## Control System Studio Training BOY Details

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

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#### **Exercise: BOY Font, Color Preferences**

#### Menu CSS, Preferences:

- Locate the BOY settings
- Assert that the Color File, Font File, Top OPIs settings use files from the BOY Examples that we just installed:

0 0	Pr	references	
type filter text	BOY Common Preferences		<b>⇔</b> • ⇔ • ▼
▼CSS Applications Alarm Debugging	Color File:	/BOY Examples/color.def	Browse
Diagnostics	Font File:	/BOY Examples/font.def	Browse
► BOY EDM2OPI Converter	Top OPIs	"/BOY Examples/main.opi"   "BOY Examples/1_2_WidgetExamples/1_WidgetExamples/1_2_WidgetExamples/1_2_WidgetExamples/1_2_WidgetExamples/1_2_WidgetExamples/1_2_WidgetExamples/1_2_WidgetExamples/1_2_WidgetExamples/1_2_WidgetExamples/1_2_WidgetExamples/1_2_WidgetExamples/1_2_WidgetExamples/1_2_WidgetEx	mples.opi"
PACE adl2boy	Probe OPI:		Browse
Editors Management	No-Editing mode		
Others	Disable Advanced Graphics		
Test ▶Trends	Display system output to B	DY Console	
▶Utilities	URL file loading timeout (ms)	5000	
▶CSS Core ▶General			
► Help ▶ Install/Update			
▶ Team		Restore Defaults (	Apply
		Cancel	ОК



### Font and Color Names

Fon

Auto Size 📃 no

When configuring a color (foreground, background, border, ...) or font (Text Update font, ...), you have two options:

a)Pick any color or font

- RGB resp. Name, Typeface, Size

#### **b**)Pick a Predefined Color resp. Font

 Remember BOY Preferences, **Color and Font file?** 

#### **Exercise**: Explain why (b) is better.





#### **Exercise: Use Predefined Fonts**

- Add a Label to your display
  - Set font to the predefined Title font
  - Set text to something like "This is the Title"
- Add another Label
  - Assert that it uses the "Default" font



#### **Portable Usage of Fonts**

Fonts differ between operating systems: "Times New" vs. "adobe-times-.." etc.

How can an OPI file "Look the same" on Windows, OS X, Linux?

- 1. If possible, install the same fonts on all your computers
  - Microsoft "Office" fonts available on most Windows and Mac OS computers because they also run MS Office
  - MS Office fonts are also available for Linux! Google "free office fonts Linux"

#### 2. BOY fonts.def file allows system-specific tweaks

```
# Though using the same MS Office font
# on all operating systems, the sizes seem
# somewhat different.
# Fix that by using different sizes for
# each OS:
Default=Verdana-regular-10
Default(macosx_cocoa)=Verdana-regular-14
Default(linux_gtk)=Verdana-regular-10
```

```
# Same with "Header1": OS X needs bigger font
# for same on-screen pixel size
Header1=Verdana-bold-24
Header1(macosx cocoa)=Verdana-bold-36
```



#### **Exercise: Schema File**

- Create a new display file "schema.opi"
  - Add a Text Update
    - Background Color: Yellow
    - Foreground Color: Red
  - Save, close the schema.opi
- Menu CSS, Preferences, CSS Applications, Display, BOY, OPI Editor
  - Set the "Schema OPI" to the schema.opi that you just created
- Create a new OPI file
  - Add a Text Update widget
  - Notice its initial Background & Foreground color?



### **Preferences: Top OPIs, Sitewide settings**

#### • Top OPIs: Appear in Toolbar



- Path names for color & font files, "Top" OPIs, Schema can be web links
  - Instead of /BOY Examples/font.def USE <u>http://some.server.org/path/font.def</u>

# Good for site-wide files like your top-level control system screen!



### **Suggestions for your site**

- After gaining some experience with BOY, somebody with design talents defines which colors, fonts, ... to use for displays at your site
- Pick fonts that look similar on all operating systems
- Create color.def, font.def, schema.opi
  - Place these on a web server
  - Configure CSS for your site to use the http://... paths to the \*.def and schema.opi
- You can put your \*.opi files into CVS
  - or subversion, Mercurial, GIT, ...CSS can include support for these
- Each night, you can publish the current \*.opi files from CVS on your web server
  - Point the "Topi OPIs" to http://web.server/opis/main.opi
  - End users can now easily run the "current" version from the Toolbar



### 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" O button to execute!

There is more, but don't go overboard!

Keep logic on the IOC.

Display is only for the display.

Don't implement whole application in BOY.





### **Widgets and Properties Galore**

- Compared to EDM, MEDM, ... BOY tries to offer specialized widgets
  - Grouping Container instead of Lines
  - LED instead of Circle-with-color-rule
  - Image Button instead of Images with conditional visibility in front of invisible button
  - Tabbed Container instead of embedded window, many invisible buttons, conditionally visible graphics, local PVs to update the display inside the embedded window
- .. with many Properties
  - Alarm sensitive Border/Background/...
  - Precision, Limits, ... from PV or direct entry





### Widgets and Properties Galore because..

**Display file describes Meaning:** 

<u>LED</u> to display something, not Circle that happens to change color.

- Group of <u>related widgets</u>, not rectangle that happens to surround something.
- Border color to reflect <u>alarm state</u>, not arbitrary change in color.

Font name "<u>Title</u>", not "Arial-bold-12".

Displays with same Representation (Lines, circles with changing color, "Arial-bold-12") look the same as displays with Meaning (group, LED, Title). But they are like compiled binaries without source code. Less useful in the long run.

In the future, files with Meaning will be easier to translate for other, new tools than files with only Representation.



#### **Rules & Scripts: Disclaimer**

... can change any property of any widget:

- Change text of label based on a PV
  - i.e. build your own Text Update
- Change color of an Ellipse based on PV
  - i.e. build your own LED
- Based on last slide, that is a **bad idea**!



Still, there are places where rules and scripts can be very powerful.

A BOY display with Rules/Scripts can replace a custom Java/Python/C/C++ application!



## **Rules, Scripts**

#### **Rules create dynamic displays**

- Easy:  $PV \rightarrow Widget Property$ 

### Scripts can to "anything"

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

operty: ] Output Ex	Background Colo pression	T		
pressions			Input PVs	
🖶 🗙 🗘	<b>0</b>		🕂 🗶 순 문	
Boolean Exp	pression	Output Value	PV Name	Trigger
pv0==0		Red	sim://ramp(0,1,1,0.5)	🗹 yes
pv0==1		Yellow		

<pre>limportPackage(Packages.org.eclipse.jface.dialogs); 2importPackage(Packages.org.csstudio.opibuilder.scriptUtil); 3 4var flagName = "popped"; 5 6if(widgetController.getExternalObject(flagName) == null){ 7 widgetController.setExternalObject(flagName, false); 8}</pre>
<pre>2importPackage(Packages.org.csstudio.opibuilder.scriptUtil); 3 4var flagName = "popped"; 5 6if(widgetController.getExternalObject(flagName) == null){ 7 widgetController.setExternalObject(flagName, false); 8}</pre>
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<pre>6if(widgetController.getExternalObject(flagName) == null){ 7     widgetController.setExternalObject(flagName, false); 8}</pre>
<pre>7 widgetController.setExternalObject(flagName, false); 8)</pre>
83
9
<pre>10var b = widgetController.getExternalObject(flagName);</pre>
11
12if(PVUtil.getDouble(pvArray[0]) > 80){
13 if(b == false){
<pre>14 widgetController.setExternalObject(flagName, true);</pre>
15 MessageDialog.openWarning(
16 null, "Warning", "The temperature you set is too high!");
17 }
18
19}else if (b == true) {
<pre>20 widgetController.setExternalObject(flagName, false);</pre>
21)



#### **Exercise: Rule to change color of Ellipse**

- Create *Ellipse* widget
- Locate its Behavior, Rules Property
- Click the "no rule attached" value to open the dialog to Attach (or edit) Rules
- Add a rule that changes the background color as shown between Red and Green, triggered by changes in the sim://sine PV
- Press "See Generated Script", compare with screenshot
- Maybe add another TextUpdate widget to display the same sim://sine PV
- Run the display



Rule Name:	My Background Rule								
Property:	Background Color (background_color)								
Output E	xpression								
Expressions			Input PVs						
	0								
<b>T A</b> U	♥	0		-					
Boolean Exp	ression	Output Value	PV Name	Trigger					
pv0<0		Red	sim://sine	✓ yes					
pv0>=0		Green							
			F						
See Gener	ated Script								
importPacka	age(Packages.org.csst	tudio.opibuilder.scriptUti	);						
if(pv0 < 0)	votil.getDouble(pvsto	лл,							
widget	setPropertyValue("ba	ackground_color","Red");							
else if(pv0>	=0) t_setPropertyValue("b;	ckaround color" "Green"							
else	aset ropertyvalue( be	enground_color, dreen,							
	setPropertyValue("ba	ckground_color",ColorFo	ntUtil.getColorFromRGB(0,0,255));						
widget									
widget									
widget									
widget									

#### **Rules vs. Scripts**

#### Rules

- are simpler: One or more PVs change <u>one property</u>
- are closer to describing Meaning
- are internally converted to scripts, but what's saved in the \*.opi file is the Meaning: Property to adjust, expressions for rule, input PVs
- should be preferred to scripts whenever possible

#### Scripts

- can be pretty much any Java Script of Jython code
- can affect multiple properties, widgets, even add and remove widgets
- should be used with care, because they can be hard to maintain in the long run
  - Use org.cstudio.opibuilder.scriptUtil (PVUtil, ColorFontUtil)
  - Add many source code comments



#### **Exercise: Rules, Scripts in OPI Examples**

- Open BOY Examples/5\_3\_Rules\_Script.opi, first in Runtime, then in Edit mode
- Check the rules behind the "Left Win!" text above the two knobs
- Check the Script attached to the left Knob
- Check the Script attached to the moving circle
  - How does it change its color?



### **Exercise: Script-generated Displays**

- Open BOY Examples/Miscellaneous/DynamicLoadWidgets/LoadWidgetsExample.opi in Runtime mode
- Enter "myConfigExample.xml", press "Load". Enter "myConfigExample2.xml", press "Load".
  - Notice a difference?
- Open SubPanel.opi in Edit mode, change it slightly by setting the color of the "Group..." label to violet, save, then press "Load" on LoadWidgetsExample.opi
  - See how it's using the current version of SubPanel.opi?

Investigate how this is done!

- What PV is attached to the text field where you enter the \*.xml file names?
- What PV is attached to the "Load" button?
- Note the script attached to the big Grouping Container that appears empty in edit mode, but is dynamically populated with copies of SubPanel.opi in runtime mode.
- Read that script together with myConfigExample.xml.
   Writing such a script requires knowledge of the BOY widget model.
   You don't have to write such a script, but you should be able to understand what it does.

Select XML config	file:				
myConfigExample	2.xml			🚰 Loa	ad
Group 0.	loc://group0:PV1 loc://group0:PV2	0.000 a.u. 0.000 a.u.	•	•	
Group 1.	loc://group1:PV1 loc://group1:PV2	0.000 a.u. 0.000 a.u.	۲ ۲	•	
Group 2.	loc://group2:PV1 loc://group2:PV2	0.000 a.u. 0.000 a.u.	۲ ۲	•	
Group 3.	loc://group3:PV1 loc://group3:PV2	0.000 a.u. 0.000 a.u.	۲ ۲	•	
Group 4.	loc://group4:PV1 loc://group4:PV2	0.000 a.u. 0.000 a.u.	۲ ۲	•	
Group 5.	loc://group5:PV1 loc://group5:PV2	0.000 a.u. 0.000 a.u.	<u>ا</u>	•	
Group 6.	loc://group6:PV1 loc://group6:PV2	0.000 a.u. 0.000 a.u.	<u>ا</u>	•	

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#### Scripts can replace custom Applications!



Display how beam loss is increased or reduced relative to a "snapshot"

Save.
Adjust,
maybe
Restore
settings

#### SNS operation group: Tim Southern, Nick Luciano

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	SCL RF Phase								0.0		
Readback	Cavity	Setpoint	Step	All	Buffer	All	Readba	ck Cavity	Setpoint	Step	All
158.31	SCL_01a	158.093 *	0.000	Save	158.093	Restore	-74.97	SCL_14a	-74.742 *	0.000	Sav
89.67	SCL_01b	89.849	0.000	Save	90.000	Restore	172.00	SCL_14b	172.247 *	0.000	Sav
156.03	SCL_01c	155.867 *	0.000	Save	155.867	Restore	-162.5	SCL_14c	-162.329	0.000	Sav
-128.24	SCL_02a	-126.298	0.000	Save	-126.298	Restore	79.91	SCL_14d	80.165	0.000	Sav
-111.18	SCL_02b	-111.346 *	0.000	Save	-111.346	Restore	-140.50	SCL_15a	-140.664 *	0.000	Sav
56.08	SCL_02c	55.934 *	0.000	Save	55.934	Restore	116.96	SCL_15b	117.21	0.000	Sa
-130.61	SCL_03a	-130.46	0.000	Save	-130.460	Restore	-166.8	SCL_15c	-166.597	0.000	Sa
-99.99	SCL_03b	-97	0.000	Save	-97.000	Restore	103.84	SCL_15d	104.035	0.000	Sa
148.79	SCL_03c	149.127	0.000	Save	149.127	Restore	-22.91	SCL_16a	-22.669	0.000	Sa
-145.93	SCL_04a	-145.75	0.000	Save	-145.750	Restore	-79.73	SCL_16b	-79.375	0.000	Sa
-47.89	SCL_04b	-47.943	0.000	Save	-47.943	Restore	1.30	SCL_16c	1.756	0.000	Sa
-144.68	SCL_04c	-144.416	0.000	Save	-144.416	Restore	-54.76	SCL_16d	-54.61	0.000	Sa

#### **Should Scripts replace custom Apps?**



## Try to keep the display tool as a display. Add logic to the IOC, not the display.



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# There is a lot you *can* do in BOY

Macros, Rules,
 Scripts, ...



#### Remember the Main Idea:

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Simply Things are Easy 1.Add widget 2.Enter PV Name 3.Run 🕥

National Laboratory