Secure by Design

AWS Security Workshop

Agenda

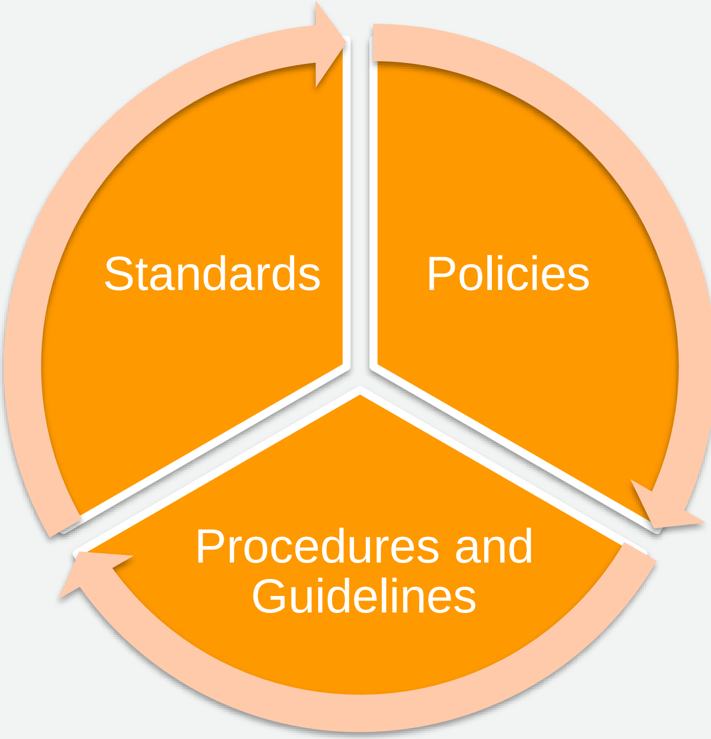
- Modernize Technical Governance
- Defining your control environment
- AWS Control Tower
- DevSecOps
- Automate Security Operations
- Continuous Compliance

Goals

- Learn how to mitigate risk
- Understand security design principles
- Discover tools to automate security enforcement at scale
- Realize that scale does not sacrifice granular security

Modernize Technology Governance

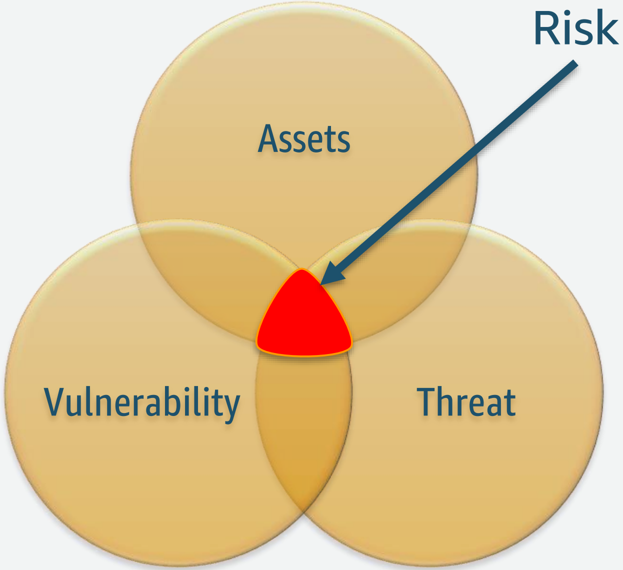
Current State – Technology Governance



Issues – Technology Governance

The majority of technology governance processes relies predominantly on administrative and operational security controls with *limited* technology enforcement.

AWS has an opportunity to innovate and advance ***Technology Governance Services***.



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

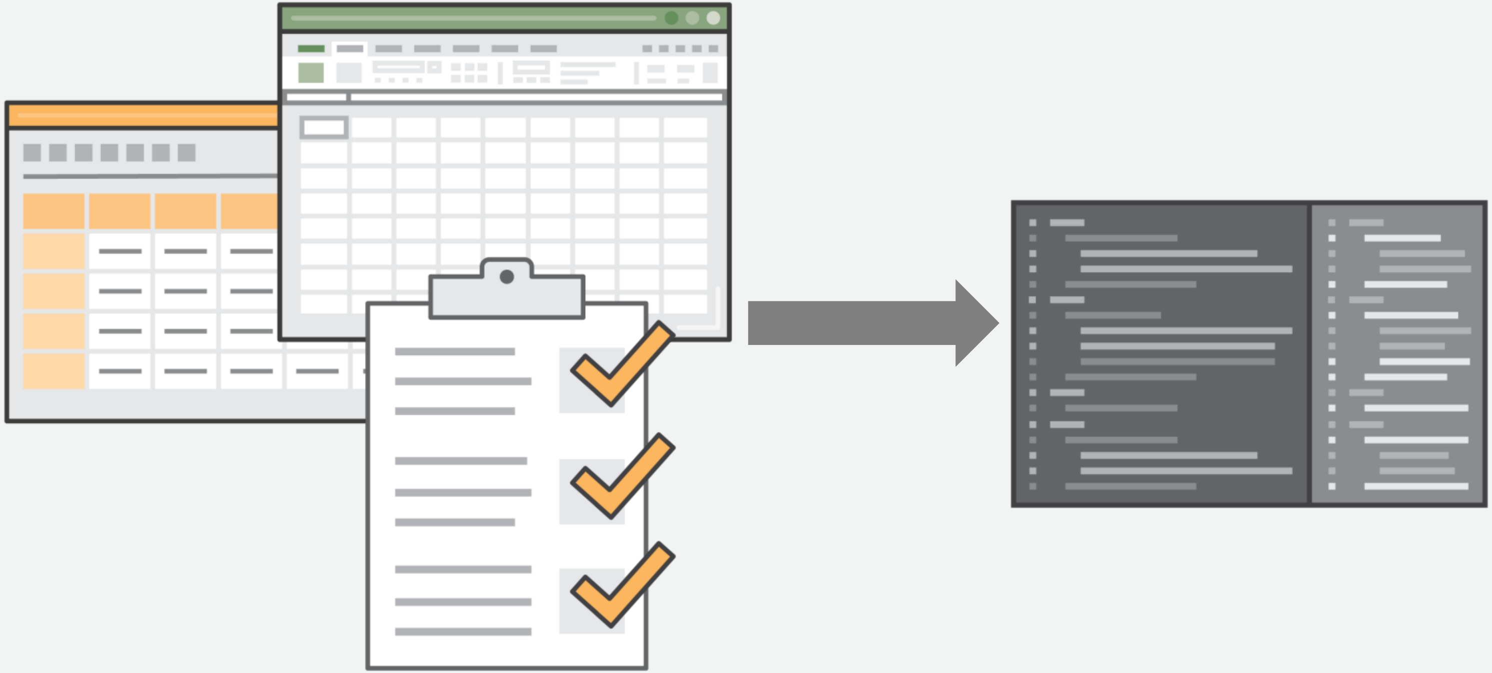
Which AWS database

What is the regulatory requirement?

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

How to verify the standards are met?

Security & Compliance then and now



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.

AWS Security Hub

AWS Identity and Access Management

Amazon CloudWatch

AWS Trusted Advisor

AWS CloudTrail

AWS Directory Service

AWS Key Management Service

AWS Config

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

SbD - Modernize Tech Governance (MTG)

Why?

Complexity is growing, making the old way to govern technology obsolete

You need automation that AWS offers to manage security

Goal - Modernize Tech Governance (MTG)

Adopting “***Prevent***” controls, making “***Detect***” controls more powerful and comprehensive

AWS Control Tower

AWS Control Tower

Automated AWS Setup

Launch an automated landing zone with best-practices blueprints

Policy Enforcement

Pre-packaged guardrails to enforce policies or detect violations

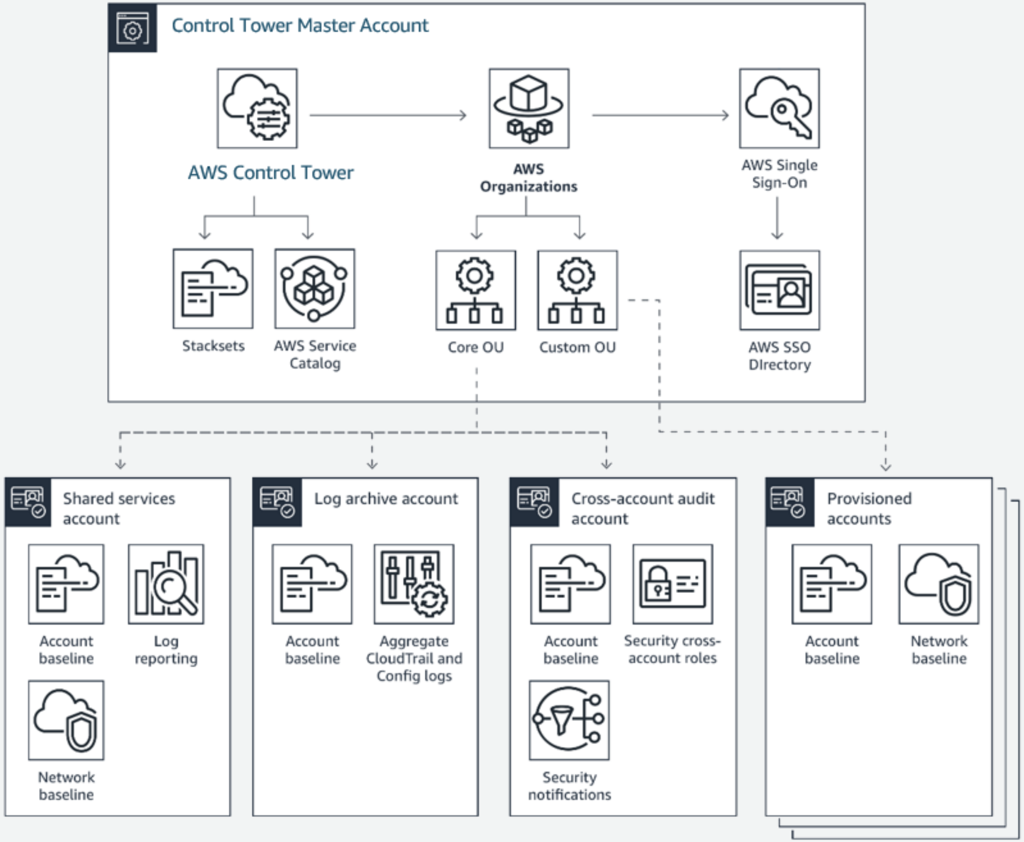
Dashboard for Oversight

Continuous visibility into workload compliance with controls

AWS Control Tower – Key Features

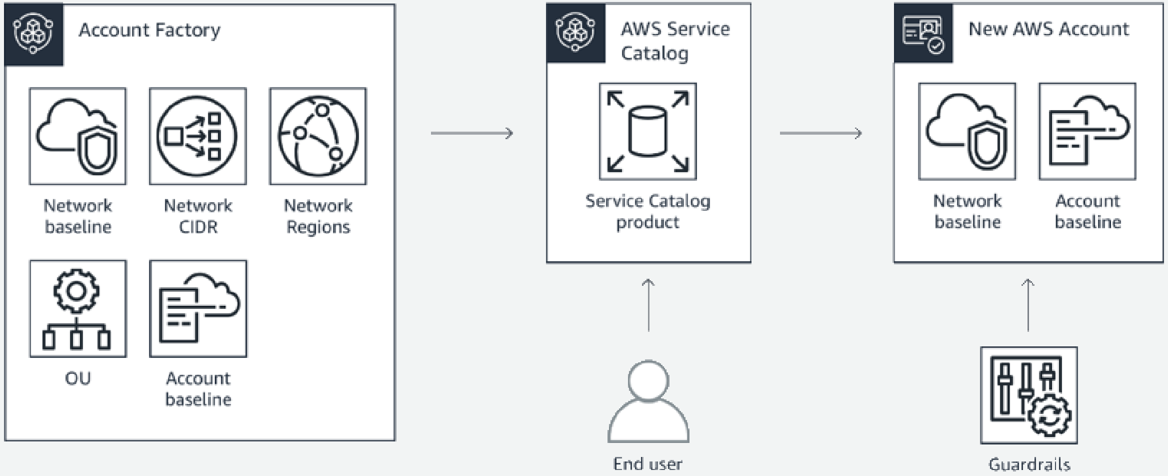
- Automated landing zone with best practice blueprints
- Guardrails for policy management
- Account factory for account provisioning
- Dashboard for visibility and actions
- Built-in identity and access management
- Preconfigured log archive and audit access to accounts
- Built-in monitoring and notifications
- Automatic updates

AWS Control Tower – Account Overview



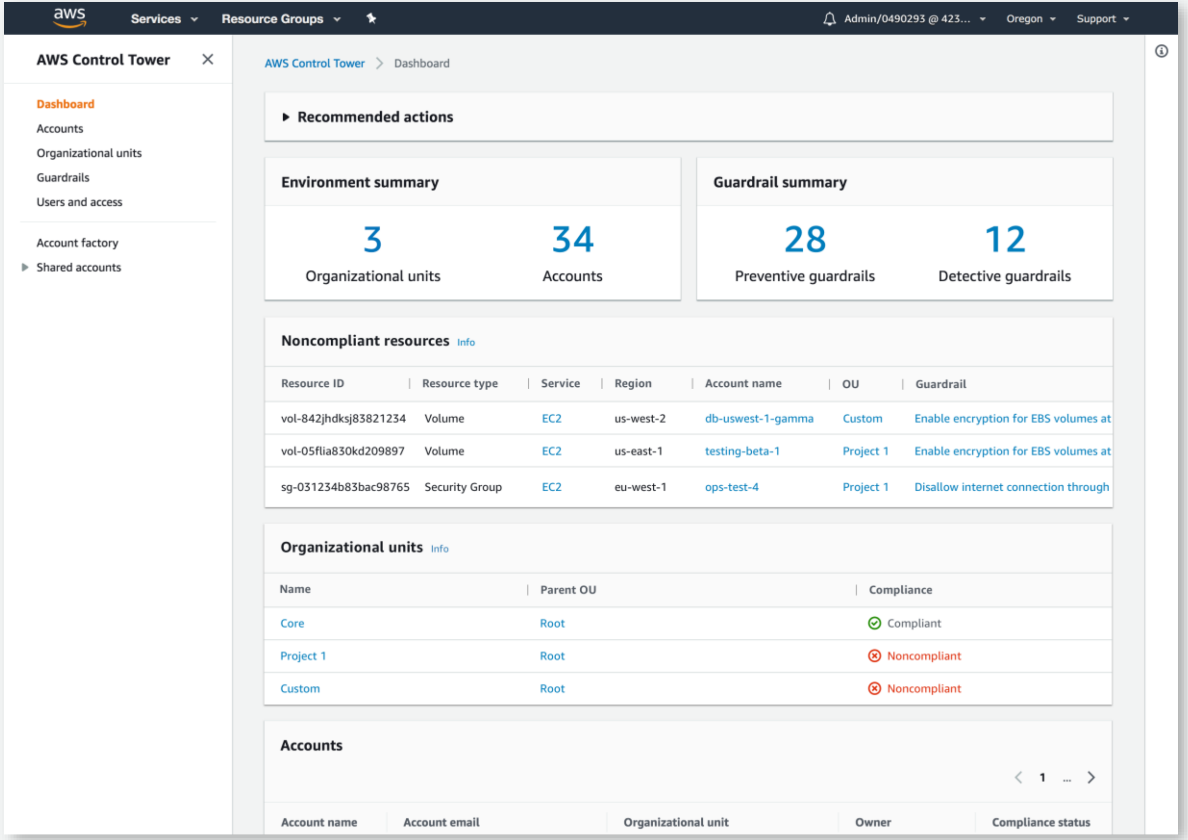
- AWS Organizations with a master and pre-created accounts for central log archive, cross-account audit, and shared services
- Pre-configured directory and single sign-on using AWS SSO (with Active Directory custom option)
- Centralized monitoring and alerts using AWS Config, AWS CloudTrail, and AWS CloudWatch

AWS Control Tower - Account Factory



- Account factory for controls on account provisioning
  - Pre-approved account baselines with VPC options
  - Pre-approved configuration options
- End user configuration and provisioning through AWS Service Catalog
- Creates/updates AWS accounts under organizational units

AWS Control Tower - Dashboard



Environment summary

3 Organizational units

34 Accounts

Guardrail summary

28 Preventive guardrails

12 Detective guardrails

Noncompliant resources Info

Resource ID	Resource type	Service	Region	Account name	OU	Guardrail
vol-842jhdksj83821234	Volume	EC2	us-west-2	db-uswest-1-gamma	Custom	Enable encryption for EBS volumes at
vol-05flia830kd209897	Volume	EC2	us-east-1	testing-beta-1	Project 1	Enable encryption for EBS volumes at
sg-031234b83bac98765	Security Group	EC2	eu-west-1	ops-test-4	Project 1	Disallow internet connection through

Organizational units Info

Name	Parent OU	Compliance
Core	Root	✓ Compliant
Project 1	Root	⊗ Noncompliant
Custom	Root	⊗ Noncompliant

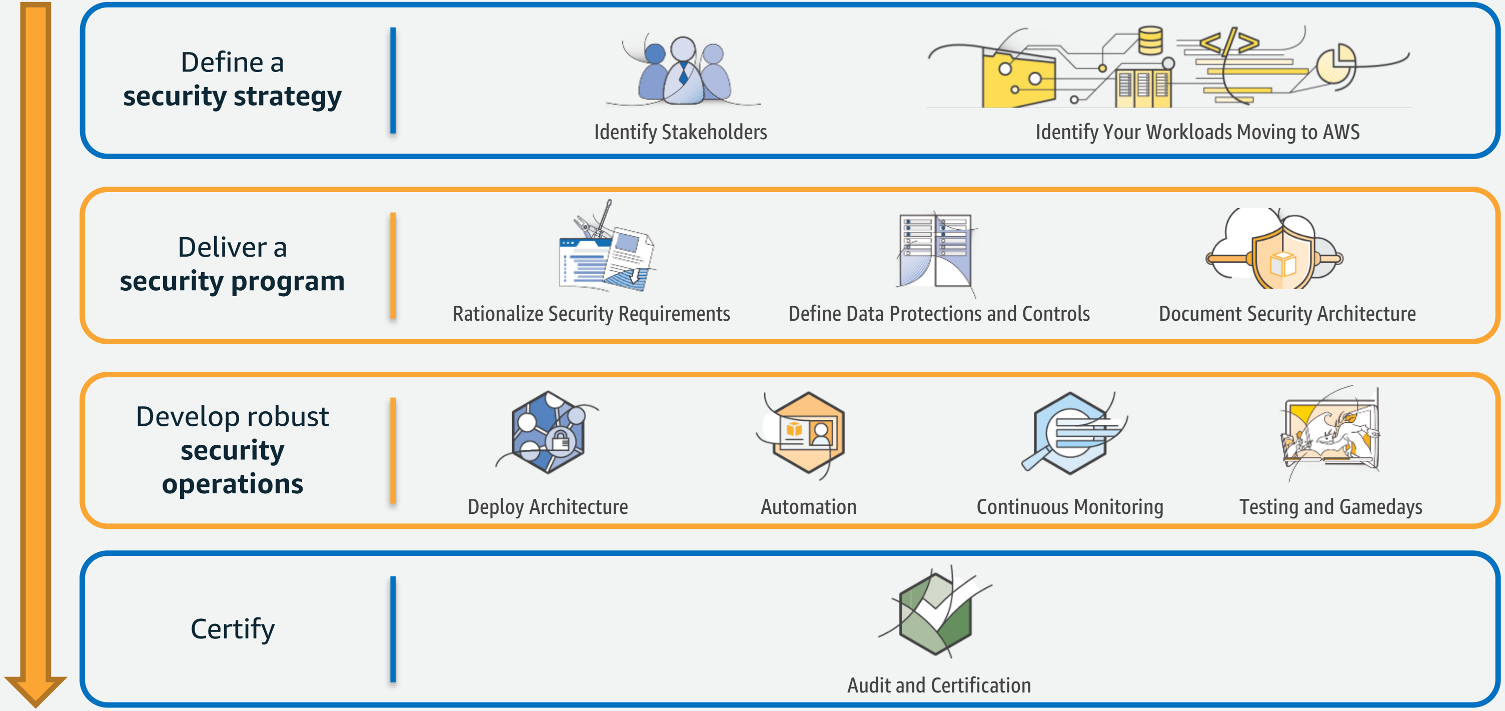
Accounts

< 1 ... >

Account name	Account email	Organizational unit	Owner	Compliance status

Security Journey

Taking the Journey



Define a **security strategy**

- Identify Stakeholders
- Identify Your Workloads Moving to AWS

Deliver a **security program**

- Rationalize Security Requirements
- Define Data Protections and Controls
- Document Security Architecture

Develop robust **security operations**

- Deploy Architecture
- Automation
- Continuous Monitoring
- Testing and Gamedays

Certify

- Audit and Certification

SbD – Rationalize Security Requirements

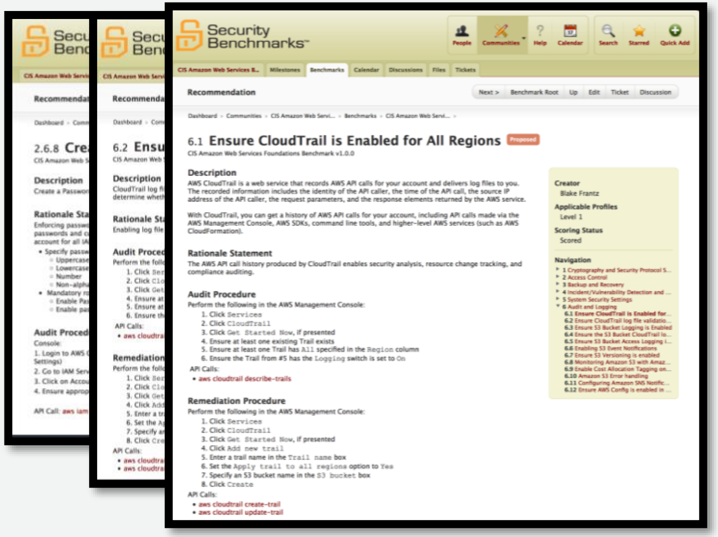
AWS has partnered with CIS Benchmarks to create consensus-based, best-practice security configuration guides that will align to multiple security frameworks globally.

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/

Center for Internet Security®



Recommendation

6.1 Ensure CloudTrail is Enabled for All Regions Proposed

CIS Amazon Web Services Foundations Benchmark v1.0.0

Description

AWS CloudTrail is a web service that records AWS API calls for your account and delivers log files to you. The recorded information includes the identity of the API caller, the time of the API call, the source IP address of the API caller, the request parameters, and the response elements returned by the AWS service.

With CloudTrail, you can get a history of AWS API calls for your account, including API calls made via the AWS Management Console, AWS SDKs, command line tools, and higher-level AWS services (such as AWS CloudFormation).

Rationale Statement

The AWS API call history produced by CloudTrail enables security analysis, resource change tracking, and compliance auditing.

Audit Procedure

Perform the following in the AWS Management Console:

1. Click `Services`
2. Click `CloudTrail`
3. Click `Get Started Now`, if presented
4. Ensure at least one existing Trail exists
5. Ensure at least one Trail has `All` specified in the `Region` column
6. Ensure the Trail from #5 has the `Logging` switch is set to `On`

API Calls:

- aws cloudtrail describe-trails

Remediation Procedure

Perform the following in the AWS Management Console:

1. Click `Services`
2. Click `CloudTrail`
3. Click `Get Started Now`, if presented
4. Click `Add new trail`
5. Enter a trail name in the `Trail name` box
6. Set the `Apply trail to all regions` option to `Yes`
7. Specify an S3 bucket name in the `S3 bucket` box
8. Click `Create`

API Calls:

- aws cloudtrail create-trail
- aws cloudtrail update-trail

Creator
Blake Frantz

Applicable Profiles
Level 1

Scoring Status
Scored

Navigation

- 1 Cryptography and Security Protocol S...
- 2 Access Control
- 3 Backup and Recovery
- 4 Incident/Vulnerability Detection and ...
- 5 System Security Settings
- 6 Audit and Logging
  - 6.1 Ensure CloudTrail is Enabled for...
  - 6.2 Ensure CloudTrail log file validatio...
  - 6.3 Ensure S3 Bucket Logging is Enabled
  - 6.4 Ensure the S3 Bucket CloudTrail lo...
  - 6.5 Ensure S3 Bucket Access Logging i...
  - 6.6 Enabling S3 Event Notifications
  - 6.7 Ensure S3 Versioning is enabled
  - 6.8 Monitoring Amazon S3 with Amaz...
  - 6.9 Enable Cost Allocation Tagging on...
  - 6.10 Amazon S3 Error handling
  - 6.11 Configuring Amazon SNS Notific...
  - 6.12 Ensure AWS Config is enabled in ...

SbD – AWS CIS Benchmark Scope

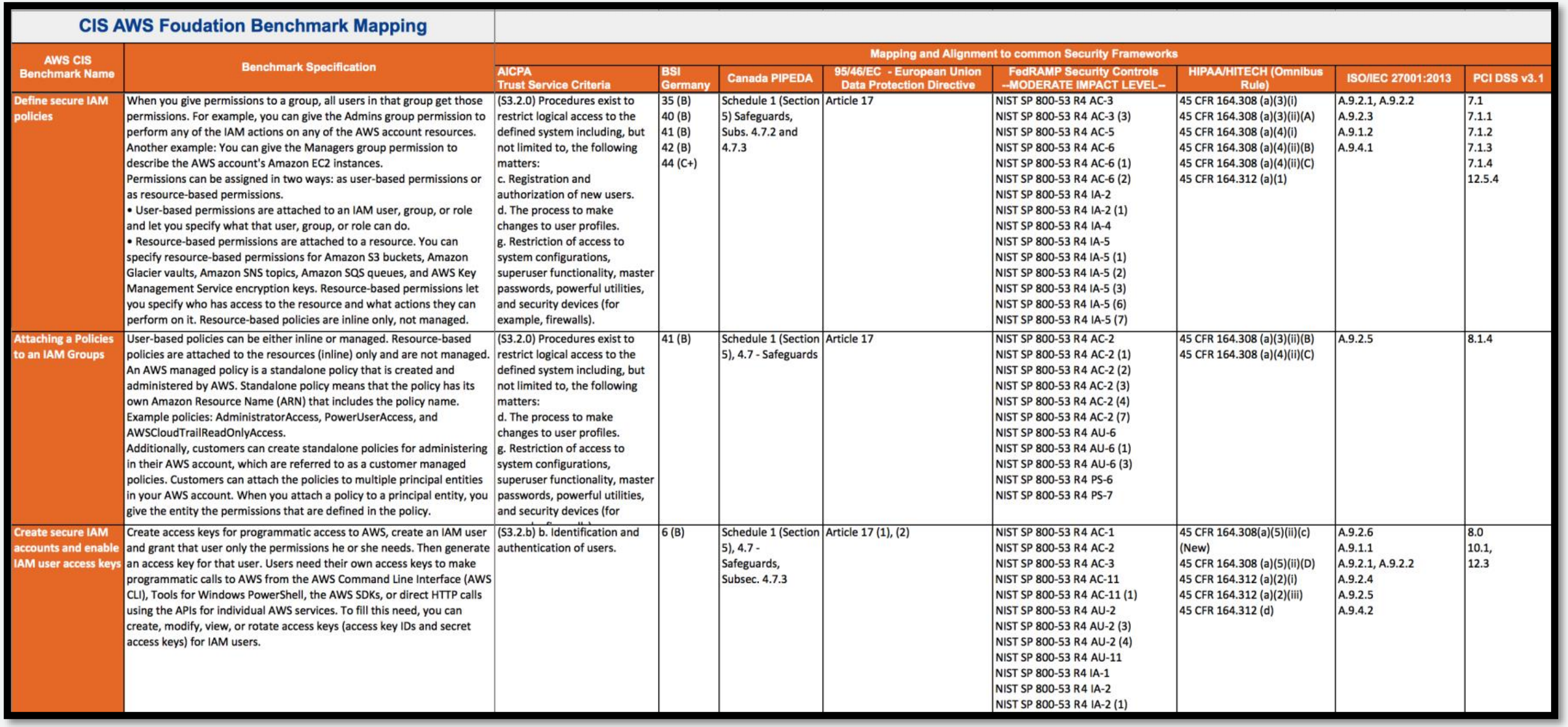
- AWS Identity and Access Management
- AWS Security Hub
- AWS Config
- AWS Key Management Service
- Simple Notification Service
- Amazon CloudWatch
- Amazon S3
- AWS CloudTrail

Foundational Benchmark

- Flow logs
- Amazon VPC
- Amazon Route 53
- Amazon EC2
- Amazon CloudFront
- Elastic Load Balancing (ELB)
- Amazon EBS
- NACL

Three-tier Web Architecture

Define Data Protections and Controls

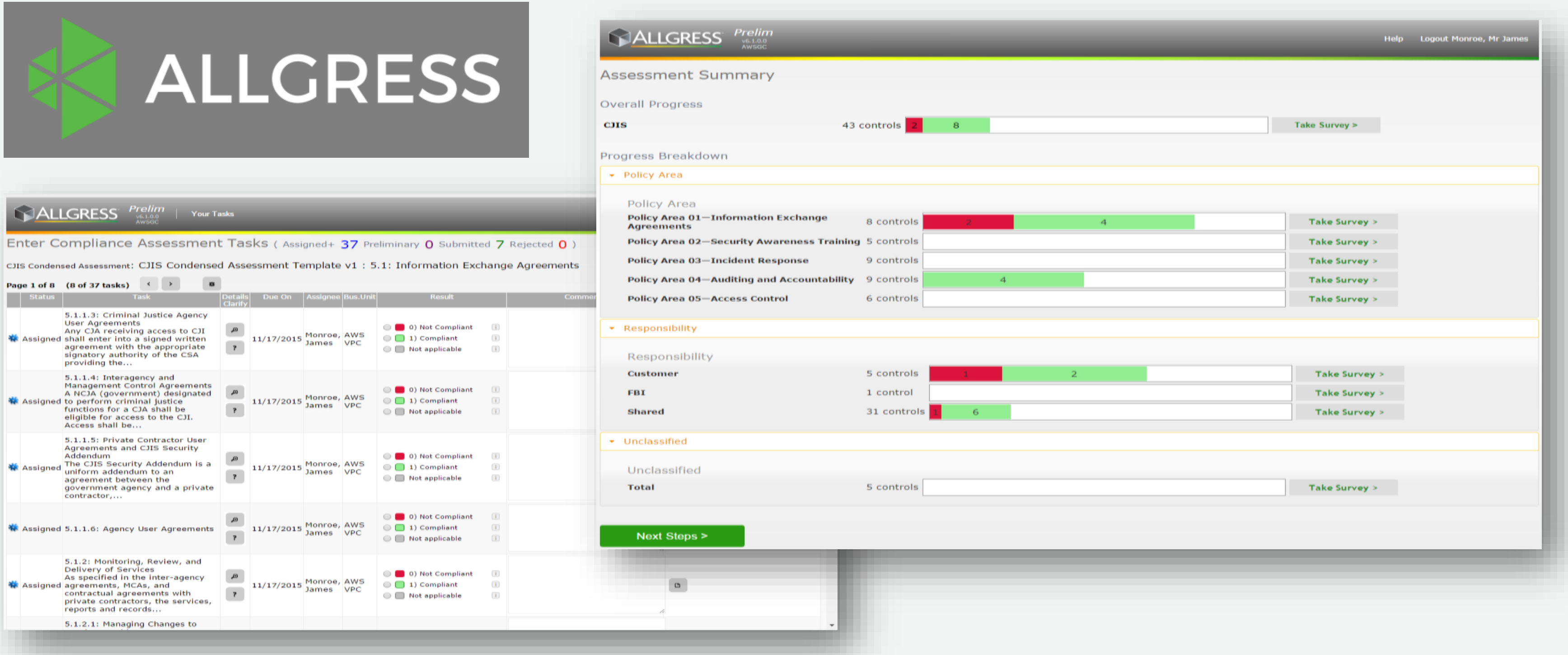


CIS AWS Foudation Benchmark Mapping

AWS CIS Benchmark Name	Benchmark Specification	Mapping and Alignment to common Security Frameworks							
		AICPA Trust Service Criteria	BSI Germany	Canada PIPEDA	95/46/EC - European Union Data Protection Directive	FedRAMP Security Controls --MODERATE IMPACT LEVEL--	HIPAA/HITECH (Omnibus Rule)	ISO/IEC 27001:2013	PCI DSS v3.1
Define secure IAM policies	When you give permissions to a group, all users in that group get those permissions. For example, you can give the Admins group permission to perform any of the IAM actions on any of the AWS account resources. Another example: You can give the Managers group permission to describe the AWS account's Amazon EC2 instances. Permissions can be assigned in two ways: as user-based permissions or as resource-based permissions. • User-based permissions are attached to an IAM user, group, or role and let you specify what that user, group, or role can do. • Resource-based permissions are attached to a resource. You can specify resource-based permissions for Amazon S3 buckets, Amazon Glacier vaults, Amazon SNS topics, Amazon SQS queues, and AWS Key Management Service encryption keys. Resource-based permissions let you specify who has access to the resource and what actions they can perform on it. Resource-based policies are inline only, not managed.	(S3.2.0) Procedures exist to restrict logical access to the defined system including, but not limited to, the following matters: c. Registration and authorization of new users. d. The process to make changes to user profiles. g. Restriction of access to system configurations, superuser functionality, master passwords, powerful utilities, and security devices (for example, firewalls).	35 (B) 40 (B) 41 (B) 42 (B) 44 (C+)	Schedule 1 (Section 5) Safeguards, Subs. 4.7.2 and 4.7.3	Article 17	NIST SP 800-53 R4 AC-3 NIST SP 800-53 R4 AC-3 (3) NIST SP 800-53 R4 AC-5 NIST SP 800-53 R4 AC-6 NIST SP 800-53 R4 AC-6 (1) NIST SP 800-53 R4 AC-6 (2) NIST SP 800-53 R4 IA-2 NIST SP 800-53 R4 IA-2 (1) NIST SP 800-53 R4 IA-4 NIST SP 800-53 R4 IA-5 NIST SP 800-53 R4 IA-5 (1) NIST SP 800-53 R4 IA-5 (2) NIST SP 800-53 R4 IA-5 (3) NIST SP 800-53 R4 IA-5 (6) NIST SP 800-53 R4 IA-5 (7)	45 CFR 164.308 (a)(3)(i) 45 CFR 164.308 (a)(3)(ii)(A) 45 CFR 164.308 (a)(4)(i) 45 CFR 164.308 (a)(4)(ii)(B) 45 CFR 164.308 (a)(4)(ii)(C) 45 CFR 164.312 (a)(1)	A.9.2.1, A.9.2.2 A.9.2.3 A.9.1.2 A.9.4.1	7.1 7.1.1 7.1.2 7.1.3 7.1.4 12.5.4
Attaching a Policies to an IAM Groups	User-based policies can be either inline or managed. Resource-based policies are attached to the resources (inline) only and are not managed. An AWS managed policy is a standalone policy that is created and administered by AWS. Standalone policy means that the policy has its own Amazon Resource Name (ARN) that includes the policy name. Example policies: AdministratorAccess, PowerUserAccess, and AWSCloudTrailReadOnlyAccess. Additionally, customers can create standalone policies for administering in their AWS account, which are referred to as a customer managed policies. Customers can attach the policies to multiple principal entities in your AWS account. When you attach a policy to a principal entity, you give the entity the permissions that are defined in the policy.	(S3.2.0) Procedures exist to restrict logical access to the defined system including, but not limited to, the following matters: d. The process to make changes to user profiles. g. Restriction of access to system configurations, superuser functionality, master passwords, powerful utilities, and security devices (for	41 (B)	Schedule 1 (Section 5), 4.7 - Safeguards	Article 17	NIST SP 800-53 R4 AC-2 NIST SP 800-53 R4 AC-2 (1) NIST SP 800-53 R4 AC-2 (2) NIST SP 800-53 R4 AC-2 (3) NIST SP 800-53 R4 AC-2 (4) NIST SP 800-53 R4 AC-2 (7) NIST SP 800-53 R4 AU-6 NIST SP 800-53 R4 AU-6 (1) NIST SP 800-53 R4 AU-6 (3) NIST SP 800-53 R4 PS-6 NIST SP 800-53 R4 PS-7	45 CFR 164.308 (a)(3)(ii)(B) 45 CFR 164.308 (a)(4)(ii)(C)	A.9.2.5	8.1.4
Create secure IAM accounts and enable IAM user access keys	Create access keys for programmatic access to AWS, create an IAM user and grant that user only the permissions he or she needs. Then generate an access key for that user. Users need their own access keys to make programmatic calls to AWS from the AWS Command Line Interface (AWS CLI), Tools for Windows PowerShell, the AWS SDKs, or direct HTTP calls using the APIs for individual AWS services. To fill this need, you can create, modify, view, or rotate access keys (access key IDs and secret access keys) for IAM users.	(S3.2.b) b. Identification and authentication of users.	6 (B)	Schedule 1 (Section 5), 4.7 - Safeguards, Subsec. 4.7.3	Article 17 (1), (2)	NIST SP 800-53 R4 AC-1 NIST SP 800-53 R4 AC-2 NIST SP 800-53 R4 AC-3 NIST SP 800-53 R4 AC-11 NIST SP 800-53 R4 AC-11 (1) NIST SP 800-53 R4 AU-2 NIST SP 800-53 R4 AU-2 (3) NIST SP 800-53 R4 AU-2 (4) NIST SP 800-53 R4 AU-11 NIST SP 800-53 R4 IA-1 NIST SP 800-53 R4 IA-2 NIST SP 800-53 R4 IA-2 (1)	45 CFR 164.308(a)(5)(ii)(c) (New) 45 CFR 164.308 (a)(5)(ii)(D) 45 CFR 164.312 (a)(2)(i) 45 CFR 164.312 (a)(2)(iii) 45 CFR 164.312 (d)	A.9.2.6 A.9.1.1 A.9.2.1, A.9.2.2 A.9.2.4 A.9.2.5 A.9.4.2	8.0 10.1, 12.3

Document Security Architecture

ALLGRESS



ALLGRESS Prelim v6.1.0.0 AWSGC | Your Tasks

Enter Compliance Assessment Tasks (Assigned+ 37 Preliminary 0 Submitted 7 Rejected 0)

CJIS Condensed Assessment: CJIS Condensed Assessment Template v1 : 5.1: Information Exchange Agreements

Page 1 of 8 (8 of 37 tasks)

	Status	Task	Details Clarify	Due On	Assignee	Bus.Unit	Result	Commen
	Assigned	5.1.1.3: Criminal Justice Agency User Agreements Any CJA receiving access to CJI shall enter into a signed written agreement with the appropriate signatory authority of the CSA providing the...		11/17/2015	Monroe, James	AWS VPC	○ 🟥 0) Not Compliant ○ 🟩 1) Compliant ○ ▨ Not applicable	
	Assigned	5.1.1.4: Interagency and Management Control Agreements A NCJA (government) designated to perform criminal justice functions for a CJA shall be eligible for access to the CJI. Access shall be...		11/17/2015	Monroe, James	AWS VPC	○ 🟥 0) Not Compliant ○ 🟩 1) Compliant ○ ▨ Not applicable	
	Assigned	5.1.1.5: Private Contractor User Agreements and CJIS Security Addendum The CJIS Security Addendum is a uniform addendum to an agreement between the government agency and a private contractor,...		11/17/2015	Monroe, James	AWS VPC	○ 🟥 0) Not Compliant ○ 🟩 1) Compliant ○ ▨ Not applicable	
	Assigned	5.1.1.6: Agency User Agreements		11/17/2015	Monroe, James	AWS VPC	○ 🟥 0) Not Compliant ○ 🟩 1) Compliant ○ ▨ Not applicable	
	Assigned	5.1.2: Monitoring, Review, and Delivery of Services As specified in the inter-agency agreements, MCAs, and contractual agreements with private contractors, the services, reports and records...		11/17/2015	Monroe, James	AWS VPC	○ 🟥 0) Not Compliant ○ 🟩 1) Compliant ○ ▨ Not applicable	
		5.1.2.1: Managing Changes to						

ALLGRESS Prelim v6.1.0.0 AWSGC — Help — Logout Monroe, Mr James

Assessment Summary

Overall Progress

CJIS	43 controls	2 8	Take Survey >

Progress Breakdown

Policy Area

Policy Area			
Policy Area 01—Information Exchange Agreements	8 controls	2 4	Take Survey >
Policy Area 02—Security Awareness Training	5 controls		Take Survey >
Policy Area 03—Incident Response	9 controls		Take Survey >
Policy Area 04—Auditing and Accountability	9 controls	4	Take Survey >
Policy Area 05—Access Control	6 controls		Take Survey >

Responsibility

Responsibility			
Customer	5 controls	1 2	Take Survey >
FBI	1 control		Take Survey >
Shared	31 controls	1 6	Take Survey >

Unclassified

Unclassified			
Total	5 controls		Take Survey >

Next Steps >

https://allgress.com/get-compliant

Security Considerations

Multiple AWS accounts

VPC, private subnets for application servers and RDS

Minimal network perimeter (Only SSL Terminating Reverse Proxy in DMZ)

Tightened Security Groups - fine grained rules for ports and CIDRs

Immutable Docker containers, CloudTrail, Central Log aggregation

Enable AWS Config, Config Rules, Aggregation, GuardDuty, and Security Hub

Security Considerations (Continued)

CIS-benchmarked AMIs

Hardened Linux/Software

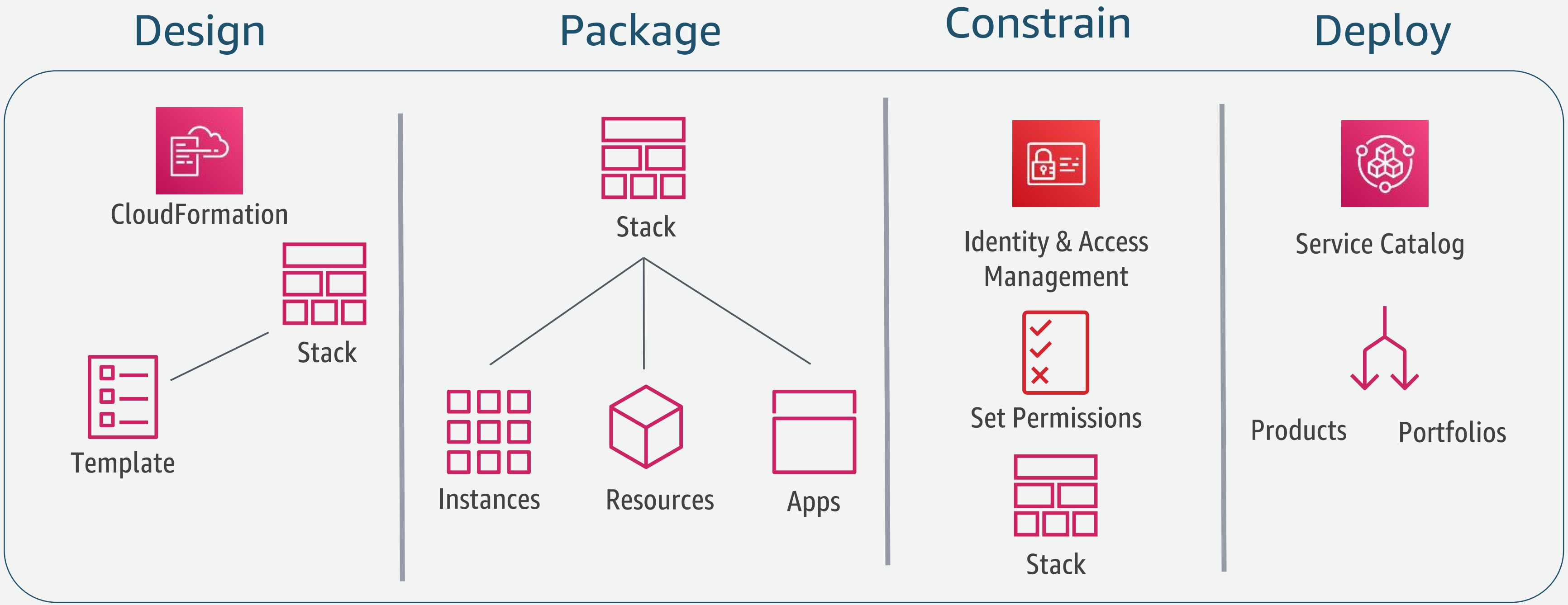
KMS-based secret management

Two-factor authentication on AMIs

Advanced user and key management using LDAP. Elimination of ec2-user

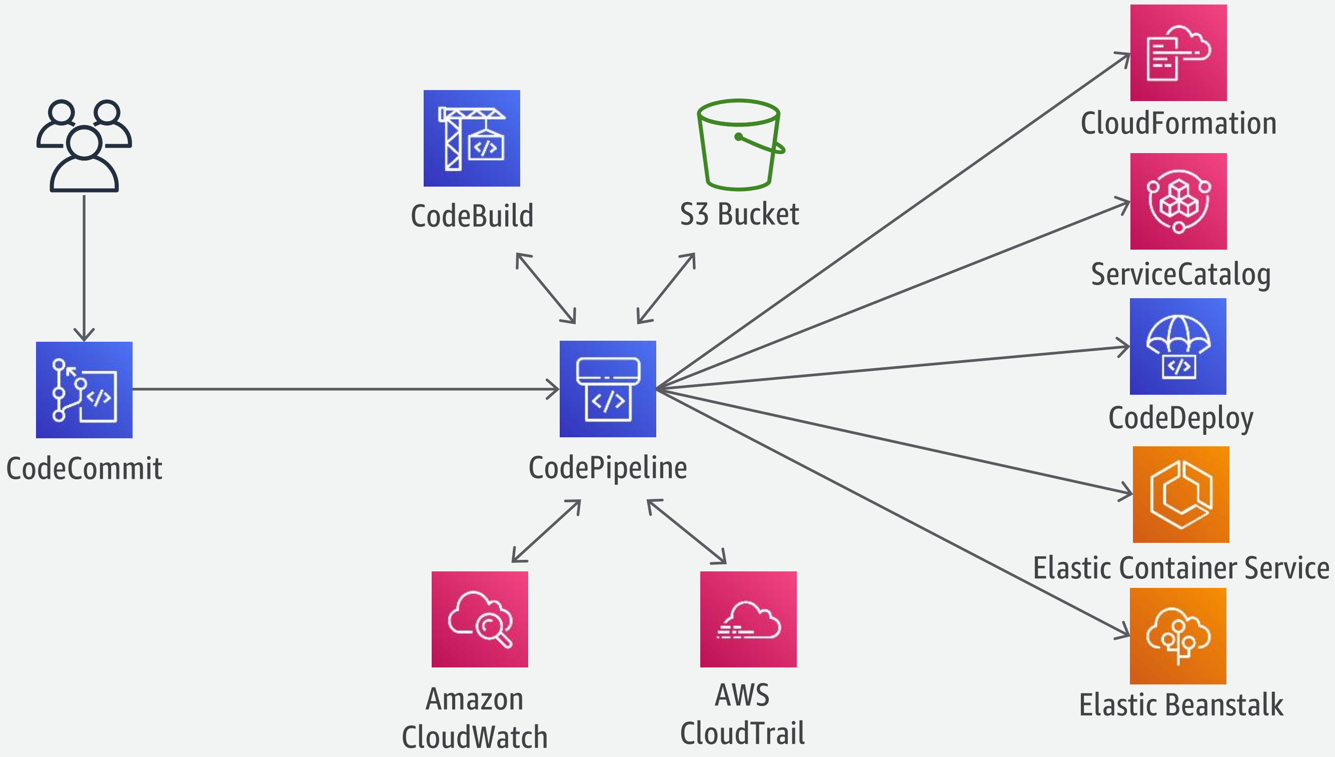
HSM for secure data/keys

SbD – Automated Deployments

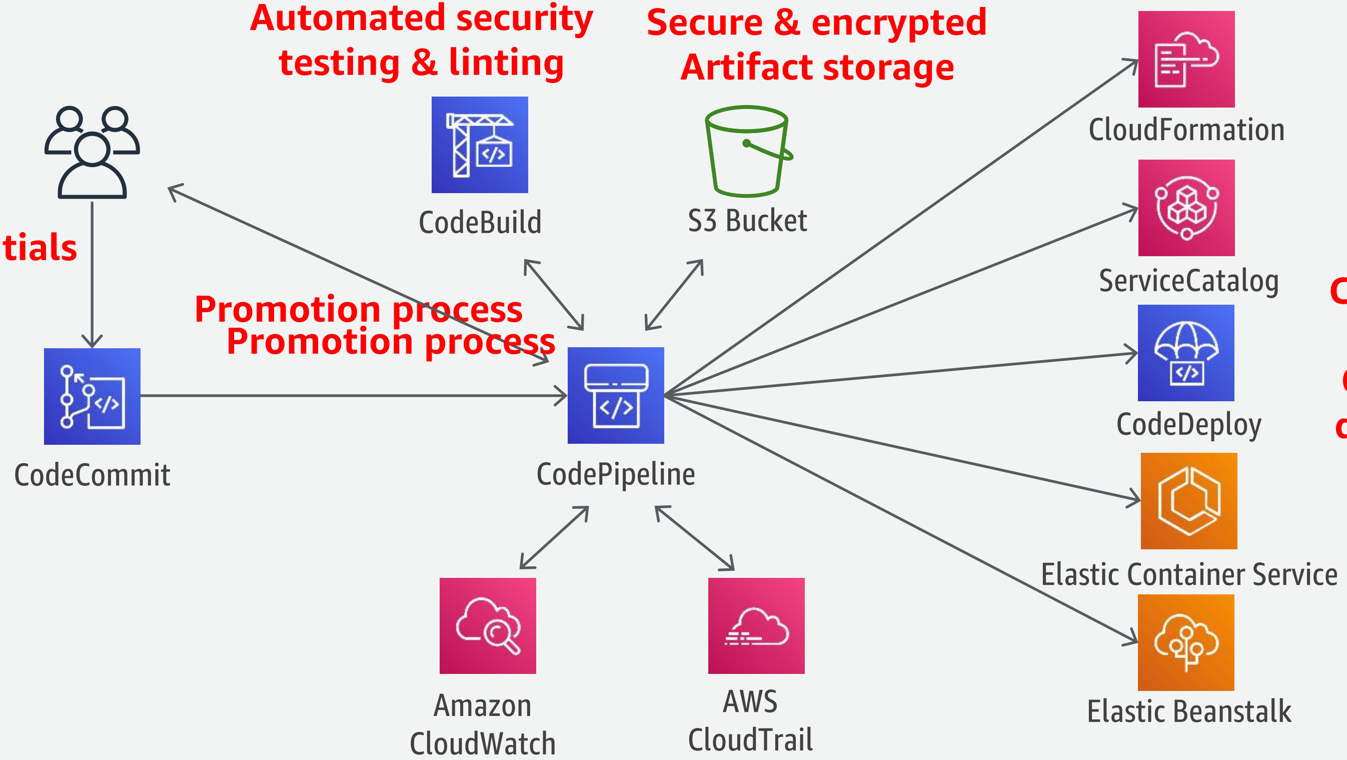


Automate deployments, provisioning, and configurations of the AWS customer environments

SbD – Continuous Deployment



SbD – Continuous Deployment



Automated security testing & linting

Secure & encrypted Artifact storage

Block credentials from git

Promotion process

Promotion process

Cross account & Cross region deployments

CodeBuild

S3 Bucket

CodeCommit

CodePipeline

CloudFormation

ServiceCatalog

CodeDeploy

Elastic Container Service

Elastic Beanstalk

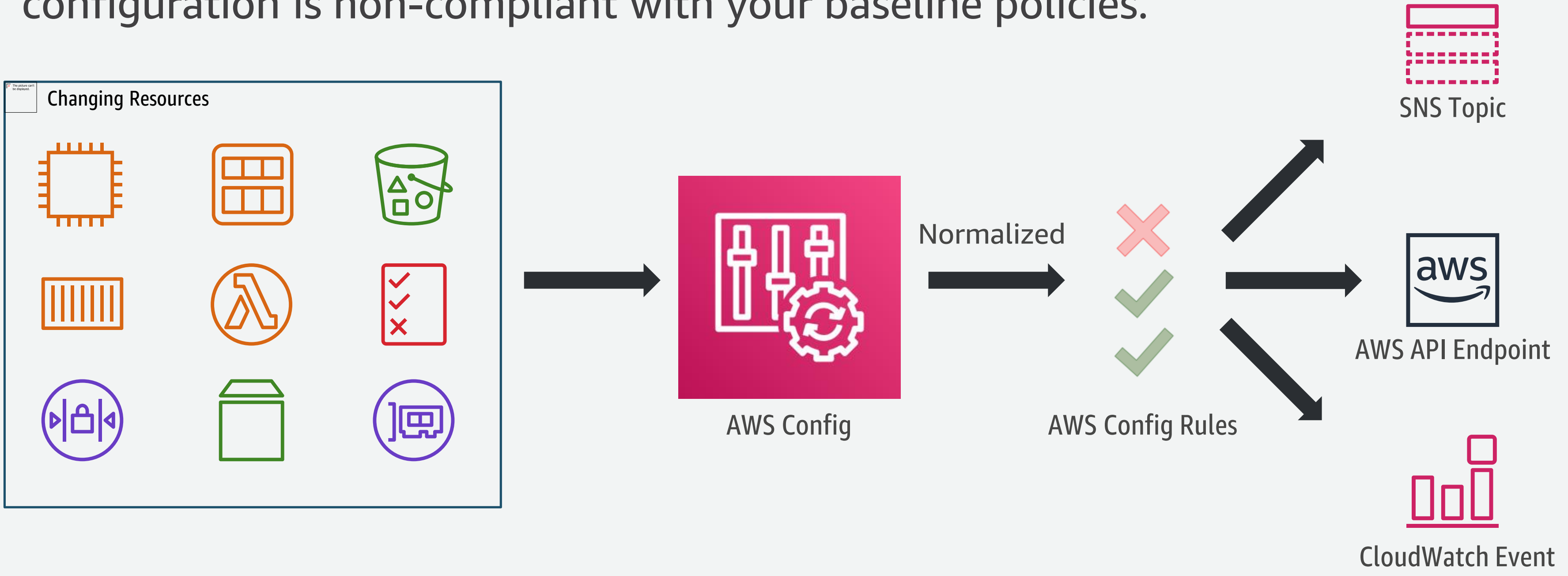
Amazon CloudWatch

AWS CloudTrail

Full auditability & logging

Continuous Compliance

AWS Config is a continuous recording and continuous assessment service, that tracks configuration changes to AWS resources and alerts you if the configuration is non-compliant with your baseline policies.



SbD - Eco-System

Security by Design

AWS Config Rules

AWS CloudFormation

Amazon Inspector

ALLGRESS

splunk>

VERIS GROUP

ALERT LOGIC®

CloudCheckr

CIS® Center for Internet Security®

Flux7

Symantec™

evident.io

SbD - Modernizing Technology Governance (MTG)

Automate Governance

Automate Deployments

Automate Security Operations

Continuous Compliance

AWS Resources

Amazon Web Services Cloud Compliance

- **https://aws.amazon.com/compliance/**

SbD website and whitepaper – to wrap your head around this

- **https://aws.amazon.com/compliance/security-by-design/**

Questions?