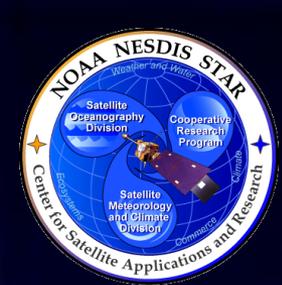


Algorithm Integration

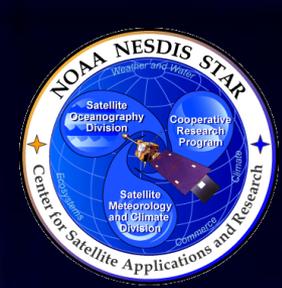
Presented by

Walter Wolf
AWG Integration Team Lead
NOAA/NESDIS/STAR



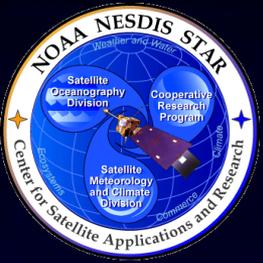
Algorithm Integration Team (AIT) East Members

- Walter Wolf – Government Lead
- Shanna Sampson – Project Lead
- Xingpin Liu – QA Lead & Monitoring Tools
- Wayne MacKenzie – GSP/Harris/AWG Liason
- Larisa Koval – Documentation
- Yunhui Zhao – CM
- Aiwu Li – Algorithm Integration
- Tianxu Yu – Algorithm Integration
- Rickey Rollins – Algorithm Integration
- Veena Jose – Algorithm Integration
- Meizhu Fan – Algorithm testing
- Zhaohui Zhang – Algorithm Integration/Framework Support
- Kristina Sprietzer – Framework Support
- Hua Xie – Sounding Integration
- Wendy Zhang – Imagery Integration
- Haibing Sun – Physical Collocations



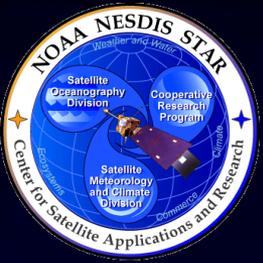
AIT Midwest Members

- Ray Garcia – AIT Midwest Lead
- William Straka – Algorithm Integration
- Graeme Martin – Algorithm Integration
- Eva Schiffer – Glance Development
- Bob Holz – Physical Collocation Lead
- Fred Nagle – Navigation Expert
- Greg Quinn – Physical Collocation Support
- Ralph Kuehn – Physical Collocation Support



Keywords

- Ambrosia
- Housekeeping
- Enterprise
- Continuity
- Opportunity

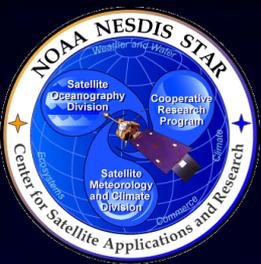


Outline

- Housekeeping
 - » Accomplishments Over the Past Year
 - » Option 2 Stragglers – Visibility, Rainfall Potential, Rainfall Probability
- The Way Forward
 - » Enterprise
 - » Continuity
 - » Enterprise & Continuity
- Summary



Housekeeping



Milestones for Baseline Products – Scheduled Deliveries Complete

- **Deliveries and Milestones**

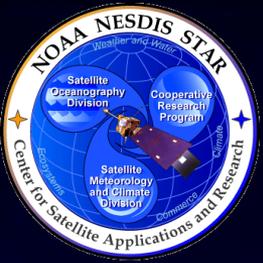
- » Draft ATBD – September 2008
- » 80% ATBD and Algorithm Package – September 2009
- » 100% ATBD and Algorithm Package – September 2010 & December 2010 respectively
- » **REMOVED – Maintenance Delivery of ATBD and Algorithm Package – September 2012**



Milestones for Option 2 Products – Scheduled Deliveries Complete

- **Deliveries and Milestones**

- » Draft ATBD – September 2008
- » 80% ATBD and Algorithm Package – September 2010
- » 100% ATBD and Algorithm Package – September 2011
 - Visibility, Rainfall Potential, and Probability of Rainfall not included

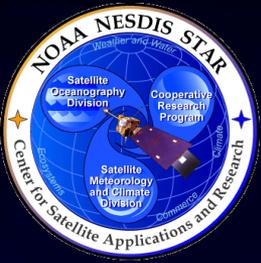


Milestones for 2012 Option 2 Products

Visibility, Probability of Rainfall and Rainfall Potential

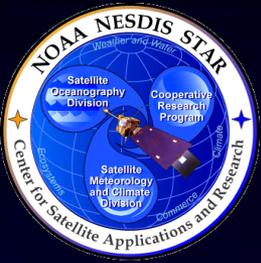
- **Deliveries and Milestones**

- » Draft ATBD – September 2008
- » 80% ATBD and Algorithm Package – September 2010
- » 100% ATBD and Algorithm Package – September 2012



Preparing for 2011 Delivery

- Conducted 6 Option 2 Algorithm Readiness Reviews
- Reviewed 18 Option 2 ATBDs
- Updated the Algorithm Interface and Ancillary Data Description Document (AIADD)
- Wrote the Baseline Algorithm Product Performance Monitoring Document



Accomplishments

- Deliver Algorithm Package containing the Option 2 100% algorithms on September 30, 2011
 - » ATBD
 - » Algorithm Interfaces and Ancillary Data Description (AIADD) Document
 - » Test Data
 - Proxy and Simulated Input Data Set
 - Output Data Sets
 - Associated Coefficient Data Sets
 - » DD250 Form
 - » MD5sum value for each file (check sum)
- Delivered the Baseline Algorithm Product Performance Monitoring Document



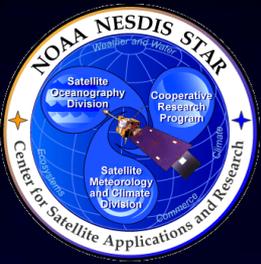
Visibility, Probability of Rainfall and Rainfall Potential Products: Current Status

- Rainfall Probability and Rainfall Potential algorithms have been reengineered
- Received version 4 internal delivery for the three products
- Software Reviews will be conducted next week



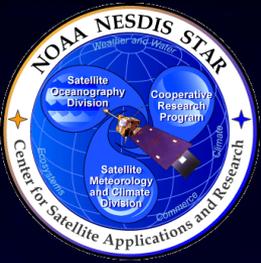
Visibility, Probability of Rainfall and Rainfall Potential Products: Next Steps

- Internal version 5 deliveries
- Integration into the framework and test the outputs
 - » Conduct 4 month runs on test data sets
- Conduct Algorithm Readiness Reviews
- September 30 delivery



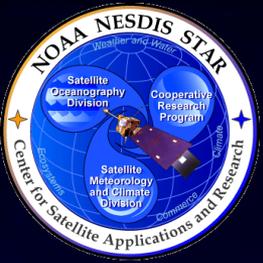
Technical Interchange Meetings (TIM) with Harris and GSP

- Harris/AER is currently implementing the AWG algorithms from the ATBDs
- Harris/AER develop an algorithm design document from which the software is developed
- Harris/AER ask questions of the AWG for algorithm clarification
- AWG answers the questions
 - » Fast turnaround is generally required
 - » AWG has already answered over 1000 questions
- This is an iterative process



Baseline Test Data Set Redelivery

- Through the process of answering the Harris/AER questions, occasional bugs are found in the software
- When bugs are fixed, the test data are regenerated and redelivered
- So far, 17 redeliveries have been made: Lightning, Cloud, Aerosol, Soundings, and Imagery baseline algorithm test data sets



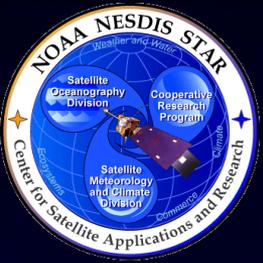
Baseline Algorithm Validation

- The baseline algorithm product teams are continuing to validate their algorithms
- Routine and deep dive Cal/Val Tools are being developed
- Documents for the routine Cal/Val Tools will be delivered in September 2012



Extended Baseline Algorithm Testing

- Continuous data feeds are being set up to process the algorithms on extended data sets
 - » Simulated data
 - » SEVIRI
- Fine tune thresholds, coefficients and look up tables
- These products will be made available to the users for testing purposes
- Algorithm upgrades will occur after launch



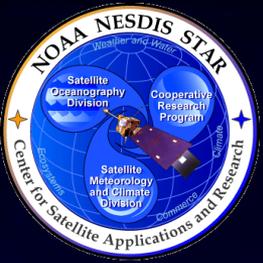
Housekeeping Wrapup

- 100% Option 2 ATBDs & Algorithm Packages were delivered on September 30, 2011
- Visibility, Probability of Rainfall and Rainfall Potential Algorithm Readiness Reviews will be completed by September 1, 2011
- 100% Option 2 ATBDs & Algorithm Packages for Rainfall Potential, Probability of Rainfall, and Visibility will be delivered on September 30, 2012
- 100% Routine Cal/Val Tool ATBDs for the Baseline Algorithms will be delivered on September 20, 2012



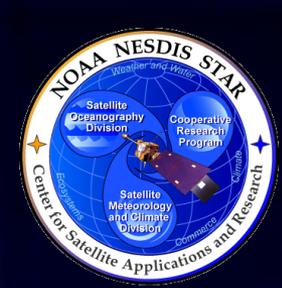
The Way Forward

Enterprise



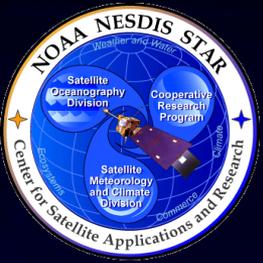
Enterprise Concept

- Why the enterprise concept?
 - » End to end cost savings
 - » Maintainability
 - » Flexibility
 - » Scalability
- OR.....



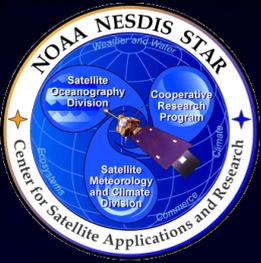
Enterprise Concept

- Because I am tired
- Tired of building a new system for every satellite launched
- Tired of implementing a new system every time a new algorithm is transitioned to operations



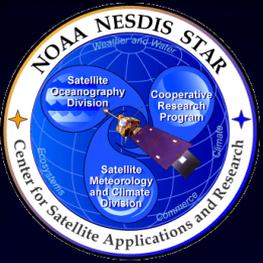
Opportunity

- GOES-R provided an opportunity to implement a new system within STAR due to the algorithm requirements
 - » One algorithm for each product
 - No specific cloud mask for each product
 - » Product precedence
 - Algorithms use prior run algorithms as input
 - » Forward model consistency
- Requirements were put in place to reduce algorithm development costs and to bring scientific consistency across products



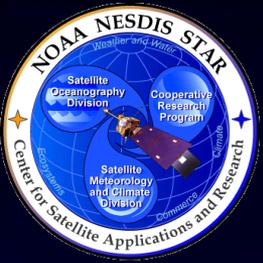
System Requirements

- In order to develop and test the algorithms, AWG needed to build a test system that could:
 - » Read in and process both geostationary and polar data (SEVIRI, GOES and MODIS)
 - » Run algorithms in precedence
 - » Use common ancillary data sets
 - » Use a common forward model
 - » Create one type of output data set
- Enterprise type of system
 - » Standardization of programming languages, software, interfaces, libraries and tools



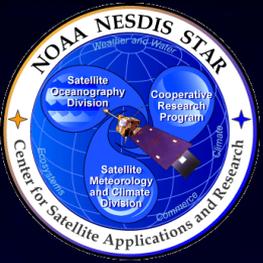
Building the System

- Ingredients required for designing the system
 - » Mulling thoughts
 - » Smart people – not me....
 - » White board
 - » Ambrosia
 - » Markers
 - » Ambrosia
 - » Eraser
 - » Ambrosia
 - » Understanding spouse
- Patience



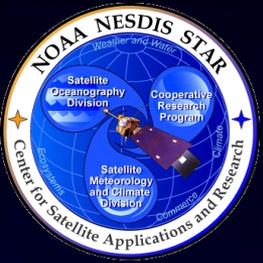
Patience

- It takes months to put each piece in place
- Software hurdles have to be dealt with along the way
- Issues have to be dealt with as the pieces are plugged together
- It just takes time



Resulting Processing System

- GOES-R Algorithm Processing Framework
 - » System that runs 57 GOES-R algorithms
 - » One algorithm for each product (i.e. one cloud mask for all products)
 - Though new algorithms may be plugged in and tested leading to replacement of algorithms
 - » Common ancillary data sets
 - » Common forward model
 - » Standardized output format
 - » Inputs both geostationary and polar radiance data

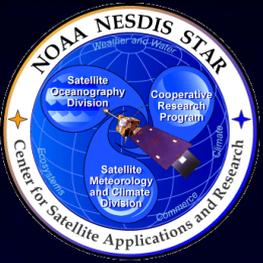


Enterprise yet?

- At this point, I would not call the Framework an enterprise system
- It is an efficient, scientifically consistent processing system
- What we are missing is

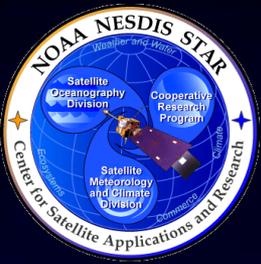


Continuity



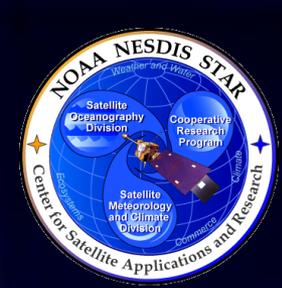
Algorithm Continuity

- Achieve continuity by having the same algorithm work on multiple instruments
- For ABI algorithm testing, the cloud mask, phase and height products have been implemented to run on both SEVIRI and MODIS data
- The cloud mask, phase and height products created from MODIS data are used for the aerosol detection and aerosol optical depth algorithm testing



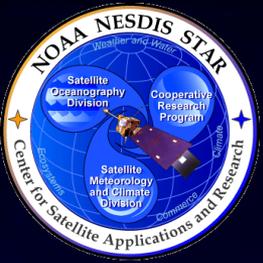
How to Achieve Algorithm Continuity

- Visionary scientists
 - » Mike Pavolonis – GEOCAT
 - » Andy Heidinger – CLAVR-x/PATMOS-x
 - » And maybe Jaime Daniels.....
- They developed offline research systems where they can process multiple types of satellite data through their various algorithms
- They probably just got tired like me.....



Opportunity

- Users have requested continuity of NOAA products between the current satellite systems and the future systems
- Continuity of products enables the users to prepare for GOES-R products
- Retrofit state of the art GOES-R algorithms to work for current satellite instruments



Current Projects

- Upgrade GOES Winds
 - » Implement GOES-R cloud mask, cloud phase and cloud height algorithms for winds due to product precedence
 - » GOES-R Framework will be delivered to operations with this project

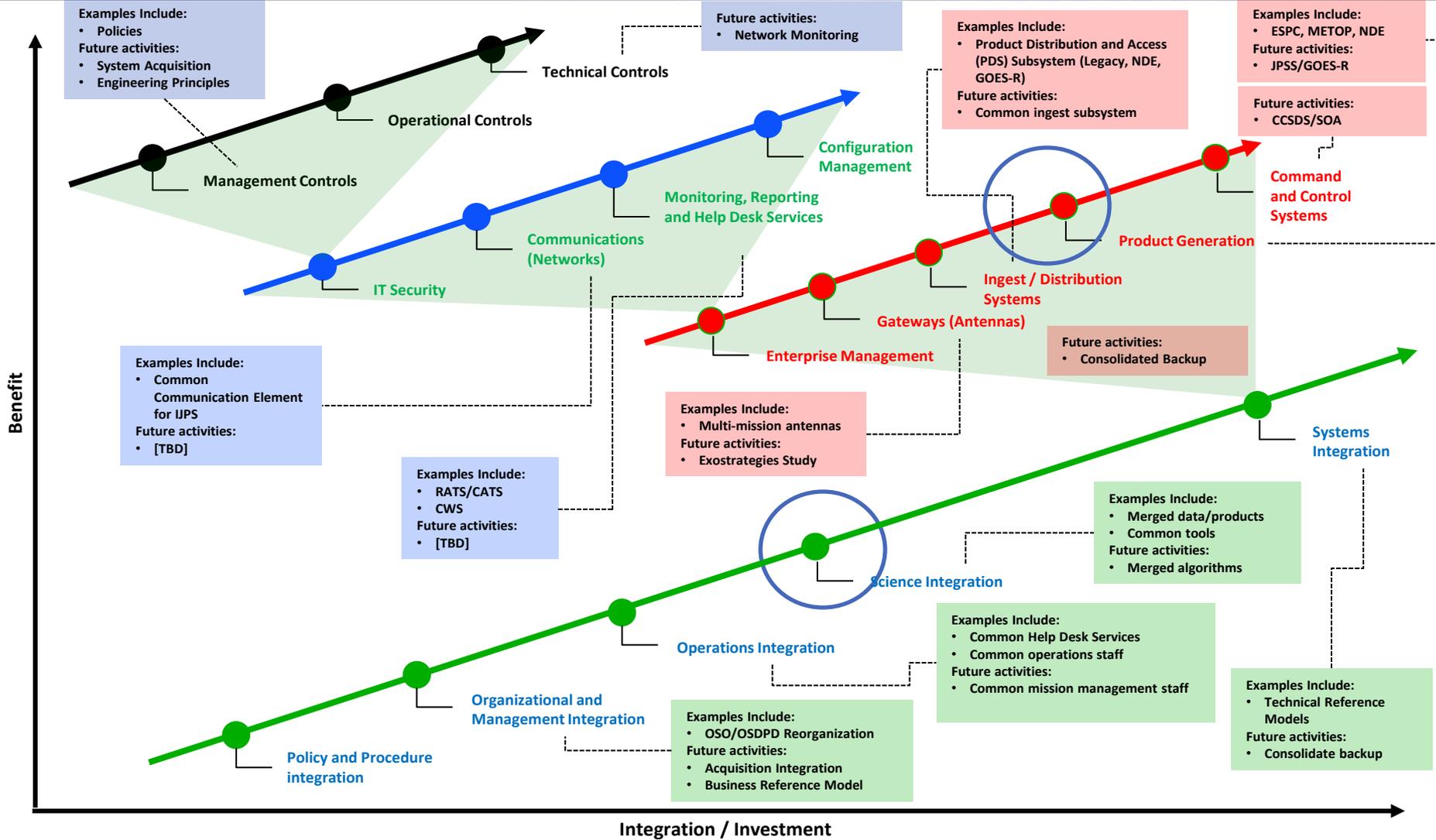
- VIIRS
 - » Polar Winds
 - » Cloud Mask, Phase, Height
 - » Cloud Optical Properties
 - » Aerosol Optical Depth
 - » Aerosol Detection
 - » Ice Concentration, Age, and Surface Temperature

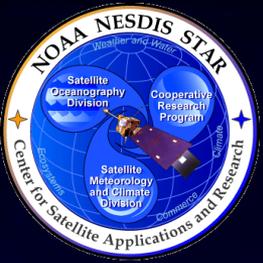


Enterprise & Continuity



NOAA Enterprise Architecture Towards Integrated Algorithm and Production Generation





STAR Enterprise Approach

- STAR has implemented a Framework that enables an enterprise approach for developing algorithms
- STAR scientists have developed algorithm software that may process data from multiple instruments to bring product continuity to the users



Summary

- **Housekeeping** – STAR is preparing to delivery the final 3 algorithms and is redelivering datasets
- **Opportunity** – Developing algorithms for multiple satellites has provided and opportunity for an enterprise system
- **Enterprise** – STAR has implemented a system for an enterprise approach for algorithm development
- **Continuity** – STAR has designed algorithms to process data from multiple satellites to bring product consistency
- **Ambrosia** – Makes things happen