3 DECEMBER 2018 / #NODEJS

Writing Scalable Architecture For Nodejs

by Zafar Saleem

Writing backend logic for any project these days is pretty easy, thanks to full stack JavaScript. This is especially so with the introduction of dozens of frameworks for both client side and server side implementation.

One of the most popular Node.js frameworks is Express.js. It offers an a project grows, it becomes hard to scale at some point.

Many developers tend to keep adding new route files and models for new services and API end points. This approach works, but it really makes it hard for future engineers to scale and add new services.

In this blog I am going to build a login and registration system that uses JWT authentication with scalable architecture. For those who prefer to get right into the code, go ahead and clone this repository.

There will be four parts in this blog.

1. Basic Architecture Setup
2. Registration
3. Login
4. Dashboard

This blog assumes that you already installed Node.js in your system. Let's get into the first step — basic architecture setup.

Basic architecture setup

First things first, make a new directory on your file system and call it `auth` (or anything you like).

```
mkdir auth
```

lines below into it.

```
{    "name": "auth",    "version": "0.0.0",    "private": true,
```

The most important part of the file above is the `dependencies` property. These are the dependencies required for the project. They will be used as middleware later in this blog.

Now go ahead and run the command below to install all of these dependencies. You may need to wait a few seconds.

```
npm install
```

Once it installs all of above dependencies, go ahead and create an `index.js` file in your root folder, like below:

```
touch index.js
```

This particular file is only responsible to start the server. To do that, add below code into it:

```
'use strict';
```

```
const server = require('./server')();const config = require('./con
```

```
server.create(config, db);server.start();
```

As you can see, this file requires three files:

1. server
2. config
3. db

We will create these next.

The code above then calls the `create` method on the server module. Finally, it calls the `start` method, which starts the server.

1. Create the `server` folder

```
mkdir server
```

Once done, `cd` into that folder and create another `index.js` file.

```
touch index.js
```

```
'use strict';
```

```
const express = require('express');const bodyParser = require('body
```

```
module.exports = function() {  let server = express(),      create,
```

```
    create = function(config, db) {      let routes = require('./rou
```

```
        // Server settings       server.set('env', config.env);
```

```
        // Returns middleware that parses json       server.use(body
```

```
        // Set up routes       routes.init(server);   };
```

```
    start = function() {       let hostname = server.get('hostname')
```

```
        server.listen(port, function () {          console.log('Expr
```

```
     return {       create: create,       start: start    };};
```

In this file, we first require all of the dependencies needed for this project. Note that more dependencies can be added into this file whenever required.

Then we export an anonymous function from this module using `module.exports` . Inside that function, create three variables: `server` , `create` and `start` .

The `server` variable is for the Express.js server. So, call the `express()` function and assign that to `server` . We will assign anonymous functions to the `create` and `start` variables.

Now, it is time to write a `create` function with two parameters: `config` and `db` .

Then set a few server settings using the server.use() function i.e. env, port and hostname. Then use `cookieParser, bodyParser, logger and` finally require passport's configuration file and call it with the required passport.

Passport middleware is used for authentication, which we will use later in this blog. To learn more about it click here.

Now it's time for API end points i.e. routes. Simply call the `init` function on routes and pass `server` into this.

Next, write the `start` function. Set `hostname` and `port` and start the server with the `listen` command inside this function.

Then, return both `create` and `start` functions to make them available for other modules to use.

2. Create the config folder

At the root level, create a `configs` folder:

```
mkdir configs
```

`cd` into that folder and create an index.js file:

```
touch index.js
```

Add the below code to the index.js file:

```
const _ = require('lodash');const env = process.env.NODE_ENV || 'l
```

```
let defaultConfig = {  env: env};
```

```
module.exports = _.merge(defaultConfig, envConfig);
```

Now create a local.js file:

```
touch local.js
```

Open it, and add the code below:

```
'use strict';
```

```
let localConfig = {  hostname: 'localhost',  port: 3000};
```

```
module.exports = localConfig;
```

This one’s simple too. We are creating a `localConfig` object and adding a few properties such as `hostname` and `port`. Then export it to use it like we are doing in the `./index.js` file.

3. Now create a database

```
touch db.js
```

Open db.js in your favourite editor and paste the below code into it.

```
module.exports = {   'secret': 'putsomethingsecretehere',   'databa
```

We are exporting a JavaScript object with properties `secret` and `database`. These are used to connect with a MongoDB database using middleware called mongoose.

Building the app

Now we are done with basic setup of our project, time for the fun stuff!

`cd` into the `server` folder and create the following folders:

First, we will cover the `routes` folder. This folder is used to add all the end points that are available for client side use. First of all go ahead and create the `index.js` file first inside the `routes` folder.

```
touch index.js
```

And put the below code into this file:

```
'use strict';



const apiRoute = require('./apis');



function init(server) {  server.get('*', function (req, res, next)



  server.use('/api', apiRoute);}



module.exports = {  init: init};
```

First, require the `apiRoute` folder which we are going to create next. This folder will contain another folder with the version number of the API i.e. `v1` .

Second create an `init` function. We are calling this function from the `server/index.js` file inside the `create` function at the bottom and passing `server` as a parameter. It simply gets all the routes and returns the next callback function.

Then use the `apiRoute` that we are requiring above. Finally, export the init function to make this function available in the rest of the project.

Now go ahead create an `apis` folder. Inside that folder create a file `index.js` .

```
mkdir apistouch index.js
```

Paste the below code into the `index.js` file.

```
'use strict';



const express = require('express');const v1ApiController = require(
let router = express.Router();



router.use('/v1', v1ApiController);



module.exports = router;
```

This file requires `express` and the api version folder i.e. `v1` . Then create the router and make `/v1` end point using `router.use()` method. Finally export the router.

It's time to create `apis/v1.js` file. Paste the below code inside the `v1.js` file:

```
'use strict';



const registerController = require('../../controllers/apis/registe


let router = express.Router();
```

```
router.use('/register', registerController);



module.exports = router;
```

We need to register the controller and express.js and create a router. Then we need to expose `register` API endpoints for client side use. Finally, we must export the router from this module.

This is the file that we are going to keep modifying. We will require more controllers here when we create them.

Now we are done with the routes folder, and it is time for the controllers folder. Go ahead and CD into that folder and create a folder `apis` .

```
mkdir apis
```

Now that we have the apis folder inside `controllers` , we are going to create the following three controllers and their respective `services` .

1. Basic Architecture Setup
2. **Registration**
3. Login
4. Dashboard

file.

```
touch register.js
```

Open this file in your favourite editor and paste the below code into it:

```
'use strict';

const express = require('express');const registerService = require(

let router = express.Router();

router.post('/', registerService.registerUser);

module.exports = router;
```

First it is requiring `express.js` and the `register` service (which we are going to write later). Then create a router using the `express.Rout` registerUser method on registerService (which we are going to write later). Finally, export the router from this module.

Now we need to require this controller inside the `routes/apis/v1.js` file which we already did.

Now registering the controller is done. It is time to get to the `services` folder. CD into that folder and create an `authentication` folder. First things first, cd into `authentication` and create a `register.js` file.

```
touch register.js
```

Then open the `register.js` file and paste the below code into it:

```
'use strict';
```

```
const express = require('express');const User = require('../../mode
```

```
const httpMessages = {  onValidationError: {    success: false,
// Register new usersfunction registerUser(request, response) {  le
```

```
  if (!email || !password) {    response.json(httpMessages.onValida
```

```
    // Attempt to save the user    newUser.save(error => {      if
```

```
module.exports = {  registerUser: registerUser};
```

In the `register` service, first we are requiring `expressjs` and `User` model. Then we are creating a JavaScript object i.e. `httpMessages` which is basically a list of all the messages we are going to send to clients via the api when the client sends the request.

Then the function `registerUser` which actually performs the registration process. Before saving the user there is a check if the user provided their email and password. If they did then create a newUser using the `new` keyword with the provided email and password.

Then simply call the `save` function on `newUser` to save that user in the database and send the appropriate response using `response.json`.

the rest of the project. We are using this inside the `controllers/register.js` file.

Before testing this to see if it works, first we need to create a `User` model. Go ahead create a file `User.js` inside the `models` folder.

```
touch User.js
```

And paste this code into the above file:

```
const mongoose = require('mongoose');const bcrypt = require('bcryp
```

```
const UserSchema = new mongoose.Schema({  email: {    type: String,
```

```
UserSchema.pre('save', function(next) {  let user = this;
```

```
  if (this.isModified('password') || this.isNew) {      bcrypt.ger
```

```
      bcrypt.hash(user.password, salt, (err, hash) => {
            user.password = hash;          next();         });      })
```

```
  // Create method to compare password input to password saved in dat
```

```
      cb(null, isMatch);  });};
```

```
  module.exports = mongoose.model('User', UserSchema);
```

First of all require the `mongoose` and `bcrypt` modules. Mongoose is used to create mongodb schema whereas bcrypt is used to encrypt passwords before storing them into the database.

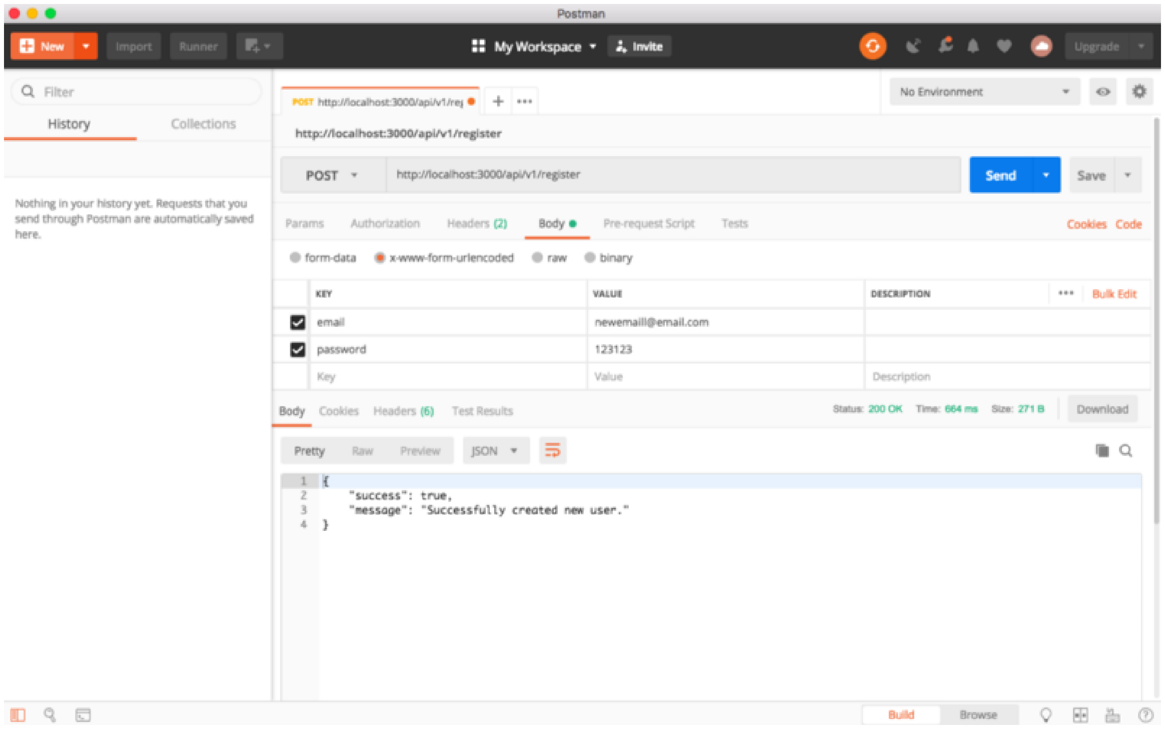
Create `UserSchema` with `email, password and role` properties. Then before saving the user, perform some checks before hashing the password.

The final function is to compare the passwords. It compares the user's password with the hashed password in the database.

Now in order to test this code, open postman (if you haven't installed below url:

```
http://localhost:3000/api/v1/register
```

Select POST as the request, choose the body tab and `form-urlencoded` and enter the email and password. Press the send button and you should see the below success message.



Nothing in your history yet. Requests that you send through Postman are automatically saved here.

POST http://localhost:3000/api/v1/register

Body: form-data [✓ x-www-form-urlencoded] raw binary

	KEY	VALUE	DESCRIPTION
✓	email	newemaill@email.com	
✓	password	123123	
	Key	Value	Description

Status: 200 OK Time: 664 ms Size: 271 B

JSON

```
{
    "success": true,
    "message": "Successfully created new user."
}
```

1. Basic Architecture Setup
2. Register
3. **Login**
4. Dashboard

It is time to focus on login. Create a `login.js` file inside the `controllers` folder.

```
touch login.js
```

Now open it and paste the below code:

```
'use strict';

const express = require('express');const loginService = require('.
```

```
let router = express.Router();
```

```
module.exports = router;
```

Again it's simple and the same as the register module: after importing `express.js` and `loginService` we are creating the router and make a post request to the root path `'/'` with the `loginUser` callback function on `loginService` . Finally export the router.

It's time to require `loginController` in the `routes/apis/v1.js` file. Your `v1.js` file should look like the below now.

```
'use strict';



const registerController = require('../../controllers/apis/registe



const express = require('express');



let router = express.Router();
```

```
module.exports = router;
```

Now for the login service, create a `login.js` file inside `services/authentication/`:

```
touch login.js
```

And paste the below code into this file:

```
'use strict';
```

```
const express = require('express');const apiRoutes = express.Router
```

```
const jwt = require('jsonwebtoken');const passport = require('pass
```

```
const User = require('../../models/User');
const httpResponse = {  onUserNotFound: {    success: false,    mes
```

```
function loginUser(request, response) {   let { email, password } =
```

```
User.findOne({    email: email  }, function(error, user) {    if (e
```

```
    if (!user) {      return response.send(httpResponse.onUserNotFo
```

```
    // Check if password matches    user.comparePassword(password,
```

```
        return response.json({          success: true, token: 'JWT
```

```
      response.send(httpResponse.onAuthenticationFail);    });  })
```

```
  module.exports = {  loginUser: loginUser};
```

First require some necessary modules such as: `express.js, jsonwebtoken, passport, db and User model`. Create a JavaScript object that has a list of messages to be sent to the client side when the http request is made to this service.

Create a loginUser function, and inside that create a couple of variables i.e. email and password, and assign the email and password sent by the user to these variables which are in `request.body`.

Then use the `findOne()` method on the `User` model to find a use based on the email sent from the client by the user. The callback function of `findOne()` accepts 2 parameters, `error and user`. First check if the above `findOne()` method throws any error — if it does then throw an error.

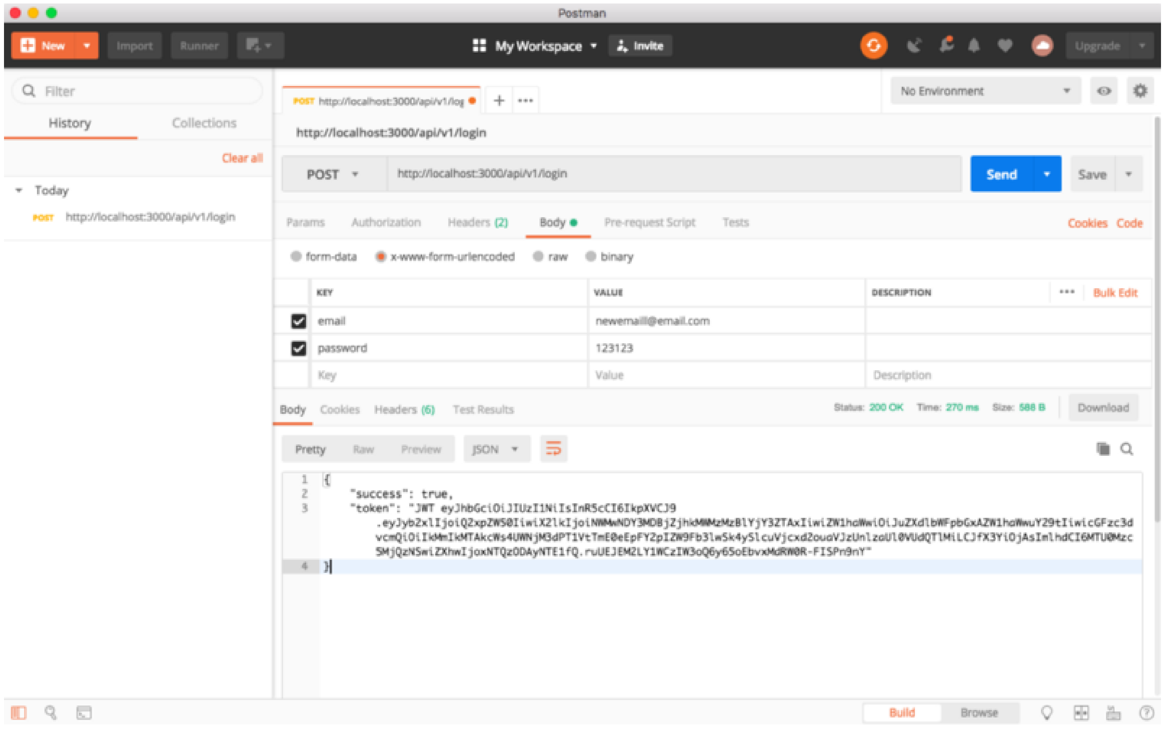
Then perform a check: if no user is found, then send the proper response with a message from the list of messages that we declared above in this module.

Then compare the password that the user sent with the one in the database using the `compare` function we wrote in the `User` model earlier in this blog.

If the password matches and it does not return an error, then we create a token using the `jsonwebtoken` module and return that token `cationFail` message

Finally export the `loginUser` function with `exports.module` so that we can use it in our controllers and anywhere else.

It's time to test login functionality. Go back to postman and this time replace `register` with `login` as the api end point in the url. Enter the email and password and press the send button. You should be able to receive a token. Go ahead and copy that to the clipboard because you will use it later to access the dashboard.



POST http://localhost:3000/api/v1/login

KEY	VALUE	DESCRIPTION
✓ email	newemaill@email.com	
✓ password	123123	
Key	Value	Description

Status: 200 OK Time: 270 ms Size: 588 B

```
{
    "success": true,
    "token": "JWT eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9
        .eyJyb2xlIjoiQ2xpZW50IiwiX2lkIjoiNWMwNDY3MDBjZjhkMWMzMzBlYjY3ZTAxIiwiZW1haWwiOiJuZXdlbWFpbGxAZW1haWwuY29tIiwicGFzc3d
        vcmQiOiIkMmIkMTAkcWs4UWNjM3dPT1VtTmE0eEpFY2pIZW9Fb3lwSk4ySlcuVjcxd2ouaVJzUnlzaUl0VUdQTlMiLCJfX3YiOjAsImlhdCI6MTU0Mzc
        5MjQzNSwiZXhwIjoxNTQzODAyNTE1fQ.ruUEJEM2LY1WCzIW3oQ6y65oEbvxMdRW0R-FISPn9nY"
}
```

2. Register
3. Login
4. **Dashboard**

Now it's time for the `dashboard.js` file. Create `dashboard.js` file inside `controllers` folder.

```
touch dashboard.js
```

And open it and paste the below code:

```
'use strict';

const passport = require('passport');const express = require('expre

let router = express.Router();

router.get('/', passport.authenticate('jwt', { session: false }), 
module.exports = router;
```

This controller is different in the sense that it requires authenticated access. That is, only a logged-in user can access the dashboard service and make different http requests.

For that reason we are also importing passport, and for the get request we are using the `passport.authenticate()` function to `getDashboard` service.

Again we need to require `dashboardController` in the `routes/apis/v1.js` file. Your `v1.js` file should look like the below:

```
'use strict';

const registerController = require('../../controllers/apis/registe

const express = require('express');

let router = express.Router();
```

```
router.use('/register', registerController);router.use('/login', lo
```

```
module.exports = router;
```

Now that `dashboardController` is available to be used for client side requests, it’s time to create its respective service. Go to the services folder and create a `dashboard` folder inside it. Create a `dashboard.js` file and put the below code inside this file.

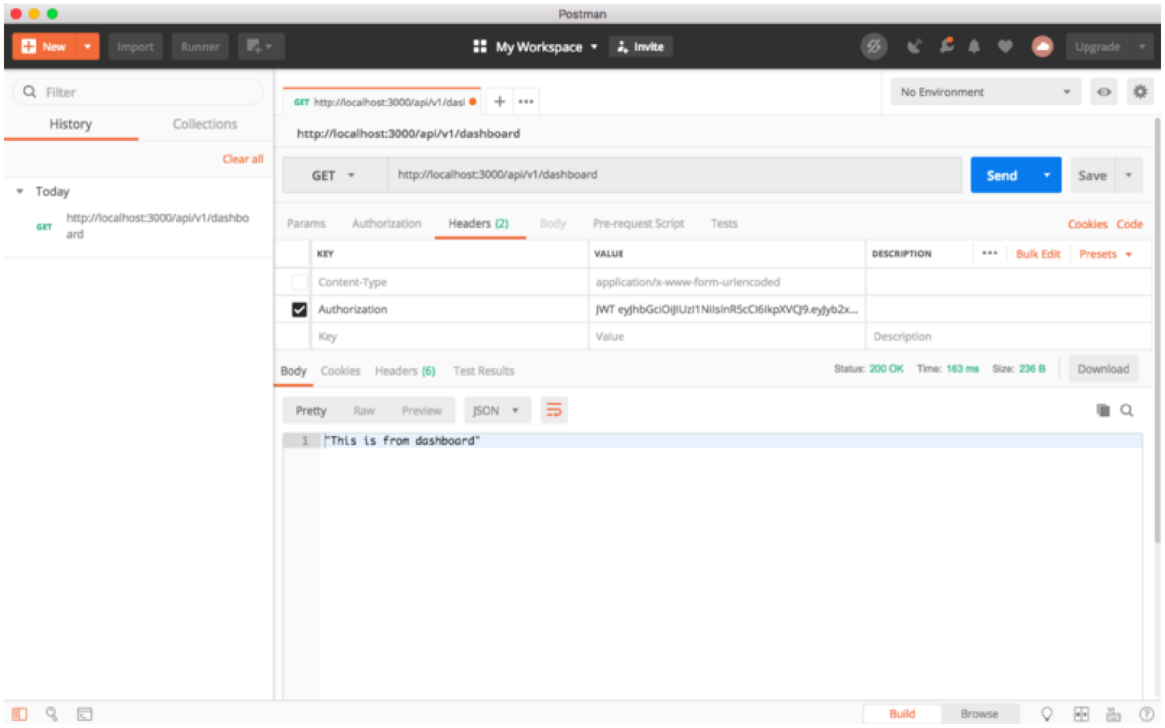
```
'use strict';
```

```
function getDashboard(request, response) {  response.json('This is
```

```
module.exports = {  getDashboard: getDashboard}
```

No fancy stuff going on. For demonstration purposes, I am simply responding with a text message `This is from dashboard`. Then export this method to be used in its respective controller which we already accomplished.

url to the dashboard. Click the headers tab and add `Authorization` and paste the JTW copied in the previous step when you logged in.



KEY	VALUE	DESCRIPTION
Content-Type	application/x-www-form-urlencoded	
✓ Authorization	JWT eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJyb2x...	
Key	Value	Description

```
"This is from dashboard"
```

You should see the message `This is from dashboard` as a response.

As you can see, when we make a new service we need one controller for it and we can keep adding new services into the architecture. If you would like to change the version of the API and also keep the current one, simply add a new `v2.js` file and redirect all requests to that end point. That is one simple example.

I hope you liked this blog and see you next time.

UPDATE: If you would like to implement its client side then please click here where I used react.js to authenticate with this server.

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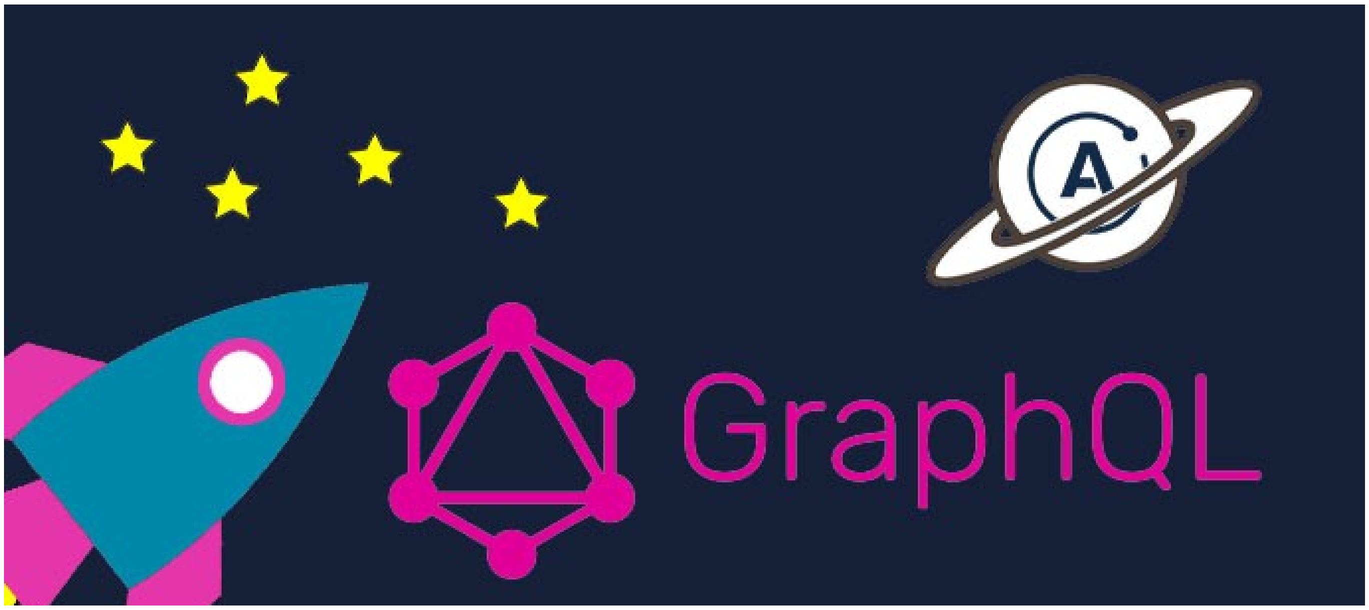

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