

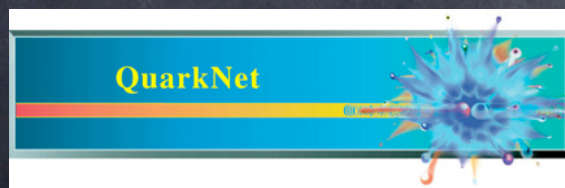
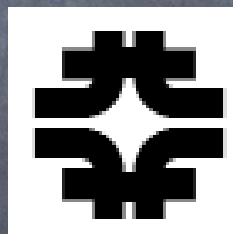
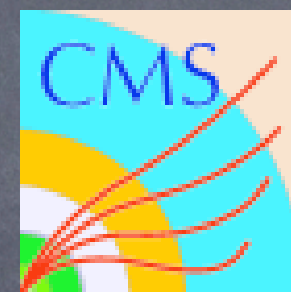
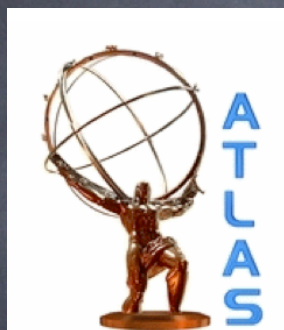
I2U2

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:



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

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

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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The screenshot shows the Cosmic Ray e-Lab web interface. The browser address bar displays the URL: http://www1.i2u2.org:8080/elab/cosmic/search.jsp?t=split&f=analyze&s=lifetime&last_q=type%3D%27split%27+AND+pr. The page title is "Cosmic Ray e-Lab". The navigation bar includes links for Home, Library, Data (selected), Posters, Site Index, and Assessment. Below the navigation bar, there are buttons for View Data, Performance, Lifetime, Flux, Shower, and View Plots. A blue banner reads "Choose data for the lifetime study." The search results section shows "Results 1 - 10 of 12 for 12 Schools WA (Searched 2629 files in 34.994 seconds)". The results list includes DeVry University, Federal Way Public Academy, Garfield High School, and Issaquah High School. The Federal Way Public Academy section is expanded, showing a list of dates from March 13 to March 31, 2006, with checkboxes for selecting files. A legend on the right side of the page defines symbols for Unstacked data, Stacked data, Blessed data, and Add/View comments.

Cosmic Ray e-Lab

Logged in as group: [tj](#) [Logout](#) [My Logbook](#)

Home Library **Data** Posters Site Index Assessment

[View Data](#) [Performance](#) [Lifetime](#) [Flux](#) [Shower](#) [View Plots](#)

Choose data for the lifetime study.

State: [Fermilab](#) [Batavia](#) [IL](#) [Everyone](#)

Advanced Search

Results 1 - 10 of 12 for 12 Schools WA (Searched 2629 files in 34.994 seconds)

▶ **DeVry University**
Federal Way, WA
963 data files: 0 blessed, 0 stacked, 41,442,688 total events.

▼ **Federal Way Public Academy**
Federal Way, WA
37 data files: 0 blessed, 0 stacked, 1,858,852 total events.

▼ March 2006 ☐ select all 12 files

<input type="checkbox"/> Mon 13	<input type="checkbox"/> Tue 14	<input type="checkbox"/> Wed 15
<input type="checkbox"/> Thu 16	<input type="checkbox"/> Fri 17	<input type="checkbox"/> Sat 18
<input type="checkbox"/> Sun 19	<input type="checkbox"/> Mon 20	<input type="checkbox"/> Tue 21
<input type="checkbox"/> Wed 22	<input type="checkbox"/> Thu 23	<input type="checkbox"/> Fri 24

▶ April 2006 10 files
▶ May 2006 15 files

▶ **Garfield High School**
Seattle, WA
227 data files: 0 blessed, 48 stacked, 7,972,981 total events.

▶ **Issaquah High School**
Issaquah, WA
56 data files: 0 blessed, 0 stacked, 1,021,658 total events.

Help

[Tutorial on lifetime study](#)

[Step-by-Step Instructions](#)

States include provinces and countries. Enter the [abbreviation](#).

Analyze

Legend

- Unstacked data
- Stacked data
- Blessed data
- Add/View comments

e-Labs support: Workflow management:

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The screenshot shows a web browser window with the URL <http://www11.i2u2.org:8080/elab/cosmic/lifetime.jsp>. The page title is "Choose lifetime parameters". The browser's address bar shows the URL, and the search bar contains "Google". The page has a navigation bar with links: Home, Library, Data (selected), Posters, Site Index, and Assessment. Below the navigation bar, there are sub-links: View Data, Performance, Lifetime (selected), Flux, Shower, and View Plots. The main content area is titled "Cosmic Ray e-Lab" and "Logged in as group: tj". It includes a "Logout" link and a "My Logbook" link. The main heading is "Calculate the lifetime of muons that stop in the detector." followed by a link "Understanding The Graph". Below this, there is a table of analysis results. The table has columns for "You're analyzing...", "Chan1 events", "Chan2 events", "Chan3 events", "Chan4 events", "Raw Data", and "Remove from analysis". The data rows show two analysis runs for "Federal Way Public Academy" on March 13 and 14, 2006, with a total of 122825 events. A link "Analyze these same files in study: flux shower" is provided. A modal window titled "Click Analyze to use the default parameters. Control the analysis by expanding the options below." is displayed, showing "Analysis Controls" (Coincidence level: 1, Check energy of 2nd pulse: yes, Gate width (seconds): 1e-5), "Plot Controls", and "Fit Controls". An "Analyze" button is at the bottom of the modal.

Choose lifetime parameters

http://www11.i2u2.org:8080/elab/cosmic/lifetime.jsp

Google

FNAL @ Work T-Mobile QuarkNet Chiron UAL EventPlot VDL UF Bridge Cosmics Calendars Astro Parenting Apache/Tomcat Apple (50) Amazon eBay Yahoo!

Cosmic Ray e-Lab Logged in as group: tj Logout My Logbook

Home Library **Data** Posters Site Index Assessment

View Data Performance **Lifetime** Flux Shower View Plots

Calculate the lifetime of muons that stop in the detector.

[Understanding The Graph](#)

You're analyzing...

	Chan1 events	Chan2 events	Chan3 events	Chan4 events	Raw Data	Remove from analysis
Federal Way Public Academy Mar 13, 2006 21:43:39 GMT	8887	9588	8847	3192	View Statistics	<input type="checkbox"/>
Federal Way Public Academy Mar 14, 2006 6:01 GMT	27212	29083	26918	9098	View Statistics	<input type="checkbox"/>
Total (2 files 122825 events)	36099	38671	35765	12290	Compare files	<input type="button" value="remove"/>

Analyze these same files in study: [flux shower](#)

Click **Analyze** to use the default parameters. Control the analysis by expanding the options below.

Analysis Controls

Coincidence level: 1

Check energy of 2nd pulse: yes

Gate width (seconds): 1e-5

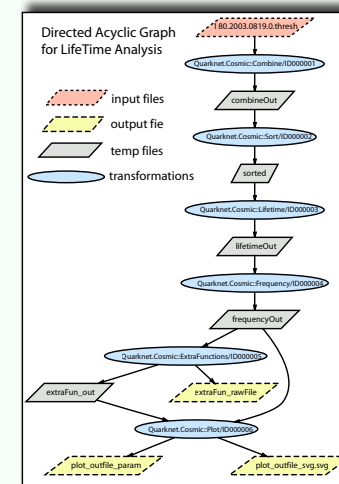
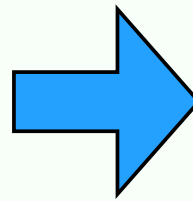
Plot Controls

Fit Controls

e-Labs support: Workflow management:

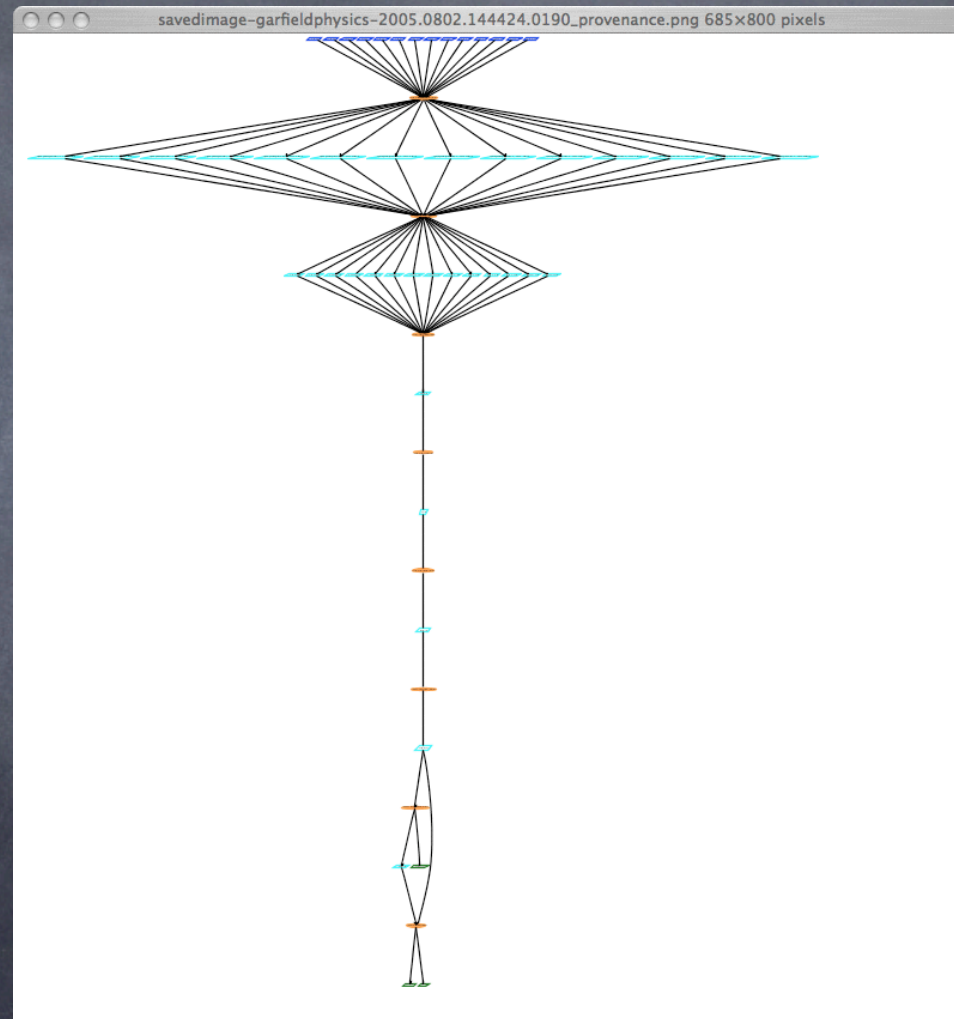
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```
TR Quarknet.Cosmic::LifetimeStudy(  
  inout combineOut,  
  none detector,  
  none extraFun_alpha_guess,  
  none extraFun_alpha_variate,  
  none extraFun_constant_guess,  
  none extraFun_constant_variate)
```



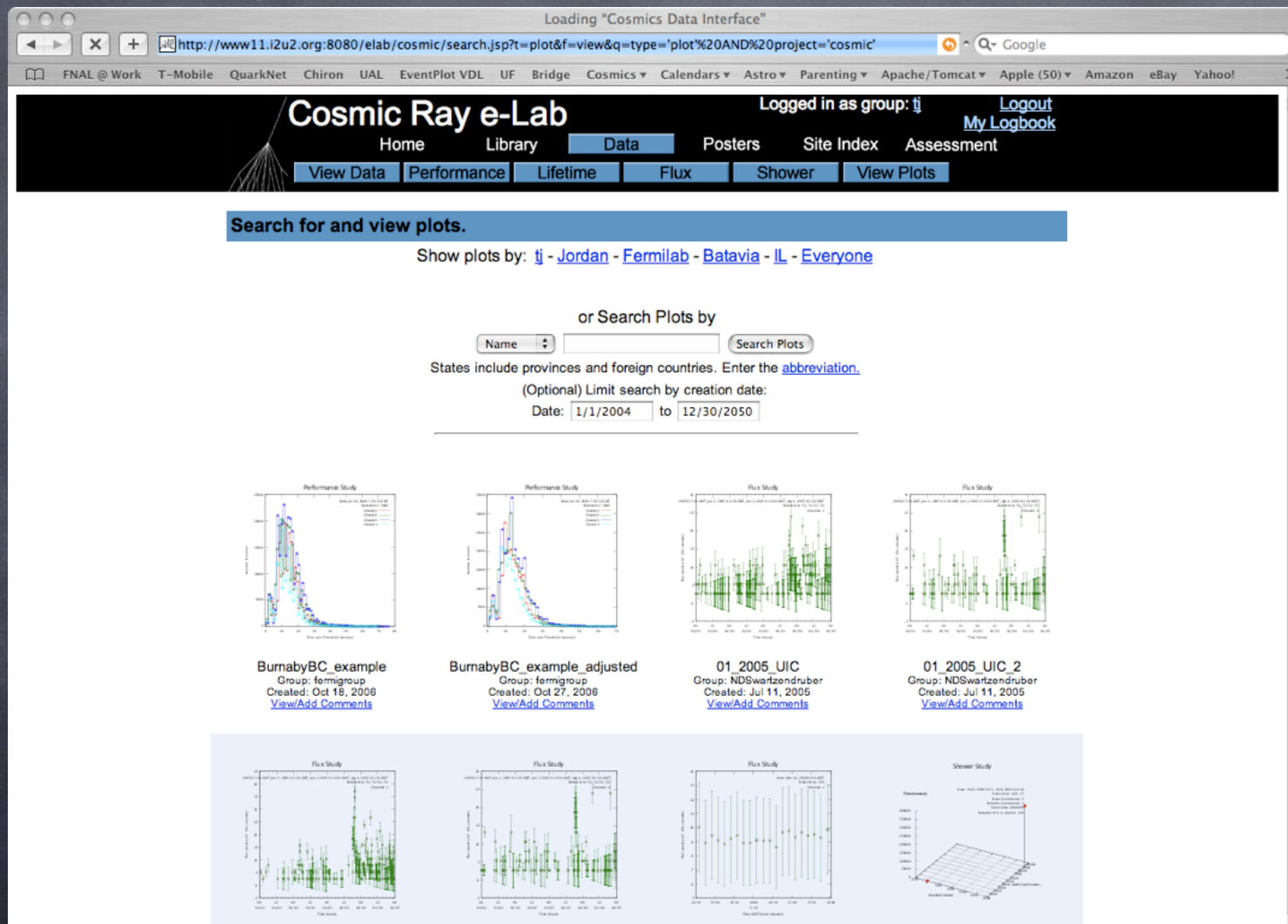
e-Labs support: Workflow management:

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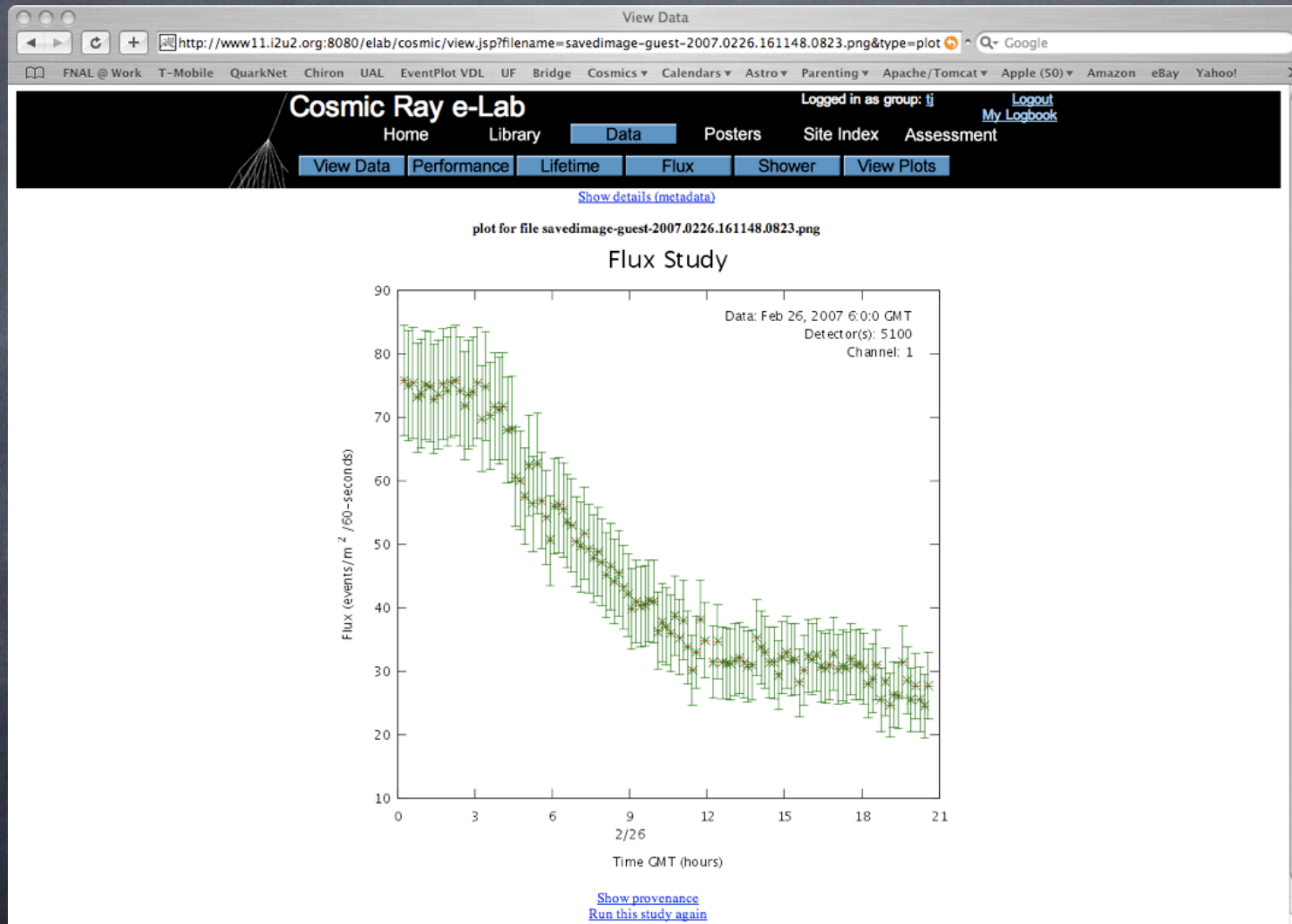
e-Labs support: Catalogue of Derived Data:

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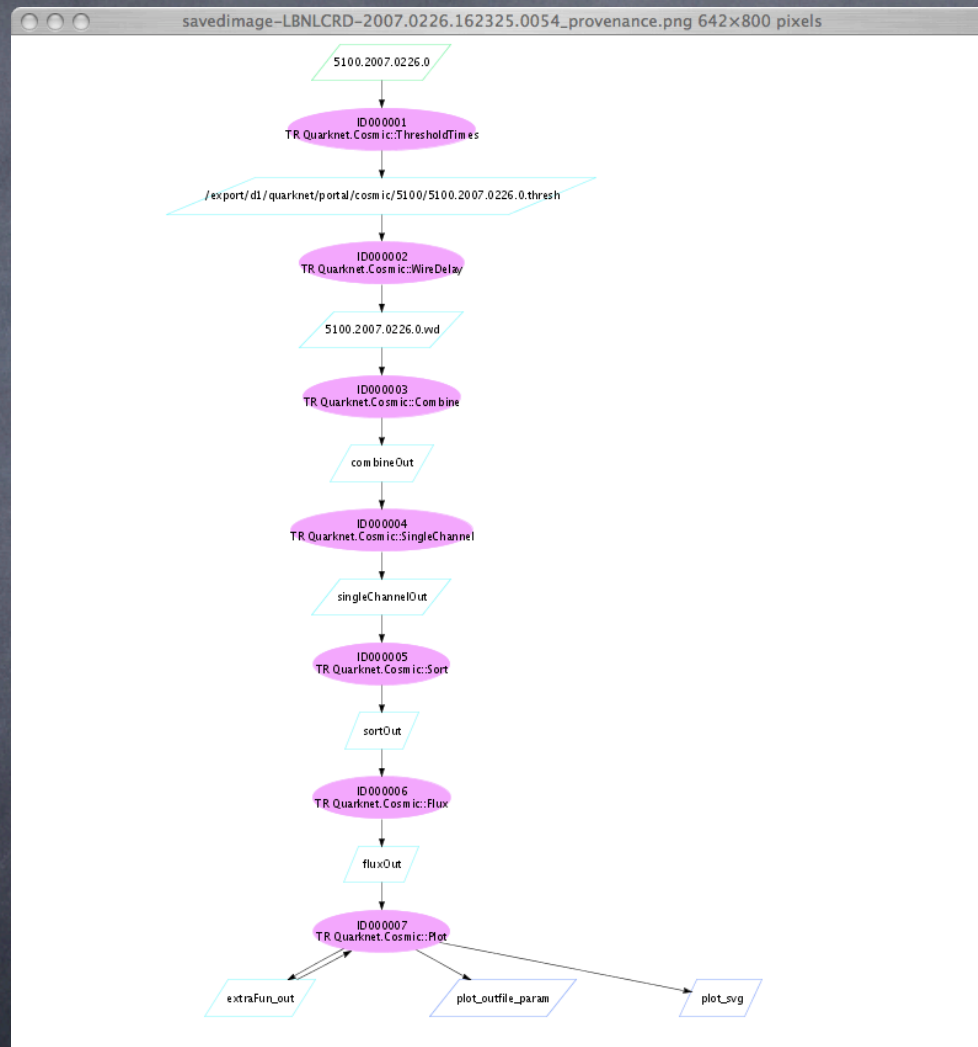
e-Labs support: Re-run an Analysis:

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e-Labs support: Data Provenance:

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e-Labs support:

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 coincidences 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 occasions, 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 arrangement 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 occurred? 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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[All Entries](#)

☒ general

Milestones from Research Basics and Study Guide

☒ if entry exists

Research Basics

☒ simple measurements

☐ simple calculations

☒ simple graphs

☐ research question

☐ research plan

A: Get Started

☒ cosmic rays

☐ cosmic ray study

☒ detector

☐ research proposal

B: Figure it Out

☐ collect upload data

☐ search parameters

☒ analysis tools

☐ data error

C: Tell Others

☐ defend solution



Logbook Entry for Group "anthro"

 Click to add a logbook entry. Click to view your teacher's comments.Comments: Number of teacher comments (number unread). New comments by your teacher are marked as ■.

Research Basics

simple measurements - Notes on simple measurements  

01/06/2005 04:11	I find it hard to use meters instead of inches.
12/15/2004 01:50 comments: 3	I wonder why this is called "simple". It doesn't seems so.
12/15/2004 10:34	Try for more.
12/15/2004 10:06	Should I be using metric units for this? Yes I think I should. In fact, I should forget about the units I am use to.
12/07/2004 06:45	I am trying to figure out how to convert my geometry to the right units.
11/30/2004 08:50 comments: 3	Let's see if we can get a different time.
11/30/2004 08:48	I will also try to get use to the energy units.
11/30/2004 08:48 comments: 3	It is hard to get use to using the units of time.

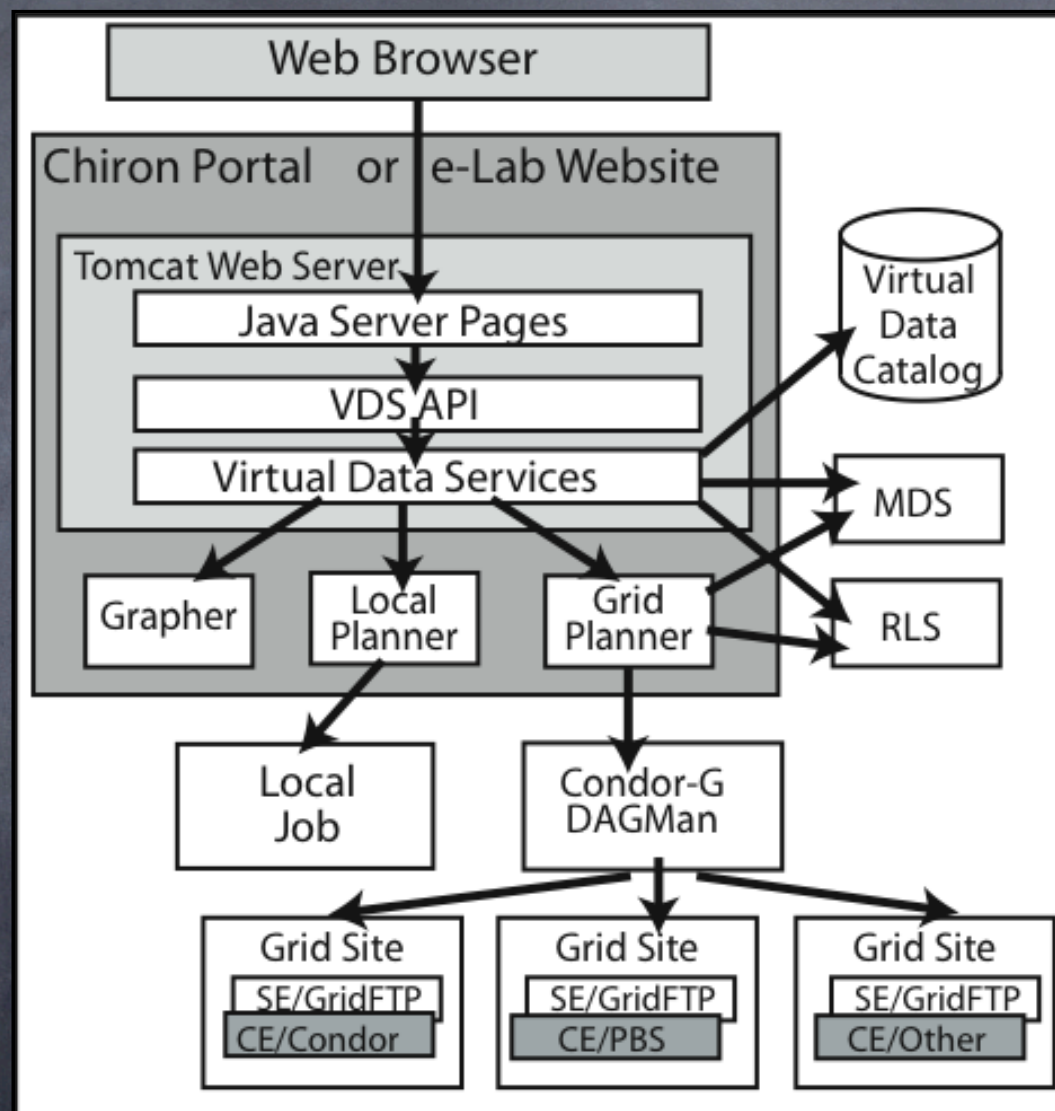
e-Labs Infrastructure:

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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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- 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:

I2U2

- 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.