Evolution of Structured OLTP databases
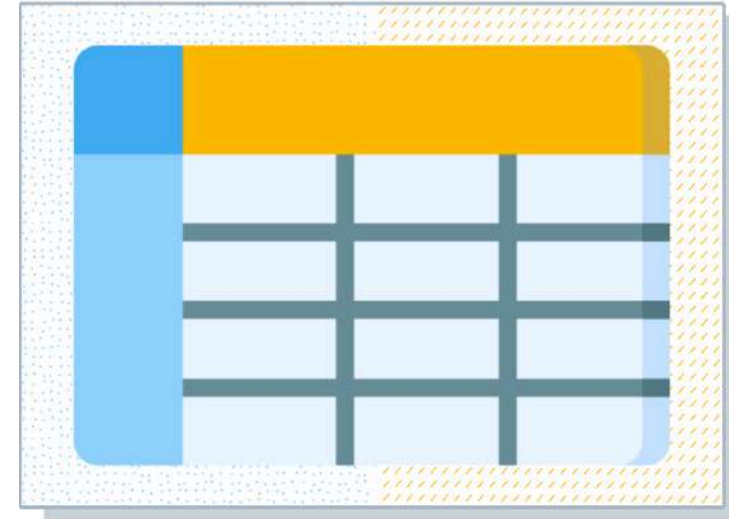
Structured Data: Well organized data (with proper structure)

- **Database**: Stored in relational databases

Two Major Workloads:

- **OLTP**: Fast, real-time transactions
- **OLAP**: Large-scale analytics, reports and insights

Journey: Let's understand the evolution of OLTP databases from on-premises to cloud
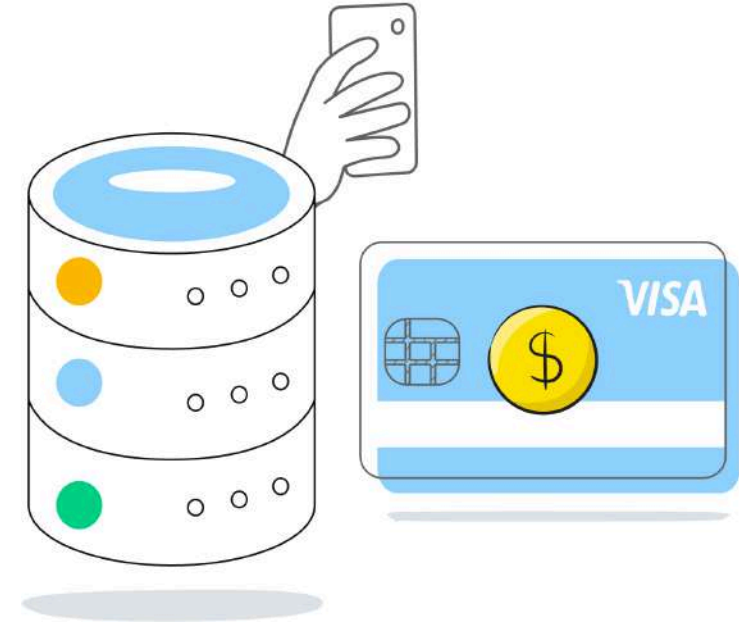
OLTP Evolution – Introduction

OLTP: Thousands of users performing transactions simultaneously

Phase 1: On Premises Databases (Manual management)

Phase 2: Cloud Regional Databases (Managed services)

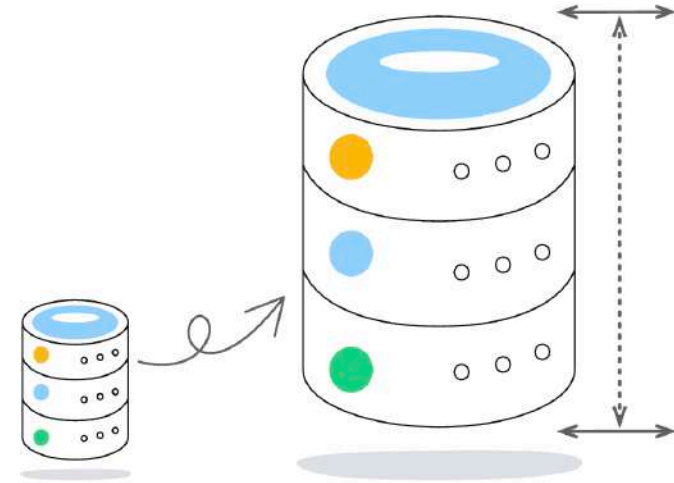**Phase 3**: Cloud Global Databases (Horizontally scalable SQL)

OLTP Phase 1: On Premises Databases

Popular Databases: Oracle, MySQL, SQL Server, PostgreSQL

Deployment: Physical servers in company data centers

- **Scaling**: Vertical only - buy a bigger server
- **Management**: Manual patching, backups, and tuning

Challenge: Difficult to manage

OLTP Phase 2: Cloud Regional Databases

Scenario: How about using a Managed Database Cloud Service?

- **Managed Services**: Cloud provider handles installation, upgrades, backups, patching, and monitoring

- **Availability**: Automated failover across Zones

- **Scaling**: Vertical (change size) or Read Replicas

Benefit: Familiar SQL engines without the operational headache

Example Services: Amazon RDS, Google Cloud SQL, Azure SQL Database
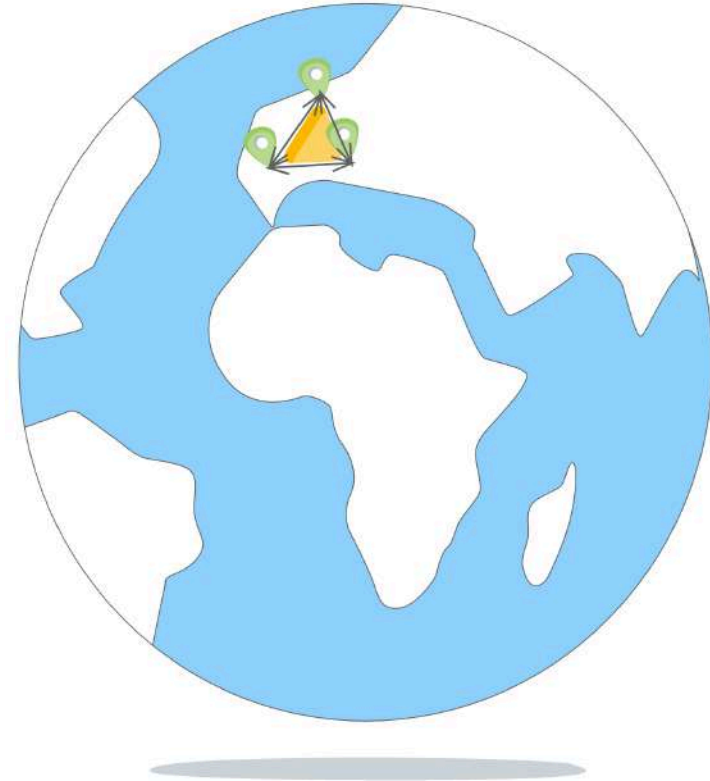
OLTP Phase 3: Cloud Global Databases

Scenario: You need relational data model with unlimited cloud-native scale

Cloud Global Databases: Data spread across multiple zones and regions

- **Horizontal Scaling**: Add more nodes to increase capacity

- **Strong Consistency**: All global users see same data at same time

Services: Google Cloud Spanner, Amazon Aurora, Azure SQL Geo-replication

Global vs Regional OLTP Databases

Feature	Global Database	Regional Database
Definition	A database deployed across multiple regions, offering low-latency global access and automatic replication	A database deployed in a single region; all data and compute stay local
Resilience	Survives regional outages	Survives Zone/AZ outages only
Cost	Higher (multi-region replication)	Lower (single region)
Example – AWS	Amazon Aurora Global Database	Amazon RDS
Example – Azure	Azure SQL with geo-replication	Azure SQL Database (single region), Azure Database (MySQL/PostgreSQL/..)
Example – Google Cloud	Cloud Spanner	Cloud SQL

Evolution of Structured OLTP databases - Summary

Structured Data: Well organized data (with proper structure)

- **Database**: Stored in relational databases
- **OLTP**: Fast, real-time transactions

Journey: We understood the evolution of OLTP databases from on-premises to cloud

- **Phase 1**: On Premises Databases
- **Phase 2**: Cloud Regional Databases
- **Phase 3**: Cloud Global Databases