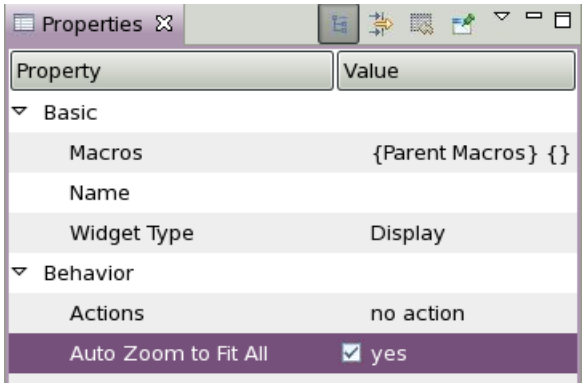
- Create display file “Macros.opi”
  - Label with Text “$(pv)”
  - Text Update with PV Name “$(pv)”
- Create display file “Linking.opi”
  - Action button with “Actions” to “Open OPI”
    - Use File Path for Macros.opi
    - Define Macros: pv= “sim://sine”
  - Add another action button (copy previous one)
    - Set macro to pv=“sim://ramp”



- Execute. Check that you can open the linked display
- Extra: Check OPI Examples, “4. Actions”
  - Can have more than one “Open OPI”
  - Any widget can have “Action”. Try Label.
  - Try Linking Container to display Macros.opi within Linking.opi

Miscellaneous

- Display has an “Auto Zoom” property
  - Size will adjust to fit window

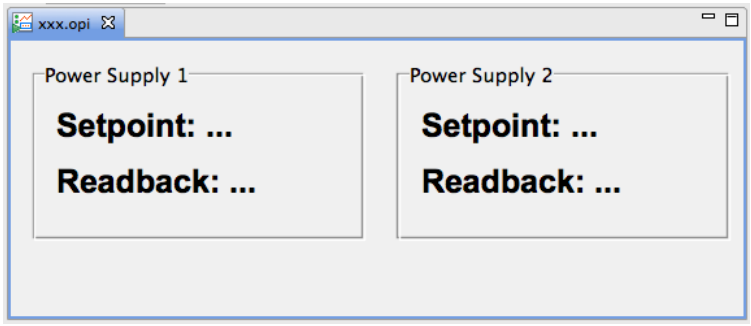


Exercise: Grouping Container

In EDM, MEDM, … we needed lines and rectangles to visually group related displays.

In BOY there is the Grouping Container

- Create a display with Grouping Containers that look like this:



  - Border Style=Group Box Style
  - Name = Power Supply 1, Power Supply 2
  - Add Labels “Setpoint:…”, “Readback:…”

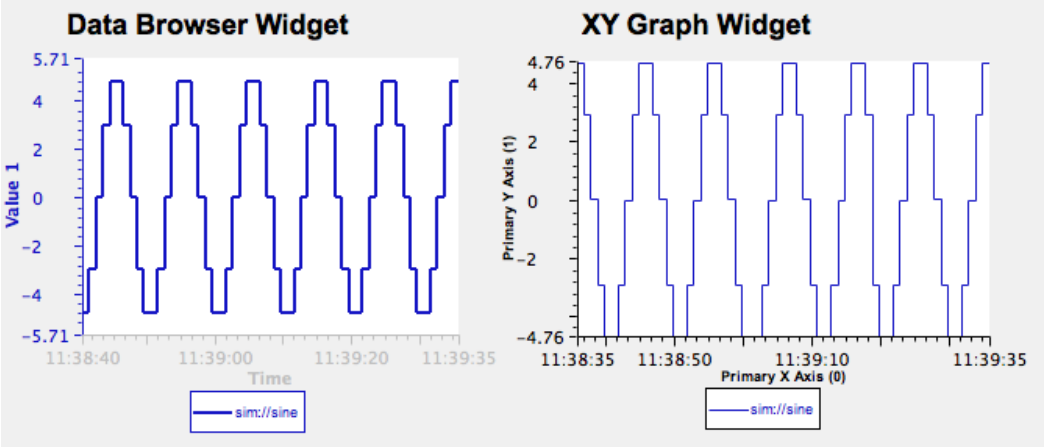
- Note how you can
  - Move the Grouping Container an all its content
  - Move Labels inside and out of the container

Exercise: "Striptool" type Plots of PV over Time

Try both options

- Data Browser Widget
  - New Data Browser Plot, add PV
  - Set desired axis and time range
  - Save as *.plt
  - Add Data Browser Widget to BOY
  - Set its File Name to the *.plt

- **XYGraph Widget**
  - **Behavior, Trigger PV: "sim://noise"**
    - **This PV updates once a second and will trigger plot updates**
  - **Primary X Axis(0), Time Format: "HH:MM:ss"**
    - **To get a "time" axis**
  - **Trace 0, Trace Type: Step Horizontally**
  - **Trace 0, Update Mode: Trigger**
  - **Trace 0, Y PV: Name of PV to plot**



- ✓ Can also display archived data
- ✓ PV can be 'monitored', showing brief spikes
- ❑ Fewer display options

- ✓ **Has many more display options**
- ❑ **Cannot show archived data**
- ❑ **PV scanned at update rate, can miss brief spikes**


TO BE
CONTINUED....