

WP5.1 Kick Off

DMSC April 2016

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BrightnESS is funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 676548

Purpose of this Meeting

- Everyone knows everyone else
- Everyone agrees about what we are trying to do together
- Everyone agrees about how we're trying to move forward
- Establish links to answer future questions and resolve problems

WP5: Real-time management of ESS data

Objectives

Maximise the scientific output of the ESS by enabling live (real time) processing of the data taken on ESS instruments. This will be achieved by developing the software infrastructure needed to make this data available as a live, publish/subscribe, (data) stream to which data reduction, and analysis, software can subscribe to process the data.

	Tasks	
Task 5.1	Creating a standard neutron event data stream for different detector types	ESS, KU
Task 5.2	Creating a standard method for streaming meta-data for fast applied fields	ESS, PSI
Task 5.3	Software to aggregate and make available the neutron event data and sample meta-data	ESS, PSI, Elettra

	Deliverables	
5.1	Design report data aggregator software	M12
5.2	Report processing choices for detector types	M21
5.3	Beta-version data aggregator software	M23
5.4	Report filed data acquisition	M24
5.5	Data aggregator software	M35
5.6	Software neutron event data processing	M36
5.7	Software fast field acquisition	M36



Software to aggregate and make available the neutron event data and sample meta-data

WP5.3 Data Aggregation

- data from different origins are collected in one point
- neutron events are bundled into per proton pulse frames
- consumers can subscribe to data at one authoritative source
- a common protocol that enables live visualisation and data treatment
- reliability is a primary concern



Potential serialisation lifted from Simon Ebner (PSI):



{"htype":"array-1.0",
"shape":[10,20],
"type":"uint16", "frame":0}

htype defines content of main header as well as the structure of the whole message (sub messages)

Sub Message(s) can be binary or JSON



ØMQ

Slow Sources	Medium Fast Sources	Fast Sources
Motion	Choppers	Detectors
Sample Environments	Sample Environment	Sample Environment
less than 14 Hz on average	less than 20 kHz maximum	
labelled monitor messages	buffered readout	event-type message stream
	Data Aggregator	ØMQ
	V V V	



Creating a standard neutron event data stream for different detector types

WP5.1 Neutron Event Processing

- post ³He problems
- background rejection, discrimination and accurate locating and time stamping of neutron events is not easy for all novel detector types
- software processing is more flexible than putting solutions in readout electronics
- processing can be tailored for requirements (high count rate vs high resolution)
- we need a framework for this kind of event formation

Example: TPC Detectors

- detector electronics emits timestamped information on secondary particle traces
- neutron scattering only needs time and location of the neutron conversion process
- probably the most raw data we will see

http://dx.doi.org/10.1088/1748-0221/10/04/P04004



WP5.1 Goals

- Convert detector output to unique pixel id and timestamp for representative detector types
- Framework to allow processing for all detector types
 - Cope with all expected input types and formats
 - Determine right processing models for different problem types
 - Output in the format expected by the aggregator

Design Considerations

- Data might be best consumed in frames (per proton pulse)
- Processing may need information from adjacent module
- Switching algorithms could be done dynamically
- There should be a route to get to the full raw input data for debugging
- Reliability, reliability, reliability



A picture





A picture





A picture



Processing Container

Construction Roadmap

2015

- Roadmap planning
- In-Kind agreements
- Startup of BrightnESS & Recruitment

2016

- Recruitment & more In-Kind
- Transition from planning into implementation
- Evaluate feasibility of technology choices
- Begin development of necessary frameworks
- Start working on lab demonstrator of data readout and streaming (Lund office)

2017

- Implementation phase
- Hardware performance tests
- Deployment and reliability tests

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HZB.

 Worry more about transition into operations

2018

- Real instrument devices may become available for integration
- BrightnESS finishes (August)

2019

- Bug fixing
- Cold commissioning
- End of year: First neutrons



WP5 Milestones and Deliverables

	9/15	10/15	11/15	12/15	01/16	02/16	03/16	04/16	05/16	06/16	07/16	08/16	09/16	10/16	11/16	12/16	01/17	02/17 03/	17 04	/17 05/	/17 06	6/17 07/17	08/17	09/17	10/17	11/17 12	2/17 0)1/18 ()2/18	03/18 0	4/18 C)5/18 0	5/18 0	7/18 08/18
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Milestones

Core	Stream IK	BrightnESS	Date	Title
	x		2016-03	Kickoff Meeting
	х		2016-06	Roadmap Choice on Streaming
		х	2016-08	Design Report Aggregator
х			2016-09	Software Design for Raw Data
		х	2017-02	Design Report Event Processing
	х		2017-06	Prototype Performance Test
		х	2017-07	Aggregator Beta Test
		х	2017-08	Fast SE Design Report
		х	2017-08	Event processing Beta Test
х			2017-10	Software Design Cataloguing
		х	2018-02	Integrated test Event Processing
	х		2018-06	Functional Test at ISIS
		Х	2018-06	Final Software Delivery for Event Processing
		х	2018-08	Software Delivery Data Aggregator
		Х	2018-08	Software Delivery Fast Sample Environment
х			2018-09	Software Design Archiving
	x		2019-08	Roadmap Document for Operations





Successful Development and Operations

Aim: Everything runs reliably, but bug fixes can be deployed easily In case of problems there are automated mechanisms in place to resume service or alert people.

We will have facilities to monitor that detect buildup of bottlenecks and backlogs and warn us appropriately.

Automatic testing before deployment, best software engineering practices and project management will be used.



Tools and Infrastructure

- # JIRA and Confluence (Issue Tracking and Wiki) provided by ESS hosted by Atlasssian accounts via Tobias or Afonso
- * Git, Github, Bitbucket

ESS has private repositories at Bitbucket Github could be perceived as more open

***** Vagrant and Virtualbox

tools for easy provisioning of (networked) VMs for development and testing ICS EPICS development standardised this way

- * DMSC Cluster & Storage
- * ESSIIP Lab

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Outlook

This meeting

See what Carsten has achieved so far. Talk to Thomas and Richard on their input. Gather tasks and prioritise. Identify open questions and when we need answers by.

Near future

More staff should arrive at DMSC. We will have common office space in COBIS soon.

