Before starting, you must:

* Install Latest version of NodeJS (nodejs.org)
* Install Visual Studio Code.

Then, you can just jump to section 2, part 5.

There is no window/document object. There is global/process.

One of the most fundamental features of Node: Module System

To see the convention name of a module, and it’s name that we can use in require, check Docs.

Git repo for the course: <https://links.mead.io/nodecourse>

Module.exports = name; *(in a file.js we gonna require in some other file.js for the name variable)*

To install a module globally, we must add the -g

To install it with admin rights(?), use “sudo” prefix. (sudo npm I [nodemon@1.18.5](mailto:nodemon@1.18.5) -g)

Nodemon app.js => will update the file at any save done to app.js

To terminate the Nodemon, press CTRL+C

Process.argv => argv = arguments variable

Package: yargs => will parse the arguments

A screenshot of a computer

Description automatically generated with medium confidence

^ console.log( yargs.argv );

YARGS implements a –help on the file too. (which will show up the commands tied to the file)

The builder property will contain only the options we want as a given command to support.

(options as arguments)

Title can be an option to our function. By default, we are not demanded to mention it.

To enable that, we must use the demandOption: true inside the command builder option.

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To enforce a type for the demanded option, we can use property type: ‘string’ like.

yargs.parse() => goes through the process of parsing the arguments with all the config details provided

fs.readFileSync() => returns a data buffer (binary code). We can .toString() to get the string.

For debugging, we can just console.log() everything and everywhere.

There is also the Node Debugger that comes with the V8 JS Engine.

* Just add “debugger” somewhere in the script, and run cmd

**node inspect** app.js add --title="Shopping" --body="sst"

* Go to chrome://inspect and under the Target, click on Inspect

Graphical user interface, text

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When we finished all steps (by pressing the PLAY blue button), we can restart it by using “restart” in the <debug> command.

**Call Stack** => track the execution of our program, by keeping track of all **functions** that are currently running. (like when we get an error, where every function called is listed until the error spotted)

* **Data structure:** add on the top of the list / remove the top item on the list

SetTimeout is not a JS function, and V8 has no implementation for it. Is NodeJS which creates an implementation of setTimeout using c++ and provides it to your NodeJS scripts to use. => it is an async way to wait a specified amount of time, and then have a function run.

So when we call setTimeout, is registering an event with NodeJS APIs, and that is an event callback pair, where the event in this case is simply to wait 2 seconds, and the callback is the function to run.

Another event callback pair might be to wait for a database request to complete, then run the callback that does something with the data.

**Node APIs** => ^

**JS is a single threaded programming language**. You can do one thing at a time.

But that doesn’t mean Node.js is completely single threaded. The code you run is indeed still single threaded, **but Node uses other threads in C++ behind the scenes to manage your events.**

**Callback Queue** => maintain a list of all the callback functions that are ready to get executed.

This is the moment the **Event Loop** comes into play. It looks at the Call Stack, and at the Callback Queue.

If the call stack is empty, it’s going to run items from the callback queue.

npm init -y => answers “yes” to all questions

Use postman-request package instead of request package, as it is now deprecated.

The “postman-request” will always return an object: body {} so we go in response.body.

encodeURIComponent(string input) - to convert the input to a safe string. (will convert ? to %3F for e.g.)

**QUESTION: In our weather API, in the accessed object, there is array weather\_descriptions.**

**When we are destructuring the object, how can we specify an index of that array?**

**If we try { weather\_descriptions[0]:description } it fails: SyntaxError: Unexpected token '['**

HTTP ‘n’ HTTPS modules of NodeJS

const request = http.request( url, (response) => {

let data = “” ;

response.on( ‘data’, (chunk) => {

// allows us to register a handler – different events we can call it for: data.

// this event will fire when data comes in

// it can be called once, or more times, so we must save the chunk in a variable until all finished

})

Response.on(‘end’,() => {

// the end event -> when we are done

})

})

request.on( ‘error’, (error) => { // some error handling });

request.end(); // we are just now sending the request.

//-------------------------------------------------------------------------------------------------------------------

**ExpressJS** jumps in.

Fast, unopinionated, minimalist web framework for NodeJS

npm i express@4.16.4

const express = require(‘express’)

const app = express();

app.get(route, ( info about incoming request aka req, res ) => { // let’s us configure what the server should do when someone tries to get the resource of the specific url (maybe we should back HTML, or maybe JSON)

res.send( “text” ); // sending something back to the requester. (can be html or object/array)

})

app.listen(3000, () => { console.log(‘Server is up on port 3000”) }); // starts the server – development port = 3000 (it’s not a standard)

// port 80 => for HTTP based websites

When doing changes to the code, server won’t be updated. We would be needed to close it and restart.

Instead, we can use nodemon which will reload the code at every change!

Node provides an absolute path to the public directory.

\_\_dirname

\_\_filename

NodeJS Path helps.

app.use( express.static(path.join(\_\_dirname,"../public")) )

express.static() => takes the path to the folder we want to serve up

**Relative path:** ./css/style.css

**Absolute path:** /css/style.css

**Template engine:** Handlebars => allows us to do 2 things:

1. Render dynamic documents as opposed to static ones
2. Create code that we can reuse across

But for using with express, we use: HBS package

Dynamic pages will now have the extension .hbs and will be placed in the project directory, under /views

To load the page ^ with express, we must add a route, and use res.render(index) (instead of res.send)

App.set( ‘view engine’, ‘hbs’ )

App.set( ‘views’, viewsPath )

https://expressjs.com/en/4x/api.html#app.set

hbs.registerPartials( partialsPath ); // sets the directory path for partials

To add a partial in another .hbs file, we must use {{>partial file name}}

To make the nodemon listen to other file changes too (instead of just .js files), we must use:

Nodemon src/app.js -e js,hbs

For a route that was not registered, we can display a 404 error: Not found.

To do that, expressJS gives the route \* .

App.get( ‘\*’, (req, res) => {} );

And can be mixed with another path, like: ‘/help/\*’

But those must be added as latest routes.

**req.query** => provides the key/value pairs from the url

**fetch() is not available in NodeJS, as it is part of the browser API.**

**Heroku** is going to give us everything we need to deploy our Node.js application to a production server.

**SSH** => Secure Shell = secure communication between 2 machines (through ssh key)

ls -a -l ~/.ssh => checking if SSH exists on computer. (~ symbol is a shortcut for user directory)

ssh-keygen -t rsa -b 4096 -C “[myemail@address.com](mailto:myemail@address.com)” => generating ssh key of type RSA (very secure and popular protocol), with 4096 bits, with a comment for the key (as a label) ((common to just use your email address for it))



First is a secret file, the key we won’t ever share, and we will just keep it on our machine.

Second is the public file key which we will share with GitHub and Heroku, for a secure communication between our machine and their server.

eval $(ssh-agent -s) => try to start up SSH agent, or simply print the process if it is already running.

ssh-add ~/.ssh/id\_rsa => add the identity

cat ~/.ssh/id\_rsa.pub => concatenates the content of the file out to the terminal

ssh -T [git@github.com](mailto:git@github.com) => testing our connection to github

heroku keys:add => heroku looks for available public keys in ~/.ssh/, and asks which one to use (if more)

heroku create app-name-unique-wide => create a new application

const port = process.env.PORT || 3000;

When running locally, script will use port 3000.

When running on Heroku, we get the port from process.env(ironment).PORT

3 changes needed:

1. Tell Heroku how to start the application (“scripts” { “start”: “node src/app.js” })
2. Make sure that all applications listen the PORT Heroku is providing
3. Fetching the data from the right path.

(move from localhost:3000/weather?search to /weather?search)

git remote => view all the remotes that are configured

git push heroku master => push to heroku git remote

When heroku sees that new commits has been pushed, is going to deploy our app again.

"scripts": {

    "start": "node src/app.js",

    "dev": "nodemon src/app.js -e js,hbs"

  },

npm uninstall -g nodemon => uninstalling global package, as “dev” cmd won’t work for somebody who doesn’t have nodemon installed globally.

npm i nodemon@1.2.0 --save-dev => installing nodemon as a devDependency only, which is used only when developing the app. When deploying it, they are not installed in the production server.

The command nodemon src/app.js won’t work anymore too. Only the ‘dev’ command will be able to access it.

**MangoDB is NoSQL**

SQL = Structured Query Language =uses=> tables

((in a table, classic rows/records and columns)

NoSQL = Not only SQL =uses=> collection (like JSON)

((in an array, one object = document, one property = field))

**ERROR: Section 10 is deprecated. (There is no such thing as Robo 3T anymore)**

**Instead, use Atlas.**

**There is a file in this directory with more details; check that out.**

**Text

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result.ops => an array of documents (in our case, one document) ((document as in NoSQL!))

^ from the documentation

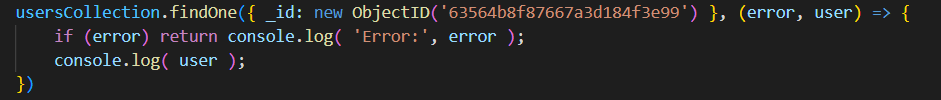
In MongoDB, the \_id s are known for GUIds (?) => Globally Unique Identifiers

\_id.id => raw binary code of the id.

ObjectId(‘o42ij3fi’) => the ID is not just a string. It is actually what is returned by the function, which is binary data.

We can fetch data from collection (db) by using collection.findOne / .find for e.g., for which it receives 2 arguments: an object, with properties used for finding/filtering documents (rows), and the callback function with (error, document);

When searching by ID, we must give \_id a new ObjectId(‘string id’)

Like: 

.find => doesn’t take a callback as a second argument, because .find will return a Cursor. (a pointer)

MongoDB doesn’t assume you need the documents in an array, so let’s you do whatever you want.

The Cursor has a .toArray(( error, documents ) => { console.log( documents ) } ) , .count( same ), etc.

When updating documents, we can use .updateOne / .updateMany.

For the update parameter, we cannot use name: ‘Andrew”, but we need to use update operators to define the behavior we want to perform.

https://www.mongodb.com/docs/manual/reference/operator/update/

Text

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.updateOne / .updateMany (probabil .find / .findOne too) returns a promise, if no callback is specified.

**Mongoose library.**

Text

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https://mongoosejs.com/

Graphical user interface, text, application

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**Validation and Sanitization are possible.**

Text

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REST API

Representational State Transfer – Application Programming Interface (REST API or RESTful API)

express.use( express.json() ) => will automatically parse incoming JSON to an object, so we can access it in our request handlers.

A screenshot of a computer

Description automatically generated with medium confidence

<https://www.webfx.com/web-development/glossary/http-status-codes/>

Text

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**Mongoose provides query methods on the model class, like this:**

https://mongoosejs.com/docs/queries.html Text

Description automatically generated

const updates = Object.keys( req.body )

Object.keys( obj ) => puts all properties of the object in an array, and returns it.

When about routing, here we go:

const router = new express.Router()

there are router.get .post .patch .delete

But, in order for the route to work, we must register it with our existing app.

const router = new express.Router()

router.get( '/test', (req, res) => {

    res.send('This is my other router')

})

app.use(router)

All routers must be placed in app/src/routers

Then, we can import it app/src/index.js by

const userRouter = require('./routers/user')

app.use(userRouter)

Hashing algorithm: BCrypt JS npm i bcryptjs

To hash a password, we can use:

const bcrypt = require('bcryptjs')

const hashedPassword = bcrypt.hash(password, 8)

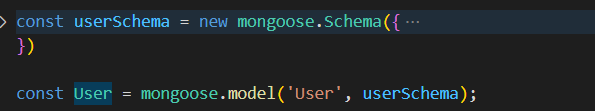
8 stands for rounds of hashing. 8 is the perfect balance between a secure pass and a good hashing speed

**Encryption != Hashing**

Encryption gives the opportunity to decode the password too, while Hashing can only encode it.

Middleware (also called pre and post *hooks*) are functions which are passed control during execution of asynchronous functions.

Middleware is specified on the schema level and is useful for writing [plugins](https://mongoosejs.com/docs/plugins.html).



For a schema, we have .pre and .post methods which can take place before/after an event.

Accepts 2 arguments: event name, and callback function (if anonymous, cannot be arrow func!!!)

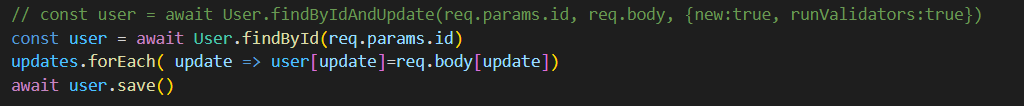
Also, need to call next() at the end of the callback.

A screenshot of a computer

Description automatically generated with medium confidence

The problem is when trying to update an item with .patch, because .findByIdAndUpdate **makes a direct call** to mongodb and .save of mangoose never gets called!

Instead, we must use .findById and we must do the update manually! (for when need to hash a pass)



Mangoose also provides a way to confirm/not if a property was changed. (like our pass)

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To add our own methods to model, we need to use a mongoose Schema just like before. That’s the only way we can add it.

So, after defining the Schema, we can just create the method under e.g. userSchema.statics.ourMethodName = () => {}

To access the method, we must use e.g. User.ourMethodName()

As another important property of a document field, we have ‘unique: true’ which will make sure the input value is unique in the document. (will never repeat. Good for Emails!)

Text

Description automatically generated

If done later, database must be wiped in order for that ^ to work.

JWT = JSON Web Token

npm i jsonwebtoken

const token = jwt.sign({ unique id }, ‘secret-phrase’, { expiresIn: “7 days” } ) // 3rd argument is optional

console.log( token )

eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJfaWQiOiJhYmMxMjMiLCJpYXQiOjE2NjY3Njc0Mjl9.HLYc2VXLHUSFxTG2j\_XPxCqph3EMBa2Fdh\_GoAj8\_N8

header => base 64 encoded JSON string => metainformation (type of token, jwt, the algorithm used)

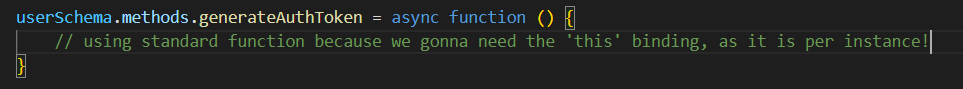
payload/body => base 64 encoded JSON string => contains data that we provided (the id)

signature => used to verify the token

The Goal of the JSON Web Token is not to hide content.

userSchema.methods.ourNewMethodName

^ to register new methods to the user instance (not User model, like earlier, when used .statics)



**Express Middleware**

// without middleware: new request -> run route handler

// with middleware: new request -> do something -> run route handler

Text

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^ and that’s how we can stop certain requests to happen.

To add middleware to an individual route, we gonna put the middleware as the second parameter, and move the callback function to be the third function.

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In our case, if ‘auth’ calls the next() function, the async callback function will be called. Otherwise, not.

For when authenticating, we must add ‘Authorization’ key to **Header**, with value ‘Bearer <token>’

Then, in the middleware, we read the header info, remove the ‘Bearer ‘ and verify the token.

Then, look for the user with that token.

const auth = async (req, res, next) => {

    try {

        const token = req.header('Authorization').replace('Bearer ','')

        const decoded = jwt.verify(token, 'thisismynewcourse')

        const user = await User.findOne({\_id: decoded.\_id, 'tokens.token': token})

        if (!user) throw new Error()

        req.user = user

        next()

    } catch(e) {

        res.status(401).send({error: 'Please authenticate first.'})

    }

}

Advanced Postman -> pm stands for postman.

Graphical user interface, application

Description automatically generated

Hiding private data

Text

Description automatically generated

We can do this also by not calling user.getPublicProfile! How? We simply change the name of the method to toJSON and things will go by themselves!

**.toJSON is a middleware (?!) which is called before an object is JSON.stringified (?!)**

To create a connection between Tasks and Users, we have 2 options:

1. Create an array in User where we store the IDs of tasks owned by that user
2. Create a new property to Task, where we store the ID of owner

Text

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Mongoose also helps with ability to add an option “ref” which accepts the name of another Model.

This way you can tie 2 models between.

Owner: {

Type: mongoose.Schema.Types.ObjectId,

Ref: ‘User’

}

User used for ref is the name used in mongoose.model( name, schema ) inside model.js

await task.populate(‘owner’) => allows us to populate data from a relationship such as the data we have for owner.

* Is gonna find the user who’s associated with this task, and task.owner will now be their profile (the entire document instead of being just the id)

Virtual property => is not data from database, is actually a relationship between 2 entities. (user / task)

userSchema.virtual('tasks', {

    ref: 'Task'

})

Examples of a route with auth required:

Text

Description automatically generated

A screenshot of a computer

Description automatically generated with medium confidence

We can set the route (/tasks) to have filters like ?completed=true / false

When we read the req.query.completed, we get ‘true’ / ‘false’ as strings, and is our job to convert them to Boolean.

Actually, every .query we get from the URL is a string.

Here is a nice trick:

Graphical user interface

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Text

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Mongoose lets us add options when fetching data, like limiting the number of items we receive.

Graphical user interface, application

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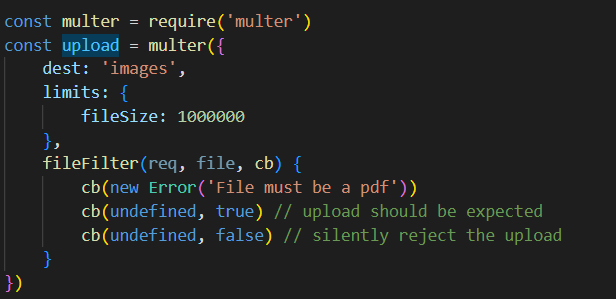
**If there is no limit specified in the URL, mongoose will just ignore the option.limit for good!**

**Ternary operators => named so because there are 3 pieces: condition, value for when condition is true, and value for when condition is false.**

Express by default doesn’t actually support file uploads.

But there is a npm library also released and maintained by the same people who does Express.

npm i [multer@1.4.1](mailto:multer@1.4.1) (Faced 3 high errors)



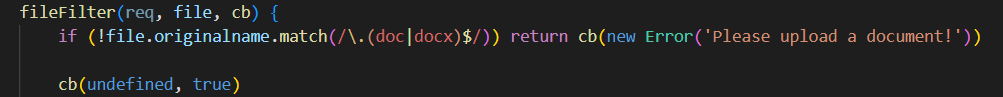
dest : ‘images’ (app/images)

limits : { fileSize : 1 000 000 } (max file size is 1mb)

fileFilter(request, file, cb)

Regex stands for Regular Expresions

[www.regex101.com](http://www.regex101.com)



**Handling Express Errors** – by using a callback function as the 4th argument, with (err, req, res, next) parameters, which lets express know this is the function to handle any uncaught errors.

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**Serving up files** - ending back the avatar to the browser, from text to image:

Text

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**Auto-cropping and Image formatting (before saving into the database)**

npm i sharp

(if you using latest version of nodeJS, use latest version of sharp. Don’t @0.21.1)

Await sharp(req.file.buffer).png.toBuffer()

Text

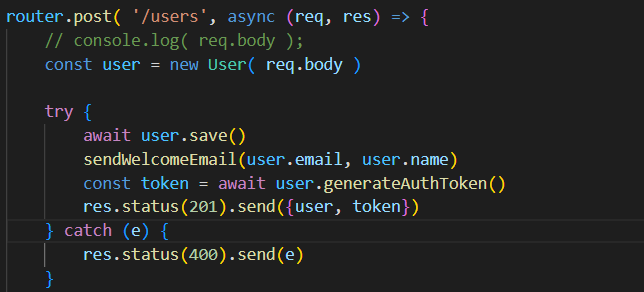
Description automatically generated

**Section 15**

Read the related file in this repo.

Even if sending a mail is an async method, we don’t need to wait for it to continue our script.

So there is no need to use await sendWelcomeEmail. We just send it, and that’s it.

****

**Html** property is also available for sgMail.send({}), to display html code inside.