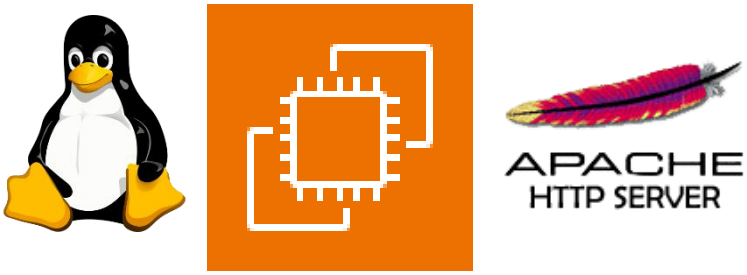
AWS Solution Architect Training with
AWS Cloud Practitioner Global Certification Training

Trainer: Aravindraj.G- Nminds Academy

Configure Application Load Balancer with 3 Linux Web Servers in AWS



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Objective

An AWS Application Load Balancer (ALB) is a fully managed Layer 7 (HTTP/HTTPS) load balancing service provided by Amazon Web Services (AWS). It is designed to handle HTTP and HTTPS traffic and offers advanced routing capabilities, allowing you to direct traffic to different resources based on the content of the request (e.g., URL paths, hostnames, query parameters, HTTP headers, etc.).

When to Use AWS Application Load Balancer:

1. Web Applications: If you are building a traditional web application or microservices application, ALB can route HTTP/HTTPS traffic to different services based on URL paths, hostnames, or headers.
2. Microservices Architecture: ALB is a good choice for microservices, where different services are hosted on different target groups. It can route traffic to the appropriate service based on the URL or other request attributes.
3. Content-based Routing: If you need to route traffic based on URL paths, hostnames, HTTP headers, or query parameters, ALB's advanced routing features are very useful.
4. SSL/TLS Termination: If you need to offload SSL/TLS decryption from your backend servers, ALB is a great option for handling HTTPS traffic securely.
5. WebSocket Applications: ALB supports WebSocket connections, making it suitable for applications that require persistent, real-time, full-duplex communication.
6. Global Applications: If you have applications that require high availability across multiple regions or availability zones, ALB's support for cross-zone load balancing helps ensure fault tolerance.

Nomenclature and Components:

1. Listeners: A listener checks for connection requests, defined by a protocol (HTTP or HTTPS) and a port (typically port 80 for HTTP or port 443 for HTTPS). It forwards traffic to one or more target groups based on rules you define.
2. Target Groups: A target group is a set of backend resources (such as EC2 instances or containers) that the ALB forwards traffic to. Each

target group can be associated with specific health check settings. Targets can be registered or deregistered as needed.

3. Rules: ALB allows you to define rules that determine how traffic is routed. You can configure rules to route traffic based on hostnames, path patterns, HTTP headers, query strings, or even the HTTP method (GET, POST, etc.).
4. Health Checks: ALB checks the health of targets by sending HTTP(S) requests to a specific path (e.g., /health). If a target is unhealthy, ALB stops routing traffic to it and forwards traffic to healthy targets.
5. Target Types: ALB supports three types of targets:
    - Instance: EC2 instances registered directly to the target group.
    - IP: IP addresses, such as instances in a private subnet or on-premise servers.
    - Lambda functions: AWS Lambda functions can also be used as targets.

Example Use Case:

Consider an e-commerce application where different services handle user authentication, product search, and order processing. You can use an ALB to route traffic as follows:

- Requests to /auth/* go to the authentication service.
- Requests to /products/* go to the product search service.
- Requests to /orders/* go to the order processing service.

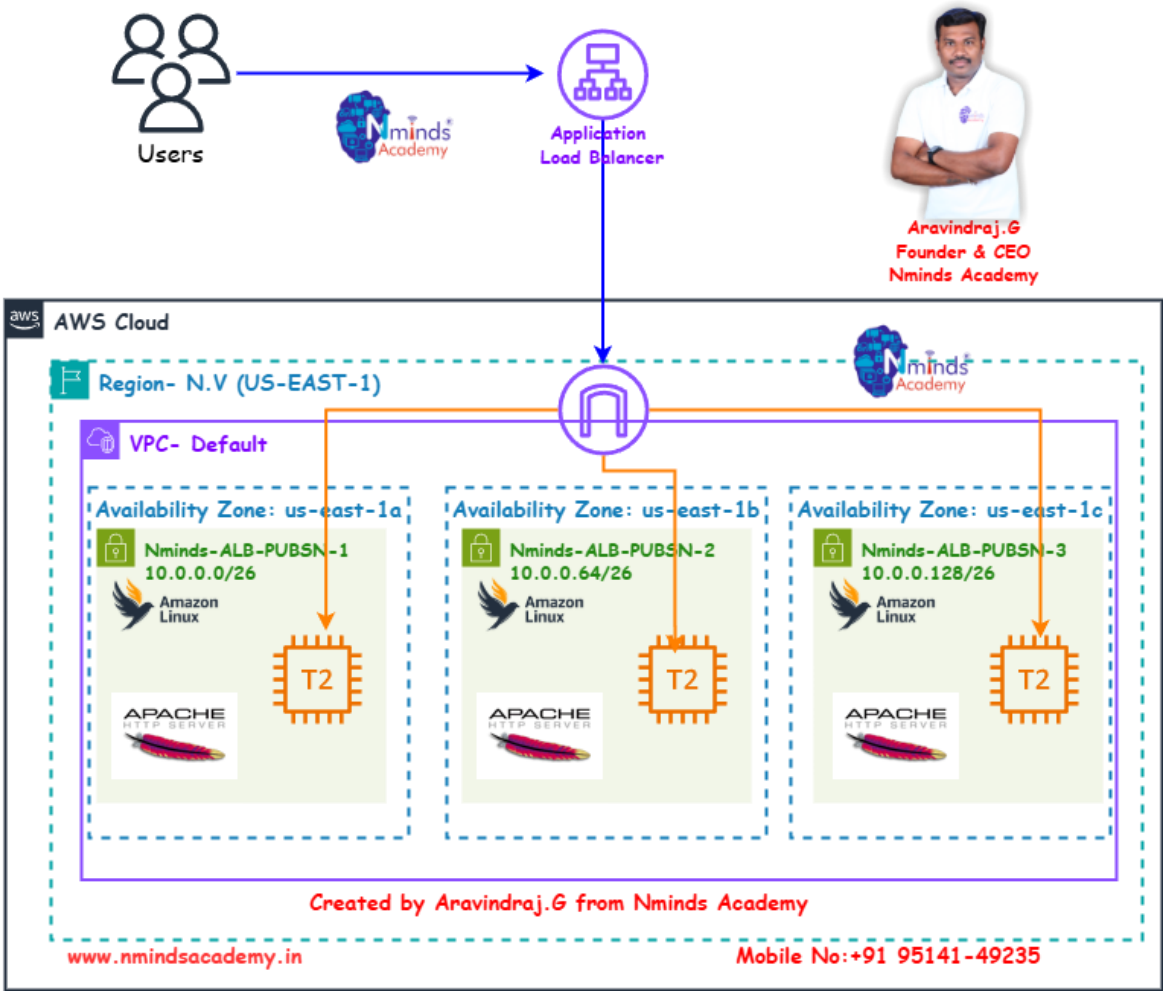
This routing setup can be achieved by configuring the ALB with path-based routing rules, improving the scalability and organization of the application.

Benefits:

- Advanced Routing: ALB provides powerful content-based routing, making it suitable for modern applications and microservices.
- SSL/TLS Termination: Offload SSL/TLS decryption to the load balancer, reducing the overhead on your application servers.
- Improved Fault Tolerance: Health checks and automatic rerouting to healthy targets ensure high availability and reliability.
- Ease of Use: Fully managed and integrates easily with other AWS services like EC2, ECS, EKS, and Lambda.

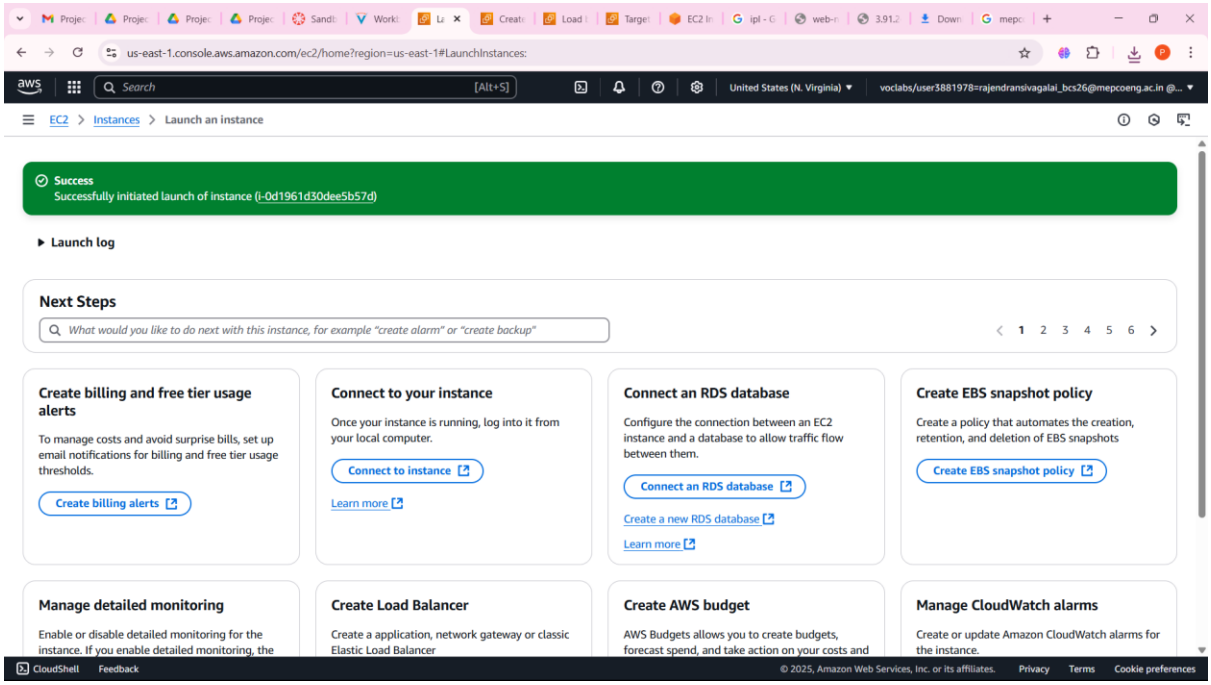
Topology

Configure High Availability with 3 Webservers using Application Load Balancer in AWS

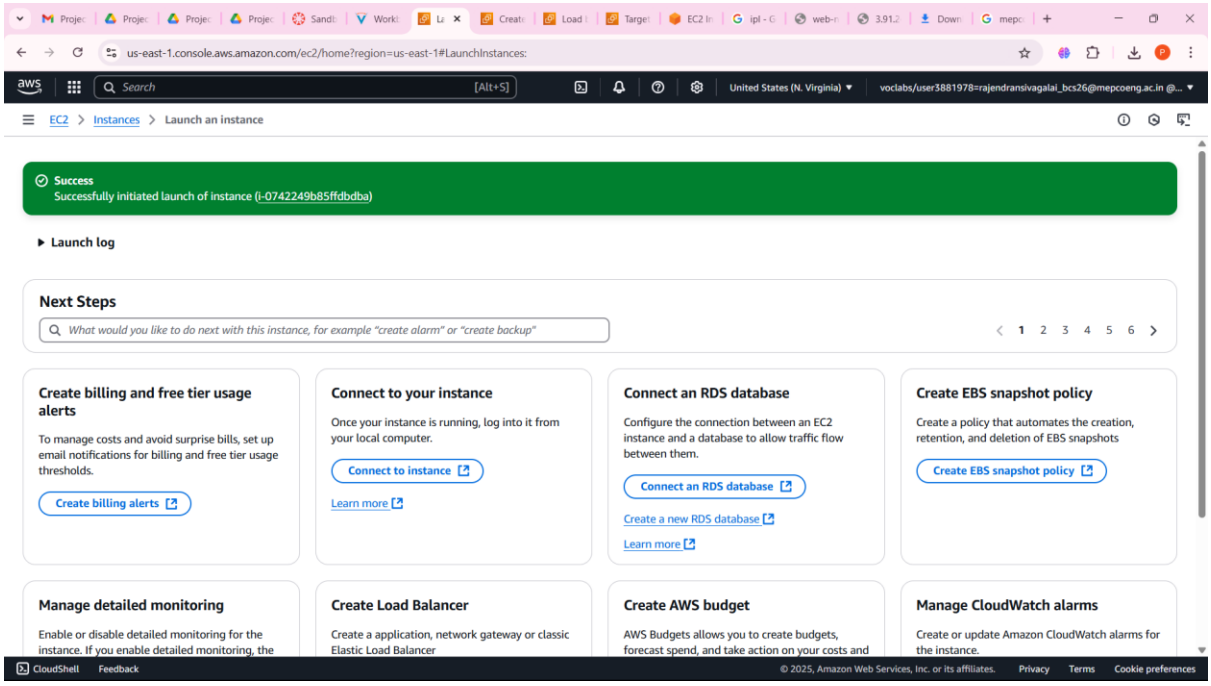


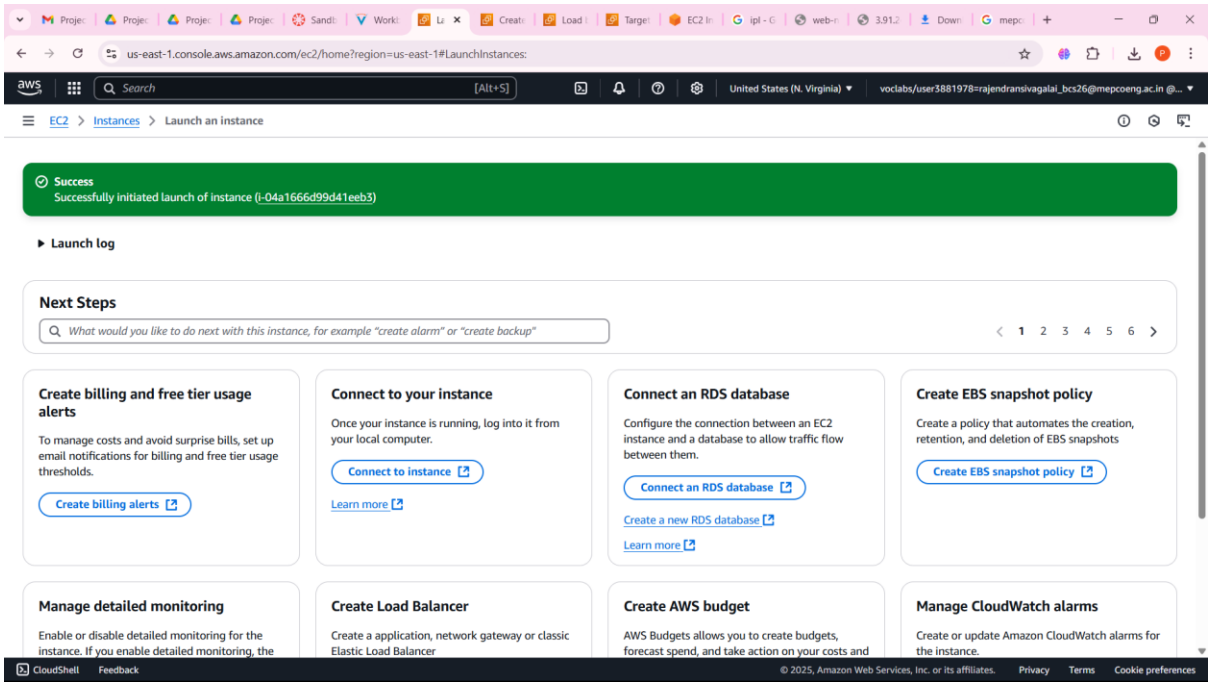
Execution Tasks:

Step 1: Launch Web-Server-1

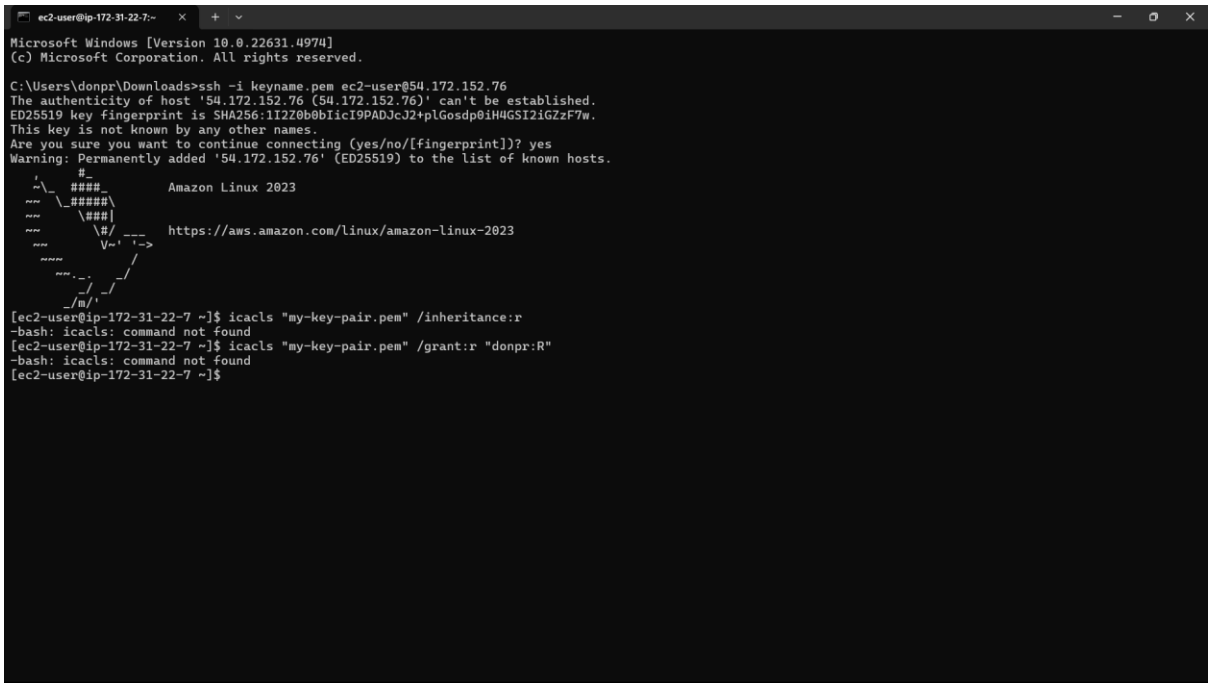


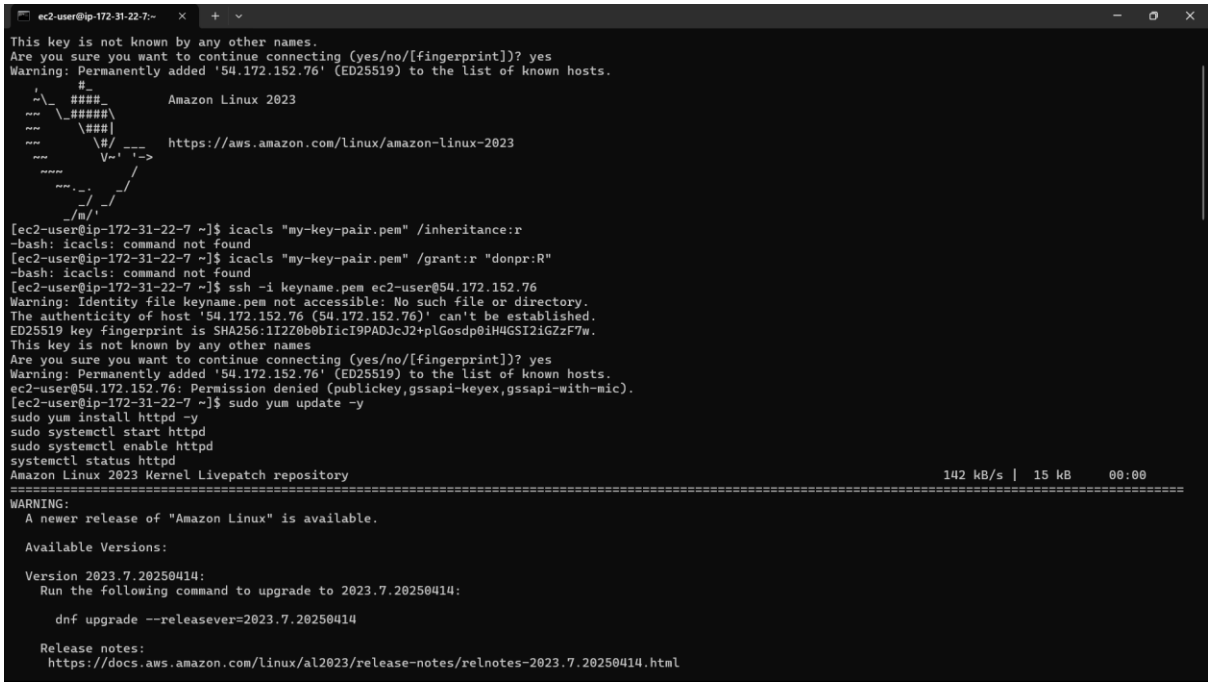
Step 2: Launch Web-Server-2 and Web-Server-3:





Step 3: Install Apache on Each Instance





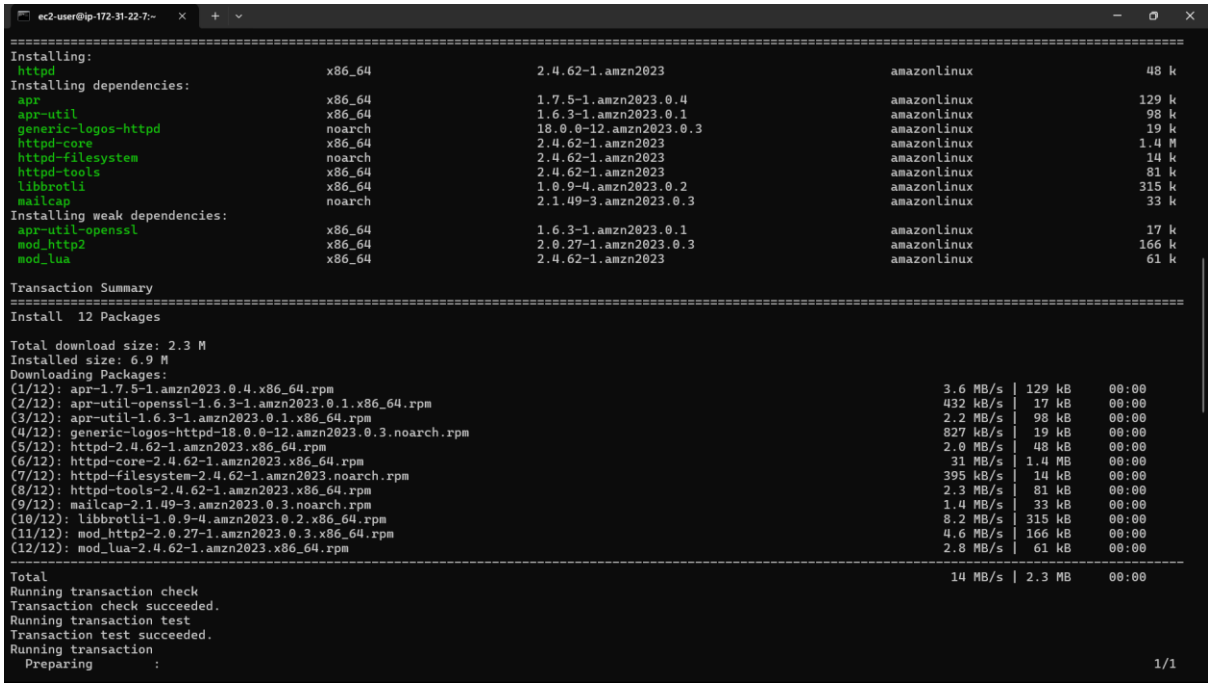
```
ec2-user@ip-172-31-22-7:~
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '54.172.152.76' (ED25519) to the list of known hosts.
   ,     #_
   ~\_  ####_        Amazon Linux 2023
  ~~  \_#####\
  ~~     \###|
  ~~       \#/ ___   https://aws.amazon.com/linux/amazon-linux-2023
   ~~       V~' '->
    ~~~         /
      ~~._.   _/
         _/ _/
       _/m/'
[ec2-user@ip-172-31-22-7 ~]$ icacls "my-key-pair.pem" /inheritance:r
-bash: icacls: command not found
[ec2-user@ip-172-31-22-7 ~]$ icacls "my-key-pair.pem" /grant:r "donpr:R"
-bash: icacls: command not found
[ec2-user@ip-172-31-22-7 ~]$ ssh -i keyname.pem ec2-user@54.172.152.76
Warning: Identity file keyname.pem not accessible: No such file or directory.
The authenticity of host '54.172.152.76 (54.172.152.76)' can't be established.
ED25519 key fingerprint is SHA256:1I2Z0b0bIicI9PADJcJ2+plGosdp0iH4GSI2iGZzF7w.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '54.172.152.76' (ED25519) to the list of known hosts.
ec2-user@54.172.152.76: Permission denied (publickey,gssapi-keyex,gssapi-with-mic).
[ec2-user@ip-172-31-22-7 ~]$ sudo yum update -y
sudo yum install httpd -y
sudo systemctl start httpd
sudo systemctl enable httpd
systemctl status httpd
Amazon Linux 2023 Kernel Livepatch repository                                                    142 kB/s |  15 kB     00:00
================================================================================================================================
WARNING:
  A newer release of "Amazon Linux" is available.

  Available Versions:

  Version 2023.7.20250414:
    Run the following command to upgrade to 2023.7.20250414:

      dnf upgrade --releasever=2023.7.20250414

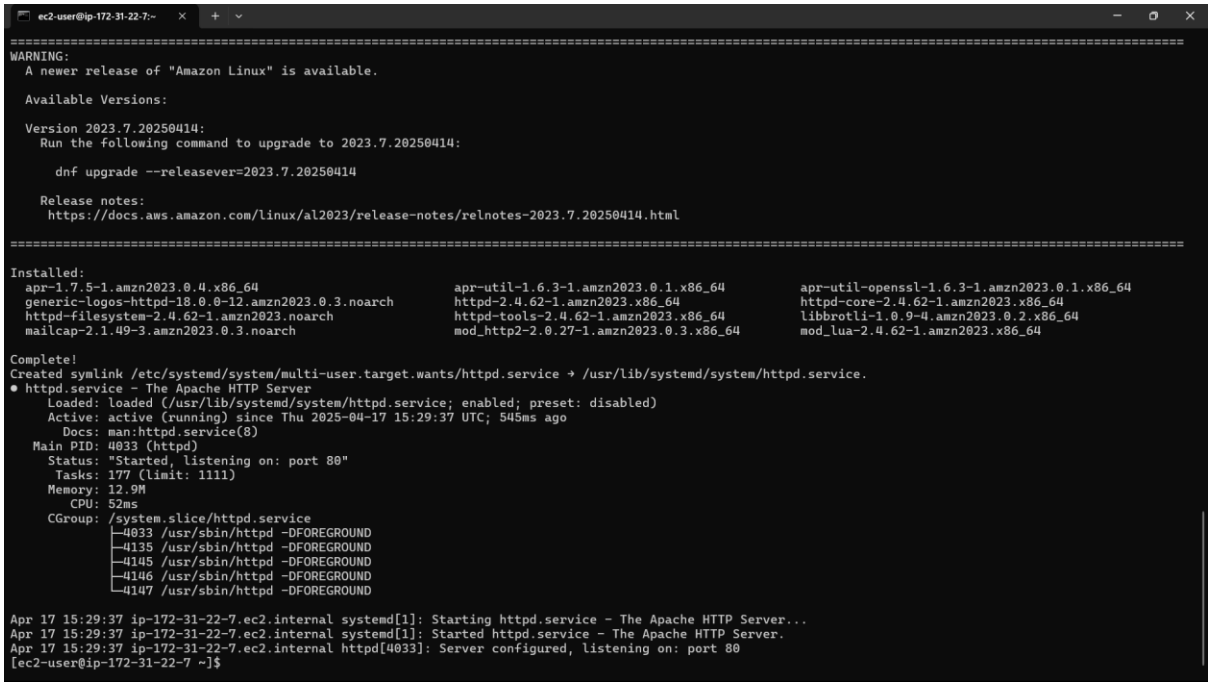
    Release notes:
     https://docs.aws.amazon.com/linux/al2023/release-notes/relnotes-2023.7.20250414.html
```



```
ec2-user@ip-172-31-22-7:~
================================================================================================================================
Installing:
 httpd                          x86_64                 2.4.62-1.amzn2023              amazonlinux                  48 k
Installing dependencies:
 apr                            x86_64                 1.7.5-1.amzn2023.0.4           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                 2.4.62-1.amzn2023              amazonlinux                 1.4 M
 httpd-filesystem               noarch                 2.4.62-1.amzn2023              amazonlinux                  14 k
 httpd-tools                    x86_64                 2.4.62-1.amzn2023              amazonlinux                  81 k
 libbrotli                      x86_64                 1.0.9-4.amzn2023.0.2           amazonlinux                 315 k
 mailcap                        noarch                 2.1.49-3.amzn2023.0.3          amazonlinux                  33 k
Installing weak dependencies:
 apr-util-openssl               x86_64                 1.6.3-1.amzn2023.0.1           amazonlinux                  17 k
 mod_http2                      x86_64                 2.0.27-1.amzn2023.0.3          amazonlinux                 166 k
 mod_lua                        x86_64                 2.4.62-1.amzn2023              amazonlinux                  61 k

Transaction Summary
================================================================================================================================
Install  12 Packages

Total download size: 2.3 M
Installed size: 6.9 M
Downloading Packages:
(1/12): apr-1.7.5-1.amzn2023.0.4.x86_64.rpm                                      3.6 MB/s | 129 kB     00:00
(2/12): apr-util-openssl-1.6.3-1.amzn2023.0.1.x86_64.rpm                         432 kB/s |  17 kB     00:00
(3/12): apr-util-1.6.3-1.amzn2023.0.1.x86_64.rpm                                 2.2 MB/s |  98 kB     00:00
(4/12): generic-logos-httpd-18.0.0-12.amzn2023.0.3.noarch.rpm                    827 kB/s |  19 kB     00:00
(5/12): httpd-2.4.62-1.amzn2023.x86_64.rpm                                       2.0 MB/s |  48 kB     00:00
(6/12): httpd-core-2.4.62-1.amzn2023.x86_64.rpm                                   31 MB/s | 1.4 MB     00:00
(7/12): httpd-filesystem-2.4.62-1.amzn2023.noarch.rpm                            395 kB/s |  14 kB     00:00
(8/12): httpd-tools-2.4.62-1.amzn2023.x86_64.rpm                                 2.3 MB/s |  81 kB     00:00
(9/12): mailcap-2.1.49-3.amzn2023.0.3.noarch.rpm                                 1.4 MB/s |  33 kB     00:00
(10/12): libbrotli-1.0.9-4.amzn2023.0.2.x86_64.rpm                               8.2 MB/s | 315 kB     00:00
(11/12): mod_http2-2.0.27-1.amzn2023.0.3.x86_64.rpm                              4.6 MB/s | 166 kB     00:00
(12/12): mod_lua-2.4.62-1.amzn2023.x86_64.rpm                                    2.8 MB/s |  61 kB     00:00
--------------------------------------------------------------------------------------------------------------------------------
Total                                                                             14 MB/s | 2.3 MB     00:00
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing        :                                                                                             1/1
```



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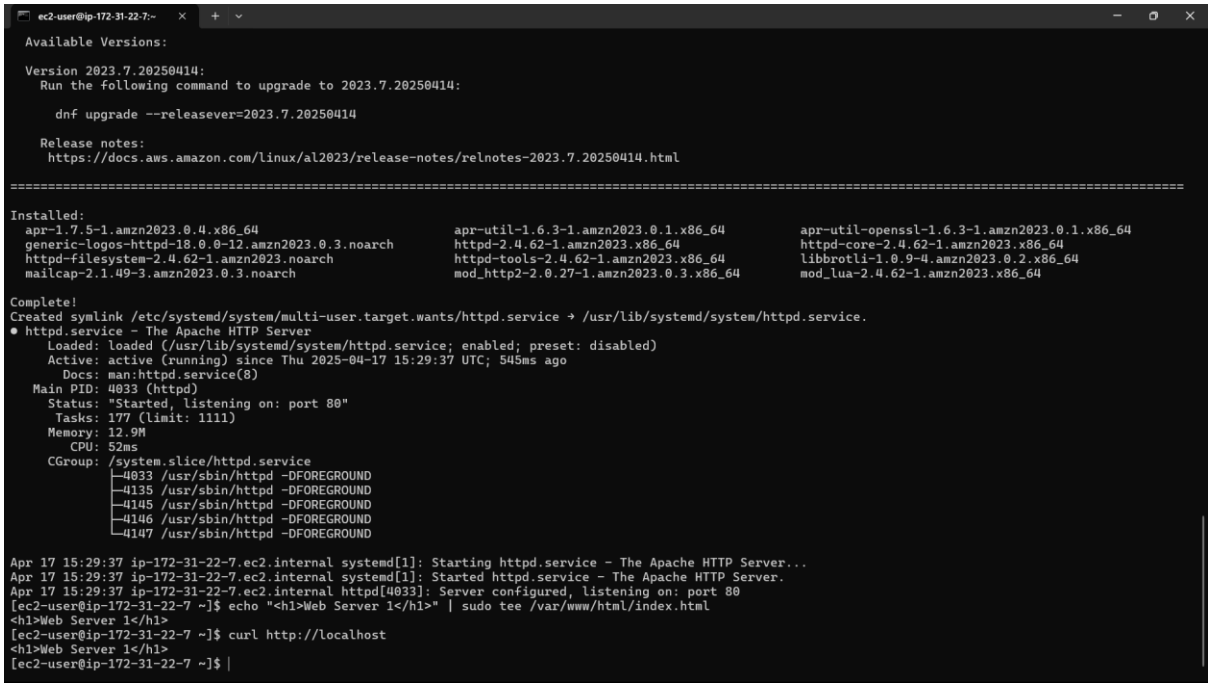
    Release notes:
     https://docs.aws.amazon.com/linux/al2023/release-notes/relnotes-2023.7.20250414.html

================================================================================================================================================================

Installed:
  apr-1.7.5-1.amzn2023.0.4.x86_64                          apr-util-1.6.3-1.amzn2023.0.1.x86_64          apr-util-openssl-1.6.3-1.amzn2023.0.1.x86_64
  generic-logos-httpd-18.0.0-12.amzn2023.0.3.noarch        httpd-2.4.62-1.amzn2023.x86_64                httpd-core-2.4.62-1.amzn2023.x86_64
  httpd-filesystem-2.4.62-1.amzn2023.noarch                httpd-tools-2.4.62-1.amzn2023.x86_64          libbrotli-1.0.9-4.amzn2023.0.2.x86_64
  mailcap-2.1.49-3.amzn2023.0.3.noarch                     mod_http2-2.0.27-1.amzn2023.0.3.x86_64        mod_lua-2.4.62-1.amzn2023.x86_64

Complete!
Created symlink /etc/systemd/system/multi-user.target.wants/httpd.service → /usr/lib/systemd/system/httpd.service.
● httpd.service - The Apache HTTP Server
     Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; preset: disabled)
     Active: active (running) since Thu 2025-04-17 15:29:37 UTC; 545ms ago
       Docs: man:httpd.service(8)
   Main PID: 4033 (httpd)
     Status: "Started, listening on: port 80"
      Tasks: 177 (limit: 1111)
     Memory: 12.9M
        CPU: 52ms
     CGroup: /system.slice/httpd.service
             ├─4033 /usr/sbin/httpd -DFOREGROUND
             ├─4135 /usr/sbin/httpd -DFOREGROUND
             ├─4145 /usr/sbin/httpd -DFOREGROUND
             ├─4146 /usr/sbin/httpd -DFOREGROUND
             └─4147 /usr/sbin/httpd -DFOREGROUND

Apr 17 15:29:37 ip-172-31-22-7.ec2.internal systemd[1]: Starting httpd.service - The Apache HTTP Server...
Apr 17 15:29:37 ip-172-31-22-7.ec2.internal systemd[1]: Started httpd.service - The Apache HTTP Server.
Apr 17 15:29:37 ip-172-31-22-7.ec2.internal httpd[4033]: Server configured, listening on: port 80
[ec2-user@ip-172-31-22-7 ~]$
```



```
ec2-user@ip-172-31-22-7:~
  Available Versions:

  Version 2023.7.20250414:
    Run the following command to upgrade to 2023.7.20250414:

      dnf upgrade --releasever=2023.7.20250414

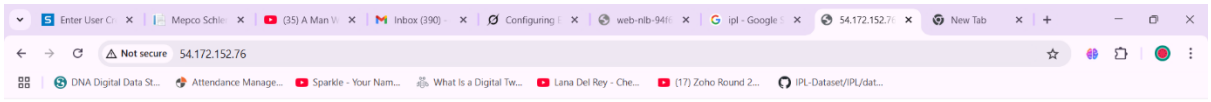
    Release notes:
     https://docs.aws.amazon.com/linux/al2023/release-notes/relnotes-2023.7.20250414.html

================================================================================================================================================================

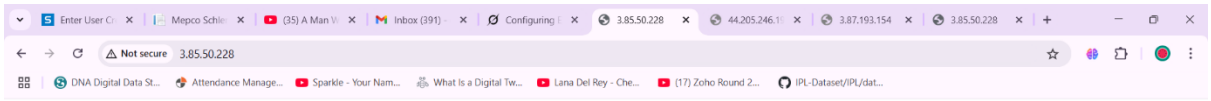
Installed:
  apr-1.7.5-1.amzn2023.0.4.x86_64                          apr-util-1.6.3-1.amzn2023.0.1.x86_64          apr-util-openssl-1.6.3-1.amzn2023.0.1.x86_64
  generic-logos-httpd-18.0.0-12.amzn2023.0.3.noarch        httpd-2.4.62-1.amzn2023.x86_64                httpd-core-2.4.62-1.amzn2023.x86_64
  httpd-filesystem-2.4.62-1.amzn2023.noarch                httpd-tools-2.4.62-1.amzn2023.x86_64          libbrotli-1.0.9-4.amzn2023.0.2.x86_64
  mailcap-2.1.49-3.amzn2023.0.3.noarch                     mod_http2-2.0.27-1.amzn2023.0.3.x86_64        mod_lua-2.4.62-1.amzn2023.x86_64

Complete!
Created symlink /etc/systemd/system/multi-user.target.wants/httpd.service → /usr/lib/systemd/system/httpd.service.
● httpd.service - The Apache HTTP Server
     Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; preset: disabled)
     Active: active (running) since Thu 2025-04-17 15:29:37 UTC; 545ms ago
       Docs: man:httpd.service(8)
   Main PID: 4033 (httpd)
     Status: "Started, listening on: port 80"
      Tasks: 177 (limit: 1111)
     Memory: 12.9M
        CPU: 52ms
     CGroup: /system.slice/httpd.service
             ├─4033 /usr/sbin/httpd -DFOREGROUND
             ├─4135 /usr/sbin/httpd -DFOREGROUND
             ├─4145 /usr/sbin/httpd -DFOREGROUND
             ├─4146 /usr/sbin/httpd -DFOREGROUND
             └─4147 /usr/sbin/httpd -DFOREGROUND

Apr 17 15:29:37 ip-172-31-22-7.ec2.internal systemd[1]: Starting httpd.service - The Apache HTTP Server...
Apr 17 15:29:37 ip-172-31-22-7.ec2.internal systemd[1]: Started httpd.service - The Apache HTTP Server.
Apr 17 15:29:37 ip-172-31-22-7.ec2.internal httpd[4033]: Server configured, listening on: port 80
[ec2-user@ip-172-31-22-7 ~]$ echo "<h1>Web Server 1</h1>" | sudo tee /var/www/html/index.html
<h1>Web Server 1</h1>
[ec2-user@ip-172-31-22-7 ~]$ curl http://localhost
<h1>Web Server 1</h1>
[ec2-user@ip-172-31-22-7 ~]$
```

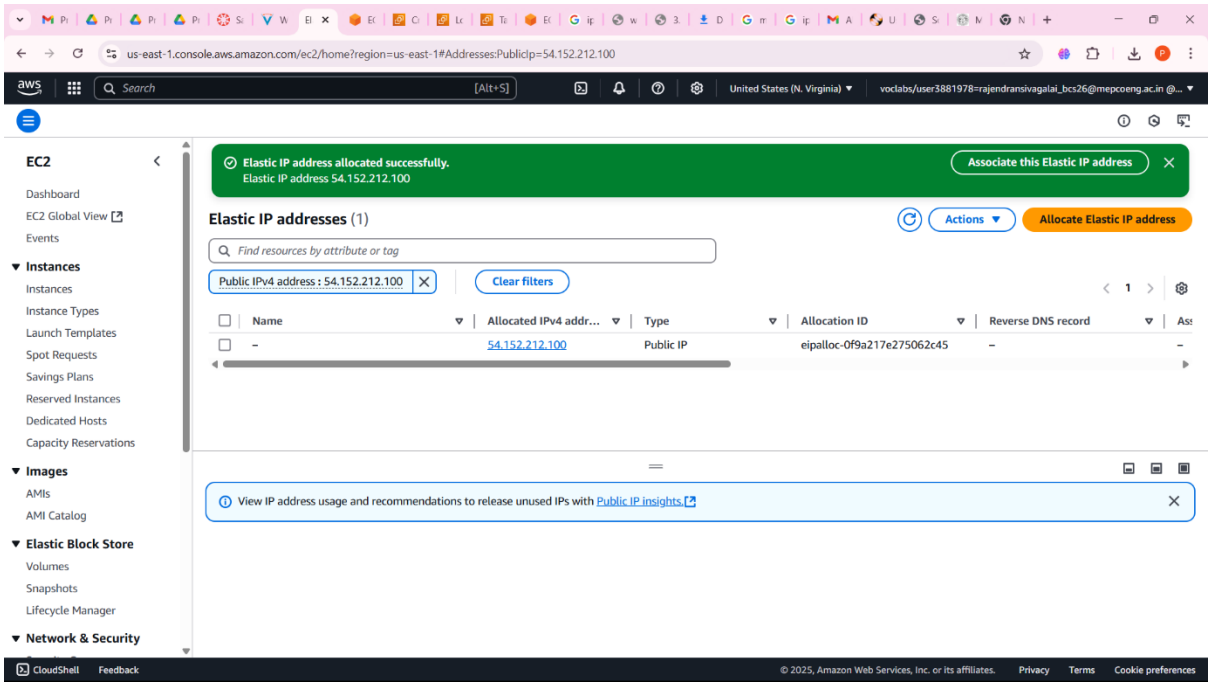


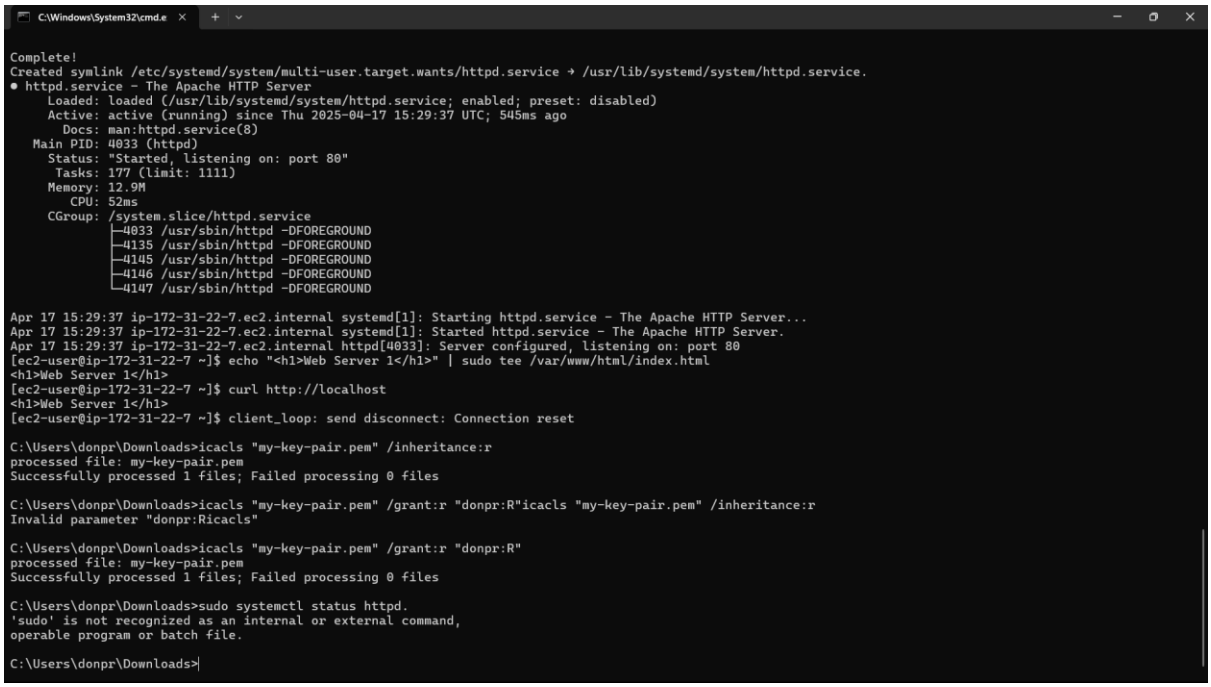
Web Server 1

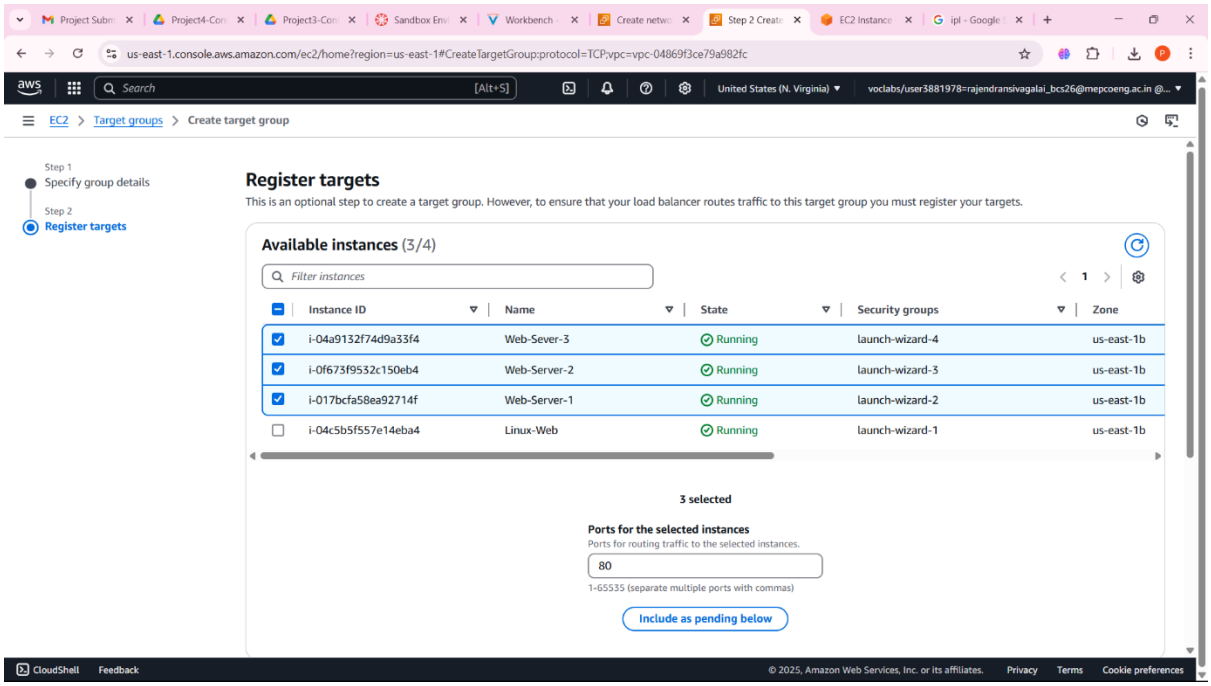


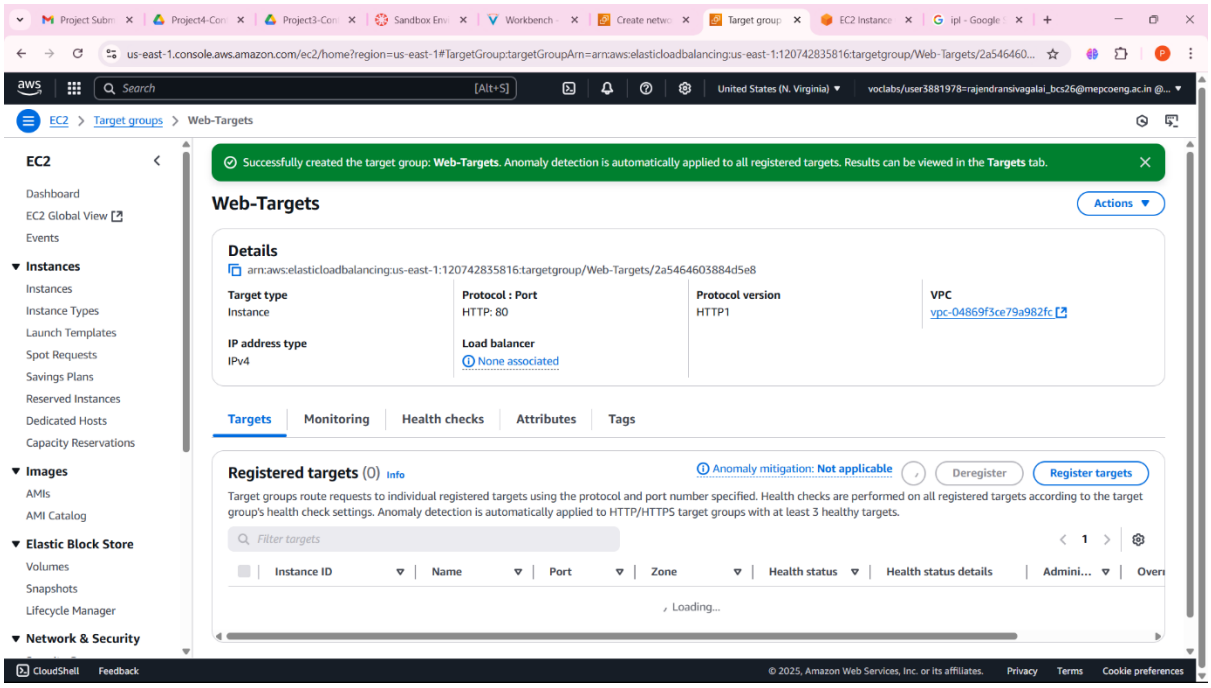
Web Server 2

Step 4: Configure Network Load Balancer






us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateTargetGroup:protocol=TCP;vpc=vpc-04869f3ce79a982fc
EC2 > Target groups > Create target group
Step 1
Specify group details
Step 2
Register targets
Register targets
This is an optional step to create a target group. However, to ensure that your load balancer routes traffic to this target group you must register your targets.
Available instances (3/4)
Filter instances
Instance ID | Name | State | Security groups | Zone
i-04a9132f74d9a33f4 | Web-Sever-3 | Running | launch-wizard-4 | us-east-1b
i-0f673f9532c150eb4 | Web-Server-2 | Running | launch-wizard-3 | us-east-1b
i-017bcfa58ea92714f | Web-Server-1 | Running | launch-wizard-2 | us-east-1b
i-04c5b5f557e14eba4 | Linux-Web | Running | launch-wizard-1 | us-east-1b
3 selected
Ports for the selected instances
Ports for routing traffic to the selected instances.
80
1-65535 (separate multiple ports with commas)
Include as pending below
CloudShell
Feedback
© 2025, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences


us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#TargetGroup:targetGroupArn=arn:aws:elasticloadbalancing:us-east-1:120742835816:targetgroup/Web-Targets/2a546460...
EC2 > Target groups > Web-Targets
Successfully created the target group: Web-Targets. Anomaly detection is automatically applied to all registered targets. Results can be viewed in the Targets tab.
Web-Targets
Actions
Details
arn:aws:elasticloadbalancing:us-east-1:120742835816:targetgroup/Web-Targets/2a5464603884d5e8
Target type
Instance
Protocol : Port
HTTP: 80
Protocol version
HTTP1
VPC
vpc-04869f3ce79a982fc
IP address type
IPv4
Load balancer
None associated
Targets
Monitoring
Health checks
Attributes
Tags
Registered targets (0) Info
Anomaly mitigation: Not applicable
Deregister
Register targets
Target groups route requests to individual registered targets using the protocol and port number specified. Health checks are performed on all registered targets according to the target group's health check settings. Anomaly detection is automatically applied to HTTP/HTTPS target groups with at least 3 healthy targets.
Filter targets
Instance ID | Name | Port | Zone | Health status | Health status details | Admini... | Overr
Loading...
EC2
Dashboard
EC2 Global View
Events
Instances
Instances
Instance Types
Launch Templates
Spot Requests
Savings Plans
Reserved Instances
Dedicated Hosts
Capacity Reservations
Images
AMIs
AMI Catalog
Elastic Block Store
Volumes
Snapshots
Lifecycle Manager
Network & Security
CloudShell
Feedback
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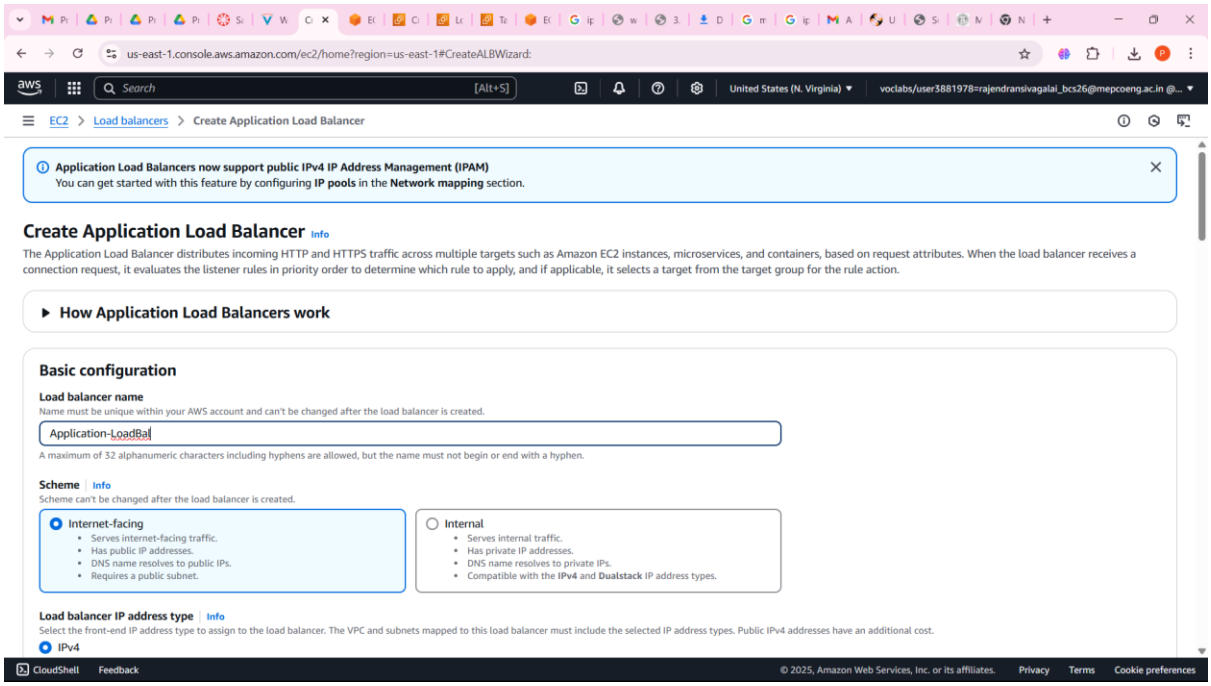
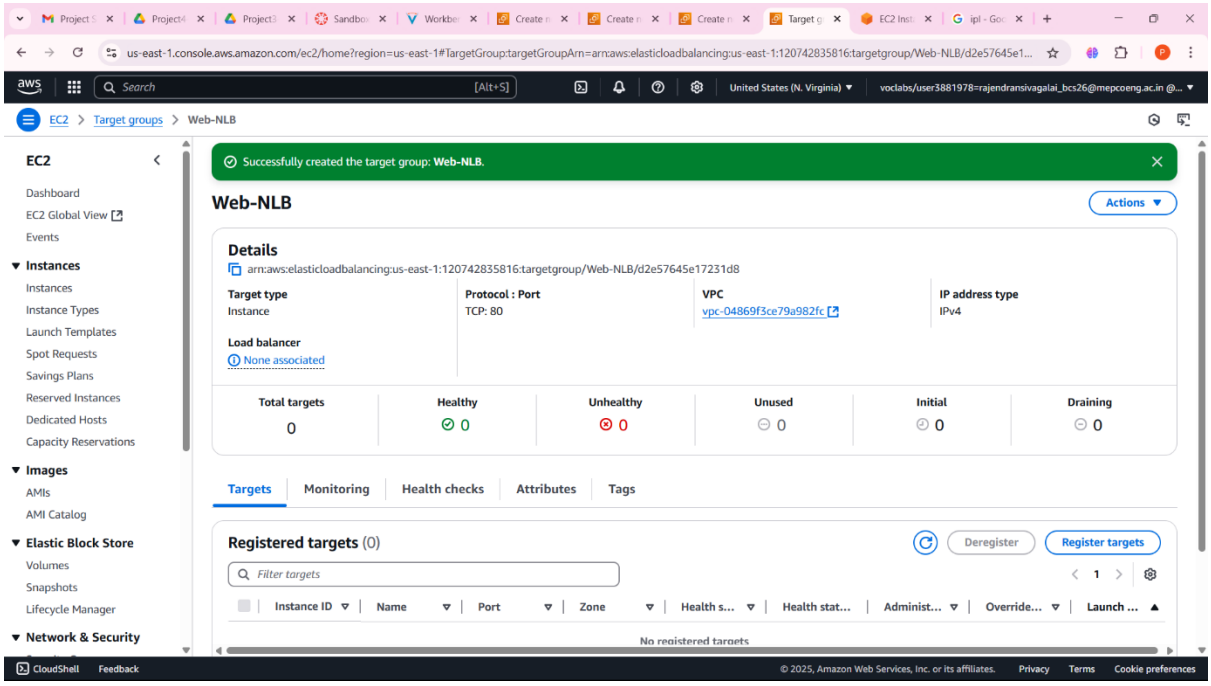
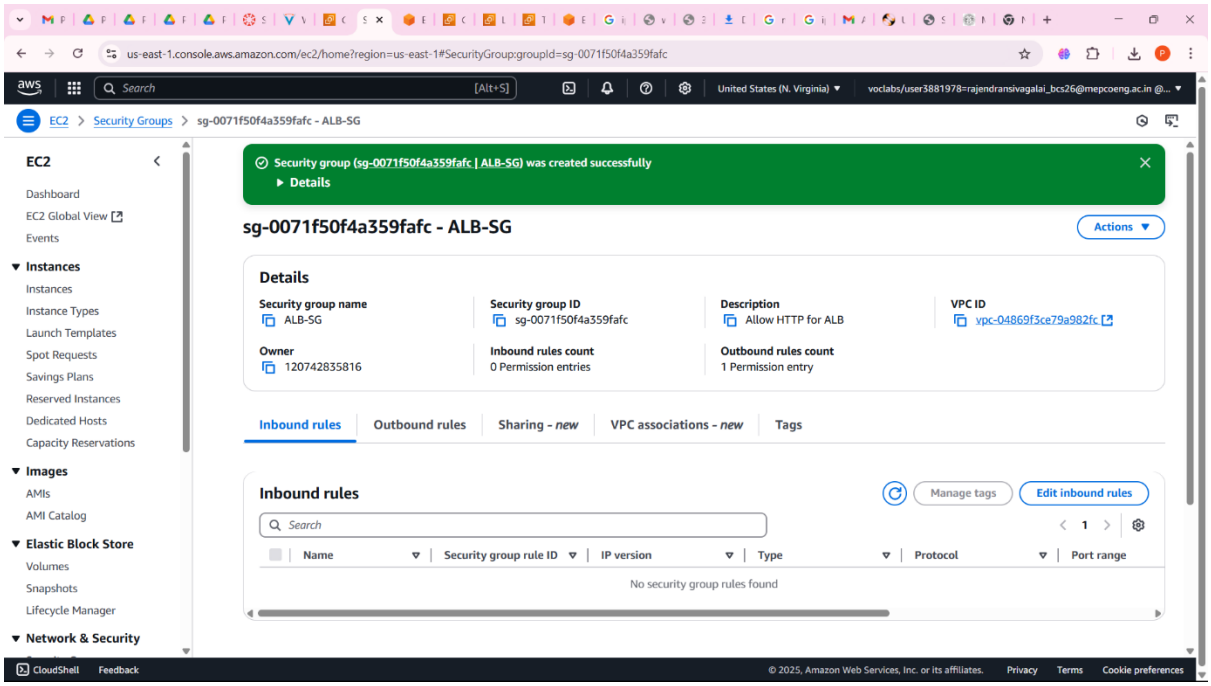
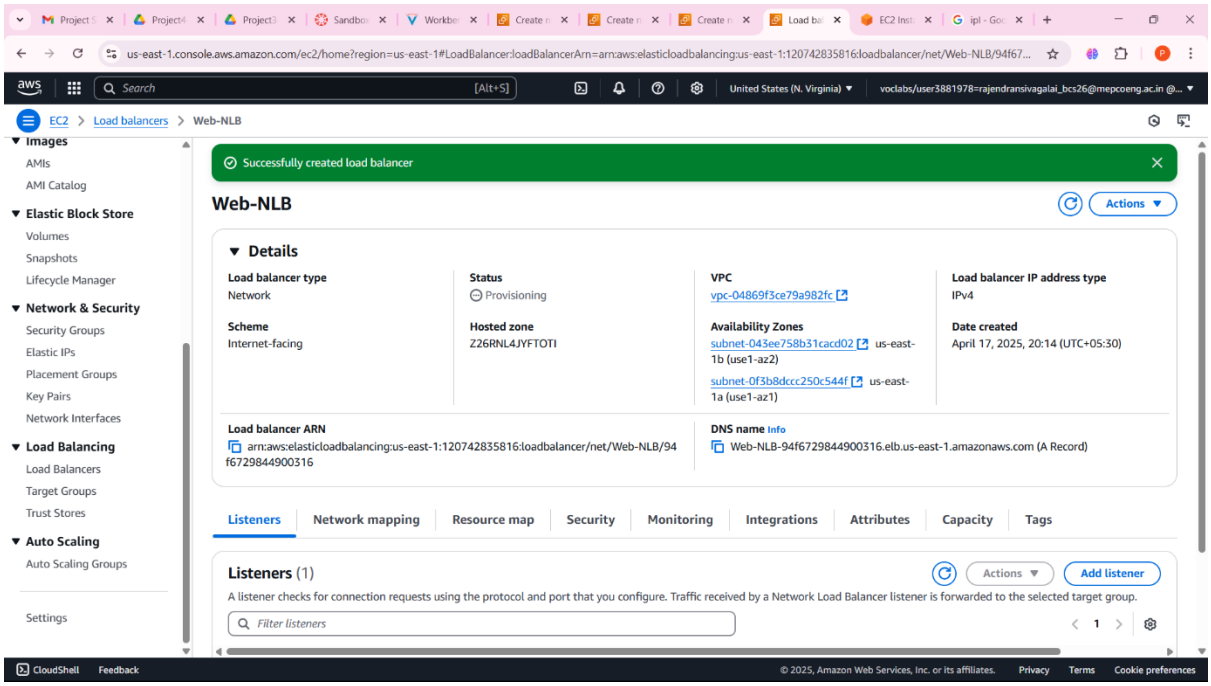


Step 5: Test Load Balancer




us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#SecurityGroup:groupId=sg-0071f50f4a359fafc
EC2 > Security Groups > sg-0071f50f4a359fafc - ALB-SG
Security group (sg-0071f50f4a359fafc | ALB-SG) was created successfully
Details
sg-0071f50f4a359fafc - ALB-SG
Actions
Details
Security group name
ALB-SG
Security group ID
sg-0071f50f4a359fafc
Description
Allow HTTP for ALB
VPC ID
vpc-04869f3ce79a982fc
Owner
120742835816
Inbound rules count
0 Permission entries
Outbound rules count
1 Permission entry
Inbound rules
Outbound rules
Sharing - new
VPC associations - new
Tags
Inbound rules
Manage tags
Edit inbound rules
Name
Security group rule ID
IP version
Type
Protocol
Port range
No security group rules found


us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#LoadBalancer:loadBalancerArn=arn:aws:elasticloadbalancing:us-east-1:120742835816:loadbalancer/net/Web-NLB/94f67...
EC2 > Load balancers > Web-NLB
Successfully created load balancer
Web-NLB
Actions
Details
Load balancer type
Network
Status
Provisioning
VPC
vpc-04869f3ce79a982fc
Load balancer IP address type
IPv4
Scheme
Internet-facing
Hosted zone
Z26RNL4JYFTOTI
Availability Zones
subnet-043ee758b31cacd02 us-east-1b (use1-az2)
subnet-0f3b8dccc250c544f us-east-1a (use1-az1)
Date created
April 17, 2025, 20:14 (UTC+05:30)
Load balancer ARN
arn:aws:elasticloadbalancing:us-east-1:120742835816:loadbalancer/net/Web-NLB/94f6729844900316
DNS name Info
Web-NLB-94f6729844900316.elb.us-east-1.amazonaws.com (A Record)
Listeners
Network mapping
Resource map
Security
Monitoring
Integrations
Attributes
Capacity
Tags
Listeners (1)
Actions
Add listener
A listener checks for connection requests using the protocol and port that you configure. Traffic received by a Network Load Balancer listener is forwarded to the selected target group.
Filter listeners