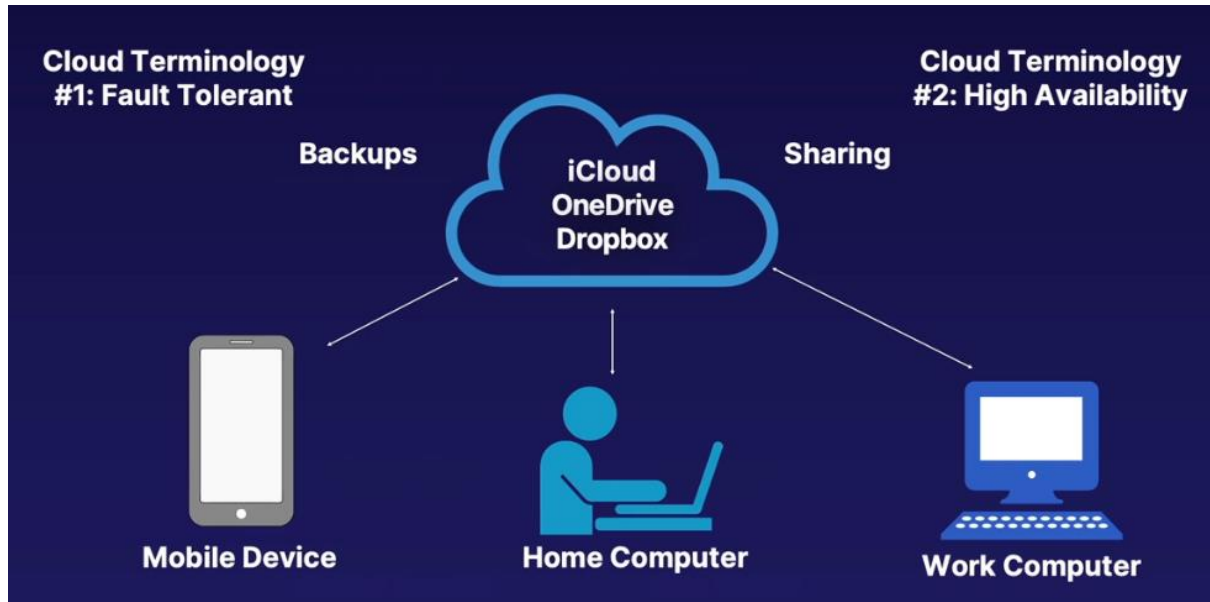


Introduction to Azure

Cloud Terminology

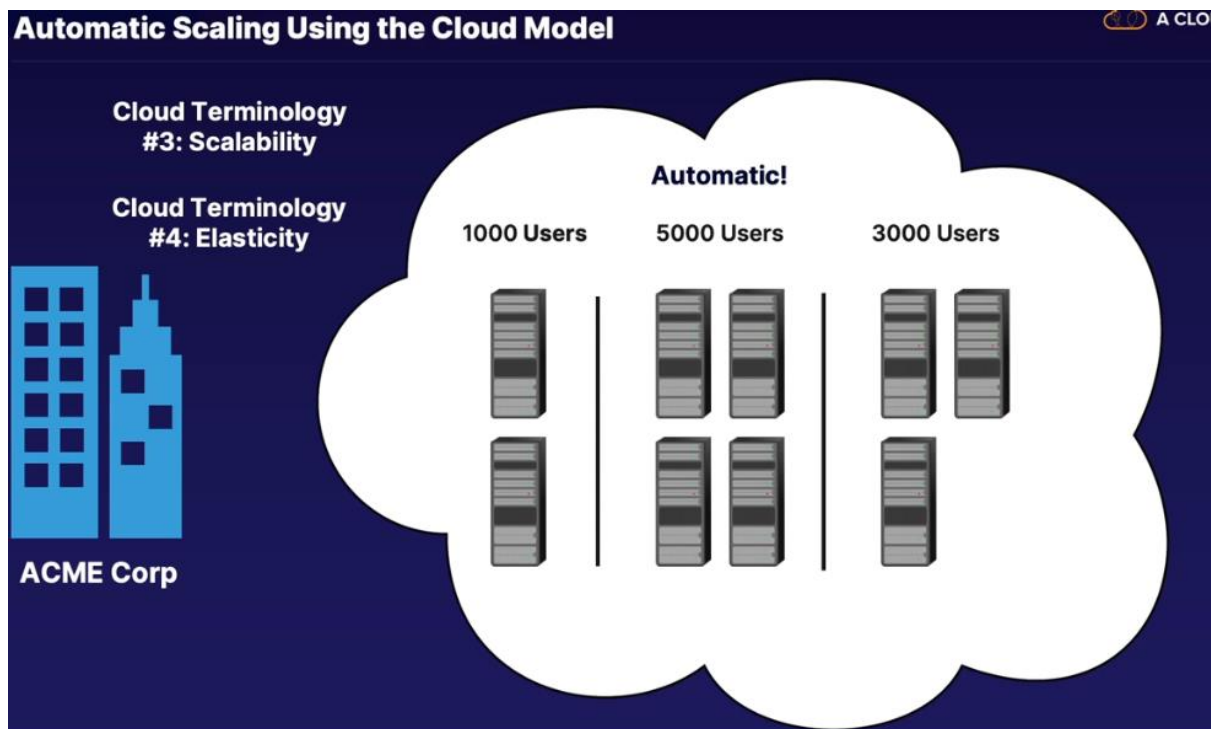
Fault tolerance

High Availability



Scalability


Elasticity



Chapter 2

Microsoft Azure

What Is Azure?



Microsoft's public cloud computing platform

Over 200 individual products and services

Build, run, and manage applications on Microsoft's global infrastructure

- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)

Supplement or replace existing on-premises computing services

Cloud computing power is a Pay as you go service

Pay-as-You-Go Pricing

- No up-front commitment for resources
- Billed by the second for using services — e.g., use a VM for 103 seconds, only pay for 103 seconds



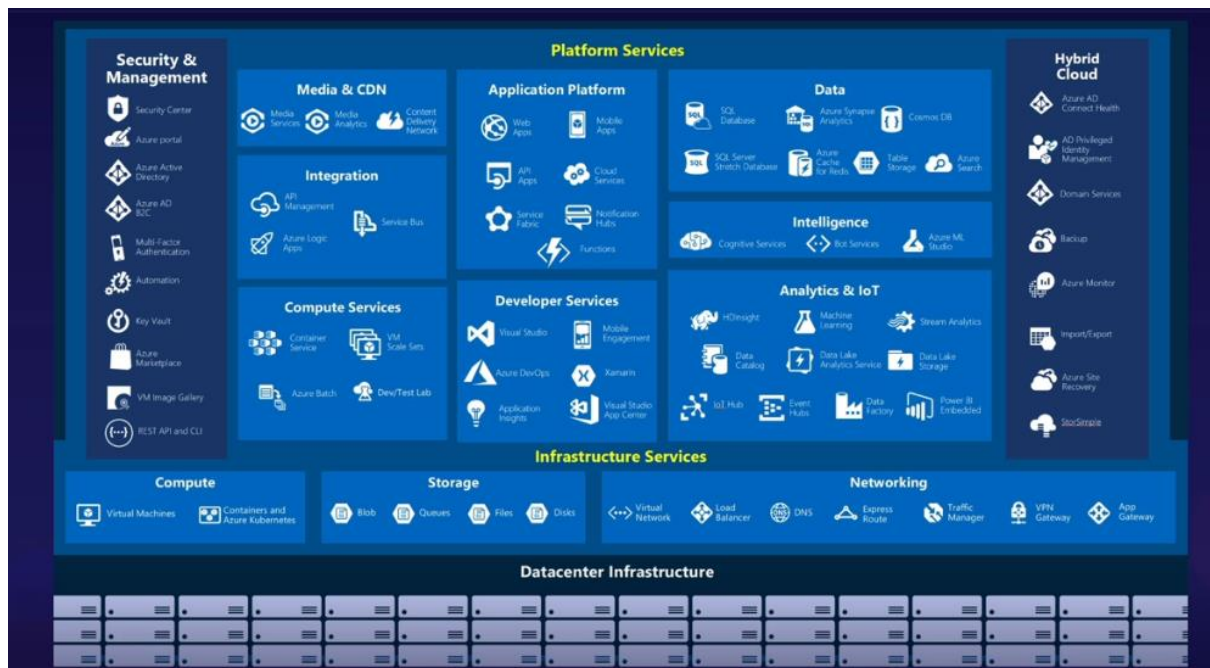
Availability and Regions

Region	Group of datacenters in a single geographic location.	Central US, South India
Availability Zone	One of several unique locations in a region.	One or more individual datacenters per zone. Each zone is self-contained (power, cooling, networking).

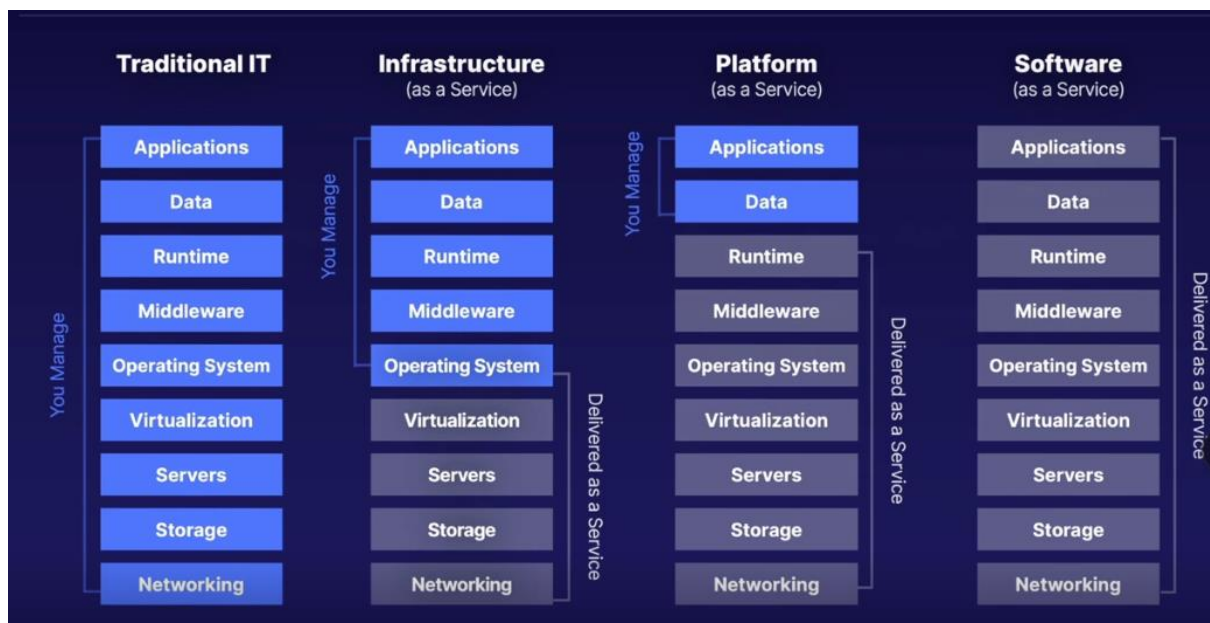
Purpose of Regions and Availability Zones

Region	High Availability Fault Tolerance	Be closer to your end users. Defend against regional outage.
Availability Zone	Fault Tolerance	Deploy resources across zones. Protect against single point of failure.

Azure Services



IaaS vs PaaS vs SaaS



Infrastructure as a Service (IaaS)

- Virtual servers
- You are responsible for maintaining OS

Platform as a Service (PaaS)

- Cloud vendor maintains infrastructure for you
- You focus on application code and data

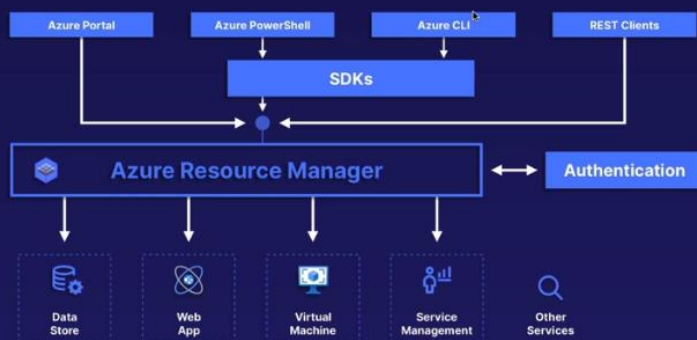
Software as a Service (SaaS)

- Vendor provides full software stack

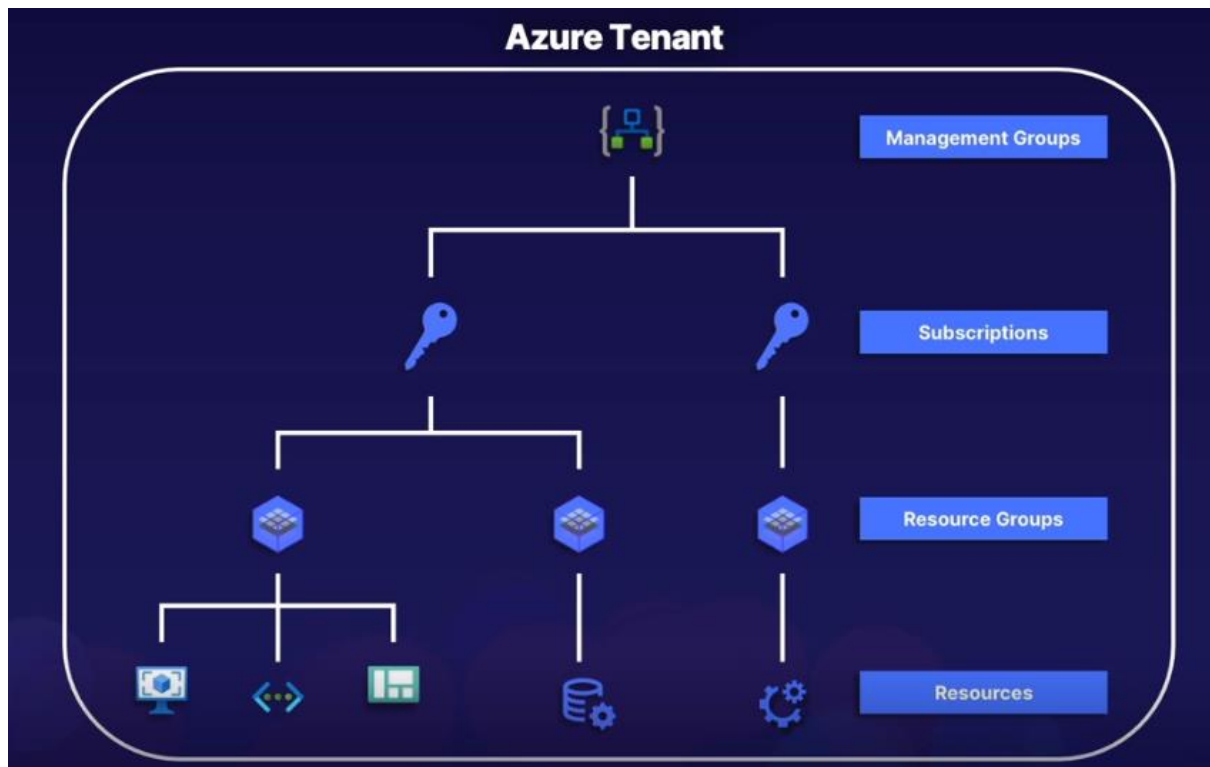
Interacting with Services

All service interaction via Azure Resource Manager (ARM)

- Centralized management layer
 - Web portal
 - Command-line interface (CLI)
 - Application access
 - Access control (authentication)

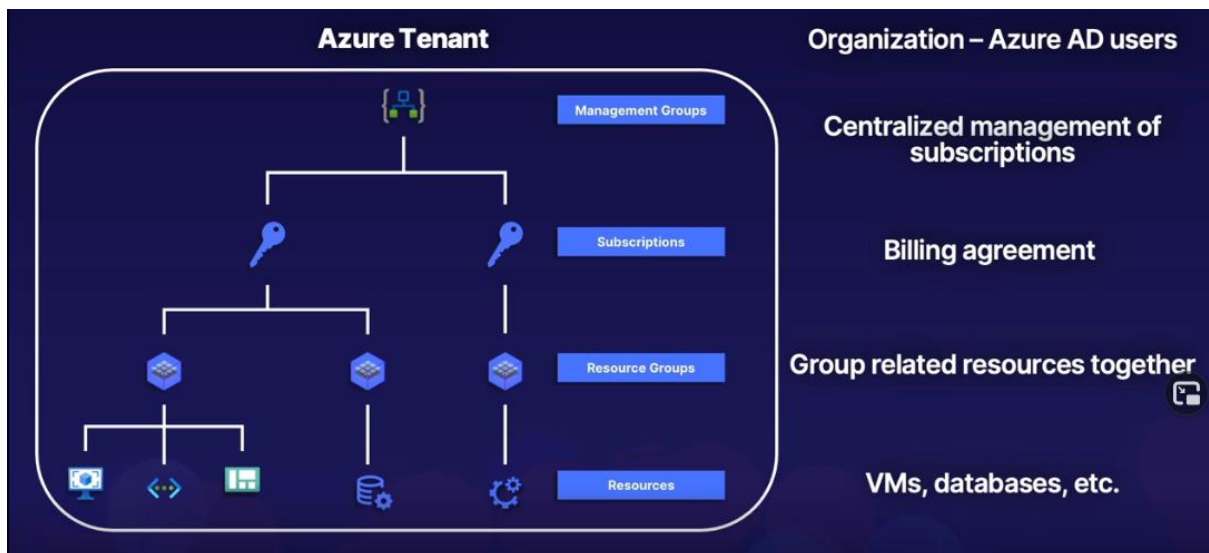


Azure Resource Hierarchy



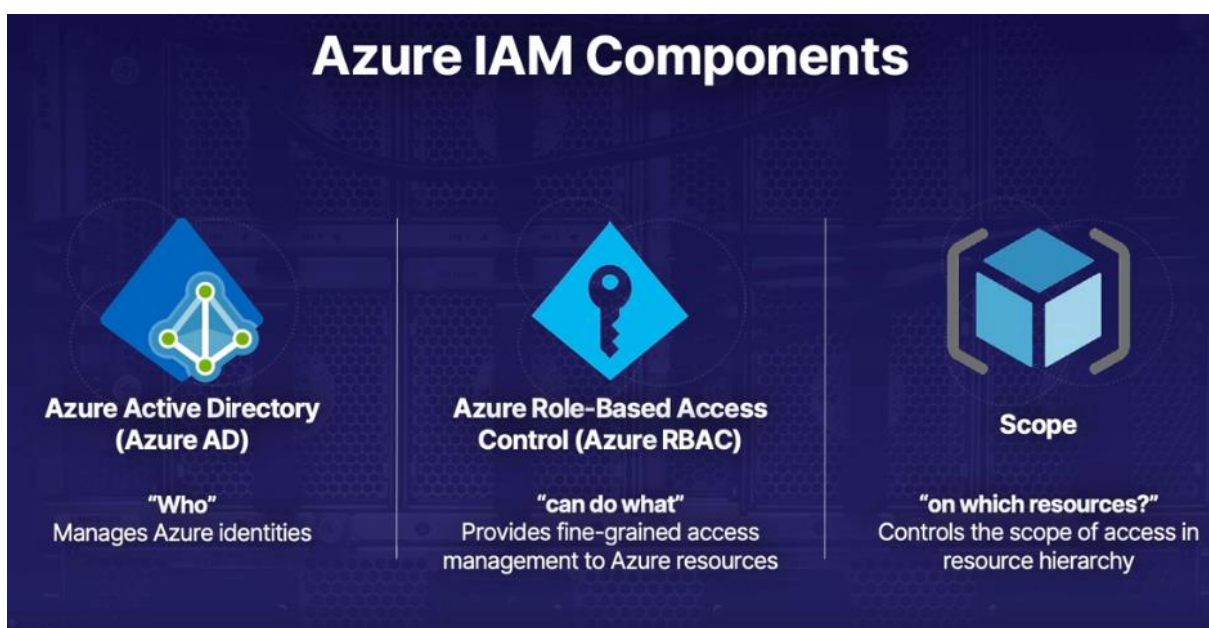
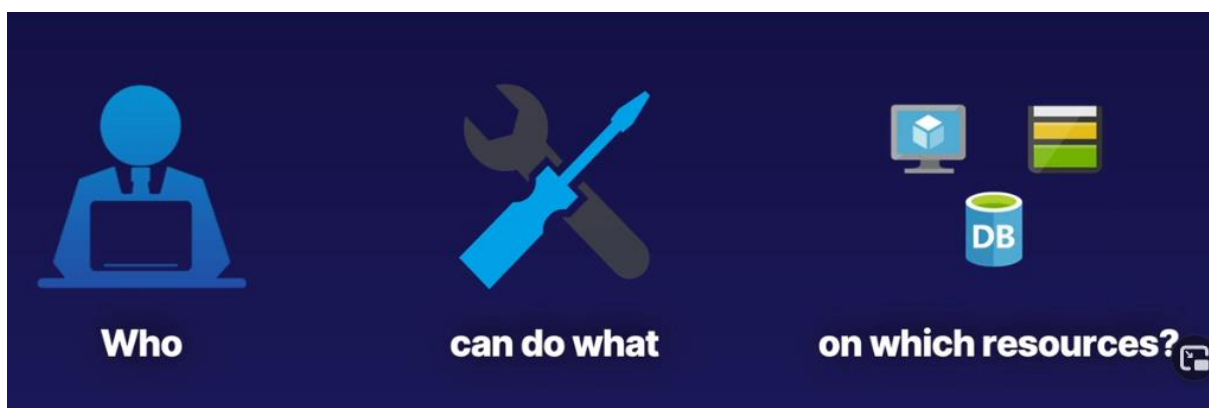
Azure Resource Hierarchy Components

Tenant	Single organization instance of Azure AD	Single "bucket" to manage all users
Management groups	Grouping component (technically optional)	Central management of multiple subscriptions
Subscriptions	Primary billing and access isolation boundry	Each subscription has its own billing agreement
Resource groups	Group resources together for same purpose/lifecycle	All Azure resources created in Resource Group
Resources	Anything created on Azure (VM, storage account, etc.)	



Identity and Access Management



Who can do what on which resources



Azure Active Directory

Cloud-based identity service

- One per tenant (company)
- Provides identity – “who are you?”
- Identity = **security principal**
- Manage end users (people) or applications
- Email format (end user) – matthew@mycompany.com




User Group Service principal Managed identity

Azure Role Based Access Control - Azure RBAC

Control access using roles

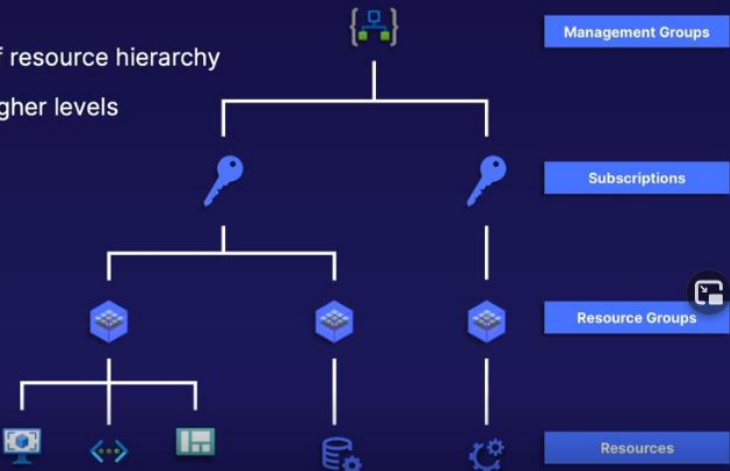
- “What are you allowed to do?”
- Assign **roles** to a **security principal**
- Roles are collections of specific **permissions**
- General and specific role types:
 - **Owner** – full access to all resources in scope
 - **Virtual Machine Contributor** – only access to manage VMs



Scope – The set of resources allowed to access

The set of resources allowed to access

- “On which resources?”
- Roles granted to various layers of resource hierarchy
- Lower levels **inherit** roles from higher levels
 - Centralized management

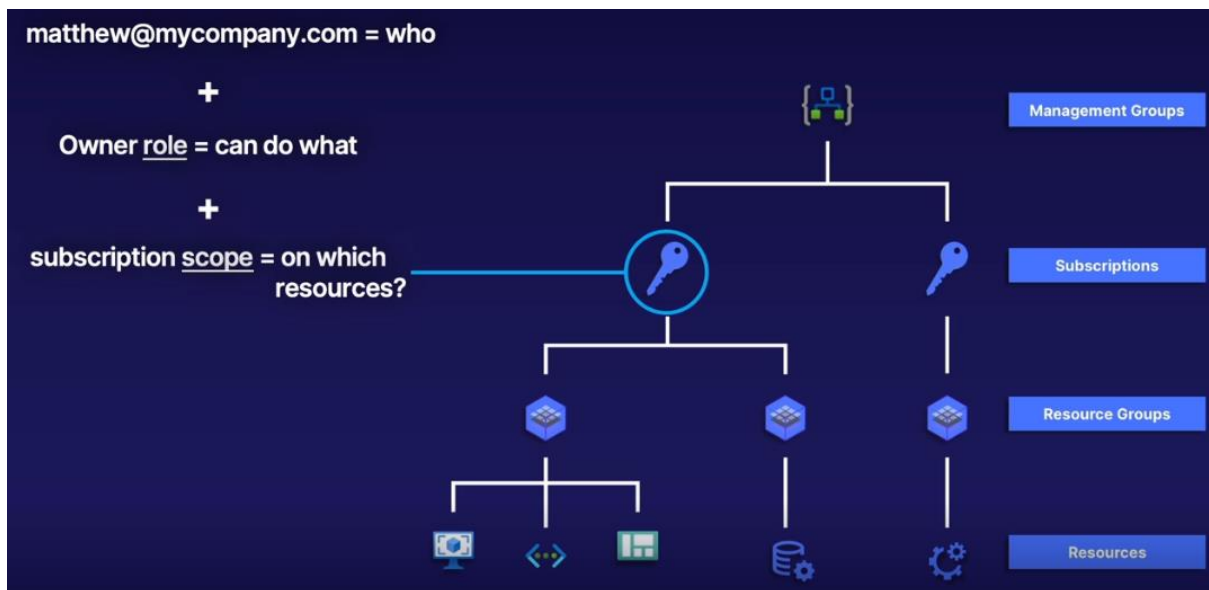


Management Groups

Subscriptions

Resource Groups

Resources



Azure Monitoring

Cloud visibility mechanism to provide information about what's happening within our resources.

Visibility into cloud performance is critically important!

- 1 Are my resources performing as expected?
- 2 Are there errors I need to be aware of?
- 3 Who is making changes to my cloud environment?

The image shows a detective wearing a grey hat and a magnifying glass over his eye, looking intently. He is wearing a light-colored shirt and a dark tie. The background is dark blue.

Logs

Text-based records of events

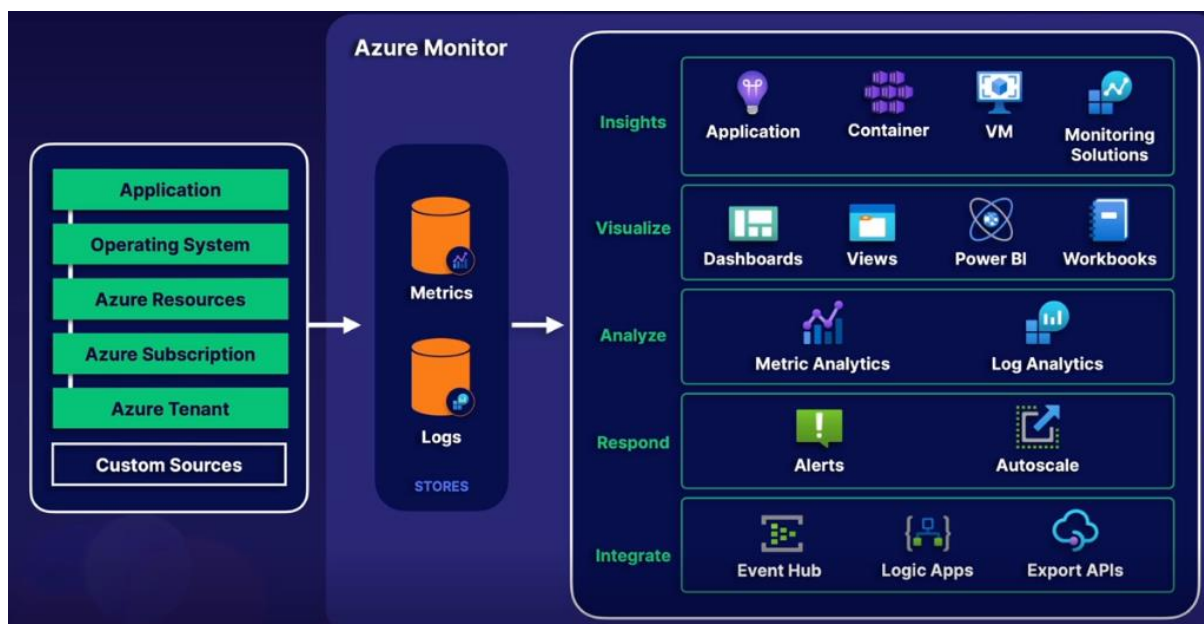
- **Activity logs:** "Who created the resource and when?"
- **OS logs:** "Why is Windows giving an error?"



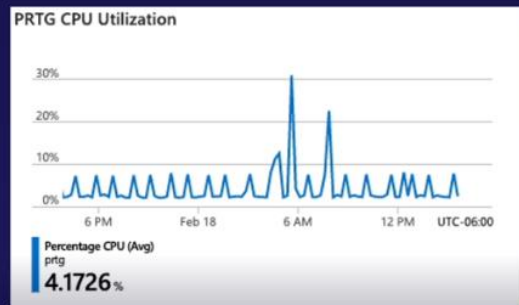
Metrics

Telemetry-based performance data

- CPU utilization
- Website latency



How does Azure Monitor answer the question: "What's happening?"

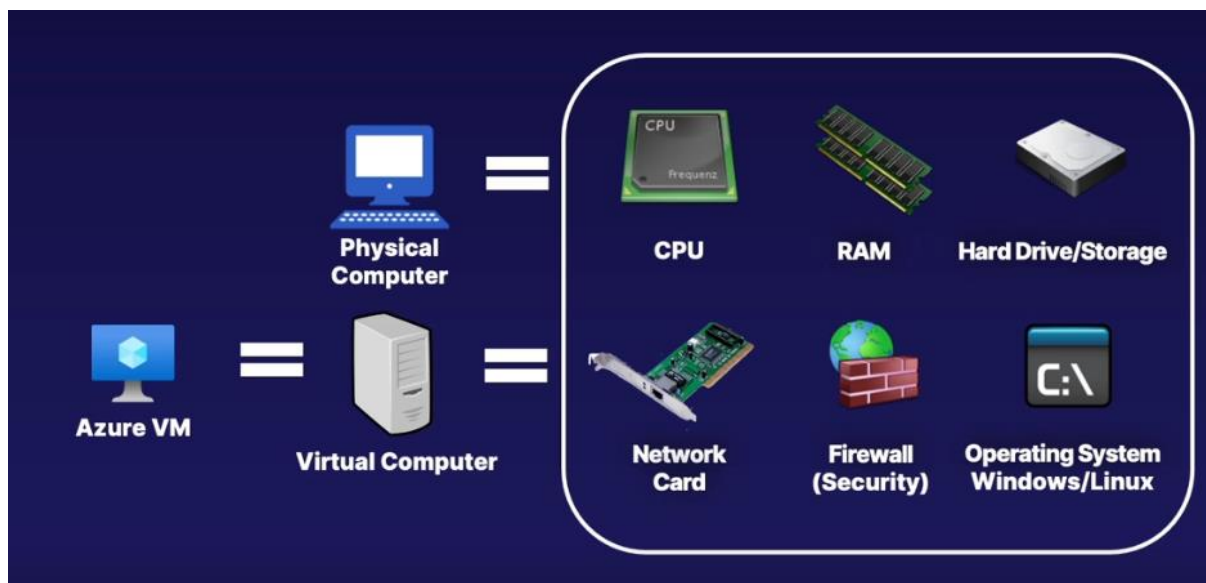


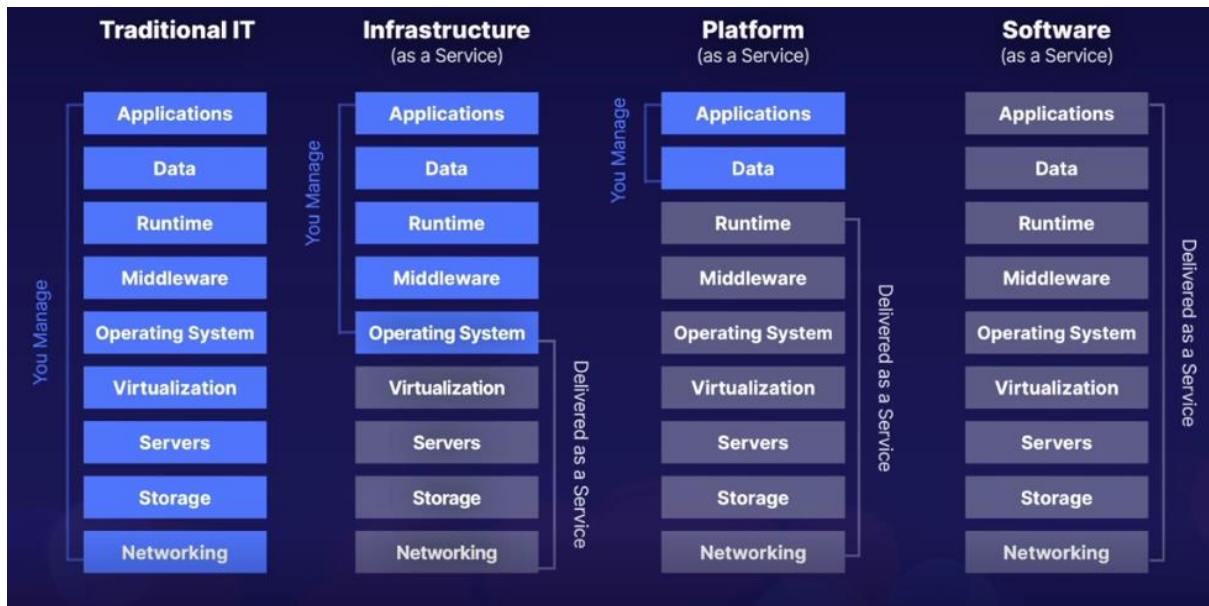
- Explore performance metrics in dashboards
- Troubleshoot Windows system errors
- Automatically alert someone when something goes wrong
- Create automated responses to events

Chapter 3

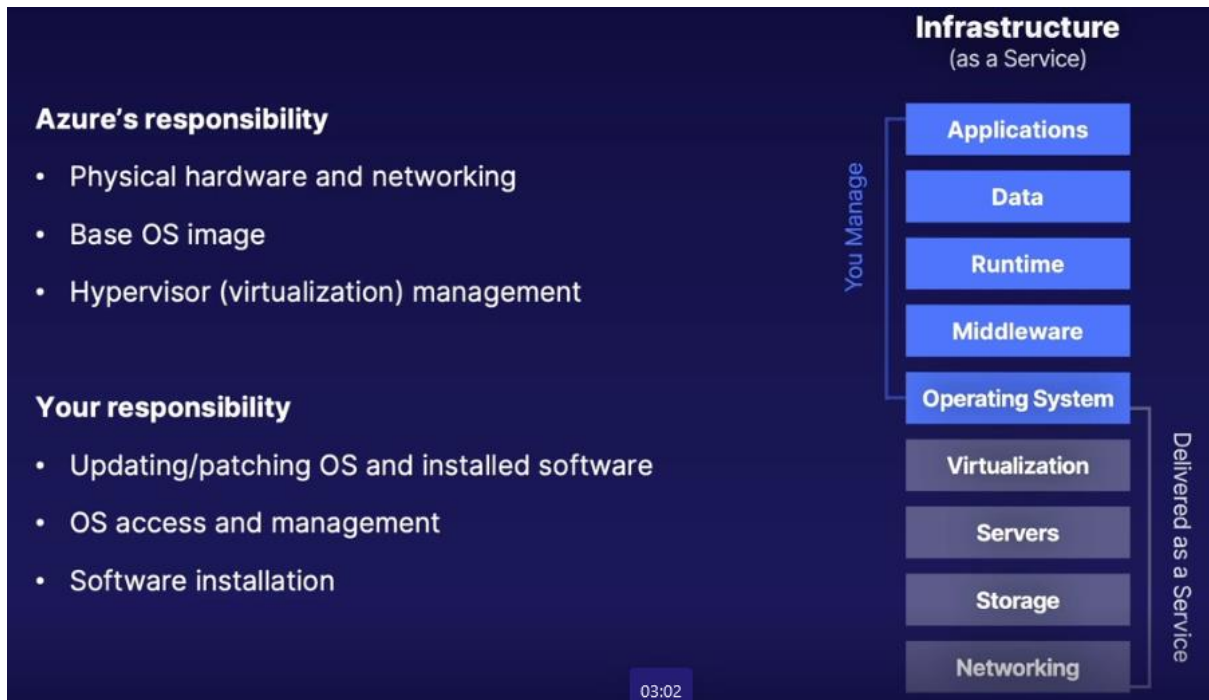
Virtual Machines

A virtual computer

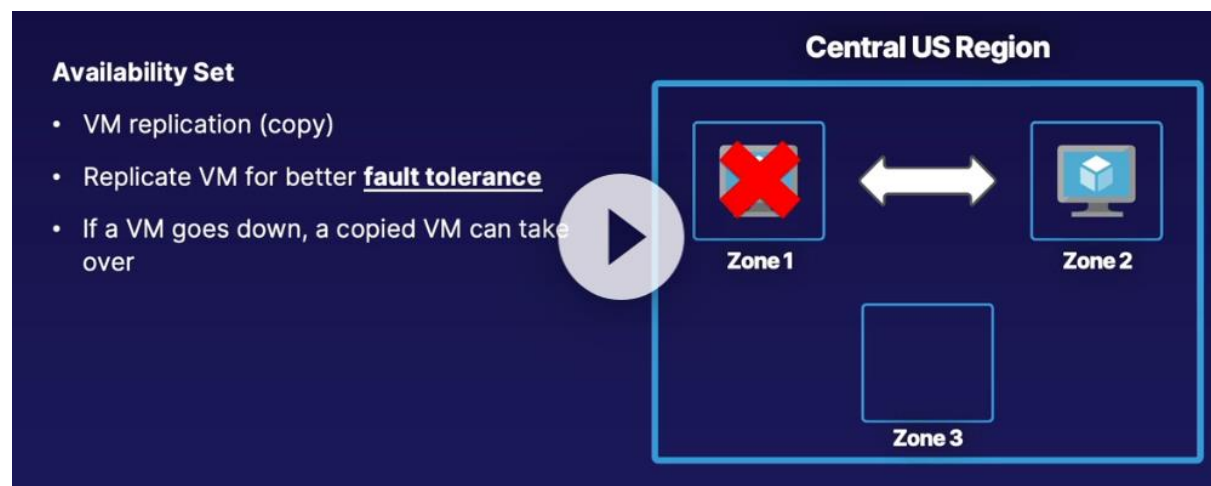




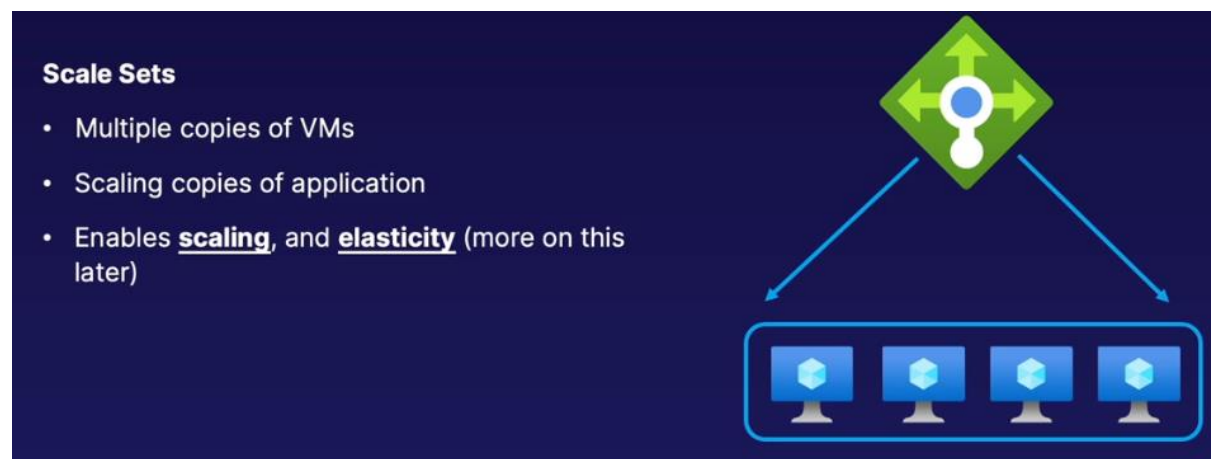
Scope of Responsibility



Availability Set



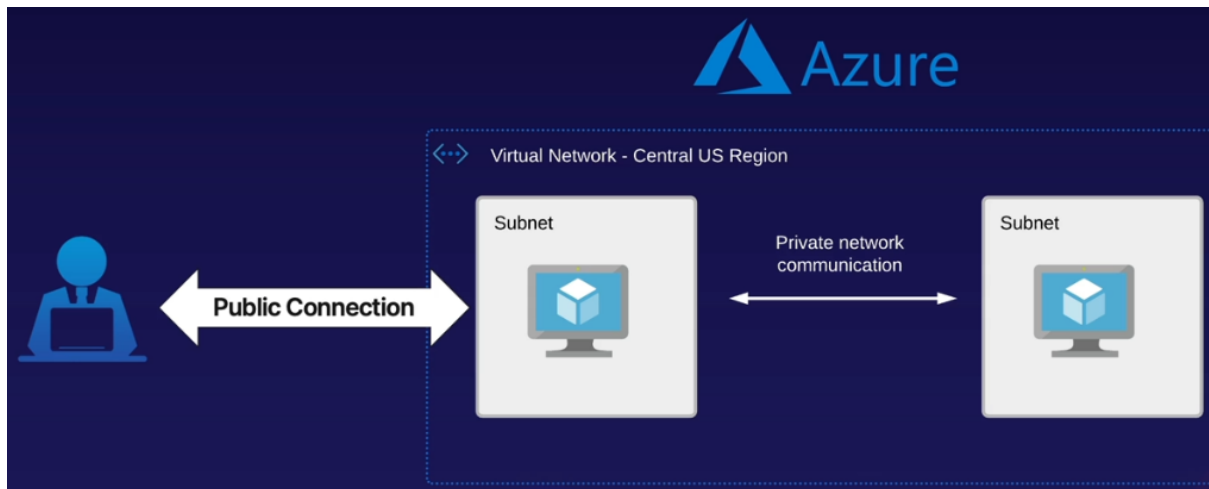
Scale Set



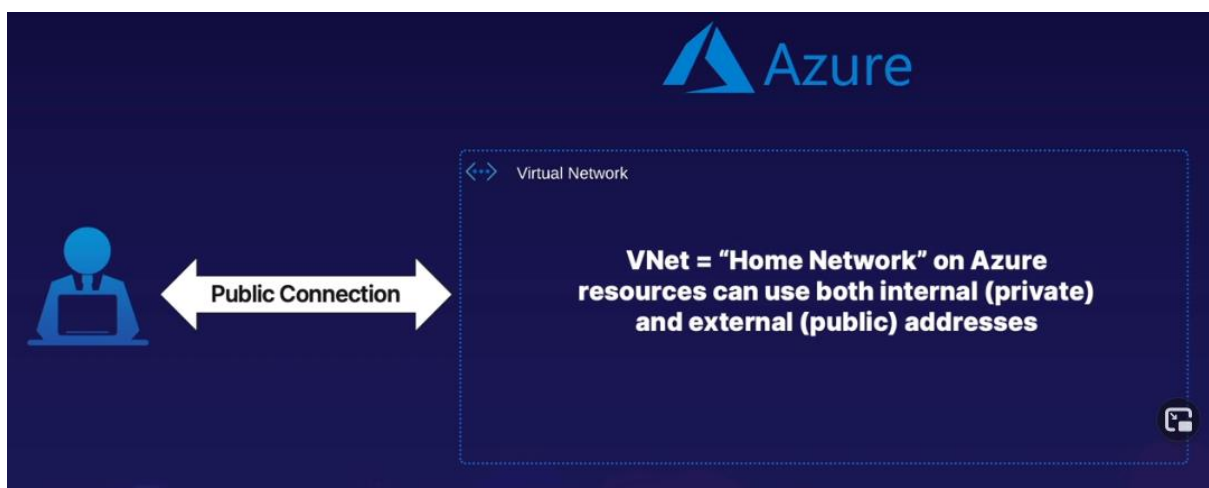
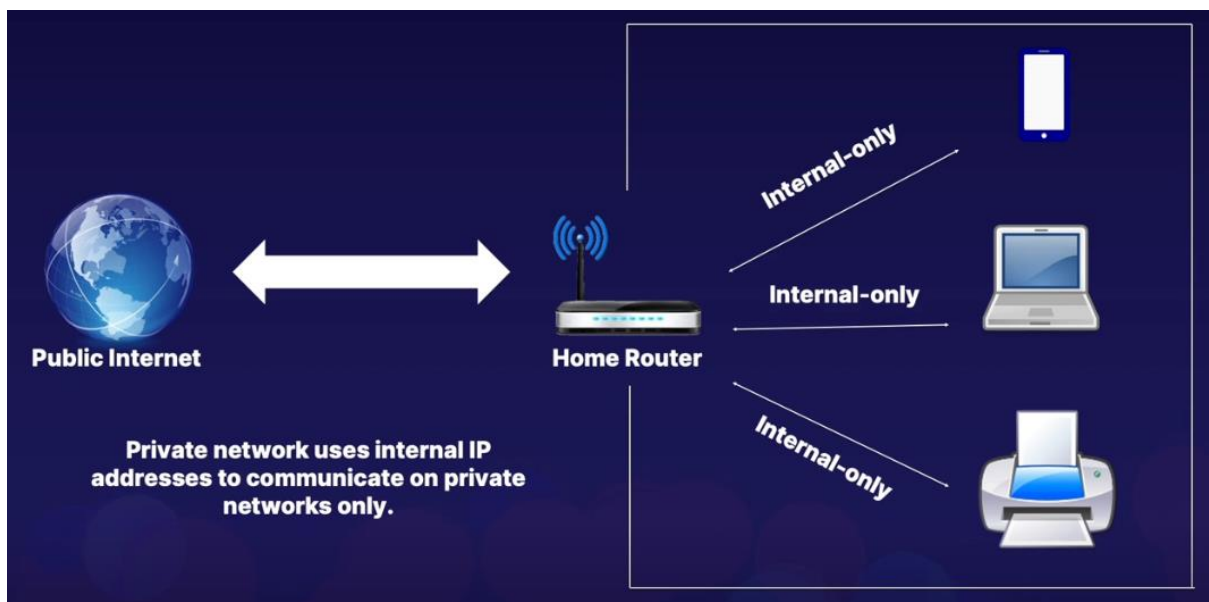
Networking

Azure Virtual Network – VNet





Private Network



Familiar networking tools to manage access:

Subnets

Segment multiple resources for precise organization

Peering/VPN/Express Route

Connect to other Azure VNets across regions, on-premises networks, or other cloud networks

Network Security Groups/Firewall

Control access to VNet resources by network protocol, port, or source locations

Storage

What Are Storage Accounts?

Azure's all-purpose storage solution for multiple data storage scenarios

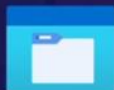
Massively scalable – petabytes and up

Managed infrastructure – just store your stuff and go

Flexible access options



Blob (object)



Files



Disks

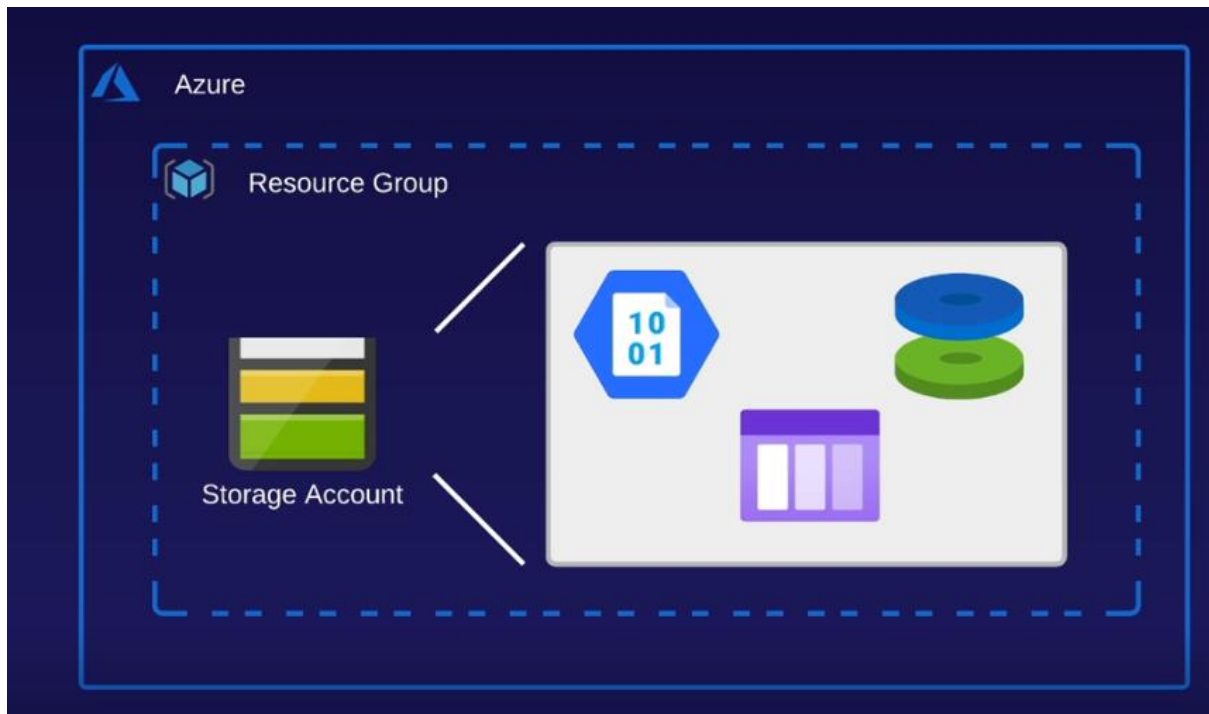


Queues



Tables (...kind of)

Storage Account Infrastructure



Blob – Binary Large Object

- Object storage
- Unstructured data
- All file types (images, videos, scripts, etc.)

Files

- Network file share in the cloud

Disks

- Virtual hard drives for VMs

Queues

- Asynchronous messaging between apps and services

Tables

- NoSQL database storage
- Gradually transitioning to Cosmos DB



Databases and Analytics

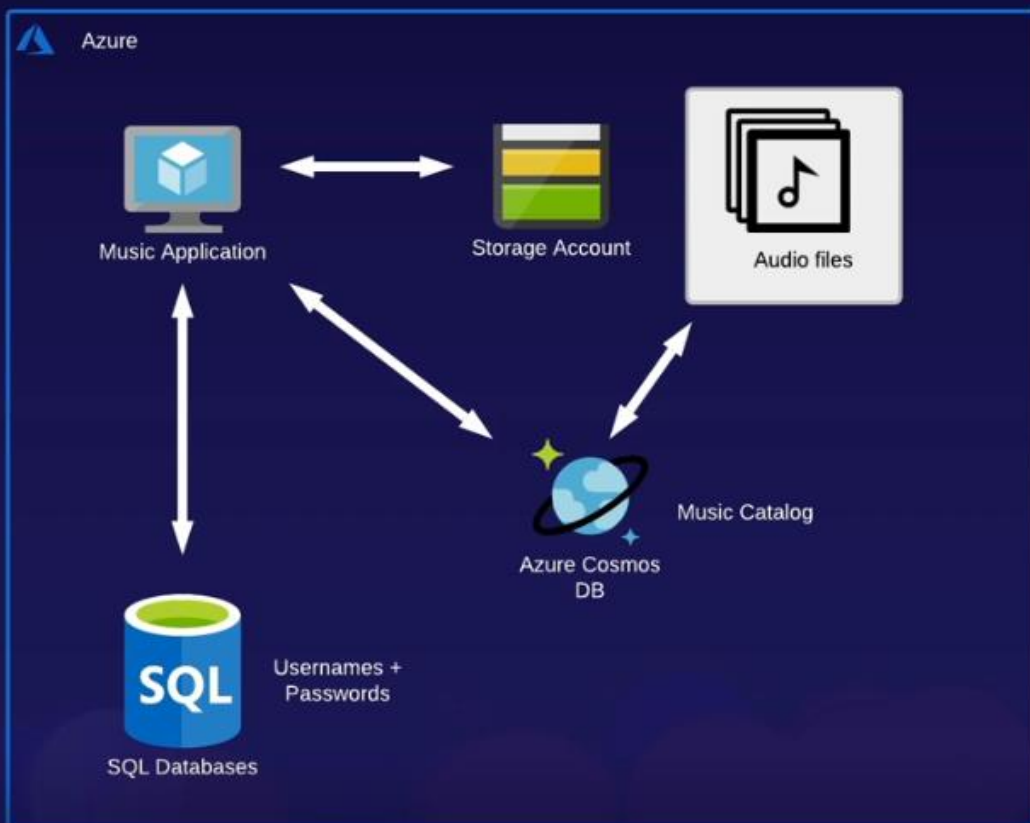
Multiple managed database services (PaaS)

Azure SQL, Cosmos DB, Managed MySQL/PostgreSQL, and others

- Multiple options with different use cases/levels of management
 - SQL vs. NoSQL
 - “Fully managed” vs. provisioned infrastructure
 - You set the compute specs/storage space vs. Azure dynamically doing it for you
 - Single region vs. multiple regions
 - Open source vs. proprietary
- Main takeaway: Azure offers multiple managed database solutions to cover any structured data scenario



Database Scenario: Music Streaming Service



Databases and Analytics

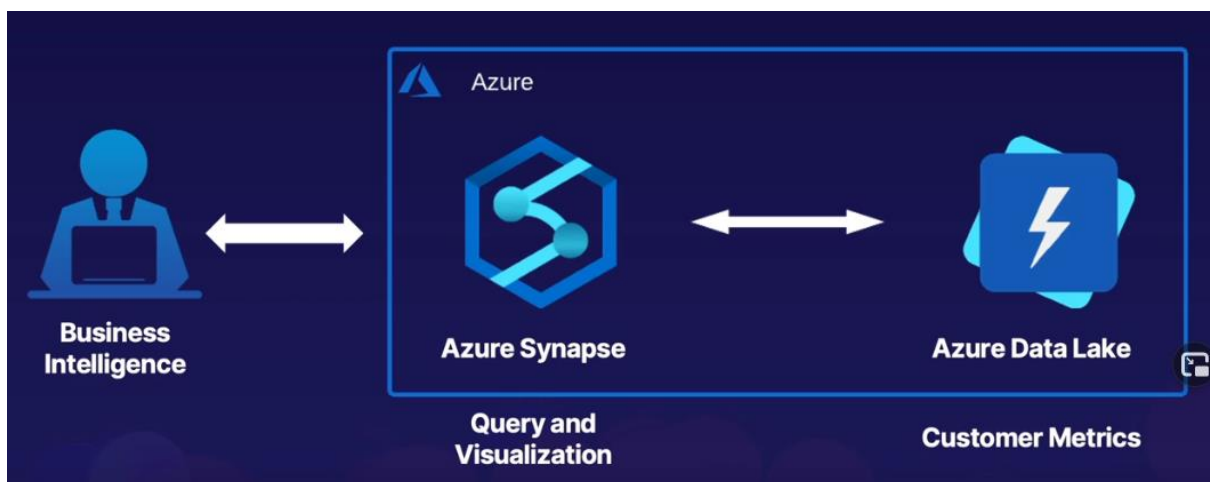
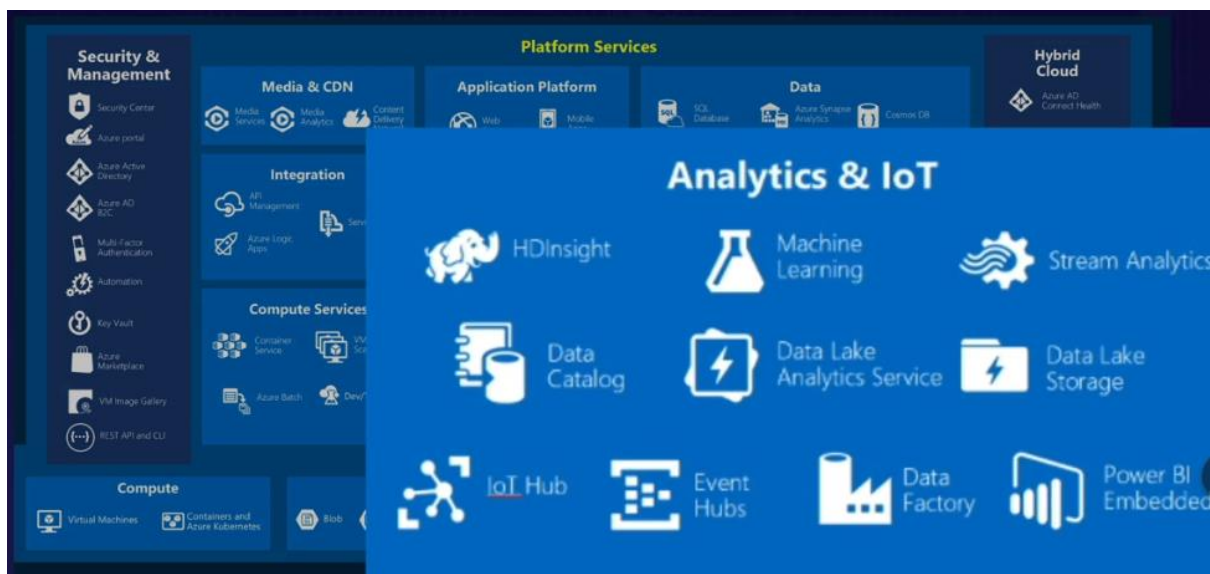
Analytics?

Analyzing data (in databases) for insights

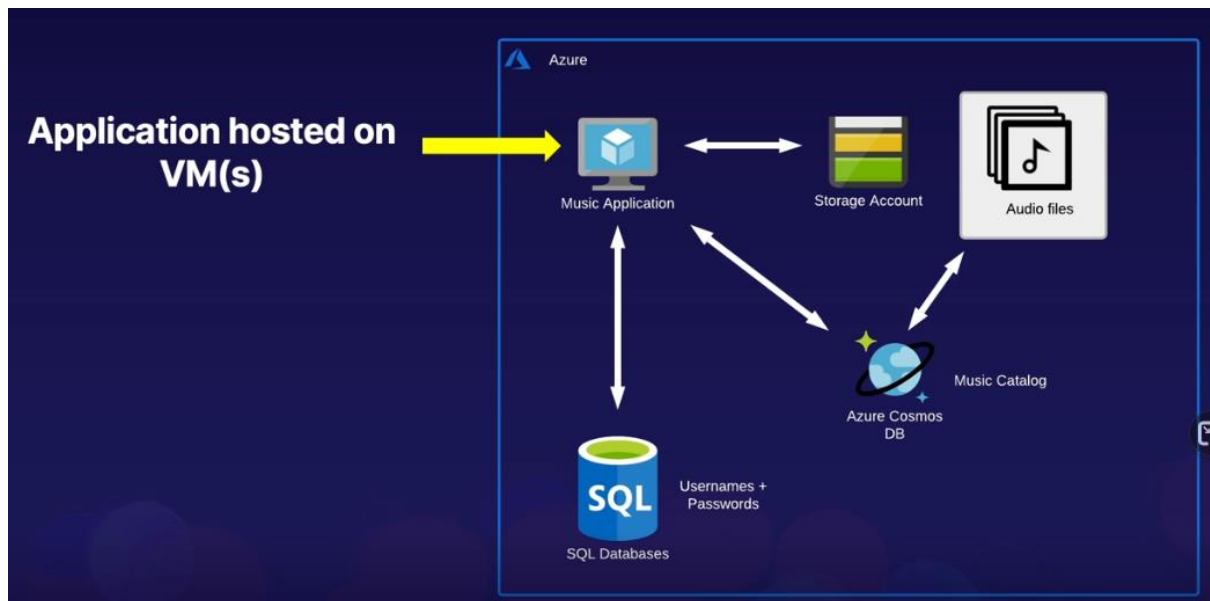
"What are our most popular features?"

Massive amounts of queried data

"How happy are our customers?"



App services / Serverless



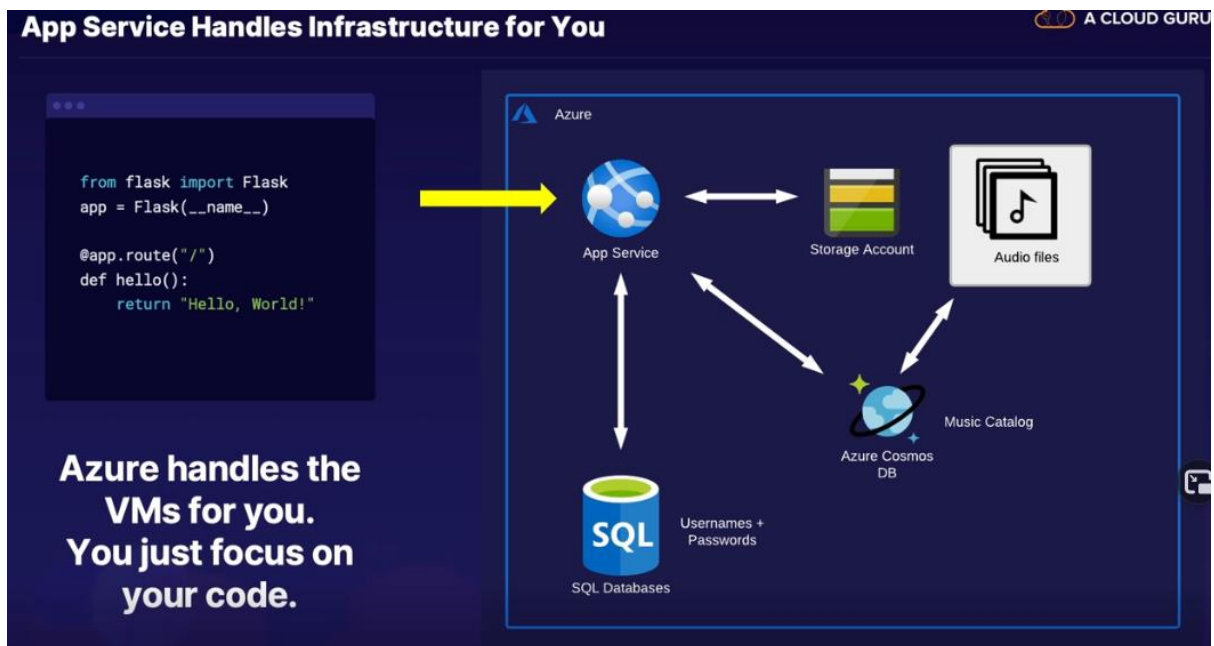
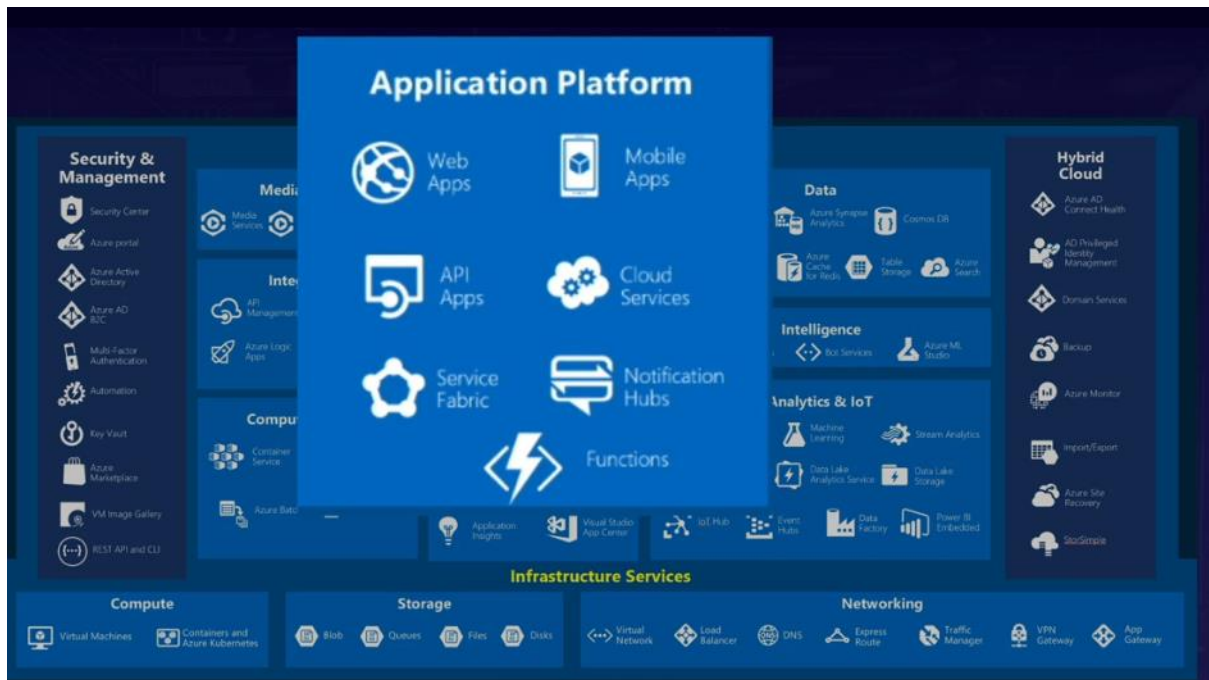
Challenges on Hosting Application on VM's

Full flexibility, but with increased responsibility

- You manage:
 - OS updates/patching
 - Compute (CPU/RAM) and storage management
 - Scaling via VM scale sets
- Result: higher management overhead

What if we want to just focus on application code, and let Azure handle everything else?

- Solution: Azure App Service



App service considerations

Trade flexibility for convenience

- App Service supports multiple languages and containers
 - But VMs are more flexible

Developer/coding focused tool

- Non-developers will not get much use

Wrapping Up

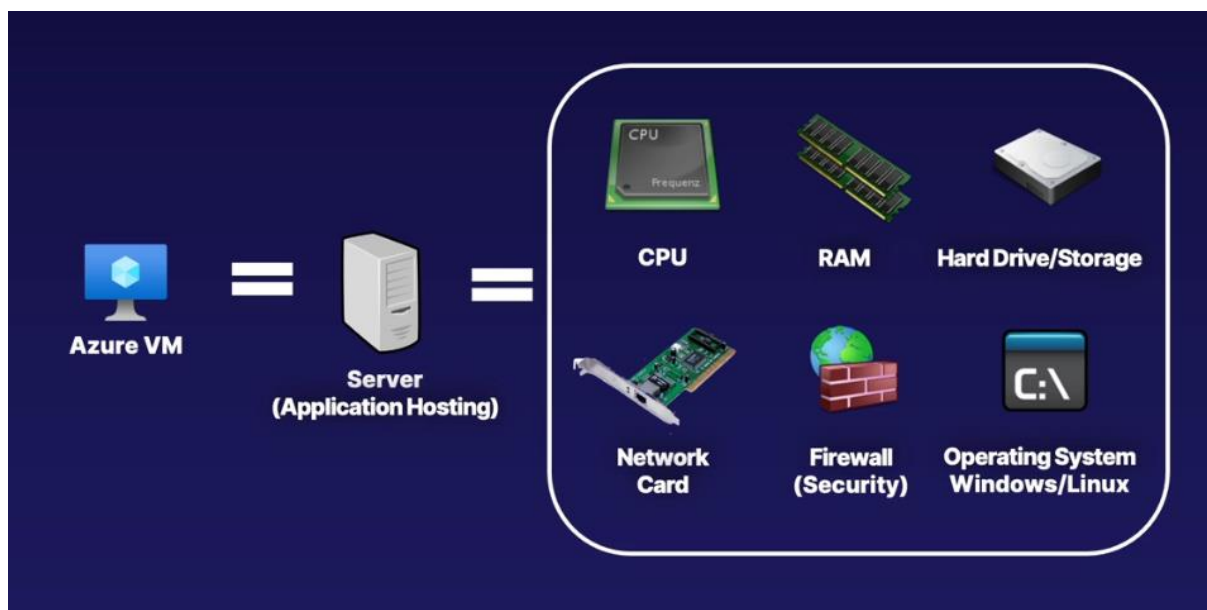
App Service:

- Provides serverless compute to host applications
- You focus on code, Azure handles the infrastructure
- Not as flexible as VMs, but with much lower management overhead

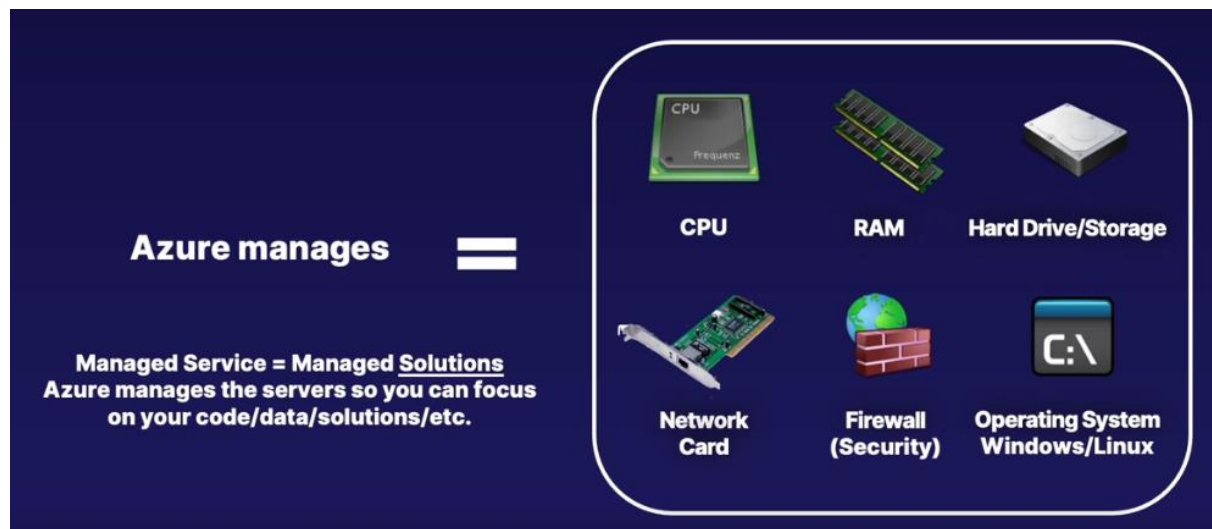
#Chapter 4

Azure Managed Services

Customer need to manage =>



Azure manage



Azure Manages:

- OS updates/patching
- Backups

You Manage:

- Compute and storage configuration
- Loading and working with your data

Different managed services handle different management responsibilities



The SQL database icon is a blue cylinder with a white rim and the letters 'SQL' in white.

Container / Kubernetes Services

What is it?

- Container management


What are containers?

- Self-contained, portable, software packaging mechanism
- Not dependent on an underlying OS


Kubernetes

- Popular container orchestration service

Azure handles the container management infrastructure, you focus on your containers



The Kubernetes icon is a cluster of purple 3D cubes arranged in a hexagonal pattern.



The Azure logo is a small icon of a document with a checkmark.

Artificial Intelligence / Machine Learning

What is it?

- Managed Machine Learning services

Machine Learning

- Enable applications to automatically recognize patterns
 - Example: image recognition
- Pre-trained services or build your own custom model

Azure manages different parts depending on the exact service:

- Pre-trained models – just bring your data
- Custom models – you bring the model and Azure provides the scaling training infrastructure



Big Data

Big data

- Analyze massive amounts of data for business results

How big is big?

- Terabytes, petabytes, and more

Multiple services for different workflows

- HDInsight – fully managed Hadoop/Spark ecosystem
- Azure Synapse – query massive amounts of data in fully serverless format
- Power BI – SaaS dashboards for visualizing data analytics



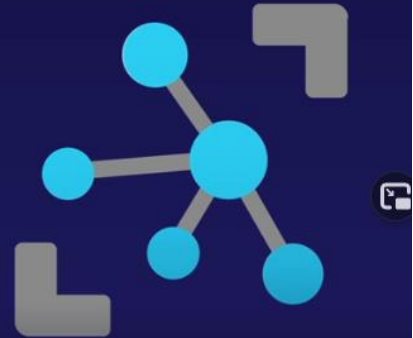
IoT

Internet of Things

- Internet connected objects
- Smart doorbells, temperature sensors, self-driving cars

Solutions for entire data collection process

- Ingestion, storage, analysis
- Integrates with big data tools



Azure Managed Services:

1

Focus on your solutions

You bring your data/code/applications, Azure handles the rest

2

Go cloud-scale

Store and process massive amounts of data, Azure handles the heavy lifting

Cloud Advantages

Fault Tolerance (a.k.a. redundancy / resiliency) Ex: 100K users

High Availability Ex: US based 😊 DC closed to users near their regions

Scalability Ex: On demand automatic

Elasticity Ex: Automatic failover => redirected working server=> recreate server => navigate users

Next steps >

AZ 900 – Broad understanding and certification prep

Linux on Azure

Azure CLI Essentials

Azure PowerShell Essentials