




























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# Cloud Architecting - Week 1

| Questions  | Answer   |
|--|--|
| What is meant by cloud computing?  | <ul style="list-style-type: none"><li>• Delivery of computing services over the Internet</li></ul>   |
| What is not a reason to move to the cloud?   | <ul style="list-style-type: none"><li>• A limited pool of services</li></ul>   |
| If you save through Cloud Computing where is it saved?   | <ul style="list-style-type: none"><li>• Online</li></ul>   |
| What are the advantages of cloud computing over computing on-premises?   | <ul style="list-style-type: none"><li>• Avoid large capital purchases</li><li>• Use on-demand capacity</li><li>• Increase speed and agility</li><li>• Go global in minutes</li></ul> |
| What is the pricing model that enables AWS customers to pay for resources on an as-needed basis?   | <ul style="list-style-type: none"><li>• Pay as you go</li></ul>  |
| Which of these is not a cloud deployment?  | <ul style="list-style-type: none"><li>• System administration as a service</li></ul>   |
| AWS owns and maintains the network-connected hardware required for application services, while you provision and use what you need.  | <ul style="list-style-type: none"><li>• True</li></ul>   |
| Which of these is not a benefit of cloud computing over on-premises computing?   | <ul style="list-style-type: none"><li>• Pay for racking, stacking and powering servers</li></ul>   |
| Which of the following are NOT benefits of AWS Cloud computing?  | <ul style="list-style-type: none"><li>• Multiple procurement cycles</li><li>• High latency</li></ul>   |
| Which of the following is a compute service?   | <ul style="list-style-type: none"><li>• Amazon EC2</li></ul>   |
| Cloud computing provides a simple way to access servers, storage, database and a broad set of application services over the Internet. You own network-connected hardware required for these services and Amazon Web Services provisions what you need. | <ul style="list-style-type: none"><li>• False</li></ul>  |
| Economies of scales results from?  | <ul style="list-style-type: none"><li>• Having hundreds of thousands of customers aggregated in the cloud</li></ul>  |

|  |   |
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| Which of these are ways to access AWS core services  | <ul style="list-style-type: none"> <li>• AWS Management Console</li> <li>• AWS Command Line Interface (AWS CLI)</li> <li>• Software Development Kits (SDKs)</li> </ul>                |
| What are some common uses of AWS   | <ul style="list-style-type: none"> <li>• Networking</li> <li>• Analytics</li> <li>• Storage</li> <li>• Virtualization</li> </ul>  |
| What best describes what AWS is?   | <ul style="list-style-type: none"> <li>• AWS is a cloud services provider</li> </ul>  |
| If you want in-depth details on how to create, manage and attach IAM access policies to IAM users, in what AWS resource should you look?         | <ul style="list-style-type: none"> <li>• AWS Service Documentation</li> </ul>   |
| What endpoints are possible to send messages to with Simple Notification Service?  | <ul style="list-style-type: none"> <li>• SMS</li> <li>• SQS</li> <li>• Lambda</li> </ul>  |
| Why would a company decide to use AWS over an on-premises data center?   | <ul style="list-style-type: none"> <li>• Highly available infrastructure</li> <li>• Elastic resources based on demand</li> <li>• No upfront cost</li> <li>• Cost-effective</li> </ul> |
| Which AWS service uses a combination of publishers and subscribers?  | <ul style="list-style-type: none"> <li>• SNS</li> </ul>   |
| Web servers running on Amazon EC2 access a legacy application running in a corporate data center.<br>What term would describe this model?        | <ul style="list-style-type: none"> <li>• Hybrid architecture</li> </ul>   |
| Where should a company go to search software listings from independent software vendors to find, test, buy and deploy software that runs on AWS? | <ul style="list-style-type: none"> <li>• AWS Marketplace</li> </ul>   |
| Which of the following is a benefit of using the AWS Cloud?  | <ul style="list-style-type: none"> <li>• Ability to focus on revenue-generating activities</li> </ul>   |
| Which of the following deployment models enables customers to fully trade their capital IT expenses for operational expenses?                    | <ul style="list-style-type: none"> <li>• Cloud</li> </ul>   |

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| Donna needs to provision a Linux server to run a web application on. What AWS service should she use to create the Linux server? | <ul style="list-style-type: none"> <li>• EC2</li> </ul>  |
| What is AWS's relational database service?   | <ul style="list-style-type: none"> <li>• RDS</li> </ul>  |
| Under what circumstances would you choose to use the AWS service CloudTrail?   | <ul style="list-style-type: none"> <li>• When you want to log what actions various IAM users are taking in your AWS account</li> </ul> |
| Consolidated billing is managed through what AWS service?  | <ul style="list-style-type: none"> <li>• AWS Organizations</li> </ul>  |



## Cloud Architecting – Point-Form Study Notes

### 1. Introduction to Cloud Computing

- **Definition:** Delivery of computing services over the Internet.
- **Storage:** Data saved online.
- **Benefits over on-premises:**
  - Avoid large capital purchases.
  - Use on-demand capacity.
  - Increase speed and agility.
  - Go global in minutes.
- **Misconceptions:**
  - Not a reason to move to cloud: *Limited pool of services.*

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### 2. Cloud Deployment Models

- **Valid models:** Cloud, Hybrid, On-premises.
- **Invalid model:** System administration as a service.
- **Hybrid architecture:** EC2 accessing legacy systems in corporate data center.

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### 3. AWS Overview

- **AWS:** A cloud services provider.
- **Common uses:**
  - Networking
  - Analytics
  - Storage
  - Virtualization
- **Benefits:**
  - Highly available infrastructure.
  - Elastic resources based on demand.
  - No upfront cost.

- Cost-effective.
  - Focus on revenue-generating activities.
- 

## 4. AWS Pricing and Cost Management

- **Pricing model:** Pay-as-you-go.
  - **Economies of scale:** Aggregation of hundreds of thousands of customers.
  - **Consolidated billing:** Managed via AWS Organizations.
  - **Not benefits:**
    - Multiple procurement cycles.
    - High latency.
    - Paying for racking, stacking, and powering servers.
- 

## 5. Core AWS Services

- **Compute:** Amazon EC2
  - **Database:** Amazon RDS
  - **Monitoring & Logging:** AWS CloudTrail
  - **Messaging:** SNS (Simple Notification Service)
  - **Access Management:** IAM (Identity and Access Management)
- 

## 6. Accessing AWS

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

## 7. AWS Marketplace

- Platform to find, test, buy, and deploy software from independent vendors.
- 

## 8. Learning Resources

- AWS Service Documentation: For creating, managing, and attaching IAM policies.
-

# Cloud Architecting - Week 2

| Question   | Answer   |
|--|--|
| For certain services like Amazon Elastic Compute Cloud (Amazon EC2) and Amazon Relational Database Service (Amazon RDS), you can invest in reserved capacity. What options are available for Reserved Instances?   | <ul style="list-style-type: none"><li>• PURI: Partial Upfront Reserved Instance</li><li>• NURI: No Upfront Reserved Instance</li><li>• AURI: All Upfront Reserved Instance</li></ul>                         |
| Where can a customer go to get more details about Amazon Elastic Compute Cloud (Amazon EC2) billing activity that took place 3 months ago?   | <ul style="list-style-type: none"><li>• AWS Cost Explorer</li></ul>  |
| To receive the discounted rate associated with Reserved Instances, you must make a full, upfront payment for the term of the agreement   | <ul style="list-style-type: none"><li>• False</li></ul>  |
| There is no charge for which of the following?   | <ul style="list-style-type: none"><li>• Inbound data transfer (with some exceptions)</li><li>• Data transfer between services within the same AWS Region</li></ul>   |
| What are the four support plans offered by AWS Support?  | <ul style="list-style-type: none"><li>• Basic, Developer, Business, Enterprise</li></ul>   |
| What AWS tool lets you explore AWS services and create an estimate for the costs of your use cases on AWS?   | <ul style="list-style-type: none"><li>• AWS Pricing Calculator</li></ul>   |
| As AWS grows, the cost of doing business is reduced and savings are passed back to the customer with lower pricing. What is this optimization called?  | <ul style="list-style-type: none"><li>• Economics of scale</li></ul>   |
| AWS offers a variety of services at no charge, for example, Amazon Virtual Private Cloud (Amazon VPC), AWS Identity and Access Management (IAM), Consolidated Billing, AWS Elastic Beanstalk, automatic scaling, AWS OpsWorks and AWS CloudFormation. However, you might be charged for other AWS services that you use in conjunction with these services | <ul style="list-style-type: none"><li>• True</li></ul>   |
| When are free data transfers applicable across AWS?  | <ul style="list-style-type: none"><li>• Free inbound data transfer for Amazon Elastic Compute Cloud (Amazon EC2)</li><li>• Free outbound data transfer between AWS services within the same Region</li></ul> |

|   |  |
|---|--|
| Unlimited services are available with the AWS Free Tier to new AWS customers for 12 months following their AWS sign-up date.  | <ul style="list-style-type: none"> <li>• False</li> </ul>  |
| What is the best definition of cloud architecture?  | <ul style="list-style-type: none"> <li>• Applying cloud characteristics to a solution that uses cloud services and features to meet technical and business requirements.</li> </ul>                                |
| The AWS Well-Architected Framework has five pillars. Two of the pillars are security and operational excellence. What are the other pillars of the Well-Architected Framework?  | <ul style="list-style-type: none"> <li>• Reliability</li> <li>• Performance efficiency</li> <li>• Cost optimisation</li> </ul>   |
| Which actions are consistent with the operational excellence pillar of the AWS Well-Architected Framework?  | <ul style="list-style-type: none"> <li>• Apply software engineering principles and methodology to infrastructure as code.</li> <li>• Review and improve processes and procedures on a continuous cycle.</li> </ul> |
| An application requires a frontend web tier of multiple servers that communicate with a backend application tier of multiple servers. Which design most closely follows Amazon Web Services (AWS) best practices?                           | <ul style="list-style-type: none"> <li>• Design the web tier to communicate with the application tier through the Elastic Load Balancing service.</li> </ul>   |
| A solution architect is developing a process for handling server failures. Which process most closely follows Amazon Web Services (AWS) best practices?   | <ul style="list-style-type: none"> <li>• Amazon CloudWatch detects a system failure. It triggers automation to provision a new server.</li> </ul>  |
| A company wants to change some functionality of their website. They are unsure of what will happen if they make the change. Which approach most closely follows Amazon Web Services (AWS) best practices?                                   | <ul style="list-style-type: none"> <li>• Provision a new server and make changes to it. Use DNS to gradually migrate users to the new server. Shut down the original server after all users migrate.</li> </ul>    |
| A company stores read-only data in Amazon S3. Most users are in the same country as the company headquarters. Some users are located around the world. Which design decision most closely follows Amazon Web Services (AWS) best practices? | <ul style="list-style-type: none"> <li>• Use a bucket in the AWS Region closest to the company headquarters. All users access the data through Amazon CloudFront.</li> </ul>                                       |
| A consultant must access a large object in an S3 bucket. They need a day to access the file. Which method for granting access most closely follows Amazon Web Services (AWS) best practices?  | <ul style="list-style-type: none"> <li>• Create a presigned URL to the object that expires in 24 hours, and give it to the consultant.</li> </ul>  |
| What are the main considerations that influence which AWS Regions to use?   | <ul style="list-style-type: none"> <li>• Latency reduction for end users</li> <li>• Compliance with laws and regulations</li> </ul>  |



What are the main considerations that influence which Availability Zones to use?

- Protection against localised natural disasters
- Application resiliency during system failures



## AWS Reserved Instances

- **Types of Reserved Instances:**
  - **PURI:** Partial Upfront Reserved Instance
  - **NURI:** No Upfront Reserved Instance
  - **AURI:** All Upfront Reserved Instance
- **Payment Requirement:**
  - You **do not** need to make a full upfront payment to receive the discounted rate → **False**



## AWS Billing & Pricing

- **Billing History Access:**
  - Use **AWS Cost Explorer** to view EC2 billing activity from 3 months ago
- **Free Services/Data Transfers:**
  - No charge for:
  - Inbound data transfer (with some exceptions)
  - Data transfer between services within the same AWS Region
- **AWS Free Tier:**
  - Not unlimited for 12 months
- **Free Data Transfers:**
  - Free **inbound** data transfer for EC2
  - Free **outbound** data transfer between services in the same Region
- **Cost Estimation Tool:**
  - Use **AWS Pricing Calculator**
- **Cost Optimization Concept:**
  - **Economies of scale:** AWS reduces costs as it grows and passes savings to customers



## AWS Support Plans

- **Four Support Plans:**
  - Basic
  - Developer
  - Business
  - Enterprise



## AWS Free Services

- Examples of free services:

- Amazon VPC
  - IAM
  - Consolidated Billing
  - AWS Elastic Beanstalk
  - Automatic Scaling
  - AWS OpsWorks
  - AWS CloudFormation
  - Note: Charges may apply for services used **with** these
- 



## Cloud Architecture & Design

- **Definition:**
    - Applying cloud characteristics to a solution using cloud services to meet technical and business needs
- 



## AWS Well-Architected Framework

- **Five Pillars:**
    - Security
    - Operational Excellence
    - Reliability
    - Performance Efficiency
    - Cost Optimization
  - **Operational Excellence Actions:**
    - Apply software engineering principles to infrastructure as code
    - Continuously review and improve processes
- 



## AWS Best Practices

- **Web & App Tier Communication:**
    - Use **Elastic Load Balancing** between web and app tiers
  - **Handling Server Failures:**
    - Use **Amazon CloudWatch** to detect failure and trigger automation to provision a new server
  - **Testing Website Changes:**
    - Provision a new server, make changes, use **DNS** to migrate users gradually
  - **Serving Global Read-Only Data:**
    - Store in S3 bucket near HQ, use **Amazon CloudFront** for global access
  - **Temporary Access to S3 Object:**
    - Use a **presigned URL** that expires in 24 hours
- 



## AWS Regions & Availability Zones

- **Choosing AWS Regions:**
  - Reduce latency for end users

- Comply with laws and regulations
  - **Choosing Availability Zones:**
    - Protect against localized natural disasters
    - Ensure application resiliency during failures
-

# Cloud Architecting - Week 3




| Question   | Answer  |
|--|---|
| Which component of the AWS Global Infrastructure does Amazon Cloudfront use to ensure low-latency delivery?  | <ul style="list-style-type: none"><li>• AWS edge locations</li></ul>  |
| You can run applications and workloads from a Region closer to the end users to _____ latency  | <ul style="list-style-type: none"><li>• decrease</li></ul>  |
| Networking, storage, compute, and databases are examples of service categories that AWS offers.  | <ul style="list-style-type: none"><li>• True</li></ul>  |
| Which of the following are geographic areas that host two or more Availability Zones?  | <ul style="list-style-type: none"><li>• AWS Regions</li></ul>   |
| _____ means the infrastructure has built-in component redundancy and _____ means that resources dynamically adjust to increases or decreases in capacity requirements. | <ul style="list-style-type: none"><li>• Fault tolerant, elastic and scalable</li></ul>  |
| Availability Zones within a Region are connected through low-latency links.  | <ul style="list-style-type: none"><li>• True</li></ul>  |
| Which of these statements about Availability Zones is not true?  | <ul style="list-style-type: none"><li>• A data center can be used for more than one Availability Zone.</li></ul>  |
| What is true about Regions?  | <ul style="list-style-type: none"><li>• A Region is a physical location that has multiple Availability Zones.</li><li>• Each Region is located in a separate geographic area.</li></ul> |
| AWS highly recommends provisioning your compute resources across _____ Availability Zones.   | <ul style="list-style-type: none"><li>• multiple</li></ul>  |
| Edge locations are only located in the same general area as Regions.   | <ul style="list-style-type: none"><li>• False</li></ul>   |
| Amazon Simple Storage Service (Amazon S3) provide a good solution for which of the following use cases?  | <ul style="list-style-type: none"><li>• An internet-accessible storage location for video files that an external website accesses</li></ul>   |
| A company is interested in using Amazon Simple Storage Service (Amazon S3) alone to host their website, instead of a traditional web server. Which                     | <ul style="list-style-type: none"><li>• HTML files and image files</li><li>• Client-side scripts</li></ul>  |

|  |   |
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| types of content does Amazon S3 support for static web hosting?  | <ul style="list-style-type: none"> <li>• Video and sound files</li> </ul>   |
| Which scenarios represent a good use for Amazon Simple Storage Service (Amazon S3)?  | <ul style="list-style-type: none"> <li>• Backing up critical data</li> <li>• Storing computation and analytics data</li> </ul>  |
| A company wants to use an S3 bucket to store sensitive data. Which actions can they take to protect their data?  | <ul style="list-style-type: none"> <li>• Enabling server-side encryption on the S3 bucket before uploading sensitive data</li> <li>• Using client-side encryption to protect data in transit</li> </ul> |
| A company must create a common place to store shared files. Which requirements does Amazon Simple Storage Service (Amazon S3) support?   | <ul style="list-style-type: none"> <li>• Recover deleted files</li> <li>• Maintain different versions of files</li> </ul>   |
| A customer service team accesses case data daily for up to 30 days. Cases can be reopened and require immediate access for 1 year after they are closed. Reopened cases require 2 days to process. Which solution meets the requirements and is the most cost efficient?                                     | <ul style="list-style-type: none"> <li>• Store case data in S3 Standard. Use a lifecycle policy to move the data into S3 Standard-Infrequent Access (S3 Standard-IA) after 30 days.</li> </ul>          |
| Which Amazon Simple Storage Service (Amazon S3) unaccelerated data transfers have an associated cost?  | <ul style="list-style-type: none"> <li>• OUT to the Internet</li> <li>• OUT to other AWS Regions</li> </ul>   |
| A company is migrating 100 terabytes (TB) of data from their on-premises data centre to Amazon S3. The company connect AWS by using a single 155 Mbps internet connection. Which data transfer option is the fastest and most cost-effective?  | <ul style="list-style-type: none"> <li>• AWS Snowball</li> </ul>  |
| A video producer must regularly transfer several video files to Amazon S3. The files range from 100-700 MB. The internet connection has been unreliable, causing some uploads to fail. Which solution provides the fastest, most reliable, and most cost-effective way to transfer these files to Amazon S3? | <ul style="list-style-type: none"> <li>• Amazon S3 multipart uploads</li> </ul>   |
| Which qualities vary by AWS Region?  | <ul style="list-style-type: none"> <li>• Cost-effectiveness of workload</li> <li>• Service and feature availability</li> </ul>  |



## AWS Global Infrastructure

- **Amazon CloudFront** uses **AWS edge locations** for low-latency delivery.
- Running workloads from a Region closer to users helps **decrease latency**.

- **AWS service categories** include:
    - Networking
    - Storage
    - Compute
    - Databases →  True
  - **AWS Regions:**
    - Geographic areas hosting **2+ Availability Zones**
    - Each Region is in a **separate geographic area**
    - A Region is a **physical location** with multiple AZs
  - **Availability Zones (AZs):**
    - Connected via **low-latency links** →  True
    - **Not true:** A data center can be used for more than one AZ
    - AWS recommends using **multiple AZs** for compute resources
  - **Edge Locations:**
    - **Not limited** to the same area as Regions →  False
- 

## **Amazon S3 (Simple Storage Service)**

### **Good Use Cases:**

- Internet-accessible storage for video files
- Hosting static websites (HTML, images, scripts, video/audio)
- Backing up critical data
- Storing computation and analytics data
- Shared file storage with:
  - File recovery
  - Version control

### **Data Protection:**

- Enable **server-side encryption** before uploading
- Use **client-side encryption** for data in transit

### **Cost-Efficient Storage:**

- Use **S3 Standard** for daily access (first 30 days)
- Apply **lifecycle policy** to move to **S3 Standard-IA** after 30 days

### **Data Transfer Costs:**

- Charged for:
  - Data **OUT to the Internet**
  - Data **OUT to other AWS Regions**

### **Large Data Migration:**

- Best option: **AWS Snowball** (fast & cost-effective for 100 TB)

### **Unreliable Internet Uploads:**

- Use **Amazon S3 multipart uploads** for large files (100–700 MB)
-



# AWS Region Considerations

- **Qualities that vary by Region:**
    - Cost-effectiveness
    - Service and feature availability
-

# Cloud Architecting - Week 4

| Question  | Answer   |
|---|--|
| In the shared responsibility model, AWS is responsible for providing what?  | <ul style="list-style-type: none"><li>• Security of the cloud</li></ul>  |
| In the shared responsibility model, which two of the following are examples of "security in the cloud"                            | <ul style="list-style-type: none"><li>• Security group configurations</li><li>• Encryption of data at rest and data in transit</li></ul>   |
| Which of the following is the responsibility of AWS under the AWS shared responsibility model?                                    | <ul style="list-style-type: none"><li>• Maintaining physical hardware</li></ul>  |
| When creating an AWS Identity and Access Management (IAM) policy, what are the two types of access that can be granted to a user? | <ul style="list-style-type: none"><li>• Programmatic access</li><li>• AWS Management Console access</li></ul>  |
| AWS Organizations enables you to consolidate multiple AWS accounts so that you centrally manage them.                             | <ul style="list-style-type: none"><li>• True</li></ul>   |
| Which of the following are best practices to secure your account using AWS Identity and Access Management (IAM)?                  | <ul style="list-style-type: none"><li>• Managing access to AWS resources</li><li>• Defining fine-grained access rights</li></ul>   |
| After initial login, what does AWS recommend as best practice for the AWS account root user?                                      | <ul style="list-style-type: none"><li>• Delete the access keys of the AWS account root user</li></ul>  |
| How would a system administrator add an additional layer of login security to a user's AWS Management Console?                    | <ul style="list-style-type: none"><li>• Enable multi-factor authentication</li></ul>   |
| AWS Key Management Service (AWS KMS) enables you to access, audit, and evaluate the configurations of your AWS resources.         | <ul style="list-style-type: none"><li>• False</li></ul>  |
| Which attributes are reasons to choose Amazon Elastic Compute Cloud (Amazon EC2)?   | <ul style="list-style-type: none"><li>• Ability to run any type of workload</li><li>• Complete control of computing resources</li></ul>  |
| What are the benefits of using an Amazon Machine Image (AMI)?   | <ul style="list-style-type: none"><li>• Selling or sharing software solutions packaged as an AMI</li><li>• Launching instances with the same configurations</li><li>• Using an AMI as a server backup for Amazon EC2 instances</li></ul> |



|  |  |
|--|--|
| A system admin must change the instance types of multiple Amazon EC2 instances. The instance were launched with a mix of Amazon EBS-backed AMIs and instance store backed AMIs. Which method is a valid way to change the instance type?   | <ul style="list-style-type: none"> <li>• Stop an Amazon EBS-backend Instance, change its instance type, and start the instance</li> </ul>  |
| A workload requires high read/write access to large local datasets. Which instance types would perform best for this workload?   | <ul style="list-style-type: none"> <li>• Memory optimised</li> <li>• Storage optimised</li> </ul>  |
| An application requires the MAC address of the Amazon EC2 instance. The architecture uses an AWS Auto Scaling group to dynamically launch and terminate instances. Which way is best for the application to obtain the MAC address?  | <ul style="list-style-type: none"> <li>• Use the use data of each instance to access the MAC address through the instance metadata.</li> </ul>   |
| A transactional workload on an Amazon EC2 instance perform high amounts of frequent read and write operations. Which Amazon EBS volume type is the best for this workload?   | <ul style="list-style-type: none"> <li>• Provisioned IOPS SSD</li> </ul>   |
| It is possible to create an NFS share on an Amazon EBS-backed Linux instance by installing and configuring an NFS server on the instance. In this way, multiple Linux systems can share the file system of that instance. Which advantages does Amazon Elastic File System (Amazon EFS) provide, compare to this solution? | <ul style="list-style-type: none"> <li>• Automatic scaling</li> <li>• High availability</li> </ul>   |
| Which feature does Amazon FSx for Windows File Server provide?   | <ul style="list-style-type: none"> <li>• Fully managed Windows file servers</li> </ul>   |
| Which descriptions of Amazon EC2 pricing options are correct?  | <ul style="list-style-type: none"> <li>• On-Demand Instances enable you to pay for compute capacity by usage time with no long-term commitments.</li> <li>• Spot instances offer spare compute capacity at discount prices, and can be interrupted.</li> </ul> |
| A company has three high-performance computing instances that must communicate with each other. The company would like to achieve maximum network performance between the instances. The most important requirement is that these systems do not share the same rack. Which placement strategy should they use?            | <ul style="list-style-type: none"> <li>• Spread</li> </ul>   |

- **AWS is responsible for:**
    - **Security of the cloud**
    - **Maintaining physical hardware**
  - **Customer is responsible for:**
    - **Security in the cloud**, including:
      - Security group configurations
      - Encryption of data at rest and in transit
- 

## **AWS Identity and Access Management (IAM)**

- **Types of access IAM can grant:**
    - Programmatic access
    - AWS Management Console access
  - **Best practices:**
    - Manage access to AWS resources
    - Define fine-grained access rights
    - Delete root user access keys after initial login
    - Enable **multi-factor authentication (MFA)** for added login security
- 

## **AWS Organizations**

- Allows consolidation of multiple AWS accounts for **centralized management**
- 

## **AWS Key Management Service (KMS)**

- **AWS KMS does NOT** enable access, audit, and evaluation of resource configurations
- 

## **Amazon EC2 (Elastic Compute Cloud)**

- **Reasons to choose EC2:**
  - Run any type of workload
  - Full control over computing resources
- **Amazon Machine Image (AMI) benefits:**
  - Launch instances with consistent configurations
  - Share/sell software solutions
  - Use as server backups
- **Changing EC2 instance types:**
  - Valid method: Stop an **EBS-backed** instance, change type, then restart
- **Instance types for high read/write workloads:**
  - **Memory optimized**
  - **Storage optimized**
- **Accessing MAC address in Auto Scaling architecture:**
  - Use **instance metadata** via user data
- **Best EBS volume for transactional workloads:**

- Provisioned IOPS SSD
- 

## Amazon EFS vs NFS on EC2

- Amazon EFS advantages:
    - Automatic scaling
    - High availability
- 

## Amazon FSx for Windows File Server

- Provides fully managed Windows file servers
- 

## Amazon EC2 Pricing Options

- On-Demand Instances:
    - Pay by usage time
    - No long-term commitments
  - Spot Instances:
    - Discounted spare capacity
    - Can be interrupted
- 

## EC2 Placement Strategy

- Spread placement group:
    - Ensures instances do **not share the same rack**
    - Ideal for high-performance computing with max network performance
-

## Cloud Architecting - Week 5

| Question  | Answer   |
|---|--|
| With Amazon Virtual Private Cloud (Amazon VPC), what is the smallest size subnet you can have in a VPC?   | <ul style="list-style-type: none"><li>• /28</li></ul>  |
| With Amazon Virtual Private Cloud (Amazon VPC), what is the maximum size IP address range you can have in a VPC?  | <ul style="list-style-type: none"><li>• /16</li></ul>  |
| You need to allow resources in a private subnet to access the internet. Which of the following must be present to enable this access?   | <ul style="list-style-type: none"><li>• NAT gateway</li></ul>                                |
| Which AWS networking service enables a company to create a virtual network within AWS?  | <ul style="list-style-type: none"><li>• Amazon Virtual Private Cloud (Amazon VPC)</li></ul>  |
| Private subnets have direct access to the internet.   | <ul style="list-style-type: none"><li>• False</li></ul>                                      |
| Which component of AWS global infrastructure does amazon CloudFront use to ensure low-latency delivery?   | <ul style="list-style-type: none"><li>• AWS edge locations</li></ul>                         |
| Which of the following is an optional security control that can be applied at the subnet layer of a VPC?  | <ul style="list-style-type: none"><li>• Network ACL</li></ul>                                |
| What happens when you use Amazon Virtual Private Cloud (Amazon VPC) to create a new VPC?  | <ul style="list-style-type: none"><li>• A main route table is created by default.</li></ul>  |
| Which of the following can be used to protect Amazon Elastic Compute Cloud (Amazon EC2) instances hosted in AWS?  | <ul style="list-style-type: none"><li>• Security group</li></ul>                             |
| You are a solutions architect who works at a large retail company that is migrating its existing infrastructure to AWS. You recommend that they use a custom VPC. When you create a VPC, you assign it to an IPv4 Classless Inter-Domain (CIDR) block of 10.0.1.0/24 (which has 256 total IP addresses). How many IP addresses are available? | <ul style="list-style-type: none"><li>• 251</li></ul>  |
| Which use case indicate that a non-relational database might be a better solution than a  | <ul style="list-style-type: none"><li>• Horizontal scaling for massive data volume</li></ul> |

|   |   |
|---|---|
| relational database?  | <ul style="list-style-type: none"> <li>• Data with unpredictable attributes</li> </ul>  |
| Which statement that compares a database service that Amazon AWS manages with a database on an Amazon EC2 instance is true?   | <ul style="list-style-type: none"> <li>• AWS manages DB patches for a database on a managed database service.</li> </ul>  |
| Which examples are good use cases for Amazon Relational Database Service (Amazon RDS)?  | <ul style="list-style-type: none"> <li>• An application that requires the database to enforce syntax rules</li> <li>• An application that requires complex joins of data</li> <li>• Running a Microsoft SQL Server in AWS</li> </ul>                                  |
| A small company is deciding which service to use for an enrolment system for their online training website. Choices are MySQL on Amazon EC2, MySQL on Amazon RDS, and Amazon DynamoDB. Which combination of use cases suggests using Amazon RDS?                                      | <ul style="list-style-type: none"> <li>• The data is highly structured.</li> <li>• Student, course and registration data are stored in many different tables.</li> <li>• The company doesn't want to manage database patches.</li> </ul>                              |
| Which scenarios are good use cases for Amazon DynamoDB?   | <ul style="list-style-type: none"> <li>• Database for serverless architecture</li> <li>• Applications that require ACID transactions</li> <li>• Document database for JavaScript Object Notation (JSON)-based documents</li> </ul>                                    |
| A small game company is designing an online game, where thousands of players can create their own in-game objects. The current design uses a MySQL database in Amazon RDS to store data for player-created objects. Which use cases suggest that DynamoDB might be a better solution? | <ul style="list-style-type: none"> <li>• Unpredictable attributes for player-created objects</li> <li>• Large number of player-created objects, each with different attributes</li> </ul>   |
| Which techniques should you use to secure an Amazon Relational Database Service (Amazon RDS) database?  | <ul style="list-style-type: none"> <li>• Security group to control network access to individual instances</li> <li>• A virtual private cloud (VPC) to provide instance isolation and firewall</li> <li>• Encryption to protect sensitive data</li> </ul>              |
| Which technique should you use to secure Amazon DynamoDB?   | <ul style="list-style-type: none"> <li>• An Amazon VPC gateway endpoint to prevent traffic from traversing the Internet</li> <li>• AWS IAM policies to define access at the table, item or attribute level</li> <li>• Encryption to protect sensitive data</li> </ul> |
| A company wants to migrate their on-premises Oracle database to Amazon Aurora MySQL. Which process describes the high-level steps?  | <ul style="list-style-type: none"> <li>• Use AWS Schema Conversion Tools to convert the schema, and then use AWS Database Migration Service (AWS DMS) to migrate the data.</li> </ul>   |

You must perform a heterogeneous migration from your on-premise facility to a database in a virtual private cloud (VPC). You will use AWS Snowball Edge and AWS Database Migration Service (AWS DMS). At which point do you use AWS Schema Conversion Tool (AWS SCT)?

- At the start, to extract the source database into the Snowball Edge, before shipping the device

---

## Amazon VPC (Virtual Private Cloud)

- Smallest subnet size: **/28**
- Largest IP range in a VPC: **/16**
- To allow private subnet access to the internet: Use a **NAT Gateway**
- AWS service for creating virtual networks: **Amazon VPC**
- Private subnets have direct internet access: **✗ False**
- Optional subnet-level security control: **Network ACL**
- Default component when creating a VPC: **Main route table**
- Protecting EC2 instances: Use **Security Groups**
- Available IPs in a **/24** CIDR block (e.g., 10.0.1.0/24): **251 usable IPs**

---

## AWS Global Infrastructure

- Amazon CloudFront ensures low-latency delivery using: **AWS edge locations**

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## Databases on AWS

### Relational vs Non-Relational

- Use non-relational DB when:
  - Need **horizontal scaling** for massive data
  - Data has **unpredictable attributes**
- **AWS-managed DB vs EC2-hosted DB:**
  - AWS **manages patches** for managed DB services

### Good Use Cases for Amazon RDS

- Enforce **syntax rules**
- Perform **complex joins**
- Run **Microsoft SQL Server**
- Structured data with multiple related tables
- No desire to manage DB patches

### Good Use Cases for Amazon DynamoDB

- Serverless architecture
- ACID transactions
- JSON-based document storage
- Unpredictable, large-scale, user-generated data



## Securing Databases



### Amazon RDS

- Use **Security Groups** for network access control
- Use **VPC** for isolation and firewall
- Use **encryption** for sensitive data



### Amazon DynamoDB

- Use **VPC Gateway Endpoint** to avoid internet traffic
- Use **IAM policies** for fine-grained access (table/item/attribute level)
- Use **encryption** for sensitive data



## Database Migration

- **Migrating Oracle to Aurora MySQL:**
    - Use **AWS Schema Conversion Tool (SCT)** to convert schema
    - Use **AWS Database Migration Service (DMS)** to migrate data
  - **Heterogeneous migration with Snowball Edge:**
    - Use **SCT at the start** to extract schema before shipping device
-

# Cloud Architecting - Week 6

| Question   | Answer   |
|--|--|
| Why is AWS more economical than traditional data centers for applications with varying compute workloads?  | <ul style="list-style-type: none"><li>• Amazon EC2 instances can be launched on-demand when needed.</li></ul>  |
| If your project requires monthly reports that iterate through very large amounts of data, which Amazon Elastic Cloud (Amazon EC2) purchasing option should you consider?                           | <ul style="list-style-type: none"><li>• Scheduled Reserved Instances</li></ul>   |
| What is included in an Amazon Machine Image (AMI)?   | <ul style="list-style-type: none"><li>• A template for the root volume for the instance</li><li>• Launch permissions that control which AWS accounts can use the AMI to launch instances.</li><li>• A block device mapping that specifies volumes to attach to the instance when it's launched</li></ul> |
| Which Amazon Elastic Compute Cloud (Amazon EC2) feature ensures your instances will not share a physical host with instances from any other customer?  | <ul style="list-style-type: none"><li>• Dedicated Instances</li></ul>  |
| Which of the following services is a serverless compute service in AWS?  | <ul style="list-style-type: none"><li>• AWS Lambda</li></ul>   |
| What is the service provided by AWS that enables developers to easily deploy and manage applications in the cloud?   | <ul style="list-style-type: none"><li>• AWS Elastic Beanstalk</li></ul>  |
| Your web application needs four instances to support study traffic all of the time. On the last day of the month, the traffic triples. What is the most cost-effective way to handle this pattern? | <ul style="list-style-type: none"><li>• Run four Reserved Instances constantly, then add eight On-Demand Instances on the last day of each month.</li></ul>  |
| Containers contain an entire operating system.   | <ul style="list-style-type: none"><li>• False</li></ul>  |
| Which Amazon EC2 option is best for long-term workloads with predictable usage patterns?   | <ul style="list-style-type: none"><li>• Reserved Instances</li></ul>   |
| Which of the following must be specified when launching a new Amazon Elastic Compute Cloud (Amazon EC2) Windows instance?  | <ul style="list-style-type: none"><li>• Amazon EC2 instance type</li><li>• Amazon Machine Image (AMI)</li></ul>  |



|  |  |
|--|--|
| Which definition describes a virtual private cloud (VPC)?  | <ul style="list-style-type: none"> <li>• A logically isolated virtual network that you define in the AWS Cloud</li> </ul>  |
| Which actions are best practices for designing a virtual private cloud (VPC)?  | <ul style="list-style-type: none"> <li>• Divide the VPC network range evenly across all Availability Zone availability</li> <li>• Create one subnet per Availability Zone for each group hosts that have unique routing requirements.</li> <li>• Reserve some address space for future use.</li> </ul> |
| A company wants to run a highly available web tier by using two EC2 instances and a load balancer. Which design is valid and provides the highest availability?  | <ul style="list-style-type: none"> <li>• Two different subnets, one per Availability Zone. Each subnet contains one EC2 instance.</li> </ul>   |
| A company's VPC has the CIDR block 172.16.0.0/21 (2048 address). It has two subnets (A and B). Each subnet must support 100 usable address now, but this number is expected to rise to at most 254 usable addresses soon. Which subnet addressing scheme meets the requirements and follow AWS best practices? | <ul style="list-style-type: none"> <li>• Subnet A: 172.16.0.0/23 (512 addresses)</li> <li>• Subnet B: 172.16.2.0/23 (512 addresses)</li> </ul>   |
| Which combination of actions enables direct internet access for IPv4 hosts in a virtual private cloud (VPC)?   | <ul style="list-style-type: none"> <li>• Configuring security groups and network ACLs to permit internet traffic.</li> <li>• Configuring hosts to have or obtain an internet-routable address</li> <li>• Creating a route for 0.0.0.0/0 that points to the internet gateway</li> </ul>                 |
| A group of consultants requires access to an EC2 instance from the internet, for 3 consecutive days each week. The instance is shut down the rest of the week. The virtual private cloud (VPC) has internet access. How should you assign an IPv4 address to the instance to give the consultants access?      | <ul style="list-style-type: none"> <li>• Associate an elastic IP address with the EC2 instance</li> </ul>  |
| Several EC2 instances launch in a VPC that has internet access. These instances should not be accessible from the internet, but they must be able to download updates from the internet. How should the instances launch?  | <ul style="list-style-type: none"> <li>• Without public IP addresses, in a subnet with a default route to a NAT gateway</li> </ul>   |
| You are configuring a bastion host to access EC2 instances in a virtual private cloud (VPC). What must you do to the security groups?  | <ul style="list-style-type: none"> <li>• Add a rule to the bastion host to allow traffic from your source IP address.</li> <li>• Add a rule to the private subnet EC2 instances to allow traffic from the bastion</li> </ul>   |

|   |  |
|---|--|
|   | host security group.   |
| You have a virtual private cloud (VPC) with a public subnet and a secure subnet. All EC2 instances in the secure subnet must be able to communicate with specific internet addresses. How can you control traffic with a network ACL?             | <ul style="list-style-type: none"> <li>• Add rules to the subnet custom network ACL to allow traffic from and to allowed internet addresses</li> </ul> |
| All of the EC2 instances in a subnet can communicate with a certain IPv4 network on the internet. How should you modify the security groups or current custom network ACL to deny traffic to and from several restricted address in that network? | <ul style="list-style-type: none"> <li>• In the network ACL, deny traffic to and from the restricted addresses.</li> </ul>                             |



## Cost Optimization & EC2 Purchasing Options

- **AWS is more economical** than traditional data centers because:
  - EC2 instances can be **launched on-demand**
- **Best EC2 purchasing option for monthly scheduled workloads:**
  - **Scheduled Reserved Instances**
- **Best EC2 option for long-term predictable workloads:**
  - **Reserved Instances**
- **Cost-effective scaling strategy:**
  - Use **4 Reserved Instances** for steady traffic
  - Add **8 On-Demand Instances** during peak (e.g., end of month)



## Amazon EC2 & AMI

- **Amazon Machine Image (AMI) includes:**
  - Template for root volume
  - Launch permissions
  - Block device mapping
- **Dedicated Instances:**
  - Ensure EC2 instances do **not share physical host** with other customers
- **Required when launching EC2 Windows instance:**
  - EC2 instance type
  - AMI



## Serverless & Application Deployment

- **Serverless compute service: AWS Lambda**
- **Service for easy app deployment & management: AWS Elastic Beanstalk**

## Containers

- Containers contain an entire OS: **✗ False**
- 

## Amazon VPC (Virtual Private Cloud)

- **Definition:** A logically isolated virtual network in AWS
  - **Best practices for VPC design:**
    - Divide network range evenly across AZs
    - Create one subnet per AZ for unique routing groups
    - Reserve address space for future use
  - **High availability web tier design:**
    - Use **two subnets in different AZs**, each with one EC2 instance
  - **Subnet addressing for growth:**
    - Subnet A: **172.16.0.0/23** (512 addresses)
    - Subnet B: **172.16.2.0/23** (512 addresses)
- 

## Internet Access in VPC

- **Enable direct internet access for IPv4 hosts:**
    - Configure **security groups & network ACLs**
    - Assign **internet-routable address**
    - Create route **0.0.0.0/0** to **internet gateway**
  - **Temporary internet access for consultants:**
    - Assign an **Elastic IP** to the EC2 instance
  - **Instances need internet access but no public exposure:**
    - Launch **without public IPs**
    - Place in subnet with **NAT gateway**
- 



## VPC Security Configuration

- **Bastion host setup:**
    - Add rule to bastion host SG to allow traffic from your IP
    - Add rule to private EC2 SG to allow traffic from bastion SG
  - **Control traffic to specific internet addresses:**
    - Use **custom network ACL rules**
  - **Block traffic to restricted IPs:**
    - Deny traffic in **network ACL** to/from those addresses
-

# Cloud Architecting - Week 7

| Question  | Answer   |
|---|--|
| Amazon Simple Storage Service (Amazon S3) is an object storage suitable for the storage of flat files like Microsoft Word documents, photos, etc. | <ul style="list-style-type: none"> <li>• True</li> </ul>   |
| Amazon S3 replicates all objects_____.  | <ul style="list-style-type: none"> <li>• in multiple Availability Zones within the same region</li> </ul>  |
| Which of the following can be used as a storage class for an S3 object lifecycle policy?  | <ul style="list-style-type: none"> <li>• S3 - Standard Access</li> <li>• S3 - Infrequent Access</li> <li>• Simple Storage Service Glacier</li> </ul>   |
| The name of an S3 bucket must be unique_____.   | <ul style="list-style-type: none"> <li>• worldwide across all AWS accounts</li> </ul>  |
| You can use Amazon Elastic File System (Amazon EFS) to:   | <ul style="list-style-type: none"> <li>• Implement storage for Amazon EC2 instances that multiple virtual machines can access at the same time.</li> </ul>   |
| Amazon Elastic Block Store (Amazon EBS) is recommended when data _____ and _____.   | <ul style="list-style-type: none"> <li>• must be quickly accessible, requiring long-term persistence</li> <li>• requires an encryption solution</li> </ul>   |
| By default, all data stored in Amazon S3 is viewable by the public  | <ul style="list-style-type: none"> <li>• False</li> </ul>  |
| Regarding Amazon S3 Glacier, what is a Vault?   | <ul style="list-style-type: none"> <li>• A container for strong archives</li> </ul>  |
| When you create a bucket in Amazon S3, it is associated with a specific AWS Region.   | <ul style="list-style-type: none"> <li>• True</li> </ul>   |
| Which of the following are features of Amazon Elastic Block Store (Amazon EBS)?   | <ul style="list-style-type: none"> <li>• Amazon EBS volumes can be encrypted transparently to workloads on the attached instance.</li> <li>• Data stored on Amazon EBS is automatically replicated within an Availability Zone.</li> </ul> |
| What is AWS Site-to-Site VPN?   | <ul style="list-style-type: none"> <li>• A solution that provides a connection between a VPC and on premises network by using IPsec</li> </ul>   |

|  |   |
|--|---|
| What does AWS Direct Connect provide?  | <ul style="list-style-type: none"> <li>• A dedicated network connection from an on-premises network to AWS that use 802.1q</li> </ul>                           |
| A company has two VPCs. VPC A has CIDR block of 10.1.0.0/16. VPC B has CIDR block of 10.2.0.0/16. Both VPCs belong to the same AWS account. What is the simplest way to connect the two VPCs so that they can route all traffic between them?  | <ul style="list-style-type: none"> <li>• VPC peering</li> </ul>   |
| Systems in a secure subnet in a VPC must access a bucket in Amazon S3. Which solution stops traffic from crossing the internet?  | <ul style="list-style-type: none"> <li>• Create a VPC gateway endpoint for Amazon S3</li> </ul>   |
| A company has 3 VPCs. VPCs A, B, and C have CIDR blocks that do not overlaps. Both A and C have separate VPC peering connections with B. However, A cannot communicate with C. What is the simplest and most cost-effective way to enable full communication between A and C?                                    | <ul style="list-style-type: none"> <li>• Add a peering connection between A and C, and route traffic between A and C through the peering connection.</li> </ul> |
| Because of a natural disaster, a company moved a secondary data centre to a temporary facility with internet connectivity. It needs a secure connection to the company's VPC that must be operational as soon as possible. The data centre will move again in 2 weeks. Which option meets the requirements?      | <ul style="list-style-type: none"> <li>• AWS Site-to-Site VPN</li> </ul>  |
| What is the simplest way to connect 100 virtual private clouds (VPCs) together?  | <ul style="list-style-type: none"> <li>• Connect the VPCs to AWS Transit Gateway</li> </ul>   |
| A company's security admin requires that EC2 instances in a specific subnet must connect to Amazon DynamoDB through a VPC endpoint. The company's network standards require that the infrastructure support high availability. Which action meets these architecture requirements without adding another subnet? | <ul style="list-style-type: none"> <li>• Associate a single VPC endpoint with the subnet</li> </ul>   |
| A company uses a single AWS Direct Connect connection between their on-premises network and their VPC. They want to ensure that the network connectivity is highly available by adding a backup connection. Which network connectivity method provides most cost-effective solution for the backup connection?   | <ul style="list-style-type: none"> <li>• An on-demand AWS Site-to-Site VPN connection across the Internet</li> </ul>  |

- **S3 is suitable for storing flat files** (e.g., Word docs, photos) →  True
  - **S3 replicates objects:**
    - Across **multiple Availability Zones** within the same Region
  - **S3 bucket names must be unique:**
    - **Worldwide across all AWS accounts**
  - **S3 Lifecycle Policy storage classes:**
    - S3 Standard Access
    - S3 Infrequent Access
    - S3 Glacier
  - **S3 bucket is associated with a Region** →  True
  - **S3 data is not public by default**
  - **S3 Glacier Vault:**
    - A container for storing archives
- 

## Amazon EFS & Amazon EBS

### Amazon EFS (Elastic File System)

- Used for **shared storage** across multiple EC2 instances

### Amazon EBS (Elastic Block Store)

- Recommended when data:
    - Must be **quickly accessible** and **persist long-term**
    - Requires **encryption**
  - Features:
    - **Encrypted volumes** (transparent to workloads)
    - **Automatic replication** within an Availability Zone
- 

## AWS Networking & Connectivity

### VPN & Direct Connect

- **AWS Site-to-Site VPN:**
  - Connects VPC to on-premises network using **IPsec**
  - Best for **temporary, quick setup**
- **AWS Direct Connect:**
  - **Dedicated network connection** using **802.1q**
  - For **high-performance, stable connectivity**
- **Cost-effective backup for Direct Connect:**
  - Use **on-demand Site-to-Site VPN**

### VPC Connectivity

- **Connect two VPCs (same account):**
  - Use **VPC Peering**
- **Connect 100 VPCs:**
  - Use **AWS Transit Gateway**

- **Enable full communication between VPCs A and C:**
    - Add **peering connection** between A and C
    - Route traffic through the new connection
- 

## **VPC Security & Access**

- **Access S3 from secure subnet without internet:**
    - Use **VPC Gateway Endpoint for S3**
  - **Access DynamoDB from subnet with high availability:**
    - Associate a **single VPC endpoint** with the subnet
  - **Consultants need EC2 access for 3 days/week:**
    - Assign an **Elastic IP** to the instance
  - **EC2 instances need internet access but no exposure:**
    - Launch **without public IPs**
    - Place in subnet with **NAT Gateway**
  - **Control traffic with Network ACL:**
    - Allow traffic **to/from specific internet addresses**
    - Deny traffic **to/from restricted addresses**
-