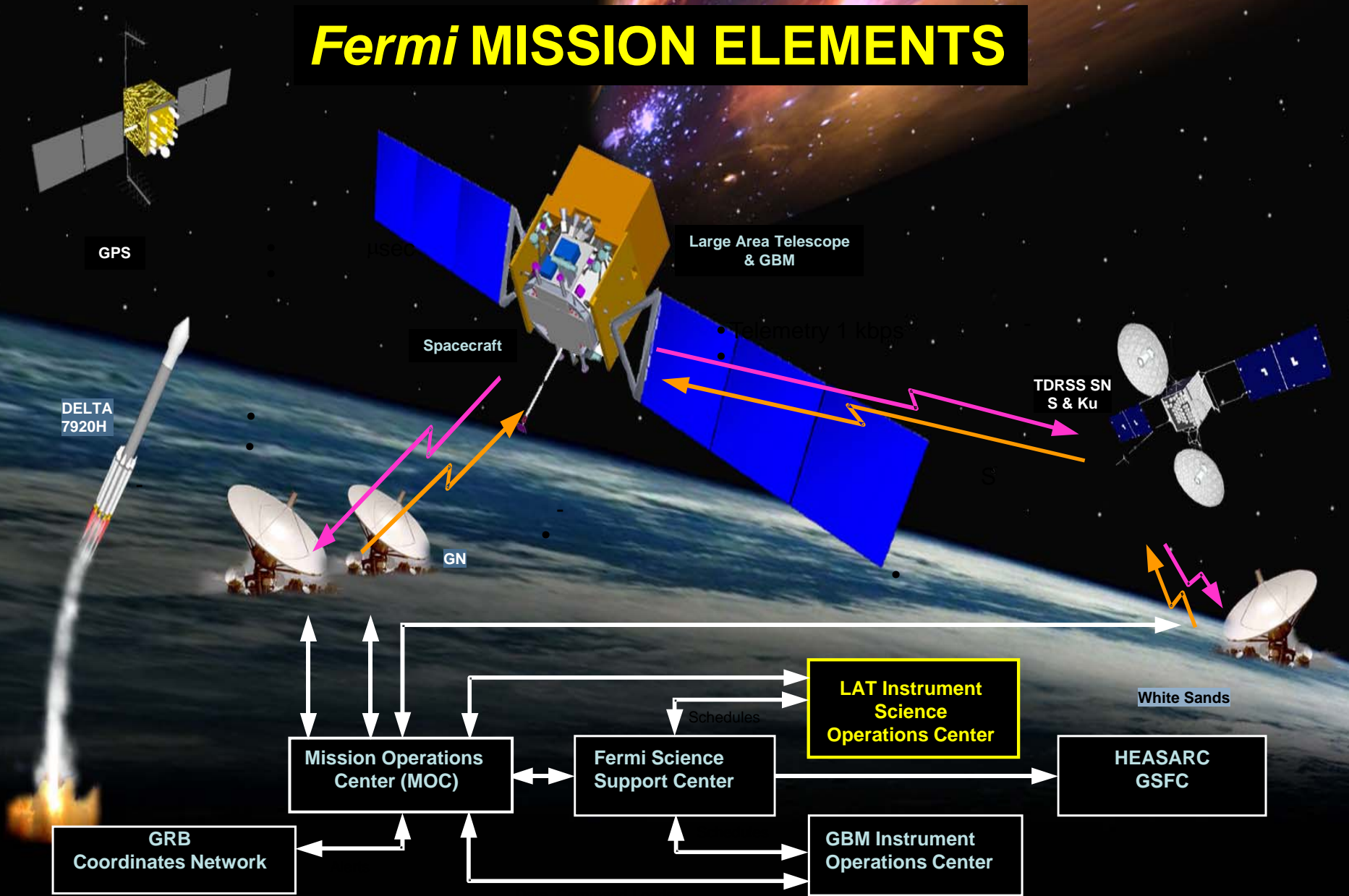

Fermi LAT Instrument Science Operations Center

Robert Cameron
Fermi LAT ISOC
Sept 14, 2010

LAT ISOC Functions

- ❑ The LAT ISOC is organized to:
 - Safely operate the instrument
 - Process and deliver LAT event data and automated science results
- ❑ Main Functions:
 - Command planning and construction
 - Instrument health and safety monitoring
 - Maintain and modify FSW and the LAT Testbed
 - Instrument performance verification and optimization
 - Process and archive LAT data
 - Maintain and optimize the software that produces science data
- ❑ ISOC supports the *Fermi* mission and the LAT Collaboration
 - ISOC @ SLAC is LAT core site => LAT Analysis Coordinator at SLAC
 - ISOC partners with the Collaboration to allow world-wide monitoring for instrument and science support

Fermi MISSION ELEMENTS



FY2010 Activities: LAT Updates

- ❑ **ISOC has maintained high efficiency for LAT data production**
 - **99.2% Uptime for Physics since the start of the Science Mission**
- ❑ **11 Flight Software updates since launch**
 - **4 FSW updates in FY2010**
 - 2009 Oct 8 (FSW B2-1-2)
 - 2009 Oct 29: final fix for reboots (FSW B2-2-0)
 - 2010 May 13 (FSW B2-2-1)
 - 2010 Jul 28 (FSW B2-2-2)
- ❑ **4 Instrument configuration updates in FY2010**
 - **updating masks for noisy channels**
- ❑ **Other Non-nominal events:**
 - **Occasional SEFIs and SEUs**
 - **2010 July 25: CAL Twr 4, Layer X1, Col 4, HE diode began misbehaving**
 - **Higher throughput testing: change of gamma-filter bypass @10 GeV**
 - **Routine Detector on-orbit calibrations**

FY2010 Activities: Data Processing

- ❑ **Since the start of the science mission (August 2008):**
 - 134 billion triggers of the LAT
 - 26 billion event readouts downlinked to the ISOC
 - 400 million events classified as photons in Level1 processing and delivered to the public by the Fermi Science Support Center
 - 250 CPU-years used for L1 processing at SLAC
 - 600 TB of output data files
 - Only ~10 hours from a data run on the LAT to delivery to FSSC
- ❑ **Science Data Monitoring**
 - 120,000 quantities monitored
 - 4238 monitored quantities with automated alarms
- ❑ **Automated science processing output delivered to FSSC**
 - Also supports Collab Flare Advocate and Burst Advocate tasks
- ❑ **Preparations for “Pass 7” and “Pass 8” processing**
 - ISOC staff expertise and resource commitments

Computer Farm Usage at SLAC

~600 CPU-years accumulated

MC resumed lately
+ P7 reprocessing

Current resources:

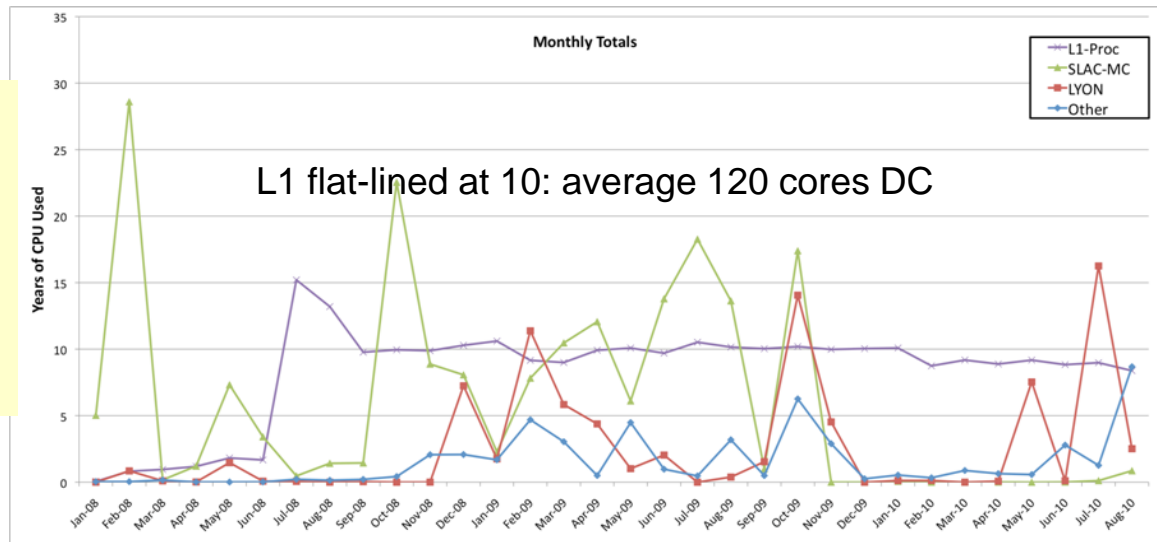
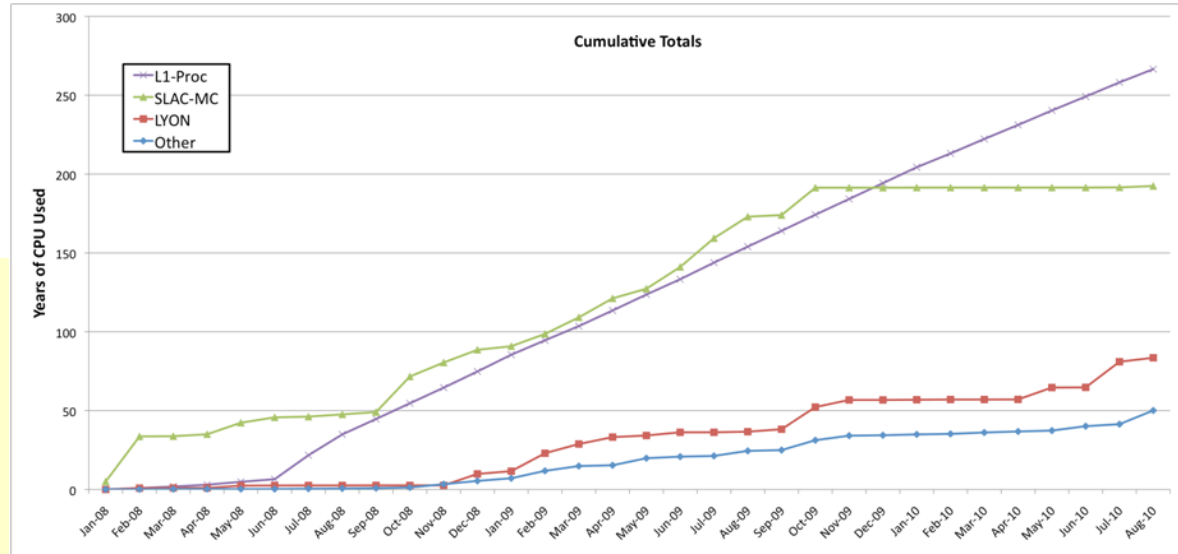
- 1600 cores@SLAC; 600@Lyon
- 1.25 PB disk in xrootd

Resource usage rate:

- 400 TB/yr disk
- 800 TB/yr tape

Reviewing data storage/access model:

- latest data on disk; older data on tape
- study whether tape access now fast enough to not be a bottleneck
- then live with fixed-size disk buffer
- validate over next 6 months
- looking to replace Oracle as sole vendor



FY2011 Planned Activities

- ❑ On-going mission support and data processing activities, plus....
- ❑ At least 3 future LAT FSW updates are being developed
 - Improvements to on-orbit detector calibrations (FSW B2-3-0)
 - Factoring FSW for improved offline use. Upgrade build system OSes. (FSW B3-0-0)
 - Add background filter for real-time GRB detection (FSW B3-1-0)
 - Will extend beyond FY2011
- ❑ Transition to “Pass 7” data processing
 - Must reprocess and redeliver entire mission dataset with Pass 7
 - Pass 6 processing and Pass 7 processing must be run in parallel for months
 - Should complete transition in FY2011
- ❑ Pass 8 development
 - Includes coordination with FSW filter updates
 - Test processing
 - Will extend beyond FY2011

Issues and Concerns

- ❑ **Sharing staff matrixed into ISOC with other PPA programs**
 - **Online and offline developers**
 - **For already identified development and maintenance, and for possible LAT improvements**
 - **Need to keep expertise and support for key LAT and Collab tasks**
 - **FSW, Event reconstruction, sub-system knowledge**

- ❑ **Additional processing burden with Pass 6 and Pass 7 running in parallel**

- ❑ **Oracle purchase of Sun Microsystems**
 - **Disk has increased in cost by about 50%**
 - **Trying to find cheaper second (and third?) source vendor**
 - **Disk deliveries from new vendor needed within 6 months**
 - **User buy-in and transition to any new data storage+access model**

Backup Slides

The Large Area Telescope

- Precision Si-strip Tracker (TKR)
70 m² of silicon detectors arranged in 36 planes. 880,000 channels.
- Hodoscopic CsI Calorimeter (CAL) 1536 CsI(Tl) crystals in 8 layers, total mass 1.5 tons.
- Segmented Anticoincidence Detector (ACD) 89 plastic scintillator tiles.
- Electronics System Includes flexible hardware trigger and onboard computing.

