

PROPOSAL FOR JOINT COLLABORATION ON EPICS SERVICES

Greg White, SLAC; Timo Korhonen, PSI, *DRAFT* v1.1 11-Mar-2011

This document is a proposal for the SLAC National Accelerator Laboratory (SLAC) and Paul Scherrer Institute (PSI) to collaborate on development of a software services layer of EPICS [1], and to use the resulting software architecture to develop an online accelerator modelling service. This work would enable rapid development of robust accelerator optimization applications, both at SLAC, PSI and other EPICS laboratories internationally.

OBJECTIVES

- 1) Collaborate on development and technical coordination of EPICS version 4 to bring it to production quality.
- 2) Develop the software architecture within EPICS v4 for accelerator software services.
- 3) Develop and publish minimum APIs for a core set of "reference" accelerator services.
- 4) Develop an implementation of the Online Model reference EPICS service, probably based on MAD (subject to more discussion at PSI).

It's envisioned that the resulting services architecture, built into EPICS, would replace AIDA.

Additionally, if desirable, the model service developed could be used to replace XAL use at SLAC, with this MAD based model service, in collaboration with the SLAC LCLS physics group.

FEATURES

EPICS v4, and the EPICS software services layer that would result from this collaboration, would have these features:

- 1) Fully compatible with EPICS v3 record support. You can run EPICS v4 on top of EPICS v3.
- 2) Enable physicists to rapidly develop highly functional, high performance, high level applications, by using commodity data services based on EPICS - a single platform for control and accelerator data (model data, Oracle data, archive data) etc as a whole
- 3) Removes the balkanization between AIDA and EPICS, replacing AIDA with EPICS by implementing the accelerator data support features of AIDA in the next version of EPICS
- 4) Enables programmers to rapidly develop high performance commodity data services
- 5) Enables very significant cost savings and efficiency increases in software development, by creating a focal point for professional grade engineering and documentation practices.

The interests of SLAC and DOE in this effort are that it has the reasonable potential to save millions of dollars by focusing accelerator control and optimization software on a single platform, while simultaneously dramatically increasing effectiveness of high level software engineers and commissioning physicists.

MANAGEMENT

A Charter document (about 2 pages) will be drawn up, detailing the remit in which the EPICS v4 work would be supported by SLAC. The charter would include objectives, deliverables, scope, funding sources, timeline, expected commitment level, participation requirements, communications mechanisms (expected reports, meeting frequency), project management, and specific outcomes desired by SLAC in terms of extensions to the existing EPICS system.

Periodic review by the SLAC Controls dept and PSI management, against the timeline and deliverables specified in the charter, enable the success of the effort to be measured. In that way continued funding and support can be evaluated.

PSI AND FUNDING

Paul Scherrer Institute (PSI) has offered to fund Greg White for a year at PSI to undertake this collaboration. PSI is interested in the full development of EPICS v4 as a platform for physics services. PSI primarily uses Matlab for applications, as we do, They are particularly interested in interfacing offline codes such as MADX and TRACY (electrons) and GENESIS (undulator) to Matlab for their upcoming SwissFEL project. This is a larger project than envelope modelling, as we do now for online optimization, but we propose driving the project by creating an envelope modelling service first, and then using what we have learnt to properly estimate and design start to end simulation.

It may also be that PSI would fund development of a Correction Plots within the EPICS v4 remit.

BACKGROUND

EPICS (Experimental Physics and Industrial Control System) [1], is a set of Open Source software tools, libraries and applications developed collaboratively and used worldwide to create distributed soft real-time control systems for scientific instruments such as a particle accelerators, telescopes and other large scientific experiments.

EPICS is the basis software on which the device controls aspects of the LCLS control system has been built. EPICS was primarily developed at ANL, but with significant input from SNS and Oak Ridge.

In the last year, the leader of the EPICS collaboration, Bob Dalesio (BNL), has organized a significant effort to create the next version of EPICS, so called EPICS v4. EPICS v4 is promised to contain the data protocol constructs and other components necessary for support high level software services, as well as controls. However, Bob and his team don't have experience of high level services. They've asked for SLAC's help in defining what is necessary in architecture, design, and development.

This proposal is to enable that work to take place, funded jointly by PSI and SLAC.

AIDA (Accelerator Integrated Data Access) [2], is a software services toolkit for high level applications which have to connect to different databases, data sources, or control systems, on possibly different platforms and whose APIs may be in different languages, to perform data interactions in the time-scales necessary for on-line accelerator applications.

In the LCLS control system, AIDA provides all the non-control kinds of data necessary for applications - like the accelerator model, archive history, the naming service, access to all the data in Oracle and other databases etc. It also provides all the SLC device control and SLC data services. This aspect of AIDA was central to the commissioning of LCLS - without it, LCLS could not have been commissioned in the timescale that it was. Also it will prove key to FACET.

REFERENCES

[1] EPICS home page, <http://www.aps.anl.gov/epics/>

[2] AIDA home page, <http://www.slac.stanford.edu/grp/cd/soft/aida/>