

# Phoebus Tools and Services

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**Kay Kasemir – SNS**

**Georg Weiss, Sky Brewer, Lars Johansson – ESS**

**Ivan Finch - ISIS**

**Martin Gaughran – DLS**

**Katy Saintin, CAOUCEN Loïc - CEA**

**Tynan Ford – ALS**

**Evan Daykin – FRIB**

**Jacqueline Garrahan – SLAC**

**Ralph Lange – ITER**

**Dariusz Jarosz – APS**

# Phoebus / CS-Studio Collaboration

- *17+ sites actively packing a site-specific CS-Studio products or Participating in the development of one or more of the EPICS services*
- *(NSLS2, SNS, ESS, FRIB, ALS, ITER, DLS, ISIS, CEA, NSRCC, KEK, FZB, DESY, CSNS, LNLS, ROAN, JLAB,...)*
- *12+ sites/labs/institutions using prepackaged products*
- Additionally, many users who do not create their own products.

## Meet Our Team

### Kunal Shroff

Community Manager  
National Synchrotron Light Source II (NSLSII) at BNL



### Kay Kasemir

Site Representative  
Spallation Neutron Source (ORNL)



### Ralph Lange

Site Representative  
ITER



### Wesley Moore

Site Representative  
Jefferson Lab (JLab)



### Ivan Finch

Site Representative  
ISIS



### Charles-Henry Patard

Site Representative  
GANIL/Spiral2



### Joerg Penning

Site Representative  
DESY



### Lorenzo Gomez

Site Representative  
Windhover Labs



### Gustavo Ciotto Pinton

Site Representative  
Laboratório Nacional de Luz Síncrotron (LNLS)



### Yongxiang Qiu

Site Representative  
CSNS



### Martin Gaughran

Site Representative  
Diamond Light Source



### Fredrik Söderberg

Site Representative  
European Spallation Source



### 손창욱 (C.W. Son)

Site Representative  
Korean Heavy Ion Accelerator (RAON)



### Georg Weiss

Site Representative  
European Spallation Source



### Xinyu Wu

Site Representative  
CSIRO



### Tanvi Ashwarya

Site Representative  
FRIB



### Dariusz Jarosz

Site Representative  
Advanced Photon Source (ANL)



### Tynan Ford

Site Representative  
Advanced Light Source (LBNL)



## EPICS Tools

*Phoebus  
CS-Studio*

## EPICS Service

*Archiver, ChannelFinder  
Save Restore, Olog,  
Alarm  
...*

The EPICS logo consists of the word "EPICS" in a bold, yellow, sans-serif font, positioned above a stylized yellow graphic that resembles a series of vertical bars or a simplified representation of a control panel interface.

# Phoebus Tools and Services

## *The Ecosystem*

- EPICS core java:  
Consists of Channel Access and PVAccess client libraries, utility libraries (epics-util, VType)
- EPICS middle layer Services:  
Archiver, Alarm, Save Restore, Channel Finder, Olog, ...
- EPICS tools:  
CS-Studio & Phoebus

**EPICS Tools**

*Phoebus  
CS-Studio*

**EPICS Service**

*Archiver, ChannelFinder  
Save Restore, Olog,  
Alarm  
...*

The logo for EPICS (European Photon Instrument Control Software) features the word "EPICS" in a bold, yellow, sans-serif font. Below the text is a stylized graphic consisting of several vertical bars of varying heights, also in yellow, set against a dark blue background.

EPICS Core Java

# Phoebus Tools and Services

## EPICS Tools

*Phoebus  
CS-Studio*

## EPICS Service

*Archiver, ChannelFinder  
Save Restore, Olog,  
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...*

The EPICS logo consists of the word "EPICS" in a bold, yellow, sans-serif font. Below the letters "P" and "I" are three horizontal yellow bars of varying lengths, creating a stylized graphic element.

- The ChannelAccess libraries are stable
  - Minor fixes
    - Parsing tables, etc..
- PVAccess libraries
  - SNS Added Security
  - ESS Expanded support for handling Tables
  - STFC Included the use of `CompletableFuture`
- Phoebus core-pv has 2 implementations of channel access connections
  - jca & Jackie
  - Validated our modular / pluggable claims
  - This is a useful debugging and diagnostic option now
- Future Plans
  - deprecate PVAccessJava, PVDataJava, normativeTypesJava
  - ChannelAccess Name Server using ChannelFinder

**EPICS Tools**

*Phoebus*

*CS-Studio*

**EPICS Service**

*Archiver, ChannelFinder*

*Save Restore, Olog,*

*Alarm*

...

**EPICS**  
**ITLU**

Phoebus Middle Layer Services

# Phoebus Tools and Services

EPICS Tools  
*Phoebus*  
*CS-Studio*

**EPICS Service**  
*Archiver, ChannelFinder*  
*Save Restore, Olog,*  
*Alarm*  
...

**EPICS**  
TULU

- Standardization of middle layer services
- Standardization Authentication Authorization
  - spring-security (ldap, ActiveDirectory,...)
  - ChannelFinder, Phoebus-Olog, Save and Restore
- Standardization Documentation
  - readthedocs
  - Use swagger to generate REST API documentation
  - Generate python clients using swagger  
<https://github.com/mrakitin/pychannelfinder/>

# Phoebus Tools and Services

EPICS Tools  
*Phoebus*  
*CS-Studio*

**EPICS Service**  
*Archiver, ChannelFinder*  
*Save Restore, Olog,*  
*Alarm*  
...

- Integration tests with Docker containers

```
A .readthedocs.yaml
A docker-compose.yml
A docker-compose-integrationtest.yml
D Dockerfile
D Dockerfile.integrationtest
D LICENSE
m pom.xml
MD README.md
```

- *Junit5 + Testcontainers*

**EPICS**  
TUWU



# Phoebus Tools and Services

## EPICS Tools

*Phoebus*  
*CS-Studio*

## EPICS Service

*Archiver, ChannelFinder*  
*Save Restore, Olog,*  
*Alarm*  
...

EPICS  
TUW

- Alarm Annunciator
  - Pluggable annunciator
    - @Override*  
*public void speak(final AnnunciatorMessage message)*
  - The **audio annunciator** will play the audio files specified for the associated alarm severity levels. Currently supported formats are AIFF and WAV files.
- Olog actions
  - A pluggable interface allows adding specific operations to be performed when a Log entry is created
  - e.g. send an email to xyz when a new log entry is created with a specific tag.
- Save and Restore
  - Check out Georg's talk

**EPICS Tools**

*Phoebus  
CS-Studio*

**EPICS Service**

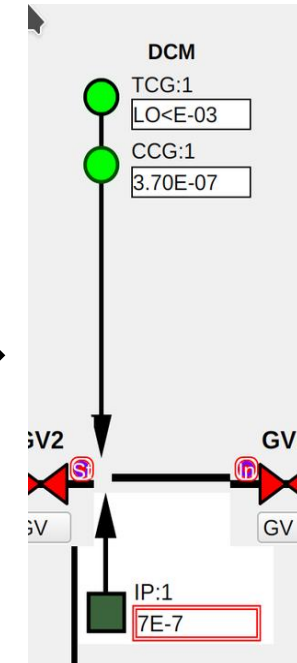
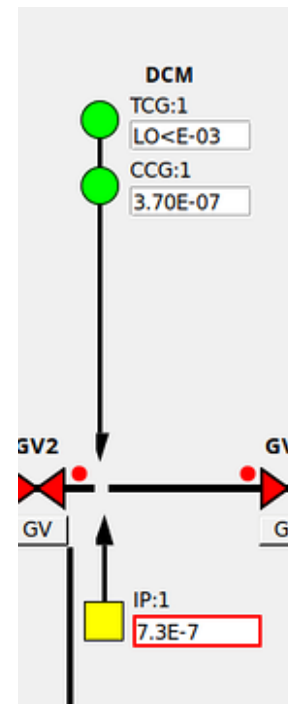
*Archiver, ChannelFinder  
Save Restore, Olog,  
Alarm  
...*

**EPICS**  
**TUW**

CS-Studio & Phoebus

# Converting screens

- Vast majority of facilities have moved to Phoebus (SNS, ESS, ISIS, ALS, CEA, HZB, ...)
- NSLS2
  - All the beamlines and Accelerator will be moving to Phoebus by 2025
  - 25k screens
- Expand the Phoebus Converter functionality
  - to pre- and post-process the display files
  - handle conversion of scripts by fixing the imports
    - import "org.csstudio.display.builder" instead of "org.csstudio.opibuilder"
  - recursive conversion

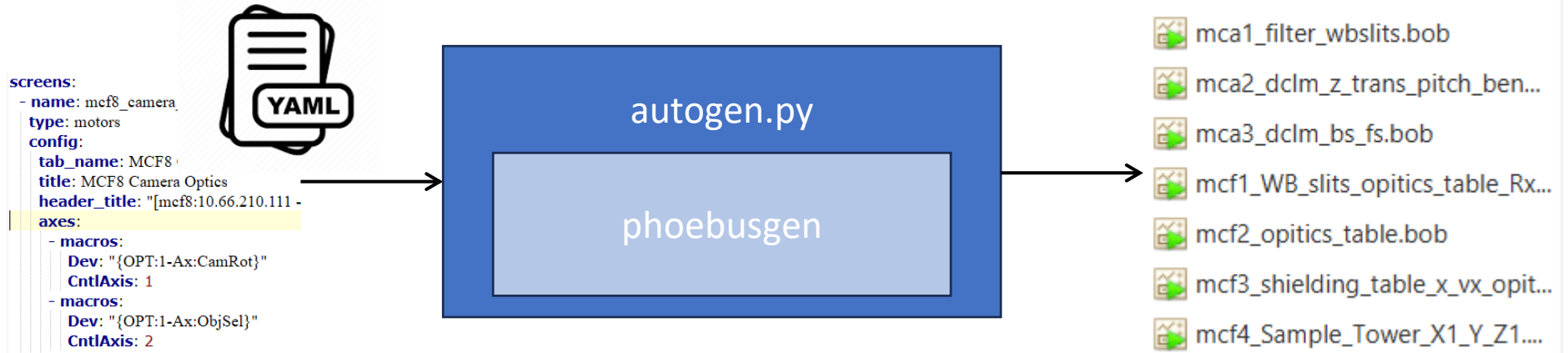


0 Open ✓ 55 Closed Author ▾

- Truncate log title but avoid ending in partial word ✓  
#2641 by tanviash was merged 4 days ago
- Handle empty description for legacy actions ✓  
#2639 by tanviash was merged last week
- Legacy longString textUpdate interactive property ✓  
#2636 by tanviash was merged 2 weeks ago
- Legacy resize option 3 mapped to None ✓  
#2631 by tanviash was merged 2 weeks ago
- Legacy XYGraph trace width ✓  
#2603 by tanviash was merged on Mar 20
- Handle tracenames from legacy xygraph widget ✓  
#2593 by tanviash was merged on Mar 15









# Converted screens...but better ALS Phoebusgen



	Sample Tower Axis X1		-3.9863 mm		-3.9855 mm		<	300.0000 mm	>	Stop	More
	Sample Tower Axis Z1		35.0000 mm		34.9980 mm		<	5.0000 mm	>	Stop	More
	Sample Tower Pitch		0.0000 deg		0.0000 deg		<	0.0025 deg	>	Stop	More
	Sample Tower Vertical Y		50.0000 mm		49.9995 mm		<	1.0000 mm	>	Stop	More
	Sample Tower Roll		0.0000 deg		0.0000 deg		<	0.0060 deg	>	Stop	More
	Upstream Inboard Y		1154.9420 mm		1154.9412 mm		<	0.2500 mm	>	Stop	More
	Upstream Outboard Y		1277.5624 mm		1277.5621 mm		<	0.2500 mm	>	Stop	More
	Downstream Y		1032.5206 mm		1032.5205 mm		<	1.0000 mm	>	Stop	More

# Converted screens...but better .bcf

- Use Widget classes
  - Maintain a consistent look
  - Reduce duplication of effort

Widget	
Type	 LED
Name	LED
Class	ON_OFF <span>LED</span>
PV Name	DEFAULT
Bit	ERROR
	GOOD_BAD
	ON_OFF
	WARNING
X Position	
Y Position	
Width	20
Height	20
Display	
Visible	<input checked="" type="checkbox"/> 
'Off' Label	
'Off' Color	  Off
'On' Label	
'On' Color	  On

# Archive DataSource

## *archive://*

- Retrieves a single archived value at a particular instant of time.
- *archive://pv\_name*
  - Retrieves the latest value in the archiver.
- *archive://pv\_name(time)*
  - Retrieves the last value at or before the specified "time".

Probe X

PV Name:  Search

Value:

Format:  Precision:

Alarm:

Time Stamp:

Metadata Probe X

PV Name:  Search

Value:

Format:  Precision:

Alarm:

Time Stamp:

Metadata:

Units: Torr  
Format: 0.123  
Display Range: 0.0 .. 1.0  
Control Range: 0.0 .. 1.0  
Warnings: 0.0 .. 0.0  
Alarms: 0.0 .. 0.0

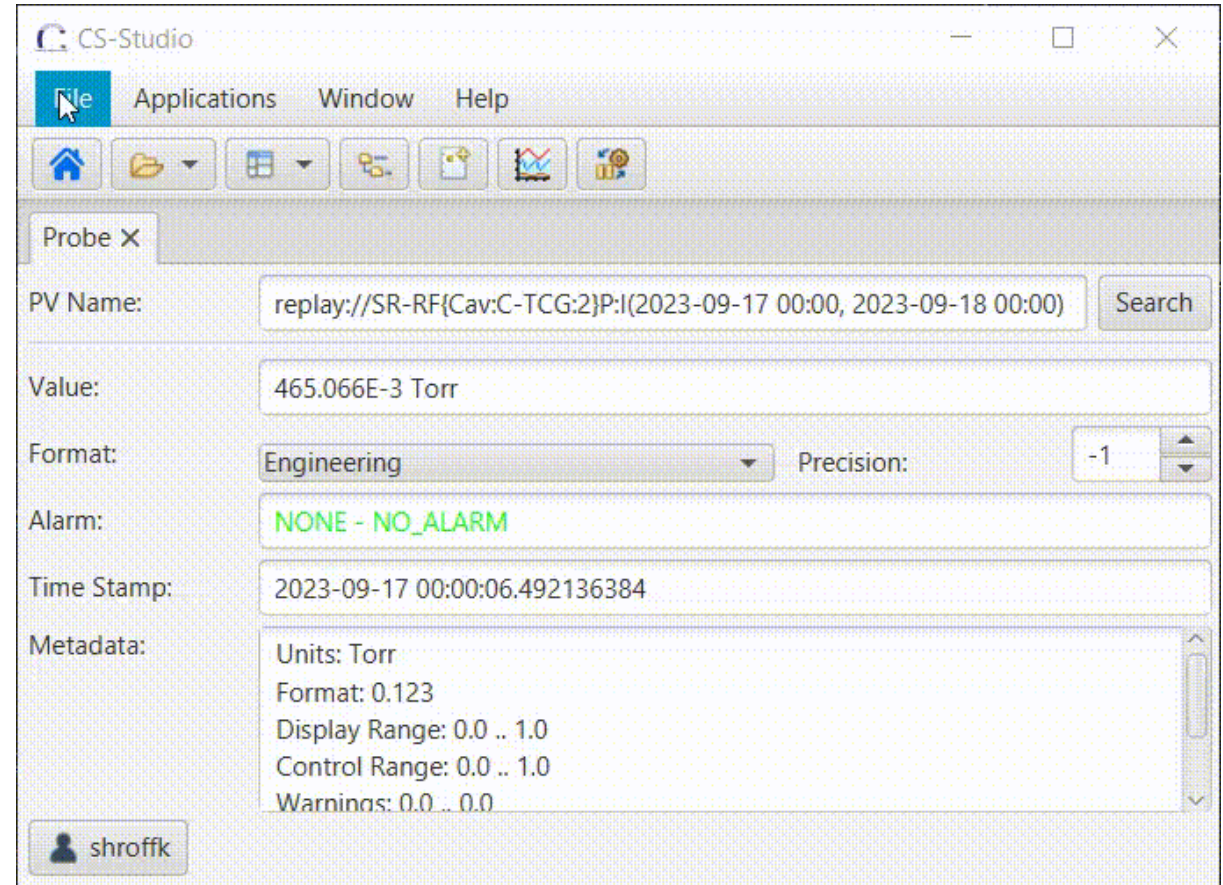
# Archive DataSource

## ***replay://***

- Creates a PV that recreates changes in values based on data from the archive.

- ***replay://pv\_name***  
***(start, end, update\_rate)***

Recreates the PV value changes using the data from the archiver between the specified start and end times. Updates occur at the rate specified by `update\_rate` (a value defined in seconds).



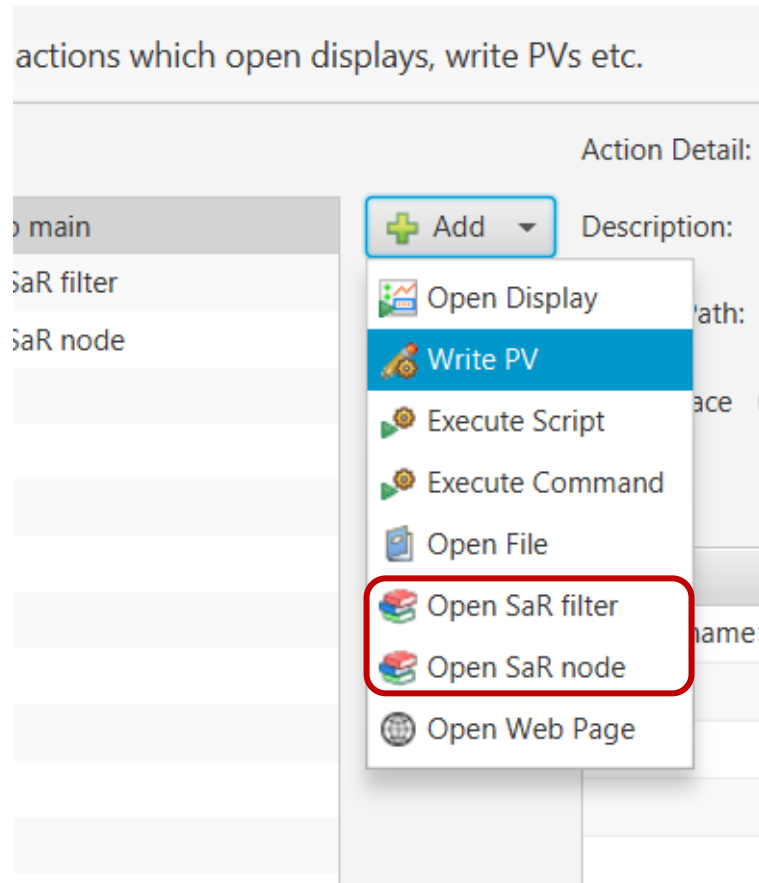


# Archive DataSource

## Use Cases

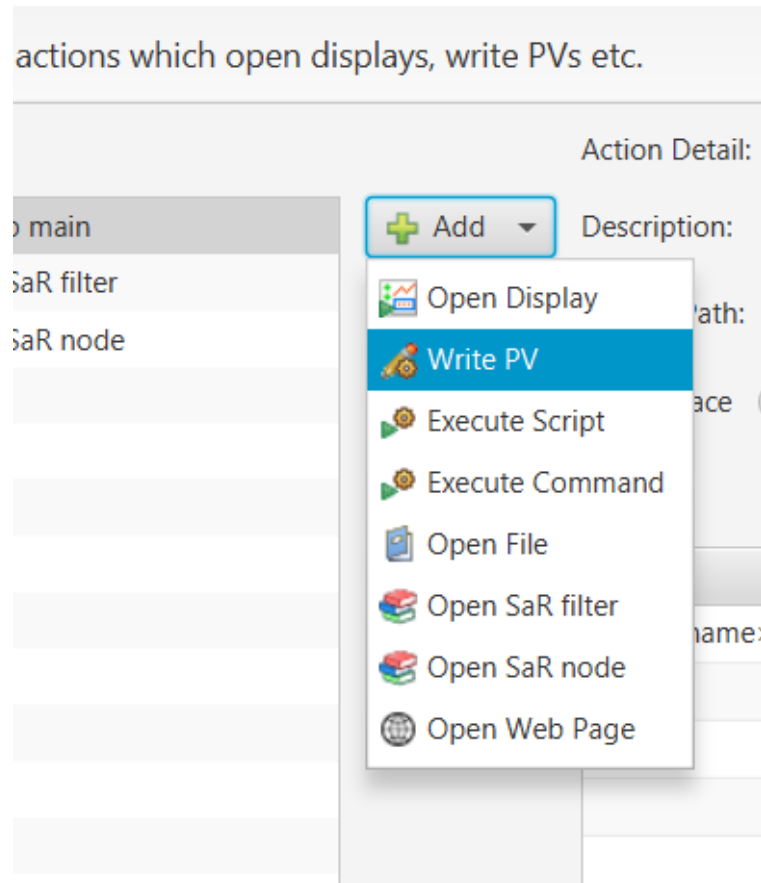
- archive://pv\_name(time)
  - Creating Save and Restore Snapshots
  - \*Recreate Phoebus application states at a specific point of time (OPI's, ...)
- replay://pv\_name(start, end, update\_rate)
  - \*Recreate the behavior of Phoebus applications
  - \*Simulate controls channels using real historical data

# Pluggable actions



- Expand the list of Display Builder Actions
  - Interface for contributing an Action Operations
  - Interface for contributing an Action Editor
- e.g.
  - Dedicated actions for Save and Restore operations

# Pluggable actions



## Benefits

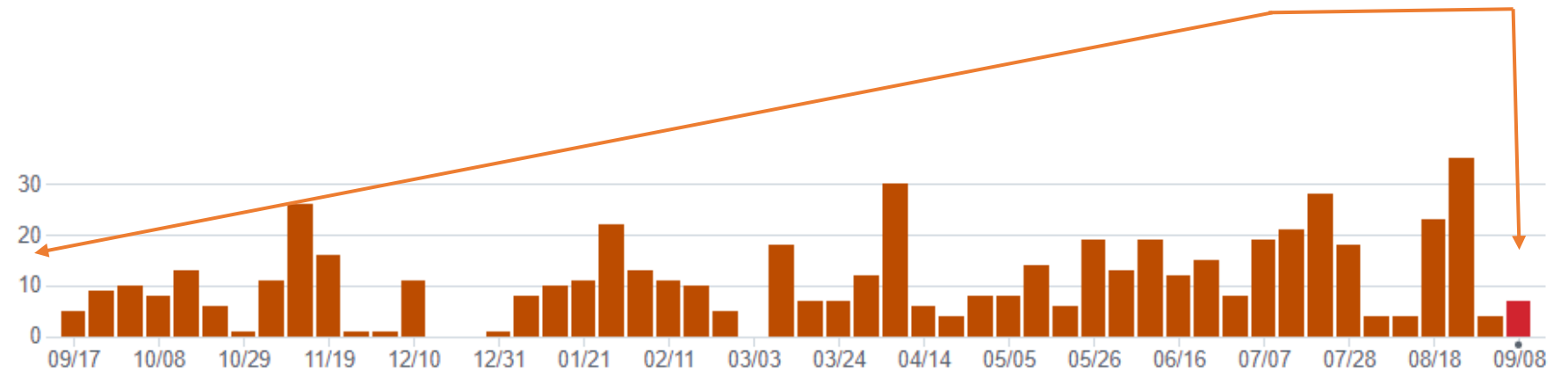
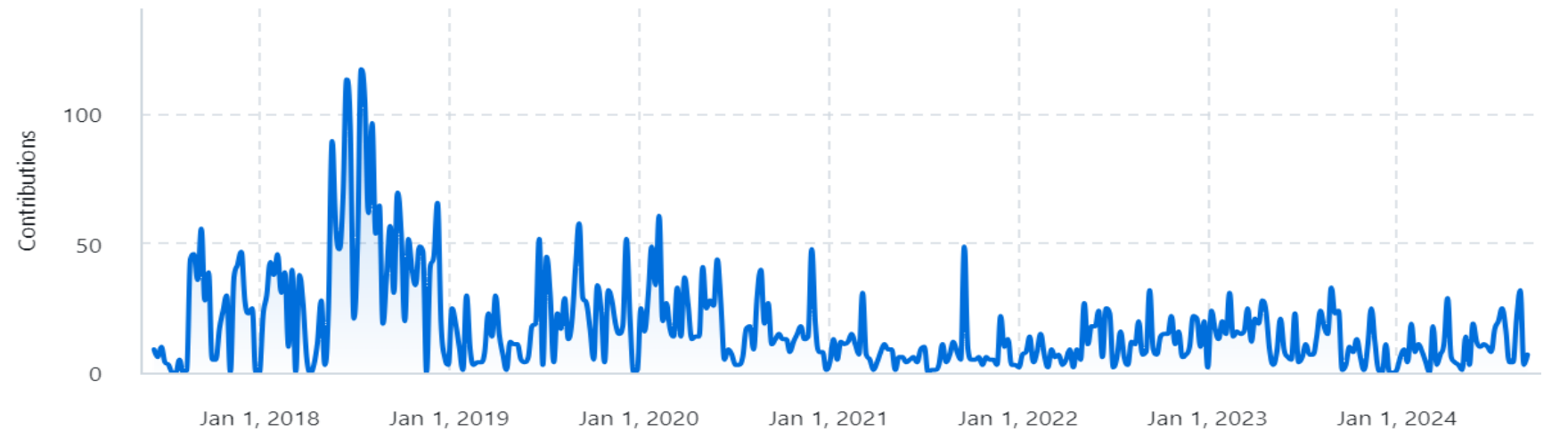
- Much easier to use
  - Custom-made editor interface
- More Efficient
  - Use the features and functionality provided by the Phoebus framework
    - Scheduling and Concurrency support - Jobs
    - Credential management
    - Connection pools
      - PV's
      - rest clients
    - Type definitions
- Safer
  - OPI screen developers don't have to add manage thread, connection, etc...

# Phoebus Tools and Services

**EPICS Tools**  
*Phoebus*  
*CS-Studio*

- EPICS tools:  
**CS-Studio & Phoebus**  
**Commits over time**

From Jun 10, 2017 to Sep 7, 2024



**EPICS Service**  
*Archiver, ChannelFinder*  
*Save Restore, Olog,*  
*Alarm*  
...

**EPICS**  
**TOOLS**

# Phoebus Tools and Services

## EPICS Tools

*Phoebus  
CS-Studio*

- EPICS tools:  
CS-Studio & Phoebus
- Phoebus is in production at multiple sites

## EPICS Service

*Archiver, ChannelFinder  
Save Restore, Olog,  
Alarm  
...*

- Drinks for contributors!!
  - XavSPM
  - Mathis-Hu
  - Smarsching
  - mgotz
  - Daykin
  - jbellister-slac
  - hboutemy
  - ptsOSL

**EPICS**  
**SLAC**

# Collaboration Status

- Phoebus
  - ~200 PR's
  - ~100 Issues with 80% closed in 2 weeks
- ChannelFinder, Phoebus-Olog, ...

<https://github.com/ControlSystemStudio>

The screenshot shows two GitHub search result panels. The top panel is filtered by 'is:issue created:>=2023-09-13' and shows a list of 41 open and 62 closed issues. The bottom panel is filtered by 'is:pr is:closed created:>=2023-09-13' and shows a list of 7 open and 198 closed pull requests. Both panels include a search bar, a 'Clear current search query, filters, and sorts' button, and a list of items with checkboxes, issue titles, and merge status indicators.

**Top Panel: Issues**

- Filters: is:issue created:>=2023-09-13
- 41 Open, 62 Closed
- Action button context menu entries to open in "New Tab" or "New Window" no long #3139 opened 1 hour ago by kasemir
- More flexibl #3133 opened la
- Drag/drop i #3132 opened la
- Yet another #3127 by georgv
- New kafka-s #3123 opened 2
- Problem wit #3116 opened 3
- backward cc #3108 by shroffk

**Bottom Panel: Pull Requests**

- Filters: is:pr is:closed created:>=2023-09-13
- 7 Open, 198 Closed
- Regression: logging of restore action not invoked ✓ #3138 by georgweiss was merged 10 hours ago
- Bug fixes for logbook image attachments ✓ #3137 by georgweiss was merged 10 hours ago
- fixed the alarm event handler performance issue ✓ FAQ #3136 by jeonghanlee was merged 7 hours ago
- Sar login ✓ #3134 by shroffk was merged 7 hours ago
- test branch for issue #3059, updating javafx version for training VM ✓ #3131 by shroffk was merged last week
- EDM converter: Fix color of transparent related display button ✓ #3130 by kasemir was merged last week

# Next Steps

- Eclipse based CS-Studio supported till Oct, 2025
- Preparing release 4.7.4
- JavaFX 22 and JDK 17

# How to contribute

- GitHub Issues
- Monthly meetings on the 2<sup>nd</sup> Wednesday of each month.



# Developers Meeting

- June 2024
- 26 in person + 2-3 remote participants



# Developers Meeting

- Epics core session
- Phoebus tools and services session
  
- Common Session
  - Documentation
  - Protocol related topics
    - Security, Types, etc...
  
- [Complete Meeting Minutes](#)

# Developers Meeting

- Anything we can do to increase the longevity of Phoebus?
  - We cannot control graphics libraries (X, Motif, SWT, JFX, ...)
- We can try to limit dependencies
- Well-structured code
  - Shared development allowed moving from Eclipse to Phoebus in a few years. Harder for site-specific additions
- Modular architecture
  - Pluggable Action Button
  - CEA proposed additional customization of automated actions for alarms.
- A plan for community owned and maintained training infrastructure and resources
- Fix controls system studio website

# Developers Meeting

- ChannelFinder
  - Completed the changes to recsync + ChannelFinder to have a Name server based on ChannelFinder: PVAccess Name server prototype ( work on Channel Access name server is on going )
- Epics Archiver Appliance
  - Converted Epics Archiver Appliance documentation to readthedocs.org (Pull request #243)
  - Closed all open PR's and fixed some small regression bugs in the Epics Archiver Appliance; it is significantly closer to being beta. Should be able to release a beta version in a couple of weeks.
  - Moved all the python2 scripts to python3 ( sample scripts - done, policies.py - ongoing)

# Developers Meeting

- Hands on introduction to the technology stack
  - Shout out to Tynan, Max, Loïc, Katy, for mentoring new members
  - Timo for helping us learn how write things nice
- Upcoming Codeathon Hosted by Diamond Light Source, February 24-28, 2025

# Useful links

<https://controlsystemstudio.org/>  
<http://phoebus.org>

- Fork us on github  
<https://github.com/ControlSystemStudio>
- ChannelFinder  
<http://channelfinder.github.io/>
- Olog  
<https://github.com/Olog>
- SaveRestore, Alarm Services, Scan Server  
<https://github.com/ControlSystemStudio/phoebus/tree/master/services>