Introduction to MongoDB

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Introduction to mongoDB®

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Databases

- Data + Base
- Add
- Access
- Update
- Delete

Purpose of Databases

- Easy to inject and retrieve data
- Able to store and use sets of data
- To get faster and accurate access of data through organized ways.
- Query data in a database (ask it questions).
- Relate data from two different tables together using JOINs.
- Create meaningful reports from data in a database.
- Information of a given type is always stored only once.
- Fault-tolerant.
- Concurrent; multiple users can use them at the same time without corrupting the data.

Applications:

Early Phase: Airline, Accounting, Railway reservation.

Now Trending:

- Social Networks: Facebook, Twitter.
- Search Engines: Bing, Google.
- Cloud Services: Amazon, Openstack.
- Big Data: Hadoop.

Types of Databases

- Relational Databases:
  - ➢ MySQL – Facebook, Twitter.
  - ➢ PostGreSQL -
  - ➢ SQLite – Browsers.
- Non Relational Databases:
  - ➢ MongoDB document
  - ➢ CouchDB document
  - ➢ ArangoDB
  - ➢ Cassandra

Relational Model

- The **relational model** (**RM**) for database management is an approach to managing data using a structure and language.

- In the relational model of a database, all data is represented in terms of tuples and grouped into relations.

- A database organized in terms of the relational model is a relational database.

Relational Databases

- A database structured to recognize relations between stored items of information.

- Data organization approach
  - Tables
  - Row
  - Columns

RDBMS

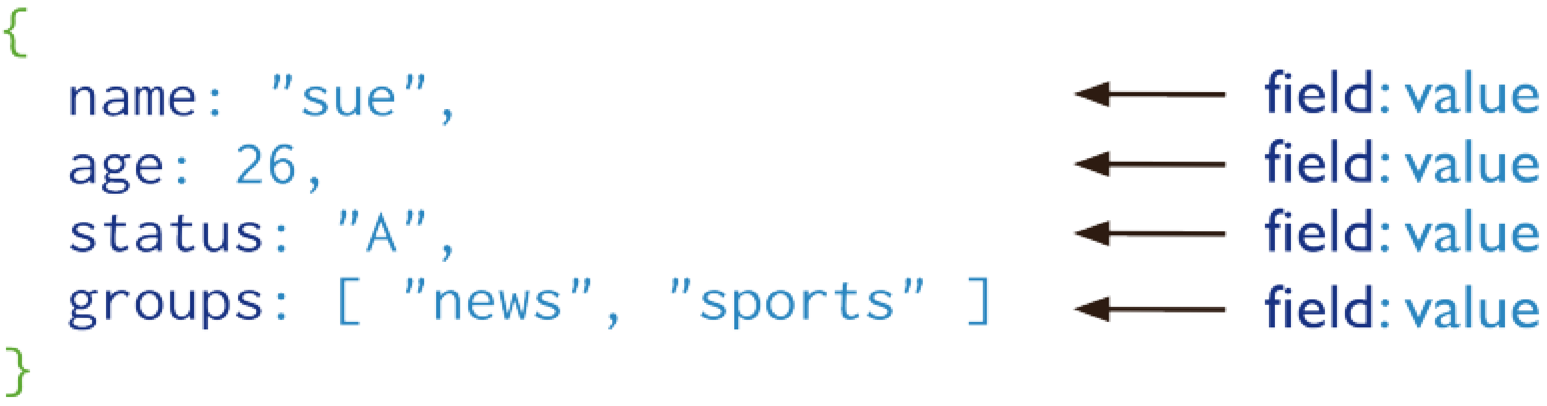
- Introduction
  - Systems that used relational databases known as RDBMS.
  - It used SQL.
    - **DML – Update.**
    - **DDL – New things**
    - **DCL – Control Access**
- Advantages
  - Building a low-volume, medium-complexity suite of applications that will evolve over time.
  - Data volumes (duplicated) would be ridiculous if you didn’t do a reasonable amount of normalization.
  - You simply don’t see a cost/benefit advantage to moving away from proven legacy technology.
- Limitations
  - Data Complexity
  - Broken Keys and Records
  - Developer Expertise
  - Hardware Performance

Introduction to MongoDB

- MongoDB (from "humongous“ i.e. huge + Monstrous) is a scalable, high-performance, open source, schema-free, document-oriented database.
  - mongodb.org

- It used NoSQL mechanism.

- A record in MongoDB is a document.



```
{
   name: "sue",
   age: 26,
   status: "A",
   groups: [ "news", "sports" ]
}
```

- The advantages of using documents are:
  - Documents (i.e. objects) correspond to native data types in many programming languages.
  - Data structure composed of field and value pairs.

Comparing Terminologies

SQL Terminologies	NoSQL Terminologies
Database	Database
Table	Collection
Row	Document

Features of MongoDB

- High Performance
  - I/O results
  - Faster keys

- High Availability
  - Replica Set

- Automatic Scaling
  - Sharding
    - Automatic balancing for changes in load and data distribution
    - Easy addition of new machines without down time
    - Scaling to one thousand nodes
    - No single points of failure
    - Automatic failover

- One or more shards, **each shard holds a portion of the total**

- **Each shard is backed by a replica set**

- Failure Management

- One or more **routers**, each one acts as a server for one or more clients.

- One or more clients, each one is (part of) the user's application and issues commands to a router via the mongo client library (driver) for its language.

- ***mongod*** is server process and mongos is router process.

Basics of MongoDB

- **JSON**
  - Stores data in Object format.
  - It supports nested looping i.e. objects within array.
  - Documents enclosed in circular braces.
  - Objects are enclosed in curly braces and separated by commas
  - JSON supports
    - Number,
    - Strings,
    - Objects
    - Arrays

Example

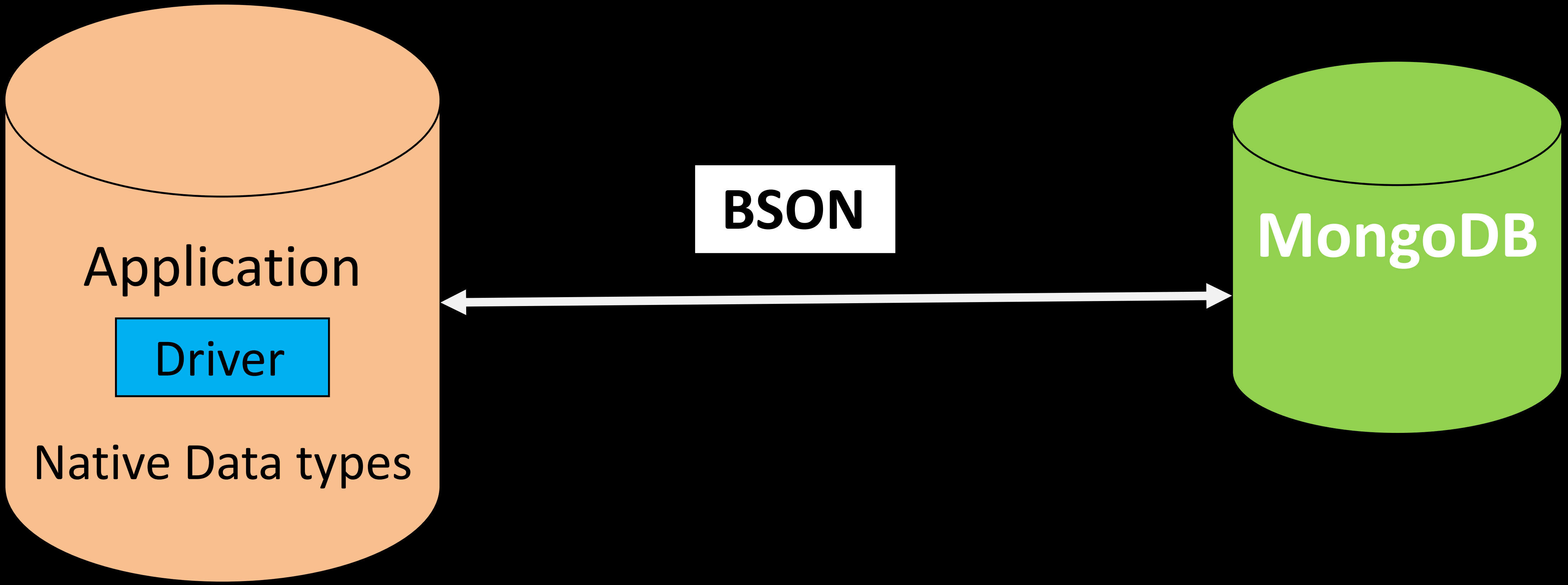
```
db.things.save
(
 {
  a : 1, b : 1,
              fruit:
              ["apple", "grapes", "pear" ]
  }
)
```

BSON

- Its binary JSON i.e. format in which mongodb stores its data.
- MDB drivers send and receive data as BSON from app.
- On app side, MDB drivers maps BSON to native Data types in relative to programming language.

- Why BSON:
  - Lightweight: Its space required to for data keeping is minimum
  - Traversable: Writing and reading indexes to MDB
  - Efficient: Encoding data to BSON and Decoding from BSON by drivers for app.

Functioning of MongoDB



Application

Driver

Native Data types

BSON

MongoDB

Working of MongoDB

- MongoDB is a **server process** that runs on Linux, Windows and OS X
  - It can be run both as a 32 or 64-bit application.

- Clients **connect** to the MongoDB process.

- MongoDB stores its data in files (default location is /data/db/), and uses **memory mapped files** for data management for efficiency.

CRUD Terms

SQL operation	MongoDB operations
Create	Create
Insert	Read
Update	Update
Delete	Remove

Limitations

- **Joins:** between two collections because it is difficult to scale out.
- **Transaction:** because documents are stored in hierarchical manner so it is not possible to access those items atomically.
- **Naming Restrictions**
  - Database Name Case Sensitivity
- **BSON Documents**
  - BSON Document Size
- **Max connection number is hardcoded to 20k.**

- Auto rollback is not for more than 300 MB; more than this manual intervention is needed.
- To shard a collection, it must be smaller than 256 GB, or else it will likely fail to shard.
- Map / Reduce are single-threaded.
- Map / Reduce cannot output to sharded collections.

Trending

- **Adobe – AEM**
- **Nokia – For Entertainment databases**
- **Facebook – Customer Data**
- **Google – Google Cloud Platform**
- **Ebay – Media Metadata**

THANKS !