Fermi LAT data processing pipeline, collaboration data servers and web based data monitoring tools.

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on behalf of the Fermi Large Area Telescope Collaboration

This poster covers the Fermi LAT data processing pipeline, data servers and web based data monitoring tools hosted at the SLAC National Accelerator Laboratory.

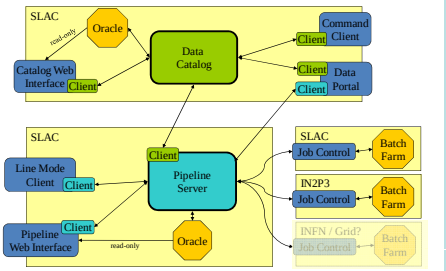
Abstract

Reconstruction, monitoring and initial automated science processing (ASP) of Fermi LAT data is controlled by a fully automated processing pipeline running at the SLAC national accelerator laboratory. This pipeline allows complex graphs of parallel data processing tasks to be constructed and executed with manual intervention by operators only required in exceptional circumstances. A suite of web applications allows the state of the processing pipeline to be monitored in real-time, presents the results of data quality monitoring and ASP analysis to scientists, and makes the final data available to collaborating scientists via a set of data servers. These technologies together make it possible for scientist to contribute to the data processing, data monitoring and data analysis from anywhere with a web connection.

Automated Processing Pipeline

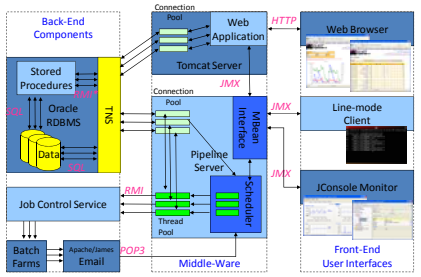
The automated processing pipeline[1] is used for processing of all LAT data as it is received at SLAC (see poster "**Implementation and performance of the Fermi LAT level 1 pipeline"**), as well as for routine analysis of data (see poster "**Routine Science Processing of Fermi LAT data for monitoring X-ray binary systems**") and for generation of Monte-Carlo simulations. The core of the processing pipeline is a Java server which find jobs ready to be run, and schedules them to be run on batch farms at SLAC or at IN2P3 in Lyon, France. The pipeline monitors the progress of jobs, keeps a complete history of all jobs run and the output and data they produce, and allows any failed jobs to be re-run (either automatically or by manual user intervention). Typically new data is processed within 10 hours of it arriving at SLAC, and with manual intervention needed for <0.01% of jobs submitted. The pipeline implementation makes extensive use of Oracle stored procedures coded in Java.

Pipeline and Data Catalog Components



Pipeline Performance and Reliability

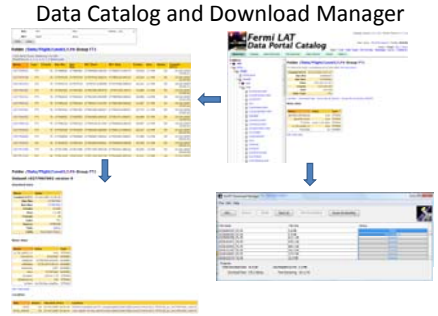
Pipeline Implementation



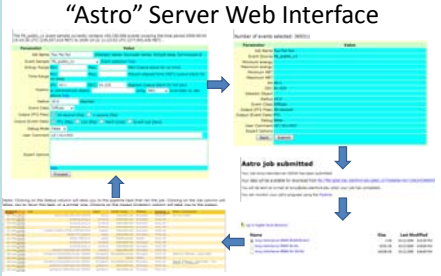
Data Catalog and Data Servers

The data products produced at SLAC are stored in an xrootd[2] based file system, and registered in a Oracle based data catalog. End users can access data files directly from the data catalog, using a web interface coupled with a Java download manager. The data products consists of a variety of FITS files and a detailed Root based N-tuple. Data servers allows efficient access to selected events in both ROOT and FITS data formats. Event access uses a combination of an Oracle database, Hierarchical Triangular Mesh[3] indexing, and the xrootd file system where the full data sets reside.

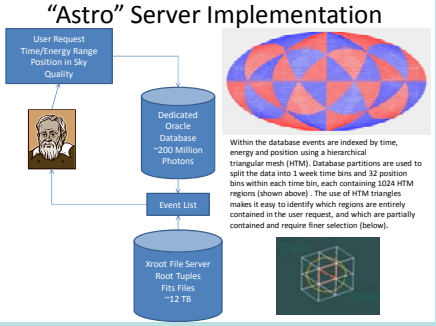
Data Catalog and Download Manager



"Astro" Server Web Interface



"Astro" Server Implementation



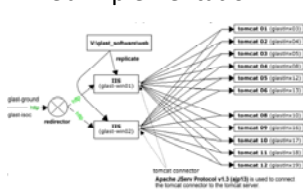
Web Based Monitoring Tools

Web based monitoring tools allow the data processing and data quality (see poster "**Science Data Monitoring for the Large Area Telescope"**) to be monitored from anywhere in the world. Additional web applications display time-based trending of spacecraft telemetry plus the results of routine science processing. All of the web tools are based on multiple tomcat servers and use JAIDA[4] for web based plotting.

Pipeline Web Interface

Data Processing and Monitoring

Web Implementation



References

1. Flath, D.L., Johnson, T.S., Turri, M., Heidenreich, K.A., "GLAST (FERMI) Data-Processing Pipeline", Astronomical Data Analysis Software and Systems XVIII, **411**, 193
2. **The Scalla Software Suite: xrootd/cmsd.** http://xrootd.slac.stanford.edu/.
3. The Hierarchical Triangular Mesh, P. Z. Kunszt, A. S. Szalay, A. R. Thakar Dept. of Physics and Astronomy, Johns Hopkins University, Baltimore, MD 21218 in Mining the Sky: Proc. of the MPA/ESO/MPE workshop, Garching, A.J.Banday, S. Zaroubi, M. Bartelmann (ed.); (Springer-Verlag Berlin Heidelberg), 631-637 (2001).
4. AIDA in Java http://java.freehep.org/jaida/index.html

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