Modernizing Technology Governance

Module – 2 Workflows

# Tradition verses Cloud (Modernized) – Governance

Tradition – Governance

- Information and technology (IT) governance is a subset discipline of corporate governance, focused on information and technology (IT) and its performance and risk management.

- The interest in IT governance is due to the on-going need within organizations to focus value creation efforts on an organization's strategic objectives and to better manage the performance of those responsible for creating this value in the best interest of all stakeholders.
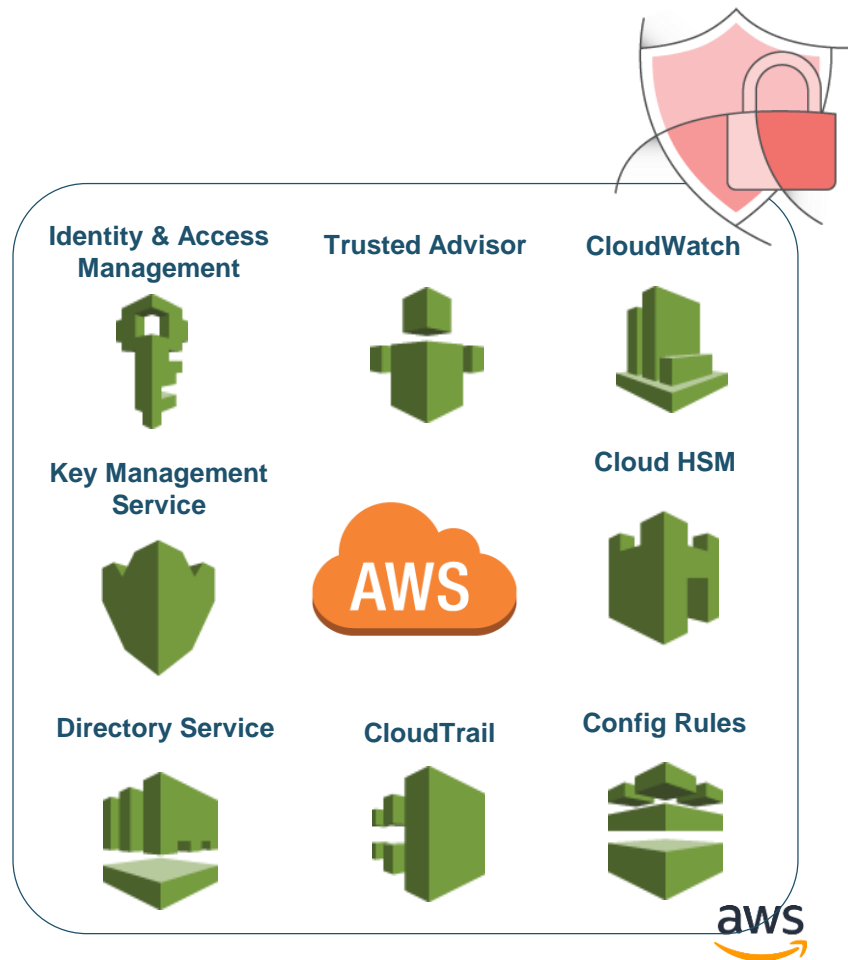
Cloud – Governance

- Technology drives your governance alignment

- Governance is a "Shared Responsibility"

- Automation is the *Key* to successful governance

- Pre-Cloud decision making process are paramount (e.g. service selection, policies, frameworks architecture, data protections, etc.).

- Focus is on Continuous Risk Treatments (CRT)
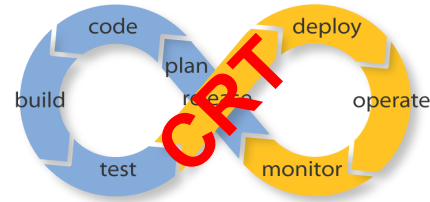
Security by Design

Security by Design (SbD) is a security assurance approach that formalizes AWS account design, automates security controls, and streamlines auditing.

Instead of relying on auditing security retroactively, SbD provides security control built in throughout the AWS IT management process.

Identity & Access Management

Trusted Advisor

CloudWatch

Key Management Service

AWS

Cloud HSM

Directory Service

**CloudTrail**

Config Rules

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Security by Design - *Design Principles*

Developing new risk mitigation capabilities, which go beyond global security frameworks, by treating risks, eliminating manual processes, optimizing evidence and audit ratifications processes through rigid automation
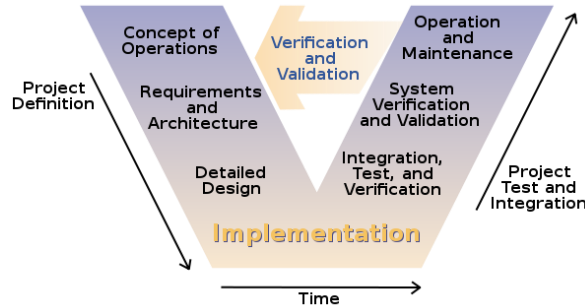
- Build security in every layer
- Design for failures
- Implement auto-healing
- Think parallel
- Plan for Breach

- Don't fear constraints
- Leverage different storage options
- Design for cost
- Treat Infrastructure as Code
    - Modular
    - Versioned
    - Constrained
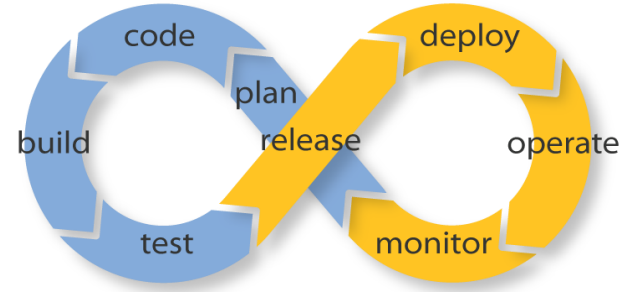
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So why Security by Design…
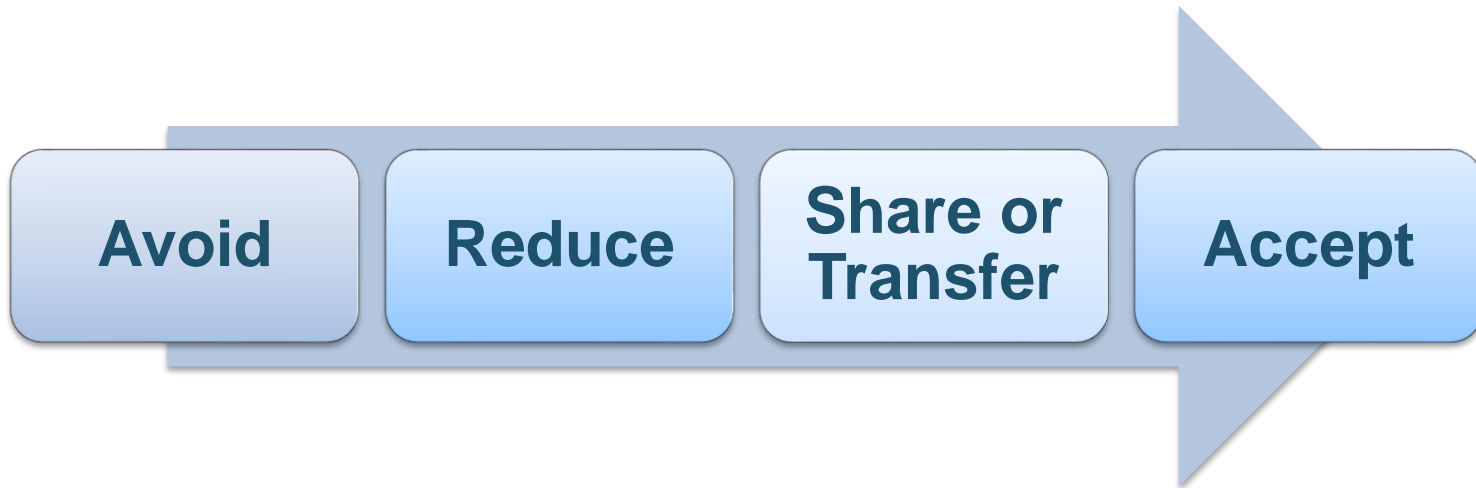
Waterfall
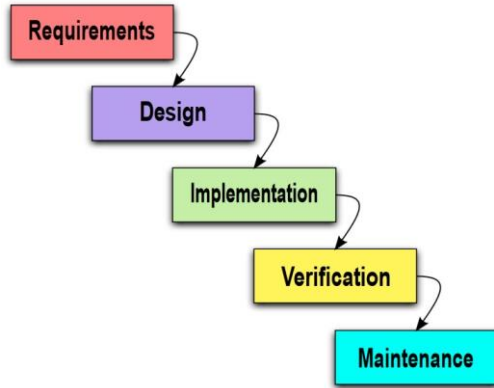
V-model

DevOps

- Designed for fixed requirements
- Must finish the whole before any part is usable
- Linear steps w verification gate
- Manual processes
- Infrequent system changes

- Designed for fixed requirements
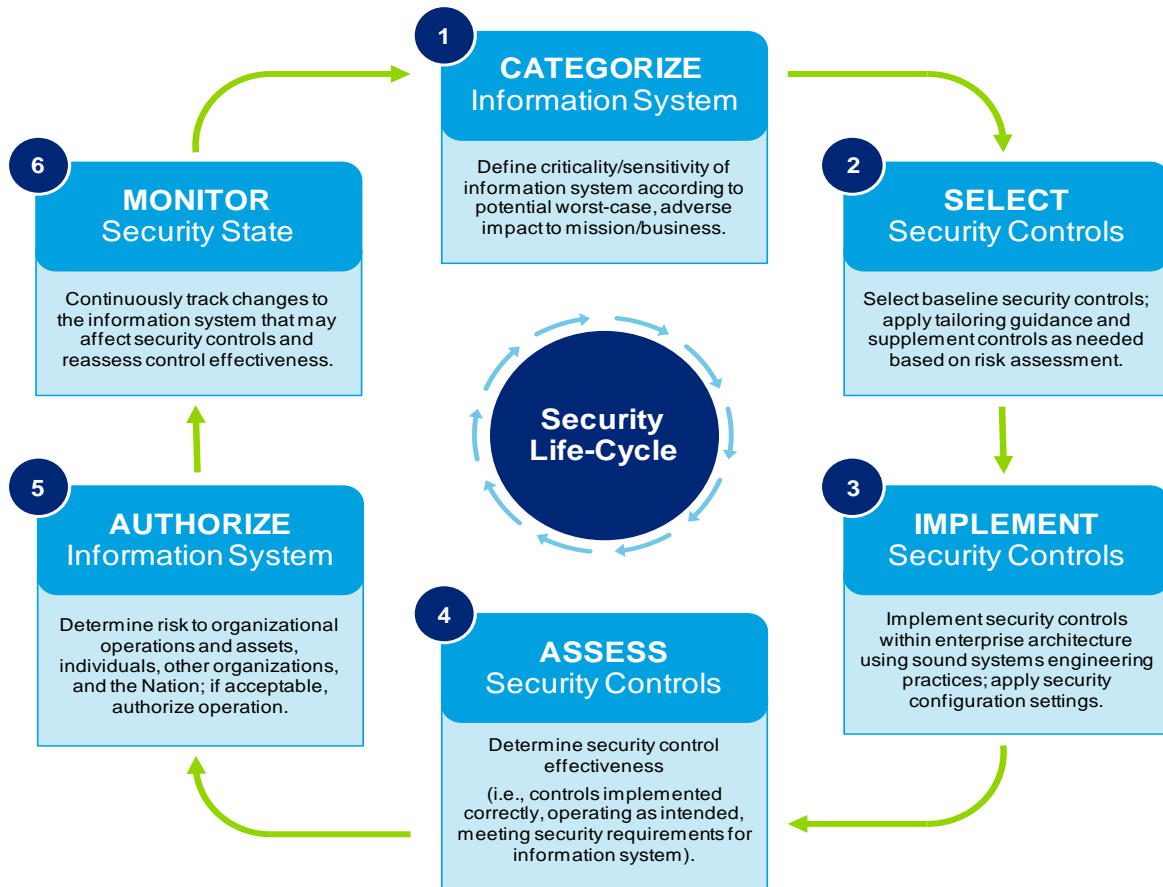- Must finish the whole before any part is usable
- Waterfall + earlier test planning
- Manual processes + tools
- Periodic system changes

- Designed for changing requirements
- Deliver smaller parts with immediate functionality
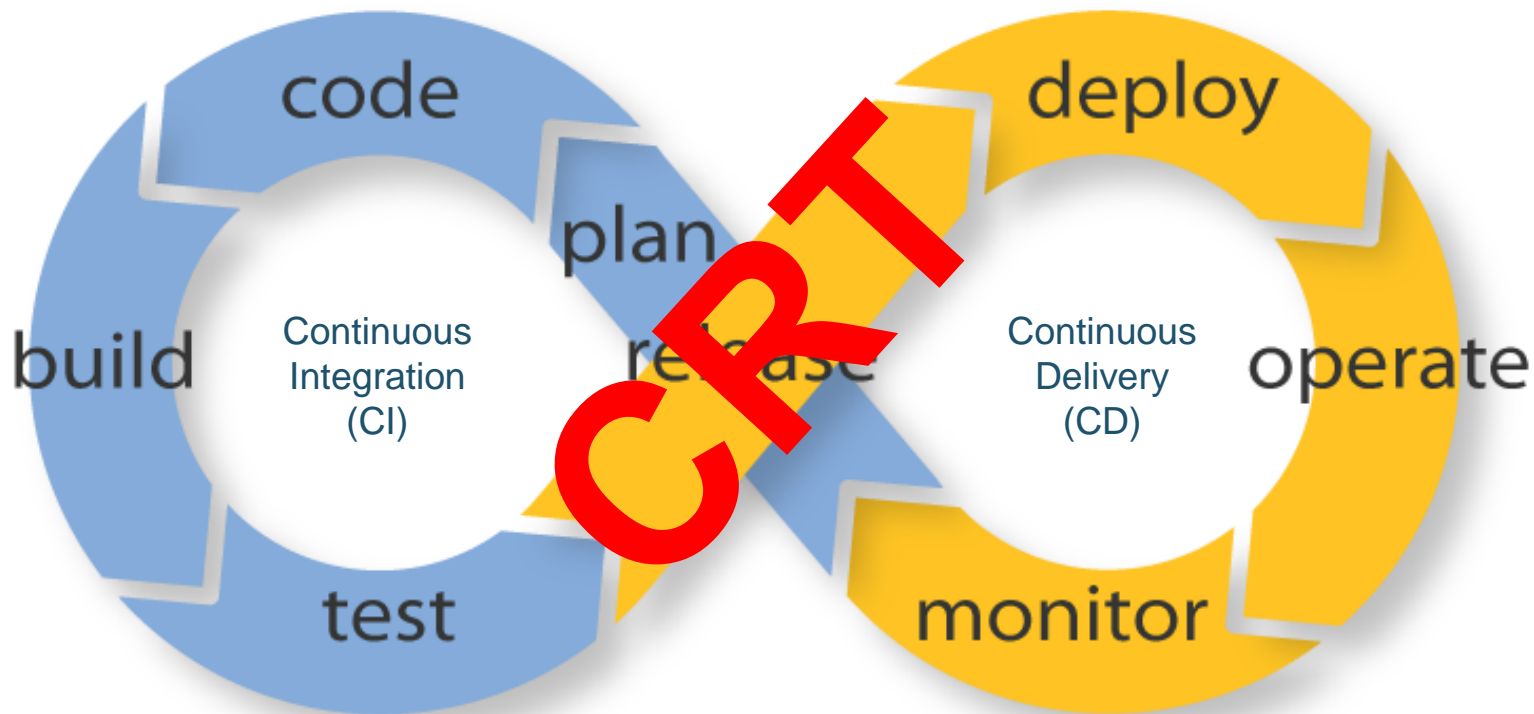- Iterative steps w testing in each
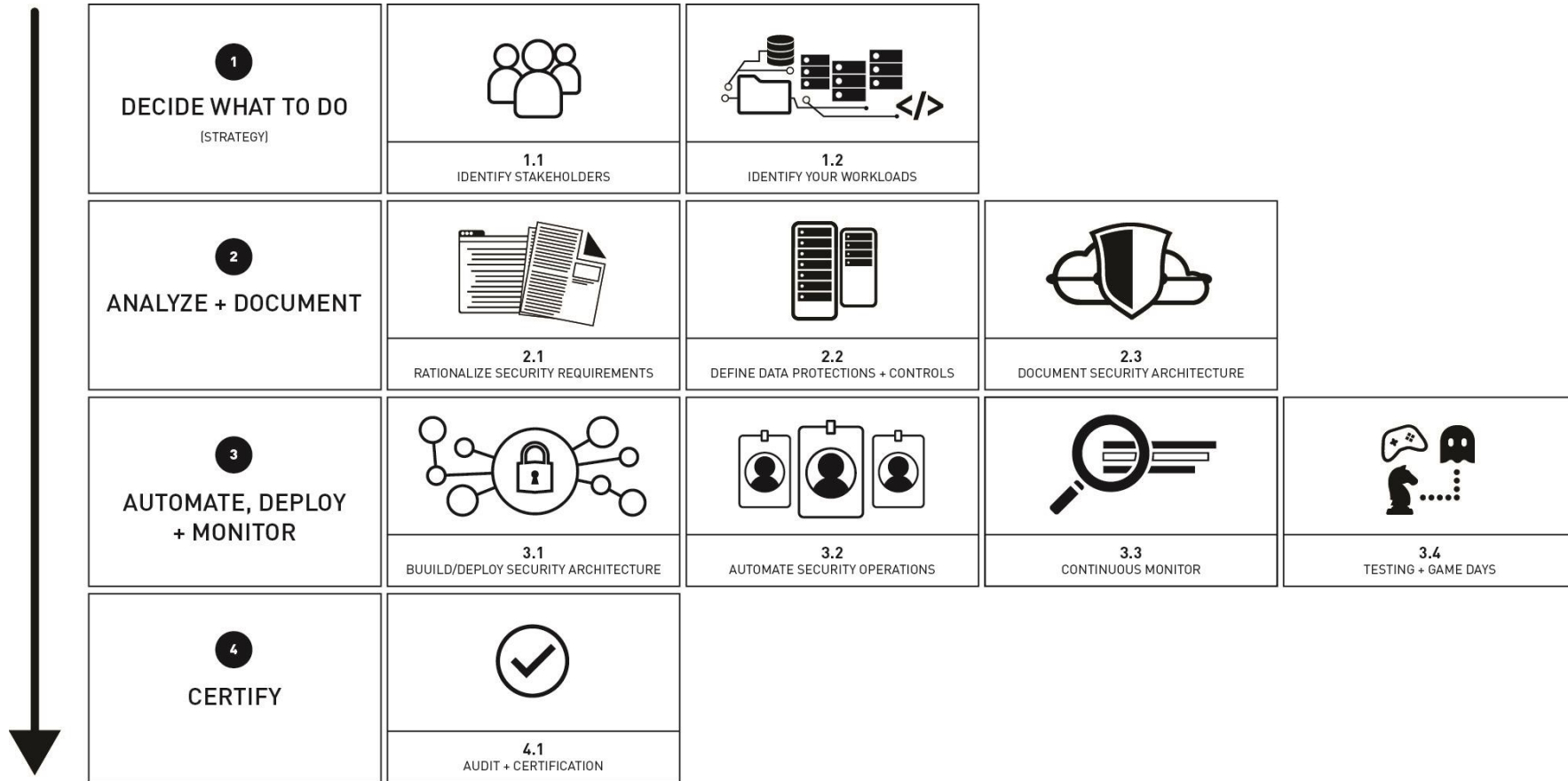- Continuous deployment

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Traditional Risk Treatments

Avoid   **Reduce**   **Share or Transfer**   **Accept**

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Traditional Security Lifecycle

Security Life-Cycle

1 CATEGORIZE Information System

Define criticality/sensitivity of information system according to potential worst-case, adverse impact to mission/business.

2 SELECT Security Controls

Select baseline security controls; apply tailoring guidance and supplement controls as needed based on risk assessment.

3 IMPLEMENT Security Controls

Implement security controls within enterprise architecture using sound systems engineering practices; apply security configuration settings.

4 ASSESS Security Controls

Determine security control effectiveness

(i.e., controls implemented correctly, operating as intended, meeting security requirements for information system).

5 AUTHORIZE Information System

Determine risk to organizational operations and assets, individuals, other organizations, and the Nation; if acceptable, authorize operation.

6 MONITOR Security State

Continuously track changes to the information system that may affect security controls and reassess control effectiveness.

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DevOps

Modernizing Technology Governance (MTG)

Step 1 - Decide what to do (Strategy)

1.1 Identify Business Units

Corporate HQ

Division

Division

Division

Sales, Business Development and
Marketing

- No regulatory requirements
- Interconnections between HQ &
  Other divisions

HIPAA

FISMA
FEDERAL INFORMATION SECURITY MANAGEMENT ACT

NIST 800-171
Compliance Criteria

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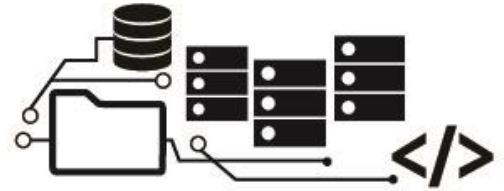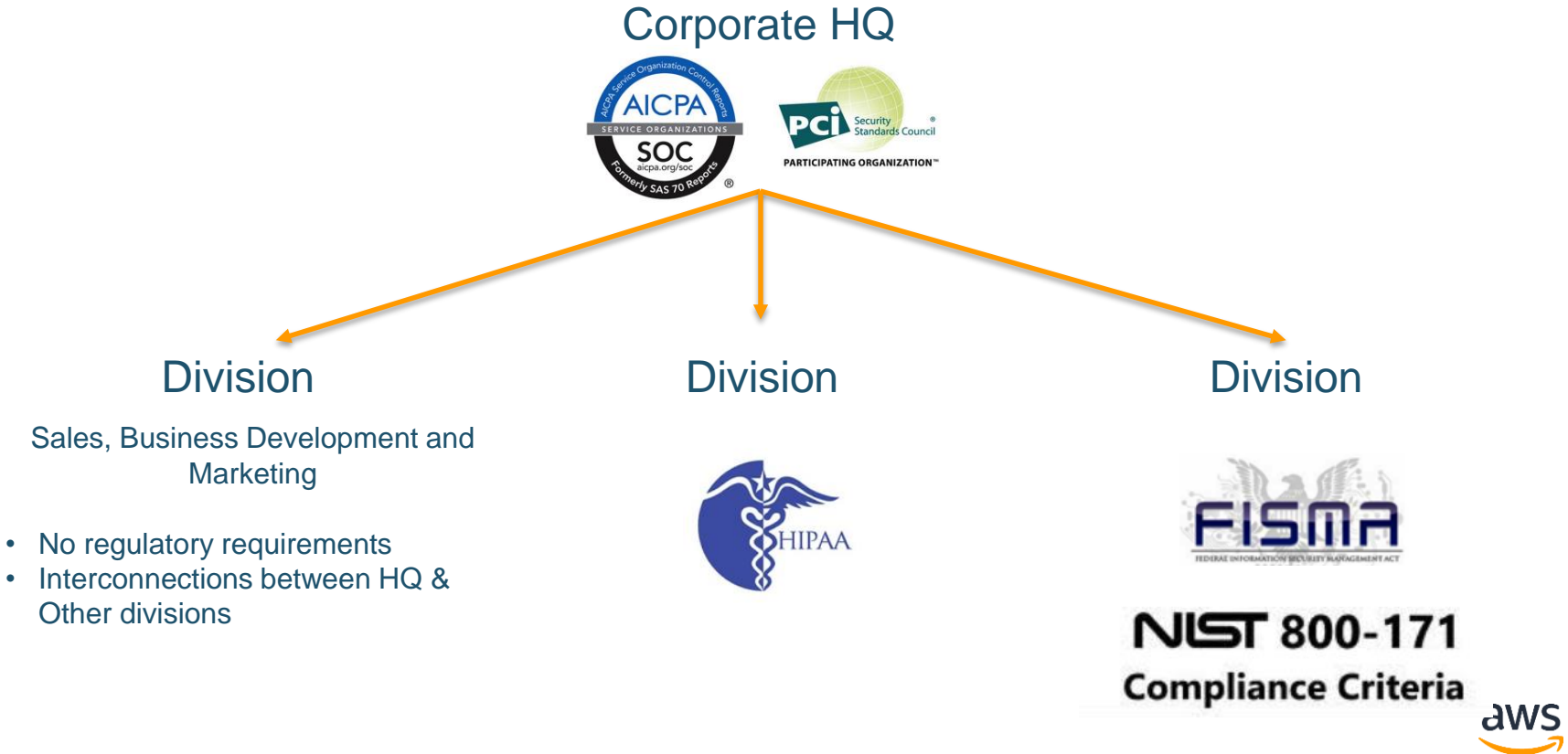
1.2 Identify your workloads

People
Employees
Customers

Technologies
Server/Severless
Data Containers
Applications

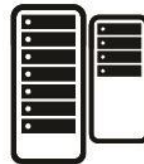**Processes**

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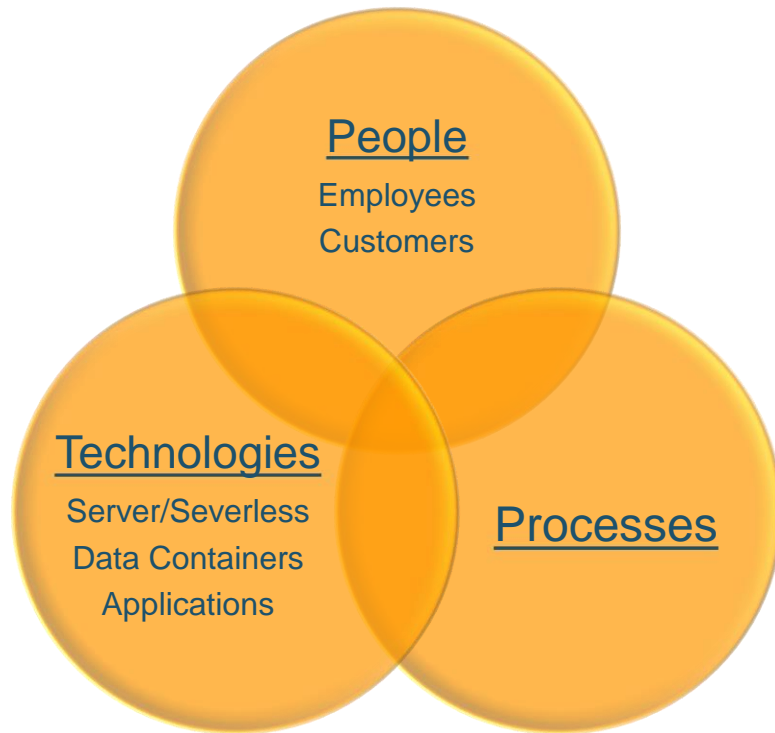
Phase 2 - Analyze, Define and Document

ANALYZE + DOCUMENT

2.1
RATIONALIZE SECURITY REQUIREMENTS

2.2
DEFINE DATA PRODUCTION + CONTROLS

2.3
DOCUMENT SECURITY ARCHITECTURE

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Rationalizing the Security Requirements

Industry Standards	Common Practices	Laws and Regulations	Internal Sources
PCI DSS	AICPA Privacy Framework	EU GDPR	Policies
FISMA	ISO	E-Government Act	Standards
HIPAA	NIST RFM	Gramm–Leach–Bliley Act	Contracts
ISO 27002		Sarbanes–Oxley Act	
NIST 800-171		HIPAA/HITECH Act	

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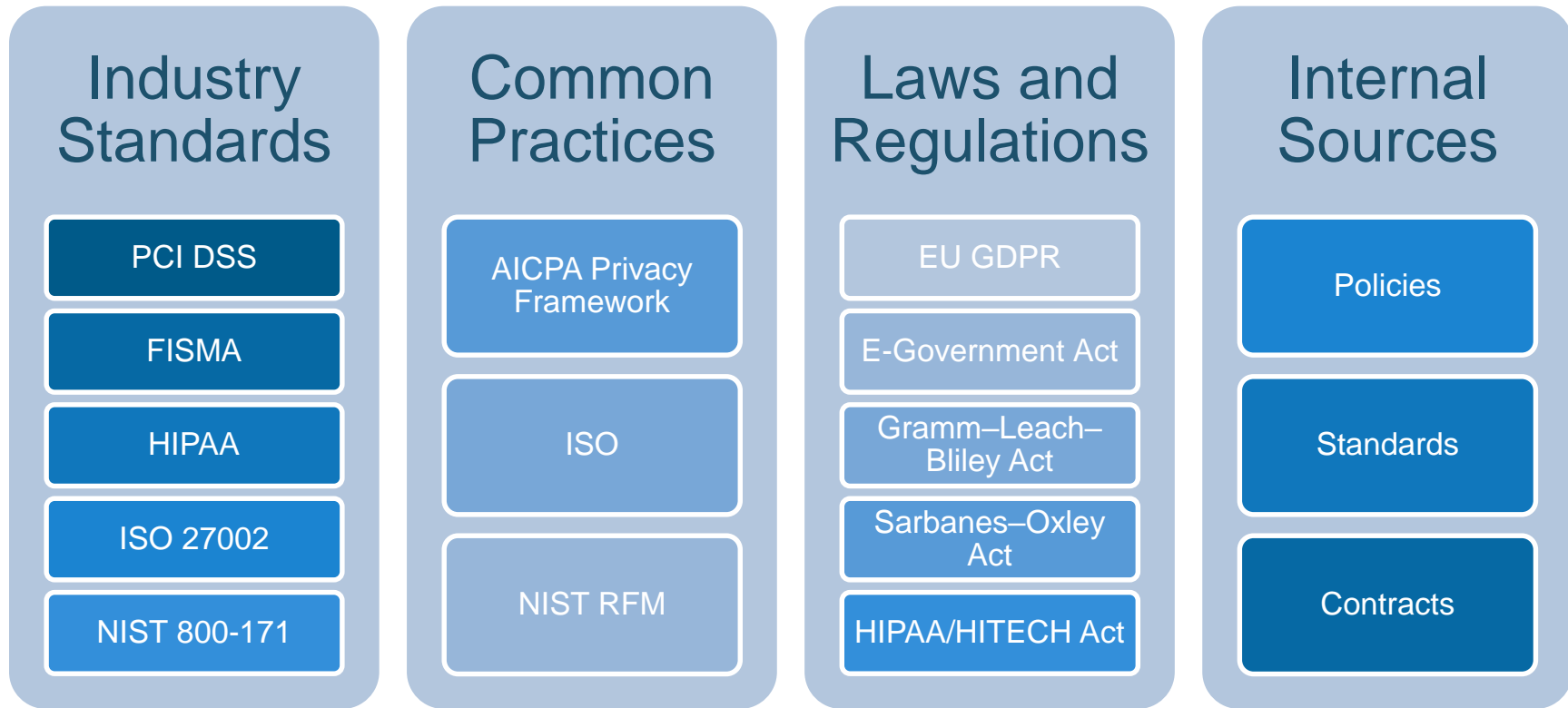
Shared Responsibility Control Types

Control Type	Description
Inherited Controls	Controls which a customer fully inherits from AWS (e.g. Data Center Controls).
Hybrid Controls	Controls for which AWS provides partial implementation of the control requirement, but require the customer to also take responsibility to fully implement the control requirement. (e.g. Access Controls and Resiliency).
Shared controls	Controls which apply to both the infrastructure layer and customer layers, but in completely separate contexts or perspectives. In a shared control, AWS provides the requirements for the infrastructure, and the customer must provide their own control implementation within their use of AWS services.
Customer Specific	Controls which are solely the responsibility of the customer, based on the application they are deploying within AWS services.

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Inherited Security and Compliance

Control #	Control Name	Control #	Control Name	Control #	Control Name
A.11.1.1	Physical security perimeter	A.11.2.1	Equipment siting and protection	A.11.2.7	Equipment siting and protection
A.11.1.2	Physical entry controls	A.11.2.2	Supporting utilities	A.11.2.8	Supporting utilities
A.11.1.3	Securing offices, rooms and facilities	A.11.2.3	Cabling security	A.11.2.9	Cabling security
A.11.1.4	Protecting against external and environmental threats	A.11.2.4	Equipment maintenance	A.11.2.7	Equipment maintenance
A.11.1.5	Working in secure areas	A.11.2.5	Removal of assets	A.17.2.1	Availability of information processing facilities
A.11.1.6	Delivery and loading areas	A.11.2.6	Security of equipment and assets off-premises	A.13.1.2	Communications security

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Rationalizing Controls

PCI-DSS 3.2
10.1: Implement audit trails to link all access to system components to each individual user. It is critical to have a process or system that links user access to system components accessed…
10.2: Implement automated audit trails for all system components to reconstruct the following events…

NIST 800-53 revision 4
AU-2: Audit Events - The organization: a. Determines that the information system is capable of auditing the following events…
AU-3: Content of Audit Records - The information system generates audit records containing information that establishes what type of event occurred…

HIPAA Security Rule
164.308(a)(1)(ii)(D) - Implement procedures to regularly review records of information system activity, such as audit logs, access reports, and security incident tracking reports…
164.308(a)(5)(ii)(c) - Procedures for monitoring log-in attempts and reporting discrepancies…

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Fused Control Approach

Fused Audit Trail (Control Example) - Implement auditing for the following events (e.g. people, processes and actions) within the organizational use of cloud computing. Monitor for both positive and negative actions of users, system, services and applications. Secure, retain and automated audit trails as well as create communication paths to other security systems for analysis, reporting and investigations.

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Define Data Protections

2.2
DEFINE DATA PROTECTIONS + CONTROLS

Problem Statement…

Issue #1 – The majority of organization do not have a mature "Data Classification" policy, process or user education schemes for internal use of data.

Issue #2 – Most organizations do not have a clean single source of "Truth" for what is their authoritive source for data. (Structured or Unstructured).

Issue #3 – Most organizations do not have an "Data Lifecycle" policy, procedure and/or operational processes for how data should be derived, protected, used, secured, transferred, achieved and destroyed when no longer relevant.

Structured Data	Unstructured Data

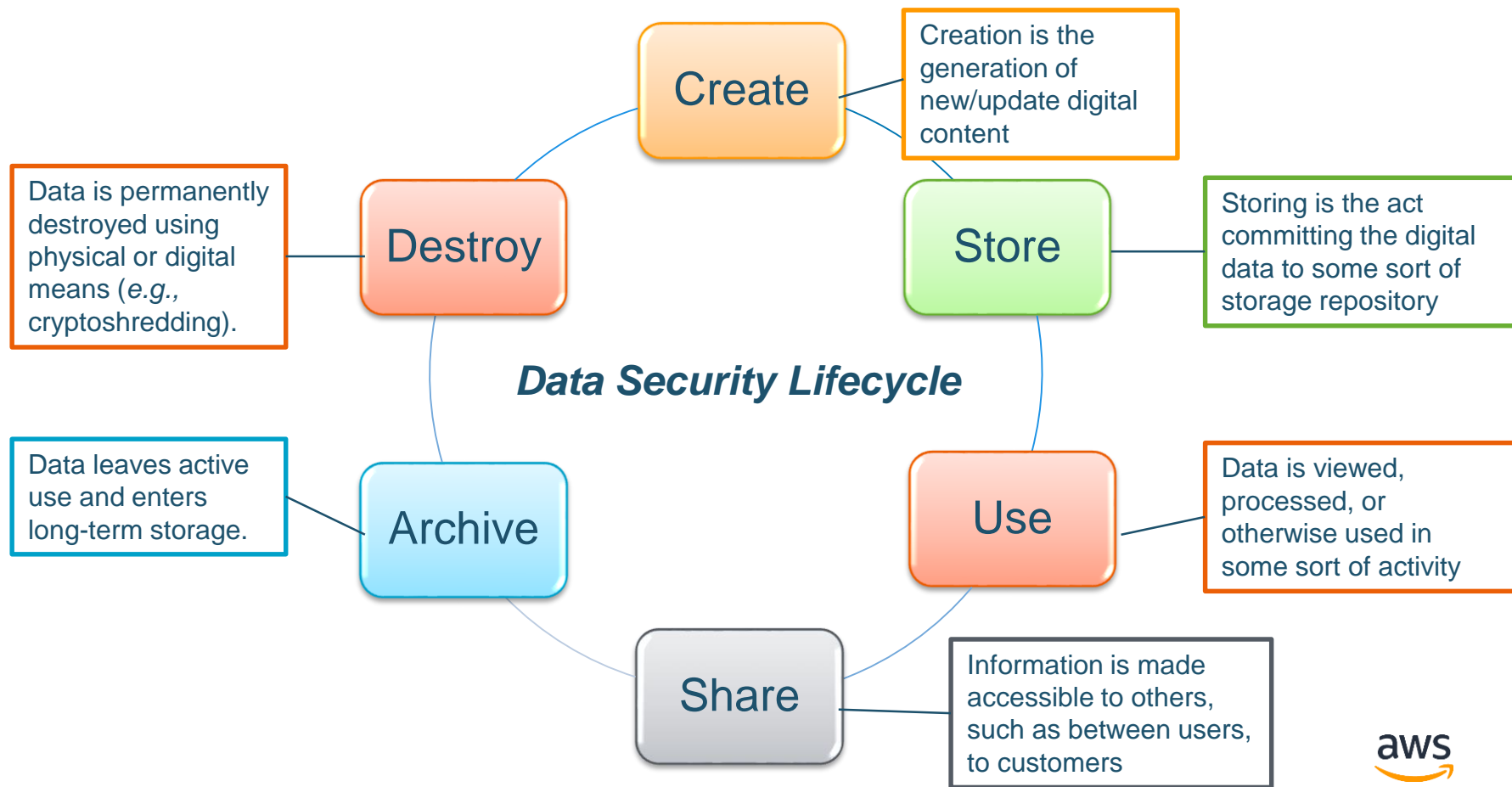| 0.103	0.176	0.387	0.300	0.379
0.333	0.384	0.564	0.587	0.857
0.421	0.309	0.654	0.729	0.228
0.266	0.750	1.056	0.936	0.911
0.225	0.326	0.643	0.337	0.721
0.187	0.586	0.529	0.340	0.829
0.153	0.485	0.560	0.428	0.628

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Data Protection Requirements

There are a number of regulatory, standards and frameworks which can impact data cloud computing.

- US - Health Insurance Portability and Accountability Act (HIPPA)
- US - Health Information Technology for Economic and Clinical Health Act (HITECH Act)
- US - Consumer Data Security and Notification Act (Amendment to Gramm-Leach-Bliley Act)
- EU - Directive 95/46/EC of the European Parliament and of the Council
- EU - Directive 2002/58 on Privacy and Electronic Communications (e.g.-Privacy Directive)
- General Data Protection Regulation (GDPR) (Regulation (EU) 2016/679)

- Canada - The Personal Information Protection and Electronic Documents Act (PIPEDA)
- UK - Data Protection Act 1998 (DPA)
- Australian - The Federal Privacy Act 1988
- Japan - The Act on the Protection of Personal Information ("APPI")
- Singapore - Personal Data Protection Act 2012
- Philippines - Data Privacy Act of 2012
- South Korea - Personal Information Protection Act ("PIPA")
- Hong Kong - The Personal Data (Privacy) Ordinance (Cap. 486) ("Ordinance")

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Data Protection Considerations

- **Access Controls**: Ensure organization can manage access to their content, services and resources independently of the cloud service provider.
  - Additionally, ensure cloud provider supports advanced set of access controls (MFA), encryption, and logging features.

- **Contractually**: Ensure the cloud providers does not access or use customer content for any purpose other than as legally required and for maintaining the cloud services.

- **Storage Locations**: Organization should be able to choose the geographic location in which their content will be stored. Cloud Providers should not move or replicate customer content outside of the customer's chosen locations.

- **Security**: Customers should choose how their customer content is secured. Through the use of various encryption of content in transit or at rest.
  - Additionally, organization should ensure they have option to manage their own encryption keys.

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Define Data Protection + Controls

Data Security Lifecycle

- **Create** — Creation is the generation of new/update digital content
- **Store** — Storing is the act committing the digital data to some sort of storage repository
- **Use** — Data is viewed, processed, or otherwise used in some sort of activity
- **Share** — Information is made accessible to others, such as between users, to customers
- **Archive** — Data leaves active use and enters long-term storage.
- **Destroy** — Data is permanently destroyed using physical or digital means (*e.g.,* cryptoshredding).

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(Security Controls + Data Protections)

- Define your architecture capacity in advance
- Align your Test/Dev systems to Production
- Automate your Architecture
- Enable Continuous integration and Deploy
- Create a Tagging Strategy
- Enable a Data Protection architecture
- Test and game days

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Defining a Tagging Strategy for Data Protection

Tagging allows organization to assign metadata to their cloud resources in the form of *tags*. Each tag is a simple label consisting of an organizational-defined key and an optional value that can make it easier to manage, search for, and filter resources.

Although there are no inherent types of tags, they enable organizations to categorize resources by purpose, owner, environment, or other criteria. As an example AWS has an outline of commonly used tagging categories and strategies to help AWS customers implement a consistent and effective tagging strategy.

General Best Practices for Tagging

- Always use a standardized, case-sensitive format for tags, and implement it consistently across all resource types.

- Consider tag dimensions that support the ability to manage resource access control, cost tracking, automation, and organization.

- Implement automated tools to help manage resource tags.

- The Resource Groups Tagging API enables programmatic control of tags, making it easier to automatically manage, search, and filter tags and resources. It also simplifies backups of tag data across all supported services with a single API call per AWS Region.

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Tagging Categories

Companies that are most effective in their use of tags typically create business-relevant tag groupings to organize their resources along technical, business, and security dimensions.

Companies that use automated processes to manage their infrastructure also include additional, automation-specific tags to aid in their automation efforts.

Technical Tags	Tags for Automation	Business Tags	Security Tags
Name – Used to identify individual resources	**Date/Time** – Used to identify the date or time a resource should be started, stopped, deleted, or rotated	**Owner** – Used to identify who is responsible for the resource	**Confidentiality** – An identifier for the specific data-confidentiality level a resource supports
Application ID – Used to identify disparate resources that are related to a specific application	**Opt in/Opt out** – Used to indicate whether a resource should be automatically included in an automated activity such as starting, stopping, or resizing instances	**Cost Center/Business Unit** – Used to identify the cost center or business unit associated with a resource; typically for cost allocation and tracking	**Compliance** – An identifier for workloads designed to adhere to specific compliance requirements
Application Role – Used to describe the function of a particular resource (e.g. web server, message broker, database)	**Security** – Used to determine requirements such as encryption or enabling of VPC Flow Logs, and also to identify route tables or security groups that deserve extra scrutiny	**Customer** – Used to identify a specific client that a particular group of resources serves	
Cluster – Used to identify resource farms that share a common configuration and perform a specific function for an application		**Project** – Used to identify the project(s) the resource supports	
Environment – Used to distinguish between development, test, and production infrastructure			
Version – Used to help distinguish between different versions of resources or applications			

Security Architecture

2.3
DOCUMENT SECURITY ARCHITECTURE

Flexibility and Complexity

How many AWS accounts

Single VPC or Multiple VPCs

IAM groups or roles

Public or private subnets

Security groups or NACLs

Can we use S3 for this

What type of encryption

Who will manage the keys

Which AWS database

What is the regulatory requirement?

What's in-scope or out-of-scope?

How to verify the standards are met?

AWS Security Architecture Recipes

AWS has partnered with CIS Benchmarks to create consensus-based, best-practice security configuration guides which will align to multiple security frameworks globally.

The Benchmarks are:

- Recommended technical control rules/values for hardening operating systems, middle ware and software applications, and network devices;

- Distributed free of charge by CIS in .PDF format

- Used by thousands of enterprises as the basis for security configuration policies and the de facto standard for IT configuration best practices.

https://www.cisecurity.org/

Document your Security Architecture

Automated multi-AZ failover
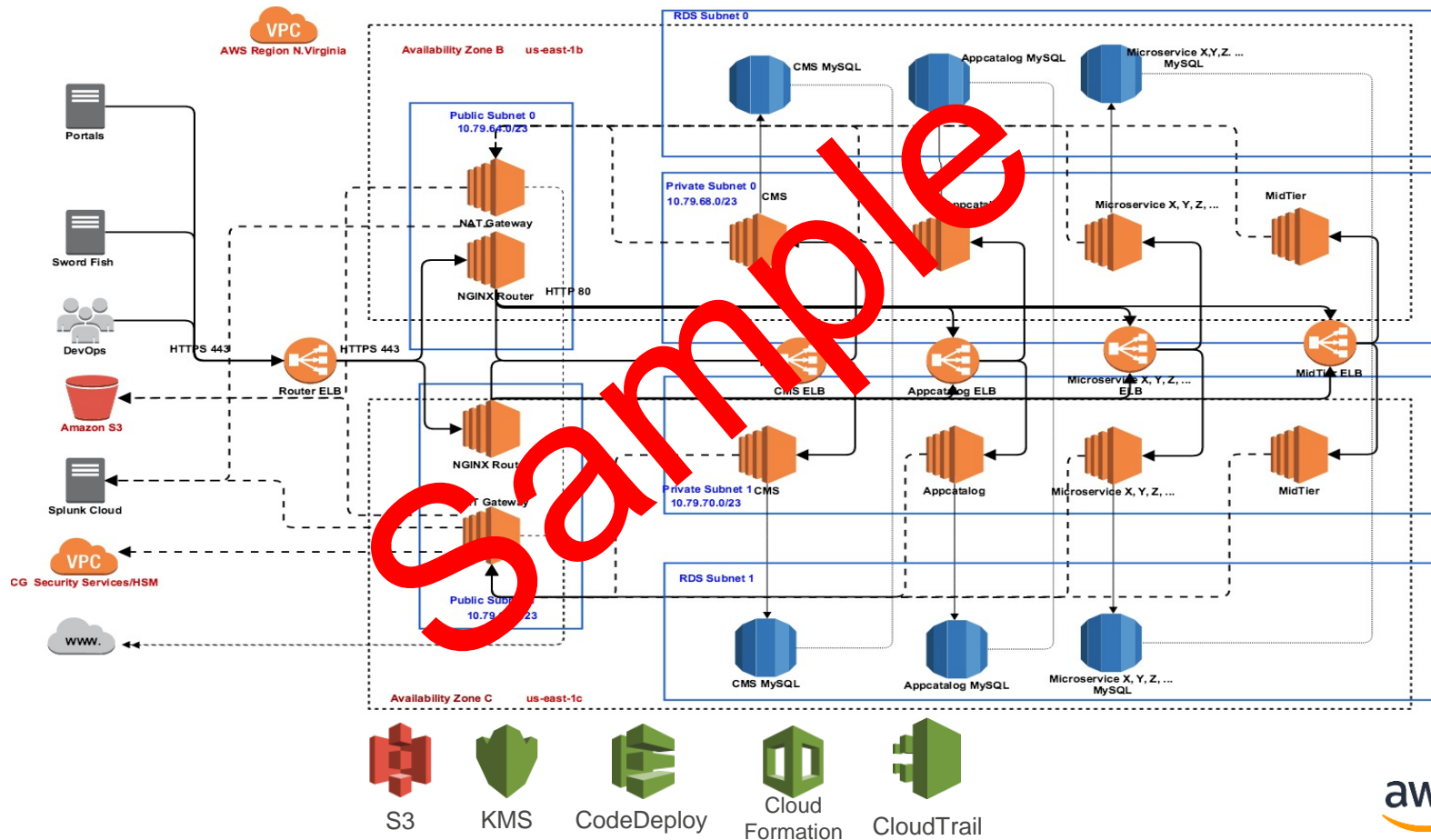
Note: All tiers are designed for automated multi-AZ failover
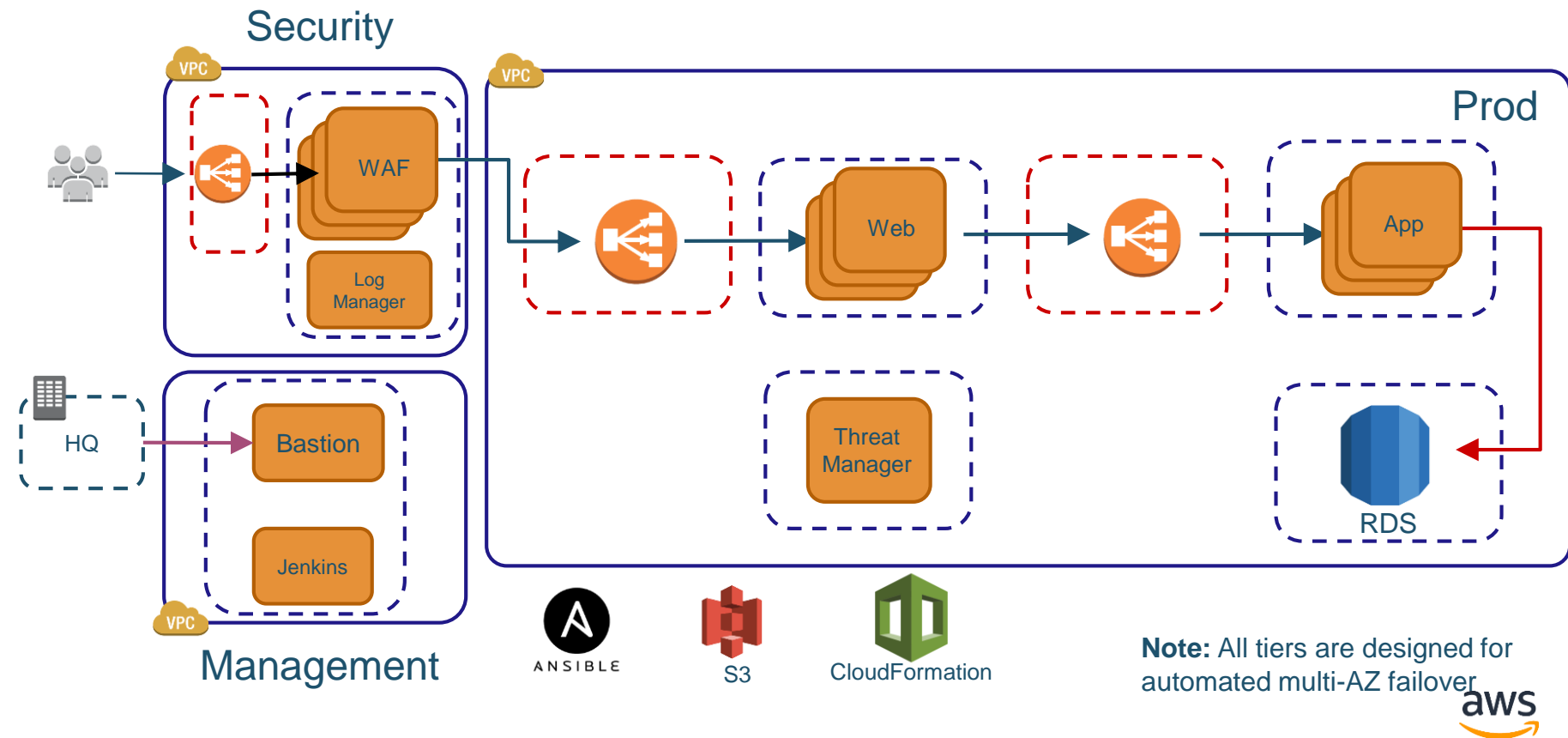
Governance as Code – *Alignments*
Modernizing Technology Governance *in the Cloud*

Risk Management
Security & Compliance lifecycle

Human Governance
Policy, Procedure and System Security Plans

Incident Response
(Identify, Protect, Detect, Respond & Recover)

Configuration Management
(Packaging, Configuration and Continuous Delivery)

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Governance as Code

Is the process of managing and provisioning machine-readable definition files, templates, scripts and recipes for regulatory workload configurations. GaC interacts with Continuous Configuration Automation (CCA) tools (e.g., Chef, Puppet, Ansible etc.) and can be thought of as an extension of traditional Infrastructure of Code frameworks. The goal of GaC is to version control solutions as scripts or declarative definitions which meet regulatory requirements and adherence with audit frameworks.

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GaC continued…

There are generally three approaches to GaC:

- **Declarative (functional**) – Aspirational (e.g. **desired state**) target configuration against regulatory requirements.
- **Imperative (procedural)** – Defines code management (**desired conclusion**) and assertion to the regularity adherence.
- **Intelligent (environment aware)** – Specifies the configuration (**correct desired state**) based on relationships, dependencies and interaction in a regulated production environment.

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Questions

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