NGAP: A (Brief) Update

PaaS, IaaS, Onboarding, and the Future

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NASA EED2/ESDIS
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Agenda

• What is NGAP?
• NGAP as a PaaS
• NGAP as an IaaS
• What’s Next?
• Questions and Answers
WHAT IS NGAP?
“NASA Takes Off to Cloud Computing”
* http://www.onthenetoffice.com/blog/2012/02/nasa_cloud/
What is NGAP?

NGAP is the NASA General Application Platform. It provides a cloud-based Platform-as-a-Service (PaaS) and Infrastructure-as-a-Service (IaaS) for ESDIS applications.
NIST Definition of Cloud Computing*

- On-demand self service
- Broad network access
- Resource pooling
- Rapid elasticity
- Measured service

* http://faculty.winthrop.edu/domanm/csci411/Handouts/NIST.pdf
NGAP: A (Brief) Update

NGAP AS A PAAS
PaaS
Platform-as-a-Service
It starts with infrastructure…

Load Balancer

HTTPS

NGAP Router
CentOS Server

NGAP Router
CentOS Server

App1
CentOS Server

App2
CentOS Server

App1
CentOS Server

App2
CentOS Server

Request Routing

Provisioning, Deployment & Orchestration
...and adds services and “slugs”

- NGAP Services
  (Monitoring, Logging, Security, Autoscaling, Billing, etc.)

- Usable cloud “platform”

- OCIO GP-MCE*
  (AWS Reseller)

- General Purpose Managed Compute Environment

- ESDIS “blessed” component

- NGAP-compliant AMI
  (Application)

- NGAP Builder
  (Creates “slug” from ECC-hosted codebases)

- NGAP Base AMI
  (Secure)

- App Source Code

- ECC
  (Code testing, tracking, deployment)
Highlights of PaaS

• Simplified AWS-focused architecture
• Focused on web application hosting
  – 12-factor applications
  – Web front-end plus database back-end
• Demonstrated Earthdata Search running in NGAP prototype with fault tolerance, high availability, and scaling
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NGAP AS AN IAAS
Discipline-oriented Data Centers

- **ASF SDC**: SAR Products, Sea Ice, Polar Processes, Geophysics
- **PO.DAAC**: Gravity, Sea Surface Temperature, Ocean Winds, Topography, Circulation & Currents
- **NSIDC DAAC**: Snow and Ice, Cryosphere, Climate Interactions, Sea Ice
- **LP DAAC**: Surface, Reflectance, Land Cover, Vegetation Indices
- **GES DISC**: Global Precipitation, Solar Irradiance, Atmospheric Composition and Dynamics, Global Modeling
- **CDDIS**: Space Geodesy, Solid Earth
- **LaRC ASDC**: Radiation Budget, Clouds, Aerosols, Trajectory Chemistry
- **ORNL DAAC**: Biogeochemical Dynamics, Biological Data, Environmental Processes

www.nasa.gov
AWS and WOS: Benchmarking at the Edges

1. Only Data Cannon will pull from NSG and will push the data to Ingest node(s).

2. All Ingest nodes will write to local storage and update Database for serving.

3. ASF decides where to serve the user, depending upon benchmarking, user’s network, etc.

*DC refers to a Datacenter in lower 48 that is not yet defined.*
Forklifting: Not ideal, but sometimes necessary
ASF Pre-NGAP

Developers & SAs

Configure system

Setup system tasks

Deploy “application”

VM

OS pkg

OS pkg

OS pkg

cron

code

code
ASF Today

NGAP Orchestration

Cloud Formation

Bamboo

Configure system

manages

Setup system tasks

Deploy “application”

NGAP VM

OS pkg

OS pkg

OS pkg

cron

code

code

NASA
WHAT’S NEXT?
## Identified Profiles

<table>
<thead>
<tr>
<th>Application Profile</th>
<th>Required features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline web application</td>
<td>SQL Database, background jobs, popular language</td>
</tr>
<tr>
<td>Persistent local storage</td>
<td>Fault-tolerant storage that survives instance reboots</td>
</tr>
<tr>
<td>Microservices</td>
<td>Private communication, complex deployment profiles</td>
</tr>
<tr>
<td>Reverse proxy control</td>
<td>Control of traffic at the router level</td>
</tr>
<tr>
<td>COTS Installation / Licensing</td>
<td>Static instances to allow licenses. Limitations in scaling.</td>
</tr>
<tr>
<td>Short lived compute jobs</td>
<td>Fast CPU and network, ephemeral storage, broad use</td>
</tr>
<tr>
<td>Legacy software</td>
<td>Obscure language and hardware support</td>
</tr>
</tbody>
</table>

For additional details, see [https://wiki.earthdata.nasa.gov/display/NGAP/Target+Application+Profiles](https://wiki.earthdata.nasa.gov/display/NGAP/Target+Application+Profiles)
# Identified Applications

<table>
<thead>
<tr>
<th>Application</th>
<th>Model, Profile, and Notable Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASF Web Objects Storage</td>
<td>IaaS, script-based, VMs, S3, and edge storage</td>
</tr>
<tr>
<td>Earthdata Search Client</td>
<td>PaaS, web application, Ruby on Rails, RDS, Node.js, AWS database migration service</td>
</tr>
<tr>
<td>CMR</td>
<td>Hybrid, Clojure API, ElasticSearch cluster, RDS (Oracle), AWS database migration service</td>
</tr>
<tr>
<td>Earthdata Developer Portal</td>
<td>PaaS, web application</td>
</tr>
<tr>
<td>Earthdata Website/CMS</td>
<td>PaaS, web application, Clojure/Ruby on Rails</td>
</tr>
</tbody>
</table>

For additional details, see [https://wiki.earthdata.nasa.gov/display/NGAP/Target+Application+Profiles](https://wiki.earthdata.nasa.gov/display/NGAP/Target+Application+Profiles)
* https://aws.amazon.com/solutions/case-studies/edmodo/
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QUESTIONS AND ANSWERS
What can I do to prepare?

• Development Best Practices
  – Thoughtful application testing
  – Don’t do it twice; automate

• Deployment Best Practices
  – Configuration Management
  – (More) Automation

• Follow 12-Factor Principles
  – http://12factor.net
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