Beamline Control and Data Acquisition at the Advanced Photon Source

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The Advanced Photon Source (APS) at Argonne National Laboratory is a third generation synchrotron radiation source, optimized to provide high-brilliance x-ray beams from undulators and wigglers. The beamlines at the APS are being constructed by Collaborative Access Teams (CATs), composed of members from universities, industry and national laboratories. The CATs will be conducting experiments in a wide variety of areas, including protein crystallography, microspectroscopy, high-pressure research, small-angle scattering, and microtomography.

Although the CATs are organized and funded independently, and have a diverse set of research interests, they have decided to work together in developing software and hardware for beamline control and data acquisition. These efforts include voluntary hardware and software standards such as:

- Common low level interface for controls
- Agreement on hardware devices to be developed and supported
- Common "look and feel" from beamline to beamline
- Data file formats
- Standard applications for spectroscopy, diffraction, etc.

At the lowest level the EPICS control system will be used to communicate with I/O devices, which will be largely VME-based. The distributed nature of EPICS and the device abstraction it provides permits a variety of higher-level applications to be used. These high-level applications will be specific to various techniques (imaging, diffraction, etc.), but the goal is to provide a common look-and-feel, and a common framework within which applications can cooperate. Many CATs will be using commercial packages, such as IDL and Visual Basic, for the user-interface. As CATs develop software they are sharing it with the EPICS collaboration and with each other through a software exchange. Because EPICS was originally designed for accelerator control, rather than data acquisition, the beamline development groups have added a number of new features to EPICS.

A draft specification for a common data file format, base upon the Hierarchical Data Format (HDF) from NCSA at the University of Illinois has been prepared. Recently the neutron diffraction community has expressed serious interest in using the same standard.

There are a number of important goals of this collaborative arrangement:

- Minimize the duplication of effort in developing control and data acquisition systems.
- Provide a common look-and-feel to users who may use several beamlines for their experiments.
- Ensure that both applications and data are portable between beamlines.

(A related paper on this topic will be published in Reviews of Scientific Instruments, as part of the 1995 Synchrotron Radiation Instrumentation conference proceedings. See "Beamline Control and Data Acquisition Software" by T. M. Mooney, et al.)