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CAP Theorem

Distributed Databases

- **Distributed databases** are designed to operate across multiple servers or even multiple regions, which makes them scalable and resilient but also introduces fundamental trade-offs.

CAP Theorem (Eric Brewer)

a distributed system cannot fully guarantee all three:

Consistency (C)

all nodes return the same data
at the same time.

Availability (A)

the system always responds,
even if data is slightly outdated.

Partition Tolerance (P)

the system keeps working
despite network failures.

Only two can be prioritized at once:

C + A

→fails under partitions.

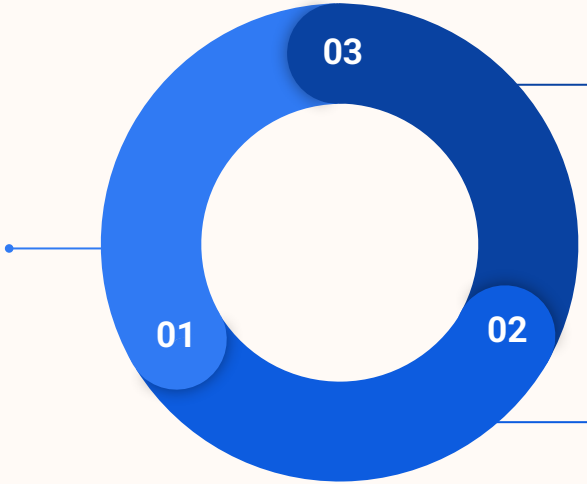
C + P

→ sacrifices availability.

A + P

→ sacrifices strict consistency.

E-commerce Marketplace (this project):



Partition Tolerance

non-negotiable (multi-region operation).

Consistency

compromised → temporary stock conflicts resolved later (cancellation, refund, backorder).

Availability

prioritized → customers can always browse, add to cart, and place orders.

Key Decision

Prioritize A + P → ensures continuous service and revenue protection; minor consistency issues are manageable.