Architecting a Transition to the Next Generation

Considerations for Re-Architecting On-going Operations

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The National Environmental Satellite, Data and Information Service (NESDIS) has evolved over 30 years and provides nearly 100 percent weather coverage to our nation.

It has significant challenges and is working in a structural way to:

- Maintain its level of success
- Provide more cost effective support
- Accommodate significant technological and environmental challenges
Acknowledgements

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► Frank Menzer and
► Pat Gregory
► Matt Rose
Our Legacy

➤ Series of mission oriented satellite systems
  – Geostationary Operational Environmental Satellite (GOES) I-M/N-P, Polar Orbiting Operational Environmental Satellite (POES), and Defense Metrological Satellite Program (DMSP)
  
➤ Acquired as “Turn-key” systems

➤ Upgrade with incremental enhancements to meet evolving needs

➤ This has resulted in
  – Ad-hoc systems-of-systems with growing obsolescence
  – Independent systems with
    • Little or no interaction
    • That perform similar functions
    • And have common evolutionary requirements (security, acquisition, and communications)
Define Success for the Architecture

► Who defines success?
  – Stakeholders
    ● Customers (e.g., Public, NWS, DoD, other Federal agencies, international partners, etc.)
    ● Senior management (achieving mission goals, setting quality standards, ensuring secure operations, and controlling costs)

► When (strategic and tactical planning)
  – Developing time-oriented views of needs and plans and technology
  – Projecting evolutionary changes in business relationships (e.g., more internationalization)
  – Speed of technology changes

► What defines success?
  – Understanding the costs of doing business
  – Defining the technical drivers – Performance, Reliability, Quality of measurements, and continuity of measurements (climate)
  – Identifying the schedule drivers – when is it needed and what are the benefits?

► How is success measured?
  – Performance Metrics (e.g., latency, reliability, cost, quality)
Process Elements

- Architecture
- Business Model
- Strategic Plans
Develop Architecture Approach

► Identify architecture goals and objectives
► Identify key architecture challenges
  – Look for greatest return ($/performance)
► Development of business metrics, technical metrics, and technical trades
  – Functions, interfaces, data and information flows
► Developing consensus among business, technical and financial leaders on success criteria
► Understanding of “as is” systems and their relationships
► Prioritize re-engineering efforts
Our Architecture Development Process

**Initiate Architecture Planning**

- Develop Roadmap

**NOAA and NESDIS Goals, Objectives, Architecture and Strategic Plans**

- Identify Architecture Goals, and Objectives
  - Project Future Needs and Reqmts.
  - Define Current Architecture
  - Identify Gaps and Overlaps
  - Identify Target Architectures
  - Evaluate and Select Target Architectures
  - Develop Roadmap

- Define Architecture Evaluation Criteria

- Project Future Capabilities & Technologies

- "As-is Architecture"

- "Target Architecture(s)"

**Mission Model**

Iterate

Architecture Plan
Use of Contemporary Tools to Capture Knowledge

- Dealing with complex systems and various levels of Standards and interfaces
- Need to catalog key interfaces and understand implication of changes
- Need a tool that deals with a multi-dimensional problem
- Need to move details into structured process
- Need to maintain traceability to Enterprise Architecture
- Provides a common language (Data Encyclopedia)
Today: Defining the Current Architecture

► Developing layered views of the architecture
  – Strategic planning, services and applications, business, data, technology, etc.
  – Started with the mission operations

► Developing frameworks for identifying, organizing, and linking elements of the current architecture
  – Functional (e.g., stewardship), Systems-of-systems (GOES-R, NPOESS)

► Identifying key interfaces
  – International (Global Earth Observation Integrated Data Environment (GEO-IDE))
## Software Integration and Test Analysis Reporting System

<table>
<thead>
<tr>
<th>Management and Supporting Functions</th>
<th>GOES I-M</th>
<th>GOES N-P</th>
<th>GOES R</th>
<th>POES</th>
<th>DMSP</th>
<th>NPOESS</th>
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<tr>
<td><strong>Acquire and Transmit Data</strong></td>
<td>IGOES SITARS</td>
<td>IGOES SITARS</td>
<td>TBD</td>
<td>FTT SITARS</td>
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<td>Antennas Rx / Tx MRS&amp;S NTACTS (WCDAS, FCDAS)</td>
<td>TBD</td>
<td>Antennas (Fbnks) Rx / Tx LEO-T/NPAS</td>
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<td>SafetyNet Svalbard</td>
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<td><strong>Make Data Products</strong></td>
<td>GIMTACS PM FDF/QATS</td>
<td>GTACS DID FDF/QATS</td>
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<td>ABE SOMS FCM SRAS</td>
<td>ABE MPSS FCM SRAS</td>
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<td>PIDES SRAS</td>
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Geo Sync

Number of Satellites

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Legend:
- GOES I/P
- GOES R/S
- TOTAL
Architecture Activities Focus Areas

► Mission Area
  - Modular Elements to cover a diverse set of missions
  - Understanding of existing systems to integrate GOES-R Technology
  - More sophisticated instruments

► Data Processing
  - Reassessment of data processing flow and concept to meet changes in volume

► Archiving
  - Implication of “Stewardship” to data archiving function (data multiplier)
Areas of Emphasis

► Evolution of Mission Systems in the GOES-R era

► Add area of initial processing
  – Data volume change with GOES-R/NPOES
  – Anticipated extension of on-orbit assets and ground system implications
  – Establish cost effective approach for increasingly diverse mission set
Next Steps

► Capture “as is” Mission Elements to work GOES-R era Integration

► Explore options with Data Processing Interface
  – Documenting “as is”
  – Looking for cost savings options
  – Capture data processing to archive interface
  – Continue to refine approach
Backup Slides
### Orbiter Mission Profile

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A System of Systems View

NOTES:

(1) A system is considered to be an assembled set of inter-related elements comprising a unified whole. Systems can be described using logical (conceptual) or physical views. Views may be partial or complete. They include all subsystems and elements required to support mission, goals, objectives and requirements as allocated or to describe constraints, physical or otherwise.

(2) Views can vary depending upon context and system definition. For example, this view shows Data Management and Applications but does not show launch systems. All of these are important architectural elements to NESDIS.

(3) Only key relationships are shown. For example, non-observational relationships of Environmental Systems to other systems are not shown.
### Acronym List

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ABE</td>
<td>Adaptive Browser Explorer</td>
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<tr>
<td>CLASS</td>
<td>Comprehensive Large Array-data Stewardship System</td>
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<tr>
<td>ESPC</td>
<td>Environmental Satellite Data Processing Center</td>
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<td>FCDAS</td>
<td>Fairbanks Command and Data Acquisition System</td>
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<td>FCM</td>
<td>Flight Control Monitor System</td>
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<td>FDF/OATS</td>
<td>Flight Dynamics Facility/Orbit and Altitude Tracking System</td>
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<td>FTT</td>
<td>Flight Time Table System</td>
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<td>GAS</td>
<td>GOES Archive System</td>
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<td>GIMTACS</td>
<td>GOES I-M Telemetry and Command System</td>
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<td>GTACS</td>
<td>GOES Tracking And Command System</td>
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<td>GVARTx</td>
<td>GOES Variable (GOES I-M Retransmitted Processed Data Format)</td>
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<td>IGOES</td>
<td>Improved GOES Utilities</td>
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<td>MPSS</td>
<td>Multi-Project Support System</td>
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<td>MRS&amp;N</td>
<td>Multi-data Use Data Link Receive System and Server</td>
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<td>NDE</td>
<td>NPOES Data Exploitation System</td>
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<td>NPAS</td>
<td>NOAA Polar Acquisition System</td>
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<td>NTACTS</td>
<td>GOES N-O Telemetry and Command System</td>
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<td>ODAPS</td>
<td>Operating Ground Equipment Data Acquisition and Patching System</td>
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<td>Product Monitor System</td>
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<td>Replacement Product Monitor</td>
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<td>SRAS</td>
<td>Secure Remote Access Server</td>
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<td>Wallops Command and Data Acquisition System</td>
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