XAL Status

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Application Programming

EPICS Collaboration Meeting
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Active Core Developers

- John Galambos (ORNL/SNS)
- Chris Allen (LANL)
- Paul Chu (ORNL/SNS)
- Tom Pelaia (ORNL/SNS)
- Andrei Shishlo (ORNL/SNS)
- Numerous people have contributed and are contributing to XAL
We deliver, you choose...

• XAL is built upon 100% pure Java offering platform independence for free

• Users can run and/or develop XAL applications on any platform with Java J2SE 5.0

• Convenient Java Web Start deployment
What is XAL?

• Foundation framework of generic tools
  – Optimization
  – Numerical analysis
  – Messaging
  – Plotting

• Application framework for rapid development of applications which share a common look and feel

• Accelerator modeling

• EPICS interface

• Applications (currently 46 applications in addition to Jeri)

• Numerous Jython scripts
EPICS Channel Access

• EPICS Channel Access is accessible through a high level XAL API and a JCA adaptor

• Users can choose between JCA JNI and CAJ pure Java provided by CosyLab
  – JCA is available from CosyLab at http://jca.cosylab.com/downloads.html
  – CAJ is available from Cosylab at http://caj.cosylab.com/
  – CAJ is the default channel access provider

• Both JCA JNI and CAJ work very well, but both have issues when monitoring thousands of PVs
  – JCA JNI effectively has a memory leak
  – CAJ stops making new connections
Performance

• Performance has been good
  – Java performance has been very good since upgrading to Java J2SE 5.0 and has not limited operations
  – JCA issues need to be resolved since more applications are accessing thousands of PVs
  – Applications have been well received by end users and are contributing to successful operations
  – More developers and physicists are turning to XAL for new applications
SNS Applications

• Physics
  – Simulation
  – Optics Design
  – Optics Measurement and Correction

• Controls
  – MPS status, masks, limits
  – Knobs

• Diagnostics
  – BPM Configuration (timing, gains, etc.)
  – Beam Loss Monitoring

• Operations
  – Save and restore
  – PV Logging
  – Beam based alignment
Application Framework

• Very stable

• Rapid application development with a consistent look and feel

• Latest feature highlights
  – Added support for Desktop Panes
  – Includes standard Java icons in menus
  – Copy, Cut and Paste menu items now automatically apply to any TransferHandler enabled component without any additional code and they automatically enable/disable as appropriate
  – Documents have a default location with the root specified by the user
  – Added a Java Logger view to display logged messages and exceptions
Optimizer Enhancements

• Begun by summer student (Adrian Kennedy)
• Third Generation of optimizers in XAL
• Extensible, object-oriented and event based
• Supports satisfaction curves
• Multiple objectives and multiple variables
• Implemented a smart algorithm strategy picker to dynamically select the best algorithm strategy for solving a problem as the problem is being solved
• Currently four algorithms
  – Simplex
  – Accelerated Gradient Step
  – Random Shrink Search
  – Random
Online Model Framework

• Object-Oriented

• Algorithms, probes and states for Linac and Ring with a common Interface for states
  – Twiss Parameters
  – Energy
  – Orbit
  – Dispersion
  – Tracking

• Convenient model parameter file for a concise specification of input parameters throughout the accelerator

• Agrees well with the real accelerator, and we continue to make improvements to performance and realism
Generate a new optics from an initial one based on user specified satisfaction criteria

Variables include Quadrupole fields, RF Cavity phases and RF Cavity Fields
Save Compare Restore (SCORE)
developed by John Galambos

- Allows users to save, compare and restore machine settings
- Settings are saved in a database for easy retrieval
Diagnostic Timing developed by Paul Chu

- Provides a convenient way to view, analyze and set diagnostic timing, gains and other settings individually or in batch.
Ring BPM Viewer developed by Andrei Shishlo

- Displays live Ring BPM data along with a memory buffer of recent data
- Allows averaging over user specified turns
- Displays turn by turn data
Loss Viewer
developed by Sarah Cousineau

- Displays BLM losses
- Provides a detail screen to aid tuning while viewing losses in any portion of the accelerator
- Shows MPS BLM alarm and warning status
Directions

• XAL continues to be a very productive tool
  – Contributed to SNS successes

• We need to address the JCA issues

• We continue to improve the online model

• More applications are in the works

• GUI tool under development for building user interfaces