CAP Theorem

What is CAP ?

C - Consistency

A - Availability

P - Partition Tolerance

Disclaimer : From now on, we will be using the terms
node/server/machine/computer interchangeably to infer any of these.

Consistency

- System should not show the problem of stale data during the Δt time(till the changes propagate)

Availability

- System should always respond even if it is with an error message or inconsistent data

Partition Tolerance

- System should not suffer in case of network failure at a specific node which can be achieved with the help of data replication.

CAP Theorem

- CAP theorem states that in a distributed system, we can achieve only two of the features out of these three (Consistency, Availability, Partition Tolerance)
- Since partition tolerance is very important wrt distributed systems, there is always a trade-off between Consistency and Availability.
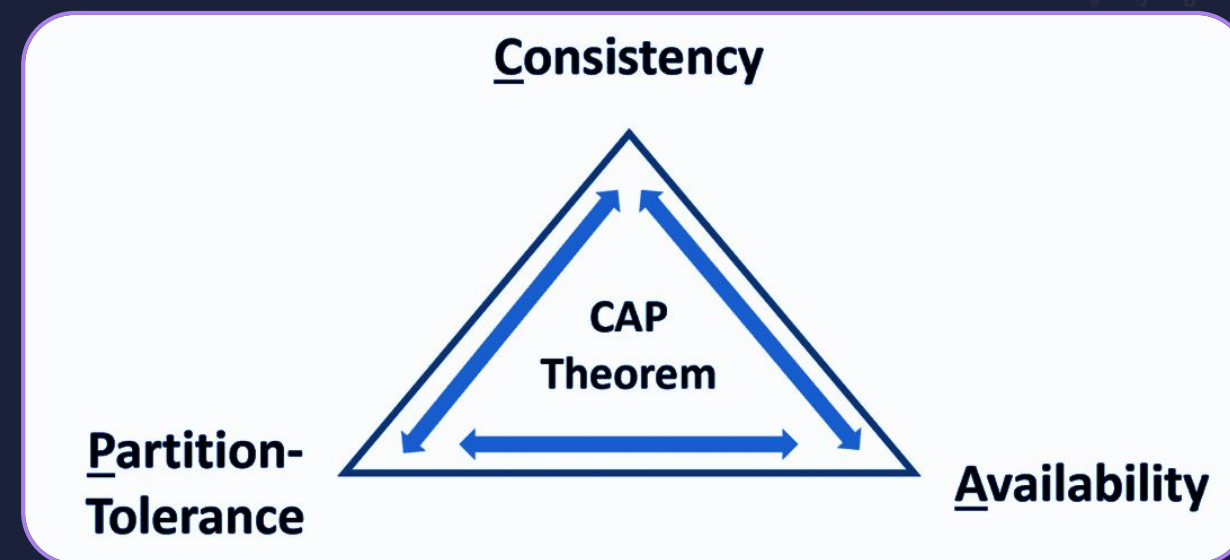
Highly consistent systems

- For a system to be highly consistent, all the reads should be stopped during the time when some changes are being propagated.
- This might result in decrease of availability.

Highly available system

- If the system has to be highly available, the data that is provided might be
  stale.
- Consistency here would be lesser

Use cases

1. Bank Transaction

Here, consistency should always be high as it involves monetary transactions between parties. Lesser availability is acceptable (as we often see, when banks claim to have servers down).

2. Social Media

Here, availability is more important and stale data is not a problem (we share only pictures/reels/tweets etc) and hence consistency takes a back seat.