19/11/2022
Saturday

Microsoft Azure Fundamentals

AZ-900

⇒ Focuses on billing, security and business centric concepts

40-60 Questions
Exam sandbox → practice
2 Yrs valid
Exam time - 60 mins
Seat time - 90 mins

Cloud concepts (15-20%)
Core Azure services (30-35%)
Security, Privacy, compliance and Trust (25-30%)
Pricing, Service Level Agreements and Lifecycles (20-25%)

What is cloud computing?

⇒ The practice of using a network of remote servers hosted on the internet to store, manage and process data, rather than a local server or a personal computer.

Dedicated Server:

⇒ One physical machine dedicated to a single business

⇒ Very Expensive
⇒ High Maintenance
⇒ High Security

Ex: Runs a single website

Virtual Private Server:

⇒ One physical machine dedicated to a single business. The physical machine is virtualized into sub-machines

Ex: Runs Multiple web apps

Shared Hosting:

One physical machine. Shared by hundreds of business. Relies on most tenants

under - utilizing their resources

⇒ very cheap
⇒ very limited

Cloud Hosting:

⇒ Multiple physical machines which are as one system. The system is abstracted into multiple cloud services.

⇒ Flexible
⇒ scalable
⇒ Secure
⇒ cost - Effective
⇒ High configurability

Common cloud services:

Four common types of cloud services for IAAS would be:

Compute: Virtual computer that can run application, programs and code.

Storage: Virtual hard - drive that can store files

Networking: Virtual network being able to define internet connections or network isolations.

Databases: Virtual database for storing reporting data or a database for general purpose web application.

Microsoft Azure: Cloud Provider Service (CSPs)

Benefits of cloud computing:

cost - effective: Pay for what you consume, no up - front cost. Pay - as - you - go (PAYG) thousands of customers sharing the cost of the resources.

Global: Launch workloads anywhere in the world.

secure: Cloud Provider take care of physical Security. Cloud services can be Secure by default. Ability to configure access down granular level.

Reliable : Back backup, disaster recovery, data replication and fault tolerance.

Scalable: Increase or decrease resources and services based on demand.

Elastic : Automate scaling during spikes and drop in demand.

Current : The underlying hardware and managed Software is patched, upgraded and replaced by the cloud provider without any interruption.

Types of cloud computing:

SAAS : → For customers
A product that is run and managed by the Service provider. Service is maintained by the CPs.

PAAS : → For Developers
Focus on the deployment and management of your apps. configuring, Provisioning, understanding The hardware are taken care by CSPs.

IAAS : → For Admins
The basic building blocks for cloud IT. Providing access to networking features, computers and data Storage space. Data centers and hardware will be taken care by CSPs.

Examples:

SAAS : Gmail, salesforce

PAAS : Heroku

IAAS : Microsoft Azure

CamScanner

Types of cloud computing Responsibilities.

On-Premise:

Customer is responsible for

- ⇒ Applications
- ⇒ Data
- ⇒ Runtime
- ⇒ Middleware
- ⇒ OS
- ⇒ Virtualization
- ⇒ Servers
- ⇒ Storage
- ⇒ Networking

Infrastructure as a service:

Customer is responsible for

- ⇒ Applications
- ⇒ Data
- ⇒ Runtime
- ⇒ Middleware
- ⇒ OS

CSP is Responsible for

- * Virtualization
- * Servers
- * Storage
- * Networking

Platform as a Service:

Customer is responsible for

- ⇒ Applications
- ⇒ Data

CSP is responsible for

- * Runtime
- * Middleware
- * OS
- * Virtualization
- * Servers
- * Storage
- * Networking

CamScanner

Software as a Service:

CSP is responsible for

⇒ Applications
⇒ Data
⇒ Runtime
⇒ Middleware
⇒ OS
⇒ Virtualization
⇒ Servers
⇒ storage
⇒ Networking

Azure's Deployment Models:

Public cloud: Everything built on the cloud provider. Also known as cloud-Native.

Azure Network:

Virtual Network

Public subnet

VM

Private subnet

DB

Private cloud: Everything built on company's data centers. Also known as On-Premise The cloud could be open stack.

On-Premise Data center:

open stack

Public subnet

M

Private subnet

DB

Hybrid: Using both On-Premise and a CSP. Express Route established the connection between On-premise and CSP.

Advantages of Azure Deployment Models:

Public cloud:

⇒ Most cost-effective
⇒ Security controls by default
⇒ You don't need in-depth knowledge of underlying infrastructure.

Private cloud:

⇒ It can meet any security compliance requirement if you put in the work.

⇒ You can configure the infrastructure however you like.

Hybrid:

⇒ could be more cost-effective based on what you offload to the cloud.

⇒ can meet all security requirements

⇒ You get the best of both worlds

Disadvantages of Azure Deployment models:

Public cloud:

⇒ Might not meet security requirements

⇒ Limited based on what the cloud service provider exposes to you.

Private cloud:

⇒ Most expensive

⇒ No guarantee for security

⇒ You need to know in-depth how to configure all levels of your infrastructure.

Hybrid:

⇒ Now You have to secure your connection to the cloud.

⇒ You need to know in-depth how to configure all levels of your

infrastructure and know the CSPs services.

Cross - cloud:

⇒ Using Multiple cloud Providers

AKA - multi cloud, hybrid - cloud.

Amazon EKS ↔ Azure Arc ↔ GCP kubernetes Engine

Total cost of Ownership:

CAPEX

On - Premise

Software License Fees

* Implementation
* configuration
* Training
* Physical security
* Hardware
* IT personal
* Maintenance

15% savings

capital Expenditure

Spending money for physical infrastructure

Deducting the expense from your tax bill over time.

⇒ Server costs (computers)
⇒ Storage costs (hard drives)
⇒ Network costs (Routers, cables, switches)
⇒ Backup and Archive costs
⇒ Disaster Recovery cost

OPEX

Azure Subscription Fees

* Implementation
* Configuration
* Training

Operational Expenditure

⇒ Non - physical costs
⇒ Leasing software and customizing features.
⇒ Training employees in cloud services
⇒ Paying for cloud support
⇒ Billing based on cloud matrices eg: compute usage
Storage usage

⇒ Datacenter costs (Rent, cooling, Physical security)

⇒ Technical Person

⇒ With capital Expenses you have to spend guess upfront what you plan to spend

⇒ With operation Expenses you can try a product or service without investing in equipment

cloud Architecture Terminologies:

Availability: Your ability to ensure a service remains available (Highly Available)

Scalability: Your ability to grow rapidly or unimpeded.

Elasticity: Your ability to shrink and grow to meet the demand.

Fault Tolerance: Your ability to prevent a failure.

Disaster Recovery: Your ability to recover from a failure. Highly Durable (DR)

High Availability:

⇒ To ensure a certain level of performance.

⇒ To ensure that there is no single point of failure.

⇒ Running your workload across multiple Availability zones ensure that if 1 or 2 AZs become unavailable your service / application remains

available.

Azure Load Balancer: A load Balancer allows you to evenly distribute traffic to multiple servers in one or multiple datacenter. If a data center or server becomes available will route the traffic to only available datacenters with servers.

High Scalability:
⇒ Your ability to increase your capacity based on the increasing demand of traffic, memory and computing power

Vertical scaling: Scaling up
Upgrade to a bigger server.

Horizontal scaling: Scaling out
Adding multiple servers

High Elasticity: Your ability to automatically increase or decrease your capacity based on the current demand of traffic, memory and computing power.

Horizontal Scaling:
Scaling out - Add more servers of the same size
Scaling In - Removing more servers of the same size.

Vertical scaling is generally hard for traditional architecture so you'll usually only see horizontal scaling described with elasticity.

Azure VM Scale Sets:

⇒ Automatically increase or decrease in response to demand or defined schedule.

SQL Server Stretch Database:

⇒ Dynamically stretch warm and cold transactional data from Microsoft SQL Server 2016 to Microsoft Azure.

Fault Tolerance:

High Durability: Your ability to recover from a disaster and to prevent the loss of data solutions that recover from a disaster is known as Disaster Recovery (DR).

Evolution of computing:

Dedicated → VMs → containers → Functions

⇒ A physical server wholly utilized by a single customer.

⇒ You have to guess your capacity. You'll overpay for an underutilized server.

⇒ Upgrading beyond your capacity will be slow and expensive.

⇒ You are limited by your operating system.

⇒ Multiple apps can result in conflicts in resource sharing.

⇒ You have a guarantee of

security, privacy and full utility of underlying resources.

Virtual Machines:

⇒ You can run multiple virtual machines on one machine.

⇒ Hypervisor is the software layer that lets you the VMs

⇒ A physical server shared by multiple customers.

⇒ You are pay for a fraction of the server.

⇒ You'll overpay for an underutilized virtual machine.

⇒ You are limited by your Guest operating system.

⇒ Multiple apps on a single virtual machine can result in conflicts in resource sharing.

Containers:

⇒ Virtual machine running multiple containers

⇒ Docker Deamon is the name of the software layer that lets you run multiple containers

⇒ You can maximize the utilized available capacity which is more cost-effective.

⇒ Your container share the

same underlying OS so containers are more efficient than multiple VMs

⇒ Multiple apps can run side by side without being limited to the same OS requirements and won't cause conflicts during resource sharing.

Functions: Break apps into little pieces of code

⇒ A managed VMs running managed containers. Known as serverless compute.

⇒ You upload a piece of code choose the amount of memory and duration.

⇒ Only responsible for code and data, nothing else

⇒ Very cost-effective, only pay for the time code is running. VMs only run when there is code to be executed.

⇒ cold starts is the side-effect of this setup. ↳ Latency

Global Infrastructure - Regions and Geographies:

A region is a grouping of multiple data centers (Availability zones)

Azure has 58 Regions available across 140 countries.

A Geography is discrete market of two or more regions that preserves data residency and compliance boundaries.

Azure Geographies:

- ⇒ United states
- ⇒ Azure Government (US)
- ⇒ Canada
- ⇒ Brazil
- ⇒ Mexico

Canada Azure Geographies.

Data Residency: Imagine you are in Canada and you want a guarantee that data will remain within Canada. choose the region when you launch a new cloud resource.

Paired Regions: Each region is paired with another region 300 miles away. Only one region is updated at a time to ensure no outages. → To avoid downtime.

Some Azure services rely on paired regions for Disaster Recovery.

Eg: Azure Geo-redundant storage (GRS) replicates data to a secondary region automatically, ensuring that data is durable even in the event That the primary region isn't recoverable.

Paired Regions

Canada	Canada central	Canada East
North America	East US	West US
Germany	Germany central	Germany Northeast

Region Types and Service Availability:

Not all Azure cloud services are available in every region.

Recommended Region

→ A region that provides the broadest range of service capabilities and is designed to support availability zones now, or in the future.

Alternate (Other) Region

⇒ A region extends Azure's footprint within a data residency boundary where a recommended region also exists.

⇒ Not designed to support AZs

⇒ These regions are label as other in the Azure Portal.

General availability (GA) is when a service is considered ready to be used publicly by everyone.

Azure cloud services are grouped into three categories. Their category determines when cloud services become available:

⇒ Foundational: When GA, immediately or in 12 months in recommended and Alternate Regions

⇒ Mainstream: When GA immediately or in 12 months in recommended regions. may become available in Alternate Regions based on customer demand.

⇒ Specialized: Available in Recommended or Alternate Region based on customer demand.

Special Regions:

⇒ Azure has specialized regions to meet compliance or legal reasons

* US DOD central
* US Gov Virginia
* US Gov Iowa

Three Azure Government secret location undisclosed.

* China East
* China North

Available between Microsoft Through a unique partnership Microsoft does not directly maintain the data centers and 21 vianet.

Availability zone: An availability zone (AZ) is physical location made up of one or more datacenter

⇒ A region will generally contain Availability zones.

⇒ Data centers within a region will be isolate from each other. But They will be close enough to provide low-latency.

⇒ Its common practice to run workloads in atleast 3 AZs to ensure services remain available in case one or two data centers fail. (High Availability)

Availability Zone Supported Regions:

⇒ Not Every Region has support for Availability zones. These regions are known as Alternate to other.

⇒ Recommended regions are suppose to have at least 3 AZs

Availability sets Fault and Update Domains:

⇒ An availability zone (AZ) in an Azure region is a combination of a fault domain and an update domain.

Fault Domain:

⇒ A logical grouping of hardware to avoid a single point of failure within an AZ.

⇒ Group of virtual machines That share a common power source and network switch.

Update Domain:

⇒ Azure may need to apply updates to the underlying hardware and software. Update domains ensure your resources do not go offline.

Availability set:

⇒ A logical grouping that you can use in Azure to ensure that the VMs you place in the availability set are different fault / update domains to avoid downtime.

Each virtual machine in an availability set is assigned a Fault Domain and Update Domain

Virtual Machine creation

⇒ Availability set creation.

computing services:

Azure virtual Machines:

⇒ Windows or Linux VMs. The most common type of compute. You choose your os. Memory, CPU, storage. You share hardware with other customers.

Azure container Instances:

⇒ Docker as a service run containerized apps on Azure without provisioning servers or VMs.

Azure Kubernetes service: (AKS)

⇒ Kubernetes as a service. Easy to deploy, manage and scale containerized applications. Uses the open source Kubernetes (K8) software.

Azure service Fabric:

Tier-1 Enterprise container as a service.

⇒ Distributed systems platform. Runs in Azure or on-premises. Easy to package

deploy, manage scalable and reliable microservices.

Azure Functions:

⇒ Event-driven, serverless compute (functions) run code without managing servers. You pay only for the compute time you consume.

Azure Batch:

⇒ Plans, schedules and executes your batch computer workloads across running 100+ jobs in parallel. Use spot VMs to save money (previously used low-priority VMs to save on compute)

Storage Services:

Azure Blob storage:

⇒ Object serverless storage. Store very large files and large amounts of unstructured files. Pay for what you store, unlimited storage, no resizing volumes, filesystem protocols.

Azure Disk storage:

⇒ A virtual volume. choose SSD or HDD, encryption by default, attach volume to VMs.

Azure File storage:

⇒ A shared volume that you can access and manage like a file server. eg SMB

Azure Queue storage:

⇒ Messaging queue. A data store for queuing and reliably delivering messages between applications.

Azure Table Storage:

⇒ Wide-column NoSQL Database. A NoSQL store that hosts unstructured data independent of any schema.

Azure data box / Azure Databox Heavy:

⇒ A rugged briefcase computer and storage designed to move terabytes or petabytes of data

Azure Archive storage:

⇒ Long term cold storage for when you need to hold onto files for years on the cheapest storage options

Azure Data Lake storage:

⇒ A centralized repository that allows you to store all your structured and unstructured data at any scale.

Database Services:

Azure cosmos DB:

⇒ A fully managed NOSQL databases. Designed for scale with guarantee of 99.999% availability

Azure SQL Database

⇒ Fully managed MS SQL database with auto-scale, integral intelligence, and robust Security

Azure Database for MySQL / PSQL / MariaDB:

⇒ Fully managed and scalable MySQL/ Postgre SQL / MariaDB database with high availability and Security.

SQL Server on VMs:

⇒ Host enterprise SQL Server apps in the cloud. Lift-and-Shift MS SQL Servers from on-premise to Azure cloud.

Azure SQL Data Warehouse / Azure Synapse Analytics:

⇒ Fully managed data warehouse with integral security at every level of scale at no extra cost

Azure Database Migration Service:

⇒ Migrates your databases to the cloud with no application code changes.

Azure cache for Redis:

⇒ caches frequently used and static data and application latency.

Azure Table storage:

⇒ Wide-column NoSQL Database. A NoSQL store that hosts unstructured data independent of any schema.

Application Integration Services:

It helps different apps talks to each other.

Azure Notifications Hub:

⇒ Publishers / Subscribers send push notifications to any platform from any backend.

Azure API Apps:

⇒ API Gateway Quickly build and consume APIs in the cloud. Route APIs to Azure Services.

Azure Service Bus:

⇒ Service Bus reliable cloud messaging as a service (Maas) and simple hybrid integration

Azure Stream Analytics:

⇒ Serverless real-time analytics,

from the cloud to the edge.

Azure Logic Apps:

⇒ Schedule, automate and orchestrate tasks, businesses processes and workflows. Integration and Enterprise Saas and Enterprise applications.

Azure API Management:

⇒ Hybrid, multi-cloud management platform for APIs across all environments. put in front of existing APIs to add additional functionality.

Azure Queue Storage:

⇒ Messaging Queue. A data store for Queuing and reliably delivering messages between applications.

Developer and Mobile Tools:

Azure SignalR service:

⇒ Real-Time messaging easily and real-time web functionality to applications. Think of it like the pushers for Azure.

Azure App service:

⇒ Easy to use service for deploying and scaling web-applications with .net, node.js, java, python and PHP Developer focus on building their web-apps, and not worry about the underlying infrastructure Think of it Heroku for Azure.

Visual Studio (Microsoft-Owned):

⇒ code Editor. The integrated development environment (IDE) designed for creating powerful, scalable application for Azure.

Xamarin (Microsoft . owned):

⇒ Mobile - App framework create powerful and scalable native mobile apps with .net and Azure

Azure Devops Services:

Azure Devops:

⇒ Plan smarter, collaborate and ship faster with a set of modern dev services.

Azure Board:

⇒ Kanban Deliver value to your users faster using proven agile tools to plan, track and discuss work across your teams

Azure pipelines:

⇒ Build, test and deploy with CI/CD that works with any language, platform and cloud. Connect to GitHub or any other Git provider and deploy continuously.

Azure Repos:

⇒ Get unlimited, cloud-hosted private Git repos and collaborate to build code with pull requests and advanced file management.

Azure Test Plans:

⇒ Test and ship with confidence using manual and exploratory testing tools.

Azure Artifacts:

⇒ Create, host and share packages with your team and add artifacts to CI/CD pipelines with a single click.

Azure DevTest Labs:

⇒ Fast, easy and lean dev-test environments.

Azure Resource Manager:

Infrastructure as code (Iac)

⇒ The process of managing and provisioning computer data centers through machine-readable definition files, rather than physical hardware configuration or interactive configuration tools.

ARM: It allows you to programmatically create Azure resources via Json template.

Azure Quickstart Templates:

⇒ Azure Quickstart is a library of pre-made ARH templates provided by the community and partners to help you quickly launch new projects for a variety of stack scenarios:

⇒ Deploy a Djmgo App

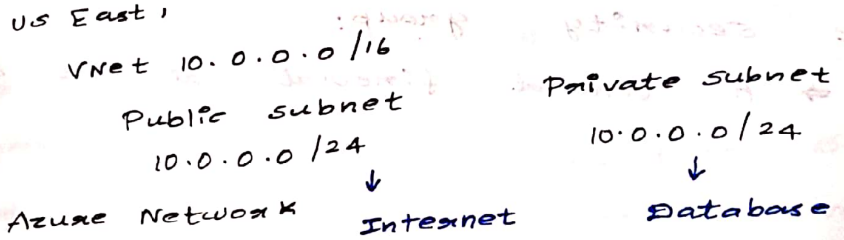
⇒ Deploy an Ubuntu VH with Docker Engine

⇒ CI/CD containerized App Deploy Docker Enterprise & Jenkins

⇒ Web App on Linux with Postgre SQL

Azure Virtual Network (vNet) and Subnets

⇒ Virtual Network (vNet) is a logically isolated section of the Azure Network where you launch your Azure resources. You choose a range of IPs using CIDR Range.



CIDR Range of 10.0.0.0/16 = 65536 IP Addresses

Subdivision of virtual network → Subnet

Subnets:

⇒ Subnet is a logical partition of IP network into multiple smaller network segments. You are breaking up your IP range for VNet into smaller networks. Subnets need to have a smaller CIDR range than to the VNet represent their portion.

eg. Subnet CIDR Range 10.00.0/24 = 256 IP Addresses

A Public subnet is one that can reach the internet

A Private subnet is one that cannot reach the internet.

Cloud - Native Networking Services:

Azure DNS:

⇒ Provides ultra-fast DNS responses and ultra-high domain availability.

Azure Virtual Network (VNet)

⇒ A logical isolated section of the Azure network for customers to launch Azure resources within.

Azure load Balancer:

⇒ OSI Level 4 (Transport) Load Balancer

Azure Application Gateway:

⇒ OSI Level 7 (HTTP) Load Balancer, can apply a web Application Firewall.

Network Security group:

⇒ A virtual firewall at the subnet level.

Enterprise / Hybrid Networking Services:

Azure Front Door:

⇒ Scalable and secure entry point for fast delivery of your global applications.

Azure Express Route:

⇒ A connection between your on-Premise to Azure cloud from 50 Mbps to 10 Gbps

Virtual WAN:

⇒ A networking service that brings many networking, security and routing functionalities together to provide a single operational interface.

Azure connection:

⇒ A VPN connection securely connects two Azure local network via (IPsec)

Virtual Network Gateway:

⇒ A site-to-site VPN connection between an Azure virtual network and your local network.

Azure Traffic Manager:

⇒ It operates at the DNS layer to quickly and efficiently direct incoming DNS requests based on the routing method of your choice

Routing method ⇒ Performance
Weighted
Priority
Geographic
Multivalue
Subnet

⇒ Route traffic to servers the geographically near by to reduce latency

⇒ Fail-over to redundant systems in-case primary systems become