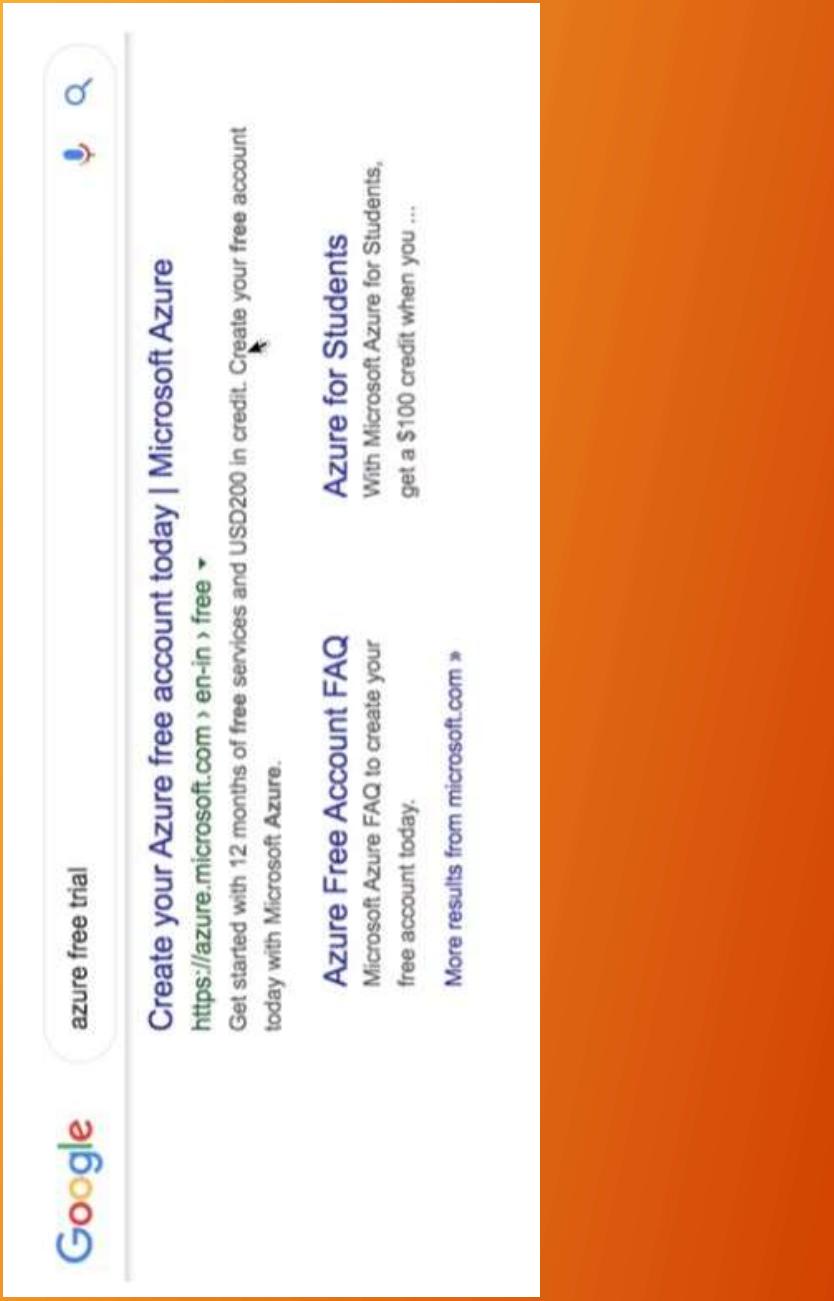
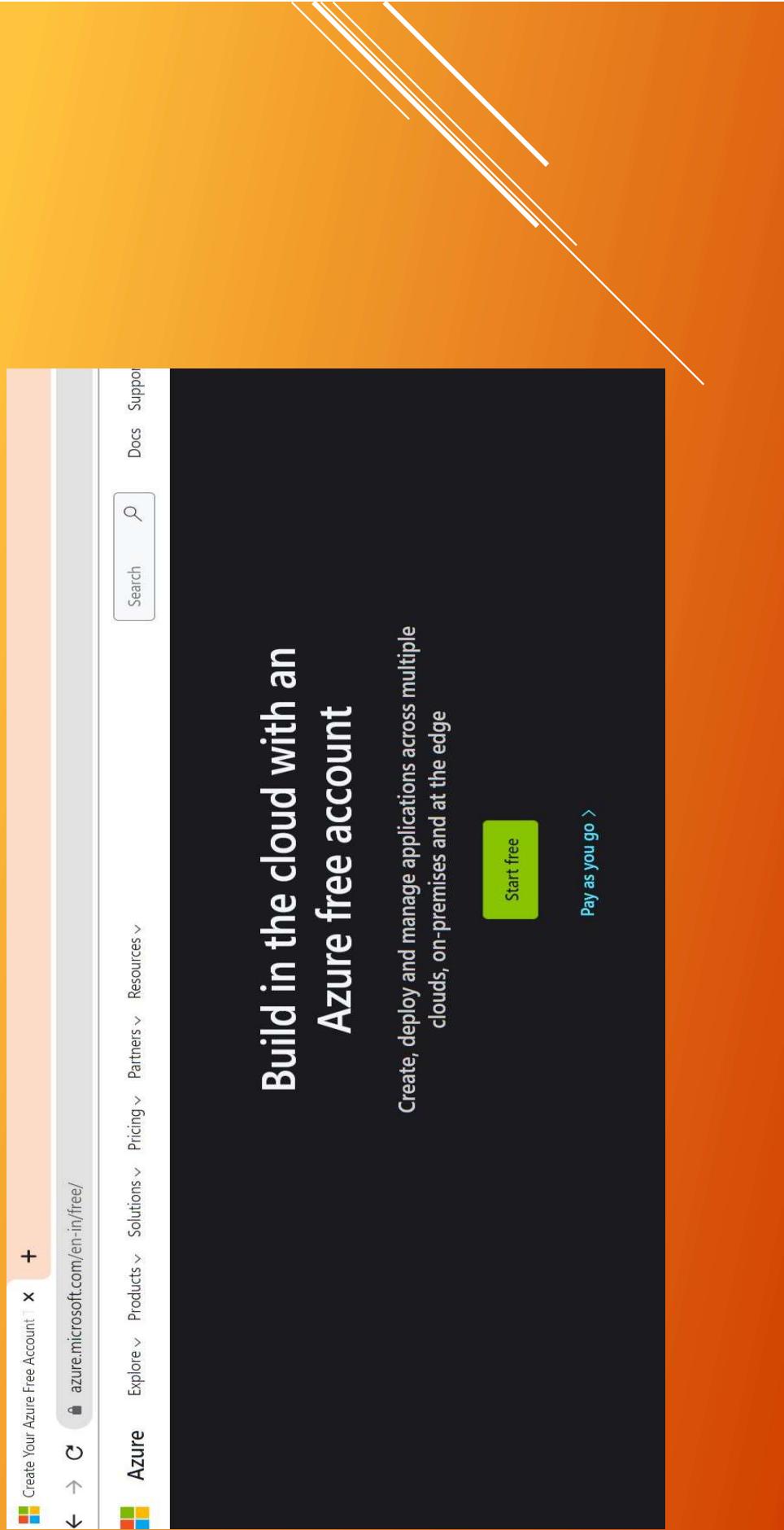


CREATE YOUR AZURE ML ACCOUNT



A screenshot of a Google search results page. The background is orange with white diagonal stripes. The search bar at the top contains the query "azure free trial". Below the search bar, there are several search results:

- Create your Azure free account today | Microsoft Azure**
<https://azure.microsoft.com/en-in/free/> ▾
Get started with 12 months of free services and USD200 in credit. [Create your free account today with Microsoft Azure.](#)
- Azure for Students**
With Microsoft Azure for Students, get a \$100 credit when you ...
- Azure Free Account FAQ**
Microsoft Azure FAQ to create your free account today.
More results from microsoft.com »



A screenshot of the Azure free account landing page. The page has a dark orange header with the Microsoft logo and the text "Create Your Azure Free Account". Below the header is a navigation bar with links for "Azure", "Explore", "Products", "Solutions", "Pricing", "Partners", "Resources", "Docs", and "Support". A search bar is also present. The main content area has a black background with white text. It features the heading "Build in the cloud with an Azure free account" and the subtext "Create, deploy and manage applications across multiple clouds, on-premises and at the edge". There are two buttons: a green "Start free" button and a blue "Pay as you go >" button. The URL "azure.microsoft.com/en-in/free/" is visible in the browser's address bar.

Sign in to your Microsoft account +

 login.live.com/login.srf?wa=wsignin1.0&rpsnv=13&ver=7.3.6963.0&wp=MBL_SSL&wreply=https%3a%2f%2fwww.microsoft.com%2fen-in%2f&id=7... ☆



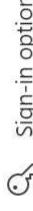
 **Sign in**

Email, phone, or Skype

No account? [Create one!](#)

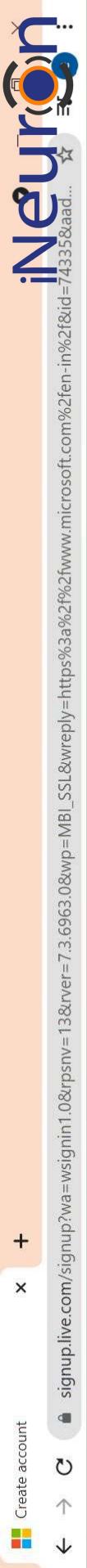
Sign in with a security key (?)

Next

 Sign-in options

Terms of use Privacy & cookies ...

24°C 🌡️ ⚡ ENG 13-08-2021



[Terms of Use](#) [Privacy & Cookies](#)

Type here to search



21:54

ENG

13-08-2021





[Terms of Use](#) [Privacy & Cookies](#)

Type here to search



Microsoft 

What's your name?

We need just a little more info to set up your account.

First name

Last name

Next

Terms of Use
Privacy & Cookies

Type here to search



21:57

ENG

13-08-2021



What's your birthdate?

We need just a little more info to set up your account. Your date of birth helps us to provide you with age-appropriate settings.

Country/region

India

Birthdate

Day ▾ Month ▾ Year

Next

Terms of Use Privacy & Cookies
21:58 ENG ⚡
13-08-2021

Type here to search





Enter code X + ↶ ↷

Microsoft

Verify email

Enter the code we sent to . If you didn't get the email, check your junk folder or try again.

Enter code

I would like information, tips, and offers about Microsoft products and services.

Choosing **Next** means that you agree to the Microsoft Services Agreement and privacy and cookies statement.

Next

Terms of Use Privacy & Cookies

24°C 21:58 ENG 13-08-2021

Type here to search



Enter code
x Inbox (1,812) - excellencetu@gm x | +

x signup.live.com/signup?wa=wsignin1.0&rpsnv=13&rver=7.3.6963.0&wp=MBI_SS1&&wreply=https%3a%2f%2fwww.microsoft.com%2fen-in%2f&id=74335&aad... ☆

Microsoft

Verify email

If you didn't get the email, check your junk folder or try again.

Enter code

I would like information, tips, and offers about Microsoft products and services.

Choosing **Next** means that you agree to the Microsoft Services Agreement and privacy and cookies statement.

Next

Terms of Use Privacy & Cookies
21:59 ENG ENG 13-08-2021

Type here to search



One month trial

\$260 Azure credit

No commitment – trial does not automatically upgrade to a paid subscription

Frequently asked questions ▾

1 (⊖) About you

* Country/Region 

* First Name 

* Last Name 

* Email address for important notifications 

- someone@example.com -

* Work Phone 

Example: 499 123 456

Organization 

- Optional -

ABN

- Recommended -

Next 

2 (⊕) Identity verification by phone

3 (⊕) Identity verification by card

One month trial

\$260 Azure credit

No commitment - trial does not automatically upgrade to a paid subscription

Frequently asked questions 

- 1  [About you](#) 
- 2  [Identity verification by phone](#) 
- 3  [Identity verification by card](#) 
- 4  [Agreement](#)

[Sign up !\[\]\(eaac180de418db4eae4b4cefebda75e8_img.jpg\)](#)

One month trial

\$200 Azure credit

No commitment – trial does not automatically upgrade to a paid subscription

Frequently asked questions ▾

1 Identity verification by phone

2 Identity verification by card

Please enter valid credit card information so we can verify your identity. You will not be charged unless you explicitly transition to a paid offer.

Payment method

New Credit/Debit Card

Your card will not be charged, though you might see a temporary authorization hold.



* Card number

* Expiration date

MM	YY
08	19

* Name on card

* Address line 1

Address line 2
(Optional)

* City

* State

- 97251 -

Next

3 Agreement

1 Identity verification by card

We ask for your credit card number to verify your identity and to keep out spam and bots.
You won't be charged unless you upgrade.

We found this payment method associated with your account:

Add a new payment method

Next

2 Agreement

1 Identity verification by card



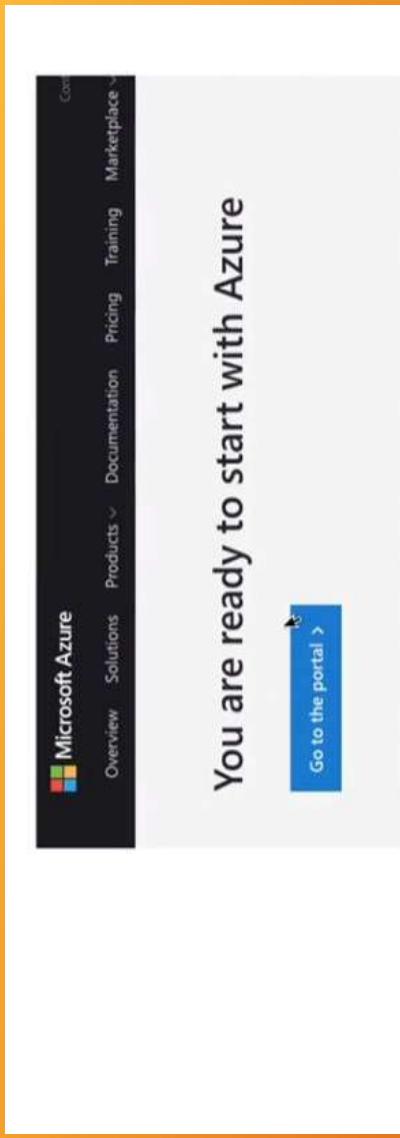
2 Agreement



- I agree to the [subscription agreement](#), [offer details](#), and [privacy statement](#).
- I would like information, tips, and offers from Microsoft or selected partners about Azure, including Azure Newsletter, Pricing updates, and other Microsoft products and services.

[Sign up](#)





You are ready to start with Azure

[Go to the portal >](#)

Join the demo to see Azure in action

Learn how to use the portal to create and manage resources and get your questions answered by Azure technical experts during a live Q&A. This demo covers:

- Building a virtual machine.
- Creating a web app.
- Deploying a SQL database.
- Customising your DevOps dashboard.

Microsoft Azure

Dashboard

Create a resource

Home

Quickstart Center

Get started

All services

Resources

Virtual machines

Load balancers

Storage accounts

Virtual networks

Active Directory

Monitor

Advisor

Security Center

Cost Management + Billing

Home > Quickstart Center

Get started Take an online course

Setup guides

Do guides walk you through deployment scenarios to help you set up, manage, and secure your Azure environments.

Azure migration guide

Welcome to Microsoft Azure

Let's show you around before you get started.

Start tour

Multiple items

Azure setup guide

Step-by-step guidance to plan, set up, and secure Azure applications.

Open

Start a project

Choose from the popular services below to create your first resources and launch your project. (Information: View All Services)

Set up a database

Explore options for managing relational or non-relational databases in the cloud.

Start tour

Deploy a virtual machine

Run your workloads in the cloud and reduce the redundancy and maintenance of physical hardware.

Start tour

Create a web app

Build and deploy web apps that can scale.

Start tour

Store, back up, or archive data

Protect data, eliminate file share redundancy.

Start tour

Start a data analytics project

Run machine learning and analytical workloads.

Start tour

Azure services



Recent resources

Name	Type	Last Viewed
Pay-As-You-Go	Subscription	2 weeks ago

Navigate



REGIONS AND AVAILABILITY ZONES

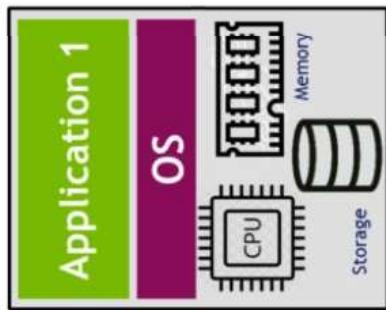




⌚ High latency



Standard Server

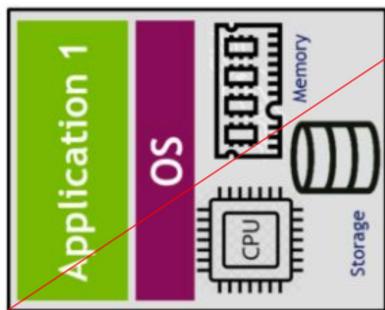


China Region

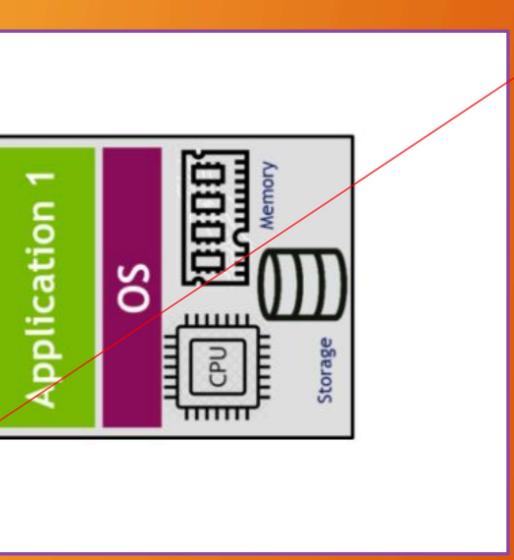
low availability



Standard Server



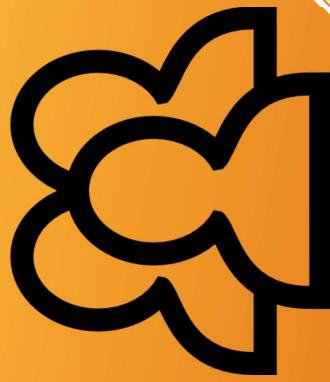
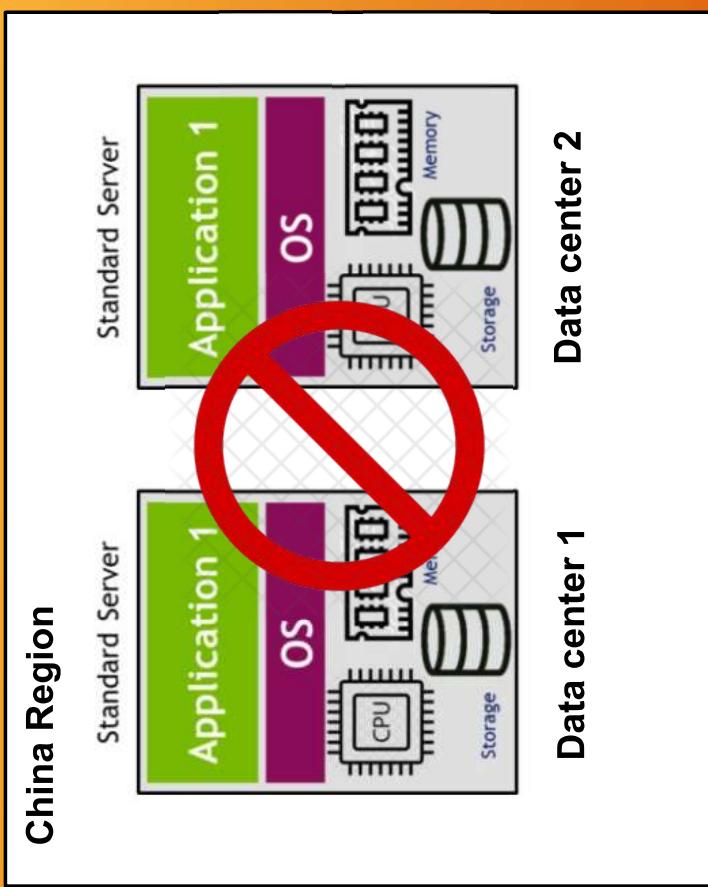
China Region



Multiple data centers



Multiple data centers

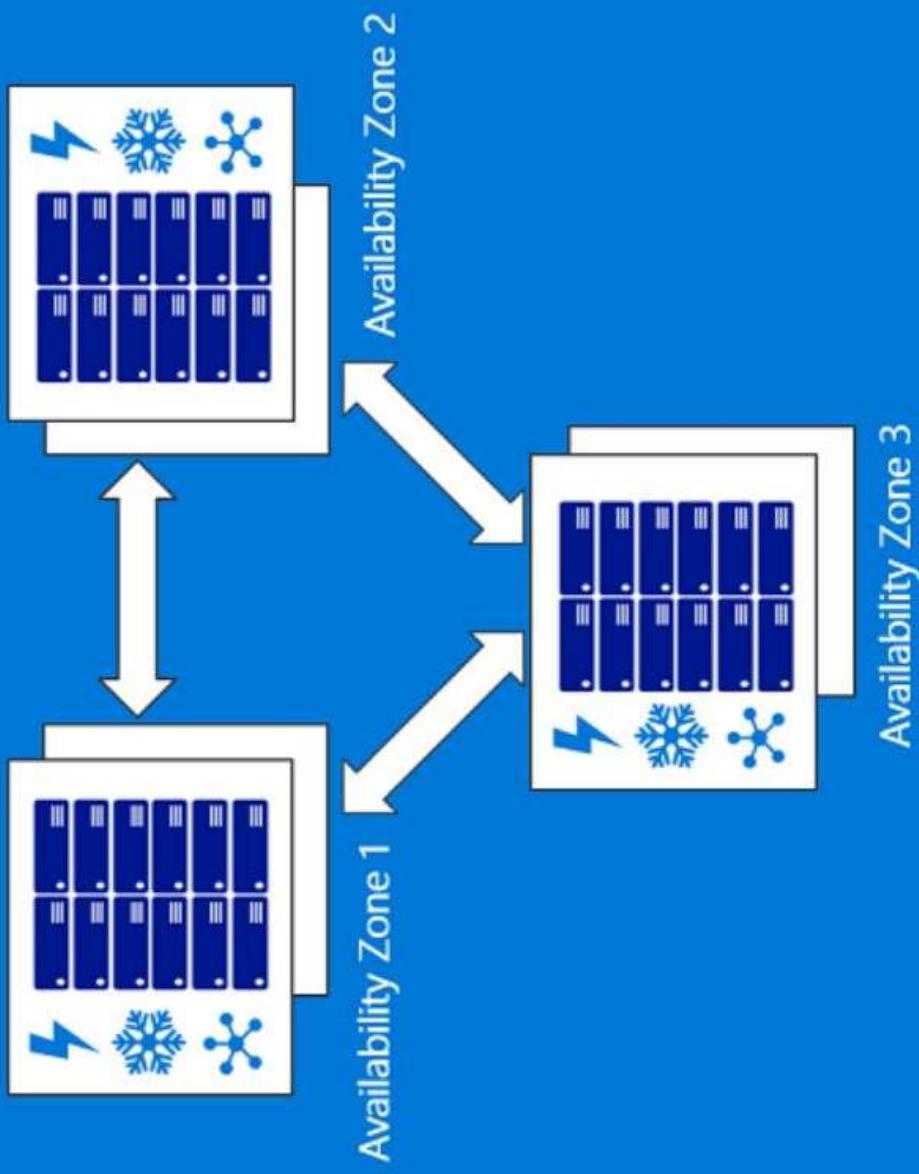


Multiple Regions





Azure Region



New Regions and AZs are constantly added

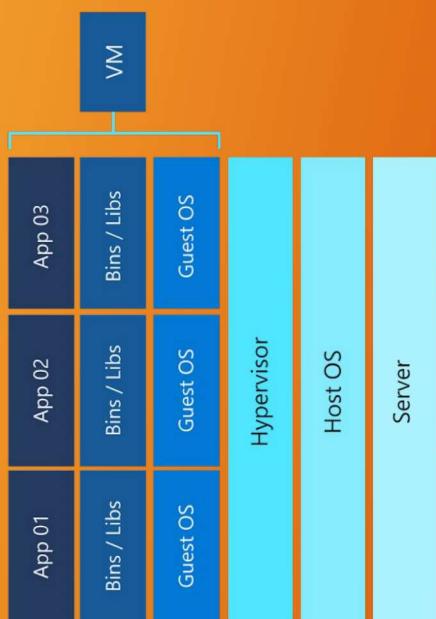
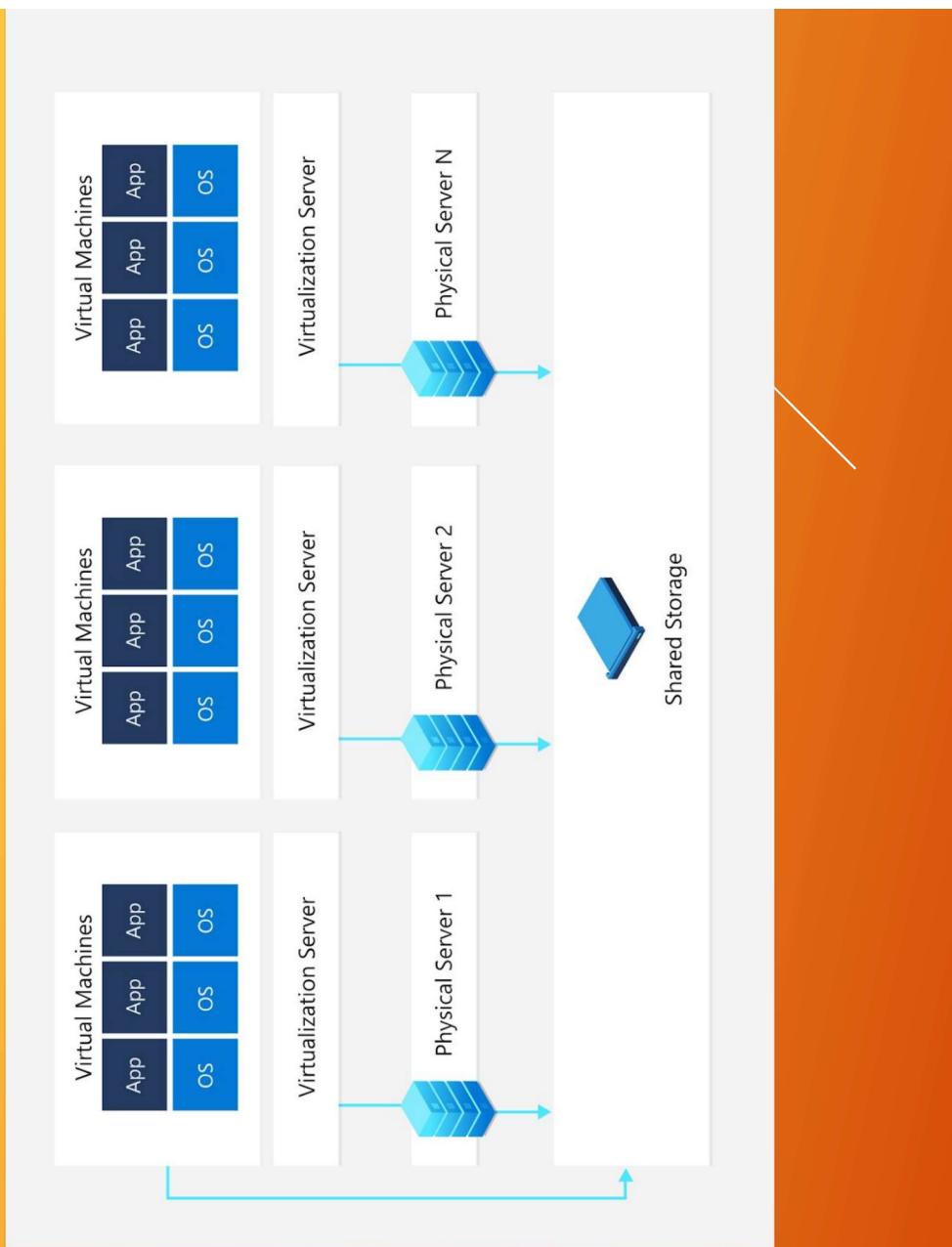
Region	Availability Zones
(US) East US	3
(Europe) West Europe	3
(Asia Pacific) Southeast Asia	3
(South America) Brazil South	3
(US) West Central US	0



VIRTUAL MACHINES

- A virtual machine, commonly shortened to just VM, is no different than any other physical computer like a laptop, smart phone or server.
- It has a CPU, memory, disks to store your files and can connect to the internet if needed.
- While the parts that make up your computer (called hardware) are physical and tangible, VMs are often thought of as virtual computers or software-defined computers within physical servers, existing only as code.





WHAT ARE VMS USED FOR?

- ▶ Building and deploying apps to the cloud.
- ▶ Trying out a new operating system (OS), including beta releases.
- ▶ Spinning up a new environment to make it simpler and quicker for developers to run dev-test scenarios.
- ▶ Backing up your existing OS.
- ▶ Accessing virus-infected data or running an old application by installing an older OS.
- ▶ Running software or apps on operating systems that they were not originally intended for.

AZURE VIRTUAL MACHINES -

FEATURES

- ▶ Create and manage lifecycle of Virtual Machine (VM) instances.
- ▶ Load balancing and auto scaling for multiple VM instances.
- ▶ Attach storage to your VM instances.
- ▶ Manage network connectivity and configuration for your VM instances

AZURE VIRTUAL MACHINES - KEY CONCEPTS

Feature	Explanation
Image	Choose Operating System and Software
VM Family	Choose the right family of hardware (General purpose or Compute/Storage/Memory optimized or GPU or HPC)
VM Size (B1s, B2s, ...)	Choose the right quantity of hardware (2 vCPUs, 4GB of memory)
Disks	Attach Virtual Disks to VMs (Block Storage)





AVAILABILITY

High availability (HA) is the ability of a system to operate continuously without failing for a designated period of time.

AVAILABILITY TABLE

Availability	Downtime (in a month)	Comment
99.95%	22 minutes	
99.99% (four 9's)	4 and 1/2 minutes	Most online apps aim for 99.99% (four 9's)
99.999% (five 9's)	26 seconds	Achieving 5 9's availability is tough



Increasing Availability for Azure VMs

Single Instance VM:

- Premium SSD or Ultra Disk: 99.9%
- Standard SSD Managed Disks: 99.5%
- Standard HDD Managed Disks: 95%



- An availability set is a logical grouping of VMs that allows Azure to understand how your application is built to provide for redundancy and availability.
- Two or more instances in **same Availability Set**: 99.95% Availability set is a logical grouping of VMs
- Fault domains: Group of VMs sharing a common power source and network switch
- Update domains: Group of VMs that are rebooted (updated) at the same time

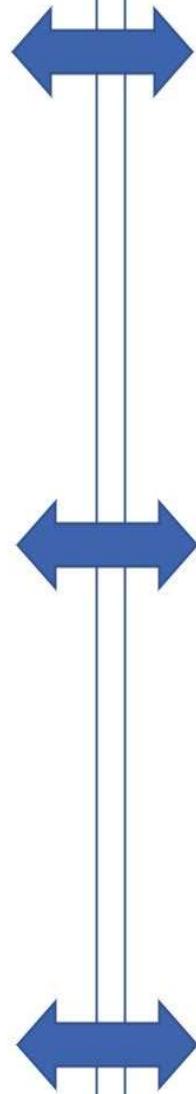
Region

Availability Set

Compute Cluster

Virtual Machine
(Fault domain 1)

Virtual Machine
(Fault domain 2)

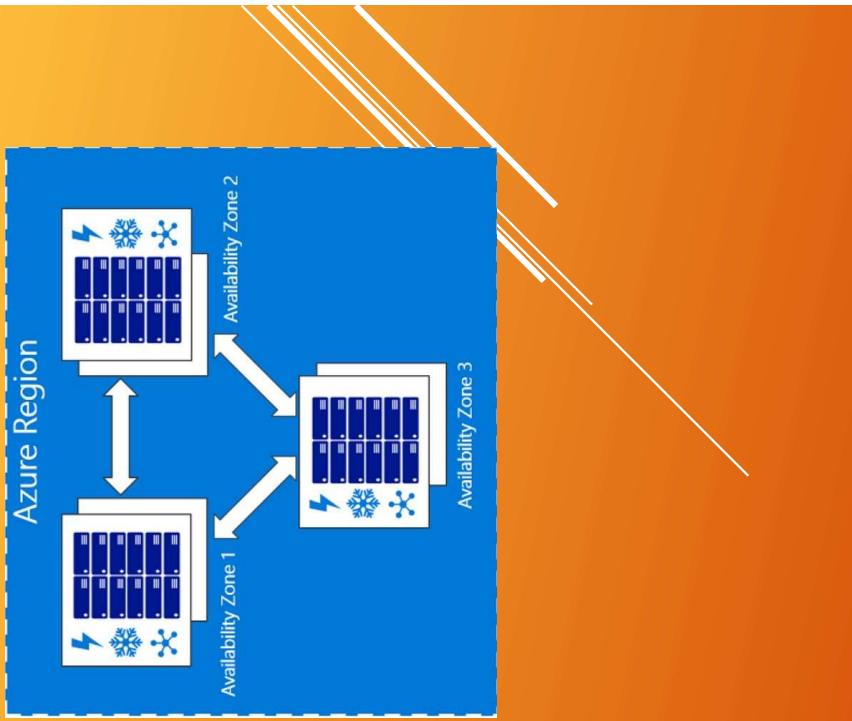


Managed Disk
(Fault domain 1)

Managed Disk
(Fault domain 2)

Storage Cluster

Two or more instances in two
or more Availability Zones in the
same Azure region: 99.99%



Azure Virtual Machines - More Features



Feature	Explanation
Static IP Address	Assign a fixed IP address to your VM Public IP addresses are charged per IP per hour
Azure Monitoring	Monitoring for your Azure VMs
Dedicated Hosts	Physical servers dedicated to one customer
Create cheaper, temporary instances for non critical workloads	Azure Spot instances
Reserve compute instances ahead of time	Reserved VM Instances (1 or 3 years)

virtual machine scale sets

- Azure virtual machine scale sets let you create and manage a group of load balanced VMs.
- The number of VM instances can automatically increase or decrease in response to demand or a defined schedule.
- Scale sets provide high availability to your applications, and allow you to centrally manage, configure, and update a large number of VMs.
- With virtual machine scale sets, you can build large-scale services for areas such as compute, big data, and container workloads.

Designing Good Solutions with VMs



Terminology

Description

Availability Are the applications available **when your users need them?**

Availability Sets and Scale Sets

Scalability Can we handle a **growth in users, traffic, or data size** without any drop in performance?

VM Size, Scale Sets and Load Balancers

Resilience Ability of system to provide acceptable behavior even when one or more parts of the system fail

Scale Sets and Load Balancers

Geo-distribution Distribute applications across regions and zones

Scale Sets and Load Balancers

Disaster Recovery

Description

How to keep your systems running in face of disasters?

Site Recovery

Managing Costs

Description

You want to keep costs low

Auto Scaling (Elasticity), Reservations, Spot Instances

Security

Description

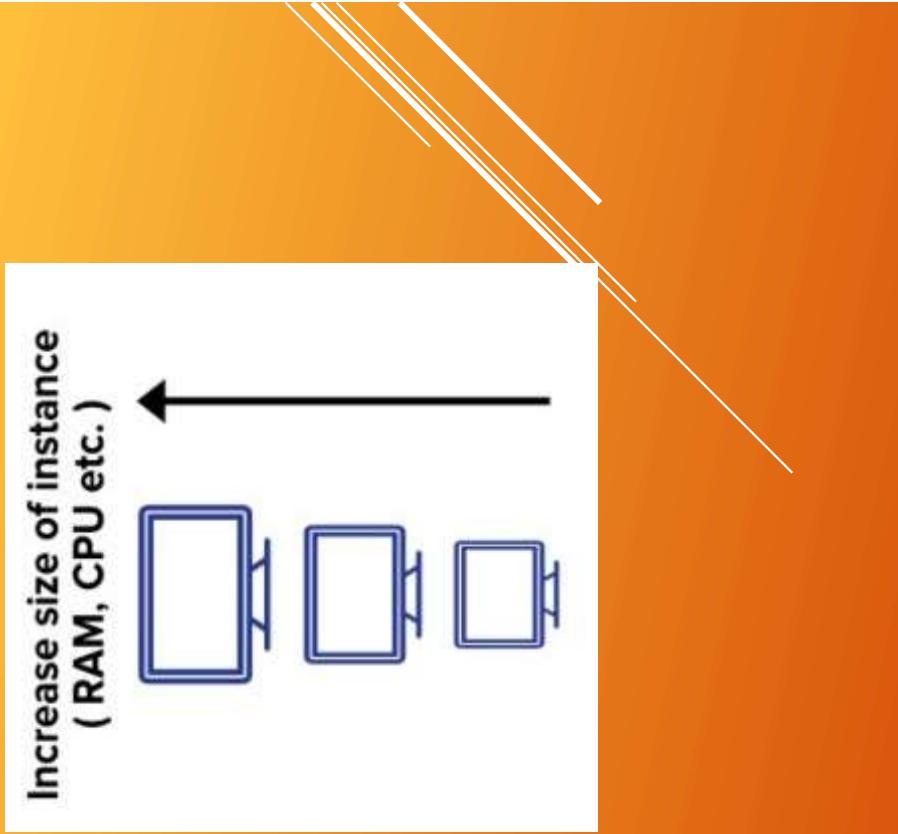
Secure your VMs

Dedicated Hosts, (More to come...)

Azure VMs

Vertical Scaling

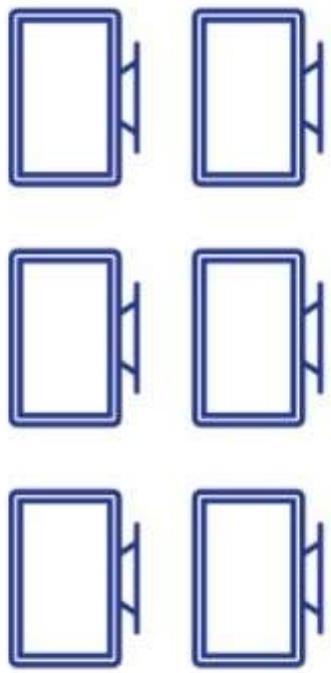
Vertical scaling, also known as scale up and scale down, means increasing or decreasing virtual machine (VM) sizes in response to a workload.



Horizontal Scaling

Autoscale only scales horizontally, which is an increase ("out") or decrease ("in") in the number of VM instances. Horizontal is more flexible in a cloud situation as it allows you to run potentially thousands of VMs to handle load.

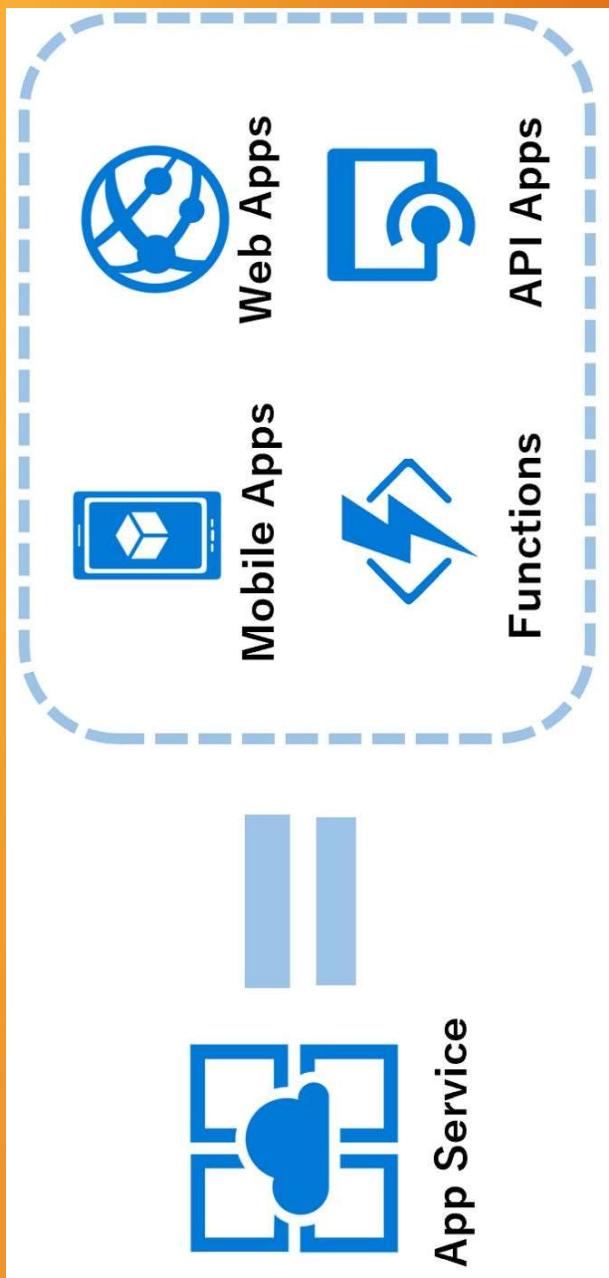
(Add more instances)



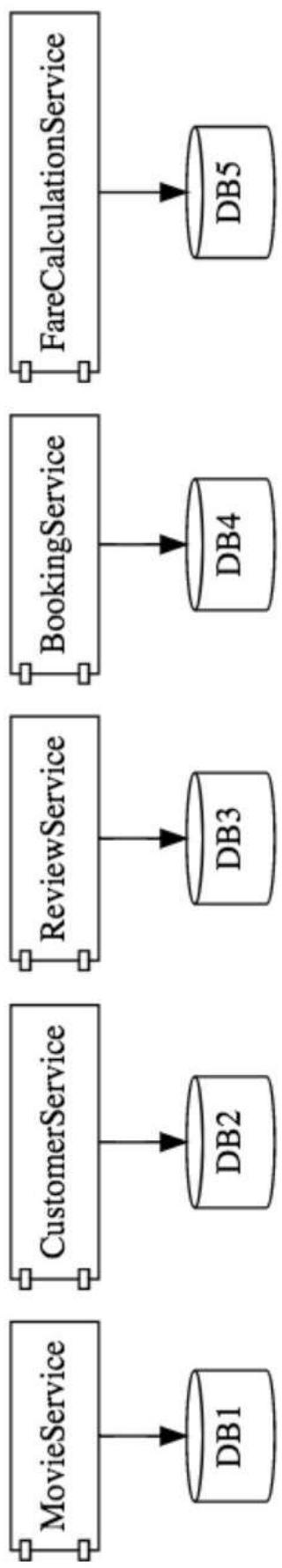
Azure Virtual Machines - Scenarios

Scenario	Solution
How can you automatically scale up and scale down VMs?	VM Scale Sets
How can you protect VMs from datacenter failures?	Deploy them to multiple AZs (Scale Sets)
How much availability do you get by deploying two or more VM instances in two or more AZs in same region?	99.99%
How can you perform disaster recovery for your VMs?	Site Recovery
How can you reduce costs for your VMs?	AutoScaling(Elasticity), Reserved & Spot Instances, Right Region - Cost varies from region to region
Will you be billed if you stop a VM?	Yes. For Storage.
Will two VMs of same size always cost the same?	No. Price changes with time. Price also is different in different regions.
How can you know who performed a specific action on a VM?	Activity Logs (kept for 90 days)

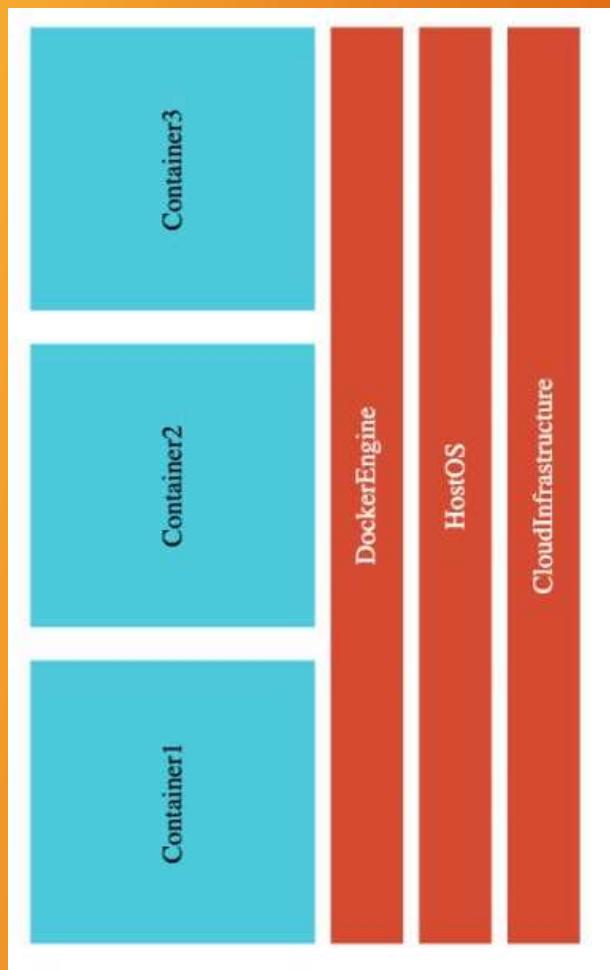
Azure App Service



Microservices



Containers - Docker



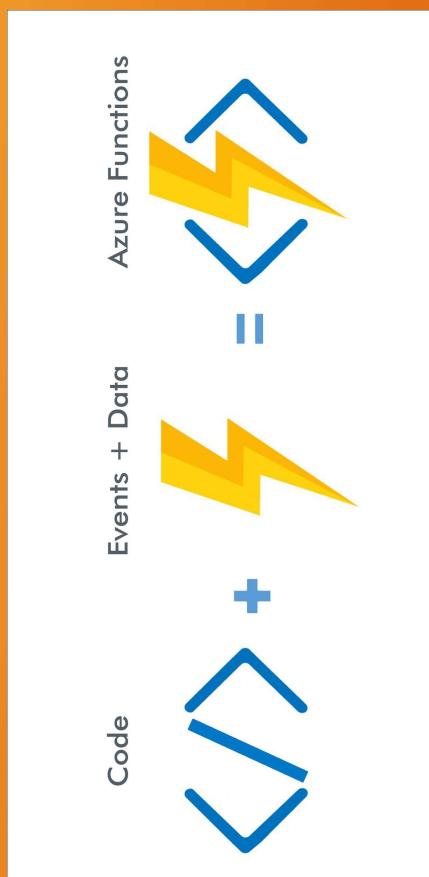
Azure Container Instances



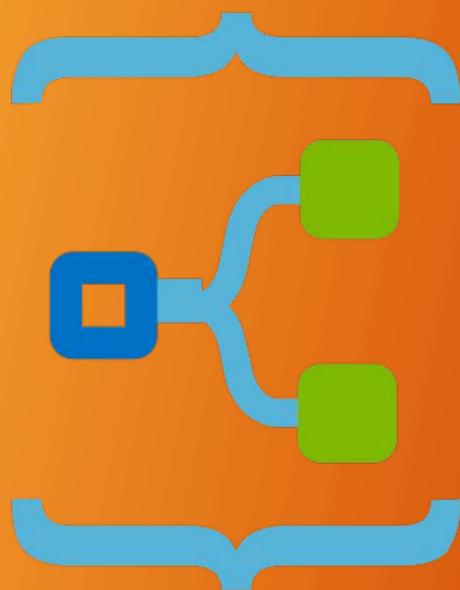
SERVERLESS



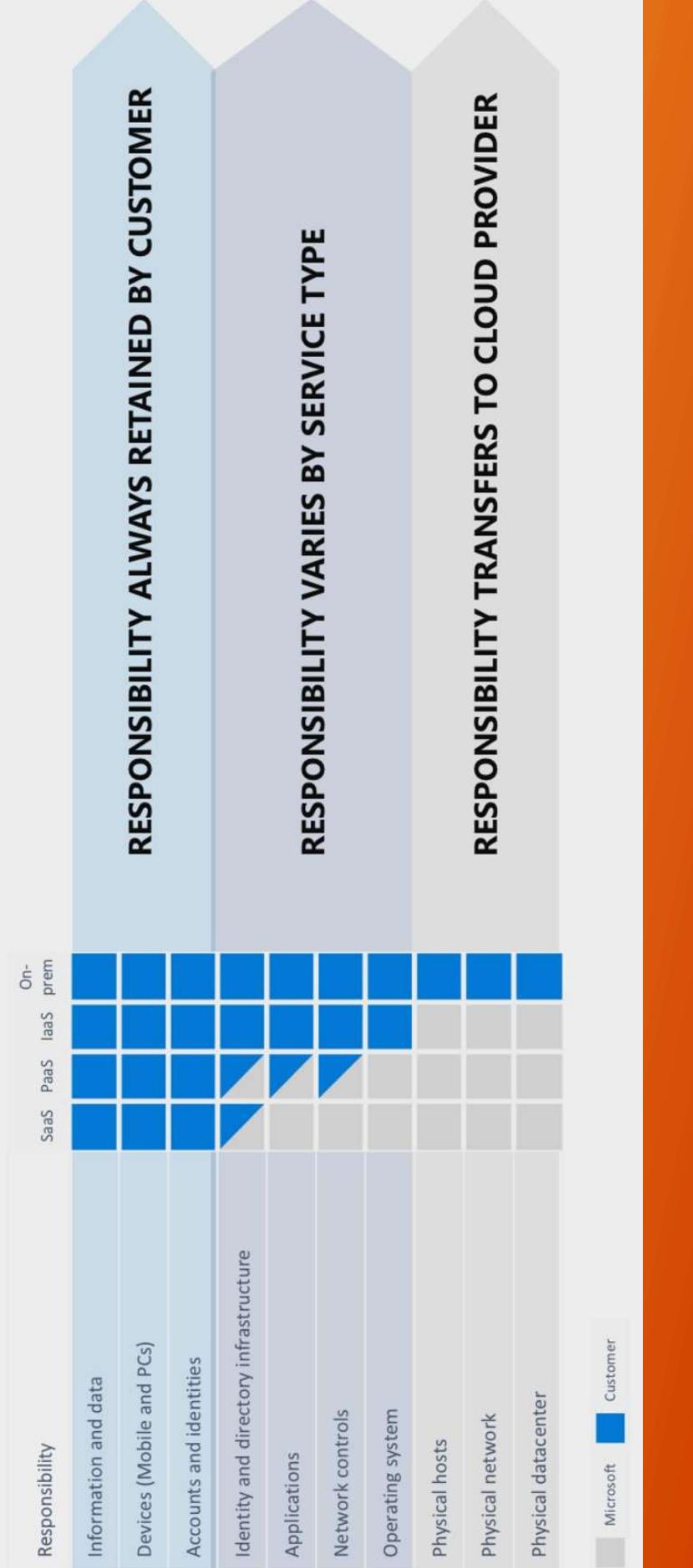
AZURE FUNCTIONS



LOGIC APPS



Shared Responsibility model



Azure Cloud Service Categories - Scenarios



Scenario	Solution
IaaS or PaaS or SaaS: Deploy Custom Application in Virtual Machines	IaaS
IaaS or PaaS or SaaS: Using Gmail	SaaS
IaaS or PaaS or SaaS: Using Azure App Service to deploy your app	PaaS
True or False: Customer is responsible for OS updates when using PaaS	False
True or False: Customer is responsible for Availability when using PaaS	False
True or False: In PaaS, customer has access to VM instances	False
True or False: In PaaS, customer can customize OS and install custom software	False
True or False: In PaaS, customer can configure auto scaling needs	True
True or False: In PaaS, customer can configure hardware needs (memory, cpu etc)	True
True or False: PaaS services only offer Compute services	False

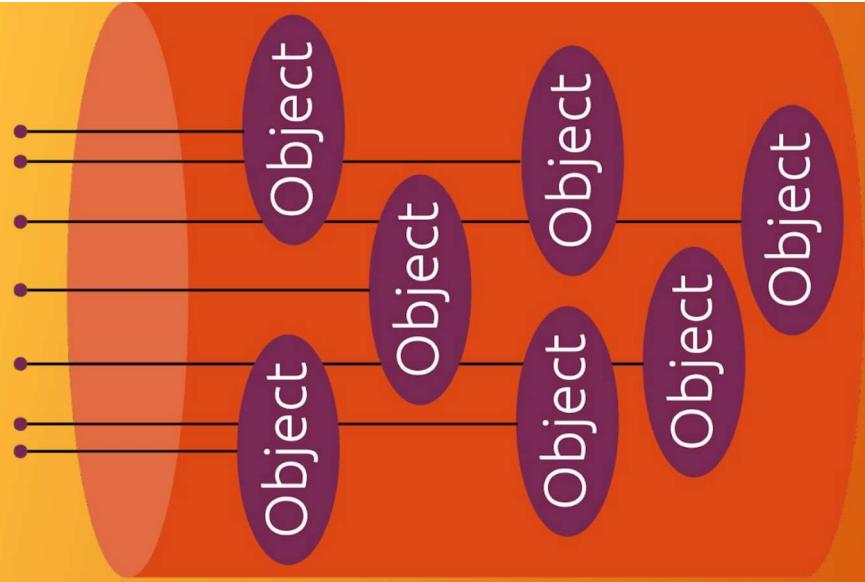
Review - Azure Services for Compute



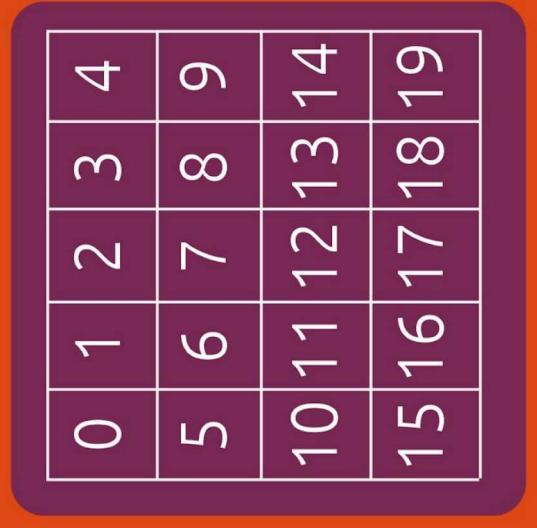
Azure Service Name	Description
Azure VMs	Windows or Linux VMs (IaaS) Use VMs when you need control over OS OR you want to run custom software You handle Availability, Scalability, Load Balancing, Software/OS Updates ...
Azure App Service	PaaS. Deploy web apps, mobile back ends and RESTful APIs quickly. Built-in Auto Scaling, Load Balancing
Azure Container Instances	PaaS (CaaS). Run isolated containers, without orchestration. You DO NOT need to provision and manage VMs. Start containers in seconds.
Azure Kubernetes Service	PaaS (CaaS). Managed Kubernetes Service. Provides container orchestration.
Azure Service Fabric	PaaS (CaaS). Microsoft's container orchestrator. Package, deploy, and manage scalable and reliable microservices Run anywhere - on premises and in the cloud
Azure Functions	Serverless (FaaS) compute for event-driven apps

STORAGE TYPES

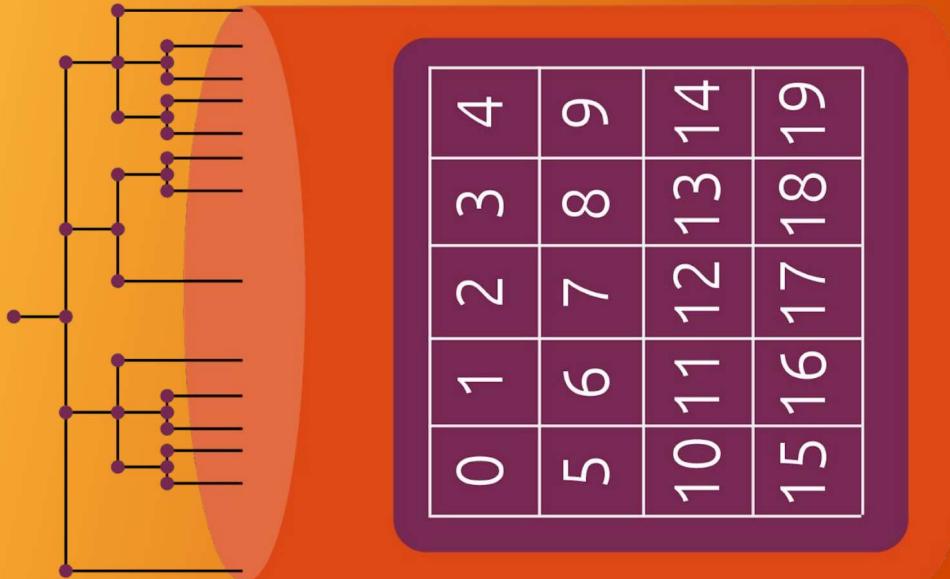
Object Storage



Block Storage



File Storage



Object

Program (API)

\$



Internet

Images, PDFs, Video



File

User

\$\$ - \$\$\$\$



LAN / 10Gb

Sharing user data,
web content

Block

Operating System

\$\$\$\$\$

Dedicated Network
Fibre Channel / 10Gb

OS, Database



► Interface ---

► Cost ---

► Performance ---

► Proximity ---

► Use Case ---

► Scale ---

AZURE STORAGE



General-Purpose Storage Account



Blob
Table
Queue
File

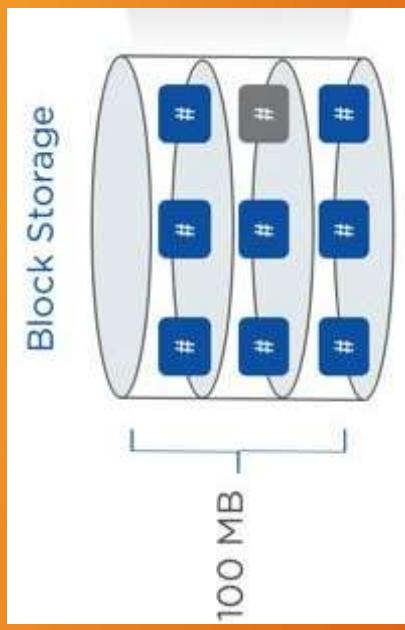
Storage Types

Azure Storage - Data Redundancy

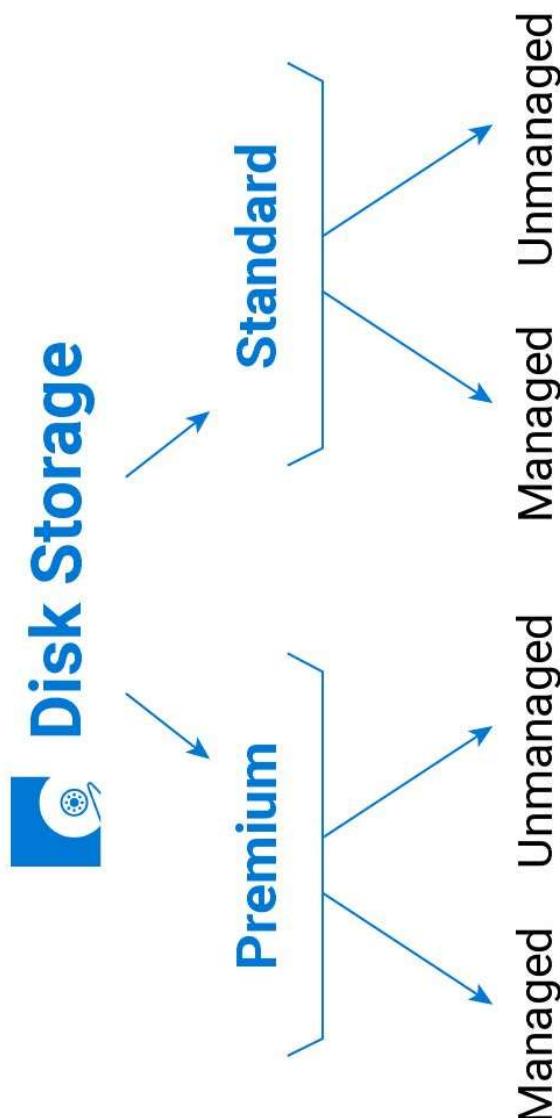
Option	Redundancy	Discussion
Locally redundant storage (LRS)	Three synchronous copies in same data center	Least expensive and least availability
Zone-redundant storage (ZRS)	Three synchronous copies in three AZs in the primary region	
Geo-redundant storage (GRS)	LRS + Asynchronous copy to secondary region (three more copies using LRS)	
Geo-zone-redundant storage (GZRS)	ZRS + Asynchronous copy to secondary region (three more copies using LRS)	Most expensive and highest availability



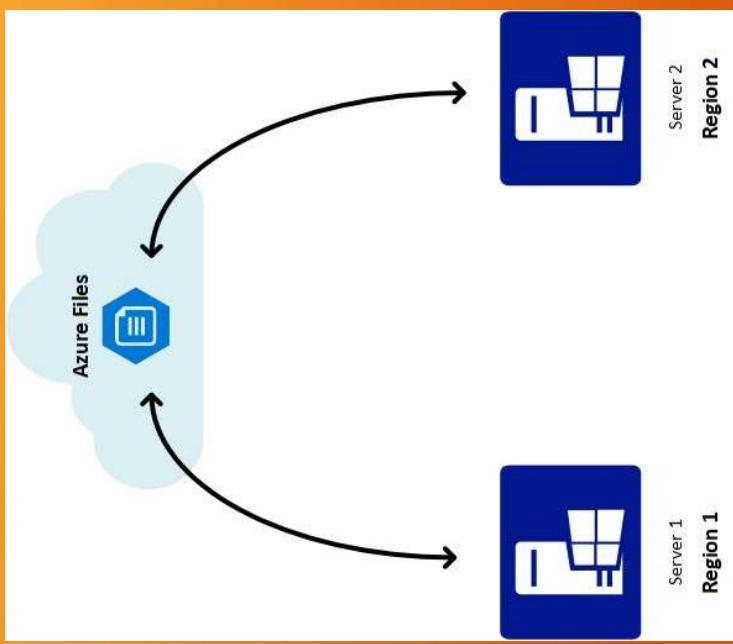
Block Storage



AZURE DISKS STORAGE



AZURE FILES



AZURE BLOB STORAGE



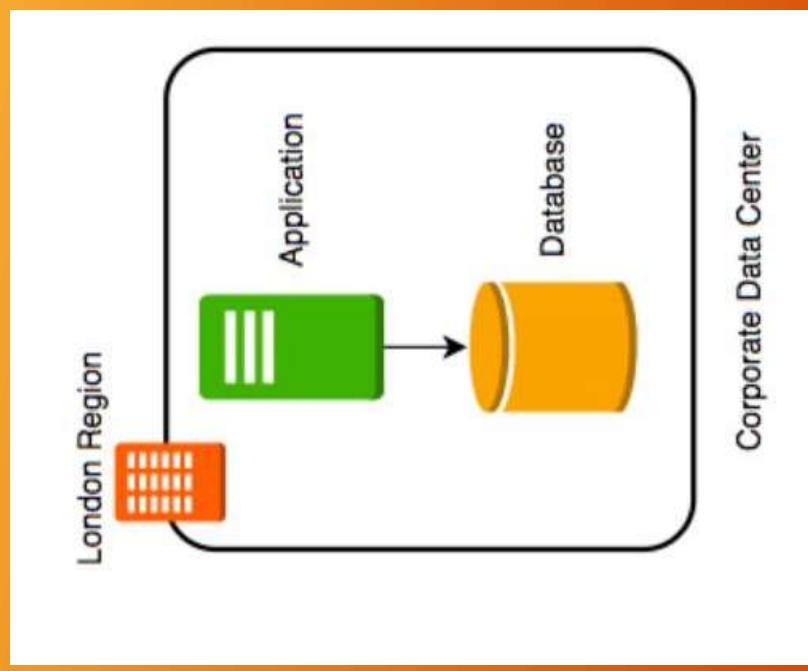
10/01

DATABASE FUNDAMENTALS

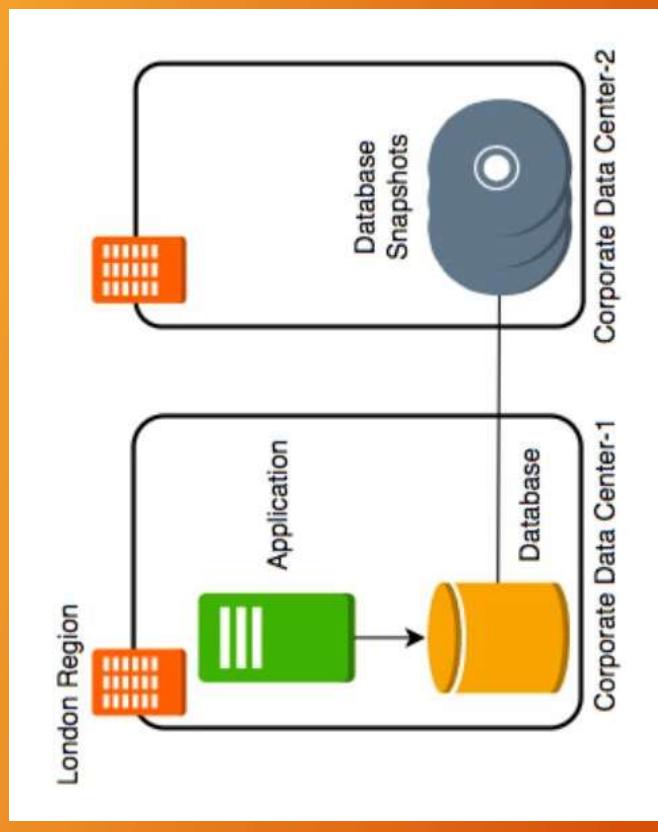
DATABASES PRIMER

- ▶ Availability
- ▶ Durability
- ▶ RTO
- ▶ RPO
- ▶ Consistency
- ▶ Transactions etc

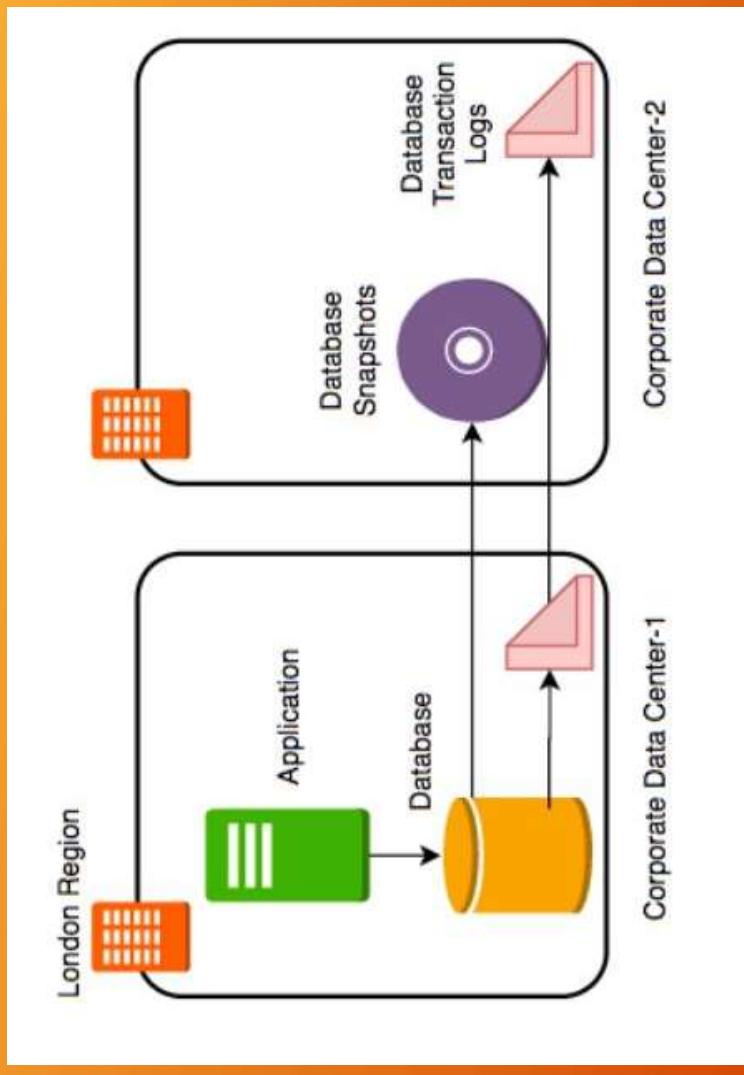
Database - Getting Started



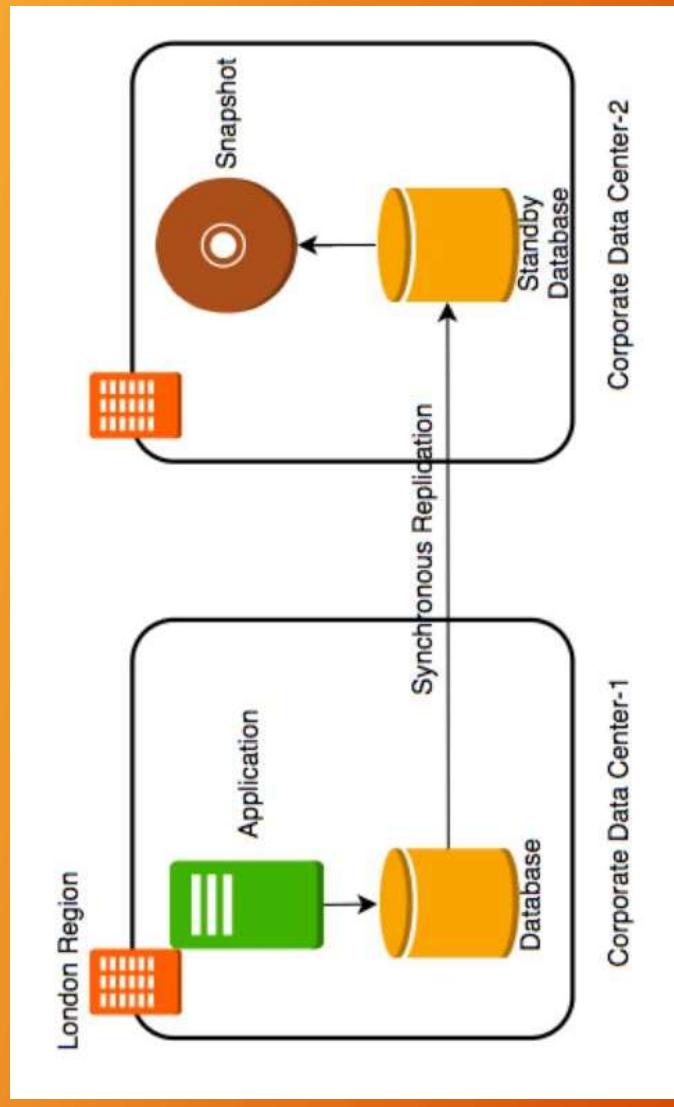
Database - Snapshots



Database - Transaction Logs



Database – Add a Standby



Availability

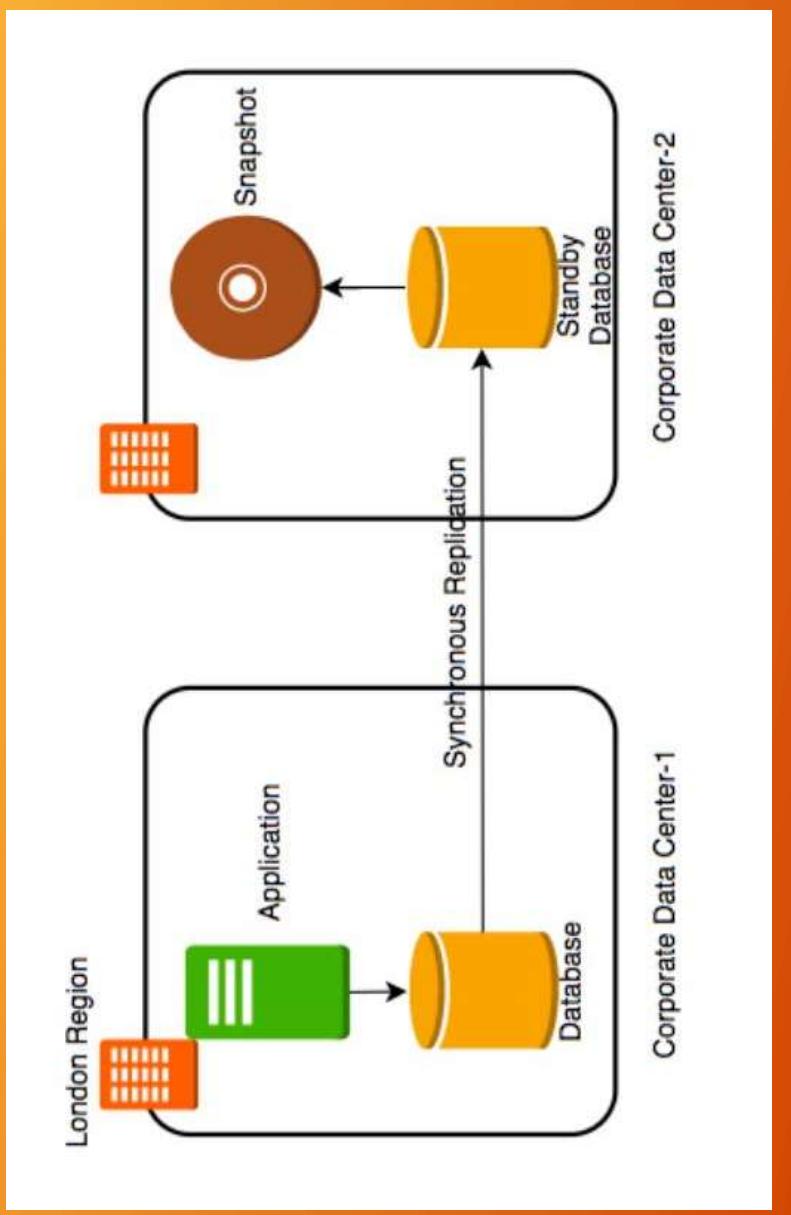
Availability

Downtime (in a month)

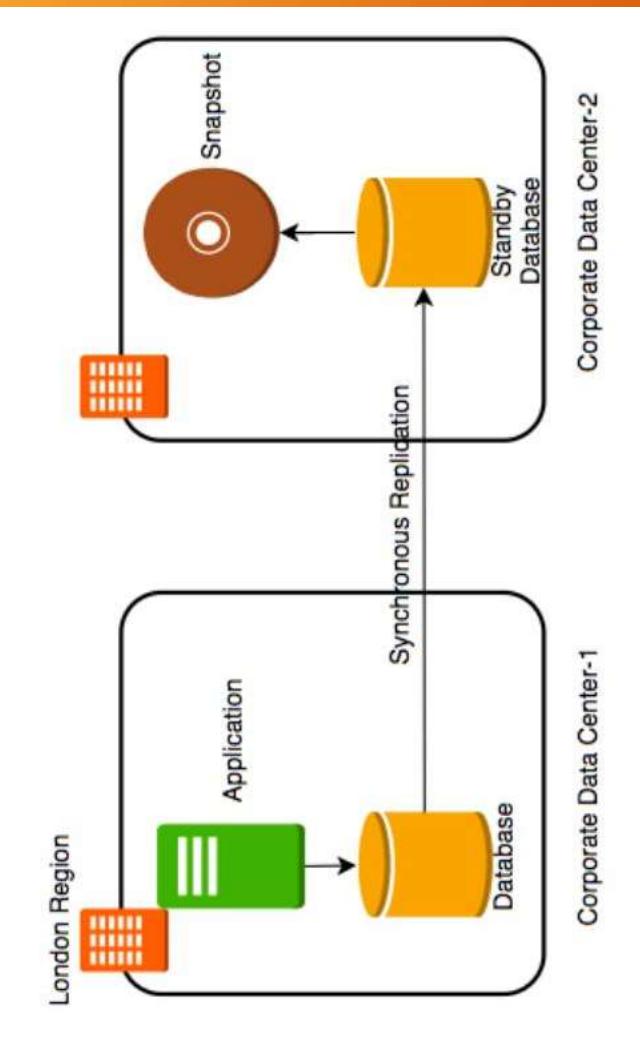
Availability	Downtime (in a month)	Comment
99.95%	22 minutes	
99.99% (4 9's)	4 and 1/2 minutes	Typically online apps aim for 99.99% (4 9's) availability
99.999% (5 9's)	26 seconds	Achieving 5 9's availability is tough

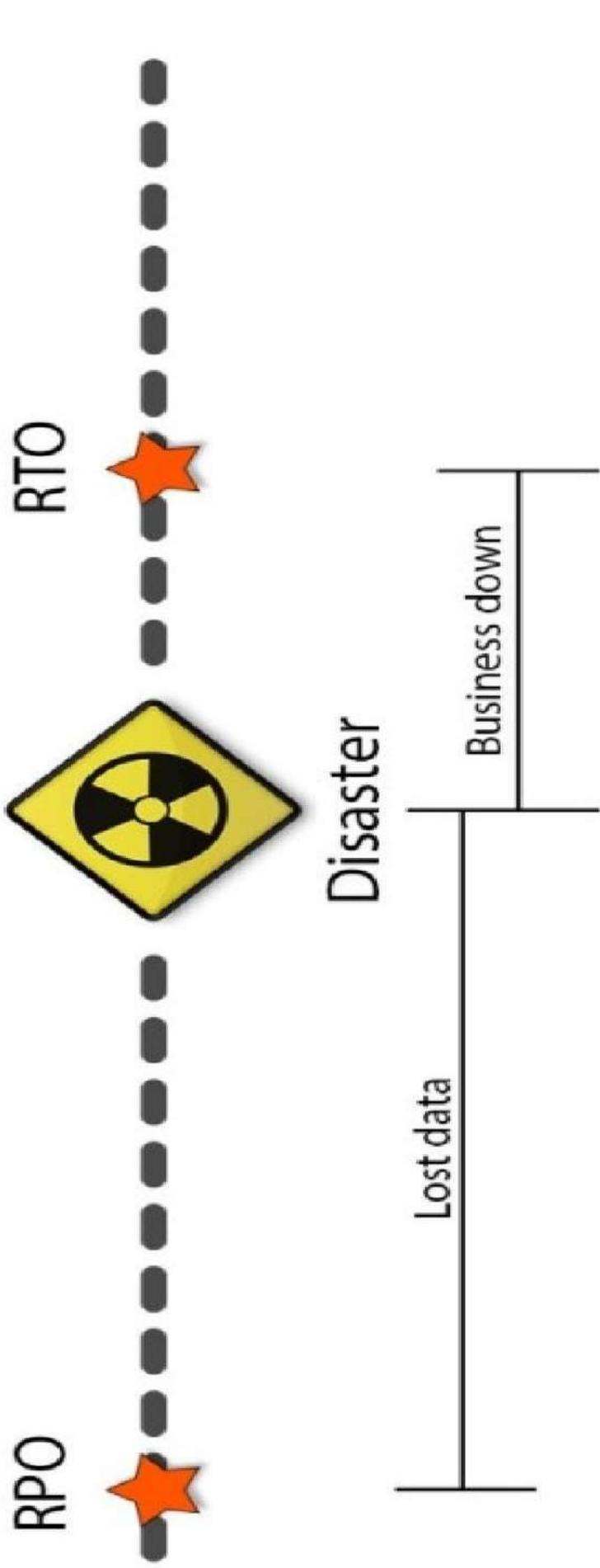


Durability



Increasing Availability and Durability of Databases





Question - RTO and RPO

You are running an application in VM instance storing its data on a persistent data storage. You are taking snapshots every 48 hours. If the VM instance crashes, you can manually bring it back up in 45 minutes from the snapshot. What is your RTO and RPO?

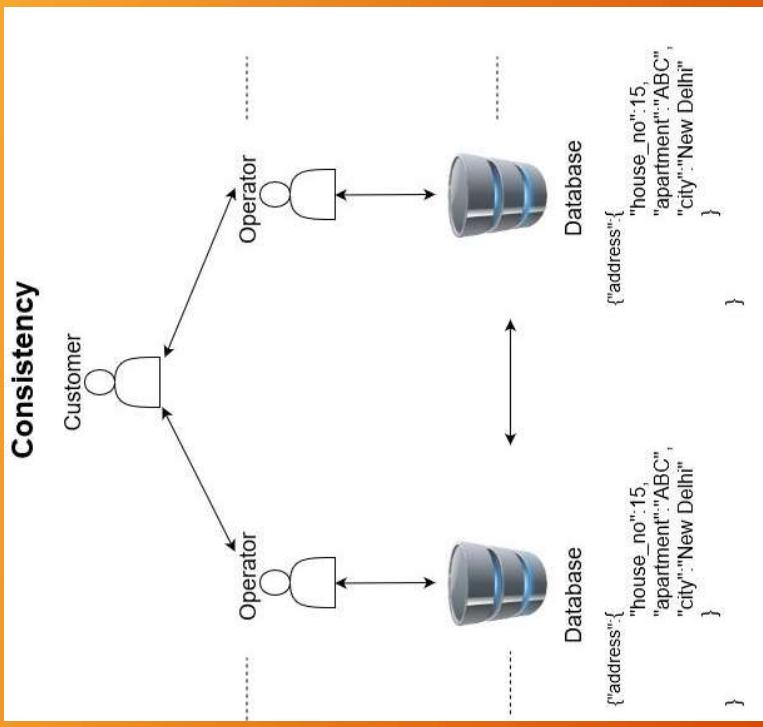
RTO - 45 minutes

RPO - 48 hours

Achieving RTO and RPO - Failover Examples

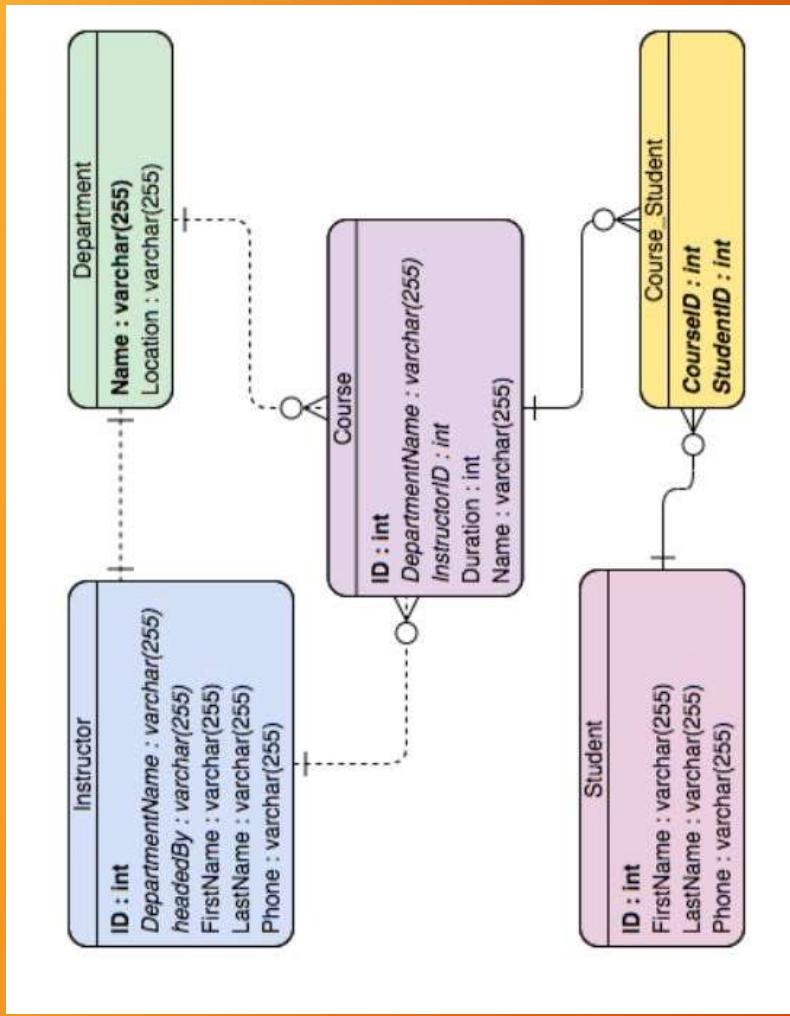
Scenario	Solution
Very small data loss (RPO - 1 minute) Very small downtime (RTO - 5 minutes)	Hot standby - Automatically synchronize data Have a standby ready to pick up load Use automatic failover from master to standby
Very small data loss (RPO - 1 minute) BUT I can tolerate some downtimes (RTO - 15 minutes)	Warm standby - Automatically synchronize data Have a standby with minimum infrastructure Scale it up when a failure happens
Data is critical (RPO - 1 minute) but I can tolerate downtime of a few hours (RTO - few hours)	Create regular data snapshots and transaction logs Create database from snapshots and transactions logs when a failure happens
Data can be lost without a problem (for example: cached data)	Failover to a completely new server

Consistency



DATABASE CATEGORIES

Relational Databases



Relational Database - OLTP (Online Transaction Processing)

Recommended Azure Managed Services:

- Azure SQL Database: Managed Microsoft SQL server
- Azure Database for MySQL: Managed MySQL
- Azure Database for PostgreSQL: Managed PostgreSQL

Relational Database - OLAP (Online Analytics Processing)

Recommended Azure Managed Services:

- Azure Synapse analytics

OLAP vs OLTP



Row-based storage

Column-based storage

NOSQL DATABASES

IN-MEMORY DATABASES



Databases - Summary

Database Type	Azure Services	Description
Relational OLTP databases	Azure SQL Database, Azure Database for MySQL, Azure Database for PostgreSQL etc.	Transactional usecases needing predefined schema and very strong transactional capabilities (Row storage)
Relational OLAP databases	Azure Synapse Analytics	Columnar storage with predefined schema. Datawarehousing & BigData workloads
NoSQL Databases	Azure Cosmos DB	Apps needing quickly evolving structure (schema-less) MongoDB (document), Cassandra (key/value) and Gremlin (graph)
In memory databases/caches	Azure Cache for Redis	Applications needing microsecond responses



Databases - Scenarios

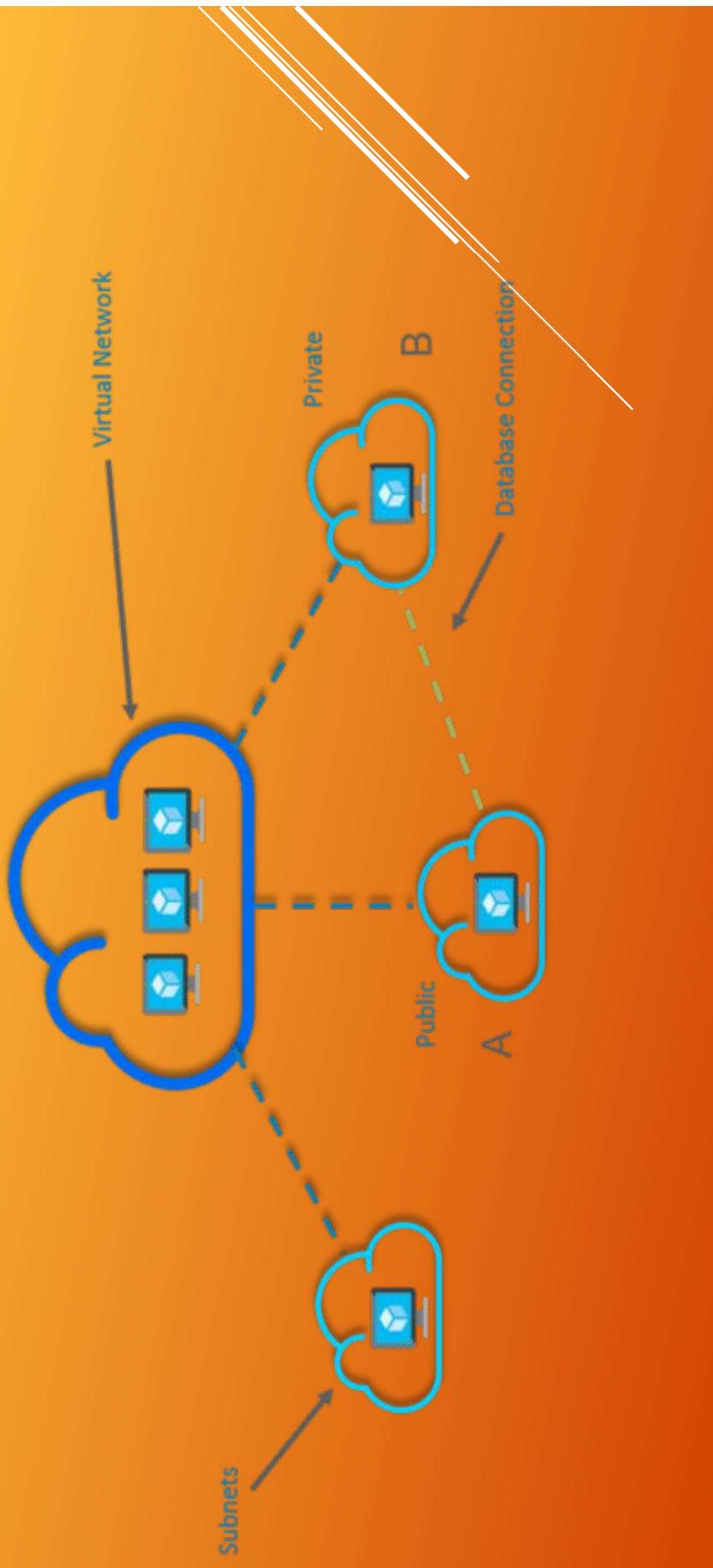
Scenario	Solution
A start up with quickly evolving schema (table structure)	Cosmos DB
Single-digit millisecond response times for global application with millions of users	Cosmos DB
Transactional local database processing thousands of transactions per second	Azure SQL Database OR Azure Database for MySQL OR Azure Database for PostgreSQL etc.
Cache data (from database) for a web application	Azure Cache for Redis
Database for analytics processing of petabytes of data	Azure Synapse Analytics

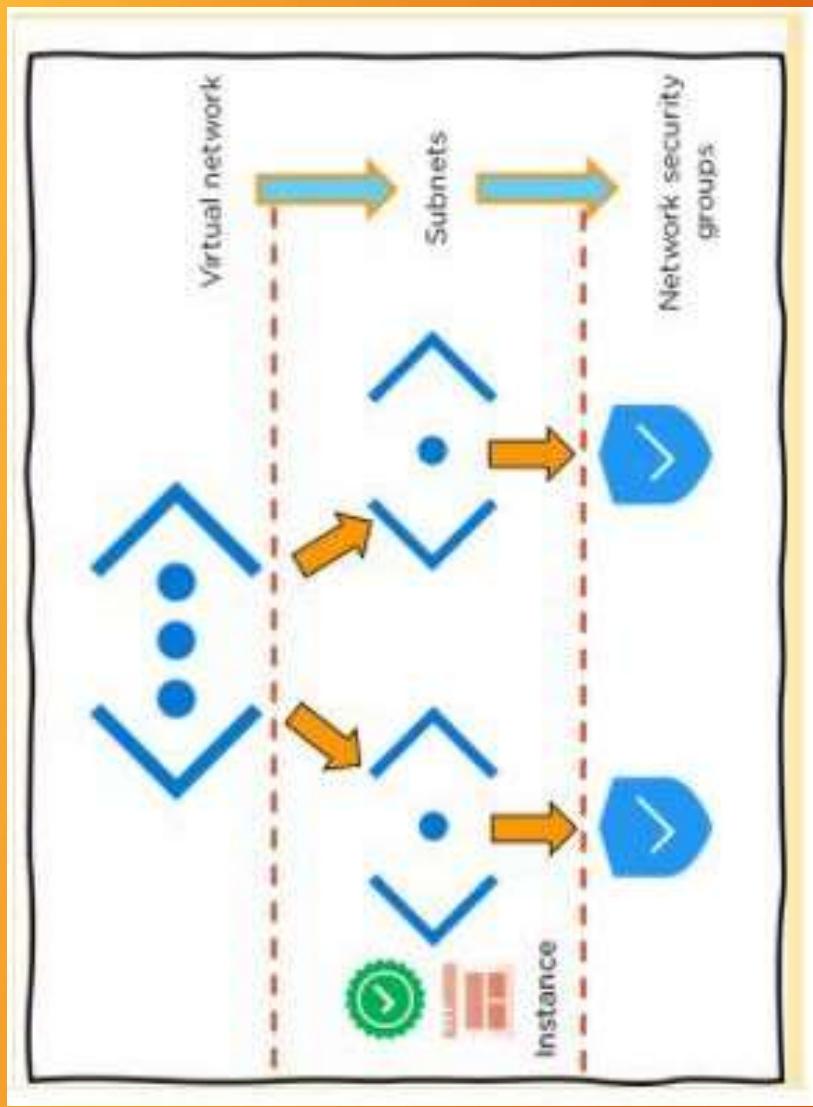


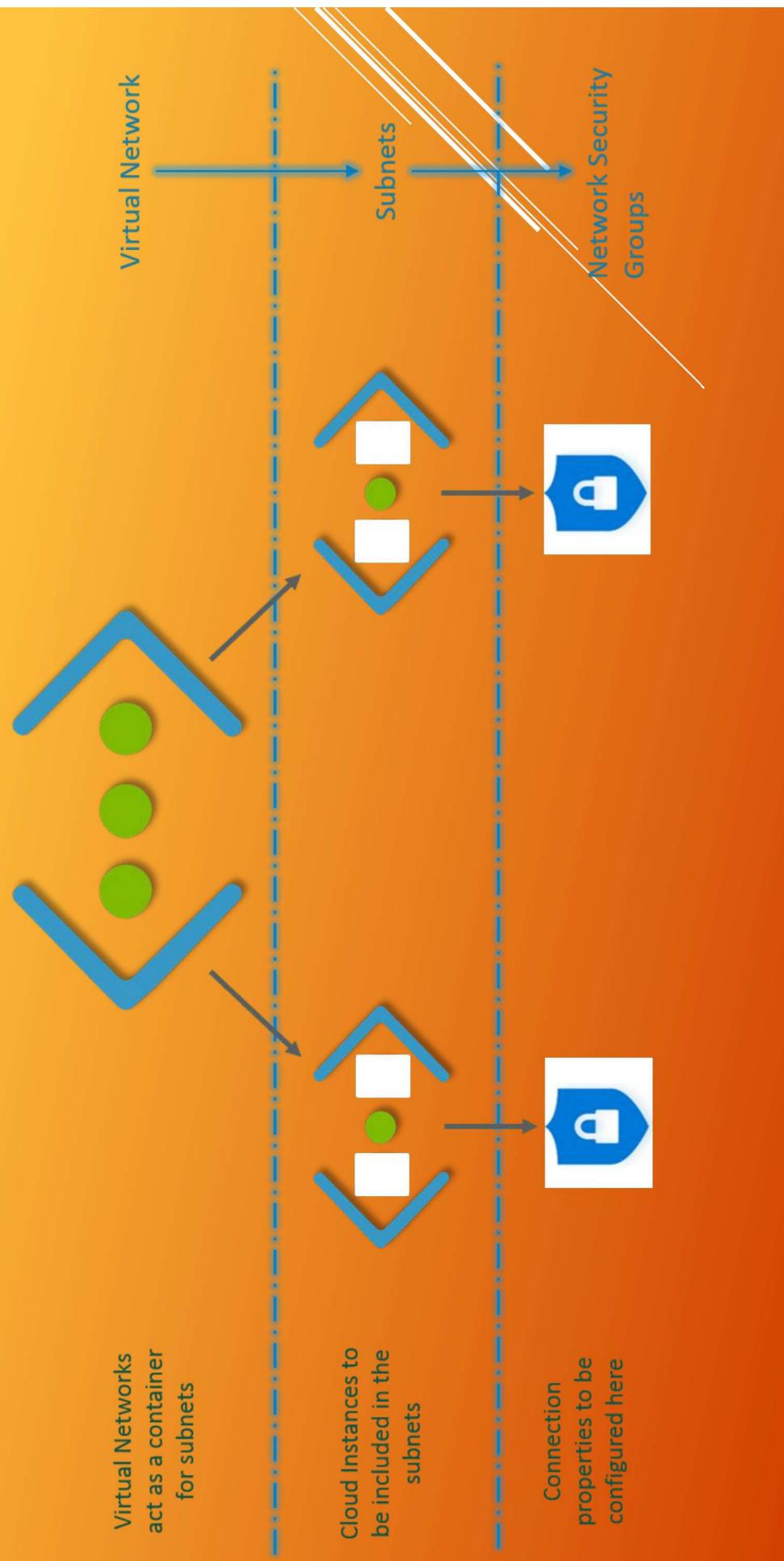
NETWORKING



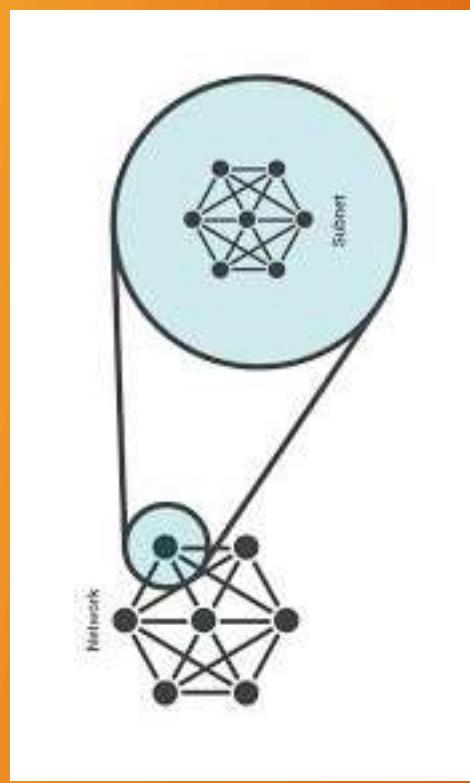
What is Virtual Network



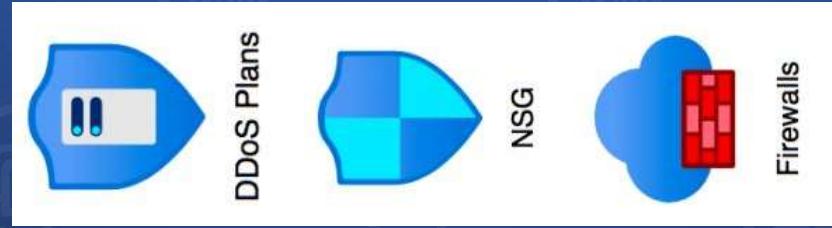




What is Subnet



Azure Network Security Groups



SECURITY BEST PRACTICE

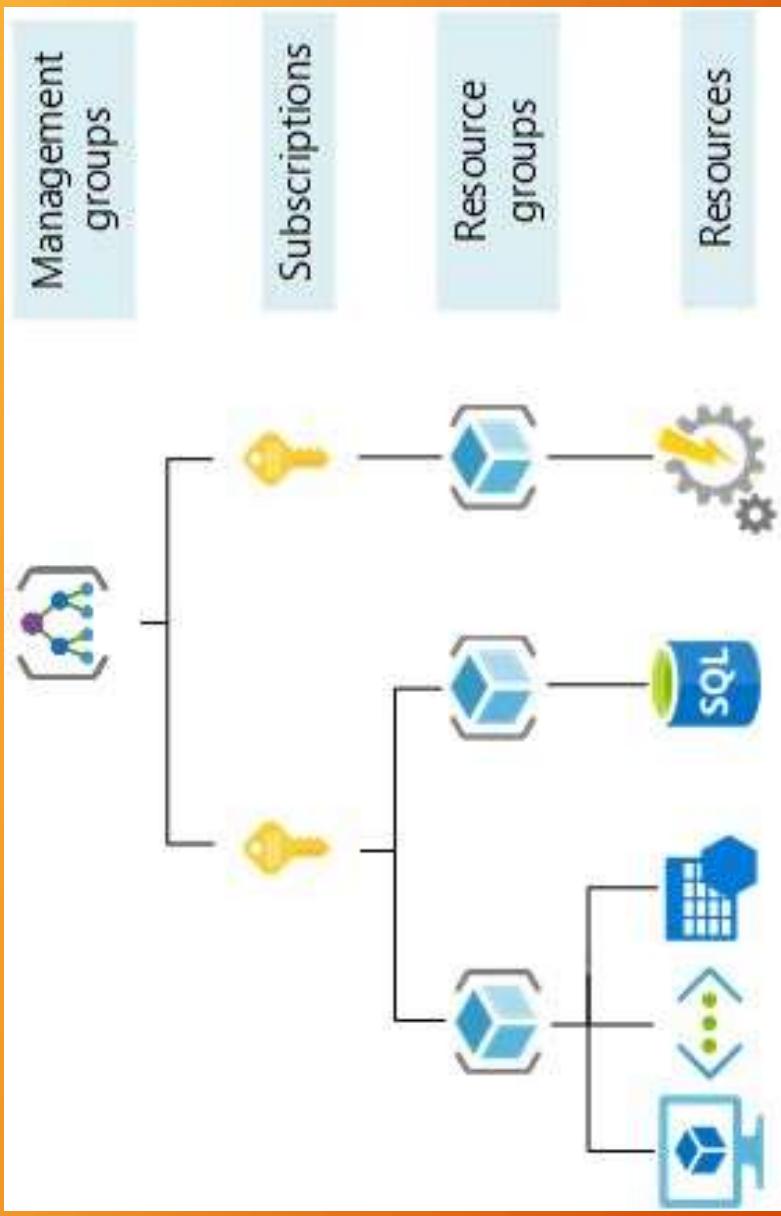


Public vs Private vs Hybrid clouds



ORGANIZING AND MANAGING AZURE RESOURCES

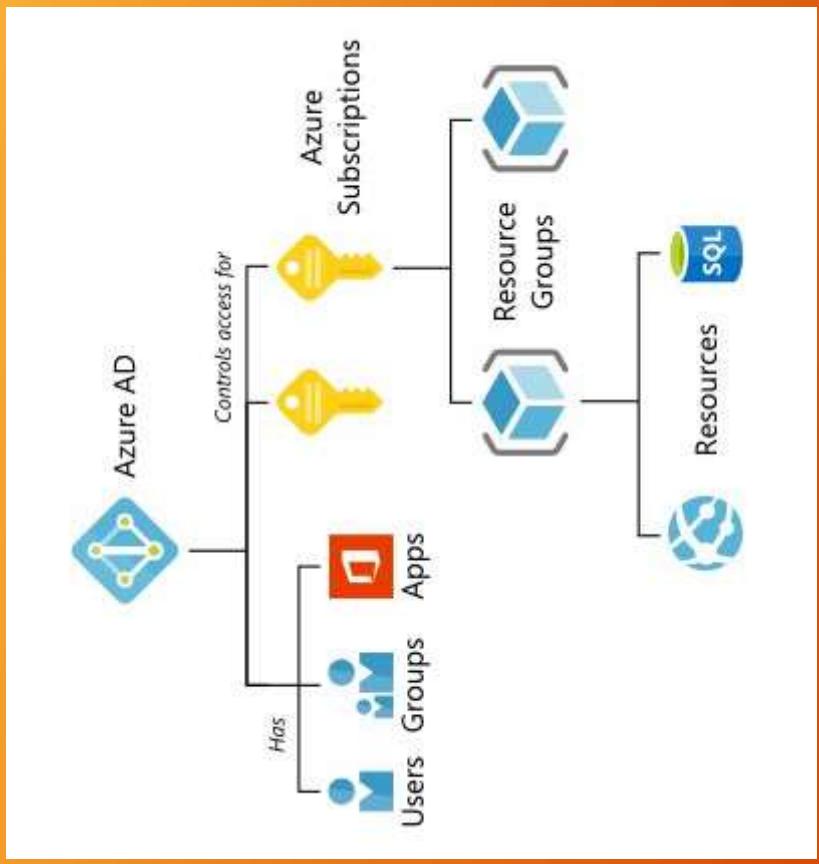
Azure Resource Hierarchy



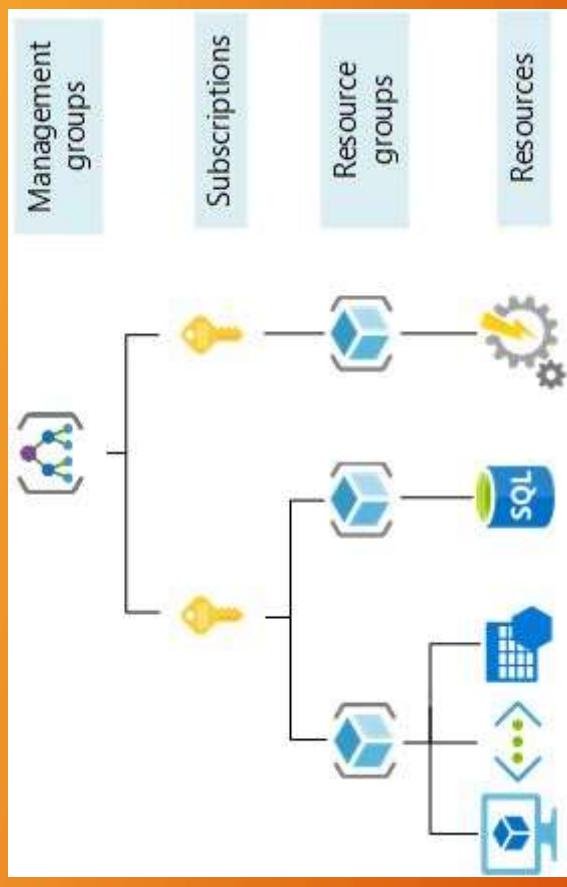
Resource Groups



Subscriptions



Management Groups

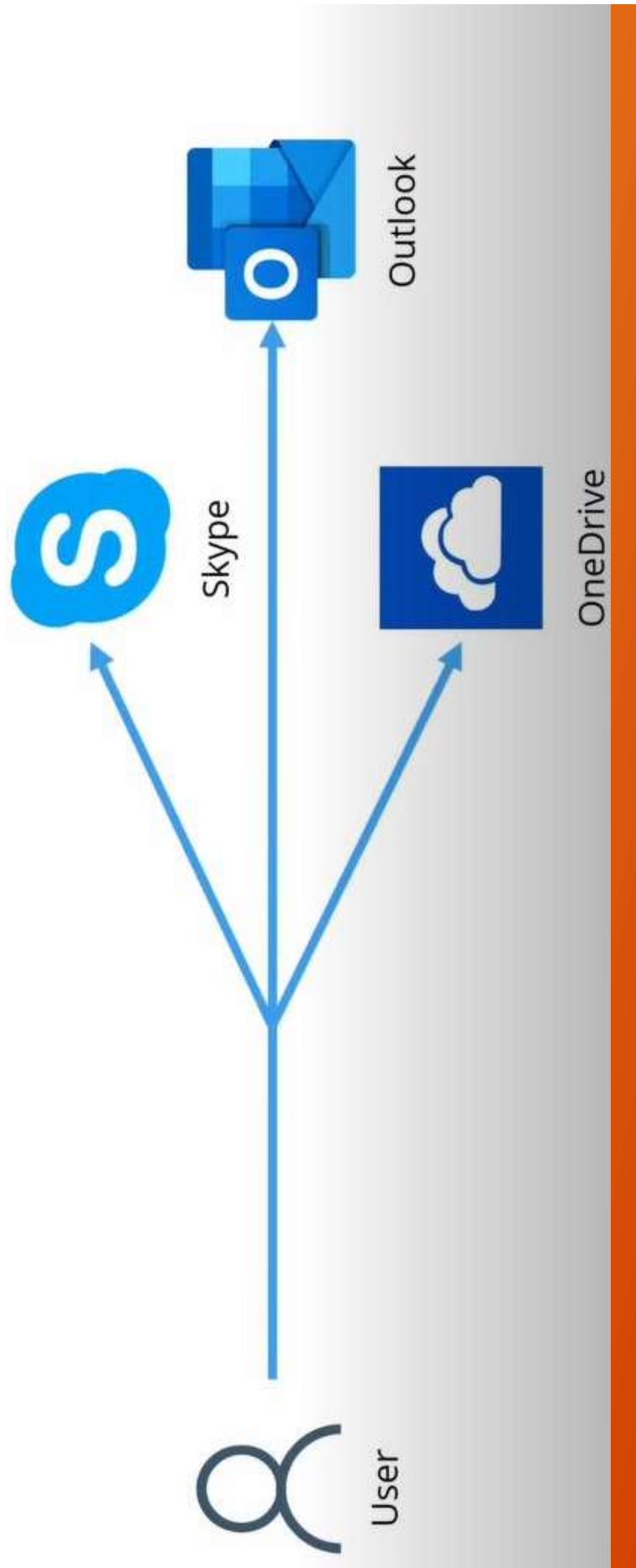




AZURE ACTIVE DIRECTORY

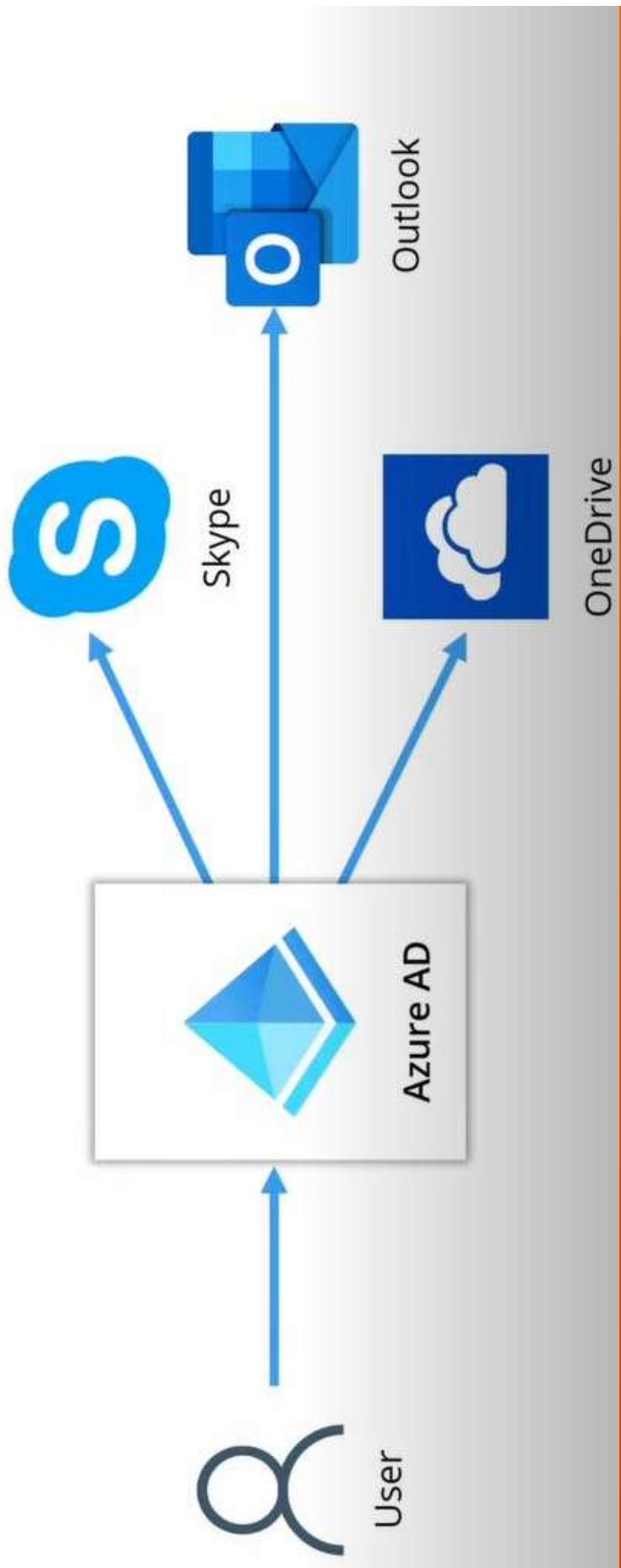
TYPICAL SCENARIOS

Where is Azure AD already used



TYPICAL SCENARIOS

Where is Azure AD already used



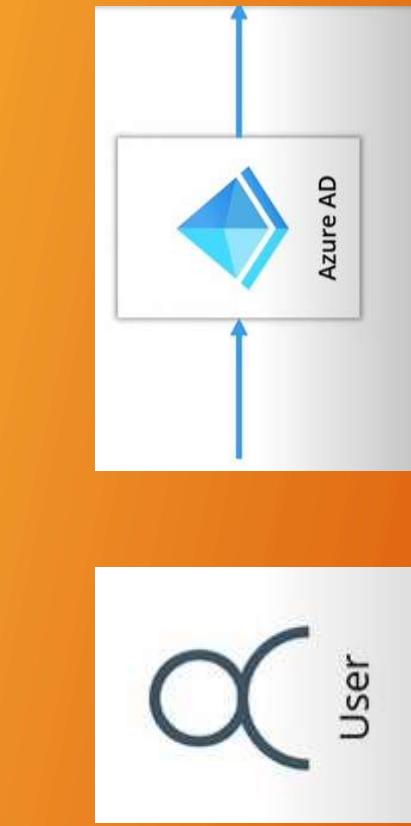
TYPICAL SCENARIOS

Where is Azure AD already used



TYPICAL SCENARIOS

Where is Azure AD already used



TYPICAL SCENARIOS

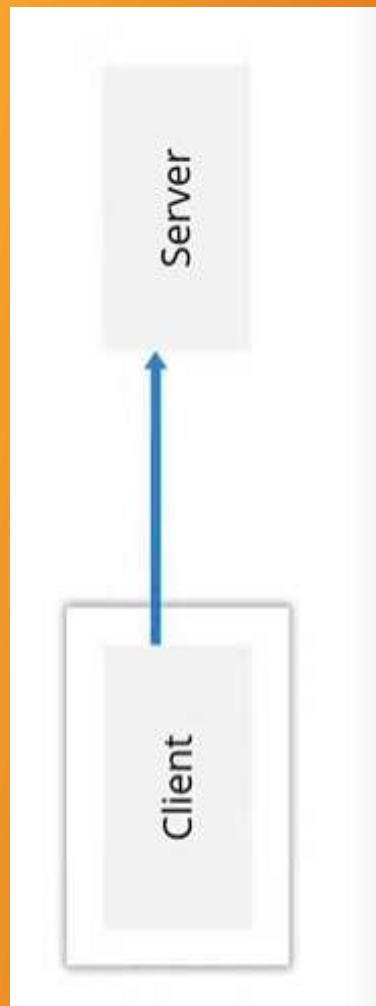
Where is Azure AD already used



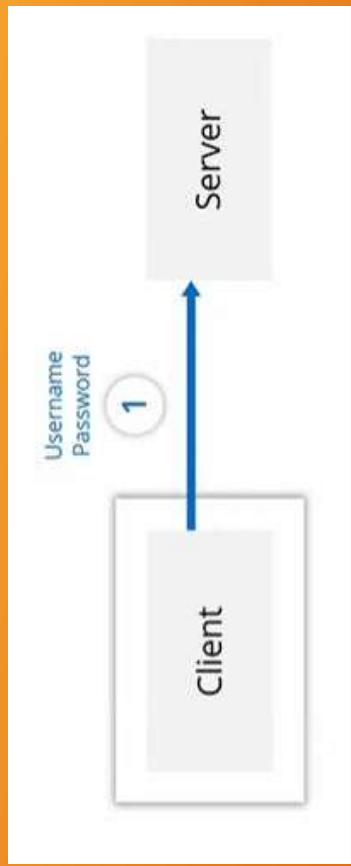
WHAT IS IDENTITY ?

- A thing that can get authenticated.
- Authentication – process of verification/ assertion of identity
- Can be a user with a username and password.
- Also applications or other servers with secret keys or certificates.

CLASSIC APPROACH



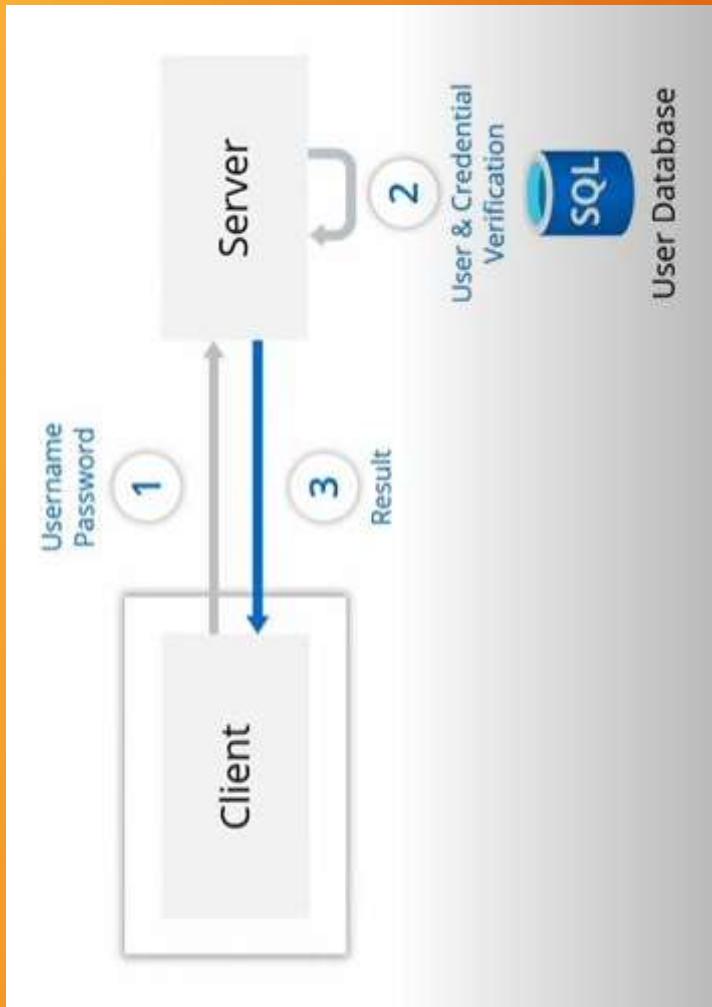
CLASSIC APPROACH



CLASSIC APPROACH

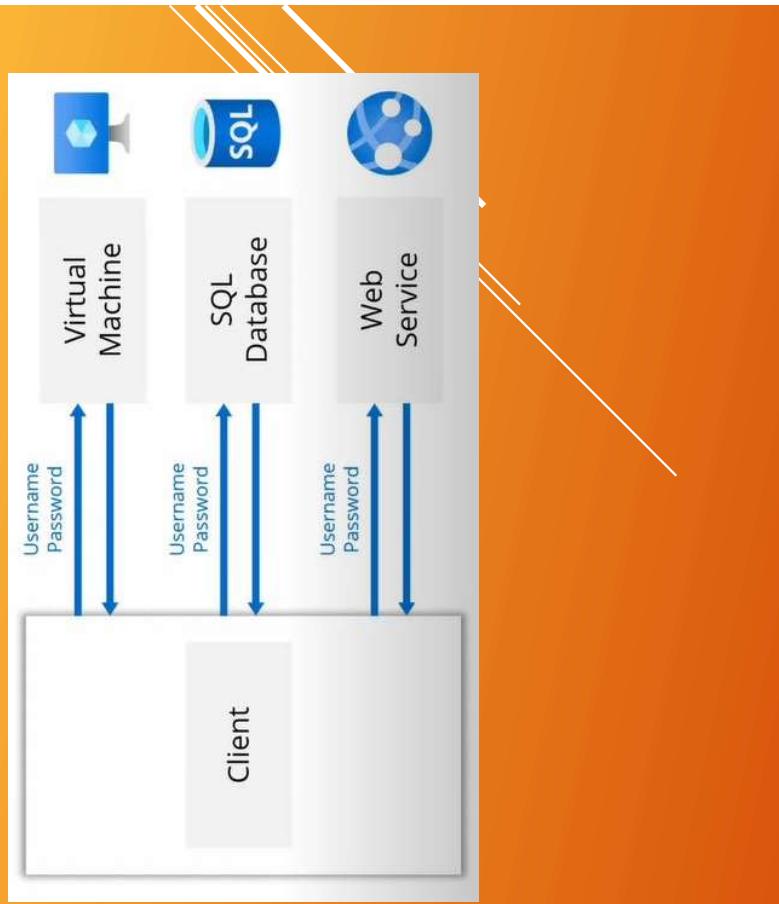


CLASSIC APPROACH



CLASSIC APPROACH - CHALLENGES

- Implementing security features takes time and money
- Security risk by maintaining user database
- User credentials change per application/service



IDENTITY PROVIDER- BENEFITS

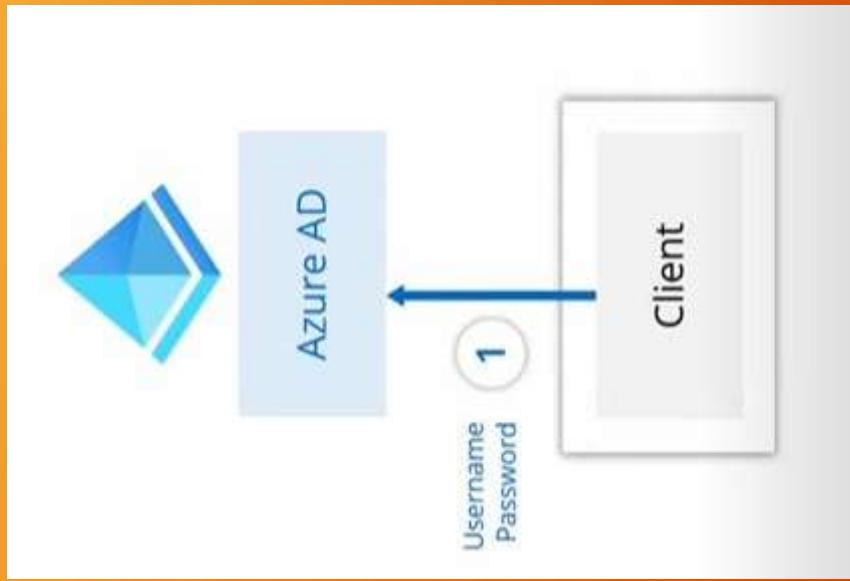
IDENTITY PROVIDER- BENEFITS



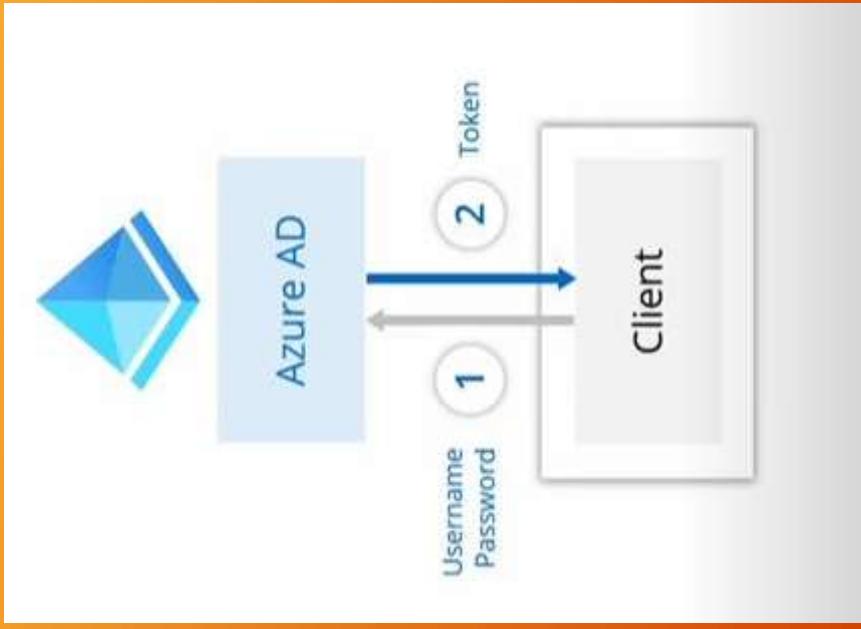
Azure AD



IDENTITY PROVIDER- BENEFITS



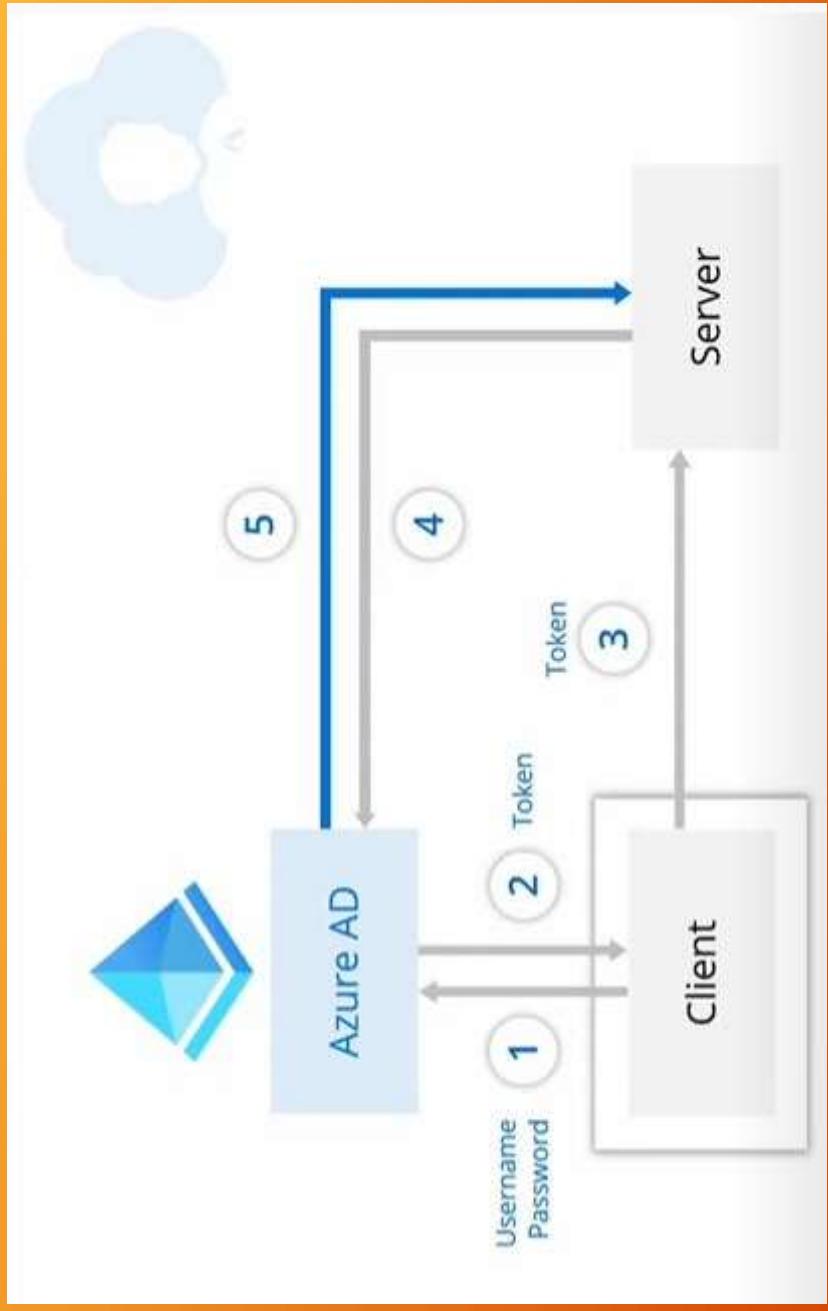
IDENTITY PROVIDER- BENEFITS



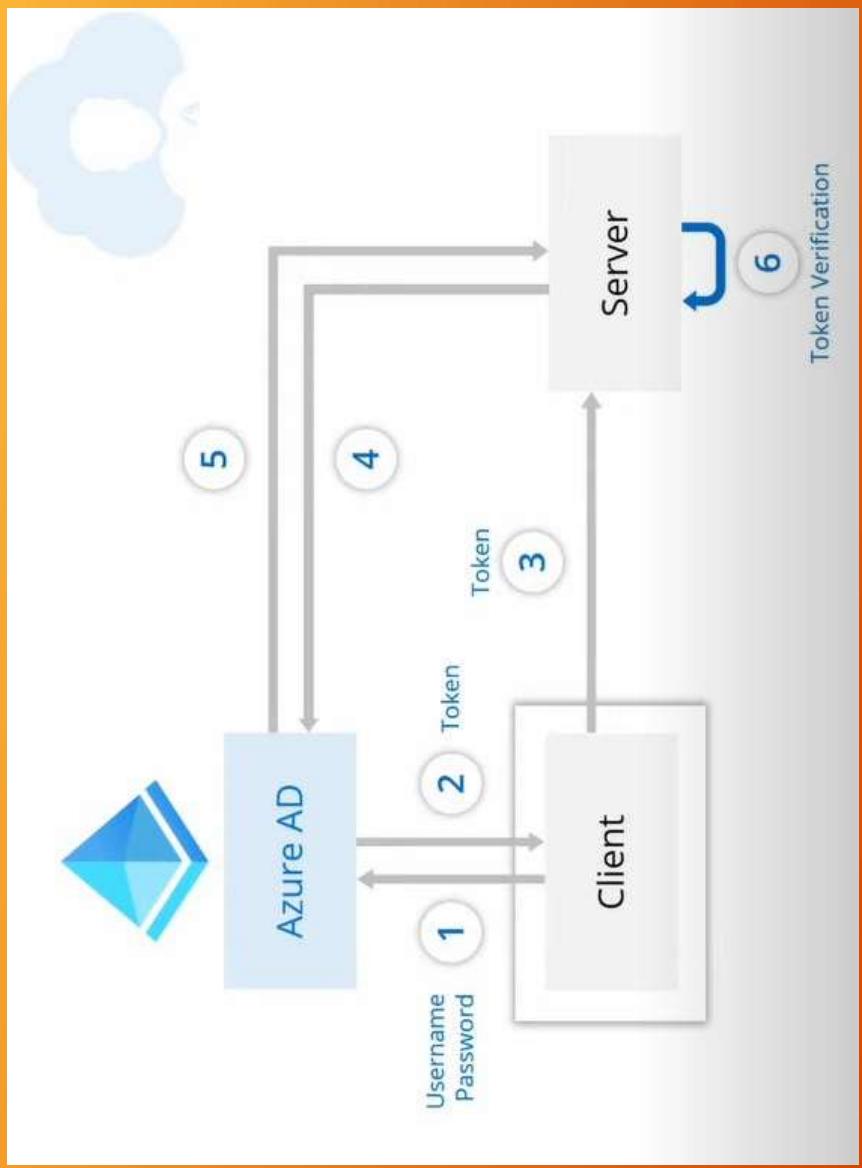
IDENTITY PROVIDER- BENEFITS



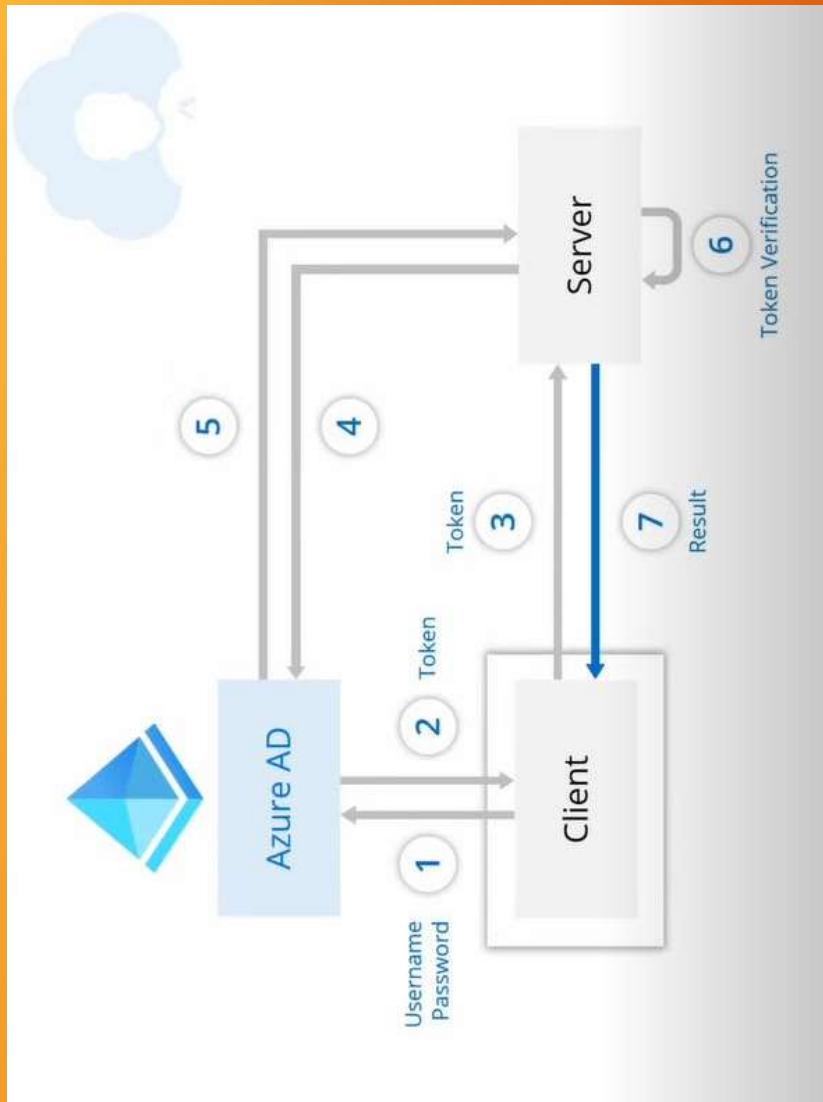
IDENTITY PROVIDER- BENEFITS



IDENTITY PROVIDER- BENEFITS

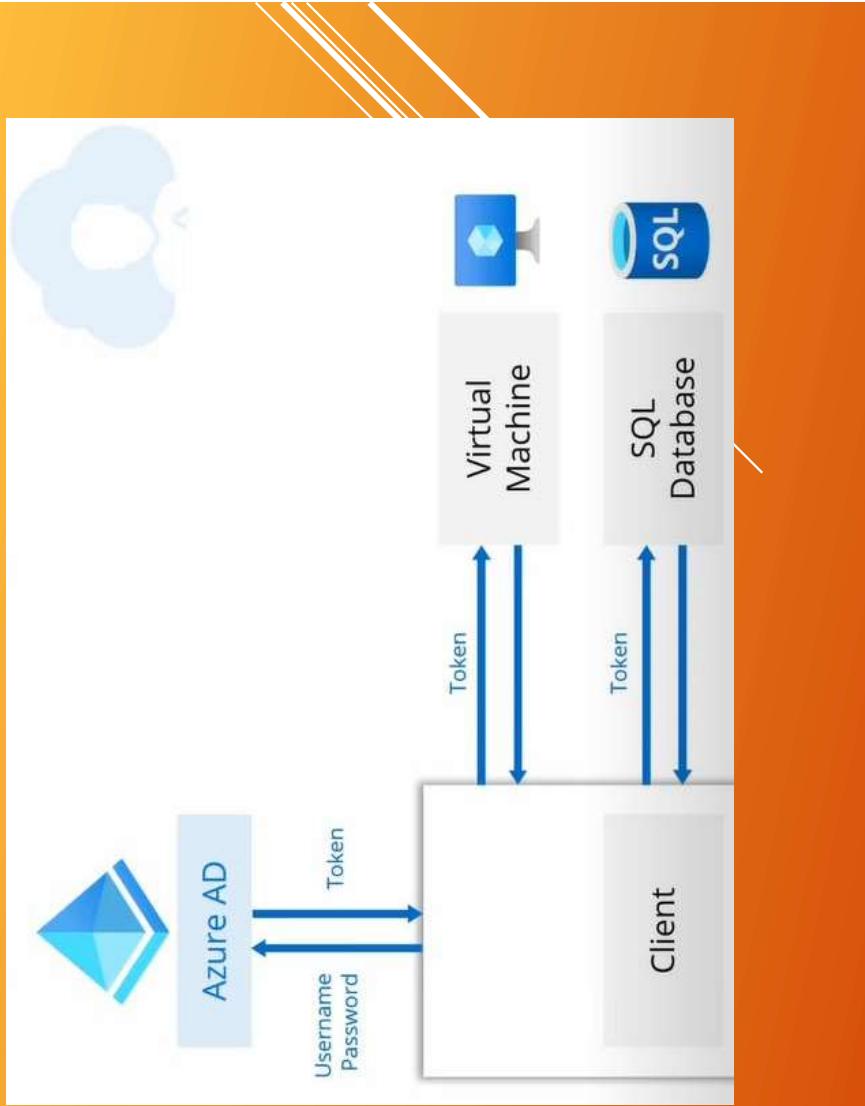


IDENTITY PROVIDER- BENEFITS



IDENTITY PROVIDER- BENEFITS

- Centralized user management
- Top notch security
- Multitude additional features like MFA, conditional access, etc.



WHO SHOULD LEARN AZURE AD

Typical user Profiles

Multi-factor Authentication,
On-Premises user synchronization,
Protect Users and Organization



IT Administrators

Single Sign-On (SSO)
Personalized Experience
Integrate with other services



Application Developers

Manage integrated apps



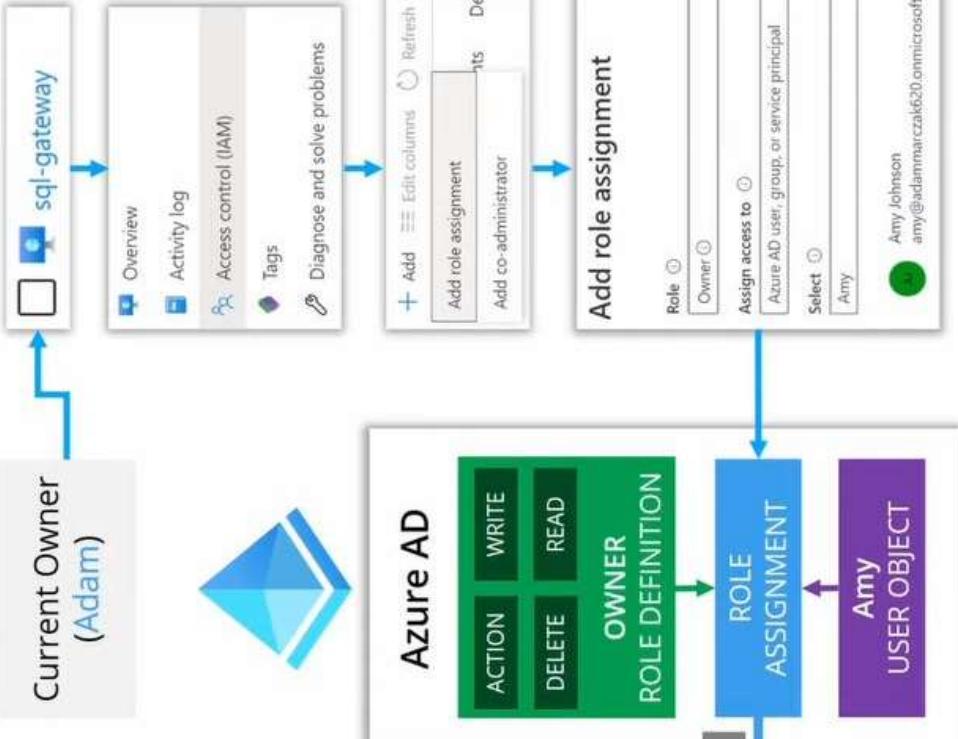
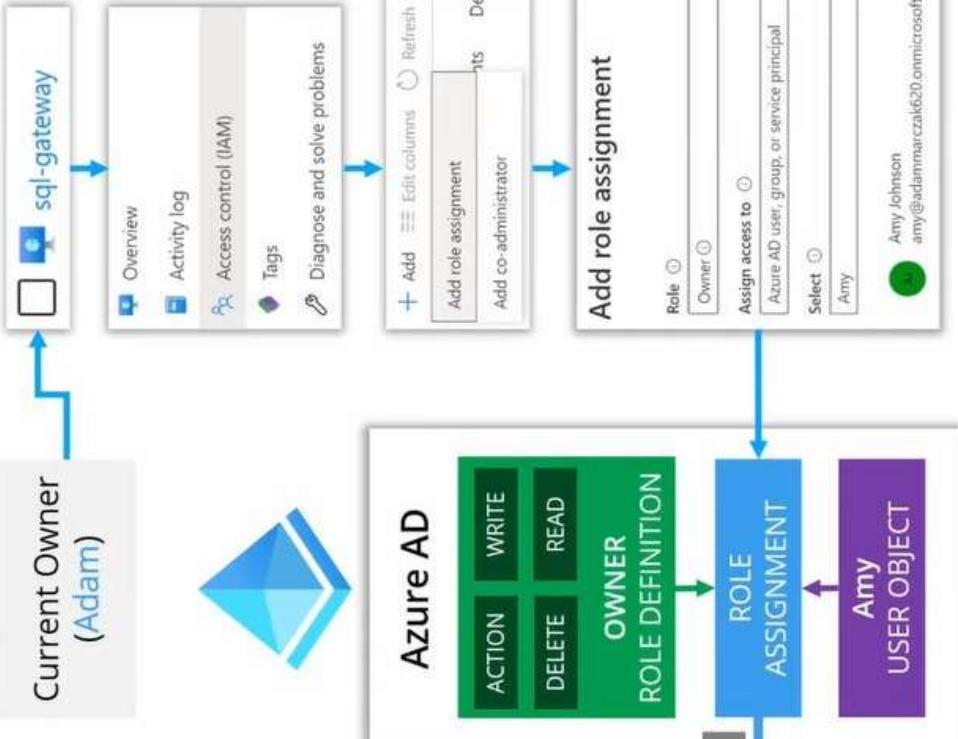
Subscribers of Microsoft 365,
Office 365 or Dynamics CRM

Access Management

How it works?



Current Owner
(Adam)



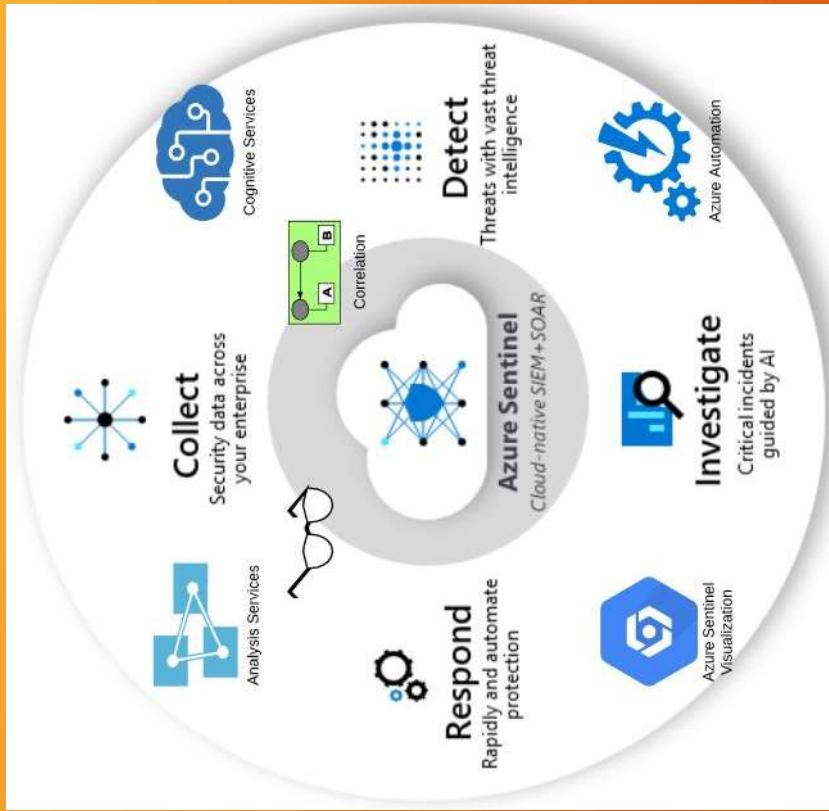
AZURE SECURITY FEATURES



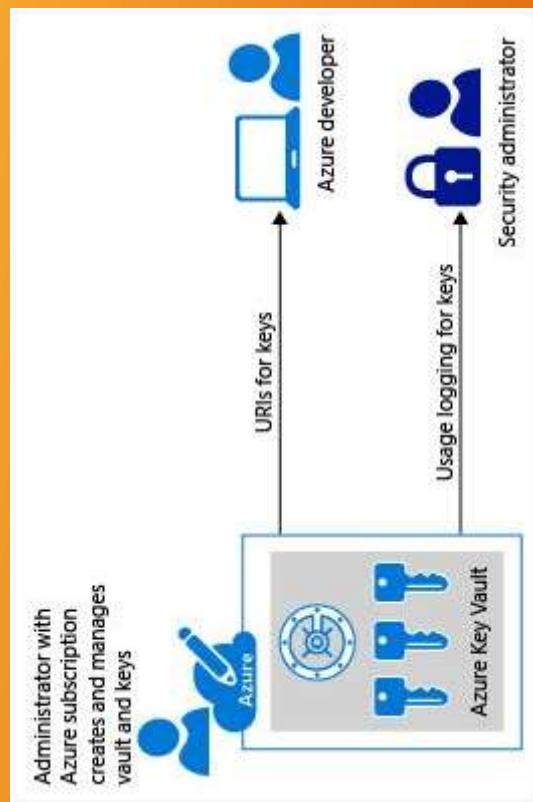
Azure Security Center



Azure Sentinel



Azure Key Vault



KEY VAULT OVERVIEW

Azure Key Vault Service helps with centralization and protection of:

- ▶ Application Secrets
- ▶ Encryption Keys
- ▶ Certificates
- ▶ Secrets backed by HSM (Hardware Security Modules)



COMMON SCENARIOS

Application Secrets for web Apps



Connection String
App String

COMMON SCENARIOS

Application Secrets for web Apps

Connection String
App String



Web App



COMMON SCENARIOS

Application Secrets for web Apps

Connection String
App String



Web App



App Settings	
Key	MySecret
Value	@Microsoft.KeyVault({reference})

COMMON SCENARIOS

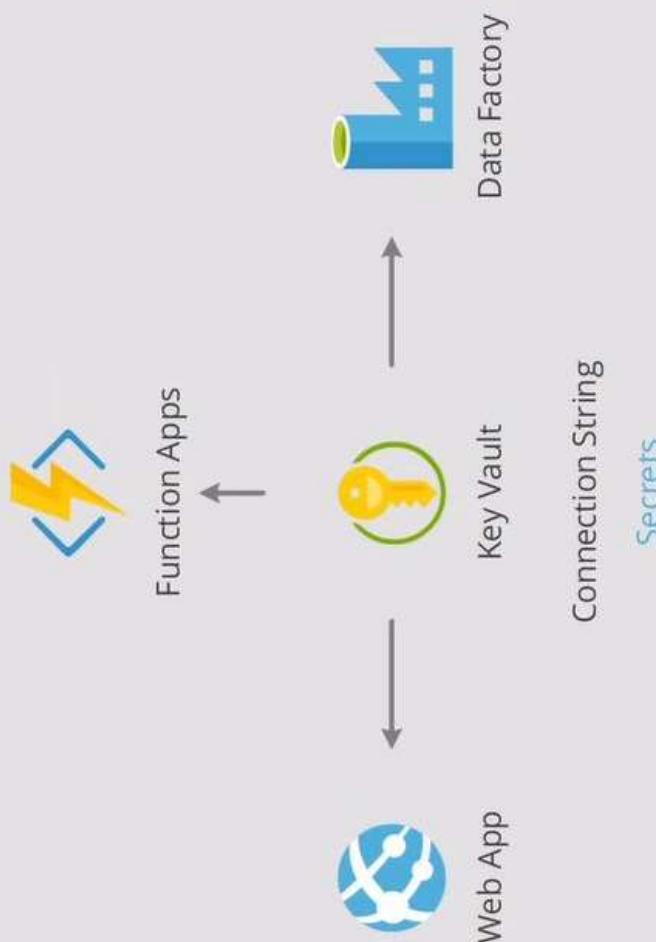
Application Secrets for web Apps



```
string secretUrl = $"https://{{keyVaultName}}.vault.azure.net/secrets/{{secretName}}";  
AzureServiceTokenProvider azureServiceTokenProvider = new AzureServiceTokenProvider();  
  
var keyVaultClient = new KeyVaultClient(  
    new KeyVaultClient.AuthenticationCallback(azureServiceTokenProvider.KeyVaultTokenCallback));  
  
var secretObject = await keyVaultClient.GetSecretAsync(secretUrl).ConfigureAwait(false);  
  
string secret = secretObject.Value;
```

COMMON SCENARIOS

Centralizing Secrets



COMMON SCENARIOS

iNeuron

Disk Encryption



KEY FEATURES

Some of the additional feature include

- Firewall settings enabling for only authorized access via networking configuration
- Auditing of Access
- Azure Active Directory integration
- Replication of Key Content
- Dynamic scaling based on usage

CORE AZURE IDENTITY SERVICES



TYPICAL IDENTITY MANAGEMENT IN THE CLOUD

iNeuron

AUTHORIZATION



Who are you?

Verify the user's identity



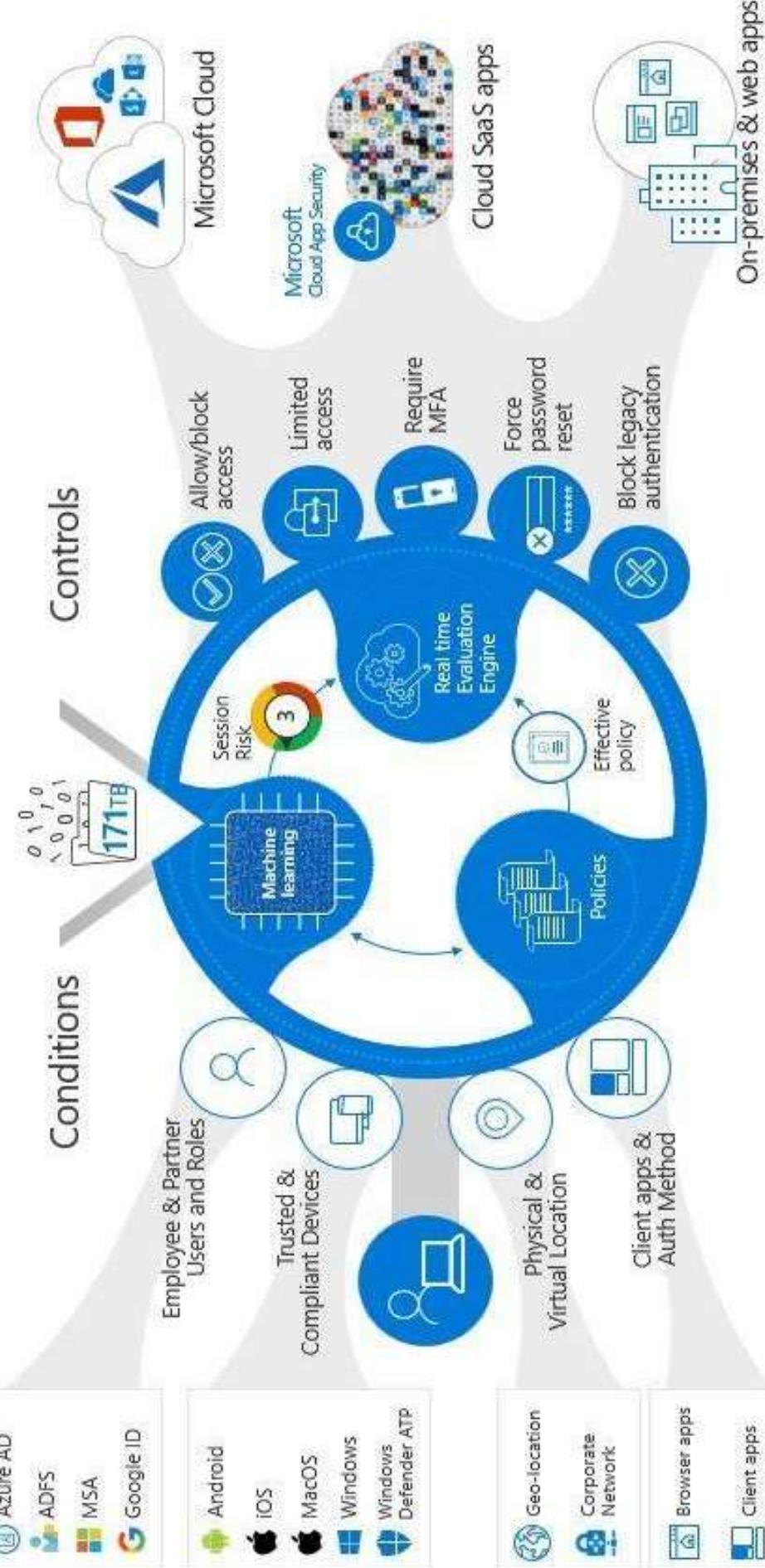
What are you allowed to do?

Determine user permissions

Microsoft Active Directory

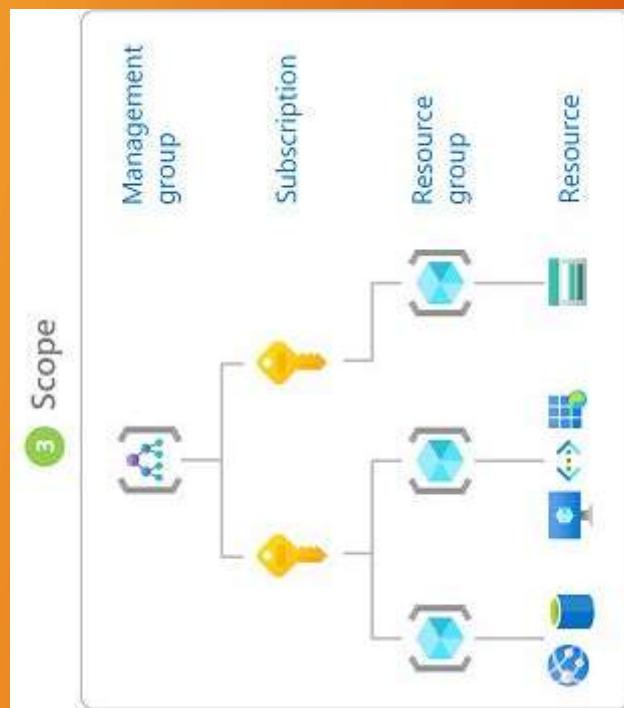


Azure AD Conditional Access

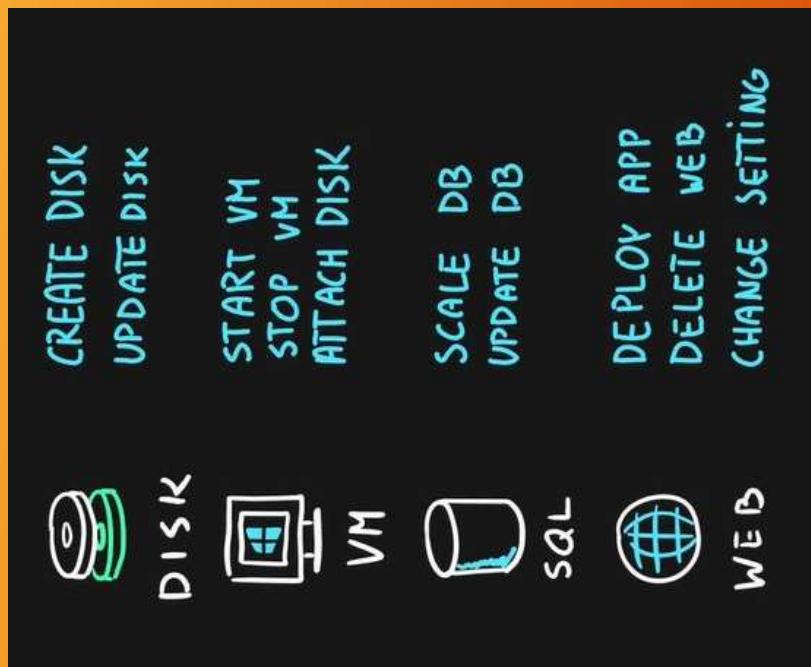


ROLE-BASED ACCESS CONTROL (RBAC)

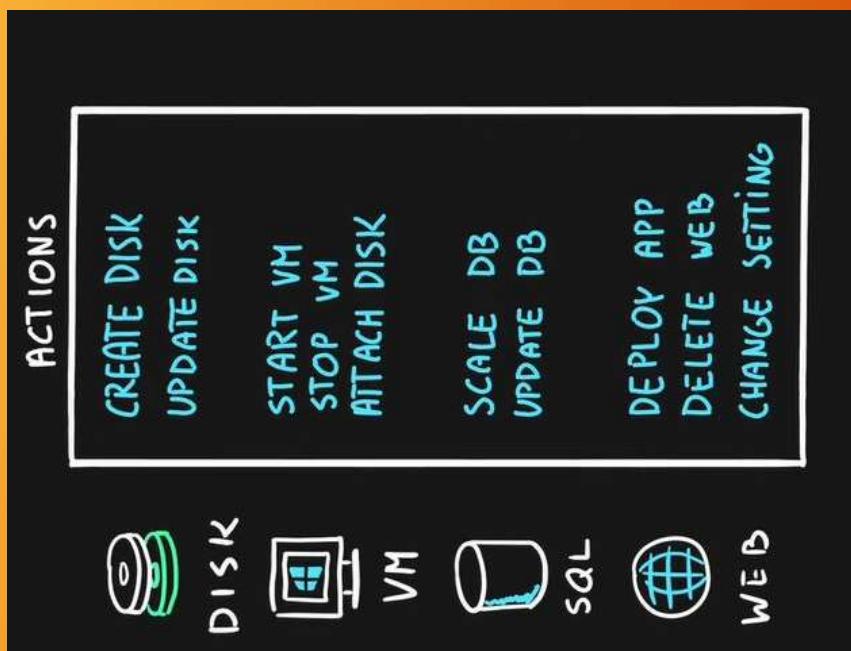
Describe the functionality and usage of role based access control (RBAC)



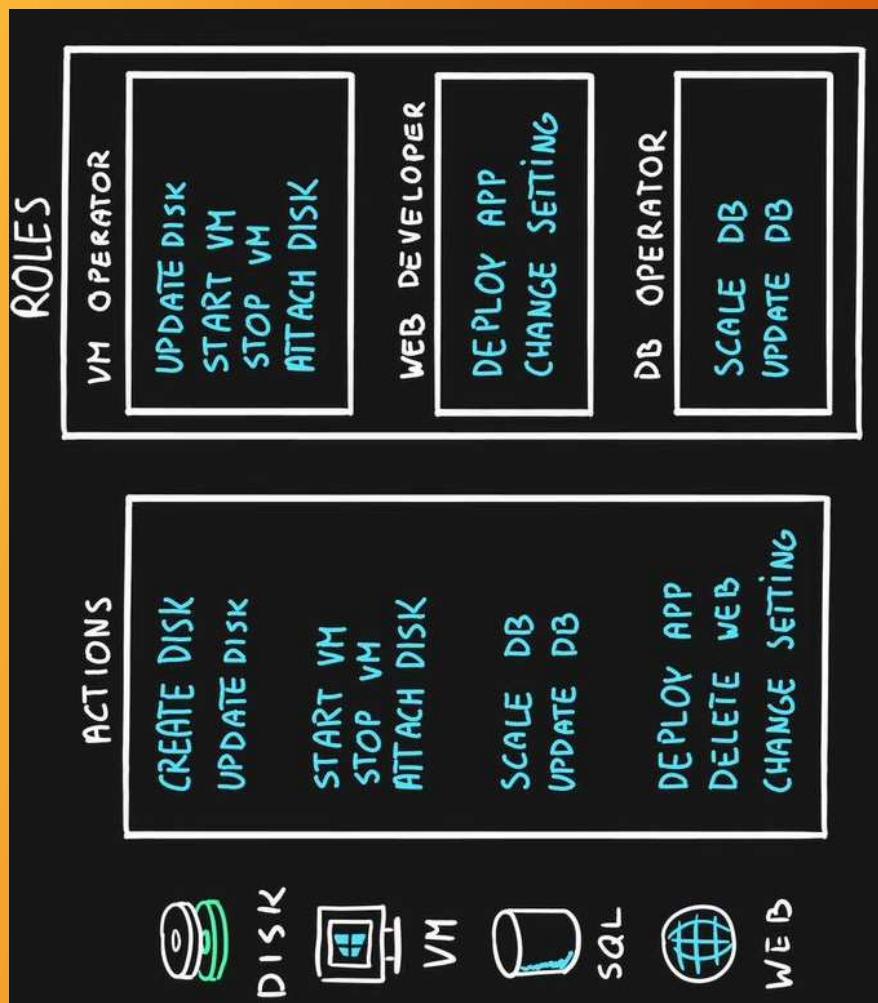
ROLE



ROLE



ROLE



ROLE

Role (Role definition) is a **collection of actions** that the assigned identity will be able to perform.

Role definition is an answer to a question
“**What** can be done?”

SECURITY PRINCIPALS

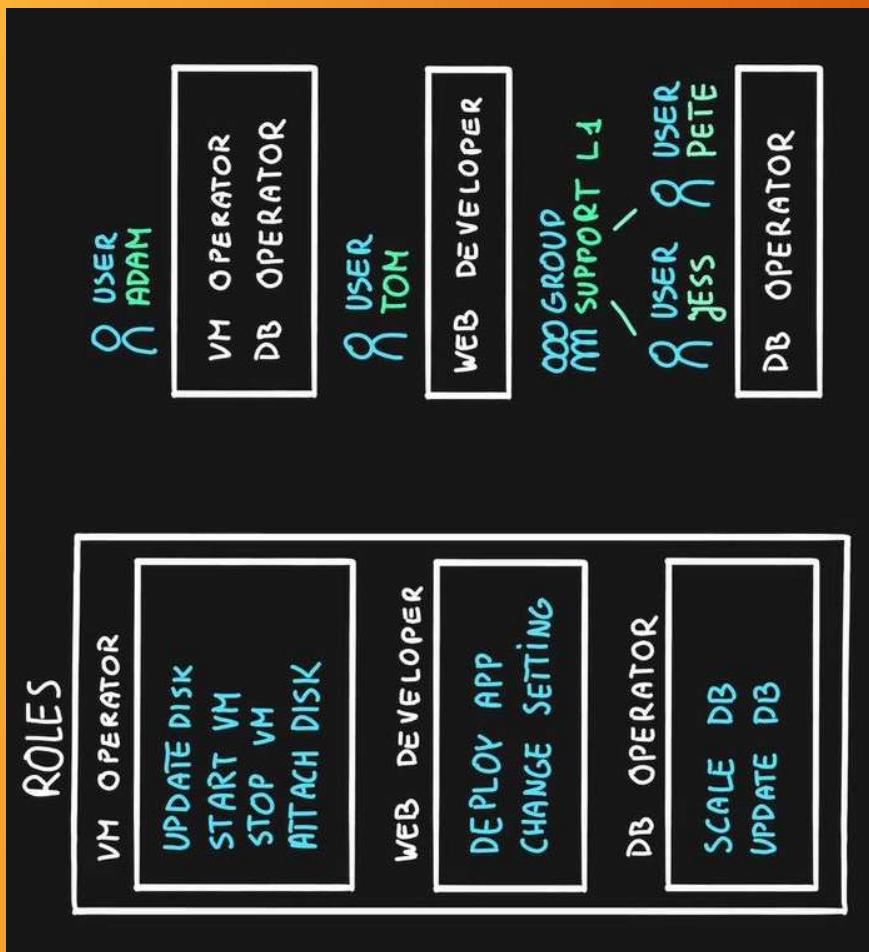
ROLE



SECURITY
PRINCIPAL



SECURITY PRINCIPALS

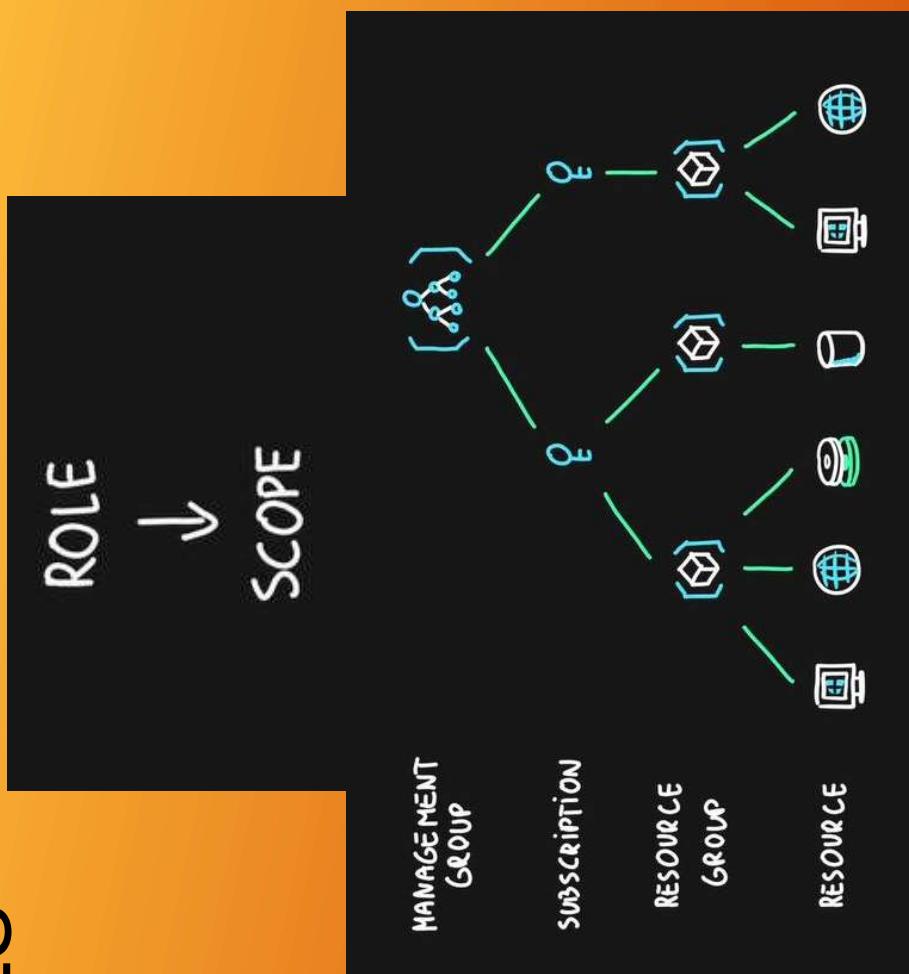


SECURITY PRINCIPAL

Security Principal is an Azure object (**identity**) that can be assigned to a role(ex. **users**, **groups** or **applications**)

Security Principal assignment is an answer to a question
“**Who** can do it?”

SCOPES



SCOPES

Scope one or more Azure resources that the access applies to.

Scope assignment is an answer to a question
“**Where** can it be done?”

Role assignment is a combination of the role definition, security principal and score

"What can be done?"

"Who can do it?"

"Where can it be done?"

OWNER - EVERYTHING

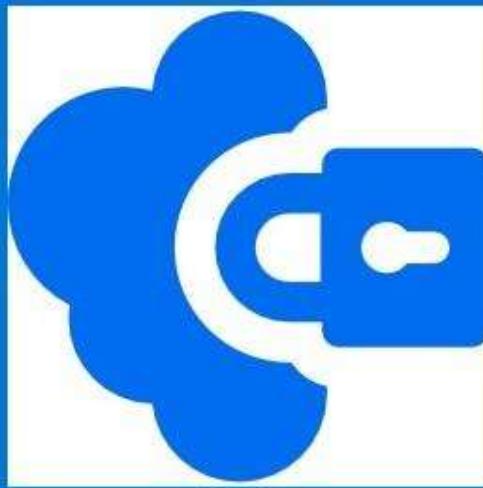


USER - ADAM

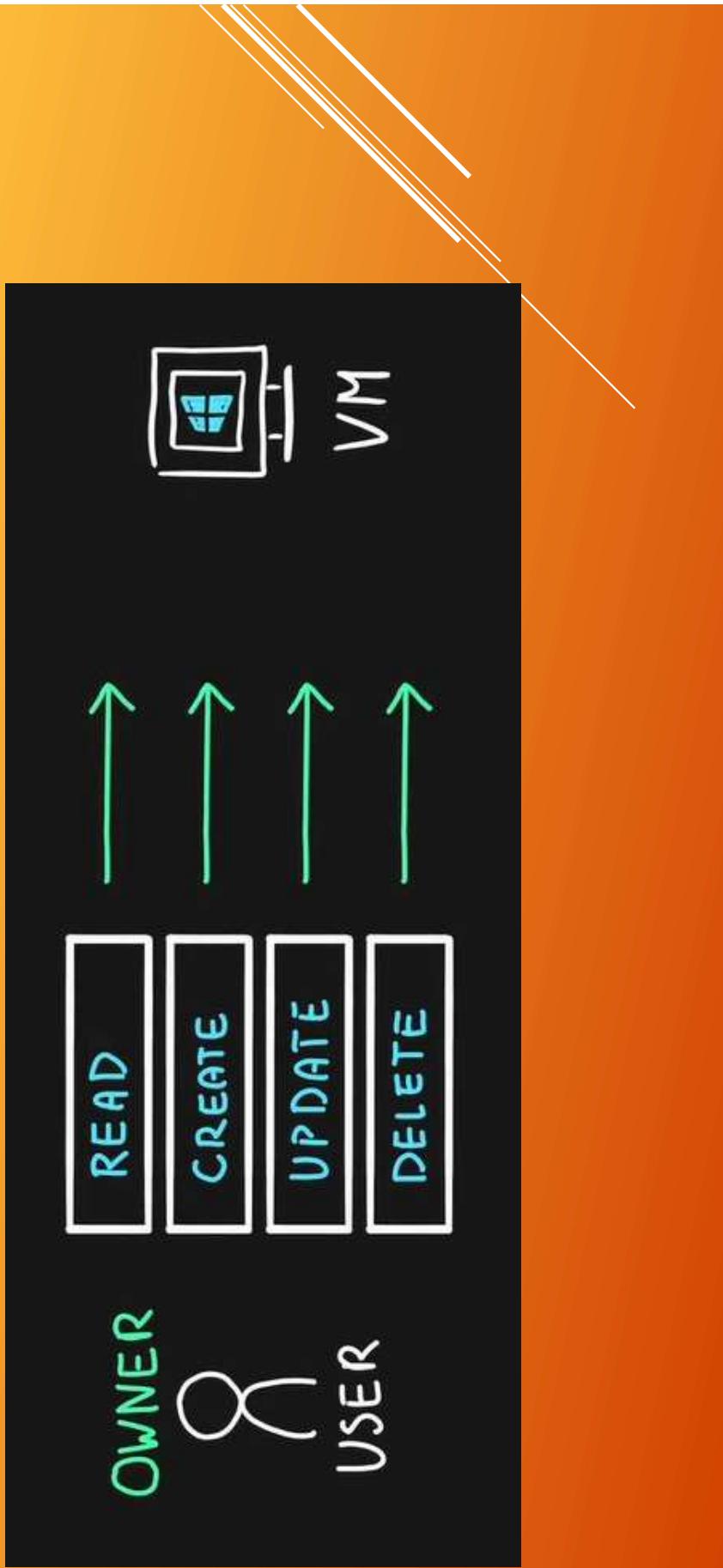


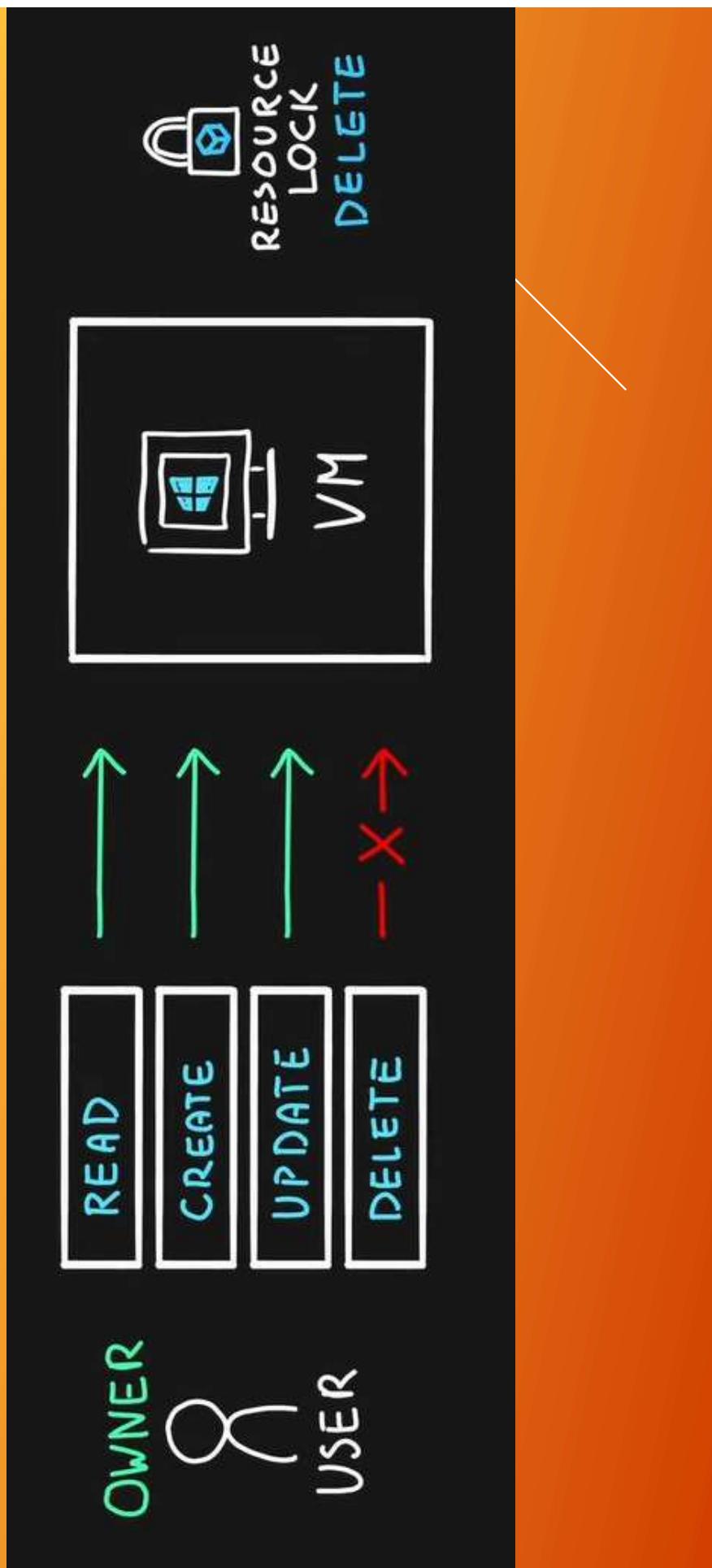
VM RESOURCE - DEV-VM

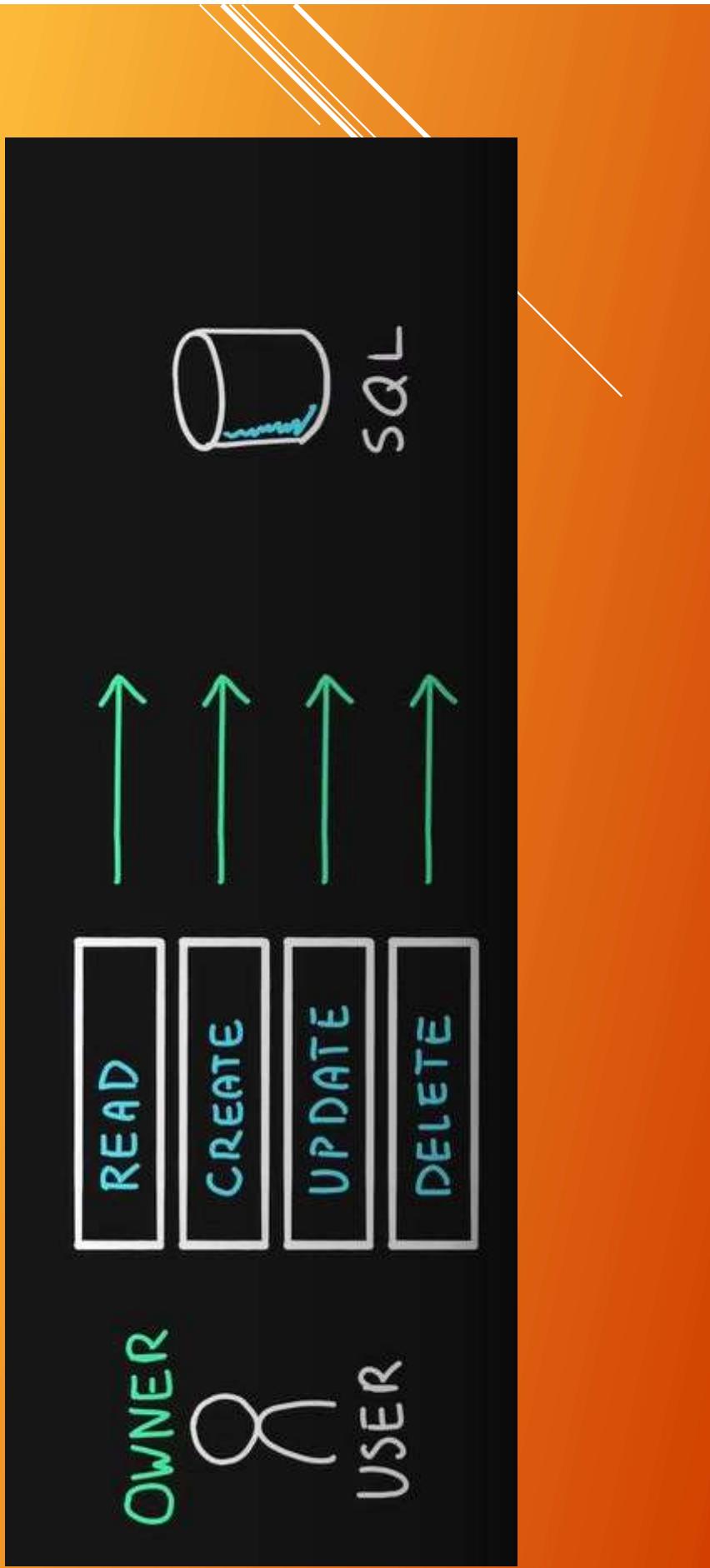
Azure Locks



WHAT IS AN AZURE RESOURCE LOCK?



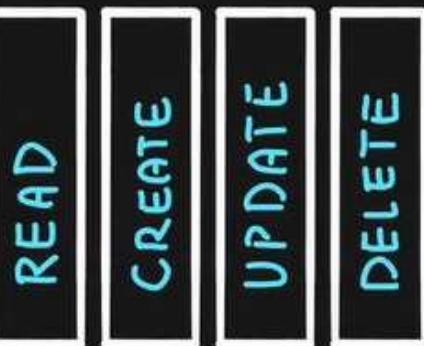




 RESOURCE LOCK
READ-ONLY



— X —
— X —
— X —
— X —



OWNER

USER

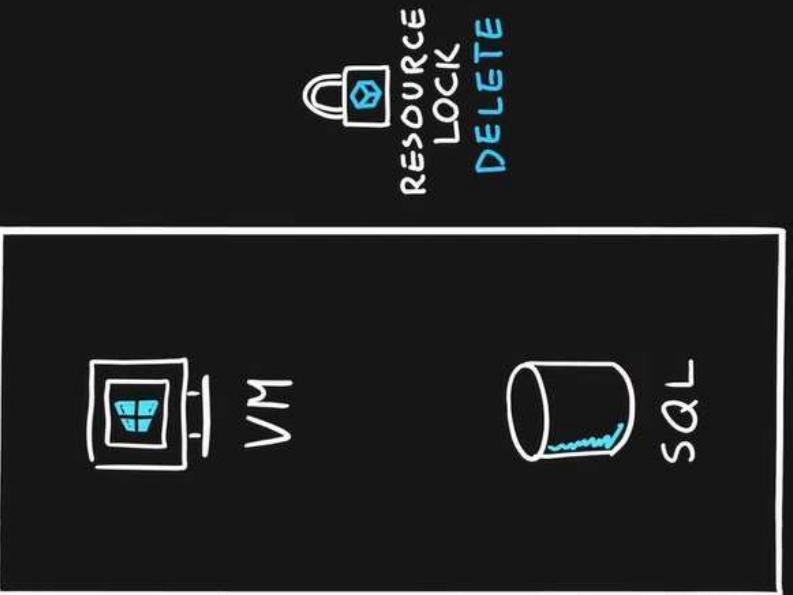
Resource Locks

OWNER
READ
CREATE
UPDATE
DELETE

USER
READ
CREATE
UPDATE
DELETE

OWNER
READ
CREATE
UPDATE
DELETE

USER
READ
CREATE
UPDATE
DELETE



RESOURCE
LOCK
DELETE

SQL

VM

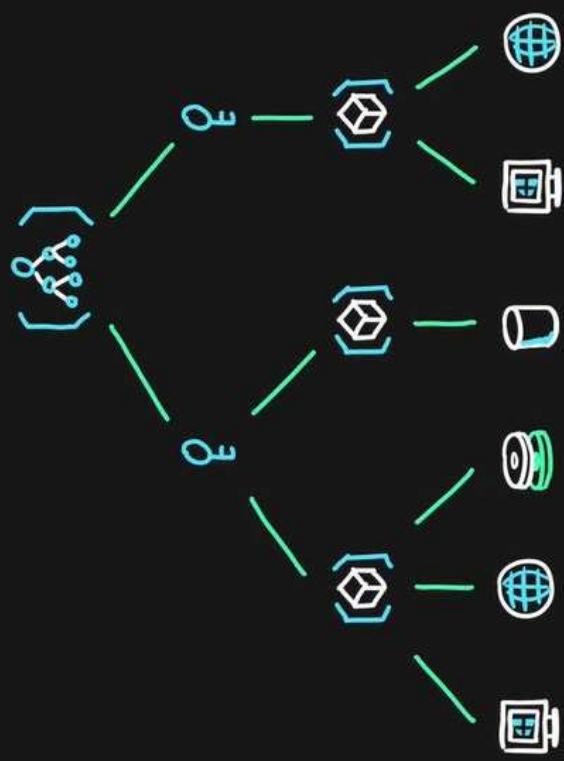
Lock Scopes

MANAGEMENT GROUP

SUBSCRIPTION

RESOURCE GROUP

RESOURCE

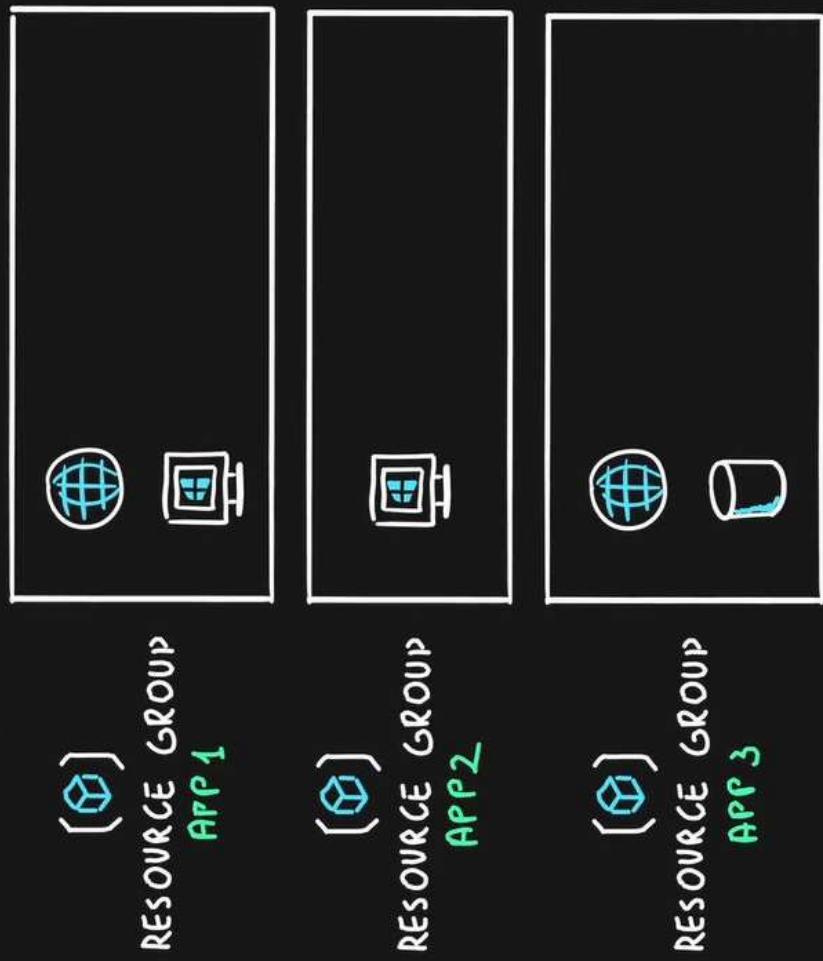


What is an Azure Resource Lock?

- Designed to **prevent accidental deletion** and/or **modification**
- Used in conjunction with RBAC
- Two types of locks
 - **Read-only (ReadOnly)** – only read actions are allowed
 - **Delete (CanNotDelete)** – all actions except delete are allowed
- Scopes are **hierarchical (inherited)**
 - Subscriptions > Resource Groups > Resources
- **Management Groups** can't be locked
- Only **Owner** and **User Access Administrator** roles can manage locks (**built-in roles**)

Azure Resource Tags

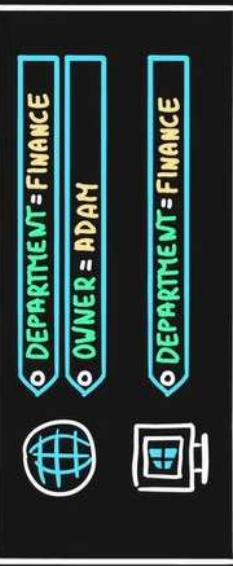
Resource Tags



Resource Tags



RESOURCE GROUP
APP 1



RESOURCE GROUP
APP 2



RESOURCE GROUP
APP 3



Resource Tags

RESOURCE GROUP
APP 1

DEPARTMENT = FINANCE
OWNER = ADAM

RESOURCE GROUP
APP 2

DEPARTMENT = FINANCE
OWNER = TOM

RESOURCE GROUP
APP 3

DEPARTMENT = SALES
OWNER = ADAM

DEPARTMENT = SALES
OWNER = TOM



OWNER = ADAM
COST_CENTER = 324



OWNER = ADAM
COST_CENTER = 581



OWNER = TOM
COST_CENTER = 123

Azure Resource Tags

- Tags are simple **Name** (key) - **Value pairs**
- Designed to help with **organization of Azure resources**
- Used for **resource governance, security, operations management, cost management, automation, etc.**
- Typical tagging strategies
 - **Functional** – mark by **function** (ex: environment = production)
 - **Classification** – mark by **policies used** (ex: classification = restricted)
 - **Finance/Accounting** – mark for **billing purposes** (ex: department = finance)
 - **Partnership** – mark by **association of users/groups** (ex: owner = tom)
- Applicable for **resources, resource groups and subscriptions**
- **NOT inherited** by default

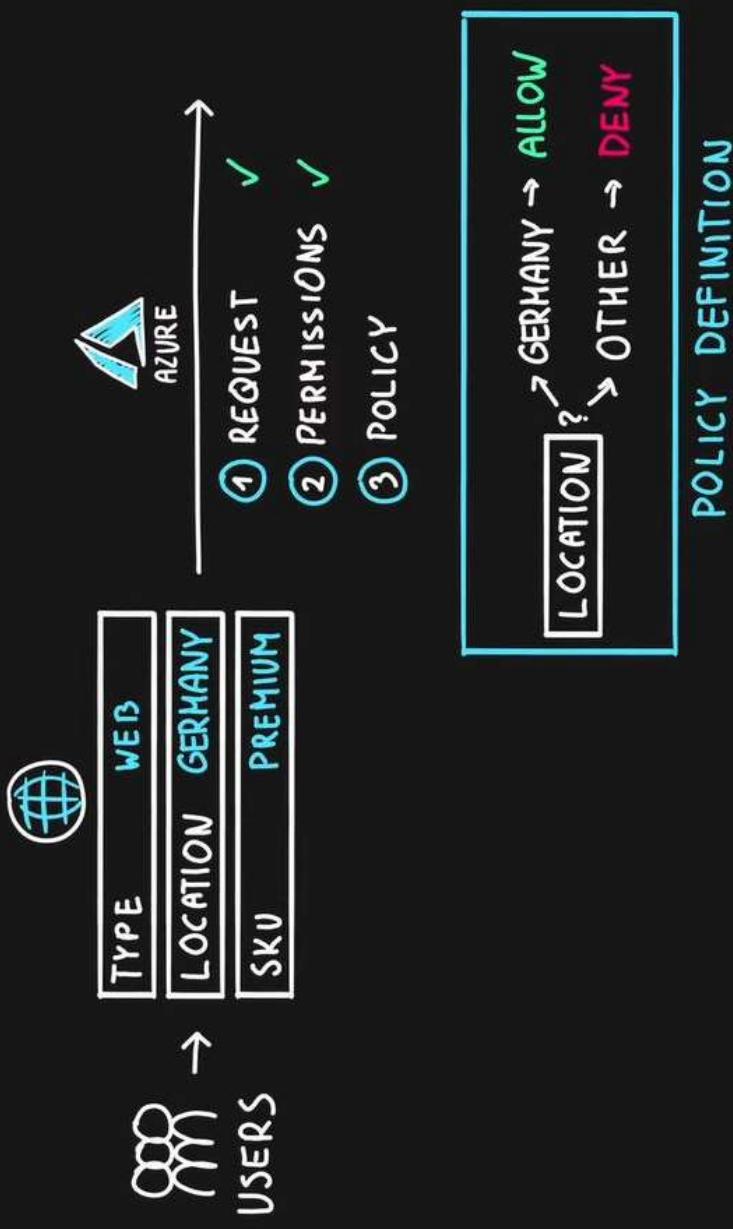
AZURE POLICY



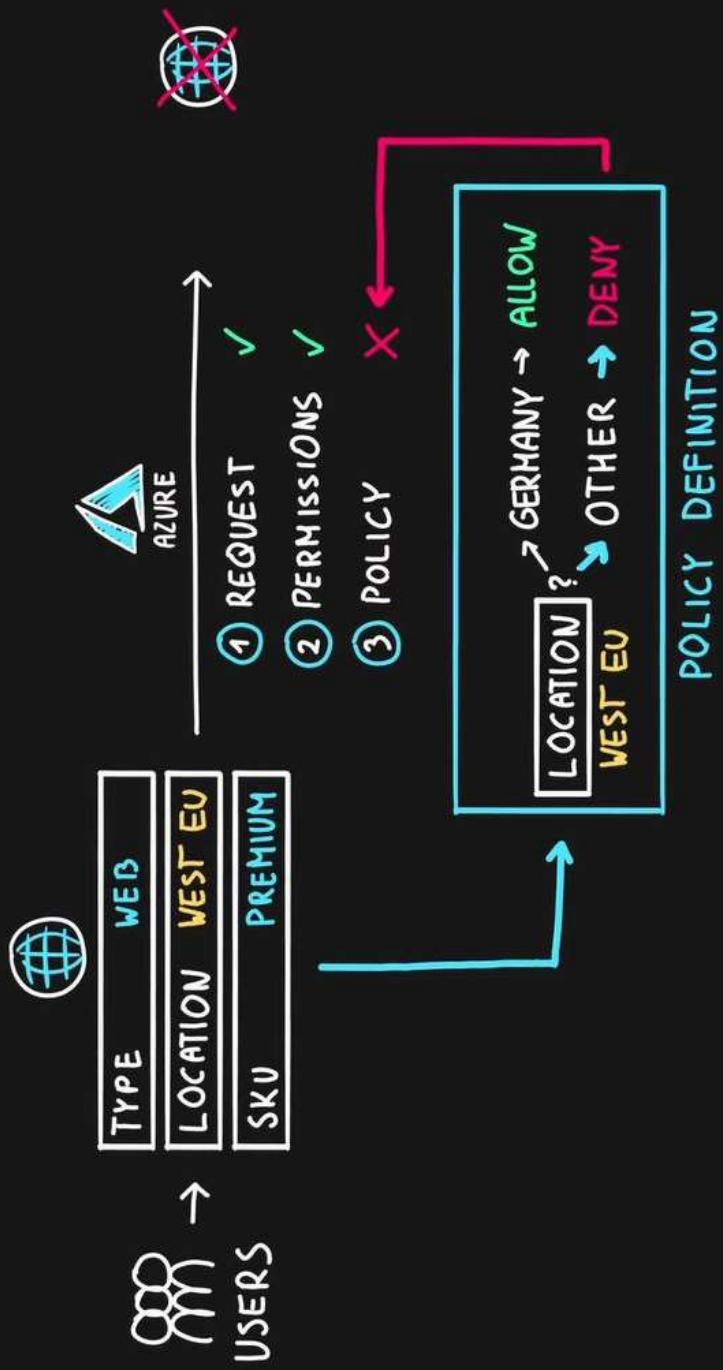
AZURE POLICY



Azure Policy



Azure Policy



AZURE POLICY

- Designed to help with **resource governance, security, compliance, cost management, etc.**
- Policies focus on **resource properties (RBAC focused on user actions)**
- Policy **definition** – Defines what should happen
 - Define the **condition** (if/else) and the **effect** (deny, audit, append, modify, etc.)
 - Examples include allowed *resource types, allowed locations, allowed SKUs, inherit resource tags*

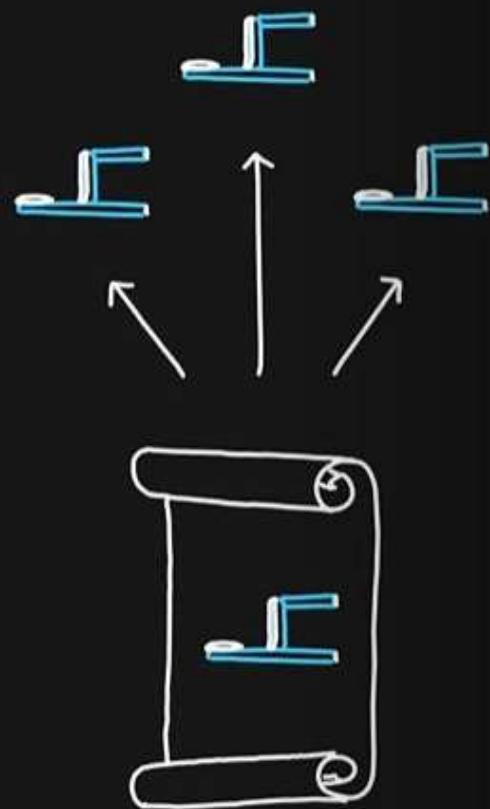
AZURE POLICY

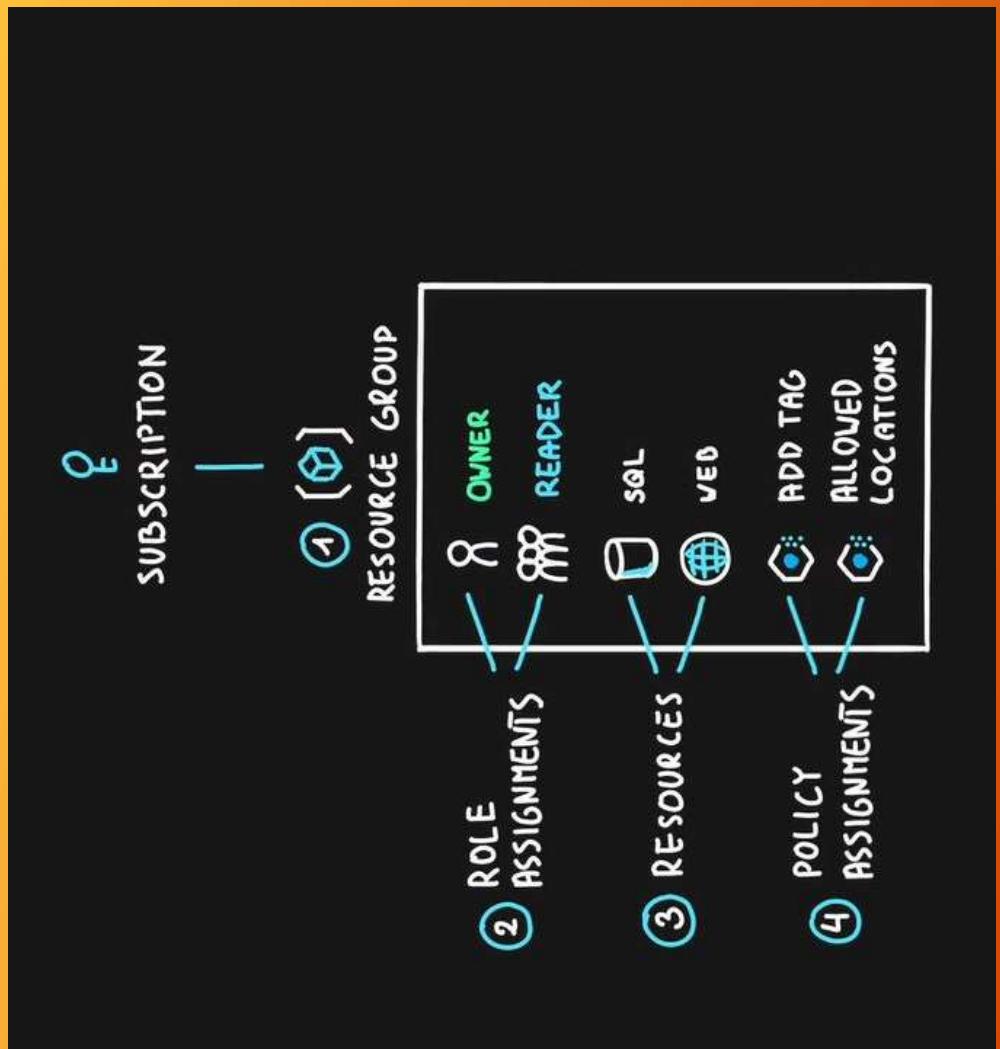
- Built-in and custom policies are supported
- Policy initiative – a group of policy definitions
- Policy assignment – assignment of a policy definition/initiative to a scope
 - Scopes can be assigned to
 - management groups,
 - subscriptions,
 - resource groups, and
 - resources
 - Policies allow for exclusions of scopes
 - Checked during resource creation or updates and existing ones with remediation tasks

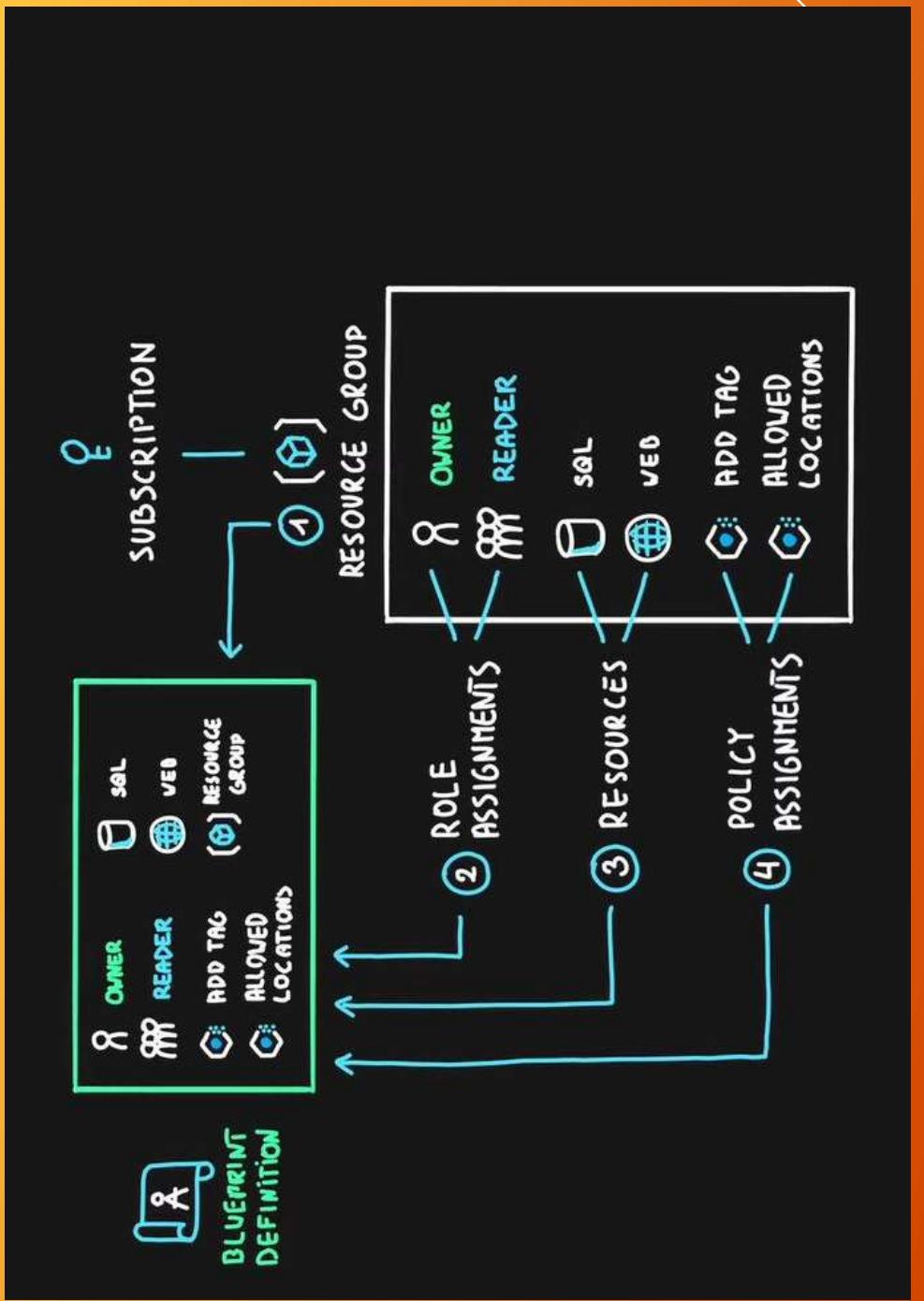


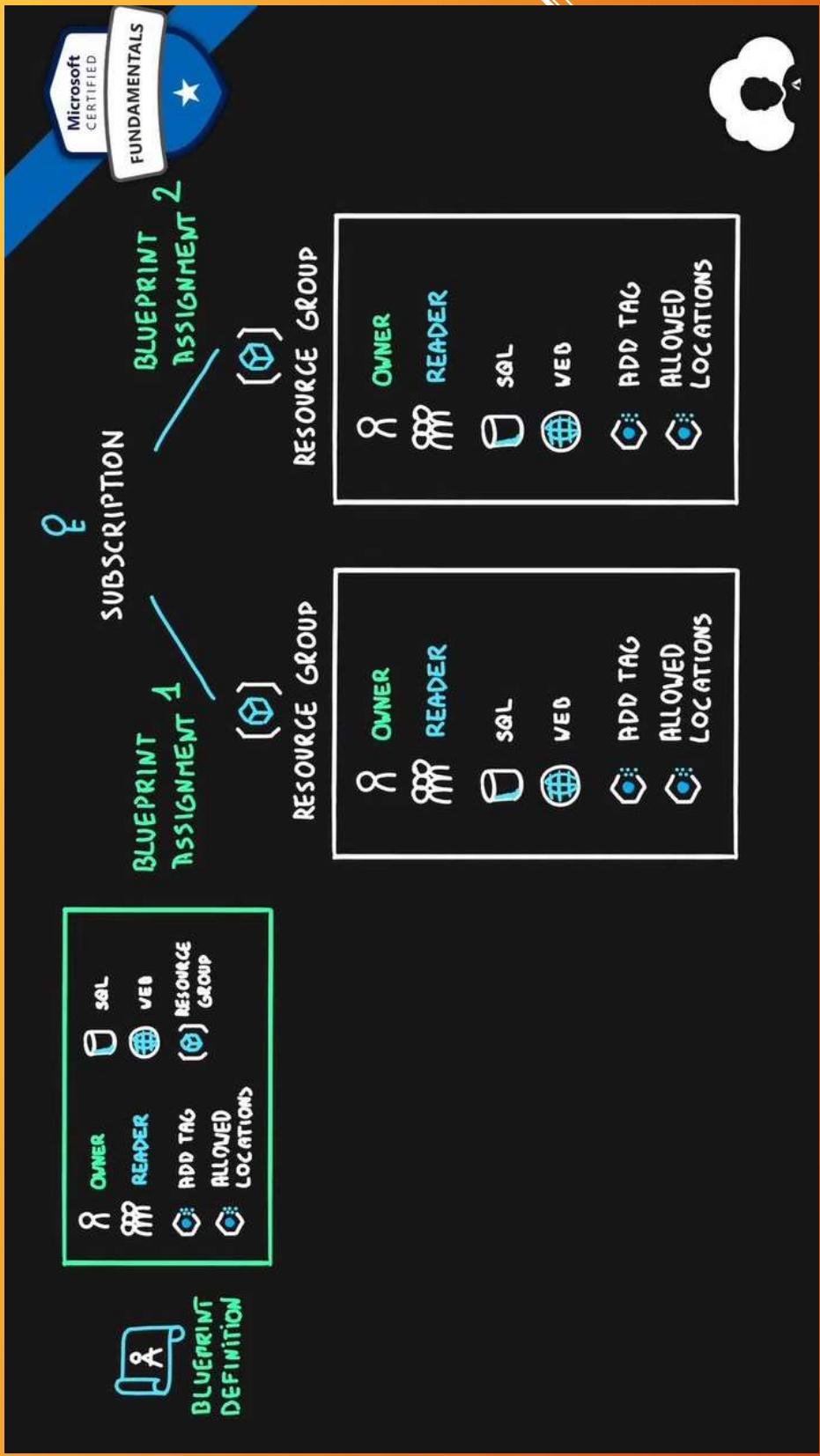
What are Azure Blueprints?

A *blueprint* is a *guide*, *pattern* or *design* for making something.







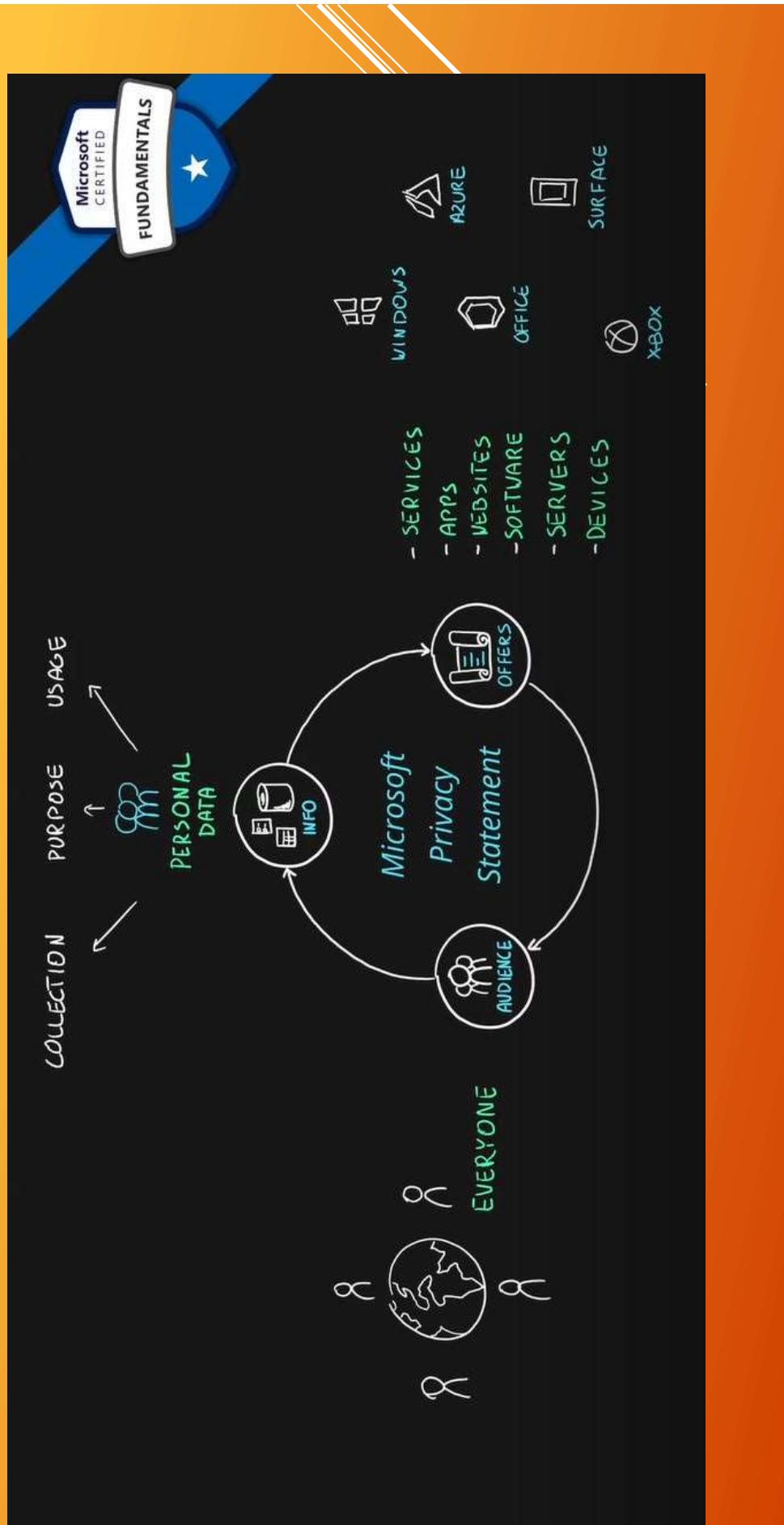


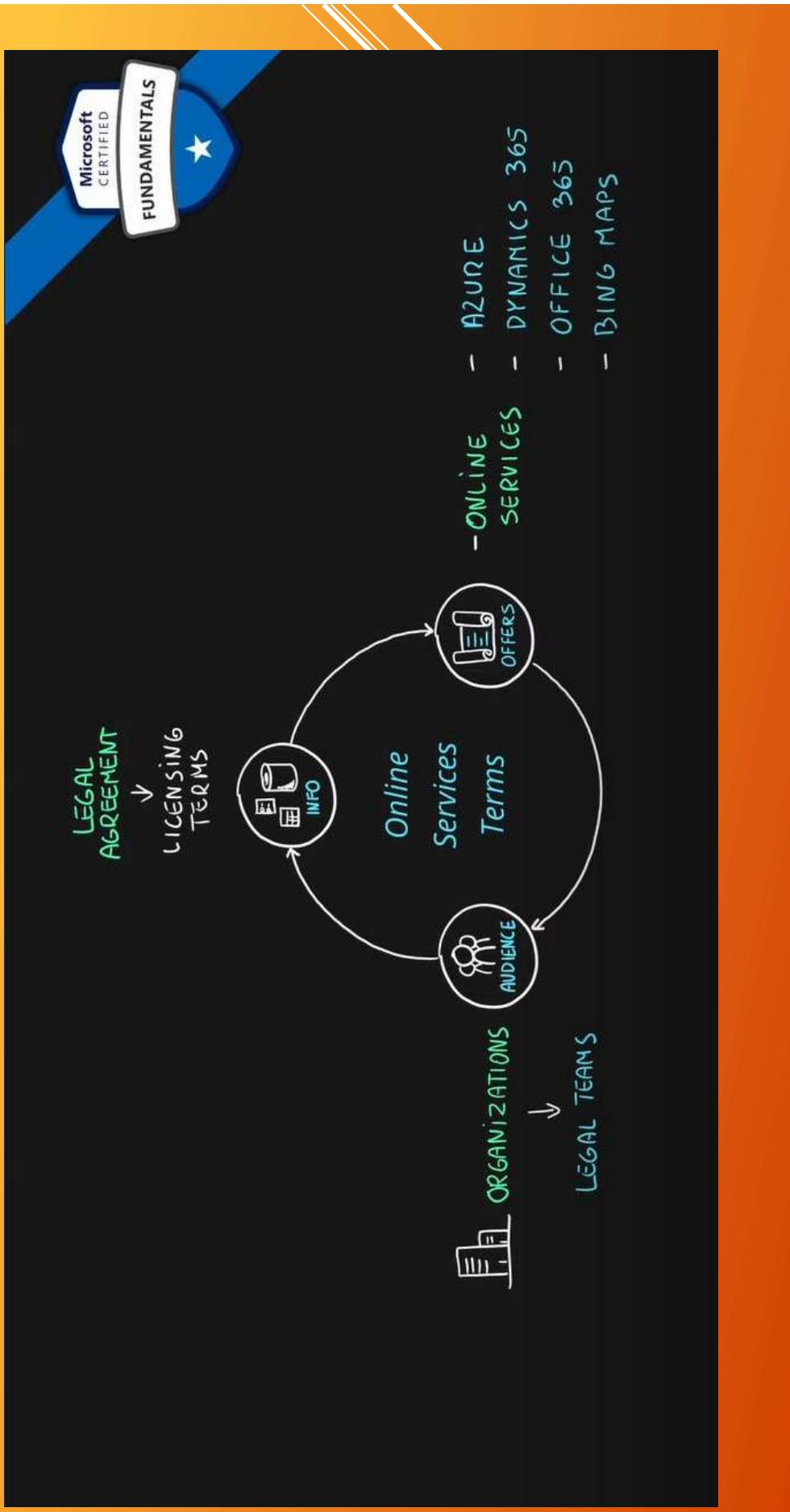
Azure Blueprints

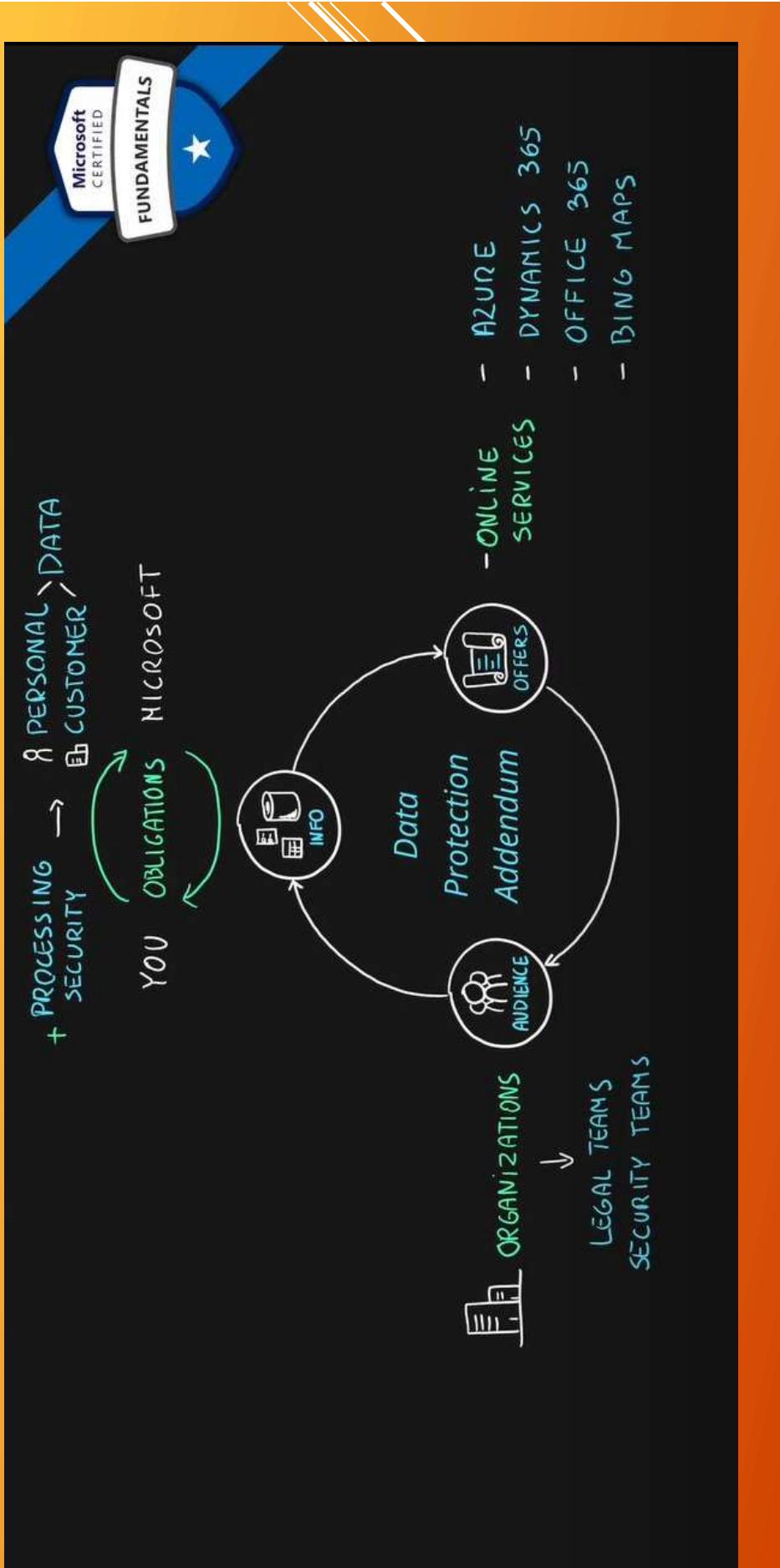
- Package of various Azure components (**artifacts**)
 - Resource Groups
 - ARM Templates
 - Policy Assignments
 - Role Assignments
- Centralized storage for organizationally **approved design patterns**
 - Blueprint **definition** – describing what should happen (reusable package)
 - Blueprint **assignment** – describing where it should happen (package deployment)

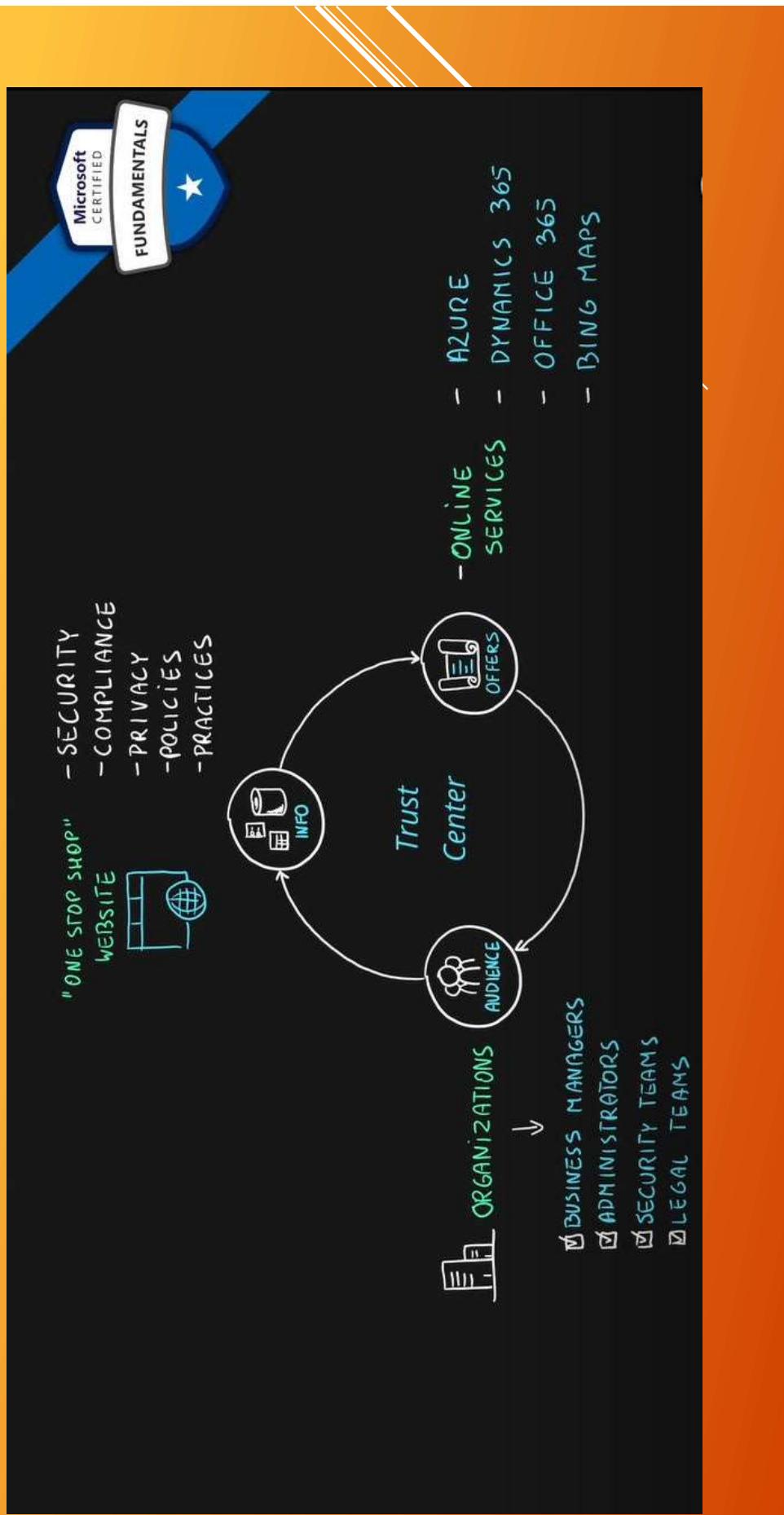
AZURE SOVEREIGN REGIONS

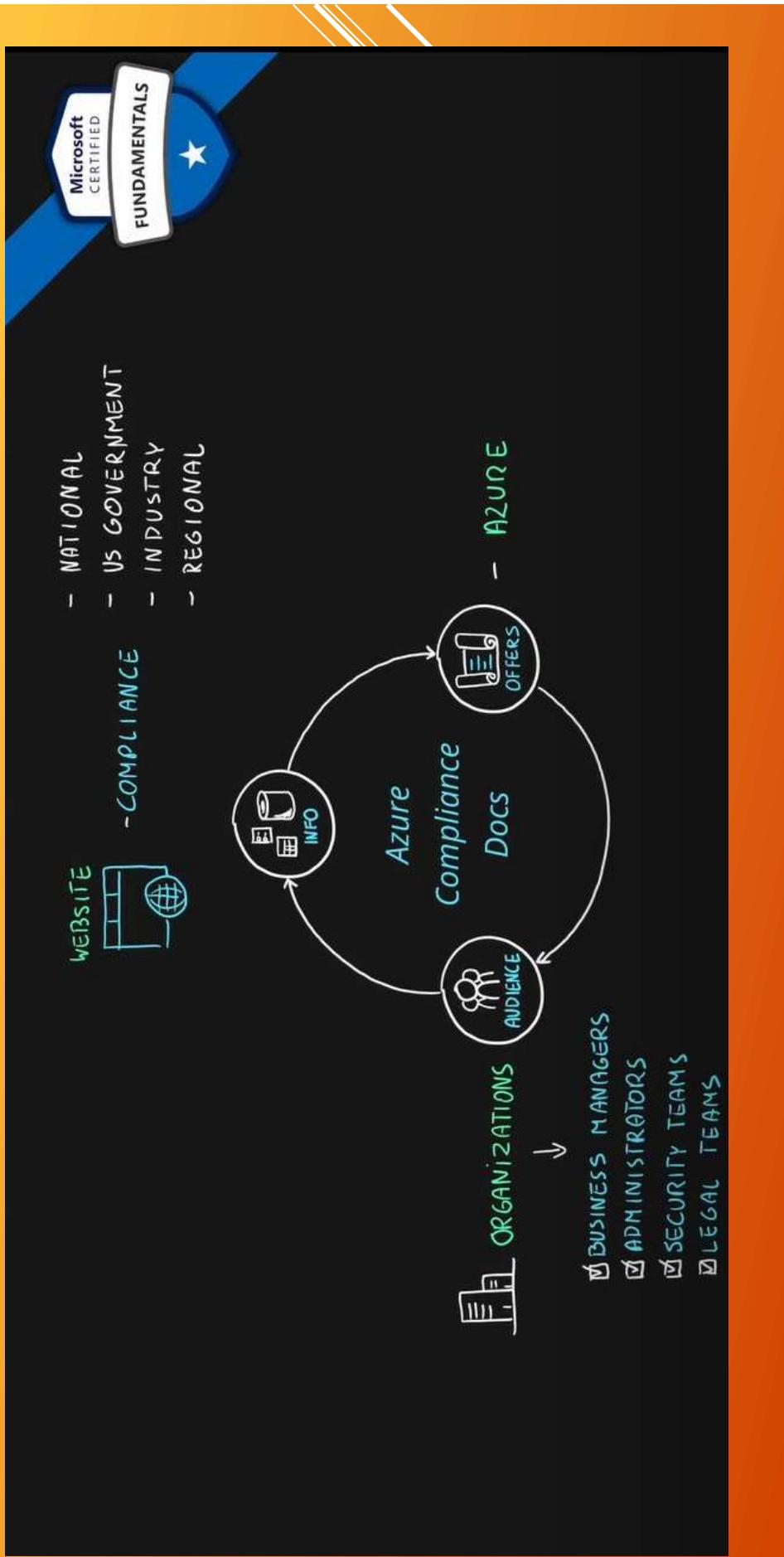














Summary

Key Characteristics

- 
- Microsoft Privacy Statement – collection, purpose and usage of personal data for all MS offers
 - Online Services Terms (OST) – license terms (use rights) for Microsoft online products and services
 - Data Protection Addendum (DPA) – in-depth specification on processing and security of personal and customer data as well as obligations of the customer and Microsoft
 - Trust Center – single place for organizations to review security, privacy and compliance of Microsoft online services
 - Azure compliance documentation – compliance documentation for Azure services
 - Azure Sovereign Regions provide Azure services in markets with very strict regulatory requirements

COST AFFECTING FACTORS



Resource Types

What kind of service do we use?



RESOURCE GROUP
FREE



VM

- CPU
- MEMORY
- UPTIME



SQl

- CPU
- MEMORY
- STORAGE
- UPTIME



LOGIC APP

- ACTIONS



STORAGE

- STORAGE x TIER
- OPERATIONS



FUNCTIONS

- EXECUTIONS
- MEMORY/SEC



Services

What is our Azure offer type?



FUNDAMENTALS



CERTIFIED



- AZURE FREE
- PAY AS YOU GO
- MPN
- VISUAL STUDIO
- MORE...

ENTERPRISE



MICROSOFT REP

PARTNER
CLOUD SOLUTION
PROVIDER

CSP



CUSTOMERS



USAGE RATES
BILLING CYCLE

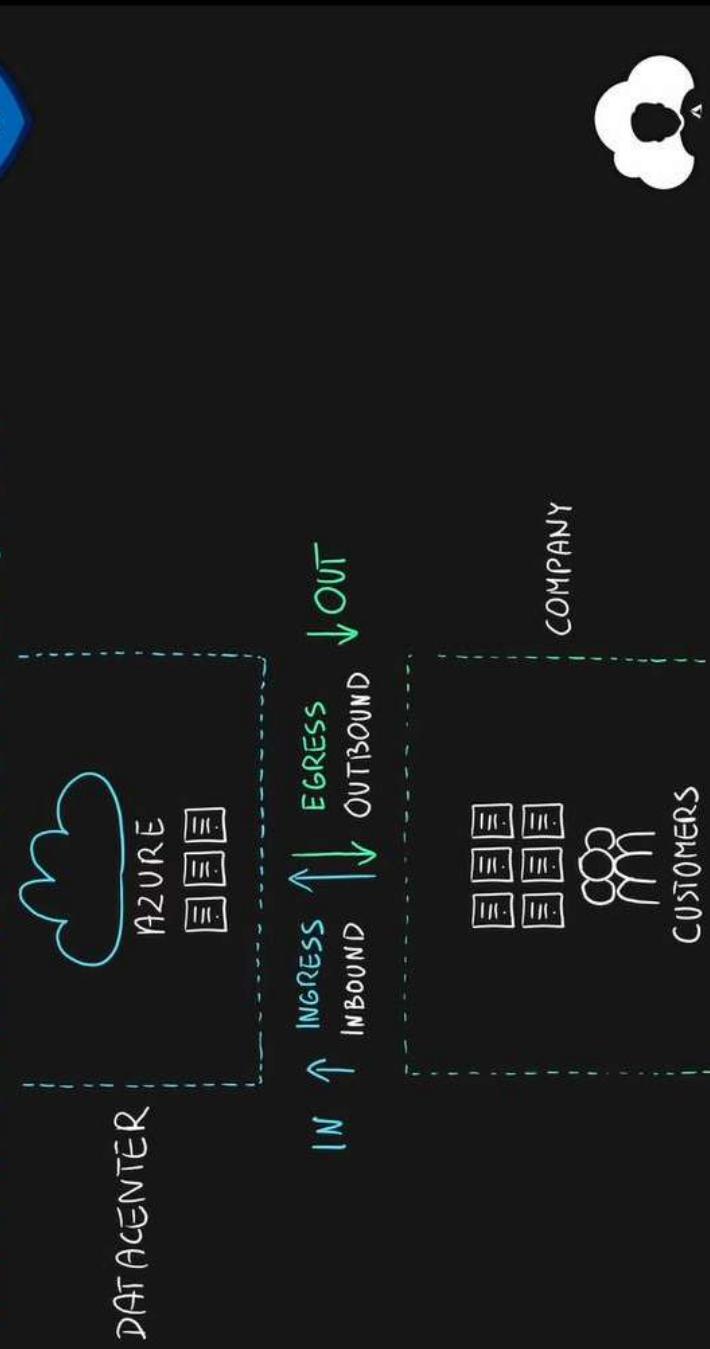
Location

Where are our services located?



Bandwidth/Traffic

How much data do we move in and out of Azure?

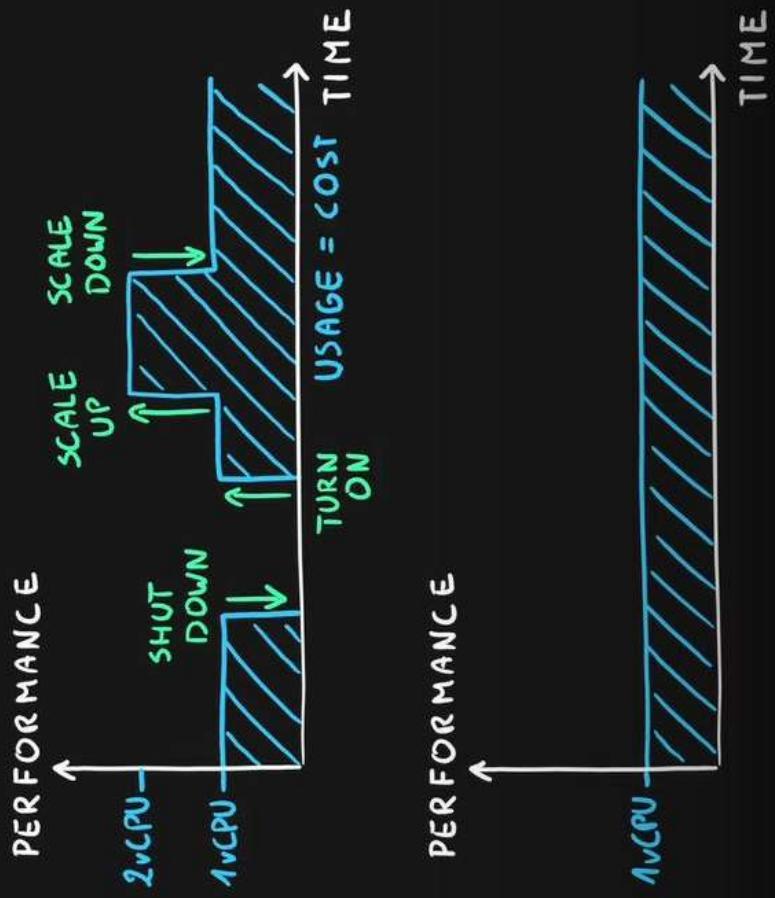


- Base Cost
 - **Resource Types** – All Azure services (resources) have resource-specific pricing models. Typically consisting of one or more metrics.
 - **Services** – Azure specific offers (Enterprise, Web Direct, CSP, etc.) have different cost and billing components like prepaids, billing cycles, - discounts, etc.
 - **Location** – running Azure services vary between Azure regions
 - **Bandwidth** – network traffic when uploading (inbound/ingress) data to Azure or downloading (outbound/egress) from Azure
- Savings
 - Reserved Instances
 - Hybrid Benefits

COST REDUCTION METHODS, RESERVATIONS



Reservations



1vCPU → \$50 / MONTH



1vCPU → \$12 / MONTH



1vCPU → \$50 / MONTH



1vCPU → \$600 / YEAR



1vCPU → \$360 / YEAR



1vCPU → \$10 / H



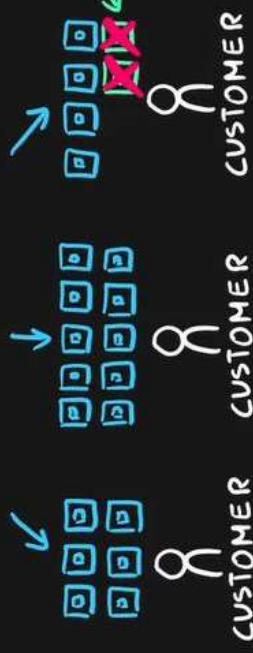
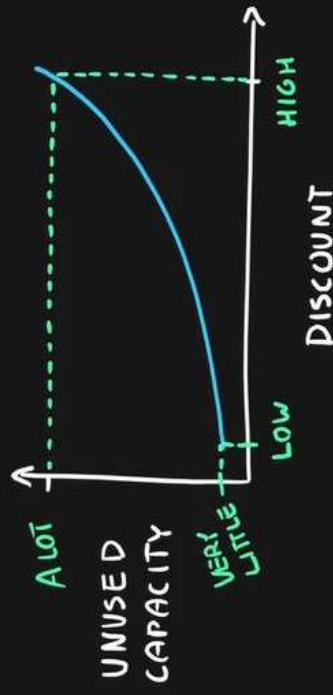
1vCPU → 60% DISCOUNT



Azure Reservations

- **Reserved instances** – Azure Virtual Machines
- **Reserved capacity** – Azure Storage, SQL Database vCores, Databricks DBUs, Cosmos DB RUs
- **Software plans** – Red Hat, Red Hat OpenShift, SUSE Linux, etc.
- **Reservations** are made for 1 or 3 years

Spot VM

DATACENTER
VM CAPACITY

Spot VM

Examples

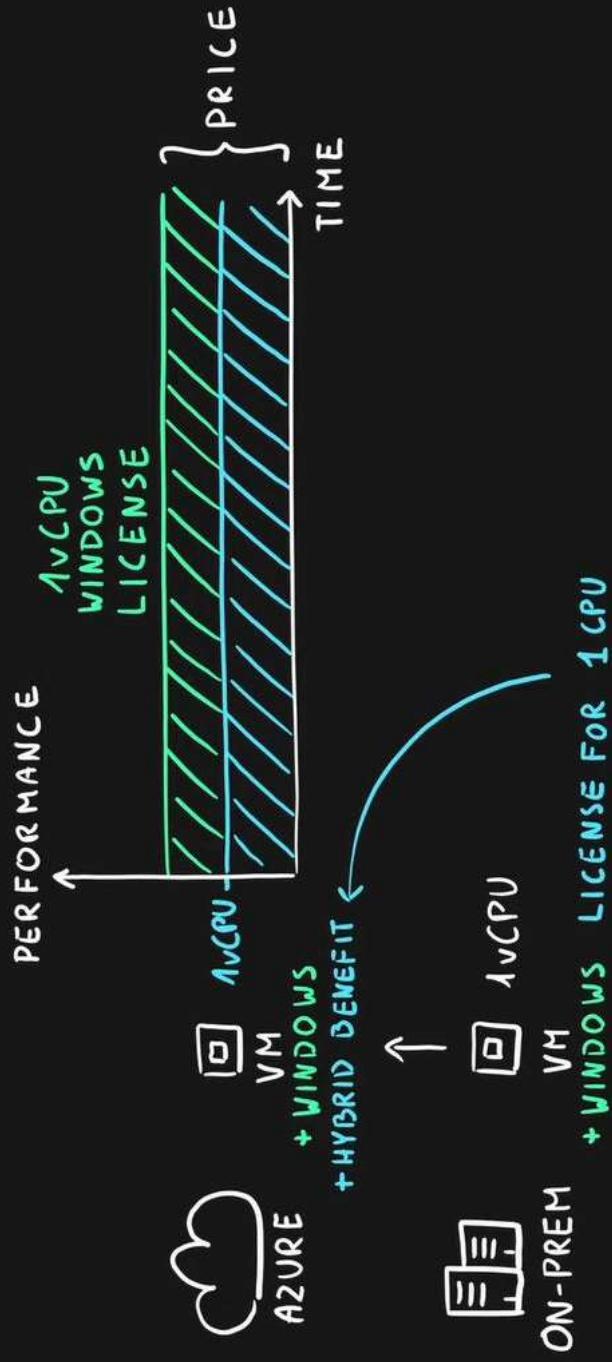
- How it works
 - Significant discount for Azure VMs
 - Capacity can be taken away at any time
 - Customer can set maximum price after discount



- Best for interruptible workloads (batch processing, dev/test environments, large compute workloads, non-critical tasks, etc.)

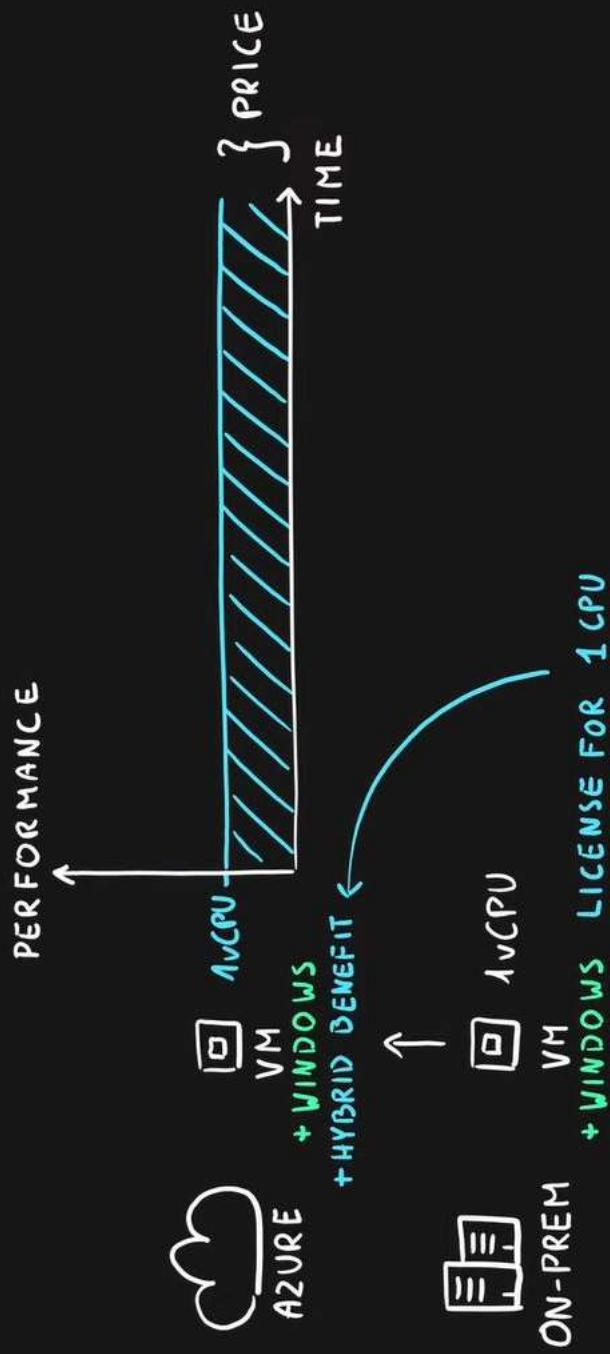


Hybrid use Benefit



ON-PREM + WINDOWS LICENSE FOR 1 CPU

Hybrid use Benefit



Hybrid Benefit

Summary

- Use existing licenses in the Azure
 - Windows Server
 - Azure VM
 - RedHat
 - Azure VM
 - SUSE Linux
 - Azure VM
 - SQL Server
 - Azure SQL Database
 - Azure SQL Managed Instance
 - Azure SQL Server on VM
 - Azure Data Factory SQL Server Integration Services



Cost Reduction Methods

Tools

- Azure Pricing Calculator – estimate cost of Azure services



Cost Reduction Methods

Tools

- Azure Pricing Calculator - estimate cost of Azure services



- Total Cost of Ownership (TCO) Calculator - compare datacenter versus Azure workloads



Cost Reduction Methods

Summary

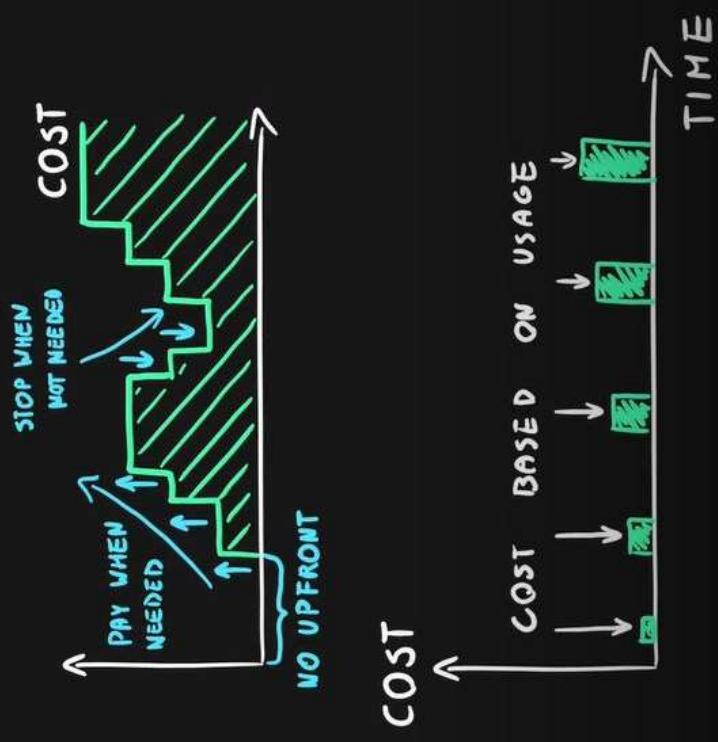
- Cost Reduction
 - Reservations (**reserved instances**, **reserved capacity**) – purchase Azure services for 1 or 3 years in advance with a significant discounts
 - Spot pricing – purchase unused Virtual Machine capacity for significant discount
 - Hybrid use benefit – use existing licenses in the cloud
- Tools
 - Pricing calculator – estimate the cost of Azure services
 - Total Cost of Ownership (TCO) **calculator** – estimate and compare the cost of running workloads in datacenter versus Azure



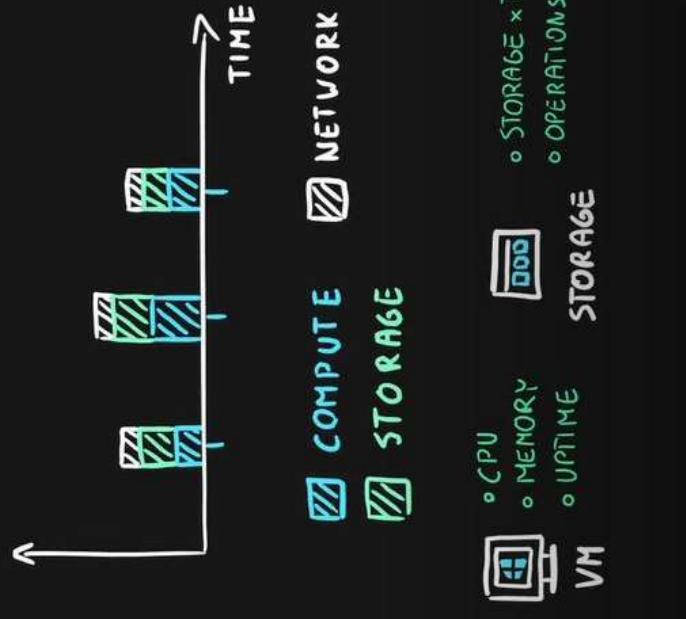
AZURE COST MANAGEMENT



Cost Management



Microsoft
CERTIFIED
FUNDAMENTALS



Cost Management



Azure Cost Management

Summary

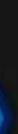
- Centralized service for reporting usage and billing of Azure environment
- Self-service cost exploration capabilities
- Budgets & alerts
- Cost recommendations
- Automated exports



Cost Management

Minimizing costs

1. Azure Pricing Calculator to choose the low-cost region
 - Good latency
 - All required services are available
 - Data sovereignty/compliance requirements
2. Hybrid use benefit and *Azure Reservations*
3. Azure Cost Management monitoring, budgets, alerts and recommendations
4. Understand service lifecycle and automate environments
5. Use autoscaling features to your advantage
6. Azure Monitor to find and scale down underutilized resources



FUNDAMENTALS



AZURE MANAGEMENT TOOLS



AZURE SUPPORT PLANS



Help + support

AZURE SUPPORT PLANS - COMPARISON



Feature	Basic	Developer	Standard	Professional Direct
Price	FREE	\$	\$\$	\$\$\$\$\$
Scope	All	Trial and non-production environments	Production environments	Business-critical applications
Email & Phone support	NOT APPLICABLE	During business hours by email only	24 X 7	24 X 7
Response time SLA	NOT APPLICABLE	Sev C:8 hours	Sev C:8 hours, Sev B:4 hours, Sev A: 1 hour	Sev C:8 hours, Sev B:4 hours, Sev A: 1 hour
Architecture Support	NA	General guidance	General guidance	Guidance from a pool of ProDirect delivery managers





AZURE ADVISOR



AZURE MONITOR



Azure Monitor



AZURE SERVICE HEALTH



AZURE MANAGEMENT SERVICES – SCENARIOS - 1

Scenario	Solution
Get details of upcoming planned outages for services you are making use of	Azure Service Health
Get details of services which will be decommissioned	Azure Service Health
Get alerts for new recommendations to improve reliability, security and performance, achieve operational excellence and reduce costs	Azure Advisor
Set up alerts for incidents & planned outages for services you are making use of	Azure Service Health
Set up alerts for issues specific to your resources - VM goes down or Database goes down or Autoscaling is triggered	Azure Monitor
Solve your application related issues	Azure Monitor (Application Insights)



AZURE MANAGEMENT SERVICES – SCENARIOS - 2

Scenario	Solution
Get suggestions on how to reduce costs of your Azure resources	Azure Advisor
Get suggestions on how to improve reliability of your Azure resources	Azure Advisor
Get suggestions on how to improve security of your Azure resources	Azure Advisor
You want to find out if you are adhering to recommended Azure best practices	Azure Advisor
Track performance of a specific database or a VM instance	Azure Monitor
Gather metrics that are tailored for your application	Azure Monitor



AZURE SLAS AND SERVICE LIFECYCLES



AZURE SERVICE LEVEL AGREEMENT (SLA)

SLA for Azure Cosmos DB

Last updated: December 2020

Azure Cosmos DB is Microsoft's fast NoSQL database with open APIs for any scale. It offers turnkey global distribution across any number of Azure regions by transparently scaling and replicating your data wherever your users are. The service offers comprehensive 99.99% SLAs which covers the guarantees for throughput, consistency, availability and latency for the Azure Cosmos DB Database Accounts scoped to a single Azure region configured with any of the five Consistency Levels or Database Accounts spanning multiple Azure regions, configured with any of the four relaxed Consistency Levels. Azure Cosmos DB allows configuring multiple Azure regions as writable endpoints for a Database Account. In this configuration, Azure Cosmos DB offers 99.999% SLA for both read and write availability.

Introduction



General Terms



SLA details



AZURE SERVICE LEVEL AGREEMENT (SLA) - REMEMBER

The following Service Levels and Service Credits are applicable to Customer's use of Virtual Machines, deployed across two or more Availability Zones in the same region:

MONTHLY UPTIME PERCENTAGE	SERVICE CREDIT
< 99.99%	10%
< 99%	25%
< 95%	100%

IDENTIFY ACTIONS THAT CAN IMPACT AN SLA

SERVICE LIFECYCLE IN AZURE

Home > Create a resource >

Marketplace

Private Marketplace Favorites Recently created Service Providers Categories

Pricing : All Operating System : All Publisher Type : All Offer Type : All Publisher name : All

Show results for 'preview'.

Showing 1 to 20 of 98 results.

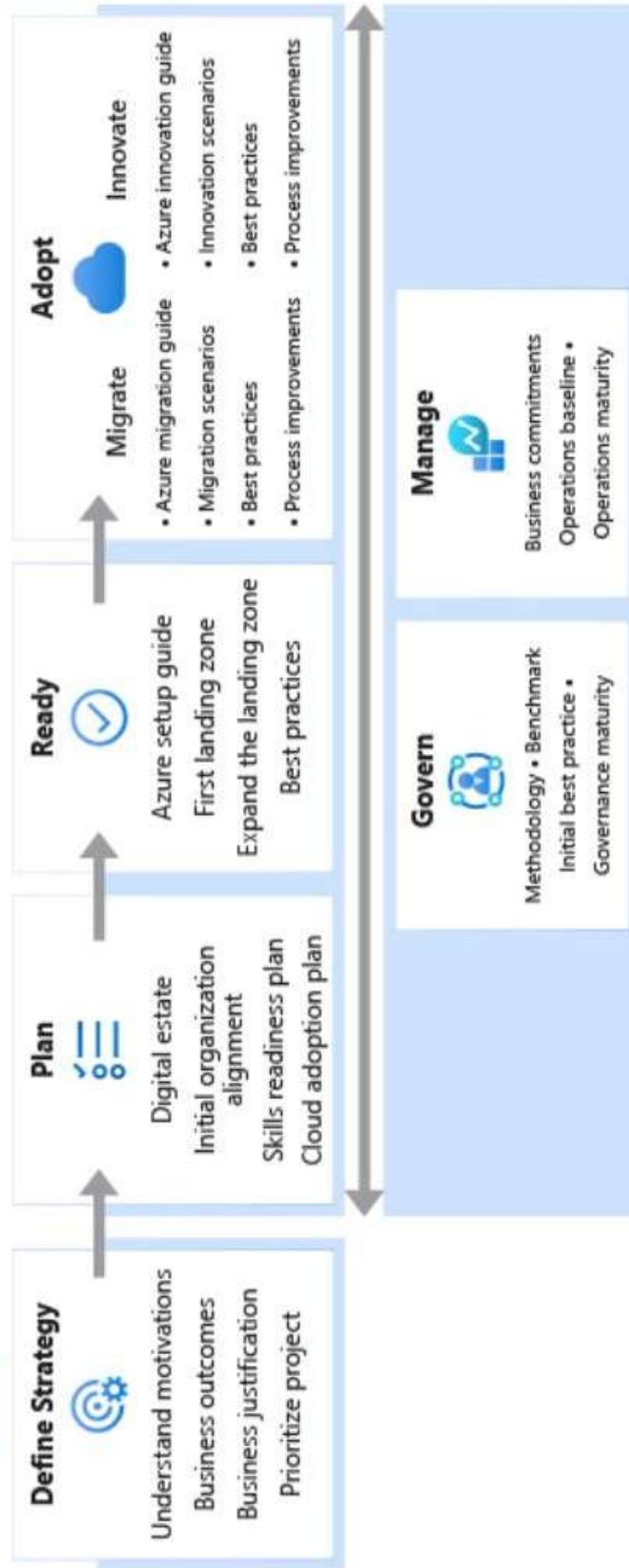
Icon	Name	Publisher	Rating
	Windows 10 Preview	Microsoft	No rating
	Azure SQL Analytics (Preview)	Microsoft	★★★ (3.8 (13 ratings))
	Blockchain		
	Compute		
	Containers		
	Databases		

AZURE GOVERNANCE FEATURES

CLOUD ADOPTION FRAMEWORK FOR AZURE



Microsoft Cloud Adoption Framework
for Azure



PRIVACY AND COMPLIANCE

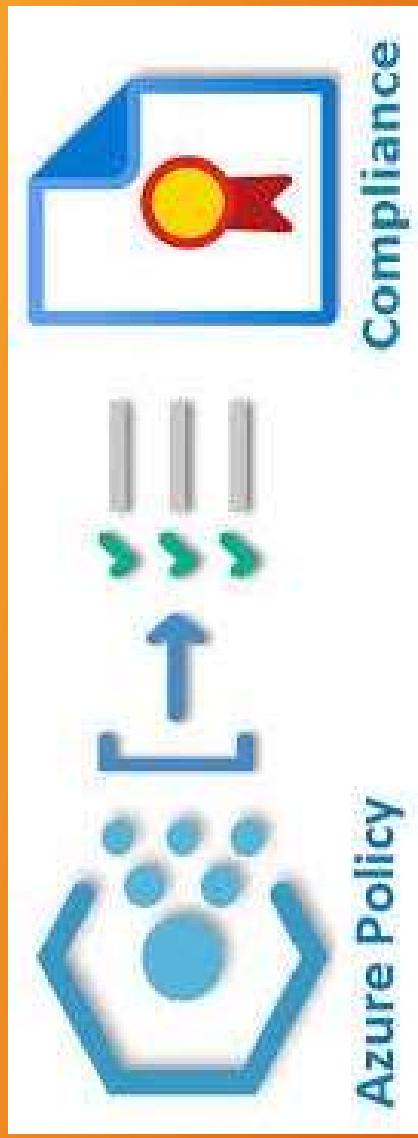


AZURE - PRIVACY & INFORMATION PROTECTION



Service/Documentation	Description
Microsoft Privacy Statement	Explains the personal data Microsoft processes, how Microsoft processes it, and for what purposes.
Product Terms Site	Terms and conditions for software and online services products.
Data Protection Addendum	Your and Microsoft's obligations with respect to the processing and security of Customer Data and Personal Data in connection with Azure Search for DPA at https://www.microsoftvolumelicensing.com/DocumentSearch.aspx . Covers Data transfer, Data retention, Data deletion and Data Security
Azure Information Protection	Classify and protect your documents and emails Add labels indicating what kind of protection/encryption you want Uses Azure Rights Management (Azure RMS) - Integrates with Office 365, Azure Active Directory etc Protection stays with the documents and emails independent of the location, networks, file servers, and applications

COMPLIANCE & AZURE - COMPLIANCE HUB & MORE



AZURE & COMPLIANCE - A QUICK SUMMARY

Service	Description
Service Trust Portal	Independent audit reports for Microsoft's Cloud services https://servicetrust.microsoft.com
Azure Compliance Hub	Compliance offerings in Azure https://docs.microsoft.com/en-us/azure/compliance/ Offers blueprints to simplify your compliance implementations
Azure Compliance Manager	Manage your organization's compliance requirements Part of Service Trust Portal



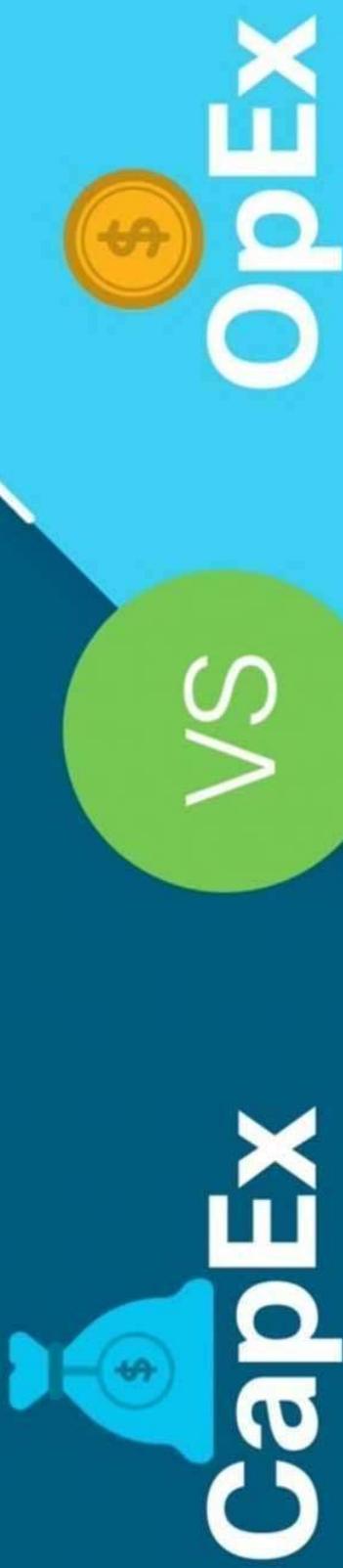
AZURE SOVEREIGN REGIONS



Service	Detail
Azure global	What we are using until now!
Azure Government	<p>Cloud environment specifically built to meet compliance and security requirements for US government</p> <p>Examples: FedRAMP (Federal Risk and Authorization Management Program), NIST (National Institute of Standards and Technology), ITAR (International Traffic in Arms Regulations), IRS 1075 (Internal Revenue Service), DoD (U.S. Department of Defense) L4, and CJIS (Criminal Justice Information Services)</p> <p>Uses physically isolated data centers and networks located in US</p> <p>Only US government entities and contractors are eligible to use Azure Government services</p>
Azure China	<p>Physically separated instance of cloud services located in China</p> <p>Operated by 21Vianet (Azure China)</p> <p>Complies with regulation in China (China Telecommunication Regulation)</p>
Azure Germany	Physically isolated instance of Microsoft Azure in Germany. No longer accepting customers!

AZURE COST MANAGEMENT - PLANNING AND MANAGING COSTS

CONSUMPTION-BASED VS FIXED-PRICE PRICING MODELS



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