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# 04 - Promises & MongoDB

## Better async code & NoSQL databases

**TWEB 2017**

**Olivier Liechti**

https://softeng-heigvd.github.io/Teaching-HEIGVD-TWEB-2017-Main/

https://t.me/joinchat/CPPWmAsLLgWdXQhoXTaNHw

https://t.me/joinchat/AAAAAEE3lWzr-jZRRMq3qg

# Weekly menu

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How are we going to spend the next 6 periods?

# Goals (1)

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- **See an alternative to callbacks**
  - Understand what Promises are
  - Write simple examples
  - Understand how to create "chains" of promises to implement pipelines of async operations

# Goals (2)

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- **Experiment with a NoSQL database**
  - Understand what MongoDB is and how it is different from RDMS
  - Experiment via the console
  - Write Javascript code to perform CRUD operations

# Webcasts

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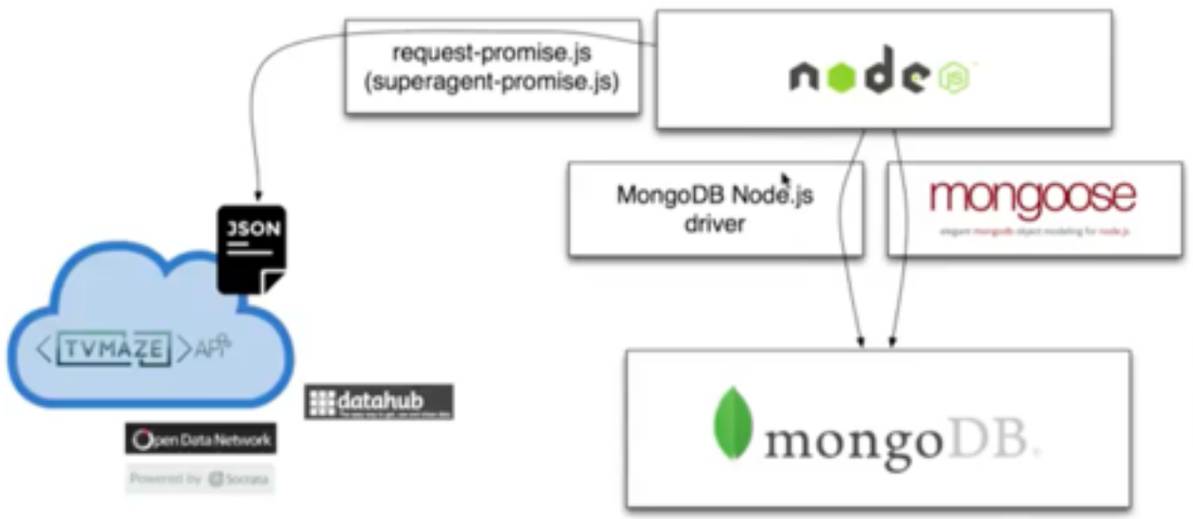
1 use one of the "promisified" npm modules to fetch JSON data from the Web




2 store the JSON documents in MongoDB collections and run queries

**Tasks**

**1. Prepare the environment**
- 1.1. Start a MongoDB server in a Docker container
- 1.2. Start a MongoDB shell in another Docker container
- 1.3. Run basic commands (create a document, find all documents)

**2. Get data from the Web**
- 2.1. Find JSON data source
- 2.2. Pick a npm module to submit HTTP requests
- 2.3. Fetch data

**3. Access MongoDB with the mongo driver**
- 3.1. Handle the connection with the MongoDB server
- 3.2. Explore the driver API
- 3.3. Interact with collections and documents

**4. Integrate all the pieces with Promises**
- 3.1. Callbacks vs promises in the APIs
- 3.2. Promise chains
- 3.3. Passing data and returning results

**5. Access MongoDB with Mongoose**
- 4.1. Select and study a template
- 4.2. Discover jquery datatables
- 4.3. Integrate the template in the project

What is **MongoDB**?
How can do I CRUD operations in the mongo shell?
How do I use the mongo **driver** in my Node.JS script?
How do I use **Mongoose** in my Node.js script?
How do I use **promises** to organize my code?

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# Webcasts

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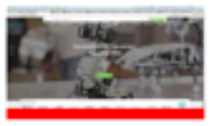
| | | | |
|---|---|---|---|
| 25 |  | **Bootcamp 4.1: Intro aux webcasts "MongoDB"**<br>by Olivier Liechti | 2:48 |
| 26 |  | **Bootcamp 4.2: prise en main de MongoDB**<br>by Olivier Liechti | 20:30 |
| 27 |  | **Bootcamp 4.3 (a): identification de la source de données JSON**<br>by Olivier Liechti | 5:40 |
| 28 |  | **Bootcamp 4.3 (b): utilisation de request-promise pour interroger l'API REST**<br>by Olivier Liechti | 15:12 |
| 29 |  | **Bootcamp 4.4: utilisation du driver node.js MongoDB**<br>by Olivier Liechti | 21:01 |
| 30 |  | **Bootcamp 4.5: implémentation de la chaîne de promesses**<br>by Olivier Liechti | 38:46 |

# Problem

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**Writing async code is hard**

Even if it is easy to understand the notion of callback, it is difficult to orchestrate multiple async operations

# Forces

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- Writing async code is not an option with Javascript.
- It is also becoming increasingly important in other languages.
- Writing code with callbacks quickly leads to problems: deeply nested "pyramids", unreadable code, tricky bugs...

# Solutions (1)

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- A long, long time ago (3 years), libraries such as **async.js** came out to address this problem.
- They expose functions to orchestrate multiple async operations: parallel(), series(), waterfall(), etc.

# waterfall(tasks, [callback])

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Runs the `tasks` array of functions in series, each passing their results to the next in the array. However, if any of the `tasks` pass an error to their own callback, the next function is not executed, and the main `callback` is immediately called with the error.

### Arguments

- `tasks` - An array of functions to run, each function is passed a `callback(err, result1, result2, ...)` it must call on completion. The first argument is an error (which can be `null`) and any further arguments will be passed as arguments in order to the next task.
- `callback(err, [results])` - An optional callback to run once all the functions have completed. This will be passed the results of the last task's callback.

### Example

```
async.waterfall([
    function(callback) {
        callback(null, 'one', 'two');
    },
    function(arg1, arg2, callback) {
      // arg1 now equals 'one' and arg2 now equals 'two'
        callback(null, 'three');
    },
    function(arg1, callback) {
        // arg1 now equals 'three'
        callback(null, 'done');
    }
], function (err, result) {
    // result now equals 'done'
});
```

- Rewrite this pyramid...

```
milkCow( function(err, milk) {
    console.log("I have " + milk + " and can prepare cheese.");
    prepareCheese(milk, function(err, cheese) {
        console.log("I have now " + cheese + " and can sell it.");
        sellCheese(cheese, function(err, money) {
            console.log("Youpi! I have my money.");
        });
    });
});
```

- into cleaner code

```
async.waterfall([milkCow, prepareCheese, sellCheese],
 function(err, results) {
    console.log("I have done all the work and now I have " + results);
});
```

# Solutions (2)

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- Promises have been proposed as a standard way to write async code.
- Initially, there was a specification (Promises/A+) with multiple implementations (bluebird, Q and tens of others).
- Today, Promises have been integrated in ECMAScript. Libraries provide additional features.


https://promisesaplus.com/

```
const myFirstPromise = new Promise((resolve, reject) => {
  // do something asynchronous which eventually calls either:
  //
  //   resolve(someValue); // fulfilled
  // or
  //   reject("failure reason"); // rejected
});
```

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Promise

```
// ignore the return value of then for now
promise.then(success, failure);

function success(result) {
  // promise has completed
  // do something with result
  return x;
}
```

```
promise2 = promise.then(success, failure);
promise2.then(success2, failure2);

function success(result) {
  // promise1 has completed
  return x;
}

function success2(result2) {
   // promise2 has completed
   // result2 is equal to x
}
```

```
promise
   .then(success, failure)
   .then(success2, failure2);

function success(result) {
  // promise1 has completed
  return x;
}

function success2(result2) {
   // promise2 has completed
   // result2 is equal to x
}
```

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# Let's write some code...

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# We want cheese
# We have a farm

We need to find a cow
Then to milk the cow
Then to transform it into cheese

# Problem

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My web app needs to store data...

where do I put it?

# Forces

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- For a long time, web applications were storing data in RDBMS (MySQL, Postgres)
- About 10 years ago, many alternatives started to appear. Today, we can choose between hundreds of "NoSQL" databases.
- Which one should we look at and how do we use it?

# Solution

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- There are different types of NoSQL databases: key-value stores, graph databases, document stores, etc.
- Document stores allow us to store semi-structured information, similar to JSON payloads.
- MongoDB was one of the early popular document stores. It still is.

# How?

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- First, understand how data is organised in MongoDB: databases, collections, documents, no schema.
- Then, learn how to perform CRUD operations via the console.
- Finally, learn how to do the same operations in Javascript.
- One more thing: learn about Mongoose.

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# Document-oriented NoSQL Database

# MongoDB

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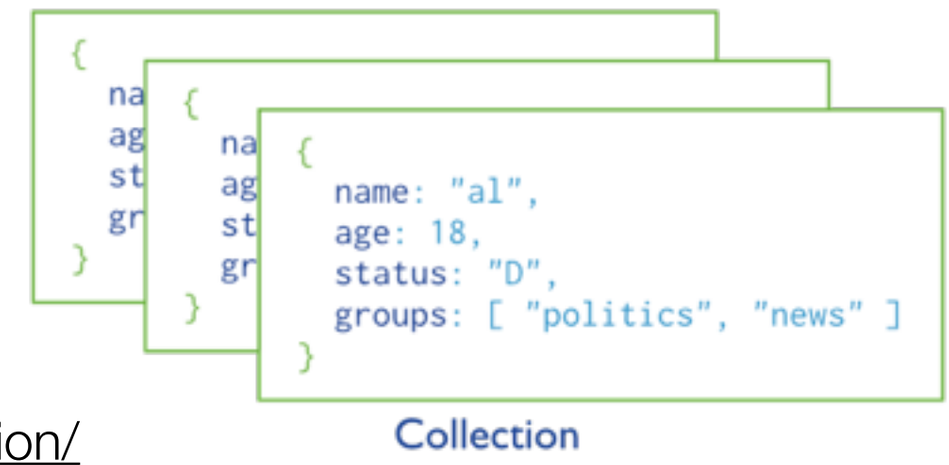
- MongoDB is one of the most popular **NoSQL** databases (and one of the first to have been categorized as such).
- It is a **schema-less document-oriented** database:
  - The data store is made of several **collections**.
  - Every collection contains a set of **documents**, which you can think of as JSON objects.
  - The **structure of documents is not defined** *a priori* and is not enforced. This means that a collection can contain documents that have different fields.

```
{
  name: "sue",                    ← field: value
  age: 26,                        ← field: value
  status: "A",                    ← field: value
  groups: [ "news", "sports" ]    ← field: value
}
```




http://docs.mongodb.org/manual/core/crud-introduction/

# Data modeling

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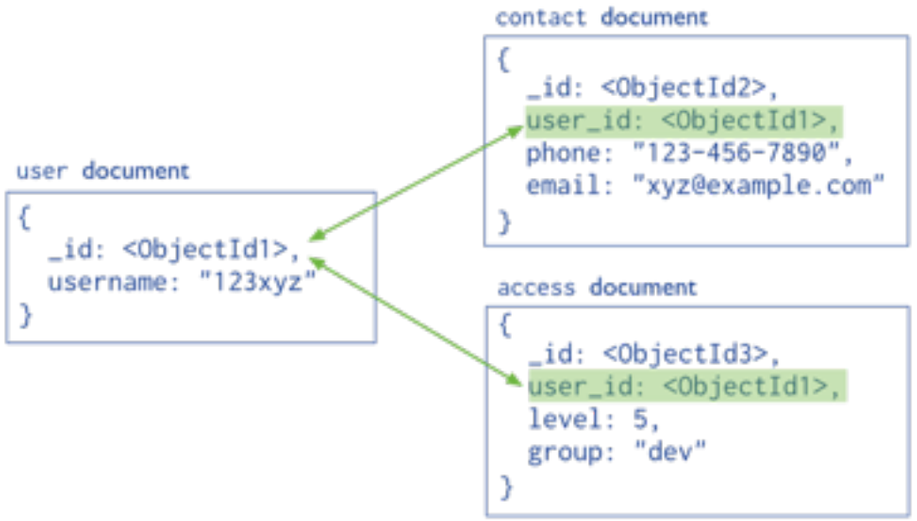
- Creating a data model with MongoDB does not have to follow the rules that apply for relational databases. Often, they should not.
- Consider theses questions: is this a **composition** relationship (**containment**)? Is this "**aggregate**" of documents often used at the same time (i.e. can we reduce chattiness)? Would embedding lead to "a lot" of data **duplication**?




**Normalized data model**
(references)


**Embedded data model**
(sub-documents)

*https://docs.mongodb.org/manual/core/data-modeling-introduction/*

# One-to-one relationships

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2 documents (requires 2 queries to get all of the person data)

```
{
    _id: "joe",
    name: "Joe Bookreader"
}

{
    patron_id: "joe",
    street: "123 Fake Street",
    city: "Faketon",
    state: "MA",
    zip: "12345"
}
```

1 single, aggregate document (in this case, it is a better choice)

```
{
    _id: "joe",
    name: "Joe Bookreader",
    address: {
                street: "123 Fake Street",
                city: "Faketon",
                state: "MA",
                zip: "12345"
              }
}
```

**Normalized data model**
(references)

**Embedded data model**
(sub-documents)

*https://docs.mongodb.org/manual/tutorial/model-embedded-one-to-one-relationships-between-documents/*

# One-to-many relationships

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```
{
    _id: "joe",
    name: "Joe Bookreader"
}

{
    patron_id: "joe",
    street: "123 Fake Street",
    city: "Faketon",
    state: "MA",
    zip: "12345"
}

{
    patron_id: "joe",
    street: "1 Some Other Street",
    city: "Boston",
    state: "MA",
    zip: "12345"
}
```

MongoDB document can have an arbitrary structure, including arrays

```
{
    _id: "joe",
    name: "Joe Bookreader",
    addresses: [
                  {
                    street: "123 Fake Street",
                    city: "Faketon",
                    state: "MA",
                    zip: "12345"
                  },
                  {
                    street: "1 Some Other Street",
                    city: "Boston",
                    state: "MA",
                    zip: "12345"
                  }
                ]
}
```

https://docs.mongodb.org/manual/tutorial/model-embedded-one-to-many-relationships-between-documents/

# One-to-many relationships

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ok if if have few books per publisher

```
{
    title: "MongoDB: The Definitive Guide",
    author: [ "Kristina Chodorow", "Mike Dirolf" ],
    published_date: ISODate("2010-09-24"),
    pages: 216,
    language: "English",
    publisher: {
                name: "O'Reilly Media",
                founded: 1980,
                location: "CA"
              }
}

{
    title: "50 Tips and Tricks for MongoDB Developer",
    author: "Kristina Chodorow",
    published_date: ISODate("2011-05-06"),
    pages: 68,
    language: "English",
    publisher: {
                name: "O'Reilly Media",
                founded: 1980,
                location: "CA"
              }
}
```

duplication

```
{
    name: "O'Reilly Media",
    founded: 1980,
    location: "CA",
    books: [12346789, 234567890, ...]
}

{
     _id: 123456789,
     title: "MongoDB: The Definitive Guide",
     author: [ "Kristina Chodorow", "Mike Dirolf" ],
     published_date: ISODate("2010-09-24"),
     pages: 216,
     language: "English"
}

{
    _id: 234567890,
    title: "50 Tips and Tricks for MongoDB Developer",
    author: "Kristina Chodorow",
    published_date: ISODate("2011-05-06"),
    pages: 68,
    language: "English"
}
```

```
{
    _id: "oreilly",
    name: "O'Reilly Media",
    founded: 1980,
    location: "CA"
}

{
    _id: 123456789,
    title: "MongoDB: The Definitive Guide",
    author: [ "Kristina Chodorow", "Mike Dirolf" ],
    published_date: ISODate("2010-09-24"),
    pages: 216,
    language: "English",
    publisher_id: "oreilly"
}

{
    _id: 234567890,
    title: "50 Tips and Tricks for MongoDB Developer",
    author: "Kristina Chodorow",
    published_date: ISODate("2011-05-06"),
    pages: 68,
    language: "English",
    publisher_id: "oreilly"
}
```

better if you have many books per publisher

*https://docs.mongodb.org/manual/tutorial/model-embedded-one-to-many-relationships-between-documents/*

# Insert data in MongoDB

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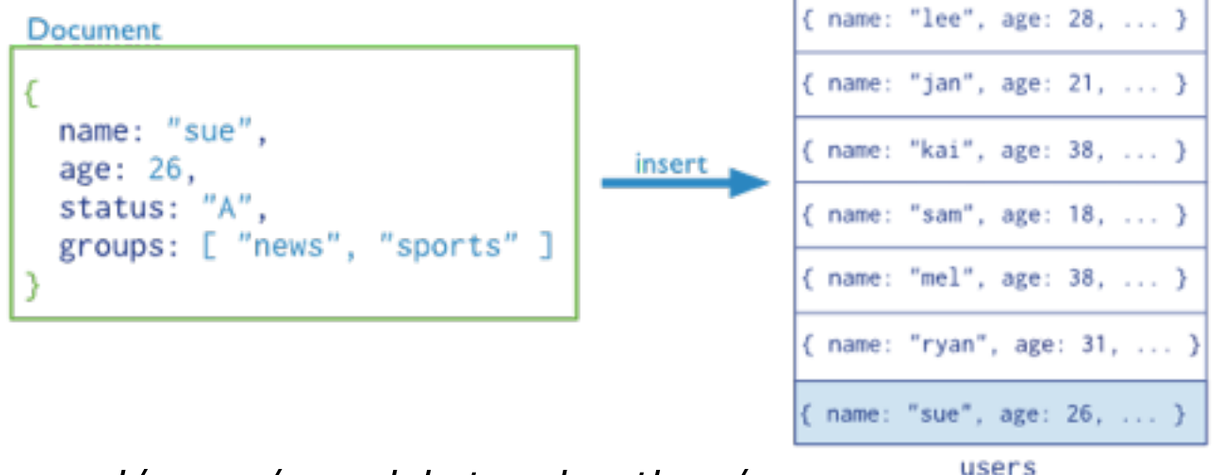
- To insert data in MongoDB, you simply have to provide a **JSON document** (with an **arbitrary structure**).
- The documents in the collection do not have to all have the same structure (this is why we talk about a **schemaless** database).


A document is always inserted in a specific collection.

MongoDB will assign a unique ID in the **_id** field for the new document.




*https://docs.mongodb.org/manual/core/crud-introduction/*

# Insert data in MongoDB

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- This is one example. You can also insert multiple documents at the same time, either by passing an array of documents or by performing a bulk operation. If you are dealing with many documents, this is important for performance reasons.

```
db.inventory.insert(
   {
     item: "ABC1",
     details: {
        model: "14Q3",
        manufacturer: "XYZ Company"
     },
     stock: [ { size: "S", qty: 25 }, { size: "M", qty: 50 } ],
     category: "clothing"
   }
)
```

```
db.inventory.find()
```

```
{ "_id" : ObjectId("53d98f133bb604791249ca99"), "item" : "AB
```

*https://docs.mongodb.org/manual/tutorial/insert-documents/*

# Update and delete data in MongoDB

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- When you update or delete documents, you specify which documents are concerned by the operation.
- You do that by specifying update or remove criteria. Specifying "{}" means that you want to apply the operation on all documents of the collection.

```
db.users.update(                    ← collection
   { age: { $gt: 18 } },            ← update criteria
   { $set: { status: "A" } },       ← update action
   { multi: true }                  ← update option
)
```

```
db.users.remove(                    ← collection
   { status: "D" }                  ← remove criteria
)
```

*https://docs.mongodb.org/manual/core/crud-introduction/*

# Update data in MongoDB

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- By default, update will modify only the first document that matches the selection criteria. You can specify the "multi" options if you want to update all documents that match the criteria.

selection criteria

```
db.inventory.update(
    { item: "MNO2" },
    {
      $set: {
        category: "apparel",
        details: { model: "14Q3", manufacturer: "XYZ Company" }
      },
      $currentDate: { lastModified: true }
    }
)
```

update operators

lastModified will be set to the current date

```
db.inventory.update(
    { category: "clothing" },
    {
      $set: { category: "apparel" },
      $currentDate: { lastModified: true }
    },
    { multi: true }
)
```

*https://docs.mongodb.org/manual/tutorial/modify-documents/*

# Update data in MongoDB

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## Update Operators

### Fields

| Name | Description |
|---|---|
| `$inc` | Increments the value of the field by the specified amount. |
| `$mul` | Multiplies the value of the field by the specified amount. |
| `$rename` | Renames a field. |
| `$setOnInsert` | Sets the value of a field if an update results in an insert of a document. Has no effect on update operations that modify existing documents. |
| `$set` | Sets the value of a field in a document. |
| `$unset` | Removes the specified field from a document. |
| `$min` | Only updates the field if the specified value is less than the existing field value. |
| `$max` | Only updates the field if the specified value is greater than the existing field value. |
| `$currentDate` | Sets the value of a field to current date, either as a Date or a Timestamp. |

### Array

#### Operators

| Name | Description |
|---|---|
| `$` | Acts as a placeholder to update the first element that matches the query condition in an update. |
| `$addToSet` | Adds elements to an array only if they do not already exist in the set. |
| `$pop` | Removes the first or last item of an array. |
| `$pullAll` | Removes all matching values from an array. |
| `$pull` | Removes all array elements that match a specified query. |
| `$pushAll` | *Deprecated.* Adds several items to an array. |
| `$push` | Adds an item to an array. |

*https://docs.mongodb.org/manual/reference/operator/update/*

# Query MongoDB

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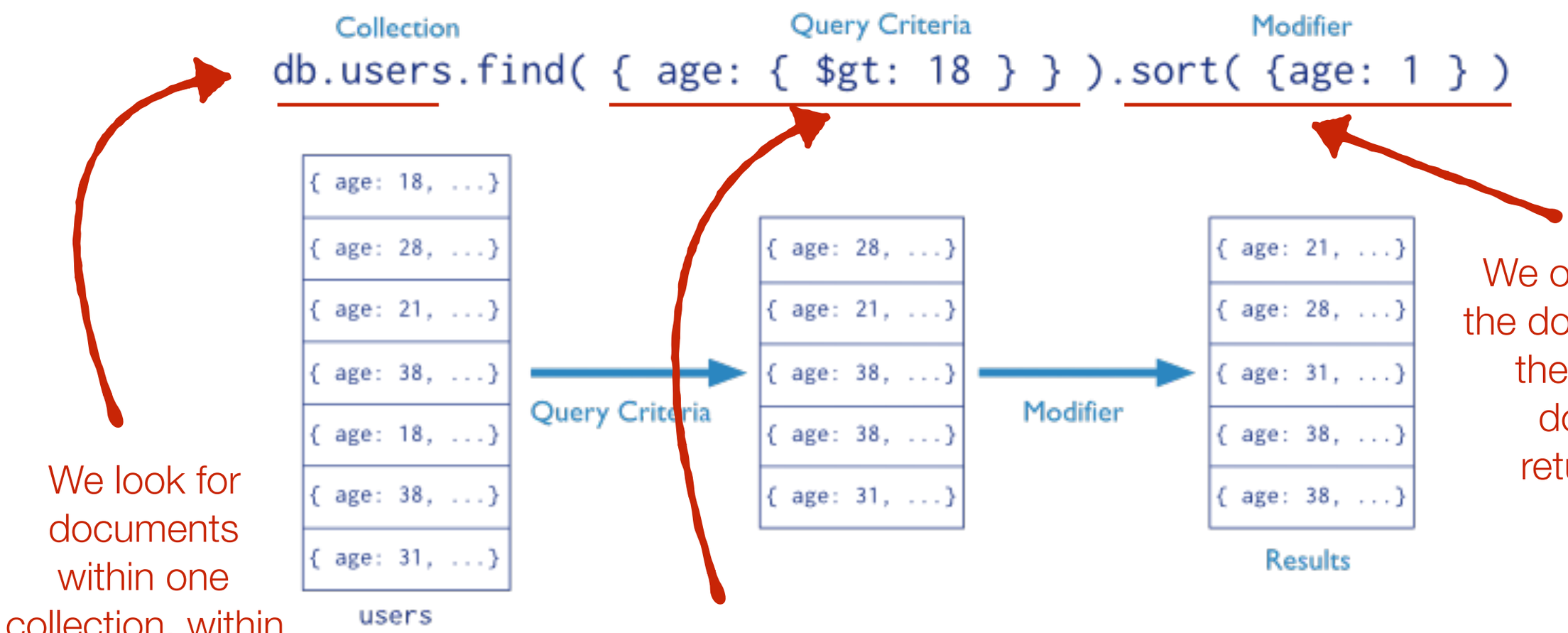
- MongoDB is one of the most popular **NoSQL** databases (and one of the first to have been categorized as such).




*https://docs.mongodb.org/manual/core/crud-introduction/*

# Query MongoDB

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```
db.inventory.find()
```

all documents

```
db.inventory.find( { type: "snacks" } )
```

documents, which have a field "type" with a value of "snacks"

```
db.inventory.find( { type: { $in: [ 'food', 'snacks' ] } } )
```

documents, which have a field "type" with have a value of "food" or "snacks"

```
db.inventory.find( { type: 'food', price: { $lt: 9.95 } } )
```

documents with a type field equal to "food" AND a price field with a value less than 9.95

```
db.inventory.find(
    {
      $or: [ { qty: { $gt: 100 } }, { price: { $lt: 9.95 } } ]
    }
)
```

documents where the quantity is more than 100 OR the price is less than 9.95

*https://docs.mongodb.org/manual/tutorial/query-documents/*

# Query MongoDB: arrays

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```
{ _id: 5, type: "food", item: "aaa", ratings: [ 5, 8, 9 ] }
{ _id: 6, type: "food", item: "bbb", ratings: [ 5, 9 ] }
{ _id: 7, type: "food", item: "ccc", ratings: [ 9, 5, 8 ] }
```

```
db.inventory.find( { ratings: [ 5, 8, 9 ] } )
```

```
{ "_id" : 5, "type" : "food", "item" : "aaa", "ratings" : [ 5, 8,
```

Exact match on the entire array

```
db.inventory.find( { ratings: 5 } )
```

Return documents if the array contains a specific value

```
{ "_id" : 5, "type" : "food", "item" : "aaa", "ratings" : [ 5, 8, 9 ] }
{ "_id" : 6, "type" : "food", "item" : "bbb", "ratings" : [ 5, 9 ] }
{ "_id" : 7, "type" : "food", "item" : "ccc", "ratings" : [ 9, 5, 8 ] }
```

*https://docs.mongodb.org/manual/tutorial/query-documents/*

# Query MongoDB: arrays

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```
{ _id: 5, type: "food", item: "aaa", ratings: [ 5, 8, 9 ] }
{ _id: 6, type: "food", item: "bbb", ratings: [ 5, 9 ] }
{ _id: 7, type: "food", item: "ccc", ratings: [ 9, 5, 8 ] }
```

```
db.inventory.find( { ratings: { $elemMatch: { $gt: 5, $lt: 9 } } } )
```

Documents where one element of ratings is at the same time > 5 AND < 9

```
{ "_id" : 5, "type" : "food", "item" : "aaa", "ratings" : [ 5, 8, 9 ] }
{ "_id" : 7, "type" : "food", "item" : "ccc", "ratings" : [ 9, 5, 8 ] }
```

```
db.inventory.find( { ratings: { $gt: 5, $lt: 9 } } )
```

Documents where there is one element of ratings > 5 and one element < 9

```
{ "_id" : 5, "type" : "food", "item" : "aaa", "ratings" : [ 5, 8, 9 ] }
{ "_id" : 6, "type" : "food", "item" : "bbb", "ratings" : [ 5, 9 ] }
{ "_id" : 7, "type" : "food", "item" : "ccc", "ratings" : [ 9, 5, 8 ] }
```

*https://docs.mongodb.org/manual/tutorial/query-documents/*

# SQL vs MongoDB

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```
SELECT *                    db.users.find(
FROM users                      { status: { $ne: "A" } }
WHERE status != "A"         )
```

```
SELECT *                    db.users.find(
FROM users                      { status: "A",
WHERE status = "A"                age: 50 }
AND age = 50                )
```

```
SELECT *                    db.users.find(
FROM users                      { $or: [ { status: "A" } ,
WHERE status = "A"                       { age: 50 } ] }
OR age = 50                 )
```

```
SELECT *                    db.users.find(
FROM users                      { age: { $gt: 25 } }
WHERE age > 25              )
```

```
SELECT *                    db.users.find(
FROM users                     { age: { $lt: 25 } }
WHERE age < 25              )
```

```
SELECT *                    db.users.find(
FROM users                     { age: { $gt: 25, $lte: 50 } }
WHERE age > 25              )
AND   age <= 50
```

```
SELECT *                    db.users.find( { user_id: /bc/ } )
FROM users
WHERE user_id like "%bc%"
```

```
SELECT *                    db.users.find( { status: "A" } ).sort( { user_id: 1 } )
FROM users
WHERE status = "A"
ORDER BY user_id ASC
```

```
SELECT *                    db.users.find( { status: "A" } ).sort( { user_id: -1 } )
FROM users
WHERE status = "A"
ORDER BY user_id DESC
```

```
SELECT COUNT(*)             db.users.count()
FROM users
                            or

                            db.users.find().count()
```

```
SELECT COUNT(user_id)       db.users.count( { user_id: { $exists: true } } )
FROM users
                            or

                            db.users.find( { user_id: { $exists: true } } ).count()
```

```
SELECT COUNT(*)             db.users.count( { age: { $gt: 30 } } )
FROM users
WHERE age > 30              or

                            db.users.find( { age: { $gt: 30 } } ).count()
```

```
SELECT DISTINCT(status)     db.users.distinct( "status" )
FROM users
```

https://docs.mongodb.org/manual/reference/sql-comparison/

# Query MongoDB: projections

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- When you perform a query, you can specify which fields you are interested in (think about performance)

```
db.inventory.find( { type: 'food' } )
```

Return all fields (no second argument)

```
db.inventory.find( { type: 'food' }, { item: 1, qty: 1 } )
```

We are only interested by the item and qty fields (we will also get _id)

```
db.inventory.find( { type: 'food' }, { item: 1, qty: 1, _id:0 } )
```

We are only interested by the item and qty fields (we really don't want to get _id)

```
db.inventory.find( { type: 'food' }, { type:0 } )
```

We want all fields except type

*https://docs.mongodb.org/manual/tutorial/project-fields-from-query-results/*

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# Accessing MongoDB from Node.js

# Accessing mongoDB from Node.js

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- In the **Java ecosystem**, it is possible to interact with a RDBMS by using a JDBC driver:
  - The program loads the driver.
  - The program establishes a connection with the DB.
  - The program sends SQL queries to read and/or update the DB.
  - The program manipulates tabular result sets returned by the driver.
- With **Node.js and mongoDB**, the process is similar:
  - There is a **Node.js driver for mongoDB** (in fact, there are several).
  - A Node.js module can connect to a mongoDB server and issue queries to **manipulate collection and documents**.

# Example 1: connect and insert

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```
var MongoClient = require('mongodb').MongoClient;

MongoClient.connect("mongodb://localhost:27017/exampleDb", function(err, db) {
  if(err) { return console.dir(err); }

  var collection = db.collection('test');

  var doc1 = {'hello':'doc1'};
  var doc2 = {'hello':'doc2'};
  var lotsOfDocs = [{'hello':'doc3'}, {'hello':'doc4'}];

  collection.insert(doc1);
  collection.insert(doc2, {w:1}, function(err, result) {});
  collection.insert(lotsOfDocs, {w:1}, function(err, result) {});

});
```

http://mongodb.github.io/node-mongodb-native/api-articles/nodekoarticle1.html

# Example 2: query

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```
var MongoClient = require('mongodb').MongoClient;

MongoClient.connect("mongodb://localhost:27017/exampleDb", function(err, db) {
  if(err) { return console.dir(err); }

  var collection = db.collection('test');
  var docs = [{mykey:1}, {mykey:2}, {mykey:3}];
  collection.insert(docs, {w:1}, function(err, result) {

    // beware of memory consumption!
    collection.find().toArray(function(err, items) {});

    // better when many documents are returned
    var stream = collection.find({mykey:{$ne:2}}).stream();
    stream.on("data", function(item) {});
    stream.on("end", function() {});

    // special case when only one document is expected
    collection.findOne({mykey:1}, function(err, item) {});

  });
});
```

http://mongodb.github.io/node-mongodb-native/api-articles/nodekoarticle1.html

# Accessing mongoDB from Node.js

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- **mongojs** is a very useful npm module, which provides an alternative to the official Node.js driver. Its API is very similar to what you type on the mongo

```
// simple usage for a local db
var db = mongojs('mydb', ['mycollection']);

// the db is on a remote server (the port default to mongo)
var db = mongojs('example.com/mydb', ['mycollection']);

// we can also provide some credentials
var db = mongojs('username:password@example.com/mydb', ['mycollection']);

// connect now, and worry about collections later
var db = mongojs('mydb');
var mycollection = db.collection('mycollection');
```

mongojs

Star 1,099

A node.js module for mongodb, that emulates the official mongodb API. It wraps mongodb-native and is available through npm

```
npm install mongojs
```

build passing

```
// find everything
db.mycollection.find(function(err, docs) {
    // docs is an array of all the documents in mycollection
});

// find everything, but sort by name
db.mycollection.find().sort({name:1}, function(err, docs) {
    // docs is now a sorted array
});
```

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# Object Document Mapping with Mongoose

# Mongoose: an ORM for MongoDB

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- In the **Java EE ecosystem**, we have seen how the **Java Persistence API** (JPA) specifies a standard way to interact with Object-Relational Mapping (ORM) frameworks**.**
  - The developer **first** creates an **object-oriented domain model**, by creating Entity classes and using various annotations (@Entity, @Id, @OneToMany, @Table, etc.)
  - He **then** uses an **Entity Manager** to **C**reate, **R**ead, **U**pdate and **D**elete objects in the DB**.**
  - The ORM framework takes care of the details: it **generates the schema** and the **SQL queries.**
- In the Javascript ecosystem, we have similar mechanisms**. With the particular yeoman generator that we use for the project**:
  - The authors have decided not use a relational database, but rather the **mongodb** document-oriented database**.**
  - They have decided to use **one of the data mapping tools** available for mongodb, namely **mongoose.** Since mongodb is a document-oriented database, it is more appropriate to talk about an Object-Document Mapping tool, rather than an ORM**.**

# Mongoose: an ODM for MongoDB

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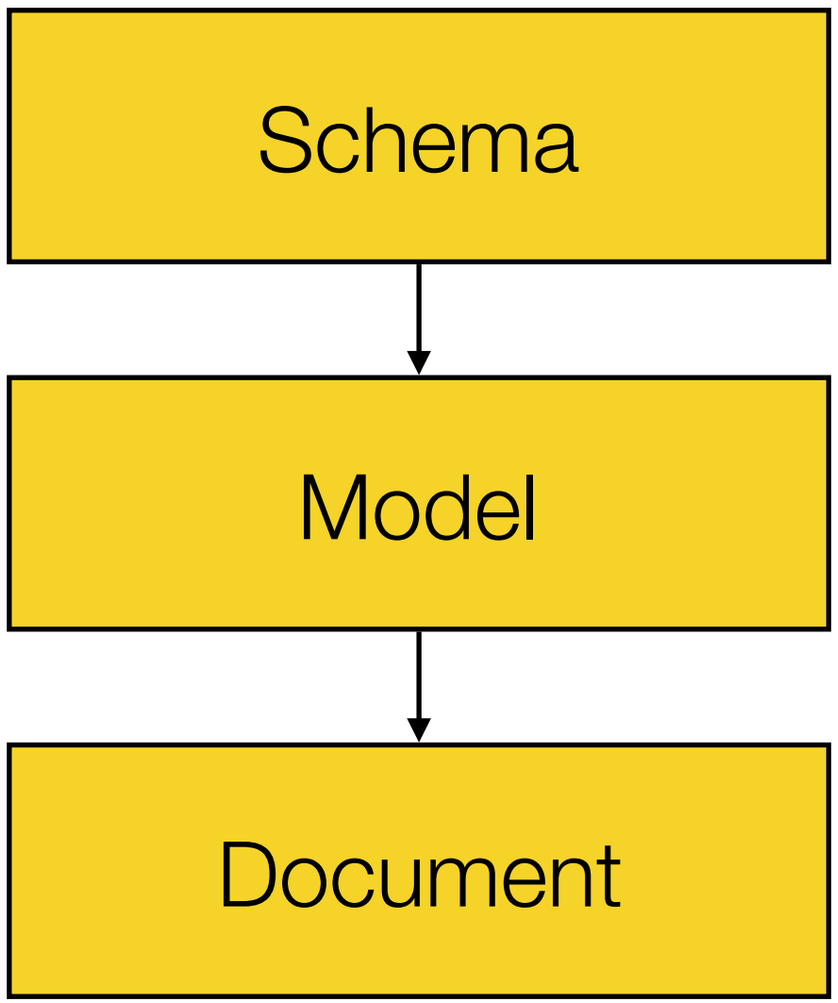
*"Mongoose provides a **straight-forward**, schema-based solution to **modeling** your application data and includes built-in type **casting**, **validation**, **query** building, business logic hooks and more, out of the box."*




"Everything in Mongoose starts with a Schema. Each **schema maps to a MongoDB collection** and defines the shape of the documents within that collection."

"**Models are fancy constructors** compiled from our Schema definitions."

"Mongoose documents represent a **one-to-one mapping** to documents as stored in MongoDB. Each document is an **instance of its Model**."

http://mongoosejs.com/docs/guide.html

# Example

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schema

model

collection

```
var userSchema = new mongoose.Schema({
  name: {
    first: String,
    last: { type: String, trim: true }
  },
  age: { type: Number, min: 0 }
});
```

```
var PUser = mongoose.model('PowerUsers', userSchema);

var johndoe = new PUser ({
  name: { first: 'John', last: '  Doe   ' },
  age: 25
});

johndoe.save(function (err) {if (err) console.log ('Error on save!')});
```

document

https://devcenter.heroku.com/articles/nodejs-mongoose

# Example: query

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we can chain conditions

```
Person
.find({ occupation: /host/ })
.where('name.last').equals('Ghost')
.where('age').gt(17).lt(66)
.where('likes').in(['vaporizing', 'talking'])
.limit(10)
.sort('-occupation')
.select('name occupation')
.exec(callback);
```

we are interested in only some of the fields

we only want to get at most 10 documents

http://mongoosejs.com/docs/queries.html

# Yo express!

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```
yo angular
```

```
// Example model

var mongoose = require('mongoose'),
  Schema = mongoose.Schema;

var ArticleSchema = new Schema({
  title: String,
  url: String,
  text: String
});

ArticleSchema.virtual('date')
  .get(function(){
    return this._id.getTimestamp();
  });

mongoose.model('Article', ArticleSchema);
```

app/models/article.js

# Yo express!

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```
yo angular
```

```
var express = require('express'),
  router = express.Router(),
  mongoose = require('mongoose'),
  Article = mongoose.model('Article');

module.exports = function (app) {
  app.use('/', router);
};

router.get('/', function (req, res, next) {
  Article.find(function (err, articles) {
    if (err) return next(err);
    res.render('index', {
      title: 'Generator-Express MVC',
      articles: articles
    });
  });
});
```

app/controllers/home.js