

Lesson 02 Demo 04

Writing PromQL Queries to Extract Specific Metrics from a Sample Dataset

Objective: To write PromQL queries for extracting and analyzing specific metrics from a Node Exporter dataset using the Prometheus UI

Tools required: Linux operating system, Docker, and Docker Compose

Prerequisites: A basic understanding of the Prometheus UI and PromQL queries

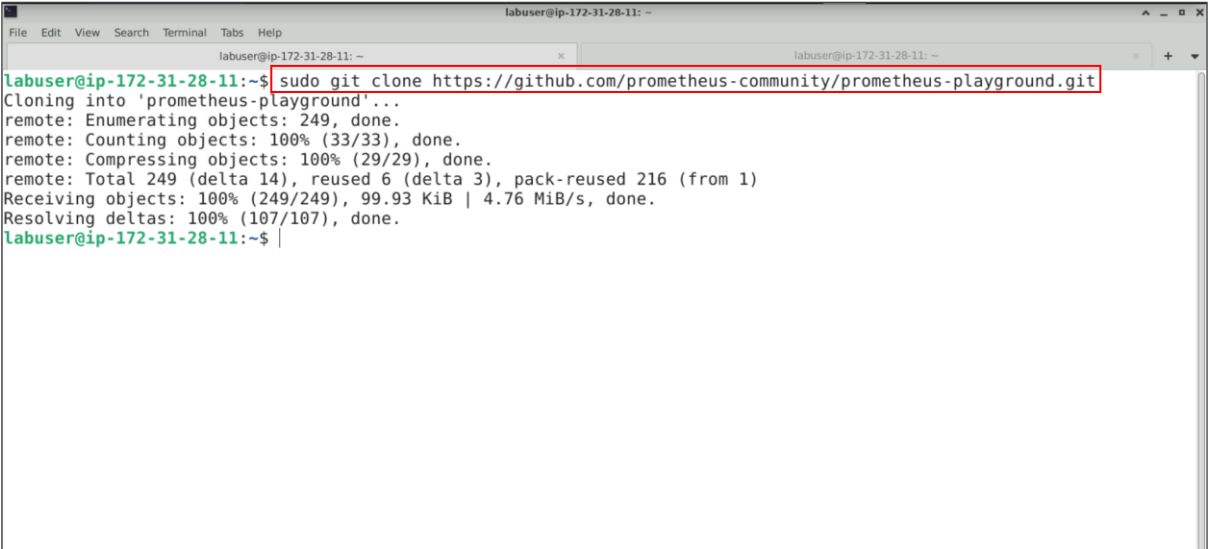
Steps to be followed:

1. Set up Prometheus and Node Exporter using Docker
2. Use the Prometheus UI to query Node Exporter metrics

Step 1: Set up Prometheus and Node Exporter using Docker

- 1.1 Open Terminal and clone the **prometheus-playground** repository from GitHub using the following command:

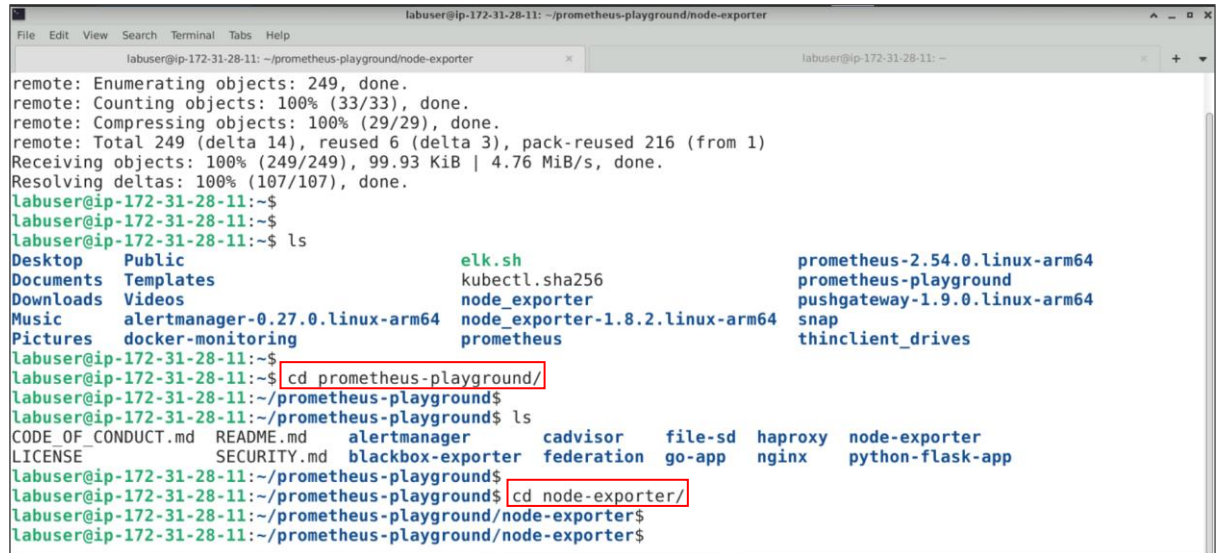
sudo git clone https://github.com/prometheus-community/prometheus-playground.git



```
labuser@ip-172-31-28-11: ~  
labuser@ip-172-31-28-11: ~$ sudo git clone https://github.com/prometheus-community/prometheus-playground.git  
Cloning into 'prometheus-playground'...  
remote: Enumerating objects: 249, done.  
remote: Counting objects: 100% (33/33), done.  
remote: Compressing objects: 100% (29/29), done.  
remote: Total 249 (delta 14), reused 6 (delta 3), pack-reused 216 (from 1)  
Receiving objects: 100% (249/249), 99.93 KiB | 4.76 MiB/s, done.  
Resolving deltas: 100% (107/107), done.  
labuser@ip-172-31-28-11: ~$
```

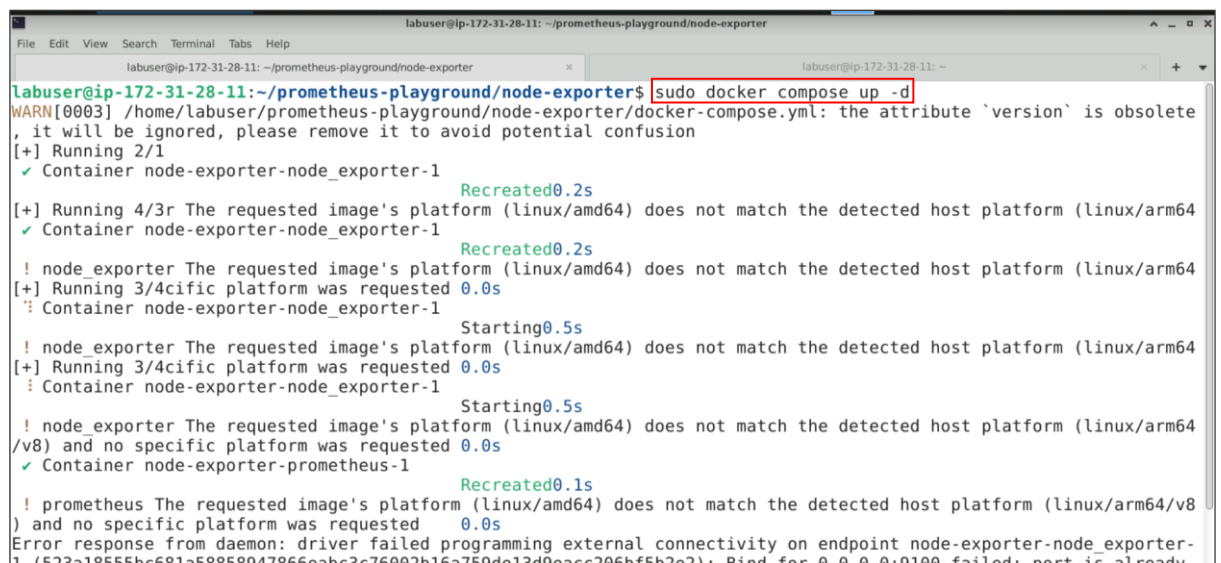
- 1.2 Change the current directory to the node-exporter folder within the cloned repository using the following commands:

```
cd prometheus-playground/  
cd node-exporter/
```



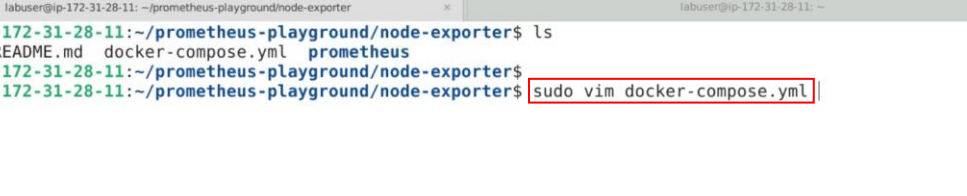
A terminal window showing the user navigating through directories. The prompt is `labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter`. The user runs `ls` and sees a list of files including `elk.sh`, `kubectrl.sha256`, `node_exporter`, `node_exporter-1.8.2.linux-arm64`, `prometheus`, `prometheus-2.54.0.linux-arm64`, `prometheus-playground`, `pushgateway-1.9.0.linux-arm64`, `snap`, and `thinclient_drives`. The user then runs `cd prometheus-playground/` and `ls` again, showing a list of files including `CODE_OF_CONDUCT.md`, `README.md`, `alertmanager`, `cadvisor`, `file-sd`, `haproxy`, `node-exporter`, `LICENSE`, `SECURITY.md`, `blackbox-exporter`, `federation`, `go-app`, `nginx`, and `python-flask-app`. Finally, the user runs `cd node-exporter/` and the prompt changes to `labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter`.

- 1.3 Start Docker containers in detached mode using the following command:
sudo docker compose up -d



A terminal window showing the execution of the `sudo docker compose up -d` command. The prompt is `labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter`. The output shows several warnings about the `'version'` attribute being obsolete in the `docker-compose.yml` file. The containers `node-exporter-node_exporter-1` and `prometheus` are recreated, while `node_exporter` is started. The output also shows that the requested image's platform (linux/amd64) does not match the detected host platform (linux/arm64). The command `sudo docker compose up -d` is highlighted with a red box.

1.4 Open the **docker-compose.yml** file for editing using the following command:
sudo vim docker-compose.yml



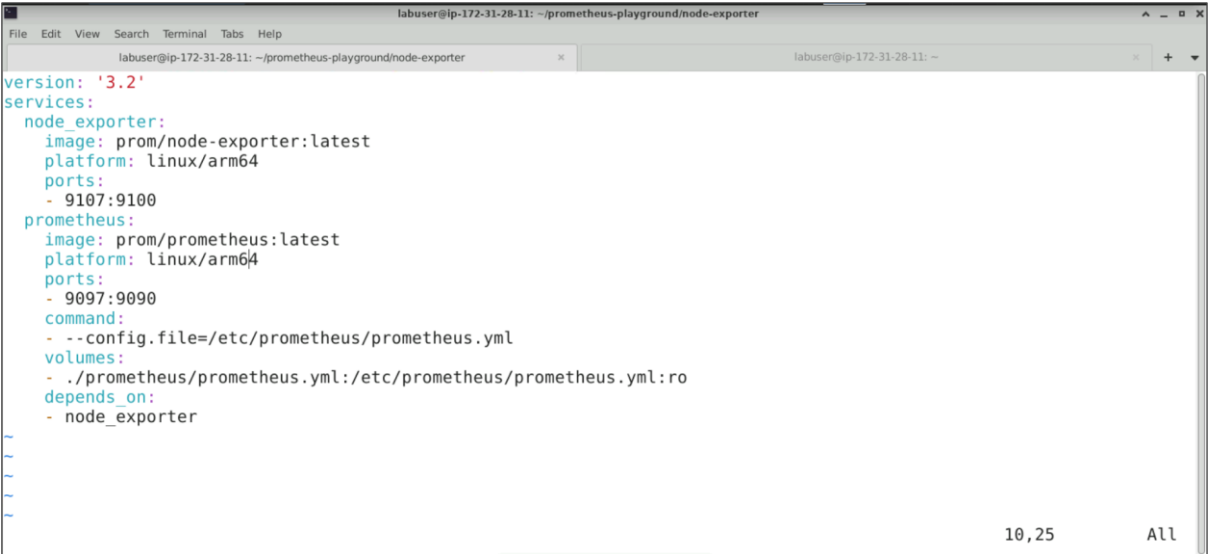
```
labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter
File Edit View Search Terminal Tabs Help
labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter
labuser@ip-172-31-28-11:~/prometheus-playground/node-exporter$ ls
Makefile  README.md  docker-compose.yml  prometheus
labuser@ip-172-31-28-11:~/prometheus-playground/node-exporter$
labuser@ip-172-31-28-11:~/prometheus-playground/node-exporter$ sudo vim docker-compose.yml
```

The configuration file should look like this:

```
labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter
File Edit View Search Terminal Tabs Help
labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter
labuser@ip-172-31-28-11: ~
version: '3.2'
services:
  node_exporter:
    image: prom/node-exporter:${NODE_EXPORTER_TAG}
    ports:
      - 9100:9100
  prometheus:
    image: prom/prometheus:${PROMETHEUS_TAG}
    ports:
      - 9090:9090
    command:
      - --config.file=/etc/prometheus/prometheus.yml
    volumes:
      - ./prometheus/prometheus.yml:/etc/prometheus/prometheus.yml:ro
    depends_on:
      - node_exporter
```

1.5 Copy and paste the following configuration into the file, then save and exit:

```
version: '3.2'
services:
  node_exporter:
    image: prom/node-exporter:latest
    platform: linux/arm64
    ports:
      - "9107:9100"
  prometheus:
    image: prom/prometheus:latest
    platform: linux/arm64
    ports:
      - "9097:9090"
    command:
      - --config.file=/etc/prometheus/prometheus.yml
    volumes:
      - ./prometheus/prometheus.yml:/etc/prometheus/prometheus.yml:ro
    depends_on:
      - node_exporter
```



The screenshot shows a terminal window with a menu bar (File, Edit, View, Search, Terminal, Tabs, Help) and a title bar (labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter). The terminal content displays the configuration for two services: node_exporter and prometheus. The node_exporter service is configured with image prom/node-exporter:latest, platform linux/arm64, and ports 9107:9100. The prometheus service is configured with image prom/prometheus:latest, platform linux/arm64, ports 9097:9090, command --config.file=/etc/prometheus/prometheus.yml, and volumes ./prometheus/prometheus.yml:/etc/prometheus/prometheus.yml:ro. The prometheus service also depends on the node_exporter service. The terminal shows the configuration being pasted into a file, with line numbers 10 and 25 visible at the bottom right.

```
labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter
version: '3.2'
services:
  node_exporter:
    image: prom/node-exporter:latest
    platform: linux/arm64
    ports:
      - 9107:9100
  prometheus:
    image: prom/prometheus:latest
    platform: linux/arm64
    ports:
      - 9097:9090
    command:
      - --config.file=/etc/prometheus/prometheus.yml
    volumes:
      - ./prometheus/prometheus.yml:/etc/prometheus/prometheus.yml:ro
    depends_on:
      - node_exporter
```

Note: The port number has been changed to avoid frequent port conflicts.

1.6 Start Docker containers using the following command:

sudo docker compose up -d

```
labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter
labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter$ ls
Makefile  README.md  docker-compose.yml  prometheus
labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter$
labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter$ sudo vim docker-compose.yml
labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter$ sudo docker compose up -d
WARN[0000] /home/labuser/prometheus-playground/node-exporter/docker-compose.yml: the attribute `version` is obsolete
, it will be ignored, please remove it to avoid potential confusion
[+] Running 2/2
 ✓ Container node-exporter-node_exporter-1  Started          0.8s
 ✓ Container node-exporter-prometheus-1     Started          1.1s
labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter$
```

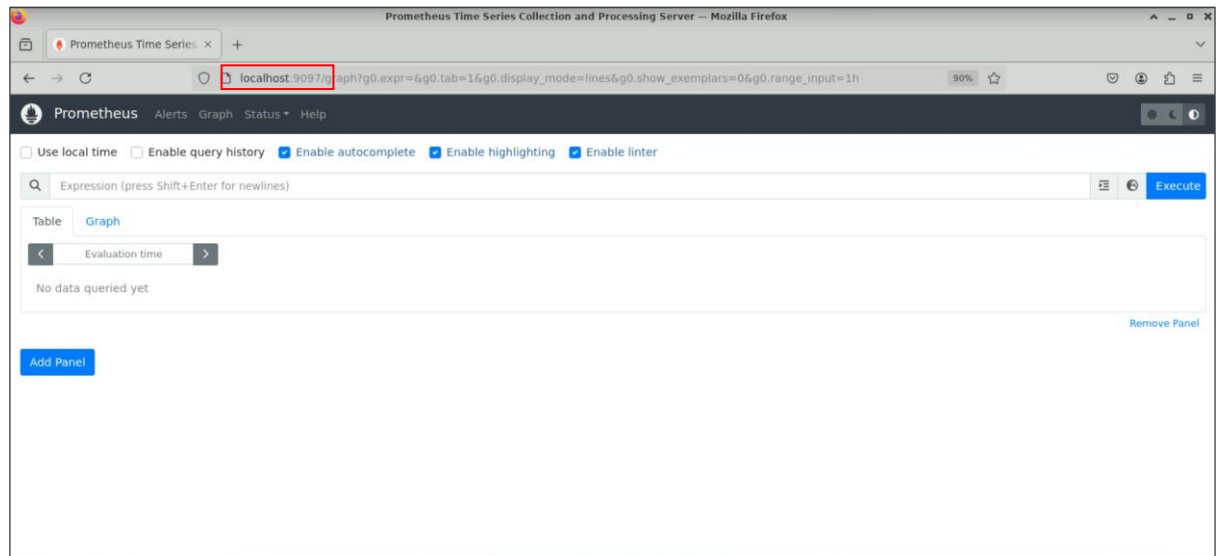
1.7 List running Docker containers using the following command:

sudo docker ps

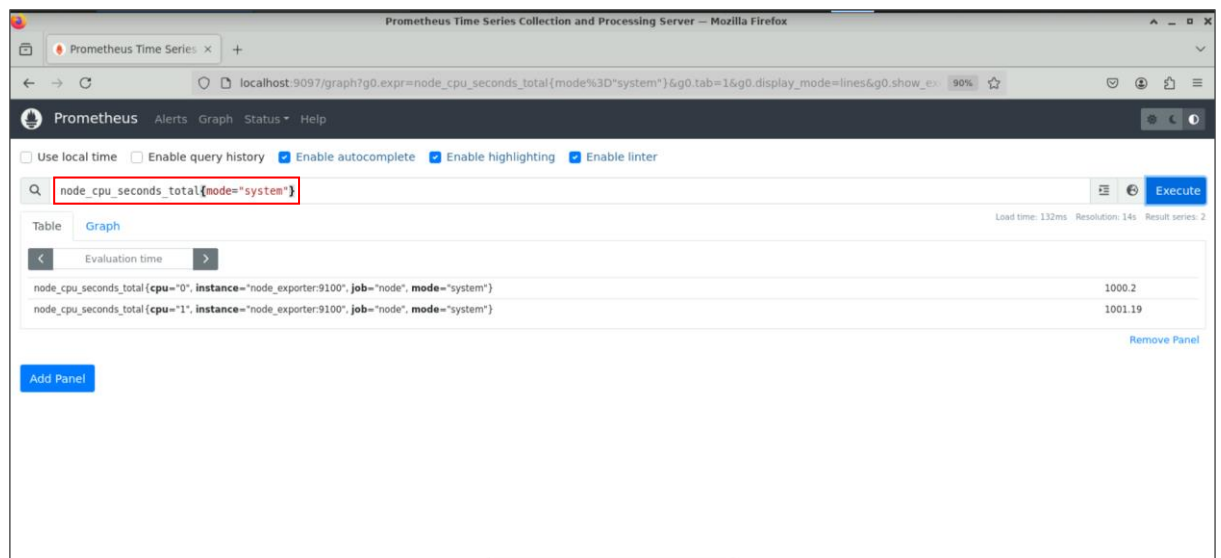
```
labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter
labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter$ sudo docker ps
WARN[0000] /home/labuser/prometheus-playground/node-exporter/docker-compose.yml: the attribute `version` is obsolete
, it will be ignored, please remove it to avoid potential confusion
[+] Running 2/2
 ✓ Container node-exporter-node_exporter-1  Started          0.8s
 ✓ Container node-exporter-prometheus-1     Started          1.1s
labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter$ sudo docker ps
CONTAINER ID   IMAGE                                COMMAND                  CREATED        STATUS
7808f26d0590   prom/prometheus:latest             "/bin/prometheus --c..." About a minute ago Up About a mi
nute          0.0.0.0:9097->9090/tcp, :::9097->9090/tcp node-exporter-prometheus-1
e61e52522dc3   prom/node-exporter:latest          "/bin/node_exporter"    About a minute ago Up About a mi
nute          0.0.0.0:9107->9100/tcp, :::9107->9100/tcp node-exporter-node_exporter-1
99e60d922f2c   grafana/grafana                    "/run.sh"               4 hours ago   Up 5 minutes
3dc04f8a396c   prom/prometheus:v2.36.2            "/bin/prometheus --c..." 4 hours ago   Up 5 minutes
3bb3744f7934   gcr.io/cadvisor/cadvisor           "/usr/bin/cadvisor -..." 4 hours ago   Up 5 minutes
f6ef4ff3e628   prom/alertmanager                   "/bin/alertmanager -..." 4 hours ago   Up 5 minutes
cc7dde7a2665   quay.io/prometheus/node-exporter:latest "/bin/node_exporter ..." 4 hours ago   Up 5 minutes
labuser@ip-172-31-28-11: ~/prometheus-playground/node-exporter$
```

Step 2: Use the Prometheus UI to query Node Exporter metrics

2.1 Open the browser and access the Prometheus UI using the following URL:
http://localhost:9097



2.2 Filter metrics using the following query:
node_cpu_seconds_total{mode="system"}

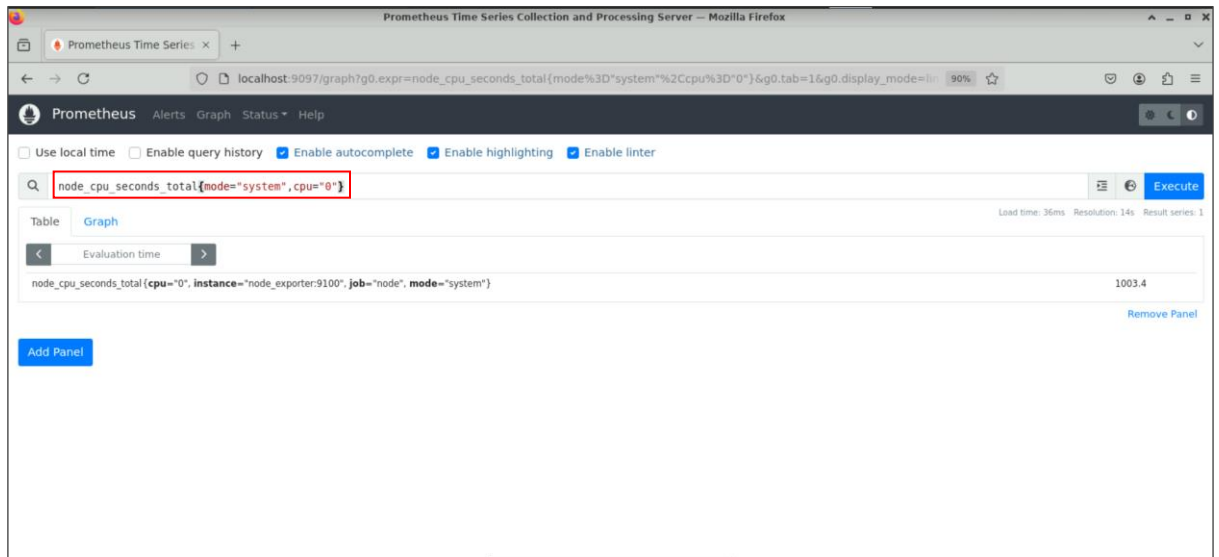


Note: This example retrieves the total CPU time spent in system mode across all CPUs.

Note: Specific metrics can be selected based on their name and labels using PromQL. The basic syntax for selecting a metric is:

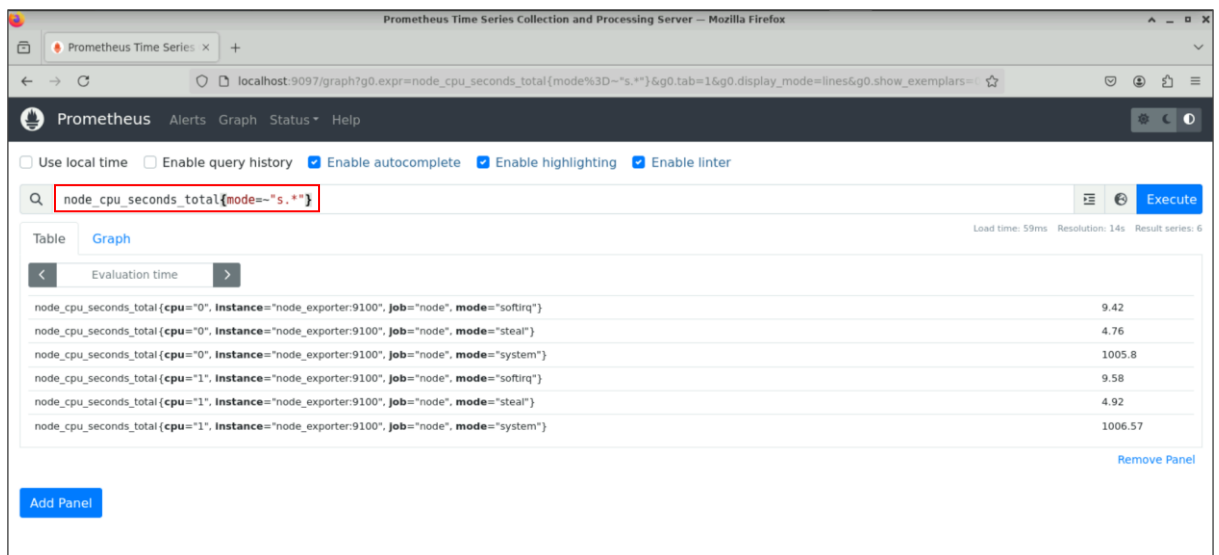
<metric_name>{<label_name>=<label_value>, ...}

2.3 Apply multiple label filters using the following query:
node_cpu_seconds_total{mode="system",cpu="0"}



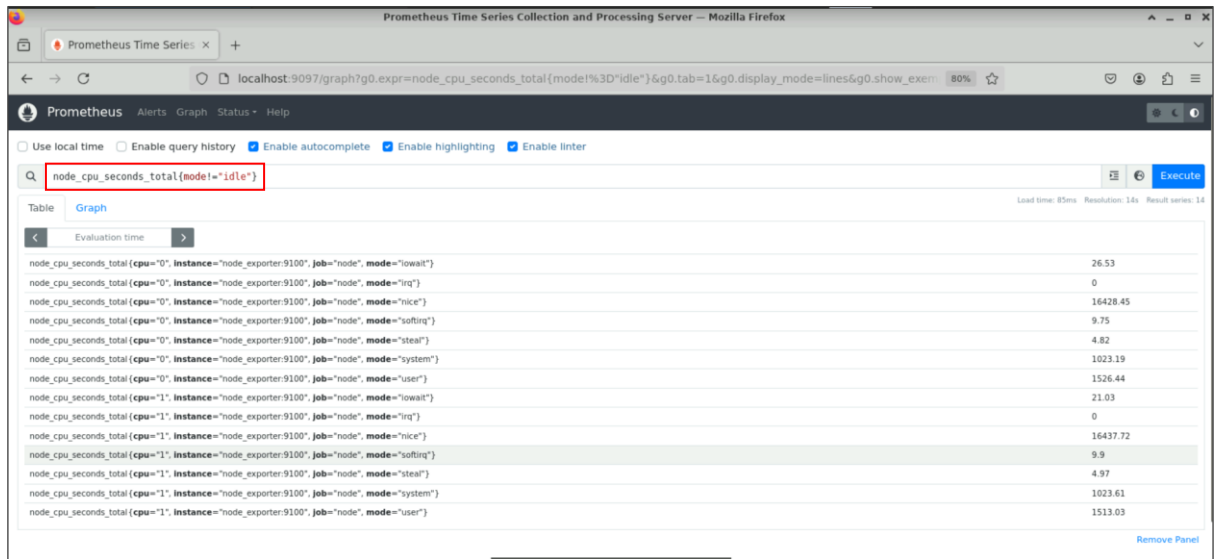
Note: This example retrieves the total CPU time spent in system mode specifically for CPU 0.

2.4 Match label values with regular expressions using the following query:
node_cpu_seconds_total{mode=~"s.*"}



Note: This example retrieves the total CPU time for all modes that start with the letter s.

2.5 Nullify a label filter using the following query:
node_cpu_seconds_total{mode!="idle"}



Note: This example retrieves the total CPU time for all modes except idle.

By following these steps you have successfully configured Node Exporter and Prometheus using Docker and written PromQL queries to extract metrics from the Node Exporter sample dataset.