Microsoft Azure

Microsoft Azure is a cloud computing platform and service created by Microsoft that allows individuals, businesses, and developers to build, deploy, and manage applications and services through Microsoft-managed data centers.

- Microsoft Azure is like a rental space in the cloud where you can:
- Run websites and apps, Store data safely, Use AI, analytics, or databases, And do all this without owning any physical servers.

- What Can You Do with Azure?
- Host websites and web apps
- Store files and databases
- Run virtual machines (like a computer in the cloud)
- Create mobile apps
- Analyze big data
- Add AI to your apps
- Back up and recover data
- Connect systems using messaging services

- 🔗**Types of Cloud Services**
- Azure Offers: IaaS (Infrastructure as a Service):Rent virtual machines, networking, and storage.
- PaaS (Platform as a Service):Focus on building apps without managing infrastructure.
- SaaS (Software as a Service):Use software over the internet (like Office 365).
- **Why Azure is Popular:**
- Works well with Microsoft products (Windows, Office, .NET)
- Global reach with data centers all over the world
- High security, scalability, and availability
- Great for both startups and large enterprises

- **Example: Building a Website Using Microsoft Azure**
- Imagine you want to create a website for your online clothing store, but…
- You don’t want to buy a server, You don’t want to worry about maintenance, You just want your site to be available 24/7,And you want to scale it when your business grows.
- How Azure Helps:
- Hosting the Website: You can use Azure Web App to deploy your website. No need to manage servers or infrastructure. Just upload your code, and Azure handles the rest.
- Storing Product Images: Use Azure Blob Storage to store product photos, videos, etc. It's scalable and secure.
- Saving Customer Data: Use Azure SQL Database to store customer details, orders, payments, etc. This is a cloud version of Microsoft SQL Server.
- Handling Traffic: If many users visit your site during a sale, Azure automatically scales resources (adds more virtual machines) to handle the load.
- Backup and Recovery: Use Azure Backup to automatically back up your website and data. If something crashes, you can restore it easily.

Application Roles in Azure

Web Role

- Handles HTTP/HTTPS requests.
- Automatically load-balanced.
- Ideal for hosting web apps, APIs, or any HTTP-based service.
- Supports horizontal scaling (add more instances).

🔧 **Worker Role**

- Designed for background tasks, processing jobs, batch operations.
- Cannot be accessed directly from the web.
- Communicates via queues, tables, or blob storage.
- Can make outbound HTTP requests for integration with external services.

Azure Data Storage Options

📂 Blob Storage

- Stores **unstructured data** (text, binary).
- Used for large files: **images, videos, logs, backups**.
- Highly **scalable and durable**.

📋 Table Storage

- NoSQL **key-value store** for semi-structured data.
- Schema-less, ideal for apps requiring fast reads/writes.
- Similar in concept to **Amazon SimpleDB**.

📬 Queue Storage

- Reliable **message passing** between components.
- Supports **asynchronous communication**.
- Enables **decoupled and distributed** architecture.

🗃️ SQL Azure (Relational Storage)

- **Fully-managed SQL database** (based on SQL Server).
- Supports **joins, transactions**, and **relational queries**.
- Optimized for **smaller datasets** (size limit ~10 GB per DB).
- Allows **horizontal scaling** by provisioning multiple DBs.

User Access:

- Users connect to Azure-hosted applications either through **HTTP** (like regular websites) or **REST web services** (used by apps and systems to interact with each other).

Load Balancer:

- Incoming requests are first handled by a Load Balancer, which distributes traffic across multiple Virtual Machines (VMs) to ensure no single machine is overwhelmed — this helps improve performance and availability.

Application Interfaces (VMs):

- Azure runs your application on Virtual Machines, which are of two types:
- **Web Role (with IIS):** For handling web interfaces (front-end, websites).
- **Worker Role**: For background tasks or processing-heavy functions that don't involve user interaction (e.g., calculations, queue processing).

Azure Storage Services:

1. Blobs: For storing large files like images, videos, backups.
2. Tables: For storing structured, non-relational data (like a lightweight database).
3. Queues: For communication between parts of the application. For example, a web role can send a message to a worker role using a queue

NET Services (Middleware Layer):

Access Control: Manages who can access what in your app (authentication & authorization).

Workflow: Automates sequences of tasks (e.g., approval processes).

Service Bus: Helps different parts of large apps talk to each other, even if they are on different machines.

SQL Azure (Database Layer):

- A cloud-based relational database (like SQL Server in the cloud).
- Organizes data in **containers** and **entities** (like tables and rows) to store structured data for application

FEATURES

1. **Wide Range of Cloud Services**

Compute: Virtual Machines (VMs), Azure Functions, App Services

Storage: Blob, Table, Queue, File storage

Databases: SQL Database, Cosmos DB, MySQL, PostgreSQL

Networking: Virtual Networks, Load Balancer, VPN Gateway

2. **Platform as a Service (PaaS)**

Lets you focus on app development without managing the underlying infrastructure.

Supports Web Apps, API Apps, and Logic Apps.

3. **Infrastructure as a Service (IaaS)**

Full control over VMs, networking, and storage.

Great for lift-and-shift of on-premise systems to the cloud.

4. **Security and Compliance**

Azure Active Directory for identity and access management.

Role-Based Access Control (RBAC).

Built-in compliance certifications (ISO, GDPR, HIPAA, etc.).

5. **Scalability and Flexibility**

Auto-scaling of resources based on demand.

Pay-as-you-go pricing model.

6. **Global Reach**

- Operates in multiple regions worldwide.
- Offers data residency options based on user requirements.

7. **Monitoring and Analytics**

Azure Monitor and Application Insights help track performance and usage.

Alerts, dashboards, and logs for real-time analysis.

8. Integration with AI and Machine Learning

Azure Machine Learning, Cognitive Services, and Bot Services to build smart applications.

9. **DevOps Support**

Integration with Azure DevOps, GitHub, and CI/CD pipelines.

Streamlines development and deployment processes. 🧰

10. **Developer Tools**

Deep integration with Visual Studio, .NET, PowerShell, and popular programming languages like Python, Java, Node.js, etc.