IKON19

ECDC – CONTROLS – ICS
REPORT FOR IKON19

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1. INTRODUCTION

This document is meant to be a brief overview of the status and progress for mainly the instrument scope of the Experiment Control and Data Curation (ECDC) Group. It includes information on the collaboration with the Neutron Instrument and Technologies Integration Support Work Package (WP12) of the Integrated Controls System (ICS) Division. The purpose is to identify areas that would warrant a closer look or discussions at IKON 19.

ECDC with WP12 cover experiment control, beamline and device controls (EPICS, including for other NSS/SD groups), data acquisition, detector software event formation, as well as data management and curation. That puts the group into the position to be the first contact for instruments for many aspects. Where work is carried out by WP12, this is based on priorities set by ECDC.

Currently the group (excluding the section for Scientific Web Applications outside of NSS) consists of 8 staff with a background in either software engineering, science or both. To ramp up support for instruments three vacant positions are currently being filled.

Until the end of last year, the focus of the group was on developing the generic core functionality. At the ESS test and integration beamline V20 at the BER II Reactor run by Helmholtz Zentrum Berlin the group has demonstrated the readiness of that framework to cover the needs of commissioning and first science of an instrument. A report by Andrew Jackson is in CHESS under ESS-1511935. Since the beginning of this year the group is started to engage with early instruments to meet the device and domain specific needs.

As part of the reorganised structure ECDC is monitored and governed by a new forum with representatives from the NSS and DMSC Management, NSS Planning Group, ICS, as well as Rasmus Toft-Petersen and Andrew Jackson for the instrument scientists.

2. YMIR

With BER II being shut down the group relies on the mock instrument "Ymir" in the Utgård workshop for integration and testing. The installation is being successively transformed to map the designs for an instrument installed on site as truly as realistically possible. Due to the impact of COVID-19 and the corresponding limitations on access to the lab, this is going at a reduced speed. But after summer this is regaining momentum. The network and computing infrastructure are currently evolving to allow verification of the planned network segregation, data flow and also of equipment mobility between instruments (for example sample environment pool equipment).

Until the focus will shift more towards installation and other activities in the instruments on site Ymir will be the main driver and demonstration platform for ECDC, WP12 and many connected groups. For motion control and choppers systems, the respective groups have a close collaboration and continuous information exchange with ECDC. The shared interfaces for controls, timing and readout are being tested, evaluated and commissioned.

3. INSTRUMENTS

In the high-level milestones for the ECDC group the delivery of customised NICOS interfaces for the first three instruments feature prominently. That marks the move away from generic development to the specific work needed for operations at individual instruments. This is also used to drive the development of the underlying device integrations, for motion, sample environment, detectors, etc. So far, many interactions with instrument teams revolve around IKON.

The team have started to extract information from the TG3 documents to eventually establish a comprehensive plan, with timelines from now, over installations, up until hot commissioning. This includes the planning for EPICS control delivered by ICS (integrated control systems division), which is coordinated and prioritized by ECDC for NSS.

The instrument Concept of Operations (ConOps) documents, that are part of the toll gate reviews, form the first starting point for the requirements on the experiment control interfaces (and for readout and data streaming). We are grateful when teams keep these documents up to date with the current designs and capabilities of the instrument and sample environment options. Early instruments have been contacted for meetings to discuss their needs. The output is being consolidated before we engage with more teams. The facility breakdown structure (FBS) is also being established, instrument by instrument. If you have special requirements or important updates, feel free to approach an ECDC member.

To flatten the curve of integration requests, the group welcomes any early procurement of equipment, so we can make progress on controls tasks while we are not as much under time pressure. Instrument teams that can identify devices that could be procured over the course of the next twelve month, are invited to get in touch.

4. NICOS

The group, together with relevant in-kind partners and experts from MLZ/JCNS, reviewed the main workflows through the experiment control interfaces. The aims were to better guide users through standard procedures, to consider if all required functionality can be discovered by users without much guidance and if status messages are appropriately placed and indicative of their current

importance. The process let to an updated user interface design that was tested at BER II and forms the basis for the graphical interfaces for ESS instruments (see figure 1 and 2).

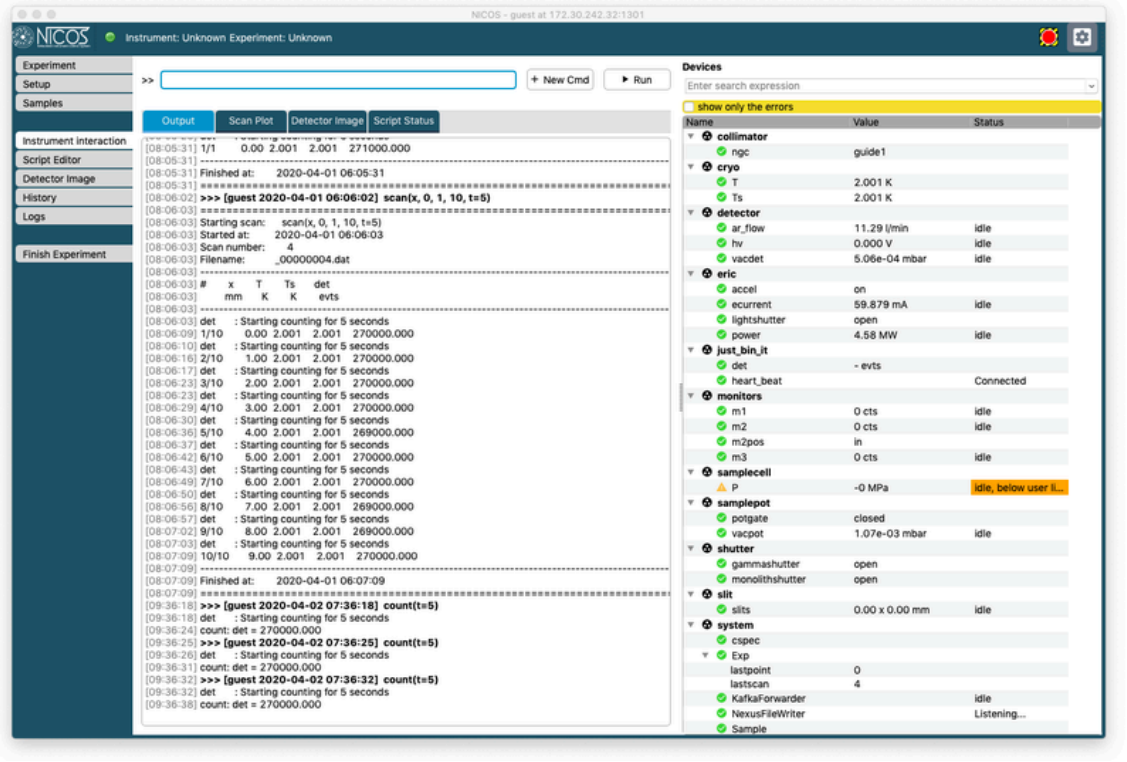

Figure 1: NICOS Scripting Dashboard

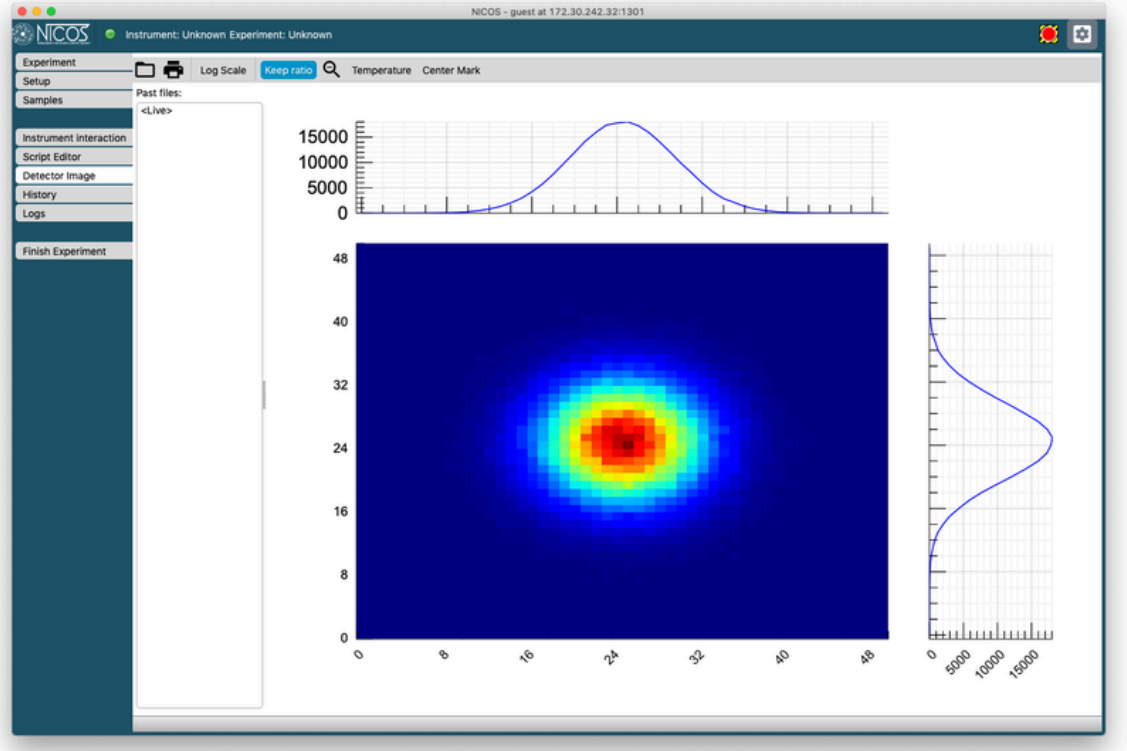

Figure 2: NICOS Detector Histogram Preview

5. DETECTORS

For detectors the ECDC group is responsible for receiving the raw detection signals from the detector readout master module developed by the detector group and to perform the subsequent event formation processing. In addition, the controls infrastructure for high voltage, gas handling, etc as well as the setup and configuration of the readout system lies with the group, at least for the coordination of the respective work to ICS.

For beam monitors the readout chain has been relatively well established. The event formation code has been streamlined and the performance of the processing exceeds the designed input rates. Some of the detector technologies have been tested using prototypical readout setups. As demonstrators of the ESS front- and backend integration become available, we can evaluate the baseline solutions and ensure they meet the requirements for downstream processing. For some of the early instruments there have been contacts with in kind teams to define interfaces and processing needs of detectors built outside the ESS suite.

The definitions of the instrument, detector and voxel geometries to be encoded in the raw NeXus data files are being developed for LoKI and DREAM at the moment. This will also allow live streaming of that information and near real-time experiment feedback from data reduction.

For imaging (ODIN) work on the integration of imaging cameras has started and from a generic point of view, no problems have been found so far. The integration of a specific camera model and especially the implementation and testing of correct timestamping is currently delayed by the COVID-19 limitations.

6. SAMPLE ENVIRONMENT

For sample environment equipment, some generic devices have been integrated and tested. The workflow has been adapted, so that the integration project is owned and started by the domain experts in the Scientific Activities Division. That ensured the whole system is available and tested before starting work. It also captures the requirements for user operations and maintenance better, leading to a higher quality integration, including graphical user interfaces (where needed) and scripting interfaces. First projects following the new processes are currently running and the benefits are being felt.

Work is going on to arrive at a better schedule to roll out integrated sample environment systems. Due to finite resources and the large number of potential systems, a suitable priority list of what is needed for hot commissioning and first science will need to be matched up with a realistic integration schedule. Due to long design and procurement lead times a number of complex systems (for example magnets) are set to arrive only during the critical instrument cold commissioning phase. We count on the support of the instruments to make this work, by early commitment to and procurement of sample environment devices needed for first science.