I2U2
Grid Computing in the High School Classroom

For the collaboration:
Thomas Jordan
University of Florida

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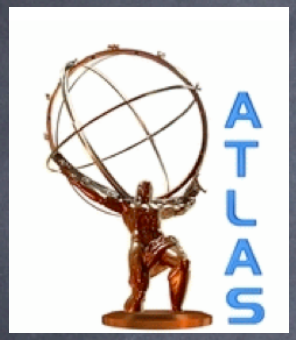
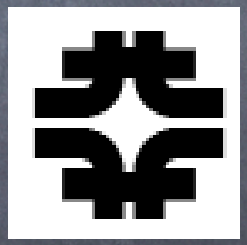
An NSF-funded collaboration

Constituent members:



ADLER 75
AMERICA'S FIRST PLANETARIUM



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An NSF-funded collaboration

Goals:

- Create a platform for 21st Century Science
- Provide a framework for science experiments to focus and encourage E & O efforts
- Utilize "the grid" to:

  Increase compute power
  Increase collaboration
  Provide access to huge datasets
  Uses range from compute resources to meta-data

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The vehicle to do this:

e-Labs and i-Labs

They allow:

- Data sharing
- Workflow management
- "Publishing" of results
- Discovery of others' data products
- Access to "canned" analysis recipes

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Existing e-Labs:

Production:

- Cosmic Rays
  Access to data from nearly 100 classroom detectors
  > 9000 "detector days" of data (flat "raw" files)
  > 200 user accounts many with data uploads

Pre-production:

- CMS (Calorimetry test beam)
- AMELIA (ATLAS event reconstruction)
- LIGO (Access to environmental monitors)
- STAR (RHIC experiment event reconstruction)

e-Labs support:

Data Search and Selection:

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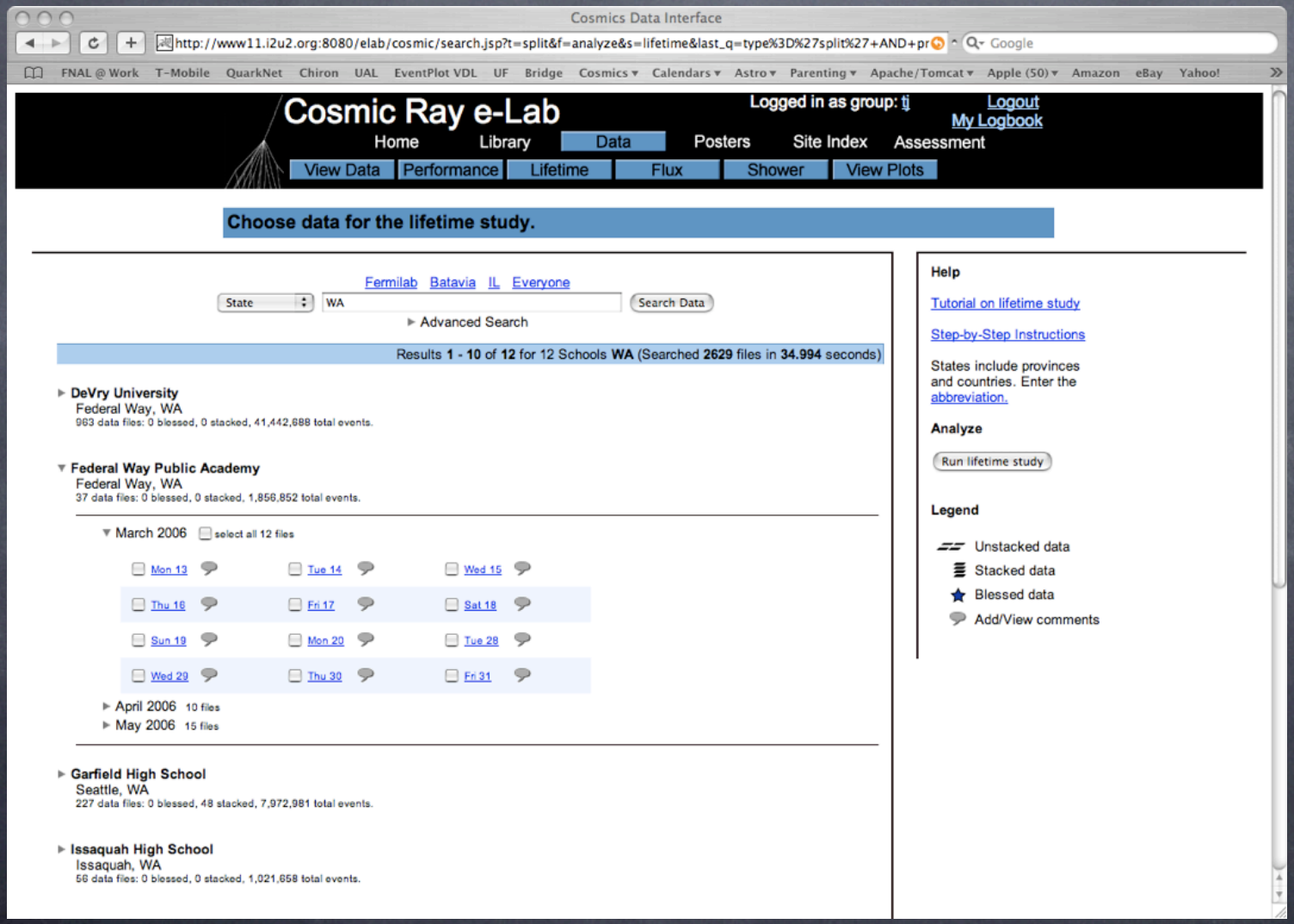

e-Labs support:

Workflow management:

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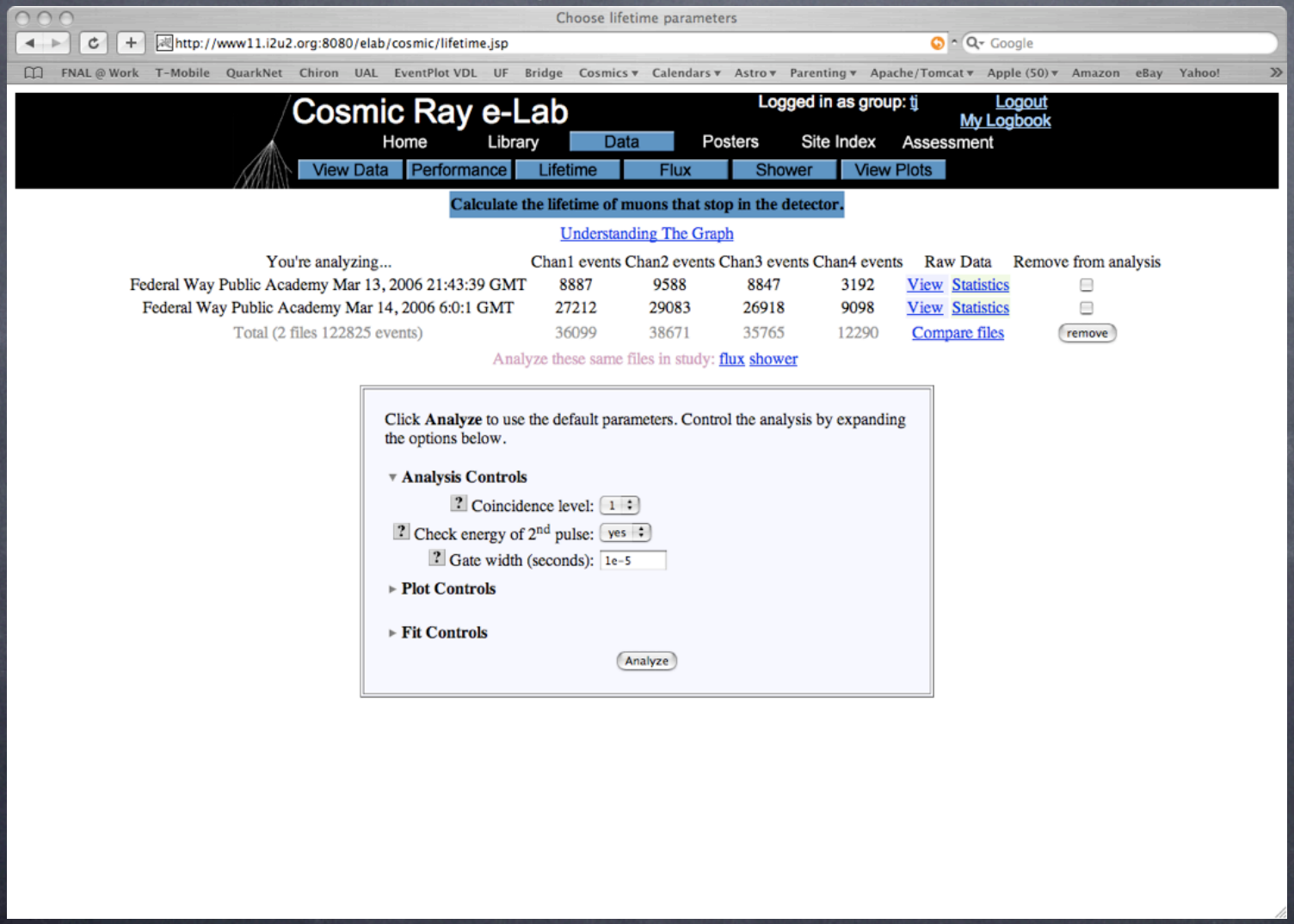

e-Labs support:
Workflow management:

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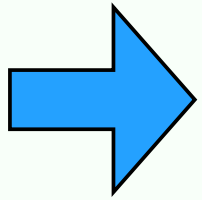
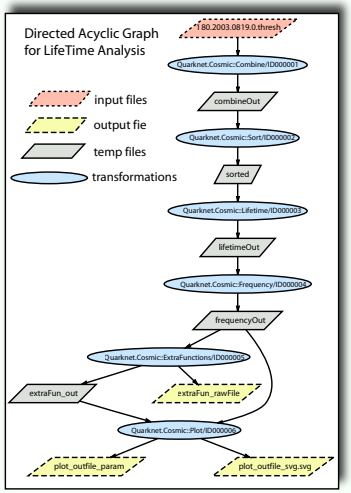
```
TR Quarknet.Cosmic::LifetimeStudy(
      inout combineOut,
      none detector,
      none extraFun_alpha_guess,
      none extraFun_alpha_variate,
      none extraFun_constant_guess,
      none extraFun_constant_variate)
```





e-Labs support:

Workflow management:

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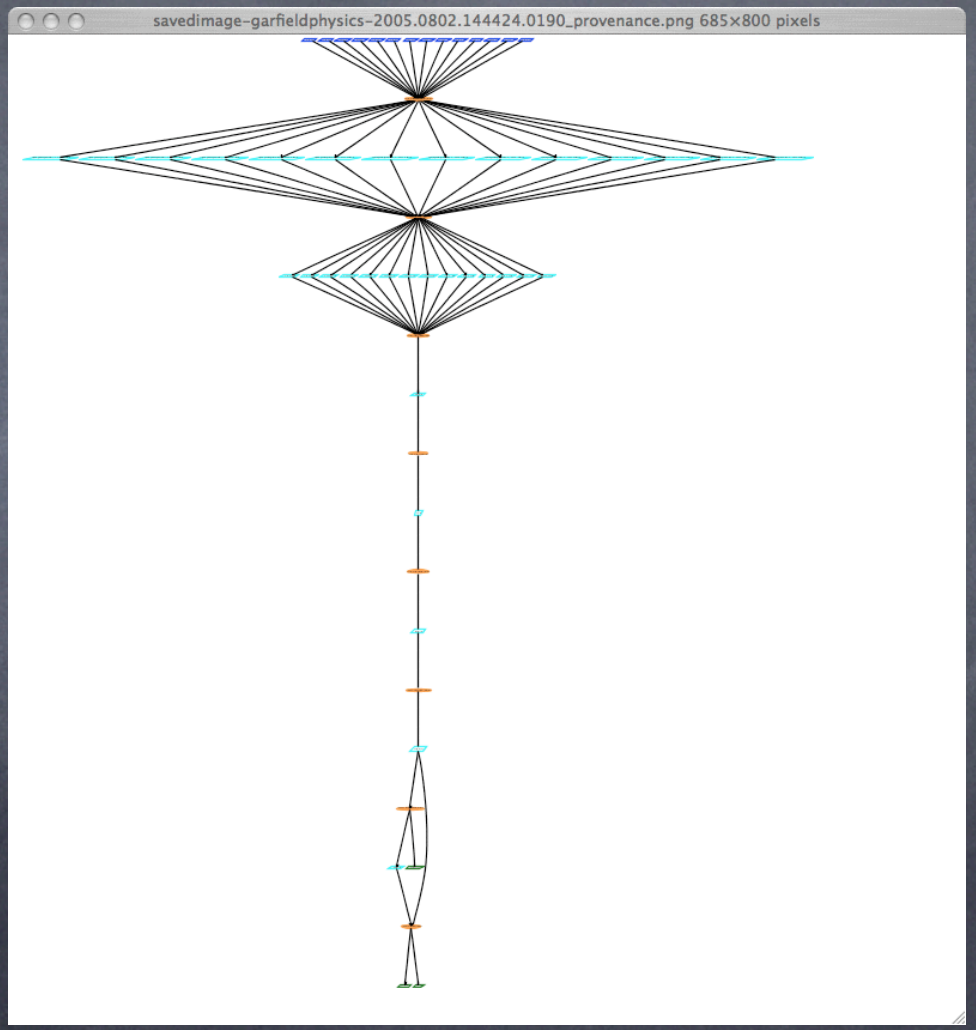

e-Labs support:

Catalogue of Derived Data:

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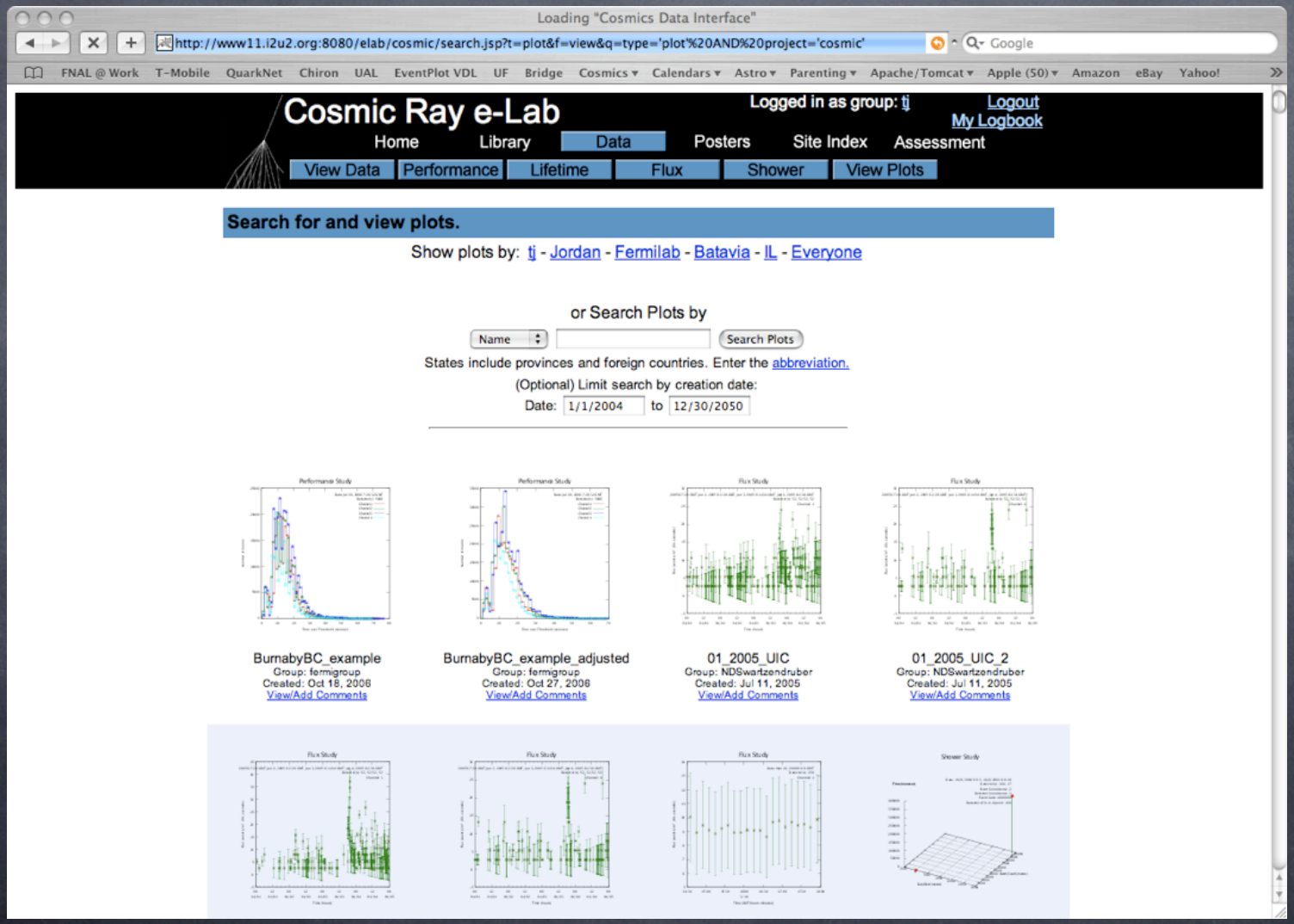

e-Labs support:

Re-run an Analysis:

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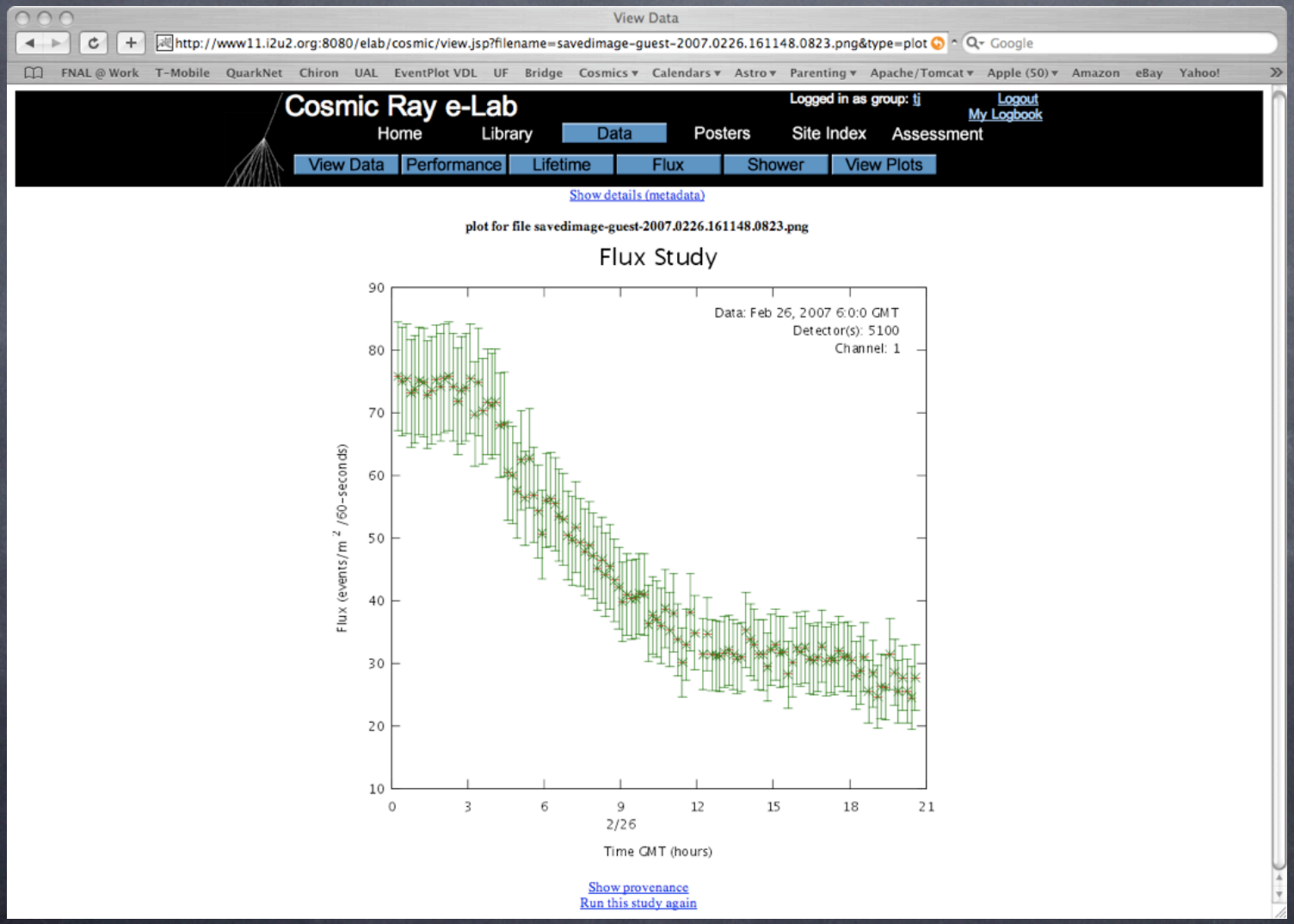

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Data Provenance:

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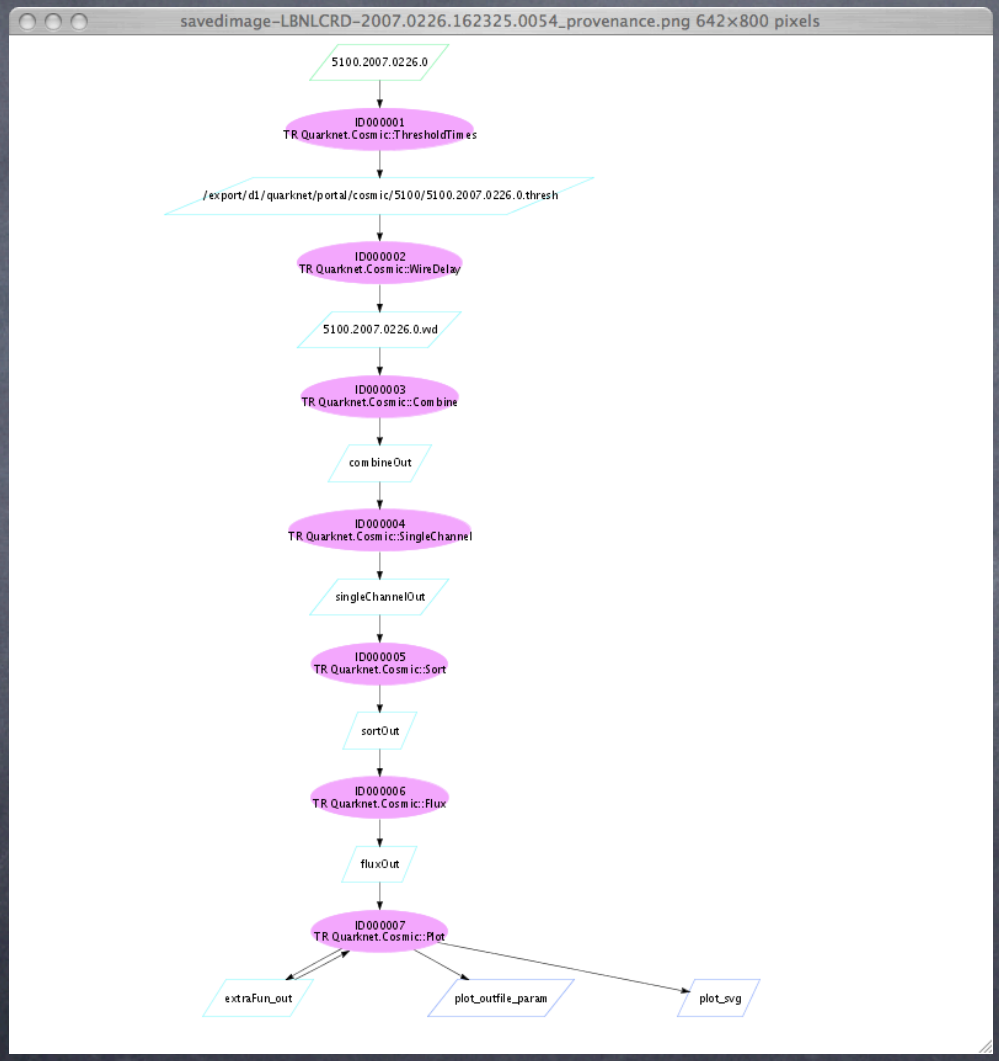

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Posters:

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An Experiment to Measure the Rate of Small Showers

6 Detectors in One Building--FNAL's Kuhn Barn

03/11/2005
Thomas Jordan

Abstract

We arranged six readouts (DAQs or detectors) from several area schools and 23 scintillators in a grid that was about 10 meters square. We evenly spaced the detectors inside this square and collected data for nearly 16 hours. We expected to see more events with coincidnences between readouts in this small arrangement as the primaries that create small showers are much more frequent than those that make huge showers.

Procedures

We collected readout boards from Alan Shepard High School, Proviso West High School, University of Illinois-Chicago as well as a few from Fermilab. We set up the experiment in Fermilab's Kuhn barn to avoid the snow and ice. (We also wanted to stay warm!)

Setup included: installing GPS, arranging counters, connecting readouts and cabling to the computers.

We set the coincidence trigger on each readout board to twofold. This is to remove some of the "background" caused by single, uncorrelated muons. We are most interested in showers here so we decided to ignore those.

Results

I only show the most energetic showers here. There are many more results to come from these data but on three occassions, we observed events that triggered at least two readouts with more than 10 signals in less than 100 ns. The first two that I show triggered on three readouts!

It would be interesting for someone to study how the number of signals varies over different trigger gates or how the number of events depends on the setting of the counter threshold.

- Figure 1: An event that triggered three readout boards (10 particles).
- Figure 2: An event that triggered three readout boards (10 particles).
- Figure 3: An event that triggered two readout boards (12 particles).

Discussions & Conclusions

This early analysis indicates the arrangment of 6 detectors into a small footprint worked. We observed 3 three events (gate = 100 ns) with more than 10 particles in each event.

There are many more events in the data than what we show here. Look for those with fewer particles or shorter gates. Further questions can include:

- How many 3 particle showers occured? 4? 7?
- How many of these events triggered 2 readouts? 4?
- How many of these events are <50 ns? 80?

e-Labs support:
Student Logbooks:

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e-Labs Infrastructure:

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- SQL database for user login and paths/to/derived/data
- Java beans for form validation and job origination
- Tomcat webserver
- VDS workflow management

e-Labs Infrastructure:

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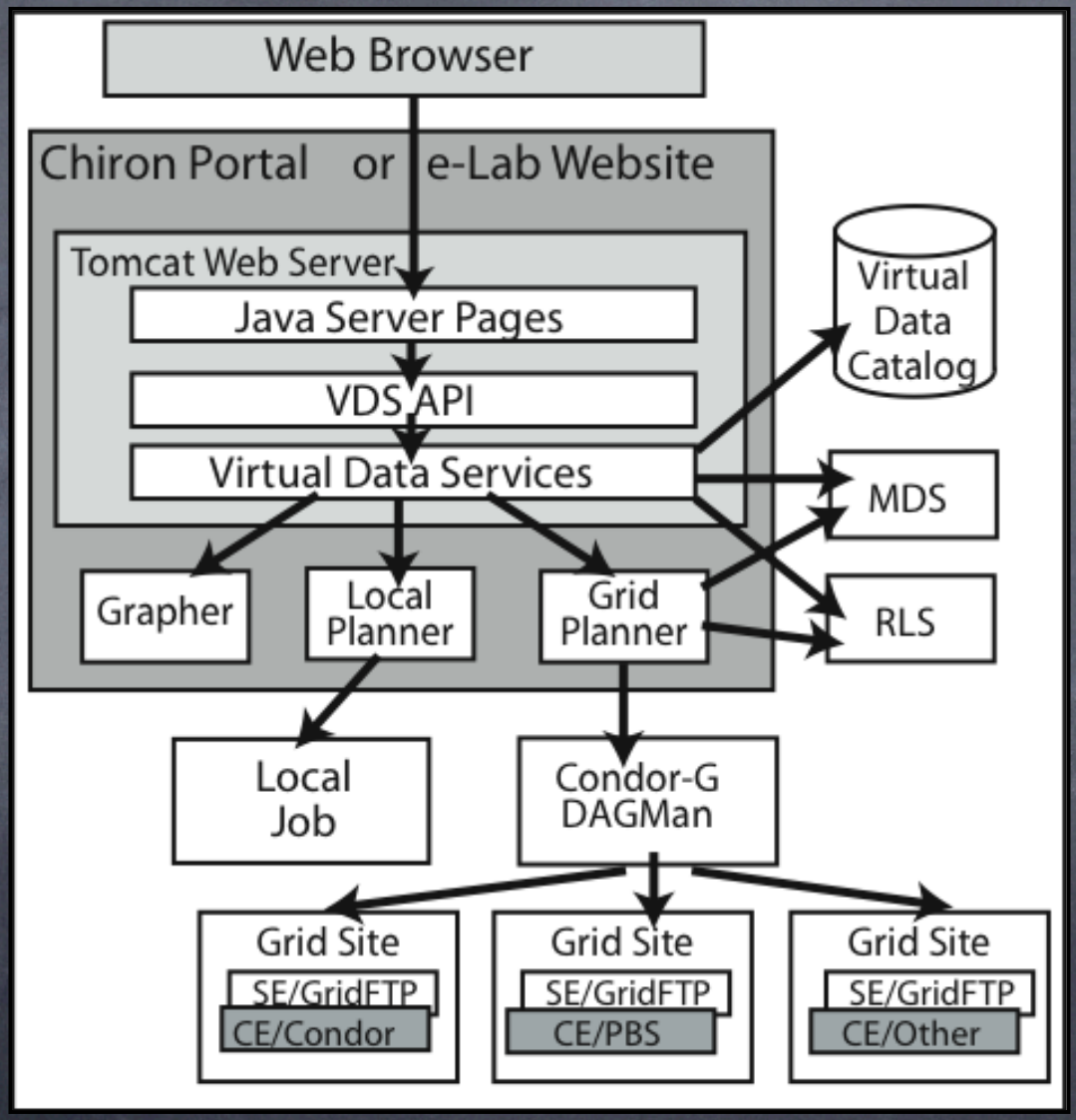

e-Labs Infrastructure:

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- Cosmic Ray e-Lab Data Analysis

  Each DAG node is a smallish perl script
  Intermediate data files are input for the next node
  Analyses are pre-defined workflows

- CMS e-Lab uses ROOT for the analysis routines

  Tomcat interface to ROOT
  Working to create SWIFT interface to ROOT

- Nearly 300 users (mostly in US High Schools)
- 10^3 saved data products
- 10^5 derived data products (18 months)

e-Labs Support:

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- Fermilab Education Office
  - Marge Bardeen
  - Bob Peterson
  - Liz Quigg
- University of Chicago/Argonne National Lab
  - Ben Clifford
  - Mihael Hategan
  - Tibi Stef-Praun
  - Mike Wilde
- University of Florida
  - Tom Jordan

Summary

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- e-Labs use the VDT API to allow students access to data and pre-defined analysis workflows.
- Computes run on a smallish cluster at Argonne National Laboratory.
- We have executed some jobs on OSG compute resources but have not put this in production.
- We have users!
- We are developing an e-Lab interface for ROOT.
- Supporting end-users is a DC effort.