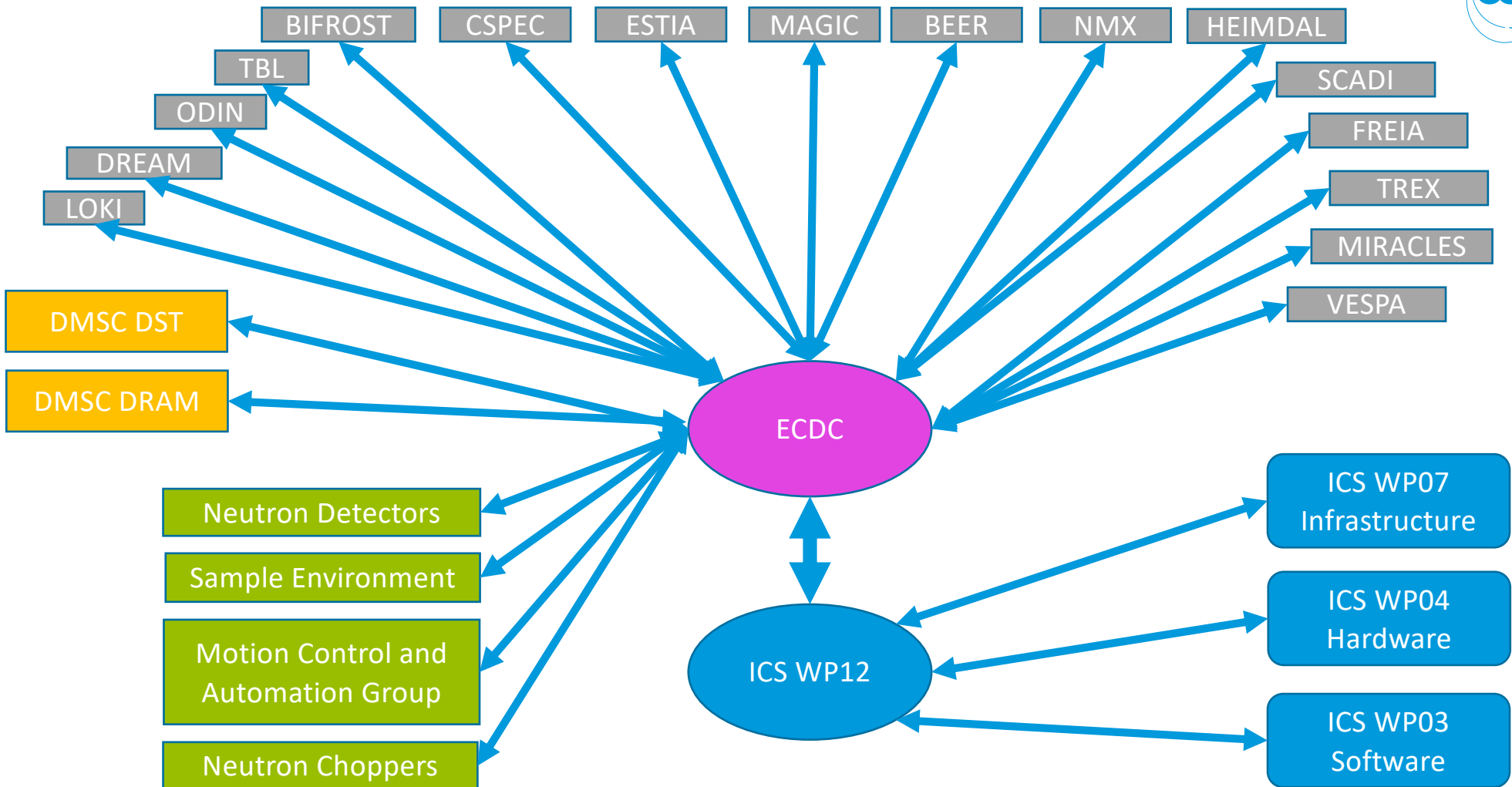EUROPEAN
SPALLATION
SOURCE

Commissioning Workshop

Experiment Control and Data Curation Group

PRESENTED BY ~~TOBIAS RICHTER~~ MATT CLARKE

2022-10
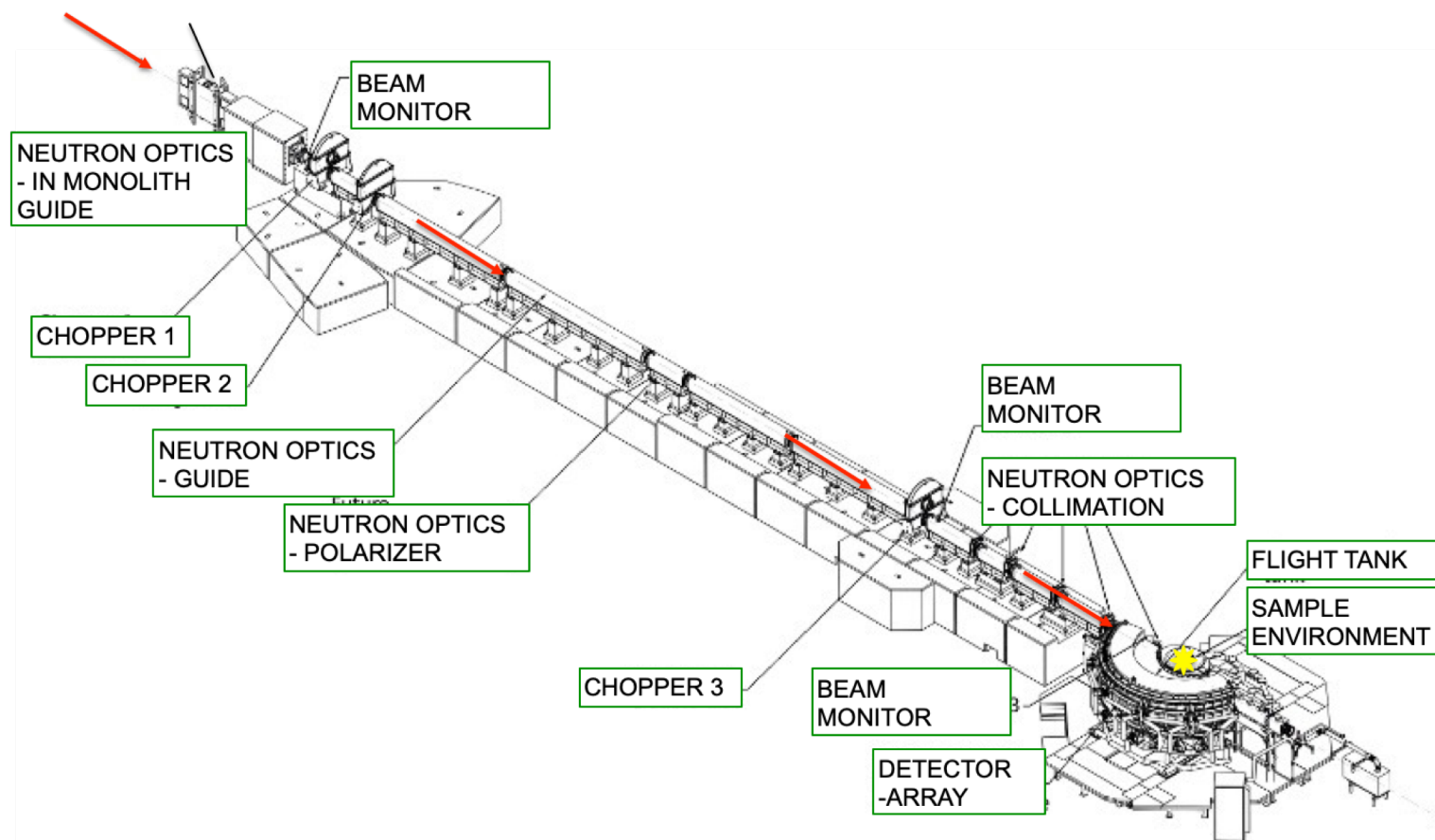
What is ECDC?

ECDC Architecture

A time-of-flight neutron instrument

BEAM MONITOR

NEUTRON OPTICS - IN MONOLITH GUIDE

CHOPPER 1

CHOPPER 2

NEUTRON OPTICS - GUIDE

NEUTRON OPTICS - POLARIZER

BEAM MONITOR

NEUTRON OPTICS - COLLIMATION

FLIGHT TANK

SAMPLE ENVIRONMENT

CHOPPER 3

BEAM MONITOR

DETECTOR -ARRAY

Instrument Readout Streaming Architecture

Result of an extensive test and evaluation phase involving many partners
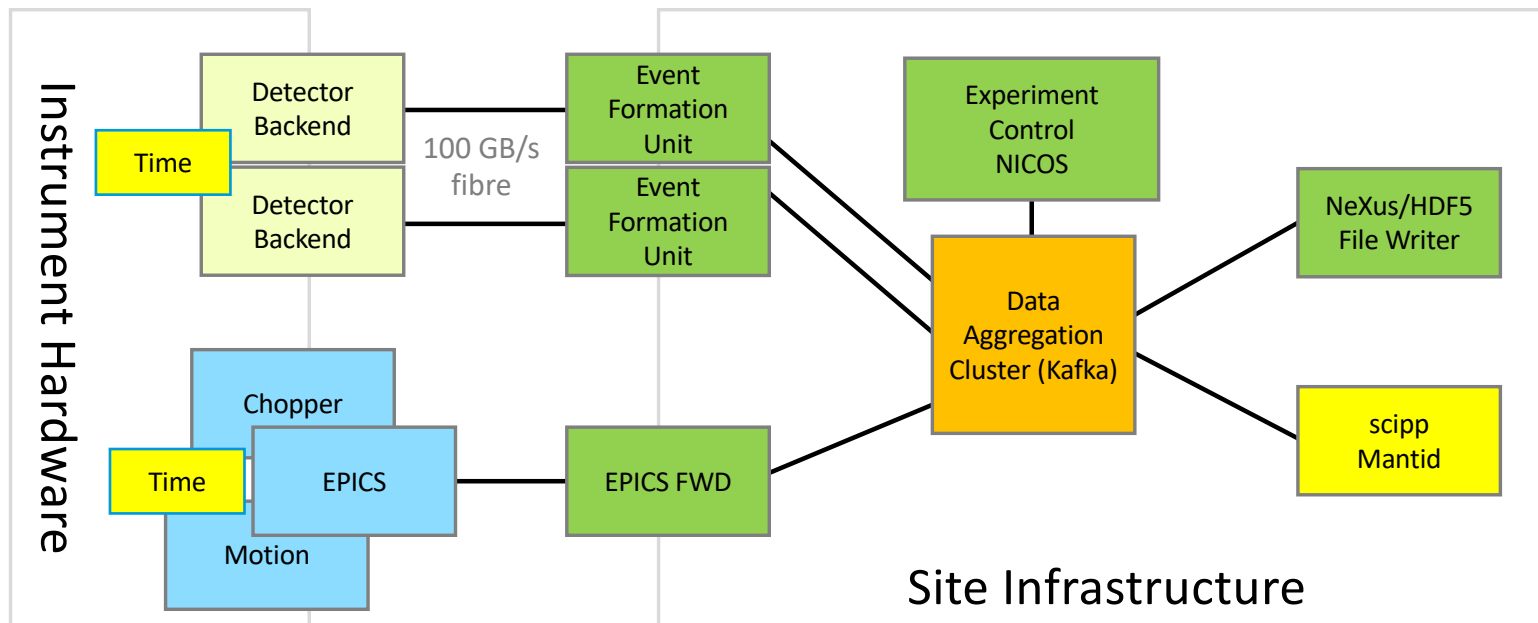
Data Acquisition

## Asynchronous and Timestamped

Every data source sends their information independently asynchronously:

- detectors & beam monitors & cameras

- choppers

- motion

- sample environment
  (temperature, pressure, fields)

Data only updated on change.

Flexible, sparse efficient storage, little hardware support needed, adequate timing synchronisation is critical.

Post processing needed in most cases.

updated value
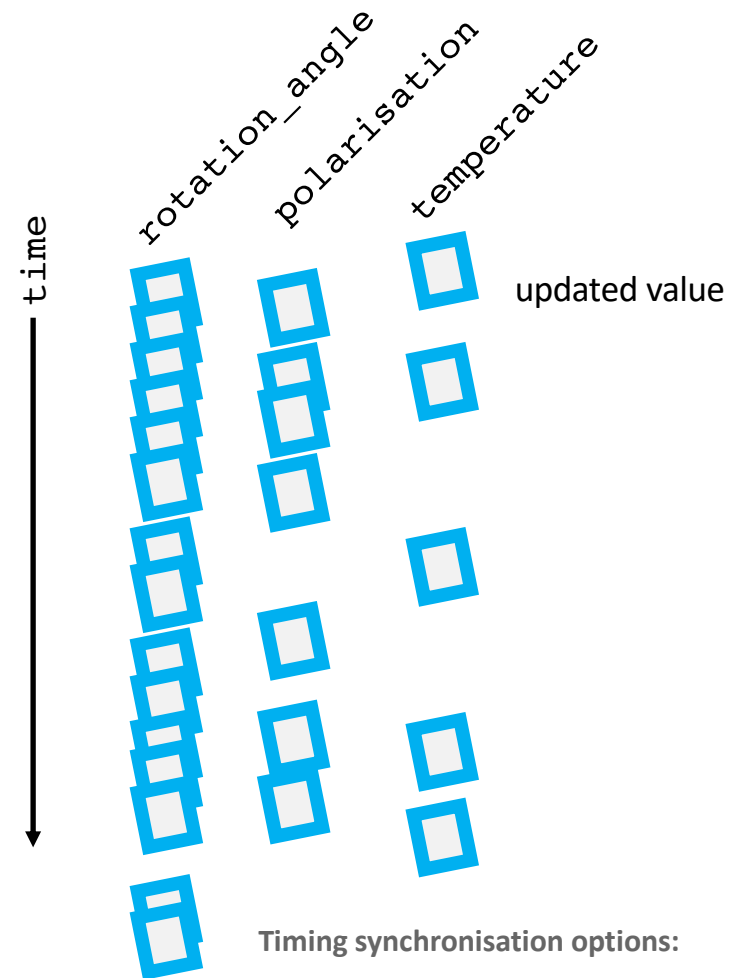
Timing synchronisation options:

- **MRF EVR (Detectors, Choppers)**

- **PTP (Beckhoff: Motion, Sample Environment)**

- **NTP (Slow Sample Env, e.g. temperature)**
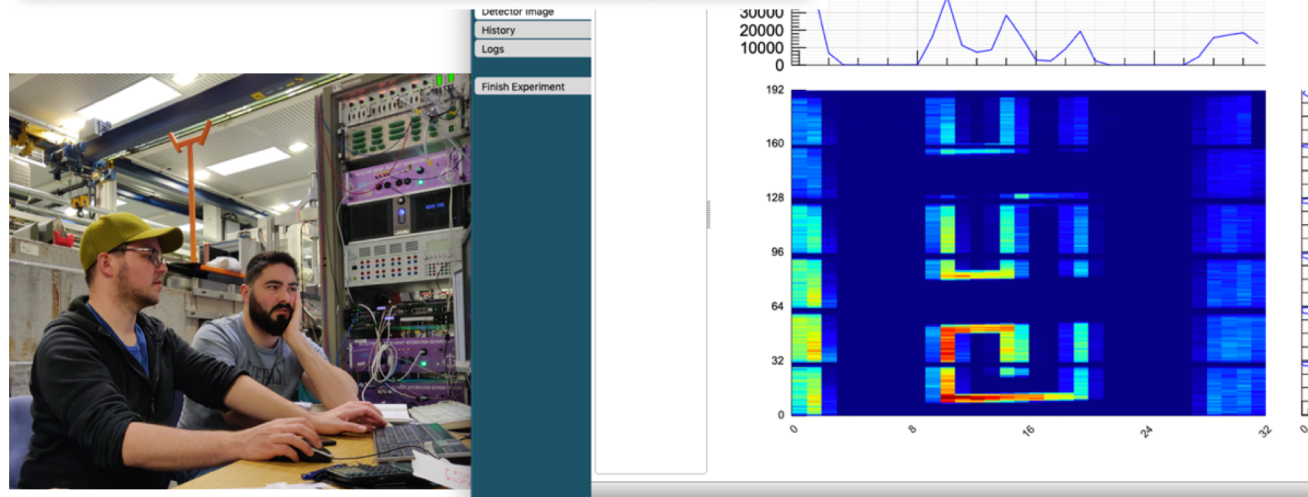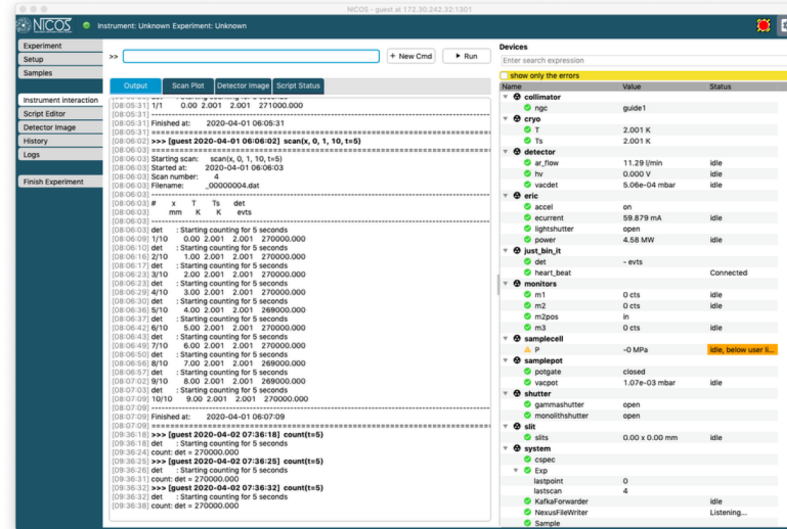
Experiment Control Programme

NICOS

Integrated high level interface and device abstraction to low level EPICS controls.

- Python CLI

- Qt user interface

- Extensible and customizable

Current activities:

- baseline UI delivery for LoKI, DREAM, ODIN and BIFROST

- filewriter control and configuration
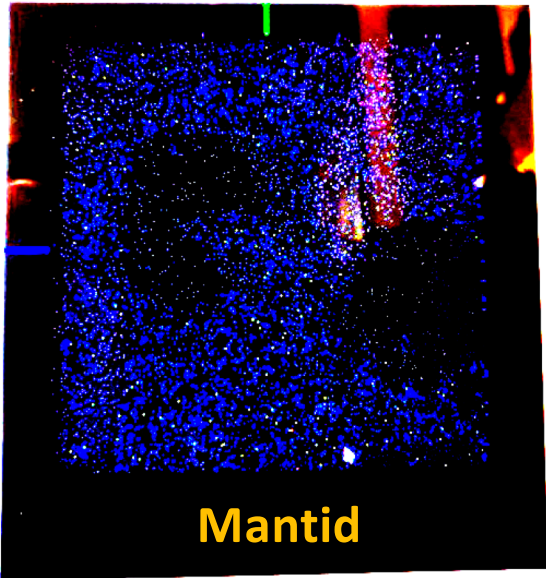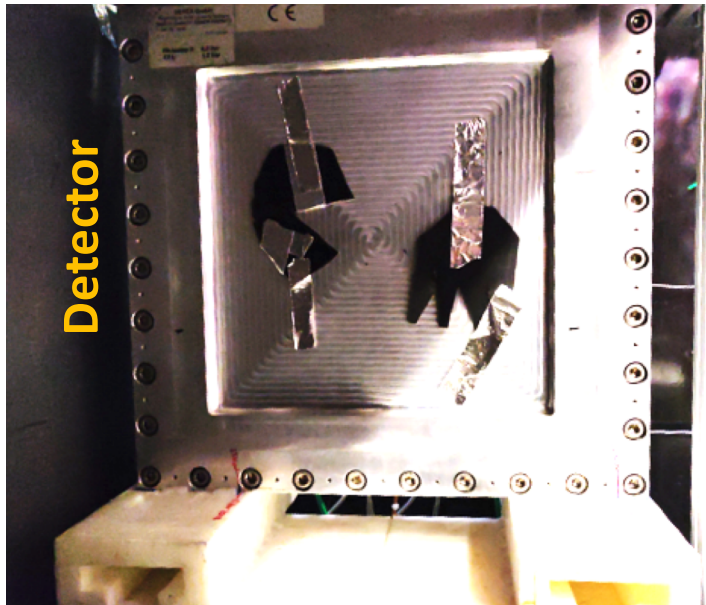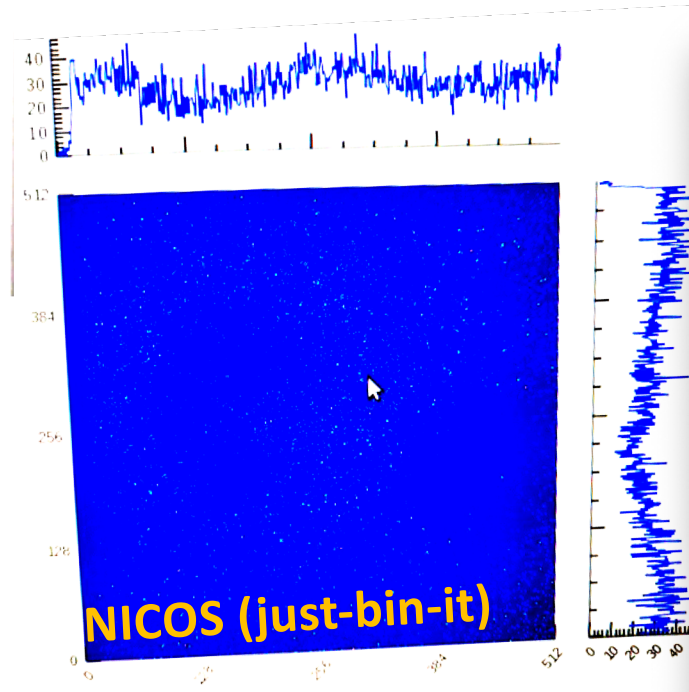
- sample and proposal information

Historic Driver of Progress:
DAQ & Controls Verification Beamtimes
December 2018 & September 2019
@ HZB (BER II V20)

Readiness Report:
ESS-1511935

Detector

Mantid

NICOS (just-bin-it)

SciChat

Integrated Data Acquisition with absolute Timing Reference
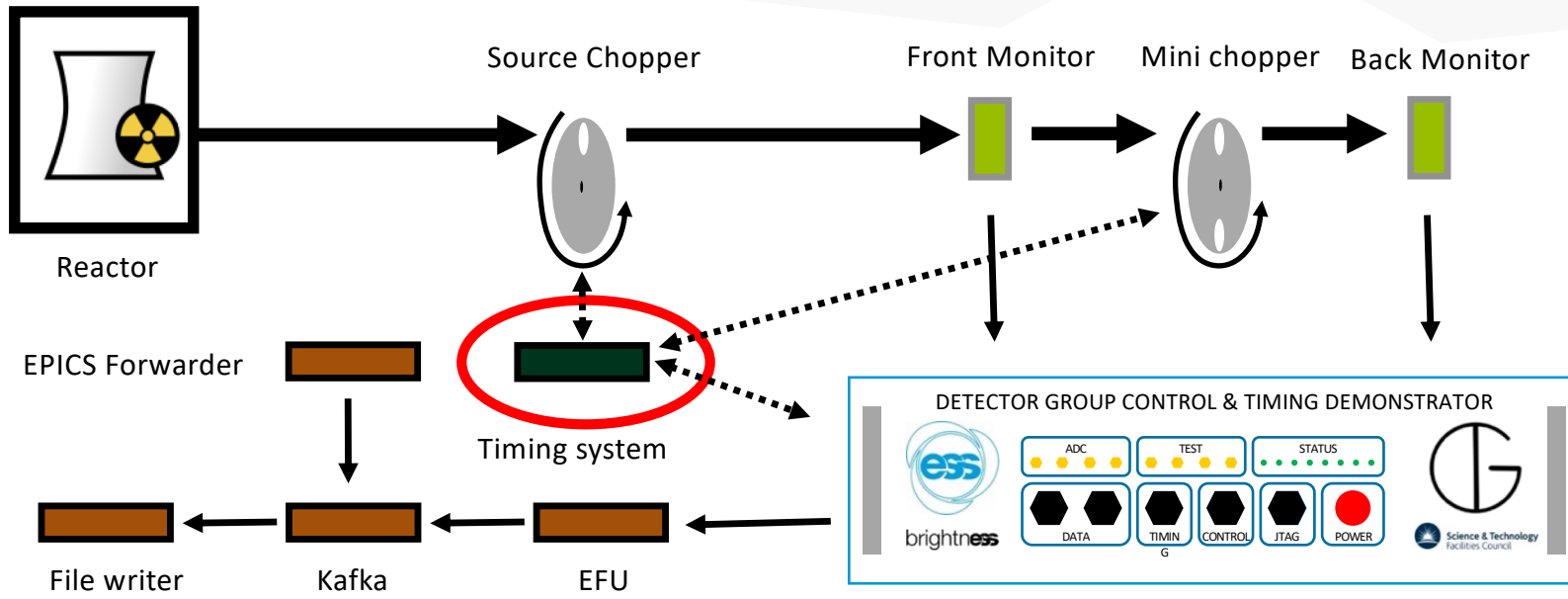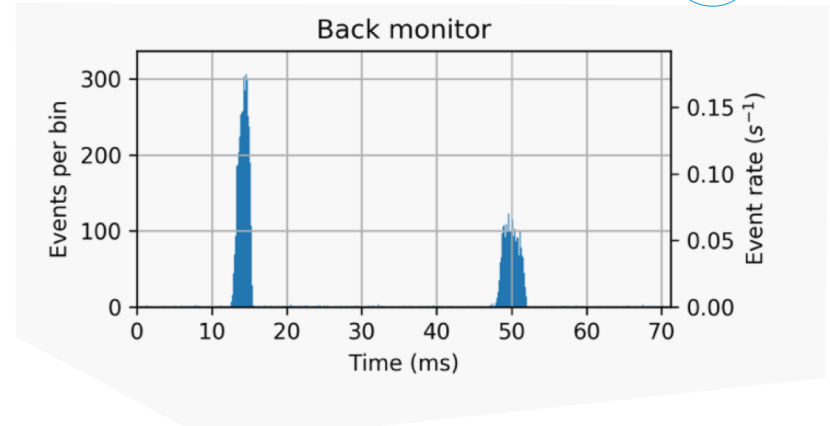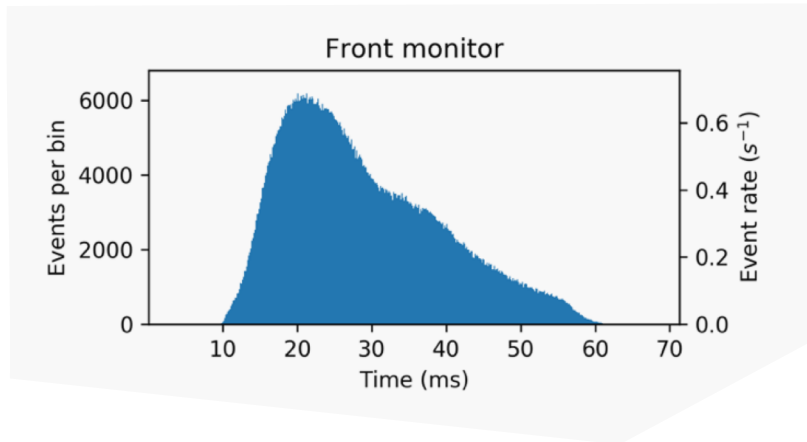
Current Activities

Preparing for cold commissioning
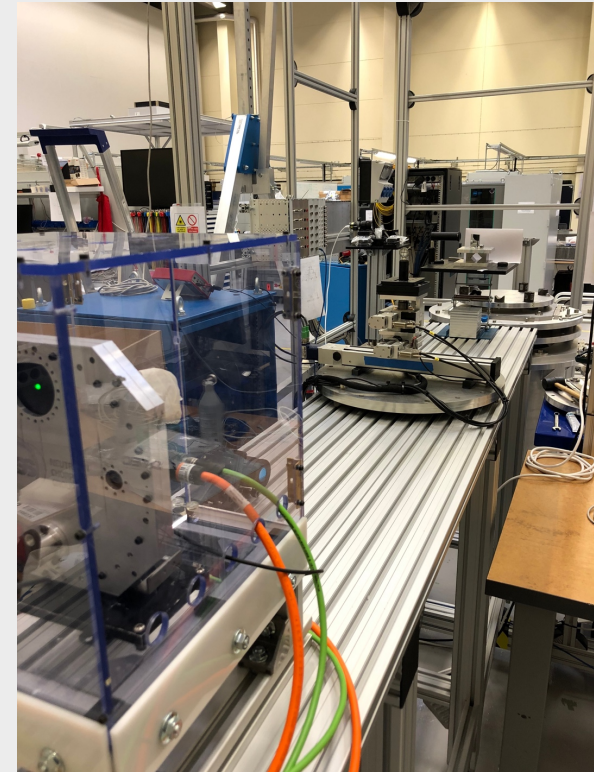
167 m²

Integration Platform (Instrument) Ymir in B02
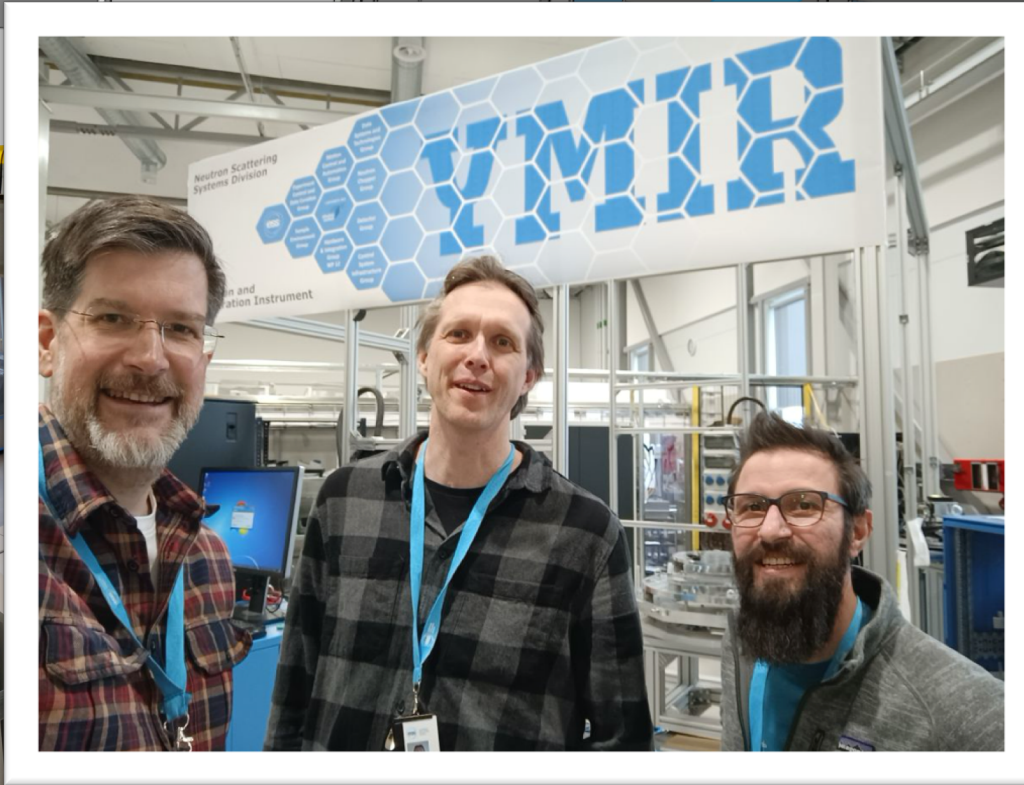
Stakeholders, Needs and Capabilities

Ymir Integration Platform

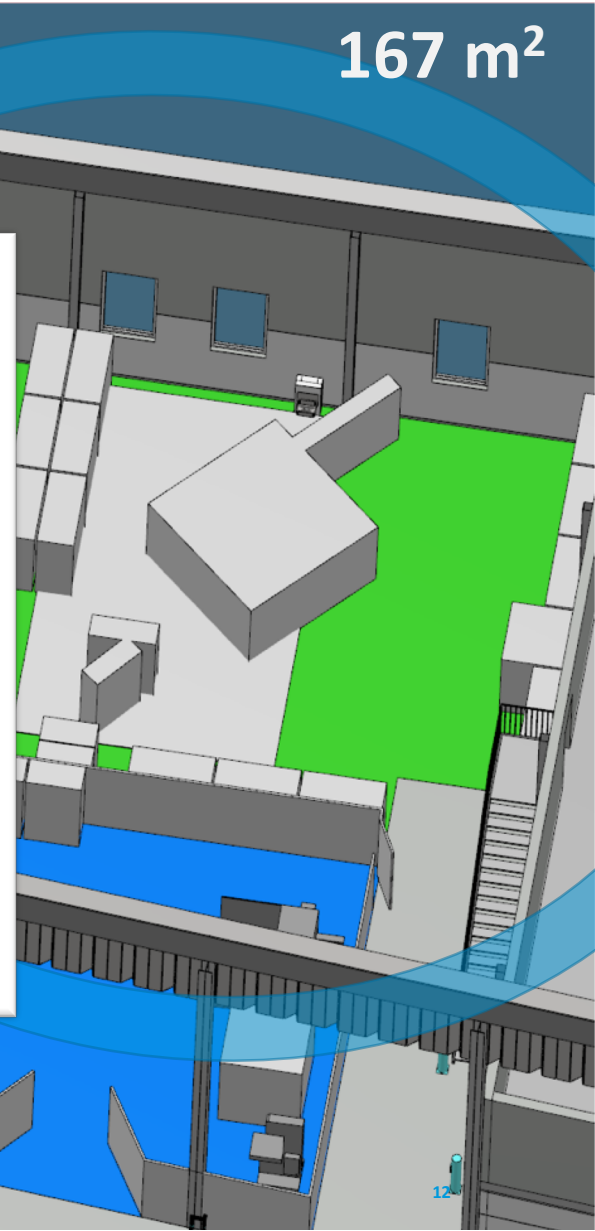| Group	Areas Responsible
ECDC	data acquisition, control, event formation
ICS WP12	EPICS device integration and infrastructure
ICS INFRA	lab networks and infrastructure
DMSC-DST	science network and infrastructure
MCAG	motion devices and low level controllers
NCG	chopper and low level controllers
SAD-SE	sample environment devices and systems
SWAP	data catalogue, logbook, sample information
DG	detectors and readout electronics

Verification Needs

- Collaboration of Teams
- Integration and Coordinated Operation of Devices and Services
- Deployment Pipeline
- Debugging and Logging
- Support
- Authentication and Permissions
- Automation
- Reliability
- Correctness
- Downstream Processing
- …

Equipment

- Realistic Sample Area
- Timing System
- Network
- Compute and Storage Capacity
- Chopper
- Detector Readout Master
- Motion Axes
- Sample Environment Equipment
- "Cabin" Workstation
- …

Intermediate ECDC Goals

To be demonstrated at Ymir
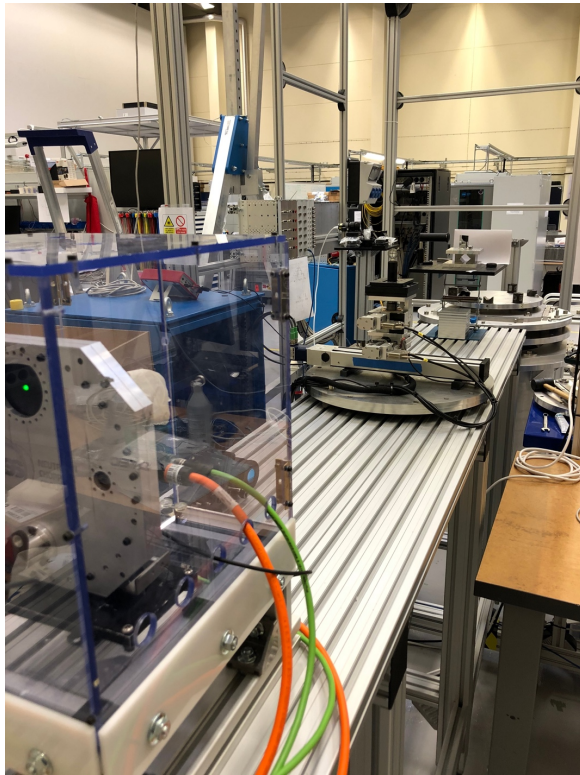
Key	Summary
ECDC-2142	Ymir: Demonstrate Kafka Authentication and Authorisation
ECDC-2153	Ymir: Light Tomography
ECDC-2466	Ymir: Connect EFU data path with NICOS control
ECDC-2143	Ymir: Have baseline deployment tools and procedures in place
ECDC-2155	Make Ymir look stunning
ECDC-2140	Ymir: Demonstrate on the fly changes to NeXus structure
ECDC-2141	Ymir: Capture sample information in NICOS
ECDC-2147	Ymir: Show use of Archiver
ECDC-2144	Ymir: Demonstrate benefits of aggregated logging and Grafana
ECDC-2145	Ymir: Remote access proof of concept
ECDC-2131	Ymir: Use SpectrumScale storage with proposal based directory
ECDC-2132	Ymir: Ingest data into a SciCat with SciChat connectivity
ECDC-2135	Ymir: Include a hardware readout system with timing
ECDC-2130	Ymir: realistic network topology
ECDC-2139	Ymir: Include "noisy" scintillator detector with HV
ECDC-2134	Ymir: Demonstrate hot plugging mobile sample environment e...
ECDC-2150	Ymir: Provide Documentation for Maintenance, Developers and...
ECDC-2152	Ymir: Scanning Project
ECDC-2137	Ymir: Demonstrate Sample Environment Timing
ECDC-2643	show workflow with multiple proposals
ECDC-2488	NICOS: Show efu status
ECDC-2489	NICOS: controlled datarates for EFU
ECDC-2151	Ymir: Show interaction with a PSS component
ECDC-2148	Ymir: Show benefits of alarm infrastructure
ECDC-2468	Ymir: Improve launch of EFUs, data sources and dashboard
ECDC-2136	Ymir: Demonstrate Motion Timing

Commissioning

Cold, Hot, First Science, Start of User Programme

- Most ICS scope is already needed for NSS system and software development.

- Most ICS scope can be tested without neutrons.

- Many systems have standard interfaces that should be well established, developed and verified, specifically for choppers and motion.

- Detector and camera integration is ongoing.

- Sample environment equipment will continue to arrive even during operations and will require continuous engagement.

- Schedule provides an extended period for cold commissioning activities

- Finding problems in the integration during hot commissioning (or later) should only be left to
  - issues that effect the neutronic performance in way that could not be tested earlier
  - unexpected problems
  - unexpected use cases

- Obviously we will require trained staff on stand-by during the later project phases to resolve any issues quickly.