Deploy and Manage Azure compute resources

The Virtual Machine Service

Virtual Machine Service

This service allows you to create a virtual machine on Azure

You don't need to manage physical servers

You can make use of On-demand pricing

You only pay based on how much you use

Buy servers

Costs money
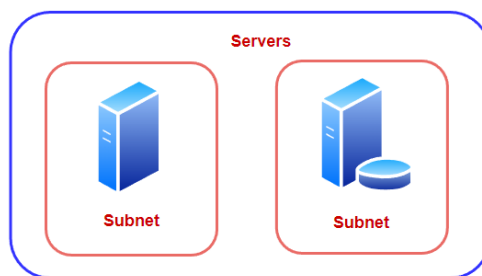
Buy storage

Setup a network

Each of your devices also gets assigned an IP address

This IP address helps to identify the devices on the network.

Wifi Router

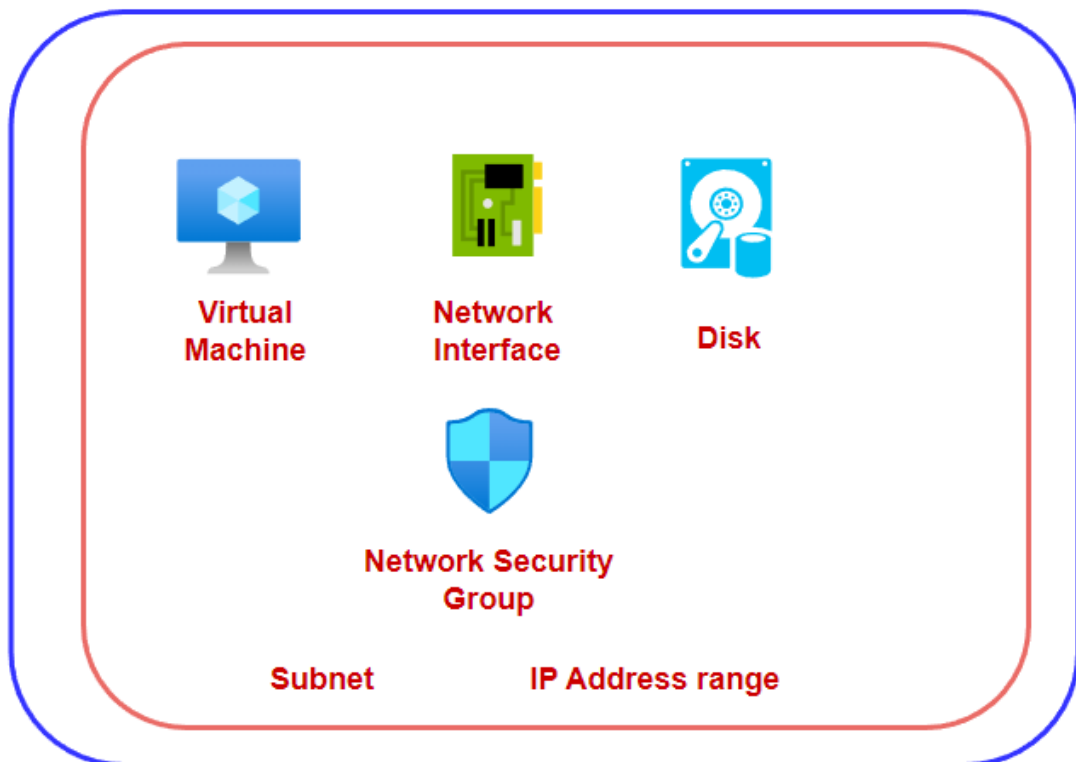**All devices are part of the network managed by your Wifi Router**

Servers

Subnet

Subnet

Network

Virtual Network   **IP Address range**

Virtual Machine

Network Interface

Disk

Network Security Group

Subnet   **IP Address range**

Lab- Installing Internet Information Services

Virtual Network   **IP Address range**

Virtual Machine

Network Interface

Disk

Internet Information Services

Web Server

Network Security Group

Subnet   **IP Address range**
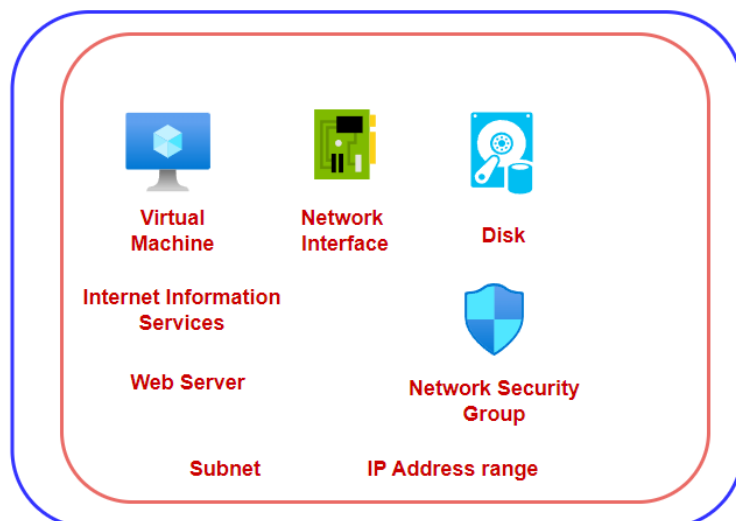
Internet Information Server listens for HTTP requests on port 80

Lab- Deploying a Linux machine- SSH keys

Azure Virtual Machine

Linux OS

SSH is an encrypted connection protocol

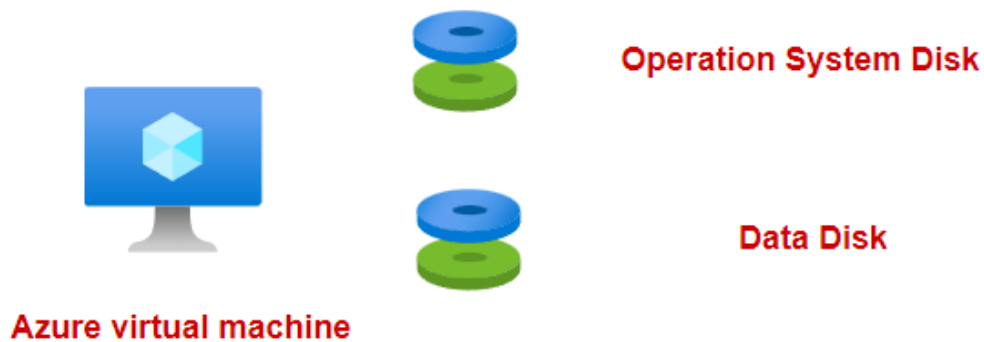**You can use SSH keys for a more secure connection**

This is based on public-private key pair

The public key is stored on the VM itself

You get the private key which is then used to authenticate onto the Linux VM

Azure Virtual Machine – Disks

Azure virtual machine - Disks

Operation System Disk

Data Disk

Azure virtual machine

The disks are managed by Azure

Designed to be highly available - 3 replicas of your data are maintained.

Operating System Disk - This has a pre-installed operating system.

Data Disk - You can store your application data here

Temporary disk - This is not a managed disk. Here the data can be lost during a maintenance event or when you redeploy the VM.

There are different types of disks - Ultra Disks, Premium SSD , Standard SSD and Standard HDD.

Throughput and IOPS

Operation System Disk

Data Disk

Azure virtual machine
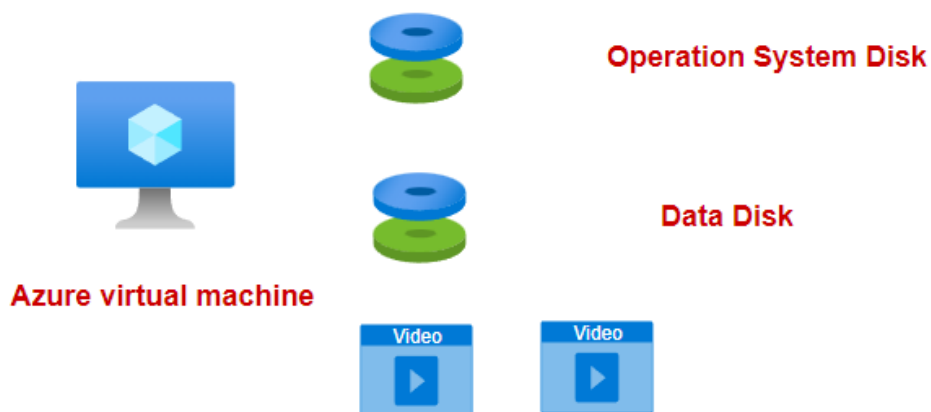
Video

Video

Large videos, need higher throughput, be able to copy large data onto the disks

Operation System Disk

Data Disk

Azure virtual machine
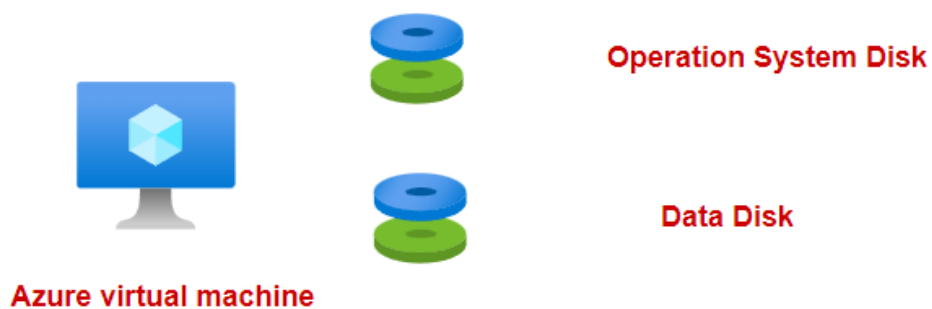
Lot of read and writes to data

What happens when we stop the machine

Restart / Stoping the VM

VM

1. If you restart the VM, the data on the temporary disk remains as it is.

2. If you Stop/Deallocate the VM, The data on the temporary disk also gets erased.

Physical server

Physical server

Azure Disks- Server Side Encryption

Server-side Disk Encryption

Here your data is automatically encrypted using 256-bit AES Encryption

This protects the data at rest

This is done for Managed disks - OS and data disks

Storage Unit - Azure Data Center

By default the encryption is carried out with Platform Managed Keys

But you can also use your own Customer-Managed Keys. For this you need to make use of Disk Encryption Sets.

Lab- Azure Key Vault Service

Software

Azure Key Vault

Server

Encryption keys

app

Certificates

Azure SQL Database

Secrets

Azure Storage account keys

Quick review on the encryption options

Azure virtual machine - Disk Encryption - Server Side Encryption

Azure virtual machine

Operation System Disk

Data Disk

Disk Encryption Set

Azure Data center storage

Platform-managed keys

Azure Key Vault

Customer managed keys

Azure virtual machine - Azure Disk Encryption

Azure virtual machine

Operation System Disk

Data Disk

Here the encryption is carried out at the operating system level

Windows Server - BitLocker

Azure Key Vault

Customer managed keys

Azure Shared Disks

Azure shared disks - This allows a managed disk to be attached to multiple virtual machines

Clustered SQL Server workload

Custom Script Extensions

Custom Script Extension

Want to install an application when the virtual machine is first launched

You want a script to run on the machine

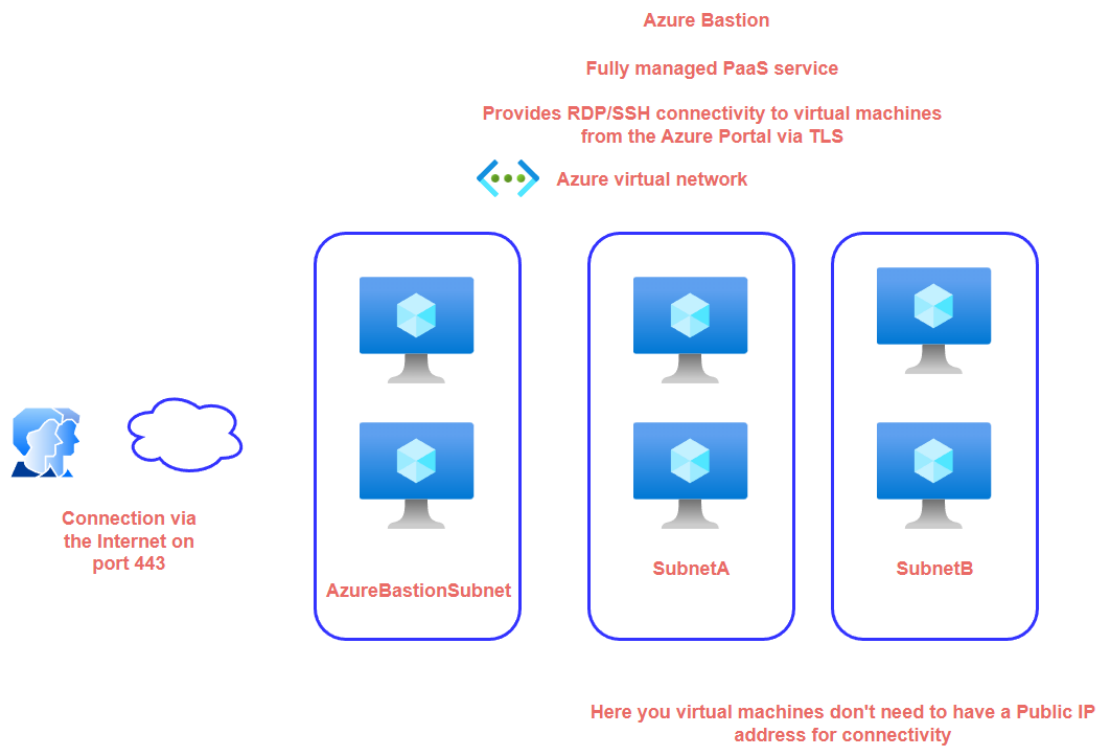The scripts can be stored in an Azure Storage Account or a GitHub account

Ensure that the scripts don't require user input

Don't put reboots inside of the script

Maxiumum allowable time for the script to run is 90 minutes

Azure Bastion Service

Azure Bastion

Fully managed PaaS service

Provides RDP/SSH connectivity to virtual machines from the Azure Portal via TLS

Azure virtual network

AzureBastionSubnet

SubnetA

SubnetB

Connection via the Internet on port 443

Here you virtual machines don't need to have a Public IP address for connectivity

Availability Sets

Availability Sets

The availability set is a logical grouping of VM's. It helps to improve the entire availability of your application.

Azure Virtual Machine

Physical server in a datacenter

What happens if there is a fault in the underlying physical server?

Or maybe Azure needs to apply an update on the physical server that requires a restart of the server.

Availability Sets can be used to manage these issues.

Fault Domain

Update Domain

When you place your virtual machine as part of an Availability set, it gets assigned a fault and update domain.

Update domain

Here Azure will apply updates to the physical infrastructure one update domain at a time.

Fault domain

Here the virtual machines in the fault domain share a common power source and network switch.

Fault Domain 0   **Fault Domain 1**

Update Domain 0   **Update Domain 1**

Update Domain 2   **Update Domain 3**
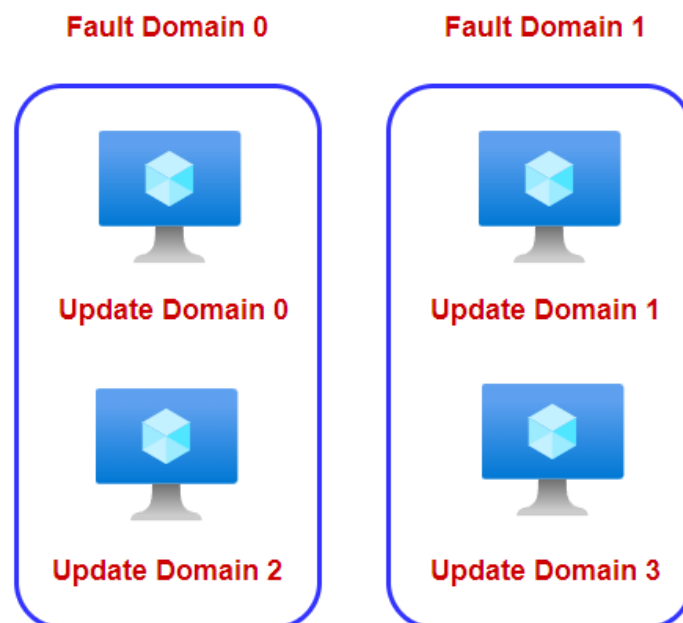
Common questions

Is there a cost for using Availaibility sets?

No. You just need to pay for the underlying virtual machines.

Am I supposed to create multiple virtual machines? Or does the Availability set feature create duplicate copies of the VM?

You have to create the multiple VM's. The Availability set is just a feature for managing availability of your machines.

Does the Availability set replicate data across the VM's.

No. You manage all of these aspects. Remember the Availability set is just a feature for managing availability for your machines.

Availability Zones

Availability Zones

These are physical locations within an Azure region. These are made up of one or more datacenters. They have independent power, cooling and networking.
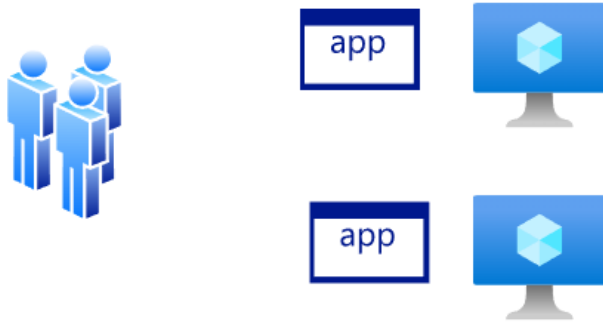
Azure Virtual Machine

In an Availability set, the machines might be located in a single datacenter

What happens if the datacenter goes down?

You can spread the deployment of your machines across datacenters by deploying them to different Availability zones

Availability Zone 1

Availability Zone 2

Availability Zone 3

Common questions

Is there a cost for using Availaibility zones?

No. You just need to pay for the underlying virtual machines.

Then why not just make use of Availability zones instead of Availability sets?

This is because there is a charge of data transfer per GB between availability zones.

Does Availability zones replicate VM's or do data transfer?

No. Again this is all managed by you. Availability zones is just another availability feature from Azure.

Azure virtual machine scale sets

Virtual machine Scale Set

app

Load on the application increases

The load on the machine starts to increase

Application could face performance issues because of the load on the Azure virtual machine
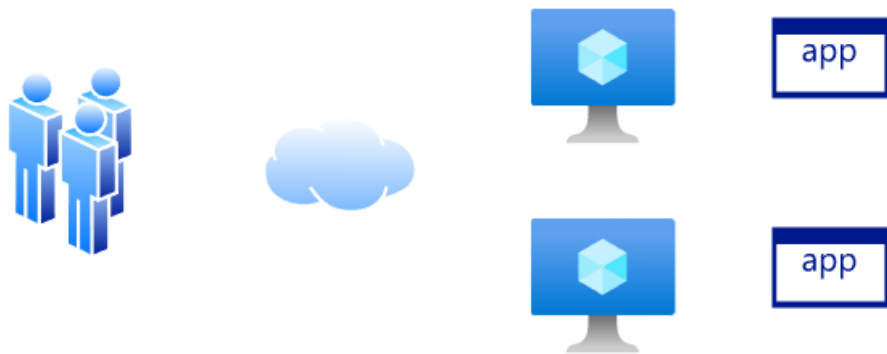
In today's world of automation, manually adding a machine to your infrastructure setup is not the most ideal approach.

Virtual Machine Scale set
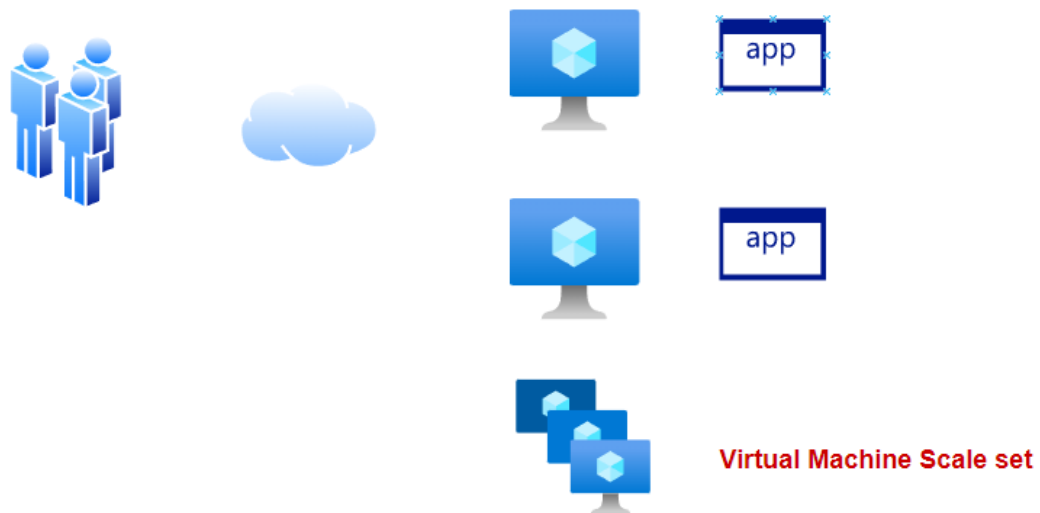
Virtual Machine Scale set is a group of virtual machines

Here the number of virtual machine instances can increase or decrease based on demand.

Understanding virtual machine images

Image

Data

Application installed

Create an image

Image - This is a copy of the full VM which inlcudes the data disks or just the OS disk

You can create an image and place as part of an Azure compute gallery

You can share the Azure compute gallery across your organization so that other users can create VM's based on the images stored in the gallery
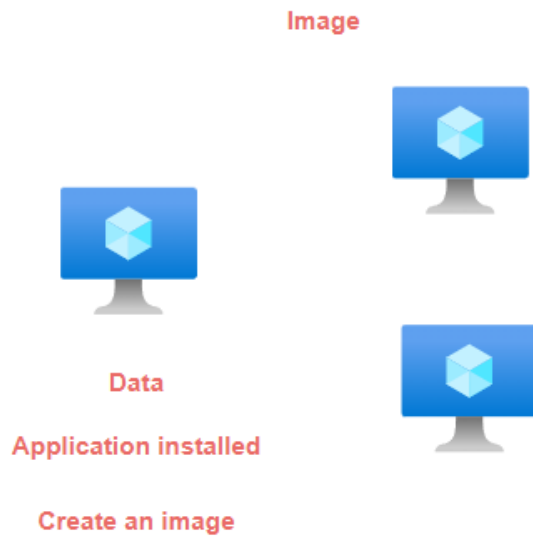
Image Definition - This is a grouping of image versions. Each image definition has information about why the image was created and other information related to the image.

Image Version - This is used to create the VM.

Two types of images that you can create

Specialized VM Images

Here information about specific users and machine information is retained

So new VM's created out of the image will have the same computer name and admin user information

Generalized VM Images

Here information about specific users and machine information is removed

Here you have to perform the process of generalization. The original VM is unusable after you perform this process

Introduction onto Azure Web Apps

Development Phase

Developers

Web Application

Deployment phase

Azure Virtual Machine

Web Server - Internet Information Services

ASP.NET Core runtime

app

Azure virtual machine

You can log in as the administrator of the machine and install any application.

Here the physical server is managed by Azure

Azure Web Apps

They just want to host a web application on Azure.

This service has support for .NET, .NET Core, Java, Ruby, Node.js, PHP, Python.

This service can also scale up and scale down based on demand.

Here the physical server is managed by Azure

The virtual machine is also managed by Azure

If the company does not want the headache of managing the virtual machine.

App Service Plan

The App Service Plan defines the set of compute resources to assign to the Web App

Azure Web Apps

App Service Plan

Based on the App Service Plan, you also get the available features.

Azure Web Apps- Deployment Slots

Deployment Slots

Staging Environments for App Service Plans

app

Standard , Premium and Isolated App Service Plan

Applications in deployment slots have their own host names

Version 1

Version 2

Production Slot
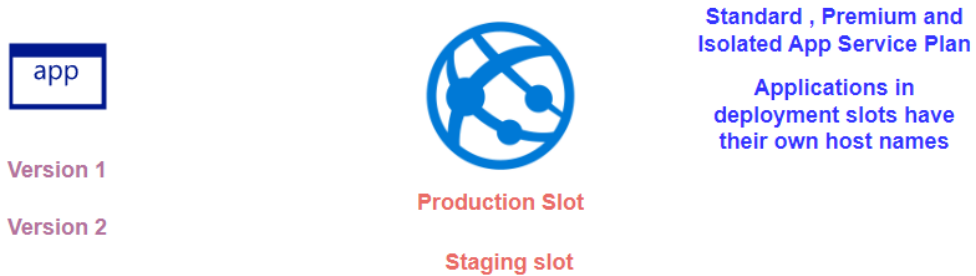
Staging slot

1. You have the chance to validate all application changes in the staging deployment slot

2. You can then swap the staging slot with the production slot

3. This helps eliminate the downtime for your application when new changes are deployed

4. You can also easily roll back the changes

Azure Web App- Virtual Network Integration

Azure Web App - VNET Integration

Virtual Network

10.0.0.0/16

Azure Web App

SubnetA

10.0.0.0/24

Standard App Service Plan or higher

Public Service

20.50.64.20

10.0.0.4

Allows the App service to access resources within the VNET

But it does not allow private inbound access to your Web App from the virtual network
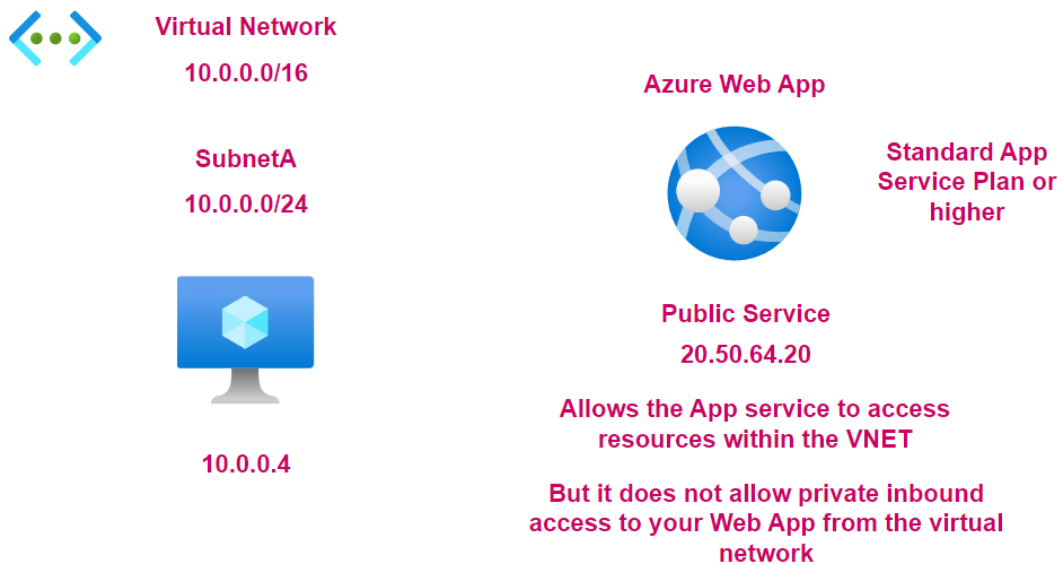
The need for containers

Isolation

App dependencies

Third-party libraries

App dependencies

Third-party libraries

App dependencies

Third-party libraries

Containers helps to package the application along with libraries , frameworks and dependencies that are required.

Portability

Operating System

Services

Applications

Virtual Machine

Operating System

Services

Applications

Virtual Machine

app

App dependencies

Third-party libraries

What is Docker

This is an open platform that is used for developing, shipping and running applications.

Docker has the ability to package and run an application in a loosely isolated environment called a container

app

Container

Isolated and lightweight environment for hosting your application

docker

Docker host

CPU, Memory , Network

Image

Container

This is a read-only template with instructions that are required to create the Docker container

This is a runnable instance of an image
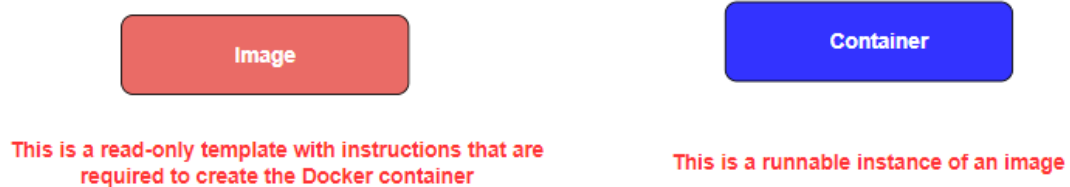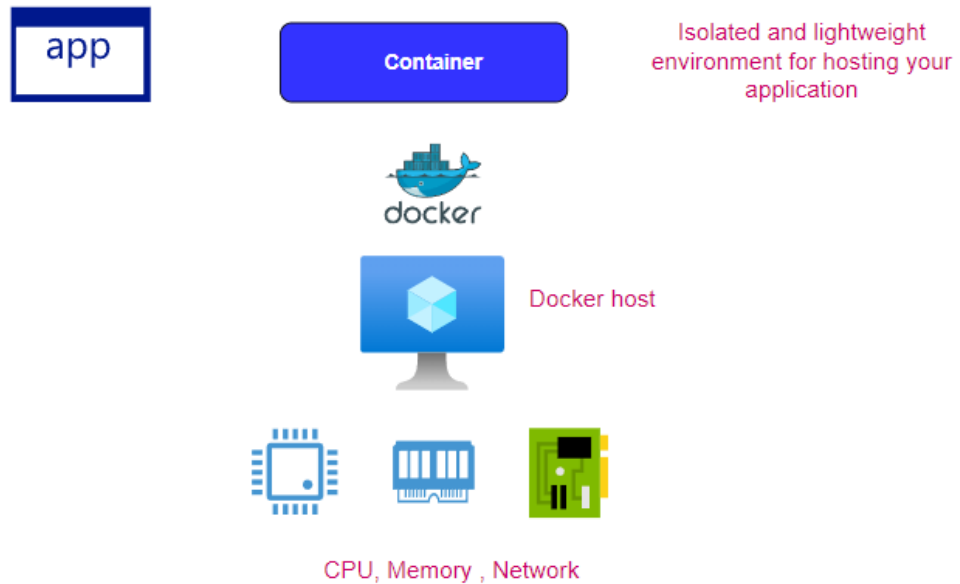
The need for an image registry

Repository of images

Docker engine

.Net Core application

nginx image

Image

nginx container
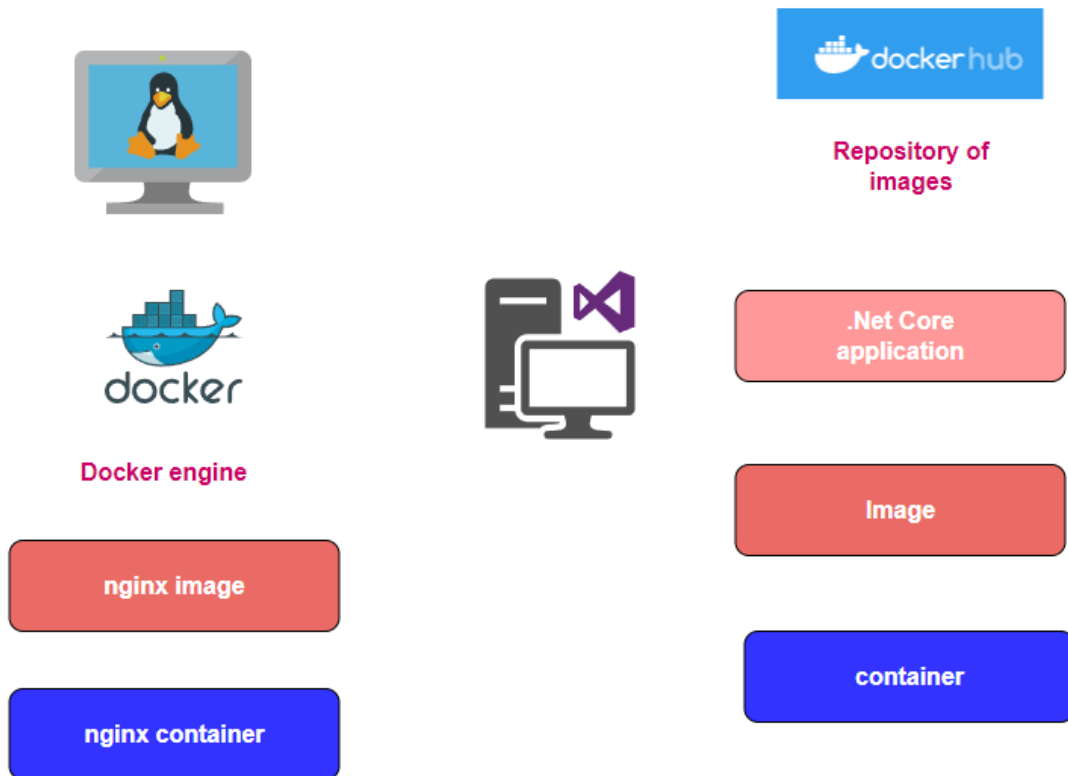
container

Containerize an application - Setup

Azure MySQL database

app

.NET 6.0

Image

Container

docker

Docker host

Linux VM
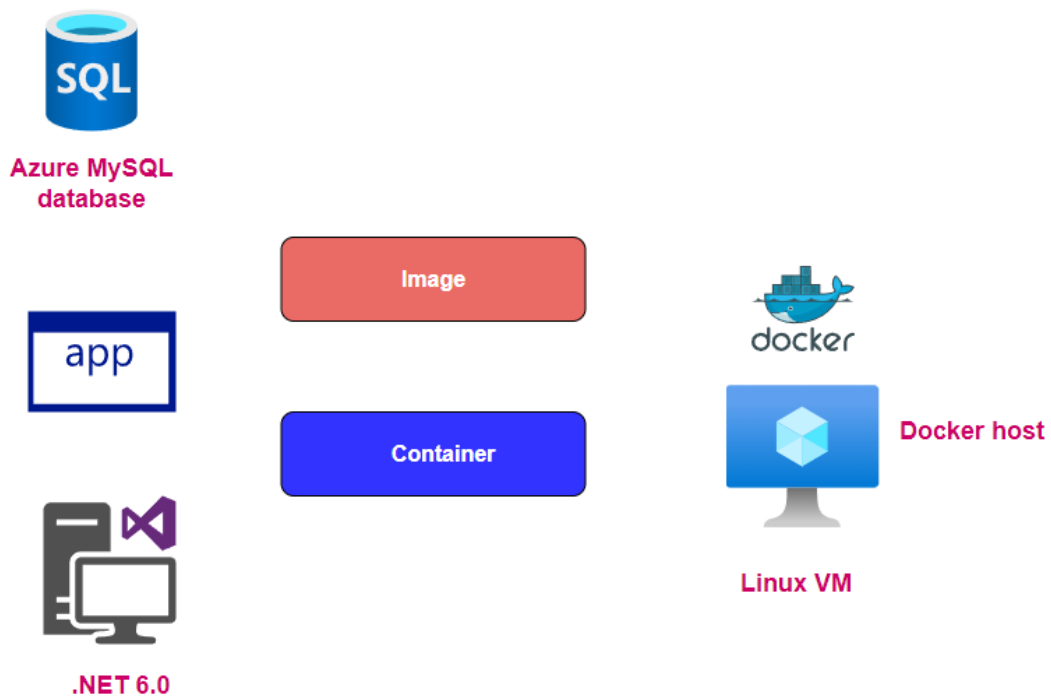
Primer on Azure Kubernetes
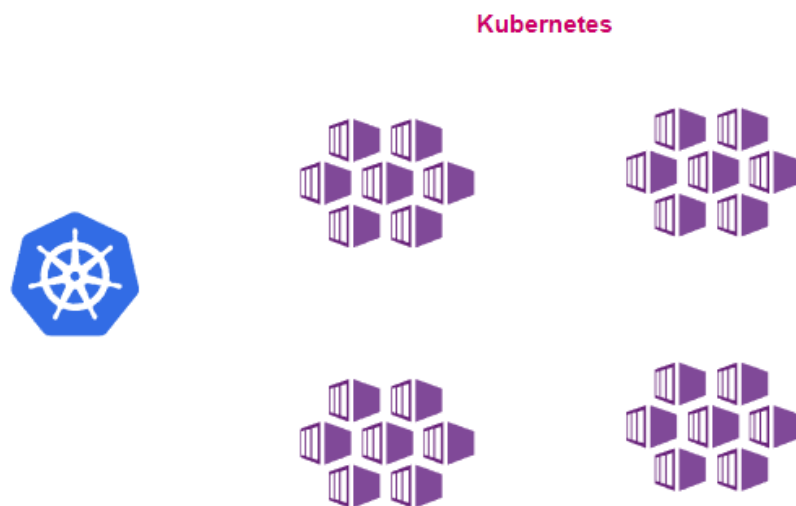
Kubernetes

Managing containers at scale

Azure Kubernetes - Managed service for Kubernetes on Azure

Kubernetes is used to orchestrate your containers for hosting your applications

Azure Kubernetes- Configuring networking

Node1 (192.168.1.4/24)

Pod 10.244.0.2
Pod 10.244.0.3
Pod 10.244.0.4

Routing / NAT

Kubenet

Node2 (192.168.1.5/24)

Pod 10.244.1.2
Pod 10.244.1.3
Pod 10.244.1.4

Routing / NAT

Kubenet

Node Subnet   192.168.1.0/24

Azure virtual network   192.168.0.0/16

https://docs.microsoft.com/en-us/azure/aks/configure-kubenet
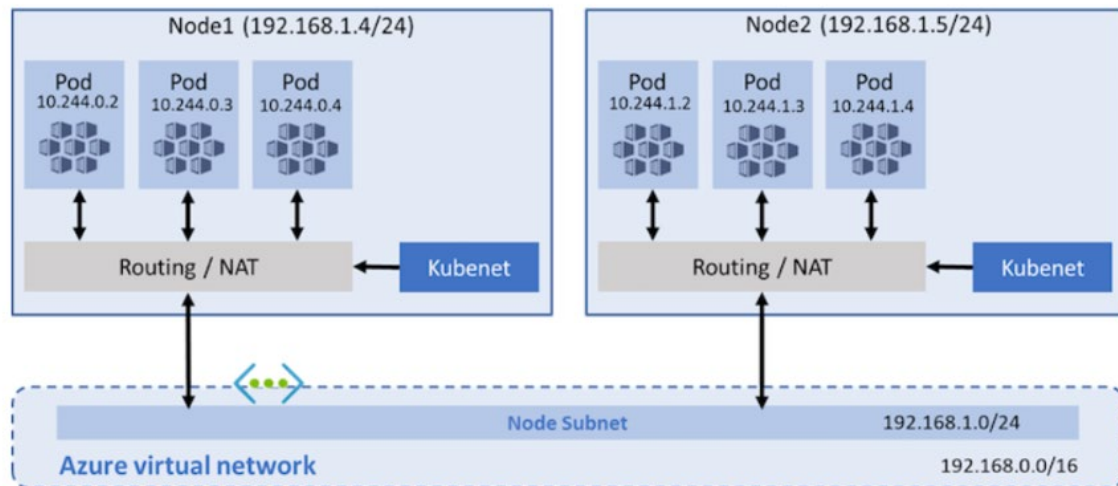
Nodes receive an IP address from the Azure virtual network

Pods receive an IP address from a logically different address space to the Azure virtual network subnet

Network Address translation is then used

Azure Container Networking Interface

Every pod gets an IP address from the subnet and can be accesed directly

This could also lead to an IP address exhaustion

Azure Kubernetes Persistent Storage- Application Setup

Azure Kubernetes cluster

Node

Pod

app

Persistent storage

Disks

app
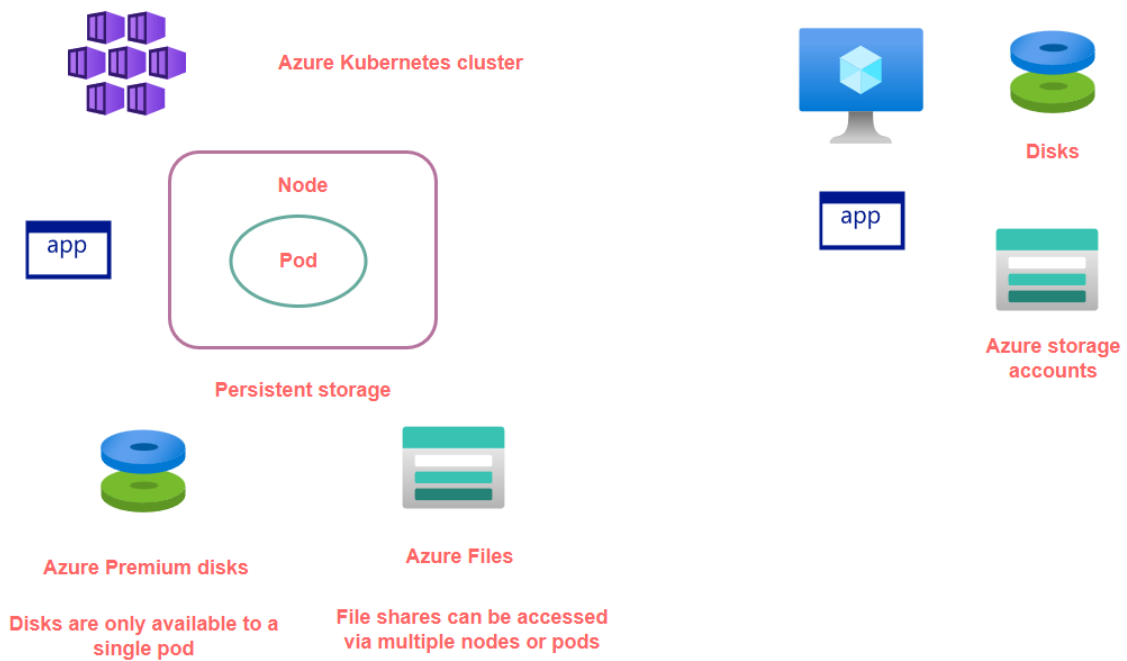
Azure storage accounts

Azure Premium disks

Disks are only available to a single pod

Azure Files

File shares can be accessed via multiple nodes or pods

Configure and manage virtual networking

Introduction to Virtual Networks in Azure

Isolated Network on the cloud

Virtual Network   10.0.0.0/16

appvm

Network Interface

Private IP Address 10.0.0.4

Public IP Address 20.107.199.52

SubnetA   10.0.0.0/24

dbvm

Network Interface

Private IP Address 10.0.1.4

SubnetB   10.0.1.0/24

RDP - Remote Desktop Protocol

Used for private communication

Allows connectivity from the Internet

Network Security Group

Network Security Group

Quick note on address spaces

An IP address is a 32-bit number

It is written in a human-readable format

Example - 192.0.2.1

11000000.00000000.00000010.00000001

Each part of the IP address is an octet that is seperated by a dot notation

Each octet can have a decimal value between 0 and 255

Minimum value -	0	0	0	0	0	0	0	0
Maximum value -	1	1	1	1	1	1	1	1

Number of values -	256	128	64	32	16	8	4	2
	0	0	0	0	0	0	0	0

Place value	128	64	32	16	8	4	2	1
	0	0	0	0	0	0	0	0

The CIDR Notation

Network and host ID

An IP address is also associated with a subnet mask

The subnet mask is used to distinguish between the network and the host id

Example - 192.0.2.0

Subnet mask - 255.255.255.0

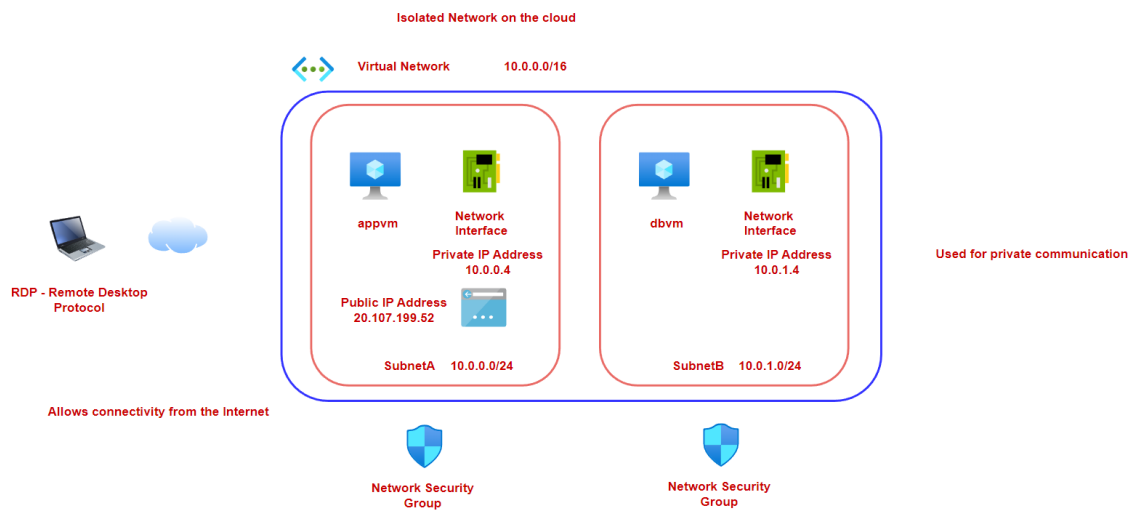Here 192.0.2.0 is the network id

192.0.2.1   192.0.2.2   192.0.2.3

Here you get 256 total number of hosts

The number of usuable IP addresses is 254

192.0.2.0 is the network id and 192.0.2.255 is the broadcast id

About IP Addresses

Isolated Network on the cloud

Virtual Network   **10.0.0.0/16**

appvm

Network Interface

Private IP Address 10.0.0.4

Public IP Address 20.107.199.52

SubnetA   10.0.0.0/24

dbvm

Network Interface

Private IP Address 10.0.1.4

SubnetB   10.0.1.0/24

Used for private communication

RDP - Remote Desktop Protocol

Allows connectivity from the Internet

Network Security Group

Network Security Group

Private IP addresses

Dynamic - This is assigned by Azure - The address is released if the network interface is deleted , or if it is assigned to a different subnet in the virtual network.

Static - Don't want the IP address to change
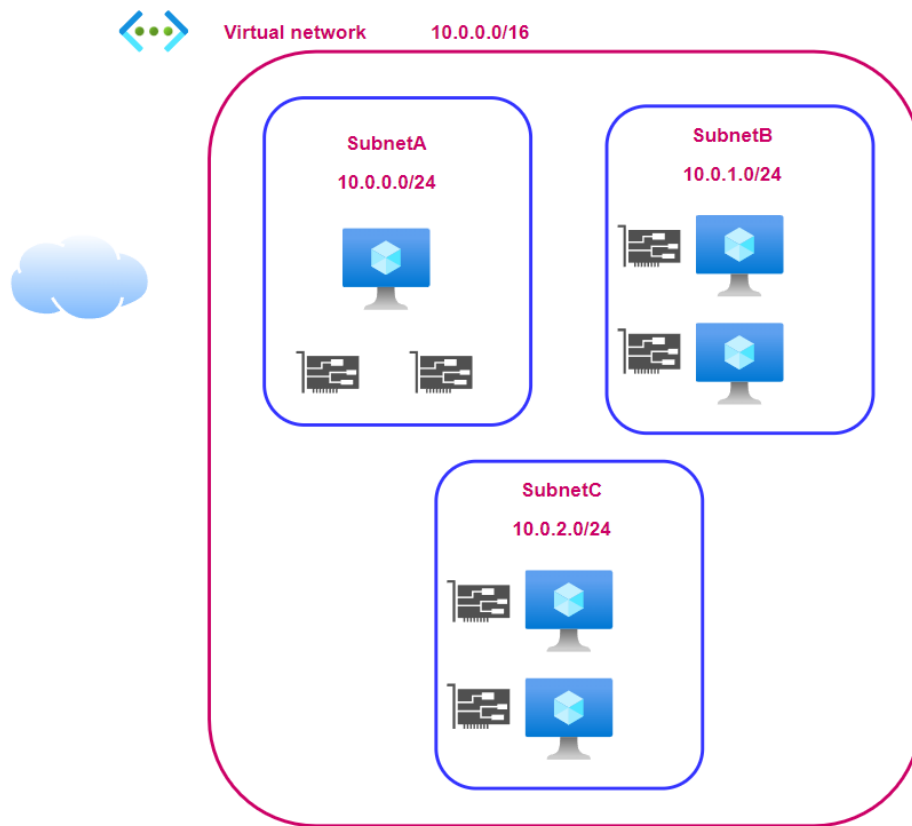
Public IP addresses

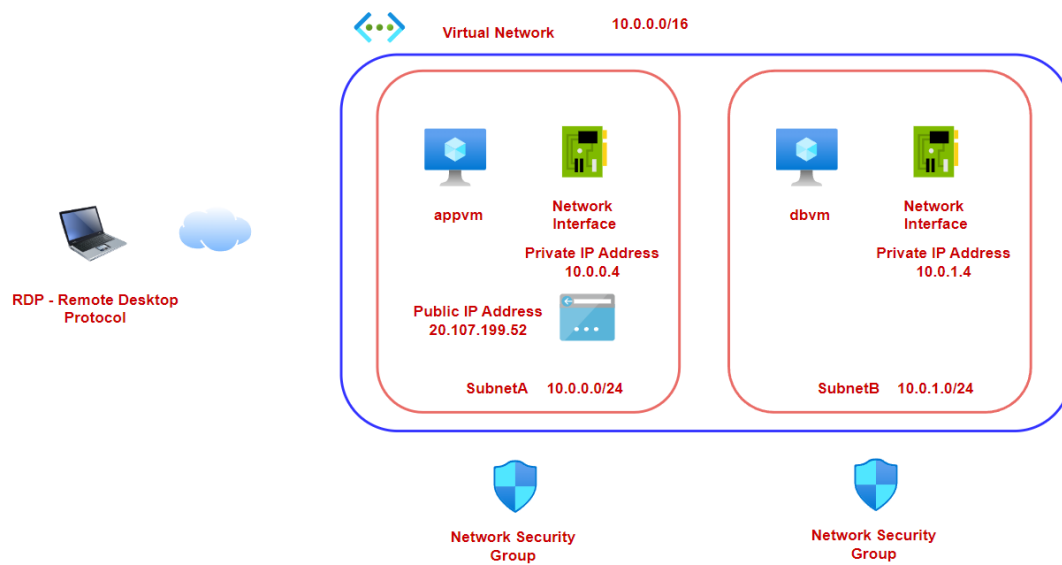**Static - The IP address is assigned the time the resource is created**

Dynamic - The IP address is allocated when it is assigned to a resource. Also the IP address is released when you stop or delete the resource.

Attaching a secondary network interface

Virtual network   10.0.0.0/16

SubnetA

10.0.0.0/24

SubnetB

10.0.1.0/24

SubnetC

10.0.2.0/24

Network Security Groups

Virtual Network   10.0.0.0/16

appvm

Network Interface

Private IP Address
10.0.0.4

Public IP Address
20.107.199.52

dbvm

Network Interface

Private IP Address
10.0.1.4

SubnetA   10.0.0.0/24

SubnetB   10.0.1.0/24

RDP - Remote Desktop Protocol

Network Security Group

Network Security Group

Network Security Groups - Used to filter traffic

Here you can define security rules that allow or deny network traffic

You define the following for the rule

1. Priority - Here the rules with the lower priority are processed first

2. Source - The source of traffic - IP address, CIDR block, service tag or application security group

Service Tag - This represents a group of IP address prefixes from a given Azure service.

3. Protocol - TCP, UDP

4. Direction - Inbound/Outbound

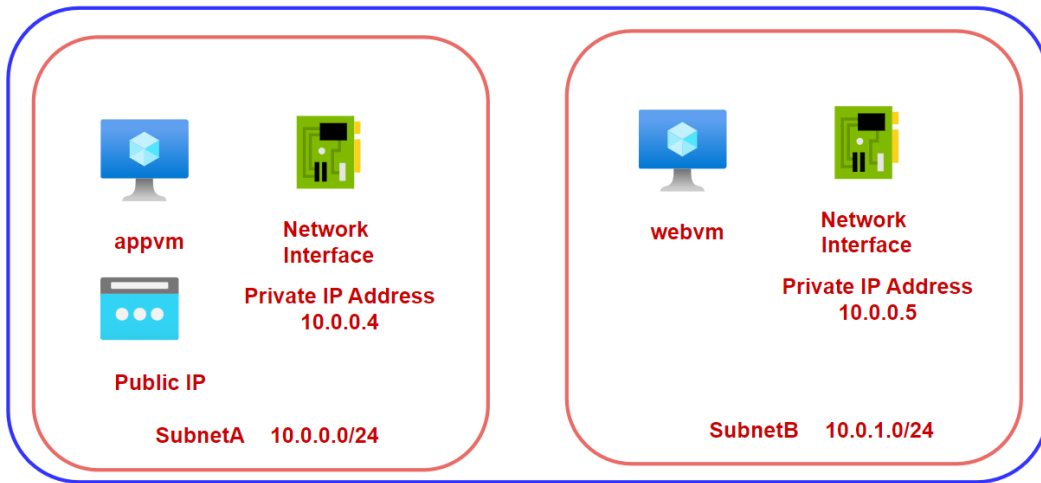**5. Port Range - Individual or a range of ports**

6. Action - Allow or Deny

Application Security Groups

Virtual Network   10.0.0.0/16

appvm   Network
                 Interface

                 Private IP Address
                 10.0.0.4

Public IP

SubnetA   10.0.0.0/24

webvm   Network
                 Interface

                 Private IP Address
                 10.0.0.5

SubnetB   10.0.1.0/24

Application Security
Group

Network Security
Group

The Azure Load Balancer Service

app-network   **10.0.0.0/16**

Internet

Azure Load Balancer

Azure Virtual Machines

default   **10.0.0.0/24**

Configuration

Public IP address - If it is a public load balancer

Health probe - This is used to monitor the backend machines

Load Balancing rules - These are used to direct the requests coming into the Load Balancer to the backend virtual machines.

The Load Balancer is used to distribute incoming traffic and distribute to the backend Azure virtual machines.

There are two different SKU's for the Load Balancer - Basic and Standard

Basic Load Balancer - No charge - But there is no SLA and there are other features like no built-in high availability.

Standard Load Balancer has an hourly charge. But you get different features like high availability via the use of Availability zones.

Load Balancer- Session Persistence

loadvm1

Public IP address

loadvm2

The Load balancer will create an affinity between the Load Balancer and the client for a session

Advantage - Can help in better performance for sessions

Disadvantage - If too many sessions are persisted on a server.
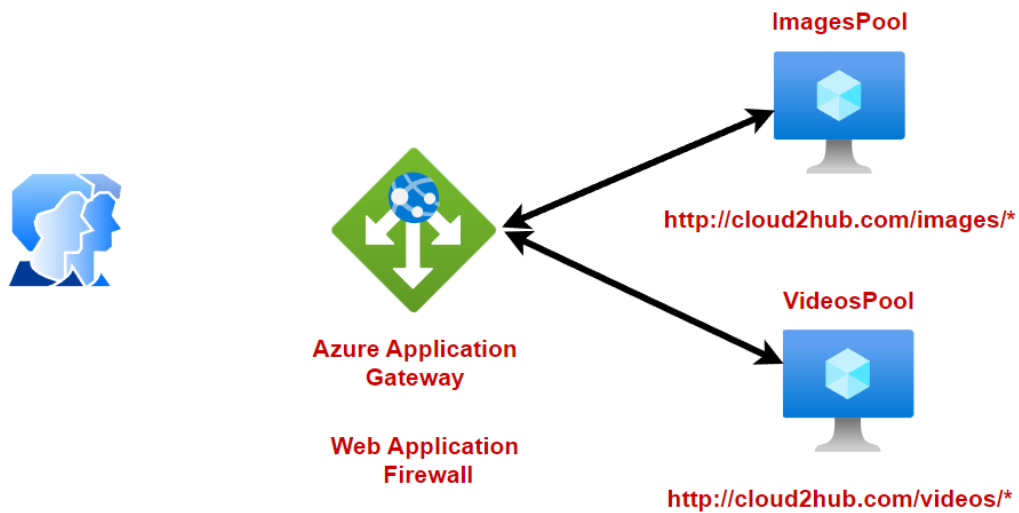
Azure Application Gateway

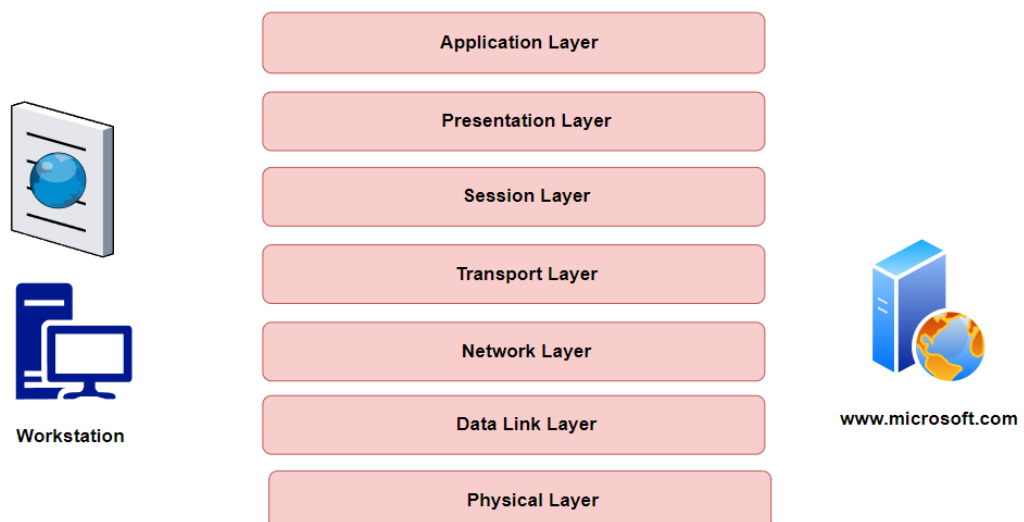**Azure Application Gateway**

Web Traffic Load Balancer

Manage web traffic for applications
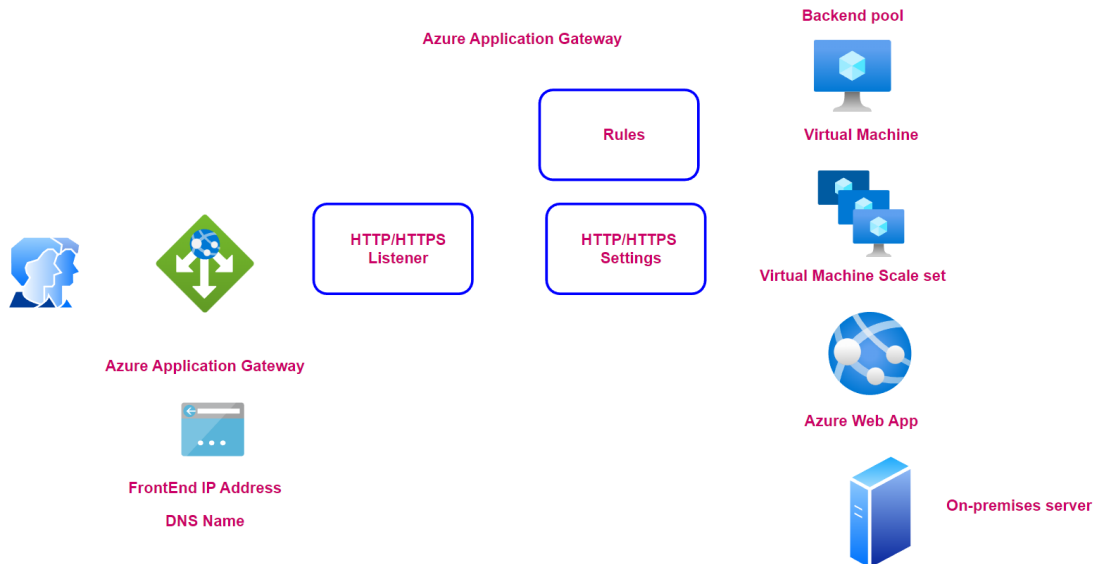
Layer 7 Load Balancer

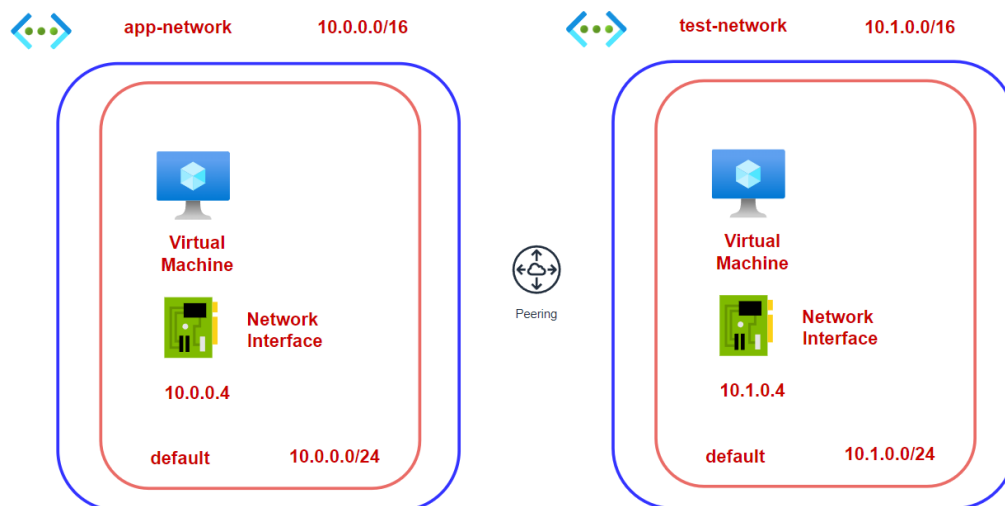**Routing decisions are made based on the HTTP attributes**

ImagesPool

http://cloud2hub.com/images/*

Azure Application Gateway

Web Application Firewall

VideosPool

http://cloud2hub.com/videos/*

OSI Model

Application Layer
Presentation Layer
Session Layer
Transport Layer
Network Layer
Data Link Layer
Physical Layer

Workstation

www.microsoft.com

Azure Application Gateway – Components

Azure Application Gateway

Rules

HTTP/HTTPS Listener

HTTP/HTTPS Settings

Azure Application Gateway

FrontEnd IP Address

DNS Name

Backend pool

Virtual Machine

Virtual Machine Scale set

Azure Web App

On-premises server

Virtual Network Peering

app-network 10.0.0.0/16

Virtual Machine

Network Interface

10.0.0.4

default 10.0.0.0/24

Peering

test-network 10.1.0.0/16

Virtual Machine

Network Interface

10.1.0.4

default 10.1.0.0/24

An Azure virtual network is an isolated network on the cloud

By default the Azure virtual machines cannot communicate across Azure virtual networks
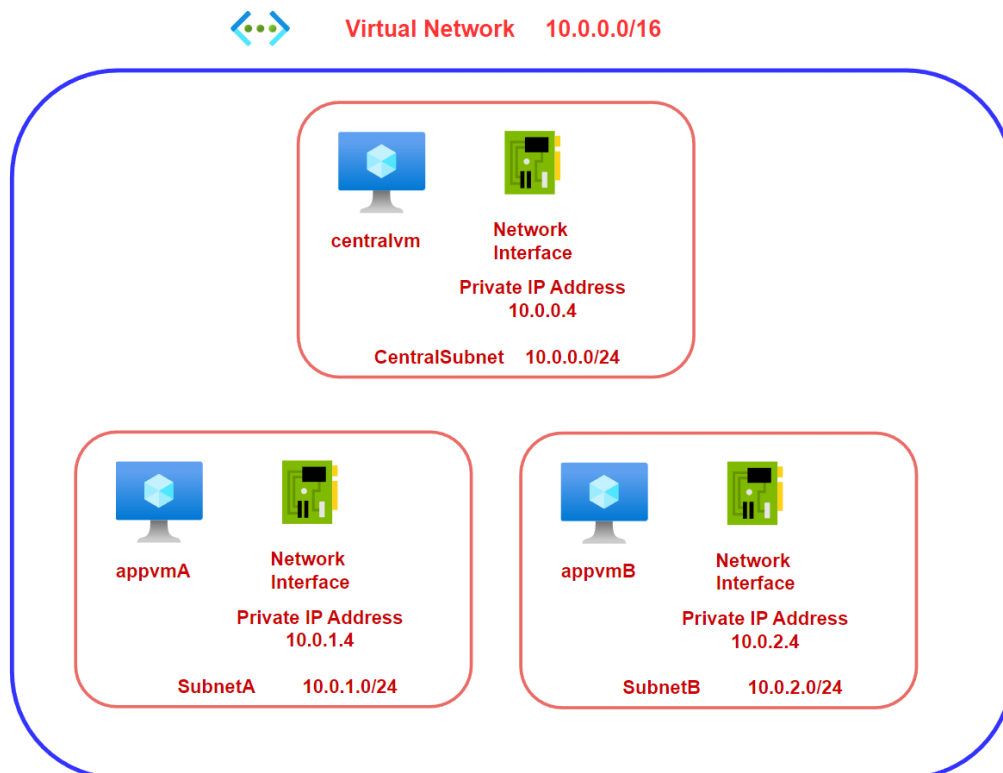
For this you have to create an Azure virtual network peering connection
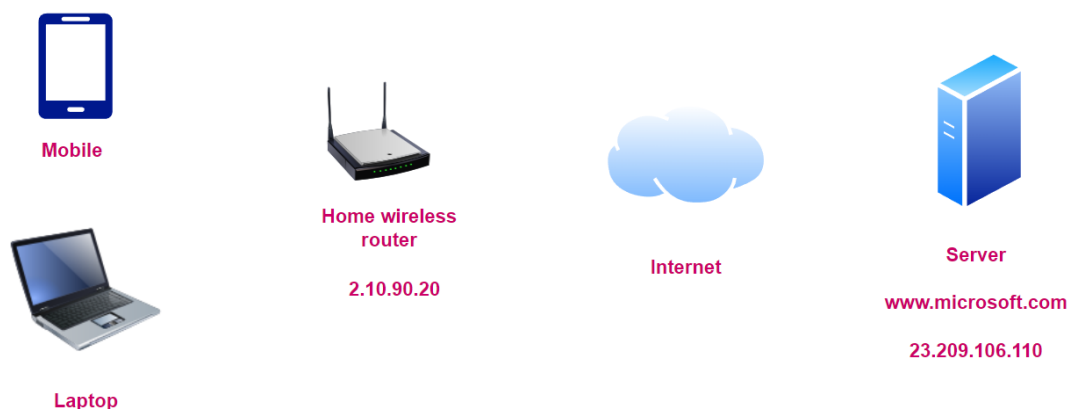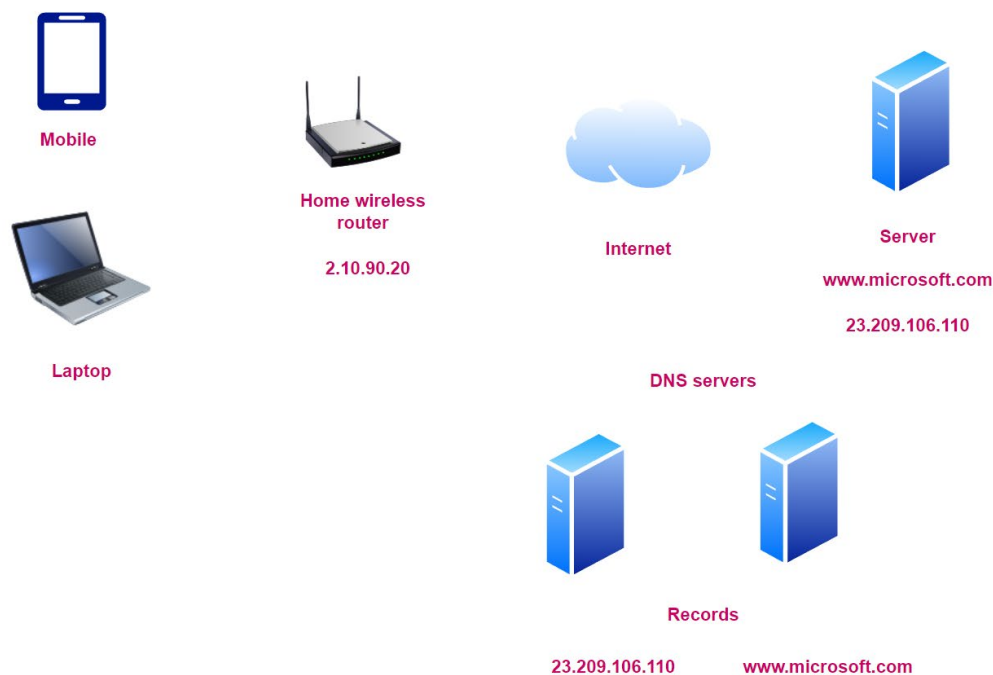
Azure Bastion

Azure Bastion

Fully managed PaaS service

**Provides RDP/SSH connectivity to virtual machines
from the Azure Portal via TLS**

Azure virtual network

**Connection via
the Internet on
port 443**

AzureBastionSubnet

SubnetA

SubnetB

**Here you virtual machines don't need to have a Public IP
address for connectivity**

User Defined Routes

Virtual Network   10.0.0.0/16

centralvm

Network Interface

Private IP Address 10.0.0.4

CentralSubnet   10.0.0.0/24

appvmA

Network Interface

Private IP Address 10.0.1.4

SubnetA   10.0.1.0/24

appvmB

Network Interface

Private IP Address 10.0.2.4

SubnetB   10.0.2.0/24

What is the domain name system

Mobile

Laptop

Home wireless router

2.10.90.20

Internet

Server

www.microsoft.com

23.209.106.110

When packets of data need to be routed via the TCP protocol , a connection needs to be established between the client and the server with the use of IP addresses

So how does my client know the IP address of www.microsoft.com

Mobile

Home wireless router

2.10.90.20

Internet

Server

www.microsoft.com

23.209.106.110

Laptop

DNS servers

Records

23.209.106.110   www.microsoft.com

Overview of setting up a Local DNS

app-network

10.0.0.0/16

dns-server

10.0.0.4

SubnetA - 10.0.0.0/24

web-server

10.0.1.4

SubnetB - 10.0.1.0/24
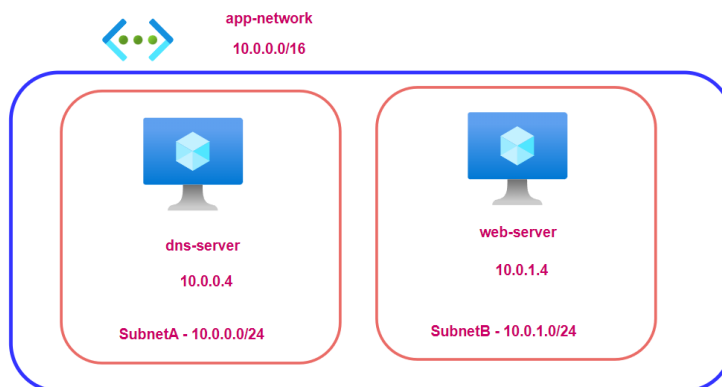
7. Now its time to use our DNS server

7.1 For the network , we need to mention our DNS Server

7.2 Restart our servers

7.3 Add a record to the zone

dns-server

1. Install Active Directory Domain services

2. Promote the server to a domain controller

3. Specify a root domain name - cloud2hub.com

6. Use Azure provided DNS names web-server.internal.cloudapp.net

web-server

4. Create a new server as part of a new subnet

5. Install Internet Information Services on the server

Implement and manage storage

What are storage accounts

Azure Storage Accounts

This is storage on the cloud via the use of different services.

Azure Blob storage

This is an object storage service

This is great for storing unstructured data

app

Video

Data Disk

Azure virtual machine

Azure Blob storage can grow automatically based on demand

Its great when you want to use it to store images, video, audio files.

Even good for storing backups.

Azure File shares

File Server

Azure Storage Account - File shares

Azure Table storage

This is great when you want to store non-relational structured data

This is when you data conforms to a schemaless design

app

Table storage
User data

Blob storage
Videos, Images
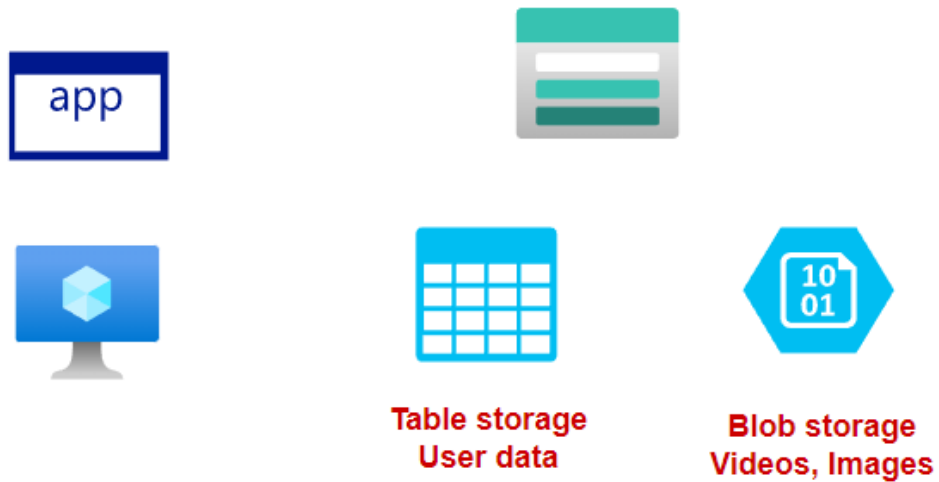
Azure Queue storage

This is a messaging based service

app

app

Azure Blob service

Its optimized for storing large
amounts of unstructured data

**Azure Storage
Account**

Blob service

Container

Files

Unique URL

Images

Videos

**Azure virtual
machine**

Block blobs

This is made up of blocks of data that
can managed individually

Append blobs

These are block blobsthat are
optimized for append operations -
Good for logging

Page blobs

This is used for virtual hard drive files
for Azure virtual machines

Azure Storage Accounts- Different authorization techniques

How can users or application authorize themselves to access the objects in the blob service

Access Keys

Shared Access Signatures

Azure AD Authentication

Azure Storage Accounts- Data Redundancy

Azure Storage account - Redundancy

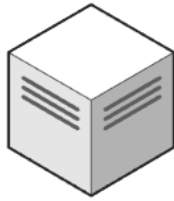**Multiple copies of your data are stored**

This helps to protect against planned and unplanned events - transient hardware failures, network or power outages.
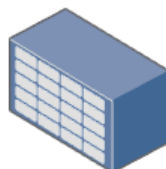
Storage Device

Data Center

Central US

Here three copies of your data are made

It helps to protect against server rack or drive failures
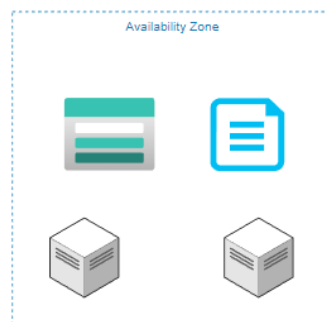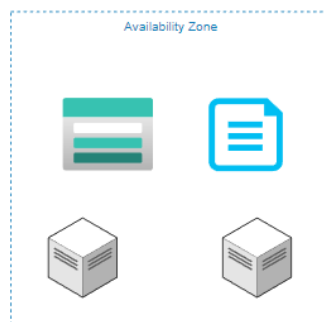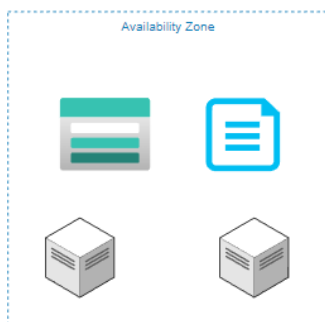
Storage Device   **Storage Device**   **Storage Device**

Zone-redundant storage   This helps to protect against data center level failures

Here data is replicated synchronously across three Azure availability zones
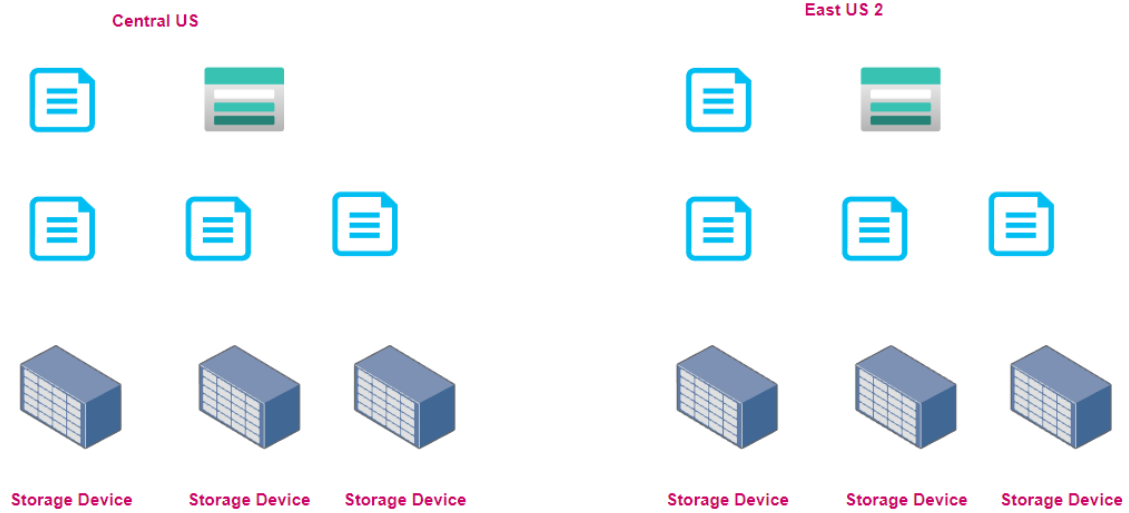
Availability Zone   Availability Zone   Availability Zone

Central US

Each availability zone is a seperate physical location with independent power, cooling and networking

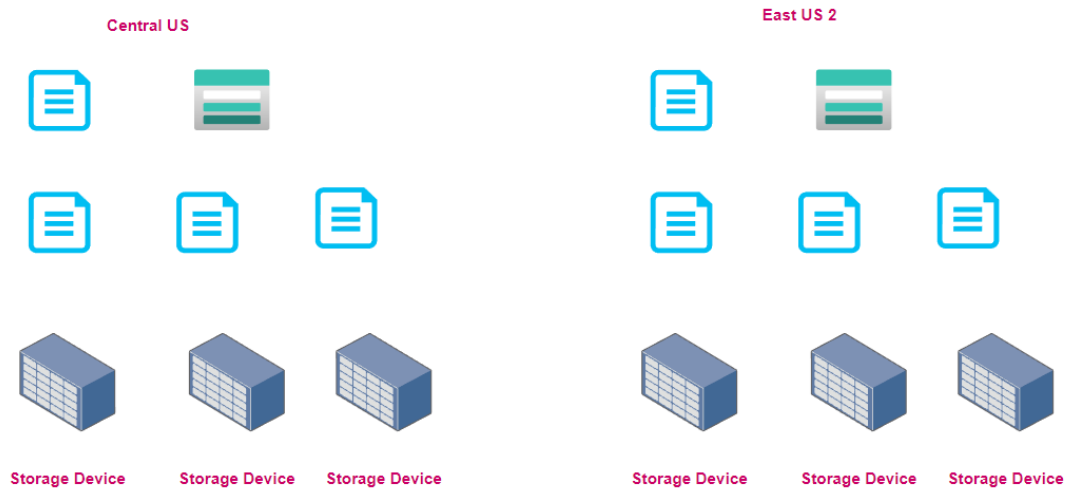Here data is replicated to another region

Central US

East US 2

Storage Device   Storage Device   Storage Device

Storage Device   Storage Device   Storage Device

Data is copied three times in the primary region using LRS

Data is copied three times in the secondary region using LRS

Read-access geo-redundant storage

Central US

East US 2

Storage Device   Storage Device   Storage Device

Storage Device   Storage Device   Storage Device

Data is copied three times in the primary region using LRS

Data is copied three times in the secondary region using LRS

Central US

Availability Zone

East US 2

Availability Zone

Storage Device   **Storage Device**   **Storage Device**
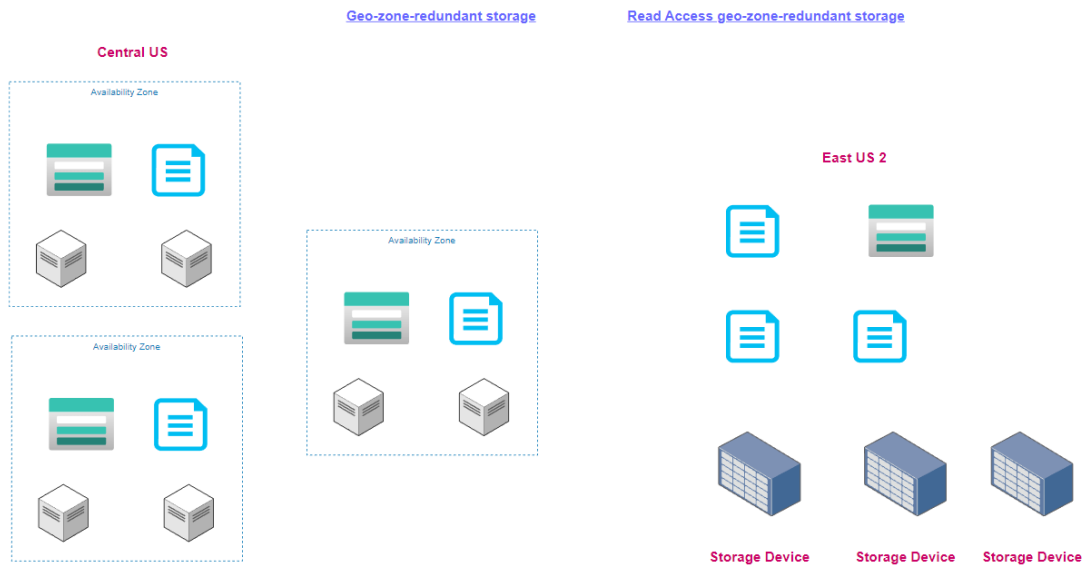
Storage Accounts- Access Tiers

Azure storage access tiers

Objects

There is a cost for storing objects
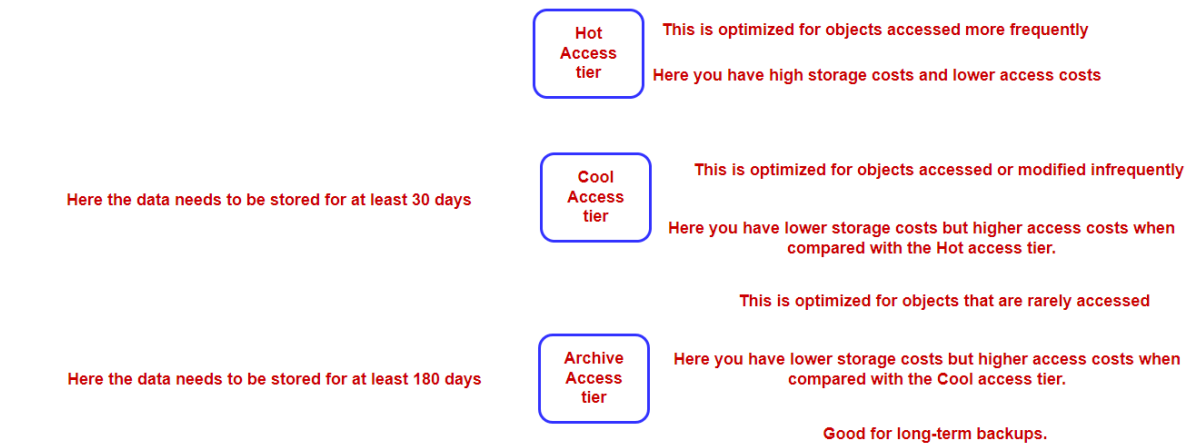
There is a cost for accessing objects

Companies might store millions of objects in a storage account

Use case - Initial there could be some objects that are accessed quite freqently. Then after some time, maybe a week or two , those objects are accessed less frequently.

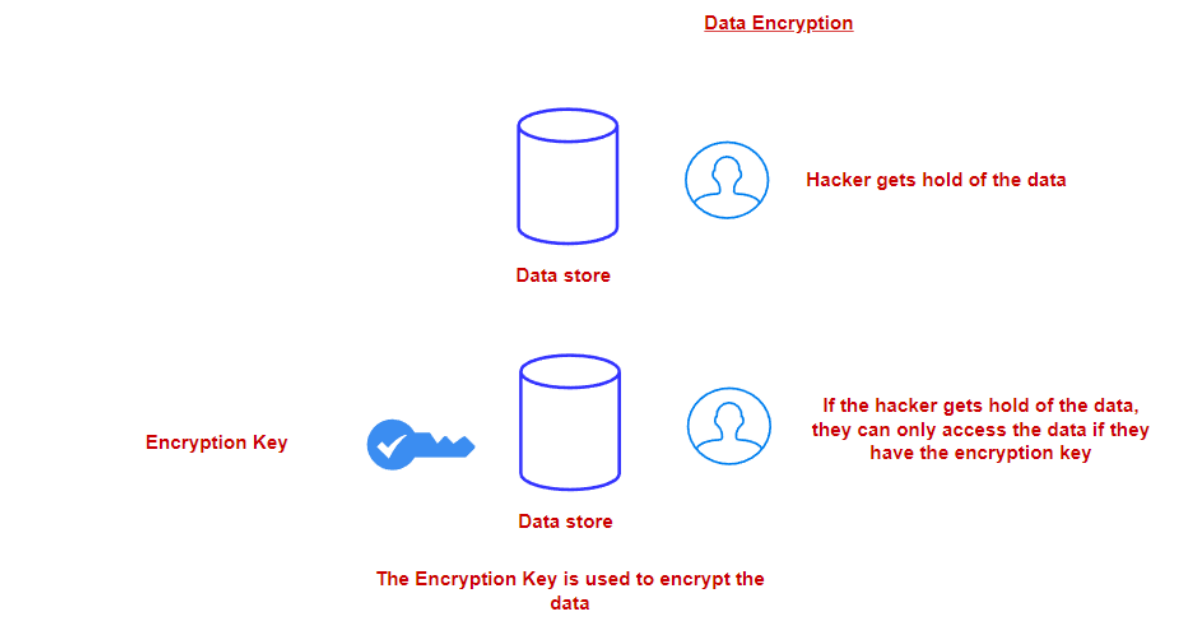**Can a company save on costs when it comes to less frequently accessed objects.**

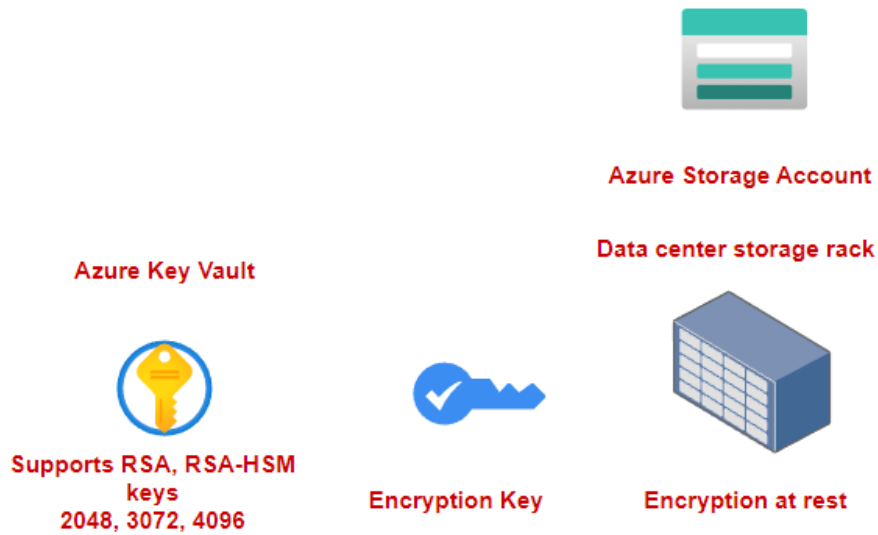**An object can be set to a particular tier**

Hot Access tier

This is optimized for objects accessed more frequently

Here you have high storage costs and lower access costs

Cool Access tier

Here the data needs to be stored for at least 30 days

This is optimized for objects accessed or modified infrequently

Here you have lower storage costs but higher access costs when compared with the Hot access tier.

This is optimized for objects that are rarely accessed

Archive Access tier

Here the data needs to be stored for at least 180 days

Here you have lower storage costs but higher access costs when compared with the Cool access tier.

Good for long-term backups.

You can set the Hot and the Cool access tier at the storage account level.

You can set the Hot ,Cool and Archive access tier at the blob level.

Azure Storage Encryption

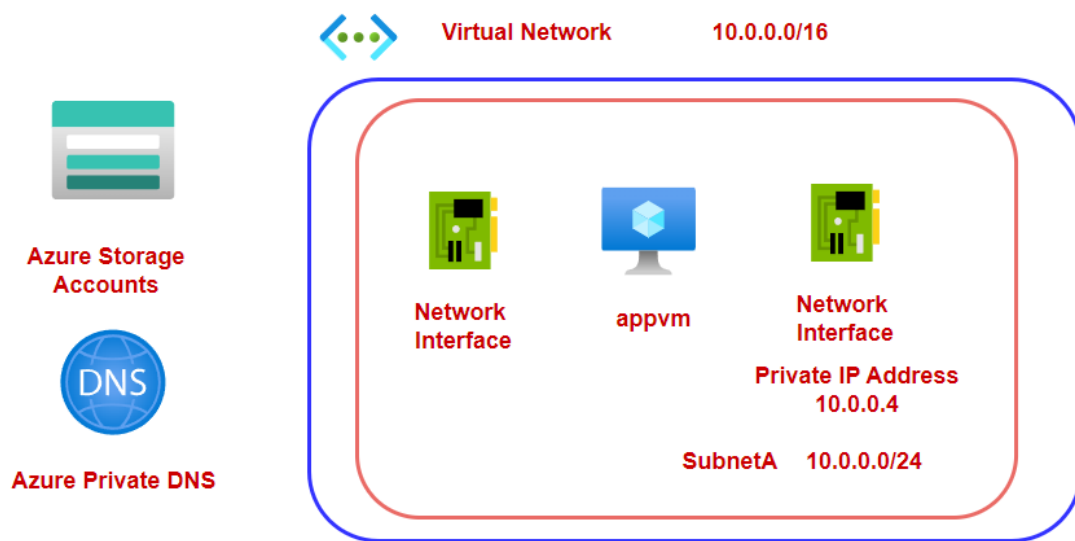**Data Encryption**

Hacker gets hold of the data

Data store

Encryption Key

Data store

If the hacker gets hold of the data, they can only access the data if they have the encryption key

The Encryption Key is used to encrypt the data

Azure Storage Account

Data center storage rack

Azure Key Vault

Supports RSA, RSA-HSM keys 2048, 3072, 4096

Encryption Key

Encryption at rest

Firewall and Network settings

Virtual Network   **10.0.0.0/16**

appvm

Network Interface

Private IP Address 10.0.0.4

SubnetA   10.0.0.0/24

Azure Storage Accounts
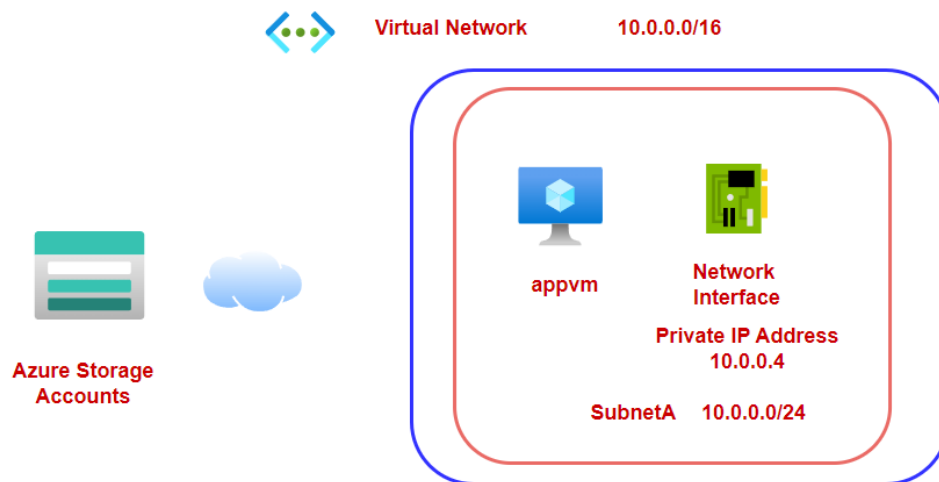
Azure Storage Accounts- Private Endpoints

Virtual Network   10.0.0.0/16

Network Interface   **appvm**   **Network Interface**

Private IP Address 10.0.0.4

SubnetA   10.0.0.0/24

Azure Storage Accounts

Azure Private DNS

Note on Premium storage accounts

Premium storage accounts

Premium block blobs

This is used when you need high performance when it comes to storage and access to data.

Here the data in the background is stored on solid-state drives. These are optimized for low latency.

Here the file transfer is also much faster.

Workloads - Streaming , Machine Learning

You have higher storage costs but lower transaction costs

Performance ⓘ *

Locally-redundant storage (LRS):
Lowest-cost option with basic protection against server rack and drive failures. Recommended for non-critical scenarios.

Zone-redundant storage (ZRS):
Intermediate option with protection against datacenter-level failures. Recommended for high availability scenarios.

Premium account type ⓘ *

Redundancy ⓘ *

Locally-redundant storage (LRS) ⌄

You can't set the access tiers

Premium file shares

Here again you get high performance and low latency

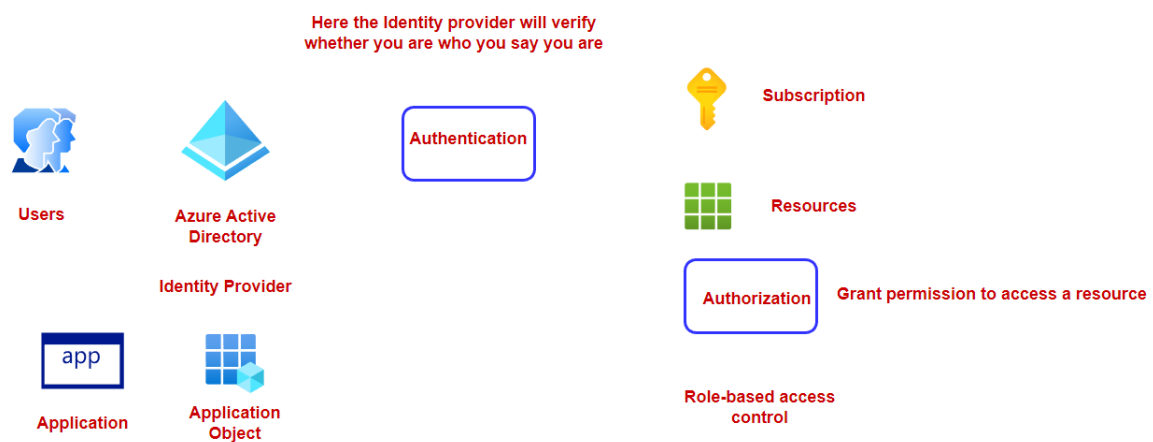Backed by solid-state drives for storage

Data redundancy

Performance ⓘ *

Locally-redundant storage (LRS):
Lowest-cost option with basic protection against server rack and drive failures. Recommended for non-critical scenarios.

Zone-redundant storage (ZRS):
Intermediate option with protection against datacenter-level failures. Recommended for high availability scenarios.

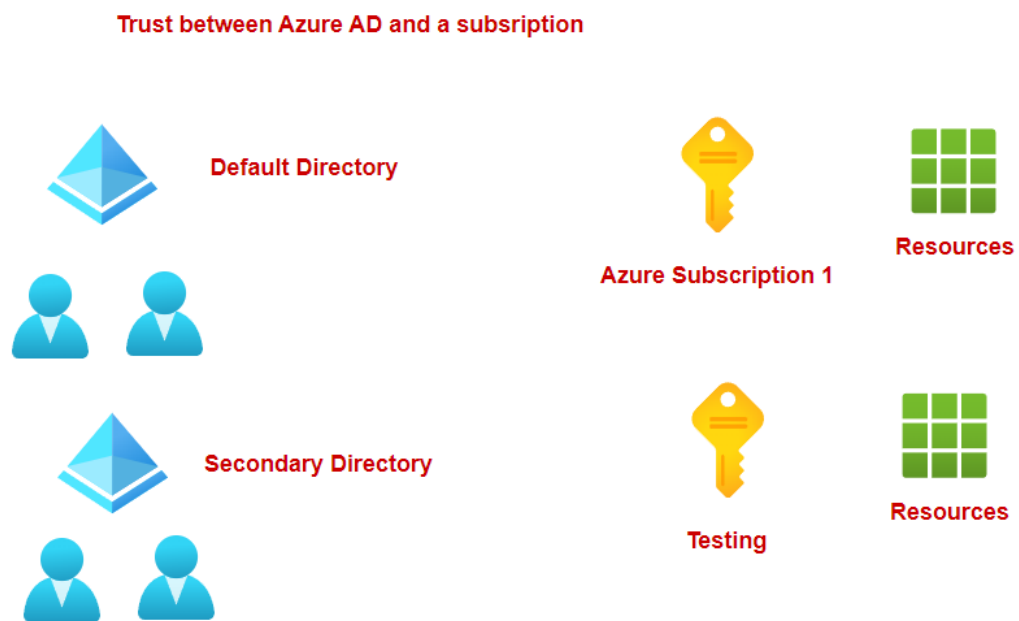Premium account type ⓘ *

Redundancy ⓘ *

Locally-redundant storage (LRS) ⌄

Manage Azure identities and governance

What is Azure Active Directory

Here the Identity provider will verify whether you are who you say you are

Authentication

Subscription

Users

Azure Active Directory

Identity Provider

Resources

Authorization   Grant permission to access a resource

app

Application

Application Object

Role-based access control

Trust between Azure Subscription and Azure AD

Trust between Azure AD and a subsription

Default Directory

Azure Subscription 1

Resources

Secondary Directory

Testing

Resources

**There is a trust relationship with Azure AD and an Azure subscription.**

Each subscription can only trust a single Azure AD directory

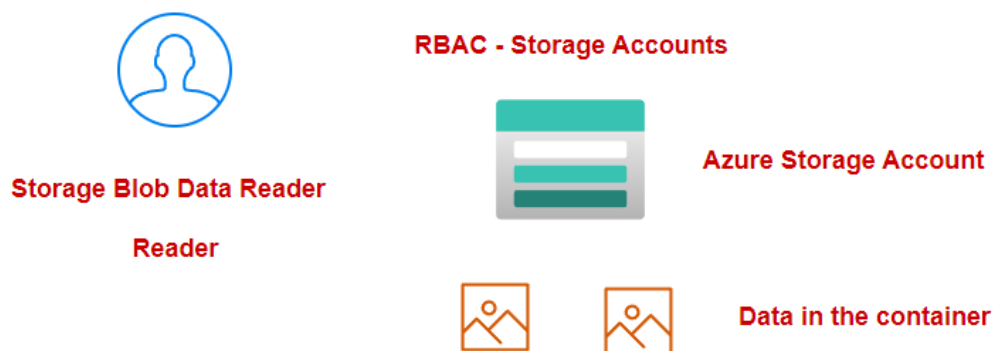**Multiple subscriptions can trust the same Azure AD directory**

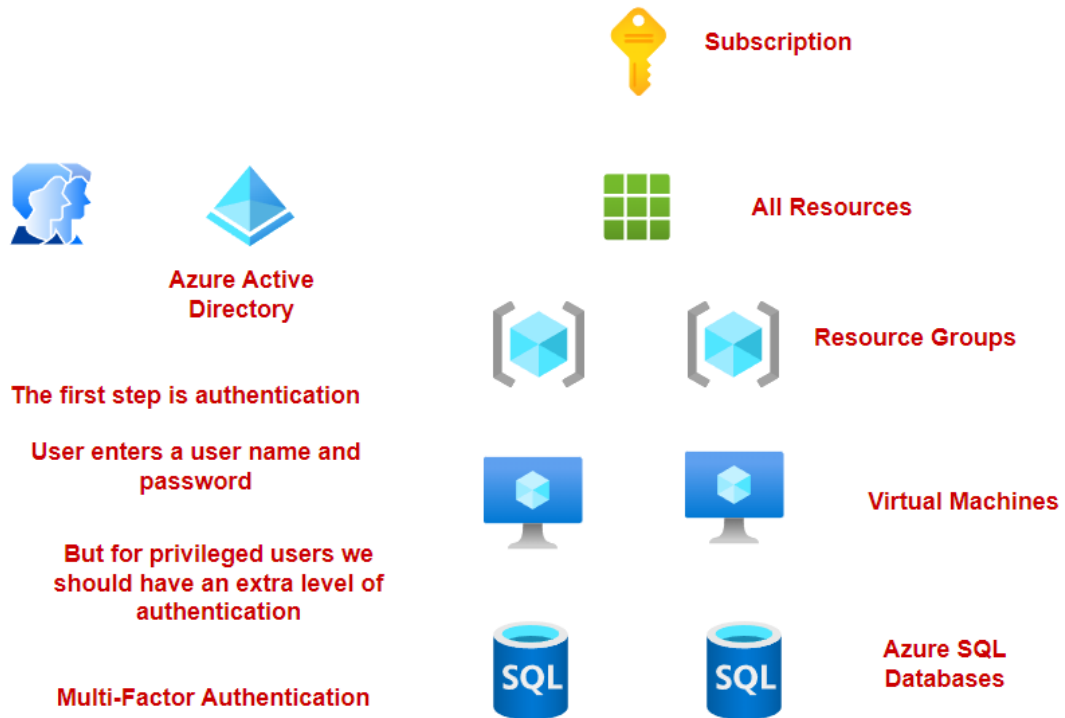# Introduction to Role Based Access Control

Role-based access control

Subscription

Azure Active Directory

All Resources

Resource Groups

Virtual Machines

Azure SQL Databases
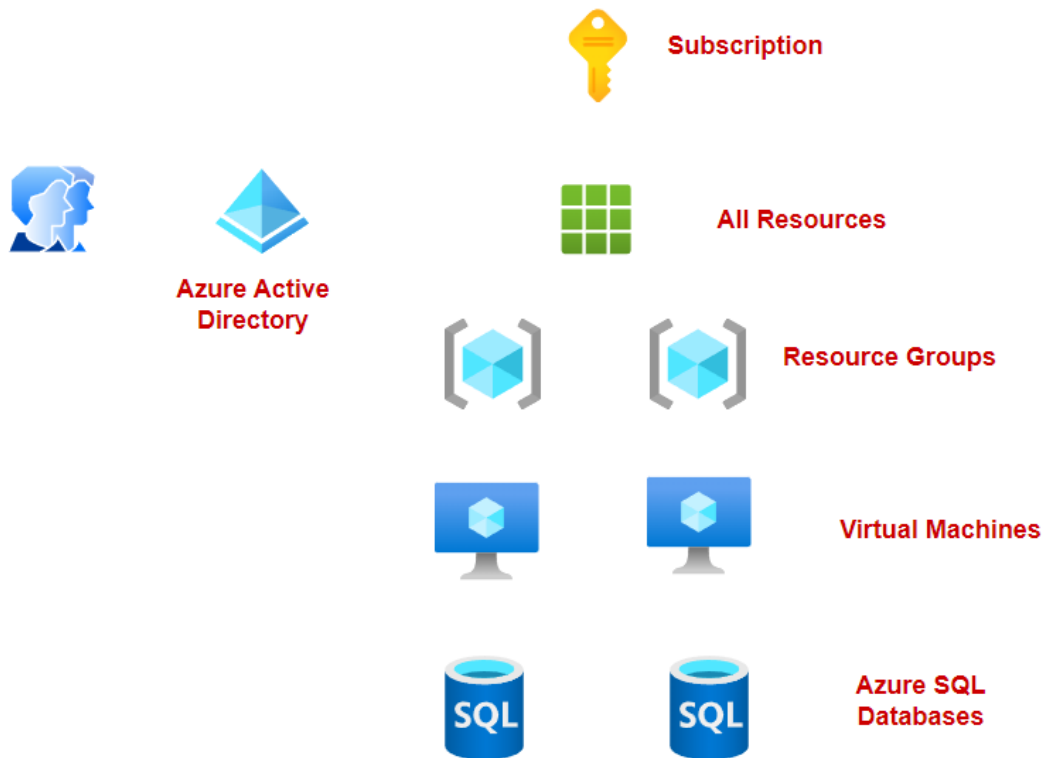
Note on Storage Account roles

RBAC - Storage Accounts

Storage Blob Data Reader

Reader

Azure Storage Account

Data in the container

What is Multi-Factor Authentication

Role-based access control

 Subscription

Azure Active Directory

 All Resources

  Resource Groups

The first step is authentication

User enters a user name and password

  Virtual Machines

But for privileged users we should have an extra level of authentication

  Azure SQL Databases

Multi-Factor Authentication

Administrative Units

Azure Active Directory

DepartmentA   **DepartmentB**   **DepartmentC**

Lab- Administrative Units

Azure Active Directory

UserA

UserB

Administrative Unit

User Administrator

AdminA

Logistics-grp

UserC

UserD

UserE

UserF

AdminB

UserG

UserH

General-grp
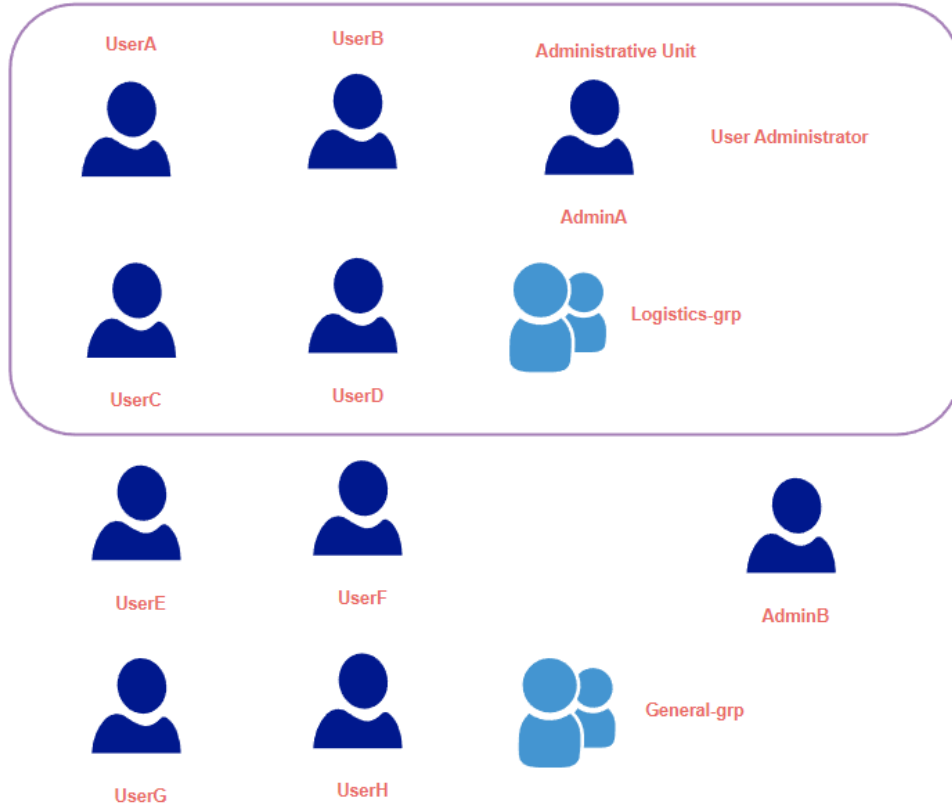
Management Groups

Role-based access control

Azure Policies

Tenant Root group

Management Groups

Subscriptions

Resource groups

Resources

Monitor and back up Azure resources

Azure Monitor

Azure virtual machine
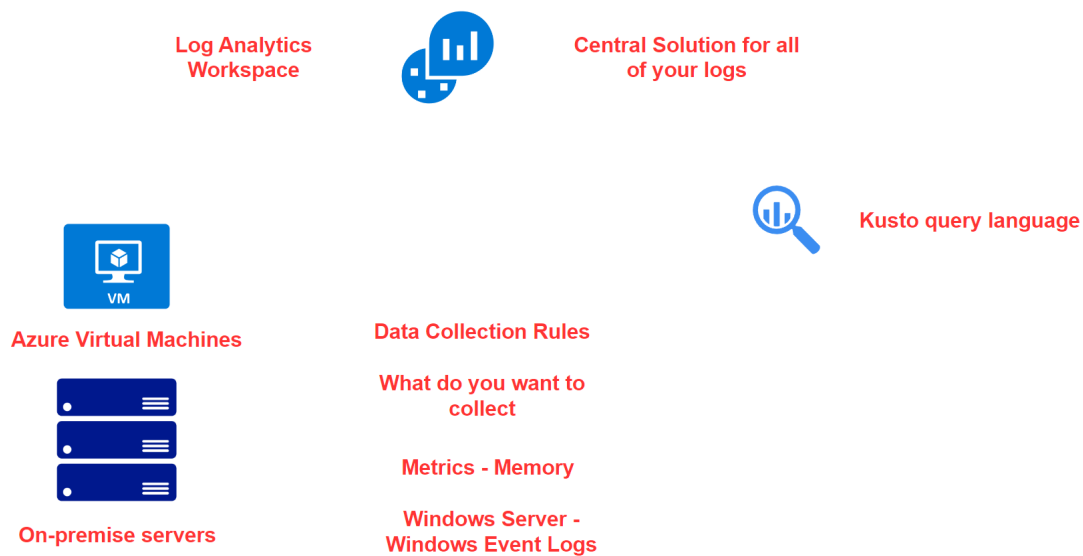

Azure Monitor

CPU Utilization   **Network utilization**

Azure Monitor alerts

**If the CPU utilization goes beyond a
particular threshold**

What is a Log Analytics Workspace

Log Analytics Workspace

Central Solution for all of your logs

Kusto query language

Azure Virtual Machines

On-premise servers

Data Collection Rules

What do you want to collect

Metrics - Memory

Windows Server - Windows Event Logs

What is the Azure Backup feature

Azure Backup for virtual machines

This provides access to data on the VM if something happens to the original VM

The backup data gets written to a Recovery Services vault

Azure virtual machines

East US

Azure Site Recovery Services vault

East US
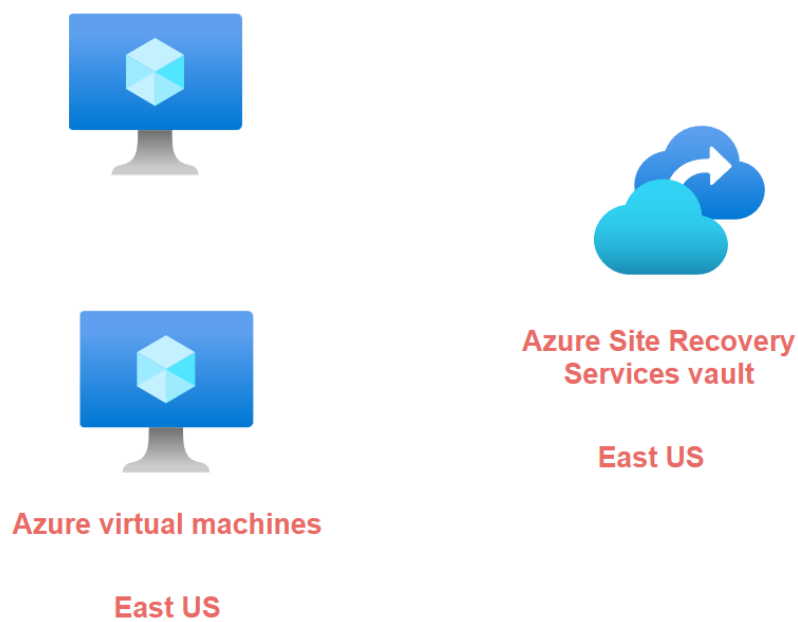
<u>Steps during a backup</u>

1. First an extention is installed on the VM - Supported for both Windows and Linux VM's

2. The backup tool first takes a snapshot of the data and stores it on the local machine

3. The snapshot of data is then copied to the Recovery Service svault

Azure Site Recovery

Azure Site Recovery

Used for business continuity and for disaster recovery

**Ensures your apps and workloads are running when
there are planned or unplanned outages**

Physical servers

Hyper-V VM's

VMWare

**Server running your
applications**

Primary data center

Secondary data center

Server running your applications

Primary data center

Servers in Azure

VM in Azure

VM in Azure

The replication frequency is high , being as low as every 30 seconds for Hyper-V VMs

Hence the RPO is low. And because you can switch over quickly, the RTO is also low

You can run planned failovers with zero-data loss

Or unplanned failovers with minimal data loss

Azure Site Recovery- Azure VM – Overview

Azure virtual network

Azure virtual machine

This machine could also be part of an Availability set

Azure storage account

This is required in the soure location. The VM changes are stored in the cache first before being sent to target storage.

Source
North Europe

Target resource group

The VM will be part of the target resource group after the failover

The target resource group must be in a different region other than the source region.

Azure virtual network

Target Azure virtual network

The VM will be part of the target virtual network after the failover.

Destination
UK South