Case Studies on Migrating Cloud Research Platforms

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Intro

- HPC System Administrator
  - Center for Research Computing @ Notre Dame
  - Union Station data center in downtown South Bend
- HARC Cloud Research Support Engineer (CRSE2)
- Responsibilities:
  - Security/compliance
  - General system administration
  - Virtualization
  - Cloud

Overview

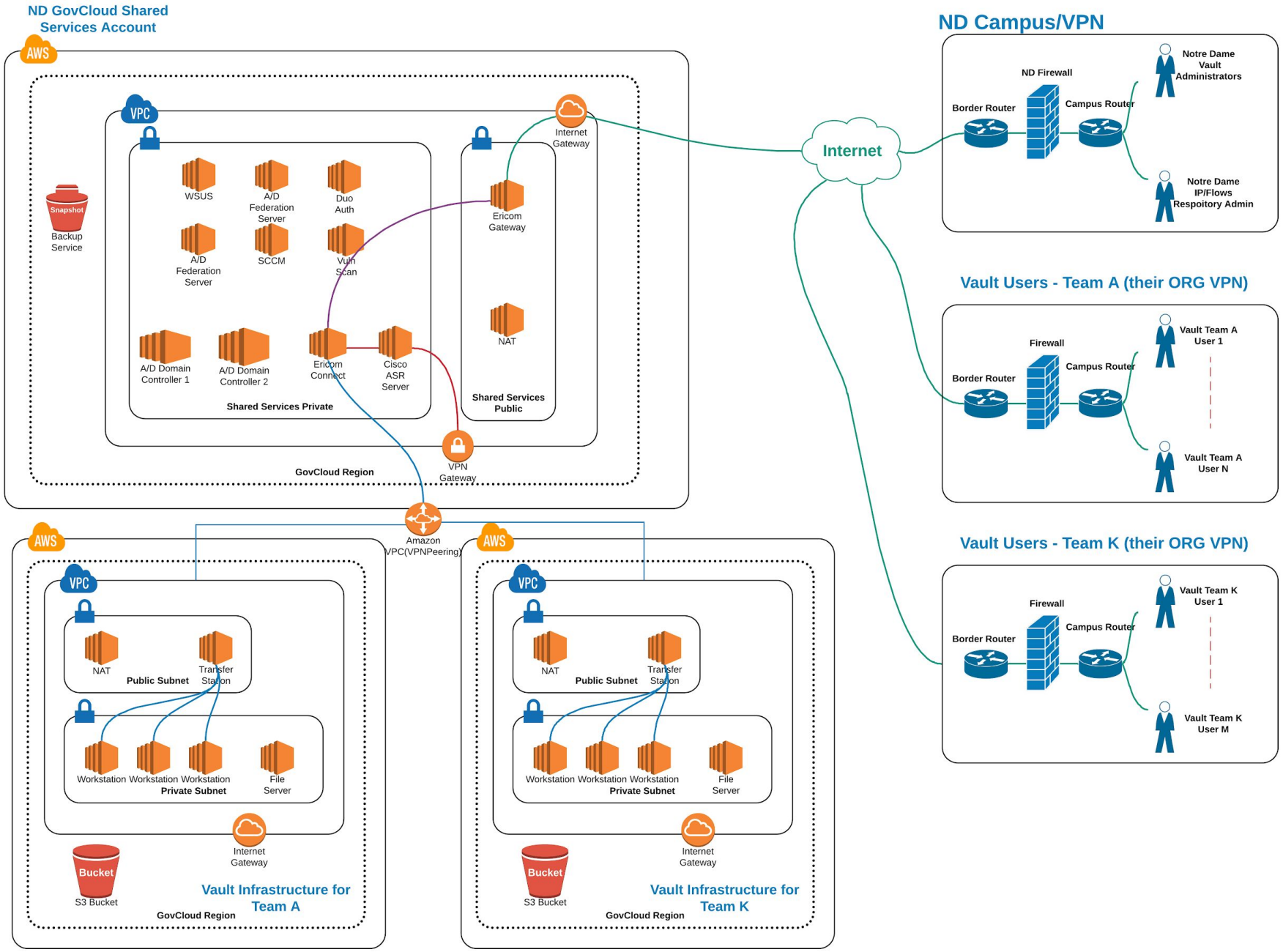
- Case studies of migrating resources to the cloud or between clouds
  - #1: Compliant environment templates
  - #2: Migrating infrastructure for project expansion
  - #3: Recreating application used for time-sensitive COVID-19 research

Case Study #1

- Interorganizational Secure Cloud Platform Templates
  - Compliant environment in AWS GovCloud
  - Core “shared services” and project VPCs
  - Use of AWS CloudFormation service
  - Allows for quick reuse in various compliant environments
    - Saves both time and effort
    - Helps lower costs (vs building from scratch)

Case Study #1 Challenges

- Core shared services not fully generalized within AWS
  - Dependencies on custom network configurations and identity and external remote desktop software
- Compatibility with other cloud platforms (AWS only)
- Collaboration and communication with various stakeholders with different responsibilities


ND GovCloud Shared Services Account
AWS
VPC
Snapshot
Backup Service
WSUS
A/D Federation Server
Duo Auth
A/D Federation Server
SCCM
Vuln Scan
A/D Domain Controller 1
A/D Domain Controller 2
Ericom Connect
Cisco ASR Server
Shared Services Private
Internet Gateway
Ericom Gateway
NAT
Shared Services Public
VPN Gateway
GovCloud Region
Internet
ND Campus/VPN
ND Firewall
Border Router
Campus Router
Notre Dame Vault Administrators
Notre Dame IP/Flows Respository Admin
Vault Users - Team A (their ORG VPN)
Firewall
Border Router
Campus Router
Vault Team A User 1
Vault Team A User N
Vault Users - Team K (their ORG VPN)
Firewall
Border Router
Campus Router
Vault Team K User 1
Vault Team K User M
Amazon VPC(VPNPeering)
AWS
VPC
NAT
Public Subnet
Transfer Station
Workstation
Workstation
Workstation
Private Subnet
File Server
Internet Gateway
Bucket
S3 Bucket
Vault Infrastructure for Team A
GovCloud Region
AWS
VPC
NAT
Public Subnet
Transfer Station
Workstation
Workstation
Workstation
Private Subnet
File Server
Internet Gateway
Bucket
S3 Bucket
Vault Infrastructure for Team K
GovCloud Region

Case Study #2

- Interprovider Transfer
  - Migrate infrastructure from ND AWS environment to a research partner's AWS environment
  - Expansion on prototype work done for previous project (common service)
  - Use of AWS CloudFormation, Packer and Ansible tools
  - Allows for quick reuse and portability

Case Study #2 Challenges

- Collaboration and communication
  - Understanding requirements, expectations, timeline
- Differences in environments
- Differences in existing/provided services
- Obtaining necessary access and privileges

Case Study #3

- Intraorganizational Service Setup
  - Migrating application to be used for time-sensitive COVID-19 research from one environment to another environment
  - HIPAA-compliance required
  - AWS CloudFormation templates utilized

Case Study #3 Challenges

- Setting up infrastructure created elsewhere with no prior knowledge/involvement of the initial setup
- Collaboration and communication
  - Understanding requirements and expectations
- HIPAA-compliance needed (new for ND)

Future Work

- Documentation, tuning
- Enhance ability to move between cloud vendors more easily
- Better educating stakeholders on best practices
- “Training the trainers”
- Contribute resources to community

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Questions?