Role of STAR Algorithm Integration Team (AIT) in the Algorithm Change Management Process for the JPSS Mission

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Abstract

The algorithm change management process is an important component towards the success of any satellite mission. For the Joint Polar Satellite System (JPSS) mission, this process becomes more significant as it involves management from two organizations (NOAA and NASA) and their associated organizational procedures for software standards and documentation standards. STAR's algorithm integration team (AIT) plays a key role in the algorithm change management process by contributing to algorithm integration, testing, evaluation, communication, documentation and life cycle reviews. In this presentation we describe in detail the contributions by STAR AIT in the algorithm change management process for the success of JPSS mission. We describe our current contributions for improving algorithms for both the Suomi NPP mission (launched October 28, 2011) and the upcoming JPSS 1 mission (planned for launch in 2017). We also discuss the procedures we follow for submitting algorithm change request packages to DPES and our interactions with various teams prior to approval by the AERB.

STAR AIT

STAR AIT provides expertise on integration of JPSS algorithms into operational systems and performs the following tasks:

- Code Testing in Algorithm Development Library (ADL) Framework
- Communication with Science Teams and Data Product and Engineering Services (DPES)
- Troubleshooting
- Change Request Submission
- Attending Team Meetings
- Reviewing Algorithm Theoretical Basis Documents (ATBD), Operational Algorithm Description (OAD) and other documents
- Consultancy to Science Teams
- Emulation of Various Operational Scenarios
- Code Analysis and Result Analysis
- Facilitation of Life Cycle Reviews

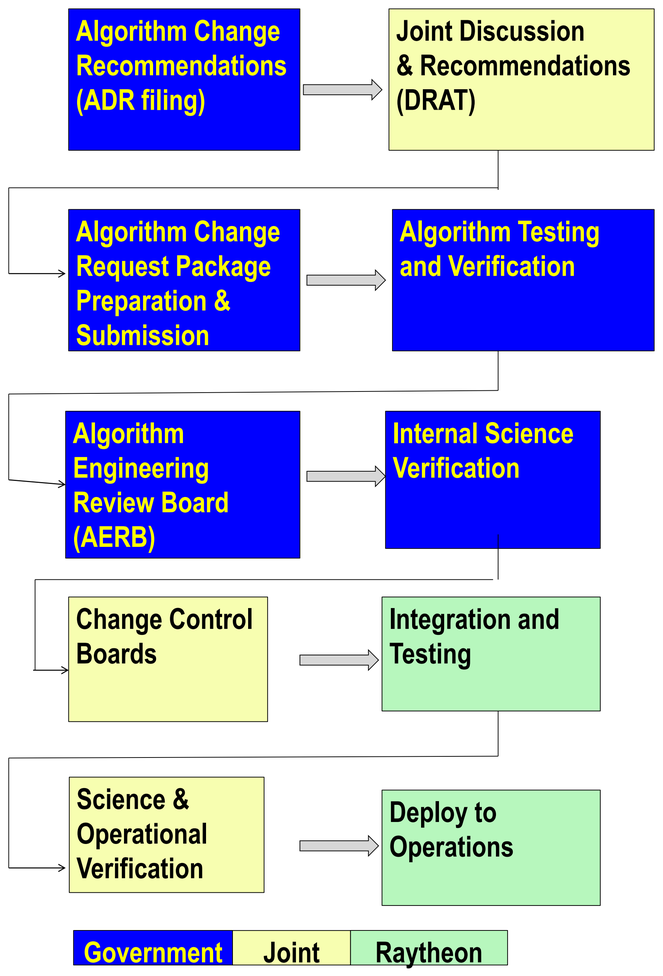
ADL Framework

- ADL is the Test System - Developed by Raytheon
- ADL mimics the Operational Interface Data Processing Segment (IDPS)
- ADL provides a Diagnostic Framework
- ADL provides one system to implement and test all the algorithms
- I-P-O Model (Input-Processing-Output)

STAR AIT Point of Contact (POC) for Different Algorithms

Algorithm	POC	Backup POCs
CrIS SDR	Vipuli Dharmawardane	Bigyani Das
ATMS SDR	Vipuli Dharmawardane	Bigyani Das
OMPS SDR – NM & NP	Bigyani Das	Vipuli Dharmawardane
OMPS EDR – NM & NP	Bigyani Das	Vipuli Dharmawardane
OMPS CAL SDR - DARKS	Bigyani Das	Weizhong Chen, Kristina Sprietzer
VIIRS SDR	Weizhong Chen	Qiang Zhao, Bigyani Das
VIIRS EDR - Cryosphere	Marina Tsidulko	Bigyani Das
VIIRS EDR - Imagery	Marina Tsidulko	Weizhong Chen
VIIRS EDR - AF	Marina Tsidulko	Weizhong Chen
VIIRS EDR – NDVI	Qiang Zhao	Bigyani Das
VIIRS EDR – Surface Reflectance	Qiang Zhao	Marina Tsidulko
VIIRS EDR – Cloud Mask	Weizhong Chen	Ruiyue Chen
VIIRS EDR – Cloud Products	Weizhong Chen	Ruiyue Chen
VIIRS EDR - Aerosol	Bigyani Das	Weizhong Chen
VIIRS EDR - LAND	Qiang Zhao	Marina Tsidulko
Requirements, Reviews, Quality Control	Valerie Mikles	Algorithm POCs
Documents	Valerie Mikles	Algorithm POCs
Scripts, Testing	Kristina Sprietzer	Algorithm POCs
Configuration Management	Yunhui Zhao	Algorithm POCs
CrIS, ATMS EDR - NUCAPS	Mike Wilson	Letitia Soulliard
Chain Runs	Weizhong Chen	Algorithm POCs
General Questions	Bigyani Das	Algorithm POCs
Management Meetings	Valerie Mikles	Bigyani Das
Software Installation/Maintenance	Weizhong Chen	Algorithm POCs

Algorithm Change Process



AIT Role

ADR Filing: Usually Algorithm Discrepancy Reports are filed by the scientists. At times the algorithm JAM or AIT POC files the ADR.

DRAT: The DRAT discussions are held to discuss the ADR and solution ideas. AIT POC participates in DRAT discussions.

TIM (Technical Interchange Meetings): Depending on the decision of the science team members, a TIM might be organized by the algorithm JAM. STAR AIT participates in TIM .

Algorithm Change Request Package Preparation and Submission: AIT's major contribution is focused on this task. This task includes testing, integration, document preparation, adding updates, preparing change request package and submitting to DPES.

DPES Testing: After AIT delivers the change request package, the testing and verification is being done by DPES and AIT is involved in this task by guiding the DPES in case of any discrepancy in the results, and supporting DPES with data and information when required.

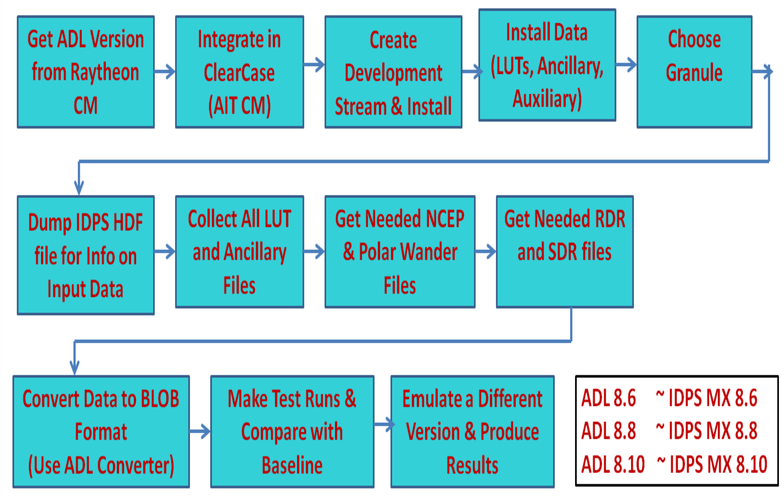
AERB Review: This review is held to discuss and verify that the proposed solution for the respective discrepancy is being tested and verified and the results support that. AIT participates in the review.

Others: After AERB completes the review, AIT in general is out of the loop. However, AIT participates on occasions in "Science and Operational Verification" phase before the final deployment to operations.

Document Review and AIT

Document	Description	Review Board	Maintained By	STAR AIT
ATBD	Description of Science Theory	AERB	Science Teams	Currently ATBD changes are submitted by AIT
OAD	Description of Implementation of ATBD	AERB	CGS Contractor	OAD changes are communicated by AIT
AS Vol1 – SRS	Performance Requirements	Ground ERB	Ground Systems Engineering	
AS Vol2 Data Dictionary	Data Format for JPSS	Ground ERB	Ground System Engineering	AIT has been asked to make changes
AS Vol 3 Ref to OAD	Refers to OAD	Ground ERB	Ground System Engineering	
AS Vol 4 Parameter File	Quality Flag and Fill Condition Requirements	AERB	DPA	AIT has been asked to make changes
CDFCB (for S-NPP)	Data Format for S-NPP	Ground ERB	CGS Contractor	AIT has been asked to contribute

AIT Integration Process Flow



Contents of the Delivered Algorithm Package (DAP)

The Delivered Algorithm Package contains the following:

Original Code
Changed Code
Original LUT
Changed LUT
Baseline Results
Updated Results
Needed Input Tables
Ancillary Data
DPES Forms
Delivery Document with Test Instructions
Redlined ATBD (if needed)
Redlined OAD (if needed)
CDFCB Changes (if needed)
SRS Data Dictionary Document (if needed)
Other supplementary documents as needed

Ref: 474-00058_JPSS-Algorithm-Change-Mgmt-Plan_B.pdf

Example Contributions to S-NPP Algorithms

- OMPS NP V8 Pro Algorithm
- OMPC TC V8 Algorithm
- Aerosol EDR
- Land surface albedo LUT updating
- Adjust Quality Flag for Thin Cirrus in Land Surface Temperature (LST) and Update LUT
- Add Quality Check for Active Fire
- Updated PCT for CrIS SDR
- Updated PCT for ATMS SDR
- Equation Modification for Sea Surface Temperature and Evaluating Downstream Impact
- Roll Back LST LUT from Provisional to Beta Version
- OMPS Cal SDR Dark Table Creation
- VIIRS Surface Reflectance Algorithm Updates
- New Rain Algorithm for CrIMSS (Cross Track Infrared and Microwave Sounder Suite)
- Wavelength Shift and New Ozone Mixing Fraction for OMPS
- Implementing NOAA Global Multi-sensor Automated Snow/Ice Map (GMASI) Tile

Example Contributions to J1 Algorithms

- OMPS NM SDR Phase 1 and 2 J1 Uppers Deliveries with algorithm updates for de-aggregation and decompression criteria
- OMPS NP SDR J1-Uppers Package
- VIIRS NDVI Package
- VIIRS SDR Package
- VIIRS GEO Package
- CrIS SDR Package for Full Resolution and Normal Resolution Processing Capabilities
- CrIS SDR Package to correct Fringe Count Error
- VIIRS Active Fire DAP to NDE

Abbreviations

AS: Algorithm Specification
ATMS: Advanced Technology Microwave Sounder
CrIS: Cross-track Infrared Sounder
DRAT: Discrepancy Report Action Team
EDR: Environmental Data Record
JAM: JPSS Algorithm Manager
OMPS: Ozone Mapping and Profiler Suite
SDR: Sensor Data Record
SRS: Software Requirement Specification
VIIRS: Visible/Infrared Imager Radiometer Suite

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