CS-Studio Phoebus Development

Dr. Patrizia Rossi and Peter Bonneau
Detector Support Group
December 14, 2021
EPICS Control System Studio

• Use EPICS for controls and monitoring.

• The EPICS operator interface (OPI) allows several types of GUls to interact with the system, each of which can run concurrently with other GUls, e.g. BOY and recently, Phoebus.

• Both BOY and Phoebus are OPIs developed by Control System Studio (CSS)
EPICS Control System Studio

• Control System Studio (CS-Studio)
  – Collection of tools and applications for controls and monitoring of systems
  – Developed and maintained by a collaboration of laboratories and universities.

• CS-Studio versions
  – Original CS-Studio (2006) based on Eclipse framework
Motivation for using CS-Studio Phoebus

• Simplifies applications e.g. channel finder
  – Fewer lines of code
    ▪ Eclipse: 11.2 kilo lines of code (KLOC), Phoebus: 4.5 KLOC
  – Reduces compile time
    ▪ Eclipse: ~30 minutes, Phoebus: ~3 minutes

• Reduces system load, e.g. Display Builder Heater Demo
  – CPU: Eclipse: ~40%, Phoebus: ~10%
  – Memory usage: Eclipse: ~9 MB, Phoebus: ~4 MB

• Software updates to Eclipse-based CS-Studio have ended

• The CS-Studio collaboration recommends all new system development be with Phoebus

[DSG Note 2021-31]
Hall C High Voltage Controls Development

- Replaced Tcl/Tk based system for HMS & SHMS detectors
  - CS-Studio BOY screens are generated automatically by Python

- Developed Python program to back up and restore EPICS HV process variables

- CS-Studio Phoebus implementation planned

DSG Note 2019-18  DSG Note 2019-20

Backup and Restore GUIs
Hall A High Voltage Controls Development

- Replacing Tcl/Tk HV controls system with Phoebus
  - Screens are automatically generated with Python

- HV Map File and Python generate a screen grid
  - LED button color indicates difference between HV set & read voltages
Hall A High Voltage Controls Development

- Main menu is generated dynamically from a Python dictionary
  - Hall A will have several experiments that use a suite of detectors in slightly different configurations

DSG Talk 2021-32

Main HV Menu Screen
Hall A SoLID Controls Development

- Converting EPICS CS-Studio BOY screens to Phoebus

SoLID Solenoid Cryo Control Reservoir – Expert Screen in Phoebus

DSG Note 2020-33
Hall A SoLID Controls Development

SoLID Solenoid Neck Temperatures Phoebus

Action button opens related Phoebus screen

SoLID Solenoid Cryo Control Reservoir Phoebus

DSG Note 2020-26
Hall C NPS Controls Development

- Converting EPICS CS-Studio BOY screens to Phoebus screens
- Each block is an embedded display (copy of the same screen)
  - Easier to make changes

**Phoebus screen**

<table>
<thead>
<tr>
<th>Row</th>
<th>00-35</th>
<th>01-35</th>
<th>02-35</th>
<th>03-35</th>
<th>04-35</th>
<th>05-35</th>
<th>06-35</th>
<th>07-35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage [V]</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Current [µA]</td>
<td>&lt;hvcaentest&gt; &lt;/hvcaentest&gt;</td>
<td>&lt;hvcaentest&gt; &lt;/hvcaentest&gt;</td>
<td>&lt;hvcaentest&gt; &lt;/hvcaentest&gt;</td>
<td>&lt;hvcaentest&gt; &lt;/hvcaentest&gt;</td>
<td>&lt;hvcaentest&gt; &lt;/hvcaentest&gt;</td>
<td>&lt;hvcaentest&gt; &lt;/hvcaentest&gt;</td>
<td>&lt;hvcaentest&gt; &lt;/hvcaentest&gt;</td>
<td>&lt;hvcaentest&gt; &lt;/hvcaentest&gt;</td>
</tr>
</tbody>
</table>

*Disclaimer: The table content is representative and may not correspond to actual data.*

**Monitor voltage, current, power status Phoebus screen**
Hall C NPS Controls Development

Temperature maps give an overall view of temperature sensors in the NPS crystal array

Visual indication of temperatures over threshold (red)

Phoebus screen displaying randomly generated values

- Temperature maps give an overall view of temperature sensors in the NPS crystal array
- Visual indication of temperatures over threshold (red)
Hall C NPS Phoebus Alarm System Development

- Phoebus Alarm System user interface is integrated in main menu
- Development started

DSG Note 2021-37
Integration of alarm system in the Phoebus main menu
Phoebus Alarm System User Interface

- Alarm Summary
  - System status overview
  - Hierarchical tree
- Operator Interface for triggered alarm
- Unacknowledged alarms
- Acknowledged alarms
- User actions
  - Access guidance on how to handle specific alarms
  - Invoke links to related operator interfaces
  - Acknowledge alarms
  - Edit alarm system configuration

![Phoebus Alarm System User Interface Diagram]

- Summary
- Operator Interface for Triggered Alarm
- Unacknowledged Alarms
- Acknowledged Alarms
- User Actions (guidance, acknowledge, configure)
Conclusion

• DSG is developing CS-Studio Phoebus for Halls A and C
  – Converting Tcl/Tk-based systems to Phoebus
  – Converting previously made CS-Studio BOY control screens to Phoebus
  – CS-Studio Phoebus alarm system for NPS