Current uses of CS-Studio at Diamond Light Source

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10:00, Thursday 22nd September, 2016

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- Motivation
- EDM conversion process at DLS
- Conversion Screenshots
- GUI Builder
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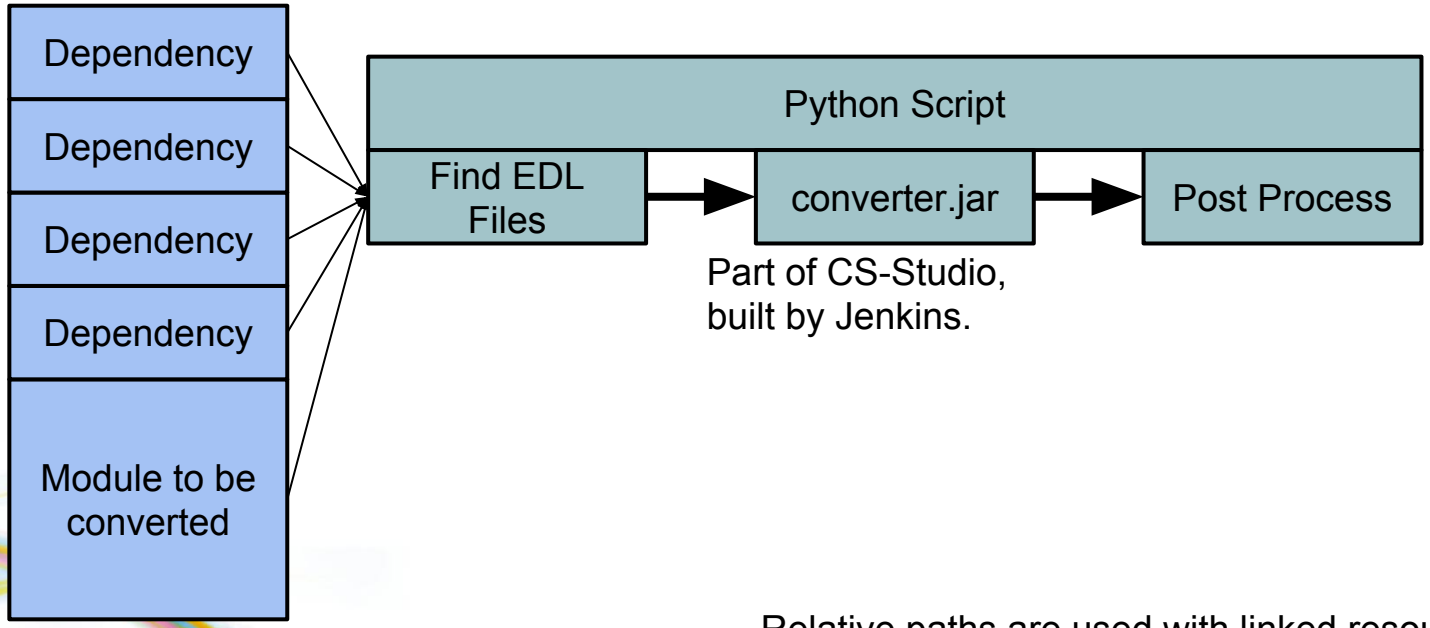
Motivation for moving from EDM to CS-Studio

- EDM is nearing end of life (or is it!? ‘Future of edm’, 14:00 today).
- EDM’s libraries are being phased out.
- EDM is supported by one person, CS-Studio has community support due to use at many sites.
- We could benefit from the rest of the infrastructure that CS-Studio provides, such as BEAST on beamlines and V4 compatibility.
- Potential to integrate into DAWN and GDA; Diamond’s data analysis and data acquisition software is also built on Eclipse RCP.

Overview of conversion process

Checkout module to be converted.
Script checks configure/* for dependencies and also checks out dependent module tree.



Relative paths are used with linked resources to take care of versioning and editing out of the read only production file system.

https://github.com/dls-controls/css-converter-python

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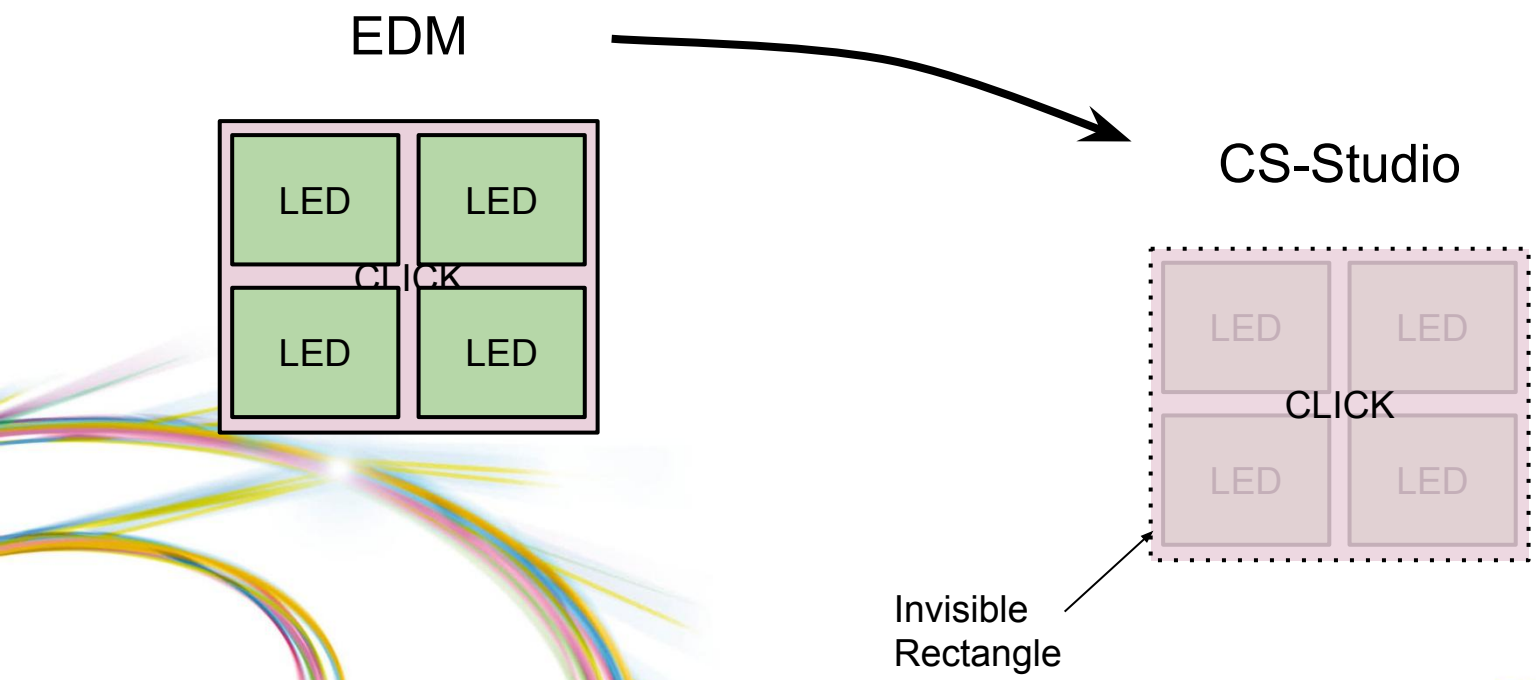
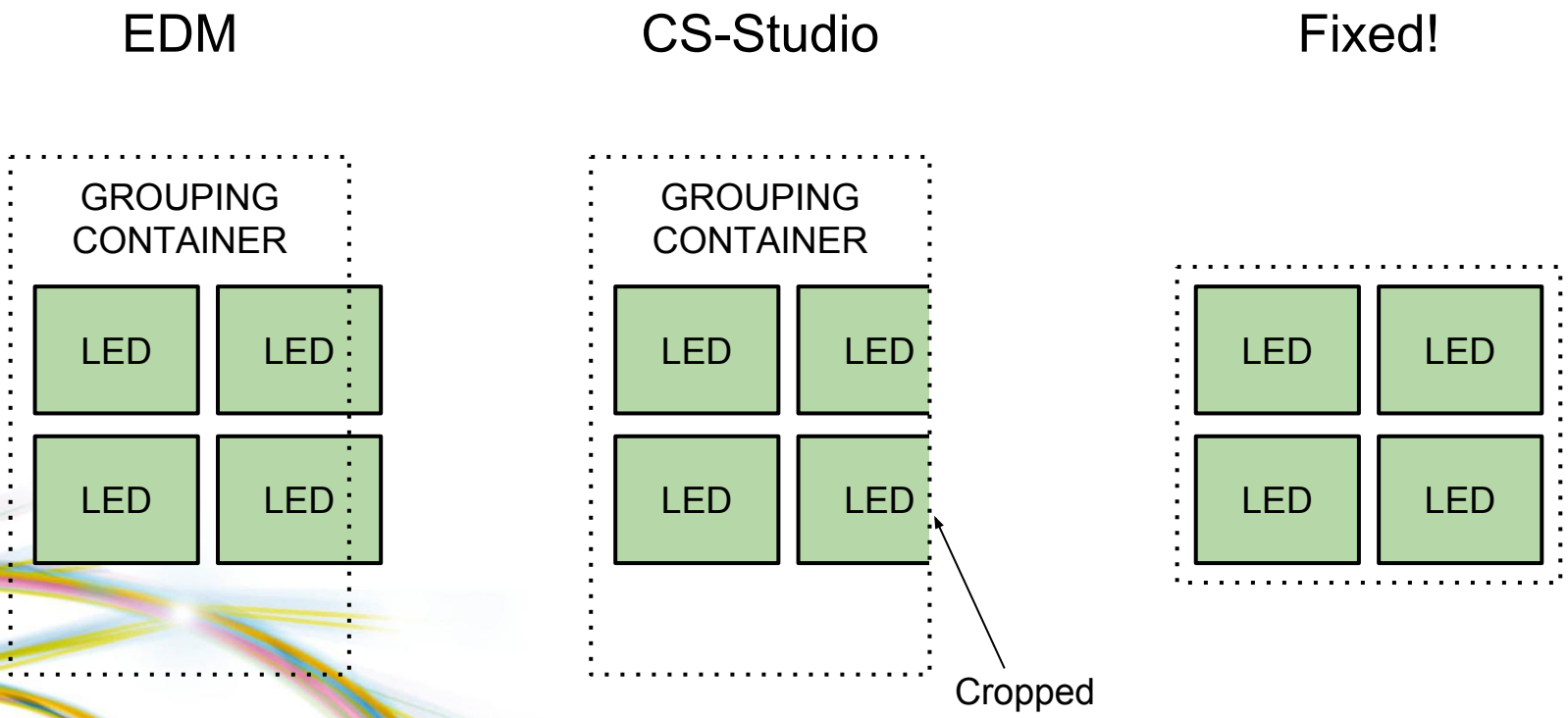
Post processing: Click ordering

Widgets must be on the top of the stack to be clickable in CS-Studio but not in EDM.
Recreate clicks on the top attached to an invisible rectangle.



Post processing: Grouping containers

Extend grouping container boundaries to include all widgets.



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Post processing

- Convert EDL symbol files for DLS symbol widget.
- Swap some fonts and sizes to improve legibility.
- Tweak colours to keep antialiased fonts legible.

Must ‘infer’ what the designer wants,
ends up with some manual corrections.

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Many small issues we have overcome

- Can’t create local Enum PVs
- Escaping quotes in external command line calls
- Unsigned data in intensity graph
- Missing grid lines in XY-Graph
- Keeping specific OPI files bound to a view when changing perspective and restarting
- Many many more...

Some more small issues yet to be overcome

- Char arrays are shown as integers in text updates, not ASCII text.
- Small (~1px) sized details can be lost by slight changes in widget and border dimensions.
- Font and colour tweaks have unexpected results when screens don’t conform to design guidelines.
- Graph missing points, because it has 250,000 of them!

These types of issue can normally be patched manually after conversion. Automated conversion needs to reduce this to an acceptable workload.

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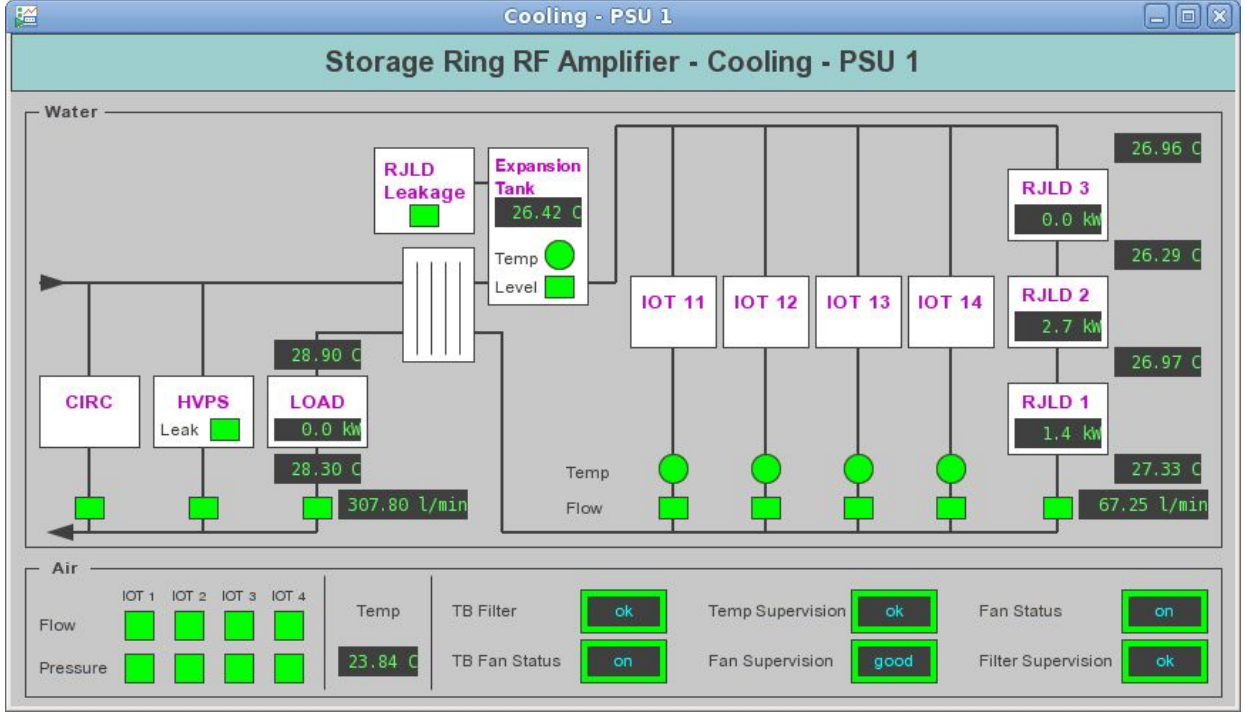
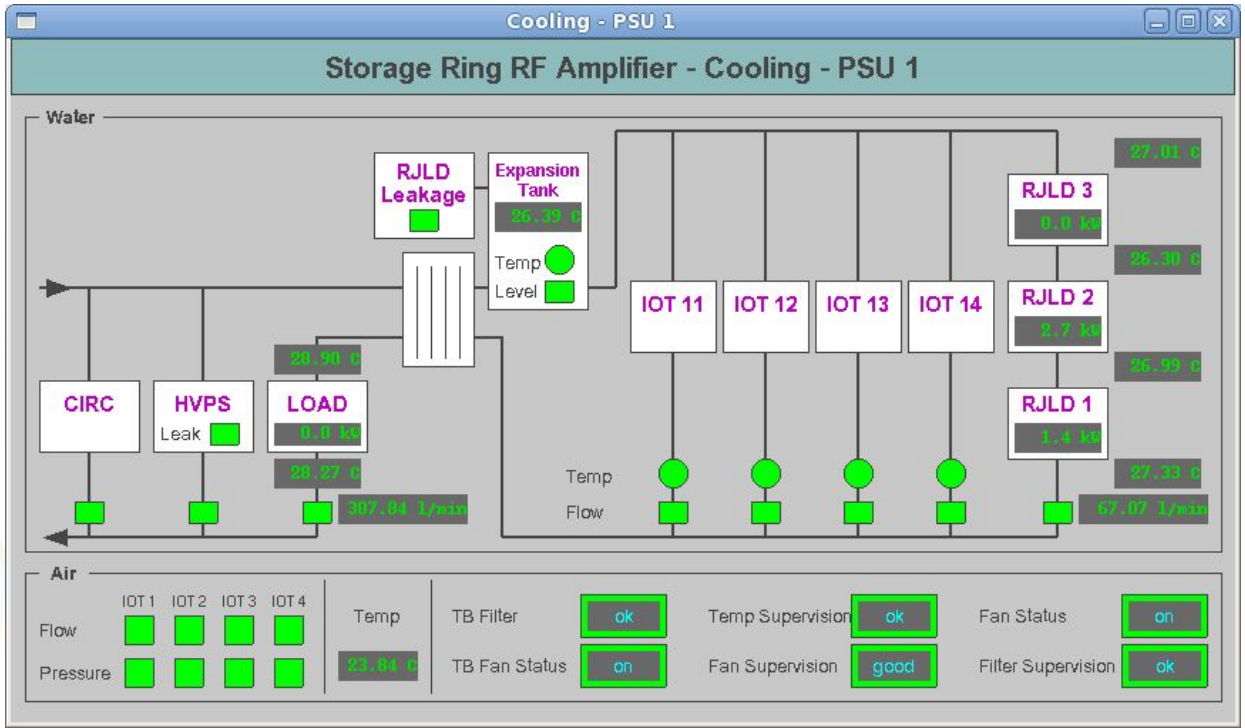

Cooling - PSU 1
Storage Ring RF Amplifier - Cooling - PSU 1
Water
RJLD Leakage
Expansion Tank
26.42 C
Temp
Level
IOT 11
IOT 12
IOT 13
IOT 14
26.96 C
RJLD 3
0.0 kW
26.29 C
RJLD 2
2.7 kW
26.97 C
RJLD 1
1.4 kW
27.33 C
28.90 C
CIRC
HVPS
Leak
LOAD
0.0 kW
28.30 C
307.80 l/min
Temp
Flow
67.25 l/min
Air
IOT 1
IOT 2
IOT 3
IOT 4
Flow
Pressure
Temp
23.84 C
TB Filter
ok
TB Fan Status
on
Temp Supervision
ok
Fan Supervision
good
Fan Status
on
Filter Supervision
ok


Cooling - PSU 1
Storage Ring RF Amplifier - Cooling - PSU 1
Water
RJLD Leakage
Expansion Tank
26.39 C
Temp
Level
IOT 11
IOT 12
IOT 13
IOT 14
27.01 C
RJLD 3
0.0 kW
26.30 C
RJLD 2
2.7 kW
26.99 C
RJLD 1
1.4 kW
27.33 C
28.90 C
CIRC
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TB Filter
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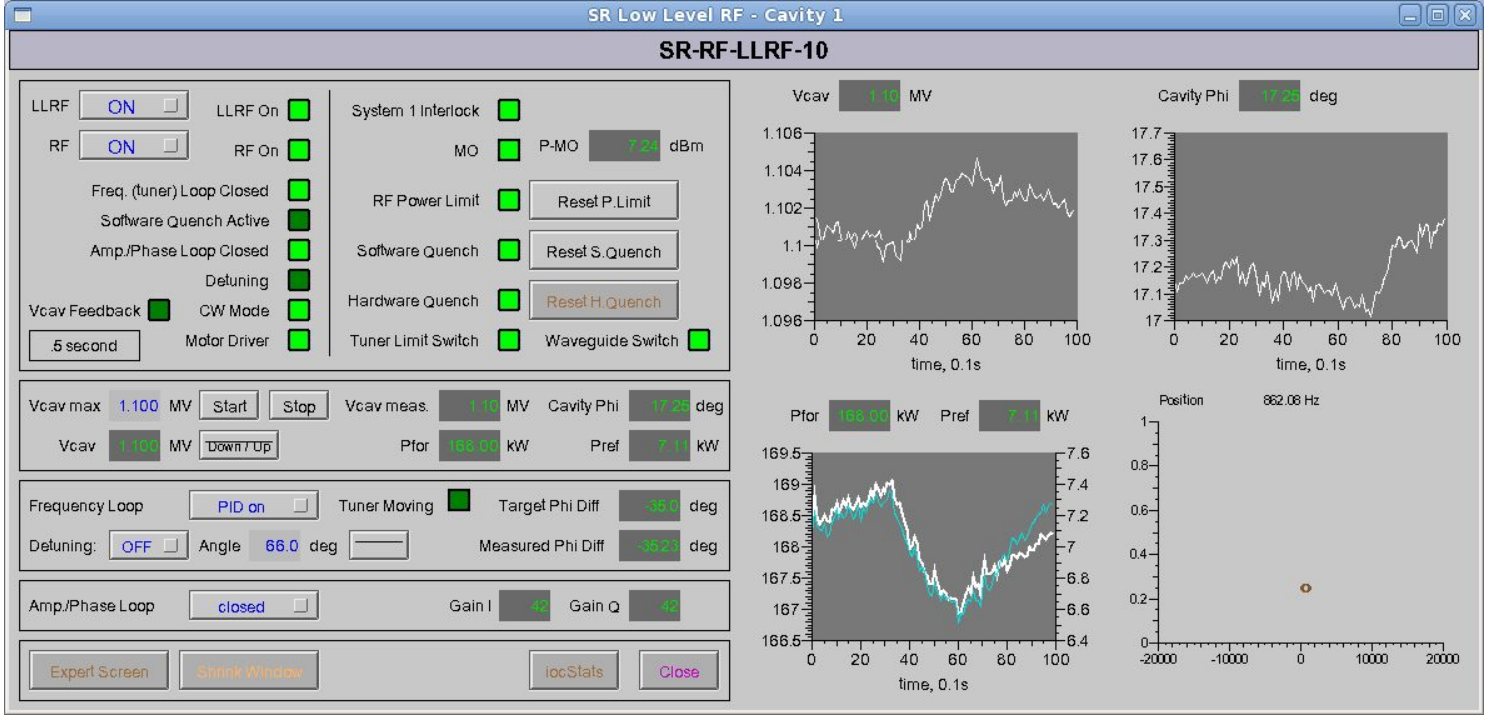
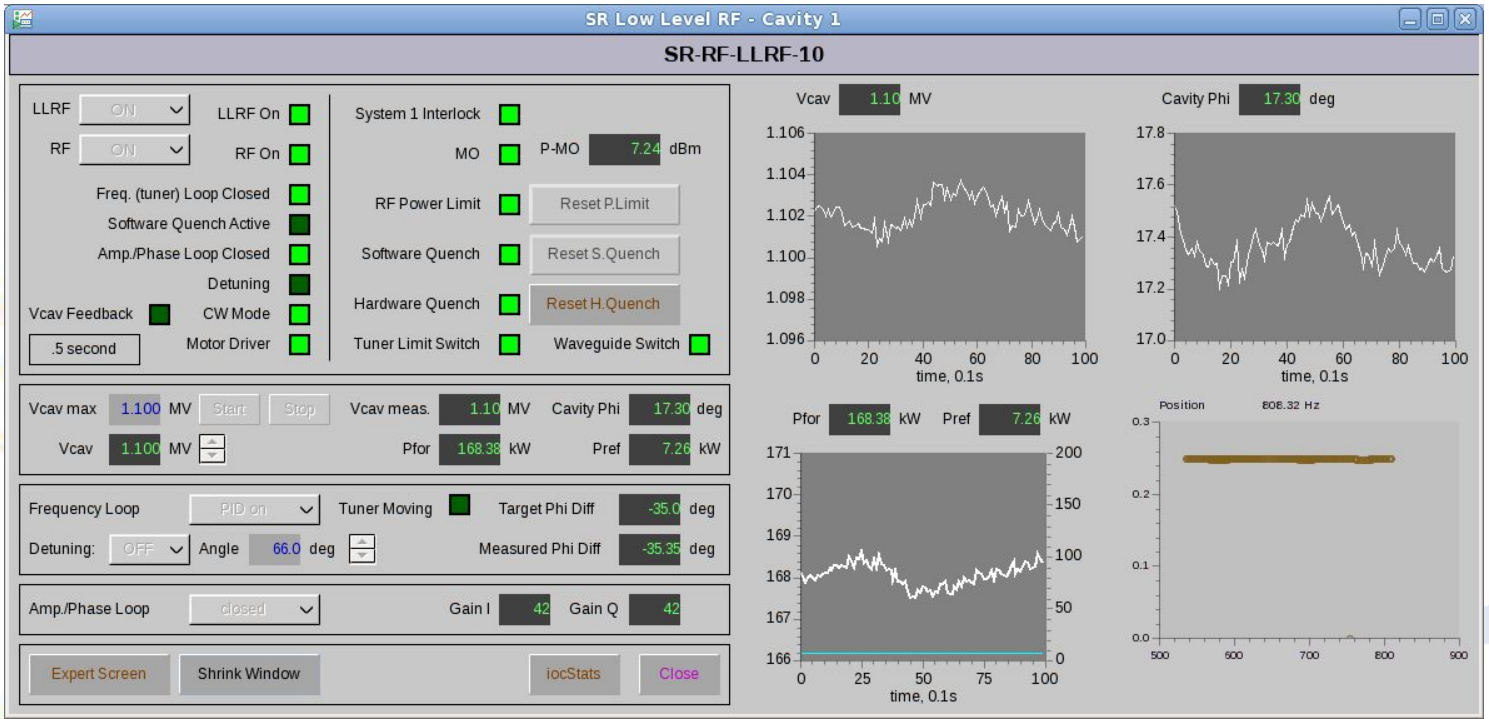

SR Low Level RF - Cavity 1
SR-RF-LLRF-10
LLRF ON
RF ON
LLRF On
RF On
Freq. (tuner) Loop Closed
Software Quench Active
Amp./Phase Loop Closed
Detuning
Vcav Feedback
CW Mode
Motor Driver
.5 second
System 1 Interlock
MO
P-MO 7.24 dBm
RF Power Limit
Reset P.Limit
Software Quench
Reset S.Quench
Hardware Quench
Reset H.Quench
Tuner Limit Switch
Waveguide Switch
Vcav max 1.100 MV
Start
Stop
Vcav meas. 1.10 MV
Cavity Phi 17.25 deg
Vcav 1.100 MV
Down / Up
Pfor 168.00 kW
Pref 7.11 kW
Frequency Loop
PID on
Tuner Moving
Target Phi Diff -35.0 deg
Detuning:
OFF
Angle 66.0 deg
Measured Phi Diff -35.23 deg
Amp./Phase Loop
closed
Gain I 42
Gain Q 42
Expert Screen
Shrink Window
iocStats
Close
Vcav 1.10 MV
time, 0.1s
Cavity Phi 17.25 deg
time, 0.1s
Pfor 168.00 kW
Pref 7.11 kW
time, 0.1s
Position 862.08 Hz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CW Mode
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Reset P.Limit
Software Quench
Reset S.Quench
Hardware Quench
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Tuner Limit Switch
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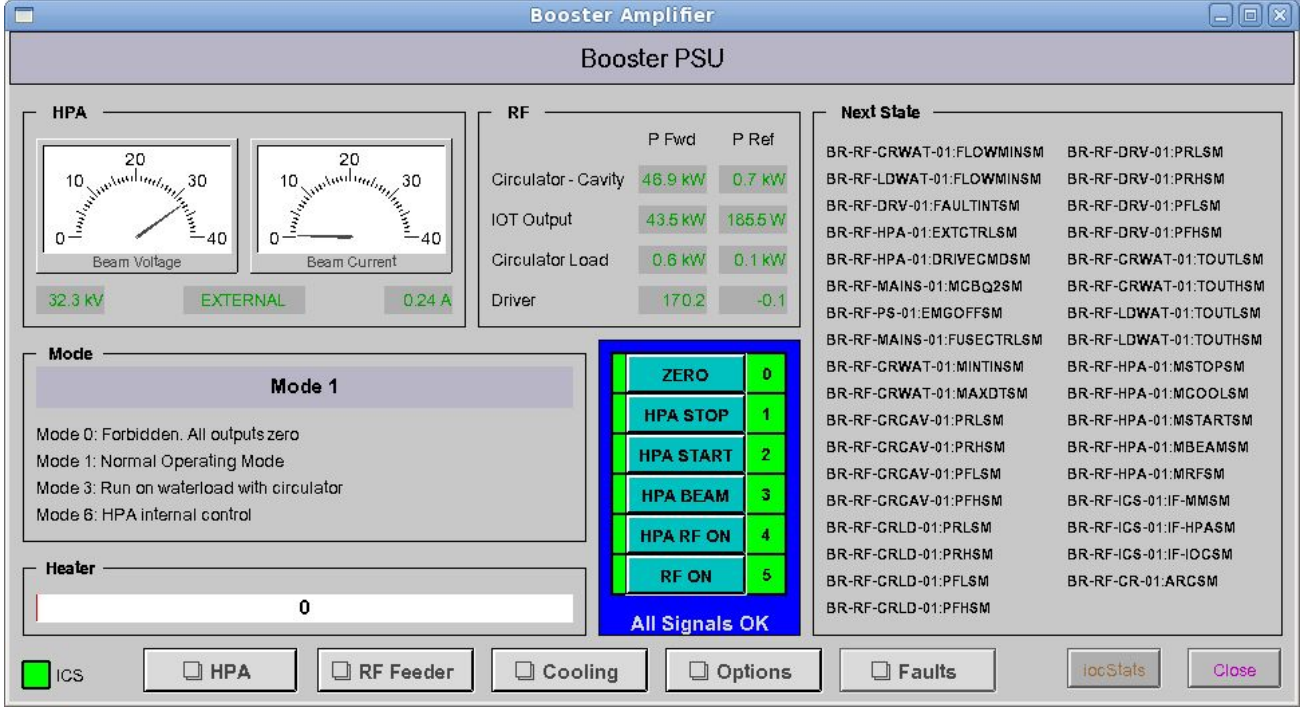
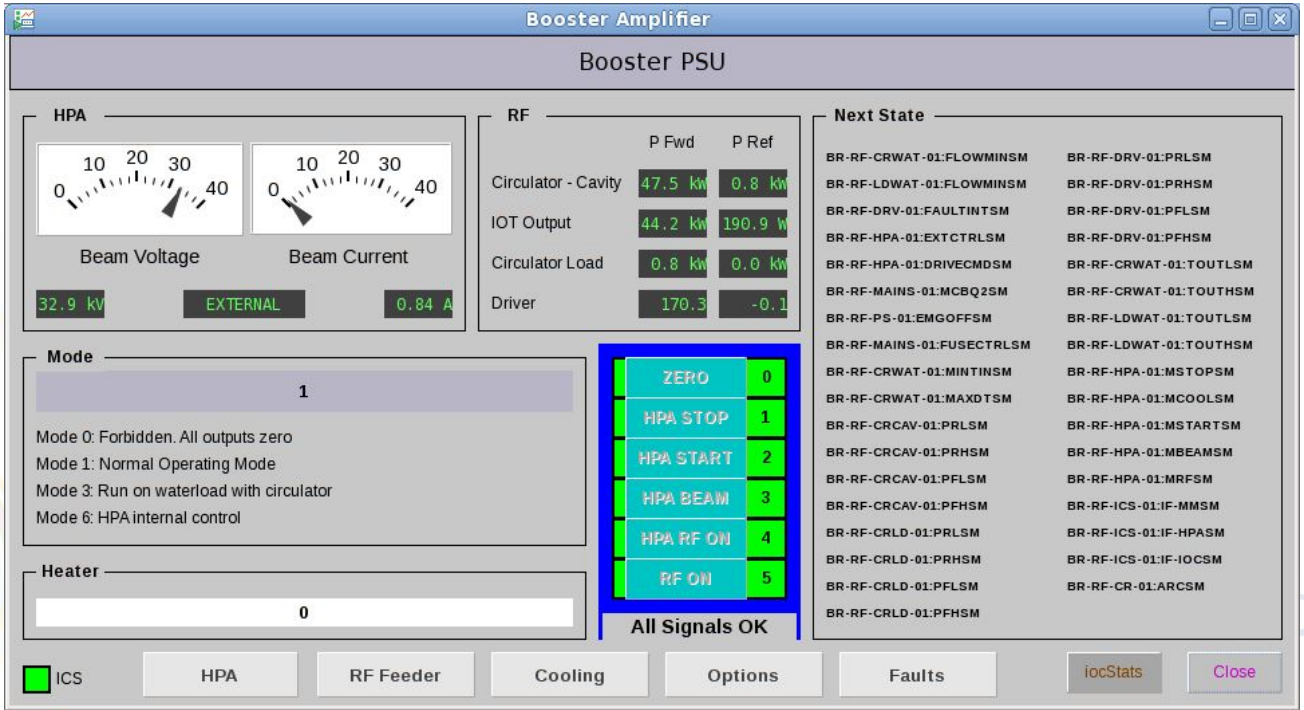
Vcav max 1.100 MV
Start
Stop
Vcav meas. 1.10 MV
Cavity Phi 17.30 deg
Vcav 1.100 MV
Pfor 168.38 kW
Pref 7.26 kW
Frequency Loop
PID on
Tuner Moving
Target Phi Diff -35.0 deg
Detuning:
OFF
Angle 66.0 deg
Measured Phi Diff -35.35 deg
Amp./Phase Loop
closed
Gain I 42
Gain Q 42
Expert Screen
Shrink Window
iocStats
Close
Vcav 1.10 MV
time, 0.1s
Cavity Phi 17.30 deg
time, 0.1s
Pfor 168.38 kW
Pref 7.26 kW
time, 0.1s
Position 808.32 Hz


Booster Amplifier
Booster PSU
HPA
Beam Voltage
Beam Current
32.3 kV
EXTERNAL
0.24 A
RF
P Fwd
P Ref
Circulator - Cavity
46.9 kW
0.7 kW
IOT Output
43.5 kW
185.5 W
Circulator Load
0.6 kW
0.1 kW
Driver
170.2
-0.1
Next State
BR-RF-CRWAT-01:FLOWMINSM
BR-RF-LDWAT-01:FLOWMINSM
BR-RF-DRV-01:FAULTINTSM
BR-RF-HPA-01:EXTCTRLSM
BR-RF-HPA-01:DRIVECMDSM
BR-RF-MAINS-01:MCBQ2SM
BR-RF-PS-01:EMGOFFSM
BR-RF-MAINS-01:FUSECTRLSM
BR-RF-CRWAT-01:MINTINSM
BR-RF-CRWAT-01:MAXDTSM
BR-RF-CRCAV-01:PRLSM
BR-RF-CRCAV-01:PRHSM
BR-RF-CRCAV-01:PFLSM
BR-RF-CRCAV-01:PFHSM
BR-RF-CRLD-01:PRLSM
BR-RF-CRLD-01:PRHSM
BR-RF-CRLD-01:PFLSM
BR-RF-CRLD-01:PFHSM
BR-RF-DRV-01:PRLSM
BR-RF-DRV-01:PRHSM
BR-RF-DRV-01:PFLSM
BR-RF-DRV-01:PFHSM
BR-RF-CRWAT-01:TOUTLSM
BR-RF-CRWAT-01:TOUTHSM
BR-RF-LDWAT-01:TOUTLSM
BR-RF-LDWAT-01:TOUTHSM
BR-RF-HPA-01:MSTOPSM
BR-RF-HPA-01:MCOOLSM
BR-RF-HPA-01:MSTARTSM
BR-RF-HPA-01:MBEAMSM
BR-RF-HPA-01:MRFSM
BR-RF-ICS-01:IF-MMSM
BR-RF-ICS-01:IF-HPASM
BR-RF-ICS-01:IF-IOCSM
BR-RF-CR-01:ARCSM
Mode
Mode 1
Mode 0: Forbidden. All outputs zero
Mode 1: Normal Operating Mode
Mode 3: Run on waterload with circulator
Mode 6: HPA internal control
Heater
0
ZERO 0
HPA STOP 1
HPA START 2
HPA BEAM 3
HPA RF ON 4
RF ON 5
All Signals OK
ICS
HPA
RF Feeder
Cooling
Options
Faults
iocStats
Close


Booster Amplifier
Booster PSU
HPA
Beam Voltage
Beam Current
32.9 kV
EXTERNAL
0.84 A
RF
P Fwd
P Ref
Circulator - Cavity
47.5 kW
0.8 kW
IOT Output
44.2 kW
190.9 W
Circulator Load
0.8 kW
0.0 kW
Driver
170.3
-0.1
Next State
BR-RF-CRWAT-01:FLOWMINSM
BR-RF-LDWAT-01:FLOWMINSM
BR-RF-DRV-01:FAULTINTSM
BR-RF-HPA-01:EXTCTRLSM
BR-RF-HPA-01:DRIVECMDSM
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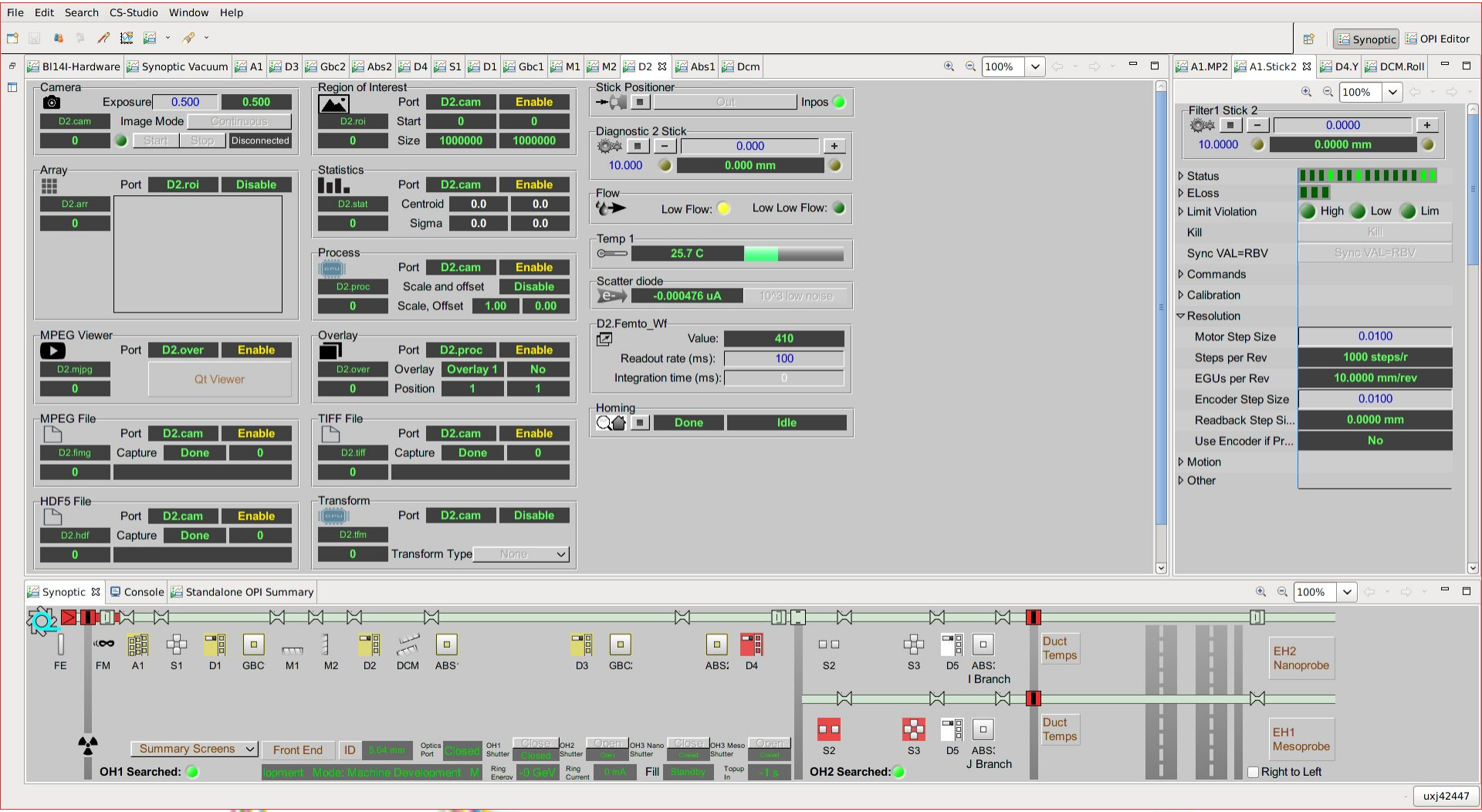
BR-RF-CRCAV-01:PRLSM
BR-RF-CRCAV-01:PRHSM
BR-RF-CRCAV-01:PFLSM
BR-RF-CRCAV-01:PFHSM
BR-RF-CRLD-01:PRLSM
BR-RF-CRLD-01:PRHSM
BR-RF-CRLD-01:PFLSM
BR-RF-CRLD-01:PFHSM
BR-RF-DRV-01:PRLSM
BR-RF-DRV-01:PRHSM
BR-RF-DRV-01:PFLSM
BR-RF-DRV-01:PFHSM
BR-RF-CRWAT-01:TOUTLSM
BR-RF-CRWAT-01:TOUTHSM
BR-RF-LDWAT-01:TOUTLSM
BR-RF-LDWAT-01:TOUTHSM
BR-RF-HPA-01:MSTOPSM
BR-RF-HPA-01:MCOOLSM
BR-RF-HPA-01:MSTARTSM
BR-RF-HPA-01:MBEAMSM
BR-RF-HPA-01:MRFSM
BR-RF-ICS-01:IF-MMSM
BR-RF-ICS-01:IF-HPASM
BR-RF-ICS-01:IF-IOCSM
BR-RF-CR-01:ARCSM
Mode
1
Mode 0: Forbidden. All outputs zero
Mode 1: Normal Operating Mode
Mode 3: Run on waterload with circulator
Mode 6: HPA internal control
Heater
0
ZERO 0
HPA STOP 1
HPA START 2
HPA BEAM 3
HPA RF ON 4
RF ON 5
All Signals OK
ICS
HPA
RF Feeder
Cooling
Options
Faults
iocStats
Close

Introduction to GUI Builder

- Diamond has two new beamlines that are currently being commissioned, I14 and I21.
- These beamlines have no legacy usage of EDM and so were ideally suited to a CS-Studio only interface.
- A framework has been developed at Diamond to automate GUI generation for beamlines, dls_guibuilder, and used on these two beamlines.

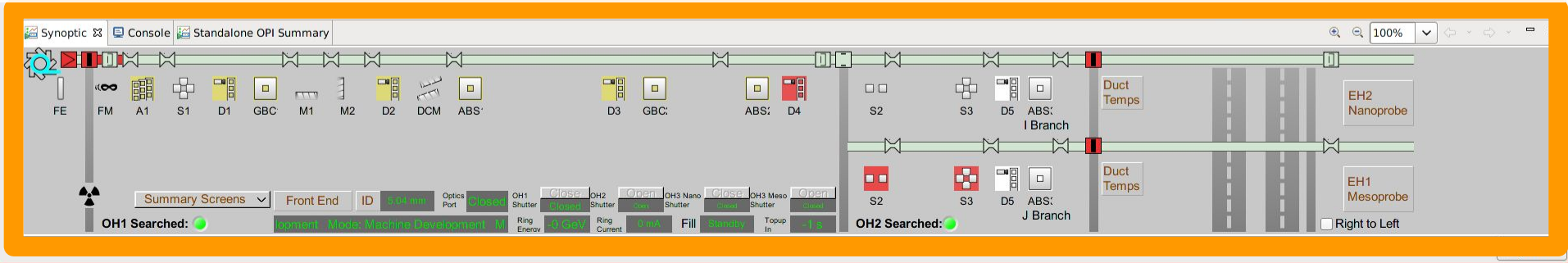
Beamline GUI overview



Beamline GUI overview

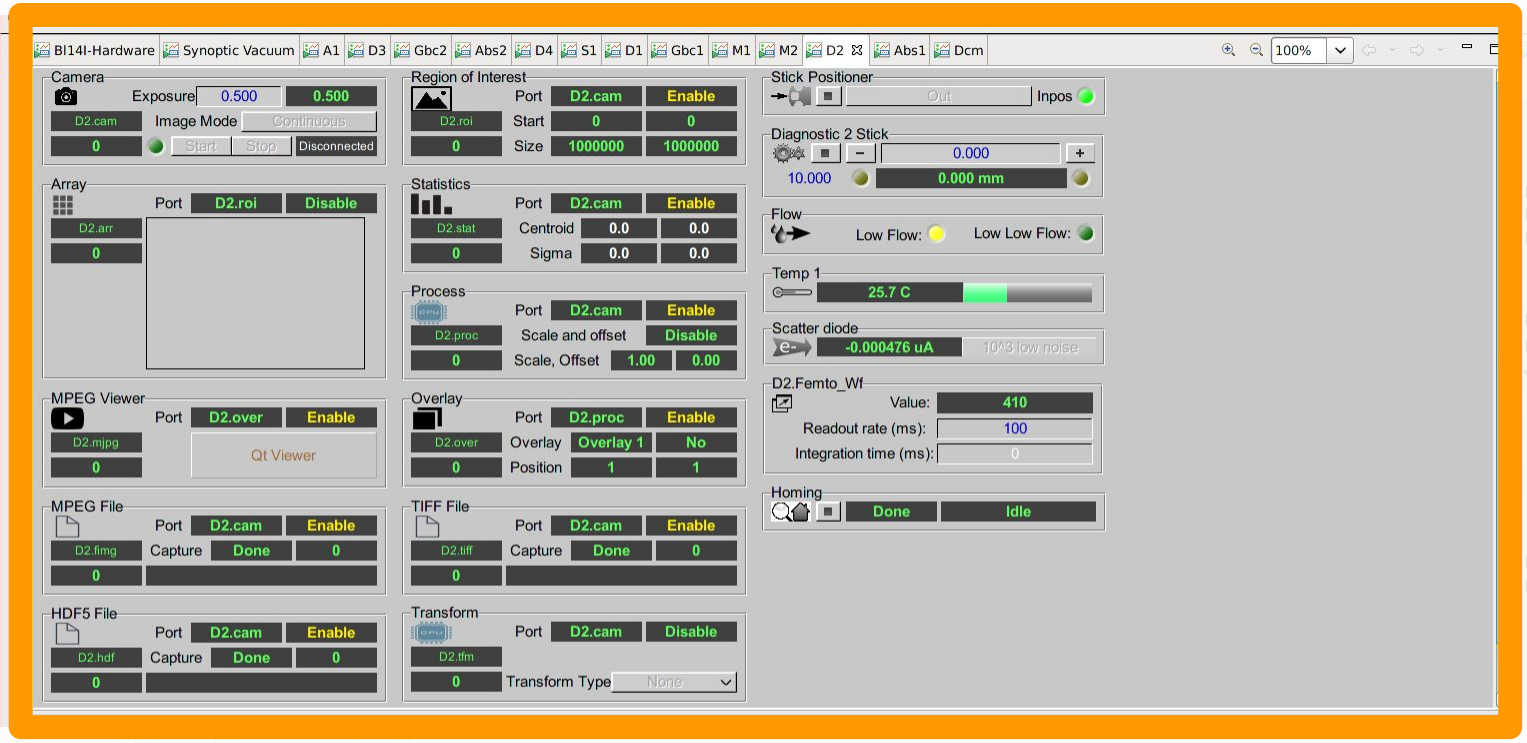
The synoptic overview remains open at all times. If the user closes this accidentally they can reset the perspective. Clicking on each icon brings up the GUI for that component ...

Synoptic Overview



Beamline GUI overview

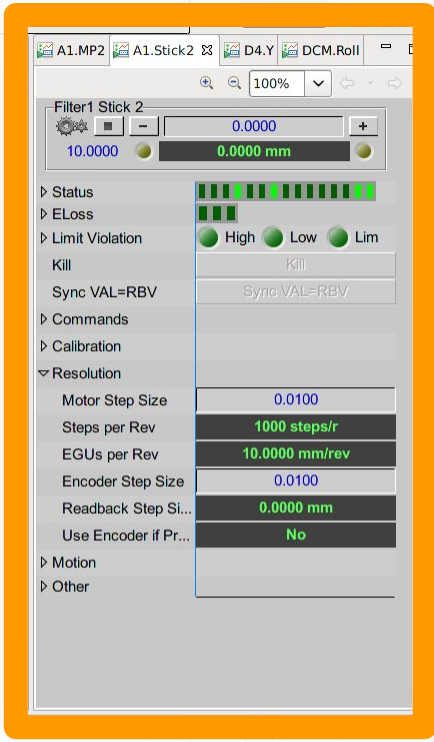
Component Overview



Get information about devices for controlling slits, monochromators, mirrors, cameras, and other beamline hardware. Clicking on each device brings up additional controls specific to that device...

Beamline GUI overview

Device Controls



Detailed controls and information for each device. Information is kept manageable using an expandable view,this is a custom DLS ‘detailpanel’ widget.

Scientists run on dual headed workstations, devices can be dragged onto the second monitor when required.

DLS GUI Builder: how it works

- Create tags in template files, in support modules, to describe the simple components that will be created when an instance of the template is instantiated.
- Create an expanded database in the usual way, then use dls_epicsparser to parse this with the gui handler to create an XML file consisting of named groups of PVs and screens to represent the simple components that have been created.
- Make a python script that uses dls_guibuilder to add definitions of the components from the XML file, and create new complex component screens and PVs by grouping definitions contained within.
- Any changes made to the OPI by hand will be kept and the OPI will just be validated against the current database.

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Summary

Making progress on automated conversions, but the process still requires some manual tweaks. RF and timing are almost ready to be rolled out to machine operators, following lattice modification.

CS-Studio on new beamlines is working well.