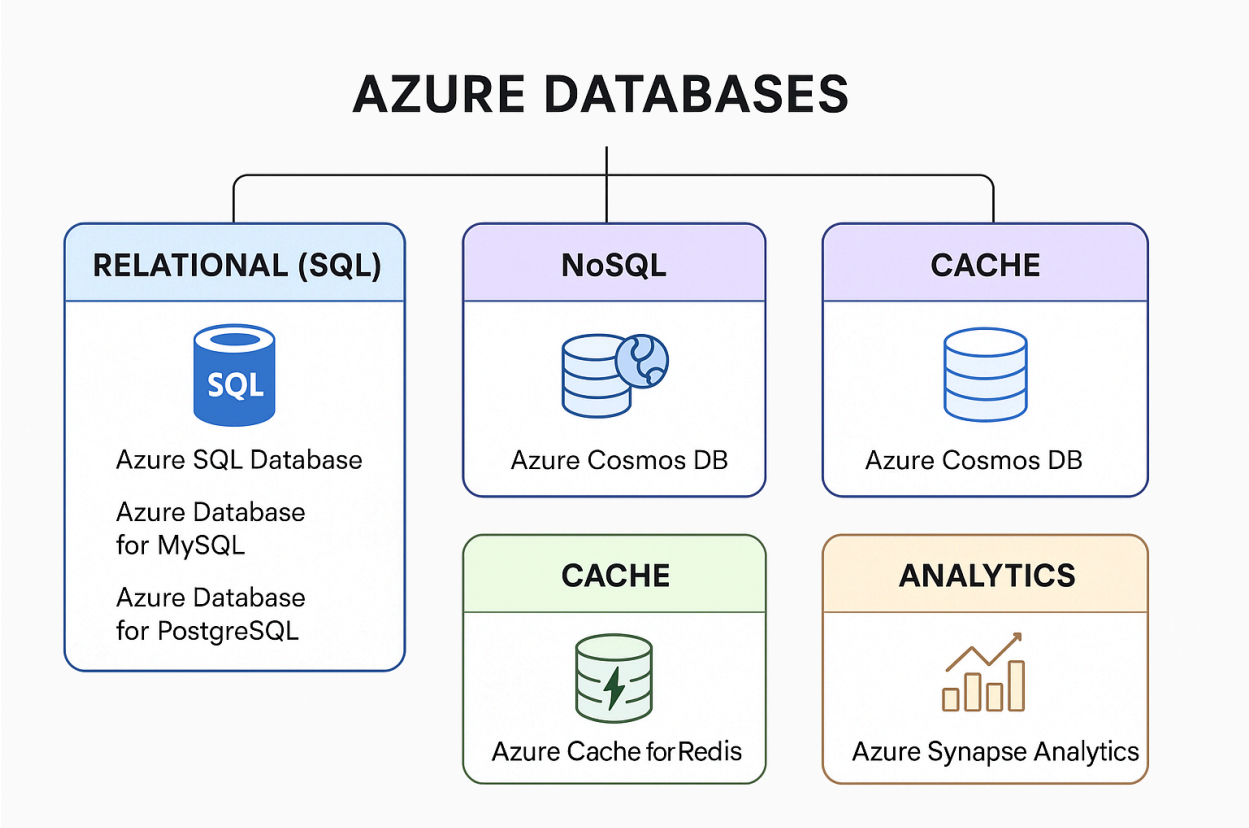
🌐 Azure Databases

Microsoft Azure provides a **Database as a Service (DBaaS)** platform that allows you to create, manage, and scale databases in the cloud without worrying about infrastructure like hardware, patching, or backups.

Azure supports **multiple types of databases** – relational, NoSQL, in-memory, and analytical – so you can choose the right one depending on your application needs.



🏗️ Categories of Azure Databases

1. Relational Databases (SQL-based)

Relational databases store data in **tables (rows and columns)** and use **SQL** for querying.

- 🔹 **Azure SQL Database**
  - Fully managed **relational database** built on Microsoft SQL Server.
  - Ideal for OLTP (Online Transaction Processing) apps.
  - Features: Auto-scaling, built-in backups, high availability, geo-replication.
  - Variants: **Single Database**, **Elastic Pool**, **Managed Instance**.
- 🔹 **Azure Database for MySQL**
  - Managed **MySQL** server.
  - Popular for open-source apps (WordPress, Drupal, eCommerce).
  - Offers built-in high availability and scaling.
- 🔹 **Azure Database for PostgreSQL**
  - Managed **PostgreSQL** with community extensions.
  - Supports advanced data types (JSON, arrays, GIS).
  - Deployment options: **Single Server**, **Flexible Server**, and **Hyperscale (Citus)** for distributed workloads.
- 🔹 **Azure Database for MariaDB**
  - Managed **MariaDB** (MySQL-compatible).
  - Open-source, but Microsoft announced retirement plans (so migration is suggested to MySQL/PostgreSQL).

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2. NoSQL Databases

NoSQL databases are **schema-less** and best for **scalable, high-performance applications**.

- 🔹 **Azure Cosmos DB**
    - Globally distributed, multi-model NoSQL DB.
    - Supports multiple APIs: **SQL API, MongoDB API, Cassandra API, Gremlin (Graph), Table API**.
    - Provides **single-digit millisecond latency**, **99.999% SLA**, and **global replication**.
    - Ideal for IoT, eCommerce, gaming, and large-scale apps.
- 🔹 **Azure Table Storage**
    - Simple key-value NoSQL store.
    - Cheaper but limited compared to Cosmos DB.
    - Good for storing structured, non-relational datasets.

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3. In-Memory Databases

Designed for **caching and fast performance**.

- 🔹 **Azure Cache for Redis**
    - Fully managed **Redis** (open-source, in-memory key-value store).
    - Used for caching, session storage, pub/sub messaging.
    - Supports sub-millisecond latency.

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4. Analytical Databases & Big Data

For **data warehousing and analytics** (OLAP workloads).

- 🔹 **Azure Synapse Analytics (formerly SQL Data Warehouse)**
    - Big data + analytics + SQL data warehouse.
    - Can query petabytes of data.
    - Integrates with **Power BI** for visualization.
- 🔹 **Azure Data Explorer (ADX)**
    - Optimized for real-time telemetry and log analytics.
    - Handles large volumes of streaming data.

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5. Hybrid & Migration Tools

Azure also helps move databases from on-prem to cloud:

- 🔹 **Azure Database Migration Service (DMS)** – Migrates SQL Server, Oracle, MySQL, PostgreSQL to Azure.
- 🔹 **SQL Server on Azure VM** – If you want full control of SQL Server on a VM instead of PaaS.

⚖️ Choosing the Right Azure Database

Use Case	Recommended Azure Database
Traditional business apps (ERP, CRM)	Azure SQL Database

Open-source web apps	MySQL / PostgreSQL
Large-scale, globally distributed apps	Cosmos DB
Caching & performance boost	Redis
Analytics & reporting	Synapse Analytics
Simple key-value store	Table Storage

✅ Advantages of Azure Databases

- Fully managed (no patching or hardware management).
- Global scalability.
- Built-in **security, compliance, and backups**.
- Integration with **Power BI, Azure Functions, Logic Apps, Event Grid**.
- Pay-as-you-go pricing.

👉 So, in short:
Azure gives you **SQL + NoSQL + Analytics + In-Memory DBs** as managed services, so you don't need to worry about infra — you just focus on data and applications.
