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A MINI PROJECT REPORT

On

E-commerce using Cloud

Submitted in partial fulfillment of the requirement
of University of Mumbai for the Course

In

Computer Engineering (VIII SEM)

Submitted By
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Subject Incharge
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CERTIFICATE

This is to certify that the requirements for the project report entitled '**E-commerce using Cloud**' have been successfully completed by the following students:

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in partial fulfillment of the course Cloud Computing Lab in Computer Engineering (VIII SEM) of Mumbai University in the Department of Computer Engineering, A.P Shah Institute of Technology, Thane(W)-400615 during the Academic Year 2021-2022.

(Deepak Khachne)

Subject Incharge

PROJECT APPROVAL

This project entitled “**E-commerce using Cloud**” by Vedant Mhatre, Aaditya Muley, Vatsal Mehta and Siddharth Nair are approved for the course Cloud Computing Lab in Computer Engineering (VIII sem) of Mumbai University in the Department of Computer Engineering.

Subject Incharge:

Date: 20/04/2022

Place: Thane

DECLARATION

We declare that this written submission for the Cloud computing Lab mini project entitled **“E-commerce using Cloud”** represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any ideas / data / fact / source in our submission. We understand that any violation of the above will cause disciplinary action by the institute and also evoke penal action from the sources which have not been properly cited or from whom prior permission has not been taken when needed.

Project Group
Members:

Vedant Mhatre
Aaditya Muley
Vatsal Mehta
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Date: 20/04/2022

Place:Thane



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Abstract

The main objective of the E-commerce Portal is to manage the details of Products, Customer, Shipping, Payment, Category. It manages all the information about Products, Sales, Category, Products. The project is totally built at the administrative end and thus only the administrator is guaranteed the access. The purpose of the project is to build an application program to reduce the manual work for managing the Products, Customer, Sales, Shipping. It tracks all the details about the Shipping, Payment, Category. Our project aims to deploy an e-commerce website to cloud and make use of AWS services to ensure smooth functioning of backend such as database details of all users who created their account, admin services such as keep track of inventory management, sales management, etc and it offers a hassle free experience for the users to enjoy their shopping by avoiding server overloading issues.

Problem Definition

Electronic Commerce is the process of doing business through computer networks. The main aim of e-commerce websites development is to sell products to users. This project aims to create a proper ecommerce end to end website for the users which will allow them to browse all products, shop according to their needs, pay for the product and finally keep a track of the products purchase history of their account.

Introduction

E-cart is a web application. This website is designed to design a proper end to end solution for e-commerce where a user can login, shop according to his needs, buy his desired products and do the payment and make a summary of the payments.

With this website, there comes huge chunks of data which needs to be stored somewhere. Cloud platform helps with storing these data. Cloud storage is one of the greatest benefits cloud computing has to offer. Any relevant business data can be stored in the cloud, which makes it more accessible and usable. That said, your data can be accessed from any device and anywhere in the world, which is ideal for any user.

That is why it makes it important to host a website using cloud services. With cloud hosting, you get a part of the so-called cloud cluster. As opposed to traditional web hosting, where you get a certain amount of space from a single server. The main benefits of cloud hosting include a major focus on uptime, isolated resources, easy scaling, and a dedicated IP address.

Literature Review

II.1. Characteristic of Cloud Computing

Five important characteristics of the cloud computing is divided into five:

1. On-demand self-service Without interacting with service provider, computing capability user can be determined automatic. Computing capabilities like server time and network storage.
2. Broad network access Capabilities that introduce users to various platforms such as telephones cellular, tablets, laptops and workstations available through network access.
3. Resource pooling Resources owned by the provider like storage resources, processing, memory, virtual machines and so on, put together to serve virtual consumers and given assignments accordingly request and dynamically. Location the resources provided are not so known by the user, but there are the possibility that the location is at that level higher can be determined.
4. Rapid elasticity Elastic ability, in this case service capacity can be easily lowered or increased according to user request. Existing capacity in this service unlimited.
5. Measured service Besides the elastic ability, cloud computing also provides services that are can be used for monitoring and optimize source usage power. This service is a form transparency for providers and users, where users can know what only resources that have been used, like bandwidth, storage and processing.

Cloud Computing Services:

Based on the services, cloud computing is divided into three types:

1. Software as a Service (Saas) Providers provide excellence where users don't need to think about licenses software, users can use software provided anywhere and whenever and operate on cloud infrastructure. Examples of this service are the use of email, twitter, skype, and Lazada.co.id

2. Platform as a Service (Paas) Providers give advantages to more focused users for application development and deployment. With this capability users can use the application provided by the provider without having to think about its operating system, network, database engine, but the user still has control for the application developed. Example the provider of Paas, such as Amazon Web Service and Windows Azure.

3. Infrastructure as a Service (IaaS) Providers give advantages to users for configuration, too rent infrastructure such as storage and network. The intended configuration can virtually change scale up or scale down. Consumers have control of the operating system and also applications that are deployed. Examples of this service are Simple Storage Service, Rackspace Cloud, and Amazon Elastic Compute Cloud.

There are many important elements that go into building a successful e-commerce website such as removing friction during the purchasing process, making the checkout smooth and easy, making the website fast and attractive, up selling users on related products, incentivizing buyers, reducing cart abandonment, nurturing past buyers to buy again, remarketing to past visitors who haven't yet purchased, using the proper payment options, having a mobile ready design and many more things which are needed to develop and e-commerce website. The most successful websites are carefully optimized to achieve a high percentage of purchases. To achieve success e-commerce websites need to integrate all of the latest online closing & upsell techniques available which have been proven to increase the chances that a visitor will purchase.

Technology stack

Cloud Environments:

- AWS - Used for the deployment of Code/main application.
- Atlas Cloud- Used for deploying Database

Web-Application Code:

- Node.js
- EJS (Embedded Javascript)
- Html and Css

Database:

- MongoDB - NoSql Database used for all database operations in the webapp.

Browser:

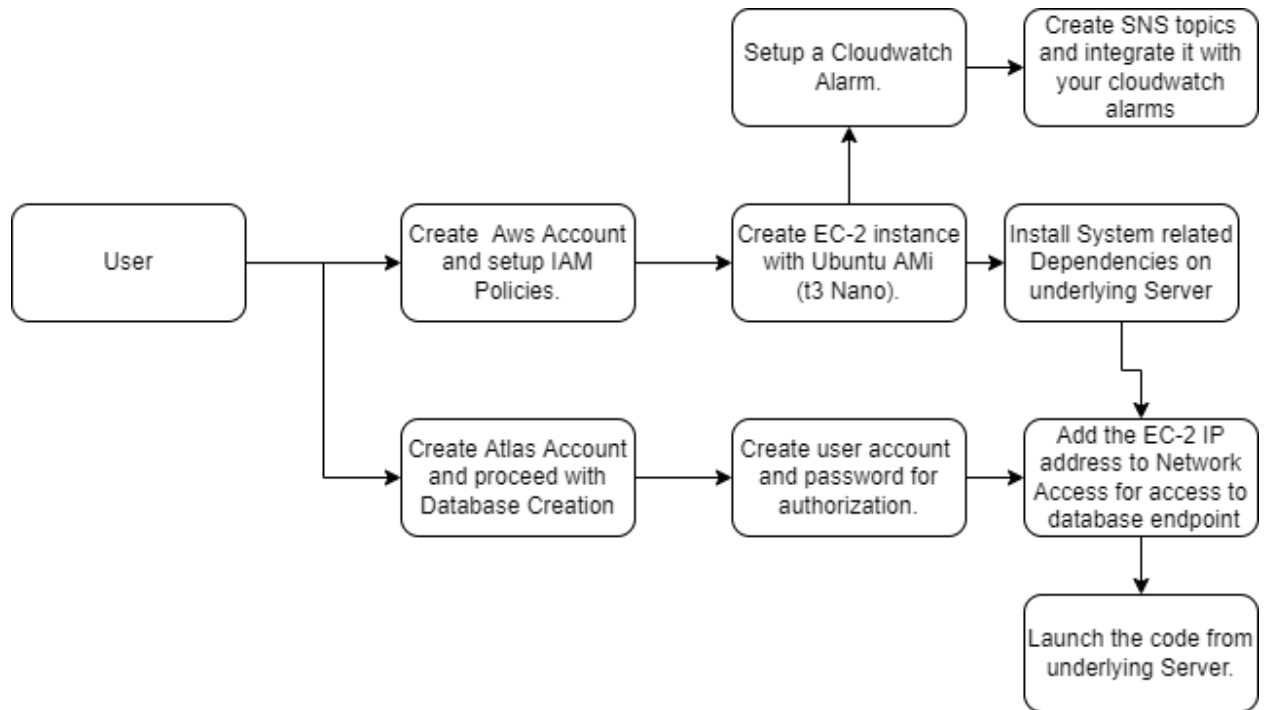
- Google Chrome: Google Chrome is a cross-platform web browser developed by Google

Implementation

- ❖ This project contains two phases
 - Setting up Infrastructure (Cloud Resources)
 - Setting up the Executable Code
 - ❖ One can Start with them in parallel so as to maximize productivity and decrease the net time taken for project completion.
-
- Setting up Infrastructure (Cloud Resources):
 - Design the Database Schema for your Application. Setup the Database Required for Project.
 - Setup a custom VPC along with subnets.
 - Setup a Security group with inbound rules such that it has access to http, https as well as a custom port 3000 for all IPV4 and IPV6.
 - Create a Ec-2 instance with a linux AMI, this instance would be a t3 nano engine as it provides maximum output with minimum cost for small scale resources.
 - This ec-2 instance would be launched in the security group that we have just created in the above steps
 - After the ec-2 instance has been setup the ip address should be copied and be attached in the Network Access section of Atlas Cloud database so that the database allows network requests sent by our web app hosted on this instance to this database resource.
 - One should also create a user in auth method in the database section of User Access so that the endpoint that is created in the database can verify the users that are sending it the request.
 - One should also start creating a razorpay account that would be needed for payment gateway.
 - After Account creation one should take in the API key generated so as to power up the asynchronous function that we'll write in js.

- We'll also setup Cloudwatch Alarms and integrate it with SNS.

❖ Use-Case Diagram:



2. Design the Database Schema for your Application. Setup the Database Required for Project as well configure the authorization and authentication steps for future.

MongoDB Atlas :

MongoDB Atlas is **a multi-cloud database service by the same people that build MongoDB**. Atlas simplifies deploying and managing your databases while offering the versatility you need to build resilient and performant global applications on the cloud providers of your choice.

MongoDB was also designed for high availability and scalability, with built-in replication and auto-sharding;

STEPS FOR CREATING DATABASE AND SETTING UP MONGODB:

- 1) Click on create database.
- 2) Choose your AWS Region i.e Mumbai.
- 3) Click on create table.
- 4) Insert any document to check.

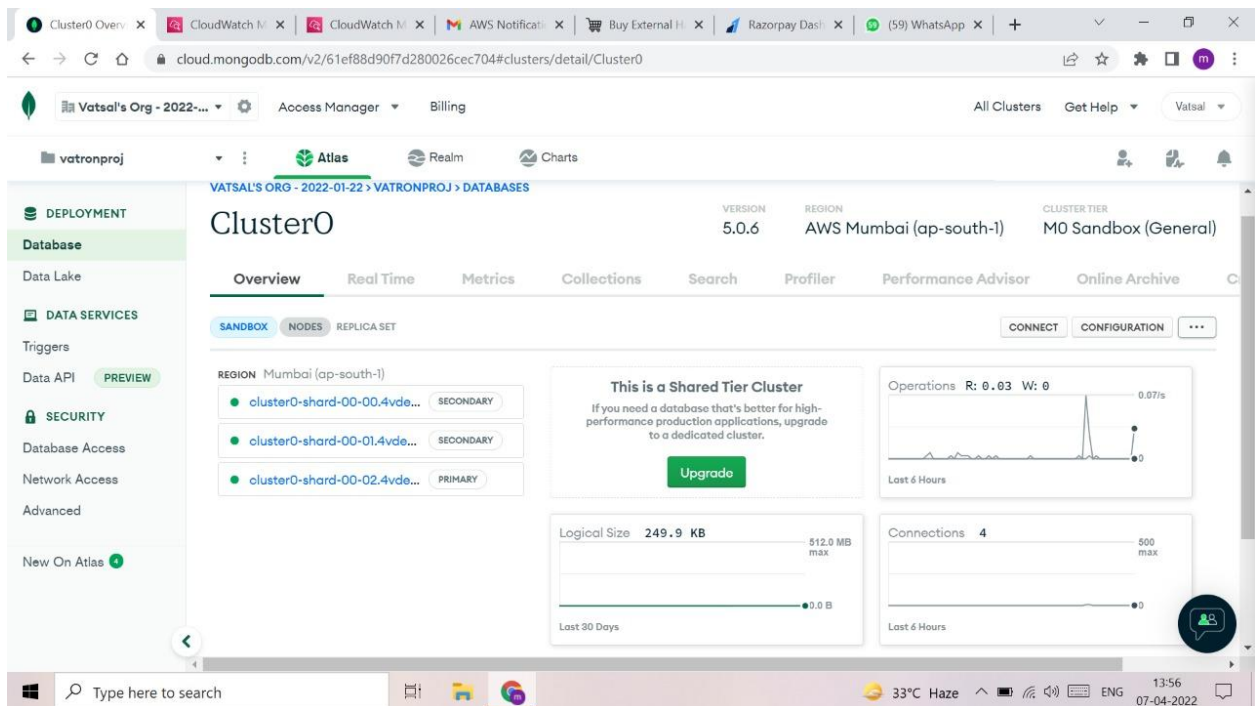
Now we'll create a username and password which can be used inside our code so as to access the database endpoint.

- Go to Database Access submenu from the left tab.
- Choose add user.
- Create a username and password.

This will now be included in the endpoint for your database which will go into the .env file for your project:

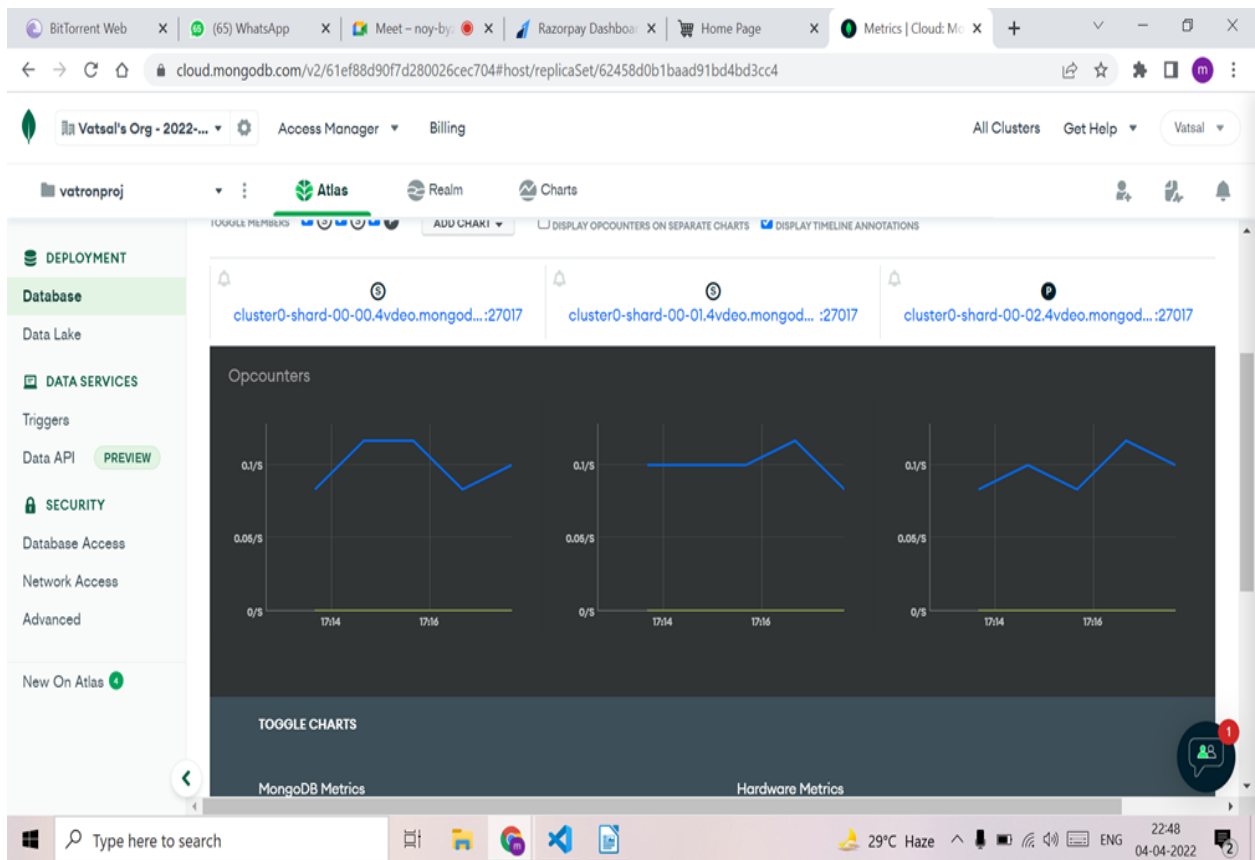
```
"mongodb+srv://{username}:{password}123@cluster0.4vdeo.mongodb.net/  
{databasename}"
```

This can also be found when one clicks on the connect button in Database on Atlas Dashboard.



One needs to create a Database Cluster in the Aws Mumbai region(ap-south-1). Mongodb provides free access for small tier databases. As seen in the figure , three sharded clusters are present in our environment.

One can easily monitor the read/write requests through real time graphs present in the Database submenu available in our environment.



Once created one can see how different nodes : primary, secondary and ternary are performing along with the respective load on them. Mongoddb provides a graph UI to its users for this purpose.

Note: The above figures arefor your representational purposes.

3. Create a VPC and attach its subnet:

VPC: Amazon Virtual Private Cloud (Amazon VPC) **enables you to launch AWS resources into a virtual network that you've defined.** This virtual network closely resembles a traditional network that you'd operate in your own data center, with the benefits of using the scalable infrastructure of AWS.

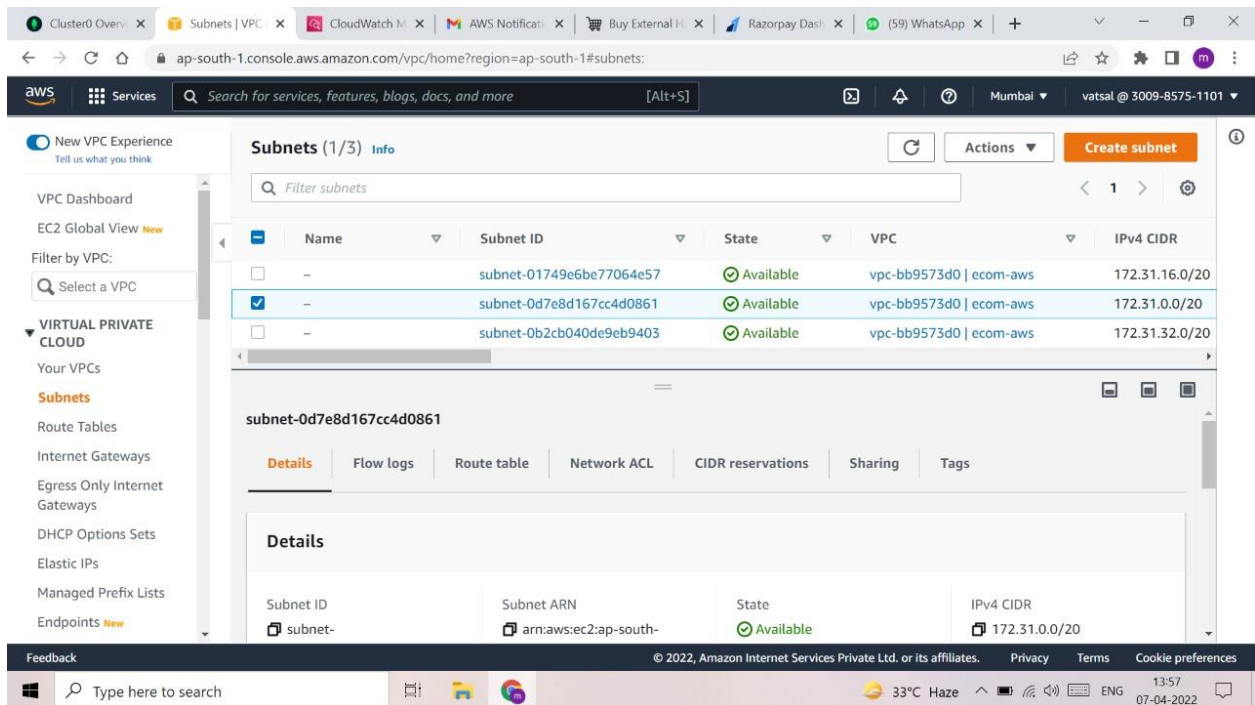
Subnets: A subnet is **a range of IP addresses in your VPC.** You can launch AWS resources, such as EC2 instances, into a specific subnet. When you create a subnet, you specify the IPv4 CIDR block for the subnet, which is a subset of the VPC CIDR block.

As seen in the below diagram we have created a vpc named ecom-aws for our project. After creation we'll now move on to the subnet.

The screenshot displays the AWS Management Console interface for a VPC. The top navigation bar shows the user is logged in as 'vatsal' with a contact number '3009-8575-1101'. The main content area is titled 'Your VPCs (1/1)' and lists a single VPC named 'ecom-aws' with ID 'vpc-bb9573d0'. The VPC is in an 'Available' state and has an IPv4 CIDR block of '172.31.0.0/16'. Below the list, the 'Details' tab is selected for the VPC 'vpc-bb9573d0 / ecom-aws'. The details section shows the following information:

Property	Value
VPC ID	vpc-bb9573d0
State	Available
DNS hostnames	Enabled
DNS resolution	Enabled
Tenancy	Default
DHCP options set	dopt-c5cf02ae
Main route table	rtb-0666c26d
Main network ACL	acl-17da137c

The left sidebar contains a navigation menu with options like 'VPC Dashboard', 'EC2 Global View', 'Subnets', 'Route Tables', 'Internet Gateways', 'Egress Only Internet Gateways', 'DHCP Options Sets', 'Elastic IPs', 'Managed Prefix Lists', and 'Endpoints'. The bottom of the screen shows a Windows taskbar with the search bar and system tray icons.



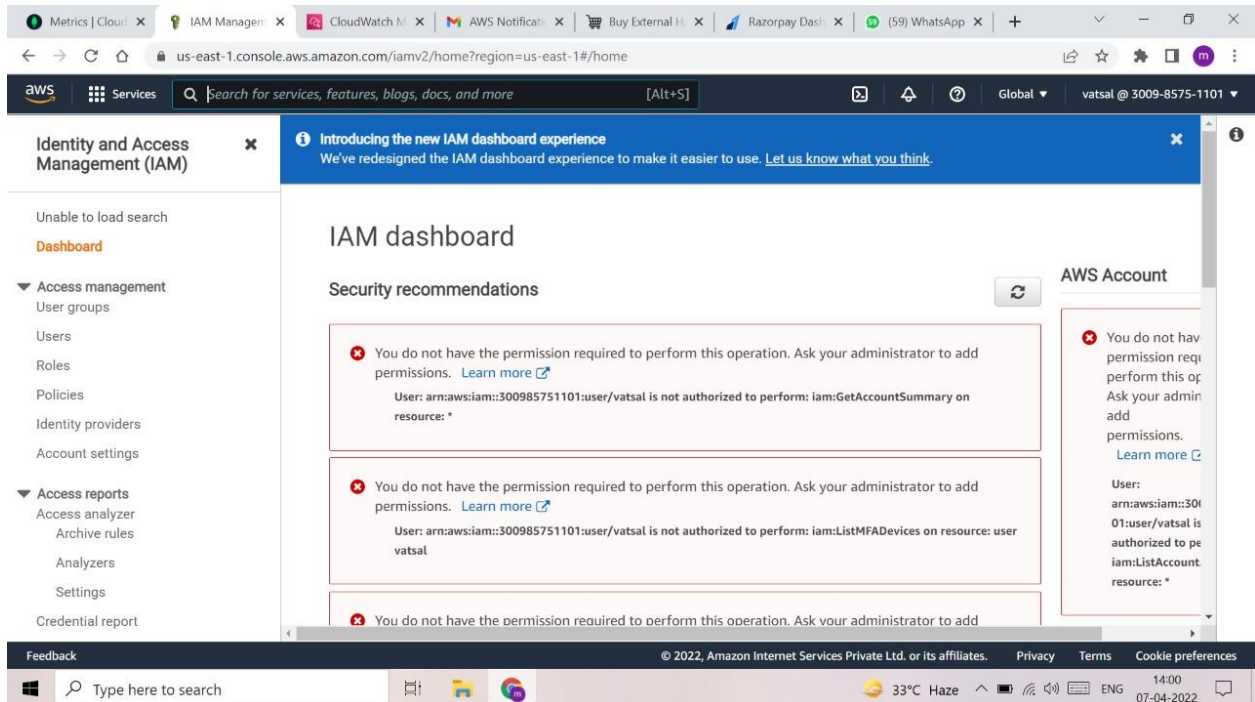
As seen in the above diagram we have created subnets and attached it to the vpc we just created named ecom-aws.

Your VPC is associated with an IPv4 CIDR or both IPv4 and IPv6 CIDRs. As a result, **any subnets you create in the VPC can be dual-stack subnets**. Any EC2 instances launched within the subnet will communicate over the IP of the subnet.

Note: One can also process in with the default VPC and subnets but have to configure the custom Security Group.

5. Creating IAM Policies.

One must be able to see the following error if a user who's not having an access to a particular resource tries to access that resource.



IAM policies define permissions for an action regardless of the method that you use to perform the operation. For example, if a policy allows the [GetUser](#) action, then a user with that policy can get user information from the AWS Management Console, the AWS CLI, or the AWS API. When you create an IAM user, you can choose to allow console or programmatic access. If console access is allowed, the IAM user can sign in to the console using a user name and password. Or if programmatic access is allowed, the user can use access keys to work with the CLI or API.

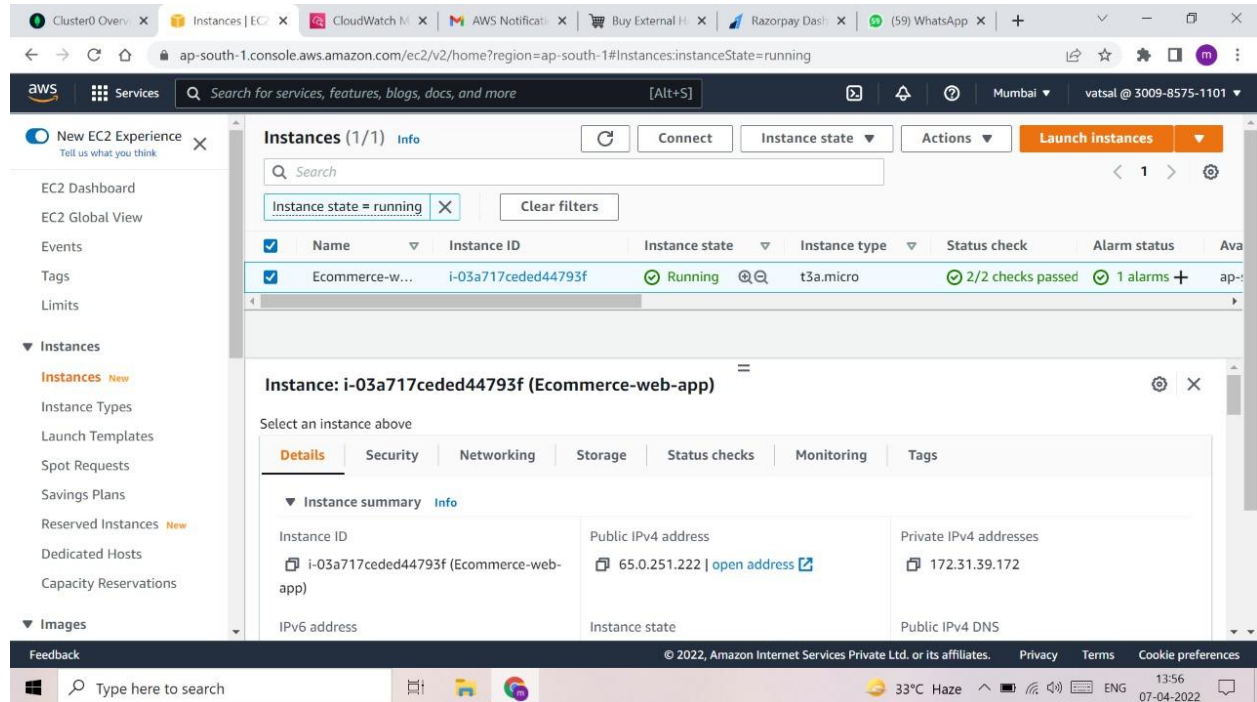
6..Create an EC-2 Instance:

STEPS FOR CREATING EC2 INSTANCE:

- A. Choose AMI: Ubuntu 20.0.4
- B. Instance Type: t2.micro
- C. No change in Instance Details.
- D. No change is Storage. Assigned storage is sufficient.
- E. Add a tag: Key: ccl-vatron
 - F. Value: instance_1 (name of instance you want)
- G. Security Group Configuration: Add Rules: Custom TCP protocol and set port number to 3000. Add HTTP and HTTPS rules as well.
- H. When asked for Key Pair, select Create a new Key Pair. Name the Key Pair and create. A .pem file will be downloaded. Know the location of this file for further use.
- I. Launch the instance
- J. Go to EC2>>Instances and wait for the Instance State to display Running and Status Check to display 2/2 checks passed before proceeding

Note:

- After the ec-2 instance has been setup the ip address should be copied and be attached in the Network Access section of Atlas Cloud database so that the database allows network requests sent by our web app hosted on this instance to this database resource.



Reasons For choosing T3 Nano Engine:

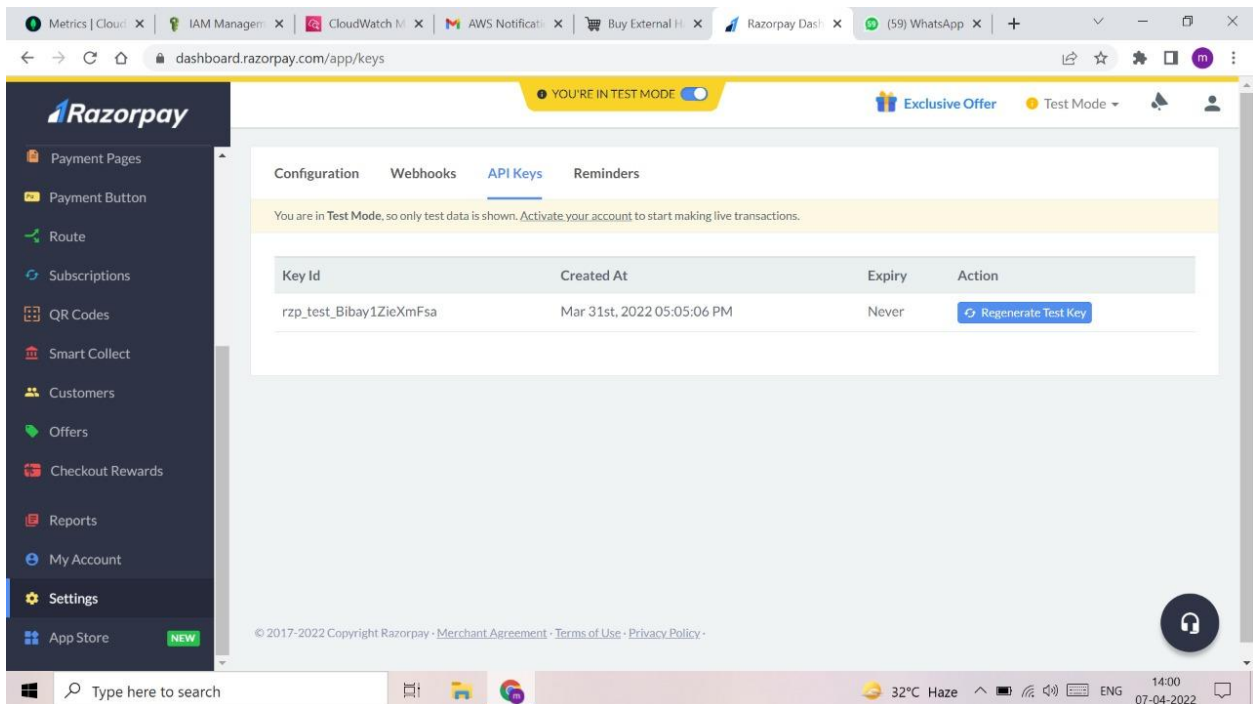
T3 instances are the low cost burstable general purpose instance type that provide a baseline level of CPU performance with the ability to burst CPU usage at any time for as long as required.

T3 instances offer a balance of compute, memory, and network resources and are a very cost effective way to run a broad spectrum of general purpose workloads including large scale micro-services, small and medium databases, virtual desktops, and business-critical applications.

7. Create a Razorpay Account :

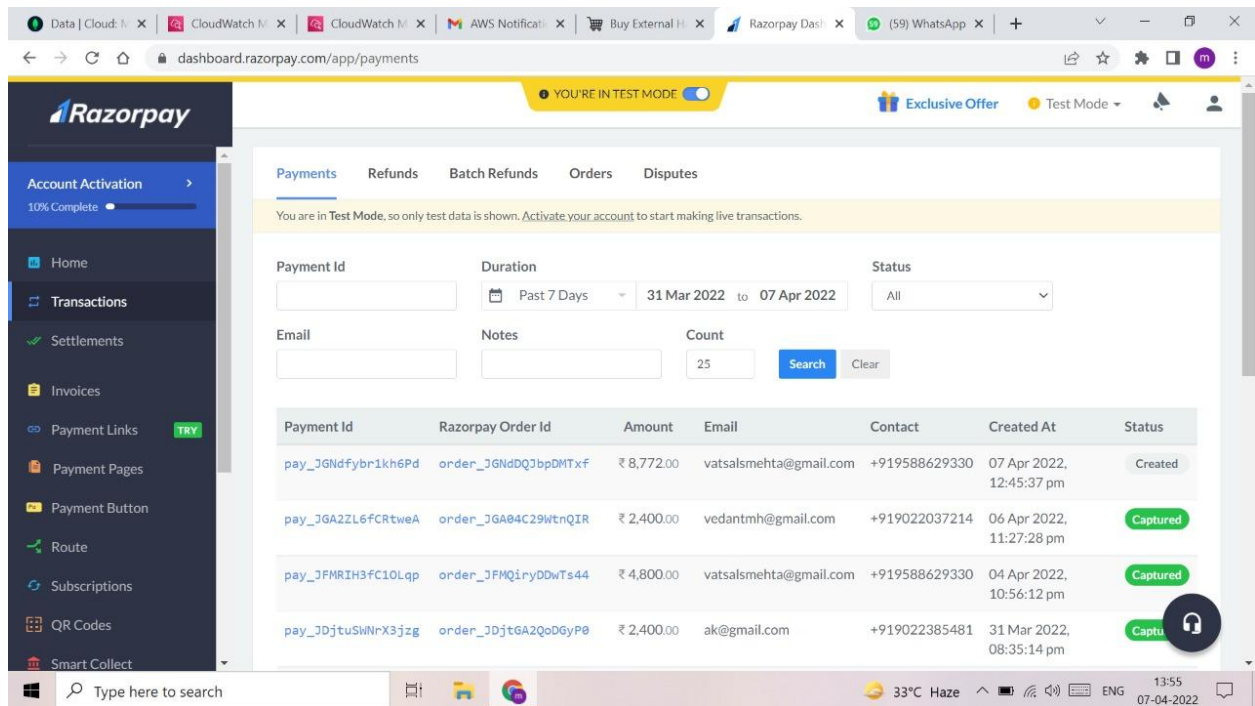
Go the official razorpay page and create a merchant account(one can choose the option as student while creating it).

After creation of account one can simply move to the settings part from left submenu and get your personal apikey.This will be further used by us inside the code.



The screenshot displays the Razorpay dashboard interface. The left sidebar contains a menu with options: Payment Pages, Payment Button, Route, Subscriptions, QR Codes, Smart Collect, Customers, Offers, Checkout Rewards, Reports, My Account, Settings, and App Store. The main content area is titled 'API Keys' and shows a table with one key entry. A yellow banner at the top of the main area indicates 'YOU'RE IN TEST MODE' and provides a link to 'Activate your account'. The footer of the dashboard includes copyright information and links to Merchant Agreement, Terms of Use, and Privacy Policy.

Key Id	Created At	Expiry	Action
rzp_test_Bibay1ZieXmFsa	Mar 31st, 2022 05:05:06 PM	Never	Regenerate Test Key



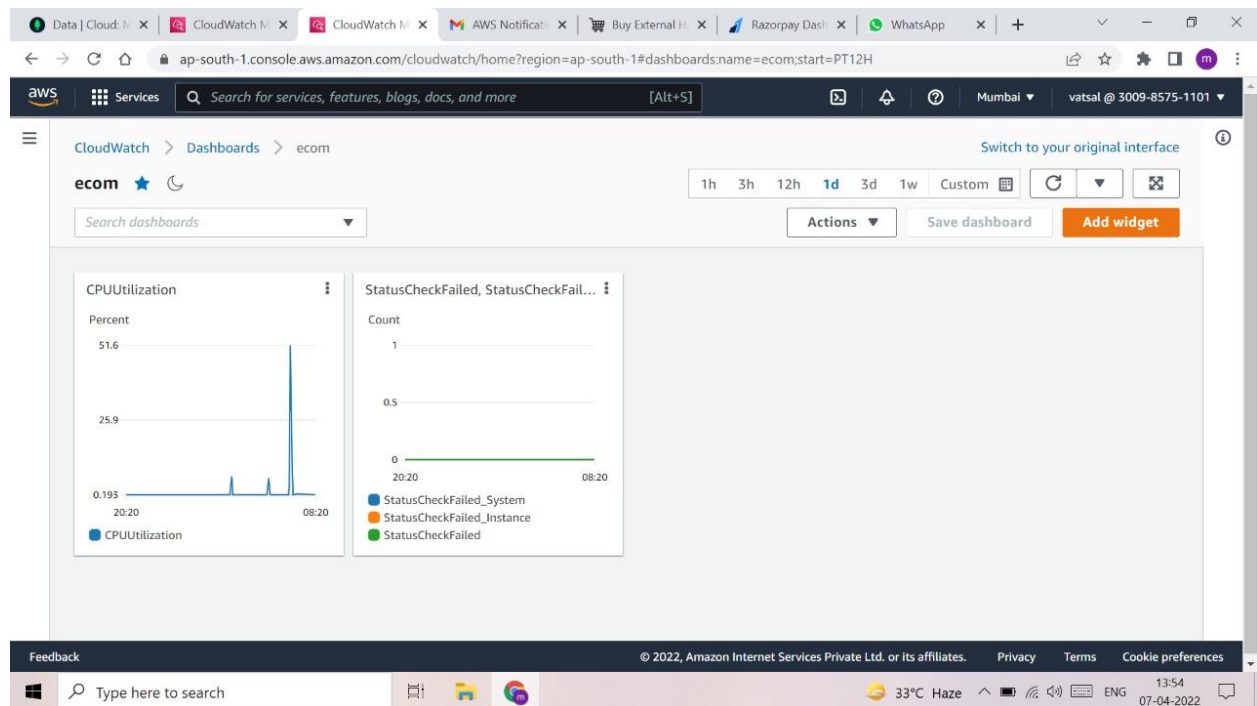
8) Cloudwatch

Amazon CloudWatch monitors your Amazon Web Services (AWS) resources and the applications you run on AWS in real time. You can use CloudWatch to collect and track metrics, which are variables you can measure for your resources and applications.

The CloudWatch home page automatically displays metrics about every AWS service you use. You can additionally create custom dashboards to display metrics about your custom applications, and display custom collections of metrics that you choose.

You can create alarms that watch metrics and send notifications or automatically make changes to the resources you are monitoring when a threshold is breached. For example, you can monitor the CPU usage and disk reads and writes of your Amazon EC2 instances and then use that data to determine

whether you should launch additional instances to handle increased load. You can also use this data to stop under-used instances to save money.



9) Simple Notification Service (SNS):

Amazon CloudWatch uses Amazon SNS to send email. First, create and subscribe to an SNS topic. When you create a CloudWatch alarm, you can add this SNS topic to send an email notification when the alarm changes state

To create an SNS topic

1. Open the Amazon SNS console at <https://console.aws.amazon.com/sns/v3/home>.

2. On the Amazon SNS dashboard, under Common actions, choose Create Topic.
3. In the Create new topic dialog box, for Topic name, enter a name for the topic (for example, **my-topic**).
4. Choose Create topic.
5. Copy the Topic ARN for the next task (for example, `arn:aws:sns:us-east-1:111122223333:my-topic`).

To subscribe to an SNS topic

1. Open the Amazon SNS console at <https://console.aws.amazon.com/sns/v3/home>.
 2. In the navigation pane, choose Subscriptions, Create subscription.
 3. In the Create subscription dialog box, for Topic ARN, paste the topic ARN that you created in the previous task.
 4. For Protocol, choose Email.
 5. For Endpoint, enter an email address that you can use to receive the notification, and then choose Create subscription.
 6. From your email application, open the message from AWS Notifications and confirm your subscription.
- Your web browser displays a confirmation response from Amazon SNS.

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ap-south-1.console.aws.amazon.com/sns/v3/home?region=ap-south-1#/subscriptions

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Amazon SNS

- Dashboard
- Topics
- Subscriptions**
- ▼ Mobile
 - Push notifications
 - Text messaging (SMS)
 - Origination numbers

Amazon SNS > Subscriptions

Subscriptions (2)

Edit Delete Request confirmation Confirm subscription Create subscription

Search

	ID	Endpoint	Status	Protocol	Topic
<input type="radio"/>	9d4c9998-39d8-4747-a4c2-0e37c8776b03	vatsalsmehta@gmail.com	Confirmed	EMAIL	Default_CloudWatch_Alarms_Topic
<input type="radio"/>	ac9e9508-a8d0-488f-8b3b-7234e977f9ba	vedanttmh@gmail.com	Confirmed	EMAIL	Default_CloudWatch_Alarms_Topic

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Cluster0 Overv x Simple Notific x CloudWatch M x AWS Notific x Buy External H x Razorpay Das x (59) WhatsApp x +

ap-south-1.console.aws.amazon.com/sns/v3/home?region=ap-south-1#/topics

aws Services Search for services, features, blogs, docs, and more [Alt+S] Mumbai vatsal @ 3009-8575-1101

Amazon SNS

- Dashboard
- Topics**
- Subscriptions
- ▼ Mobile
 - Push notifications
 - Text messaging (SMS)
 - Origination numbers

Amazon SNS > Topics

Topics (1)

Edit Delete Publish message Create topic

Search

	Name	Type	ARN
<input type="radio"/>	Default_CloudWatch_Alarms_Topic	Standard	arn:aws:sns:ap-south-1:300985751101:Default_CloudWatch_Alarms_Topic

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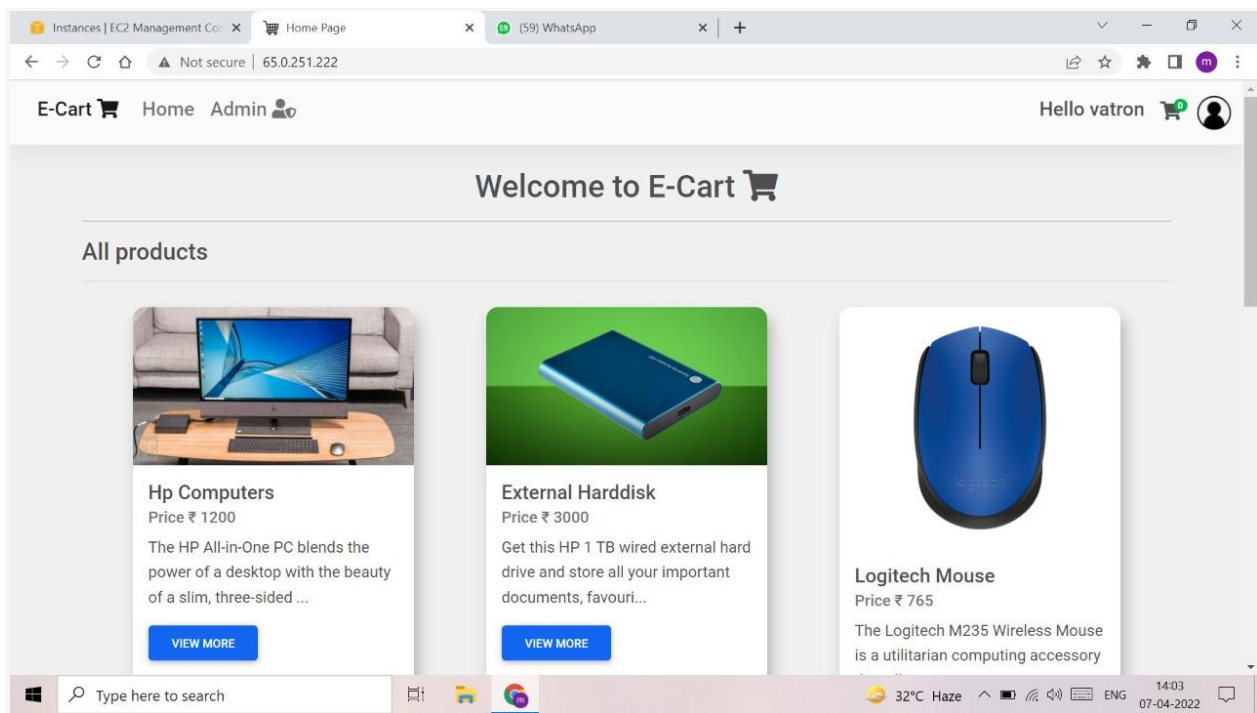
10. Deploying the Code inside Server:

- Installing Git: `sudo apt-get -y install git-core`
- Cloning the repo, enter the following command in cli :
- `git clone https://github.com/vatsalsmehta/ecom_project`
- Install Node.js on server with the below command:
- `sudo apt-get update && sudo apt-get install -y build-essential g++ tmux`
- `curl -O- https://raw.githubusercontent.com/nvm-sh/nvm/v0.34.0/install.sh | bash`
- `. ~/.nvm/nvm.sh`
- `nvm install node`

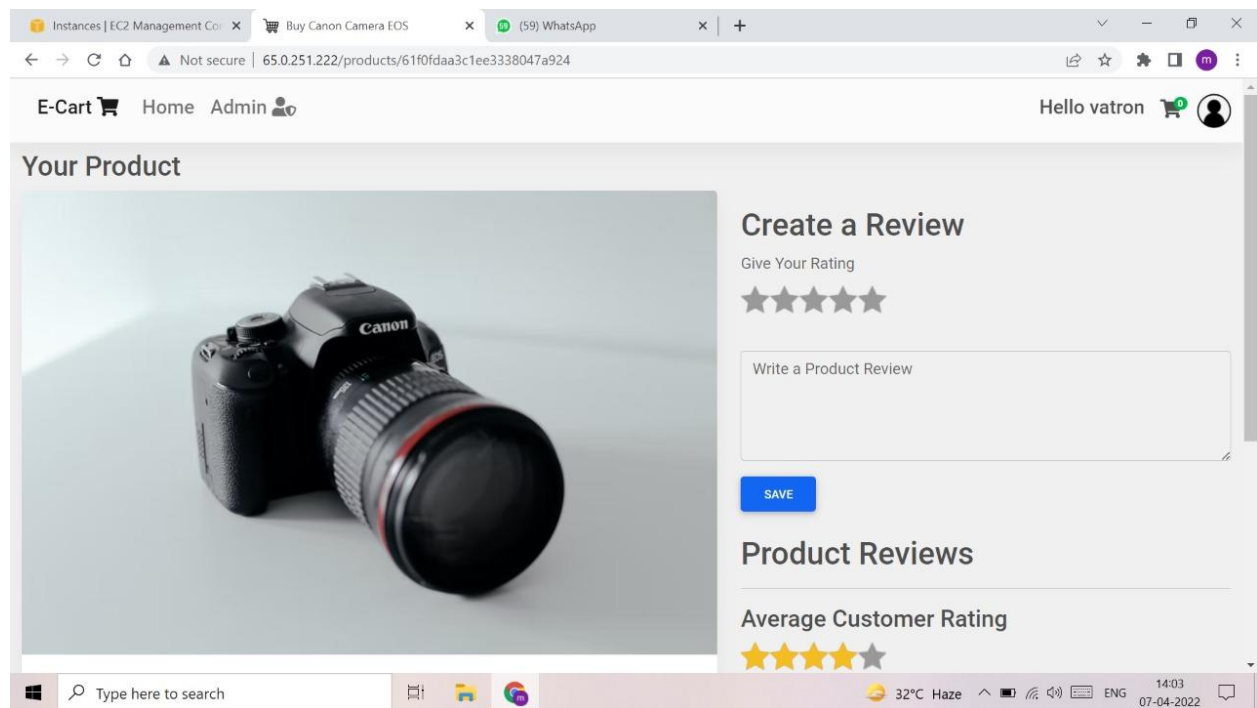
We have successfully installed all the needed dependencies needed for our project. Now we can start the project from our server

- `Cd ecom_project`
- `npm install`
- `npm start`

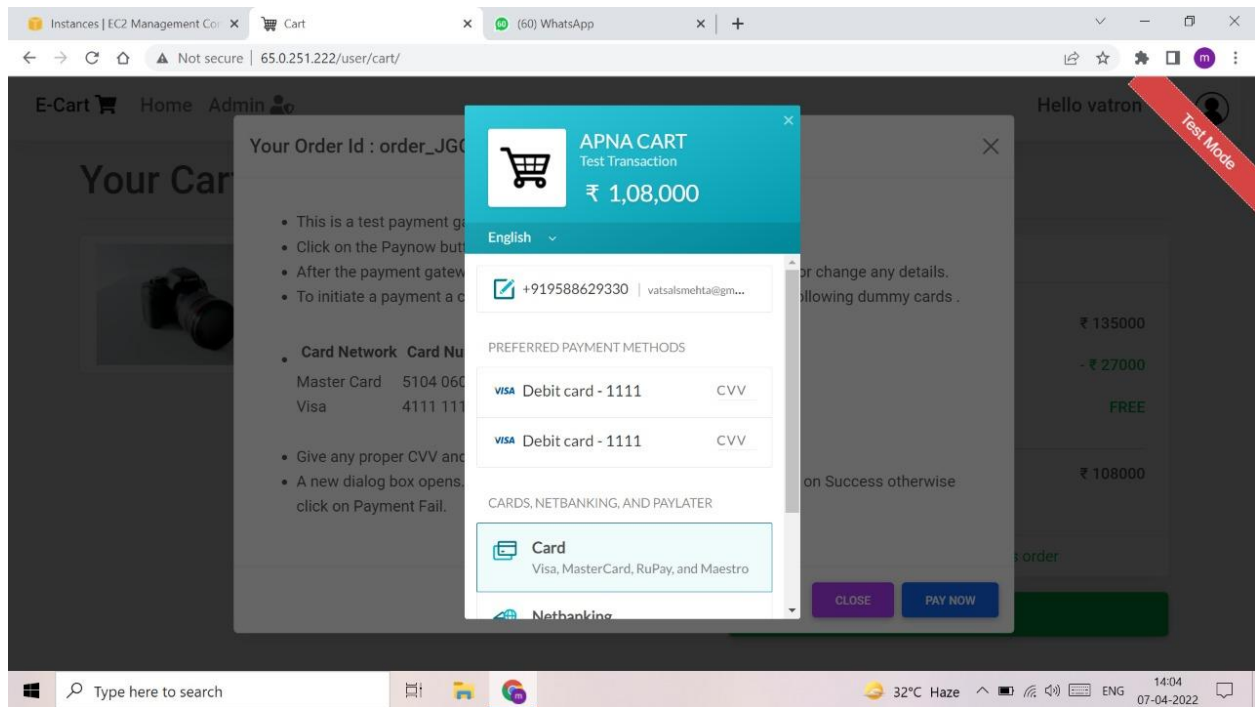
This will start the project on our IP address.



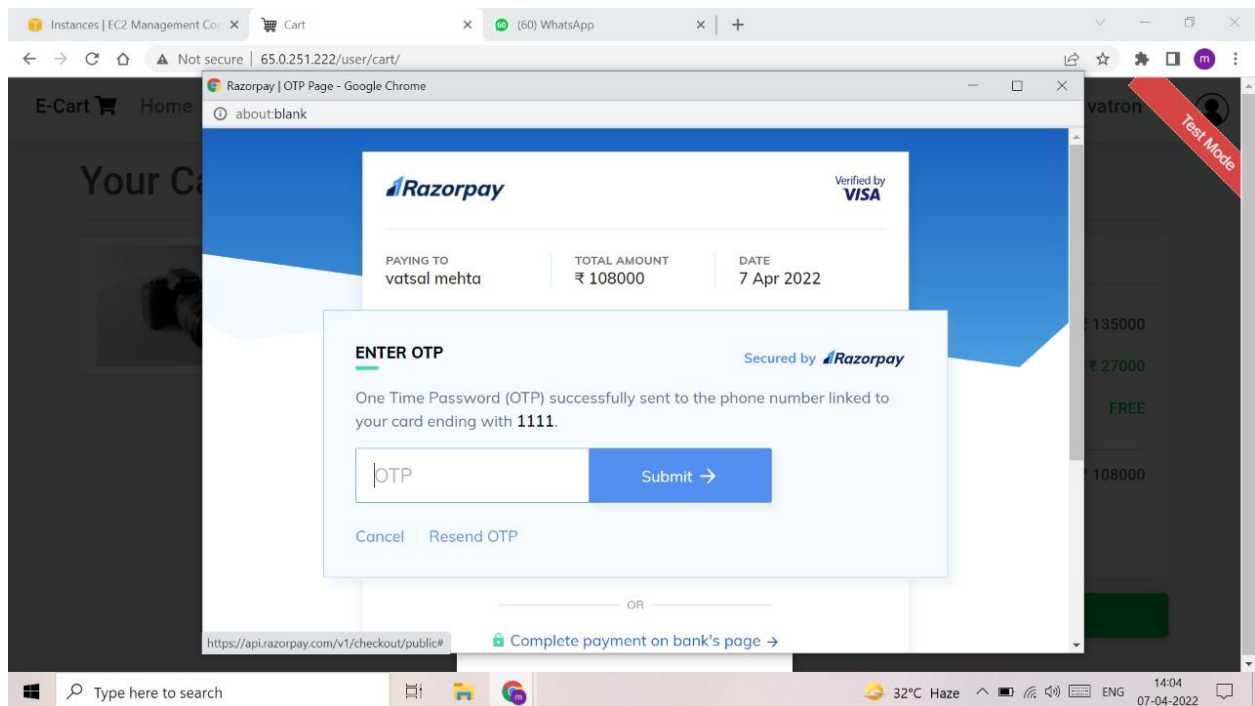
Webapp Homepage



Product Page



Payment Portal



Dashboard for Payments

YOU'RE IN TEST MODE

Exclusive Offer Test Mode

Payments Refunds Batch Refunds Orders Disputes

You are in Test Mode, so only test data is shown. Activate your account to start making live transactions.

Payment Id Duration Status

Email Notes Count Search Clear

Payment Id	Razorpay Order Id	Amount	Email	Contact	Created At	Status
pay_3GNdfybr1kh6Pd	order_3GNdDQ3bpDMTxf	₹ 8,772.00	vatsalsmehta@gmail.com	+919588629330	07 Apr 2022, 12:45:37 pm	Created
pay_3GA2ZL6fCrtweA	order_3GA84C29WtnQIR	₹ 2,400.00	vedantmh@gmail.com	+919022037214	06 Apr 2022, 11:27:28 pm	Captured
pay_3FMRIH3fC10Lqp	order_3FMQiryDDwTs44	₹ 4,800.00	vatsalsmehta@gmail.com	+919588629330	04 Apr 2022, 10:56:12 pm	Captured
pay_3DjtuShNrX3jzg	order_3DjtGA2QoDgyP0	₹ 2,400.00	ak@gmail.com	+919022385481	31 Mar 2022, 08:35:14 pm	Captu

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Realtime Dashboard for Payments.

Summary and future scope

The project was deployed successfully onto the cloud platform, AWS and is now live for users to access. We have used all the free resources for developing the project.

We have added payment integration to our project. In Future , this project can be taken a step ahead by adding multilingualism to this site. Many features can be added to this project to make it more robust

Learning Outcomes

The basic concepts learned during this project are:

To develop Dynamic Website using Node.js, MongoDB, cloud

Deploying the project on AWS

Using various services of AWS to improve working of your website

References

[1] Cloud Standards Customer Council (2014). Practical Guide to Cloud Computing.
<http://www.cloud-council.org/resource-hub.htm#practical-guide-to-cloud-computing-v2>

[2] Alexandrou, M., n.d. , Web Development Methodology ,
mariosalexandrou.com [blog]Available
at:<<http://www.mariosalexandrou.com/blog/web-development-methodology-part1>
> [Accessed 15 April 2011]

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I express my warm thanks to Prof. Deepak Khachne for their support and guidance.

Thank you.