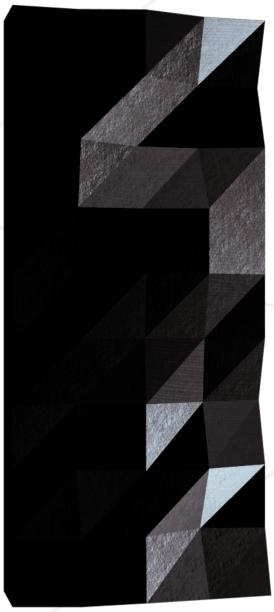

Node.js

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Summary: Learn backend development with Node JS.

Contents

Chapter I

Foreword

"`Programming is like magic.` You write very specific instructions in arcane languages to invoke commends, and if you get it even a little bit wrong you risk unleashing demons and destroying everything."

Chapter II

Introduction

What is a server? A server is a computer/device/program that is dedicated to managing network resources. Most any computer is capable of serving as a network server. A server serves information to our client. The information we need is stored in our database. How do we communicate with the server in order to get the proper information? We communicate with our application server through an Application Programming Interface, or an API. An API is a set of functions and procedures, it receives requests and returns responses.

Learn more about the internet, servers, and APIs:

- How the internet works
- What is a Computer Server?
- What is an API?

Chapter III

Goals

By completing these exercises you will learn about creating servers and APIs work. You will learn about writing backend services with JavaScript.

Chapter IV

General instructions

We will start with some simple guided lessons on the basics of setting up and testing a Node.js server. Once you've completed the basic lessons you will apply your new knowledge towards creating your own API for tracking Todos.

Chapter V

Exercise 00 : Hello World!

It's time setup our first Node.js project. What is Node.js? Node.js is a JavaScript runtime. Basically Node allows us to run JavaScript outside of a web browser.

Let's start by creating a new directory called `Basics` from the Terminal. Now `cd` into our new directory and run `npm init`. Go ahead and just press enter through all the prompts, they're not important for our project.

Once we have our project intialized we can add our first Node Package. Run `npm install -save express`. The "npm install" command add the express package to our project, using the "–save" flag saves it as a project dependency.

Our directory should now consist of the `package.json` file and our `node_modules` folder. We will also add a `.gitignore` file. Inside this file simply write `node_modules` and git will now know to ignore our `node_modules` directory.

Now to actually build our server! Create a file called `server.js`. Inside this file write the following code:

```
// Server.js
const express = require("express")

const app = express();

app.get('/', (req, res) => {
    console.log("Hello world!");
    res.status(200).send("Hello world");
});

const PORT = 3000;
app.listen(PORT, () => {
    console.log(`Server running at http://localhost:${PORT}`);
});
$
```

Check out this link for more information on npm.

Let's setup our start script. Open up `package.json` and under the scripts object replace `"test"` with `"start"` and then replace the script's value with the command `"node server.js"`. Your package.json should look like this:

```
{
    "name": "basics",
    "version": "1.0.0",
    "description": "",
    "main": "index.js",
    "scripts": {
        "start": "node server.js"
    },
    "author": "Don Stolz",
    "license": "ISC",
    "dependencies": {
        "express": "^4.16.4"
    }
}
```

Finally our server is ready to run. From the root of your `Basics` project run `npm run start` and head to http://localhost:3000/ to check out your server.

`Use "control + c" to quit your server.`

Chapter VI

Exercise 01 : Setting up additional endpoints

Now that we have our basic server setup we can start adding more endpoints to expand our functionalty. What is an endpoint? An endpoint is a URL pattern used to communicate with an API. Endpoints can also be differntiated by their HTTP methods. An HTTP method allows us to indicate the type of action we are trying to preform. Our current server consists of a single ‘GET‘ endpoint.

Check out MDN for more information on the different types of HTTP methods.

Let’s first add a database so that we have some information for our new endpoints to access. Create a file called `"db.json"` in this file create a simple array of user objects with the fields `"name"` and `"id"`. It should look something like this.

```
[
    {
        "name": "Don",
        "id": 0
    },
    {
        "name": "Dan",
        "id": 1
    }
]
```

Now we can access our database by importing it the same way we imported the express library. Simply add `const db = require("./db.json");` to the top of our `server.js` file.

Setup a new ‘GET‘ endpoint called `"/users"`. It will be setup simarly to our ‘Hello World¡ example, except it will return our database:

```
// Get all users
app.get("/users", (req, res) => {
    res.status(200).send(db);
});
```

Notice that along with the response we send back we also set the status code to 200. Status code 200 indicates that the request has succeeded. Check out the different status code values here

Next, we will setup a route to retrieve an individual user from our database. Setup another 'GET' endpoint and call it `"/users/:id"`. Using `":id"` will allow us to retrieve `"id"` as a variable from the request parameters. Follow the snippet below:

```
// Get user by ID
app.get("/users/:id", (req, res) => {
    const { id } = req.params;

    const user = db.find(item => item.id == id);
    if (user) {
        res.status(200).send(user);
    } else {
        res.status(404).send("Could not find user");
    }
});
```

Notice the new status code 404. This indicates an error, specifically that the server could not find the requested resources. Try testing your endpoints by going to http://localhost:3000/user and http://localhost:3000/users/0

Chapter VII

Exercise 02 : Setting up POST endpoints

We can fetch our entire db and individual users, now we will learn how to set up a 'POST' endpoint so we can add new users to our database. In order to do this we will be adding a few additonal libraries. First run `npm install -save body-parser`. Then add the body-parser middleware to our express app. We will also be adding the `"fs"` library to access the file system, this library comes with Node. The top of your `server.js` file should look like this:

```
// Server.js
const express = require("express");
const db = require("./db.json");
const fs = require("fs");
const bodyParser = require("body-parser");
const app = express();

// Add bodyparsing middleware to app
app.use(bodyParser.json());
```

Set up a new ‘POST‘ endpoint called `"/users"`, this will be exactly the same as our ‘GET‘ route except we will use `app.get('/users')`. In this route we will also be pulling the `"name"` variable out of `"req.body"`, this is what we setup the `"body-parser"` middleware for. We will check that name exists, if it doesn't we will return a `400` status. Next we will setup the new user object and assign it's `name` and `id` values. Once we have the object setup, we can push it to the database. However, simply push the new value to the database will not update the file itself. We will have to first convert our JSON array into a string, then use the `fs` module to write the stringified database to our JSON file. Follow this example:

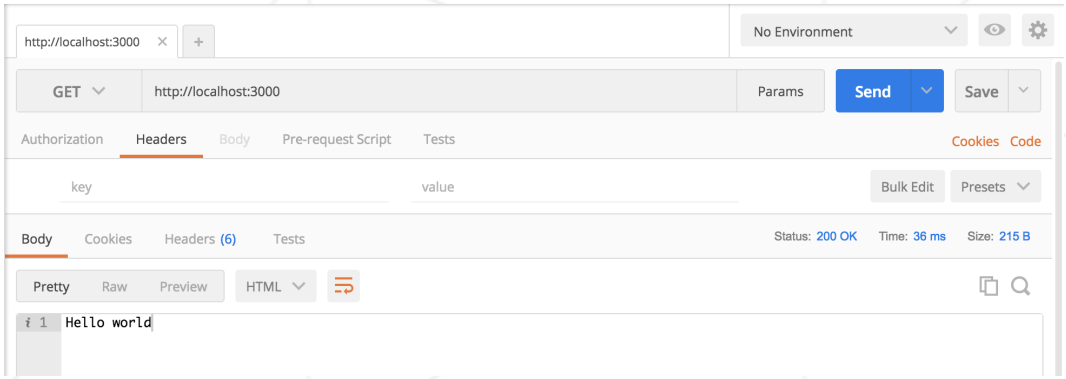
```
// Create new user
app.post("/users", (req, res) => {
    const { name } = req.body;
    if (!name) {
        res.status(400).send("Could not add user");
    }
    let user = {};
    user.name = name;
    user.id = db.length;
    db.push(user);
    // Convert DB to JSON string
    data = JSON.stringify(db);
    // Write string to file
    fs.writeFile("./db.json", data, "utf8", err => {
        if (err) {
        res.status(404).send(‘Failed to add ${user.name} to db‘);
        }
        res.status(200).send(‘Added ${user.name} to db‘);
    });
});
```

Chapter VIII

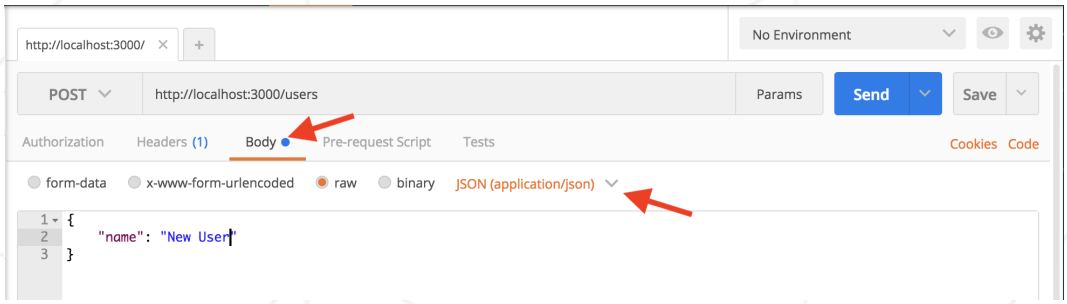
Exercise 03 : Testing with Postman

So we've setup a 'POST' route, but how do we send data with our request? We will be using a tool called Postman to test our routes. Head to the Application directory and open Postman, or use 'command + space' and search Postman.

Feel free to login with google or head straight to the app. Once you are inside you can quickly test our 'GET' requests by add `localhost:3000` as the 'request URL' like so:



Now that we know how to setup a 'GET' request we can setup our 'POST' request in a similar way. Here we will also want to add a body for sending the name of the user to add. We will head to the `body` tab and select `raw` as our format. Next we will also need to specify that our data is `JSON content`. Then we can add create a JSON object to add a new user. You should get a response that says `"Added New User to db"` with a status of 200.



logging in with Google will allow you to save your routes which we will come in handy when your testing the Mandatory parts.

The final tool you will want to add to your project before starting the Mandatory Parts is nodemon. Nodemon is a development tool that will automatically refresh our server whenever we make file changes, this way we will avoid having to manually shutdown and restart our server everytime we make changes. To add nodemon run `npm install -save-dev nodemon`. Then open your package.json file. Add a new script called `"start-watch"` and give it the value `"nodemon server.js"`. Now we can run `npm run start-watch` and nodemon will take care of refreshing our server. Your `package.json` file should look like this:

```
{
  "name": "test",
  "version": "1.0.0",
  "description": "",
  "main": "index.js",
  "scripts": {
    "start": "node server.js",
    "start-watch": "nodemon server.js"
  },
  "author": "",
  "license": "ISC",
  "dependencies": {
    "body-parser": "^1.18.3",
    "express": "^4.16.4"
  },
  "devDependencies": {
    "nodemon": "^1.18.10"
  }
}
```

Chapter IX

Mandatory part 1

Now you are equiped with enough knowledge and tools to build your own API. You will be building an API to keep track of Todos. Your endpoints should be as followed:

- GET `"/todos"` -> Gets all Todos in database
- GET `"/todos/:id"` -> Gets single Todo by ID
- POST `"/todos"` -> Add new Todo to database
- POST `"/todos/:id"` -> Update single Todo by ID
- DELETE `"/todos/:id"` -> Delete single Todo by ID

Use a `db.json` like we did in our previous example for storage.

Chapter X

Mandatory part 2

Now that we are pros at writing APIs we will connect our API to a proper database instance. Your challenge will be to `FIRST COPY` your existing API, then replace our current file system database with a newly setup Mongo database.

`First` follow the MongoDB PDF for instructions on setting up a cloud instance of MongoDB.

Once we have our DB setup, we can set up Mongoose. Mongoose is an Object Document Modeler, it allows us to define a schema and easily connect to MongoDB. We will install it using `npm install -save mongoose` and require it at the top as usual. Then we can add the following snippet to connect our API to MongoDB through

```
// Connect to MongoDB
mongoose.connect("mongodb+srv://dstolz:42marvin@cluster0-4bipl.mongodb.net/test?retryWrites=true",
{ useNewUrlParser: true }
);

// Test MongoDB connection
const connection = mongoose.connection;
connection.once("open", function() {
        console.log("MongoDB database connection established successfully");
        });
```

In order to use MongoDB with Mongoose we will also have to create a schema. Create a seperate file called `todo.model.js` and add the following code:

```
const mongoose = require("mongoose");
const Schema = mongoose.Schema;

let Todo = new Schema({
        task: {
                type: String,
                required: true
                },
                completed: {
                        type: Boolean,
                        required: true
                        }
                        });

                        module.exports = mongoose.model("Todo", Todo);
```

We can import our todo model at the top of our `server.js` file.

```
const Todo = require("./todo.schema");
```

Head to the Getting Started section of the mongoose docs to learn more.

Check out the Mongoose model API docs

Chapter XI

Bonus Parts

XI.1 Bonus Part 1

Follow the Heroku PDF to remotely host your server.

XI.2 Bonus Part 2

Add routes that expand on the existing functionalty of your API.

Chapter XII

Turn-in and peer-evaluation

Always be ready to explain your code. Also be prepared to demonstrate your routes in Postman.