Security on AWS

Infrastructure and Services to elevate your security in the cloud

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Agenda – Security on AWS

- How AWS thinks about Security
- The AWS Shared Responsibility Model
- Foundational Controls
- The Well Architected Framework – The Security Pillar
    - Identity and Access Management
    - Detection
    - Infrastructure Protection
    - Data Protection
    - Incident Response

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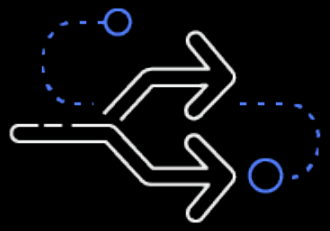
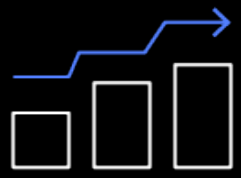
How AWS thinks about Security

Security is the top priority

Security is
everyone's responsibility



Guardrails, not gates



Security is a journey

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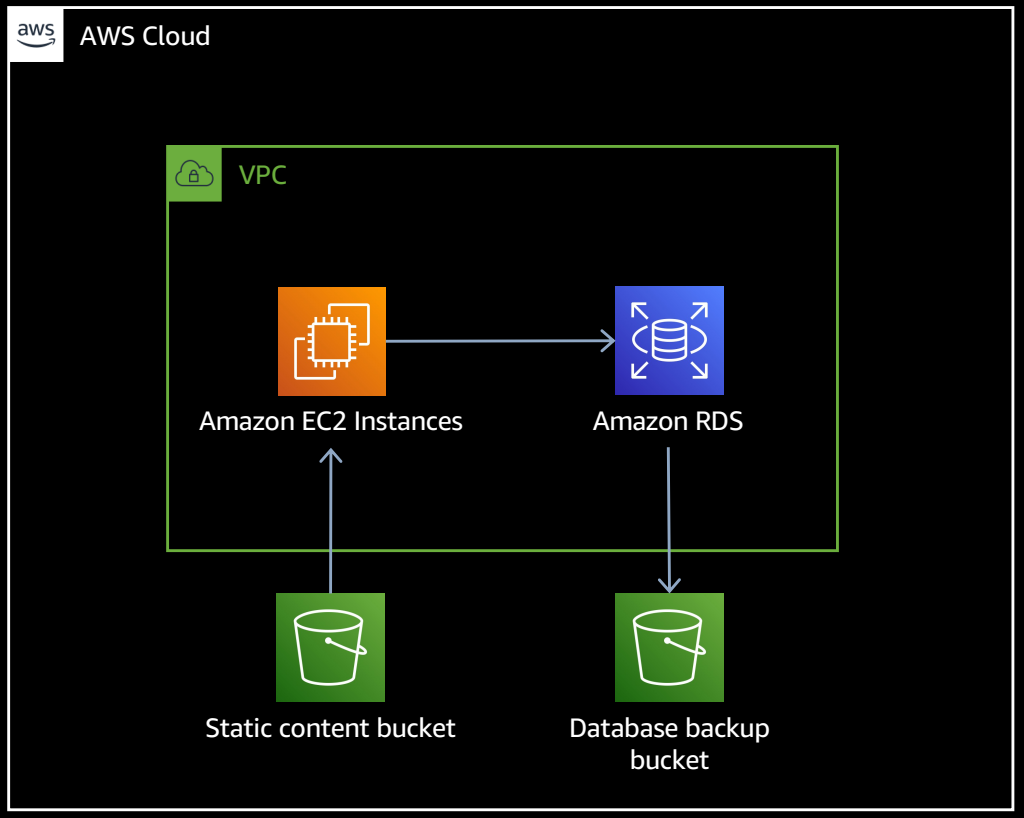
Introducing Bob

- Bob
- Chief Engineer
- Doesn’t know much about Security



The AWS Shared Responsibility Model

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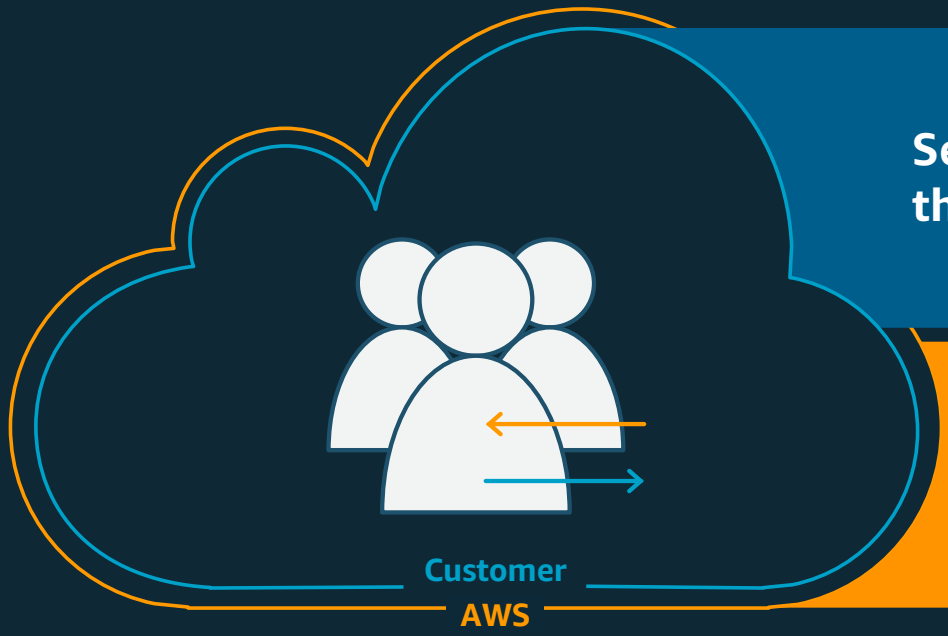
Shared responsibility model



Security IN the Cloud

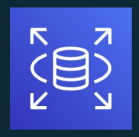
Customer responsibility will be determined by the AWS Cloud services that a customer selects

Security OF the Cloud

AWS is responsible for protecting the infrastructure that runs all of the services offered in the AWS Cloud

The line varies …

Amazon EC2



Amazon RDS

S3

Lambda

DynamoDB

More Customizable
+
More Customer responsibility

	Infrastructure Services	Container Services	Abstracted Services
CUSTOMER DATA			
CLIENT-SIDE DATA ENCRYPTION			
SERVER-SIDE ENCRYPTION			
NETWORK TRAFFIC PROTECTION			
PLATFORM & APPLICATION MANAGEMENT			
OS, NETWORK, FIREWALL CONFIGURATION			
COMPUTE / STORAGE / DATABASE / NETWORK			
HARDWARE/AWS GLOBAL INFRASTRUCTURE			
CUSTOMER IAM	CUSTOMER IAM	CUSTOMER IAM	CUSTOMER IAM
AWS IAM	AWS IAM	AWS IAM	AWS IAM

Less customizable
+
Less Customer responsibility
+
More best practices built-in

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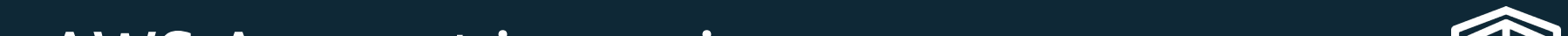
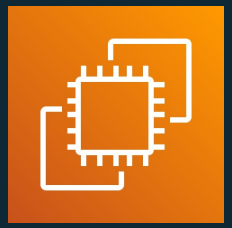
Your AWS Account is precious



AWS Account

Sensitive customer data



Running workloads

Payment information

Foundational Security controls

- Accurate account information
- Protecting your Root User
- Using IAM Users
- Configuring alarms
- Turning CloudTrail ON
- Using AWS Config
- Using Trusted Advisor

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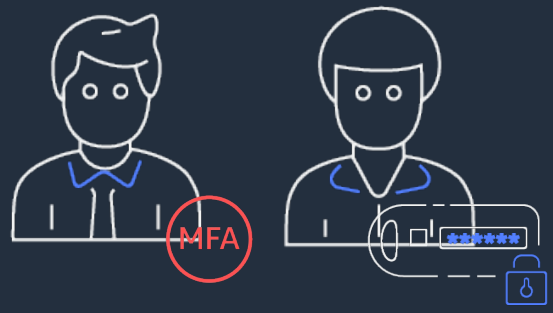
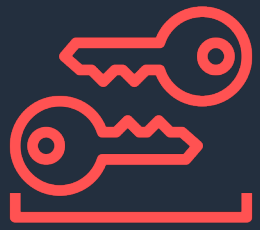
Protect your Root User

Use a complex password

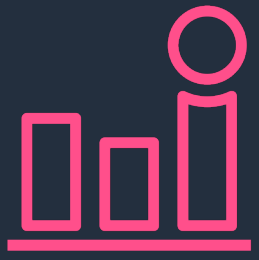
Turn on MFA



Separate password and MFA holder



Delete access keys



Set up alarms

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AWS CloudTrail

AWS CloudTrail – Auditing, Governance and Compliance

Record Activity – actions taken by user, role or AWS service

Simplify compliance by automatically recording and storing activity logs

Gain visibility – view, search, download, analyze, respond

Troubleshoot – who/what took which action and when?

Build security automation by tracking and responding to threats

Features - CloudTrail Insights, CloudTrail Lake, Log Encryption, File Integrity Validation

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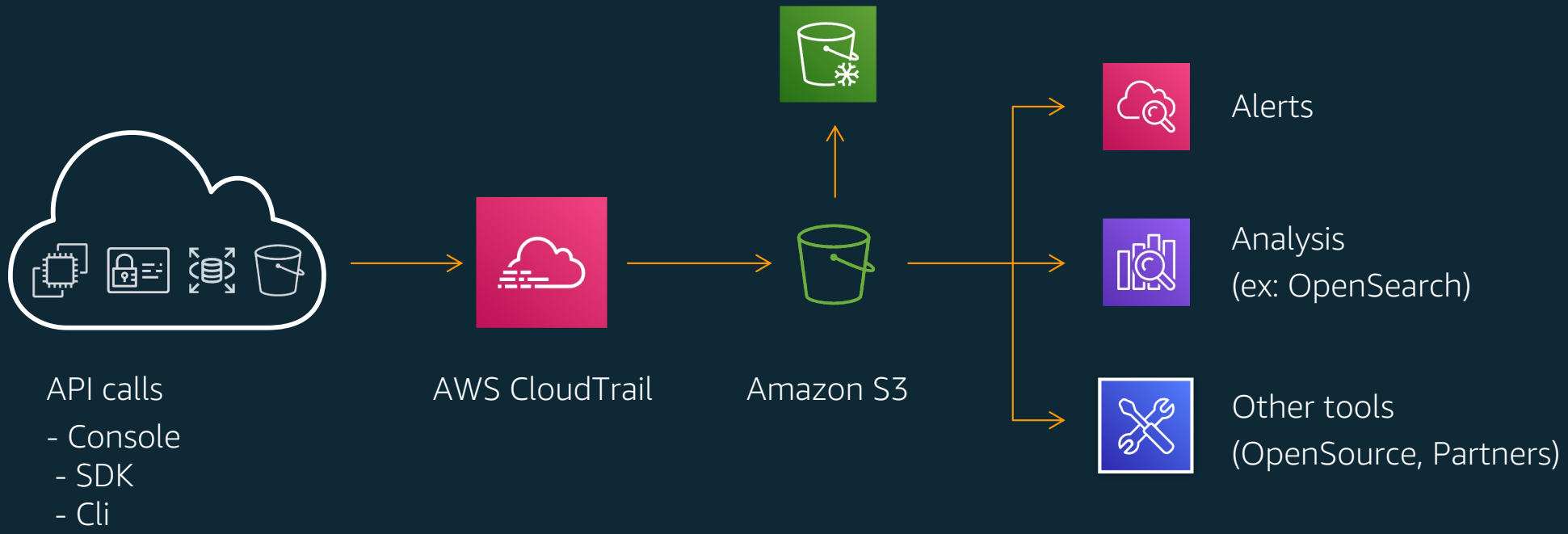
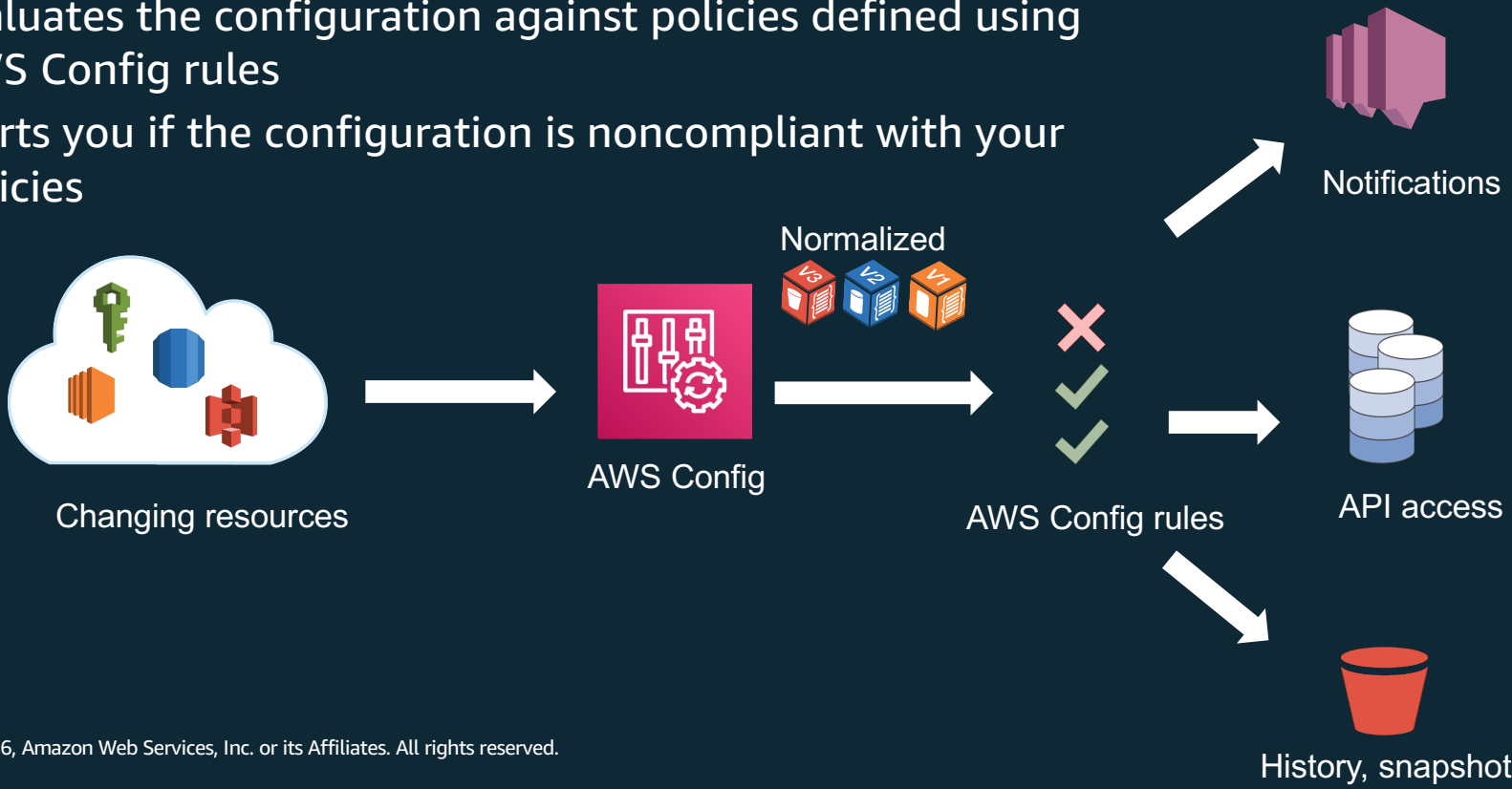
AWS CloudTrail: Audit of actions



AWS Config

AWS Config

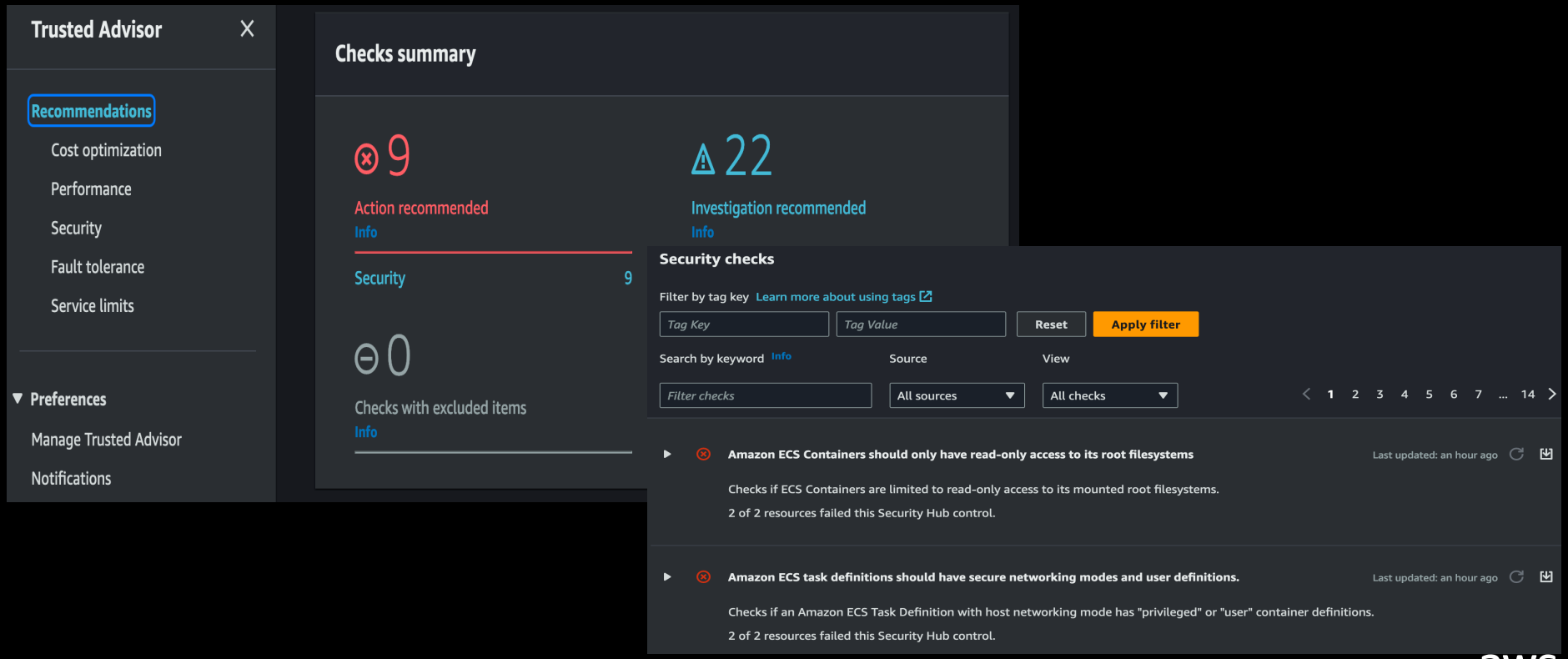
- Configuration auditor
- Monitors configuration changes over time
- Evaluates the configuration against policies defined using AWS Config rules
- Alerts you if the configuration is noncompliant with your policies

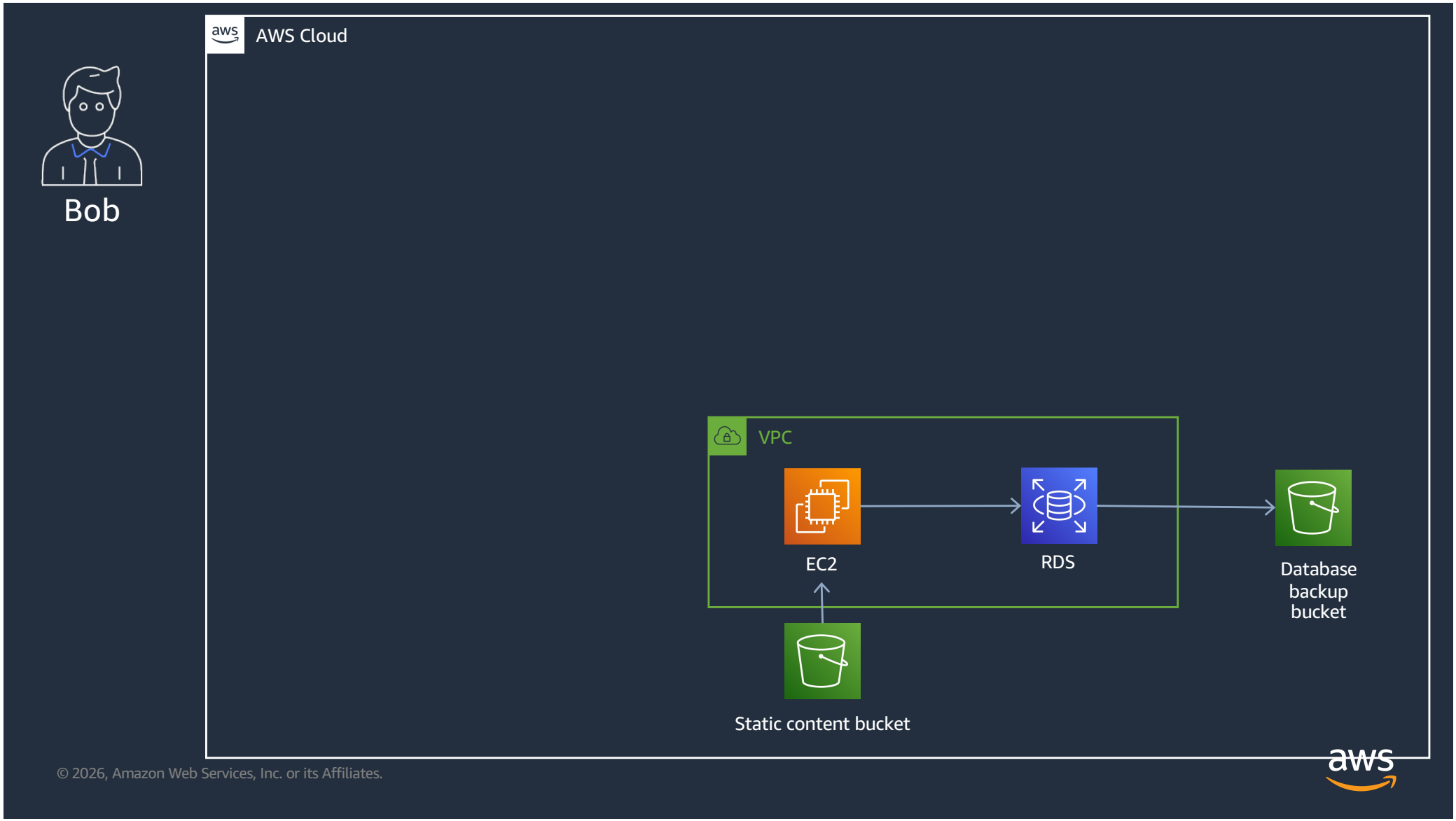


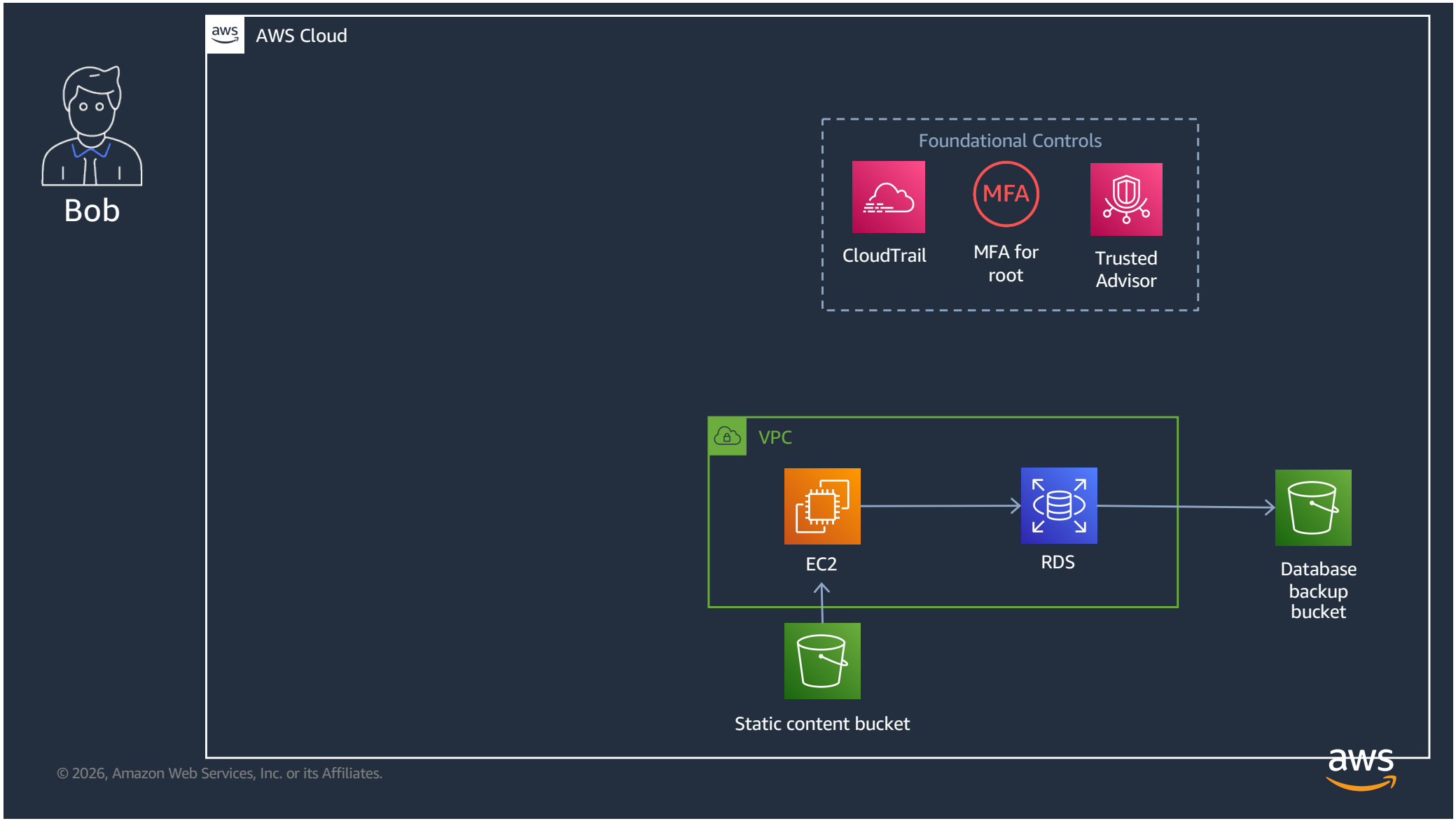
AWS Trusted Advisor

AWS Trusted Advisor

LEVERAGE TRUSTED ADVISOR TO ANALYZE YOUR AWS RESOURCES FOR BEST PRACTICES FOR AVAILABILITY, COST, PERFORMANCE AND SECURITY.







The AWS Well Architected Framework

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AWS W-A Security Pillar

Identity and access management

Detective controls

Infrastructure protection

Data protection

Incident response

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AWS security, identity, and compliance solutions

Identity and access management

AWS Identity and Access Management (IAM)

AWS IAM Identity Center

AWS Organizations

AWS Directory Service

Amazon Cognito

AWS Resource Access Manager

Amazon Verified Permissions

Detective controls

AWS Security Hub

Amazon GuardDuty

Amazon Security Lake

Amazon Inspector

Amazon CloudWatch

AWS Config

AWS CloudTrail

VPC Flow Logs

AWS IoT Device Defender

Infrastructure protection

AWS Firewall Manager

AWS Network Firewall

AWS Shield

AWS WAF

Amazon VPC

AWS PrivateLink

AWS Systems Manager

AWS Verified Access

Data protection

Amazon Macie

AWS Key Management Service (KMS)

AWS CloudHSM

AWS Certificate Manager

AWS Private CA

AWS Secrets Manager

AWS VPN

Server-Side Encryption

Incident response

Amazon Detective

Amazon EventBridge

AWS Backup

AWS Security Hub

AWS Elastic Disaster Recovery

Compliance

AWS Artifact

AWS Audit Manager

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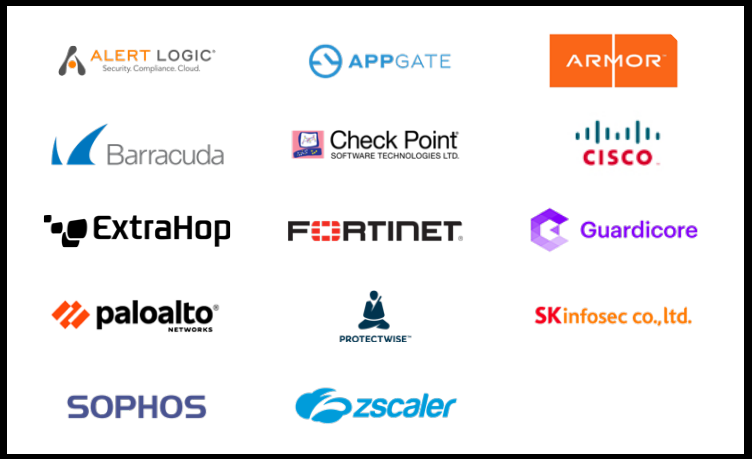
Large community of security partners & solutions

Network and infrastructure security



Host and endpoint security

Identity and access control

Application security

Vulnerability and configuration analysis

Data protection and encryption

Logging, monitoring, SIEM, threat detection, and analytics

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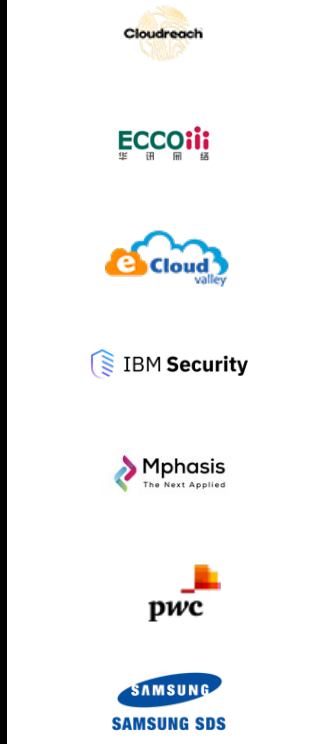
Consulting and technology competency partners

Security engineering

Governance, risk, and compliance

Security operations and automation



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Identity and Access Management

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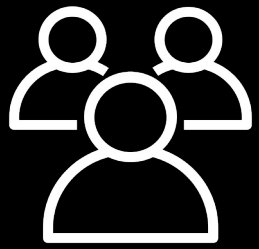
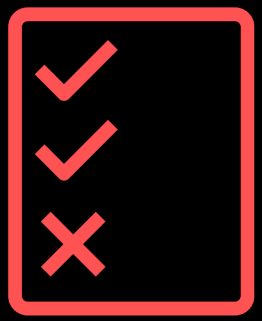
Who can access what

Who

can access

what





Developers and applications

Permissions

Resources

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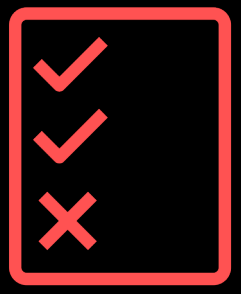

Policy Authorization

Policy Guardrails

Goal: Least privileged access

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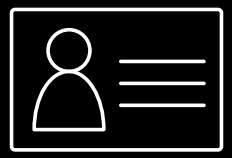

Identity and access management

Define, enforce, and audit user permissions across AWS services, actions, and resources

AWS Identity and Access Management (IAM)

Securely manage access to AWS services and resources

AWS IAM Identity Center

Centrally manage SSO access to multiple AWS accounts and business apps

AWS Directory Service

Managed Microsoft Active Directory in AWS

Amazon Cognito

Add user sign-up, sign-in, and access control to your web and mobile apps

AWS Organizations

Policy-based management for multiple AWS accounts

AWS Resource Access Manager

Simple, secure service for sharing AWS resources

Amazon Verified Permissions

Fine-grained permissions and authorization for your applications

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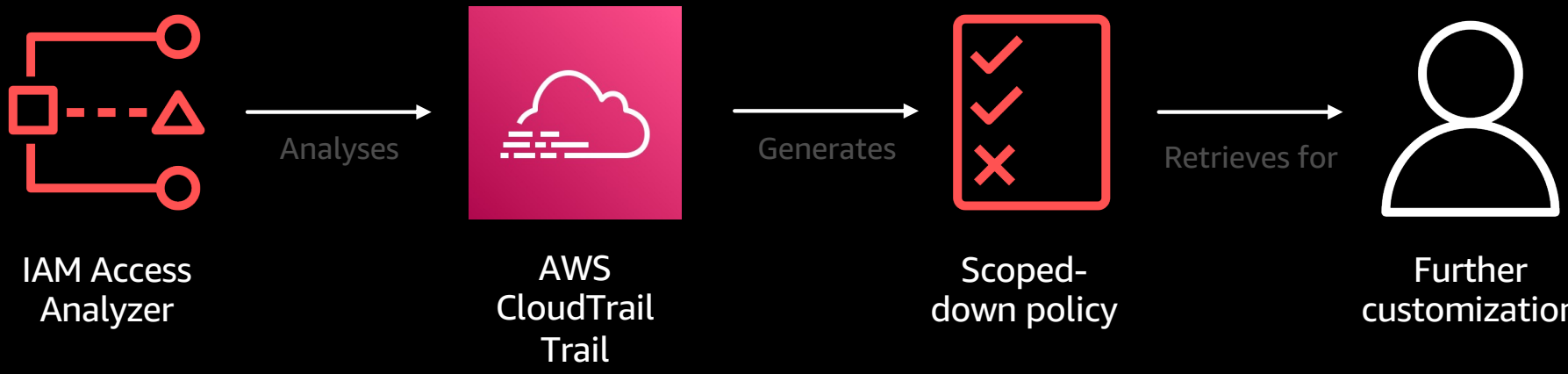
IAM Access Analyzer - Generate Policies based on Access Activity

IAM Access Analyzer reviews your AWS CloudTrail logs and generates a policy template that contains the permissions that have been used by the entity in your specified time frame.



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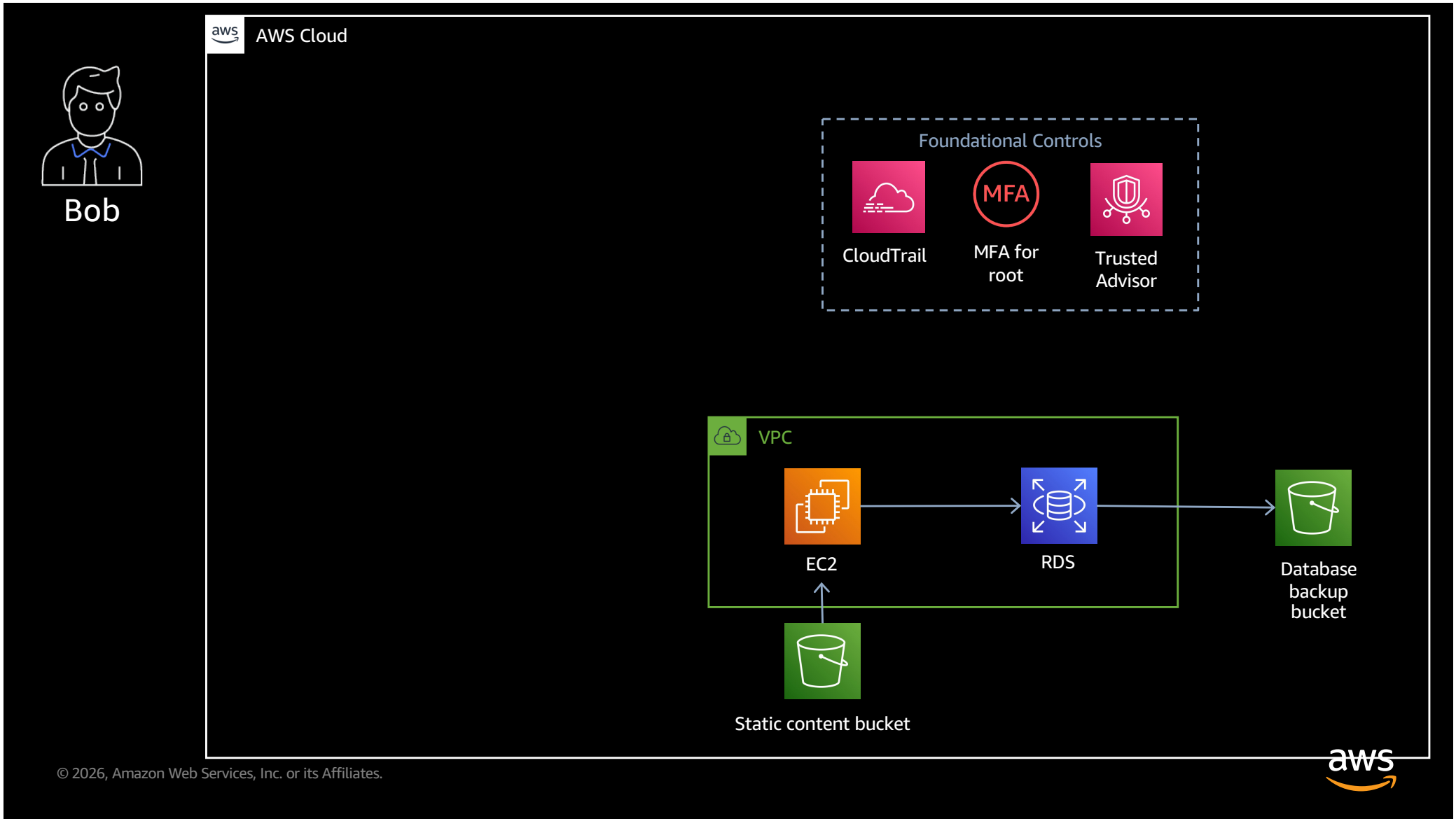

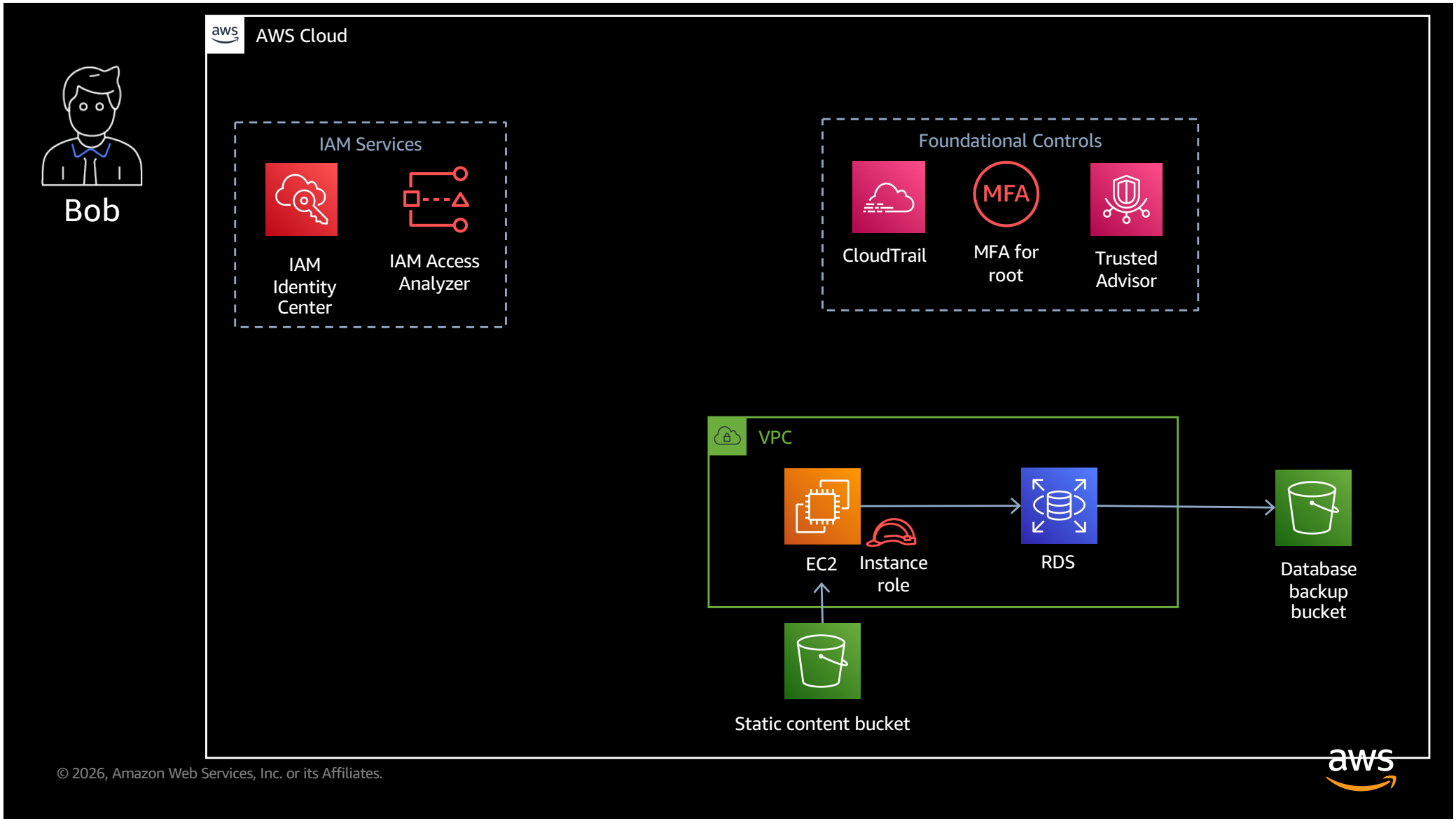

Detection

Detective controls

Gain the visibility you need to spot issues before they impact your business, improve your security posture, and reduce the risk profile of your environment

AWS Security Hub
Automate AWS security checks and centralize security alerts.

Amazon GuardDuty
Protect your AWS accounts with intelligent threat detection.

Amazon Inspector
Automated and continual vulnerability management at scale.

Amazon CloudWatch
Observe and monitor resources and applications on AWS, on premises, and on other clouds.

AWS Config
Assess, audit, and evaluate configurations of your resources.

AWS CloudTrail
Track user activity and API.

VPC Flow Logs
Capture info about IP traffic going to and from network interfaces in your VPC.

Amazon Security Lake
Automatically centralize your security data in a few steps.

Amazon GuardDuty

What is Amazon GuardDuty?

Amazon GuardDuty is a threat detection service that continuously monitors for malicious activity and unauthorized behavior to protect your AWS accounts and workloads.

Threat detection using two methods:

- Threat Intelligence
- Machine Learning

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How GuardDuty works

Data sources

VPC flow logs

DNS logs

Login events

CloudTrail events

S3 data plane events

EKS control plane logs & runtime activity

Security analytics

Machine learning

Threat intelligence

Continuous learning

Security findings

Actionable

Accurate

Contextual

Integration

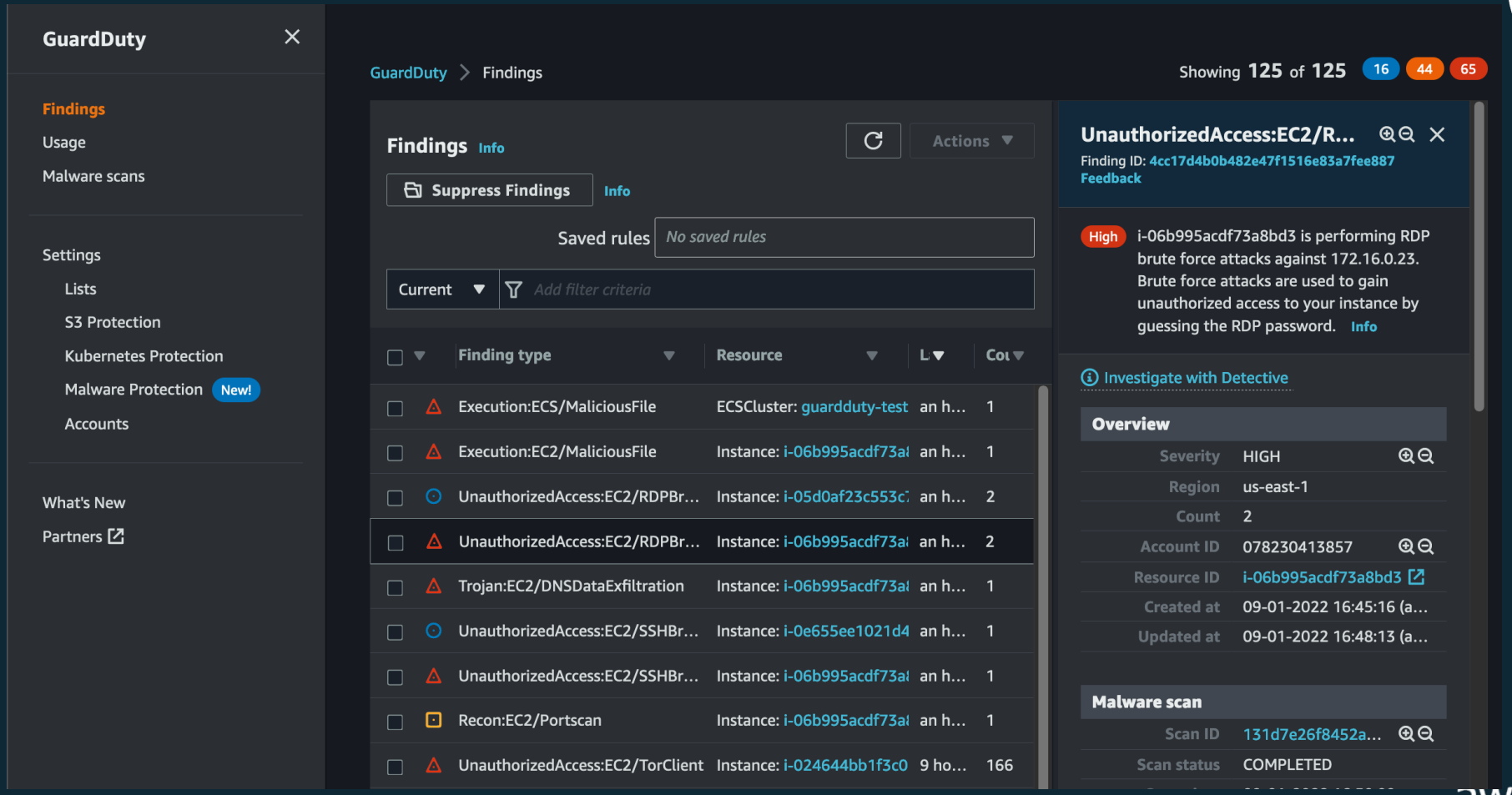
Amazon Detective

AWS Security Hub

Amazon EventBridge

AWS Partner Network

Threat Detection — Amazon GuardDuty



Amazon Inspector

Amazon Inspector

AUTOMATED AND CONTINUAL VULNERABILITY MANAGEMENT AT SCALE

Amazon Inspector is an automated vulnerability management service that continually scans AWS workloads for software vulnerabilities and unintended network exposure.

- AMAZON ELASTIC COMPUTE CLOUD (EC2)
- CONTAINER IMAGES RESIDING IN AMAZON ELASTIC CONTAINER REGISTRY (AMAZON ECR)
- AWS LAMBDA FUNCTIONS

CVE finding example

Finding	Instance i-0fd51405cc6151ae1 is vulnerable to CVE-2017-16650 → Vulnerability
Severity	High
Description	The qmi_wwan_bind function in drivers/net/usb/qmi_wwan.c in the Linux kernel through 4.13.11 allows local users to cause a denial of service (divide-by-zero error and system crash) or possibly have unspecified other impact via a crafted USB device. → Impact
Recommendation	Use your Operating System's update feature to update package kernel-0:4.4.41-36.55.amzn1, kernel-tools-0:4.4.41-36.55.amzn1. For more information see https://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2017-16650 → Remediation

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Inspector – Checks for Network Exposure

Amazon Inspector analyzes AWS network configuration to find what is reachable?

List of resources analyzed:

- Security Groups
- VPCs
- Network interfaces
- Subnets
- Network ACLs
- Route tables
- Elastic load balancers
- Application load balancers
- Internet gateways
- Virtual private gateways
- Direct Connect
- VPC peering connections

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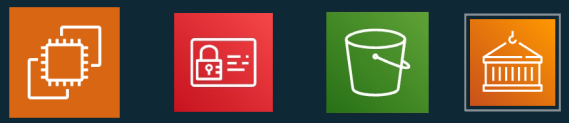
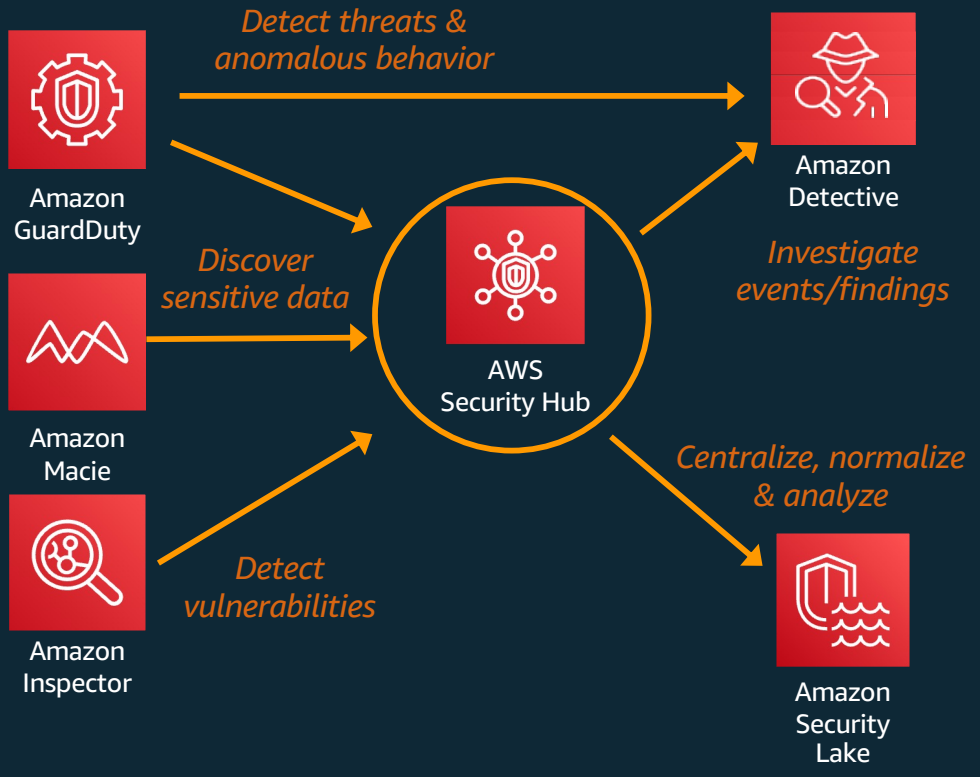
AWS Security Hub

Threat detection, monitoring, and response

Security Monitoring and Threat Detection



Integrated with AWS Workloads in an AWS Account, along with identities and network activity



Automated compliance checks

CIS AWS Foundations

by AWS

Description
The Center for Internet Security (CIS) AWS Foundations Benchmark is a set of security configuration best practices for AWS.

Compliance readiness: 12%

Resources failing: 42 (44%)

Disable | View findings

New PCI DSS

by AWS

Description
The Payment Card Industry Data Security Standard is an information security standard for organizations that handle credit cards. The PCI Standard is administered by the Payment Card Industry Security Standards Council.

Enable

Identity and Access Management (IAM)

by AWS Security Best Practices

Description
Identity and access management are key parts of an information security program, ensuring that only authorized and authenticated users are able to access your resources, and only in a manner that you intend.

Compliance readiness: 17%

Resources failing: 88 (92%)

Disable | View findings

Detective controls

by AWS Security Best Practices

Description
You can use detective controls to identify a potential security threat or incident. They are an essential part of governance frameworks and can be used to support a quality process, a legal or compliance obligation, and for threat identification and response efforts.

Compliance readiness: 84%

Resources failing: 14 (15%)

Disable | View findings

Infrastructure protection

by AWS Security Best Practices

Description
Infrastructure protection encompasses control methodologies, such as defense in depth, necessary to meet best practices and organizational or regulatory obligations.

Compliance readiness: 25%

Resources failing: 61 (64%)

Disable | View findings

Data protection

by AWS Security Best Practices

Description
Foundational practices that influence security should be in place. For example, data classification provides a way to categorize organizational data based on levels of sensitivity, and encryption protects data by way of rendering it unintelligible to unauthorized access.

Compliance readiness: 78%

Resources failing: 14 (15%)

Disable | View findings

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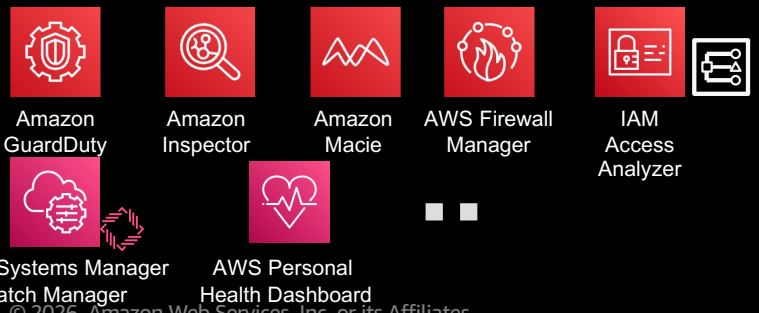
AWS Security Hub: Partners

Partners submitting findings



Partners taking action

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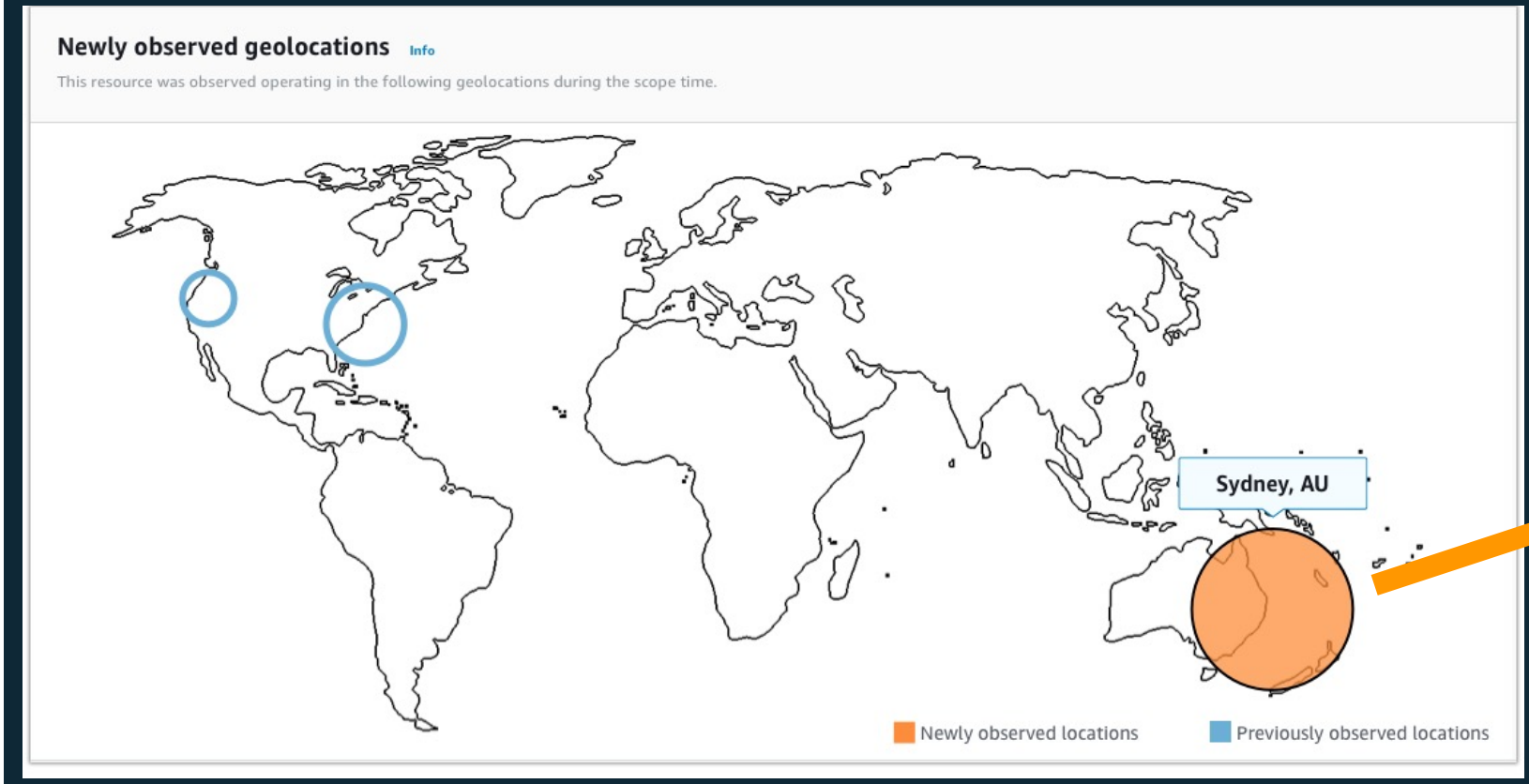
Amazon Detective

Amazon Detective

Analyze and visualize security data to rapidly get to the root cause of potential security issues

Investigation example

Amazon Detective - Investigations



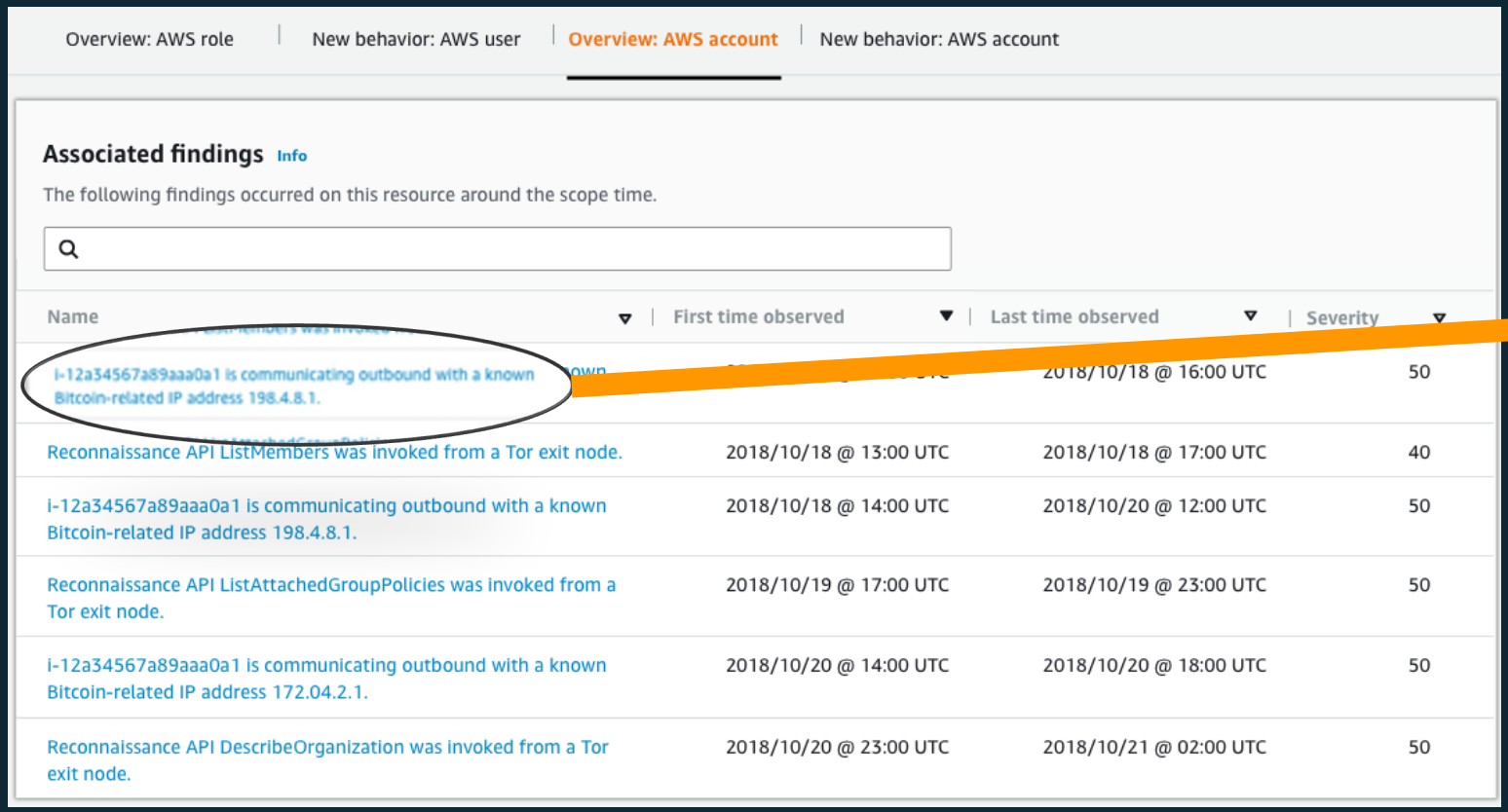
Abnormal activity in Sydney region

Amazon Detective - Investigations

Successful calls ramping up

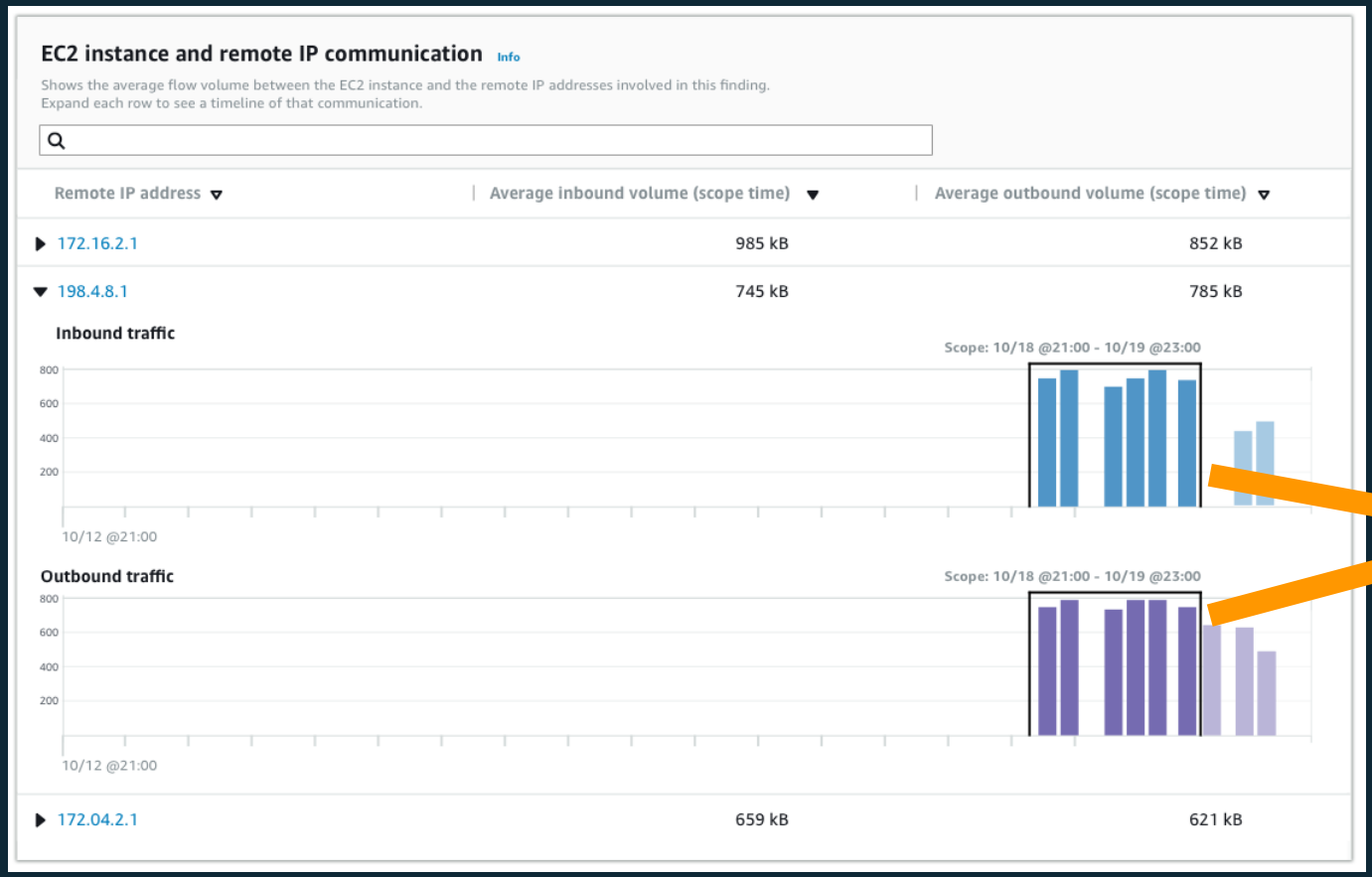
Failed calls spiking and then falling

Amazon Detective - Investigations

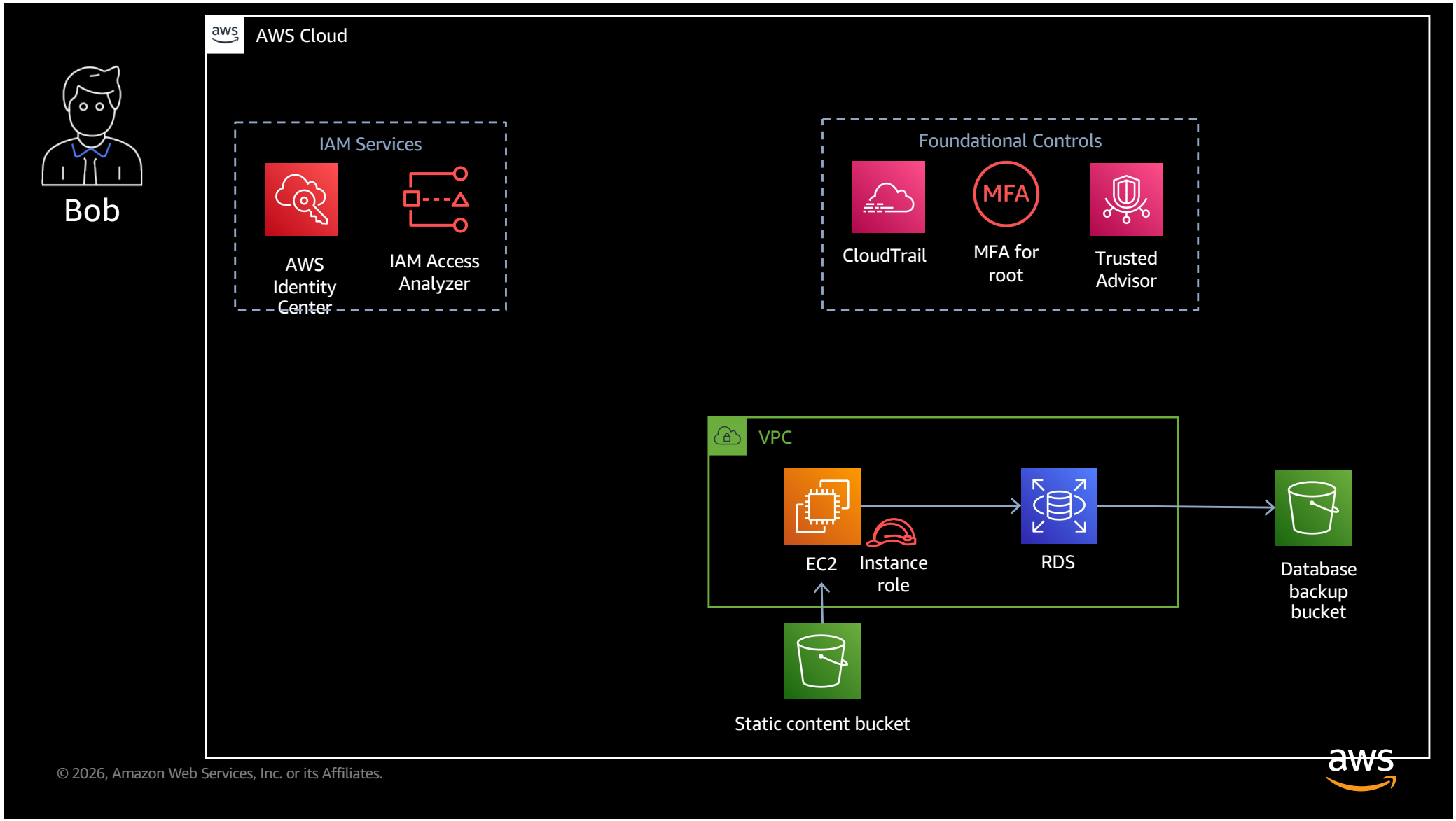


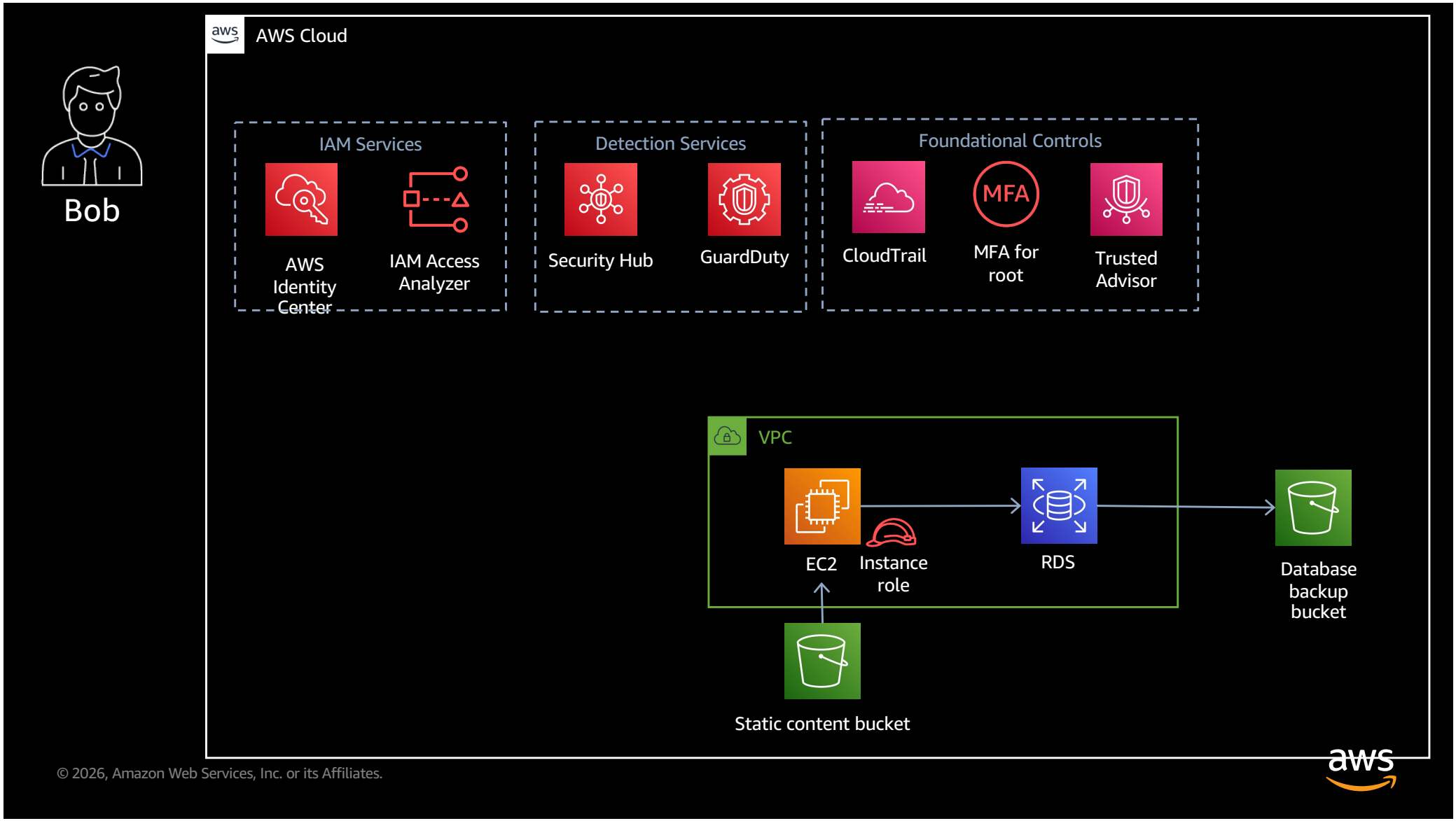
Finding indicating crypto-mining activity

Amazon Detective - Investigations



Traffic to Bitcoin-related IPs





Infrastructure Security

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Infrastructure protection

Reduce surface area to manage and increase privacy for and control of your overall infrastructure on AWS

AWS Firewall Manager

Centrally configure and manage firewall rules across your accounts.

AWS Network Firewall

Deploy network firewall security across your VPCs.

AWS Shield

Maximize application availability and responsiveness with managed DDoS protection.

AWS WAF (Web Access Firewall)

Protects your web applications from common exploits.

Amazon Virtual Private Cloud

Define and launch AWS resources in a logically isolated virtual network.

AWS PrivateLink

Establish connectivity between VPCs and AWS services without exposing data to the internet.

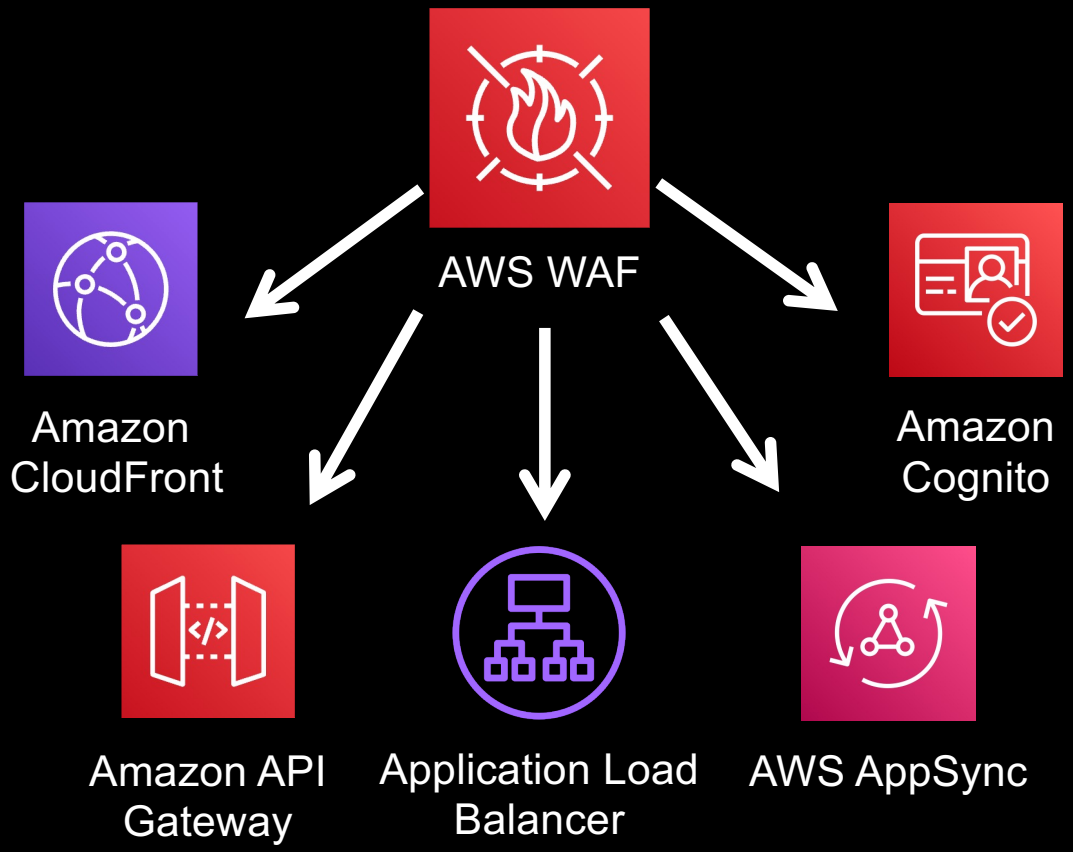
AWS Systems Manager

Gain operational insights into AWS and on-premises resources.

AWS Verified Access

Provide secure access to corporate applications without a VPN.

AWS WAF - Layer 7 Protection



- Managed, Elastic, and **Integrated** WAF
- Pay-as-you-go
- Rules Managed by AWS
  + Custom Rules.
  + Provided by partners

DDoS protection with AWS Shield

Standard

Available to all AWS customers at no additional cost

- Protection against the most common attacks (SYN/UDP Floods, Reflection Attacks, etc. Layer 3/4)
- Automatic detection and mitigation

Advanced

Paid service that provides additional protection against sophisticated attacks

+ Protection against advanced attacks (Layer 7)
+ 24x7 DDoS Response Team (Proactive/Reactive)
+ Cost protection
+ Faster Mitigation/Better Visualization
+ Includes WAF and Firewall Manager

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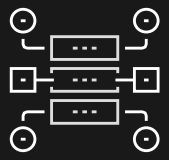
AWS Network Firewall: Native Firewall



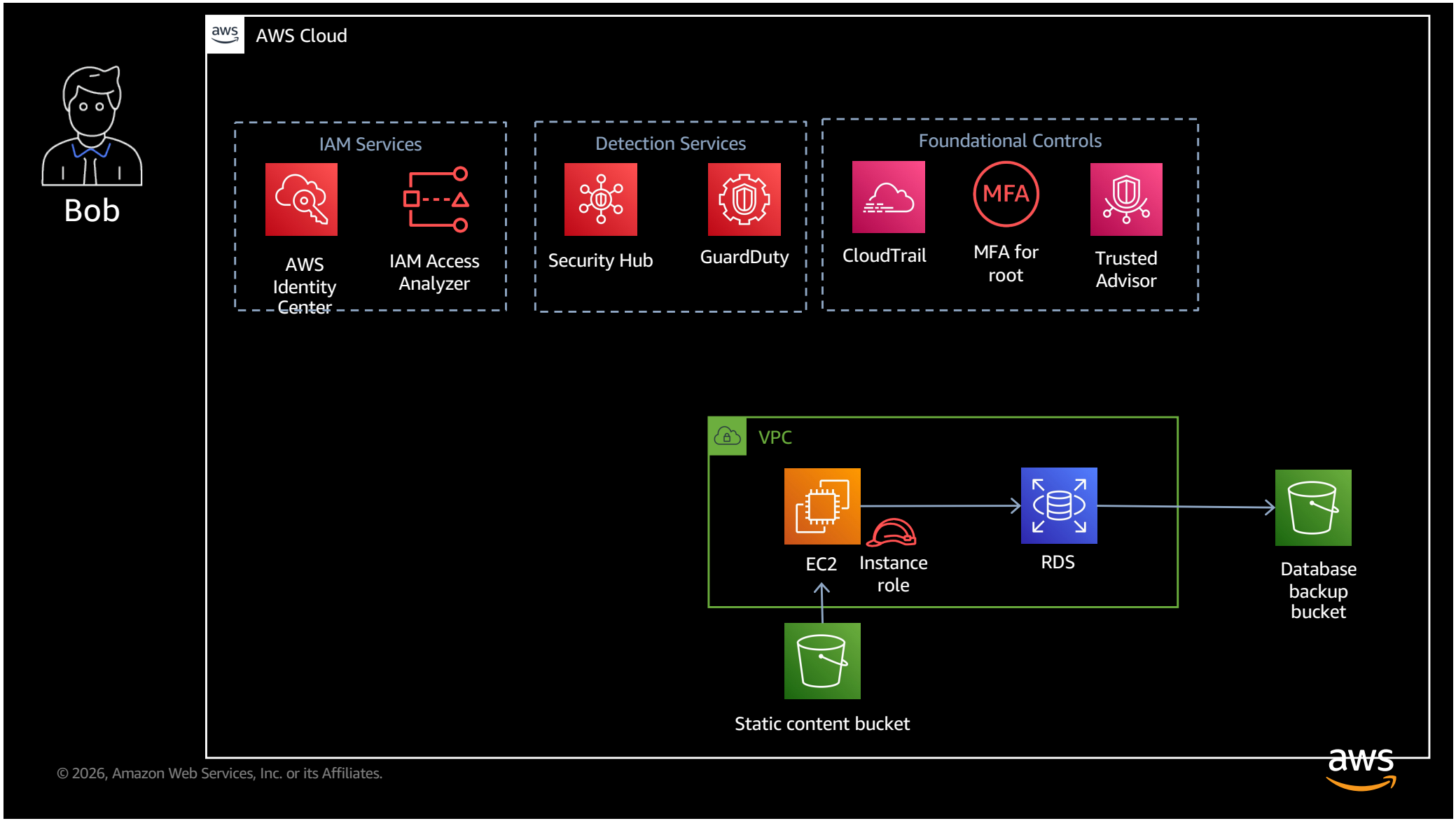
Automatically scale, managed AWS infrastructure

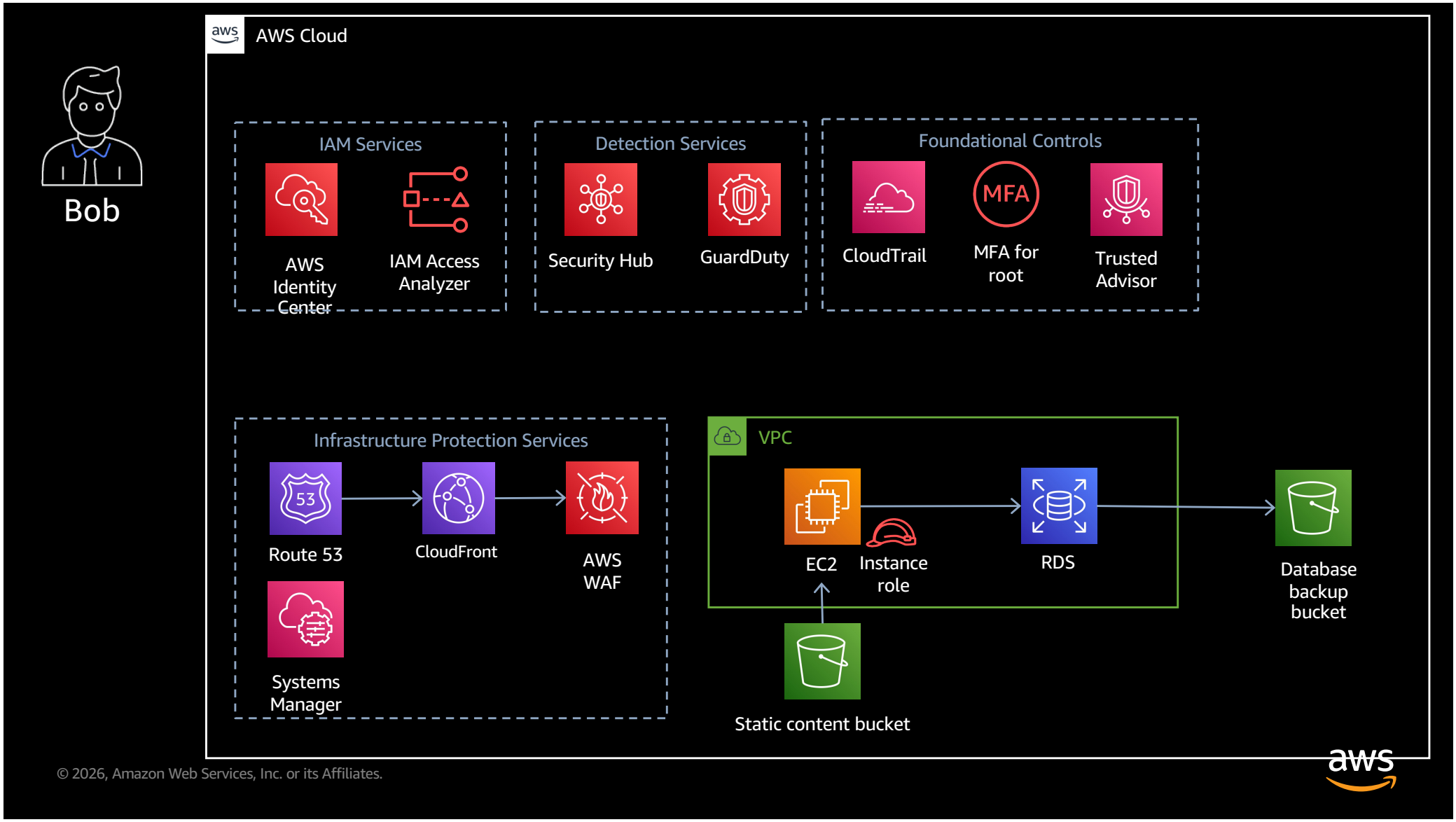
Highly flexible, high-capacity rule engine with managed IPS rules

Centrally manage policies, real-time monitoring

There are no upfront commitments and you only pay for what you use

aws





Data protection

Data protection

A suite of services designed to automate and simplify many data protection and security tasks ranging from key management and storage to credential management.

Amazon Macie
Discover and protect your sensitive data at scale.

AWS Key Management Service (AWS KMS)
Create and control keys used to encrypt or digitally sign your data.

AWS CloudHSM
Manage single-tenant hardware security modules (HSMs) on AWS.

AWS Certificate Manager
Provision and manage SSL/TLS certificates with AWS services and connected resources.

AWS Secrets Manager
Centrally manage the lifecycle of secrets.

AWS VPN
Connect your on-premises networks and remote workers to the cloud.

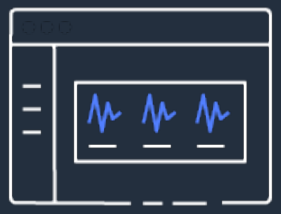
Server-Side Encryption
Flexible data encryption options using AWS service managed keys, AWS managed keys via AWS KMS, or customer managed keys.

AWS Private CA
Create private certificates to identify resources and protect data.

Amazon Macie

Amazon Macie

- *Discover and protect your sensitive data at scale*



Gain visibility and evaluate

- Bucket inventory
- Bucket policies

Discover sensitive data

- Inspection jobs
- Flexible scope

Centrally manage at scale

- AWS Organizations
- Managed & custom data detections

Automate and take actions

- Detailed findings
- Management APIs

Amazon Macie – Data Identifiers

- Fully managed sensitive data types
- Amazon Macie maintains a growing list of sensitive data types that include common personally identifiable information (PII) and other sensitive data types as defined by data privacy regulations, such as GDPR, PCI-DSS, CCPA and HIPAA.

Data identifiers

- *Financial (card, bank account numbers…)*
- *Personal (names, address, contact…)*
- *National (passport, ID, driver license…)*
- *Medical (healthcare, drug agency …)*
- *Credentials & secrets (AWS secret keys, private keys …)*
- *Custom – regex, keywords*
- *Allow Lists*

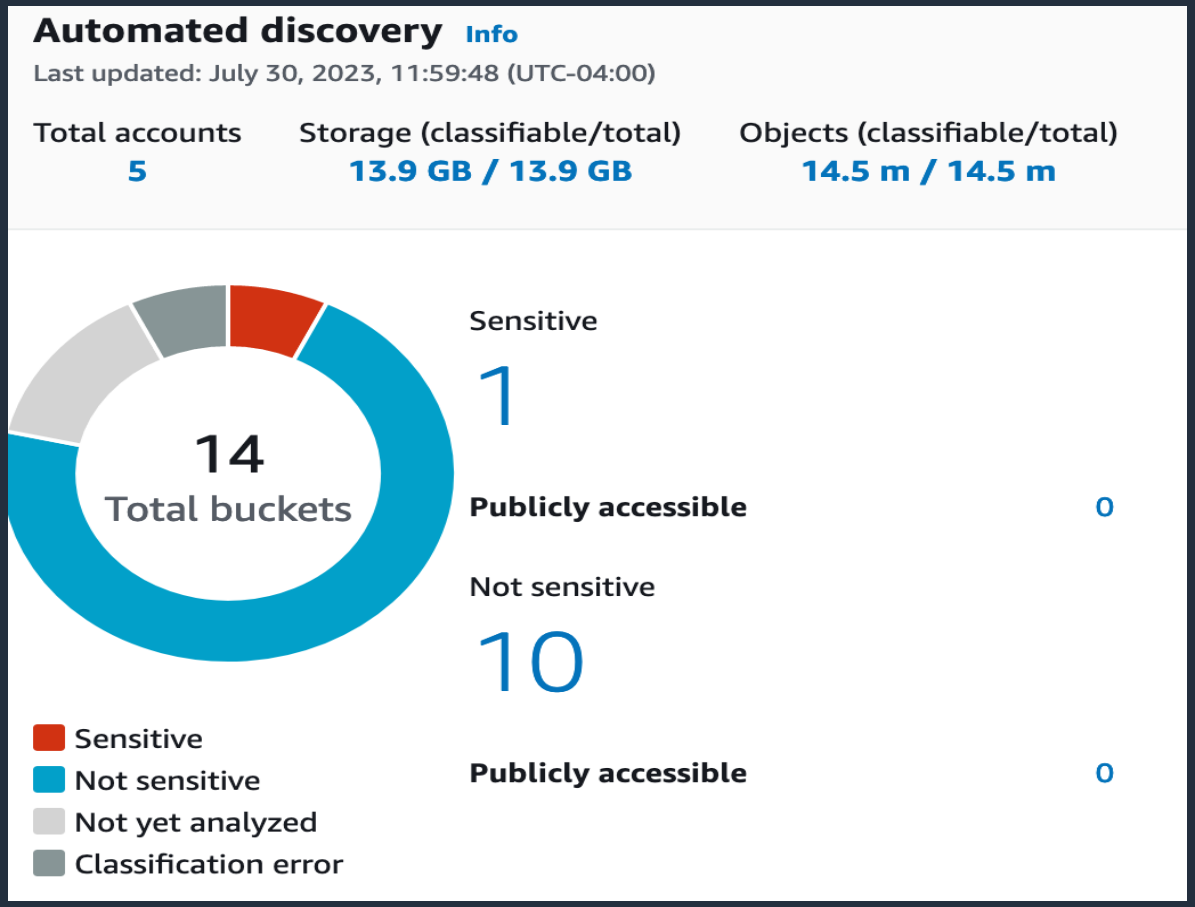
Amazon Macie – Supported File Formats

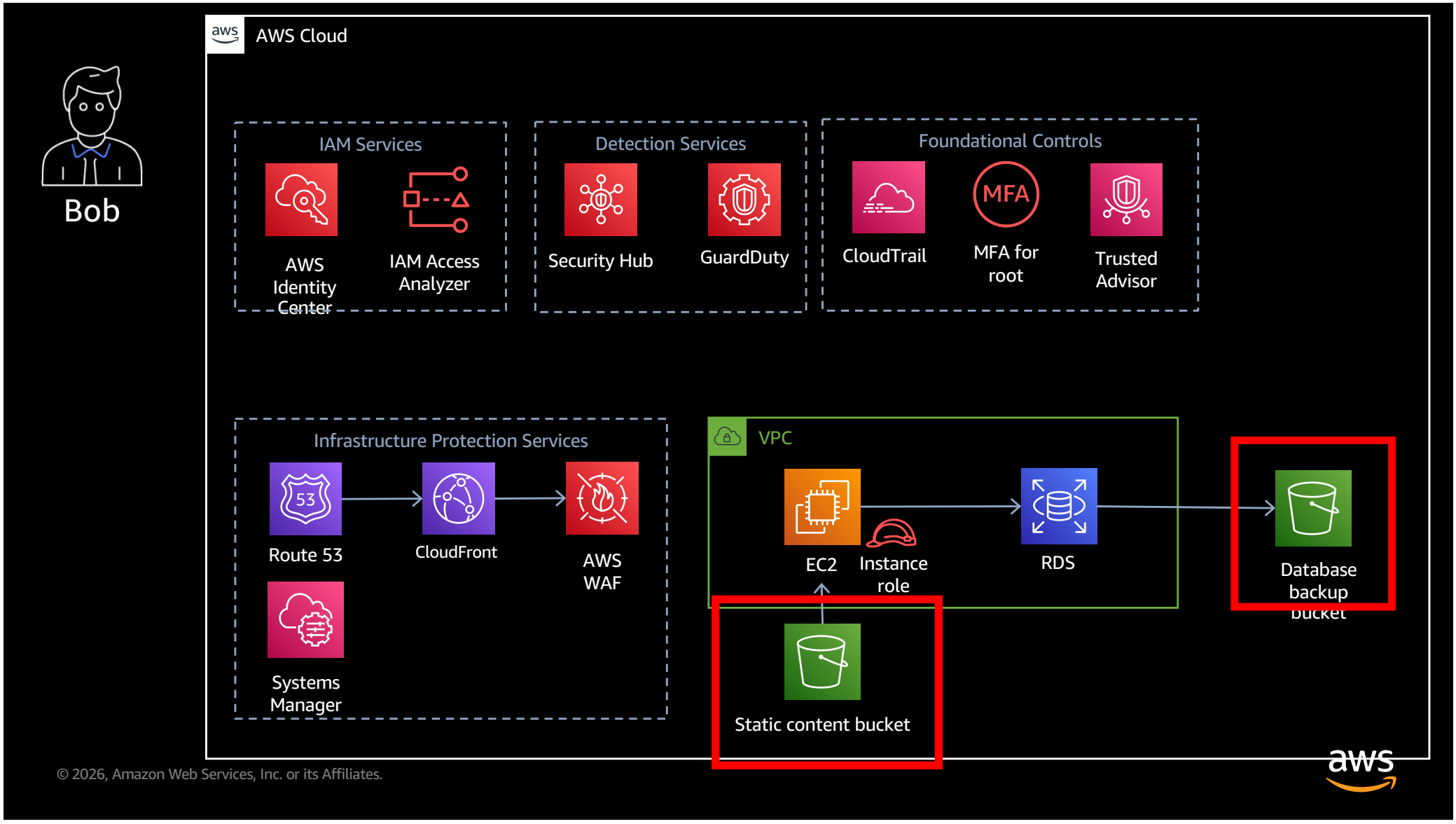
- Supported file and storage formats in Amazon Macie
- When Amazon Macie analyzes data in an S3 bucket, it performs a deep inspection that factors the file or storage format for the data. Macie can analyze and detect sensitive data in many different formats, including commonly used compression and archive formats.

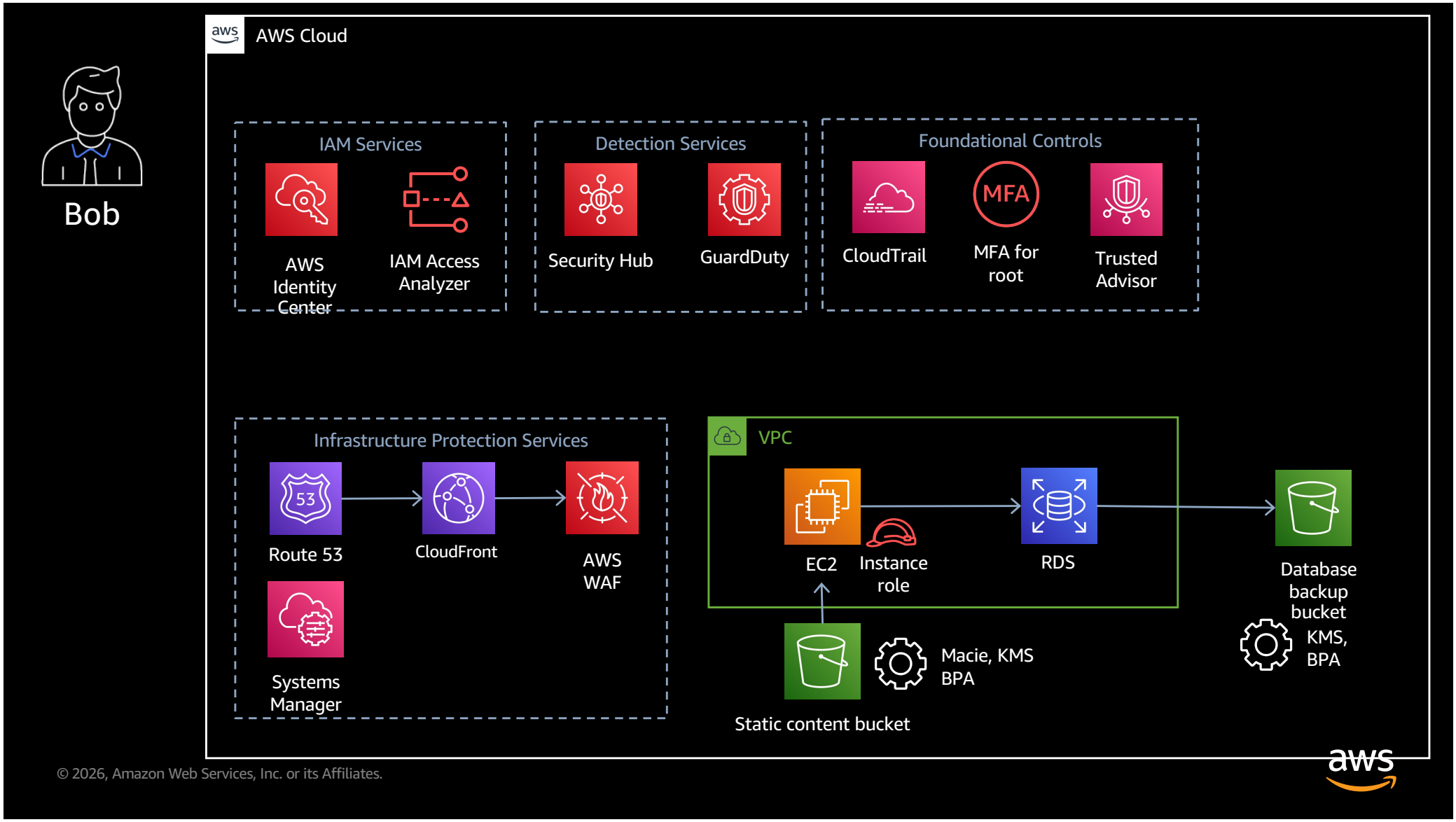
File and storage formats

Big Data - Apache Avro object containers and Apache Parquet files
Compression or archive - .gz, .gzip, .tar, .zip
Document - .doc, .docx, .pdf, .xls, .xlsx
Text - .csv, .htm, .html, .json, .tsv, .txt, .xml, and others (depending on the type of non-binary text file)

Amazon Macie – Summary Dashboard







Incident Response

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Incident response

During an incident, containing the event and returning to a known good state are important elements of a response plan. AWS provides the following tools to automate aspects of this best practice.

Amazon Detective

Analysis and visualization of security data to get to the root cause of potential security issues quickly

Amazon EventBridge

Serverless event bus that makes it easier to build event-driven applications to scale your programmed, automated response to incidents

AWS Backup

Centrally manage and automate backups across AWS services to simplify data protection at scale

AWS Security Hub

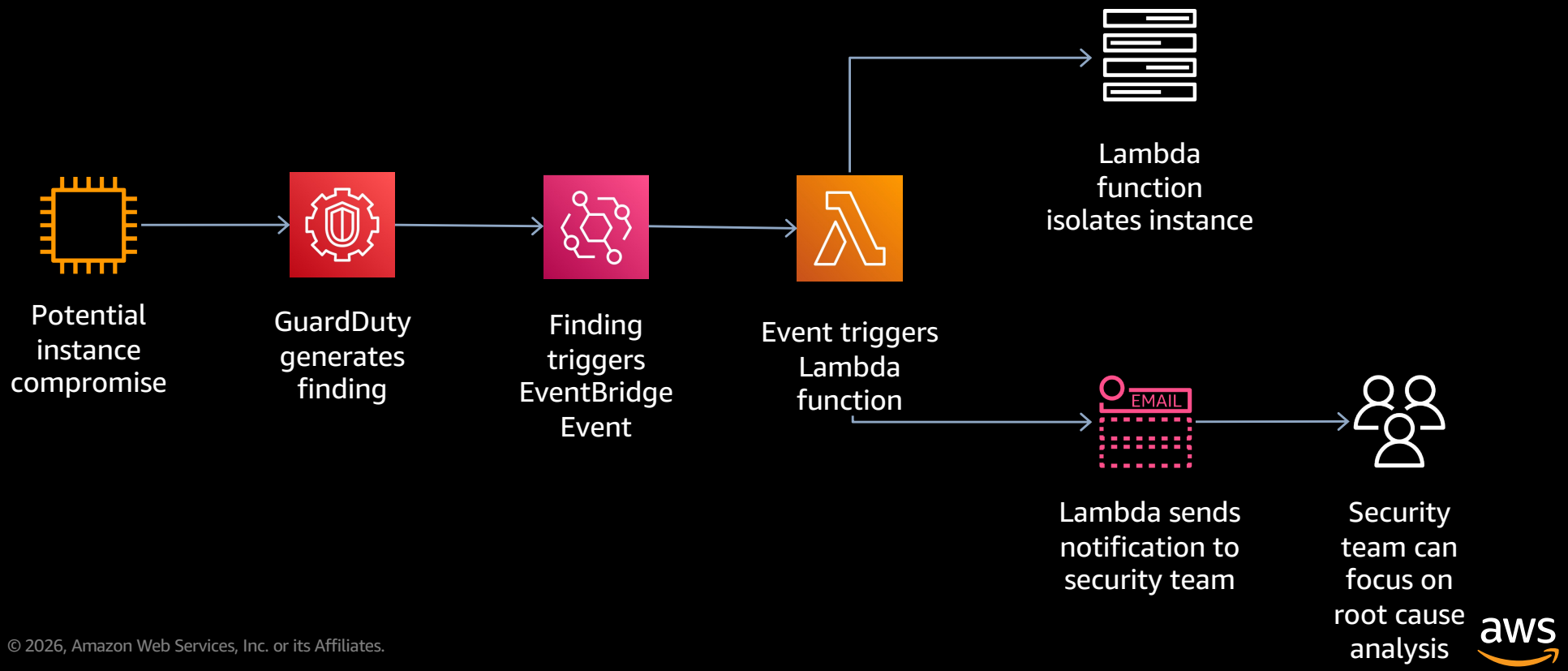
Out-of-the-box integrations with ticketing, chat, SIEM, SOAR, threat investigation, incident management, and GRC tools to support your security operations workflows

AWS Elastic Disaster Recovery

Fast, automated, cost-effective disaster recovery

Automated Incident Response – simple example

Automated process



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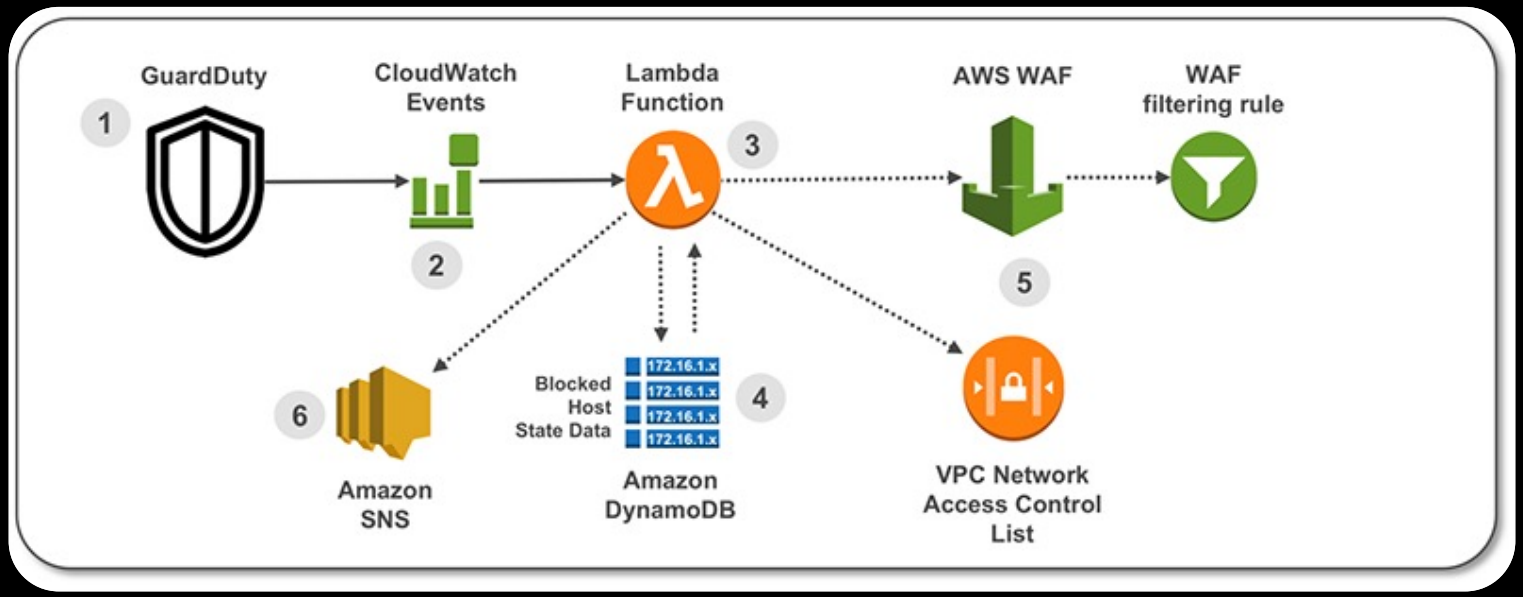
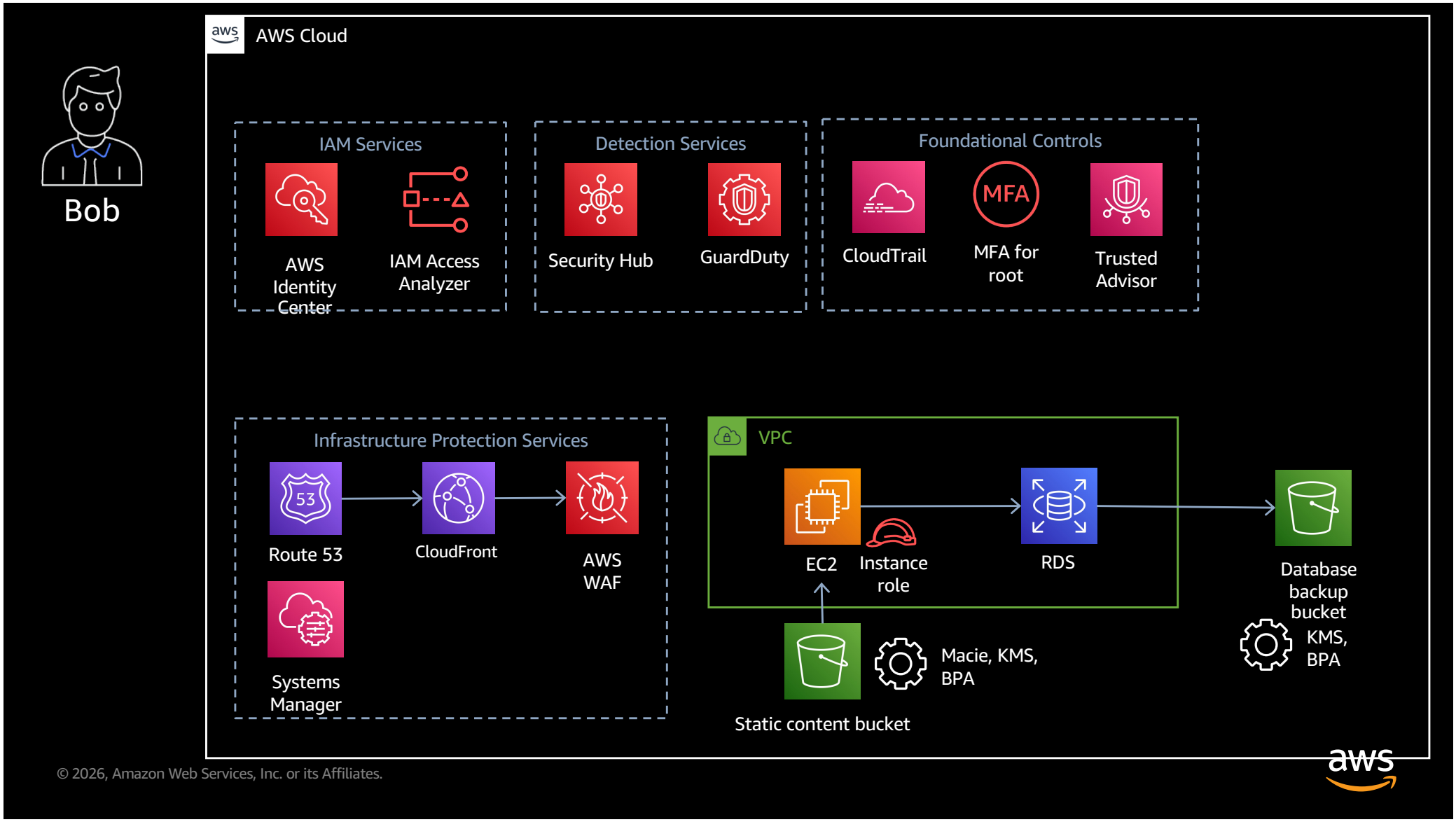
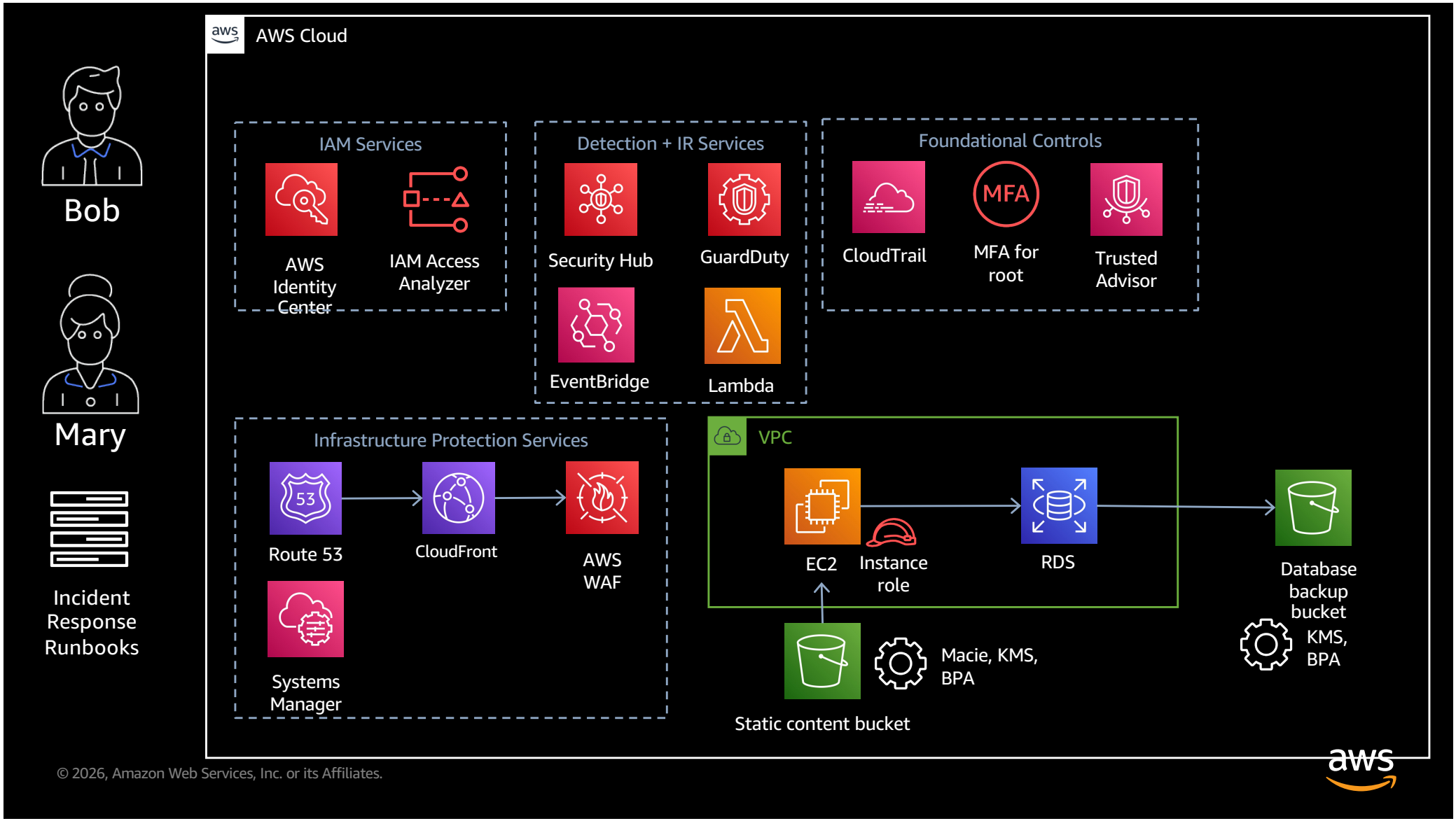
Automatic block of suspicious hosts using Amazon GuardDuty and AWS WAF.







Recap

- How AWS thinks about Security
- The AWS Shared Responsibility Model
- Foundational controls
- The Well Architected Framework – The Security Pillar
    - Identity and Access Management
    - Detection
    - Infrastructure protection
    - Data protection
    - Incident response

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Useful Resources

- AWS Security Portal
- AWS Startup Security Baseline (SSB)
- AWS Security Solutions Library
- Security Pillar of AWS Well-Architected Framework – Design cloud architectures with security in mind.
- Security Reference Architecture
- AWS Architecture Center
- AWS Security Services
- Best Practices for Security, Identity and Compliance – Whitepapers, blogs, videos, workshops
- Customer Success Stories
- Security Competency Partners
- Security Learning

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Thank you!

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