How to implement sharding

How Does Sharding Work?

The sharding process involves several key components including:

1. **Sharding Key**: The shard key is a unique identifier used to determine which shard a particular piece of data belongs to. It can be a single column or a combination of columns.
2. **Data Partitioning**: Partitioning involves splitting the data into shards based on the shard key. Each shard represents a portion of the total data set. Common strategies to partition database are **range-based, hash-based, and directory-based sharding.**
3. **Shard Mapping**: Creating a mapping of shard keys to shard locations.
4. **Shard Management**: The shard manager oversees the distribution of data across shards, ensuring data consistency and integrity.
5. **Query Routing**: The query router intercepts incoming queries and directs them to the appropriate shard(s) based on the shard key.

Or implement Consistent Hashing

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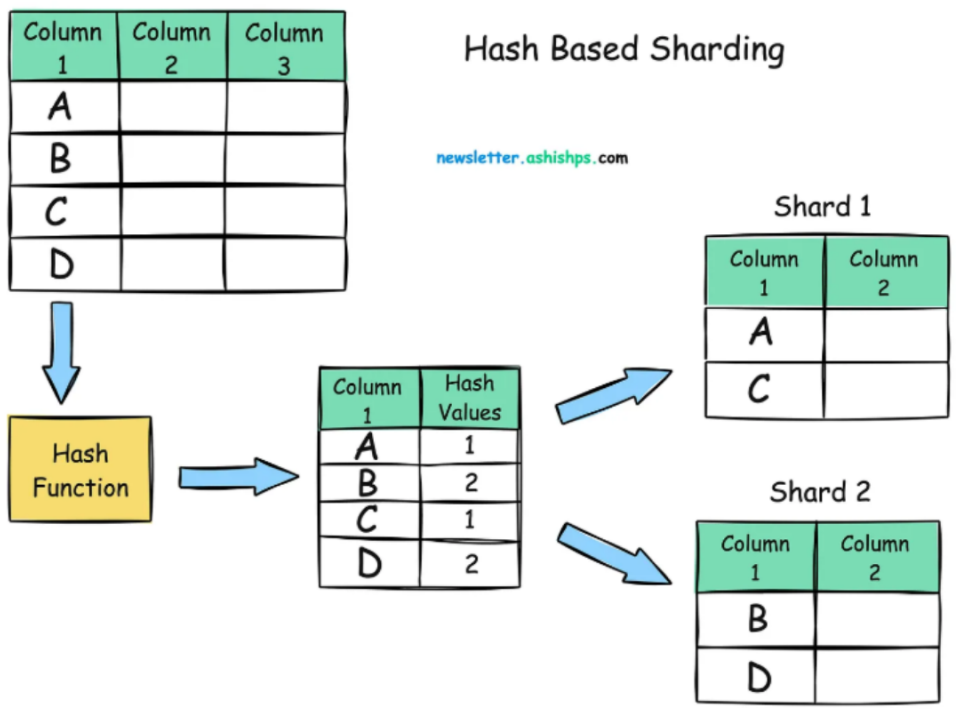
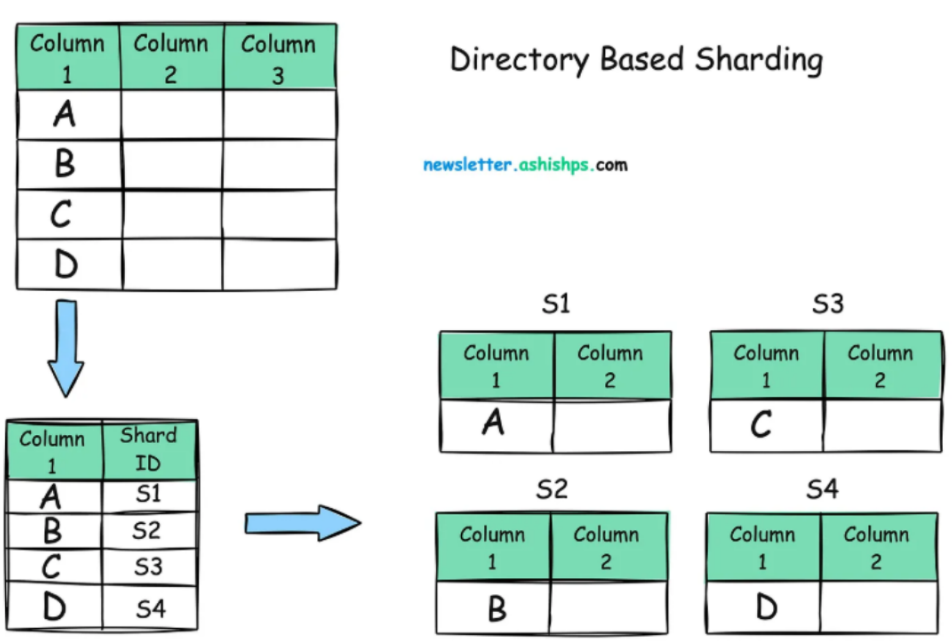
Sharding Strategies

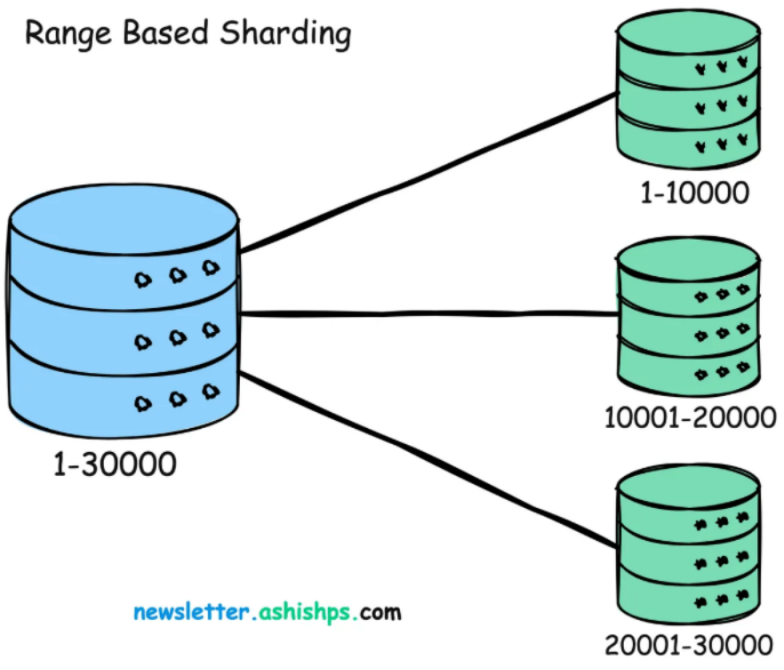
- **Hash-Based Sharding**: Data is distributed using a hash function, which maps data to a specific shard.
    - **Example:** `Hash(user_id) % 2` determines the shard number for a user, distributing users evenly across 2 shards.



- **Directory-Based Sharding**: Maintains a lookup table that directly maps specific keys to specific shards.



- **Range-Based Sharding**: Data is distributed based on a range of values, such as dates or numbers.
    - **Example:** Shard 1 contains records with IDs from 1 to 10000, Shard 2 contains records with IDs from 10001 to 20000, and so on.



- **Geo-Based Sharding**: Data is distributed based on geographic location.
    - **Example:** Shard 1 serves users in North America, Shard 2 serves users in Europe, Shard 3 serves users in Asia.