

Enhancing Control System GUI Experience

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EPIC, TIFRH

Agenda

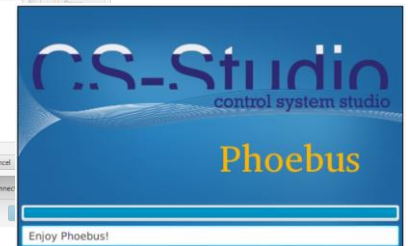
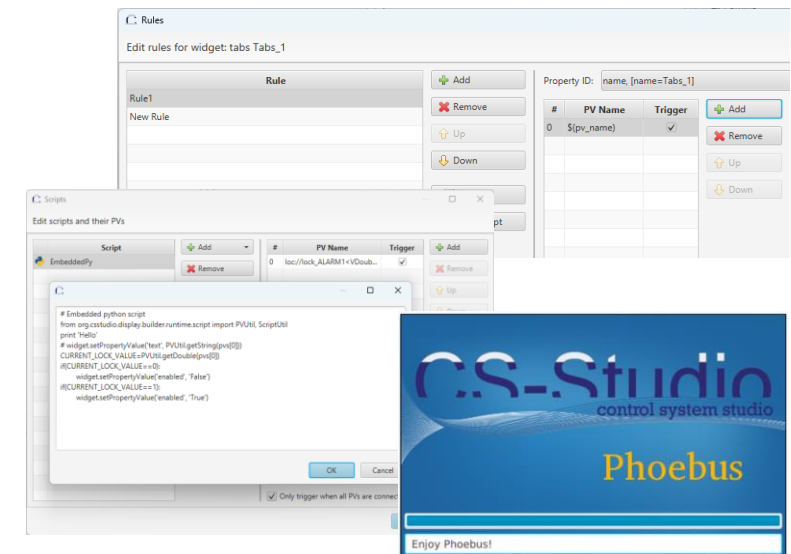
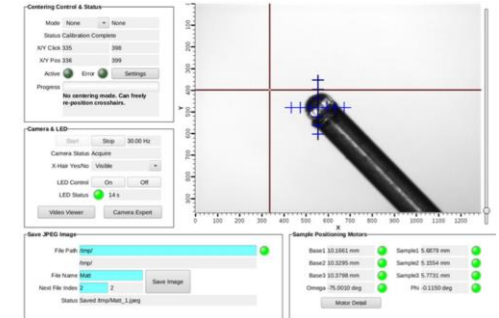
- Motivation
- EPAC Control System application
- Future work

Why need a new one?

CS-Studio Phoebus

One of the industry's favorite tool, no doubt its powerful but it lacks

- **Authenticate** – Relies on Operating System user
- **Look and feel** – Lacks visually appealing user interfaces
- **Feature Accessibility** – Steep learning curve to master Rules, Scripts, etc.
- **Desktop-Only support** – Limited to desktop use only
- **Maintainability** – Hard to maintain and keep track of all the rules and scripts
- **Automated Tests** – Hard to test the application interfaces

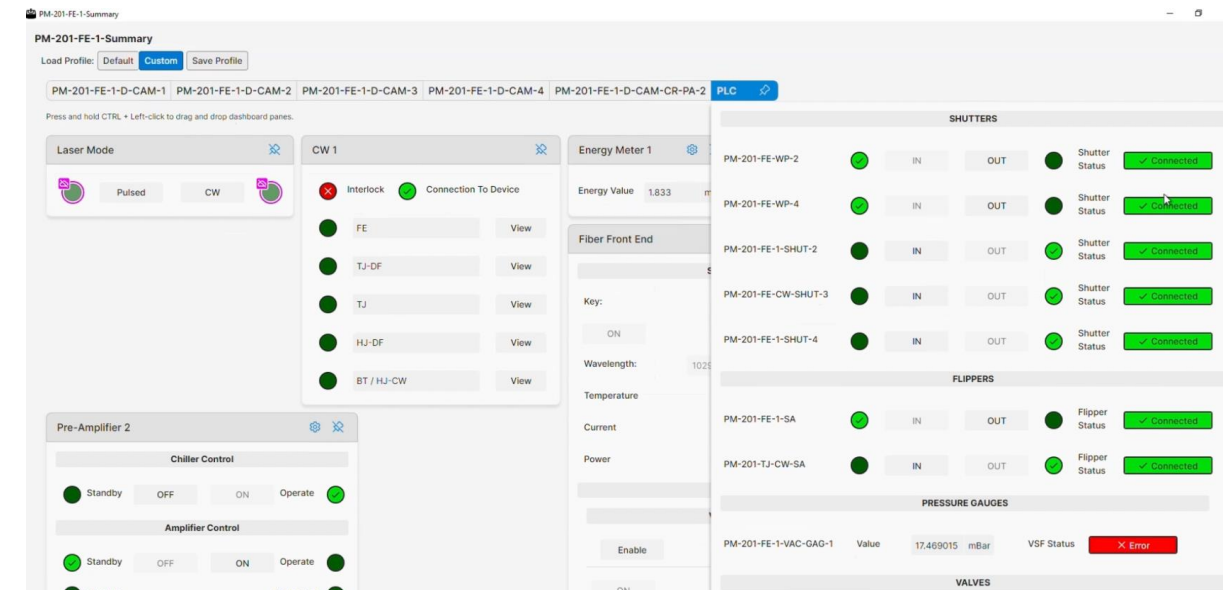


EPAC Control System application

Introducing a new control system software –
EPAC Control System application

- Built with .NET framework (Blazor and C#)
- Developed by **CLF controls team** and **EPIC team**
- Operational at the Extreme Photonics Applications Centre (EPAC), Central Laser Facility (CLF), UK

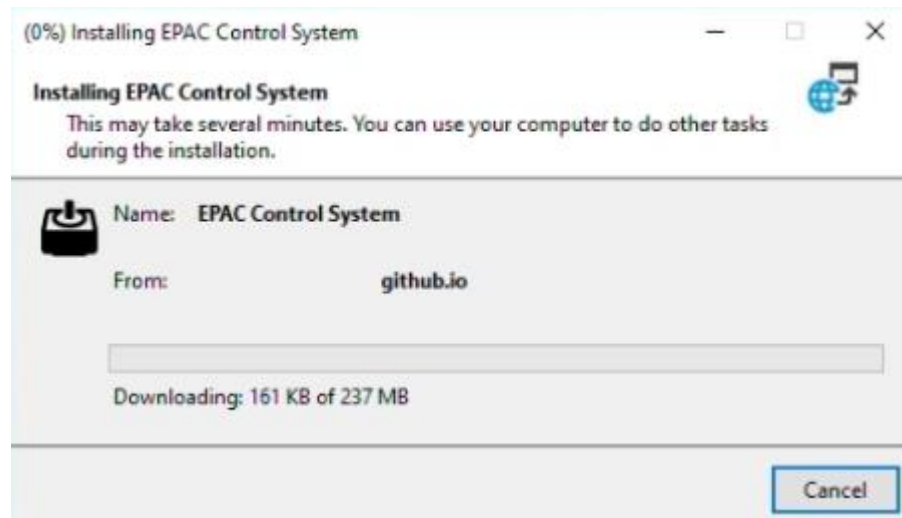
Quick Peek



Key Features

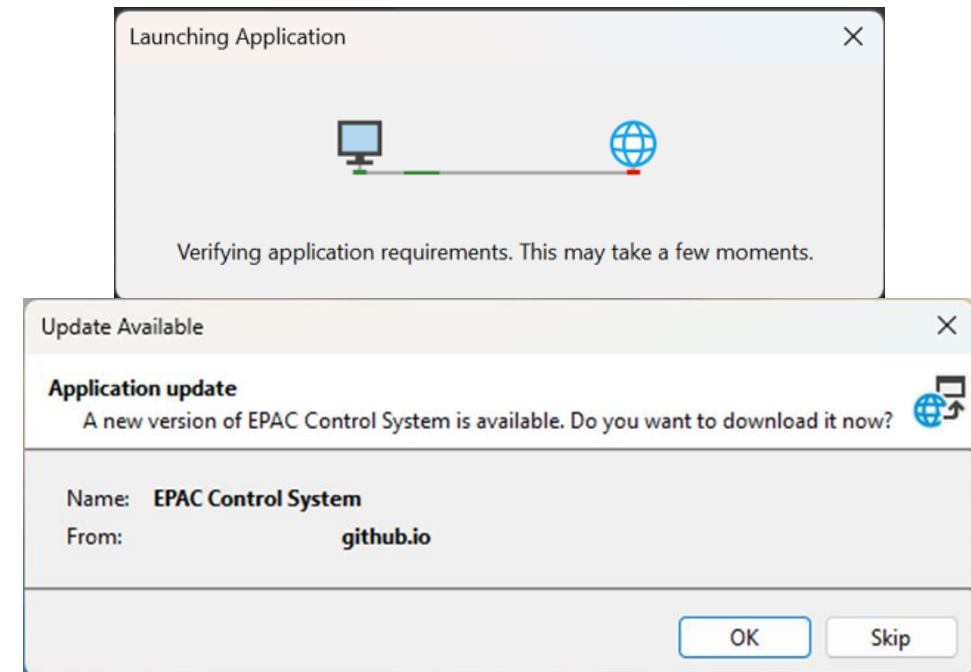
★ One Click Installation

Easy Installation with a simple setup link and minimal user effort.



★ Check Updates and Install

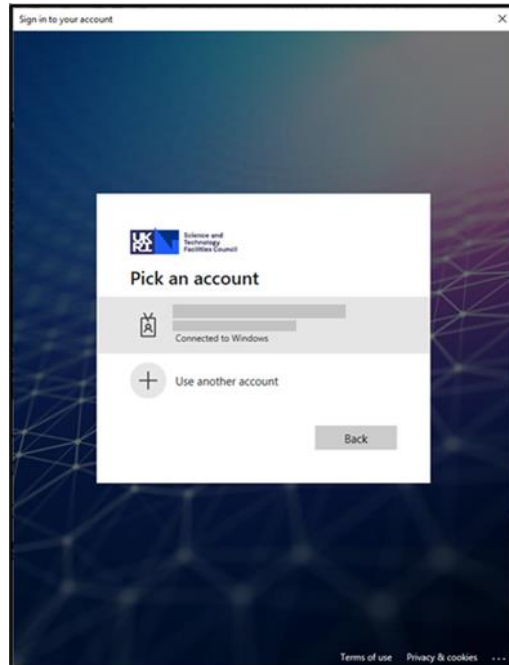
Always checks for latest update at application start



Key Features

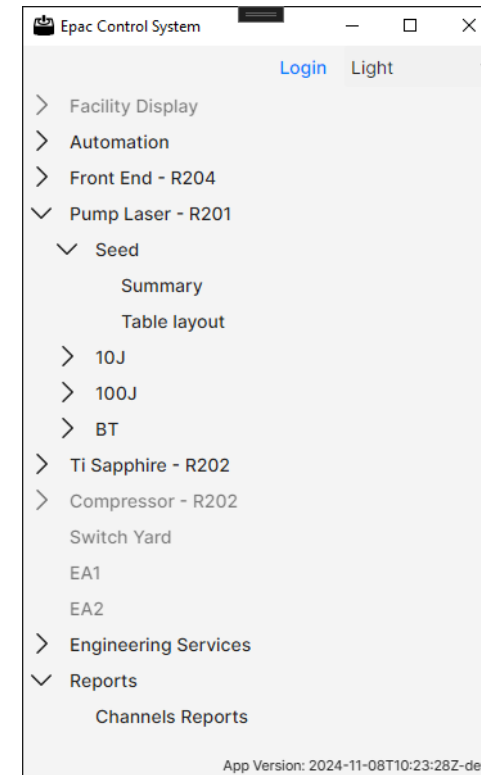
★ Authentication

Login into the application using Azure AD Identity and save your profile for personalized experience



★ Customize the Navigation Pane

Based on your facility requirement, customize the navigation menu



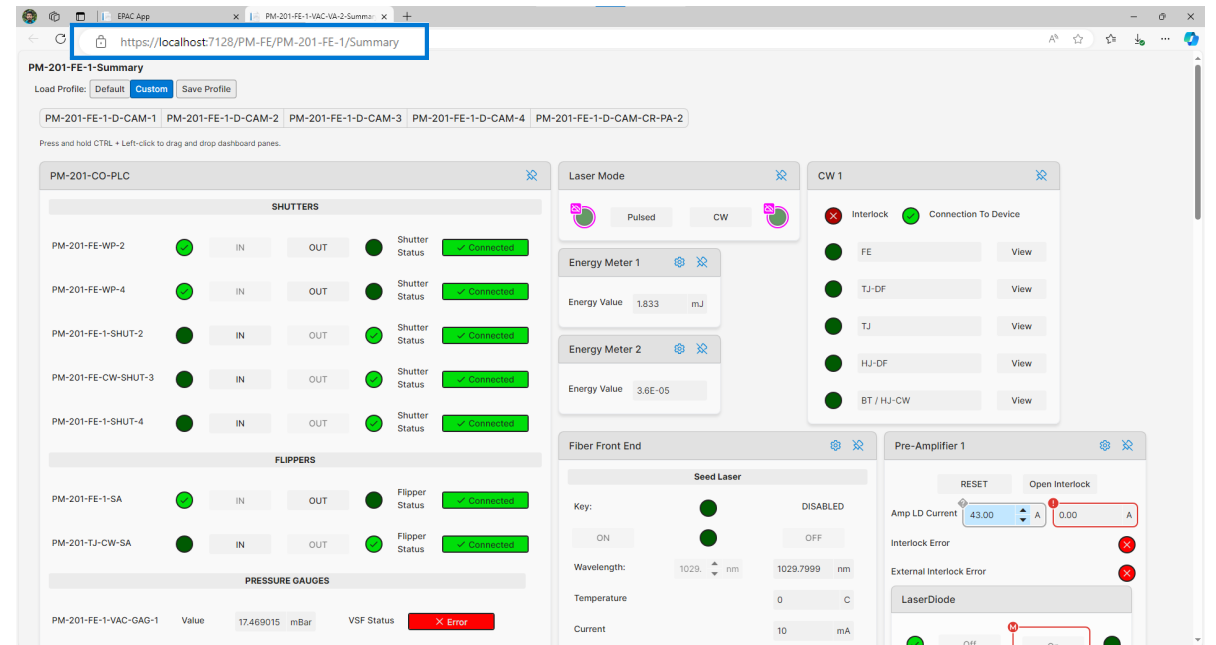
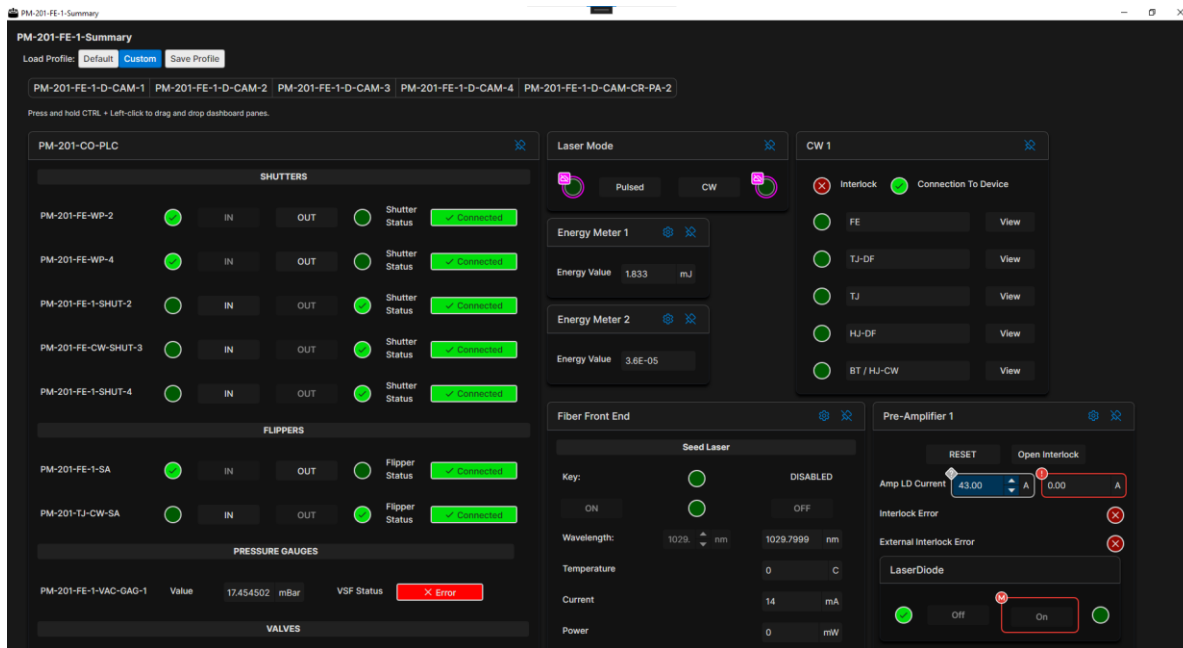
Key Features

★ Themes

Supports both Light and Dark modes for a personalized experience

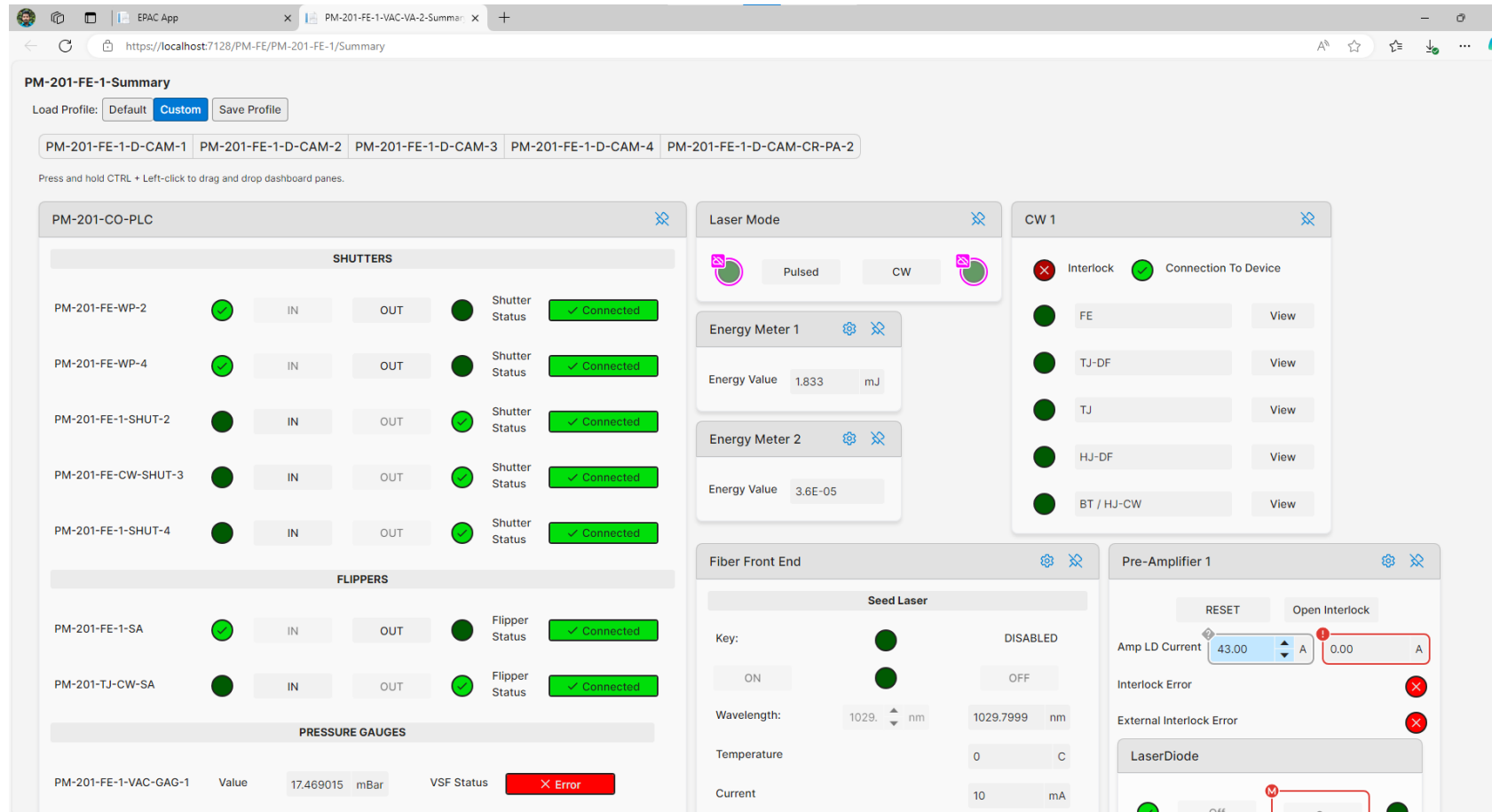
★ Browser Access

Use the application directly from your web browser for added convenience



Key Features

★ **Sample Summary Page:** Multiple relevant devices arranged as a dashboard

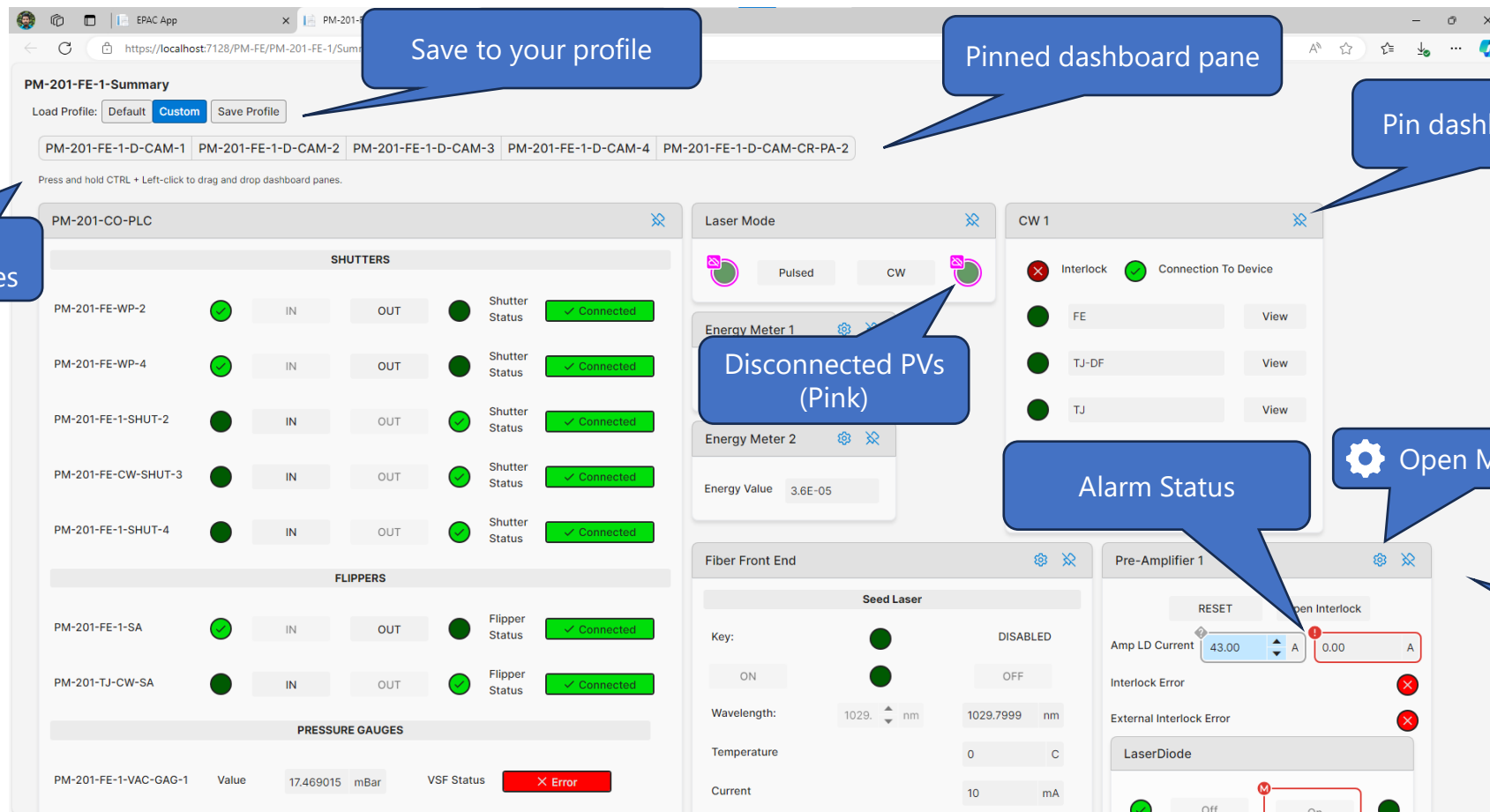


The screenshot displays a web-based dashboard for the PM-201-FE-1 system. The interface includes a browser window with the URL `https://localhost:7128/PM-FE/PM-201-FE-1/Summary`. The dashboard is titled "PM-201-FE-1-Summary" and features a "Load Profile" section with "Default" and "Custom" options, and a "Save Profile" button. Below this, there are tabs for different device categories: "PM-201-FE-1-D-CAM-1", "PM-201-FE-1-D-CAM-2", "PM-201-FE-1-D-CAM-3", "PM-201-FE-1-D-CAM-4", and "PM-201-FE-1-D-CAM-CR-PA-2". A note indicates: "Press and hold CTRL + Left-click to drag and drop dashboard panes." The main content area is divided into several panels:

- PM-201-CO-PLC:** Contains sections for "SHUTTERS" and "FLIPPERS". Each section lists devices with their status (green checkmark for connected, red X for error) and "IN" and "OUT" buttons. Shutter status is also shown as "Connected".
- Energy Meter 1:** Shows "Energy Value" as 1.833 mJ.
- Energy Meter 2:** Shows "Energy Value" as 3.6E-05.
- Laser Mode:** Includes "Pulsed" and "CW" buttons, and a "Connection To Device" indicator.
- CW 1:** Lists various components like "FE", "TJ-DF", "TJ", "HJ-DF", and "BT / HJ-CW" with "View" buttons.
- Fiber Front End:** Includes a "Seed Laser" section with "Key" (DISABLED), "Wavelength" (1029.7999 nm), "Temperature" (0 C), and "Current" (10 mA).
- Pre-Amplifier 1:** Features "RESET" and "Open Interlock" buttons, "Amp LD Current" (43.00 A), and "Interlock Error" (red X).
- PRESSURE GAUGES:** Shows "PM-201-FE-1-VAC-GAG-1" with a "Value" of 17.469015 mBar and a "VSF Status" of "Error" (red X).

Key Features

★ **Sample Summary Page:** Multiple relevant devices arranged as a dashboard



The screenshot shows a web-based dashboard for the EPAC App. At the top, there are navigation options for 'Default' and 'Custom' load profiles, and a 'Save Profile' button. Below this, a row of device selection buttons is visible. The main dashboard area is divided into several panels:

- PM-201-CO-PLC:** A large panel containing sub-sections for SHUTTERS, FLIPPERS, and PRESSURE GAUGES. Each sub-section lists devices with their status (green checkmarks for 'Connected', red 'X' for 'Error') and control buttons (IN, OUT).
- Laser Mode:** A panel with 'Pulsed' and 'CW' modes, and a 'Connection To Device' indicator.
- Energy Meter 1 & 2:** Panels showing energy values (e.g., 3.6E-05) and a 'Disconnected PVs (Pink)' indicator.
- Fiber Front End:** A panel for 'Seed Laser' with 'ON/OFF' controls, 'Wavelength' (1029 nm), and 'Current' (10 mA) readouts.
- Pre-Amplifier 1:** A panel with 'Amp LD Current' (43.00 A), 'Interlock Error' (red X), and 'External Interlock Error' (red X).

Save to your profile

Pinned dashboard pane

Pin dashboard pane

Re-arrange dashboard panes

Disconnected PVs (Pink)

Alarm Status

Open Main page

Values, Alarms, Limits, and more are always in sync with the IOC

Key Features

★ **Sample Main Page:** Detailed information and settings for each individual device

PM-201-FE-1-PA-1-Main

PM-201-FE-1-PA-1-Main

Connection Status

Connection State ●

LaserDiode

● ●

HighVoltage

● ●

Shutter 1

● ●

Trigger

Internal External

Gate

Internal External

Mode

Pulse Picker Alignment

About

Serial Number 19057 Version 3.07 ID 10

Monitor

AMP LD#1 Temperature 20.0 C LD Runtime 1148 h Humidity(%) 47.0 %

Settings

Frequency Hz Hz %

Amp LD Current A A %

Width (sync) (ns) ns ns %

Injection Delay ns ns %

Coarse Delay ns ns %

Timeouts

Shutter Timeout s LD Timeout s HV Timeout s

Enter here how long to wait before displaying a warning to the user if the machines does not follow the command

Safety

Interlock Error ✖

External Interlock Error ✖

Amplifier Current Limit ●

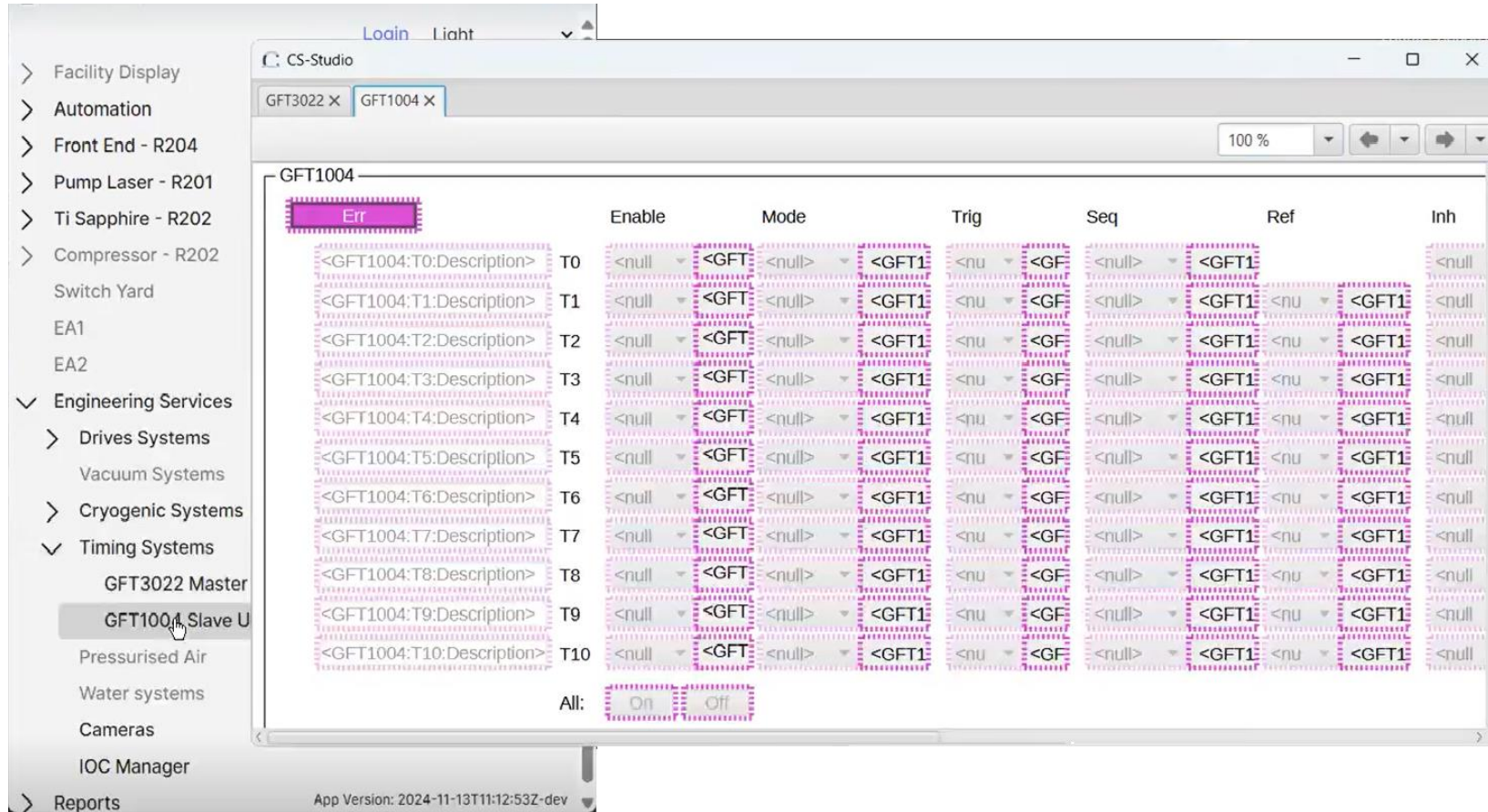
Amplifier Temp Error ●

Errors

Oscillator Mode Locked ●

Key Features

★ **Access Phoebus files:** Add Link to open from application



The screenshot shows the CS-Studio application interface. On the left is a sidebar with a tree view containing various facility components. The main window displays a configuration table for 'GFT1004'. The table has the following structure:

		Enable	Mode	Trig	Seq	Ref	Inh
Err							
<GFT1004:T0:Description>	T0	<null>	<GFT>	<GFT1>	<nu>	<GFT1>	<null>
<GFT1004:T1:Description>	T1	<null>	<GFT>	<GFT1>	<nu>	<GFT1>	<null>
<GFT1004:T2:Description>	T2	<null>	<GFT>	<GFT1>	<nu>	<GFT1>	<null>
<GFT1004:T3:Description>	T3	<null>	<GFT>	<GFT1>	<nu>	<GFT1>	<null>
<GFT1004:T4:Description>	T4	<null>	<GFT>	<GFT1>	<nu>	<GFT1>	<null>
<GFT1004:T5:Description>	T5	<null>	<GFT>	<GFT1>	<nu>	<GFT1>	<null>
<GFT1004:T6:Description>	T6	<null>	<GFT>	<GFT1>	<nu>	<GFT1>	<null>
<GFT1004:T7:Description>	T7	<null>	<GFT>	<GFT1>	<nu>	<GFT1>	<null>
<GFT1004:T8:Description>	T8	<null>	<GFT>	<GFT1>	<nu>	<GFT1>	<null>
<GFT1004:T9:Description>	T9	<null>	<GFT>	<GFT1>	<nu>	<GFT1>	<null>
<GFT1004:T10:Description>	T10	<null>	<GFT>	<GFT1>	<nu>	<GFT1>	<null>
All:		On	Off				

The sidebar on the left includes the following items: Facility Display, Automation, Front End - R204, Pump Laser - R201, Ti Sapphire - R202, Compressor - R202, Switch Yard, EA1, EA2, Engineering Services (expanded), Drives Systems, Vacuum Systems, Cryogenic Systems, Timing Systems (expanded), GFT3022 Master, GFT1004 Slave U (selected), Pressurised Air, Water systems, Cameras, IOC Manager, and Reports. The application version is noted as 2024-11-13T11:12:53Z-dev.

Key Features

★ **Active Channels Reporting:** Detailed information on all active channels

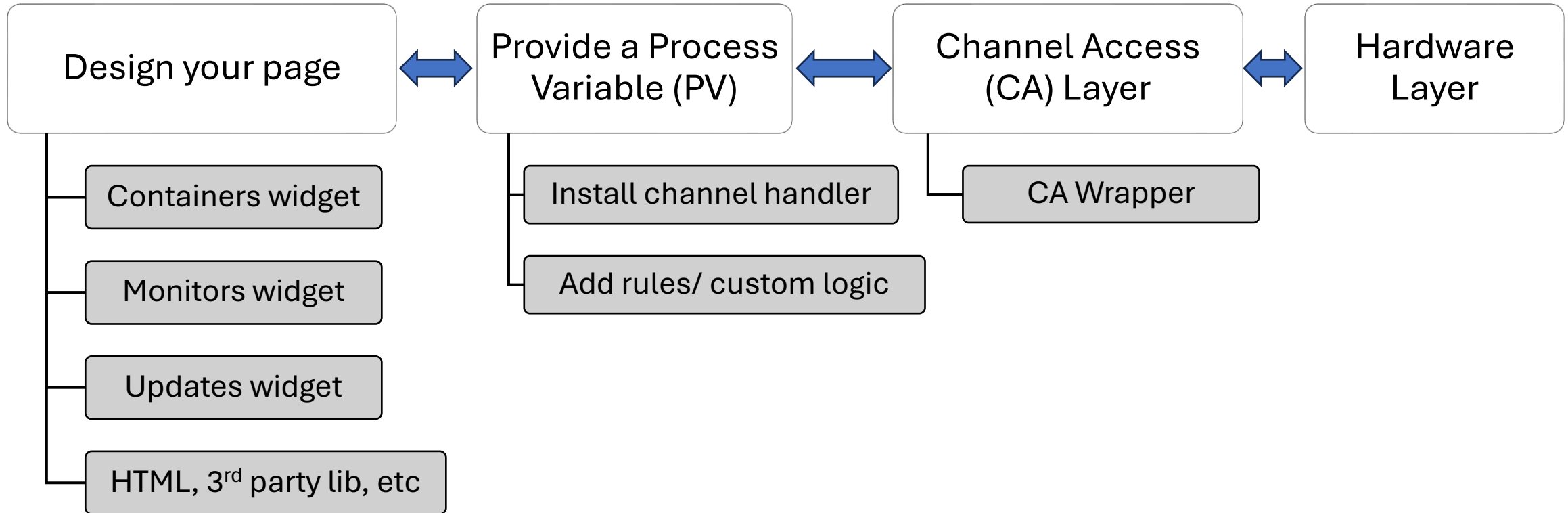
Channel Reports

Channel Reports

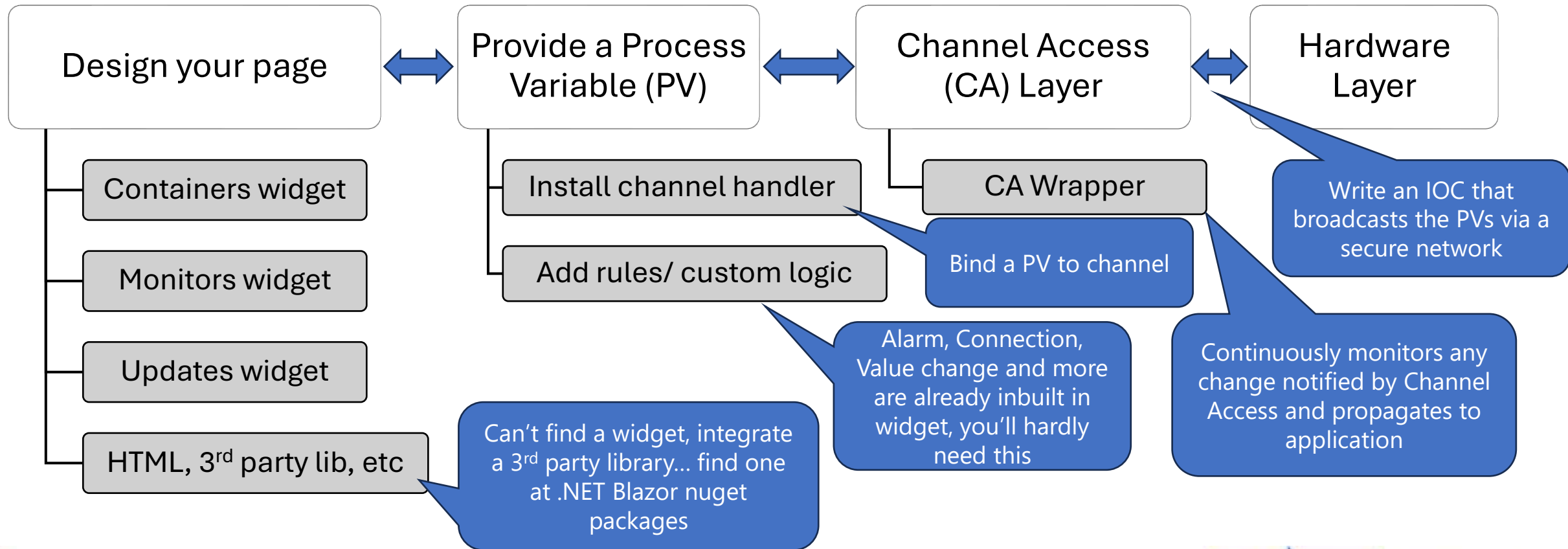
Active Channels (310)

Q	Channel Name	Type	Host IP And Port	Clones	Connected?	Created At	Monitored?	Invalid?	Comments
	PM-201-FE-1-PA-1-ReadSerial	Remote	192.1 ...	0	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-ReadVersion	Remote	192.1 ...	0	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-ReadId	Remote	192.1 ...	0	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-ReadLD1Temp	Remote	192.1 ...	0	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-ReadLDRuntime	Remote	192.1 ...	0	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-ReadHumidity	Remote	192.1 ...	0	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-ReadPkiFreq	Remote	192.1 ...	1	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-ReadPkiDelay	Remote	192.1 ...	1	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-ReadCoarseDelay	Remote	192.1 ...	1	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-StatOsc	Remote	192.1 ...	0	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-StatAmpCurr	Remote	192.1 ...	0	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-StatAmpTemp	Remote	192.1 ...	0	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-SelTrig	Remote	192.1 ...	1	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-SelGate	Remote	192.1 ...	1	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-SelMode	Remote	192.1 ...	1	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-TFL:SyncFreqTimeoutCount	Remote	192.1 ...	0	YES	25/11/2024 08:24:48	NO	NO	
	PM-201-FE-1-PA-1:SyncFreqTimeoutStatus	Remote	192.1 ...	0	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-TFL:SyncDelayTimeoutCount	Remote	192.1 ...	0	YES	25/11/2024 08:24:48	NO	NO	
	PM-201-FE-1-PA-1:SyncDelayTimeoutStatus	Remote	192.1 ...	0	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-FE-1-PA-1-TFL:CoarseDelayTimeoutCount	Remote	192.1 ...	0	YES	25/11/2024 08:24:48	NO	NO	
	PM-201-FE-1-PA-1:CoarseDelayTimeoutStatus	Remote	192.1 ...	0	YES	25/11/2024 08:24:48	YES	NO	
	PM-201-ITL-TFL:OverallStatus	Remote		0	NO	25/11/2024 08:11:45	YES	NO	
	LOC:ISR201InterlockTripped_LOGIC	Local	simulated	1	YES	25/11/2024 08:11:45	YES	NO	
	TS-202-TIME-ITL-TFL:OverallStatus	Remote		0	NO	25/11/2024 08:11:45	YES	NO	
	LOC:ISR202InterlockTripped_LOGIC	Local	simulated	0	YES	25/11/2024 08:11:45	YES	NO	
	FE-204-ITL-TFL:OverallStatus	Remote		0	NO	25/11/2024 08:11:45	YES	NO	
	LOC:ISR204InterlockTripped_LOGIC	Local	simulated	0	YES	25/11/2024 08:11:45	YES	NO	

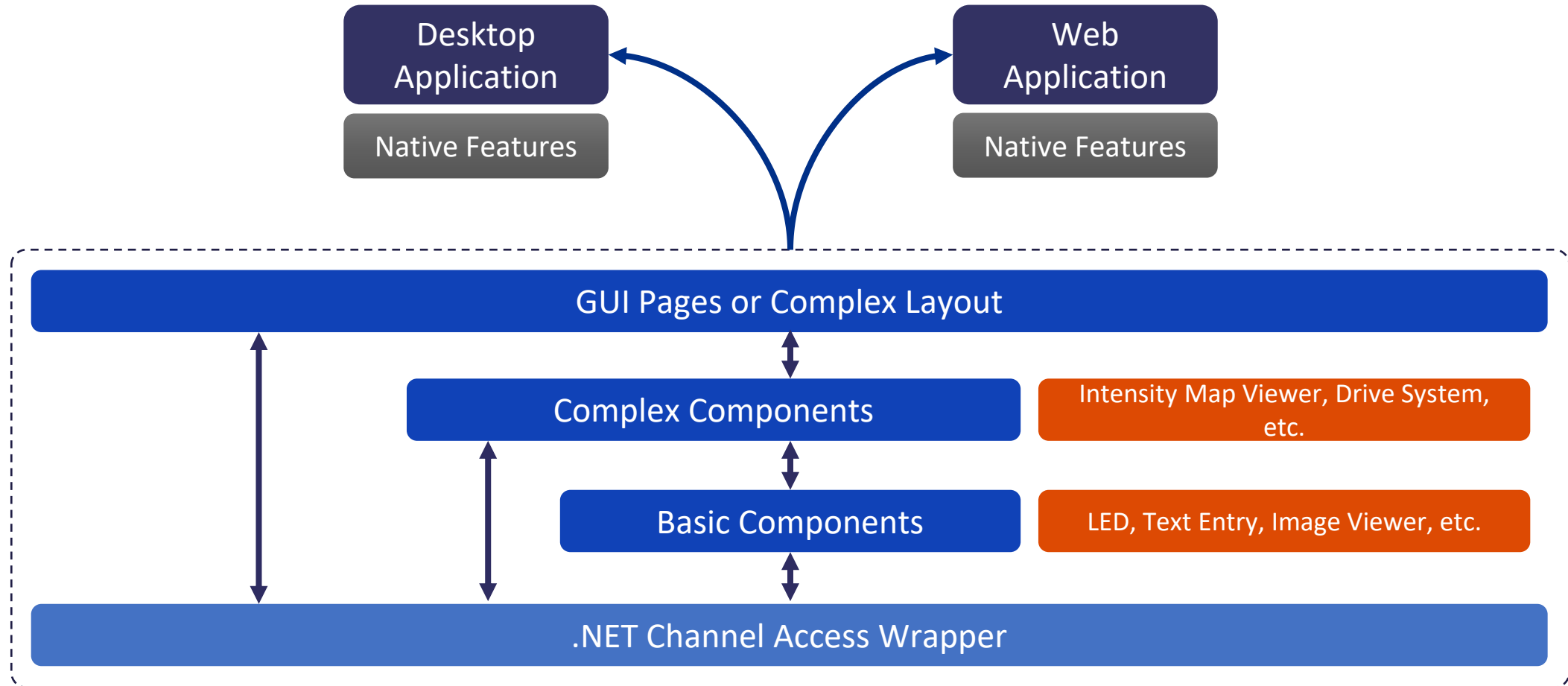
Workflow



Workflow

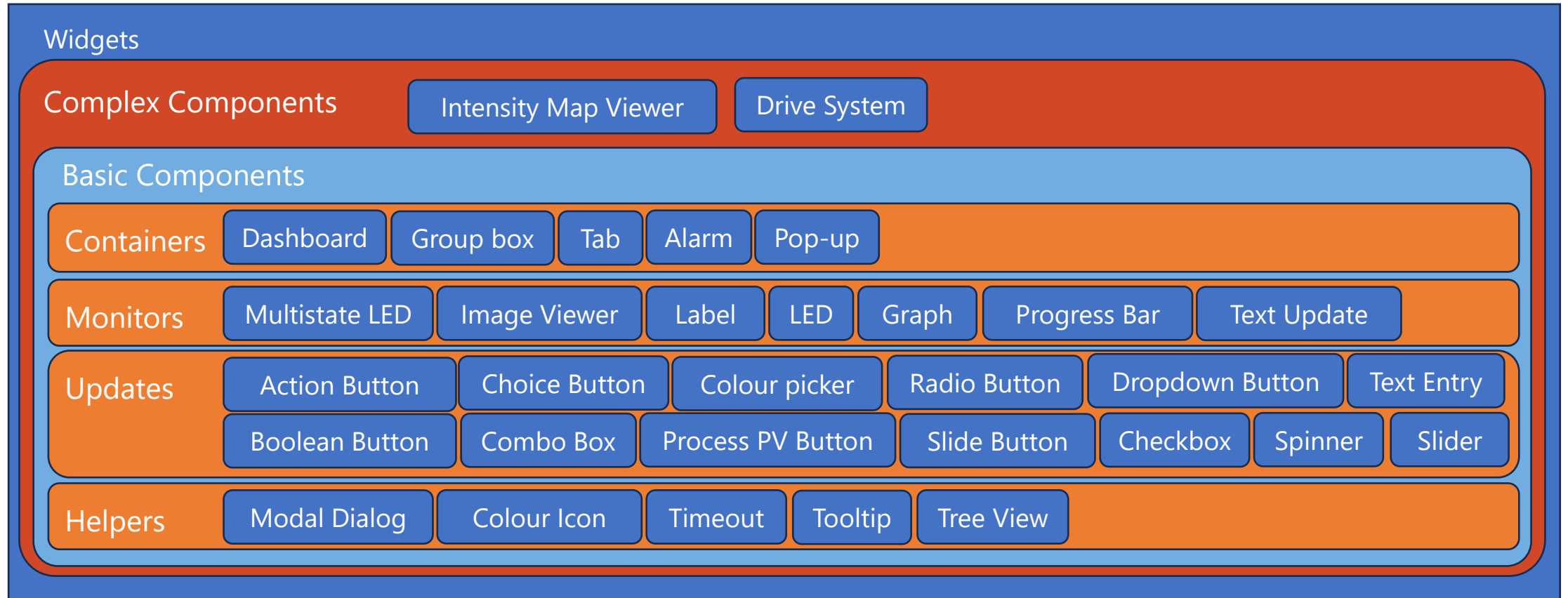


Application Architecture



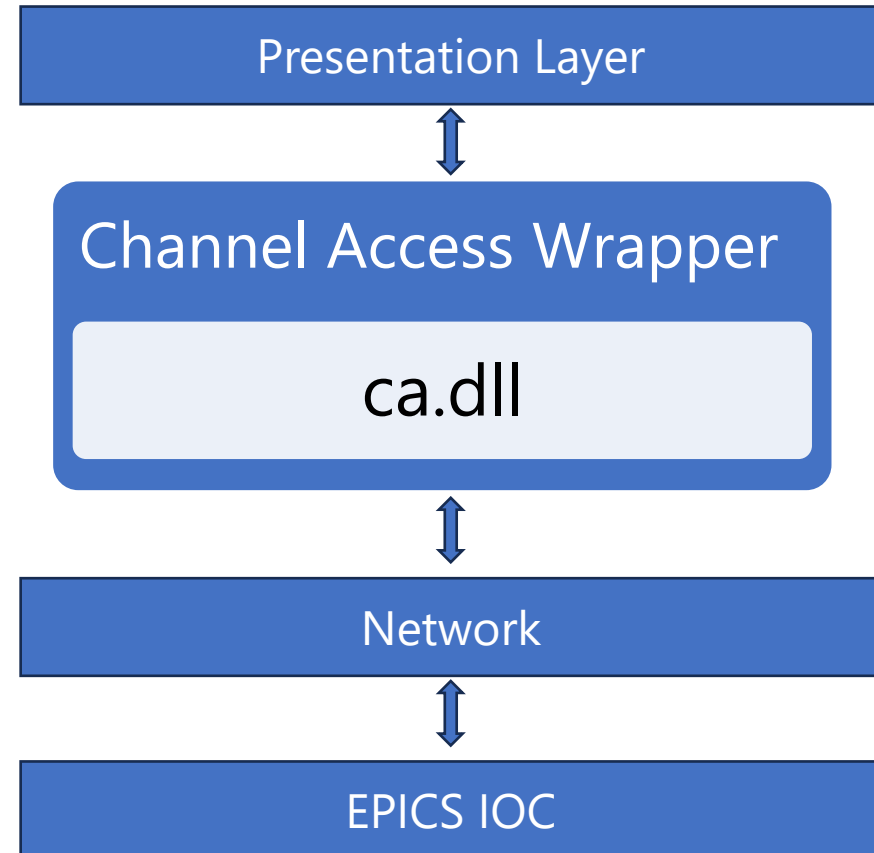
GUI Components

All the Phoebus widgets and more ...



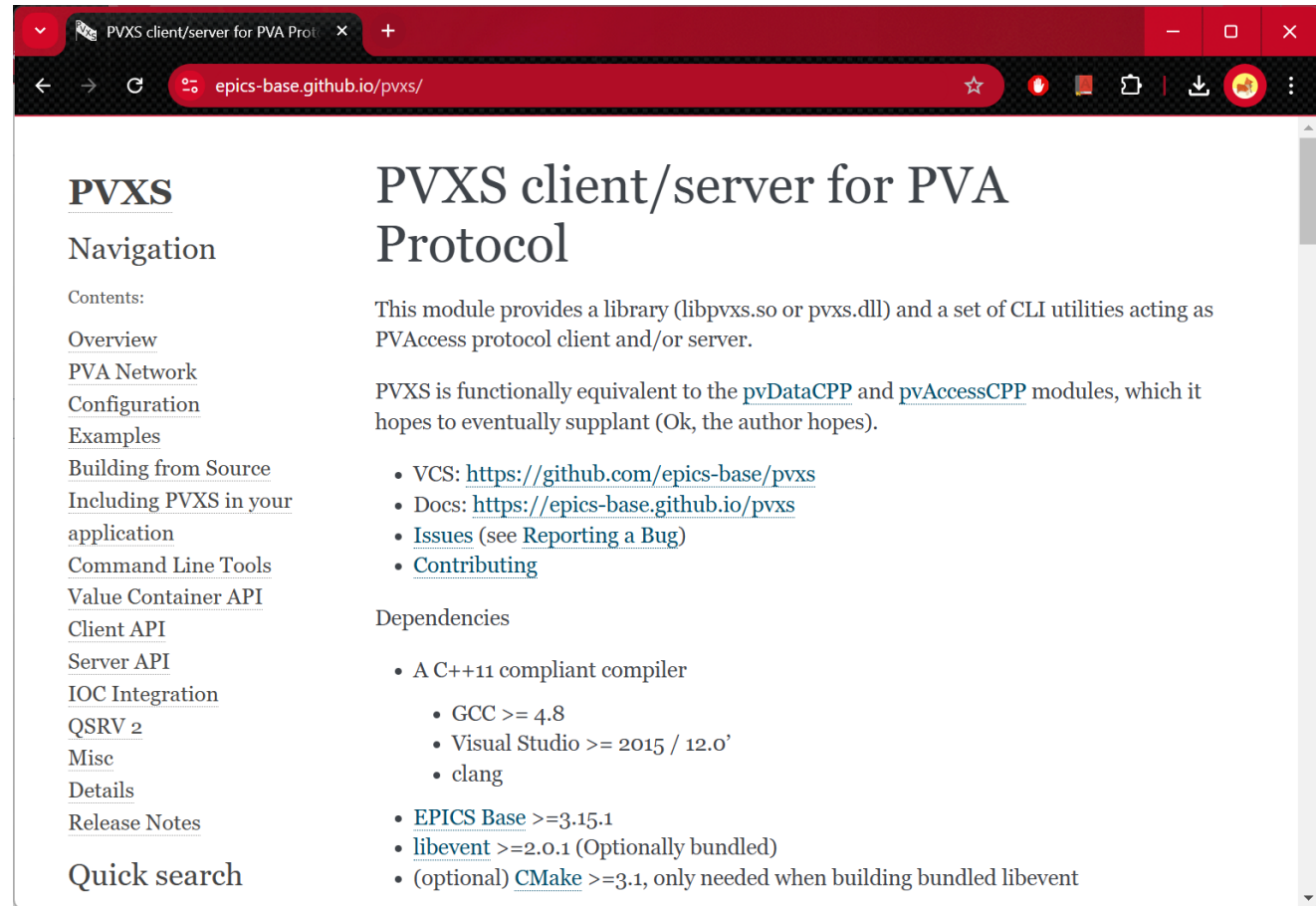
.NET Channel Access Wrapper

- EPICS provides a C API methods for accessing channel access features
<https://epics.anl.gov/base/R3-14/12-docs/CAref.html>
- CA Wrapper - C# library that wraps the methods provided by ca.dll to communicate with the process variables (PV) available over the network



Future Work

- .NET PV Access Wrapper using the pvxs library



The screenshot shows a web browser window with the address bar displaying `epics-base.github.io/pvxs/`. The page content is as follows:

PVXS

Navigation

Contents:

- [Overview](#)
- [PVA Network](#)
- [Configuration](#)
- [Examples](#)
- [Building from Source](#)
- [Including PVXS in your application](#)
- [Command Line Tools](#)
- [Value Container API](#)
- [Client API](#)
- [Server API](#)
- [IOC Integration](#)
- [QSRV 2](#)
- [Misc](#)
- [Details](#)
- [Release Notes](#)

Quick search

PVXS client/server for PVA Protocol

This module provides a library (`libpvxs.so` or `pvxs.dll`) and a set of CLI utilities acting as PVAAccess protocol client and/or server.

PVXS is functionally equivalent to the [pvDataCPP](#) and [pvAccessCPP](#) modules, which it hopes to eventually supplant (Ok, the author hopes).

- VCS: <https://github.com/epics-base/pvxs>
- Docs: <https://epics-base.github.io/pvxs>
- [Issues](#) (see [Reporting a Bug](#))
- [Contributing](#)

Dependencies

- A C++11 compliant compiler
 - GCC >= 4.8
 - Visual Studio >= 2015 / 12.0'
 - clang
- [EPICS Base](#) >=3.15.1
- [libevent](#) >=2.0.1 (Optionally bundled)
- (optional) [CMake](#) >=3.1, only needed when building bundled libevent

Thank You !

Any questions?

Feel free to contact me at

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