Microsoft Azure (Team 2)

Distributed Computing Presentation

Introduction to Microsoft Azure

M Raj Ragavender
22z233

What is Azure?

- **Azure** is **Microsoft's cloud computing platform** that provides services like virtual machines, databases, AI, networking, and security.
- It enables businesses to **run applications on a distributed global infrastructure**, eliminating the need for physical servers.
- With **data centers in over 60 regions worldwide**, Azure ensures low-latency performance, high availability, and scalability.
- **Azure** was launched by **Microsoft on February 1, 2010**. It was developed under the leadership of **Satya Nadella**, who played a major role in transforming Microsoft into a cloud-driven company.

Role in enabling Distributed Computing

One of Azure's biggest strengths is its **role in distributed computing**.

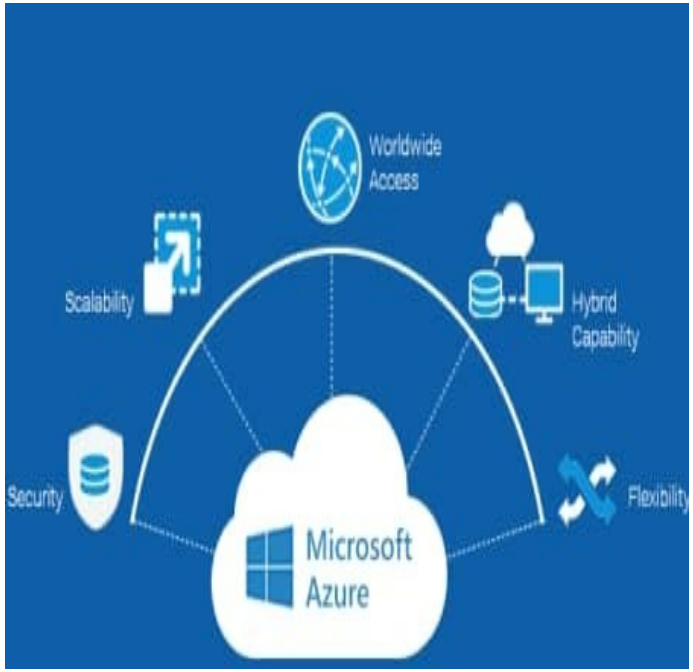
It allows organizations to run applications and store data across multiple locations, ensuring:

- ➔ **High Availability**: Services remain operational even if one data center fails.
- ➔ **Load Balancing**: Distributes traffic efficiently to avoid bottlenecks.
- ➔ **Edge Computing**: Processes data closer to users, reducing latency.

This makes Azure ideal for businesses that need global operations and real-time data processing.

Key Features of Azure

- ★ **Global Infrastructure**: Provides cloud services across multiple regions.
- ★ **Scalability**: Automatically adjusts resources based on demand.
- ★ **Security & Compliance**: Offers 90+ compliance certifications for data security.
- ★ **Hybrid Cloud Support**: Integrates with on-premise infrastructure.
- ★ **AI & Big Data Capabilities**: Includes tools for machine learning, IoT, and analytics.
- ★ **Multi-Language Support**: Works with Python, Java, .NET, and more.



Advantages & Disadvantages of Azure

Advantages:

- Scalability & Flexibility
- Security & Compliance
- Global Reach & Distributed Computing

Disadvantages:

- Complex Pricing Structure
- Learning Curve
- Dependence on Internet Connectivity

A Competitive Edge over AWS and GCP

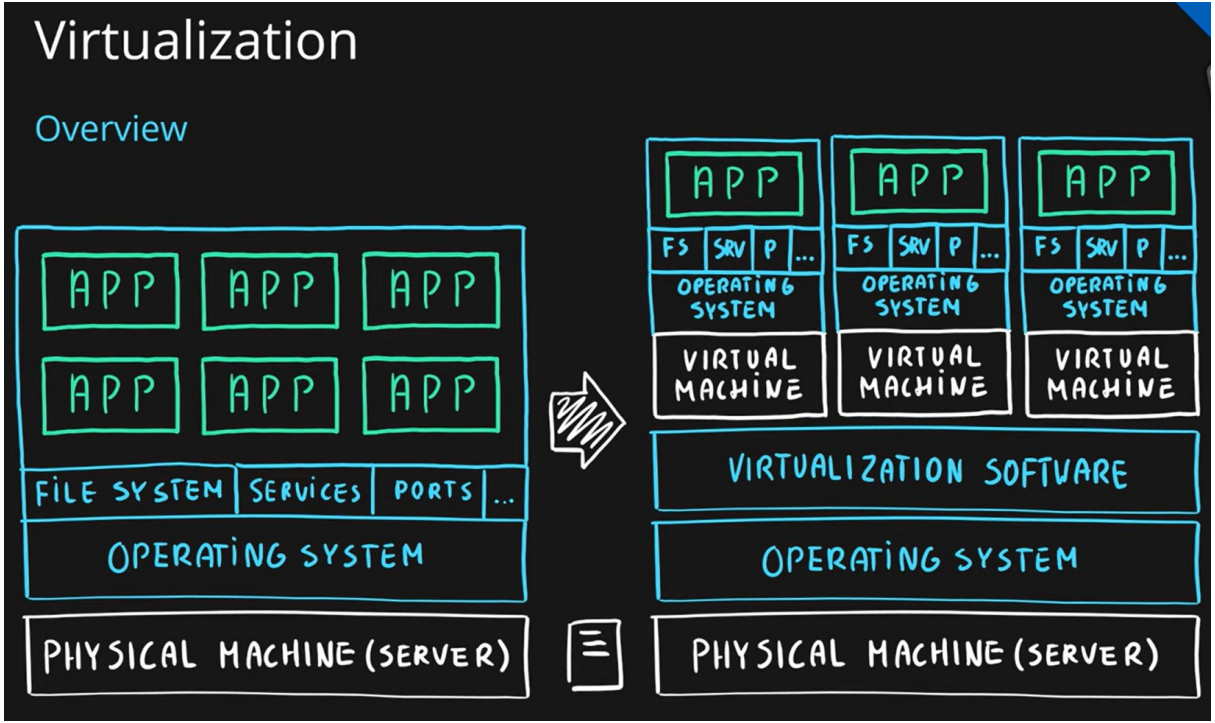
Comparison Factor	Microsoft Azure	Amazon Web Services (AWS)	Google Cloud Platform (GCP)
Hybrid Cloud Support	Best hybrid cloud integration with on-premise solutions	Limited hybrid capabilities	Less focus on hybrid cloud
Enterprise Integration	Seamlessly integrates with Microsoft products (Windows, Office 365)	Less optimized for Microsoft environments	Limited Microsoft compatibility
Pricing for Enterprises	More cost-effective for businesses using Microsoft ecosystem	Generally higher pricing	Competitive pricing but fewer enterprise benefits
Security & Compliance	90+ compliance certifications, strong enterprise security	Secure, but compliance varies by region	Fewer compliance options
Global Reach	60+ regions with **data centers closer to enterprises**	Largest global reach, but expensive	Fewer regions than Azure

Compute Services in Azure

Rohith Prakash
22z254

Azure offers a range of compute services designed to meet different workloads, from traditional virtual machines to serverless and containerized solutions. These services provide scalability, reliability, and security, catering to various business needs.

1. **Azure Virtual Machines**
2. **Azure Virtual Machine Scale Sets(VMSS)**
3. **Azure Container Instance**
4. **Azure Kubernetes Service**
5. **Azure App Service**
6. **Azure Functions**



Key Characteristics

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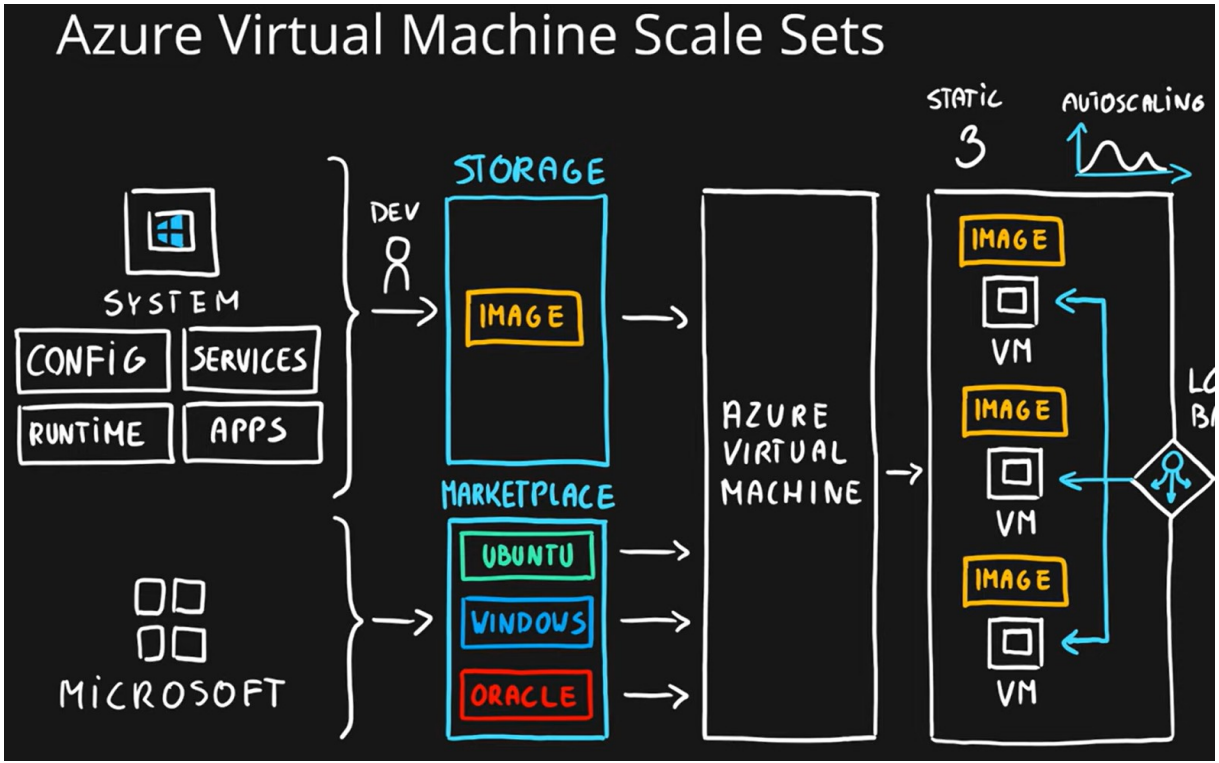
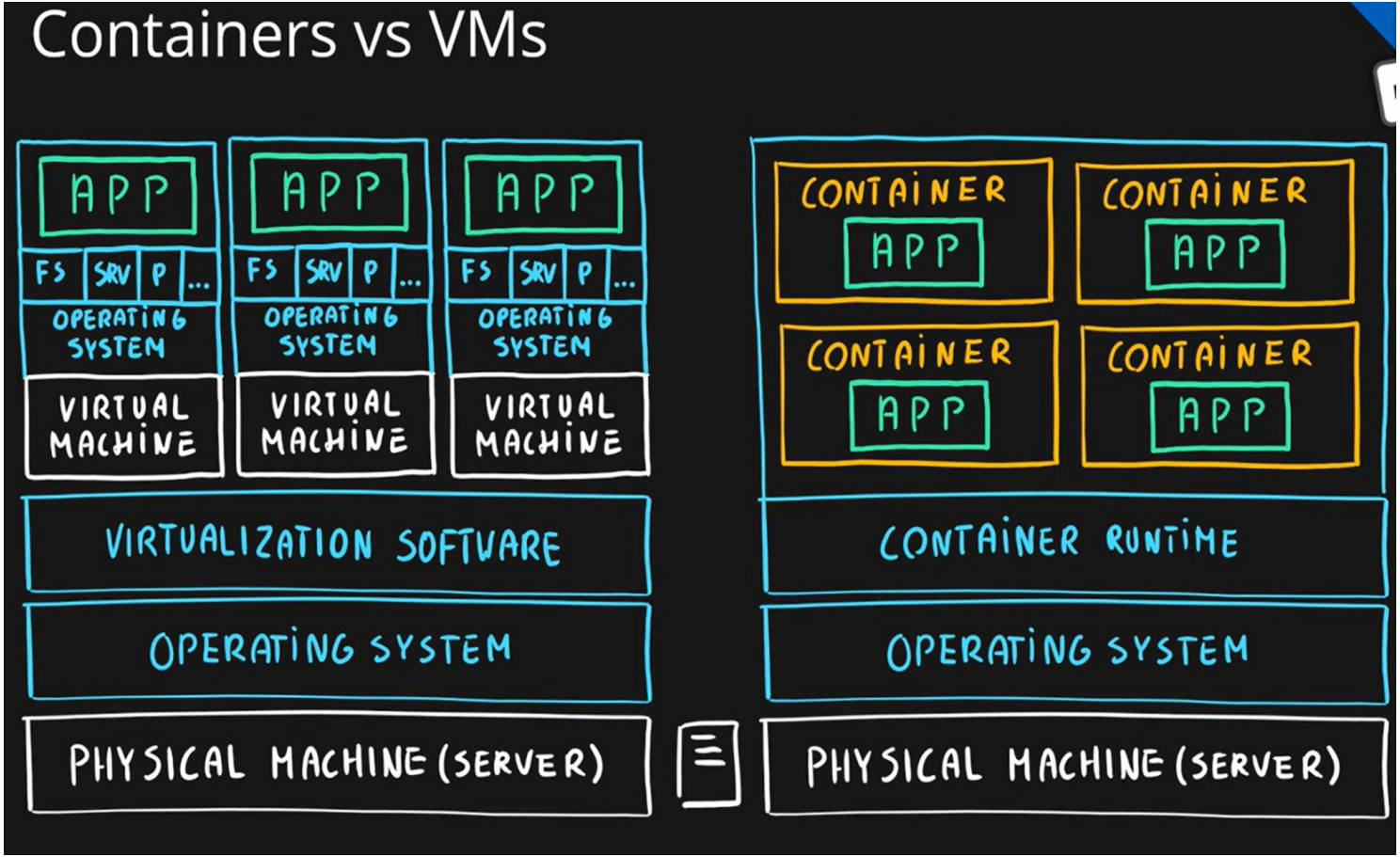
- Emulation of physical machines
- Different virtual hardware configuration per machine/app
- Different operating systems per machine/app
- Total separation of environments
  - file systems,
  - Services,
  - Ports,
  - Middleware,
  - configuration

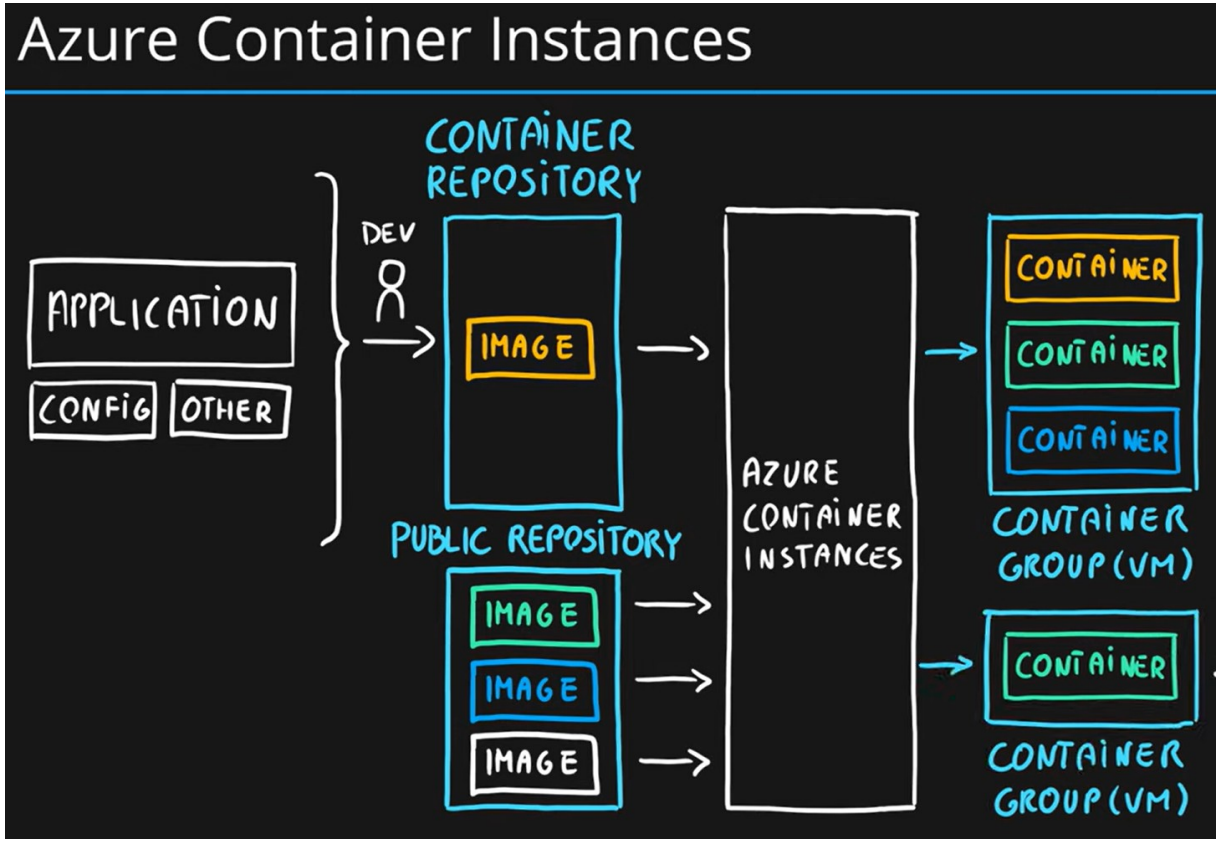


Key Characteristics

- Infrastructure as a Service (IaaS)
- Set of identical virtual machines
- Built-in auto scaling features
- Designed for manual and auto-scaled workloads like web services, batch processing, etc.

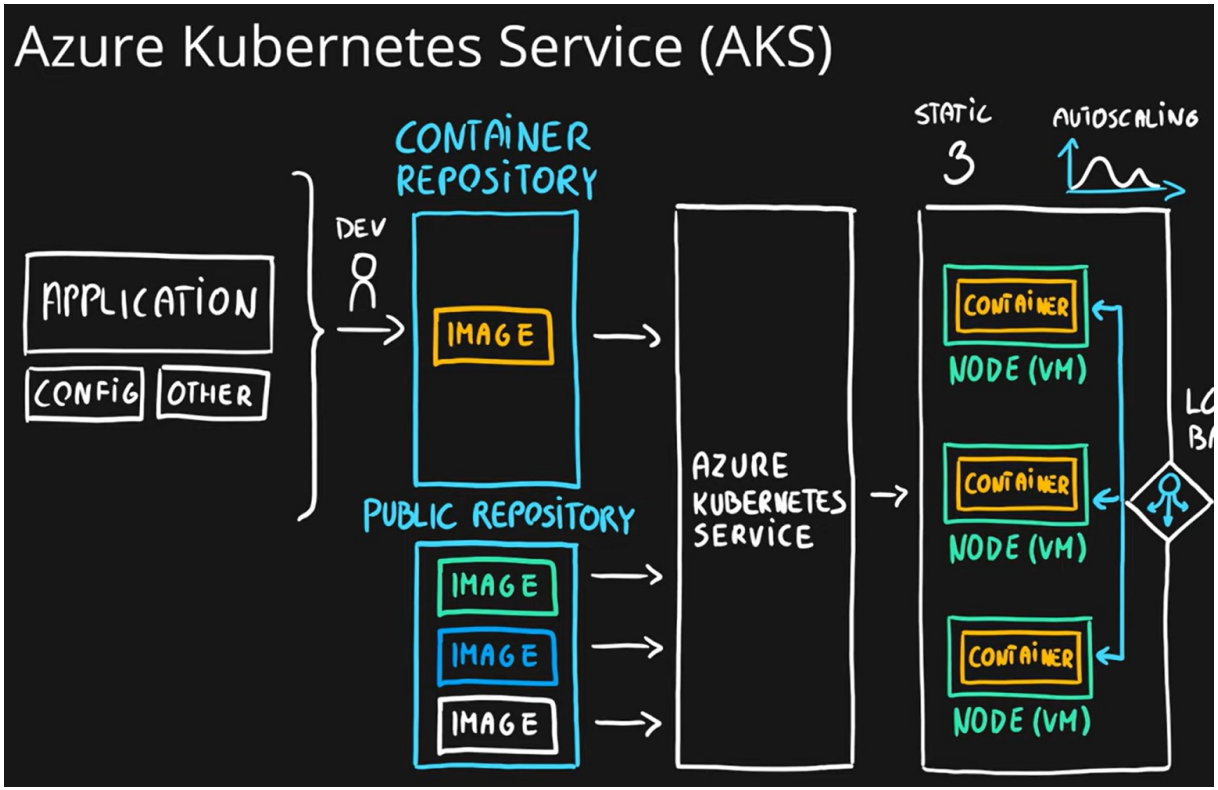
Containers vs VMs





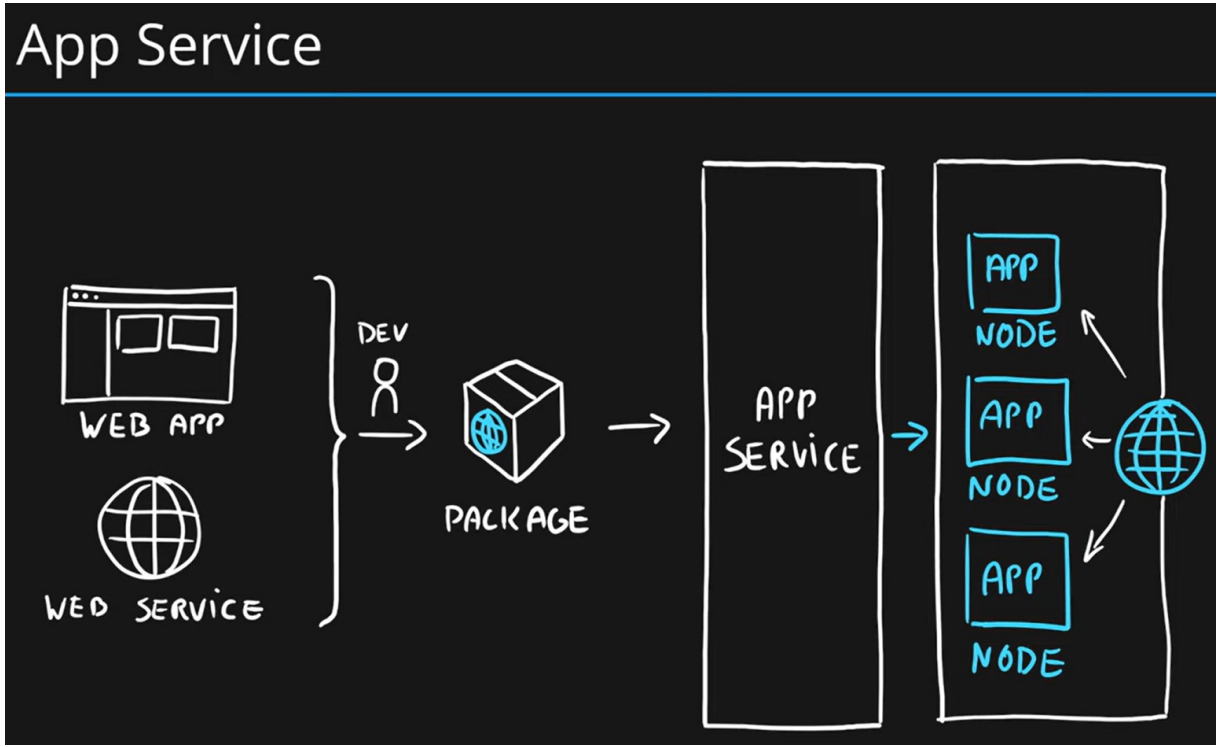
Key Characteristics

- Simplest and fastest way to run a container in Azure
- Platform as a Service
- Serverless Containers
- Designed for
  - Small and simple web apps/services
  - Background jobs
  - Scheduled scripts



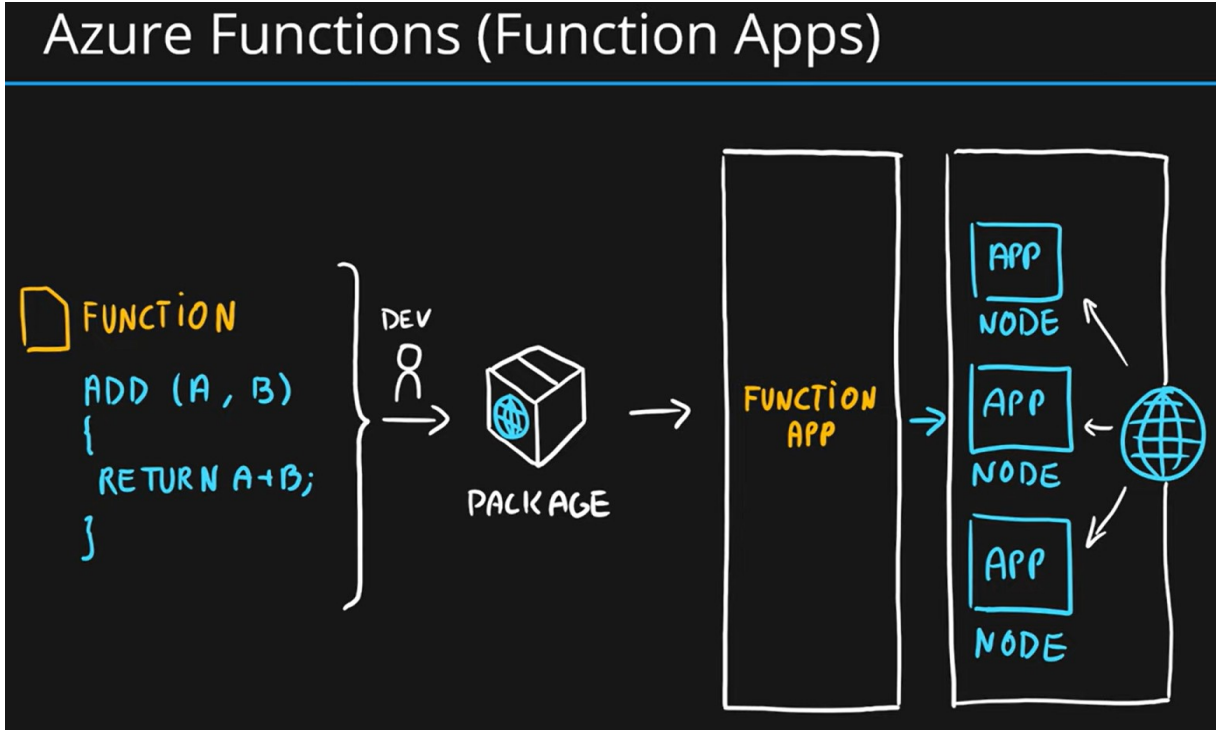
Key Characteristics

- Open-source container orchestration platform
- Platform as a Service
- Highly scalable and customizable
- Designed for high scale container deployments



Key Characteristics

- Designed as enterprise grade web application service
- Platform as a Service
- Supports multiple programming languages and containers

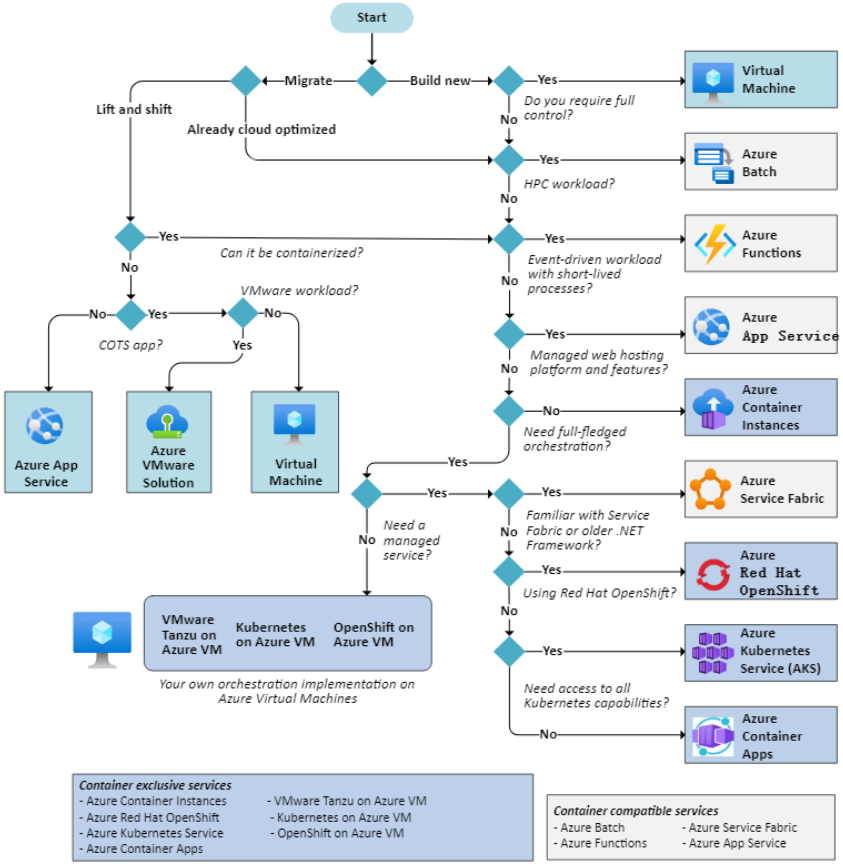


Key Characteristics

- Platform as a Service
- Serverless
- Two hosting/pricing models
  - Consumption-based plan
  - Dedicated plan
- Designed for micro/nano-services

Summary

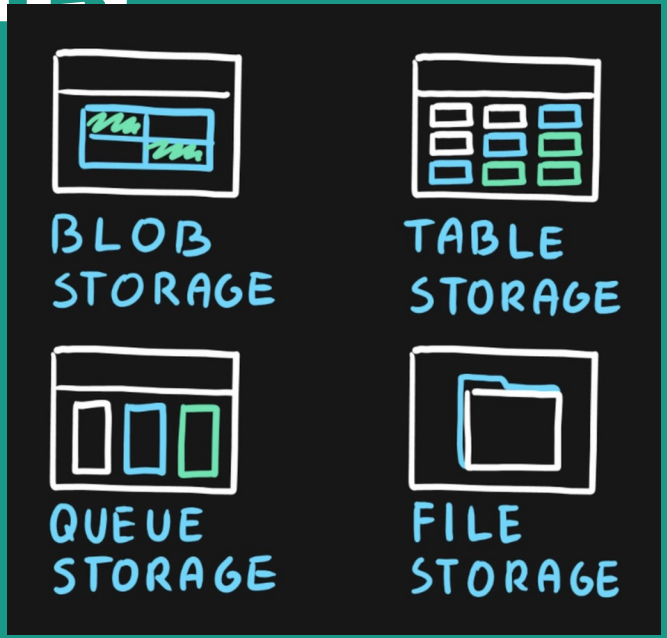
- Virtual Machines (IaaS)
  Custom software, custom requirements, very specialized, high degree of control
- VM Scale Sets (IaaS)
  Auto-scaled workloads for VMs
- Container Instances (PaaS)
  Simple container hosting, easy to start
- Kubernetes Service (PaaS)
  Highly scalable and customizable container hosting platform
- App Services (PaaS)
  Web applications, a lot of enterprise web hosting features, easy to start
- Functions (PaaS) (Function as a Service) (Serverless)
  micro/nano-services, excellent consumption-based pricing , easy to start



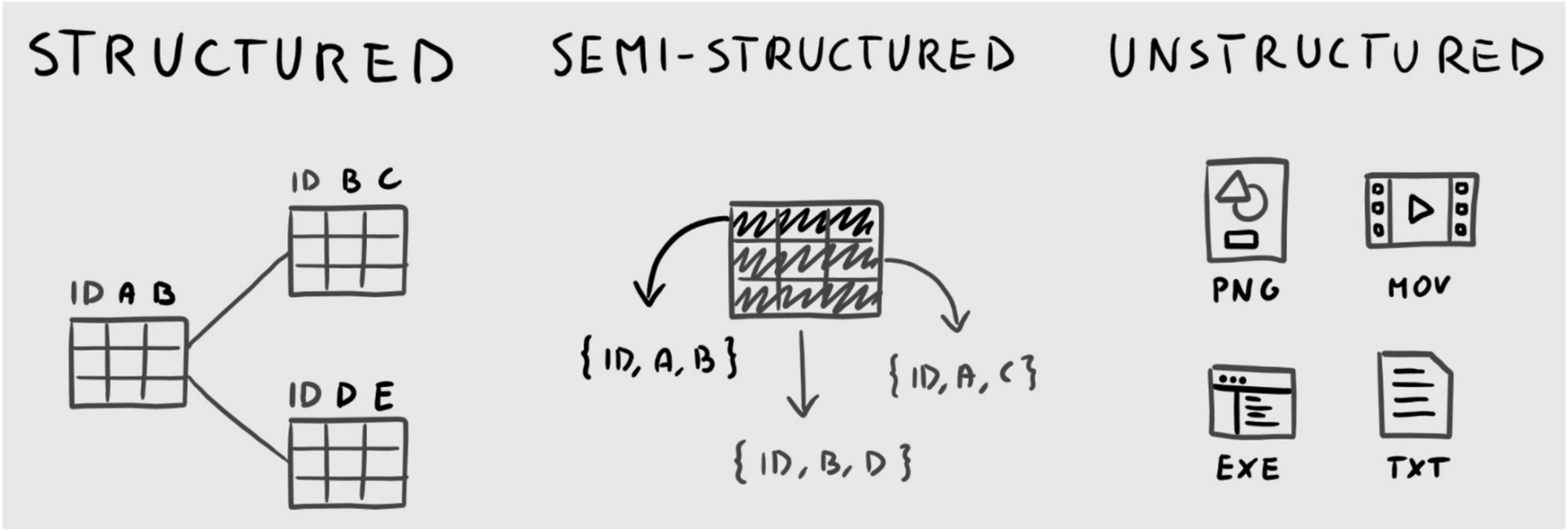
Microsoft Azure

Storage Solutions
In Azure

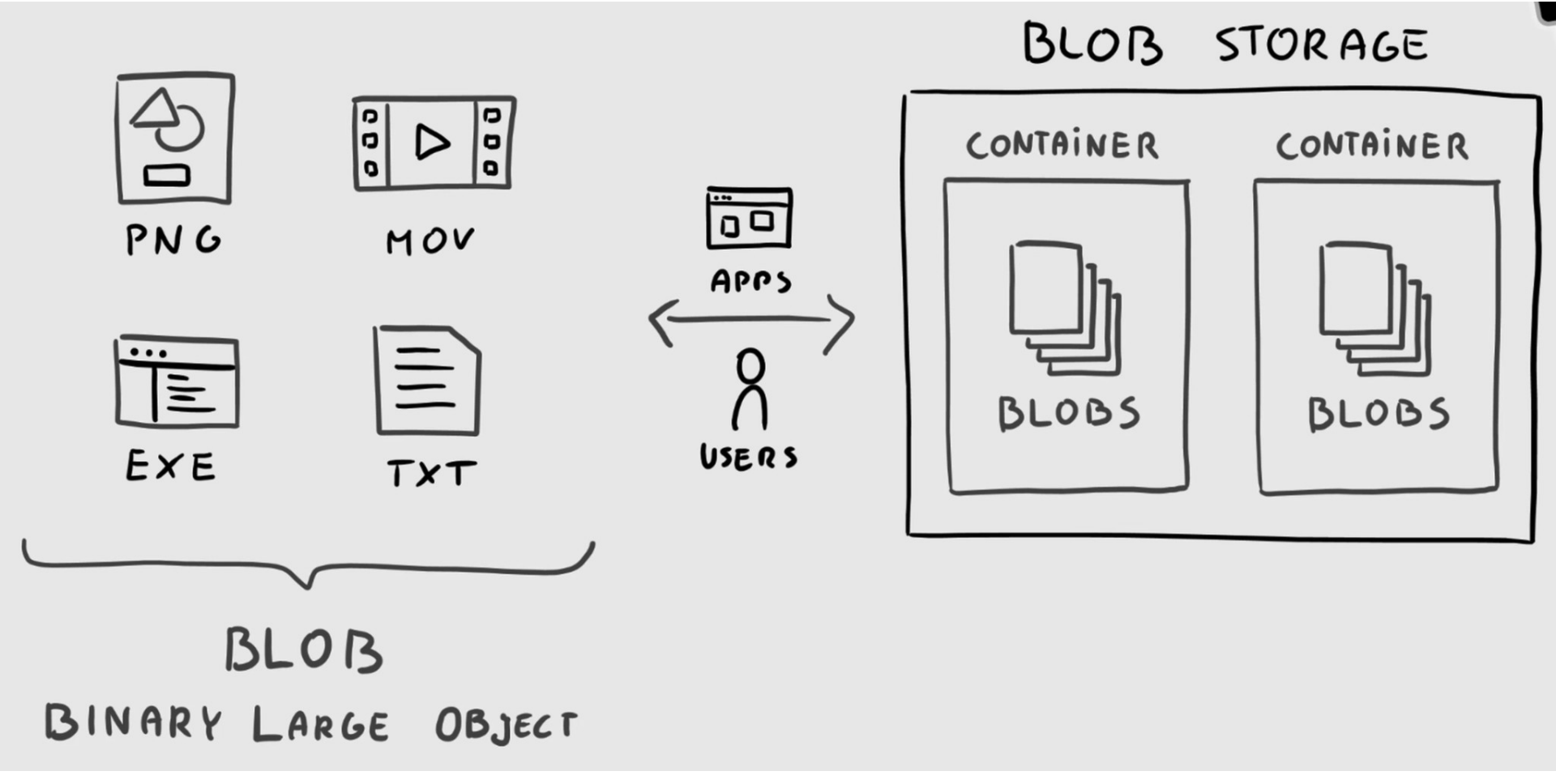
Kishoreadhith V
22z232



Types of stored data



Azure Blob storage

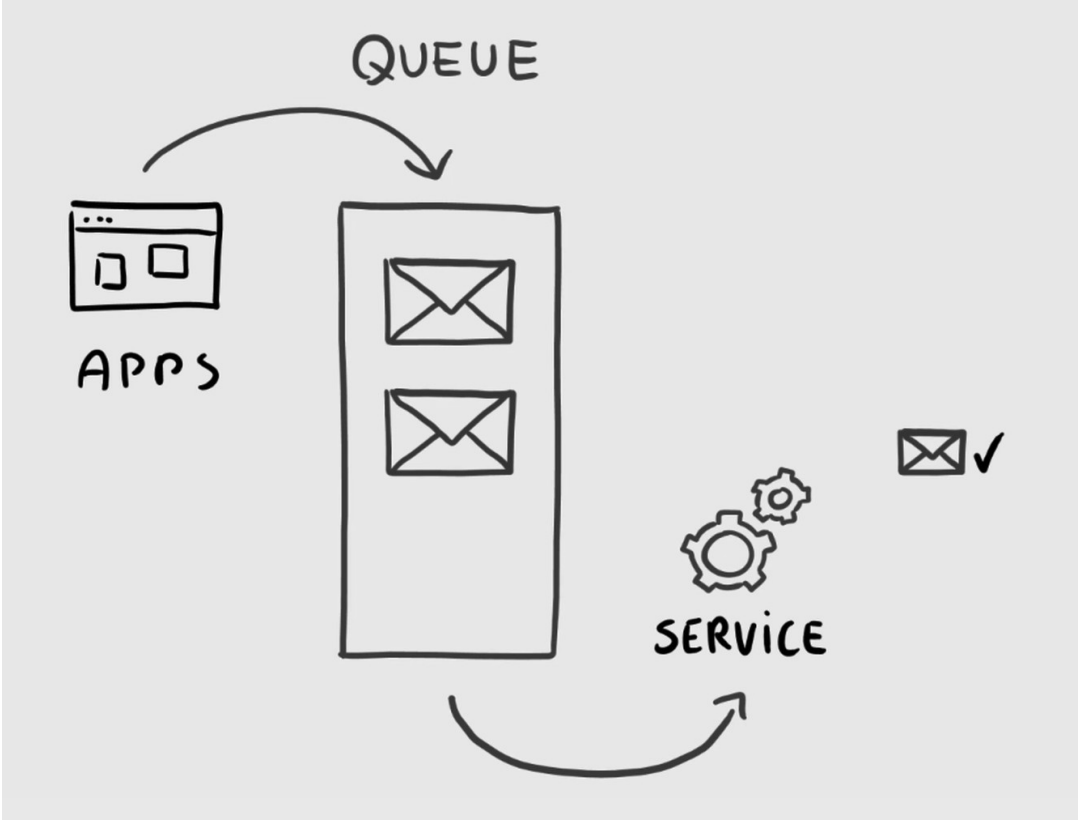


Azure Blob Storage

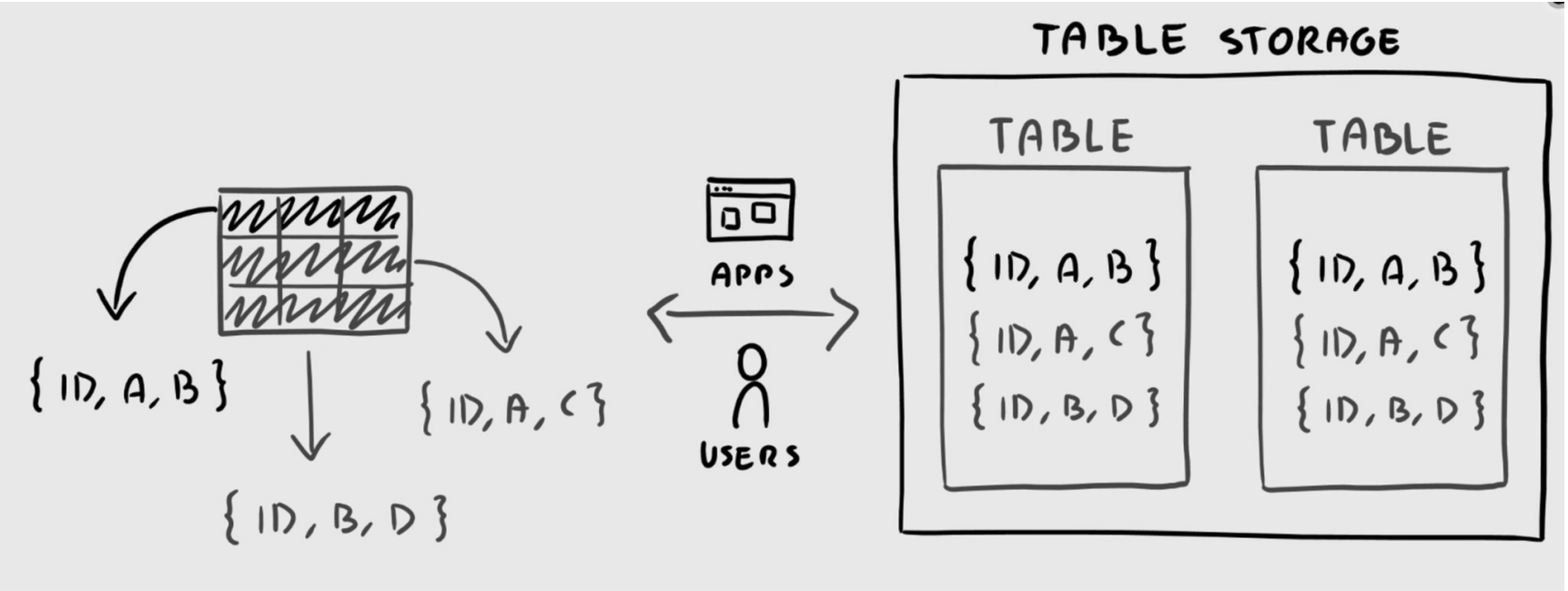
- Storage of any kind of files
- (BLOB - **B**inary **L**arge **OB**bject - file)
- 3 storage tiers
  - Hot - frequently accessed data
  - Cool - infrequently accessed data
  - Archive - rarely (if-ever) accessed data

Azure queue stora

- Storage for small pieces of data (messages)
- Designed for scalable asynchronous processing



Azure table storage



Azure table storage

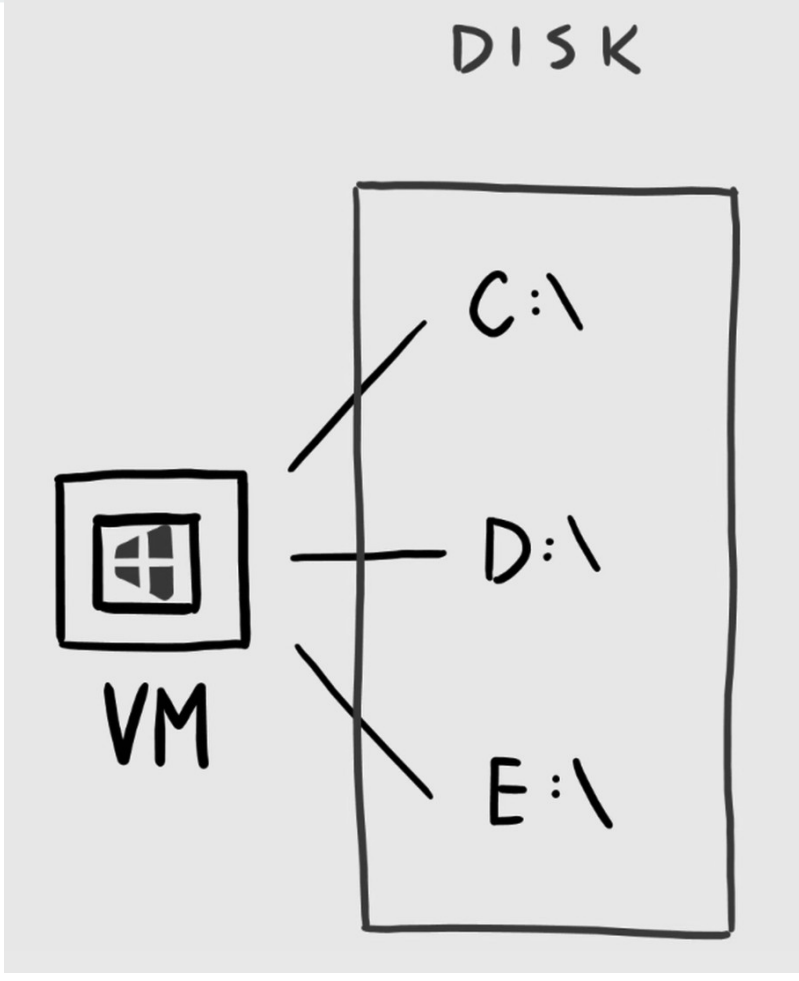
- Storage for semi-structured data (NoSQL)
- No need for foreign joins, foreign keys, relationships or strict schema
- Designed for fast access using compound keys
- Many programming interfaces and SDKs

Azure file storage

- Used to store files (sounds similar to blob storage)
- Gives access to shared drives
- Usage scenarios:
  - Lift and Shift: move your existing application without re-writing code to use blob storage
  - Extended on-premise files share with azure file storage (like a virtual hard drive)

Azure disk storage

- Disk emulation in the cloud
- Persistent storage for Virtual Machines
- Different
  - sizes,
  - types (SSD, HDD)
  - performance tiers
- Disk can be unmanaged or managed



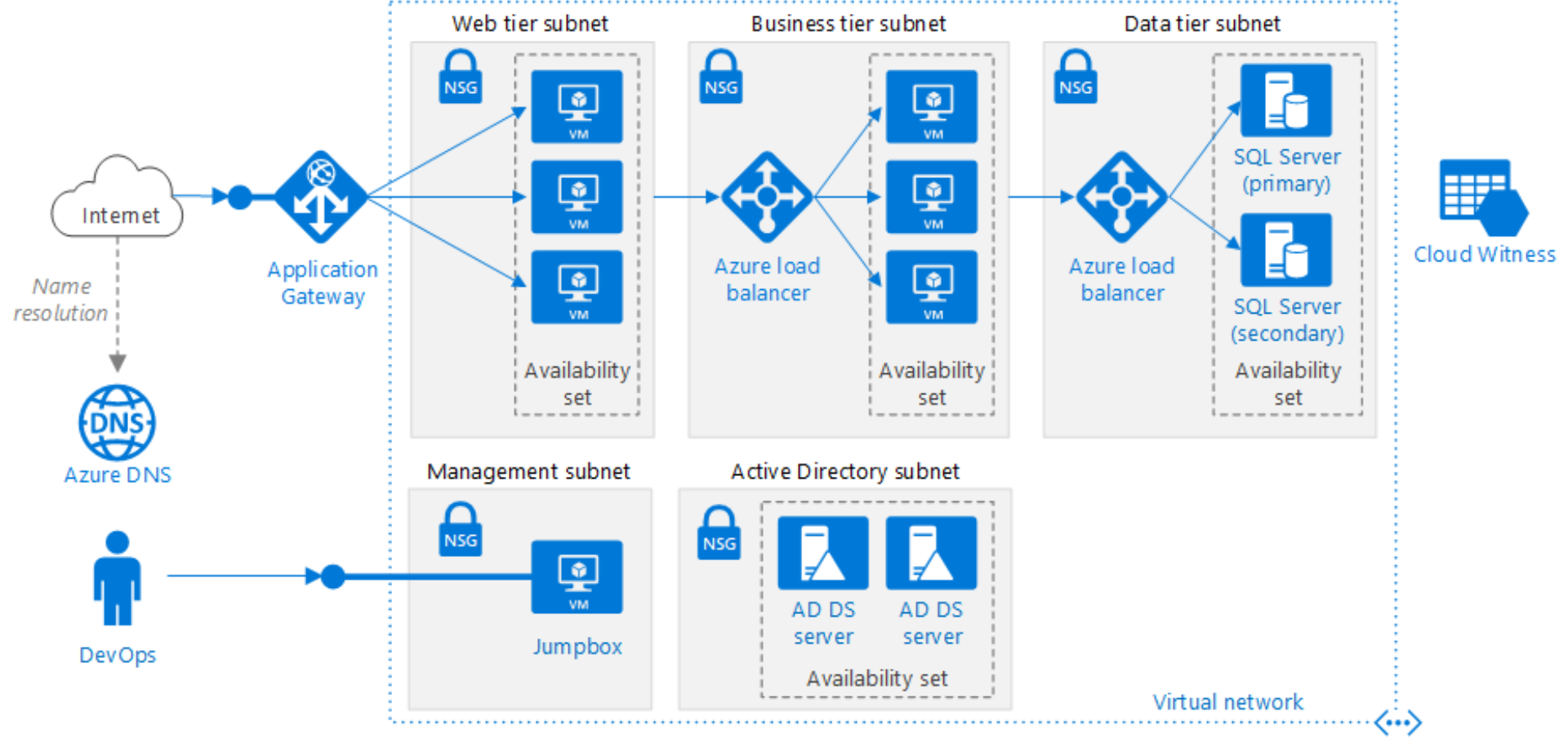
Networking and Content Delivery in Azure

Anandkumar NS
22z209

Azure Virtual Networks

- Provisions are isolated, private networks in the cloud.
- Enables secure communication between Azure Resources
- Customisable IP addresses and subnets for control

These networks are like your own private network in the cloud where you can provision isolated envs where you have dedicated resources like virtual machines or databases which can talk securely to one another…

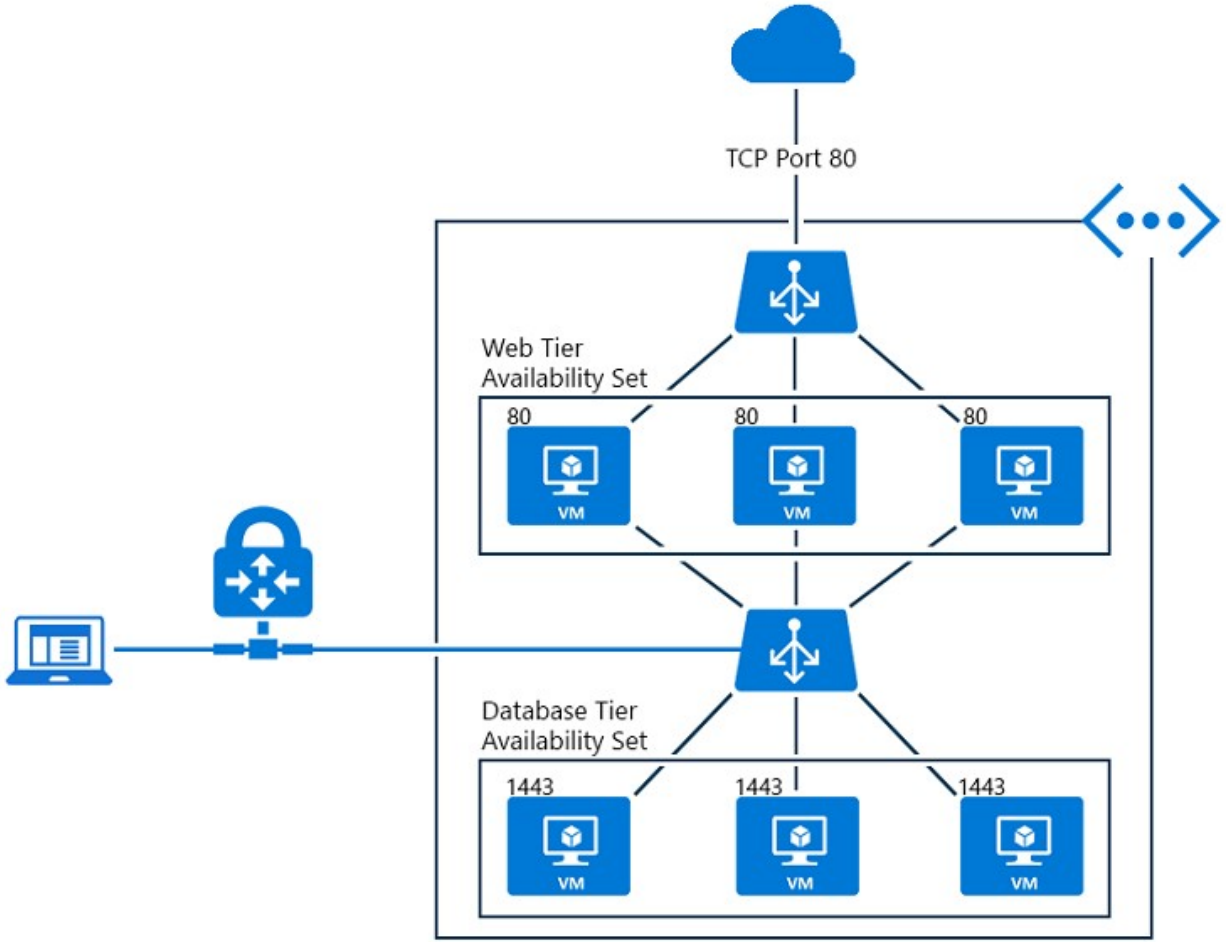


Azure Virtual Network

Azure Load Balancer

- Distributes incoming traffic across multiple resources for high availability.
- Supports both public (internet facing) and internal load balancing
- Ensures that the system can scale under heavy loads

This is the mechanism that allows applications to expand and occupy more compute which enables the application to accommodate a higher volume of simultaneous users.

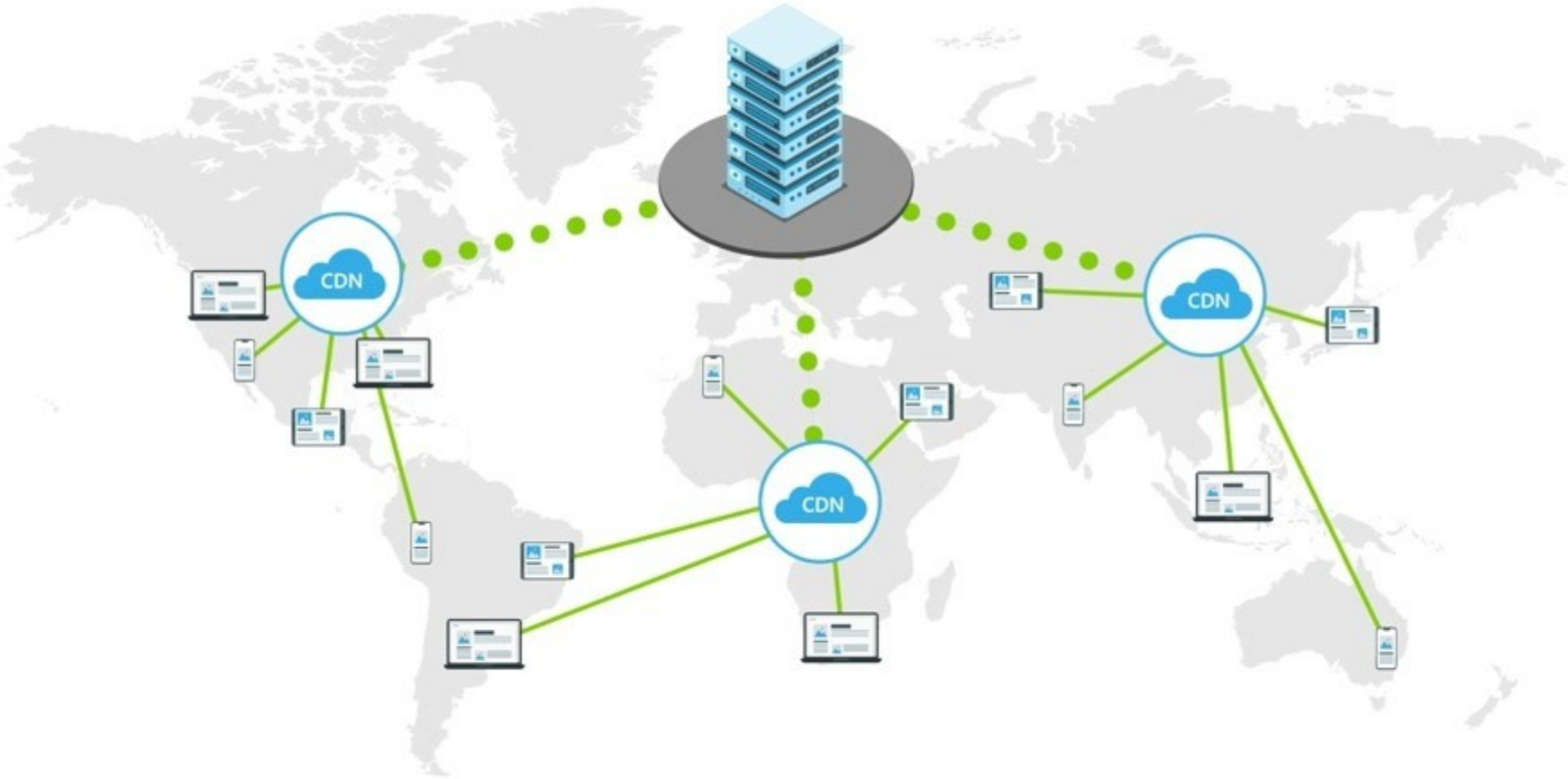


Azure Load Balancing

Azure Content Delivery Network (CDN)

- Speeds up content delivery by caching it closer to users worldwide.
- Reduces latency and improves user experience for websites, videos, etc.
- Integrates with Azure services for seamless performance.

Azure Content Delivery Network—or CDN—brings content closer to users globally. By caching things like websites or videos at edge locations, it cuts latency and boosts performance.


CDN
CDN
CDN

Database and Analytics Services

Naveen Ragav K
22z242

Azure SQL Database

1. It offers high availability, scalability, and security without the need for manual maintenance.
2. AI-powered performance tuning ensures optimal efficiency.
3. Ideal for enterprise applications, e-commerce, and financial services.

Works effortlessly with Power BI, Azure Functions, and other Azure services, enabling end-to-end data management and reporting.

Azure Cosmos DB

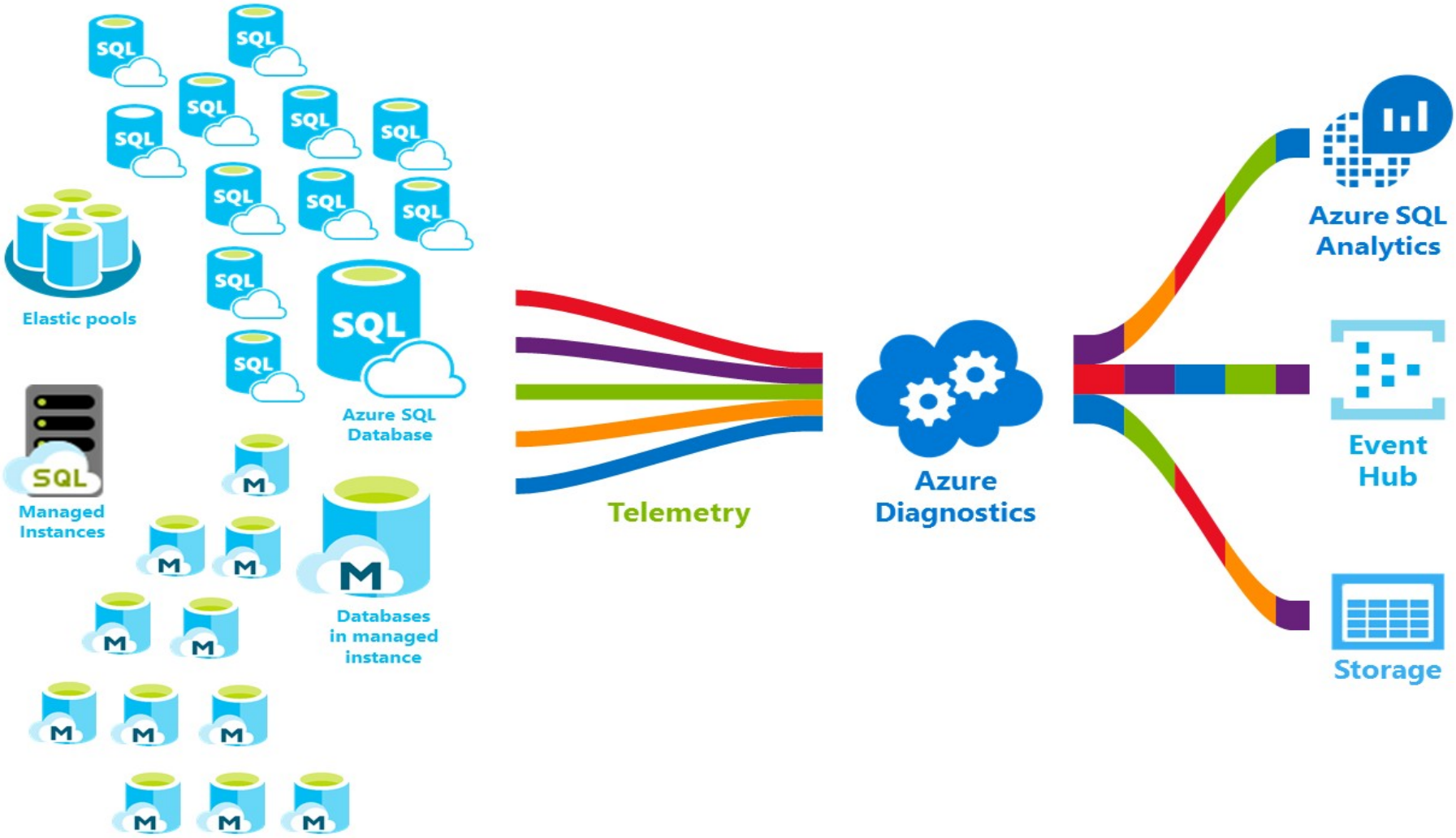
1. Supports multiple APIs, including SQL, MongoDB, and Cassandra.
2. Provides low latency and automatic scaling for real-time applications.
3. Used in IoT, AI-driven applications, gaming, and social media platforms.

It ensures 99.999% availability by replicating data across multiple regions, making it highly reliable for mission-critical applications.

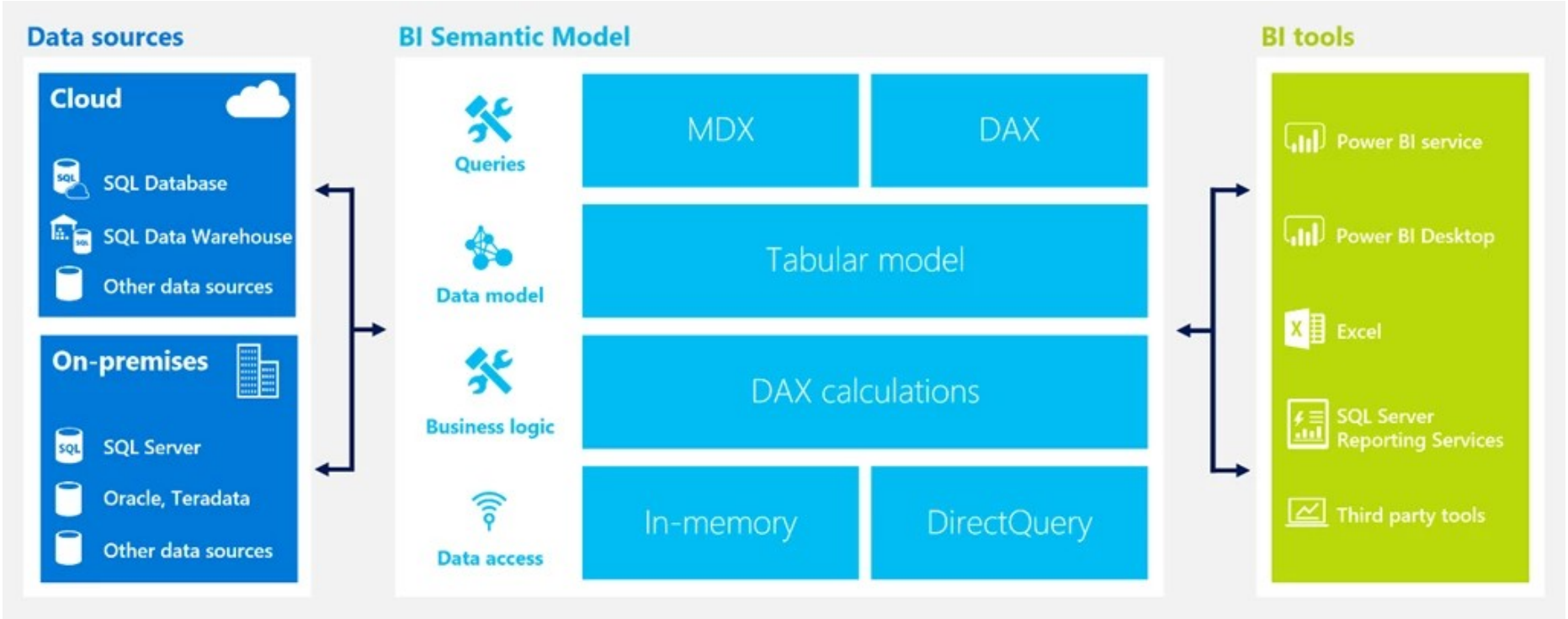
Azure Synapse Analytics

1. Combines big data and data warehousing for deep insights.
2. Real-time data processing with built-in AI & machine learning capabilities.
3. Used in business intelligence, predictive analytics, and large-scale reporting.

Businesses can run analytics on large datasets without managing infrastructure, reducing costs and complexity.


Elastic pools
Azure SQL Database
Managed Instances
Databases in managed instance
Telemetry
Azure Diagnostics
Azure SQL Analytics
Event Hub
Storage

Azure BI & Analytics Workflow



Security and Management Tools

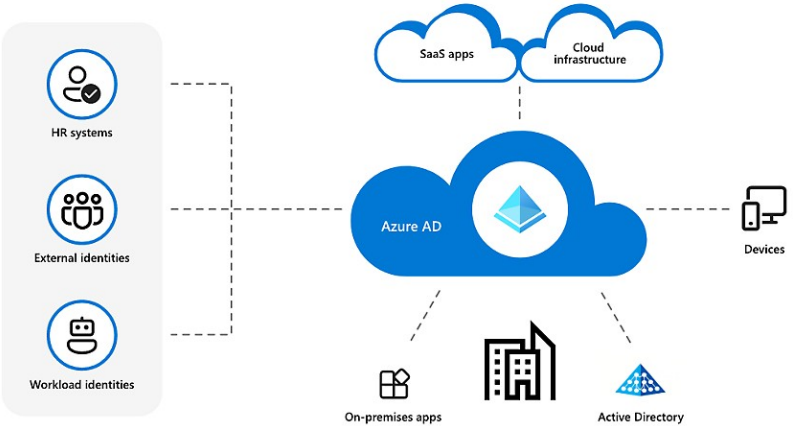
Dhakkshin S R
22z215

Some Key Components:

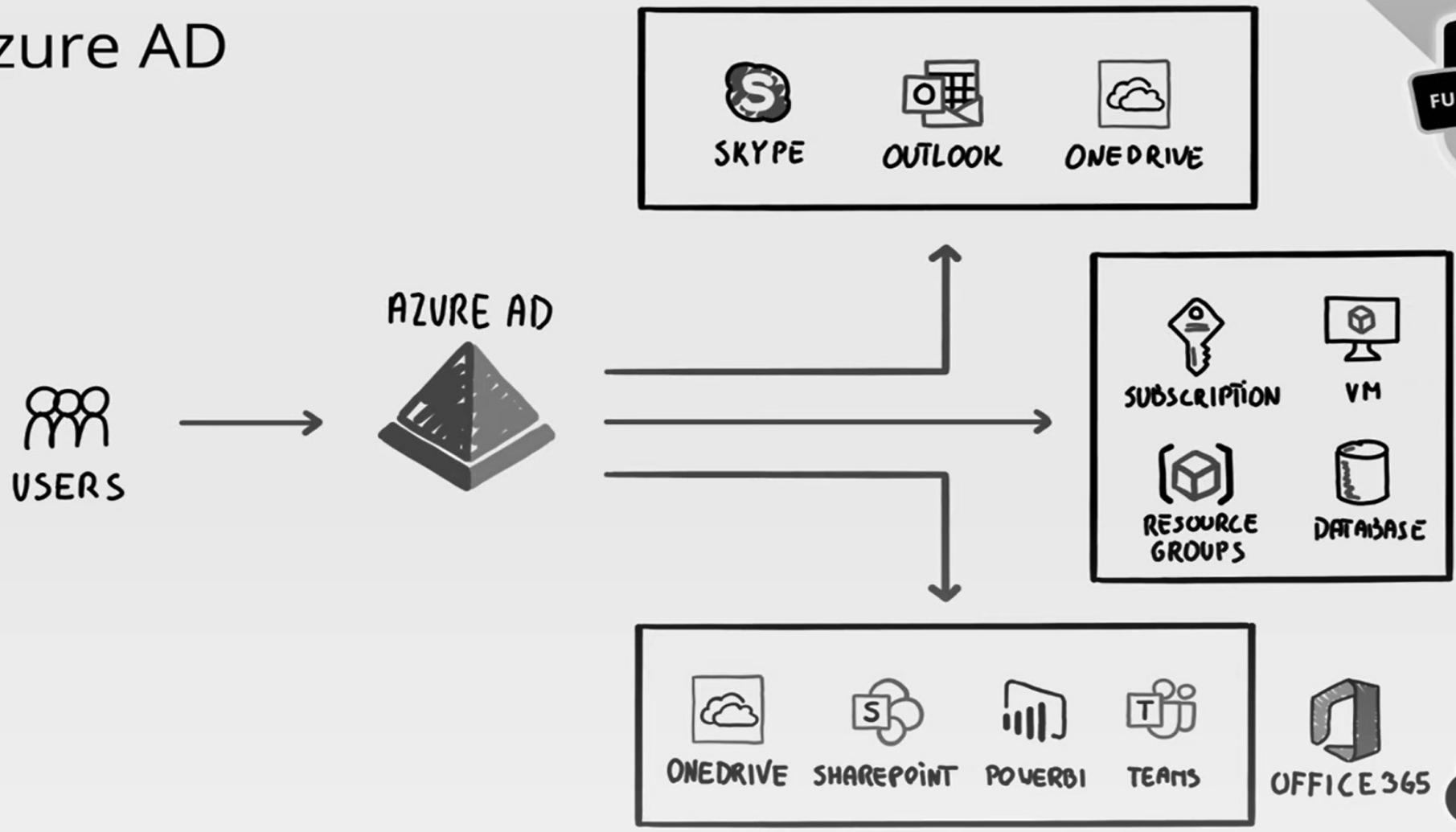
1. Azure Active Directory: Identity and access management.
2. Azure Key Vault: Secure storage of secrets and keys.
3. Azure Monitor: Comprehensive monitoring solution.
4. Azure Security Center: Unified security management.

1. Active Directory

- Cloud-based **Identity and Access Management** (IAM).
- **Authentication** (Who are you?) and **Authorization** (What can you do?).
- **Role-Based Access Control** (RBAC)
- **Conditional Access**: If-Then security policies
- Hybrid Identity: Bridging on-premises Active Directory with Azure.
- *Think of Entra ID as the "sudo" command for your entire cloud environment, controlling who gets elevated privileges.*



Azure AD


SKYPE
OUTLOOK
ONEDRIVE
AZURE AD
USERS
SUBSCRIPTION
VM
RESOURCE GROUPS
DATABASE
ONEDRIVE
SHAREPOINT
POWERBI
TEAMS
OFFICE365

Users | All users (Preview)

Default Directory - Azure Active Directory

«

All users (Preview)

Deleted users (Preview)

Password reset

User settings

Diagnose and solve problems

Activity

Sign-ins

Audit logs

Bulk operation results

Troubleshooting + Support

New support request

+ New user + New guest user Bulk operations Refresh Reset password

This page includes previews available for your evaluation. View previews →

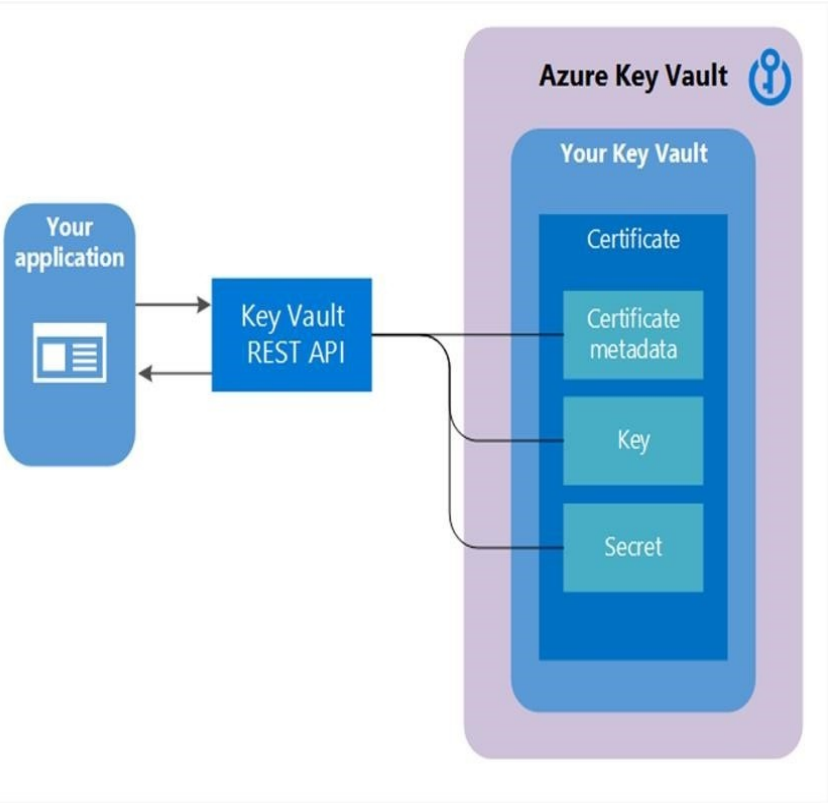
Search users Add filters

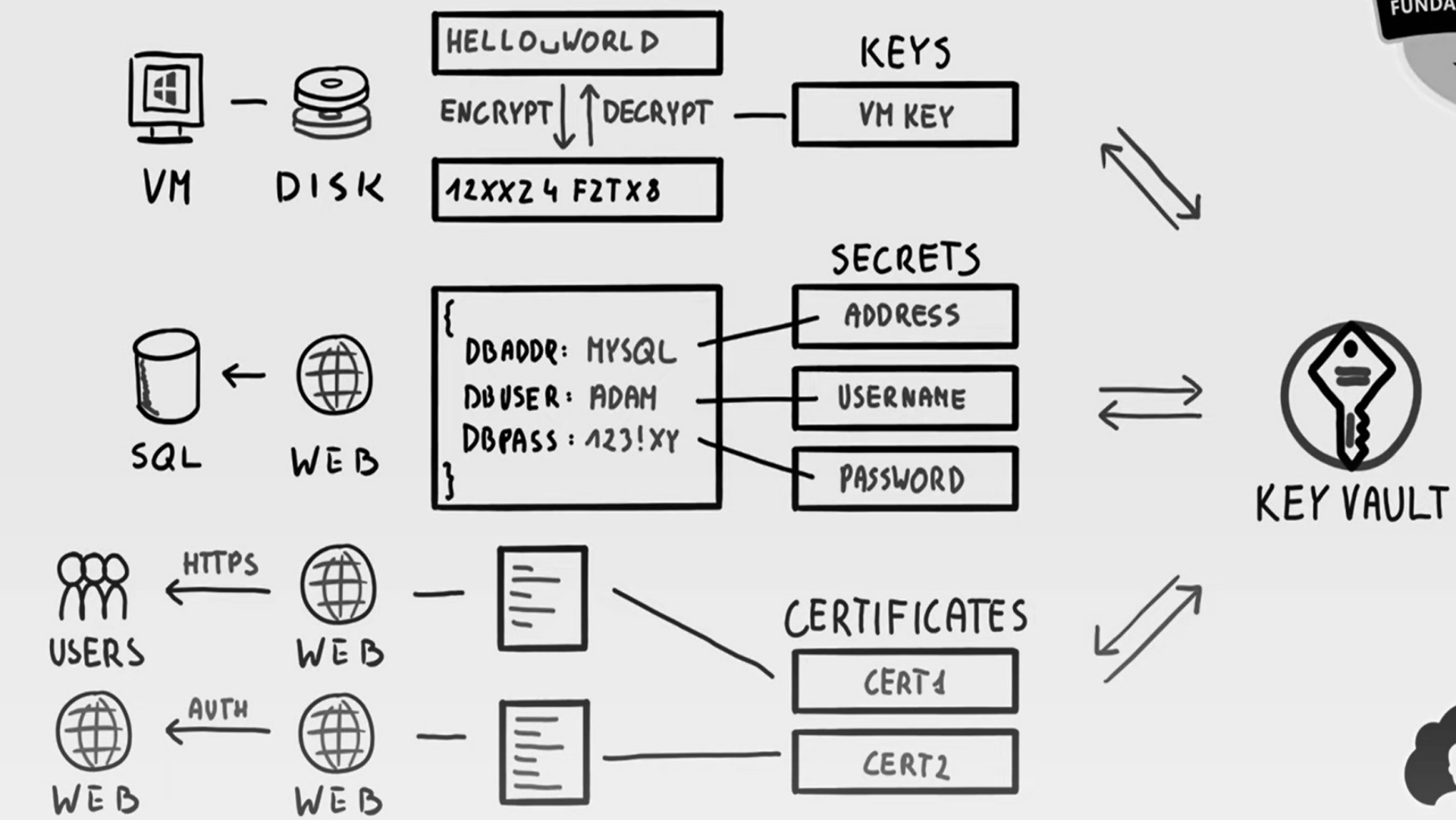
2 users found

Name	User principal n...	User type	Directory synced
Adam Marczak	adam_marczak.io#E...	Member	No
AJ Alice Jones	alice.jones@adamm...	Member	No

2. Key Vault

- Centralized storage for secrets (API keys, passwords), keys, and certificates.
- Hardware Security Modules (**HSMs**) for cryptographic key protection.
- **Access control policies**: Restrict access to sensitive data.
- **Key rotation**: Automated key lifecycle management.
- *Like a highly secure, encrypted password manager for your cloud applications.*




HELLO WORLD
ENCRYPT
DECRYPT
12XX24 F2TX8
KEYS
VM KEY
VM
DISK
SECRETS
{
DBADDR: MYSQL
DBUSER: ADAM
DBPASS: 123!XY
}
ADDRESS
USERNAME
PASSWORD
KEY VAULT
SQL
WEB
HTTPS
USERS
WEB
CERTIFICATES
CERT1
AUTH
WEB
WEB
CERT2

az-900-key-vault

Key vault

Search (Ctrl+/)

Overview
Activity log
Access control (IAM)
Tags
Diagnose and solve problems

Settings

Keys
Secrets
Certificates
Access policies
Networking
Security

Delete | Move | Refresh | Share to mobile

Essentials

Resource group (change)
az-900-keyvault

Location
West Europe

Subscription (change)
Microsoft Azure Sponsorship

Subscription ID
f73706f8-c55b-42b7-9d31-6fc8e0d24146

Vault URI
https://az-900-key-vault.vault.azure.n

Sku (Pricing tier)
Standard

Directory ID
61a089d3-5ab4-4818-a1c8-9e439e96

Directory Name
Default Directory

Soft-delete
Enabled

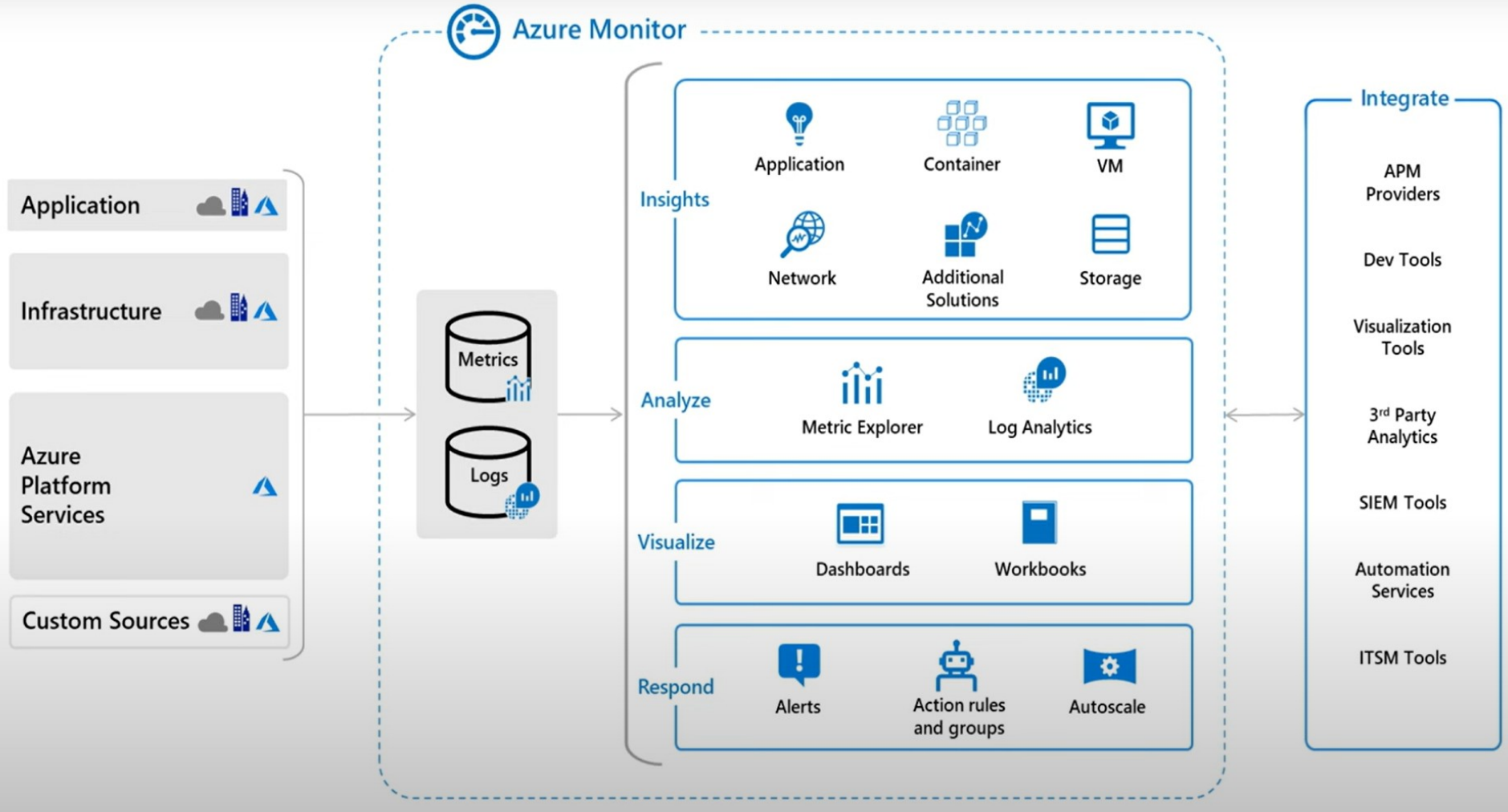
Purge protection
Enabled

Tags (change)
Click here to add tags

3. Azure Monitor

- Comprehensive monitoring: Metrics, logs, and traces.
- Application Insights: Application performance monitoring (like a debugger).
- Log Analytics: Powerful log querying (like grep on steroids).
- Alerting: Proactive notifications for critical events.
- *Like a system profiler and debugger for your entire Azure infrastructure.*

Azure Monitor


Azure Monitor
Application
Infrastructure
Azure Platform Services
Custom Sources
Metrics
Logs
Insights
Application
Container
VM
Network
Additional Solutions
Storage
Analyze
Metric Explorer
Log Analytics
Visualize
Dashboards
Workbooks
Respond
Alerts
Action rules and groups
Autoscale
Integrate
APM Providers
Dev Tools
Visualization Tools
3rd Party Analytics
SIEM Tools
Automation Services
ITSM Tools

Monitor | Overview

Microsoft

Search

Overview
Activity log
Alerts
Metrics
Logs
Change Analysis
Service Health
Workbooks

Insights

Applications
Virtual Machines
Storage accounts
Containers
Networks
SQL (preview)
Azure Cosmos DB
Key Vaults
Azure Cache for Redis
Azure Data Explorer Clusters
Log Analytics workspaces
Azure Stack HCI (preview)
Service Bus (preview)
Insights Hub

Overview | Tutorials | What's new

Insights

Use curated monitoring views for specific Azure resources. View all insights

Application insights

Monitor your app's availability, performance, errors, and usage.

View ··· More

Container Insights

Gain visibility into the performance and health of your controllers, nodes, and containers.

View ··· More

VM Insights

Monitor the health, performance, and dependencies of your VMs and VM scale sets.

View ··· More

Network Insights

View the health and metrics for all deployed network resources.

View ··· More

Detection, triage, and diagnosis

Visualize, analyze, and respond to monitoring data and events. Learn more about monitoring

Metrics

Create charts to monitor and investigate the usage and performance of your Azure resources.

View ··· More

Alerts

Get notified and respond using alerts and actions.

View ··· More

Logs

Analyze and diagnose issues with log queries.

View ··· More

Workbooks

View, create and share interactive reports.

View ··· More

Change Analysis

Investigate what changed to triage incidents.

View ··· More

Azure Monitor SCOM managed instance

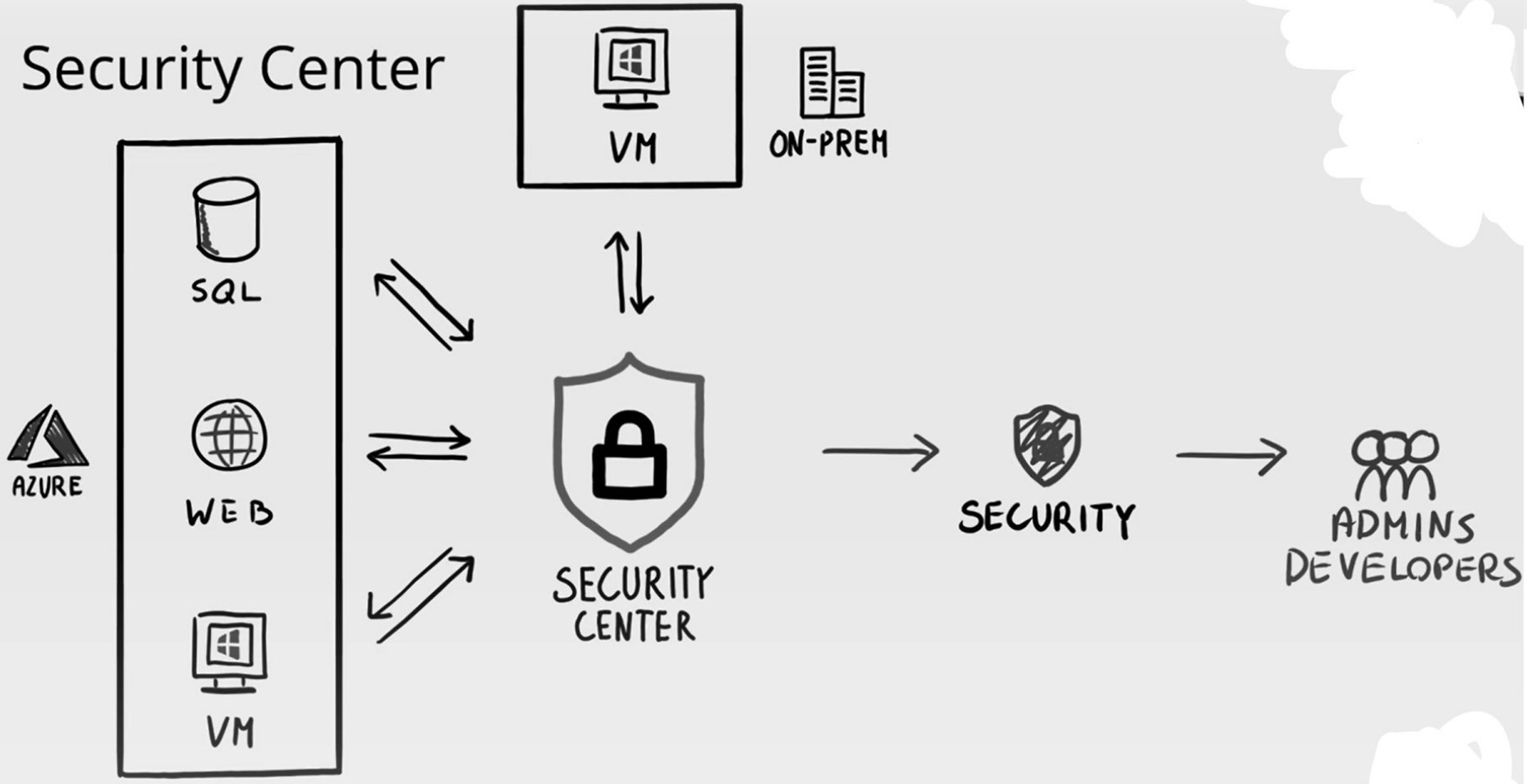
SCOM managed instance monitors workloads running on cloud and on-prem.

View ··· More

4. Azure Security Center

- Unified security management: **Security posture and threat protection**.
- Secure Score: Security health assessment.
- Azure Defender: Advanced threat protection (Just-in-Time VM access, etc.).
- **Hybrid security**: Protection of on prem servers.
- *Like an antivirus and firewall, but for your cloud environment, with proactive threat detection.*

Security Center



Security Center | Overview

Showing 2 subscriptions

Search (Ctrl+/)

Subscriptions What's new

General

- Overview
- Getting started
- Recommendations
- Security alerts
- Inventory
- Community

Cloud Security

- Secure Score
- Regulatory compliance
- Azure Defender

Management

- Pricing & settings
- Security policy
- Security solutions

2
Azure subscriptions

13
Active recommendations

3
Security alerts

Secure score

Current secure score

COMPLETED
Controls
3/14

COMPLETED
Recommendations
27/40

Improve your secure score >

Azure Defender

Resource coverage

Insights

Most prevalent recommendations (by resources)

- A vulnerability assessment soluti...
- Adaptive application controls fo...
- Vulnerabilities in security config...
- Storage account public access s...

Controls with the highest potential incr

- Enable MFA +18
- Remediate vulnerabilities +1
- Enable encryption at rest +7

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