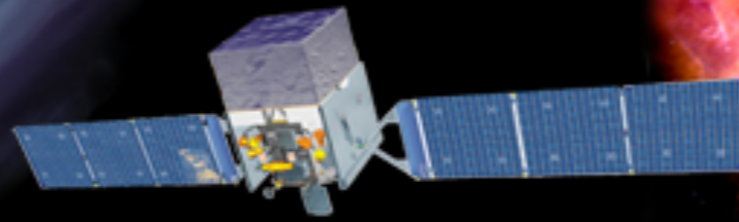


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Science Support Center



DATA PROCESSING, DATA SERVERS & SOFTWARE DEVELOPMENT

Elizabeth C. Ferrara
Deputy Lead Scientist, FSSC
University of Maryland, CRESST





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

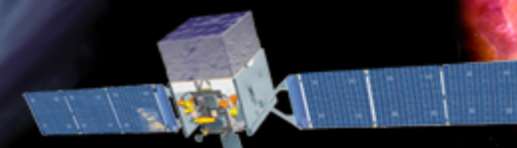
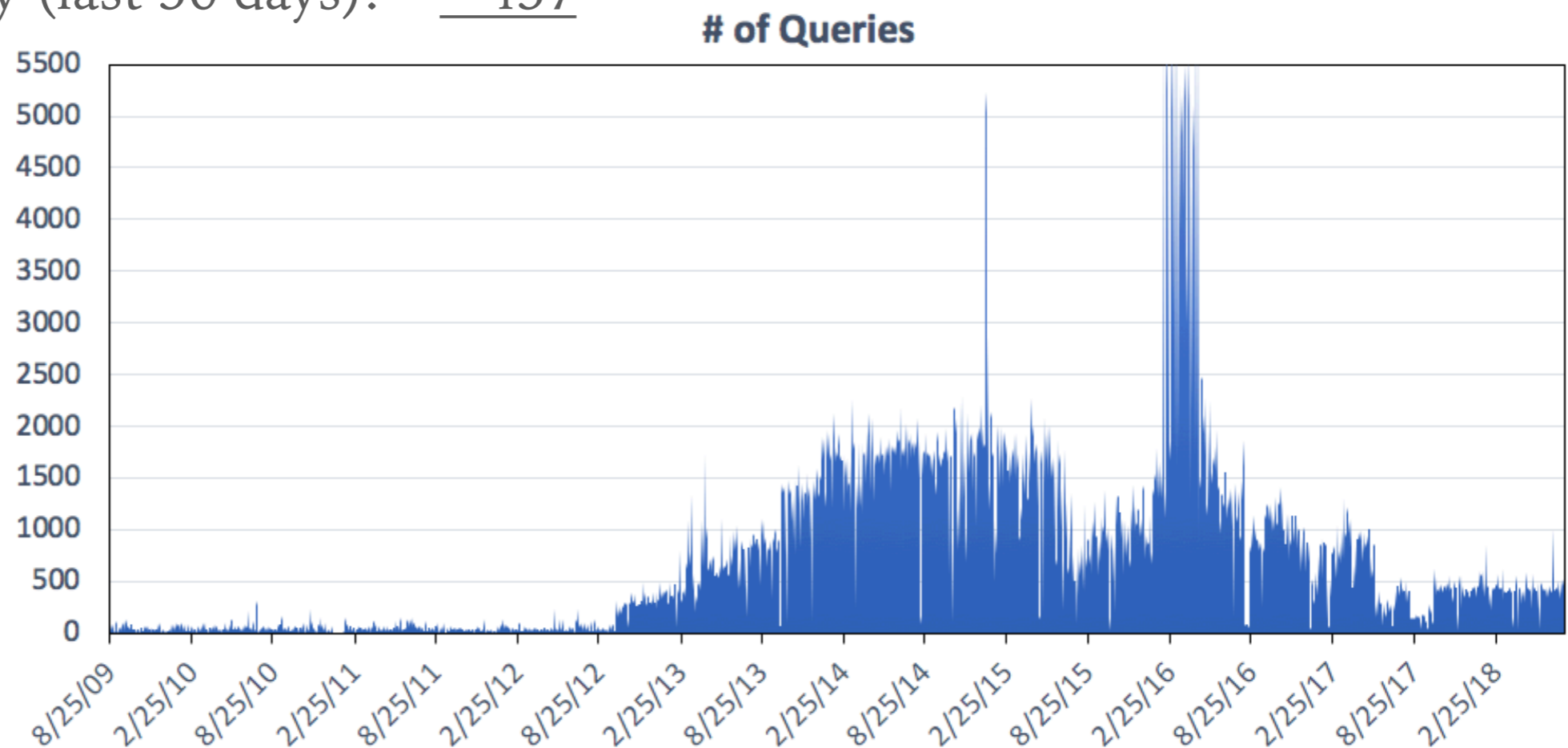




FSSC LAT SERVER STATISTICS

➤ 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





FSSC DATA STATUS

- 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





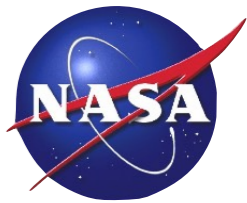
NEW PAGE: LAT DATA GAPS

LAT Data Gaps

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

Start MET	Stop MET	Start Time	Stop Time	Duration (days)	Notes
250687179	250710111	2008-12-11 11:19:38	2008-12-11 17:41:50	0.27	
258437343	258856049	2009-03-11 04:09:01	2009-03-16 00:27:27	4.85	Safe Hold
276023993	276055527	2009-09-30 17:19:51	2009-10-01 02:05:25	0.36	
340865214	340889542	2011-10-21 04:46:52	2011-10-21 11:32:20	0.28	
356251782	356274691	2012-04-16 06:49:40	2012-04-16 13:11:29	0.27	
377603293	377662072	2012-12-19 09:48:10	2012-12-20 02:07:49	0.68	
404112118	404155634	2013-10-22 05:21:55	2013-10-22 17:27:11	0.50	
425439971	425488604	2014-06-26 01:46:08	2014-06-26 15:16:41	0.56	
519685047	519739272	2017-06-20 20:57:22	2017-06-21 12:01:07	0.63	
542868807	544458120	2018-03-16 04:53:22	2018-04-03 14:21:55	18.39	Safe Hold





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





SCIENCE TOOLS PLATFORM USAGE

Mac OS X	10.11	10.12
	110	355
	3.0%	9.8%

Scientific Linux	SL6	SL7
	129	212
	3.8%	5.9%

Other Linux	Ubuntu 16.04	Ubuntu 17.10
	648	1781
	18.0%	49.4%

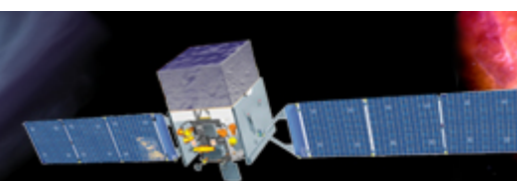
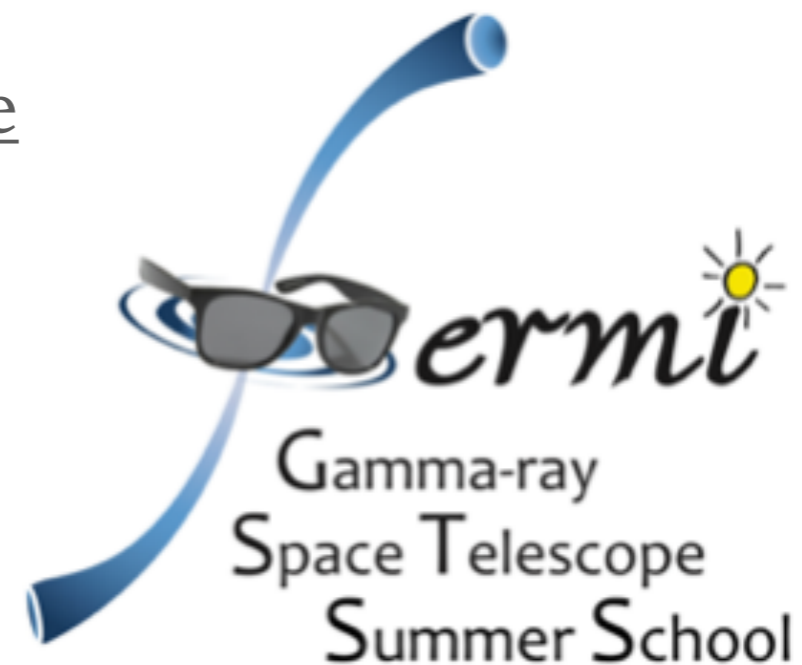
Source
372
10.3%

*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 (v1.1r6p3) 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



MISSION OPERATIONS & USER SUPPORT

- 3 TOO's 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

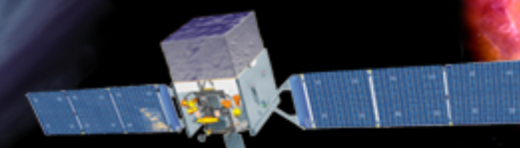
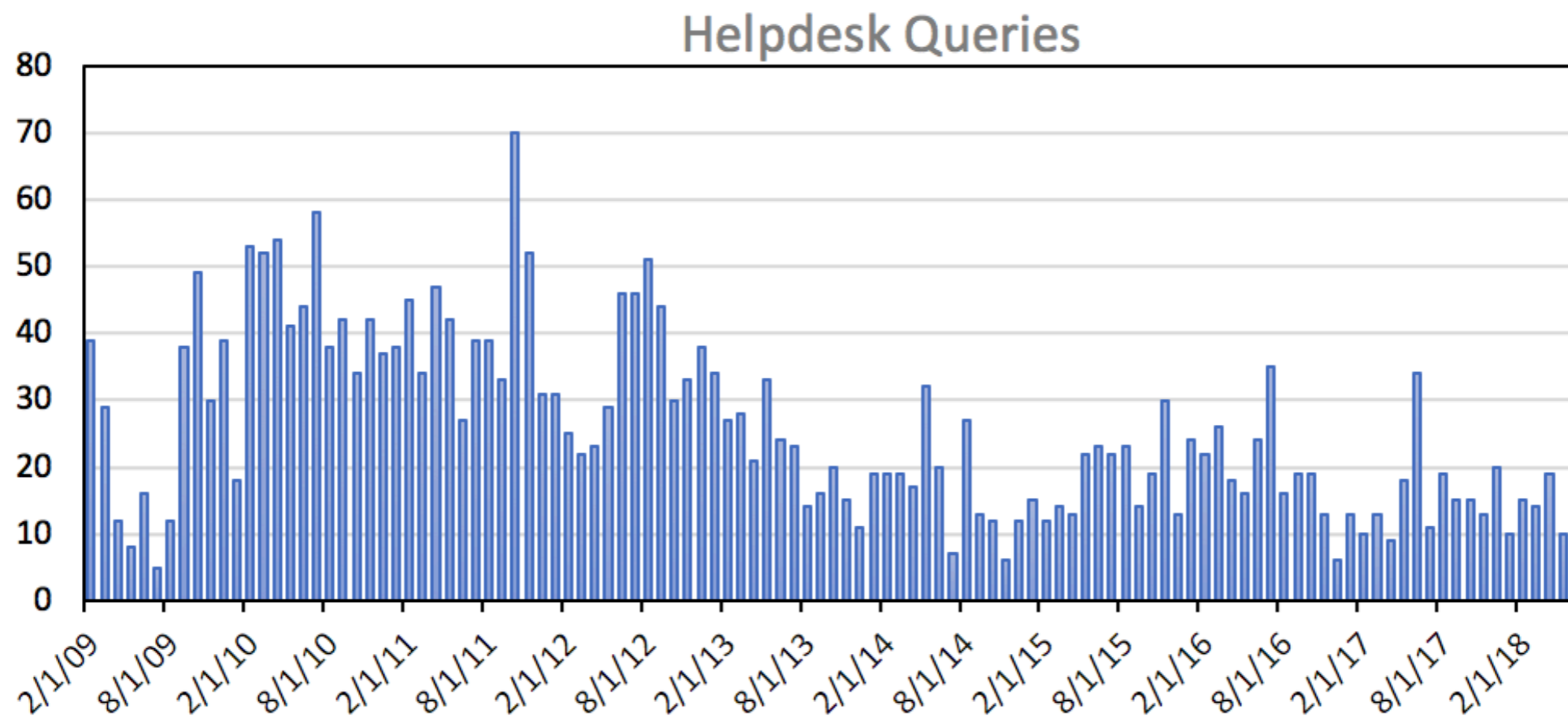




FERMI HELP DESK

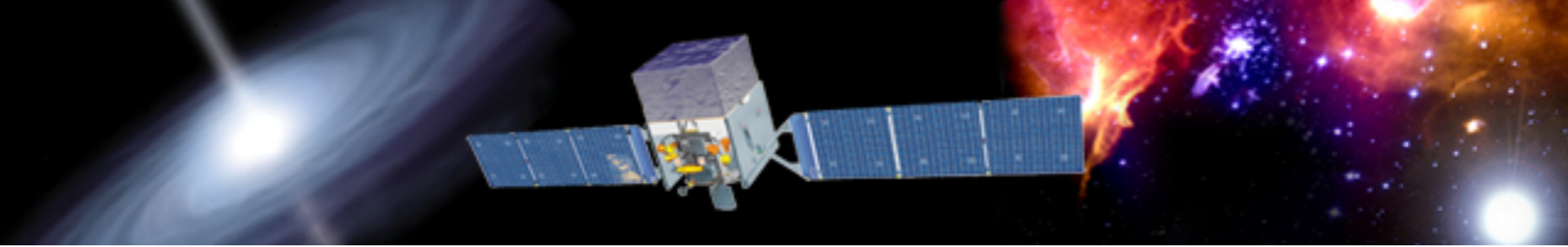
► Help Desk

- >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



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SLAC \Rightarrow FSSC

TRANSITION STATUS

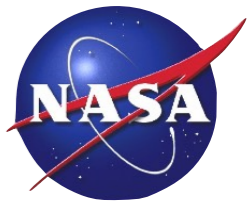




LAT OPERATIONS TRANSITION

- ▶ 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 \Rightarrow Shadow operations \Rightarrow 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 next 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





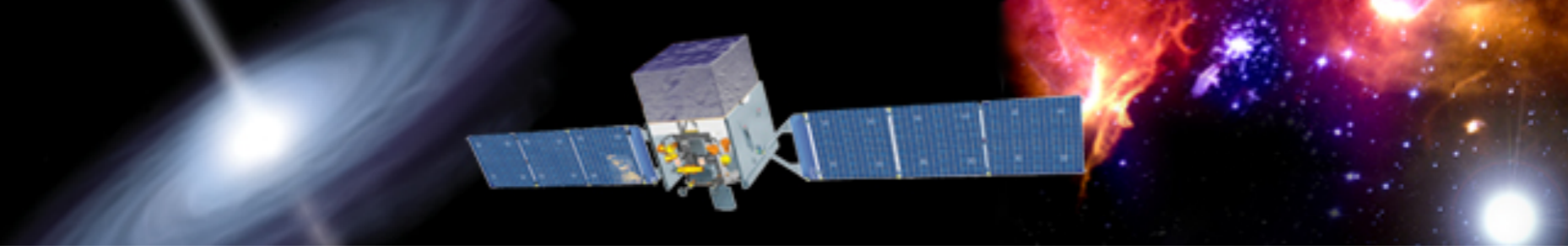
TRANSITION TIMELINE

- 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



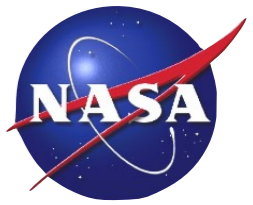
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BACKUP SLIDES





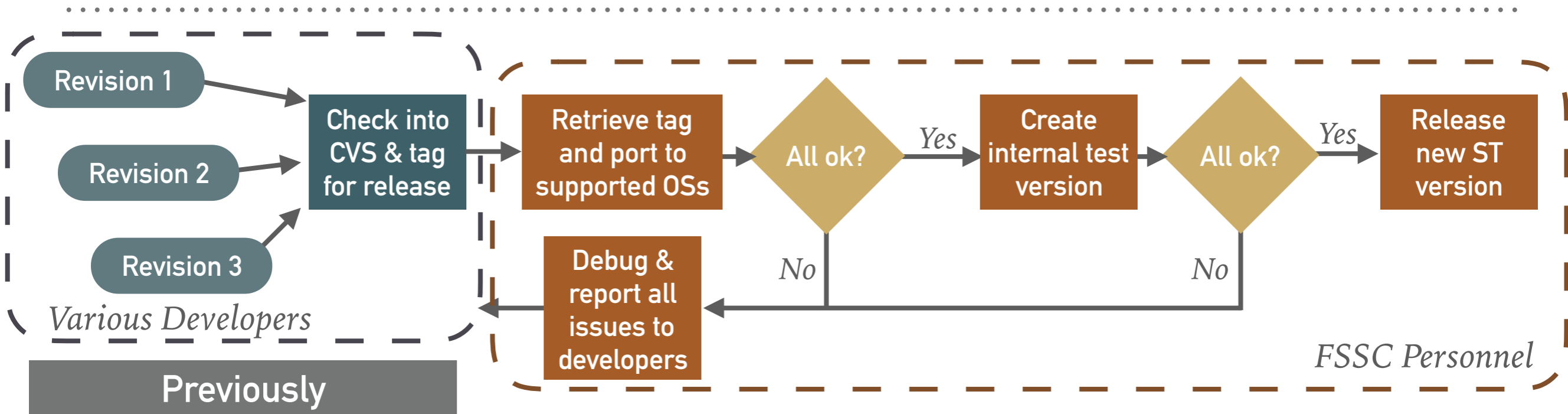
“SOFTWARE WEEKS” FOR INTENSIVE TRAINING

- Two software weeks complete (Feb. '17, Sept. '17, Feb. '18)
 - FSSC/LAT/SLAC personnel face-to-face training
 - Focused breakout sessions \Rightarrow 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



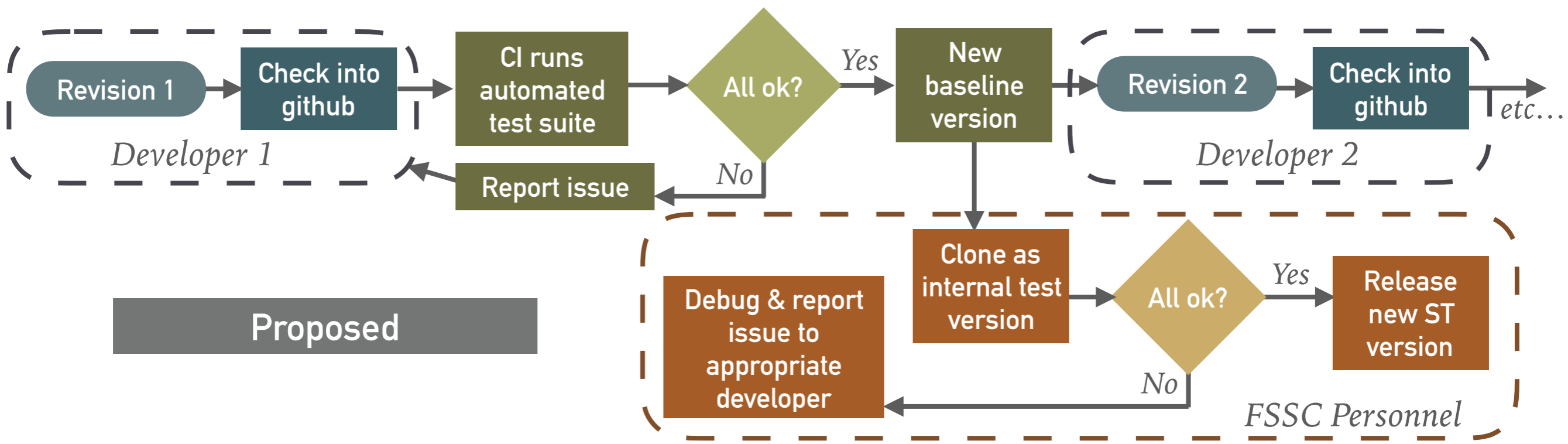
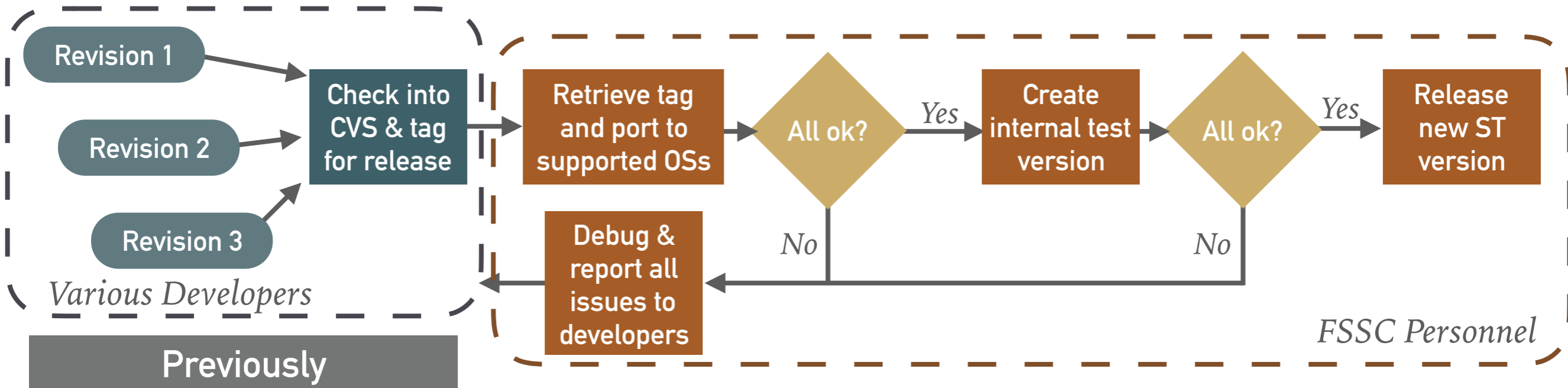


NEW SOFTWARE MANAGEMENT PARADIGM





NEW SOFTWARE MANAGEMENT PARADIGM





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

