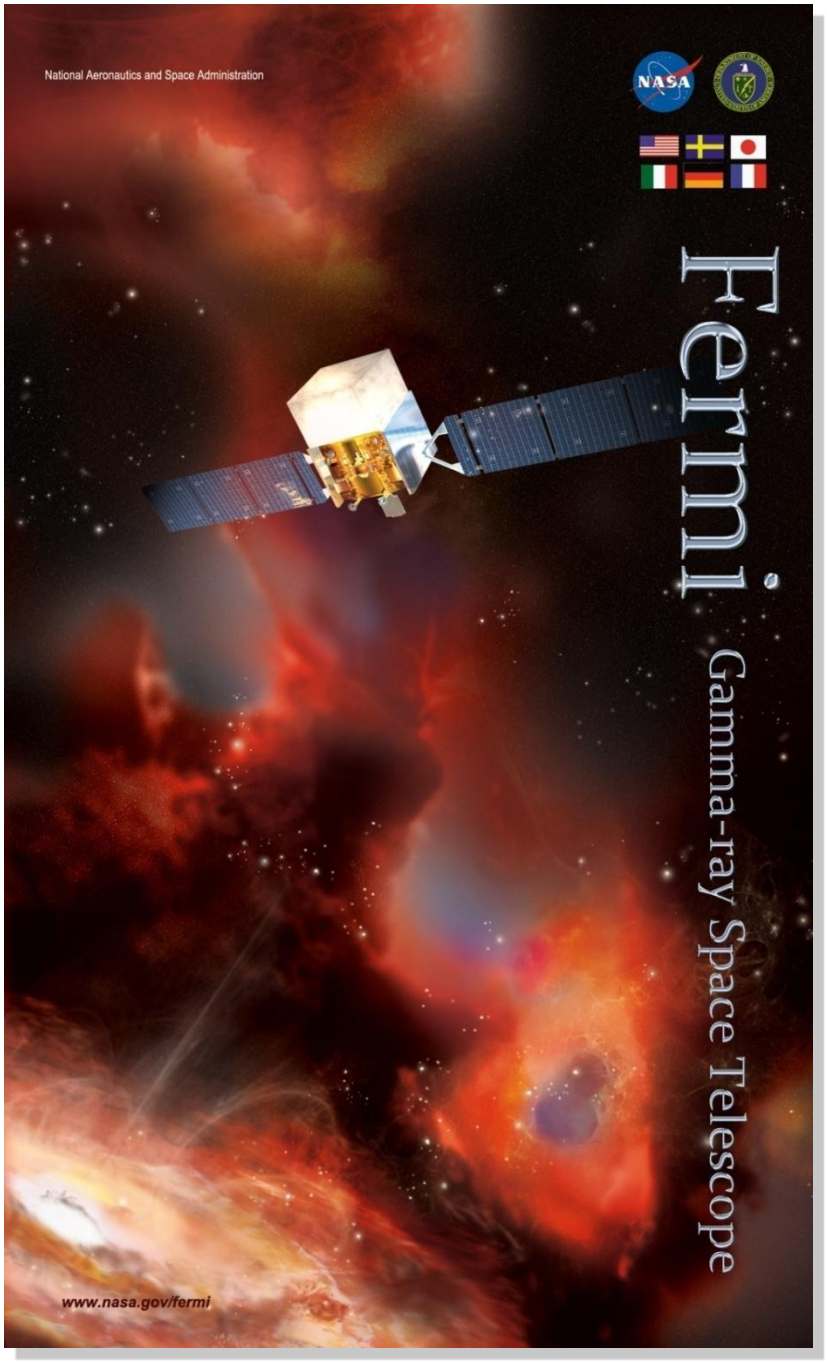
Fermi Gamma-Ray Space Telescope Processing Pipeline and Data Catalog and Online Monitoring

Tony Johnson

SLAC
NATIONAL ACCELERATOR LABORATORY

tonyj@slac.stanford.edu

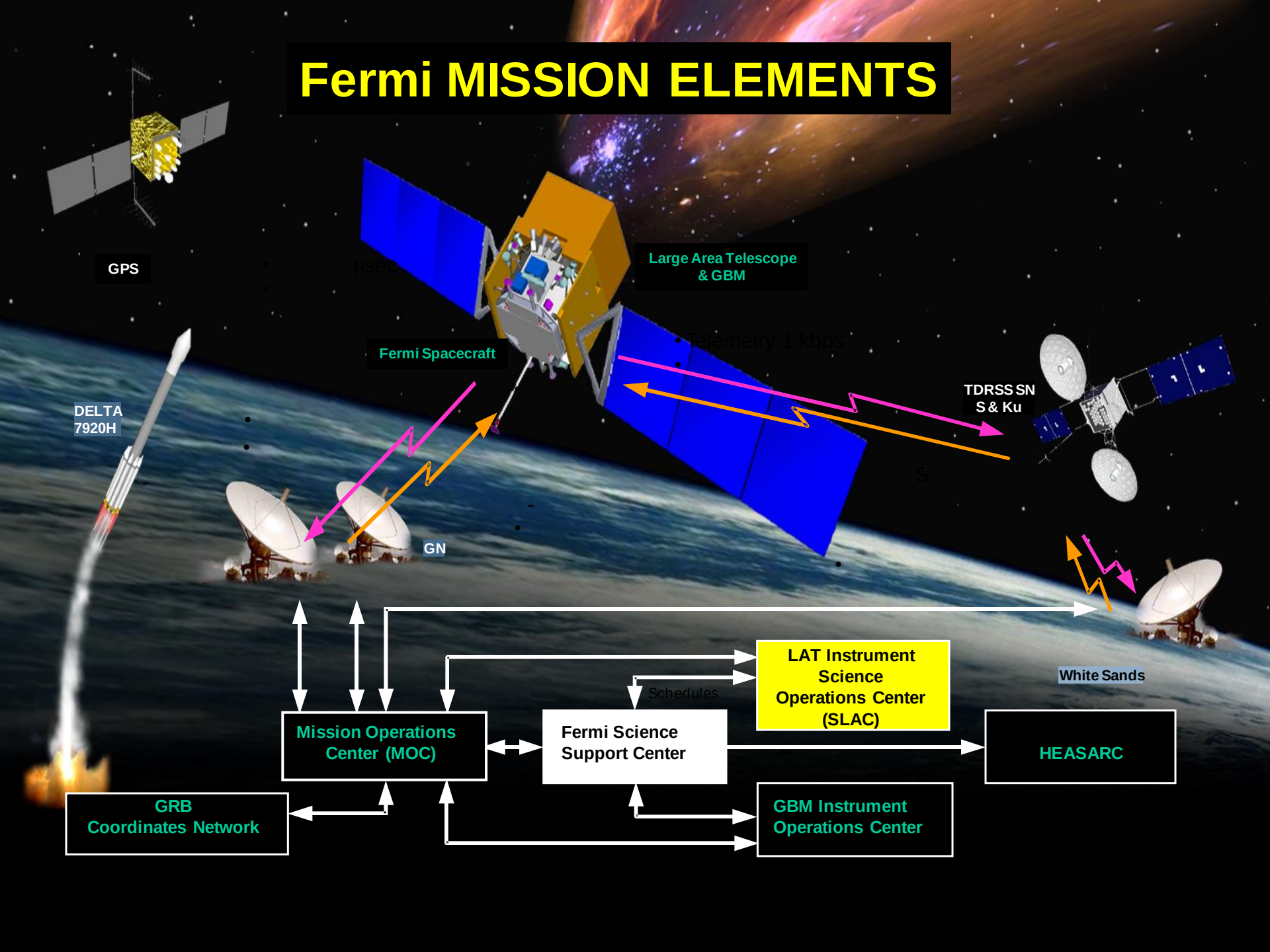


Overview

- **Fermi infrastructure**
  - **Automated data processing pipeline**
    - **Also use for MC simulation**
  - **Data quality monitoring**
  - **Data access and data selection tools**
  - **Future development**
- **Explore potential for future use by CTA**
  - **Reuse of any existing Fermi tools?**
  - **Reuse of experience and lessons learned from Fermi?**
  - **Development of future CTA tools?**

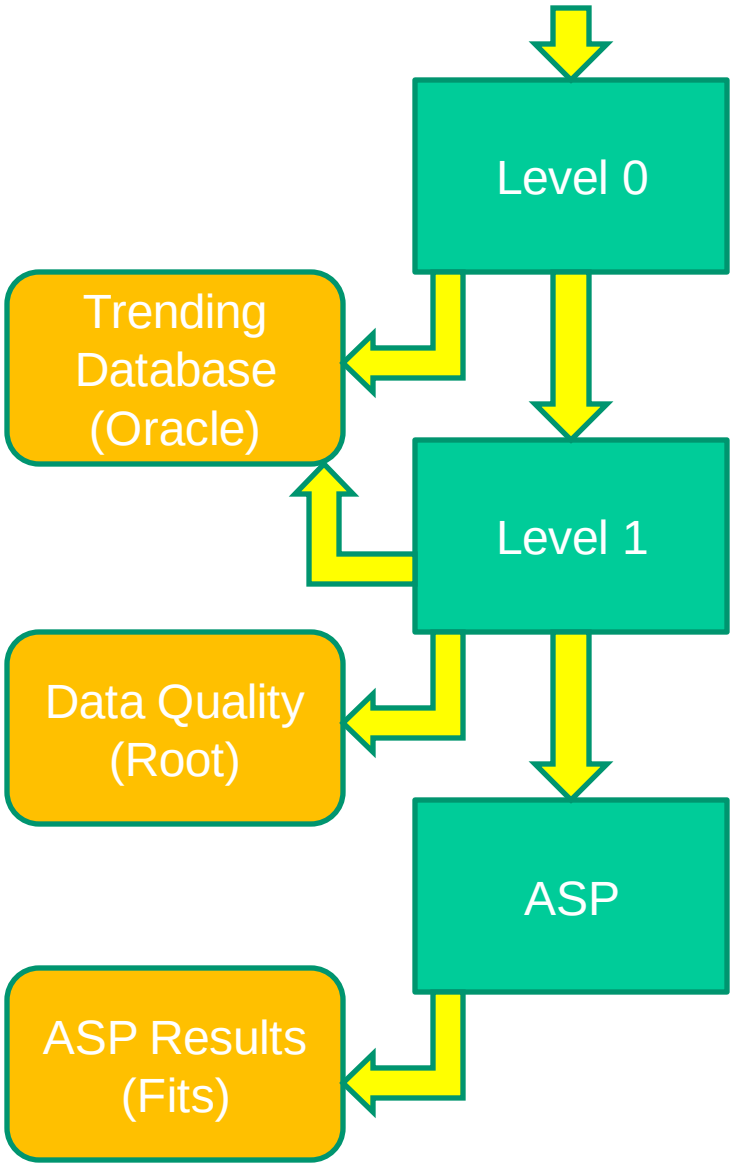
Launched 11 June 2008 – LAT activated 25 June

Fermi MISSION ELEMENTS



Data Processing Flow at SLAC

- Downlink from Goddard Space Flight Center
  - ~8 downloads per day
  - 15 GB total daily
- Level 0 Processing
  - Automatically launched as data arrives
  - Decode & repackage incoming data
    - Split science data from telemetry data
- Level 1 Processing
  - Full event reconstruction: 750 GB/day
  - Data Quality Monitoring
  - Transfer science summary files to Fermi Science Support Center - 200 MB/day
    - Immediately available to the public
- ASP (Automated Science Processing)
  - GRB and Flare detection
  - Spectral analysis
- 120,000 quantities continuously monitored
  - Mixture of Oracle, Root, Fits data

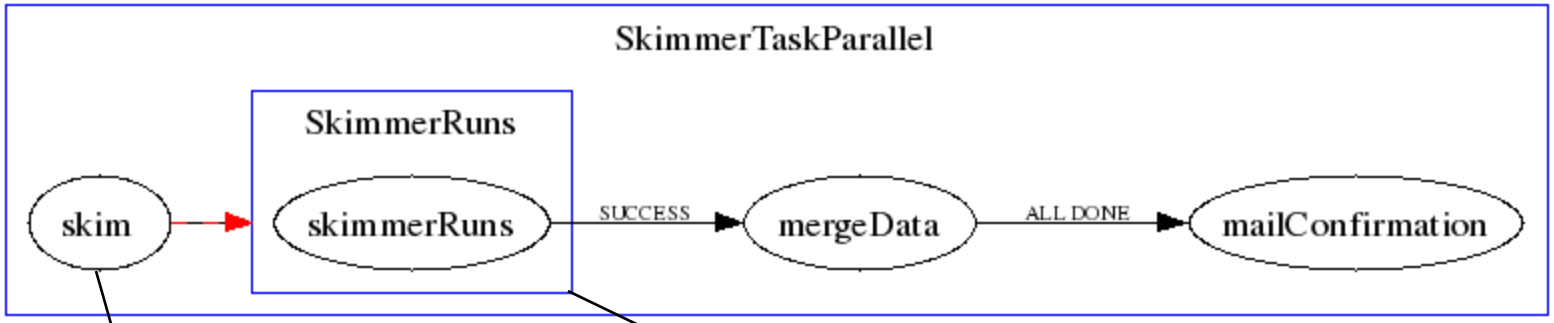


Data Processing Pipeline

- Allow completely automatic processing of Fermi data
  - Reconstruction and initial analysis of incoming data
    - Aim to completely process incoming data in 3 hours
      - Requires massive parallelization (2000 jobs, 800 cores)
      - Less than .01% of batch jobs require manual intervention
  - Re-processing of data
  - Monte-Carlo simulation of data
    - Sufficient capacity to do MC simulations and reprocessing without impacting data processing
- Full bookkeeping for maintaining provenance of data products
- Ability to roll back failed (or successful) jobs
  - Including automatic resubmission of all downstream jobs
- Web interface to allow data processing to be monitored or controlled from anywhere

Anatomy of a Pipeline Task

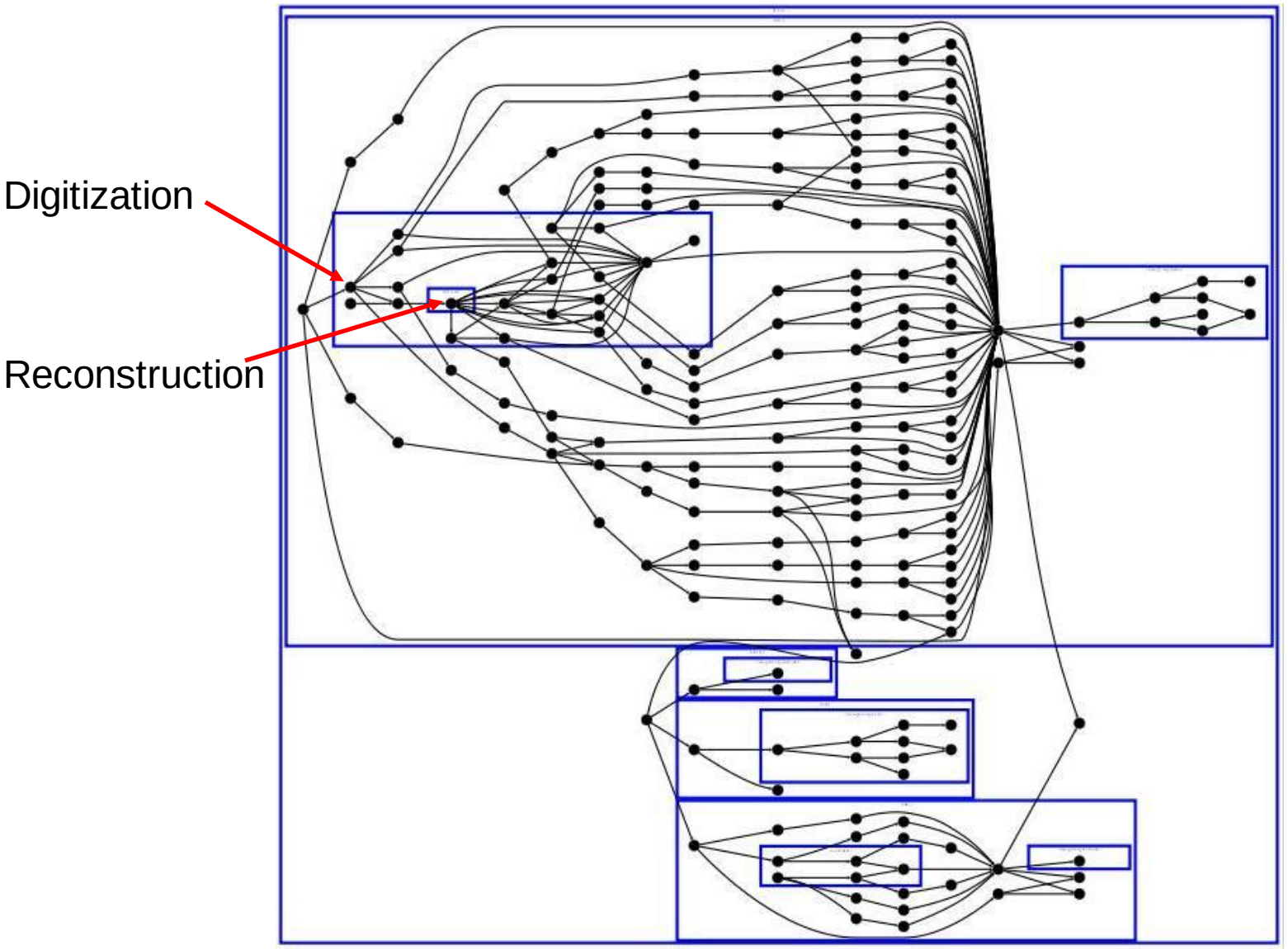
Tasks, Subtasks, Processes, Streams, specified in user written XML



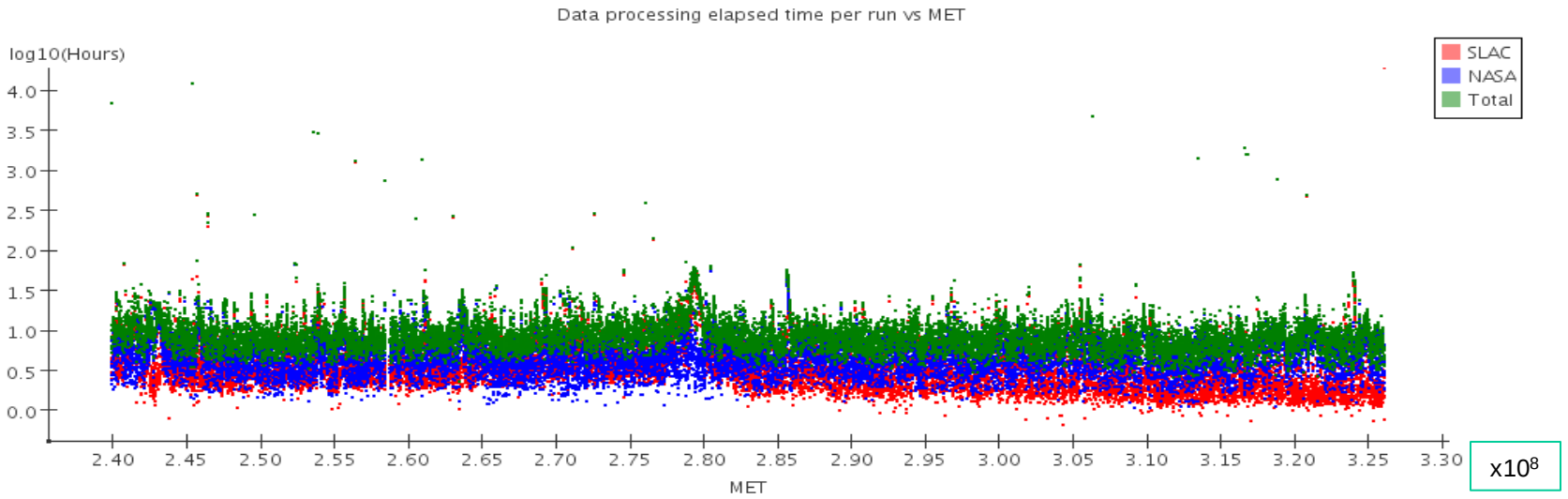

```
<process name="skim">
    <script>
        <![CDATA[
 from java.util import HashMap
 start = 0
 chunk_size = DP_FILE_LINES/DP_SUBTASKS + 1
 for i in range(DP_SUBTASKS):
    vars = HashMap()
    vars.put("DP_START", start)
    end = min( start + chunk_size, DP_FILE_LINES )
    vars.put("DP_END", end)
    if end>start:
       pipeline.createSubstream("SkimmerRuns",i,vars)
    start = end
 ]]>
    </script>
    <createsSubtasks>
        <subtask>SkimmerRuns</subtask>
    </createsSubtasks>
</process>
```

```
<task name="SkimmerRuns" type="Data" version="1.0">
    <process name="skimmerRuns">
        <variables>
            <var name="streamID">${format(pipeline.stream,"%04d")}</var>
        </variables>
        <job maxCPU="${DP_SKIMMER_MAXCPU}">
            cat ${DP_FILE_LIST} | head -${DP_END} | tail -$((DP_END-DP_START)) > partlist
            export SK_FILE_LIST_FILE=partlist
            export SK_OUT_DIR=${DP_OUT_DIR}/${streamID}
            export SK_ENFORCE_OUTPUT_FILES=false
            export SK_MAX_FILE_SIZE=0
            export SK_OUT_FILE_BODY=${DP_JOBNAME}-${streamID}
            mkdir -p ${SK_OUT_DIR}
            $SK_DIR/bin/skimmer
        </job>
    </process>
</task>
```

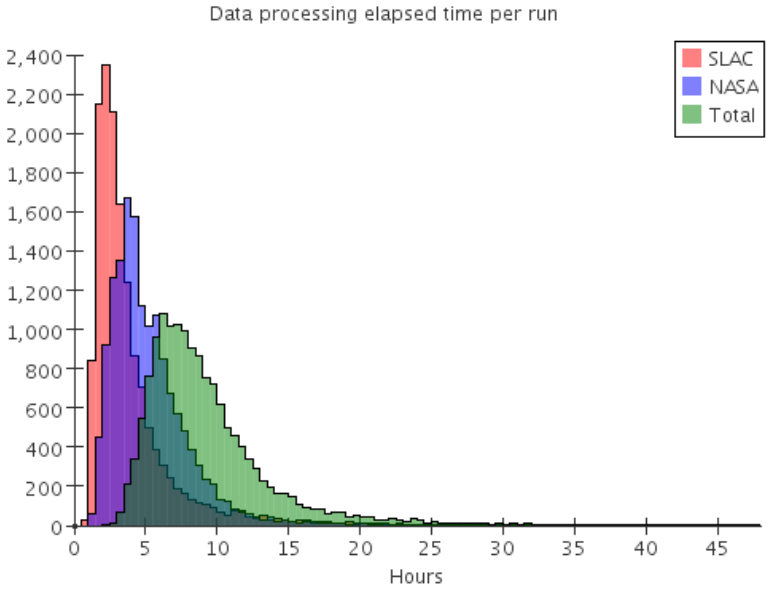
Level 1 Processing Task Example



Pipeline Performance and Reliability



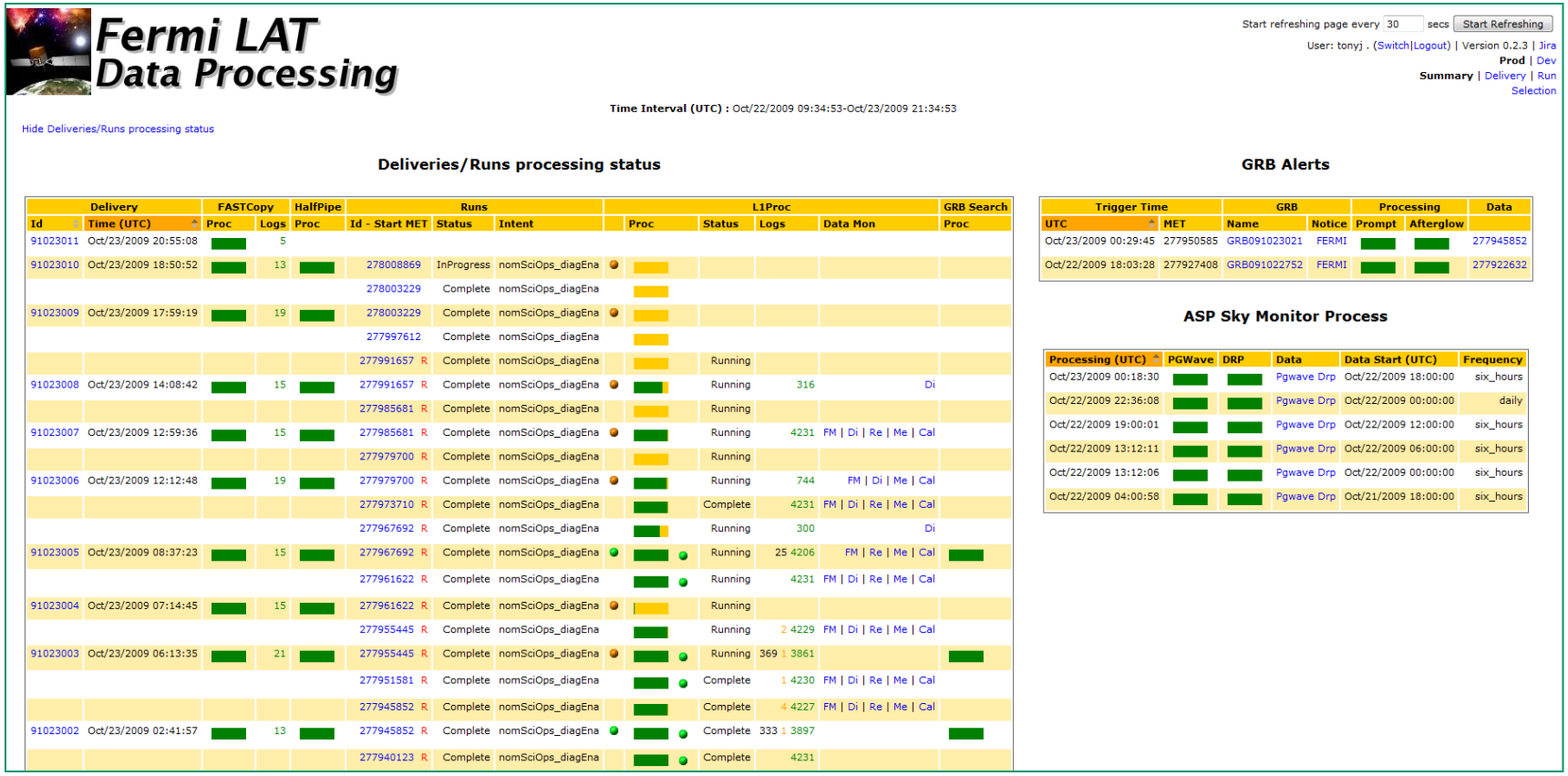
Elapsed time between data being recorded on satellite and arriving at SLAC (blue), and between arriving at SLAC and being totally processed (red), and total elapsed time (green). Almost all data is fully processed <24 hours after being recorded.



ISOC Control Room

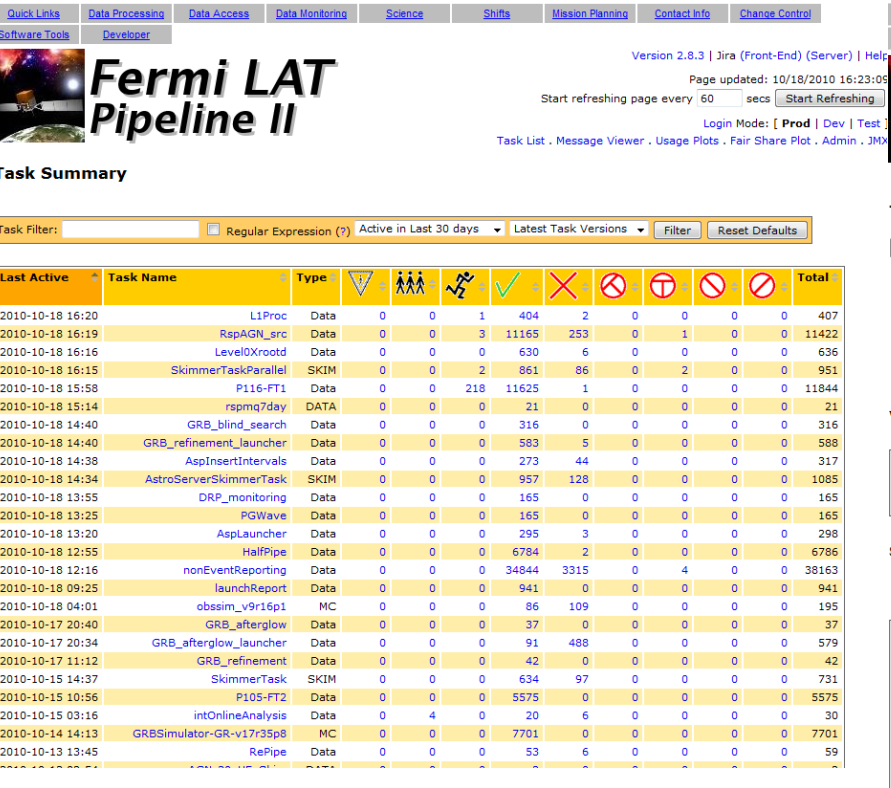
- **"Duty Scientists" monitoring data quality daily**
- **All of the data processing and data quality monitoring can be done from the web**

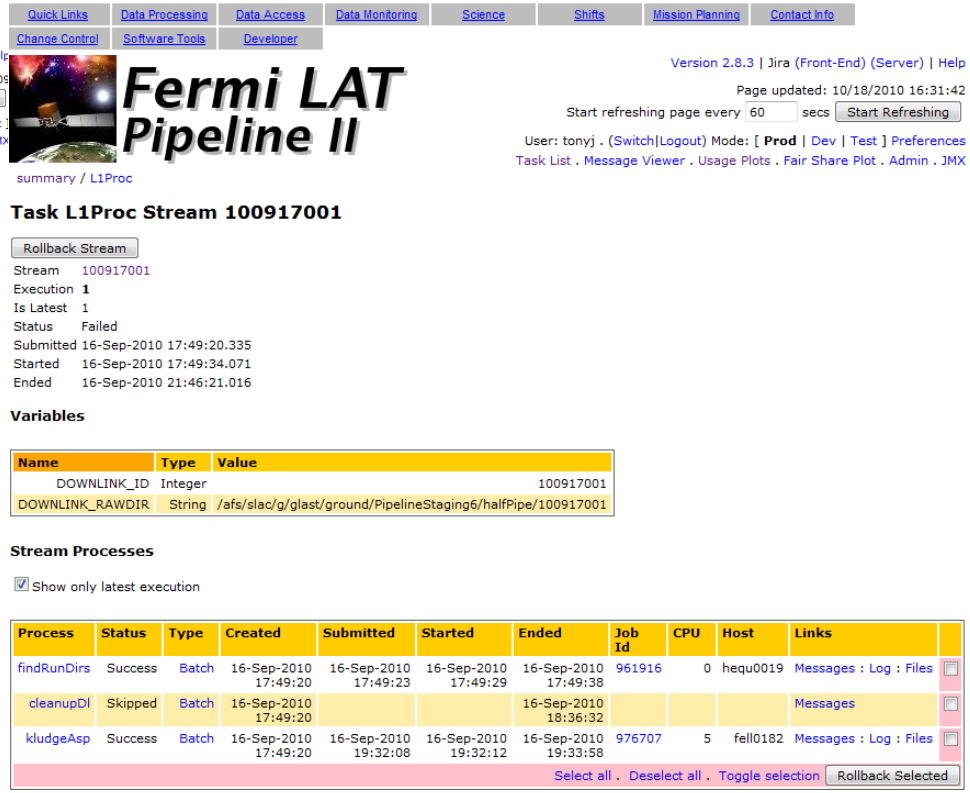
Monitoring Data Processing



- **Web interface allows**
  - **Quick overview of data processing**
  - **Flags runs requiring further attention**
  - **Allows "drill-down" to isolate/identify problems**

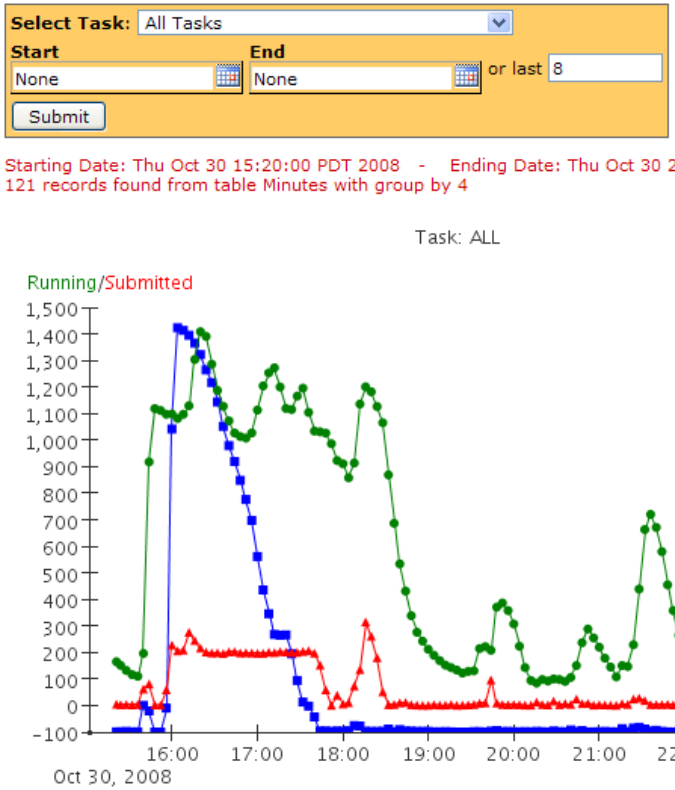
Processing Pipeline Web Interface

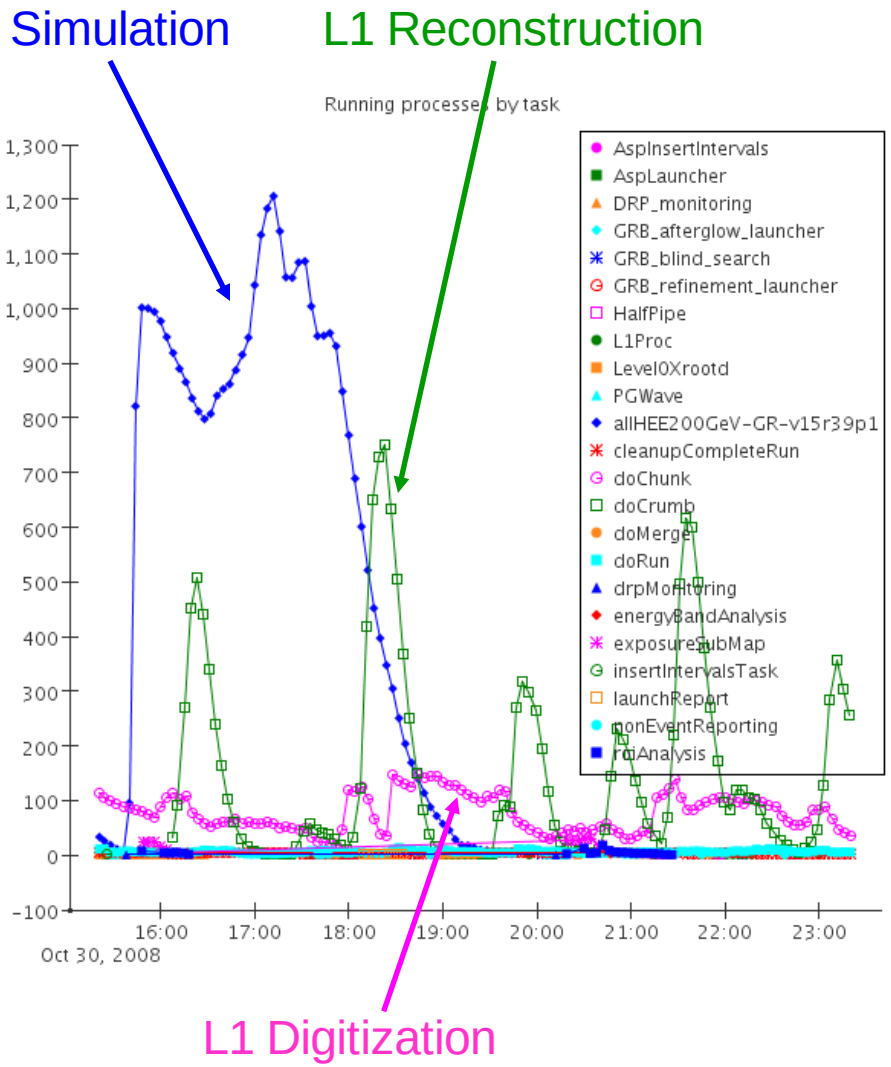




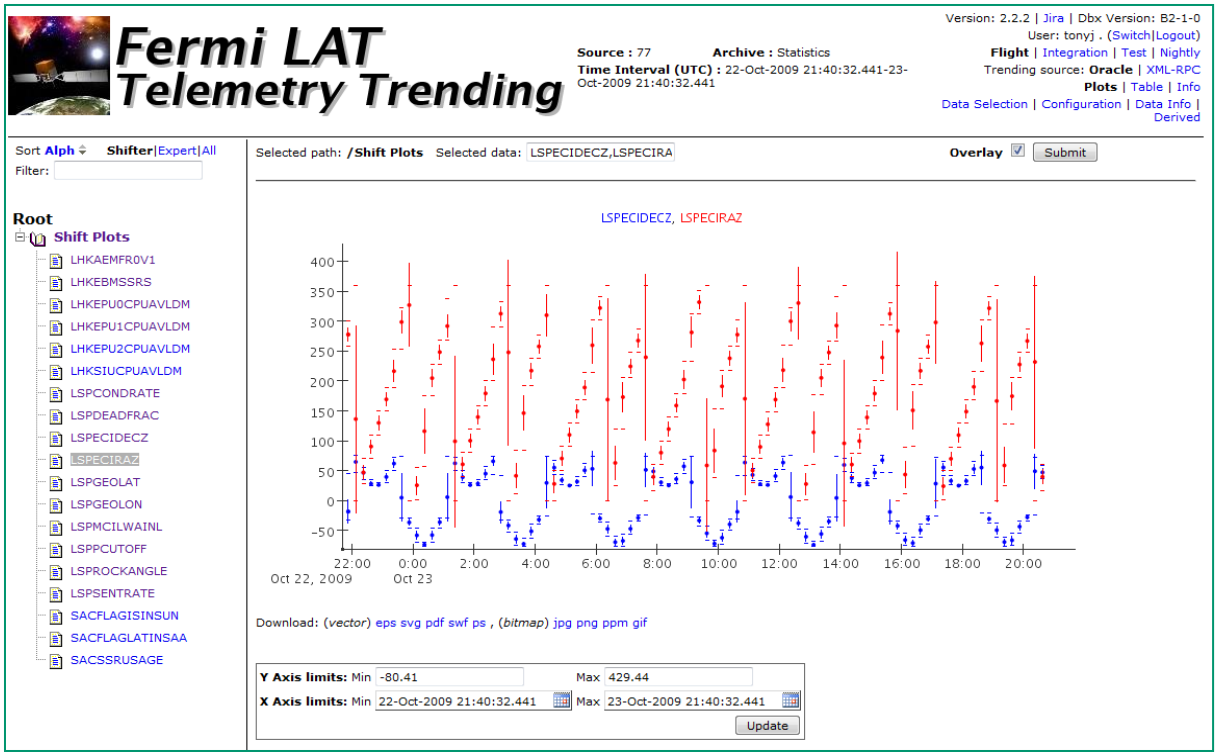
- **Pipeline web interface allows**
  - **Many views of data processing, down to log files of individual jobs**
  - **Job submission (but normally done from command line)**
  - **If jobs do fail they can be "rolled back" directly from the web interface**

Front End: Activity Plots





Telemetry Trending

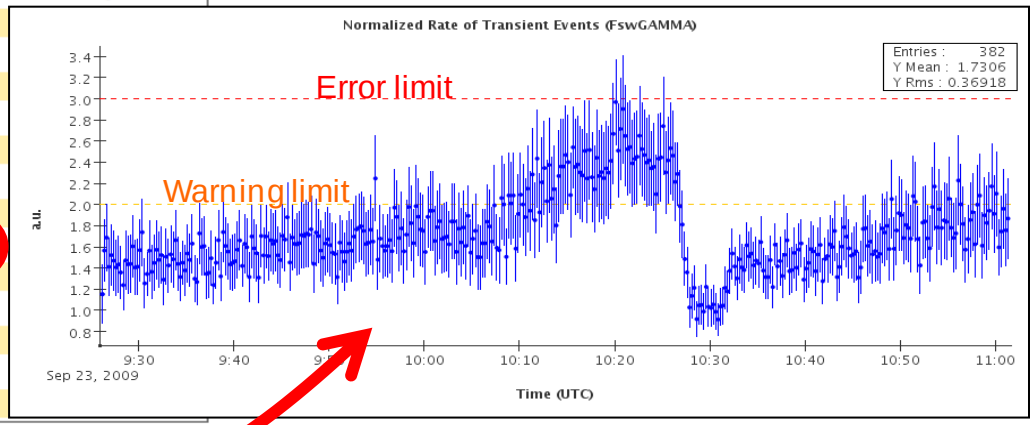


- **Web interface allows**
  - **Dynamic selection of time period**
  - **Dynamic overlay of quantities**
  - **Customized tree to draw attention to important plots**
    - **Can be customized for individuals or groups**
- **Cross trending of housekeeping and level 1 data**

Automated Alarms

Alarms for run 275390766

Mode	Type	Error	Warning	Undefined	Clean
acdPedsAnalyzer	Hist	0	0	0	14
calGainsAnalyzer	Hist	0	0	0	18
CalPed	Hist	0	0	0	2
calPedsAnalyzer	Hist	0	0		
Digi	Hist	0	0		
Digi	Trend	0	0		
FastMon	Hist	0	0		
FastMon	Trend	0	0		
fastMonError	Trend	0	0		
Merit	Hist	0			
Merit	Trend	0	1		
Recon	Hist	0			
Recon	Trend	0	0		
TkrMon	Trend	0	0		
verifyFt2Error	Trend	0	0		
verifyLog	Trend	0	0		



WARNING Status

Severity	Mode	Type	Variable Name	Algorithm	Value	Limits	Details
5	Merit	Trend	OutF_NormRateTransientEvts	values	2.97 +- 0.81	[-1.0E10 | -1.0E10 | --- | 2.0 | 3.0]	View

- **Automated alarms are used to alert duty scientists to anomalies**
- **Use fixed limits and reference histograms**
- **Many quantities are highly orbit dependent, so particle fluxes, geomagnetic variables must be taken into account**
  - **20 different alarm algorithms**

Data Access

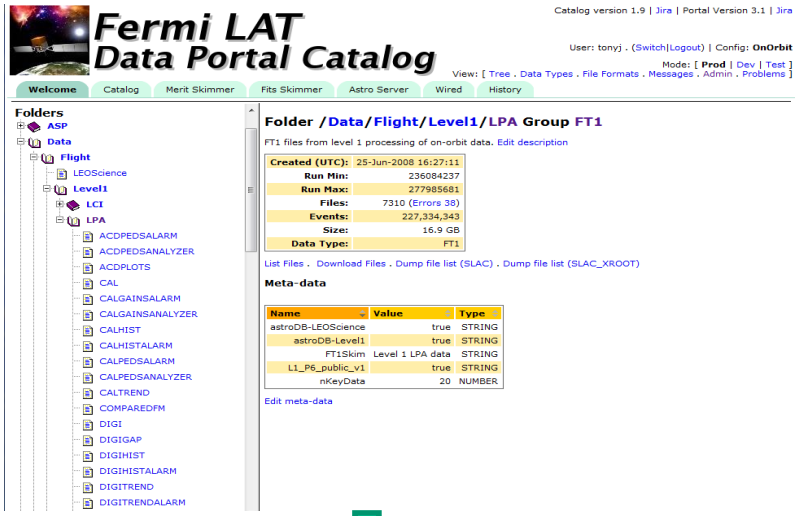
- Fermi data is immediately available to the public
  - Via Fermi Science Support Center
- ISOC supports collaboration data servers which provide
  - Full access to data via web based "data catalog"
    - Access to public files plus extended event formats
    - Search based on arbitrary "meta-data" associated with datasets
  - Web based event display for looking at detailed reconstruction of individual events
  - Web based data selection tools
    - With support for producing Root and Fits files

Data Catalog Web Interface

Folder /Data/Flight/Level1/LPA Group FT1

7,310 items found, displaying 1 to 500.
[First/Prev] **1**, 2, 3, 4, 5, 6, 7, 8 [Next/Last]

Name	Type	Format	Run Min	Run Max	MET Start	MET Stop	Events	Size	Status	Created (UTC)
r0277985681	FT1	fit	277985681	277985681	277985683.905165	277990271.085179	30,504	2.7 MB	OK	23-Oct-2009 19:56:21
r0277979700	FT1	fit	277979700	277979700	277979702.903274	277984145.085137	23,534	2.1 MB	OK	23-Oct-2009 19:19:55
r0277973710	FT1	fit	277973710	277973710	277973712.90496	277977906.089333	30,101	2.7 MB	OK	23-Oct-2009 18:26:11
r0277967692	FT1	fit	277967692	277967692	277967694.903479	277971873.08714	15,808	1.4 MB	OK	23-Oct-2009 15:28:46
r0277961622	FT1	fit	277961622	277961622	277961624.903399	277965984.086222	28,896	2.6 MB	OK	23-Oct-2009 15:31:20
r0277955445	FT1	fit	277955445	277955445	277955447.910756	277960098.085405	41,667	3.7 MB	OK	23-Oct-2009 17:47:14
r0277951581	FT1	fit	277951581	277951581	277951583.905027	277954232.085327	23,772	2.1 MB	OK	23-Oct-2009 10:54:16
r0277945852	FT1	fit	277945852	277945852	277945854.903315	277951571.085071	64,889	5.7 MB	OK	23-Oct-2009 14:09:05
r0277940123	FT1	fit	277940123	277940123	277940125.911704	277945842.086144	48,907	4.3 MB	OK	23-Oct-2009 13:54:41
r0277934394	FT1	fit	277934394	277934394	277934396.906468	277940113.085254	60,327	5.3 MB	OK	23-Oct-2009 06:33:40
r0277928665	FT1	fit	277928665	277928665	277928667.906523	277934384.085057	47,486	4.2 MB	OK	23-Oct-2009 09:02:42
r0277922632	FT1	fit	277922632	277922632	277922634.903501	277928655.098038	53,059	4.7 MB	OK	23-Oct-2009 05:28:1
r0277917385	FT1	fit	277917385	277917385	277917387.905128	277922501.086144	39,463	3.5 MB	OK	23-Oct-2 00:
r0277911633	FT1	fit	277911633	277911633	277911635.907139	277916406.085126	37,431	3.3 MB	OK	23-O



Folder /Data/Flight/Level1/LPA Group FT1

Dataset r0277967692 version 0

Standard Data

Name	Value
Created (UTC):	23-Oct-2009 15:28:46
Run Min:	277967692
Run Max:	277967692
Events:	15,808
Size:	1.4 MB
Format:	fit
Type:	FT1
Source:	PIPELINE
Task:	doRun
Links	Download History

Meta-data

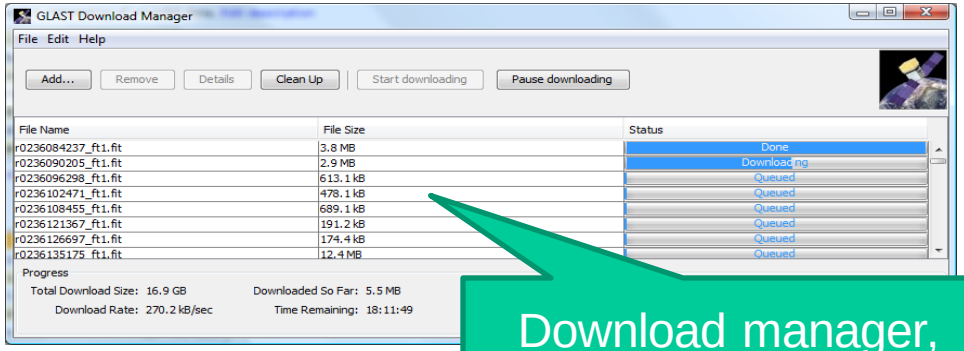
Name	Value	Type
L1_P6_public_v1	true	STRING
nDownlink	91023005	NUMBER
nMetStart	277967694.903479	NUMBER
nMetStop	277971873.08714	NUMBER
nMootKey	2557	NUMBER
nRun	277967692	NUMBER
sCreator	L1Proc-1.79	STRING
sDataSource	LPA	STRING
sIntent	nomSciOps_diagEna	STRING

Edit meta-data

Location

Site	Status	Checked (UTC)	Location
SLAC	OK	23-Oct-2009 16:01:39	/nfs/farm/g/glast/u20/FT1-2copies/glast/Data/Flight/Level1/LPA/prod/1.79/ft1/gll_ph_r0277967692_v000.fit
SLAC_XROOT	OK	23-Oct-2009 15:29:44	root://glast-rdr.slac.stanford.edu//glast/Data/Flight/Level1/LPA/prod/1.79/ft1/gll_ph_r0277967692_v000.fit

Drill down to get more details



Download manager, reliable download of multiple files

“Astro” Server Web Interface

The P6_public_v1 event sample currently contains 190,185,596 events covering the time period 2008-08-04 15:43:36 UTC (239,557,418 MET) to 2009-10-22 11:23:53 UTC (277,903,436 MET) .

Parameter	Value
Job Name	%u-%t-%n *Arbitrary name: %u=user name, %t=job type, %n=unique id*
Event Sample	P6_public_v1 *Event selection help*
Energy Range	Min: Max: *MeV (Leave blank for no limit)*
Time Range	Min: Max: *Mission elapsed time (MET) (Leave blank for no limit)*
Position	RA: 40.1 DEC: 61.225 *degrees (Leave blank for full sky)* or astronomical object: using NED *overrides ra, dec above help*
Radius	10.0 *degrees*
Event Class	Diffuse
Output (FT2 Files)	30 second (fits) 1 second (fits)
Output (Event Data)	FT1 (fits) LS1 (fits) Merit (root) Event-List (text)
Debug Mode	False
User Comment	LS I 61+303
Expert Options	*help*

Proceed

Number of events selected: 369311

Parameter	Value
Job Name	%u-%t-%n
Event Source	P6_public_v1
Minimum energy	
Maximum energy	
Minimum MET	
Maximum MET	
RA	40.1
DEC	61.225
Galactic Object	
Radius	10.0
Event Class	Diffuse
Output (FT2 Files)	30-second
Output (Event Data)	FT1
Debug	false
User Comment	LS I 61+303
Expert Options	

Back Submit

Astro job submitted

Your job tonyj-AstroServer-00040 has been submitted.

Your data will be available for download from ftp://ftp-glast.slac.stanford.edu/glast.u27/DataServer/1256243366055

You will be sent an e-mail at tonyj@slac.stanford.edu when your job has completed.

You can monitor your job's progress using the Pipeline

Note: Clicking on the Status column will take you to the pipeline task that ran the job. Clicking on the Job column will allow you to rerun this task, or a similar one. Clicking on the Output Directory column will take you to the output.

Submit Time	Job	User	Task Type	Status	Output Directory	User Comment
22-Oct-2009 13:31	tonyj-AstroServer-00040	tonyj	AstroServer	Success	View dir	LS I 61+303
22-Oct-2009 08:01	arodrig_ana_4	arodrig	AstroServer	Success	View dir	
22-Oct-2009 07:30	arodrig_ana_3	arodrig	AstroServer	Success	View dir	
22-Oct-2009 07:29	arodrig_ana_3	arodrig	AstroServer	Success	View dir	
22-Oct-2009 00:36	Aug08_Oct08_2008_J0953p0755	bijanb	AstroServer	Success	View dir	
21-Oct-2009 13:46	Abdo-FT2-Oct21	abdo	AstroServer	Success	View dir	
21-Oct-2009 13:44	Abdo-AllSky-5	abdo	FitsSkimmer	Failed	View dir	
21-Oct-2009 08:53	arodrig_ana_2	arodrig	AstroServer	Success	View dir	
21-Oct-2009 08:12	arodrig_ana_1	arodrig	AstroServer	Success	View dir	
21-Oct-2009 01:01	parent-AstroServer-00004	parent	AstroServer	Success	View dir	
20-Oct-2009 14:32	borgland-SimpleSkimmer-00052	borgland	SimpleSkimmer	Success	View dir	Pass7.2 Diffuse - Aug-Sept
20-Oct-2009 14:15	uchiyama-1713-13mon	uchiyama	Astro	Failed	View dir	
20-Oct-2009 14:02	borgland-SimpleSkimmer-00051	borgland	SimpleSkimmer	Success	View dir	Pass6 Diffuse - Aug-Sept - For Pass7.2 validation
20-Oct-2009 05:37	guillemo-AstroServer-00003	guillemo	AstroServer	Success	View dir	
20-Oct-2009 05:35	guillemo-AstroServer-00002	guillemo	AstroServer	Success	View dir	

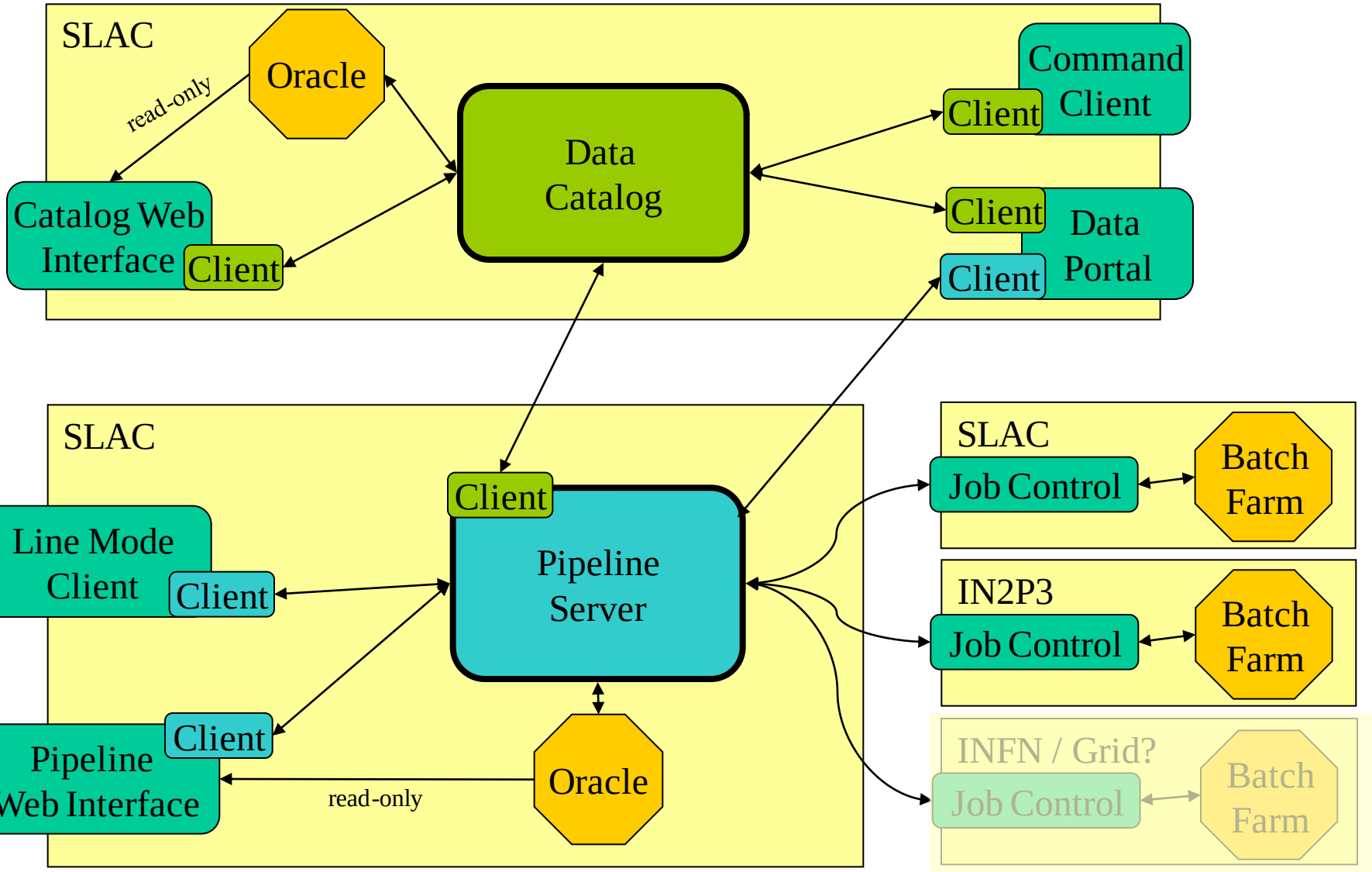
Up to higher level directory

Name	Size	Last Modified
tonyj-AstroServer-00040-README.html	4 KB	10/22/2009 8:31:00 PM
tonyj-AstroServer-00040-ft1.fits	33351 KB	10/22/2009 8:39:00 PM
tonyj-AstroServer-00040-ft2-30s.fits	144206 KB	10/22/2009 8:46:00 PM

Implementation

- Pipeline, Web Servers implemented in Java
  - Apache tomcat web server
    - Redundant servers for reliability, scalability
  - Java Server Pages (JSP) for web pages
    - Extensive use of 3rd party and custom tag libraries
      - DisplayTag for tabular data
      - AIDA tld for dynamic plot generation
  - JMX for monitoring, control
  - JaSIG CAS single-signon for user authentication
- Extensive use of database for storing state, history
  - Oracle (10g, 11)
    - Java Stored Procedures for performance
    - GridControl for performance, tuning, montitoring

Pipeline and Data Catalog Implementation



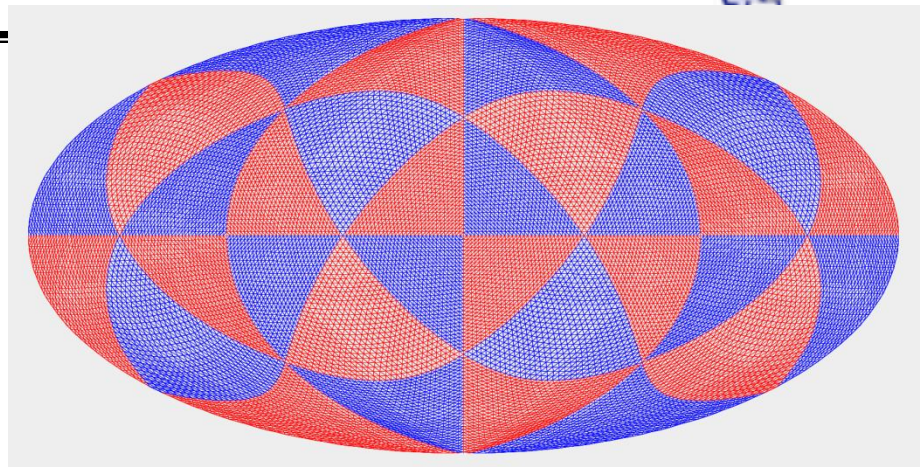
"Astro" Server Implementation

User Request
Time/Energy Range
Position in Sky
Quality

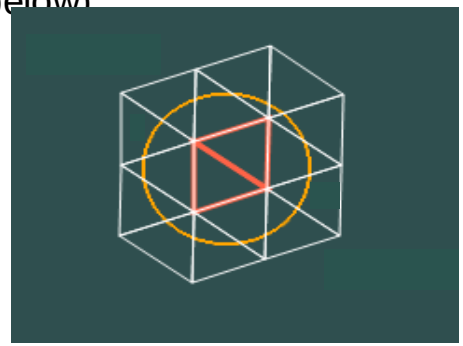
Dedicated
Oracle
Database
~500-4500
Million
Photons

Event List

Xroot File Server
Root Tuples
Fits Files
~50 TB



Within the database events are indexed by time, energy and position using a hierarchical triangular mesh (HTM). Database partitions are used to split the data into 1 week time bins and 32 position bins within each time bin, each containing 1024 HTM regions (shown above) . The use of HTM triangles makes it easy to identify which regions are entirely contained in the user request, and which are partially contained and require finer selection (below)

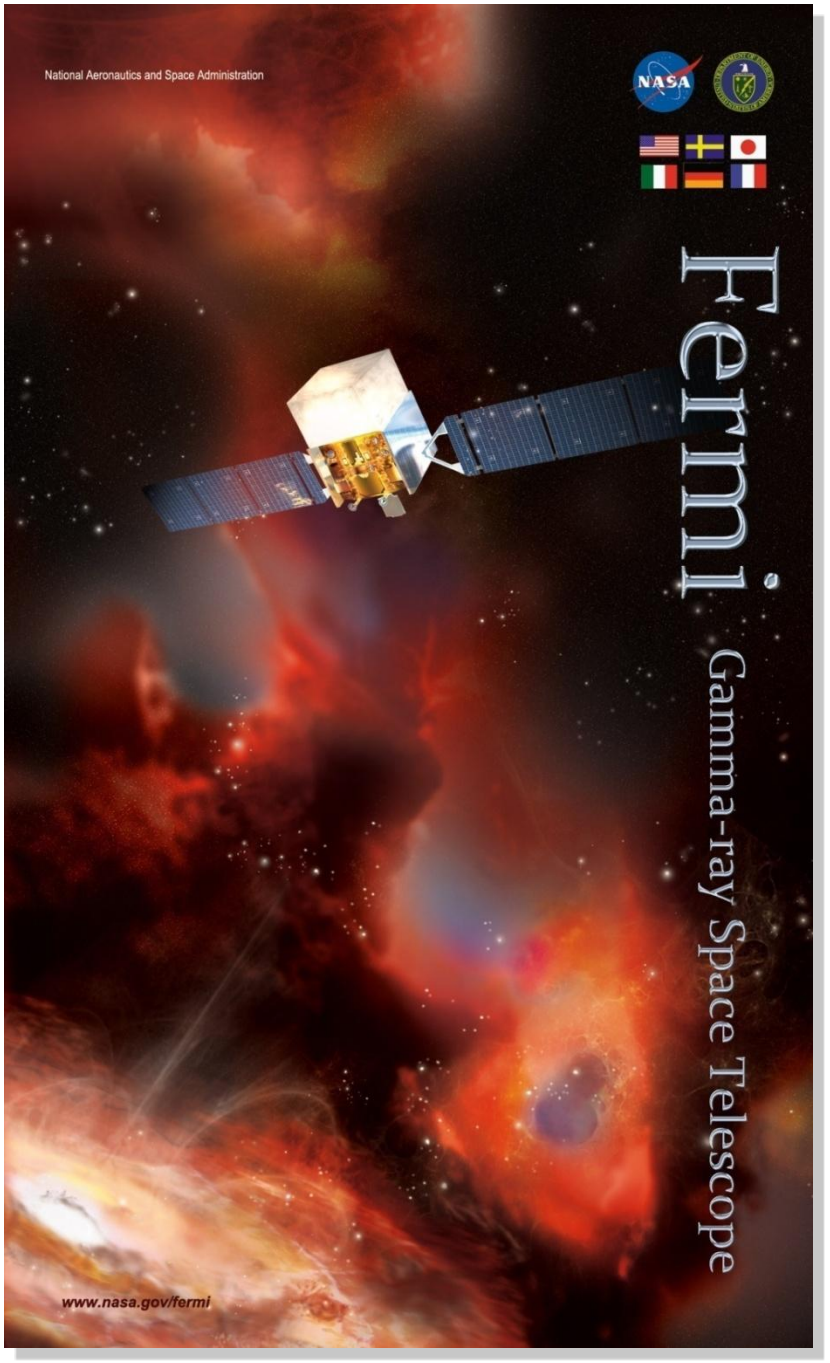


Conclusions

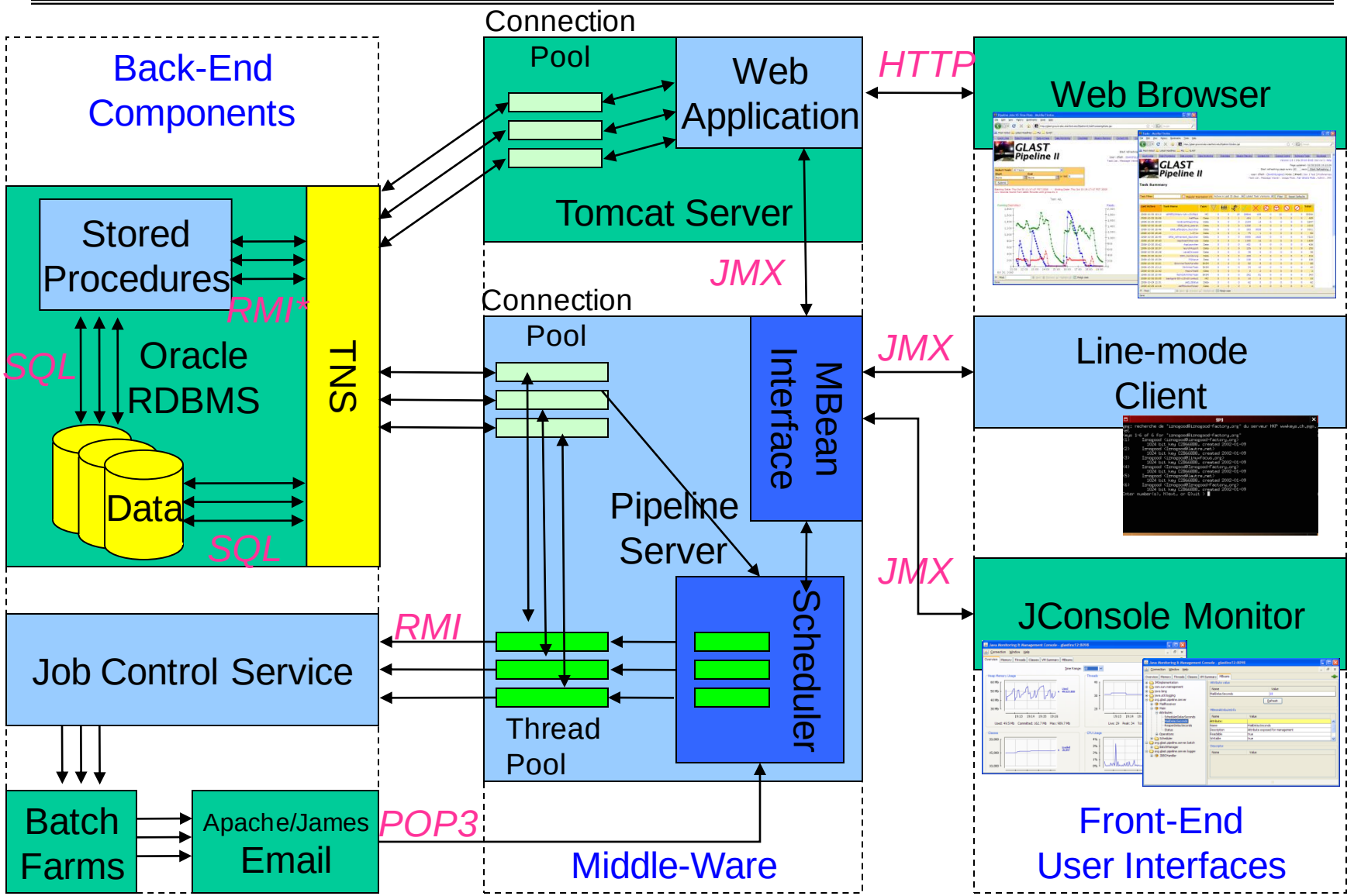
- Fermi data pipeline, data catalog and monitoring tools have been in production use for 4 years
  - Have proved very reliable for data processing
  - Web based tools allows monitoring load to be distributed world wide
- Important design decision to avoid tight coupling to specific experiment
  - Fermi tools already being used by other experiments
    - EXO, CDMS
    - Being evaluated for use by James Webb Space Telescope
- Future work planned to
  - Support submission of pipeline jobs to more systems
    - Currently support LSF (SLAC), BQS (Lyon), Condor
    - Adding support for Grid Engine, EEGE Grid
  - Increase interactivity of web applications (AJAX, Web 2.0, GWT)
- Interested in exploring reuse of tools and/or experience for CTA
  - Good area to start may be use of pipeline for some CTA simulations

Extra Slides

SLAC
NATIONAL ACCELERATOR LABORATORY



Pipeline Implementation



Technologies Used

- Database
  - Oracle
    - Java Stored Procedures for performance
    - Scheduled Server-side Jobs for monitoring, stats-gathering
    - Hierarchical queries
- Servers and Client Libraries (Pipeline, Data Catalog)
  - Java
    - Extensive use of threads, concurrency utilities for performance
  - Jython interpreter for user scripts
  - JMX MxBean Interfaces for monitoring, communication
  - XML used for processing-task definitions
  - Batch jobs use e-mail for status notification
    - Apache/James Email server
- Web:
  - Apache/Tomcat servers
  - JSP for web pages
    - DisplayTag for tabular data
    - AIDA tag libraries for plotting
    - Custom tag libraries expose Pipeline client methods
  - Java Servlets
    - Serve GraphViz State diagrams
  - JMX Interfaces

Data Catalog design goals

- Support multiple storage formats
  - AFS, NFS, xrootd, dCache, Grid etc ….
- Support multiple file locations for same datasets
  - SLAC, IN2P2, …
- Allow arbitrary meta-data to be stored with datasets
  - As much meta-data as possible should be extracted from the file itself to ensure integrity
- Dataset access from web, command line, API
  - Including search based on meta-data
- Avoid tight coupling to specific experiment to allow for reuse
  - Avoid tight coupling with pipeline

Processing Pipeline Web Interface

Quick Links | Data Processing | Data Access | Data Monitoring | Science | Shifts | Mission Planning | Contact Info | Change Control | Software Tools | Developer

Fermi LAT Pipeline II

Version 2.8.3 | Jira (Front-End) (Server) | Help

Page updated: 10/18/2010 16:23:05

Start refreshing page every 60 secs | Start Refreshing

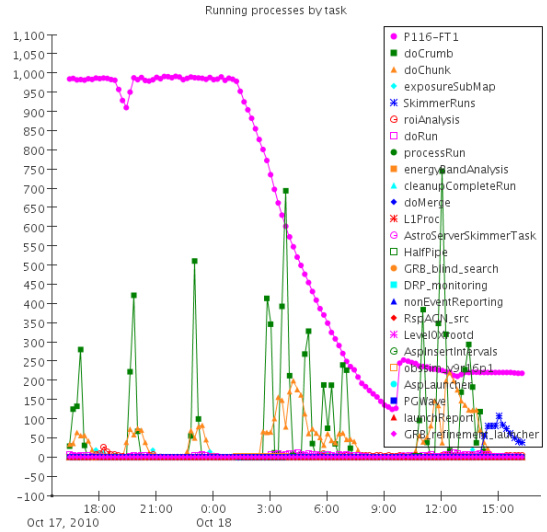
Login Mode: [**Prod** | Dev | Test]

Task List . Message Viewer . Usage Plots . Fair Share Plot . Admin . JMX

Task Summary

Task Filter: | Regular Expression (?) | Active in Last 30 days | Latest Task Versions | Filter | Reset Defaults

Last Active	Task Name	Type										Total
2010-10-18 16:20	L1Proc	Data	0	0	1	404	2	0	0	0	0	407
2010-10-18 16:19	RspAGN_src	Data	0	0	3	11165	253	0	1	0	0	11422
2010-10-18 16:16	Level0Xrootd	Data	0	0	0	630	6	0	0	0	0	636
2010-10-18 16:15	SkimmerTaskParallel	SKIM	0	0	2	861	86	0	2	0	0	951
2010-10-18 15:58	P116-FT1	Data	0	0	218	11625	1	0	0	0	0	11844
2010-10-18 15:14	rspmq7day	DATA	0	0	0	21	0	0	0	0	0	21
2010-10-18 14:40	GRB_blind_search	Data	0	0	0	316	0	0	0	0	0	316
2010-10-18 14:40	GRB_refinement_launcher	Data	0	0	0	583	5	0	0	0	0	588
2010-10-18 14:38	AspInsertIntervals	Data	0	0	0	273	44	0	0	0	0	317
2010-10-18 14:34	AstroServerSkimmerTask	SKIM	0	0	0	957	128	0	0	0	0	1085
2010-10-18 13:55	DRP_monitoring	Data	0	0	0	165	0	0	0	0	0	165
2010-10-18 13:25	PGWave	Data	0	0	0	165	0	0	0	0	0	165
2010-10-18 13:20	AspLauncher	Data	0	0	0	295	3	0	0	0	0	298
2010-10-18 12:55	HalfPipe	Data	0	0	0	6784	2	0	0	0	0	6786
2010-10-18 12:16	nonEventReporting	Data	0	0	0	34844	3315	0	4	0	0	38163
2010-10-18 09:25	launchReport	Data	0	0	0	941	0	0	0	0	0	941
2010-10-18 04:01	obssim_v9r16p1	MC	0	0	0	86	109	0	0	0	0	195
							0	0	0	0	0	37
							488	0	0	0	0	579
							0	0	0	0	0	42
							97	0	0	0	0	731
							0	0	0	0	0	5575
							6	0	0	0	0	30
							0	0	0	0	0	7701
							6	0	0	0	0	59



Quick Links | Data Processing | Data Access | Data Monitoring | Science | Shifts | Mission Planning | Contact Info | Change Control | Software Tools | Developer

Fermi LAT Pipeline II

Version 2.8.3 | Jira (Front-End) (Server) | Help

Page updated: 10/18/2010 16:31:42

Start refreshing page every 60 secs | Start Refreshing

User: tonyj . (Switch|Logout) Mode: [**Prod** | Dev | Test] Preferences

Task List . Message Viewer . Usage Plots . Fair Share Plot . Admin . JMX

summary / L1Proc

Task L1Proc Stream 100917001

Rollback Stream

Stream 100917001
Execution **1**
Is Latest 1
Status Failed
Submitted 16-Sep-2010 17:49:20.335
Started 16-Sep-2010 17:49:34.071
Ended 16-Sep-2010 21:46:21.016

Variables

Name	Type	Value
DOWNLINK_ID	Integer	100917001
DOWNLINK_RAWDIR	String	/afs/slac/g/glast/ground/PipelineStaging6/halfPipe/100917001

Stream Processes

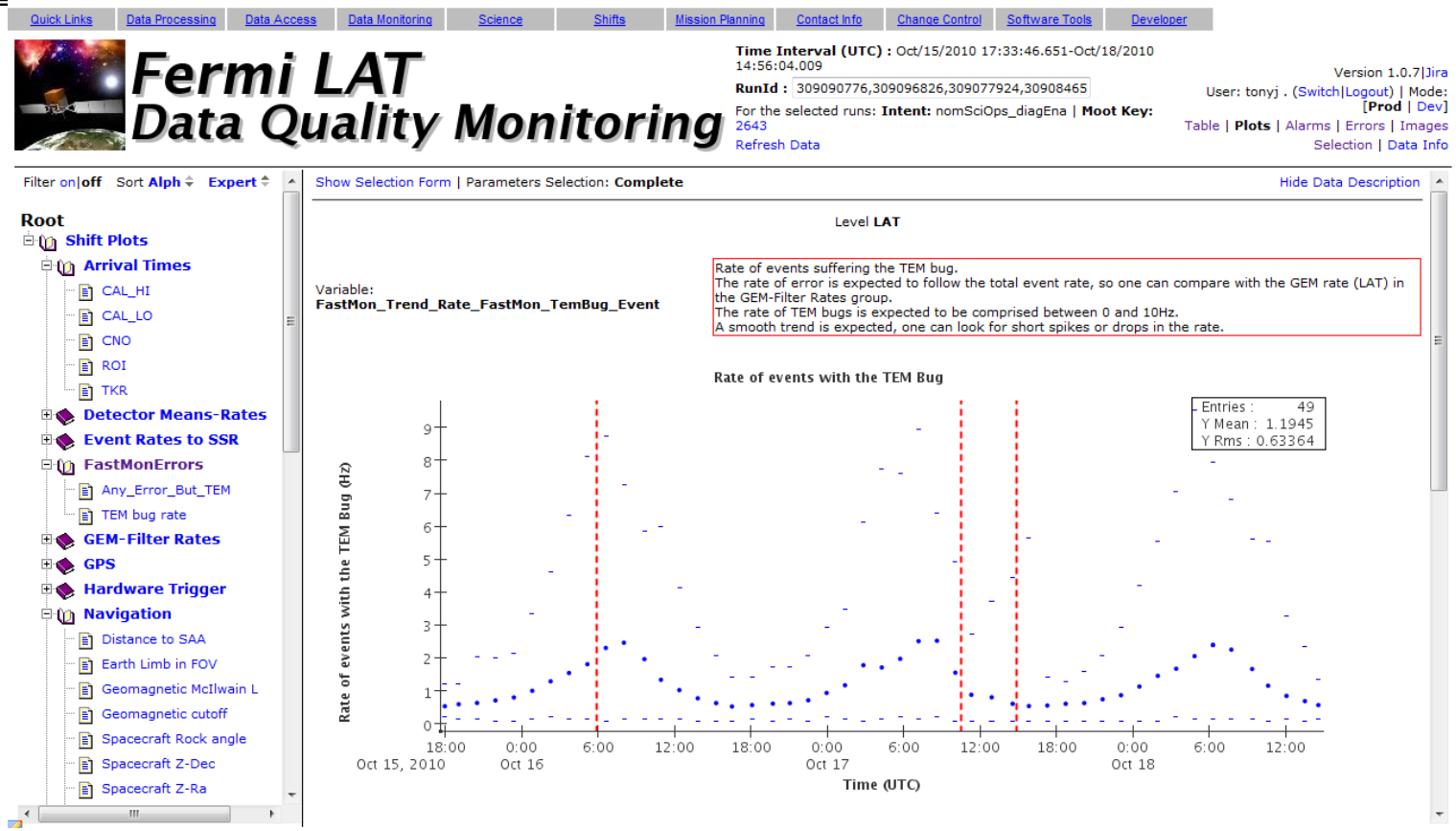
Show only latest execution

Process	Status	Type	Created	Submitted	Started	Ended	Job Id	CPU	Host	Links	
findRunDirs	Success	Batch	16-Sep-2010 17:49:20	16-Sep-2010 17:49:23	16-Sep-2010 17:49:29	16-Sep-2010 17:49:38	961916	0	hequ0019	Messages : Log : Files	
cleanupDl	Skipped	Batch	16-Sep-2010 17:49:20			16-Sep-2010 18:36:32				Messages	
kludgeAsp	Success	Batch	16-Sep-2010 17:49:20	16-Sep-2010 19:32:08	16-Sep-2010 19:32:12	16-Sep-2010 19:33:58	976707	5	fell0182	Messages : Log : Files	

Select all . Deselect all . Toggle selection | Rollback Selected

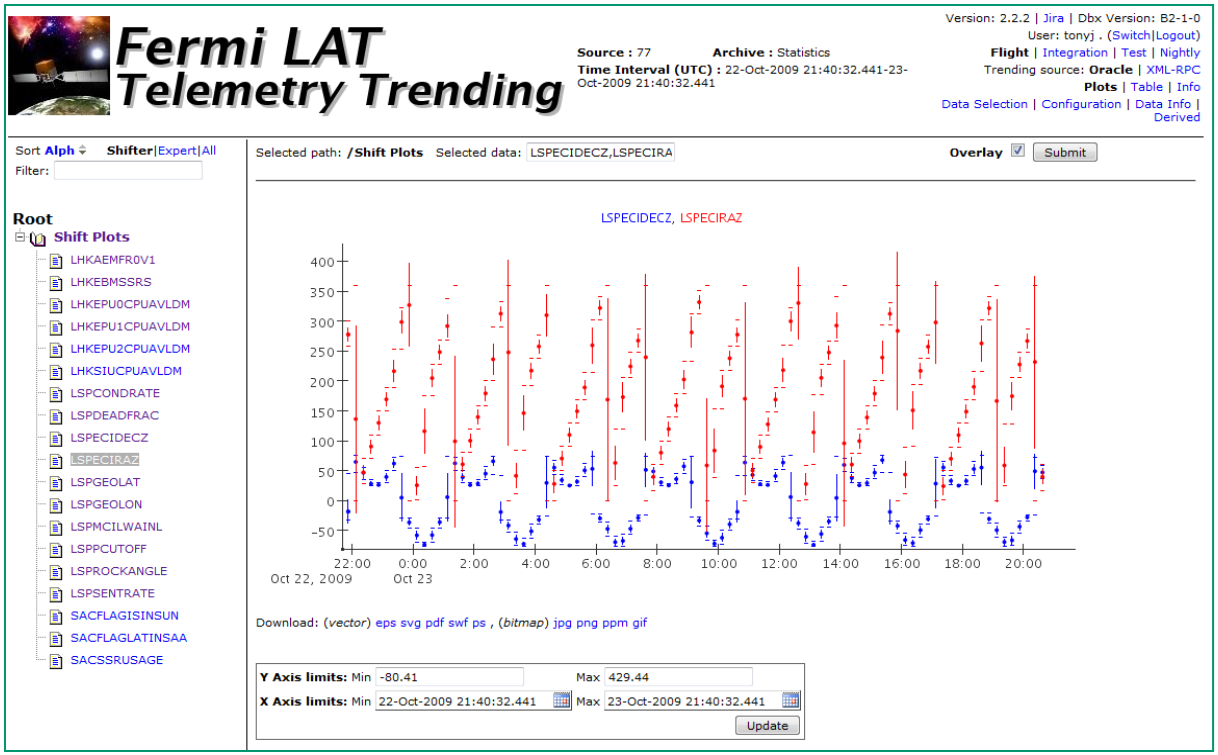
- **Pipeline web interface allows**
  - **Many views of data processing, down to log files of individual jobs**
  - **If jobs do fail they can be "rolled back" directly from the web interface**

Data Quality Monitoring



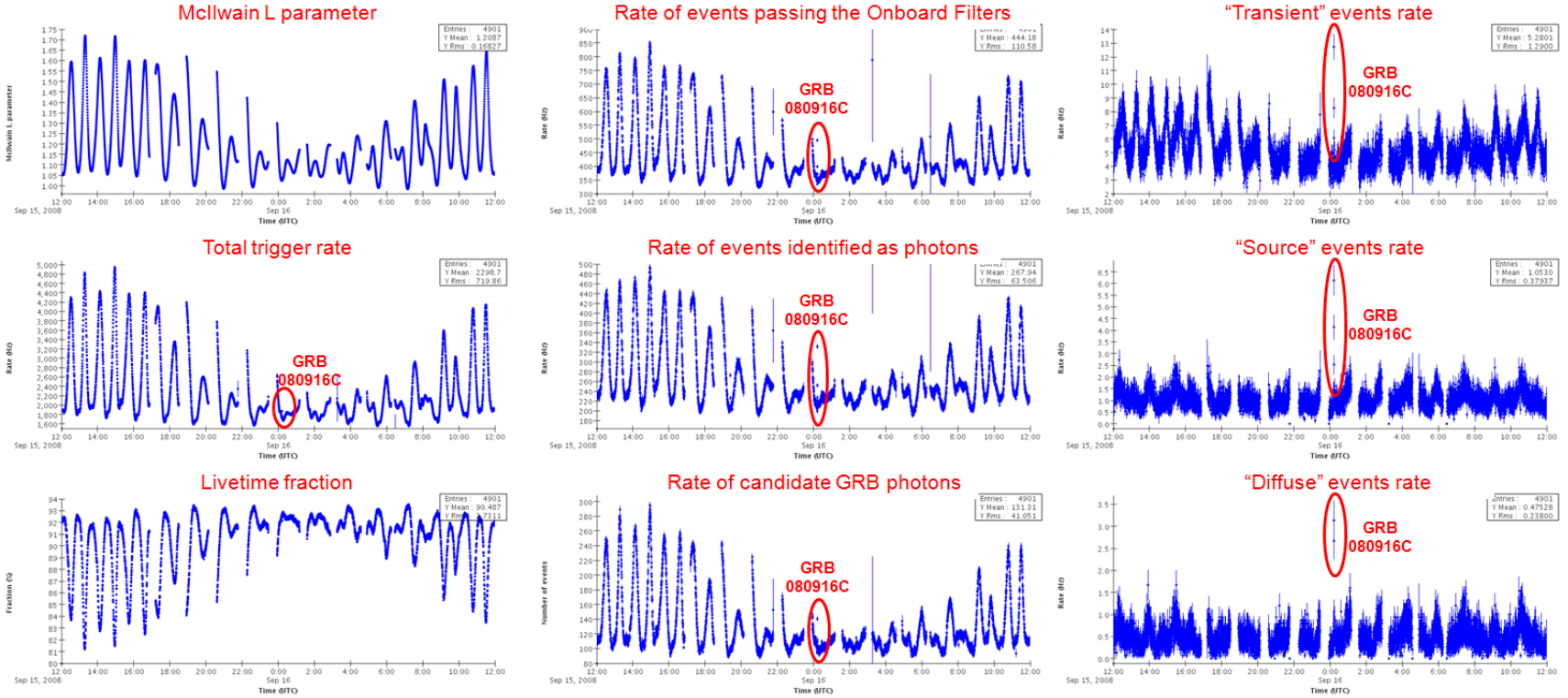
- **Web interface allows**
  - **Show data from single run or aggregate set of runs**
  - **View description of each plot**
  - **View/Print multiple plots**
  - **Customized tree to draw attention to important plots**
    - **Can be customized for individuals or groups**

Telemetry Trending



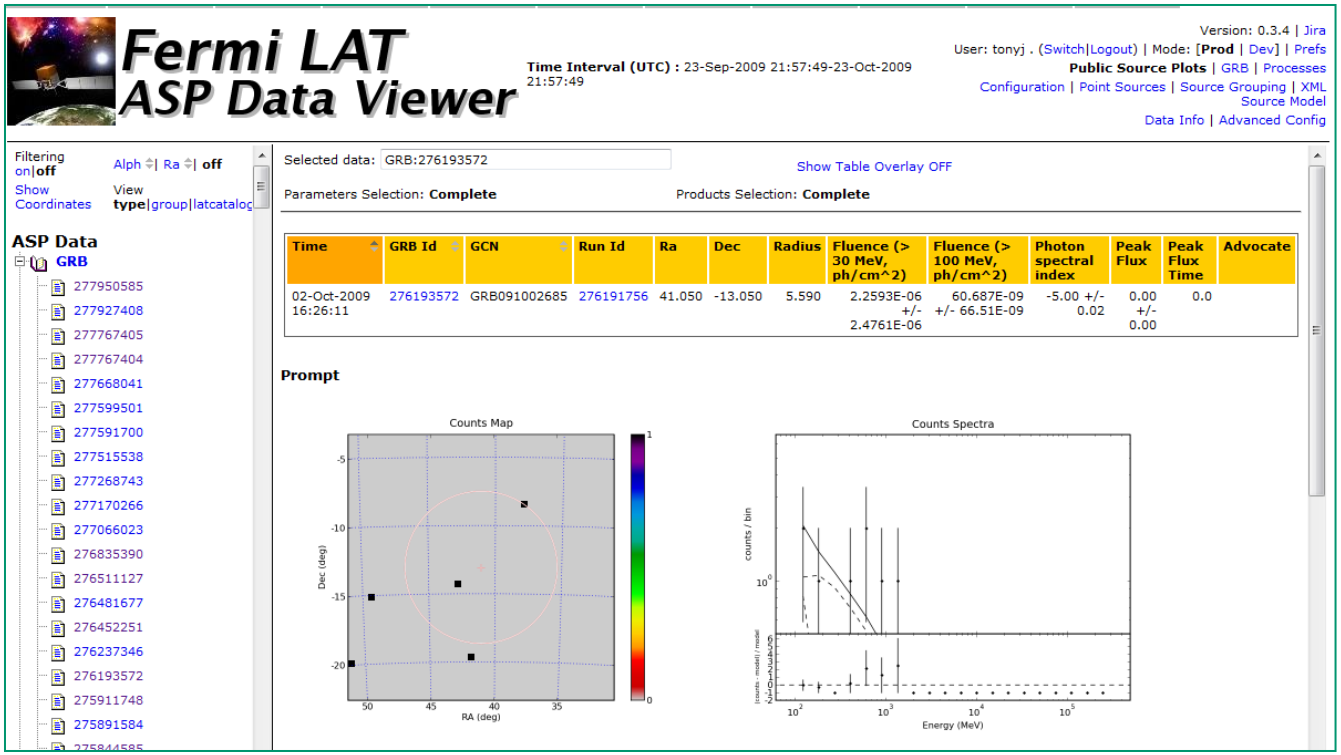
- **Web interface allows**
  - **Dynamic selection of time period**
  - **Dynamic overlay of quantities**
  - **Customized tree to draw attention to important plots**
    - **Can be customized for individuals or groups**
- **Cross trending of housekeeping and level 1 data**

Data Quality Monitoring



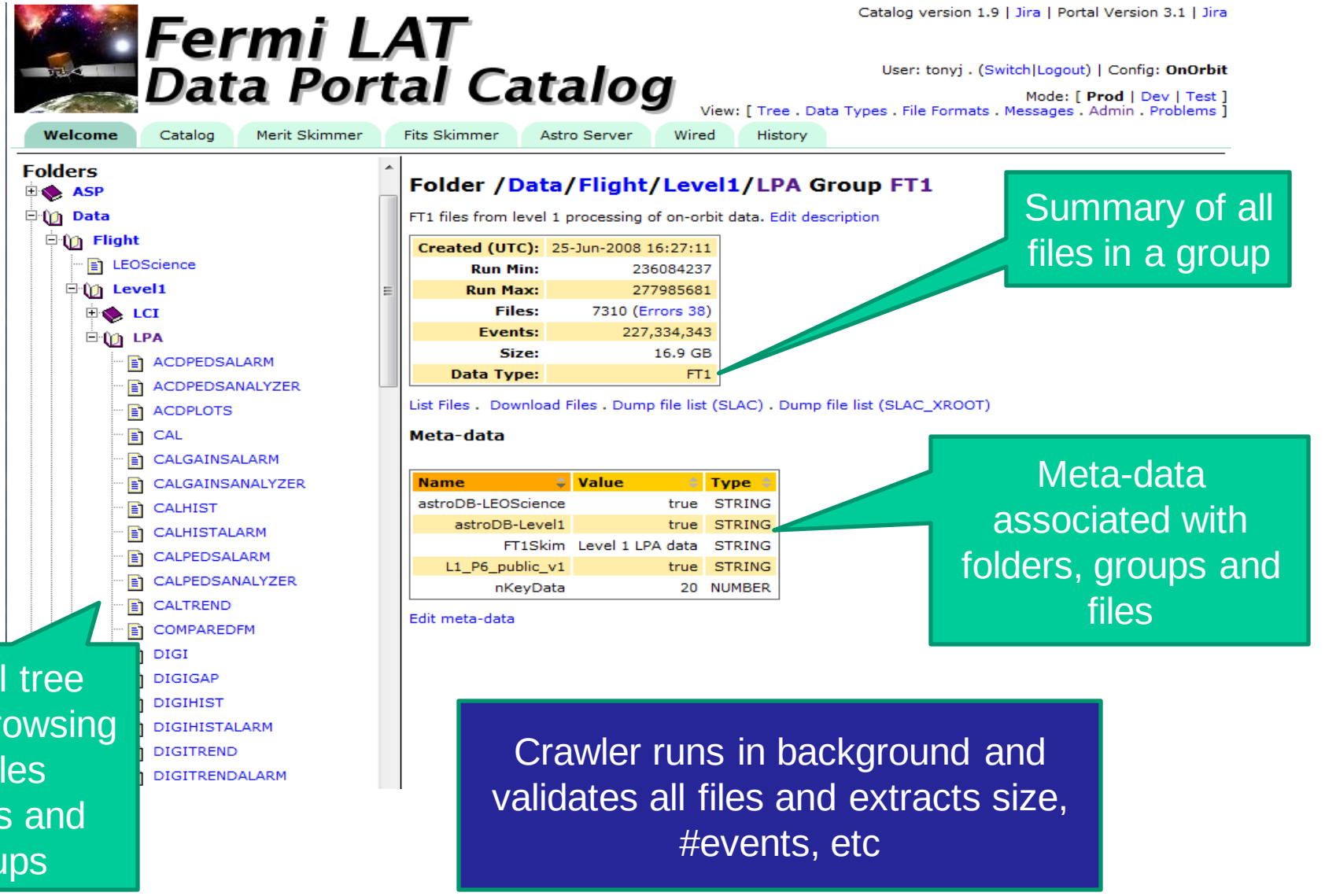
- **The trending graphs below show some rate summary plots for the 24 hours around GRB.**
- **Strong correlation with orbital period (~90 minutes) can clearly be seen**
- **This burst was so bright that it can be seen even in the global rate plots.**

Automated Science Processing



- Used to rapidly detect Gamma Ray Bursts or other flaring events
- Enabled timely notification of interesting events to external astrophysical community

Data Catalog Web Interface



Summary of all files in a group

Meta-data associated with folders, groups and files

Logical tree allows browsing for files Folders and Groups

Crawler runs in background and validates all files and extracts size, #events, etc

Acknowledgments

Software Development Team:

Daniel Flath

Charlotte Hee

Karen Heidenreich

Claudia Lavalley

Tony Johnson

Max Turri

Beta Testers:

Warren Focke

Tom Glanzman

Front End: Line-mode Clients

- **Command line tools for direct or scripted interaction with middle-ware**
  - **Control Server**
    - **Ping**
    - **Restart**
    - **Shutdown**
  - **Upload Task Definitions**
  - **Manage processing streams**
    - **Create**
    - **Delete**
    - **Cancel**
    - **Retry from failure point**
  - **Query processing history**
  - **Plus Interaction with Data Catalog**

Front End: Web Interfaces

- Provides all administrative functions available in a user-friendly interactive GUI
- Interactive displays show active (and historical) processing
  - Filtering by Task, Process, Status(es), Stream-range, Date-range
- Processing Statistics Plots
  - Provided by AIDA tag library
  - System throughput plots
    - Filterable by Task, Date-Range
  - Individual process statistics plots
    - CPU time (vs Wallclock)
    - Pending time
    - By Batch Host-type
- Task diagrams generated by GraphViz and image-mapped to provide links to task element (Sub-tasks, processes) displays

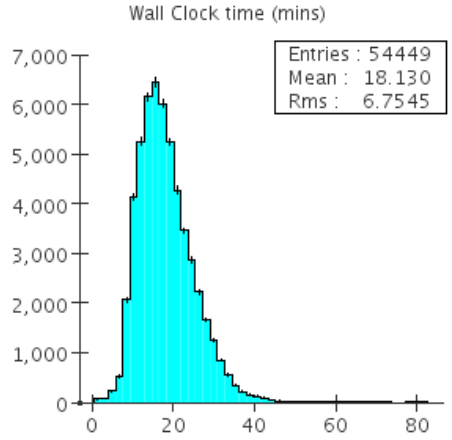
Front End: Task Summary Display

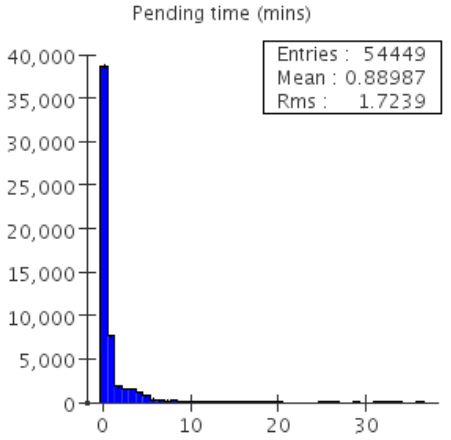
Task Filter: [ ] Regular Expression (?) [Active in Last 30 days] [Latest Task Versions] [Filter] [Reset Defaults]

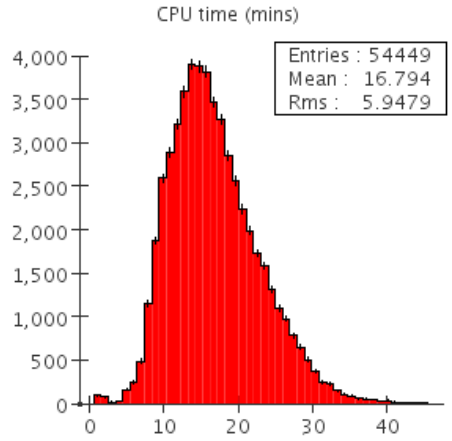
Last Active	Task Name	Type										Total
2008-10-30 23:12	L1Proc	Data	0	0	5	78	1	0	0	0	0	84
2008-10-30 22:47	HalfPipe	Data	0	0	0	488	0	0	0	0	0	488
2008-10-30 22:39	nonEventReporting	Data	0	0	0	2207	14	0	0	0	0	2221
2008-10-30 22:13	GRB_blind_search	Data	0	0	0	1008	9	0	0	0	0	1017
2008-10-30 22:13	GRB_afterglow_launcher	Data	0	0	0	283	3034	0	0	0	0	3317
2008-10-30 22:12	GRB_refinement_launcher	Data	0	0	0	5596	1620	0	0	0	0	7216
2008-10-30 22:10	AspInsertIntervals	Data	0	0	0	1397	14	0	0	0	0	1411
2008-10-30 22:10	AspLauncher	Data	0	0	0	408	5	0	0	0	0	413
2008-10-30 21:31	DRP_monitoring	Data	0	0	0	211	7	0	0	0	0	218
2008-10-30 20:23	PGWave	Data	0	0	0	110	0	0	0	0	0	110
2008-10-30 19:47	allHEE200GeV-GR-v15r39p1	MC	0	0	0	29861	427	0	16	0	0	30304
2008-10-30 18:37	launchReport	Data	0	0	0	255	0	0	0	0	0	255
2008-10-30 16:28	Level0Xrootd	Data	0	0	0	38	0	0	0	0	0	38
2008-10-30 15:01	SkimmerTaskParallel	SKIM	0	0	0	80	8	0	0	0	0	88
2008-10-30 13:12	SkimmerTask	SKIM	0	0	0	33	10	0	0	0	0	43
2008-10-30 12:42	ReproTest8	Data	0	0	0	0	2	0	0	0	0	2
2008-10-30 10:40	AstroSkimmerTask	SKIM	0	0	0	262	81	0	0	0	0	343
2008-10-30 03:55	backgnd-GR-v15r40-Limbo2	MC	0	0	0	10	0	0	0	0	0	10
2008-10-29 12:31	setL1Status	Data	0	0	0	62	0	0	0	0	0	62
2008-10-29 12:16	aeffMonitorPulsar	Data	0	0	0	0	4	0	0	0	0	4
2008-10-29 08:12	GRB_afterglow	Data	0	0	0	137	3	0	0	0	0	140
2008-10-29 08:07	backgnd-GR-v15r40-Limbo	MC	0	0	0	3610	0	0	0	0	0	3610
2008-10-29 07:55	backgnd-GR-v15r39p1-FullDay	MC	0	0	0	70000	0	0	0	0	0	70000
2008-10-29 02:44	GRB_refinement	Data	0	0	0	107	11	0	0	0	0	118

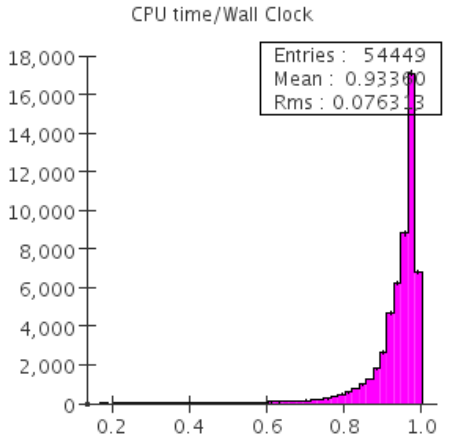
Front End: Process Detail Plots

Summary | recon

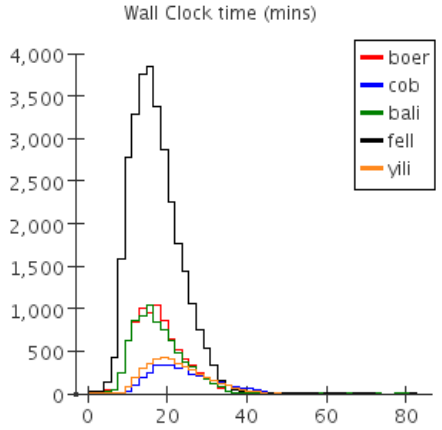


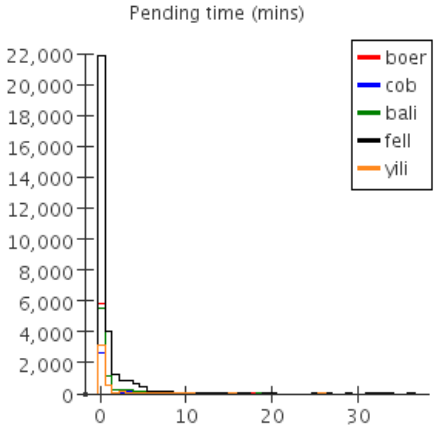


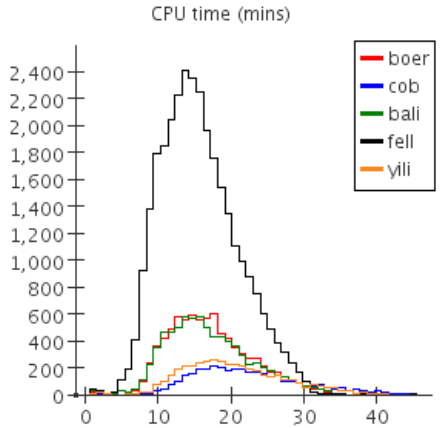


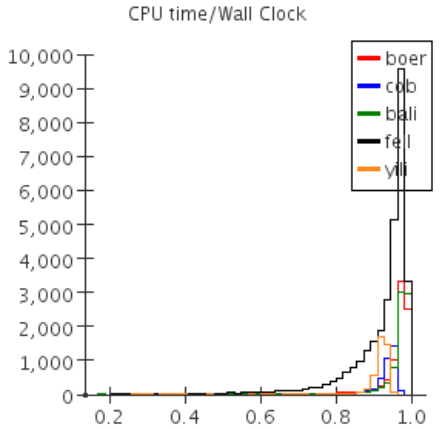


PLOTS by BATCH NODES









Front End: Job Detail Display

Task doChunk Process fastMonHist Stream 81031004.247117860.15155

Type	Batch
Status	Running
Stream	81031004.247117860.15155
CreateDate	30-Oct-2008 22:46:16.000
SubmitDate	30-Oct-2008 23:14:54.482
StartDate	30-Oct-2008 23:14:59.000
EndDate	
CPU Used	
Memory Used	
Swap Used	
Execution Host	boer0105
Exit Code	
Working Dir	/nfs/farm/g/glast/u15/pipeline-II/prod/log/L1Proc/1.68/doRun/doChunk/fastMonHist/081xxxxxx/031xxx/004/247xxxxxx/117xxx/860/015xxx/155
Log File	/nfs/farm/g/glast/u15/pipeline-II/prod/log/L1Proc/1.68/doRun/doChunk/fastMonHist/081xxxxxx/031xxx/004/247xxxxxx/117xxx/860/015xxx/155/logFile.txt
Execution Number	**1**
Retry Number	**0**
Is Latest	1
Batch Job ID	423937

Links: View Messages

Variables

Nothing found to display.

☑ Show UpStream Process Instances
☑ Show Downstream Process Instances
☐ Show Created SubStreams

Upstream Process Instances

Wait Condition	Process	Status	Type	Created	Submitted	Started	Ended	Job Id	CPU	Host	Links
Success	fastMonTuple	Success	Batch	30-Oct-2008 22:46:16	30-Oct-2008 22:46:26	30-Oct-2008 22:46:33	30-Oct-2008 23:14:31	421514	1646	bali0244	Messages : Log : Files

Downstream Process Instances

Wait Condition	Process	Status	Type	Created	Submitted	Started	Ended	Job Id	CPU	Host	Links
Success	checkChunk	Waiting	Batch	30-Oct-2008 22:46:17							Messages
DONE	mergeFastMonHist	Waiting	Batch	30-Oct-2008 22:45:22							Messages

Middle Tier: Threading

- **Makes extensive use of Java Concurrency library (java.util.concurrent)**

- **Scheduler Threads**
  - **Look for work and delegate to Execution pool**
    - **Ready Jobs (Script and Batch)**
    - **Submits work to execution threads**
  - **Handle Email status-messages**
    - **Checks for email**
    - **Submits status transition calculations to execution threads**
    - **Receives confirmation from workers, deletes email**
  - **Reaper**
    - **Searches for 'lost' jobs in Batch, updates processing history accordingly**

- **Execution Threads**
  - **Decode email status messages and update process records**
  - **Execute Jython script processes directly**
  - **Submit Batch jobs to Farms**