

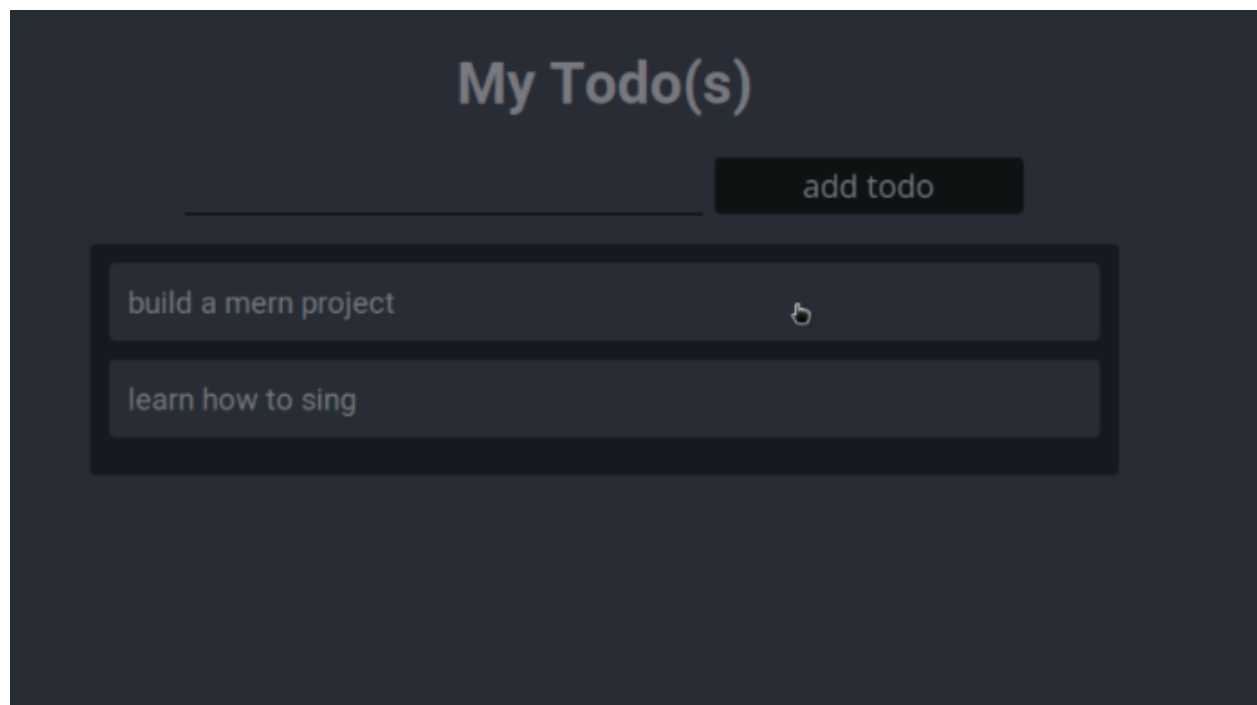
SIMPLE TO-DO APPLICATION ON MERN WEB STACK

The goal of this project is to describe the concepts and process of Continuous Integration, Continuous Delivery / Deployment and DevOps practices using a Mern web stack.

Never heard about Mern stack? No - Okay.

Mern => mongodb, express, reactjs and nodejs

Project



Tldr;

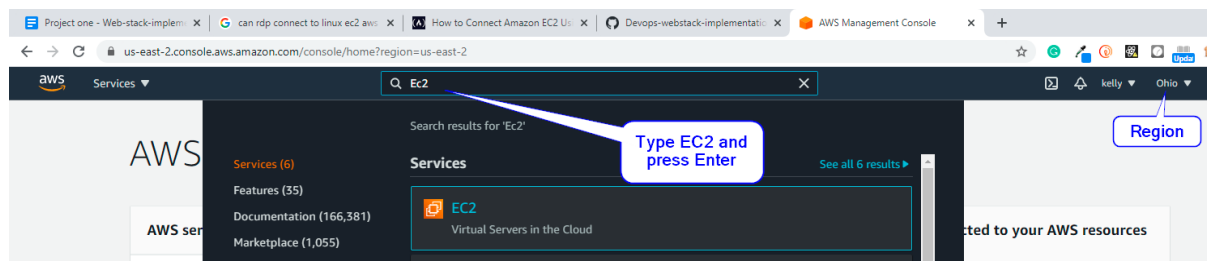
#Video link

Prerequisites:

- Aws account running an EC2 instance
- Internet connection
- Fundamental Knowledge of downloading and installing
- Basics Linux skills

Implementation

- Open your PC browser and login to <https://aws.amazon.com/>
- A region is selected by default (change if necessary), from the search bar type EC2 and click.



- From the Ec2 dashboard, click on the button “Launch instance” to start using a virtual server.

Launch instance

To get started, launch an Amazon EC2 instance, which is a virtual server in the cloud.

Launch instance ▼

Note: Your instances will launch in the US East (Ohio) Region

- An AMI window displays, type “Ubuntu” on the search bar and hit enter, or scroll down to select “Ubuntu Server 20.04 LTS (HVM), SSD Volume Type” based on your system architecture.

Note: the AMI (Amazon machine image) is always different from user to user

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Add Tags 6. Configure Security Group 7. Review

Cancel and Exit

Step 1: Choose an Amazon Machine Image (AMI)

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. You can select an AMI provided by AWS, our user community, or the AWS Marketplace, or you can select one of your own AMIs.

Search by Systems Manager parameter

Search: ubuntu

Type desired OS (ubuntu) and press Enter

Quick Start (8)

My AMIs (0)

AWS Marketplace (553)

Community AMIs (12881)

☐ Free tier only ⓘ

Free tier eligible

Ubuntu Server 20.04 LTS (HVM), SSD Volume Type - ami-0a91cd140a1fc148a (64-bit x86) / ami-0742a572c2ce45ebf (64-bit Arm)

Ubuntu Server 20.04 LTS (HVM), EBS General Purpose (SSD) Volume Type. Support available from Canonical (<http://www.ubuntu.com/cloud/services>).

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes

Select

☒ 64-bit (x86)

☐ 64-bit (Arm)

Free tier eligible

Ubuntu Server 18.04 LTS (HVM), SSD Volume Type - ami-0dd9f0e7df0f0a138 (64-bit x86) / ami-0d2751e39abf67ea8 (64-bit Arm)

Ubuntu Server 18.04 LTS (HVM), EBS General Purpose (SSD) Volume Type. Support available from Canonical (<http://www.ubuntu.com/cloud/services>).

Root device type: ebs Virtualization type: hvm ENA Enabled: Yes

Select

☒ 64-bit (x86)

☐ 64-bit (Arm)

- The next step of configuring our EC2 is to select the instance type, preferably a **t2 micro - Free tier**. Then click (3) configure instance showing at the top or click next configuration details at the bottom.

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Add Tags 6. Configure Security Group 7. Review

Step 2: Choose an Instance Type

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases. Instances are virtual servers that can run applications. They have varying combinations of CPU, memory, storage, and networking capacity, and give you the flexibility to choose the appropriate mix of resources for your applications. [Learn more](#) about instance types and how they can meet your computing needs.

Filter by: All instance families Current generation Show/Hide Columns

Currently selected: t2.micro (- ECUs, 1 vCPUs, 2.5 GHz, -, 1 GiB memory, EBS only)

	Family	Type	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance	IPv6 Support
<input type="checkbox"/>	t2	t2.nano	1	0.5	EBS only	-	Low to Moderate	Yes
<input checked="" type="checkbox"/>	t2	t2.micro Free tier eligible	1	1	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	t2	t2.small	1	2	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	t2	t2.medium	2	4	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	t2	t2.large	2	8	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	t2	t2.xlarge	4	16	EBS only	-	Moderate	Yes
<input type="checkbox"/>	t2	t2.2xlarge	8	32	EBS only	-	Moderate	Yes
<input type="checkbox"/>	t3	t3.nano	2	0.5	EBS only	Yes	Up to 5 Gigabit	Yes
<input type="checkbox"/>	t3	t3.micro	2	1	EBS only	Yes	Up to 5 Gigabit	Yes

Cancel Previous Review and Launch Next: Configure Instance Details

Move to next step

- To configure the instance, we will leave all default but scroll to the bottom and on the advanced details section, in the user data column add below script as shown on the screenshot.

```
#!/bin/bash
```

```
sudo apt update -y
```

```
sudo apt upgrade -y
```

```
sudo apt install nodejs npm -y
```

Move to next step

The screenshot shows the AWS Management Console interface for configuring an EC2 instance. The top navigation bar includes the AWS logo, a search bar, and user information. The main content area is titled 'Step 3: Configure Instance Details' and features a progress bar with seven steps: 1. Choose AMI, 2. Choose Instance Type, 3. Configure Instance (active), 4. Add Storage, 5. Add Tags, 6. Configure Security Group, and 7. Review.

Under 'Step 3: Configure Instance Details', there are several configuration sections:

- Tenancy:** A dropdown menu set to 'Shared - Run a shared hardware instance'.
- Elastic Inference:** A checkbox labeled 'Add an Elastic Inference accelerator'.
- Credit specification:** A checkbox labeled 'Unlimited'.
- File systems:** Buttons for 'Add file system' and 'Create new file system'.
- Advanced Details:** A section containing several options:
 - Enclave:** A checkbox labeled 'Enable'.
 - Metadata accessible:** A dropdown menu set to 'Enabled'.
 - Metadata version:** A dropdown menu set to 'V1 and V2 (token optional)'.
 - Metadata token response hop limit:** A dropdown menu set to '1'.
 - User data:** A section with radio buttons for 'As text' (selected), 'As file', and 'Input is already base64 encoded'. Below these is a text area containing a bash script:

```
#!/bin/bash
sudo apt update -y
sudo apt upgrade -y
sudo apt install nodejs -y
```

At the bottom right of the page, there are four buttons: 'Cancel', 'Previous', 'Review and Launch', and 'Next: Add Storage'. The 'Next: Add Storage' button is circled in red.

- Move to tab 5 to Add tags to our EC2 instance, I have deliberately skipped tab 4 to choose the default storage volume given by AWS.

Tags are key-value paired fields and help to categorize your AWS resource, now click ADD TAG to assign a unique name and move to next.

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Add Tags 6. Configure Security Group 7. Review

Step 5: Add Tags

A tag consists of a case-sensitive key-value pair. For example, you could define a tag with key = Name and value = Webserver.
A copy of a tag can be applied to volumes, instances or both.
Tags will be applied to all instances and volumes. [Learn more](#) about tagging your Amazon EC2 resources.

Key (128 characters maximum)	Value (256 characters maximum)	Instances	Volumes	Network Interfaces
name	memStack	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

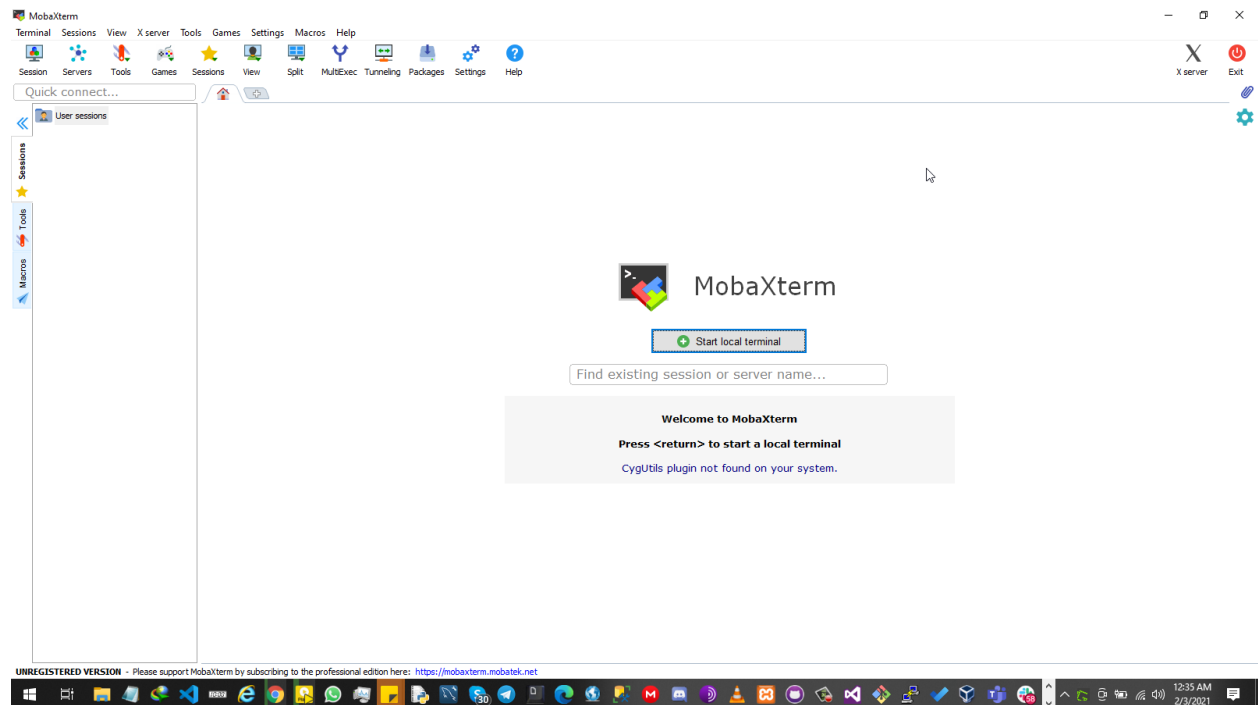
[Add another tag](#) (Up to 50 tags maximum)

Move to Next

- We will not modify the default security group, but go with the default console access via ssh on **port 22**.

Reason: The security Group are set of firewall rules which denies and grant access to our EC2 instance,

To access the EC2 instance with a console, we use mobaxterm as shown below



Move to Next

Concluding our Ec2 setup,

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Add Tags 6. Configure Security Group 7. Review

Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. [Learn more](#) about Amazon EC2 security groups.

Assign a security group: ☒ Create a **new** security group
☐ Select an **existing** security group

Security group name:

Description:

Type ⓘ	Protocol ⓘ	Port Range ⓘ	Source ⓘ	Description ⓘ
SSH ▾	TCP	22	Custom ▾ 0.0.0.0/0	e.g. SSH for Admin Desktop

Warning

Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.

- Click review and launch

You will get a Prompt to Create a Private Key File, feel free to choose an existing one, if it already exists on the same PC.

Download the key file to a good location, to be used later, Then Launch.

Select an existing key pair or create a new key pair



A key pair consists of a **public key** that AWS stores, and a **private key file** that you store. Together, they allow you to connect to your instance securely. For Windows AMIs, the private key file is required to obtain the password used to log into your instance. For Linux AMIs, the private key file allows you to securely SSH into your instance.

Note: The selected key pair will be added to the set of keys authorized for this instance. Learn more about [removing existing key pairs from a public AMI](#).

Create a new key pair



Key pair name

memstack

Download Key Pair



You have to download the **private key file** (*.pem file) before you can continue. **Store it in a secure and accessible location.** You will not be able to download the file again after it's created.

Cancel

Launch Instances



Initiating Instance Launches

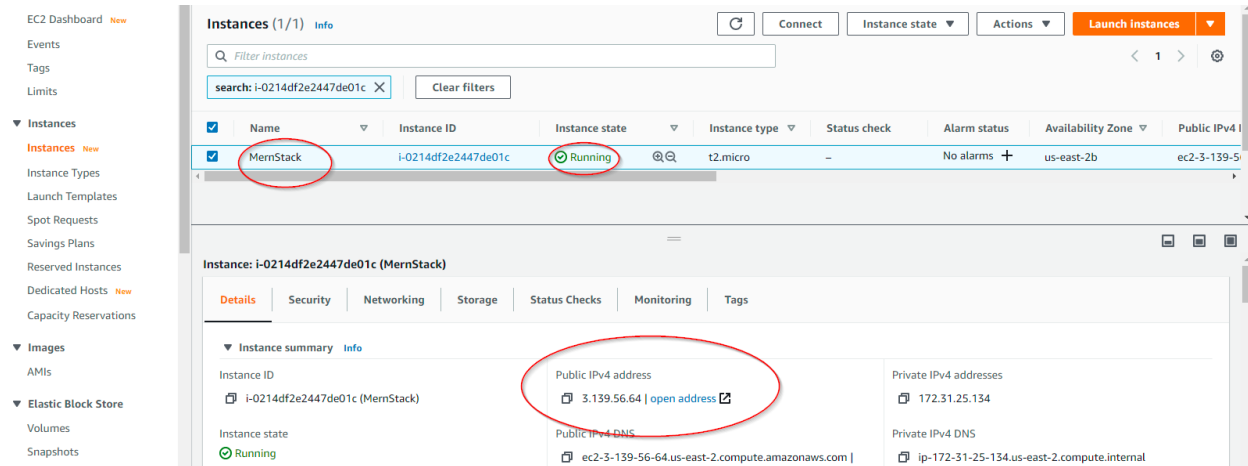
Please do not close your browser while this is loading

Creating security groups... Successful

Authorizing inbound rules... Successful

Initiating launches...

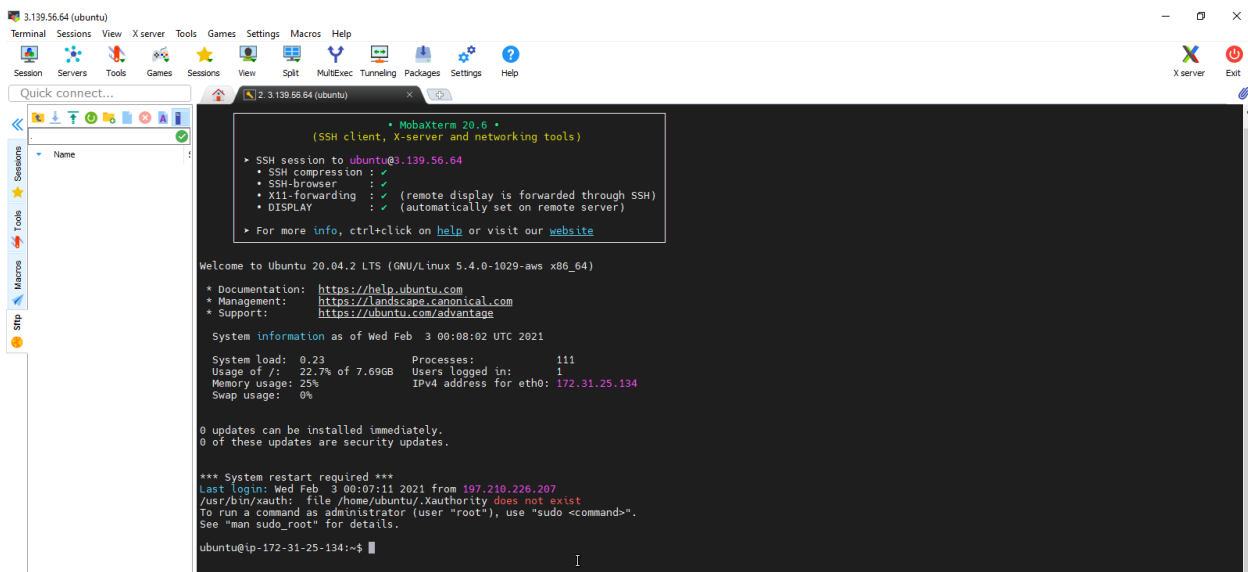
Done? Good Job, let's get to business now.



Copy your own Public IP as shown on the above screenshot, now it's time to use the console

Yay!!!

Now, Open mobaxterm to connect the Ec2 instance with the public ip shown above,



You have now connected to the EC2 instance via SSH

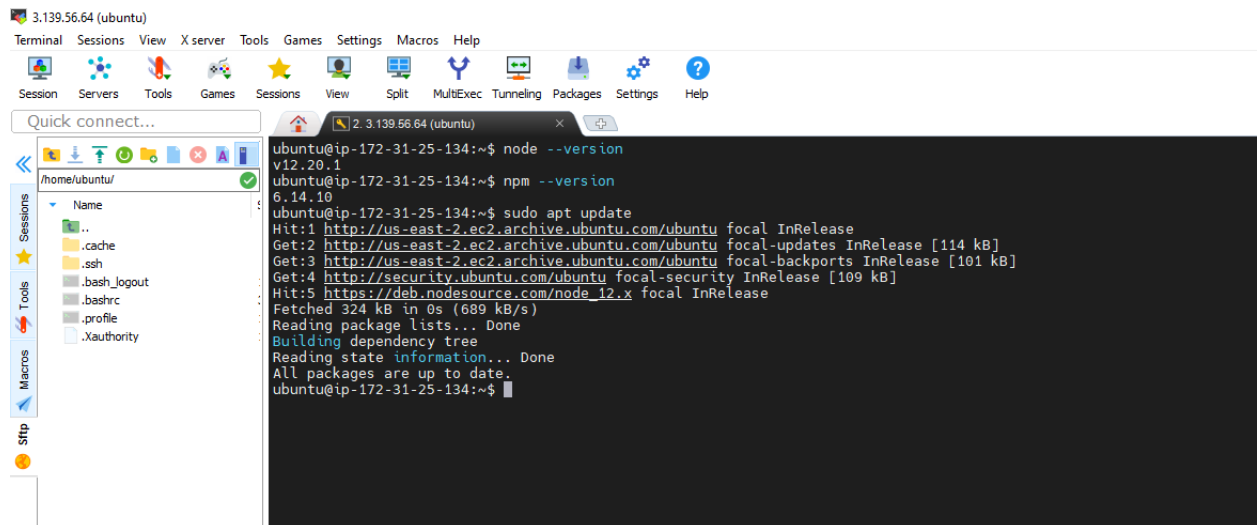
Type **clear**, to have a neat console and proceed.

We will now check if our userdata scripts were loaded.

Type:

node --version

npm --version



```
3.139.56.64 (ubuntu)
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
Quick connect...
/home/ubuntu/
Sessions
  Name
  ..
  .cache
  .ssh
Tools
  .bash_logout
  .bashrc
  .profile
  .Xauthority
Macros
Sftp

ubuntu@ip-172-31-25-134:~$ node --version
v12.20.1
ubuntu@ip-172-31-25-134:~$ npm --version
6.14.10
ubuntu@ip-172-31-25-134:~$ sudo apt update
Hit:1 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:3 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-backports InRelease [101 kB]
Get:4 http://security.ubuntu.com/ubuntu focal-security InRelease [109 kB]
Hit:5 https://deb.nodesource.com/node_12.x focal InRelease
Fetched 324 kB in 0s (689 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
All packages are up to date.
ubuntu@ip-172-31-25-134:~$
```

By default EC2 user is given sudo privilege

Great!!!

Application Code Setup

We have our linux instance up and nodejs installed, let's setup the code for our project.

Run this code:

```
$ mkdir todo && cd todo
```

```
ubuntu@ip-172-31-25-134:~$ mkdir todo && cd todo
ubuntu@ip-172-31-25-134:~/todo$ npm init
This utility will walk you through creating a package.json file.
It only covers the most common items, and tries to guess sensible defaults.
```

```
See `npm help init` for definitive documentation on these fields
and exactly what they do.
```

```
Use `npm install <pkg>` afterwards to install a package and
save it as a dependency in the package.json file.
```

```
Press ^C at any time to quit.
```

```
package name: (todo)
```

```
version: (1.0.0)
```

```
description: A todo app on AWS
```

```
entry point: (index.js) app.js
```

```
test command:
```

```
git repository:
```

```
keywords:
```

```
author: Fredrick kelly
```

```
license: (ISC) MIT
```

```
About to write to /home/ubuntu/todo/package.json:
```

```
{
  "name": "todo",
  "version": "1.0.0",
  "description": "A todo app on AWS",
  "main": "app.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1"
  },
  "author": "Fredrick kelly",
  "license": "MIT"
}
```

```
Is this OK? (yes)
```

```
ubuntu@ip-172-31-25-134:~/todo$ ls
```

```
package.json
```

```
ubuntu@ip-172-31-25-134:~/todo$ █
```

Install ExpressJs

Express is a framework for Node.js, which helps to define routes of your application based on HTTP methods and URLs.

To use express, we need to install it using npm as shown below:

Run this code:

```
$ sudo npm install express
```

```
ubuntu@ip-172-31-25-134:~/todo$ sudo npm install express
npm notice created a lockfile as package-lock.json. You should commit this file.
npm WARN todo@1.0.0 No repository field.

+ express@4.17.1
added 50 packages from 37 contributors and audited 50 packages in 3.028s
found 0 vulnerabilities

ubuntu@ip-172-31-25-134:~/todo$
```

Great MYSQL is installed and configured for use, we could test by running below code:

```
$ touch app.js && ls
```

```
ubuntu@ip-172-31-25-134:~/todo$ touch app.js && ls
app.js  node_modules  package-lock.json  package.json
ubuntu@ip-172-31-25-134:~/todo$
```

Now we have create the file, let's Install the dotenv module to store our environmental variables

```
$ npm install dotenv
```

```
ubuntu@ip-172-31-25-134:~/todo$ npm install dotenv
npm WARN todo@1.0.0 No repository field.

+ dotenv@8.2.0
added 1 package and audited 51 packages in 0.835s
found 0 vulnerabilities

ubuntu@ip-172-31-25-134:~/todo$
```

Now let's add some code for our project into app.js file created earlier

```
$ vim app.js
```

Copy and paste below code:

```
// import express

const express = require('express');

// setting the env. config file

require('dotenv').config();

// create app server from the express module

const app = express();

// create and assign port

const port = process.env.PORT || 5500;

// calling the middleware function and allowing cors via http headers from any origin

app.use((req, res, next) => {

  res.header("Access-Control-Allow-Origin", "*");

  res.header("Access-Control-Allow-Headers", "Origin, X-Requested-With, Content-Type, Accept");

  next();

});

// the next middleware function, sends text

app.use((req, res, next) => {

  res.send('Welcome to my Express Buddy!');

});

// app server listens on env port or given port 5500

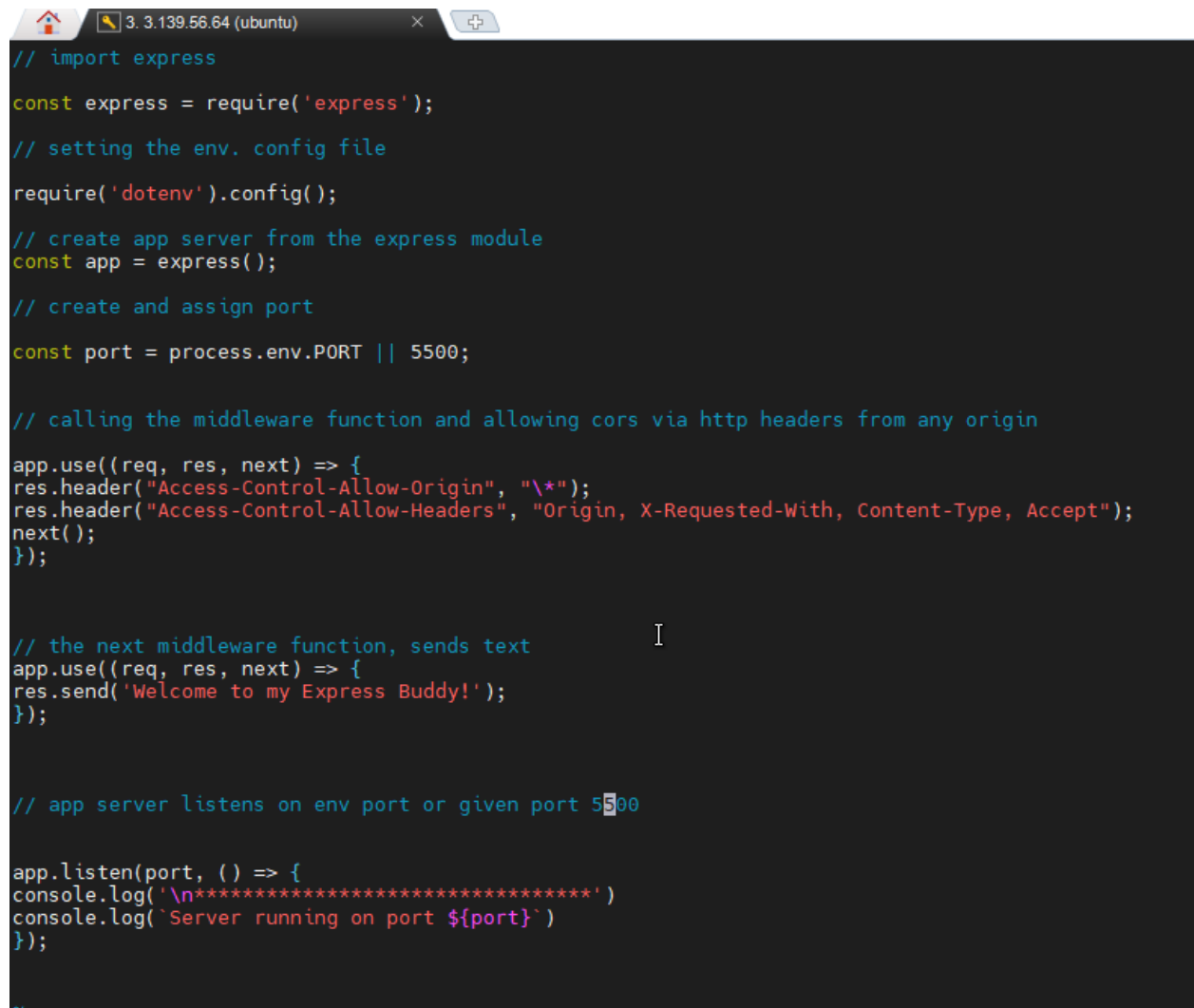
app.listen(port, () => {

  console.log('\n*****')

  console.log(`Server running on port http://localhost:${port}`)

});
```

Remember to press save and exit - " :wq "

A screenshot of a terminal window with a dark background. The window title bar shows a home icon, a network icon, and the text '3. 3.139.56.64 (ubuntu)'. The code is written in a light blue monospace font. It imports Express, sets up dotenv for environment variables, creates an Express app, and configures CORS. A middleware function sends a 'Welcome to my Express Buddy!' message. The server is configured to listen on port 5500 or the environment variable PORT. Finally, it logs the server status and listens on the specified port.

```
// import express
const express = require('express');

// setting the env. config file
require('dotenv').config();

// create app server from the express module
const app = express();

// create and assign port
const port = process.env.PORT || 5500;

// calling the middleware function and allowing cors via http headers from any origin
app.use((req, res, next) => {
  res.header("Access-Control-Allow-Origin", "*");
  res.header("Access-Control-Allow-Headers", "Origin, X-Requested-With, Content-Type, Accept");
  next();
});

// the next middleware function, sends text
app.use((req, res, next) => {
  res.send('Welcome to my Express Buddy!');
});

// app server listens on env port or given port 5500

app.listen(port, () => {
  console.log('\n*****')
  console.log(`Server running on port ${port}`)
});
```

Notice that we have specified to use port **5500** in the code. This will be required later when we go on the browser.

Result to confirm above script, run

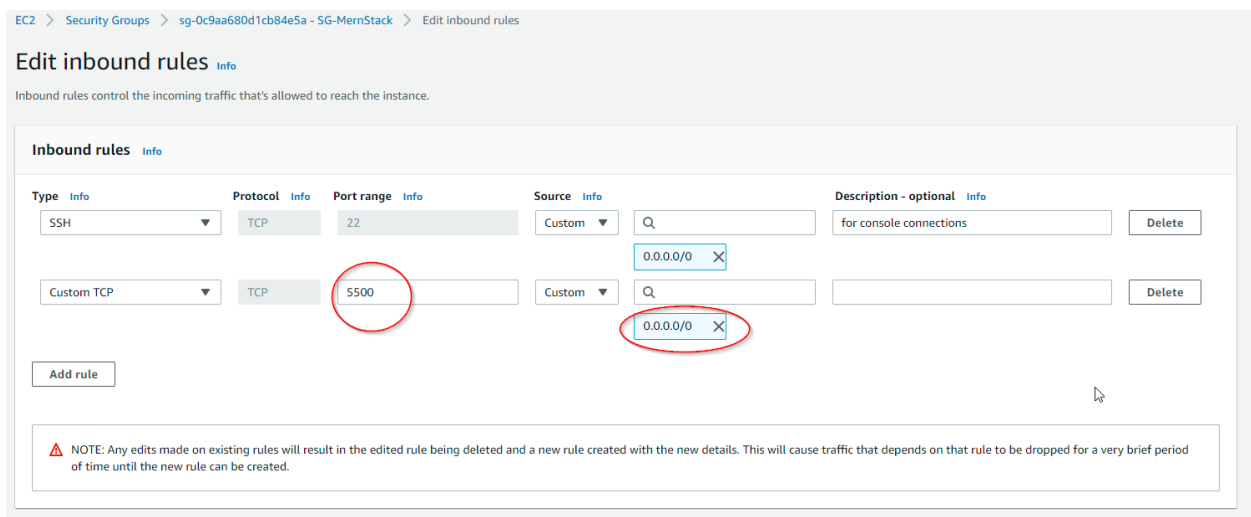
```
node app.js
```

```
ubuntu@ip-172-31-25-134:~/todo$ node app.js

*****
Server running on port 5500
█
```

Excellent!!!

Now we need to open this port on our Security Group by editing the inbound rule as shown below:



Let's check the browser now and confirm it runs on port 5500 using the ip or DNS name.



Welcome to my Express Buddy!

Routes

There are three actions that our To-Do application needs to be able to do:

- Create a new task
- Display list of all tasks
- Delete a completed task

Each task will be associated with some particular endpoint and will use different standard HTTP request methods or sometimes called HTTP verbs :

POST (Create task),

GET (Read tasks by id),

DELETE (Remove task by id)

For each task, we need to create routes that will define various endpoints that the To-do app will depend on. A simple route can be represented as `"/route"`

So let us create a folder, navigate to it and create a file to store all routes

```
$ mkdir routes && cd routes
```

```
$ touch api.route.js
```

```
$ vim api.route.js
```

ubuntu@ip-172-31-25-134: ~/todo/routes

```
ubuntu@ip-172-31-25-134:~/todo$ mkdir routes && cd routes
ubuntu@ip-172-31-25-134:~/todo/routes$ touch api.route.js
vim api.route.js
ubuntu@ip-172-31-25-134:~/todo/routes$ vim api.route.js
```

```
ubuntu@ip-172-31-25-134: ~/todo/routes
// import express and router function
const express = require ('express');
const router = express.Router();

// using the router, create an endpoint on a get method, then move to next middleware function
router.get('/todos', (req, res, next) => {
});

// using the router, create an endpoint on a post method, then move to next middleware function
router.post('/todos', (req, res, next) => {
});

// using the router, create an endpoint by ID on a delete method.
router.delete('/todos/:id', (req, res, next) => {
})

// export the router module, to be called in app.js
module.exports = router;
~
~
~
~
-- INSERT --
25,25 A11
9:16 AM 2/3/2021
```

Models

Now comes the interesting part, since the app is going to make use of MongoDB which is a NoSQL database, we need to create a model.

A model is at the heart of JavaScript based applications, and it is what makes it interactive.

We will also use models to define the database schema . This is important so that we will be able to define the fields stored in each MongoDB document.

To create a Schema and a model, we will install mongoose which is a Node.js package that makes working with mongodb easier.

Change directory back Todo folder with **cd ..** and install Mongoose

```
$ cd ..
```

```
$ npm install mongoose
```

```
ubuntu@ip-172-31-25-134:~/todo$ npm install mongoose -y
npm WARN todo@1.0.0 No repository field.

+ mongoose@5.11.14
added 31 packages from 96 contributors and audited 82 packages in 2.976s

2 packages are looking for funding
  run `npm fund` for details

found 0 vulnerabilities
```

Run below command:

```
$ mkdir models && cd models && touch todo.model.js
```

Type “ls” without the quotes to confirm the file was created

```
$ vim todo.model.js
```

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

const Schema = mongoose.Schema;

//create schema for todo

const TodoSchema = new Schema({
  action: {
    type: String,
    required: [true, 'The todo text field is required']
  }
})

//create model for todo

const Todo = mongoose.model('todo', TodoSchema);

module.exports = Todo;
```

Now we need to update our routes from the file **api.route.js** in 'routes' directory to make use of the new model.

In routes directory, delete the code inside with **:%d** command and paste there code below into it then save and exit

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

const router = express.Router();

const Todo = require('../models/todo.model');

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

  //this will return all the data, exposing only the id and action field to the client

  Todo.find({}, 'action')

  .then(data => res.json(data))

  .catch(next)

});

router.post('/todos', (req, res, next) => {

  if(req.body.action){

    Todo.create(req.body)

    .then(data => res.json(data))

    .catch(next)

  }else {

    res.json({

      error: "The input field is empty"

    })

  }

});

router.delete('/todos/:id', (req, res, next) => {

  Todo.findOneAndDelete({"_id": req.params.id})

  .then(data => res.json(data))

  .catch(next)

})

module.exports = router;
```

```

ubuntu@ip-172-31-25-134: ~/todo/routes
const express = require('express');
const router = express.Router();
const Todo = require('../models/todo');

router.get('/todos', (req, res, next) => {
  //this will return all the data, exposing only the id and action field to the client
  Todo.find({}, 'action')
    .then(data => res.json(data))
    .catch(next)
});

router.post('/todos', (req, res, next) => {
  if(req.body.action){
    Todo.create(req.body)
      .then(data => res.json(data))
      .catch(next)
  }else {
    res.json({
      error: "The input field is empty"
    })
  }
});

router.delete('/todos/:id', (req, res, next) => {
  Todo.findOneAndDelete({"_id": req.params.id})
    .then(data => res.json(data))
    .catch(next)
});

module.exports = router;

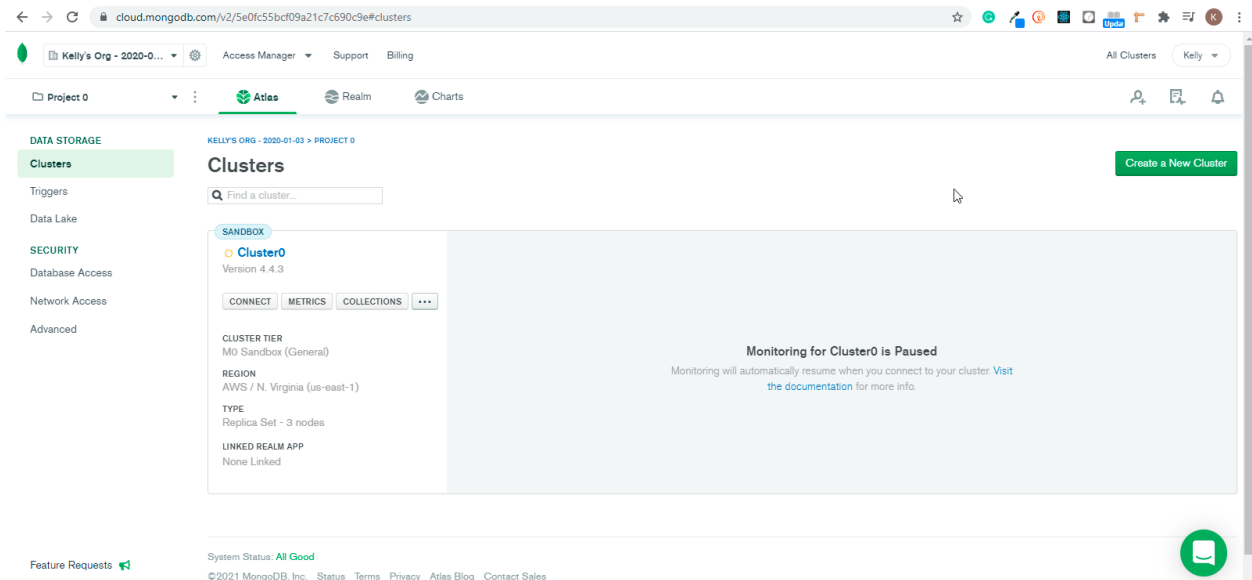
```

Good Job!

MongoDB Database

We need a database where we will store our data. For this we will make use of mLab. mLab provides MongoDB database as a service solution (DBaaS), so to make life easy, you will need to sign up for a shared clusters free account, which is ideal for our use case. Sign up [here](#). Follow the sign up process, select AWS as the cloud provider, and choose a region near you.

We need to tell apache to enable this new directory to serve our site and disable the default site directory:



Add IP Access List Entry

Atlas only allows client connections to a cluster from entries in the project's IP Access List. Each entry should either be a single IP address or a CIDR-notated range of addresses. [Learn more.](#)

ADD CURRENT IP ADDRESS

Access List Entry:

0.0.0.0/0

Comment:

Mern stack project for darey.io devops training



This entry is temporary and will be deleted in

1 week

Cancel

Confirm

Run this code to store our environment variable file

```
$ touch .env
```

```
$ vim .env
```

```
DB = 'mongodb+srv://<username>:<password>@<network-  
address>/<dbname>?retryWrites=true&w=majority'
```

Remember to get your dbname, username and password to update your **.env** file

×

Create Database

DATABASE NAME ⓘ

Enter database name

COLLECTION NAME ⓘ

Enter collection name

☐ **Capped Collection**
Before MongoDB can save your new database, a collection name must be specified at the time of creation.

Cancel

Create

Check the .env file using this command as shown " **ls -lra** "

```
ubuntu@ip-172-31-25-134:~/todo$ ls -lra
total 68
drwxrwxr-x  2 ubuntu ubuntu  4096 Feb  3 08:45 routes
-rw-rw-r--  1 ubuntu ubuntu   331 Feb  3 08:25 package.json
-rw-r--r--  1 ubuntu ubuntu 23742 Feb  3 08:25 package-lock.json
drwxr-xr-x 79 ubuntu ubuntu  4096 Feb  3 08:25 node_modules
drwxrwxr-x  2 ubuntu ubuntu  4096 Feb  3 08:31 models
-rw-rw-r--  1 ubuntu ubuntu   836 Feb  3 07:44 app.js
-rw-rw-r--  1 ubuntu ubuntu    93 Feb  3 12:41 .env
-rw-r--r--  1 ubuntu ubuntu 12288 Feb  3 07:29 .app.js.swp
drwxr-xr-x  7 ubuntu ubuntu  4096 Feb  3 12:41 ..
drwxrwxr-x  5 ubuntu ubuntu  4096 Feb  3 12:41 .
```


Now we need to update the index.js to reflect the use of **.env** so that Node.js can connect to the database.

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

const bodyParser = require('body-parser');

const mongoose = require('mongoose');

const routes = require('./routes/api.route');

const path = require('path');

require('dotenv').config({ path: '.env' });

const app = express();

const port = process.env.PORT || 5500;

//connect to the database

mongoose.connect(process.env.DB,{ useUnifiedTopology: true }, { useNewUrlParser: true })

.then(() => console.log('Hey, smile now your database connected successfully!'))

.catch(err => console.log(err));

//since mongoose promise is depreciated, we override it with node's promise

mongoose.Promise = global.Promise;

app.use((req, res, next) => {

  res.header("Access-Control-Allow-Origin", "*");

  res.header("Access-Control-Allow-Headers", "Origin, X-Requested-With, Content-Type, Accept");

  next();

});

app.use(bodyParser.json());

app.use('/api', routes);

app.use((err, req, res, next) => {

  console.log(err);

  next();

});

app.listen(port, () => {

  console.log(`Server running on port ${port}`)

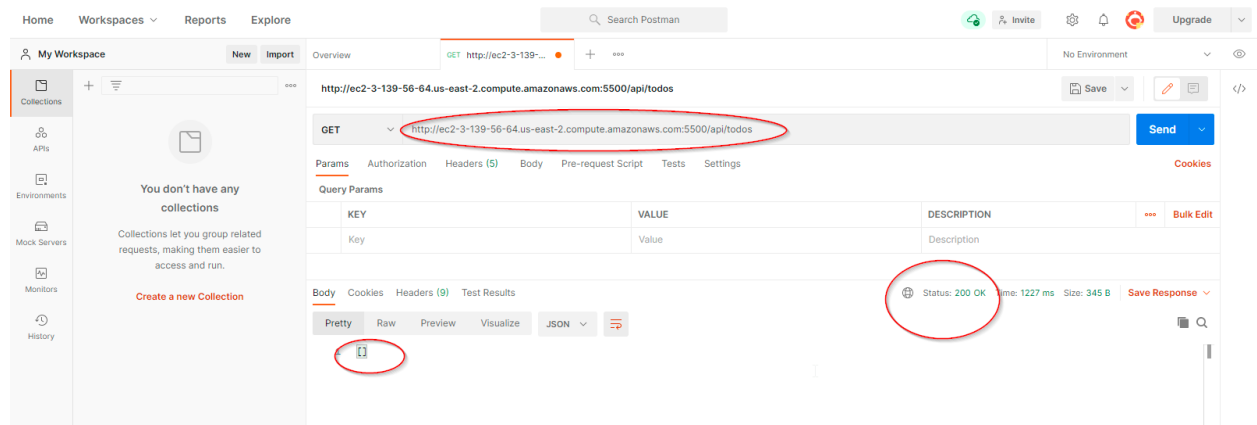
});
```

Simply delete existing content in the **app.js** file, and update it with the entire code above, and the result is below.

```
ubuntu@ip-172-31-25-134:~/todo$ node app.js
(node:43553) DeprecationWarning: current URL string parser is deprecated, and will be removed in a
n. To use the new parser, pass option { useNewUrlParser: true } to MongoClient.connect.
Server running on port 5500
Hey, smile now your database connected successfully!
```

Testing Backend Code without Frontend using RESTful API

We will be using Postman to test all the API endpoints and make sure they are working. For the endpoints that require body, we will return JSON back with the necessary fields.



We will add a raw content to the body, with the help of the body parser to generate a new todo.

See below output:

POST METHOD

Home Workspaces Reports Explore Search Postman

My Workspace New Import Overview POST http://ec2-3-139-56-64.us-east-2.compute.amazonaws.com:5500/api/todos

POST http://ec2-3-139-56-64.us-east-2.compute.amazonaws.com:5500/api/todos

Params Authorization Headers (8) Body Pre-request Script Tests Settings

Headers 7 hidden

KEY	VALUE	DESCRIPTION
<input checked="" type="checkbox"/> Content-Type	application/json	
Key	Value	Description

Body Cookies Headers (9) Test Results

Status: 200 OK Time: 396 ms Size: 423 B Save Response

Pretty Raw Preview Visualize JSON

```
1 [{"_id": "601ad0e8b55c9aab40d27c8f",
2   "action": "Finish project 29 and 30",
3   "_v": 0}
4 ]
5
```

GET METHOD

Overview GET http://ec2-3-139-56-64.us-east-2.compute.amazonaws.com:5500/api/todos/ No Environment

http://ec2-3-139-56-64.us-east-2.compute.amazonaws.com:5500/api/todos/ Save

GET http://ec2-3-139-56-64.us-east-2.compute.amazonaws.com:5500/api/todos/ Send

Params Authorization Headers (8) Body Pre-request Script Tests Settings

Headers 7 hidden

KEY	VALUE	DESCRIPTION
<input checked="" type="checkbox"/> Content-Type	application/json	
Key	Value	Description

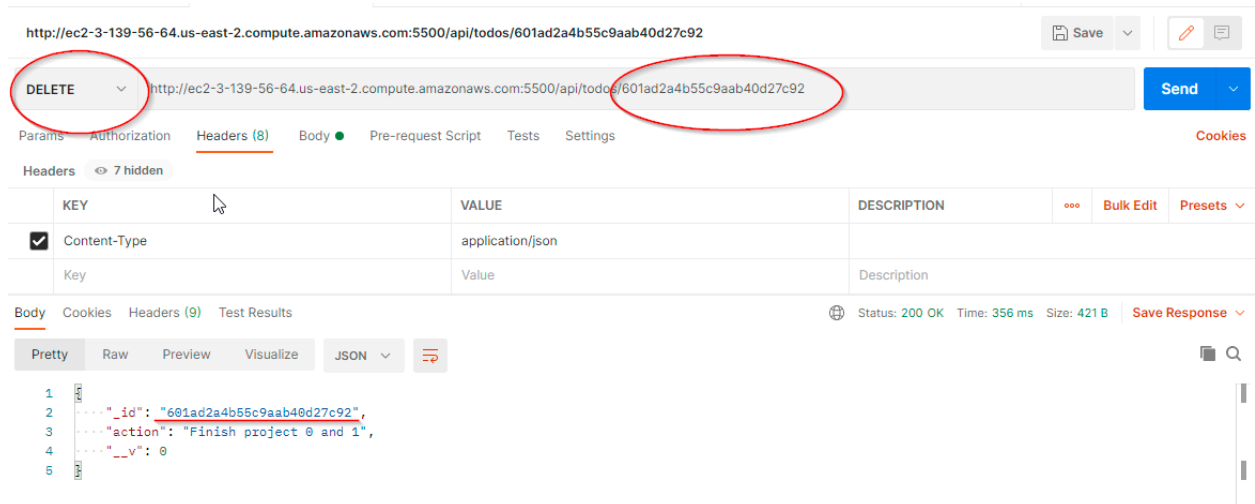
Body Cookies Headers (9) Test Results

Status: 200 OK Time: 319 ms Size: 556 B Save Response

Pretty Raw Preview Visualize JSON

```
1 [
2   {
3     "_id": "601ad289b55c9aab40d27c90",
4     "action": "Finish project 29 and 30"
5   },
6   {
7     "_id": "601ad297b55c9aab40d27c91",
8     "action": "Finish project 2 and 3"
9   },
10  {
11    "_id": "601ad2a4b55c9aab40d27c92",
12    "action": "Finish project 0 and 1"
13  }
14 ]
```

DELETE METHOD



Frontend creation

we are done with the functionality we want from our backend and API, it is time to create a user interface for a Web client (browser) to interact with the application via API. To start out with the frontend of the To-do app, we will use the create-react-app command to scaffold our app.

In the same root directory as your backend code, which is the Todo directory, run:

```
$ npx create-react-app client
```

This will create a new folder in your Todo directory called client, where you will add all the react code.

```
Success! Created client at /home/ubuntu/todo/client
Inside that directory, you can run several commands:
```

```
npm start
  Starts the development server.
```

```
npm run build
  Bundles the app into static files for production.
```

```
npm test
  Starts the test runner.
```

```
npm run eject
  Removes this tool and copies build dependencies, configuration files
  and scripts into the app directory. If you do this, you can't go back!
```

We suggest that you begin by typing:

```
cd client
npm start
```

```
Happy hacking!
```

```
ubuntu@ip-172-31-35-124:~/todo$
```

Next we run below code:

```
$ npm install concurrently --save-dev
$ npm install nodemon --save-dev
```

Now edit the package.json file with below:

```
"scripts": {
  "start": "node index.js",
  "start-watch": "nodemon index.js",
  "dev": "concurrently \"npm run start-watch\" \"cd client && npm start\"",
},
```

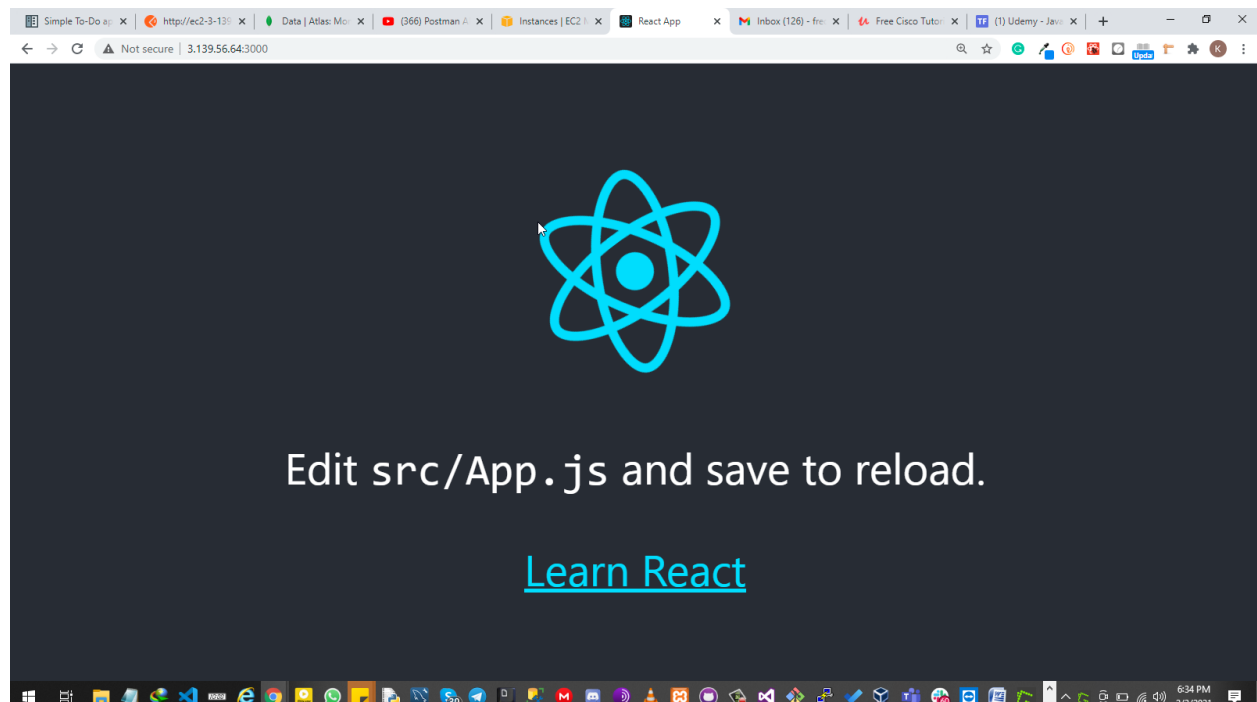
Configure Proxy

```
$ cd client
```

```
$ vim package.json
```

Add the key value pair in the package.json file `"proxy": "http://localhost:5500"`

Check the browser



Creating your React Components

```
$ cd client
```

```
$ cd src && mkdir components && cd components
```

```
$ touch Input.js ListTodo.js Todo.js
```

Inside input.js file

```
import React, { Component } from 'react';
import axios from 'axios';

class Input extends Component {

  state = {
    action: ""
  }

  addTodo = () => {
    const task = {action: this.state.action}

    if(task.action && task.action.length > 0){
      axios.post('/api/todos', task)
        .then(res => {
          if(res.data){
            this.props.getTodos();
            this.setState({action: ""})
          }
        })
        .catch(err => console.log(err))
    }else {
      console.log('input field required')
    }
  }

  handleChange = (e) => {
    this.setState({
      action: e.target.value
    })
  }

  render() {
    let { action } = this.state;
    return (
      <div>
        <input type="text" onChange={this.handleChange}
          value={action} />
        <button onClick={this.addTodo}>add todo</button>
      </div>
    )
  }
}
```

To make use of Axios, which is a Promise based HTTP client for the browser and node.js, you need to cd into your client from your terminal and run yarn add axios or npm install axios.

```
$ cd ..
```

```
$ cd ..
```

```
$ npm install axios
```

```
$ cd src/components
```

```
$ vi ListTodo.js
```

```
import React from 'react';

const ListTodo = ({ todos, deleteTodo }) => {

  return (
    <ul>
    {
      todos &&
      todos.length > 0 ?
      (
        todos.map(todo => {
          return (
            <li key={todo._id} onClick={() =>
              deleteTodo(todo._id)}>{todo.action}</li>
          )
        })
      )
      :
      (
        <li>No todo(s) left</li>
      )
    }
    </ul>
  )
}

export default ListTodo
```



```
import React, {Component} from 'react';
import axios from 'axios';

import Input from './Input';
import ListTodo from './ListTodo';

class Todo extends Component {

  state = {
    todos: []
  }

  componentDidMount(){
    this.getTodos();
  }

  getTodos = () => {
    axios.get('/api/todos')
      .then(res => {
        if(res.data){
          this.setState({
            todos: res.data
          })
        }
      })
      .catch(err => console.log(err))
  }

  deleteTodo = (id) => {
    axios.delete(`/api/todos/${id}`)
      .then(res => {
        if(res.data){
          this.getTodos()
        }
      })
      .catch(err => console.log(err))
  }

  render() {
    let { todos } = this.state;

    return(
      <div>
        <h1>My Todo(s)</h1>
        <Input getTodos={this.getTodos}/>
        <ListTodo todos={todos} deleteTodo={this.deleteTodo}/>
      </div>
    )
  }
}

export default Todo;
```

Delete the logo and adjust our `App.js` to look like this.

Move to the src folder

```
$ cd ..
```

```
$ vi app.js
```

```
import React from 'react';

import Todo from './components/Todo';
import './App.css';

const App = () => {
  return (
    <div className="App">
      <Todo />
    </div>
  );
}

export default App;
```

In the src directory open the `App.css`

```
$ vi app.css
```

```
.App {
text-align: center;
font-size: calc(10px + 2vmin);
width: 60%;
margin-left: auto;
margin-right: auto;
}

input {
height: 40px;
width: 50%;
border: none;
border-bottom: 2px #101113 solid;
background: none;
font-size: 1.5rem;
color: #787a80;
}

input:focus {
outline: none;
}

button {
width: 25%;
height: 45px;
border: none;
margin-left: 10px;
font-size: 25px;
background: #101113;
border-radius: 5px;
color: #787a80;
cursor: pointer;
}

button:focus {
outline: none;
}

ul {
list-style: none;
text-align: left;
padding: 15px;
background: #171a1f;
border-radius: 5px;
}

li {
padding: 15px;
font-size: 1.5rem;
margin-bottom: 15px;
background: #282c34;
border-radius: 5px;
overflow-wrap: break-word;
cursor: pointer;
}

@media only screen and (min-width: 300px) {
.App {
width: 80%;
}

input {
width: 100%
}

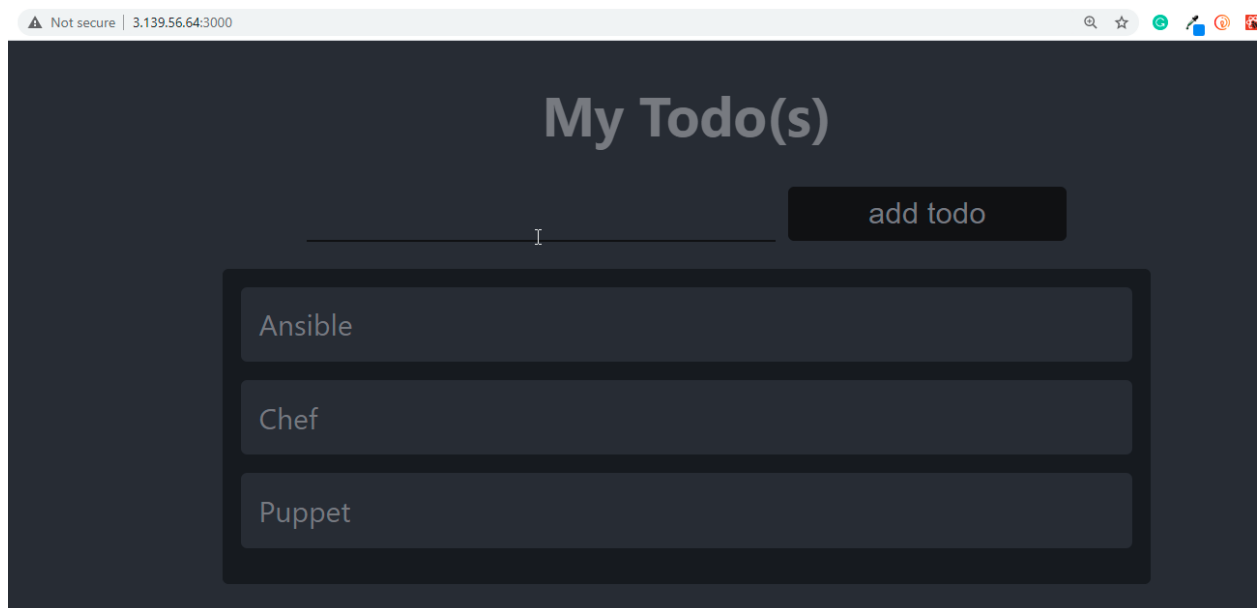
button {
width: 100%;
margin-top: 15px;
margin-left: 0;
}
}

@media only screen and (min-width: 640px) {
.App {
width: 60%;
,
```

```
body {  
  margin: 0;  
  padding: 0;  
  font-family: -apple-system, BlinkMacSystemFont, "Segoe UI", "Roboto", "Oxygen",  
  "Ubuntu", "Cantarell", "Fira Sans", "Droid Sans", "Helvetica Neue",  
  sans-serif;  
  -webkit-font-smoothing: antialiased;  
  -moz-osx-font-smoothing: grayscale;  
  box-sizing: border-box;  
  background-color: #282c34;  
  color: #787a80;  
}  
  
code {  
  font-family: source-code-pro, Menlo, Monaco, Consolas, "Courier New",  
  monospace;  
}
```

Edit index.css and add above code, next navigate to the todo directory and run

```
$ npm run dev
```



Then refresh and check your browser.

You should get above output when you visit the browser - A simple To-Do App, deployed on a MERN stack

Hope this was informative.

PS: Remember to terminate your EC2 instance.

