aws training and certification

AWS Cloud Practitioner Exam Prep for Partners

AWS Training and Certification

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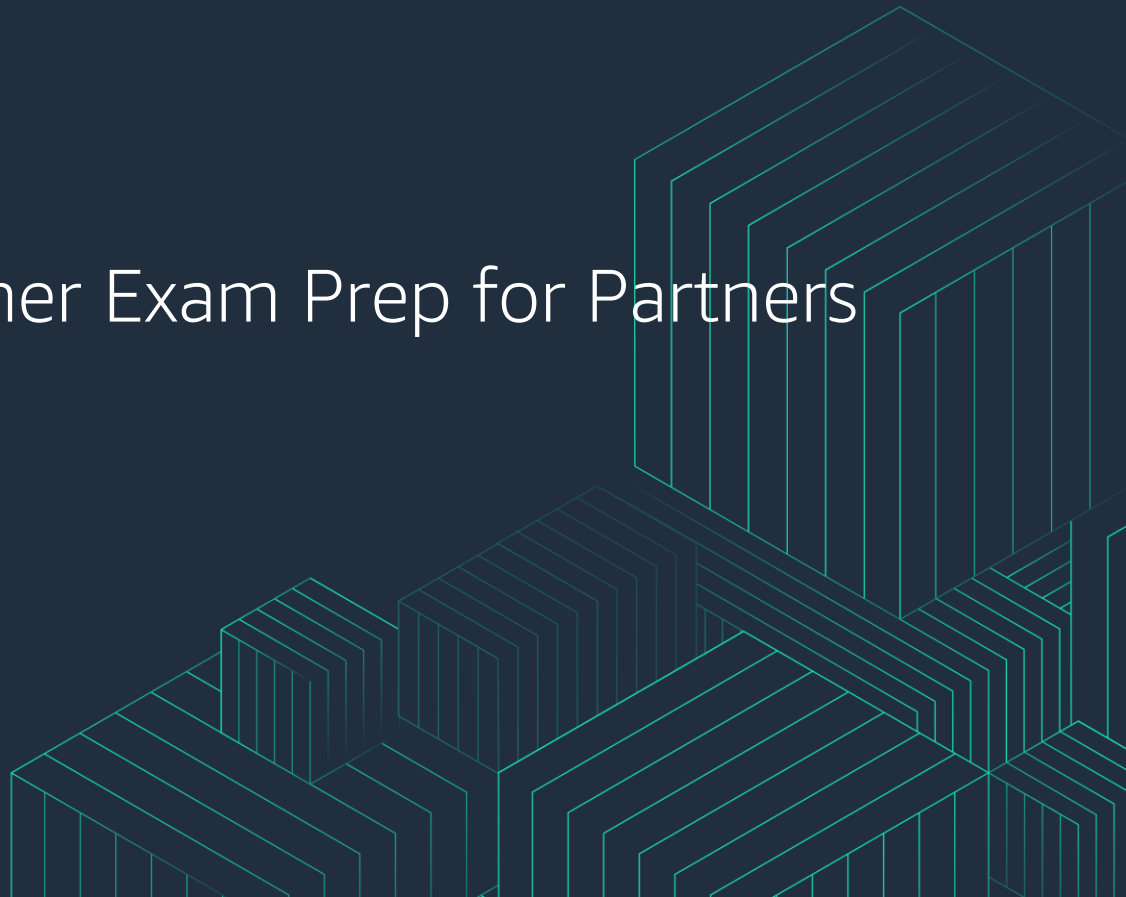


Course Agenda

AWS Cloud & Core Services

- Welcome and Introductions
- Module 1: Understanding the AWS Cloud
- Module 2: Security and Compliance
- Module 3: AWS Services
- Module 4: Pricing, TCO and Cost Optimization
- Module 5: AWS Well Architected Framework
- Module 6: APN Resources to Help You

Q&A Session

Welcome

- Guide for the AWS Certified Cloud Practitioner.
- Should not be taken as the sole source of study to perform the exam AWS CCP.
- Consider supporting material to further your studies.

Knowledge Check

Question 1

Which of the following are features of an edge location. Choose 3 answers from the options given below

A) Used in Conjunction with the CloudFront Service

B) Distribute Load across multiple resources

C) Cache common responses

D) Distribute content to users

Question 2

Which of the below mentioned services is equivalent to hosting virtual servers on an on-premise location?

A) Amazon EC2

B) AWS Regions

C) AWS IAM

D) AWS Server

Question 3

You have a set of EC2 Instances and get a DDos attack from the internet which of the following can help in reducing the overall threat to your EC2 Instances. Choose 2 answers from the options given below

A) Usage of AWS Config

B) Usage of Internet Gateway

C) Usage of Security Groups

D) Usage of Network Access Control Lists

Question 4

Which service allows for the collection and tracking of metrics for AWS services?

A) Amazon CloudFront

B) Amazon CloudSearch

C) Amazon CloudWatch

D) Amazon Machine Learning (Amazon ML)

Question 5

Which service should an administrator use to register a new domain name with AWS?

A) Amazon Route 53

B) Amazon Cloud Front

C) Elastic Load Balancing

D) Amazon Virtual Private Cloud (Amazon VPC)

Question 6

Which of the following services uses AWS edge locations?

A) Amazon Virtual Private Cloud (Amazon VPC)

B) Amazon CloudFront

C) Amazon Elastic Compute Cloud (Amazon EC2)

D) AWS Storage Gateway

Question 7

Which AWS services can be used to store files? Choose 2 answers from the options given below

A) Amazon CloudWatch

B) Amazon Simple Storage Service (Amazon S3)

C) Amazon Elastic Block Store (Amazon EBS)

D) AWS Config

E) Amazon Athena

Question 8

Who has control of the data in an AWS account?

A) AWS Support Team

B) AWS Account Owner

C) AWS Security Team

D) AWS Technical Account Manager (TAM)

AWS Certified Cloud Practitioner

AWS Certified Cloud Practitioner

About the Exam

- 90 minutes
- US$ 100,00
- Immediate Result
- Score : 100 to 1000 (Minimum 700 PASS)
- 65 questions

Multiple-responses:

What are AWS services? :

(•) IAM
(•) CloudFront
( ) AWS Games
( ) ForCloud
( ) Discovery Tiers

Multiple-Choice:

CloudFront Service Infrastructure:

(•) EdgeLocations
( ) Data Centers
( ) AWS Transceivers
( ) Cloud Content
( ) External DNS

AWS Certified Cloud Practitioner

Exam Topics

The table below lists the main content domains and their weightings.**Domain**	**% of Examination**
Domain 1: Cloud Concepts	28%
Domain 2: Security	24%
Domain 3: Technology	36%
Domain 4: Billing and Pricing	12%
TOTAL	**100%**

https://aws.amazon.com/certification/certified-cloud-practitioner/

How to add 30min (1/2)

Non-native English speaking countries are eligible to add 30min to exam time.

Standard Time: 90min

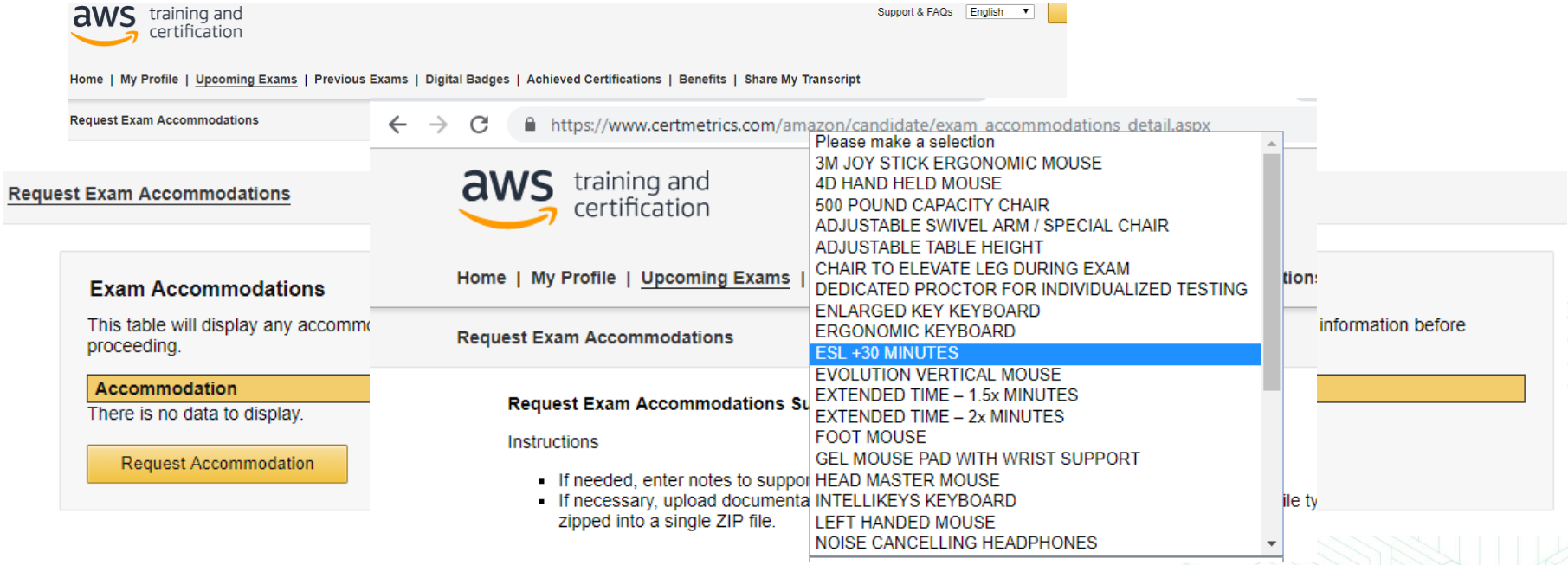
Extended Time: 120min

- ✓ Must be done before exam scheduling.
- ✓ Auto approval process.
- ✓ 1 time only.

How to do this?

Go to certification portal (aws.training/Certification)

How to add 30min (2/2)



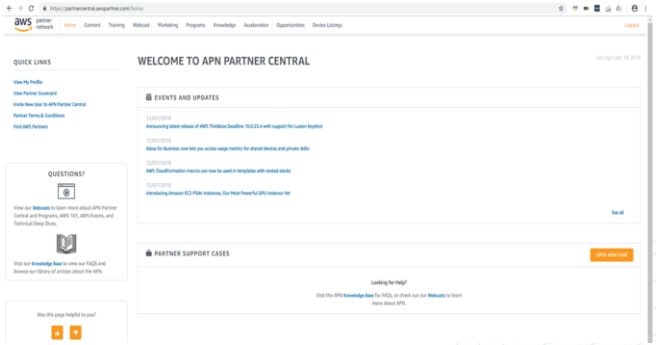
AWS Certified Cloud Practitioner

Resources

- AWS Training (aws.amazon.com/training)
  - AWS Business Professional (Digital)
  - AWS TCO and Cloud Economics (Digital)

- Whitepapers on AWS
  - Overview of Amazon Web Services
  - Architecting for the Cloud: AWS Best Practices
  - How AWS Pricing Works
  - Cost Management in the AWS Cloud
  - AWS support plan comparison

apn-portal.com



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AWS Certified Cloud Practitioner

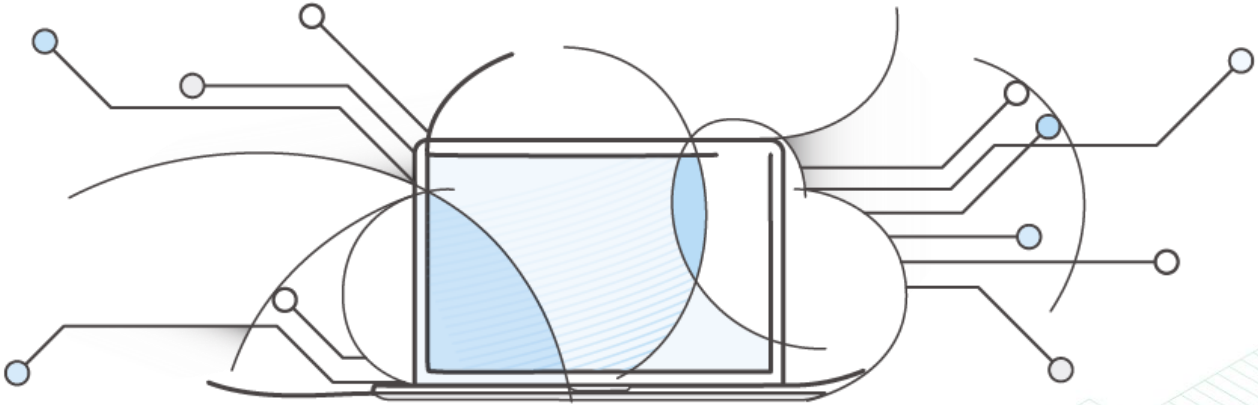
To Do

- Review this material.
- Go to AWS site and read about the main services https://aws.amazon.com
- Understand Cloud AWS value proposition, principles and advantages.
- Security in the cloud: AUP, SRM, Compliance, IAM, MFA.
- Global AWS Infrastructure, multi-AZ architectures, services scope.
- Pricing models and organizational structure.

Module 1:
Understanding the AWS Cloud

What is Cloud Computing

Cloud computing is the on-demand delivery of compute power, database storage, applications, and other IT resources through a cloud services platform via the internet with pay-as-you-go pricing.



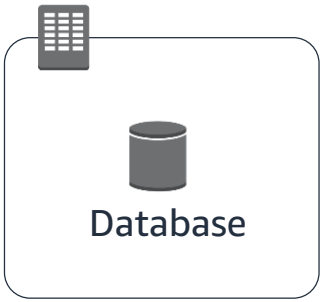
Why Customers are Moving to AWS

- Trade Capital Expense for Variable Expense
- Increase Speed & Agility
- Streamline & Enhance Infrastructure Decisions
- Reduce Expenses

- Scale Globally
- Increase Innovation
- Accelerate Time to Business Value

Transitioning from a Self-Managed to a Fully Managed Service

Self-Managed



Corporate data center

Amazon EC2 Service

AWS Data Center(s)

Fully Managed Service

AWS Data Center(s)

What Sets AWS Apart?

Enterprise Leadership

Building and managing the cloud since 2006

Service Breadth and Depth

Over 165 services

Pace of Innovation

1957 features in 2018

Global Presence

69 Availability Zones in 22 geographic regions around the world

Amazon Culture

+70 proactive price reductions

Security

#1 Priority

Largest Partner Ecosystem

aws 

AWS Marketplace and APN

Hybrid Cloud

Broadest set of hybrid capabilities of any cloud provider

AWS Global Infrastructure

22 Geographical Regions, 1 Local Region, 69 Availability Zones, 160+ PoPs

Region & Number of Availability Zones (AZs)

GovCloud (US)
US-East (3), US-West (3)

US West
Oregon (4)
Northern California (3)

US East
N. Virginia (6), Ohio (3)

Canada
Central (2)

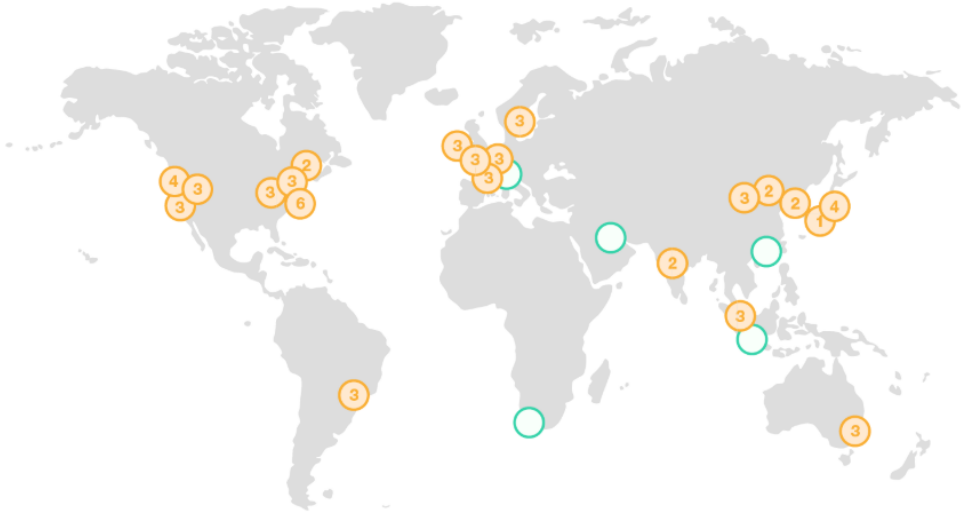
South America
São Paulo (3)

Middle East
Bahrain (3)

Europe
Frankfurt (3)
Ireland (3)
London (3)
Paris (3)
Stockholm (3)

Asia Pacific
Singapore (3), Sydney (3),
Tokyo (4), Osaka-Local (1)*
Seoul (2), Mumbai (2)
Hong Kong SAR (3)

China
Beijing (2), Ningxia (3)

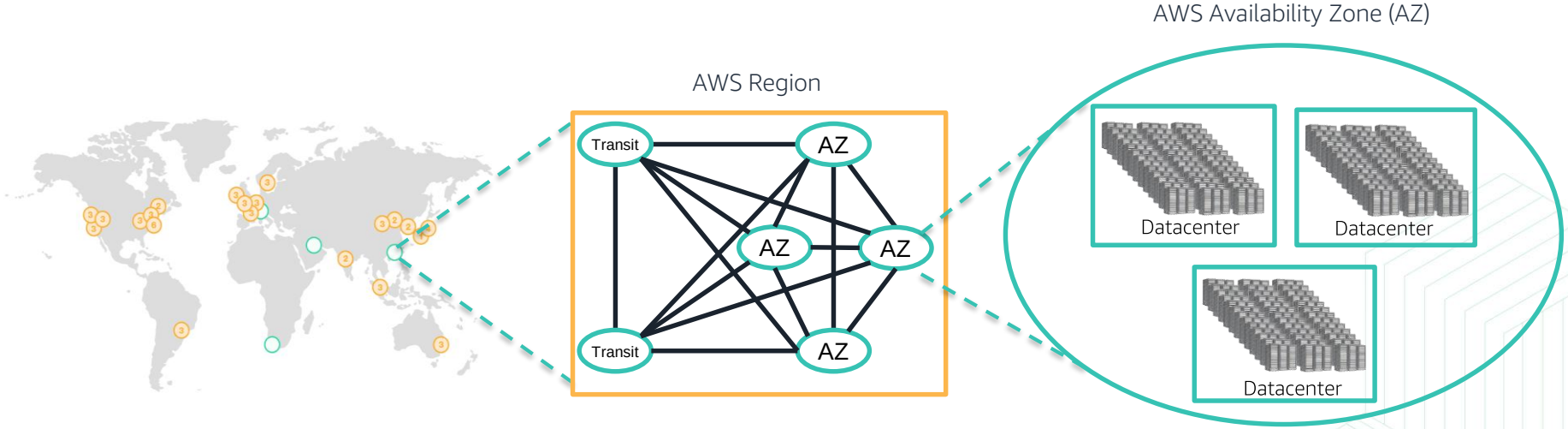


Announced Regions

Four Regions and 12 AZs in Bahrain, Cape Town, Jakarta and Milan

AWS Region Design

AWS Regions are comprised of multiple AZs for high availability, high scalability, and high fault tolerance. Applications and data are replicated in real time and consistent in the different Azs



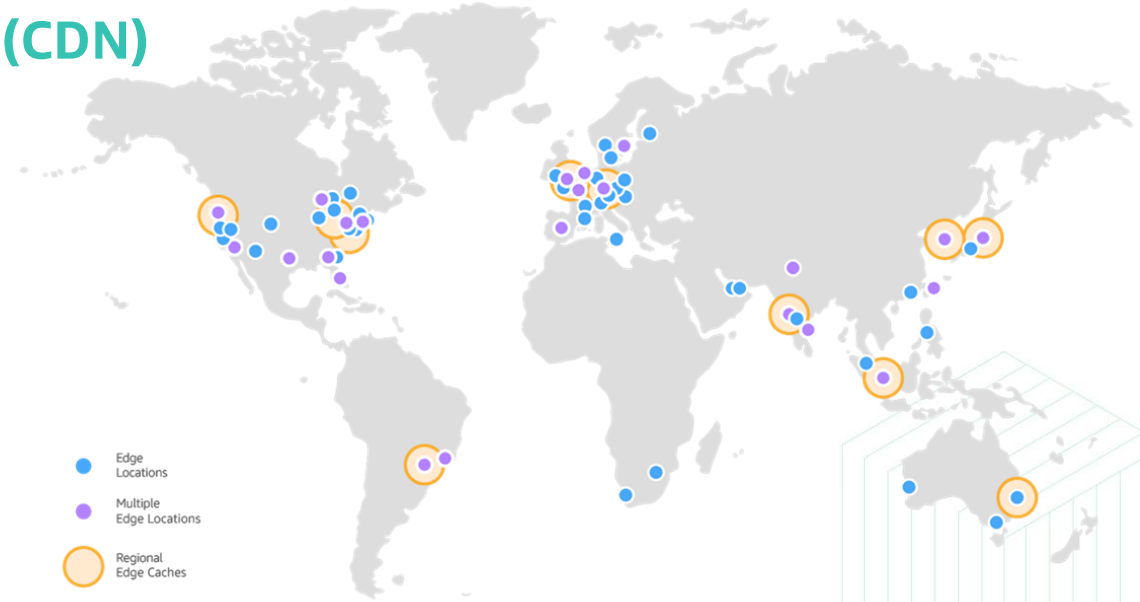
A Region is a physical location in the world where we have multiple **Availability Zones.**

Availability Zones consist of one or more discrete data centers, each with redundant power, networking, and connectivity, housed in separate facilities.

Amazon CloudFront

Content Delivery Network (CDN)

- Netflix
- Content close to users = less latency
- Static content (web pages, texts, images, movies)

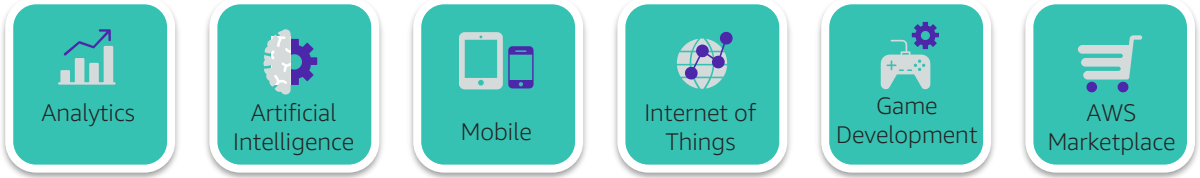


Edge Location = Point of presence where the content cache is performed.

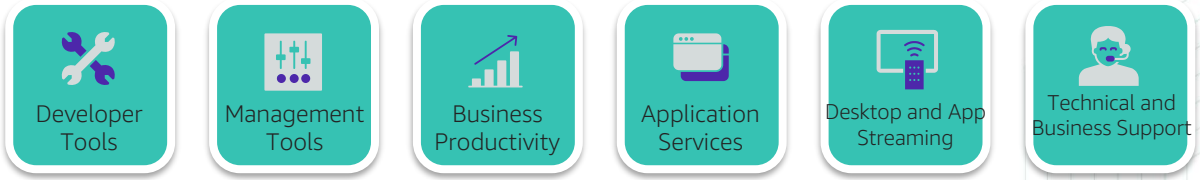
AWS Platform Services

Over 165 Services

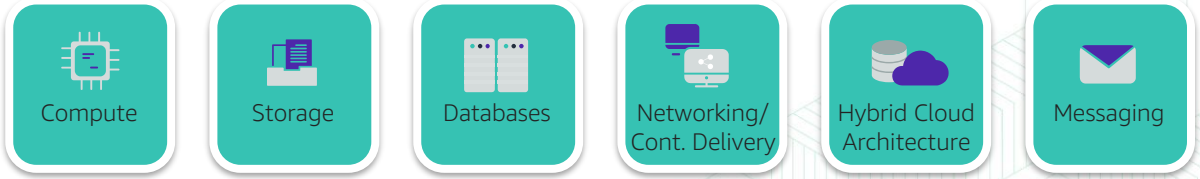
Advanced Services



Business Process Services



Foundational Services



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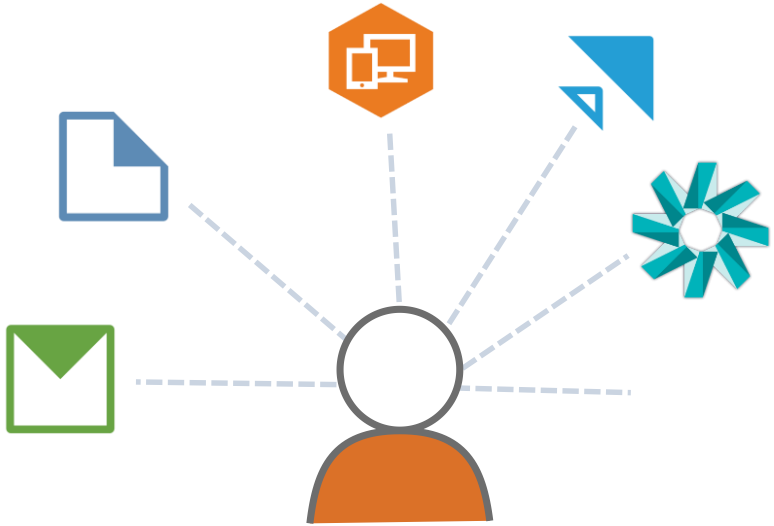
Introducing Amazon Enterprise Applications



Productivity
- WorkMail
- WorkDocs

Desktop & Apps
- WorkSpaces
- AppStream 2.0

UC and Customer Service
- Amazon Chime
- Amazon Connect

Services Availability per Region

Americas | Europe / Middle East / Africa | Asia Pacific

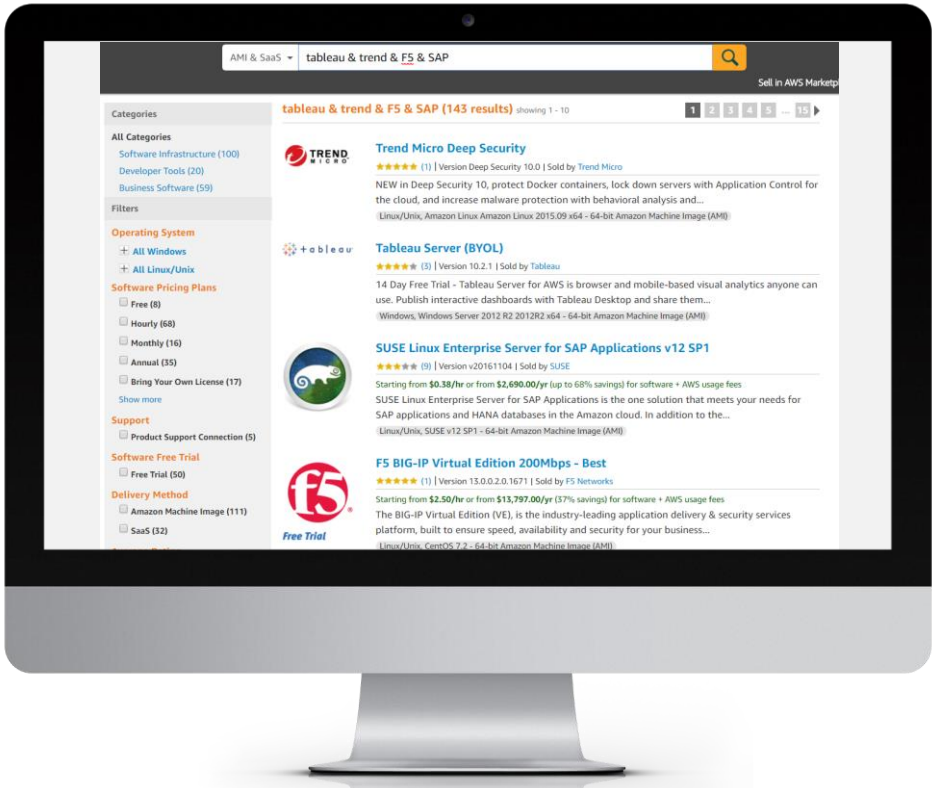
Services Offered:	Northern Virginia	Ohio	Oregon	Northern California	Montreal	São Paulo	GovCloud (US-West)	GovCloud (US-East)
Alexa for Business	✓							
Amazon API Gateway	✓	✓	✓	✓	✓	✓	✓	✓
Amazon AppStream 2.0	✓		✓					
Amazon Athena	✓	✓	✓				✓	
Amazon Aurora - MySQL-compatible	✓	✓	✓	✓	✓		✓	✓
Amazon Aurora - PostgreSQL-compatible	✓	✓	✓	✓	✓		✓	✓
Amazon Chime	✓							
Amazon Cloud Directory	✓	✓	✓					
Amazon CloudSearch	✓		✓	✓		✓		

Region Table

- Take into account the availability of services in each region.
- Service values vary by region.

https://aws.amazon.com/about-aws/global-infrastructure/regional-product-services/

AWS Marketplace Overview



AWS Marketplace is an online store that supports:

01	Over **1,400** participating ISVs
02	**190,000+** active customers
03	**4,200+** software listings
04	Over **570M** hours of software per month

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AWS Hybrid Architecture Support

01. Almost every AWS customer with on-premises infrastructure is running a hybrid architecture.

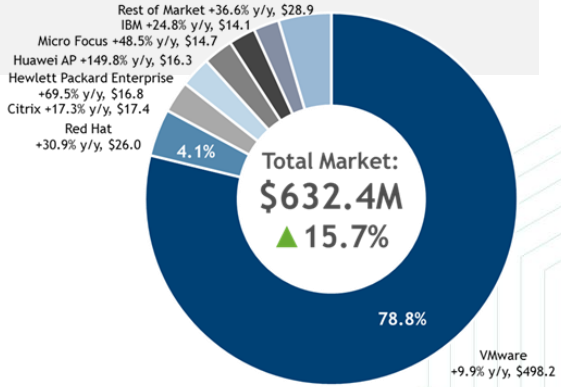
02. AWS offers seamless integration with existing on-premises data centers - customers can leverage existing investments

03. Easily run on VMWare workloads on AWS with seamless deployment and management

04. AWS offers the only VMWare-delivered, sold and supported service available on a leading public cloud

79%

of existing Enterprise workloads run on VMware*



*** IDC Worldwide Cloud System Software 2015 Share Snapshot**

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Module 2:
Security and Compliance

Customers Benefit from Advanced Security Controls

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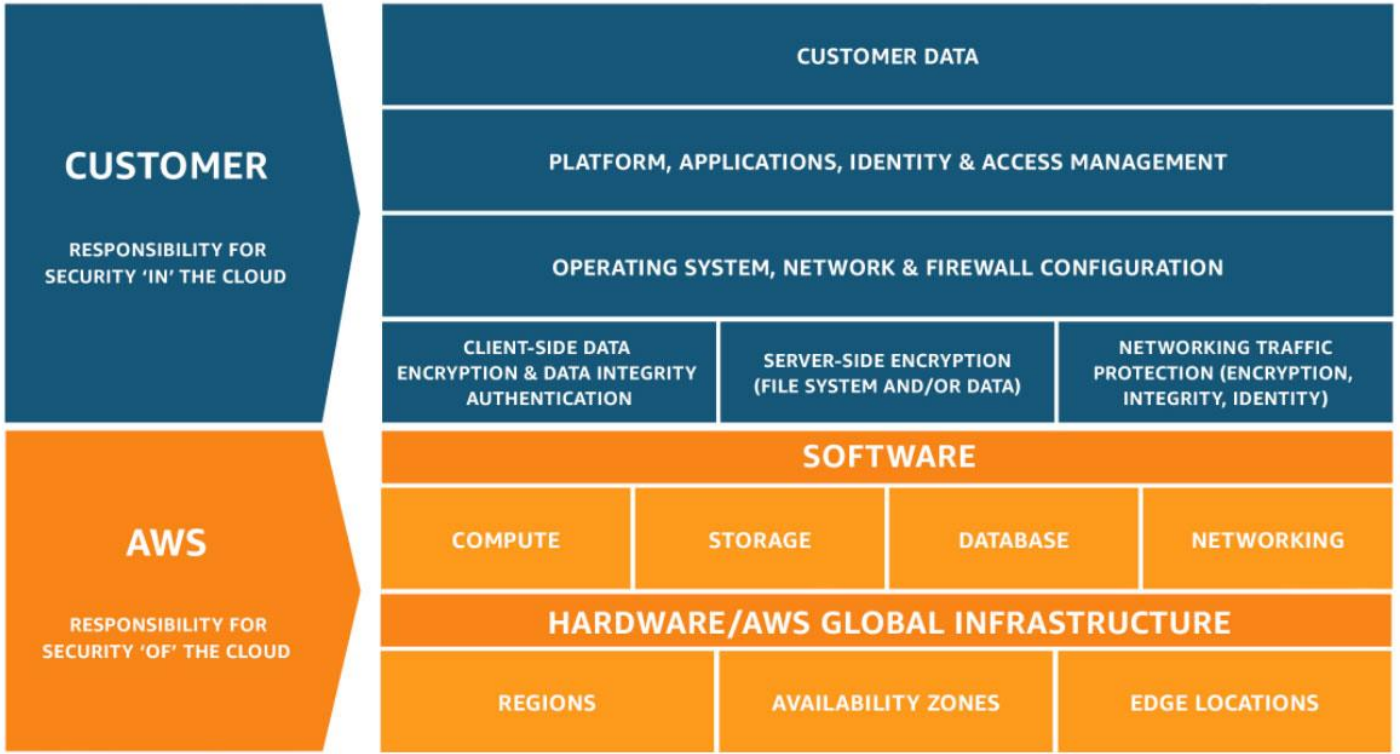
Shared Responsibility Model

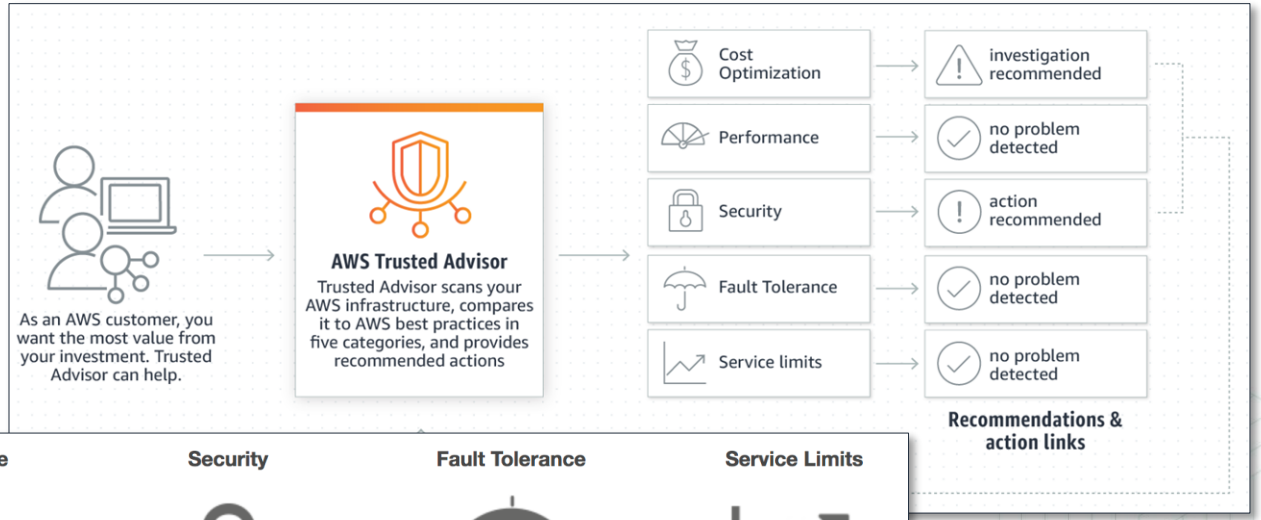


AWS Built-In Security

Security Focus	Security Services and Features
Infrastructure Security	Amazon VPC AWS WAF Encryption in-transit with TLS with all services AWS Artifact
Identity and Access Control	AWS Identity and Access Management (IAM) AWS Multi-Factor Authentication AWS Directory Service
Monitoring and Logging	AWS Trusted Advisor AWS CloudTrail Amazon CloudWatch Amazon Macie
Inventory and Configuration	Amazon Inspector AWS Config AWS CloudFormation
DDoS Mitigation	AWS Shield Auto Scaling Amazon CloudFront Amazon Route 53
Data Encryption	Encryption with all AWS storage and database services AWS KMS AWS CloudHSM

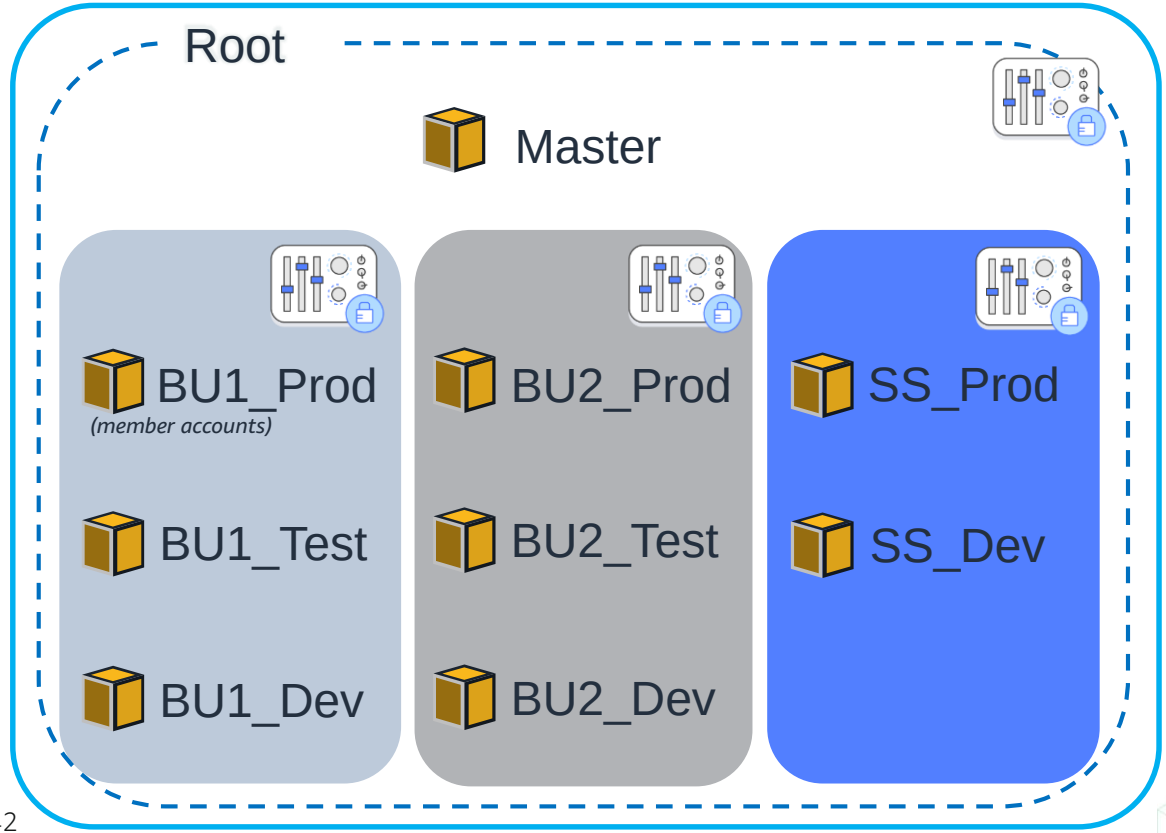
AWS Trusted Advisor

How it works



https://aws.amazon.com/premiumsupport/technology/trusted-advisor/

AWS Organizations



Organization

Root

Master account

Member accounts

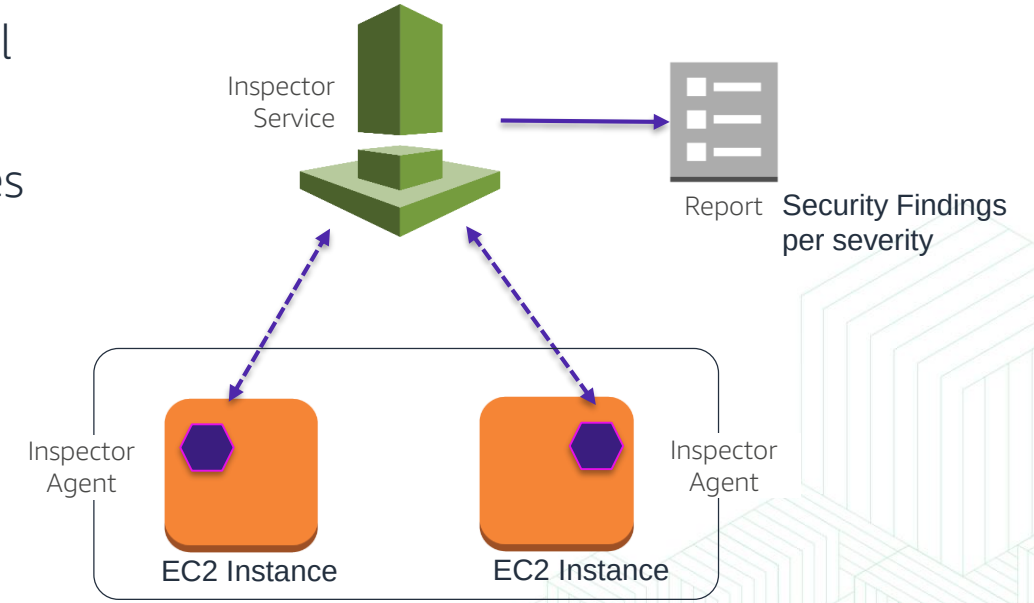
Organizational unit

Service control policy

Amazon Inspector

Vulnerability Assessment Service

- On-Demand Pricing model
- CVE & CIS Rules Packages
- AWS AppSec Best Practices



https://aws.amazon.com/inspector/

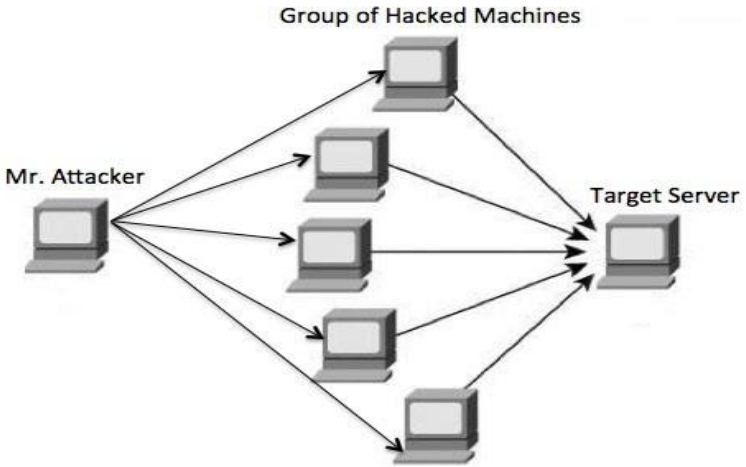
AWS Shield and AWS Shield Advanced

Provides DDoS protection service that safeguards your customers' web applications running on AWS.

- Always-on Detection
- Defend against common attacks
- No Cost for Standard

- DDos Response Team 24x7
- DDos cost protection
- Global availability

DDoS : Distributed Denial of Service.
Botnets, massive attacks



AWS Assurance Programs:

58+ Certifications

Certifications / Attestations	Laws, Regulations, and Privacy	Alignments / Frameworks
C5 [Germany]	CISPE	CIS
Cyber Essentials Plus [UK]	EU Model Clauses	CJIS
DoD SRG	FERPA	CSA
FedRAMP	GLBA	ENS [Spain]
FIPS	HIPAA	EU-US Privacy Shield
IRAP [Australia]	HITECH	FISC
ISO 9001	IRS 1075	FISMA
ISO 27001	ITAR	G-Cloud [UK]
ISO 27017	My Number Act [Japan]	GxP (FDA CFR 21 Part 11)
ISO 27018	U.K. DPA - 1988	ICREA
MLPS Level 3 [China]	VPAT / Section 508	IT Grundschutz [Germany]

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

On-Demand Access to Compliance Reports

AWS Artifact

Download Compliance Reports on Demand

AWS Security

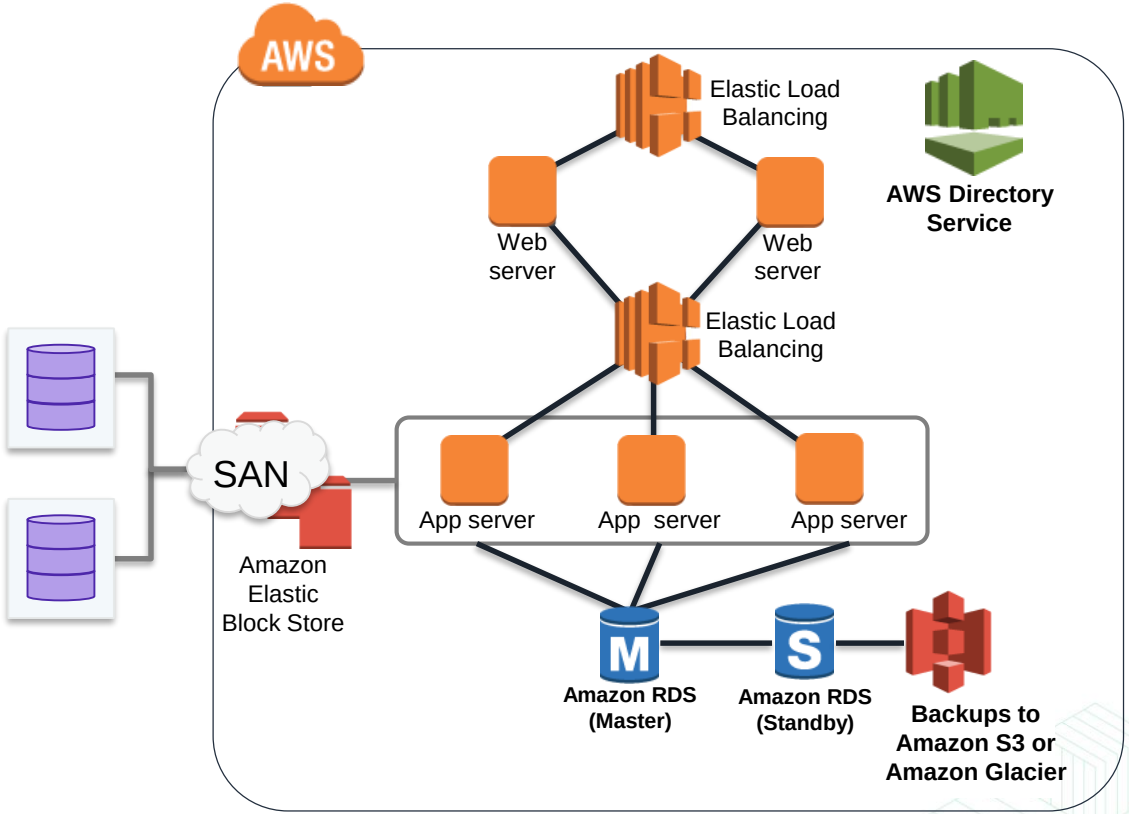
No matter how carefully engineered the services are, from time to time it may be necessary to notify customers of security and privacy events with AWS services. We will publish security bulletins below. You can also subscribe to our Security Bulletin RSS Feed to keep abreast of security announcements.

ID	Date	Type	Subject
AWS-2019-002	February 11, 2019	Important	Container Security Issue (CVE-2019-5736)
AWS-2019-001	January 4, 2019	Important	Kubernetes Security Issues (CVE-2018-18264 and kubectl proxy)
AWS-2018-020	December 4, 2018	Important	Kubernetes Security Issue (CVE-2018-1002105)
AWS-2018-019	August 14, 2018	Important	L1 Terminal Fault Speculative Execution Issue
AWS-2018-018	August 6, 2018	Important	Linux Kernel Updates to address SegmentSmack & FragmentSmack
AWS-2018-017	June 13, 2018	Important	Xen Security Advisory 267
AWS-2018-016	June 13, 2018	Informational	Redis Security Advisory
AWS-2018-015	May 21, 2018	Important	Additional Processor Speculative Execution Research Disclosures
AWS-2018-014	May 8, 2018	Informational	Xen Security Advisories 260-262 (XSA-260, XSA-261, XSA-262)
AWS-2018-013	January 3, 2018	Important	Processor Speculative Execution Research Disclosure

Security Bulletins

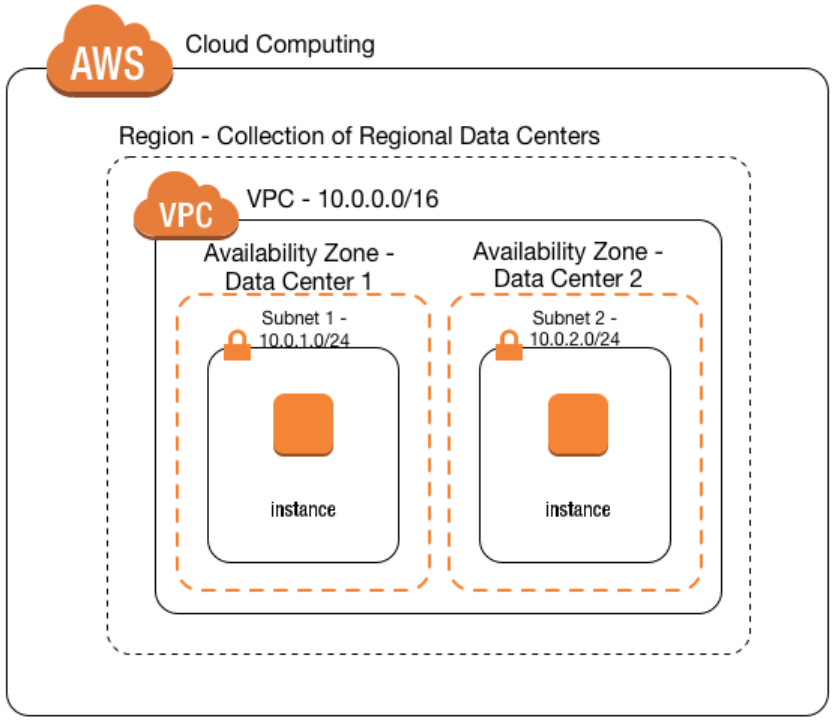
Module 3:
AWS Architecture and Services

Mapping On-premises Services to AWS



AWS Cloud Hierarchy

Global Services > Regional > VPC > AZ > Host



Route 53 – DNS
CloudFront

Region

Buckets S3
AMI Images

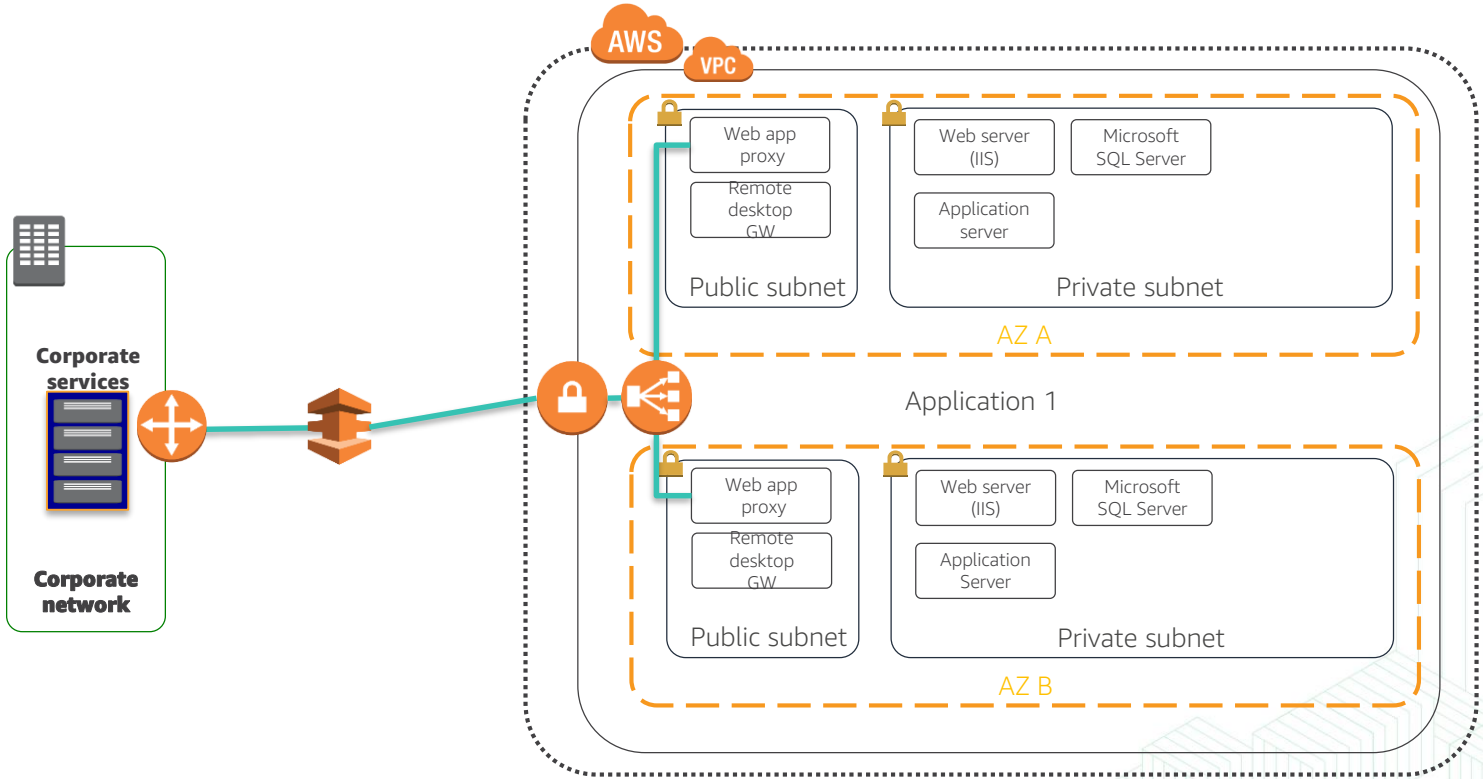
AZ

Instances EC2/RDS
Volumes EBS
Conteiners

Host

Host applications
Anti-virus, Licenses

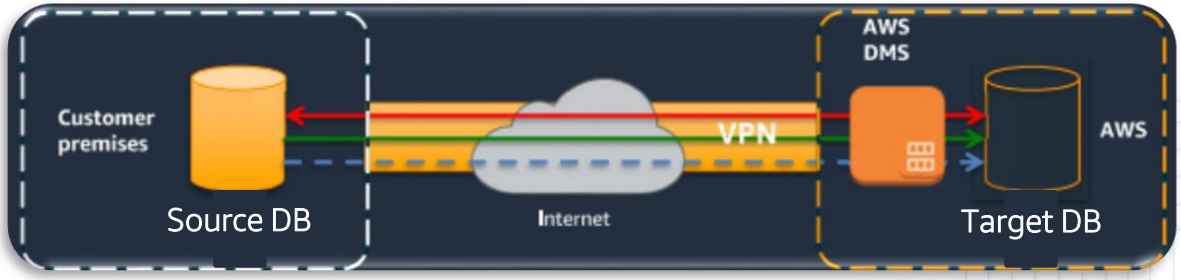
Use Multi-AZ Patterns to Increase Reliability



Tools for Migrations

- Server Migration Service

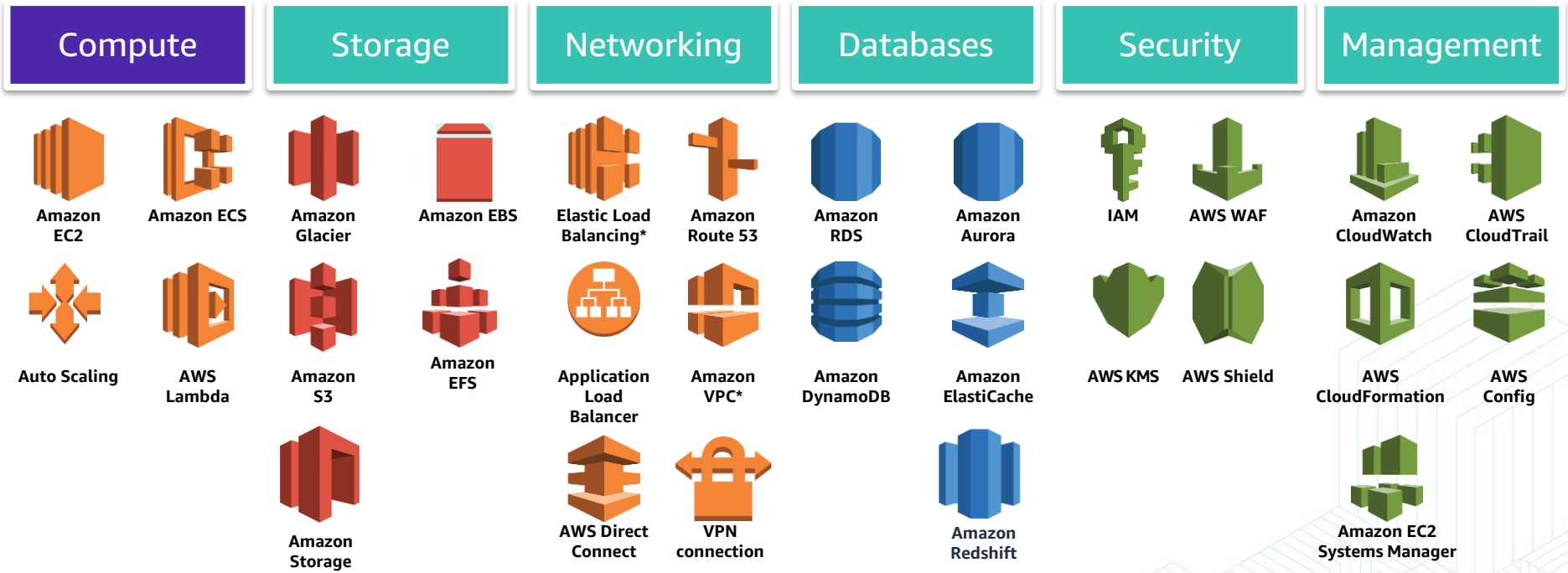
- Database Migration Service



- Snowball

- Secure, Fast, Offline transfer
- Size: 50TB, 80TB, 100TB.
- Low bandwidth uplinks.

AWS Compute Services



AWS Compute Services

How will you deliver the application executables?

- Instances
  - Amazon EC2
- Containers
  - Amazon ECS, Amazon EKS
  - AWS Fargate
- Serverless
  - AWS Lambda

Amazon EC2

Amazon Elastic Compute Cloud (Amazon EC2)

- Virtual machine instance running on an AWS hypervisor
- Support numerous distributions of Linux or Microsoft Windows
- Complete control of your host operating system with root and administrator accounts
- Responsible for all installed applications
- Multiple types and sizes of instances
- Remote access via SSH or Remote Desktop

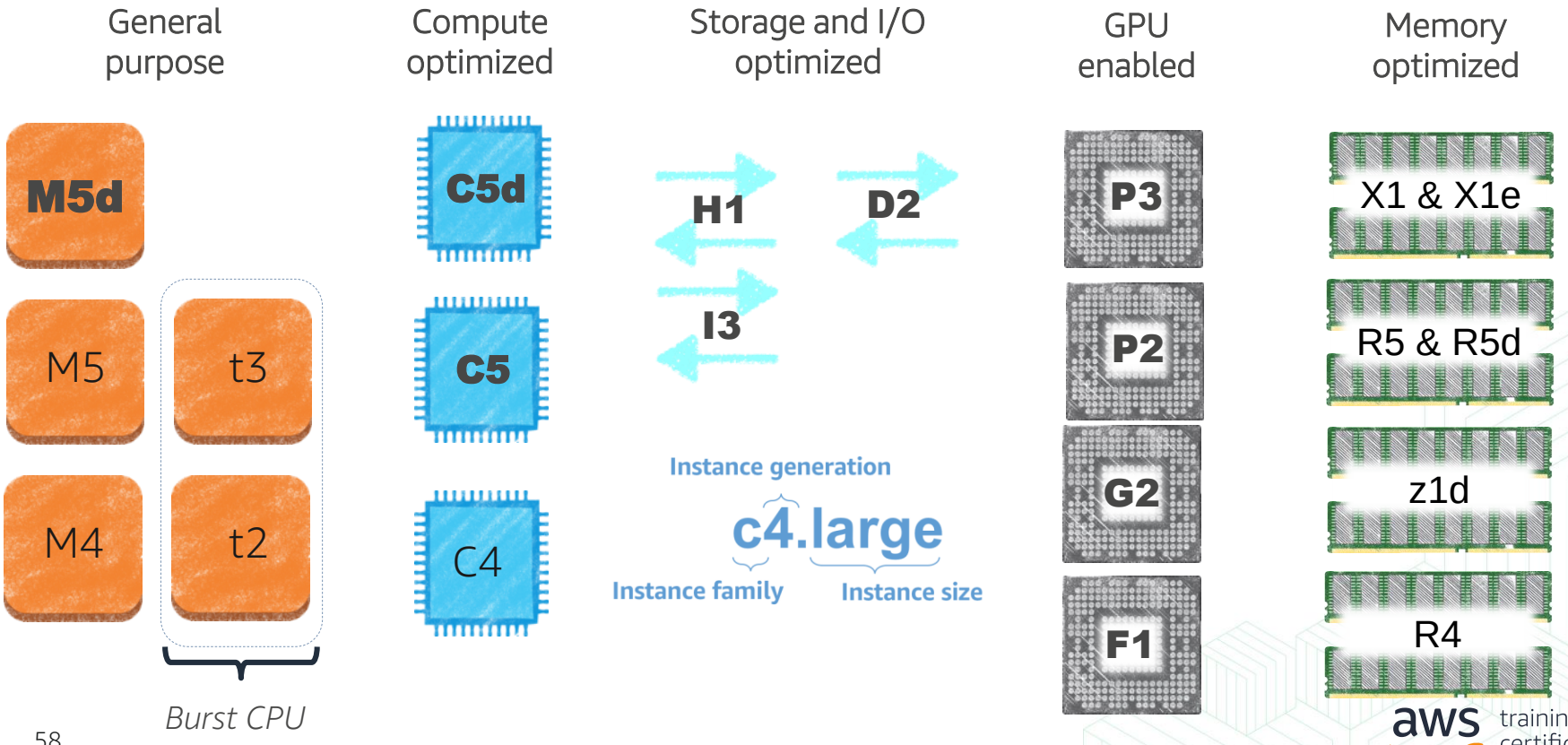
https://aws.amazon.com/ec2/

Amazon Machine Image (AMI)

AMI Content

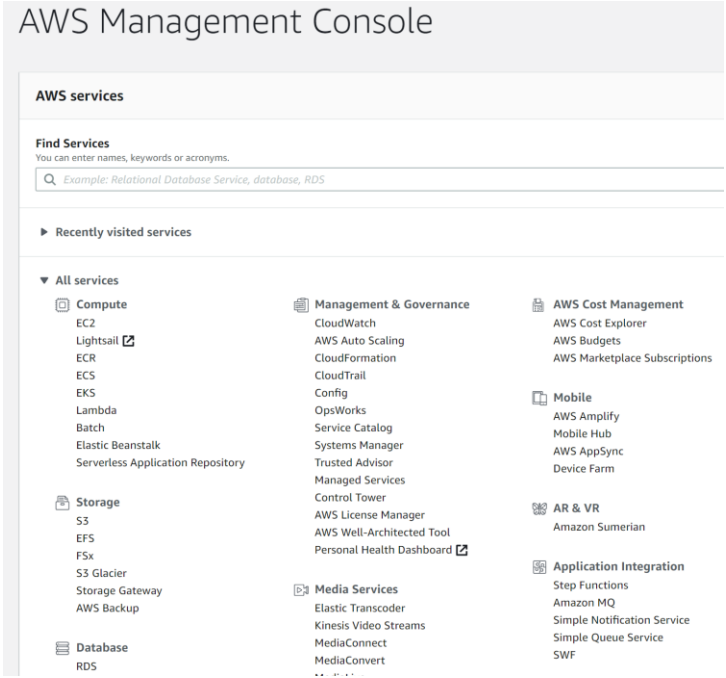
- Defines which OS to use (Linux, Windows)
- Public and private AMI's
- Defined at instance launch process

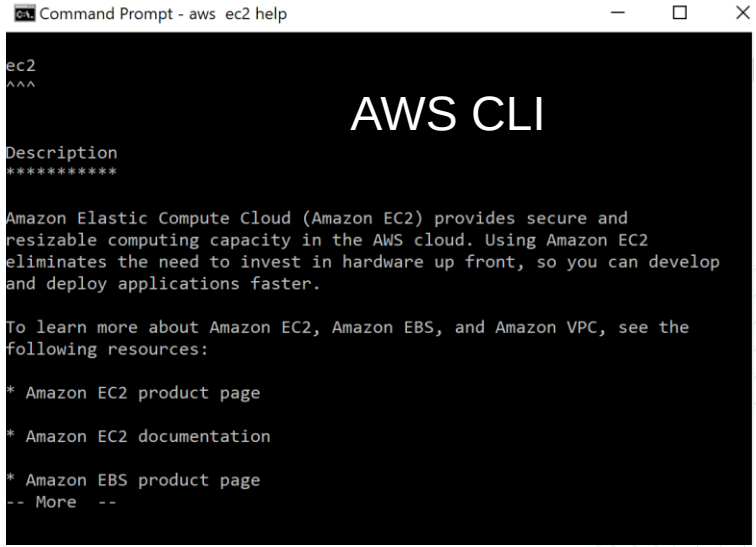
Amazon EC2 - Instance Types



AWS Instance Access

Amazon EC2 Instance Launch:





AWS SDK

AWS CLI

How to use the AWS CLI tool:

- Can be installed on : Windows, Linux, macOS, or Unix
- Requires : Python 2 version 2.6.5+ or Python 3 version 3.3+
- Easy installation method using ‘pip’

Created into an IAM user
programmatic key

```
$ aws configure
AWS Access Key ID [None]: AKIAIOSFODNN7EXAMPLE
AWS Secret Access Key [None]: wJalrXUtnFEMI/K7MDENG/bPxRfi
Default region name [None]: us-west-2
Default output format [None]: ENTER
```

IAM > Users > ‘user’ > Security Credentials > Access keys

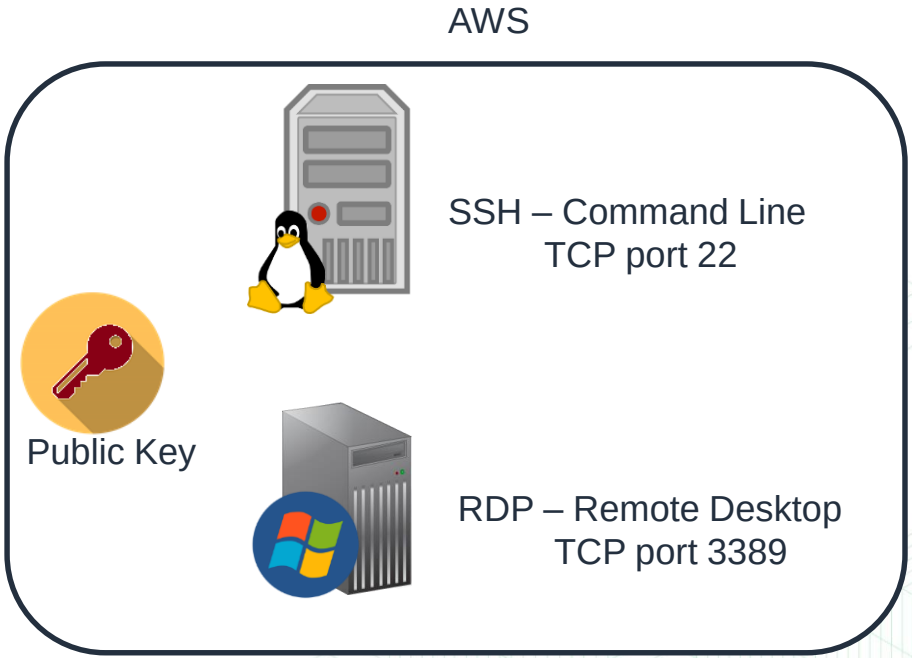
Create access key

Access key ID	Created	Last used	Status
AKIAJUQGZH[redacted]	2019-01-28 17:20 UTC-0300	2019-01-29 15:48 UTC-0300 with s3 in us-east-1	Active | Make inactive
AKIAIU7243X[redacted]	2019-02-05 09:00 UTC-0300	2019-03-08 10:55 UTC-0300 with ec2 in us-east-1	Active | Make inactive

Amazon EC2 –Remote Access

At the moment of creation of the instance it is defined which key-pair will be used to access the instance.

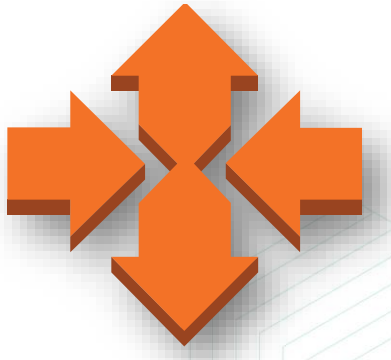
"A key pair consists of a **public key** that AWS stores, and a **private key file** stored by the user."



Auto Scaling

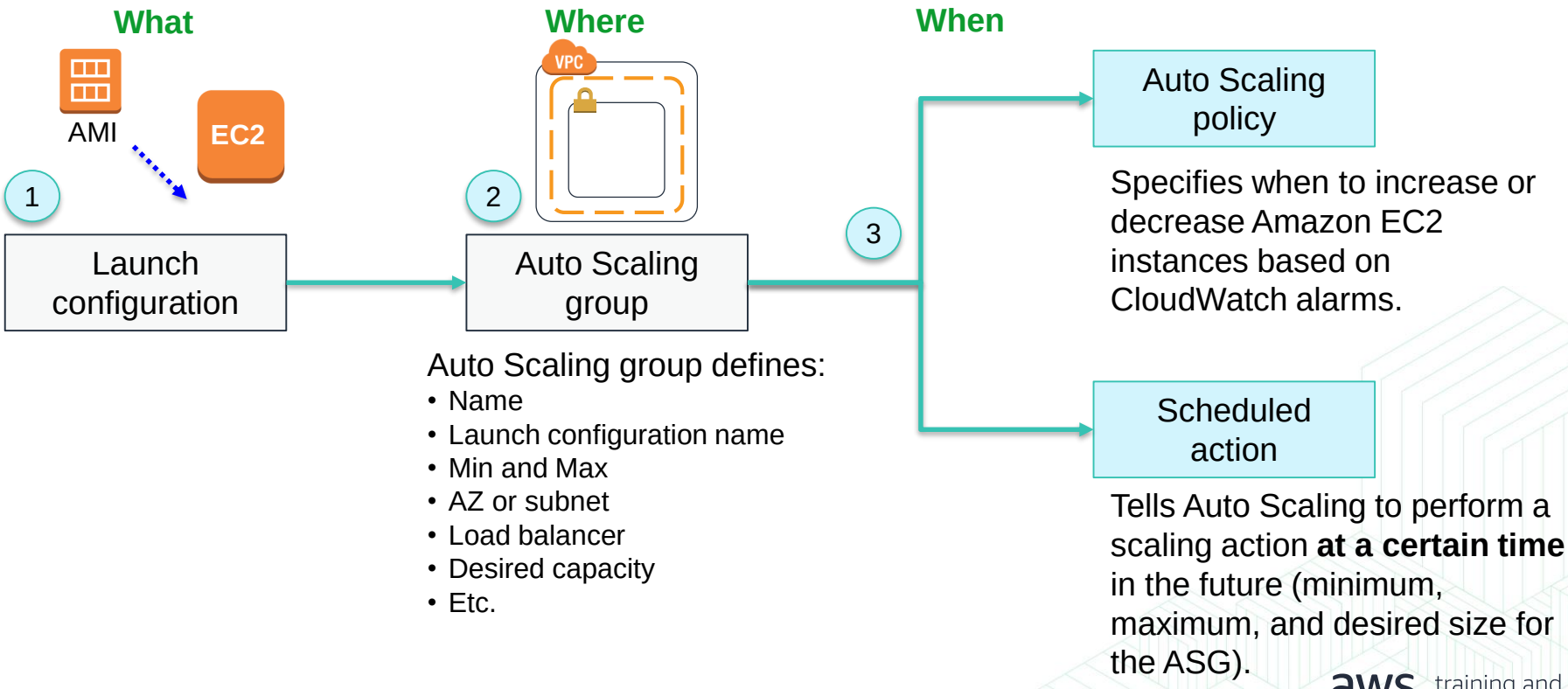
Automatically launch or terminate Amazon EC2 instances

- User-defined policies driven by CloudWatch
- Health status checks
- Schedules
- Manually using set-desired-capacity in the CLI



Scale out to meet demand, scale in to reduce costs.

How Does Auto Scaling Work?



Auto Scaling: Maximum Capacity Size

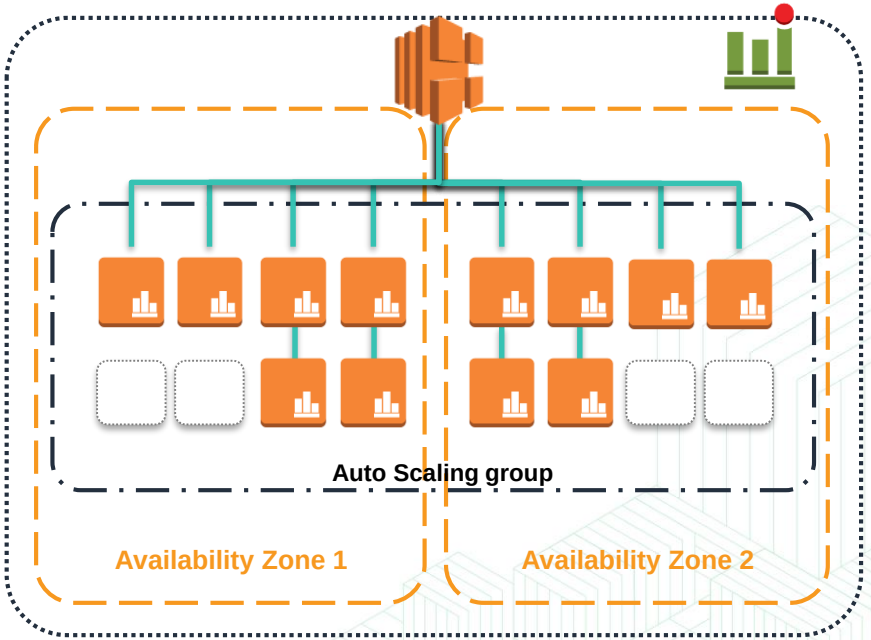
Auto Scaling group:

- Minimum = 2
- Maximum = 12

Auto Scaling policy:

- When CPU utilization is greater than 60%
- Add 100% of group = **double the capacity**

CPU utilization triggers the alarm: capacity is doubled until CPU utilization drops below 60% or max capacity is reached.



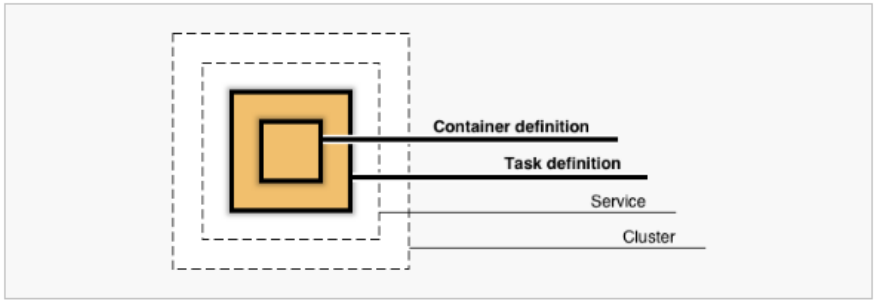
Amazon Container

Elastic Container Service (ECS)

Elastic Container Service for Kubernetes (EKS)

- AWS runs the EC2 cluster management
- Eliminates the complexity of operating container infrastructure
- Microservices

Diagram of ECS objects and how they relate



https://aws.amazon.com/ecs/

AWS Lambda: Serverless Compute

No servers to manage

Continuous Scaling

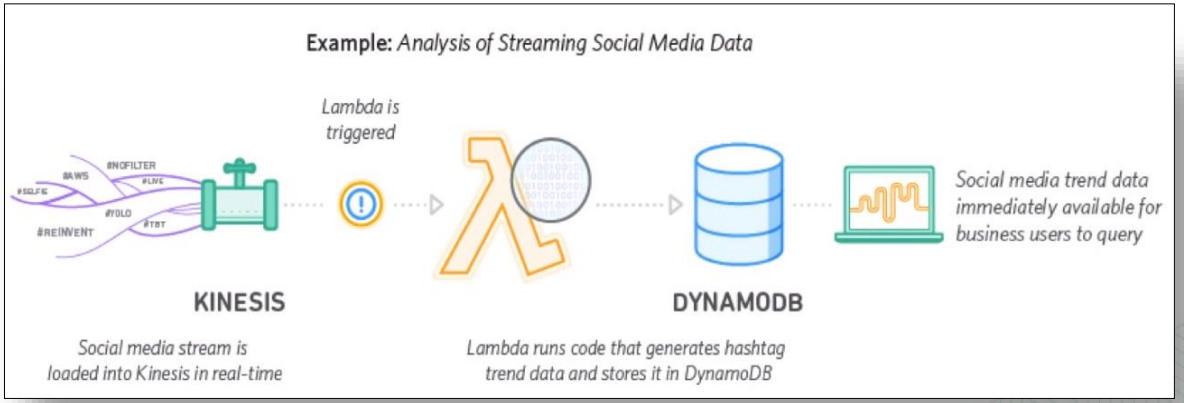
Pay only for compute time used

AWS Lambda Video https://www.youtube.com/watch?v=eOBq__h4OJ4 **(3:01)**

AWS Lambda

Use Cases:

- Building modular, scalable, lightweight applications
- Serverless data processing on demand
- Perform data validation, filtering, sorting, or other transformations.
- Image thumb-nailing, in-app activity, website clicks, or output from devices



https://aws.amazon.com/lambda/

Compute – Knowledge Check

Question 1

You are currently hosting an infrastructure and most of the EC2 instances are near 90 - 100% utilized. What is the type of EC2 instances you would utilize to ensure costs are minimized?

A. Reserved instances

B. On-demand instances

C. Spot instances

D. Regular instances

Question 2

You work for a company that is planning on using the AWS EC2 service. They currently create golden images of their deployed operating system. Which of the following correspond to a golden image in AWS?

A. EBS Volumes

B. EBS Snapshots

C. Amazon Machines Images

D. EC2 Copies

Question 3

Which of the following services relates the concept of "scaling up resources based on demand"?

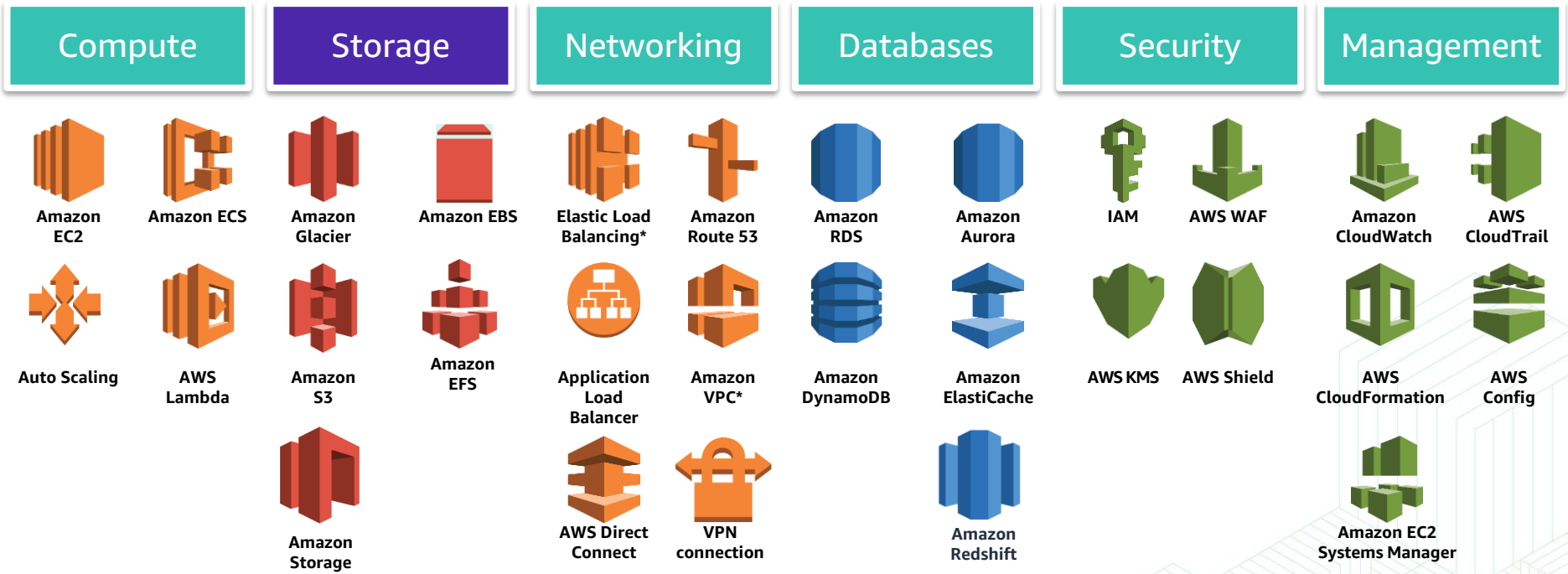
A. Auto Scaling

B. Elastic Load Balancer

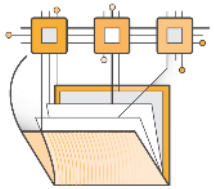
C. VPC

D. Subnet

AWS Storage Services

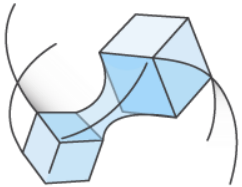


Storage Options

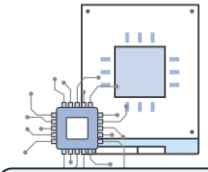


Amazon EFS

File



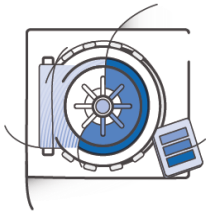
Amazon EBS



Amazon EC2 Instance Store

Block

Amazon S3



Amazon Glacier

Object

Data Transfer

AWS Direct Connect

AWS Snowball

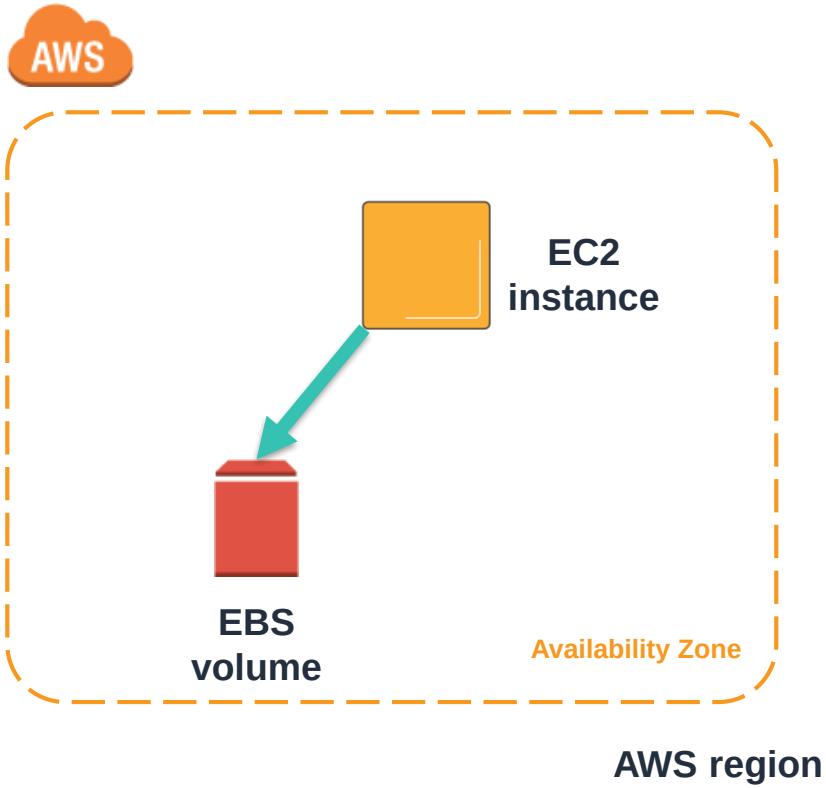
S3 Transfer Acceleration

Storage Gateway

Amazon Kinesis Firehose

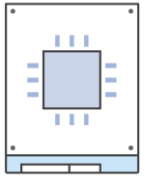
ISV Connectors

What is Amazon Elastic Block Storage (EBS)?



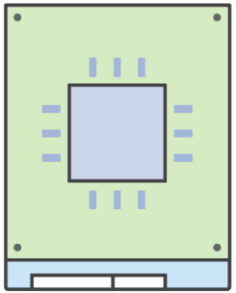
- Block storage as a service
- Create, attach volumes through an API
- Service accessed over the network
- Volume and instance must be in the same AZ
- Detach and attach between instances

EBS Volume Types



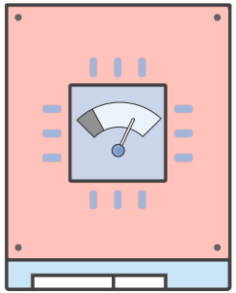
SSD

HDD



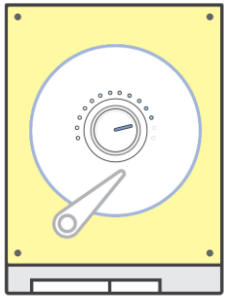
gp2

General Purpose SSD



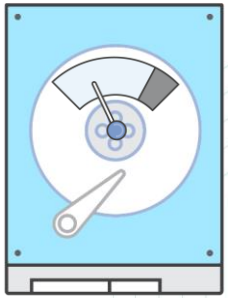
io1

Provisioned IOPS SSD



st1

Throughput Optimized HDD



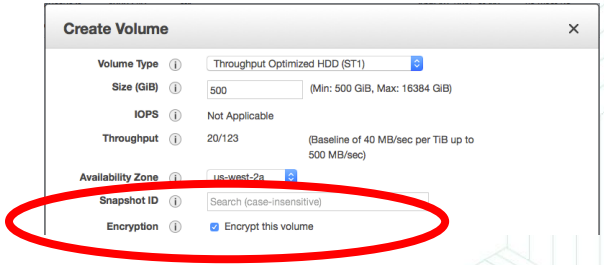
sc1

Cold HDD

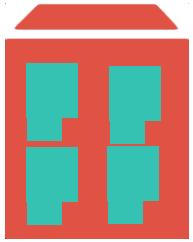
EBS Encryption

- Boot and data volumes can be encrypted
- Attach both encrypted and unencrypted
- No volume performance impact
- Supported by all Amazon EBS volume types
- Snapshots also encrypted

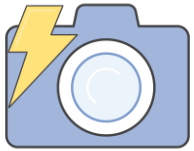
Encryption



Amazon EBS Snapshot



Amazon EBS volume



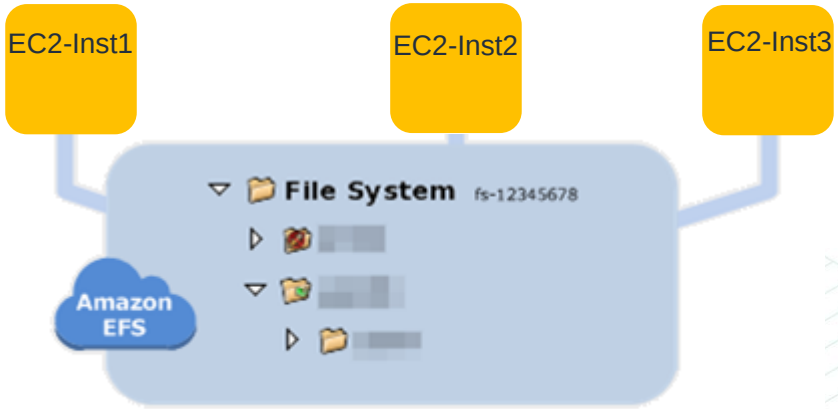
Amazon EBS snapshot

- Point-in-time backup
- Stored in Amazon S3 (low cost and high durability backup of data)
- Snapshots can be used to create new volumes

Amazon EFS

Amazon Elastic File System

- Fully managed
- No hardware, network, file layer
- No need to provision storage in advance
- Create a scalable file system in seconds!
- Simple pricing = Pay for actual storage consumed
- Multiple EC2 instances accessing at the same time



File System as a Service

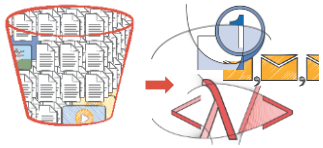
Amazon S3 – Simple Storage Service

99.999999999% durability and 99.99% availability of objects over a given year

- Storage of any type of file (objects).
- There is no limit on the number of objects or total space.
- Redundantly store your objects on multiple devices across a minimum of 3 Availability Zones (AZs).
- Uses a bucket concept.

Amazon S3 Features

S3 Features



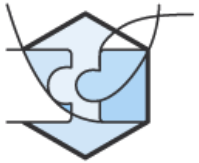
Event notifications

Cross-region replication

S3 Transfer Acceleration

VPC endpoint for Amazon S3

Amazon CloudWatch
AWS CloudTrail support



Lifecycle policy

Expired object delete marker

Incomplete multipart upload expiration

Faster upload over long distances S3 Transfer Acceleration

Change your endpoint, not your code

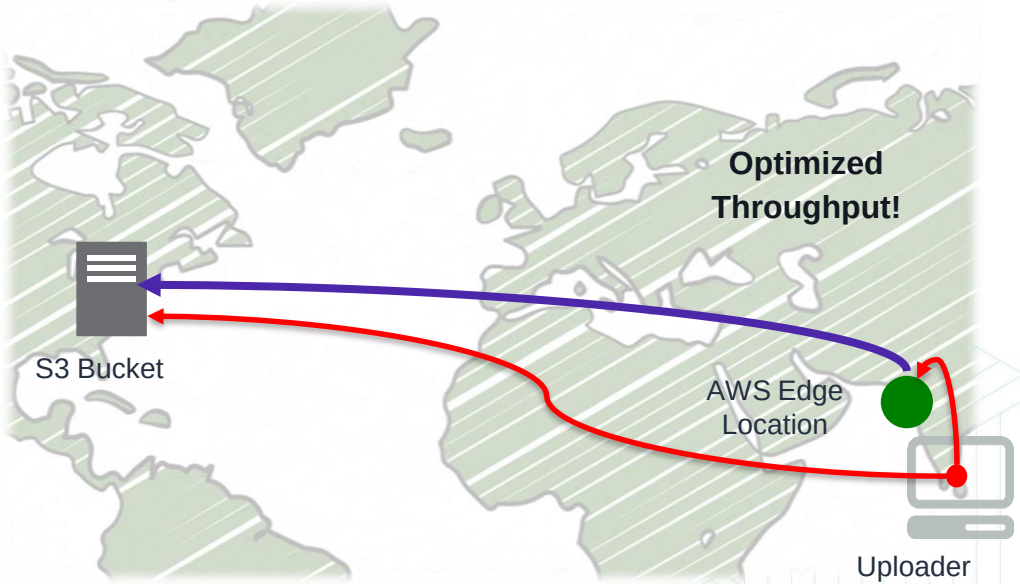
No firewall changes or client software

Longer distance, larger files, more benefit

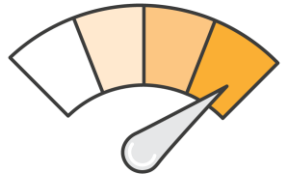
Faster or free

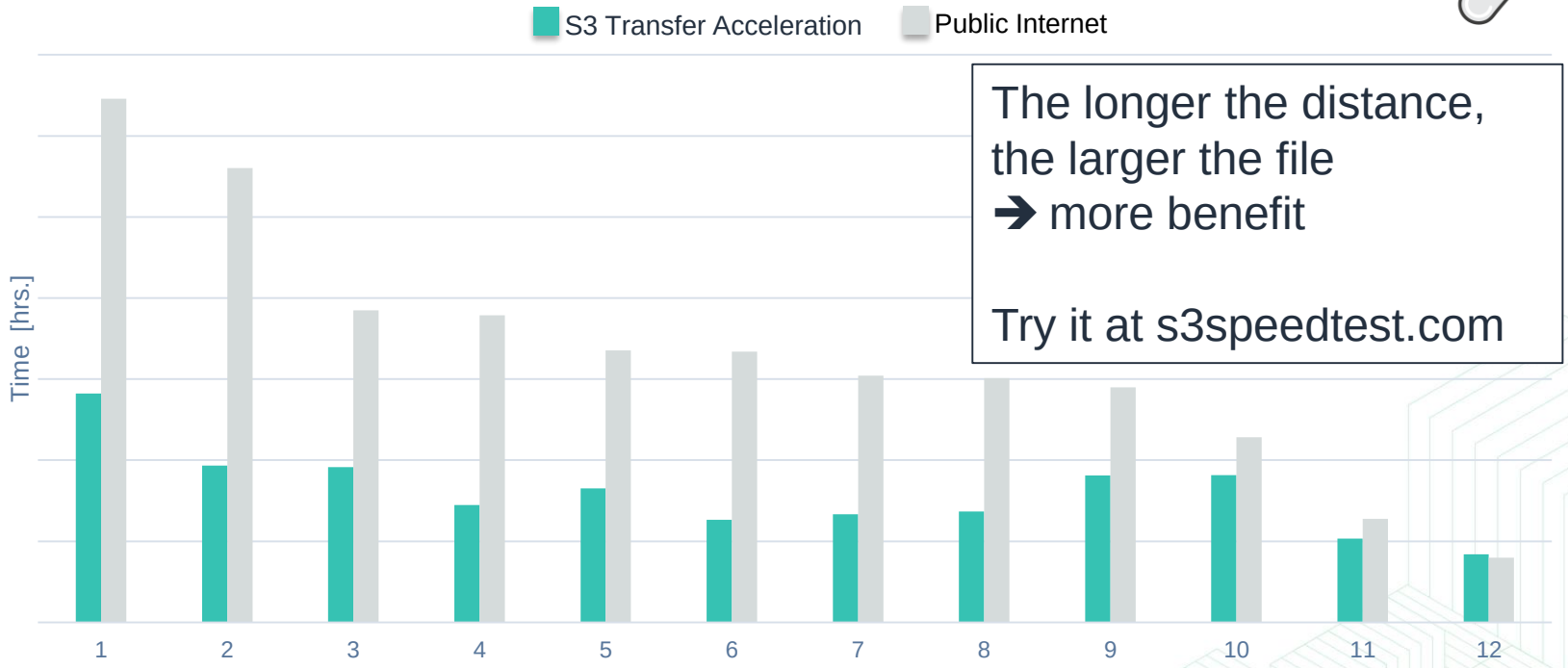
166 global edge locations

Try it at S3speedtest.com



How fast is S3 Transfer Acceleration?





The longer the distance, the larger the file
➔ more benefit

Try it at s3speedtest.com

500 GB upload from these edge locations to a bucket in Singapore

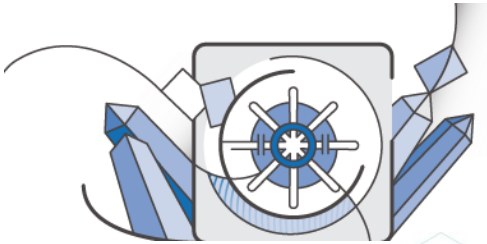
aws training and certification

Amazon S3 Storage Classes

Standard

Standard – Infrequent Access

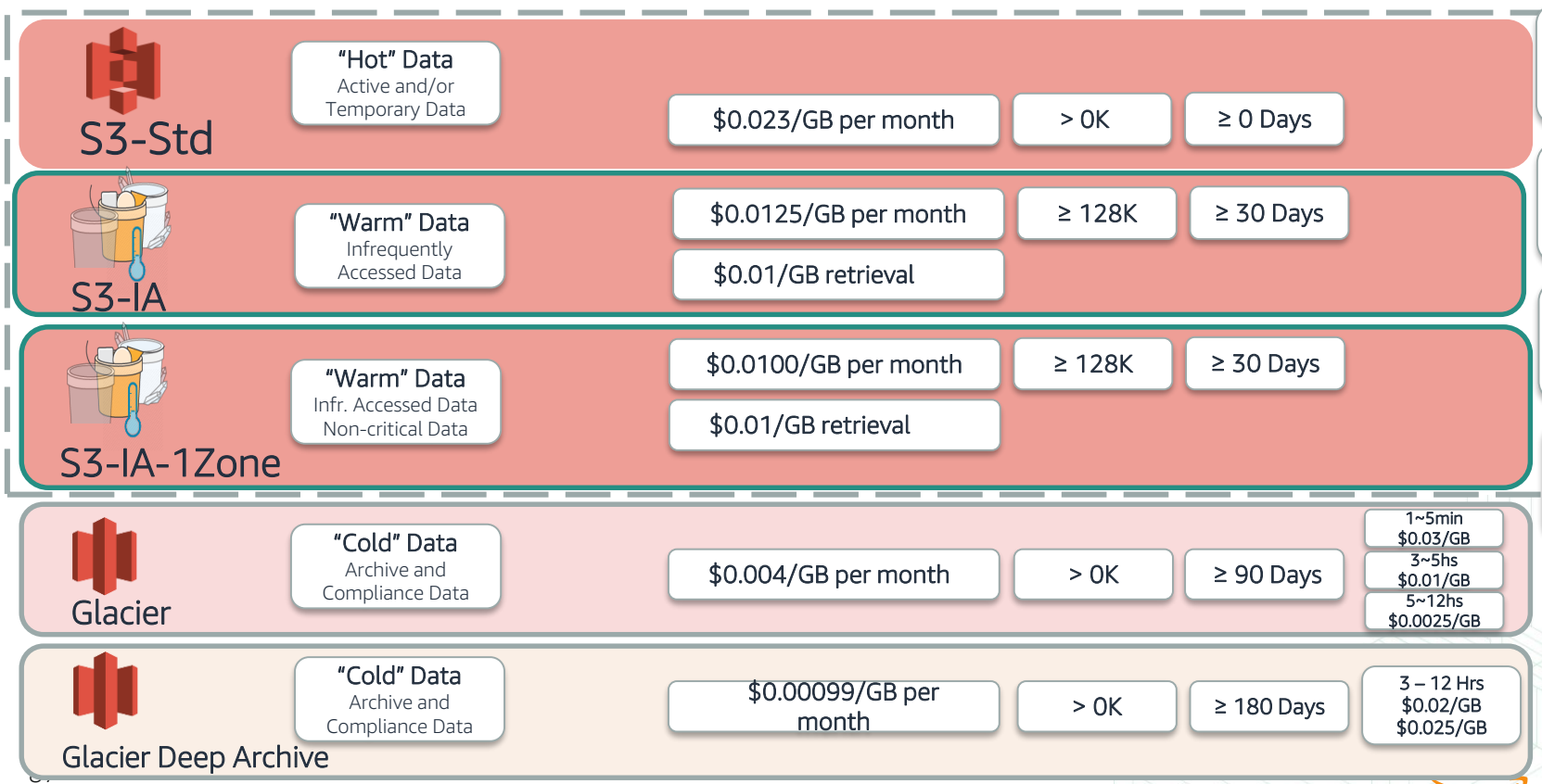
One Zone – Infrequent Access



Amazon Glacier

Active data → Infrequently accessed data → Archive data

Storage Tiered to Your Requirements



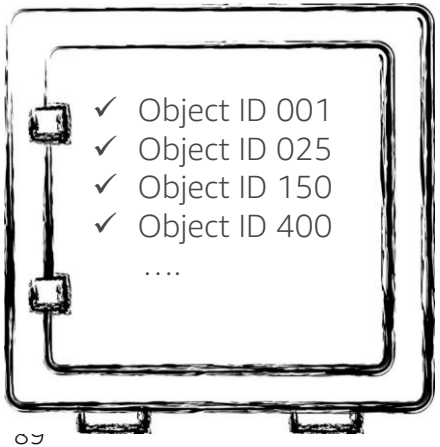
Amazon S3 Security

- You can control access to buckets and objects with:
  - Access Control Lists (ACLs)
  - Bucket policies
  - Identity and Access Management (IAM) policies
- You can upload or download data to Amazon S3 via SSL encrypted endpoints.
- You can encrypt data using AWS SDKs.

Amazon S3 Glacier

Long term storage solution

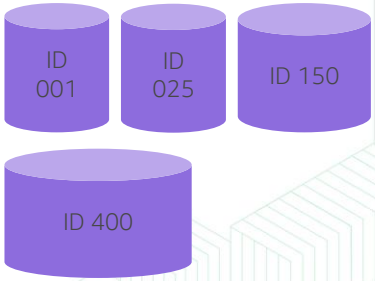
- Long term archiving, backup
- Low cost
- Data are extracted by executing retrieval jobs



Archive retrieval job

- ~~Expedited: 1~5min~~
- ❑ Standard: 3~5hs
- ❑ Bulk: 5~12hs

Ready to download!



99.999999999% durability of objects over a given year

What is AWS Storage Gateway?

Service connecting an on-premises software appliance with cloud-based storage

Works with your existing applications

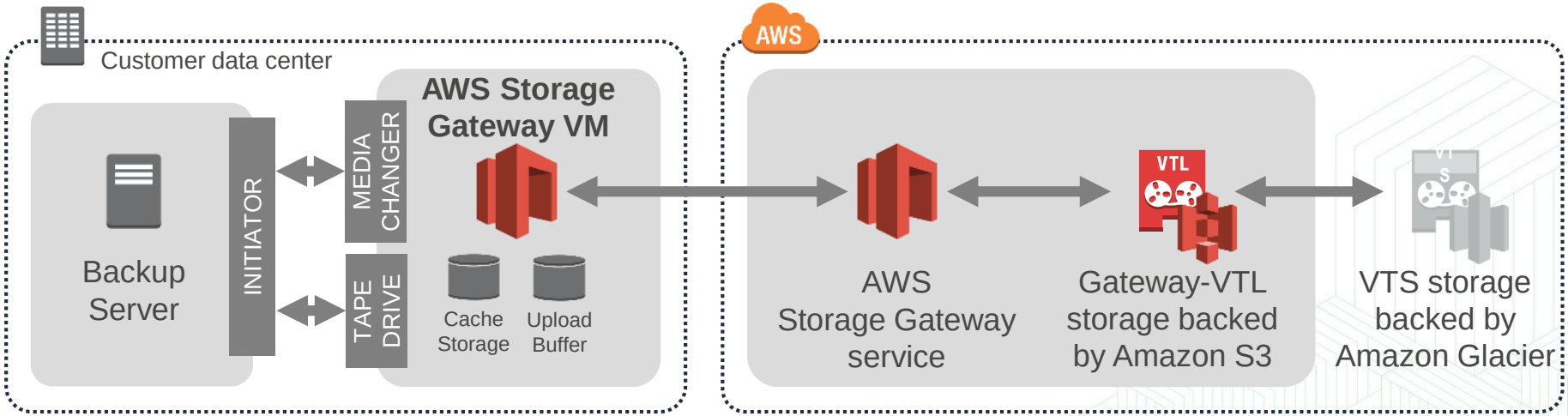
Secure and durable storage in AWS

Low-latency for frequently used data

Scalable and cost-effective on-premises storage - $125 per gateway per month + S3/Glacier storage fees

Storage Gateway VTL (Enterprise Backup Use Case)

- Replace or augment your aging tape infrastructure with durable object storage
- Virtual tapes stored in AWS. Frequently accessed data cached on-premises



Storage – Knowledge Check

Question 1

Which AWS services can be used to store files? Choose 2 answers

A. Amazon CloudWatch

B. Amazon Simple Storage Service (Amazon S3)

C. Amazon Elastic Block Store (Amazon EBS)

D. AWS Config

E. Amazon Athena

Question 2

A company wants to store data that is not frequently accessed. What is the best and cost-efficient solution that should be considered?

A. Amazon Storage Gateway

B. Amazon Glacier

C. Amazon EBS

D. Amazon S3

Question 3

There is a requirement for storage of objects. The objects should be able to be downloaded via a URL. Which storage option would you choose?

A. Amazon S3

B. Amazon Glacier

C. Amazon Storage Gateway

D. Amazon EBS

Question 4

Which of the following is the amount of storage that can be stored in the Simple Storage service?

A. 1 TB

B. 5 TB

C. 1 PB

D. Virtually unlimited storage

Question 5

A company is deploying a two-tier, highly available web application to AWS. Which service provides durable storage for static content while utilizing lower Overall CPU resources for the web tier?

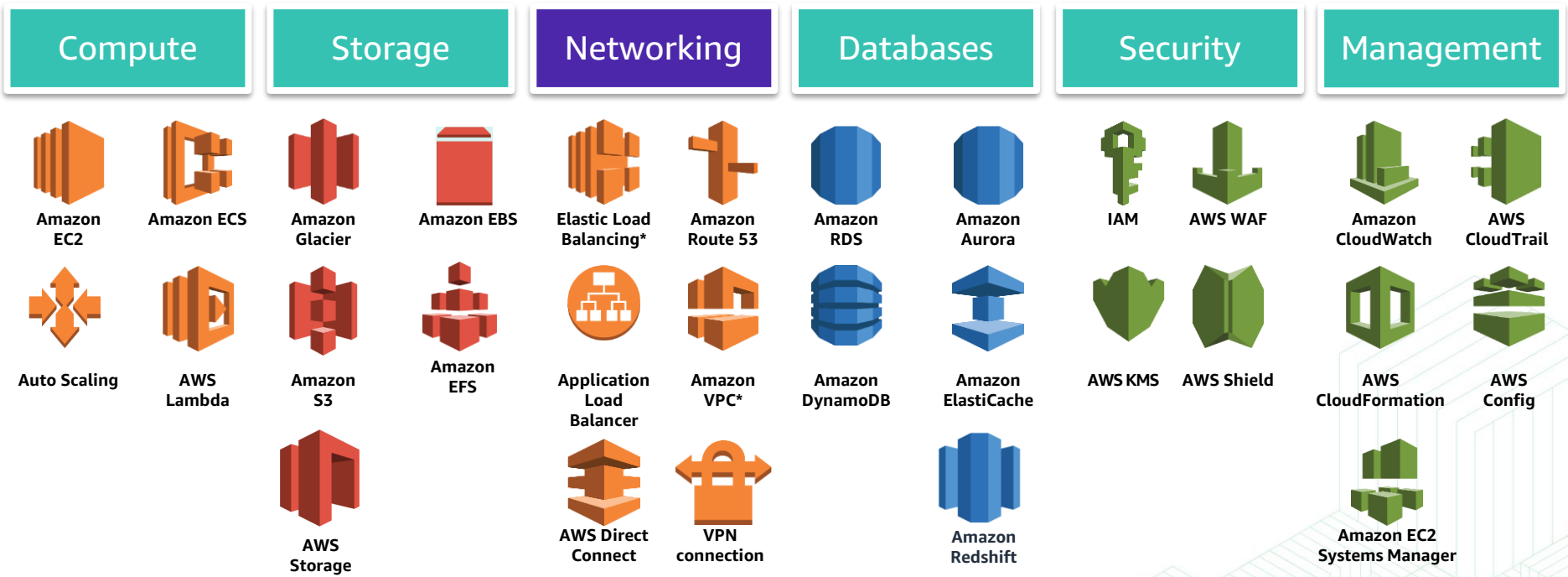
A. Amazon EBS volume

B. Amazon S3

C. Amazon EC2 instance store

D. Amazon RDS instance

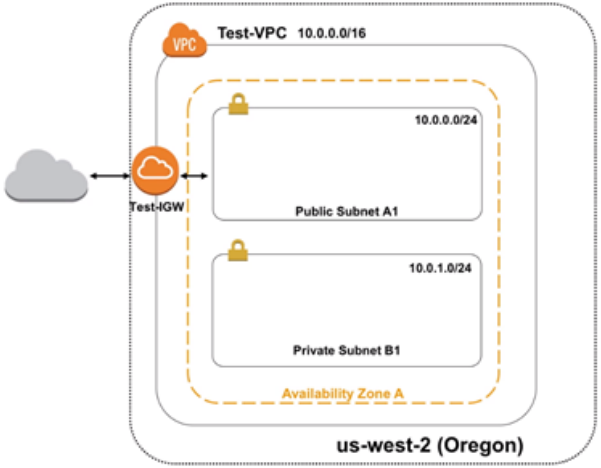
AWS Networking Services



Amazon VPC

Provision a logically isolated section of the AWS cloud

- Control your virtual networking environment
  - Subnets
  - Route tables
  - Security groups
  - Network ACLs
- Connect to your on-premises network via VPN or Direct Connect
- Control if and how your instances access the Internet



Router

Internet gateway

Customer gateway

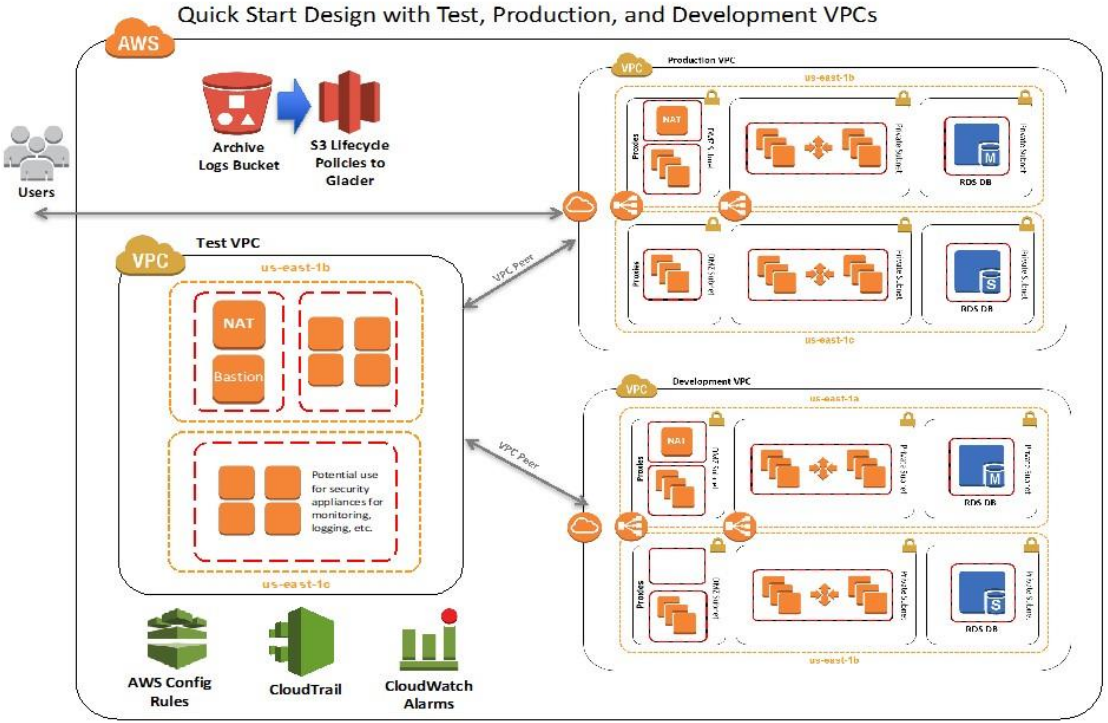
Virtual private gateway

VPN connection

VPC peering

https://aws.amazon.com/vpc/

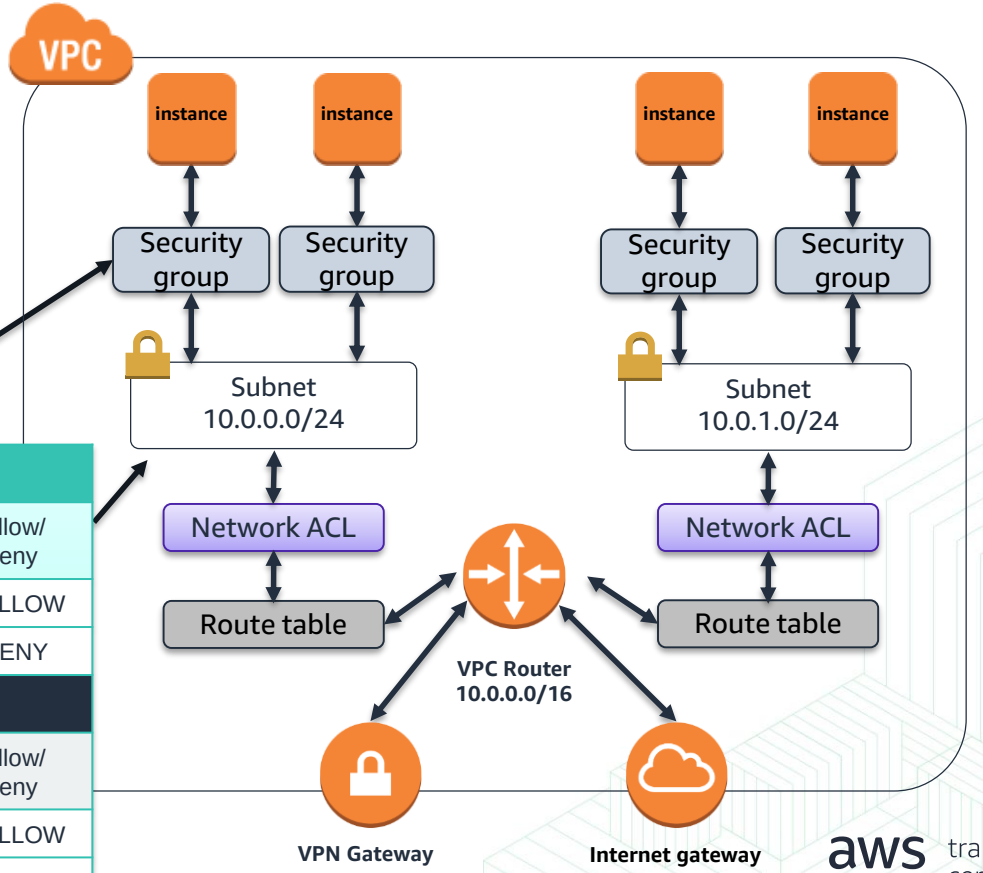
VPCs as Strategy



Security in Your VPC

Security groups

- Virtual Firewalls / stateful
- Network access control lists (ACLs)



Security Group Inbound Rules

Protocol	Po	
TCP	44	

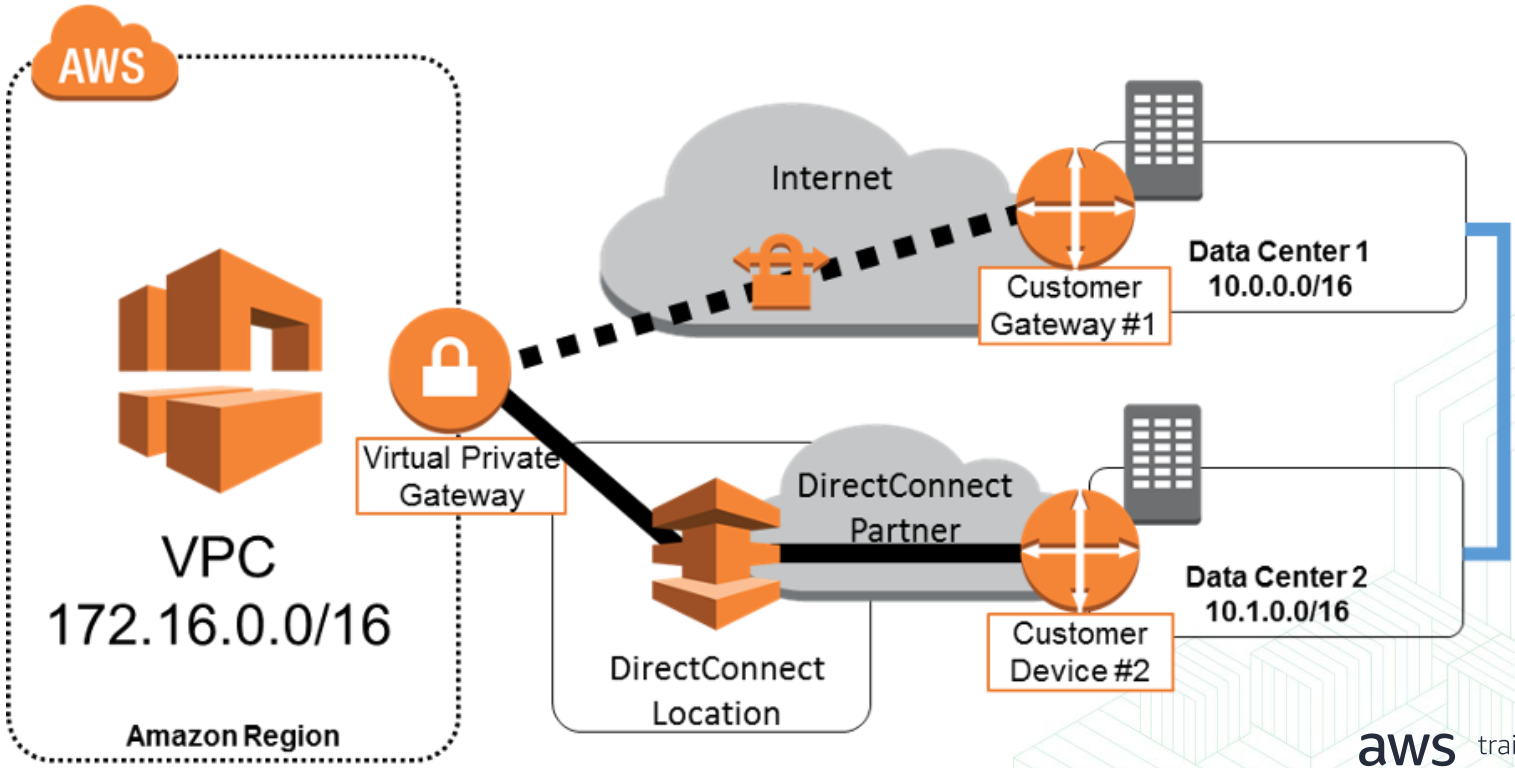
Inbound

Rule #	Source IP	Protocol	Port	Allow/ Deny
100	0.0.0.0/0	All	All	ALLOW
*	0.0.0.0/0	All	All	DENY

Outbound

Rule #	Dest IP	Protocol	Port	Allow/ Deny
100	0.0.0.0/0	all	all	ALLOW
*	0.0.0.0/0	all	all	DENY

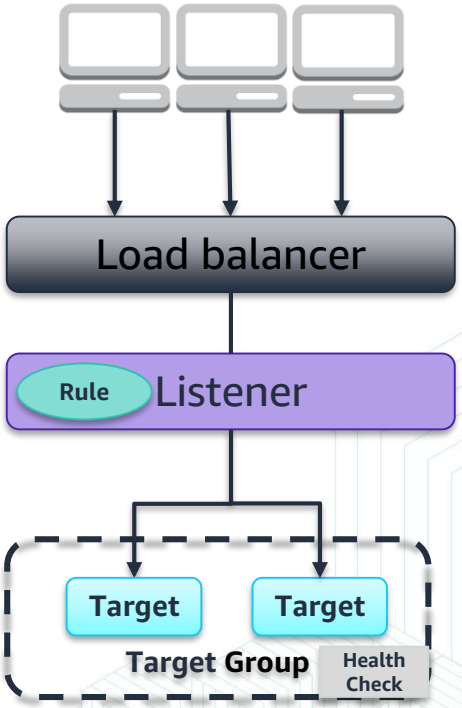
Amazon Virtual Private Cloud Corporate Datacenter Connectivity



Amazon Elastic Load Balancing (ELB)

ELB increases application resiliency

- Automatically distributes incoming application traffic
- Health Checks for application high availability
- Integrates with other AWS services
  - Route 53
  - Internet Gateway
  - Identity and Access Management



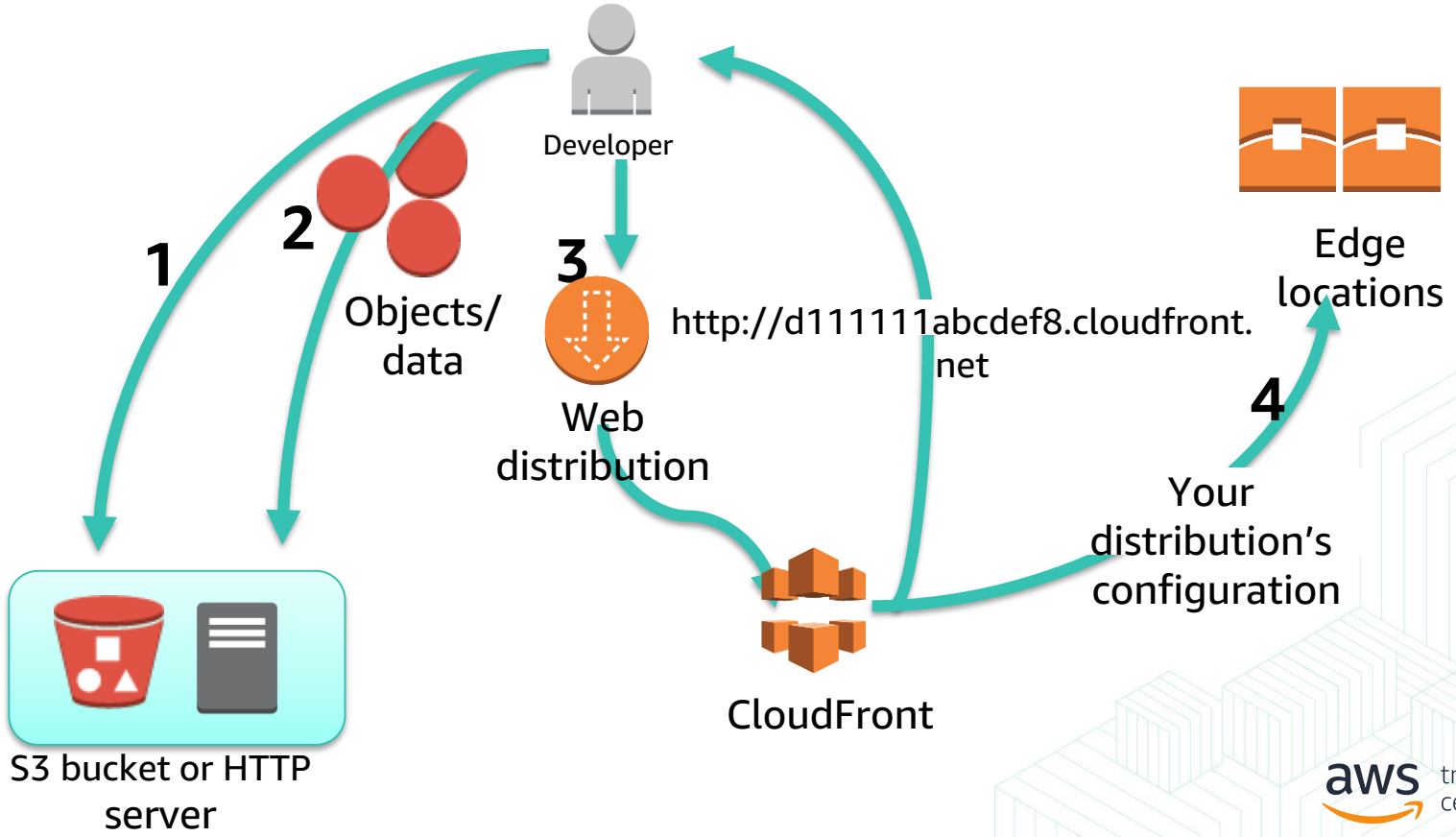
https://aws.amazon.com/elasticloadbalancing/

Amazon CloudFront

- Content delivery network (CDN) with optimization
- Distribute content to end users with low latency and high data transfer rates
- Broad, geographic presence beyond AWS Regions
- Accelerate data uploaded from end users
- Use cases:
  - Accelerating web application performance
  - Caching static web content and frequent database query results
  - Offloading TLS termination

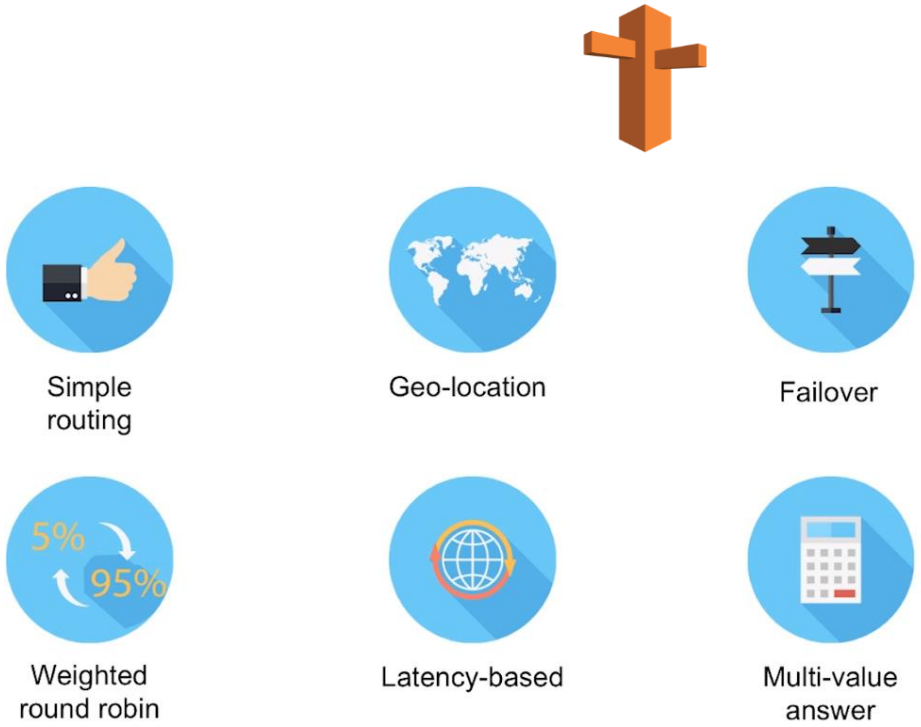
https://aws.amazon.com/cloudfront/

How You Configure CloudFront to Deliver Content



Amazon Route 53

- Global Domain Name System (DNS) service
- Highly available and scalable – 100% availability SLA
- Critical tool integrated with many AWS services



https://aws.amazon.com/route53/

Network – Knowledge Check

Question 1

Which of the following services helps provide a dedicate connection from on-premise infrastructure to resources hosted in the AWS Cloud?

A. AWS VPC

B. AWS VPN

C. AWS Direct Connect

D. AWS Subnets

Question 2

You are planning on deploying a video-based application onto the AWS Cloud. These videos will be accessed by users across the world. Which of the below services can help stream the content in an efficient manner to the users across the globe?

A. Amazon SES

B. Amazon CloudTrail

C. Amazon CloudFront

D. Amazon S3

Question 3

Which of the following service is most useful when a Disaster Recovery method is triggered in AWS?

A. Amazon Route 53

B. Amazon SNS

C. Amazon SQS

D. Amazon Inspector

Question 4

Which of the following networking component can be used to host EC2 resources in the AWS Cloud?

A. AWS Trusted Advisor

B. AWS VPC

C. AWS Elastic Load Balancer

D. AWS Autoscaling

Question 5

Which of the following can be used to protect EC2 Instances hosted in AWS? Choose 2 answers from the options given below:

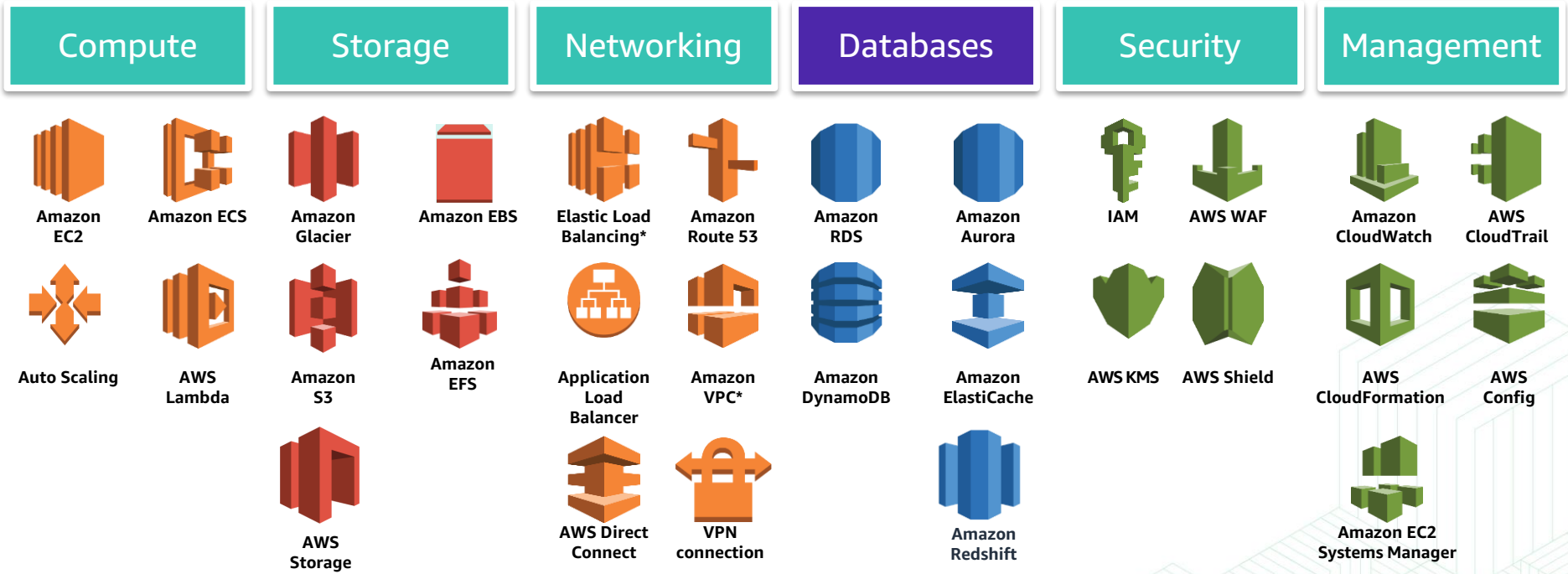
A. Usage of Security Groups

B. Usage of AMI's

C. Usage of Network Access Control Lists

D. Usage of the Internet gateway

AWS Database Services



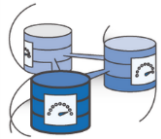
Amazon RDS

Amazon RDS

- Relational databases
- Fully managed and secure
- Fast, predictable performance
- Simple and fast to scale
- Low cost, pay for what you use

MySQL

PostgreSQL



Amazon Aurora

MariaDB

Microsoft SQL Server

ORACLE

aws training and certification

https://aws.amazon.com/rds/

Amazon Aurora

Delivered as a managed service on top of RDS

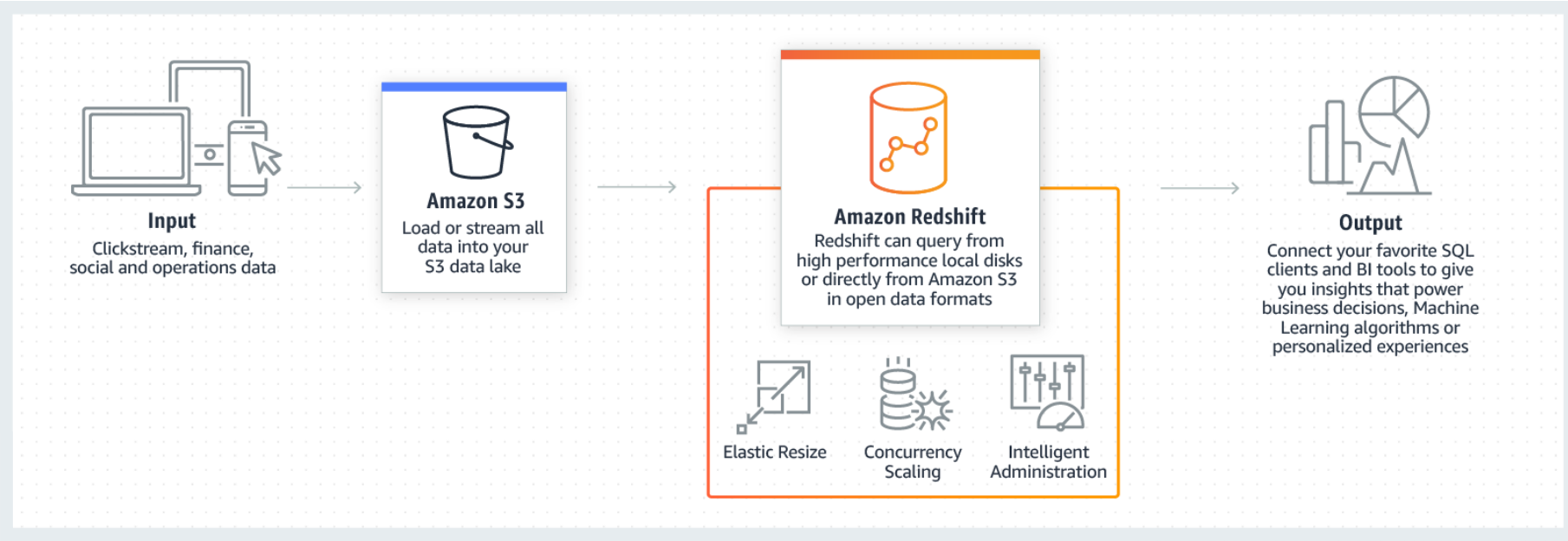
- ☑ **Speed** and **availability** of high-end commercial databases
- ☑ Up to 64TiB of **auto-scaling SSD storage**
- ☑ **Automatic Backup** (1 – 35 days)
- ☑ **Automatic Upgrade**
- ☑ Drop-in **compatibility** with MySQL and PostgreSQL
- ☑ Simple **pay as you go** pricing

Amazon DynamoDB

- Fully managed NoSQL database
- Fast, consistent performance
- Highly scalable
- Flexible
- Event-driven programming
- Fine-grained access control

Amazon Redshift: Data Warehousing

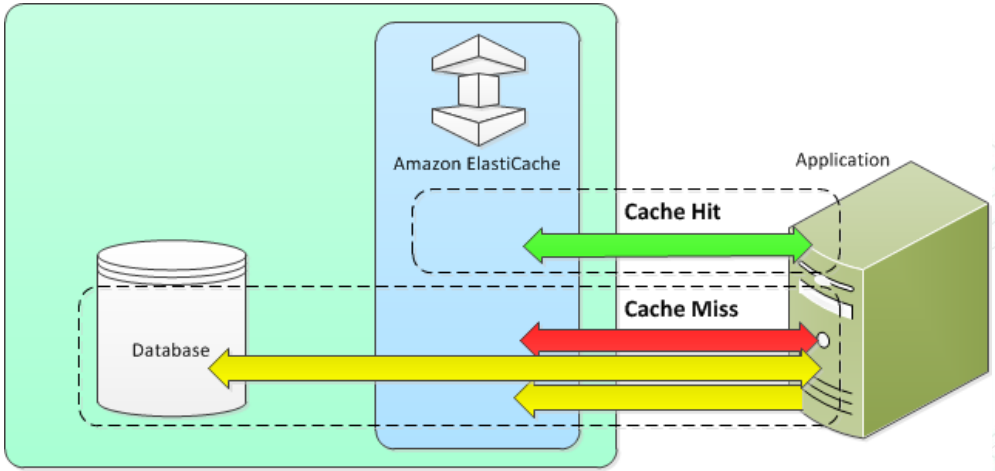
Amazon Redshift is a fast, scalable data warehouse



Amazon ElastiCache

A fully-managed in-memory data store or cache environment in the cloud.

- Improves performance by retrieving data from high-throughput and low-latency, in-memory data stores.
- Use Cases:
  - Gaming
  - Ad-Tech
  - Financial Services
  - Healthcare
  - IoT



https://aws.amazon.com/elasticache/

Databases – Knowledge Check

Question 1

Which of the following is a fully managed NoSQL database service available with AWS?

A. AWS RDS

B. AWS DynamoDB

C. AWS Redshift

D. AWS MongoDB

Question 2

Which AWS service automates infrastructure provisioning and administrative tasks for an analytical data warehouse?

A. Amazon Redshift

B. Amazon DynamoDB

C. Amazon ElastiCache

D. Amazon Aurora

Question 3

Which of the following is a compatible MySQL database which also can grow in storage size on its own?

A. Aurora

B. DynamoDB

C. RDS Microsoft SQL Server

D. RDS MySQL

Question 4

Which of the following features of Amazon RDS allows for better availability of databases. Choose 2 answers from the options given below:

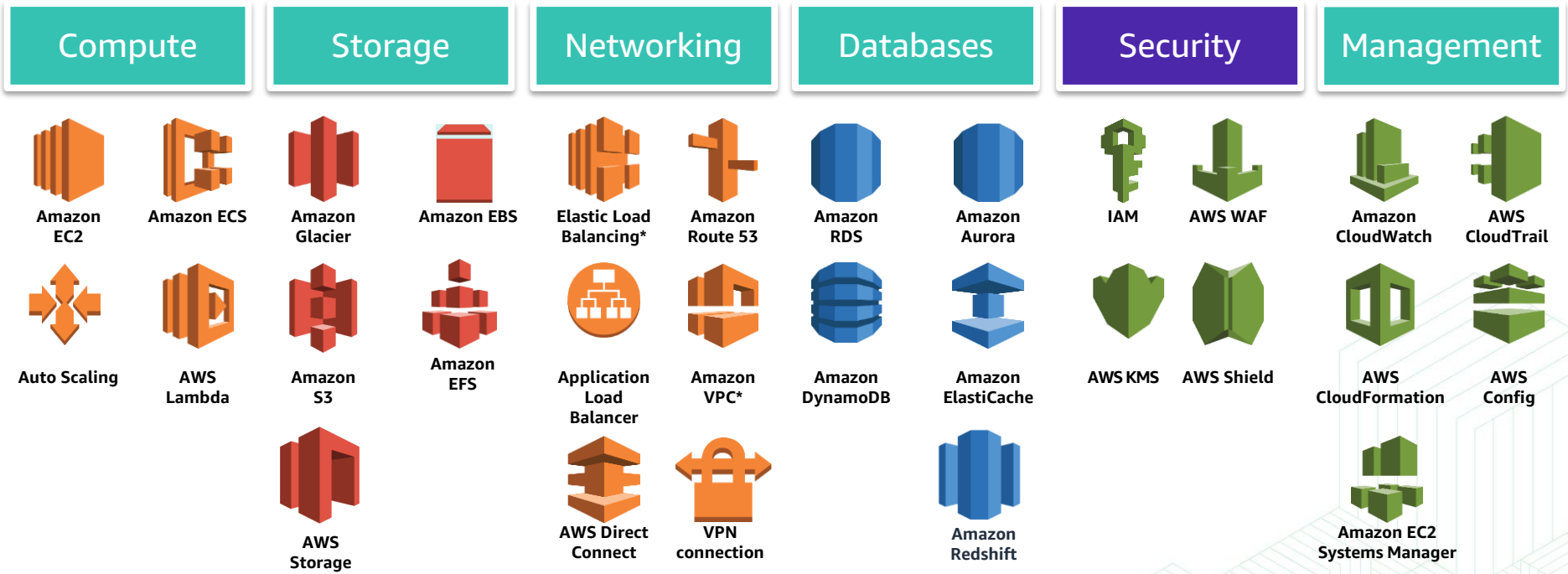
A. VPC Peering

B. Multi-AZ

C. Read Replicas

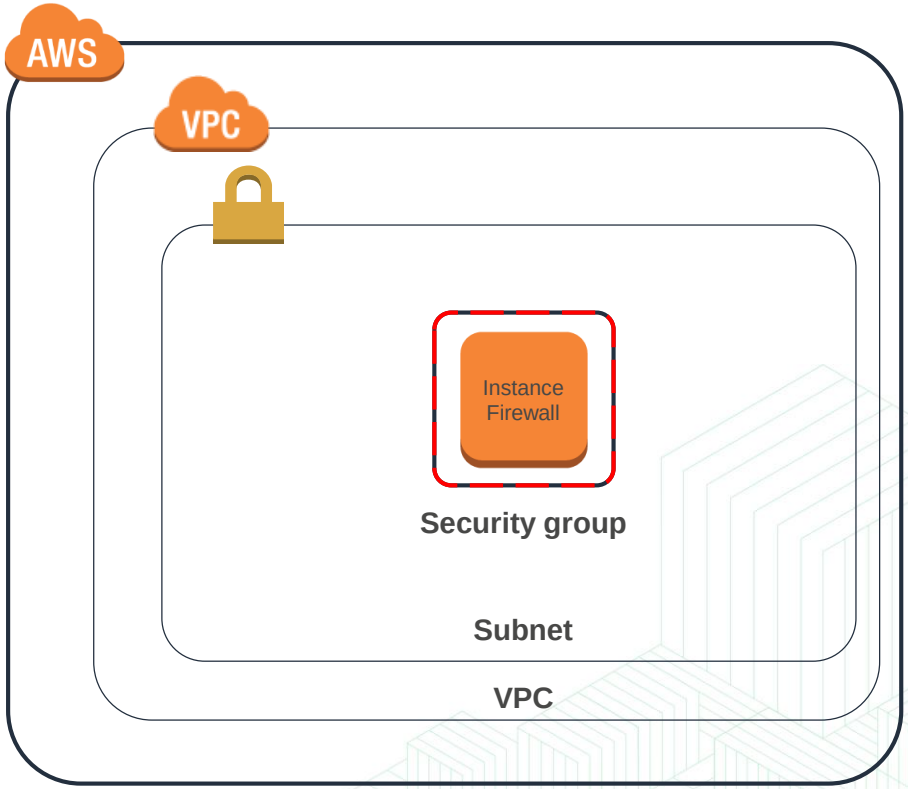
D. Multi-Region

AWS Security Services



The Layered Security Approach

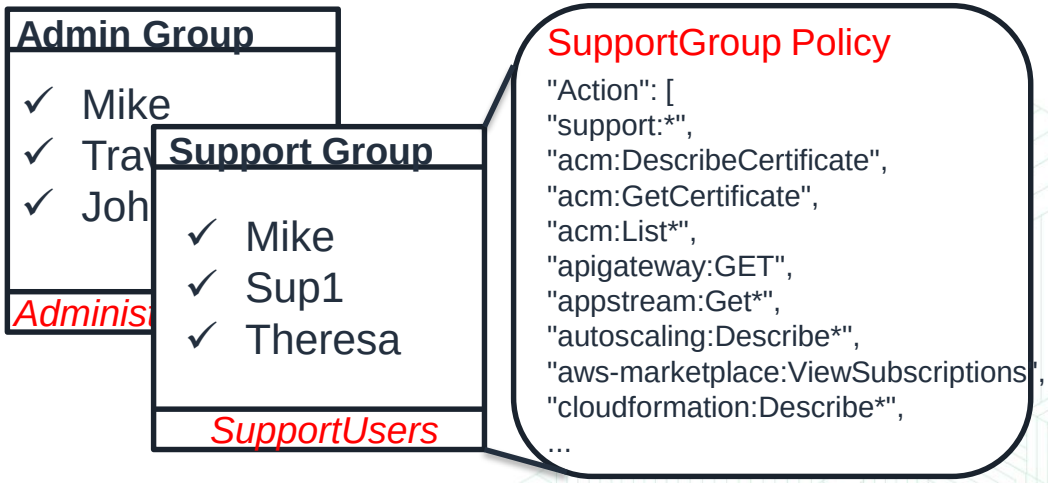
- Secured Infrastructure
  - Secured endpoints
  - Compliance alignments and frameworks
  - Certifications and attestations
- VPC
  - Workload isolation
- Security Group
  - Port/protocol filtering
- Instance Firewall
  - Rule-based protection at the OS level



AWS Identity & Access Management

A core AWS security service.

Defines administrative profiles.
Who can do what on the AWS console or by the additional management tools.



https://aws.amazon.com/iam/

AWS Principals

Account Owner ID (Root Account)

- Access to all subscribed services.
- Access to billing.
- Access to console and APIs.
- Access to Customer Support.

IAM Users, Groups and Roles

- Access to specific services.
- Access to console and/or APIs.
- Access to Customer Support (Business and Enterprise).

Temporary Security Credentials

- Access to specific services.
- Access to console and/or APIs.

https://docs.aws.amazon.com/IAM/latest/UserGuide/best-practices.html

IAM Root Account Best Practices

- 1st account created (email + password)
- Do not use the root user for your everyday tasks
- Securely lock away the root user credentials
  - Delete any programmatic keys
  - Enable MFA on Root Account
  - Change the Root password to a strong password

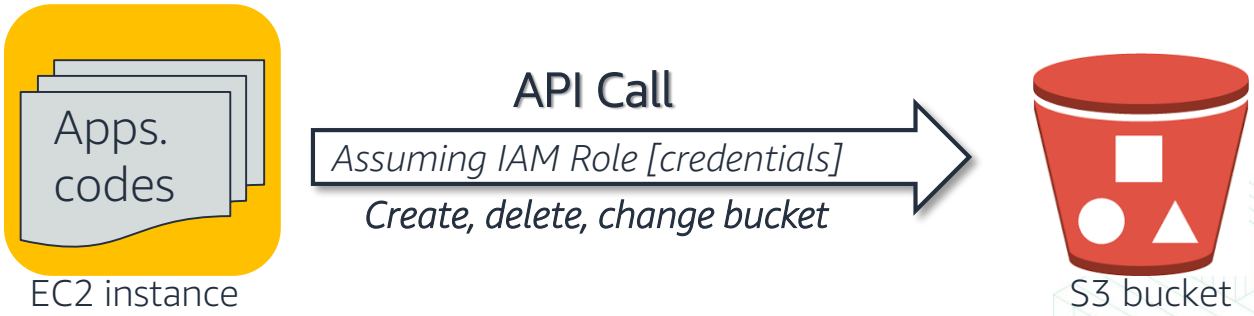
https://docs.aws.amazon.com/IAM/latest/UserGuide/best-practices.html

IAM Roles Best Practices

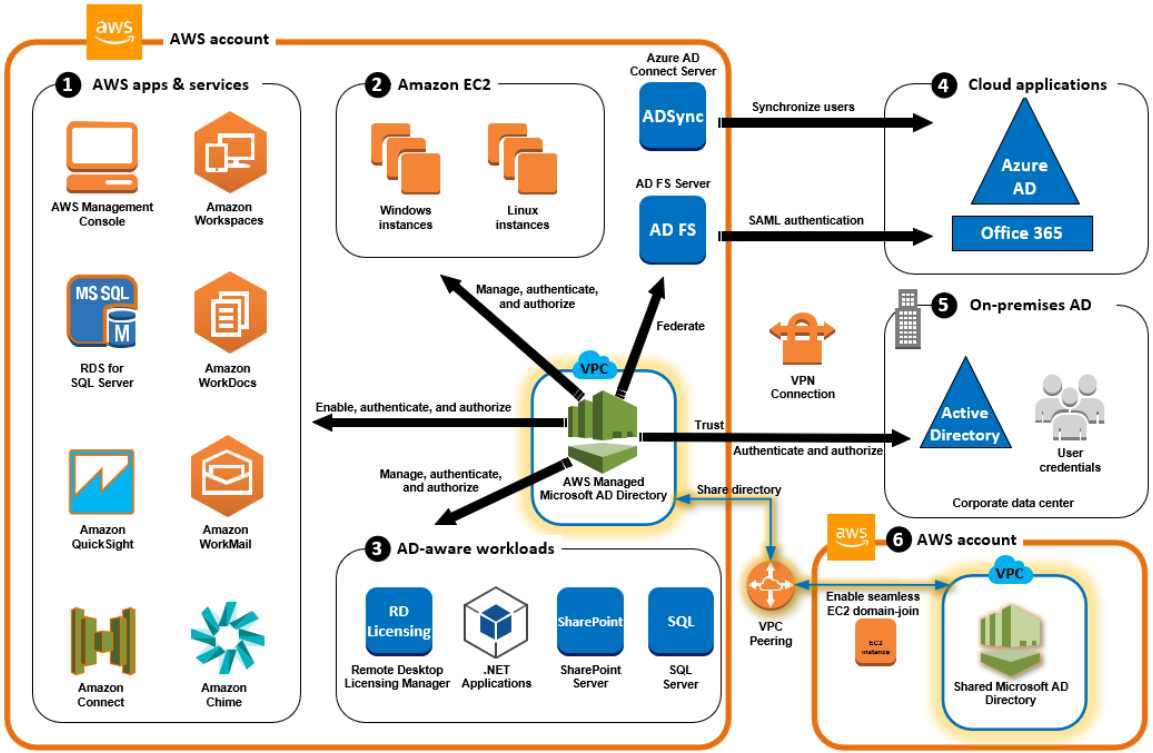
IAM identity that can be assumable by anyone who needs it.

Ex.: users, applications, services, federated users

- ✗ Long term passwords
- ✗ Long term access keys
- ✓ Temporary security credentials



AWS Directory Service

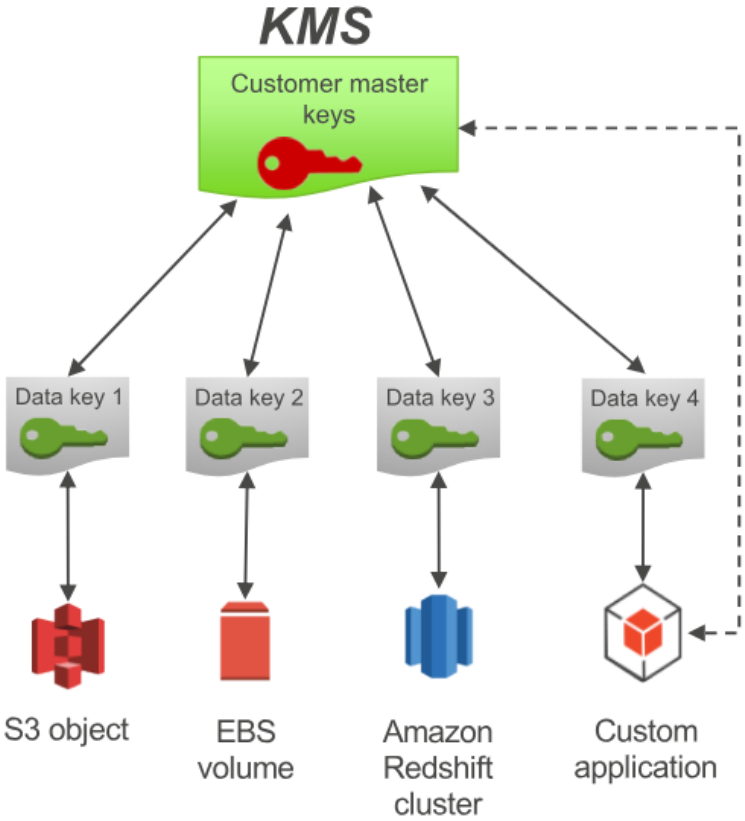


1. Sign In to AWS Applications and Services with AD Credentials
2. Manage Amazon EC2 Instances
3. Provide Directory Services to Your AD-Aware Workloads
4. SSO to Office 365 and Other Cloud Applications
5. Extend Your On-Premises AD to the AWS Cloud
6. Share Your Directory to Seamlessly Join Amazom EC2 Instances to a Domain Across AWS Accounts

AWS Key Management Service (AWS KMS)

Data encryption with KMS

- Managed service to use encryption keys
- Integrated with many AWS services
- Integrated with AWS CloudTrail
  - provide auditable logs of key usage



https://aws.amazon.com/kms/

AWS Web Application Firewall (AWS WAF)

- Protects web applications
- Filter traffic based on custom rules
- Easy to deploy as part of Amazon CloudFront or ELB
- Provides real-time metrics and detailed request data
- Configure manually or via an Amazon API
- Integrate third-party. workload-optimized, AWS WAF configuration rules
- AWS Firewall Manager synchronizes AWF WAF rules across multiple-accounts

https://aws.amazon.com/waf/

AWS Shield (Standard or Advanced)

- Guards against distributed denial of service (DDoS) attacks
- AWS Shield Standard
  - Addresses common layer 3-4 DDoS incidents
  - Monitors network flows for quick attack detection
  - Mitigates service impacts automatically
- AWS Shield Advanced
  - Enhanced DDoS detection and response
  - Supports customized rules against sophisticated attacks
  - Includes AWS DDoS Response Team 24x7
  - Covers cost of increased resource utilization due to attack

https://aws.amazon.com/shield/

Security – Knowledge Check

Question 1

Which service allows an administrator to create and modify AWS user permissions?

A. AWS Config

B. AWS Cloud Trail

C. AWS Key Management Service (AWS KMS)

D. AWS Identity and Access Management (IAM)

Question 2

Which of the following is the responsibility of the AWS customer according to the Shared Security Model?

A. Managing AWS Identity and Access Management (IAM)

B. Securing edge locations

C. Monitoring physical device security

D. Implementing service organization Control (SOC) standards

Question 3

Which of the following security requirements are managed by AWS customers? Select 2 answers from the options given below.

A. Password Policies

B. User permissions

C. Physical security

D. Disk disposal

E. Hardware patching

Question 4

How can the AWS Management Console be secured against unauthorized access?

A. Apply Multi-Factor Authentication (MFA)

B. Set up a secondary password

C. Request root access privileges

D. Disable AWS console access

Question 5

When giving permission to users via the AWS Identity and Access Management tool, which of the following principles should be applied when granting permissions?

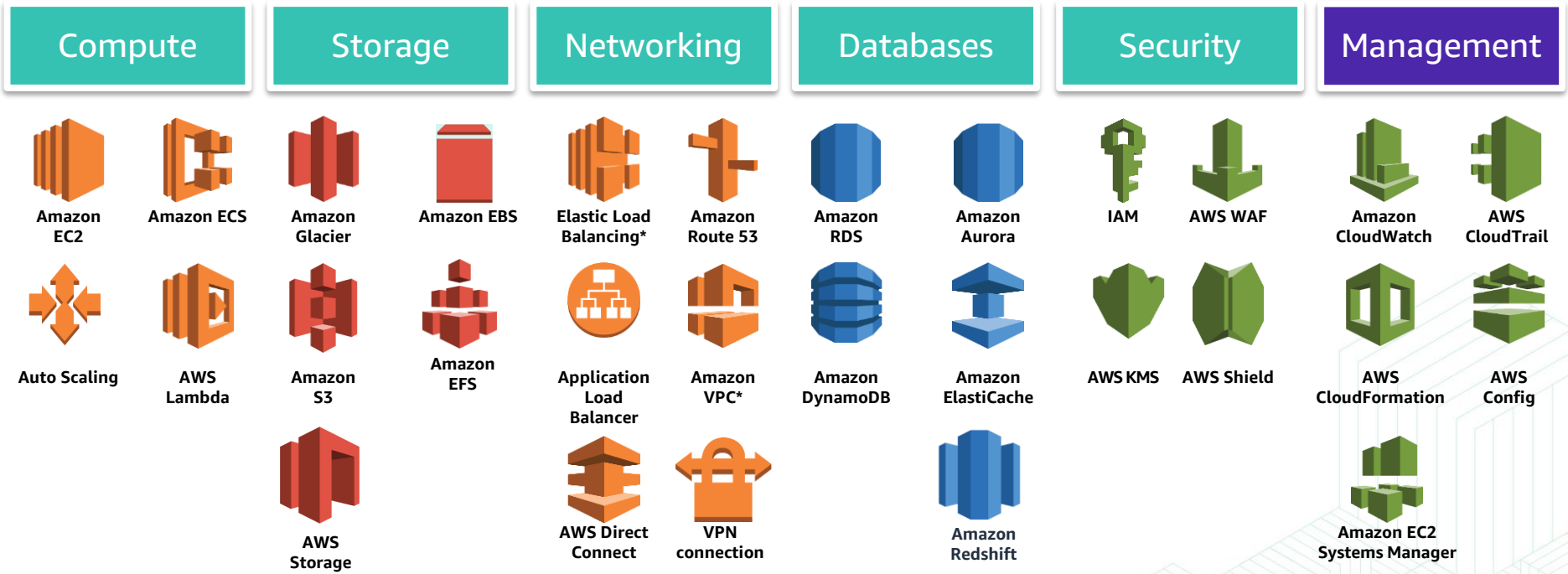
A. Principle of least privilege

B. Principle of greatest privilege

C. Principle of most privilege

D. Principle of lower privilege

AWS Management Services

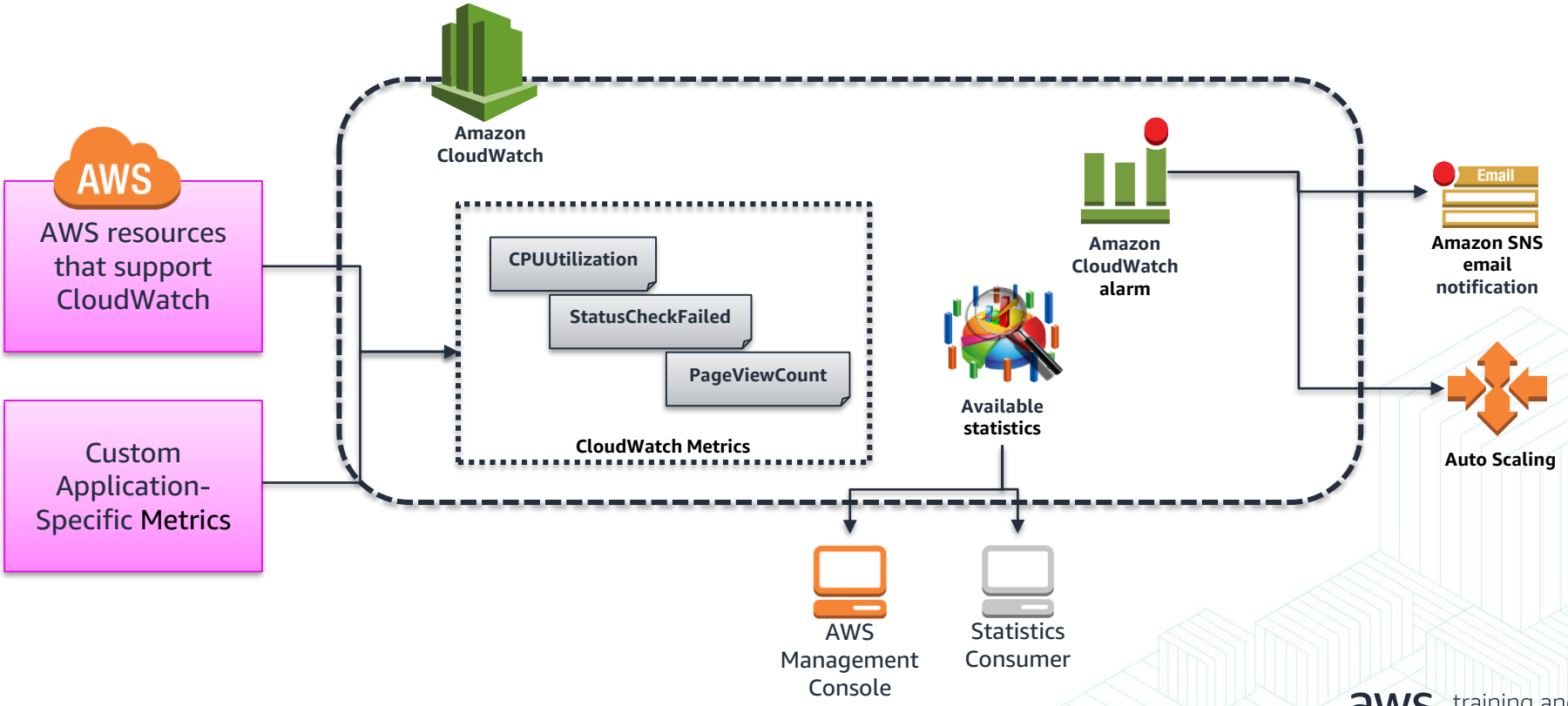


AWS CloudWatch

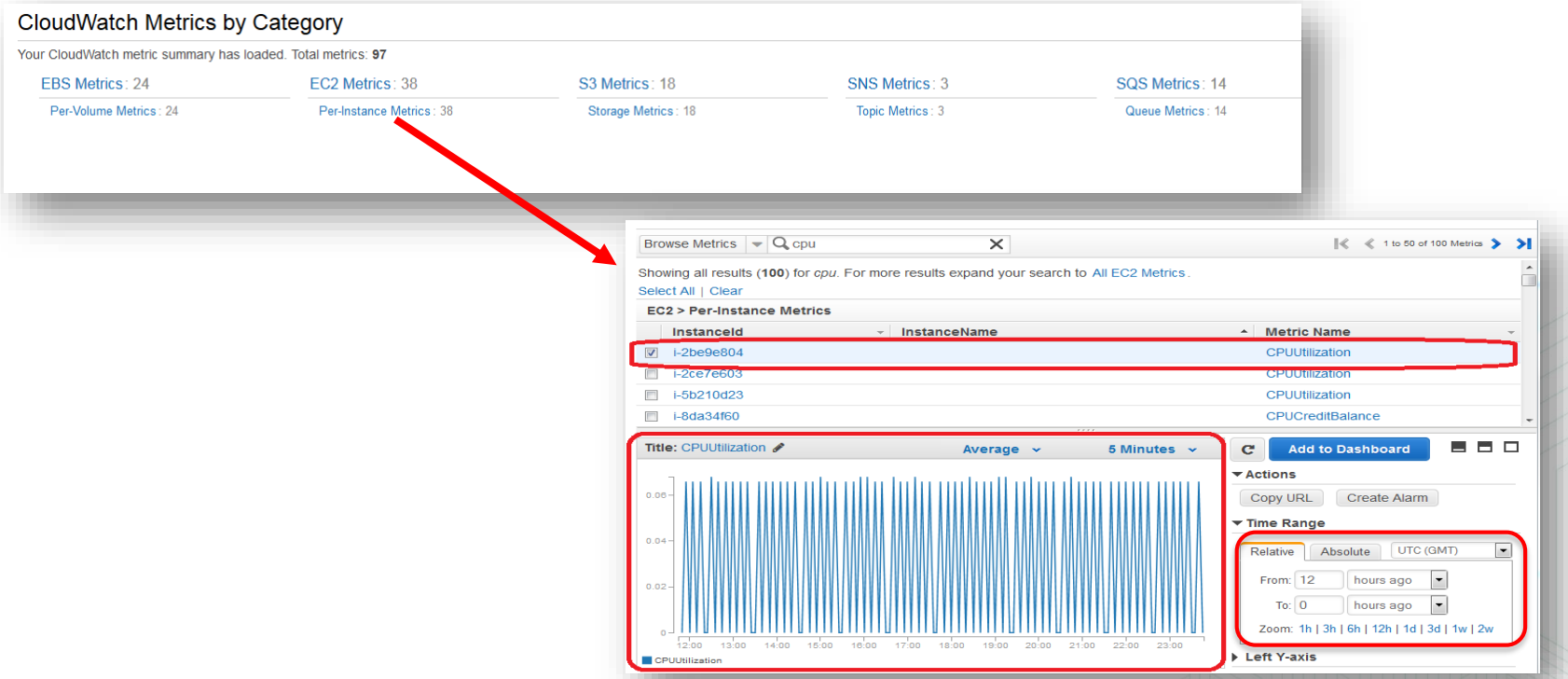
- Monitoring service for AWS cloud resources and applications
- Collect and track metrics, monitor log files, and set alarms
- Gain visibility into resource utilization, application performance, and operational health
- Set alarms to send notifications or take other automated actions
- Supports custom dashboards
- Use cases:
  - Cost management; billing alerts

https://aws.amazon.com/cloudwatch/

AWS CloudWatch Alarms



CloudWatch Metrics Examples



AWS CloudTrail

CloudTrail provides the event history of AWS account activity

- Permits governance, compliance, audit.
- Logs API calls.
- Security analysis.
- Tracking of resource changes.
- Problems solution.

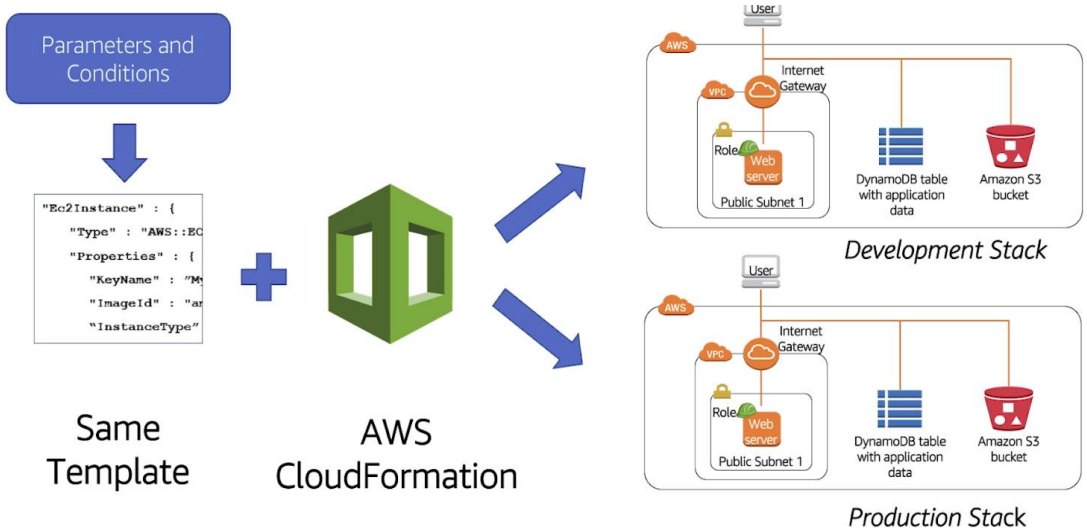
Who did that?!

	Event time	User name	Event name
▶	2018-12-11, 09:18:14 AM	guilheh	LookupEvents
▶	2018-12-11, 09:18:12 AM	guilheh	LookupEvents
▼	2018-12-11, 09:18:08 AM	guilheh	GetTrailStatus

AWS access key	ASIARH23VDGQ7AAGFEHN	**Event time**	2018-12-11, 09:18
AWS region	us-east-1	**Read only**	true
Error code		**Request ID**	3427bca8-7e4a-4
Event ID	a3e0b8ef-5d3f-47a4-93d8-c9a2cfc53757	**Source IP address**	179.153.59.157
Event name	GetTrailStatus	**User name**	guilheh
Event source	cloudtrail.amazonaws.com		

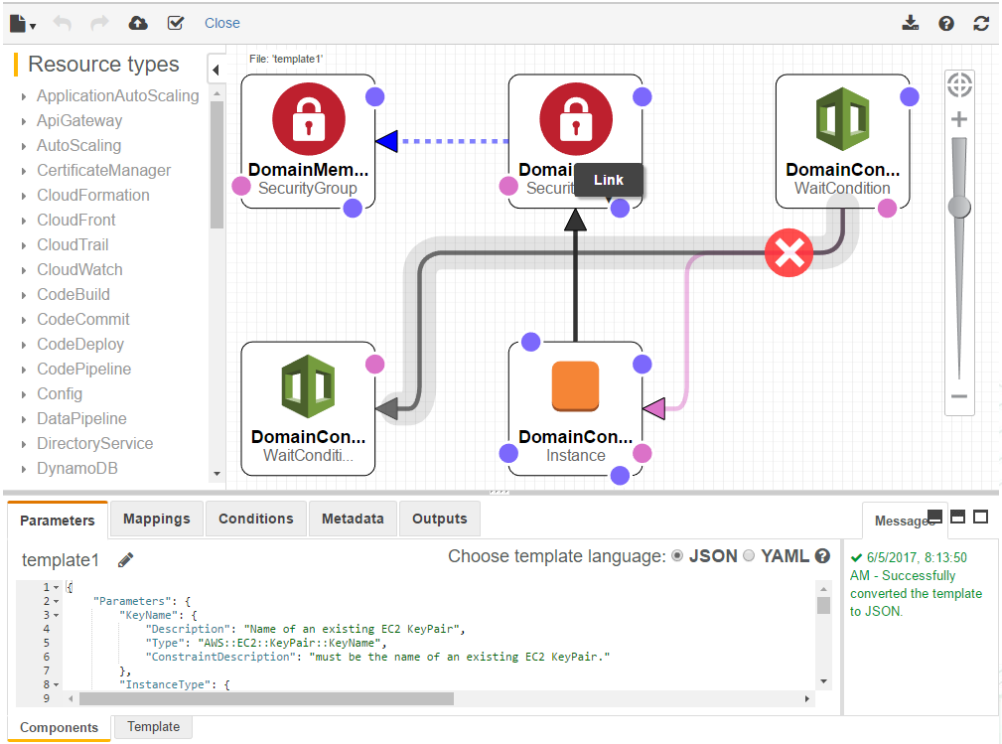
Benefits of AWS CloudFormation

- Create stacks in multiple regions from the same template.
- Update and delete stacks easily.
- Document your infrastructure.
- Maintain your infrastructure as a code artifact
  - Use a code repository such as AWS CodeCommit or GitHub
- Sample templates available for multiple workloads.



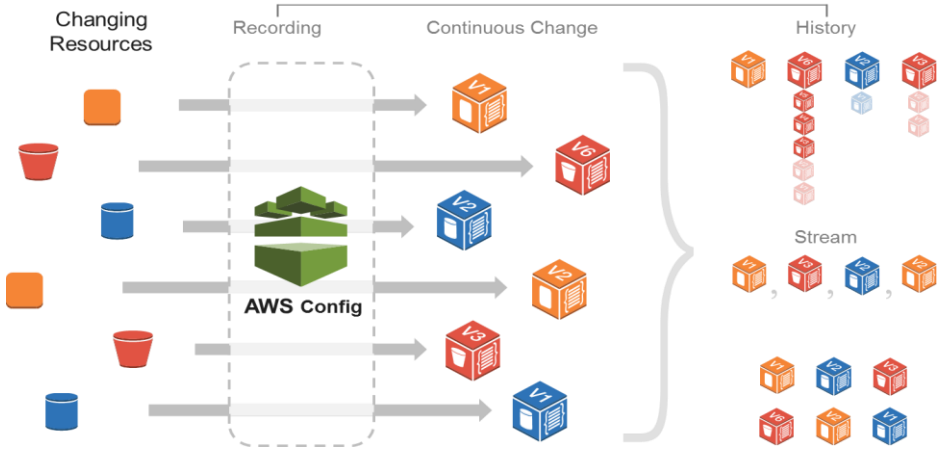
AWS CloudFormation Designer

- Visualize template resources
- Modify template with drag-and-drop gestures
- Customize sample templates



AWS Config

Managed service for tracking AWS inventory and configuration, and configuration change notification.



AWS Config

- Amazon EC2
- Amazon EBS
- Amazon VPC
- AWS CloudTrail

- Security analysis
- Audit compliance
- Change management
- Troubleshooting
- Discovery

aws training and certification

Management Services – Knowledge Check

Question 1

You want to monitor the CPU utilization of an EC2 resource in AWS. Which of the below services can help in this regard?

A. AWS CloudTrail

B. AWS Inspector

C. AWS Trusted Advisor

D. AWS CloudWatch

Question 2

Which of the following services helps in governance, compliance, and risk auditing in AWS?

A. AWS Config

B. AWS CloudTrail

C. AWS CloudWatch

D. AWS SNS

Question 3

A company needs to know which user was responsible for terminating several critical Amazon Elastic Compute Cloud (Amazon EC2) Instances. Where can the customer find this information?

A. AWS Trusted Advisor

B. Amazon EC2 instance usage report

C. Amazon CloudWatch

D. AWS CloudTrail logs

Question 4

You have a DevOps team in your current organization structure. They are keen to know if there is any service available in AWS which can be used to manage infrastructure as code. Which of the following can be met with such a requirement?

A. Using AWS CloudFormation

B. Using AWS Config

C. Using AWS Inspector

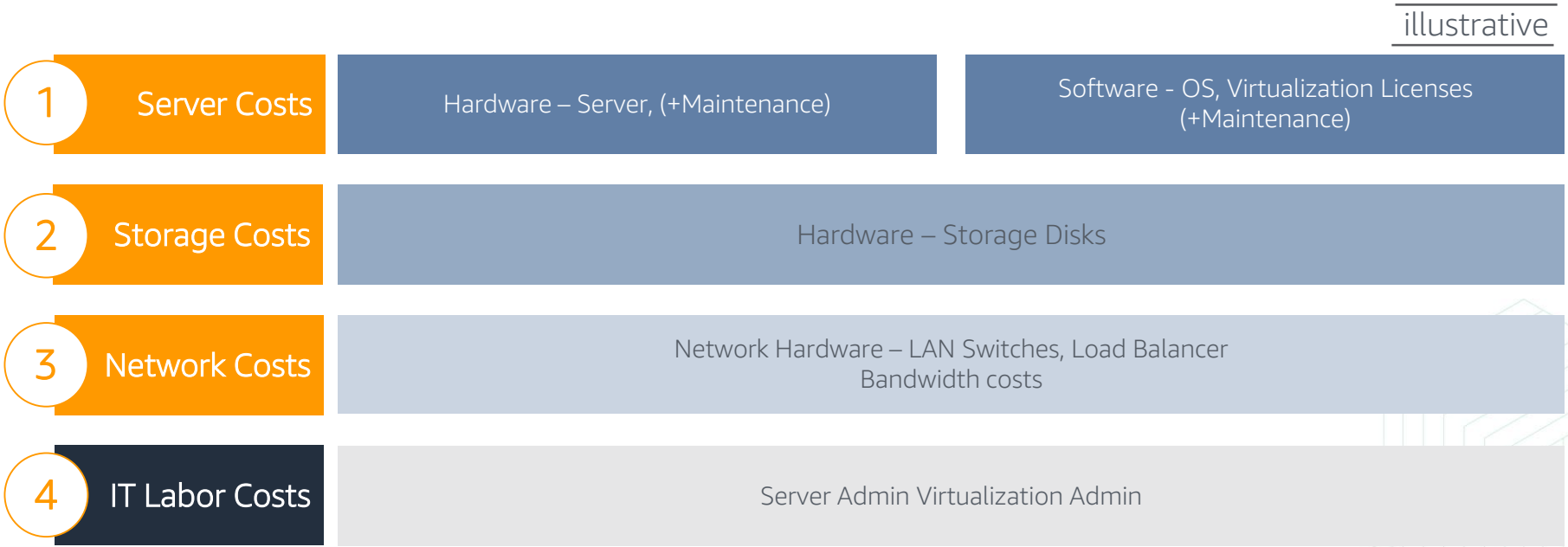
D. Using AWS Trusted Advisor

Module 4:
Pricing, TCO and Cost Optimization on AWS

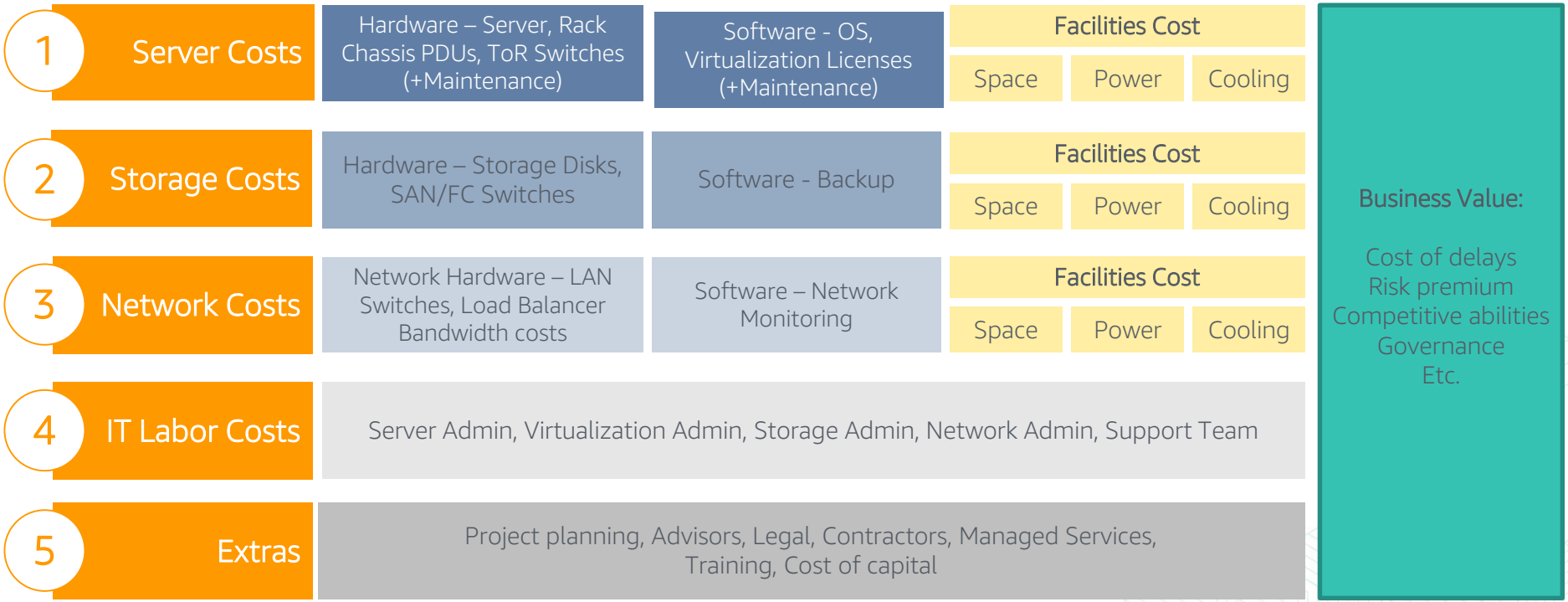
Cloud Value Framework

What is it?	Infrastructure cost savings / avoidance from moving to the Cloud.	Efficiency improvement by function on a task by task basis.	Benefit of improving SLAs & reducing unplanned outage.	Deploying new features / applications faster and reducing errors.
Examples	50%+ reduction in TCO (GE)	Over 500 hours per year of server configuration time saved (Sage)	Critical workloads run in multiple AZs & Regions for robust DR (Expedia)	Launch of new products 75% faster (Unilever)

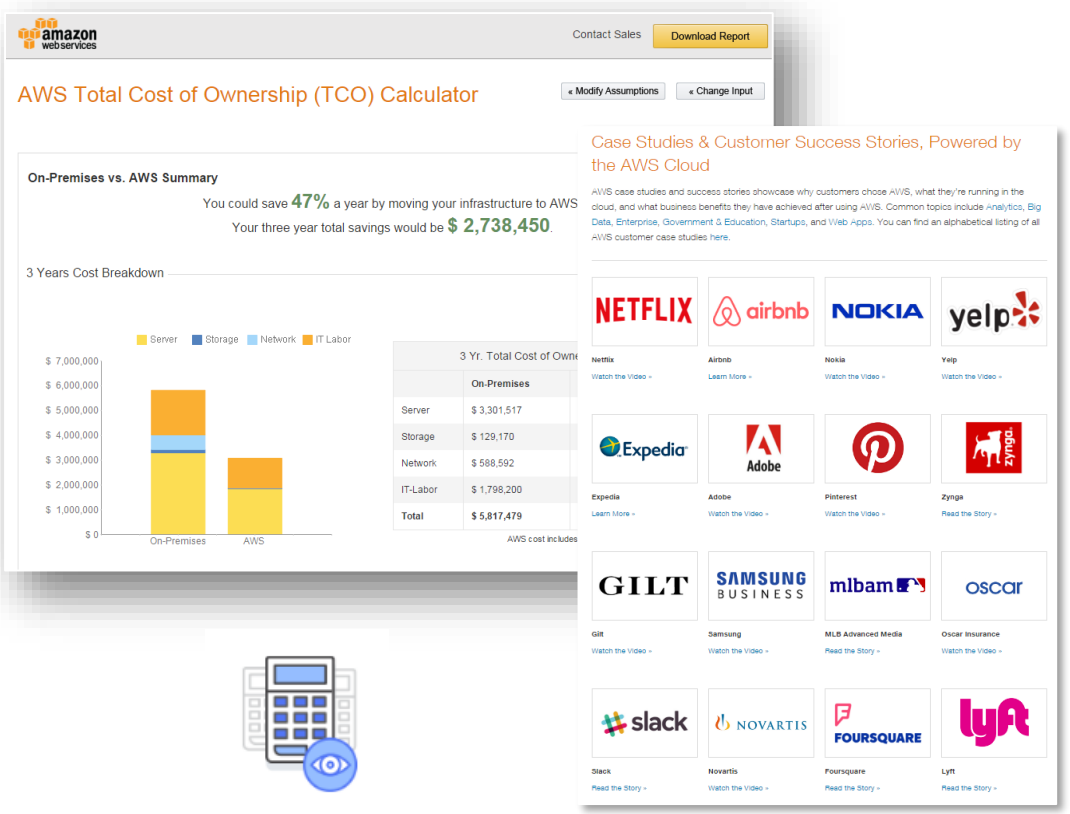
TCO the way customers typically see it



TCO the way it really is



Resources to get started



AWS TCO Calculator

https://awstcocalculator.com

AWS Economics Center

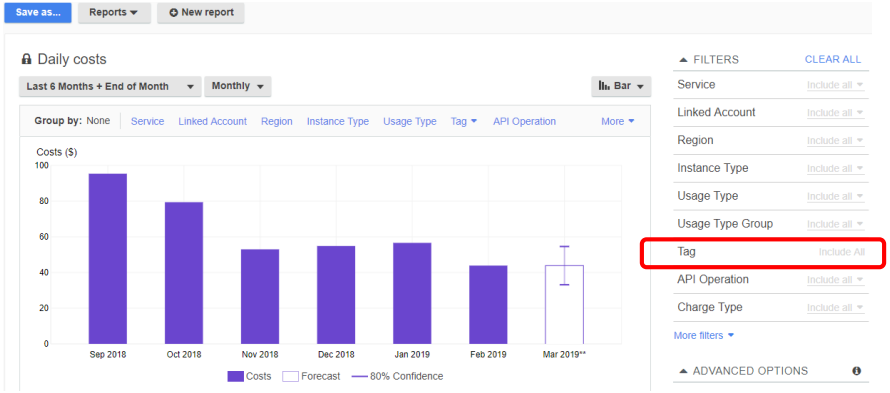
http://aws.amazon.com/economics/

Case Studies and Research

http://aws.amazon.com/solutions/case-studies

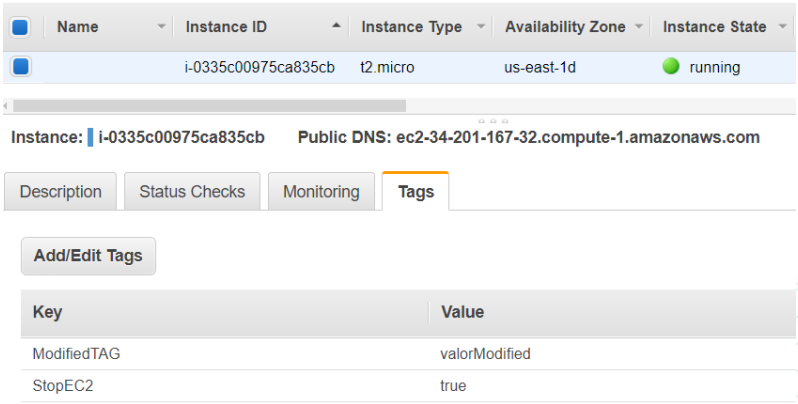
Tools for Cost Visibility

Cost Explorer



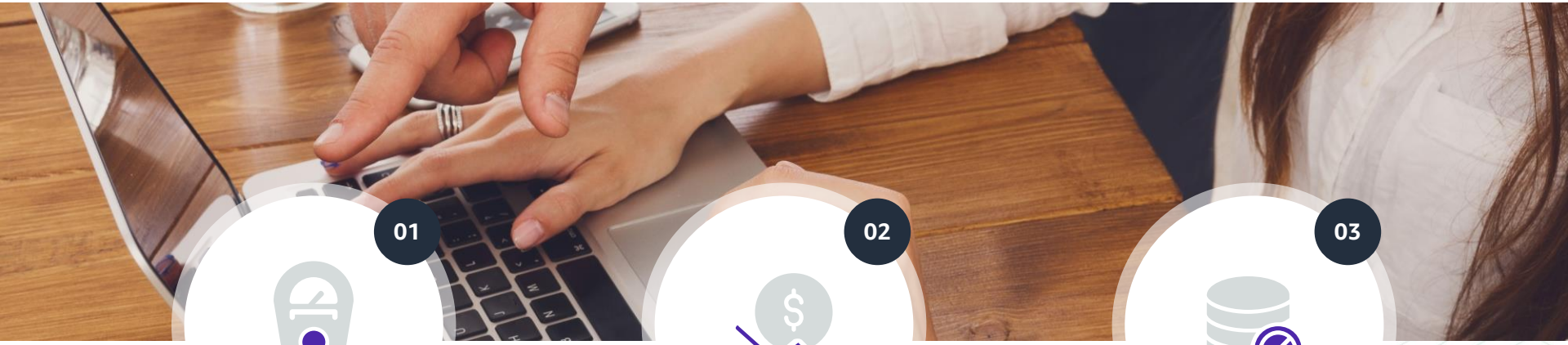
- Monthly Spend by Service View
- Monthly Spend by Linked Account View
- Daily Spend View

TAGs



- Identify and organize your AWS resources
- Integrated with multi AWS Services
- EC2, RDS, S3, Glaciers, Redshift, etc...

AWS Pricing Philosophy



01

Pay Only for What You Use

02

Low Cost

03

No Up-Front Capital Expense

On-Demand and Reserved

Instance Type	Benefits	When to Position	Workloads
On-Demand	• Billing by the second (new as of 10/2/17) • Modify compute capacity	• Customer seeking to avoid long contracts and upfront payments	• Short-Term/Fluctuates • Desired to Run to Completion • Dev/Test
Standard - **Reserved Instance**	• 50%-70% less than On-Demand instances	• Customer able to commit to 1yr, 3 year term	• Steady-state applications

Convertible Reserved Instances

Instance Type	Benefits	When to Position	Workloads
Convertible – **Reserved Instance**	• Reduced price during Reserved Instance term • Change Reserved Instance family, type, OS, or tenancy	• For customers lacking understanding of future workloads	• Steady-state but can change Example 

Spot Instances

Instance Type	Benefits	When to Position	Workloads
Spot Fleet Unused EC2 instance that is available for less than the On-Demand price.	• Discounts compared to on-demand pricing • Run continuously for a set duration at lower pricing	• When workloads can continue after interruptions; for diversification across multiple instance types and AZs	• Batch processing, Hadoop workflow, HPC grid • Encoding, rendering, modeling, analysis, or continuous integration

Dedicated Instances and Dedicated Hosts

Instance Type	Benefits	When to Position	Workloads
Dedicated Instance	• Instances run on hardware dedicated to you only	• For workloads that require dedicated hardware to meet unique security and compliance needs	• Data isolation required
• Customer must pay an hourly instance fee		• Customer must pay a dedicated per region fee	
Dedicated Host	• Instances run on hardware dedicated to you only • License portability • Fine grain control of hardware	• For existing server-bound software licenses that are bound to VMs, sockets, or physical cores	• Data isolation required • License dependent applications or services

Billing Comparison

Select Billing Option

N.Virginia, 30thJan2019.

Instance Type: m5.xlarge
Operating System: Linux
Usage: 100 % Utilized/Month

Per Instance Prices & Projected Costs (all in USD)

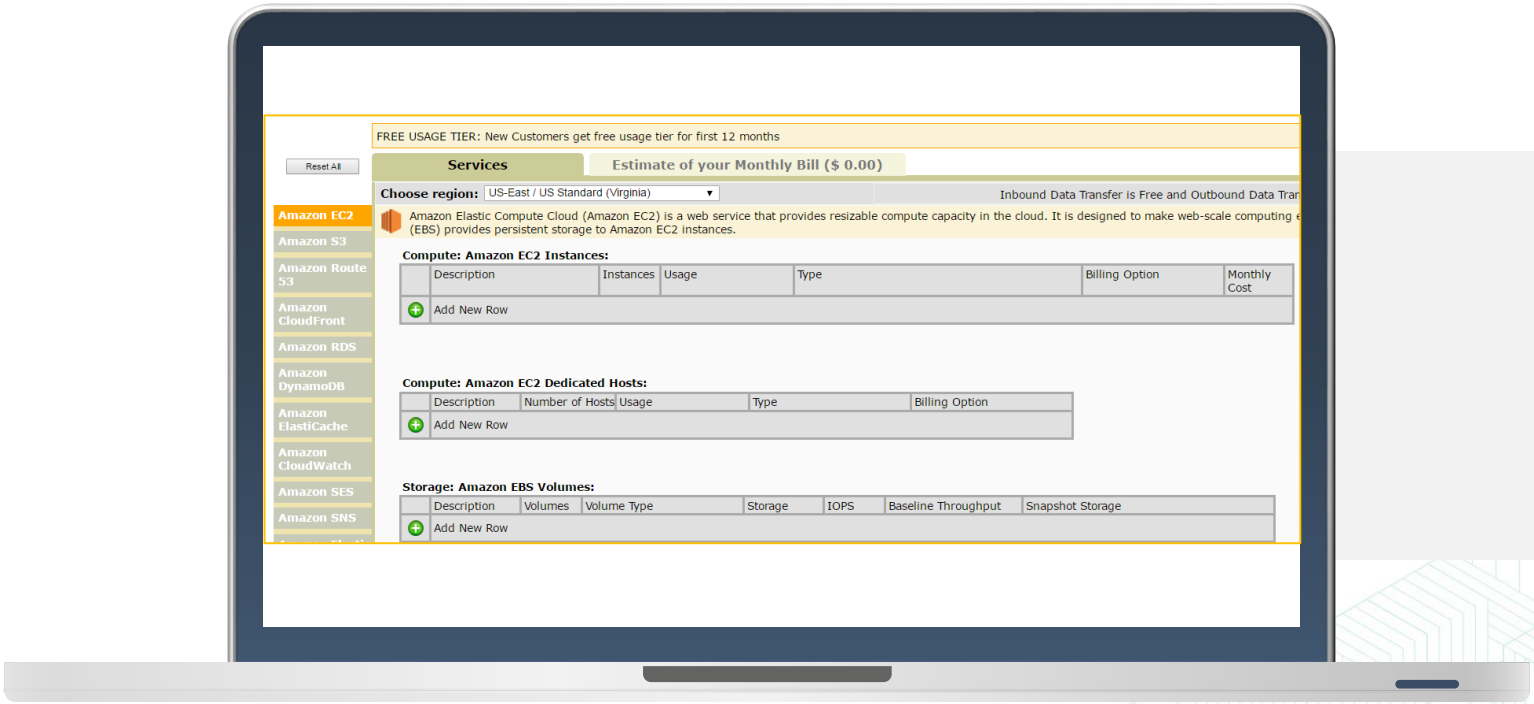
Select	Name	Upfront Price	Effective Hourly Cost	Effective Monthly Cost	1 Year Cost	3 Year Cost
◉	On-Demand (No Contract)	---	0.192	140.55	1686.60	5059.80
○	1 Yr No Upfront Reserved	0.00	0.123	89.79	1077.48	3232.44
○	1 Yr Partial Upfront Reserved	512.00	0.116	85.01	1020.08	3060.24
○	1 Yr All Upfront Reserved	1003.00	0.114	83.59	1003.00	3009.00
○	3 Yr No Upfront Reserved	0.00	0.085	62.05	---	2233.80
○	3 Yr Partial Upfront Reserved	1030.00	0.078	57.09	---	2054.92
○	3 Yr All Upfront Reserved	1937.00	0.074	53.81	---	1937.00
○	1 Yr No Upfront Convertible	0.00	0.141	102.93	1235.16	3705.48
○	1 Yr Partial Upfront Convertible	588.00	0.134	97.91	1174.92	3524.76
○	1 Yr All Upfront Convertible	1153.00	0.132	96.09	1153.00	3459.00
○	3 Yr No Upfront Convertible	0.00	0.097	70.81	---	2549.16
○	3 Yr Partial Upfront Convertible	1185.00	0.090	65.77	---	2367.60
○	3 Yr All Upfront Convertible	2322.00	0.088	64.50	---	2322.00

Reserved

Convertible

Estimating Cost Savings

Simple Monthly Calculator



Module 5:
AWS Well-Architected Framework

The AWS Well-Architected Framework

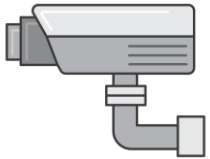
Design Principles

- Stop guessing your capacity needs
- Test systems at production scale
- Automate to make architectural experimentation easier
- Allow for evolutionary architectures
- Data-Driven Architectures
- Improve through game days

Pillars of AWS Well-Architected

Operational Excellence

Security



Reliability

Performance Efficiency

Cost Optimization

Operational Excellence

The ability to run and monitor systems to deliver business value and continually improve supporting processes and procedures.

Principles

- Perform operations with code
- Align operations processes to business objectives
- Make regular, small, incremental changes
- Test for responses to unexpected events
- Learn from operational events and failures
- Keep operations procedures current

Coverage Area

- Preparation
- Operation
- Response

Operational Excellence: AWS Services

Prepare

- AWS Config rules

Operate

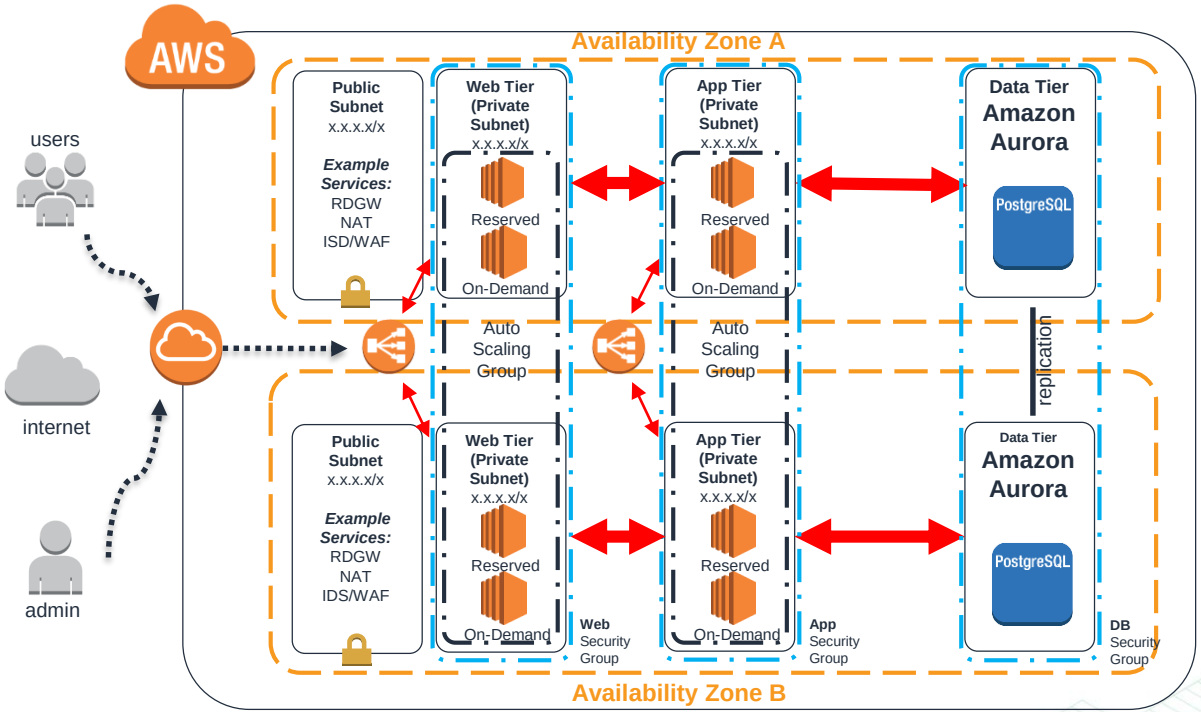
- Amazon CloudWatch

Evolve

- Amazon ElastiSearch Services (Amazon ES)

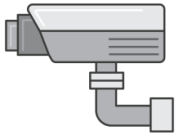
Applying Operational Excellence

1. Use of CloudWatch to achieve visibility in the cloud



2. Use of CodeStar to deploy Infrastructure as Code

Security



The ability to protect information, systems, and assets while delivering business value through risk assessments and mitigation strategies.

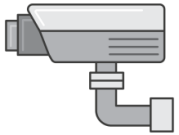
Principles

- Apply security at all layers
- Enable traceability
- Implement a principle of least privilege
- Focus on securing your system
- Automate security best practices

Coverage Areas

- Identity and access management
- Detective controls
- Infrastructure protection
- Data protection
- Incident response

Security: AWS Services



Identity and Access Management

- IAM, MFA

Detective Controls

- Cloud Trail, AWS Config, CloudWatch

Infrastructure Protection

- Amazon VPC

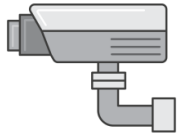
Data Protection

- ELB, Amazon EBS, Amazon S3, Amazon RDS, Amazon Macie, AWS KMS,

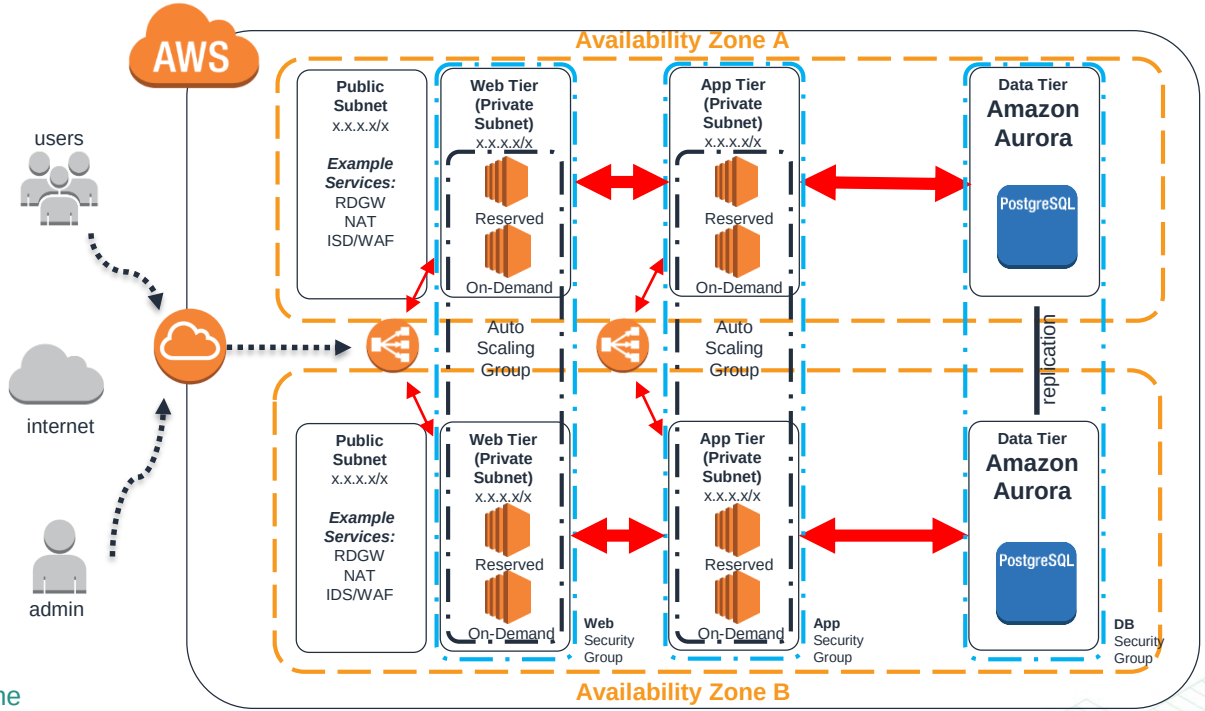
Incident Response

- AWS CloudFormation

Applying Security Best Practices



1. Public and private subnets
   - ELB and other edge devices are the only things the public can reach
   - The application of WAF, and Shield at the edge to control traffic



2. The use of IAM (Dive deep – Understand the roles and users.)

3. The use of CloudTrail and Config to maintain a known infrastructure state

4. Using IAM to create roles that ensure that only the App tier can talk to the database

Reliability

The ability of a system to recover from infrastructure or service failures, dynamically acquire computing resources to meet demand, and mitigate disruptions such as misconfigurations or transient network issues.

Principles

- Test recovery procedures
- Automatically recover from failure
- Scale horizontally to increase aggregate system availability
- Stop guessing capacity
- Manage change in automation

Coverage Areas

- Foundations
- Change Management
- Failure Management

Reliability: AWS Services

Foundations

- AWS Trusted Advisor , IAM, Amazon VPC, DirectConnect

Change Management

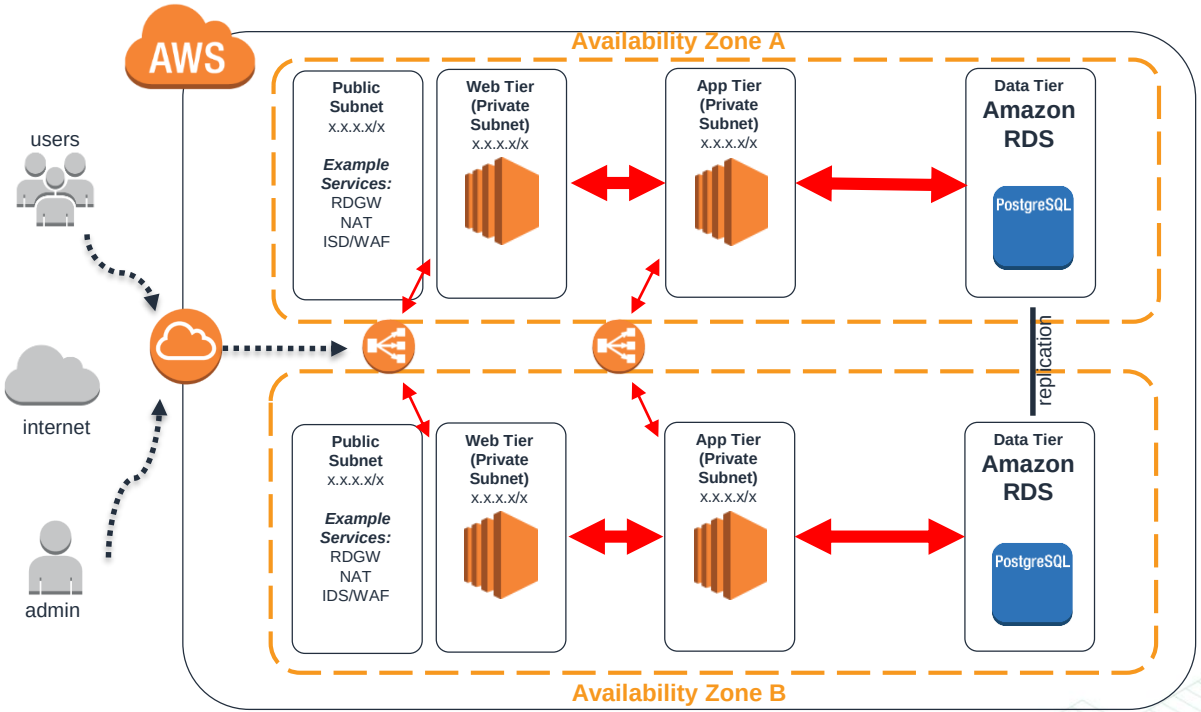
- AWS CloudTrail, AWS Config, Auto Scaling, CloudWatch

Failure Management

- AWS CloudFormation, Amazon S3, Amazon Glacier, AWS KMS

Applying Reliability

1. Multi-AZ
2. Database replication between the two AZs



3. Scalable ELB instances
   - Independent resource scalability.
   - Independent service recovery – when used with auto-scaling
   - This will be relevant when we talk about "Performance Efficiency" as well.

Performance Efficiency

The ability to use computing resources efficiently to meet system requirements, and to maintain that efficiency as demand changes and technologies evolve.

Principles

- Democratize advanced technologies
- Go global in minutes
- Use serverless architectures
- Experiment more often
- Mechanical sympathy

Coverage Areas

- Selection
- Review
- Tradeoffs

Performance Efficiency: AWS Services

Selection

- **Compute**: Auto Scaling
- **Storage:** Amazon EBS, Amazon S3
- **Database:** Amazon RDS, Amazon DynamoDB
- **Network:** Amazon Route 53, Amazon VPC, AWS Direct Connect

Review

- AWS Blog

Monitoring

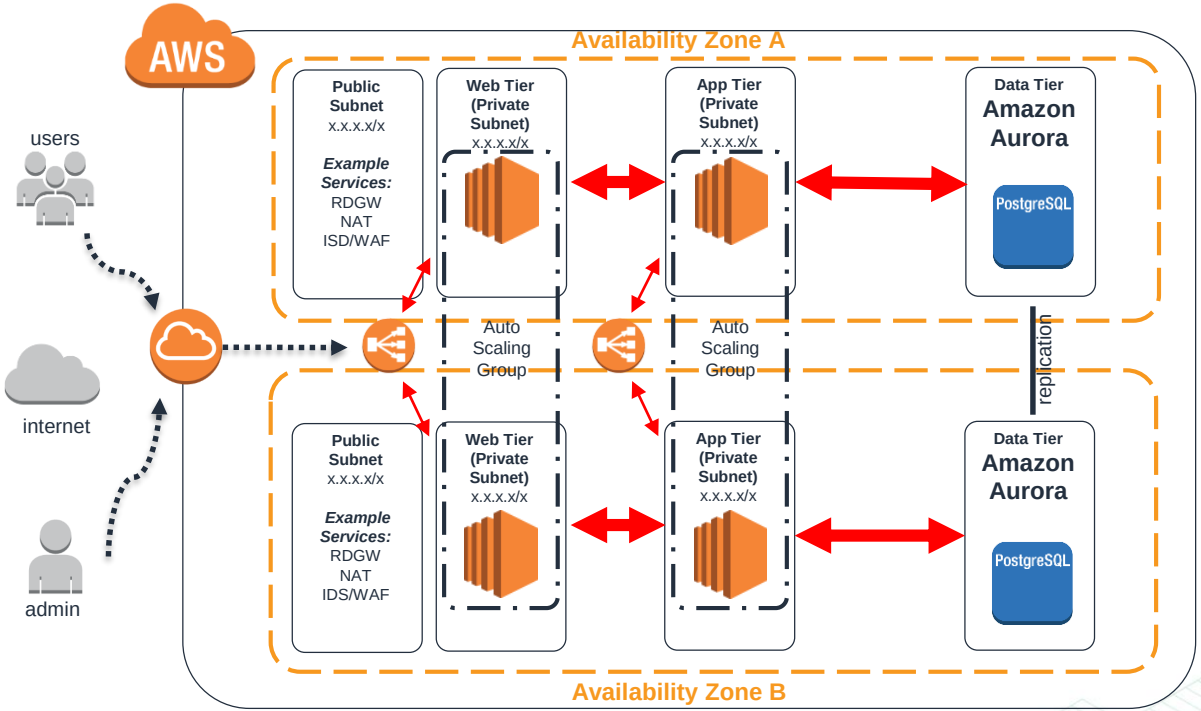
- Amazon CloudWatch, AWS Lambda

Tradeoffs

- Amazon ElastiCache, Amazon CloudFront, AWS Snowball, Read replicas for RDS

Applying Performance Efficiency

1. Auto Scaling groups



2. CloudFormation as a tool to facilitate repeatability and global deployment

Cost Optimization

The ability to avoid or eliminate unneeded cost or suboptimal resources

Principles

- Adopt a consumption model
- Benefit from economies of scale
- Stop spending money on data center operations
- Analyze and attribute expenditure
- Use managed services to reduce cost of ownership

Coverage Areas

- Cost-Effective Resources
- Matching Supply and Demand
- Expenditure Awareness
- Optimizing Over Time

Cost Optimization: AWS Services

Cost-Effective Resources

- AWS Well-Architected Framework

Matching Supply and Demand

- Auto Scaling

Expenditure Awareness

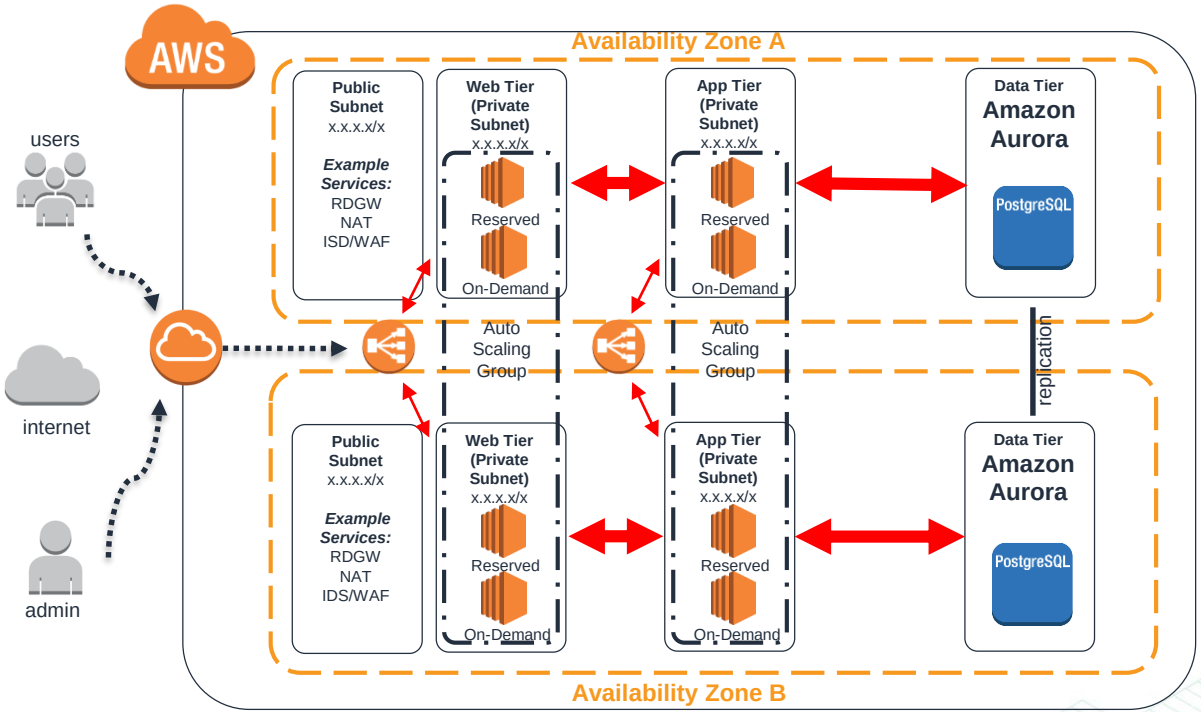
- Amazon CloudWatch, Amazon Simple Notification Services (SNS)

Optimizing Over Time

- AWS Blogs, AWS Trusted Advisor, AWS Cost Explorer

Applying Cost Optimization

1. combination of reserved and on-demand instances

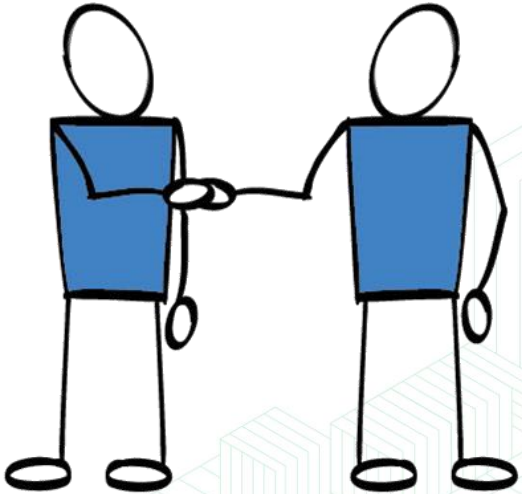


2. The use of Aurora as the relational database layer

Value Proposition

Help Customers:

- Consistent approach to reviewing architectures
- Understand and reduce risk in your architecture
- Learn best practices
- Influence future architectures
- Generate additional opportunities



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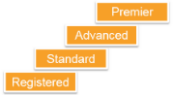
Module 6:
APN Resources to Help You

APN Program Resources

APN Program Guide



Benefits and Requirements

Training and Certification

APN Portal

Marketing

APN Partner Programs

Monthly Partner-Facing Webinars

APN Personnel Resources

APN Blog, Newsletter, Twitter

https://partnercentral.awspartner.com

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APN How-To Guides and AWS Events

AWS How-To Guides

Building Your Business With AWS

APN Partner Development Plan

AWS Events

AWS Global Summits:
one-day events

500-6,000

AWS re-Invent:
four-day events

+50,000

Sponsorship Opportunities

AWS Field Programs
Free half-day events

50-500

Partner Training

Workshops and Bootcamps

AWS Digital Learning Platform

https://www.aws.training/

Videos, Labs, and Classes

Specialty Courses for APN Partners With Business and Technical Tracks

Accreditations

Business Track

- **AWS Business Professional**
- **AWS TCO and Cloud Economics**
- AWS Foundations Business
- Big Data and Analytics on AWS
- Windows on AWS
- Migration to AWS
- SAP on AWS
- Amazon Connect
- Machine Learning on AWS
- Introduction to Cloud Adoption Framework

Technical Track

- **AWS Technical Professional**
- **AWS TCO and Cloud Economics**
- **AWS Foundations Technical**
- Well-Architected Framework
- Windows on AWS
- Migration to AWS
- SAP on AWS
- Amazon Connect
- Professional Services BootCamp
- Machine Learning on AWS

https://partnercentral.awspartner.com

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AWS Certification

Available AWS Certifications

aws certified
Updated May 2019

Professional

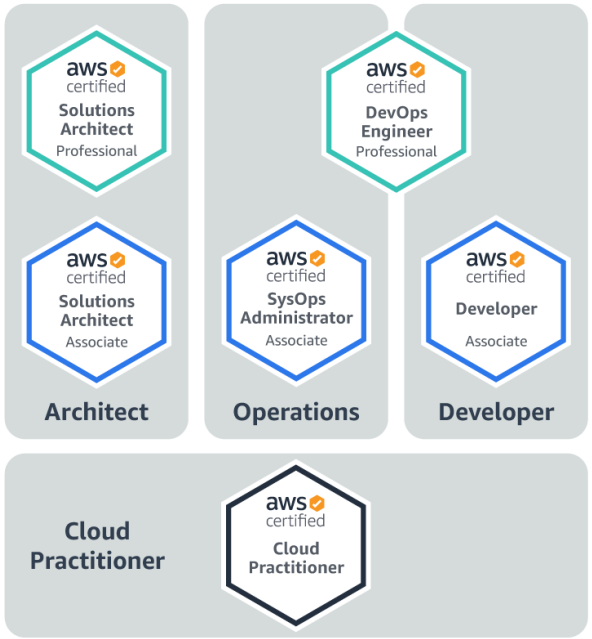
Two years of comprehensive experience designing, operating, and troubleshooting solutions using the AWS Cloud

Associate

One year of experience solving problems and implementing solutions using the AWS Cloud

Foundational

Six months of fundamental AWS Cloud and industry knowledge



Specialty

Technical AWS Cloud experience in the Specialty domain as specified in the **exam guide**

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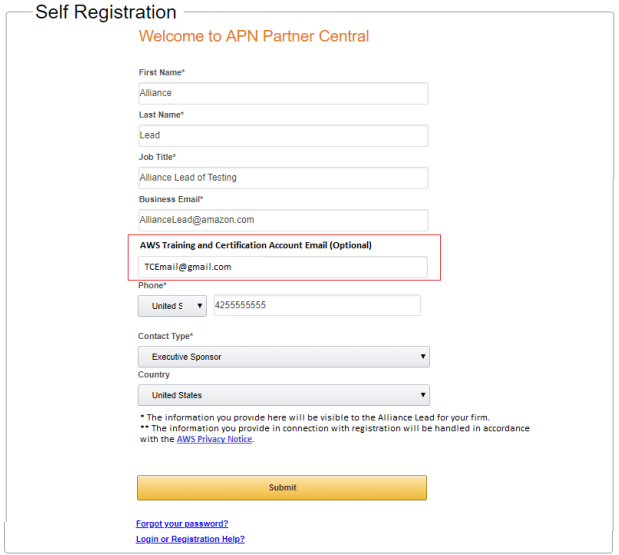
Linking a Partner Account to a Certification Account

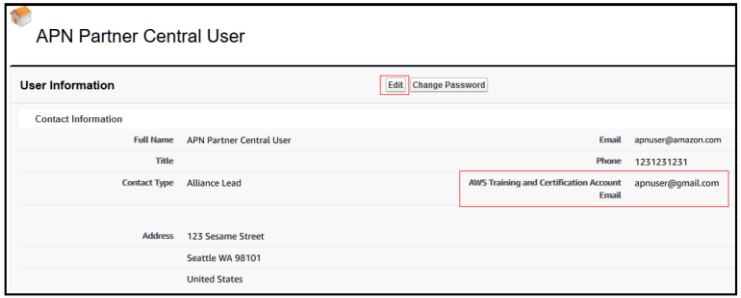
Problem: Partners not be credited for employee certifications.

Solution: fill in a new field called "AWS Training and Certification Account Email"

New user registration



Existing user update



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Class Evaluation and Assessment

Please look for the email link to take the **class evaluation** survey.