g·able

MongoDB 3.0

Introduction to MongoDB

Topics

- Introduction to MongoDB
- MongoDB High Availability (HA) Architecture
- References

NoSQL

- A NoSQL (often interpreted as Not only SQL) database provides a mechanism for storage and retrieval of data that is modelled in means other than the tabular relations used in relational databases.

- Motivations for this approach include simplicity of design, horizontal scaling, and finer control over availability.

- The data structures used by NoSQL databases differ from those used in relational databases, making some operations faster in NoSQL and others faster in relational databases.

- NoSQL databases are increasingly used in big data and real-time web applications.

- Many NoSQL stores compromise consistency in favour of availability and partition tolerance. Most NoSQL stores lack true ACID (Atomicity, Consistency, Isolation, Durability) transactions.

What is MongoDB

- MongoDB is an open-source document database that provides high performance, high availability, and automatic scaling.

- Document Database :-

A record in MongoDB is a document, which is a data structure composed of field and value pairs. MongoDB documents are similar to JSON objects. The values of fields may include other documents, arrays, and arrays of documents.

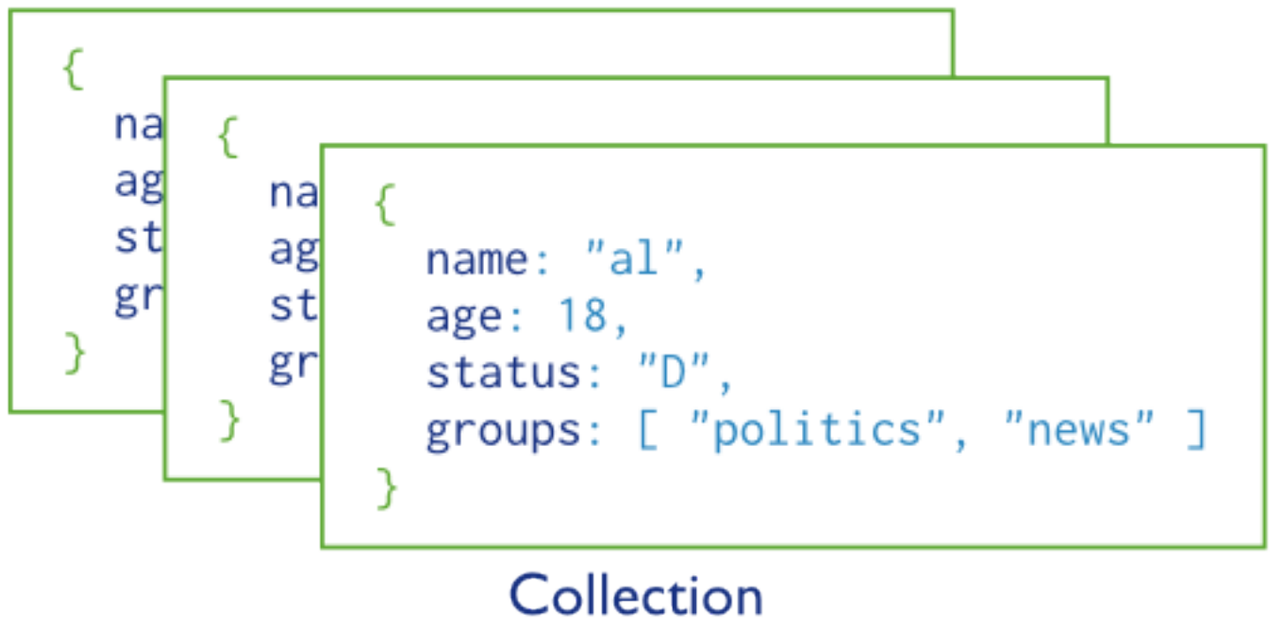
Document-Based Benefits

- The advantages of using documents are:
  - Documents (i.e. objects) correspond to native data types in many programming languages.
  - Embedded documents and arrays reduce need for expensive joins.
  - Dynamic schema supports fluent polymorphism.

MongoDB Document Example

- Document

- Collection



Key Features

- **High Performance** :- MongoDB provides high performance data persistence. In particular…
  - Support for embedded data models reduces I/O activity on database system.
  - Indexes support faster queries and can include keys from embedded documents and arrays.
- **High Availability** :- To provide high availability, MongoDB's replication facility, called replica sets, provide:
  - Automatic failover.
  - Data redundancy.
  - A replica set is a group of MongoDB servers that maintain the same data set, providing redundancy and increasing data availability.
- **Automatic Scaling** :- MongoDB provides horizontal scalability as part of its core functionality.
  - Automatic sharding distributes data across a cluster of machines.
  - Replica sets can provide eventually-consistent reads for low-latency high throughput deployments.

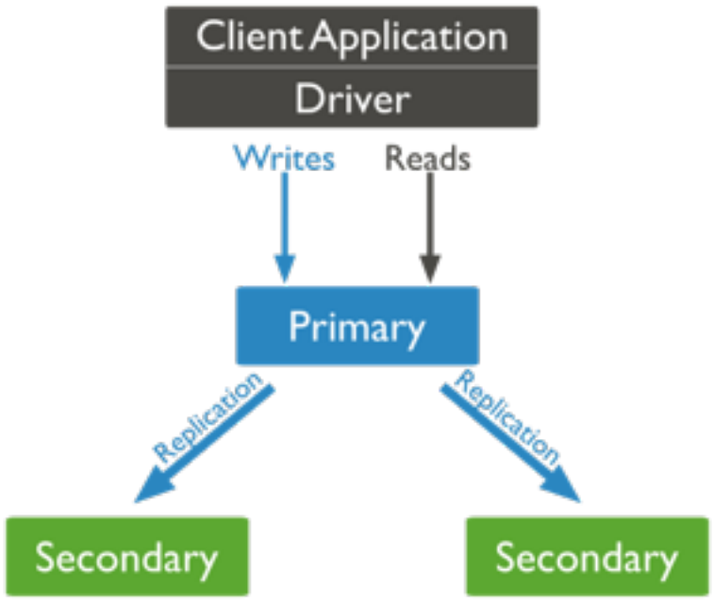
MongoDB HA: Replication

- A replica set in MongoDB is a group of mongod processes that maintain the same data set.

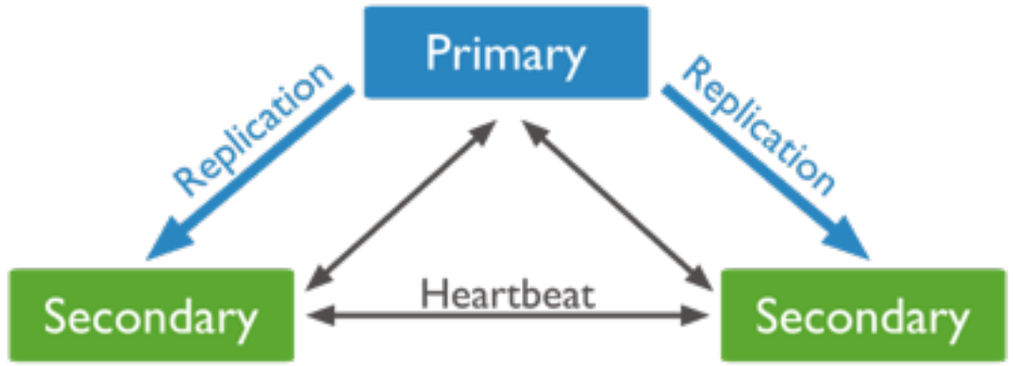
- Replica sets provide redundancy and high availability, and are the basis for all production deployments. With multiple copies of data on different database servers, replication protects a database from the loss of a single server.

- In some cases, you can use replication to increase read capacity. Clients have the ability to send read and write operations to different servers.

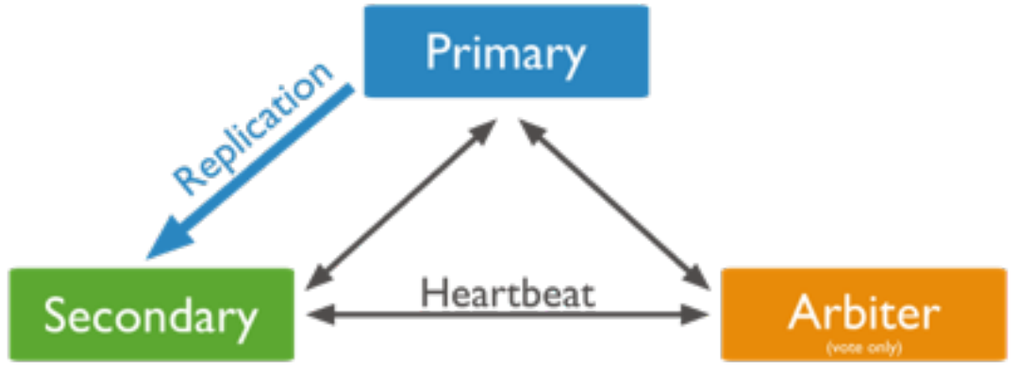
Replica Set Architecture



Basic Architecture



Replication



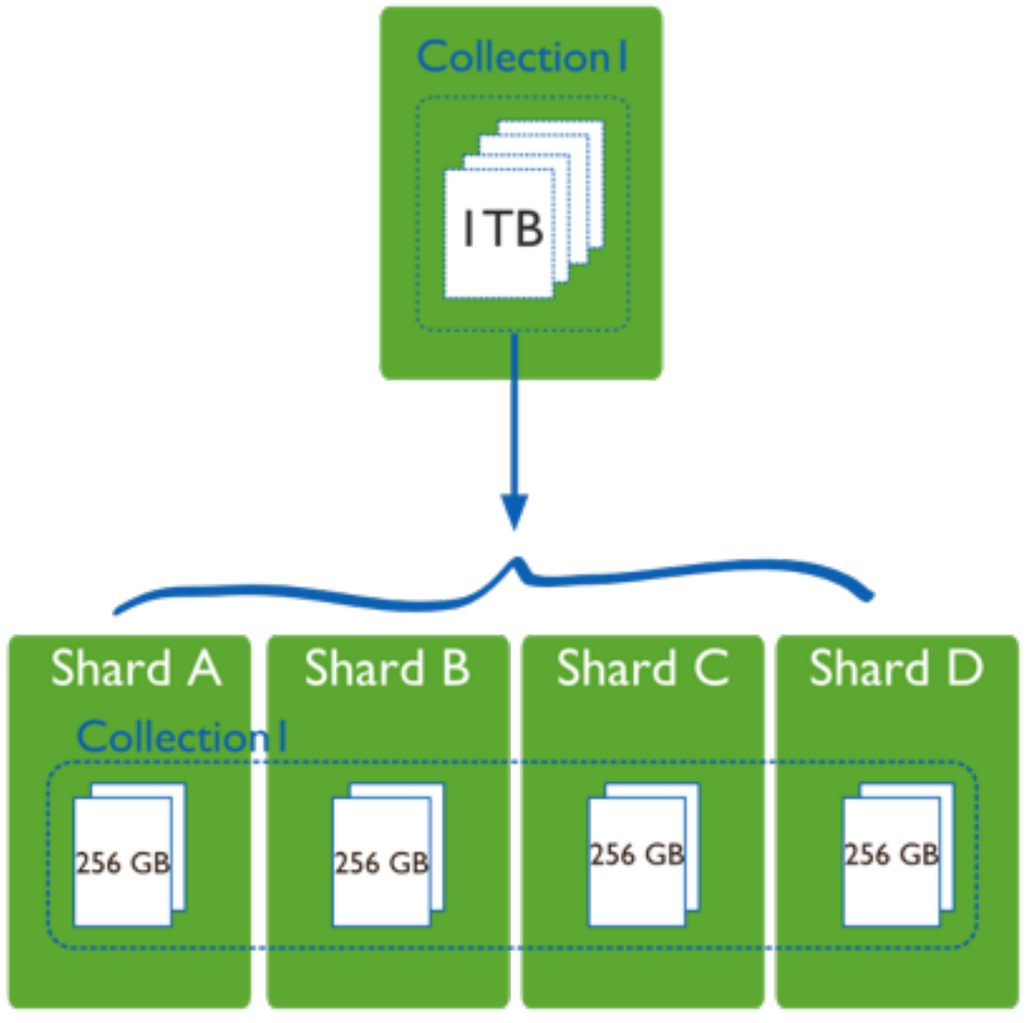
Replication with Arbiter

MongoDB Scale Out: Sharding

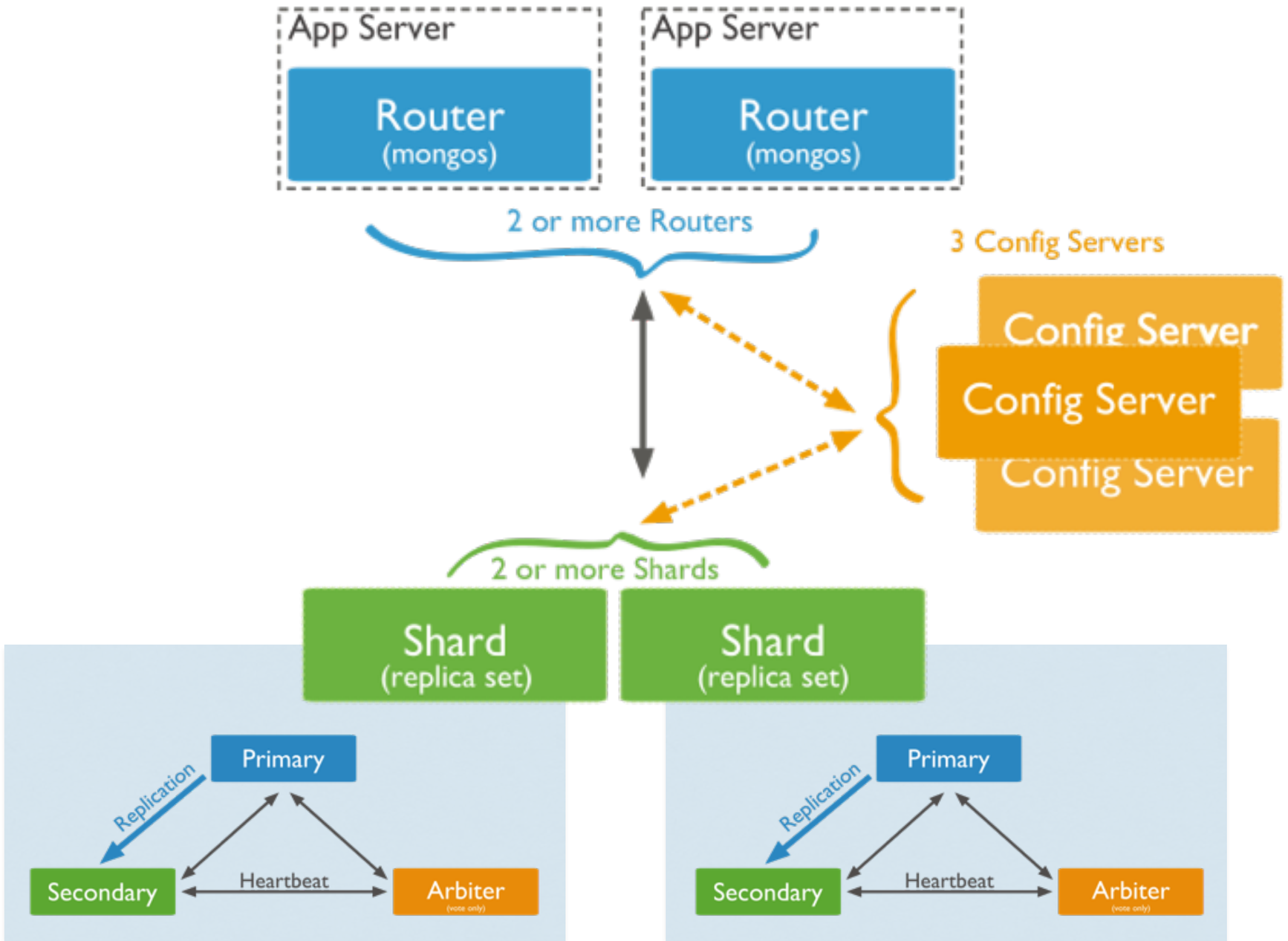
- Sharding is a method for storing data across multiple machines. MongoDB uses sharding to support deployments with very large data sets and high throughput operations.

- High query rates can exhaust the CPU capacity of the server. Larger data sets exceed the storage capacity of a single machine.

- To address these issues of scales, database systems have two basic approaches: vertical scaling and sharding.



Sharding Architecture



Packages

- mongodb-org-server :-
  This package contains the `mongod` daemon and associated configuration and init scripts.

- mongodb-org-mongos :-
  This package contains the `mongos` daemon.

- mongodb-org-shell :-
  This package contains the `mongo` shell.

- mongodb-org-tools :-
  This package contains the following MongoDB tools: `mongoimport bsondump, mongodump, mongoexport, mongofiles, mongooplog, mongoperf, mongorestore, mongostat, and mongotop`.

References

- About MongoDB Documents
  http://docs.mongodb.org/manual/about/
- References Manual
  http://docs.mongodb.org/master/MongoDB-reference-manual.pdf
- The Little MongoDB Book
  http://openmymind.net/2011/3/28/The-Little-MongoDB-Book/