What is XAL?

• Development environment for creating accelerator physics applications, scripts and services
  – Control room applications
  – Analysis applications

• Application framework

• Toolbox of Java packages

• Ant based build system (independent of IDE)

• Developed initially for the Spallation Neutron Source (SNS)

• Used in commissioning and running SNS
Active Developers at SNS

• Chris Allen
• Delphy Nypaver Armstrong
• Sarah Cousineau
• John Galambos
• Tom Pelaia
• Andrei Shishlo
• Yan Zhang
• Alexander Zhukov
Collaboration

• Home: http://www.ornl.gov/~t6p/Main/XAL.html

• Source Forge Project: xaldev
  – http://sourceforge.net/projects/xaldev
  – Source code managed using Subversion

• Dozens of developers among several sites
  – SNS, SLAC, BNL, JPARC, GANIL and others
  – Paul Chu (SLAC) has been actively contributing to the SNS source code

• XAL 2 effort managed by Chris Allen
  – http://sourceforge.net/projects/xal2

• Contact us to participate
Applications, Scripts and Services

• Five dozen applications covering:
  – Accelerator Physics
  – Controls

• Three services
  – PV Logger
  – MPS Reporting
  – Trip Monitor

• Many scripts
Recent Work

• Core Enhancements
• Bug Fixes
• Cleanup
• Application Development
• Collaboration
Core Enhancements

• Synoptic display handles wrapping with origin offset

• Message Center adds options for both latent and fresh posting of events

• Added Digital Filtering (ITR and FTR) classes

• Added Frequency Analysis classes

• Accelerator Applications
  – improved accelerator and sequence validation

• Applications support new view features
  – document modification indicator
  – file path navigation in document title
Bug Fixes

• Fixed multiple bugs in the MAD generator
• Fixed Thick Dipole to properly account for reference bend angle
• Fixed a race condition upon application startup
• Fixed broken HTML in API documentation
**Cleanup**

- Removed obsolete applications:
  - Loss Monitor, MPS Post Mortem, SCL AFF Monitor, Object Explorer, Charts, Orbit Display, XIO

- Removed obsolete files and directories
  - Directories: Config, Resources, bin
  - Several files

- Reduced the number of third party jar files
  - Removed: mem-moni, concurrent, cf-jca, cf, activation

- Ongoing Effort
New Applications (sample)

- Injection Dump Wizard
- Injection Painting
- Beam at Foil Control (HEBT and Ring)
- Optics Editor
- Bunch Shape Monitor Analysis
- CCL Orbit Correction
- Ring Tune Monitor
- Longitudinal Shaker
- Control BLM Limits
Significant Application Enhancements

• MTV
  – Major update

• Wire Analysis
  – New Twiss matching algorithm

• SCORE
  – Support for string PVs
  – Disable obsolete PV groups

• Loss Viewer 2
  – Major update
MTV Enhancements
Andrei Shishlo

- Bug fixes
- Bind to Book value
- Memorize Value
- Restore Original value (cached per PV)
- Support for arbitrary PVs
Optics Editor
Tom Pelaia

• Edit the hardware status of a device
  - Many applications check a device’s status to determine whether to use it

• Quick filter search

• Provide a comment explaining the status
CCL Orbit Correction
Andrei Shishlo

- Measure the orbit at locations throughout the CCL
  - Measure orbit at BPMs
  - Apply BPM offsets
  - Project orbit to points between the BPMs using online model

- Correct the orbit throughout the CCL
• Measure orbit at the Foil from HEBT and Ring
  – Measure orbit at BPMs about the foil
  – Use online model to project orbit to the foil
Ring Tune Monitor
Tom Pelaia

- Calculate and display the live fractional ring tunes
  - Monitor the turn by turn beam position at a selected BPM
  - Perform a discrete Fourier Transform of the BPM data for each transverse plane
  - Display the fractional tunes
Injection Painting
Sarah Cousineau

• Injection kicker painting
  – Generate a waveform matching start and end amplitudes and timing information
  – Save waveform to a file which can be loaded
  – Send the specified injection kicker waveforms to the machine
Loss Viewer 2 Enhancements
Alexander Zhukov

- Added an MPS Limit Controller
- Histogram of any particular BLM loss distribution with history plot
- Plot of the weighted average beam loss for an accelerator sequence
Collaboration Enhancements

• New website with documentation and XAL lecture series
  – http://www.ornl.gov/~t6p/Main/XAL.html
  – RSS News Feed
  – Fresh XAL API Documentation

• Synchronize Source Forge code with SNS code
FY09 Roadmap

• Develop and enhance applications as requested
• Cleanup XAL
• Improve and enhance the online model
• Improve XAL collaboration both inside and outside of SNS
• Develop a smarter, more powerful application launcher that eliminates the need to have scripts
• Build an agent based system for dynamically distributing services on demand
• Investigate Java 6 support
Cleanup XAL (FY09)

- Reduce the number of third party jar files and better document the remaining ones on which we depend
- Migrate the remaining applications which depend on the proprietary charting packages to use the open source charting options
- Remove deprecated applications and code
- Fix broken Javadoc documentation
Online Model Changes (FY09)

- Improve online synching performance using batch CA operations and monitors
- Fix the space charge bug in which the online model fails in the presence of bends
- Support multipole magnets
XAL Collaboration (FY09)

• Post and maintain API documentation
• Provide online resources and tutorials
• Support developers from the operations group
• Maintain the Source Forge repository and create site specific branches
• Provide an XAL Lite branch which isolates the application framework
References

• Home: http://www.ornl.gov/~t6p/Main/XAL.html

• News Feed: http://www.ornl.gov/~t6p/Main/XALBlog/XALBlog.html

• Source Code: http://sourceforge.net/projects/xaldev

• XAL 2: http://sourceforge.net/projects/xal2