Service levels

**Phases**

Cold commissioning: Service level 0

After hot commissioning: Service level 1

Early science: Service level 1

User operations: Service level 2 & 3

**Service levels**

**Service level 0 - Control of instruments and acquisition of data, archive and curation of collected data**

* Experiment control system defined compatible with ICS and NT and DAQ systems
* File format and event data format defined and compatible with downstream services
* DAQ architecture defined
* DAQ system integrated with detector front end electronics
* Event processing algorithms have been implemented and verified
* Timing system integration allows timestamped neutron event data, metadata and controls data, and store it.
* Access to critical systems available - ICS - network ...
* Definition of time=zero (depends on the accelerator and instrument)
* Manual Experimental Control
* Hardware in place to operate manual experimental control and data acquisition, including parallel file system and Kafka cluster
* Support for DAQ and controls
* Instrument specific DMSC project management / single-point-of-contact in the form of instrument data scientist
* File locations and essential metadata are recorded in data catalogue
* Data curation system tracks life cycle of datasets and supports user queries based on metadata
* DOIs available for raw data
* Users can download data from the data catalogue
* Live visualisation of detector images and channels (commissioning tool)

**Objectives and success criteria**

* DMSC support for commissioning of instruments
* Collection of timestamped data synchronous with accelerator operation
* Neutron data file written & catalogued in accordance with the the DP
* Software exists to read data file and create TOF histograms from event list
* Meta data timestamps can be used to filter bad events (choppers, moderator parameters, target parameters, accelerator parameters)
* DAQ system demonstrated to work at the expected bandwidth for initial operations
* DAQ tested at expected bandwidth for 2-5MW operation on a fully populated detector
* Recorded datasets are findable in the catalogue

**Service level 1 - Framework for manual data reduction, Experimental Control and Data analysis packages manual operation**

* Data reduction framework compatible with distributed architecture
* Core algorithms working (Load, rebin, convert units, unary and binary operations - don’t forget all the annoying fix up algorithms that exist to make things work)
* Visualisation of TOF data for pixelated detectors compatible with ESS detector systems
* ESS data tested to be compatible with existing reduction workflows
* Supported data analysis packages compatible with ESS reduced data format - or ESS reduced data format compatible with data analysis packages
* Data replicated to CPH
* Remote experiment control available
* Remote data reduction and analysis available
* Support for DAQ, controls, reduction and analysis (Instrument Data Scientist)
* Specific analysis and modelling software available for early science - maybe only at the prototype level

**Objectives and success criteria**

* Instrument can run a science programme with manual control over DAQ (including scripting level of automation) data reduction framework and supported data analysis packages.
* Users can manually process (reduce and analyse) their data using software provisioned by ESS for the most common tasks in reasonable time. The software can be maintained by ESS at modest cost.
* Users can remotely access infrastructure that allows reduction and analysis from off site.
* Instrument teams or users get support for early scientific success if desired

**Service level 2 - Automated reduction workflows, automated analysis - experiment control feedback**

* Automated reduction service available. Defined and standardized procedures work.
* Live data reduction and associated visualization in operation
* Automated data analysis for some specific experiments
* Live analysis and associated visualization for high-throughput techniques
* NICOS/ECP API available for feedback to running experiment from reduction and analysis for high-throughput techniques
* Reduction workflow defined and compatible with data catalogue
* Remote access to processed data (data catalogue)

**Objectives and success criteria**

* Automated data reduction workflows publishing reduced data to the catalogue
* Users can use live data processing to guide their experiments on-the-fly
* Higher outcome from experiments and better exploitation of beamtime

**Service level 3  - Support for advanced analysis and simulation**

* Supported modelling and simulation codes defined and available
* Infrastructure for simulation defined and available
* Access mechanism and user portal allows reviewed allocation of simulation and modelling support
* Modelling and simulation group provide support for accepted experiment proposals
* Modelling and simulation group work with users to expand toolbox for analysis

**Objectives and success criteria**

* Increase impact from experiments at ESS
* Advance the field of neutron scattering