Cloud Enabled Architecture for the NESDIS Ground Enterprise

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End-to-End Data Management for NOAA’s Weather Enterprise

All aspects of product and data management should be taken into consideration when exploring enterprise cloud solutions.

Satellite Ground is just a piece of the NOAA enterprise which can leverage cloud computing.
Mission and Vision of NESDIS

The National Environmental Satellite, Data and Information Service (NESDIS)

**OUR MISSION**
... is to provide secure and timely access to global environmental data and information from satellites and other sources to both promote and protect the Nation’s environment, security, economy and quality of life.

**OUR VISION**
... is to expand understanding of our dynamic planet as the trusted source of environmental data.
We are moving beyond exploitation of a NOAA-centric Observing System ...
...to greater utilization of a growing global constellation of Earth Observation satellites.
NESDIS Cloud Strategic Objectives

- **Establish an approach** to investigate the potential for hosting all NESDIS ground functions in the cloud.

- **Define strategic goals** to outline a path for an integrated ground enterprise to leverage cloud technologies.

- **Cloud Pilot Projects** to support Experimentation, Migration, and Transformation activities.

NESDIS first established a Cloud Strategy Document to guide all cloud computing assessment, development and operationalization by asking: *Why not the cloud?*
NESDIS Cloud Strategy

Vision: Implement cloud-enabled end-to-end ground service capabilities that are secure, scalable, lifecycle cost effective, and data source agnostic.

Strategic goals for NESDIS Cloud Computing:

1. **Maintain continuity of operations**, products, and services
2. **Evaluate the benefits** of migrating the end-to-end ground architecture to the cloud based on trade studies, cost-benefit analysis and enterprise risk assessment
3. **Maximize use of cloud-native capabilities**
4. Implement clear governance by **defining roles and responsibilities**
5. **Define requirements** for the cloud architecture to include confidentiality, integrity and availability
6. **Compliant with security, data and acquisition regulations**
7. **Collaborate with NOAA OCIO and Line Offices** to develop a NOAA cloud utility contract
Cloud computing has already been demonstrated as a viable implementation for satellite ground compute, storage and dissemination.

Adoption of commercial cloud computing fundamentally changes the culture – and change is HARD.

NESDIS will leverage commercial cloud computing to our toolkit going forward.
Imagine a World where NESDIS Ground is Completely in the Cloud

- NESDIS is focusing on the architectural level, not current system implementation:
  1. Approach the cloud from architectural functionality
  2. Assume those functions are done completely in the cloud

- What are the technical barriers prohibiting a NESDIS migration to the cloud?
  - The resulting barriers we formulated into pilot projects

- Pilot results will guide NESDIS cloud implementation decisions
# NESDIS Cloud Pilot Projects in Execution

<table>
<thead>
<tr>
<th>Project</th>
<th>Function</th>
<th>New Project Scope</th>
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<tbody>
<tr>
<td>1</td>
<td>Security in the Commercial Cloud</td>
<td>Develop NESDIS Authority to Operate (ATO) methodology to meet security standards in the commercial FedRAMP Moderate cloud by tailoring up security controls</td>
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<tr>
<td>2</td>
<td>Extension of Common Ingest, Cataloging, and Discoverability to the Cloud</td>
<td>Extend the NESDIS-built common data ingest, cataloging, and discoverability functionality to near-real time ingest and calibration/validation enterprise and demonstrate this capability in the commercial cloud</td>
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<tr>
<td>3</td>
<td>Native Ingest, Product Generation and Science Development in the Cloud</td>
<td>Demonstrate that industry cloud-native approaches for compute, storage and dissemination can be utilized in a common architecture to meet all current NESDIS system needs</td>
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<tr>
<td>4</td>
<td>Distribution Framework</td>
<td>Examine NESDIS common architecture for cloud-based data distribution that limits egress cost from the commercial cloud</td>
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Cloud Pilot 3 will demonstrate **cloud-native industry approaches** applied to ingest, product generation, distribution and science support.

Evaluation of operationalization will be on how well the approach meets NESDIS’ performance needs.
Secure Ingest Gateway Pilot (SIGP)

- SIGP on Amazon Web Services (AWS) provides:
  - Enterprise secure methods for ingesting data from external providers
  - Agility to modify the compute resources to meet new data source needs
  - Scalability for compute resources
  - NESDIS is transitioning SIGP into an operational capability
NESDIS Lessons Learned

**TECHNOLOGY**
- Commercial cloud services **can support** satellite data products & formats
- Future programs may no longer provide **end-to-end solutions**
- **Lift and shift** migration works, but is the **least effective** approach*
- Future architectures must leverage cloud native tools

**RISK**
- **Security controls strategy** needs to be adopted
- Confidentiality, Integrity, Availability (CIA) must be considered

**PEOPLE**
- Federal IT staff require **cloud training**
- Organizational culture needs to change to **realize the benefits of cloud technology**

**ACQUISITION**
- **Procurement strategy and processing times** need to be change to realize the benefits of the cloud

*In the case of operational HPC, the results can vary. This bullet is NESDIS-specific.*
THANK YOU

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