

AWS Certified Cloud Practitioner Prep Course (CLF-C01) 2021

AWS Certification Prep Course for Exam (CLF-C01)





Section 1 – Course Overview

Understanding the AWS Exam

Section Overview

INSTRUCTOR
INTRO

COURSE
OVERVIEW

LEARNING
REINFORCEMENTS

PRE
REQUIREMENTS

AWS
CERTIFICATION
OVERVIEW

CLOUD
PRACTITIONER
OVERVIEW



Course and Instructor Intro

Intro and Understanding the Course Content and Flow

About Your Instructor

Joseph Holbrook, CLO of Techcommanders in Jacksonville, FL

- Certified Blockchain Solutions Architect (CBSA)
- Certified Google Cloud Platform Cloud Architect
- Certified AWS Solutions Architect and more
- Brocade Distinguished Architect (BDA) 2013
- EMC Proven Professional – Expert – Cloud (EMCCE)
- Published Course Author on Pearson Safari, Udemy, LinkedIn Learning
- Published Book Author – Architecting Enterprise Blockchain Solutions
- CompTIA Subject Matter Expert, SME
- Prior US Navy Veteran



Course Section Overview

INTRO

AWS CLOUD
COMPUTING
OVERVIEW

AWS CORE SERVICES

CLOUD BILLING AND
PRICING / SUPPORT

CLOUD SECURITY/IAM

CLOUD
ARCHITECTURE BEST
PRACTICES

AWS USE CASES

EXAM
READINESS/PRACTICE
QUESTIONS

Learning Reinforcements

- AWS Service Demos/Labs
- Whiteboard Discussions
- AWS Website Review
- Documentation Links
- Exercises available
- Community Sites



Pre Requirements

PRE-REQS

INTERNET

AWS
ACCOUNT

CAN USE
FREE TIER

PRACTICE

REVIEW



AWS Certifications & Cloud Practitioner Exam Overview

Exam Overview

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Why Get Certified?

Professional

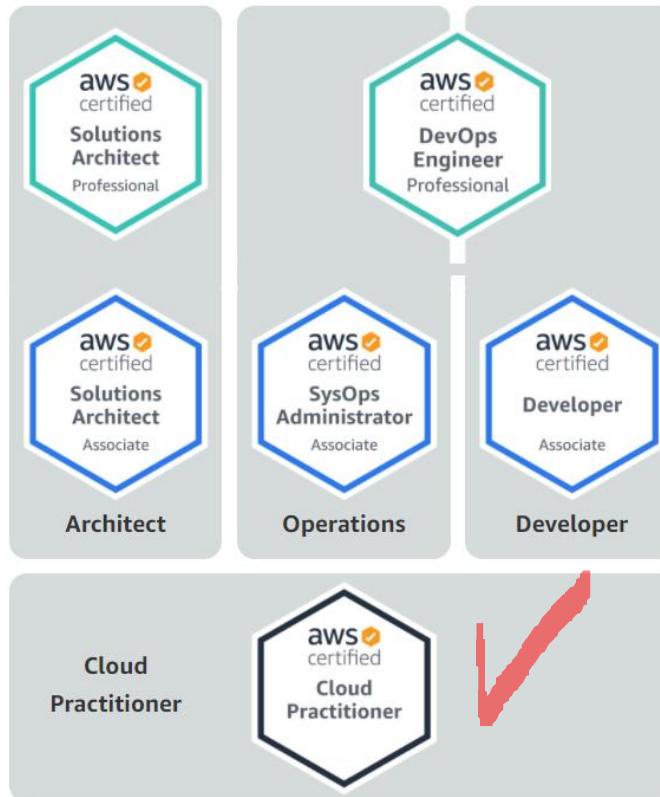
Two years of comprehensive experience designing, operating, and troubleshooting solutions using the AWS Cloud

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



<https://aws.amazon.com/certification>

More on this at the closeout of the course

Cloud Practitioner

● Domain 1: Cloud Concepts	26%
● Domain 2: Security and Compliance	25%
● Domain 3: Technology	33%
● Domain 4: Billing and Pricing	16%
TOTAL	100%

Examinee Abilities

It validates an examinee's ability to:

- Explain the value of the AWS Cloud.
- Understand and explain the AWS shared responsibility model.
- Understand AWS Cloud security best practices.
- Understand AWS Cloud costs, economics, and billing practices.
- Describe and position the core AWS services, including compute, network, databases, and storage.
- Identify AWS services for common use cases.

Cloud Practitioner Objectives

Information and the Objectives to the exam are located here.

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



Section 2 : AWS Cloud Computing Overview

Understanding the domain testable objectives

Section Overview

DOMAIN
OVERVIEW

Intro to Cloud
Computing

What are the
Business Enablers
of Cloud
Computing?

Why AWS

AWS Cloud
Overview

AWS Regions and
Zones (Global
Infra)

AWS Management
Interfaces

Demo AWS
Management
Interfaces

Demo AWS Free
Tier

Summary

Review Questions

Domain Overview

- Define the AWS Cloud and its value proposition
- Identify aspects of AWS Cloud economics



Intro to Cloud Computing

What is the Cloud?

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Defining Cloud Computing

SP 800-145 Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction.

This cloud model is composed of five essential characteristics, three service models, and four deployment models.

NIST – SP-800-145

<https://csrc.nist.gov/publications/detail/sp/800-145/final>



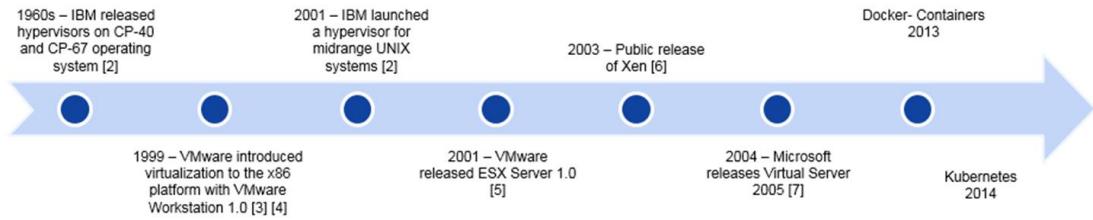
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Cloud computing is the on-demand delivery of compute resources, database storage, applications, and other IT resources through a cloud services platform via the internet with pay-as-you-go pricing

Cloud or Virtualization?

- Virtualization is an enabling technology for cloud computing and cloud computing services.
- For cloud computing to occur, it is necessary to separate resources from their physical location.
- Without virtualization, the cloud becomes very difficult to manage.
- In addition, cloud computing is a business model where ownership of physical resources rests with one party, and the service users, which form the other party, are billed for their real use.

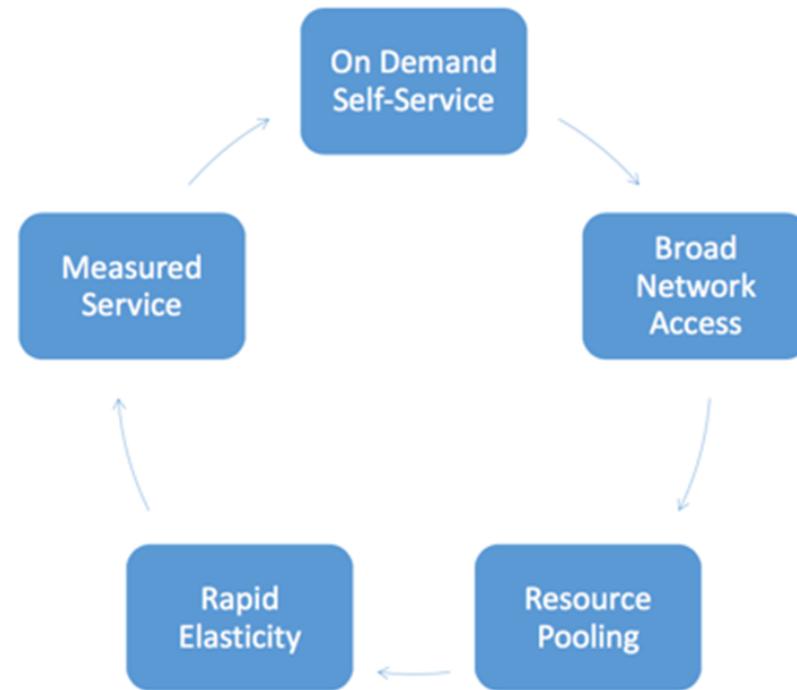
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- Virtualization was used in mainframe computing as early as in 1960s by IBM.
- 1999 - VMware introduced virtualization into the x86 platform (PC environment).

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Which Characteristics define a Cloud



NIST Five Essential Cloud Characteristics

- On Demand Self Service
- Broad Network Access
- Resource Pooling
- Rapid Elasticity
- Measured Service

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Cloud Service Models

Software
Applications

Software as a Service (SaaS), which provides applications to users.

Platform
Software Components

Platform as a Service (PaaS), which provides specialized software components and programming tools to developers.

Infrastructure
Servers, Computing Resources

Infrastructure as a Service (IaaS), which provides computing infrastructure resources as a service to administrators.

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Infrastructure as a Service (IaaS) contains the basic building blocks for cloud IT and typically provides access to networking features, computers and data storage space.



IaaS provides the highest level of flexibility and management control over the infrastructure (Example – AWS EC2)

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Platform as a Service (PaaS) removes the need for your organization to manage the underlying infrastructure and allows you to focus on the deployment and mgmt. of your applications.

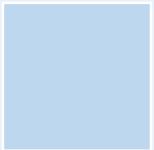


PaaS provides the second highest level of flexibility and management control over the infrastructure. (Example – AWS Elastic Beanstalk)

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Software as a Service (SaaS) provides you a complete product that is run and managed by the service provider.



You worry only about using the software and not about infrastructure.

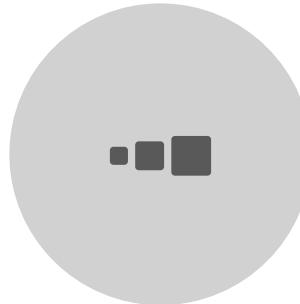


SaaS provides the lowest level of flexibility and management control over the infrastructure. (Example – MS O365)

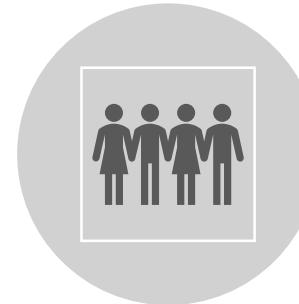
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PRIVATE CLOUD



HYBRID



COMMUNITY



PUBLIC

NIST Defines Four Deployment Models

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On-premises – you run everything in your own DC



Hybrid – Combine two or more of the models.

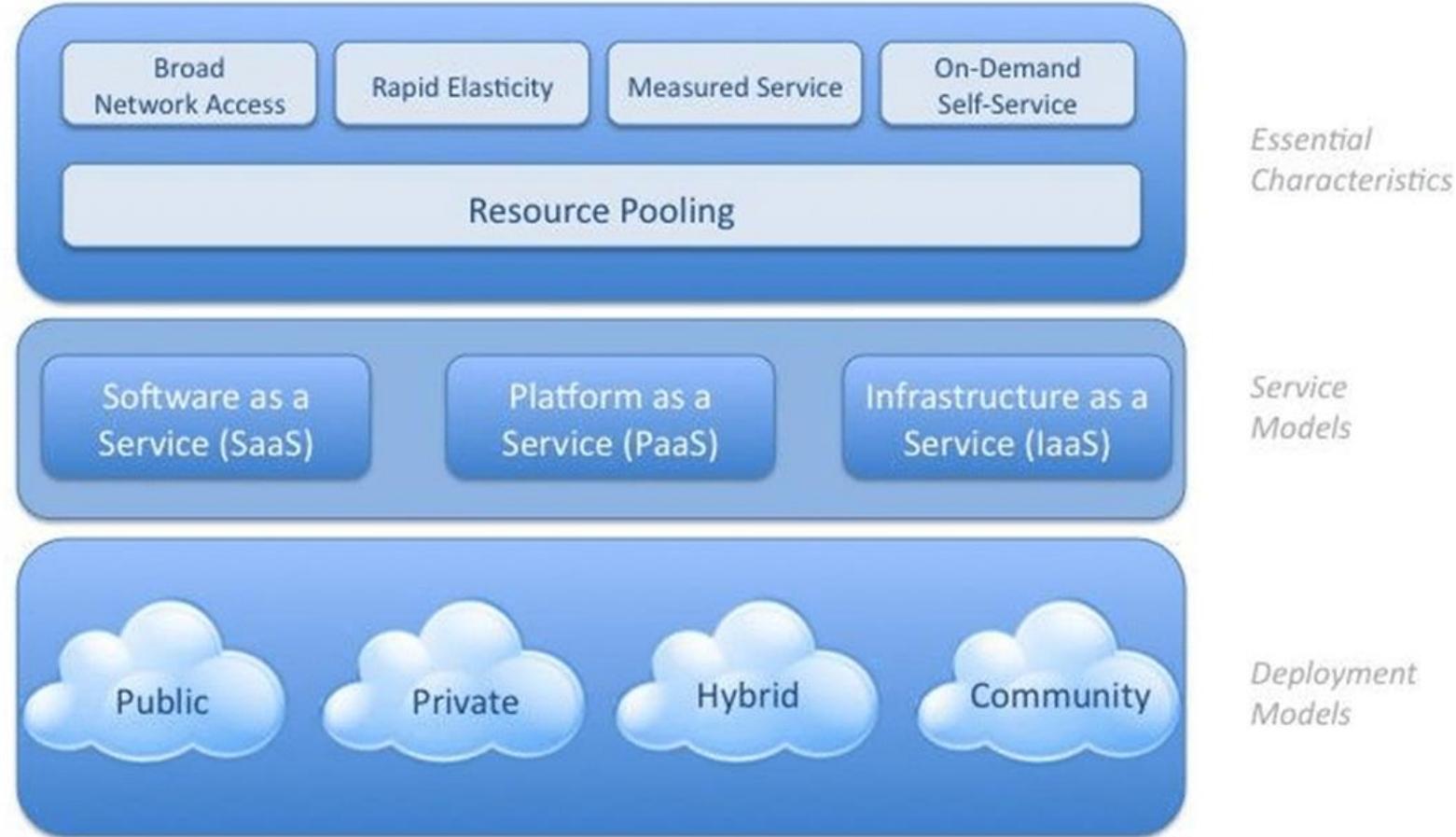


Community – Shared deployment between organizations.



Public Cloud – you run all your services in a Public Cloud

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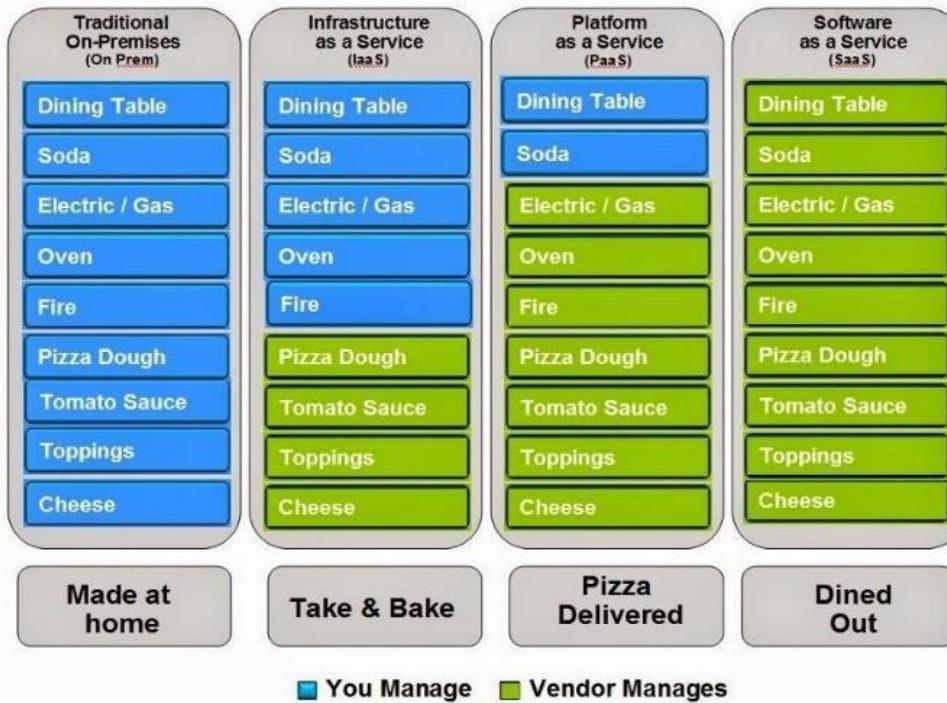


Difference between Service Models?

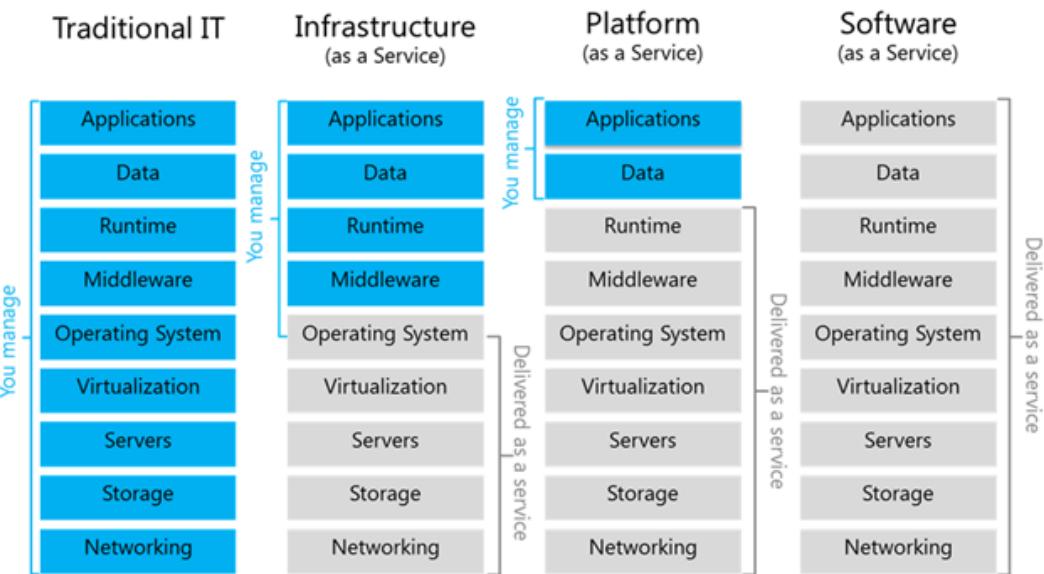
- Mainly the functionality and services offered
- Shared Responsibility model (How much customer and provider perform)
- Like the Pizza Model

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Pizza as a Service



Graphic – Paul Kerrison



Graphic - Vmware

Multi-Tenancy

Multi-tenancy is a resource pooling feature of cloud computing that enables an instance of the resources to serve different consumers (tenants), each of which is isolated from the other.

AWS uses multi tenancy

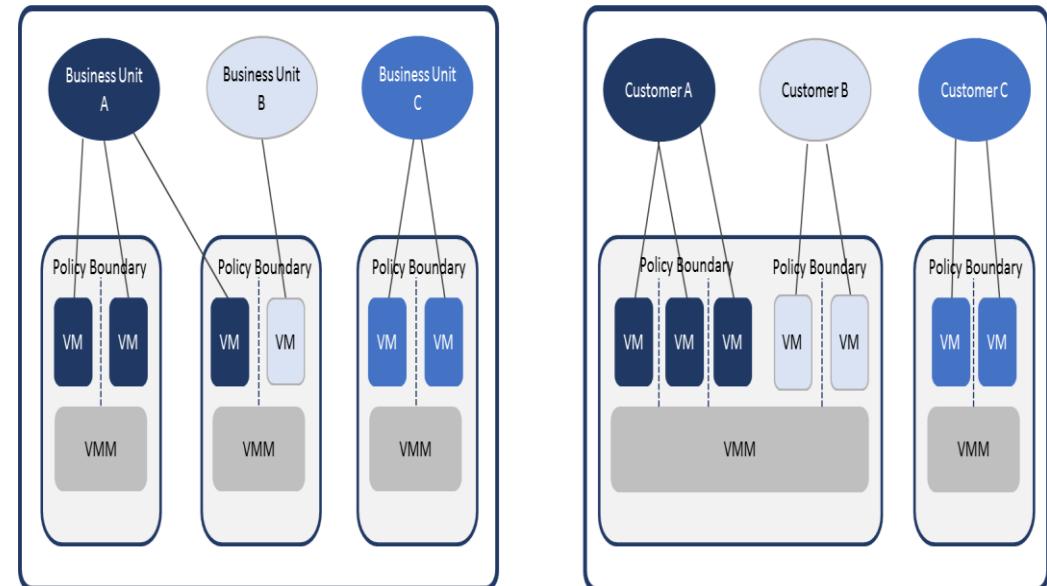
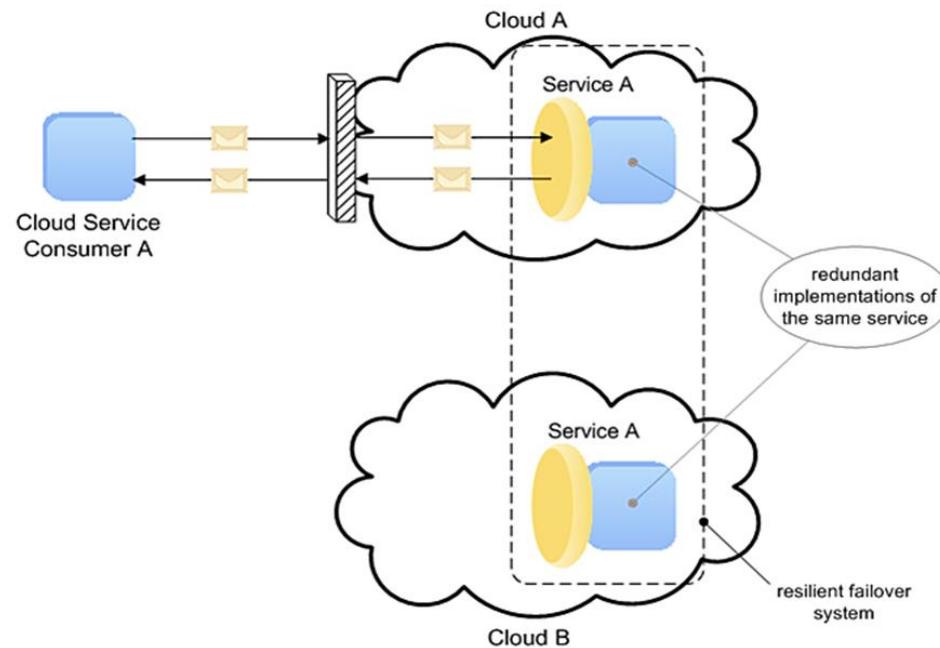


Diagram - VMWare

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Resiliency

Resilient computing is a form of failover that distributes redundant implementations of IT resources across physical locations

AWS we use Regions and AZ's

Characteristics of Resiliency

- IT resources can be pre-configured so that if one becomes deficient, processing is automatically handed over to another redundant IT resource.
- Within cloud computing, resiliency can refer to redundant IT resources within the same cloud (but in different physical locations) or across multiple clouds.
- Cloud consumers can increase the reliability and availability of their applications by leveraging the resiliency of cloud-based IT resources.

Replication

- Replication is sharing information to ensure consistency between redundant resources, such as software or hardware components, to improve reliability, fault-tolerance, or accessibility and avoid a single point of failure.
- Replication ensures that data modifications are written to multiple sources thereby increasing data durability.

Orchestration

- Orchestration describes the automated arrangement, coordination, and management of complex computer systems, middleware, and services
- AWS we use CloudFormation (IaC)

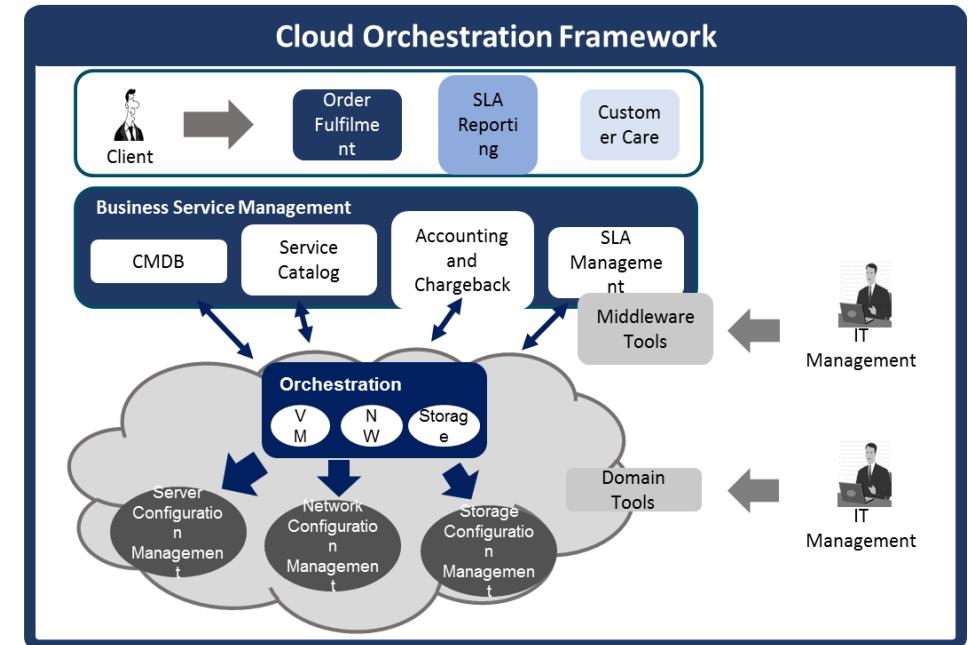


Diagram - VMWare

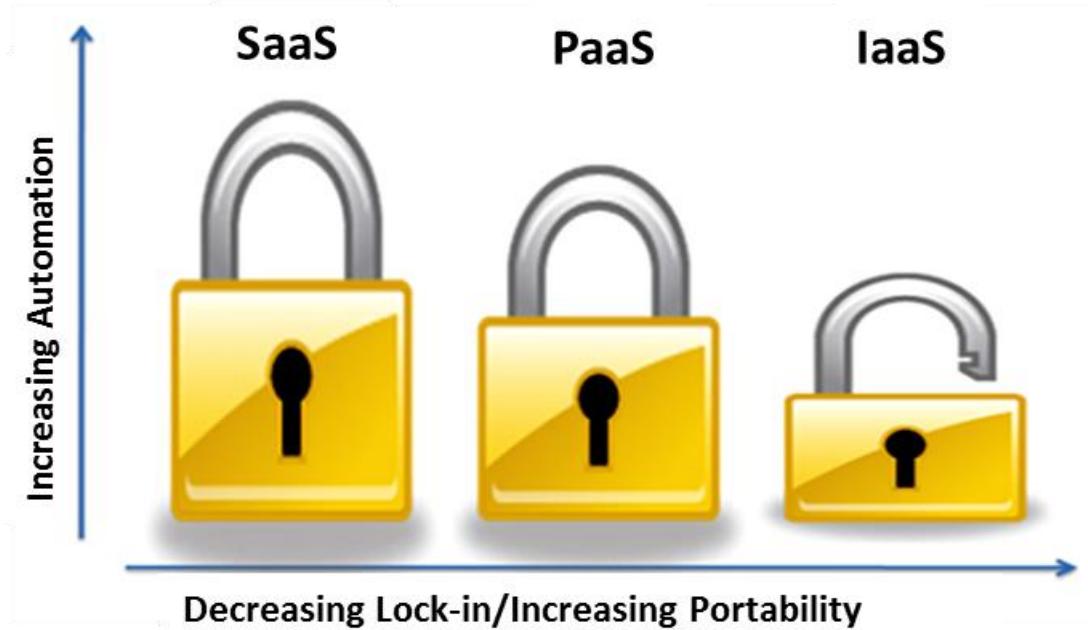
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Characteristics of Chargeback

- Chargeback is an act or policy of allocating the cost of an organization's centrally located resources to the individuals or departments which use them.
- Improves Cloud Spending
- Allocates responsibility to departments, groups, locations, etc.
- Separate accounts



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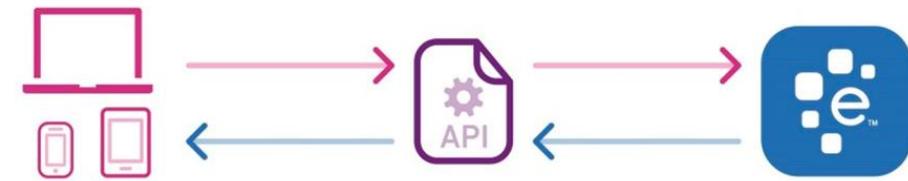
Vendor Lock In

- Vendor lock-in refers to the restricted or proprietary use of a technology or service developed by a vendor that ensures high customer dependence on the vendor services.
- Typically, the higher the cloud layer you operate in, the greater the lock-in.
- Reduced thru use of “Open API’s”

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Cloud Standards

- Cloud standards are currently being developed by a number of bodies.
- When standardization exists, then the risk of vendor lock-in gets reduced.
- Portability, Interoperability, and many other functionalities, such as auditing, monitoring, and reporting is improved due to uniformity.
- Open API, Rest API





Test Tips

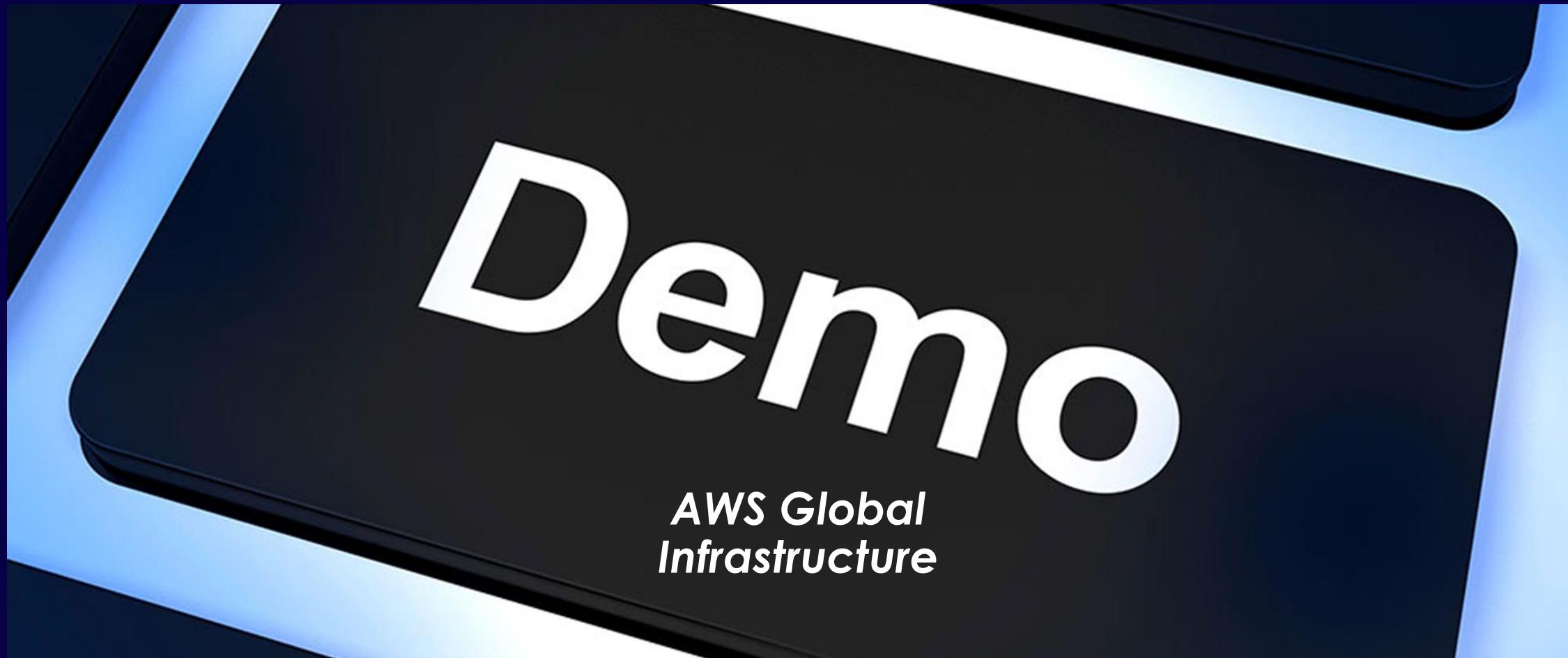
- AWS is a Public Cloud
- Hybrid Cloud is when we combine our on premises apps with AWS.
- Three Service Models – IaaS, PaaS, SaaS
- EC2 is an IaaC solution while Elastic Beanstalk is a PaaS



Test Tips

- NIST Five Essential Cloud Characteristics?
- Chargeback helps with managing cloud spending.
- Difference between Deployment Models?
- Vendor Lock in is prevented by open standards.

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**AWS Global
Infrastructure**

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What are the Business Enablers for Cloud Computing?

Driving and enabling the migration to the cloud.

Business Enablers

Cloud Computing has many significant business enablers. Some of the common ones are

- Time to Market
- Scalability
- Flexibility
- Business Models (Enablement)
- Reduced IT Staffing

Business Enablers

Cloud Computing has many significant business enablers. Some of the common ones are

- Reduced Infrastructure Spending
- Tax Benefits (CAPEX/OPEX)
- On Demand Resources



Intro to AWS

AWS Overview of Capabilities and Services

Why AWS?

AWS is chosen as the cloud service for a significant number of reasons. These are the most common.

- Infrastructure
- Availability
- Competitive Pricing
- First to Market
- Portfolio of Services

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- Amazon Web Services(AWS) is a cloud service from Amazon.
- AWS provides services in the form of cloud services.
- These services can be used to create and deploy any type of application in the cloud.
- Largest cloud computing base
- Established in 2006



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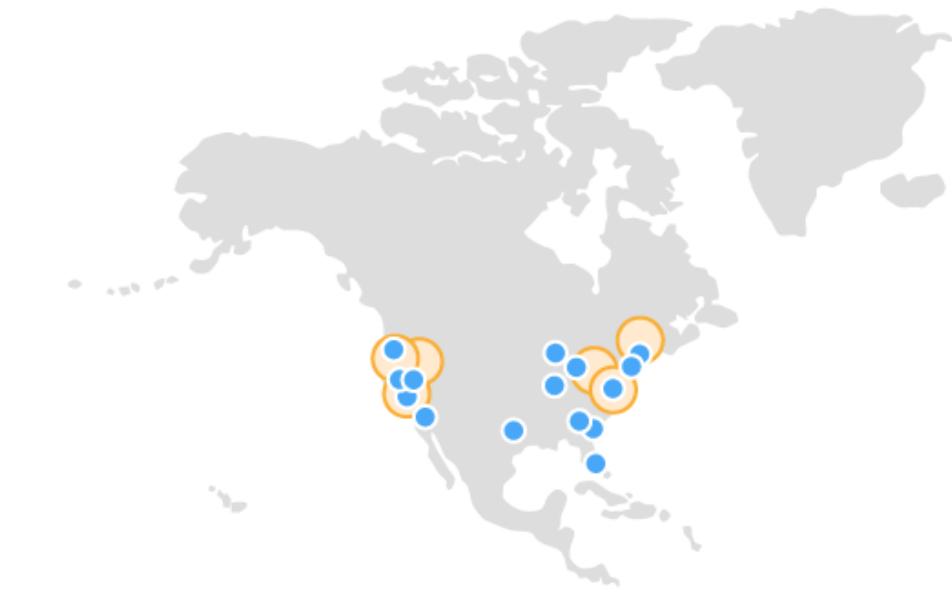
AWS Benefits

- Low-Cost Services
- Agility and Elasticity
- Open and Flexible
- Secure

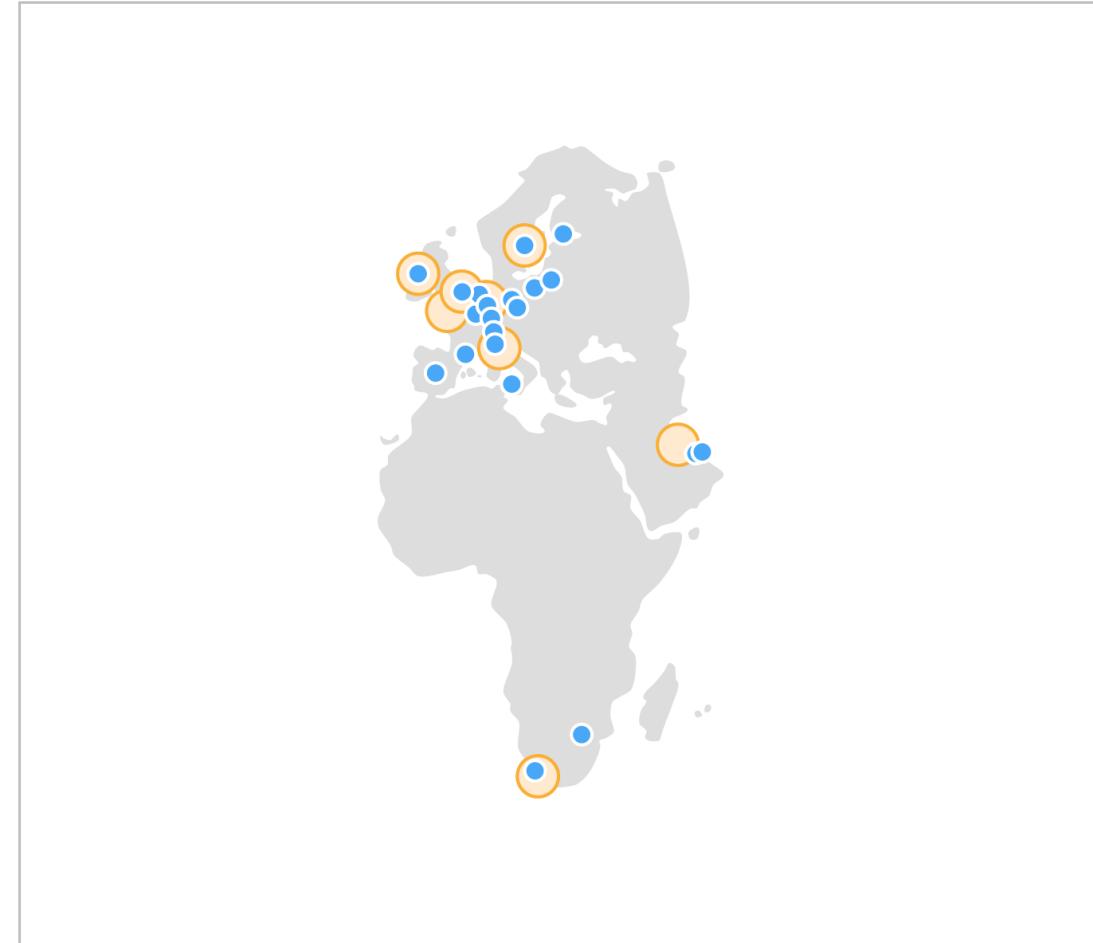
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Regions and Availability Zones (AZ)

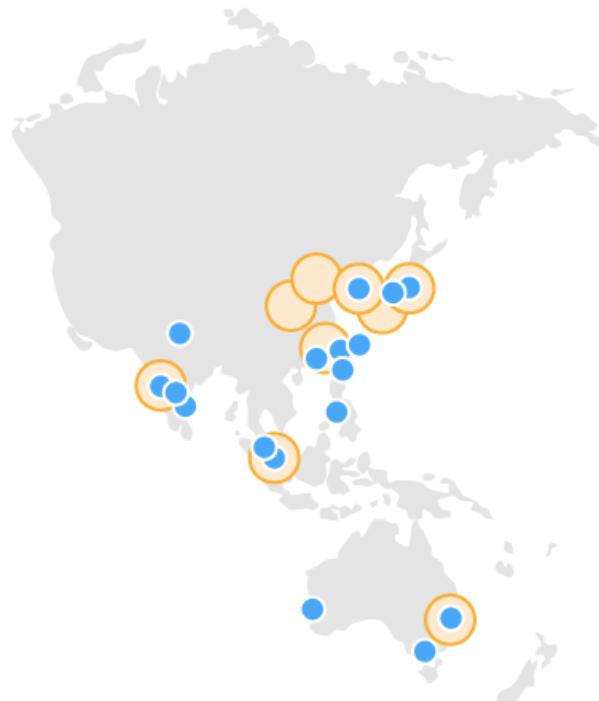
- Region is a physical location around the world where AWS clusters their data centers.
- Availability Zone (AZ) is one or more discrete data centers with redundant power, networking, and connectivity in an AWS Region
- AWS Local Zones place compute, storage, database, and other select AWS services closer to end-users



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AWS Edge Network Locations

- Amazon CloudFront, Amazon Route 53, AWS Firewall Manager, AWS Shield, and AWS WAF services are offered at AWS Edge Locations.
- GovCloud (Fedramp)

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- Compute
- Storage
- Database
- Migration
- Network and Content Delivery
- Management Tools
- Security & Identity Compliance
- Messaging
- Big Data/AI/ML
- DevOps
- Numerous Other Services (Over 200)

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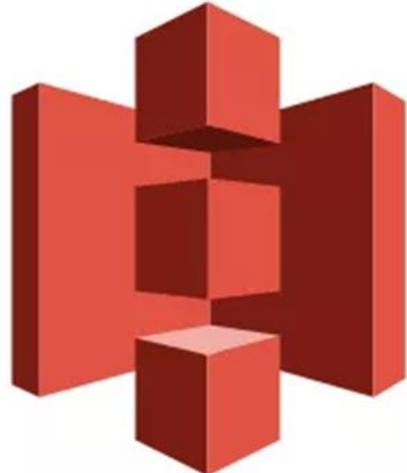
The Compute domain includes services related to compute workloads.

Includes the following services:

- EC2 (Elastic Compute Cloud)
- Lambda
- Elastic Beanstalk (PaaS)
- Amazon LightSail



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The Storage domain includes services related data storage.

Includes the following services:

- S3 (Simple Storage Service)
- Elastic Block Store
- Amazon Glacier

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The Database domain is used for database related workloads.

Includes the following services:

- Amazon Aurora
- Amazon RDS
- Amazon DynamoDB
- Amazon RedShift



AWS RDS

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The Migration domain is used for transferring data to or from the AWS Infrastructure

Includes the following services:

- AWS Database Migration Service
- AWS SnowBall
- CloudEndure
- Migration Hub

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The Networking and Content Delivery domain is used for isolating your network infrastructure, and content delivery is used for faster delivery of content.

Includes the following services:

- Amazon Route 53
- AWS CloudFront
- Amazon VPC
- Cloud Interconnect



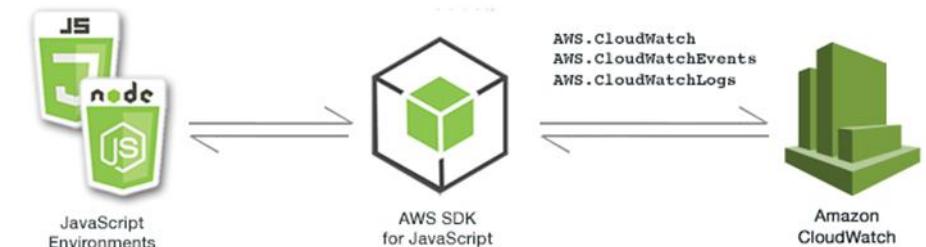
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Cloud Management

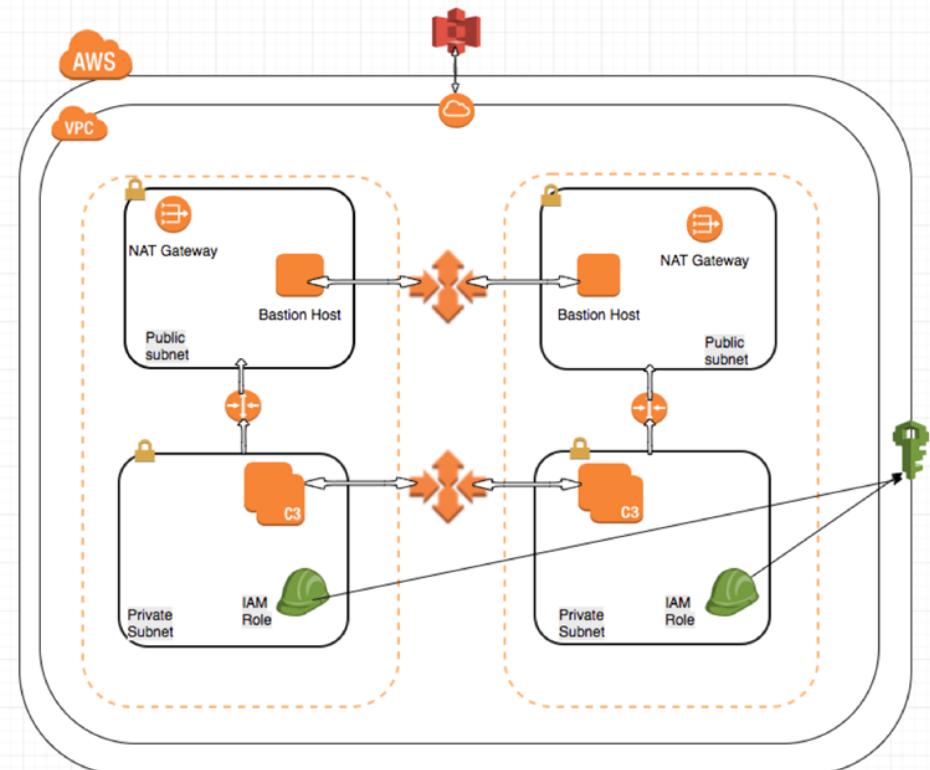
The Management Tools domain consists of services which are used to manage other services in AWS

It includes the following services:

- AWS CloudWatch
- AWS CloudFormation
- AWS CloudTrail



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The Security & Identity, Compliance domain consist of services which are used to manage to authenticate and provide security to your AWS resources.

Consists of some of the following services:

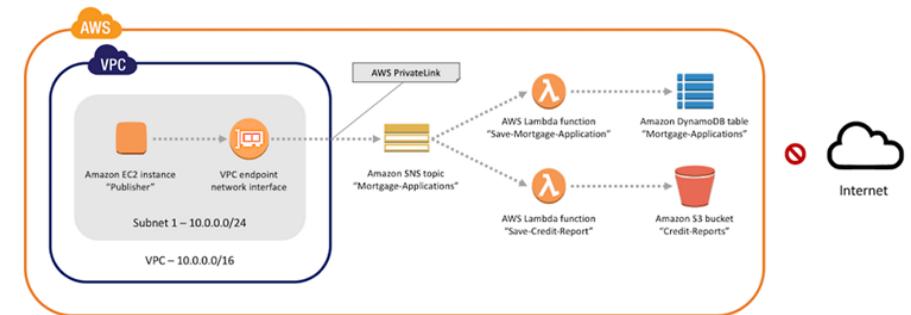
- AWS IAM
- AWS KMS
- AWS Shield
- AWS Guard Duty

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The Messaging domain consists of services which are used for queuing, notifying or emailing messages.

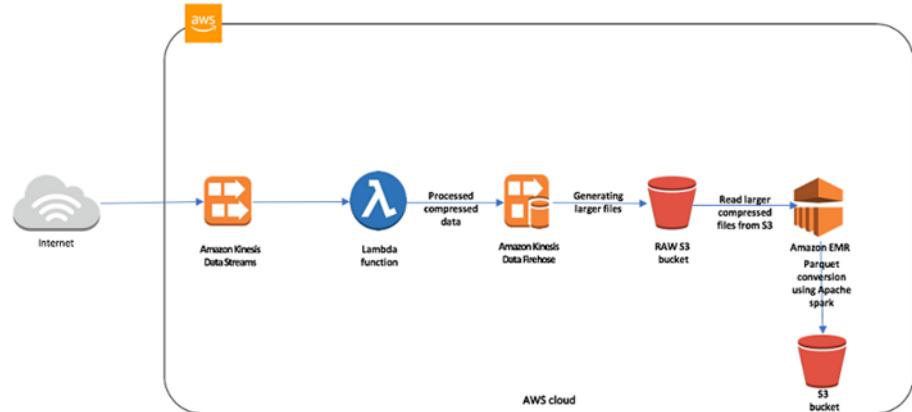
Consists of the following domains:

- Amazon SQS
- Amazon SNS
- Amazon SES
- Amazon Pinpoint



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Big Data



The Big Data domain consists of services that ingest, transform and derive value.

Consists of the following domains:

Amazon Elastic MapReduce (EMR)

Amazon Redshift

Amazon DynamoDB

Amazon Kinesis

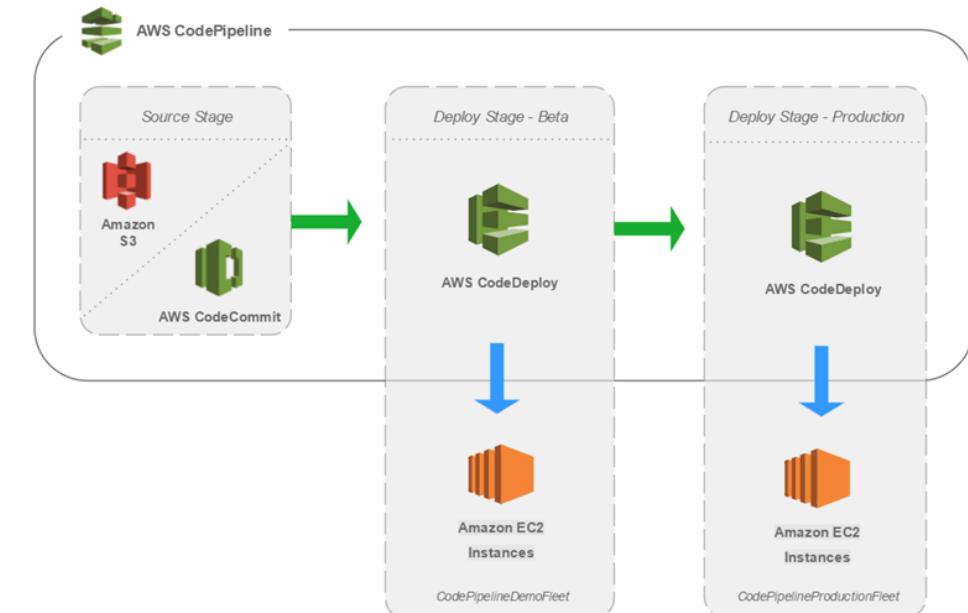
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The DevOps domain provides services that implement SDLC bases services for developers

Consists of the following domains:

- AWS CloudFormation
- AWS CodePipeline
- AWS Code Build
- AWS CodeCommit
- AWS X-Ray
- AWS Elastic BeanStalk

DevOps





Test Tips

- AWS was established in 2006
- AWS has a service portfolio to meet every enterprise requirement.
- Availability Zones represents one or more discrete data centers (Redundancy)
- Regions are physical locations that consist of Availability Zones.



AWS Global Infrastructure

Infrastructure, Networking, Edges, Regions and Zones

AWS Global Infrastructure

AWS Cloud Platform Global Infrastructure

- Availability Zones
- Regions
- Edges
- Local Zones

https://aws.amazon.com/about-aws/global-infrastructure/regions_az/

AWS Global Infrastructure

- Availability Zone represents **one or more discrete data centers**. Each DC is with redundant power, networking, and connectivity, housed in separate facilities.
- **Accomplish HA/FT by using multiple Availability Zones(AZ)** and reduce risk to your production applications.
- 77 Availability Zones



AWS Global Infrastructure

- An AWS Region is a physical location in the world that **consists of multiple Availability Zones**
- All AWS Regions are **completely isolated** from each other but connected thru multiple low latency links
- 24 Launched Regions



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MyBlockchainExperts ▾ N. Virginia ▾

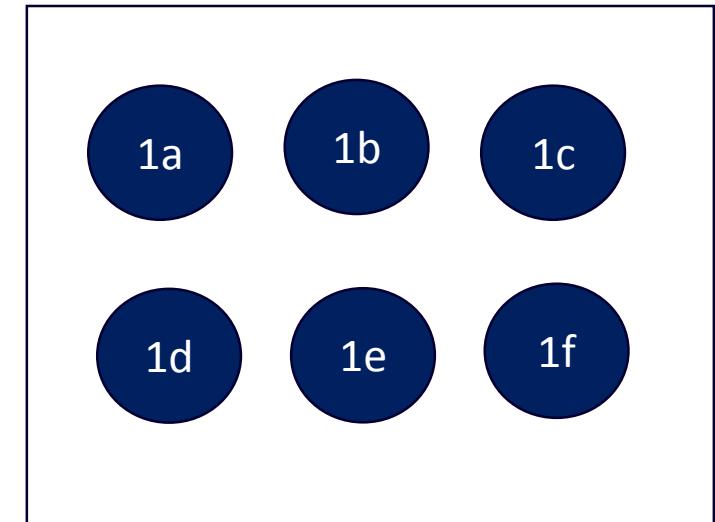
US East (N. Virginia) us-east-1
US East (Ohio) us-east-2
US West (N. California) us-west-1
US West (Oregon) us-west-2
Africa (Cape Town) af-south-1
Asia Pacific (Hong Kong) ap-east-1
Asia Pacific (Mumbai) ap-south-1
Asia Pacific (Seoul) ap-northeast-2
Asia Pacific (Singapore) ap-southeast-1
Asia Pacific (Sydney) ap-southeast-2
Asia Pacific (Tokyo) ap-northeast-1
Canada (Central) ca-central-1
Europe (Frankfurt) eu-central-1
Europe (Ireland) eu-west-1
Europe (London) eu-west-2
Europe (Milan) eu-south-1
Europe (Paris) eu-west-3
Europe (Stockholm) eu-north-1
Middle East (Bahrain) me-south-1
South America (São Paulo) sa-east-1

Zone status

Zone	Status
us-east-1a (use1-az1)	Zone is operating normally
us-east-1b (use1-az2)	Zone is operating normally
us-east-1c (use1-az4)	Zone is operating normally
us-east-1d (use1-az6)	Zone is operating normally
us-east-1e (use1-az3)	Zone is operating normally
us-east-1f (use1-az5)	Zone is operating normally

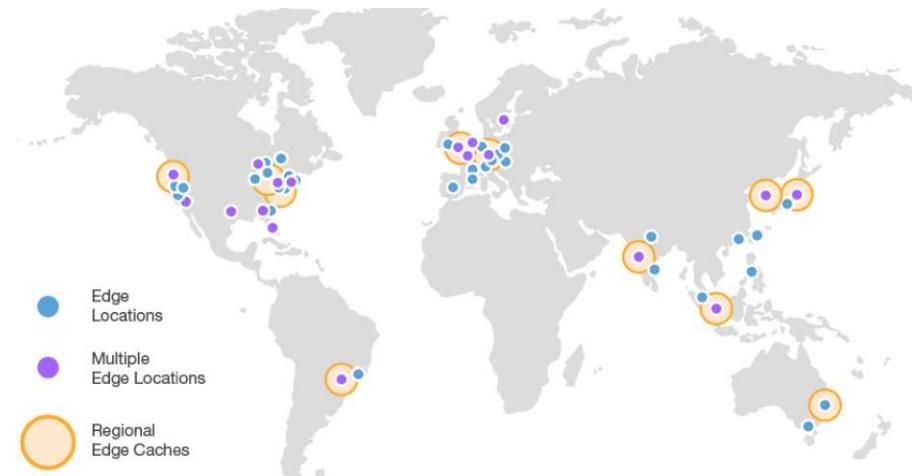
AWS Global Infrastructure

- Regions and Availability Zones
- Region – US East (6 Zones)



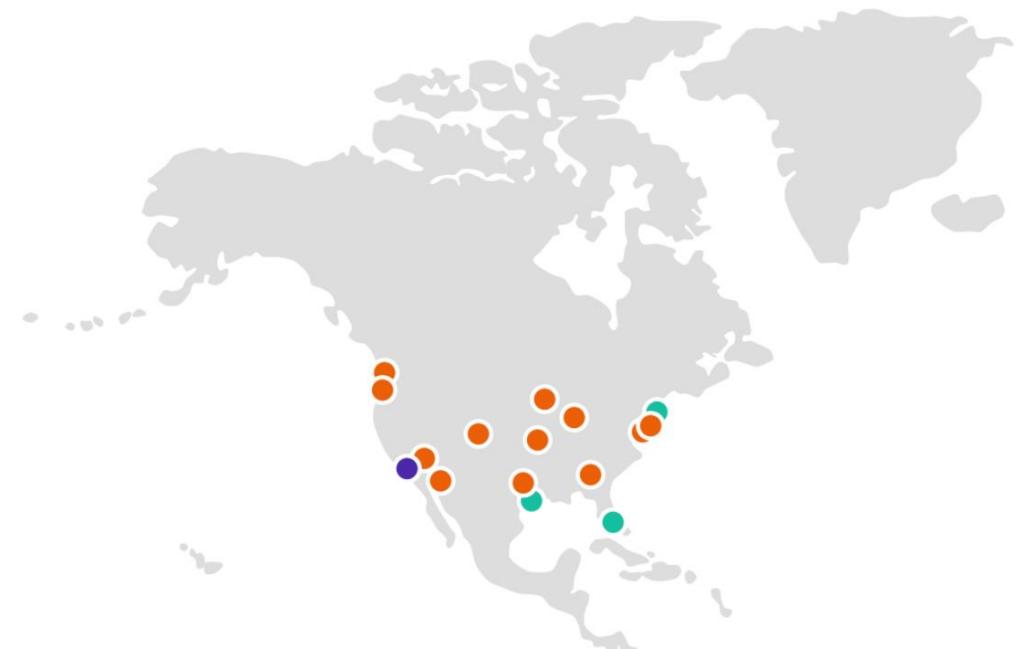
AWS Global Infrastructure

- Edge Locations are **AWS endpoints** that cache content locally to provide lower latency for the users.
- Services Supported: Amazon CloudFront, Amazon Route 53, AWS Firewall Manager, AWS Shield, and AWS WAF
- 210+ Edge Locations and 12 Regional Edge Caches



AWS Global Infrastructure

- AWS Local Zones are a type of AWS infrastructure deployment that places AWS compute, storage, database, and other select services close to large population, industry, and IT centers.
- Boston, Houston, and Miami





Test Tips

- Availability Zones represents one or more discrete data centers (Redundancy)
- Regions are physical locations that consist of Availability Zones.
- Edge Location cache content locally for the users. (AWS Endpoints)



Connecting to AWS

Interacting with the Cloud Service

Connecting to AWS

AWS provides three distinct options in order to interact with the AWS Cloud Platform:

- AWS Management Console
- AWS Command Line Interface (CLI)
- AWS Software Development Kits (SDKs)

Console

The AWS Management Console is a graphical user interface for accessing a wide range of AWS Cloud services and managing compute, storage, and other cloud resources

The AWS Management Console is a web application that comprises and refers to a broad collection of service consoles for managing Amazon Web Services

Access the AWS Web Management Console <https://console.aws.amazon.com>

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Console

Navigation Bar

aws Services ▾ Search for services, features, marketplace products, and docs [Alt+S] MyBlockchainExperts ▾ N. Virginia ▾ Support ▾

New EC2 Experience Learn more

Launch Instance Connect Actions ▾

EC2 Dashboard Events Tags Limits

INSTANCES

Instances Instance Types Launch Templates Spot Requests Savings Plans Reserved Instances Dedicated Hosts

Scheduled Instances Capacity Reservations

Menu Selection

Filter by tags and attributes or search by keyword

Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS (IPv4)	IPv4 Put
AwsCourse...	i-013469fc6e09d7a46	t2.micro	us-east-1c	running	⚠️ Unable to d...	None	ec2-54-90-216-247.co...	54.90.216.247
SysopsApp...	i-06e71adf6963f685a	t2.micro	us-east-1d	running	⚠️ Unable to d...	None	ec2-18-215-237-25.co...	18.215.237.25
Jenkins	i-0cbff1f086ae067030	t3a.small	us-east-1a	running	2/2 checks ...	OK	ec2-34-235-34-255.co...	34.235.3

Navigation Pane

Command Line Interface (CLI)

The AWS Command Line Interface (CLI) is a unified tool to manage your AWS services

With just one tool to download and configure, you can control multiple AWS services from the command line and automate them through scripts

After AWS CLI tool installation, you can begin making calls to your AWS services from the command line

Application Programming Interface (API)

A software development kit, or SDK, is really nothing more than a set of tools that allow developers to create software or apps for a specific platform, operating system, computer system or device

Using SDKs, you can access and manage AWS services with your preferred development language or platform

<https://aws.amazon.com/tools/>

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SDKs



SDKs take the complexity out of coding by providing language-specific APIs for AWS services



JavaScript



Python



PHP



.NET



Ruby



Java



Go



Node.js



C++



Test Tips

- Management Console is the GUI.
- CLI is used to interact with AWS for deploying resources and executing scripts. PowerShell also.
- SDK contains tools and APIs.

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Section Summary

Section 2 : AWS Cloud Computing Overview



2

Section

Section Summary

- The NIST cloud model is composed of five essential characteristics, three service models, and four deployment models.
- Cloud Computing has many significant business enablers. Some of the common ones are Reduced Infrastructure Spending, Tax Benefits (CAPEX/OPEX), On Demand Resources
- AWS provides three distinct options in order to interact with the AWS Cloud Platform
- Some common AWS Benefits are Low-Cost Services, Agility and Elasticity, Open and Flexible, Secure.
- Region is a physical location around the world where AWS clusters their data centers.
- Availability Zone (AZ) is one or more discrete data centers with redundant power, networking, and connectivity in an AWS Region
- Elastic BeanStalk is Compute PaaS. EC2 is Compute IaaS
- Amazon CloudFront can reduce costs for content delivery and increases performance by edge locations
- CLI is used to interact with AWS for deploying resources and executing scripts. PowerShell also.

Section Review Questions

Section 2 : AWS Cloud Computing Overview



Review Questions

Which of the following NIST Five Essential Cloud Characteristics would be used for enabling the sharing of resources between cloud tenants? (Select One)

- On Demand Self Service
- Broad Network Access
- Resource Pooling
- Rapid Elasticity
- Measured Service

Review Questions

Which of the following NIST Five Essential Cloud Characteristics would be used for enabling the sharing of resources between cloud tenants? (Select One)

- On Demand Self Service
- Broad Network Access
- **Resource Pooling**
- Rapid Elasticity
- Measured Service

Review Questions

Which of the following would be considered benefits of using AWS. (Select Three)

- Use of Low Cost Services
- Open and Flexible Service
- Supports Open APIs for every service
- Secure Services enabled
- Services are fully managed

Review Questions

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- Open and Flexible Service
- Supports Open APIs for every service
- Secure Services enabled
- Services are fully managed

Review Questions

Which service provides a cost-effective solution to cache the static content and reduce the load on the origin servers (Select One)

- CloudFront
- Global Load Balancing
- ELB
- ALB

Review Questions

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- CloudFront
- Global Load Balancing
- ELB
- ALB

Review Questions

A _____ is a physical location around the world where AWS clusters their data centers. (Select One)

- Region
- Edge
- Availability Zone
- Local Zone

Review Questions

A _____ is a physical location around the world where AWS clusters their data centers. (Select One)

- Region
- Edge
- Availability Zone
- Local Zone

Review Questions

Which of the following NIST Five Essential Cloud Characteristics would provide the ability to receive proper billing for your cloud services? (Select One)

- On Demand Self Service
- Broad Network Access
- Resource Pooling
- Rapid Elasticity
- Measured Service

Review Questions

Which of the following NIST Five Essential Cloud Characteristics would provide the ability to receive proper billing for your cloud services? (Select One)

- On Demand Self Service
- Broad Network Access
- Resource Pooling
- Rapid Elasticity
- **Measured Service**

Review Questions

AWS provides three distinct options in order to interact with the AWS Cloud Platform. What are they? (Select Three)

- CLI
- SDK
- Console
- Radius
- Edge

Review Questions

AWS provides three distinct options in order to interact with the AWS Cloud Platform. What are they? (Select Three)

- CLI
- SDK
- Console
- Radius
- Edge

Review Questions

Which of the following two statements are true about Edge location in AWS? (Select Two)

- Edge Locations are AWS endpoints that cache content locally
- Services Supported are Amazon CloudFront, S3, Amazon Route 53, AWS Firewall Manager, AWS Shield, and AWS WAF
- Edge Locations are Regions that cache content locally.
- Services Supported are only compute and storage services.

Review Questions

Which of the following two statements are true about Edge location in AWS? (Select Two)

- Edge Locations are AWS endpoints that cache content locally
- Services Supported are Amazon CloudFront, S3, Amazon Route 53, AWS Firewall Manager, AWS Shield, and AWS WAF
- Edge Locations are Regions that cache content locally.
- Services Supported are only compute and storage services.



Section 3 : AWS Core Services

Understanding the domain testable objectives

Section Overview

DOMAIN OVERVIEW	CORE SERVICES	EC2 (IAAS)	DEMO DEPLOY AN EC2 INSTANCE	SIMPLE STORAGE SERVICE (S3) BASICS
DEMO -CREATE A STORAGE BUCKET AND UPLOAD FILES	ELASTIC BLOCK STORE (EBS) BASICS	RELATIONAL DATA SERVICE (RDS) BASICS	ELASTIC BEAN STALK (PAAS)	DEMO - CREATE A SAMPLE APP USING ELASTIC BEANSTALK
VIRTUAL PRIVATE CLOUD (VPC)	DEMO - CREATE YOUR FIRST VPC IN AWS CLOUD PLATFORM	IAM	MONITORING AND MANAGEMENT	RT 53
ELB/AUTOSCALING	SNS	CLOUDFRONT	SUMMARY	REVIEW QUESTIONS

Domain Overview

- Identify the core AWS services



Core Services

What is a core service?

Core Services

AWS provides numerous services to provide you numerous opportunities to onboard AWS.

Core services are the most used cloud services for enterprise deployments.

- Compute
- Networking
- IAM
- Storage, Databases and Big Data

Core Services

Not Core Services

- ML/AI
- Mobile
- Collaboration
- Alexa
- And many more.

Compute Options AWS

- Compute Options include services that allow you to carry out computational abilities via a series of instructions used by applications and systems. This is done by using both processor and memory capacity in the cloud.
- Servers, Containers and Serverless
- EC2, Lambda, Elastic BeanStalk, EKS, etc

Storage Options AWS

- Storage Services in the AWS Cloud cover object, file and block storage options.
- Storage options can include data services such as big data solutions and analytics as well.
- Relational and Non-Relational databases.
- S3, EBS, RDS, Aurora are the main focus for exam.

Network Options AWS

- Network Services in the AWS Cloud cover Amazon VPC (Virtual Private Cloud) which provides versatile network performance in AWS, which means it provides both integrated security and a private cloud to your enterprise.
- DNS and other services are covered
- NAT and Routing
- Connections to AWS such as AWS Direct Connect and Peering.
- Content Delivery such as CloudFront is covered

Security Options AWS

- Security Options in AWS provides services that help you protect your data, accounts, and workloads from unauthorized access.
- AWS data protection services provide encryption and key management and threat detection that continuously monitors and protects your accounts and workloads.
- Identity and Access Management (IAM) to other services that prevent attacks to your cloud deployments.
- Security Groups and NACLs.



Elastic Compute Cloud (EC2)

Compute Service

EC2 Instance Options

- Amazon EC2 provides a wide selection of instance types optimized to fit different use cases.
- Instance types comprise varying combinations of CPU, memory, storage, and networking capacity and give you the flexibility to choose the appropriate mix of resources for your applications.
- Each instance type includes one or more instance sizes, allowing you to scale your resources to the requirements of your target workload.

EC2 Instance Options

- On-Demand Instances are compute capacity by the hour with no long-term commitments. You can increase or decrease your compute capacity depending on the demands of your application and only pay the specified hourly rate for the instances you use.
- Reserved Instances are compute capacity at a significant discount (up to 75%) compared to On-Demand instance pricing. 1 or 3 Year terms
- Spot Instances are available at up to a 90% discount compared to On-Demand prices and let you take advantage of unused EC2 capacity in the AWS Cloud. (auction)

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Instance Types Available

- General Purpose
- Compute Optimized
- Memory Optimized
- Accelerated Computing
- Storage Optimized

	General Purpose	Compute Optimized	Memory Optimized	Accelerated Computing	Storage Optimized				
Type	t2	m5	c5	r4	x1e	p3	h1	i3	d2
Description	Burstable, good for changing workloads	Balanced, good for consistent workloads	High ratio of compute to memory	Good for in-memory databases	Good for full in-memory applications	Good for graphics processing and other GPU uses	HDD backed, balance of compute and memory	SDD backed, balance of compute and memory	Highest disk ratio
Mnemonic	t is for tiny or turbo	m is for main or happy medium	c is for compute	r is for RAM	x is for extreme	p is for pictures	h is for HDD	i is for IOPS	d is for dense

Parkmycloud.com



Test Tips

- Instance types comprise varying combinations of CPU, memory, storage, and networking capacity
- Reserved Instances provide a discount over On Demand Instances.
- Spot Instances are excess capacity provided at a discount by AWS for under 24 hours.
- Choose the right instance type based on your workload.

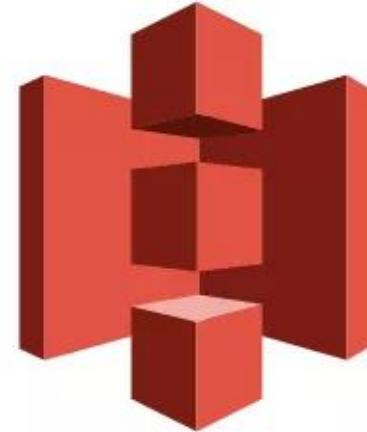


Amazon Simple Storage Service (Amazon S3)

Understanding AWS S3 Capabilities

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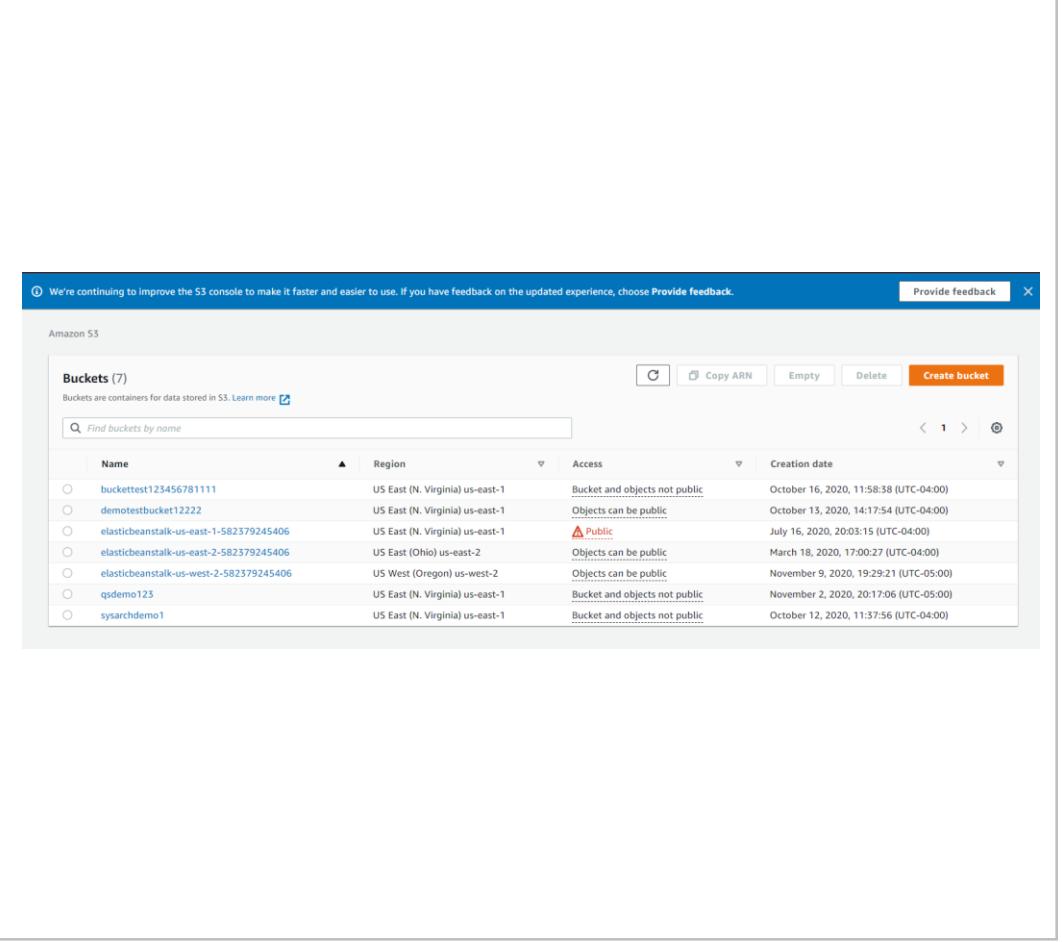
- Amazon Simple Storage Service (Amazon S3) is an object storage service that offers industry-leading scalability, data availability, security, and performance.
- Easy-to-use management features
- Designed for 99.99999999% (11 9's) of durability
- Stores data for millions of applications for companies all around the world.



Amazon S3

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- Amazon S3 or Amazon Simple Storage Service provides object storage through a web service interface
- With Amazon S3 you can store and retrieve any amount of data, at any time, from anywhere on the internet.

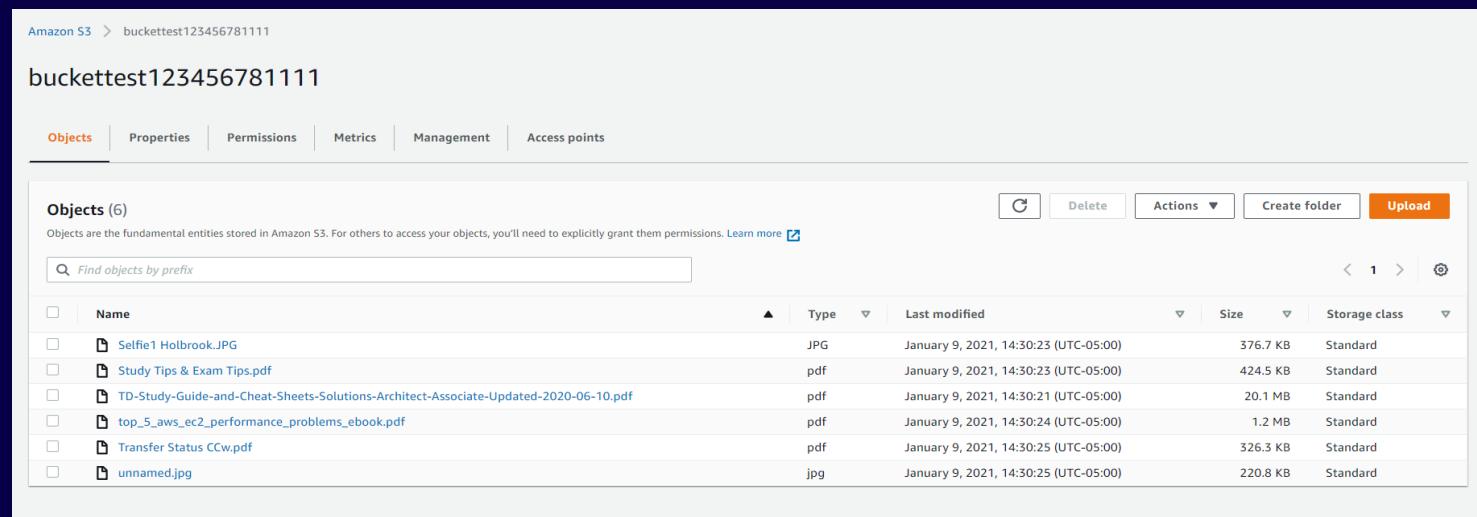


The screenshot shows the AWS S3 console interface. At the top, there is a blue header bar with the text "We're continuing to improve the S3 console to make it faster and easier to use. If you have feedback on the updated experience, choose Provide feedback." and a "Provide feedback" button. Below the header, the title "Amazon S3" is displayed. Underneath, the heading "Buckets (7)" is shown, with a note that "Buckets are containers for data stored in S3. Learn more." A search bar labeled "Find buckets by name" is present. To the right of the search bar are buttons for "Copy ARN", "Empty", "Delete", and "Create bucket". Below these buttons are navigation arrows and a refresh icon. The main content area is a table titled "Buckets" with columns: Name, Region, Access, and Creation date. The table lists seven buckets:

Name	Region	Access	Creation date
buckettest123456781111	US East (N. Virginia) us-east-1	Bucket and objects not public	October 16, 2020, 11:58:38 (UTC-04:00)
demotestbucket12222	US East (N. Virginia) us-east-1	Objects can be public	October 13, 2020, 14:17:54 (UTC-04:00)
elasticbeanstalk-us-east-1-582379245406	US East (N. Virginia) us-east-1	Public	July 16, 2020, 20:03:15 (UTC-04:00)
elasticbeanstalk-us-east-2-582379245406	US East (Ohio) us-east-2	Objects can be public	March 18, 2020, 17:00:27 (UTC-04:00)
elasticbeanstalk-us-west-2-582379245406	US West (Oregon) us-west-2	Objects can be public	November 9, 2020, 19:29:21 (UTC-05:00)
qsdemo123	US East (N. Virginia) us-east-1	Bucket and objects not public	November 2, 2020, 20:17:06 (UTC-05:00)
sysarchdemo1	US East (N. Virginia) us-east-1	Bucket and objects not public	October 12, 2020, 11:37:56 (UTC-04:00)

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- Access Points
- Tiers
- Lifecycles
- Monitoring
- Data Transfer
- IAM



The screenshot shows the AWS S3 console interface. At the top, there's a breadcrumb navigation bar: Amazon S3 > buckettest123456781111. Below it, the bucket name 'buckettest123456781111' is displayed. A horizontal menu bar follows with tabs: Objects (which is orange, indicating it's selected), Properties, Permissions, Metrics, Management, and Access points. To the right of the menu are buttons for Create folder and Upload. The main area is titled 'Objects (6)' and contains a table with the following data:

Name	Type	Last modified	Size	Storage class
Selfie1 Holbrook.JPG	JPG	January 9, 2021, 14:30:23 (UTC-05:00)	376.7 KB	Standard
Study Tips & Exam Tips.pdf	pdf	January 9, 2021, 14:30:23 (UTC-05:00)	424.5 KB	Standard
TD-Study-Guide-and-Cheat-Sheets-Solutions-Architect-Associate-Updated-2020-06-10.pdf	pdf	January 9, 2021, 14:30:21 (UTC-05:00)	20.1 MB	Standard
top_5_aws_ec2_performance_problems_ebook.pdf	pdf	January 9, 2021, 14:30:24 (UTC-05:00)	1.2 MB	Standard
Transfer Status CCw.pdf	pdf	January 9, 2021, 14:30:25 (UTC-05:00)	326.3 KB	Standard
unnamed.jpg	jpg	January 9, 2021, 14:30:25 (UTC-05:00)	220.8 KB	Standard

Terminology in S3

- A **Bucket** is a container for objects stored in Amazon S3 and these buckets contain objects.

Global Namespace https://s3.<bucket_name>.amazonaws.com/object_name

- An **Object** consists of object data and metadata; object data is the actual data, while metadata is just data about data. Objects have a key name that identifies the object.
- A **Storage Class** specifies the performance and durability of the objects.

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Amazon S3 offers a range of storage classes designed for different use cases.

- Amazon S3 Standard (S3 Standard)
- Amazon S3 Intelligent-Tiering (S3 Intelligent-Tiering)
- Amazon S3 Standard-Infrequent Access (S3 Standard-IA)
- Amazon S3 One Zone-Infrequent Access (S3 One Zone-IA)
- Amazon S3 Glacier (S3 Glacier)
- Amazon S3 Glacier Deep Archive (S3 Glacier Deep Archive)

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Amazon S3 offers a range of storage classes designed for different use cases.

	S3 Standard	S3 Intelligent-Tiering*	S3 Standard-IA	S3 One Zone-IA†	S3 Glacier	S3 Glacier Deep Archive
Designed for durability	99.999999999% (11 9's)					
Designed for availability	99.99%	99.9%	99.9%	99.5%	99.99%	99.99%
Availability SLA	99.9%	99%	99%	99%	99.9%	99.9%
Availability Zones	≥3	≥3	≥3	1	≥3	≥3

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Amazon S3 offers a range of storage classes designed for different use cases such as performance access requirements.

- Standard – (default)Standard Storage Class is used for performance-sensitive use cases (those that require millisecond access time) and frequently accessed data
- Standard_IA and Onezone_IA – Infrequently Accessed is designed for long-lived and infrequently accessed data Amazon S3 charges a retrieval fee for these objects, so they are most suitable for infrequently accessed data. (30 days or more)
- Glacier - data stored in this storage class has a minimum storage duration period of 90 days and can be accessed in 1-5 minutes using expedited retrieval
- Deep_Archive - Minimum storage duration period of 180 days and a default retrieval time of 12 hours; lowest cost storage option in AWS

Transfer Acceleration

- Amazon S3 Transfer Acceleration enables fast, easy, and secure transfers of files over long distances between your client and an S3 bucket, using Amazon CloudFront's globally distributed edge locations.
- S3 Transfer Acceleration reduces the variability in Internet routing, congestion and speeds that can affect transfers, and logically shortens the distance to S3 for remote applications.
- Resulting in better user and application experiences.

Cross Region

Cross-region replication enables automatic, asynchronous copying of objects across buckets in different AWS Regions.



Test Tips

- Objects consist of object data and metadata
- Amazon S3 offers a range of storage classes designed for different use cases such as performance access requirements.
- A Bucket is a container for objects stored in Amazon S3 and these bucket contain objects
- Use S3 Transfer Acceleration to minimize latency for long distance transfers between your client and S3 bucket.



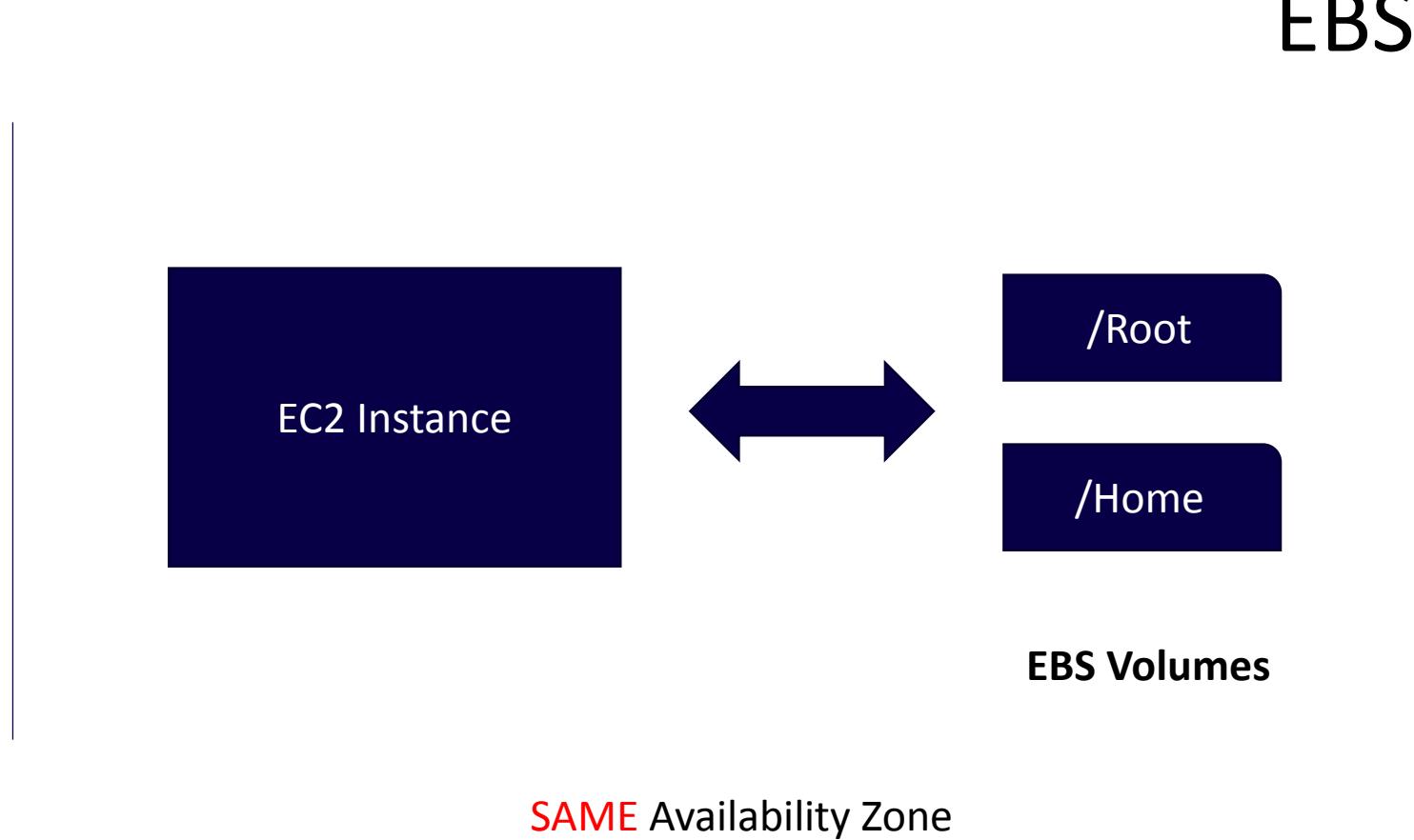
Elastic Block Store (EBS)

Block Storage Service

EBS

- Amazon EBS allows you to create storage volumes and attach them to Amazon EC2 instances.
- Amazon EBS volumes are placed in a specific Availability Zone where they are automatically replicated to protect you from the failure of a single component.
- All EBS volume types offer durable snapshot capabilities and are designed for 99.999% availability.
- <https://aws.amazon.com/ebs/features>

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EBS IOPS

- Provisioned IOPS SSD (io1) - latency-sensitive transactional workloads
- General Purpose SSD (gp2) - balance price and performance for a wide variety of transactional data.
- Throughput Optimized HDD (st1) for frequently accessed, throughput intensive workloads
- Cold HDD (sc1) - for less frequently accessed data.

EBS IOPS

- Use Cases for EBS Volumes

Solid State Drives (SSD)	Hard Disk Drives (HDD)
General Purpose SSD Balanced for economy and performance	Throughput Optimized HDD: Inexpensive, for high use, intensive workloads
Provisioned IOPS SSD High performance, for important applications	Cold HDD Cheap, used for infrequent access

EBS IOPS

Feature	IOPS	Notes
Max IOPS/Instance	80,000	SSD/HDD
Max IOPS**/Volume	64,000	250, 500, 1600, 64,000
Max Throughput***/Volume	1,000MB/s	1000/250 SSD 250/500 –HDD
Max Throughput/Instance	2,375 MB/s	All
Dominant Performance Attribute	IOPS/MB/s	SSD- IOPS MB/s - HDD

*Default volume type

**io1/gp2 based on 16K I/O size, st1/sc1 based on 1 MB I/O size

***volume throughput is calculated as MB = 1024^2 bytes

EBS Burst Performance

- Use Burst performance over Base.
- Use I/O credits to handle occasional peaks. Each volume receives an initial I/O credit balance of 5.4 million I/O credits, which is enough to sustain the maximum burst performance of 3,000 IOPS for 30 minutes.
- EBS Snapshots and Backups - backups are automated, snapshots are manual



Test Tips

- EBS is block storage meant to provide volumes for EC2 Instances.
- Know that latency-sensitive transactional workloads should use the Provisioned IOPS SSD (io1) type of EBS



Relational Data Service (RDS)

SQL Data Services

What is RDS?

Amazon **Relational** Database Service (RDS) is a web service that makes it easier to set up, operate, and scale a **relational database** in the cloud.

- RDS provides cost-efficient, resizable capacity for an industry-standard relational database and manages common database administration tasks.
- Supports MySQL, MariaDB, PostgreSQL, Oracle, Microsoft SQL Server, and the new, MySQL-compatible Amazon Aurora DB engine



RDS Instances

- The DB Instance is really the most basic building block of AWS RDS services.
- A Database(DB) instance is a database environment in the AWS, similar to running a development environment.
- Each DB instance runs a DB Engine on AWS, which in turn determines the CPU and memory the DB will utilize.

RDS Engines

Engine options

Engine type [Info](#)

- Amazon Aurora 
- MySQL 
- MariaDB 
- PostgreSQL 
- Oracle 
- Microsoft SQL Server 

RDS Databases

RDS > Databases > database-1

database-1

Modify Actions ▾

Summary			
DB identifier database-1	CPU -	Status ✓ Available	Class db.t2.micro
Role Instance	Current activity	Engine	Region & AZ us-east-1f
MySQL Community			

RDS DB Availability

- AWS resources are housed in highly available data center facilities in different areas of world, these data centers are called regions which further contain multiple distinct locations called Availability Zones
- Each AZ is engineered to be isolated from failures in other AZs, and to provide inexpensive, low-latency network connectivity to other AZs in the same region
- DB instances can be hosted in different AZs, an option called a Multi-AZ deployment.

RDS AZ

- Amazon automatically provisions and maintains a synchronous standby replica of the DB instance in a different AZ.
- Primary DB instance is synchronously replicated across AZs to the standby replica
- Provides data redundancy, failover support, eliminate I/O freezes, and minimize latency spikes during system backups.



Test Tips

- RDS is an AWS web service that makes it easier to set up, operate, and scale a relational database in the cloud.
- Supports SQL and other relational databases.
- Database Instance deployed determines the memory and CPU available.



Elastic Beanstalk

PaaS

Elastic Beanstalk

- PaaS for web apps
- AWS extracts the complexity of deployments
- PHP, Ruby on Rails, Python, Java, .NET, Go, Node.js
- Docker, Apache, Nginx, etc..
- No charge for Beanstalk, you just pay for resources used.



What is Elastic BeanStalk App?

Application or Environment

An Elastic Beanstalk application is a logical collection of Elastic Beanstalk components, including environments, versions, and environment configurations.

- Elastic Beanstalk applications are conceptually similar to a **folder**.
- Elastic Beanstalk environments are a collection of AWS resources running an application version. (Each environment **runs only one application version at a time**)

Elastic Beanstalk Benefits

Benefits of Elastic Beanstalk

- Fast and Simple to start
- Enhances Developer Productivity
- Impossible to outgrow
- Managed Service
- Complete Resource Control



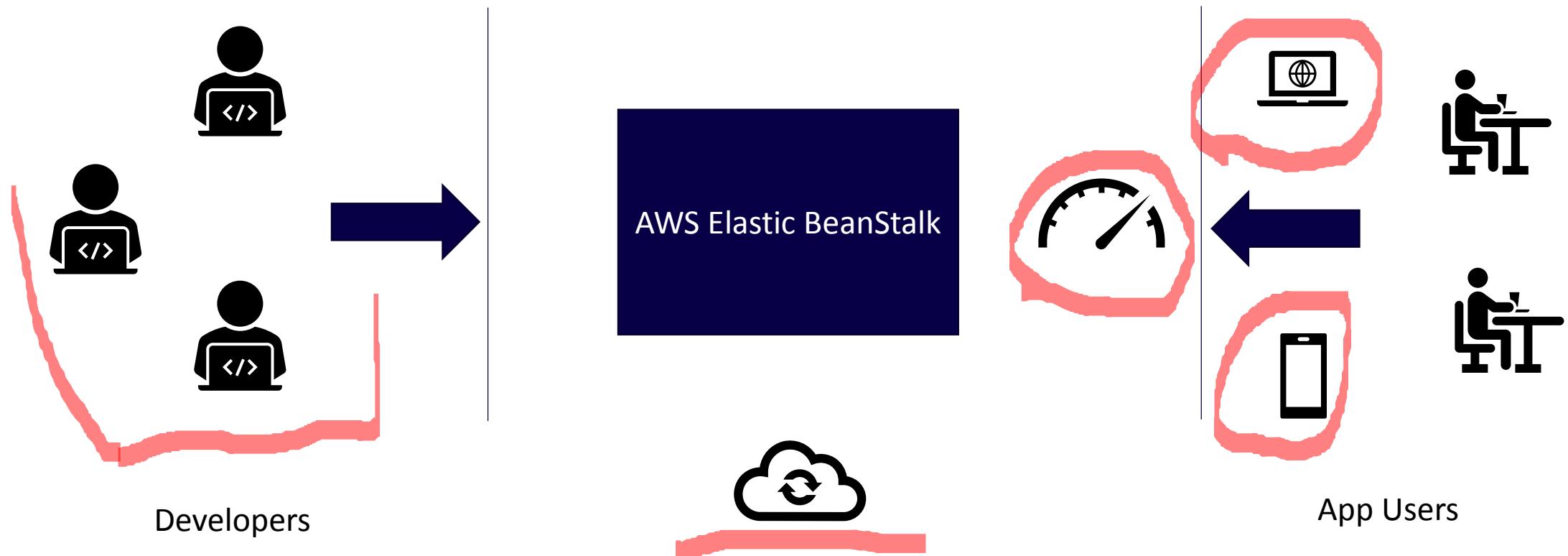
Elastic BeanStalk Managed Capacity

Elastic Beanstalk handles the following. (So your developers can focus on coding)

- Load Balancing
- Provisioning
- Auto Scaling
- Monitoring



Elastic Beanstalk Deployment



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Elastic Beanstalk Dashboard

The screenshot shows the AWS Elastic Beanstalk Environment dashboard. On the left, a sidebar menu has 'Environments' selected. The main content area displays a table titled 'All environments' with two entries:

Environment name	Health	Application name	Date created	Last modified	URL	Running versions	Platform	Platform state	Tier name
Bootcampdemo-env	Suspended	Bootcampdemo	2020-10-02 19:32:00 UTC-0400	2020-10-02 19:35:24 UTC-0400	quickstart.us-east-1.elasticbeanstalk.com	Sample Application	Corretto 11 running on 64bit Amazon Linux 2	Supported	WebServer
Demoapp-env	Suspended	Demoapp	2020-09-30 20:12:22 UTC-0400	2020-09-30 20:15:30 UTC-0400	Demoapp-env.eba-vkwfm6sk.us-east-1.elasticbeanstalk.com	Sample Application	Python 3.7 running on 64bit Amazon Linux 2	Supported	WebServer

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-

Elastic Beanstalk Environments

Elastic Beanstalk > Environments

All environments

Filter results matching the display values

Actions Create a new environment

Environment name	Health	Application name	Date created	Last modified	URL	Running versions	Platform	Platform state	Tier name
AwsCourse-env	Ok	AWS Course	2020-12-17 15:00:44 UTC-0500	2020-12-17 15:04:06 UTC-0500	AwsCourse-env.eba-i3ivns2m.us-east-1.elasticbeanstalk.com	Sample Application	Python 3.7 running on 64bit Amazon Linux 2	Supported	WebServer
Bootcampdemo-env	Suspended	Bootcampdemo	2020-10-02 19:32:00 UTC-0400	2020-12-17 14:59:34 UTC-0500	quickstart.us-east-1.elasticbeanstalk.com	Sample Application	Corretto 11 running on 64bit Amazon Linux 2	Supported	WebServer
Demoapp-env	Suspended	Demoapp	2020-09-30 20:12:22 UTC-0400	2020-09-30 20:15:30 UTC-0400	Demoapp-env.eba-vkwfm6sk.us-east-1.elasticbeanstalk.com	Sample Application	Python 3.7 running on 64bit Amazon Linux 2	Supported	WebServer

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Elastic Beanstalk Example

Demoapp-env

Demoapp-env.eba-vkwfm6sk.us-east-1.elasticbeanstalk.com (e-a8qphfnt8a)

Application name: Demoapp

Actions ▾

Health	Running version	Platform
 Grey Causes	Sample Application Upload and deploy	 Python 3.7 running on 64bit Amazon Linux 2/3.1.1 Platform update scheduled Change

Health Elastic Beanstalk

AwsCourse-env

AwsCourse-env.eba-i3ivns2m.us-east-1.elasticbeanstalk.com (e-gpvmkjkx7m)
Application name: AWS Course

Actions ▾

Health	Running version	Platform
 Ok Causes	Sample Application Upload and deploy	 Python 3.7 running on 64bit Amazon Linux 2/3.1.3 Change



Test Tips

- Elastic Beanstalk is a “managed PaaS service”
- Elastics Beanstalk environments are a collection of AWS resources running an application version
- Elastics Beanstalk measures metrics about the number of requests your application is receiving, as well as the status codes of the responses.



Virtual Private Cloud (VPC)

Understanding the service

VPC Basics

Amazon Virtual Private Cloud (Amazon VPC) lets you provision a logically isolated section of the AWS Cloud where you can launch AWS resources in a virtual network that you define.

- You can use both IPv4 and IPv6 in your VPC for secure and easy access to resources and applications.
- You can easily customize the network configuration of your Amazon VPC.
- Similar to a private data center or sandbox within the AWS infrastructure.

VPC Benefits

- Secure
- Simple
- Customizable

VPC

VPC – Internet Gateway

- Your connection to the outside world is the Internet Gateway.
- The IGW is a transparent component.
- It does not have an IP address of its own and is not a component that you need to manage.

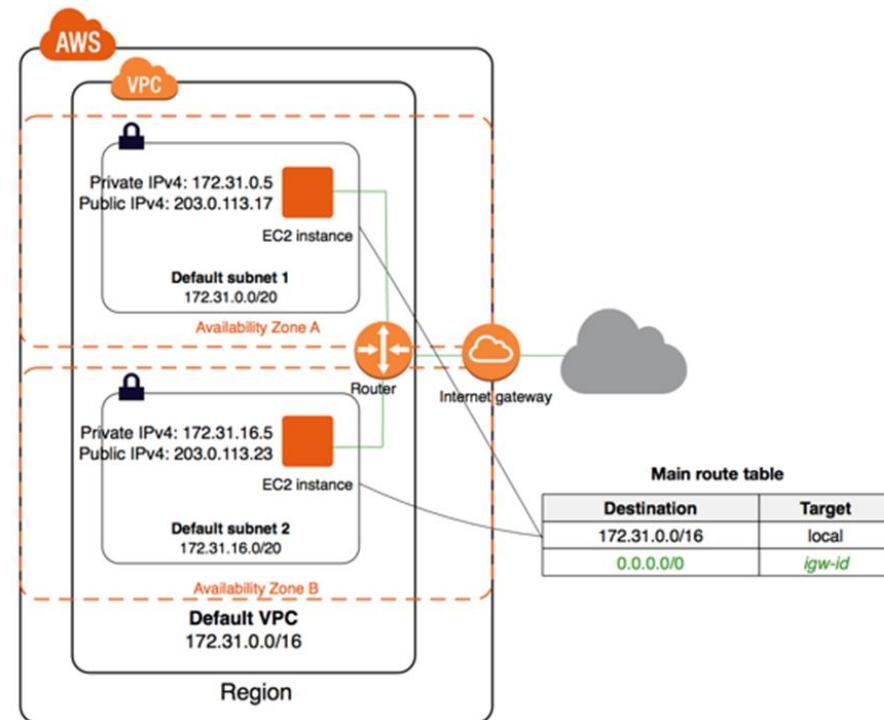
VPC

- You can use multiple Availability Zone deployments
- Use security groups and network ACLs
- Use IAM policies to control access
- Use Amazon CloudWatch to monitor your VPC components and VPN connections
- Use flow logs to capture information about IP traffic going to and from network interfaces in your VPC.

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- Subnets
- Route Tables
- Internet Gateway
- Security Groups
- NACLs
- Elastic IPs
- DHCP
- NAT
- Peering
- Endpoints

VPC



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VPC

VPC with a size /16 IPv4 CIDR block (172.31.0.0/16).

This provides up to 65,536 private IPv4 addresses.

VPC

- A VPC endpoint enables private connections between your VPC and supported AWS services and VPC endpoint services powered by AWS PrivateLink.
- Two Types - interface endpoints and gateway endpoints

VPC

An interface endpoint is an elastic network interface with a private IP address from the IP address range of your subnet that serves as an entry point for traffic destined to a supported service.

- PrivateLink is used
- No need for an internet gateway, a NAT device, or a virtual private gateway.

VPC

A gateway endpoint is a gateway that you specify as a target for a route in your route table for traffic destined to a supported AWS service.

The following AWS services are supported:

- Amazon S3
- DynamoDB

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VPC

For exam we need to know default quotas

Resource	Default	Comments
VPCs per Region	5	<p>The quota for internet gateways per Region is directly correlated to this one. Increasing this quota increases the quota on internet gateways per Region by the same amount.</p> <p>You can have 100s of VPCs per Region for your needs even though the default quota is 5 VPCs per Region.</p>
Subnets per VPC	200	-
IPv4 CIDR blocks per VPC	5	This primary CIDR block and all secondary CIDR blocks count toward this quota. This quota can be increased up to a maximum of 50.
IPv6 CIDR blocks per VPC	1	This quota cannot be increased.

<https://docs.aws.amazon.com/vpc/latest/userguide/amazon-vpc-limits.html>



Test Tips

- VPC is similar to your sandbox of resources in AWS
- Know Use Cases for A VPC
- What is the IGW?
 - It is your connection to the outside world is the Internet Gateway.
- VPC Supports IPv4 and IPv6

AWS Certified Cloud Practitioner (CLF-C01) 2021 Course



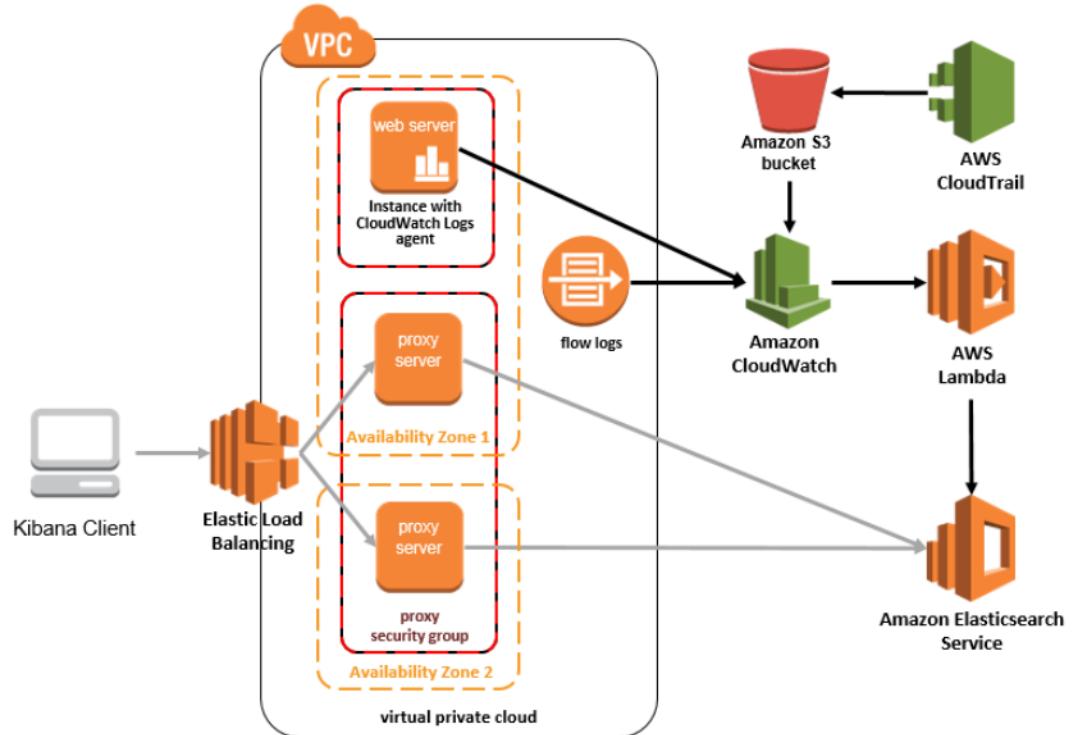


Monitoring, Logging and Compliance

CloudWatch Native Monitoring and Logging

CloudWatch

- CloudWatch is a very powerful native tool to monitor your environment.
- It can also be used for logging or to be used for compliance reasons



CloudWatch

Monitoring service that runs on AWS that monitors your resources in real time

- CloudWatch uses subscriptions for real time logging
- Collect and monitor log files
- Collect and track resources/metrics
- Create and Set alarms
- Automatically react to changes in your AWS resources.

CloudWatch

Accessing CloudWatch

- AWS CloudWatch Console
- AWS CLI
- CloudWatch API
- AWS SDKs

CloudWatch

Monitors most AWS Resources such as

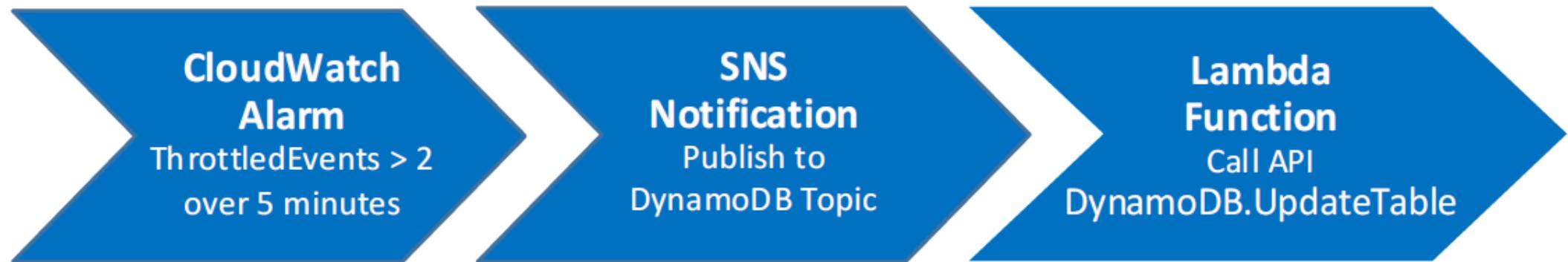
- Amazon EC2
- Amazon S3
- Amazon DynamoDB tables
- Amazon EBS volumes
- Amazon RDS DB instances
- Amazon Elastic MapReduce job flows
- Elastic Load Balancers
- Other resources in AWS



Amazon CloudWatch

CloudWatch

For Example - CloudWatch can perform several actions



CloudWatch

CloudWatch does not monitor applications per say.

- It does monitors resources for applications
- It does react to resource issues with events
- Does not provide application discovery
- Does not provide complete visibility
- Does not track transactions
- Does not provide extended analytics.



Amazon CloudWatch

CloudWatch

Some considerations

- Does not provide extended analytics. Third party applications may be needed if you need to extend past capability of CloudWatch
- Check the AWS partners for solutions
- Health of application resources can be monitored but don't get confused over discovery, transactions etc..

CloudWatch

Event Driven Monitoring

- Use CloudWatch Events to react to application resource issues.

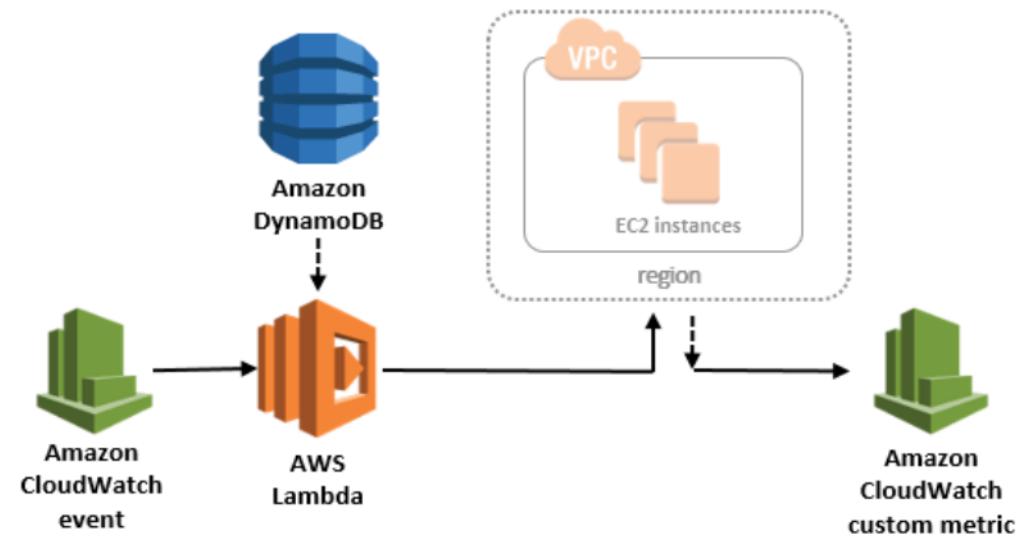
Create notification a pipeline via

- SNS
- Lambda

CloudWatch

Event Driven Monitoring

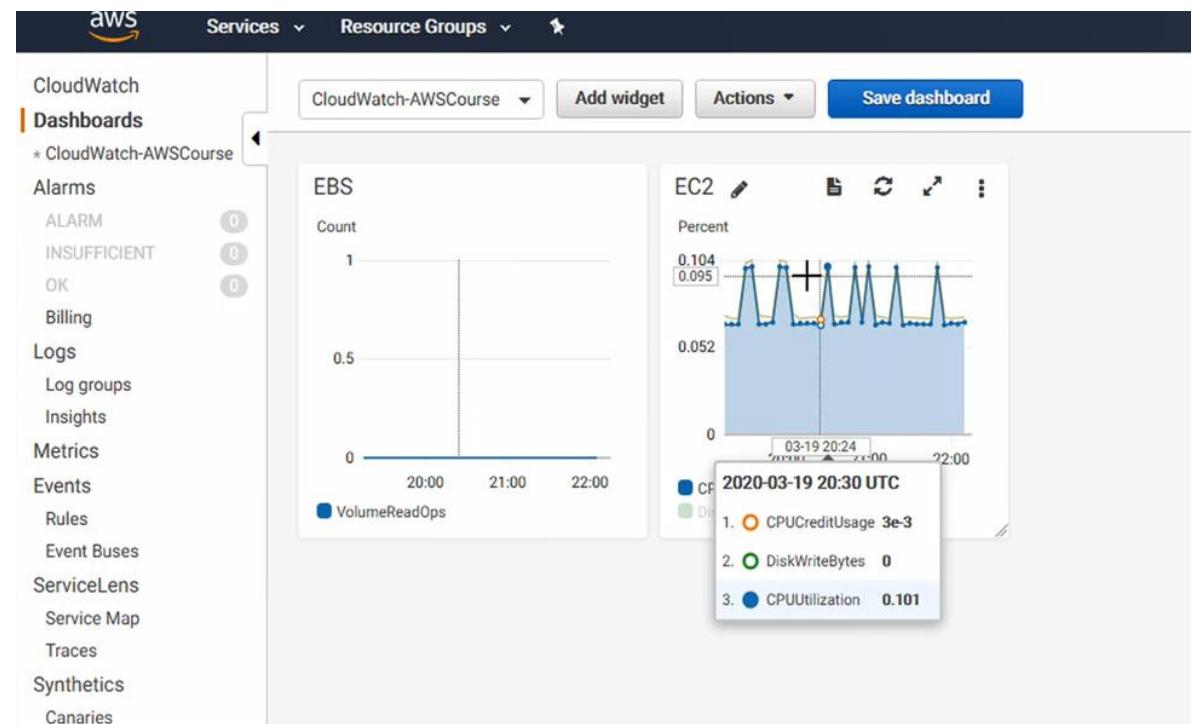
- CloudWatch and Lambda combined
- Use for triggers after an event



CloudWatch Dashboards

Dashboards

- CloudWatch Dashboards can be customized
- Used for monitoring groups of machines
- **Use separate dashboards for different views or compliance.**
For Example – Different regions.



CloudWatch Logging

- CloudWatch uses **subscriptions** for real time logging
- Configure AWS services as “targets”
- Near **real time “stream”**



CloudWatch Logging



- Monitor Logs from Amazon EC2 Instances in Real-time
- Monitor AWS CloudTrail Logged Events
- Archive Log Data

CloudTrail

- CloudTrail is a service that enables governance, compliance, operational auditing, and risk auditing.
- Log continuously, monitor continuously and retain account activity

The screenshot shows the AWS CloudTrail Dashboard. At the top left, it says "CloudTrail > Dashboard". Below that is a "Dashboard" section with a "Create trail" button. To the right are two panels: "CloudTrail Insights" and "Event history".

CloudTrail Insights:

Event name	Event start time
CreateLogGroup	July 22, 2020, 16:28 (UTC-04:00)

Event history:

Event name	Event time	Event source
RunInstances	July 27, 2020, 14:27 (UTC-04:00)	ec2.amazonaws.com
RunInstances	July 27, 2020, 14:25 (UTC-04:00)	ec2.amazonaws.com
RunInstances	July 27, 2020, 14:24 (UTC-04:00)	ec2.amazonaws.com
RunInstances	July 27, 2020, 14:23 (UTC-04:00)	ec2.amazonaws.com
RunInstances	July 27, 2020, 14:22 (UTC-04:00)	ec2.amazonaws.com

At the bottom right of the event history table is a link "View full Event history".

CloudTrail

- CloudTrail is enabled in your AWS account
- Audits API Activity
- Create a trail to archive, analyze and respond to changes in your AWS resources.
- Two Types of Trails - A trail either applies to all regions or one that applies to one region. (default)
- Organization trail can be created to log all events in an Orgs for ALL accounts.

CloudTrail

- CloudTrail publishes logs every 5 minutes
- Events are the record of an activity in AWS. Can be user, role, service that is monitored by CloudTrail

Management Events (Default)

Data Events



Test Tips

- CloudWatch is a native monitoring and logging solution in AWS
- Configure AWS resources as targets.
- Event Driven Monitoring is accomplished thru extending to services such as Lambda (pipelines)
- A namespace is a container for CloudWatch Metrics. Namespace format AWS/Service

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AWS Route 53

DNS Services

Route 53 -DNS

- AWS Route 53 is AWS DNS service which is highly scalable and available.
- Can be used for internal and external services
- Supports numerous features such as domain registration, traffic flow, resolver, failover, Geo DNS, ELB, etc
- Health Checking – DNS Failover



Elastic Load Balancer (ELB)

Load Balancing with AWS EC2

Elastic Load Balancer (ELB)

Why use a load balancer?

- Distribute Network Traffic to EC2 across multiple targets.
- Enables Fault Tolerance
- Single Zone or Multiple Zones
- Listener checks connections



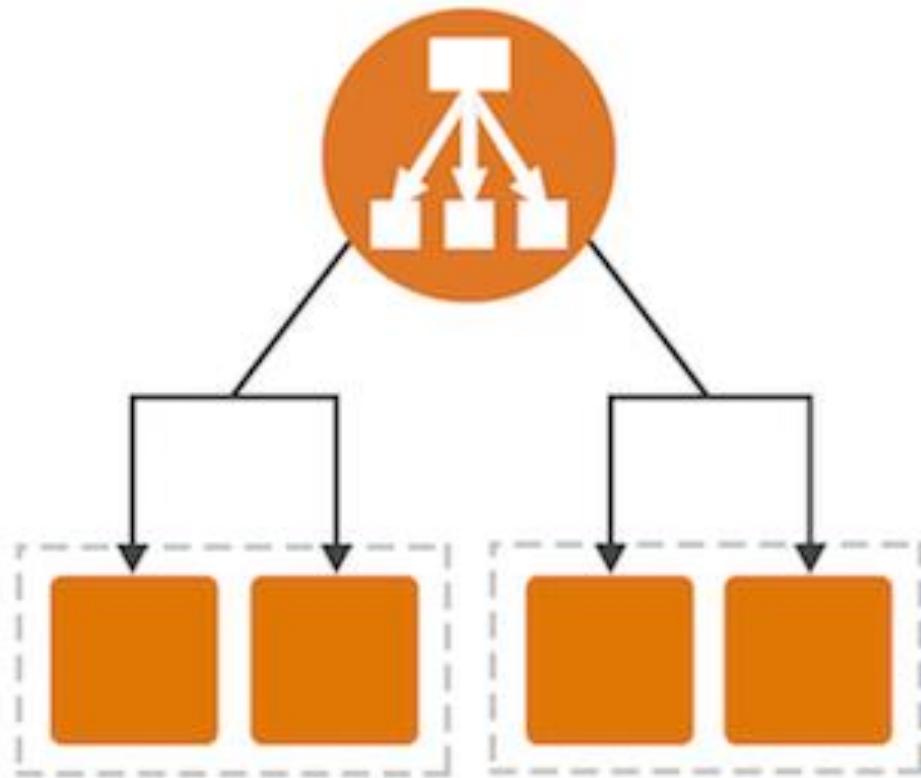
Amazon Elastic
Compute Cloud
(EC2)



Elastic Load Balancer (ELB)

Features

- High Availability
- Health Checks
- Security Features
- TLS Termination
- Layer 4 or 7
- Monitoring



Elastic Load Balancer (ELB)

There are four types to understand

- *Classic Load Balancer*
- *Application Load Balancer*
- *Network Load Balancer*
- Gateway Load Balancer

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Load Balancers in AWS

- Classic Load Balancer is ideal for simple load balancing of traffic across multiple EC2 instances (EC2 Network Only)
- Application Load Balancer offers ability to route traffic to multiple services or load balance across multiple ports on the same EC2 instance.

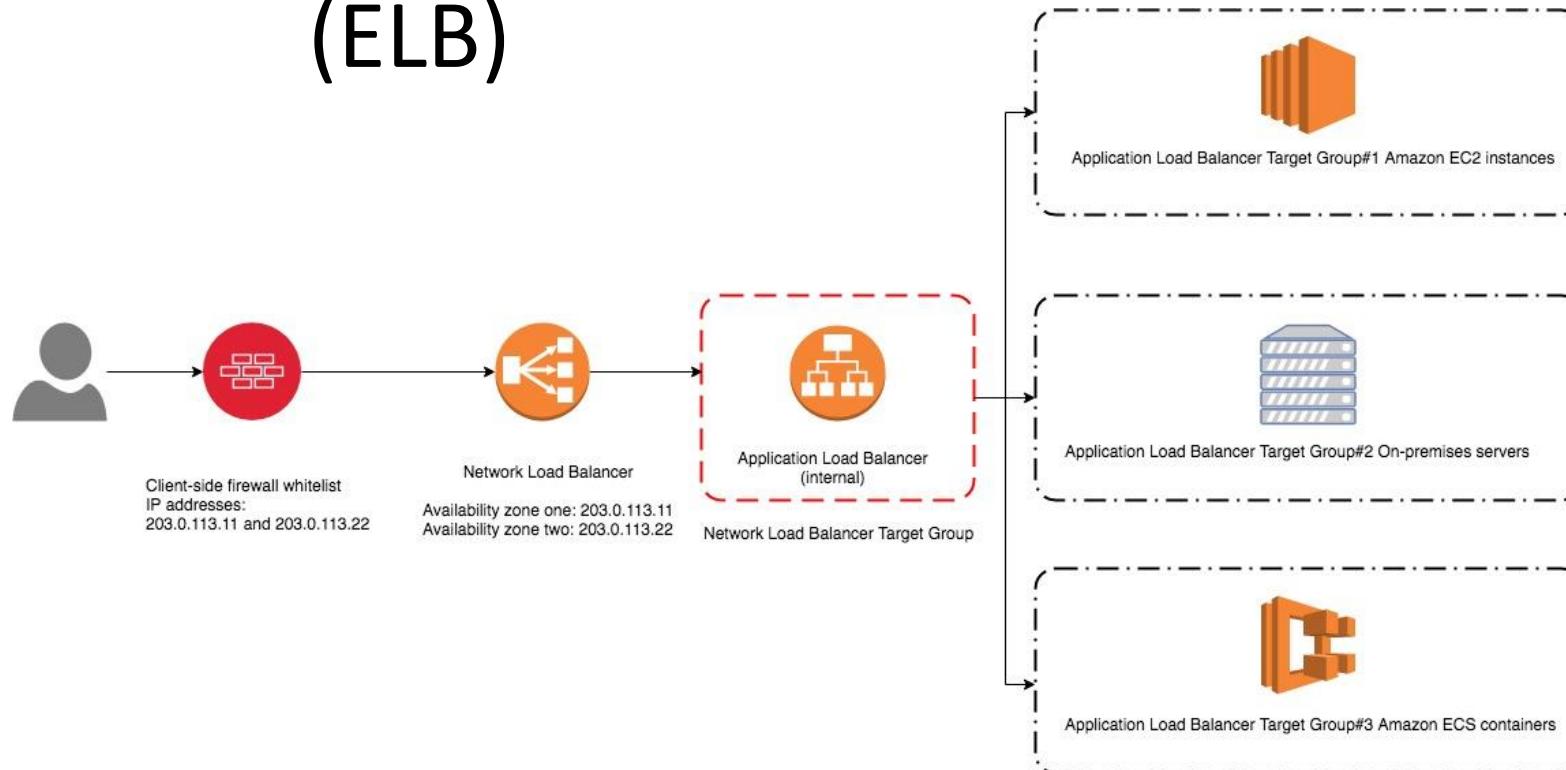
Operating at the **Application level (Layer 7)**

- Network Load Balancer is best suited for load balancing of Transmission Control Protocol (TCP), User Datagram Protocol (UDP) and Transport Layer Security (TLS) traffic where extreme performance is required.

Operating at the **connection level (Layer 4)**

- Gateway - Gateway Load Balancer makes it easy to deploy, scale, and run third-party virtual networking appliances.

Elastic Load Balancer (ELB)





Test Tips

- ELB – Know why to use
- ELB – How to setup
- ELB – What are three types -
Classic Load Balancer,
Application Load Balancer ,
Network Load Balancer



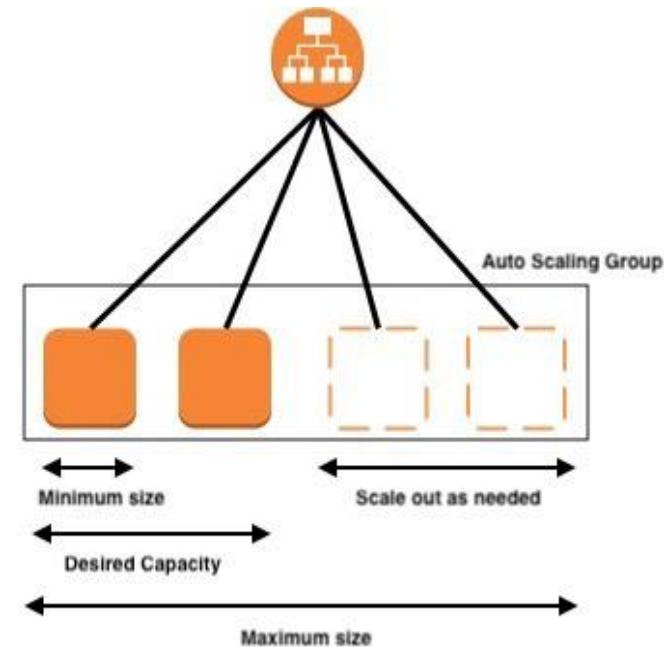
Autoscaling

Autoscaling with AWS EC2

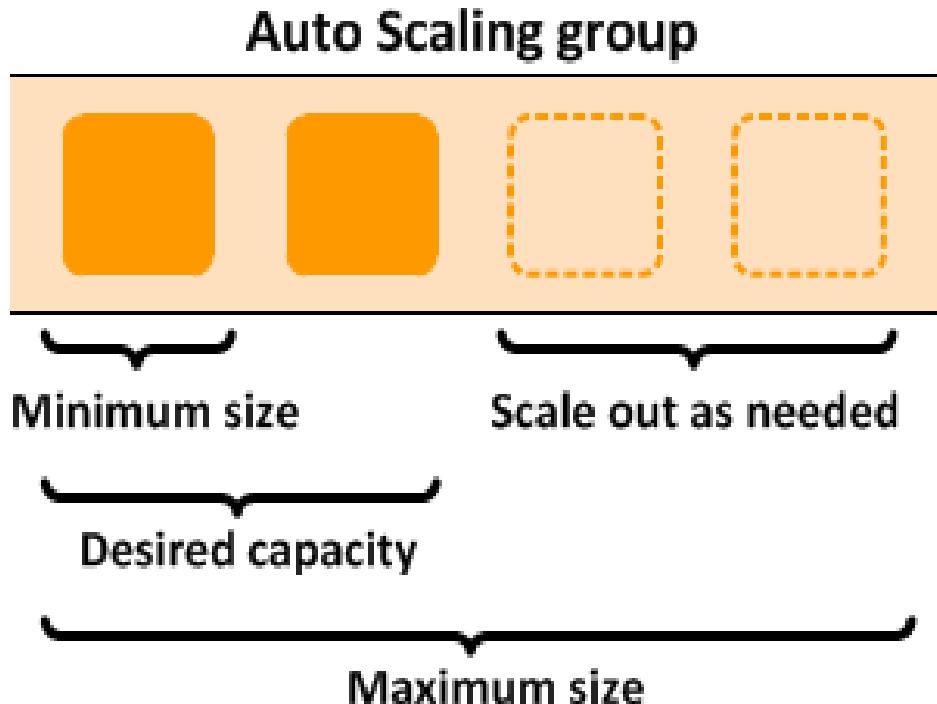
Autoscaling

Auto Scaling monitors your applications and automatically adjusts capacity to maintain steady, predictable performance at the lowest possible cost

- Right Sized Resources
- Autoscaling Groups
- Uses Policies
- No Additional Charge



Autoscaling



- EC2 instances are grouped in Auto Scaling Groups and can monitor:
- Minimum number of EC2 instances
- Desired number of EC2 instances
- Maximum number of EC2 instances
- Uses a scaling policy that will automatically launch or terminate instances as your application demands

Autoscaling

Load Balancing vs Autoscaling?

- Load balancing evenly distributes load to application instances in all availability zones in a region while auto scaling ensures that your EC2 instances can scale up or down based on the workload.
- We use the Autoscaler to effectively scale based on CPU usage so that instances increase or decrease dynamically based on the load.



Test Tips

- Auto Scaling monitors your applications and automatically adjusts capacity to maintain steady, predictable performance at the lowest possible cost
- Uses Autoscaling Groups



Lambda

Function as a Service (FaaS)

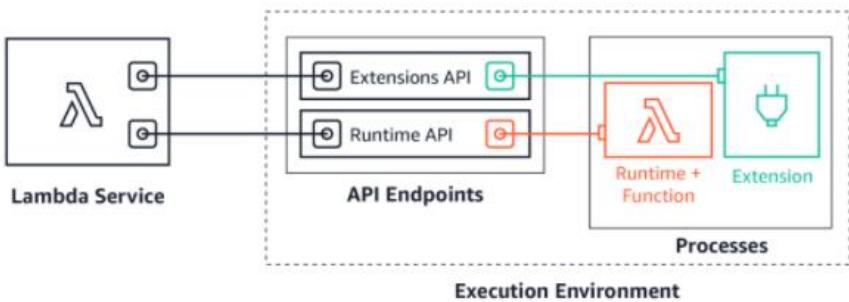
Lambda



- AWS Lambda is an **event-driven, serverless** computing platform / service that lets you run code without provisioning or managing servers.
- AWS Lambda can be extended to other AWS services with custom logic or you create your own back-end services that operate at AWS scale.

Lambda

- Used mainly for building microservices applications. (**stateless**)
- Function as a Service (FaaS)
- Managed Service which handles
- Lambda @Edge allows you to run Lambda functions to provide customized content that will be delivered by CloudFront.



Lambda

Runtimes Supported (Execution Environments)

- Node.js
- Java
- Python
- .NET Core
- Go
- Ruby
- Rust

Lambda

Pricing

- You pay only for the compute time you consume, there is no charge when your code is not running
- You are charged based on the number of requests for your functions and the time it takes for your code to execute
- Lambda registers a request each time it starts executing in response to an event notification or invoke call



Test Tips

- AWS Lambda is an event-driven, serverless computing platform
- Lambda functions are stateless
- Pricing is based on the number of requests for your functions and the time it takes for your code to execute



Simple Notification Service (SNS)

Pub Sub Messaging

SNS

- Amazon Simple Notification Service (Amazon SNS) is a web service that coordinates and **manages the sending or delivery of messages to subscribing endpoints or clients**
- Two types of clients: **publishers and subscribers**, also referred to as producers and consumers
- Publishers communicate **asynchronously with subscribers by producing and sending a message to a topic**, which is a logical access point and comm. channel

SNS Notifications

- Publishers are people or applications such as CloudWatch and S3 that can send Notifications to a SNS Topic.
- **Topic is a list of Subscribers who receive the Notification.**
- Topics have an ARN (unique)
- **Subscribers are EndPoints**, email, http, SMS that receive notifications.



Test Tips

- SNS is a Push service (Not Both or Pull)
- Two types of clients, publishers and subscribers, also referred to as producers and consumers

Section Summary

Section 3 – AWS Core Services



3

Section

Section Summary

- Amazon EC2 provides a wide selection of instance types optimized to fit different use cases
- Amazon EBS allows you to create storage volumes and attach them to Amazon EC2 instances.
- Amazon Relational Database Service (RDS) is a web service that makes it easier to set up, operate, and scale a relational database in the cloud.
- Elastic BeanStalk is a PaaS and provides developers a place to deploy and test applications.
- Amazon VPC is a sandbox of cloud resources.
- Monitoring your resources is critical to your cloud spending, security and scaling
- CloudWatch is a powerful AWS service that should be utilized in your deployments.
- AWS Route 53 is AWS DNS service which is highly scalable and available.
- Amazon Simple Notification Service (Amazon SNS) is a web service that coordinates and manages the sending or delivery of messages to subscribing endpoints or clients

Section Review Questions

Section 3 – AWS Core Services



Section Review Questions

CloudWatch uses _____ for real time logging. (Select One)

- Metrics
- Insights
- Subscriptions
- Statistics

Section Review Questions

CloudWatch uses _____ for real time logging. (Select One)

- Metrics
- Insights
- Subscriptions
- Statistics

Section Review Questions

CloudWatch uses dashboards to provide a customizable home page so you can monitor resources in a single view. Which of the following are two facts that describe CloudWatch Dashboards? (Select Two)

- Dashboards are limited to 10,000 per account
- Dashboards are limited to 1000 per account
- Dashboards are global and not region specific
- Dashboards are regional and specific to regions

Section Review Questions

CloudWatch uses dashboards to provide a customizable home page so you can monitor resources in a single view. Which of the following are two facts that describe CloudWatch Dashboards? (Select Two)

- Dashboards are limited to 10,000 per account
- Dashboards are limited to 1000 per account
- Dashboards are global and not region specific
- Dashboards are regional and specific to regions

Section Review Questions

Which type of instance would you recommend for your customer to deploy for batch jobs that are not critical to your organization?

- On Demand
- Spot Instances
- Standard Reserved Instances
- Convertible Reserved Instances

Section Review Questions

Which type of instance would you recommend for your customer to deploy for batch jobs that are not critical to your organization?

- On Demand
- **Spot Instances**
- Standard Reserved Instances
- Convertible Reserved Instances

Section Review Questions

Which AWS service supports developers by providing a PaaS which extracts the complexity of deployments? (Select One)

- Elastic Block Store
- Elastic Compute Cloud
- Elastic Bean Stalk
- Lambda

Section Review Questions

Which AWS service supports developers by providing a PaaS which extracts the complexity of deployments? (Select One)

- Elastic Block Store
- Elastic Compute Cloud
- **Elastic Bean Stalk**
- Lambda

Section Review Questions

RDS is a relational database service that deploys the service in what type of provisioning unit? (Select One)

- Database(DB) instance
- Database(DB) volume
- Database(DB) snapshot
- Database(DB) runtime

Section Review Questions

RDS is a relational database service that deploys the service in what type of provisioning unit? (Select One)

- Database(DB) instance
- Database(DB) volume
- Database(DB) snapshot
- Database(DB) runtime

Section Review Questions

A _____ is a container for _____ stored in AWS. (Select One)

- DB Instance, Volumes
- Bucket, Objects
- Bucket, Files
- Object, Buckets
- DB Instance, Buckets

Section Review Questions

A _____ is a container for _____ stored in AWS. (Select One)

- DB Instance, Volumes
- Bucket, Objects
- Bucket, Files
- Object, Buckets
- DB Instance, Buckets



Section 4 : Cloud Pricing Billing and Cloud Support

Understanding the domain testable objectives

Section Overview

SECTION
OVERVIEW

CLOUD
BILLING

CLOUD SPEND

Demo Create
a Billing Alarm

Budgets

Demo Budgets

Demo Cost
Explorer

Demo AWS
Pricing
Calculator

Trusted
Advisor

Support
Options

Section
Review

Review
Questions

Domain Overview

- Compare and contrast the various pricing models for AWS
- Recognize the various account structures in relation to AWS billing and pricing
- Identify resources available for billing support
- Identify resources for technology support



Billing and Cost Management

Understanding your Cloud Spending

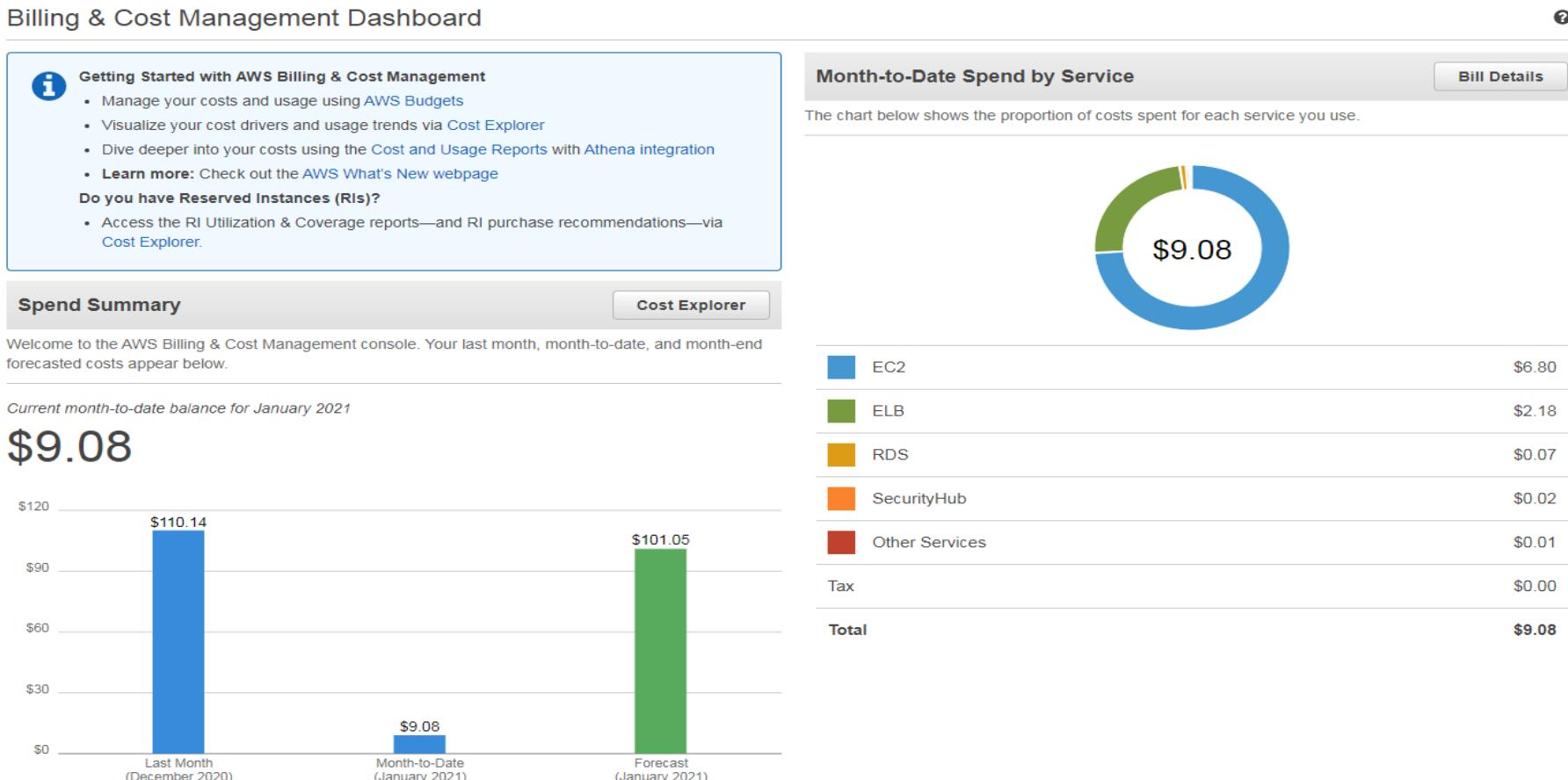
Billing and Pricing Overview

- AWS provides a solid Return on Investment (ROI) when cloud spending is properly managed
- AWS provides not only flexibility and scalability in services but also pricing options.
- Pricing is based on different pricing models and you should use the proper pricing model for the proper use case.
- AWS Provides tools that provide visibility into pricing and cloud spending.

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Billing and Cost Management Dashboard

- Home
- Cost Management
 - Cost Explorer
 - Budgets
 - Budgets Reports
 - Savings Plans
 - Cost & Usage Reports
 - Cost Categories
 - Cost allocation tags
- Billing
 - Bills
 - Orders and invoices
 - Credits
 - Purchase orders
- Preferences
 - Billing preferences
 - Payment methods
 - Consolidated billing
 - Tax settings



Charges

- There are no charges for data transfer inbound (into AWS), data transfer outbound is charged; outbound traffic is aggregated on your bill (AWS Data Transfer Out) as /GB
- Storage is paid on a per GB basis
- Compute is paid by the minute or hour

EC2 Charging Variables

EC2 is flexible on how you deploy and how pricing is structured

Instances can be priced based on

- Region/AZ
- AMI
- Networking
- Time Deployed
- Cost Model

EC2 Charging Units

Charging Units

- The minimum unit of time that will be charged is a minute (60 seconds), but after your first minute of time, it is charged for seconds.
- Cost will vary based on region, zone and other factors

EC2 Pricing Cost Models

There are four pricing models for Amazon EC2 instances:

- On-Demand Instances – Provides for instant use with no commitment
- Reserved Instances – Provides for cost savings with commitment
- Spot Instances – Available AWS capacity at a significant discount for short term
- Dedicated Hosts – Use for license bound/compliance applications

EC2 Pricing Cost Models

There are four pricing models for Amazon EC2 instances:

- On-Demand Instances billing is by the second.
- Spot Instances fluctuates periodically based on supply and demand. Supports both per hour and per second (Linux Instances) billing. (Up to 90% Discount)
- Reserved Instances terms are committed 1- or 3-year terms. (Up to 75% Discount)
- Dedicated Hosts are billed the same as On Demand but are billed per hour (Not per second)

Billing Management

Preferences

PDF

Billing
Alarm/Alert

Billing
Reports



Test Tips

- Charges are incurred for costs leaving the cloud (Egress)
- Don't get confused over Billing Alarm and Billing Alert.
- Setup Alerts then Setup Alarms is the workflow



Test Tips

- Billing is per minute initially(Then Per second) and is dependent on several factors.
- If a VM was deployed for 50 seconds then you charged a minute.
- Spot instances are good for what type of workload?
- Understand the four EC2 Pricing cost schemes



Cloud Spend Management

Managing your Cloud Spending

Reduce Cloud Spending

- Select the right instance size for your workload (Right Size)
- Use Cloudwatch, Cost Explorer to monitor costs/usage
- Use Trusted Advisor for best practices (Cost Optimization)
- Use Auto Scaling to align your resources with demand
- Consolidated Billing provides cost savings
- Shutdown or Terminate unused instances

Reduce Cloud Spending

- Reserved and Spot Instances as needed
- Consider Savings Plans
- Use Cost Allocation Tags
- Compute Optimizer
- Use Third Party Tools
- Audit your AWS deployment
- Follow Best Practices

Reduce Cloud Spending

- Reserved Instances provide up to a 75% discount
- Reserved Instances provides a “predictable” cost model
- With RIs, you commit in advance for usage which in return means a lower price
- With reservations, you can choose to pay with no-upfront, partial upfront or all upfront
- More upfront payment, the bigger discount

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Reduce Cloud Spending

Compute Savings Plans for Amazon EC2 Compute Savings Plans for AWS Fargate Compute Savings Plans for AWS Lambda

EC2 Instance Savings Plans

Compute Savings Plans for Amazon EC2

Compute Savings Plans apply to EC2 Instance usage regardless of instance family, size, AZ, AWS Region, OS or tenancy.

Select terms for your Compute Savings Plans

Term length	Payment options
1 year	No Upfront

<https://aws.amazon.com/savingsplans/pricing/>

Select a region, operating system, and tenancy to view rates

Region	Operating system	Tenancy
US East (Ohio)	Linux	Shared

Cloud Spend Management



Managing your cloud spending is critical and AWS provides your enterprise tools such as:

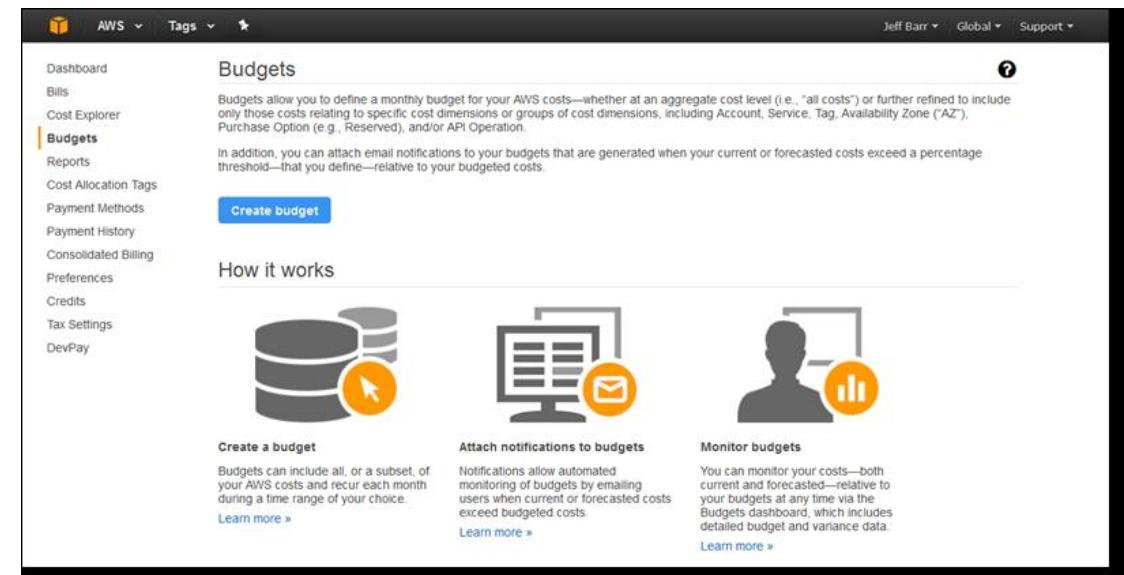
- AWS Budgets
- Cost Explorer
- AWS Cost & Usage Reports
- Billing alerts
- Billing Preferences

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Budgets

Budgets can help keeps cost in check and will send alerts

- Cost exceeds Threshold
- Forecasted to exceed
- Set Thresholds
- 2 Free budgets (Cost for exceeding)
- Up to 20,000 can be set up



Cost Explorer

Cost Explorer allows you to estimate costs and usage.

- Generate reports
- Understand cloud usage (Consumed)
- Access from Cost and Billing Management
- Access RI purchase recommendations



Budgets vs Cost Explorer

What is the real difference?

Budgets provide you the ability to set custom budgets that alert you when your costs or usage exceed (or are forecasted to exceed) your budgeted amount.

- Used to budget costs **before** they have been incurred

AWS Cost Explorer is an easy-to-use interface that lets you visualize, understand, and manage your AWS costs and usage over time.

- Used to explore costs **after** they have been incurred



Test Tips

- Right Sizing is critical for Cost Optimization/Cloud Spend Management
- Budgets can be setup to help avoid cost overruns.
- 20,000 can be setup per account
- 2 Free Budgets, Others are at a cost



Test Tips

- Cost Explorer is used to visualize costs after consumed.
- Budgets are used to forecasts costs and prevent overspending.

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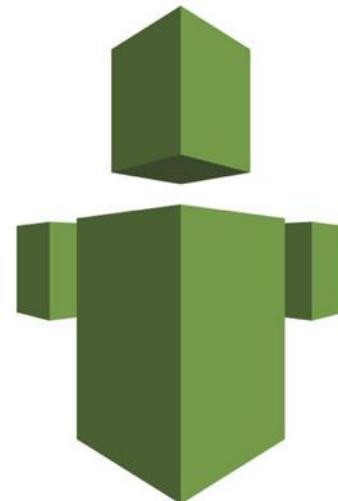
Trusted Advisor

Overview

Trusted Advisor

The main purpose of Trusted Advisor is to recommend improvements across your AWS account to help optimize and hone your environment based on AWS best practices.

- Provides a visual and live dashboard.
- Recommendations are broken into five categories



Trusted Advisor

Five distinct categories of recommendations are

- Cost Optimization - which helps to identify ways in which you could optimize your resources
- Performance - this scans your resources to highlight any potential performance issues across multiple services

Trusted Advisor Categories

Five distinct categories of recommendations are (Continued)

- Security - this category analyses your environment for any potential security weaknesses or vulnerabilities
- Fault Tolerance - which suggests best practices to maintain service operations by increasing resiliency, should a fault or incident occur across your resources
- Service Limits – Checks for more than 80% of the service limit usage.

Trusted Advisor Dashboard

Cost Optimization



0 ✓ 9 ▲ 0 !

\$7,516.85

Potential monthly savings

Performance



3 ✓ 7 ▲ 0 !

Security



2 ✓ 4 ▲ 11 !

Fault Tolerance



0 ✓ 15 ▲ 5 !

Service Limits



37 ✓ 0 ▲ 1 !

Trusted Advisor Checks

- Trusted Advisor has a list of checks based on AWS best practices.
- Uses checks to see how your account resources and architecture is implemented to determine if you're aligned with them or not.
- Acts as an auditor in some respects

The screenshot shows the AWS Trusted Advisor interface for security checks. At the top, there's a navigation bar with tabs for Security, Fault Tolerance, Service Limits, and Preferences. Below the navigation bar, there's a summary section with a lock icon, the number of checks (3 green, 2 yellow, 1 red), and a refresh button. The main area is titled "Security Checks" and lists four items:

Check Type	Description	Last Refreshed	Actions
Red (MFA on Root Account)	Checks the root account and warns if multi-factor authentication (MFA) is not enabled. MFA is not enabled on the root account.	Refreshed: 2 months ago	
Yellow (Amazon S3 Bucket Permissions)	Checks buckets in Amazon Simple Storage Service (Amazon S3) that have open access permissions or allow access to any authenticated AWS user. 1 of 7 buckets have permission properties that grant global access.	Refreshed: 2 minutes ago	
Yellow (Security Groups - Specific Ports Unrestricted)	Checks security groups for rules that allow unrestricted access (0.0.0.0/0) to specific ports. 19 of 57 security group rules allow unrestricted access to a specific port.	Refreshed: 2 months ago	
Green (Amazon EBS Public Snapshots)	Checks the permission settings for your Amazon Elastic Block Store (Amazon EBS) volume snapshots and alerts you if any snapshots are marked as public. 0 EBS snapshots are marked as public.	Refreshed: 2 minutes ago	

Trusted Advisor Checks

- Trusted Advisor has over 50 checks
- These checks depend on the support agreement you hold with AWS.
- Most of the checks are only available if you have a business or enterprise support plan with AWS.
- There are some free ones available.

Trusted Advisor Security Checks

- Security Groups
- IAM Use
- Bucket Permissions
- MFA
- Cloud Trail Logging
- RDS public snapshots
- EBS public snapshots
- CloudFront SSL Certs
- Exposed Access Keys
- Password Policy
- Key Rotation



Test Tips

- Know the use case for Trusted Advisor. – Provides recommendations and Visuals
- There are five categories of recommendations based on AWS Best Practices
- Cost Optimization requires a paid support contract
- Security and Service Limits are Free w/o support

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Support Options

Getting help when needed

Support Options

Basic Support in AWS is Free to all users.

Basic includes access to AWS Trusted Advisor - 7 core Trusted Advisor checks and provides guidance to AWS best practices

<https://aws.amazon.com/premiumsupport/plans/>

Support Options

Support in AWS has three “premium” options

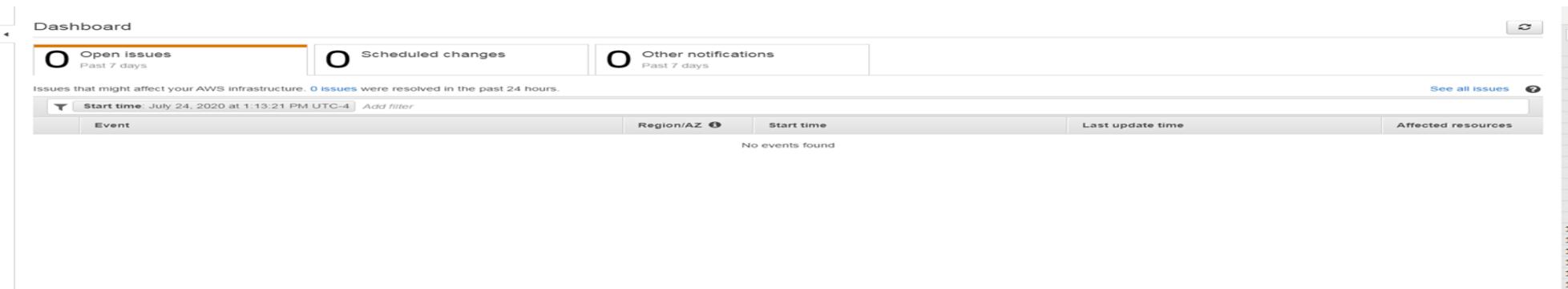
- Business
- Developer
- Enterprise

“Pay more and get better support options from support team”. Pricing is based on greater of monthly AWS usage/fee.

Support Issues

Maintenance issues can occur and can be discovered or monitored

- AWS Service Health Dashboard <https://status.aws.amazon.com/>
- Personal Health Dashboard





Test Tips

- Basic Support is free and includes 7 Trusted Advisor Checks
- Personal Health Dashboard is for your deployed AWS resources
- Service Health Dashboard is global AWS resources

Section Summary

Section 4 -Cloud Billing /Pricing and Cloud Support



4

Section

Section Summary

- Pricing is based on different pricing models and you should use the proper pricing model for the proper use case.
- The main purpose of Trusted Advisor is to recommend improvements across your AWS account to help optimize and hone your environment based on AWS best practices
- Budgets can be setup to help avoid cost overruns. 20,000 can be setup per account, 2 Free Budgets, Others are at an additional cost.
- Amazon AWS offers pay-as-you-go, on-demand pricing, with the best ROI for your specific use cases.
- Cost Explorer allows gain insight to what your cloud spend has been.
- Personal Health Dashboard is for you deployed AWS resources whereas the Service Health Dashboard is for global AWS resources.
- Basic Support includes access to AWS Trusted Advisor - 7 Core Trusted Advisor checks and provides guidance to AWS best practices

Section Review Questions

Section 4 - Cloud Billing / Pricing and Cloud Support



Section Review Questions

Which of the following are the best ways we can manage our billing and determine cost issues? (Select Two)

- Trusted Advisor C.O checks
- Cost Explorer
- Systems Manager
- Contact Support

Section Review Questions

Which of the following are the best ways we can manage our billing and determine cost issues? (Select Two)

- Trusted Advisor C.O checks
- Cost Explorer
- Systems Manager
- Contact Support

Section Review Questions

Which of the following tool would you want to use to understand previous cloud spending patterns? (Select One)

- Trusted Advisor C.O checks
- Cost Explorer
- Budgets
- Systems Manager

Section Review Questions

Which of the following tool would you want to use to understand previous cloud spending patterns? (Select One)

- Trusted Advisor C.O checks
- Cost Explorer
- Budgets
- Systems Manager

Section Review Questions

Which of the following two statements are true about Budgets in AWS? (Select Two)

- Budgets are included with Enterprise and Business support plans
- You receive 2 Free budgets and if you use more than two you will be charged per budget.
- Up to 20,000 can be set up in AWS Budgets
- Budgets can provide insight into past spending habits.

Section Review Questions

Which of the following two statements are true about Budgets in AWS? (Select Two)

- Budgets are included with Enterprise and Business support plans
- You receive 2 Free budgets and if you use more than two you will be charged per budget.
- Up to 20,000 can be set up in AWS Budgets
- Budgets can provide insight into past spending habits.

Section Review Questions

Which of the following statements are correct about charges incurred in AWS? (Select Three)

- There no charges for data transfer inbound (into AWS)
- Data transfer outbound is not charged (out of AWS)
- Storage is paid on a per GB basis
- Compute is paid by the minute or hour
- Support is charged by number of support calls

Section Review Questions

Which of the following statements are correct about charges incurred in AWS? (Select Three)

- There no charges for data transfer inbound (into AWS)
- Data transfer outbound is not charged (out of AWS)
- Storage is paid on a per GB basis
- Compute is paid by the minute or hour
- Support is charged by number of support calls

Section Review Questions

Your organization is wanting to reserved cloud spending and move off of On Demand instances. What would be benefits of using a Reserved Instance? (Select Three)

- Reserved Instances provide for EC2, RDS, ECS and Lambda savings.
- Reserved Instances provides a “predictable” cost model
- With RIs, you commit in advance for usage which in return means a lower price
- With reservations, you can choose to pay with no-upfront, partial upfront or all upfront

Section Review Questions

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- With RIs, you commit in advance for usage which in return means a lower price
- With reservations, you can choose to pay with no-upfront, partial upfront or all upfront

Section Review Questions

You are currently having issues with EC2 instances only in the Northern VA region. What site could you reference to find out if there is a “system wide” issue without logging into your AWS Account? (Select One)

- Trusted Advisor Site
- Personal Health Dashboard
- AWS Service Health Dashboard
- AWS Support Web Dashboard

Section Review Questions

You are currently having issues with EC2 instances only in the Northern VA region. What site could you reference to find out if there is a “system wide” issue without logging into your AWS Account? (Select One)

- Trusted Advisor Site
- Personal Health Dashboard
- **AWS Service Health Dashboard**
- AWS Support Web Dashboard



Section 5 : Cloud Security/IAM with AWS

Understanding the domain testable objectives

Section Overview

DOMAIN
OVERVIEW

Intro to AWS
Security

AWS Security
Best Practices

Shared
Security
Model

CLOUD IAM

Trusted
Advisor

AWS Shield

AWS Macie

AWS Inspector

WAF

Section
Review

Review
Questions

Domain Overview

- Define the AWS shared responsibility model
- Define AWS Cloud security and compliance concepts
- Identify AWS access management capabilities
- Identify resources for security support



Intro to AWS Security Services

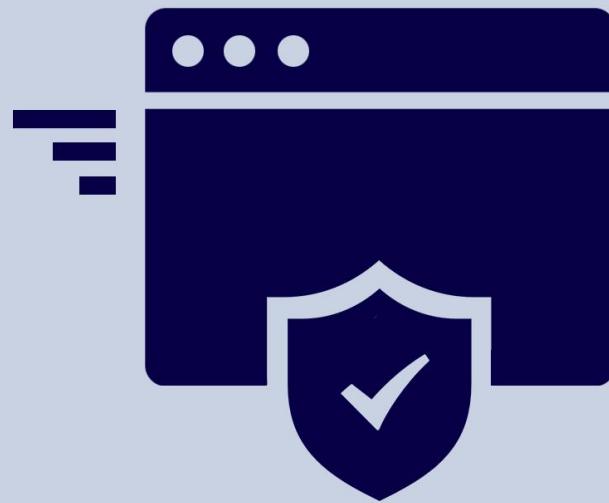
Understanding your Options

AWS Security Services



- Automation
- Fully Managed Services
- Secure and Reliable
- Built for Scale
- Large Partner Ecosystem
- Programmable
- Free and Pay As You Go

Types of Security Services



- Data Protection
- Identity and Access Management
- Infrastructure Protection
- Threat Detection
- Continuous Monitoring
- Compliance
- Data Privacy



AWS Security Services

- AWS Security Hub
- AWS Guard Duty
- AWS CloudHSM
- Amazon Inspector
- AWS Key Management Service
- AWS Trusted Advisor
- AWS Cloud Trail

AWS Security Services

- AWS SSO
- AWS Cognito
- AWS Directory Services
- AWS Resource Manager
- AWS Config
- AWS WAF
- AWS Shield

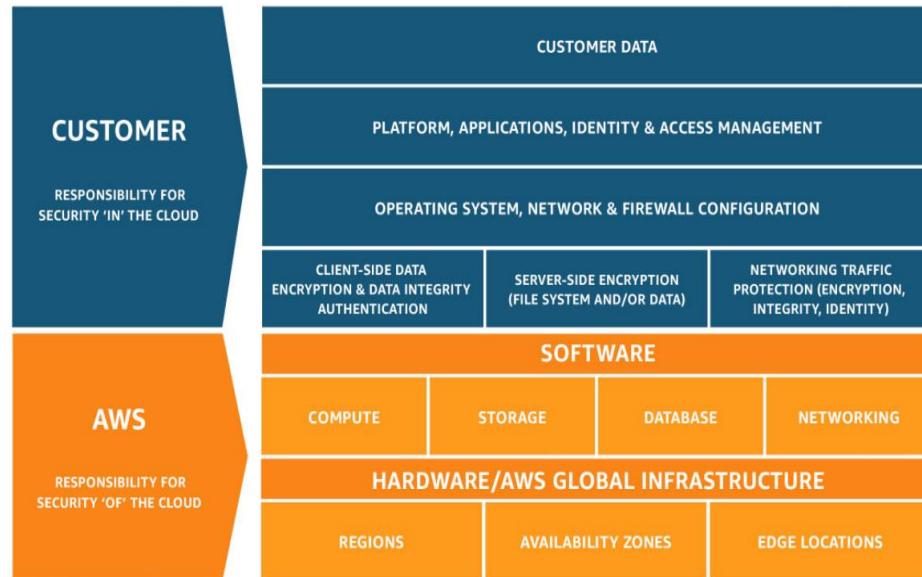




AWS Shared Security and Best Practices

Overview of AWS Security Best Practices and Share Responsibility

AWS Shared Responsibility Model



Shared Security Model – Actually review the shared responsibility model and know what the provider does for security and what the user is responsible for.

Customer and AWS have distinct responsibilities

<https://aws.amazon.com/compliance/shared-responsibility-model/>

AWS Security Best Practices



Just some of the Best Practices

- Patching – Patching your hosts is critical.
Linux or Windows.
- Root accounts can be damaging if compromised. Disable root access for APIs
- Multi Factor Authentication – Ensure that MFA implementations are enforced.

AWS Security Best Practices

AWS Just some of the Best Practices

- IAM Access Keys - Rotate or change your access keys at least once every 60 -90 days.
- IAM – Use the “Principle of least privilege”.
- Trusted Advisor – Use trusted advisor for finding the obvious security flaws in your deployments
- Auditing – The only way to really know what is going on is by using an auditing solution. Audit access logs, audit permissions, audit resource utilization.

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AWS Just some of the Best Practices

- AWS RDS Security Group Access Risks- grants specific security group permission for VM instance to access from Ips
- CloudFront SSL Certificates. Validated that the origin server has current SSL certificates.



IAM

Overview

AWS Credentials

Security credentials are used to verify who you are and whether you have permission to access the resources that you are requesting.



AWS Temporary Credentials



- Temporary credentials expire automatically after a set period.
- You have control over the duration that the credentials are valid.

AWS Account ID

AWS account ID

- A 12-digit number, such as 123456789012, that uniquely identifies an AWS account.

Canonical ID

- An alpha-numeric identifier, such as 79a59df900b949e55d96a1e698fbacedfd6e09d98eacf8f8d5218e7cd47ef2be, that is an obfuscated form of the AWS account ID.
- Use console or CLI to find credentials
- `#aws sts get-caller-identity --query Account --output text`

Role or Policy?

- A policy is an object in AWS that, when associated with an entity or resource, defines their permissions.
- AWS evaluates these policies when a principal, such as a user, makes a request.
- Permissions in the policies determine whether the request is allowed or denied.
- Most policies are stored in AWS as JSON documents.

Role or Policy?

“IAM Roles are defined as a set of permissions that grant access to actions and resources in AWS and a policy is something that will be assigned to a role”

Role or Policy?

An inline policy is one that is attached with an IAM identity (such as a user, group, or role). Inline policies are the inherent part of the associated identity.

IAM Policies

There are **three different types of IAM policies**

- Managed Policies
- Customer Managed Policies
- Inline Policies.

Access Analyzer

AWS IAM Access Analyzer helps you identify the resources in your organization and accounts, such as Amazon S3 buckets or IAM roles, that are shared with an external entity.

Root User

- This is the root user. Accessed by signing in with the email address and password that you used to create the account.
- The AWS account root user or an IAM administrator for the account can create IAM identities

Root User and Groups

- An **IAM user** is an entity that you create in AWS
- A *group* is a collection of IAM users managed as a unit.
- An IAM role is very similar to a user, in that it is an identity with permission policies that determine what the identity can and cannot do in AWS

IAM Role Considerations

Consider creating an IAM role in the following situations

- You have an app that runs on an Amazon Elastic Compute Cloud (Amazon EC2) instance and that app makes requests to AWS.
- You're creating an app that runs on a mobile phone and that makes requests to AWS.
- You want to allow users to federate into AWS.



Test Tips

- Differentiate between Roles and Users.
- Root User vs IAM User
- “IAM Roles are defined as a set of permissions that grant access to actions and resources in AWS and a policy is something that will be assigned to a role”



Test Tips

- “IAM Roles are defined as a set of permissions that grant access to actions and resources in AWS and a policy is something that will be assigned to a role”
- Use case of AWS IAM Access Analyzer



Security Groups and NACLS

Protecting the Networks

Security Groups and NACLS

VPC – Security Group

- Security groups are responsible for controlling the traffic in and out of your instances.
- Security groups are a required form of defense for instances, because an instance must be associated with at least one security group.
- Ports and Protocols
- Allow only, No Denies
- Uses least privilege approach
- Rules are applied as a group

Security Groups and NACLs

VPC – NACLs

- NACLs limit the outbound traffic to specific instances or to certain destinations only which are also more granular.
- Automatically applied to all instances in a subnet
- Both Allow and Deny rules allowed
- Rules are processed one at a time

Security Groups and NACLS

Comparing– NACLS vs Security Groups

Security Groups	NACLS
Instance level	Subnet Level
Stateful	Stateless
All Rules	In numbered order
Applies to EC2 Instance	ALL

Security Groups and NACLS

Let us remember for the exam

“Security groups work at the instance level while NACLS work at the subnet level”



Test Tips

- Security Groups are firewall rules that allow access to the VM.
- Security Groups support Allow only, No Denies
- NACLs limit the outbound traffic to specific instances or to certain destinations only which are also more granular.
- NACLs provide Allow and Deny rules



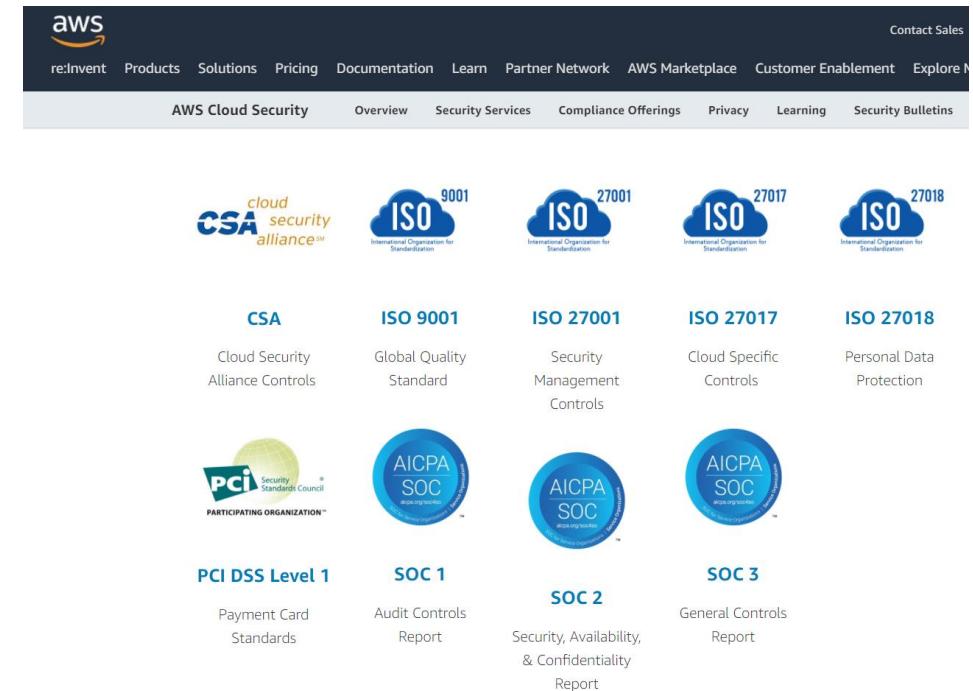
Compliance Resources

Overview of Options

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Compliance

- AWS computing environments are continuously audited, with certifications from accreditation entities across geographies and verticals (Fedramp, SOX, ISO 27001, PCI DSS, etc.)
- Obtain a Compliance Report with AWS Artifact
- <https://aws.amazon.com/compliance/programs/>



Compliance Tools/Services

- AWS Audit Manager - Provides you the ability to continuously audit your AWS usage to simplify how you assess risk and compliance with regulations and industry standards.
- AWS Artifact – Provides a no cost, self-service portal for on-demand access to AWS compliance reports and for entering into select online agreements.
- AWS Inspector - Amazon Inspector enables you to analyze the behavior of your AWS resources and helps you identify potential security issues. (Compliance Reporting)

Compliance Tools/Services

- AWS Config – Provides cloud managers the insight to assess, audit, and evaluate the configurations of your AWS resources.
- AWS Security Hub - provides a consolidated view of your security status in AWS. Automate security checks, manage security findings, and identify the highest priority security issues across your AWS environment.

Security standards

Enabling AWS Security Hub grants it permissions to conduct security checks. [Service Linked Roles \(SLRs\)](#) with the following services are used to conduct security checks: Amazon CloudWatch, Amazon SNS, AWS Config, and AWS CloudTrail.

- Enable AWS Foundational Security Best Practices v1.0.0
- Enable CIS AWS Foundations Benchmark v1.2.0
- Enable PCI DSS v3.2.1

CloudTrail

- CloudTrail is a service that enables governance, compliance, operational auditing, and risk auditing.
- Log continuously, monitor continuously and retain account activity

The screenshot shows the AWS CloudTrail Dashboard. At the top left, it says "CloudTrail > Dashboard". Below that is a "Dashboard" section with a "Create trail" button. To the right are two panels: "CloudTrail Insights" and "Event history".

CloudTrail Insights:

Event name	Event start time
CreateLogGroup	July 22, 2020, 16:28 (UTC-04:00)

Event history:

Event name	Event time	Event source
RunInstances	July 27, 2020, 14:27 (UTC-04:00)	ec2.amazonaws.com
RunInstances	July 27, 2020, 14:25 (UTC-04:00)	ec2.amazonaws.com
RunInstances	July 27, 2020, 14:24 (UTC-04:00)	ec2.amazonaws.com
RunInstances	July 27, 2020, 14:23 (UTC-04:00)	ec2.amazonaws.com
RunInstances	July 27, 2020, 14:22 (UTC-04:00)	ec2.amazonaws.com

At the bottom right of the event history table is a link "View full Event history".



Security Services

Overview for Cloud Practitioner Exam

Security Services

- AWS Inspector
- AWS Guard Duty
- AWS Macie
- AWS Config



AWS Inspector

AWS Inspector

- Amazon Inspector is an automated security assessment service that helps improve the security and compliance of applications deployed on AWS.
- Amazon Inspector automatically assesses applications for exposure, vulnerabilities, and deviations from best practices.



AWS Inspector

- Amazon Inspector security assessments help you check for unintended network accessibility of your Amazon EC2 instances and for vulnerabilities on those EC2 instances.
- Helps reduce exposure to vulnerabilities
- API Driven with optional agent
- Built in library of rules and reports

AWS Inspector

Rules and Reports

- Rule Severity are High, Medium or Low
- Findings Report and a Full Report

AWS Inspector

Welcome to Amazon Inspector

Amazon Inspector assessments check for security exposures and vulnerabilities in your EC2 instances. Learn more about [how Inspector functions](#).

Inspector uses a [Service-linked Role](#) to describe your EC2 instances and network configuration.

Assessment Setup

You can use the options below to get the following assessments on all of your EC2 instances in this AWS region. Click [Run weekly](#) for the assessment to run at this time once a week starting now, [Run once](#) for a one-time assessment, or [Advanced setup](#) for custom assessments.

Network Assessments (Inspector Agent is not required)

- **Assessments performed:** Network configuration analysis to checks for ports reachable from outside the VPC. [Learn more](#)
- **Optional Agent:** If the Inspector Agent is installed on your EC2 instances, the assessment also finds processes reachable on port. Learn more about [Inspector Agent](#)
- **Pricing:** Pricing for [network assessments](#) is based on the monthly volume of instance-assessments, where an instance-assessment denotes a successful assessment of an instance. For example, for 100 instances assessed weekly, the monthly cost would be around \$61/month. [Learn more](#)

Host Assessments (Inspector Agent is required)

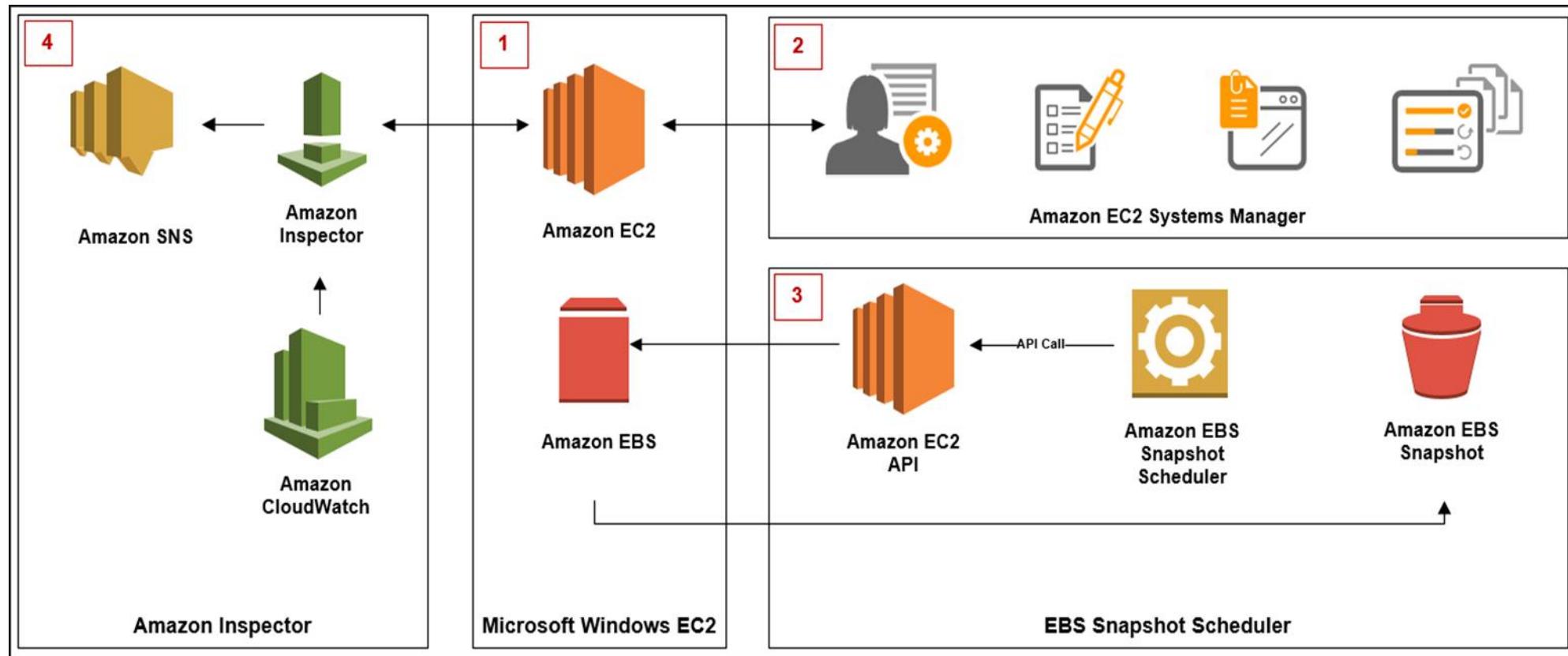
- **Assessments performed:** Vulnerable software (CVE), host hardening (CIS benchmarks), and security best practices. [Learn more](#)
- **Agent Deployment:** Inspector assessments require an agent to be installed on your EC2 instances. We will automatically install the agent for instances that allow [System Manager Run Command](#). Learn more about [Inspector Agent](#) and how to manually install agent.
- **Pricing:** Pricing for [host assessments](#) is based on the monthly volume of agent-assessments, where an agent-assessment denotes a successful assessment of an instance. For example, for 100 instances assessed weekly, the monthly cost would be around \$120/month. [Learn more](#)

[Run weekly \(recommended\)](#)

[Run once](#)

[Advanced setup](#)

AWS Inspector





AWS Guard Duty

AWS Guard Duty

- Analyzes literally billions of events to identify trends, patterns, and anomalies to find behavior that are recognizable signs that something may be wrong.
- Receives Input from multiple data streams.
- Several threat intelligence feeds
- Staying aware of malicious IP addresses and domains

AWS Guard Duty

GuardDuty searches customers specified

- Virtual Private Cloud (VPC) Flow Logs
- AWS CloudTrail
- DNS logs

You can also set a whitelist list and a blacklist

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AWS Guard Duty

The screenshot shows the AWS GuardDuty findings interface. The left sidebar includes links for GuardDuty, Findings (selected), Settings, Lists, Accounts, What's New, and Free trial. The main area displays a table of findings with columns: Finding type, Resource, Last seen, and Count. Each finding is preceded by a small colored icon (blue, orange, red, or green). The table lists 16 findings, all of which occurred 'a few seconds ago' and involve EC2 instances (e.g., UnauthorizedAccess, Trojan, Recon, Backdoor, DenialOfService, RDPBruteForce, PortProbe, EMRUnprotectedPort, PortRelay, UnusualProtocol, Spambot, NetworkPortUnusual).

Finding type	Resource	Last seen	Count
[SAMPLE] UnauthorizedAccess:EC2/TorIPCaller	Instance: i-99999999	a few seconds ago	1
[SAMPLE] Trojan:EC2/BlackholeTraffic	Instance: i-99999999	a few seconds ago	1
[SAMPLE] Recon:EC2/Portscan	Instance: i-99999999	a few seconds ago	1
[SAMPLE] Backdoor:EC2/DenialOfService.Udp	Instance: i-99999999	a few seconds ago	1
[SAMPLE] Backdoor:EC2/DenialOfService.Tcp	Instance: i-99999999	a few seconds ago	1
[SAMPLE] UnauthorizedAccess:EC2/RDPBruteForce	Instance: i-99999999	a few seconds ago	1
[SAMPLE] Recon:EC2/PortProbeUnprotectedPort	Instance: i-99999999	a few seconds ago	1
[SAMPLE] Backdoor:EC2/DenialOfService.UdpOnTcpPorts	Instance: i-99999999	a few seconds ago	1
[SAMPLE] Recon:EC2/PortProbeEMRUnprotectedPort	Instance: i-99999999	a few seconds ago	1
[SAMPLE] UnauthorizedAccess:EC2/TorClient	Instance: i-99999999	a few seconds ago	1
[SAMPLE] Backdoor:EC2/DenialOfService.Dns	Instance: i-99999999	a few seconds ago	1
[SAMPLE] UnauthorizedAccess:EC2/TorRelay	Instance: i-99999999	a few seconds ago	1
[SAMPLE] Backdoor:EC2/DenialOfService.UnusualProtocol	Instance: i-99999999	a few seconds ago	1
[SAMPLE] Backdoor:EC2/Spambot	Instance: i-99999999	a few seconds ago	1
[SAMPLE] Behavior:EC2/NetworkPortUnusual	Instance: i-99999999	a few seconds ago	1

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AWS Guard Duty

The screenshot shows the AWS GuardDuty service interface under the 'List management' section. The left sidebar includes links for Findings, Settings, Lists (which is selected), Accounts, What's New, Free trial, and Partners. The main content area is divided into two sections: 'Trusted IP lists' and 'Threat lists'. Both sections follow a similar layout: a descriptive text block with a 'Learn more' link, a blue-bordered callout box with an info icon and a detailed description, and a table header with columns for List name, List file URL, Format, and Active status.

Trusted IP lists

Trusted IP lists consist of IP addresses that are whitelisted for secure communication with your AWS environment. GuardDuty does not generate findings for IP addresses that are included in trusted IP lists. [Learn more](#)

Info Trusted IP lists consist of IP addresses that are whitelisted for secure communication with your AWS environment. GuardDuty does not generate findings for IP addresses that are included in trusted IP lists. [Learn more](#)

List name	List file URL	Format	Active
-----------	---------------	--------	--------

Threat lists

Threat lists consist of known malicious IP addresses. GuardDuty generates findings for IP addresses that are included in threat lists. [Learn more](#)

Info Threat lists consist of known malicious IP addresses. GuardDuty generates findings for IP addresses that are included in threat lists. [Learn more](#)

List name	List file URL	Format	Active
-----------	---------------	--------	--------



AWS Macie

AWS Macie

- AWS Macie is a security service that use Machine Learning to discover, identify and protect sensitive data in AWS.
- Looks for PII data or intellectual property
- Data Loss Prevention (DLP)



AWS Certified SysOps Administrator Associate 2020

AWS Macie

Amazon Macie automates the discovery of sensitive data at scale and lowers the cost of protecting your data. Macie automatically provides an inventory of Amazon S3 buckets including a list of unencrypted buckets, publicly accessible buckets, and buckets shared with AWS accounts outside those you have defined in AWS Organizations.

The screenshot shows the Amazon Macie service console. At the top right, there is a dropdown menu set to "US East (N. Virginia)". The main header features the Amazon Macie logo with a blue mountain icon and the text "amazon Macie". Below the header, a sub-header reads: "Amazon Macie is a data visibility security service that helps classify and protect your sensitive and business-critical content." There are two calls-to-action: a yellow "GET STARTED" button and a blue "Getting started guide" link. The main content area is divided into three sections: "Discover" (represented by a person icon with a cursor over a document), "Classify" (represented by a computer monitor icon with a cursor over binary code and gears), and "Protect" (represented by a computer monitor icon with a cursor over a padlock). Each section has a brief description and a "Learn more" link. At the bottom, a note states: "Amazon Macie processes multiple types of content sources. For detailed pricing information about each content source that Macie uses and usage related charges, see [Amazon Macie Pricing](#)".



AWS Config

AWS Config

- AWS Config is a service that enables you to assess, audit, and evaluate the configurations of your AWS resources.
- Config continuously monitors and records your AWS resource configurations and allows you to automate the evaluation of recorded configurations against desired configurations.

AWS Config

- AWS Config offers AWS defined, pre-built templates and config rules along with user-defined customized rules.
- Account owner is immediately notified via Amazon SNS about all changes to the resources.
- Note---This AWS Config rule is currently only available in AWS N. Virginia region for now, but AWS Config as a service is available in all the regions.

AWS Config

- Retrieves configurations of one or more resources that exist in your account
- Retrieves historical configurations of one or more resources
- Produces a snapshot of the current configurations of the supported resources
- Evaluates your AWS resource configurations for desired settings
- Sends notifications whenever a resource is created, modified, or deleted
- Shows relevant relationships between resources



Test Tips

- Distinguish between security services.
- Macie uses ML and is for DLP.
- Config is use for configuration assessments
- Guard Duty uses threat intelligence feeds and is a Threat Intelligence tool

Section Summary

Section 5 -AWS Security and Compliance Services



5

Section

Section Summary

- Audit access logs, audit permissions, audit resource utilization
- Policies can be categorized as permissions. Roles do not have permissions
- Identity vs Resources based policies.
- AWS Config is a service that enables you to assess, audit, and evaluate the configurations of your AWS resources.
- Amazon Inspector security assessments help you check for unintended network accessibility of your Amazon EC2 instances and for vulnerabilities on those EC2 instances.
- Guard Duty receives threat intelligence from numerous feeds. Threat Intelligence Tool
- Macie is a DLP Solution for PII and other sensitive information.
- Trusted Advisor has five distinct categories of recommendations.
- CloudTrail records both Management and Data Events. Publishes every 5 minutes
- NACLs limit the outbound traffic to specific instances or to certain destinations only which are also more granular.

Section Review Questions

Section 5 - AWS Security and Compliance Services



Section Review Questions

Which of the following statements are true about CloudTrail? (Select Two)

- CloudTrail is able to capture full application logs from services
- CloudTrail is enabled by default for new AWS Accounts
- By default, all regions are applied to a new trail
- CloudTrail focuses on auditing API activity

Section Review Questions

Which of the following statements are true about CloudTrail? (Select Two)

- CloudTrail is able to capture full application logs from services
- **CloudTrail is enabled by default for all AWS Accounts**
- By default, all regions are applied to a new trail
- **CloudTrail focuses on auditing API activity**

Section Review Questions

Which of the following AWS services focuses on threat intelligence. (Select One)

- GuardDuty
- AWS WAF
- Trusted Advisor
- AWS Security Hub

Section Review Questions

Which of the following AWS services focuses on threat intelligence. (Select One)

- GuardDuty
- AWS WAF
- Trusted Advisor
- AWS Security Hub

Section Review Questions

Which of the following statements are true about IAM Groups in AWS? (Select Two)

- An IAM group is a collection of IAM users
- A user can not belong to multiple groups
- A user can belong to multiple groups
- Groups do not have credentials and therefore can access web services

Section Review Questions

Which of the following statements are true about IAM Groups in AWS? (Select Two)

- An IAM group is a collection of IAM users
- A user can not belong to multiple groups
- A user can belong to multiple groups
- Groups do not have credentials and therefore can access web services

Section Review Questions

Which of the following statements are true about AWS Security Token Services in AWS? (Select Two)

- Provides trusted users with temporary credentials
- AWS STS is a regional service
- AWS STS is a global service
- Provides a customized domain for logins

Section Review Questions

Which of the following statements are true about AWS Security Token Services in AWS? (Select Two)

- Provides trusted users with temporary credentials
- AWS STS is a regional service
- AWS STS is a global service
- Provides a customized domain for logins

Section Review Questions

Which of the following AWS services uses ML to provide for data loss prevention of sensitive data? (Select One)

- GuardDuty
- Macie
- Inspector
- AWS Security Hub

Section Review Questions

Which of the following AWS services uses ML to provide for data loss prevention of sensitive data? (Select One)

- GuardDuty
- Macie
- Inspector
- AWS Security Hub

Section Review Questions

“IAM _____ are defined as a set of permissions that grant access to actions and resources in AWS and a _____ is something that will be assigned to a role”

(Select One)

- Roles, Policy
- Accounts, Policy
- Policies, Roles
- Roles, Permission

Section Review Questions

“IAM _____ are defined as a set of permissions that grant access to actions and resources in AWS and a _____ is something that will be assigned to a role”

(Select One)

- Roles, Policy
- Accounts, Policy
- Policies, Roles
- Roles, Permission



Section 6 : Cloud Architecture Best Practices

Understanding the domain testable objectives

Section Overview

DOMAIN
OVERVIEW

AWS Well
Architected
Framework

Demo - AWS
Well Architected
Framework Tool

AWS Cloud
Design

AWS Cloud
Design
Principles

Scalability and
Elasticity

HA

Section Review

Review
Questions

Domain Overview

- List the different cloud architecture design principles



AWS Well Architected Framework

What is the Well Architected Framework?

Design Principles

The AWS Well Architected Framework

- Documentation is extensive and I recommend you review before exam.
- <https://wa.aws.amazon.com/index.en.html>

Design Principles

The AWS Well Architected Framework

- Framework has Five Pillars
- Best Practices mean to enforce good decisions
- Solid Security
- Provide for Consistent Measurement

Design Principles

The AWS Well Architected Framework

- Security
- Reliability
- Performance
- Operational Excellence
- Cost Optimization

Design Principles

The AWS Well Architected Framework

- Scalability
- Disposable Resources
- Automation



How is Cloud Different than On Premises

Different for On Premises Design and Deployments

IT Architectures and Assets

- IT Architectures can provide significant benefits when updated.
- Moving from On Premises to “Cloud” can lead to immediate benefits like scalability, agility, performance and elasticity, that are possible.
- Efficiencies can be induced that are either technical or business or both.
- CAPEX vs OPEX costing can be achieved.
- IT Assets become more “programmable” in the cloud
- AWS services are up and running in minutes and you can utilize them as needed, no limits are set. (Capacity is unlimited)

Cloud Applications

- Applications can be deployed to meet compliance requirements
- Applications can be deployed closer to users to provide benefits (lower latency)
- High availability and fault tolerance for your apps can be deployed with AWS global infrastructure. No need for DR sites.
- Managed Services are available to reduce administrative overhead.
- Instantly provision resources in the cloud while on premises can be days or longer.



AWS Design Principles

Designing your services

Design Principles

- Loose Coupling
- Services, not Servers
- Databases
- Managing Volumes of Data
- Removing SPOF
- Optimize Costs
- Caching

Loose Coupling

- Security
- Cloud Architecture Best Practices

Loosely Coupled

- A loosely coupled architecture is more fault tolerant, as components are not directly dependent on each other and the failure of one component does not bring the whole system down
- Highly available environments use multiple availability zones (AZ).
- Avoid Single Point of Failures (SPOF)
- Enable Elasticity such as thru ELB and AutoScaling

Loosely Coupled

- A loosely coupled architecture is more fault tolerant, as components are not directly dependent on each other and the failure of one component does not bring the whole system down
- Highly available environments use multiple availability zones (AZ).
- Avoid Single Point of Failures (SPOF)
- Enable Elasticity such as thru ELB and AutoScaling

Design Principles

- Best practices - Use AWS managed services and also migrate to serverless architectures as much as possible.
- Use Services, not Servers For example - AWS Lambda is the AWS compute service that will run your code on your behalf using AWS architecture.
- Managed services can reduce your administrative overhead. For Example - With Elastic Beanstalk your developers just code and AWS worries about the backend.
- Automation is also key. Automate alerts, provisioning, etc.

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Overview of AWS Infrastructure



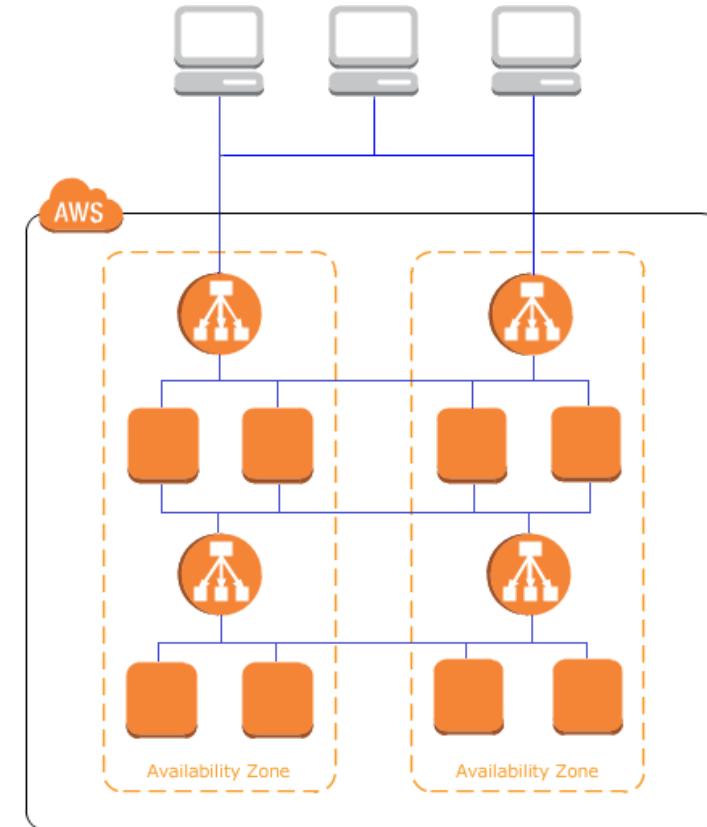


Multi-Tier Architecture Solutions

- Single Tier or Multi Tier?

Defining Multi Tier

- Single-Tier
- Multi-Tier

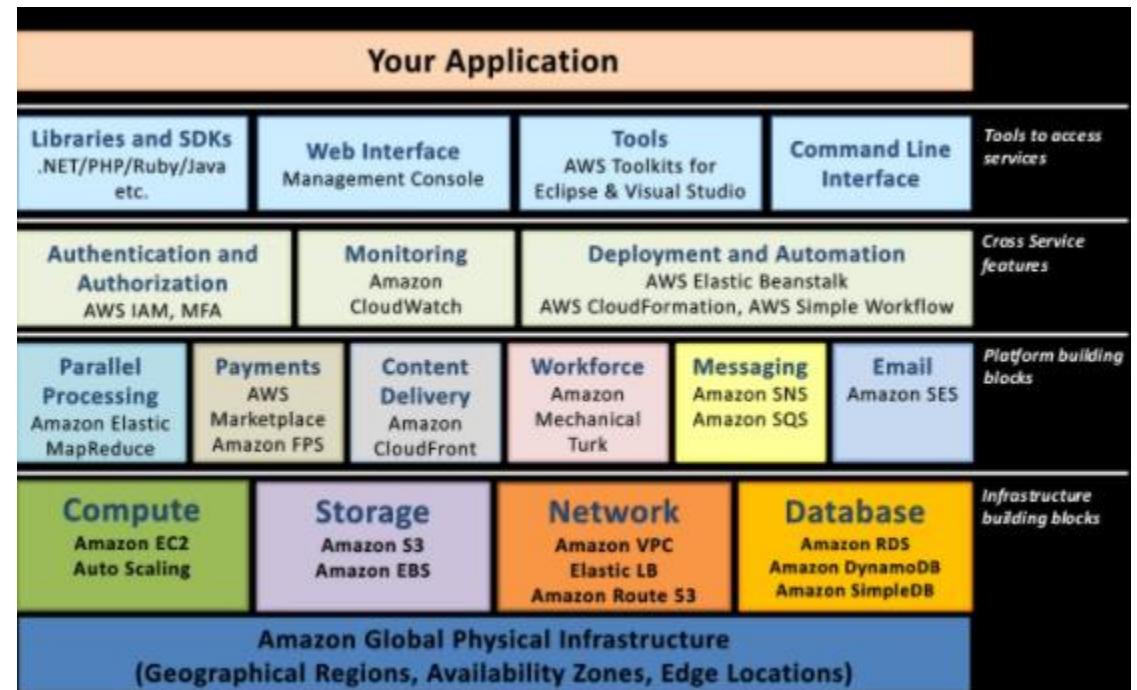


Defining Multi Tier

- A multi-tier application is any application developed and distributed among more than one layer.
- It logically separates the different application-specific, operational layers.
- The number of layers varies by business and application requirements, but three-tier is the most commonly used architecture.
- Each of these layers or tiers does a specific task and can be managed independently of each other

- Public Layer
- Application Layer
- Database Layer

Layers of Cloud Apps



Considerations

- Modularity
- Scalability
- HA
- Fault Tolerance
- Security

Fault Tolerant Services

- S3
- Elastic Load Balancer
- Autoscaling
- CloudFront
- Elastic BeanStalk
- IAM
- ElastiCache



Scalability/Elasticity

Considerations for the exam requirements

Scalability and Elasticity

Elasticity and Scalable are commonly confused.

- Scalability is the **measure of a system's ability** to increase or decrease in performance and cost in response to changes in application and system processing demands.
- Elasticity is the ability to automatically or dynamically increase or decrease the resources as needed. In the cloud, resources are elastic, meaning they can instantly grow or shrink to match the requirements of a specific application.
Elasticity - match the supply of resources to your demand.



Elasticity and Scalability

- Scalability often is discussed at the application layer, highlighting capability of a system, network or process to handle a growing amount of work, or its potential to be enlarged in order to accommodate that growth.
- Scalable architectures provide the ability to grow your environment when this is needed usually on demand.
- Cloud computing allows virtually unlimited growth, but the underlying architecture must be designed to support this.
- Horizontal, Vertical or Diagonal Scaling

Elasticity and Scalability

For example, Elasticity in cloud infrastructure involves enabling the hypervisor to create virtual machines or containers with the resources to meet the real-time demand.

Elasticity and Scalability

Auto Scaling, you can maintain application availability and scale your Amazon EC2 capacity up or down automatically according to conditions you define.



Test Tips

- Know scalability vs elasticity.
- ELB and Auto Scaling spans across Multi-AZs to provide High Availability
- Edge Caching or Application Data



HA/FT

Terminology, Features and Capabilities

HA vs FT

- High Availability(HA) means that a system will almost always maintain uptime, albeit sometimes in a degraded state.
- High availability is architected by the complete removing single points of failure by using system redundancy
- Fault Tolerance (FT) means that a system will almost always maintain uptime and users will not notice anything different during a primary system outage.
- Consistent User Experience

HA vs FT

- Reliability is the outcome cloud service providers strive for (result)
- Resiliency refers to a system's ability to recover from a fault and maintain persistency of service dependability in the face of faults
- Resiliency is the ability of a cloud-based service to withstand certain types of failure and yet remain functional from the customer perspective.
- In Summary --- Reliability is the outcome, Resilience is the way you achieve the outcome.

Stateless or Stateful?

Stateful or Stateless?

- Stateless applications don't "store" any data and connections are independent from one another. (loosely coupled)
- A stateless application is an application that needs no knowledge of previous interactions and stores no session information. Stateless is ideal for distributed systems.
- Stateful applications store data such as sessions, hosts ids, sign ins, etc and are generally dependent on the platform. (prior knowledge)
- Stateless applications provide for better scaling and HA capacity.

Loosely Coupled

- A loosely coupled architecture is more fault tolerant, as components are not directly dependent on each other and the failure of one component does not bring the whole system down
- Highly available environments use multiple availability zones (AZ).
- Avoid Single Point of Failures (SPOF)
- Enable Elasticity such as thru ELB and AutoScaling

Microservices

- Microservices – Is a software architecture that can be achieved by decoupling a monolithic application into independent modules that each contain the components necessary to execute a single business function.
- Microservices typically communicate with each other using language-agnostic APIs like REST.

Benefits of High Availability

- High availability across multiple instances/multiple availability zones.
- Auto Scaling of instances (scale up and scale down) based on the number of requests coming in
- Additional Security to the instances/database that is in production
- No impact to end-users during the newer version of code deployment
- No Impact during patching the instances

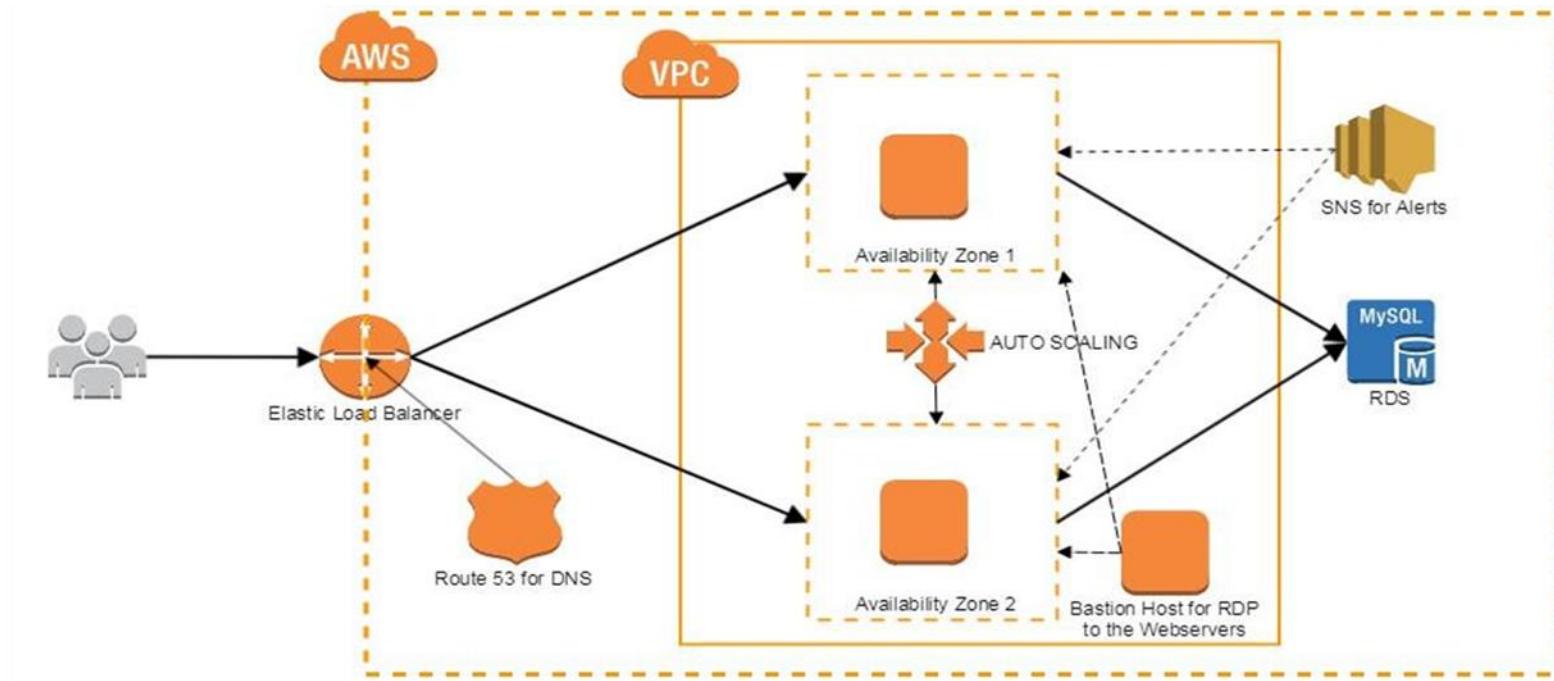
High Availability Monitoring

- Instance hardware failure can be avoided as Auto Scaling automatically detects this and launches a new instance in case this happens.
- Auto Scaling/ELB also has health monitors that detect Zone failure and launch new instances in a healthy zone until AWS restores the failure Zone to a healthy state.
- Metrics in the Cloud Watch service can be customized so that we can monitor the application based on the number of users using the application or also the memory consumed by the particular instance.

Services that provide HA

- EC2 – Elastic Compute Cloud
- AWS RDS – Relational Database Service
- AS – Auto Scaling
- ELB – Elastic Load Balancer
- SNS – Simple Notification Service
- VPC – Virtual Private Cloud
- Route53 – DNS service

High Availability





Test Tips

- Understand HA and how to deploy in AWS
- What is an Availability Zone?
- Loosely coupled apps are best for HA
- Resiliency vs Reliability
- Stateless or stateful? Stateless does need prior knowledge(cookies, etc)

Section Summary –

Section 6 – Cloud Architecture Best Practices



6

Section

Section Summary

- The AWS Well Architected Framework has Five Pillars which are Security, Reliability, Performance, Operational Excellence and Cost Optimization
- Moving from On Premises to “Cloud” can lead to immediate benefits like scalability, agility, performance and elasticity, that are possible.
- AWS Global Infrastructure uses Availability Zones and Regions to provide options for FT/HA
- A multi-tier application is any application developed and distributed among more than one layer.
- Auto Scaling, you can maintain application availability and scale your Amazon EC2 capacity up or down automatically according to conditions you define.
- Loosely coupled apps are best for HA because they are stateless.(Not Dependent on platform)

Section 6 - Review Questions

Cloud Architecture Best Practices



Section Review Questions

When considering designing a multi tier application which of the following two statements are true? Select Two

- Each of these layers or tiers does a specific task and can be managed independently of each other
- Three-tier applications are the most used architecture type in Cloud
- Single-tier applications are the most used architecture in Cloud
- Design your cloud service based on costs first and then availability.

Section Review Questions

When considering designing a multi tier application which of the following two statements are true? Select Two

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- Single-tier applications are the most used architecture in Cloud
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Section Review Questions

Which of the following three statements would be true about the AWS Well Architected Framework? (Select Three)

- The Framework has Four Pillars
- Best Practices meant to enforce good decisions
- Provides for Solid Security Design
- Provides for Consistent Measurement
- Can use Trusted Adviser to facilitate the framework

Section Review Questions

Which of the following three statements would be true about the AWS Well Architected Framework? (Select Three)

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Section Review Questions

Which of the following pillar(s) of the AWS Well Architected Framework would be referenced to include the ability to support development and run workloads effectively, gain insight into their operation, and continuously improve supporting processes and procedures to delivery business value? (Select One)

- Security
- Performance Efficiency
- Operational Excellence
- Reliability
- Cost Optimization

Section Review Questions

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Which of the following pillar(s) of the AWS Well Architected Framework would be referenced to pillar includes the ability to use computing resources efficiently to meet system requirements, and to maintain that efficiency as demand changes and technologies evolve? (Select One)

- Operational Excellence
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- Operational Excellence
- Security
- **Performance Efficiency**
- Reliability
- Cost Optimization



Section 7 : AWS Service Use Cases

Understanding the domain testable objectives

Section Overview

SECTION
OVERVIEW – USE
CASES

AWS Service Use
Case - IoT

AWS Service Use
Case -Storage
Services

AWS Service Use
Case - Relational
Databases

AWS Service Use
Case - Data
Analytics

AWS Service Use
Case - Mobile

Other Use Cases

Section Review

Review
Questions

Domain Overview

- Identify AWS services for common use cases.

Section Summary

Section 7 : High Availability and Automation/Optimization



7

Section

Section Summary

- Oracle, PostgreSQL, MySQL and MariaDB use Amazon failover technology
- Auto Scaling monitors your applications and automatically adjusts capacity to maintain steady, predictable performance at the lowest possible cost
- Create a new template or use an existing CloudFormation template using the JSON or YAML format.
- RDS MySQL allows only up to five replicas
- Elasticity in cloud infrastructure involves enabling the hypervisor to create virtual machines or containers with the resources to meet the real-time demand.
 - *ELB and Auto Scaling spans across Multi-AZs to provide High Availability*
 - Highly available environments use multiple availability zones (AZ).
 - Amazon EC2 maintenance uses a live-update process to minimize customer impact.

Section Review Questions

Section 7 : High Availability and Automation/Optimization



Review Questions

Which service provides a cost-effective solution to cache the static content and reduce the load on the origin servers

- CloudFront
- Global Load Balancing
- ELB
- ALB

Review Questions

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- ALB

Review Questions

Which of the following statements are correct about HA on AWS? (Select Two)

- Always use Multi AZ Zones
- Always use Instance Groups with different images
- Use ELB, Autoscaling for RDS instances
- Deploy loosely coupled apps to reduce dependency on services

Review Questions

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- Always use Instance Groups with different images
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Review Questions

Which of the following statements are True about Auto Scaling on AWS? (Select Three)

- Autoscaling is used for right sizing and meeting demand
- Lifecycle hooks provide custom actions capacity
- Autoscaling is fully integrated with S3 and EC2
- Autoscaling uses a launch template as a configuration template for its EC2 instances.
- Autoscaling implements YAML for launch templates

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Review Questions

Amazon Aurora replicates data to how many storage nodes in a Multi-AZ deployment to withstand availability impacts? (Select One)

- Ten
- Five
- Six
- Twelve

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Review Questions

A collection of AWS resources in CloudFormation is called a_____? (Select One)

- Template
- Stack
- Deployment
- YAML
- Auto Scaling Group

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Section Review Questions

Maintenance issues on AWS can be identified by referring to what two dashboards?
(Select Two)

- Personal Health Dashboard
- Trusted Advisor Dashboard
- Service Catalog Dashboard
- Service Health Dashboard

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- Service Health Dashboard

Section Review Questions

Your customer has contacted you and asked you to look at their AWS bill to save some costs. Which of the following services can you use to help identify Right Sizing opportunities for the customer? (Select Three)

- Trusted Advisor
- Compute Optimizer
- Cost Explorer
- Pricing Calculator
- Service Catalog

Section Review Questions

Your customer has contacted you and asked you to look at their AWS bill to save some costs. Which of the following services can you use to help identify Right Sizing opportunities for the customer? (Select Three)

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- Service Catalog



Section 8 -Course Summary and Closeout

Review and AWS Certifications

Section Overview

Course Review

Exam
Registration

Demand And
Compensation

Additional
Resources

Closeout and
Resources



Course Topic Summary

Summary of Course Content

Summary

- What is the Cloud Computing model
- Multi-tenancy is a resource pooling feature of cloud computing
- Amazon Web Services(AWS) is a cloud service from Amazon
- AWS EC2 is a compute service for deploying VMs
- AWS EBS is a block storage solutions that provides low latency
- AWS S3 is an object storage service that is highly scalable and cost efficient
- AWS RDS is a managed relational database service that supports several database engines

Summary

- Elastic Load Balancer (ELB) is the load balancer technology used in AWS and can be deployed as either the Classic, Network or Application load balancer.
- AWS Security Service provide numerous benefits and features such as automation, fully managed services and built for scale.
- Amazon CloudFront is a fast content delivery network (CDN) service
- CloudWatch is a native monitoring service that runs on AWS that monitors your resources as well as applications. Supports monitoring and logging.
- Cloud Spending can be managed via billing and management tools such as Billing, Budgets, Trusted Advisor and Cost Explorer



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- AWS Associate Solutions Architect Cert Prep Course
- AWS Monitoring and Management Course
- AWS Security Fundamentals Course

Resources Online

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- Contact me at Techcommanders



EMAIL

techie@techcommanders.com



WEBSITE

www.techcommanders.com



PHONE

(904) 512 5529