LISE IS STEERING EXPERIMENTS

MOTIVATION

A system of inhouse-developed hardware and software has been the standard measuring equipment used at the HZB storage ring. The components were working reliably but became more and more difficult to maintain. First ideas about an improved system resulted from development work on commercial hardware components with a flexible software architecture. The software architecture was then developed as a first prototype in 2013. In 2015 this development became a regular project initiated by the HZB management.

Influenced by results of projects like ‘unified log data management’ the project started as MoVe (modernisation and unification of experiment control systems). In 2016, all existing experiment control systems were fully replaced with MoVe.

Putting emphasis on a modular design and implementation, the LabVIEW software stack, these components were chosen as a development base. In the new system, our focus has been on creating a framework at the storage ring but the framework should serve as universal experiment control system.

NAMING

LISE/M (‘Lise’ in the name was given in honour of Lise Meitner (1878-1968) where the first prototypes of our software were just named ‘M’). While the ‘full name’ is somewhat cumbersome, the latter turned out to be too short (so distinct idea which’s going on if one told you ‘we did it with M’). Ongoing development of the ‘modular measurement and control system’ lead us to ‘m’/c’ short enough to mark module functions and to prefix dependent modules. So, m is short for m/c which is short for ‘LISE/M’ - we’ll settle this by the end of 2017.

FEATURES

- modular system architecture
- unified message bus
- message format: sender | timestamp | instruction | parameter
- central XML configuration file
- device parameters, EPICS server variables, GUI elements
- user defined sections for data files, columns, additional devices etc.
- user-friendly editor is provided
- one framework for an universal (‘commissioning’) version and beamline specific versions
- universal features
  - free scalable numerical and graphical display
  - theoretically unlimited number of measurement channels (tested setup: 30 channels)
  - up to 32 diagrams with 8 channels each
  - ‘file’ for current measurement
  - up to 16 buffers (each buffer contains a full measurement cycle with all measuring points)
  - number of measuring points is only limited by RAM
  - fixed and flexible built-in scan modes
  - variable scan stopping via sequence definitions
  - standard x-mode to display and store values with time stamps (without actually scanning)
  - remote interface for max. flexibility
  - flexible logging facility
  - flexible data (output) module
  - dynamic device interface
  - simulation mode for devices and modules
  - special connector box with 32 BNC sockets to adapt e.g. counter modules
  - EPICS as client and server
  - JAVA/EMC interface
  - HPS specific control interface via TCP or serial connection
  - for direct control of optical beamline elements
  - for external access to m/c’s internal variables, functions and devices
  - EAT interface
  - log and meta data is collected
  - measurement and meta data will be stored in a specific transfer area according to the proposal number of the current measurement
  - the actual transfer into the IAT system is externally initiated with no impact on the running measurements
  - ScEPIC interface
  - a first prototype client implementation

CONCLUSION

LISE/M resp. m/c was successfully deployed at the first instruments in 2017. Both, the universal (‘commissioning’) version as well as the individual, special (e.g. ‘nano cluster trap’) version perform very well.

The results show that the learning curve for the development team is manageable and the chosen approach can be used to tailor the system according to individual needs. The developed framework should work for a wide range of common measurement tasks. As system it works “out of the box” for typical commissioning tasks - the great flexibility allows approximately any kind of special system setup.

MORE INFORMATION

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