Internet2 Cloud Strategy
Update and Community Resources
Internet2 Cloud Strategy Update

George K. Loftus
AVP Network Services, Internet2
Cloud Strategy Focus:

• Integrated organization-wide thinking on cloud solution requirements developed in concert with the Internet2 community.

• How do we leverage the contractual and program benefits the community has developed through NET+ and other agreements?

• How do we bring together community knowledge and tools in support of a multi-cloud approach for researchers and enterprise?

• How do we leverage Internet2 & R&E community private infrastructure and trusted identity solution to connect members with public and private clouds?
Cloud Requirements Program

- Analyze Cloud Access Solutions
- Survey of current state of the cloud market
- User Story Collection
- First Phase service development and pilots
- Formation of advisory council

After Global Summit 18 we move in to a new phase, moving “Cloud Access” to a service and beginning translation of the collected user stories in to future roadmap items
Cloud Requirements: We need community use stories:

We are currently gathering stories from the community about how they are using, or want to use, cloud infrastructure to meet their research and enterprise compute and storage needs.

Send us a few sentences that tell your story about your requirements at: [https://tinyurl.com/y8xkhy5k](https://tinyurl.com/y8xkhy5k)

Story collection is open and we have received about 40 thus far.
An Example Story: (Thanks Emory University):

One of the challenges we have seen with our cloud connectivity strategy is being able to secure robust and reliable private cloud connectivity. There are a lot of options and providers to choose from, but in many cases those connections are shared and/or may have single points of failures.

We would like to see an offering where we can leverage private cloud connectivity including 10G or multiple 10Gb ports that also could meet the reliability and diversity requirements of a highly available data center connection.

Additionally, given that much of the push towards the cloud is about being able to bring solutions to production faster, we would like to see connectivity that can be ordered and provisioned via API and internet portals to eliminate the delays associated with the traditional submission of a service order to obtain a virtual cross connect or to have a VLAN provisioned.
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<td>Off-premise HPC and big data options for new faculty researchers</td>
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Roadmap Input & Annual Planning Cycle

- Infrastructure Enablement Focus (Network Portal & API enablement)
- New Features Resulting from User Story Sorting

2018 Features

2019 Features

2020 Features

- Requirements Gathering
- Infrastructure Requests
- New User Stories
- Feature Development
- Feature Planning & Community Input Startup
- User Story Sorting
- New User Stories
- New Features Resulting from User Story Sorting
- Feature Planning & Community Validation
- Requirements Gathering
Cloud Strategy Focus:

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NET+ Cloud Services Update

Sean O’Brien
Program Manager, Internet2
Community-Driven Internet2 Cloud Services

Services conceived, tested and vetted based on R&E standards

Peer-driven solution roadmaps address evolving user and enterprise needs

Services meet R&E security, compliance and accessibility standards

Leverages R&E federated identity standards enabling seamless sign-in with campus credentials

Collaborative scale provides standard agreements and terms for all

Architected to perform across advanced Internet2 Network and global peers
Defining Community: Internet2 Cloud Partnerships

The Internet2 Member Community:

Affiliates & Non-Members: Extending benefits to more communities (K20, Libraries, Museums)

Global Partners: Partnering with International NRENs

Industry Members:
The Result? A **TRUSTED ECOSYSTEM** of Tailored Top-Quality Cloud Solutions
Areas of Focus for NET+ Cloud Services

• Deliver the current successes, through the current key success factors, through a portfolio of modest size

• Representing “high-impact” services (“impact” = high adoption; ”infrastructural”; strategic to community and other Internet2 interests) in a self-supporting business model

• Aligning cloud services portfolio services efforts to Internet2's cross-organizational cloud strategies (ex. Google Cloud Platform work)

• Updating business models and agreements to improve transactional efficiently (ex. Migration of agreements to provider-direct community validated agreements or through resellers/distributors)
Why NET+ Cloud Services?

- Influences industry to develop services more useful to the Research and Education community
- Encourages competition among service providers on direct value of services
- Encourages collaboration within the community
- Provides an opportunity for each member of the community to contribute to expansion of service offerings
- Encourages a strategic relationship between the community and service providers
- Provides a basis for long-term collaboration on R&D
NET+ Service Lifecycle

Pre-validation

SERVICE VALIDATION

Validated and available

EARLY ADOPTER

GENERAL AVAILABILITY

SUNSET

Research Incubator

Pre-validation

Validated and available

SUNSET
Service development

- Discovery
  - Understanding the opportunity (what are the possibilities? Market scope?)
- Alignment
  - Are the provider and community goals strategically aligned (are we headed in the same direction?)
- Feasibility
  - Are the investments and mutual accommodations required likely to materialize?
- Identifying a Sponsor
  - A CIO or executive from a member institution
- Developing a Proposal
  - With support of the Sponsor
- Identifying additional SV participants
- Review of Requirements
  - Networking, Identity, Security, Business model and terms
NET+ Service Validation

• Assessment of the service for inclusion in the catalogue, applying a consistent process, and determining how best to make it available at scale to the entire higher education community:

• SV Group is led by the Sponsoring institution and Internet2 and Includes:
  • Service Provider
  • Sponsoring University and 5-7 University Participants

• SV participants represent
  • The Community
  • Apply a consistent process to assess the service for inclusion in the catalogue
  • Determine how to make it available at scale to the entire R&E community
NET+ Service Validation Components

• Functional Assessment
  • Review features and functionality
  • Tune service for research and education community

• Technical Integration
  • Network: determine optimal connection and optimize service to use the Internet2 R&E network
  • Identity: InCommon integration

• Security and Compliance
  • Security assessment: Cloud Controls Matrix
  • FERPA, HIPAA, privacy, data handling
  • Accessibility

• Business
  • Legal: customized agreement using NET+ community contract templates
  • Business model
  • Define pricing and value proposition

• Deployment
  • Documentation
  • Use cases
  • Support model
Service Stewardship – Ongoing Service Administration

• Ongoing review and management of the key areas of focus from service validation
  • Functional, identity, network, security, accessibility, business and legal

• Convening the community in meaningful ways around cloud services
  • Service advisory boards (one board for every service in general availability)
  • Service working groups (ex. Learning management system integration)
  • Online communities of practice (community forum, Slack channel, email)

• Support for cloud standards, integrations and overall cloud architecture

• Contract administration
  • Internet2 reviews campus concerns, questions and proposed changes with the Service Provider
  • Changes are made to the base Customer Agreement to benefit all participants
  • Contracts are revised and amended for product evolution and community requirements
How NET+ Cloud Services Help the Community

• Community based due diligence
• Improves risk management by vetting service providers
• Improves risk management via standard and beneficial contract terms
• Ensures fair treatment in the market (no hidden clauses for other universities)
• Reduces costs of administration
• Reduces price risk by leveraging purchasing power of the community to scale demand
• Provides a framework for ongoing collaboration with service providers on product roadmap
Examples of NET+ services supporting the community

• Unique service offering components or elements for research and education
  • Box alumni accounts
  • DocuSign unlimited envelops
  • Instructure stopped charging the community for their metadata
  • LastPass delegated administration functionality
  • ServiceNow provides free student licenses

• Data Egress waivers with Microsoft, Amazon Web Services and Google Cloud Platform all came out of the work on the NET+ program. Benefits are extended beyond just the NET+ program to the broader research and education community.

• There are countless examples of service providers completing compliance product enhancements or documents based on service validation efforts.
Data Egress Waiver/Discount

• Data Egress Fee Waiver/Discount available on AWS, Azure, and Google Cloud Platform

• Reduces charges for data egress destined for a *registered* institution

• Up to 15% of an payer/billing (read institutionally-managed) account's monthly spend

• Should the institution exceed 15% egress, they will be charged at the standard peering egress or private interconnect egress pricing rate (or in some cases receive a warning).

• For typical usages, compute makes up the vast majority of charges on an account in aggregate, offsetting most or all egress charges.
Data Egress Waiver/Discount - Example

- If an institution spends
  - $100,000 in a given month, and
  - $15,000 of that spend is in data egress charges,
  - They will only pay the remaining $85,000.

- Real Life Example: University of Chicago
  - Account contains the most used University web properties
  - $3,761 (pre-discounted) usage charges for April 2018
  - Waived data transfer of 1.4 Tb would have been $28.81, or 0.076% of total spend
Federal Cloud Grants and Credits Flow
What’s next for NET+ Cloud Services?

• Focus on delivering 2018 priorities, including:
  • Aligning cloud services portfolio services efforts to Internet2's cross-organizational cloud strategies (ex. Google Cloud Platform work)
  • Updating business models and agreements to improve transactional efficiency (ex. Migration of agreements to provider-direct community validated agreements or through resellers/distributors)
  • Sunsetting underutilized services to focus community efforts

• Updating the Infrastructure and Platform Services Program

• Updating the NET+ Cloud Services Lifecycle, with a focus on two key areas:
  • Updating the service intake and evaluation process for new services
  • Enhancing service stewardship efforts for existing services

• Working with partner organizations to enhance the value of the NET+ program
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Community Cloud Resources

Sara Jeanes

Program Manager, Internet2
Cloud Services Technical Vision

- Driving interlinkages between Trust and Identity and Internet2 Network, to support using public cloud services
  - Example: T&I stack to manage access to the OESS Network admin console to provision Internet2 Cloud Connect

- Bringing together community knowledge and tools in support of a multicloud approach
  - Example: Cloud Wiki and Cookbooks

- Broadening technical conversation about cloud to include a broader subset of the Internet2 community and members outside the community
  - Example: Participation in the Cloud Native Computing Foundation (CNCF)
Cloud Services High Order Technical Bits

- Internet2 Cloud Connect
  - Building toward multicloud
  - Scalable
- Cloud identity question/model
  - Multi-leveled (app and account/project)
  - Varies by public cloud
- Cloud IaaS stack normalization
  - Storage and compute primitives and translation
  - Role of containers and functions
- Cloud cost estimation/management
- Facilitation of integrations between cloud services
Internet2 Cloud Services "Stack"
Service Advisory Board Model

SV & Subscribing Campuses

Service Provider

Tier 2, 3 Support

Campus Feedback & Requests

Regular Updates on Community Requests

Product Roadmap

Aggregate Community Feedback

Community Advisory Board
Supporting Community Activities

• Partnerships between industry and higher education to support domain-area research using cloud technologies
  • Large Data Management Genomic Biodiversity Summit at KU
    • **Speakers from Internet2, Microsoft, University of Oklahoma, University of California, and the University of Kansas** to explored the challenges of managing and analyzing large data in the context of genomic biodiversity research. Sessions were held at the KU Commons.
    • [http://provost.ku.edu/genomic-biodiversity-summit](http://provost.ku.edu/genomic-biodiversity-summit)
• Creating community events to support highly adopted community services
  • NET+ Box Community Summit at CMU
    • **Twenty universities from around the country gathered at Carnegie Mellon University (CMU) in Pittsburgh, Penn., on June 1 and 2 for the first NET+ Box community summit. The summit included a half-day of product updates from the Box team and a full-day of community conversation and presentations.**
    • [https://www.internet2.edu/blogs/detail/14139](https://www.internet2.edu/blogs/detail/14139)
• Support for cloud efforts across community groups
  • **Joint meeting of the Cloud Computing Constituency Group (EDUCAUSE) and Cloud Services Working Group (Internet2)**
    • [https://www.educause.edu/discuss/cloud-computing-constituent-group](https://www.educause.edu/discuss/cloud-computing-constituent-group)
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Cloud Access Overview

George Loftus
AVP Network Services, Internet2
Cloud Access Program

Develop a strategy and technical capabilities to promote inter-platform interoperability at the network, workflow and data access layers.
### Cloud Access Services

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<th>Cloud Exchange</th>
<th>Cloud Connect</th>
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- **Use of the community’s existing 800 Gbps+ of layer 3 peering capabilities to the major cloud providers for advanced, community enabled access to cloud services.**

- **Enabling the Internet2 & Regional infrastructures to offer “direct-connect” private Layer 2 and Layer 3 access to Microsoft, Amazon and Google cloud platforms.**
**Internet2 Cloud Access Request Workflow**

**START**

Need to access the cloud using R&E networks?

**DO YOU REQUIRE**
a private network connection to extend your data center into the cloud using private address space or your own public address space?

**YES**

**ANSWER:**
Consider Cloud Connect (Direct Connect) to Cloud Providers

**NO**

**ANSWER:**
Utilize Internet2 Regional Cloud Exchange Peering (TR-CPS)

**END**

**DO YOU REQUIRE**
access to multiple providers and/or locations?

**YES**

Contact Internet2 or your regional about Cloud Connect Layer 2 and Layer 3 features

**END**

**NO**

Contact Internet2 or your regional about point to point wave or Layer 2 solutions to the cloud

**END**
I40

Regional provides its members with direct access to over 15 cloud service providers on the Cloud Exchange. Cloud Exchange allows Regional members to have high performing on-net access to cloud service providers, avoiding the commodity internet and reducing latency. Regional engineers have the ability to review and optimize member connections to the Cloud Exchange—along the entire path to help members make the most of their cloud connections. Cloud Exchange was designed from the ground up to focus on hosting cloud providers most valued by the Research & Education community.
Internet2 Cloud Connect

Regional Network

CLOUD EXCHANGE

aws

Google Cloud Platform
Google Cloud Dedicated Interconnect
Microsoft Azure
Microsoft Azure Express Route

Amazon AWS Direct Connect

CLOUD CONNECT

aws

Google Cloud Platform

Microsoft Azure

Regional Network

CAMPUS
LIBRARY
HOSPITAL
GOVERNMENT
K-12
MUSEUM
GENERIC
Layer 2 – AL2S Connection Option
Layer 3 – MPLS L3VPN Option
L3VPN
Multi-cloud Community Use Case
Cloud Connect – Current Status

**Microsoft:**
- **Access:**
  - Available: Ashburn & Chicago
  - Next Site: Dallas June ’18
  - Future: West Coast - Bay Area Fall ’18
- **Members connected:**
  - OSHEAN – Layer 2 & Layer 3
  - Georgia Tech – Layer 3
  - Vanderbilt – Layer 2

**Amazon:**
- **Access:**
  - Available: Ashburn & Chicago
  - Next Site: Dallas June ’18
  - Future: West Coast – Bay Area Fall ’18
- **Members connected:**
  - MCNC – working to bring up pilot connection
  - University of Michigan – working to bring up pilot
  - OSHEAN – working with Brown University
  - Georgia Tech - working to bring up pilot connection

**Google:**
- **Access:**
  - Available: Chicago
  - Ashburn, Dallas, Bay Area planned
Questions?

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NET+ Cloud Services: netplus@internet2.edu