DATA PROCESSING, DATA SERVERS & SOFTWARE DEVELOPMENT

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FSSC OPERATIONS PERSONNEL

- 4 data operations & software support personnel
  - Science analysis software development & performance
  - Data server software & maintenance (GSFC)
  - LAT data pipeline & archive support (SLAC)

- 3.5 science support personnel
  - Mission operations (both S/C & LAT)
  - Documentation updates
  - Helpdesk responses
FSSC LAT SERVER STATISTICS

- LAT Data Server
  - Currently serving: Pass 8 data (since 24 July 2015)
  - Data downloaded: 88.54 TB (as of 28 July 2018)
  - Mission average queries/day: ~721 (photon database)
  - Queries/day (last 30 days): ~437
Data ingest for both LAT and GBM is proceeding smoothly

- Reprocessed Pass 8 files ingested up to March 2018 into backup data server
  - Preparing for near-term release (with updated science tools)
  - Updated spacecraft files may accompany this release

GBM data files updated:

- Continuous TTE files updated to use more convenient hourly format
- “Timing glitches” prior to summer 2015 corrected back to Nov 2012

Added “Data Gaps” page to LAT Data Server after March 2018 event

- Summarizes all periods without LAT data lasting more than 6 hours
## LAT Data Gaps

The table below lists gaps in the LAT data that are longer than 6 hours.

<table>
<thead>
<tr>
<th>Start MET</th>
<th>Stop MET</th>
<th>Start Time</th>
<th>Stop Time</th>
<th>Duration (days)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2008-12-11 11:19:38</td>
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<td>258437343</td>
<td>258856049</td>
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<td>2009-03-16 00:27:27</td>
<td>4.85</td>
<td>Safe Hold</td>
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<td>276023993</td>
<td>276055527</td>
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<td>2009-10-01 02:05:25</td>
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<td>2012-04-16 13:11:29</td>
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<td>2017-06-21 12:01:07</td>
<td>0.63</td>
<td></td>
</tr>
</tbody>
</table>
NEW DATA CATALOGS

➤ One new LAT high-level data product
  ➤ FL8Y source list:
    ➤ Uses 8 years of Pass 8 data
    ➤ Not the full catalog analysis → not recommended for scientific publications

➤ In work:
  ➤ GBM Earth Occultation Catalog (249 sources)
  ➤ Next LAT catalog in development

➤ Once final, catalogs are usually imported into BROWSE format (searchable)
  ➤ FL8Y has not been made available in BROWSE
SCIENCE TOOLS CURRENT STATUS

➤ Current science tools (v11r5p3) release date: 15 Feb 2018
  ➤ Significant infrastructure changes to allow support for:
    ➤ Scientific Linux 6, &7
    ➤ Mac OS X 10.11 (El Capitan) & 10.12 (Sierra)
    ➤ Ubuntu 16.04, 17.10
    ➤ Compatible with Fedora 24, 26, & 27, & Mac OS X 10.13 (High Sierra)
    ➤ Also supports significant improvements to fermipy functionality

➤ GBM analysis tools:
  ➤ rmfit: v4.3.2 is still current
  ➤ gtburst: updated in February ST release to v02-02-00
  ➤ gspec: in development by GBM team
    ➤ Not yet ready for inclusion in Fermi Science Tools release
<table>
<thead>
<tr>
<th>Platform</th>
<th>Ubuntu 16.04</th>
<th>Ubuntu 17.10</th>
<th>Source</th>
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<tbody>
<tr>
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<tr>
<td></td>
<td>3.0%</td>
<td>9.8%</td>
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<tr>
<td>Scientific Linux</td>
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<td>212</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.8%</td>
<td>5.9%</td>
<td></td>
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<tr>
<td>Other Linux</td>
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<td>1781</td>
<td>372</td>
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<tr>
<td></td>
<td>18.0%</td>
<td>49.4%</td>
<td>10.3%</td>
</tr>
</tbody>
</table>

**Total downloads of v11r5p3 = 3607 (only 4 months)**
SCIENCE TOOLS CONTAINERIZATION

➤ Developed annually for Fermi Summer School

➤ Intended for cross-platform installation (using Docker)
  ➤ Able to be used with Windows operating system
  ➤ Uses most recent version of Science Tools (v11r5p3)

➤ Available on github for general community
  ➤ https://github.com/fermi-lat/FermiBottle
FUTURE SCIENCE TOOLS RELEASES

➤ New version of tools (v11r6p3) in development
  ➤ Moving to Conda build system (uses anaconda python)
    ➤ 3rd party dependencies handled by Conda → smaller codebase to maintain
    ➤ Reduces/eliminates library compatibility errors
    ➤ Makes installation and updates much easier
    ➤ Installation more compatible with user’s environment

➤ Adding automated ‘continuous integration’ to ST development
  ➤ Unified version (SLAC & FSSC) now being maintained in GitHub
  ➤ Upon check-in, updated binaries are automatically built and unit tests run across multiple platforms using virtual containers
  ➤ Should catch issues early in the development process and significantly reduce time required to resolve platform-specific errors
3 TOOs implemented since last meeting (10 months)
- 2 for Novae
- 1 for Crab

Transition to AO-11 coming in mid-August 2018

Helpdesk distributed among additional personnel
- More diverse responders
- Improved response time
FERMI HELP DESK

➤ Help Desk

➤ >3500 requests over the lifetime of the mission
➤ 0.5 queries/day running average over the last year
➤ ~80% asking for information, 15% reporting issues, 5% spam
SLAC $\Rightarrow$ FSSC
TRANSITION STATUS
LAT OPERATIONS TRANSITION

➤ DOE has planned reductions / workforce transfer to new programs at Launch +10 years

➤ After Oct 1, 2018, most SLAC/DOE staff available on “as-needed” basis

➤ FSSC increased staff by 2 personnel to handle additional workload (reported last meeting)

➤ Prioritized training for tasks by mission criticality

➤ Mission Operations

➤ Data Processing & Archiving

➤ Software development & maintenance
TRANSITION PLAN

➤ Knowledge transfer ⇒ Shadow operations ⇒ Full transition
  ➤ “Knowledge transfer” period began in Feb 2017
  ➤ “Shadow operations” began late 2017
  ➤ FSSC personnel now taking shifts for all standard activities
  ➤ Reminder: data pipeline & L0 archive remains at SLAC
MISSION OPERATIONS TRANSITION

- Regular planning process now includes LAT timeline and generation of LAT weekly/quarterly reports
- See report by Robin Corbet
DATA PROCESSING & ARCHIVING TRANSITION

- Divide & Conquer approach
  - 2-3 FSSC members training for each task, with 1 lead
  - Refocused available skill sets & recovered legacy knowledge
  - Pulling together available documentation & expanding/revising as appropriate

- Currently in Shadow/Joint Operations
  - FSSC personnel now responding to issues as they arise, in coordination with LAT team members
  - Documentation of issues and their resolution is a high priority

- New team (LAT + FSSC) has increased # of trained personnel by a factor of 2 ⇒ Needed for mission critical task
SOFTWARE DEVELOPMENT TRANSITION

➤ Transition to github nearly complete
  ➤ Analysis tools converted
  ➤ Still developing processes for LAT data reconstruction pipeline (uses some common code)

➤ Transition to Conda distribution for ST nearly complete

➤ Static software (pipeline) will be maintained in containers as underlying operating systems become obsolete

➤ Special activities (e.g. leap second implementation) will require SLAC personnel participation past the transition date
  ➤ Time available for these activities
TRANSITION TIMELINE

➤ Initiated January 2017

➤ Software Weeks: Face-to-face meeting of principal actors
  ➤ February 2017 - Assign transition roles, initial training
  ➤ September 2017 - Intensive training, documentation
  ➤ January 2018 - Readiness for shadow operations
  ➤ Late summer 2018 - Readiness for final transition

➤ Transition on track for October 1, 2018
“SOFTWARE WEEKS” FOR INTENSIVE TRAINING

➤ Two software weeks complete (Feb. ’17, Sept. ’17, Feb. ’18)
  ➤ FSSC/LAT/SLAC personnel face-to-face training
  ➤ Focused breakout sessions ⇒ High level of knowledge transfer

➤ One more software week planned
  ➤ Late Aug./Early Sept. 2018: Review results of shadow ops and complete any necessary training
NEW SOFTWARE MANAGEMENT PARADIGM

Previously

Revision 1

Check into CVS & tag for release

Revision 2

Retrieve tag and port to supported OSs

Revision 3

Debug & report all issues to developers

Various Developers

All ok?

Check into github

Deferred version

All ok?

Create internal test version

All ok?

Release new ST version

FSSC Personnel

Previously

Revision 1

Check into github

Revision 2

CI runs automated test suite

Revision 3

New baseline version

Developer 1

All ok?

Report issue

Yes

Revise version

No

Debug & report to appropriate developer

FSSC Personnel

Proposed

Revision 1

Check into github

Revision 2

CI runs automated test suite

Revision 3

New baseline version

Developer 2

All ok?

Clone as internal test version

Yes

Release new ST version

No

Debug & report to appropriate developer

FSSC Personnel
MISSION OPERATIONS TRANSITION

- Currently performing Shadow Operations

- Training for nominal timeline planning complete
  - FSSC personnel now planning/review at 50% or greater
  - Provide regular status reporting

- Ongoing training for less-frequent nominal activities
  - LAT calibration requests, Tracker hot strip masks, etc.
  - Some issues with permissions for these
  - Not yet able to perform smoothly

- Non-nominal tasks (flight software updates, etc.) will continue to be supported by DOE personnel as needed