### **Database**

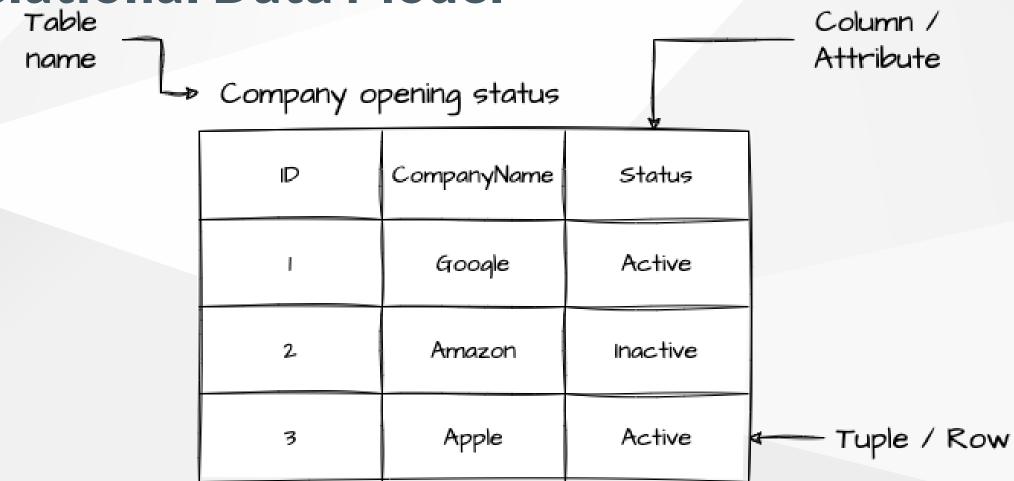
- Database
- <u>Database Management System</u>
- Relational Database
- NoSQL Database

### Relational vs NoSQL

- MySQL, SQLite, Oracle, ...
- Data Model
  - Tables
  - Relationships
- Operations
  - CRUD
- Access Control
  - o GUI
  - o API, ODBC, JDBC, ...

- MongoDB, Redis, Cassandra, ...
- Data Model
  - Documents
  - Collections
- Operations
  - CRUD
- Access Control
  - o GUI
  - API, mongoose for JS

### **Relational Data Model**



#### Company opening status

ID	CompanyName	Status
I	Google	Inactive
2	Walmart	Active
3	Apple	Active

#### Interviewee

ID	Name	Company
I	Aaron	Apple
2	Alex	Walmart
3	John	Apple

#### **Database Access**

- GUI
  - MySQL Workbench
  - MySQL Shell for VS Code
- API
  - o ODBC
  - o JDBC
  - ORM Object Relational Mapping
    - Hibernate, SQLAlchemy, Sequelize, ...

### SQL

- <u>SQL</u>
- <u>SQL Syntax</u>
- SQL Tutorial

```
SELECT column1, column2, ...

FROM table_name
WHERE condition;
```

```
CREATE TABLE table_name (
   column1 datatype,
   column2 datatype,
   column3 datatype,
   ...
);
```

# MySQL

- Local Setup
  - MySQL Community Server
  - MacOS: <u>Homebrew</u> brew install mysql
  - Docker
    - MySQL
- mysql -u root -p

sql/index.js

# MySQL connection with Node.js

- mysql2
- <u>sequelize</u>

# **NoSQL Database**

- Document
  - JSON
- Collection
  - Table
- Document Database
  - MongoDB
  - CouchDB

### **Document Data Model**

https://api.github.com/users/mojombo/repos

### **Evolution of MongoDB**

- Initial NoSQL databases supported read-only operations
- Not good at high volume transactional operations
  - MongoDB 4.0 supports multi-document ACID transactions
- MongoDB has evolved for
  - Foreign key in addition to embedded documents
  - Schema validation
  - Aggregation pipeline
  - Indexes

O ...

### Comparison between MongoDB and MySQL

MongoDB	MySQL
Collection	Table
Document	Row
Field	Column
Index	Index
Embedded Document	Join
Reference	Foreign Key

### MongoDB

- Local Setup
  - MongoDB Community Server
  - Docker: <u>MongoDB</u>
- Cloud
  - MongoDB Atlas
- Access to MongoDB
  - GUI: MongoDB Compass
  - API: mongoose

### Shared access to MongoDB

You can definitely setup your own MongoDB server either in local or in cloud, and have your own connection access. Or, you can use our shared access to sample MongoDB server I created for this class. I will share the username and password in the Slack channel.

```
mongodb+srv://<username>:<password>@fullstack-
training.gw3nkbl.mongodb.net/<database>
```

### MongoDB CRUD

#### **CRUD Operations**

- Read
  - o db.collection.find()
  - o db.collection.findOne()
- Create
  - o db.collection.insertOne()
  - o db.collection.insertMany()

- Update
  - o db.collection.updateOne()
  - o db.collection.updateMany()
- Delete
  - db.collection.deleteOne()
  - db.collection.deleteMany()

mongo/index.js

# MongoDB connection with Node.js

- mongoose
- mongoose document

http-server-mongodb/index.js

# Http Server with MongoDB

- Setup MongoDB connection
- Setup HTTP server
- Map HTTP requests to CRUD operations
  - o get all
  - o get one
  - create
  - update
  - delete