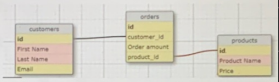
Overview of MongoDB

What you will learn

- Explain what MongoDB is
- List different components of MongoDB
- Describe why and where to use MongoDB

What is MongoDB database?

- A document and a NoSQL database



store data as document which

- Where data is structured in non-relational way

Order document

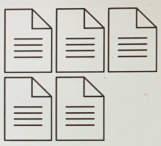
What are documents?

- Associative arrays like JSON objects or Python dictionaries
- For example: A student document

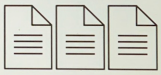
```
{
 "firstName": "John",
 "lastName": "Doe",
 "email": "john.doe@email.com",
 "studentId": 20217484
}
```

What is a collection?

- Is a group of stored documents
- For example, all student records in Students section (**collection**) and
- Staff records in Employees section (**collection**)



Students



Employees

What is a database?

- A database stores collections

Students and Employees collections stored in a database called CampusManagementDB

Documents in detail - 1/2

See the following fields in the document: firstName, lastName, email and studentId

```
{                    key        value
 "firstName": "John",
 "lastName": "Doe",
 "email":    "john.doe@email.com",
 "studentId": 20217484
}
```

Documents in detail - 2/2

MongoDB supports various data types:

```
{
 "name": "John",
 "dateOfBirth": ISODate("2000-01-01T14:45:00.000Z"),
 "studentId": 20217484,
 "enrolled": true,
 "balance": 20.01,
 "address": {
  "city": "Stonefield",
  "country": "UK"
 },
 "interests": ["football", "skiing", "travelling"]
}
```

or unix style epic dates

sub-documents

lists, not just text

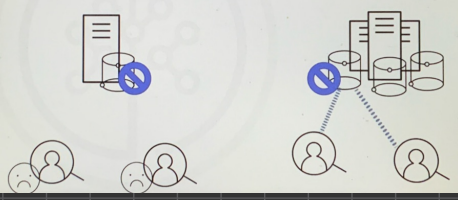
Why use MongoDB?

- Model data as you read/write, not the other way
  - Traditional relational databases: Create the schema first, then create the tables
  - To store another field, you have to alter tables

```
SELECT * FROM Orders INNER JOIN Customers...
ALTER TABLE Customers...
```

Why use MongoDB?

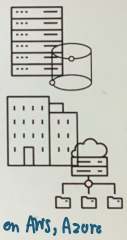
- Model data as you read/write, not the other way
- Bring structured/unstructured data
- High availability for keeping multiple copies of data (each structure)



Where to use MongoDB

MongoDB is a popular choice of database for

- Large and unstructured
- Complex
- Flexible
- Highly scalable applications
- Self-managed, hybrid, or cloud hosted

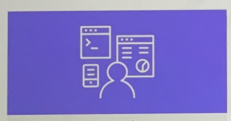


https://www.ibm.com/cloud/databases-for-mongodb

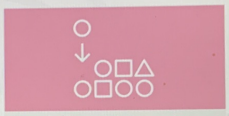
or MongoDB on AWS, Azure and Google Cloud

Advantages of MongoDB

What you will learn



Identify the key benefits of using MongoDB



Explain why it suits your evolving data needs

Flexibility with schema

```
{
  "street": "10 High St",
  "city": "London",
  "postcode": "W1 1SU"
}
```

No zip code for UK

compare in RDBMS, must be present in each row (zip, postcode) with a lot of fields with no values, but in MongoDB is not a problem → it allows

```
{
  "street": "8717 West St",
  "city": "New York",
  "zip": "10940"
}
```

No postcode for USA

MongoDB allows flexibility with the schema

Code-first approach

In relational databases

- Design
- Then code

```
CREATE TABLE Students (
    FirstName varchar(255),
    LastName varchar(255),
    Email varchar(255),
    StudentId int);

INSERT INTO Students
VALUES (
    "John",
    "Doe",
    "john.doe@email.com",
    20217484);
```

Code-first approach

In relational databases

- Design
- Then code

In MongoDB, code first!

- No complex table definitions
- Write as soon as you connect to DB

```
db.persons.insertOne({
  "firstName": "John",
  "lastName": "Doe",
  "email": "john.doe@email.com",
  "studentId": 20217484
})
```

Evolving schema

The whole world changed in 2020!

```
//pre-covid schema
{
  "street": "10 High St",
  "city": "London",
  "postcode": "W1 1SU"
}
```

```
//evolved schema
{
"street": "10 High St",
"city": "London",
"postcode": "W1 1SU",
"contactlessDelivery": true
}
```

to quickly evolve schema to store additional information

Unstructured data

Stock Market Aggregator → from diff sources

The unstructure table can be stored in one collection

```
{
  "symbol": "IBM",
  "open": 235.9,
  "high": 237.47,
  "low": 233.17
}
```

```
{
  "stockName": "IBM",
  "pricing": {
    "o": 235.9,
    "h": 237.47,
    "l": 233.17
  }
  date: "2021-03-01T00:00:00+0000"
}
```

Querying and analytics

query & analytics capabilities

MongoDB querying using MQL

to find data

Has a wide range of operators

For complex analysis use aggregation pipelines

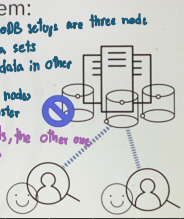
High availability

MongoDB is natively a highly available system:

- Resilience through redundancy
- No system maintenance downtime
- No upgrade downtime

Typical MongoDB setups are three node replica sets keep data in other data-bearing nodes in the cluster

if one system fails, the other one takes over



Use cases for MongoDB

What you will learn

- List the most common use cases for MongoDB
- Describe the Many Sources – One View use case
- Describe the IoT use case

What you will learn

- Describe the E-commerce use case
- Describe the Real-time Analytics use case
- Describe the Gaming use case
- Describe the Finance use case

Many Sources – One View

silo = a repository of data that's controlled by one department or business unit and isolated from the rest of an organization

- No more data silos
- Easy data ingestion
- Consolidate different data
- Flexible schema

Internet of Things (IoT)

- Billions of IoT devices around the world
- Vast amount of data ↙ generate
- Scale
- Expressive querying

E-commerce

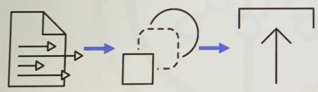
- Products with different attributes
- Optimized for read
- Dynamic schema

```
{ "storage": "64GB", "network": "5G", "color": "black" }
```

```
{ "publisher": "Oxford Press", "writer": "John Doe",
"pages": 250 }
```

Real-time analytics

- Quick response to changes
- Simplified ETL
- Real time, along with operational data



Gaming

- Globally scalable
- No downtime
- Supporting rapid development

Finance

Speed

Security

Reliability