Alarm System & Phoebus Upgrade

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Trigger/DAQ Workshop

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Migration to Phoebus

Overview

What is this about?

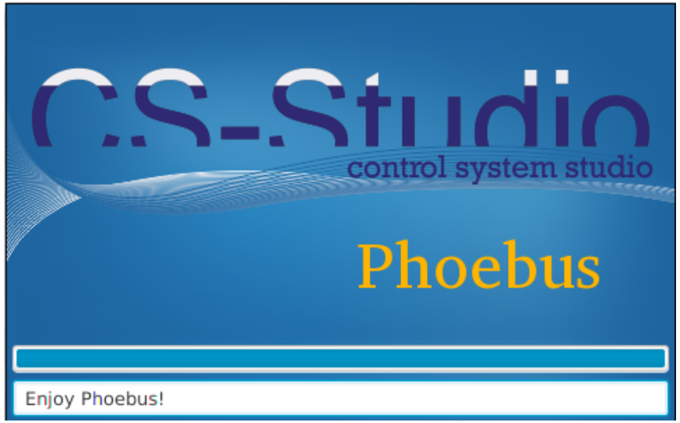
- CSS was based on the Eclipse toolkit. Dependency management and esp. the build process were painful.
- Phoebus' UI has been rewritten based on JavaFX. Building is now trivial. OPI display performance has been greatly improved.

Why do we care?

- Upstream CSS is more or less in bugfix-only mode.
- New development mostly takes place in the Phoebus branch.

How to upgrade?

- Two steps:
  1) Get the software up and running.
  2) Port our content (OPIs).



Enjoy Phoebus!

Migration to Phoebus
Applications

- All important CSS applications from upstream have been ported to Phoebus.
  Look & feel very similar.
- The new OPI display is called „Display Builder“; OPIs are now called BOBs.

PXD / Belle-specific applications:

- ConfigDB interface: Port to JFX-based UI quite advanced. Funtionality is there.
- ES Log Display: Port to JFX-based UI ongoing. Message display is working.
- UNICOS-specific widgets (for IBBelle): Not started, yet.
- NSM Data Source: To be ported to new data source plugin format. (Based on RxJava Flowable.)

⇒ Having a fully usable Phoebus setup „soon“ is realistic.

Migration to Phoebus

OPI to BOB Upgrade Path

- Display Builder can seamlessly open OPI files.
- Most actually do look quite good already at this stage.

  ⇒ Conversion can be spread out in time. OPIs and BOBs will just mix.
- In the ideal case, open all OPIs once in the editor and save the resulting BOBs.

- Display rules are usually compatible.
- Many scripts need to be manually adapted.

BEAST Alarm System

The Lifecycle of an Alarm

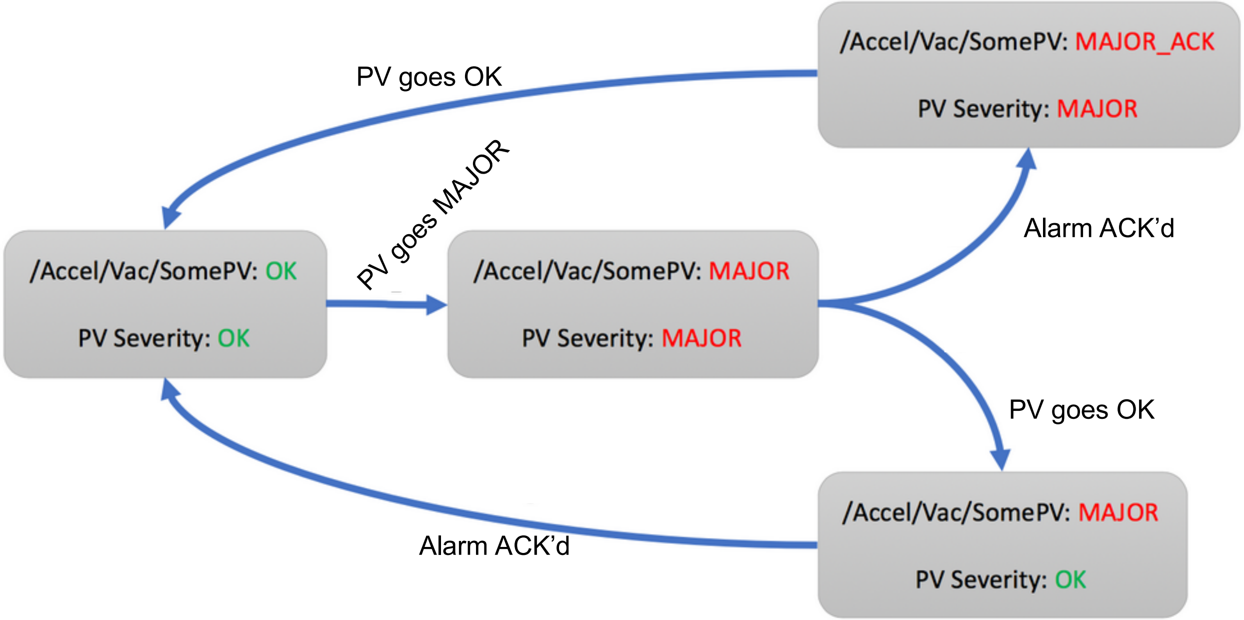
For latched alarms (the typical case):

Once the PV signals an alarm state, two things need to happen to clear the alarm:

- the PV has to go back to OK
- the operator has to acknowledge the alarm

The order is not important.

⇒ No alarm condition, however short, can be missed by the operator.



/Accel/Vac/SomePV: OK
PV Severity: OK

/Accel/Vac/SomePV: MAJOR
PV Severity: MAJOR

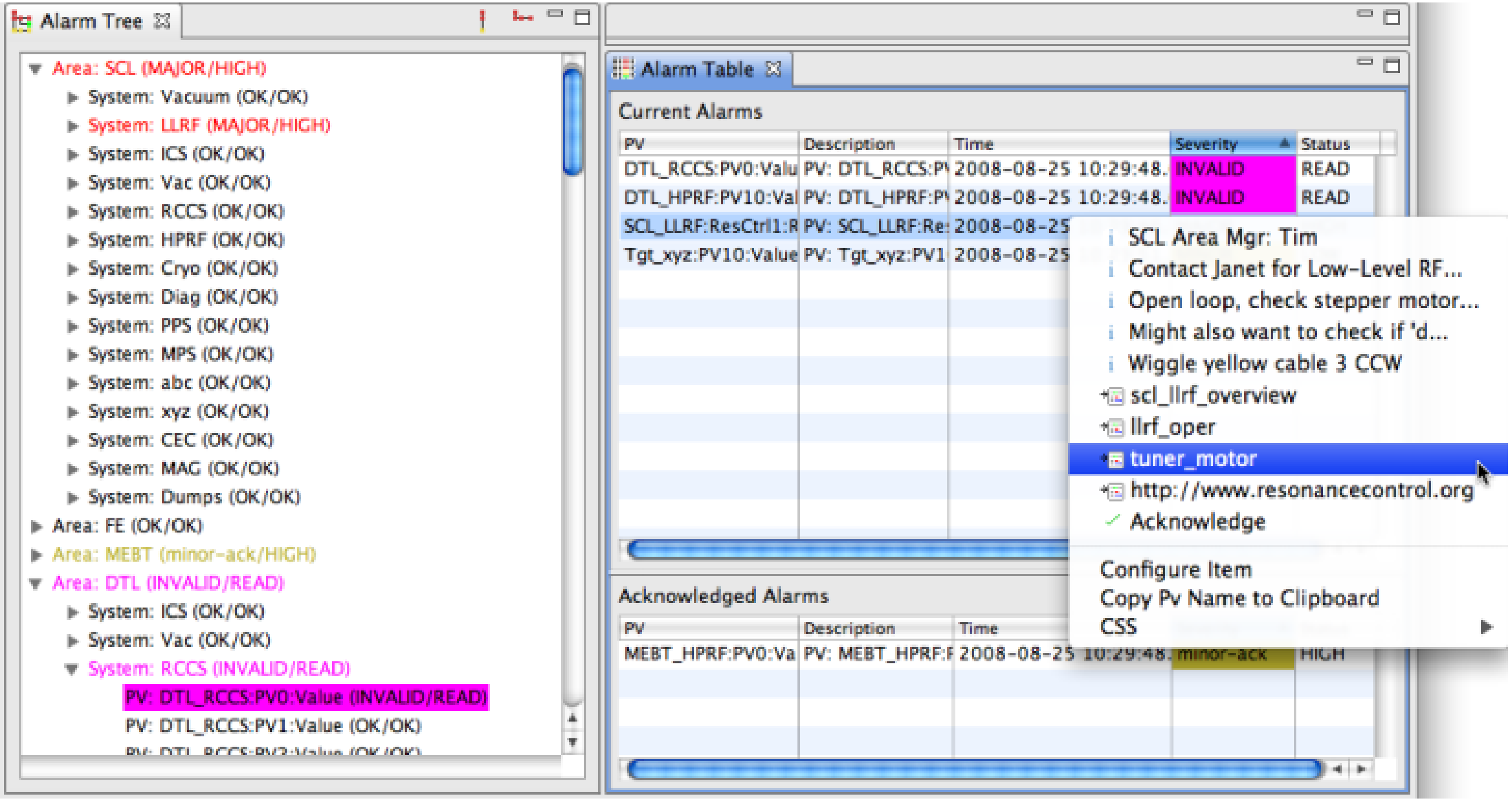
/Accel/Vac/SomePV: MAJOR_ACK
PV Severity: MAJOR

/Accel/Vac/SomePV: MAJOR
PV Severity: OK

From the Phoebus Documentation

BEAST Alarm System

UI Components: Alarm Tree and Alarm Table



Area: SCL (MAJOR/HIGH)
- System: Vacuum (OK/OK)
- System: LLRF (MAJOR/HIGH)
- System: ICS (OK/OK)
- System: Vac (OK/OK)
- System: RCCS (OK/OK)
- System: HPRF (OK/OK)
- System: Cryo (OK/OK)
- System: Diag (OK/OK)
- System: PPS (OK/OK)
- System: MPS (OK/OK)
- System: abc (OK/OK)
- System: xyz (OK/OK)
- System: CEC (OK/OK)
- System: MAG (OK/OK)
- System: Dumps (OK/OK)

Area: FE (OK/OK)

Area: MEBT (minor-ack/HIGH)

Area: DTL (INVALID/READ)
- System: ICS (OK/OK)
- System: Vac (OK/OK)
- System: RCCS (INVALID/READ)
  - PV: DTL_RCCS:PV0:Value (INVALID/READ)
  - PV: DTL_RCCS:PV1:Value (OK/OK)
  - PV: DTL_RCCS:PV2:Value (OK/OK)

Current Alarms

PV	Description	Time	Severity	Status
DTL_RCCS:PV0:Valu	PV: DTL_RCCS:P\	2008-08-25 10:29:48.	INVALID	READ
DTL_HPRF:PV10:Val	PV: DTL_HPRF:P\	2008-08-25 10:29:48.	INVALID	READ
SCL_LLRF:ResCtrl1:R	PV: SCL_LLRF:Re:	2008-08-25		
Tgt_xyz:PV10:Value	PV: Tgt_xyz:PV1	2008-08-25		

SCL Area Mgr: Tim
Contact Janet for Low-Level RF...
Open loop, check stepper motor...
Might also want to check if 'd...
Wiggle yellow cable 3 CCW
scl_llrf_overview
llrf_oper
tuner_motor
http://www.resonancecontrol.org
Acknowledge
Configure Item
Copy Pv Name to Clipboard
CSS

Acknowledged Alarms

PV	Description	Time	Severity	Status
MEBT_HPRF:PV0:Va	PV: MEBT_HPRF:F	2008-08-25 10:29:48.	minor-ack	HIGH

BEAST Alarm System

New Generation Components

Compared to the „old“ system

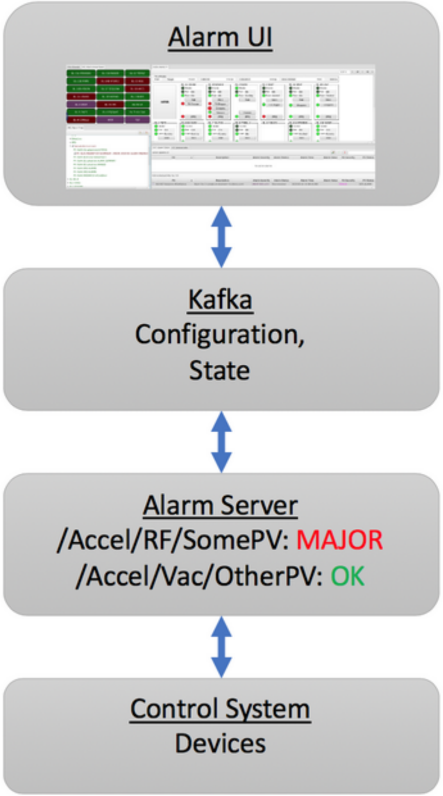
- All concepts remain unchanged.
- No changes on the IOC level are required.

Upgrade steps

- Start the Kafka service.
- Load the alarm tree configuration.
- Start the new alarm server service.
- Use the new UI.

⇒ **Easy upgrade.**

But note: Running both systems in parallel is not useful:
All alarms would have to be ack’d in two screens.



Alarm UI

Kafka
Configuration,
State

Alarm Server
/Accel/RF/SomePV: MAJOR
/Accel/Vac/OtherPV: OK

Control System
Devices

From the Phoebus Documentation

new version
integrated in Phoebus

replaces ActiveMQ
+ PostgreSQL

new version

no changes required

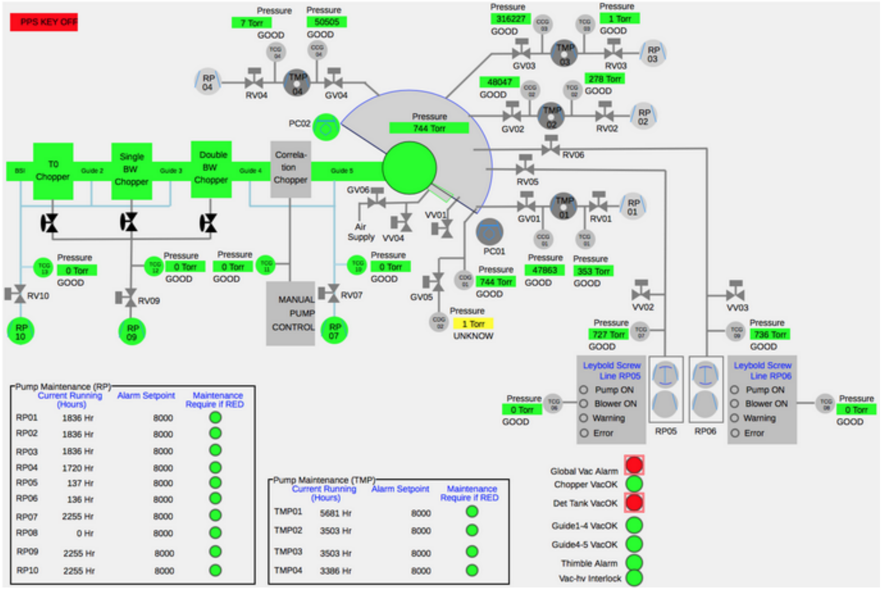
Web Access to Control Screens

Before: WebOPI. Based on Eclipse RAP.

- Complete screens sent from server to client (widgets drawn on server side).

Since: dbwr („Display Builder Web Runtime“).

- Completely new development (together with „PV Web Socket“ pvws).
- Widget drawing moved to client side.
- PV changes communicated from server to client (via JSON).
- ⇒ Better performance, but each widget must also have a client-side implementation to draw it. Available for most widgets.



Pump Maintenance (RP)

	Current Running (Hours)	Alarm Setpoint	Maintenance Require if RED
RP01	1836 Hr	8000	🟢
RP02	1836 Hr	8000	🟢
RP03	1836 Hr	8000	🟢
RP04	1720 Hr	8000	🟢
RP05	137 Hr	8000	🟢
RP06	136 Hr	8000	🟢
RP07	2255 Hr	8000	🟢
RP08	0 Hr	8000	🟢
RP09	2255 Hr	8000	🟢
RP10	2255 Hr	8000	🟢

Pump Maintenance (TMP)

	Current Running (Hours)	Alarm Setpoint	Maintenance Require if RED
TMP01	5681 Hr	8000	🟢
TMP02	3503 Hr	8000	🟢
TMP03	3503 Hr	8000	🟢
TMP04	3386 Hr	8000	🟢

Global Vac Alarm	🔴
Chopper VacOK	🟢
Det Tank VacOK	🔴
Guide1-4 VacOK	🟢
Guide4-5 VacOK	🟢
Thimble Alarm	🟢
Vac-hv Interlock	🟢

Thank you!

PXD PS Overview in Phoebus

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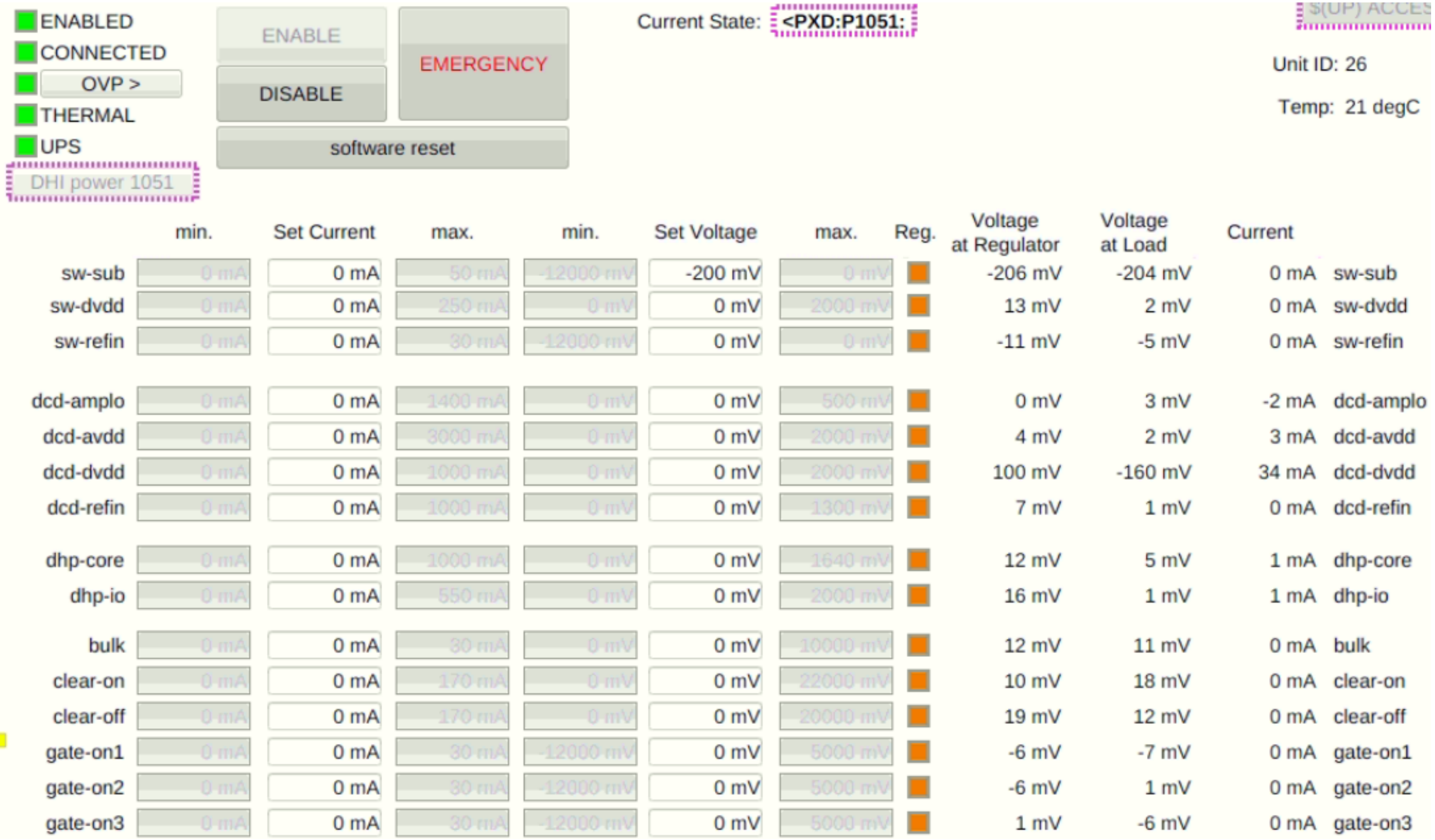


🟩 ENABLED
🟩 CONNECTED
🟩 OVP >
🟩 THERMAL
🟩 UPS

DHI power 1051

Current State: <PXD:P1051:

Unit ID: 26

Temp: 21 degC

	min.	Set Current	max.	min.	Set Voltage	max.	Reg.	Voltage at Regulator	Voltage at Load	Current	
sw-sub	0 mA	0 mA	50 mA	-12000 mV	-200 mV	0 mV	🟧	-206 mV	-204 mV	0 mA	sw-sub
sw-dvdd	0 mA	0 mA	250 mA	0 mV	0 mV	2000 mV	🟧	13 mV	2 mV	0 mA	sw-dvdd
sw-refin	0 mA	0 mA	30 mA	-12000 mV	0 mV	0 mV	🟧	-11 mV	-5 mV	0 mA	sw-refin
dcd-amplo	0 mA	0 mA	1400 mA	0 mV	0 mV	500 mV	🟧	0 mV	3 mV	-2 mA	dcd-amplo
dcd-avdd	0 mA	0 mA	3000 mA	0 mV	0 mV	2000 mV	🟧	4 mV	2 mV	3 mA	dcd-avdd
dcd-dvdd	0 mA	0 mA	1000 mA	0 mV	0 mV	2000 mV	🟧	100 mV	-160 mV	34 mA	dcd-dvdd
dcd-refin	0 mA	0 mA	1000 mA	0 mV	0 mV	1300 mV	🟧	7 mV	1 mV	0 mA	dcd-refin
dhp-core	0 mA	0 mA	1000 mA	0 mV	0 mV	1640 mV	🟧	12 mV	5 mV	1 mA	dhp-core
dhp-io	0 mA	0 mA	550 mA	0 mV	0 mV	2000 mV	🟧	16 mV	1 mV	1 mA	dhp-io
bulk	0 mA	0 mA	30 mA	0 mV	0 mV	10000 mV	🟧	12 mV	11 mV	0 mA	bulk
clear-on	0 mA	0 mA	170 mA	0 mV	0 mV	22000 mV	🟧	10 mV	18 mV	0 mA	clear-on
clear-off	0 mA	0 mA	170 mA	0 mV	0 mV	20000 mV	🟧	19 mV	12 mV	0 mA	clear-off
gate-on1	0 mA	0 mA	30 mA	-12000 mV	0 mV	5000 mV	🟧	-6 mV	-7 mV	0 mA	gate-on1
gate-on2	0 mA	0 mA	30 mA	-12000 mV	0 mV	5000 mV	🟧	-6 mV	1 mV	0 mA	gate-on2
gate-on3	0 mA	0 mA	30 mA	-12000 mV	0 mV	5000 mV	🟧	1 mV	-6 mV	0 mA	gate-on3

no manual adjustments done

Display Builder

Mission Definition[1]

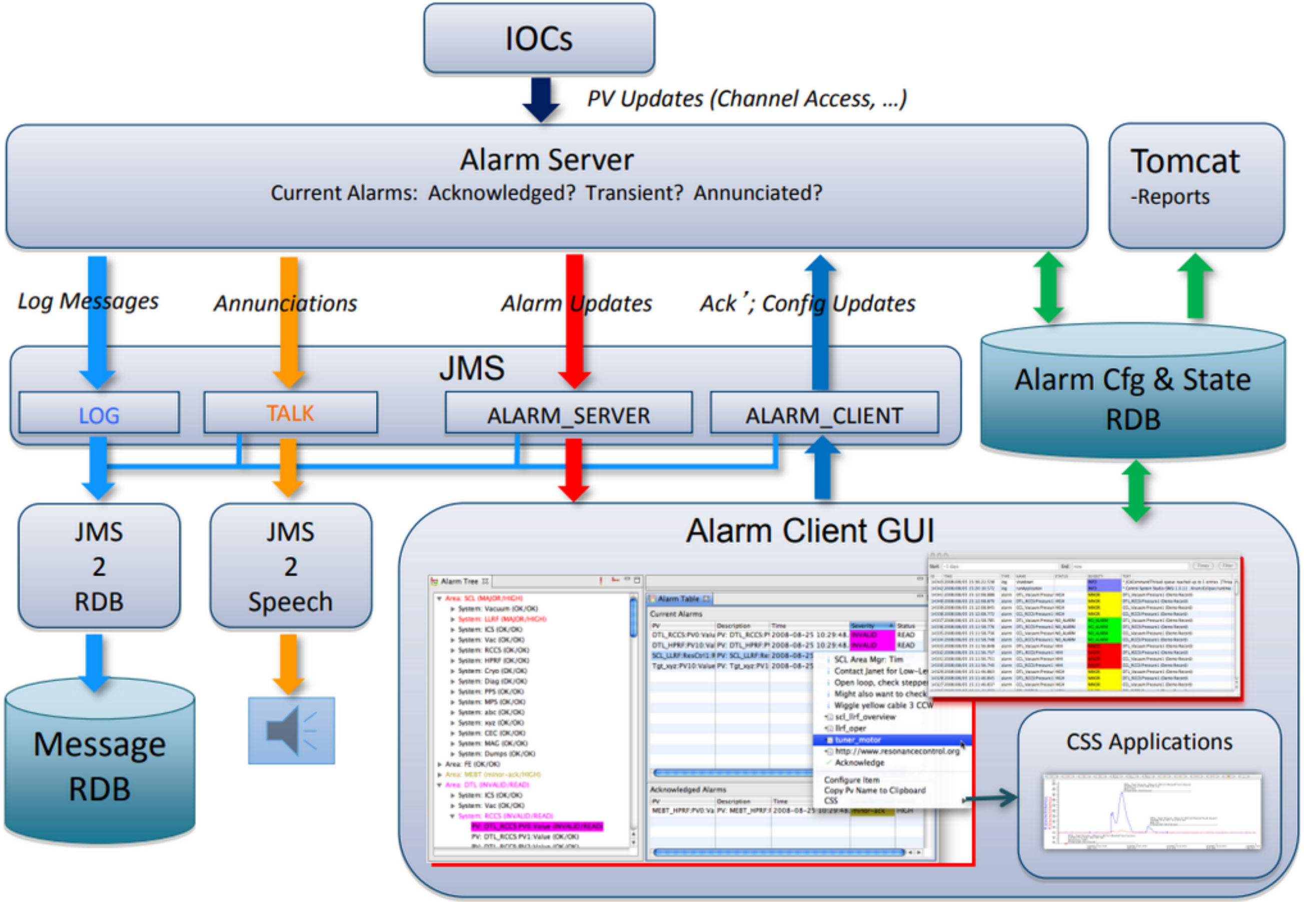
The Display Builder development started in the Eclipse-based version of CS-Studio as an update of CS-Studio 'BOY', i.e. the org.csstudio.opibuilder.* code in https://github.com/ControlSystemStudio/cs-studio

It aims for similar functionality and "look", including the ability to read most existing *.opi files, while adding these improvements:

- Model loads in background threads. Opening a new display will avoid user interface freeze when the display startup is delayed because of embedded displays or slow display file access over http.
- Separation of Model, Representation, Runtime and Editor to facilitate long term maintainability.
- Model without reference to details of the Representation (SWT/GEF, color, dimensions, ..) to allow each to be developed and optimized in parallel.
- Representation could be SWT, AWT, .., JavaFX, favoring the latter because it currently promises best performance and long term Java support.
- Runtime handles PV updates and scripts in background threads, again lessening the likelihood of user interface freezeups.

Alarm System Architecture

CSS Generation



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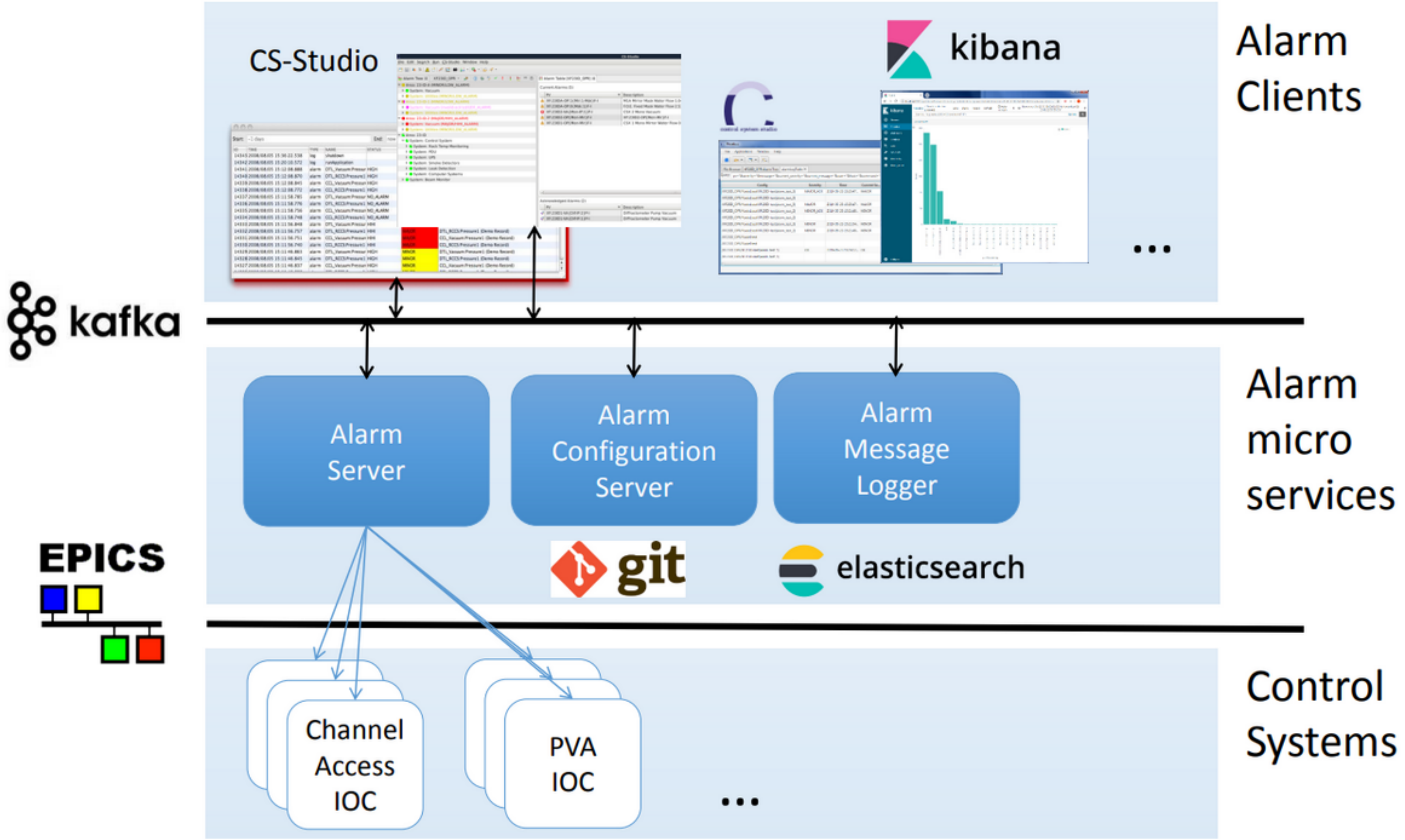
Alarm System Architecture

Phoebus Generation


CS-Studio
kibana
control system studio
...
Alarm Clients
kafka
Alarm Server
Alarm Configuration Server
Alarm Message Logger
git
elasticsearch
Alarm micro services
EPICS
Channel Access IOC
PVA IOC
...
Control Systems