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ISIS Neutron and Muon Source
Welcome

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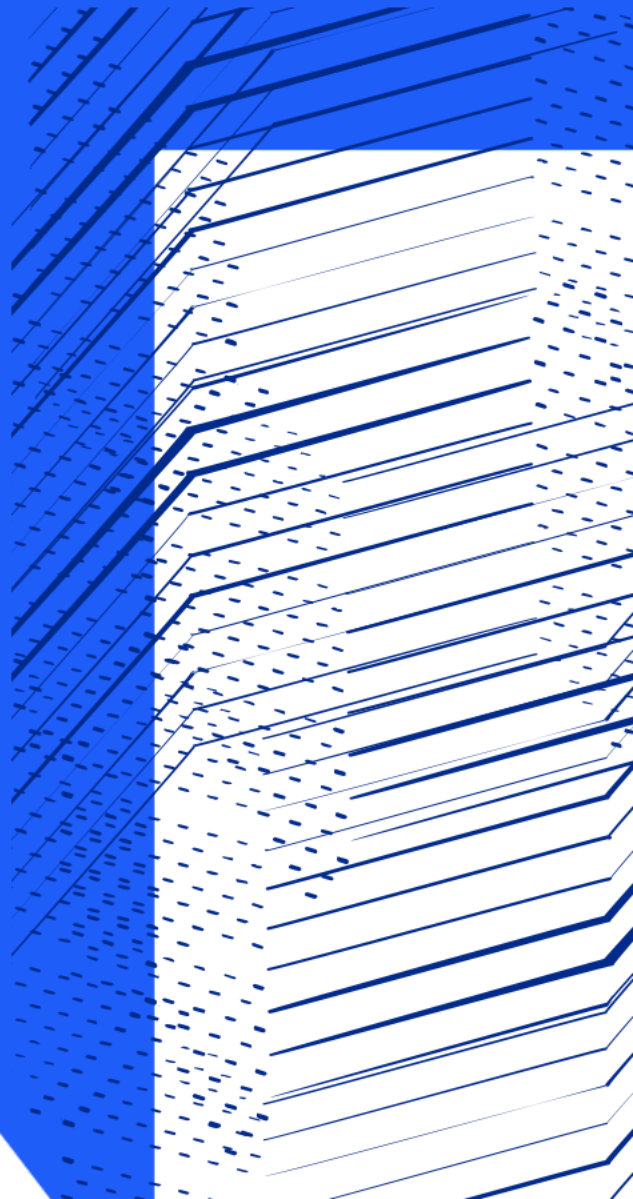
EPICS Transition at the ISIS Accelerators

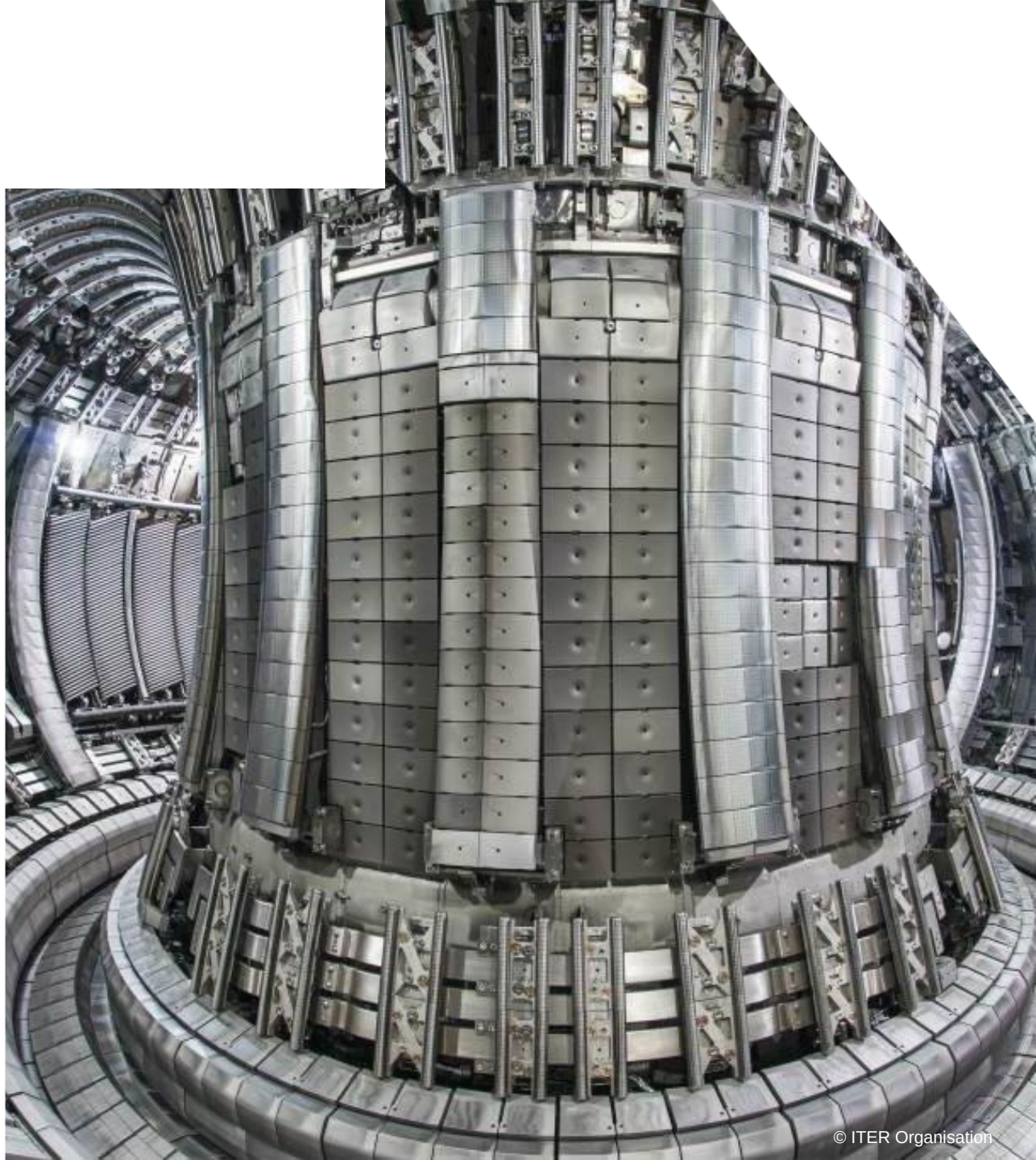
Ivan Finch

What we use now,
Where we're going,
How we're going to get there



Collaborations

- First-time meeting the wider EPICS Community and asking for help was at Cadarache / ITER 2019!
- Received valuable advice – foremost having a good naming convention document and sticking to it
- EPICS Oxfordshire is running again – ISIS, Diamond, CLF, and CCFE. But last also involved Daresbury. Next planned for Jan / Feb; if interested let me know!



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What We Use Now

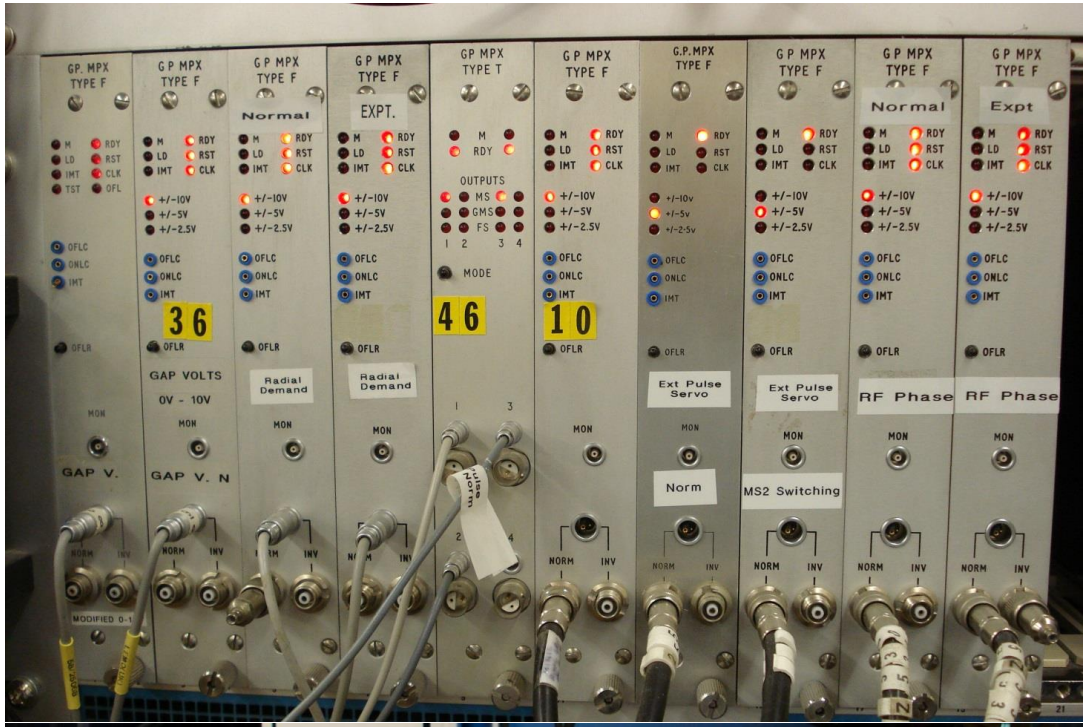
Our existing hardware and software

Heterogenous Hardware

There are three generations of hardware (MPX, STE, and CPS) developed in-house and managed by the controls group. We still have a small amount of controls hardware (MPX crates) from the 1980s.

The largest set of hardware the controls system interfaces with is our CPS systems.

As well as these systems we need to interface with a variety of PLCs via FINS and Modbus, and soon CIP. Also National Instruments PXI crates and other more exotic hardware.



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Vsystem at ISIS

EPICS will be our third control system.

Currently we use the proprietary closed-source Vsystem control system, which is a complete package including alarm handler and logging. We have customised this system with our own MQTT interface, data archiving, and web-based alarm viewer.

The only other accelerator site that uses Vsystem is ATLAS at Argonne.

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Where We're Going

What our implementation of EPICS will look like

Transition Decisions

Made

- favour PVAccess over Channel Access
- prefer IOCs (or equivalents) in containers on centrally managed servers
- Phoebus for user interaction

Deferred

- selection of technology for archiving of PVs
- selection of alarm handler software

Opportunistic

- Allow obsolescence to take care of old hardware

Fortunate

- Already a dedicated controls network

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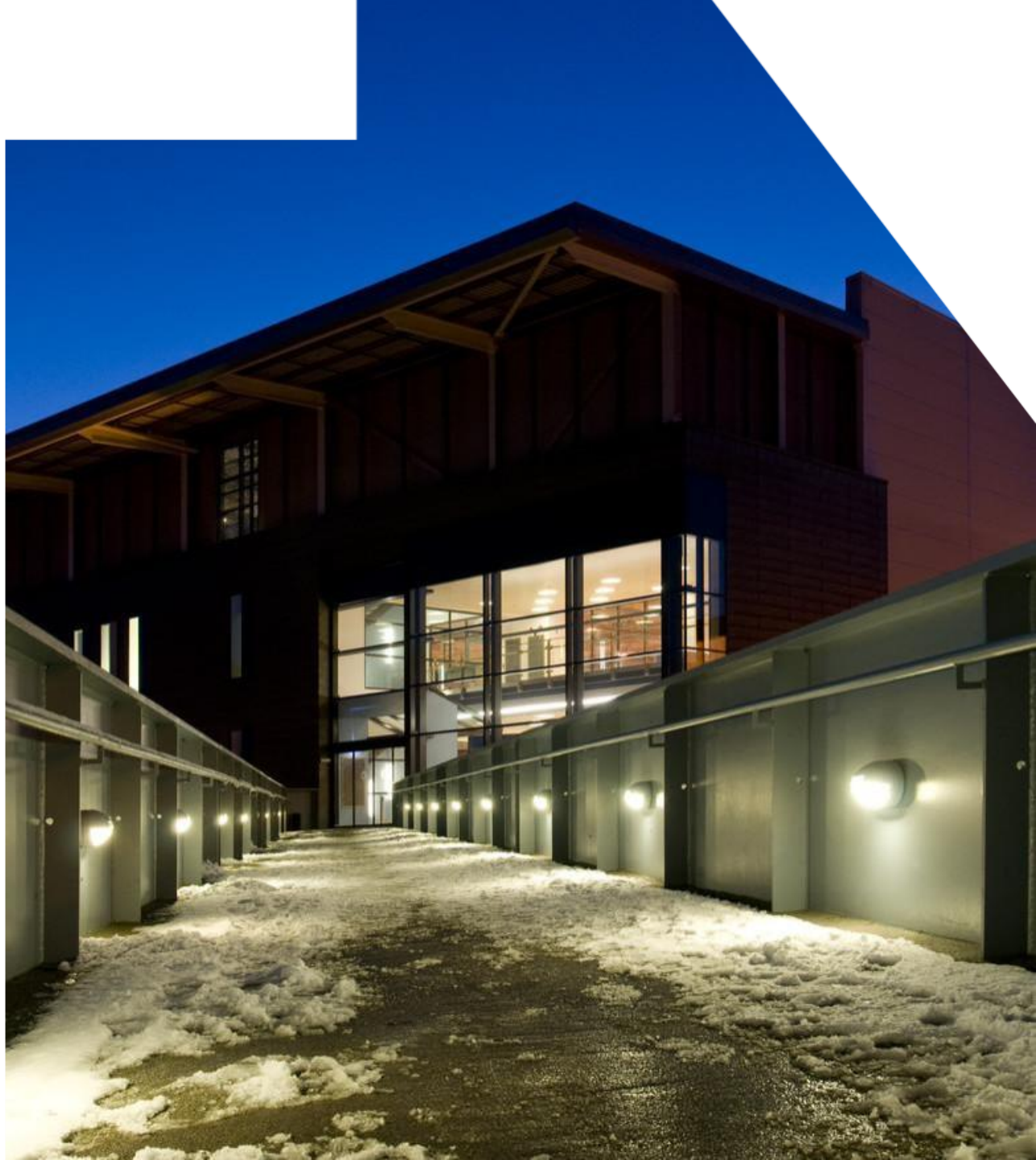
How We're Getting There

The transition from Vsystem to EPICS

Hardware Interfaces

- First from-scratch IOCs developed to interface with Omron PLCs via the CIP protocol
- We have tested community developed EPICS IOCs interfacing with:
  - FINS (used for existing target station Omron PLCs)
  - MODBUS (used by synchrotron RF and other users)
  - Proprietary XML format used by our CPS & PXI crates
- We will not be interfacing MPX and STE directly to EPICS, instead supporting to obsolescence through `PVEcho`



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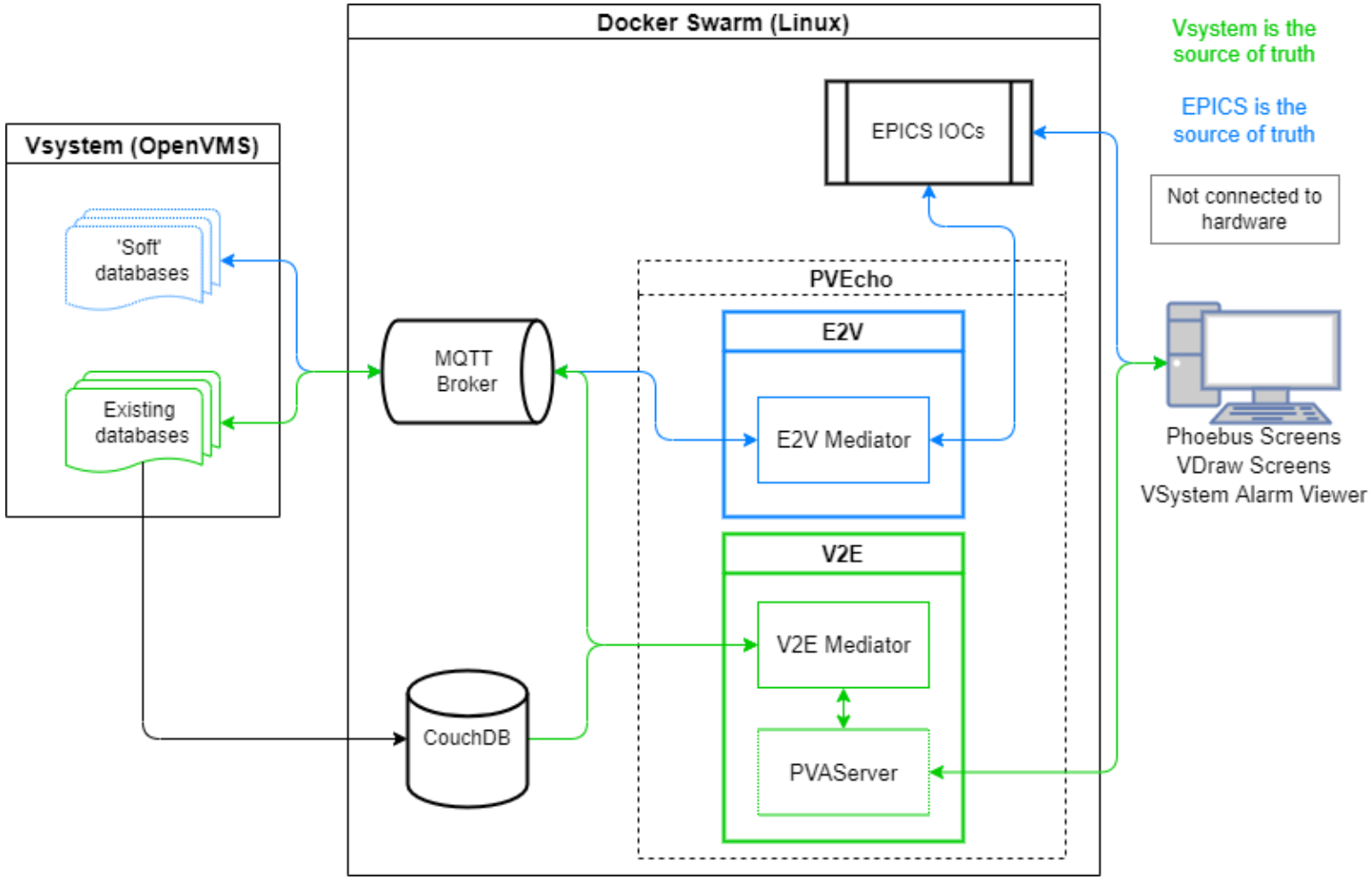
PVEcho – Bridge between EPICS and Vsystem

- ~10k Lines of Code (Python), of which ~7.5k LOCs are unit and integration tests
- Supporting systems include Vsystem events driven Python code, Mosquitto (MQTT broker), CouchDB, etc.
- Deployed and working since Dec 2021, but still under development



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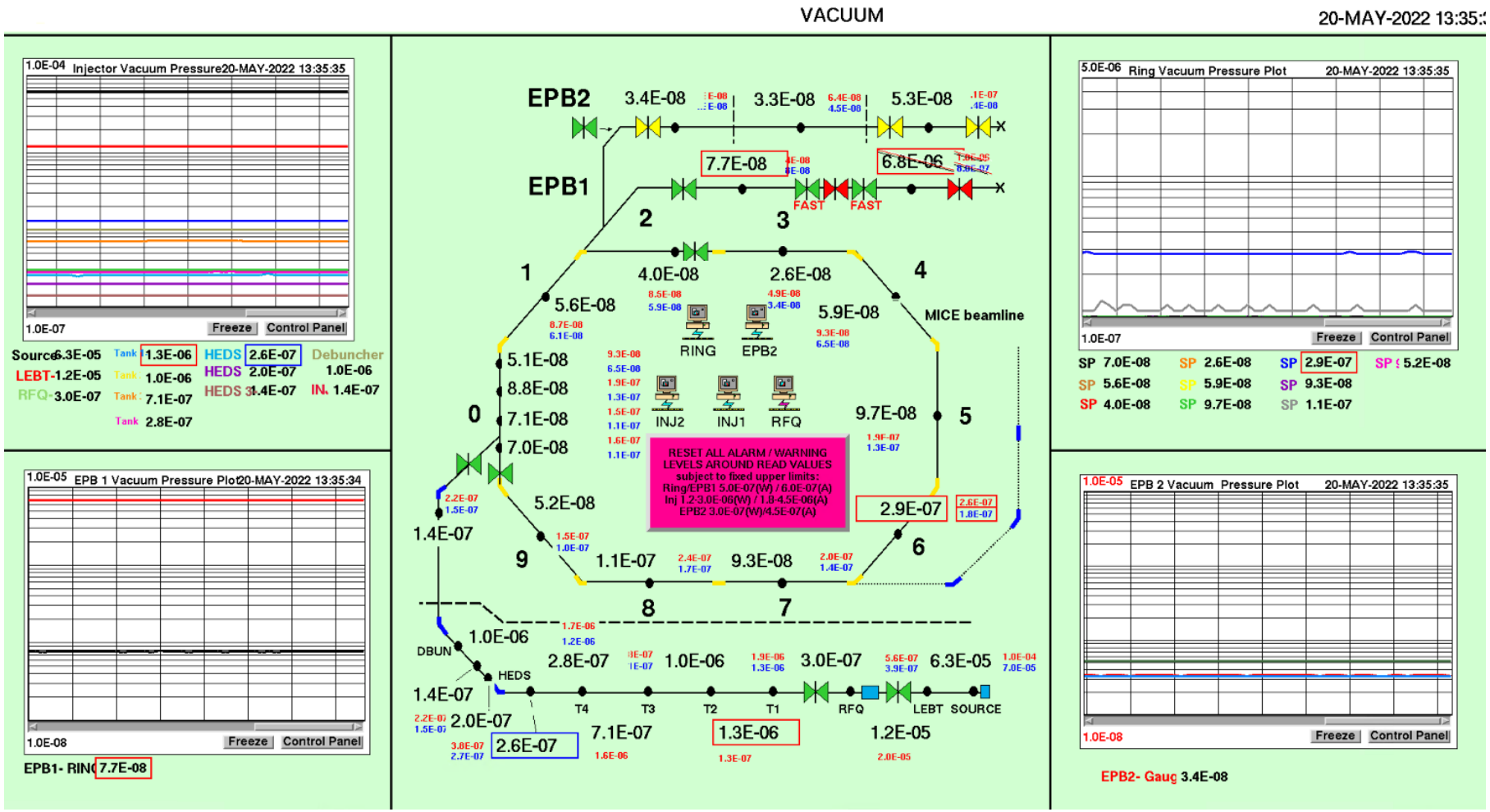
Screens Conversion (vcdParser)

- Vsystem control screens are saved in a binary file format (VCD files). The format of these VCD files was unknown, but through experimentation the file format has been decoded.
- EPICS has a variety of GUI tools, but most development is concentrated in CS Studio (used in ISIS Experiment Controls) and Phoebus (closely related). We have selected Phoebus. Phoebus uses XML files which may largely be understood by inspection.
- We have written a program, `vcdParser`, which automatically converts Vsystem control screens into Phoebus control screens.

Screens Conversion – Vsystem Original



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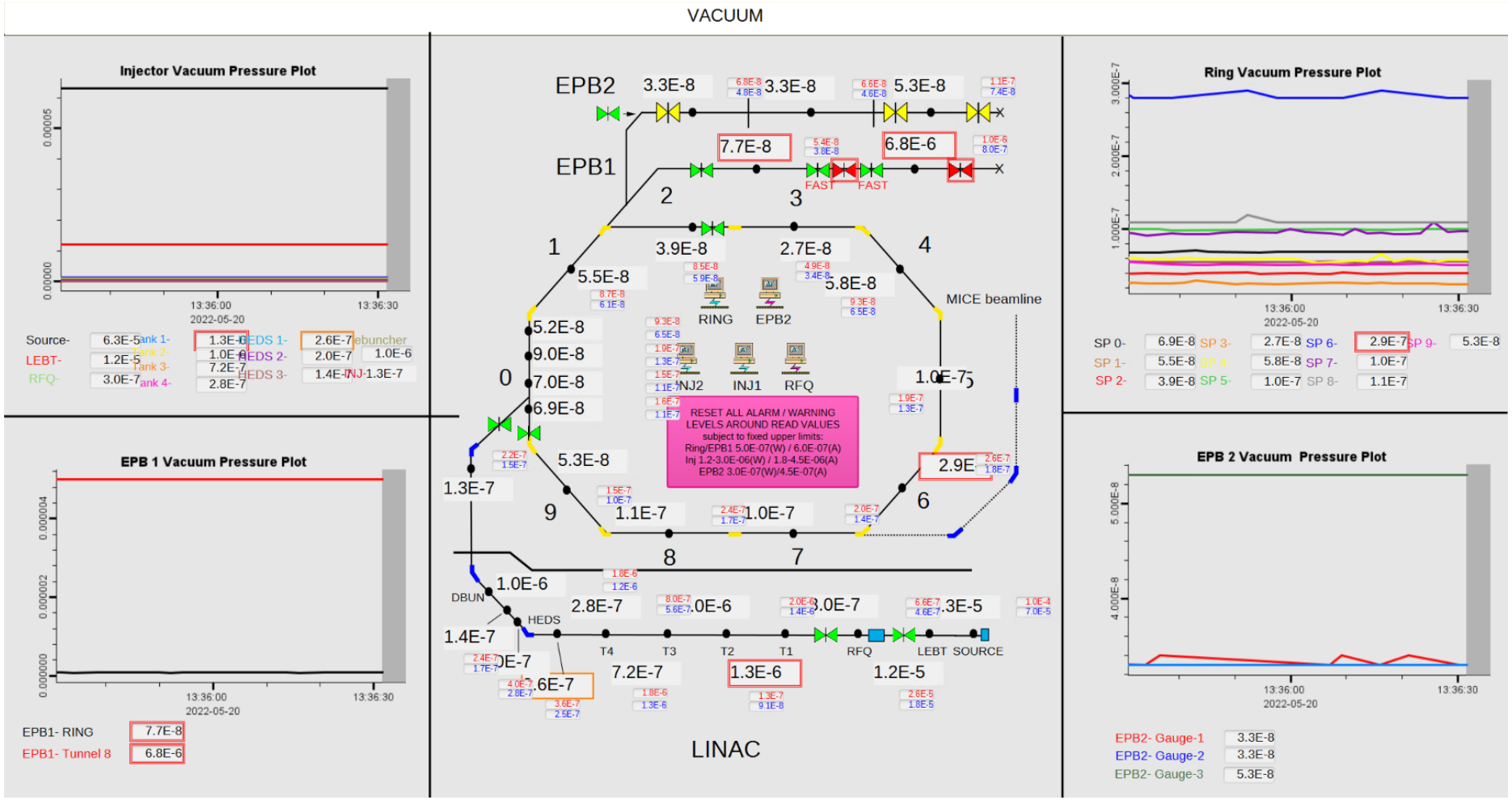
Automatically Converted Screen (VCDParser)



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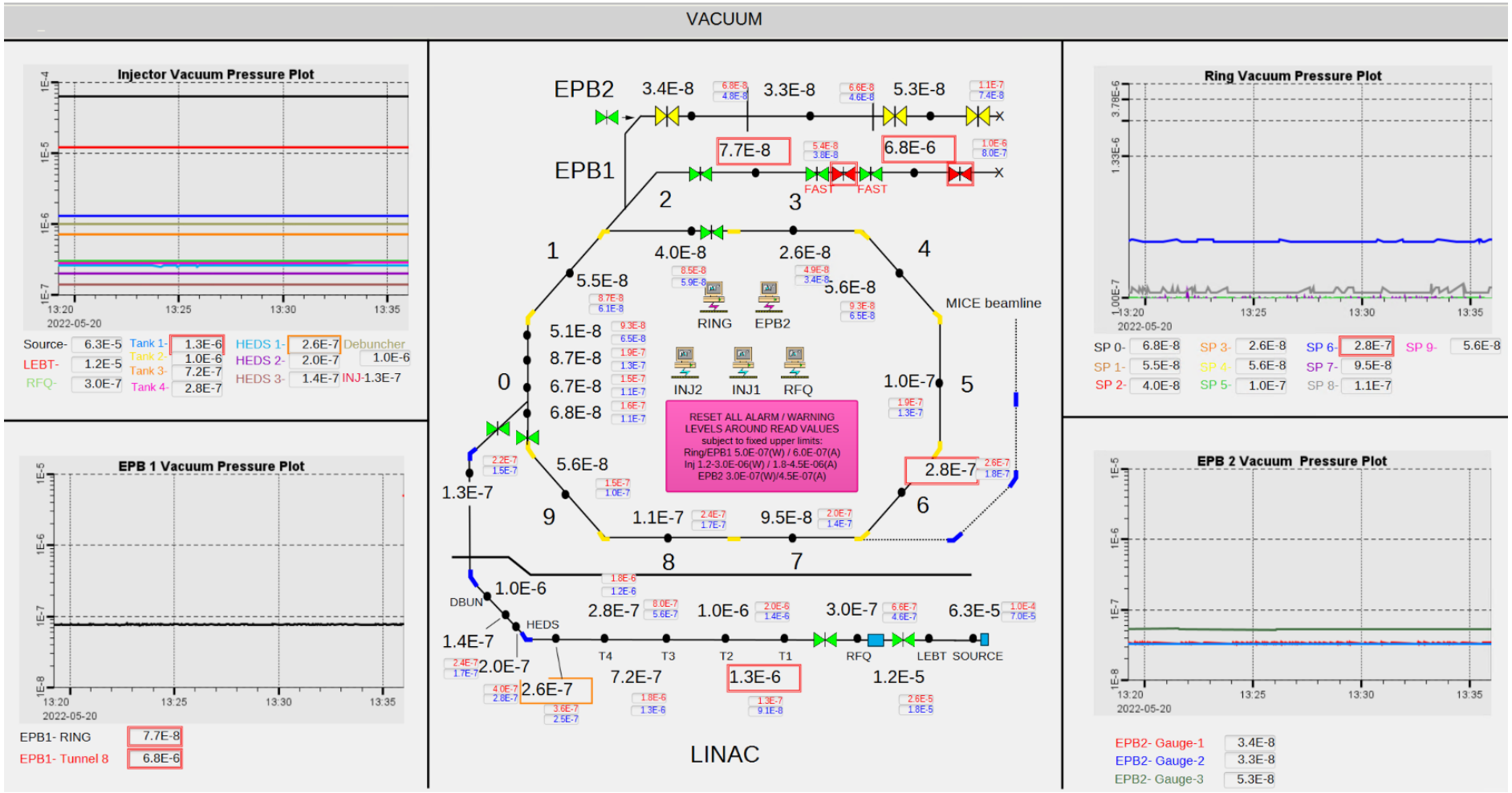
Manually Corrected Screen (data from pvecho)



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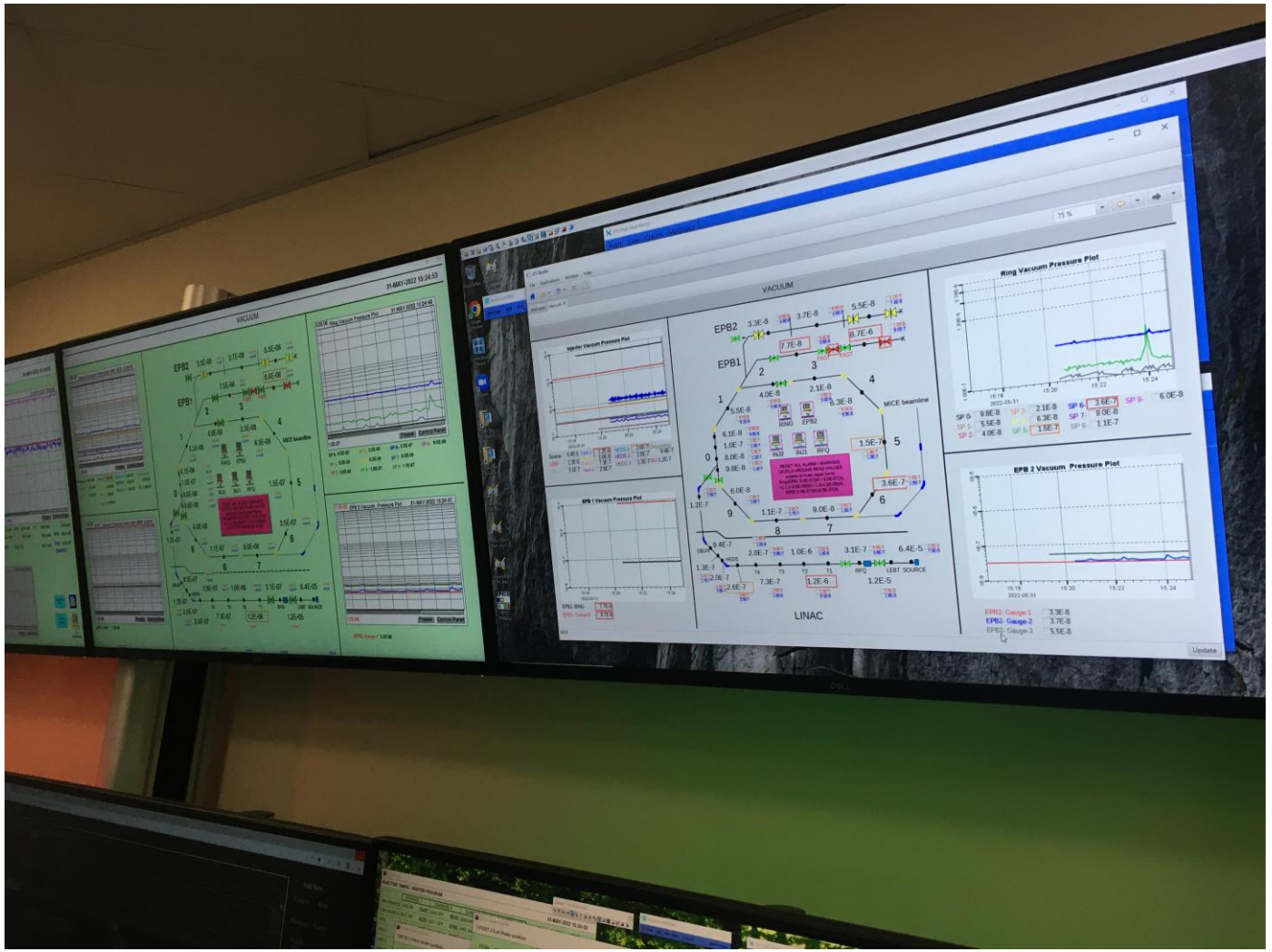
Screen in ISIS MCR

- Successfully running since February 2022.
- Deployment designed to build user confidence, gather feedback from MCR crew, and develop experience in controls team.
- It has highlighted a number of issues that must be resolved before we can continue deployment of converted screens, especially keeping manual tweaks as the converter improves.



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But first… EPICS

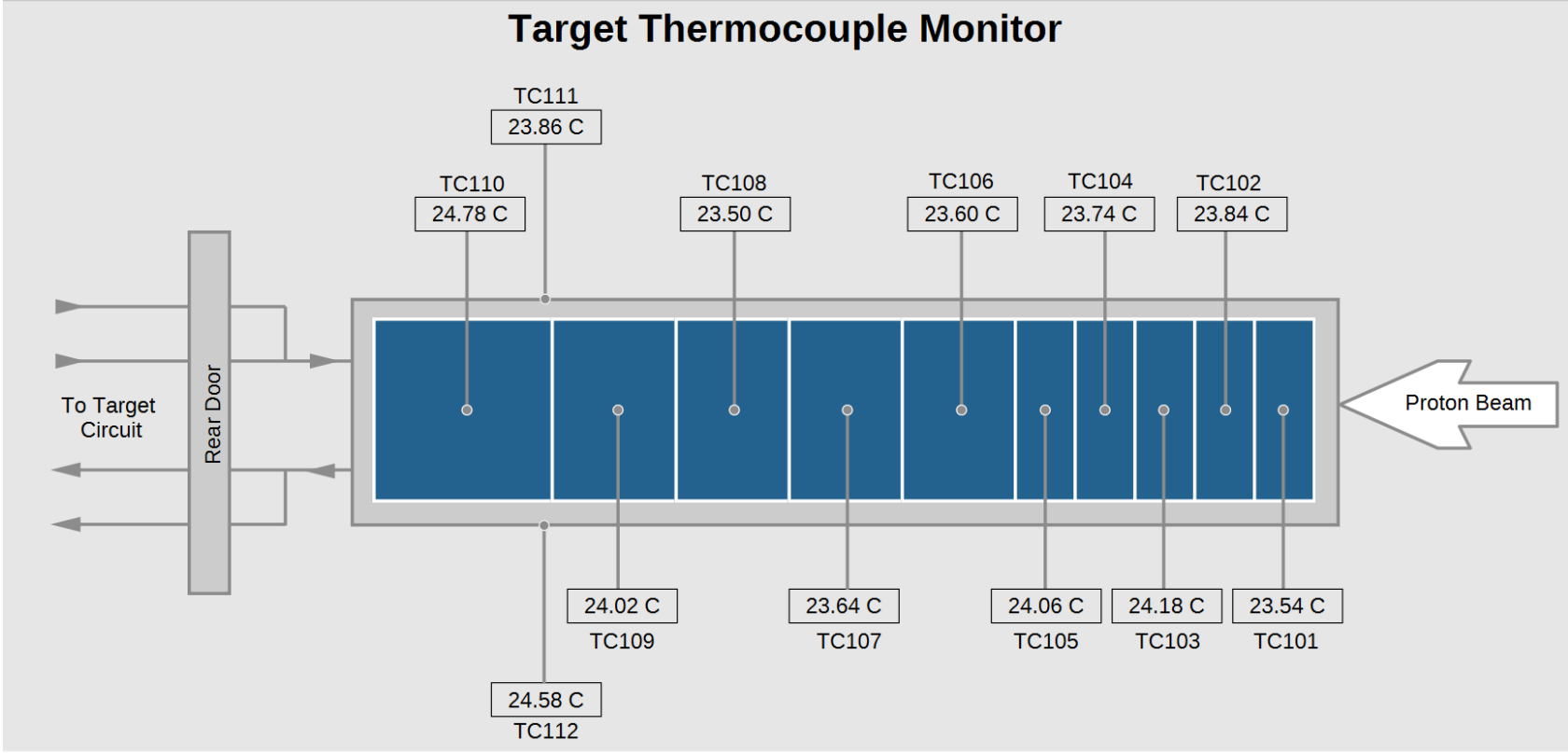
Not everything is a slow transition from our existing systems

Target Station 1 – EPICS end-to-end

- ISIS has two target stations which produce neutrons for our beamlines. Target Station 1 (TS1) has operated since the mid-80s and has undergone a major refit.

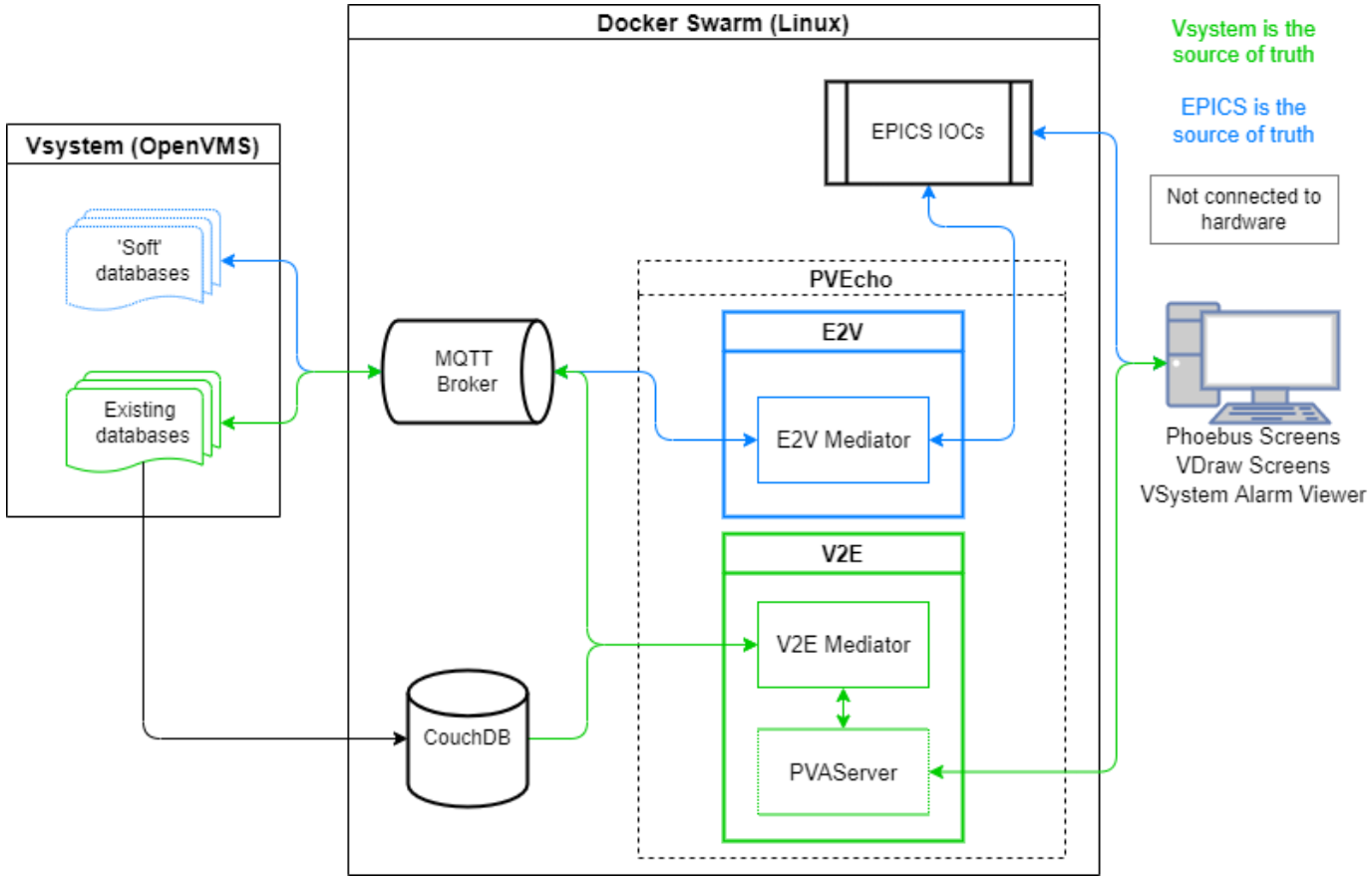
- All PLCS have been replaced with new Omron PLCs using the CIP protocol

- EPICS IOCs (actually PvaPy) and Phoebus control screens



PVEcho – Bridge between EPICS and Vsystem

- Feed alarms from EPICS to Vsystem so that we need only run one alarm handler in the MCR
- Values from EPICS into Vsystem to allow us to reuse existing applications (specifically the halo steering)
- Allow us to reuse our existing archiving solutions



Challenges

Docker development on Windows with PVAcess

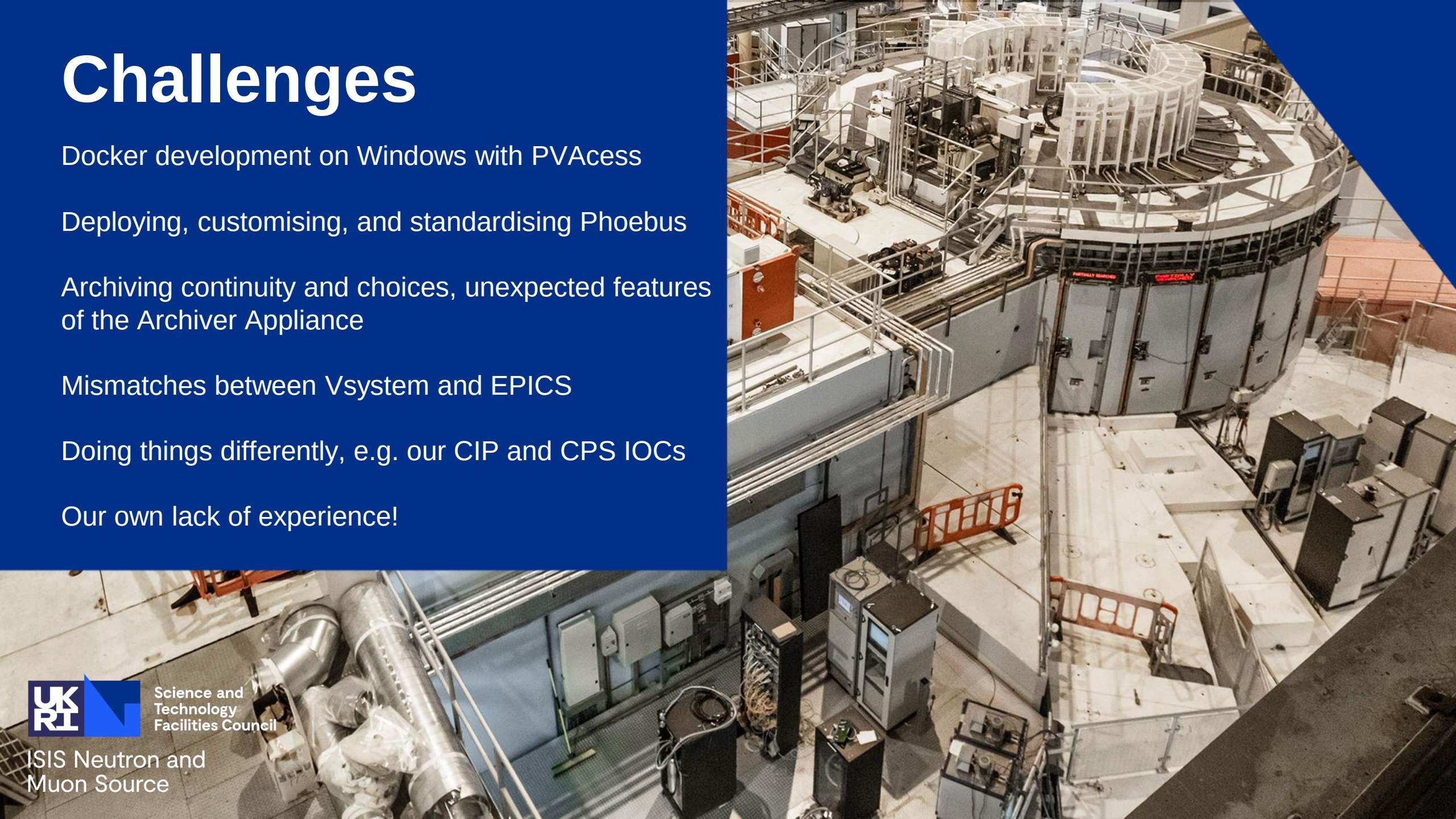
Deploying, customising, and standardising Phoebus

Archiving continuity and choices, unexpected features of the Archiver Appliance

Mismatches between Vsystem and EPICS

Doing things differently, e.g. our CIP and CPS IOCs

Our own lack of experience!



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Questions?

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Thank you

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