Open R2O Architecture

Reducing the Cost of Entry for Science Applications

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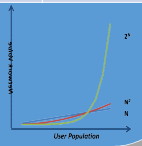
Imperative for Change

- Constraints
  - Limited budget for the sustainment of older operational satellite science algorithms
- Opportunities
  - OSPO is looking to retire products and product systems as new products become operational
  - OSGS is moving towards an Integrated Ground Enterprise where the algorithms become services
- Goal
  - Provide continuity of NOAA products between current and future NOAA operational satellites

Social Networking Impact

Platform Era	Use Model	Network Value	Role of NOAA	Wx Community Role
1st Generation (Pre-JPSS/GOES-R)	Broadcast	Sarnoff $\propto N$	• All observations • All Products • Most Applications	• Consume NOAA data with little value-add
2nd Generation (JPSS/GOES-R)	Networked	Metcalf $\propto N^2$	• All observations • Most Products • Many Applications	• Value-add to NOAA data for particular customer needs
3rd Generation (Post-JPSS/Goes-R)	Communities of Interest	Reed $\propto 2^N$	• Most observations • Foundational Products • Core Mission Applications	• Users NOAA data as base to add value in diverse markets

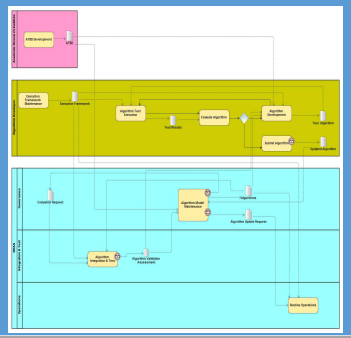
As the relative cost of IT Infrastructure continues to decrease, the role of the provider as the "sole source" of value will diminish → the End-Users will be empowered



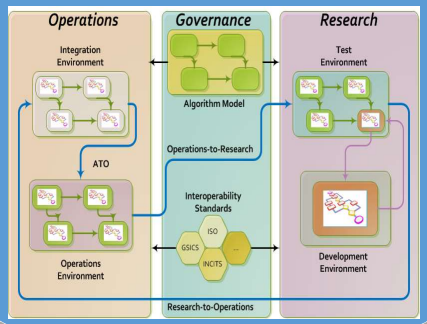
Algorithm R2O

- Enterprise Product Lifecycle
  - Formal process for product algorithm development and operational integration
  - Focus is on a repeatable mature approach that ensures high-quality operational algorithms
- Pros
  - Well Governed Science
  - Performance & Reliability
- Cons
  - Slow to Respond to Change
  - Mission Dependent Integration
  - Divergent Implementation
- Challenge
  - How to maintain rigor of the Enterprise Product Lifecycle
  - Take advantage of cloud tech
  - Engage broader scientific research community
  - Provide agility / responsiveness to integrate improved science

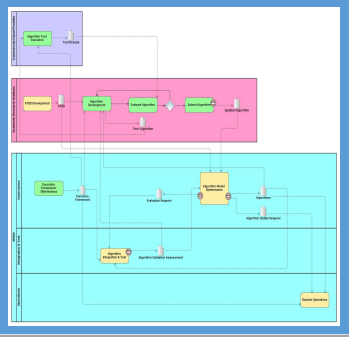
"As-Is" R2O Process



Open R2O Model

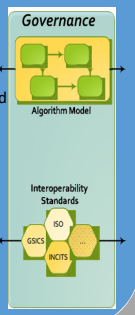


"To-Be" R2O Process

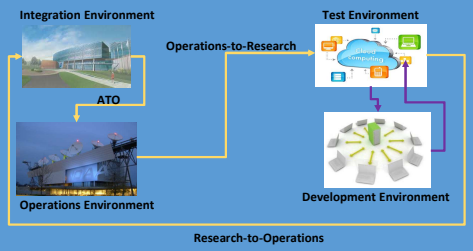


Governance is Key

- Architected for Modularity
  - Deployable, manageable, reusable, composable, stateless, providing concise interfaces
  - The Algorithm Model is Owned and Governed by an established Authority (e.g. NOAA)
  - The Authority manages the Compliance Program for approving implementations of Algorithm Modules for operational use
- The Adoption of Standards
  - Coding Standards
  - Common Execution Control Design Pattern
  - Interface Standards
  - Data & Metadata Standards



Deployment Flexibility



Next Steps

- Establish a Consortium (Industry/Government/Academia)
  - Develop Execution Control Patterns
  - Domain Specific Working Groups
  - Establish Open R2O Architecture Compliance Framework
- Establish Cloud based test environment
  - Access to near-Real-Time Satellite Data
  - Prototype the re-engineering of subset of algorithms to Open R2O Architecture

The advent of ubiquitous commodity computing services affords us the opportunity to rethink our approach to developing environmental science applications. Current approaches based on resource constrained, tightly controlled processing resources accessible to only a select few gives way to unconstrained, open processing solutions accessible to a broader community of science application researchers, developers and end-users.

Built around rigorous algorithm architecture models, an open algorithm development API and a scalable algorithm execution architecture, the "Open R2O Architecture" significantly reduces the cost of entry to perform basic research, provide high-throughput product generation services, or provide value-added end-user services.

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