

OLTP and OLAP

Understand the difference between **online transaction processing (OLTP)** and **online analytical processing (OLAP)**.

OLTP

VS

OLAP

Processes data from transactions in real time (e.g., customer orders, banking transactions, payments, and booking systems).

OLTP is all about data processing and completing large numbers of small transactions in real time.

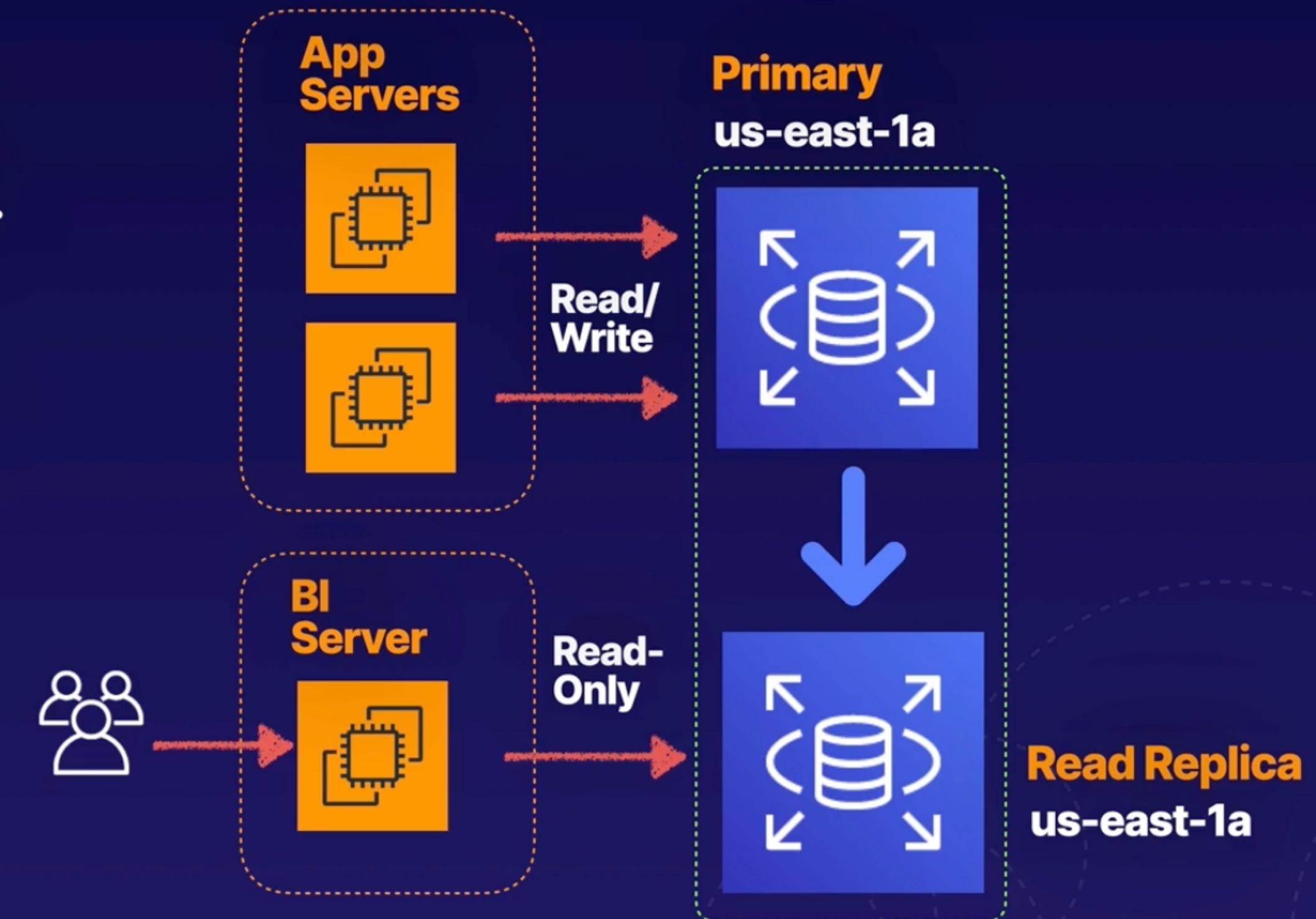
Processes complex queries to analyze historical data (e.g., analyzing net profit figures from the past 3 years and sales forecasting).

OLAP is all about data analysis using large amounts of data, as well as complex queries that take a long time to complete.

What Is a Read Replica?

A **read replica** is a read-only copy of your primary database.

Great for read-heavy workloads and takes the load off your primary database.



Key Facts

1

Scaling Read Performance

Primarily used for scaling, **not** for disaster recovery!

2

Requires Automatic Backup

Automatic backups must be enabled in order to deploy a read replica.

3

Multiple Read Replicas Are Supported

MySQL, MariaDB, PostgreSQL, Oracle, and SQL Server allow you to add up to 5 read replicas to each DB Instance.



Multi-AZ

- An exact copy of your production database in another Availability Zone.
- Used for disaster recovery.
- In the event of a failure, RDS will automatically fail over to the standby instance.

Read Replica

- A read-only copy of your primary database in the same AZ, cross-AZ, or cross-region.
- Used to increase or scale read performance.
- Great for read-heavy workloads and takes the load off your primary database for read-only workloads (e.g., Business Intelligence reporting jobs).

VS



 STUDY TIP

What Is Aurora?

Amazon Aurora is a MySQL- and PostgreSQL-compatible relational database engine that combines the speed and availability of high-end commercial databases with the simplicity and cost-effectiveness of open-source databases.

Things to Know about Aurora

- ✓ Start with 10 GB. Scales in 10-GB increments to 128 TB (storage Auto Scaling).
- ✓ Compute resources can scale up to 96 vCPUs and 768 GB of memory.
- ✓ 2 copies of your data are contained in each Availability Zone, with a minimum of 3 Availability Zones. 6 copies of your data.



3 TYPES OF Aurora Replicas Available

Aurora Replicas

You can currently have
15 read replicas with
Aurora.



MySQL Replicas

You can currently have
5 read replicas with
Aurora MySQL.



PostgreSQL

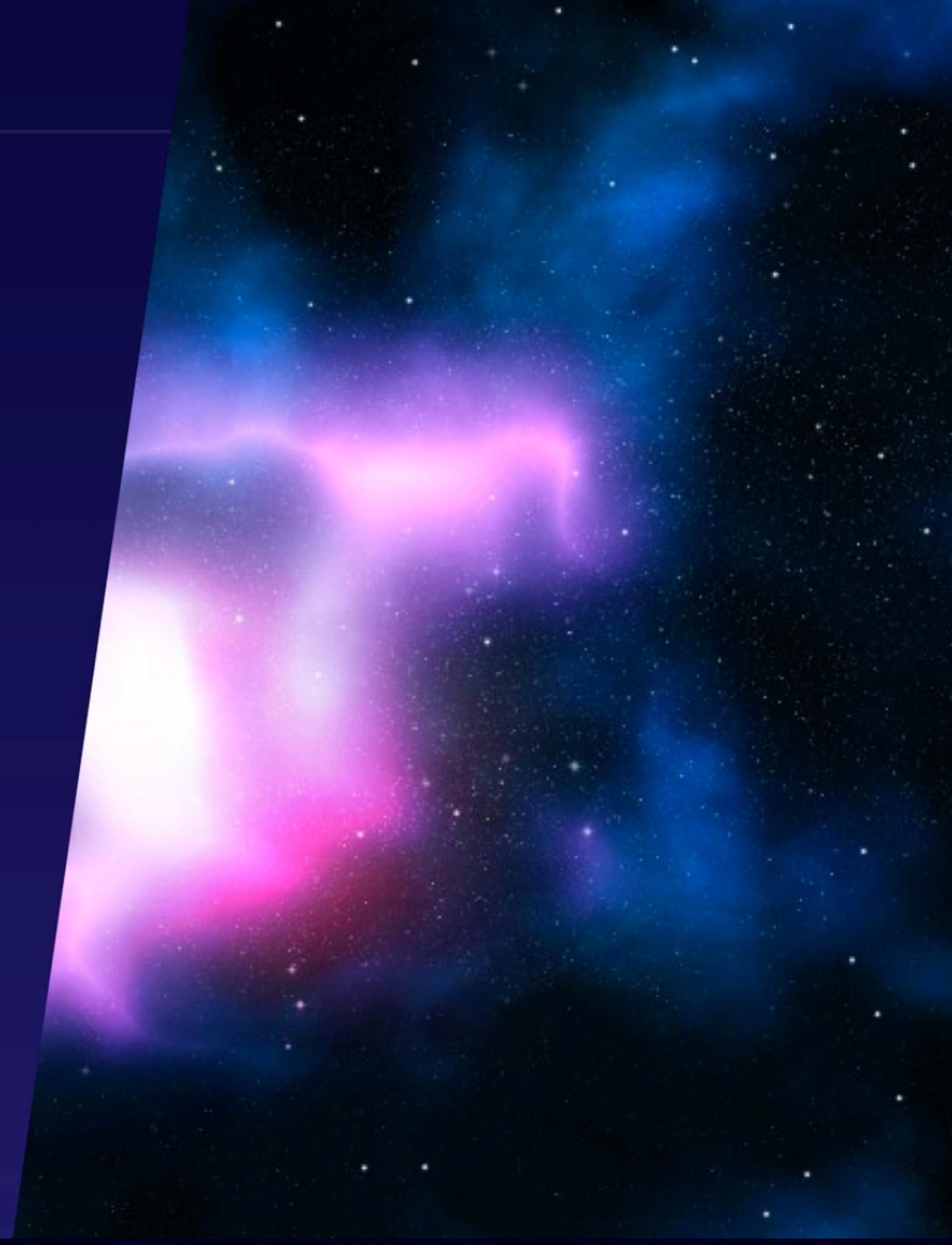
You can currently have
5 read replicas with
Aurora PostgreSQL.



Scaling

Scaling Aurora

- Aurora is designed to **transparently handle the loss of up to 2 copies of data** without affecting database write availability and up to 3 copies without affecting read availability.
- Aurora **storage is also self-healing**. Data blocks and disks are continuously scanned for errors and repaired automatically.



Types of Aurora Replicas

Feature	Amazon Aurora Replicas	MySQL Replicas
Number of replicas	Up to 15	Up to 5
Replication type	Asynchronous (milliseconds)	Asynchronous (seconds)
Performance impact on primary	Low	High
Replica location	In-region	Cross-region
Act as failover target	Yes (no data loss)	Yes (potentially minutes of data loss)
Automated failover	Yes	No
Support for user-defined replication delay	No	Yes
Support for different data or schema vs. primary	No	Yes

Amazon Aurora Serverless

An on-demand, auto-scaling configuration for the MySQL-compatible and PostgreSQL-compatible editions of Amazon Aurora. **An Aurora Serverless DB cluster automatically starts up, shuts down, and scales capacity up or down based on your application's needs.**



Aurora Backups

Backups with Aurora

- ✓ Automated backups are always enabled on Amazon Aurora DB Instances. Backups do not impact database performance.
- ✓ You can also take snapshots with Aurora. This also does not impact on performance.
- ✓ You can share Aurora snapshots with other AWS accounts.

What Is DynamoDB?

What Is DynamoDB?

Amazon DynamoDB is a **fast and flexible NoSQL database** service for all applications that need consistent, single-digit millisecond latency at any scale.

It is a fully managed database and supports both document and key-value data models.

Its flexible data model and reliable performance make it a great fit for mobile, web, gaming, ad-tech, IoT, and many other applications.



4 Facts about DynamoDB

- ✓ Stored on SSD storage
- ✓ Spread across 3 geographically distinct data centers
- ✓ Eventually consistent reads (default)
- ✓ Strongly consistent reads

What's the difference between **eventually consistent reads** and **strongly consistent reads?**

Eventually

Consistency across all
**copies of data is usually
reached within a second.**

Repeating a read after a
short time should return the
updated data. Best read
performance.

Strongly

A strongly consistent read
**returns a result that
reflects all writes** that
received a successful
response prior to the read.

VS

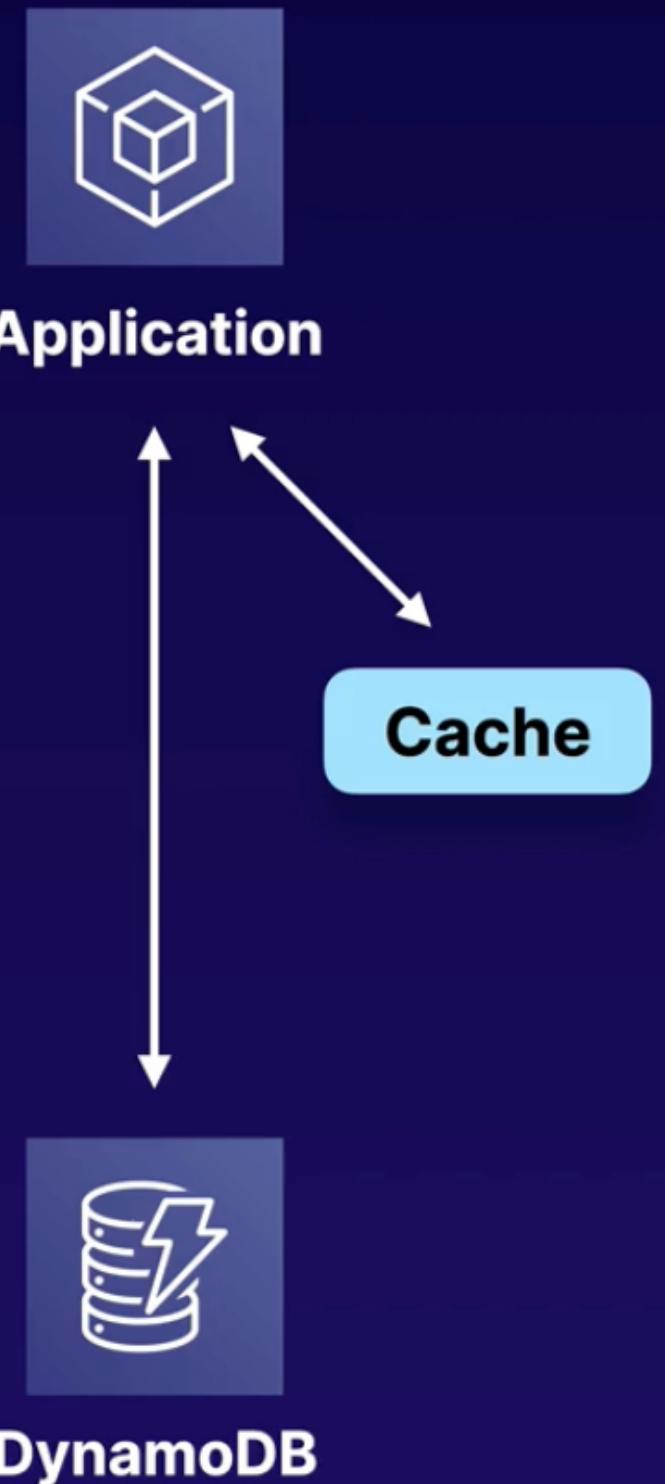
DynamoDB Accelerator (DAX)

- Fully managed, highly available, in-memory cache
- 10x performance improvement
- Reduces request time from milliseconds to **microseconds** — even under load
- No need for developers to manage caching logic



DynamoDB Accelerator (DAX)

Traditional Cache



Caching with DAX



ACID Diagram

ACID for Databases

ATOMIC

All changes to the data must be performed successfully or not at all.

Consistent

Data must be in a consistent state before and after the transaction.

Isolated

No other process can change the data while the transaction is running.

Durable

The changes made by a transaction must persist.





ACID with DynamoDB

DynamoDB transactions provide developers atomicity, consistency, isolation, and durability (ACID) across 1 or more tables within a single AWS account and region.

You can use transactions when building applications that require coordinated inserts, deletes, or updates to multiple items as part of a single logical business operation.

Use Cases for DynamoDB Transactions

- ✓ Processing financial transactions
- ✓ Fulfilling and managing orders
- ✓ Building multiplayer game engines
- ✓ Coordinating actions across distributed components and services

DynamoDB Transactions

-  If you see any scenario question that mentions ACID requirements, think **DynamoDB transactions**.
-  DynamoDB transactions provide developers **atomicity, consistency, isolation, and durability** (ACID) across 1 or more tables within a single AWS account and region.
-  **All-or-nothing** transactions.