Cloud Surprises in Moving NASA EOSDIS Applications into Amazon Web Services

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1. NASA is not a Heroku or PaaS world

• We thought NGAP would primarily be “Heroku for Earth Science”
  – Hosting for web applications
  – Limited application profiles
  – Ease of Use
“The needs of the many…”

• We were asked for a lot of different things
  – Hosting for web applications all the things
  – Limited Broad application profiles
  – Ease of Use (??)

• As the de facto cloud platform, NGAP had to evolve to meet these broader needs

* [https://pixabay.com/p-1458869](https://pixabay.com/p-1458869)
NGAP as a PaaS

- ECC (Code testing, tracking, deployment)
- App Source Code
- NGAP Base AMI (Secure)
- NGAP Builder (Creates “slug” from ECC-hosted codebases)
- NGAP-compliant AMI (Application)
- NGAP Services (Monitoring, Logging, Security, Autoscaling, Billing, etc.)
- OCIO GP-MCE (AWS Reseller)

Usable cloud “platform”

- ESDIS “blessed” component
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.*
The evolution from PaaS to (more) IaaS

- **NGAP 0.1**: 100% PaaS
- **NGAP 1.0**: 80% PaaS
- **NGAP 1.1**: 60% PaaS
- **NGAP Sandbox**: <50% PaaS
2. Managed Services are the shizzle

• *We thought* NGAP would primarily be a “*hosting platform*”
  – Reduce hardware buys
  – Provide operational support for apps

• *AWS does* lots of cool stuff
  – Supplies resources (instances, networks, etc.)
  – Monitors and keeps those resources running
Prefer Services Over Custom Code

• But AWS also *provides* some cool stuff ™
  – Lambda
  – Step Functions
  – AWS Batch
  – API Gateway
  – Something(s) since I wrote this presentation
3. EOSDIS Applications are as Sophisticated as AWS allows

• *We thought* that most of the applications we’d support would be *“web applications”*
  – Think Rails + database + S3
  – Think buildpacks
  – Think well-constrained technical problems
Managed Services Drive Innovation

• Instances to Containers
  – Greater segregation of functionality
  – Movement toward services over monoliths
• Software on an Instance to AWS Service
  – ElasticSearch to AWS ElasticSearch
  – RabbitMQ to AWS SQS
  – Etc.
• And bigger changes… *(more on that later)*
GIBS to GIBS in the Cloud
4. NGAP is not as easy as AWS to operate

- *We thought* that NGAP would basically offer the ease of operation that AWS offers to a typical application
  - Low-effort monitoring
  - Low-effort logging
  - Low-latency response times from operations
5. AWS uses an open-ended spending model

- *We thought* we’d just turn on Amazon’s billing controls and be A-OK.
  - Set spending limits
  - Produce granular billing reports
  - Limit egress at predetermined thresholds
Amazon provides the information and empowers the user

• Amazon wants to inform but not limit
  – AWS is happy to email you
  – AWS is happy to let you know what you’re spending
  – AWS (reasonably) cannot force action, because “the action” is not standard
Egress (in particular) is a big deal

• When data leaves your application, service, data store, etc. …
  – …and goes to another region
  – …and goes outside of AWS

• Egress is expensive
  – Rack Rates: $0.08/GB after first 150TB
  – In other words, a significant portion of total monthly cloud-associated costs
Cost isn’t even the biggest issue

• A huge bill is bad… …but jail is worse.

• The Anti-Deficiency Act (ADA) disallows unbounded costs

• We need a means of absolutely limiting egress costs

6. Favor Re-architecture over “just getting into the cloud”

• *We thought* that many applications would simply move their architecture to NGAP and (more or less) call it a day
Case Study: ASF

Developers & SAs

- Configure system
- Setup system tasks
- Deploy “application”

VM

- OS pkg
- OS pkg
- OS pkg
- cron
- code
- code
“Direct” Forklift onto NGAP

NGAP Orchestration

- Cloud Formation
- Bamboo

- Configure system
- Setup system tasks
- Deploy “application”

NGAP VM

- OS pkg
- OS pkg
- OS pkg
- cron
- code
- code

NASA
But... it turns out...

“We wish we’d re-architected.” – ASF

Why?

• Managed Services
• Natural Inflection Point
• Opportunity for Innovation
ASF, Rearchitected
Ingest, Rearchitected
One of the great beauties of architecture is that each time, it is like life starting over again.

-Renzo Piano
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