Lessons Learned: Achieving True Digital Transformation in Healthcare with Public Cloud

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HIMSS CENTRAL & SOUTHERN OHIO Chapter

Background & Biography

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Adjunct Professor, DePaul University, College of Computing and Digital Media

- Skilled in public cloud, data center design and network security
- Over 10 years working in the information technology and healthcare industries

aws certified Solutions Architect Associate

aws certified Developer Associate

CISCO CERTIFIED CCIE

Overview

Digital Transformation in Healthcare

Public Cloud Use Cases

Lessons Learned

- #1 Security
- #2 Enterprise Skills Gap
- #3 Master One Cloud First

“

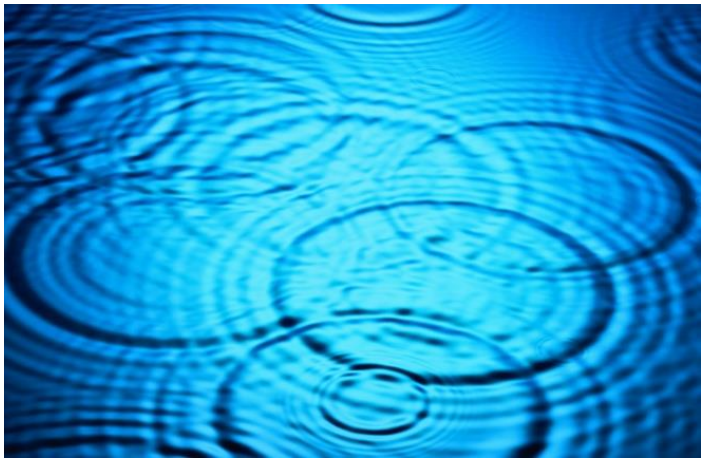
By 2020, 40% of healthcare providers will realize their electronic health record (EHR) technology cannot fully support their care delivery needs.

Mike Jones, VP Analyst
How Healthcare Provider CIOs Can Successfully

Achieve Digital Care Transformation
Gartner (2019)

Healthcare Digital Transformation

True digital business transformation requires business model change, and the value proposition is the foundation of a business model.



Changes to the value proposition will cause a ripple effect that creates dependencies and business design adjustments in other areas — some will be expected, while others will not be expected.

The Path to Digital Healthcare

The vertical path encompasses the digitization of the business of healthcare management

- Nonclinical activities
- Removal of waste
- Real-time orchestration of healthcare resources

The horizontal path encompasses the digitization of clinical capabilities and lies at the heart of every organization's value proposition.

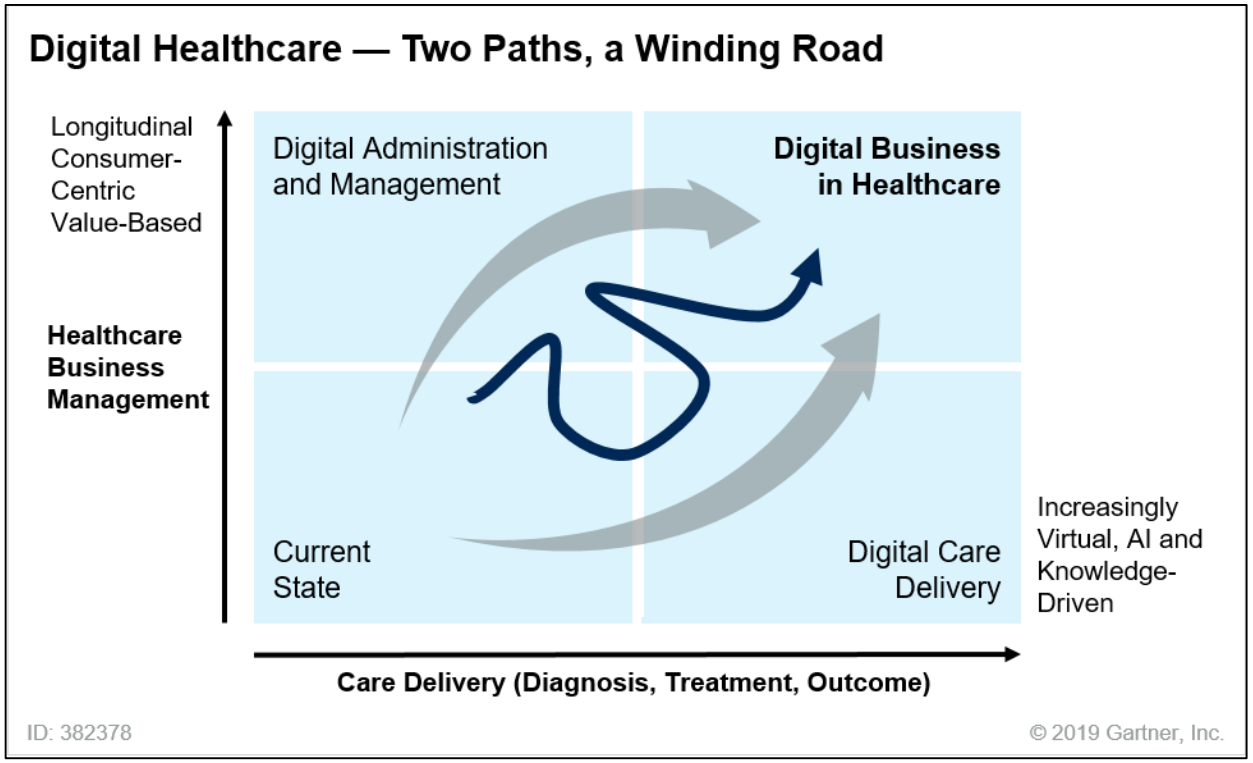
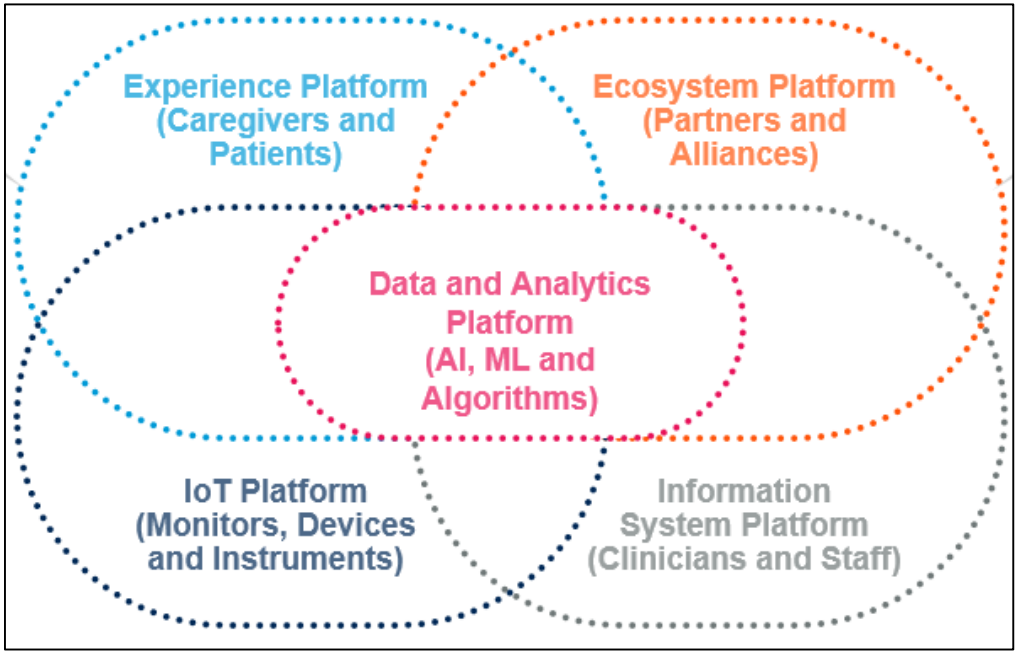


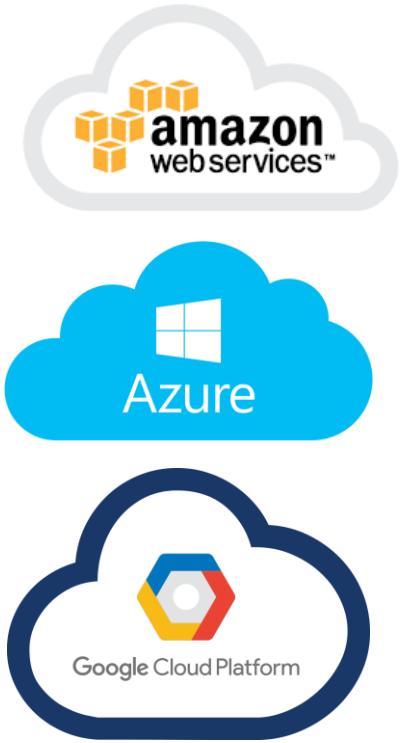
Photo Credit: Gartner 2019

https://www.gartner.com/document/3904769?ref=TypeAheadSearch&qid=e4bbec1ccb3e44d0e4ce2c

New Capabilities = New Digital Platform

These New Capabilities Are Driving Public Cloud Consumption





Public Cloud Use Cases in Healthcare IT

Business Intelligence

Analytics

- Denial Management
- Population Cost Prediction
- Fraud, Waste, Abuse
- Rx Cost Variance

Research

ML / AI

- Genomic Sequencing
- Cancer Research
- Molecular Biology

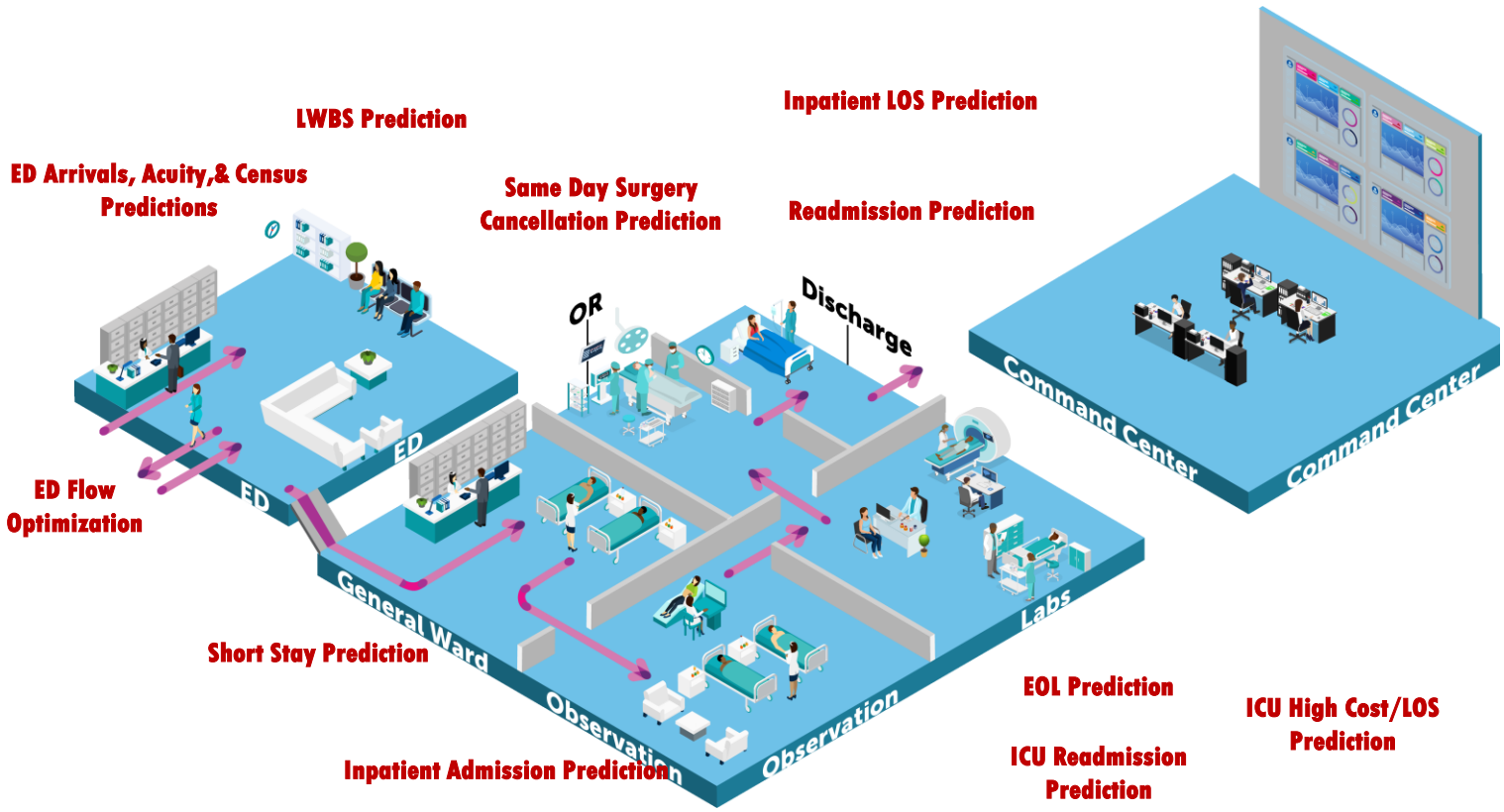
Operational Efficiency

ML / AI

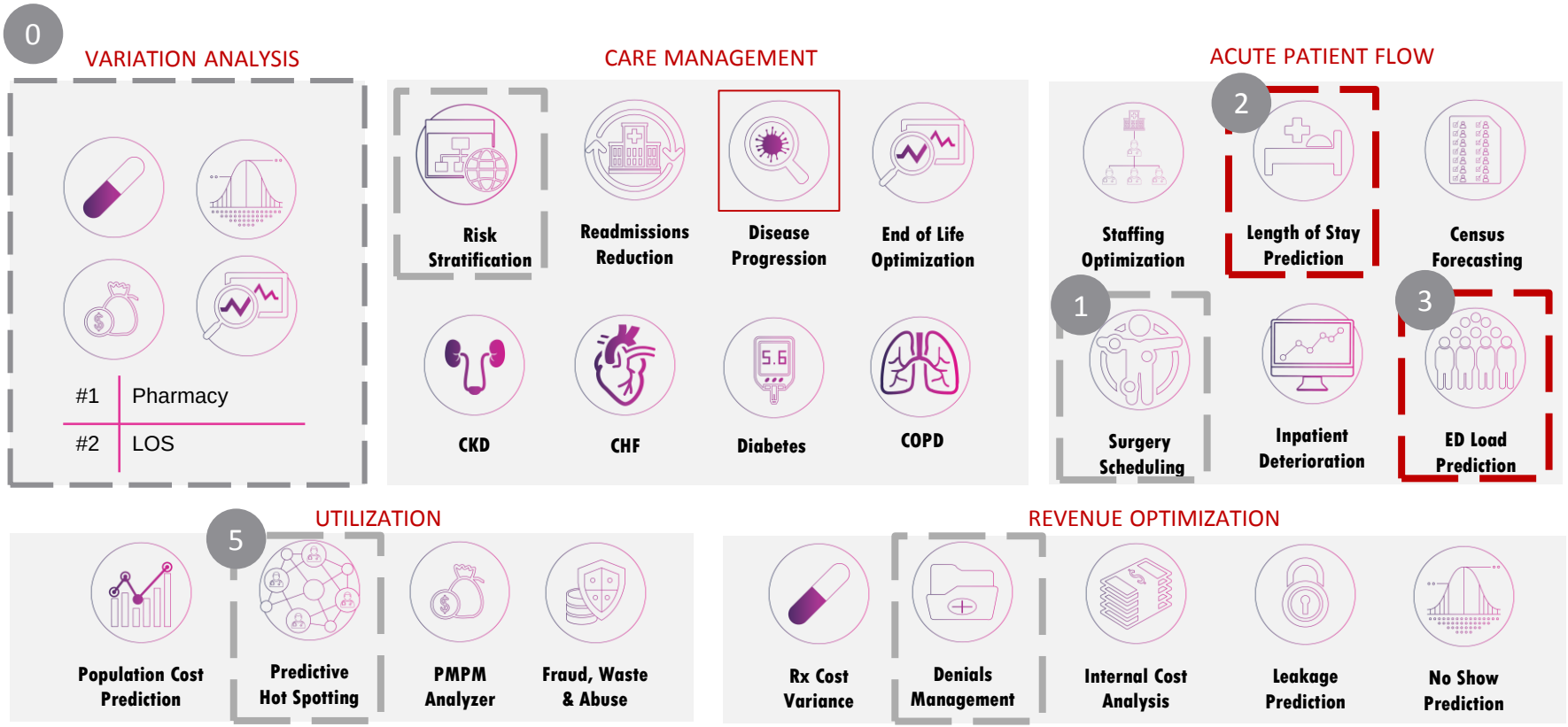
- Census Forecasting
- Patient Bed Scheduling
- Ambulatory Scheduling

Healthcare IT Use Cases: AI / ML

AI in Patient Flow, Staffing and Bed Management



Leveraging Applied AI in Healthcare IT



Building Analytics Pipelines for Genomic Sequencing

"Using AWS, we are able to offer our customers a lower cost, high-performance genomic-analysis platform, which can help them speed their time to answers."

Andy Nelson - Informatics & Cloud Operations, Illumina

https://aws.amazon.com/solutions/case-studies/illumina/

Lesson Learned #1 – Security

Managing PHI and HIPAA Compliance

Public Cloud Shared Responsibility Model

Customer

Customer Responsibility

- Customer Data
- Platform, Apps, I&AM
- OS, Network, Firewall Cong.
- Client-Side Data Encryption
- Server-Side Encryption
- Network Traffic & Protection

Cloud Provider Responsibility

- Cloud Service Provider Environment
- Addresses by Current Cloud Foundations
- Engagement

Eliminate Confusion – Example HIPAA

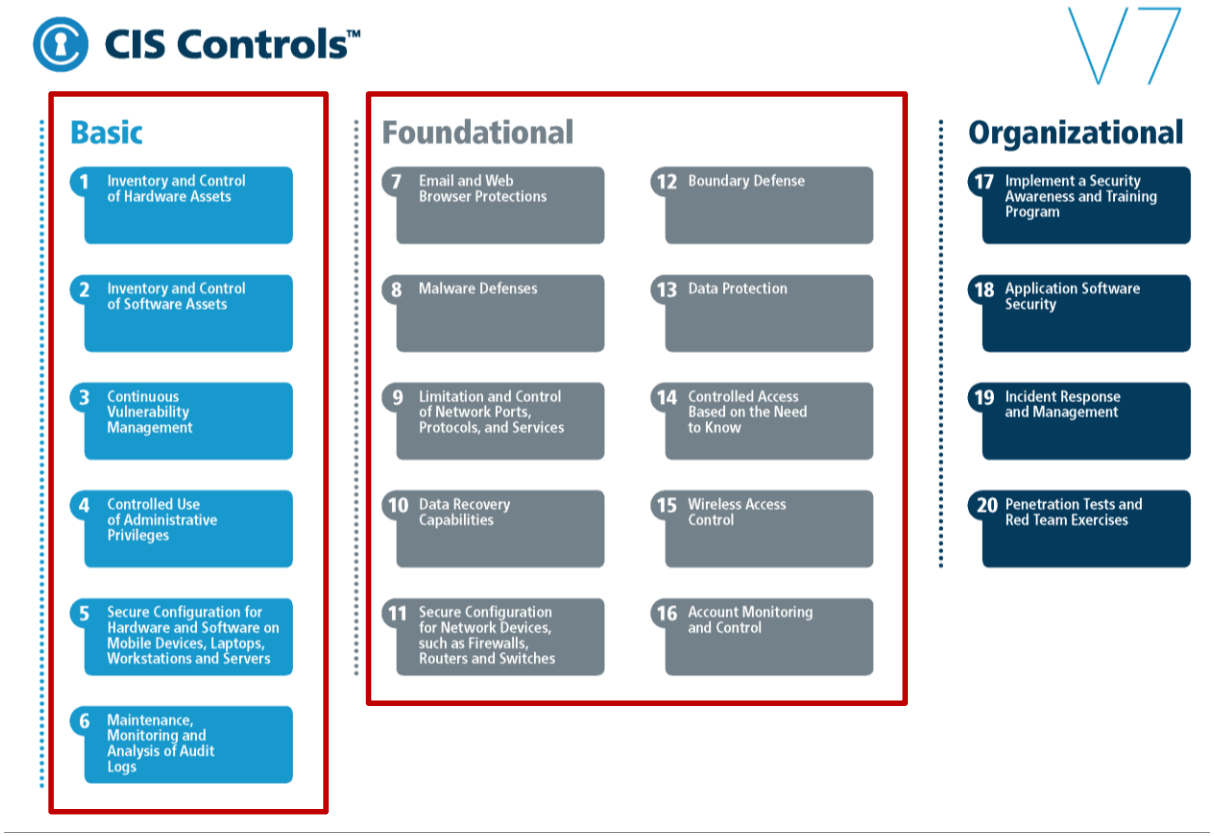
- Understanding roles and responsibility

When you sign your BAA with the cloud provider you will receive language in your contract similar or exactly like this:

> When you accept the BAA, AWS requires you to do the following:
>
> – Use only **'HIPAA Eligible' services** to create, receive, maintain, or transmit PHI
> – Implement appropriate privacy and security safeguards in order to protect PHI
> – Utilize the highest level of audit logging in connection for all HIPAA Eligible Services we choose to use
> – Maintain the maximum retention of logs in connection of our use of all HIPAA Eligible Services we choose to use
> – Must encrypt all PHI in rest and transit

What are CIS Controls?

CIS Critical Controls are a set of standards that are used to define what a secure configuration is when configuring your cloud resources **AND**
operating systems in the cloud including security processes that support the OS



Understanding Tools in AWS / Azure

- This is a useful tool

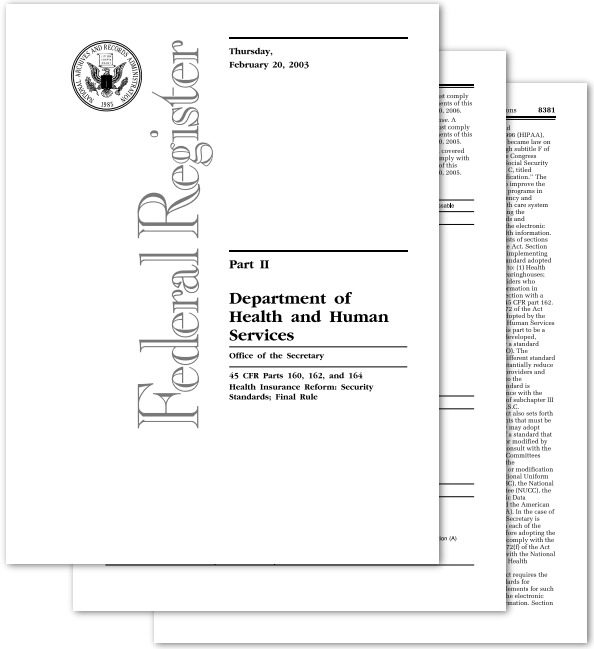
Understanding Tools in AWS / Azure

- This is a useful tool

- You still have to use the tool properly

Guidelines Under HIPAA

What Are the Guidelines Under HIPAA Section 164?



HIPAA COMPLIANT

https://www.hhs.gov/hipaa/for-professionals/security/index.html

Eliminate Confusion – Example HIPAA

What does HHS Service Say?

"The HIPAA Security Rule establishes national standards to protect individuals' electronic personal health information that is created, received, used, or maintained by a covered entity. The Security Rule requires appropriate administrative, **physical** and **technical** safeguards to ensure the **confidentiality, integrity, and security** of electronic protected health information."

https://www.hhs.gov/hipaa/for-professionals/security/index.html

Eliminate Confusion – Example HIPAA

We analyzed every HIPAA 164.3x security control and aligned them to corresponding CIS 20 Control categories

CIS Control 1: Inventory and Control of Hardware Assets
1.1 Utilize an Active Discovery Tool
1.2 Use a Passive Asset Discovery Tool
1.3 Use DHCP Logging to Update Asset Inventory
1.4 Maintain Detailed Asset Inventory
1.5 Maintain Asset Inventory Information
1.6 Address Unauthorized Assets
1.7 Deploy Port Level Access Control
1.8 Utilize Client Certificates to Authenticate Hardware Assets

CIS Control 2: Inventory and Control of Software Assets
2.1 Maintain Inventory of Authorized Software
2.2 Ensure Software is Supported by Vendor
2.3 Utilize Software Inventory Tools
2.4 Track Software Inventory Information
2.5 Integrate Software and Hardware Asset Inventories
2.6 Address Unapproved Software
2.7 Utilize Application Whitelisting
2.8 Implement Application Whitelisting of Libraries
2.9 Implement Application Whitelisting of Scripts
2.10 Physically or Logically Segregate High Risk Applications

CIS Control 6: Maintenance, Monitoring and Analysis of Audit Logs
6.1 Utilize Three Synchronized Time Sources
6.2 Activate Audit Logging
6.3 Enable Detailed Logging
6.4 Ensure Adequate Storage for Logs
6.5 Central Log Management
6.6 Deploy SIEM or Log Analytic Tools
6.7 Regularly Review Logs

CIS Control 9: Limitation and Control of Network Ports, Protocols, and Services
9.1 Associate Active Ports, Services and Protocols to Asset Inventory
9.2 Ensure Only Approved Ports, Protocols and Services Are Running
9.3 Perform Regular Automated Port Scans
9.4 Apply Host-Based Firewalls or Port Filtering
9.5 Implement Application Firewalls

CIS Control 11: Secure Configuration for Network Devices, such as Firewalls, Routers, and Switches
11.1 Maintain Standard Security Configurations for Network Devices
11.2 Document Traffic Configuration Rules
11.3 Use Automated Tools to Verify Standard Device Configurations and Detect Changes
11.4 Install the Latest Stable Version of Any Security Related Updates on All Network Devices
11.5 Manage Network Devices Using Multifactor Authentication and Encrypted Sessions
11.6 Use Dedicated Workstations For All Network Administrative Tasks
11.7 Manage Network Infrastructure Through a Dedicated Network

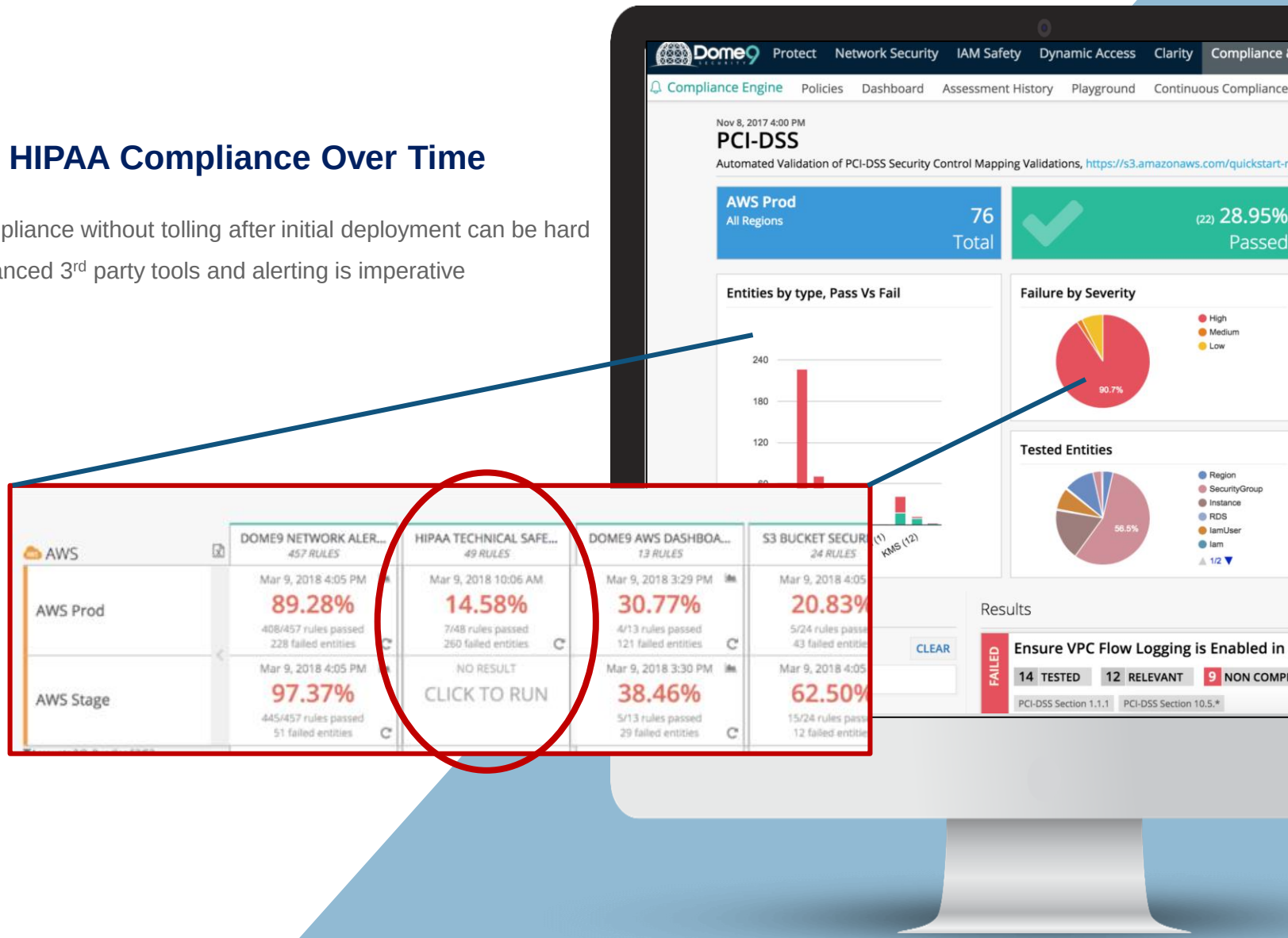
CIS Control 16: Account Monitoring and Control
16.1 Maintain an Inventory of Authentication Systems
16.2 Configure Centralized Point of Authentication
16.3 Require Multi-Factor Authentication
16.4 Encrypt or Hash all Authentication Credentials
16.5 Encrypt Transmittal of Username and Authentication Credentials
16.6 Maintain an Inventory of Accounts
16.7 Establish Process for Revoking Access

CIS Control 8: Malware Defenses
CIS Control 8.1 - 8.8: Malware Defenses
CIS Control 12.1 - 12.12: Boundary Defense
CIS Control 16.8 - 16.13: Account Monitoring and Control
CIS Control 19.1 - 19.8: Incident Response and Management
CIS Control 20.1 - 20.8: Penetration Tests and Red Team Exercises

Advanced Tooling

Maintaining HIPAA Compliance Over Time

- Maintaining compliance without tolling after initial deployment can be hard
- Leveraging advanced 3rd party tools and alerting is imperative



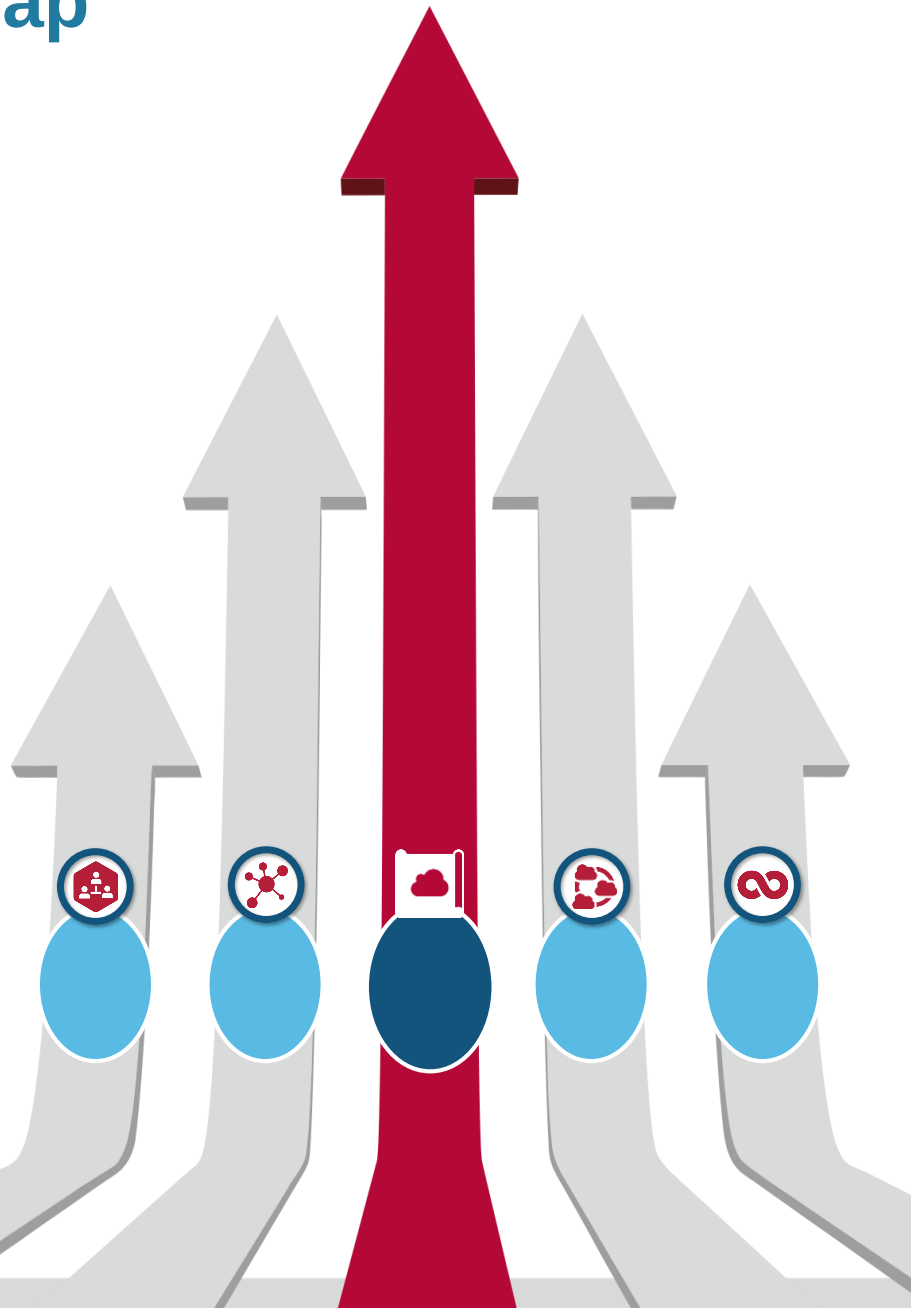
Lesson Learned #2 – Skills Gap

Challenges of Managing The Current Enterprise Skills Gap

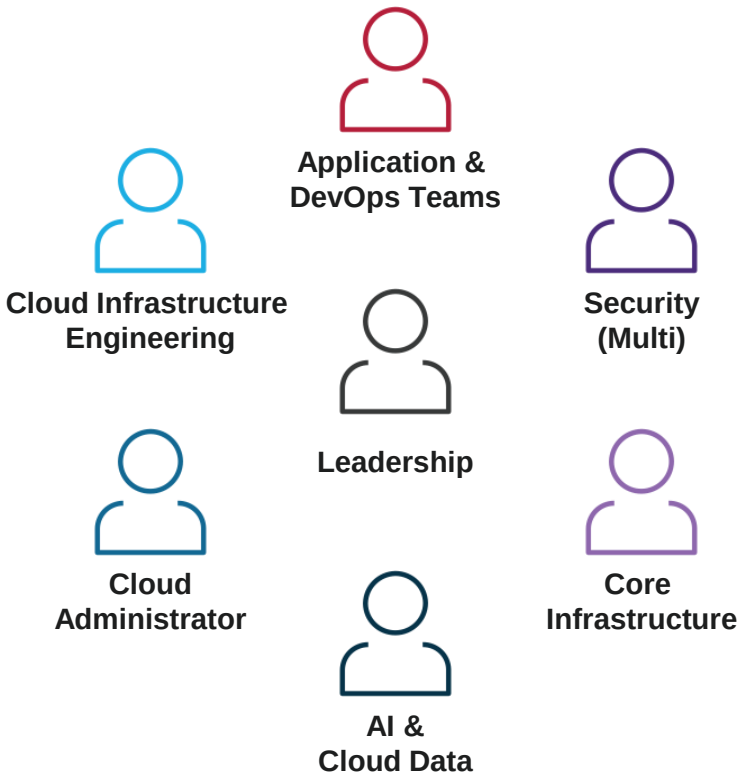
Current Enterprise Skills Gap

- By 2020, 75% of enterprises will experience visible business disruptions due to infrastructure and operations skills gaps, an increase from less than 20% in 2016.
- Leaders confirm that the number and complexity of requirements are growing due to;
  - Internet of Things (IoT)
  - Hybrid IT infrastructure
  - Cloud migrations
  - DevOps requirements

Claudio Da Rold, Distinguished VP Analyst
Gartner (2018)



Create a Cloud Community of Excellence



Q: Why Community vs Center of Excellence?

A: Center creates walls. Community enables and empowers people

Charter

- Provide Business and Application Team with expertise to support digital transformation initiatives
- Culture and alignment of expectations
- Focused on ensuring Security, Performance, Availability, Cost Controls, Governance

Cloud Team Responsibilities

Governance

- Prioritize Services
- Validate Roadmap
- Analyze Costs & Financials Assess Staffing
- Establish Technical Direction
- Evangelize Cloud Services

Plan

- Standardize Infrastructure Configurations
- Review Infrastructure Code
- Define Service Offerings
- Assess Application Placements
- Standardize Provisioning Process
- Resource Preservation Management

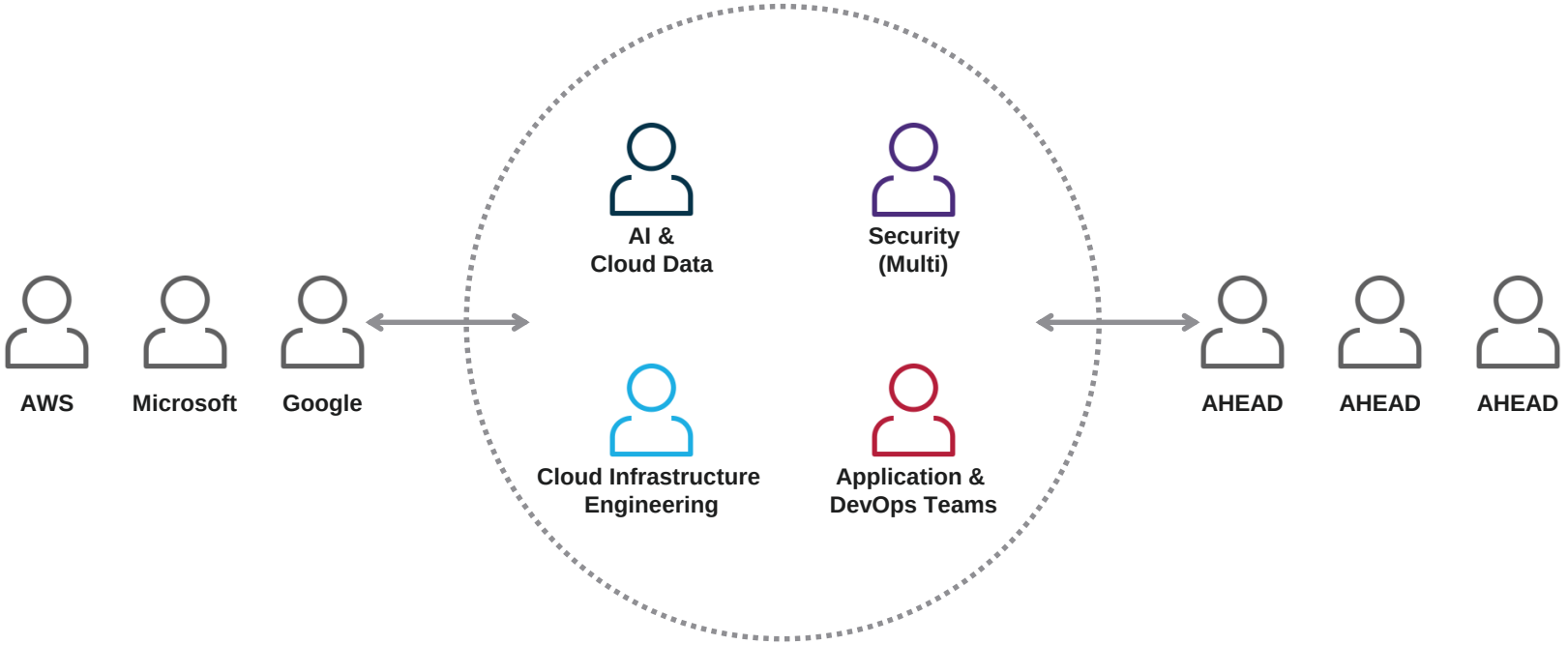
Build

- Automate Services
- Implement & Maintain Code
- Analyze Capacity Management
- Develop OS Configurations
- Implement Security Policies

Run

- Perform Compliance Monitoring
- Enforce security Configurations
- Report on Change Control Impacts
- Perform Private Cloud Fabric Additions
- Maintain Operational Uptime

Incorporate Vendors & Partners



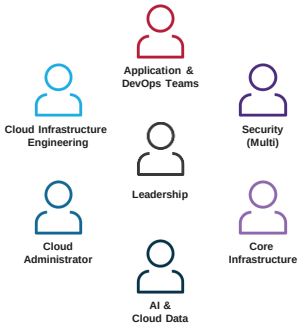
*Don’t let Vendors/Partners become your CCOE

Architecture Review Board (Guidance)

- Review Architectures before deployment
- Enforce Standards
- Review Automation Processes
- Review Cost
- Help **DRIVE** projects forward

Who’s doing what?

Tiger Team and Community



- Be the start
- Explore and evangelize services
- Drive POCs
- Training and Sharing
- Change control review

Cost Optimization and Security (KTLO)

Group of people with responsibilities for keeping house in order.

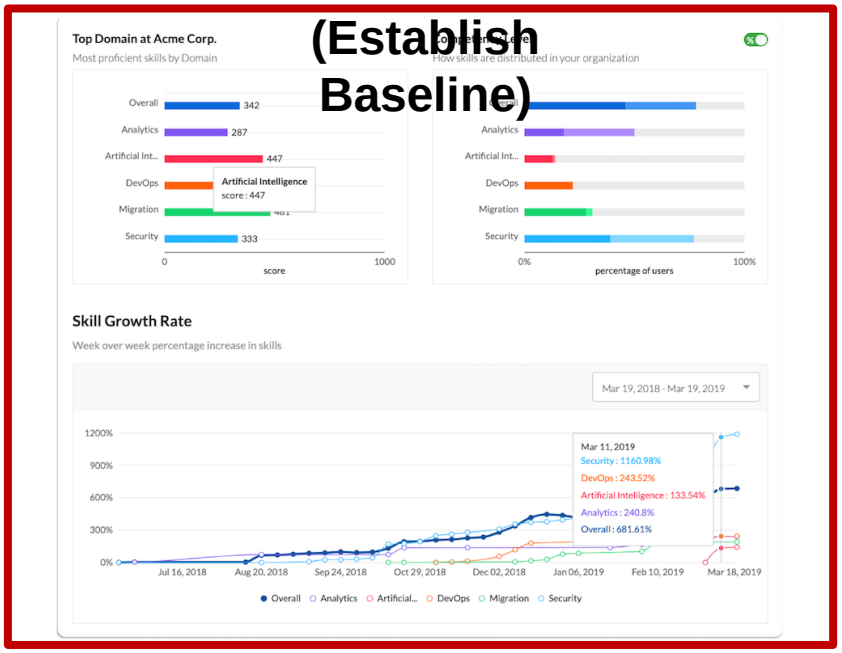
- Cost Optimization
- Sprawl
- Weekly/Monthly Checks (Scheduled)

Architecture Review Board

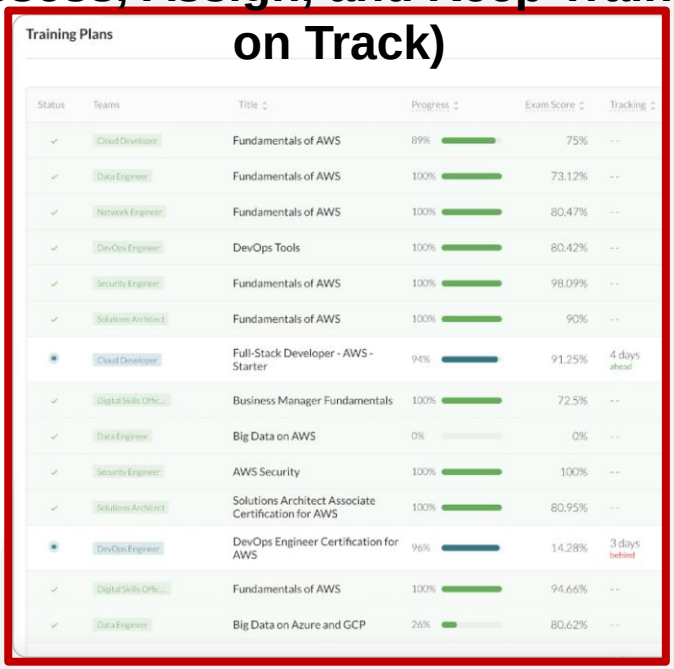
- Review architectures before deployment
- Enforce Standards
- Review Automation Processes

Developing Training Plans

Skill Assessments (Establish Baseline)



Develop Customized Training Plans (Assess, Assign, and Keep Training on Track)



CloudAcademy

Lesson Learned #3 – Master One Cloud First

Concentrate First on Getting One Cloud Provider Right

The Multi-Cloud Myth

Impact on Skills, Training, and Hiring

For most organizations, we recommend seeking deep technical and specialist talent within a single public cloud in order to maximize efficiency and engineering depth.

Operationalizing a Single Cloud Provider

Build the right enterprise guardrails, security, and operational controls and get those right in one platform rather than try to duplicate them across multiple cloud providers.

Concentrate First on Getting One Cloud Provider Right

While there are benefits to a multi-cloud strategy, the potential risks outweigh the gains.

Build a Public Cloud Operating Model

Education

Account Structure

Common Services

Network

Storage, Backup and Disaster Recovery

Identity and Access Management

Automation and Orchestration

Enterprise Service Management Integration

Monitoring and Operations

Security

Cost Controls

Governance

Infrastructure as Code

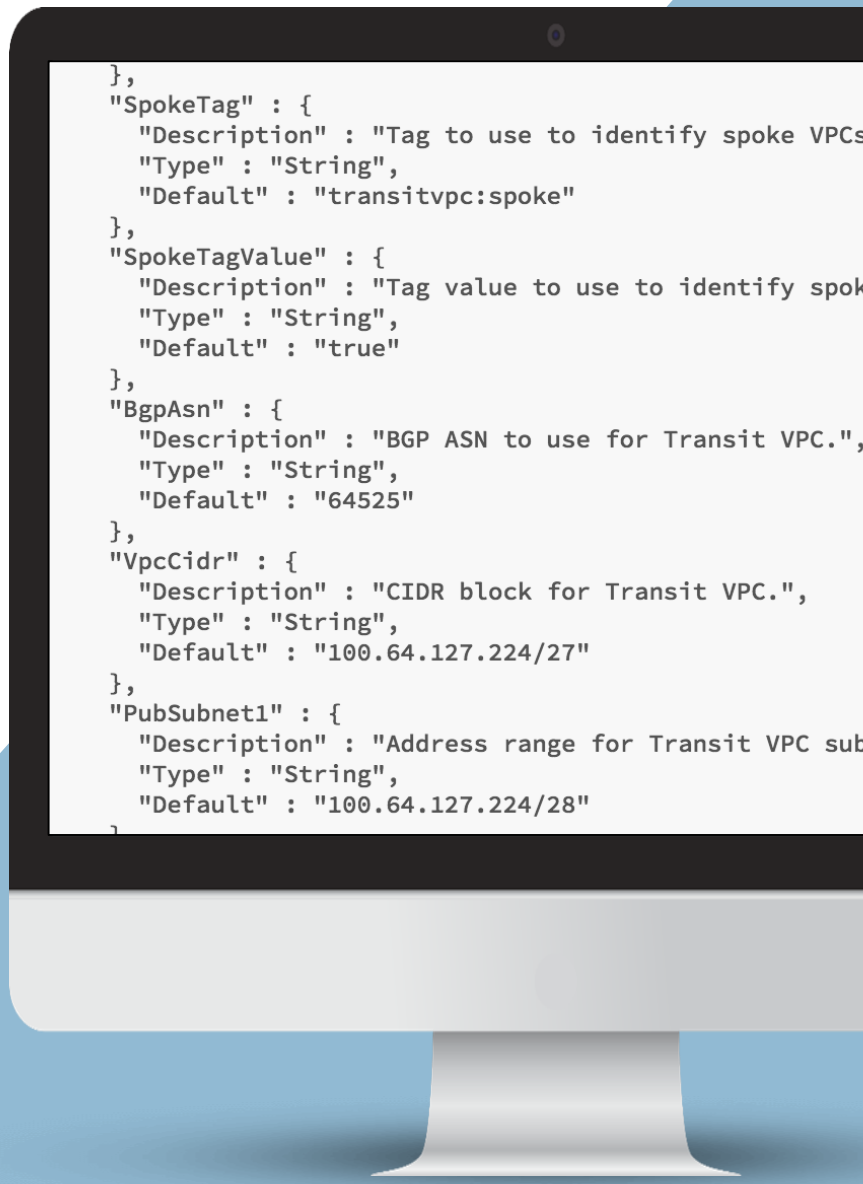
Why Leverage IaC?

Simplify Infrastructure Management

A CloudFormation template is simply a JSON or YAML-formatted text file that describes the AWS infrastructure needed to run an application or service along with any interconnection between them.

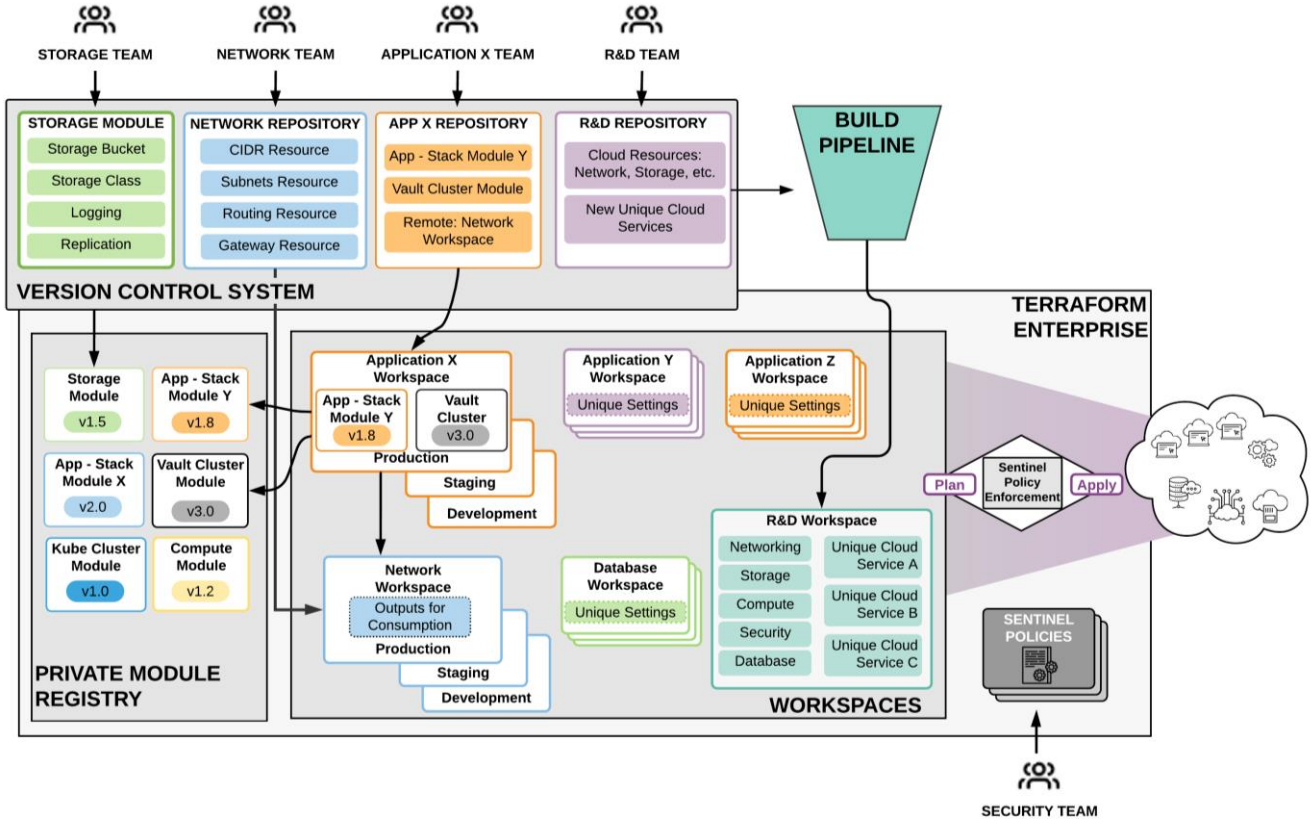
Quickly Replicate Your Infrastructure

Using template parameters enable a single template to be used for many infrastructure deployments with different configuration values, such as how many instances to deploy for the application.



Terraform Enterprise by HashiCorp

Managing Infrastructure as Code at the Enterprise Level



- Enterprise Teams segregated by architectural boundaries
- Teams managing re-usable modules that developers can re-use.
- Re-usable modules to represent the common elements, and then represent each instance as a separate configuration

Questions?