

Phoebus

June 2018
ANL EPICS Meeting

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Key CS-Studio Feedback, Developers & Users

✓ Useful Applications

✓ Nice Integration

- Fragile, long build process (>30 minutes!)
- Hard to create site-specific “Product”
- Awkward, haphazard window & workspace environment

Evolution of CS-Studio

JavaFX SWT

- BOY
- Data Browser
- PV Tree
- Probe
- PV Table
- Alarms
- Channels
- Scan
- ... more ...
- Eclipse
- Java 8

- Display Builder
- Data Browser
- PV Tree
- Probe
- PV Table
- Alarms
- Channels
- Scan
- ... more ...
- Eclipse
- Java 8 (9, 10)

- Display Builder
- Data Browser
- PV Tree
- Probe
- PV Table
- Alarms
- Channels
- Scan
- ... more ...
- Phoebus
- Java 9, 10

Since ~2010:
Operational at several sites

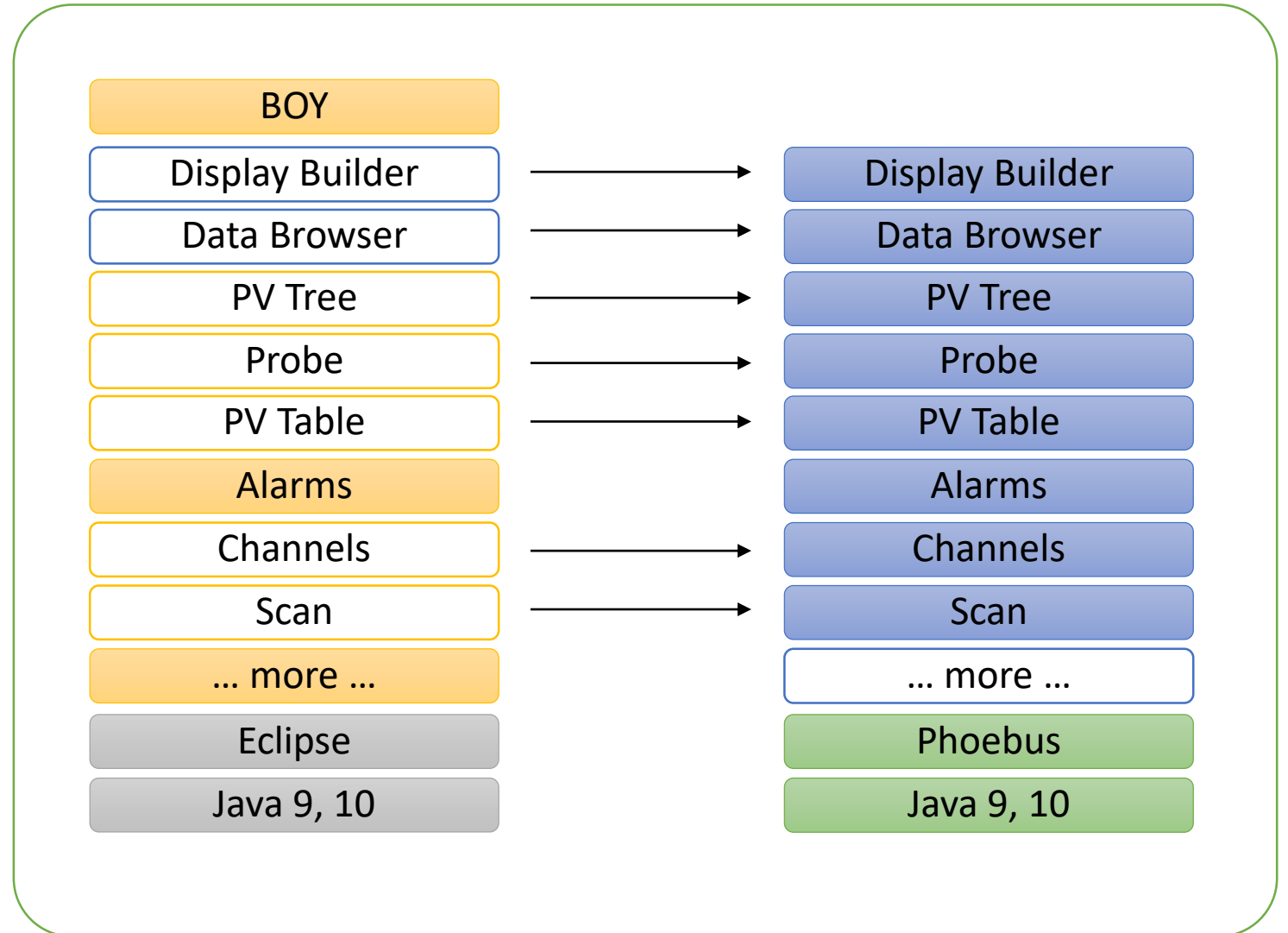
Since ~2016

First release
end of 2018

Combined Product

One download

Invoking certain functions in CS-Studio/RCP will start that component in CS-Studio/Phoebus



CS-Studio: Since ~2006 based on eclipse

- Great at the time:

- Build Setup
- Module System
- Preferences
- Extensibility
- Graphics

... but there are now (better) alternatives

- Strong ties to IDE

- Awkward layout constraints for control system user interface
- “Workspace” that’s different from the file system
- Odd menu entries that we don’t need

From Eclipse to Phoebus

- Tycho/Maven build setup → Maven or ant
- OSGi bundles → Jar files, maybe later Java 9 modules
- RCP Extension Points → Java Services
- RCP Preferences → Java Preferences
- SWT → JavaFX
- Workspace → File System
- RCP Workbench → Phoebus “Docking”

“Phoebus”

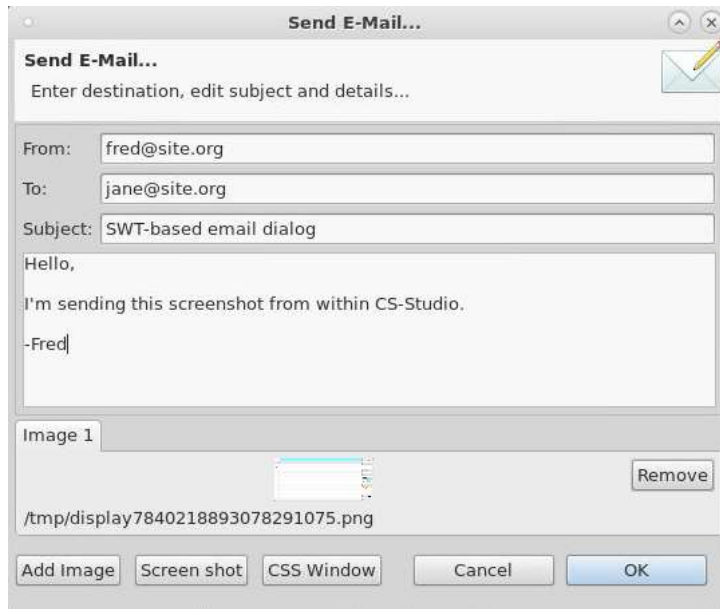
-  eclipse shadowed



- Phoebus (Greek for “bright”)
= Apollo as God of Light



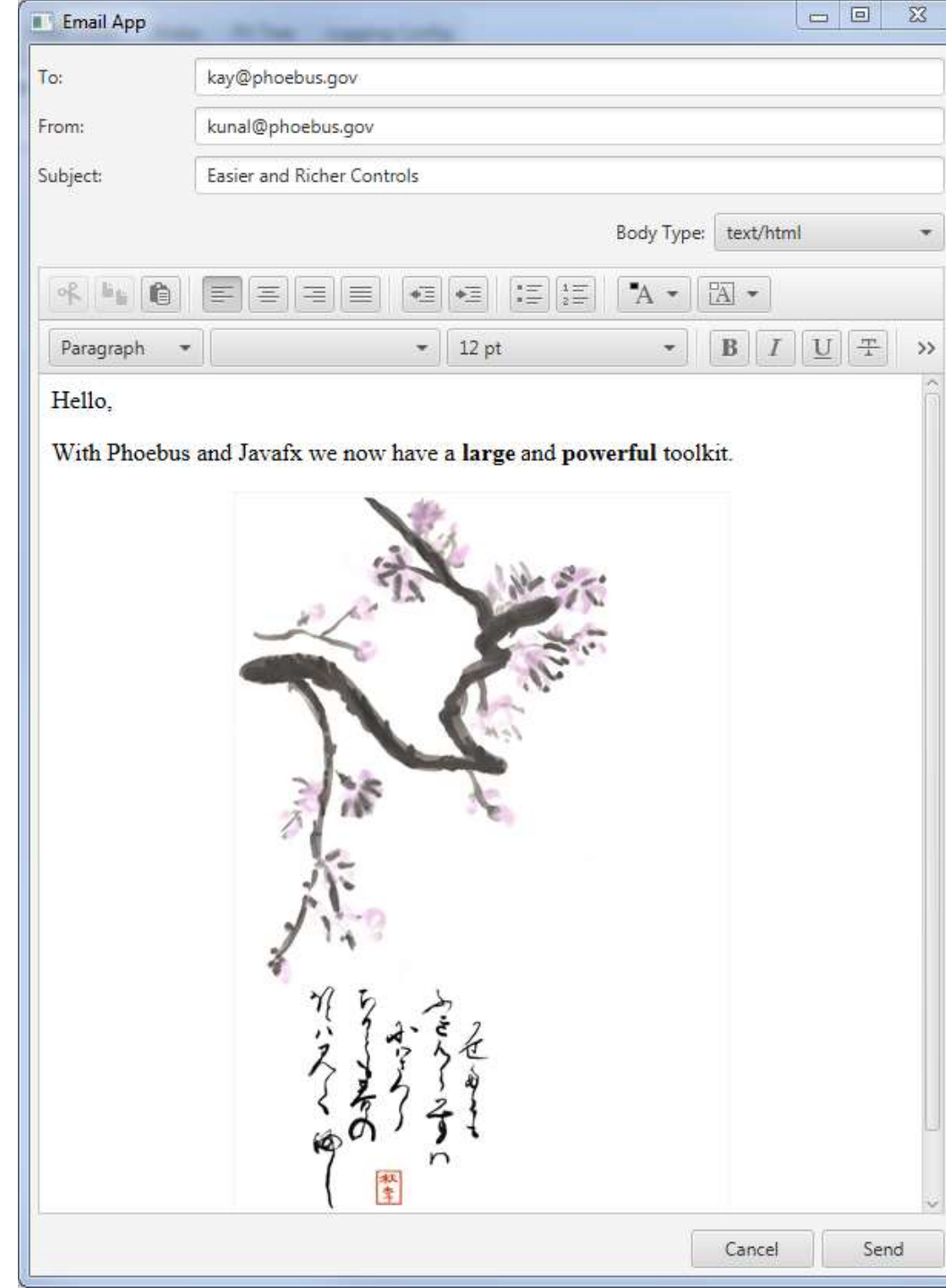
SWT vs. JavaFX



SWT used to be better than AWT

AWT/Swing caught up,
SWT now only used by Eclipse

➔ JavaFX is the latest Java-based UI



Building..

CS-Studio on Eclipse

- Maven/tycho
- Network dependencies
- Full rebuild takes >30 minutes
- Monthly cannot-build-at-all problems
- Must use Eclipse to develop

CS-Studio on Phoebus

- ✓ Maven or ant
- ✓ Can build from git clone + 1 ZIP
- ✓ Full rebuild takes ~20 seconds (!)

- ✓ Can (& still want to) use Eclipse to develop, but also Netbeans, VI, ..

Startup Times

- CS-Studio on Eclipse: 8 secs
(details depend on what's being restored)
- Open files from command line:
Only display files.

Not always finding the running instance because needs to locate window.

- Phoebus: 4 secs
(for a similar collection of panels)
 - `phoebus.sh -resource ..`
Open display files,
or probe, PV Table, .. with PVs.
- Succeeds because connects to TCP port.

Eclipse: Little control where new panels open

Floating 'Quick view' panels?

Console in middle?

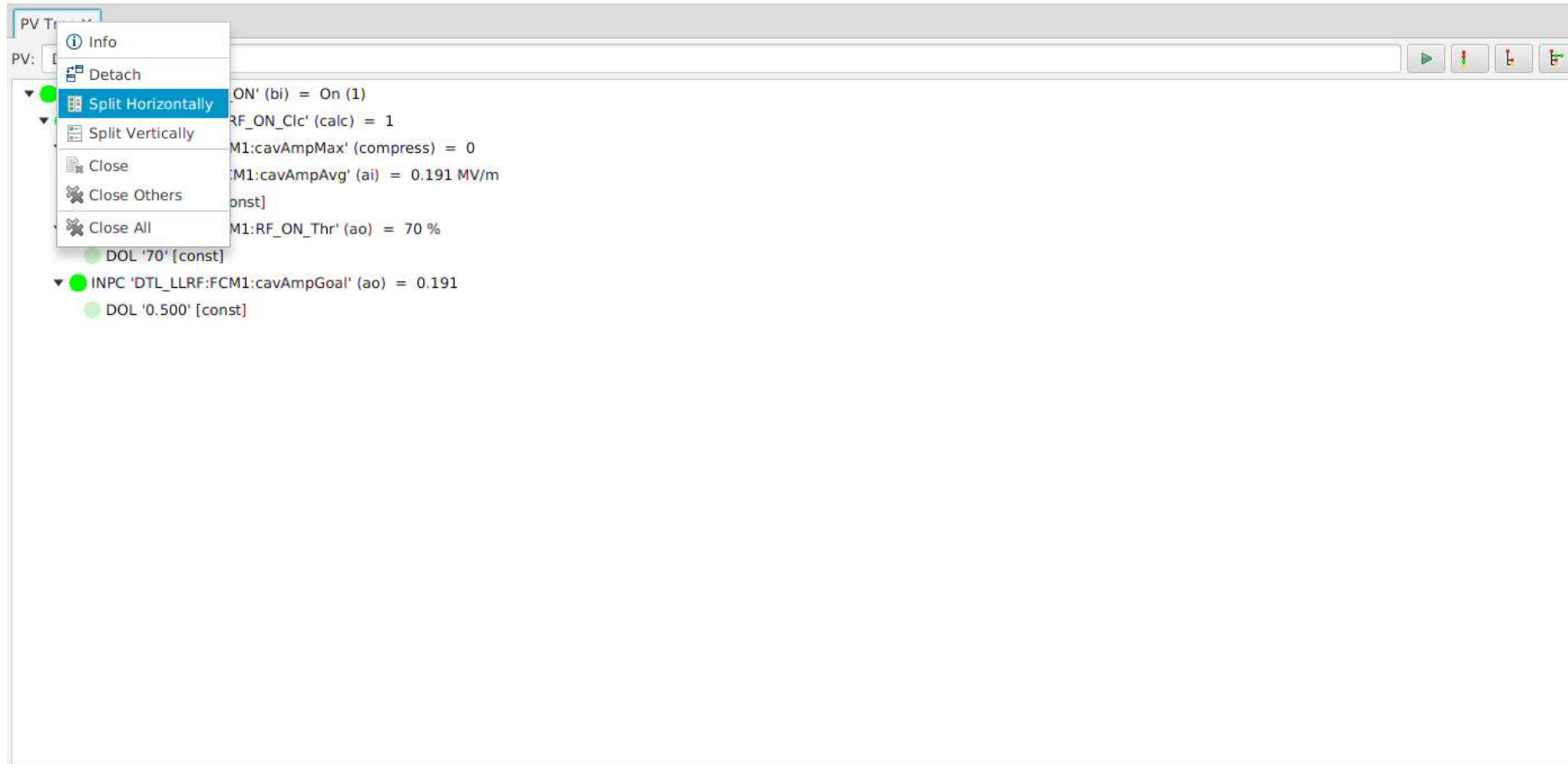
Empty Properties?

The screenshot displays the Eclipse IDE with the CS-Studio plugin. The main window is titled 'VULCAN' and contains several panels:

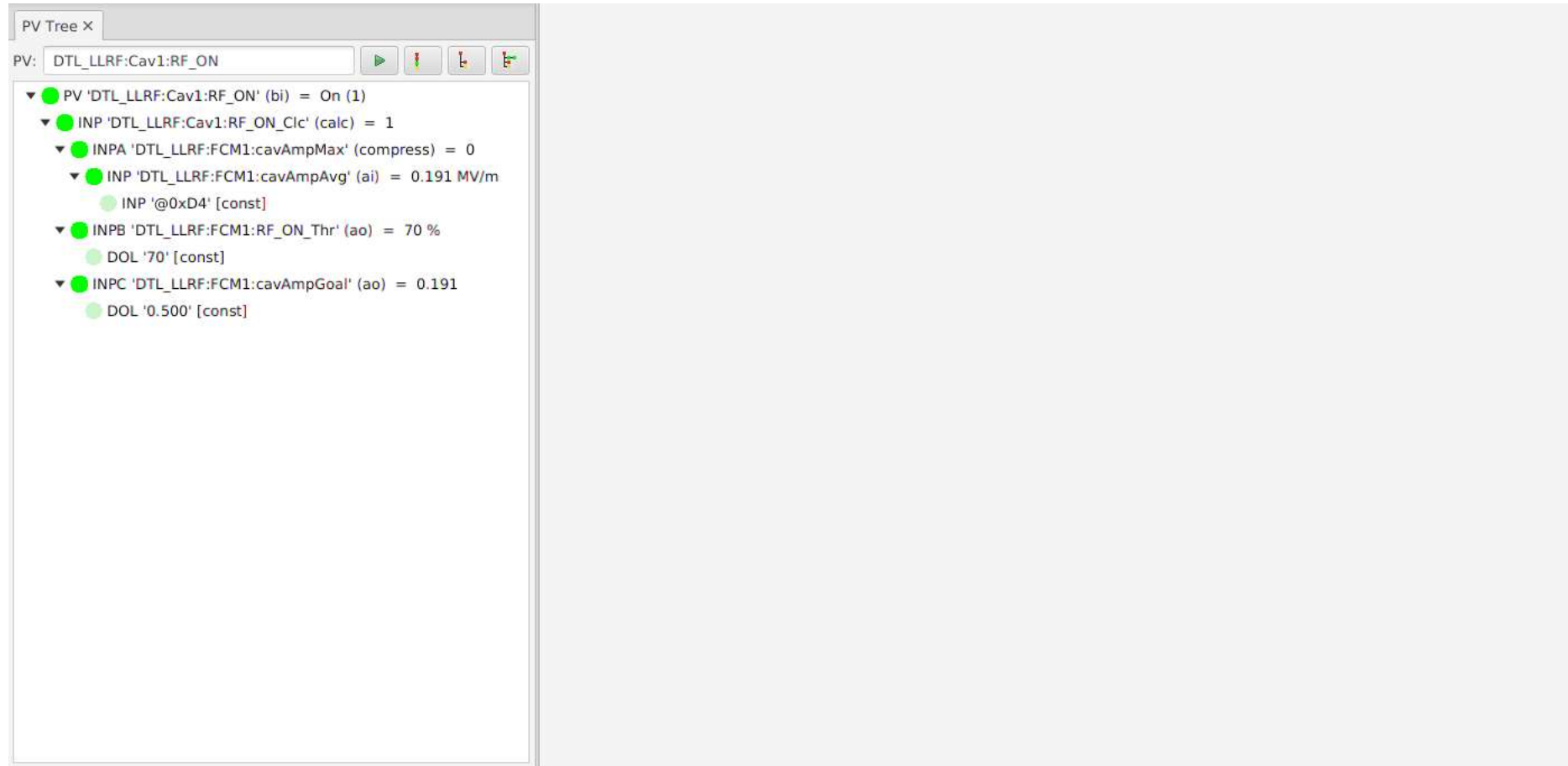
- Navigator:** A tree view on the left showing the project structure with files like 'BL7_Timing.opi', 'BL7_moxa.opi', etc.
- Control Panel:** The central area contains various controls for the VULCAN system, including 'Cave Status' (Cave Beam Permit: YES, Cave Temperature: 68.8 F, HVAC Space Temperature: 71.0 F), 'Preset Mode' (20 Hz, 30 Hz, 60 Hz), and various detectors and choppers.
- Console:** A window in the middle showing log messages from the CS-Studio application.
- Properties:** A window on the right showing the properties of the selected element, including 'PV: BL7.Chop.SkF12.PresetStat30' and its value.

The bottom of the screenshot shows a plot of 'CP_Bmln:TT07308.Y [p]' over time, with a red line showing a step function and some noise.

Docking: Like Tabs in web browser, plus “split” and “detach”



Window with horizontal Split



.. Added tab to new section

The screenshot displays a software interface with two main windows. The left window, titled 'PV Tree X', shows a hierarchical tree of variables under the path 'DTL_LLRF:Cav1:RF_ON'. The right window, titled 'Main X', displays a 'Display Builder Examples' panel with a grid of widget buttons categorized into Information, Graphics, Monitors, Controls, Plots, and Structure.

PV Tree X

PV: DTL_LLRF:Cav1:RF_ON

- PV 'DTL_LLRF:Cav1:RF_ON' (bi) = On (1)
 - INP 'DTL_LLRF:Cav1:RF_ON_Clc' (calc) = 1
 - INPA 'DTL_LLRF:FCM1:cavAmpMax' (compress) = 0
 - INP 'DTL_LLRF:FCM1:cavAmpAvg' (ai) = 0.191 MV/m
 - INP '@0xD4' [const]
 - INPB 'DTL_LLRF:FCM1:RF_ON_Thr' (ao) = 70 %
 - DOL '70' [const]
 - INPC 'DTL_LLRF:FCM1:cavAmpGoal' (ao) = 0.191
 - DOL '0.500' [const]

Main X

Display Builder Examples

100 %

Information	Graphics	Monitors	Controls	Plots	Structure	MI
Introduction	Label	Text Update	Text Entry	X/Y Plot	Group	
Properties	Picture	LED	Toggle Buttons	Image	Embedded	
Classes	Polygon/line	Byte Monitor	Action Buttons	Data Browser	Tabs	
Macros		Tank	Incr. Controls		Navigation Tabs	
Actions		Table	Combo Box		Array	
Scripts		Gauges	Radio Button			
Enablement		Meters	File Selector			
		Symbols	Knob			
			Thumb Wheel			

Press buttons to see sub-displays.

Note you can also navigate between buttons via <Tab> key or <Shift> and cursor keys, then press <SPACE> to activate button.

Can split further...

The screenshot shows a software interface with a context menu open over a tree view. The menu options are: Info, Detach, Split Horizontally, Split Vertically (highlighted), Close, Close Others, and Close All. The tree view shows a hierarchy of objects, including 'INPC 'DTL_LLRF:FCM1:cavAmpGoal' (ao) = 0.191' and its child 'DOL '0.500' [const]'. Below the tree view, there are several property fields with values like 'On (1)', '1', '0', '0.191 MV/m', '70 %', and '0.191'.

The main window, titled 'Main X', displays 'Display Builder Examples'. It features a grid of buttons organized into categories:

- Information:** Introduction, Properties, Classes, Macros, Actions, Scripts, Enablement
- Graphics:** Label, Picture, Polygon/line
- Monitors:** Text Update, LED, Byte Monitor, Tank, Table, Gauges, Meters, Symbols
- Controls:** Text Entry, Toggle Buttons, Action Buttons, Incr. Controls, Combo Box, Radio Button, File Selector, Knob, Thumb Wheel
- Plots:** X/Y Plot, Image, Data Browser
- Structure:** Group, Embedded, Tabs, Navigation Tabs, Array

At the bottom of the window, there is a note: 'Press buttons to see sub-displays. Note you can also navigate between buttons via <Tab> key or <Shift> and cursor keys, then press <SPACE> to activate button.'

Added another tab

The screenshot displays a software interface with two main windows. The left window, titled 'PV Tree x', shows a hierarchical tree of process variables (PVs) under the path 'DTL_LLRF:Cav1:RF_ON'. The tree includes several sub-elements like 'INPA', 'INPB', and 'INPC', each with associated values and constants. Below the tree is an 'Active Jobs x' section with a table header for 'Name' and 'Status', which currently shows 'No background jobs'.

The right window, titled 'Main x', is titled 'Display Builder Examples' and contains a grid of buttons for different widget categories. The categories are 'Information', 'Widgets', 'Monitors', 'Controls', and 'Plots'. The 'Information' category includes buttons for Introduction, Properties, Classes, Macros, Actions, Scripts, and Enablement. The 'Widgets' category is further divided into 'Graphics' (Label, Picture, Polygon/line), 'Monitors' (Text Update, LED, Byte Monitor, Tank, Table, Gauges, Meters, Symbols), 'Controls' (Text Entry, Toggle Buttons, Action Buttons, Incr. Controls, Combo Box, Radio Button, File Selector, Knob, Thumb Wheel), and 'Plots' (X/Y P, Image, Data Br).

At the bottom of the right window, there is a note: 'Press buttons to see sub-displays. Note you can also navigate between buttons via <Tab> key or <Shift> and cursor keys, then press <SPACE> to activate button.'

Save and Re-Load Layouts

The screenshot shows the Phoebus software interface. The 'Window' menu is open, showing options like 'Always Show Tabs', 'Save Layout As...', and 'Load Layout'. The 'Load Layout' option is selected, and a sub-menu is visible with options: 'Alarms', 'Example1', 'Example2', 'Example3', 'Example4', 'Mine', and 'Nothing'. The 'Mine' option is highlighted.

The interface is divided into several sections:

- Display Builder Examples:** A grid of widget categories including Information, Widgets, Graphics, Monitors, Controls, and Plots.
- Text Update Widget:** A panel showing the widget's configuration and examples. It includes fields for 'Basic Number' (4.76 a.u.), 'Disconnecting channel' (<sim://intermittent>), and 'Basic Text' (AAAAAA). It also shows a rotated version of the widget and a yellow background with green text.
- LED Widget:** A panel explaining the LED widget's functionality. It shows the 'Value' (3.00 a.u.), 'Default' state (green), and 'Bits' (0, 1, 2). It also shows the 'State' (Zero, One, Two, Three, Invalid) and 'Alarms' (green LED with border).

Fixed Layout Sections

The screenshot displays a software interface with several components:

- Alarm Area Panel:** Contains two colored boxes labeled "Demo" (red) and "Vacuum" (magenta).
- Alarm Tree:** A sidebar showing a tree view with "Demo" and "Vacuum" entries.
- Display Builder Examples:** A window showing XML code for configuring a dock stage with fixed panes.
- Alarm Table:** A table showing 1001 active alarms and 0 acknowledged alarms.

XML Code:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<memento show_tabs="true">
  <DockStage_MAIN height="1337.0" maximized="true" width="2560.0" x="0.0" y="23.0">
    <split pos="0.21696637998436277">
      <split horizontal="false" pos="0.3119486768243785">
        <pane fixed="true" selected="0">
          <DockItem_07dd06d5_35c8_4369_852b_29ec4dfa40d5 application="alarm_area"/>
        </pane>
        <pane fixed="true" selected="0">

```

Alarm Table (Active Alarms):

PV	Description	Alarm Severity	Alarm Status	Alarm Time	Alarm Value	PV Severity	PV Status
sim://sine(...)	sim://sine(-770, 7...	MAJOR	LOLO	2018-06-11 13:07:29.225	-732.313517...	MAJOR	LOLO
sim://sine(...)	sim://sine(-897, ...	MAJOR	LOLO	2018-06-11 13:07:29.246	-853.09769...	MAJOR	LOLO
sim://sine(...)	sim://sine(-76, 7...	MAJOR	LOLO	2018-06-11 13:07:28.917	-72.280295...	MAJOR	LOLO
sim://sine(...)	sim://sine(-879, ...	MAJOR	LOLO	2018-06-11 13:07:29.240	-835.97867...	MAJOR	LOLO

Alarm Table (Acknowledged Alarms):

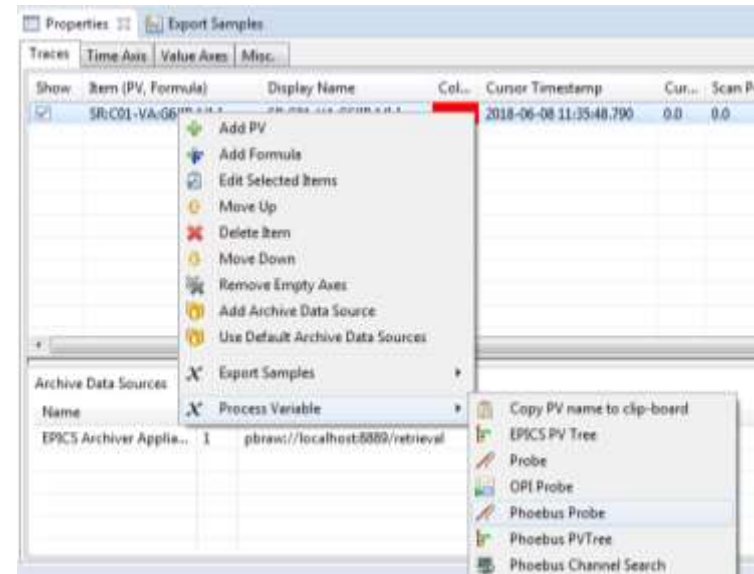
PV	Description	Alarm Severity	Alarm Status	Alarm Time	Alarm Value	PV Severity	PV Status
No acknowledged alarms							

Open Tools from Command Line

```
-resource /path/to/file  
-resource file:/path/to/file  
-resource http://my.site/path/to/file  
-resource file:/path/to/file?app=display_runtime&  
MACRO1=value+1&MACRO2=abc  
-resource pv://?SomePV&app=probe  
-resource pv://?SomePV&OtherPV&app=pv_table
```

- First call will start phoebus
- Follow-up calls can open resource in existing window
- Used to integrate RCP-based CS-Studio

- Opens that file with the default application.
- Same, but makes the 'file' schema specific.
- Reads web link, opens with default application.
- Opens file with 'display_runtime' app passing macros.
- Opens the 'SomePV' with 'probe'.
- Opens two PVs PV with 'pv_table'.



Progress

Completed

- ✓ Probe
- ✓ PV Tree
- ✓ PV Table
- ✓ File Browser (basic)
- ✓ Data Browser
- ✓ Display Builder
- ✓ Scan UI
- ✓ Scan Server
- ✓ .. and infrastructure:
 - ✓ Autocomplete, Macros, ..
 - ✓ Build & Development Environment

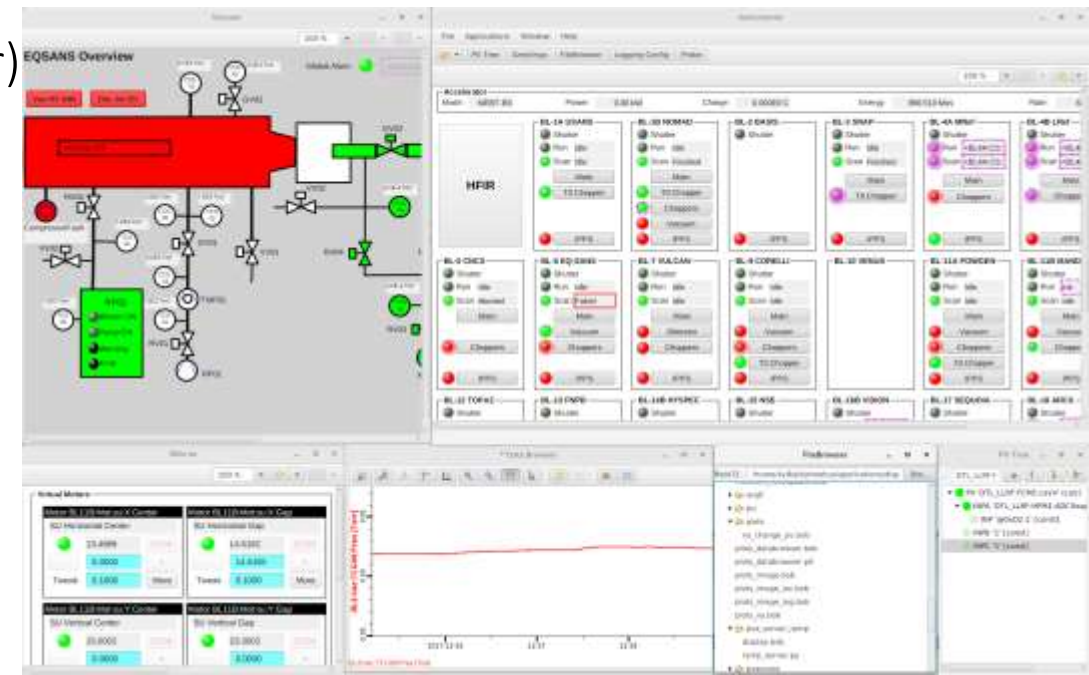
99% compatibility with existing
PV Table, Display Builder, Data Browser
configuration files

Plan (end of 2018)

- ❑ Alarm UI (required for SNS beam lines)
- ❑ Channel Finder UI
- ❑ Logbook Support
- ❑ CS-Studio/Eclipse integration

Also planned, but not essential

- ❑ File Browser (better)
- ❑ Archive Engine



Phoebus

File Applications Window Help

Greetings FileBrowser Probe PV Tree Logging Config

Welcome ChannelTree X

Query: *C01*I*

- ▼ *C01*I
 - ▼ 1wire-cr-rga
 - ▼ OneWire_C01
 - ▶ 10.0.152.133:48908
 - ▶ RTC_C01
 - ▶ cs-snmp
 - ▼ hrtc-p2
 - ▼ 10.0.152.133:59713
 - UT:C01{RG:D1-HRTC}Err-I
 - UT:C01{RG:D1-HRTC}ID-I
 - UT:C01{RG:D1-HRTC}T-I
 - UT:C01{RG:D2-HRTC}Err-I
 - UT:C01{RG:D2-HRTC}ID-I
 - UT:C01{RG:D2-HRTC}T-I
 - ▶ diagioc-c01
 - ▶ diagioc-c02
 - ▶ diagioc-c03
 - ▶ diagioc-c04
 - ▶ diagioc-c05
 - ▶ diagioc-c06
 - ▶ diagioc-c07
 - ▶ diagioc-c08

Phoebus based
Channel Finder Tree w/t
Lazy loading
4.5k Loc

CS-Studio

File Edit Search Run CS-Studio Window Help

Quick Access

Navigator Channel Tree by Property

Query: *C01*I* Configure

- ▲ 1wire-cr-rga
 - ▲ OneWire_C01
 - ▶ 10.0.152.133:48908
 - ▲ RTC_C01
 - ▶ 10.0.152.133:49974
 - ▶ cs-snmp
 - ▲ hrtc-p2
 - ▲ 10.0.152.133:59713
 - UT:C01{RG:D1-HRTC}Err-I
 - UT:C01{RG:D1-HRTC}ID-I
 - UT:C01{RG:D1-HRTC}T-I
 - UT:C01{RG:D2-HRTC}Err-I
 - UT:C01{RG:D2-HRTC}ID-I
 - UT:C01{RG:D2-HRTC}T-I
- ▲ diagioc-c01
 - ▶ SR:C01-BI
 - ▲ SR:C01-FOFB
 - ▶ 10.0.152.1:44369
 - ▶ 10.0.152.1:44381
 - ▶ diagioc-c02
 - ▶ diagioc-c03
 - ▶ diagioc-c04
 - ▶ diagioc-c05
 - ▶ diagioc-c06
 - ▶ diagioc-c07
 - ▶ diagioc-c08
 - ▶ diagioc-c09

Eclipse based
Channel Finder Tree w/t
Lazy loading
11.2k Loc

Fishtank Heater Demo for user ky9

Requires fishtank IOC

Room
Temperature: 25 C

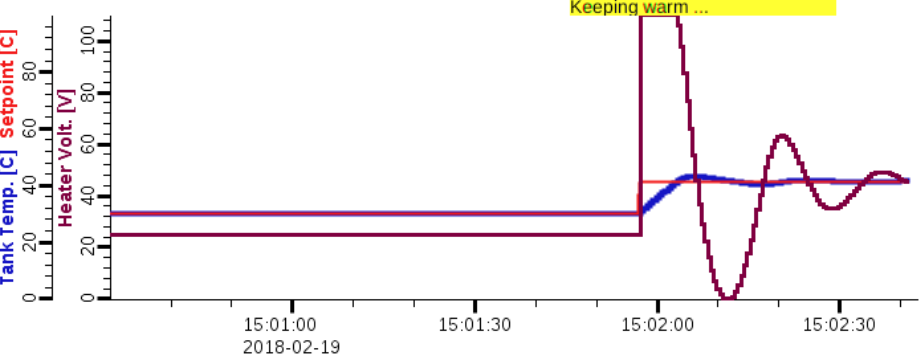
Water Tank
Temperature: 41.5 C
Isolation Factor: 0.0100
Heat Capacity: 0.0010
Sensor: OK

Setpoint
100
80
60
40
20
0

Heater
Voltage: 45 V
Power: 170 W
supervisory
closed_loop

Controller
Output: 45.324
Prop. Gain: 10.000
Integral Gain: 5.000
Error: -0.1
Err. Integral: 9.292
Integral Limit: 20.000
Status: Keeping warm ...

Phoebus:
¼ CPU,
½ Memory



Fishtank Heater Demo for user ky9

Requires fishtank IOC

Room
Temperature: 25 C

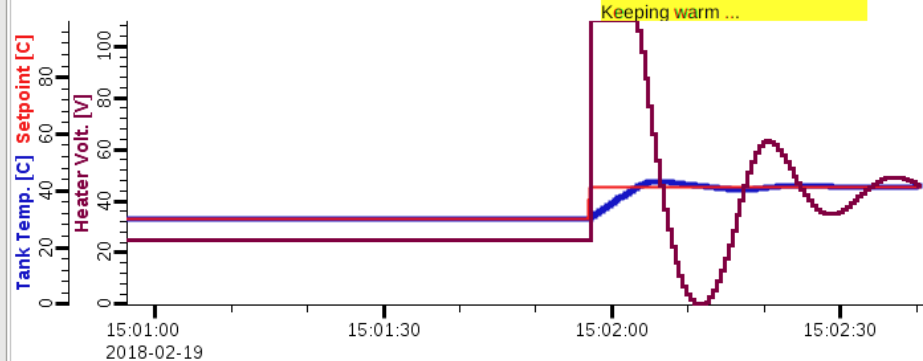
Water Tank
Temperature: 41.5 C
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Prop. Gain: 10.000
Integral Gain: 5.000
Error: -0.1
Err. Integral: 9.292
Integral Limit: 20.000
Status: Keeping warm ...

CS-Studio with
Eclipse



ky9@diane:~/git/org.csstudio.display.builder/org.csstudio.display.builder.model/examples/fishtank

```
top - 15:02:40 up 7 days, 15:44, 3 users, load average: 0.87, 1.14, 0.93
Tasks: 275 total, 2 running, 273 sleeping, 0 stopped, 0 zombie
%Cpu(s): 7.4 us, 1.1 sy, 0.0 ni, 90.6 id, 0.9 wa, 0.0 hi, 0.0 si, 0.0 st
KiB Mem : 16172032 total, 3128668 free, 7447444 used, 5595920 buff/cache
KiB Swap: 8191996 total, 8191996 free, 0 used, 7494792 avail Mem
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
28473	ky9	20	0	7197228	1.399g	52256	S	41.9	9.1	1:53.73	/opt/jdk1.8.0_121/bin/java -Dosgi.requiredJavaVersion=1.8 -XX:+UseG1GC -XX:+UseStringDeduplication -Dosgi.requiredJavaVersion=1.8 -Xms256m -
28380	ky9	20	0	9.967g	646620	68068	S	10.6	4.0	1:00.10	/opt/jdk-9/bin/java -Dfile.encoding=UTF-8 -classpath /home/ky9/git/phoebus/dependencies/target/lib/py4j-0.10.2.1.jar:/home/ky9/git/phoebus/a

Phoebus

The next version of CS-Studio

- ✓ Simpler, faster development setup
- ✓ Simpler, more obvious panel layout
- ✓ On track for 1st release end of 2018



Display Builder

Data Browser

PV Tree

Probe

PV Table

Alarms

Channels

Scan

... more ...

Phoebus

Java 9, 10