

REACT AUTOMATION STUDIO: MODERN SCIENTIFIC CONTROL WITH THE WEB

Dr William Duckitt



Overview

- What is React Automation Studio?
- System Architecture
- Historical milestones
- Demos
- Community Involvement

What is React Automation Studio?



- Progressive web application framework
- Enables the control of large scientific equipment through EPICS from any smart device or web browser connected to a network

Beamline Control System Example

Diagram of a beamline with components: FC1, Q1Harp1, FC2, Q2 Harp2 FC3, Harp3 FC4, BM1, STR2XY, STR1XY, SLITXY1, Harp4, STR2Y, STR3Y, SLITXY2.

Device Description	Setpoint	Readback	Saved Value	Status
Q1	5000.000 A	5000.000 A	N/A	On
Q2	5000.000 A	5000.000 A	N/A	On
Q3	3444.000 A	3444.000 A	N/A	On
BM1	5000.000 A	0.000 A	N/A	Off
STR1XY X	5000.000 A	5000.000 A	N/A	Off
STR1XY Y	5000.000 A	5000.000 A	N/A	Off
STR2XY X	5000.000 A	5000.000 A	N/A	Off
STR2XY Y	5000.000 A	5000.000 A	N/A	Off
STR2Y	5000.000 A	0.000 A	N/A	Off
STR3Y	5000.000 A	0.000 A	N/A	Off
SLITXY1 X Gap	1.0 mm	0.0 mm	N/A	Off
SLITXY1 X Offset	1.0 mm	0.0 mm	N/A	Off
SLITXY1 Y Gap	1.0 mm	0.0 mm	N/A	Off
SLITXY1 Y Offset	1.0 mm	0.0 mm	N/A	Off

Q3 Setpoint: 3444.000 A, Readback: 3444.000 A

Scan rate: .1 second

Setpoint: 3444.000 A

Device Power: ON

Setpoint timestamp: 27 Sep 2023 14:48:52:472

All the components are now reusable hooks components. See the style guide Beamline Components section for more details!

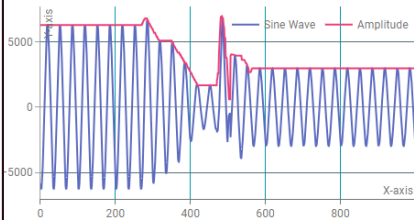
What is React Automation Studio?



```
<ThumbWheel
  pv='$(device)'  
  macros={{  
    '$(device)':'testIOC:amplitude'  
  }}  
  prec_integer={3}  
  prec_decimal={1}  
/>
```

Amplitude of Sine wave
6275.000

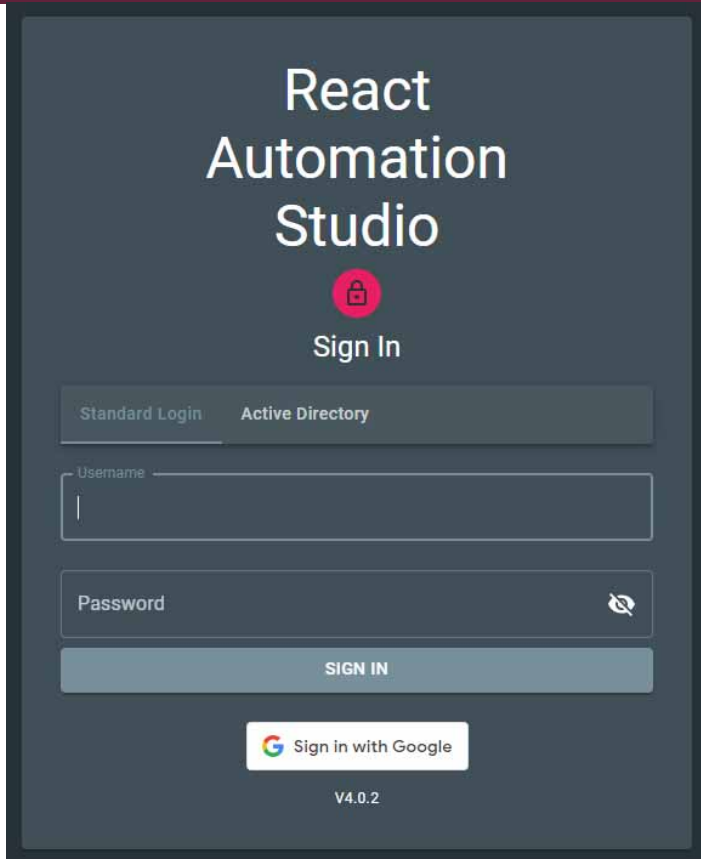
```
<TextInput  
  pv='$(device):amplitude'  
  macros={{{'$(device)':'testIOC'}}}  
  usePvLabel={true}  
  prec={3}  
  alarmSensitive={true}  
/>
```



```
<GraphY  
  pvs=[['testIOC:test4',  
        'testIOC:test5'] ]  
  legend=[['Sine Wave',  
          'Amplitude']]  
/>
```

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The screenshot displays the 'Admin Page' interface for 'ACCESS CONTROL'. On the left, a sidebar lists user roles: DEFAULT, OPERATOR, RFENGINEER, and ADMIN. The main content area is titled 'UAG' and 'ADMIN'. It features a 'Roles' section with a table listing roles and their names, and a 'Rules' section with a table defining access permissions based on regular expressions.

Index	Role
0	admin
1	alarmAdmin

Regex	Read Access	Write Access
[0-9].*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
[a-z].*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
[A-Z].*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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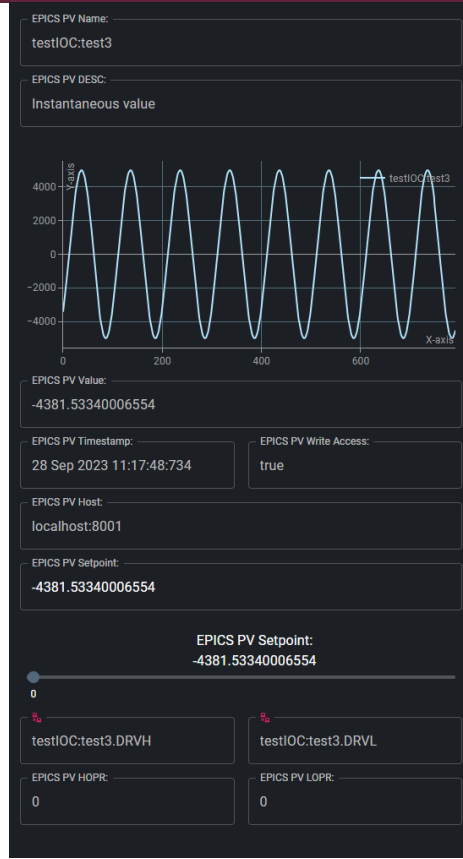
The screenshot displays the React Automation Studio interface for a 'DEMO ALARM HANDLER'. The top navigation bar includes 'ALARM TABLE' and 'NOTIFICATION SETUP'. The left sidebar lists 'ALARM AREAS' with categories like BEAMLINE DEMO, BUILDING DEMO, CYCLOTRON DEMO (selected), AIR, RF, SAFETY, VACUUM, WATER, EPICS PVS DEMO, and VAULT DEMO.

The main content area is divided into two sections:

- ALARM TABLE: CYCLOTRON DEMO**: A table with columns for PV NAME, PV VALUE, ALM STATUS, LAST ALM VAL, LAST ALM TIME, LAST ALM ACK TIME, ENBL, LAT, and NTFY. It shows several alarm entries, including a 'NOT CLEAR' status for 'demoAlarmsIOC:cyclotron_interlocks' and a 'FAULT' status for 'demoAlarmsIOC:cyclotron_RF1', both marked as 'MAJOR_ALARM'.
- ALARM LOG: CYCLOTRON DEMO**: A log of recent alarm events, such as '21:56:49 Wed, 30 Aug 2023: demoAlarmsIOC:cyclotron_RF1 - MAJOR_ALARM triggered, alarm value = FAULT'.

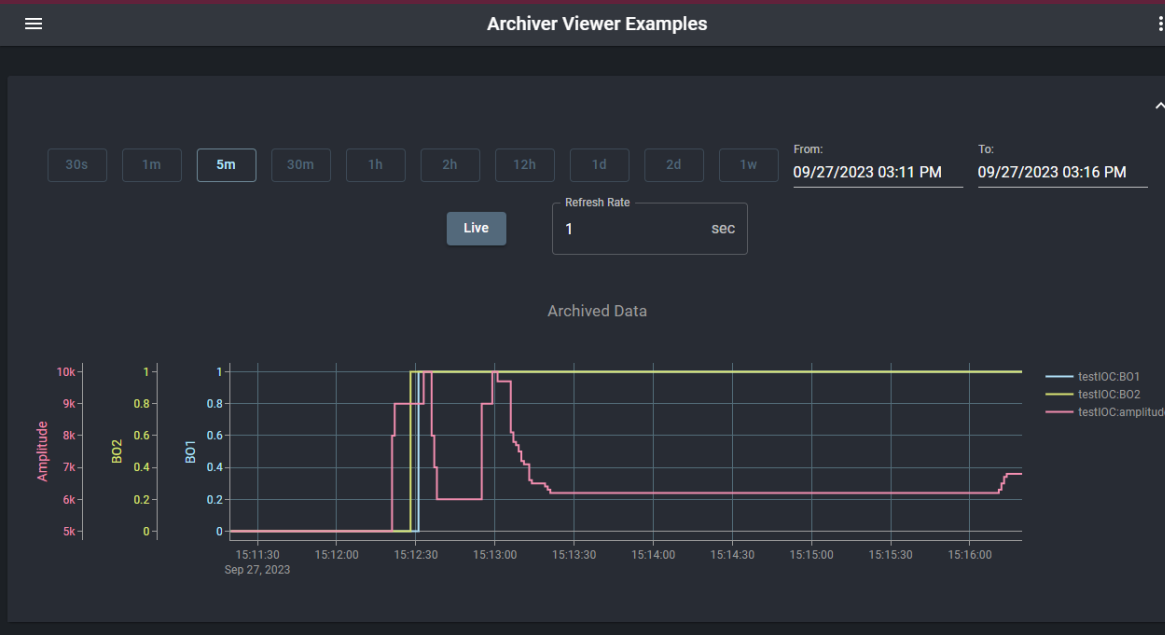
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 - Alarm-handling with notifications

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 - Archived data viewing

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Load Save Example

RF Frequency: 3 GHz, Energy: 3 GeV, Description: 3rd settings

RF Frequency [GHz]	Energy [GeV]	Description	Date	Status	Device Description	Saved Value	New Value	PV Value	Units
3	3	1st settings	7-9-2023 10:30	Pending	Ps1 setpoint	5000	5000	5000.0	A
3	3	2nd settings	7-9-2023 10:32	Pending	Ps2 setpoint	3144.0	3144.0	5000.0	A
3	3	3rd settings	7-9-2023 10:34	Working	Ps3 setpoint	4353.0	4353.0	5000.0	A
					Ps4 setpoint	4478.0	4478.0	5000.0	A
					Str1 x setpoint	4269.0	4269.0	5000.0	A
					Str1 y setpoint	5000	5000	5000.0	A
					Str2 x setpoint	4385.0	4385.0	5000.0	A
					Str2 y setpoint	4308.0	4308.0	5000.0	A
					Str3 y setpoint	5000	5000	5000.0	A
					Str4 x setpoint	5000	5000	5000.0	A
					Slitxy1 x gap setpoint	2.0	2.0	1.0	mm
					Slitxy1 x offset setpoint	2.0	2.0	1.0	mm
					Slitxy1 y gap setpoint	1	1	1.0	mm
					Slitxy1 y offset setpoint	1	1	1.0	mm
					Slitxy2 x gap setpoint	1	1	1.0	mm
					Slitxy2 x offset setpoint	1	1	1.0	mm
					Slitxy2 y gap setpoint	1	1	1.0	mm
					Slitxy2 y offset setpoint	1	1	1.0	mm
					Slitxy3 x gap setpoint	1	1	1.0	mm
					Slitxy3 x offset setpoint	1	1	1.0	mm

OPERATOR ADVANCED

LOAD NEW VALUES WRITE NEW VALUES SAVE VALUES

System On/Off ON

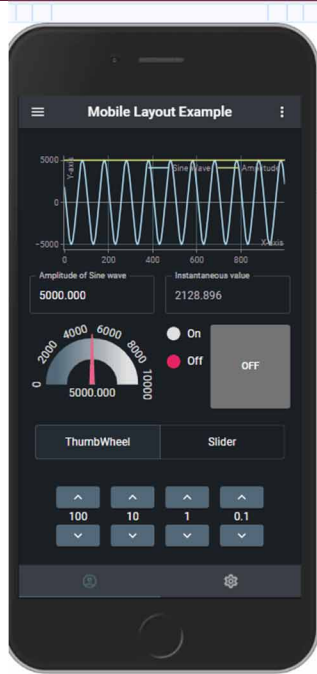
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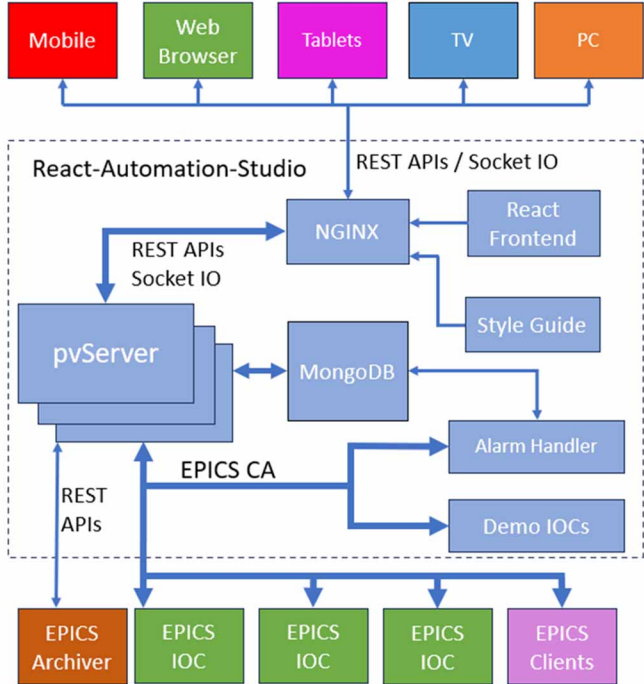
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 - Themeable

React Automation Studio = Real-time Control With The Web



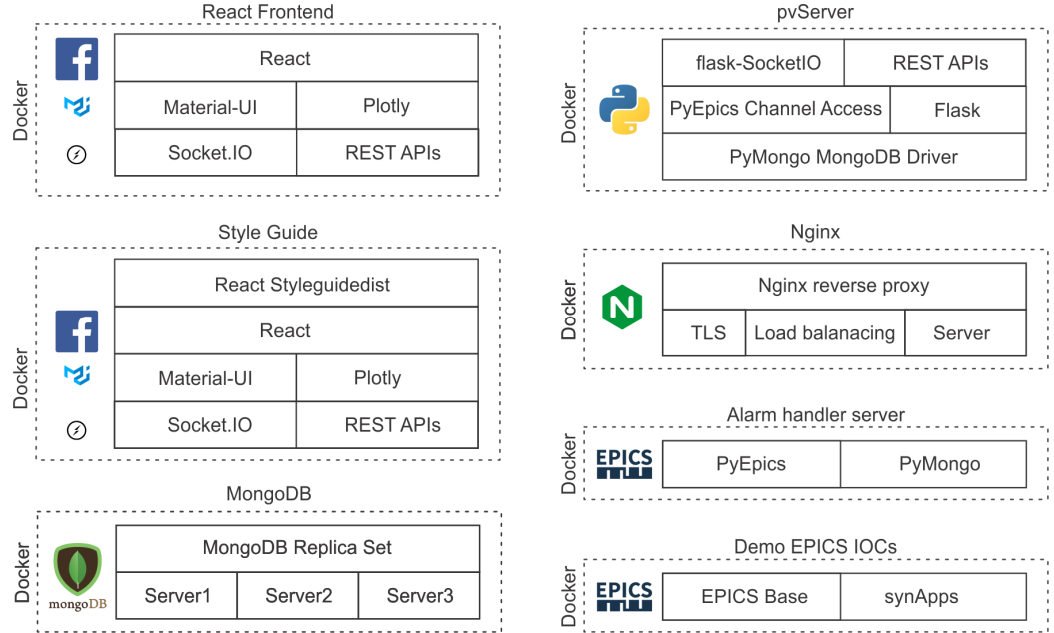
System Architecture

Block Diagram



Orchestrated with Docker Compose

Microservices



Provided as a Git mono-repo

Milestones

- V1.00 October 2019 - Initial Public Release
- V2.0.0 August 2020 - Moved to React Hooks, centralised all the Widgets, separated all the App Logic, Preview of the Alarm Handler, Load/Save
- V2.1.0 October 2020 - Added Epics Archiver Viewer component
- V2.2.0 January 2021 - New Array Container, New Light Panel
- V3.0.0 May 2021 – MongoDB, Web based administration, Nginx, Alarm Handler supports Signal notifications, changed the Graphing Library to Plotly, External Authentication via Active Directory or Google Authentication
- V4.0.0 August 2022 Updated to the latest React, Material UI and updates to pvServer
- Current V4.0.2 July 2023 Minor updates
- Future V5.0.0 In testing

Demos

React Automation Studio

- Mobile Demos
 - MOBILE DEMO 1
 - MOBILE DEMO 2
 - EPICS DEMOS
 - 3D DEMOS
- Desktop Demos
 - TABLE CONTROL DEMO
 - BEAM LINE CONTROL DEMO
 - MOBILE DEMO 1
 - MOBILE DEMO 2
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 - 3D DEMOS
- Whats New
 - V4.0.2 Thursday 13 July 2023 Minor Updates:
 - Package updates to all Node modules
 - Updated to the latest Node LTS
 - MUI has been updated to the latest packages
 - Minor Bug Fixes and Updates:
 - A few minor bug fixes to the pvServer
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 - Changed the contact information to Github Discussions:
<https://github.com/React-Automation-Studio/React-Automation-Studio>
- Staging
 - STAGING
- Preview
 - ALARM HANDLER DEMO
 - VAULT DEMO
 - LOADSAVE EXAMPLE
 - ARCHIVER DATA VIEWER DEMO
- Help
 - HELP AND STYLE GUIDE

 Mobile Demos

MOBILE DEMO 1

MOBILE DEMO 2

EPICS DEMOS

3D DEMOS

 Desktop Demos

TABLE CONTROL DEMO

BEAM LINE CONTROL DEMO

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 Staging

STAGING

 Preview

ALARM HANDLER DEMO

VAULT DEMO

LOADSAVE EXAMPLE

ARCHIVER DATA VIEWER DEMO

 Help

HELP AND STYLE GUIDE

Acknowledgements

- Justin Abraham
- Giovanni Savarese
- Davide Macarto
- Ivo Hannak

- Please get involved:
<https://github.com/React-Automation-Studio/React-Automation-Studio>

- Or contact:
 - William Duckitt wdduckitt@sun.ac.za
 - Justin Abraham jk.abraham@ilabs.nrf.ac.za

Thank you

- Any questions?