

Research to Operations (R2O) History, Present Day, and Future Vision

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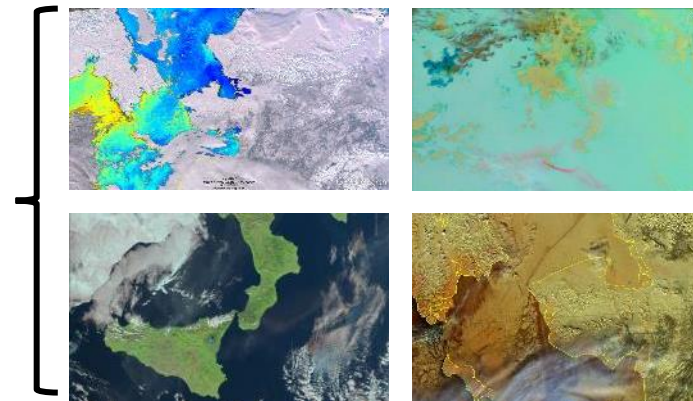
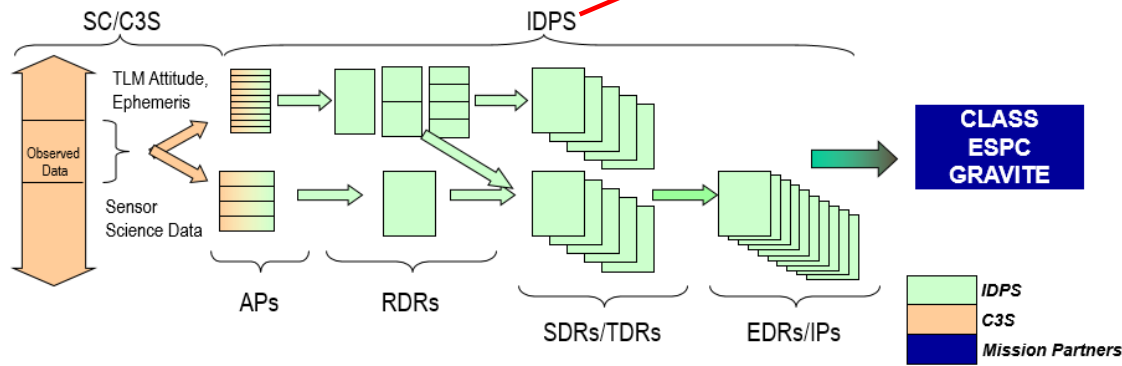
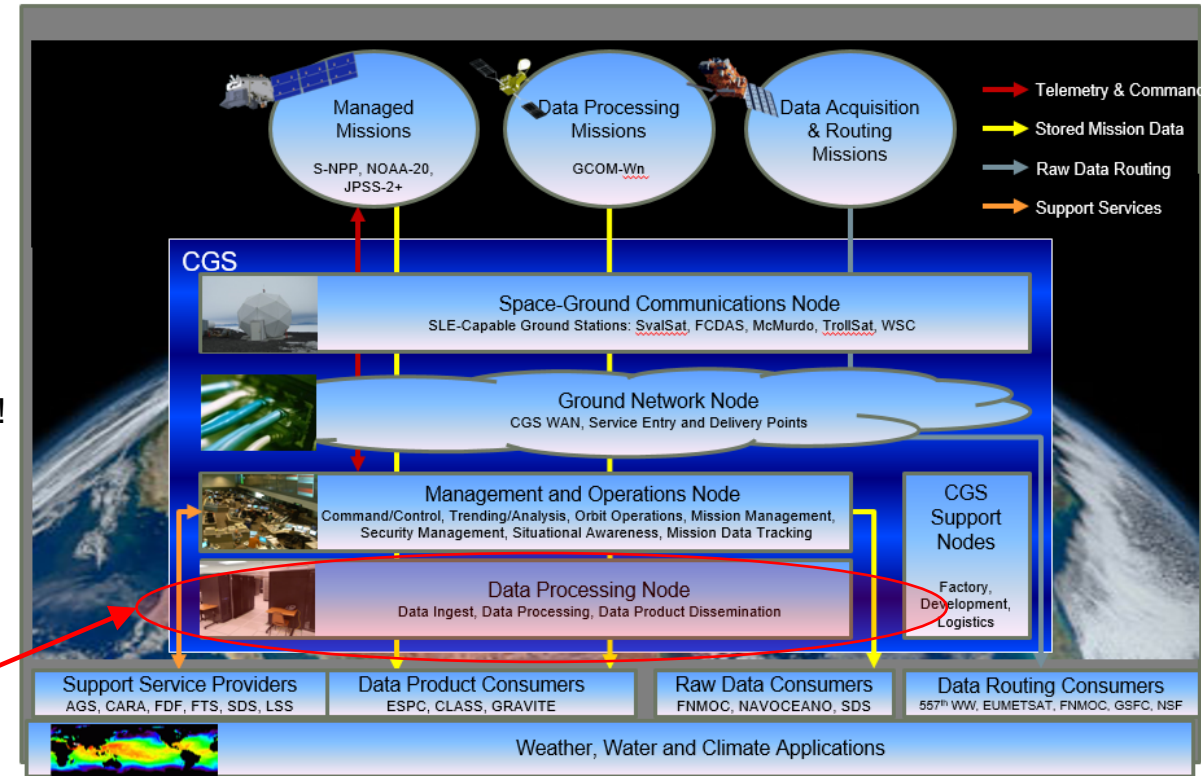
Friends and Partners in Aviation Weather (FPAW)
17 May 2023

Agenda

- Today's presentation will summarize the evolution of Research to Operations (R2O) through the lens of our support to three different NOAA programs:
 - Joint Polar Satellite System (JPSS) Common Ground System (CGS)
 - A historical view
 - Advanced Weather Interactive Processing System (AWIPS)
 - A more recent and ongoing view
 - Earth Prediction Innovation Center (EPIC)
 - Changing the R2O paradigm for environmental modeling

JPSS CGS DPN Overview

- **Data Processing Node (DPN)**
 - Ingests Mission Data packets (APs) received from C3S
 - Produces Data Products: RDRs, SDRs, TDRs, EDRs
 - Delivers to Mission Partners: CLASS, GRAVITE, and ESPC
- **Key Architectural Features**
 - Configurable data driven algorithm processing chains
 - Data is processed for the S-NPP, N20, GCOM-W missions and ready for J02!
 - DPN is operating in Amazon Web Services (AWS)
 - Processing load balanced for fault management
 - NIST 800-53 v3 security implementation
 - Focus on Low Data Latency and High Availability of data products
- DPN operations receives ~400 GB of data from 3 spacecraft and delivers over 7 Terabytes of data to Mission Partners every day



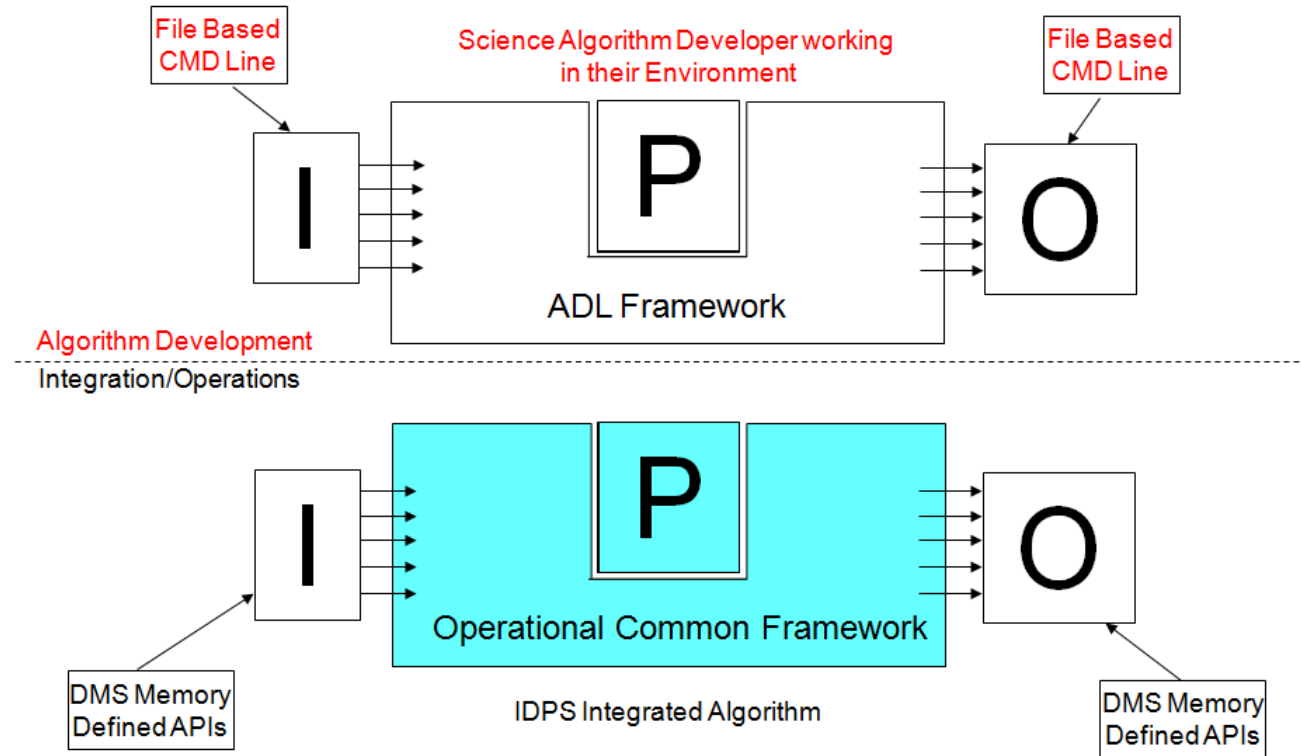
DPN processes observed photons into deliverable products - Observation Time to MP Delivery: <100 min

JPSS Data Processing Algorithms: the R20 Challenge

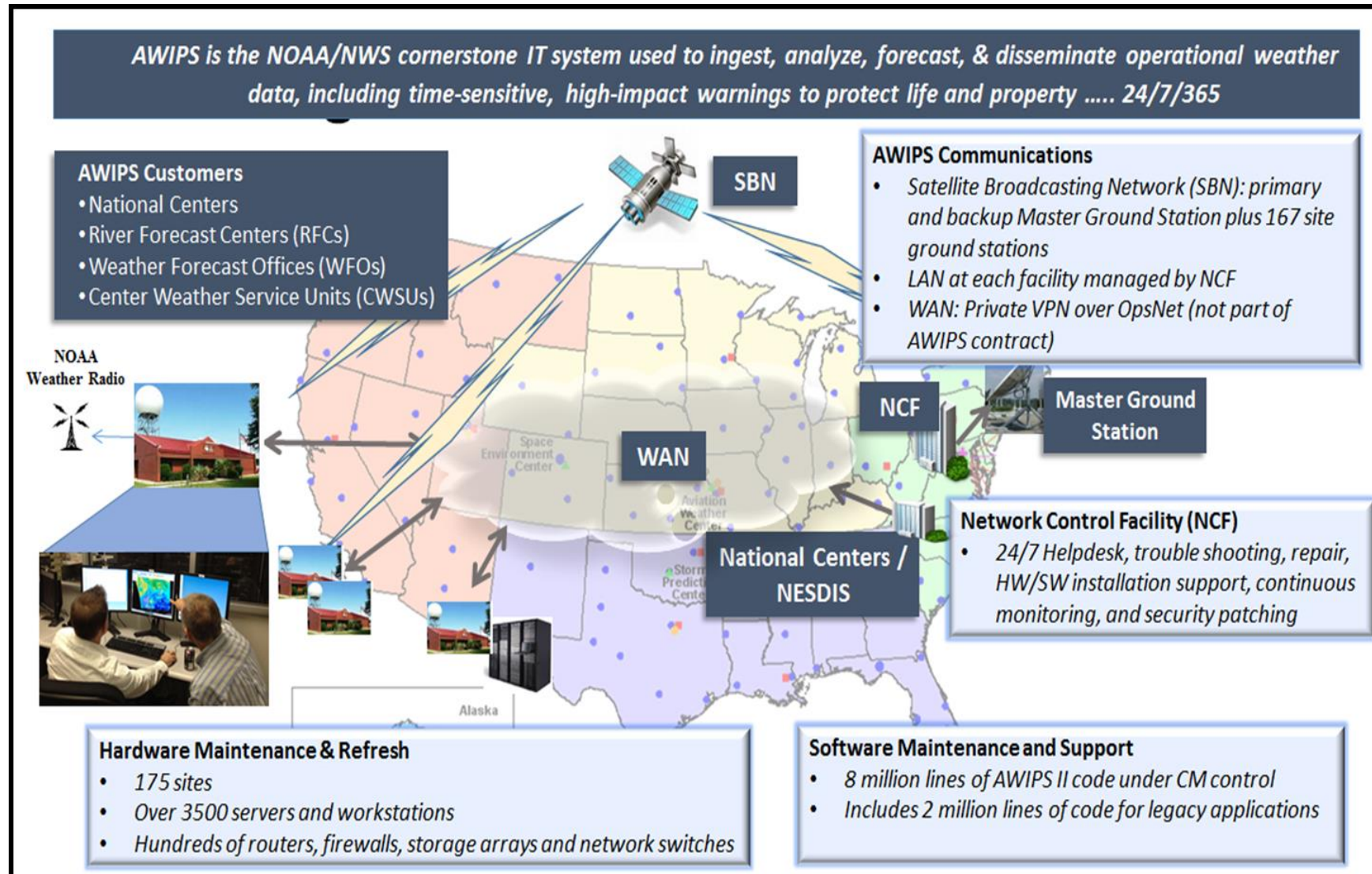
- As noted on the previous chart, the latency requirements for JPSS data processing are very stringent, to support real-time protection of life and property via weather modeling and forecasting
- Science algorithms are typically not developed to provide optimum performance or to run 24/7 in operations; the focus is generally on accuracy
- In the 2000's, science algorithms had to be converted into operational code that would run continually and efficiently on high-performing hardware
- After the Suomi-NPP launch in 2011, the algorithms required frequent science updates, which had to be implemented without “breaking” existing functionality

JPSS Data Processing Algorithms: the R20 Solutions

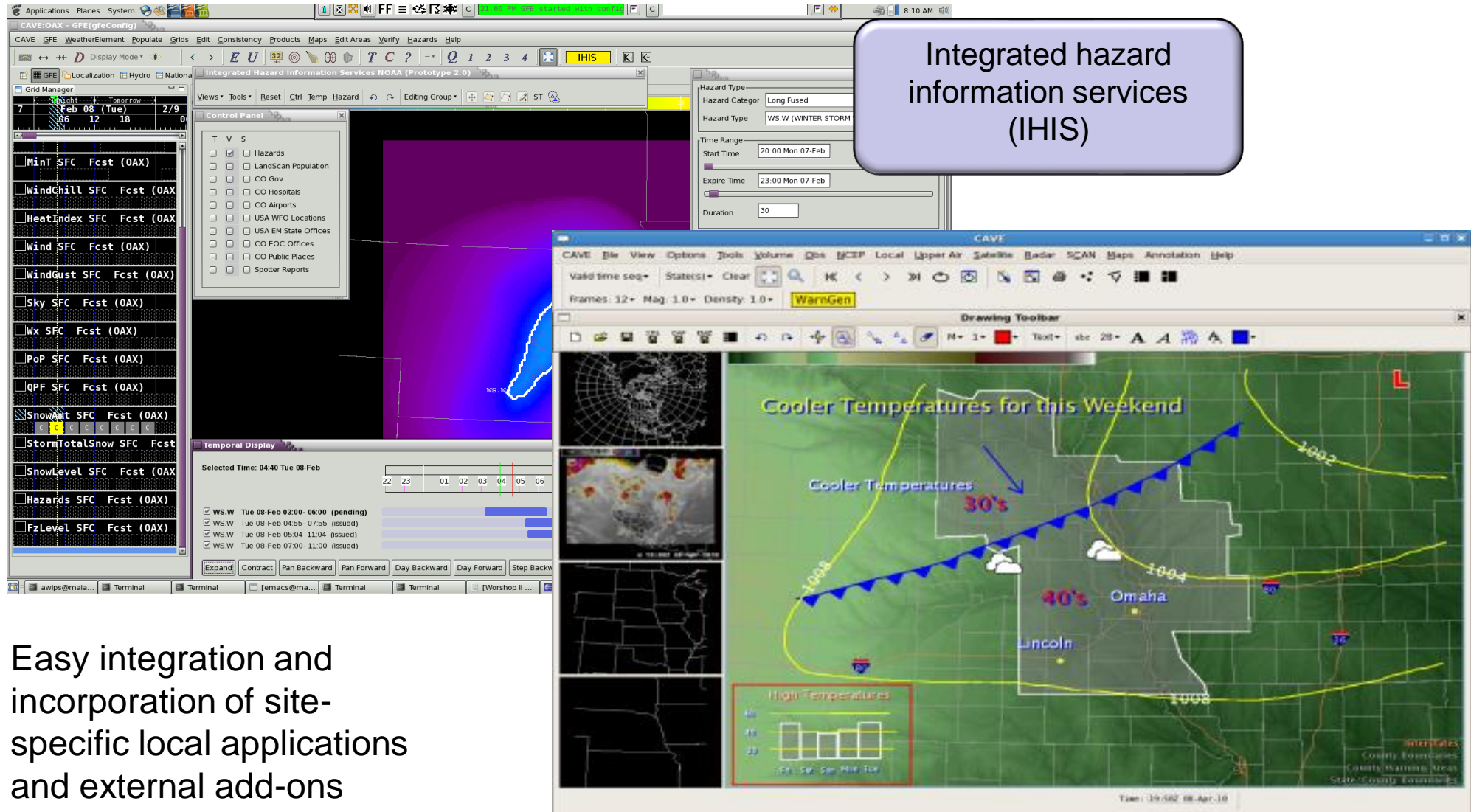
- Algorithm Development Library (ADL): allows algorithm developers to easily work in their home environments, without the restrictions or learning curve imposed by interfacing directly with the operational system.
- Binary Algorithm Adapter (BAA): Very useful for stable algorithms, such as legacy science systems, particularly when source code is not available or easily adaptable to ADL form
- Accelerated Release Cycle (ARC): replaced standard semi-annual sustainment build cycles for all algorithm updates, dropping to nominal 10 week cycle



AWIPS: Tools for the Forecaster



AWIPS: Integration of New Technologies from Both Researchers and Forecasters



Integrated hazard information services (IHIS)

Easy integration and incorporation of site-specific local applications and external add-ons

EPIC Partnering with the Community

Vision: Enable the most accurate and reliable operational numerical forecast model in the world

Mission: To be the *catalyst* for community research and modeling system advances that continually inform and accelerate advances in our nation's operational forecast modeling systems.

What EPIC is....

- A virtual community model development environment
- Management of cloud- ready code
- Community access to NOAA observations, data & tools
- Community support & engagement
- Clear research & model transition to operations priorities
- Expected expansion to other additional model components
- EPIC: focus on the Unified Forecast System (UFS)



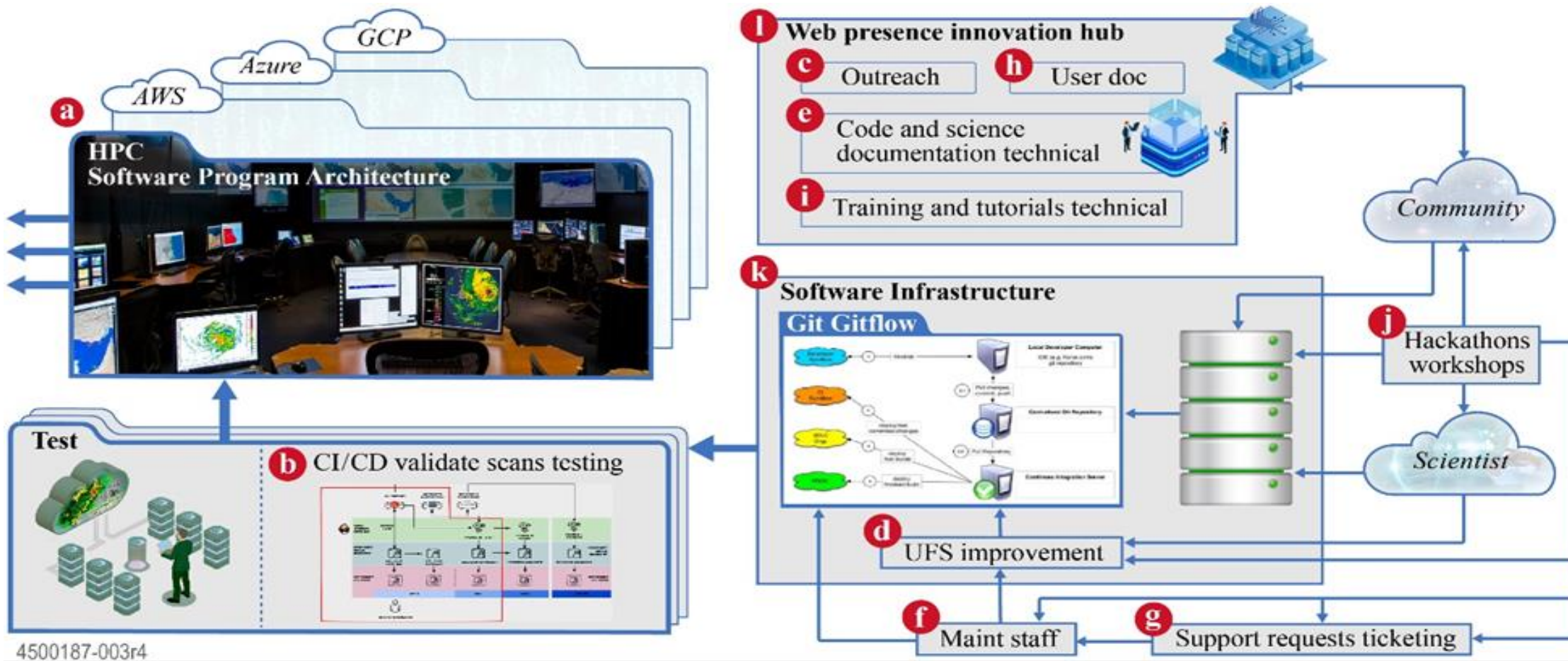
Cloud Use



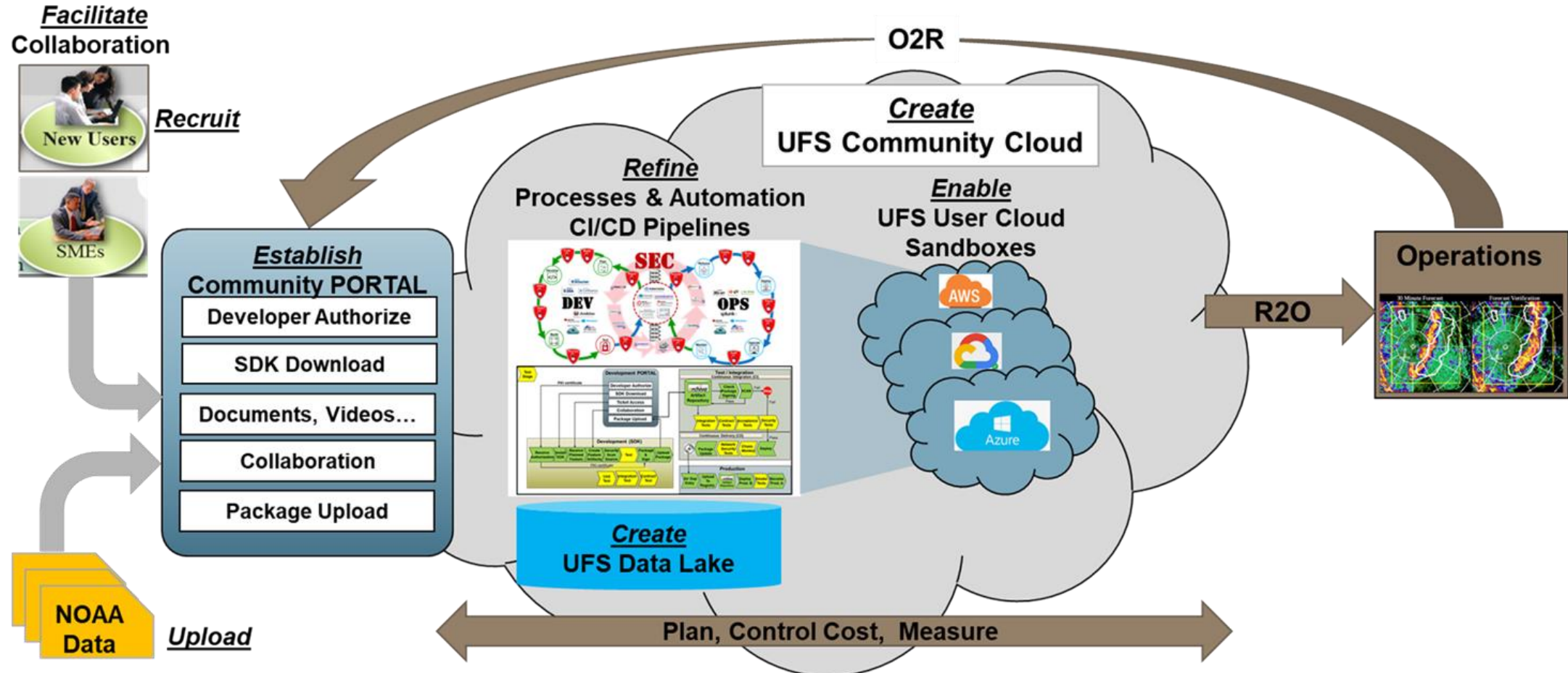
EPIC Industry Perspective

- Raytheon's role is to *enable* the science
- EPIC provides this open collaboration platform to make it easier for industry, government labs, academia, and others to work closely and in line with the government tools and practices to get the most out of each other's work
- The EPIC open collaboration platform is a centerpiece of NOAA and national global model development, with the potential to develop and support a community global modeling system for all spatial scales
- We have defined the building blocks of this open development platform and are well into implementing the EPIC vision and mission

EPIC Open Development Platform



EPIC Community Center



EPIC Portal: <https://epic.noaa.gov>

Thank You!