1. **Define cloud computing ??**

Cloud computing is the ability to access on-demand computing resources over the internet.

**EX-** Data storage, Computing power, Applications, Servers, Development tools, Networking capabilities, Databases, Software, Analytics, Intelligence.

1. **Describe the shared responsibility model ??**

The shared responsibility model is a cloud security framework that defines the security responsibilities of cloud service providers (CSPs) and customers.

The model ensures that security responsibilities are distributed between the cloud provider and the customer, reducing overall security risk.

1. **Define cloud models, including public, private, and hybrid ??**

Public cloud

Data and information that can be shared with multiple people and organizations. Public clouds are delivered over the internet and hosted by external providers.

Private cloud

Data and information that is only accessible to users within an organization. Private clouds are typically on-premises, either in a company's local data centre or a separate physical infrastructure provided by a third party.

Hybrid cloud

A combination of public and private clouds. Hybrid clouds allow businesses to use public cloud services on private infrastructure.

1. **Identify appropriate use cases for each cloud model ??**

Public Cloud Use Cases

* Web Hosting and Development
* Big Data Analytics
* Content Delivery and Distribution
* Backup and Disaster Recovery
* Development and Testing Environments

Private Cloud Use Cases:

* Regulatory Compliance:
* Sensitive Data Handling:
* Legacy Applications:
* High-Performance Computing (HPC):

Hybrid Cloud Use Cases:

* Data Backup and Recovery:

Use Case: Using a combination of on-premises or private cloud storage and public cloud storage for data backup and recovery.

* Application Bursting:

Use Case: Scaling applications during periods of increased demand by extending them to the public cloud.

1. **Describe the consumption-based model ??**

Consumption-based pricing model provides customers with the flexibility to use cloud resources as needed, pay only for what they use, and adjust their consumption to optimize costs.

1. **Compare cloud pricing models ??**

1. **Describe the benefits of high availability and scalability in the cloud ??**

High availability can provide a continuous user experience with no apparent downtime, even when things go wrong.

Ability of a system or service to remain operational and accessible with minimal downtime.

Scalability refers to scaling out or scaling up while automatically providing resources as needed.

1. **Describe the benefits of reliability and predictability in the cloud ??**

Reliability refers to the ability of a system or service to consistently perform as expected, with minimal downtime or service interruptions. It focuses on ensuring consistent and dependable performance.

Reliability in cloud computing is the ability of cloud services and applications to function correctly and consistently, even in the face of failures or errors.

Predictability is knowing your application will always perform as expected and knowing what it will cost.

1. **Describe the benefits of security and governance in the cloud??**

Cloud security protects cloud-based services, applications, and data. It can help with Monitoring, Data protection, Security tools, and customer support.

Cloud governance is a set of policies and rules that guide how an organization uses cloud services and resources.

1. **Describe the benefits of manageability in the cloud??**

Manageability in the cloud allows you to easily provision, configure, and monitor resources in an individual cloud service.

Manageability is management of cloud resources and how we interact with them.

1. **Describe infrastructure as a service (IaaS)??**

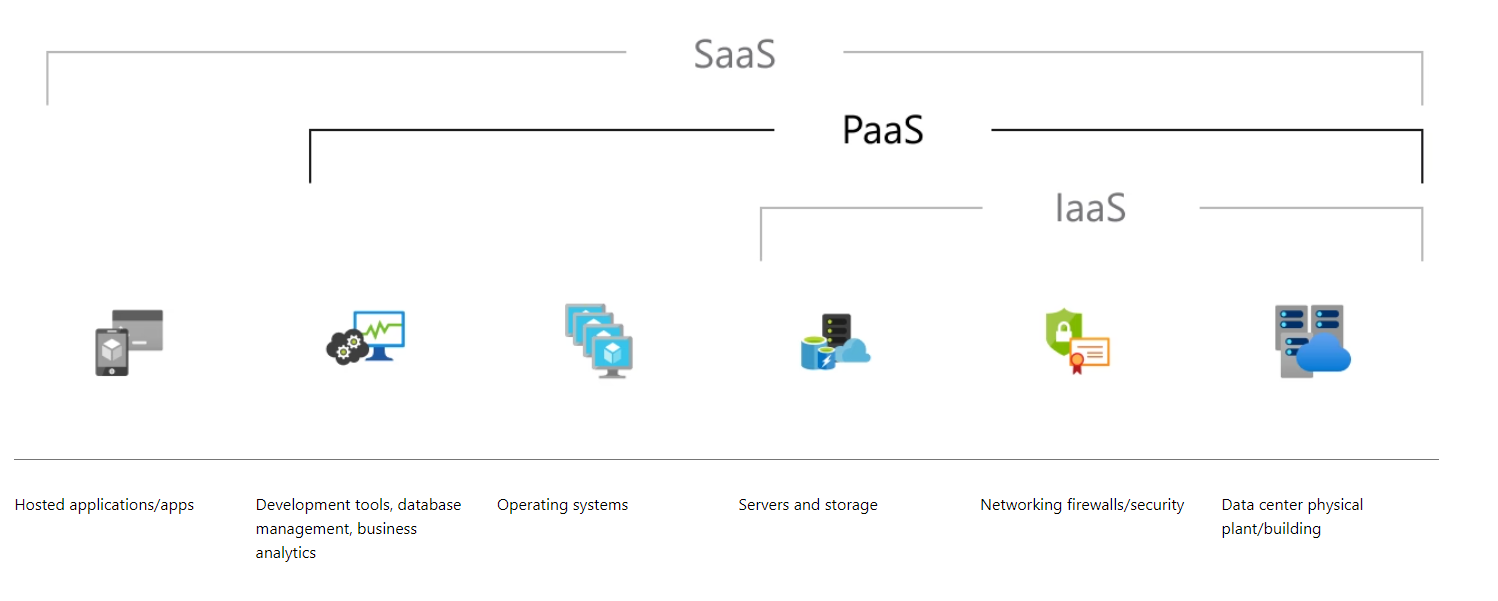
Infrastructure as a Service (IaaS) is one of the fundamental service models in cloud computing. It provides a comprehensive cloud-based infrastructure that includes virtualized computing resources, storage, and networking.

1. **Describe platform as a service (PaaS)??**

Platform as a Service (PaaS) is a cloud computing service model that provides a platform and environment for developers to build, deploy, and manage applications without worrying about the underlying infrastructure and complexities.

1. **Describe software as a service (SaaS)??**

Software as a Service (SaaS) is a cloud computing service model that delivers software applications over the internet on a subscription basis.



1. **Identify appropriate use cases for each cloud service (IaaS, PaaS, and SaaS)??**

* IaaS is appropriate when you want total control
* Reduced expenses, disaster recovery
* PaaS is appropriate when you want a development platform already built and you just want to add your code.
* Building software products
* SaaS is appropriate when you want ready to use application solution.
* SaaS provides software as a service to end-users.

1. **Describe Azure regions, region pairs, and sovereign regions??**

An Azure region is a geographic area that contains multiple data centers that are connected through a dedicated low-latency network.

Under each Azure region there will be availability zones.

Azure region pairs are two Azure regions that are close enough to provide low-latency connectivity.

**Azure region pairs are:**

* Within the same geographic region
* Close enough to provide low-latency connectivity
* Prewired with high bandwidth connectivity between them

Sovereign regions are Azure regions that are designed to meet the needs of customers who require compliance with specific regulations or data sovereignty requirements.

Sovereign regions are dedicated to specific sovereign entities, such as:

Azure Government - US

Azure China

Azure Australia

Azure Germany

1. **Describe availability zones??**

Availability zones (AZs) are isolated data centers that are located within specific regions.

AZs have independent power, cooling, and networking infrastructure. They are designed so that if one zone experiences an outage, the remaining zones can support regional services, capacity, and high availability.

1. **Describe Azure datacenters??**

Azure data centers are physical buildings that contain thousands of servers, power, cooling, and networking infrastructure.

1. **Describe Azure resources and resource groups??**

Azure resources are entities that you create within Azure. Examples of resources include:

Virtual machines, Network cards, Disks, Storage, SQL databases, Web apps, Virtual networks, Subscriptions, Management groups, Tags.

Resource groups are logical containers that hold these resources for an Azure tenant. Organizing resources into resource groups makes it possible to manage them more effectively.

All resources must be in a resource group, and a resource can only be a member of a single resource group. Resource groups can't be nested. If you delete a resource group, all resources contained within it are also deleted.

1. **Describe subscriptions??**

An Azure subscription is a logical unit of Azure services that are linked to an Azure account. It serves as a single billing unit for Azure resources used in that account.

1. **Describe management groups??**

Azure management groups are logical containers that allow you to organize Azure subscriptions and apply governance controls.

**You can create management groups to:**

* Group your subscriptions together
* Take actions in bulk
* Manage your resource hierarchy
* Protect your resource hierarchy

1. **Describe the hierarchy of resource groups, subscriptions, and management groups??**

Management Groups contain one or more subscriptions.

Inside of Subscriptions are Resource Groups.

Resource Groups belong to exactly one Subscription.

Inside Resource group we will have resources.

1. **Compare compute types, including container instances, virtual machines (VMs), and functions??**

Container instances are best for running single containerized applications with minimal setup and management.

VMs are better for running complex applications with specific software requirements.

Azure Functions are best for event-driven code and small functions.

1. **Describe VM options, including Azure Virtual Machines, Azure Virtual Machine Scale Sets, availability sets, and Azure Virtual Desktop??**

* A virtual machine (VM) is a digital version of a physical computer.
* An Azure virtual machine gives you the flexibility of virtualization without having to buy and maintain the physical hardware that runs it.
* Azure Virtual Machine Scale Sets (VMSS) is a service that allows you to create and manage a group of identical, auto-scaling Virtual Machines (VMs).
* The number of VM instances can automatically increase or decrease based on conditions.
* An Availability Set is a logical grouping of two or more Azure VMs within the same data center.
* These VMs are distributed across different physical racks, fault domains, and update domains.
* Fault Domains: Azure divides its data centers into separate fault domains. VMs within the same Availability Set are automatically distributed across different fault domains. This ensures that if one fault domain experiences a hardware failure, it doesn't affect all the VMs in the set.
* Update Domains: Azure also divides its data centers into update domains. VMs within an Availability Set are distributed across different update domains, so that during planned maintenance events (like system updates), not all VMs are taken offline simultaneously.
* Azure Virtual Desktop (AVD) is a Microsoft Azure-based system that provides virtualized desktops and applications in the cloud.

1. **Describe resources required for virtual machines??**

Virtual machines (VMs) require four primary resources to function: CPU, Memory, Network, Hard disk.

1. **Describe application hosting options, including the Web Apps feature of Azure App Service, containers, and virtual machines??**

Azure Web Apps (Azure App Service):

Azure Web Apps, part of Azure App Service, is a Platform as a Service (PaaS) offering designed for hosting web applications, APIs, and mobile backends. It is best suited for modern web applications and services that don't require direct control over the underlying infrastructure.

Containers:

Containers, such as Docker containers, provide a consistent environment for deploying applications and their dependencies. They are well-suited for microservices architectures, cloud-native applications, and scenarios where you need to ensure consistent environments across different platforms.

Virtual Machines (VMs):

Virtual machines are suitable for hosting a wide range of applications, including legacy systems, custom software, and more complex workloads. VMs offer full control over the virtualized infrastructure, allowing you to install and configure the operating system and software as needed.

* Azure Web Apps for hosting web applications and APIs.
* Containers for orchestrating and scaling micro-services in a cloud-native application.
* Virtual Machines for running specific workloads that require full control over the environment

1. **Describe virtual networking, including the purpose of Azure Virtual Networks, Azure virtual subnets, peering, Azure DNS, Azure VPN Gateway, and Azure ExpressRoute??**

* Azure Virtual Network (VNet) is a service that allows Azure resources to communicate securely with each other, the internet, and on-premises networks.
* Subnets enable you to divide VNet into one or more subnetworks and allocate a portion of the VNet address space to each subnet. By doing thus we can have multiple networks on the same VNet
* Allows two separate networks to connect and communicate with each other. This connection enables data to flow between the networks, making resources, services, and applications in one network accessible to the other.
* Azure DNS is a managed Domain Name System (DNS) service provided by Microsoft Azure. DNS is a fundamental system that translates human-readable domain names (like www.example.com) into IP addresses that computers use to identify each other on the internet. Azure DNS simplifies the management of DNS records and domain names for your Azure resources and applications.
* A VPN gateway is a specific type of virtual network gateway that is used to send encrypted traffic between an Azure virtual network and an on-premises location over the public internet.
* If you need a private, secure, high-bandwidth, low-latency connection, directly from your data center or infrastructure to Azure, ExpressRoute is the service you want.

1. **Define public and private endpoints??**

Public endpoints are accessible over the public internet. When a resource, such as a virtual machine or web app, has a public endpoint, it can be accessed from anywhere with an internet connection. Users can access the resource by its public IP address or domain name.

Public endpoints are commonly used for web servers, public-facing websites, and services that need to be accessed from the internet.

Private endpoints are accessible only within a private network, providing an extra layer of security. A private endpoint, is not accessible over the public internet. This allows the resource to be accessed securely within the VNet or through a Virtual Network Service Endpoint.

Private endpoints are used when you want to restrict access to a resource and keep it within a private network. This is common for databases, storage accounts, and other sensitive resources that should not be exposed to the public internet.

1. **Compare Azure storage services??**

**Blob –** Binary Large Object

* These blobs of data are stored in containers, inside the storage account.
* That means there are three layers to Blob storage: storage account, container, and then blob.
* In Blobs we can store any type of data and in any size.
* The blobs or items will have a unique address. So we can able to get data easily.
* We can store any type of data such as images, audio files, video files, log files, backup and disaster recovery.

**Disk**

• Disk storage is a Disk

• Disk storage is referred to, is what you attach to your VMs.

• Azure will look after the physical disk for you and guarantees its uptime and backup. (Uptime refers to the amount of time that a computer system, server, application, or service is operational and available for use.)

• Azure guarantees Size and performance of the disks.

• Easy to upgrade your disk size and type.

**File**

On-Premises File storage Problems:

- You only have a limited amount of storage

- More time and resources need to spent on maintaining backups

- It is hard to keep all data secure at all times. Specialist assistance is needed.

- It is Difficult to share files across teams and organizations.

All the above problems will be solved by using File Storage Account in cloud

• By using cloud file storage we can share access to your on-premises infrastructure.

• You don’t have to worry about hardware or OS

• Network and power outages won’t affect your storage.

1. **Describe storage tiers??**

**Pricing Tiers::**

HOT COOL ARCHIVE

Access time is less More More compare to hot and cool

Storage cost is High Low Low

Access cost is Low High High

Hot is used for data that is frequently accessed

Cool is used for data that is infrequently accessed.

Archive is used for data that you need to store for a very long time but expect to access very rarely.

1. **Describe redundancy options??**

When it comes to storing critical data, you need to know that your data is protected against unexpected failures.

* It creates multiple replicated copies of your data.
* Copying data is completely automatic
* Minimum 3 copies will be created.
* This copying process is invisible to end user.
* Higher availability means higher cost.

Locally redundant storage (LRS)

Replicates your storage account three times within a single data center in the primary region. LRS is the lowest-cost redundancy option and offers the least durability.

Geo-redundant storage (GRS)

Copies data three times within the primary region and three times in a secondary region in single AZ.

Zone-redundant storage (ZRS)

It stores each copy of data in three availability zones in primary region.

Geo-Zone redundant storage (GZRS)

In primary region one copy on each AZ and in secondary region 3 copies in single AZ.

1. **Describe storage account options and storage types??**
2. **Identify options for moving files, including AzCopy, Azure Storage Explorer, and Azure File Sync??**

AzCopy::

* AzCopy is a command-line utility for occasional data transfers.
* It is a downloaded application.
* It is able to transfer both blob and Azure Files storage types.
* It is especially useful for automated scripting routines

Integrated in both Bash and PowerShell scripts for different automated routines

Storage Explorer::

* Storage Explorer is a graphical user interface, or a GUI interaction method
* Using Storage explorer we can simply drag and drop different data types into and out of Azure Storage.
* We can move all types of storage accounts ( not only blob and files storage)

Azure File Sync::

* This works specifically with Azure Files storage format in which it will automatically synchronize the Azure File Service with on-premises file servers.
* We can use this situations like you have on-premises locations with local file servers however you want to maintain the cloud availability
* We can synchronize files between multiple on-premises locations.

1. **Describe migration options, including Azure Migrate and Azure Data Box??**

Azure Data Box::

This is used in the scenario of transfer lots (Too much to transfer over the internet) of data and/ or limited network bandwidth.

* Offline data transfer to/from Azure
* Order and receive the Data Box, prepare and copy data.
* Copy data to physical data storage device (Data box)
* Configure, seal, and schedule pickup, and Microsoft handles secure data transfer to Azure, after which you access and manage data in the cloud.
* To Azure : Data box data is transferred to storage account
* From Azure : Data box delivered to on-premises location for on-site transfer

Azure Migrate::

Azure Migrate is a tool provided by Microsoft to help organizations move their computer systems and data from their own data centers (on-premises) to Microsoft's cloud platform, Azure. Here's a simplified step-by-step process:

1. Prepare: Set up an Azure account and create a project for your migration.
2. Discover: Install a tool on your on-premises servers to collect information about them.
3. Assess: Based on the collected data, Azure Migrate helps you understand which servers can be moved to Azure, what kind of virtual machines you need in Azure, and how much it might cost.
4. Plan: Create a plan for how you'll move your servers. This includes deciding which servers to move first and setting up the necessary resources in Azure.
5. Migrate: Actually move your servers to Azure according to your plan. This might involve copying data and configurations from your own servers to Azure.
6. **Describe directory services in Azure, including Microsoft Azure Active Directory (Azure AD), part of Microsoft Entra and Azure Active Directory Domain Services (Azure AD DS)??**

Microsoft Azure Active Directory (Azure AD) is a cloud-based identity and access management solution. It acts as a centralized directory for managing user IDs, authentication, and authorization in the Azure cloud environment.

1. **Describe authentication methods in Azure, including single sign-on (SSO), multifactor authentication, and password-less??**

Single sign-on (SSO)

Allows users to log in to many apps and services using a single set of credentials. SSO uses modern authentication protocols such as SAML 2.0, OpenID Connect, OAuth 2.0, and WS-Federation.

Multifactor authentication

Uses a two-step verification process to make it more difficult for attackers to hack into someone's ID. For example, some banks send customers a call or one-time password as a text message when they sign in to their online bank account.

Passwordless authentication

Allows users to upgrade their account in the app for a full passwordless experience.