



NoSQL Databases ODM

Node.js Global Mentoring program



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Agenda

- NoSQL essentials:
 - NoSQ.. wait, what?
 - Key features
 - Data models classification
 - ACID? CAP? Does it matter?
- MongoDB essentials:
 - Key features
 - Pros & Cons
 - MongoDB + Node.js = ❤️
- Practice! Practice! Practice!
 - Quick start guide: installation, CLI, GUI
 - Native driver
 - Mongoose

NOSQL ESSENTIALS

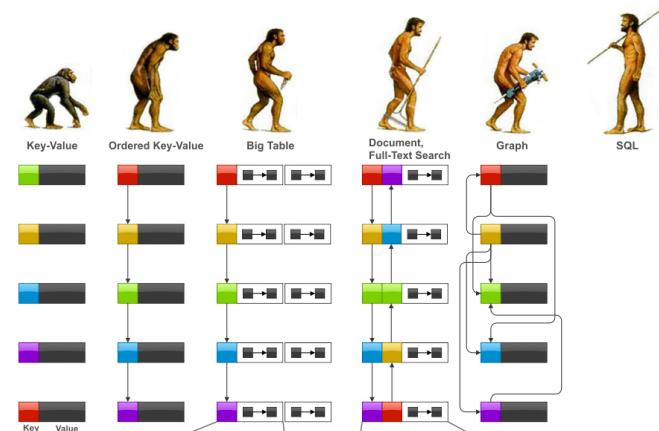
NoSQL Essentials

DEFINITION

- Not Only SQL
- Non relational
- Not a complete replacement for SQL but a compliment to

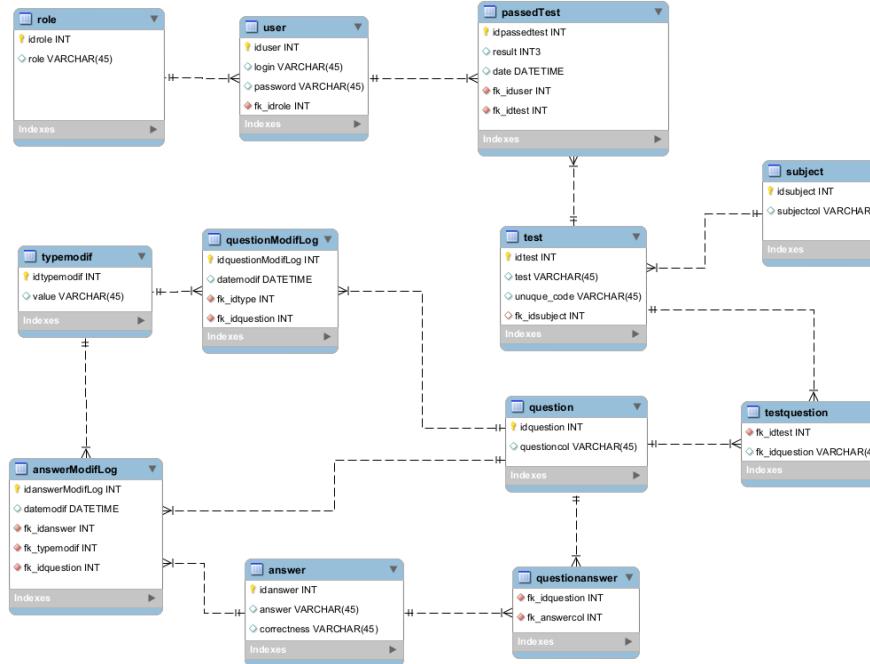
KEY FEATURES

- Multi-model: graph, document, wide-column, key-value
- Flexibility in storing data: schemas
- Scalability
- Distribution
- High operation speed
- Fault tolerance



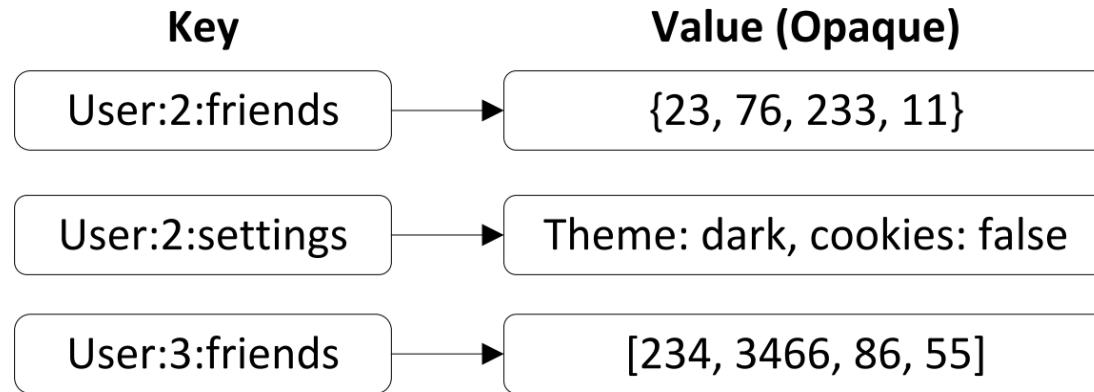
NoSQL Essentials

SQL DATA STRUCTURE



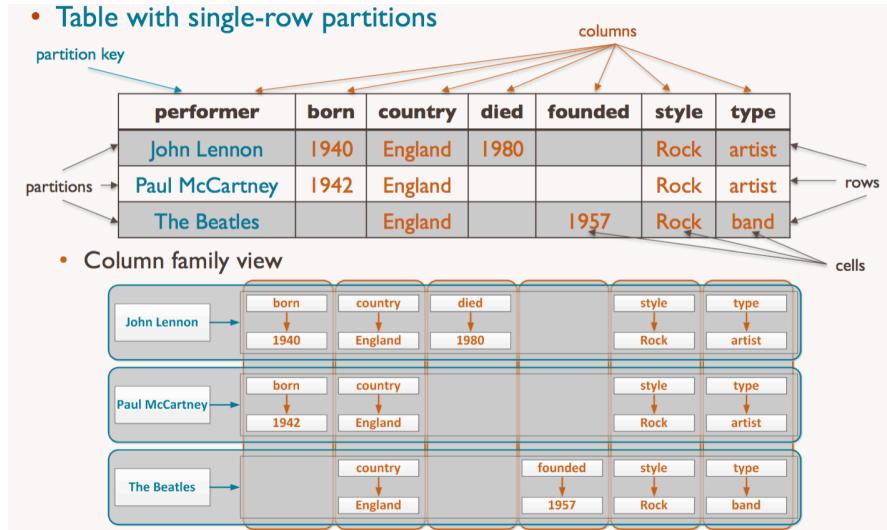
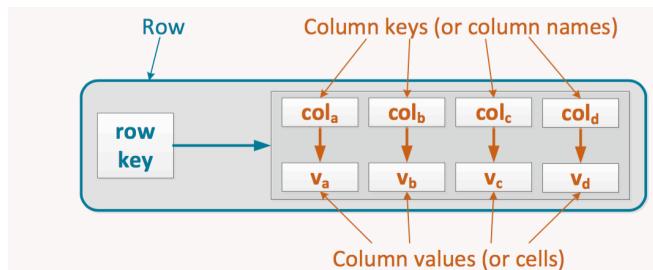
NoSQL Essentials

NOSQL DATA STRUCTURE: KEY-VALUE



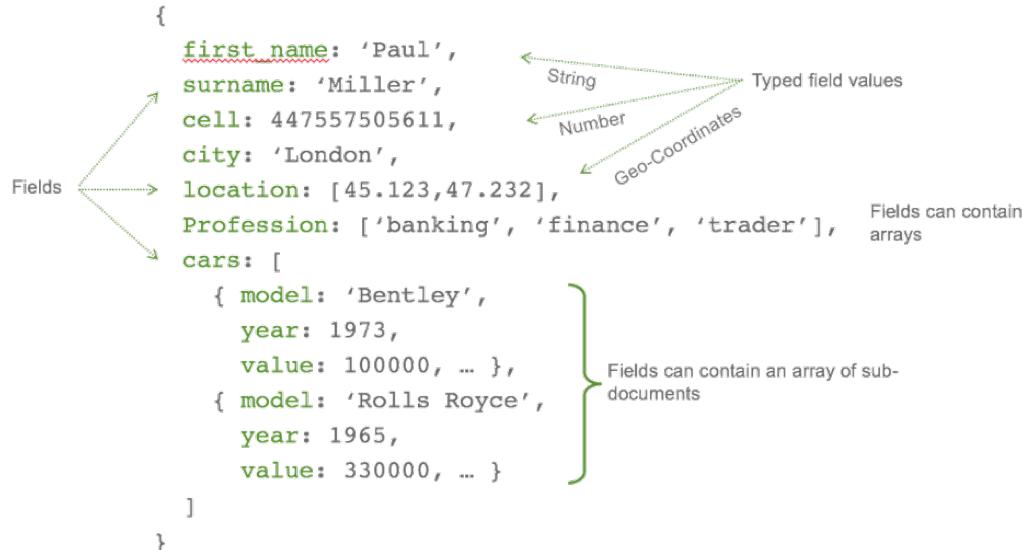
NoSQL Essentials

NOSQL DATA STRUCTURE: WIDE COLUMN



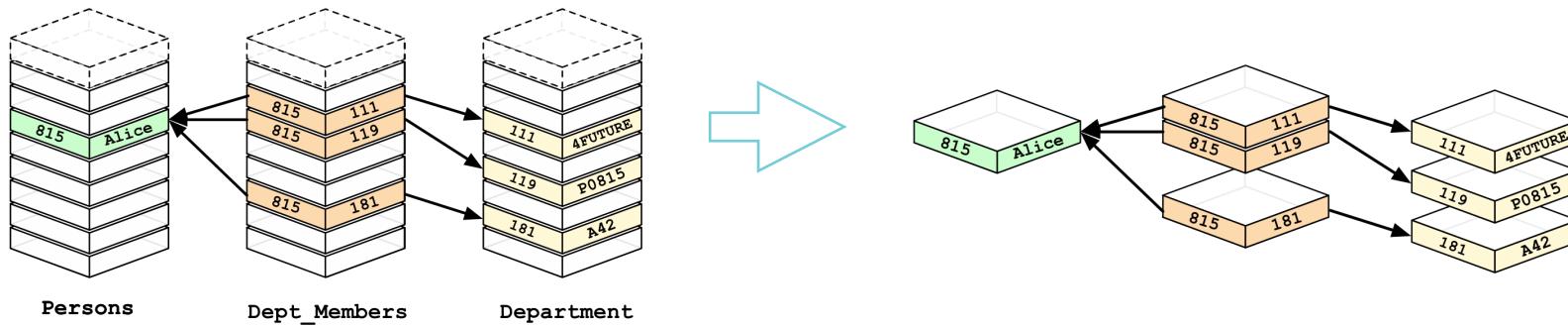
NoSQL Essentials

NOSQL DATA STRUCTURE: DOCUMENT



NoSQL Essentials

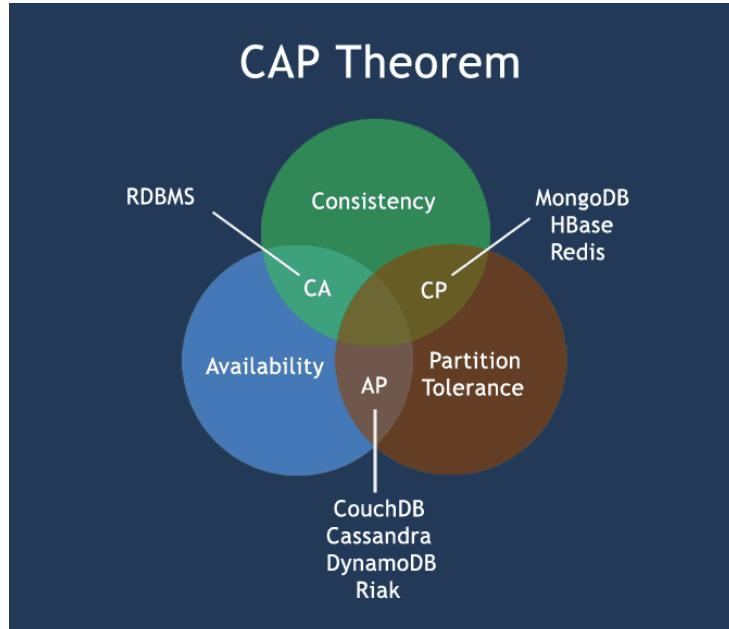
NOSQL DATA STRUCTURE: GRAPH



KEY-VALUE	WIDE COLUMN	GRAPH	DOCUMENT
<ul style="list-style-type: none"> • Unique key-value pairs, like dictionary • Examples: Redis, Memcached 	<ul style="list-style-type: none"> • Uses tables, rows and columns, but the names and the format can vary from row to row in the same table. • A wide column store can be interpreted as two-dimensional key-value store • Examples: CassandraDB, HBase 	<ul style="list-style-type: none"> • Use nodes that contain the lists of relationship records. These records represent relations with other nodes, which eliminates the (time-consuming) search-match operations • Examples: Neo4j, Giraph 	<ul style="list-style-type: none"> • JSON, XML or BSON • Fill the document with whatever you want • Examples: MongoDB, Couchbase

But what about ACID and CAP?

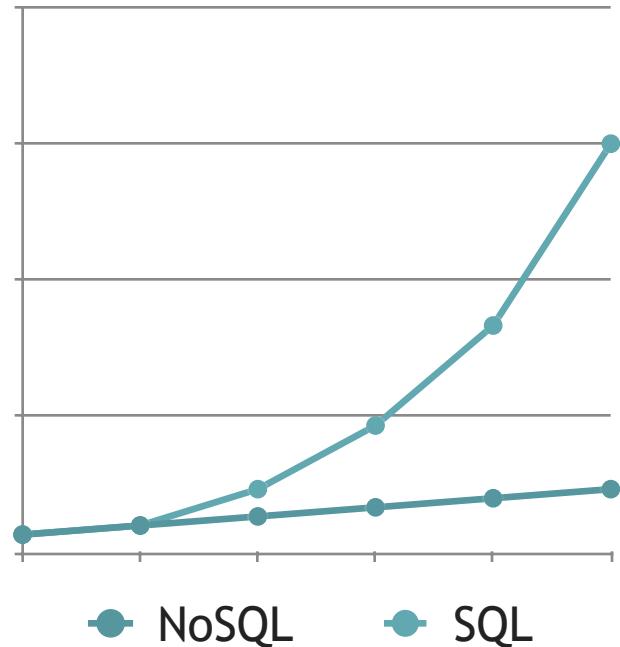
NoSQL Essentials



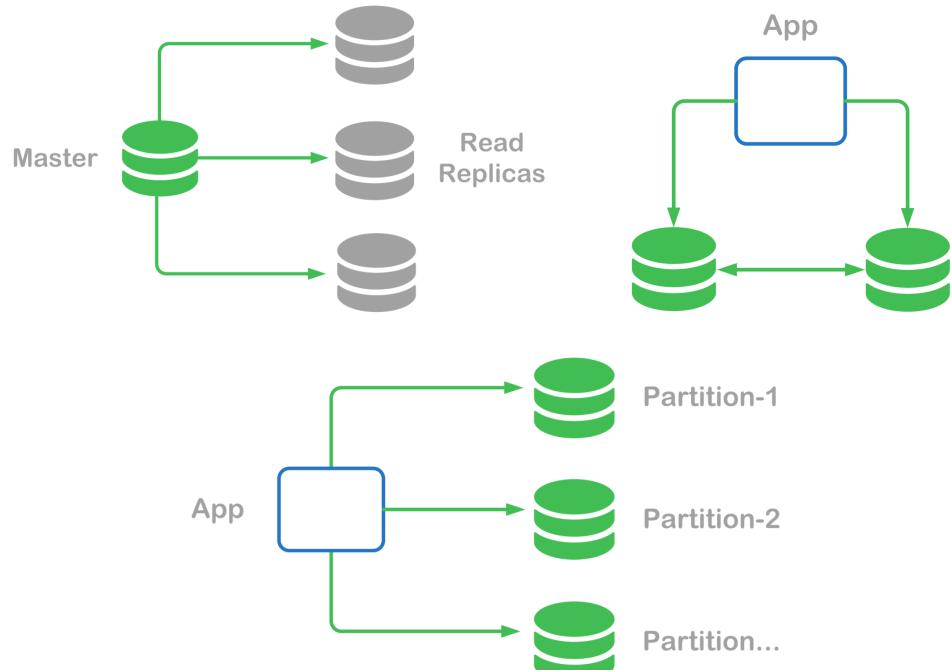
- Availability: every request receives a (non-error) response - without guarantee that it contains the most recent write
- Consistency: every read receives the most recent write or an error
- Partition Tolerance: the system continues to operate despite an arbitrary number of messages being dropped (or delayed) by the network between nodes

NoSQL Essentials

COST OF SCALING



SCALING APPROACHES



NoSQL Essentials



- A** Atomicity requires that each transaction be "all or nothing": if one part of the transaction fails, then the entire transaction fails, and the database state is left unchanged.
- C** The consistency property ensures that any transaction will bring the database from one valid state to another.
- I** The isolation property ensures that the concurrent execution of transactions results in a system state that would be obtained if transactions were executed serially, i.e., one after the other.
- D** The durability property ensures that once a transaction has been committed, it will remain so, even in the event of power loss, crashes, or errors.

NoSQL and ACID? Lol, whatever.



NoSQL Essentials

WHILE COMPARING SQL AND NOSQL YOU SHOULD TAKE CARE ABOUT

- Structure of the data
- Flexibility (or Agile'ity)
- Scalability
- Transactions
- Availability (or ACID compliancy)
- Data normalization / Performance



MONGODB ESSENTIALS

MongoDB Essentials

KEY FEATURES

- BSON data format
- Ad-hoc queries
- File storage
- Indexing
- Replication
- Aggregation framework
- Load balancing
- Capped collections

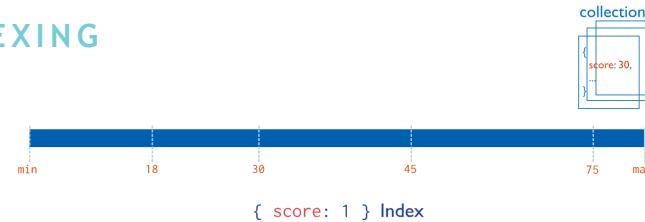


MongoDB Essentials

BSON DATA FORMAT

```
{  
  "_id": ObjectId("12e6789f4b01d67d71da3211"),  
  "title": "Key features Of MongoDB",  
  "comments": [  
    ...  
  ]  
}
```

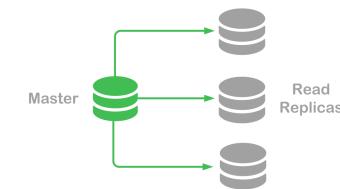
INDEXING



AD-HOC QUERIES

```
db.Employees.find({ emp_surname:/DiCaprio/ });
```

REPLICATION



FILE STORAGE

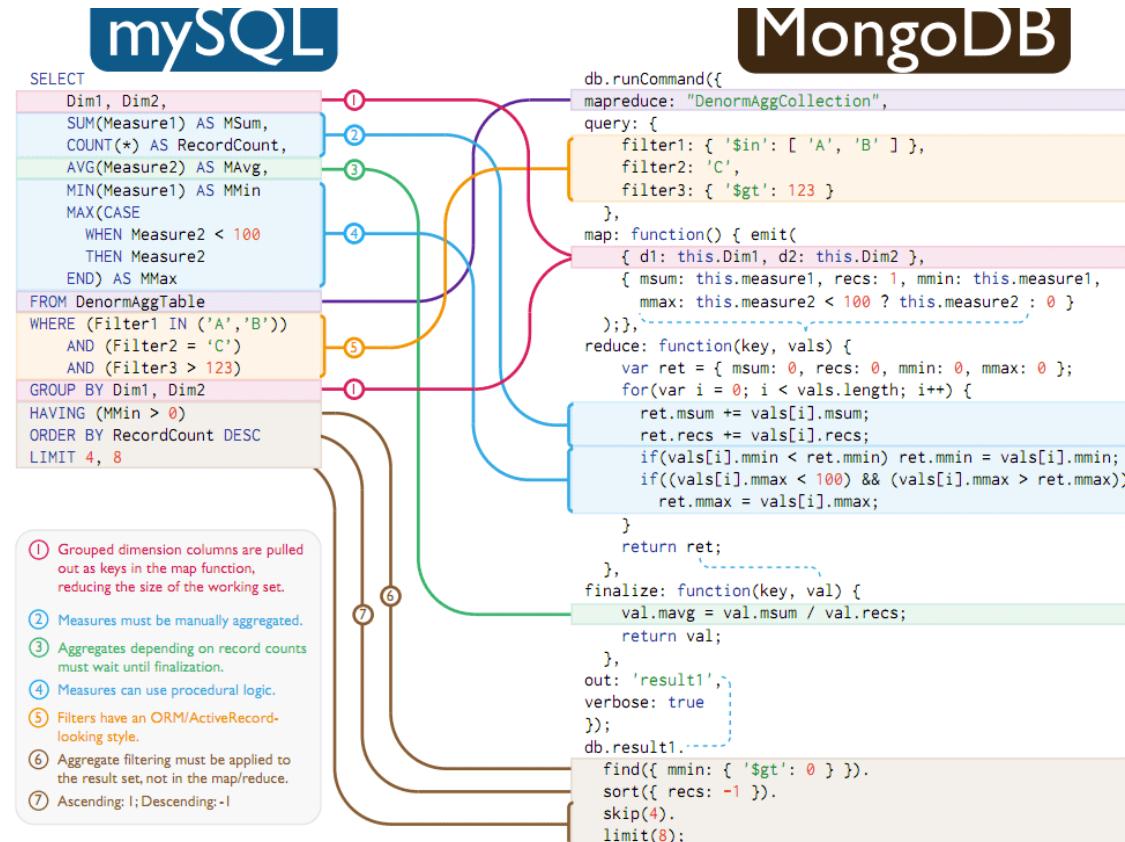


CAPPED COLLECTIONS

```
dbd.createCollection('logs', {  
  capped: true,  
  size: 300  
});
```

MongoDB Essentials

AGGREGATION FRAMEWORK



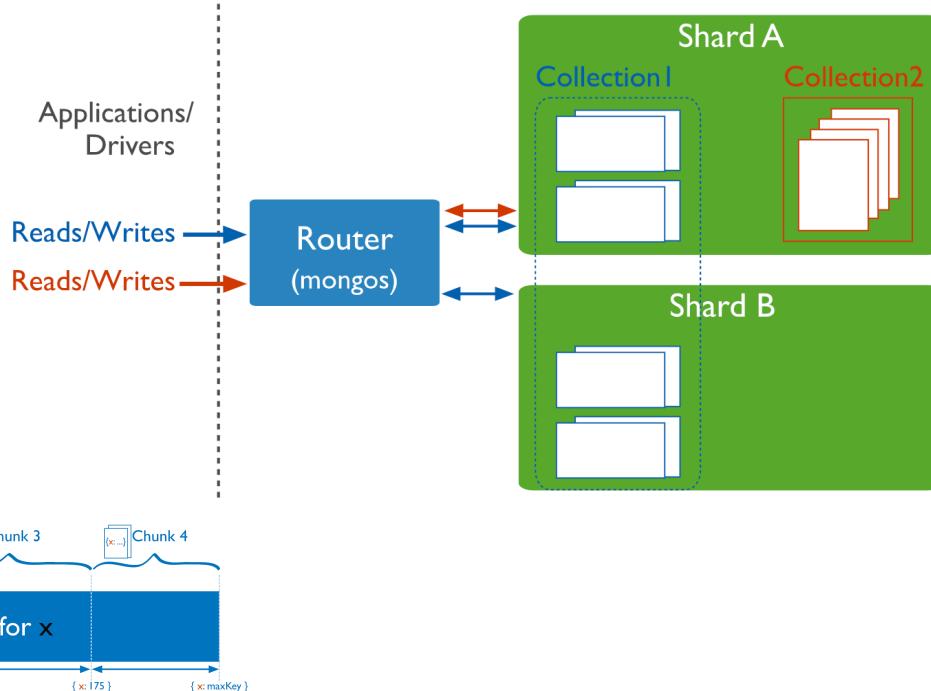
MongoDB Essentials

SHARDING: ADVANTAGES

- Reads/Writes
- Storage capacity
- High availability

SHARDING: CONSIDERATIONS

- Carefully picked shard keys
- Operational restrictions
- Sharding Existing Collection Data Size



<https://docs.mongodb.com/manual/core/sharded-cluster-requirements/#sharding-operational-restrictions>

MongoDB Essentials

Advantages

- Performance
- Document Model



mongoDB

- Flexible Schema

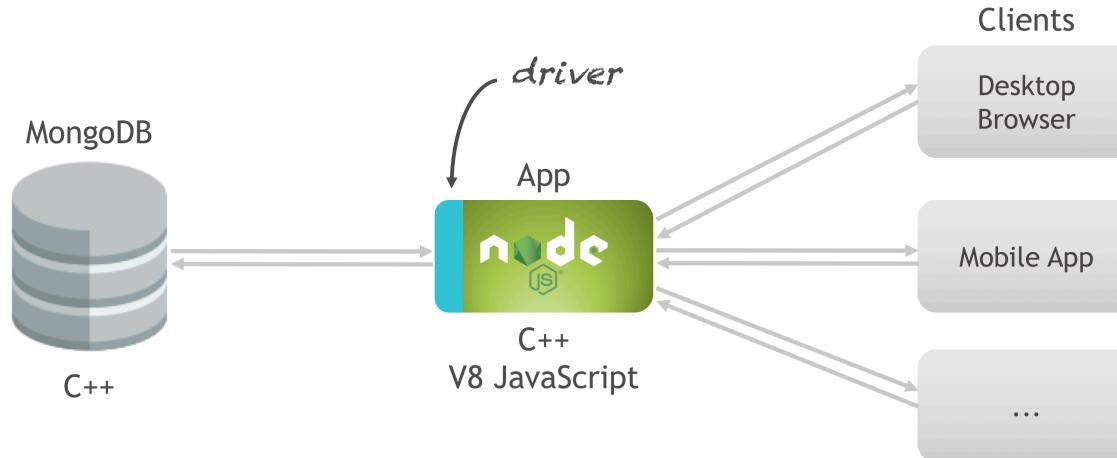
Disadvantages

- No transaction
- No join

- Memory limitation

MongoDB Essentials

MONGODB + NODE.JS = ❤



MongoDB Essentials

BUT.. WHAT ABOUT CODING?



PRACTICE! PRACTICE! PRACTICE!

Practice! Practice! Practice!

INSTALL

<https://docs.mongodb.org/manual/installation/>

- EXE
- TAR.GZ
- Homebrew package `brew update && brew install mongodb`

RUN

`mongod --dbpath /path/to/your/db/folder`



Practice! Practice! Practice!

REPL CHEATSHEET

C	• insert()
R	• find()
U	• update()
D	• remove()

Practice! Practice! Practice!

MONGODB NATIVE DRIVER

```
npm i --save mongodb
```

DEMO



I'm going to
keep this very
high level

Practice! Practice! Practice!

MONGOOSE ODM

```
npm i --save mongoose
```

mongoose

DEMO



Practice! Practice! Practice!

MONGOOSE CHEATSHEET

- Schemas
- Models
- Querying (exec, chaining)
- Built-in validation
- Custom validation
- Middleware

SUMMARY

QUESTIONS?

- When to consider a NoSQL vs Relational Database <https://resources.whitesourcesoftware.com/blog-whitesource/when-to-consider-a-nosql-vs-relational-database>
- MongoDB explained in 5 minutes: <https://www.credera.com/blog/technology-insights/java/mongodb-explained-5-minutes-less/>
- Sharding explained <http://www.bmc.com/blogs/mongodb-sharding-explained/>
- Aliaksei Bahachuk talks about MongoDB indexing, aggregation, etc. (RU-only) <https://videoportal.epam.com/video/LoEL6Gad> and <https://videoportal.epam.com/video/KR7LQ3J4>
- Mongoose quick start guide: <http://mongoosejs.com/docs/index.html>
- Permission issue while running mongod: <https://stackoverflow.com/questions/7948789/mongodb-mongod-complains-that-there-is-no-data-db-folder>



THANK YOU!