NODE.JS NIGHTS

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DATABASES & DOCKER

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AGENDA

- Database types
- Docker (for development)
- ORMs

DATABASE TYPES

DATABASE TYPES

- Relational Databases
- Non-relational databases
  - NoSQL

Relational
Tend to be larger,
monolithic

Non-relational
Newer field, lots
of players

RELATIONAL DATABASES

RELATIONAL DATABASES

- Emerged in the 70's
- Store data according to a schema
  - Data definition
- Allows data to be displayed as tables with rows and columns
- Provide functionality for reading, creating, updating, and deleting data
  - Data manipulation/query
  - **S**tructured **Q**uery **L**anguage

RELATIONAL DATABASES

Advantages

- Well-documented and mature technologies
- SQL standards are well-defined and commonly accepted
- Have ACID-compliant transactions
    - **A**tomicity
    - **C**onsistency
    - **I**solation
    - **D**urability

RELATIONAL DATABASES

Disadvantages

- Don't work well — or at all — with unstructured or semi-structured data
    - Schema and type constraints
    - Non-suitable for large analytics or IoT event loads
- When migrating to another RDBMS, schemas and types must generally be identical between source and destination tables for migration to work

NON-RELATIONAL DATABASES

NON-RELATIONAL DATABASES

- Existed since the late 60's
- Can be schema agnostic
  - Allow unstructured and semi-structured data to be stored and manipulated
- Increasingly used in **big data** and **real-time web** applications
- Have different types to solve different problems/needs

NON-RELATIONAL DATABASES

Types

- Key-Value Stores
    - Store only key-value pairs
    - Provides basic functionality for retrieving the value associated with a known key
- Wide Column Stores (Big Data)
    - Schema-agnostic
    - Works as a multi-dimensional key-value store

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NON-RELATIONAL DATABASES

Types

- Document Stores
  - Schema-free
  - Store data in form of JSON documents
- Graph Databases
  - Represent data as a network of related nodes (or objects)
  - Typically used when analysis of the relationships between nodes is the end goal of the system

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NON-RELATIONAL DATABASES

Advantages

- Schema-free data models
  - More flexible and easier to administer
- Generally more horizontally scalable and fault-tolerant
- Data can easily be distributed across different nodes
  - To improve availability and/or partition tolerance, you can choose that data on some nodes be "eventually consistent"

NON-RELATIONAL DATABASES

Disadvantages

- Lack of relationships
- Data consistency needs to be taken care in the application logic
- Are generally less widely adopted and mature than RDBMS solutions
- Each database type have specific formats and constraints
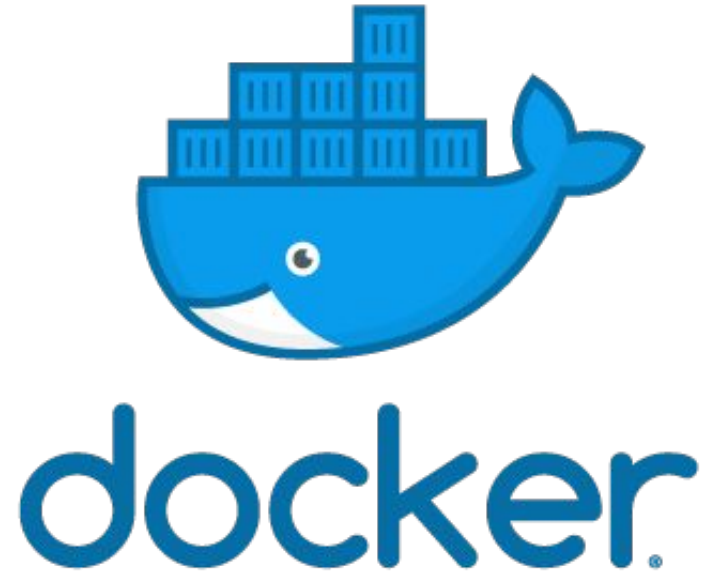
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POPULARITY - RDBMS vs. NoSQL
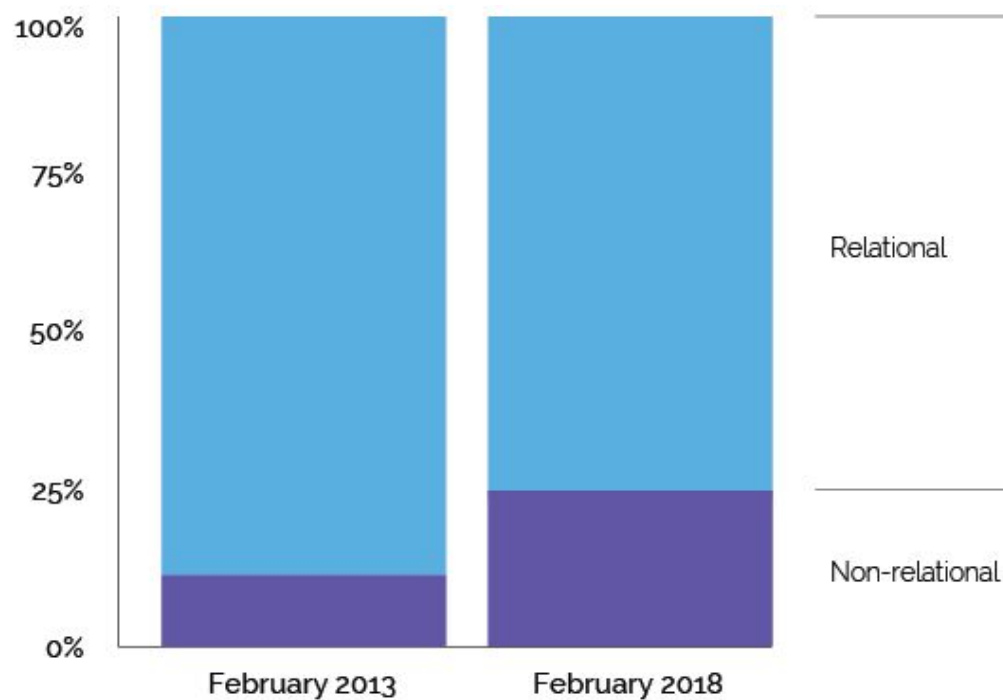
Source: https://db-engines.com/en/ranking_trend

DOCKER

DOCKER

- Run software packages called "containers"
- Isolated from each other
- Bundle their own tools, libraries and configuration files
- More lightweight than virtual machines

```
 1 FROM node:boron
 2
 3 RUN mkdir -p /usr/src/app
 4 WORKDIR /usr/src/app
 5
 6 COPY package.json /usr/src/app
 7 RUN npm install
 8
 9 COPY . /usr/src/app
10
11 EXPOSE 8080
12
13 CMD ["node", "index.js"]
```

Dockerfile → build → Docker Image (Image) → run → Docker Container

DOCKER-COMPOSE

- Compose is a tool for defining and running multi-container Docker applications.
  - Uses YAML file as definition

```yaml
services:
  database:
    image: postgres:11.2
    container_name: nodejsnights-db
    environment:
      POSTGRES_DB: nodejsnights
    ports:
      - 5432:5432
```

ORM

ORM

- **O**bject-**R**elational **M**apping
- Represents database rows (and it's relationships) as objects
- Wraps implementation-specific details in a common API
- Helps to change the DBMS if needed
- Helps to maintain the database structure in a "timeline" (database migrations)

ORM

- Sequelize
- Bookshelf
- Objection.js

EXAMPLE TIME

THAT'S IT

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QUESTIONS

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