Notes - Session 12 - Consistent Hashing and Capacity Estimation

What is Consistent Hashing?

Consistent hashing is a technique used in distributed systems to evenly distribute data across a cluster of nodes, such as servers or databases, and to minimize reorganization when nodes are added or removed. Here's an overview along with examples and diagrams:

Understanding Consistent Hashing

Basic Concept: Consistent hashing maps data to a node in a system so that when the number of nodes changes, only a minimal amount of data is moved.

Hash Ring: Imagine a circular space (like a clock) where each point on the ring represents a hash value. Both data items and nodes are mapped onto this ring based on their hash values.

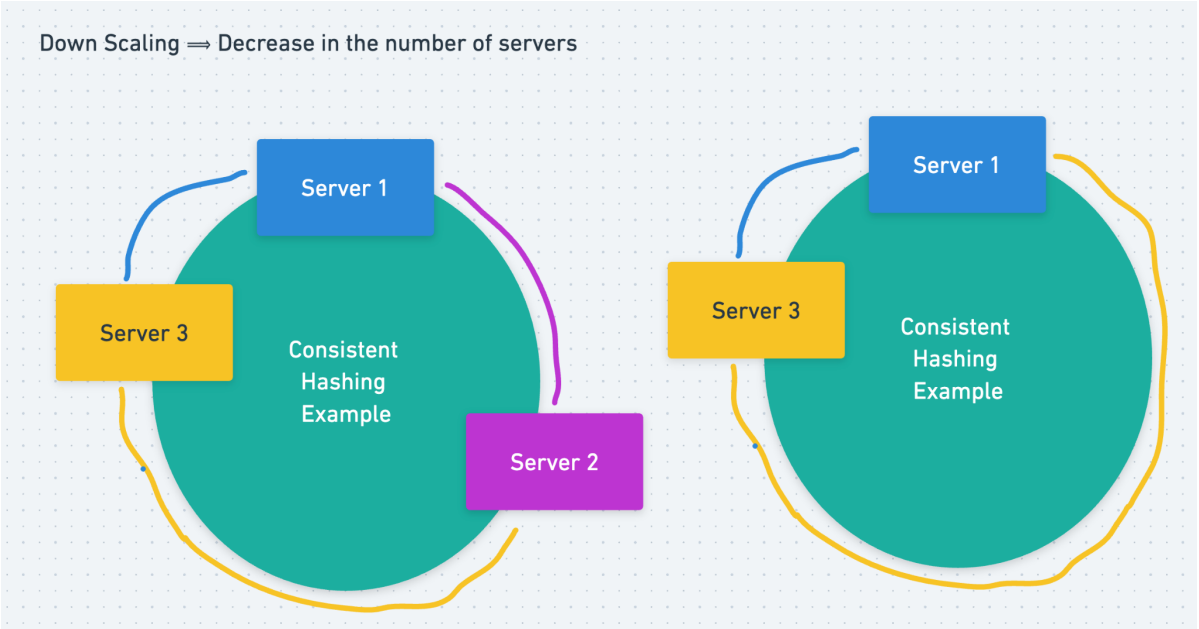
Data Assignment: Data is assigned to the nearest node on the ring in a clockwise direction. Each node is responsible for the data that falls between it and the previous node on the ring.

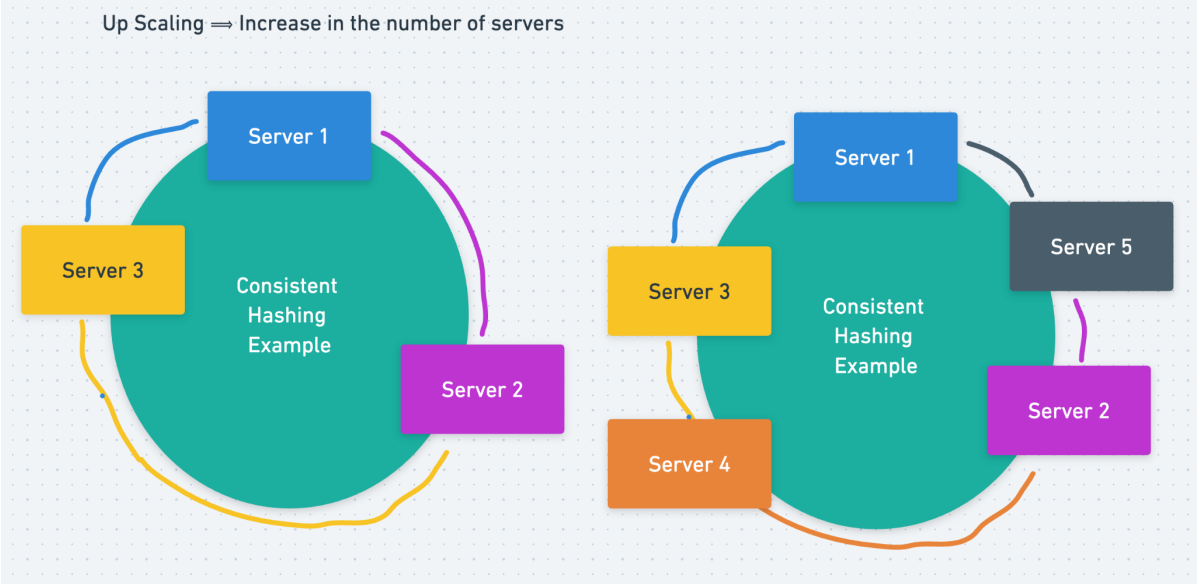
Scaling: When a new node is added, it takes its position on the ring and takes responsibility for some data from the node next to it. When a node is removed, its data is taken over by the next node.

Examples in System Design

Distributed Caches: In a distributed cache system, consistent hashing ensures that when a cache machine is added or removed, only a small portion of the cache keys need to be remapped to different machines.

Load Balancing: It can be used for load balancing in distributed web services, where requests are evenly distributed across a pool of servers.





Capacity Estimation

Real life example: Packing for a trip

Tech Example: Instagram

Capacity Estimation for Instagram

Storage Estimation:

Users ⇒ DAU: 1 M // DAU ⇒ Daily Active User MAU ⇒ Monthly Active User

Posts per user: 2 posts

Size of a post: 5 MB

How much storage do I need for storing photos on Instagram?

DAU * Posts per day * Size of a post * 30 (month) * 12 (year)

1 * 2 * 5 * 360 = 3600 MB = 3.6 GB

Through Estimation:

1M * 2 = 2 Million request / day

Queries per second (qps) = 2 M / 86400 = 23 qps

How many requests can 1 server handle per second = 5 qps

Total number of servers = 5 servers

Write Requests = 1 M * 2 photos = 2 million write requests to db

how many photos does each user see on Instagram per day? = 100

Read requests = 1 M * 100 = 100 million read requests

Read / Write = 100 / 2 = 50