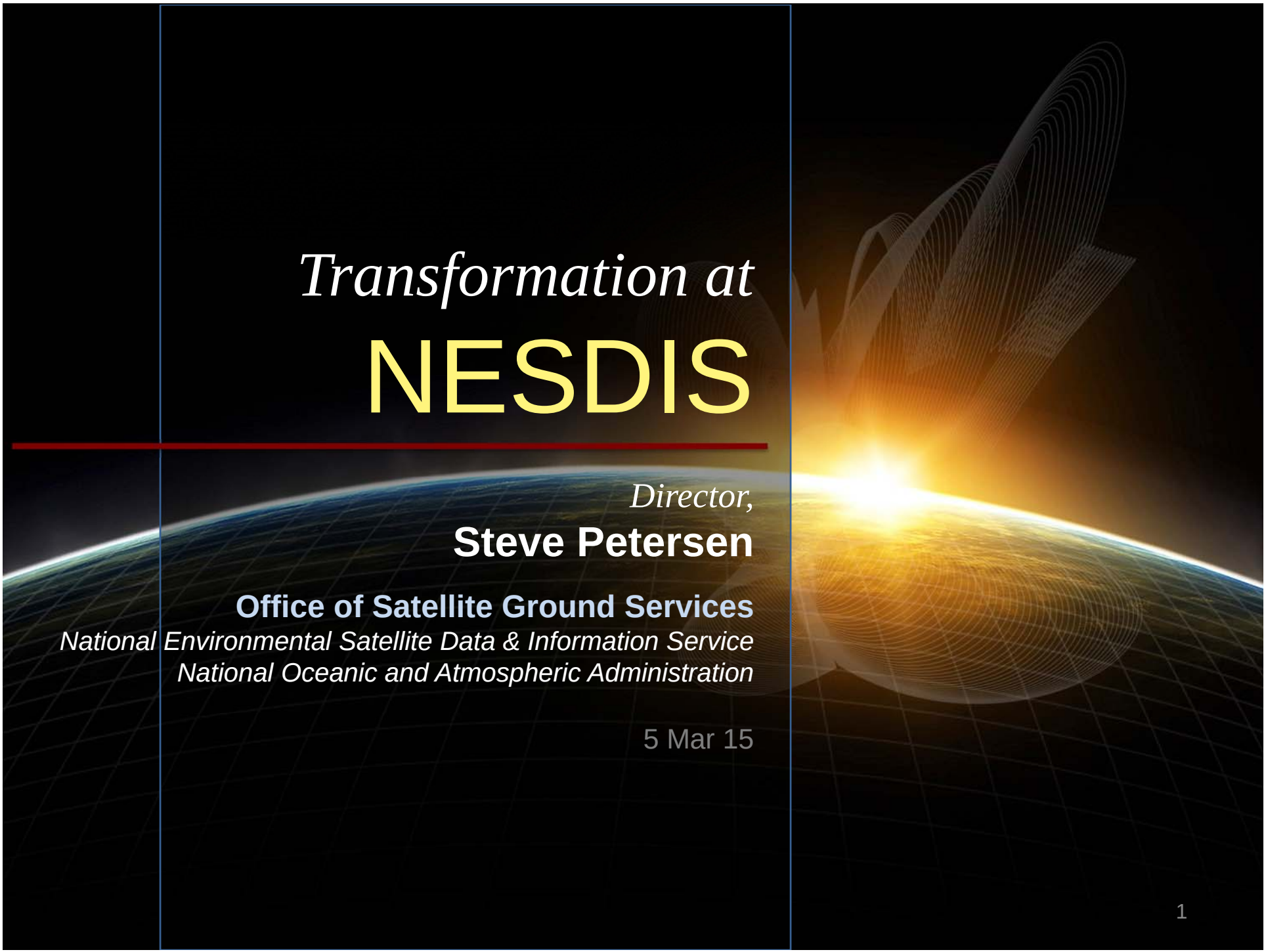


# *Transformation at* NESDIS


*Director,*

**Steve Petersen**

**Office of Satellite Ground Services**

*National Environmental Satellite Data & Information Service*

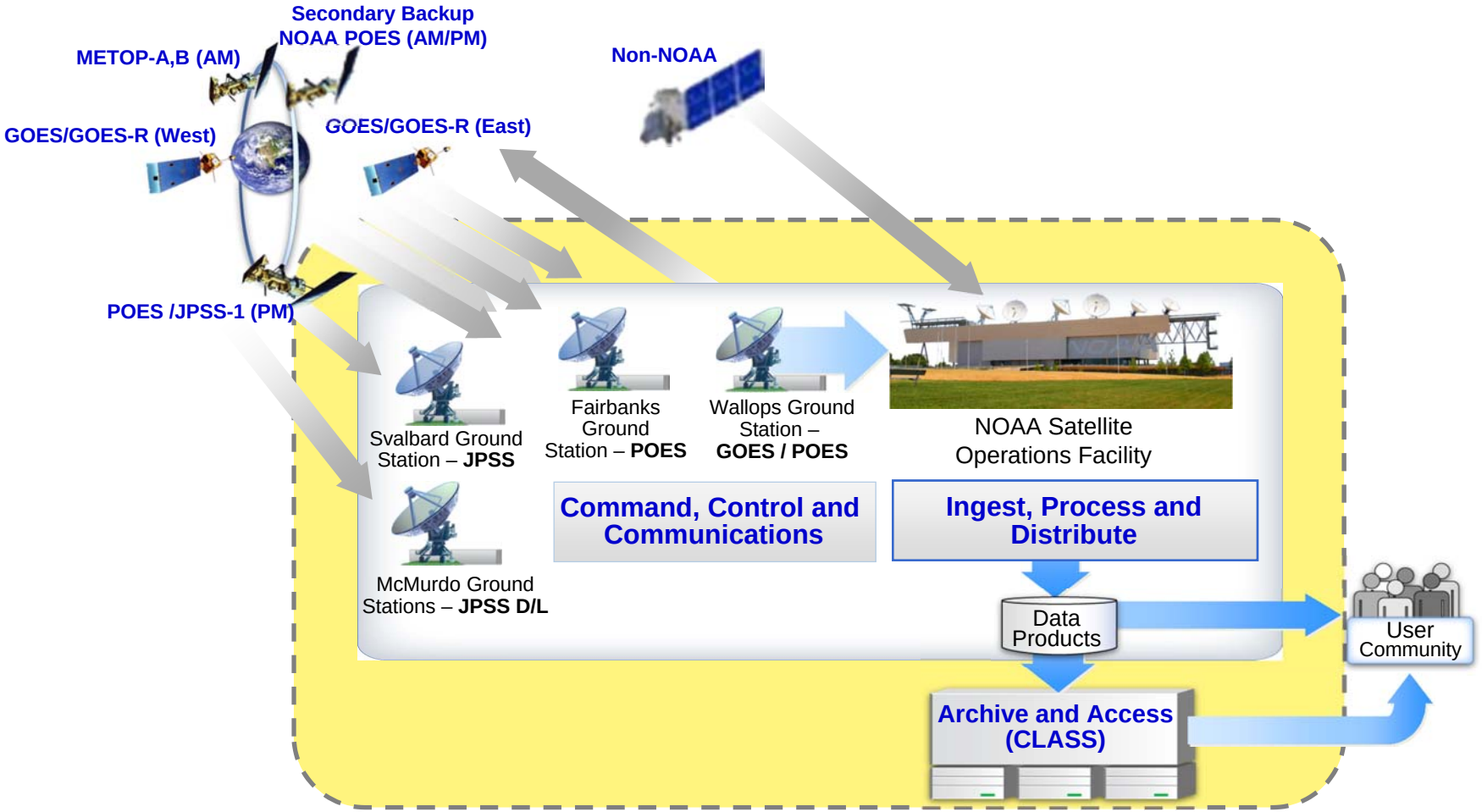
*National Oceanic and Atmospheric Administration*


5 Mar 15

# Overview

- **The NESDIS Weather Satellite Enterprise Today**
- **The Need to Manage our Ground Systems as an Integrated Enterprise**
- **Organizing for Change**
- **Implementing the Enterprise Approach while Supporting Operations – Changing the Engines in Mid-Flight while Keeping Flying**
  - Short-Term and Long-Term Strategies
  - Underwritten by Architecture Analysis and Systems Engineering

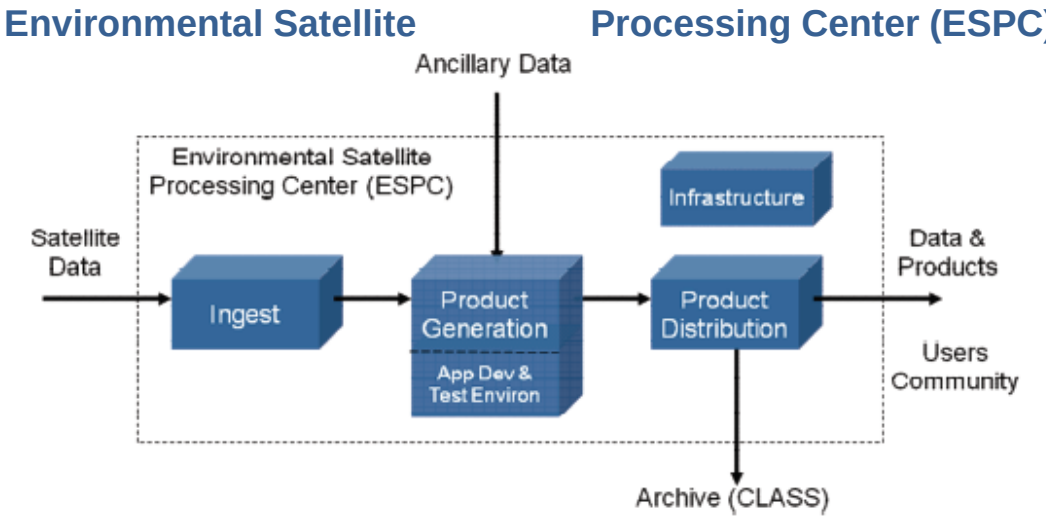
# NESDIS Weather Satellite Enterprise




*The Ground Enterprise Connects Multiple Elements of NESDIS*

# Legacy ESPC Product Processing

- **The Environmental Satellite Processing Center (ESPC) is NOAA's primary data processing system for the Nation's environmental satellite data**
  - ESPC ingests, processes, and distributes environmental data and information received from all of NOAA's satellites, DoD satellites, and several foreign countries' satellites
- **ESPC Redundancies**
  - Each satellite mission provides its own set of product processing systems
  - Each processing system contains its own infrastructure and applications, creating redundancy and duplication of the same data and capabilities as other processing systems



# Leading NESDIS' Migration to the Future Ground Enterprise

## Today's Ground

- New highly-capable, stand-alone ground systems with modest interoperability and parts commonality, plus legacy elements
  - High sustainment and O&M costs
  - Inefficient use of government & contractor personnel
  - New segments are expensive
- Lack of an enterprise approach to future capability development.
  - Limited use of similar capabilities across missions
  - Limited ability to leverage existing systems for new products / services
  - Difficult and costly to integrate future missions

## Future Ground Enterprise

- Enterprise approach with flexible, agile concepts of operation that reduce costs and speed product / service deployment
- Integrating current & new infrastructure with common services for interoperability and improved utilization
- Improved parts commonality for more efficient use of resources
- Separate hardware and software sustainment activities, enabling hardware refresh and new capability insertions as opportunities and budgets permit
- Establishing well-defined, common business processes & procedures, and roles & responsibilities across all ground projects

*Never Buy Another Stand-Alone Ground System*

# Delivering the Benefits of an Enterprise Approach

## Mission Success

- **Accelerated deployment of new ground system capabilities**
  - Elimination of redundant acquisitions of common ground system functionality
  - Common hardware and software environment for deployment of new functionality
  - Implementation of business process changes to streamline deployment

## Cost Effectiveness Success

- **Avoidance of mission ground system costs**
  - Elimination of redundant development of common ground system functionality
  - Sharing of common but underutilized infrastructure resources across satellite programs
  - Simplification of ground operations to require fewer support staff

# NESDIS Perspective on Transformation

- **Move to Enterprise Ground must be achieved while executing on existing missions and acquisitions / commitments**
  - Simultaneously sustain current capability and transition two new ground segments to sustainment
  - Then integrate, modify and enhance capabilities
    - Ground Enterprise Architectures Services (GEARS)
  - While exploiting early opportunities to achieve progress on key challenges

- **Challenges exist in processes, procedures, and workforce / culture**
  - Existing workforce acquires and sustains with legacy system approaches
    - Many small contracts, stand-alone acquisitions, hands-on software maintenance, limited systems limited architecture considerations
  - New systems (GOES-R, JPSS) need different approaches
    - Potentially too complex for hands-on government software maintenance
    - Integrated maintenance and sustainment
    - Enterprise focus brings architecture and systems engineering influences on tech refresh cycles
  - GEARS emphasis on systems engineering requires additional staff (engineers)
    - Realignment of current acquisition roles from operations to sustainment

# OSGS Vision and Mission Guide NESDIS Transition to a Ground Enterprise

***Strengthening NESDIS:***

A new organization, the Office of Satellite Ground Services (OSGS), will consolidate the development and sustainment of all NESDIS ground systems. OSGS will leverage common ground services and guide development of an enterprise ground architecture

## OSGS Vision

One integrated, cross-program, cross-NESDIS team creating and sustaining the Ground Enterprise Architecture Services (GEARS)

## OSGS Mission

- Sustain Current Ops (GOES, POES, S-NPP, …)
- Enable Future Ops (GOES-R, JPSS, …)
- Create Enterprise Ground (GEARS = NDE, PDA, CLASS..)

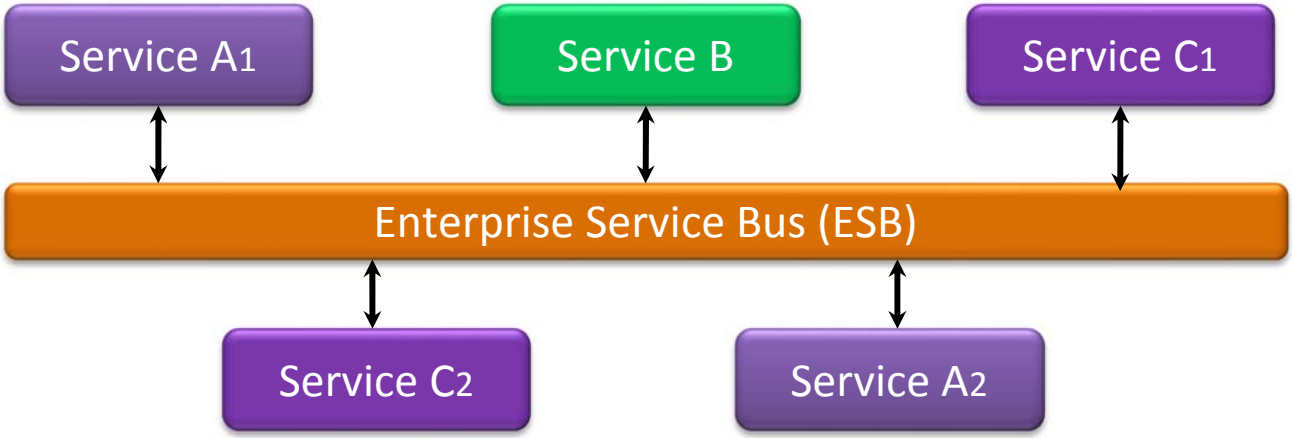
# Mission #1: Sustain Current Capability and Develop Early Enterprise Elements

- **Sustain existing legacy capabilities, primarily GOES, POES, and Antennas**
  - Executing “must-do” refresh and modernization projects
  - Adopting “enterprise thinking” whenever possible; for example, Enterprise Security Remediation & Advancement (ESRA) security activities
- **Continue to develop CLASS Archive, NDE Product Generation, and PDA centralized distribution as early enterprise capabilities**
  - Service-Oriented Architecture approach
  - On-track to support GOES-R and JPSS launches
  - Already integrated to varying degrees with legacy capabilities
- **Move miscellaneous development activities into OSGS**
  - Apply enterprise focus and Software Development Life Cycle
- **Look for Opportunities to achieve Cost Avoidance**

# Environmental Satellite Processing and Distribution System (ESPDS)

- **Modernizes the NESDIS Environmental Satellite Processing Center (ESPC)**
  - Single enterprise solution that meets the needs of existing (legacy), GOES-R, S-NPP/JPSS, and GCOM-W, with scalability to meet future environmental satellite needs
  - Includes modernization of the Product Generation (PG), Product Distribution (PD), and Infrastructure segments of the ESPC (with Ingest as a potential future modernization)
  - Provides environmental satellite data and services to a growing user community including:
    - NOAA Line Offices (NWS, NMFS, NOS, NIC, NESDIS, etc.)
    - DoD (AFWA, NAVO, etc.)
    - Other U.S. and international users (government, universities, foreign partners, etc.)
- **Will be implemented at the primary and backup ESPC sites:**
  - NOAA Satellite Operations Facility (NSOF) in Suitland, MD (Primary-Current)
  - Consolidated Back Up (CBU) facility in Fairmont, WV (Backup-Future)
- **Provides a scalable and secure infrastructure as a foundational building block upon which all other system functions and services reside**

# ESPDS is Built Upon a SOA




- **ESPDS uses a Service-Oriented Architecture (SOA)**
- **Using a SOA provides the following benefits:**
  - **Extensibility:** The loose coupling of services allows the ability to ***add new functionality*** to the system ***without impacting the existing capabilities***
  - **Reusability:** ESPDS services will be ***usable for future integration***, benefitting future government systems
  - **Modularity:** ESPDS services are able to be ***upgraded and replaced easily***
  - **Cost:** All of the above enable ***long term cost benefits***

# PDA Operational Concept

- **PDA provides a paradigm shift in the agency's approach to managing real-time distribution of environmental satellite data:**
  - Allows approved users to manage their data access details (product customization, selection and transfer method)
  - Provides the user with greater data discovery (via the online catalog) and OSPO with greater data organizational control
  - Enables OSPO to manage / monitor the user's data volume usage and user's access to product groups
- **Data access reviewed and granted by the Data Access Review Board (DARB) – product groups and data volume allocations**

# Comprehensive Large Array-data Stewardship System (CLASS)

***Direct Connectivity to:***

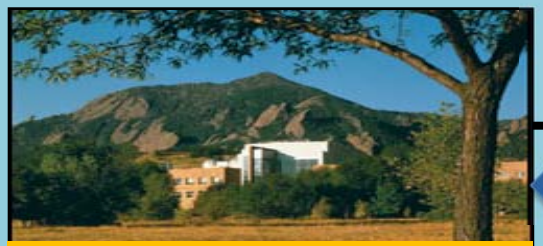
- ESPC- NOAA Environmental Satellite Processing Center
- National Ice Center
- NOAA Coastal Watch
- JPSS Interface Data Processing Segment (IDPS)

**Functions**

- Test and Integration Environment
- Operations
  - Ingest
  - Storage (Disk & Tape)
  - Public Access
- Satellite Landing Zone
- Development Environment

CLASS NCDC, Asheville NC

CLASS NSOF, Suitland MD



CLASS NGDC, Boulder CO

**Development Team**
Fairmont, WV

**Users**

**Users**

*Replication via NOAA Science Network(N-WAVE)*

# CLASS Benefits

- **As an enterprise solution, CLASS will reduce anticipated cost growth associated with storing environmental datasets by:**
  - Providing common services for acquisition, security, and project management for the IT system supporting NOAA Archives
  - Consolidating stand-alone, legacy archival storage systems thereby reducing the number of IT systems for NOAA to manage and customers to access.
  - Relieving data owners of archival storage-related system development and operations issues
- **CLASS contributes to NOAA's target Enterprise Architecture through Data Center Consolidation and migrating environmental data holdings from legacy systems for long term preservation, access and dissemination**

# Mission #2: Enable Completion of GOES-R & JPSS Ground Systems and Transition to Sustainment

- **Continue to support both acquisition programs by matrixing employees from the GOES-R and JPSS ground projects back to the same roles they held before the reorganization**

- **Facilitate employee opportunities to gain skills needed for implementing sustainment**
  - Expect that a portion of existing workforce will become sustainers after transition

- **Participate in transition working groups; focus on tech refresh cycles, processes, tools**
  - Vector future evolution towards enterprise now -- working with SPO teams

*Cost Avoidance by optimizing the Tech Refresh Cycles for economies of scale, based on needs of the entire enterprise*

# Mission #3: Create the Integrated Enterprise: Ground Enterprise Architecture Services (GEARS)

- **In FY14 we drafted a Concept of Operation and began to develop Enterprise and System Architectures that describe the full GEARS services-based capability**
- **In FY15 and FY16 we will finish the Architecture definition and produce a Gap Analysis and a Transition Roadmap**
- **In parallel we are conducting prototyping activities (lab)**
- **Subsequently we plan to develop pecific services with associated performance, cost, and schedule metrics**
  - Existing Legacy, GOES-R, and JPSS services will be reused whenever feasible

# GEARS Concept Of Operations Guides Its Development

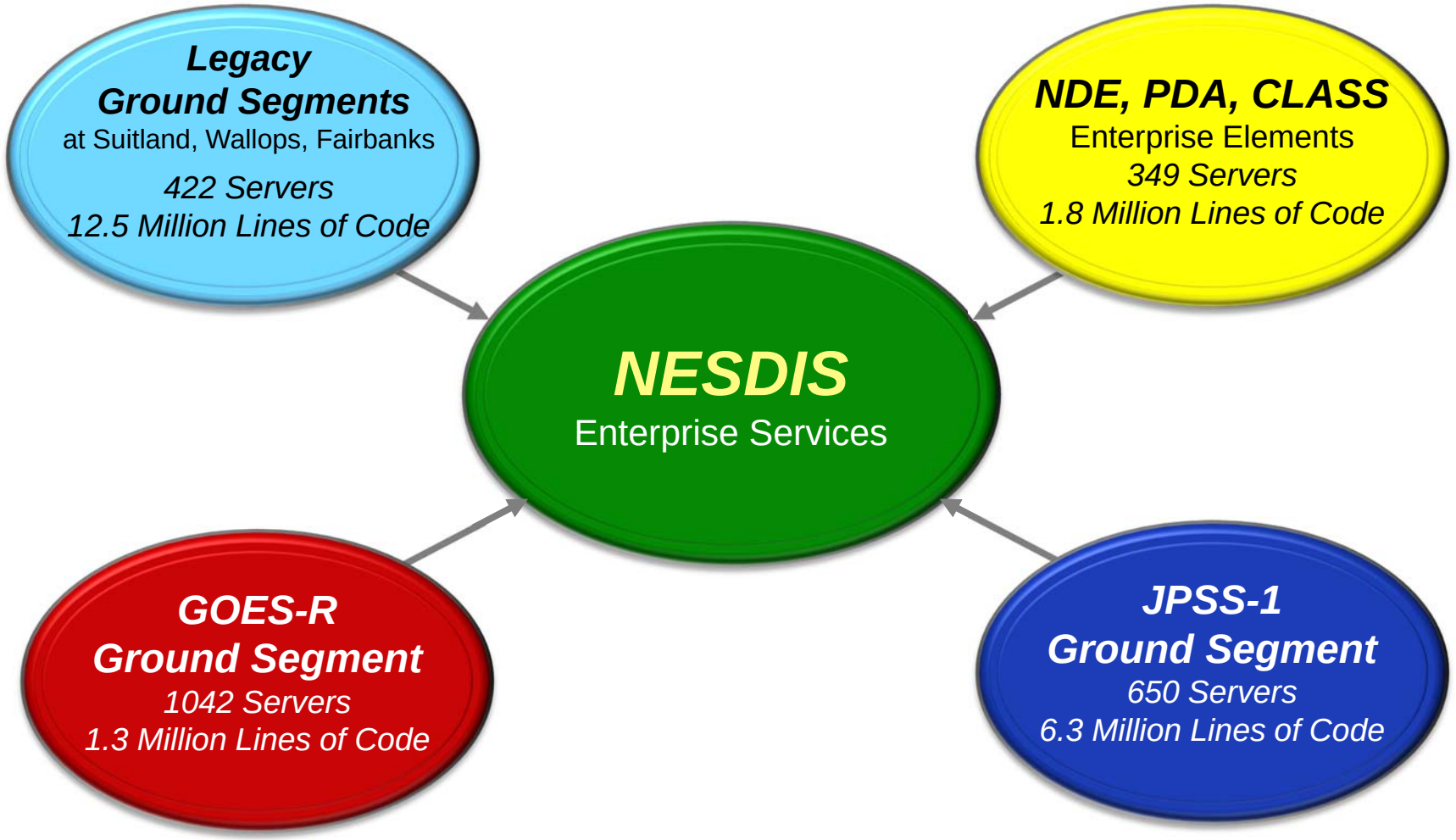
## General Attributes

- Enterprise management
  Shared infrastructure
  Mission isolation
- Hardware agnostic
  Location agnostic
  Acquisition approach agnostic
- Service oriented architecture
  Common services reuse
  Standards-based
- Automation capable
- Highly secure

## Illustrative Use Cases

- Day-in-the-Life Satellite Operations
- Integration of a New Satellite Mission
- Integration of an External Data Product
- Adding a Unique Ad-Hoc Query I/F
- Transition of a NASA Research Satellite Mission to NOAA Operations
- New Data Product Requirement
- New Algorithm Development
- Algorithm Sustainment
- Calibration and Validation Support
- Automation of a Ground System Function
- Adding a New Common Capability to GEARS

# Ground Enterprise Content & Scope - Metrics



# Service-Oriented Approach to Enterprise Avoids Costs and Accelerates Delivery of New Capabilities

## Common Services

- Available to any Enterprise application
- Registered in the enterprise service registry
- Negotiated SLA with each user of the service
- Maintained by Enterprise
- Changes require approval by the GEAR System Governance Board

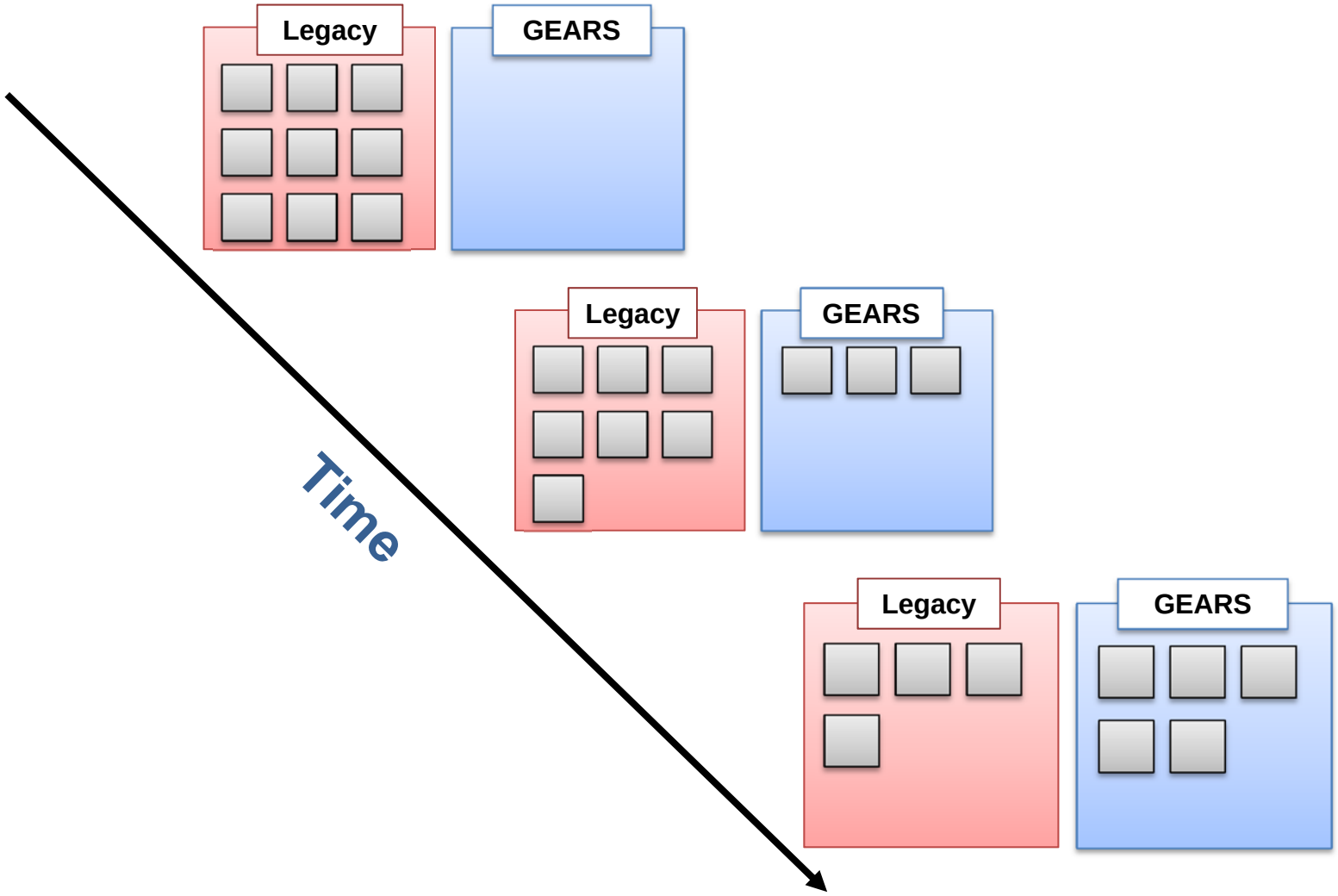
## Private Services

- Specific to a particular Enterprise-hosted application
- Not visible or usable outside that application
- Not approved or funded by Enterprise
- Maintained by the application provider

# Service Suites – Results from Initial FY14 Analysis

| Service Suite | Description |
|---|---|
| **Observatory Management** | The suite of services that support the collection of mission data needed for producing products |
| **Product Management** | The suite of services that support the management of products that are produced and made available to consumers |
| **Enterprise Management** | The suite of services that provide a common capability to monitor, report, and manage the operational NCGS. Along with other services, the enterprise management suite of services enable operations to have situational awareness necessary to proactively manage operations. |
| **Infrastructure** | The suite of services that provide the hardware and virtualization infrastructure that hosts the NCGS software and data. |
| **Developer/Maintainer** | The suite of services that support the researchers, new mission developers and system maintainers in reuse of code and integration and test of new capabilities |

# Evolution from Stand-Alone to Services-Based GEARS Capability



# Attacking every Source of Cost: Operations, Maintenance, & Sustainment

| Area | Approach |
|---|---|
| ***Operations*** | |
| **Labor** | Automation of common functions<br>Common User Interface for reduced training, more flexibility<br>Adoption of common tools across enterprise (CM, Risk) |
| **Facilities** | IT Trailers (Footprint, Utilities, less upgrade expense) |
| **Services** | NWave Network Comms |
| ***Maintenance*** | |
| **Hardware** | Technical Reference Model (Spares) |
| **Software** | Reduce overall LOC through common services<br>Eliminate COTS licenses |
| ***Sustainment*** | |
| **Tech Refresh** | Assessment of commodity vs top-of-the-line components<br>Adopt Common Algorithm Framework |

# NESDIS Transformation Summary

- **Near-term product generation, distribution, and archival activities are meeting all milestones, closely integrated with the JPSS, GOES-R, and legacy ground programs**
- **GEARS planning is well underway, addressing key architecture, concept of operation, and transition issues in collaboration with JPSS, GOES-R, NWS and NOAA CIO**
- **Cost avoidance is a key objective that influences every aspect of our work**

***Sustain Current Ops*** (GOES, POES, S-NPP, …)

***Enable Future Ops*** (GOES-R, JPSS, …)

***Create Enterprise Ground*** (GEARS = NDE, PDA, CLASS, …)