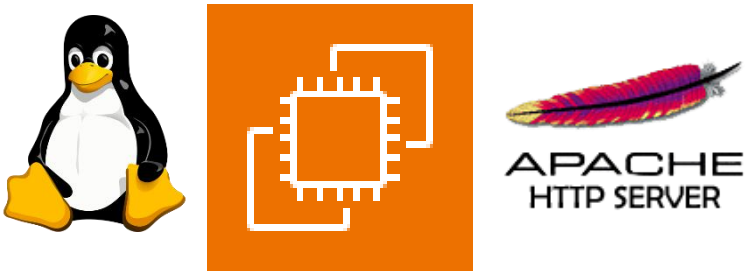
AWS Solution Architect Training with
AWS Cloud Practitioner Global Certification Training

Trainer: Aravindraj.G- Nminds Academy

Configure Network Load Balancer with 3 Linux Web Servers in AWS



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Objective

An AWS Network Load Balancer (NLB) is a highly scalable and high-performance Layer 4 (TCP/UDP) load balancing service provided by Amazon Web Services (AWS). It is designed to handle millions of requests per second while maintaining ultra-low latencies, making it ideal for applications that require high availability and fault tolerance at the transport layer.

Key Features of AWS Network Load Balancer:

1. Layer 4 Load Balancing: NLB operates at the Transport Layer (Layer 4) of the OSI model, meaning it forwards network packets based on IP protocol (TCP, UDP, or TLS), and it can efficiently balance traffic for any application protocol that operates at this layer.
2. High Availability and Scalability: NLB automatically scales to handle increasing traffic volumes. It distributes incoming traffic across multiple targets (EC2 instances, containers, IP addresses) within one or more availability zones.
3. Static IP Support: NLB provides a single static IP address for each availability zone, which simplifies DNS management. You can also associate an Elastic IP (EIP) with the NLB to maintain a static, publicly reachable IP address.
4. TLS Termination: NLB supports TLS termination (encrypted traffic), allowing secure connections from clients to be offloaded at the load balancer. This reduces the burden on backend servers.
5. Health Checks: NLB performs health checks on targets to ensure traffic is only forwarded to healthy instances. If a target becomes unhealthy, traffic is redirected to healthy targets.
6. High Throughput: Designed to handle millions of requests per second, NLB is optimized for performance and can be used for real-time applications, such as gaming, IoT, and financial applications that require very low latencies.
7. Connection-based Load Balancing: NLB uses the client's IP address and port to route traffic, maintaining the source IP, which can be beneficial in some use cases like logging and monitoring.
8. Cross-Zone Load Balancing: By default, cross-zone load balancing is enabled, which means traffic is distributed evenly across all available targets in all availability zones. You can disable it if you want to control traffic distribution more finely.

NLB Architecture:

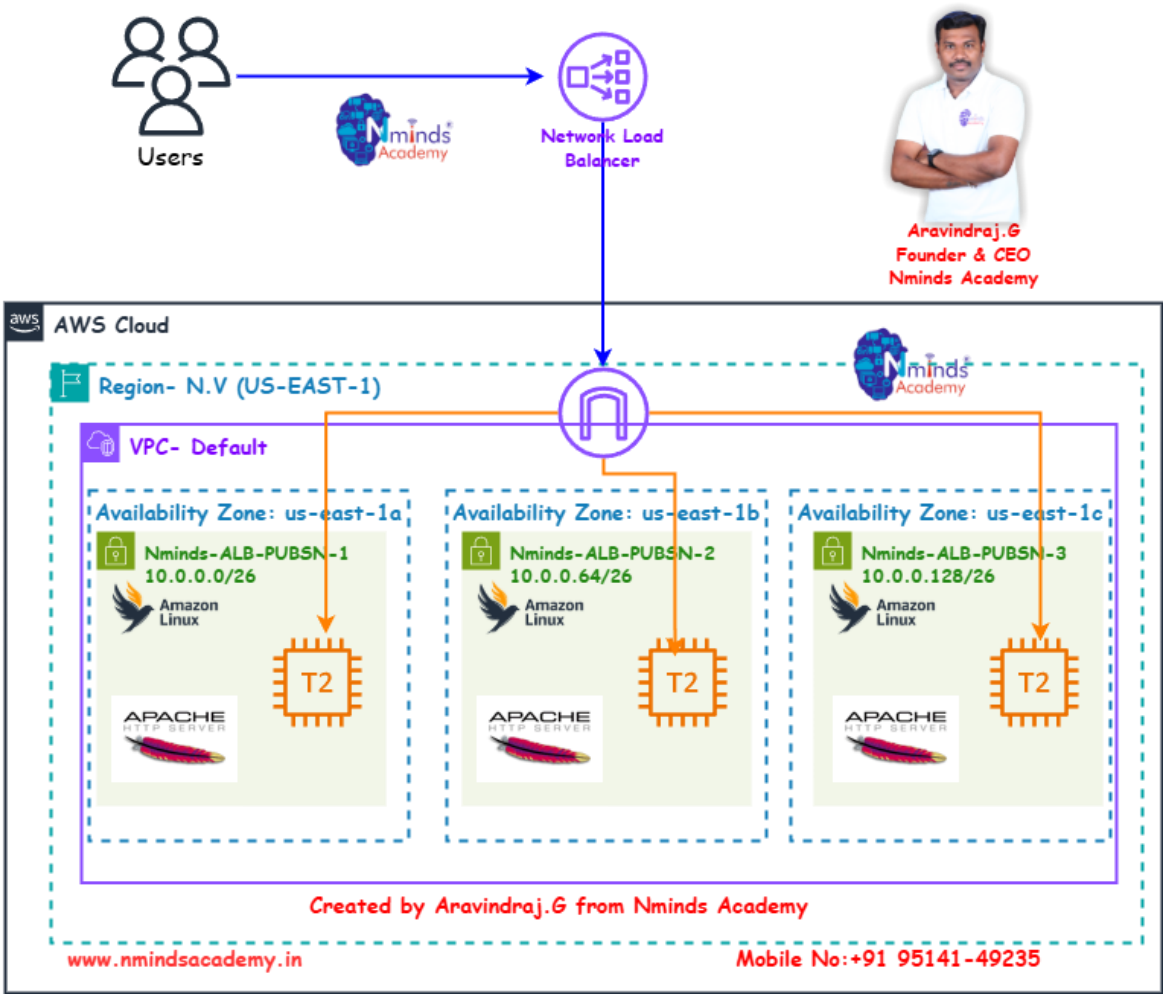
1. Listeners: A listener is a process that checks for connection requests. When a request arrives at the NLB, it listens on a specific port (e.g., port 80 for HTTP, port 443 for HTTPS) and forwards the request to an appropriate target group.
2. Target Groups: A target group is a set of EC2 instances, containers, or IP addresses that will receive the traffic forwarded by the NLB. You can configure health checks for each target group to monitor the health of your resources.
3. Target Registration: Targets (e.g., EC2 instances) need to be registered with the NLB. These targets can be in any available zone in the region, and the NLB will distribute traffic based on their health and availability.

Benefits:

- Fast performance: Designed for low latency and high throughput.
- Highly scalable: Can handle millions of requests per second.
- Fault tolerance: Automatically redirects traffic to healthy targets.
- Support for IP address-based routing: Retains the original IP of the client request.

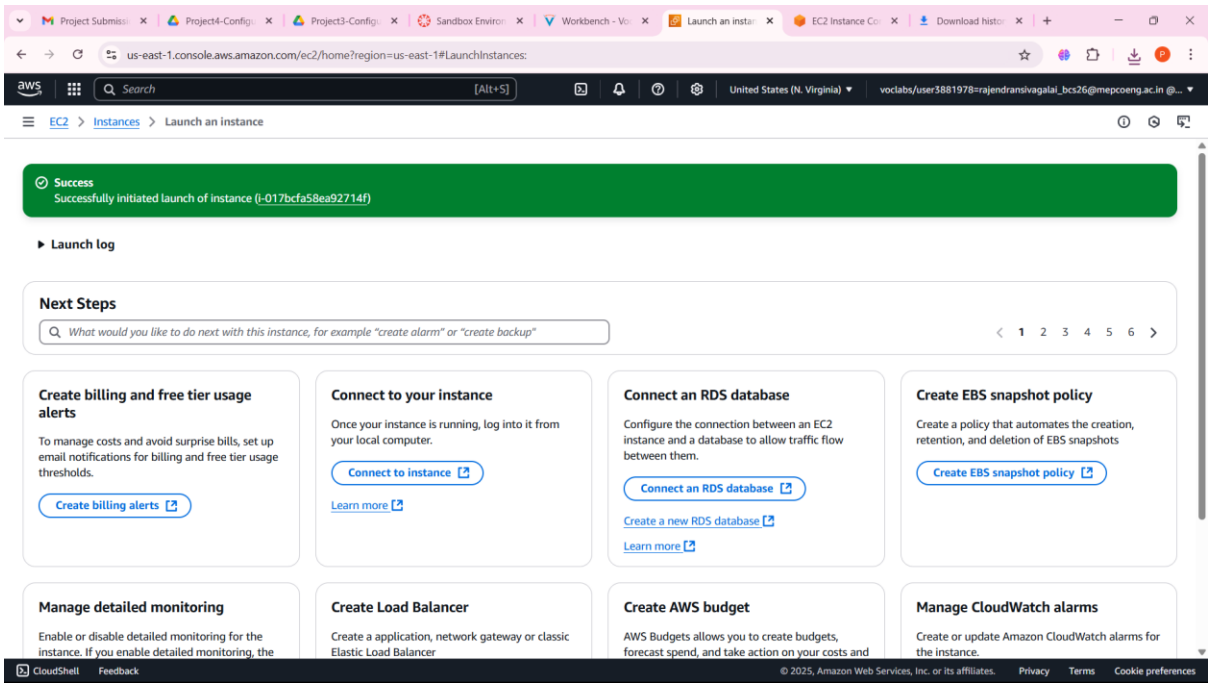
Topology

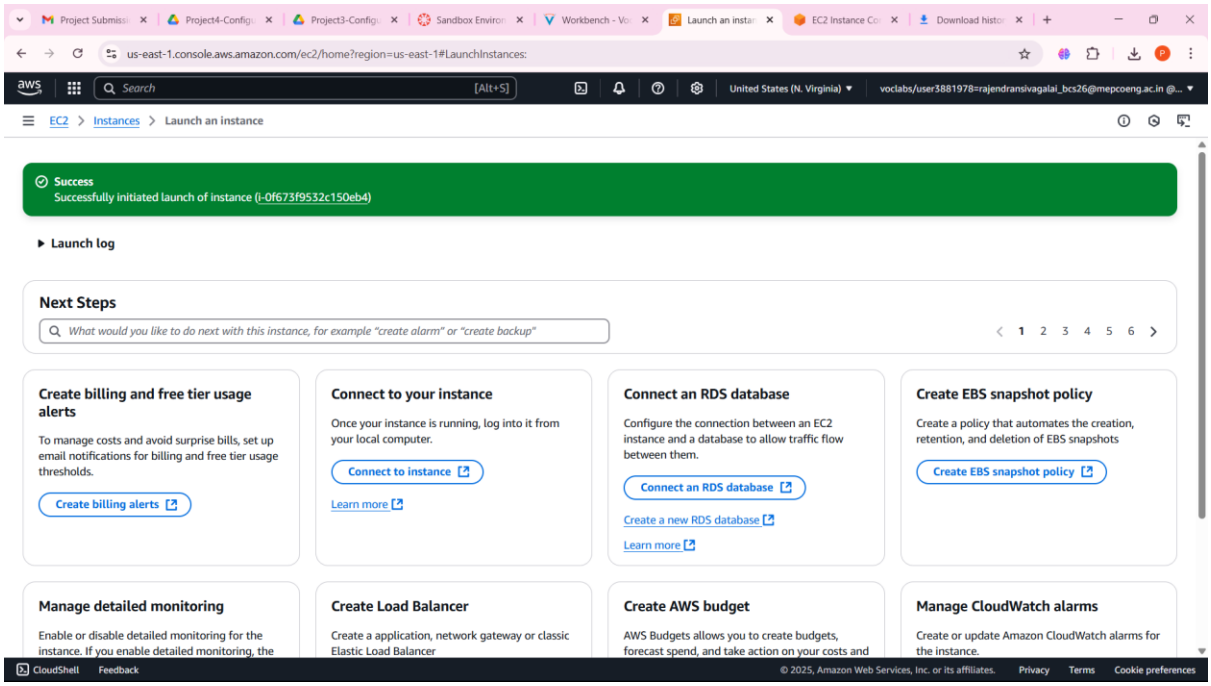
Configure High Availability with 3 Webservers using Network Load Balancer in AWS

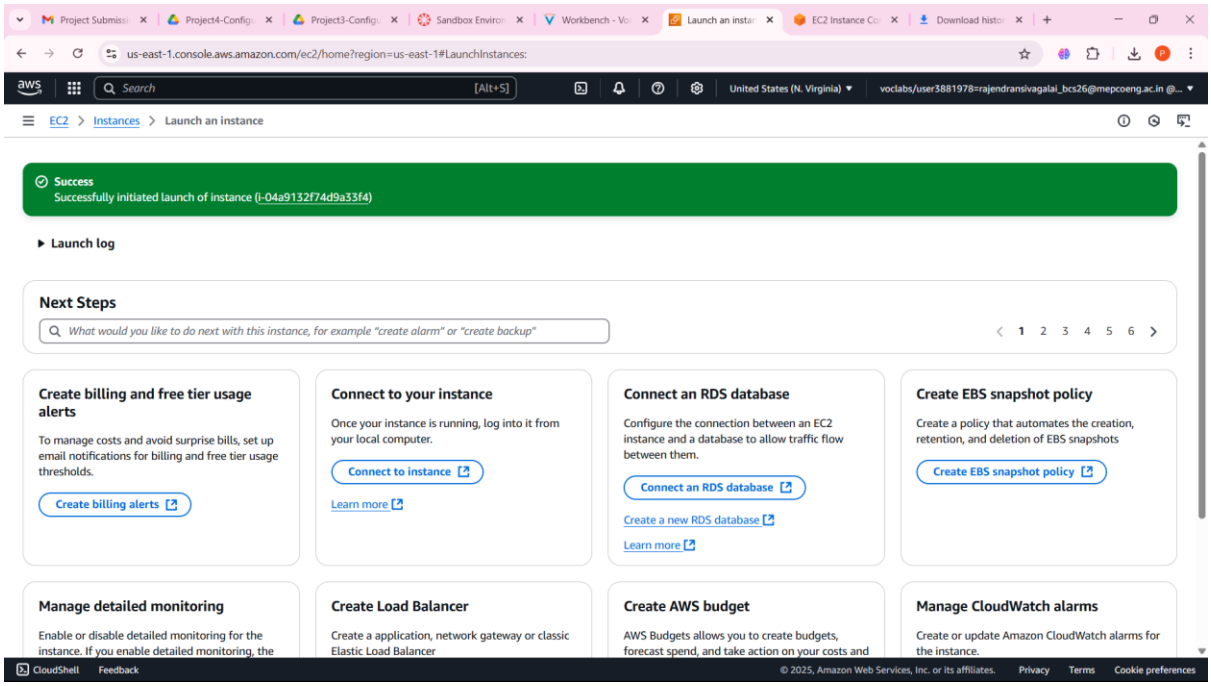


Execution Tasks:

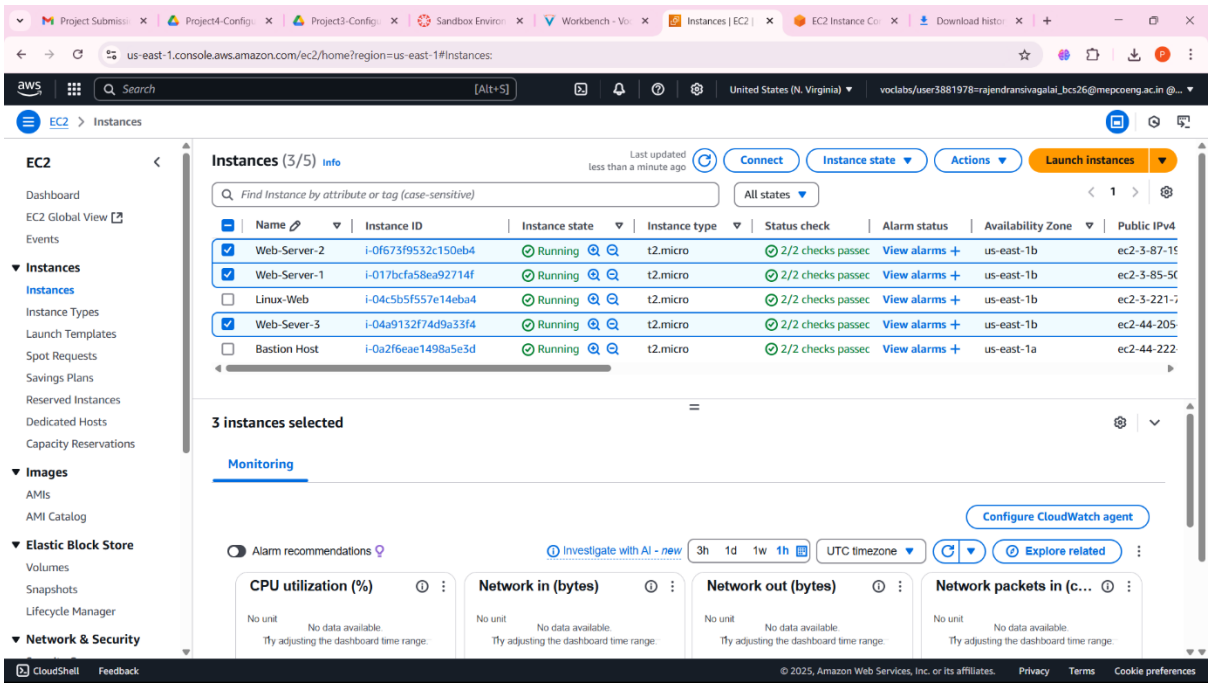
Step 1: Create three instances







Step 2: Verify Instances



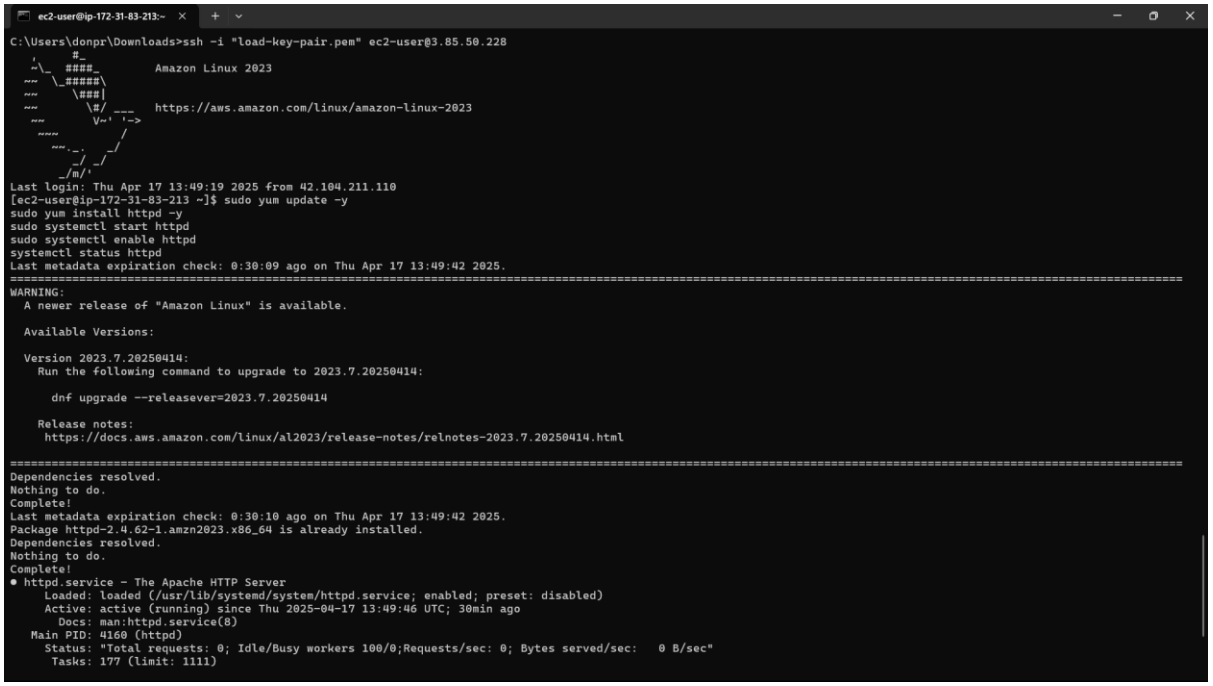
Step 3: Install Apache on Each Instance

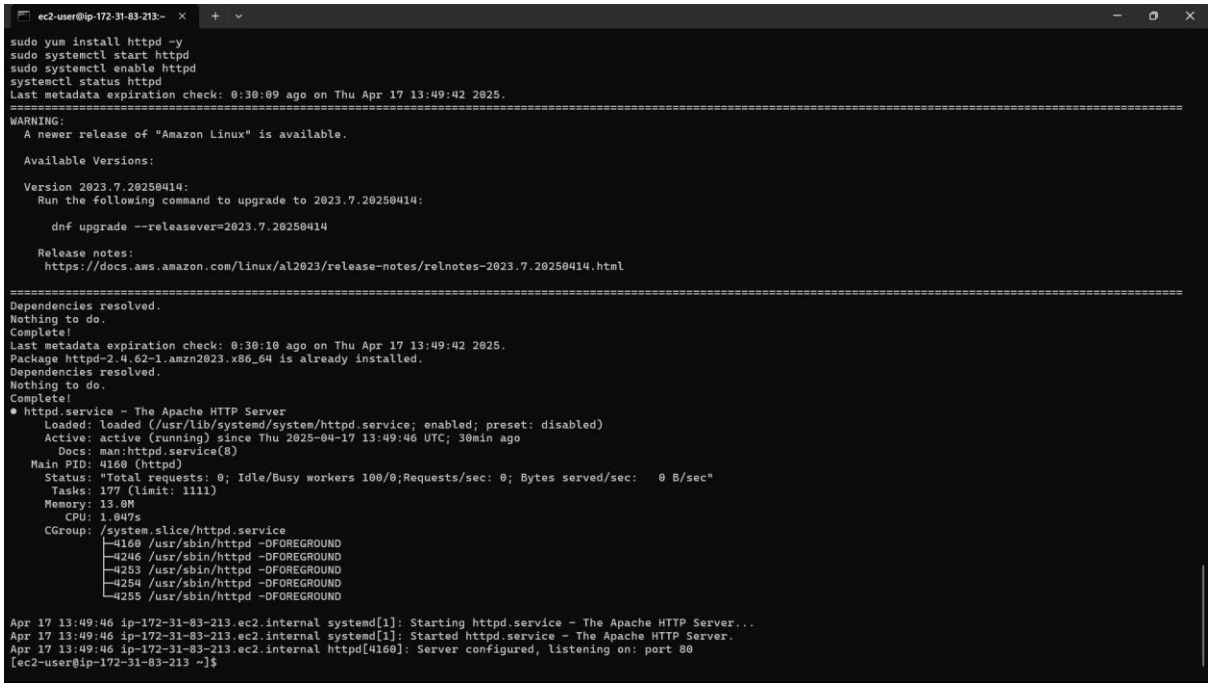
```
C:\Users\donpr\Downloads>ssh -i "my-key-pair (1).pem" ec2-user@3.91.247.206
   ,     #_
   ~\_  ####_        Amazon Linux 2023
  ~~  \_#####\
  ~~     \###|
  ~~       \#/ ___   https://aws.amazon.com/linux/amazon-linux-2023
   ~~       V~' '->
    ~~~         /
      ~~._.   _/
         _/ _/
       _/m/'
Last login: Thu Apr 17 13:00:38 2025 from 18.206.107.29
[ec2-user@ip-172-31-82-133 ~]$
[ec2-user@ip-172-31-82-133 ~]$ sudo yum update -ysudo yum update -y
usage: yum [-c [config file]] [-q] [-v] [--version] [--installroot [path]] [--nodocs] [--noplugins] [--enableplugin [plugin]] [--disableplugin [plugin]]
           [--releasever RELEASEVER] [--setopt SETOPTS] [--skip-broken] [-h] [--allowerasing] [-b | --nobest] [-C] [-R [minutes]] [-d [debug level]] [--debugsolver]
           [--showduplicates] [-e ERRORLEVEL] [--obsoletes] [--rpmverbosity [debug level name]] [-y] [--assumeno] [--enablerepo [repo]] [--disablerepo [repo] | --repo
           [repo]] [--enable | --disable] [-x [package]] [--disableexcludes [repo]] [--repofrompath [repo,path]] [--noautoremove] [--nogpgcheck] [--color COLOR]
           [--refresh] [-4] [-6] [--destdir DESTDIR] [--downloadonly] [--comment COMMENT] [--bugfix] [--enhancement] [--newpackage] [--security] [--advisory ADVISORY]
           [--bz BUGZILLA] [--cve CVES] [--sec-severity {Critical,Important,Moderate,Medium,Low}] [--forcearch ARCH]
Command line error: argument -y/--assumeyes: ignored explicit argument 'sudo'
[ec2-user@ip-172-31-82-133 ~]$ sudo yum update -y
Amazon Linux 2023 Kernel Livepatch repository                                                          146 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

====================================================================================================================================
Dependencies resolved.
Nothing to do.
Complete!
[ec2-user@ip-172-31-82-133 ~]$ sudo yum install httpd -y
Last metadata expiration check: 0:00:04 ago on Thu Apr 17 13:06:30 2025.
Dependencies resolved.
====================================================================================================================================
 Package                              Architecture            Version                                   Repository              Size
====================================================================================================================================
```

```
 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                                                            3.1 MB/s | 129 kB     00:00
(2/12): apr-util-openssl-1.6.3-1.amzn2023.0.1.x86_64.rpm                                               362 kB/s |  17 kB     00:00
(3/12): apr-util-1.6.3-1.amzn2023.0.1.x86_64.rpm                                                       1.6 MB/s |  98 kB     00:00
(4/12): generic-logos-httpd-18.0.0-12.amzn2023.0.3.noarch.rpm                                          879 kB/s |  19 kB     00:00
(5/12): httpd-2.4.62-1.amzn2023.x86_64.rpm                                                             2.2 MB/s |  48 kB     00:00
(6/12): httpd-filesystem-2.4.62-1.amzn2023.noarch.rpm                                                  647 kB/s |  14 kB     00:00
(7/12): httpd-tools-2.4.62-1.amzn2023.x86_64.rpm                                                       2.7 MB/s |  81 kB     00:00
(8/12): httpd-core-2.4.62-1.amzn2023.x86_64.rpm                                                         27 MB/s | 1.4 MB     00:00
(9/12): mailcap-2.1.49-3.amzn2023.0.3.noarch.rpm                                                       1.0 MB/s |  33 kB     00:00
(10/12): libbrotli-1.0.9-4.amzn2023.0.2.x86_64.rpm                                                     6.0 MB/s | 315 kB     00:00
(11/12): mod_http2-2.0.27-1.amzn2023.0.3.x86_64.rpm                                                    5.3 MB/s | 166 kB     00:00
(12/12): mod_lua-2.4.62-1.amzn2023.x86_64.rpm                                                          2.6 MB/s |  61 kB     00:00
------------------------------------------------------------------------------------------------------------------------------------
Total                                                                                                   11 MB/s | 2.3 MB     00:00
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing        :                                                                                                             1/1
  Installing       : apr-1.7.5-1.amzn2023.0.4.x86_64                                                                            1/12
  Installing       : apr-util-openssl-1.6.3-1.amzn2023.0.1.x86_64                                                               2/12
  Installing       : apr-util-1.6.3-1.amzn2023.0.1.x86_64                                                                       3/12
  Installing       : mailcap-2.1.49-3.amzn2023.0.3.noarch                                                                       4/12
  Installing       : httpd-tools-2.4.62-1.amzn2023.x86_64                                                                       5/12
  Installing       : libbrotli-1.0.9-4.amzn2023.0.2.x86_64                                                                      6/12
  Running scriptlet: httpd-filesystem-2.4.62-1.amzn2023.noarch                                                                  7/12
  Installing       : httpd-filesystem-2.4.62-1.amzn2023.noarch                                                                  7/12
```

```
C:\Windows\System32\cmd.e

  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!
[ec2-user@ip-172-31-82-133 ~]$ sudo systemctl enable httpd
Created symlink /etc/systemd/system/multi-user.target.wants/httpd.service → /usr/lib/systemd/system/httpd.service.
[ec2-user@ip-172-31-82-133 ~]$ systemctl status httpd
○ httpd.service - The Apache HTTP Server
     Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; preset: disabled)
     Active: inactive (dead)
       Docs: man:httpd.service(8)
[ec2-user@ip-172-31-82-133 ~]$ curl http://localhost
curl: (7) Failed to connect to localhost port 80 after 0 ms: Couldn't connect to server
[ec2-user@ip-172-31-82-133 ~]$ sudo useradd -m sftpuser
sudo passwd sftpuser
Changing password for user sftpuser.
New password:
[ec2-user@ip-172-31-82-133 ~]$ sudo useradd -m sftpuser
useradd: user 'sftpuser' already exists
[ec2-user@ip-172-31-82-133 ~]$ sudo passwd sftpuser
Changing password for user sftpuser.
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
[ec2-user@ip-172-31-82-133 ~]$ sudo mkdir -p /home/sftpuser/.ssh
sudo touch /home/sftpuser/.ssh/authorized_keys\
> ^C
[ec2-user@ip-172-31-82-133 ~]$ sudo mkdir -p /home/sftpuser/.ssh
sudo touch /home/sftpuser/.ssh/authorized_keys
[ec2-user@ip-172-31-82-133 ~]$ ssh-keygen -t rsa -b 4096
Generating public/private rsa key pair.
Enter file in which to save the key (/home/ec2-user/.ssh/id_rsa): C:\Users\YourName\.ssh\id_rsa.pub^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[
D^[[D^C
```

```
C:\Windows\System32\cmd.e

     Active: inactive (dead)
       Docs: man:httpd.service(8)
[ec2-user@ip-172-31-82-133 ~]$ curl http://localhost
curl: (7) Failed to connect to localhost port 80 after 0 ms: Couldn't connect to server
[ec2-user@ip-172-31-82-133 ~]$ sudo useradd -m sftpuser
sudo passwd sftpuser
Changing password for user sftpuser.
New password:
[ec2-user@ip-172-31-82-133 ~]$ sudo useradd -m sftpuser
useradd: user 'sftpuser' already exists
[ec2-user@ip-172-31-82-133 ~]$ sudo passwd sftpuser
Changing password for user sftpuser.
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
[ec2-user@ip-172-31-82-133 ~]$ sudo mkdir -p /home/sftpuser/.ssh
sudo touch /home/sftpuser/.ssh/authorized_keys\
> ^C
[ec2-user@ip-172-31-82-133 ~]$ sudo mkdir -p /home/sftpuser/.ssh
sudo touch /home/sftpuser/.ssh/authorized_keys
[ec2-user@ip-172-31-82-133 ~]$ ssh-keygen -t rsa -b 4096
Generating public/private rsa key pair.
Enter file in which to save the key (/home/ec2-user/.ssh/id_rsa): C:\Users\YourName\.ssh\id_rsa.pub^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[D^[[
D^[[D^C
[ec2-user@ip-172-31-82-133 ~]$ ssh-keygen -t rsa -b 4096
Generating public/private rsa key pair.
Enter file in which to save the key (/home/ec2-user/.ssh/id_rsa): C:\Users\donpr\.ssh\id_rsa.pub
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in C:\Users\donpr\.ssh\id_rsa.pub
Your public key has been saved in C:\Users\donpr\.ssh\id_rsa.pub.pub
The key fingerprint is:
SHA256:1CTqUMRI1OsAsHgq9iTp9lfE7U3MH58bjlEbi863d90 ec2-user@ip-172-31-82-133.ec2.internal
The key's randomart image is:
+---[RSA 4096]----+
|.. oo=o . .      |
|... ..o. +       |
|o ... o.o +      |
| o. .o.+ . + . o |
|o+ . oo S o . = =|
|+ +   .. . . + * |
| o .  .     o + =|
|. .  .       + +E|
|   ..          ..+|
+----[SHA256]-----+
[ec2-user@ip-172-31-82-133 ~]$ client_loop: send disconnect: Connection reset

C:\Users\donpr\Downloads>
```


ec2-user@ip-172-31-83-213:~
C:\Users\donpr\Downloads>ssh -i "load-key-pair.pem" ec2-user@3.85.50.228
Amazon Linux 2023
https://aws.amazon.com/linux/amazon-linux-2023
Last login: Thu Apr 17 13:49:19 2025 from 42.104.211.110
[ec2-user@ip-172-31-83-213 ~]$ sudo yum update -y
sudo yum install httpd -y
sudo systemctl start httpd
sudo systemctl enable httpd
systemctl status httpd
Last metadata expiration check: 0:30:09 ago on Thu Apr 17 13:49:42 2025.
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
Dependencies resolved.
Nothing to do.
Complete!
Last metadata expiration check: 0:30:10 ago on Thu Apr 17 13:49:42 2025.
Package httpd-2.4.62-1.amzn2023.x86_64 is already installed.
Dependencies resolved.
Nothing to do.
Complete!
● 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 13:49:46 UTC; 30min ago
Docs: man:httpd.service(8)
Main PID: 4160 (httpd)
Status: "Total requests: 0; Idle/Busy workers 100/0;Requests/sec: 0; Bytes served/sec: 0 B/sec"
Tasks: 177 (limit: 1111)


ec2-user@ip-172-31-83-213:~
sudo yum install httpd -y
sudo systemctl start httpd
sudo systemctl enable httpd
systemctl status httpd
Last metadata expiration check: 0:30:09 ago on Thu Apr 17 13:49:42 2025.
WARNING:
A newer release of "Amazon Linux" is available.
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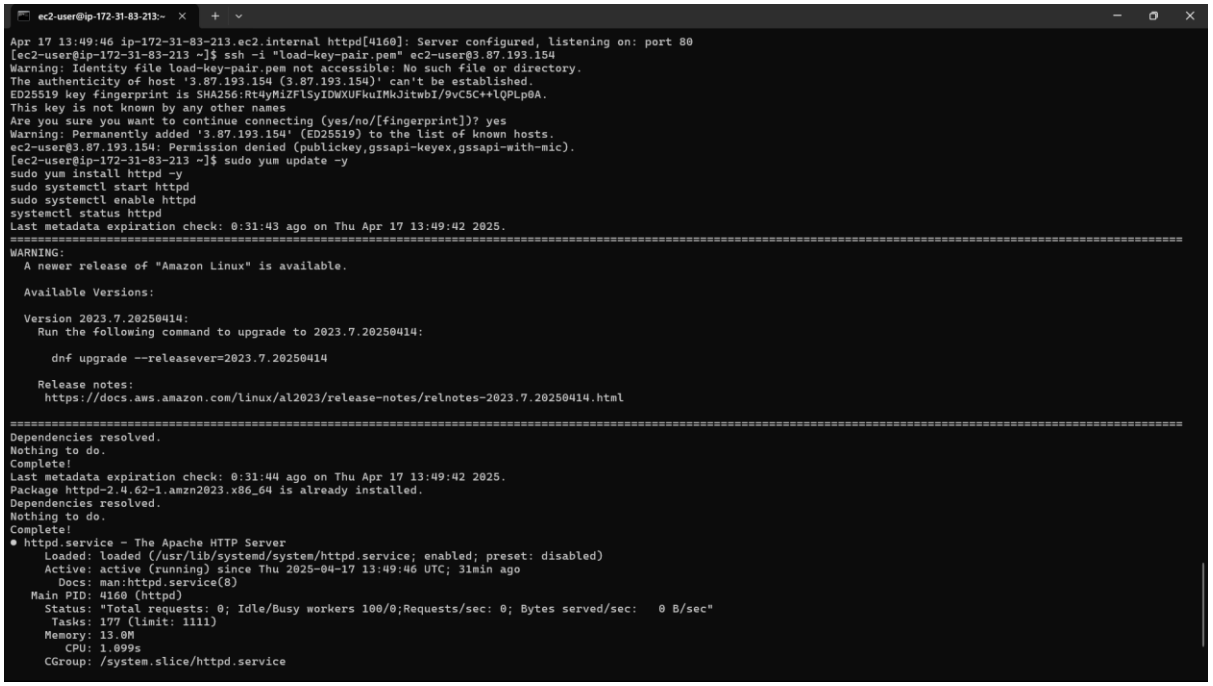
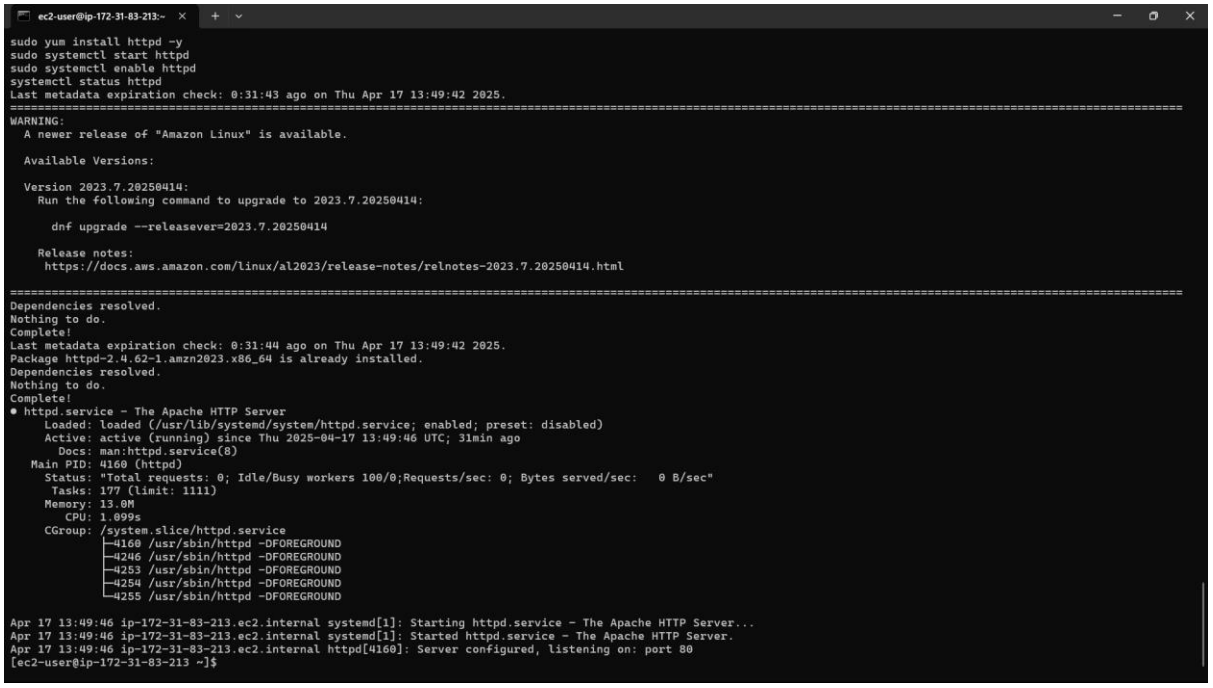
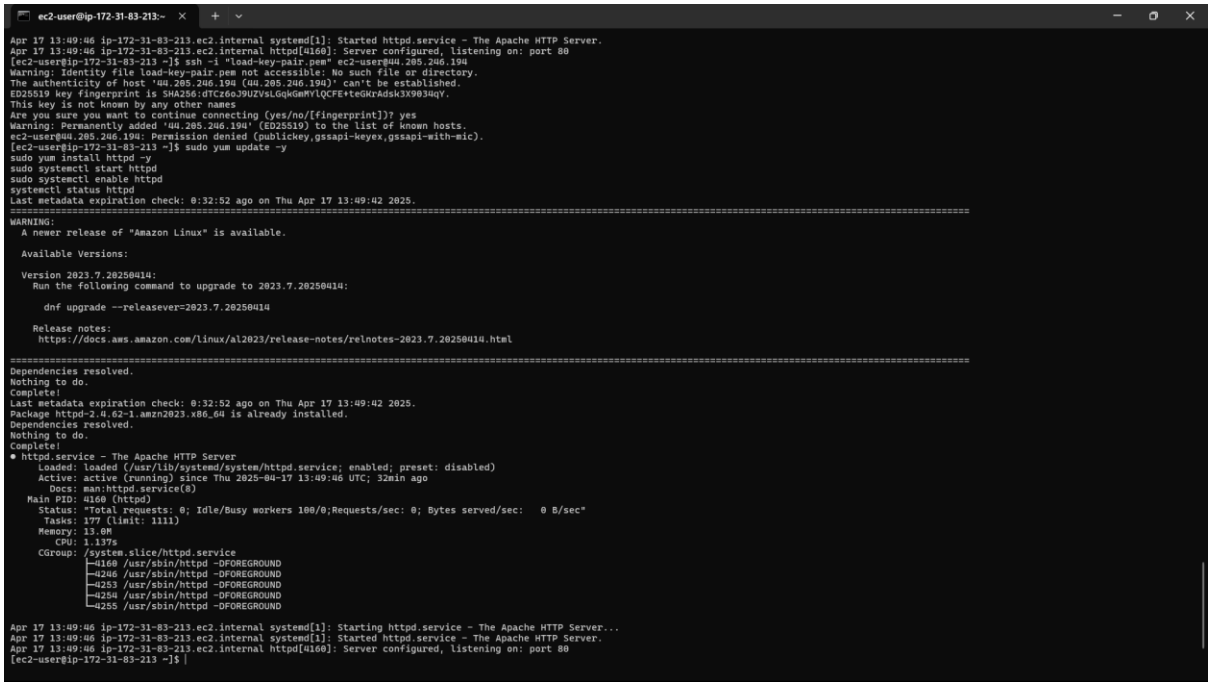
Release notes:
https://docs.aws.amazon.com/linux/al2023/release-notes/relnotes-2023.7.20250414.html
Dependencies resolved.
Nothing to do.
Complete!
Last metadata expiration check: 0:30:10 ago on Thu Apr 17 13:49:42 2025.
Package httpd-2.4.62-1.amzn2023.x86_64 is already installed.
Dependencies resolved.
Nothing to do.
Complete!
● 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 13:49:46 UTC; 30min ago
Docs: man:httpd.service(8)
Main PID: 4160 (httpd)
Status: "Total requests: 0; Idle/Busy workers 100/0;Requests/sec: 0; Bytes served/sec: 0 B/sec"
Tasks: 177 (limit: 1111)
Memory: 13.0M
CPU: 1.047s
CGroup: /system.slice/httpd.service
├─4160 /usr/sbin/httpd -DFOREGROUND
├─4246 /usr/sbin/httpd -DFOREGROUND
├─4253 /usr/sbin/httpd -DFOREGROUND
├─4254 /usr/sbin/httpd -DFOREGROUND
└─4255 /usr/sbin/httpd -DFOREGROUND
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal systemd[1]: Starting httpd.service - The Apache HTTP Server...
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal systemd[1]: Started httpd.service - The Apache HTTP Server.
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal httpd[4160]: Server configured, listening on: port 80
[ec2-user@ip-172-31-83-213 ~]$

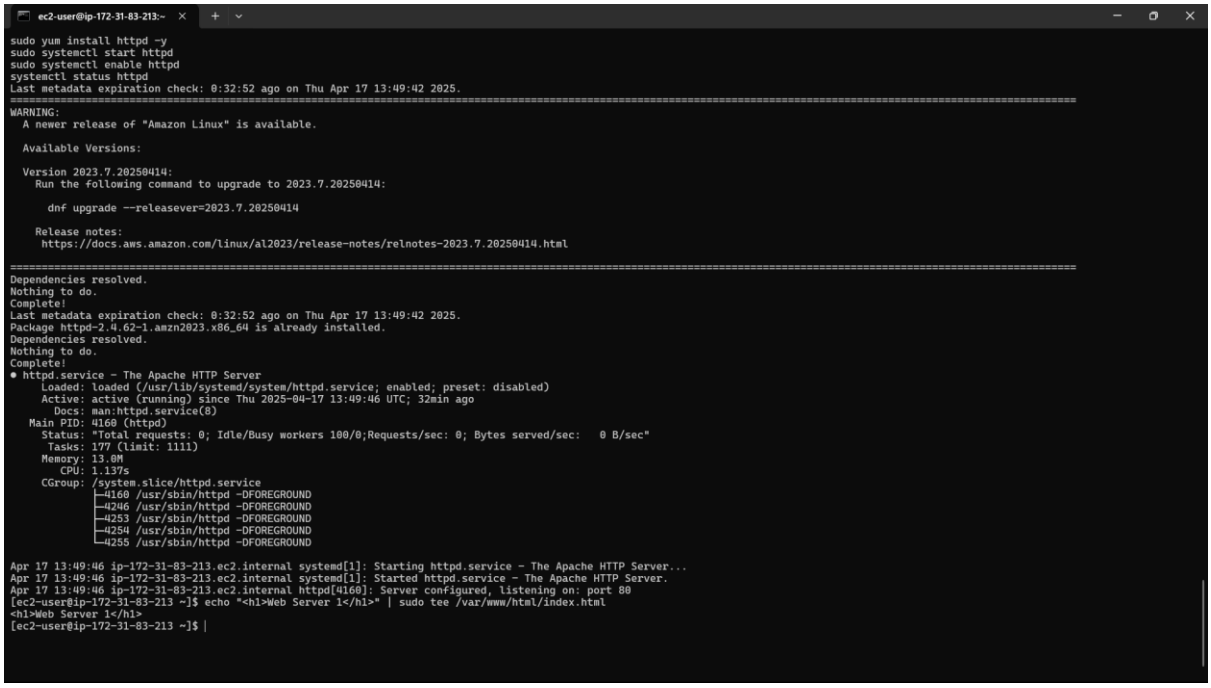


```
ec2-user@ip-172-31-83-213:~
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal httpd[4160]: Server configured, listening on: port 80
[ec2-user@ip-172-31-83-213 ~]$ ssh -i "load-key-pair.pem" ec2-user@3.87.193.154
Warning: Identity file load-key-pair.pem not accessible: No such file or directory.
The authenticity of host '3.87.193.154 (3.87.193.154)' can't be established.
ED25519 key fingerprint is SHA256:Rt4yMiZFlSyIDWXUFkuIMkJitwbI/9vC5C++lQPLp0A.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '3.87.193.154' (ED25519) to the list of known hosts.
ec2-user@3.87.193.154: Permission denied (publickey,gssapi-keyex,gssapi-with-mic).
[ec2-user@ip-172-31-83-213 ~]$ sudo yum update -y
sudo yum install httpd -y
sudo systemctl start httpd
sudo systemctl enable httpd
systemctl status httpd
Last metadata expiration check: 0:31:43 ago on Thu Apr 17 13:49:42 2025.
================================================================================================================================================================
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

================================================================================================================================================================
Dependencies resolved.
Nothing to do.
Complete!
Last metadata expiration check: 0:31:44 ago on Thu Apr 17 13:49:42 2025.
Package httpd-2.4.62-1.amzn2023.x86_64 is already installed.
Dependencies resolved.
Nothing to do.
Complete!
● 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 13:49:46 UTC; 31min ago
       Docs: man:httpd.service(8)
   Main PID: 4160 (httpd)
     Status: "Total requests: 0; Idle/Busy workers 100/0;Requests/sec: 0; Bytes served/sec:   0 B/sec"
      Tasks: 177 (limit: 1111)
     Memory: 13.0M
        CPU: 1.099s
     CGroup: /system.slice/httpd.service
```

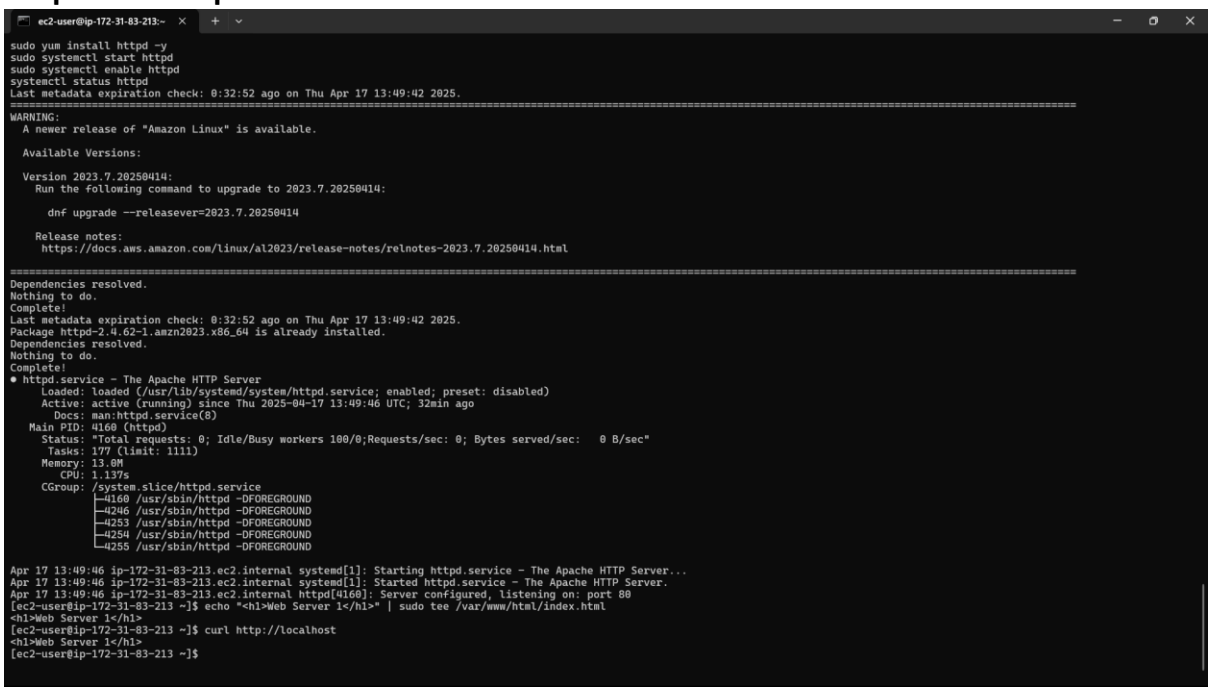


```
ec2-user@ip-172-31-83-213:~
sudo yum install httpd -y
sudo systemctl start httpd
sudo systemctl enable httpd
systemctl status httpd
Last metadata expiration check: 0:31:43 ago on Thu Apr 17 13:49:42 2025.
================================================================================================================================================================
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

================================================================================================================================================================
Dependencies resolved.
Nothing to do.
Complete!
Last metadata expiration check: 0:31:44 ago on Thu Apr 17 13:49:42 2025.
Package httpd-2.4.62-1.amzn2023.x86_64 is already installed.
Dependencies resolved.
Nothing to do.
Complete!
● 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 13:49:46 UTC; 31min ago
       Docs: man:httpd.service(8)
   Main PID: 4160 (httpd)
     Status: "Total requests: 0; Idle/Busy workers 100/0;Requests/sec: 0; Bytes served/sec:   0 B/sec"
      Tasks: 177 (limit: 1111)
     Memory: 13.0M
        CPU: 1.099s
     CGroup: /system.slice/httpd.service
             ├─4160 /usr/sbin/httpd -DFOREGROUND
             ├─4246 /usr/sbin/httpd -DFOREGROUND
             ├─4253 /usr/sbin/httpd -DFOREGROUND
             ├─4254 /usr/sbin/httpd -DFOREGROUND
             └─4255 /usr/sbin/httpd -DFOREGROUND

Apr 17 13:49:46 ip-172-31-83-213.ec2.internal systemd[1]: Starting httpd.service - The Apache HTTP Server...
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal systemd[1]: Started httpd.service - The Apache HTTP Server.
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal httpd[4160]: Server configured, listening on: port 80
[ec2-user@ip-172-31-83-213 ~]$
```

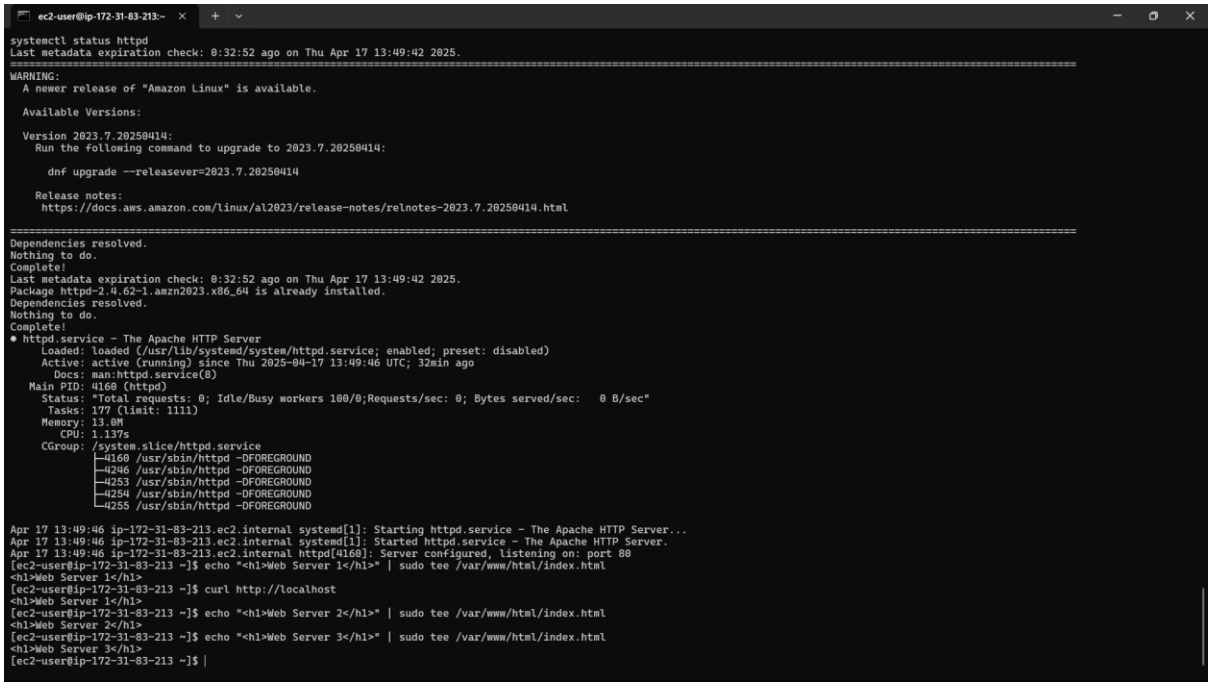

ec2-user@ip-172-31-83-213:~
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal systemd[1]: Started httpd.service - The Apache HTTP Server.
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal httpd[4160]: Server configured, listening on: port 80
[ec2-user@ip-172-31-83-213 ~]$ ssh -i "load-key-pair.pem" ec2-user@44.205.246.194
Warning: Identity file load-key-pair.pem not accessible: No such file or directory.
The authenticity of host '44.205.246.194 (44.205.246.194)' can't be established.
ED25519 key fingerprint is SHA256:dTCz6oJ9UZVsLGqkGmMYlQCFE+teGKrAdsk3X9034qY.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '44.205.246.194' (ED25519) to the list of known hosts.
ec2-user@44.205.246.194: Permission denied (publickey,gssapi-keyex,gssapi-with-mic).
[ec2-user@ip-172-31-83-213 ~]$ sudo yum update -y
sudo yum install httpd -y
sudo systemctl start httpd
sudo systemctl enable httpd
systemctl status httpd
Last metadata expiration check: 0:32:52 ago on Thu Apr 17 13:49:42 2025.
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
Dependencies resolved.
Nothing to do.
Complete!
Last metadata expiration check: 0:32:52 ago on Thu Apr 17 13:49:42 2025.
Package httpd-2.4.62-1.amzn2023.x86_64 is already installed.
Dependencies resolved.
Nothing to do.
Complete!
● 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 13:49:46 UTC; 32min ago
Docs: man:httpd.service(8)
Main PID: 4160 (httpd)
Status: "Total requests: 0; Idle/Busy workers 100/0;Requests/sec: 0; Bytes served/sec: 0 B/sec"
Tasks: 177 (limit: 1111)
Memory: 13.0M
CPU: 1.137s
CGroup: /system.slice/httpd.service
├─4160 /usr/sbin/httpd -DFOREGROUND
├─4246 /usr/sbin/httpd -DFOREGROUND
├─4253 /usr/sbin/httpd -DFOREGROUND
├─4254 /usr/sbin/httpd -DFOREGROUND
└─4255 /usr/sbin/httpd -DFOREGROUND
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal systemd[1]: Starting httpd.service - The Apache HTTP Server...
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal systemd[1]: Started httpd.service - The Apache HTTP Server.
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal httpd[4160]: Server configured, listening on: port 80
[ec2-user@ip-172-31-83-213 ~]$

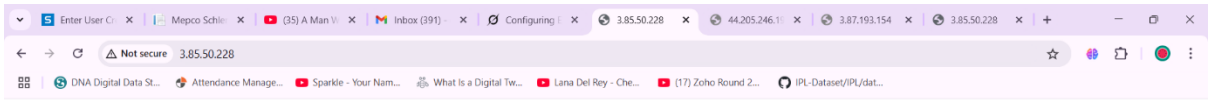

ec2-user@ip-172-31-83-213:~
sudo yum install httpd -y
sudo systemctl start httpd
sudo systemctl enable httpd
systemctl status httpd
Last metadata expiration check: 0:32:52 ago on Thu Apr 17 13:49:42 2025.
WARNING:
A newer release of "Amazon Linux" is available.
Available Versions:
Version 2023.7.20250414:
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
Dependencies resolved.
Nothing to do.
Complete!
Last metadata expiration check: 0:32:52 ago on Thu Apr 17 13:49:42 2025.
Package httpd-2.4.62-1.amzn2023.x86_64 is already installed.
Dependencies resolved.
Nothing to do.
Complete!
● 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 13:49:46 UTC; 32min ago
Docs: man:httpd.service(8)
Main PID: 4160 (httpd)
Status: "Total requests: 0; Idle/Busy workers 100/0;Requests/sec: 0; Bytes served/sec: 0 B/sec"
Tasks: 177 (limit: 1111)
Memory: 13.0M
CPU: 1.137s
CGroup: /system.slice/httpd.service
├─4160 /usr/sbin/httpd -DFOREGROUND
├─4246 /usr/sbin/httpd -DFOREGROUND
├─4253 /usr/sbin/httpd -DFOREGROUND
├─4254 /usr/sbin/httpd -DFOREGROUND
└─4255 /usr/sbin/httpd -DFOREGROUND
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal systemd[1]: Starting httpd.service - The Apache HTTP Server...
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal systemd[1]: Started httpd.service - The Apache HTTP Server.
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal httpd[4160]: Server configured, listening on: port 80
[ec2-user@ip-172-31-83-213 ~]$ echo "<h1>Web Server 1</h1>" | sudo tee /var/www/html/index.html
<h1>Web Server 1</h1>
[ec2-user@ip-172-31-83-213 ~]$

Step 4 :Test Apache

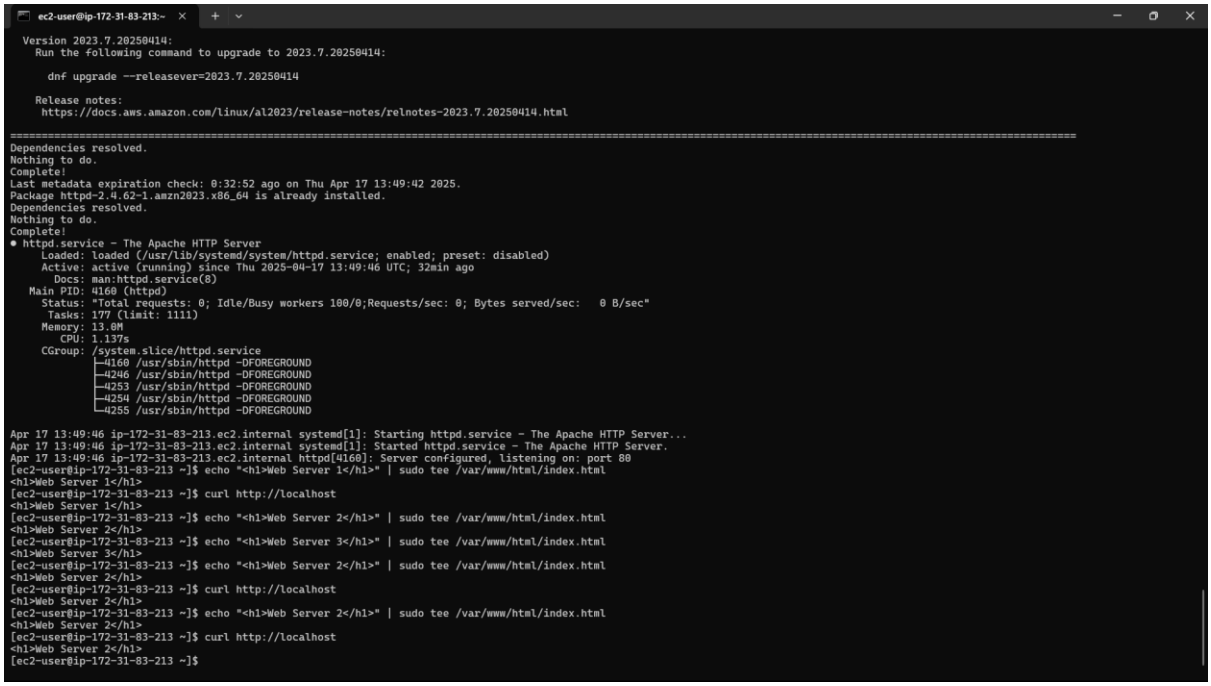


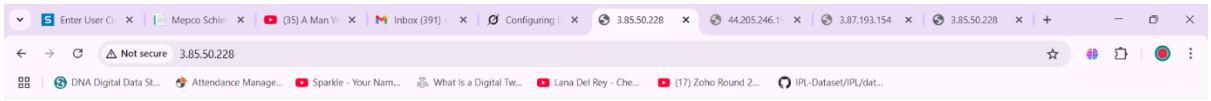
Web Server 1


ec2-user@ip-172-31-83-213:~
systemctl status httpd
Last metadata expiration check: 0:32:52 ago on Thu Apr 17 13:49:42 2025.
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
Dependencies resolved.
Nothing to do.
Complete!
Last metadata expiration check: 0:32:52 ago on Thu Apr 17 13:49:42 2025.
Package httpd-2.4.62-1.amzn2023.x86_64 is already installed.
Dependencies resolved.
Nothing to do.
Complete!
● 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 13:49:46 UTC; 32min ago
Docs: man:httpd.service(8)
Main PID: 4160 (httpd)
Status: "Total requests: 0; Idle/Busy workers 100/0;Requests/sec: 0; Bytes served/sec: 0 B/sec"
Tasks: 177 (limit: 1111)
Memory: 13.0M
CPU: 1.137s
CGroup: /system.slice/httpd.service
├─4160 /usr/sbin/httpd -DFOREGROUND
├─4246 /usr/sbin/httpd -DFOREGROUND
├─4253 /usr/sbin/httpd -DFOREGROUND
├─4254 /usr/sbin/httpd -DFOREGROUND
└─4255 /usr/sbin/httpd -DFOREGROUND
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal systemd[1]: Starting httpd.service - The Apache HTTP Server...
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal systemd[1]: Started httpd.service - The Apache HTTP Server.
Apr 17 13:49:46 ip-172-31-83-213.ec2.internal httpd[4160]: Server configured, listening on: port 80
[ec2-user@ip-172-31-83-213 ~]$ echo "<h1>Web Server 1</h1>" | sudo tee /var/www/html/index.html
<h1>Web Server 1</h1>
[ec2-user@ip-172-31-83-213 ~]$ curl http://localhost
<h1>Web Server 1</h1>
[ec2-user@ip-172-31-83-213 ~]$ echo "<h1>Web Server 2</h1>" | sudo tee /var/www/html/index.html
<h1>Web Server 2</h1>
[ec2-user@ip-172-31-83-213 ~]$ echo "<h1>Web Server 3</h1>" | sudo tee /var/www/html/index.html
<h1>Web Server 3</h1>
[ec2-user@ip-172-31-83-213 ~]$


Not secure
3.85.50.228

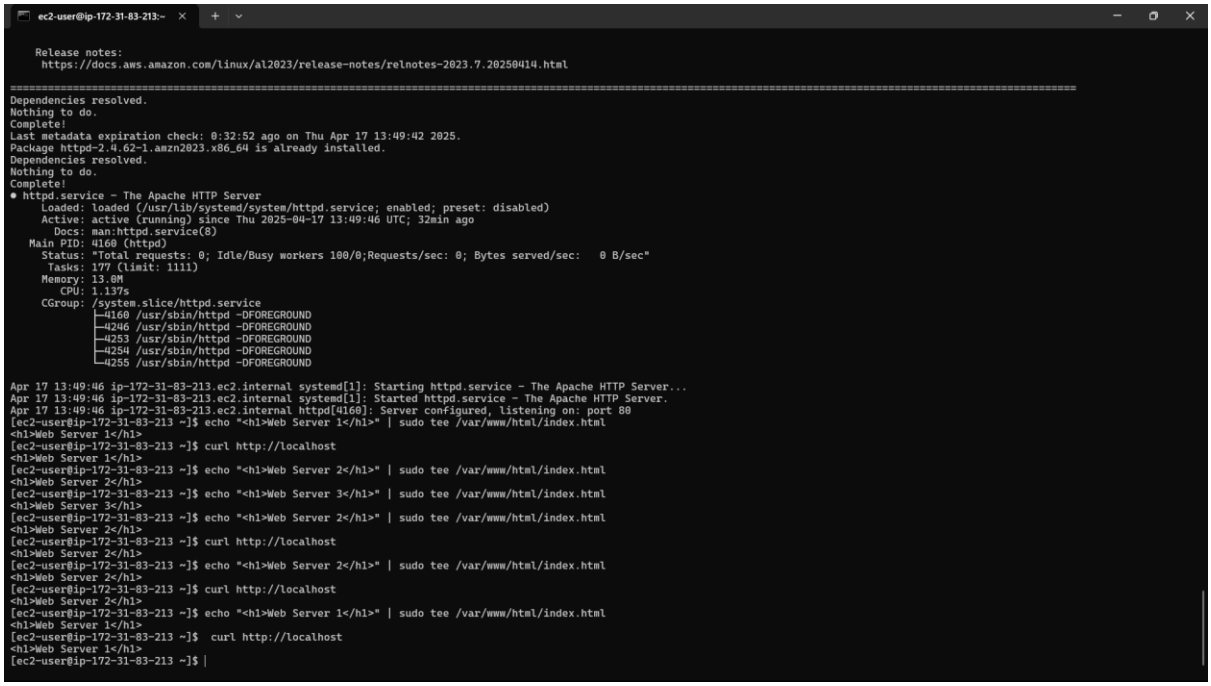
Web Server 2



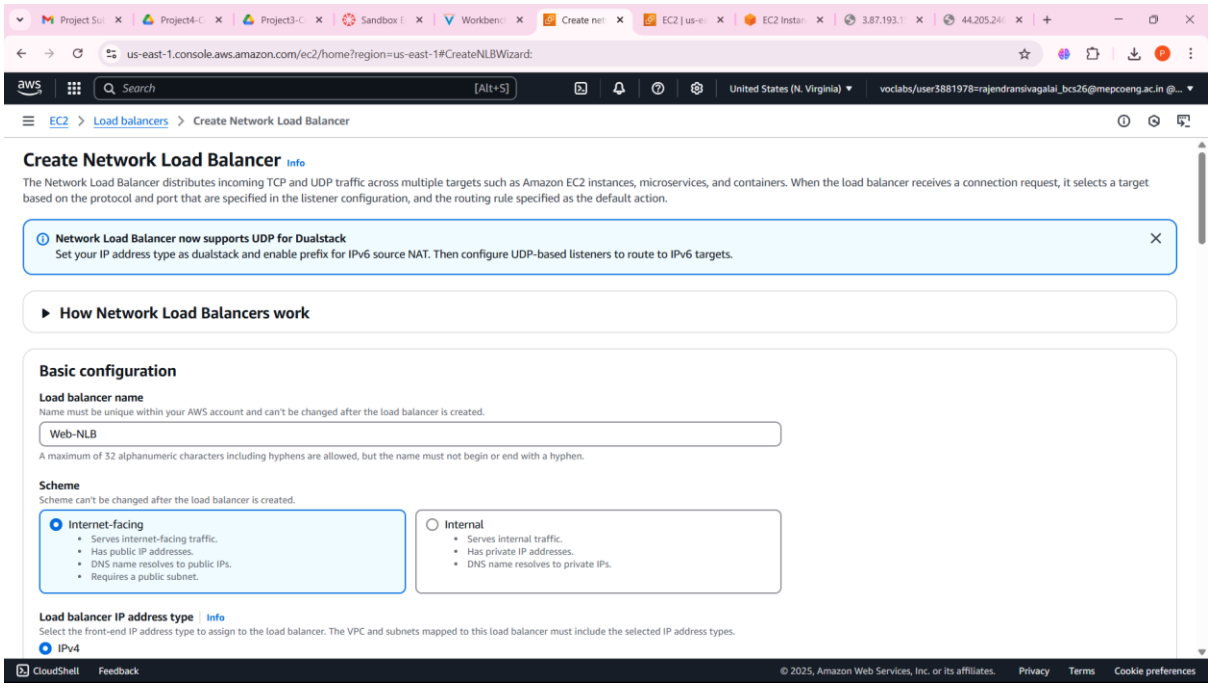


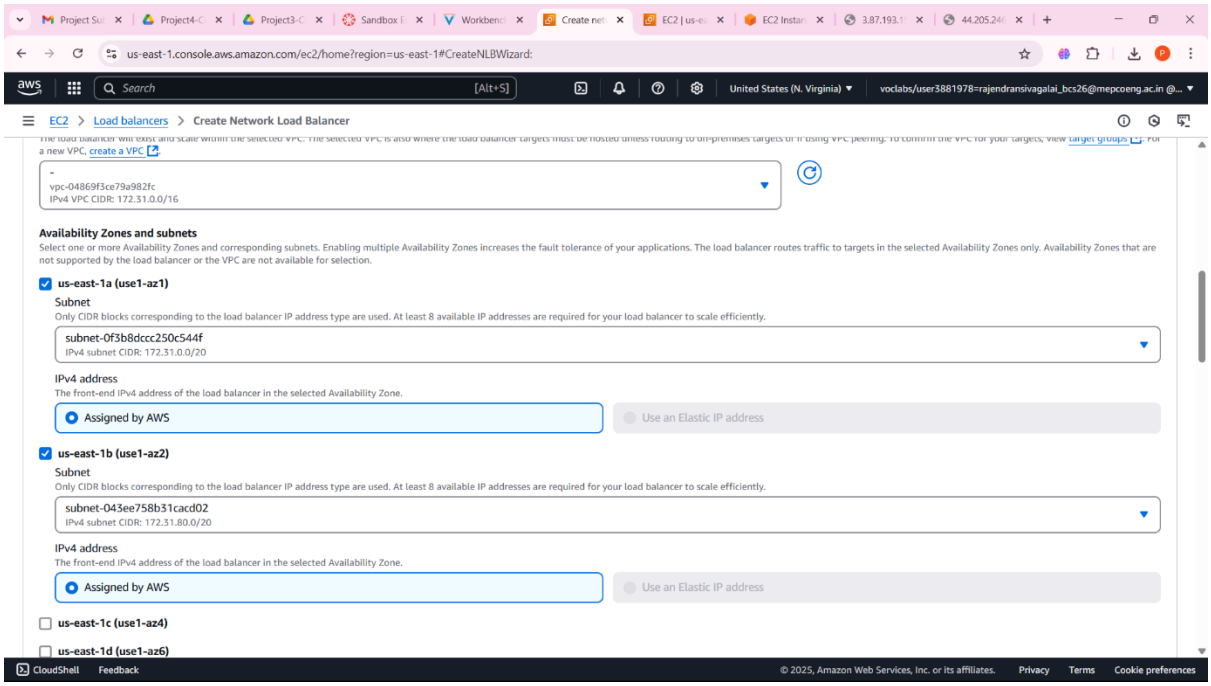
Web Server 1

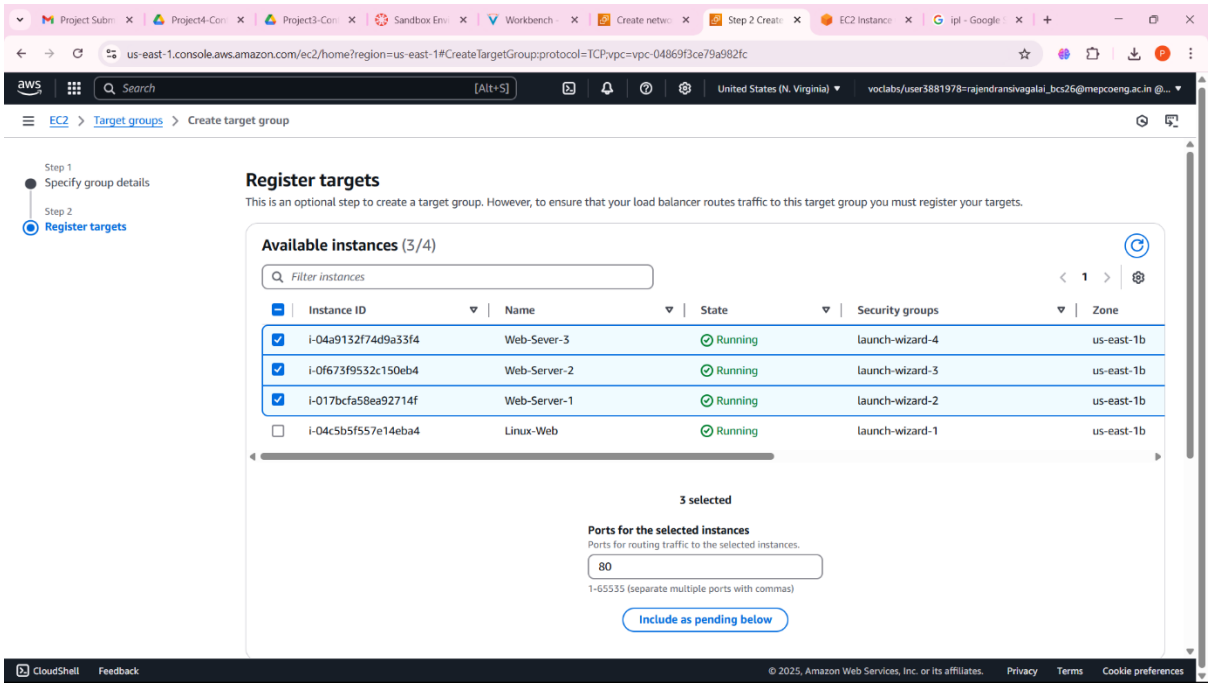
Step 5: Repeat for Web-Server-2 and Web-Server-3:

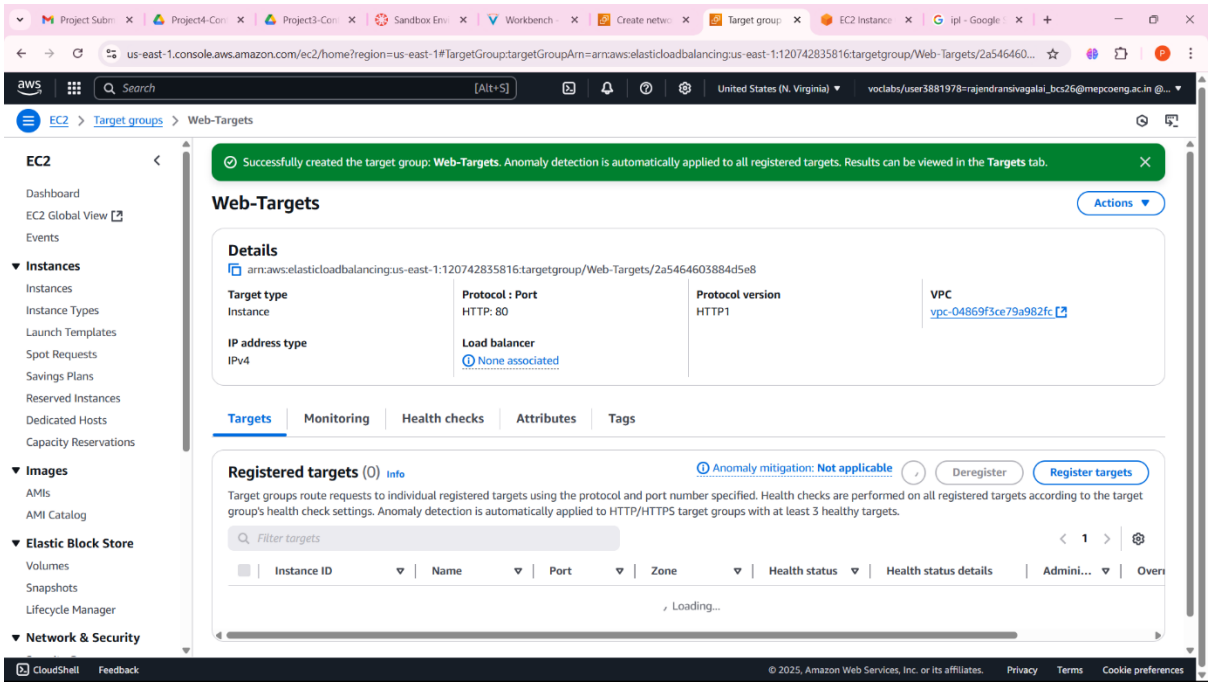


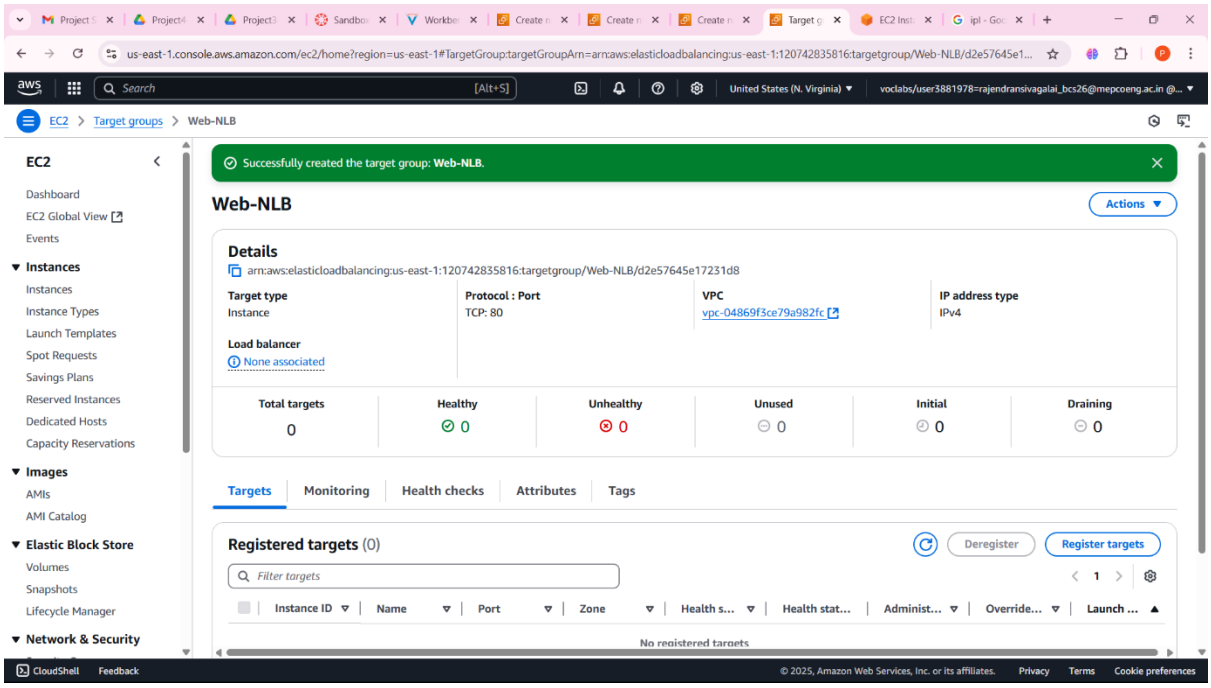
Step 6: Configure Network Load Balancer

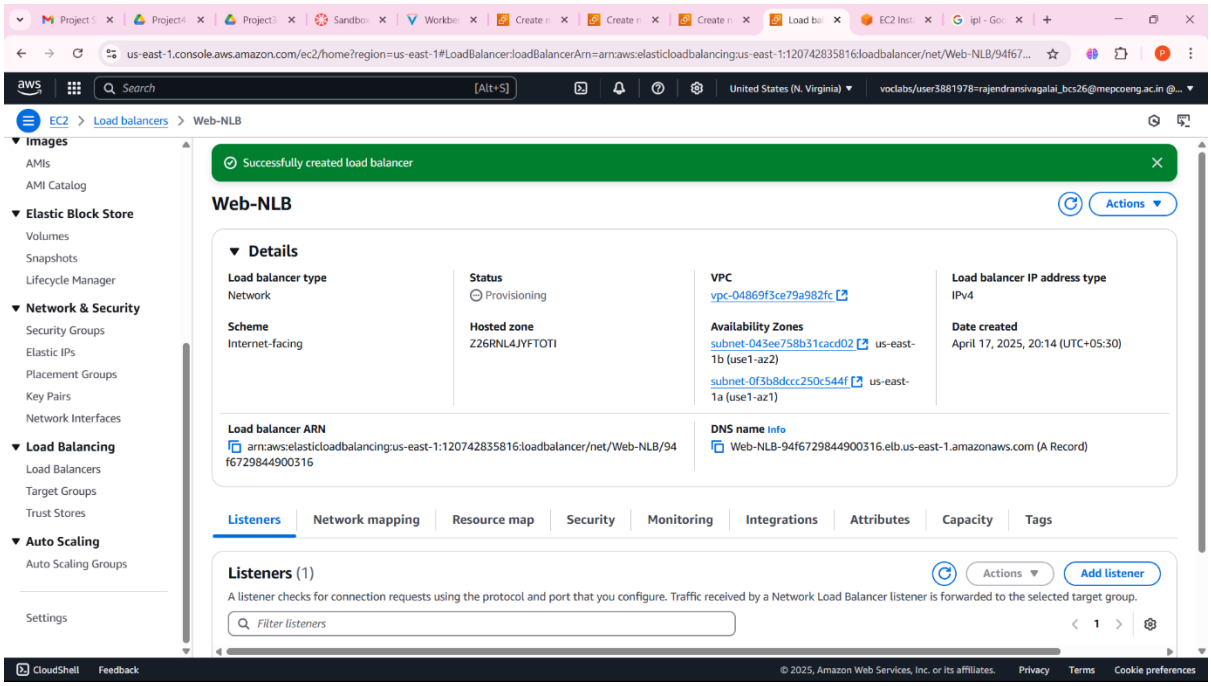



us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#CreateNLBWizard:
EC2 > Load balancers > Create Network Load Balancer
vpc-04869f3ce79a982fc
IPv4 VPC CIDR: 172.31.0.0/16
Availability Zones and subnets
Select one or more Availability Zones and corresponding subnets. Enabling multiple Availability Zones increases the fault tolerance of your applications. The load balancer routes traffic to targets in the selected Availability Zones only. Availability Zones that are not supported by the load balancer or the VPC are not available for selection.
us-east-1a (use1-az1)
Subnet
Only CIDR blocks corresponding to the load balancer IP address type are used. At least 8 available IP addresses are required for your load balancer to scale efficiently.
subnet-0f3b8dccc250c544f
IPv4 subnet CIDR: 172.31.0.0/20
IPv4 address
The front-end IPv4 address of the load balancer in the selected Availability Zone.
Assigned by AWS
Use an Elastic IP address
us-east-1b (use1-az2)
Subnet
Only CIDR blocks corresponding to the load balancer IP address type are used. At least 8 available IP addresses are required for your load balancer to scale efficiently.
subnet-043ee758b31cacd02
IPv4 subnet CIDR: 172.31.80.0/20
IPv4 address
The front-end IPv4 address of the load balancer in the selected Availability Zone.
Assigned by AWS
Use an Elastic IP address
us-east-1c (use1-az4)
us-east-1d (use1-az6)
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#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


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
Loading...


Successfully created the target group: Web-NLB.
Web-NLB
Actions
Details
arn:aws:elasticloadbalancing:us-east-1:120742835816:targetgroup/Web-NLB/d2e57645e17231d8
Target type
Instance
Protocol : Port
TCP: 80
VPC
vpc-04869f3ce79a982fc
IP address type
IPv4
Load balancer
None associated
Total targets
0
Healthy
0
Unhealthy
0
Unused
0
Initial
0
Draining
0
Targets
Monitoring
Health checks
Attributes
Tags
Registered targets (0)
Deregister
Register targets
Filter targets
Instance ID
Name
Port
Zone
No registered targets


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
CloudShell
Feedback
© 2025, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences