



BITS Pilani

Hyderabad Campus

Computer Science and Information Systems

A report on Cloud Computing Mini-Project

Members

Kushal Chakraborty [2022H1030089H]

Mohammad Avesh Husain [2022H1030090H]

Aritra Kumar Dutta [2022H1030096H]

Introduction

The web application developed by the team for the mini project is Hospital Management System (HMS). The app has been deployed in Amazon Web Services. The Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) of the Amazon Web Services (AWS) has been used here.

Handling patient appointments using manual approach in clinics can become very chaotic and unorganized. It can also be very erroneous and time consuming since the booking and cancellation of appointments of various doctors in various available timeslots for patients can create a huge unstructured data. The maintenance of this data manually can become a very hectic process. The HMS software created in this project can ease the work of medical professionals to a great extent.

In the next sections descriptions about the various aspects of the software are going to be discussed.

Software Architecture and Design

In this section the Software Architecture and Design are going to be discussed.

Tools used in the project: Nodejs, HTML, CSS, JavaScript, MySQL

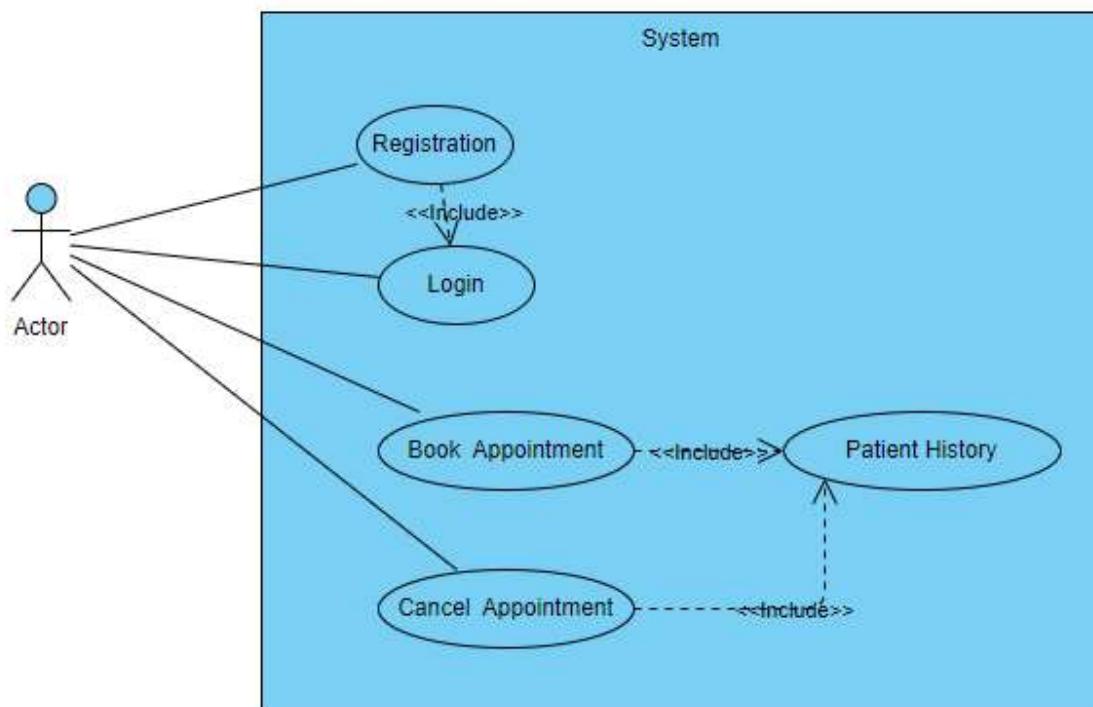
The main **Modules** of the Software are:

- 1) Registration
- 2) Login
- 3) Dashboard
 - a) Patient Information
 - b) Patient Appointment History
- 4) Book Appointments
- 5) Cancel Appointments

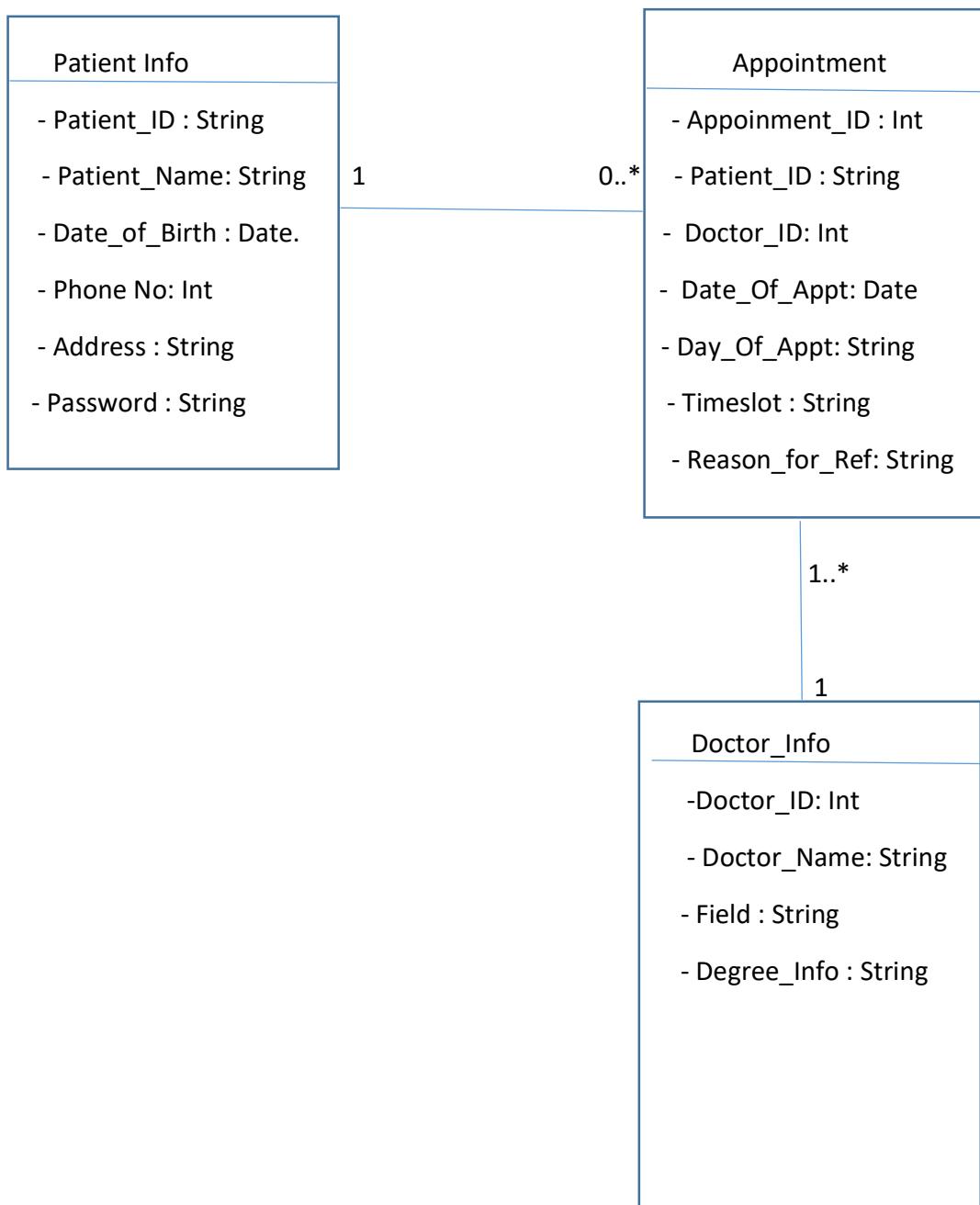
Functionalities of our Application Modules:

- 1) **Registration:** A person will first register himself with his Name, Date of Birth, Address, Phone Number and Password. The Patient will be provided with a Patient ID.
- 2) **Login:** The patient can login with his provided Patient ID and Password.
- 3) **Dashboard:** Once the patient logs in successfully, the patient will be provided with a dashboard. The dashboard displays the patient Information and also the patient's history of appointments.
- 4) **Book Appointments:** The dashboard provides the patients with a service to book the appointments with various doctors listed along with their timeslots and days in which they are available. The patients can provide the Medical Reason for Reference and book the slots by clicking on the Book button.
- 5) **Cancel Appointments:** The dashboard also provides the patients with the facility to cancel the booked appointments.

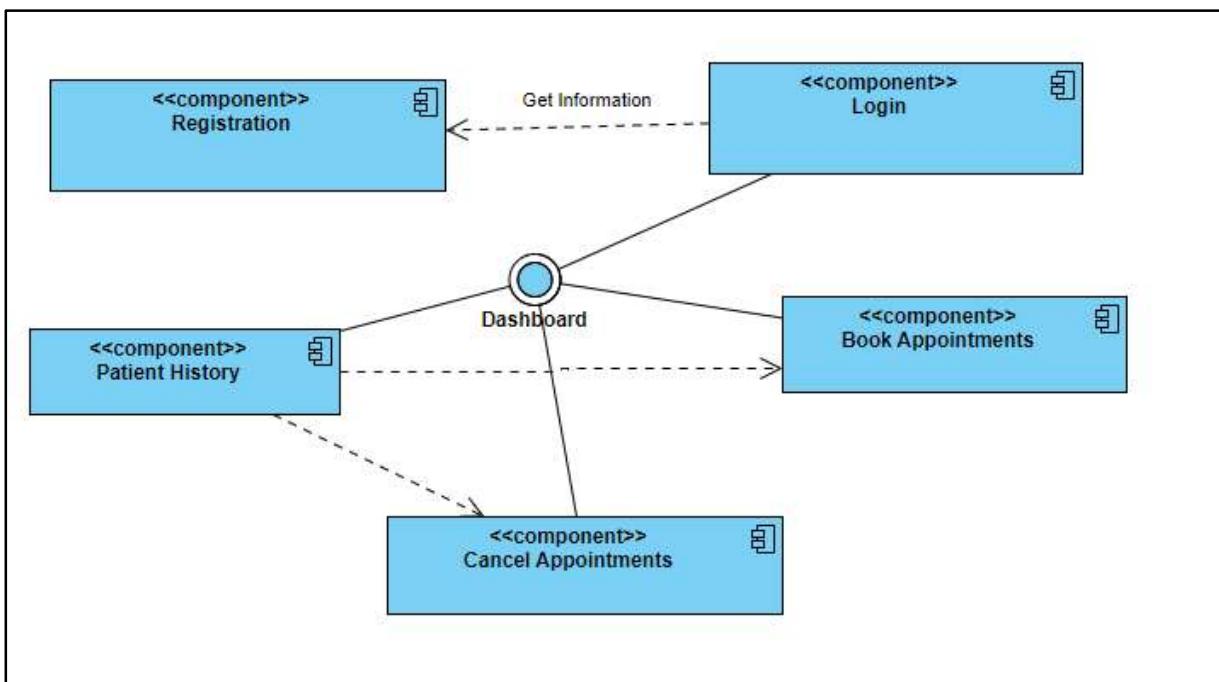
Use Case Diagram of the System:



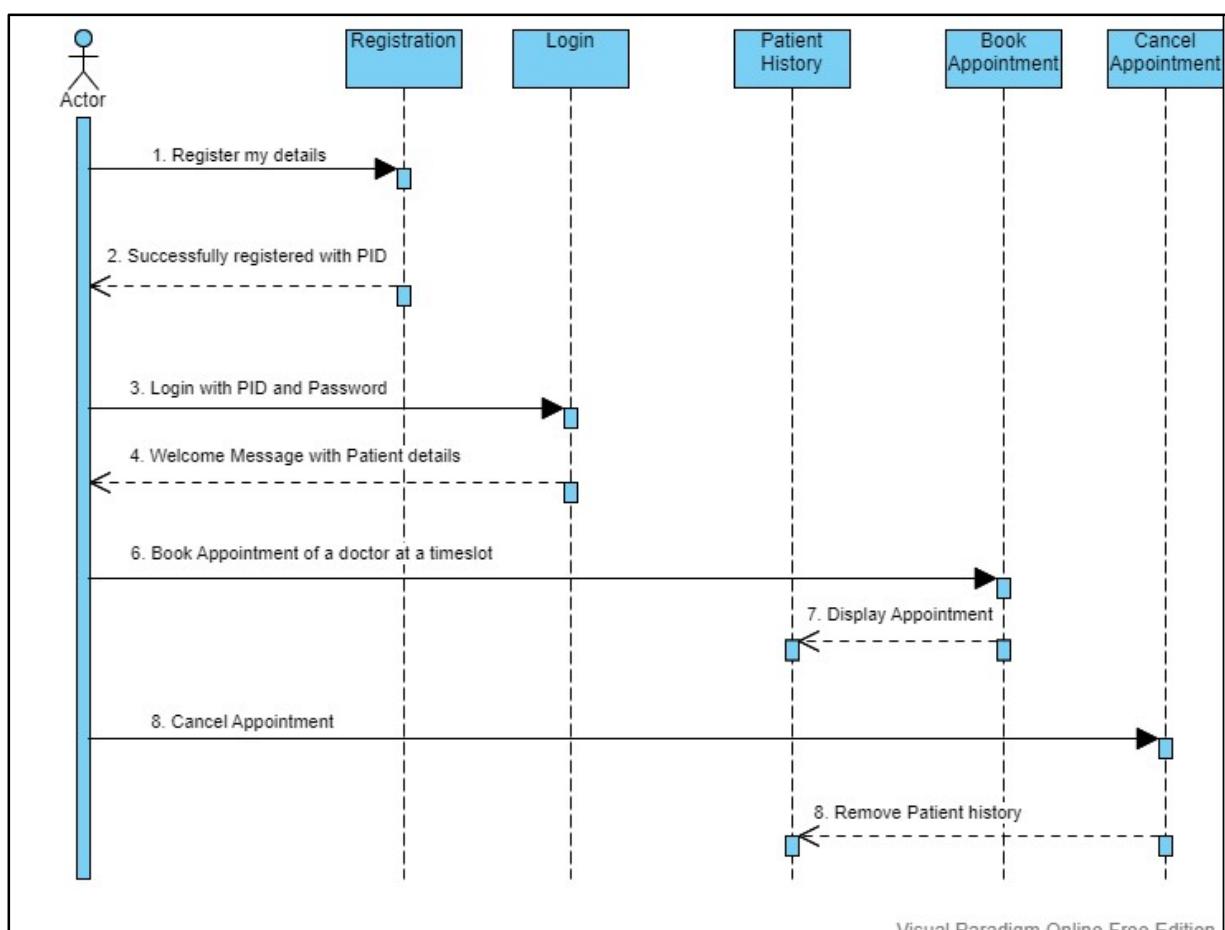
Class Diagram of the System:



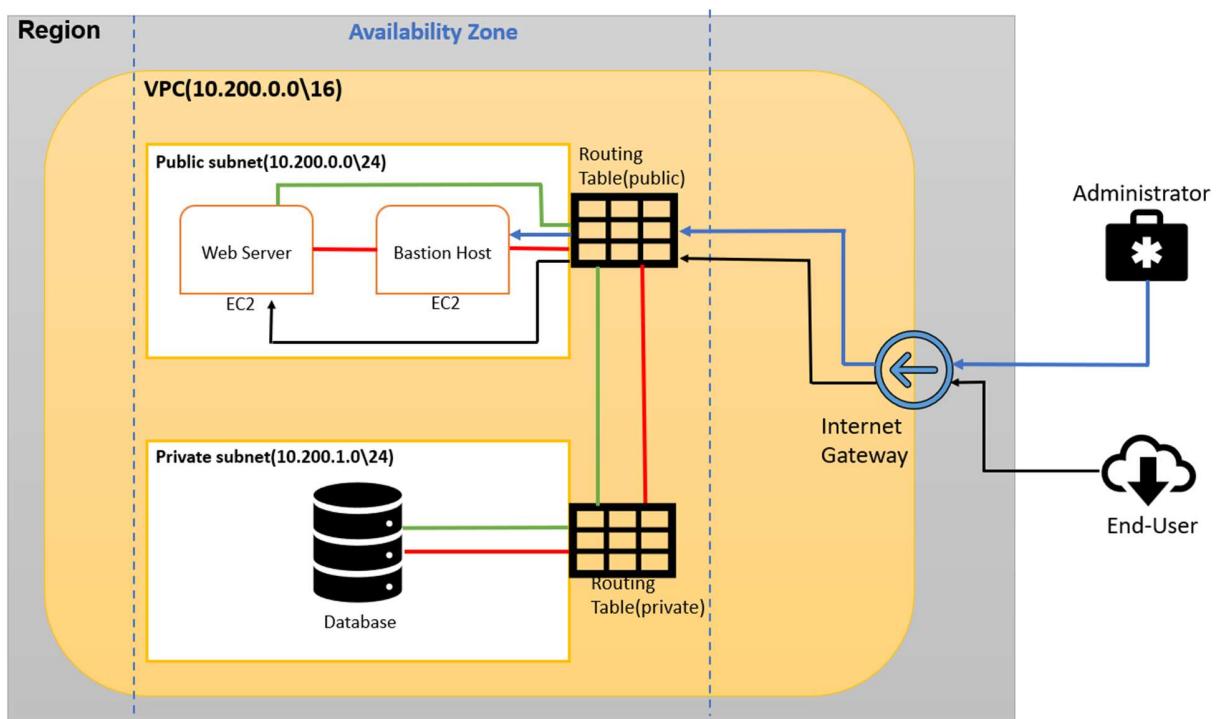
Component Diagram of the System:



Sequence Diagram of the System:



Architecture Used in the Cloud System



Infrastructures of AWS used:

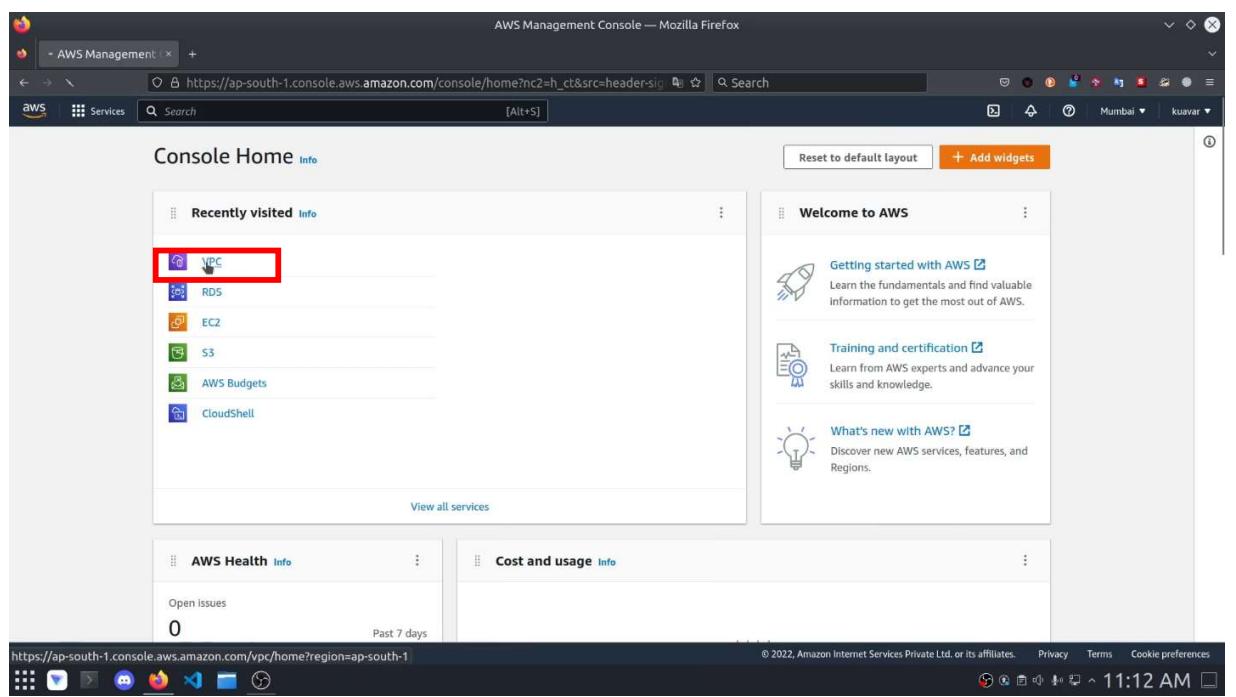
- 1) **Virtual Private Cloud (VPC)**: With Amazon VPC, we have created a virtual network topology so that one part of the network is easily accessible by any end user on the outside internet and the other part of the network is kept secured from outside access and attack from Internet.
- 2) **Subnets**: Using this AWS infrastructure we have created two subnets: public and private. Public Subnet contains resources which can be accessed from outside Internet. Resources in private subnet is not accessible from outside VPC and Internet.
- 3) **Internet Gateway**: Using this infrastructure the traffic from the outside internet to public subnet has been controlled.
- 4) **Security Groups**: We have used security groups to control or allow the flow of only certain traffic from Web Server EC2 instance in public subnet to the database instance in the private subnet.
- 5) **Routers**: Route tables in routers have been created for private subnets to control the access of private subnet.
- 6) **Amazon RDS**: Using Amazon RDS we have created Database server in private subnet which uses MySQL technology.
- 7) **Amazon EC2**: Amazon EC2 instances have been used for the creation of Web Server and Bastion Hosts.

Implementation Details of the Project

In this section we will discuss about the steps we have followed to build the project and deploy it in Amazon Web Services.

1) Creation of Virtual Private Cloud

Step 1: Click on VPC from “Console Home”.



Step 2: Click on “Your VPCs” present in the left-hand side window pane.

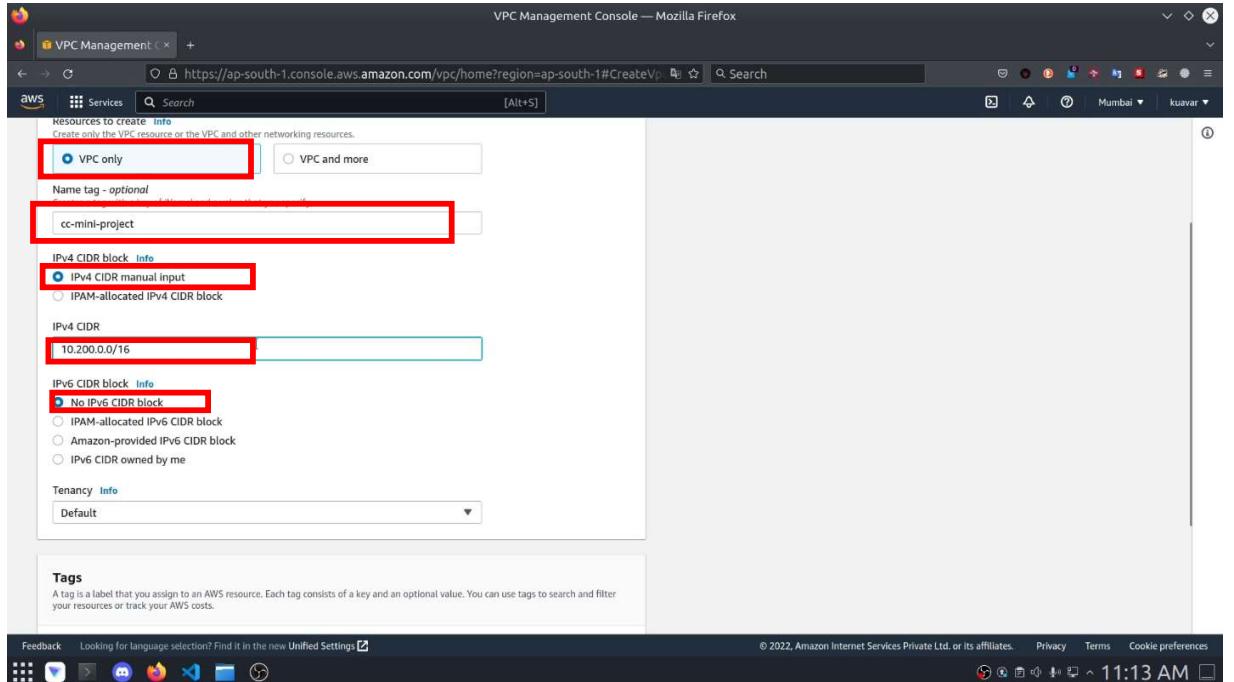
The screenshot shows the AWS VPC Management Console interface. On the left sidebar, under the 'Virtual private cloud' section, the 'Your VPCs' item is highlighted with a red box. The main content area displays various AWS services related to VPCs, such as VPCs, Subnets, Route Tables, Internet Gateways, Egress-only Internet Gateways, DHCP option sets, Elastic IPs, Managed prefix lists, Endpoints, Endpoint services, NAT gateways, Peering connections, Security, Network ACLs, and Security groups. A central panel titled 'Resources by Region' lists these resources with dropdown menus for 'See all regions'. To the right, there are sections for 'Service Health' (loading), 'Settings' (Zones, Console Experiments), 'Additional Information' (VPC Documentation, All VPC Resources, Forums, Report an Issue), and 'AWS Network Manager' (Get started with Network Manager). The URL in the browser is https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#vpcs:.

Step 3: Displays the list of all VPCs present (some may even be present by default). Click on “Create VPC”.

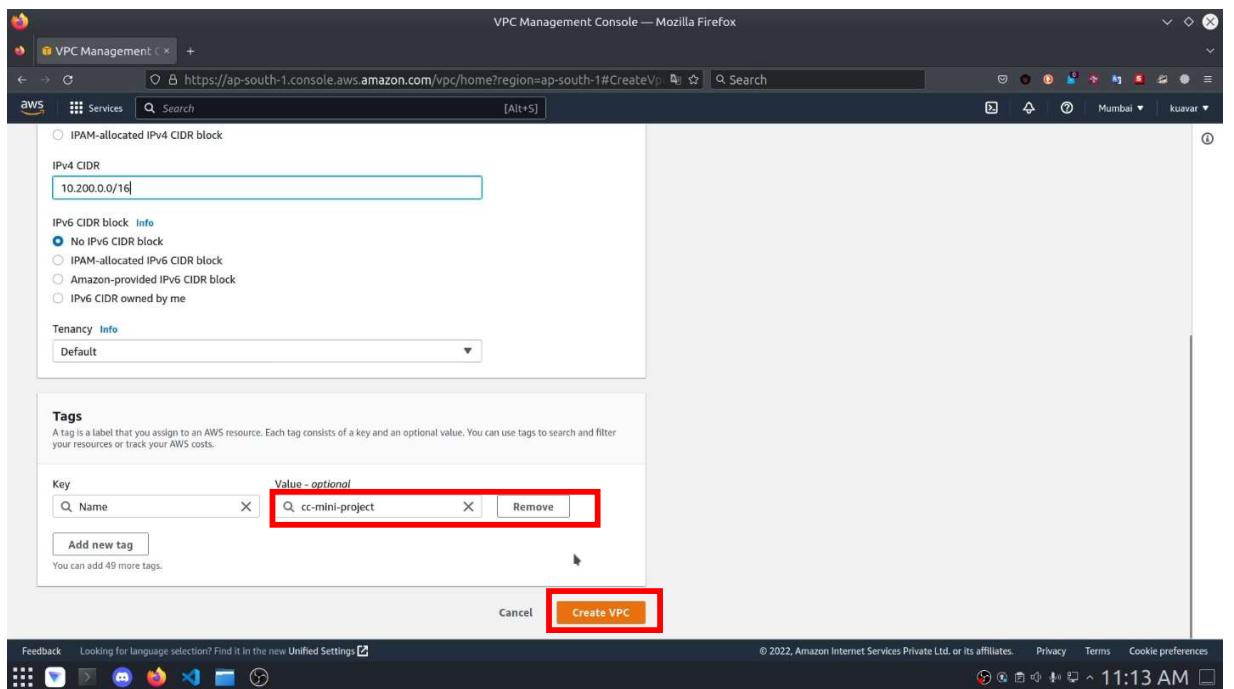
The screenshot shows the 'Your VPCs' page of the AWS VPC Management Console. The left sidebar shows the same navigation options as the previous screen. The main area is titled 'Your VPCs (4) Info' and contains a table with four rows of VPC information. The columns are: Name, VPC ID, State, IPv4 CIDR, IPv6 CIDR, and DHCP option set. The VPC IDs listed are: 'vpc-014b1383306f50010', 'vpc-025cede16b6b5b4cd', 'vpc-05f6ab0b1871aa438', and 'vpc-08ddfec00217b1a35'. All VPCs are marked as 'Available'. The 'Actions' button at the top right is highlighted with a red box. The URL in the browser is https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#vpcs:.

Name	VPC ID	State	IPv4 CIDR	IPv6 CIDR	DHCP option set
-	vpc-014b1383306f50010	Available	172.30.0.0/16	-	dopt-0c3af4c545d6
-	vpc-025cede16b6b5b4cd	Available	172.30.0.0/16	-	dopt-0c3af4c545d6
-	vpc-05f6ab0b1871aa438	Available	172.31.0.0/16	-	dopt-0c3af4c545d6
-	vpc-08ddfec00217b1a35	Available	172.30.0.0/16	-	dopt-0c3af4c545d6

Step 4: Click on “VPC only”. Provide a “tag name” for the VPC. Provide a IPv4 CIDR address block to the VPC. Select “No IPv6 CIDR block” (as we only want to deal with IPv4 addresses).



Step 5: The tag name appears as “Value” in “Tags” section. Finally click on “Create VPC” to create the VPC.



Step 6: The following two screenshots show the details of VPC including the IPv4 CIDR block assigned after the successful creation of VPC.

The screenshot shows the AWS VPC Management Console in Mozilla Firefox. The URL is <https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#VpcDetail>. The page displays the details of a VPC named "vpc-0636af6ef76b6c366 / cc-mini-project".

VPC Details:

VPC ID	State	DNS hostnames	DNS resolution
vpc-0636af6ef76b6c366	Available	Disabled	Enabled
Tenancy	DHCP option set	Main route table	Main network ACL
Default	dopt-0c3af4c545d610629	rtb-045c829cc1aa44b73	acl-0abf6da3d5708e7c2
Default VPC	IPv4 CIDR	IPv6 pool	IPv6 CIDR (Network border group)
No	10.200.0.0/16	-	-
Network Address Usage metrics	Route 53 Resolver DNS Firewall rule groups	Owner ID	
Disabled	-	666048581388	

CIDRs:

Address type	CIDR	Network Border Group	Pool	Status
IPv4	10.200.0.0/16	-	-	Associated

This screenshot is identical to the one above, showing the AWS VPC Management Console in Mozilla Firefox. The URL is <https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#VpcDetail>. It displays the same VPC details and CIDR configuration as the first screenshot.

2) Creation of Internet Gateway for VPC

Step 1: Click on “Internet gateways” on the left-hand side window pane. The following window appears. Then click on “Create Internet gateway” to create the gateway.

The screenshot shows the AWS VPC Management Console. On the left sidebar, under the 'Virtual private cloud' section, the 'Internet gateways' option is selected and highlighted with a red box. In the main content area, there is a table header for 'Internet gateways' with columns: Name, Internet gateway ID, State, VPC ID, and Owner. Below the table, a message says 'Loading internet gateways'. At the top right of the main area, there is a red box around the 'Create internet gateway' button. The browser address bar shows the URL: https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#igws:.

Step 2: Provide a “Name tag” for the Internet Gateway which also appears as a “Value” under “Tags” section. Finally click on “Create Internet gateway” button.

The screenshot shows the 'Create internet gateway' wizard. The top navigation bar shows 'VPC > Internet gateways > Create internet gateway'. The main form has two sections: 'Internet gateway settings' and 'Tags - optional'. In the 'Internet gateway settings' section, there is a 'Name tag' input field containing 'cc-mini-project-igw', which is also highlighted with a red box. In the 'Tags - optional' section, there is a table with one row: 'Key' is 'Name' and 'Value - optional' is 'cc-mini-project-igw', both of which are also highlighted with a red box. At the bottom of the form, there is a 'Create internet gateway' button, which is also highlighted with a red box. The browser address bar shows the URL: https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#CreateIn.

Step 3: Internet Gateway successfully created.

The screenshot shows the AWS VPC Management Console in Mozilla Firefox. The URL is https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#InternetGw. A green banner at the top right says "The following internet gateway was created: igw-0656eed26c73402d - cc-mini-project-igw. You can now attach to a VPC to enable the VPC to communicate with the internet." Below this, the breadcrumb navigation shows VPC > Internet gateways > igw-0656eed26c73402d. The main content area displays the details for the Internet gateway "igw-0656eed26c73402d / cc-mini-project-igw". The "Details" tab is selected, showing the following information:

Internet gateway ID	State	VPC ID	Owner
igw-0656eed26c73402d	Detached	-	666048581388

Below the details, there is a "Tags" section with one tag listed:

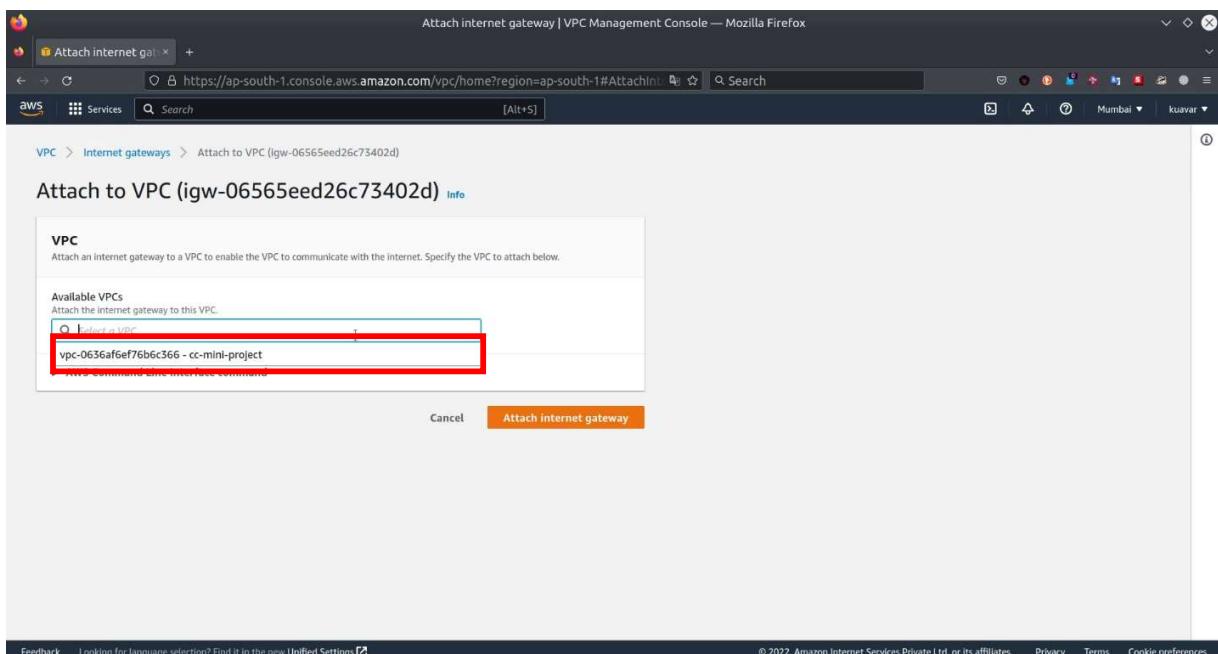
Key	Value
Name	cc-mini-project-igw

On the far right of the main content area, there is an "Actions" dropdown menu. At the bottom of the page, there is a feedback link and a footer with copyright information and a timestamp of 11:16 AM.

Step 4: Now we need to attach this created Internet Gateway to our created VPC.

This screenshot is identical to the previous one, showing the AWS VPC Management Console with the same URL and banner message. However, the "Actions" dropdown menu at the top right of the main content area has a red box drawn around the "Attach to a VPC" button, indicating the next step in the process.

Step 5: Attach it to our previously created VPC by selecting it from drop down list. Now click on “Attach Internet gateway”.



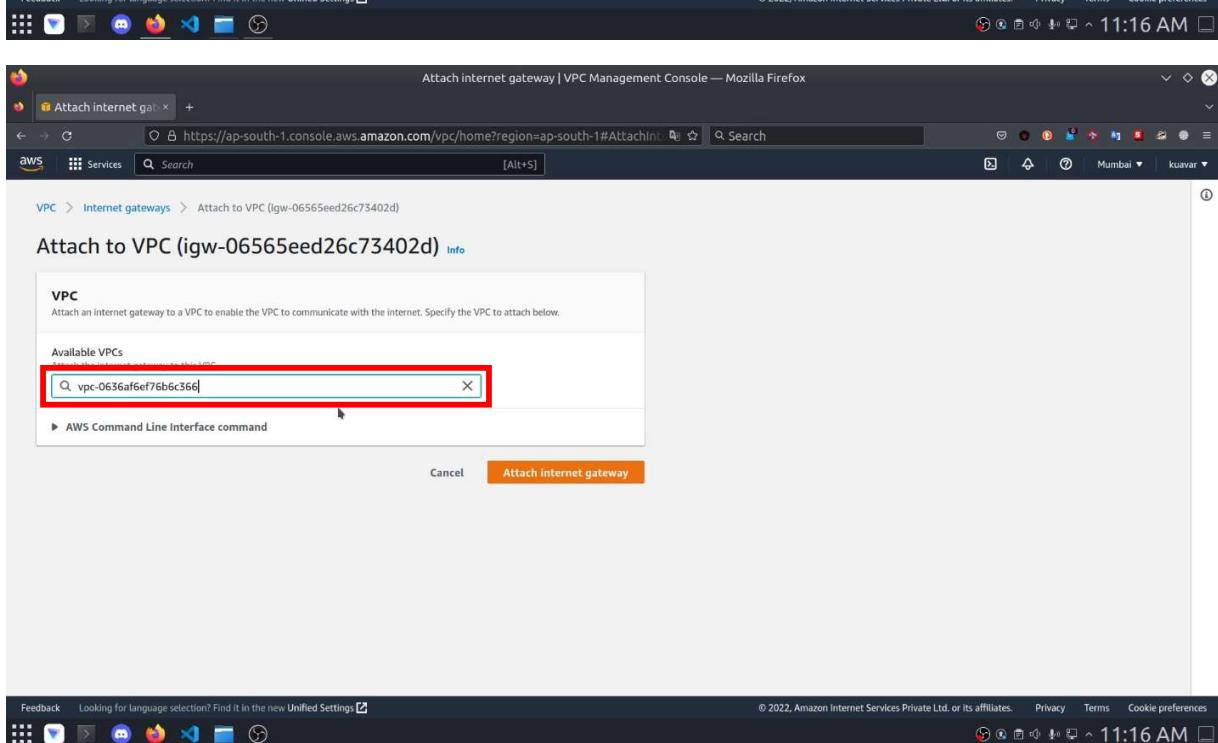
Attach to VPC (igw-06565eed26c73402d) [Info](#)

VPC
Attach an internet gateway to a VPC to enable the VPC to communicate with the internet. Specify the VPC to attach below.

Available VPCs
Attach the internet gateway to this VPC.

vpc-0636af6ef76b6c366 - cc-mini-project

Cancel **Attach internet gateway**



Attach to VPC (igw-06565eed26c73402d) [Info](#)

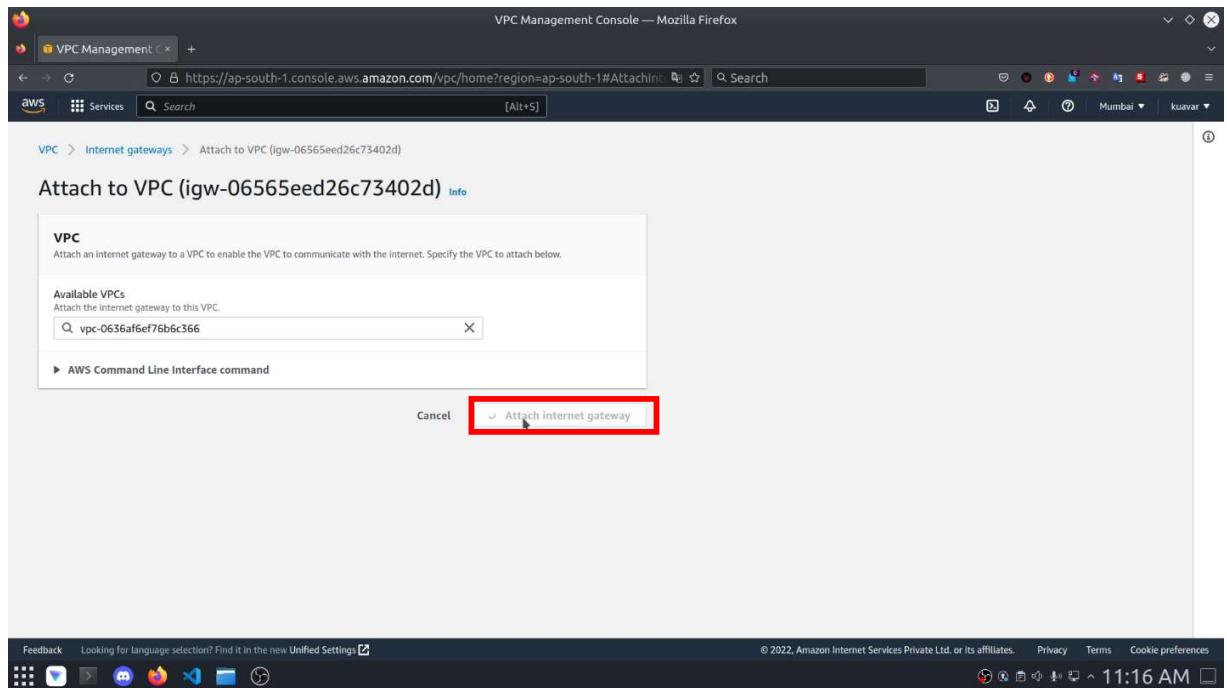
VPC
Attach an internet gateway to a VPC to enable the VPC to communicate with the internet. Specify the VPC to attach below.

Available VPCs
Attach the internet gateway to this VPC.

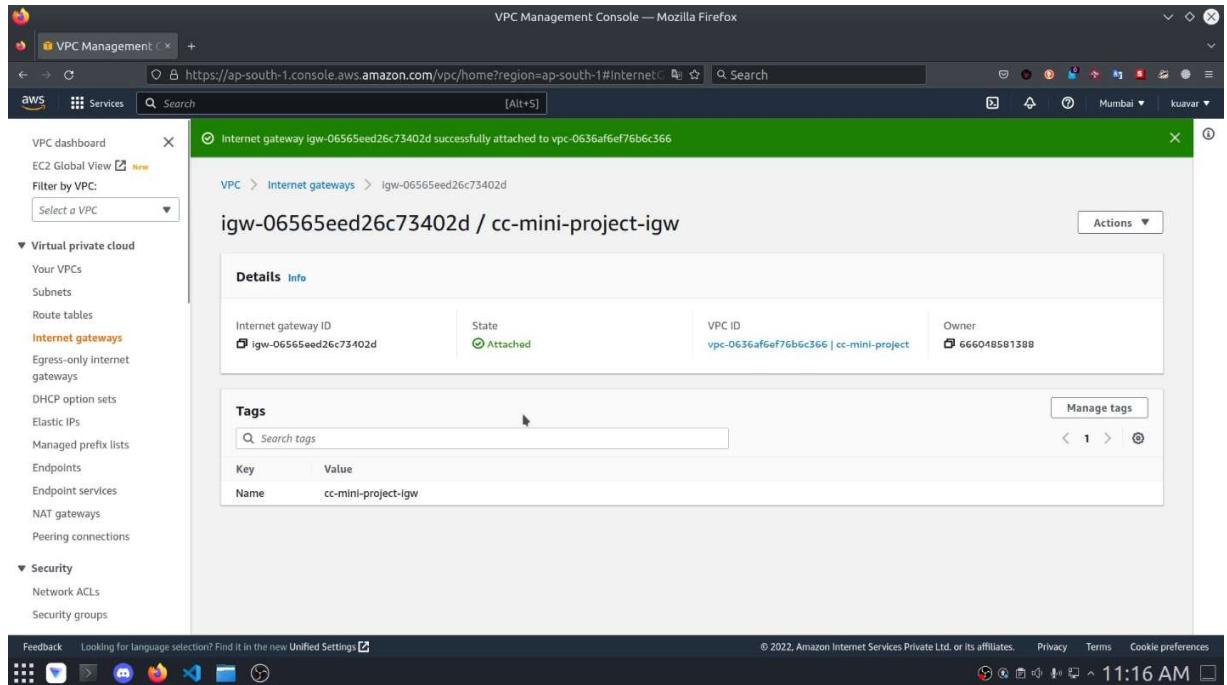
vpc-0636af6ef76b6c366

▶ AWS Command Line Interface command

Cancel **Attach internet gateway**



Step 6: The Internet Gateway for the VPC has been created successfully.



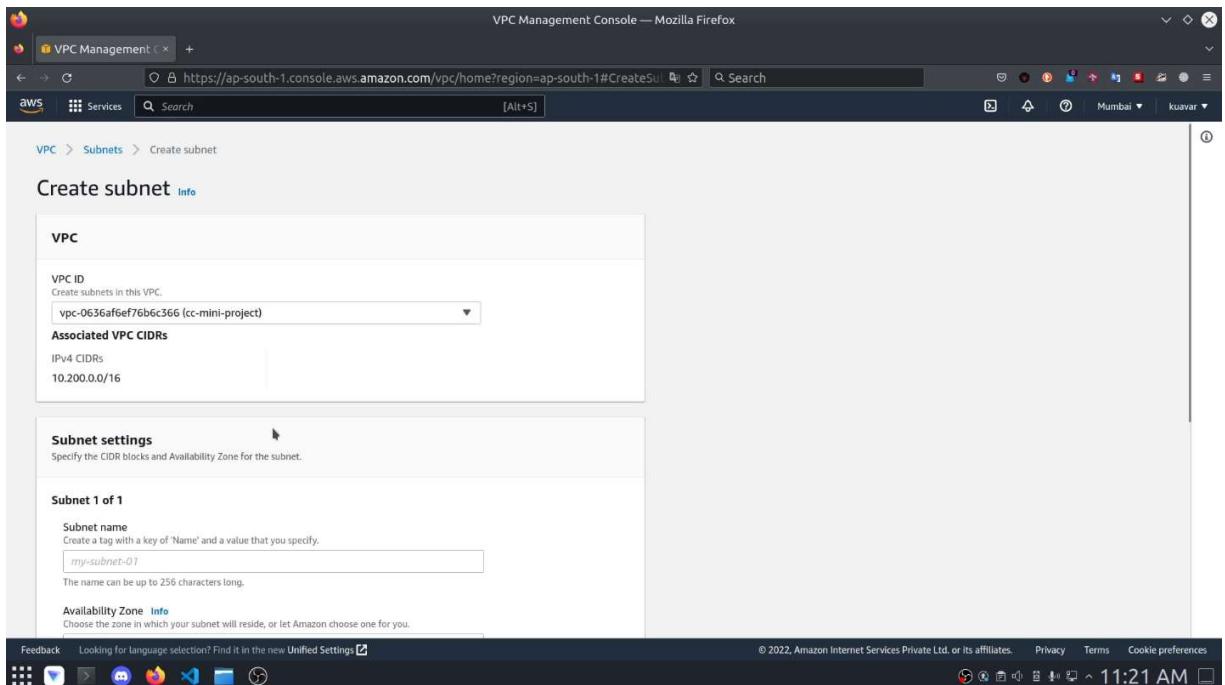
3) Creation of Public Subnet

Step 1: Click on “Subnets” on the left window pane. The list of subnets previously created appears. Click on “Create Subnet”.

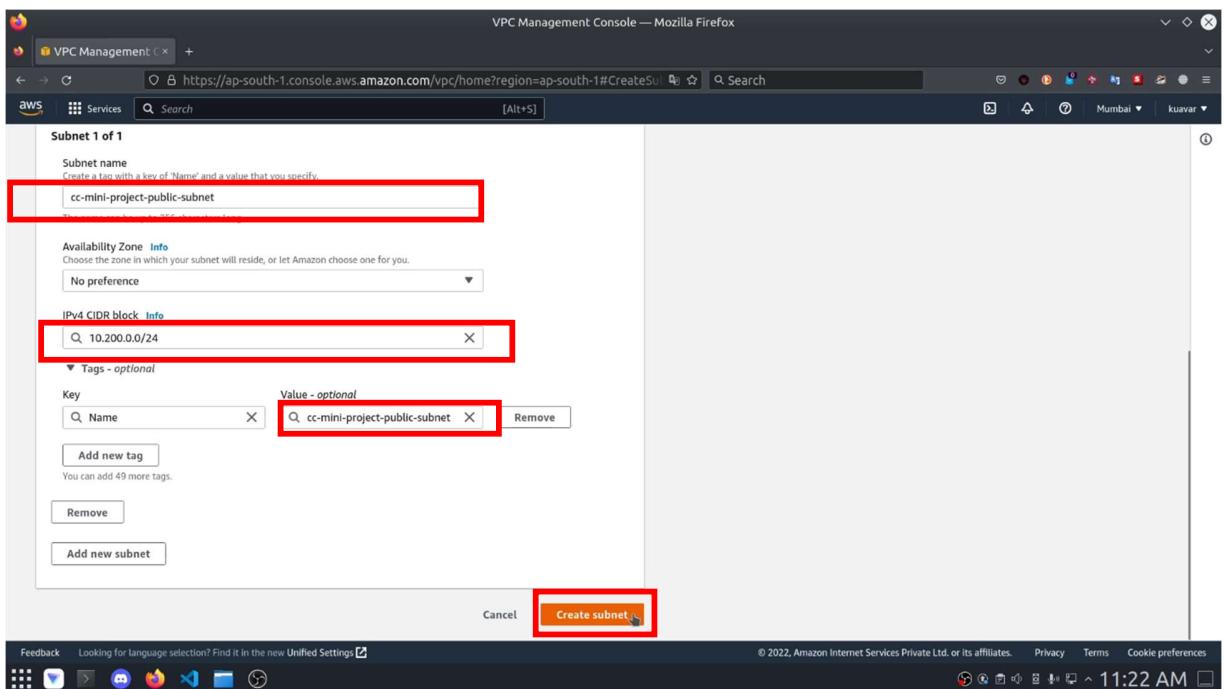
The screenshot shows the AWS VPC Management Console. On the left, there's a sidebar with various options like 'Virtual private cloud', 'Your VPCs', and 'Subnets'. The 'Subnets' link is highlighted with a red box. The main area displays a table titled 'Subnets (15) Info' with columns for Name, Subnet ID, State, VPC, IPv4 CIDR, and IPv6 CIDR. A new row is being added at the bottom. At the top right of the main area, there's a 'Create subnet' button, which is also highlighted with a red box.

Step 2: Select “VPC ID” from the drop-down menu to attach the subnet to the created VPC.

The screenshot shows the 'Create subnet' dialog box. In the 'VPC' section, there's a 'VPC ID' dropdown menu. It lists several VPCs: 'vpc-014b1383306f50010', 'vpc-025cede16b6b5b4cd', 'vpc-0636afef76b6c366 (cc-mini-project)', 'vpc-05f6ab0b1871aa438', and 'vpc-08ddfec00217b1a35'. The 'vpc-0636afef76b6c366 (cc-mini-project)' option is selected and highlighted with a red box. At the bottom right of the dialog box, there's a 'Create subnet' button, which is also highlighted with a red box.

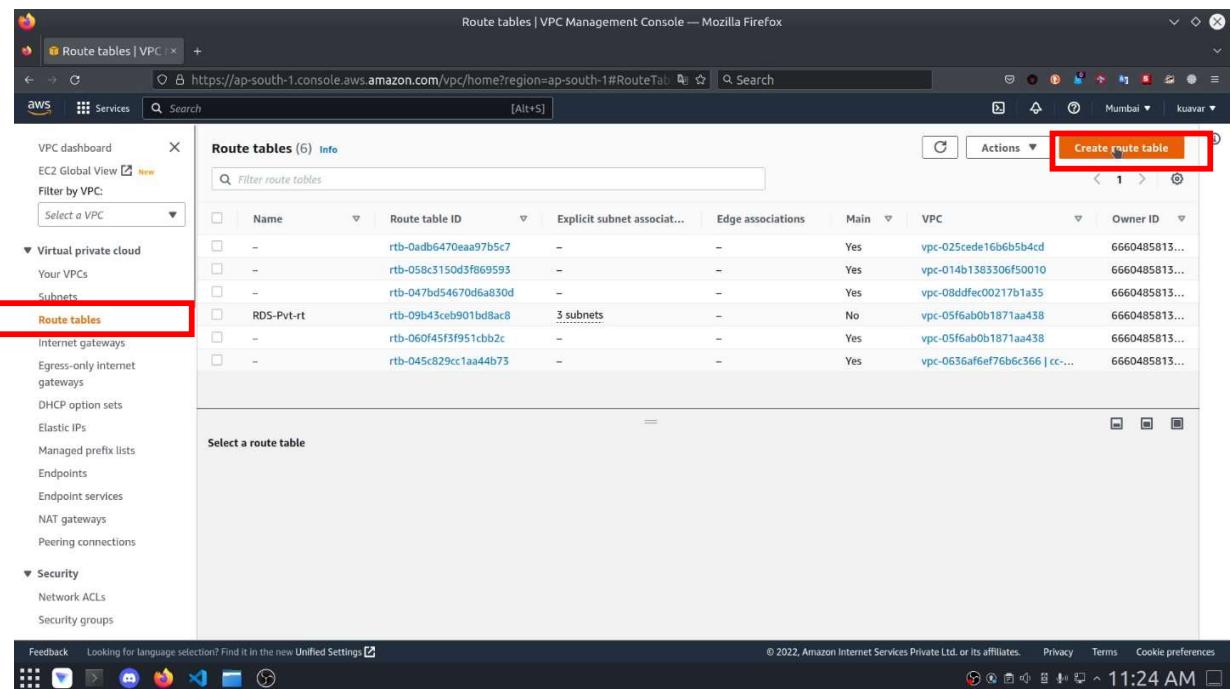


Step 3: Provide a “Subnet name” which appears “Value” in the “Tags” section. Provide a IPv4 CIDR block for the subnet from the IPv4 CIDR block attached to the VPC. Finally click on “Create subnet” button.



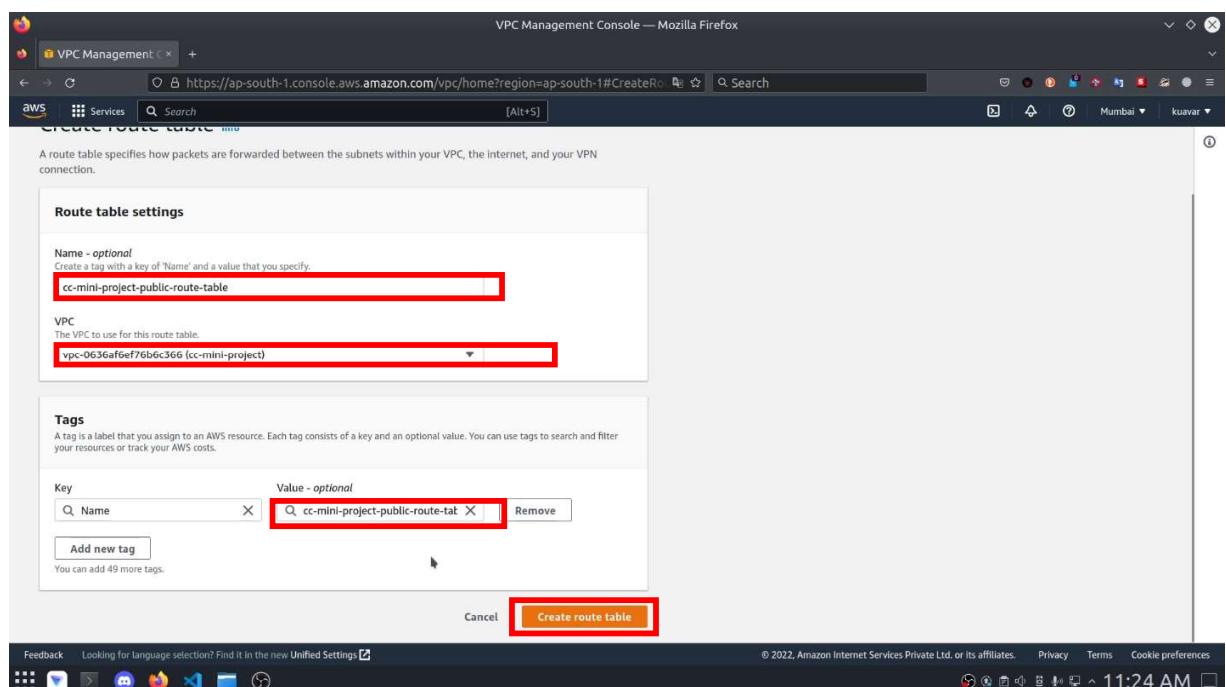
4) Creation and Attachment of a route table to the public subnet.

Step 1: Click on “Route tables” on the left-hand side window pane. Now click on “Create Route table”.



The screenshot shows the AWS VPC Management Console. On the left, there's a sidebar with various VPC-related options like Virtual private cloud, Your VPCs, Subnets, and Route tables, which is currently selected and highlighted with a red box. The main area displays a table of existing route tables with columns for Name, Route table ID, Explicit subnet associations, Edge associations, Main, VPC, and Owner ID. A new route table named 'RDS-Pvt-rt' is listed, showing it's associated with 3 subnets. At the top right, there's a 'Create route table' button, which is also highlighted with a red box. The URL in the browser is https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#RouteTables.

Step 2: Provide a “Route table name” which appears “Value” in the “Tags” section. Attach it to the created VPC. Finally click on “Create route table”.



The screenshot shows the 'Create route table' wizard. In the first step, 'Route table settings', the 'Name' field is filled with 'cc-mini-project-public-route-table' and the 'VPC' dropdown is set to 'vpc-0636af6ef76b6c366 (cc-mini-project)'. Both are highlighted with red boxes. In the second step, 'Tags', there is one tag defined: 'Name: cc-mini-project-public-route-table'. The 'Create route table' button at the bottom is also highlighted with a red box. The URL in the browser is https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#CreateRouteTable.

Step 3: Route table has been created successfully. Now we need to “Edit routes” to make it publicly accessible.

The screenshot shows the AWS VPC Management Console in Mozilla Firefox. A success message at the top right states: "Route table rtb-0c34583bb5e37afdd | cc-mini-project-public-route-table was created successfully." On the left, a sidebar lists various VPC components like Virtual private cloud, Route tables, and Security. The main area displays the details of the newly created route table, including its ID (rtb-0c34583bb5e37afdd), VPC (vpc-0636af6ef76b6c366 | cc-mini-project), and a single route entry (Destination: 10.200.0.0/16, Target: local). A red box highlights the "Edit routes" button in the top right corner of the route table list.

Step 4: Click on “Add route”. Add route “0.0.0.0/0” under “Destination” and under “Target” select the Internet Gateway ID previously created. Finally click on “Save Changes”.

The screenshot shows the "Edit routes" page for the previously created route table. It displays a table with one existing route entry (Destination: 10.200.0.0/16, Target: local) and a red box highlighting the "Add route" button in the bottom left corner of the table. At the bottom right, there are "Cancel", "Preview", and "Save changes" buttons. The "Save changes" button is highlighted with a red box.

VPC Management Console — Mozilla Firefox

VPC Services Search [Alt+S] Mumbai kuavar

https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#EditRoute

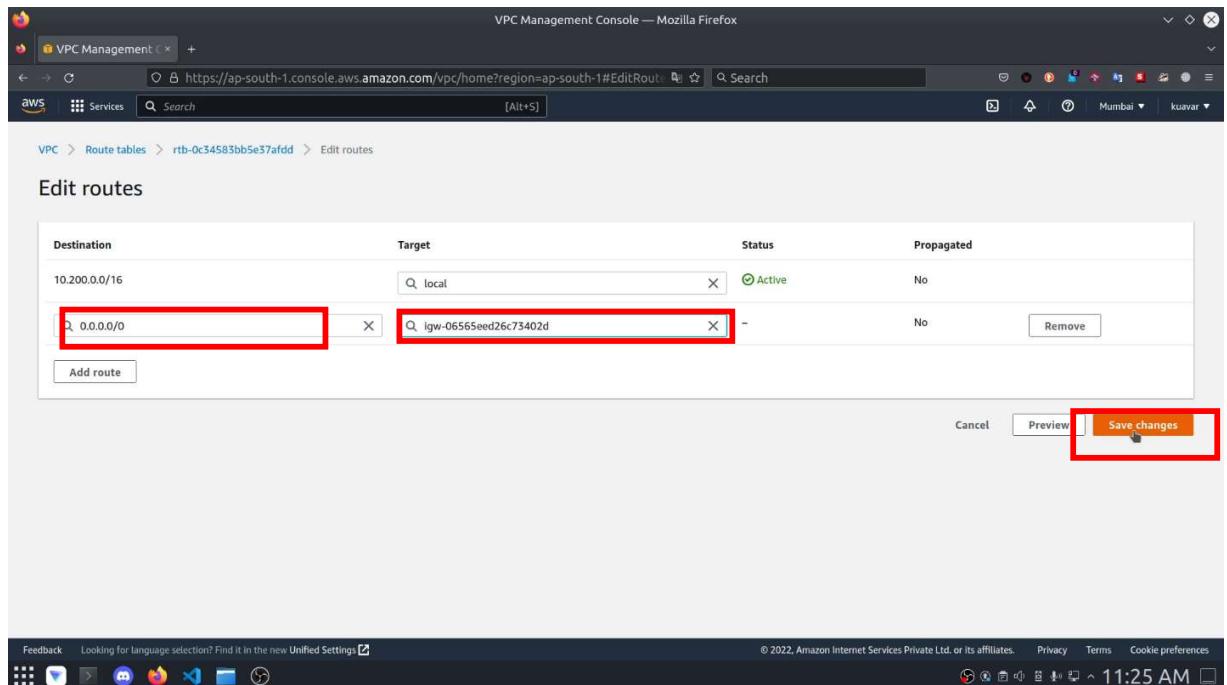
VPC > Route tables > rtb-0c34583bb5e37afdd > Edit routes

Edit routes

Destination	Target	Status	Propagated
10.200.0.0/16	local	Active	No
0.0.0.0/0	igw-06565eed26c73402d	-	No

Add route Cancel Preview Save changes

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 11:25 AM



Step 5: Now we will attach this route table to our public subnet. Click on “Subnet associations” tab.

VPC Management Console — Mozilla Firefox

VPC Services Search [Alt+S] Mumbai kuavar

https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#RouteTable

Updated routes for rtb-0c34583bb5e37afdd / cc-mini-project-public-route-table successfully

Details You can now check network connectivity with Reachability Analyzer Run Reachability Analyzer

Virtual private cloud Details Info

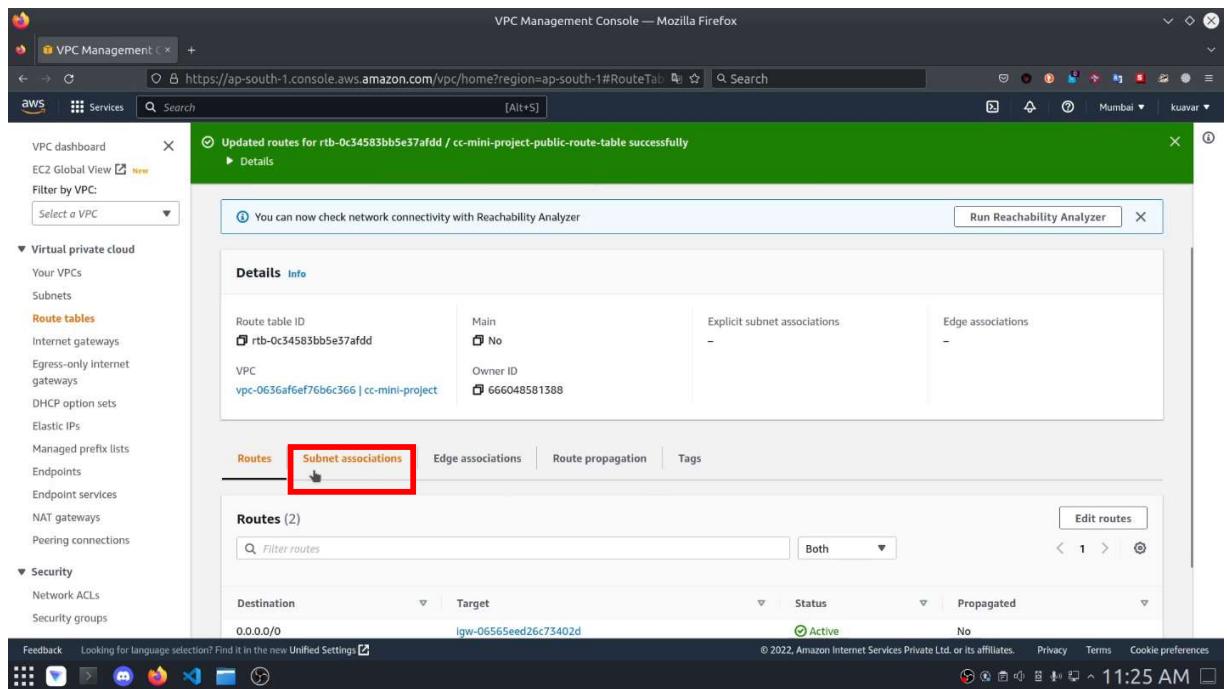
Route table ID	Main	Explicit subnet associations	Edge associations
rtb-0c34583bb5e37afdd	No	-	-
VPC	Owner ID	Edge associations	
vpc-0636af6ef76b6c366 cc-mini-project	666048581388	-	

Routes Subnet associations Edge associations Route propagation Tags

Routes (2)

Destination	Target	Status	Propagated
0.0.0.0/0	igw-06565eed26c73402d	Active	No

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 11:25 AM



Step 6: Click on “Edit Subnet associations”.

The screenshot shows the AWS VPC Management Console in Mozilla Firefox. The URL is <https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#EditRouteTable>. The page displays a success message: "Updated routes for rtb-0c34583bb5e37afdd / cc-mini-project-public-route-table successfully". Below this, there are tabs for Routes, Subnet associations, Edge associations, Route propagation, and Tags. The Subnet associations tab is selected. Under "Explicit subnet associations (0)", there is a search bar and a button labeled "Edit subnet associations". Under "Subnets without explicit associations (1)", there is a search bar and a button labeled "Edit subnet associations". The sidebar on the left lists various VPC management options like Virtual private cloud, Route tables, Security, and Network ACLs. The bottom right corner shows the time as 11:26 AM.

Step 7: Select the created public subnet and click on “Save associations”.

The screenshot shows the "Edit subnet associations" dialog in the AWS VPC Management Console. The URL is <https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#EditRouteTable>. The dialog title is "Edit subnet associations". It shows a table of "Available subnets (1/1)" with one entry: "cc-mini-project-public-subnet" (Subnet ID: subnet-0b9ea6fddb152e824, IPv4 CIDR: 10.200.0.0/24, Route table ID: Main (rtb-045c829cc1aa44b73)). This row is highlighted with a red box. Below the table is a "Selected subnets" section containing the same subnet entry, also highlighted with a red box. At the bottom right is a "Save associations" button, which is also highlighted with a red box.

Step 8: Route table has been successfully created and attached to public subnet. This subnet will now be accessible from anywhere in the Internet.

The screenshot shows the AWS VPC Management Console in Mozilla Firefox. The URL is <https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#RouteTab>. The page displays a success message: "You have successfully updated subnet associations for rtb-0c34583bb5e37afdd / cc-mini-project-public-route-table". The main content area shows the details of the route table "rtb-0c34583bb5e37afdd / cc-mini-project-public-route-table". It includes fields for Route table ID, Main, VPC, Owner ID, and Explicit subnet associations. Below this, there are tabs for Routes, Subnet associations, Edge associations, Route propagation, and Tags. The Routes tab shows two routes: one to 0.0.0.0/0 targetting igw-06565eed26c73402d and another to 10.200.0.0/16 targetting local. A button labeled "Run Reachability Analyzer" is visible. The bottom of the screen shows the AWS navigation bar and the status bar indicating the time as 11:26 AM.

This screenshot is identical to the one above, showing the AWS VPC Management Console. However, the "Routes" table in the "Routes" section is now highlighted with a red border. The table contains the following data:

Destination	Target	Status	Propagated
0.0.0.0/0	igw-06565eed26c73402d	Active	No
10.200.0.0/16	local	Active	No

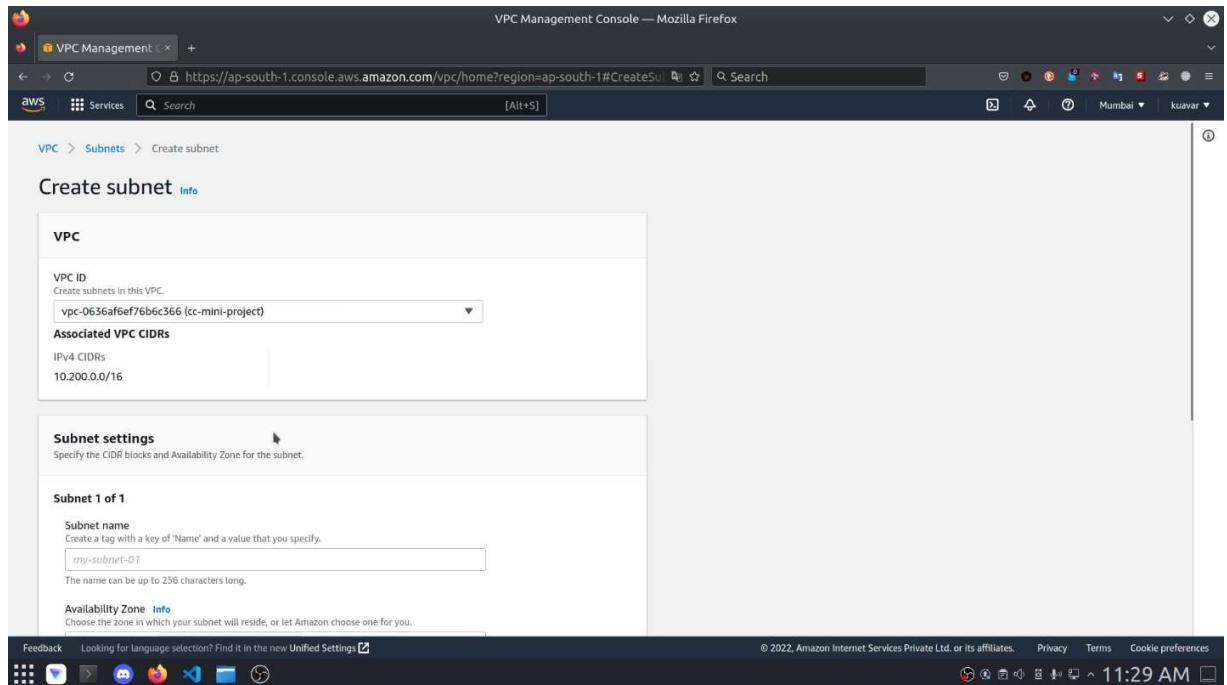
5) Creation of Private subnet

Step 1: Click on “Subnets” on the left window pane. The list of subnets previously created appears. Click on “Create Subnet”.

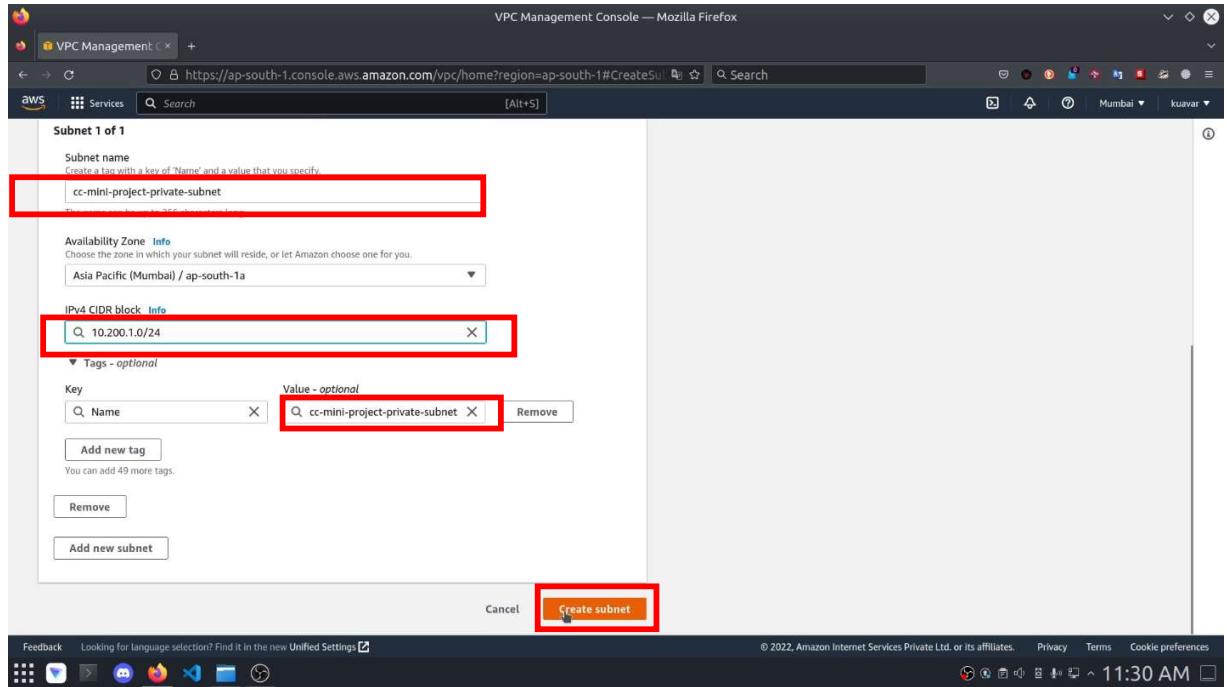
The screenshot shows the AWS VPC Management Console in Mozilla Firefox. The URL is <https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#subnets>. The left sidebar has a red box around the 'Subnets' option under 'Virtual private cloud'. The main pane displays a table of subnets with one row selected, also highlighted with a red box. The selected subnet is 'subnet-0b9ea6fdb152e824' from the 'cc-mini-project-public-subnet' VPC. The 'Actions' button at the top right is also highlighted with a red box. Below the table, the subnet's details are shown in a modal window, including its ID, ARN, state, and IPv4 CIDR.

Step 2: Select “VPC ID” from the drop-down menu to attach the subnet to the created VPC.

The screenshot shows the 'Create subnet' dialog in the AWS VPC Management Console. The URL is <https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#CreateSubnet>. The 'VPC' section is expanded, showing a dropdown menu for 'VPC ID' with several options listed. One option, 'vpc-0656af6ef76b6c366 (cc-mini-project)', is highlighted with a red box. At the bottom right of the dialog is an orange 'Create subnet' button.



Step 3: Provide a “Subnet name” which appears “Value” in the “Tags” section. Provide a IPv4 CIDR block for the subnet from the IPv4 CIDR block attached to the VPC and other than the one provided to public subnet. Finally click on “Create subnet” button.



Step 4: Private subnet created successfully.

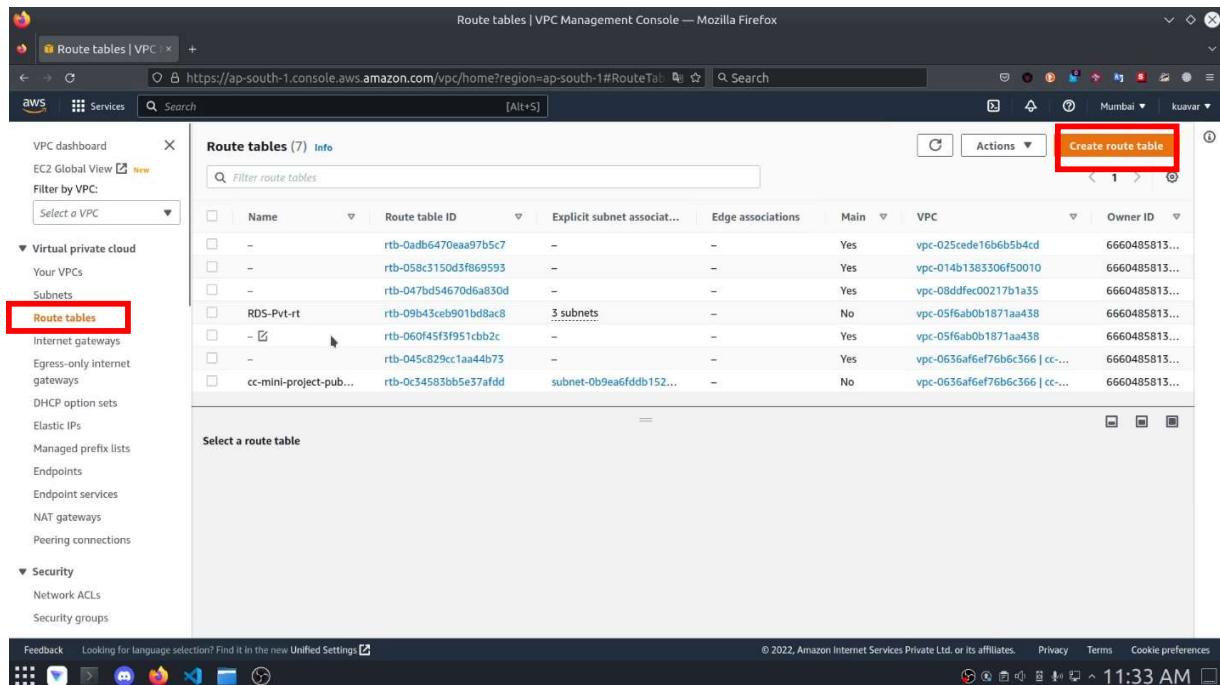
The screenshot shows the AWS VPC Management Console in Mozilla Firefox. The URL is <https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#subnets>. A green success message at the top says "You have successfully created 1 subnet: subnet-00fe813f3afb40959". The main table displays one subnet:

Subnet ID	Name	Subnet ID	State	VPC	IPv4 CIDR	IPv6 CIDR
subnet-00fe813f3afb40959	cc-mini-project-priv...	subnet-00fe813f3afb40959	Available	vpc-0636af6ef76b6c366 cc...	10.200.1.0/24	-

The left sidebar shows the navigation menu for VPC management, including options like VPC dashboard, EC2 Global View, Filter by VPC, Subnets (selected), Route tables, Internet gateways, Egress-only internet gateways, DHCP option sets, Elastic IPs, Managed prefix lists, Endpoints, Endpoint services, NAT gateways, Peering connections, Security, Network ACLs, and Security groups. The status bar at the bottom shows the time as 11:30 AM.

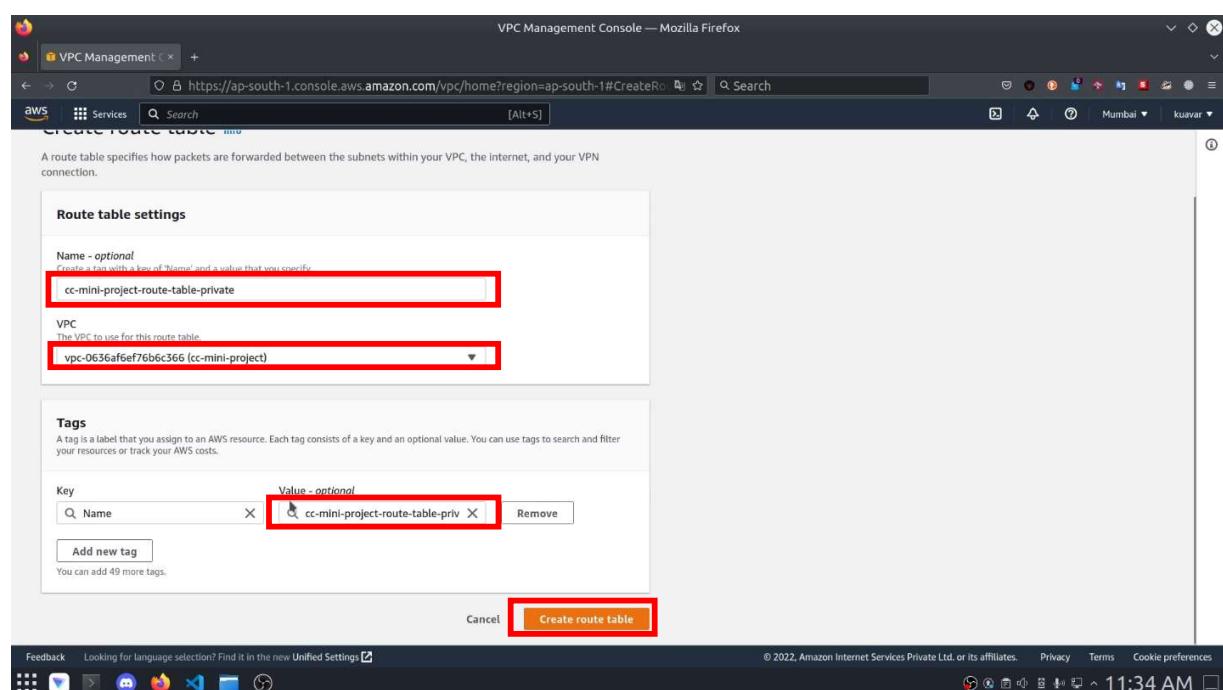
6) Creation and Attachment of a route table to the private subnet.

Step 1: Click on “Route table” tab on the left window pane. Click on “Create Route table”.



The screenshot shows the AWS VPC Management Console. The left sidebar has 'Route tables' selected. The main area displays a table of route tables with columns for Name, Route table ID, Explicit subnet association, Edge associations, Main, VPC, and Owner ID. A red box highlights the 'Create route table' button at the top right of the main content area.

Step 2: Provide the route table name and attach it to the created VPC. Click on “Create route table”.



The screenshot shows the 'Create route table' wizard. The 'Route table settings' step is displayed. The 'Name' field contains 'cc-mini-project-route-table-private'. The 'VPC' dropdown is set to 'vpc-0636af6ef76b6c566 (cc-mini-project)'. The 'Tags' section shows a single tag 'cc-mini-project-route-table-priv' with a value of 'cc'. A red box highlights the 'Create route table' button at the bottom right.

Step 3: Now attach it to the created private subnet. Click on “Subnet associations” tab.

The screenshot shows the AWS VPC Management Console. On the left, there's a sidebar with options like VPC dashboard, EC2 Global View, Filter by VPC, Virtual private cloud (with Your VPCs, Subnets, Route tables, Internet gateways, Egress-only internet gateways, DHCP option sets, Elastic IPs, Managed prefix lists, Endpoints, Endpoint services, NAT gateways, Peering connections), Security (Network ACLs, Security groups), and a Feedback link. The main area shows a success message: "Route table rtb-0aed9f3d7f7fe93 | cc-mini-project-route-table-private was created successfully." Below this, the "Details" tab is selected, showing route table ID rtb-0aed9f3d7f7fe93, VPC id, and other details. The "Subnet associations" tab is highlighted with a red box. Under "Routes (1)", there's one entry: Destination 10.200.0.0/16, Target local, Status Active, and Propagated No. At the bottom right of the main area, there's an "Edit routes" button.

Step 4: Click on “Edit subnet associations”.

This screenshot shows the same AWS VPC Management Console interface as the previous one, but with the "Subnet associations" tab selected. It displays two sections: "Explicit subnet associations (0)" and "Subnets without explicit associations (1)". The "Edit subnet associations" button for both sections is highlighted with a red box. The "Explicit subnet associations" section has a note: "No subnet associations. You do not have any subnet associations." The "Subnets without explicit associations" section lists one subnet: "subnet-00fe813f3afb40959 | cc-mini-project-private-subnet" with IPv4 CIDR 10.200.1.0/24 and IPv6 CIDR -. At the bottom right of the main area, there's an "Edit subnet associations" button.

Step 5: Select the created private subnet and click on “Save associations”.

VPC Management Console — Mozilla Firefox

https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#EditRouteTableAssociations

VPC > Route tables > rtb-0aedd9f3d7f76fe93 > Edit subnet associations

Edit subnet associations

Change which subnets are associated with this route table.

Available subnets (1/2)

Name	Subnet ID	IPv4 CIDR	IPv6 CIDR	Route table ID
cc-mini-project-public-subnet	subnet-0b9ea6fdbb152e824	10.200.0.0/24	-	rtb-0c34583bb5e37afdd / cc-mini-project-public-route-table
cc-mini-project-private-subnet	subnet-00fe813f3afb40959	10.200.1.0/24	-	Main (rtb-045c829cc1aa44b73)

Selected subnets

subnet-00fe813f3afb40959 / cc-mini-project-private-subnet

Cancel Save associations

Step 6: Route table successfully attached to private subnet.

VPC Management Console — Mozilla Firefox

https://ap-south-1.console.aws.amazon.com/vpc/home?region=ap-south-1#RouteTableAssociations

VPC > Route tables > rtb-0aedd9f3d7f76fe93

rtb-0aedd9f3d7f76fe93 / cc-mini-project-route-table-private

You have successfully updated subnet associations for rtb-0aedd9f3d7f76fe93 / cc-mini-project-route-table-private.

Actions

Details Info

Route table ID rtb-0aedd9f3d7f76fe93	Main No	Explicit subnet associations subnet-00fe813f3afb40959 / cc-mini-project-private-subnet	Edge associations -
VPC vpc-0636af6ef76b6c366 cc-mini-project	Owner ID 666048581388		

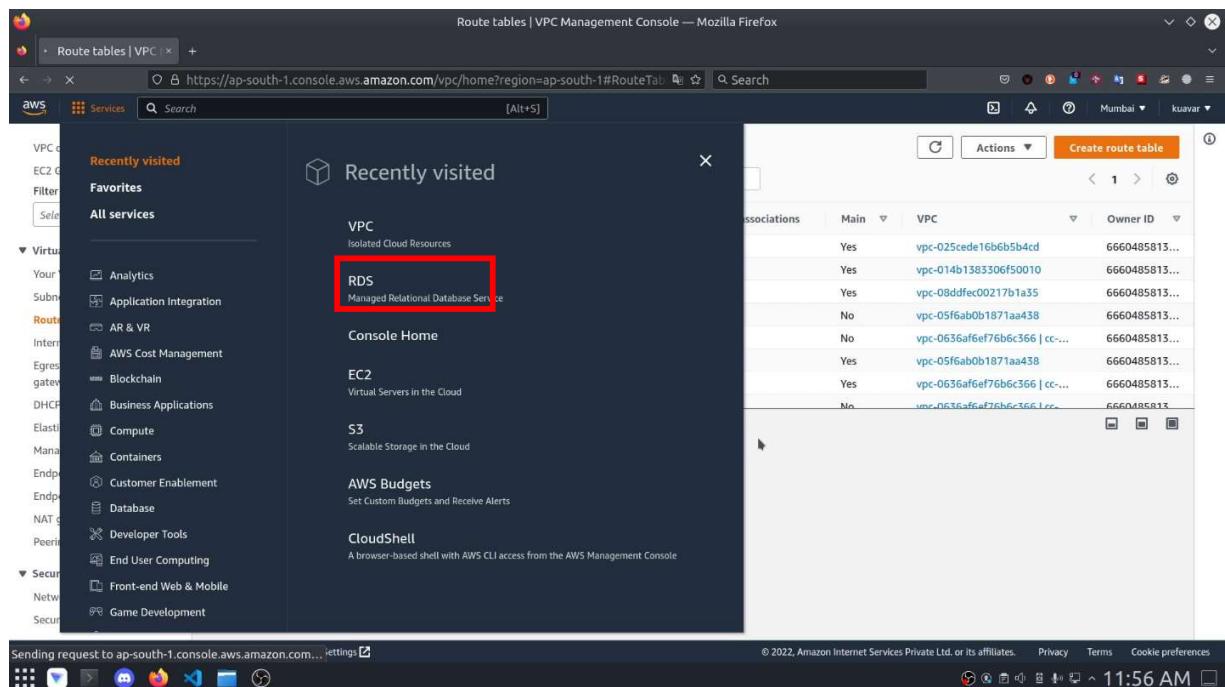
Routes Subnet associations Edge associations Route propagation Tags

Routes (1)

Edit routes

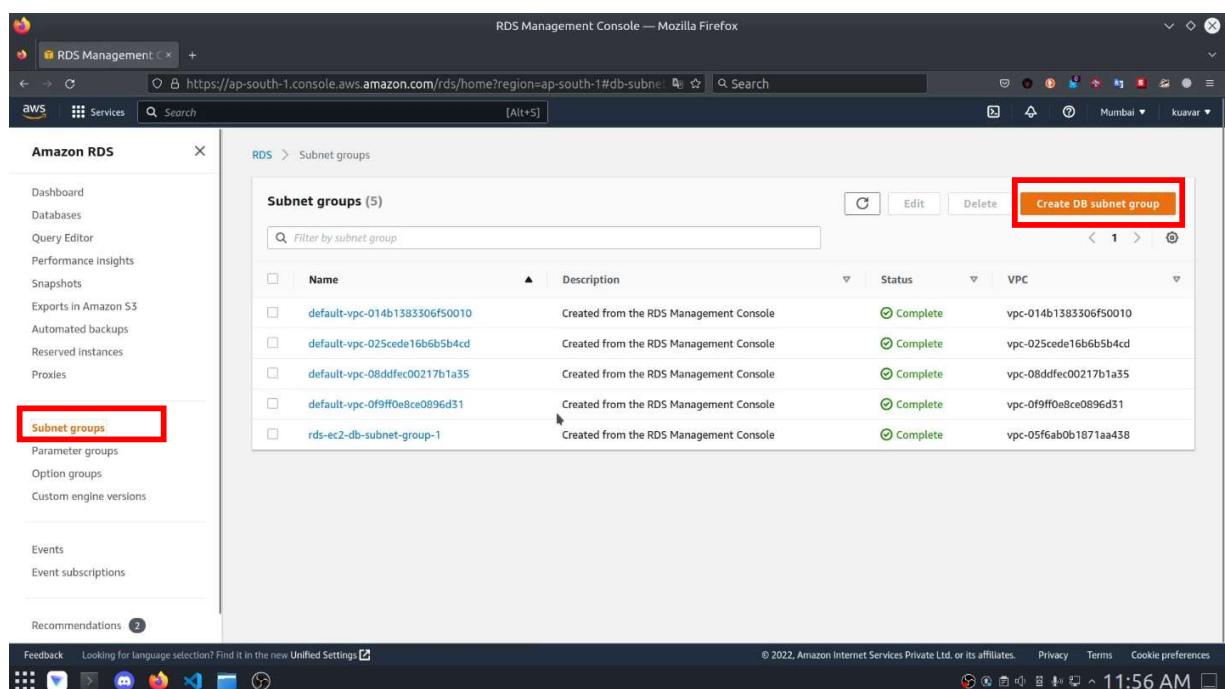
7) Create RDS subnet association

Step 1: Click on RDS.



The screenshot shows the AWS VPC Management Console. On the left, there's a navigation pane with various services like VPC, EC2, Lambda, etc. In the center, a 'Recently visited' section lists several services, with 'RDS' highlighted by a red box. To the right, a table titled 'Route tables' lists associations between VPCs and subnets. The table has columns for 'Associations', 'Main', 'VPC', and 'Owner ID'. Several rows are listed, each with a unique VPC ID and owner ID.

Step 2: Click on “Subnet groups” on the left window pane. Now click on “Create DB subnet group”.



The screenshot shows the AWS RDS Management Console. On the left, there's a sidebar with options like Dashboard, Databases, and Subnet groups. 'Subnet groups' is selected and highlighted by a red box. The main area shows a table of existing subnet groups, each with a name, description, status, and VPC. At the top right of the table, there's a prominent orange 'Create DB subnet group' button, which is also highlighted by a red box.

Step 3: Provide “Name”, “Description” and attach to created VPC.

RDS Management Console — Mozilla Firefox

https://ap-south-1.console.aws.amazon.com/rds/home?region=ap-south-1#create-db

Amazon RDS Services Search [Alt+S]

RDS > Subnet groups > Create DB subnet group

Create DB subnet group

To create a new subnet group, give it a name and a description, and choose an existing VPC. You will then be able to add subnets related to that VPC.

Subnet group details

Name
You won't be able to modify the name after your subnet group has been created.
cc-mini-project-rds-subnet-group
Must contain from 1 to 255 characters. Alphanumeric characters, spaces, hyphens, underscores, and periods are allowed.

Description
Subnet group for RDS of CC Mini project

VPC
Choose a VPC identifier that corresponds to the subnets you want to use for your DB subnet group. You won't be able to choose a different VPC identifier after your subnet group has been created.

Choose a VPC

vpc-025cede16b6b5b4cd
vpc-014b1383306f50000
cc-mini-project (vpc-0656af6ef76b6c366)
vpc-05f6ab0b1871aa438
vpc-08ddfec00217b1a35

Availability Zones

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11:57 AM

Step 4: Add the private subnet and proper “Availability Zone”. (The error message is due to the fact that we forgot to select the private subnet). Finally click on “Create”.

RDS Management Console — Mozilla Firefox

https://ap-south-1.console.aws.amazon.com/rds/home?region=ap-south-1#create-db

Amazon RDS Services Search [Alt+S]

RDS > Subnet groups > Create DB subnet group

Availability Zones

Choose the Availability Zones that include the subnets you want to add.

Choose an availability zone

ap-south-1a X ap-south-1b X

Subnets

Choose the subnets that you want to add. The list includes the subnets in the selected Availability Zones.

Select subnets

subnet-0856bd28a67a06bf1 (10.200.2.0/24) X
subnet-00fe813f3afb40959 (10.200.1.0/24) X

Subnets selected (2)

Availability zone	Subnet ID	CIDR block
ap-south-1b	subnet-0856bd28a67a06bf1	10.200.2.0/24
ap-south-1a	subnet-00fe813f3afb40959	10.200.1.0/24

We're sorry, your request to create DB subnet group cc-mini-project-rds-subnet-group has failed. Subnet IDs are required.

Create

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11:58 AM

Step 5: RDS Subnet group was successfully created.

The screenshot shows the AWS RDS Management Console in Mozilla Firefox. The URL is https://ap-south-1.console.aws.amazon.com/rds/home?region=ap-south-1#db-subnet. The left sidebar shows 'Amazon RDS' with 'Databases' selected. The main content area shows a success message: 'Successfully created cc-mini-project-rds-subnet-group. View subnet group'. Below it is a table titled 'Subnet groups (6)' with columns: Name, Description, Status, and VPC. The table lists six entries, all marked as 'Complete':

Name	Description	Status	VPC
cc-mini-project-rds-subnet-group	Subnet group for RDS of CC Mini project	Complete	vpc-0636af6ef76b6c366
default-vpc-014b1383306f50010	Created from the RDS Management Console	Complete	vpc-014b1383306f50010
default-vpc-025cede16b6b5b4cd	Created from the RDS Management Console	Complete	vpc-025cede16b6b5b4cd
default-vpc-08ddfec00217b1a35	Created from the RDS Management Console	Complete	vpc-08ddfec00217b1a35
default-vpc-0f9ff0e8ce0896d31	Created from the RDS Management Console	Complete	vpc-0f9ff0e8ce0896d31
rds-ec2-db-subnet-group-1	Created from the RDS Management Console	Complete	vpc-05f6ab0b1871aa438

8) Create RDS and configure MySQL.

Step 1: Click on “Databases” on left window pane.

The screenshot shows the AWS RDS Management Console in Mozilla Firefox. The URL is https://ap-south-1.console.aws.amazon.com/rds/home?region=ap-south-1#db-subnet. The left sidebar shows 'Amazon RDS' with 'Databases' selected. The main content area shows a table titled 'Subnet groups (5)' with columns: Name, Description, Status, and VPC. The table lists five entries, all marked as 'Complete':

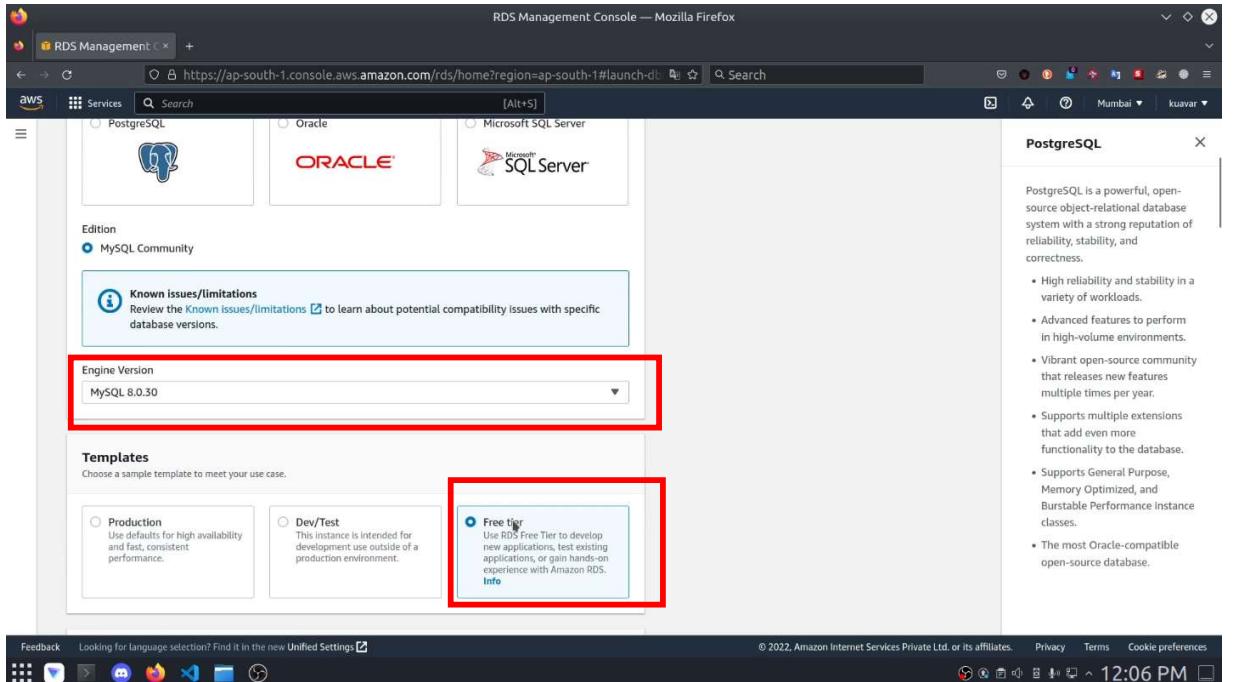
Name	Description	Status	VPC
default-vpc-014b1383306f50010	Created from the RDS Management Console	Complete	vpc-014b1383306f50010
default-vpc-025cede16b6b5b4cd	Created from the RDS Management Console	Complete	vpc-025cede16b6b5b4cd
default-vpc-08ddfec00217b1a35	Created from the RDS Management Console	Complete	vpc-08ddfec00217b1a35
default-vpc-0f9ff0e8ce0896d31	Created from the RDS Management Console	Complete	vpc-0f9ff0e8ce0896d31
rds-ec2-db-subnet-group-1	Created from the RDS Management Console	Complete	vpc-05f6ab0b1871aa438

Step 2: Click on “Create Database”.

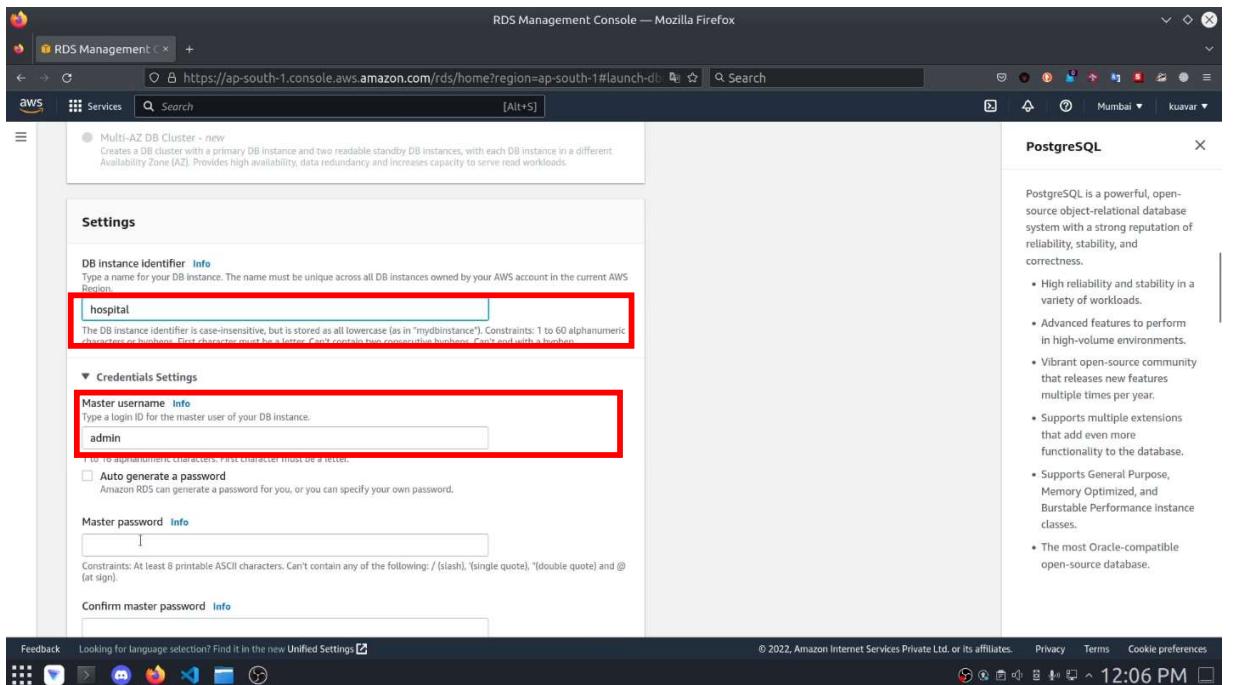
The screenshot shows the AWS RDS Management Console. In the top navigation bar, there's a link to 'Services' and a search bar. Below the navigation, the 'Databases' section is displayed with a table. The table has columns for DB identifier, Role, Engine, Region & AZ, Size, Status, CPU, Current activity, and Maintenance. Two databases are listed: 'flashcard' (Instance, MySQL Community, ap-south-1a, db.t3.micro, Available, 1.96%, 1 Connections, none) and 'hospital' (Instance, MySQL Community, ap-south-1b, db.t3.micro, Deleting). At the top right of the table, there's a 'Create database' button, which is highlighted with a red box. The bottom of the screen shows the standard Linux desktop interface with icons and a clock showing 12:06 PM.

Step 3: Select “Standard”, “MySQL”, “MySQL version”, “Free Tier”.

The screenshot shows the 'Create database' wizard. It starts with a message: 'We listened to your feedback! Now, create a database with a single click using our pre-built configurations! Or choose your own configurations.' Below this is a 'Create database' button. The main area is titled 'Choose a database creation method' with two options: 'Standard create' (selected) and 'Easy create'. The 'Standard create' option is described as setting all configuration options, including availability, security, backups, and maintenance. The 'Easy create' option is described as using recommended best-practice configurations where some options can be changed after creation. The next step is 'Engine type', which lists 'Amazon Aurora', 'MySQL' (selected), 'MariaDB', 'PostgreSQL', 'Oracle', and 'Microsoft SQL Server'. A red box highlights both the 'Standard create' option and the 'MySQL' engine type. To the right, there's a sidebar for 'PostgreSQL' with its features and a note about its compatibility with Oracle.



Step 4: Provide the “Database name”, “Username” and “Password”.



RDS Management Console — Mozilla Firefox

https://ap-south-1.console.aws.amazon.com/rds/home?region=ap-south-1#launch

Services Search [Alt+S]

aws Mumbai kavar

>Password and Kerberos authentication
Choose a directory in which you want to allow authorized users to authenticate with this DB instance using Kerberos Authentication.

Monitoring

Monitoring

Enable Enhanced monitoring
Enabling Enhanced monitoring metrics are useful when you want to see how different processes or threads use the CPU.

▼ Additional configuration
Database options, encryption turned on, backup turned on, backtrack turned off, maintenance, CloudWatch Logs, delete protection turned off.

Initial database name [Info](#)
 If you do not specify a database name, Amazon RDS does not create a database.

DB parameter group [Info](#)

Option group [Info](#)

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12:08 PM

PostgreSQL

PostgreSQL is a powerful, open-source object-relational database system with a strong reputation of reliability, stability, and correctness.

- High reliability and stability in a variety of workloads.
- Advanced features to perform in high-volume environments.
- Vibrant open-source community that releases new features multiple times per year.
- Supports multiple extensions that add even more functionality to the database.
- Supports General Purpose, Memory Optimized, and Burstable Performance Instance classes.
- The most Oracle-compatible open-source database.

RDS Management Console — Mozilla Firefox

https://ap-south-1.console.aws.amazon.com/rds/home?region=ap-south-1#launch

Services Search [Alt+S]

aws Mumbai kavar

Region: hospital

The DB instance identifier is case-insensitive, but is stored as all lowercase (as in "mydbinstance"). Constraints: 1 to 60 alphanumeric characters or hyphens. First character must be a letter. Can't contain two consecutive hyphens. Can't end with a hyphen.

▼ Credentials Settings

Master username [Info](#)
Type a login ID for the master user of your DB instance.
 1 to 16 alphanumeric characters. First character must be a letter.
 Auto generate a password
Amazon RDS can generate a password for you, or you can specify your own password.

Master password [Info](#)
 Constraints: At least 8 printable ASCII characters. Can't contain any of the following: / (slash), ' (single quote), " (double quote) and @ (at sign).

Confirm master password [Info](#)

Instance configuration

The DB instance configuration options below are limited to those supported by the engine that you selected above.

DB instance class [Info](#)
 Standard classes (includes m classes)
 Memory optimized classes (includes r and x classes)

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12:06 PM

PostgreSQL

PostgreSQL is a powerful, open-source object-relational database system with a strong reputation of reliability, stability, and correctness.

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- Supports multiple extensions that add even more functionality to the database.
- Supports General Purpose, Memory Optimized, and Burstable Performance Instance classes.
- The most Oracle-compatible open-source database.

Step 5: Select Instance Configuration and Storage.

The screenshot shows the AWS RDS Management Console for PostgreSQL. On the left, there's a sidebar with 'Services' and a search bar. The main area has tabs for 'Instance configuration' and 'Storage'. Under 'Instance configuration', the DB instance class is set to 'db.t3.micro' (2 vCPUs, 1 GiB RAM, Network: 2,085 Mbps). The 'Include previous generation classes' checkbox is unchecked. Under 'Storage', the storage type is 'General Purpose SSD (gp2)' and the allocated storage is 200 GiB. A right-hand sidebar provides details about PostgreSQL, including its features and compatibility.

Step 6: Under Connectivity Select “Do not connect to EC2 resource” and select the created VPC from drop down menu.

The screenshot shows the AWS RDS Management Console under the 'Connectivity' tab. It includes sections for 'Storage autoscaling', 'Compute resource', and 'Virtual private cloud (VPC)'. In the 'Compute resource' section, the 'Don't connect to an EC2 compute resource' option is selected (highlighted with a red box). In the 'Virtual private cloud (VPC)' section, the VPC 'cc-mini-project (vpc-0636af6ef76b6c366)' is selected. A note at the bottom states 'After a database is created, you can't change its VPC.'

Step 7: Select the DB Subnet Group which was created previously and change “Public Access” to “No” since we do not want the database to be accessible from outside the Internet.

Compute resource
Choose whether to set up a connection to a compute resource for this database. Setting up a connection will automatically change connectivity settings so that the compute resource can connect to this database.

Don't connect to an EC2 compute resource
Don't set up a connection to a compute resource for this database. You can manually set up a connection to a compute resource later.

Connect to an EC2 compute resource
Set up a connection to an EC2 compute resource for this database.

Virtual private cloud (VPC) Info
Choose the VPC. The VPC defines the virtual networking environment for this DB instance.

cc-mini-project (vpc-0636af6ef76b6c36)

Only VPCs with a corresponding DB subnet group are listed.

DB Subnet group Info
Choose the DB subnet group. The DB subnet group defines which subnets and IP ranges the DB instance can use in the VPC that you selected.

cc-mini-project-rds-subnet-group

Public access Info
Choose whether to allow public access to the database. Amazon EC2 instances and other resources outside of the VPC can connect to your database if you select Yes.

Yes
RDS assigns a public IP address to the database. Amazon EC2 instances and other resources outside the VPC can connect to your database. Choose one or more VPC security groups that specify which resources can connect to the database.

No
RDS doesn't assign a public IP address to the database. Only Amazon EC2 instances and other resources inside the VPC can connect to your database. Choose one or more VPC security groups that specify which resources can connect to the database.

VPC security group (firewall) Info
Choose one or more VPC security groups to allow access to your database. Make sure that the security group rules allow the connection to the database.

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12:06 PM

Step 8: Select “Database Port” and select “Password authentication” under “Database Authentication”.

Create an RDS Proxy Info
RDS automatically creates an IAM role and a Secrets Manager secret for the proxy. RDS Proxy has additional costs. For more information, see [Amazon RDS Proxy pricing](#).

Additional configuration

Database port Info

3306

Database authentication

Password authentication
Authenticates using database passwords.

Password and IAM database authentication
Authenticates using the database password and user credentials through AWS IAM users and roles.

Password and Kerberos authentication
Choose a directory in which you want to allow authorized users to authenticate with this DB instance using Kerberos Authentication.

Monitoring

Monitoring

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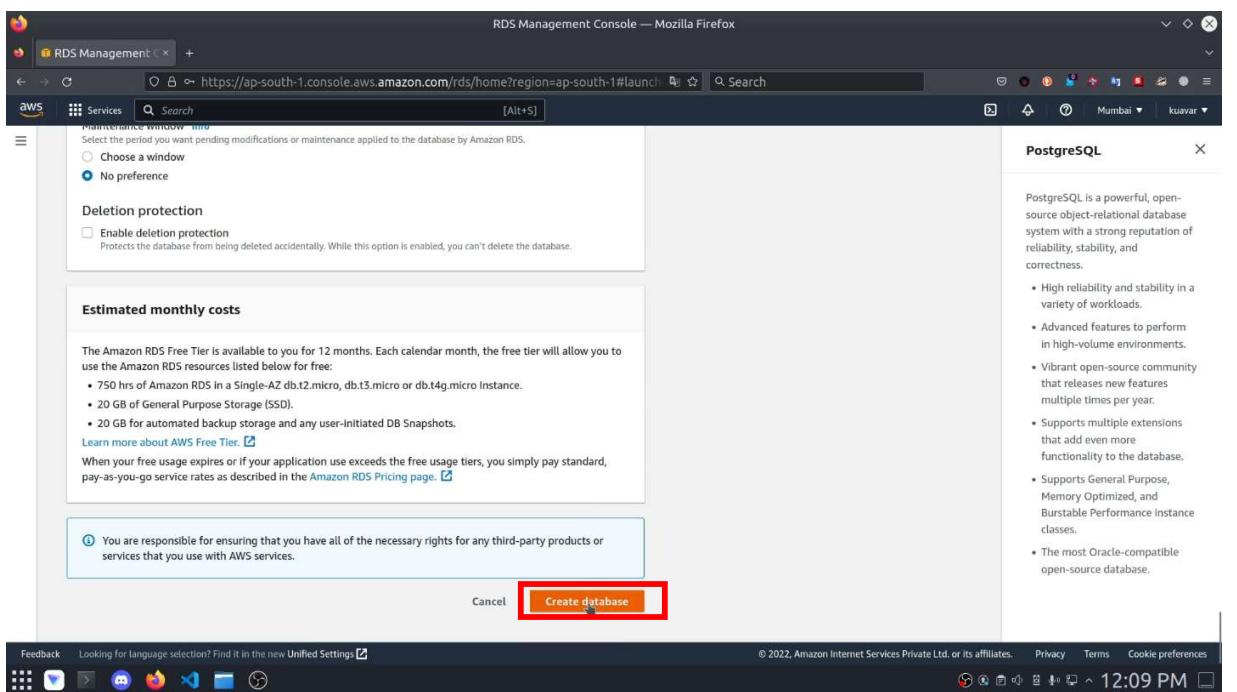
12:07 PM

Select “Availability Zone” and “Create new Security Group”.

The screenshot shows the AWS RDS Management Console in Mozilla Firefox. On the left, there's a sidebar with navigation links like 'Services' and 'Search'. The main content area is titled 'PostgreSQL' and contains a brief description of PostgreSQL as a powerful open-source database. Below the description is a bulleted list of features. The central part of the screen is a configuration form for creating a new VPC security group. It includes sections for 'VPC security group (firewall)', 'Availability Zone', 'RDS Proxy', 'Additional configuration', and 'Database authentication'. The 'Create new' button is highlighted with a red box. The 'Availability Zone' dropdown is also highlighted with a red box. At the bottom, there's a 'Feedback' link and a footer with copyright information and a timestamp of 12:08 PM.

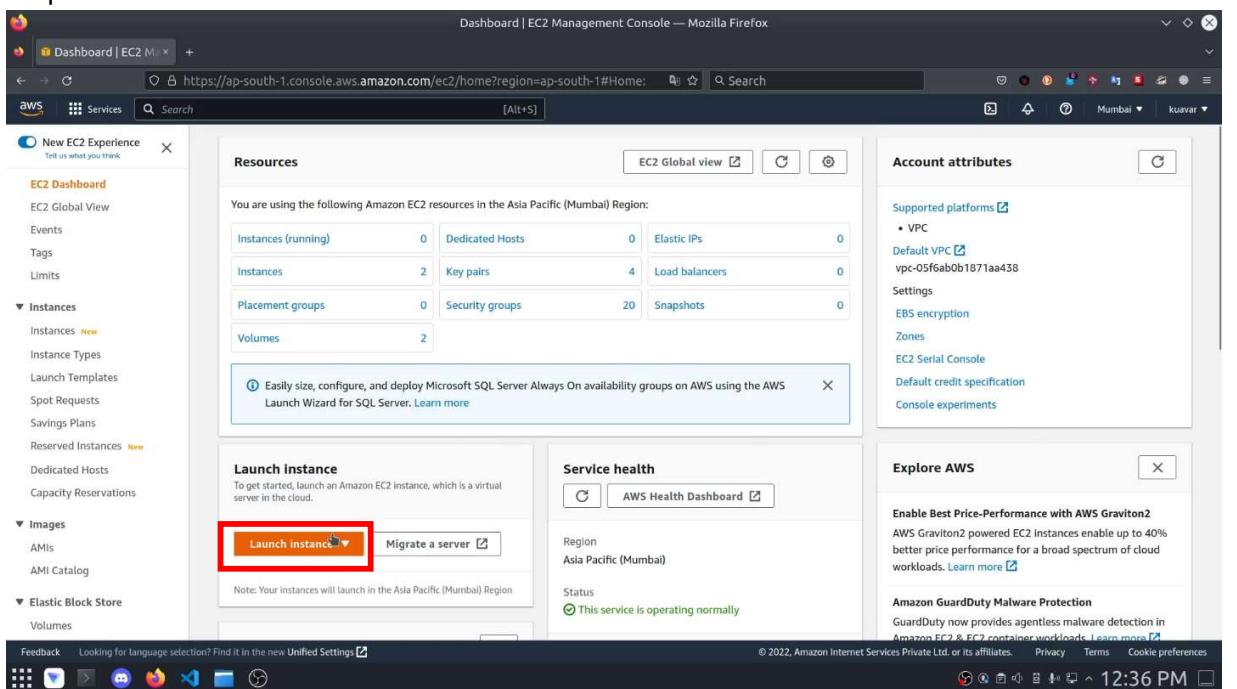
This screenshot shows the same RDS Management Console interface as the previous one, but with more specific details filled in. In the 'New VPC security group name' field, the value 'cc-mini-project-rds-sg' is entered. The 'Availability Zone' dropdown still has 'ap-south-1a' selected. The rest of the configuration form and the right-hand PostgreSQL information panel are identical to the first screenshot.

Step 9: Finally click on “Create database”.



9) Creation of Web Server using EC2 instance

Step 1: Click on “Launch Instance”.

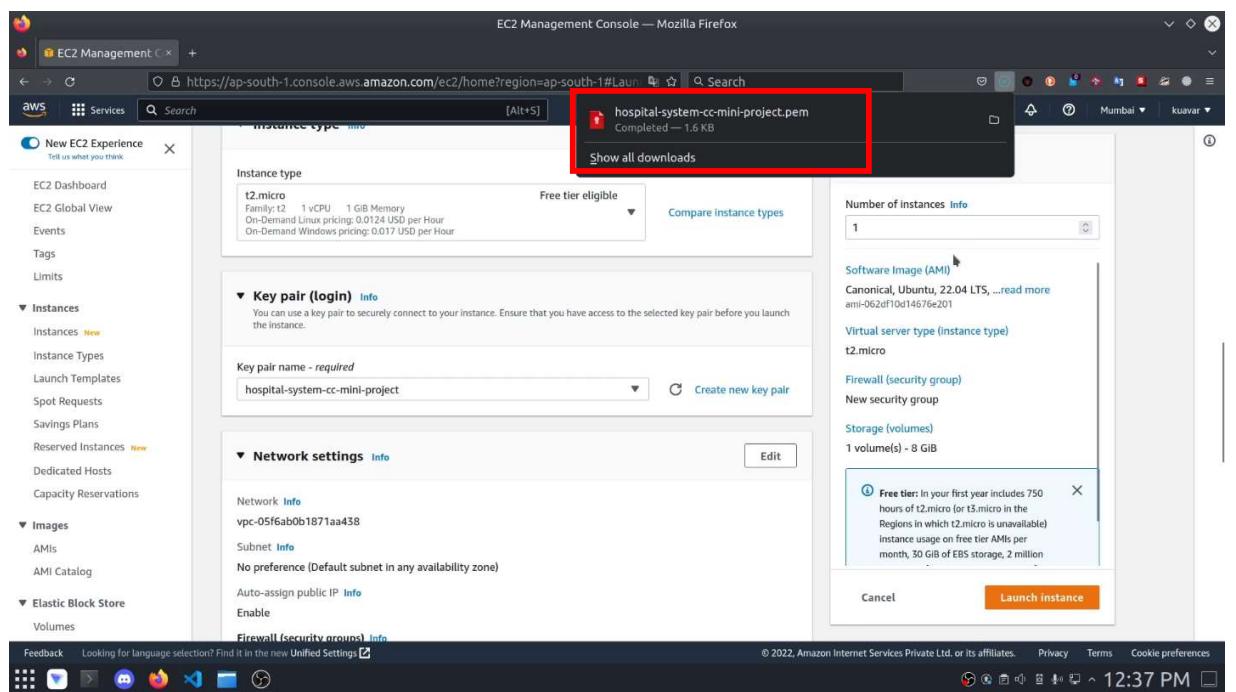
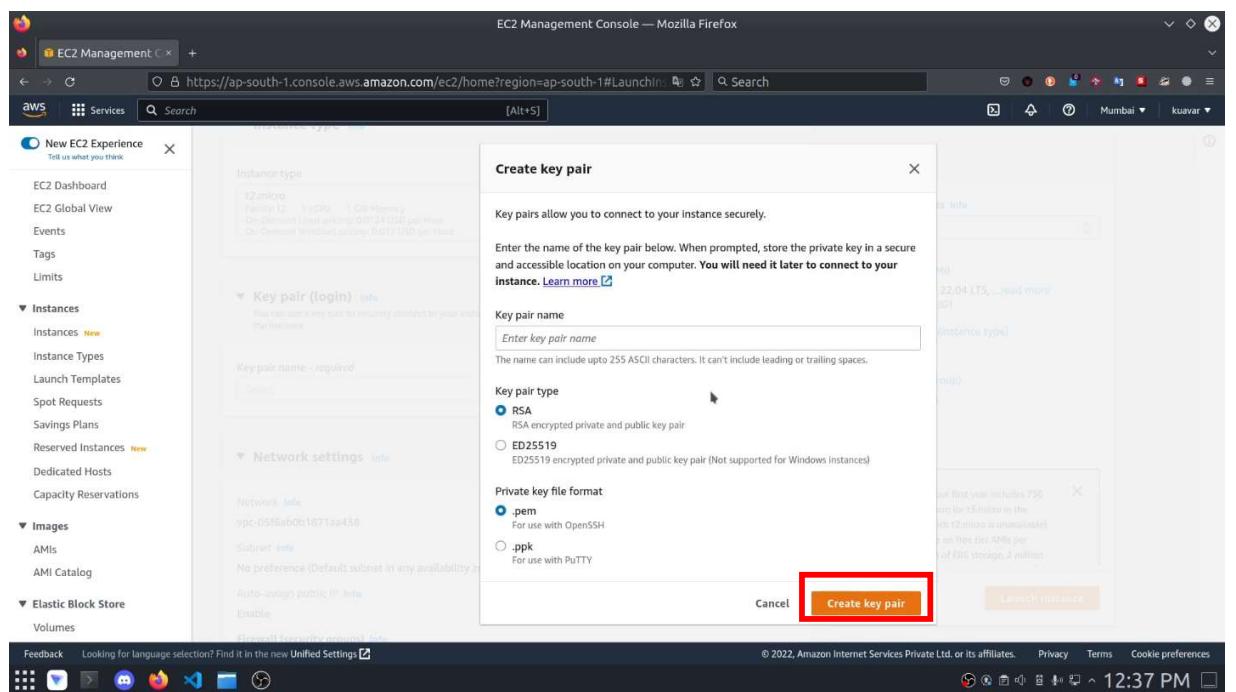


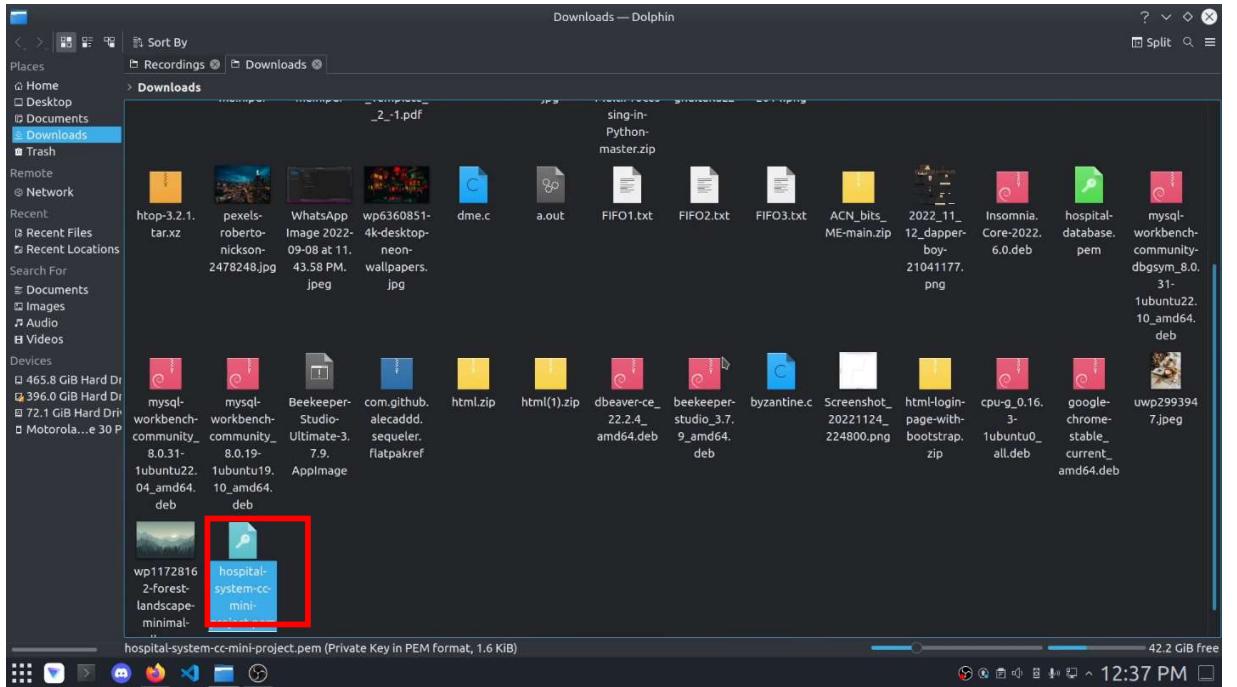
Step 2: Provide the name for the EC2 instance and select the Amazon Linux as AMI.

The screenshot shows the AWS EC2 Management Console interface. On the left, there's a navigation sidebar with options like EC2 Dashboard, Instances, Images, and Elastic Block Store. The main area is titled 'Launch an instance'. In the 'Name and tags' step, the 'Name' field contains 'cc-mini-project-nodejs-mysql-webapp'. Below it, the 'Application and OS Images (Amazon Machine Image)' section lists various AMIs, with 'Amazon Linux' selected. The 'Virtual server type (instance type)' dropdown is set to 't2.micro'. On the right, a summary panel shows 1 instance, the selected AMI, and the instance type. A large orange 'Launch instance' button is prominently displayed at the bottom right.

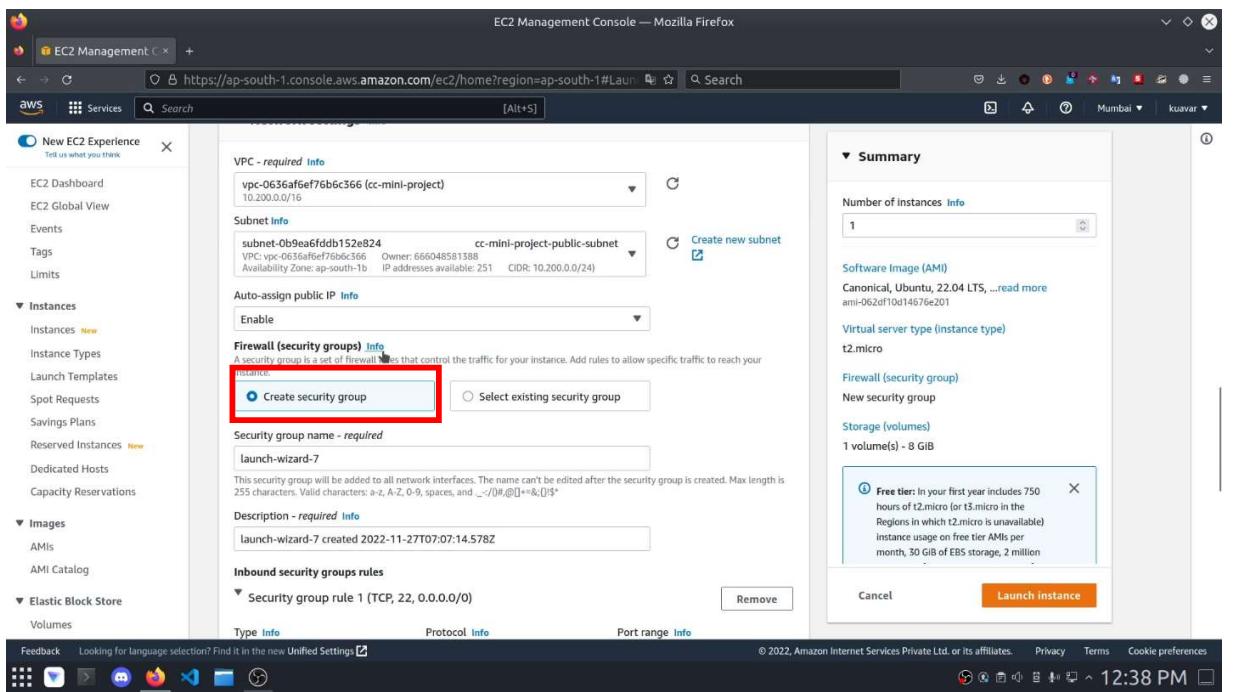
This screenshot continues the 'Launch an instance' process. It shows the 'Application and OS Images (Amazon Machine Image)' step. A grid of AMI icons is displayed, with 'Ubuntu' being the selected option. Below the grid, a detailed description of the selected AMI ('Ubuntu Server 22.04 LTS (HVM), SSD Volume Type') is provided, including its AMI ID, Virtualization type, ENA support, and Root device type. The 'Launch instance' button remains at the bottom right.

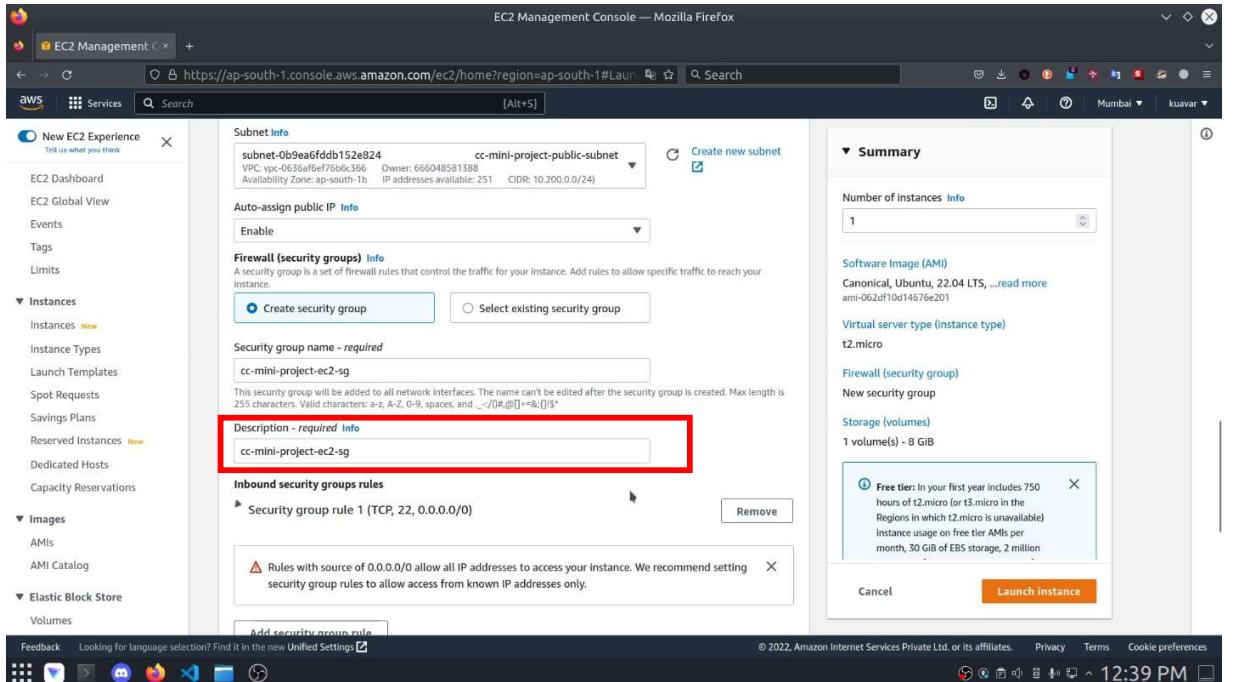
Step 3: Create a key pair for the instance. It will be created as a .pem file which will get downloaded in the local machine.



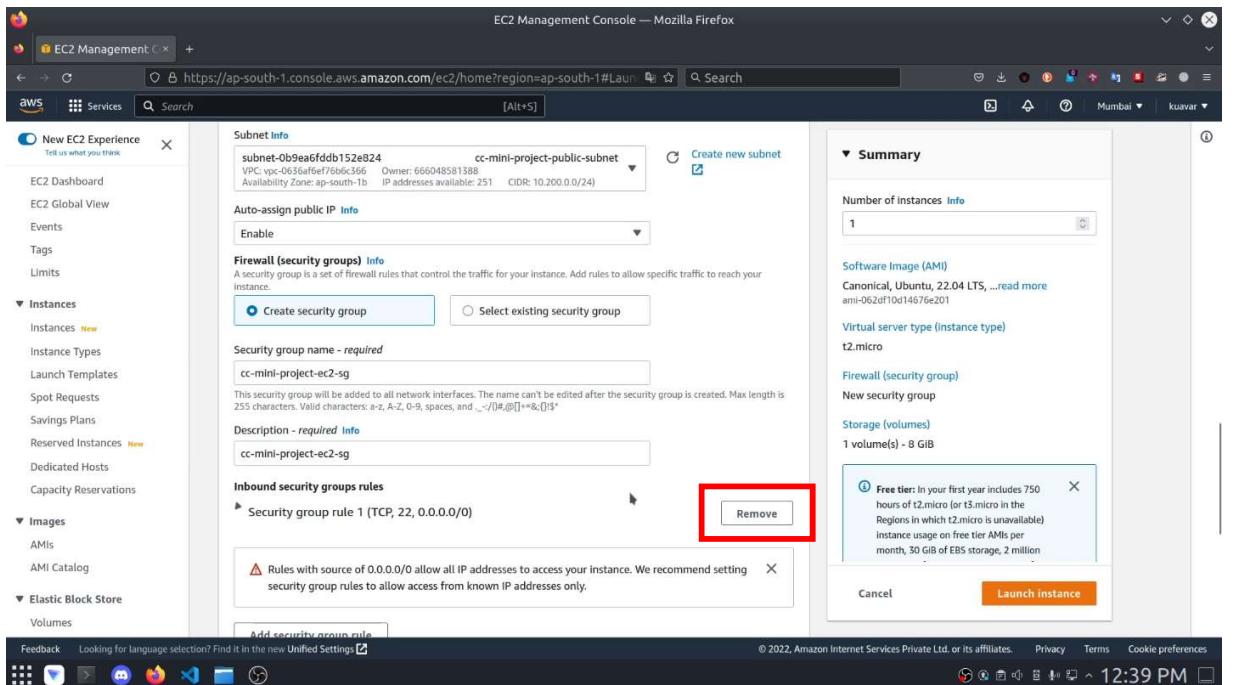


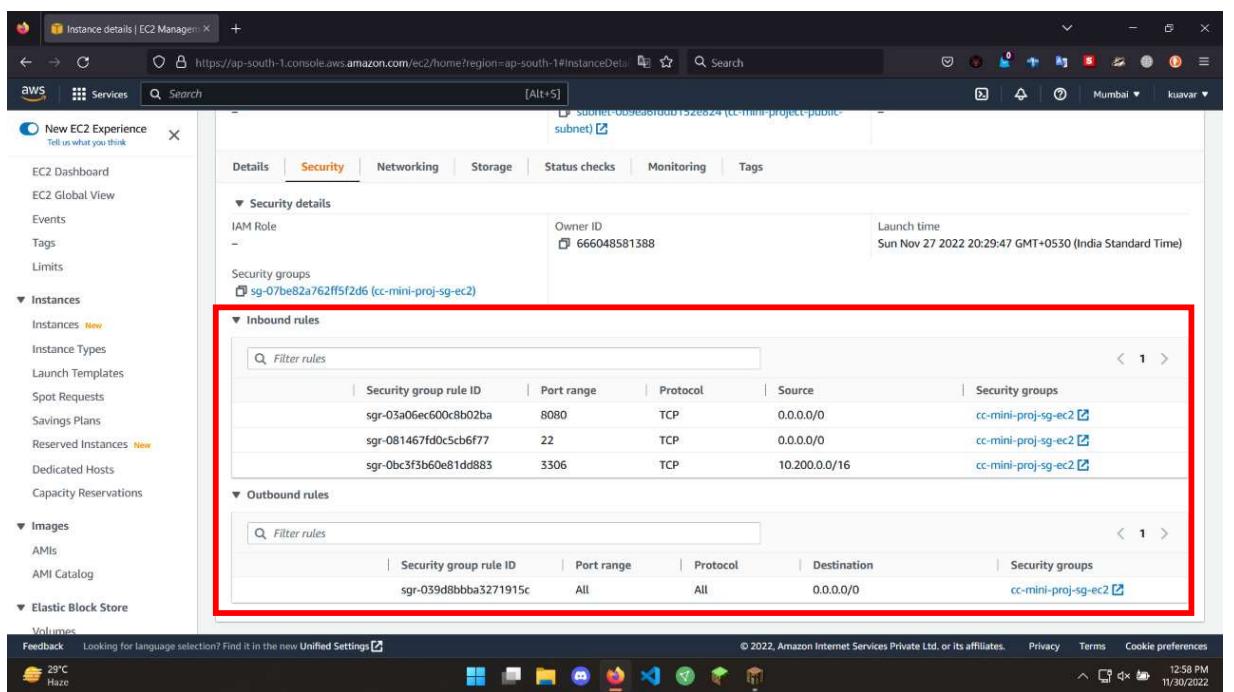
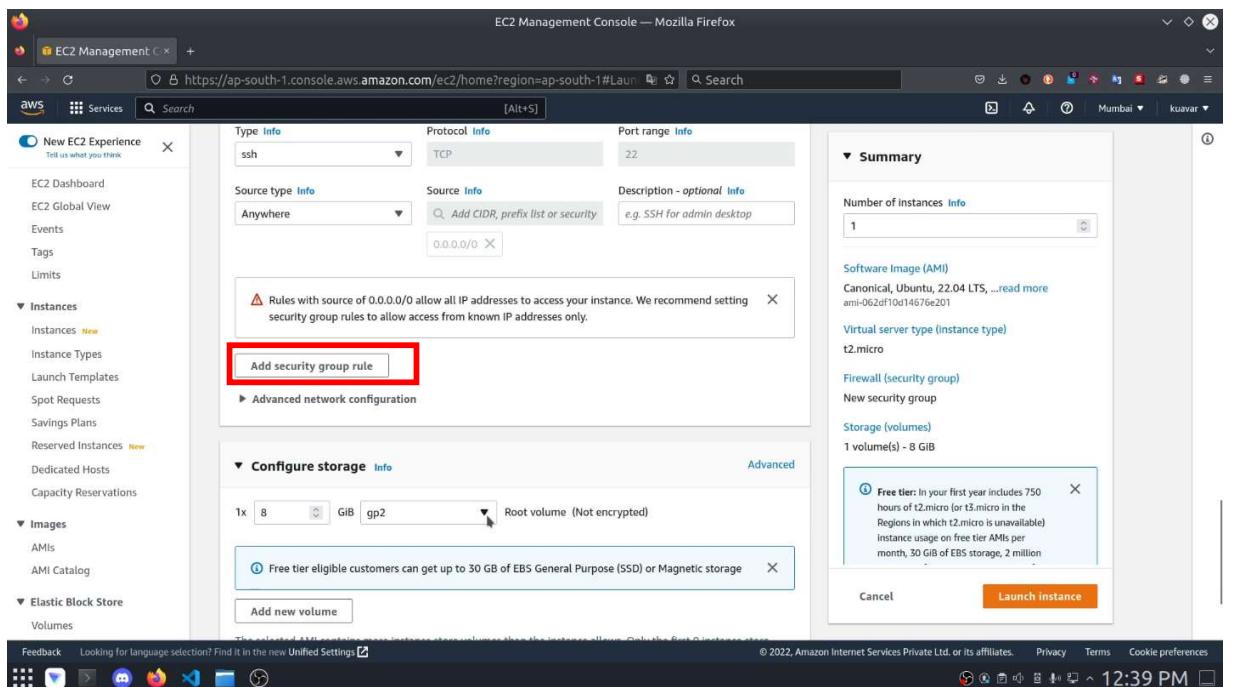
Step 4: Create a security group for this webserver EC2 instance. Provide a Security group name for the instance.





Step 5: Click on “Add Security Group” and “Remove” to create the final security group with “Inbound” and “Outbound” rules for the Web Server EC2 instance.

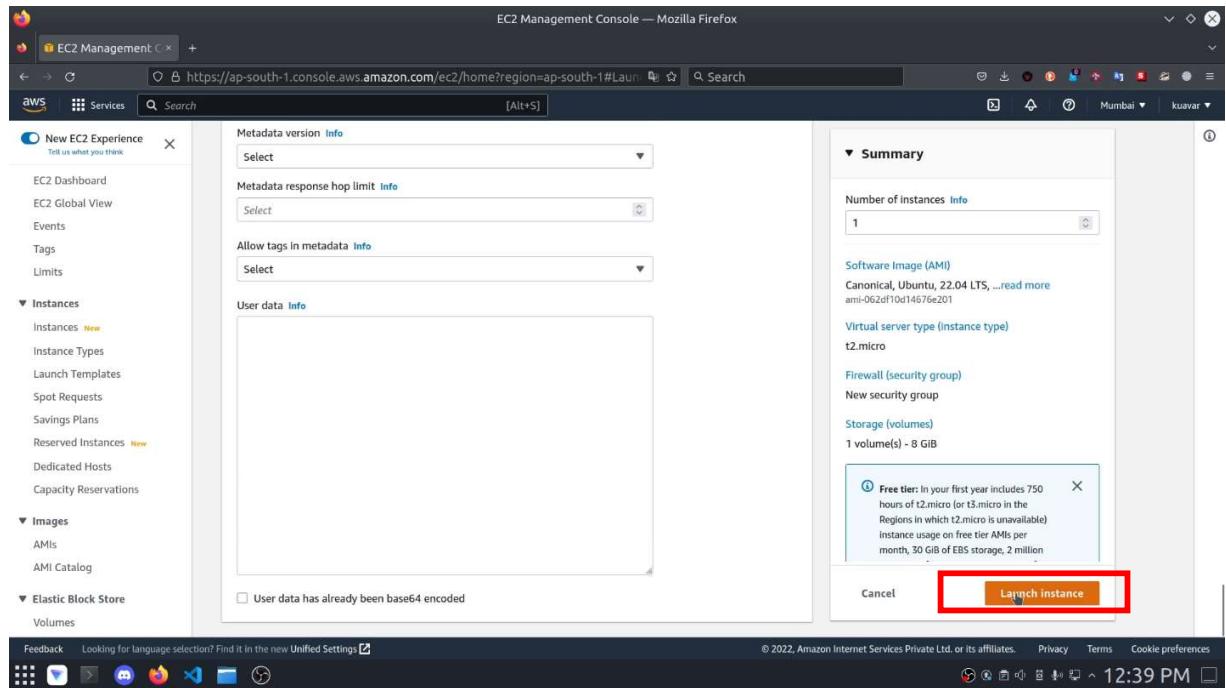




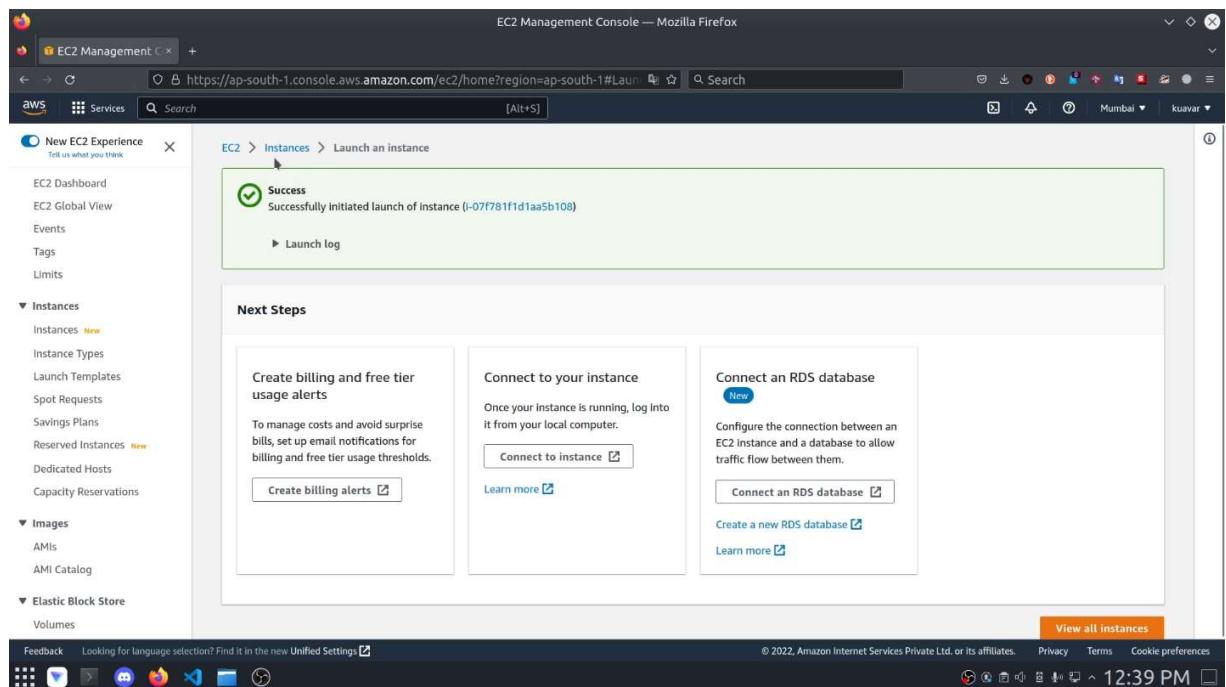
In Inbound rules:

- First Rule indicates that it can accept any HTTP request from any traffic whose source is anywhere outside the Internet.
- Second Rule indicates that it can accept SSH connection from any host which has private key pair file
- Third Rule is to accept the result of the query from RDS whose source is in VPC.

Step 6: Finally click on “Create Instance” to create the EC2 instance successfully.

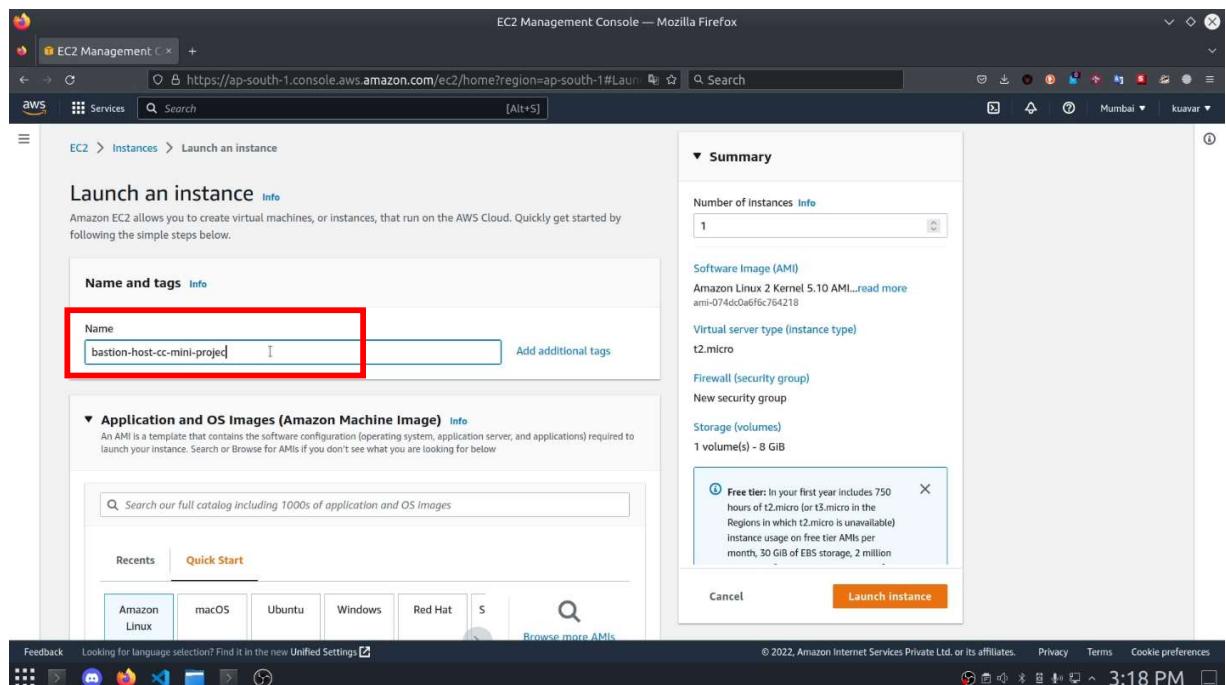


EC2 instance created and launched successfully.

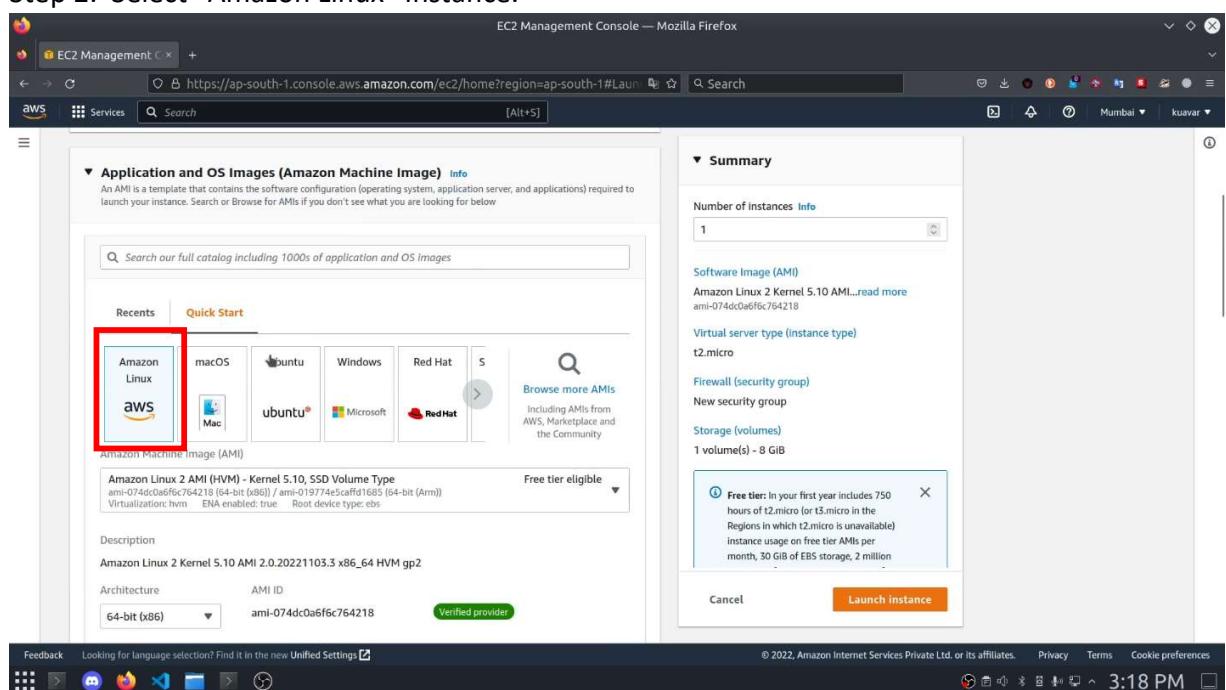


10) Creation of Bastion Host

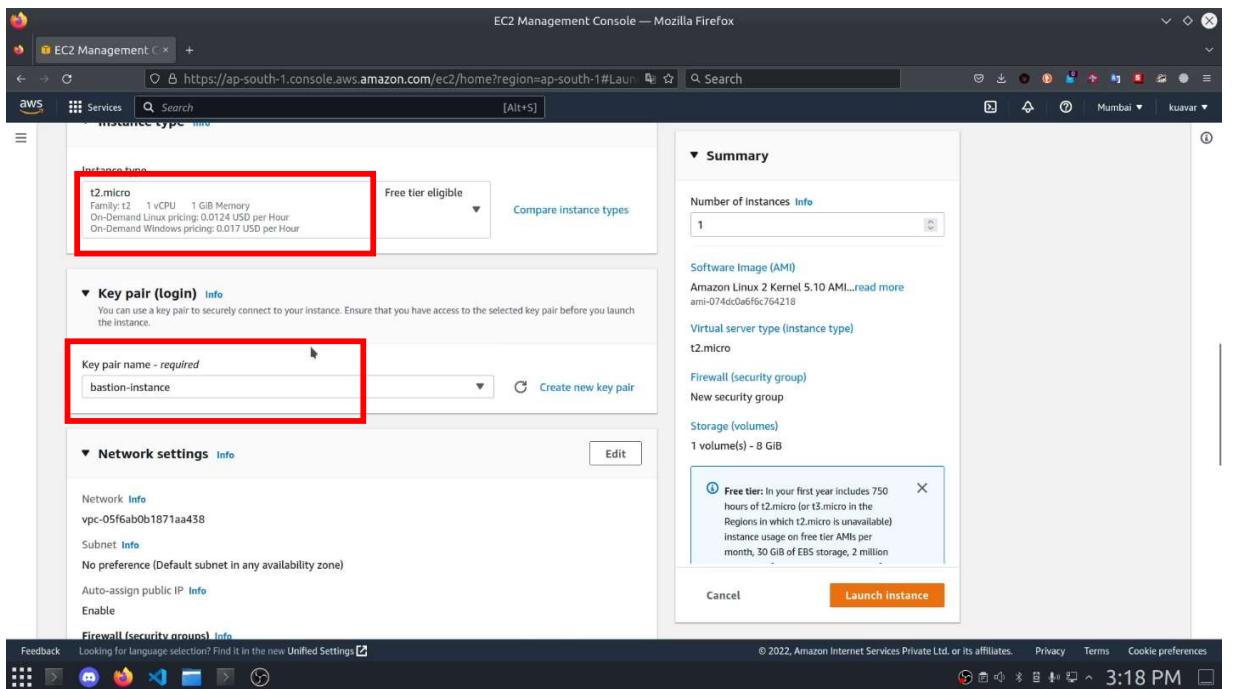
Step 1: Provide a name for the Bastion Host EC2 Instance.



Step 2: Select “Amazon Linux” Instance.

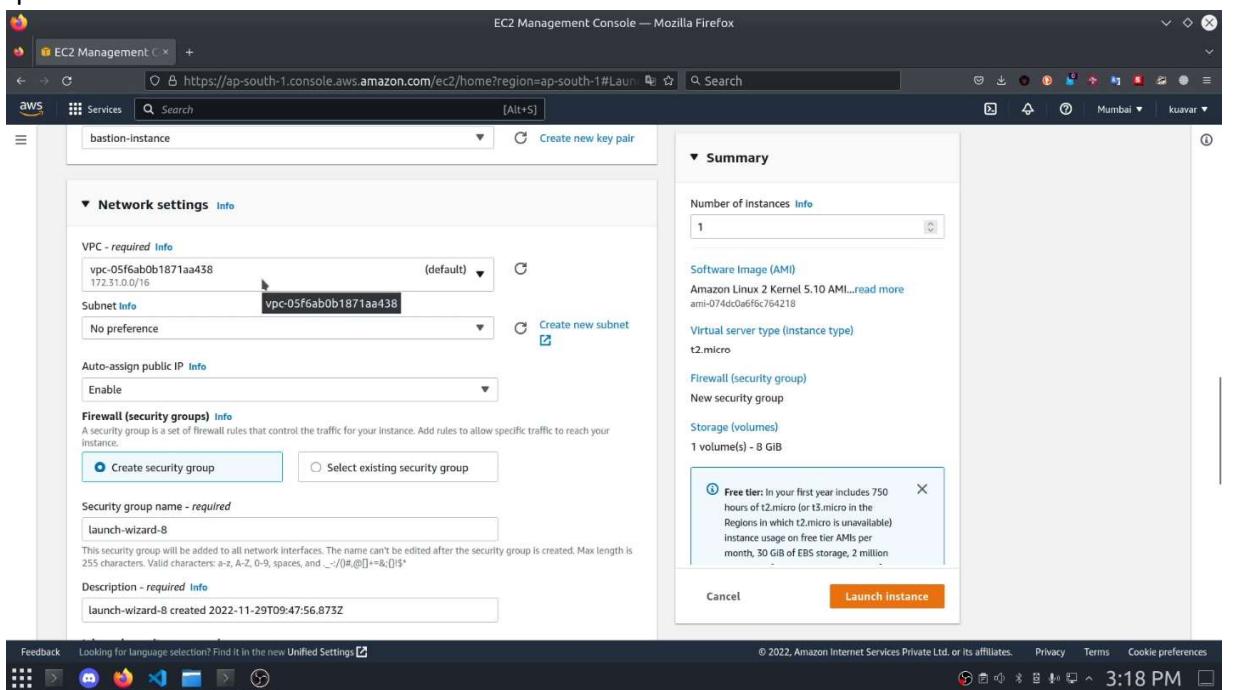


Step 3: Select “Instance type” as t2. micro and a “key-pair” for bastion.

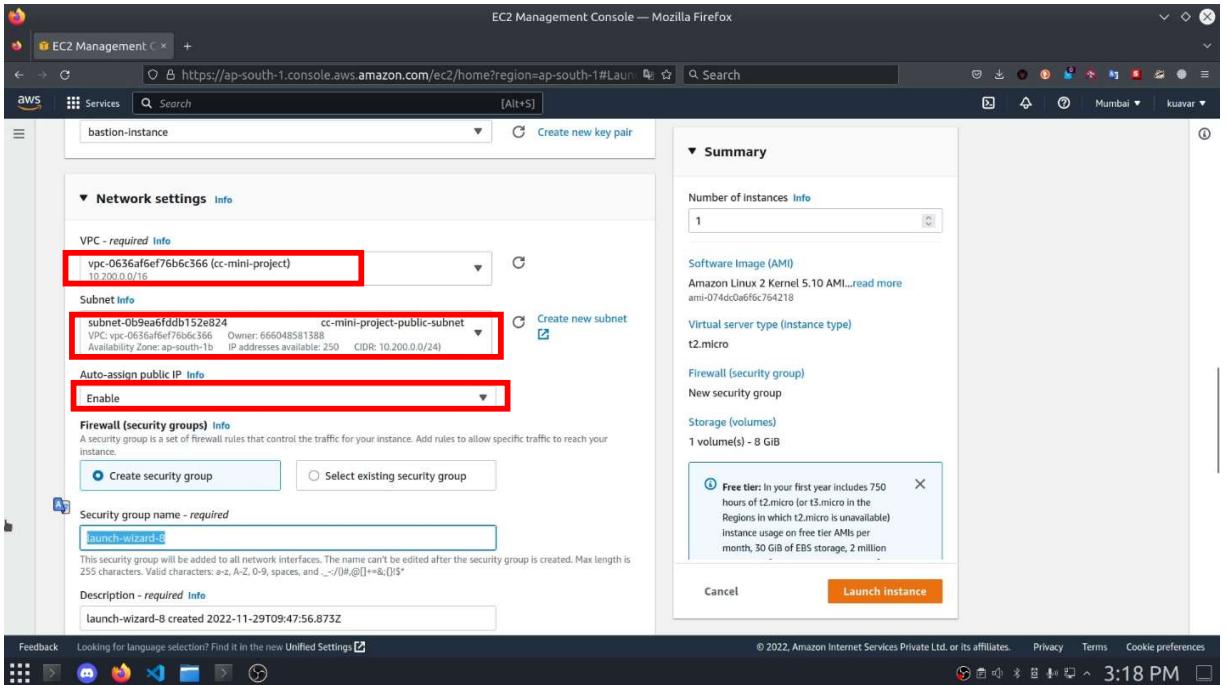


The screenshot shows the AWS EC2 Management Console in Mozilla Firefox. The URL is <https://ap-south-1.console.aws.amazon.com/ec2/home?region=ap-south-1#Launch>. The instance type 't2.micro' is selected and highlighted with a red box. The key pair 'bastion-instance' is also selected and highlighted with a red box. The 'Summary' section shows 1 instance. The 'Software Image (AMI)' is set to Amazon Linux 2 Kernel 5.10 AMI. The 'Virtual server type (instance type)' is t2.micro. The 'Storage (volumes)' section shows 1 volume(s) - 8 GiB. A tooltip for the 'Free tier' is visible, stating: 'Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) instance usage on free tier AMIs per month, 30 GiB of EBS storage, 2 million'. The 'Launch instance' button is at the bottom right.

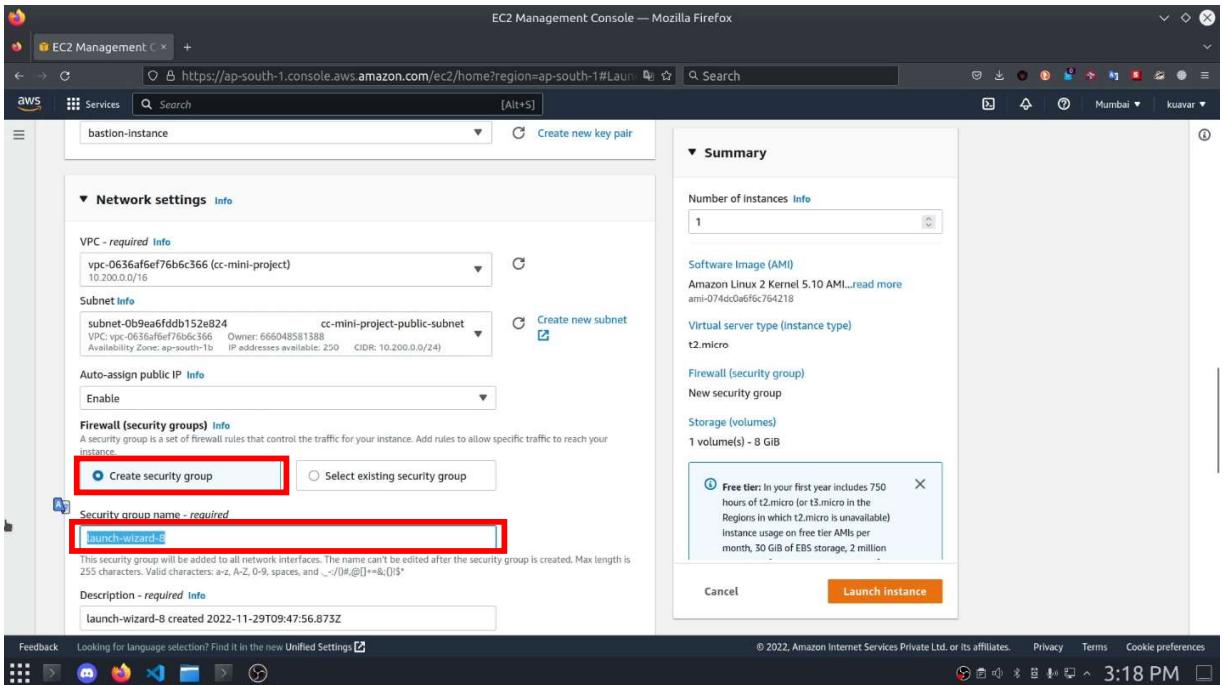
Step 4: Select the created VPC and the public subnet for the instance and also “Enable” “Auto assign public IP”.



The screenshot shows the AWS EC2 Management Console in Mozilla Firefox. The URL is <https://ap-south-1.console.aws.amazon.com/ec2/home?region=ap-south-1#Launch>. The 'Network settings' section shows 'VPC - required' set to 'vpc-05f6ab0b1871aa438' and 'Subnet Info' set to 'vpc-05f6ab0b1871aa438'. The 'Auto-assign public IP' section has 'Enable' selected. The 'Security group' section shows 'Create security group' selected. The 'Summary' section shows 1 instance. The 'Software Image (AMI)' is set to Amazon Linux 2 Kernel 5.10 AMI. The 'Virtual server type (instance type)' is t2.micro. The 'Storage (volumes)' section shows 1 volume(s) - 8 GiB. A tooltip for the 'Free tier' is visible, stating: 'Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) instance usage on free tier AMIs per month, 30 GiB of EBS storage, 2 million'. The 'Launch instance' button is at the bottom right.



Step 5: Create a Security Group for bastion host EC2 instance with the following inbound and outbound rules.



EC2 Management Console — Mozilla Firefox

https://ap-south-1.console.aws.amazon.com/ec2/home?region=ap-south-1#Launch

New EC2 Experience

Subnet Info

subnet-0b9ea6fdb152e024 cc-mini-project-public-subnet

VPC: vpc-063a6fe7606c366 Owner: 666048581388 Availability Zone: ap-south-1b IP addresses available: 250 CIDR: 10.200.0.0/24

Create new subnet

Auto-assign public IP Info

Enable

Firewall (security groups) Info

A security group is a set of firewall rules that control the traffic for your instance. Add rules to allow specific traffic to reach your instance.

Create security group Select existing security group

Description - required Info

bastion-host-sg

This security group will be added to all network interfaces. The name can't be edited after the security group is created. Max length is 255 characters. Valid characters: a-z, A-Z, 0-9, spaces, and _~!@#\$%^&(){}+=<>`

Description - required Info

bastion-host-sg

Inbound security groups rules

Security group rule 1 (TCP, 22, 0.0.0.0/0)

Type Info Protocol Info Port range Info

ssh TCP 22

Source type Info Source Info Description - optional Info

Anywhere Add CIDR, prefix list or security e.g. SSH for admin desktop

Remove

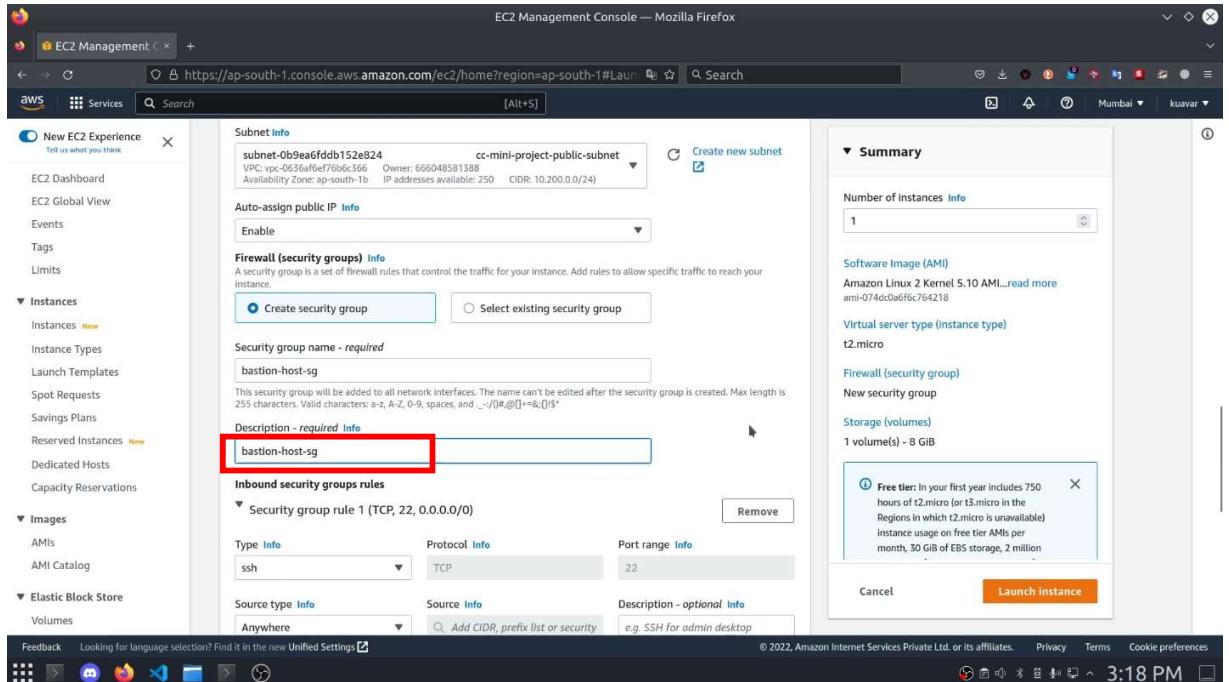
Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) Instance usage on free tier AMIs per month, 30 GiB of EBS storage, 2 million

Cancel Launch instance

Feedback Looking for language selection? Find it in the new Unified Settings

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3:18 PM



EC2 Management Console — Mozilla Firefox

https://ap-south-1.console.aws.amazon.com/ec2/home?region=ap-south-1#Launch

New EC2 Experience

Subnet Info

bastion-host-sg

This security group will be added to all network interfaces. The name can't be edited after the security group is created. Max length is 255 characters. Valid characters: a-z, A-Z, 0-9, spaces, and _~!@#\$%^&(){}+=<>`

Description - required Info

bastion-host-sg

Inbound security groups rules

Security group rule 1 (TCP, 22, 0.0.0.0/0)

Type Info Protocol Info Port range Info

ssh TCP 22

Source type Info Source Info Description - optional Info

Anywhere Add CIDR, prefix list or security e.g. SSH for admin desktop

0.0.0.0/0

Remove

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.

Add security group rule Advanced

Advanced network configuration

Configure storage Info

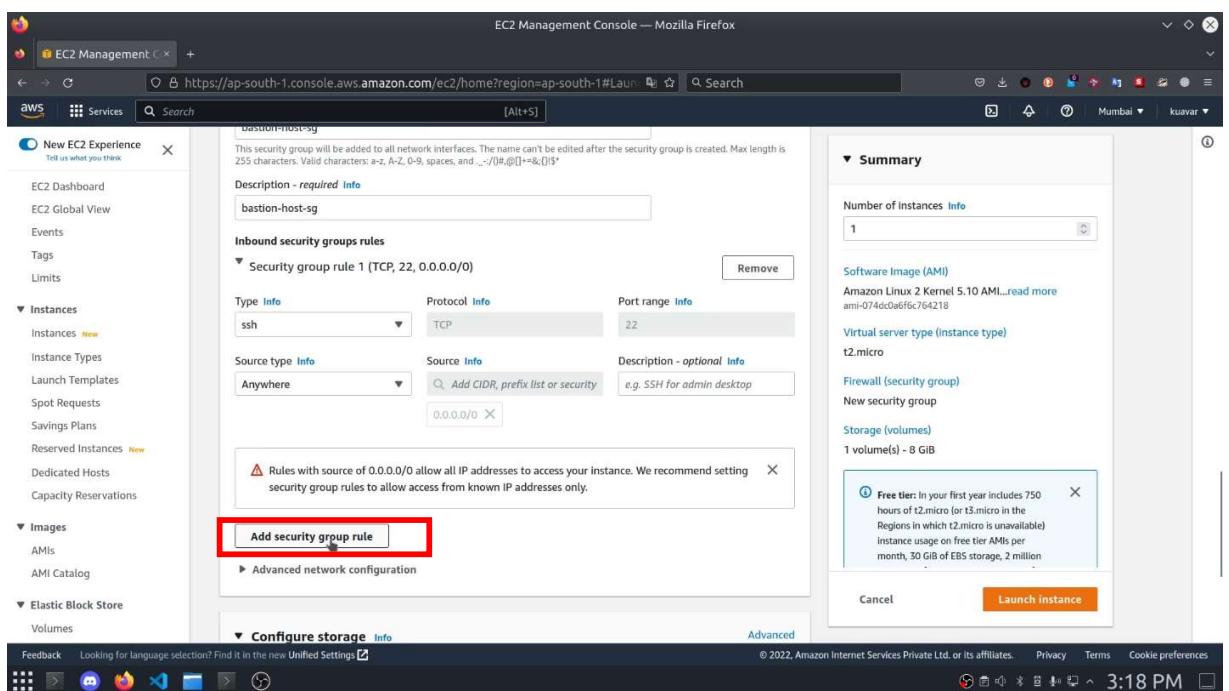
Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) Instance usage on free tier AMIs per month, 30 GiB of EBS storage, 2 million

Cancel Launch instance

Feedback Looking for language selection? Find it in the new Unified Settings

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The screenshot shows the AWS EC2 Instance Details page for an instance named 'cc-mini-project-public-subnet0'. The 'Security' tab is selected. The 'Inbound rules' and 'Outbound rules' sections are highlighted with a red box.

Inbound rules:

Name	Security group rule ID	Port range	Protocol	Source	Security groups
-	sgr-06bac051c09854be9	22	TCP	0.0.0.0/0	bastion-host-sg
-	sgr-0ae2d2ae9fce9bb4	3306	TCP	10.200.0.0/16	bastion-host-sg

Outbound rules:

Name	Security group rule ID	Port range	Protocol	Destination	Security groups
-	sgr-0f49dbce7a9de52a0	All	All	0.0.0.0/0	bastion-host-sg

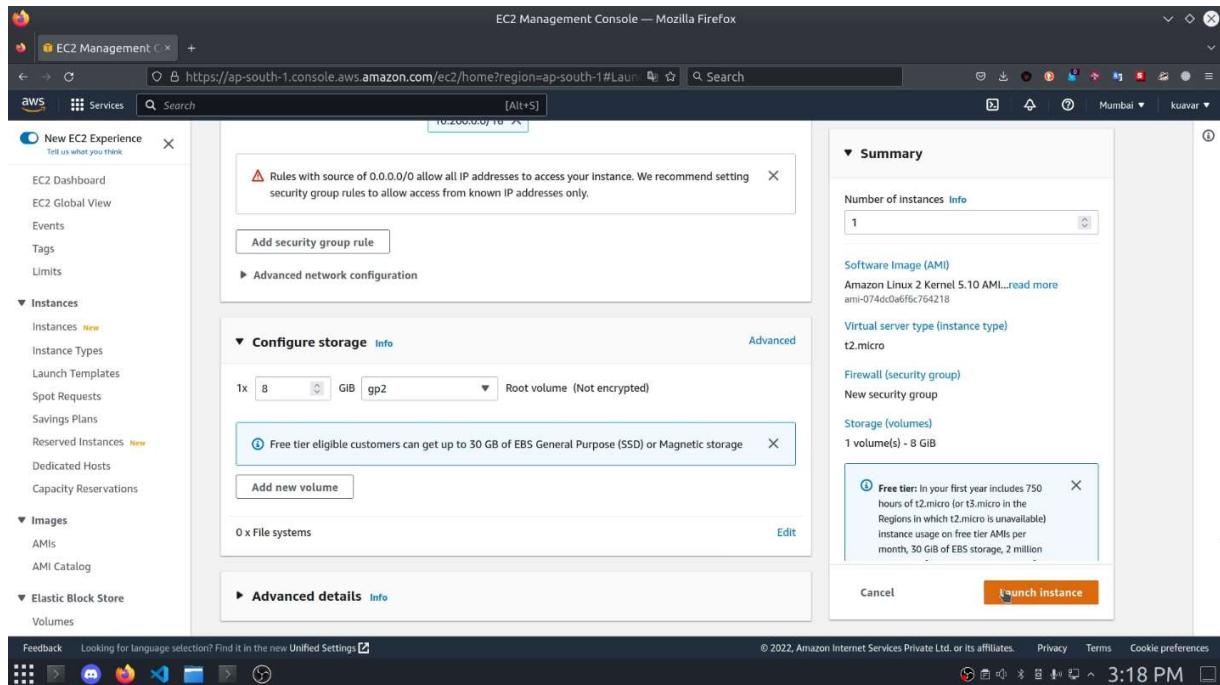
Inbound rules:

- The first rule allows bastion host to accept ssh connection from any host which will have its key value pair .pem file.
- The second rule allows bastion host to accept traffic from RDS instance. This rule allows the bastion host to manage the databases like adding data in tables, adding tables to databases.

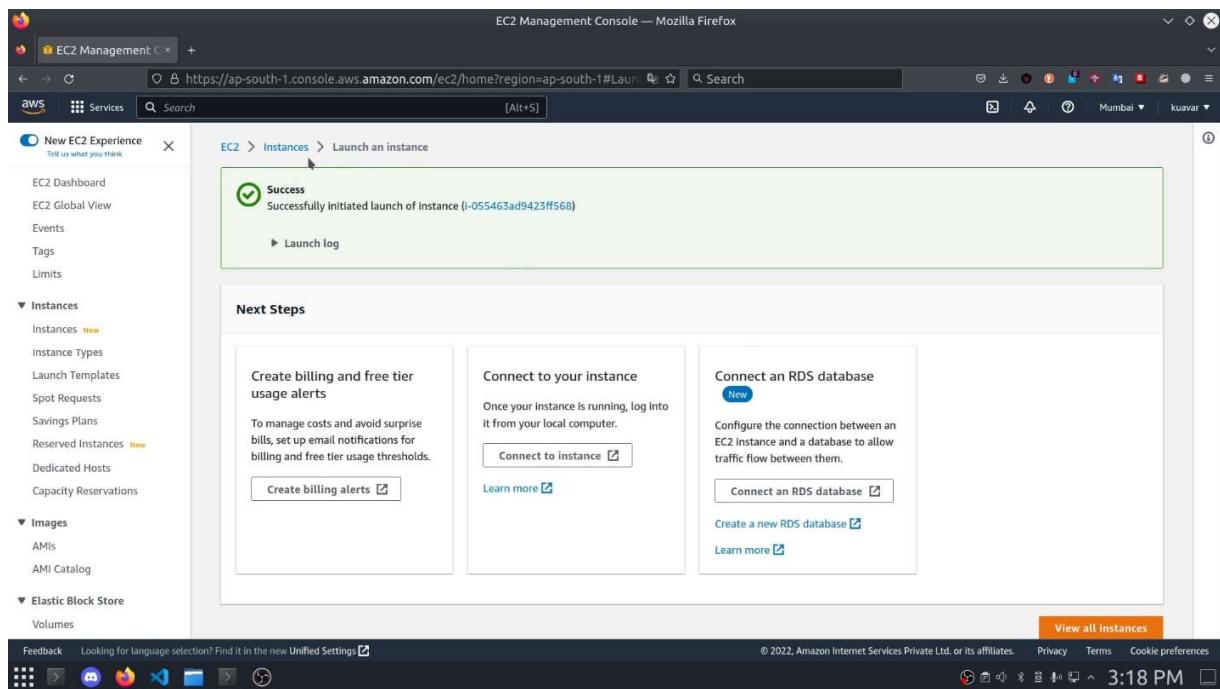
Outbound Rules:

- Can send traffic to any host in the Internet. This enables bastion host to manage web server EC2 instance.

Step 6: Finally click on “Create Instance”.



Bastion Host successfully created.

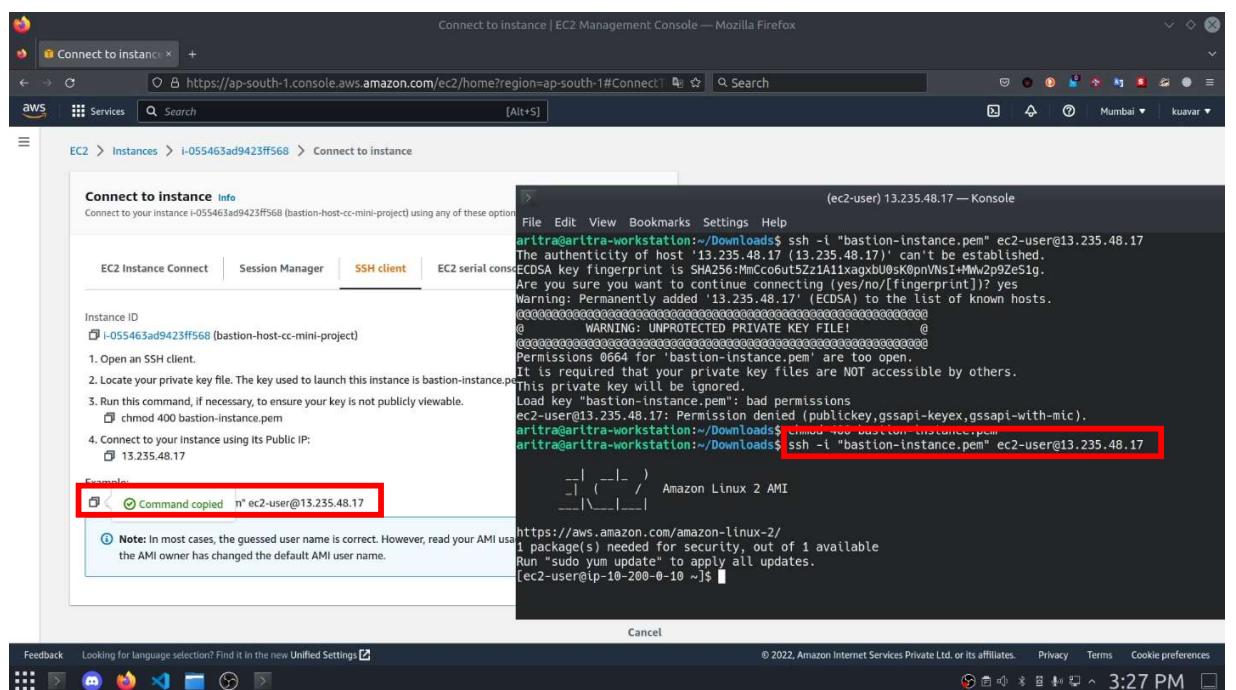


11) SSH into Bastion host

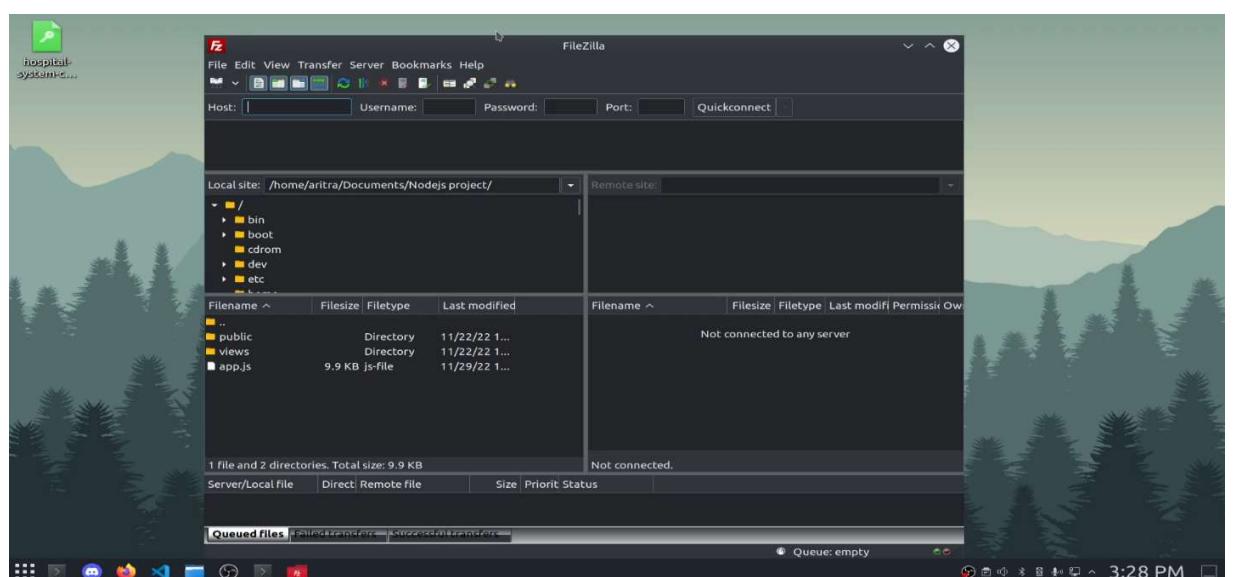
From this section onwards our target will be to access and manage the web server and RDS database using Bastion host.

But first we will SSH into bastion host.

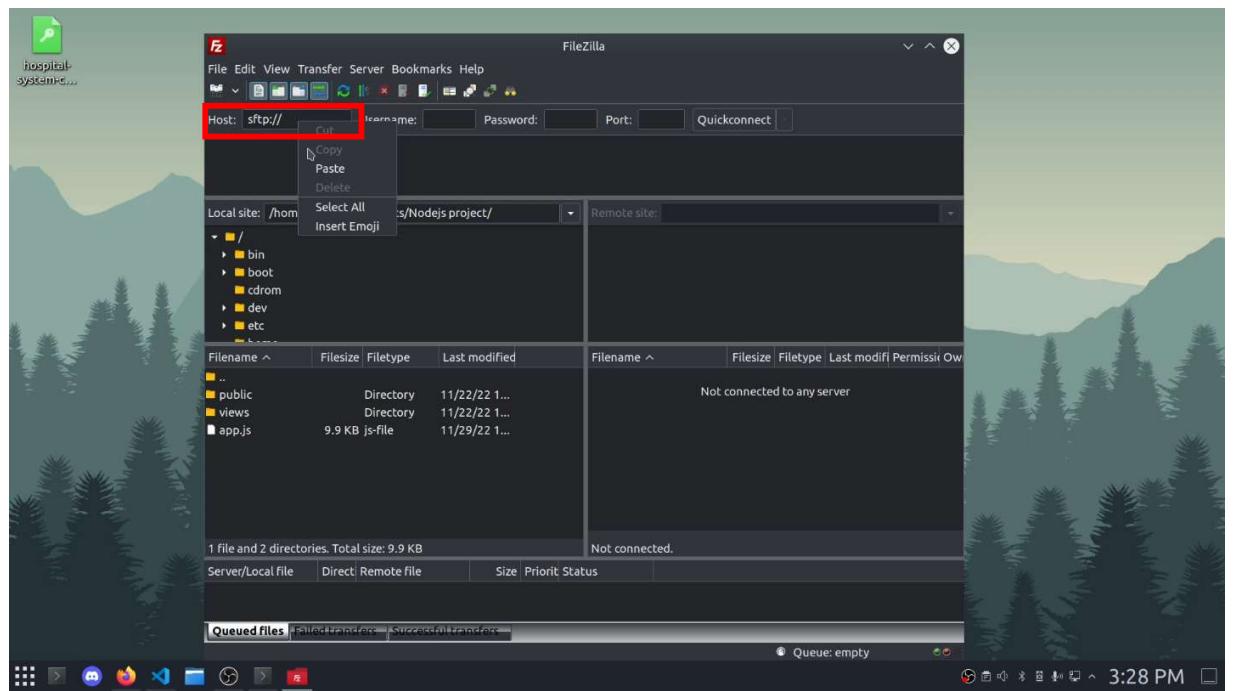
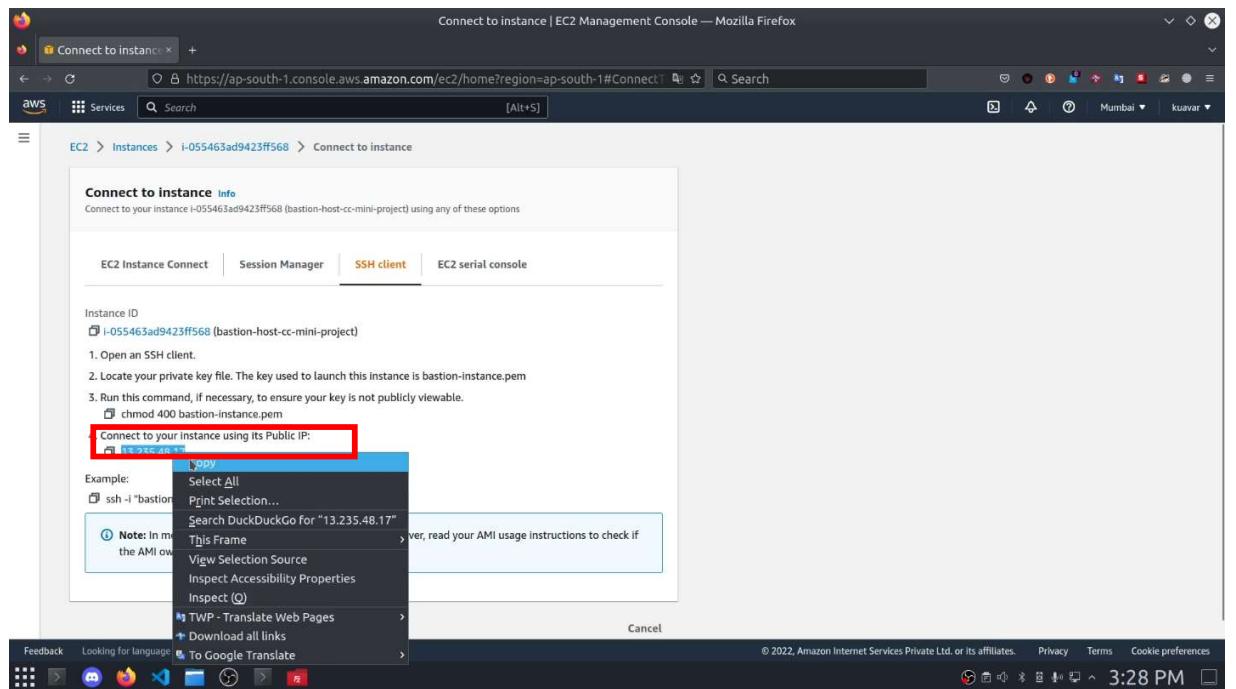
Step 1: First we have connected to bastion host from our localhost terminal.

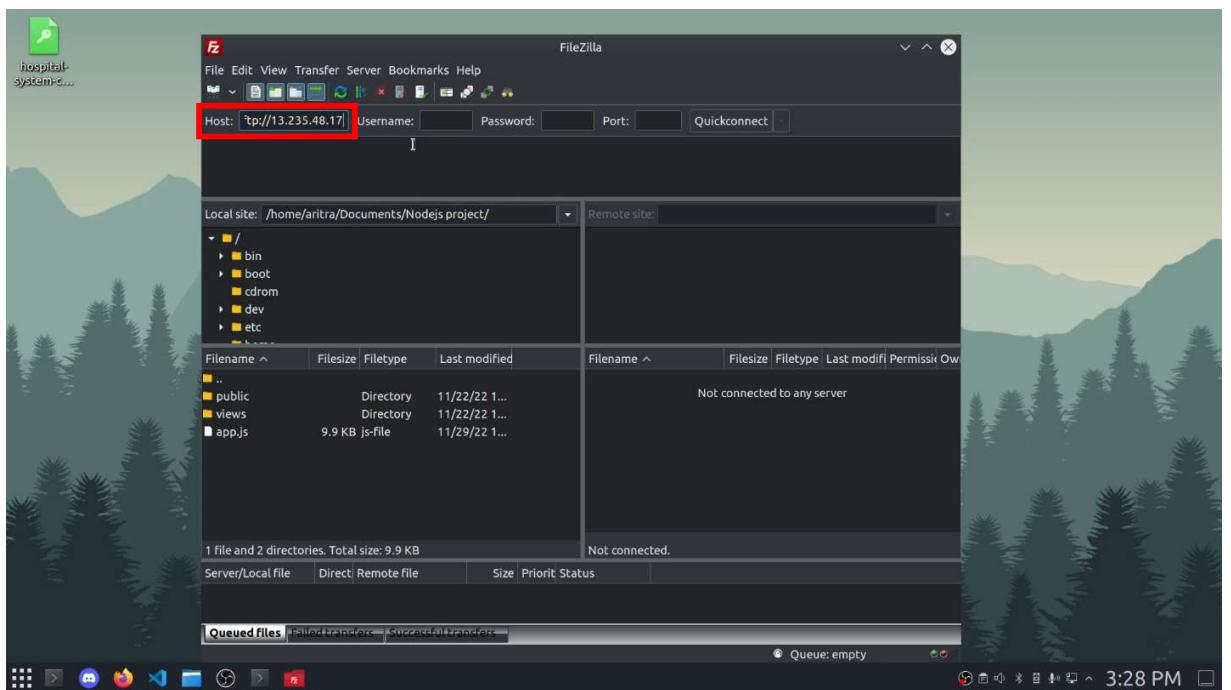


Step 2: Now we will load the private key pair of web server ec2 instance into bastion host ec2 instance. We will be performing this using FileZilla software.

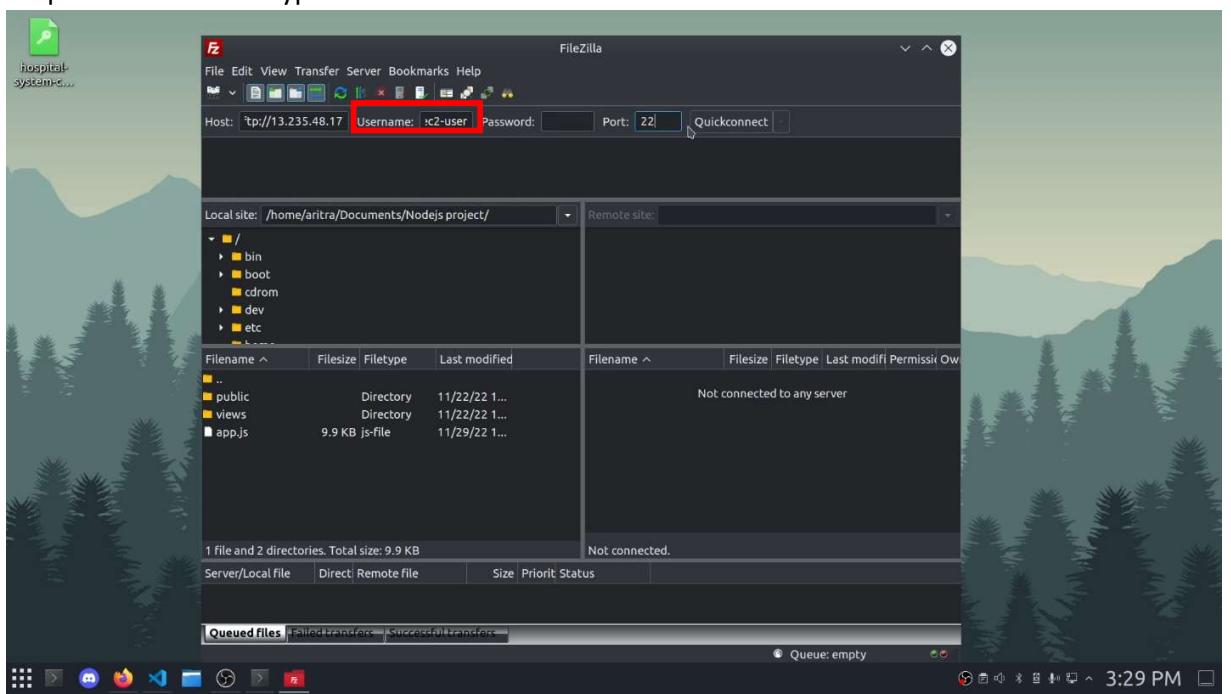


Step 1: Copy the public IP address in “Host” of FileZilla.

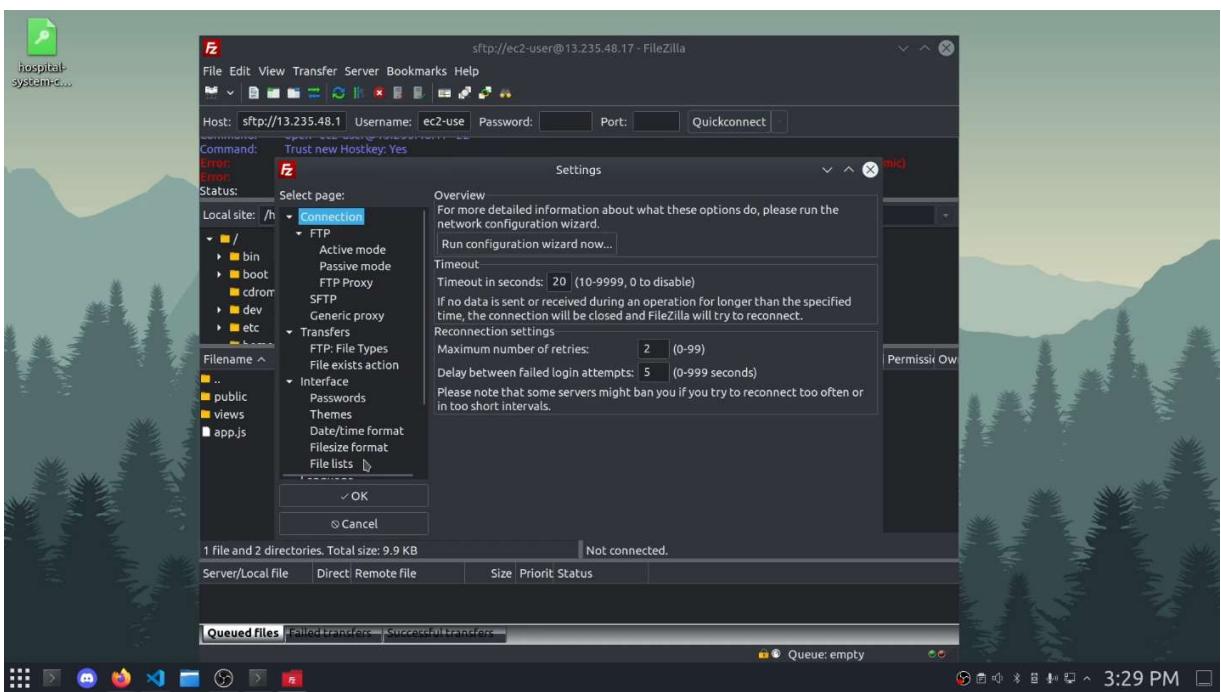
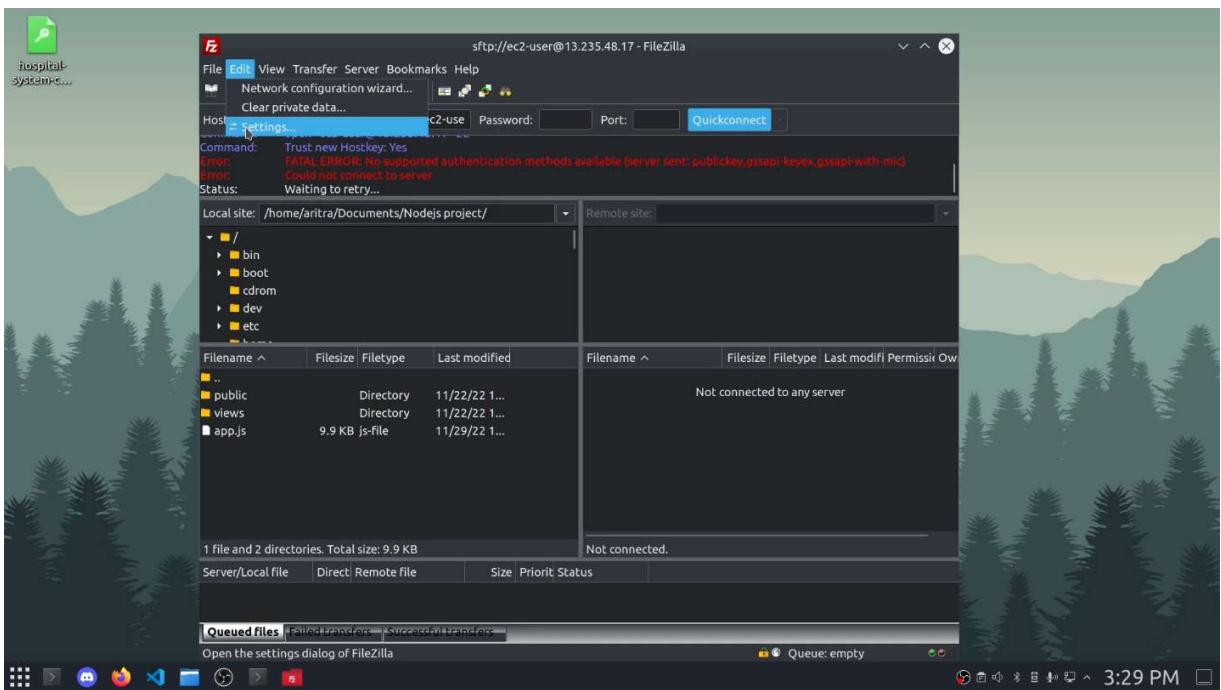


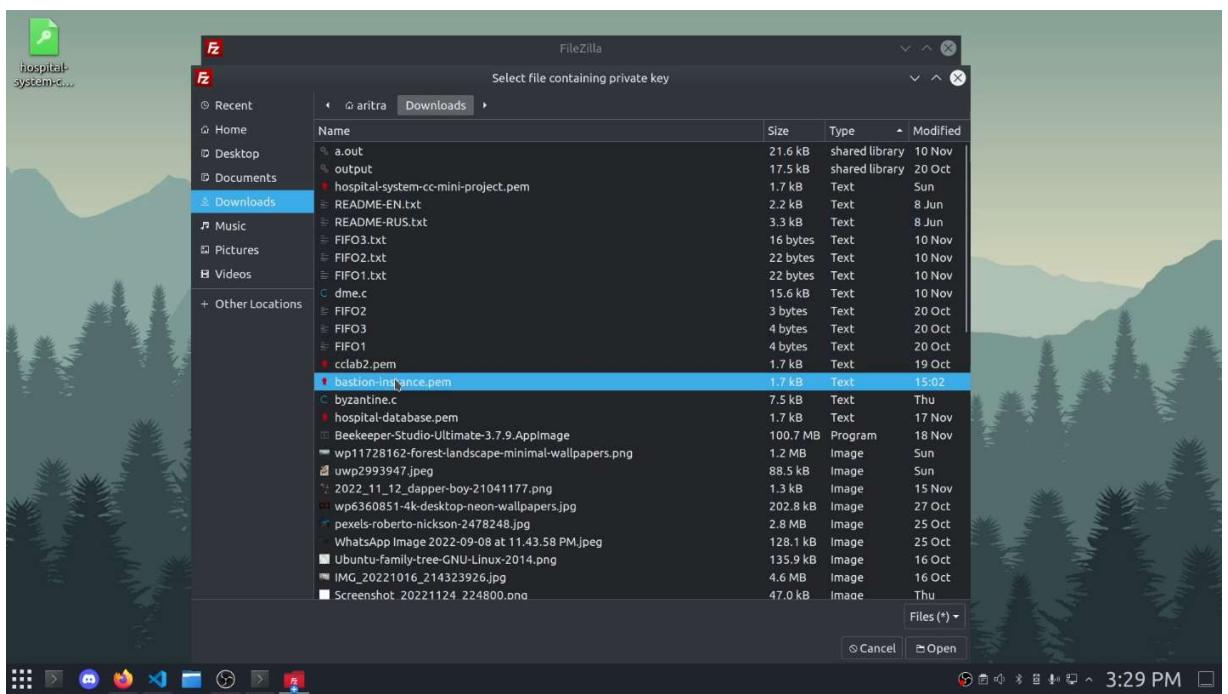
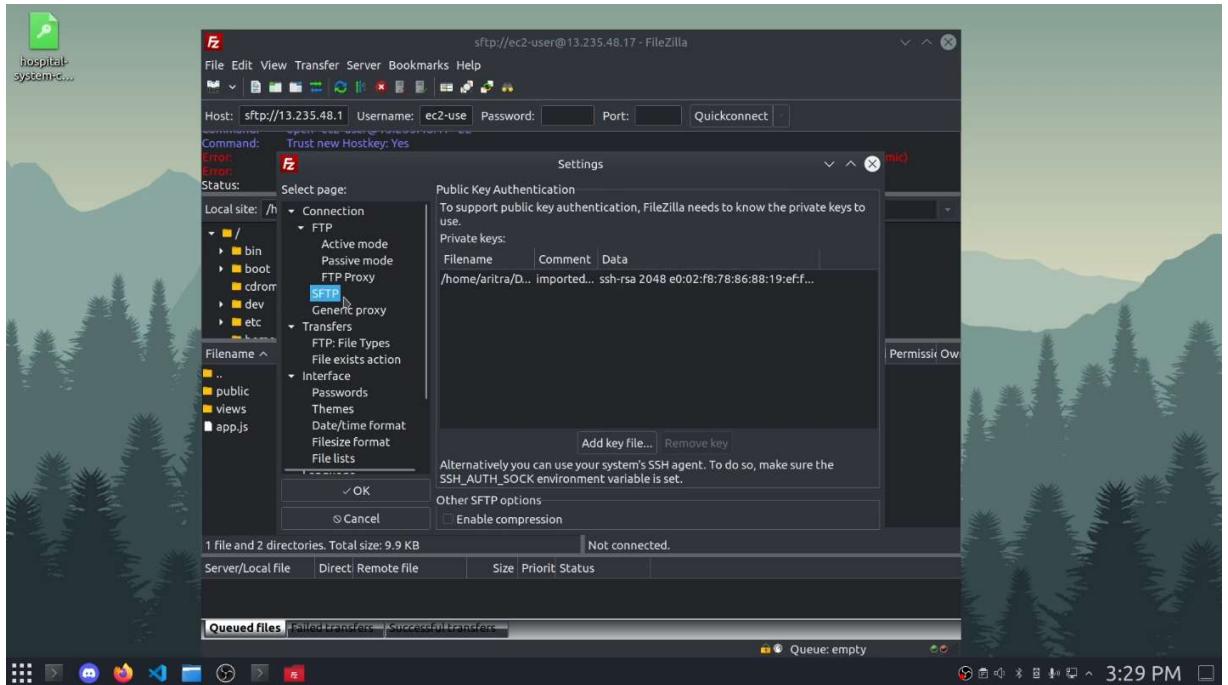


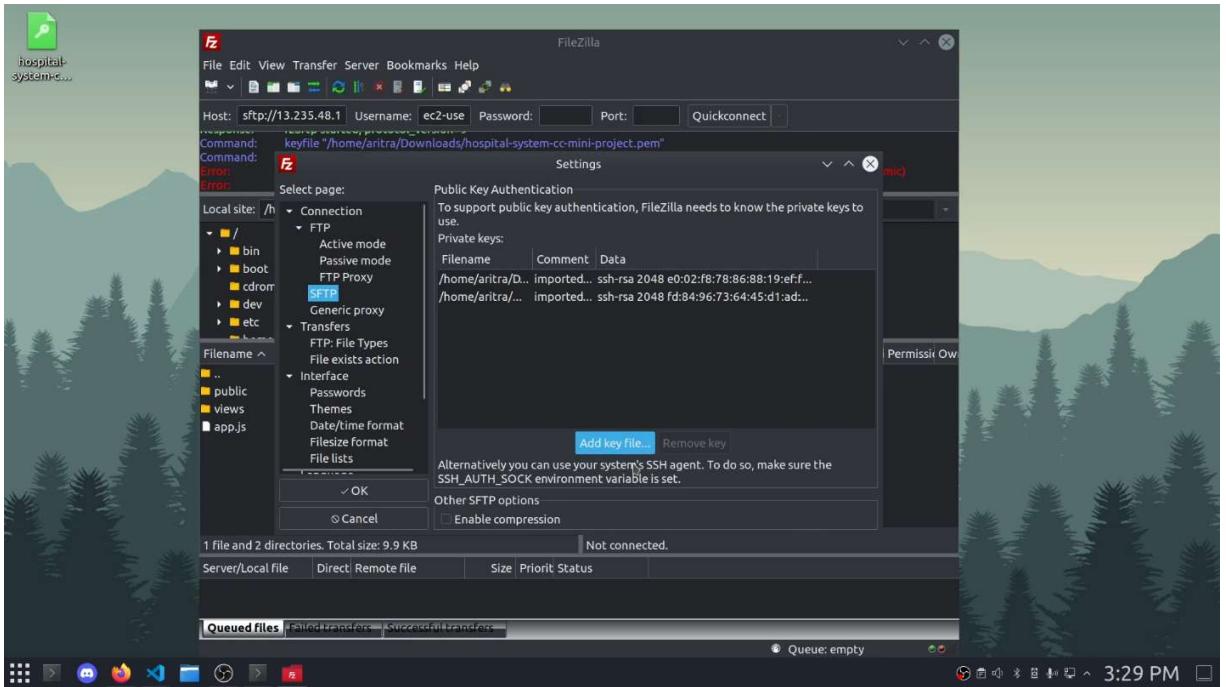
Step 2: In Username type “ec2-user”.



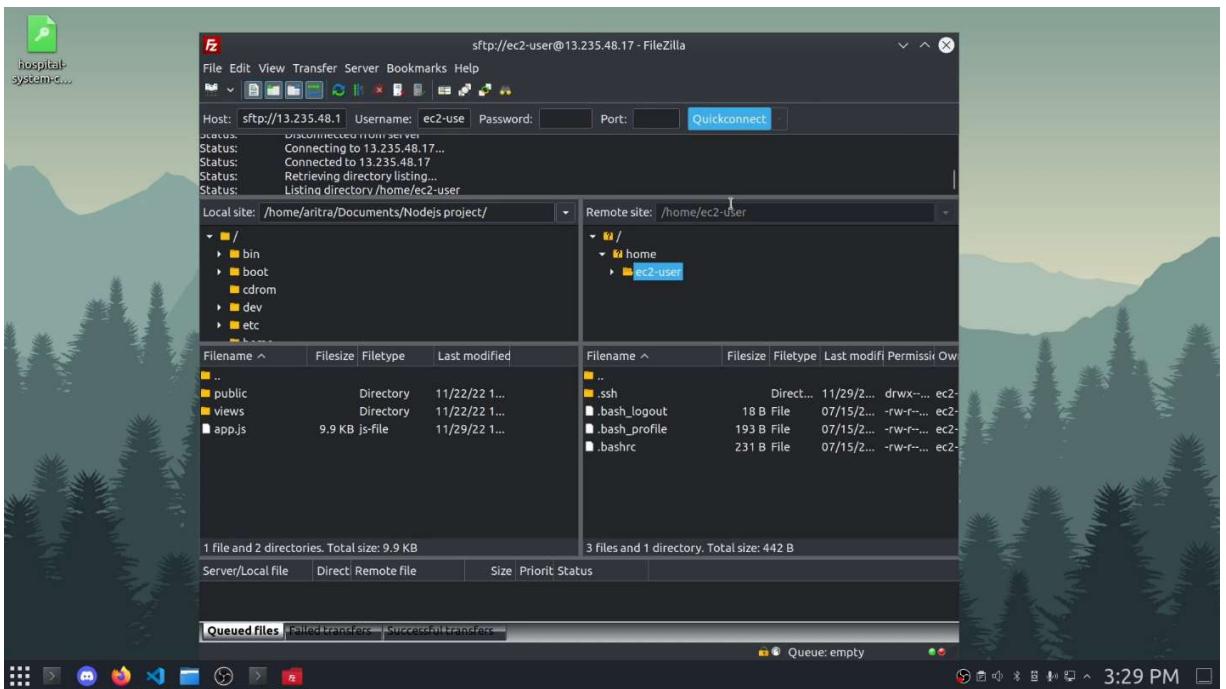
Step 3: Import the private key pair file of the EC2 instance in FileZilla.

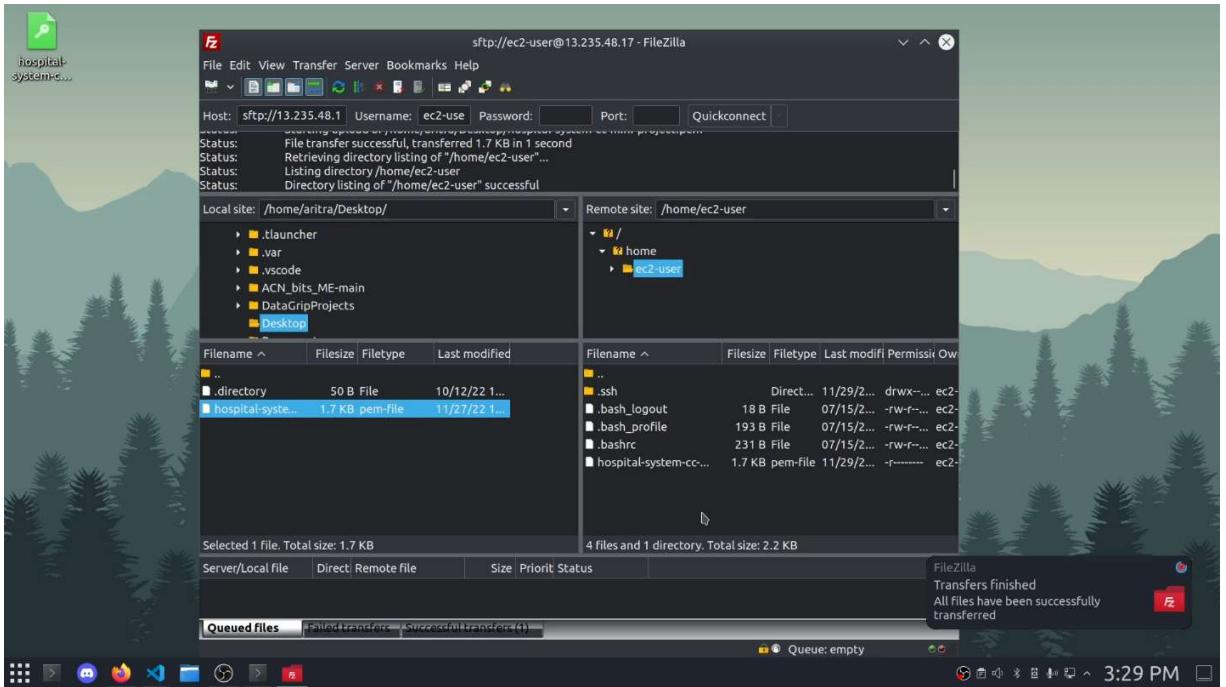






Step 4: After FileZilla has been successfully connected to EC2 instance, go to the required directory of localhost and transfer the file to the EC2 instance by dragging the file.

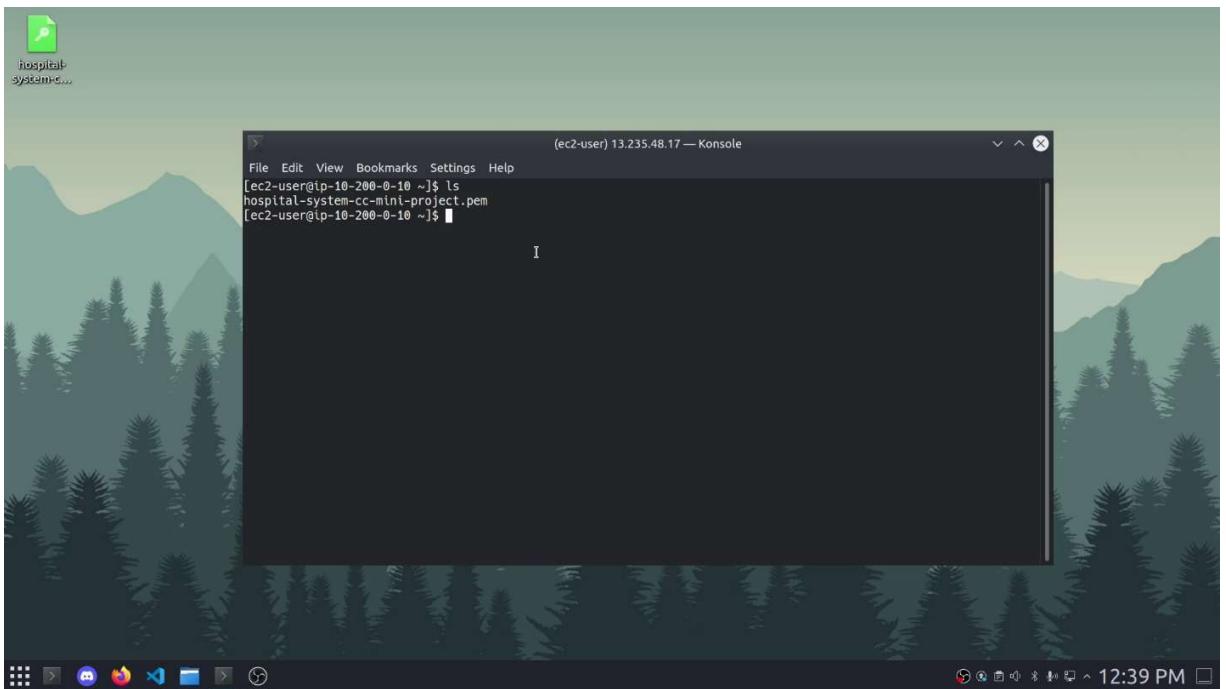




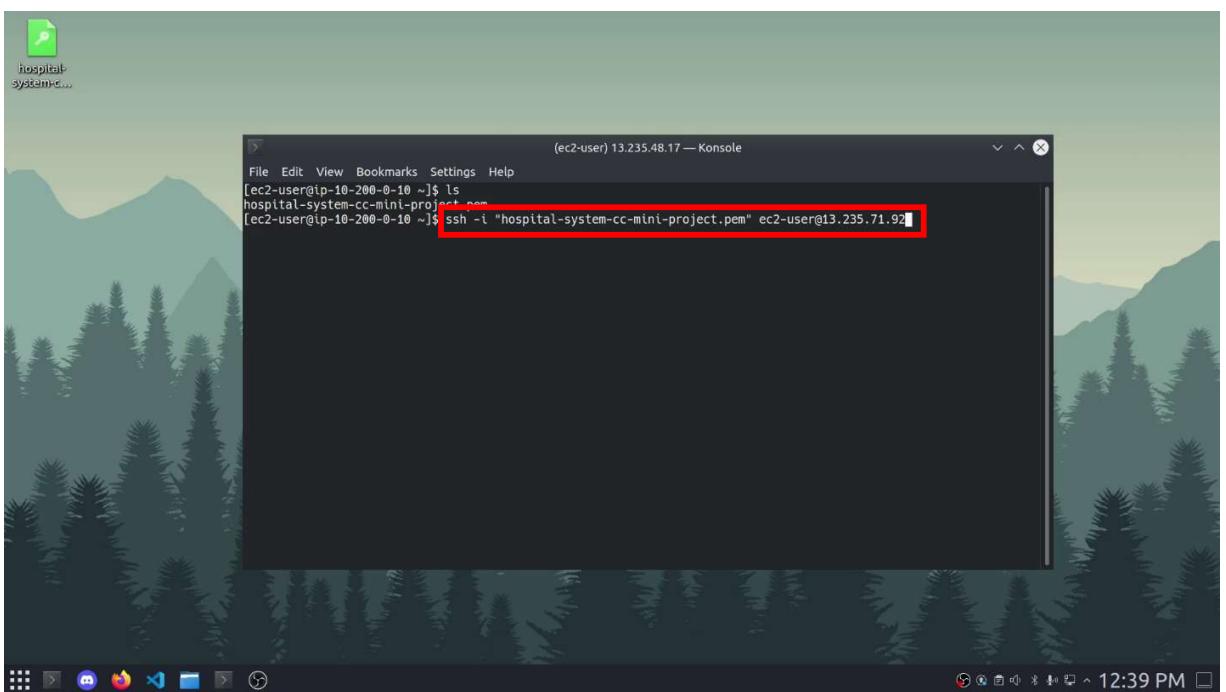
12) Connecting to web server EC2 instance from Bastion Host EC2 instance

Currently we are in bastion host. The private Key pair file of Web Server EC2 instance has been transferred to bastion host using FileZilla. Now we will connect to web server instance using bastion host instance.

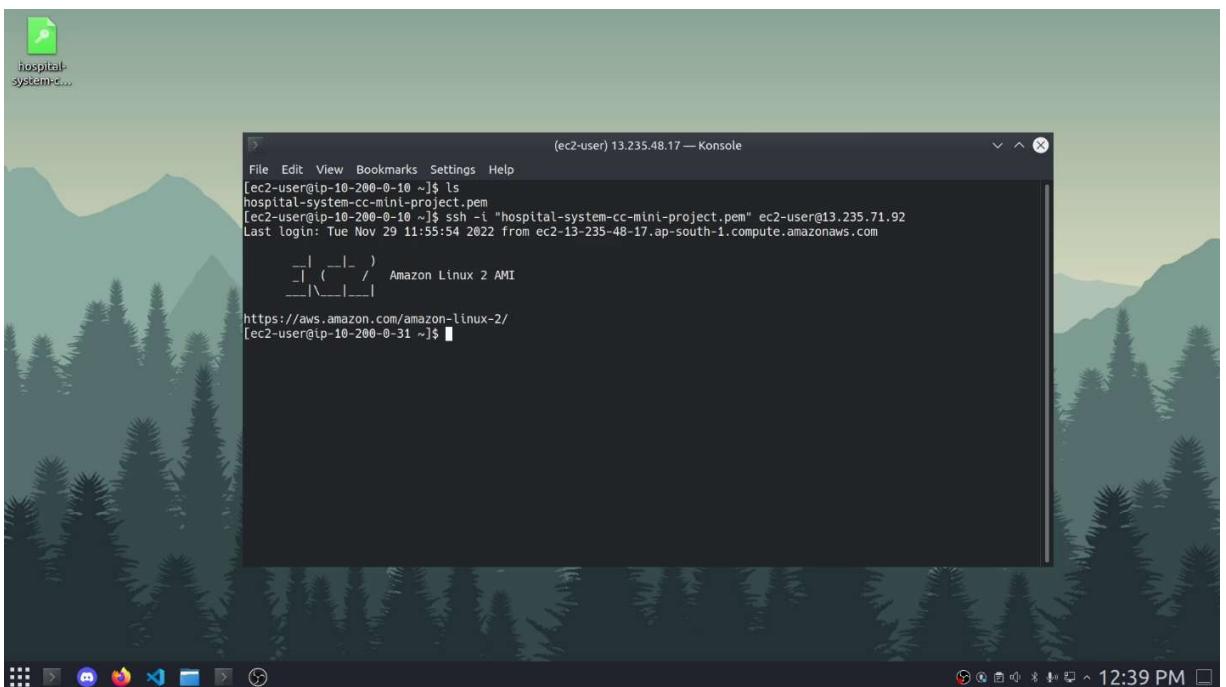
Step 1: Check whether private key pair value of web server EC2 instance is available in bastion host.



Step 2: Type the below ssh command to get connected to web server instance from bastion host instance.

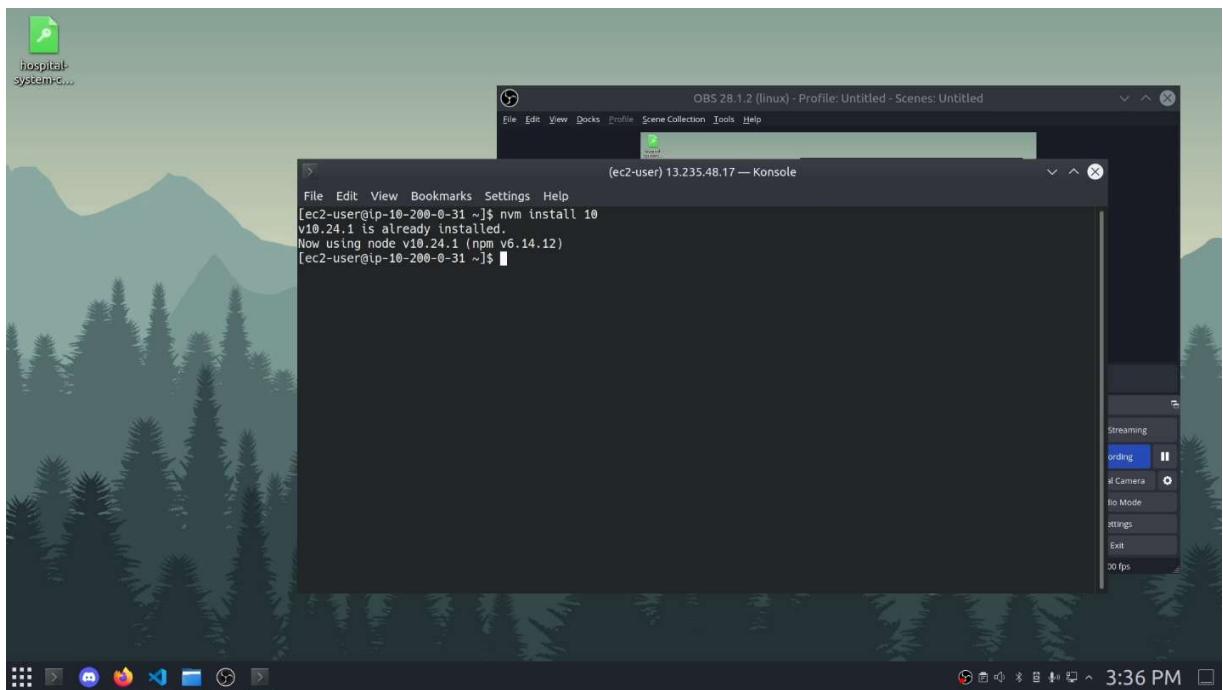


Step 3: Web server instance is thus connected from bastion host instance.



Hence from bastion host we have successfully connected to web server instance.

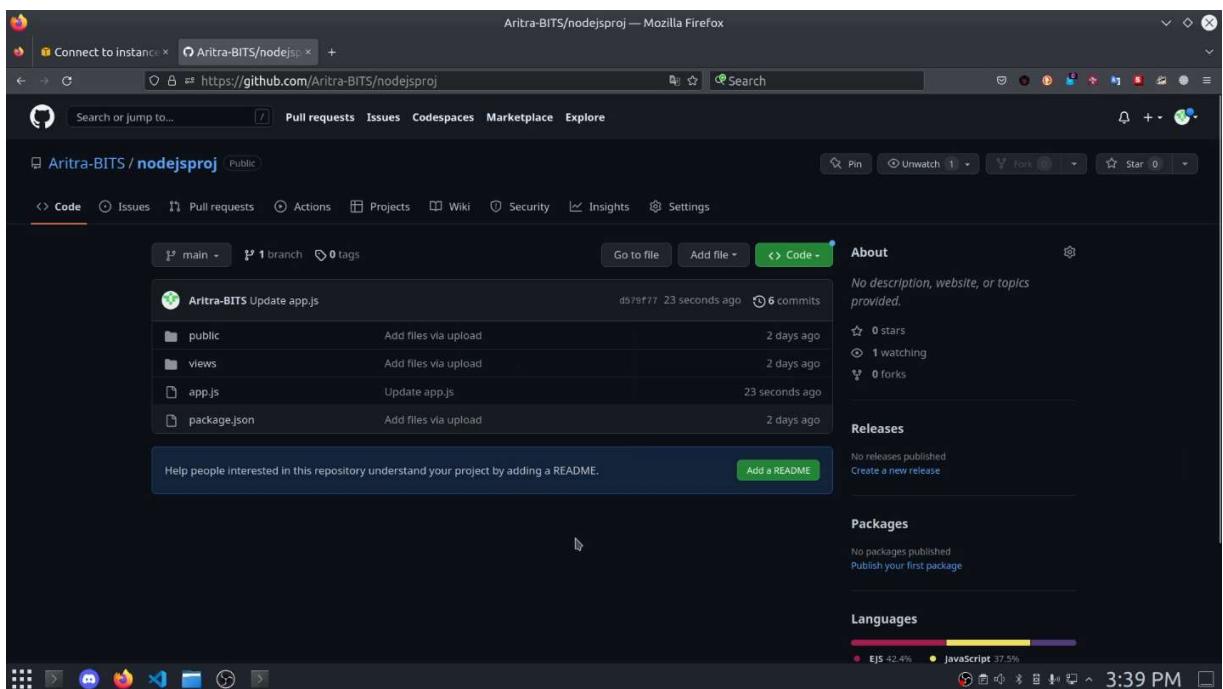
13) Node JS setup in web server using bastion host



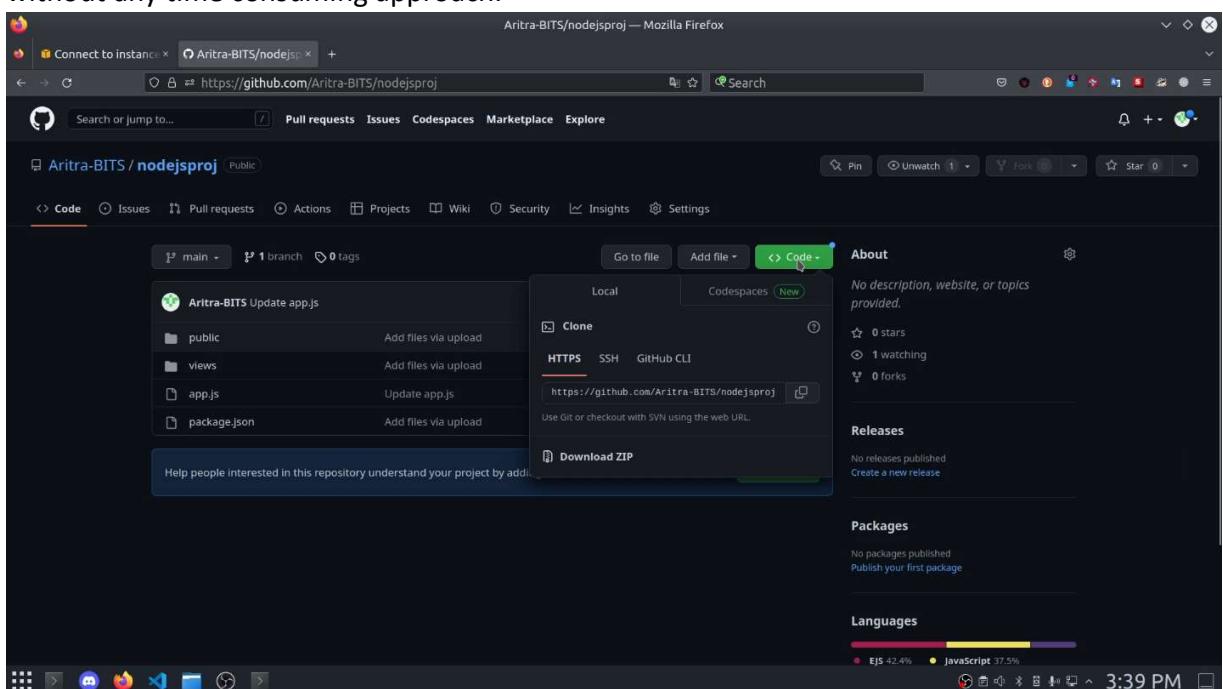
Nodejs installed successfully.

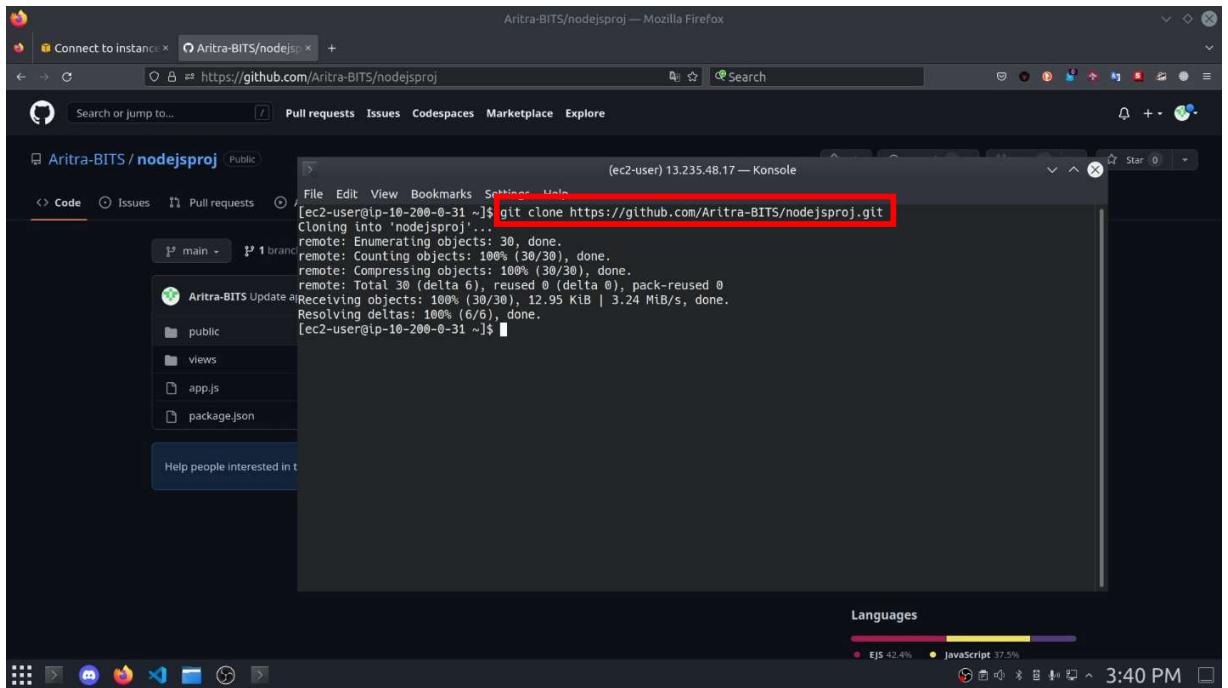
14) Load Webapp into web server using bastion host

Step 1: Our webapp code has been tested locally and uploaded in GitHub. This is done to transfer all our project files from local to EC2 instance successfully without any time consuming approach



Step 2: Cloning from our GitHub repository into web server EC2 instance using bastion host. This is done to transfer all our project files from local to EC2 instance successfully without any time consuming approach.

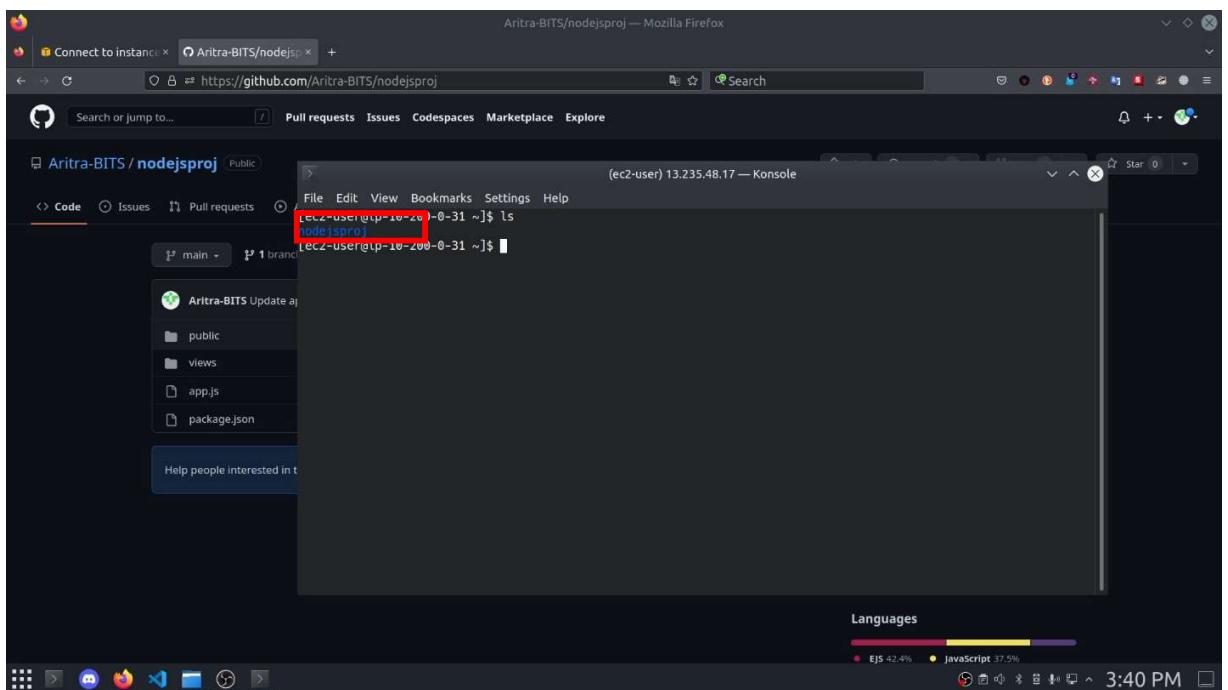




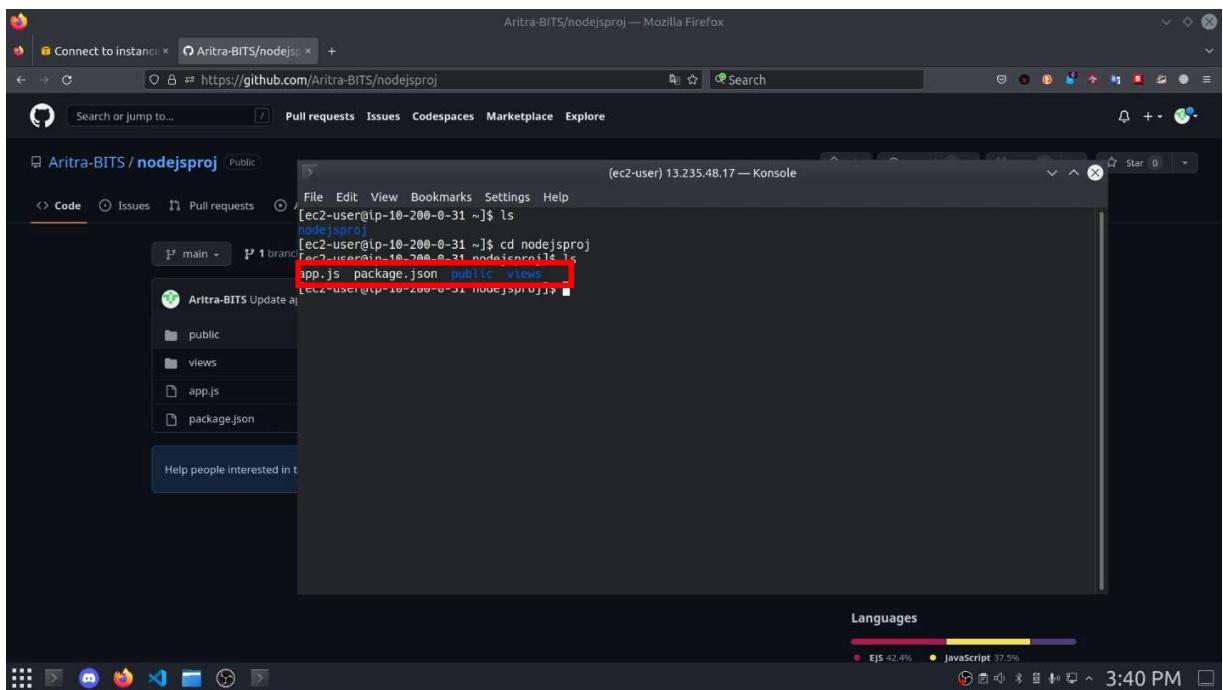
```
[ec2-user@ip-10-200-0-31 ~]$ git clone https://github.com/Aitra-BITS/nodejsproj.git
Cloning into 'nodejsproj'...
remote: Enumerating objects: 30, done.
remote: Counting objects: 100% (30/30), done.
remote: Compressing objects: 100% (30/30), done.
remote: Total 30 (delta 6), reused 0 (delta 0), pack-reused 0
Receiving objects: 100% (30/30), 12.95 KiB | 3.24 MiB/s, done.
Resolving deltas: 100% (6/6), done.
[ec2-user@ip-10-200-0-31 ~]$
```

Now all our project files are uploaded into web server EC2 instance using bastion host.

Step 3: Now we are able to see our project directory and app.js (main file) in web server EC2 instance (accessed through bastion host).



```
[ec2-user@ip-10-200-0-31 ~]$ ls
nodejsproj
[ec2-user@ip-10-200-0-31 ~]$
```



- 15) Defining nm. entry and setting up Nodejs packages in web server EC2 instance (using bastion host)

```
File Edit View Bookmarks Settings Help
[ec2-user@ip-10-200-0-31 nodejsproj]$ 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: (nodejsproj)
```

```
File Edit View Bookmarks Settings Help
[ec2-user@ip-10-200-0-31 nodejsproj]$ 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: (nodejsproj)
version: (1.0.0)
description:
entry point: (app.js)
test command:
git repository: (https://github.com/Aritra-BITS/nodejsproj.git)
keywords:
author: aritra kushal avesh
license: (ISC) █
```

```
File Edit View Bookmarks Settings Help
author: aritra kushal avesh
license: (ISC)
About to write to /home/ec2-user/nodejsproj/package.json:

{
  "name": "nodejsproj",
  "version": "1.0.0",
  "description": "",
  "main": "app.js",
  "scripts": {
    "test": "echo \\\"Error: no test specified\\\" && exit 1"
  },
  "repository": {
    "type": "git",
    "url": "git+https://github.com/Aritra-BITS/nodejsproj.git"
  },
  "author": "aritra kushal avesh",
  "license": "ISC",
  "bugs": {
    "url": "https://github.com/Aritra-BITS/nodejsproj/issues"
  },
  "homepage": "https://github.com/Aritra-BITS/nodejsproj#readme"
}

Is this OK? (yes) █
```

```
File Edit View Bookmarks Settings Help
license: (ISC)
About to write to /home/ec2-user/nodejsproj/package.json:

{
  "name": "nodejsproj",
  "version": "1.0.0",
  "description": "",
  "main": "app.js",
  "scripts": {
    "test": "echo \\\"Error: no test specified\\\" && exit 1"
  },
  "repository": {
    "type": "git",
    "url": "git+https://github.com/Aritra-BITS/nodejsproj.git"
  },
  "author": "aritra kushal avesh",
  "license": "ISC",
  "bugs": {
    "url": "https://github.com/Aritra-BITS/nodejsproj/issues"
  },
  "homepage": "https://github.com/Aritra-BITS/nodejsproj#readme"
}

Is this OK? (yes) yes
[ec2-user@ip-10-200-0-31 nodejsproj]$
```

```
File Edit View Bookmarks Settings Help
[ec2-user@ip-10-200-0-31 nodejsproj]$ vim package.js
```

```
File Edit View Bookmarks Settings Help
{
  "name": "nodejsproj",
  "version": "1.0.0",
  "description": "",
  "main": "app.js",
  "scripts": {
    "test": "echo \\\"Error: no test specified\\\" && exit 1"
  },
  "repository": {
    "type": "git",
    "url": "git+https://github.com/Aritra-BITS/nodejsproj.git"
  },
  "author": "aritra kushal avesh",
  "license": "ISC",
  "bugs": {
    "url": "https://github.com/Aritra-BITS/nodejsproj/issues"
  },
  "homepage": "https://github.com/Aritra-BITS/nodejsproj#readme"
}
~
~
~
~
~
~
"package.json" 19L, 473B
1,1
All
```

```
File Edit View Bookmarks Settings Help
[ec2-user@ip-10-200-0-31 nodejsproj]$ vim package.json
[ec2-user@ip-10-200-0-31 nodejsproj]$ npm install ejis --save
npm notice created a lockfile as package-lock.json. You should commit this file.
npm WARN nodejsproj@1.0.0 No description

+ ejis@3.1.8
added 16 packages from 8 contributors and audited 16 packages in 1.1s

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

found 0 vulnerabilities

[ec2-user@ip-10-200-0-31 nodejsproj]$ npm install request --save
npm WARN deprecated request@2.88.2: request has been deprecated, see https://github.com/request/request/issues/3142
npm WARN deprecated har-validator@5.1.5: this library is no longer supported
npm WARN deprecated uuid@3.4.0: Please upgrade to version 7 or higher. Older versions may use Math.random() in c
ertain circumstances, which is known to be problematic. See https://v8.dev/blog/math-random for details.
[...]
[.....] / fetchMetadata: sill resolveWithNewModule sshpk@1.17.0 checking installable status
```

```
File Edit View Bookmarks Settings Help
[ec2-user@ip-10-200-0-31 nodejsproj]$ npm install crypto --save
npm WARN deprecated crypto@1.0.1: This package is no longer supported. It's now a built-in Node module. If you've
depended on crypto, you should switch to the one that's built-in.
npm WARN nodejsproj@1.0.0 No description
```

```
+ crypto@1.0.1
added 1 package and audited 91 packages in 1.134s

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

found 0 vulnerabilities
```

```
[ec2-user@ip-10-200-0-31 nodejsproj]$ 
```

```
File Edit View Bookmarks Settings Help
[ec2-user@ip-10-200-0-31 nodejsproj]$ npm install crypto --save
npm WARN deprecated crypto@1.0.1: This package is no longer supported. It's now a built-in Node module. If you've
depended on crypto, you should switch to the one that's built-in.
npm WARN nodejsproj@1.0.0 No description
```

```
+ crypto@1.0.1
added 1 package and audited 91 packages in 1.134s

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

found 0 vulnerabilities
```



```
[ec2-user@ip-10-200-0-31 nodejsproj]$ npm install mysql --save
npm WARN nodejsproj@1.0.0 No description
```

```
+ mysql@2.18.1
added 11 packages from 14 contributors and audited 102 packages in 1.826s
```

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

```
found 0 vulnerabilities
```

```
[ec2-user@ip-10-200-0-31 nodejsproj]$ 
```

```

File Edit View Bookmarks Settings Help
[ec2-user@ip-10-200-0-31 nodejsproj]$ npm install express --save
npm WARN nodejsproj@1.0.0 No description

+ express@4.18.2
added 27 packages from 25 contributors and audited 129 packages in 2.079s

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

found 0 vulnerabilities

[ec2-user@ip-10-200-0-31 nodejsproj]$ npm install express cookie-parser --save
npm WARN nodejsproj@1.0.0 No description

+ express@4.18.2
+ cookie-parser@1.4.6
added 2 packages from 3 contributors, updated 2 packages and audited 131 packages in 1.514s

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

found 0 vulnerabilities

[ec2-user@ip-10-200-0-31 nodejsproj]$ █

```

16) Connection to Database in RDS through Bastion Host

Step 1: First obtain the endpoint of RDS through the following steps:

The screenshot shows the Amazon RDS Management Console interface. On the left, there's a sidebar with various navigation links such as Dashboard, Databases, Query Editor, Performance insights, Snapshots, Exports in Amazon S3, Automated backups, Reserved instances, Proxies, Subnet groups, Parameter groups, Option groups, Custom engine versions, Events, Event subscriptions, and Recommendations. The main content area is titled "Resources" and shows usage statistics for the Asia Pacific (Mumbai) region: 2 DB instances (2/20), 0.4 TB/100 TB allocated storage, 0 DB Clusters (0/40), 0 Reserved instances (0/20), 7 Snapshots (7), 0 Manual DB Cluster (0/100), 0 DB Instance (0/100), 0 Automated DB Cluster (0), 7 DB Instance (7), 8 Recent events (8), and 0 Event subscriptions (0/20). To the right, there's a "Additional information" section with links to Getting started with RDS, Overview and features, Documentation, Articles and tutorials, Data import guide for MySQL, Data import guide for Oracle, Data import guide for SQL Server, New RDS feature announcements, Pricing, and Forums. Below that is a "Database Preview Environment" section with a note about early access to new DB engine versions.

RDS Management Console — Mozilla Firefox

https://ap-south-1.console.aws.amazon.com/rds/home?region=ap-south-1#database

Amazon RDS

Databases

DB identifier Role Engine Region & AZ Size Status CPU

DB identifier	Role	Engine	Region & AZ	Size	Status	CPU
flashcard	Instance	MySQL Community	ap-south-1a	db.t3.micro	Available	2.57%
hospital-db	Instance	MySQL Community	ap-south-1a	db.t3.micro	Available	2.26%

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4:07 PM

This screenshot shows the 'Databases' page in the Amazon RDS Management Console. It lists two MySQL Community instances: 'flashcard' and 'hospital-db'. Both instances are in the 'ap-south-1a' region and are currently available. The 'hospital-db' instance has a CPU usage of 2.26%.

RDS Management Console — Mozilla Firefox

https://ap-south-1.console.aws.amazon.com/rds/home?region=ap-south-1#database

Amazon RDS

Databases

DB identifier hospital-db

Summary

DB identifier	CPU	Status	Class
hospital-db	2.26%	Available	db.t3.micro

Connectivity & security Monitoring Logs & events Configuration Maintenance & backups Tags

Connectivity & security

Endpoint & port	Networking	Security
Endpoint hospital-db.cs03ypvtwtdo.ap-south-1.rds.amazonaws.com	Availability Zone ap-south-1a	VPC security groups cc-mini-project-rds-sg (sg-099960fb5dd4b0a79)
Port 3306	VPC cc-mini-project (vpc-0636af6ef76b6c366)	Active
		Publicly accessible

Feedback Looking for language selection? Find it in the new Unified Settings.

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4:07 PM

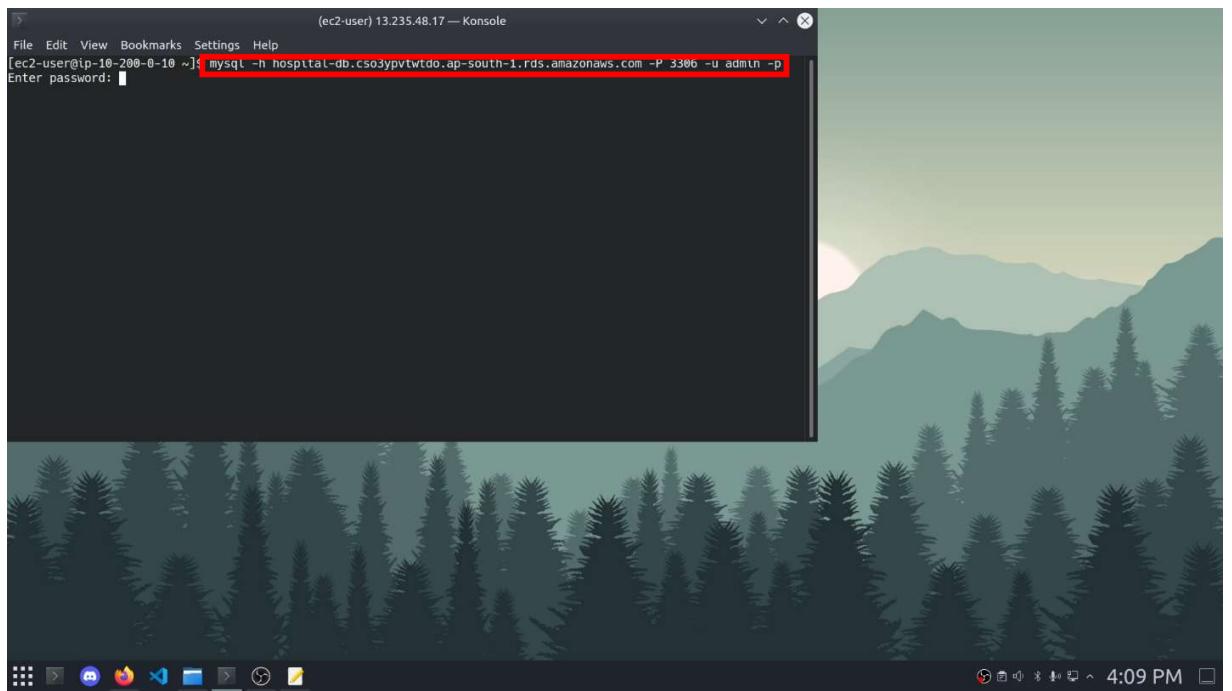
This screenshot shows the details for the 'hospital-db' database. It displays the 'Summary' section and the 'Connectivity & security' tab. In the 'Connectivity & security' tab, the 'Endpoint' field is highlighted with a red box. The endpoint value is 'hospital-db.cs03ypvtwtdo.ap-south-1.rds.amazonaws.com'. Other fields include 'Port' (3306), 'Networking' (Availability Zone: ap-south-1a), and 'Security' (VPC security group: cc-mini-project-rds-sg, VPC: cc-mini-project). The 'Security' section also indicates that the VPC is active and publicly accessible.

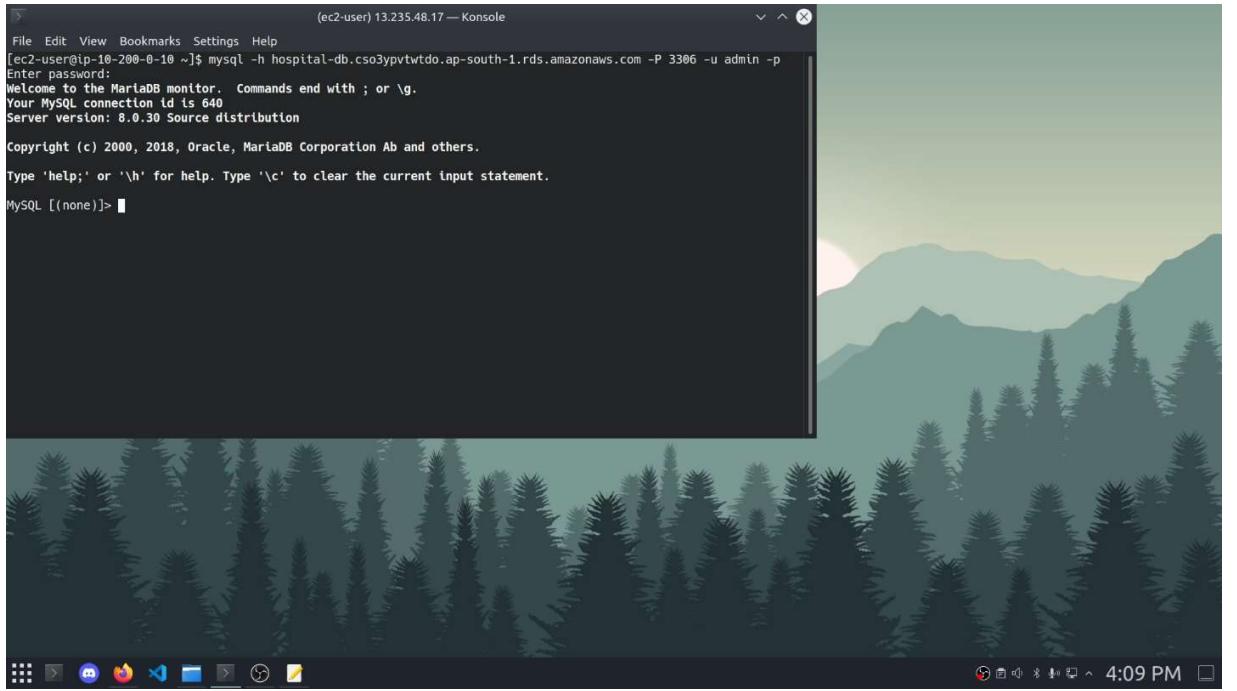
The screenshot shows the Amazon RDS Management Console in Mozilla Firefox. A context menu is open over a database instance named 'hospital-db'. The menu options include 'Open Link', 'Copy' (which is highlighted), and 'Select All'. The database details shown are:

Summary	
Status	Available
Class	db.t3.micro
Region & AZ	ap-south-1a
Engine	MySQL Community

Below the summary, there's a 'Security' section listing VPC security groups and a 'Publicly accessible' status set to 'No'. The URL in the address bar is <https://ap-south-1.console.aws.amazon.com/rds/home?region=ap-south-1#database>.

Step 2: After that use the following command with endpoint in the given terminal:



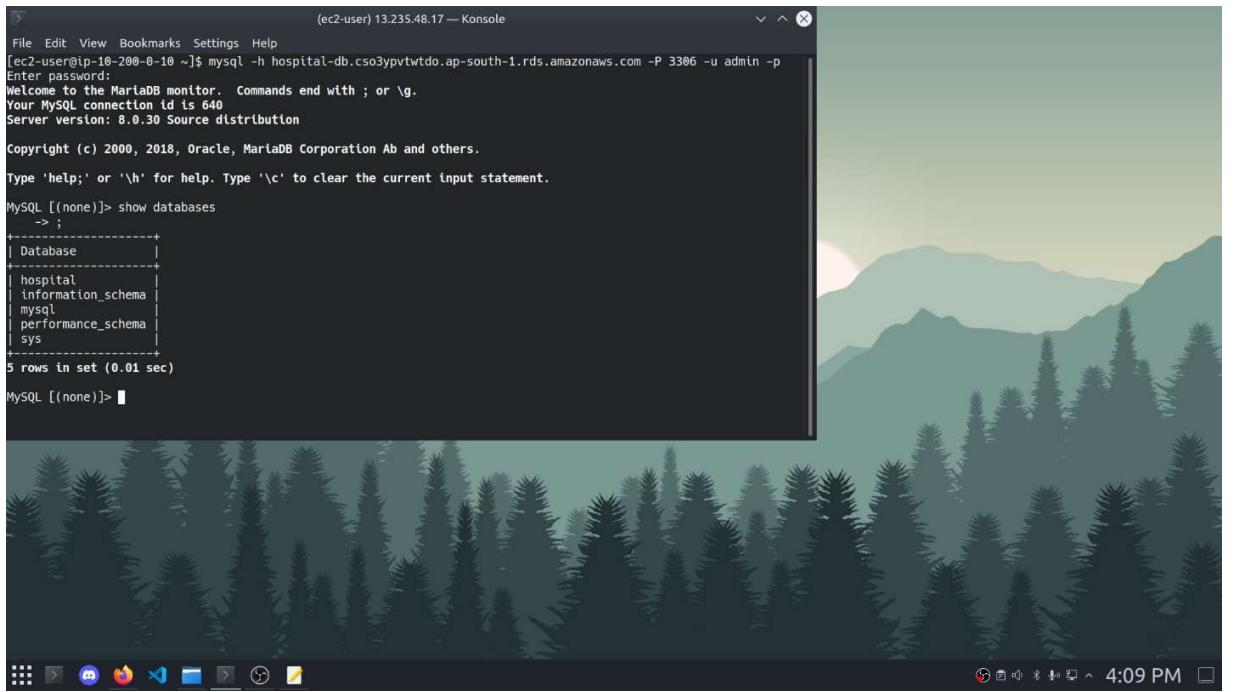


```
(ec2-user) 13.235.48.17 — Konsole
File Edit View Bookmarks Settings Help
[ec2-user@ip-10-200-0-10 ~]$ mysql -h hospital-db.cso3ypvtwtdo.ap-south-1.rds.amazonaws.com -P 3306 -u admin -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MySQL connection id is 640
Server version: 8.0.30 Source distribution

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MySQL [(none)]> 
```



```
(ec2-user) 13.235.48.17 — Konsole
File Edit View Bookmarks Settings Help
[ec2-user@ip-10-200-0-10 ~]$ mysql -h hospital-db.cso3ypvtwtdo.ap-south-1.rds.amazonaws.com -P 3306 -u admin -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MySQL connection id is 640
Server version: 8.0.30 Source distribution

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

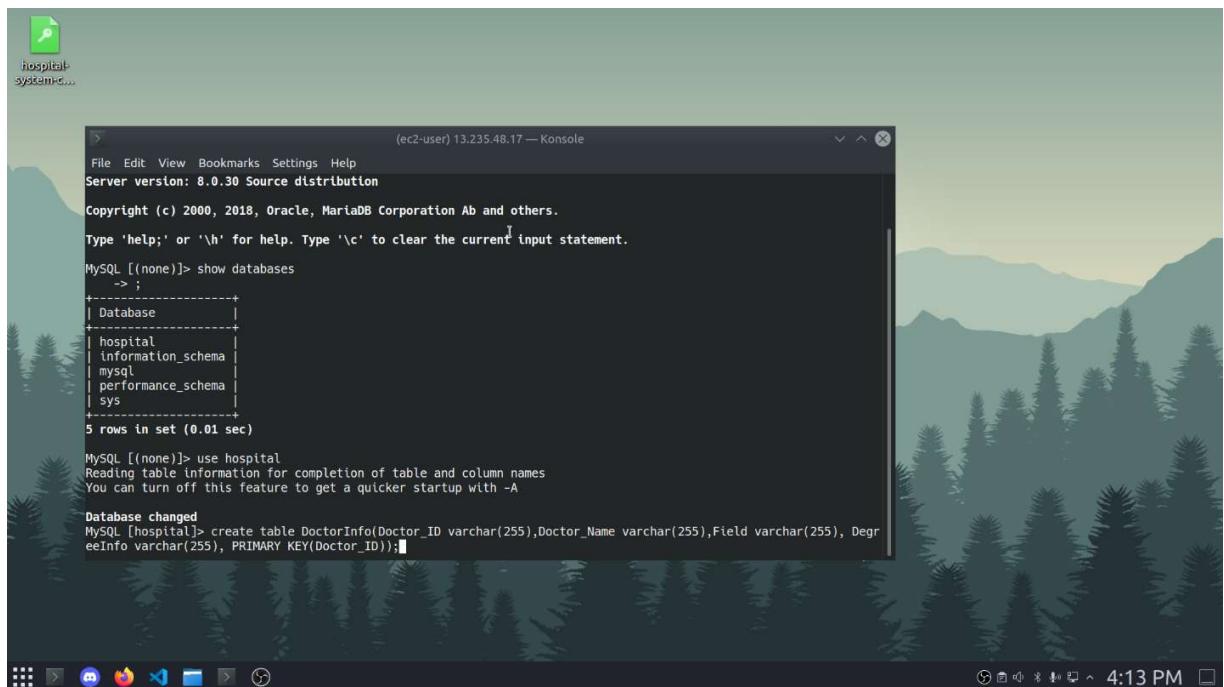
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MySQL [(none)]> show databases
-> ;
+-----+
| Database |
+-----+
| hospital |
| information_schema |
| mysql |
| performance_schema |
| sys |
+-----+
5 rows in set (0.01 sec)

MySQL [(none)]> 
```

Hence database in RDS connected through bastion host.

17) Populating the database with tables and values

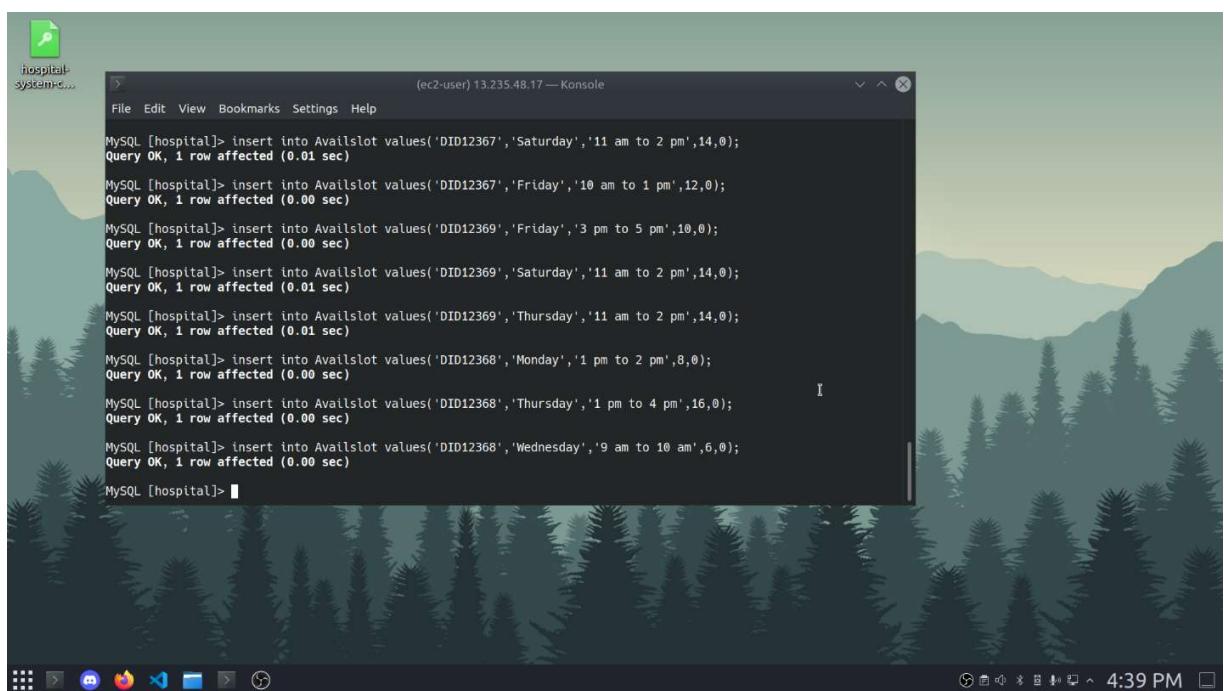


(ec2-user) 13.235.48.17 — Konsole

```
File Edit View Bookmarks Settings Help
Server version: 8.0.30 Source distribution
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.
MySQL [(none)]> show databases
->;
+-----+
| Database |
+-----+
| hospital |
| information_schema |
| mysql |
| performance_schema |
| sys |
+-----+
5 rows in set (0.01 sec)

MySQL [(none)]> use hospital
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A
Database changed
MySQL [hospital]> create table DoctorInfo(Doctor_ID varchar(255),Doctor_Name varchar(255),Field varchar(255), DegreInfo varchar(255), PRIMARY KEY(Doctor_ID));
```

4:13 PM



(ec2-user) 13.235.48.17 — Konsole

```
File Edit View Bookmarks Settings Help
MySQL [hospital]> insert into Availslot values('DID12367','Saturday','11 am to 2 pm',14,0);
Query OK, 1 row affected (0.01 sec)

MySQL [hospital]> insert into Availslot values('DID12367','Friday','10 am to 1 pm',12,0);
Query OK, 1 row affected (0.00 sec)

MySQL [hospital]> insert into Availslot values('DID12369','Friday','3 pm to 5 pm',10,0);
Query OK, 1 row affected (0.00 sec)

MySQL [hospital]> insert into Availslot values('DID12369','Saturday','11 am to 2 pm',14,0);
Query OK, 1 row affected (0.01 sec)

MySQL [hospital]> insert into Availslot values('DID12369','Thursday','11 am to 2 pm',14,0);
Query OK, 1 row affected (0.01 sec)

MySQL [hospital]> insert into Availslot values('DID12368','Monday','1 pm to 2 pm',8,0);
Query OK, 1 row affected (0.00 sec)

MySQL [hospital]> insert into Availslot values('DID12368','Thursday','1 pm to 4 pm',16,0);
Query OK, 1 row affected (0.00 sec)

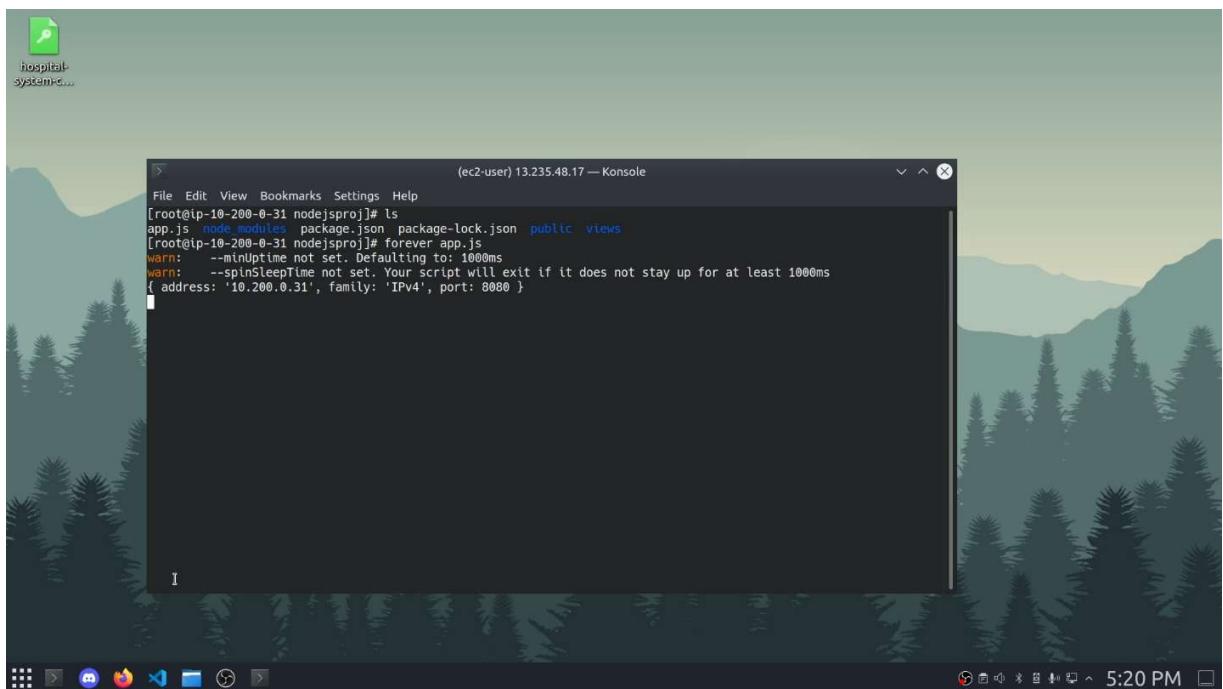
MySQL [hospital]> insert into Availslot values('DID12368','Wednesday','9 am to 10 am',6,0);
Query OK, 1 row affected (0.00 sec)

MySQL [hospital]>
```

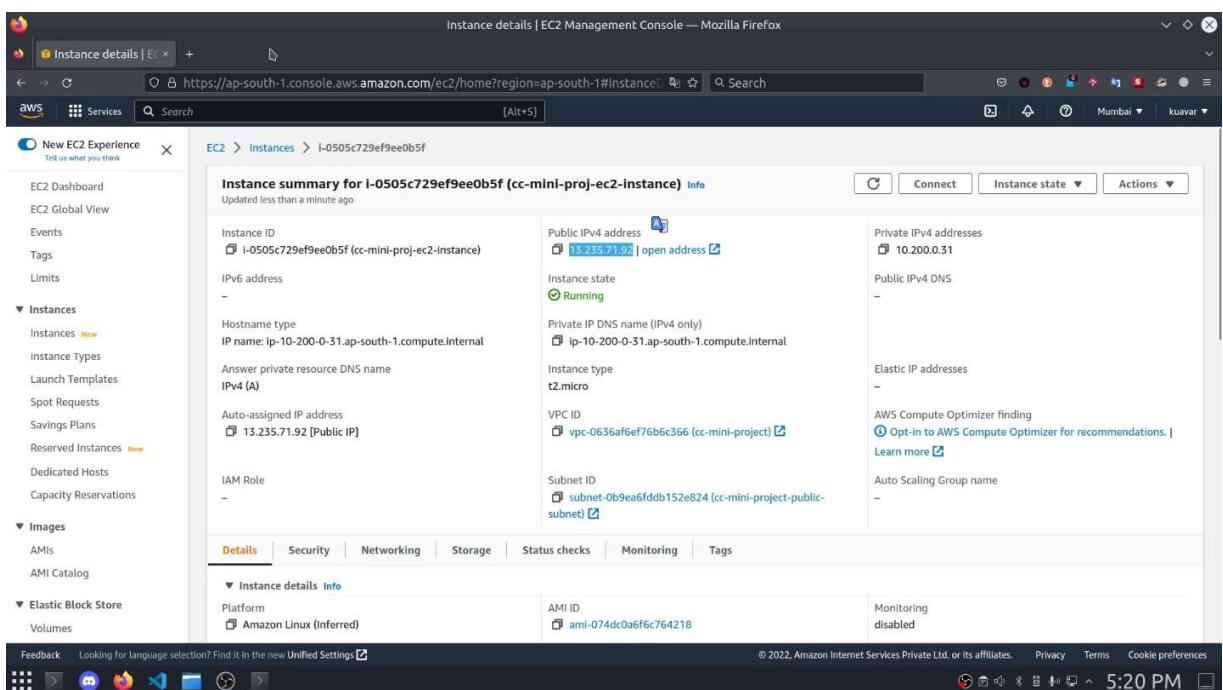
4:39 PM

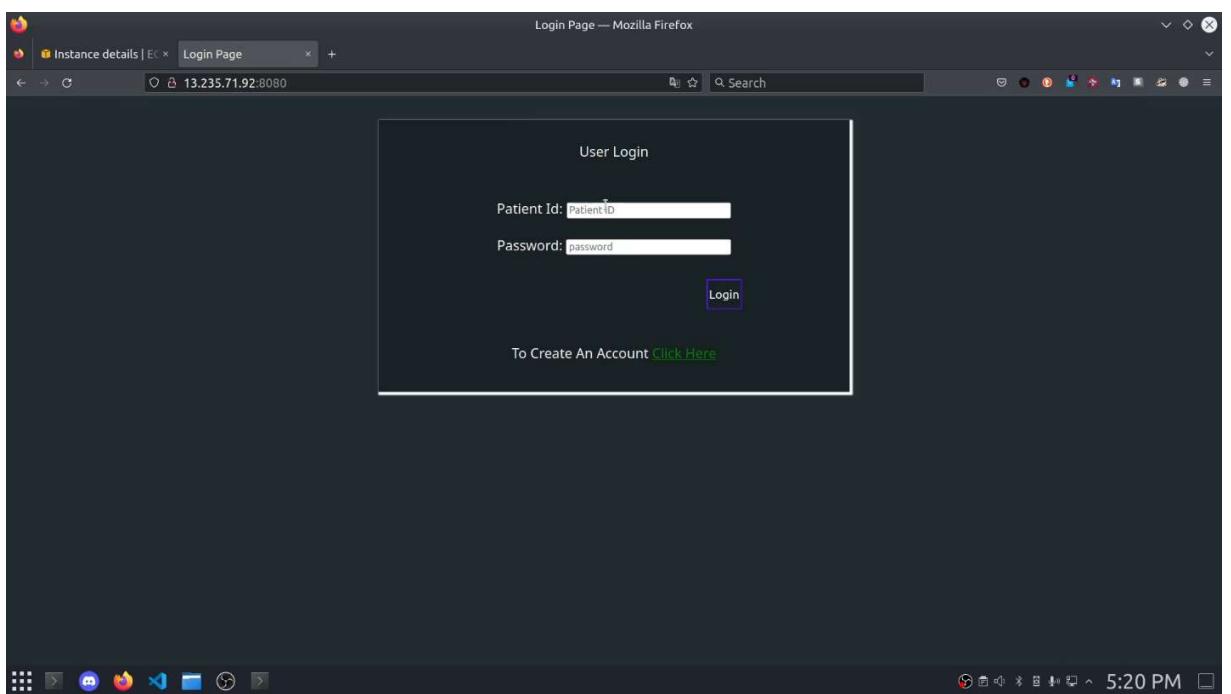
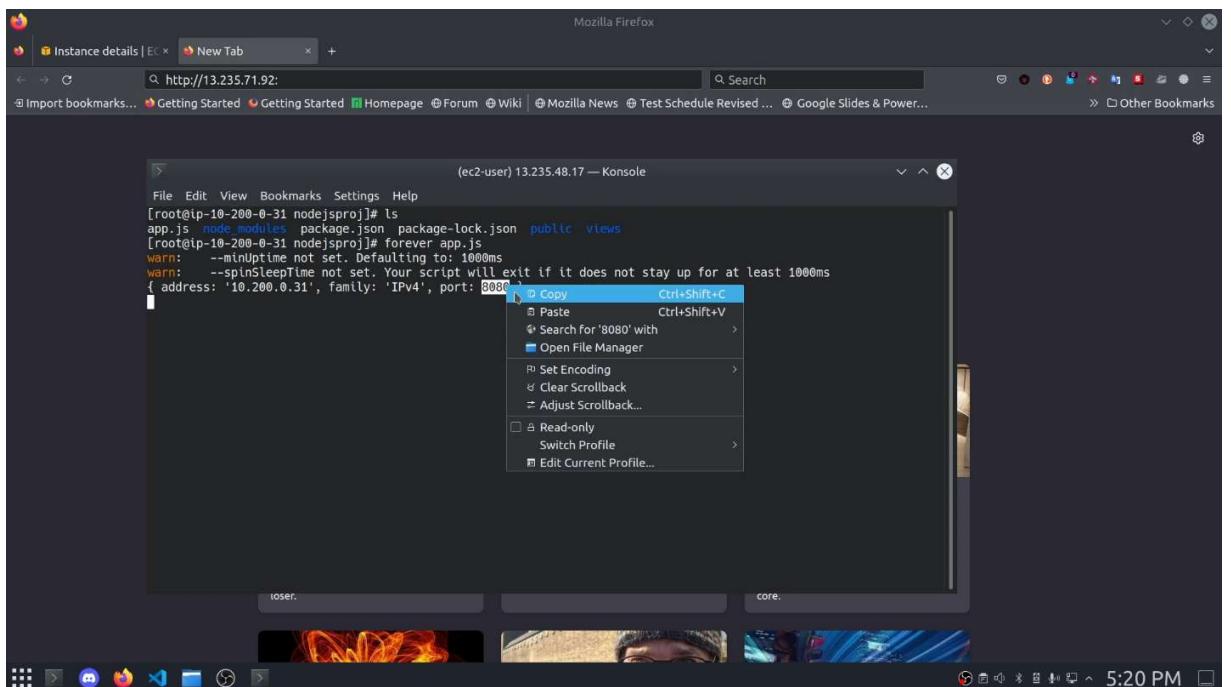
18) Deploying and testing the Hospital Management System application in Web Server EC2 instance through Bastion Host

Step 1: Typing the command forever app.js starts the web server.



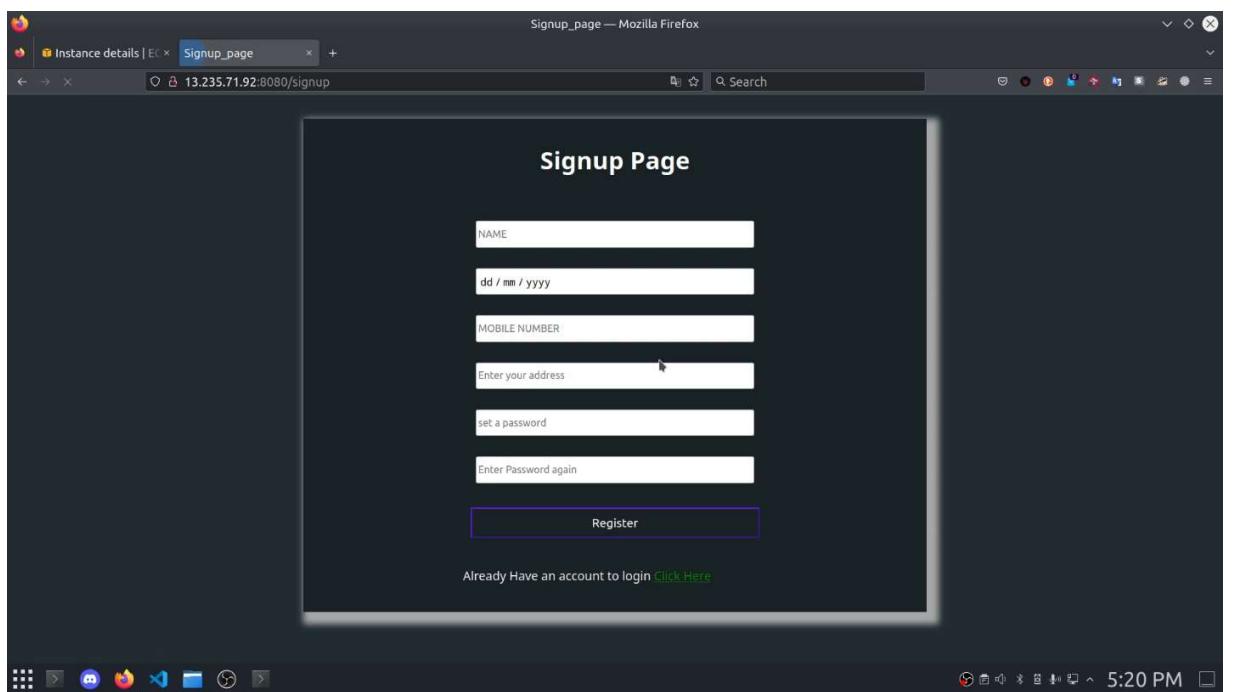
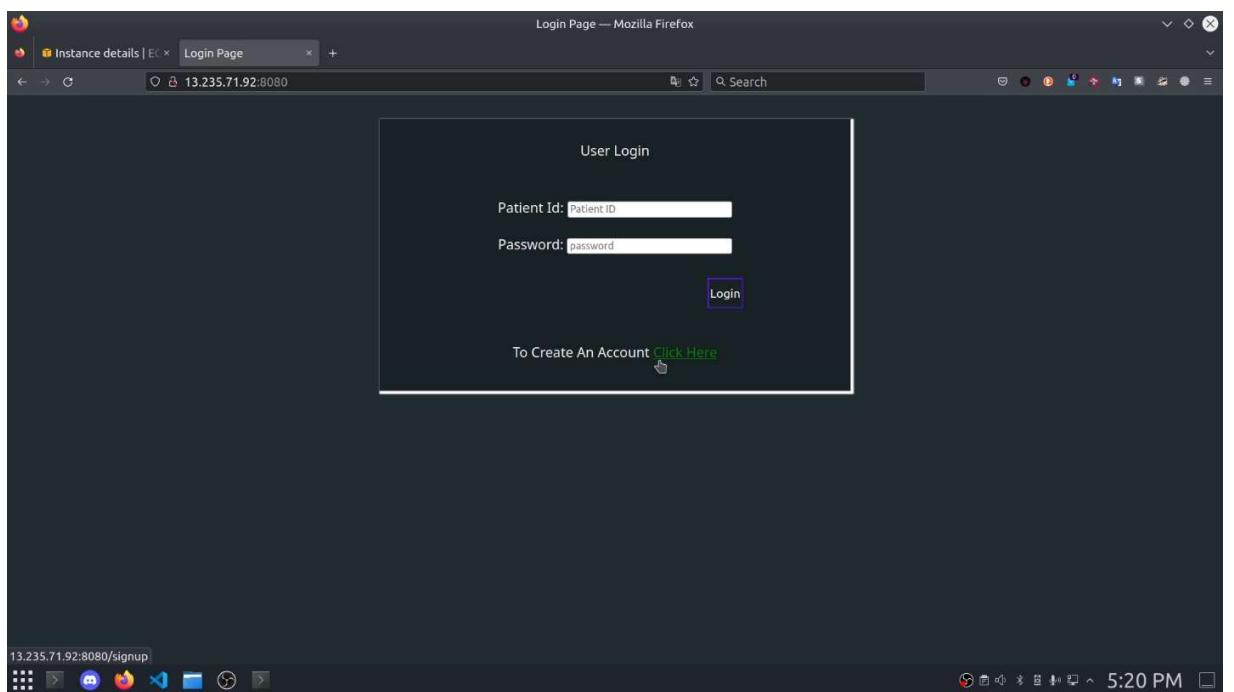
Step 2: Now we can access the website in our server by just typing the public IPv4 address of the web server (as we have not implemented DNS) along with the port number.



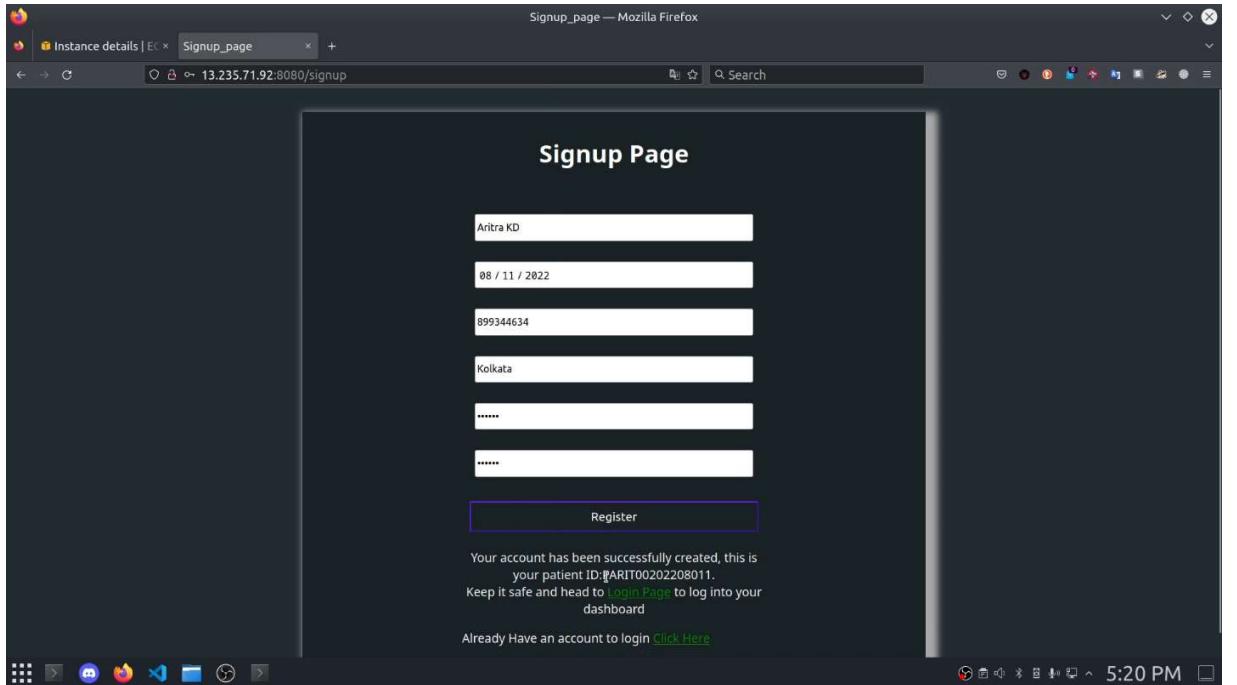


19) Steps to use our Web Application

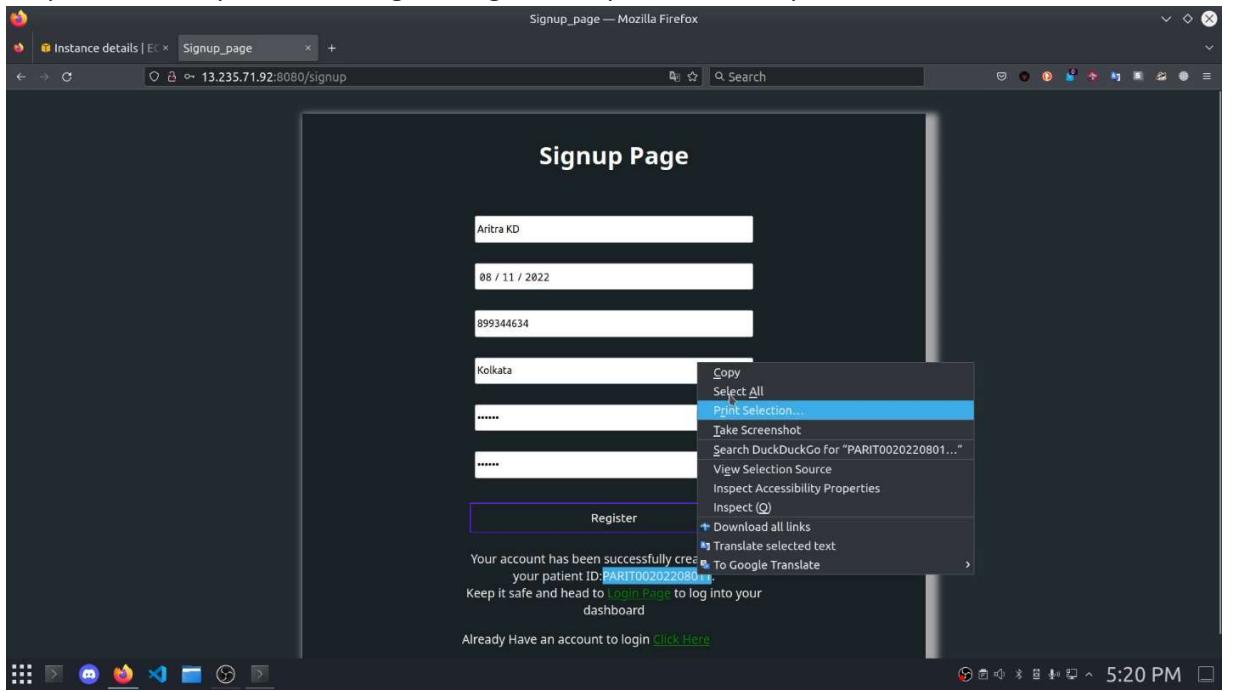
Step 1: First the patient needs to create an account and register

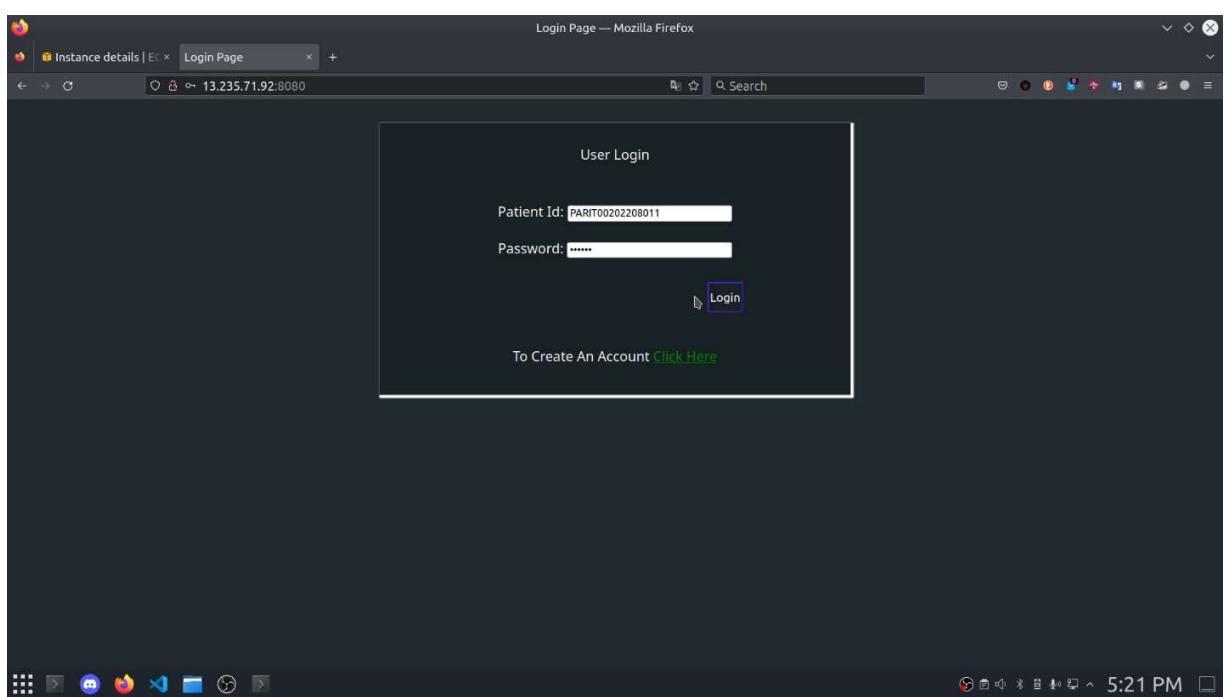
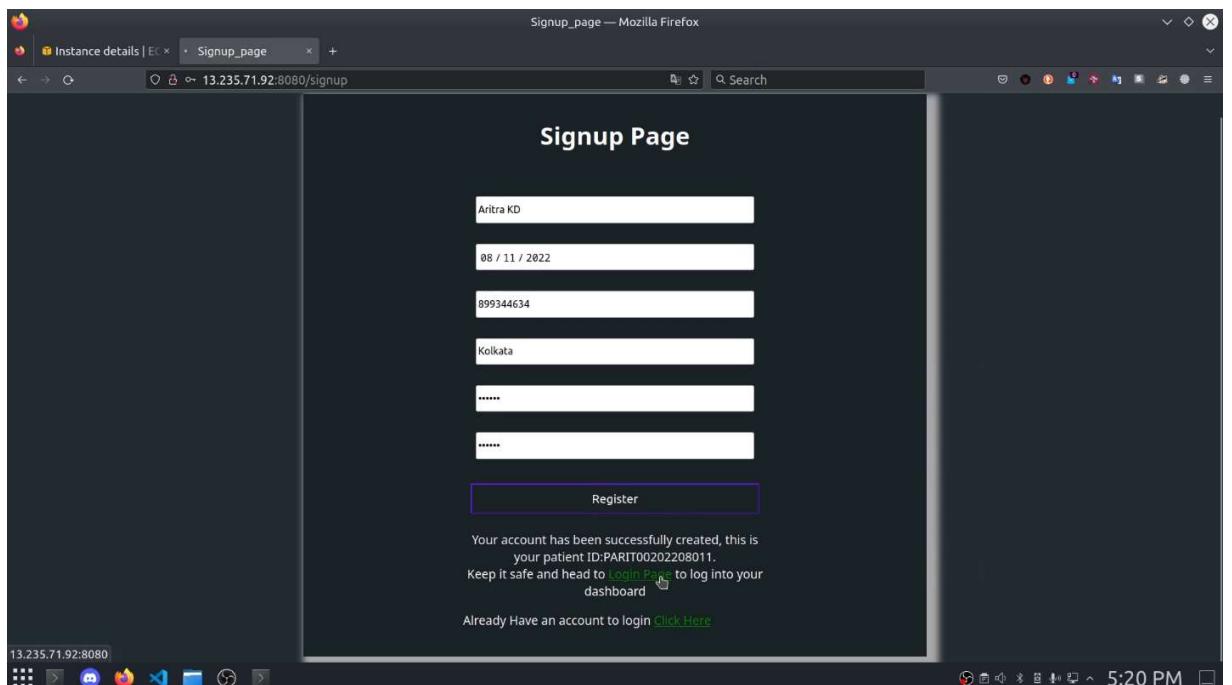


Step 2: After successful registration the patient will be provided with a Patient ID. The patient needs to be store it for future login into the account.

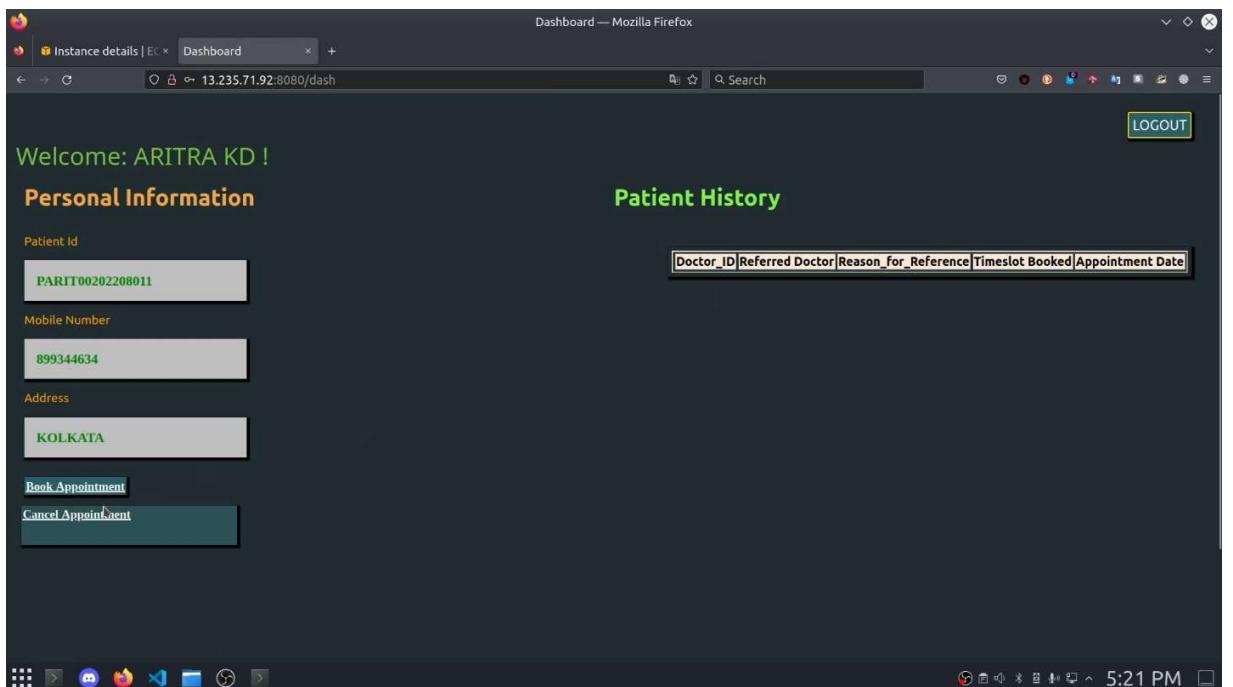


Step 3: Now the patient can login using his/her patient id and password.

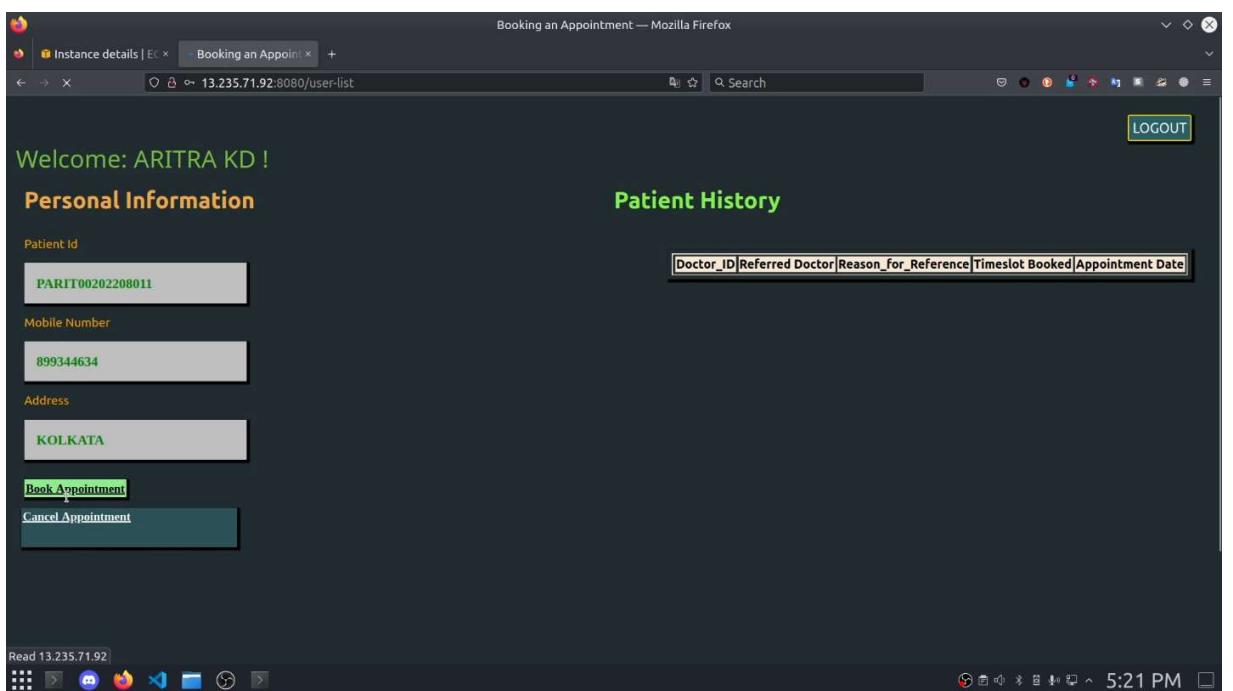




Now the patient will be redirected to a dashboard where he/she can see his registered information and also his/her history of appointments.



Step 4: Now the patient can book an appointment with a doctor at the days and timeslots in which the doctor is available. The patient can click on “Book Appointment” button. He will be redirected to the booking page.



	DID	Specialty	Doctor Name	Qualification	Day	Time Slot	Available Slots	Action
1	DID12345	GENERAL PHYSICIAN	RAM SHARMA	MBBS,MD	Monday	9 am to 12 pm	12	Book Slot
2	DID12345	GENERAL PHYSICIAN	RAM SHARMA	MBBS,MD	Monday	6 pm to 8 pm	8	Book Slot
3	DID12345	GENERAL PHYSICIAN	RAM SHARMA	MBBS,MD	Wednesday	11 am to 1 pm	8	Book Slot
4	DID12345	GENERAL PHYSICIAN	RAM SHARMA	MBBS,MD	Friday	10 am to 1 pm	12	Book Slot
5	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Tuesday	10 am to 1 pm	10	Book Slot
6	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Tuesday	8 pm to 10 pm	10	Book Slot
7	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Wednesday	9 am to 10 am	6	Book Slot
8	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Saturday	11 am to 2 pm	14	Book Slot
9	DID12347	RADIOLOGY	Dr. ANWESHA CHATTERJEE	MD	Saturday	11 am to 2 pm	14	Book Slot
10	DID12347	RADIOLOGY	Dr. ANWESHA CHATTERJEE	MD	Monday	1 pm to 2 pm	8	Book Slot
11	DID12347	RADIOLOGY	Dr. ANWESHA CHATTERJEE	MD	Thursday	1 pm to 4 pm	16	Book Slot
12	DID12357	ORTHOPAEDICS	Dr. AMAL BHATTACHARJEE	MBBS,MD,FRCS	Thursday	1 pm to 4 pm	15	Book Slot
13	DID12357	ORTHOPAEDICS	Dr. AMAL BHATTACHARJEE	MBBS,MD,FRCS	Thursday	1 pm to 4 pm	15	Book Slot
14	DID12357	ORTHOPAEDICS	Dr. AMAL BHATTACHARJEE	MBBS,MD,FRCS	Saturday	11 am to 2 pm	14	Book Slot
15	DID12367	EYE SPECIALIST	Dr. NIRMAN BHATTACHARJEE	MBBS,MD	Saturday	11 am to 2 pm	14	Book Slot
16	DID12367	EYE SPECIALIST	Dr. NIRMAN BHATTACHARJEE	MBBS,MD	Saturday	11 am to 2 pm	14	Book Slot
17	DID12367	EYE SPECIALIST	Dr. NIRMAN BHATTACHARJEE	MBBS,MD	Friday	10 am to 1 pm	12	Book Slot
18	DID12368	DENTIST	Dr. MADHU JOSHI	BDS,MDS	Monday	1 pm to 2 pm	8	Book Slot
19	DID12368	DENTIST	Dr. MADHU JOSHI	BDS,MDS	Thursday	1 pm to 4 pm	16	Book Slot
20	DID12368	DENTIST	Dr. MADHU JOSHI	BDS,MDS	Wednesday	9 am to 10 am	6	Book Slot
21	DID12369	NEUROLOGIST	Dr. AMRATANSH SHARMA	MBBS,MD	Friday	3 pm to 5 pm	10	Book Slot
22	DID12369	NEUROLOGIST	Dr. AMRATANSH SHARMA	MBBS,MD	Saturday	11 am to 2 pm	14	Book Slot
23	DID12369	NEUROLOGIST	Dr. AMRATANSH SHARMA	MBBS,MD	Thursday	11 am to 2 pm	14	Book Slot

Step 5: The patient can select a doctor according to the required preference and reason at his/her preferred timeslot, give a reason for reference in the textbox provided and click on book slot button. The page will also show how many more appointments are available at a given slot on a given day for a doctor.

	DID	Specialty	Doctor Name	Qualification	Day	Time Slot	Available Slots	Action
3	DID12345	GENERAL PHYSICIAN	RAM SHARMA	MBBS,MD	Wednesday	11 am to 1 pm	8	Book Slot
4	DID12345	GENERAL PHYSICIAN	RAM SHARMA	MBBS,MD	Friday	10 am to 1 pm	12	Book Slot
5	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Tuesday	10 am to 1 pm	10	Book Slot
6	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Tuesday	8 pm to 10 pm	10	Book Slot
7	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Wednesday	9 am to 10 am	6	Book Slot
8	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Saturday	11 am to 2 pm	14	Book Slot
9	DID12347	RADIOLOGY	Dr. ANWESHA CHATTERJEE	MD	Saturday	11 am to 2 pm	14	Book Slot
10	DID12347	RADIOLOGY	Dr. ANWESHA CHATTERJEE	MD	Monday	1 pm to 2 pm	8	Book Slot
11	DID12347	RADIOLOGY	Dr. ANWESHA CHATTERJEE	MD	Thursday	1 pm to 4 pm	16	Book Slot
12	DID12357	ORTHOPAEDICS	Dr. AMAL BHATTACHARJEE	MBBS,MD,FRCS	Thursday	1 pm to 4 pm	back pain	Book Slot
13	DID12357	ORTHOPAEDICS	Dr. AMAL BHATTACHARJEE	MBBS,MD,FRCS	Thursday	1 pm to 4 pm	15	Book Slot
14	DID12357	ORTHOPAEDICS	Dr. AMAL BHATTACHARJEE	MBBS,MD,FRCS	Saturday	11 am to 2 pm	14	Book Slot
15	DID12367	EYE SPECIALIST	Dr. NIRMAN BHATTACHARJEE	MBBS,MD	Saturday	11 am to 2 pm	14	Book Slot
16	DID12367	EYE SPECIALIST	Dr. NIRMAN BHATTACHARJEE	MBBS,MD	Saturday	11 am to 2 pm	14	Book Slot
17	DID12367	EYE SPECIALIST	Dr. NIRMAN BHATTACHARJEE	MBBS,MD	Friday	10 am to 1 pm	12	Book Slot
18	DID12368	DENTIST	Dr. MADHU JOSHI	BDS,MDS	Monday	1 pm to 2 pm	8	Book Slot
19	DID12368	DENTIST	Dr. MADHU JOSHI	BDS,MDS	Thursday	1 pm to 4 pm	16	Book Slot
20	DID12368	DENTIST	Dr. MADHU JOSHI	BDS,MDS	Wednesday	9 am to 10 am	6	Book Slot
21	DID12369	NEUROLOGIST	Dr. AMRATANSH SHARMA	MBBS,MD	Friday	3 pm to 5 pm	10	Book Slot
22	DID12369	NEUROLOGIST	Dr. AMRATANSH SHARMA	MBBS,MD	Saturday	11 am to 2 pm	14	Book Slot
23	DID12369	NEUROLOGIST	Dr. AMRATANSH SHARMA	MBBS,MD	Thursday	11 am to 2 pm	14	Book Slot

[Back To Dashboard](#)

Booking an Appointment — Mozilla Firefox

Instance details | EC x Booking an Appointment x +

13.235.71.92:8080/user-list

Search

Dashboard for booking Appointment

S.NO	Doctor ID	Field	Doctor Name	Degree	Day	Time Slot	Reason For Reference	No of Bookings Left	Book
1	DID12345	GENERAL PHYSICIAN	RAM SHARMA	MBBS,MD	Monday	9 am to 12 pm		12	Book Slot
2	DID12345	GENERAL PHYSICIAN	RAM SHARMA	MBBS,MD	Monday	6 pm to 8 pm		8	Book Slot
3	DID12345	GENERAL PHYSICIAN	RAM SHARMA	MBBS,MD	Wednesday	11 am to 1 pm		8	Book Slot
4	DID12345	GENERAL PHYSICIAN	RAM SHARMA	MBBS,MD	Friday	10 am to 1 pm		12	Book Slot
5	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Tuesday	10 am to 1 pm		10	Book Slot
6	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Tuesday	8 pm to 10 pm		10	Book Slot
7	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Wednesday	9 am to 10 am		6	Book Slot
8	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Saturday	11 am to 2 pm		14	Book Slot
9	DID12347	RADIOLOGY	Dr. ANWESHA CHATTERJEE	MD	Saturday	11 am to 2 pm		14	Book Slot
10	DID12347	RADIOLOGY	Dr. ANWESHA CHATTERJEE	MD	Monday	1 pm to 2 pm		8	Book Slot
11	DID12347	RADIOLOGY	Dr. ANWESHA CHATTERJEE	MD	Thursday	1 pm to 4 pm		16	Book Slot
12	DID12357	ORTHOPAEDICS	Dr. AMAL BHATTACHARJEE	MBBS,MD,FRCS	Thursday	1 pm to 4 pm		14	Book Slot
13	DID12357	ORTHOPAEDICS	Dr. AMAL BHATTACHARJEE	MBBS,MD,FRCS	Thursday	1 pm to 4 pm		14	Book Slot
14	DID12357	ORTHOPAEDICS	Dr. AMAL BHATTACHARJEE	MBBS,MD,FRCS	Saturday	11 am to 2 pm		14	Book Slot
15	DID12367	EYE SPECIALIST	Dr. NIRMAN BHATTACHARJEE	MBBS,MD	Saturday	11 am to 2 pm		14	Book Slot
16	DID12367	EYE SPECIALIST	Dr. NIRMAN BHATTACHARJEE	MBBS,MD	Saturday	11 am to 2 pm		14	Book Slot
17	DID12367	EYE SPECIALIST	Dr. NIRMAN BHATTACHARJEE	MBBS,MD	Friday	10 am to 1 pm		12	Book Slot
18	DID12368	DENTIST	Dr. MADHU JOSHI	BDS,MDS	Monday	1 pm to 2 pm		8	Book Slot
19	DID12368	DENTIST	Dr. MADHU JOSHI	BDS,MDS	Thursday	1 pm to 4 pm		16	Book Slot

5:21 PM

Step 6: Now we can go back to the dashboard by clicking on “Back to Dashboard” button.

Booking an Appointment — Mozilla Firefox

Instance details | EC x Booking an Appointment x +

13.235.71.92:8080/user-list

Search

3	DID12345	GENERAL PHYSICIAN	RAM SHARMA	MBBS,MD	Wednesday	11 am to 1 pm		8	Book Slot
4	DID12345	GENERAL PHYSICIAN	RAM SHARMA	MBBS,MD	Friday	10 am to 1 pm		12	Book Slot
5	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Tuesday	10 am to 1 pm		10	Book Slot
6	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Tuesday	8 pm to 10 pm		10	Book Slot
7	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Wednesday	9 am to 10 am		6	Book Slot
8	DID12346	PSYCHIATRY	Dr. SANJAY MALHOTRA	MD	Saturday	11 am to 2 pm		14	Book Slot
9	DID12347	RADIOLOGY	Dr. ANWESHA CHATTERJEE	MD	Saturday	11 am to 2 pm		14	Book Slot
10	DID12347	RADIOLOGY	Dr. ANWESHA CHATTERJEE	MD	Monday	1 pm to 2 pm		8	Book Slot
11	DID12347	RADIOLOGY	Dr. ANWESHA CHATTERJEE	MD	Thursday	1 pm to 4 pm		16	Book Slot
12	DID12357	ORTHOPAEDICS	Dr. AMAL BHATTACHARJEE	MBBS,MD,FRCS	Thursday	1 pm to 4 pm		14	Book Slot
13	DID12357	ORTHOPAEDICS	Dr. AMAL BHATTACHARJEE	MBBS,MD,FRCS	Thursday	1 pm to 4 pm		14	Book Slot
14	DID12357	ORTHOPAEDICS	Dr. AMAL BHATTACHARJEE	MBBS,MD,FRCS	Saturday	11 am to 2 pm		14	Book Slot
15	DID12367	EYE SPECIALIST	Dr. NIRMAN BHATTACHARJEE	MBBS,MD	Saturday	11 am to 2 pm		14	Book Slot
16	DID12367	EYE SPECIALIST	Dr. NIRMAN BHATTACHARJEE	MBBS,MD	Saturday	11 am to 2 pm		14	Book Slot
17	DID12367	EYE SPECIALIST	Dr. NIRMAN BHATTACHARJEE	MBBS,MD	Friday	10 am to 1 pm		12	Book Slot
18	DID12368	DENTIST	Dr. MADHU JOSHI	BDS,MDS	Monday	1 pm to 2 pm		8	Book Slot
19	DID12368	DENTIST	Dr. MADHU JOSHI	BDS,MDS	Thursday	1 pm to 4 pm		16	Book Slot
20	DID12368	DENTIST	Dr. MADHU JOSHI	BDS,MDS	Wednesday	9 am to 10 am		6	Book Slot
21	DID12369	NEUROLOGIST	Dr. AMRATANSH SHARMA	MBBS,MD	Friday	3 pm to 5 pm		10	Book Slot
22	DID12369	NEUROLOGIST	Dr. AMRATANSH SHARMA	MBBS,MD	Saturday	11 am to 2 pm		14	Book Slot
23	DID12369	NEUROLOGIST	Dr. AMRATANSH SHARMA	MBBS,MD	Thursday	11 am to 2 pm		14	Book Slot

Back To Dashboard

5:21 PM

Now we can see that the booked appointment is also displayed in patient history.

The screenshot shows a Firefox browser window with a dark theme. The address bar displays "13.235.71.92:8080/dash". The main content area has two sections: "Personal Information" on the left and "Patient History" on the right. In "Personal Information", there are fields for Patient Id ("PARIT00202208011"), Mobile Number ("899344634"), and Address ("KOLKATA"). Below these are buttons for "Book Appointment" and "Cancel Appointment". In the "Patient History" section, there is a table with one row:

Doctor_ID	Referred Doctor	Reason_for_Reference	Timeslot Booked	Appointment Date
DID12357	Dr. AMAL BHATTACHARJEE	back pain	1 pm to 4 pm	11/29/2022

Step 7: Now the patient can cancel an appointment by clicking on the “Cancel Appointment” button. The patient will be redirected to a page where the patient will be able to view all the booked appointments. The patient can cancel the appointment by clicking on the “Cancel Slot” button of the respective timeslot. This entry will also be removed from patient history of dashboard.

The screenshot shows the same Firefox browser window as before. The "Cancel Appointment" button in the "Personal Information" section is now highlighted with a red background and white text. The rest of the interface remains the same, including the "Patient History" table which still shows the previous booking.

Booking an Appointment — Mozilla Firefox

Instance details | EC x Booking an Appointment x +

13.235.71.92:8080/cancel

Search

Click on Cancel to cancel your appointment

S.NO	Patient ID	Doctor ID	Doctor Name	Date of Appointment	Day	Time Slot Booked	Reason For Reference	Cancel
1	PARIT00202208011	DID12357	Dr. AMAL BHATTACHARJEE	11/29/2022	Thursday	1 pm to 4 pm	back pain	Cancel Slot

[Back To Dashboard](#)

5:21 PM

Booking an Appointment — Mozilla Firefox

Instance details | EC x Booking an Appointment x +

13.235.71.92:8080/cancel

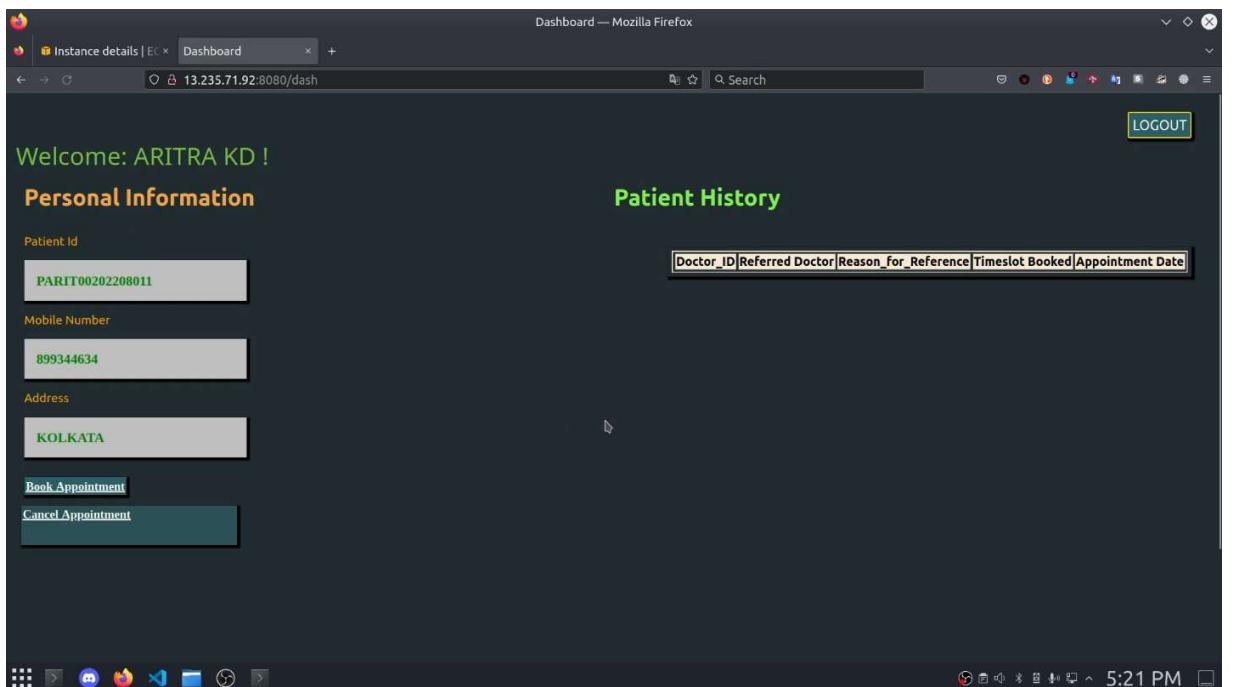
Search

Click on Cancel to cancel your appointment

S.NO	Patient ID	Doctor ID	Doctor Name	Date of Appointment	Day	Time Slot Booked	Reason For Reference	Cancel
No Data Found								

[Back To Dashboard](#)

5:21 PM



Step 8: The patient can log out by simply clicking the “Logout” button.

