# Get Started with MongoDB

Outline

- **Setup MongoDB**
- What is NoSQL and MongoDB
- Setup MongoDB Cloud
  - Access it with MongoDB Compass

Install MongoDB on Windows

- [Official Setup Guide](#)
- Download installer
  - https://www.mongodb.com/try/download/community?tck=docs_server
- Run the installer
  - Choose <u>complete</u> setup type
  - <u>No need</u> to install it as a service
  - Use default value for other settings

Install MongoDB on Windows
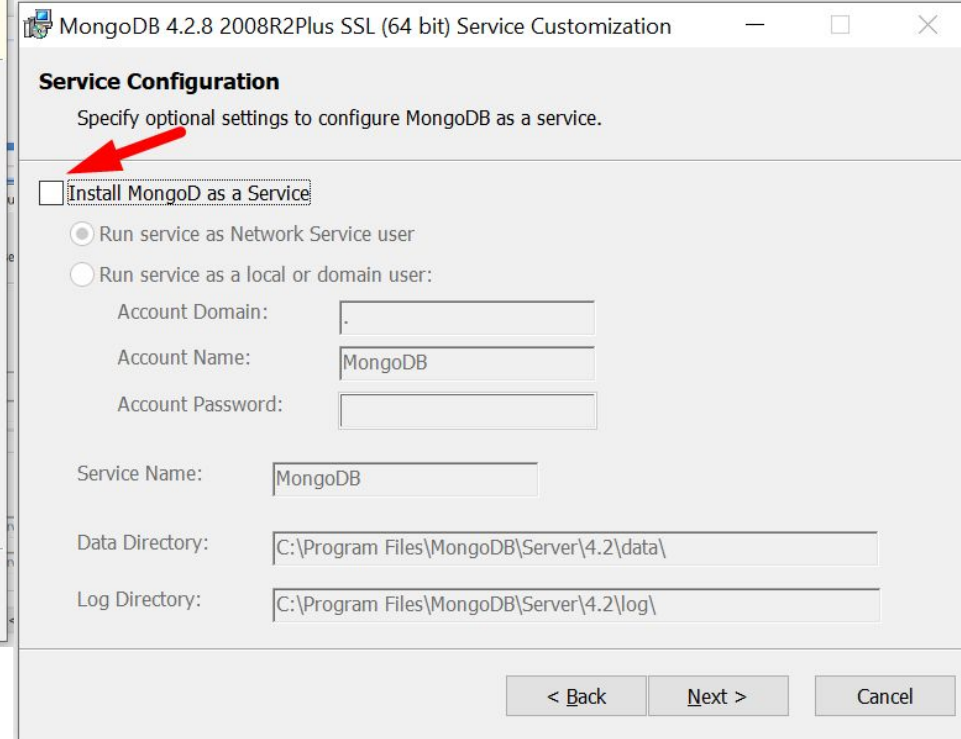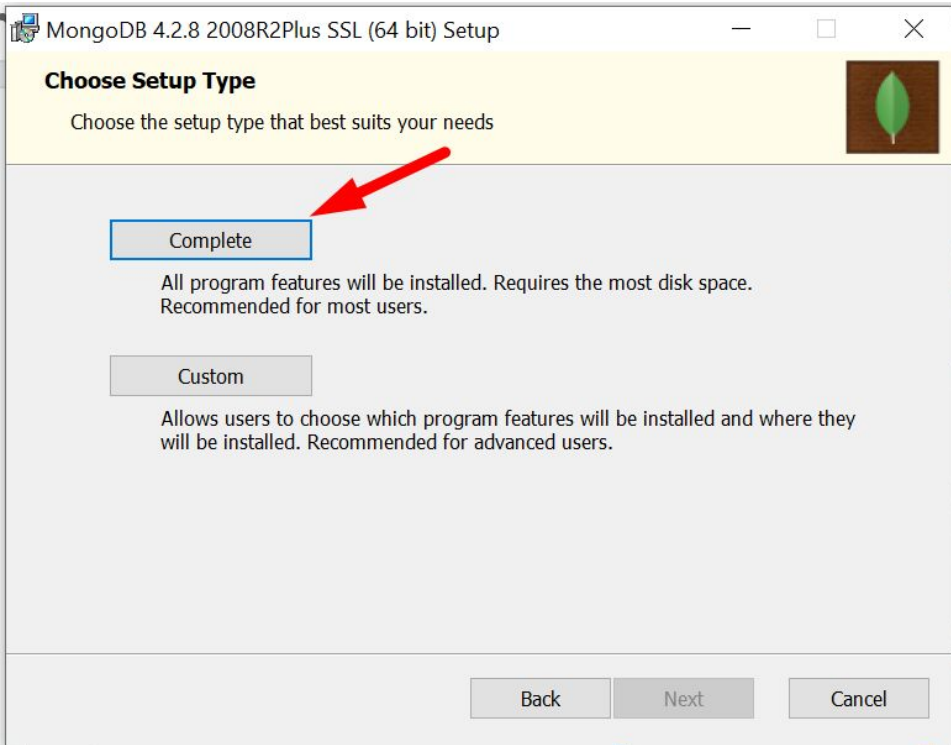
Run MongoDB Service on Windows

- Run the service
  - Create a folder in C drive   **c:\data\db**
  - Add bin folder as an entry in environment variable **Path**. For version 4.4, use

    ```
    C:\Program Files\MongoDB\Server\4.4\bin
    ```

  - Start a new command line, and run following commands

    ```
    mongod --version
    mongo --version
    ```

Setup MongoDB on Mac

- [Official Setup Guide](#)
- Install Homebrew
- Install MongoDB

```
brew tap mongodb/brew
brew install mongodb-community@4.4
```

- Start/Stop Service

```
brew services start mongodb-community@4.4
brew services stop mongodb-community@4.4
```

Running MongoDB

- MongoDB installation brings 2 executable, `mongod` and `mongo`
- mongod
  - The primary daemon process for the MongoDB system
  - Handles data requests, manages data access and performs background management operations.
- mongo
  - The command-line shell that connects to a specific instance of `mongod`

Running MongoDB

- In a new command prompt, run `mongod` to run a mongo server demon. Leave it running.
- In another command prompt, run `mongo` shell command to interact with server.

```
> help
> show databases
> use demo
> db
> db.createCollection('Students')
> db.Students.insertOne({name: "Ah Boy", age: 12,
subjects:["Maths", "English"]})
> db.Students.find()
```

Outline

- Setup MongoDB
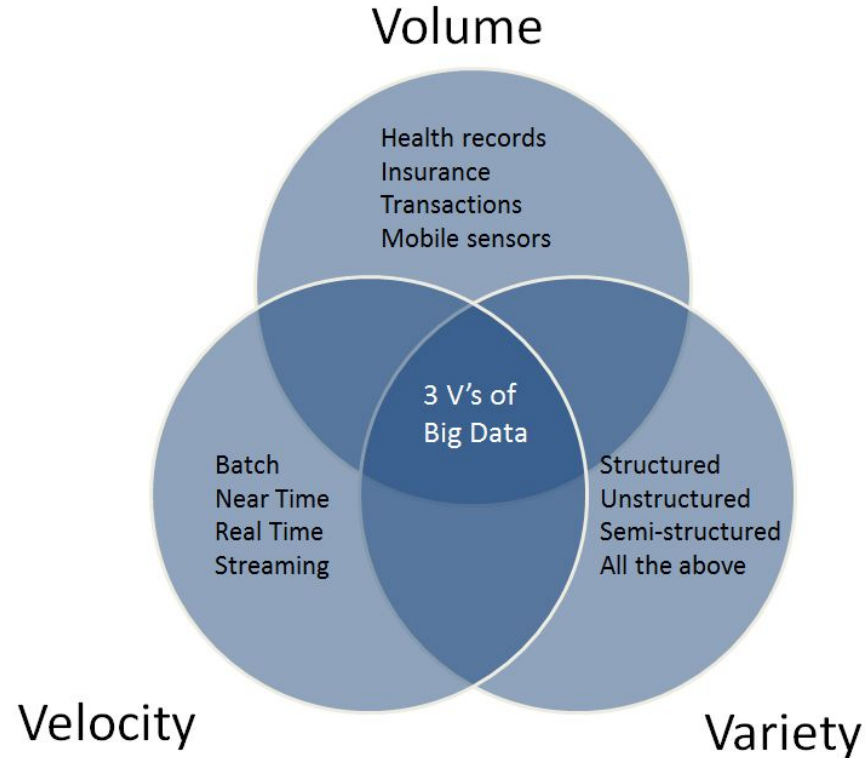- **What is NoSQL and MongoDB**
- Setup MongoDB Cloud

Relational Databases

- Highly structured data
- ACID Requirements
  - (Atomicity, Consistency, Isolation, Durability)
  - Emphasize on data integrity and reduce anomalies
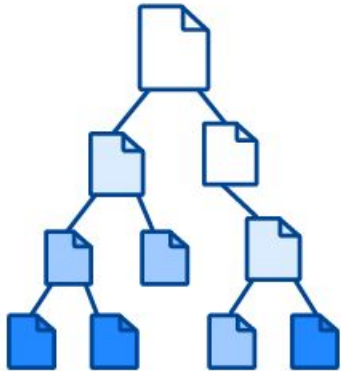- Complex queries and reports
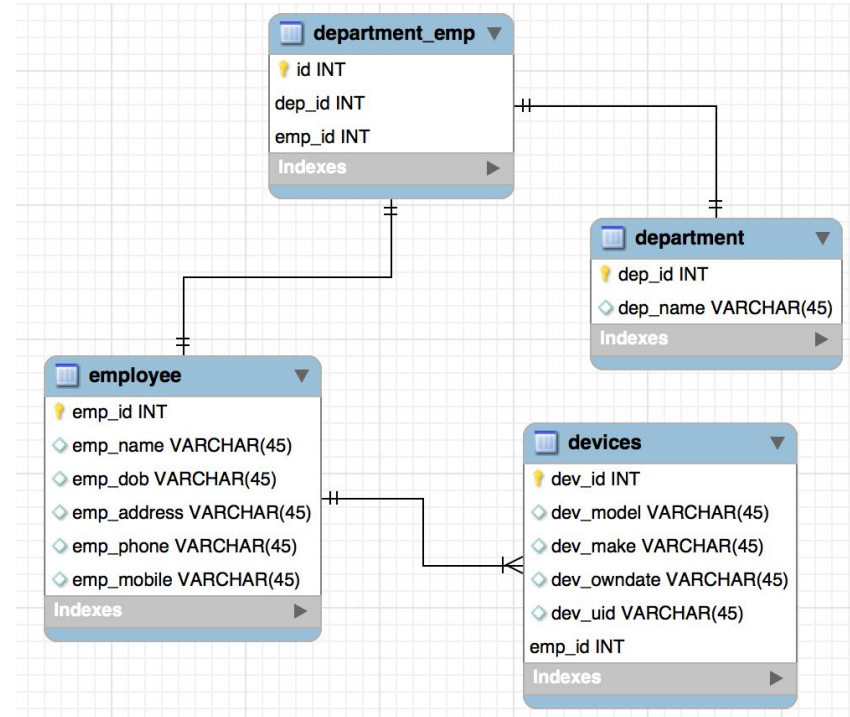
NoSQL Databases

- "Not Only SQL"
- Why NoSQL gains popularity?
  - Flexible Data Requirements
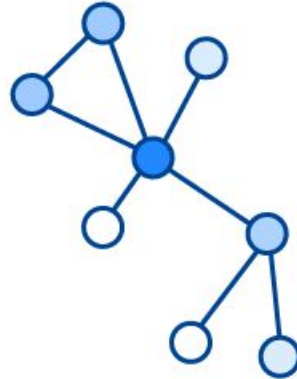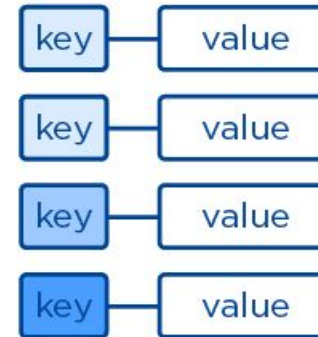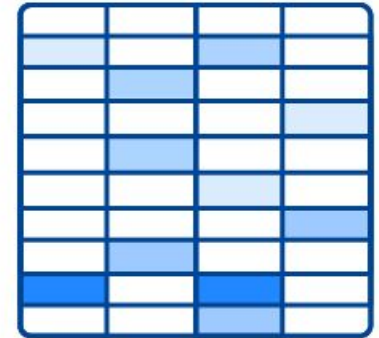 - Rapid Data Growth and Scalab
  - Concurrent Performance

Volume

Health records
Insurance
Transactions
Mobile sensors

3 V's of
Big Data

Batch
Near Time
Real Time
Streaming

Structured
Unstructured
Semi-structured
All the above

Velocity

Variety

Types of NoSQL Database

Document

Graph

Key-Value

key — value

key — value

key — value

key — value

Wide-column

Wide-Column Databases

EmpNo	EName	Job	Mgr	HireDate
7369	SMITH	CLERK	7902	17/12/1980
7499	ALLEN	SALESMAN	7698	20/02/1981
7521	WARD	SALESMAN	7698	22/02/1981
7566	JONES	MANAGER	7839	2/04/1981
7654	MARTIN	SALESMAN	7698	28/09/1981
7698	BLAKE	MANAGER	7839	1/05/1981
7782	CLARK	MANAGER	7839	9/06/1981

Logical Schema

- **Allow selection of a field easily**
- **Good for reporting**

Block 1	7369	7499	7521	7566	7654
Block 2	SMITH	ALLEN	WARD	JONES	MARTIN
Block 3	CLERK	SALESMAN	SALESMAN	MANAGER	SALESMAN
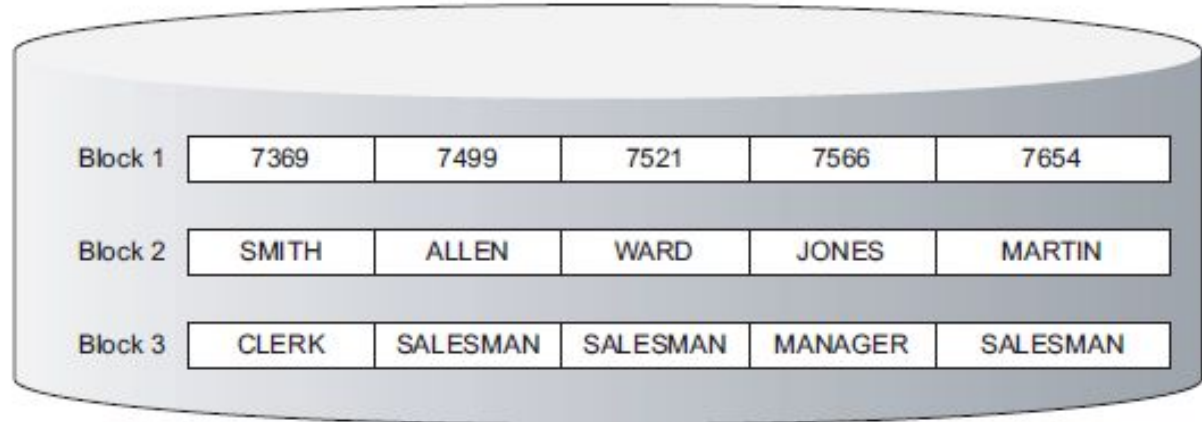
Column Store physical layout

Column Database stores column values together

http://guyharrison.squarespace.com/blog/20

Key-Value Databases

| Keys		Values
2398239	→	{ "name": "Michał", "Age": "31"}
2398240	→	"Lorem ipsum dolor sit amet"
2398241	→	{ "name": "Marlon Brando", "Profession": "Actor"}
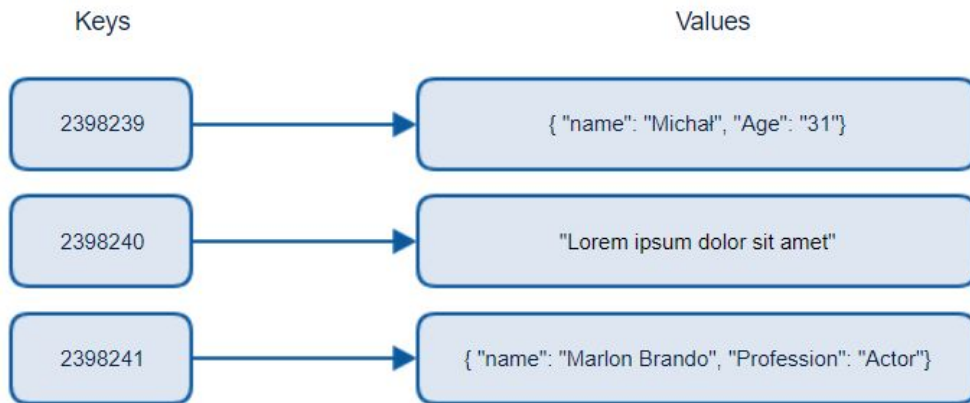
- **Each record is a key-value pair**
- **Used in file system, object storage for archiving**
- **E.g. AWS S3, Google Cloud Storage, Azure Cosmos DB**

Products

Primary Key — Partition Key / Sort Key — Attributes

Schema is defined per item

Product ID	Type			
1	Book ID	Odyssey	Homer	1871
2	Album ID	6 Partitas	Bach	
2	Album ID: Track ID	Partita No. 1		
3	Movie ID	The Kid	Drama, Comedy	Chaplin

Items

14
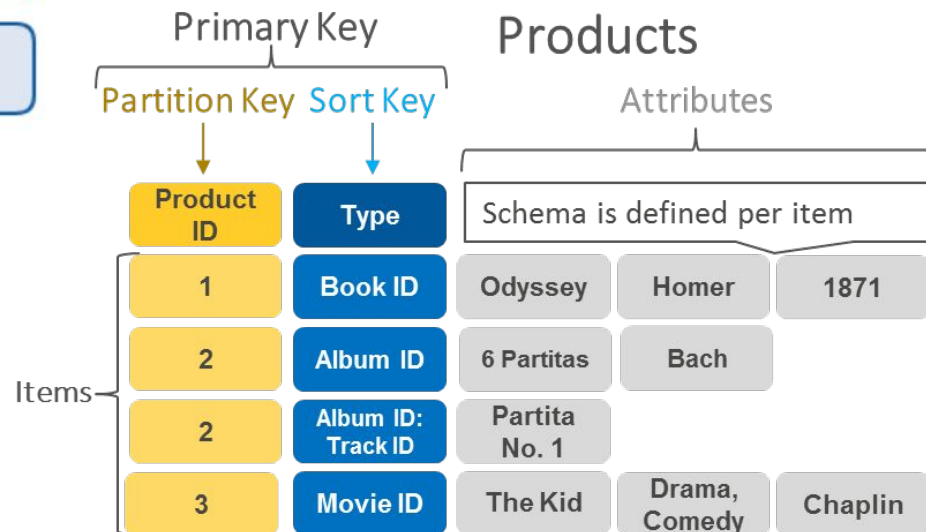
Graph Database

- **Application in knowledge graph, network structure, social network graph, recommendation system**
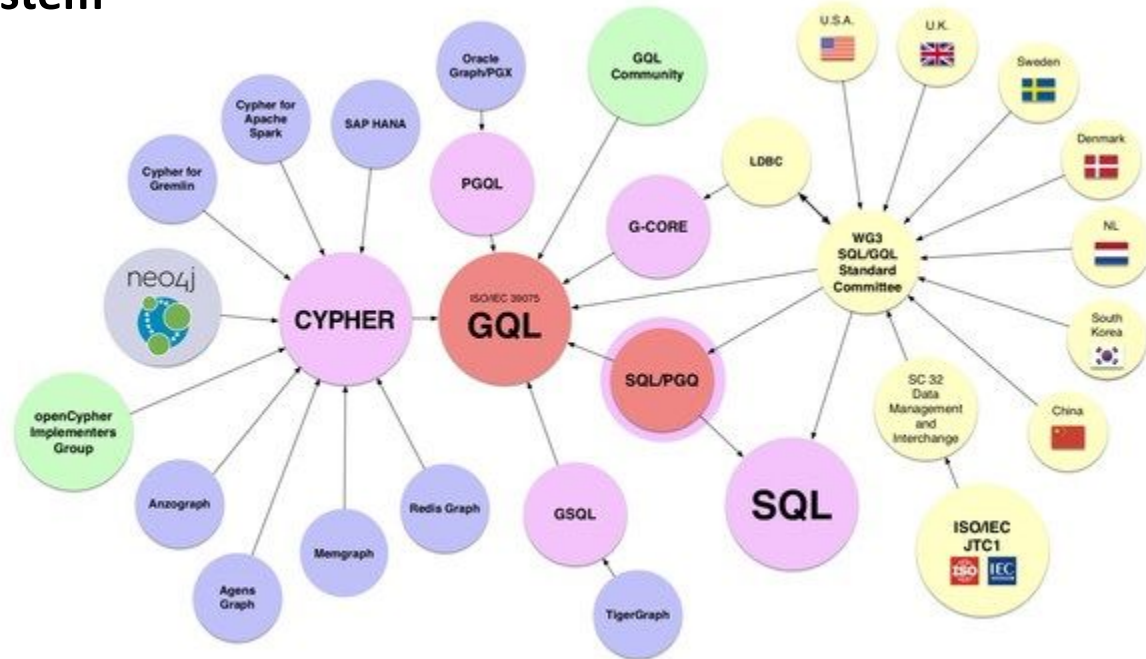
NoSQL Databases
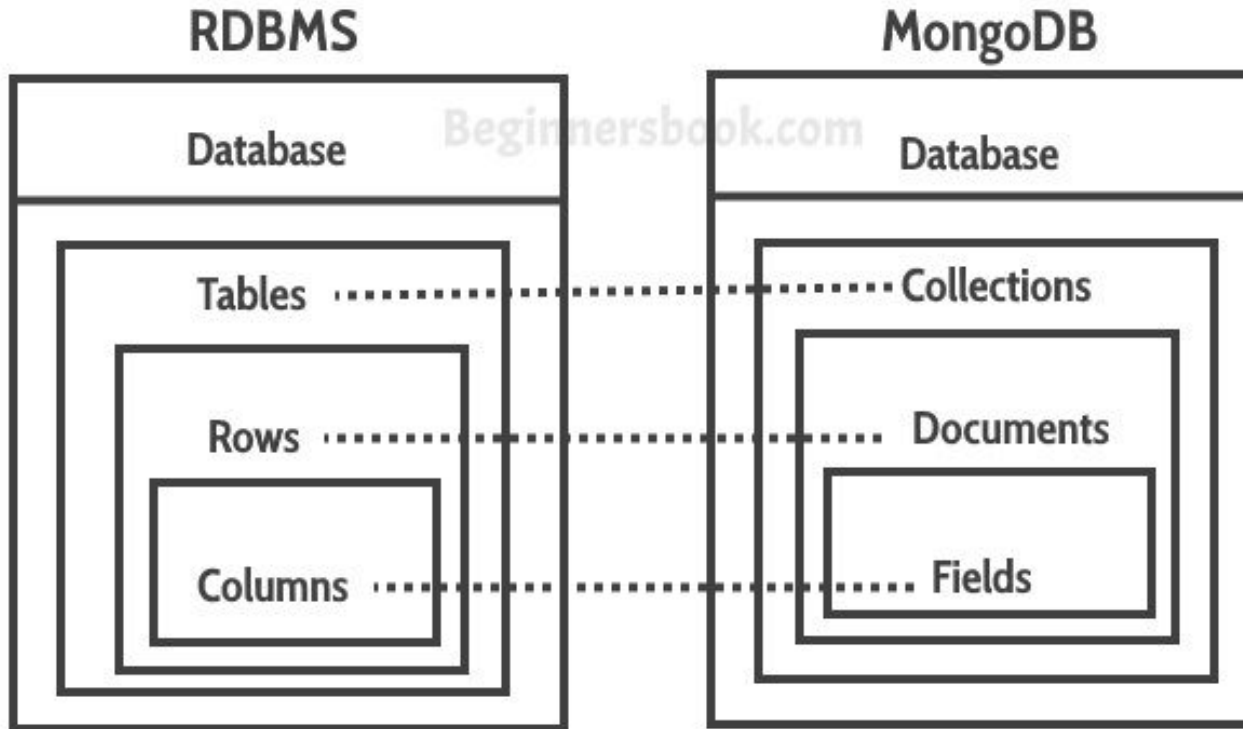
Document

Graph

Key-Value

Wide Column

What is MongoDB

- A cross-platform, document oriented NoSQL database
  - Each key pairs with a document
  - Each document is a complex data structure

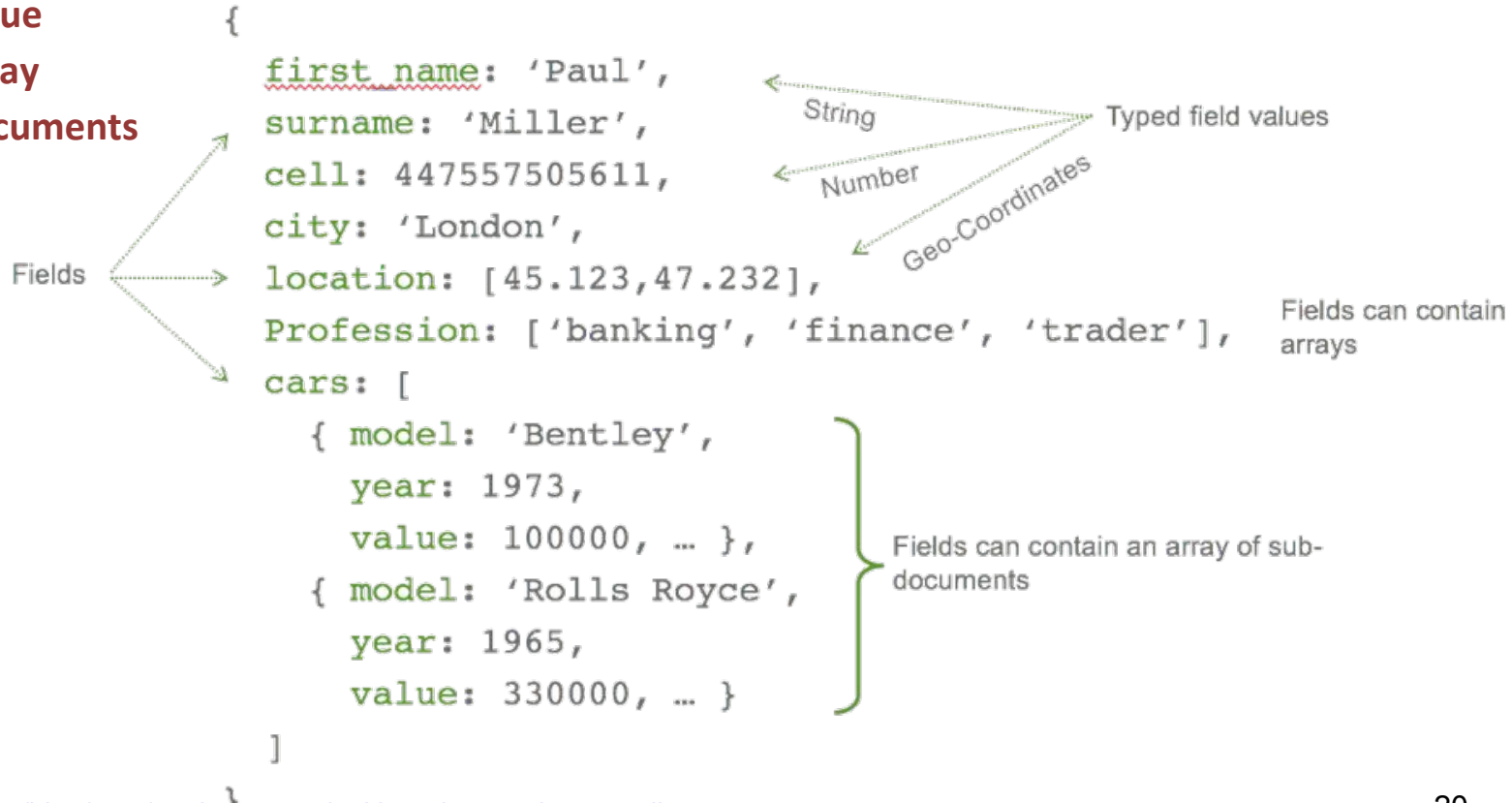https://itnext.io/introduction-to-mongodb-2t81773c3c4t
https://scalegrid.io/blog/2019-database-trends-sql-vs-nosql-top-databases-single-vs-multiple-database-use/

17
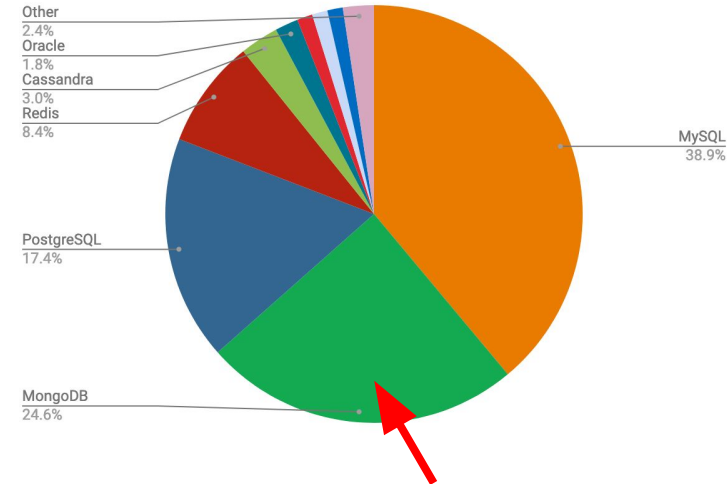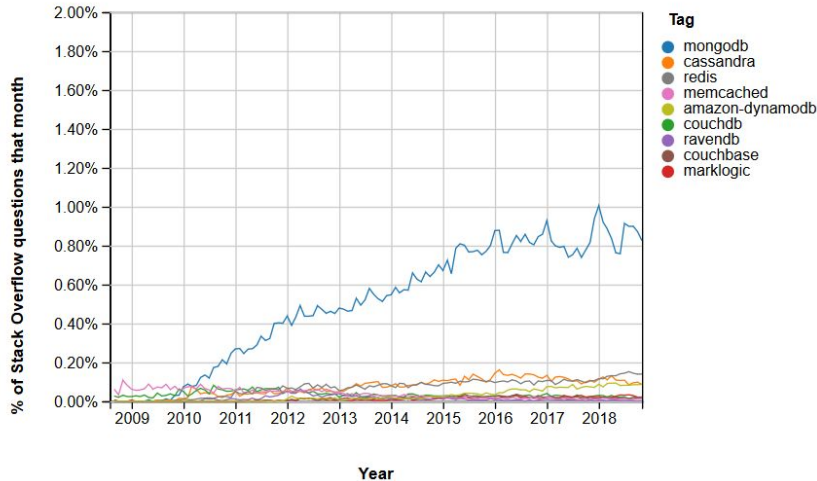
Mapping Relational to MongoDB

MongoDB Document

- _id
  - Field name **_id** is reserved for use as a primary key
  - Must be unique in the collection and immutable

- Key-value
- Key-array

- sub-documents

```json
{
    "_id" : ObjectId("5ce931fe18383670514bfacf"),
    "title" : "Interstellar",
    "director" : "Christopher Nolan",
    "year" : 2014,
    "budget" : 1650000000,
    "genre" : [
            "Adventure",
            "Drama",
            "Sci-Fi"
    ],
    "stars" : [
            {
                    "name" : "Matthew McConaughey",
                    "birthYear" : 1969,
                    "nationality" : "American",
                    "wonOscar" : true
            },
            {
                    "name" : "Anne Hathaway",
```

Another Document

- **Key-value**
- **Key-array**
- **sub-documents**

```
{
    first_name: 'Paul',                                          String
    surname: 'Miller',                                                          Typed field values
    cell: 447557505611,                                          Number
    city: 'London',
    location: [45.123,47.232],                       Geo-Coordinates
    Profession: ['banking', 'finance', 'trader'],               Fields can contain
                                                                arrays
    cars: [
        { model: 'Bentley',
          year: 1973,
          value: 100000, … },
        { model: 'Rolls Royce',                      Fields can contain an array of sub-
          year: 1965,                                documents
          value: 330000, … }
    ]
}
```

Fields

Table vs Collection

● Document schema is flexible

Relational Database

Student_Id	Student_Name	Age	College
1001	Chaitanya	30	Beginnersbook
1002	Steve	29	Beginnersbook
1003	Negan	28	Beginnersbook

MongoDB

```
{
 "_id": ObjectId("......"),
 "Student_Id": 1001,
 "Student_Name": "Chaitanya",
 "Age": 30,
 "College": "Beginnersbook"
}
{
 "_id": ObjectId("......"),
 "Student_Id": 1002,
 "Student_Name": "Steve",
 "Age": 29,
 "College": "Beginnersbook"
}
```

Outline

- Setup MongoDB
- What is NoSQL and MongoDB
- **Setup MongoDB Cloud**
  - Access it with MongoDB Compass

MongoDB Cloud

- A fully managed cloud database.
- Register account
  - Go to https://www.mongodb.com/cloud
  - Click on "Try MongoDB Cloud Now"
  - Sign up using Google account or email

MongoDB Cloud

MongoDB Cloud is the best way to build data-driven applications.

Try MongoDB Cloud Now

Create a Free Cluster

- Create a cluster free shared cluster
  - Pick a cloud provider and choose a region in Singapore or nearby
- Create a database user
  - Choose "Password" authentication method
  - Allow "Read and write to any database" privileges

Note: it will take a while for cluster to be created.

Create Database and Collection (1/3)

- A cluster can contain multiple databases. Each database can contain multiple collections (aka tables)
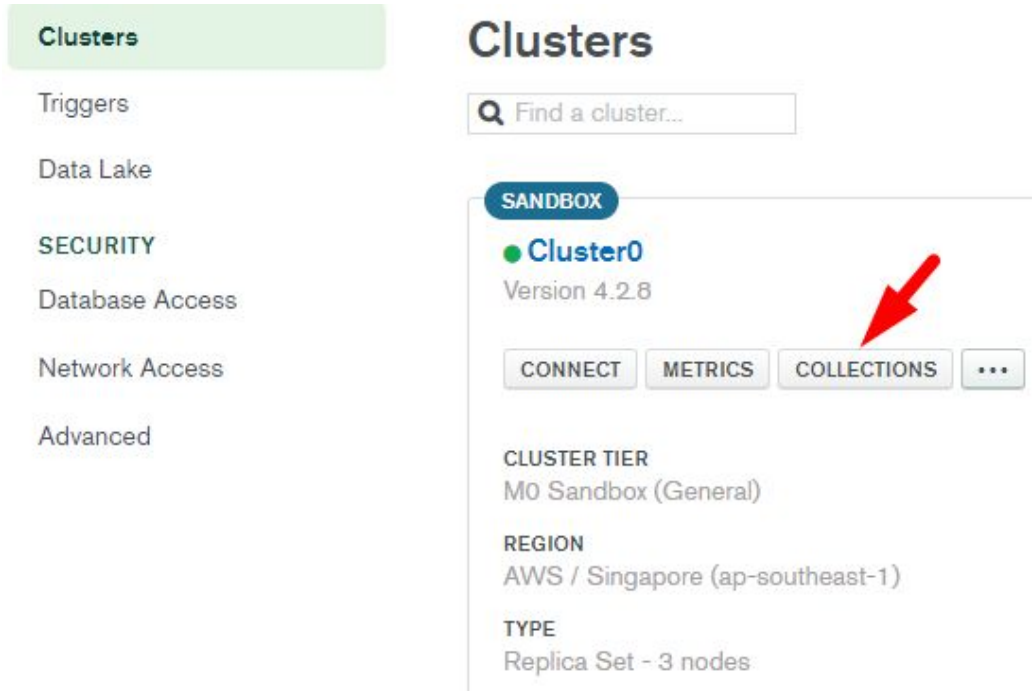
Create Database and Collection (2/3)

- Click on "Add My Own Data".

Create Database and Collection (3/3)

- Create a database "demo" and a collection "students"

Create Database

DATABASE NAME ❓

demo

COLLECTION NAME ❓

students

☐ Capped Collection

Before MongoDB can save your new database, a collection
name must be specified at the time of creation.

Cancel   Create

Setup Connection

- Go back to Clusters; Click on CONNECT for Cluster0

Network Access

- IP Whitelist is the list of IPs which can connect to database
  - For security, it is recommended to limit the IP addresses, e.g. your company IP range
  - For practice purpose, we will allow access from anywhere

Database Access

- Wizard helps you to generate connection string
  - Choose to generate connection string for MongoDB Compass
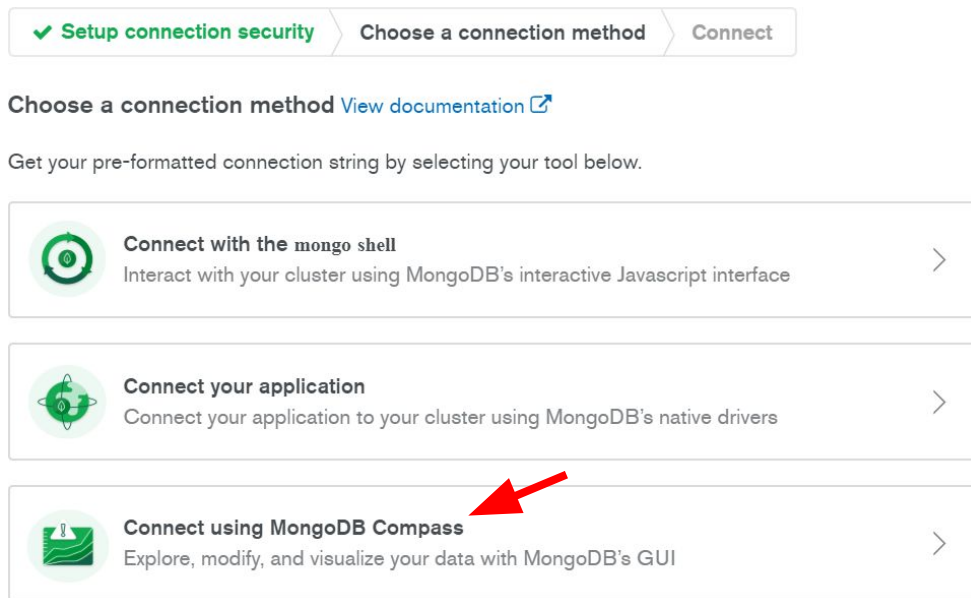
Connection String

- Copy the generated connection string
  - mongodb+srv://<username>:<password>@cluster0.30mjg.mongodb.net/

MongoDB Compass

- **Start MongoDB Compass**
  - Replace username & password in connection string
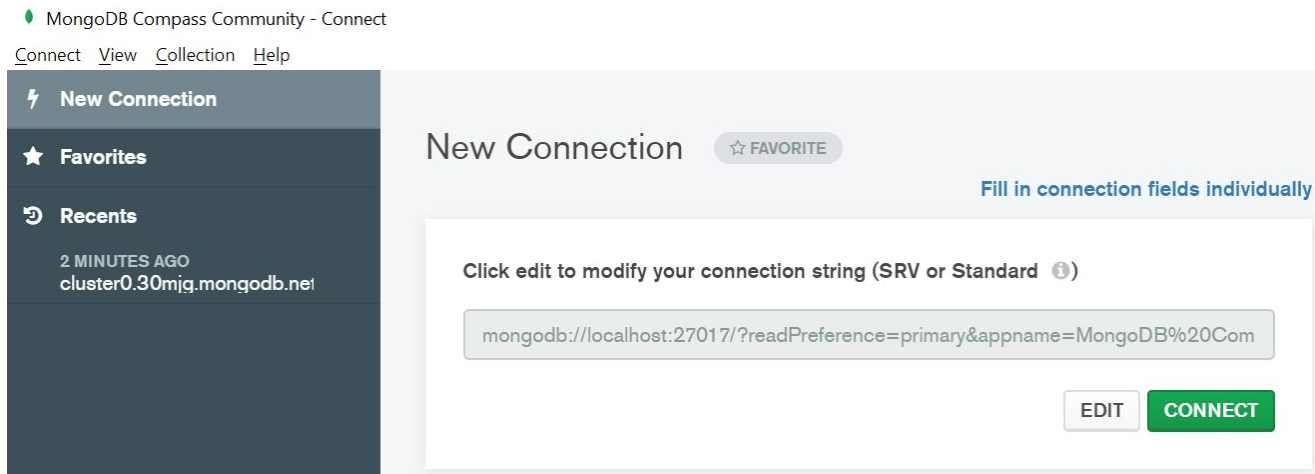
Create Database

- Create a new database "leisure" with first collection named "tvshow".

Import File

- Browse into "leisure.tvshow" collection, import file "tv-shows.json".
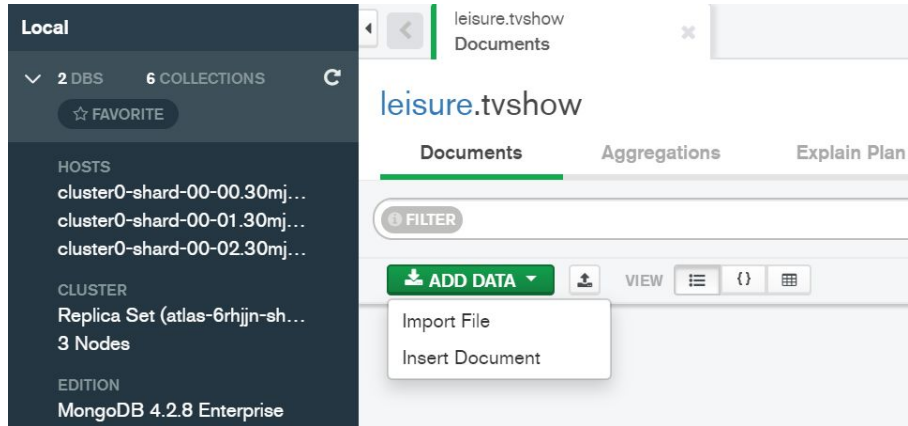
Browse and Filter Data in Collection

leisure.tvshow   DOCUMENTS 240

Documents   Aggregations   Explain Plan   Indexes

ⓘ FILTER   {"runtime":60, status:"Running"}

⬇ ADD DATA ▾   ⬆   VIEW ☰ {} ⊞   Di

```
_id: ObjectId("5f03ce3d5508020b4c502f3c")
id: 4
url: "http://www.tvmaze.com/shows/4/arrow"
name: "Arrow"
type: "Scripted"
language: "English"
> genres: Array
status: "Running"
runtime: 60
premiered: "2012-10-10"
officialSite: "http://www.cwtv.com/shows/arrow"
> schedule: Object
> rating: Object
weight: 99
> network: Object
webChannel: null
> externals: Object
> image: Object
summary: "<p>After a violent shipwreck, billionaire playboy Oliver Queen was mis..."
updated: 1536062117
> _links: Object
```

Setup Connection

● Choose correct driver and version; copy code example

Reference