

# Control System Studio Training

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## BOY Details

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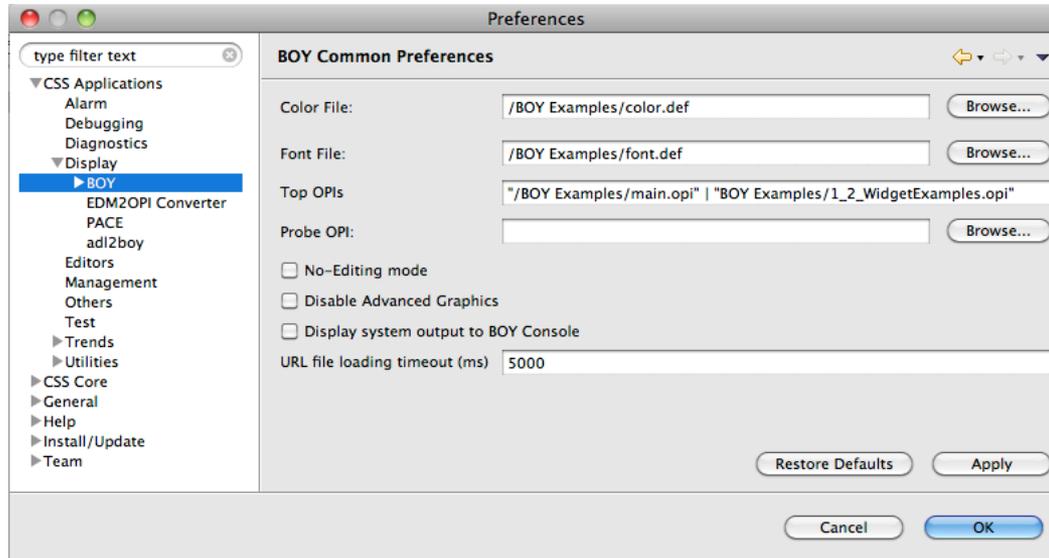
A lot of material from  
Nadine Utzel, ITER  
and BOY online help  
by Xihui Chen, SNS

Jan. 2013

# 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:

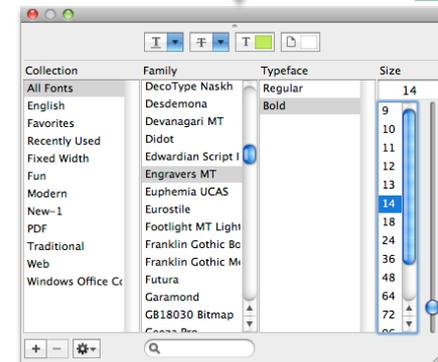
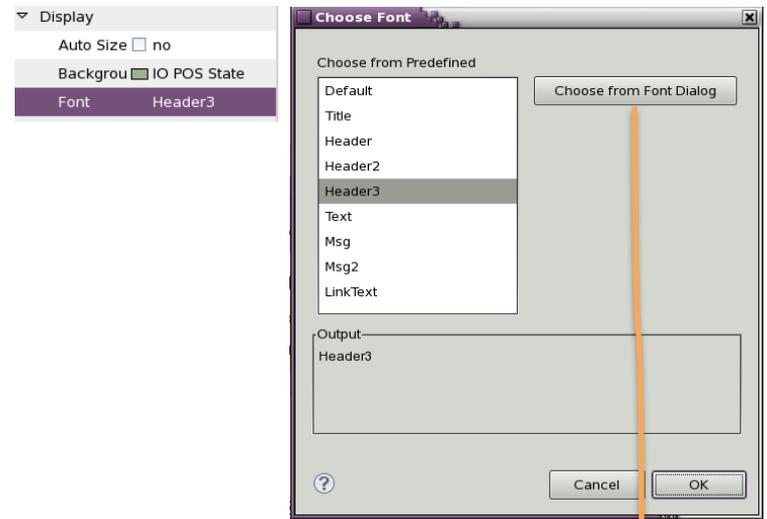
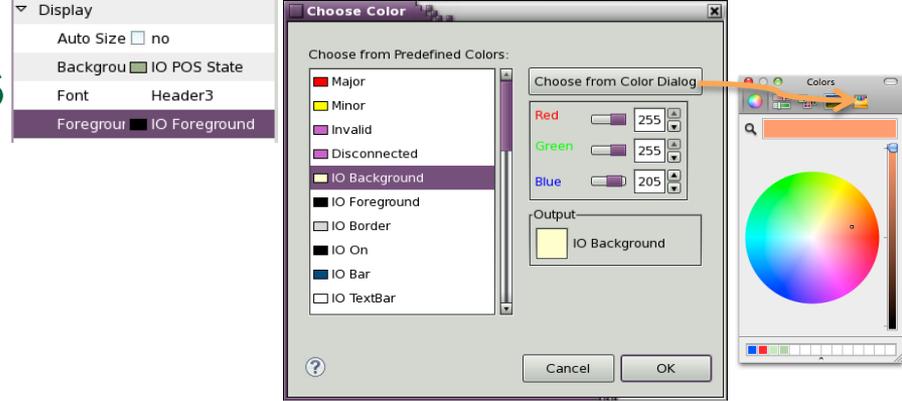


# Font and Color Names

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(macosex_cocoa)=Verdana-regular-14
Default(linux_gtk)=Verdana-regular-10

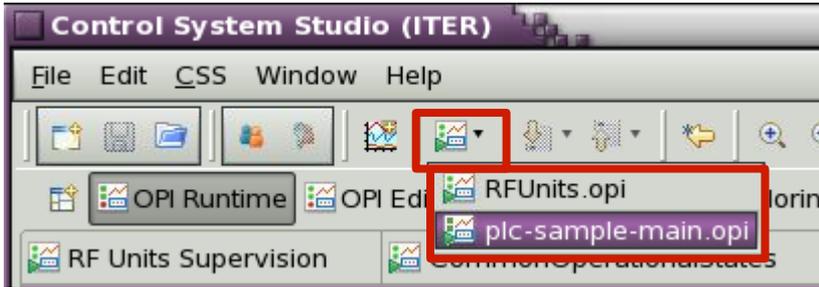
# Same with “Header1”: OS X needs bigger font
# for same on-screen pixel size
Header1=Verdana-bold-24
Header1(macosex_cocoa)=Verdana-bold-36
```

# 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 <http://some.server.org/path/font.def>

**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

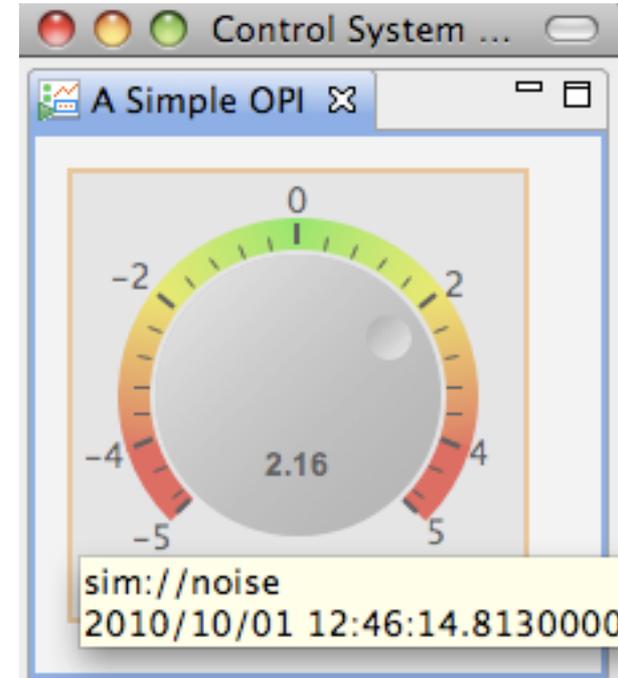
1. Drag a widget, e.g. Knob, from palette to editor
2. Enter the PV name in Properties view
3. Click the “Run”  button to execute!

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
  - **Actions**

# Widgets and Properties Galore because..

Display file describes **Meaning**:

LED to display something, not Circle that happens to change color.

Group of related widgets, not rectangle that happens to surround something.

Border color to reflect alarm state, not arbitrary change in color.

Font name "Title", 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!**

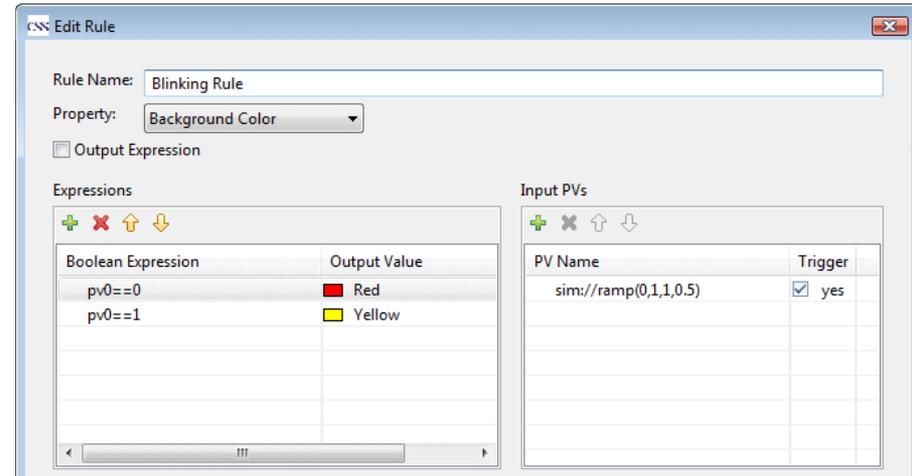
# Rules, Scripts

Rules create dynamic displays

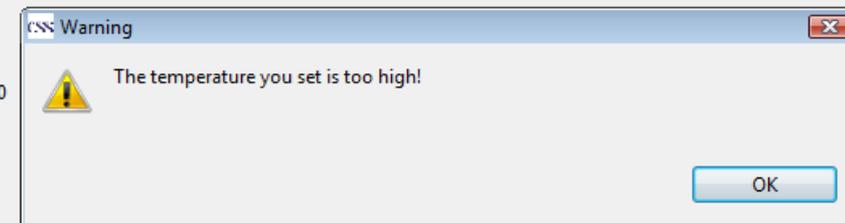
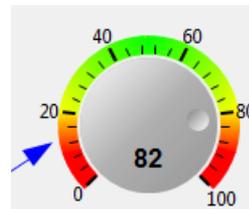
- Easy: PV → Widget Property

Scripts can do “anything”

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

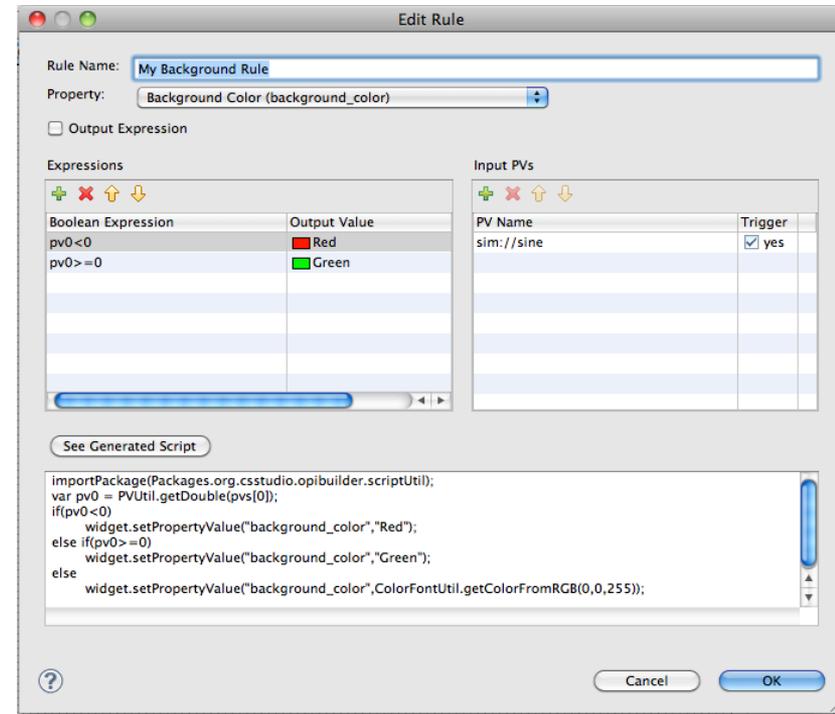
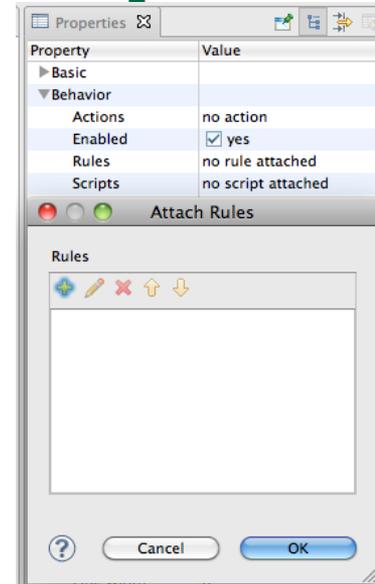


```
KnobValueDialog.js
1 importPackage(Packages.org.eclipse.jface.dialogs);
2 importPackage(Packages.org.csstudio.opibuilder.scriptUtil);
3
4 var flagName = "popped";
5
6 if(widgetController.getExternalObject(flagName) == null){
7     widgetController.setExternalObject(flagName, false);
8 }
9
10 var 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 }
```



# 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



# Rules vs. Scripts

## Rules

- are simpler: One or more PVs change one property
- 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 or 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?

The screenshot displays the 'Best OPI Yet (BOY)' interface, which is designed to maximize the flexibility of OPI. The interface is divided into several sections:

- Rules & Javascripts:** A blue header section with the text 'Maximize the flexibility of OPI'.
- Examples:** A blue header section on the right side.
- Example1: Compare value:** A yellow box containing instructions: '1. Adjust the knobs to see who will win. 2. Adjust the left knob to see a warning dialog when value exceeds 80.' A blue arrow points from this box to the left knob.
- Example2: Change size and location with script:** A green box with a blue arrow pointing to a large red circle at the bottom of the interface.
- Example3: Blinking:** A green box with a blue arrow pointing to a yellow button labeled 'Slow'.
- Knobs:** Two circular gauges with scales from 0 to 100. The left knob shows a value of 42, and the right knob shows a value of 37. A red text label 'Left Win!' is positioned above the left knob.
- Buttons:** A blue button labeled 'Use Rules to change text and color' is located above the knobs. A blue button labeled 'Use Script to pop up warning dialog' is located below the knobs.

# 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?

Select XML config file:  
myConfigExample2.xml  Load

|          |                                      |                          |   |   |
|----------|--------------------------------------|--------------------------|---|---|
| Group 0. | loc://group0:PV1<br>loc://group0:PV2 | 0.000 a.u.<br>0.000 a.u. |  |  |
| Group 1. | loc://group1:PV1<br>loc://group1:PV2 | 0.000 a.u.<br>0.000 a.u. |  |  |
| Group 2. | loc://group2:PV1<br>loc://group2:PV2 | 0.000 a.u.<br>0.000 a.u. |  |  |
| Group 3. | loc://group3:PV1<br>loc://group3:PV2 | 0.000 a.u.<br>0.000 a.u. |  |  |
| Group 4. | loc://group4:PV1<br>loc://group4:PV2 | 0.000 a.u.<br>0.000 a.u. |  |  |
| Group 5. | loc://group5:PV1<br>loc://group5:PV2 | 0.000 a.u.<br>0.000 a.u. |  |  |
| Group 6. | loc://group6:PV1<br>loc://group6:PV2 | 0.000 a.u.<br>0.000 a.u. |  |  |

## 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.

# Scripts can replace custom Applications!



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

Save,  
Adjust,  
maybe  
Restore  
settings

| SCL RF Phase |         |          |       |      |          |         |          |         |          |       |      |
|--------------|---------|----------|-------|------|----------|---------|----------|---------|----------|-------|------|
| Readback     | Cavity  | Setpoint | Step  | All  | Buffer   | All     | Readback | Cavity  | Setpoint | Step  | All  |
| 158.31       | SCL_01a | 158.093  | 0.000 | Save | 158.093  | Restore | -74.37   | SCL_14a | -74.742  | 0.000 | Save |
| 89.57        | SCL_01b | 89.849   | 0.000 | Save | 90.000   | Restore | 172.00   | SCL_14b | 172.247  | 0.000 | Save |
| 155.83       | SCL_01c | 155.867  | 0.000 | Save | 155.867  | Restore | -162.88  | SCL_14c | -162.329 | 0.000 | Save |
| -126.24      | SCL_02a | -126.298 | 0.000 | Save | -126.298 | Restore | 79.91    | SCL_14d | 80.165   | 0.000 | Save |
| -111.18      | SCL_02b | -111.346 | 0.000 | Save | -111.346 | Restore | -140.53  | SCL_15a | -140.864 | 0.000 | Save |
| 55.95        | SCL_02c | 55.934   | 0.000 | Save | 55.934   | Restore | 116.89   | SCL_15b | 117.21   | 0.000 | Save |
| -130.51      | SCL_03a | -130.46  | 0.000 | Save | -130.460 | Restore | -165.87  | SCL_15c | -166.597 | 0.000 | Save |
| -95.98       | SCL_03b | -97      | 0.000 | Save | -97.000  | Restore | 103.84   | SCL_15d | 104.035  | 0.000 | Save |
| 148.73       | SCL_03c | 149.127  | 0.000 | Save | 149.127  | Restore | -22.97   | SCL_16a | -22.869  | 0.000 | Save |
| -145.93      | SCL_04a | -145.75  | 0.000 | Save | -145.750 | Restore | -79.73   | SCL_16b | -79.375  | 0.000 | Save |
| -47.93       | SCL_04b | -47.943  | 0.000 | Save | -47.943  | Restore | 1.58     | SCL_16c | 1.756    | 0.000 | Save |
| -144.65      | SCL_04c | -144.416 | 0.000 | Save | -144.416 | Restore | -54.75   | SCL_16d | -54.61   | 0.000 | Save |

SNS operation group:  
Tim Southern, Nick Luciano

# Should Scripts replace custom Apps?



**Try to keep the display tool as a display.**

**Add logic to the IOC, not the display.**

# Summary

There is a lot you *can* do in BOY

- Macros, Rules, Scripts, ...

Remember the Main Idea:

Simply Things are Easy

1. Add widget
2. Enter PV Name
3. Run 

