Microsoft AZ-900

Azure Fundamental

Azure Fundamentals exam is an opportunity to prove knowledge of cloud concepts, Azure services, Azure workloads, security and privacy in Azure, as well as Azure pricing and support. Candidates should be familiar with the general technology concepts, including concepts of networking, storage, compute, application support, and application development.

Skills measured

- **Describe cloud concepts (20-25%)**
- **Describe core Azure services (15-20%)**
- **Describe core solutions and management tools on Azure (10-15%)**
- **Describe general security and network security features (10-15%)**
- **Describe identity, governance, privacy, and compliance features (15-20%)**
- **Describe Azure cost management and Service Level Agreements (10-15%)**

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(MODULE-1)

WHAT IS CLOUD-

Cloud computing is the delivery of computing services over the internet by using a pay-as-you-go pricing model.

TYPES OF CLOUD-

Public cloud: Services are offered over the public internet and available to anyone who wants to purchase them. Cloud resources, such as servers and storage, are owned and operated by a third-party cloud service provider, and delivered over the internet.

Private cloud: A private cloud consists of computing resources used exclusively by users from one business or organization. A private cloud can be physically located at your organization's on-site (on-premises) datacenter, or it can be hosted by a third-party service provider.

Hybrid cloud: A hybrid cloud is a computing environment that combines a public cloud and a private cloud by allowing data and applications to be shared between them.

ADVANTAGES OF CLOUD-

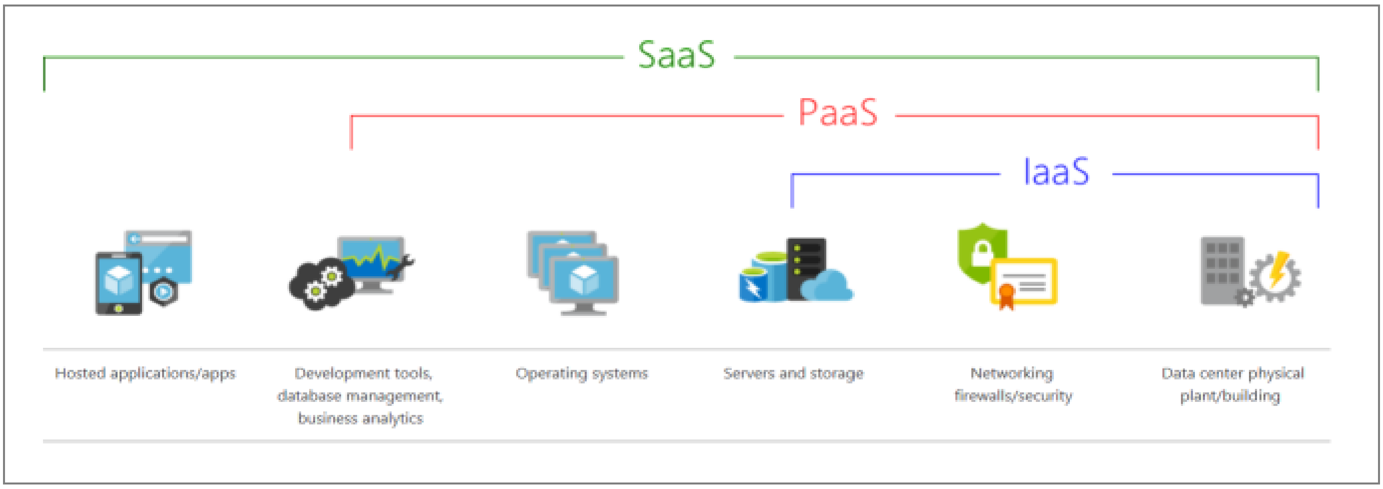
- **High availability**: Depending on the service-level agreement (SLA) that you choose, your cloud-based apps can provide a continuous user experience with no apparent downtime, even when things go wrong.
- **Scalability**: Apps in the cloud can scale *vertically* and *horizontally*:
  - Scale vertically to increase compute capacity by adding RAM or CPUs to a virtual machine.
  - Scaling horizontally increases compute capacity by adding instances of resources, such as adding VMs to the configuration.
- **Elasticity**: You can configure cloud-based apps to take advantage of autoscaling, so your apps always have the resources they need.
- **Agility**: Deploy and configure cloud-based resources quickly as your app requirements change.

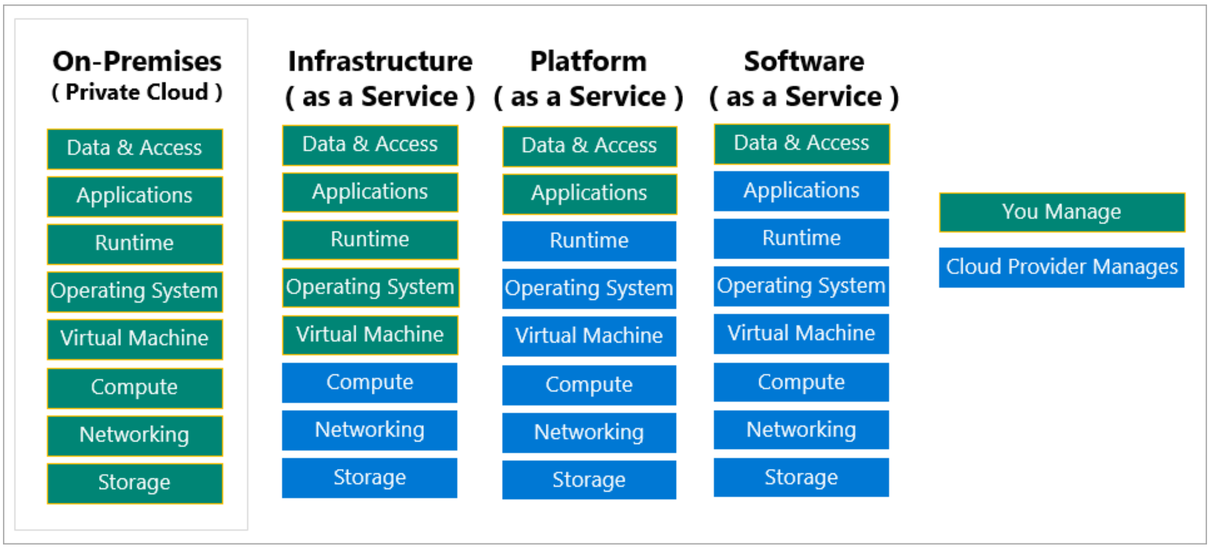
- **Geo-distribution**: You can deploy apps and data to regional datacenters around the globe, thereby ensuring that your customers always have the best performance in their region.
- **Disaster recovery**: By taking advantage of cloud-based backup services, data replication, and geo-distribution, you can deploy your apps with the confidence that comes from knowing that your data is safe in the event of disaster.

Capital expenses vs. operating expenses

- **Capital Expenditure (CapEx)** is the up-front spending of money on physical infrastructure, and then deducting that up-front expense over time. The up-front cost from CapEx has a value that reduces over time.
- **Operational Expenditure (OpEx)** is spending money on services or products now, and being billed for them now. You can deduct this expense in the same year you spend it. There is no up-front cost, as you pay for a service or product as you use it.

IaaS vs PaaS vs SaaS-


SaaS
PaaS
IaaS
Hosted applications/apps
Development tools, database management, business analytics
Operating systems
Servers and storage
Networking firewalls/security
Data center physical plant/building



On-Premises (Private Cloud)	Infrastructure (as a Service)	Platform (as a Service)	Software (as a Service)
🟩 Data & Access	🟩 Data & Access	🟩 Data & Access	🟩 Data & Access
🟩 Applications	🟩 Applications	🟩 Applications	🟦 Applications
🟩 Runtime	🟩 Runtime	🟦 Runtime	🟦 Runtime
🟩 Operating System	🟩 Operating System	🟦 Operating System	🟦 Operating System
🟩 Virtual Machine	🟩 Virtual Machine	🟦 Virtual Machine	🟦 Virtual Machine
🟩 Compute	🟦 Compute	🟦 Compute	🟦 Compute
🟩 Networking	🟦 Networking	🟦 Networking	🟦 Networking
🟩 Storage	🟦 Storage	🟦 Storage	🟦 Storage

🟩 You Manage

🟦 Cloud Provider Manages

OVERVIEW OF AZURE SUBSCRIPTIONS, MANAGEMENT GROUPS, AND RESOURCES:

- **Azure Regions-** A region is a geographical area on the planet that contains at least one but potentially multiple datacenters that are nearby and networked together with a low latency network.
- **Azure Availability zones-** Availability zones are physically separate datacenters within an azure region. Each availability zones is made up of one or more datacenters equipped with independent power,cooling and networking. It is mostly useful if one datacenter goes down the other down continuous working.
- **Azure Region pairs-** Availability zones are created by using obne or more datacenters. There is a minimum of three zones within a single region. It is possible that a large disaster could cause an outage big enough to affect even two data centers. That's why azure also create region pairs.
- **Azure Resources-** A manageable items that available through azure. EX-VM, storage accounts, web apps, databases.
- **Resource group-** A container that holds related resources for an azure solution. The resource group includes resources that you want to manage as a group. If a resource group deleted then resource under it will be delete.

(MODULE-2)

AZURE COMPUTE SERVICES-

1. **Virtual machines-** Virtual machines are software emulations of physical computers. They include a virtual processor, memory, storage and networking resources.
2. **VM Scale Set-** VM scale set are used to deploy and manage a set of identical VMs.
3. **App services-** With azure service you can quickly build, deploy and scale web apps, mobile and API apps running on any platform. It is Paas.
4. **Containers & Kubernetes-** Container instances and Kubernetes service are azure compute resources that you can use to deploy and manage containers. Containers lightweight, virtualized application environments. Thay are designed to be quickly created, scaled out and stopped dynamically.
5. **Functions-** Functions are ideal when you are concerned only about the code running your service and not the underlying platform or infrastrure. It is commonly used when you need to perform work in response to event, timer.

AZURE NETWORKING-

1. **Virtual networking-** It allows customer to create, manage, monitor and secure between Azure resources/VM. And also between Resources and on premise network. To connect multiple VM Vnet peering is used in Azure. It allows to connect and act as one. There is also other options called vpn gateway.
2. **VPN Gateway-** It allows you to connect on premise environments. So you can enable your network to talk with your network within onpremise environments. This communication is done over the public internet and entirely encrypted.
3. **Load balancer-** Load balancer simply means distribution of traffic across multiple resources/VM. So if you have two VM you can create a load balancer infront them to equally distribute the traffic among them.
4. **Application Gateway-** It has same function as load balancer but it is used in case of web application mostly.
5. **Content delivery network-**

AZURE STORAGE ACCOUNT FUNDAMENTAL-

1. **Disk storage-** Disk storage provides disks for azure vm.
2. **Blob storage-** It is used to store massive amount of unstructured data. It have 3 tiers.

   - **Hot access tier-**Used for storing data that is accessed frequently.
   - **Cool access tier-**Used for storing data that is accessed unfrequently.
   - **Archive access tier-**Used for storing data is rarely used.

3. **File storage-** Azure file storage is fully managed file shares in the cloud that are accessible via the industry standard SMB. Azure file storage is a fully managed distributed file system based on the SMB protocol and looks like a typical hard drive once mounted

(MODULE-3)

CORE SOLUTIONS AND MANAGEMENT TOOLS ON AZURE-

AZURE IOT SERVICES:

1. **Azure IOT Hub**- For Bidirectional communication between Iot application and devices.
2. **Azure IOT central**- Provide UI interface to connect quickly and provide dashboard to manage everything.
3. **Azure sphere**- To maintain end to end strong security.

AZURE AI SERVICES:

1. **Azure machine learning-** Used to predict future outcomes based on private historical data.
2. **Azure cognitive services-** To understand the content and meaning of images, video, images and audio or to translate into another language.
3. **Azure cognitive service personalizer services-** Predict user behaviour or provide with personalizes recommendations
4. **Azure BOT services-** Used to provide answer to commonly asked question by customer so that customer will feel they are talk with real human.

AZURE SERVERLESS TECHNOLOGY:

1. **Azure functions-**If code is already develoved and you want to make some changes then use it.
2. **Azure logic app-** If code is not develoved and your team have no idea about coding then use this.

BEST TOOL FOR MANAGING AND CONFIGURING AZURE ENVIRONMENT:

1. **Azure portal:** To access virtually every feature of azure.
2. **Azure mobile app:** Azure mobile app provides ios and android access to your azure resources when you are away from your computer.
3. **Azure powershell:** Powershell has helped windows centric it organization automate many of their on-premises operations for years.
4. **Azure CLI:** CLI has helped Linux centric it organization automate many of their on-premises operations for years.

5. **ARM Templets:** The developer, Devops professional or IT professional needs only to define the desired state and configuration of each resource in the ARM template and template does the rest.

BEST TOOL TO HELP ORGANIZATION BUILD BETTER SOL:

1. Azure DevOps Services:

Azure DevOps Services is a suite of services that address every stage of the software development lifecycle.

- **Azure Repos** is a centralized source-code repository where software development, DevOps engineering, and documentation professionals can publish their code for review and collaboration.
- **Azure Boards** is an agile project management suite that includes Kanban boards, reporting, and tracking ideas and work from high-level epics to work items and issues.
- **Azure Pipelines** is a CI/CD pipeline automation tool.
- **Azure Artifacts** is a repository for hosting artifacts, such as compiled source code, which can be fed into testing or deployment pipeline steps.
- **Azure Test Plans** is an automated test tool that can be used in a CI/CD pipeline to ensure quality before a software release.

2. **Github and Github action**- Open source platform allows third party to integrate their own inventories of new and used items
3. **Azure Devtest Labs**- Provide an automated means of managing the process of building and setting up. Developer and tester can perform test across a variety of environments.

BEST MONITORING SERVICES

1. **Azure advisor:** It evaluates your azure resources and make recommendation to help improve reliability, security and performances. Alert when new recommendation are available.
2. **Azure monitor:** Measure custom events alongside other uses metrics.
3. **Azure service health:** Used to setup alert that are specific to azure outage that affect all azure customers.

(MODULE-4)

GENERAL SECURITY & NETWORK SECURITY FEATURES-

1. **Azure security center:** It is a monitoring service that provides visibility of your security posture across all of your services both on azure and on-premises.
2. **Secure score:** Secure score is a measurement of an organization security posture. Secure score is based on security controls, or groups of related security recommendations.
3. **Azure sentinel:** It detect and respond to security threats. It uses intelligent security analytics and threat analysis. Azure sentinel enable you to collect cloud data at scale, Detect previously undetected threats, Investigate threats with AI, Respond to incidents rapidly.
4. **Azure key vault:** To manage secrets, manage encryption keys, Manage SSL/TLS certificates, Store secrets backed by hardware security modules.
5. **Azure Dedicated host:** To host azure virtual machines on dedicated physical server. It gives you visibility into and control over the server infrastructure that's running on your VM. Lets you choose the number of processor, server capabilities, VM series and VM sizes within the same host.

- **What is defense in depth?**
  1. Physical security- CCTv
  2. Identity and access-Id card
  3. Perimeter-Use DDos protection to filter large scale attacks
  4. Network-Limit communication between resources, deny by default
  5. Compute-
  6. Application
  7. Data

- **Azure firewall (To protect virtual networks)-** To limit all outbound traffic from VMs to known hosts. A *firewall* is a network security device that monitors incoming and outgoing network traffic and decides whether to allow or block specific traffic based on a defined set of security rules. You can create firewall rules that specify ranges of IP addresses. Only clients granted IP addresses from within those ranges are allowed to access the destination server.

- **DDoS Protection-** An attackers can bring down your website by sending a large volume of network traffic to your servers. In this situations DDoS protection is best solution. A distributed denial of service attack attempts to overwhelm and exhaust an application's resources, making the application slow or unresponsive to legitimate users. DDoS attacks can target any resource that's publicly reachable through the internet, including websites. Azure DDoS Protection (Standard) helps protect your Azure resources from DDoS attacks.

When you combine DDoS Protection with recommended application design practices, you help provide a defense against DDoS attacks. DDoS Protection uses the scale and elasticity of Microsoft's global network to bring DDoS mitigation capacity to every Azure region. The DDoS Protection service helps protect your Azure applications by analyzing and discarding DDoS traffic at the Azure network edge, before it can affect your service's availability.

- **Network security group (NSG)-** A network security group enables you to filter network traffic to and from Azure resources within an Azure virtual network. You can think of NSGs like an internal firewall. An NSG can contain multiple inbound and outbound security rules that enable you to filter traffic to and from resources by source and destination IP address, port, and protocol.

It is mostly used to deny by deafault policy so that VMs can not connect to each other.

(MODULE-5)

SECURE ACCESS TO YOUR APPLICATIONS BY USING AZURE IDENTITY SERVICES:

- **Azure AD-** Azure AD provides identity services that enable your users to sign in and access both Microsoft cloud applications and cloud applications that you develop.
- **Single Sign-on-** It enables a user to sign in one time and use that credential to access multiple resources and applications from different providers.
- **Multifactor Authentications-** It is a process where a user is promoted during sign-in process for an additional form of identification. Examples includes a code on their mobile phones or a finger print scan.

1. Something the user knows- email or password
2. Something the user has- OTP that the user received
3. Something the user is- Fingerprint or face scan

- **Conditional access-** it is a tool that azure AD uses to allow or deny access to resources based on identity signals. Here the signal may be the users location, the user device or the application that the user is trying to access. Based on these signals, the decision might be to allow full access if the user is signing from their usual location. If the user is signing in from an unusual location or a location that marked as high risk then access might be blocked e tirely or possibly granted after the user provides a second form of authentication.
- **Role Based access control(RABC)-** To give only right access to perform their job. You can manage access permissions on the access control pane in the azure portal.
- **Resource Locks-** A resource locks prevent resources from being accidentally deleted or changed.
    1. CanNotDelete- It means authorized people can still read and modify a resource but can not delete that.
    2. Readonly- It means authorized person cam only read can not modify it.
- **Azure Tags-** It is used to organize related resources in one place. You can add, modify, delete resource tags through powershell, azure CLI, Azure resource manager templets, The REST API or azure portal.
- **Azure policy-** Azure policy is a service that enables you to create, assign and manage policies that control or audit your resources. These policies

enforce different rules across all of your resource configurations so that those configurations stay compliant with corporate standards.

(MODULE-6)

COMPARE COSTS BY USING THE TOTAL COST OF OWNERSHIP CALCULATOR:

- **TCO Calculator-** It helps you estimate the cost savings of operating your solution on azure over time, instead of in your on-premises datacenter. This is how TCO calculator works.
  1. Define your workloads-what you are going to used
  2. Adjust assumptions-Review what software license you have so that eliminate that in cloud
  3. View the Report- Noe view the report and calculate which is cost saving
- **How do I purchase azure services-** Through an enterprise agreement, directly from the web, through cloud solution provider.
- **What factors affect ccosts-** The way you use resources, your subscriptions, pricing from third party vendors are common factors. Location and network traffic also affect costs.
- **How to minimize total cost on Azure-**
  1. Understand the estimate costs before you deploy
  2. Use azure advisor to monitor your usage
  3. Use spending limit to restrict your spending
  4. Use Azure Reservations to prepay
  5. Choose low-cost locations and regions
  6. Research available cost-savings Offers
  7. Use azure cost management + Billing to control spendings
  8. Apply tags to identify cost owners
  9. Resize underutilized virtual machines
  10. Deallocate VM during off hours
  11. Delete unused resources
  12. Migrate from IaaS to PaaS
  13. Save on licensing costs