PARSHVANATH CHARITABLE TRUST'S

A. P. Shah Institute of Technology

Thane, 400615

Academic Year: 2022-23
Department of Computer Engineering

CSL605 SKILL BASED LAB COURSE: CLOUD COMPUTING

<u>Mini Project Report</u>

- **Title of Project** : Covid-19 Visualizer
- **Year and Semester** : TE Sem 6
- **Group Members Name and Roll No.** : Eeshan Joshi
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Introduction:

The COVID-19 pandemic has brought the world to a standstill, affecting every aspect of life. As the virus continues to spread, there is a growing need for reliable data visualization tools that can help individuals and organizations better understand the impact of the virus on communities and make informed decisions about how to manage the pandemic.

To address this need, we have developed a COVID-19 visualizer that provides accurate and up-to-date information on the number of infected, dead, and cured people across the globe. The visualizer allows users to sort data by countries and regions, as well as view the data on a logarithmic scale.

The COVID-19 visualizer is designed to be easy to use, with an intuitive user interface that allows users to quickly access the information they need. The visualizer is also mobile-friendly, making it accessible to users on the go.

Overview of Features:

The COVID-19 visualizer is a comprehensive tool that provides a range of features to help users better understand the impact of the virus. These features include:

Accurate Data: The visualizer draws data from reliable sources, such as the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC), ensuring that users have access to the most accurate and up-to-date information.

The visualizer also provides graphical representations of data, making it easy for users to interpret and analyze the information. Users can view graphs of infected, dead, and cured people over time, as well as compare data across different countries and regions. This is particularly useful for tracking the spread of the virus and identifying potential hotspots.

Another important feature of the COVID-19 visualizer is its sorting and filtering options. Users can sort data by countries and regions, making it easy to compare data between different areas. Users can also filter data by specific dates, making it possible to track changes over time. This is especially useful for identifying trends and making predictions about the future spread of the virus.

The visualizer also offers a logarithmic scale option, which is particularly useful when dealing with exponential data. The logarithmic scale allows users to see changes in the data more clearly, especially when dealing with large numbers. This feature is particularly useful when tracking the spread of the virus over time and identifying potential hotspots.

Finally, the COVID-19 visualizer is designed to be mobile-friendly, making it accessible to users on the go. Users can access the visualizer from any device, including smartphones, tablets, and desktop computers. This ensures that users can stay up-to-date with the latest information and make informed decisions about how to manage the pandemic, regardless of where they are.

Problem definition:

With the COVID-19 pandemic affecting the world in unprecedented ways, there is a pressing need for data visualization tools that can help individuals and organizations better understand the spread of the virus and its impact on communities. The goal of this project is to develop a COVID-19 data visualizer that can display data from various sources, such as the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC), in a user-friendly and informative way. The visualizer should allow users to explore trends in COVID-19 cases, hospitalizations, and deaths, as well as compare data across regions and over time. Ultimately, the aim is to provide insights that can inform public health policy and decision-making, as well as help individuals better understand the risks and impact of COVID-19 in their communities.

The COVID-19 pandemic has created a need for accurate and reliable data to help individuals and organizations make informed decisions about how to manage the spread of the virus. However, the sheer volume of data available can be overwhelming, and it can be difficult for non-experts to interpret and analyze the information effectively.

This is where a COVID-19 data visualizer comes in. The visualizer can collect and present data from various sources, such as the WHO and CDC, in a way that is easy to understand and analyze. The visualizer should be user-friendly and allow users to interact with the data, allowing them to explore trends, compare data across regions and over time, and make informed decisions based on the insights provided.

Description:

EC2 is used to deploy the frontend of the COVID-19 data visualizer. This cloud service provides a secure and reliable environment for running web applications, including those built using HTML, CSS, and JavaScript. EC2 allows developers to quickly provision computing resources and scale them up or down as needed, making it an ideal solution for hosting web applications.

Amazon Simple Storage Service (S3) is a cloud storage service that provides scalable, durable, and secure object storage in the cloud. S3 is used to store the database for the COVID-19 data visualizer. The database contains data on the number of infected, dead, and cured individuals per country, and it is updated regularly to ensure that users have access to the most up-to-date information. S3 allows developers to store and retrieve data from anywhere in the world, and it provides a cost-effective and scalable solution for storing and managing large volumes of data.

Amazon Virtual Private Cloud (VPC) is a cloud networking service that enables users to create a secure virtual network in the cloud. VPC is used to isolate the COVID-19 data visualizer from other applications and services, ensuring that it remains secure and protected from unauthorized access. VPC enables developers to create a virtual network topology that closely resembles a traditional network, providing the flexibility and control needed to deploy complex applications in the cloud.

The COVID-19 pandemic has brought about the need for reliable tools that can provide accurate and up-to-date information on the spread of the virus. In response to this need, we have developed a COVID-19 data visualizer that leverages the cloud services of Amazon Web Services (AWS) to provide a fast, reliable, and scalable solution.

The COVID-19 data visualizer is designed with a microservices architecture that uses a frontend, a backend, and a database. The frontend is built using HTML, CSS, and JavaScript while the backend is implemented using JSON. The database is hosted on Amazon S3, and it is used to store and retrieve data such as the number of infected, dead, and cured individuals per country.

Amazon EC2 is utilized to deploy the frontend of the COVID-19 data visualizer. This cloud service provides a scalable and reliable hosting environment that can handle large volumes of traffic. The frontend is developed using HTML, CSS, and JavaScript, and it is optimized for performance, ensuring that users can access the visualizer quickly and easily.

To enable efficient communication between the frontend and the backend, the backend is implemented using JSON. JSON provides a lightweight and easily readable data format that enables efficient communication between the components of the visualizer.

Amazon S3 is used to host the database for the COVID-19 data visualizer. S3 provides a scalable and reliable storage solution that can handle large volumes of data. The database stores data on the number of infected, dead, and cured individuals per country, and it is updated regularly to ensure that users have access to the most up-to-date information.

To ensure the security of the COVID-19 data visualizer, access is controlled through HTTPS, and Amazon VPC is used to create a secure virtual network that isolates the visualizer from other applications and services. This cloud service provides a secure and scalable solution for deploying applications in the cloud.

The COVID-19 data visualizer is developed using an Agile development methodology. This methodology emphasizes collaboration, flexibility, and rapid prototyping, making it ideal for developing complex applications like the COVID-19 data visualizer. The visualizer is continuously tested and refined throughout the development process, ensuring that it meets the needs of users and can handle large volumes of data.

In terms of software requirements, the COVID-19 data visualizer utilizes HTML, CSS, JavaScript, and JSON. Amazon EC2 is used to deploy the frontend, while Amazon S3 is used to store the database.

Course outcomes:

AWS Cloud Services: Students will learn how to use popular cloud services provided by AWS such as EC2, S3, and VPC to deploy and manage web applications in the cloud.

Front-End Development: Students will learn how to create responsive and interactive user interfaces using front-end web development tools such as HTML, CSS, and JavaScript.

Back-End Development: Students will learn how to manage and manipulate data using back-end technologies such as JSON.

Data Visualization: Students will learn how to create clear and compelling data visualizations that help users understand complex information.

Project Management: Students will learn how to work collaboratively on a software development project, including project planning, task delegation, and version control.

Software Development Life Cycle: Students will gain experience in the software development life cycle, including requirements gathering, design, development, testing, and deployment.

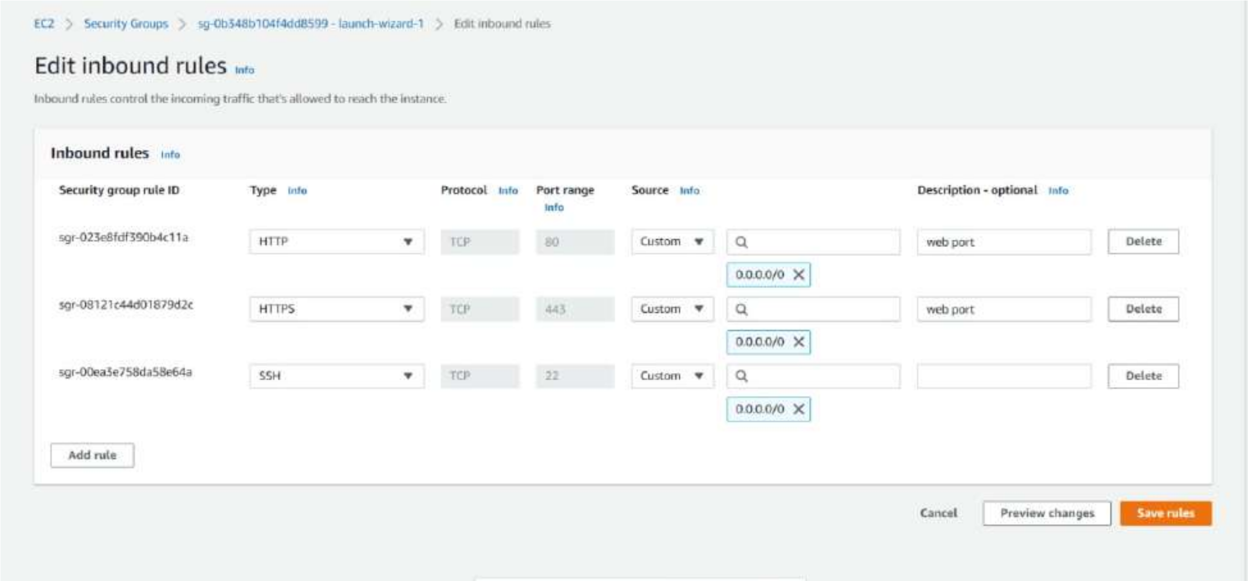
Security: Students will learn about the importance of security in web application development and gain hands-on experience securing a web application using AWS services such as VPC.

Data Analysis: Students will gain experience in data analysis by analyzing COVID-19 data and visualizing it in a meaningful way to help users understand the impact of the pandemic.

User Experience (UX) Design: Students will gain experience in user experience design, including user research, prototyping, and testing, to ensure that the COVID-19 data visualizer is easy to use and understand.

Cloud Computing: Students will gain a fundamental understanding of cloud computing concepts and learn how to deploy and manage web applications in the cloud.

Implementation:



EC2 > Security Groups > sg-0b348b104f4dd8599 - launch-wizard-1 > Edit inbound rules

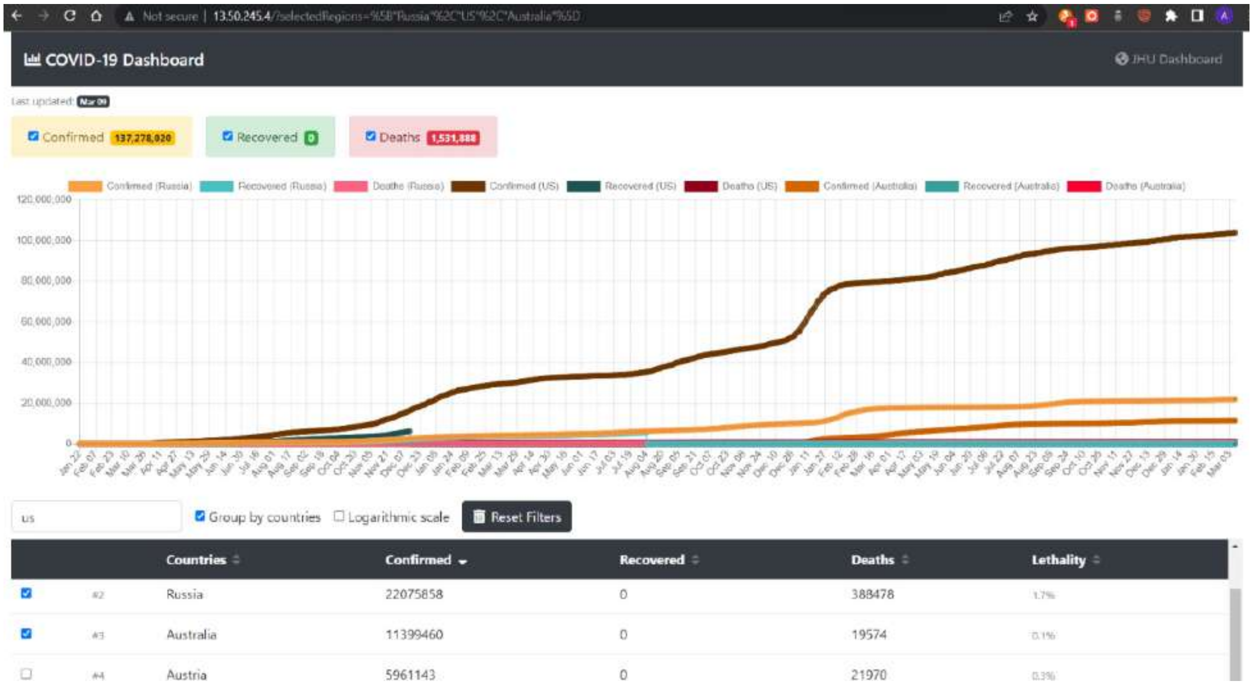
Edit inbound rules Info

Inbound rules control the incoming traffic that's allowed to reach the instance.

Inbound rules Info

Security group rule ID	Type Info	Protocol Info	Port range Info	Source Info		Description - optional Info	
sgr-023e8fdf390b4c11a	HTTP	TCP	80	Custom	0.0.0.0/0	web port	Delete
sgr-08121c44d01879d2c	HTTPS	TCP	443	Custom	0.0.0.0/0	web port	Delete
sgr-00ea3e758da58e64a	SSH	TCP	22	Custom	0.0.0.0/0		Delete

Asddsa



Not secure | 13.50.245.4/?selectedRegions=%5B"Russia"%2C"US"%2C"Australia"%5D

COVID-19 Dashboard

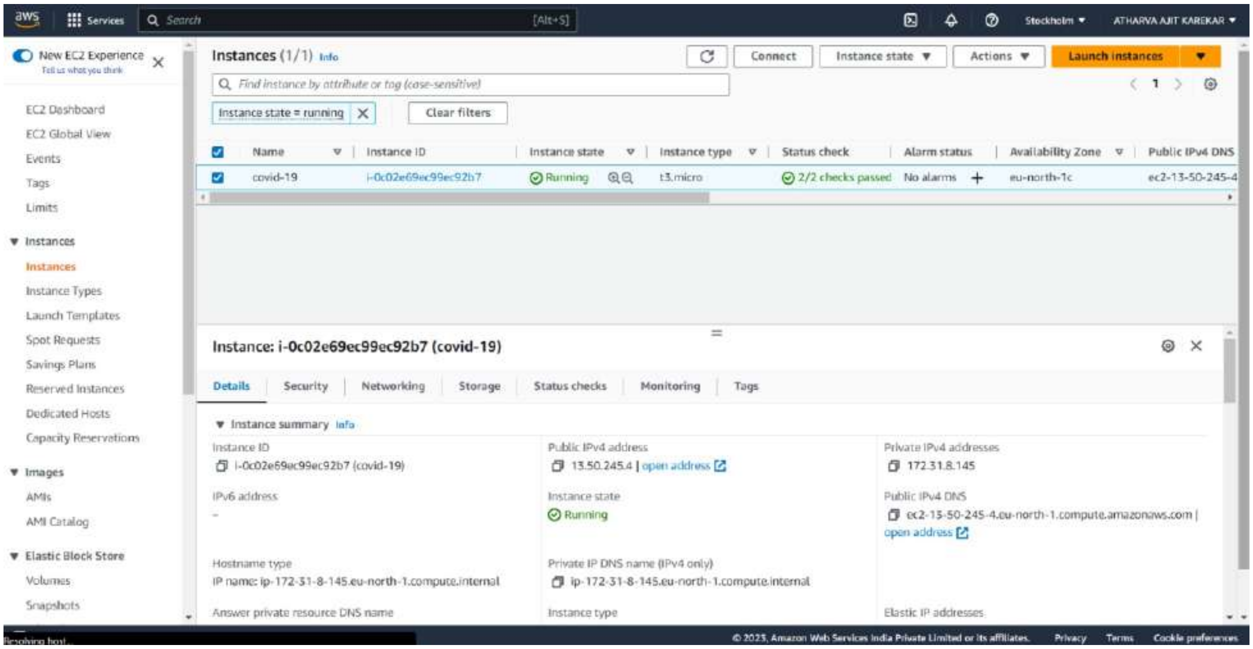
Last updated: Mar 09

☑ Confirmed 137,278,020 ☑ Recovered 0 ☑ Deaths 1,531,888

us ☑ Group by countries ☐ Logarithmic scale

		Countries	Confirmed	Recovered	Deaths	Lethality
☑	#2	Russia	22075858	0	388478	1.7%
☑	#3	Australia	11399460	0	19574	0.1%
☐	#4	Austria	5961143	0	21970	0.3%

The above is the visualised data deployed on the front end. The confirmed, Recovered, and Deaths data is stored in the backend using S3.



Instances (1/1) Info

Find instance by attribute or tag (case-sensitive)

Instance state = running ✕   Clear filters

☑	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS
☑	covid-19	i-0c02e69ec99ec92b7	✓ Running	t3.micro	✓ 2/2 checks passed	No alarms +	eu-north-1c	ec2-13-50-245-4

Instance: i-0c02e69ec99ec92b7 (covid-19)

▼ Instance summary Info

Instance ID: i-0c02e69ec99ec92b7 (covid-19)

Public IPv4 address: 13.50.245.4 | open address

Private IPv4 addresses: 172.31.8.145

IPv6 address: –

Instance state: ✓ Running

Public IPv4 DNS: ec2-13-50-245-4.eu-north-1.compute.amazonaws.com | open address

Hostname type: IP name: ip-172-31-8-145.eu-north-1.compute.internal

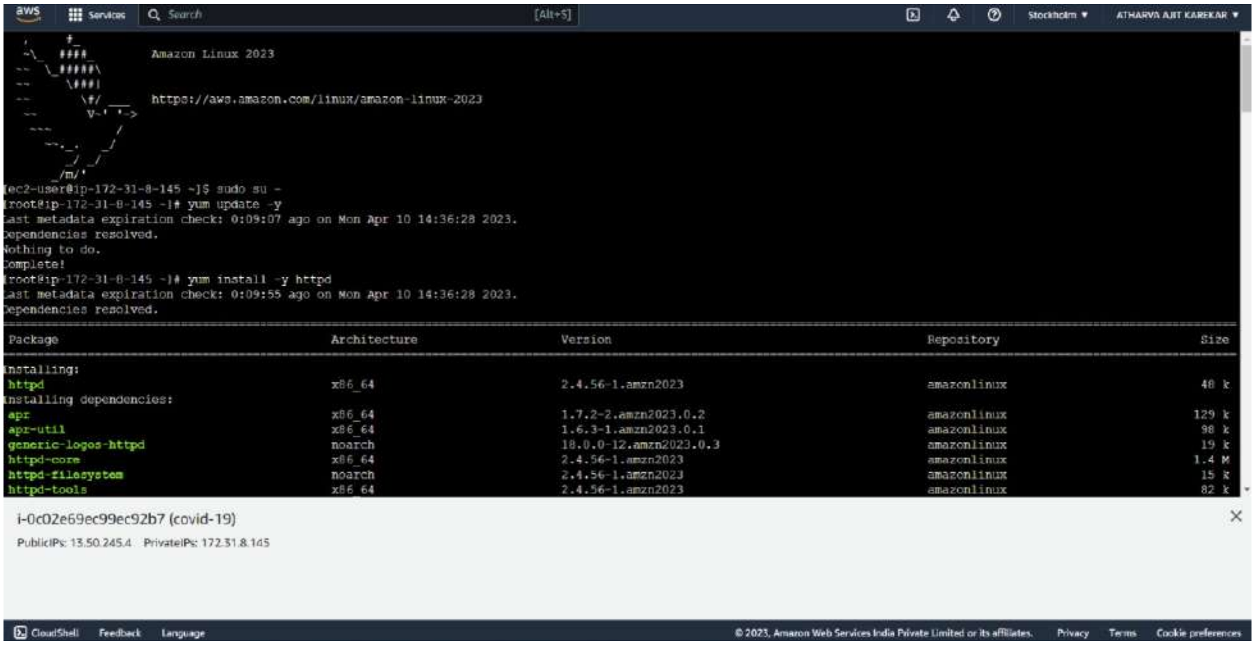
Private IP DNS name (IPv4 only): ip-172-31-8-145.eu-north-1.compute.internal

Answer private resource DNS name

Instance type

Elastic IP addresses

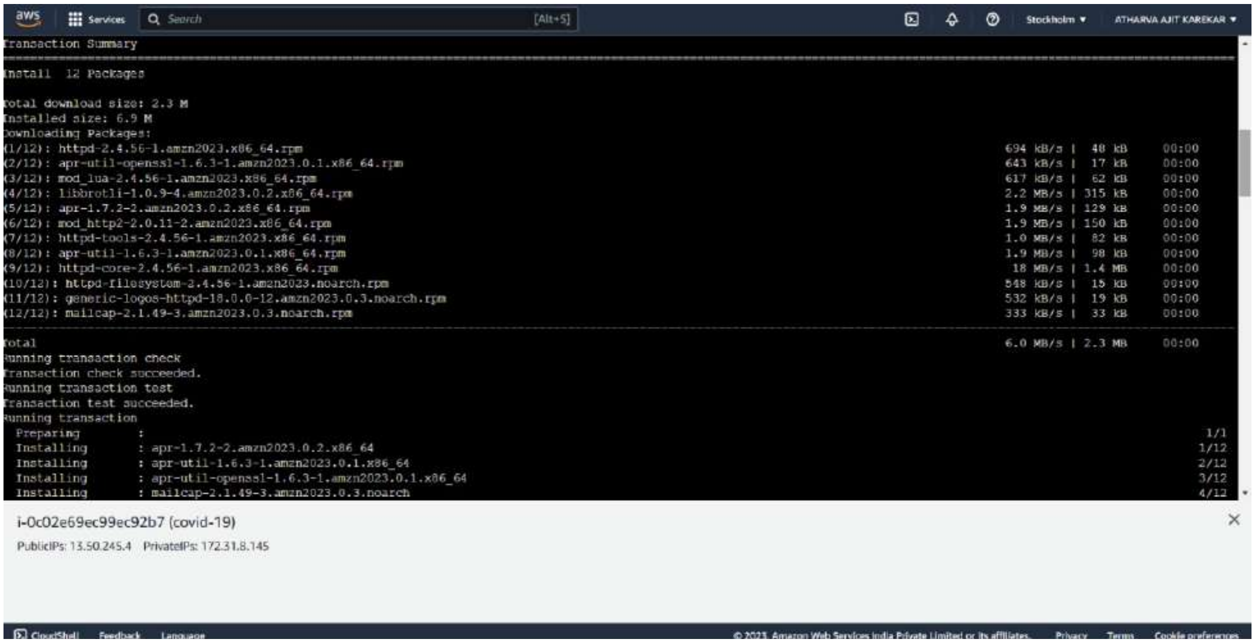
The above is an image of the EC2 instance.



```
   ,     #_
   ~\_  ####_        Amazon Linux 2023
  ~~  \_#####\
  ~~     \###|
  ~~       \#/ ___   https://aws.amazon.com/linux/amazon-linux-2023
   ~~       V~' '->
    ~~~         /
      ~~._.   _/
         _/ _/
       _/m/'
[ec2-user@ip-172-31-8-145 ~]$ sudo su -
[root@ip-172-31-8-145 ~]# yum update -y
ast metadata expiration check: 0:09:07 ago on Mon Apr 10 14:36:28 2023.
ependencies resolved.
othing to do.
omplete!
[root@ip-172-31-8-145 ~]# yum install -y httpd
ast metadata expiration check: 0:09:55 ago on Mon Apr 10 14:36:28 2023.
ependencies resolved.
==========================================================================================================
 Package                  Architecture       Version                          Repository            Size
==========================================================================================================
nstalling:
 httpd                    x86_64             2.4.56-1.amzn2023                amazonlinux           48 k
nstalling dependencies:
 apr                      x86_64             1.7.2-2.amzn2023.0.2             amazonlinux          129 k
 apr-util                 x86_64             1.6.3-1.amzn2023.0.1             amazonlinux           98 k
 generic-logos-httpd      noarch             18.0.0-12.amzn2023.0.3           amazonlinux           19 k
 httpd-core               x86_64             2.4.56-1.amzn2023                amazonlinux          1.4 M
 httpd-filesystem         noarch             2.4.56-1.amzn2023                amazonlinux           15 k
 httpd-tools              x86_64             2.4.56-1.amzn2023                amazonlinux           82 k
```

i-0c02e69ec99ec92b7 (covid-19)

PublicIPs: 13.50.245.4   PrivateIPs: 172.31.8.145

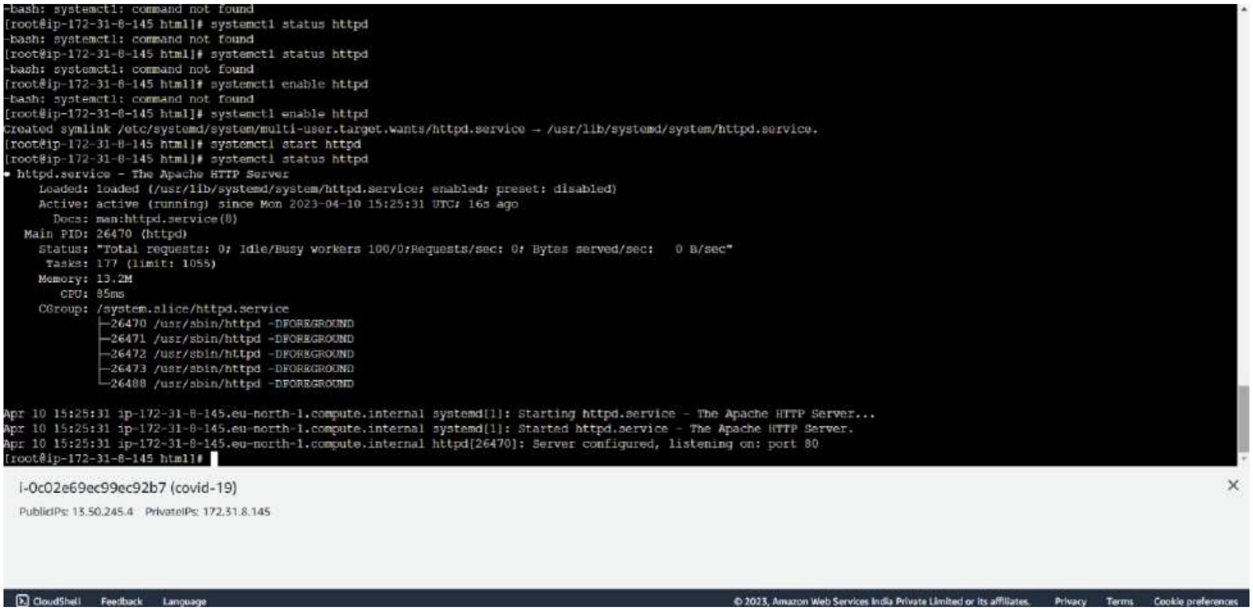


```
ransaction Summary
================================================================================================================================
nstall  12 Packages

otal download size: 2.3 M
nstalled size: 6.9 M
ownloading Packages:
1/12): httpd-2.4.56-1.amzn2023.x86_64.rpm                                                        694 kB/s |  48 kB     00:00
2/12): apr-util-openssl-1.6.3-1.amzn2023.0.1.x86_64.rpm                                          643 kB/s |  17 kB     00:00
3/12): mod_lua-2.4.56-1.amzn2023.x86_64.rpm                                                      617 kB/s |  62 kB     00:00
4/12): libbrotli-1.0.9-4.amzn2023.0.2.x86_64.rpm                                                 2.2 MB/s | 315 kB     00:00
5/12): apr-1.7.2-2.amzn2023.0.2.x86_64.rpm                                                       1.9 MB/s | 129 kB     00:00
6/12): mod_http2-2.0.11-2.amzn2023.x86_64.rpm                                                    1.9 MB/s | 150 kB     00:00
7/12): httpd-tools-2.4.56-1.amzn2023.x86_64.rpm                                                  1.0 MB/s |  82 kB     00:00
8/12): apr-util-1.6.3-1.amzn2023.0.1.x86_64.rpm                                                  1.9 MB/s |  98 kB     00:00
9/12): httpd-core-2.4.56-1.amzn2023.x86_64.rpm                                                    18 MB/s | 1.4 MB     00:00
10/12): httpd-filesystem-2.4.56-1.amzn2023.noarch.rpm                                            548 kB/s |  15 kB     00:00
11/12): generic-logos-httpd-18.0.0-12.amzn2023.0.3.noarch.rpm                                    532 kB/s |  19 kB     00:00
12/12): mailcap-2.1.49-3.amzn2023.0.3.noarch.rpm                                                 333 kB/s |  33 kB     00:00
--------------------------------------------------------------------------------------------------------------------------------
otal                                                                                             6.0 MB/s | 2.3 MB     00:00
unning transaction check
ransaction check succeeded.
unning transaction test
ransaction test succeeded.
unning transaction
 Preparing        :                                                                                                        1/1
 Installing       : apr-1.7.2-2.amzn2023.0.2.x86_64                                                                       1/12
 Installing       : apr-util-1.6.3-1.amzn2023.0.1.x86_64                                                                  2/12
 Installing       : apr-util-openssl-1.6.3-1.amzn2023.0.1.x86_64                                                          3/12
 Installing       : mailcap-2.1.49-3.amzn2023.0.3.noarch                                                                  4/12
```

i-0c02e69ec99ec92b7 (covid-19)

PublicIPs: 13.50.245.4   PrivateIPs: 172.31.8.145


CloudShell
Feedback
Language
© 2023, Amazon Web Services India Private Limited or its affiliates.
Privacy
Terms
Cookie preferences

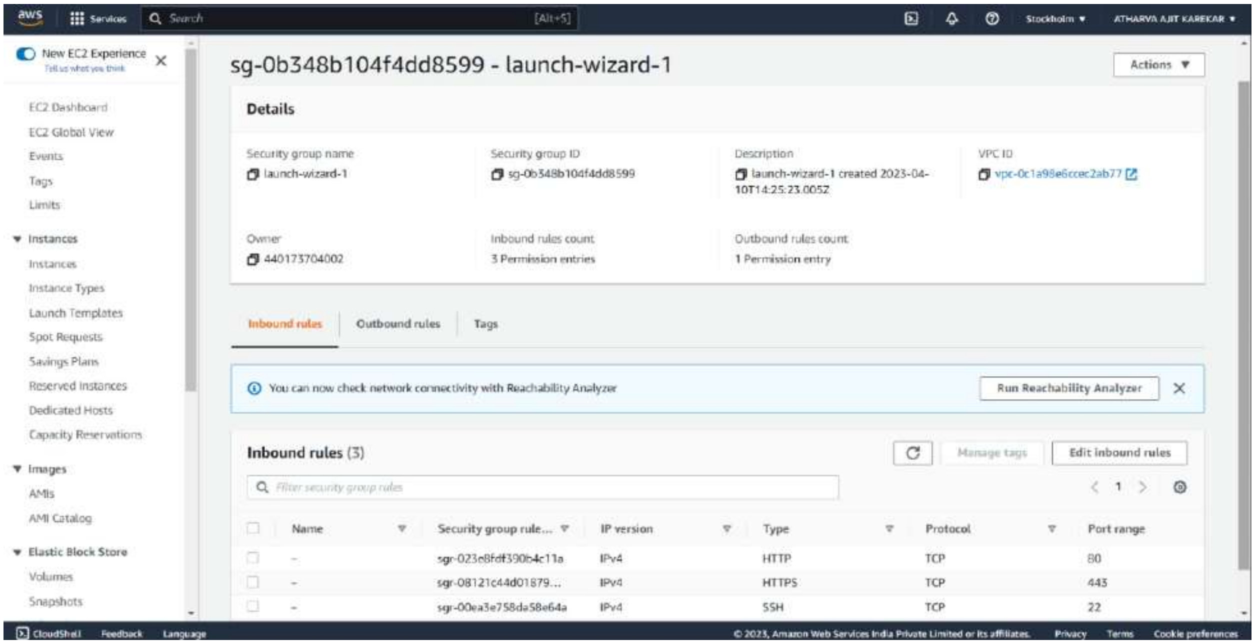
```
-bash: systemctl: command not found
[root@ip-172-31-8-145 html]# systemctl status httpd
-bash: systemctl: command not found
[root@ip-172-31-8-145 html]# systemctl status httpd
-bash: systemctl: command not found
[root@ip-172-31-8-145 html]# systemctl enable httpd
-bash: systemctl: command not found
[root@ip-172-31-8-145 html]# systemctl enable httpd
Created symlink /etc/systemd/system/multi-user.target.wants/httpd.service → /usr/lib/systemd/system/httpd.service.
[root@ip-172-31-8-145 html]# systemctl start httpd
[root@ip-172-31-8-145 html]# systemctl status httpd
● httpd.service - The Apache HTTP Server
     Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; preset: disabled)
     Active: active (running) since Mon 2023-04-10 15:25:31 UTC; 16s ago
       Docs: man:httpd.service(8)
   Main PID: 26470 (httpd)
     Status: "Total requests: 0; Idle/Busy workers 100/0;Requests/sec: 0; Bytes served/sec:   0 B/sec"
      Tasks: 177 (limit: 1055)
     Memory: 13.2M
        CPU: 85ms
     CGroup: /system.slice/httpd.service
             ├─26470 /usr/sbin/httpd -DFOREGROUND
             ├─26471 /usr/sbin/httpd -DFOREGROUND
             ├─26472 /usr/sbin/httpd -DFOREGROUND
             ├─26473 /usr/sbin/httpd -DFOREGROUND
             └─26488 /usr/sbin/httpd -DFOREGROUND

Apr 10 15:25:31 ip-172-31-8-145.eu-north-1.compute.internal systemd[1]: Starting httpd.service - The Apache HTTP Server...
Apr 10 15:25:31 ip-172-31-8-145.eu-north-1.compute.internal systemd[1]: Started httpd.service - The Apache HTTP Server.
Apr 10 15:25:31 ip-172-31-8-145.eu-north-1.compute.internal httpd[26470]: Server configured, listening on: port 80
[root@ip-172-31-8-145 html]# 
```

i-0c02e69ec99ec92b7 (covid-19)

PublicIPs: 13.50.245.4   PrivateIPs: 172.31.8.145

The instance is running.



sg-0b348b104f4dd8599 - launch-wizard-1

Details

Security group name: launch-wizard-1

Security group ID: sg-0b348b104f4dd8599

Description: launch-wizard-1 created 2023-04-10T14:25:23.005Z

VPC ID: vpc-0c1a98e6ccec2ab77

Owner: 440173704002

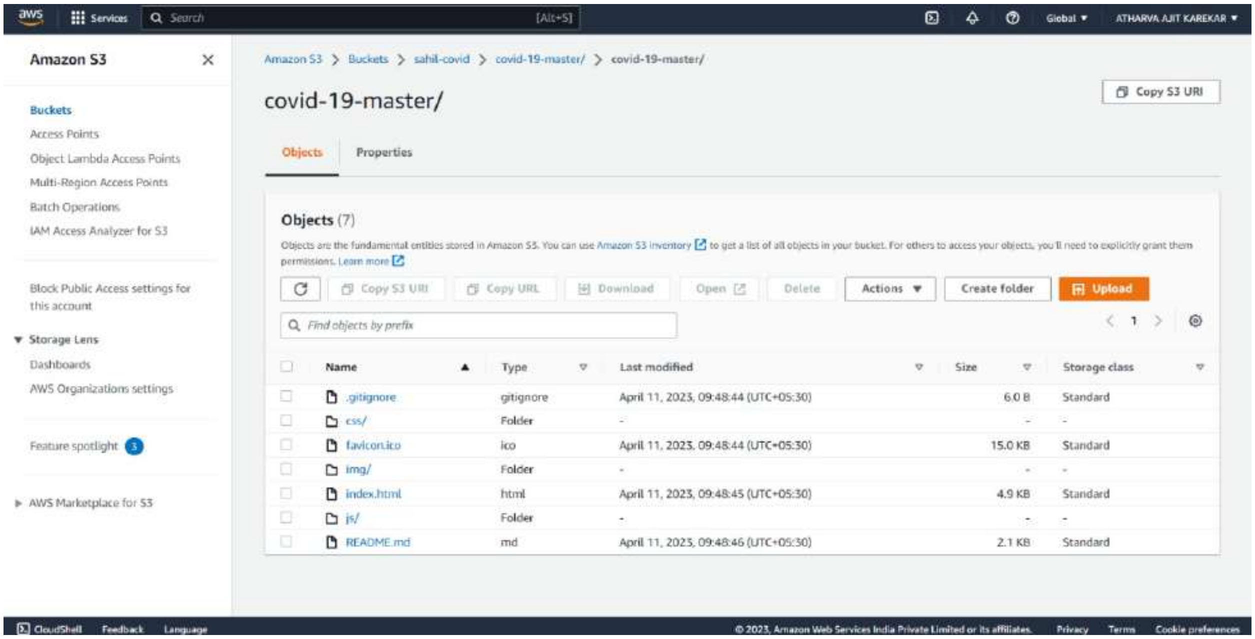
Inbound rules count: 3 Permission entries

Outbound rules count: 1 Permission entry

You can now check network connectivity with Reachability Analyzer

Inbound rules (3)

Name	Security group rule...	IP version	Type	Protocol	Port range
-	sgr-023e8fdf390b4c11a	IPv4	HTTP	TCP	80
-	sgr-08121c44d01879...	IPv4	HTTPS	TCP	443
-	sgr-00ea3e758da58e64a	IPv4	SSH	TCP	22



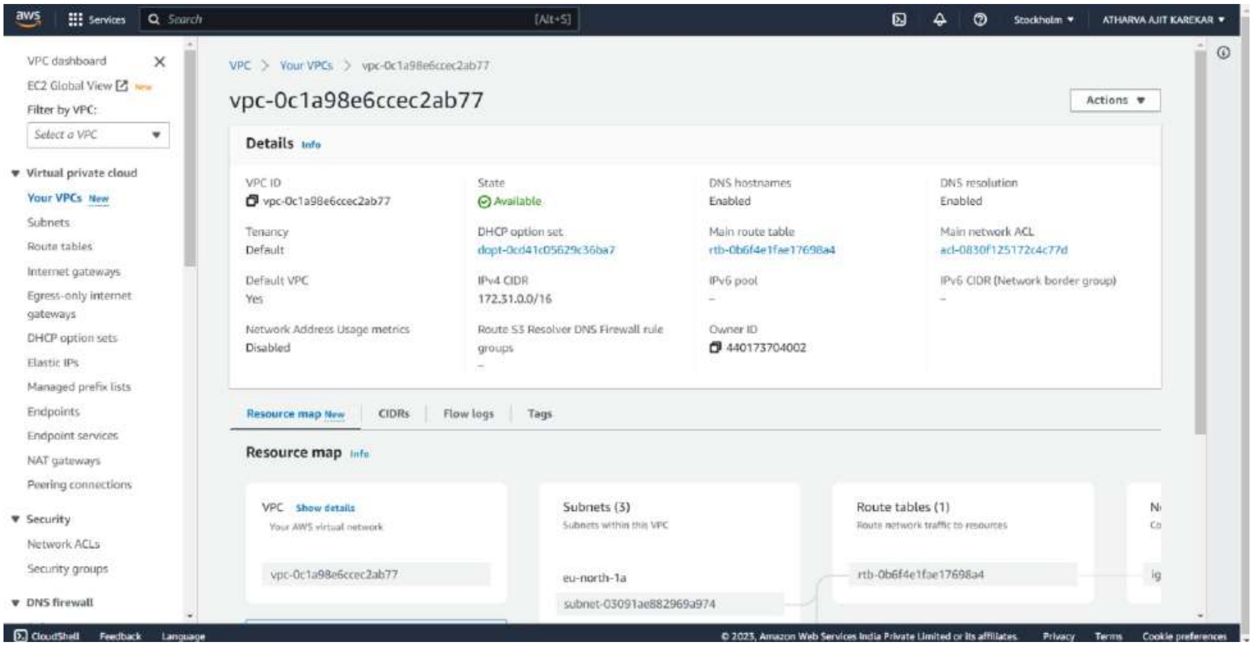
covid-19-master/

Objects (7)

Objects are the fundamental entities stored in Amazon S3. You can use Amazon S3 inventory to get a list of all objects in your bucket. For others to access your objects, you'll need to explicitly grant them permissions. Learn more

Name	Type	Last modified	Size	Storage class
.gitignore	gitignore	April 11, 2023, 09:48:44 (UTC+05:30)	6.0 B	Standard
css/	Folder	-	-	-
favicon.ico	ico	April 11, 2023, 09:48:44 (UTC+05:30)	15.0 KB	Standard
img/	Folder	-	-	-
index.html	html	April 11, 2023, 09:48:45 (UTC+05:30)	4.9 KB	Standard
js/	Folder	-	-	-
README.md	md	April 11, 2023, 09:48:46 (UTC+05:30)	2.1 KB	Standard

The S3 bucket storing the database and V



vpc-0c1a98e6ccec2ab77

Details Info

VPC ID
vpc-0c1a98e6ccec2ab77

State
Available

DNS hostnames
Enabled

DNS resolution
Enabled

Tenancy
Default

DHCP option set
dopt-0cd41c05629c36ba7

Main route table
rtb-0b6f4e1fae17698a4

Main network ACL
acl-0830f125172c4c77d

Default VPC
Yes

IPv4 CIDR
172.31.0.0/16

IPv6 pool
–

IPv6 CIDR (Network border group)
–

Network Address Usage metrics
Disabled

Route 53 Resolver DNS Firewall rule groups
–

Owner ID
440173704002

Resource map New | CIDRs | Flow logs | Tags

Resource map Info

VPC Show details
Your AWS virtual network
vpc-0c1a98e6ccec2ab77

Subnets (3)
Subnets within this VPC
eu-north-1a
subnet-03091ae882969a974

Route tables (1)
Route network traffic to resources
rtb-0b6f4e1fae17698a4

N
Co
ig