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INTRODUCTION TO MongoDB

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Agenda

- Introduction to MongoDB
- Terminology and Concepts
- Advantages of MongoDB over RDBMS
- Architecture
- JSON and BSON
- Demo

What is MongoDB ?

- MongoDB is a cross-platform, document oriented database.

- Full Index Support for High Performance.

- Documents based queries for Easy Readability.

- Auto Sharding for Easy Scalability.

- Replication and Failover for High Availability.

- MongoDB is written in C++.

Mongodb is leading NoSql solution

- NoSql, which stand for "not only SQL" is an alternative to traditional relational databases.

- NoSql databases are either schema-free or have relaxed schemas.

- **Sql Vs NoSql**
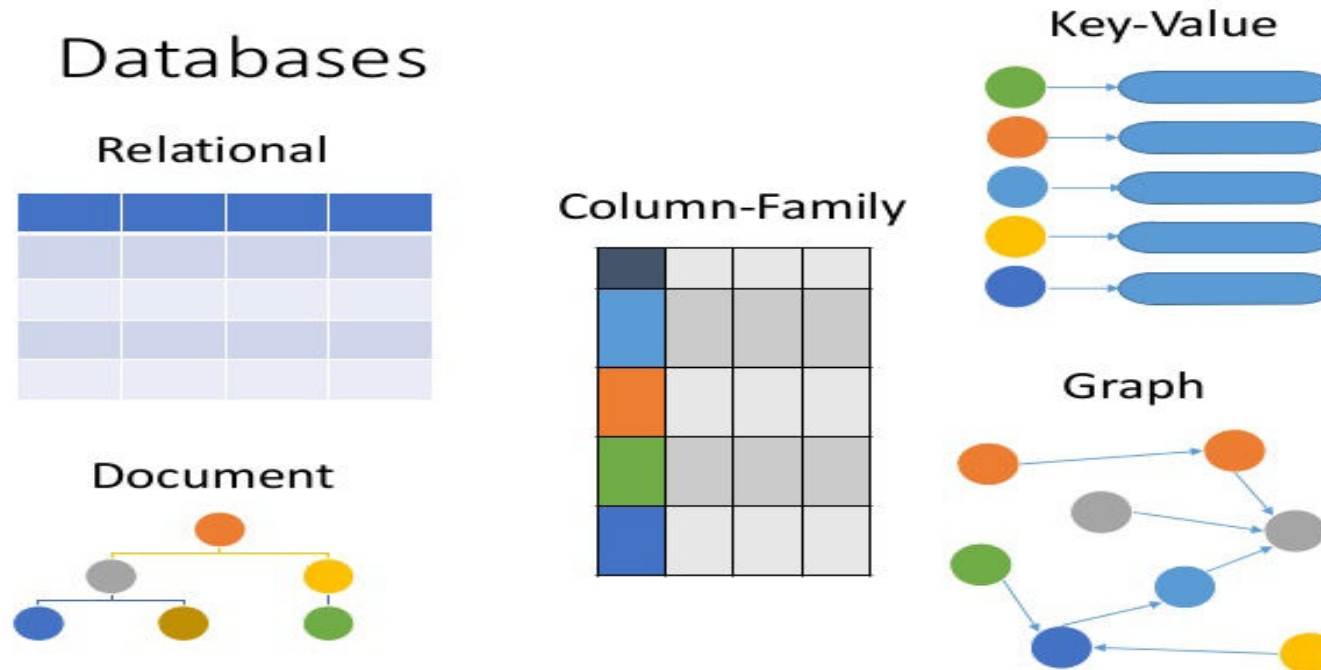
Terminology and Concepts
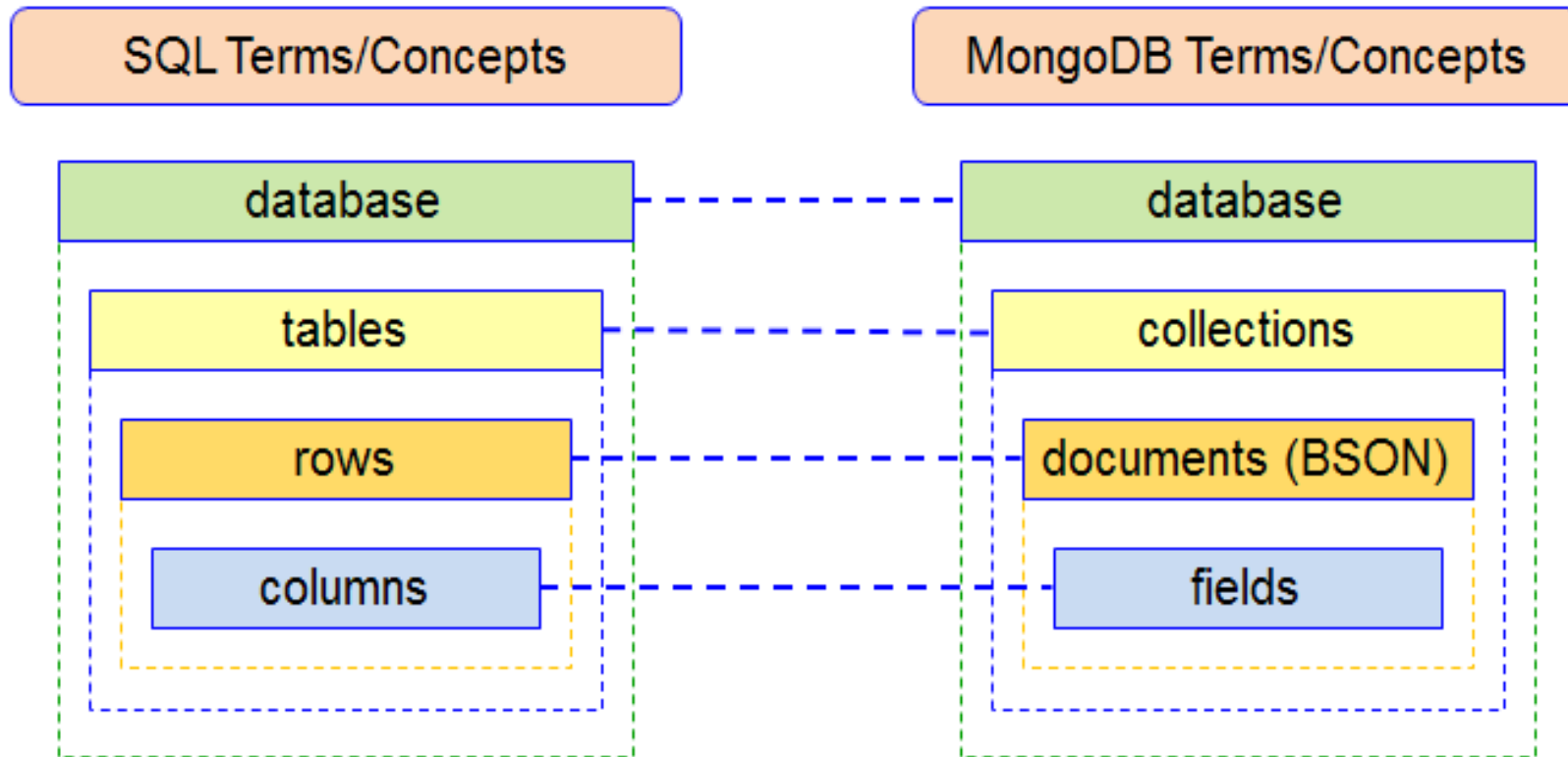
Advantages of MongoDB over RDBMS

1. Schema-Based vs Schema-less

RDBMS:

Defined the schema for student Table:

CREATE TABLE student(2id bigint PRIMARY KEY NOT NULL,3name TEXT)

Insert the record :

Insert into student values (1,"Kunal");

Try to add one more column while inserting data:

Insert into student values (1,"Kunal","kunal@gmail.com");
2ERROR 1136 (21S01): Column count doesn't match value count at row 1

Advantages of MongoDB over RDBMS

MongoDB:

Let's try the same thing with MongoDB : Here we don't need to create the schema. There is no concept of a table. In Mongo, we insert the record in the collections. And we don't need to define any schema structure for any operation.

```
> db.student.insert({"id":1, "name":"john"})
WriteResult({ "nInserted" : 1 })
```

Let's try to insert:

```
> db.student.insert({"id":2, "name":"Esme", "email":"esme123@gmail.com"})
WriteResult({ "nInserted" : 1 })
```

Here, I am inserting in the student collection.

```
> db.student.find()
{ "_id" : ObjectId("5b309168d6b0141df7a886c5"), "id" : 1, "name" : "john" }
{ "_id" : ObjectId("5b30931041fad026ac1748ce"), "id" : 2, "name" : "Esme", "email" : "esme123@gmail.com" }
>
```

Advantages of MongoDB over RDBMS

2. Conversion of Object to Store in Relation Database

```
// your application code
class Foo { int x; string [] tags;}
```

x	name
1	Abc
2	Xyz

tagId	x
33	1
34	2
33	2

tagId	tag
33	'red'
34	'blue'

Advantages of MongoDB over RDBMS

No Need of Object Conversion to Store in MongoDB

```
// your application code
class Foo { int x; string [] tags;}

// mongo document for Foo
{ x: 1, tags: ['abc','xyz'] }
```
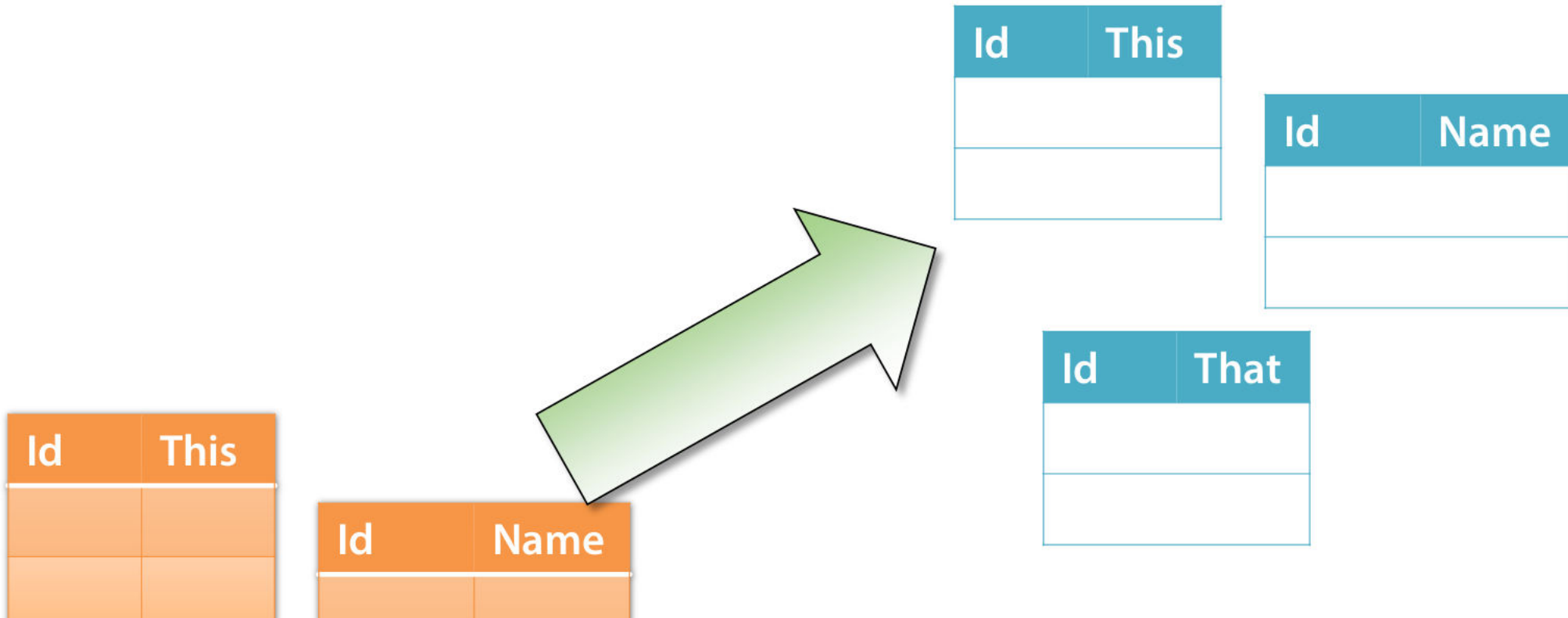
Advantages of MongoDB over RDBMS

3. Scalability -RDBMS

- Transaction spans rows and tables
- Rigid consistency model

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Advantages of MongoDB over RDBMS

- **Replication or sharding**

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Advantages of MongoDB over RDBMS

- **Solutions?**
  1. De-normalize tables
  2. Relaxed consistency

Id	This

Id	Name

Id	That

Id	is	That	me

Lock

Advantages of MongoDB over RDBMS

Scalability – MongoDB

No schema
Single document write scope
Eventual consistency
Capped Collection

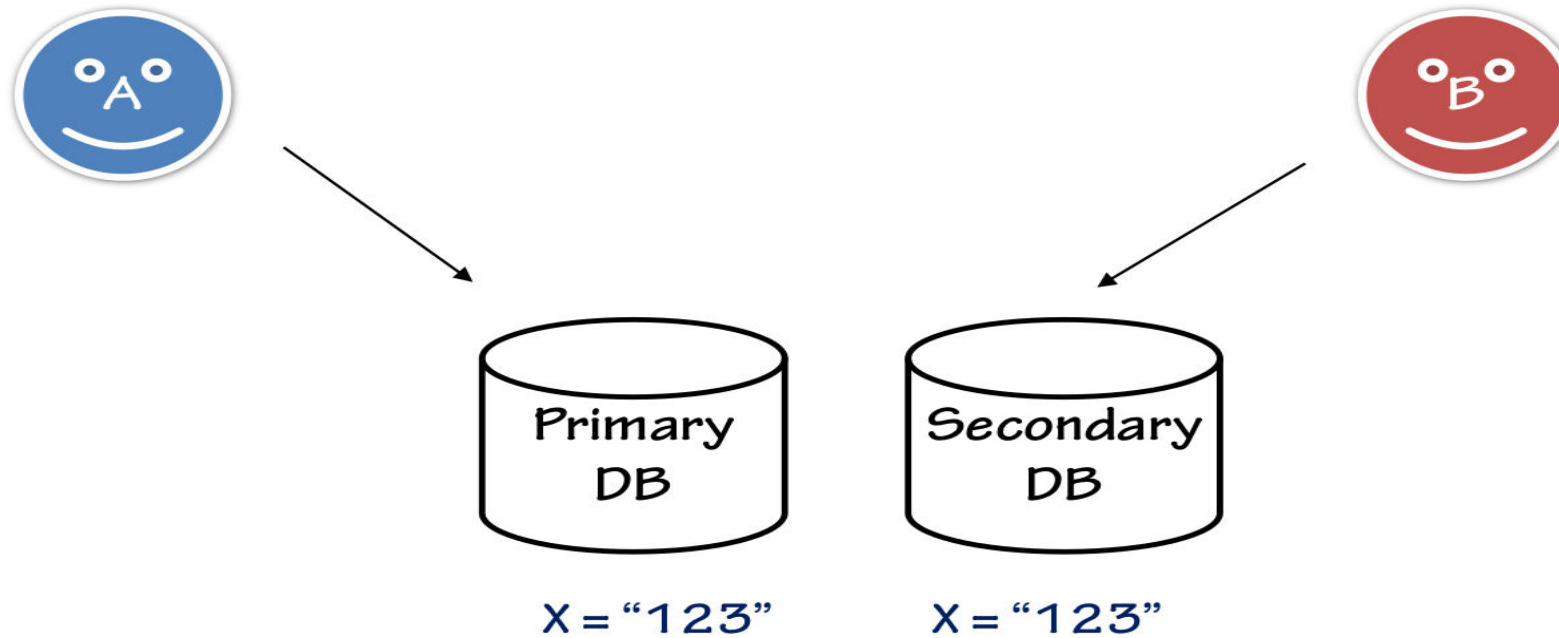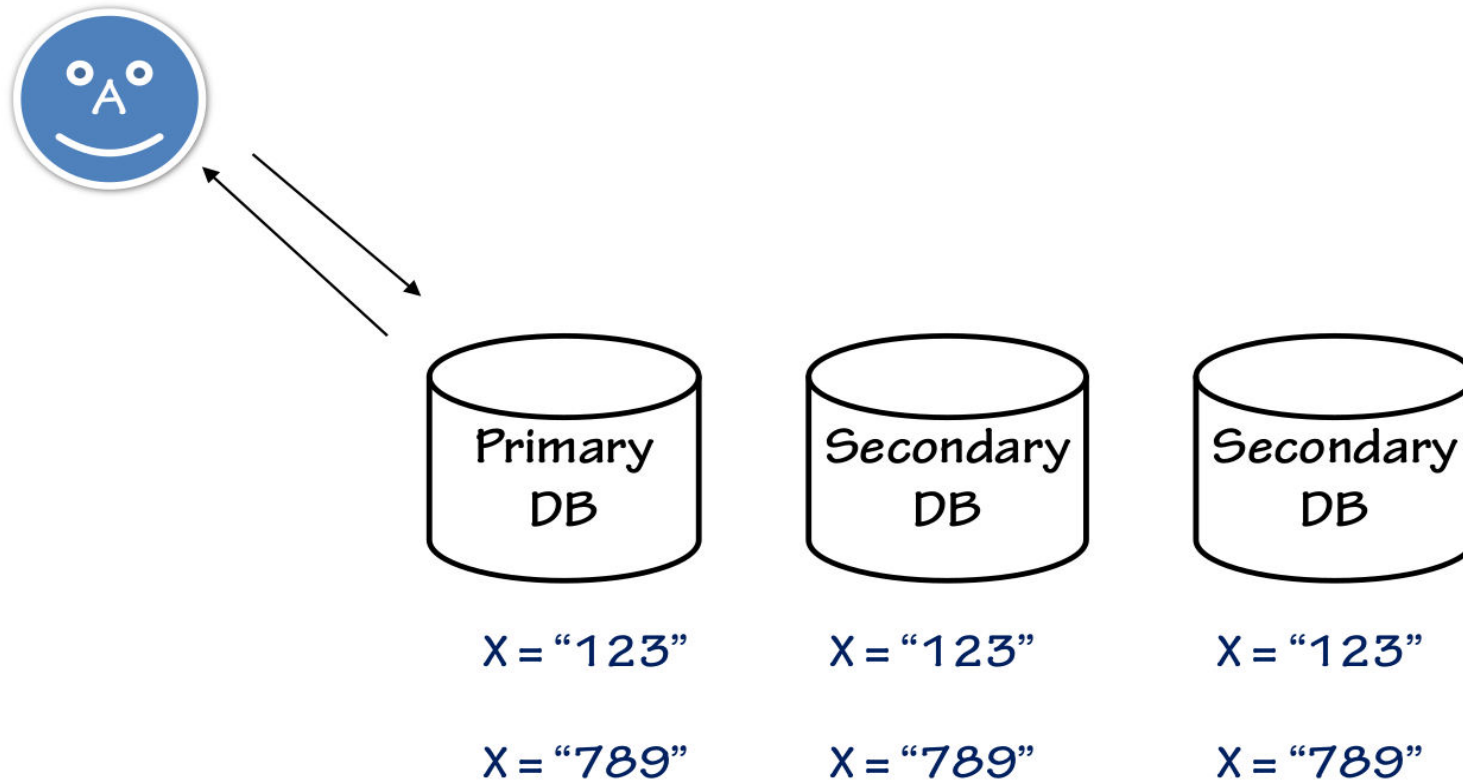| Id	This

Id	Name

Id	That

Advantages of MongoDB over RDBMS

Consistency

Advantages of MongoDB over RDBMS

Consistency Choices - Complete

Primary DB: X = "123", X = "789"

Secondary DB: X = "123", X = "789"

Secondary DB: X = "123", X = "789"

Advantages of MongoDB over RDBMS

Consistency Choices – Fire & Forget

	Primary DB	Secondary DB	Secondary DB
	X = "123"	X = "123"	X = "123"
	X = "789"	X = "789"	X = "789"

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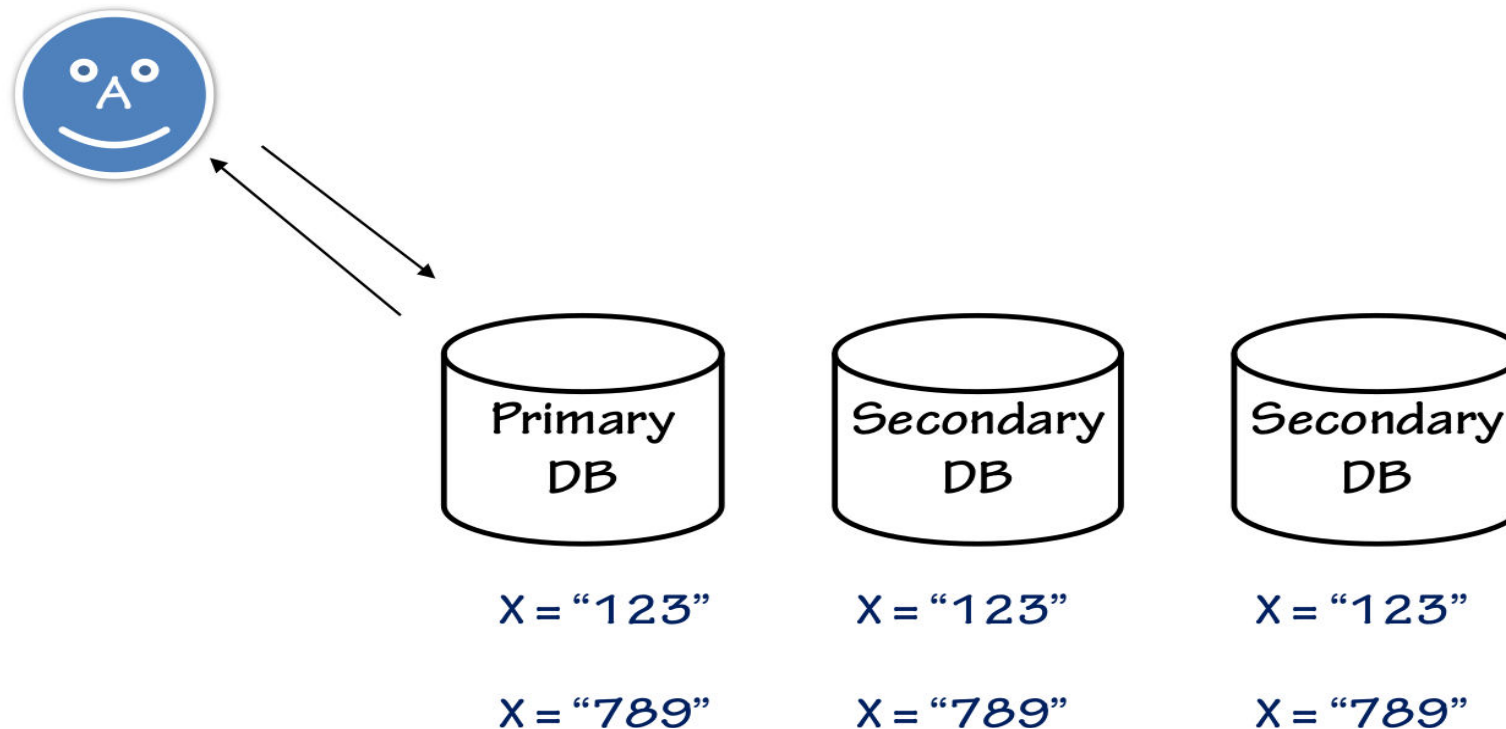
Advantages of MongoDB over RDBMS

Consistency Choices - Majority

|	Primary DB	Secondary DB	Secondary DB
	X = "123"	X = "123"	X = "123"
	X = "789"	X = "789"	X = "789"
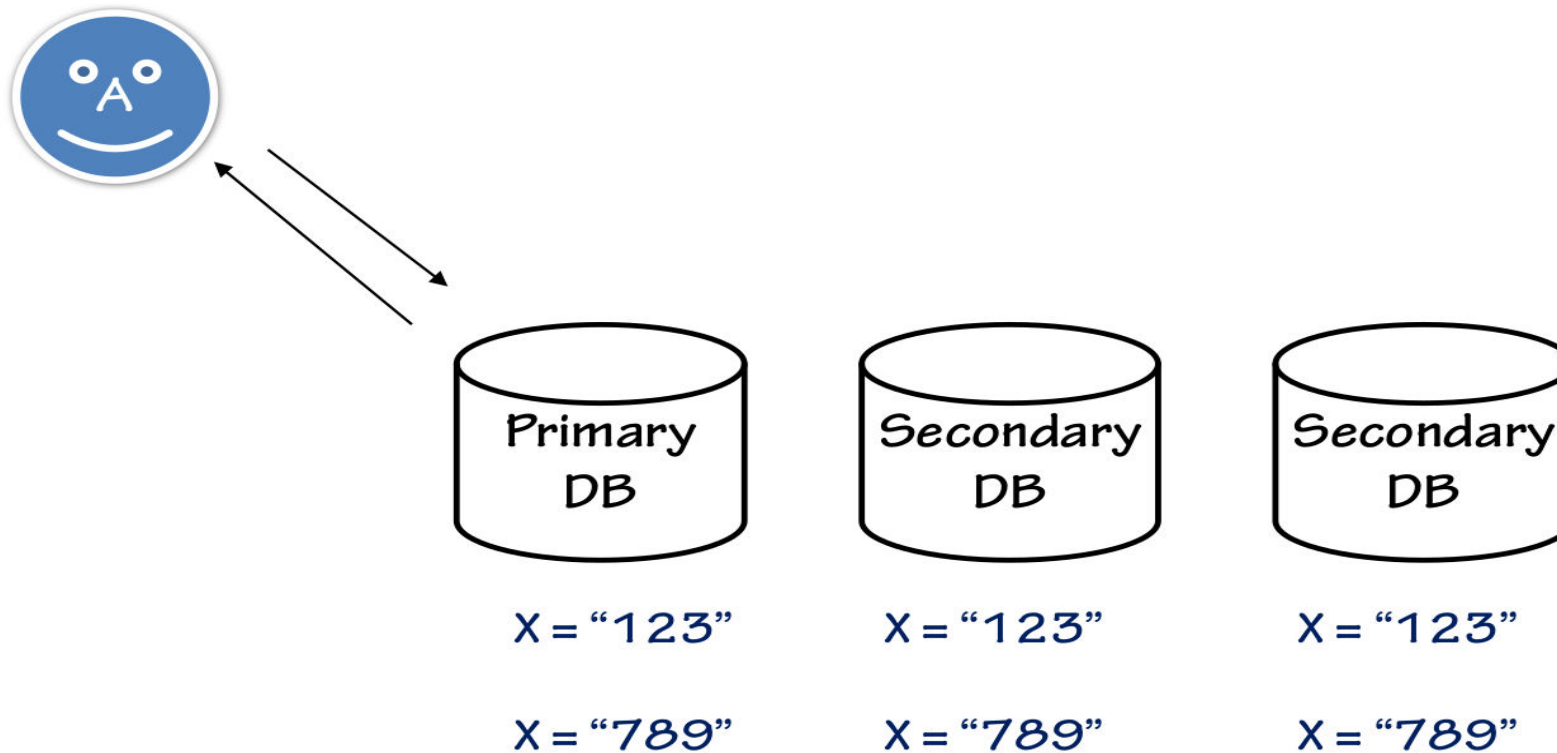
Other Advantages of MongoDB over RDBMS

- No complex joins.

- Uses internal memory for storing the working set, enabling faster access of data.

- A document-based data model. The basic unit of storage is analogous to JSON, Python dictionaries, Ruby hashes, etc. This is a rich data structure capable of holding arrays and other documents.
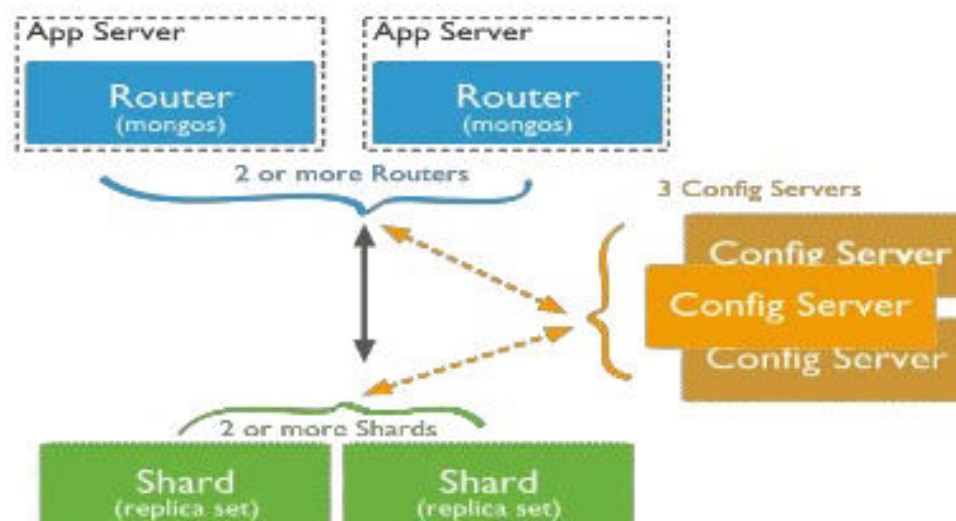
Architecture
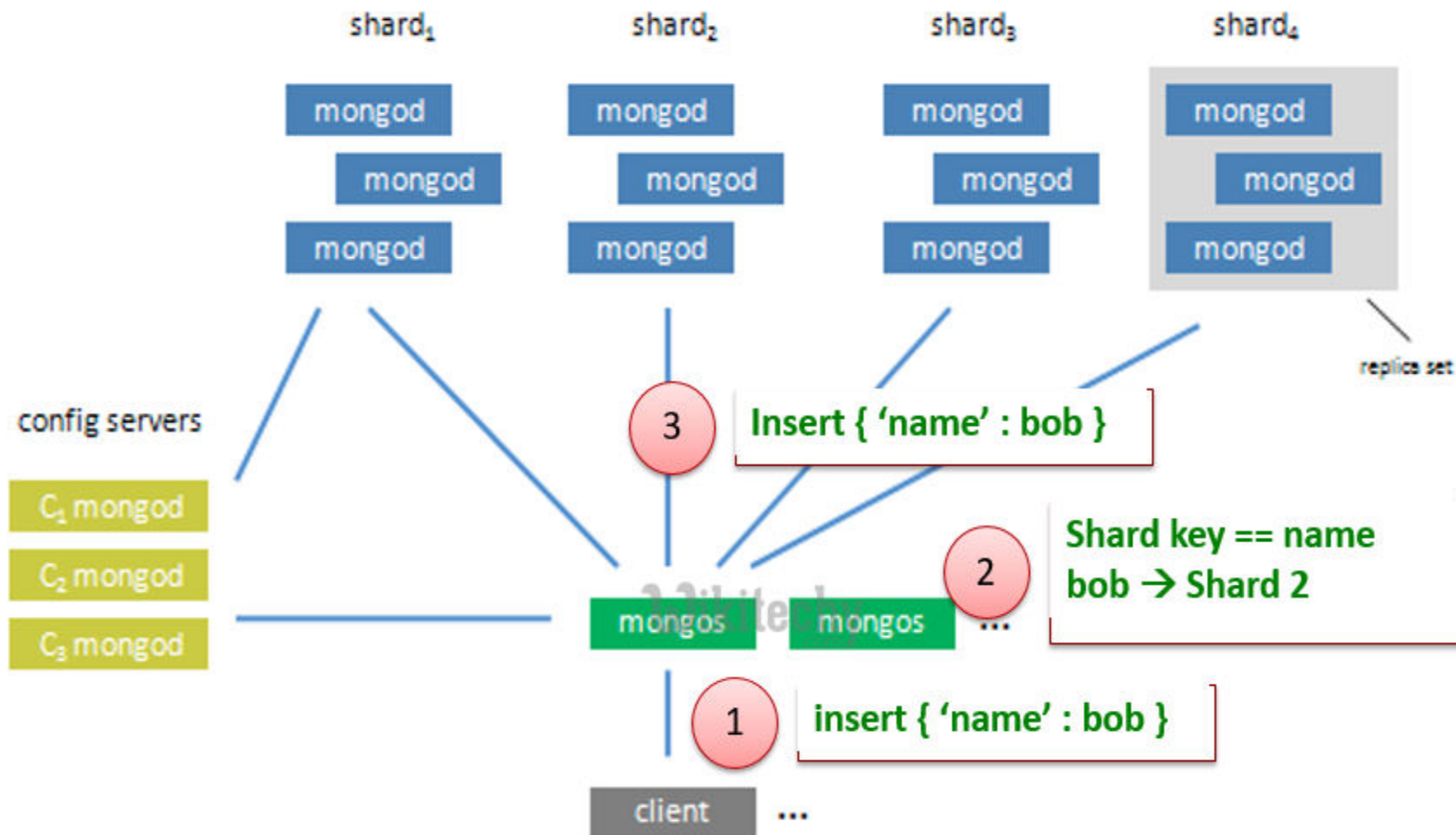
Replication set
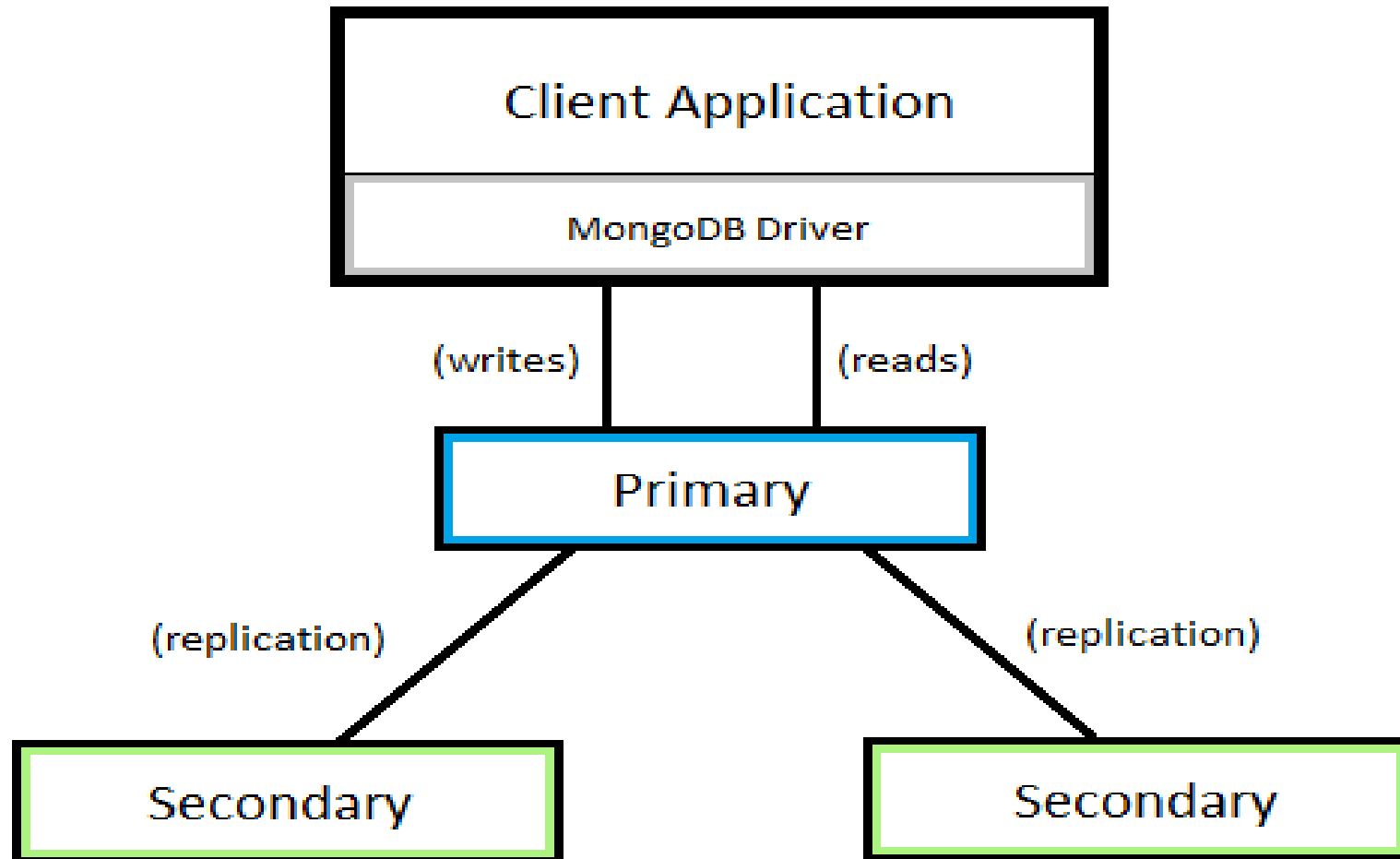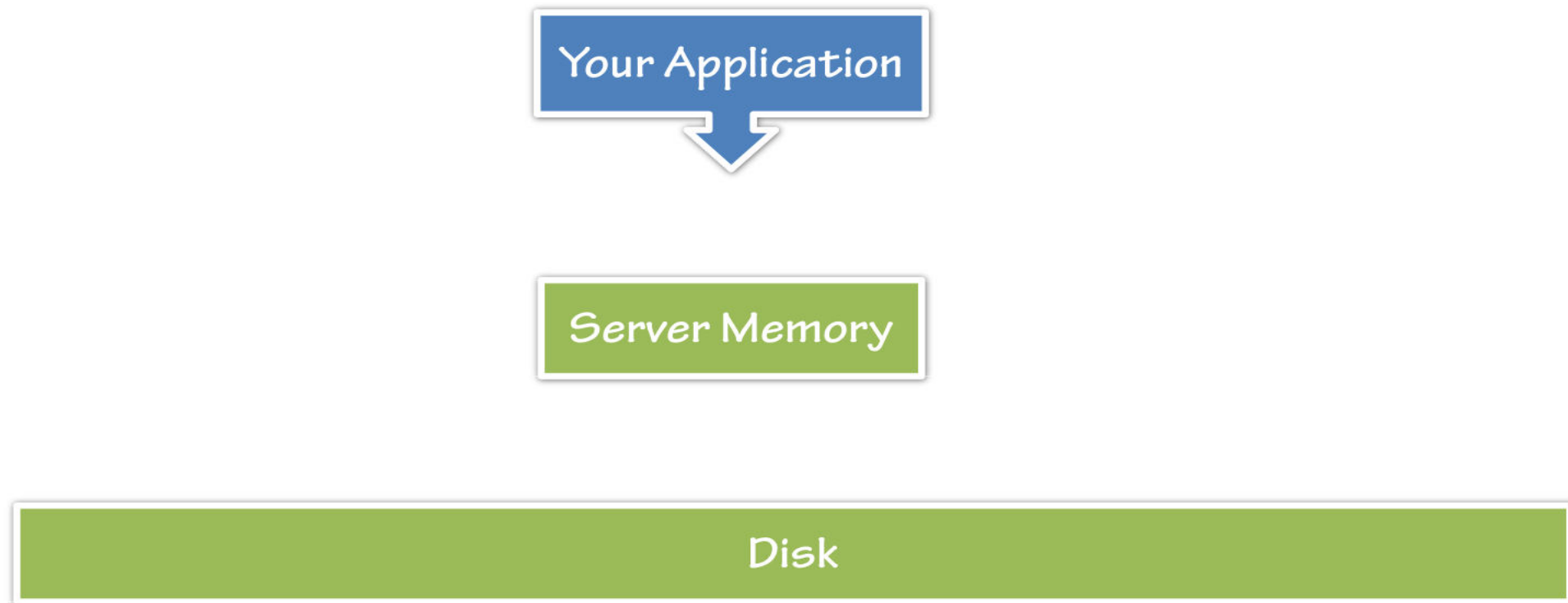
Sharding

MongoDB Sharded Cluster

- **Config Servers** store the cluster's metadata - mapping of data set to the shards.

- **Query Routers** (mongos instances) interface with applications and direct operations to appropriate shard(s) by using the metadata.

How Data is Stored ?

JSON

```
{
   _id: ObjectId(7df78ad8902c)
   title: 'MongoDB Overview',
   description: 'MongoDB is no sql database',
   by: 'tutorials point',
   url: 'http://www.tutorialspoint.com',
   tags: ['mongodb', 'database', 'NoSQL'],
   likes: 100,
   comments: [
                        {  user:'user1',
                          message: 'My first comment',
                          dateCreated: new Date(2011,1,20,2,15),
                          like: 0},
                       { user:'user2',
                         message: 'My second comments',
                        dateCreated: new Date(2011,1,25,7,45),
                         like: 5 }
               ]
}
```

BSON

```
{"hello": "world"}
→
\x16\x00\x00\x00                          // total document size
\x02                                       // 0x02 = type String
hello\x00                                  // field name
\x06\x00\x00\x00world\x00                  // field value
\x00                                       // 0x00 = type EOO ('end of object')
```

DEMO