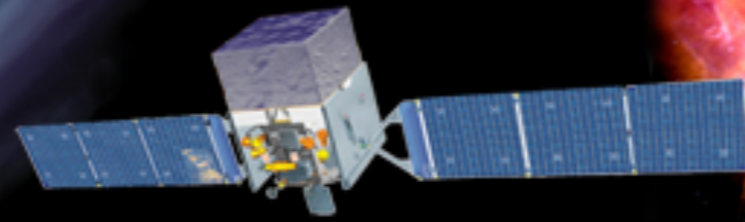


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Science Support Center

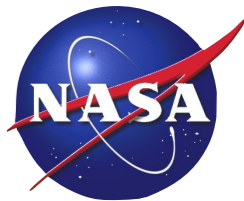


# OPERATIONS, DATA SERVERS & SOFTWARE DEVELOPMENT

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*Elizabeth C. Ferrara*  
*Deputy Lead Scientist, FSSC*





# MISSION OPERATIONS

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- 3 operations support personnel (+1 in training)
- 11 TOO's implemented since last meeting (13 months)
  - 4 for Novae
  - 3 for Crab
  - 3 for flaring AGN
  - 1 other transient event
- Transition to AO-10 effective August 17, 2017
- Positive interactions with new FOT personnel
  - FOT responsiveness to TOO requests has been proactive



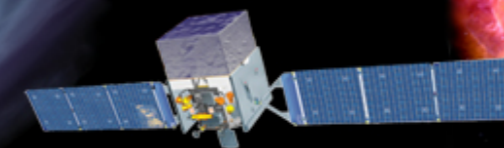
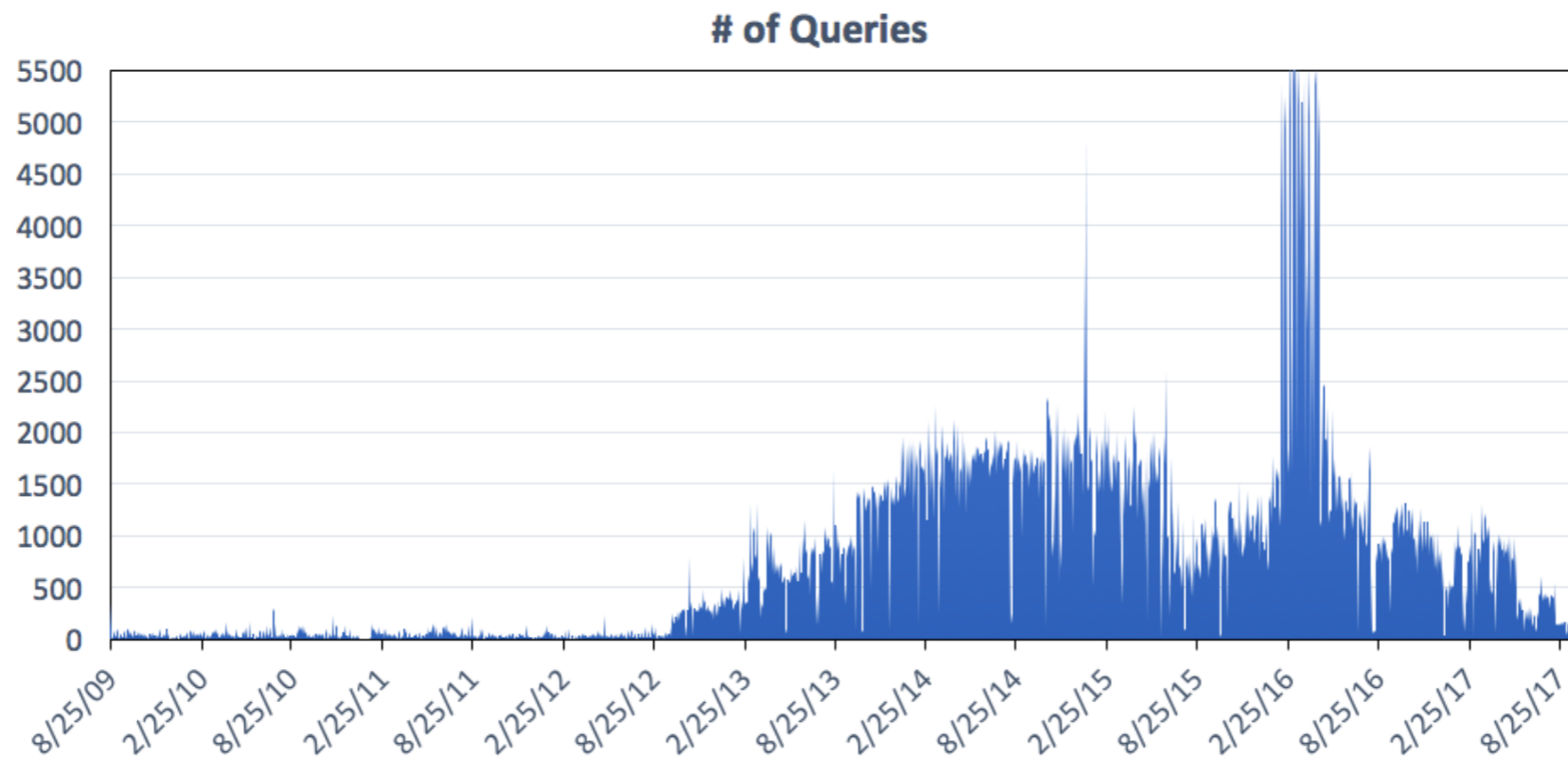


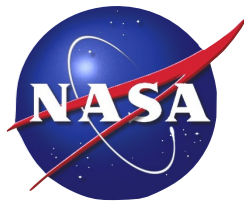
# FSSC DATA STATUS

---

## ➤ LAT Data Server

- Currently serving: Pass 8 data (since 24 July 2015)
- Data downloaded: 42.06 TB (as of 8 Oct. 2017)
- Mission average queries/day: ~750 (photon database)
- Queries/day (last 30 days): ~130



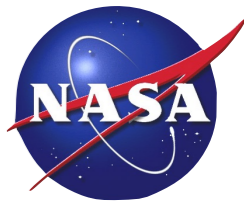


# FSSC DATA STATUS

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  - Data downloaded: 42.06 TB (as of 8 Oct. 2017)
  - Mission average queries/day: ~750 (photon database)
  - Queries/day (last 30 days): ~130
- Data ingest for both LAT and GBM is proceeding smoothly
  - Added Continuous TTE files for GBM
- Ready for update to GBM data files:
  - Converting continuous TTE files to more convenient hourly format
  - Correcting “timing glitches” present prior to summer 2015





# SCIENCE TOOLS CURRENT STATUS

---

- Current science tools (v10r0p5) release date: 20 Sept 2016
  - Supports:
    - Scientific Linux 5, 6, & 7
    - Mac OS X 10.9, 10.10, & 10.11
    - Fedora 20 & 21
    - Ubuntu 14.04, 14.10
  
- New version (v11r5p3) in development - currently in testing/bug fixes
  - Will support additional OSs (lots of infrastructure changes):
    - Mac OS X 10.12, Ubuntu 16.04 & 16.10
  - Dropping support for:
    - SL 5, Mac OS X 10.9 & 10.10, Ubuntu 14.04 & 14.10
  - Supports significant improvements to fermipy functionality
  
- GBM analysis tools:
  - rmfit: v4.3.2 is still current
  - gtburst - update in new release: v01-00-00 ⇒ v02-02-00



# SCIENCE TOOLS PLATFORM USAGE

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|                     |                            |              |           |  |
|---------------------|----------------------------|--------------|-----------|--|
| Mac OS X            | 10.9      10.10      10.11 |              |           | <i>Total downloads<br/>of v10r0p5<br/>=19383</i> |
|                     | 930                        | 1765         | 704       |  |
|                     | 4.8%                       | 9.1%         | 3.6%      |  |
| Scientific<br>Linux | SL5      SL6      SL7      |              |           | Source   |
|                     | 1891                       | 1562         | 2074      | 2606   |
|                     | 9.8%                       | 8.1%         | 10.7%     | 13.4%  |
| Other<br>Linux      | Ubuntu 14.04               | Ubuntu 14.10 | Fedora 20 | Fedora 21  |
|                     | 4418                       | 1867         | 596       | 970  |
|                     | 22.8%                      | 9.6%         | 3.1%      | 5.0%   |

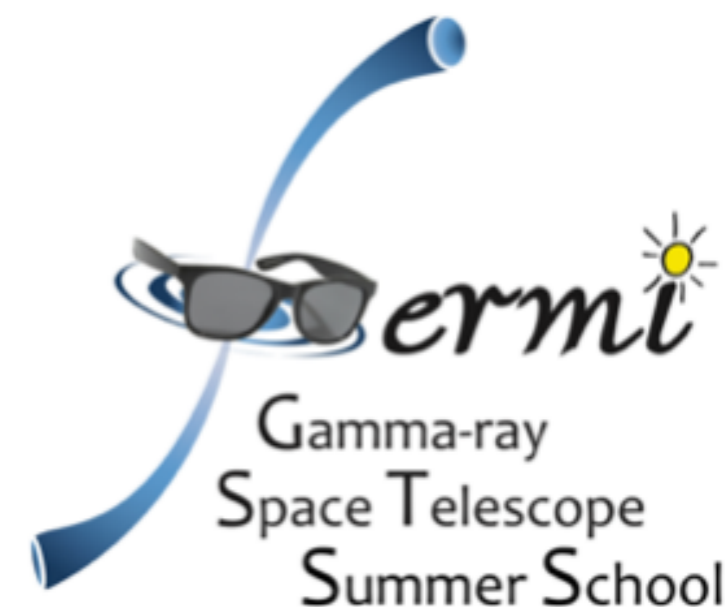
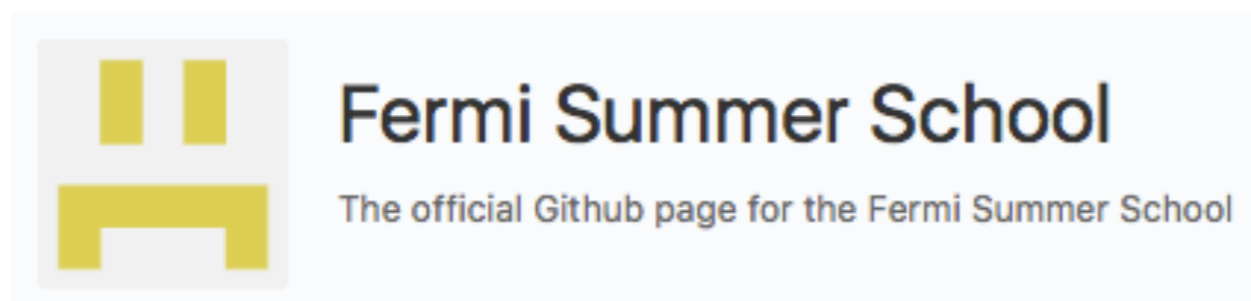




# SCIENCE TOOLS CONTAINERIZATION

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- Developed annually for Fermi Summer School
- Available on github for general community ([Link](#))
- Intended for cross-platform installation
  - Still issues with some host OSs (mostly Windows)
  - Working to resolve these for next year's version



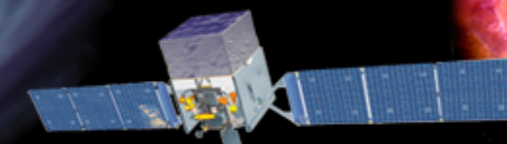
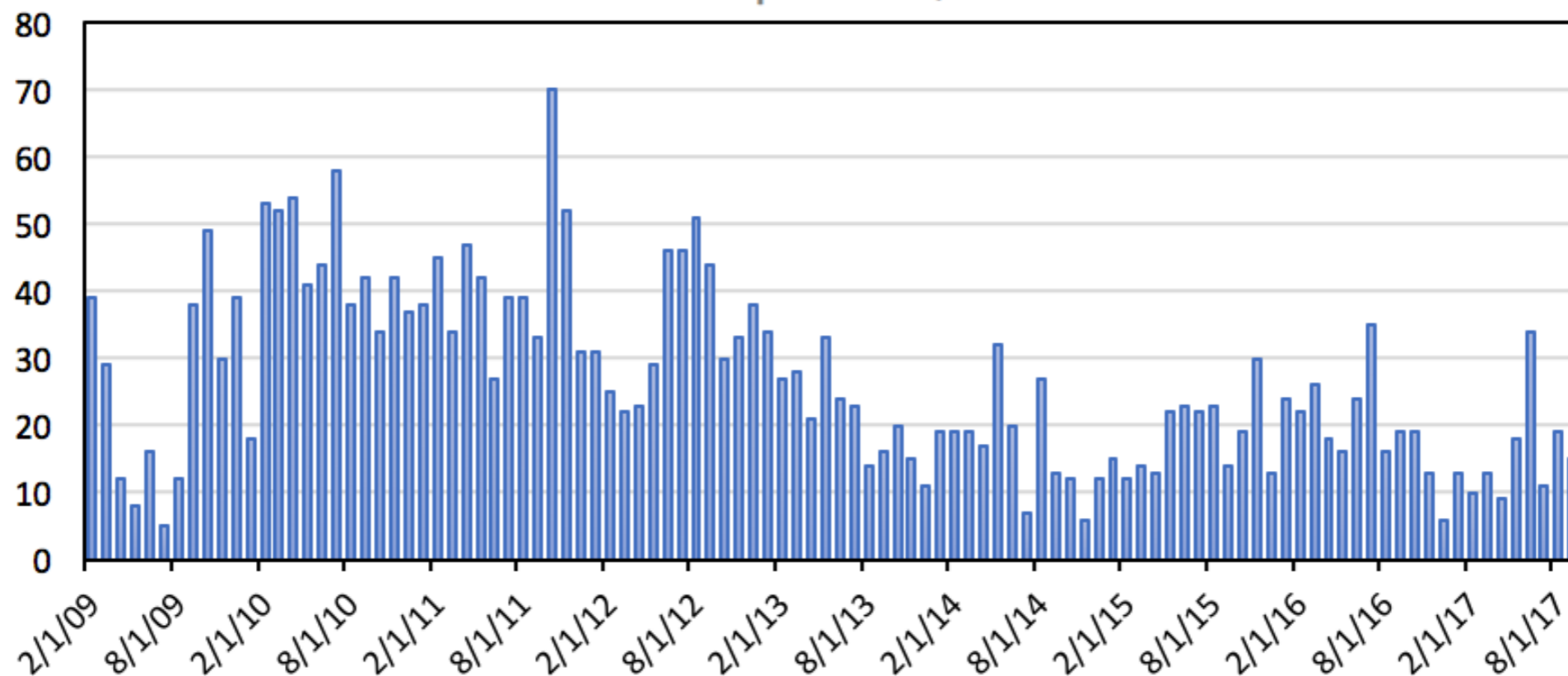


# FERMI HELP DESK

## ► 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

Helpdesk Queries





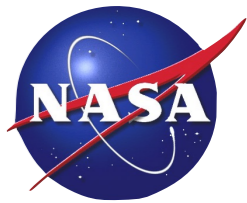


# NEW DATA CATALOGS

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- Added two new high-level data products
  - 2FAV catalog - 2<sup>nd</sup> LAT All-sky Variability Catalog
  - 3FHL catalog - 3<sup>rd</sup> LAT High-Energy Source Catalog (> 10 GeV)
- Coming soon: GBM Earth Occultation Catalog (249 sources)
  
- New catalogs include significant ancillary information:
  - XML models with final fitted parameters for each source
  - DS9 region files
  - Archive of spatial templates and spectral models for all extended sources included in the catalog analysis.
  
- Once final, catalogs are imported into BROWSE format to allow for easy searching





# CONTRACT CHANGES

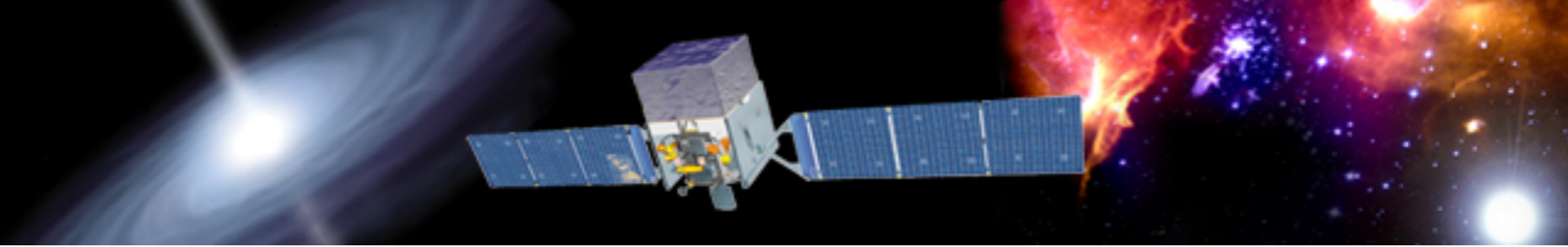
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- SESDA3 contract recompeted - Now SESDA4
  - All but 1 software developers changing employers
  - Working to ensure continuity of personnel
    - Critical to DOE transition



**Fermi**

Science Support Center

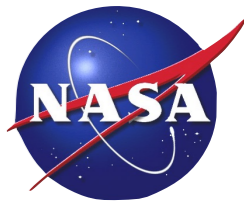


**SLAC  $\Rightarrow$  FSSC**

**TRANSITION STATUS**

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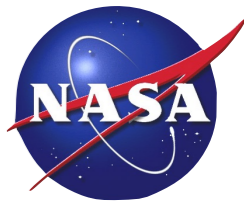


# LAT OPERATIONS TRANSITIONING AWAY FROM SLAC

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- DOE has planned reductions / workforce transfer to new programs at Launch+10 years
  - After Oct 1, 2018, DOE staff available on “as-needed” basis
  - Current “knowledge transfer” period began in Feb 2017
- Tasks prioritized by mission criticality
  - Mission Operations
  - Data Processing & Archiving
  - Software development & maintenance





# PLANNED APPROACH

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- Knowledge transfer  $\Rightarrow$  Shadow operations  $\Rightarrow$  Full transition
- “Divide & Conquer” approach
  - 2-3 FSSC members training for each task, with 1 lead
  - Incorporating expertise from LAT instrument team, when available
- FSSC personnel reoriented to cover additional workload
  - Reduced one management FTE, added two developer FTEs
  - Refocused available skill sets
  - Recovered legacy knowledge





# “SOFTWARE WEEKS” FOR INTENSIVE TRAINING

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- Two software weeks complete (Feb. & Sept. 2017)
  - FSSC/LAT/SLAC personnel face-to-face training
  - Focused breakout sessions  $\Rightarrow$  High level of knowledge transfer
- Two more software weeks planned
  - Jan. 29 - Feb. 2, 2018: Finalize training and initiate full shadow operations
  - Late Aug./Early Sept. 2018: Review results of shadow ops and complete any necessary training





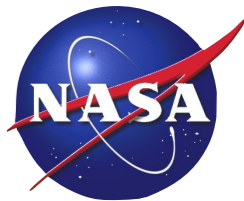


# MISSION OPERATIONS TRANSITION

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- Currently performing partial Shadow Operations
- Training for nominal timeline planning complete
  - FSSC personnel now performing planning/review once per month
- Training in progress for providing regular status reporting
- Ongoing training for less-frequent nominal activities
  - LAT calibration requests, Tracker hot strip masks, etc.
- Non-nominal tasks (flight software updates, etc.) will continue to be supported by DOE personnel as needed





# DATA PROCESSING & ARCHIVING

---

- Currently in Knowledge Transfer
- Initial training at September 2017 software week
  - FSSC personnel now asking questions, reviewing documentation, and writing procedures
  - Shadow operations expected to begin Feb. 2018
- New team will result in a significant increase in trained personnel ⇒ Needed for mission critical task



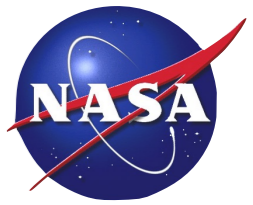


# SOFTWARE DEVELOPMENT & MAINTENANCE

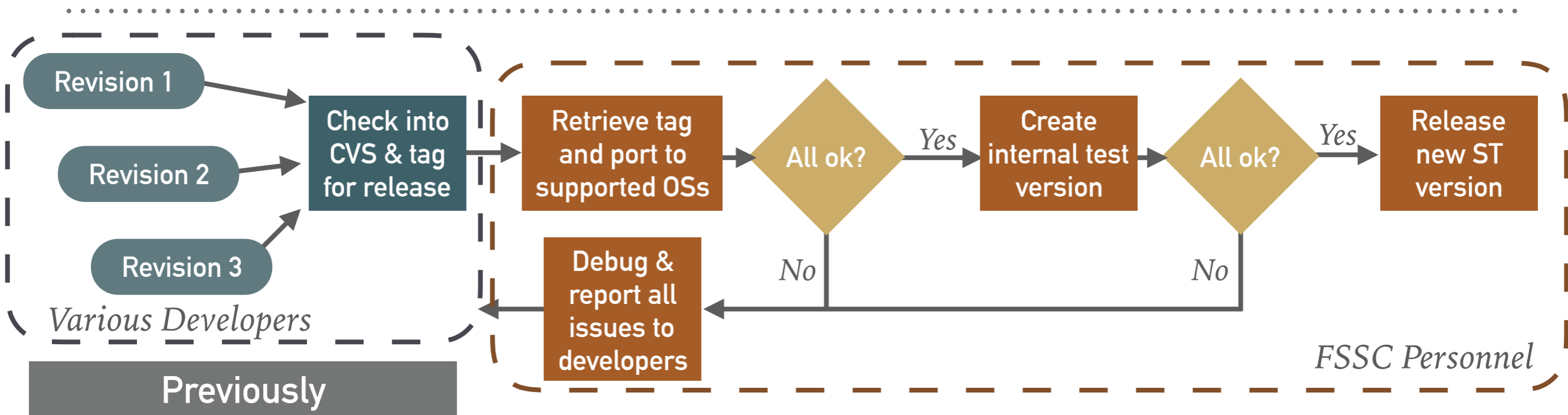
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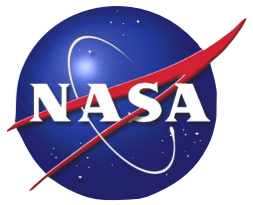
- Transition from current CVS-based repository to github
  - Allows greater flexibility
  - Access to continuous integration (Jenkins CI)
- Transition analysis software distribution to Conda
- Static software (pipeline) will be maintained in containers as underlying operating systems become obsolete
- Special activities (e.g. leap second implementation) will likely require expertise & training past the transition date



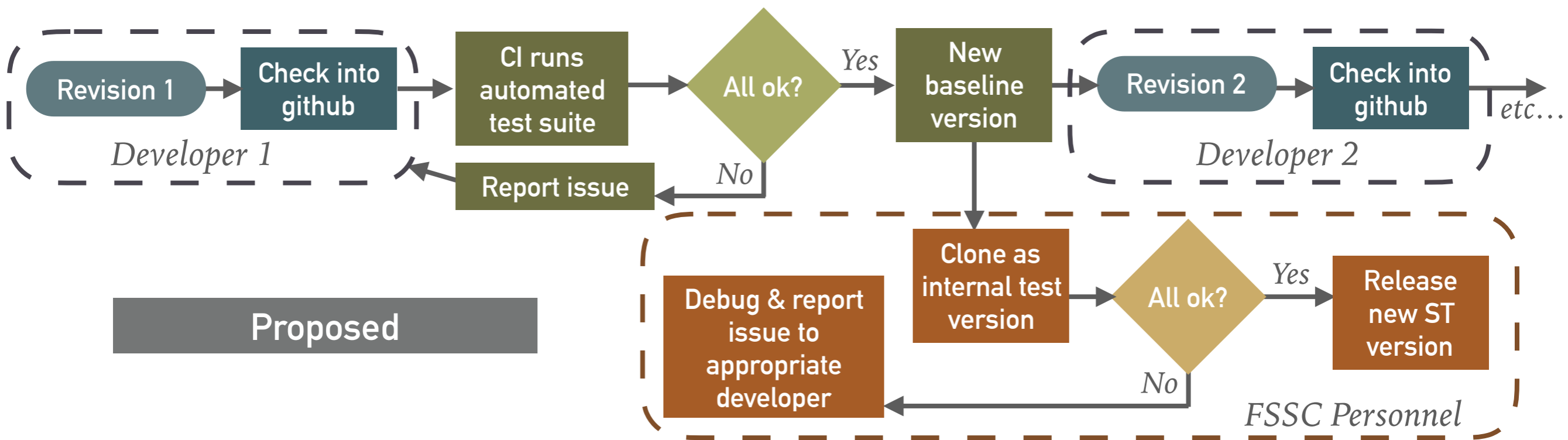
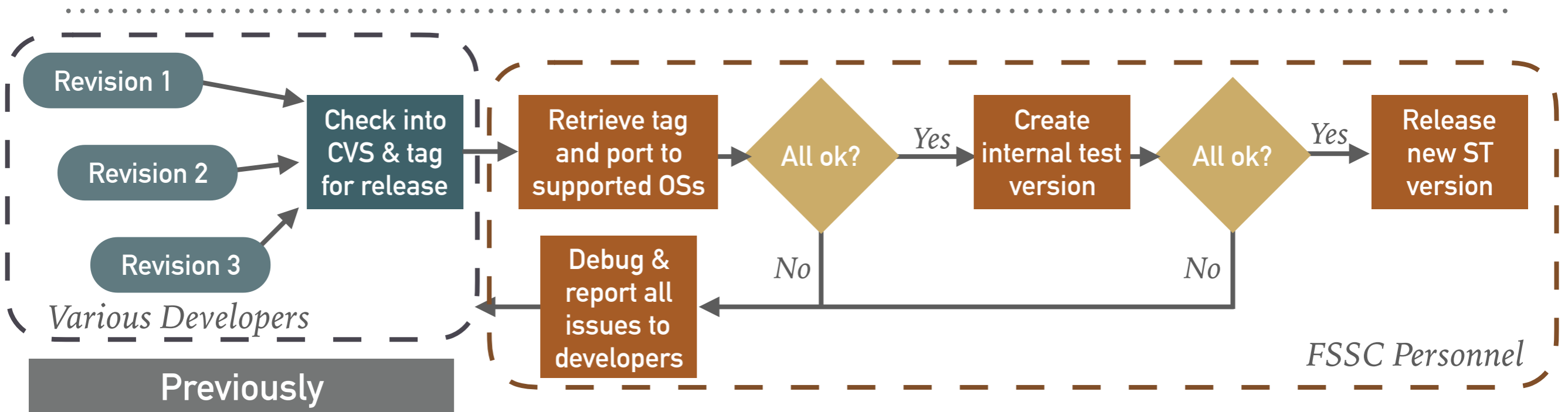


# NEW SOFTWARE MANAGEMENT PARADIGM





# NEW SOFTWARE MANAGEMENT PARADIGM





# TRANSITION TIMELINE

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- 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 to be completed by October 1, 2018

