CLOUD COMPUTING (CS G527)

MINI PROJECT REPORT

GROUP – 5

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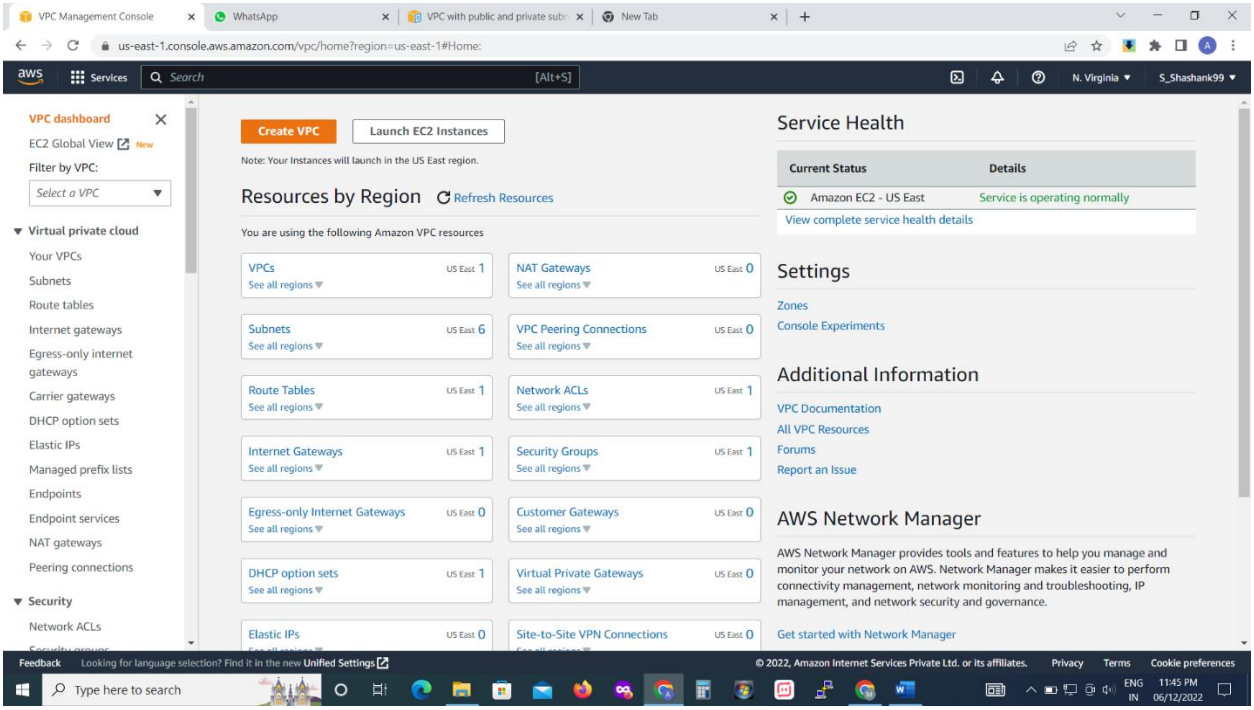
Phase 1:

We created a web application using MERN stack with React acting as front-end and MongoDB Atlas as database server.

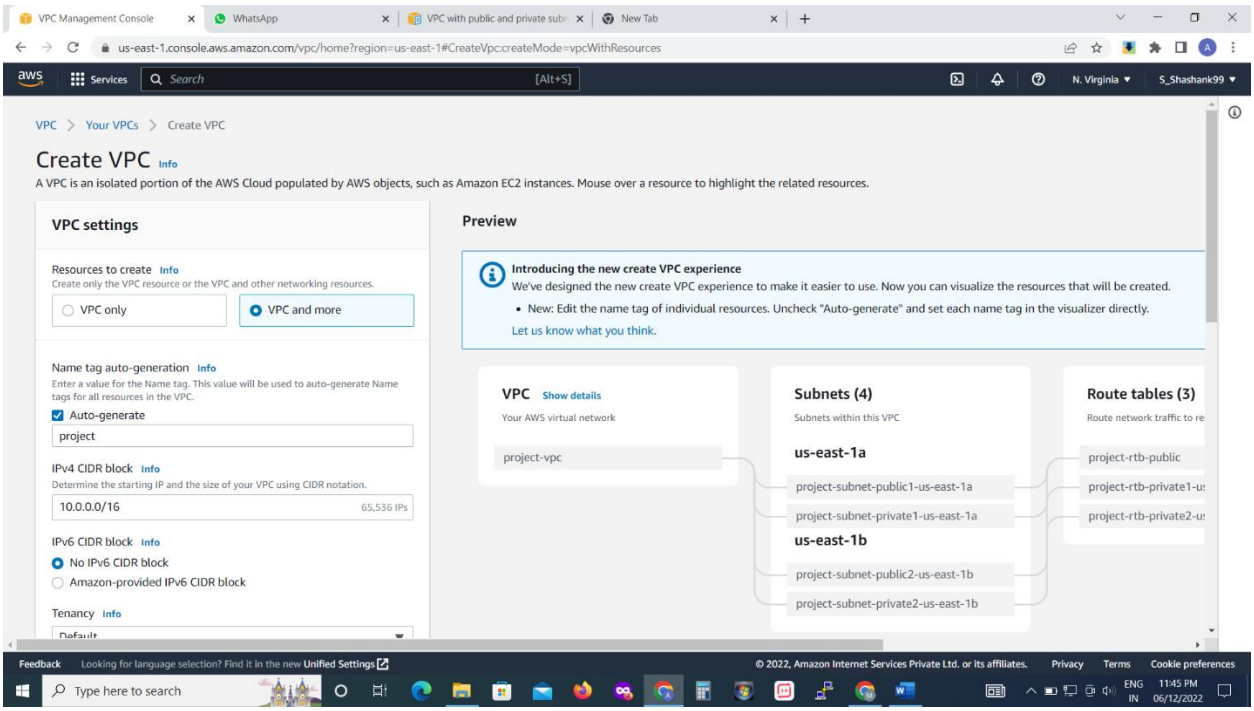
Phase 2:

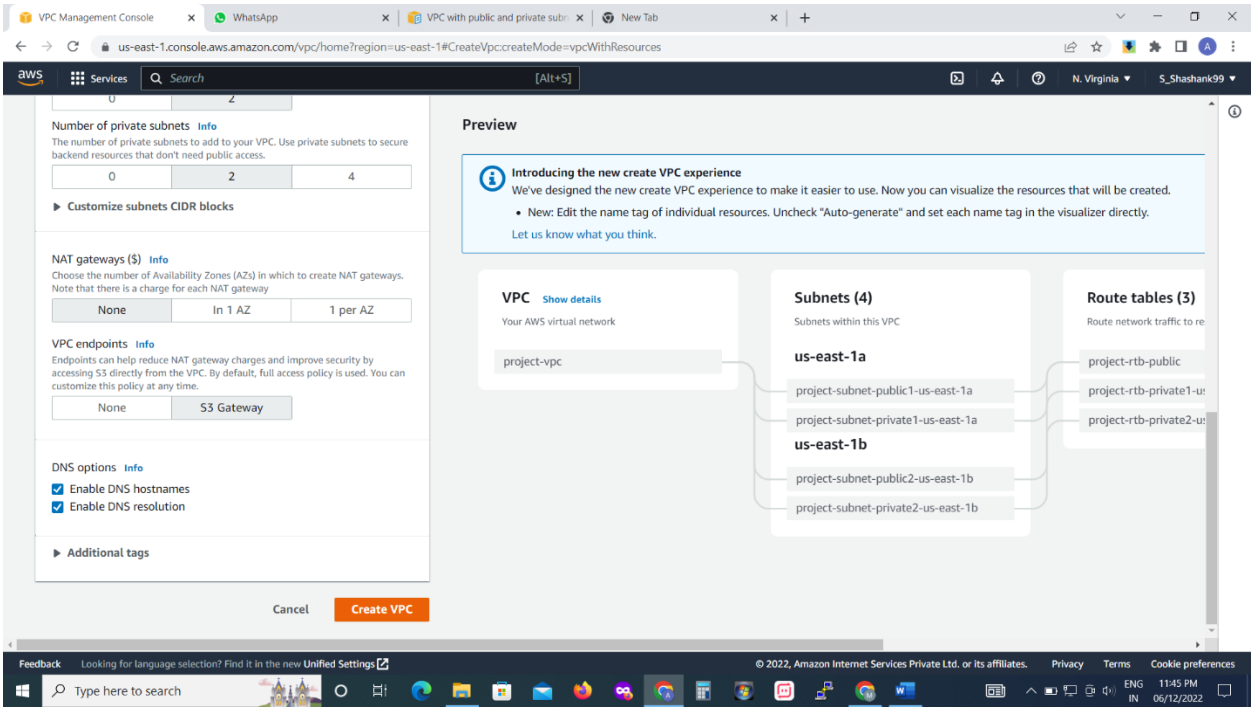
Step 1: <u>Creating VPC</u>

- Login to AWS console. Go to VPC console and select Create VPC.

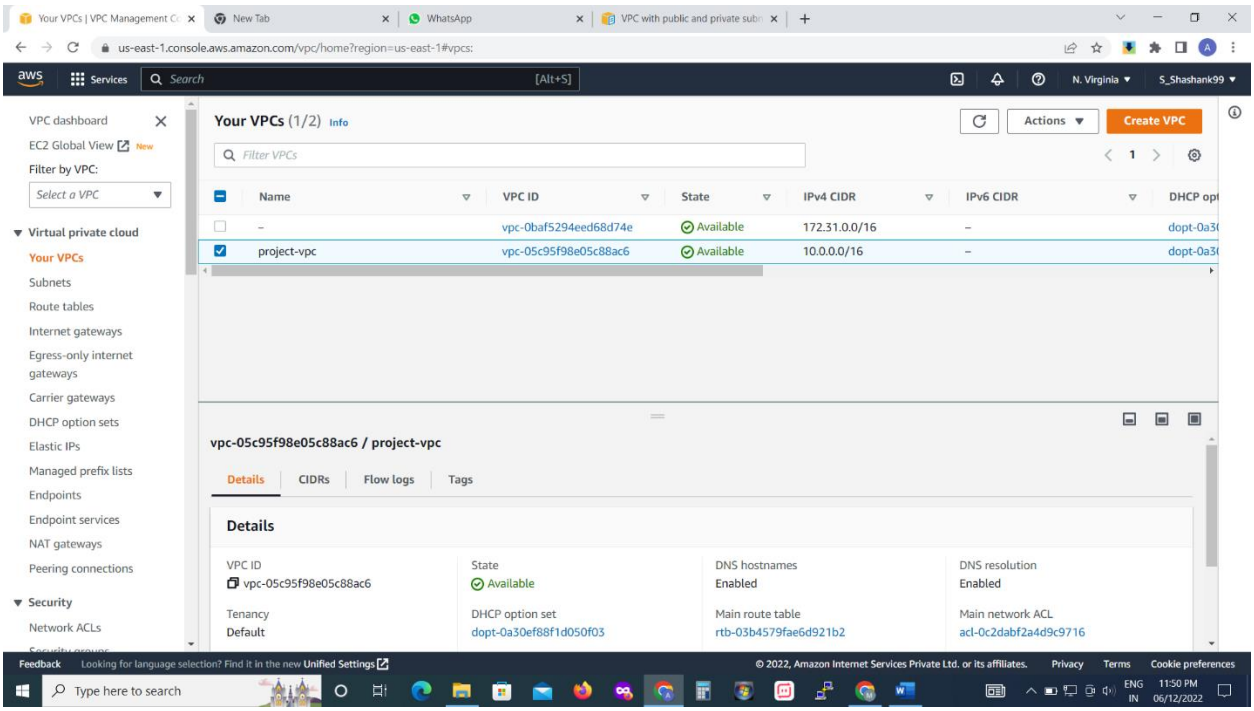


- Provide VPC name to your new VPC. Select VPC and more option and select the Auto-generate option and click on Create to create your VPC.



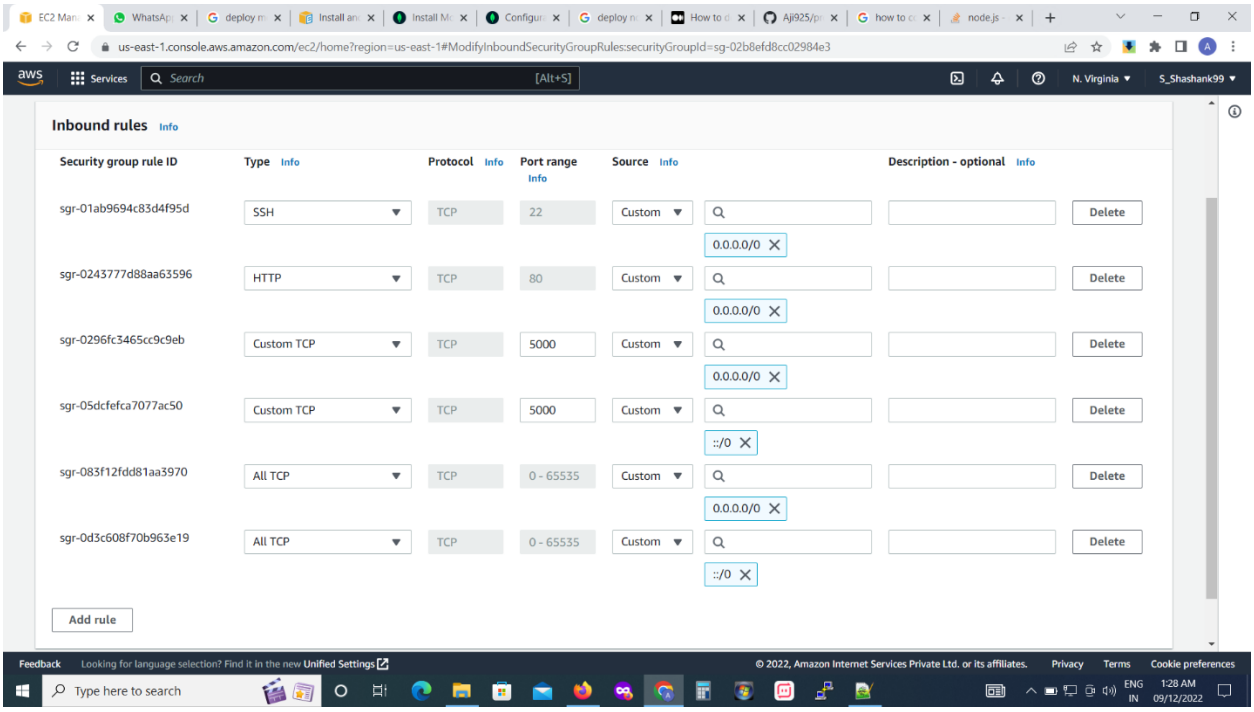


- Created VPC can be viewed in Your VPCs tab.

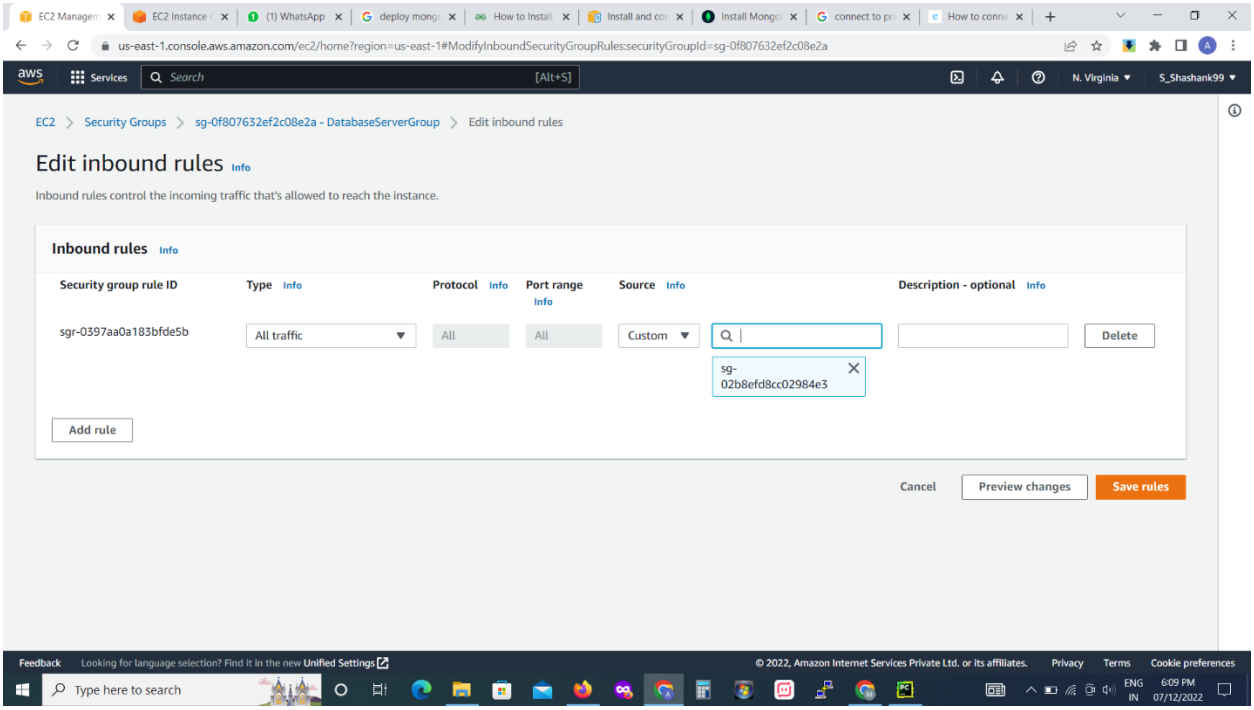


Step 2: Create Security Groups for your VPC which will be used later for your Web Server instance and Database Server instance and enable auto-assign public IPv4 address for the public subnet you will use for the Web Server from the VPC created.

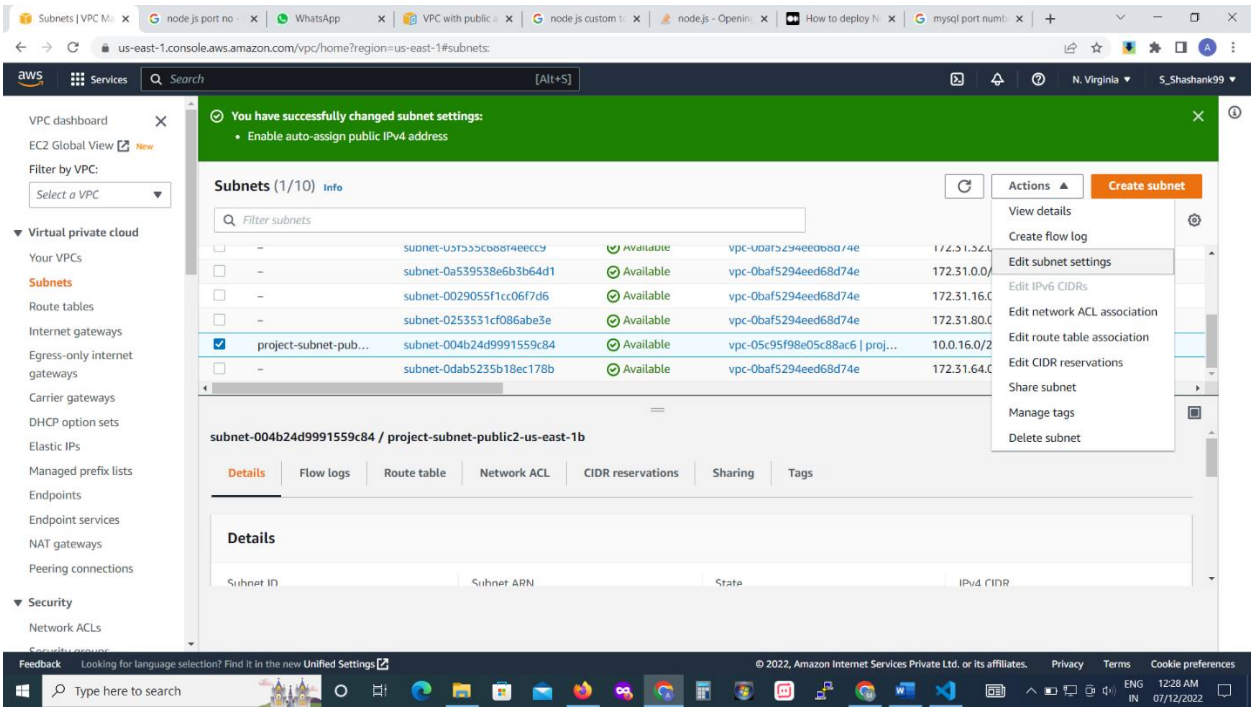
- Under VPC console scroll and go to Security Groups tab and create New Security Group for your Web Server EC2 instance and add appropriate Inbound Rules.



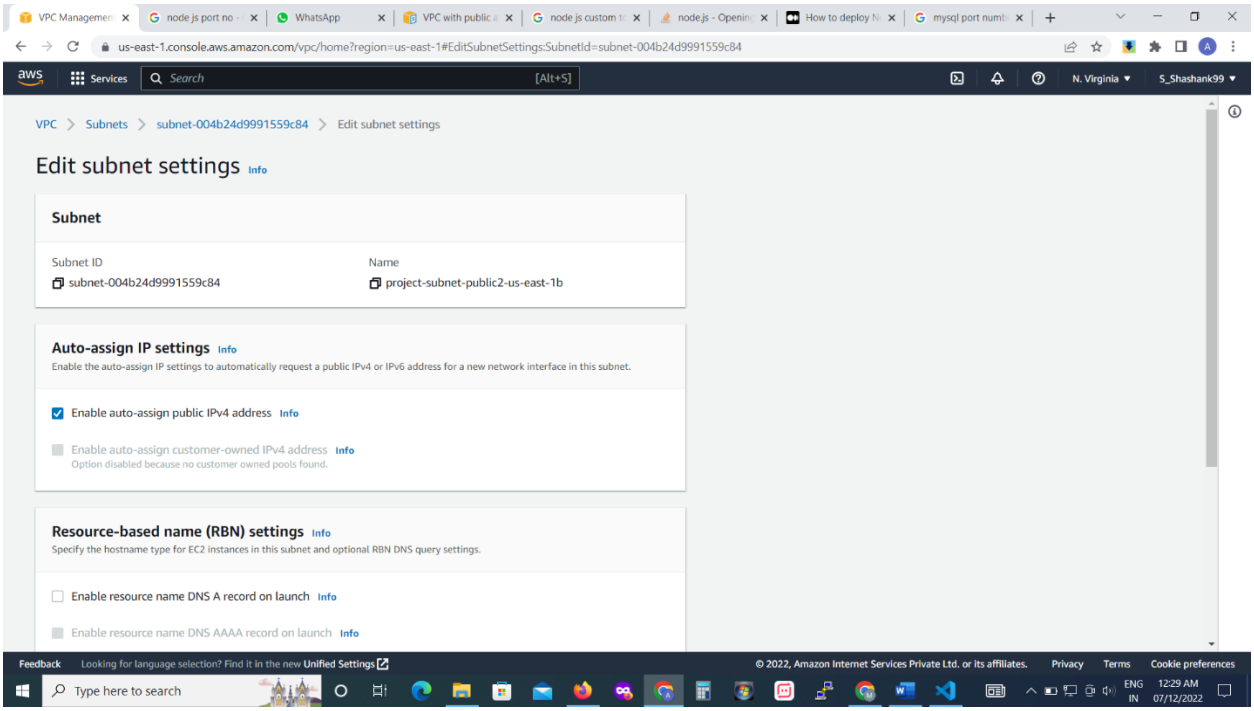
- Under VPC console scroll and go to Security Groups tab and create New Security Group for your Database Server EC2 instance and add appropriate Inbound Rules. For source add the security group created for Web Server.



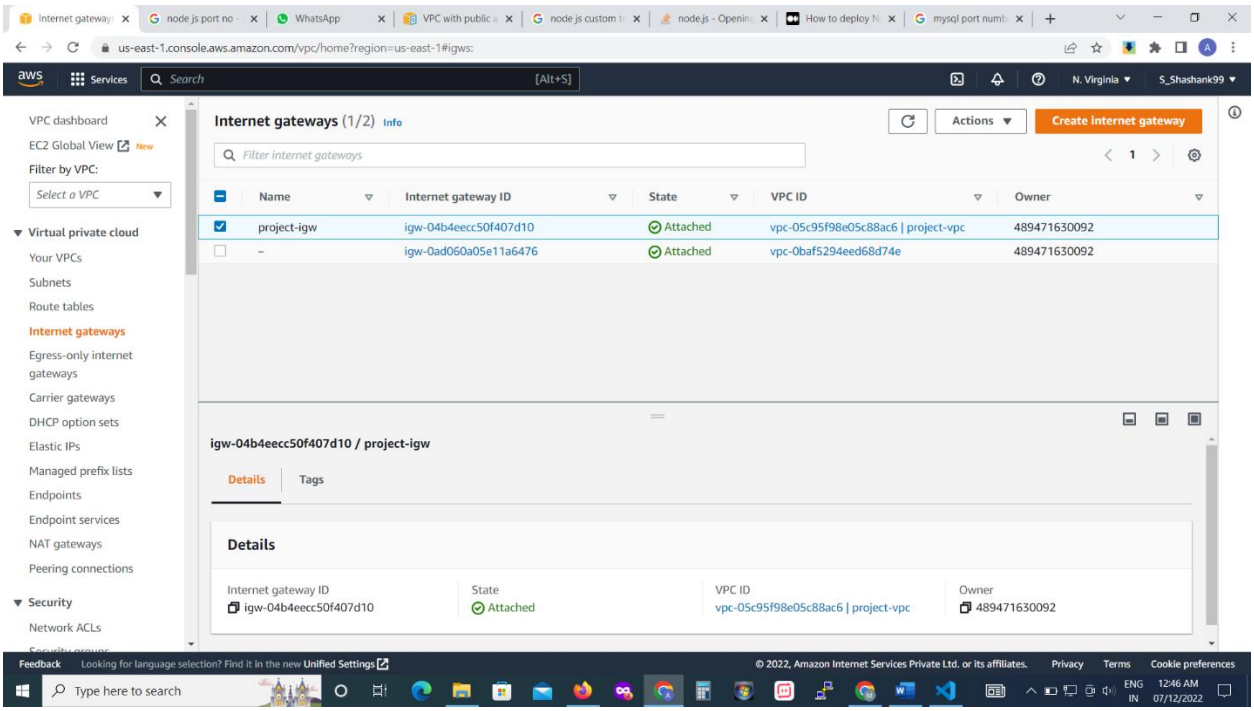
- Go to Subnets tab in VPC console and select the public subnet in which you will create your Web Server. Go to Actions and select Edit Subnet settings.



- Select the Enable auto-assign public IPv4 address and save changes.

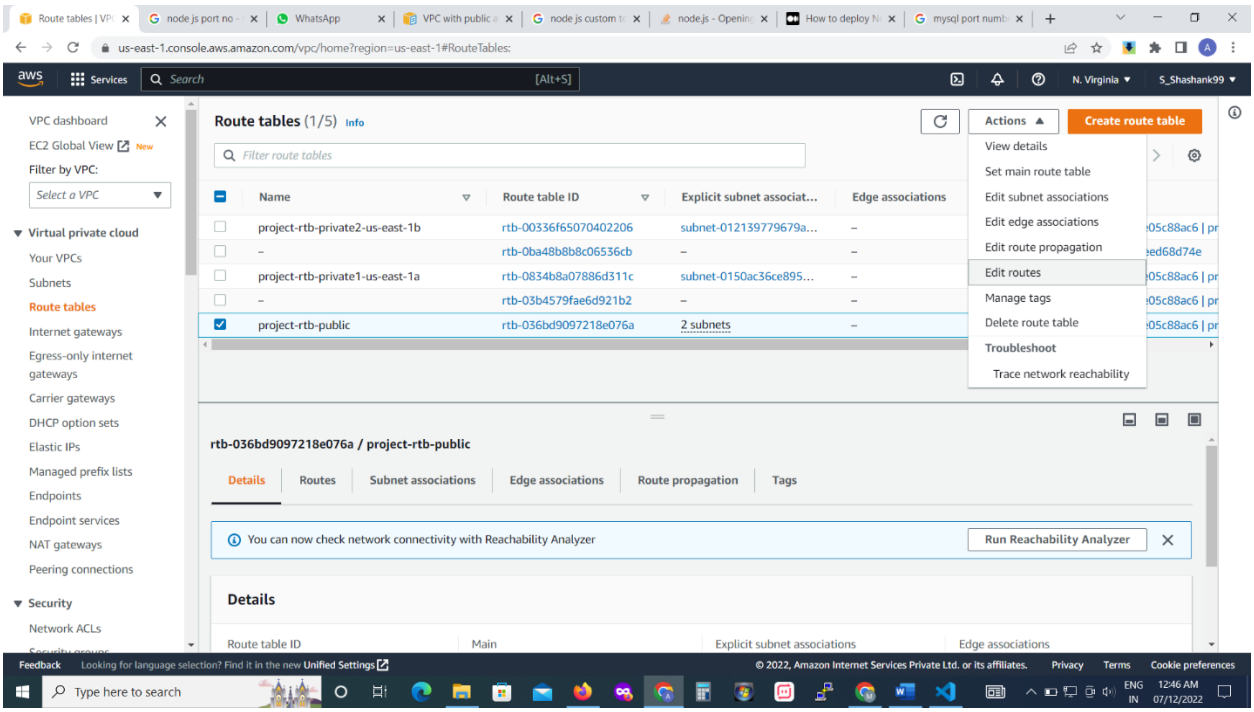


<u>Step 3</u>: Create Internet Gateway (IGW) for your VPC from the respective tab.

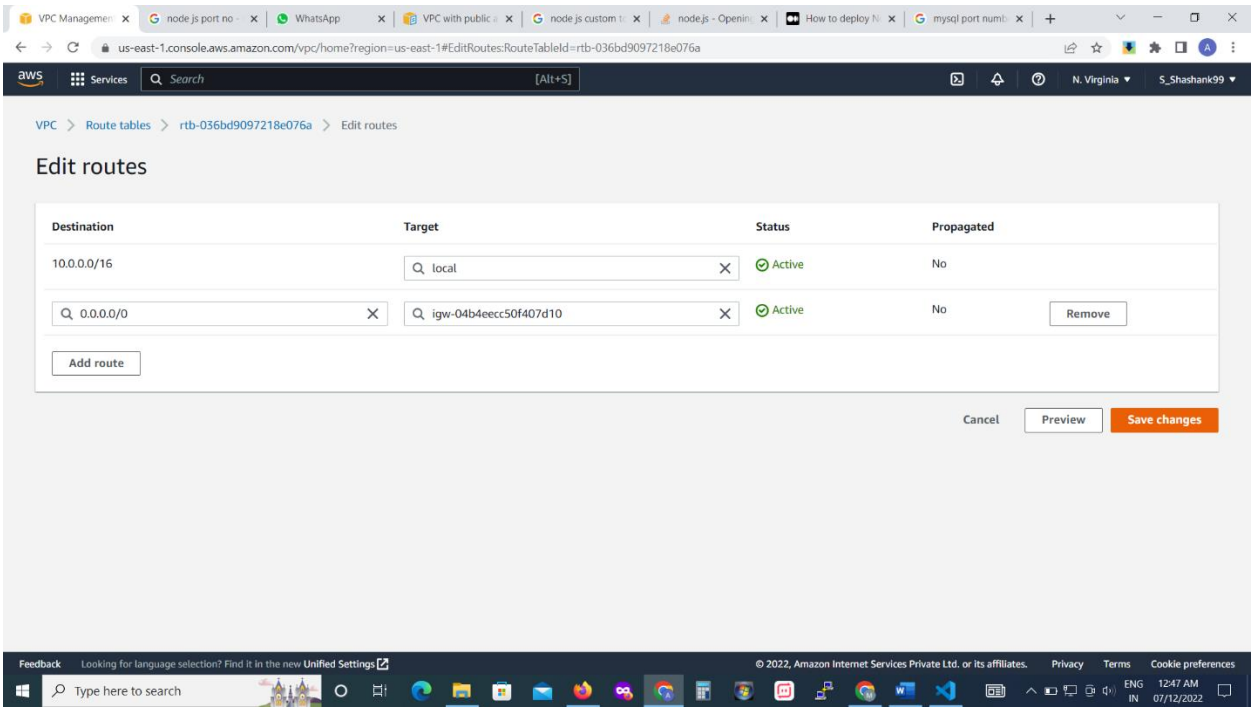


Step 4: Configure Route Tables

- Go to Route Tables tab and select the public route table for your VPC and select Edit routes.

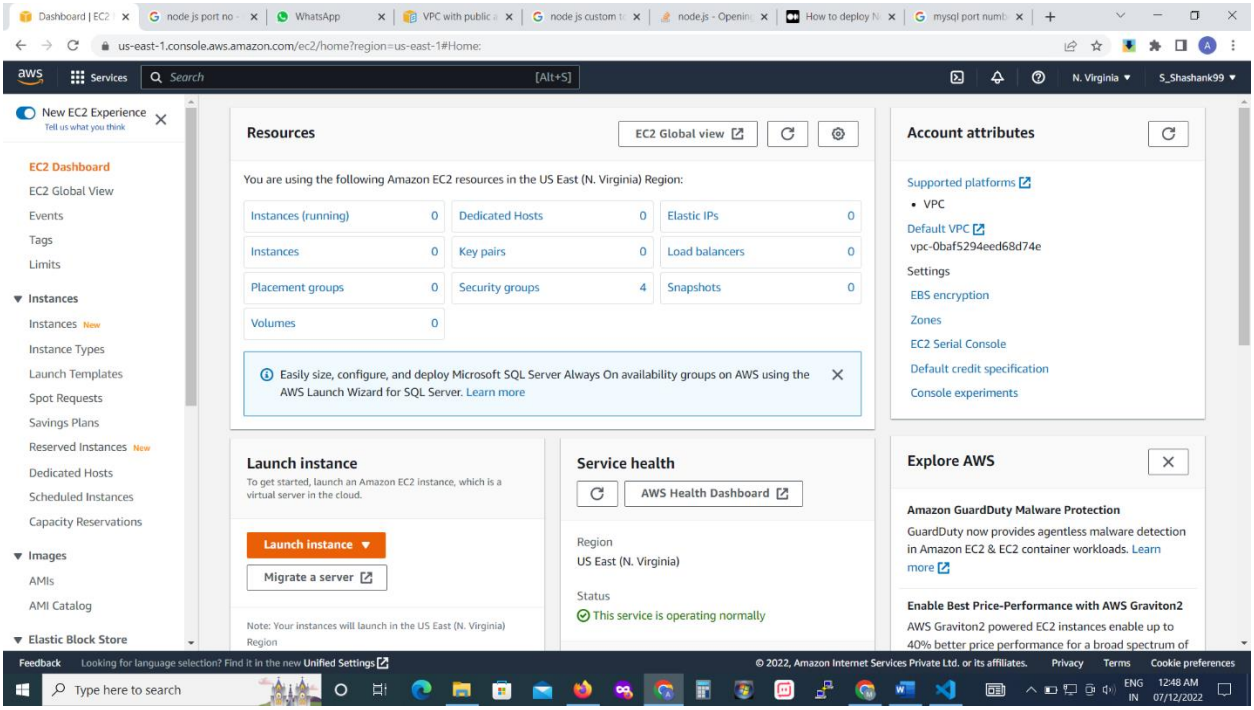


- Add destination as 0.0.0.0/0 and target as your IGW created for VPC and click on Save changes.



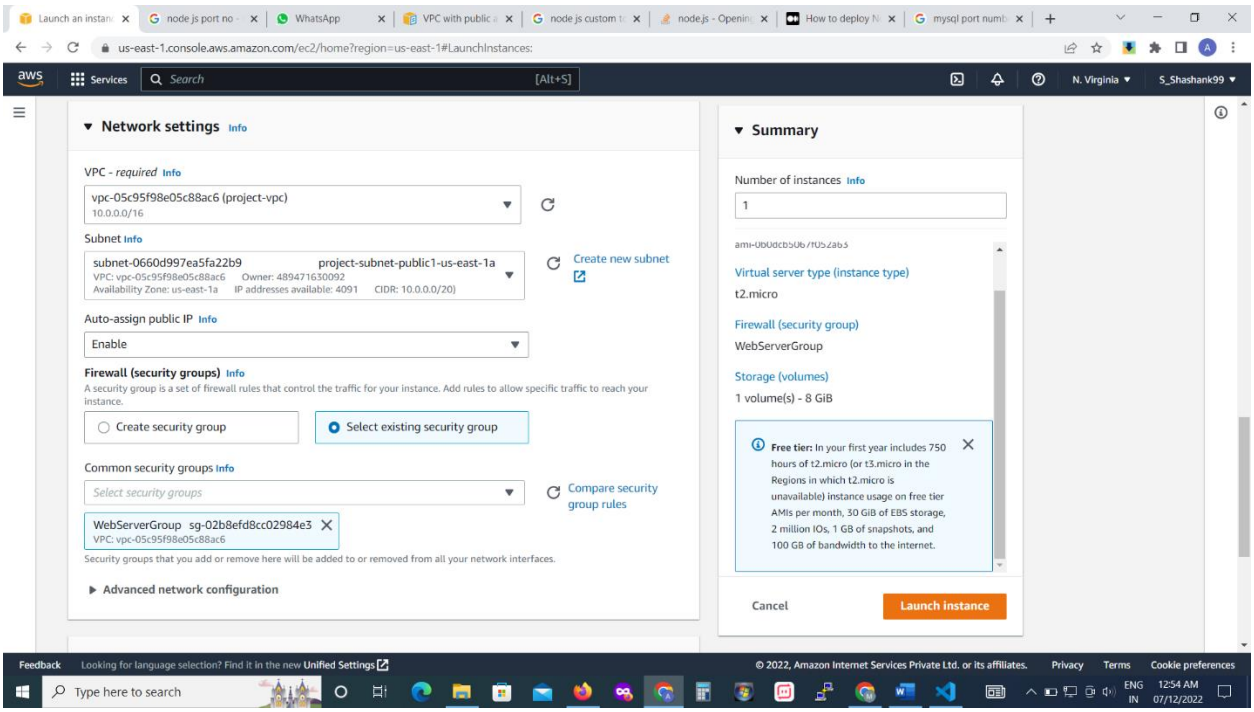
Step 5: Create public EC2 instance for your Web Server

- Go to EC2 dashboard from your AWS console and click on Launch Instance to create your Web Server EC2 instance.



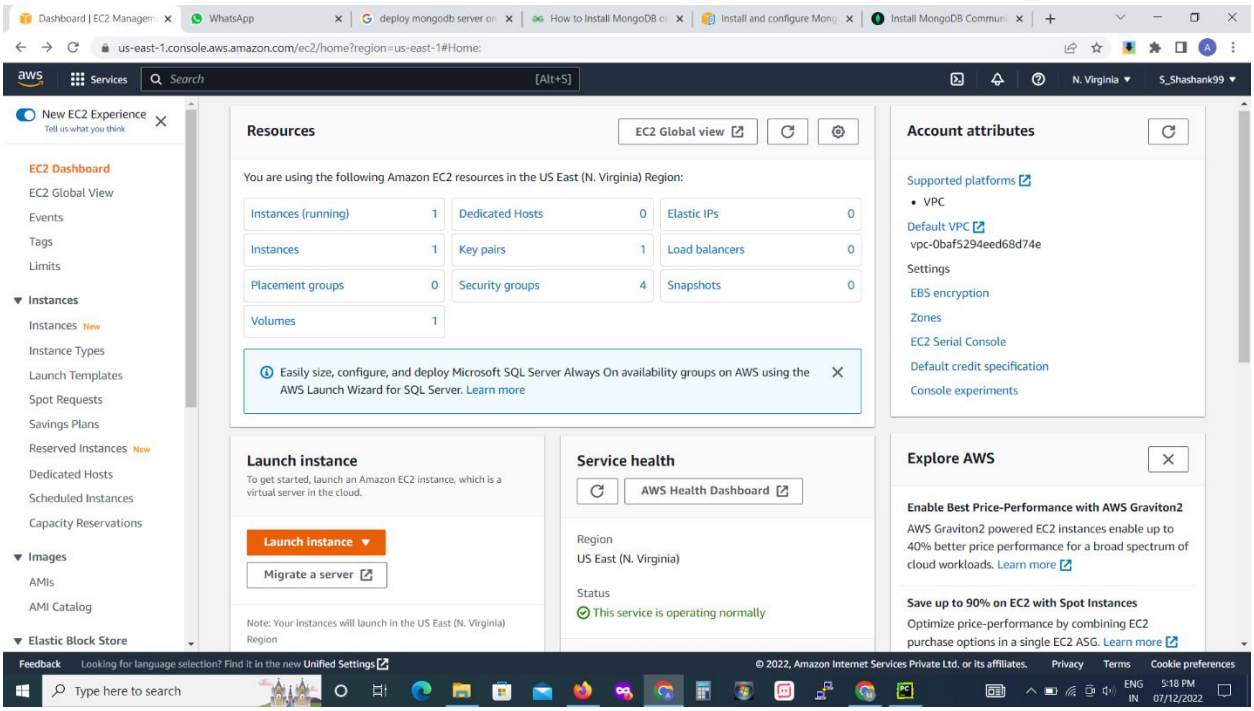
- Select Amazon Linux 2 AMI and instance type t2.micro.
- Create a key pair for your Web Server EC2 instance.

- Edit Network Settings and add created VPC information and select existing Security Groups option and select the Security Group created for your Web Server in your VPC. Enable Auto-assign public IP.
- Click on Launch Instance to create the Web Server EC2 instance.

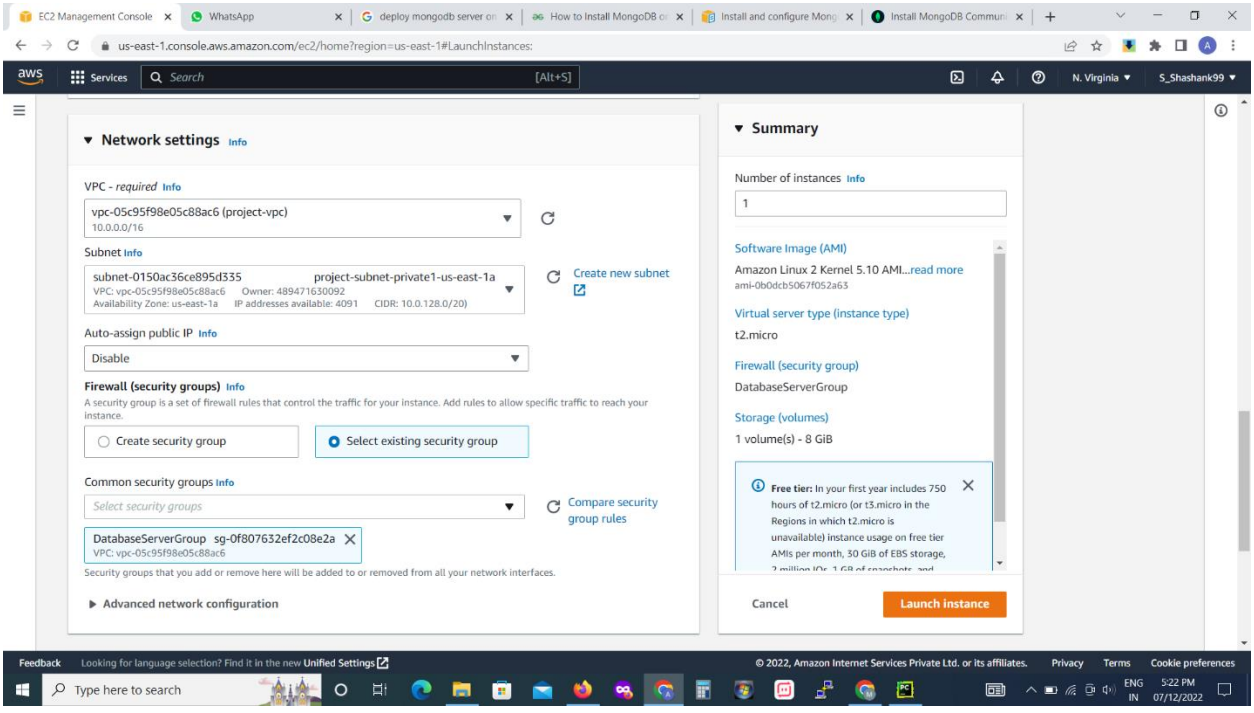


Step 6: Create private EC2 instance for your Database Server

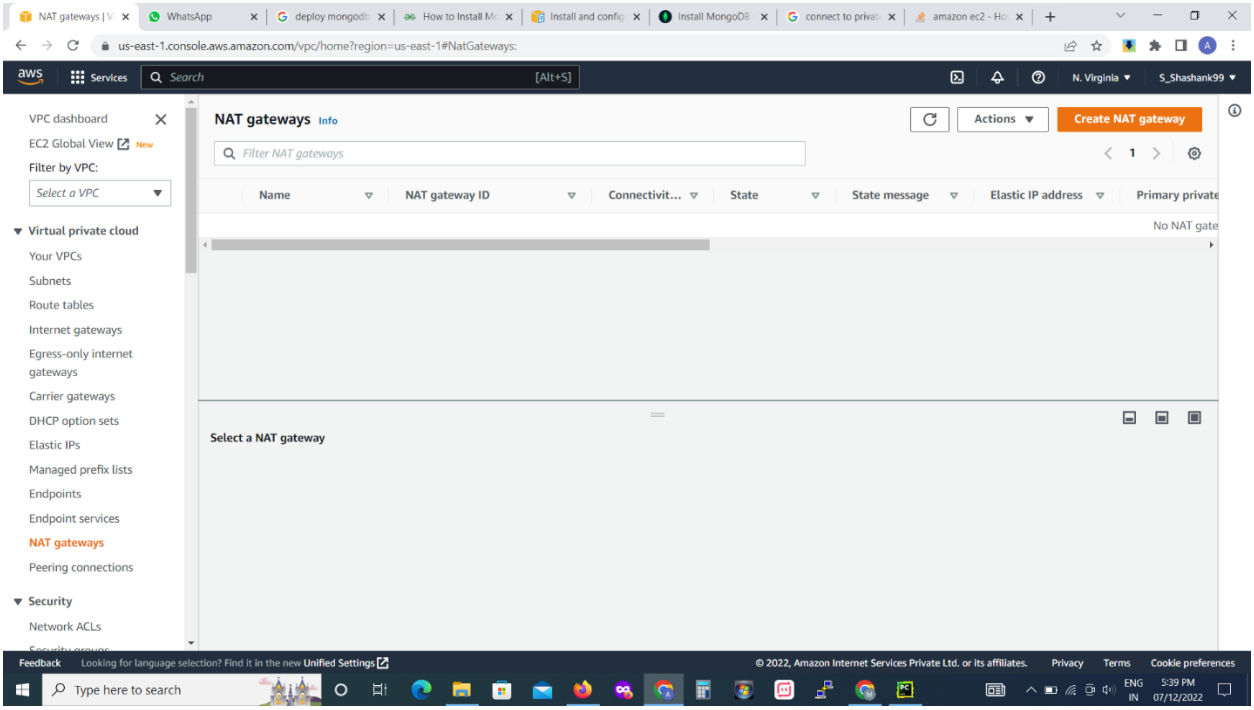
- Go to EC2 dashboard from your AWS console and click on Launch Instance to create your Web Server EC2 instance.



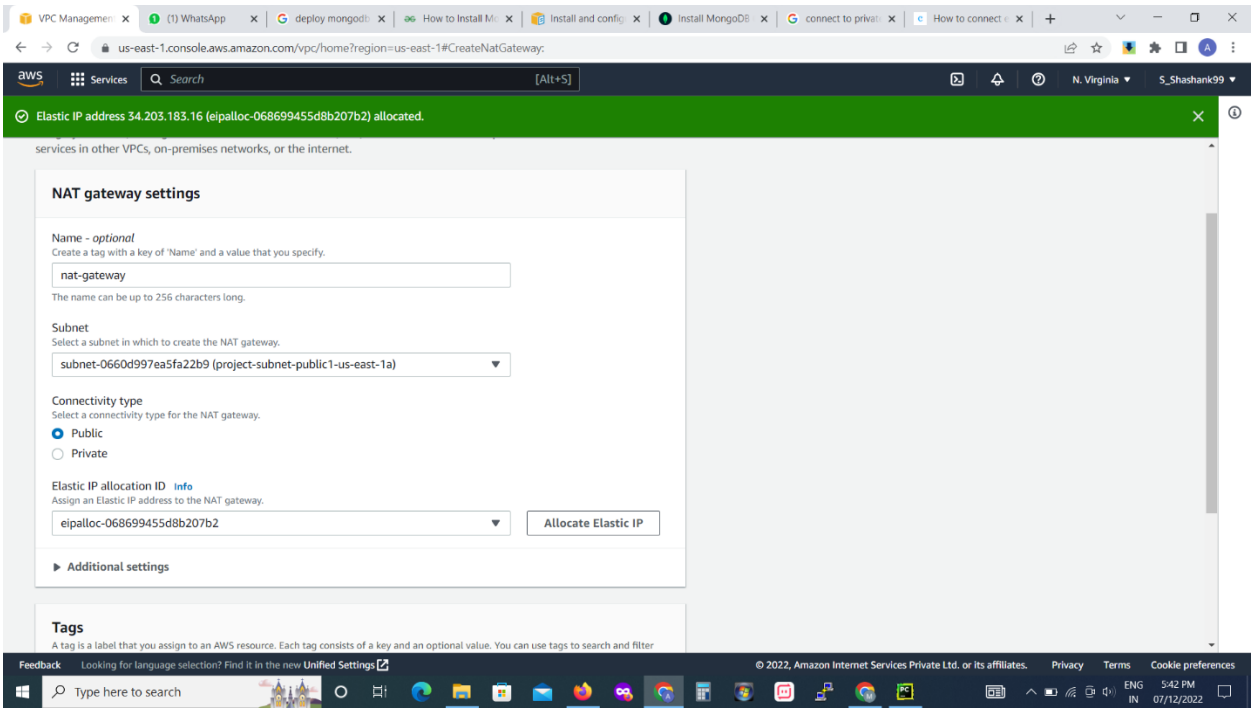
- Select Amazon Linux 2 AMI and instance type t2.micro.
- Create a key pair for your Database Server EC2 instance.
- Edit Network Settings and add created VPC information and select existing Security Groups option and select the Security Group created for your Database Server in your VPC. Disable Auto-assign public IP to create a private EC2 instance.
- Click on Launch Instance to create the Database Server EC2 instance.

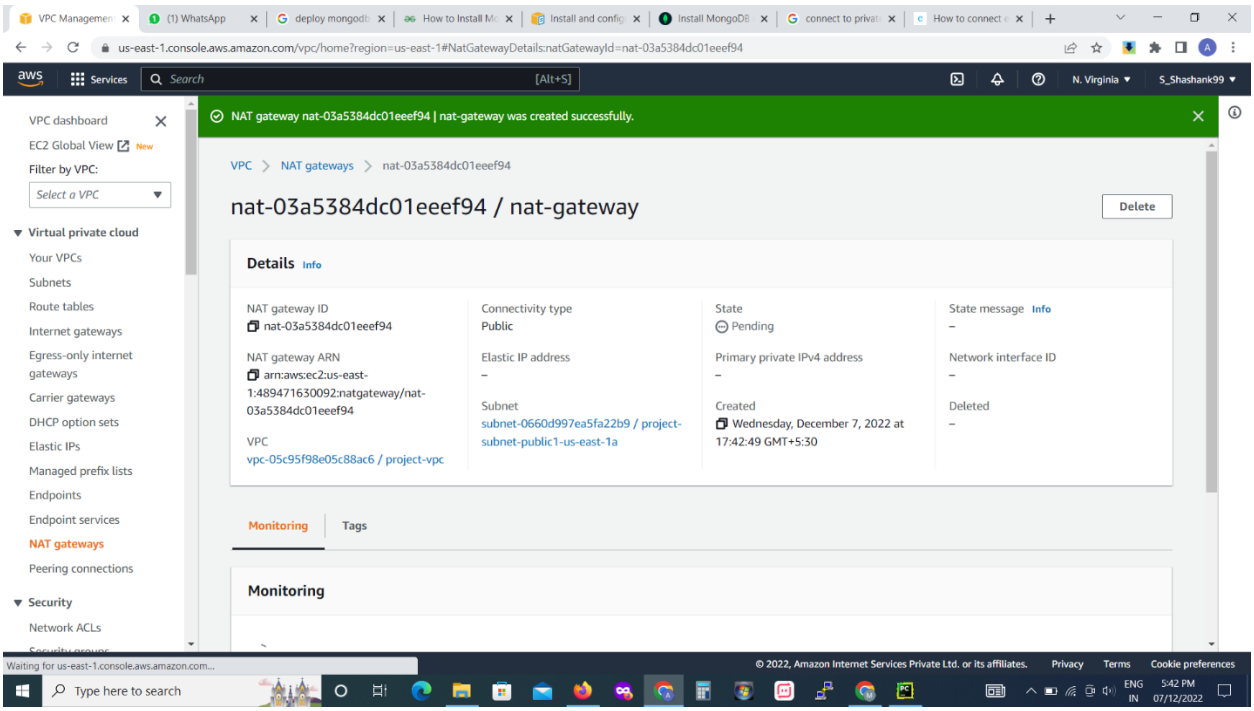


Step 7: Create NAT gateway in public subnet to connect public EC2 instance to private EC2 instance in private subnet.

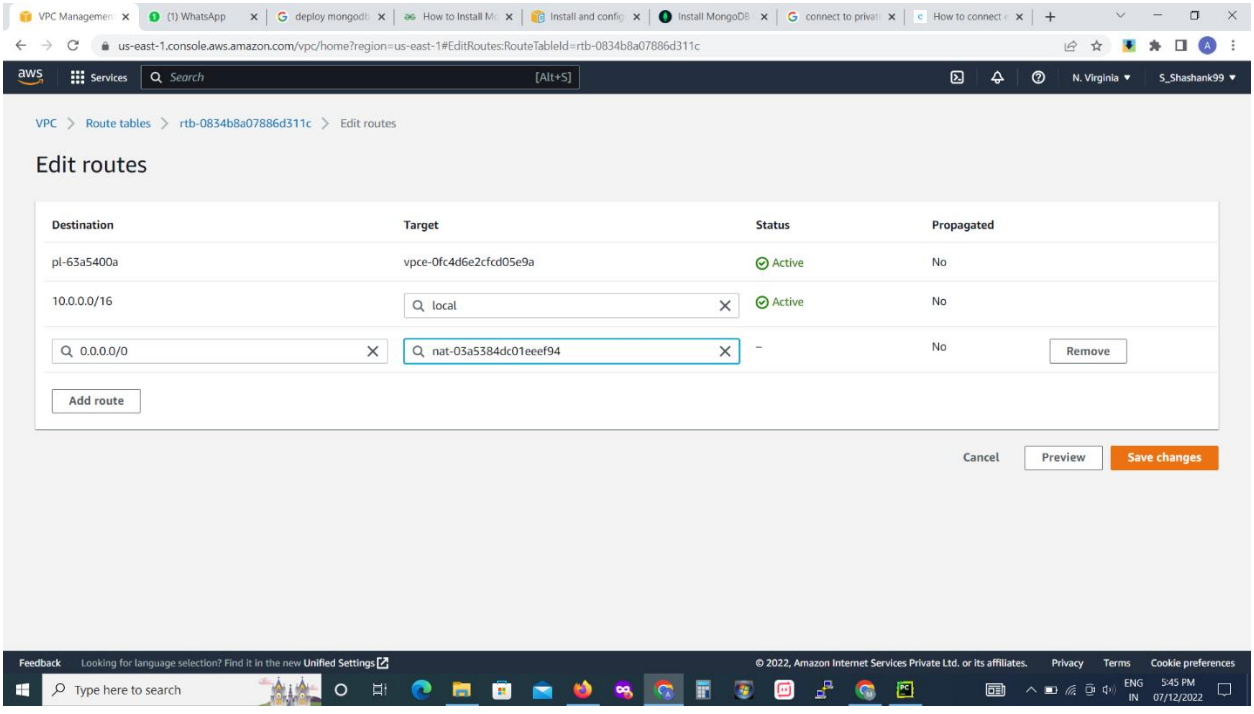


- Give a name for your NAT Gateway and select the public subnet in which public EC2 instance was created earlier.
- Assign Elastic IP address and add appropriate tags.



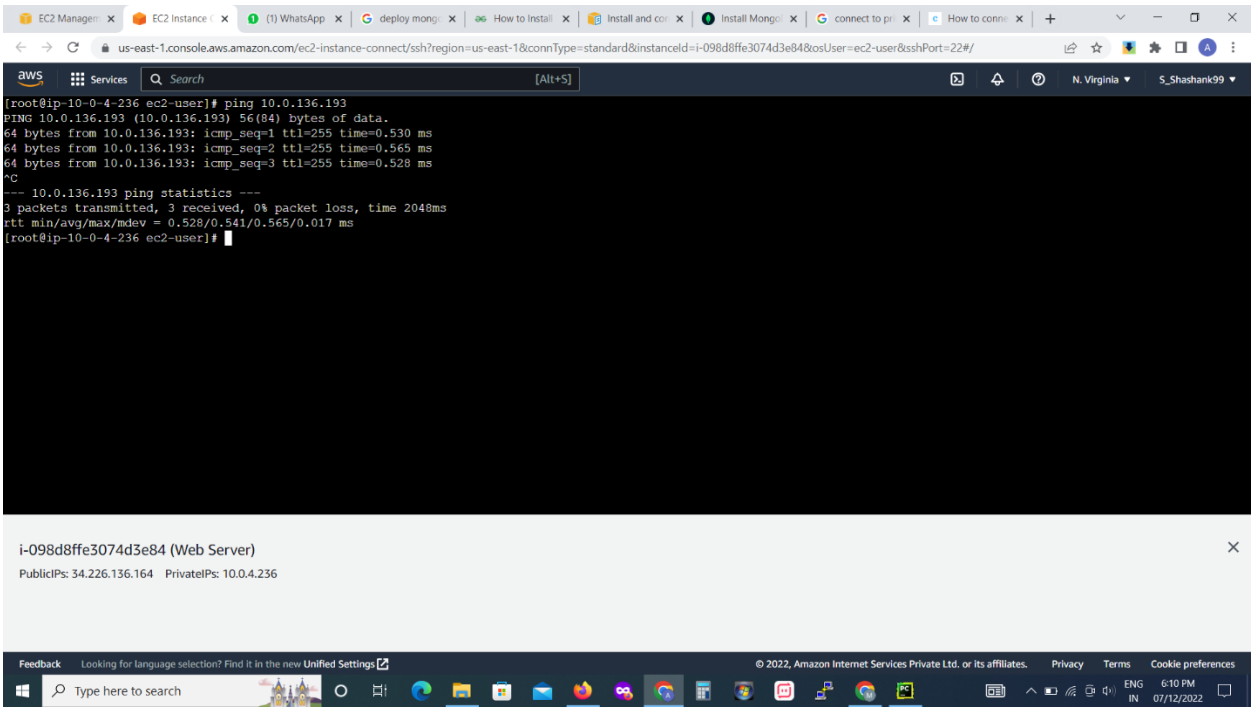


- Configure private Route table for the NAT Gateway by adding destination as 0.0.0.0/0 and target as your NAT Gateway.



Step 8: Connect to Web Server EC2 instance and install default packages.

Step 9: Check connectivity to private Database Server EC2 instance.



Step 10: Connect to your private Database Server EC2 instance.

- Create and save private key of Database Server.(Here file name given is db-server.pem)
  - nano db-server.pem
- Change permissions of the private key file
  - chmod 400 db-server.pem
- Use SSH to connect to the private server
  - ssh ec2-user@<private_ip of db-server> -i db-server.pem
- This will connect your public EC2 web server to your private Database Server.

Step 11: Install MongoDB on your Database Server

- Refer official MongoDB site for installation steps https://www.mongodb.com/docs/manual/tutorial/install-mongodb-on-amazon/
- Configure the package management system(yum).
  - sudo nano /etc/yum.repos.d/mongodb-org-6.0.repo
- Add below lines to the repo file and save it.

[mongodb-org-6.0]

name=MongoDB Repository

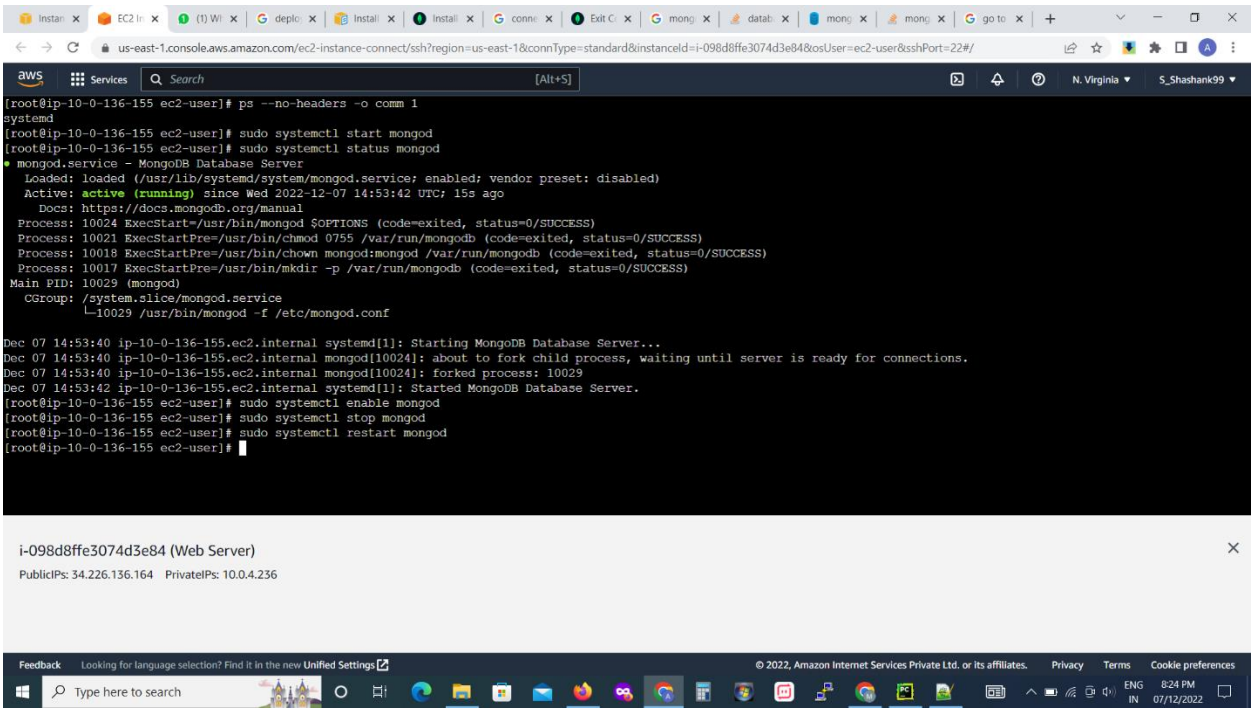
baseurl=https://repo.mongodb.org/yum/amazon/2/mongodb-org/6.0/x86_64/

gpgcheck=1

enabled=1

gpgkey=https://www.mongodb.org/static/pgp/server-6.0.asc

- Execute the following command to install latest stable version of MongoDB
  - sudo yum install -y mongodb-org
- Check which init system your platform uses and proceed further accordingly.
- Execute following command to check init system
  - ps --no-headers -o comm 1
- It returned systemd so follow systemd related further steps.
- To start MongoDB execute following command
  - sudo systemctl start mongod
- This will start MongoDB to verify whether MongoDB has started successfully execute following command
  - sudo systemctl status mongod
- To ensure MongoDB will start following a system reboot run following command
  - sudo systemctl enable mongod
- You can now begin using MongoDB by using mongosh command.



Step 12: Configure bindIp in the mongod.conf file. (Encountered problems)

- By default MongoDB server mongod only accepts loopback connections from IP address 127.0.0.1 (localhost). To allow connection from anywhere else in your VPC we need to edit the bindIp value.
- Run the following command to access the mongod.conf file
  - sudo nano /etc/mongod.conf
- Edit the mongod.conf file and look for following lines

```
# network interfaces
net:
  port: 27017
  bindIp: 127.0.0.1  # Enter 0.0.0.0,:: to bind to all IPv4 and IPv6 addresses or, alternatively, use the net.
```

- Modify the bindIp line so it looks like the following (Edit according to solution provided following line will give error as mongod.service failed)

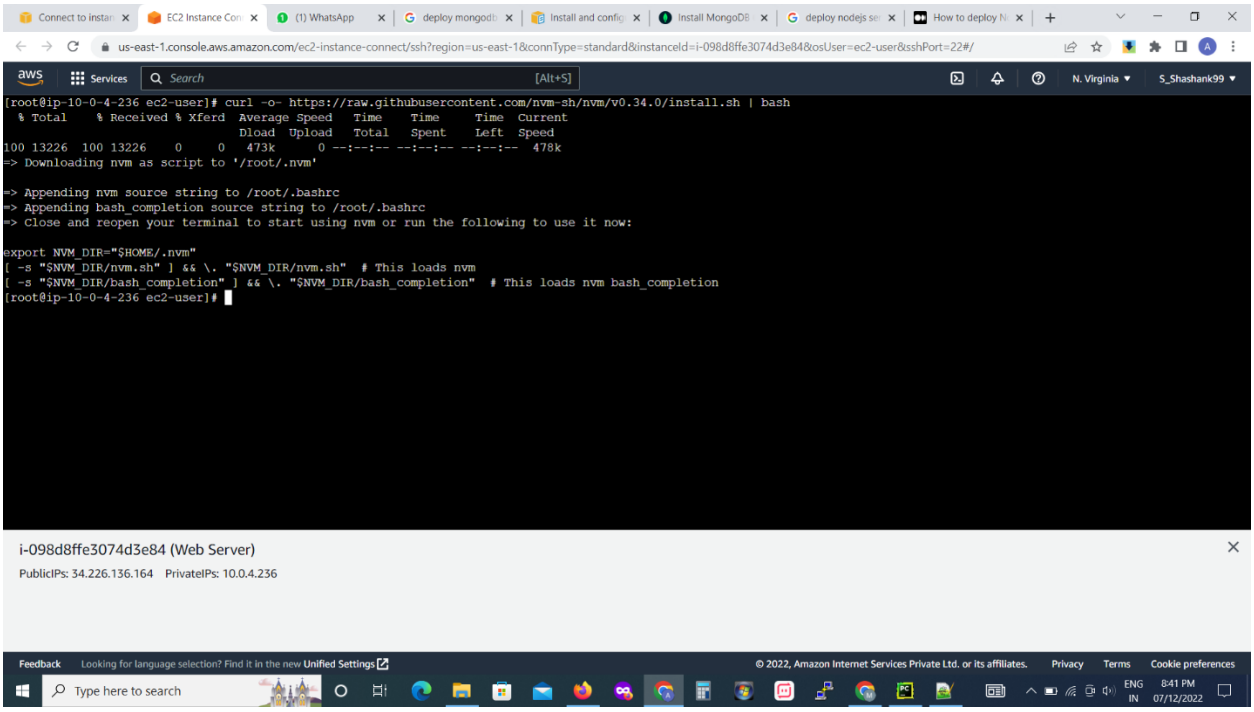
```
bindIp: public-dns-name
```

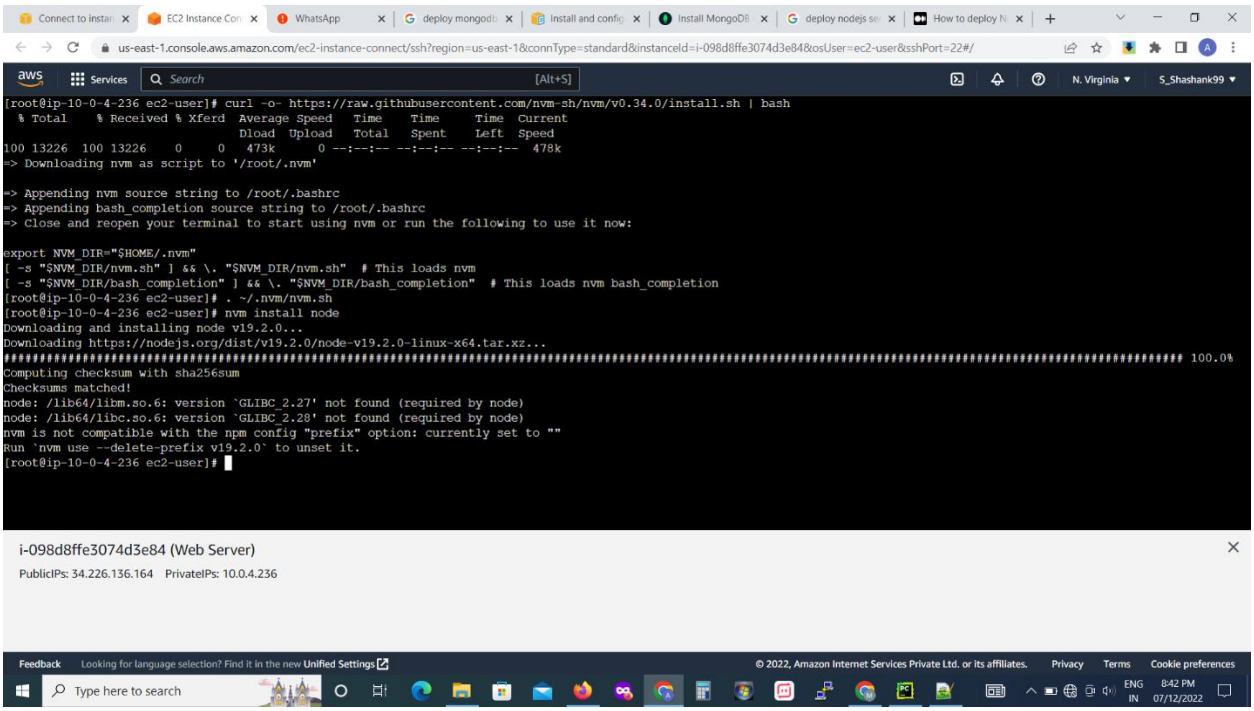
- Replace public-dns-name with actual public DNS name
- Save the mongod.conf file and restart mongod.
  - sudo service mongod restart
- After executing above line mongod.service failed message was displayed with an exit code referring to an un-recoverable error. So we had to terminate the private EC2 instance and recreate the instance by following same steps.
- After recreating the private EC2 Database Server and installing MongoDB the bindIp field should be edited as follows:
  - Following is the solution for bindIp problem. Maximum editing of this value in the mongod.conf file is 1(one).
  - bindIp: <private_ip of web server>
- Save the mongod.conf file and restart mongod.
  - sudo service mongod restart
- The modification is done successfully and mongod.service won't fail. If failure occurred terminate current instance again and repeat the installation steps with editing the bindIp in same way as shown in solution.
- After successfully restarting mongod you can execute MongoDB queries from your Web Server.

Step 13: Installing NodeJS and required dependencies on Web Server.

- Connect to your public EC2 Web Server instance.
- To install node version manager (nvm) run following command
  - curl -o- https://raw.githubusercontent.com/nvm-sh/nvm/v0.34.0/install.sh | bash

- Activate nvm by typing the following command
  - . ~/.nvm/nvm.sh
- Use nvm to install latest stable version of Node.js
  - nvm install 16
- To test that node and npm are properly installed run following commands.
  - node -v or node --version
  - npm -v or npm --version



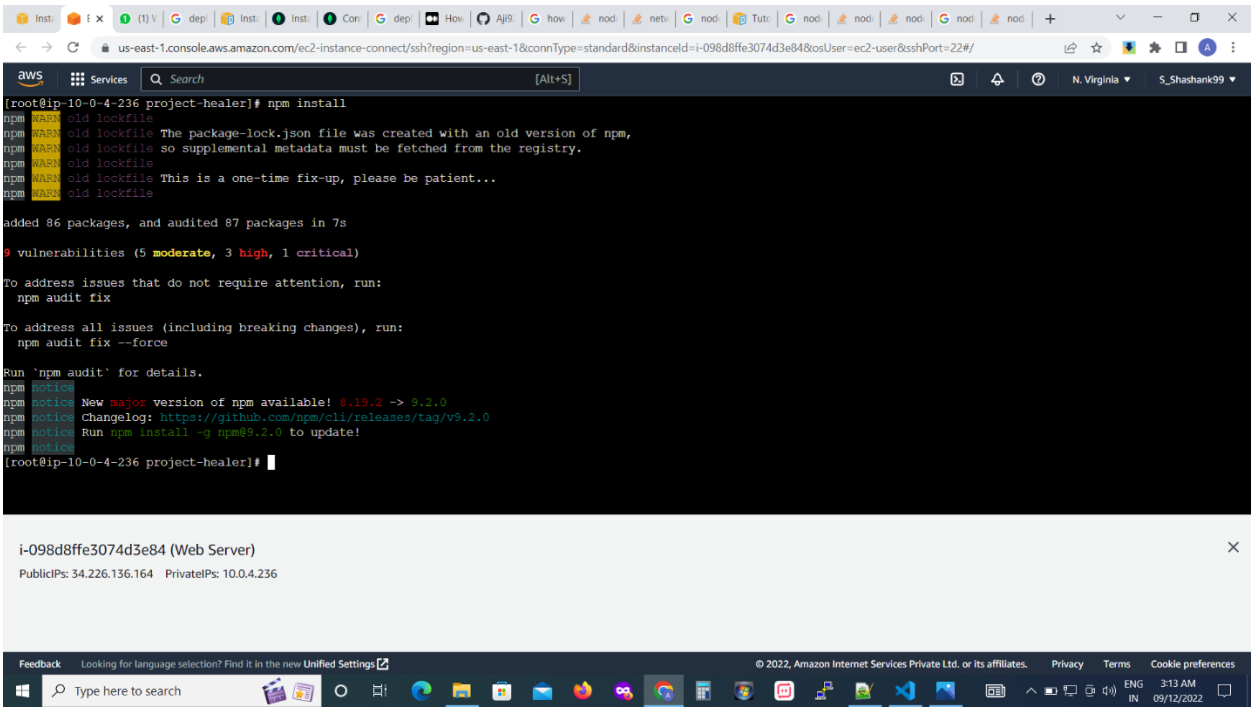


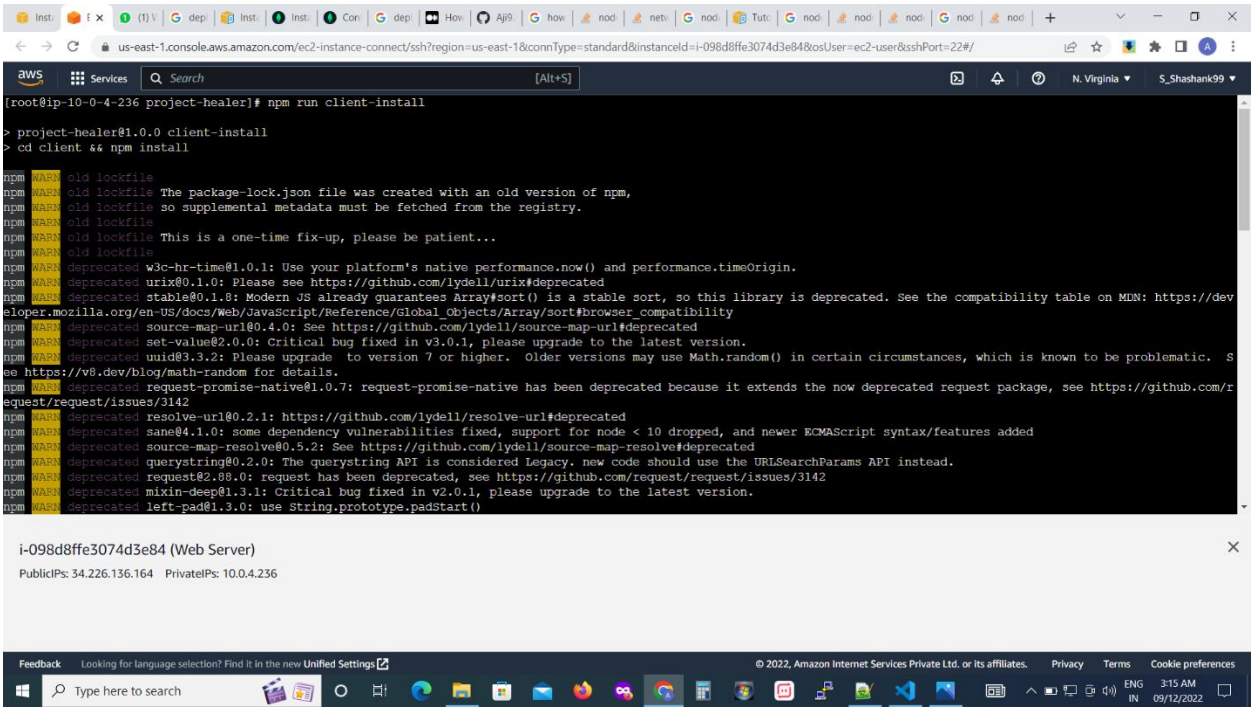
Step 14: Installing Git and clone repository from GitHub

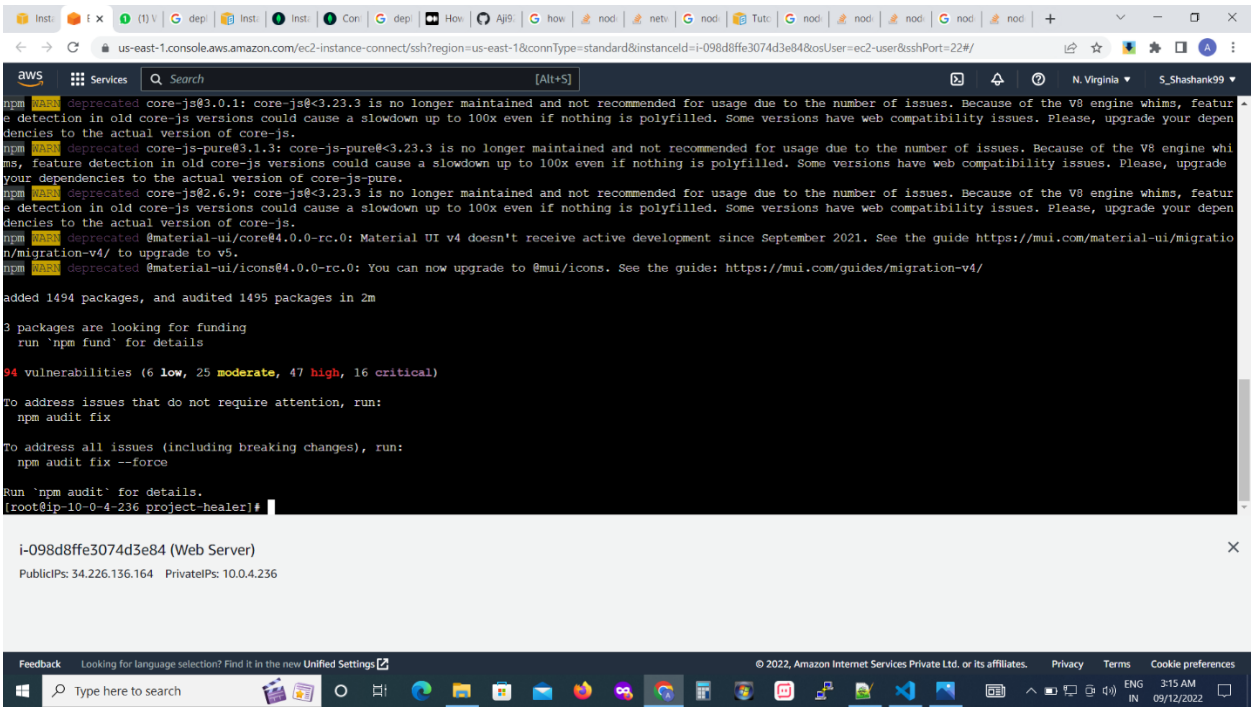
- To install git run following command
  - sudo yum install git -y
- To verify if git has been properly installed run following command
  - git –version
- To clone the code repository from GitHub run following command
  - git clone https://github.com/Aji925/project-healer.git
- This will create a folder with name project-healer which will contain your code files.

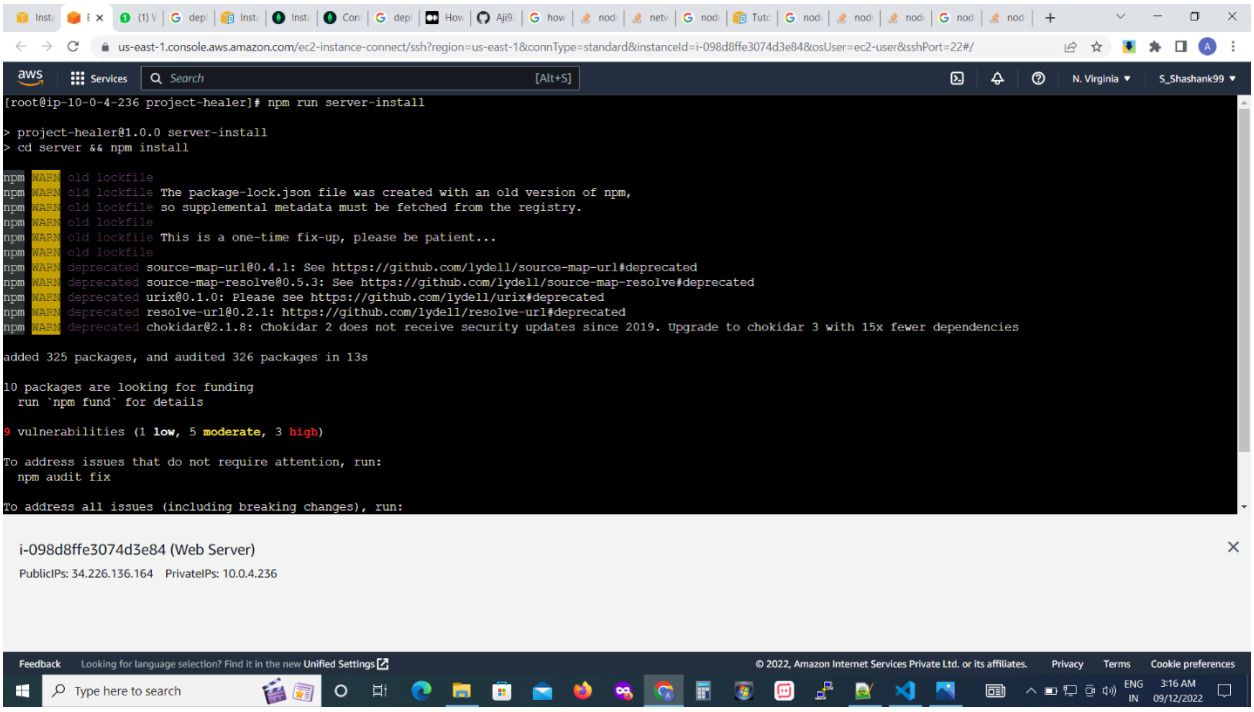
Step 15: Installing required dependencies for the Node.js application cloned from GitHub.

- To install node dependencies and any other project dependencies run following set of commands.
  - cd project-healer
  - npm install 16
  - npm install
  - npm run client-install
  - npm run server-install
- This will install all the required dependencies.


us-east-1.console.aws.amazon.com/ec2-instance-connect/ssh?region=us-east-1&connType=standard&instanceId=i-098d8ffe3074d3e84&osUser=ec2-user&sshPort=22#/
aws
Services
Search
[Alt+S]
N. Virginia
S_Shashank99
[root@ip-10-0-4-236 project-healer]# npm install
npm WARN old lockfile
npm WARN old lockfile The package-lock.json file was created with an old version of npm,
npm WARN old lockfile so supplemental metadata must be fetched from the registry.
npm WARN old lockfile
npm WARN old lockfile This is a one-time fix-up, please be patient...
npm WARN old lockfile
added 86 packages, and audited 87 packages in 7s
9 vulnerabilities (5 moderate, 3 high, 1 critical)
To address issues that do not require attention, run:
npm audit fix
To address all issues (including breaking changes), run:
npm audit fix --force
Run `npm audit` for details.
npm notice
npm notice New major version of npm available! 8.19.2 -> 9.2.0
npm notice Changelog: https://github.com/npm/cli/releases/tag/v9.2.0
npm notice Run npm install -g npm@9.2.0 to update!
npm notice
[root@ip-10-0-4-236 project-healer]#
i-098d8ffe3074d3e84 (Web Server)
PublicIPs: 34.226.136.164 PrivateIPs: 10.0.4.236
Feedback
Looking for language selection? Find it in the new Unified Settings
© 2022, Amazon Internet Services Private Ltd. or its affiliates.
Privacy
Terms
Cookie preferences
Type here to search
ENG
IN
3:13 AM
09/12/2022


us-east-1.console.aws.amazon.com/ec2-instance-connect/ssh?region=us-east-1&connType=standard&instanceId=i-098d8ffe3074d3e84&osUser=ec2-user&sshPort=22#/
aws
Services
Search
[Alt+S]
N. Virginia
S_Shashank99
[root@ip-10-0-4-236 project-healer]# npm run client-install
> project-healer@1.0.0 client-install
> cd client && npm install
npm WARN old lockfile
npm WARN old lockfile The package-lock.json file was created with an old version of npm,
npm WARN old lockfile so supplemental metadata must be fetched from the registry.
npm WARN old lockfile
npm WARN old lockfile This is a one-time fix-up, please be patient...
npm WARN old lockfile
npm WARN deprecated w3c-hr-time@1.0.1: Use your platform's native performance.now() and performance.timeOrigin.
npm WARN deprecated urix@0.1.0: Please see https://github.com/lydell/urix#deprecated
npm WARN deprecated stable@0.1.8: Modern JS already guarantees Array#sort() is a stable sort, so this library is deprecated. See the compatibility table on MDN: https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Array/sort#browser_compatibility
npm WARN deprecated source-map-url@0.4.0: See https://github.com/lydell/source-map-url#deprecated
npm WARN deprecated set-value@2.0.0: Critical bug fixed in v3.0.1, please upgrade to the latest version.
npm WARN deprecated uuid@3.3.2: Please upgrade to version 7 or higher. Older versions may use Math.random() in certain circumstances, which is known to be problematic. See https://v8.dev/blog/math-random for details.
npm WARN deprecated request-promise-native@1.0.7: request-promise-native has been deprecated because it extends the now deprecated request package, see https://github.com/request/request/issues/3142
npm WARN deprecated resolve-url@0.2.1: https://github.com/lydell/resolve-url#deprecated
npm WARN deprecated sane@4.1.0: some dependency vulnerabilities fixed, support for node < 10 dropped, and newer ECMAScript syntax/features added
npm WARN deprecated source-map-resolve@0.5.2: See https://github.com/lydell/source-map-resolve#deprecated
npm WARN deprecated querystring@0.2.0: The querystring API is considered Legacy. new code should use the URLSearchParams API instead.
npm WARN deprecated request@2.88.0: request has been deprecated, see https://github.com/request/request/issues/3142
npm WARN deprecated mixin-deep@1.3.1: Critical bug fixed in v2.0.1, please upgrade to the latest version.
npm WARN deprecated left-pad@1.3.0: use String.prototype.padStart()
i-098d8ffe3074d3e84 (Web Server)
PublicIPs: 34.226.136.164 PrivateIPs: 10.0.4.236
Feedback
Looking for language selection? Find it in the new Unified Settings
© 2022, Amazon Internet Services Private Ltd. or its affiliates.
Privacy
Terms
Cookie preferences
Type here to search
ENG
IN
3:15 AM
09/12/2022





Step 16: Modifying Database URL in application for connecting it to private EC2 Database Server instead of MongoDB Atlas

- Run the following command in the project-healer directory to edit the server.js file present in server directory.

- sudo nano server/server.js

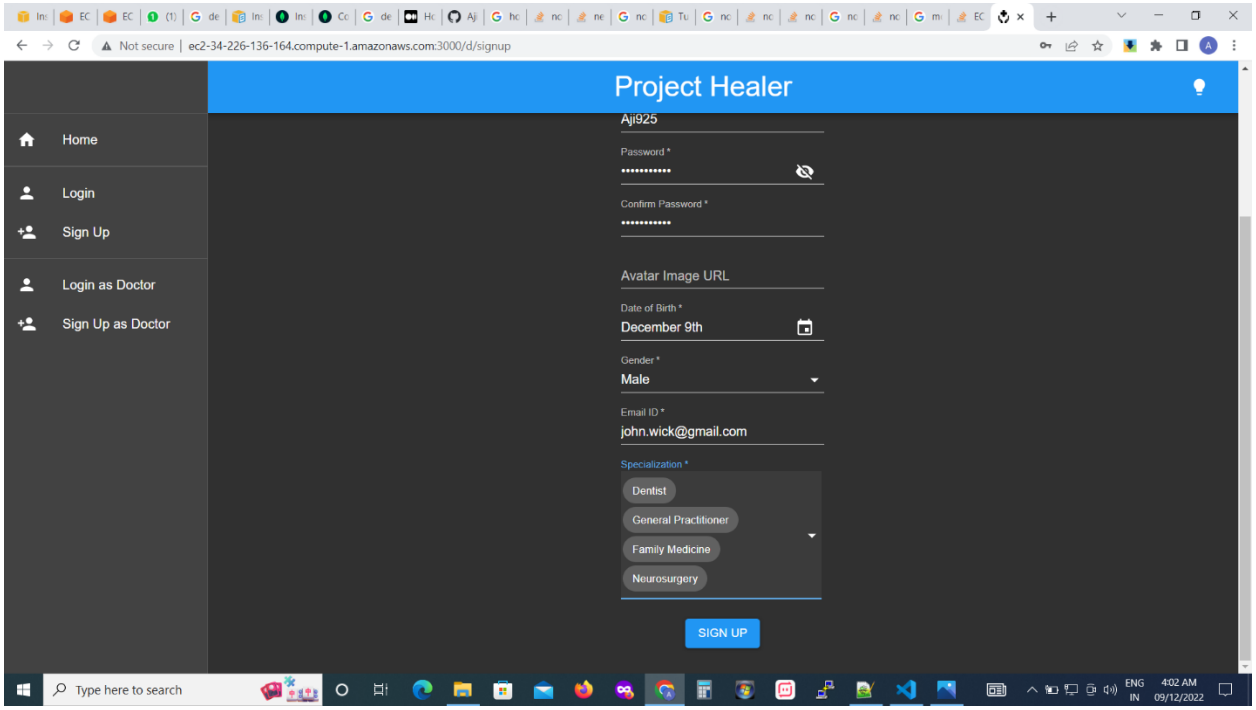
- Find the url used for MongoDB connection

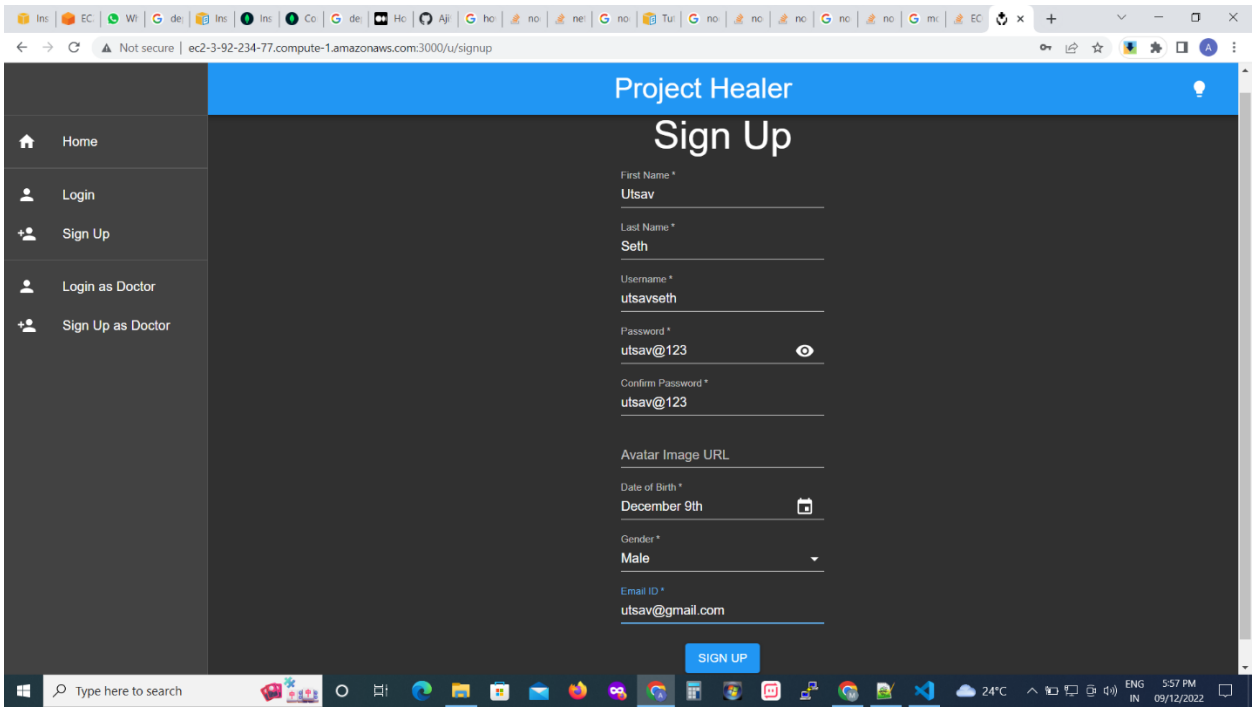
```
15
16  const url = process.env.DATABASE_URL || "mongodb://10.0.129.153:27017/local";
17  mongoose.connect(url, { useNewUrlParser: true, useUnifiedTopology: true });
18  mongoose.set("useFindAndModify", false);
19  mongoose.set("useCreateIndex", true);
20
```

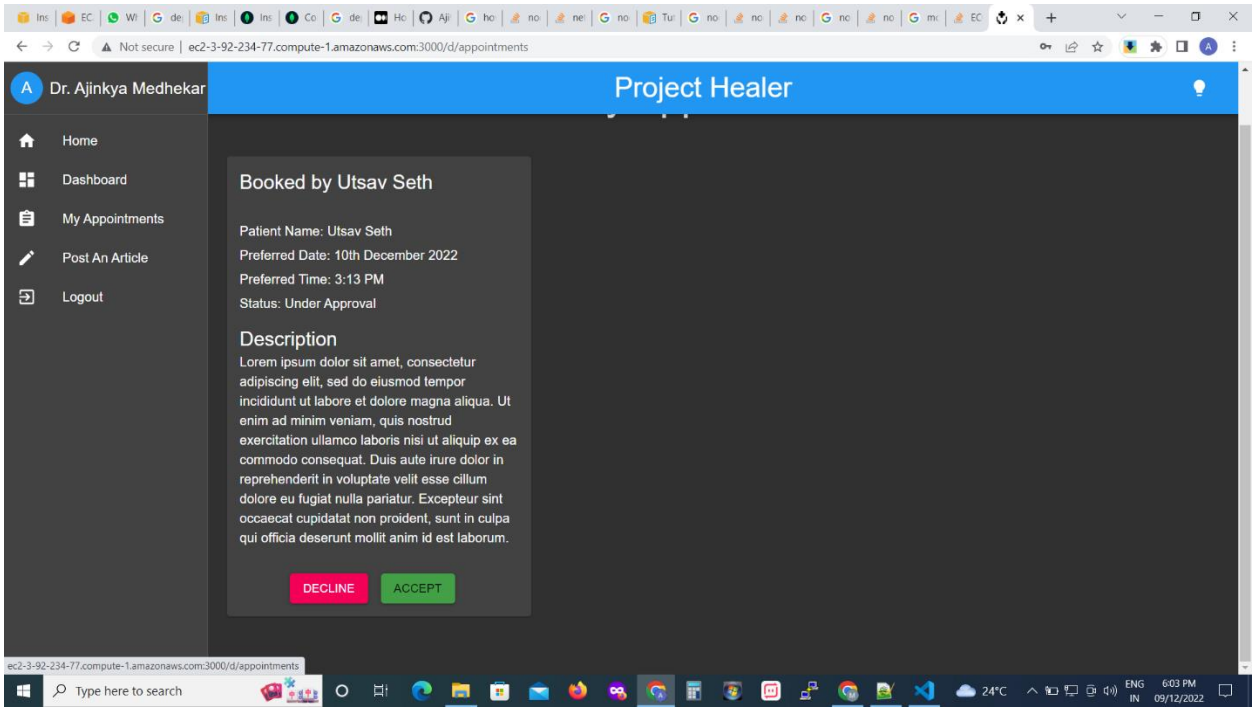
- Edit the url (from above Fig line 16) and add mongodb url for our private Database Server(from above Fig the string “mongodb://10.0.129.153:27017/local”). The added url string will be of form:
  - “mongodb://<private_ip of db-server>:27017/local”
- This will allow the application server to send database queries to our private EC2 Database Server.

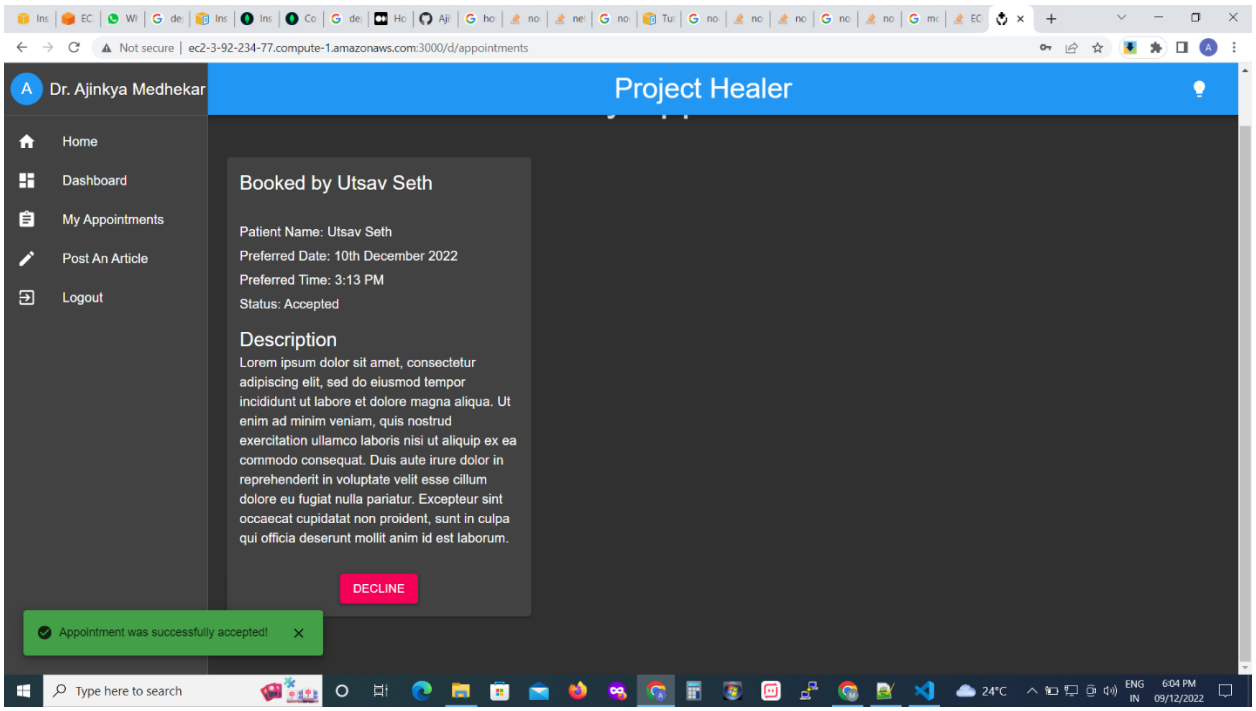
Step 17: Running the NodeJS application server and accessing it on browser

- To run our application server, execute following command inside the project-healer directory.
  - npm run dev
- This will compile the application code and run the application server. Once the application server is running, you can access the application via the following URL
  - <public-dns-name of web-server>:3000/
- Some screenshots showing the application running are given below.




Not secure | ec2-3-92-234-77.compute-1.amazonaws.com:3000/u/signup
Project Healer
Home
Login
Sign Up
Login as Doctor
Sign Up as Doctor
Sign Up
First Name *
Utsav
Last Name *
Seth
Username *
utsavseth
Password *
utsav@123
Confirm Password *
utsav@123
Avatar Image URL
Date of Birth *
December 9th
Gender *
Male
Email ID *
utsav@gmail.com
SIGN UP
Type here to search
24°C
ENG
IN
5:57 PM
09/12/2022


Not secure | ec2-3-92-234-77.compute-1.amazonaws.com:3000/d/appointments
Dr. Ajinkya Medhekar
Project Healer
Home
Dashboard
My Appointments
Post An Article
Logout
Booked by Utsav Seth
Patient Name: Utsav Seth
Preferred Date: 10th December 2022
Preferred Time: 3:13 PM
Status: Under Approval
Description
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.
DECLINE
ACCEPT
ec2-3-92-234-77.compute-1.amazonaws.com:3000/d/appointments
Type here to search
24°C
ENG
IN
6:03 PM
09/12/2022


Not secure | ec2-3-92-234-77.compute-1.amazonaws.com:3000/d/appointments
Dr. Ajinkya Medhekar
Project Healer
Home
Dashboard
My Appointments
Post An Article
Logout
Booked by Utsav Seth
Patient Name: Utsav Seth
Preferred Date: 10th December 2022
Preferred Time: 3:13 PM
Status: Accepted
Description
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.
DECLINE
Appointment was successfully accepted!
Type here to search
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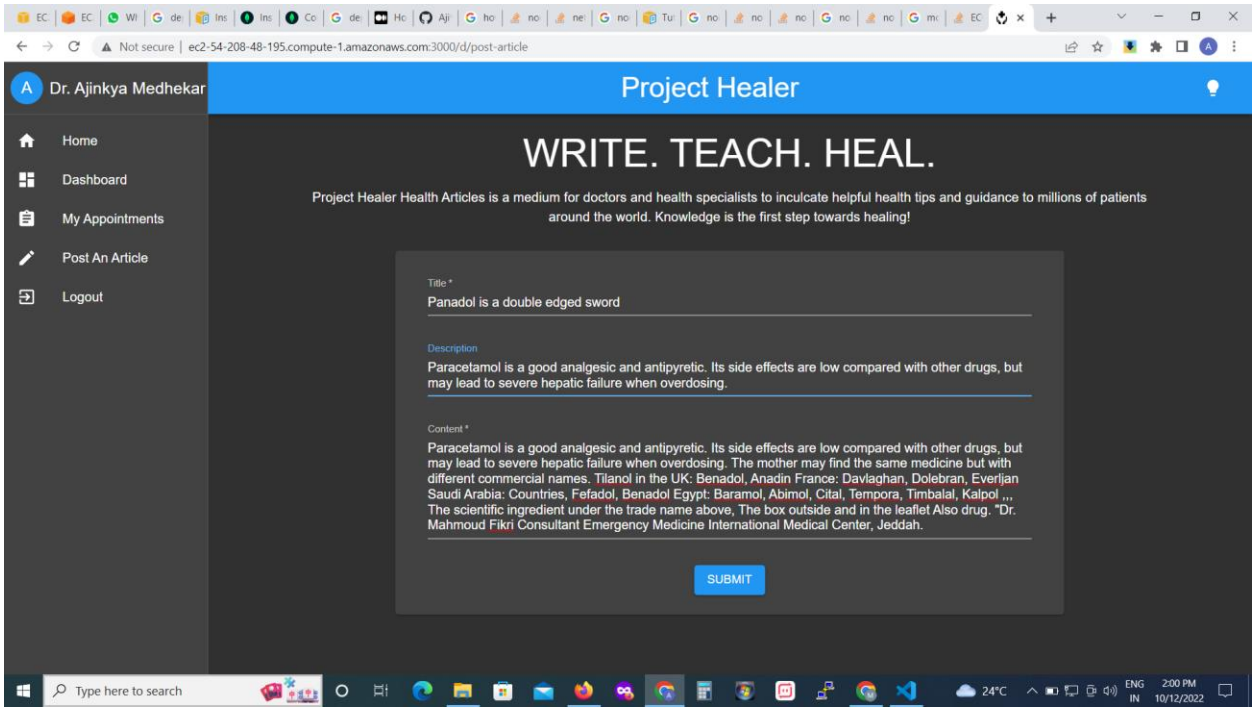
ENG IN
6:04 PM 09/12/2022


Not secure | ec2-54-208-48-195.compute-1.amazonaws.com:3000/d/post-article
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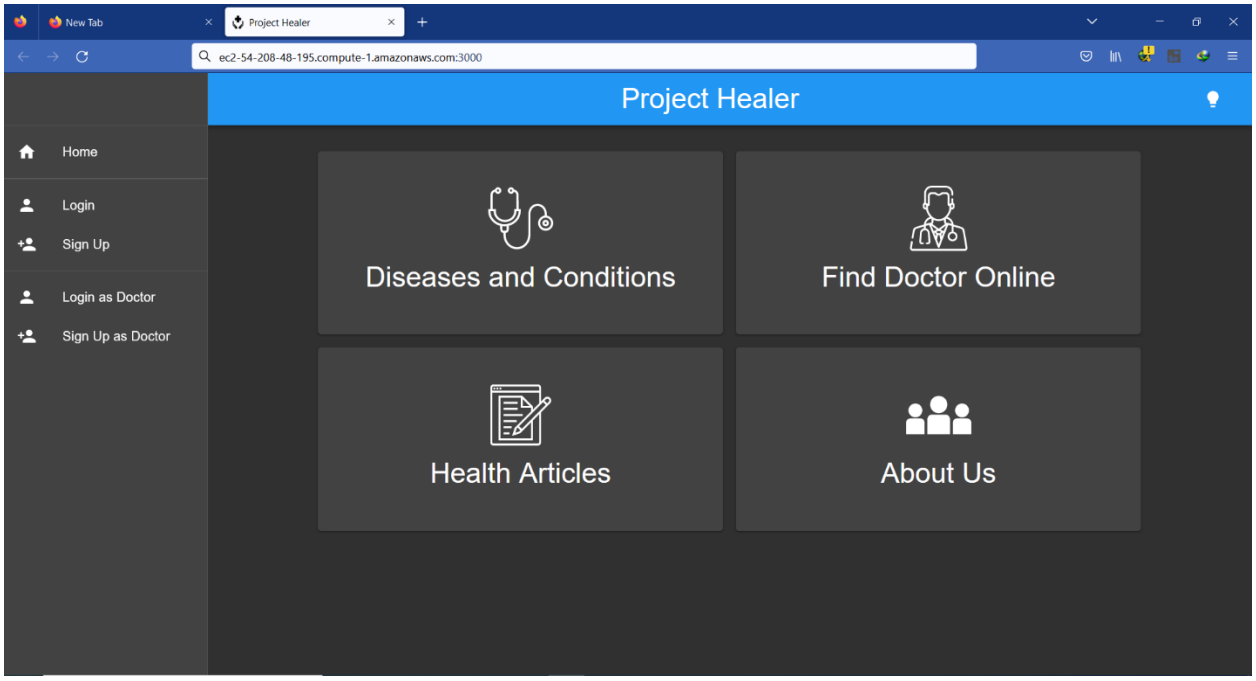
Project Healer Health Articles is a medium for doctors and health specialists to inculcate helpful health tips and guidance to millions of patients around the world. Knowledge is the first step towards healing!
Title *
Panadol is a double edged sword
Description
Paracetamol is a good analgesic and antipyretic. Its side effects are low compared with other drugs, but may lead to severe hepatic failure when overdosing.
Content *
Paracetamol is a good analgesic and antipyretic. Its side effects are low compared with other drugs, but may lead to severe hepatic failure when overdosing. The mother may find the same medicine but with different commercial names. Tilanol in the UK: Benadol, Anadin France: Davlaghan, Dolebran, Everljan Saudi Arabia: Countries, Fefadol, Benadol Egypt: Baramol, Abimol, Cital, Tempora, Timbalal, Kalpol ,,, The scientific ingredient under the trade name above, The box outside and in the leaflet Also drug. "Dr. Mahmoud Fikri Consultant Emergency Medicine International Medical Center, Jeddah.
SUBMIT
Type here to search
24°C
ENG IN
2:00 PM 10/12/2022


New Tab
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Sign Up as Doctor
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