Control System Studio: BOY

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

July 2017

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BOY – Best OPI, Yet

Operator Interface Editor



Runtime





Example: ITER





Examples: SNS

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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

😭 🔛 OPI Runtime		
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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



Help - CSS (ITER) (on next.codac.iter.org)	
Search: Go Scop	e_ All topics
Contents 👜 🛛 🚀 🖃 😫 🛙	() () () () () () () () () ()
🗄 🧇 CODAC Core System	CSS Applications > Display > Best OPI Yet > Widgets
🗉 🗐 CSS Applications	
🗉 💴 Display	XY Graph
🗉 🖼 RDB Table Editor	
🗉 🖾 adl2Boy - Converter	A widget that is able to plot 1D or 2D data in an XY Graph. It has comprehensive drawing and operating
PV Table	functionalities:
🗏 🖾 Best OPI Yet	
Introduction	Supports scalar PV, array or waveform PV.
Install Examples	• Line chart, scatter chart, bar chart, step chart, area chart
Getting Started	Abundant interactive operating capabilities: Five Zoom Types, Panning, Auto Scale, Add/Remove
OPI Editor Perspective	Annotations, Undo/Redo, Take snapshot.
OPI Editor	Configure properties at Runtime, such as chaning trace color, line width and axis color etc,
OPI Runtime	• Multiple axes support
🗉 🖽 Setting Preferences	• Log scale, date time format axis support
🗉 🔛 Widgets	• Group regenus by axes
Widget Properties	· Annotations could be nee of shapped to a trace
PV Widgets	
🗉 💷 Shape Widgets	
🗎 Label	$ \left\ \begin{array}{c} \text{Irends} \\ \end{array} \right\ \approx \left\ $
🗎 Image	99.8 Multi-Axes Graph
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🗎 Text Update	40 - Ili Anotation 1
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🗎 XY Graph	
Intensity Graph	≥-20 60 <u>2</u>
Byte Monitor	
Action Button	
Menu Button	0.09.8
Text input	2011-05-02 2011-05-02 2011-05-02 2011-05-02 2011-05-02
Spinner	15:35:16 15:35:19 15:35:20 15:35:21 01
Scrollbar	
Charle Day	Line Bar Area Primary X Axis (0)
Check Box	
Container Widgets	Operations
Web Prower	
Grid Lavout	The widget is equipped with a toolbar which allows you to:
Color and Font	
BPV Connectivity	• Configure the properties of graph, axes of traces.
Action	Aud/Remove Annotations. Annotations are moveable by dragging and dropping.
	Ferror in allo scaling. Zoom In/Out on plotting area or axes in different ways

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!

nobe 🛛	
PV Formula:	=sin
Value: [UN	$\int_{\Omega} \frac{f_x \sin(t)}{s \sin(t)} = \frac{1}{s} $
New Value:	Formula Functions (2 matching items) fx sin(fx sinh(
	History (0 matching items)
Л Р	robe ^{III} sin(<vnumber>arg)</vnumber>
PV	Formula: =sin(2*

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





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, <u>OPI Editor</u>.
 - Close first.opi, now double-click the file in the Navigator. Does it open in the <u>Editor</u>?
- In the Navigator, open the Context Menu on first.opi and select Open With, <u>OPI Runtime</u>.
 - Close first.opi, now double-click the file in the Navigator. Does it open in the <u>Runtime</u>?



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



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: [♥] Q Q 92%
 - Use context menu to open in 'tabs' or new Window
- Try with OPI Examples: Open in tab, ... Window



OPIs in 'Tabs'



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

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

		Properties:			
🗣 🖹 🗶 😯 🤤		Property	Value		
🕍 Add Open OPI		File Path	AmplifierDsp.opi		
🚝 Add Open OPI in View		Macros	{Parent Macros} {PSH:	=RF-ICH1, CTRL=RF-ICH1-R	
Add Write PV		Replace	🔲 no		
Add Execute Command		Description			
Add Execute Javascript					
4 Add Play WAV File	ouse click event on widget.				
😂 Add Open File					

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
- \checkmark PV can be 'monitored', showing brief spikes
- 26 Fewer display options

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

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