Improving the Efficiency of Product Processing and Research to Operations for an Enterprise Ground System

01/14/2016
Unique Ground System for each Mission

Gradual Evolution to EGS

One Ground System Supports all Missions
R2O Process Overview & Roles

- **Government Management** – Responsible for verifying user requirements; ensures algorithm requirements are consistent with Industry requirements; and operational algorithm software/system architecture are synergistic with algorithms requirements.
- **Government Science Team (GST)** – Owns/oversees the algorithm science.
- **Industry** – Responsible for operational algorithm software/system architecture for mission implementation
- **Algorithm Integration and Development (I & D) Teams** – Joint meetings ensure coordination/communication is shared
Keys to Engineering Success

- **Establish a mission perspective.** Everyone is committed to making the Program succeed from the start. There are no “sand box” issues too overcome and all are open and forthcoming about their thoughts.

- **Direct communication** between the engineer implementing the algorithm and the algorithm science/ATBD author to minimize the risk of misinterpretation. There also needs to be Government Management Team supervision and a record of the conversation to ensure requirements creep does not occur.

- **Having GST review the ATBDs** and integrate them prior to delivery is essential. Many potential issues can be addressed before delivery to the Industry Team. This minimizes potential rework and maintains effective cost control.

- **Adopting a “faithful implementation” approach.** The Industry Team should not deviate from the ATBDs.
• **Designate a single manager on the GST, the Government Management and the Industry Teams.** Each has total authority to control all facets of the algorithm work on their side of the interface. This ensures free flow of communication, accountability, responsibility for implementation of the algorithms, and no multiple layers of bureaucracy. It connects the technical oversight to program controls and helps ensure schedule and cost maintenance.

• **A solid set of rules for who is responsible for what.** Clearly define who is responsible for Algorithms Science and who is responsible for implementing the science in the form of operational algorithms.

• **Established and communicated processes for both the GST and the Industry Teams.** This fosters better communication and allows integration of schedules across teams. If the Industry Team establishes a process to audit ATBDs for content and maturity once they are delivered by the Government, this allows the Government to know when questions will be asked by the Industry and when the questions need to be answered in order for work to flow smoothly within the documented schedules.

• **Make the GST a stakeholder in the Industry Team work.** Having GST work directly with the Industry Team ensures each side is fully aware of the process and status of the other side. This helps to prevent misinterpretations of the ATBD and catches any misunderstandings that do arise earlier. A closer working knowledge of each other also fosters a better “team” feeling of common goals, rather than a nebulous “other side” doing work somewhere that is thrown over a wall.
Keys to Management Success (2 of 2)

- **Clearly written algorithm science that must be implemented.** The Algorithm Theoretical Basis Documents (ATBDs) are the communication vehicles for bridging requirements and science. These ATBDs should be clearly written so that everyone understands what needs to be implemented.

- **Established rules of engagement for meetings.** The first set of ATBDs may not be clear to everyone. TIMs are required to be sure everyone understands the written words in the ATBDs. In addition, everyone must understand what is permitted and what is not permitted at a meeting. For example, the GST may not task the Industry Team to do additional work, only a Government COTR can do that.

- **Clearly defined requirements for measuring success.** For example, the GST has a defined set of quality characteristics they must meet and the Industry Team must successfully implement the GST algorithms.

- **Time and trust are great adjuncts to a successful program.** It takes time for all sides to understand what the other sides are thinking and need. This understanding evolves to a “trust” between the parties that fosters better work and better communication. Once the trust is established a cohesive team will emerge that works synergistically towards the goal of a successful Program.
R2O is a Reversible Process!!!

• A viable R2O program cannot survive without an excellent O2R program!
  – Algorithm insertion ease is not just for the operational system, but also for the research/development systems
    • An operational algorithm that cannot be easily transferred to a research facility (O2R) will probably not be the basis for the next algorithm improvement (R2O) making implementation of future improvement mods difficult.

• The GOES-R Industry Teams now have two methods for improving ease of R2O2R
  – Algorithm Work Bench (AWB)
  – Algorithm Bridge Service (ABS)
Algorithm Workbench (AWB)

- Key features:
  - Data model interface common among development, test, and production environments
  - Standard algorithm execution model
  - Compatible with major algorithm languages including C++, FORTRAN, Python
  - Design new algorithms or adapt/wrap existing ones
  - Algorithms managed as components including inputs, outputs, precedence chains

For more details please see paper J12.4 in this session
Algorithm Bridge Service (ABS)

- ABS is a new Harris Solution for promotion of R2O2R

- New algorithms can be inserted into the GOES-R SOA Enterprise without software modification
  - Therefore the same algorithm software can also be easily transferred back to a research environment with no special infrastructure requirements other than what the original researcher designed

- The ABS Test Algorithm Service connects a new algorithm executable to the PG Service Management SOA function which:
  - Gives the Enterprise start/stop control of the algorithm.
  - Reports basic algorithm status information to the Enterprise
ABS R2O

- New algorithms are examined for operational suitability
  - Latency
  - Ancillary data
  - etc

Research

First Step

Input Data Files  Output Data Files

Input Data Files  Output Data Files
ABS Operations

PG Service Management

Data Fabric

Real Time Data

Formatted (Custom)

Data Staging Service

Input Data Files

Output Data Files

Real Time Data

Control Status Filename

Data Fabric

Algorithm

ABS Connected Service

Input Data Files

Output Data Files

ABS Connected Service

Input Data Files

Output Data Files

ABS Connected Service

Input Data Files

Output Data Files
ABS O2R

Because the algorithm software has not been modified, it is easily given back to the research organizations for improvements/upgrades.

Research

Return 2 Research
Conclusion

• Communication and clear roles/responsibilities ensure success

• R2O2R is a reversible process that must work in both directions
  – Research to Operations
  – Operations to Research

• Harris & AER have enabled R2O2R bi-directionality with ABS and AWB
  – Promotes Enterprise evolution as research improves/updates algorithms