TRƯỜNG ĐẠI HỌC KINH TẾ

**KHOA THỐNG KÊ – TIN HỌC**

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**CHUYÊN NGÀNH QUẢN TRỊ HỆ THỐNG THÔNG TIN**

**Microsoft Azure Exam AZ-900 Certification WhizCard**

Sinh viên thực hiện : Nguyễn Thị Thanh Thư

Lớp : 45k21.1

Đơn vị thực tập : TMA Innovation Park

Cán bộ hướng dẫn : Đào Văn Tiến Dũng

Giảng viên hướng dẫn : ThS.Cao Thị Nhâm

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# **UNDERSTAND CLOUD CONCEPTS**

## **Cloud Computing**

* + 1. What is Cloud Computing?
* Cloud computing transmits computer services via the Internet (the cloud) to enable faster innovation, more flexible resources, and scale economies. You typically only pay for the cloud services you use, which allows you to save money, better manage your infrastructure, and expand as your company develops.
  + 1. On-premises vs. Cloud
* If you wish to be on-premises, you must make significant upfront investments in servers, storage, security, and a place for a data center, among other things. This is known as CapEx, which many businesses cannot afford in the first place. There are many additional drawbacks for on-premises, such as no scalability, no disaster recovery, and so on, which we will explore more.
  + 1. Why Cloud?
* The supply of computer services via the internet utilizing a pay-as-you-go pricing mechanism is known as cloud computing. You usually just pay for the cloud services you utilize, which allows you to do things like:
* Reduce your operational expenses.
* Improve the efficiency of your infrastructure.
* Scale up or down as your company's requirements vary.
* To put it another way, cloud computing uses someone else's data center to rent computing power and storage
* You may handle cloud resources the same way you would your local data center’s resources. You return them after you've finished using them. You are only charged for what you use. This is called OpEx.
* You rent CPUs and storage when you need them rather than keeping them in your data center. The cloud provider maintains the underlying infrastructure for you. You may utilize the cloud to rapidly solve your most difficult business problems and provide cutting-edge solutions to your users.
  + 1. CapEx vs. OpEx

|  |  |  |
| --- | --- | --- |
|  | **CapEx** | **OpEx** |
| Purpose | Assets intended to benefit the organization for more than one year | Ongoing expenses to run the day-to-day business |
| The way of purchasing | One-time purchase | Pay-as-you-go approach |
| Accounting treatment | CapEx can’t be fully deducted in the accountign period. They are depreciated or amortized over time | OpEx is fully deducted in the accounting period |
| Example | Purchasing office buildings, equipment, vechicles,intellectual propety assets | Consumables, wages, rent, maintenace, and repair of machinery |

* + 1. Advantages of Cloud Computing
* Scalability: is the process of allocating or deallocating resources.
* Elasticity: can be also termed as automatic scaling of the resources, i.e., the ability of the resources to scale dynamically.
* Agility: It is the process of deallocating or allocating resources quickly. Generally, when it comes to On-premises, it may take many hours or days to allocate a new resource, but it's just a matter of minutes when it comes to the cloud.
* Fault Tolerance: The capacity to stay operational during component and service failures is referred to as fault tolerance.
* Disaster Recovery: Disaster Occurs when there is a natural catastrophe. So we have to duplicate the resources at various locations to be up and running even during times of catastrophe.
* High Availability: It’s the capacity to keep the resources accessible for a long time with minimal downtime. The greater the availability, the better it is. Most of the resources in azure have high availability.

## **Different Cloud Models**

* + 1. Three kinds of cloud models
       - 1. *Software as a service :*
* With this service, you don't need to download or install any software on your PC.
* As with many cloud services, it can be accessed through the internet via a web browser.
* The cloud vendor manages everything. You simply need to concentrate on how you can get the most out of it.
* Examples of SaaS: Office 365, Google docs, Google sheets, DropBox, etc.
* Users: End Customers
  + - * 1. *Platform as a service :*
* It's a service that lets clients maintain and develop applications without worrying about the underlying infrastructure.
* In this service, the cloud vendor manages infrastructure, operating system, middleware, etc.
* Examples of PaaS: Heroku, Google App Engine, Azure Web Apps, OpenShift
* Users – Developers
  + - * 1. *Infrastructure as a service :*
* It’s a service that provides key computation, storage, and networking resources on demand but in a virtual environment.
* The cloud vendor manages the infrastructure in this service, but the User itself manages the operating system, middleware, runtime, etc.
* Examples of IaaS: DigitalOcean, AWS, Microsoft Azure, Azure Virtual Machines, Google Cloud Platform
* Users: System administrators

IaaS vs. PaaS vs. Saa

|  |  |  |  |
| --- | --- | --- | --- |
|  | IaaS | PaaS | SaaS |
| Who use it | System Administrators | Developers | End users |
| What users get | Virtual data center to store information and create platforms for services and app development, testing, and development | Virtual platform and tools to create, test and deploy apps and services | Web software and apps to complete business tasks |
| Provider controls | Servers Storage Networking Virtualization | Servers Storage Networking Virtualization os Middleware Runtime | Servers Storage Networking Virtualization os Middleware Runtime Applications Data |
| User controls | OS Middleware Runtime Applications Data | Applications Data | - |

## **Cloud Types**

* + 1. Public Cloud
* In this kind of cloud, the whole infrastructure is situated at the cloud vendor aka the business that sells its services to the general public.
* In the case of the public cloud, we just need to go to the website of the relevant cloud provider and build or administer the resources.
* Others can use the resources that we previously utilized once we destroy them.
* Examples:- Microsoft Azure, Amazon Web Services
  + 1. Private Cloud
* This type of cloud is similar to a public cloud, but the difference is that the infrastructure and requirements are reserved for just a single organization only.
* The resources are isolated and can’t be used by other organizations.
* The cloud can be located on-premise as well.
* Examples:- Azure stack, Amazon private cloud
  + 1. Hybrid Cloud
* This is a combination of public cloud and private cloud. This is much more complex than public or private clouds. In this type of cloud
* The public cloud is used for non-critical tasks.
* The private cloud is used to carry out critical tasks.

# **UNDERSTAND AZURE CORE SERVICES-PART 1**

## **What is Azure**

* Azure is one of the largest cloud service providers in the world.
* It offers you the flexibility to use your preferred tools and frameworks to create, manage, and deploy apps on a large global network.
* Azure's ever-expanding nature makes it one of the finest on the market, and it is also provided by one of the biggest and most famous MNCs in Microsoft.
* Azure provides a wide range of services, including computing resources, networking resources, serverless computing, and many more.

## **Azure Regions**

### Region

* Azure has regions across the world that can be used to host resources
* These are different geographic locations situated across the world
* You can host resources in Azure in any one of the available regions

### Availability Zone

* These are physically separate locations within an Azure region
* Each availability zone is made up of one or more data centers
* Each is equipped with independent power, cooling, and networking
* You can use Availability Zones to run mission-critical applications with high availability and low-latency replication

### Understanding

* When you create resources in Azure, they are made in an underlying data center
* Azure is responsible for maintaining the data center
* The data center contains all the physical infrastructure required to host resources in Azure

## **Azure Architecture for management of Resources**

* + 1. Azure Subscriptions
* As the name implies, a subscription is a logical entity that grants access to deploy and consume Azure resources.
* A resource may be anything from a virtual machine to a storage account or something related to networking.
* Almost anything in Azure can be utilized as a resource.
* A subscription is something that can be purchased and used for a certain amount of time. The same is true for Azure subscriptions.
  + 1. Azure Management Groups
* A company may use Azure management groups to govern and manage access, compliance, and rules for their subscription inside their tenancy.
* An azure management group comes above the azure subscription in the hierarchy of management of resources in Azure.
* A subscription can only have one management group.
  + 1. Azure Resource Group
* A resource group is a next level in the hierarchy of Azure Architecture. A resource group is the logical mapping of the resources.
* For Creating Any Resource, you need a resource group.
* An Azure Management group is optional. However, azure resource groups and subscriptions are required. Resource groups can’t be nested.
  + 1. Azure Resources
* A resource is something that is used to manage services in azure.
* At any one moment, a resource can only be in one resource group.
* The final component in the Azure architectural hierarchy is the resource.
* A resource group and a resource can be in two different locations; there is no restriction.

## **Azure Virtual Network**

Azure Virtual Machines are hosted in an Azure Virtual Network. In Azure, you create your virtual network. If necessary, you may build several virtual networks in Azure. Each virtual network in azure needs to be assigned to an address space. Example of an address space 15.0.0.0/16

Some called subnets have an address space that is a subset of the virtual network. As there can be many subsets for a set of numbers, there can be many subnets for a virtual network. You can spin up a virtual machine in a subnet, each machine launched in a subnet gets a private IP address. A private IP address facilitates inter-subnet communication.

## **Virtual Machines**

* + 1. Virtualization
* In general, virtualization refers to the process of simulating something.
* The technique of operating a virtual instance of a computer system in a layer separate from the real hardware is known as virtualization.
* It most often refers to the use of several operating systems on a computer system at the same time.
* So, if you have a Windows computer, you may run a Linux-based operating system in a Windows virtual machine by using technologies like VMware, which supports Virtualization.
  + 1. Azure Virtual Machines (Infrastructure As A Service)

1. Azure Virtual Machines are an IAAS offering
2. Azure Virtual Machine:

* Are cost-effective
* Multiple resources are created along with VM when created
* Users can choose amongst a variety of available configurations and OS as per the requirements.
* With regular use of a Linux operating system through virtualization, one must download software such as VMware and certain files linked to the Linux OS itself, but this is not the case for Azure Virtual Machines, which can be run in the cloud itself.
* We don't need to download any hefty software since we can connect to the VM directly in many ways. Two of those ways are:
* Using Remote Desktop Connection (RDP)
* Using Azure Bastion Service
* A public IP address is assigned to the virtual machine for it to communicate with the internet. It's important to know how virtual machines are created in azure. For that, please refer to the link given below.

## **Azure Dedicated Hosts**

* This is a service that gives you a physical server as a resource
* This allows you to host one or more virtual machines on the physical server
* Her the advantage is that no other customer can host their VMs on the physical server
* This provides hardware isolation at the physical server level
* You also get control over the maintenance event that gets initiated by the Azure platform

## **Network Security Groups**

### Network Security Groups

* Use to control traffic into your subnet on Virtual Machine
* It consists of rules for Inbound and Outbound traffic
* Traffic within a Virtual Network is automatically allowed
* You need to allow traffic from the Internet explicitly

### Rules

* Each rule has a source and destination
* This can be either an IP address, a CIDR block, a service tag, or an application security group
* You define the port numbers for the rule
* You define the protocol
* You decide whether to allow or Deny the action

## **Virtual Machine Scale Sets**

### Understanding

* This service allows you to create a set of identical virtual machines
* Allows you to scale on demand
* Add’s an element of high availability to your infrastructure
* You can place the machines in the scale set behind either a Load balancer or an Application Gateway

### Scale Sets

* Allows you to scale your infrastructure based on demand
* Infrastructure can scale-out
* Infrastructure can scale in
* Can be applied to Azure Web Apps as well

## **Azure Load Balancer**

* + 1. Understanding
* Provides high availability for your applications
* The load balancer itself is a fully managed service in Azure
* Allows you to distribute traffic to your backend Virtual Machines
  + 1. Purpose
* You can create an Internal Load Balancer- Only balance traffic from within a Virtual Network
* You can create a Public Load Balancer-This can be used to load balance internet traffic to Virtual Machines
* There are 2 pricing tiers for Load Balancers-Basic and Standard
* Backend Pool- These are nothing but your Virtual Machines. For the standard load balancer, you can define many backed virtual machines
* For the Basic Load Balancer-You can define a Virtual Machines, an availability set, or a scale set
* Health Probe- This is used to check whether a backend virtual machine is healthy or not
* Load Balancing Rules - This defines how to route traffic when it arrives on the load balancer
* You use the rules to redirect traffic to the backend pool
* You can also enable Session Persistence-Here client IPs can be directed to the same backend virtual machines

## **Azure Application Gateway**

* Fully Managed service
* You can also add Wen Application Firewall as a feature
* Protect against common attacks such as SQL injection, cross-site scripting attacks
* You can use this feature to protect web applications that sit behind the Application Gateway
* The Application Gateway also has a feature of a Web Application Firewall
* A load balancer that works at layer 7-Application layer

## **Azure Storage Accounts**

### BLOB

* Object storage solution
* Store unstructured data
* Store log files
* Good for storing files, videos, images
* Features for BLOB storage
* Hot storage tier - idea for objects that an accessed frequently
* Cool tier - Optimized for data that is infrequently accessed
* Archive tier - Optimized for data that is rarely accessed
* You can also set restraints on accessing objects in BLOB storage

### Table Storage

* Used for storing structured NoSQL data
* This is a key attribute store
* Cost-effective option for storage of table-like data for applications
* An example is the storage of user data for applications

### File Storage

* Allows for retrieval of files via the Server Message Block Protocol
* You can mount file shares on Windows, Linux, and macOS-based machines
* Here you don’t need to manage file servers

### Queue Storage

* Service used for storage and retrieval of messages
* Good when you want to decouple components of an application
* A single message in the queue can be up to 64KB in size
* You can store millions of messages in the queue

## **Region Pairs**

* Now a region itself consists of data centers
* These data centers are connected via a low-latency network
* Azure geography is an area of the world that contains at least one Azure region
* A region pair consists of two regions within the same geography
* If there are any platform updates, the updates are carried out to each region in the pair at a time
* Some of the Azure services make use of region pairs
* You can’t decide on the regions in the region pair

|  |  |
| --- | --- |
| **Storage Type** | **Example Usage** |
| Table | No SQL Data |
| Queue | Retrieve and Save Messages |
| Blob | Images,PDF, etc |
| File | Mounting file shares on Various Operating Systems |

## **Azure VPN Gateway**

### Understanding

* Virtual Private Network Gateway
* This is used to connect your on-premises network to an Azure network
* The traffic sent via the Gateway is encrypted

### Point to Site Connection

* This is used to connect workstations to an Azure Virtual Network
* You need to install the VPN client
* And make use of certificates for authenticating

### The site to Site Connection

* This is used to connect on-premises networks to Azure networks
* The traffic is encrypted using the IPSec protocol
* Your on-premise network should have a VPN device with an IP address that is routable over the Internet

## **Virtual Network Peering**

* When you enable Virtual network peering between virtual networks, the traffic flows between the virtual machines located in the virtual network via the Microsoft backbone infrastructure
* This is a security benefit wherein the traffic does not flow via the Internet
* Also, you get a low-latency, high-bandwidth connection between the resources in the different virtual networks
* You can connect virtual networks which are either located in the same Azure region
* Or you can connect virtual networks located across Azure regions

## **Azure ExpressRoute**

* This service allows you to extend a company’s on-premise network to the Microsoft cloud using a private connection that is provided by a connectivity provider
* The connection allows you to connect to Microsoft services such as Microsoft Azure and Office 365
* The connectivity can be from the any-to-any network, a point-to-point Ethernet connection, or through a virtual cross-connection via an Ethernet exchange
* The connection uses Layer 3 routine. Here BGP is used to exchange routes between the on-premise network, the instances in Azure, and Microsoft public addresses

## **Azure Web App**

* + 1. Understanding
* Platform as a service on the cloud
* Service for hosting web applications
* Used to remove the burden of managing the underlying infrastructure for web applications
  + 1. Purpose
* Hosting a Web Application
* Hosting a Web Application-Multiple Apps
* Hosting a Web Application-Scaling
* Install security updates
  + 1. Feature
* .Net, .Net Core, Java, Ruby, Node.JS, PHP, Python
* The underlying serves can be Windows or Linux
* DevOps-Continuous deployment
* Blue-Green deployment using staging slots
* Authenticate with external providers -Azure AD, Facebook, Google

## **Windows Virtual Desktop**

* + 1. Understanding
* This is a desktop and application virtualization service that runs on the cloud
* Here you can setup a multi-session Windows 10 deployment
* You can also virtualize Microsoft 365 Apps for enterprise
* You can manage Windows 10, Windows Server, and Windows 7 desktops and apps with a unified management experience
  + 1. Host pool
* This is a collection of Azure virtual machines
* These machines register to Windows Virtual Desktop as session hosts
* The machine will run the Windows Virtual Desktop agent
  + 1. App groups
* This is a logical Grouping of applications that are installed on session hosts
* There are two types of app groups
* Remote app-Here the users access the RemoteApps that are selected individually. These are then published to the app group
* Desktop-Here the users access the full desktop
  + 1. Workspace
* This is a logical grouping of application groups in Windows Virtual Desktop
* Here each application group must be associated with a workspace for users to be able to see the remote applications and desktops that are published to them
  + 1. End Users
* Here you assign users to the application groups

## **Azure Databricks**

* This is the Apache Spark-based analytics platform that is optimized for the Microsoft Azure cloud
* With Azure Databricks, you can create Fully managed Apache Spark clusters
* You can dynamically autoscale clusters. You can also create serverless clusters and also share them across teams
* You have easy data exploration with the help of notebooks in R, Python, Scala, and SQL
* You can use interactive dashboards to create dynamic reports
* It has security aspects when it comes to Role-based access control and integration with Azure Active Directory

## **Azure HDInsight**

* This is a cloud distribution of Hadoop-based components
* This service makes it easier to process large amounts of data
* This service is based on the open-source frameworks of Hadoop, Apache Spark, Apache Hive, Apache Kafta, Apache Storm, E, etc
* You can create Azure HDInsight clusters for batch processing needs
* These clusters are created on-demand. So you save on costs

## **Azure Resource Manager templates**

* This is a JSON(JavaScript Object Notation) template that contains the resources that you want to create in Azure
* You can then submit this template to Azure Resource Manager
* Azure Resource Manager will then create the resources based on the template definition
* This is good when you need to create the same set of resources-Test the environment
* The difference between the template
* Schema: This describes the version of the template language
* ContentVersion: This is the version of the templates
* Resources: This is the main section when you define the resources that need to be deployed as part of the template
* Parameters: These are values that can be provided to the template that can be used to customize the deployment of the resources
* Variables: These are values that can be reused in the template
* Functions: These are user-defined functions that can be used in the template
* Outputs: These are values that are returned after the deployment

## **Cognitive services**

* These are a set of services in Azure that helps you to build cognitive intelligence in your applications
* Here you don’t need to have much knowledge of Artificial intelligence to use these services
* Cognitive services are divided into five main categories

#### Vision

* Computer Vision API - This provides an API for processing images
* By processing the images, it can get information from the images
* For example, it can help find faces in the images
* Or even extract text from the images

#### Speech

* This provides speech services to an application
* It includes capabilities such as translating speech to text
* Or even converting text to speech
* It can also perform speech translation as well

#### Language

* This allows you to perform an analysis of the text to decide on what to do next
* For example, you can use this service to understand what a person wants
* It can be used to build a question-and-answer service
* You can try to understand the sentiments in the text

#### Decision

* Here you can check for different aspects of the content
* For example, you can detect any abnormalities in the data collected
* You can also use the Content Moderator to monitor for offensive language

#### Search

* Bing News Search: This can be used to list a series of news articles based on a user’s query
* Bing Video Search: This can be used to list a series of video articles based on a user’s query
* Bing News Search: This can be used to list a series of search results based on a user’s query

## **Azure Bot Service**

* + 1. What is the Azure Bot Service
* The entire idea of Bots-This helps to provide an experience to a user interacting with another person rather than a computer
* Bots are interactive programs that read to what a person is trying to ask
* And then based on the person’s request, the bot needs to answer the person
* The bot should be able to interpret what the user is trying to say
* And then generate an appropriate response

## **Azure DevOps**

* + 1. What is Azure DevOps
* DevOps is a combination of aspects such as culture, practices, and tools
* These aspects are used to bring together teams such as development, operational, security, etc to achieve a common goal
* And that goal is to deliver applications and services at a high velocity
* When it comes to tools, there are various tools available in the market to achieve this purpose
* Azure Boards: Here teams can create and track user stories, backlog items, tasks, features, and bugs that are linked to a project
* Azure Repos: This is a set of version control tools that helps you to manage your code
* Azure Pipelines: This can be used to automatically build and test your code project
* Azure Test Plans: Here you can manage manual testing which includes User acceptance testing, Exploratory Testing, and Shareholder feedback
* Azure Artifacts: Here you can create and share Maven, npm, and NuGet package feeds from public and private sources with teams of any size

## **Azure DevOps - Understanding the lifecycle**

Every service in Azure follows its own service lifecycle. Almost all the services in azure have three stages.

* **Private Preview:** These services are only available for specific types of customers.
* **Public Preview:** All clients have access to these services. This kind of service is not finished, implying that it is unsuitable for production stages; furthermore, the service under public preview doesn't have SLAs.
* **General Availability:** These services are accessible to the whole community, support SLAs, and are appropriate for production environments.

## **Azure DevOps - Using GitHub**

* This is a platform that is used for hosting sources code repositories
* These repositories can be the version with the use of Git as the underlying version control software
* It’s also now a part of Microsoft
* You can pick up code hosted in Github when it comes to using Azure DevOps services

## **Azure DevTest Labs**

* This is a service that allows developers or teams to get up and running with resources such as Azure virtual machines without waiting for approval
* With DevTest Labs, you can create labs based on pre-configured Azure Resource Manager templates
* You can also set policies on the number of machines that can be created
* You can set auto-shutdown and auto-start schedules on VMs

## **Serverless Solutions**

* + 1. The benefits of serverless solutions
* Here you don’t need to maintain the underlying physical infrastructure
* You also don’t need to manage the underlying software hosted on the compute infrastructure
* And normally for serverless services, you only pay for what you use
* This is a large cost-benefit for companies
* Their capital expense is reduced
* And their operational expense is also reduced
  + 1. The different serverless solutions from Azure
* Azure Functions: This is the serverless compute service.
* Here you can deploy your function code onto Azure
* Here you only pay for the amount of time the code runs
* Serverless Kubernetes: Kubernetes is used for deploying your container-based applications. There is a serverless version of Kubernetes that is also available
* Azure Logic App: This is used to design workflows in Azure
* Business users can create workflows and integrations
* Workflows can connect to a variety of Azure services and third-party services as well
* Azure Event Grid: This is the event-based service in Azure
* Here you can work with events generated from Azure services
* Azure API management: This can be used to manage your various backed APIs
* Azure SQL database: There is a serverless version of the Azure SQL database
* Here you only pay for the computer used
* You can pause and resume workloads on the database
* Azure Cosmos DB: Here also they have a serverless pricing option available

## **Azure Functions**

* + 1. Understanding
* Serverless compute service available from Azure
* Use various development languages – C#,F#,Node.js, Java, or PHP
* Consumption Plan-Pay for only what you use
* Can integrate it with various of the Azure services
  + 1. Important Points
* Costing-Consumption Plan or App Service Plan
* Consumption Plan-You only get charged for the number of execution, execution time, and Memory used
* Consumption Plan-Maximum allowable execution time is 5 minutes
* App Service Plan-Have Instance allocated, have the function running for a longer time, using more memory

## **Lab - Azure Functions**

## **Lab - Azure Event Grid**

### What is the Event Grid Service

* You can take advantage of the Event Grid Service listens to events emitted by Azure services
* You can subscribe to the various events published by Azure services
* You can then define an Event Handler that can be used to process the event
* You can also define your custom events
* This service is highly available because it is spread across multiple fault domains and availability zones in every region

## **Azure Logic Apps**

### Understanding

* Helps to automate and orchestrate tasks
* Help to build workflows
* Various templates already available to build workflows

### Features

* Fully managed and serverless service
* You can build workflows and don’t need to worry about the infrastructure to store the workflows
* The workflows can integrate with various Azure services and third-party services as well
* You can build workflows via a Visual Designer
  + 1. Parts
* Triggers: Some of the connectors like Azure BLOC storage have the facility to trigger the Azure Logic App
* Action: What to do when an event is triggered
* Do you want to send an email to the IT administrator during the event?
* Do you want to call an Azure Function?

## **Lab - Azure Logic Apps**

## **Azure CosmosDB**

* + 1. Understanding
* Multi-Model database
* Low latency access to data
* Instant replication f data across regions
* Scales based on demand
* Fully managed and serverless
  + 1. Features
* Provides 99,999% availability for reads and writes
* Ability to scale from thousands to hundreds of millions of requests/sec
* Cosmos BD guarantees less than 10-ms latencies for reads and indexed writes at the 99th percentile
* Work with various APIs -SQL, MongoDB, Cassandra, Gremlin, and Table
  + 1. Throughput
* This ensures CosmosDB allocates the right resources
* The throughput is a combined measure of CPU, Memory, and IOPS
* Helps have an even measure no matter which API you choose
* The Throughput is measured in the Request Unit
* Billing is done on an hourly basis

## **Azure SQL Database**

* + 1. Understanding
* Platform as a service for Microsoft SQL Server
* Here the Infrastructure is managed by Azure
* Flexible deployment and pricing options
* Access to the latest feature of Microsoft SQL Server
  + 1. Differences
* SQL PaaS
* 99,99% availability
* Built-in backups and recovery
* Some minimal set of features may not be available
* Reduces infrastructure and maintenance costs
* SQL IaaS
* You have full control over the SQL Server engine
* Easy to migrate an existing on-premise instance
* You need to patch the system
* You need to manage the availability
  + 1. Options
* Create a SQL Database along with the underlying server. Here the server is managed by Azure
* Complete the PaaS option where you don’t need to mention the server details-Managed Instance
* The Managed Instance option is good for companies who just need to lift and shift their existing on-premise database to Azure
  + 1. Pricing
* DTU-Database Transaction Unit-Bundles measure computing, storage, and IO resources
* Good for companies who just want a simple option for managing their underlying resources
* vCore-based model-Here customers choose the amount of computing and storage
* This gives more flexibility and control to the underlying resources
* The vCore Model is also ideal if you already have existing SQL Server licenses
  + 1. Connect and work
* Use the traditional tools just like working with an on-premise database
* SQL Server Management Studio
* Visual Studio IDE
* .Net programs

## **Lab - Azure Database for MySQL**

* This is a platform as a service that is available for the MySQL Community Edition
* Here you get built-in high availability
* You also get automated backups and point-in-time restore for 35 days
* The underlying service is responsible for maintaining the underlying hardware and keeping the database engine up-to-date
* Here the company does not have to bear the overhead of maintaining the underlying infrastructure

## **Azure Database for PostgreSQL**

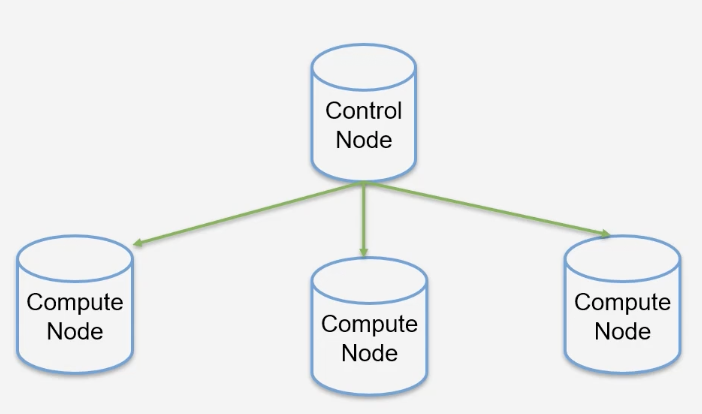
* This is a platform as a service that is available for the PostgreSQL Community Edition
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* You also get automated backups and point-in-time restore for 35 days
* The underlying service is responsible for maintaining the underlying hardware and keeping the database engine up-to-date
* Here the company does not have to bear the overhead of maintaining the underlying infrastructure

## **SQL Managed Instance**

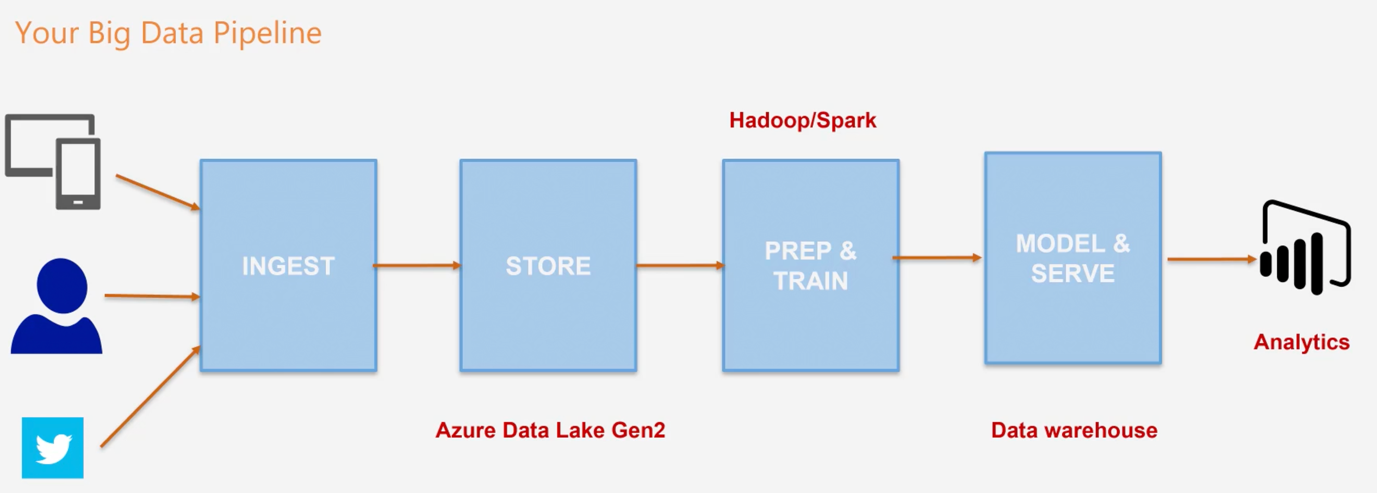
* + 1. What is the Azure SQL Managed Instance
* This is again a cloud-based service for hosting a SQL database
* Here the main benefit is that the underlying database engine has near 100% compatibility with the latest SQL Server Enterprise Edition Database engine
* This makes it easier for companies to lift and shift their existing SQL server workloads onto Azure
* It also provides native virtual network implementation
* Here you get the features of high availability and backup

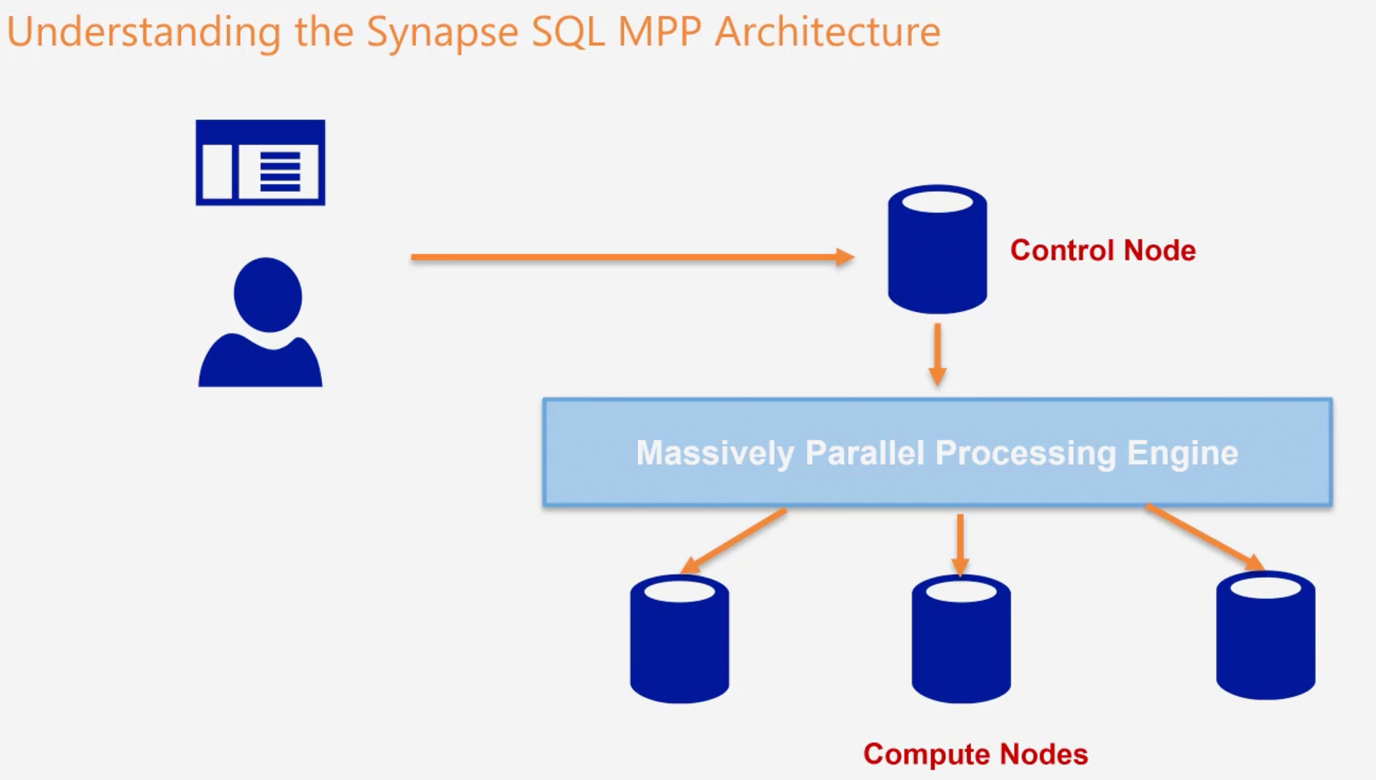
|  |  |
| --- | --- |
| **IF YOU WANT TO** | **USE THIS** |
| Managed intelligent SQL in the Cloud | Azure SQL database |
| With a managed community MySQL database service, you can provide high availability and elastic scalling to open-scource mobile and web apps, or you may transfer MySQL workloads to the cloud | Azure Database for My SQL |
| On open-source PostgreSQL, create scalable, secure and fully managed enterprise-ready apps, scale out single-node PostgreSQL and Oracle workloads to th cloud | Azure Database for PostgreSQL |
| Build anywhere, at any scale, app with assured low latency and high availability or transfer Cassandra, MongoDB and other NoSQL workloads to the cloud | Azure Cosmos DB |
| SQL instance in the cloud that is managed and always up to date | Azure SQL Managed Instance |

## **Azure SQL Data Warehouse**

* + 1. Understanding
* Enterprise Data Warehouse on Azure
* Used to Storing petabytes of data
* Perfect data store when you want to have an end-to-end big data solution on Azure
* Data is stored in relational tables using columnar storage
* Storing data in such a way reduces the storage costs and improves query performance
* You can perform query analysis over large data sets
* Remember that the data warehouse is not used for transactional data
  + 1. Architecture
* Applications connect and issue T-SQL commands against the Control Node
* The Control Node uses an MPP Engine( Massively Parallel Processing) that optimizes the queries for the Compute Nodes

## **Azure Synapse Analytics**

* + 1. What is the Azure Synapse Analytics Service
* This is an analytics service that helps enterprises build data warehousing and Big data analytics solutions
* There are currently four components of Azure Synapse
* Synapse SQL-This is a complete T-SQL-based analytics solution
* Spark-This is the Apache Spark system
* Synapse Pipeline-This is used for Hybrid data integration
* Studio-This is a Unified user experience
* Synapse SQL pool
* This represents a collection of analytic resources that are provisioned when using Synapse SQL
* You can import big data in the pool with the use of PolyBase T-SQL queries
* Your business can then gather insights into the data stored in the SQL pool
  + 1. Understanding the Synapse SQL MPP Architecture



* Synapse SQL uses a node-based architecture
* Here applications or users connect and issue T-SQL commands against the Control node
* The Control node runs the MPP engine. The MPP engine then optimizes the queries for parallel processing
* The operations are then passed to the Compute nodes to perform the queried work
  + 1. What are Data Warehousing units?
* A Data Warehousing Unit is a bundle of three resources-CPU, memory and IO
* When you create a SQL pool, you have to mention the number of Data Warehousing units you require for the pool
* If you want higher performance for your pool, you can increase the number of units at any point in time

## **Azure Content Delivery Network**

* + 1. Understanding
* Effective delivery of web content to users
* Users around the world get a seamless experience
* Popular content can be cached
  + 1. How does the flow work
* If a request is made from a user to the Azure CDN endpoint, the request is sent to the closest point of presence. This would be closest to the location of the user
* If the edge server in the Pont of presence does not have the resource, then the edge server will contact the Origin server to get the resource
* The resource is cached on the edge server and also sent to the user
* The resource will be cached in the Point of Presence based on the TLL(Time to Live)
  + 1. Create a CDN
* You first need to create a CDN Profile
* You then create a CDN Endpoint-Existing Web App, storage account, or another origin
* You can attach multiple endpoints to the profile

## **Lab - Azure Content Delivery Network**

## **IoT Tools**

The term **Internet of Things** refers to any gadget with a sensor. A sensor receives analog data and converts it to a digital signal before transmitting it to a central server through an onboard network connection, such as a wifi radio.

* + 1. IoT Hub
* It is a managed service accessible via the cloud that allows for two-way communication with your IoT devices. Telemetry data could well be routed via it. **IoTHub** allows you to manage IoT devices by provisioning them and updating the
  + 1. Machine Learning Service
* Service used to train, deploy, automate and manage machine learning models
* How does the typical workflow work
* You deploy machine learning scripts in python
* Create a compute target
* Submit the script to the compute target
* Query the experiment
* See if it meets the desired results
* If not, change the scripts and run the scripts
* If the script gives the desired result, register the persisted model in the model registry
  + 1. Machine Learning Studio
* Simple drag and drop tool
* You can use this tool to build, test and deploy predictive analytics solutions on your data
* You can easily drag and drop data sets
* You can also drag analytics modules onto an interactive canvas
* All of this forms an experiment, a training experiment in the beginning
* After running the training experiment and you are happy with the results, you can convert the experiment to a predictive experiment

## **Big Data Tools**

* Azure SQL Data Warehouse
* Azure HDInsight
* Fully managed service open-source analytics service
* You can use the service to run frameworks such as Hadoop, Apache Spark, Apache Hive, LLAP, Apache Kafka, Apache Storm, R
* Built with full redundancy and high availability
* The service automatically deploys a cluster of Virtual Machines
* Azure Data Lake Analytics
* Allows you to run queries on terabytes to petabytes of data
* It uses a U-SQL language that is similar to SQL
* You can use tools like Visual Studio to work with Data Analytics

## **Azure Management Tools**

* Azure Portal: This is the web or browser-based experience
* PowerShell-command line and scripting purpose
* You can also use PowerShell for Azure. You can run PowerShell on Windows, macOS, and Linux-based machines
* Azure Command-Line Interface-This is a specific command-line interface for Azure
* You need to install the required tools for using the Azure command-line interface

## **Lab - Azure Container Instances**

* + 1. What is Azure Container Instances
* This is a service that allows you to easily deploy containers in Azure
* Here you don’t need to manage the underlying virtual machines for hosting the container instances
* The container groups deployed via the Azure Container Instance gets an IP address and a fully qualified domain name
* Here you can deploy both Windows and Linux containers

## **Lab - Azure Kubernetes**

* + 1. What is Kubernetes
* This is a tool that is used to manage container-based applications
* This is the ideal tool that teams use to deploy microservices-based applications
* The Kubernetes service provides support for both stateless and stateful applications
* Azure Kubernetes just provides a managed Kubernetes service on the Azure cloud platform
* This helps reduce the complexity that is involved in the deployment and working with core management task

# **UNDERSTAND SECURITY, PRIVACY, COMPLIANCE, AND TRUST**

## **Authentication and Authorization**

* + 1. Authentication
* This is the process of identifying a user
* How does the application know whether the user is really whom they say they are
* So this is done via authentication
* The simplest form is to allow the user to enter a user name and password
* This is the process of identifying a user
* Store all the user names and passwords in a database
* Validate the user names and passwords from the database
* Active Directory can be used for authentication purposes
  + 1. Azure AD
* Identity and access management service
* You can manage access for users to the Azure portal or other apps like Office 365
* You can also manage access to internal applications
* Azure AD has a lot of features that go beyond simple password management
  + 1. Azure AD has different versions
* Azure AD Free-User and Groups management
* You can synchronize users from your on-premise environment
* You get basic reports
* You can also get Single Sign On capabilities
* Azure AD Basic
* Control access via groups
* Soft Service password reset
* Azure AD Premium P1
* Supports dynamic groups
* Cloud write-back capabilities
* Azure AD Premium P1
* Identity Protection-Provides conditional access to application
* Privileged Identity Management-help discover, restrict and monitor administrators and their access to resources
  + 1. Authorization
* This is the process of giving access to resources for the user’s identity

## **Azure Sentinel**

* + 1. What is the Azure Sentinel service
* This is a cloud-native, security information event management and security orchestration automated response solution
* It has the following capabilities
* Collection of data at cloud scale: the service can collect data across all users, devices, applications, and infrastructure. This includes both on-premises and cloud environments
* Detection of threats: It has in-built threat intelligence to detect threats to your environment
* Threat Investigation: It can hunt for suspicious activities at a scale
* Usage of workbooks: You can create interactive reports with the data that is collected by the service
* Analytics: Azure Sentinel can correlate alerts into Incidents. There are many in-built rules to detect threats. You can also define your own custom rules
* Playbooks: You can perform security orchestration with the help of playbooks

## **Azure Security Center**

## **Azure Firewall**

* + 1. What is the Azure Firewall service
* This is a fully managed cloud-based network security service
* This can be used to protect your resources in an Azure virtual network
* Within this service, you can create and enforce application and network connectivity policies
* This service can automatically scale up based on demand

## **Role-based access control**

* Provides a mechanism to provide access to resources
* There are many inbuilt roles available
* Example – If you want a user to perform management activities for Virtual Machines, there is a Virtual Machine contributor role
* You can also create your custom roles
* You can create roles at different scope levels
* Board categories
* Owner role: The user can manage everything
* Reader role: The user can view everything only
* Contributor role: The user can manage all resources

## **Azure Multi-Factor Authentication**

* Provides an extra layer of security during the authentication process

1. Enter a user name
2. Enter a password
3. Use might get a code on a registered mobile device
4. Code is required to complete authentication

## **Azure Key Vault**

* Azure Key Vault is a cloud service for storing and safely accessing secrets.
* It is used for key management, secret management, certificate management, and storing secrets supported by hardware models.
* Azure Key Vault can centralize application secrets, monitor access, and use, and simplifies resource management.

## **Compliance**

* GDPR-General Data Protection Regulation-Law on data protection and privacy
* ISO-International Organization for Standardization-independent, non-governmental organization. The members of these organizations are from various countries. They meet to provide common standards between nations
* NIST-National Institute of Standards and Technology

## **Azure Security tools**

* + 1. Azure Firewall
* Fully managed service that can be used to protect resources in an Azure virtual network
* It’s a service that has high availability and automatic scalability
  + 1. DDOS Protection
* Basic Protection that is always enabled
* Real-time monitoring of traffic and mitigation of common network-level attacks
* This offering is Free
* Standard Protection-This is available for a fee per month
* Here you can get real-time metrics and diagnostics logs via Azure Monitor
* Post-attack mitigation reports
* Access to DDoS experts during an active attack
  + 1. Azure Security Center
* Security management system
* Assesses the resources hosted in Azure and decides whether they are secure or not
* Raise threat prevention recommendations and threat detection alerts
  + 1. Azure Advanced Threat Protection
* Cloud-based security solution
* Used to protect identities stored in Azure AD
* Identify and investigate suspicious user activities

## **Azure Policies**

* Provides governance for your Azure account

1. There is a mandate to ensure all resources have a department tag
2. Due to cost constraints, no one should be allowed to create a virtual machine that has a higher capacity
3. No one should be allowed to create an Azure SQL Server instance in a particular resource group

## **Management Groups**

* + 1. Using management groups
* Using a management group is useful when a company has many subscriptions
* You can club the subscription under management groups
* This help to manage the access, policies, and compliance for those subscriptions
* When you group the subscriptions under a management group, they inherit the conditions that are applied at the management group level

## **Azure Locks**

* This provides the ability to ensure that a resource is not accidentally deleted or modified
* The locks can be defined at the subscriptions, resource group, or resource level
* CanNotDelete: This means that authorized users can still read and modify a resource, but they can’t delete the resource
* ReadOnly: This means that authorized users can read a resource, but they can’t delete or update the resource

## **Azure Blueprints**

* This feature allows companies to define a repeatable set of Azure resources for their Azure subscriptions
* This helps to quickly build up an environment that adheres to the company’s standards and deployment patterns
* The Artifacts that you can deploy with Azure Blueprints are Role Assignments, Policy Assignments, Azure Resource Manager templates, and Resource Groups

## **Azure Monitor**

* + 1. Understanding
* Used to collect, and analyze telemetry from Azure and your on-premise environments
* You can also use certain features to proactively identify issues in your applications
* View metrics and logs for various resources hosted in Azure

## **Azure Advisor**

Azure Advisor is a recommendation tool that provides suggestions by using some algorithms on four key aspects for resources hosted in Azure, namely: high availability, security, performance, and cost.

It’s better to follow these recommendations as it is very beneficial to maintain the health of the resources and the cost deduction.

## **Summary**

# **UNDERSTAND AZURE PRICING AND SUPPORT**

## **Agenda**

## **Cost Estimation**

## **Lab - Cost Management**

## **Azure Support plans**

## **Azure Mobile App**

## **Azure Service Level Agreements**

## **Summary**