MongoDB Specification in Maude

BEATRIZ ALCAIDE

Maude

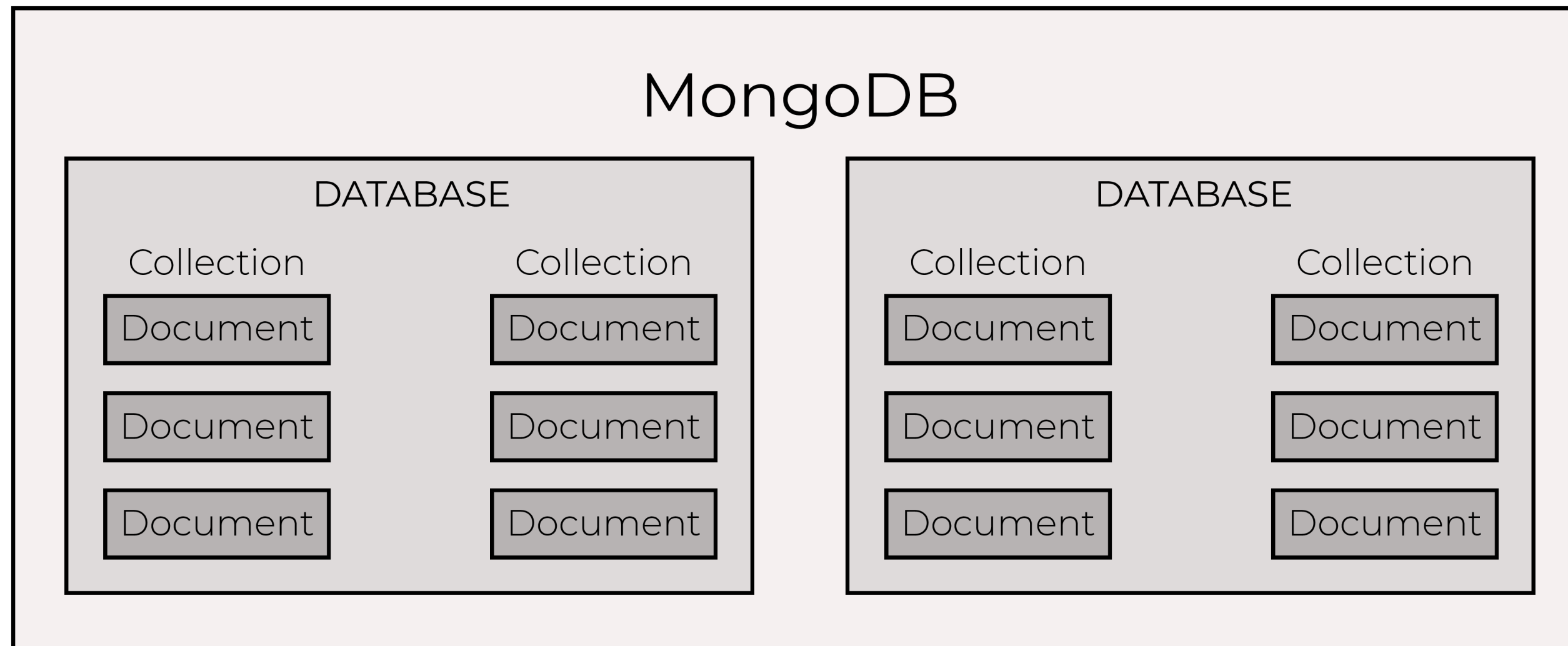- Language:
  - Executable semantics.
- Rewriting Logic.
- MEL.

MongoDB

- DBMS.
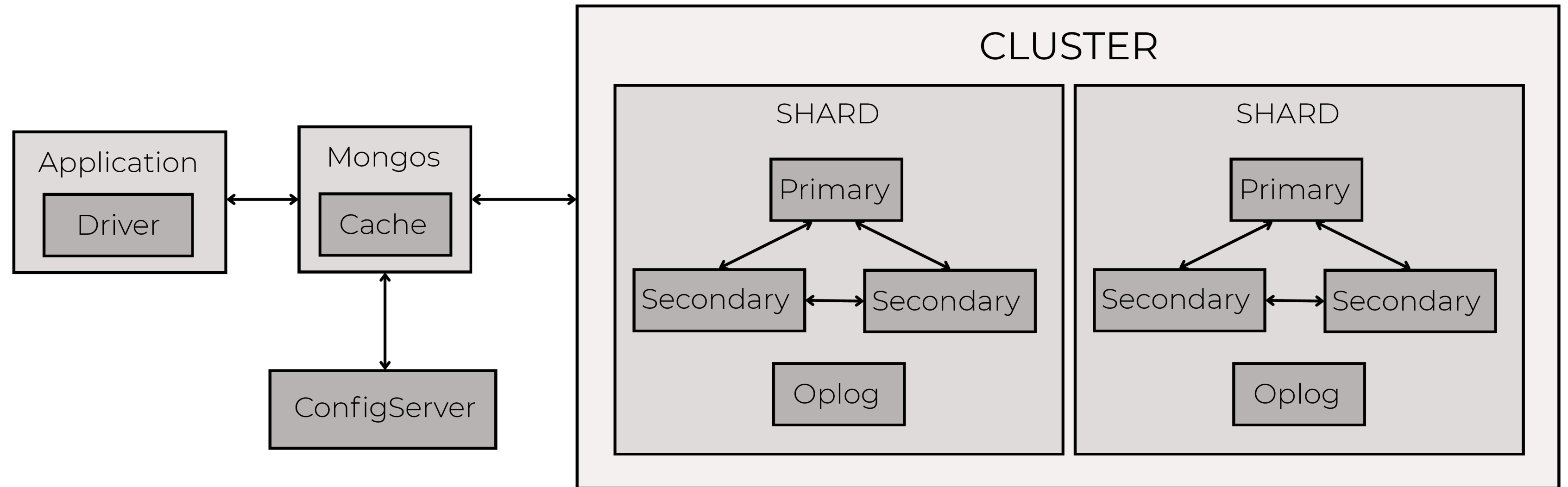- NoSQL.
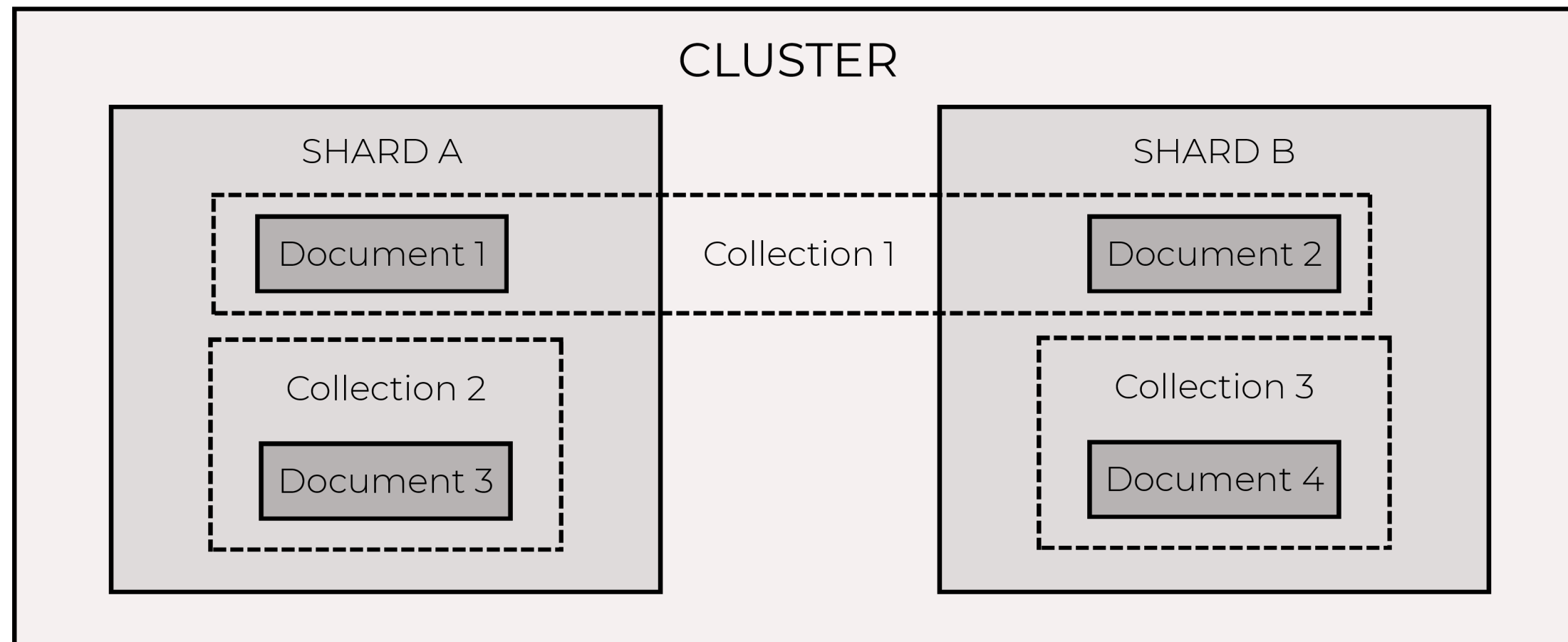- Distributed.

MongoDB's Data Model

MongoDB's Architecture

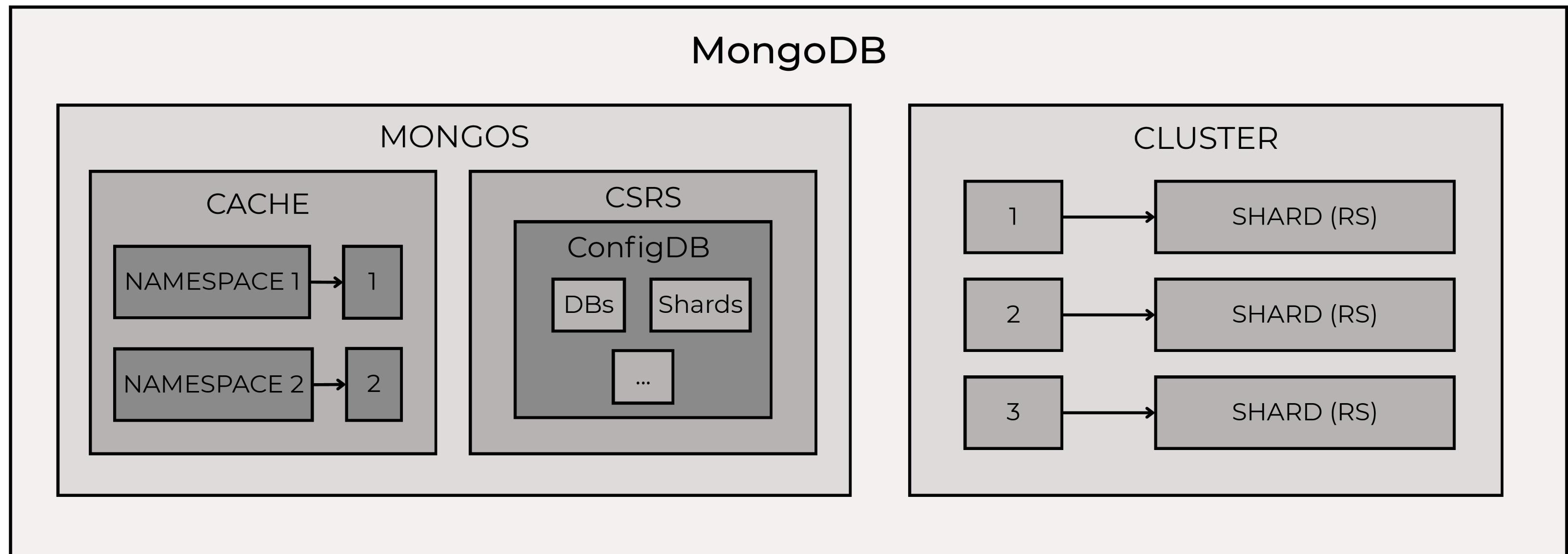# Sharded Collections

CLUSTER

SHARD A

Document 1

Collection 1

Document 2

SHARD B

Collection 2

Document 3

Collection 3

Document 4

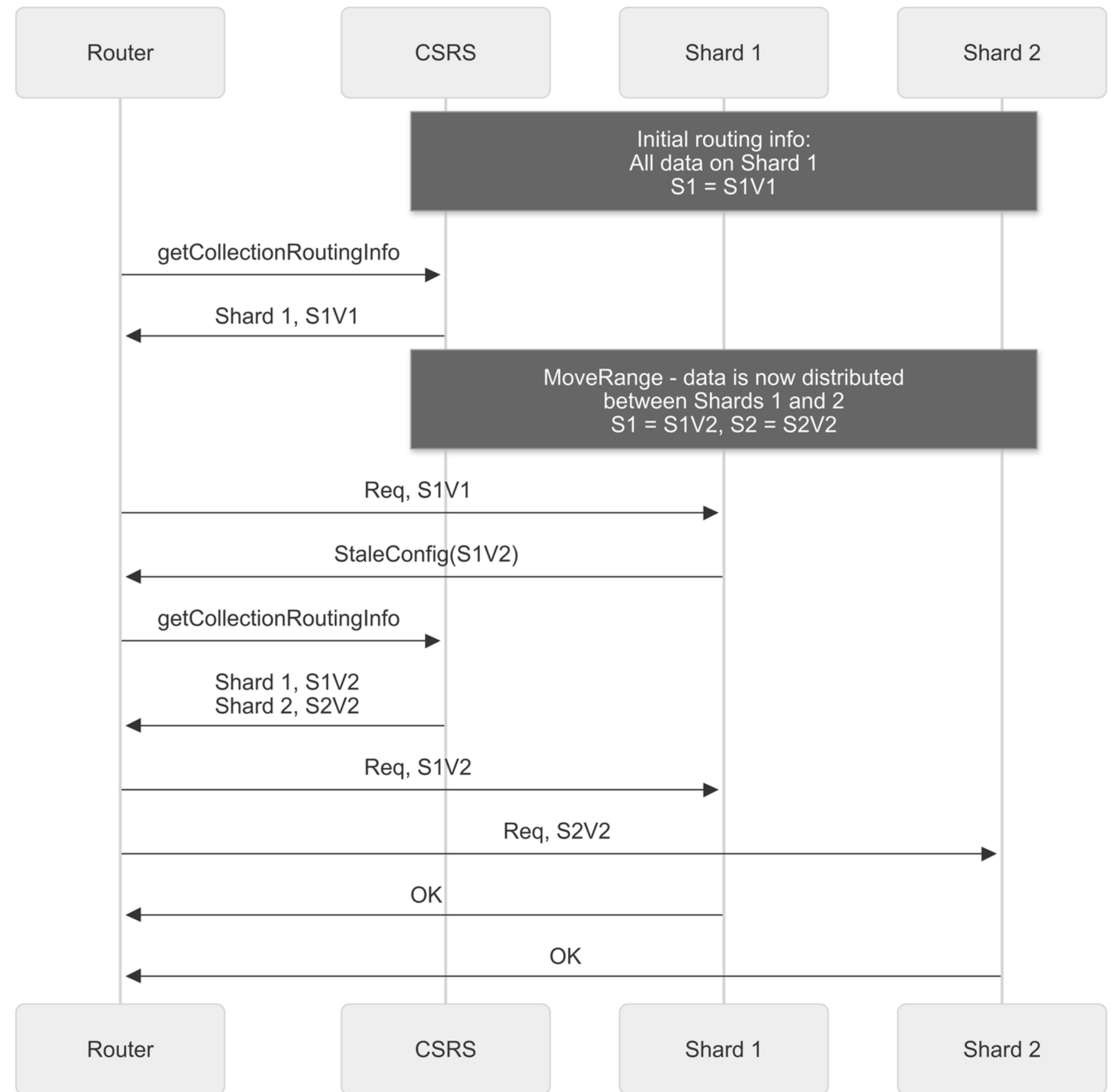MongoDB uses **Shard Keys** to route sharded queries:
- Hashed-Based
- Range-Based

Functional Modules

Versioning Protocol

The **routing info** tells the router the set of shards that should be contacted.

Router | CSRS | Shard 1 | Shard 2

Initial routing info:
All data on Shard 1
S1 = S1V1

getCollectionRoutingInfo →

← Shard 1, S1V1

MoveRange - data is now distributed
between Shards 1 and 2
S1 = S1V2, S2 = S2V2

Req, S1V1 →

← StaleConfig(S1V2)

getCollectionRoutingInfo →

← Shard 1, S1V2
Shard 2, S2V2
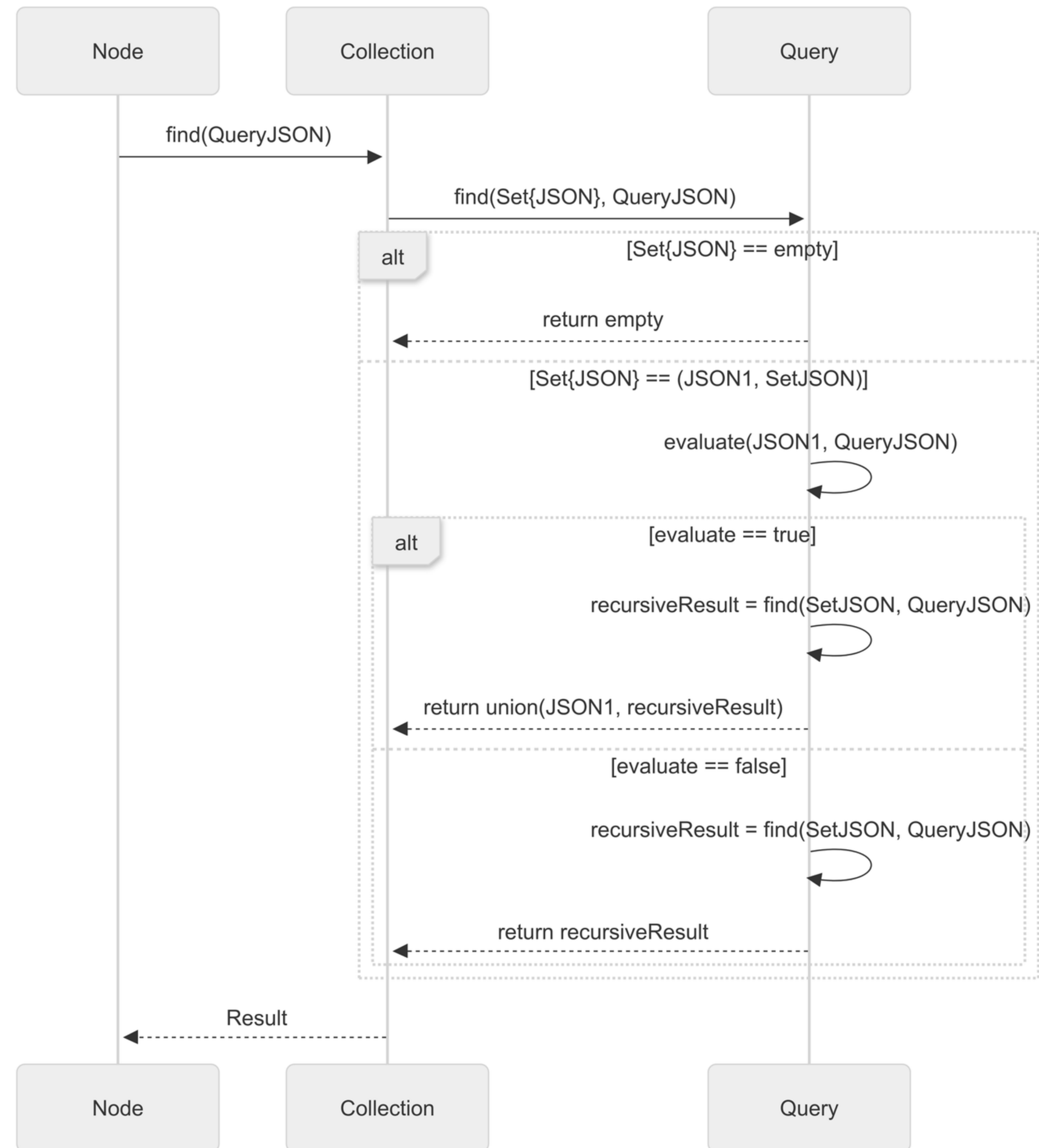
Req, S1V2 →

Req, S2V2 →

← OK

← OK

Update Replica Set
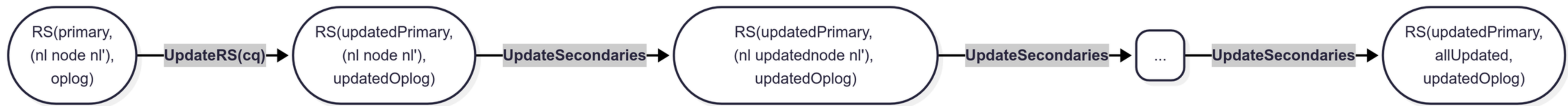
Queries

The find function receives a **JSON-like** object that **defines** the **conditions** documents must meet to be included in the query result.

Future work

- Conformance testing.
- Consensus algorithm.
- Expand query operators.
- Indexes.
- Model check.

Thank you!