

# **Sri Lanka Institute of Information Technology**



**Visual Analytics and User Experience Design (IT4031)**

**Project ID: 2023\_A2\_G45**

**Assignment 2**

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## 01.Introduction

In software development, DevOps monitoring is the practice of tracking and measuring the performance and health of systems and applications in order to identify and correct issues early. This involves gathering information on a variety of topics, such as CPU use, storage space, and application response times. DevOps monitoring may assist teams in preventing outages or service degradation by seeing issues early.

Prometheus, Grafana and Node exporters are commonly used together in docker/ Kubernetes/ clouds to monitor system-level application insights. These tools specifically provide node and container statistics, which allow developers to analyse real-time metrics of containers and nodes. Prometheus node exporter can more specifically be used to get node metrics and system-level insights.

The main object of this assignment is to implement a deployment to capture metrics from an application and visualize those by using the Grafana dashboards. To achieve that we Set up a Linux server monitoring system using Grafana, node exporter & Prometheus.

### 1.1 Monitoring system

Our Linux monitoring system consists of 3 components.

- 1) Prometheus
- 2) Exporter
- 3) Grafana

This system to monitor our Linux server metrics.

### 1.2 What is Prometheus?

It is an open-source system monitoring and alerting toolkit. Prometheus collects and stores its metrics as time-series data which means that the information about the metrics is kept together with the timestamp at which it was captured and optional key-value pairs known as labels.

### 1.3 What is Grafana?

Grafana is the dashboard component of this monitoring system. With Grafana you can create, explore and share all of your data through beautiful, flexible dashboards. In this system, Grafana collects the metrics from Prometheus & displays them in form of graphs & charts.

## 1.4 What is an exporter?

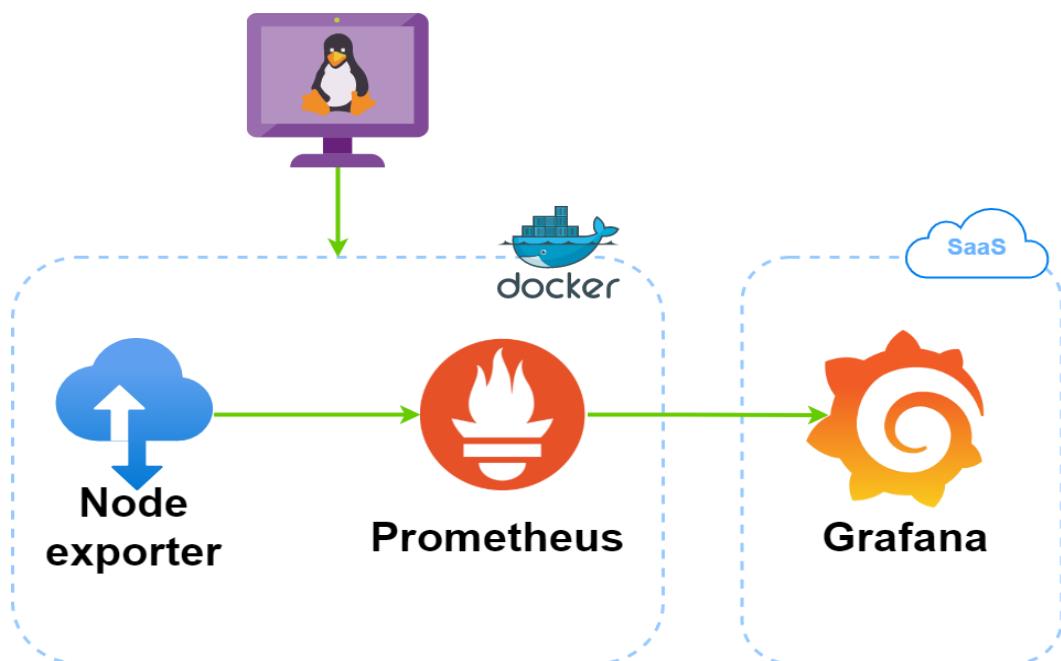
An exporter is a library that exports metrics from 3rd party systems, *such as Linux servers*, to Prometheus. To monitor the Linux servers, Node Exporter is used. The Prometheus Node Exporter is an open-source time-series monitoring and alerting system for cloud-native environments, including Kubernetes. It is capable of gathering and archiving node-level measurements as time-series data and timestamping the information.

## 1.5 What will we monitor?

This system is used to monitor our Linux server metrics such as CPU, RAM, Disk, Network, etc. These metrics will be displayed on a Grafana dashboard. This dashboard can be set to refresh automatically after a fixed time.

## 1.6 Why Monitoring?

- Monitoring is used to assess performance of servers & applications.
- Timely detection of issues and preventing failures.
- Capacity planning.



## 1.7 Setup Procedure

1. Create two ec2 instances.
2. Install docker inside the VM.
3. Install Prometheus Node Exporter on Linux servers to be monitored
4. Install Prometheus and Grafana
5. Configure Node Exporter
6. Configure Prometheus server
7. Add Dashboards to Grafana
8. Start visualizing system metrics on Grafana

Under the next topics high-level overview of the process is discussed.

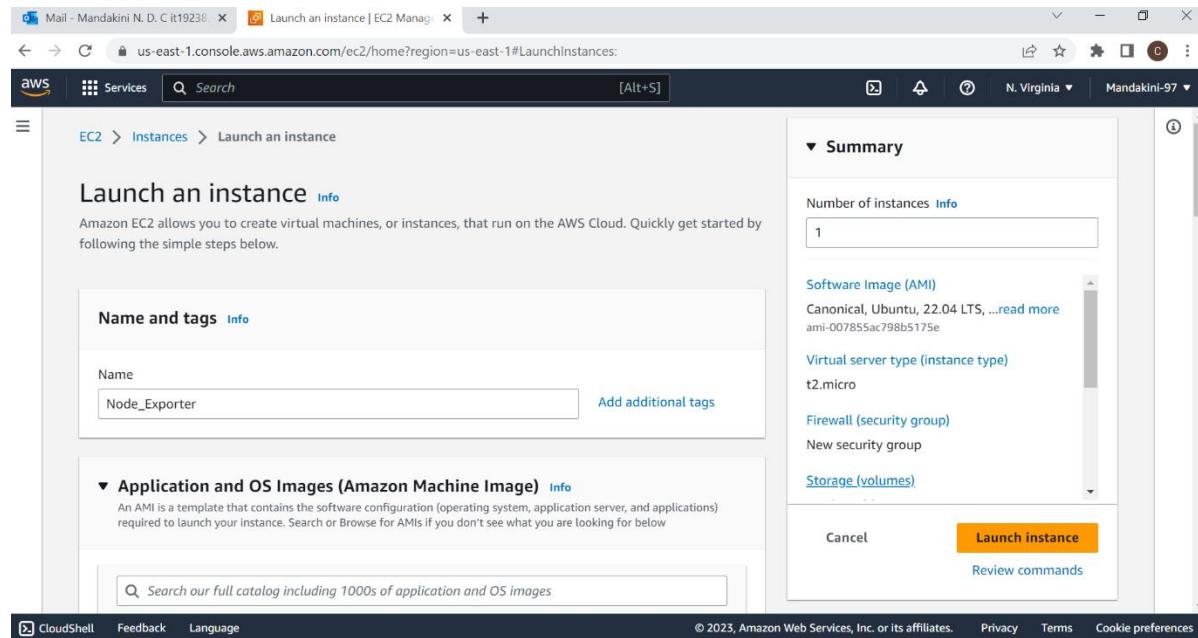
## 02.Step 1: Install Node-Exporter on AWS EC2

### 2.1 Application Deployment

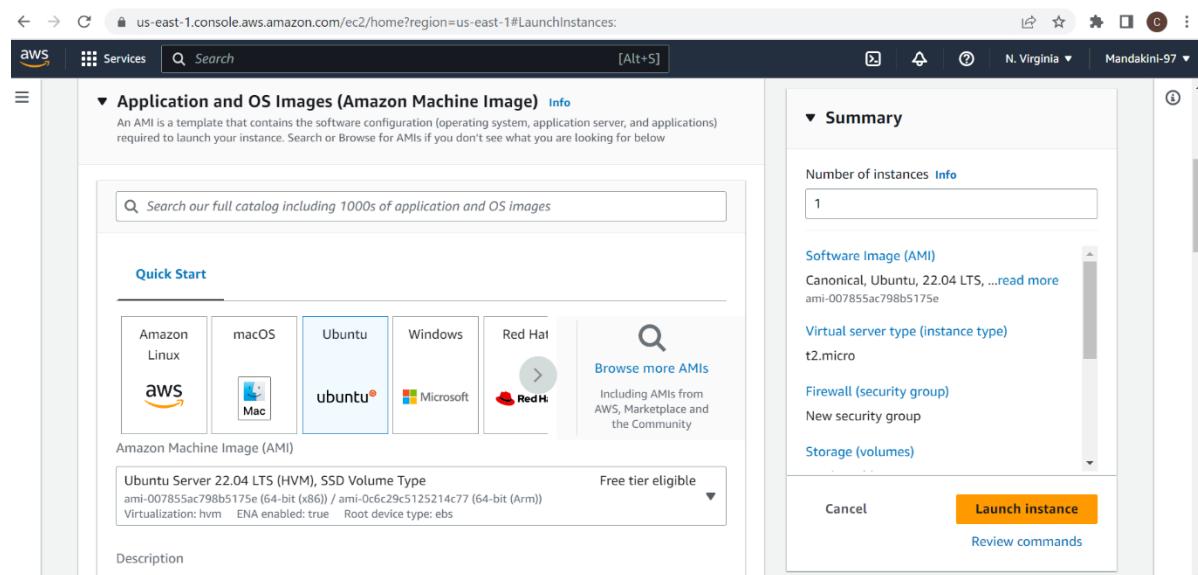
#### 2.1.1 Launch EC2 Instance for node exporter

Selected application is to fetch metric information was Linux host running on an instance in AWS.

Here are the main steps that we followed to set up the application in AWS.



**STEP 1:** Go to AWS EC2 Dashboard in the AWS console and start the launch instance wizard



**STEP 2:** Select Ubuntu Server 22.04 LTS SSD Volume type latest version

Description  
Canonical, Ubuntu, 22.04 LTS, amd64 jammy image build on 2023-03-25

Architecture AMI ID  
64-bit (x86) ami-007855ac798b5175e Verified provider

Instance type  
t2.micro Free tier eligible  
Family: t2 1 vCPU 1 GiB Memory Current generation: true  
On-Demand Windows pricing: 0.0162 USD per Hour  
On-Demand SUSE pricing: 0.0116 USD per Hour  
On-Demand RHEL pricing: 0.0716 USD per Hour  
On-Demand Linux pricing: 0.0116 USD per Hour

All generations Compare instance types

Key pair (login) Info  
You can use a key pair to securely connect to your instance. Ensure that you have access to the selected key pair before you launch the instance.

Number of instances Info  
1

Software Image (AMI)  
Canonical, Ubuntu, 22.04 LTS...read more  
ami-007855ac798b5175e

Virtual server type (instance type)  
t2.micro

Firewall (security group)  
New security group

Storage (volumes)

Cancel Launch instance Review commands

### STEP 3: Choose t2. micro as instance type

Instance type  
t2.micro Free tier eligible  
Family: t2 1 vCPU 1 GiB Memory Current generation: true  
On-Demand Windows pricing: 0.0162 USD per Hour  
On-Demand SUSE pricing: 0.0116 USD per Hour  
On-Demand RHEL pricing: 0.0716 USD per Hour  
On-Demand Linux pricing: 0.0116 USD per Hour

All generations Compare instance types

Key pair (login) Info  
You can use a key pair to securely connect to your instance. Ensure that you have access to the selected key pair before you launch the instance.

Key pair name - required  
node\_exporter1 Create new key pair

Network settings Info  
Edit  
Network Info  
vpc-0946cf108e32c0fa5

Number of instances Info  
1

Software Image (AMI)  
Amazon Linux 2023 AMI 2023.0.2...read more  
ami-0889a44b331db0194

Virtual server type (instance type)  
t2.micro

Firewall (security group)  
New security group

Storage (volumes)

Cancel Launch instance Review commands

### STEP 4: Create a new key pair

The screenshot shows the 'Network settings' section of the AWS EC2 instance creation wizard. It includes fields for selecting a VPC (vpc-0946cf108e32c0fa5), subnet (subnet-036922e4a8dc15f3), and security group (launch-wizard). The 'Auto-assign public IP' dropdown is set to 'Disable'. A note about firewall security groups is present.

*STEP 5: Configure the instance details. We selected the default VPC and the default subnet.*

The screenshot shows the 'Configure storage' section of the AWS EC2 instance creation wizard. It displays a root volume of 8 GiB using gp2 storage. A note indicates that free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage. The 'Advanced' tab is visible at the top right.

*STEP 6: Add Storage as 8gb*

The screenshot shows the AWS EC2 Inbound Rules configuration page. The top navigation bar includes the AWS logo, Services, a search bar, and account information (Owner: 877732366031, N. Virginia region, Mandakini-97). A sidebar on the left lists various EC2 management options like EC2 Dashboard, Instances, and Images. The main content area displays three inbound rules:

Security group rule...	IP version	Type	Protocol	Port range
sgr-063555d4c7e8efbb3	IPv4	Custom TCP	TCP	9100
sgr-0a05677a6b388663f	IPv4	HTTPS	TCP	443
sgr-03a7a9927288fa1ea	IPv4	SSH	TCP	22

A message at the top right says "You can now check network connectivity with Reachability Analyzer" with a "Run Reachability Analyzer" button.

*STEP 7: Configure the Security group. We used port 9100 for Node\_Exporter*

The screenshot shows the AWS EC2 Instance Launch Wizard - Summary step. The top navigation bar and sidebar are identical to the previous screenshot. The main summary section includes:

- Number of instances: 1
- Software Image (AMI): Canonical, Ubuntu, 22.04 LTS, ami-007855ac798b5175e
- Virtual server type (instance type): t2.micro
- Firewall (security group): launch-wizard-1
- Storage (volumes)

At the bottom are "Cancel", "Launch instance" (in orange), and "Review commands" buttons.

*STEP 8: Review Instance launch*

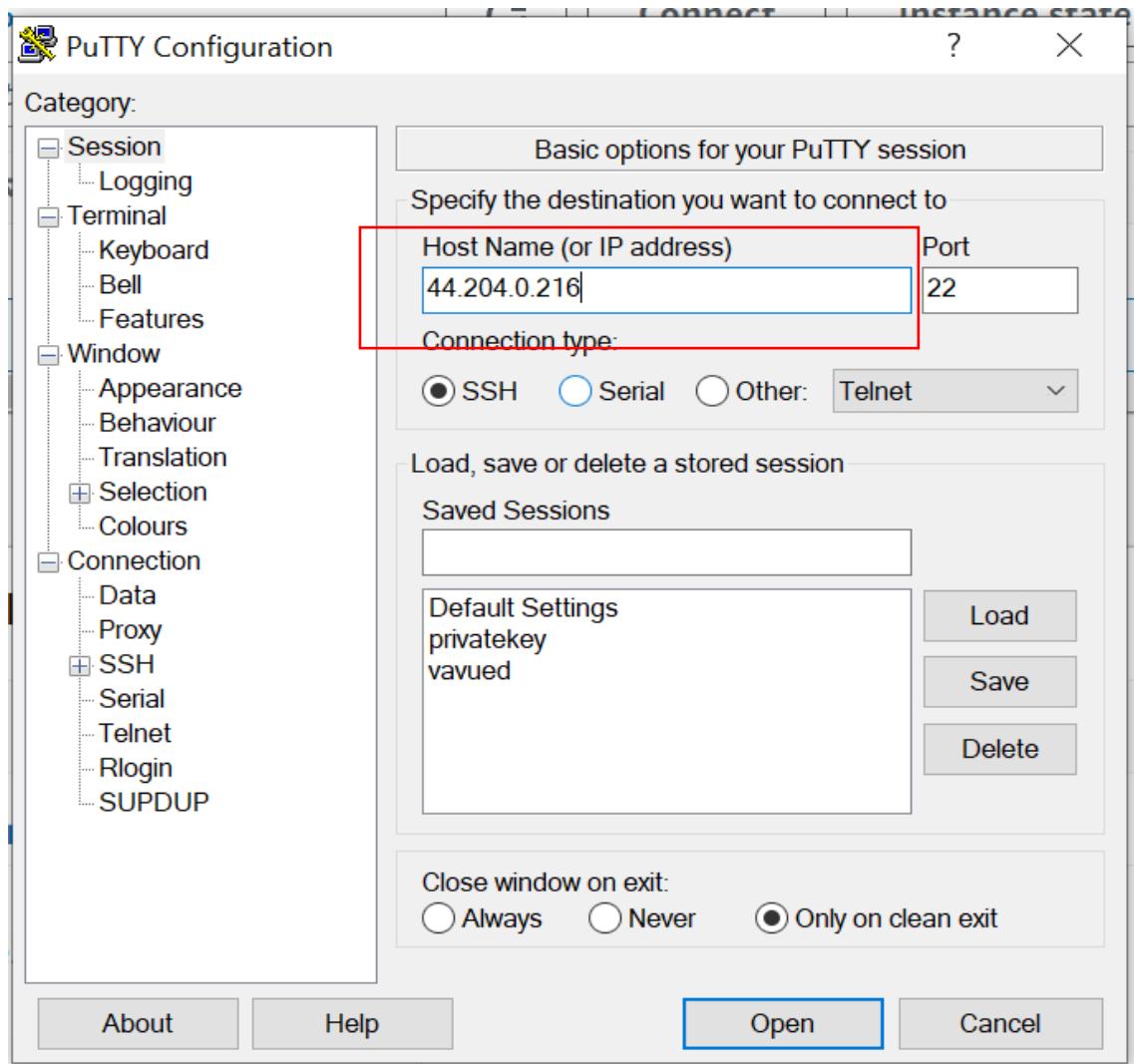
The screenshot shows the AWS EC2 Instances "Launch an instance" page. At the top, there's a success message: "Successfully initiated launch of instance (i-0875ca6f1b5439032)". Below it is a "Launch log" button. A "Next Steps" section follows, featuring a search bar and three cards: "Create billing and free tier usage alerts", "Connect to your instance", and "Connect an RDS database".

### STEP 9: Launch the instance

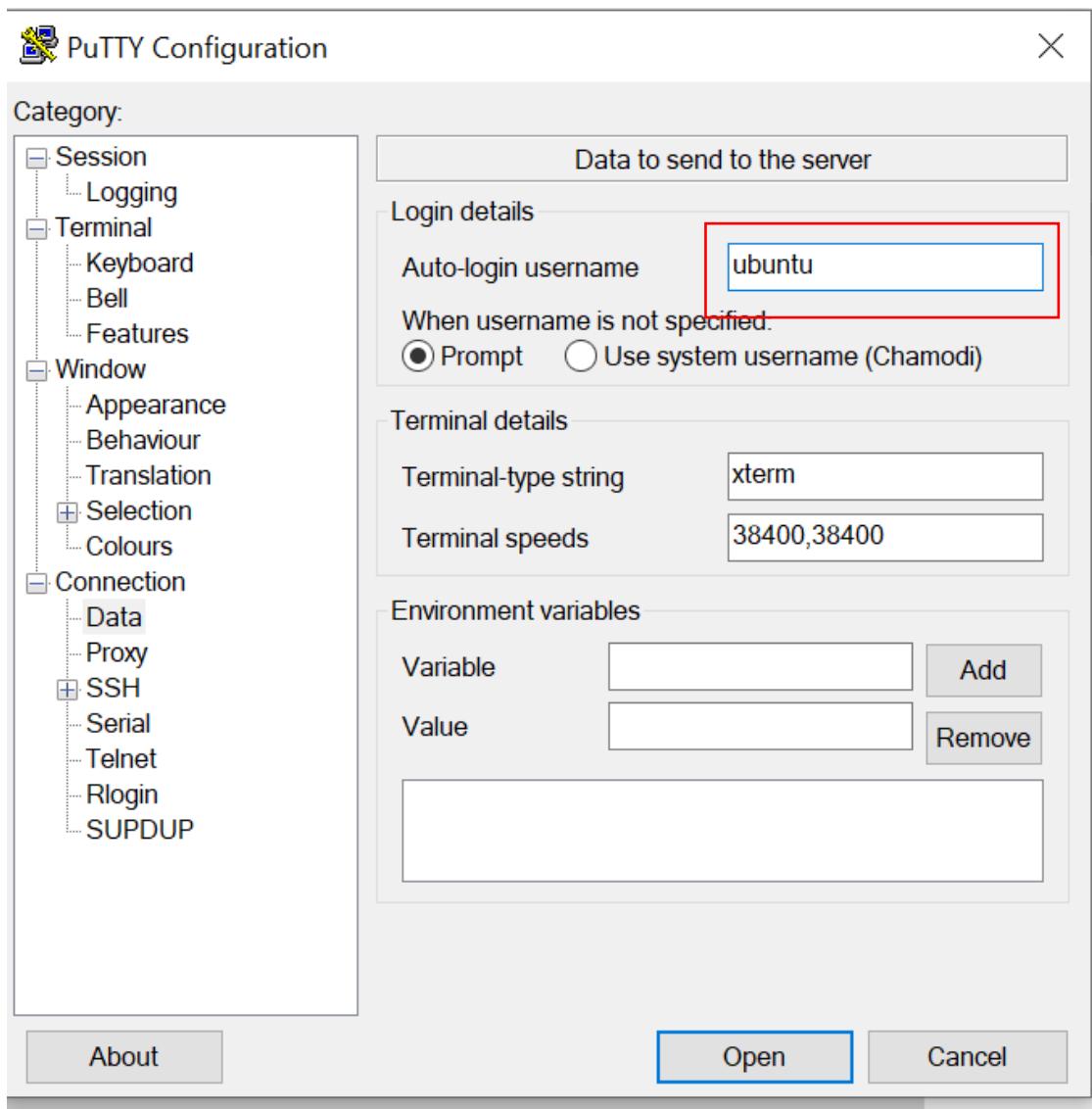
The screenshot shows the AWS EC2 Instances page with two instances listed: "Prometheus" and "Node\_Exporter". The "Node\_Exporter" instance is selected. The "Details" tab of its instance summary is open, displaying its public IPv4 address (44.204.0.216) and private IPv4 address (172.31.86.166).

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Ava
Prometheus	i-0817efc30948b45df	Running	t2.micro	2/2 checks passed	No alarms	us-e
Node_Exporter	i-0fc765b987ee75e26	Running	t2.micro	2/2 checks passed	No alarms	us-e

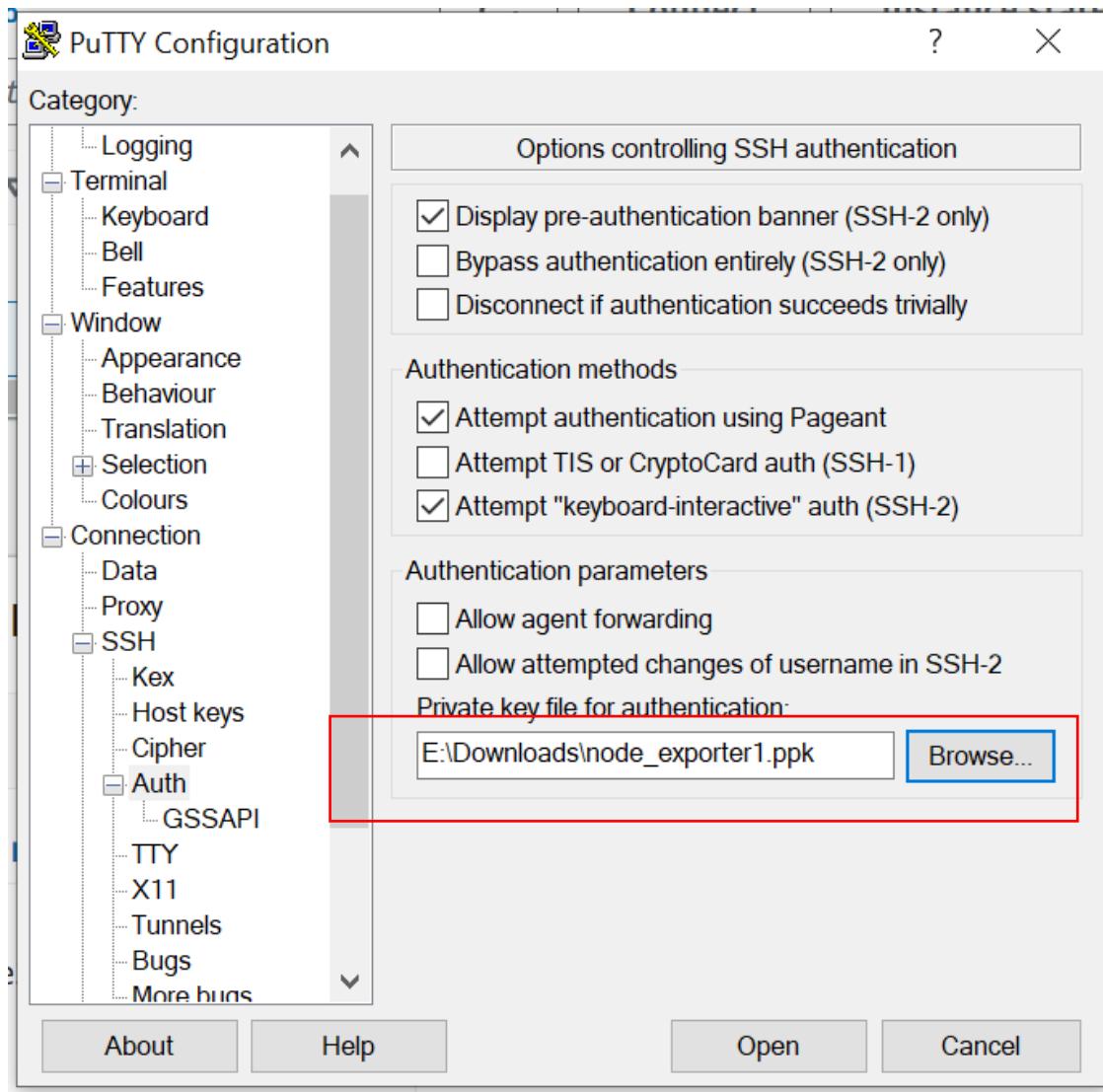
### STEP 10: Get the public IPv4 address of the AWS EC2 instance



*STEP 11: Connected the AWS Linux EC2 instance to computer using the SSH protocol. PuTTY is a SSH client that allows to do this from a local computer running windows*



STEP 12: PuTTY configuration – Login details



STEP 13: PuTTY configuration – Authentication

## 2.1.2 Install docker inside the virtual machine

As the next step we installed docker inside the virtual machine. Docker is popular virtualization software that helps its users in developing, deploying, monitoring, and running applications in a Docker Container with all their dependencies. You may create and distribute containerized apps and microservices using Docker, a program that is simple to install.

Docker Engine can be installed in different ways. Install using the apt repository is the way we used. Below information shows the steps for install the docker.

### 01.Update the apt package index and install packages to allow apt to use a repository over HTTPS:

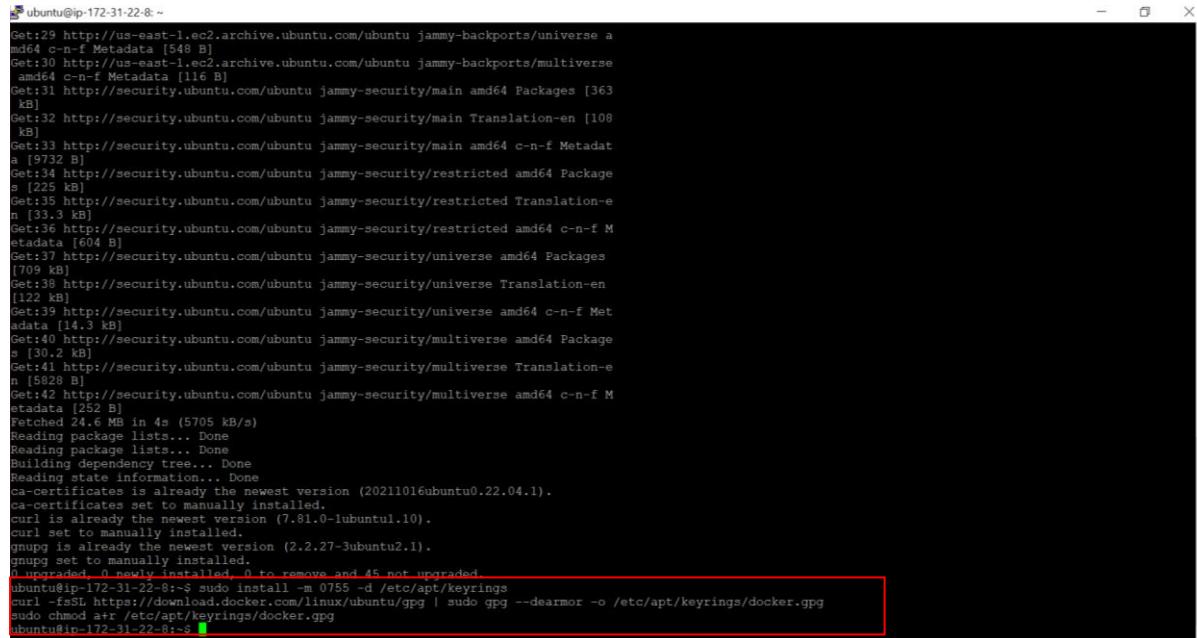
```
sudo apt-get update  
sudo apt-get install ca-certificates curl gnupg
```

```
ubuntu@ip-172-31-22-8:~  
login as: ubuntu  
Authenticating with public key "node_exporter1"  
Welcome to Ubuntu 22.04.2 LTS (GNU/Linux 5.15.0-1031-aws x86_64)  
* Documentation: https://help.ubuntu.com  
* Management: https://landscape.canonical.com  
* Support: https://ubuntu.com/advantage  
  
System information as of Sun May 14 12:48:06 UTC 2023  
  
System load: 0.13427734375 Processes: 101  
Usage of /: 20.2% of 7.57GB Users logged in: 0  
Memory usage: 21% IPv4 address for eth0: 172.31.22.8  
Swap usage: 0%  
  
Expanded Security Maintenance for Applications is not enabled.  
0 updates can be applied immediately.  
  
Enable ESM Apps to receive additional future security updates.  
See https://ubuntu.com/esm or run: sudo pro status  
  
The list of available updates is more than a week old.  
To check for new updates run: sudo apt update  
  
The programs included with the Ubuntu system are free software;  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/*copyright.  
  
Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by  
applicable law.  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
ubuntu@ip-172-31-22-8:~$ sudo apt-get update  
sudo apt-get install ca-certificates curl gnupg  
[get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease  
[get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease [11  
9 kB]  
[get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease [108 kB]
```

```
ubuntu@ip-172-31-22-8:~  
mde4 Packages [22.2 kB]  
Get:28 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe Translation-en [15.0 kB]  
Get:29 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 c-n-f Metadata [548 B]  
Get:30 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/multiverse amd64 c-n-f Metadata [116 B]  
Get:31 https://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [363 kB]  
Get:32 http://security.ubuntu.com/ubuntu jammy-security/main Translation-en [108 kB]  
Get:33 https://security.ubuntu.com/ubuntu jammy-security/main amd64 c-n-f Metadata [9732 B]  
Get:34 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Package [225 kB]  
Get:35 http://security.ubuntu.com/ubuntu jammy-security/restricted Translation-en [313 kB]  
Get:36 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 c-n-f Metadata [604 B]  
Get:37 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [709 kB]  
Get:38 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en [122 kB]  
Get:39 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 c-n-f Metadata [14.3 kB]  
Get:40 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Package [312 kB]  
Get:41 http://security.ubuntu.com/ubuntu jammy-security/multiverse Translation-en [582 kB]  
Get:42 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 c-n-f Metadata [252 B]  
Fetched 24.6 MB in 4s (5705 kB/s)  
Reading package lists... Done  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
ca-certificates is already the newest version (20211016ubuntu0.22.04.1).  
ca-certificates set to manually installed.  
curl is already the newest version (7.81.0-1ubuntu1.10).  
curl set to manually installed.  
gnupg is already the newest version (2.2.27-3ubuntu2.1).  
gnupg set to manually installed.  
0 upgraded, 0 newly installed, 0 to remove and 45 not upgraded.  
ubuntu@ip-172-31-22-8:~$
```

## 02. Add Docker's official GPG key:

```
sudo install -m 0755 -d /etc/apt/keyrings  
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmor -o  
/etc/apt/keyrings/docker.gpg  
sudo chmod a+r /etc/apt/keyrings/docker.gpg
```



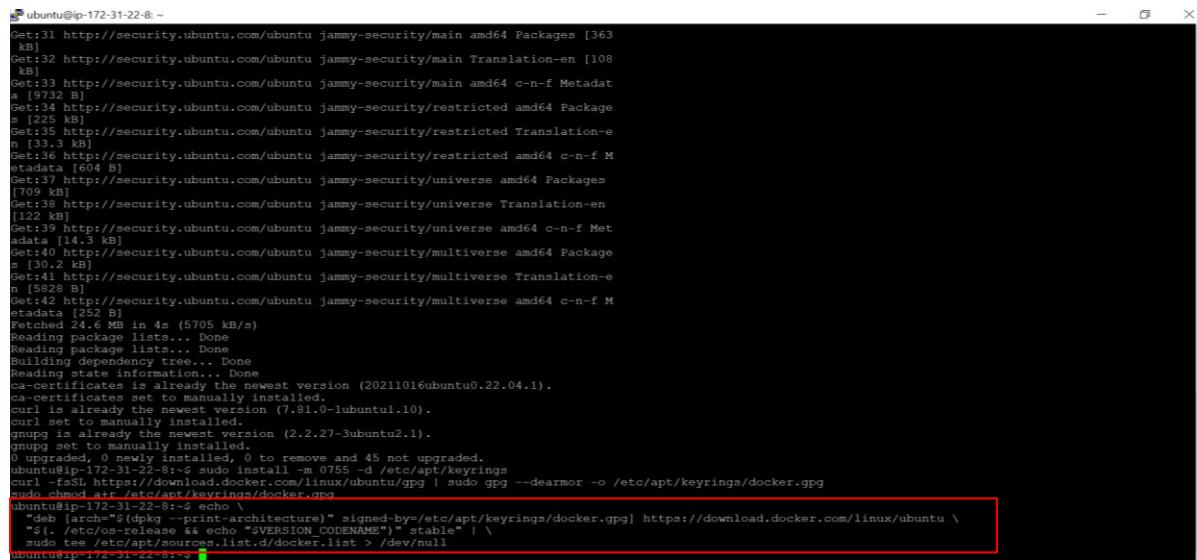
A terminal window titled 'ubuntu@ip-172-31-22-8: ~'. It shows the command to add the Docker GPG key and its execution. The output includes package download details and a success message.

```
Get:29 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 c-n-f Metadata [548 B]  
Get:30 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/multiverse amd64 c-n-f Metadata [116 B]  
Get:31 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [363 kB]  
Get:32 http://security.ubuntu.com/ubuntu jammy-security/main Translation-en [108 kB]  
Get:33 http://security.ubuntu.com/ubuntu jammy-security/main amd64 c-n-f Metadata [9732 B]  
Get:34 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Package [225 kB]  
Get:35 http://security.ubuntu.com/ubuntu jammy-security/restricted Translation-en [33.3 kB]  
Get:36 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 c-n-f Metadata [604 B]  
Get:37 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [709 kB]  
Get:38 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en [122 kB]  
Get:39 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 c-n-f Metadata [14.3 kB]  
Get:40 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [30.2 kB]  
Get:41 http://security.ubuntu.com/ubuntu jammy-security/multiverse Translation-en [5828 B]  
Get:42 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 c-n-f Metadata [252 B]  
Fetched 24.6 MB in 4s (5705 kB/s)  
Reading package lists... Done  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
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curl set to manually installed.  
gnupg is already the newest version (2.2.27-3ubuntu2.1).  
gnupg set to manually installed.  
0 upgraded, 0 newly installed, 0 to remove and 45 not upgraded.  
ubuntu@ip-172-31-22-8:~$ sudo install -m 0755 -d /etc/apt/keyrings  
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmor -o /etc/apt/keyrings/docker.gpg  
sudo chmod a+r /etc/apt/keyrings/docker.gpg  
ubuntu@ip-172-31-22-8:~$
```

Docker Installation

## 03. Use the following command to set up the repository:

```
echo \  
"deb [arch="$(dpkg --print-architecture)" signed-by=/etc/apt/keyrings/docker.gpg]  
https://download.docker.com/linux/ubuntu \  
"$(./etc/os-release && echo "$VERSION_CODENAME")" stable" | \  
sudo tee /etc/apt/sources.list.d/docker.list > /dev/null
```



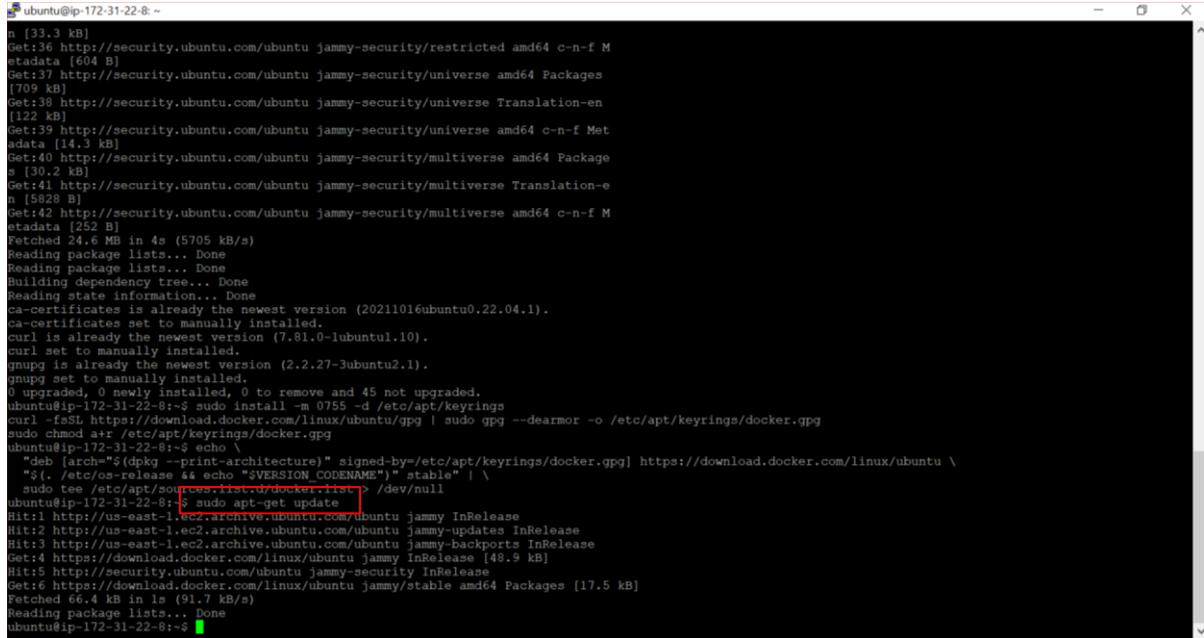
A terminal window titled 'ubuntu@ip-172-31-22-8: ~'. It shows the command to set up the Docker repository and its execution. The output includes package download details and a success message.

```
Get:31 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [363 kB]  
Get:32 http://security.ubuntu.com/ubuntu jammy-security/main Translation-en [108 kB]  
Get:33 http://security.ubuntu.com/ubuntu jammy-security/main amd64 c-n-f Metadata [9732 B]  
Get:34 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Package [225 kB]  
Get:35 http://security.ubuntu.com/ubuntu jammy-security/restricted Translation-en [33.3 kB]  
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Get:37 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [709 kB]  
Get:38 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en [122 kB]  
Get:39 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 c-n-f Metadata [14.3 kB]  
Get:40 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [30.2 kB]  
Get:41 http://security.ubuntu.com/ubuntu jammy-security/multiverse Translation-en [5828 B]  
Get:42 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 c-n-f Metadata [252 B]  
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Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
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curl set to manually installed.  
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gnupg set to manually installed.  
0 upgraded, 0 newly installed, 0 to remove and 45 not upgraded.  
ubuntu@ip-172-31-22-8:~$ sudo install -m 0755 -d /etc/apt/keyrings  
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmor -o /etc/apt/keyrings/docker.gpg  
sudo chmod a+r /etc/apt/keyrings/docker.gpg  
ubuntu@ip-172-31-22-8:~$ echo "deb [arch="$(dpkg --print-architecture)" signed-by=/etc/apt/keyrings/docker.gpg] https://download.docker.com/linux/ubuntu \  
"$(./etc/os-release && echo "$VERSION_CODENAME")" stable" | \  
sudo tee /etc/apt/sources.list.d/docker.list > /dev/null  
ubuntu@ip-172-31-22-8:~$
```

Docker Installation

## 04.Update the apt package index:

```
sudo apt-get update
```

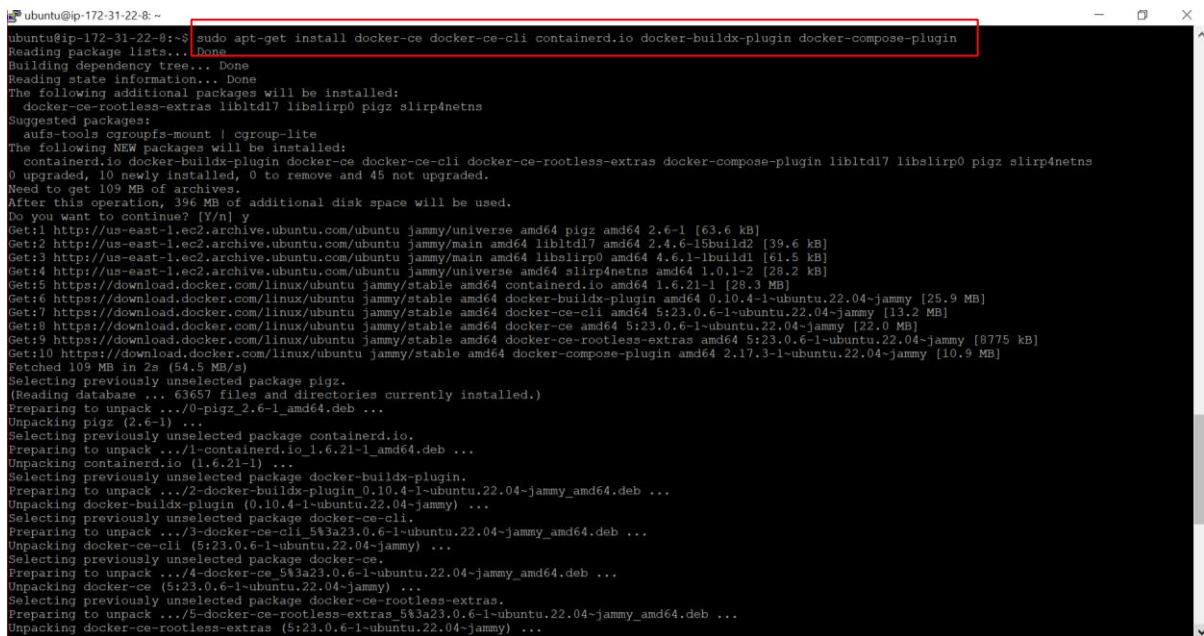


```
[ubuntu@ip-172-31-22-8: ~]
[133.3 kB]
Get:36 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 c-n-f M
  etadata [604 B]
Get:37 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages
  [709 kB]
Get:38 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en
  [122 kB]
Get:39 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 c-n-f Met
  adata [14.3 kB]
Get:40 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Package
  [30.2 kB]
Get:41 http://security.ubuntu.com/ubuntu jammy-security/multiverse Translation-e
  n [5828 B]
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  etadata [252 B]
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curl set to manually installed.
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gnupg set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 45 not upgraded.
ubuntu@ip-172-31-22-8:~$ sudo install -m 0755 -d /etc/apt/keyrings
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmor -o /etc/apt/keyrings/docker.gpg
sudo chmod a+r /etc/apt/keyrings/docker.gpg
ubuntu@ip-172-31-22-8:~$ echo \
  "deb [arch=$(dpkg --print-architecture)] signed-by=/etc/apt/keyrings/docker.gpg] https://download.docker.com/linux/ubuntu \
  '$(lsb_release -c -s) echo \"$VERSION CODENAME\" stable" | \
  sudo tee /etc/apt/sources.list.d/docker.list > /dev/null
ubuntu@ip-172-31-22-8:~$ sudo apt-get update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Get:4 https://download.docker.com/linux/ubuntu jammy InRelease [48.9 kB]
Hit:5 http://security.ubuntu.com/ubuntu jammy-security InRelease
Get:6 https://download.docker.com/linux/ubuntu jammy/stable amd64 Packages [17.5 kB]
Fetched 66.4 kB in 1s (91.7 kB/s)
Reading package lists... Done
ubuntu@ip-172-31-22-8:~$
```

## Docker Installation

## 05.To Install latest version of Docker Engine, containerd, and Docker Compose and run:

```
sudo apt-get install docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-compose-
plugin
```



```
[ubuntu@ip-172-31-22-8: ~]
ubuntu@ip-172-31-22-8:~$ sudo apt-get install docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-compose-plugin
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  docker-ce-rootless-extras libltdl7 libslirp0 pigz slirp4netns
Suggested packages:
  aufs-tools cgroupfs-mount libcgroup-lite
The following NEW packages will be installed:
  containerd.io docker-buildx-plugin docker-ce docker-ce-rootless-extras docker-compose-plugin libltdl7 libslirp0 pigz slirp4netns
0 upgraded, 10 newly installed, 0 to remove and 45 not upgraded.
Need to get 109 MB of archives.
After this operation, 396 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 pigz amd64 2.6-1 [63.6 kB]
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 libltdl7 amd64 2.4.6-15build2 [39.6 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 libslirp0 amd64 4.6.1-1build1 [61.5 kB]
Get:4 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 slirp4netns amd64 1.0.1-2 [28.2 kB]
Get:5 https://download.docker.com/linux/ubuntu jammy/stable amd64 docker-buildx-plugin amd64 0.10.4-1~jammy [25.9 MB]
Get:6 https://download.docker.com/linux/ubuntu jammy/stable amd64 docker-ce amd64 5:23.0.6-1~ubuntu.22.04~jammy [13.2 MB]
Get:7 https://download.docker.com/linux/ubuntu jammy/stable amd64 docker-ce-rootless-extras amd64 5:23.0.6-1~ubuntu.22.04~jammy [22.0 MB]
Get:8 https://download.docker.com/linux/ubuntu jammy/stable amd64 docker-ce-rootless-extras amd64 5:23.0.6-1~ubuntu.22.04~jammy [8775 kB]
Get:9 https://download.docker.com/linux/ubuntu jammy/stable amd64 docker-compose-plugin amd64 2.17.3-1~ubuntu.22.04~jammy [10.9 MB]
Fetched 109 MB in 2s (54.5 MB/s)
Selecting previously unselected package pigz.
(Reading database ... 63657 files and directories currently installed.)
Preparing to unpack .../0-pigz_2.6-1_amd64.deb ...
Unpacking pigz (2.6-1) ...
Selecting previously unselected package containerd.io.
Preparing to unpack .../1-containerd.io_1.6.21-1_amd64.deb ...
Unpacking containerd.io (1.6.21-1) ...
Selecting previously unselected package docker-buildx-plugin.
Preparing to unpack .../2-docker-buildx-plugin_0.10.4-1~ubuntu.22.04~jammy_amd64.deb ...
Unpacking docker-buildx-plugin (0.10.4-1~ubuntu.22.04~jammy) ...
Selecting previously unselected package docker-ce-cli.
Preparing to unpack .../3-docker-ce-cli_5:3a23.0.6-1~ubuntu.22.04~jammy_amd64.deb ...
Unpacking docker-ce-cli (5:3a23.0.6-1~ubuntu.22.04~jammy) ...
Selecting previously unselected package docker-ce.
Preparing to unpack .../4-docker-ce_5:23.0.6-1~ubuntu.22.04~jammy_amd64.deb ...
Unpacking docker-ce (5:23.0.6-1~ubuntu.22.04~jammy) ...
Selecting previously unselected package docker-ce-rootless-extras.
Preparing to unpack .../5-docker-ce-rootless-extras_5:3a23.0.6-1~ubuntu.22.04~jammy_amd64.deb ...
Unpacking docker-ce-rootless-extras (5:23.0.6-1~ubuntu.22.04~jammy) ...
```

```

ubuntu@ip-172-31-22-8:~ 
Unpacking docker-ce (5:23.0.6-1ubuntu.22.04-jammy) ...
Selecting previously unselected package docker-ce-rootless-extras.
Preparing to unpack .../docker-ce-rootless-extras_5%3a23.0.6-1ubuntu.22.04-jammy_amd64.deb ...
Unpacking docker-ce-rootless-extras (5:23.0.6-1ubuntu.22.04-jammy) ...
Selecting previously unselected package docker-ce-rootless-plugin.
Preparing to unpack .../6-docker-ce-rootless-plugin_2.17.3-1ubuntu.22.04-jammy_amd64.deb ...
Unpacking docker-compose-plugin (2.17.3-1ubuntu.22.04-jammy) ...
Selecting previously unselected package libltdl7:amd64.
Preparing to unpack .../7-libltdl7_2.4.6-15build2_amd64.deb ...
Unpacking libltdl7:amd64 (2.4.6-15build2) ...
Selecting previously unselected package libslirp0:amd64.
Preparing to unpack .../8-libslirp0_4.6.1-1build1_amd64.deb ...
Unpacking libslirp0:amd64 (4.6.1-1build1) ...
Selecting previously unselected package slirp4netns.
Preparing to unpack .../9-slirp4netns_1.0.1-2_amd64.deb ...
Unpacking slirp4netns (1.0.1-2) ...
Setting up docker-buildx-plugin (0.10.4-1ubuntu.22.04-jammy) ...
Setting up containerd.io (1.6.21-1) ...
Created symlink /etc/systemd/system/multi-user.target.wants/containerd.service → /lib/systemd/system/containerd.service.
Setting up docker-compose-plugin (2.17.3-1ubuntu.22.04-jammy) ...
Setting up docker-ce-cll (5:23.0.6-1ubuntu.22.04-jammy) ...
Setting up libslirp0:amd64 (4.6.1-1build1) ...
Setting up pigz (2.6-1) ...
Setting up docker-ce-rootless-extras (5:23.0.6-1ubuntu.22.04-jammy) ...
Setting up slirp4netns (1.0.1-2) ...
Setting up docker-ce (5:23.0.6-1ubuntu.22.04-jammy) ...
Setting up docker-ce (5:23.0.6-1ubuntu.22.04-jammy) ...
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service → /lib/systemd/system/docker.service.
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /lib/systemd/system/docker.socket.
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.1) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.
No services need to be restarted.
No containers need to be restarted.
No user sessions are running outdated binaries.
No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-22-8:~ 

```

### *Docker Installation*

<b>06.Verify that the Docker Engine installation is successful by running the hello-world image:</b>
--

<i>sudo docker run hello-world</i>
------------------------------------

```

ubuntu@ip-172-31-22-8:~ 
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /lib/systemd/system/docker.socket.
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.1) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.
No services need to be restarted.
No containers need to be restarted.
No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-22-8:~ $ sudo docker run hello-world
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
719385e32844: Pull complete
Digest: sha256:fc6c190ccba13e80938cdff0bb199fdbbb86d6e3e013783e5a766f50f5dbce0
Status: Downloaded newer image for hello-world:latest
Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
 1. The Docker client contacted the Docker daemon.
 2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
    (amd64)
 3. The Docker daemon created a new container from that image which runs the
 executable that produces the output you are currently reading.
 4. The Docker daemon streamed that output to the Docker client, which sent it
 to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
$ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
https://hub.docker.com/

For more examples and ideas, visit:
https://docs.docker.com/get-started/
ubuntu@ip-172-31-22-8:~ $ 

```

### *Docker Installation*

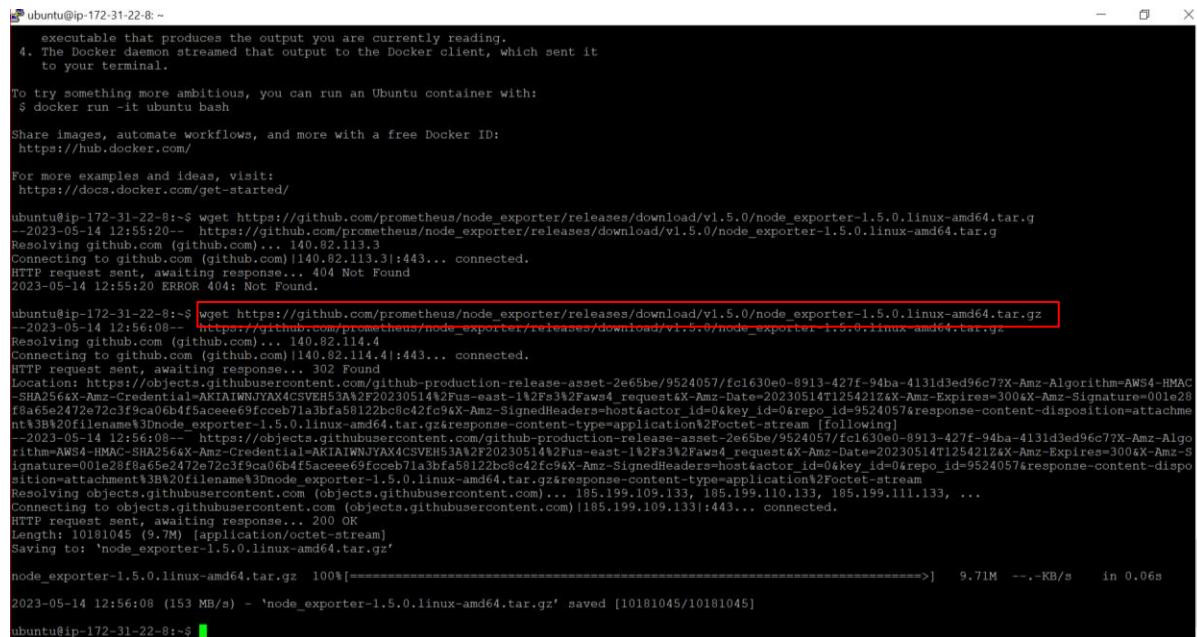
## 2.2 API Implementation

### 2.2.1 Node Exporter

Here are the steps followed in order to configure the node exporter on the docker image.

#### 01. Download node exporter from Prometheus.io:

```
wget  
https://github.com/prometheus/node_exporter/releases/download/v1.5.0/node_exporter-  
1.5.0.linux-amd64.tar.gz
```



```
ubuntu@ip-172-31-22-8:~  
  executable that produces the output you are currently reading.  
 4. The Docker daemon streamed that output to the Docker client, which sent it  
  to your terminal.  
To try something more ambitious, you can run an Ubuntu container with:  
$ docker run -it ubuntu bash  
Share images, automate workflows, and more with a free Docker ID:  
https://hub.docker.com/  
For more examples and ideas, visit:  
https://docs.docker.com/get-started/  
ubuntu@ip-172-31-22-8:~$ wget https://github.com/prometheus/node_exporter/releases/download/v1.5.0/node_exporter-1.5.0.linux-amd64.tar.gz  
--2023-05-14 12:55:20-- https://github.com/prometheus/node_exporter/releases/download/v1.5.0/node_exporter-1.5.0.linux-amd64.tar.gz  
Resolving github.com (github.com)... 140.82.113.3  
Connecting to github.com (github.com)|140.82.113.3|:443... connected.  
HTTP request sent, awaiting response... 404 Not Found  
2023-05-14 12:55:20 ERROR 404: Not Found.  
ubuntu@ip-172-31-22-8:~$ wget https://github.com/prometheus/node_exporter/releases/download/v1.5.0/node_exporter-1.5.0.linux-amd64.tar.gz  
--2023-05-14 12:56:08-- https://github.com/prometheus/node_exporter/releases/download/v1.5.0/node_exporter-1.5.0.linux-amd64.tar.gz  
Resolving github.com (github.com)... 140.82.114.4  
Connecting to github.com (github.com)|140.82.114.4|:443... connected.  
HTTP request sent, awaiting response... 302 Found  
Location: https://objects.githubusercontent.com/github-production-release-asset-2e65be/9524057/fc1630e0-8913-427f-94ba-4131d3ed96c7?X-Amz-Algorithm=AWS4-HMAC-  
SHA256&X-Amz-Credential=AKIAIWNJYAX4CSVERH53A%2F20230514%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20230514T125421Z&X-Amz-Signature=001e28  
f8ac5e2472e72c3f9ca06b4f5aceee69fcceeb71a3bfa58122bc8c42fc9&X-Amz-SignedHeaders=host&actor_id=0&key_id=0&repo_id=9524057&response-content-disposition=attachme  
nt%3B%20filename%3Dnode_exporter-1.5.0.linux-amd64.tar.gz&response-content-type=application%2Foctet-stream [following]  
--2023-05-14 12:56:08-- https://objects.githubusercontent.com/github-production-release-asset-2e65be/9524057/fc1630e0-8913-427f-94ba-4131d3ed96c7?X-Amz-  
Algorithm=AWS4-HMAC-  
SHA256&X-Amz-Credential=AKIAIWNJYAX4CSVERH53A%2F20230514%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20230514T125421Z&X-Amz-Signature=001e28  
f8ac5e2472e72c3f9ca06b4f5aceee69fcceeb71a3bfa58122bc8c42fc9&X-Amz-SignedHeaders=host&actor_id=0&key_id=0&repo_id=9524057&response-content-dispo  
sition=attachment%3B%20filename%3Dnode_exporter-1.5.0.linux-amd64.tar.gz&response-content-type=application%2Foctet-stream  
Resolving objects.githubusercontent.com (objects.githubusercontent.com)... 185.199.109.133, 185.199.110.133, 185.199.111.133, ...  
Connecting to objects.githubusercontent.com (objects.githubusercontent.com)|185.199.109.133|:443... connected.  
HTTP request sent, awaiting response... 200 OK  
Length: 10181045 (9.7M) [application/octet-stream]  
Saving to: "node_exporter-1.5.0.linux-amd64.tar.gz"  
  
node_exporter-1.5.0.linux-amd64.tar.gz 100%[=====] 9.71M ---.KB/s in 0.06s  
2023-05-14 12:56:08 [153 MB/s] - 'node_exporter-1.5.0.linux-amd64.tar.gz' saved [10181045/10181045]  
ubuntu@ip-172-31-22-8:~$
```

#### Node Exporter Installation

## 02. Unzipped downloaded file:

```
tar -xvf node_exporter-1.5.0.linux-amd64
```

```
ubuntu@ip-172-31-22-8:~$ docker run -it ubuntu bash
Share images, automate workflows, and more with a free Docker ID:
https://hub.docker.com/
For more examples and ideas, visit:
https://docs.docker.com/get-started/
ubuntu@ip-172-31-22-8:~$ wget https://github.com/prometheus/node_exporter/releases/download/v1.5.0/node_exporter-1.5.0.linux-amd64.tar.gz
--2023-05-14 12:55:20-- https://github.com/prometheus/node_exporter/releases/download/v1.5.0/node_exporter-1.5.0.linux-amd64.tar.gz
Resolving github.com (github.com)... 140.82.113.3
Connecting to github.com (github.com)|140.82.113.3|:443... connected.
HTTP request sent, awaiting response... 404 Not Found
2023-05-14 12:55:20 ERROR 404: Not Found.

ubuntu@ip-172-31-22-8:~$ wget https://github.com/prometheus/node_exporter/releases/download/v1.5.0/node_exporter-1.5.0.linux-amd64.tar.gz
--2023-05-14 12:56:08-- https://github.com/prometheus/node_exporter/releases/download/v1.5.0/node_exporter-1.5.0.linux-amd64.tar.gz
Resolving github.com (github.com)... 140.82.114.4
Connecting to github.com (github.com)|140.82.114.4|:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://objects.githubusercontent.com/github-production-release-asset-2e65be/9524057/fc1630e0-8913-427f-94ba-4131d3ed96c7?X-Amz-Algorithm=AWS4-HMAC-SHA256X-Amz-Credential=AKIAIWNJYAX4CSVEH53A%2F20230514%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20230514T125421Z&X-Amz-Expires=3004X-Amz-SignedHeaders=host&actor_id=0&repo_id=9524057&response-content-disposition=attachment;filename=node_exporter-1.5.0.linux-amd64.tar.gz
--2023-05-14 12:56:08-- https://objects.githubusercontent.com/github-production-release-asset-2e65be/9524057/fc1630e0-8913-427f-94ba-4131d3ed96c7?X-Amz-Algorithm=AWS4-HMAC-SHA256X-Amz-Credential=AKIAIWNJYAX4CSVEH53A%2F20230514%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20230514T125421Z&X-Amz-Expires=3004X-Amz-SignedHeaders=host&actor_id=0&repo_id=9524057&response-content-disposition=attachment;filename=node_exporter-1.5.0.linux-amd64.tar.gz
Resolving objects.githubusercontent.com (objects.githubusercontent.com)|185.199.109.133|:443... connected.
Connecting to objects.githubusercontent.com (objects.githubusercontent.com)|185.199.109.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 10181045 (9.7M) [application/octet-stream]
Saving to: 'node_exporter-1.5.0.linux-amd64.tar.gz'

node_exporter-1.5.0.linux-amd64.tar.gz 100%[=====] 9.71M --.-KB/s in 0.06s
2023-05-14 12:56:08 (153 MB/s) - 'node_exporter-1.5.0.linux-amd64.tar.gz' saved [10181045/10181045]

ubuntu@ip-172-31-22-8:~$ tar -xvf node_exporter-1.5.0.linux-amd64.tar.gz
node_exporter-1.5.0.linux-amd64/LICENSE
node_exporter-1.5.0.linux-amd64/NOTICE
node_exporter-1.5.0.linux-amd64/node_exporter
ubuntu@ip-172-31-22-8:~$
```

## Node Exporter Installation

## 03. ls command to verify downloaded file was there:

```
ubuntu@ip-172-31-22-8:~$ For more examples and ideas, visit:
https://docs.docker.com/get-started/
ubuntu@ip-172-31-22-8:~$ wget https://github.com/prometheus/node_exporter/releases/download/v1.5.0/node_exporter-1.5.0.linux-amd64.tar.gz
--2023-05-14 12:55:20-- https://github.com/prometheus/node_exporter/releases/download/v1.5.0/node_exporter-1.5.0.linux-amd64.tar.gz
Resolving github.com (github.com)... 140.82.113.3
Connecting to github.com (github.com)|140.82.113.3|:443... connected.
HTTP request sent, awaiting response... 404 Not Found
2023-05-14 12:55:20 ERROR 404: Not Found.

ubuntu@ip-172-31-22-8:~$ wget https://github.com/prometheus/node_exporter/releases/download/v1.5.0/node_exporter-1.5.0.linux-amd64.tar.gz
--2023-05-14 12:56:08-- https://github.com/prometheus/node_exporter/releases/download/v1.5.0/node_exporter-1.5.0.linux-amd64.tar.gz
Resolving github.com (github.com)... 140.82.114.4
Connecting to github.com (github.com)|140.82.114.4|:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://objects.githubusercontent.com/github-production-release-asset-2e65be/9524057/fc1630e0-8913-427f-94ba-4131d3ed96c7?X-Amz-Algorithm=AWS4-HMAC-SHA256X-Amz-Credential=AKIAIWNJYAX4CSVEH53A%2F20230514%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20230514T125421Z&X-Amz-Expires=3004X-Amz-SignedHeaders=host&actor_id=0&repo_id=9524057&response-content-disposition=attachment;filename=node_exporter-1.5.0.linux-amd64.tar.gz
--2023-05-14 12:56:08-- https://objects.githubusercontent.com/github-production-release-asset-2e65be/9524057/fc1630e0-8913-427f-94ba-4131d3ed96c7?X-Amz-Algorithm=AWS4-HMAC-SHA256X-Amz-Credential=AKIAIWNJYAX4CSVEH53A%2F20230514%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20230514T125421Z&X-Amz-Expires=3004X-Amz-SignedHeaders=host&actor_id=0&repo_id=9524057&response-content-disposition=attachment;filename=node_exporter-1.5.0.linux-amd64.tar.gz
Resolving objects.githubusercontent.com (objects.githubusercontent.com)|185.199.109.133|:443... connected.
Connecting to objects.githubusercontent.com (objects.githubusercontent.com)|185.199.109.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 10181045 (9.7M) [application/octet-stream]
Saving to: 'node_exporter-1.5.0.linux-amd64.tar.gz'

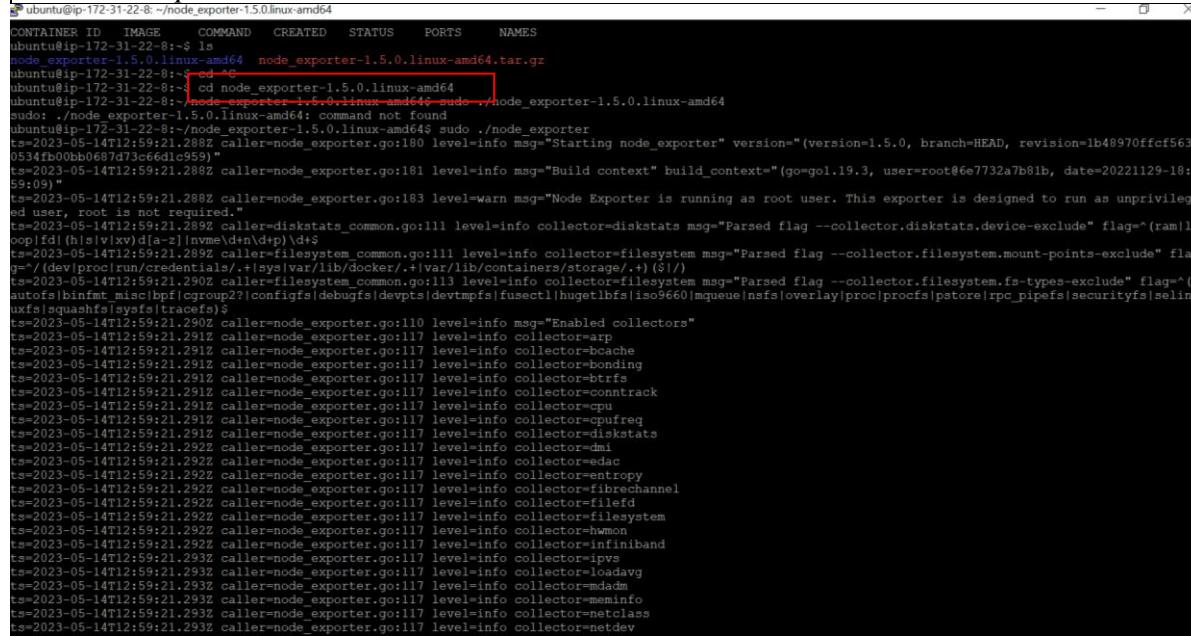
node_exporter-1.5.0.linux-amd64.tar.gz 100%[=====] 9.71M --.-KB/s in 0.06s
2023-05-14 12:56:08 (153 MB/s) - 'node_exporter-1.5.0.linux-amd64.tar.gz' saved [10181045/10181045]

ubuntu@ip-172-31-22-8:~$ tar -xvf node_exporter-1.5.0.linux-amd64.tar.gz
node_exporter-1.5.0.linux-amd64/
node_exporter-1.5.0.linux-amd64/LICENSE
node_exporter-1.5.0.linux-amd64/NOTICE
node_exporter-1.5.0.linux-amd64/node_exporter
ubuntu@ip-172-31-22-8:~$ sudo docker ps
CONTAINER ID        IMAGE               COMMAND             STATUS              PORTS   NAMES
ubuntu@ip-172-31-22-8:~$ ls
node_exporter-1.5.0.linux-amd64  node_exporter-1.5.0.linux-amd64.tar.gz
ubuntu@ip-172-31-22-8:~$
```

## Node Exporter Installation

## 04. Go inside the node exporter directory:

```
Cd node_exporter-1.5.0.linux-amd64
```

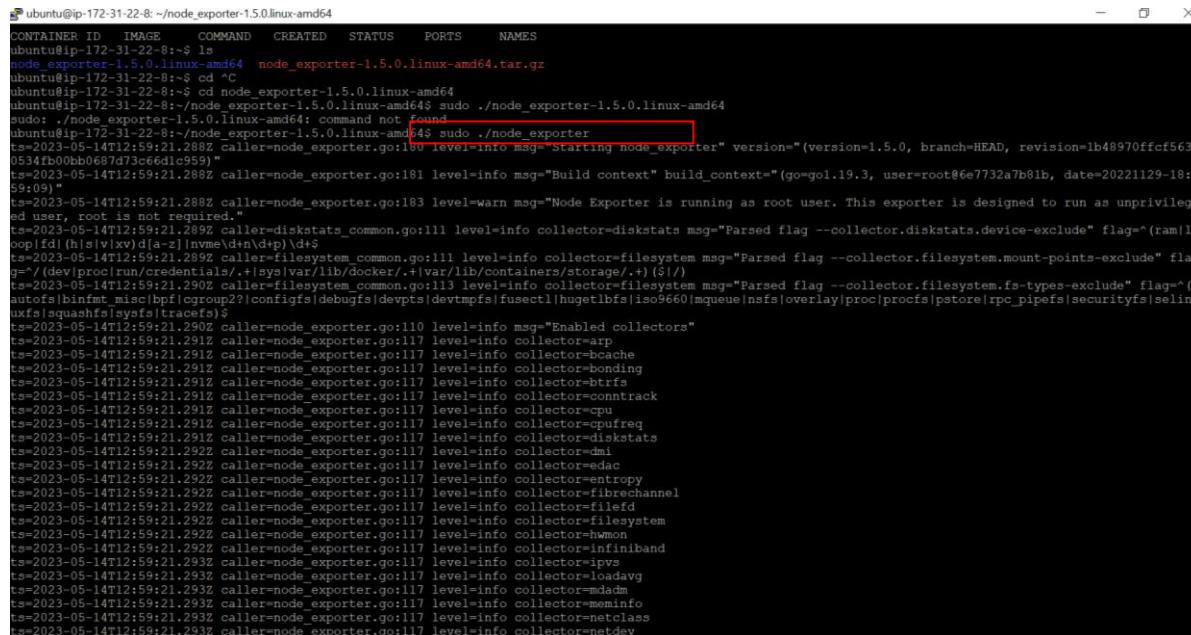


```
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
ubuntu@ip-172-31-22-8:~$ ls
node_exporter-1.5.0.linux-amd64 node_exporter-1.5.0.linux-amd64.tar.gz
ubuntu@ip-172-31-22-8:~$ cd *
ubuntu@ip-172-31-22-8:~/node_exporter-1.5.0.linux-amd64
ubuntu@ip-172-31-22-8:~/node_exporter-1.5.0.linux-amd64: command not found
ubuntu@ip-172-31-22-8:~/node_exporter-1.5.0.linux-amd64: command not found
ts=2023-05-14T12:59:21.288Z caller=node_exporter.go:180 level=info msg="Starting node_exporter" version="(version=1.5.0, branch=HEAD, revision=lb48970ffccf5630534fb00bb0687d73c6d1c959)" ts=2023-05-14T12:59:21.288Z caller=node_exporter.go:181 level=info msg="Build context" build_context="(go=gol19.3, user=root@6e7732a7b81b, date=20221129-18:59:09)" ts=2023-05-14T12:59:21.288Z caller=node_exporter.go:183 level=warn msg="Node Exporter is running as root user. This exporter is designed to run as unprivileged user, root is not required." ts=2023-05-14T12:59:21.289Z caller=diskstats_common.go:111 level=info collector=diskstats msg="Parsed flag --collector.diskstats.device-exclude" flag="(ram1.pop1fd[(h|v|x)v|d[a-z]|nvm|d|n|d+p])|d+s" ts=2023-05-14T12:59:21.289Z caller=filesystem_common.go:111 level=info collector=filesystem msg="Parsed flag --collector.filesystem.mount-points-exclude" flag="/(dev|proc|run|credentials|.+|sys|var|lib|docker|.|+var|lib|containers|storage|.)|($|/)" ts=2023-05-14T12:59:21.290Z caller=filesystem_common.go:113 level=info collector=filesystem msg="Parsed flag --collector.filesystem.fs-types-exclude" flag="(autofs|binfmt_misc|bpf|cgroup2?|configs|debugfs|devtmpfs|fusectl|hugetlbfs|iso9660|mqueue|nsfs|overlay|proc|procfs|pstore|rpc_pipes|securityfs|selinux|squashfs|systems|tracefs)" ts=2023-05-14T12:59:21.290Z caller=node_exporter.go:110 level=info msg="Enabled collectors" ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=arp ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=bcache ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=bonding ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=bttrfs ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=crontrack ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=cpu ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=cupfreq ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=diskstats ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=dma ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=edac ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=entropy ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=fibrechannel ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=filefd ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=filesystem ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=hmon ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=infiniband ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=ipvs ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=loadavg ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=mdadm ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=meminfo ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=netclass ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=netdev
```

## Node Exporter Installation

## 05. Run node exporter:

```
sudo ./node_exporter
```



```
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
ubuntu@ip-172-31-22-8:~$ ls
node_exporter-1.5.0.linux-amd64 node_exporter-1.5.0.linux-amd64.tar.gz
ubuntu@ip-172-31-22-8:~$ cd *
ubuntu@ip-172-31-22-8:~/node_exporter-1.5.0.linux-amd64 sudo ./node_exporter-1.5.0.linux-amd64
ubuntu@ip-172-31-22-8:~/node_exporter-1.5.0.linux-amd64: command not found
ts=2023-05-14T12:59:21.288Z caller=node_exporter.go:180 level=info msg="Starting node_exporter" version="(version=1.5.0, branch=HEAD, revision=lb48970ffccf5630534fb00bb0687d73c6d1c959)" ts=2023-05-14T12:59:21.288Z caller=node_exporter.go:181 level=info msg="Build context" build_context="(go=gol19.3, user=root@6e7732a7b81b, date=20221129-18:59:09)" ts=2023-05-14T12:59:21.288Z caller=node_exporter.go:183 level=warn msg="Node Exporter is running as root user. This exporter is designed to run as unprivileged user, root is not required." ts=2023-05-14T12:59:21.289Z caller=diskstats_common.go:111 level=info collector=diskstats msg="Parsed flag --collector.diskstats.device-exclude" flag="(ram1.pop1fd[(h|v|x)v|d[a-z]|nvm|d|n|d+p])|d+s" ts=2023-05-14T12:59:21.289Z caller=filesystem_common.go:111 level=info collector=filesystem msg="Parsed flag --collector.filesystem.mount-points-exclude" flag="/(dev|proc|run|credentials|.+|sys|var|lib|docker|.|+var|lib|containers|storage|.)|($|/)" ts=2023-05-14T12:59:21.290Z caller=filesystem_common.go:113 level=info collector=filesystem msg="Parsed flag --collector.filesystem.fs-types-exclude" flag="(autofs|binfmt_misc|bpf|cgroup2?|configs|debugfs|devtmpfs|fusectl|hugetlbfs|iso9660|mqueue|nsfs|overlay|proc|procfs|pstore|rpc_pipes|securityfs|selinux|squashfs|systems|tracefs)" ts=2023-05-14T12:59:21.290Z caller=node_exporter.go:110 level=info msg="Enabled collectors" ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=arp ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=bcache ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=bonding ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=bttrfs ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=crontrack ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=cpu ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=cupfreq ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=diskstats ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=dma ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=edac ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=entropy ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=fibrechannel ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=filefd ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=filesystem ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=hmon ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=infiniband ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=ipvs ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=loadavg ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=mdadm ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=meminfo ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=netclass ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=netdev
```

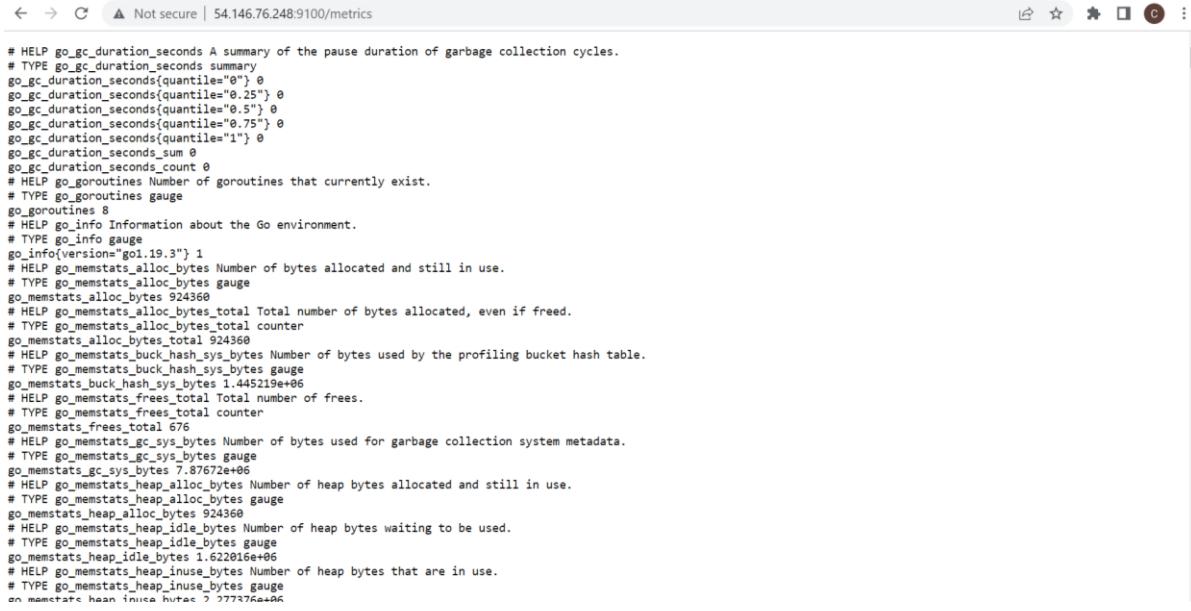
```
ubuntu@ip-172-31-22-8: ~/node_exporter-1.5.0.linux-amd64
ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=crontrack
ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=cpu
ts=2023-05-14T12:59:21.291Z caller=node_exporter.go:117 level=info collector=cpufreq
ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=diskstats
ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=dm
ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=edac
ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=entropy
ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=fibrechannel
ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=filesystem
ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=hwmmon
ts=2023-05-14T12:59:21.292Z caller=node_exporter.go:117 level=info collector=infiniband
ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=ipvs
ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=loadavg
ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=madm
ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=meminfo
ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=netclass
ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=netdev
ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=netstat
ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=nfs
ts=2023-05-14T12:59:21.293Z caller=node_exporter.go:117 level=info collector=nfd
ts=2023-05-14T12:59:21.294Z caller=node_exporter.go:117 level=info collector=nvme
ts=2023-05-14T12:59:21.294Z caller=node_exporter.go:117 level=info collector=os
ts=2023-05-14T12:59:21.294Z caller=node_exporter.go:117 level=info collector=powersupplyclass
ts=2023-05-14T12:59:21.294Z caller=node_exporter.go:117 level=info collector=pressure
ts=2023-05-14T12:59:21.294Z caller=node_exporter.go:117 level=info collector=rapl
ts=2023-05-14T12:59:21.294Z caller=node_exporter.go:117 level=info collector=schedstat
ts=2023-05-14T12:59:21.294Z caller=node_exporter.go:117 level=info collector=selinux
ts=2023-05-14T12:59:21.294Z caller=node_exporter.go:117 level=info collector=sockstat
ts=2023-05-14T12:59:21.294Z caller=node_exporter.go:117 level=info collector=softnet
ts=2023-05-14T12:59:21.295Z caller=node_exporter.go:117 level=info collector=stat
ts=2023-05-14T12:59:21.295Z caller=node_exporter.go:117 level=info collector=tapestats
ts=2023-05-14T12:59:21.295Z caller=node_exporter.go:117 level=info collector=textfile
ts=2023-05-14T12:59:21.295Z caller=node_exporter.go:117 level=info collector=thermal_zone
ts=2023-05-14T12:59:21.295Z caller=node_exporter.go:117 level=info collector=time
ts=2023-05-14T12:59:21.295Z caller=node_exporter.go:117 level=info collector=timex
ts=2023-05-14T12:59:21.295Z caller=node_exporter.go:117 level=info collector=udp_queues
ts=2023-05-14T12:59:21.295Z caller=node_exporter.go:117 level=info collector=username
ts=2023-05-14T12:59:21.295Z caller=node_exporter.go:117 level=info collector=vmstat
ts=2023-05-14T12:59:21.296Z caller=node_exporter.go:117 level=info collector=xfs
ts=2023-05-14T12:59:21.296Z caller=node_exporter.go:117 level=info collector=zfs
ts=2023-05-14T12:59:21.296Z caller=tls_config.go:232 level=info msg="Listening on" address=[::]:9100
ts=2023-05-14T12:59:21.296Z caller=tls_config.go:235 level=info msg="TLS is disabled." http2=false address=[::]:9100
```

### *Node Exporter Installation*

## **06. Exported Metrics from the node exporter**



### *Exported Node Exporter*



The screenshot shows a web browser window with the URL [54.146.76.248:9100/metrics](http://54.146.76.248:9100/metrics). The page displays a large list of metrics, each with a help text, type, and current value. The metrics are categorized by prefix: go\_gc\_duration\_seconds, go\_goroutines, go\_info, go\_memstats, and go\_memstats\_gc\_sys\_bytes.

```
# HELP go_gc_duration_seconds A summary of the pause duration of garbage collection cycles.
# TYPE go_gc_duration_seconds summary
go_gc_duration_seconds{quantile="0"} 0
go_gc_duration_seconds{quantile="0.25"} 0
go_gc_duration_seconds{quantile="0.5"} 0
go_gc_duration_seconds{quantile="0.75"} 0
go_gc_duration_seconds{quantile="1"} 0
go_gc_duration_seconds_sum 0
go_gc_duration_seconds_count 0
# HELP go_goroutines Number of goroutines that currently exist.
# TYPE go_goroutines gauge
go_goroutines 8
# HELP go_info Information about the Go environment.
# TYPE go_info gauge
go_info{version="go1.19.3"} 1
# HELP go_memstats_alloc_bytes Number of bytes allocated and still in use.
# TYPE go_memstats_alloc_bytes gauge
go_memstats_alloc_bytes 924360
# HELP go_memstats_alloc_bytes_total Total number of bytes allocated, even if freed.
# TYPE go_memstats_alloc_bytes_total counter
go_memstats_alloc_bytes_total 924360
# HELP go_memstats_buck_hash_sys_bytes Number of bytes used by the profiling bucket hash table.
# TYPE go_memstats_buck_hash_sys_bytes gauge
go_memstats_buck_hash_sys_bytes 1.445219e+06
# HELP go_memstats_frees_total Total number of frees.
# TYPE go_memstats_frees_total counter
go_memstats_frees_total 676
# HELP go_memstats_gc_sys_bytes Number of bytes used for garbage collection system metadata.
# TYPE go_memstats_gc_sys_bytes gauge
go_memstats_gc_sys_bytes 7.87672e+00
# HELP go_memstats_heap_alloc_bytes Number of heap bytes allocated and still in use.
# TYPE go_memstats_heap_alloc_bytes gauge
go_memstats_heap_alloc_bytes 924360
# HELP go_memstats_heap_idle_bytes Number of heap bytes waiting to be used.
# TYPE go_memstats_heap_idle_bytes gauge
go_memstats_heap_idle_bytes 1.622016e+06
# HELP go_memstats_heap_inuse_bytes Number of heap bytes that are in use.
# TYPE go_memstats_heap_inuse_bytes gauge
go_memstats_heap_inuse_bytes 7.77776e+06
```

### Exported Metrics from the node exporter

## 03. Step 2: Install Prometheus on AWS EC2

### 3.1 Launch EC2 Instance for Prometheus

The screenshot shows the 'Launch an instance' wizard in the AWS EC2 console. In the 'Name and tags' section, the name 'Prometheus' is entered. In the 'Application and OS Images (Amazon Machine Image)' section, the search bar contains 'Search our full catalog including 1000s of application and OS images'. The right sidebar displays summary information, including the number of instances (1), software image (Amazon Linux 2023 AMI 2023.0.2...), virtual server type (t2.micro), and storage (New security group). A prominent orange 'Launch instance' button is visible.

*STEP 1: Go to AWS EC2 Dashboard in the AWS console and start the launch instance wizard*

The screenshot shows the 'Launch an instance' wizard with the 'Quick Start' tab selected. It lists several OS options: Amazon Linux, macOS, Ubuntu, Windows, and Red Hat. Below this, a specific AMI for 'Ubuntu Server 22.04 LTS (HVM), SSD Volume Type' is highlighted, showing its details: ami-007855ac798b5175e (64-bit (x86)) / ami-0c6c29c5125214c77 (64-bit (Arm)), Virtualization: hvm, ENA enabled: true, Root device type: ebs. The right sidebar is identical to the previous screenshot, showing the same summary and configuration options.

*STEP 2: Select Ubuntu Server 22.04 LTS SSD Volume type latest version*

The screenshot shows the AWS EC2 console interface for launching a new instance. In the left sidebar, 'Services' is selected. The main area displays the configuration for launching an instance. On the left, a detailed view of the selected AMI (ami-007855ac798b5175e) is shown, including its architecture (64-bit x86), AMI ID, and verification status ('Verified provider'). Below this, the 'Instance type' section is expanded, showing the 't2.micro' option as selected ('Free tier eligible'). The 'Summary' panel on the right indicates 1 instance will be launched. The 'Software Image (AMI)' is set to Canonical, Ubuntu, 22.04 LTS. The 'Virtual server type (instance type)' is set to t2.micro. The 'Launch instance' button is prominently displayed in orange at the bottom right of the summary panel.

*STEP 3: Choose t2. micro as instance type.*

This screenshot continues the AWS EC2 instance launch process. The 'Key pair (login)' section is now active, showing the previously created key pair 'node\_exporter1' selected in the 'Key pair name - required' dropdown. The 'Network settings' section is also visible. The 'Summary' panel remains on the right, showing 1 instance to be launched with the same AMI and instance type configurations as before. The 'Launch instance' button is again highlighted.

*STEP 4: Choose previous key pair.*

The screenshot shows the AWS EC2 Launch Instances wizard at Step 5: Network settings. On the left, under Network settings, it shows a VPC (vpc-0946cf108e32c0fa5) and a subnet (No preference). Under Firewall (security groups), it shows options to Create security group or Select existing security group. A note says "We'll create a new security group called 'launch-wizard-20' with the following rules:" followed by three checkboxes: Allow SSH traffic from Anywhere (0.0.0.0/0), Allow HTTPS traffic from the internet, and Allow HTTP traffic from the internet. On the right, the Summary section shows 1 instance, AMI Canonical, Ubuntu, 22.04 LTS, instance type t2.micro, and a New security group. At the bottom are Cancel, Launch instance, and Review commands buttons.

*STEP 5: Configure the instance details. We selected the default VPC and the default subnet*

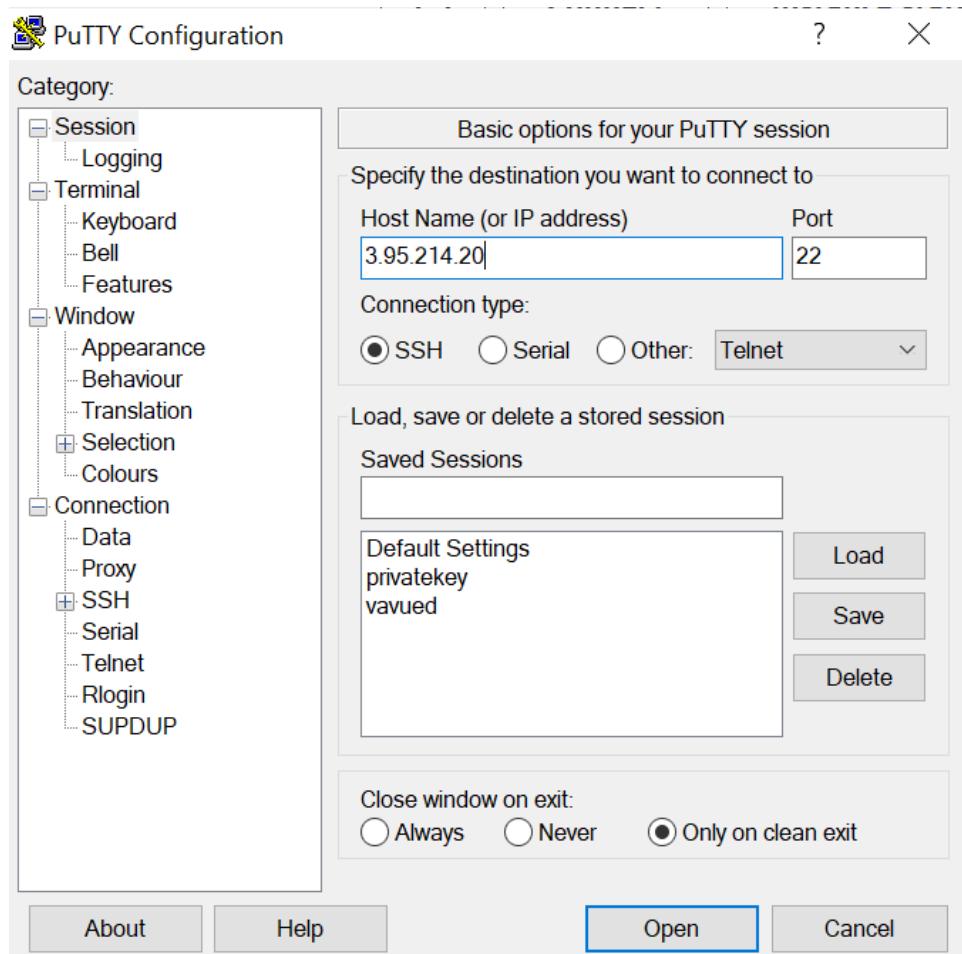
The screenshot shows the AWS EC2 Launch Instances wizard at Step 6: Configure storage. It shows a configuration for a Root volume (Not encrypted) of 8 GiB gp2. A note says "Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage". Below this, it says "The selected AMI contains more instance store volumes than the instance allows. Only the first 0 instance store volumes from the AMI will be accessible from the instance". Under Advanced details, there is an "Edit" button. On the right, the Summary section shows 1 instance, AMI Canonical, Ubuntu, 22.04 LTS, instance type t2.micro, and a New security group. At the bottom are Cancel, Launch instance, and Review commands buttons.

*STEP 6: Add Storage as 8gb*

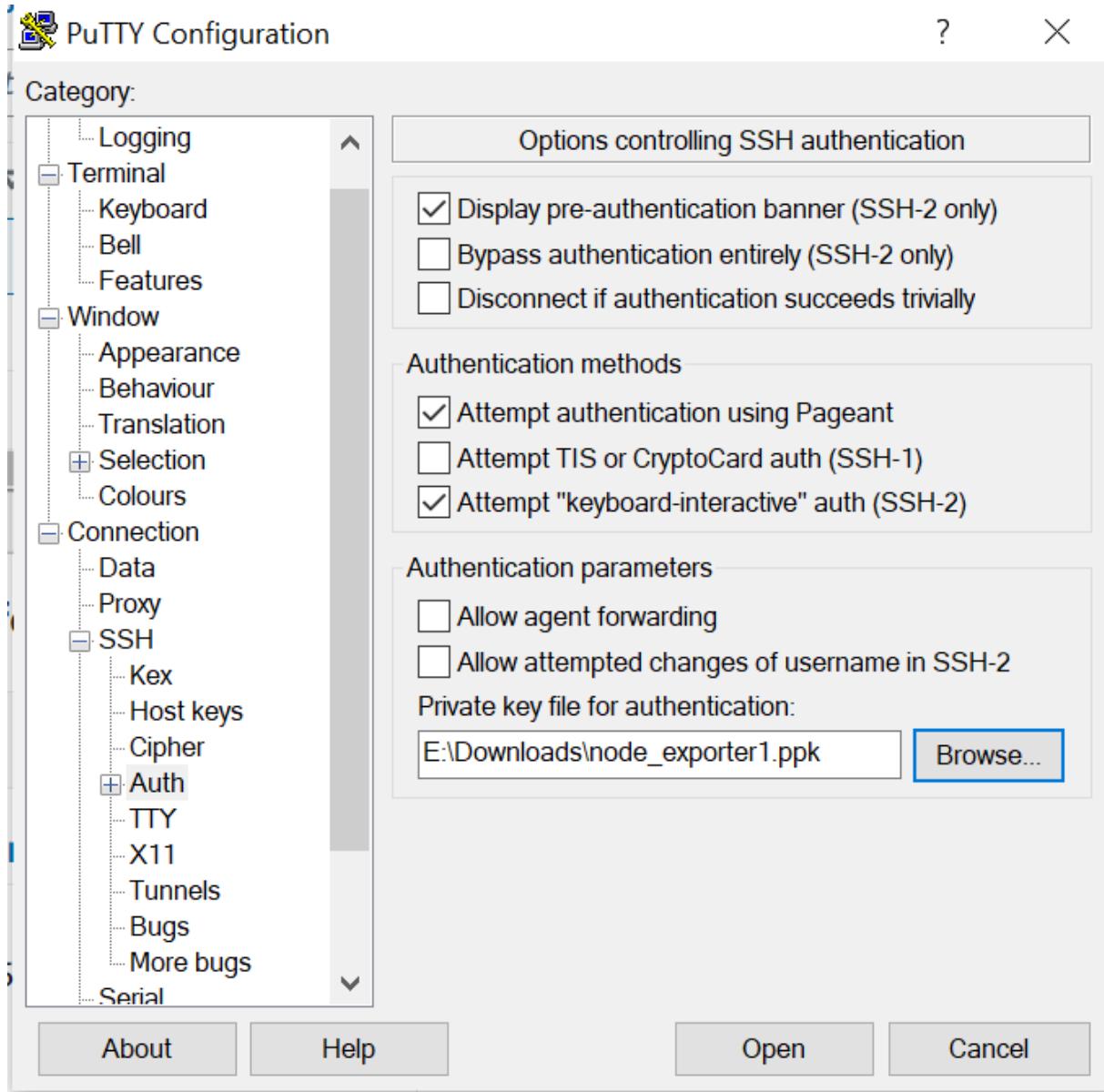
The screenshot shows the AWS EC2 Security Groups Inbound rules configuration page. The interface includes a sidebar with navigation links like EC2 Dashboard, EC2 Global View, Events, Limits, Instances, Images, CloudShell, Feedback, and Language. The main content area displays the title "Inbound rules (4)" and a table of security group rules. The table columns are: group rule..., IP version, Type, Protocol, and Port range. The rules listed are:

group rule...	IP version	Type	Protocol	Port range
1e95950780d9a9	IPv4	HTTPS	TCP	443
69be613b282...	IPv4	Custom TCP	TCP	3000
b891b699112...	IPv4	SSH	TCP	22
62d93598816...	IPv4	Custom TCP	TCP	9090

*STEP 7: Configure the Security group. We used port 9090 for Prometheus*



*STEP 8: Connected the AWS Linux EC2 instance to computer using the SSH protocol. PuTTY is a SSH client that allows to do this from a local computer running windows*



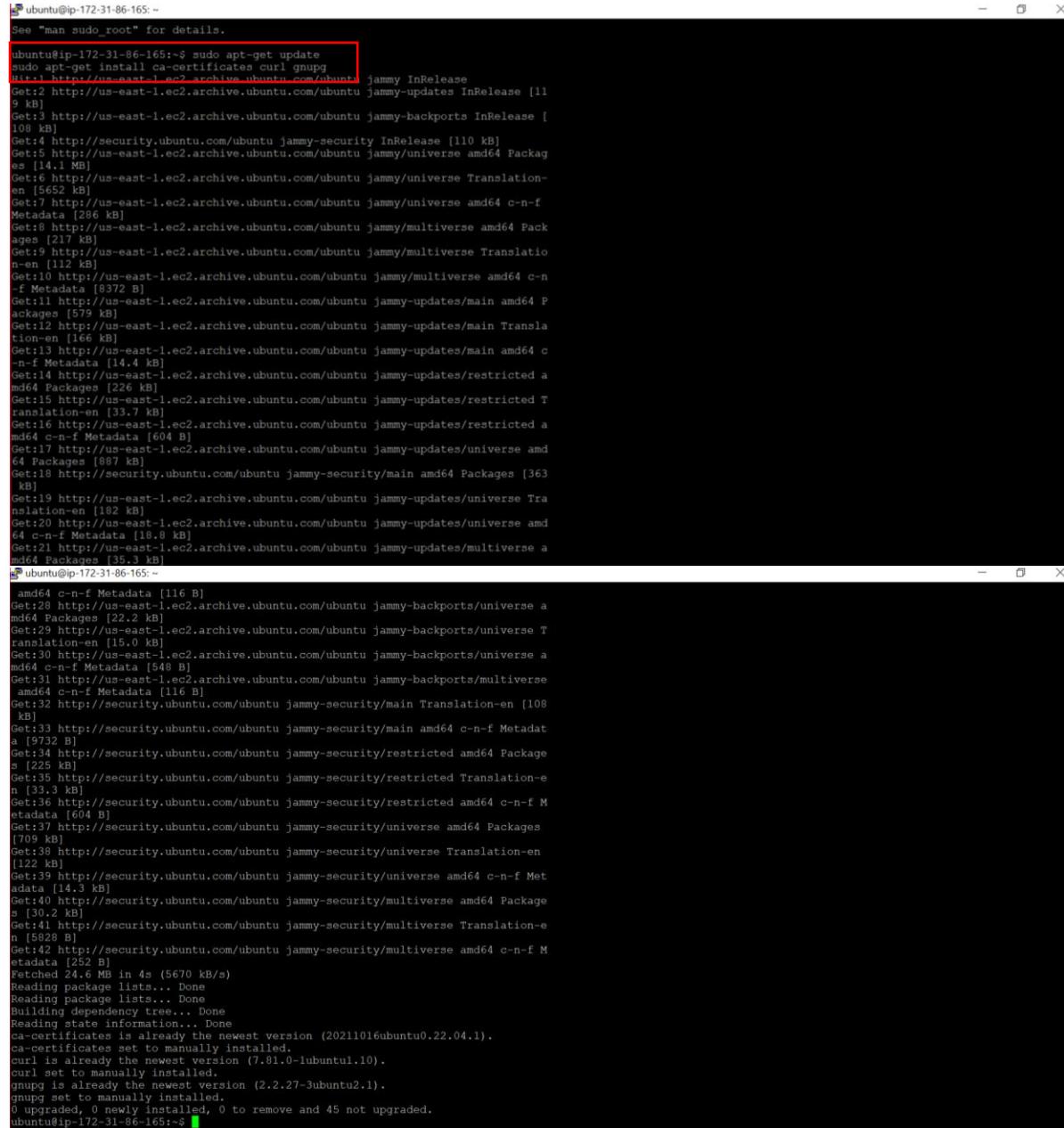
STEP 9: PuTTY configuration – Authentication

### 3.2 Install docker inside the virtual machine

Again, we have to install docker inside this virtual machine as same as the process of previous docker installation for node exporter.

#### 01.Update the apt package index and install packages to allow apt to use a repository over HTTPS:

```
sudo apt-get update  
sudo apt-get install ca-certificates curl gnupg
```

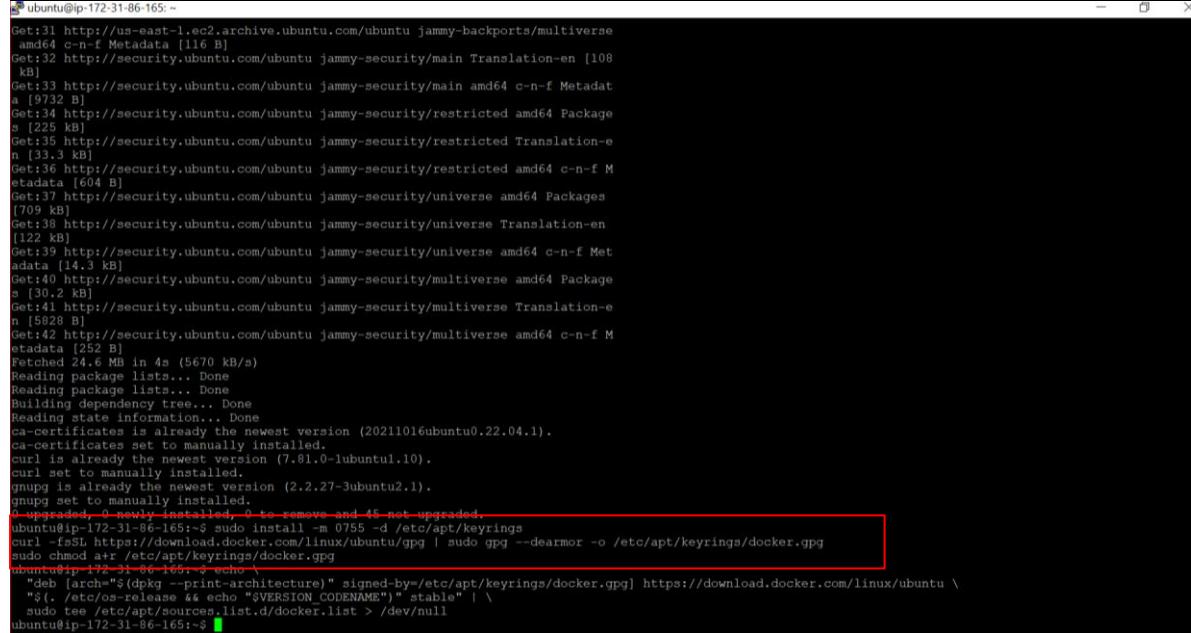


```
ubuntu@ip-172-31-86-165:~  
See "man sudo_root" for details.  
ubuntu@ip-172-31-86-165:~$ sudo apt-get update  
[sudo apt-get install ca-certificates curl gnupg]  
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease [11  
9 kB]  
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease [11  
08 kB]  
Get:4 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]  
Get:5 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 Packag  
es [14.1 MB]  
Get:6 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/universe Translation-  
en [5652 kB]  
Get:7 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 c-n-f  
Metadata [286 kB]  
Get:8 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse amd64 Pack  
ages [217 kB]  
Get:9 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse Translatio  
n-en [112 kB]  
Get:10 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse amd64 c-n  
-f Metadata [8372 B]  
Get:11 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 P  
ackages [579 kB]  
Get:12 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main Transla  
tion-en [166 kB]  
Get:13 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 c  
-n-f Metadata [14.4 kB]  
Get:14 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted a  
md64 Packages [22.2 kB]  
Get:15 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted T  
ranslation-en [18.0 kB]  
Get:16 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted a  
md64 c-n-f Metadata [604 B]  
Get:17 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd  
64 Packages [887 kB]  
Get:18 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [363  
kB]  
Get:19 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe Tra  
nslation-en [182 kB]  
Get:20 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd  
64 c-n-f Metadata [18.8 kB]  
Get:21 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse a  
md64 Packages [35.3 kB]  
ubuntu@ip-172-31-86-165:~  
. amd64 c-n-f Metadata [116 B]  
Get:28 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe a  
md64 Packages [22.2 kB]  
Get:29 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe T  
ranslation-en [15.0 kB]  
Get:30 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe a  
md64 c-n-f Metadata [548 B]  
Get:31 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/multiverse  
amd64 c-n-f Metadata [116 B]  
Get:32 http://security.ubuntu.com/ubuntu jammy-security/main Translation-en [108  
kB]  
Get:33 http://security.ubuntu.com/ubuntu jammy-security/main amd64 c-n-f Metadat  
a [9732 B]  
Get:34 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Package  
s [225 kB]  
Get:35 http://security.ubuntu.com/ubuntu jammy-security/restricted Translation-e  
n [33.3 kB]  
Get:36 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 c-n-f M  
etadata [604 B]  
Get:37 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages  
[709 kB]  
Get:38 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en  
[122 kB]  
Get:39 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 c-n-f Met  
adata [14.3 kB]  
Get:40 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Package  
s [30.2 kB]  
Get:41 http://security.ubuntu.com/ubuntu jammy-security/multiverse Translation-e  
n [5828 B]  
Get:42 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 c-n-f M  
etadata [252 B]  
Fetched 24.6 MB in 4s (5670 kB/s)  
Reading package lists... Done  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
ca-certificates is already the newest version (20211016ubuntu0.22.04.1).  
ca-certificates set to manually installed.  
curl is already the newest version (7.81.0-1ubuntu1.10).  
curl set to manually installed.  
gnupg is already the newest version (2.2.27-3ubuntu2.1).  
gnupg set to manually installed.  
0 upgraded, 0 newly installed, 0 to remove and 45 not upgraded.  
ubuntu@ip-172-31-86-165:~
```

Docker Installation

## 02. Add Docker's official GPG key:

```
sudo install -m 0755 -d /etc/apt/keyrings  
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmor -o  
/etc/apt/keyrings/docker.gpg  
sudo chmod a+r /etc/apt/keyrings/docker.gpg
```

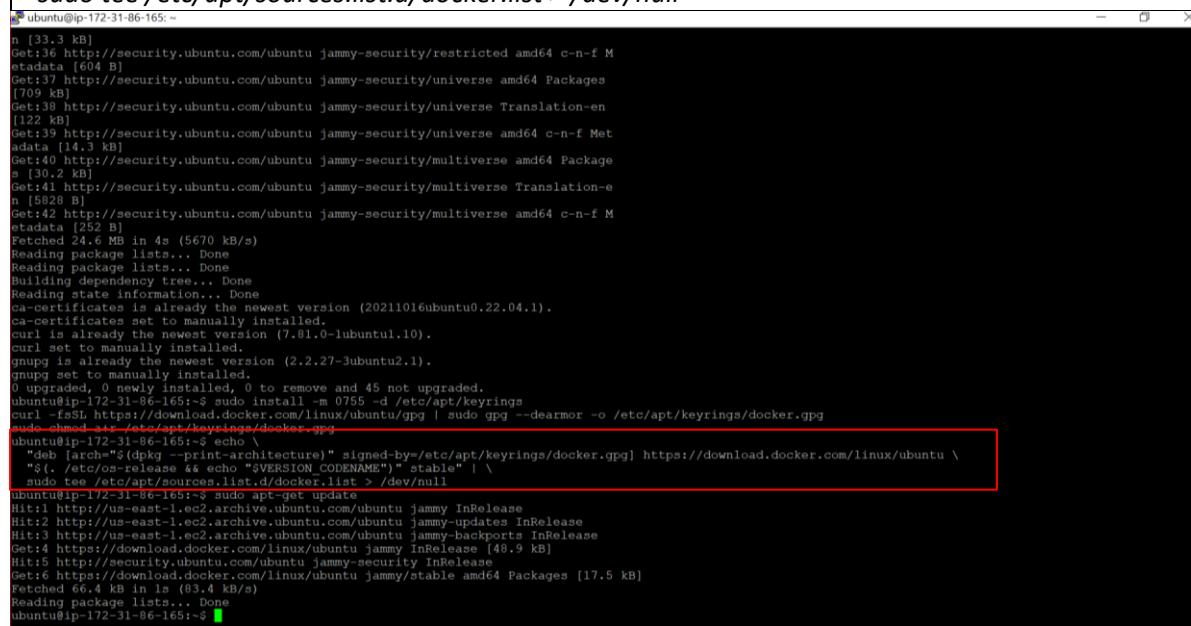


```
ubuntu@ip-172-31-86-165:~  
Get:31 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/multiverse  
amd64 c-n-f Metadat [116 B]  
Get:32 http://security.ubuntu.com/ubuntu jammy-security/main Translation-en [108 kB]  
Get:33 http://security.ubuntu.com/ubuntu jammy-security/main amd64 c-n-f Metadat  
a [9732 B]  
Get:34 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Package  
s [225 kB]  
Get:35 http://security.ubuntu.com/ubuntu jammy-security/restricted Translation-e  
n [33.3 kB]  
Get:36 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 c-n-f M  
etadata [604 B]  
Get:37 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages  
[709 kB]  
Get:38 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en  
[122 kB]  
Get:39 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 c-n-f Met  
adata [14.3 kB]  
Get:40 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Package  
s [30.2 kB]  
Get:41 http://security.ubuntu.com/ubuntu jammy-security/multiverse Translation-e  
n [5828 B]  
Get:42 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 c-n-f M  
etadata [252 B]  
Fetched 24.6 MB in 4s (5670 kB/s)  
Reading package lists... Done  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
ca-certificates is already the newest version (20211016ubuntu0.22.04.1).  
ca-certificates set to manually installed.  
curl is already the newest version (7.81.0-lubuntu1.10).  
curl set to manually installed.  
gnupg is already the newest version (2.2.27-3ubunt2.1).  
gnupg set to manually installed.  
0 upgraded, 0 newly installed, 0 to remove and 45 not upgraded.  
ubuntu@ip-172-31-86-165:~$ sudo install -m 0755 -d /etc/apt/keyrings  
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmor -o /etc/apt/keyrings/docker.gpg  
sudo chmod a+r /etc/apt/keyrings/docker.gpg  
ubuntu@ip-172-31-86-165:~$ echo '  
"deb [arch="$(dpkg --print-architecture)" signed-by=/etc/apt/keyrings/docker.gpg] https://download.docker.com/linux/ubuntu \\  
"\$(. /etc/os-release && echo "$VERSION_CODENAME")" stable" | \  
sudo tee /etc/apt/sources.list.d/docker.list > /dev/null  
ubuntu@ip-172-31-86-165:~$
```

## Docker Installation

## 03. Use the following command to set up the repository:

```
echo '  
"deb [arch="$(dpkg --print-architecture)" signed-by=/etc/apt/keyrings/docker.gpg]  
https://download.docker.com/linux/ubuntu \  
"\$(. /etc/os-release && echo "$VERSION_CODENAME")" stable" | \  
sudo tee /etc/apt/sources.list.d/docker.list > /dev/null
```

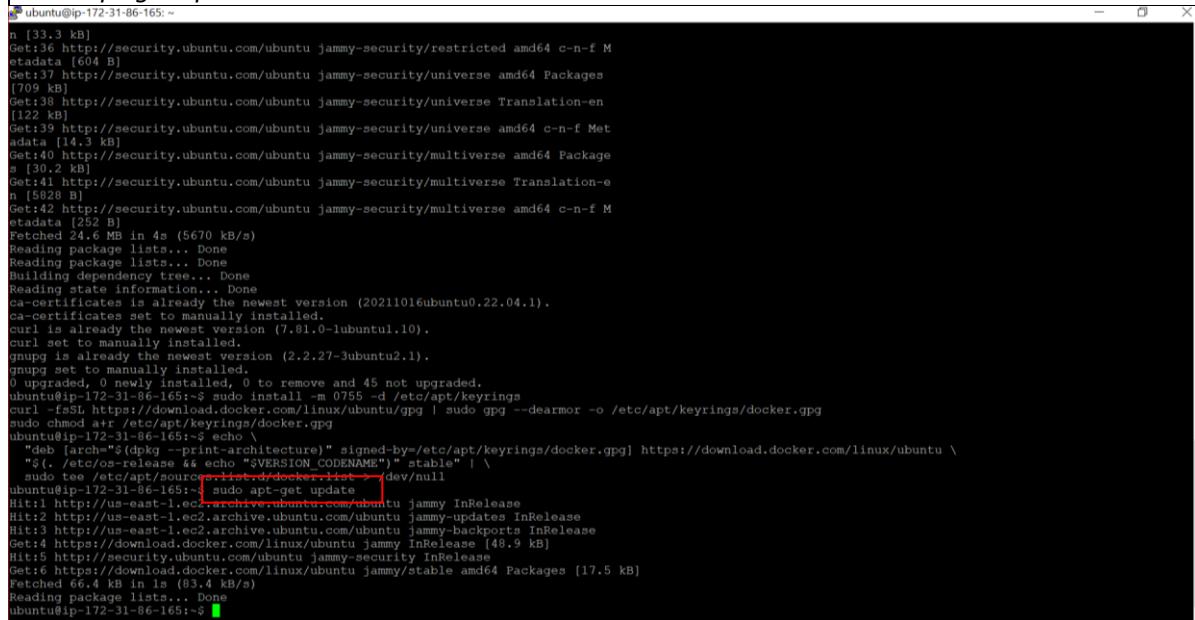


```
ubuntu@ip-172-31-86-165:~  
n [33.3 kB]  
Get:36 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 c-n-f M  
etadata [604 B]  
Get:37 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages  
[709 kB]  
Get:38 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en  
[122 kB]  
Get:39 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 c-n-f Met  
adata [14.3 kB]  
Get:40 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Package  
s [30.2 kB]  
Get:41 http://security.ubuntu.com/ubuntu jammy-security/multiverse Translation-e  
n [5828 B]  
Get:42 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 c-n-f M  
etadata [252 B]  
Fetched 24.6 MB in 4s (5670 kB/s)  
Reading package lists... Done  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
ca-certificates is already the newest version (20211016ubuntu0.22.04.1).  
ca-certificates set to manually installed.  
curl is already the newest version (7.81.0-lubuntu1.10).  
curl set to manually installed.  
gnupg is already the newest version (2.2.27-3ubunt2.1).  
gnupg set to manually installed.  
0 upgraded, 0 newly installed, 0 to remove and 45 not upgraded.  
ubuntu@ip-172-31-86-165:~$ sudo install -m 0755 -d /etc/apt/keyrings  
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmor -o /etc/apt/keyrings/docker.gpg  
sudo chmod a+r /etc/apt/keyrings/docker.gpg  
ubuntu@ip-172-31-86-165:~$ echo '  
"deb [arch="$(dpkg --print-architecture)" signed-by=/etc/apt/keyrings/docker.gpg] https://download.docker.com/linux/ubuntu \\  
"\$(. /etc/os-release && echo "$VERSION_CODENAME")" stable" | \  
sudo tee /etc/apt/sources.list.d/docker.list > /dev/null  
ubuntu@ip-172-31-86-165:~$ sudo apt-get update  
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease  
Hit:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease  
Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease  
Get:4 https://download.docker.com/linux/ubuntu jammy InRelease [48.9 kB]  
Get:5 https://security.ubuntu.com/ubuntu jammy-security InRelease  
Get:6 https://download.docker.com/linux/ubuntu jammy/stable amd64 Packages [17.5 kB]  
Fetched 66.4 kB in 1s (83.4 kB/s)  
Reading package lists... Done  
ubuntu@ip-172-31-86-165:~$
```

## Docker Installation

#### 04.Update the apt package index:

```
sudo apt-get update
```

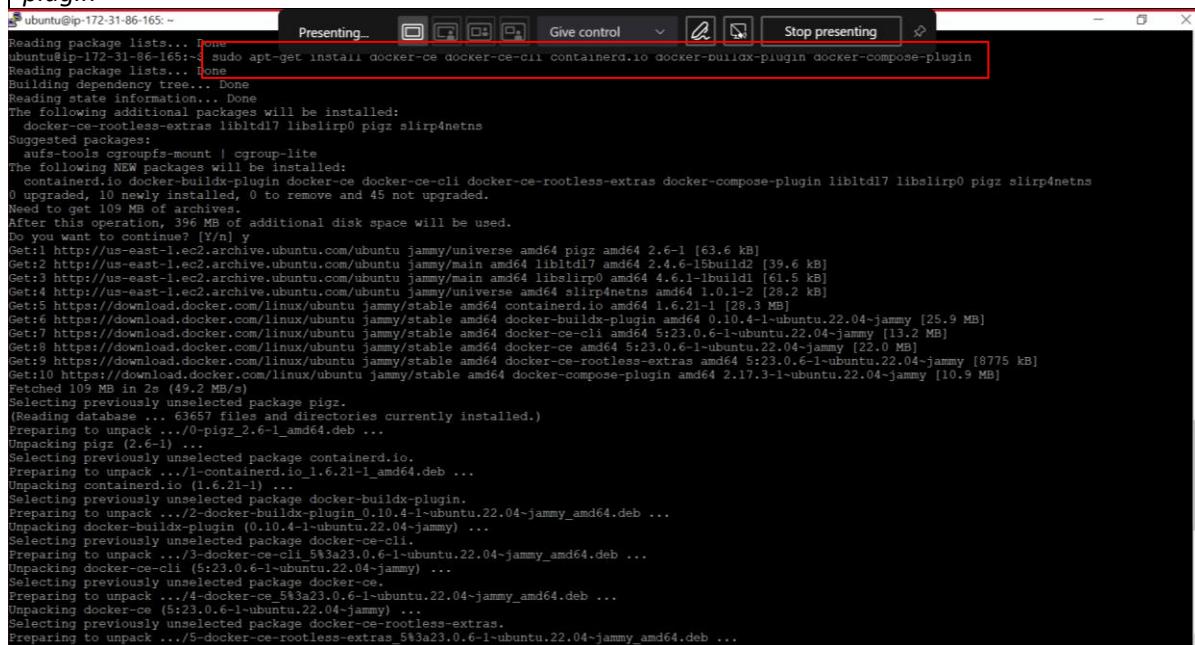


```
[13.3 kB]
Get:36 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 c-n-f M
  etadata [604 B]
Get:37 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [709 kB]
Get:38 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en [122 kB]
Get:39 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 c-n-f Met
  adata [14.3 kB]
Get:40 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Package
  s [30.2 kB]
Get:41 http://security.ubuntu.com/ubuntu jammy-security/multiverse Translation-e
  n [5828 B]
Get:42 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 c-n-f M
  etadata [252 B]
Fetched 24.6 MB in 4s (5670 kB/s)
Reading package lists... Done
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
ca-certificates is already the newest version (20211016ubuntu0.22.04.1).
ca-certificates set to manually installed.
curl is already the newest version (7.81.0-ubuntu1.10).
curl set to manually installed.
gnupg is already the newest version (2.2.27-3ubuntu2.1).
gnupg set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 45 not upgraded.
ubuntu@ip-172-31-86-165:~$ sudo install -m 0755 -d /etc/apt/keyrings
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmor -o /etc/apt/keyrings/docker.gpg
sudo chmod a+r /etc/apt/keyrings/docker.gpg
ubuntu@ip-172-31-86-165:~$ echo \"
  \"deb [arch=$(dpkg --print-architecture) signed-by=/etc/apt/keyrings/docker.gpg] https://download.docker.com/linux/ubuntu \
  \"$ (. /etc/os-release && echo \"$VERSION_CODENAME\" )\" stable\" | \
  sudo tee /etc/apt/sources.list.d/docker.list > /dev/null
ubuntu@ip-172-31-86-165:~$ sudo apt-get update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Get:4 https://download.docker.com/linux/ubuntu jammy InRelease [48.9 kB]
Hit:5 http://security.ubuntu.com/ubuntu jammy-security InRelease
Get:6 https://download.docker.com/linux/ubuntu jammy/stable amd64 Packages [17.5 kB]
Fetched 66.4 kB in 1s (83.4 kB/s)
Reading package lists... Done
ubuntu@ip-172-31-86-165:~$
```

### Docker Installation

#### 05.To Install latest version of Docker Engine, containerd, and Docker Compose and run:

```
sudo apt-get install docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-compose-
plugin
```



```
Reading package lists...
ubuntu@ip-172-31-86-165:~$ sudo apt-get install docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-compose-plugin
Reading package lists...
Building dependency tree...
Reading state information...
The following additional packages will be installed:
  docker-ce-rootless-extras libltdl7 libslirp0 pigz slirp4netns
Suggested packages:
  aufs-tools cgroupfs-mount | cgroup-lite
The following NEW packages will be installed:
  containerd.io docker-buildx-plugin docker-ce docker-ce-rootless-extras docker-compose-plugin libltdl7 libslirp0 pigz slirp4netns
0 upgraded, 10 newly installed, 0 to remove and 45 not upgraded.
Need to get 109 MB of archives.
After this operation, 396 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 pigz amd64 2.6.1 [63.6 kB]
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 libltdl7 amd64 2.4.6-1build2 [39.6 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 libslirp0 amd64 4.6.1-1build1 [61.5 kB]
Get:4 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 slirp4netns amd64 1.0.1-2 [28.2 kB]
Get:5 https://download.docker.com/linux/ubuntu jammy/stable amd64 containerd.io amd64 1.6.21-1 [28.3 MB]
Get:6 https://download.docker.com/linux/ubuntu jammy/stable amd64 docker-buildx-plugin amd64 0.10.4-1-ubuntu.22.04-jammy [25.9 MB]
Get:7 https://download.docker.com/linux/ubuntu jammy/stable amd64 docker-ce-cli amd64 5:23.0.6-1-ubuntu.22.04-jammy [13.2 MB]
Get:8 https://download.docker.com/linux/ubuntu jammy/stable amd64 docker-ce amd64 5:23.0.6-1-ubuntu.22.04-jammy [22.0 MB]
Get:9 https://download.docker.com/linux/ubuntu jammy/stable amd64 docker-ce-rootless-extras amd64 5:23.0.6-1-ubuntu.22.04-jammy [8775 kB]
Get:10 https://download.docker.com/linux/ubuntu jammy/stable amd64 docker-compose-plugin amd64 2.17.3-1-ubuntu.22.04-jammy [10.9 MB]
Fetched 109 MB in 2s (49.2 MB/s)
Selecting previously unselected package pigz.
(Reading database ... 63657 files and directories currently installed.)
Preparing to unpack .../0-pigz_2.6-1_amd64.deb ...
Unpacking pigz (2.6-1) ...
Selecting previously unselected package containerd.io.
Preparing to unpack .../1-containerd.io_1.6.21-1_amd64.deb ...
Unpacking containerd.io (1.6.21-1) ...
Selecting previously unselected package docker-buildx-plugin.
Preparing to unpack .../2-docker-buildx-plugin_0.10.4-1-ubuntu.22.04-jammy_amd64.deb ...
Unpacking docker-buildx-plugin (0.10.4-1-ubuntu.22.04-jammy) ...
Selecting previously unselected package docker-ce-cli.
Preparing to unpack .../3-docker-ce-cli_5%3a23.0.6-1+ubuntu.22.04-jammy_amd64.deb ...
Unpacking docker-ce-cli (5:23.0.6-1+ubuntu.22.04-jammy) ...
Selecting previously unselected package docker-ce.
Preparing to unpack .../4-docker-ce_5%3a23.0.6-1+ubuntu.22.04-jammy_amd64.deb ...
Unpacking docker-ce (5:23.0.6-1+ubuntu.22.04-jammy) ...
Selecting previously unselected package docker-ce-rootless-extras.
Preparing to unpack .../5-docker-ce-rootless-extras_5%3a23.0.6-1+ubuntu.22.04-jammy_amd64.deb ...
```

```

ubuntu@ip-172-31-86-165: ~
Unpacking docker-ce (5:23.0.6-1~ubuntu.22.04~jammy) ...
Selecting previously unselected package docker-ce-rootless-extras.
Preparing to unpack .../5-docker-ce-rootless-extras_5%3a23.0.6-1~ubuntu.22.04~jammy_amd64.deb ...
Unpacking docker-ce-rootless-extras (5:23.0.6-1~ubuntu.22.04~jammy) ...
Selecting previously unselected package docker-compose-plugin.
Preparing to unpack .../6-docker-compose-plugin_2.17.3-1~ubuntu.22.04~jammy_amd64.deb ...
Unpacking docker-compose-plugin (2.17.3-1~ubuntu.22.04~jammy) ...
Selecting previously unselected package libltdl7:amd64.
Preparing to unpack .../7-libltdl7_2.4.6-15build2_amd64.deb ...
Unpacking libltdl7:amd64 (2.4.6-15build2) ...
Selecting previously unselected package libslirp0:amd64.
Preparing to unpack .../8-libslirp0_4.6.1-1build1_amd64.deb ...
Unpacking libslirp0:amd64 (4.6.1-1build1) ...
Selecting previously unselected package slirp4netns.
Preparing to unpack .../9-slirp4netns_1.0.1-2_amd64.deb ...
Unpacking slirp4netns (1.0.1-2) ...
Setting up docker-buildx-plugin (1.10.4-1~ubuntu.22.04~jammy) ...
Setting up containerd.io (1.6.21-1) ...
Created symlink /etc/systemd/system/multi-user.target.wants/containerd.service → /lib/systemd/system/containerd.service.
Setting up docker-compose-plugin (2.17.3-1~ubuntu.22.04~jammy) ...
Setting up libltdl7:amd64 (2.4.6-15build2) ...
Setting up docker-ce-cli (5:23.0.6-1~ubuntu.22.04~jammy) ...
Setting up libslirp0:amd64 (4.6.1-1build1) ...
Setting up pigz (2.6-1) ...
Setting up docker-ce-rootless-extras (5:23.0.6-1~ubuntu.22.04~jammy) ...
Setting up slirp4netns (1.0.1-2) ...
Setting up docker-ce (5:23.0.6-1~ubuntu.22.04~jammy) ...
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service → /lib/systemd/system/docker.service.
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /lib/systemd/system/docker.socket.
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.1) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.
No services need to be restarted.
No containers need to be restarted.
No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-86-165:~
```

### Docker Installation

#### 06.Verify that the Docker Engine installation is successful by running the hello-world image:

*sudo docker run hello-world*

```

ubuntu@ip-172-31-86-165: ~
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /lib/systemd/system/docker.socket.
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.1) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.
No services need to be restarted.
No containers need to be restarted.
No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-86-165:~ sudo docker run hello-world
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
719385e32844: Pull complete
Digest: sha256:fc6cf906cbfa013e8093cd0b199fdbbb86d6e3e013783e5a766f50f5dbce0
Status: Downloaded newer image for hello-world:latest
Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
 1. The Docker client contacted the Docker daemon.
 2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
    (amd64)
 3. The Docker daemon created a new container from that image which runs the
    executable that produces the output you are currently reading.
 4. The Docker daemon streamed that output to the Docker client, which sent it
    to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
$ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
https://hub.docker.com/

For more examples and ideas, visit:
https://docs.docker.com/get-started/
ubuntu@ip-172-31-86-165:~
```

### Docker Installation

### 3.3 Install Prometheus

After installing docker, here are the steps followed in order to configure the Prometheus on the docker image.

#### 01. Download Prometheus image from prometheus.io:

```
wget https://github.com/prometheus/prometheus/releases/download/v2.44.0/prometheus-2.44.0.linux-amd64.tar.gz
```

```
ubuntu@ip-172-31-86-165:~$ wget https://github.com/prometheus/prometheus/releases/download/v2.44.0/prometheus-2.44.0.linux-amd64.tar.gz
--2023-05-14 13:18:05 -- https://github.com/prometheus/prometheus/releases/download/v2.44.0/prometheus-2.44.0.linux-amd64.tar.gz
Resolving github.com (github.com)... 140.82.113.4
Connecting to github.com (github.com)... 140.82.113.4:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://objects.githubusercontent.com/github-production-release-asset-2e65be/6838921/e7f4fc67-722c-4e3b-b3f4-9abcd8b9359b7X-Amz-Algorithm=AWS4-HMAC-SHA256X-Amz-Credential=AKIAIWJYAX4CSVERH3A%2F20230514%2Fus-east-1%2F8%2Faws4_requestX-Amz-Date=20230514T131805Zx-Amz-Expires=300X-Amz-Signature=ee73bae29bfcce7f8116103950cae0f91c01c35634159a0283a957b63d7b1b4a&Amz-SignedHeaders=host&actor_id=0&key_id=0&repo_id=6838921&response-content-disposition=attachment%3B%20filename%3Dprometheus-2.44.0.linux-amd64.tar.gz&response-content-type=application%2Foctet-stream [following]
--2023-05-14 13:18:05 -- https://objects.githubusercontent.com/github-production-release-asset-2e65be/6838921/e7f4fc67-722c-4e3b-b3f4-9abcd8b9359b7X-Amz-Algorithm=AWS4-HMAC-SHA256X-Amz-Credential=AKIAIWJYAX4CSVERH3A%2F20230514%2Fus-east-1%2F8%2Faws4_requestX-Amz-Date=20230514T131805Zx-Amz-Expires=300X-Amz-Signature=ee73bae29bfcce7f8116103950cae0f91c01c35634159a0283a957b63d7b1b4a&Amz-SignedHeaders=host&actor_id=0&key_id=0&repo_id=6838921&response-content-disposition=attachment%3B%20filename%3Dprometheus-2.44.0.linux-amd64.tar.gz&response-content-type=application%2Foctet-stream
Resolving objects.githubusercontent.com (objects.githubusercontent.com)... 185.199.111.133, 185.199.108.133, 185.199.109.133, ...
Connecting to objects.githubusercontent.com (objects.githubusercontent.com)|185.199.111.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 90577277 (86M) [application/octet-stream]
Saving to: 'prometheus-2.44.0.linux-amd64.tar.gz'

prometheus-2.44.0.linux-amd64.tar.gz 100%[=====] 86.38M 134MB/s in 0.6s
2023-05-14 13:18:06 (134 MB/s) - 'prometheus-2.44.0.linux-amd64.tar.gz' saved [90577277/90577277]

ubuntu@ip-172-31-86-165:~$ tar -xvf prometheus-2.44.0.linux-amd64.tar.gz
prometheus-2.44.0.linux-amd64/
prometheus-2.44.0.linux-amd64/prometheus.yml
prometheus-2.44.0.linux-amd64/console_libraries/
prometheus-2.44.0.linux-amd64/console_libraries/prom.lib
prometheus-2.44.0.linux-amd64/console_libraries/menu.lib
prometheus-2.44.0.linux-amd64/LICENSE
prometheus-2.44.0.linux-amd64/NOTICE
prometheus-2.44.0.linux-amd64/consoles/
prometheus-2.44.0.linux-amd64/consoles/node-overview.html
prometheus-2.44.0.linux-amd64/consoles/node-disk.html
prometheus-2.44.0.linux-amd64/consoles/index.html.example
prometheus-2.44.0.linux-amd64/consoles/node-cpu.html
prometheus-2.44.0.linux-amd64/consoles/prometheus.html
prometheus-2.44.0.linux-amd64/consoles/node.html
prometheus-2.44.0.linux-amd64/consoles/prometheus-overview.html
prometheus-2.44.0.linux-amd64/consoles/prometheus
prometheus-2.44.0.linux-amd64/promtool
ubuntu@ip-172-31-86-165:~$ ls
prometheus-2.44.0.linux-amd64  prometheus-2.44.0.linux-amd64.tar.gz
ubuntu@ip-172-31-86-165:~$
```

#### Prometheus Installation

#### 02. Unzipped downloaded file:

```
tar -xvf prometheus-2.44.0.linux-amd64.tar.gz
```

```
Location: https://objects.githubusercontent.com/github-production-release-asset-2e65be/6838921/e7f4fc67-722c-4e3b-b3f4-9abcd8b9359b7X-Amz-Algorithm=AWS4-HMAC-SHA256X-Amz-Credential=AKIAIWJYAX4CSVERH3A%2F20230514%2Fus-east-1%2F8%2Faws4_requestX-Amz-Date=20230514T131805Zx-Amz-Expires=300X-Amz-Signature=ee73bae29bfcce7f8116103950cae0f91c01c35634159a0283a957b63d7b1b4a&Amz-SignedHeaders=host&actor_id=0&key_id=0&repo_id=6838921&response-content-disposition=attachment%3B%20filename%3Dprometheus-2.44.0.linux-amd64.tar.gz&response-content-type=application%2Foctet-stream [following]
--2023-05-14 13:18:05 -- https://objects.githubusercontent.com/github-production-release-asset-2e65be/6838921/e7f4fc67-722c-4e3b-b3f4-9abcd8b9359b7X-Amz-Algorithm=AWS4-HMAC-SHA256X-Amz-Credential=AKIAIWJYAX4CSVERH3A%2F20230514%2Fus-east-1%2F8%2Faws4_requestX-Amz-Date=20230514T131805Zx-Amz-Expires=300X-Amz-Signature=ee73bae29bfcce7f8116103950cae0f91c01c35634159a0283a957b63d7b1b4a&Amz-SignedHeaders=host&actor_id=0&key_id=0&repo_id=6838921&response-content-disposition=attachment%3B%20filename%3Dprometheus-2.44.0.linux-amd64.tar.gz&response-content-type=application%2Foctet-stream
Resolving objects.githubusercontent.com (objects.githubusercontent.com)... 185.199.111.133, 185.199.108.133, 185.199.109.133, ...
Connecting to objects.githubusercontent.com (objects.githubusercontent.com)|185.199.111.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 90577277 (86M) [application/octet-stream]
Saving to: 'prometheus-2.44.0.linux-amd64.tar.gz'

prometheus-2.44.0.linux-amd64.tar.gz 100%[=====] 86.38M 134MB/s in 0.6s
2023-05-14 13:18:06 (134 MB/s) - 'prometheus-2.44.0.linux-amd64.tar.gz' saved [90577277/90577277]

ubuntu@ip-172-31-86-165:~$ tar -xvf prometheus-2.44.0.linux-amd64.tar.gz
prometheus-2.44.0.linux-amd64/
prometheus-2.44.0.linux-amd64/prometheus.yml
prometheus-2.44.0.linux-amd64/console_libraries/
prometheus-2.44.0.linux-amd64/console_libraries/prom.lib
prometheus-2.44.0.linux-amd64/console_libraries/menu.lib
prometheus-2.44.0.linux-amd64/LICENSE
prometheus-2.44.0.linux-amd64/NOTICE
prometheus-2.44.0.linux-amd64/consoles/
prometheus-2.44.0.linux-amd64/consoles/node-overview.html
prometheus-2.44.0.linux-amd64/consoles/node-disk.html
prometheus-2.44.0.linux-amd64/consoles/index.html.example
prometheus-2.44.0.linux-amd64/consoles/node-cpu.html
prometheus-2.44.0.linux-amd64/consoles/prometheus.html
prometheus-2.44.0.linux-amd64/consoles/node.html
prometheus-2.44.0.linux-amd64/consoles/prometheus-overview.html
prometheus-2.44.0.linux-amd64/consoles/prometheus
prometheus-2.44.0.linux-amd64/promtool
ubuntu@ip-172-31-86-165:~$ ls
prometheus-2.44.0.linux-amd64  prometheus-2.44.0.linux-amd64.tar.gz
ubuntu@ip-172-31-86-165:~$ sudo mv prometheus-2.44.0.linux-amd64*
mv: missing destination file operand after 'prometheus-2.44.0.linux-amd64*'
Try 'mv --help' for more information.
ubuntu@ip-172-31-86-165:~$ sudo mv prometheus-2.44.0.linux-amd64/ prometheus
ubuntu@ip-172-31-86-165:~$
```

#### Prometheus Installation

### 03. Delete unzipped file and rename it as Prometheus:

*Sudo rm prometheus-2.44.0.linux-amd64.tar.gz*  
*Sudo mv prometheus-2.44.0.linux-amd64*

```
-SHA256X-Amz-Credential=AKIAIWNNYAX4CSVEH53A%2F0230514%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20230514T131805Z&X-Amz-Signature=e6e73b  
b29ffce7f8116103950cae8f91c01c35634159a0283a957b763d71b4axX-Amz-SignedHeaders=host&actor_id=0&key_id=6838921&response-content-disposition=attachme  
nt%3B%20filename%3Dprometheus-2.44.0.linux-amd64.tar.gz&response-content-type=application%2Foctet-stream [following]  
--2023-05-14 13:18:05-- https://objects.githubusercontent.com/github-production-release-asset-2e65be/6838921/e74fc67-722c-4e3b-b3f4-9abcd8b9359b?X-Amz-Algo  
rithm=AWS4-HMAC-SHA256X-Amz-Credential=AKIAIWNNYAX4CSVEH53A%2F0230514%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20230514T131805Z&X-Amz-Signature=e6e73b  
a29ffce7f8116103950cae8f91c01c35634159a0283a957b763d71b4axX-Amz-SignedHeaders=host&actor_id=0&key_id=6838921&response-content-dispo  
sition=attachment%3B%20filename%3Dprometheus-2.44.0.linux-amd64.tar.gz&response-content-type=application%2Foctet-stream  
Resolving objects.githubusercontent.com (objects.githubusercontent.com)... 185.199.111.133, 185.199.108.133, 185.199.109.133, ...  
Connecting to objects.githubusercontent.com (objects.githubusercontent.com)|185.199.111.133|:443... connected.  
HTTP request sent, awaiting response... 200 OK  
Length: 90577277 (86M) [application/octet-stream]  
Saving to: 'prometheus-2.44.0.linux-amd64.tar.gz'  
  
prometheus-2.44.0.linux-amd64.tar.gz 100%[=====] 86.38M 134MB/s in 0.6s  
  
2023-05-14 13:18:06 (134 MB/s) - 'prometheus-2.44.0.linux-amd64.tar.gz' saved [90577277/90577277]  
  
ubuntu@ip-172-31-86-165:~$ tar -xvf prometheus-2.44.0.linux-amd64.tar.gz  
prometheus-2.44.0.linux-amd64/  
prometheus-2.44.0.linux-amd64/prometheus.yml  
prometheus-2.44.0.linux-amd64/console_libraries/  
prometheus-2.44.0.linux-amd64/console_libraries/prom.lib  
prometheus-2.44.0.linux-amd64/console_libraries/menu.lib  
prometheus-2.44.0.linux-amd64/LICENSE  
prometheus-2.44.0.linux-amd64/NOTICE  
prometheus-2.44.0.linux-amd64/consoles/  
prometheus-2.44.0.linux-amd64/consoles/node-overview.html  
prometheus-2.44.0.linux-amd64/consoles/node-disk.html  
prometheus-2.44.0.linux-amd64/consoles/index.html.example  
prometheus-2.44.0.linux-amd64/consoles/node-cpu.html  
prometheus-2.44.0.linux-amd64/consoles/prometheus.html  
prometheus-2.44.0.linux-amd64/consoles/node.html  
prometheus-2.44.0.linux-amd64/consoles/prometheus-overview.html  
prometheus-2.44.0.linux-amd64/prometheus  
prometheus-2.44.0.linux-amd64/promtool  
ubuntu@ip-172-31-86-165:~$ ls  
prometheus-2.44.0.linux-amd64 prometheus-2.44.0.linux-amd64.tar.gz  
ubuntu@ip-172-31-86-165:~$ sudo mv prometheus-2.44.0.linux-amd64/ prometheus  
ubuntu@ip-172-31-86-165:~$ cd prometheus/  
ubuntu@ip-172-31-86-165:~/prometheus$
```

### Prometheus Installation

### 04. Go inside to the Prometheus directory:

*Cd prometheus*

```
-SHA256X-Amz-Credential=AKIAIWNNYAX4CSVEH53A%2F0230514%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20230514T131805Z&X-Amz-Signature=e6e73b  
b29ffce7f8116103950cae8f91c01c35634159a0283a957b763d71b4axX-Amz-SignedHeaders=host&actor_id=0&key_id=6838921&response-content-dispo  
sition=attachment%3B%20filename%3Dprometheus-2.44.0.linux-amd64.tar.gz&response-content-type=application%2Foctet-stream  
Resolving objects.githubusercontent.com (objects.githubusercontent.com)... 185.199.111.133, 185.199.108.133, 185.199.109.133, ...  
Connecting to objects.githubusercontent.com (objects.githubusercontent.com)|185.199.111.133|:443... connected.  
HTTP request sent, awaiting response... 200 OK  
Length: 90577277 (86M) [application/octet-stream]  
Saving to: 'prometheus-2.44.0.linux-amd64.tar.gz'  
  
prometheus-2.44.0.linux-amd64.tar.gz 100%[=====] 86.38M 134MB/s in 0.6s  
  
2023-05-14 13:18:06 (134 MB/s) - 'prometheus-2.44.0.linux-amd64.tar.gz' saved [90577277/90577277]  
  
ubuntu@ip-172-31-86-165:~$ tar -xvf prometheus-2.44.0.linux-amd64.tar.gz  
prometheus-2.44.0.linux-amd64/  
prometheus-2.44.0.linux-amd64/prometheus.yml  
prometheus-2.44.0.linux-amd64/console_libraries/  
prometheus-2.44.0.linux-amd64/console_libraries/prom.lib  
prometheus-2.44.0.linux-amd64/console_libraries/menu.lib  
prometheus-2.44.0.linux-amd64/LICENSE  
prometheus-2.44.0.linux-amd64/NOTICE  
prometheus-2.44.0.linux-amd64/consoles/  
prometheus-2.44.0.linux-amd64/consoles/node-overview.html  
prometheus-2.44.0.linux-amd64/consoles/node-disk.html  
prometheus-2.44.0.linux-amd64/consoles/index.html.example  
prometheus-2.44.0.linux-amd64/consoles/node-cpu.html  
prometheus-2.44.0.linux-amd64/consoles/prometheus.html  
prometheus-2.44.0.linux-amd64/consoles/node.html  
prometheus-2.44.0.linux-amd64/consoles/prometheus-overview.html  
prometheus-2.44.0.linux-amd64/prometheus  
prometheus-2.44.0.linux-amd64/promtool  
ubuntu@ip-172-31-86-165:~$ ls  
prometheus-2.44.0.linux-amd64 prometheus-2.44.0.linux-amd64.tar.gz  
ubuntu@ip-172-31-86-165:~$ sudo rm prometheus-2.44.0.linux-amd64.tar.gz  
ubuntu@ip-172-31-86-165:~$ sudo mv prometheus-2.44.0.linux-amd64/  
mv: missing destination file operand after 'prometheus-2.44.0.linux-amd64'  
Try 'mv --help' for more information.  
ubuntu@ip-172-31-86-165:~$ cd prometheus/  
ubuntu@ip-172-31-86-165:~/prometheus$  
LICENSE NOTICE console_libraries consoles_prometheus_prometheus.prometheus.yml_promtool  
ubuntu@ip-172-31-86-165:~/prometheus$
```

### Prometheus Installation

## 05. Give ls command to see the list of files available inside the Prometheus directory

```
nt%3B%20filename%3Dprometheus-2.44.0.linux-amd64.tar.gz&response-content-type=application%2Foctet-stream [following]
--2023-05-14 13:18:05-- https://objects.githubusercontent.com/github-production-release-asset-2e65be/6838921/e7f4fc67-722c-4e3b-b3f4-9abcd8b9359b?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAIWNJYAX4CSVEH53A%2F20230514%2Fus-east-1%2Faws4_request&X-Amz-Date=20230514T131805Z&X-Amz-Expires=300&X-Amz-Signature=6e73bab29ffcc7f8b116103950cae8f91c01c35634159a0283a957b763d71b4a&X-Amz-SignedHeaders=host&actor_id=0&key_id=0&repo_id=6838921&response-content-disposition=attachment%3B%20filename%3Dprometheus-2.44.0.linux-amd64.tar.gz&response-content-type=application%2Foctet-stream
Resolving objects.githubusercontent.com (objects.githubusercontent.com)... 185.199.111.133, 185.199.108.133, 185.199.109.133, ...
Connecting to objects.githubusercontent.com (objects.githubusercontent.com)|185.199.111.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 90577277 (8.6M) [application/octet-stream]
Saving to: 'prometheus-2.44.0.linux-amd64.tar.gz'

2023-05-14 13:18:06 (134 MB/s) - 'prometheus-2.44.0.linux-amd64.tar.gz' saved [90577277/90577277]

ubuntu@ip-172-31-86-165:~$ tar -xvf prometheus-2.44.0.linux-amd64.tar.gz
prometheus-2.44.0.linux-amd64/
prometheus-2.44.0.linux-amd64/prometheus.yml
prometheus-2.44.0.linux-amd64/console/libraries/
prometheus-2.44.0.linux-amd64/console/libraries/prom.lib
prometheus-2.44.0.linux-amd64/console/libraries/menu.lib
prometheus-2.44.0.linux-amd64/LICENSE
prometheus-2.44.0.linux-amd64/NOTICE
prometheus-2.44.0.linux-amd64/consoles/
prometheus-2.44.0.linux-amd64/consoles/node-overview.html
prometheus-2.44.0.linux-amd64/consoles/node-disk.html
prometheus-2.44.0.linux-amd64/consoles/index.html.example
prometheus-2.44.0.linux-amd64/consoles/node-cpu.html
prometheus-2.44.0.linux-amd64/consoles/prometheus.html
prometheus-2.44.0.linux-amd64/consoles/prometheus-overview.html
prometheus-2.44.0.linux-amd64/prometheus
prometheus-2.44.0.linux-amd64/promtool
ubuntu@ip-172-31-86-165:~$ ls
prometheus-2.44.0.linux-amd64_prometheus-2.44.0.linux-amd64.tar.gz
ubuntu@ip-172-31-86-165:~$ sudo rm prometheus-2.44.0.linux-amd64.tar.gz
ubuntu@ip-172-31-86-165:~$ sudo mv prometheus-2.44.0.linux-amd64*
mv: missing destination file operand after 'prometheus-2.44.0.linux-amd64'
Try 'mv --help' for more information.
ubuntu@ip-172-31-86-165:~$ sudo mv prometheus-2.44.0.linux-amd64/ prometheus/
ubuntu@ip-172-31-86-165:~/prometheus$ ls
LICENSE NOTICE console/libraries consoles prometheus prometheus.yml promtool
ubuntu@ip-172-31-86-165:~/prometheus$
```

### 3.4 Target Configuration

STEPS	COMMANDS
01. Go inside the Prometheus directory	Cd Prometheus
02. Open Prometheus.yml file	sudo vi Prometheus.yml
03. Create a job for the node exporter	<ul style="list-style-type: none"> <li>- job_name: 'node_exporter'</li> <li>static_configs:</li> <li>- targets: ['44.204.0.216:9100']</li> </ul> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">Port of node exporter</div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">Public IP of node exporter</div>
04. Restart Prometheus	Sudo ./prometheus

```
ubuntu@ip-172-31-26-54: ~/prometheus
scrape_interval: 15s # Set the scrape interval to every 15 seconds. Default is every 1 minute.
evaluation_interval: 15s # Evaluate rules every 15 seconds. The default is every 1 minute.
# scrape_timeout is set to the global default (10s).

# Alertmanager configuration
alerting:
  alertmanagers:
    - static_configs:
      - targets:
        # - alertmanager:9093

# Load rules once and periodically evaluate them according to the global 'evaluation_interval'.
rule_file:
  # - "first_rules.yml"
  # - "second_rules.yml"

# A scrape configuration containing exactly one endpoint to scrape:
# Here it's Prometheus itself.
scrape_configs:
  # The job name is added as a label 'job=<job_name>' to any timeseries scraped from this config.
  - job_name: "prometheus"
    # metrics_path defaults to '/metrics'
    # scheme defaults to 'http'.
    static_configs:
      - targets: ["localhost:9090"]
  - job_name: "node_exporter"
    # metrics_path defaults to '/metrics'
    # scheme defaults to 'http'.
    static_configs:
      - targets: ["44.204.0.216:9100"]

-- INSERT --
```

Prometheus.yml

```

prometheus-2.44.0.linux-amd64/consoles/node.html
prometheus-2.44.0.linux-amd64/consoles/prometheus-overview.html
prometheus-2.44.0.linux-amd64/prometheus
prometheus-2.44.0.linux-amd64/promtool
ubuntu@ip-172-31-86-165:~ ls
prometheus-2.44.0.linux-amd64 prometheus-2.44.0.linux-amd64.tar.gz
ubuntu@ip-172-31-86-165:~ sudo rm prometheus-2.44.0.linux-amd64.tar.gz
ubuntu@ip-172-31-86-165:~ sudo mv prometheus-2.44.0.linux-amd64
mv: missing destination file operand after 'prometheus-2.44.0.linux-amd64'
Try `man mv` for more information.
ubuntu@ip-172-31-86-165:~ sudo mv prometheus-2.44.0.linux-amd64/ prometheus
ubuntu@ip-172-31-86-165:~ cd prometheus/
ubuntu@ip-172-31-86-165:~/prometheus$ ls
LICENSES NOTICE console_libraries consoles prometheus prometheus.yml promtool
ubuntu@ip-172-31-86-165:~/prometheus$ sudo vi prometheus.yml
ubuntu@ip-172-31-86-165:~/prometheus$ sudo ./prometheus
ts=2023-05-14T13:32:00.362 caller=main.go:531 level=info msg="No time or size retention was set so using the default time retention" duration=15d
ts=2023-05-14T13:32:00.362 caller=main.go:531 level=info msg="Starting Prometheus Server" mode=server version="(version=2.44.0, branch=HEAD, revision=lac51311698a5c60f15fe27f89b1154a1f6558)"
ts=2023-05-14T13:32:00.362 caller=main.go:580 level=info build_context="(go=go1.20.4, platform=linux/amd64, user=root@8739e8181c5db, date=20230514-06:18:11, tags=netgo, buildinnamesets,stringlabels)"
ts=2023-05-14T13:32:00.362 caller=main.go:581 level=info host_details="(Linux 5.15.0-1031-aws #35-Ubuntu SMP Fri Feb 10 02:07:18 UTC 2023 x86_64 ip-172-31-86-165 (none))"
ts=2023-05-14T13:32:00.362 caller=main.go:582 level=info fd_limits="(soft=1048576, hard=1048576)"
ts=2023-05-14T13:32:00.362 caller=main.go:583 level=info vm_limits="(soft=unlimited, hard=unlimited)"
ts=2023-05-14T13:32:00.362 caller=web.go:562 level=info component=web msg="Start listening for connections" address=0.0.0.0:9090
ts=2023-05-14T13:32:00.362 caller=main.go:1016 level=info msg="Starting TSDR"
ts=2023-05-14T13:32:00.362 caller=head.go:588 level=info component=tldb msg="Replaying on-disk memory mappable chunks if any"
ts=2023-05-14T13:32:00.362 caller=head.go:677 level=info msg="On-disk memory mappable chunks replay completed" duration=3.820µs
ts=2023-05-14T13:32:00.362 caller=head.go:677 level=info msg="Replaying WAL, this may take a while"
ts=2023-05-14T13:32:00.362 caller=tls config.go:232 level=info component=web msg="Listening on address=[::]:9090"
ts=2023-05-14T13:32:00.362 caller=tls config.go:235 level=info component=web msg="TLS is disabled." http2=false address=[::]:9090
ts=2023-05-14T13:32:00.362 caller=head.go:748 level=info component=tldb msg="WAL segment loaded" segment=0 maxSegment=0
ts=2023-05-14T13:32:00.362 caller=head.go:785 level=info component=tldb msg="WAL replay completed" checkpoint_replay_duration=39.492µs wal_replay_duration=1.73896µs wal_replay_duration=731ns total_replay_duration=1.9825ms
ts=2023-05-14T13:32:00.150Z caller=main.go:1037 level=info fs_type=EXT4_SUPER_MAGIC
ts=2023-05-14T13:32:00.150Z caller=main.go:1040 level=info msg="TSDB started"
ts=2023-05-14T13:32:00.150Z caller=main.go:1220 level=info msg="Loading configuration file" filename=prometheus.yml
ts=2023-05-14T13:32:00.150Z caller=main.go:1257 level=info msg="Completed loading of configuration file" filename=prometheus.yml totalDuration=3.613994ms db
storage=1.653µs remote_storage=1.877µs web_handler=1.05µs query_engine=1.407µs scrape=3.20201ms scrape_sd=24.46µs notify=32.322µs notify_sd=15.934µs rules=2.
lus tracing=7.105µs
ts=2023-05-14T13:32:00.150Z caller=main.go:1001 level=info msg="Server is ready to receive web requests."
ts=2023-05-14T13:32:00.150Z caller=manager.go:995 level=info component="rule manager" msg="Starting rule manager..."

```

```

ubuntu@ip-172-31-17-125:~ 
Unpacking docker-ce (5:23.0.6-1ubuntu.22.04-jammy) ...
Selecting previously unselected package docker-ce-rootless-extras.
Preparing to unpack .../5-docker-ce-rootless-extras_5%3a23.0.6-1ubuntu.22.04-jammy_amd64.deb ...
Unpacking docker-ce-rootless-extras (5:23.0.6-1ubuntu.22.04-jammy) ...
Selecting previously unselected package docker-compose-plugin.
Preparing to unpack .../6-docker-compose-plugin_2.17.3-1-ubuntu.22.04-jammy_amd64.deb ...
Unpacking docker-compose-plugin (2.17.3-1-ubuntu.22.04-jammy) ...
Selecting previously unselected package libltdl7:amd64.
Preparing to unpack .../7-libltdl7_2.4.6-15build2_amd64.deb ...
Unpacking libltdl7:amd64 (2.4.6-15build2) ...
Selecting previously unselected package libslirp0:amd64.
Preparing to unpack .../8-libslirp0_4.6.1-1build1_amd64.deb ...
Unpacking libslirp0:amd64 (4.6.1-1build1) ...
Selecting previously unselected package slirp4nets.
Preparing to unpack .../9-slirp4nets_1.0.1-2_amd64.deb ...
Unpacking slirp4nets (1.0.1-2) ...
Setting up docker-buildx-plugin (0.10.4-1-ubuntu.22.04-jammy) ...
Setting up docker-containerd.io (1.6.21-1) ...
Created symlink /etc/systemd/system/multi-user.target.wants/containerd.service → /lib/systemd/system/containerd.service.
Setting up docker-compose-plugin (2.17.3-1-ubuntu.22.04-jammy) ...
Setting up libltdl7:amd64 (2.4.6-15build2) ...
Setting up docker-ce-cliv (5:23.0.6-1-ubuntu.22.04-jammy) ...
Setting up libslirp0:amd64 (4.6.1-1build1) ...
Setting up pigz (2.6-1) ...
Setting up docker-ce-rootless-extras (5:23.0.6-1-ubuntu.22.04-jammy) ...
Setting up slirp4nets (1.0.1-2) ...
Setting up docker-ce (5:23.0.6-1-ubuntu.22.04-jammy) ...
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service → /lib/systemd/system/docker.service.
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /lib/systemd/system/docker.socket.
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.1) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

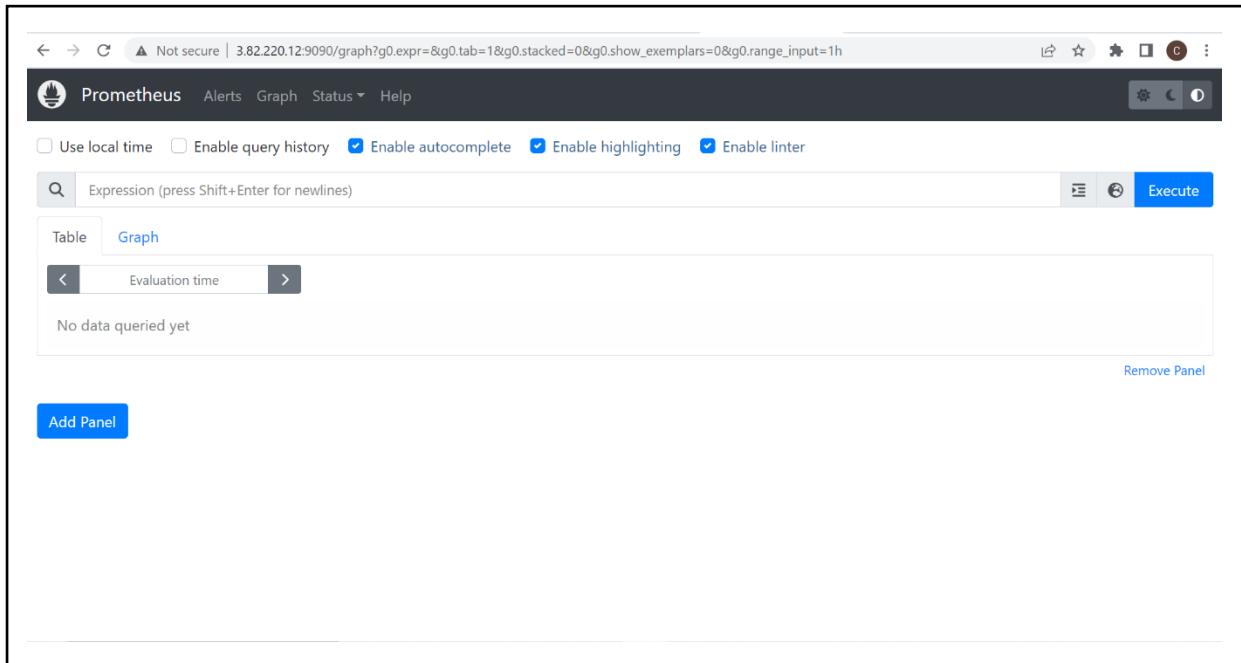
No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-17-125:~$ 

```

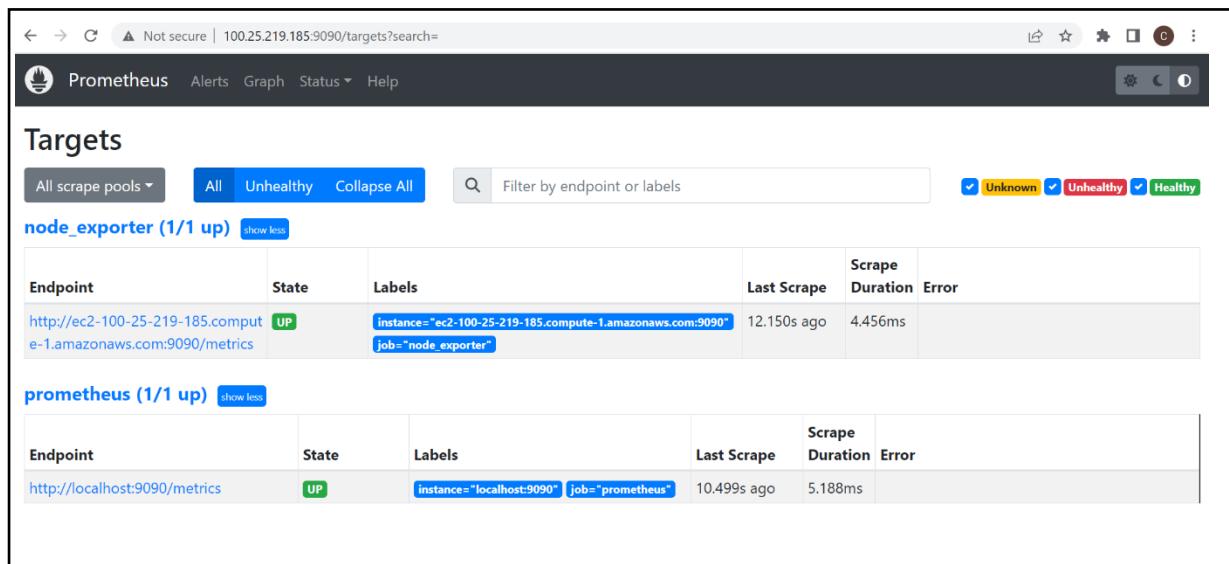
### Run prometheus

### 3.4.1 Service discovery active in the port 9090



The screenshot shows the Prometheus Graph interface. At the top, there are several configuration options: 'Use local time' (unchecked), 'Enable query history' (unchecked), 'Enable autocomplete' (checked), 'Enable highlighting' (checked), and 'Enable linter' (checked). Below these is a search bar labeled 'Expression (press Shift+Enter for newlines)'. Underneath the search bar, there are two tabs: 'Table' (selected) and 'Graph'. A date range selector 'Evaluation time' is shown with arrows for navigation. The main area displays the message 'No data queried yet'. In the bottom right corner, there is a 'Remove Panel' link and a blue 'Add Panel' button.

### 3.4.2 Target up for Prometheus and node exporter

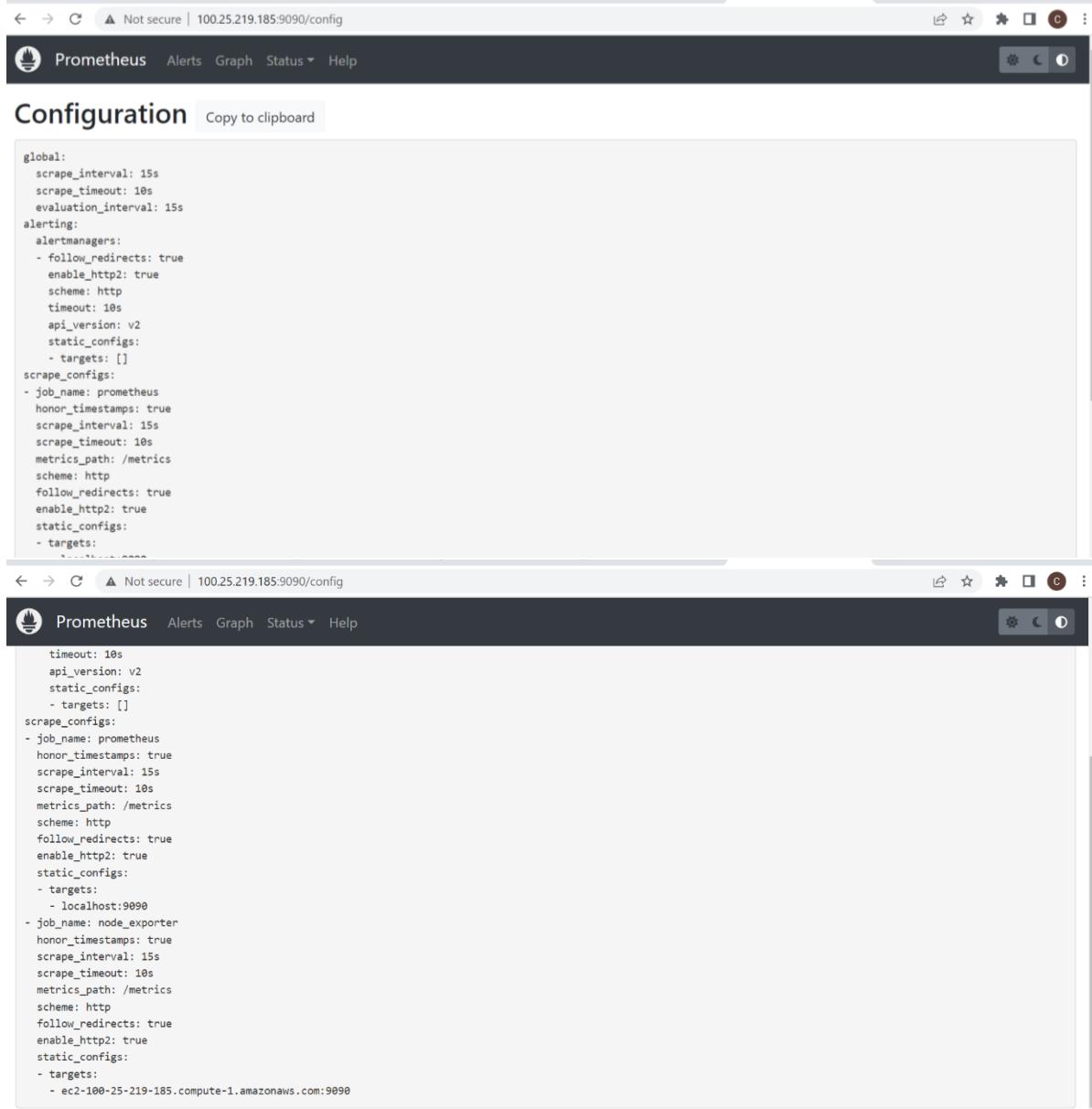


The screenshot shows the Prometheus Targets interface. At the top, there are filters: 'All scrape pools' (dropdown), 'All' (selected), 'Unhealthy', 'Collapse All', a search bar 'Filter by endpoint or labels', and status checkboxes for 'Unknown' (checked), 'Unhealthy' (checked), and 'Healthy' (checked). Below this, there are two sections: 'node\_exporter (1/1 up)' and 'prometheus (1/1 up)'. Each section has a 'show less' link. The 'node\_exporter' section shows one target: `http://ec2-100-25-219-185.compute-1.amazonaws.com:9090/metrics`. The 'prometheus' section shows one target: `http://localhost:9090/metrics`. Both targets are marked as 'UP' and have 'instance' and 'job' labels. The table columns are Endpoint, State, Labels, Last Scrape, Scrape Duration, and Error.

Endpoint	State	Labels	Last Scrape	Scrape Duration	Error
<code>http://ec2-100-25-219-185.compute-1.amazonaws.com:9090/metrics</code>	UP	<code>instance="ec2-100-25-219-185.compute-1.amazonaws.com:9090"</code> <code>job="node_exporter"</code>	12.150s ago	4.456ms	

Endpoint	State	Labels	Last Scrape	Scrape Duration	Error
<code>http://localhost:9090/metrics</code>	UP	<code>instance="localhost:9090"</code> <code>job="prometheus"</code>	10.499s ago	5.188ms	

### 3.4.3 Prometheus Configuration



The image shows two screenshots of a web browser displaying Prometheus configuration files. Both screenshots have a dark header bar with the Prometheus logo, 'Alerts', 'Graph', 'Status', and 'Help' buttons.

The top screenshot shows the 'Configuration' tab. The URL in the address bar is 'Not secure | 100.25.219.185:9090/config'. The content is a JSON-like configuration file:

```
global:
  scrape_interval: 15s
  scrape_timeout: 10s
  evaluation_interval: 15s
alerting:
  alertmanagers:
    - follow_redirects: true
      enable_http2: true
      scheme: http
      timeout: 10s
      api_version: v2
      static_configs:
        - targets: []
scrape_configs:
  - job_name: prometheus
    honor_timestamps: true
    scrape_interval: 15s
    scrape_timeout: 10s
    metrics_path: /metrics
    scheme: http
    follow_redirects: true
    enable_http2: true
    static_configs:
      - targets:
```

The bottom screenshot shows another tab of configuration. The URL is 'Not secure | 100.25.219.185:9090/config'. The content is a similar JSON configuration file:

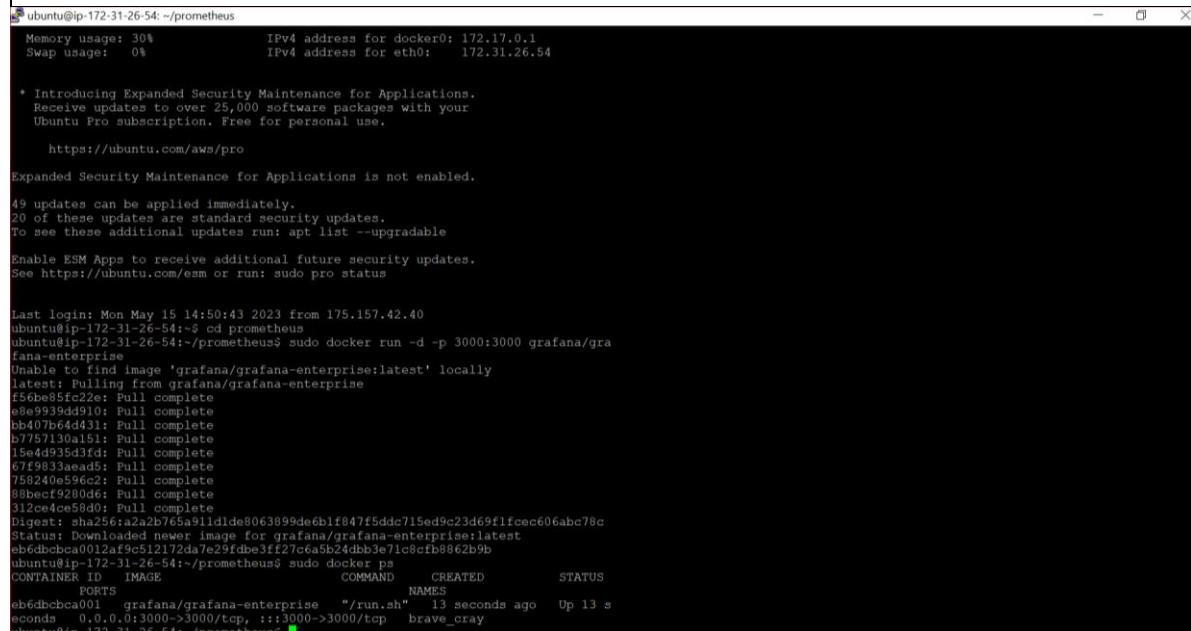
```
timeout: 10s
api_version: v2
static_configs:
  - targets: []
scrape_configs:
  - job_name: prometheus
    honor_timestamps: true
    scrape_interval: 15s
    scrape_timeout: 10s
    metrics_path: /metrics
    scheme: http
    follow_redirects: true
    enable_http2: true
    static_configs:
      - targets:
          - localhost:9090
  - job_name: node_exporter
    honor_timestamps: true
    scrape_interval: 15s
    scrape_timeout: 10s
    metrics_path: /metrics
    scheme: http
    follow_redirects: true
    enable_http2: true
    static_configs:
      - targets:
          - ec2-100-25-219-185.compute-1.amazonaws.com:9090
```

## 04. Step 3: Grafana Dashboard

### 4.1 Dashboard Creation

#### 01. Install and Configure Grafana on Ubuntu

```
sudo docker run -d -p 3000:3000 grafana/grafana-enterprise
```



```
ubuntu@ip-172-31-26-54: ~/prometheus
Memory usage: 30%           IPv4 address for docker0: 172.17.0.1
Swap usage:  0%           IPv4 address for eth0:   172.31.26.54

* Introducing Expanded Security Maintenance for Applications.
Receive updates to over 25,000 software packages with your
Ubuntu Pro subscription. Free for personal use.

https://ubuntu.com/aws/pro

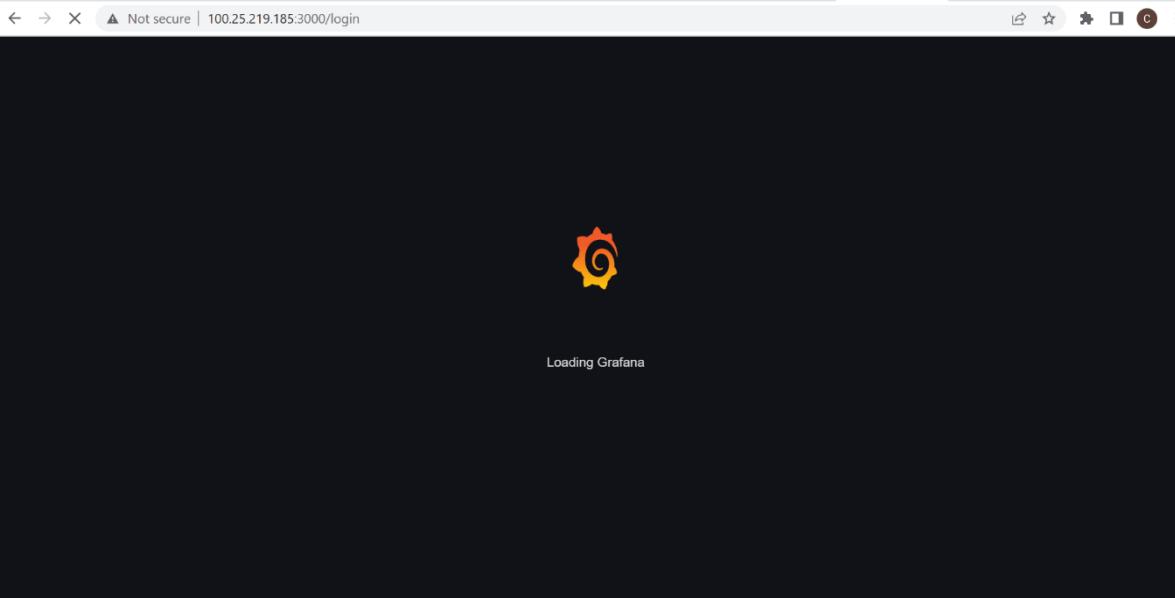
Expanded Security Maintenance for Applications is not enabled.

49 updates can be applied immediately.
20 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

Last login: Mon May 15 14:50:43 2023 from 175.157.42.40
ubuntu@ip-172-31-26-54:~$ cd prometheus
ubuntu@ip-172-31-26-54:~/prometheus$ sudo docker run -d -p 3000:3000 grafana/grafana-enterprise
Unable to find image 'grafana/grafana-enterprise:latest' locally
latest: Pulling from grafana/grafana-enterprise
f56be805fc22: Pull complete
e8e9939d910: Pull complete
bb407b64d431: Pull complete
b7757130a151: Pull complete
15e4d935d3fd: Pull complete
67f9833ead5: Pull complete
758240e596c2: Pull complete
98becf9280d6: Pull complete
312e4ce58d0: Pull complete
Digest: sha256:a2a2b765a91ldide8063999de6bf847ff5ddc715ed9c23d6f91fcec606abc78c
Status: Downloaded newer image for grafana/grafana-enterprise:latest
eb6dbcba0012af9c512172da7e29fde3ff27c6a5b24ddb3e7lc8cfb8862b9b
ubuntu@ip-172-31-26-54:~/prometheus$ sudo docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED            STATUS              PORTS
eb6dbcba001        grafana/grafana-enterprise   "/run.sh"          13 seconds ago    Up 13 seconds
0.0.0.0:3000->3000/tcp, :::3000->3000/tcp   brave_cray
```

#### 02. Run Grafana server



The image shows two screenshots of a web browser displaying the Grafana interface.

**Top Screenshot (Login Page):**

- The title bar shows the URL: `Not secure | 100.25.219.185:3000/login`.
- The main content is the "Welcome to Grafana" login screen with a yellow gear logo.
- Form fields:
  - Email or username: `admin`
  - Password: `*****`
- A blue "Log in" button.
- A link "Forgot your password?".
- The bottom navigation bar includes links: Documentation, Support, Community, Enterprise (Free & unlicensed), and v9.5.2 (cfeaa75916).

**Bottom Screenshot (Home Dashboard):**

- The title bar shows the URL: `Not secure | 100.25.219.185:3000/?orgId=1`.
- The main content is the "Welcome to Grafana" dashboard.
- Header: "Welcome to Grafana" and "Need help? Documentation Tutorials Community Public Slack".
- Left sidebar: "Basic" section with a brief introduction and a "Grafana fundamentals" tutorial.
- Middle section:
  - "TUTORIAL" section: "DATA SOURCE AND DASHBOARDS" and "Grafana fundamentals".
  - "DATA SOURCES" section: "Add your first data source" with a database icon.
  - "DASHBOARDS" section: "Create your first dashboard" with a dashboard icon.
- Bottom navigation: "Dashboards" and "Latest from the blog".
- The bottom navigation bar is identical to the top one, showing various browser tabs and system status.

### 03. Create Prometheus as the Data Source

Prometheus data source was created as below in order to retrieve metrics from Prometheus to Grafana

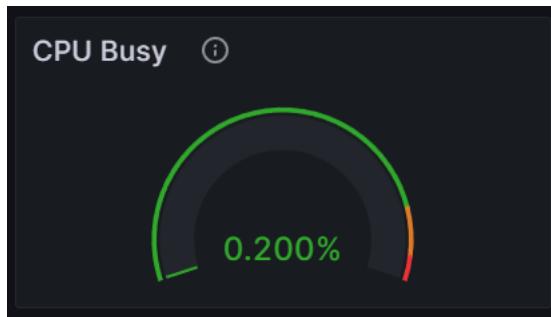
The screenshot shows the Grafana Administration interface with a red border around the main content area. The left sidebar is titled 'Administration' and includes a 'Data sources' section with options like Plugins, Users, Teams, Service accounts, Default preferences, Settings, Organizations, and Statistics and licensing. The main panel is titled 'Prometheus' and shows the configuration for a 'Prometheus' data source. The 'Settings' tab is selected. Under the 'HTTP' section, the URL is set to 'http://localhost:9090'. The 'Auth' section is collapsed. Below the configuration, there's a 'Misc' section with options for Disable metrics lookup (disabled), Default editor (Choose), and Custom query parameters ('Example: max\_source\_resolution=5m&timeout=10'). A status message 'Data source is working' with a green checkmark is displayed. At the bottom are buttons for Back, Explore, Delete, and Save & test.

## 4.2 Used Metrics

- 1. Gauge** - A gauge is a metric that represents a single numerical value that can arbitrarily go up and down. Gauges are typically used for measured values like temperatures or current memory usage, but also "counts" that can go up and down, like the number of concurrent requests.
- 2. Counters** - A counter is a cumulative metric that represents a single monotonically increasing counter whose value can only increase or be reset to zero on restart.
- 3. Histograms** - Histograms. The histogram metric type measures the frequency of value observations that fall into specific predefined buckets.

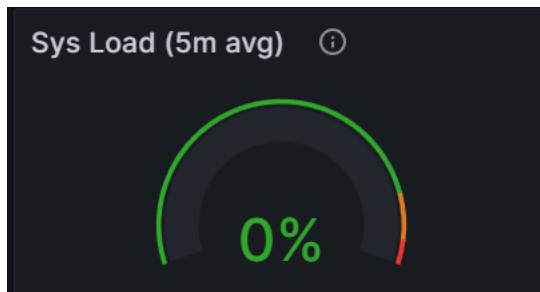
### 4.2.1 Gauges

#### 1. CPU Busy



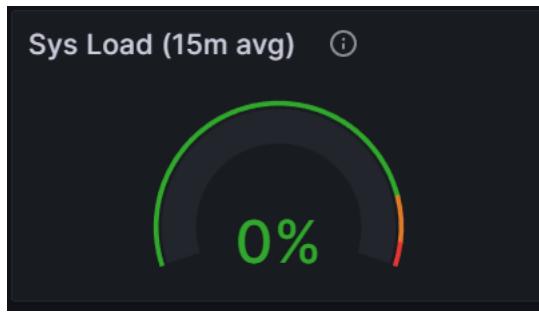
```
(sum by(instance) (irate(node_cpu_seconds_total{instance=\"$node\", job=\"$job\", mode!="idle"})[$__rate_interval]) / on(instance) group_left sum by (instance)((irate(node_cpu_seconds_total{instance=\"$node\", job=\"$job\"})[$__rate_interval]))) * 100
```

#### 2. System Load (5min avg)



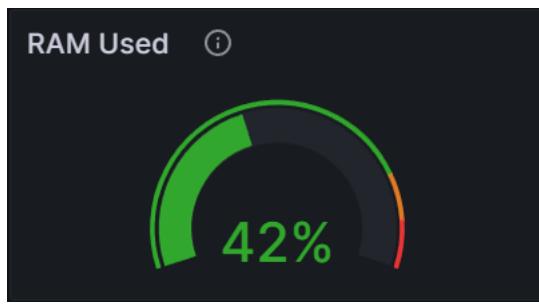
```
avg(node_load5{instance=\"$node\", job=\"$job\"}) / count(count(node_cpu_seconds_total{instance=\"$node\", job=\"$job\"}) by (cpu)) * 100
```

### 3. System Load (15min avg)



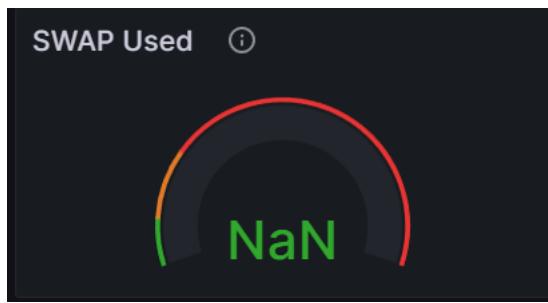
```
avg(node_load15{instance=\"$node\", job=\"$job\"})  
/ count(count(node_cpu_seconds_total{instance=\"$node\", job=\"$job\"}) by (cpu))  
* 100
```

### 4. RAM Used



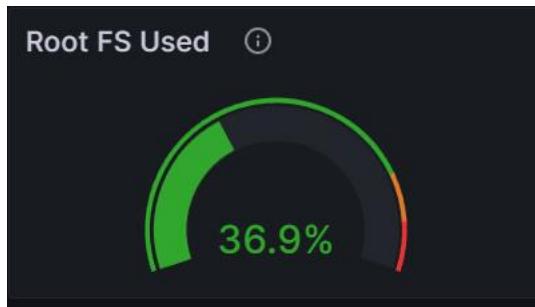
```
((node_memory_MemTotal_bytes{instance=\"$node\", job=\"$job\"} -  
node_memory_MemFree_bytes{instance=\"$node\", job=\"$job\"}) /  
(node_memory_MemTotal_bytes{instance=\"$node\", job=\"$job\"} )) * 100
```

### 5. SWAP Used



```
((node_memory_SwapTotal_bytes{instance=\"$node\", job=\"$job\"} -  
node_memory_SwapFree_bytes{instance=\"$node\", job=\"$job\"}) /  
(node_memory_SwapTotal_bytes{instance=\"$node\", job=\"$job\"} )) * 100
```

## 6. Root FS Used



```
100 -  
((node_filesystem_avail_bytes{instance="$node", job="$job", mountpoint="/", fstype!= "rootfs"} * 100) /  
node_filesystem_size_bytes{instance="$node", job="$job", mountpoint="/", fstype!= "rootfs"})
```

### 4.2.2 Counters

#### 1.Uptime

```
node_time_seconds{instance="$node", job="$job"} -  
node_boot_time_seconds{instance="$node", job="$job"}
```

#### 2.SWAP Total

```
node_memory_SwapTotal_bytes{instance="$node", job="$job"}
```

#### 3.CPU Cores

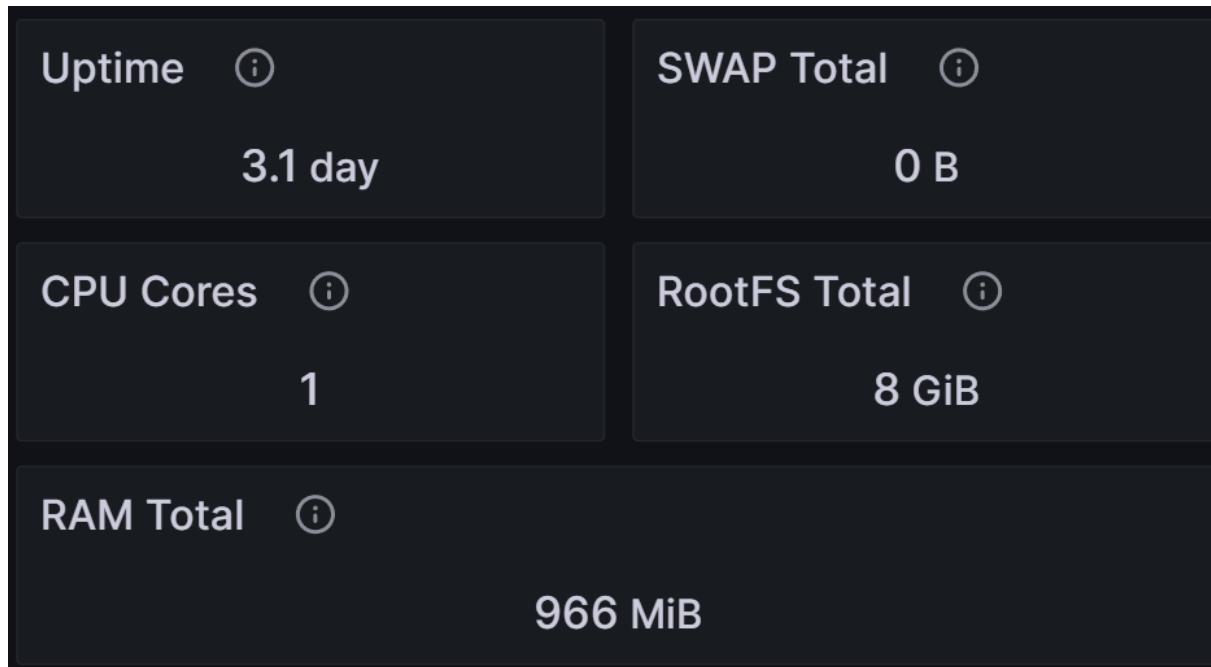
```
count(count(node_cpu_seconds_total{instance="$node", job="$job"}) by (cpu))
```

#### 4.RootFS Total

```
node_filesystem_size_bytes{instance="$node", job="$job", mountpoint="/", fstype!= "rootfs"}
```

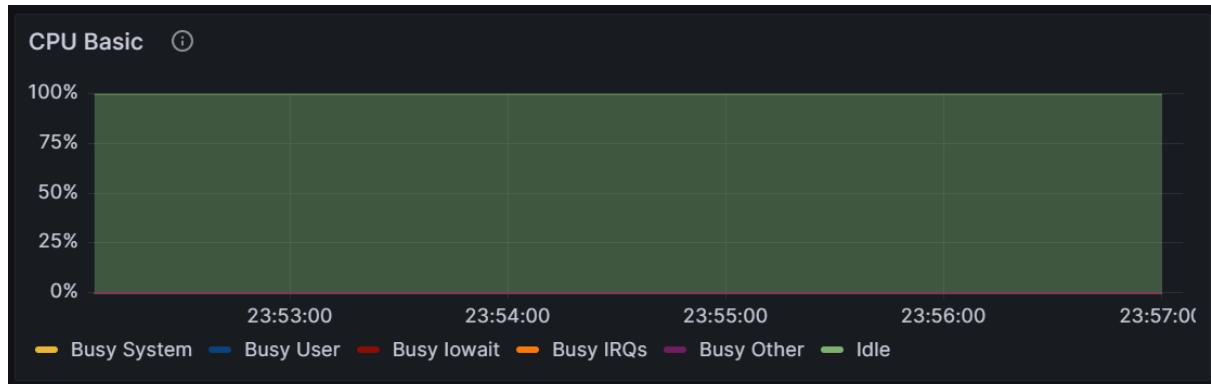
#### 5.RAM Total

```
node_filesystem_size_bytes{instance="$node", job="$job", mountpoint="/", fstype!= "rootfs"}
```



#### 4.2.3 Histogram

##### 1.CPU Basic



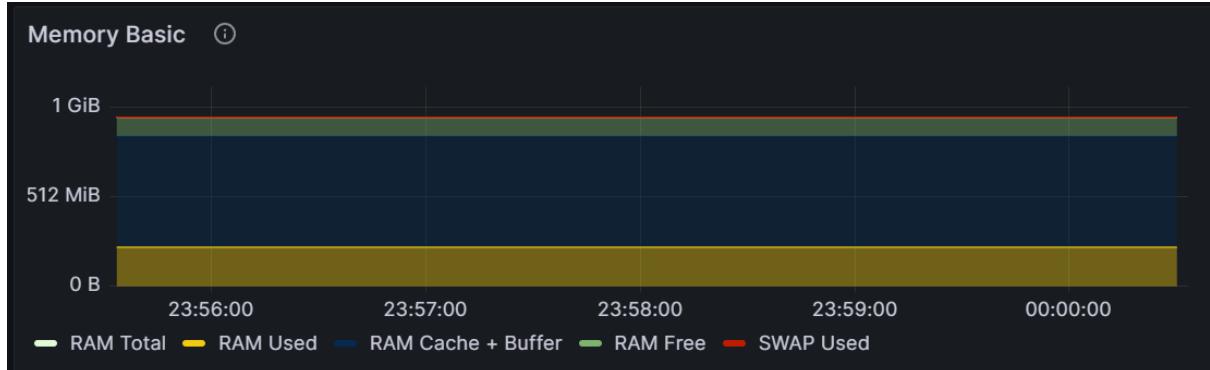
```
sum by(instance) (irate(node_cpu_seconds_total{instance="$node",job="$job",mode="system"}[$__rate_interval])) / on(instance) group_left sum by (instance)((irate(node_cpu_seconds_total{instance="$node",job="$job"}[$__rate_interval])))
```

```
sum by(instance) (irate(node_cpu_seconds_total{instance="$node",job="$job",mode="user"}[$__rate_interval])) / on(instance) group_left sum by (instance)((irate(node_cpu_seconds_total{instance="$node",job="$job"}[$__rate_interval])))
```

```
sum by(instance) (irate(node_cpu_seconds_total{instance="$node",job="$job",mode="iowait"}[$__rate_interval])) / on(instance) group_left sum by
```

```
(instance)((irate(node_cpu_seconds_total{instance="$node", job="$job"}[$__rate_interval]))
sum by(instance) (irate(node_cpu_seconds_total{instance="$node", job="$job", mode=~".*irq"}[$__rate_interval])) / on(instance) group_left sum by
(instance)((irate(node_cpu_seconds_total{instance="$node", job="$job"}[$__rate_interval])))
```

## 2.Memory Basic



```
node_memory_MemTotal_bytes{instance="$node", job="$job"}
```

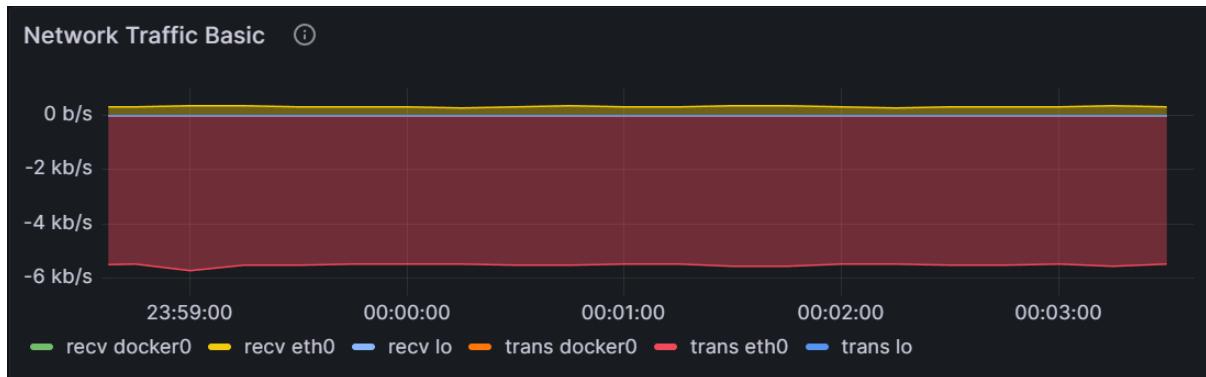
```
node_memory_MemTotal_bytes{instance="$node", job="$job"} -  
node_memory_MemFree_bytes{instance="$node", job="$job"} -  
(node_memory_Cached_bytes{instance="$node", job="$job"} +  
node_memory_Buffers_bytes{instance="$node", job="$job"} +  
node_memory_SReclaimable_bytes{instance="$node", job="$job"})
```

```
node_memory_Cached_bytes{instance="$node", job="$job"} +  
node_memory_Buffers_bytes{instance="$node", job="$job"} +  
node_memory_SReclaimable_bytes{instance="$node", job="$job"}
```

```
node_memory_MemFree_bytes{instance="$node", job="$job"}
```

```
(node_memory_SwapTotal_bytes{instance="$node", job="$job"} -  
node_memory_SwapFree_bytes{instance="$node", job="$job"})
```

### 3.Network Traffic Basic

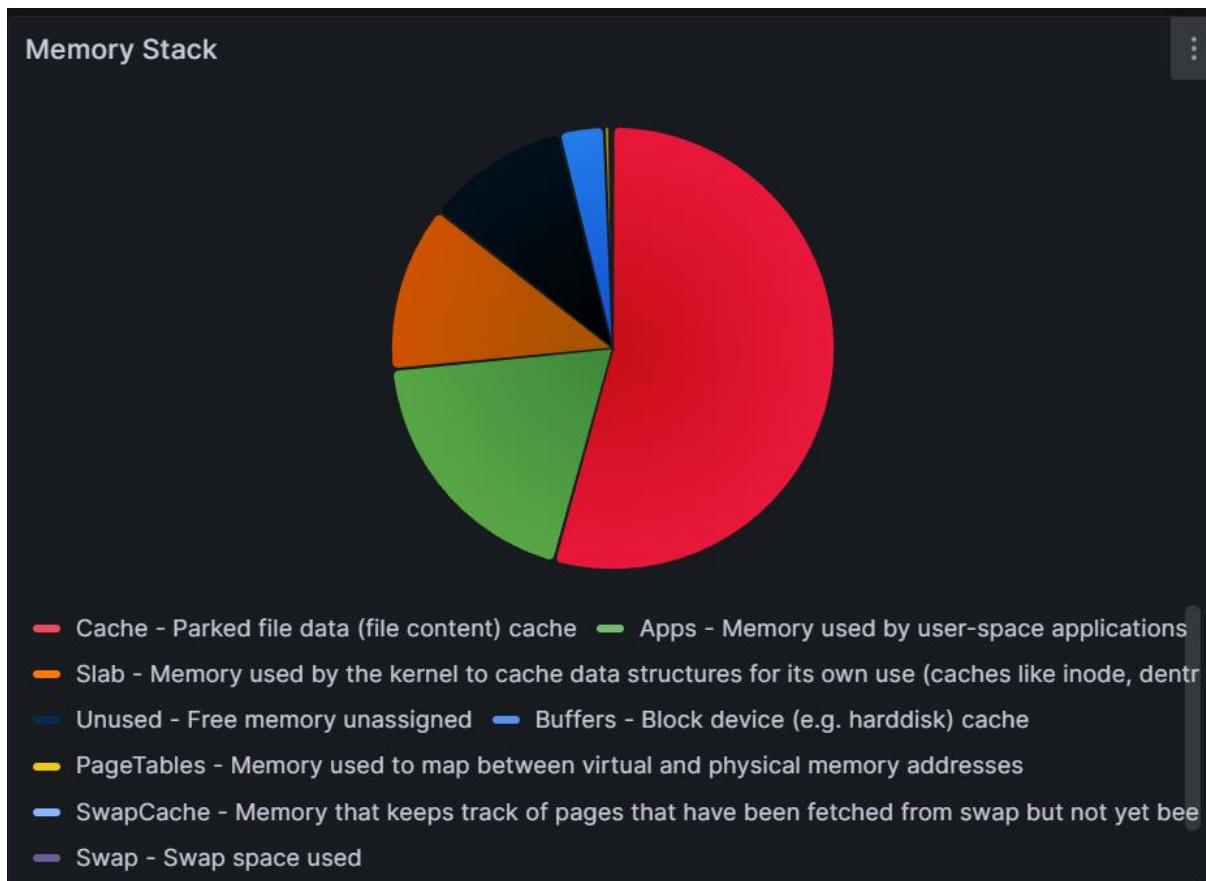


```
irate(node_network_receive_bytes_total{instance=\"$node\", job=\"$job\"}[$__rate_interval])*8
```

```
irate(node_network_transmit_bytes_total{instance=\"$node\", job=\"$job\"}[$__rate_interval])*8
```

#### 4.2.4 Pie Chart

##### 1.Memory Stack



```
node_memory_MemTotal_bytes{instance="$node",job="$job"} -  
node_memory_MemFree_bytes{instance="$node",job="$job"} -  
node_memory_Buffers_bytes{instance="$node",job="$job"} -  
node_memory_Cached_bytes{instance="$node",job="$job"} -  
node_memory_Slab_bytes{instance="$node",job="$job"} -  
node_memory_PageTables_bytes{instance="$node",job="$job"} -  
node_memory_SwapCached_bytes{instance="$node",job="$job"}
```

```
node_memory_PageTables_bytes{instance="$node",job="$job"}
```

```
node_memory_SwapCached_bytes{instance="$node",job="$job"}
```

```
node_memory_Slab_bytes{instance="$node",job="$job"}
```

```
node_memory_Cached_bytes{instance="$node",job="$job"}
```

```
node_memory_Buffers_bytes{instance="$node",job="$job"}
```

```
node_memory_MemFree_bytes{instance="$node",job="$job"}
```

```
(node_memory_SwapTotal_bytes{instance="$node",job="$job"} -  
node_memory_SwapFree_bytes{instance="$node",job="$job"})
```

```
node_memory_HardwareCorrupted_bytes{instance="$node",job="$job"}
```

#### 4.2.5 Bar Gauge

##### 1.Memory Active / Inactive Detail



```
node_memory_Inactive_file_bytes{instance="$node", job="$job"}
```

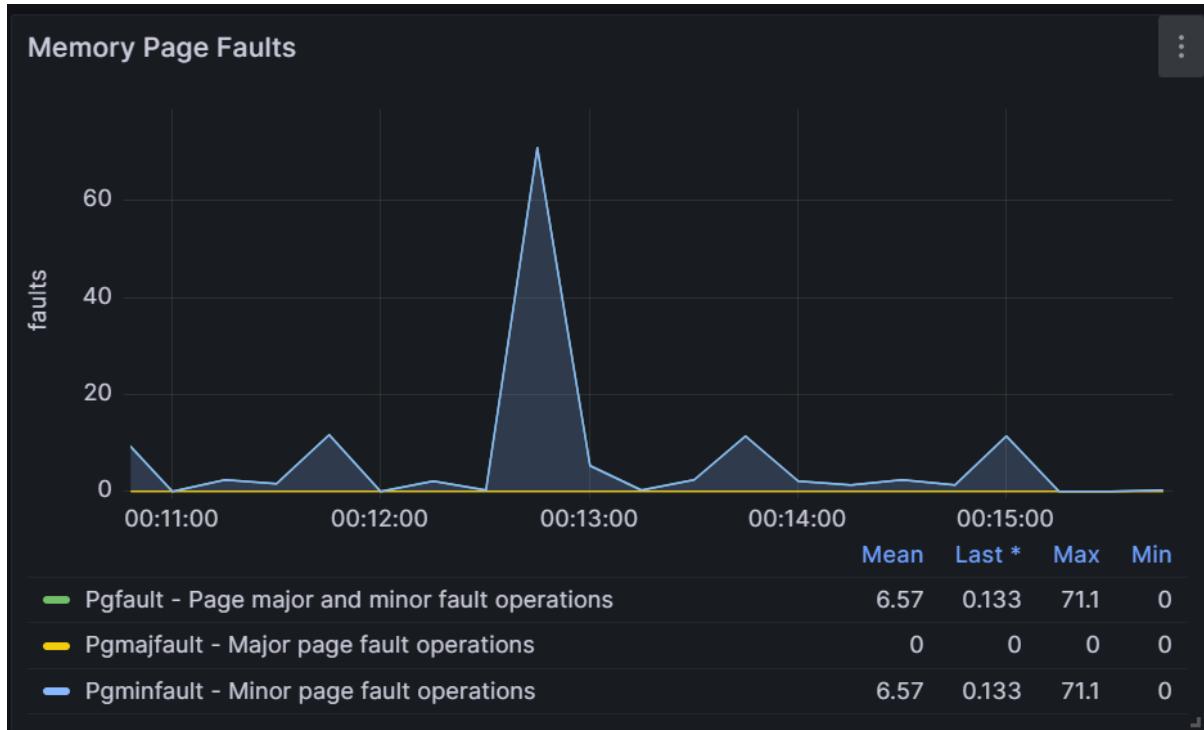
```
node_memory_Inactive_anon_bytes{instance="$node", job="$job"}
```

```
node_memory_Active_file_bytes{instance="$node", job="$job"}
```

```
node_memory_Active_anon_bytes{instance="$node", job="$job"}
```

#### 4.2.6 Time Series

##### 1. Memory Page Faults



```
irate(node_vmstat_pgfault{instance="$node",job="$job"}[$__rate_interval])
```

```
irate(node_vmstat_pgmajfault{instance="$node",job="$job"}[$__rate_interval])
```

```
irate(node_vmstat_pgfault{instance="$node",job="$job"}[$__rate_interval]) -  
irate(node_vmstat_pgmajfault{instance="$node",job="$job"}[$__rate_interval])
```

## 4.3 Grafana Dashboard Visualization



## 4.4 Setting up alerting

The screenshot shows the 'Alert rules > Add rule' screen in Grafana. On the left sidebar, 'Alert rules' is selected. The main area has two steps: Step 1, 'Set an alert rule name', which asks for a 'Rule name' (e.g., 'Give your alert rule a name.') and Step 2, 'Set a query and alert condition'. Under Step 2, there are three options: 'Grafana managed alert' (selected), 'Mimir or Loki alert', and 'Mimir or Loki recording rule'. A note at the bottom says 'Select "Grafana managed" unless you have a Mimir, Loki or Cortex data source with the Ruler API enabled.'

*STEP1: Give a name for alert rule and set a query and alert condition*

The screenshot shows the 'Alert rules > Add rule' screen in Grafana, continuing from the previous step. It displays the configuration for the 'Grafana managed alert'. The top section shows a Prometheus query: 'rate(prometheus\_http\_requests\_total{job="prometheus"}[\$\_\_rate\_interval])'. Below this are sections for 'Reduce' (Function: Mean, Input: A) and 'Threshold' (Input: B, IS ABOVE: 0). A checkbox 'Make this the alert condition' is checked. At the bottom are buttons for '+ Add query', '+ Add expression', and 'Preview'.

*STEP2: Select the data source ,metric , label, and add rate function ,function,mode and input*

**3 Alert evaluation behavior**

Folder  Select a folder for your rule.

Evaluation group (interval)  
Select a group to evaluate all rules in the same group over the same time interval.

Choose

for  5m

> Configure no data and error handling

**4 Add details for your alert rule**

Write a summary to help you better manage your alerts. Click [here](#) for documentation on how to template annotations and labels.

Summary and annotations

Summary  Text

Description  Text

### STEP3: Select folder and add details and save

**Alert rules**

Rules that determine whether an alert will fire

Search by data sources  All data sources

State: Firing Normal Pending Alert Recording

Health: Ok No Data Error

Search  View as: Grouped List State

1 rule 1 pending

**Grafana**

Failure Monitoring > Failure Monitoring

State	Name	Health	Summary	Next evaluation	Actions
Pending for 3m	Failure Alerts	ok		in a few seconds	<input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/>

**Alert rules**

Rules that determine whether an alert will fire

Search by data sources  All data sources

State: Firing Normal Pending Alert Recording

Health: Ok No Data Error

Search  View as: Grouped List State

1 rule 1 firing

**Grafana**

Failure Monitoring > Failure Monitoring

State	Name	Health	Summary	Next evaluation	Actions
Firing for 3m	Failure Alerts	ok		in a minute	<input type="button"/> <input type="button"/> <input type="button"/> <input type="button"/>

Mimir / Cortex / Loki  
No rules found.

Not secure | 3.95.214.20:3000/alerting/list

State	Labels	Created
Pending	alertname=Failure Alerts code=200 grafana_folder=Failure Monitoring handler=/-/ready instance=localhost:9090 job=prometheus	2023-05-19 13:04:00
Pending	alertname=Failure Alerts code=200 grafana_folder=Failure Monitoring handler=/api/v1/label/name/values instance=localhost:9090 job=prometheus	2023-05-19 13:04:00
Pending	alertname=Failure Alerts code=200 grafana_folder=Failure Monitoring handler=/api/v1/labels instance=localhost:9090 job=prometheus	2023-05-19 13:04:00
Pending	alertname=Failure Alerts code=200 grafana_folder=Failure Monitoring handler=/api/v1/metadata instance=localhost:9090 job=prometheus	2023-05-19 13:04:00
Pending	alertname=Failure Alerts code=200 grafana_folder=Failure Monitoring	2023-05-19

Not secure | 3.95.214.20:3000/alerting/list

State	Labels	Created
Pending	handler=/api/v1/query_range instance=localhost:9090 job=prometheus	2023-05-19 13:04:00
Pending	alertname=Failure Alerts code=200 grafana_folder=Failure Monitoring handler=/api/v1/rules instance=localhost:9090 job=prometheus	2023-05-19 13:04:00
Pending	alertname=Failure Alerts code=200 grafana_folder=Failure Monitoring handler=/api/v1/scrape_pools instance=localhost:9090 job=prometheus	2023-05-19 13:04:00
Pending	alertname=Failure Alerts code=200 grafana_folder=Failure Monitoring handler=/api/v1/series instance=localhost:9090 job=prometheus	2023-05-19 13:04:00
Pending	alertname=Failure Alerts code=200 grafana_folder=Failure Monitoring handler=/api/v1/status/buildinfo instance=localhost:9090 job=prometheus	2023-05-19 13:04:00
Pending	alertname=Failure Alerts code=200 grafana_folder=Failure Monitoring handler=/api/v1/status/config instance=localhost:9090 job=prometheus	2023-05-19 13:04:00
Pending	alertname=Failure Alerts code=200 grafana_folder=Failure Monitoring handler=/api/v1/targets instance=localhost:9090 job=prometheus	2023-05-19 13:04:00
Pending	alertname=Failure Alerts code=200 grafana_folder=Failure Monitoring handler=/config instance=localhost:9090 job=prometheus	2023-05-19 13:04:00
Pending	alertname=Failure Alerts code=200 grafana_folder=Failure Monitoring handler=/favicon.ico instance=localhost:9090 job=prometheus	2023-05-19 13:04:00
Pending	alertname=Failure Alerts code=200 grafana_folder=Failure Monitoring	2023-05-19

#### STEP4: Results

## 05. Member Contribution

FUNCTIONALITIES	MEMBER
<b>VPC/Docker</b> Setting up Cloud environment and deploying application inside VM	E. M. H. S. De Saram (IT19951454)
<b>Prometheus</b> Configuration and setting up Prometheus and deploy using docker	Nimasha K. G. K. (IT19117706)
<b>Node-exporter</b> Setting up the Node exporter and deploy using docker	Mandakini N. D. C. (IT19238340)
<b>Target configuration</b> Configure the target using Node exporter in Prometheus.yml file	Gunasiri R. H. I. M. (IT19953816)
<b>Grafana Dashboard</b> Visualize matrices using Grafana dashboards deployed in docker	All Members

## 06. Assignment Details

### **Submitted documents:**

- Report
- Presentation
- Video
- Dashboard (JSON file)
- Prometheus.yml file

### **Link details:**

1.Grafana Dashboard : <http://3.95.214.20:3000/d/rYddlPWk/prometheus-dashboard?orgId=1>

Username : admin

Password : chamodijk10@A

2.Prometheus instance : <http://3.95.214.20:9090/targets?search=>

3.Node Exporter instance: <http://44.204.0.216:9100/metrics>

## **References**

- [1] <https://docs.docker.com/engine/install/ubuntu/>
- [2] <https://blog.devops.dev/how-to-monitor-a-linux-server-using-prometheus-grafana-bf08f79b5c69#:~:text=Monitoring%20a%20Linux%20server%20using,to%20visualize%20the%20collected%20metrics.>
- [3] <https://blog.knoldus.com/how-to-monitor-linux-machines-using-prometheus-and-grafana/>
- [4] <https://computingforgeeks.com/monitor-linux-server-with-prometheus-grafana/>
- [5] <https://shashanksrivastava.medium.com/set-up-a-linux-server-monitoring-system-using-grafana-prometheus-bb3448f585b8>
- [6] <https://grafana.com/docs/grafana/latest/dashboards/>