# NOAA/NESDIS Process for Research to Operations



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### Satellite Products and Services Review Board (SPSRB)

SPSRB is the NOAA/NESDIS body responsible for the oversight and guidance to effectively manage the satellite product life cycle process from product development, transition into operations, enhancements and retirement

The SPSRB focuses on the transition of satellite products from research into operations to meet a user need for satellite information. There are three distinct ways satellite products can be examined by the SPSRB to transition from research into operations:

(1) User request: users can identify a need for new or improved satellite observations or products.

(2) Science Improvement: scientific agencies can identify a maturing scientific development or algorithm thought to provide significant user benefit.

(3) **Project Manager Development:** NOAA/NESDIS program or project managers can receive requirements to develop new or improved products.



### Satellite Products and Services Review Board (SPSRB)

### SPSRB Executive Board:

- Co-chaired by the STAR and OSPO Directors
- Principal voting members: OSD, STAR and OSO Directors, OSPO Deputy Director, NESDIS Data Centers and NWS
- Meets quarterly to review and approve new processes and policies

### SPSRB Manager:

- OSPO employee who oversees and manages the processing of user requests and tracks their progress to completion or termination.
- SPSRB Secretary: Two years appointment and rotates between STAR and OSPO
- SPSRB Process Improvement Working Group (SPI WG)

#### SPSRB

- Co-chaired by OSPO and STAR Deputy Directors
- Principal members: STAR, OSD, OSPO, NESDIS Data Center s and NWS
- Meets 3rd Wed of Every Month
- Provides satellite product development guidance and policy



## **Satellite Products Drivers**

User Requirements/User Request: Users identify need for new or improved satellite observation or products

Mature Science Development: Scientists can identify mature scientific development or algorithm thought to provide significant user benefit

NOAA Program/NESDIS Project Manager Directed Project: NOAA/NESDIS program or project managers provide requirements to develop new or improved replacement products

Directed Non-NOAA Satellite Partnerships: NOAA/NESDIS management agrees to international or interagency partnerships to fill "gaps" in satellite product requirements



### **SPSRB Web Sites**

### The SPSRB Website: <u>http://projects.osd.noaa.gov/spsrb/</u>

- Policies
- Site Stream Stre
- Software standards
- Best practices
- Archive guidance
- Documentation templates (under review)
- Code review standards (in progress)
- Request Tracking Systems

### Secure SPSRB Website



Done

#### https://requesttracker.osd.noaa.gov

#### <u>/admin\_login.asp</u>

- Sovernment only access
- User request
- Project management tracking
- SPSRB secure database





#### **SPSRB Key Processes** and Interfaces **SPSRB Web Site** (SPSPR Process Paper) **User Request** http://projects.osd.noaa.gov/spsrb/doc/ 1. User 2. Science Improvement SPSRB Process Paper Ver11-5.doc User 3. Project Manager Consolidated/Mission Assessment Change or Observational SPSRB 1. Request and Requirement Assessment **Project Manager Requirements List** Databases 2. Technical Assessment (CORL/MORL) SPEEDS 3. NOAA Partnership Policy Requirement **Resource Identification** 1. Annual Product Reviews 2. Project Manager Reviews **Analysis of Alternatives** 3. Out -of-cycle Review PPBES 1. Integrated Project Team Formed 2. Proposal for Product Development **Allocate Funding** (Solution Analysis and Selection) **Approved Project Plan Initial Project Plan Product Development** 1. Development 2. Pre -operational 3. Operational Reporting 1. Project **Operational Decision** 2. Management 1. New Product **Operational Decision** 1. Update Product **Resource and Development** NOAA Observational **Divesture or Retirement Decision** Planning System Architecture NOAA Partnership Policy Requirement (NOSA) **PROCESS STEPS** 6

# User Request and Requirements Assessment







## **Analysis of Alternatives**



## **Resource Identification**





## **Satellite Products Development**





## Satellite Products Development

Three product phases with key tasks to be considered for every project for R2O

> Additional key tasks are encouraged Key events like satellite launches, user milestones, etc.

Task guidance can be found on SPSRB web http://projects.osd.noaa.gov /spsrb/briefing\_temps.htm Design reviews, documentation, etc

#### **Development Stage**

- 1. IPT Lead informed to begin product development
- 2. Initial Archive Requirements identified
- 3. Quality Monitoring Concept Defined
- 4. Long-term Maintenance Concept Defined
- 5. Preliminary Design Review
- 6. Development processing system defined
- 7. Initial Information Technology (IT) Security concept defined
- 8. Test case processed
- 9. Critical Design Review
- 10. Code is prepared for implementation
- 11. Final Archive requirements identified
- 12. Operational and backup processing defined

#### **Pre-Operations Stage**

- 1. Operational and backup processing capabilities in place
- 2. Final IT Security Concept Defined
- 3. Pre-operational product output evaluated & tested
- 4. Code transitions to operations; all documentation is complete
- 5. Operational and backup capabilities reach ops status
- 6. Brief SPSRB capability is ready to go operational

#### **Operations Stage**

The IPT prepares and presents a SPSRB decision brief using the briefing template "Declaring A Product Operational"

- 1. SPSRB declares product operational
  - 1. SPSRB Secretary/Manager update the SPSRB product metrics web pages
    - 2. OSD updates Satellite Products database



### Annual Review for Satellite Product Development

Requirements identified by program managers, management and NOAA end users

- Project plans briefed using the Satellite Product and Services Review Board (SPSRB) template (<u>http://projects.osd.noaa.gov/spsrb/proj\_plan.htm</u>)
  - STAR and OSPO capture research to operations costs
  - Solution of the second second
  - Additional OSPO long term maintenance costs addressed through OSPO base

### **Executive Board**

- Composed of STAR Deputy, OSPO SSD Division Chief, and OSD Project Managers (i.e., people who control the funds)
- Recommends adjustments in project plans
- Recommends funding allocations
- OSD approves PAC funding allocations



### Product Divestiture or Retirement Phase







### Product Divestiture or Retirement Phase

Initiating Event	Initiating Criteria	Responsible Party
System-driven		
Satellite instrument failure	Degradation or unavailable data	OSO; STAR; OSPO
Satellite platform failure	Unavailable data	OSD; OSPO
New satellite instrument/ platform	New and possibly improved data	OSD; STAR; OSPO
New, improved product	Improved quality; new algorithm; new parameter	OSPO; STAR
New IT systems	New production system	OSPO
User-driven		
Annual product re-validation	Revalidate original user requirement; continuous customer satisfaction plan	OSPO
Objective product-use metrics	Metrics indicate no interest in product by user; continuous customer satisfaction	OSPO; STAR
Established decommissioning date	Agreement with user for divestiture or retirement	OSPO
Fiscally-driven		
Reduction in fiscal or personnel resources	Annual ORF funding not adequate; automation of products realized	OSPO
User ceases funding for production	PPBES or external product development/implementation funding not realized or terminated	OSPO
Not part of mission	Re-focus of assets; identical product produced by other agency	OSPO





## Infrared Atmospheric Sounding Interferometer (IASI)

- IASI is the Infrared Atmospheric Sounding Interferometer aboard the Metop series of satellites
- Development for IASI products for Metop-A started in 2004 and the operational products were made available since September 2007.
- The modular design of this operational system allowed for many testing, validations, and algorithm performance improvements
- Products include radiances, atmospheric Temperatures & Moistures soundings, carbon products, and trace gases
- Thinned Radiances are planned for operations from Metop-B in October 2012 with additional products transitioning to operations in the summer of 2013



The plot is the IASI cloud cleared radiance (CCR) at the channel 965.5cm-1. Browsing the map can check if the CCR range is **reasonable**.



## **Executed IASI project as a prototype**

The STAR Enterprise Product Lifecycle (STAR EPL) Process was developed and first time used for IASI System Development

The STAR EPL is oriented toward the creation and maintenance of product-generation systems.

Each system is customarily developed as a distinct project with its own development lifecycle.

Projects may have a wide variety of requirements, determined by:

- the number of participating organizations,
- the size and complexity of the required input/output data,
- the complexity of the processing algorithm and software,
- the algorithm risks, and
- the needs of the intended product end users

STAR EPL Process Assets: These are a set of items that define the enterprise standards and best practices.

- Task Guidelines
- Stakeholder Guidelines
- Peer Review Guidelines
- Review Checklists
- Training Documents
- Document Guidelines



## **STAR EPL Process for IASI**

#### The STAR EPL is a complete product development process

- 11 process steps take a system from research to operations in a sequence of well-defined phases
- These phases and steps have been designed to be compatible with research to operations phases and steps currently used by STAR, but with CMMI practices inserted

#### **Basic Phase \***

Step 1 – Basic Research

#### **Exploratory Phase \***

- Step 2 Focused Research and Development
- Step 3 Project Proposal

#### **Plan Phase**

- Step 4 Resource Identification
- Step 5 Development Project Plan
- Gate 3 Review

#### **Design Phase**

- Step 6 Project Requirements → PRR
- Step 7 Preliminary Design  $\rightarrow$  PDR
- Step 8 Detailed Design → CDR
- Gate 4 Review

#### **Build Phase**

- Step 9 Code and Test Data Development → TRR
- Step 10 Code Test and Refinement  $\rightarrow$  CTR
- Step 11 System Integration and Test  $\rightarrow$  SRR
- Gate 5 Review



## **STAR EPL Gate Reviews**

The STAR EPL Development phases include 3 Gate Reviews. These are management reviews that occur at the end of an EPL Phase.

- Plan: Gate 3 (step 5)
- Section Design: Gate 4 (step 8)
- Suild: Gate 5 (step 11)

## Items reviewed include project status, project risks, closure of actions and reports from relevant technical reviews

Solution These are captured by defined entry and exit criteria for each Gate Review

## Management approval at a Gate Review is required before the project can proceed to the next phase

Each review has entry criteria and exit criteria to manage risk and maintain quality control

- STAR standard entry and exit criteria are established and maintained in documented review guidelines and checklists
- Projects may tailor the entry and exit criteria
  - Project tailoring must be documented in the project plan, subject to review and approval

## Review entry and exit criteria are process requirements that must be included in the projects' requirements documentation



## **STAR EPL Process for IASI**

The STAR EPL process includes 6 Technical Reviews

- Project Requirements Review (PRR step 6)
- Preliminary Design Review (PDR step 7)
- Scritical Design Review (CDR step 8)
- Section 2017 Secti
- Sode Test Review (CTR step 10)
- System Readiness Review (SRR step 11)
- To establish and maintain project control, risks are identified during project planning and periodically evaluated and revised
  - In particular, risk evaluation and identification of new risks is a standard part of each review
  - Review exit criteria require an acceptable mitigation plan for each risk
  - For each of the reviews, there is a Peer Review Guideline (PRG) that provides the STAR review guidelines
  - Solution For each review, there is also a Review Checklist (CL)



## STAR EPL – Risks and Actions

### **Risk evaluation will generate risk mitigation actions**

Review exit criteria require that the risk mitigation plans have identified the necessary actions to implement the plans.

### Actions are examined at each review

- Satisfactory completion of the action closure plan must be demonstrated for approval of closed actions
- Review exit criteria require that a satisfactory closure plan be defined for each open or new action
- Closure of actions may be deferred to a later review. Deferred actions must be reported in the review report to ensure that they are considered at the designated later review.



### STAR EPL Features the Best Characteristics of Waterfall and Spiral Development





### **IASI** Product System SPSRB Milestones and Key Tasks (L1)

ID	Task Name	Otr 3 Otr 4	2004		2005	2006	2007	2008
1	IASI L1C	QU JQU 4	Tan Ing. T				Four rou zou	
2	Algorithm Development Phase		Щ	P				
3	IPT Branch Lead informed to begin, prepare for PDR	Ma	y 3 '04 (	Sep	29 '04			
4	Preliminary Design Review			se	p 29 '04			
5	Algorithm Development system defined		Sep	15 '04 📥	Dec 1 '04			
6	Preliminary System Development			Jan 3 '05		Alan 12 '06		
7	Initial Archive Requirement identified			Dec 2 '04 🧧	Jul 6 '05			
8	Quality Monitoring Concept defined				• <mark>√</mark> Jul 6 '0	5		
9	Long term maintantance concept defined				⊕ <b>_</b> Jul 6 '0	5		
10	Test Case Processed				Jul 6 '05 📩 Od	rt 25 '05		
11	Operational and backup processing defined				Nov 17 '05 🍗	Dec 14 '05		
12	Critical Design Review					Jan 12 '06		
13	System Development				Jan 12 '06		Mar 29م	ə '07
14	Final archive requirement defined				Dec 15 '05 🕻	Feb 8 '06		
15	Code is prepared for implementation				Feb 9 '0	6 ૻ Apr 28 '06		
16	Pre-operational Phase						Ψ	
17	Operational and backup processing capabilities in place						⊕ <mark>_</mark> Mar 3	/0 '07
18	Pre-operational product output evaluated & tested					Mar 3	0 '07 🟋 Apr 🕯	26 '07
19	Developed Operational Products Implementation Plan					Apr	27 '07 👗 Ma	y 24 '07
20	Evaluated and Modify Operational Documentation					Ma	y 25 '07 <u> </u> Jı	un 21 '07
21	Validation and Verification of Operational Quality Assurance for IASI Products					Ma	y 25 '07 <u> </u> Ji	un 21 '07
22	Validation and Verification of Monitoring capability for IASI Products					Ma	y 25 '07 👝	) Aug 20 '07
23	Test Readiness Review						r 🗄	Jun 21 '07
24	OSDPD Contractor Staff Training for IASI Products System					J	un 1 '07 🚃	] Aug 31 '07
25	Prepare for Transition to Operation						Aug 20 '07	🔵 Sep 17 '07
26	Code transition to Operations; all documentation is complete						Aug 20 '07	Sep 14 '07
27	Briefing SPSRB capability is ready to operational							⊕_Sep 20 '07
28	Operational and backup capabilities is ready to operational							📲 Sep 20 '07
29	Operational Phase							♣ Sep 28 '07
30	SPSRB declares product operational							Sep 28 '07
31	OSD updates Satellite Products database							<b>⊕<sup>™</sup>Sep 28 '07</b>



### IASI Product System SPSRB Milestones and Key Tasks (L2)

ID	Task Name	2004		2005	2006	2007	2008	- 22 2
1	Algorithm Development Phase	Qtr 1	Qtr 2 Qtr 3 Qtr 4	Qtr 1 Qtr 2 Qtr 3 Qtr 4	Qtr 1 Qtr 2 Qtr 3 Qtr 4	Qtr 1 Qtr 2 Qtr 3 Qtr 4	Qtr 1 Qt	12   Qtr 3
2	IPT Branch Lead informed to begin prepare for PDR		-			· · · · · · · · · · · · · · · · · · ·		
3	Preliminary Design Review		9/2					
4	Algorithm Development system defined							
5	Initial Archive Requirement identified		<u> </u>					
6	Quality Monitoring Concept defined			7/6				
7	Long term maintance concept defined			7/6				
8	Test Case Processed							
9	Operational and backup processing defined				12/20			
10	Final archive requirement defined							
11	Critical Design Review					11/30		
12	Code is prepared, for implementation				* · · · ·		1	
13	12 System Development	÷				•		
14	Pre-operational Phase						-	
15	Operational and backup processing capability in place					A-3/30		•
16	OSD Updates Satellite Products Database					d		
17	Begin pre-operational product output evaluation					L. C.		
18	Begin looking at sub-pixel ILS correction							
19	Begin collection data for V&V							
20	Operational and backup capabilities reach ops status					8/30		
21	Developed Operational Products Implementation Plan					d A	1	
22	Evaluated and Modify Operational Documentation					-		
23	Validation and Verification of Operational Quality Assurance					10		
24	Validation and Verification of Monitoring capability for IASI P					40		
25	OSDPD Contractor Staff Training for IASI Products System							
26	Code transition to Operations; all documentation is complete	K				×	2	
27	Prepare for Transition to Operation						*	7
28	Briefing SPSRB capability is ready to operational							6/18
29	Operational Phase							-
30	Validation and Verification of operational quality of L1 produc						ſ	
31	Validation and Verification of operational quality of L2 produc						1	5
32	SPSRB declares product operational							6/18
33	OSD updates Satellite Products database						1	6/18



## NOAA/NESDIS Process for Research to Operations

### Conclusions

The transition to operations of new satellite products requires approval through the SPSRB process

SPSRB is the NOAA/NESDIS body responsible for the oversight and guidance to effectively manage the satellite product life cycle process from product development, transition into operations, enhancements and retirement

Four product phases Product Development Phase, Pre-Operational Phase, Operational Phase, and Product Divestiture or Retirement Phase with key tasks are considered for every project

The STAR Enterprise Product Lifecycle (STAR EPL) process is used for product development and each product system is customarily developed as a distinct project with its own development lifecycle.

The process takes about three years from Research to Operations.

<u>User Request https://requesttracker.osd.noaa.gov/admin\_login.asp.</u>

