Database Sharding Architectures Summary

Sharding Type	Operation Mechanism	Example	Advantages	Disadvantages
Range-Based Sharding	Split data based on continuous value ranges of shard key.	User ID 1–1000 → Shard A; 1001–2000 → Shard B.	Easy implementation; efficient range queries.	Hot spots; requires manual rebalancing.
Hashed Sharding	Apply hash function to shard key; hash decides the shard.	hash(user_id) % 3 → Shard 0/1/2.	Uniform data distribution; avoids hot spots.	Poor range query support; costly rebalancing.
Directory Sharding	Lookup table maps keys or ranges to shards.	Directory: 1–5000 → Shard A; 5001–9000 → Shard B.	Flexible; easy to rebalance.	Directory may be a single point of failure; extra lookup needed.
Geo Sharding	Shard based on geographic region; users stored near their location.	US users → US shard; EU users → EU shard.	Low latency; meets data locality laws.	Uneven regional load; difficult global queries.