

STAR Algorithm Integration Team

Tools, Processes, and Milestones

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J1- Readiness

The JPSS Algorithm Integration Team (AIT) brings technical expertise and support to product algorithms, specifically in testing and validating science algorithms in the Algorithm Development Library (ADL) environment.

What we do:

- Assist teams with code updates, testing, and deliveries
- Provide technical support and expertise to teams
- Provide avenue for effective configuration management
- Facilitate a structured test and review process for new algorithms

We have developed a variety of in-house software for organizing, managing, and transitioning product algorithms. Additionally, we are taking leadership in the process of enhancing algorithms to meet upgraded requirements for J-1. Our involvement in the development and review process, in addition to our expertise in integrating the evolving algorithms into ADL, will make it possible to plug the new algorithms into the operational system with greater efficiency and ease.

J1 Algorithm Review Milestones

STAR AIT coordinates with science teams to present algorithm reviews in keeping with the SPSRB process. Algorithm reviews have been completed for all major algorithm changes for J1. Completed review dates are listed in the table below. These algorithm changes include:

- Addition of Top-of-Canopy NDVI output to the Vegetation Index algorithm.
- Addition of high-resolution processing capabilities for CrIS SDR algorithm.
- Addition of high-resolution processing capabilities for the OMPS NP and NTC algorithm.
- Addition of the Fire Radiative Process and Fire Map to the Active Fire algorithm. Transition of algorithm to the NDE operational system.

Algorithm	Critical Design Review	Test Readiness Review	Algorithm Readiness Review
TOC NDVI EDR	5/22/14	11/6/14	4/24/15
CrIS SDR	8/21/14	X	5/12/15
Active Fire EDR	12/2/14	X	6/18/15
OMPS NP & NTC SDR	10/29/14	X	9/15

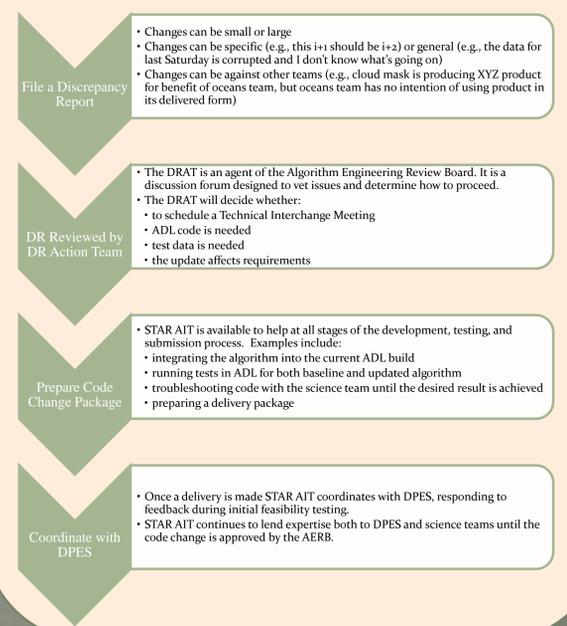
Algorithm Change Process

The Algorithm Change Process is regulated to preserve the integrity and functionality of the operational system.

As we look toward J1 Readiness, many algorithm changes are not in response to discrepancies and errors in the code, but rather changing and updating the code to accommodate:

- New J1 Requirements
- The upgrade to the Block 2.0 operational system.

Algorithm upgrades follow the established change process documented in the Algorithm Change Management Plan. New algorithms (related to new J1 products) follow an additional review process prior to the submission of the change packaged to DPES.



Integration Specialists

AIT has five integration specialists each assigned to specific Sensor Data Record (SDR) and Environmental Data Record (EDR) teams based on expertise. Integration specialists:

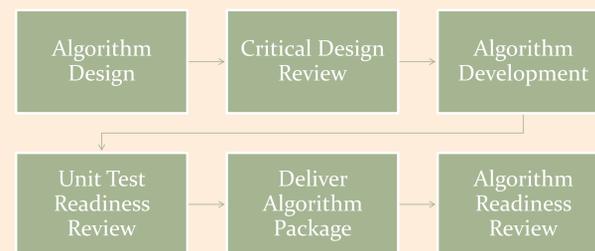
- Interact directly with algorithm teams during development, testing, and integration
- Attend meetings with science teams to keep apprised of algorithm status
- Provide test results to algorithm team
- Provide chain run test results to all affected teams
- Prepare and deliver algorithm packages
- Maintain support through review and integration process



Algorithm Review Process

New algorithms developed for J1 are subject to the STAR Enterprise Lifecycle Review Process (EPL)

- consistent with the Satellite Product and Services Review Board (SPSRB) review process
- adds value to product development
- generates standard documentation covering:
 - Requirements and Risks
 - Algorithm Theoretical Basis
 - Implementation Plan
 - Software Architecture
 - Quality Assurance
- process tailored based on implementation timescale and development progress
- tailored reviews mitigate risk by eliminating overhead of preparing multiple reviews
- technical risk is low because Level 1 and Level 2 requirements are handled by a separate review board and are already developed



Requirements Tracking

- STAR AIT compiles Requirements Allocation Documents (RAD) for J1 Algorithms undergoing a review process.
- The RAD contains Level 3 and 4 requirements allocated to STAR.
- The RAD operates in parallel with the NASA Software Requirement Specification documents
- Requirements in the RAD are traced to Level 1 and Level 2 requirements documents
- The RAD is a standard deliverable and is made available at each review.
- Requirements and changes to requirements are discussed at each review.

Quality Assurance

STAR AIT in conjunction with JPSS STAR Management (J-STAR) has developed a Quality Assurance Plan that describes the QA procedures for the STAR JPSS project. The AIT QA Lead is responsible for maintaining situational awareness of the JPSS project as a whole and coordinating with management and oversight teams.



For QA purposes, AIT:

- uses Clearcase/Clearquest for algorithm configuration management
- complies with the Algorithm Change Management procedures put forth by Data Products Engineering & Services (DPES)
- assists algorithm teams in maintaining accurate and up-to-date documentation throughout the development process

Recent DRs

STAR ASSISST regularly assists science teams with algorithm changes.

- We have generally worked on 30-40 DRs per FY.
- The current directive has emphasized KPPs. Most of our current work focuses on SDR algorithms and development and integration of J1 products. Past years have shown greater emphasis on Land, Aerosol, and Cryosphere EDRs.
- Integration and testing involves creating baseline and modified runs of test data. In cases for Cloud Mask and Aerosol changes, we diligently test the effect on downstream products using the Chainrun script.

The flow chart below shows an abbreviated version of the algorithm change process. AIT provides assistance to the science team's development of the product algorithms in the offline system. We will help science teams develop and integrate changes into ADL. We then aid in the submission process to DPES. When the updated operational algorithm is delivered, we can assist with merging the developing code with the new operational system.



The table below shows a list of DRs we have worked on and/or submitted Algorithm Change Packages (ACP) for in the past fiscal year. ACP submission is an iterative process as we work with DPES to overcome the differences between the ADL and G-ADA systems.

Team	DRs	Summary of Work
Active Fires	7245	Implement J1 Upper - Integrate Fire Radiation Product and Fire Mask into code, delivery to NDE.
Aerosols	7723, 7786, 7787	Improve Aerosol algorithm Dust Model, Ephemeral Water, and Snow test products. Delivery to DPES.
ATMS	7879, 7941, 7954, 7966	Update PTCs, incorporate full radiance testing, perform integration and testing. Delivery to DPES.
Cloud Mask	7535, 7538	Integrate new Cloud Shadow calculation. Replace tiles with climatology input
Cloud Mask/Aerosols	7437, 7438, 7408	Changes related to ephemeral water and cloud phase, integrated and tested in ADL.
CrIS SDR	7486, 7895, 7926, 4481	Implement J1 Upper - Modification of code for full spectral resolution.
Cryosphere	7791	Eliminate Ice surface Temperature algorithm dependency
OMPS EDR	4256	Improve OMPS NP Algorithm. Run baselines and tests on updated code.
OMPS SDR	7248, 7249, 7450, 7451, 7654, 7655, 7824, 7827, 7828, 7340, 7341, 7831	Implement J1 Upper - Modify wavelength scale, aggregation, and glueware features.
Surface Reflectance	7635, 7784, 7785, 7943	Update SRIP to handle changes in AOT input.
Vegetation Index	4376, 7216, 7697, 7039	Implement J1 Upper - Add TOC NDVI to the algorithm code.
VIIRS SDR	8036	Add new LUTs and RSB Autocal features.

AIT Tools

Chain run script

The Chain run script is a Perl script that automates the staging and processing of multiple JPSS SDR and EDR products. The tool, developed by STAR AIT facilitates efficient and consistent tests of interdependent algorithms.

Dark OMPS Generator Script (DOGS)

The Dark OMPS Generator Script (DOGS) is a Perl wrapper developed by the AIT to facilitate the OMPS Dark Table production process. Currently, Dark OMPS tables are generated by hand on the NASA PEATE system. DOGS will automate the table production and allow the process to transition to NOAA's GRAVITE system. Weekly dark table updates are important for correct radiance values and accuracy of other downstream ozone operational products which use either the OMPS Nadir Profiler (NP) or OMPS Nadir Mapper (NM).

SASQUATCH

Simplified And Streamlined Quality Assurance Through Coding Help

EPL Review documents include both Requirements Allocation Documents (RADs) and Requirements slides with identical content. Additionally, a spreadsheet is provided for review showing requirements tracing to Level 1 and Level 2 requirements. SASQUATCH is a perl script that reads requirements from a spreadsheet and generates both the RAD and Review slides, thus ensuring consistent content and formatting. EPL Review documents include a Review Item Disposition (RID) spreadsheet that tracks all risks and review items. For each review, the review items in the RID are presented. Building on the capability of SASQUATCH, Risk-QUATCH converts the RID spreadsheet into properly formatted presentation slides for the review.

