DEVOPS

DAY 6 Task

Prometheus and Grafana

PROMETHEUS

Prometheus is an open-source system monitoring and alerting toolkit originally built at SoundCloud. It is now a standalone open source project . Prometheus joined the Cloud Native Computing Foundation in 2016 as the second hosted project, after Kubernetes.

FEATURES

1. A multi-dimensional data model with time series data identified by metric name and key/value Pairs
2. PromQL, a flexible query language to leverage this dimensionality
3. No reliance on distributed storage; single server nodes are autonomous
4. Time series collection happens via a pull model over HTTP
5. Pushing time series is supported via an intermediary gateway
6. Targets are discovered via service discovery or static configuration
7. Multiple modes of graphing and dashboarding support

PROMETHEUS COMMANDS

```
sudo useradd \
  --system \
  --no-create-home \
  --shell /bin/false Prometheus
```

```
wget https://github.com/prometheus/prometheus/releases/download/v2.47.1/prometheus-2.47.1.linux-amd64.tar.gz
tar -xvf prometheus-2.47.1.linux-amd64.tar.gz
sudo mkdir -p /data /etc/prometheus
cd prometheus-2.47.1.linux-amd64/
sudo mv prometheus promtool /usr/local/bin/
sudo mv consoles/ console_libraries/ /etc/prometheus/
```

```
sudo mv prometheus.yml /etc/prometheus/prometheus.yml
sudo chown -R prometheus:prometheus /etc/prometheus/ /data/

cd
rm -rf prometheus-2.47.1.linux-amd64.tar.gz
prometheus --version
sudo vim /etc/systemd/system/prometheus.service

[Unit]
Description=Prometheus
Wants=network-online.target
After=network-online.target
StartLimitIntervalSec=500
StartLimitBurst=5
[Service]
User=prometheus
Group=prometheus
Type=simple
Restart=on-failure
RestartSec=5s
ExecStart=/usr/local/bin/prometheus \
  --config.file=/etc/prometheus/prometheus.yml \
  --storage.tsdb.path=/data \
  --web.console.templates=/etc/prometheus/consoles \
  --web.console.libraries=/etc/prometheus/console_libraries \
  --web.listen-address=0.0.0.0:9090 \
  --web.enable-lifecycle
[Install]
WantedBy=multi-user.target

sudo systemctl enable prometheus
sudo systemctl start prometheus
```

```
sudo systemctl status prometheus
journalctl -u prometheus -f --no-pager

sudo useradd \
    --system \
    --no-create-home \
    --shell /bin/false node_exporter

wget https://github.com/prometheus/node_exporter/releases/download/v1.6.1/node_exporter-1.6.1.linux-amd64.tar.gz
tar -xvf node_exporter-1.6.1.linux-amd64.tar.gz

sudo mv \
  node_exporter-1.6.1.linux-amd64/node_exporter \
  /usr/local/bin/

rm -rf node_exporter*

node_exporter –version

sudo vim /etc/systemd/system/node_exporter.service

[Unit]
Description=Node Exporter
Wants=network-online.target
After=network-online.target
StartLimitIntervalSec=500
StartLimitBurst=5
[Service]
User=node_exporter
Group=node_exporter
Type=simple
Restart=on-failure
```

RestartSec=5s

ExecStart=/usr/local/bin/node_exporter \

--collector.logind

[Install]

WantedBy=multi-user.target

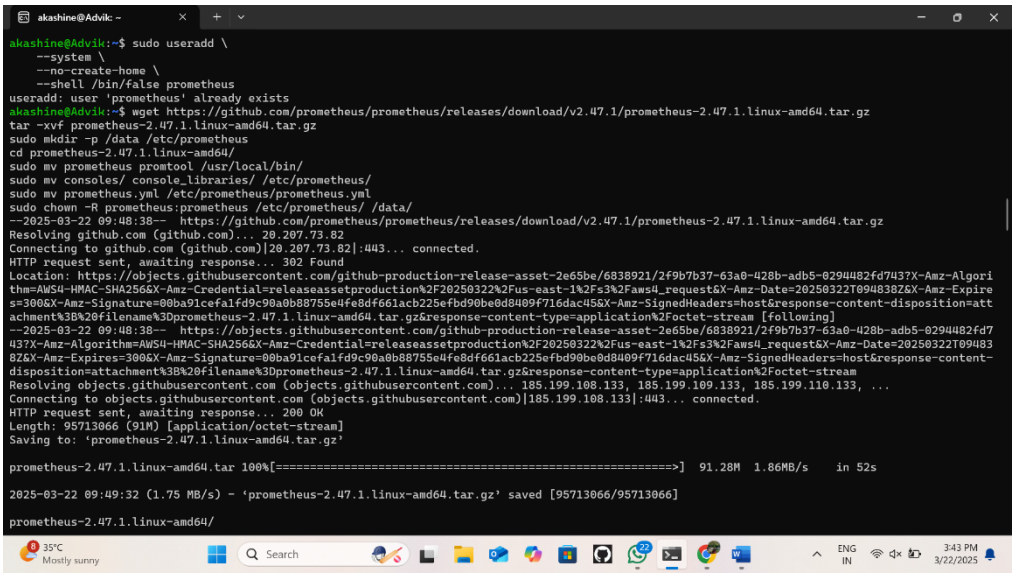
sudo systemctl enable node_exporter

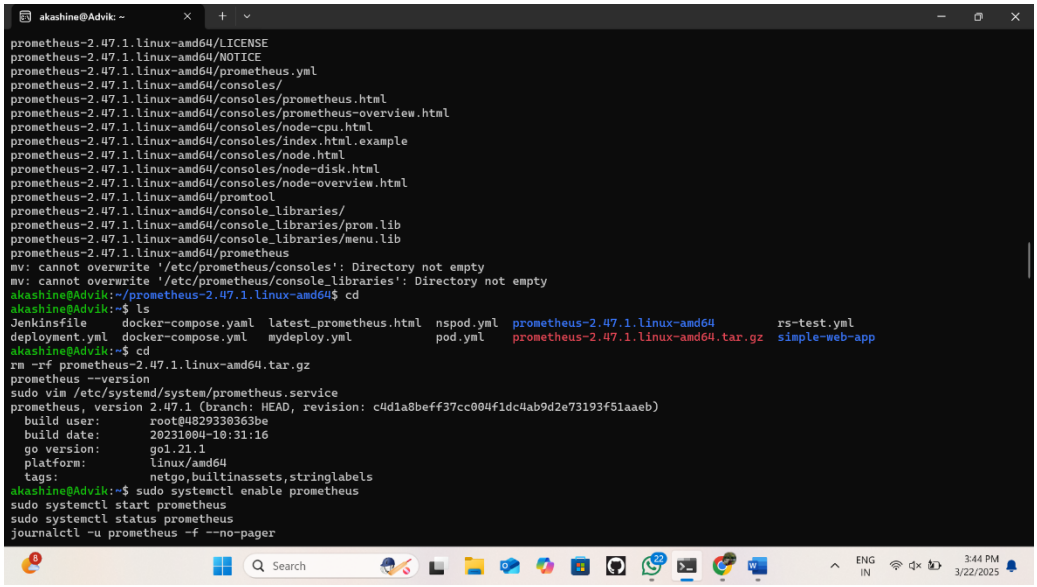
sudo systemctl start node_exporter

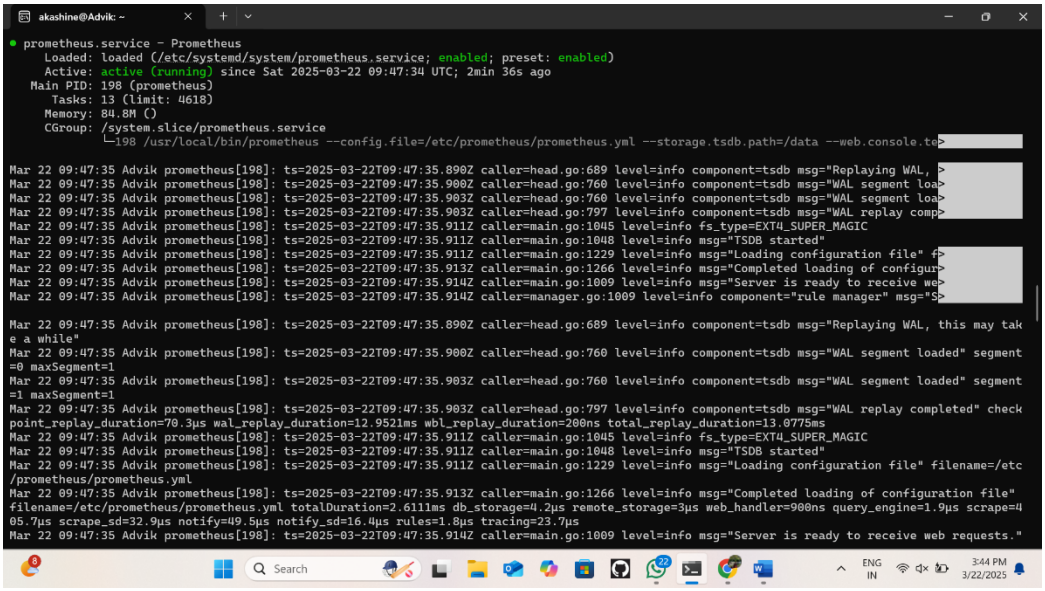
sudo systemctl status node_exporter

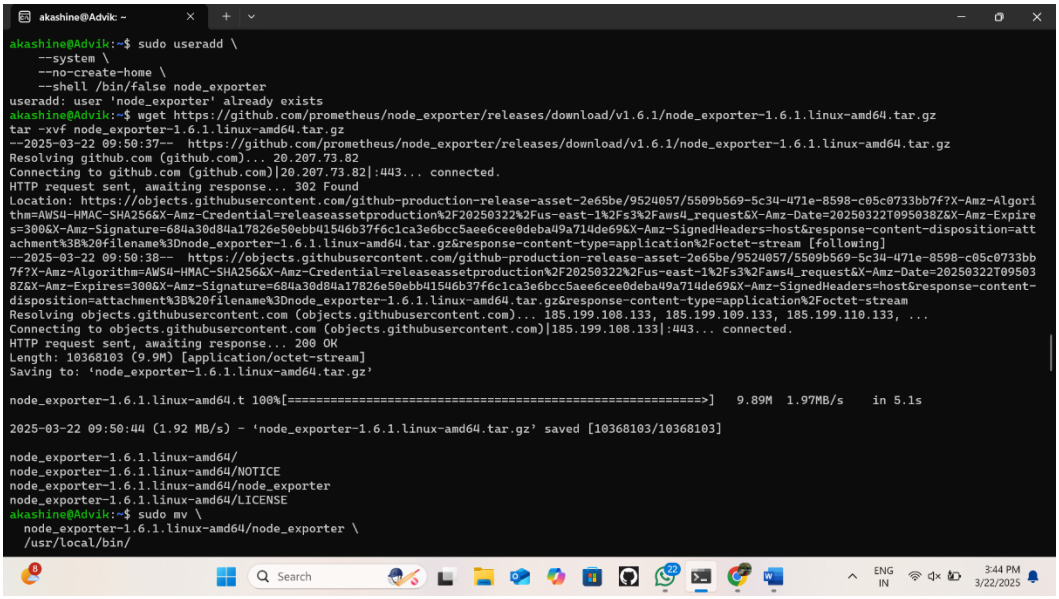
journalctl -u node_exporter -f --no-pager

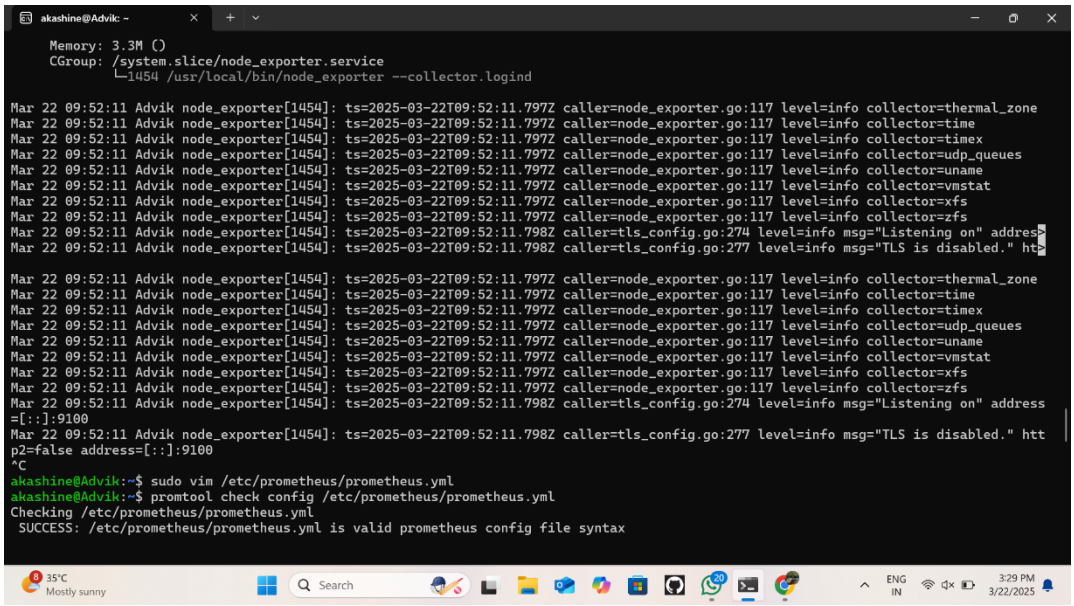
sudo vim /etc/prometheus/prometheus.yml

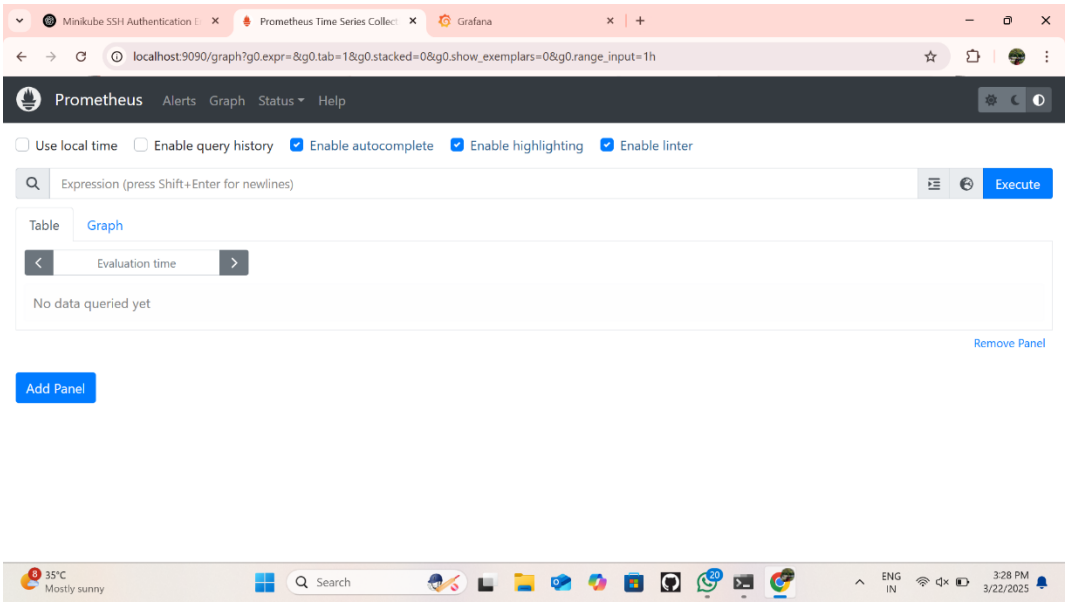





akashine@Advik: ~
● prometheus.service - Prometheus
Loaded: loaded (/etc/systemd/system/prometheus.service; enabled; preset: enabled)
Active: active (running) since Sat 2025-03-22 09:47:34 UTC; 2min 36s ago
Main PID: 198 (prometheus)
Tasks: 13 (limit: 4618)
Memory: 84.8M ()
CGroup: /system.slice/prometheus.service
└─198 /usr/local/bin/prometheus --config.file=/etc/prometheus/prometheus.yml --storage.tsdb.path=/data --web.console.te
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.890Z caller=head.go:689 level=info component=tsdb msg="Replaying WAL,
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.900Z caller=head.go:760 level=info component=tsdb msg="WAL segment loa
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.903Z caller=head.go:760 level=info component=tsdb msg="WAL segment loa
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.903Z caller=head.go:797 level=info component=tsdb msg="WAL replay comp
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.911Z caller=main.go:1045 level=info fs_type=EXT4_SUPER_MAGIC
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.911Z caller=main.go:1048 level=info msg="TSDB started"
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.911Z caller=main.go:1229 level=info msg="Loading configuration file" f
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.913Z caller=main.go:1266 level=info msg="Completed loading of configur
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.914Z caller=main.go:1009 level=info msg="Server is ready to receive we
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.914Z caller=manager.go:1009 level=info component="rule manager" msg="S
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.890Z caller=head.go:689 level=info component=tsdb msg="Replaying WAL, this may tak
e a while"
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.900Z caller=head.go:760 level=info component=tsdb msg="WAL segment loaded" segment
=0 maxSegment=1
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.903Z caller=head.go:760 level=info component=tsdb msg="WAL segment loaded" segment
=1 maxSegment=1
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.903Z caller=head.go:797 level=info component=tsdb msg="WAL replay completed" check
point_replay_duration=70.3µs wal_replay_duration=12.9521ms wbl_replay_duration=200ns total_replay_duration=13.0775ms
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.911Z caller=main.go:1045 level=info fs_type=EXT4_SUPER_MAGIC
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.911Z caller=main.go:1048 level=info msg="TSDB started"
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.911Z caller=main.go:1229 level=info msg="Loading configuration file" filename=/etc
/prometheus/prometheus.yml
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.913Z caller=main.go:1266 level=info msg="Completed loading of configuration file"
filename=/etc/prometheus/prometheus.yml totalDuration=2.6111ms db_storage=4.2µs remote_storage=3µs web_handler=900ns query_engine=1.9µs scrape=4
05.7µs scrape_sd=32.9µs notify=49.5µs notify_sd=16.4µs rules=1.8µs tracing=23.7µs
Mar 22 09:47:35 Advik prometheus[198]: ts=2025-03-22T09:47:35.914Z caller=main.go:1009 level=info msg="Server is ready to receive web requests."
Search
ENG
IN
3:44 PM
3/22/2025


akashine@Advik: ~
akashine@Advik:~$ sudo useradd \
--system \
--no-create-home \
--shell /bin/false node_exporter
useradd: user 'node_exporter' already exists
akashine@Advik:~$ wget https://github.com/prometheus/node_exporter/releases/download/v1.6.1/node_exporter-1.6.1.linux-amd64.tar.gz
tar -xvf node_exporter-1.6.1.linux-amd64.tar.gz
--2025-03-22 09:50:37-- https://github.com/prometheus/node_exporter/releases/download/v1.6.1/node_exporter-1.6.1.linux-amd64.tar.gz
Resolving github.com (github.com)... 20.207.73.82
Connecting to github.com (github.com)|20.207.73.82|:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://objects.githubusercontent.com/github-production-release-asset-2e65be/9524057/5509b569-5c34-471e-8598-c05c0733bb7f?X-Amz-Algori
thm=AWS4-HMAC-SHA256&X-Amz-Credential=releaseassetproduction%2F20250322%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20250322T095038Z&X-Amz-Expire
s=300&X-Amz-Signature=684a30d84a17826e50ebb41546b37f6c1ca3e6bcc5aee6cee0deba49a714de69&X-Amz-SignedHeaders=host&response-content-disposition=att
achment%3B%20filename%3Dnode_exporter-1.6.1.linux-amd64.tar.gz&response-content-type=application%2Foctet-stream [following]
--2025-03-22 09:50:38-- https://objects.githubusercontent.com/github-production-release-asset-2e65be/9524057/5509b569-5c34-471e-8598-c05c0733bb
7f?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=releaseassetproduction%2F20250322%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20250322T09503
8Z&X-Amz-Expires=300&X-Amz-Signature=684a30d84a17826e50ebb41546b37f6c1ca3e6bcc5aee6cee0deba49a714de69&X-Amz-SignedHeaders=host&response-content-
disposition=attachment%3B%20filename%3Dnode_exporter-1.6.1.linux-amd64.tar.gz&response-content-type=application%2Foctet-stream
Resolving objects.githubusercontent.com (objects.githubusercontent.com)... 185.199.108.133, 185.199.109.133, 185.199.110.133, ...
Connecting to objects.githubusercontent.com (objects.githubusercontent.com)|185.199.108.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 10368103 (9.9M) [application/octet-stream]
Saving to: 'node_exporter-1.6.1.linux-amd64.tar.gz'
node_exporter-1.6.1.linux-amd64.t 100%[==========>] 9.89M 1.97MB/s in 5.1s
2025-03-22 09:50:44 (1.92 MB/s) - 'node_exporter-1.6.1.linux-amd64.tar.gz' saved [10368103/10368103]
node_exporter-1.6.1.linux-amd64/
node_exporter-1.6.1.linux-amd64/NOTICE
node_exporter-1.6.1.linux-amd64/node_exporter
node_exporter-1.6.1.linux-amd64/LICENSE
akashine@Advik:~$ sudo mv \
node_exporter-1.6.1.linux-amd64/node_exporter \
/usr/local/bin/
Search
ENG
IN
3:44 PM
3/22/2025


akashine@Advik: ~
Memory: 3.3M ()
CGroup: /system.slice/node_exporter.service
└─1454 /usr/local/bin/node_exporter --collector.logind
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=thermal_zone
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=time
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=timex
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=udp_queues
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=uname
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=vmstat
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=xfs
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=zfs
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.798Z caller=tls_config.go:274 level=info msg="Listening on" addres
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.798Z caller=tls_config.go:277 level=info msg="TLS is disabled." ht
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=thermal_zone
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=time
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=timex
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=udp_queues
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=uname
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=vmstat
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=xfs
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.797Z caller=node_exporter.go:117 level=info collector=zfs
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.798Z caller=tls_config.go:274 level=info msg="Listening on" address
=[::]:9100
Mar 22 09:52:11 Advik node_exporter[1454]: ts=2025-03-22T09:52:11.798Z caller=tls_config.go:277 level=info msg="TLS is disabled." htt
p2=false address=[::]:9100
^C
akashine@Advik:~$ sudo vim /etc/prometheus/prometheus.yml
akashine@Advik:~$ promtool check config /etc/prometheus/prometheus.yml
Checking /etc/prometheus/prometheus.yml
SUCCESS: /etc/prometheus/prometheus.yml is valid prometheus config file syntax
35°C
Mostly sunny
Search
ENG
IN
3:29 PM
3/22/2025



GRAFANA

Grafana is an open-source, web-based analytics and visualization tool that allows users to query, visualize, and manage data from various sources, including time-series databases, cloud services, and more. It's known for its dashboards, alerting capabilities, and integration with various data sources, making it a popular choice for monitoring infrastructure and applications.

FEATURES

1. Supports Prometheus, MySQL, PostgreSQL, Elasticsearch, Loki, etc.
2. Customizable visualizations with graphs, tables, and heatmaps**.**
3. Advanced filtering and transformations for time-based data.
4. Set up alerts with Slack, email, Teams, PagerDuty, etc.
5. Powerful query builders for SQL, PromQL, and more.
6. Extend functionality with various plugins and cloud integrations.

GRAFANA COMMANDS

sudo apt-get install -y apt-transport-https software-properties-common

wget -q -O - https://packages.grafana.com/gpg.key | sudo apt-key add -

echo "deb https://packages.grafana.com/oss/deb stable main" | sudo tee -a /etc/apt/sources.list.d/grafana.list

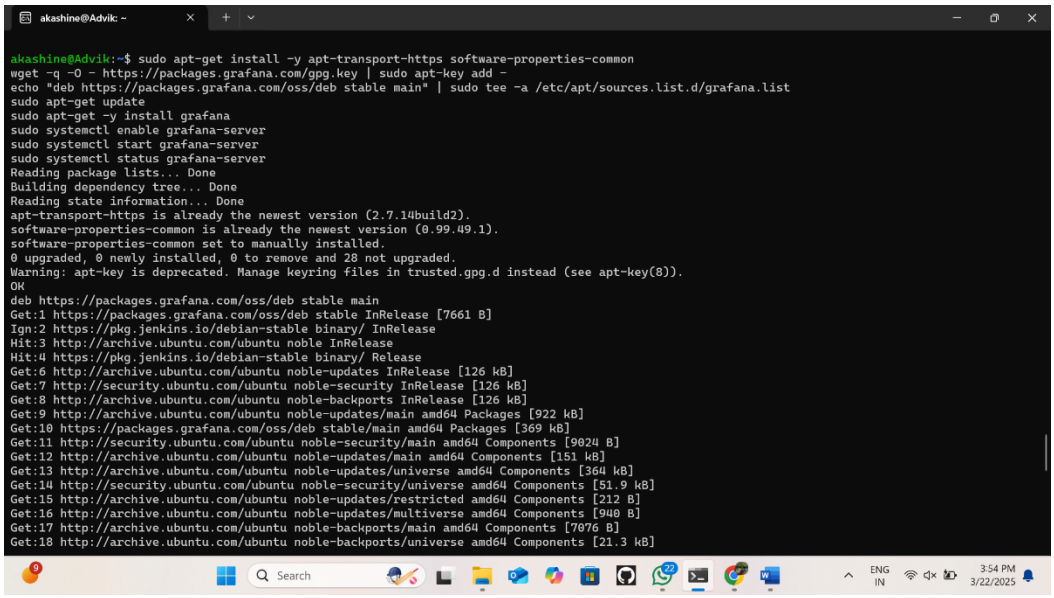
sudo apt-get update

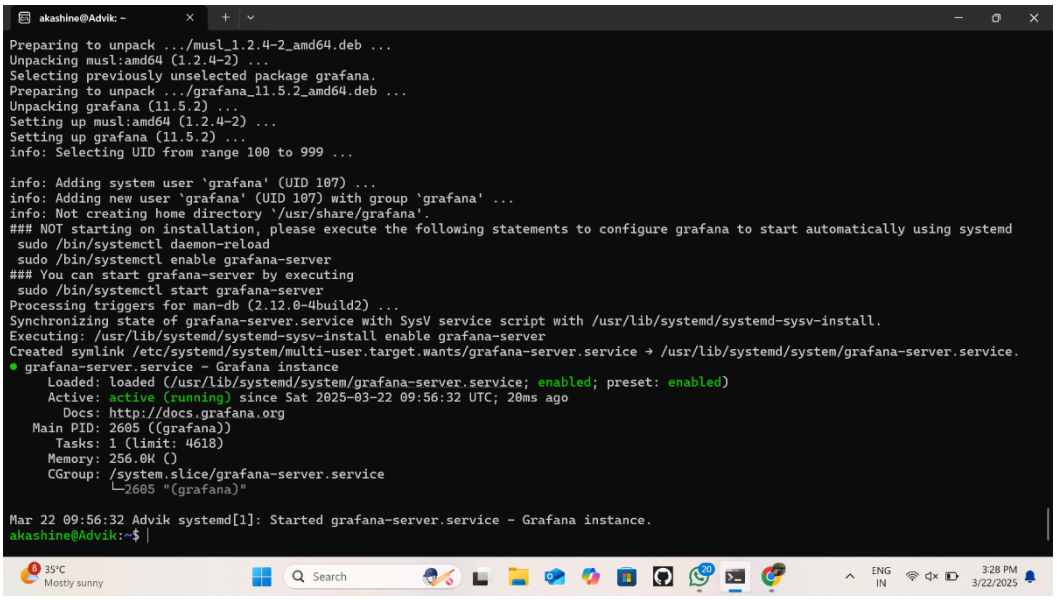
sudo apt-get -y install grafana

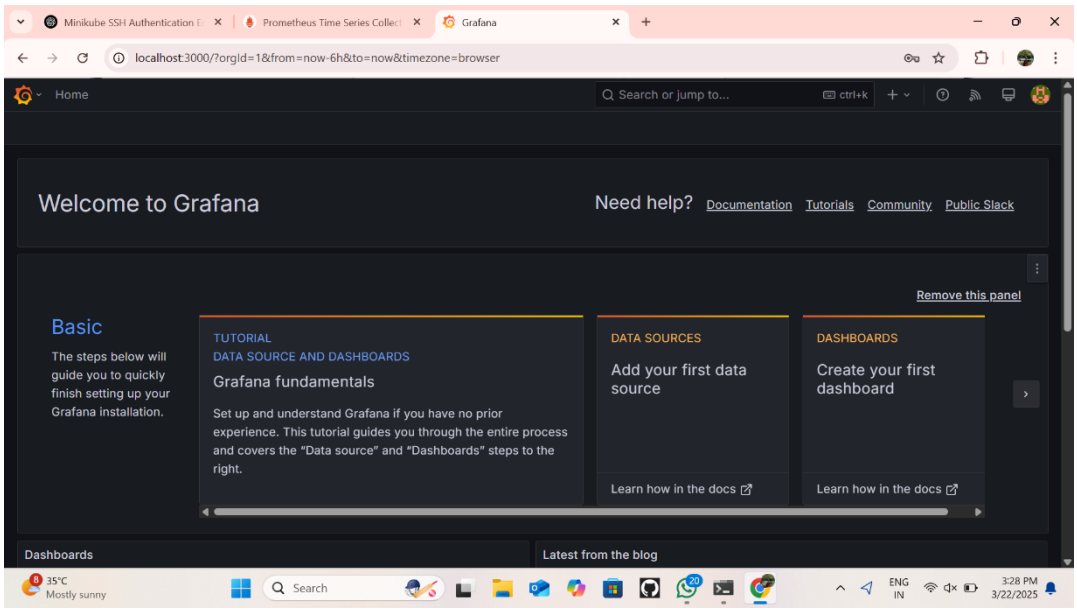
sudo systemctl enable grafana-server

sudo systemctl start grafana-server

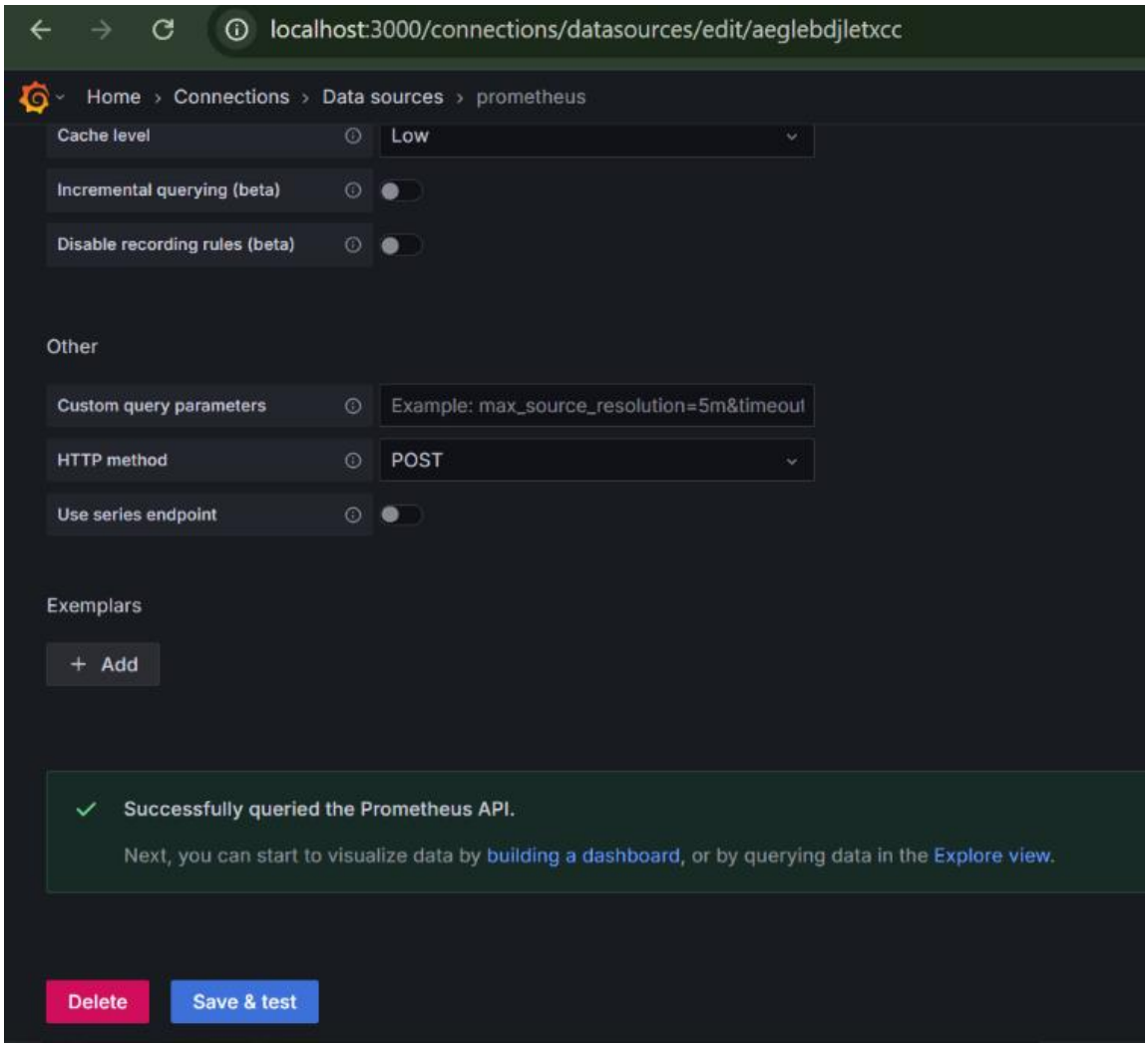
sudo systemctl status grafana-server

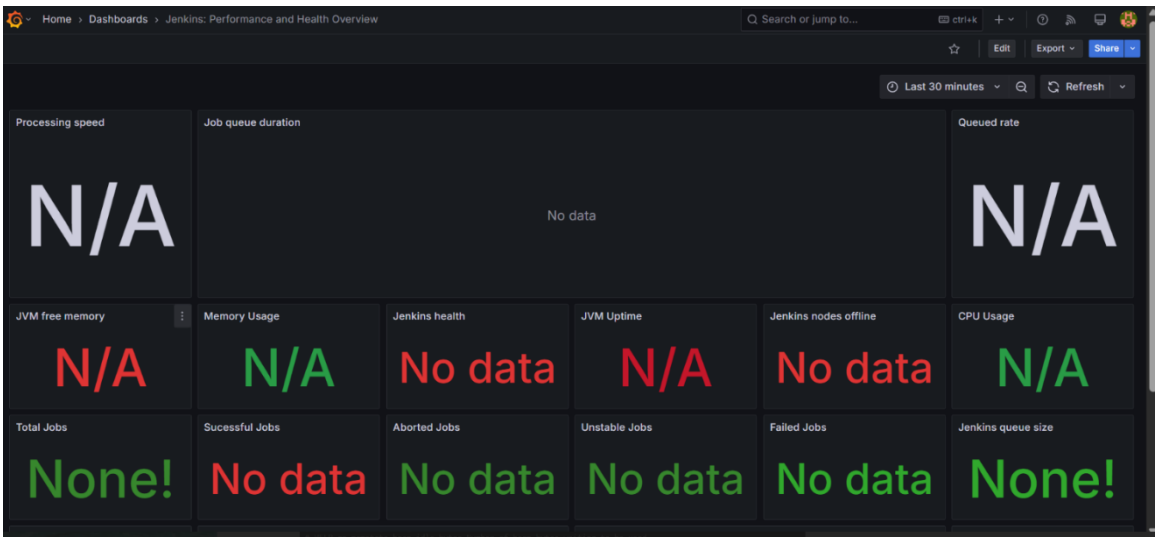


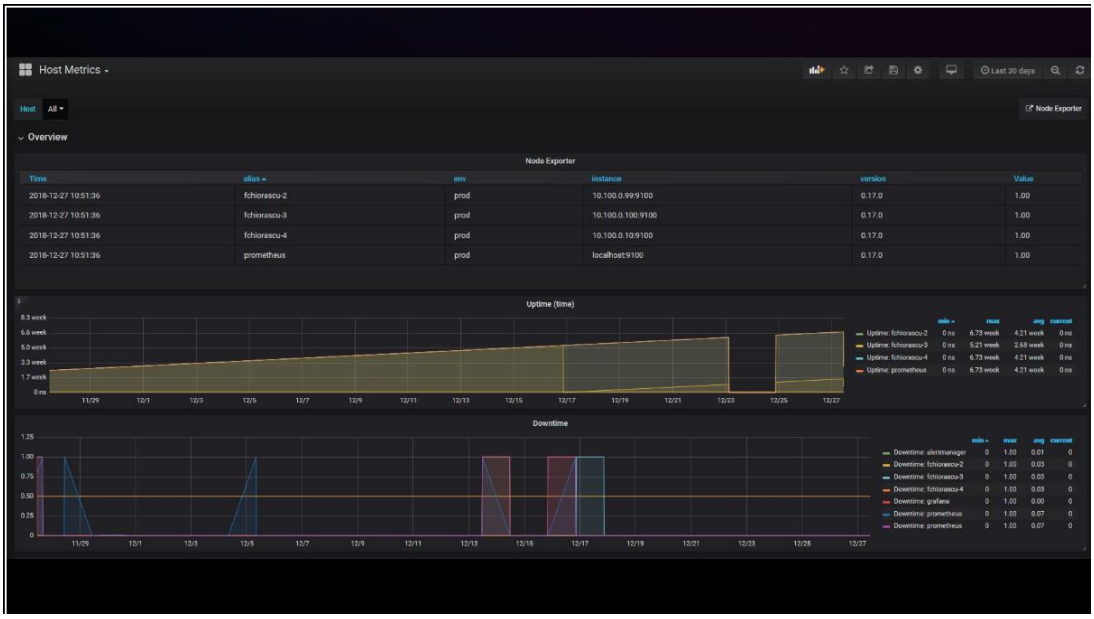


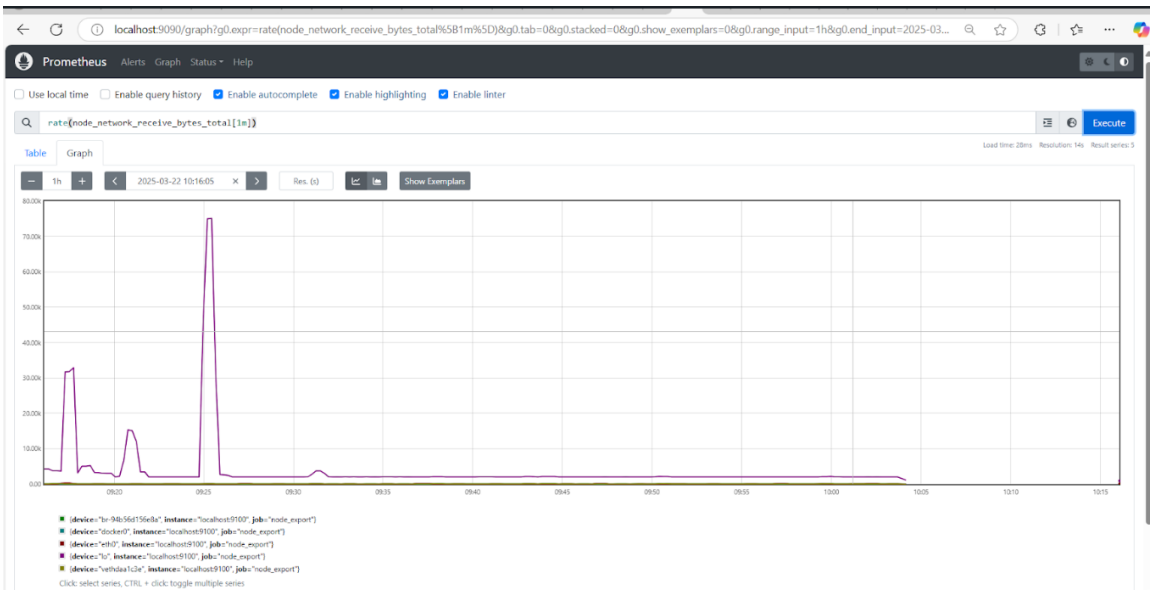


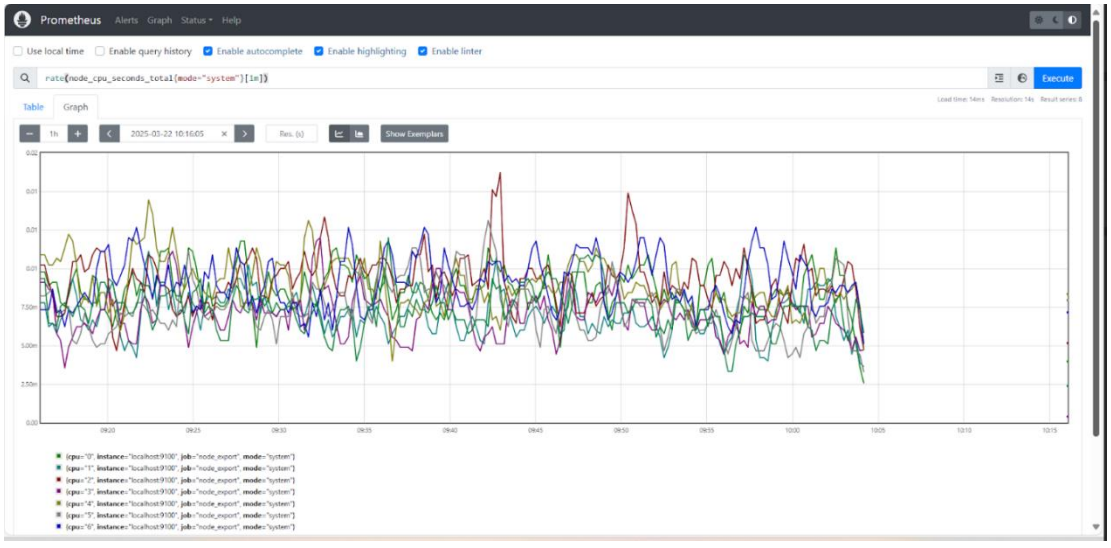

```
# HELP go_gc_duration_seconds A summary of the pause duration of garbage collection cycles.
# TYPE go_gc_duration_seconds summary
go_gc_duration_seconds{quantile="0"} 5.9879e-05
go_gc_duration_seconds{quantile="0.25"} 0.000146969
go_gc_duration_seconds{quantile="0.5"} 0.000187749
go_gc_duration_seconds{quantile="0.75"} 0.00035961
go_gc_duration_seconds{quantile="1"} 0.00135097
go_gc_duration_seconds_sum 0.009039947
go_gc_duration_seconds_count 31
# HELP go_goroutines Number of goroutines that currently exist.
# TYPE go_goroutines gauge
go_goroutines 36
# HELP go_info Information about the Go environment.
# TYPE go_info gauge
go_info{version="go1.21.1"} 1
# HELP go_memstats_alloc_bytes Number of bytes allocated and still in use.
# TYPE go_memstats_alloc_bytes gauge
go_memstats_alloc_bytes 2.5360568e+07
# 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 1.84000352e+08
# 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 1.492327e+06
# HELP go_memstats_frees_total Total number of frees.
# TYPE go_memstats_frees_total counter
go_memstats_frees_total 1.302908e+06
# 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 4.830976e+06
# 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 2.5360568e+07
# 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 1.0903552e+07
# 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 2.9696e+07
# HELP go_memstats_heap_objects Number of allocated objects.
# TYPE go_memstats_heap_objects gauge
go_memstats_heap_objects 116081
# HELP go_memstats_heap_released_bytes Number of heap bytes released to OS.
# TYPE go_memstats_heap_released_bytes gauge
go_memstats_heap_released_bytes 4.292608e+06
# HELP go_memstats_heap_sys_bytes Number of heap bytes obtained from system.
# TYPE go_memstats_heap_sys_bytes gauge
```


localhost:3000/connections/datasources/edit/aeglebdjletxcc
Home › Connections › Data sources › prometheus
Cache level
Low
Incremental querying (beta)
Disable recording rules (beta)
Other
Custom query parameters
Example: max_source_resolution=5m&timeout
HTTP method
POST
Use series endpoint
Exemplars
+ Add
Successfully queried the Prometheus API.
Next, you can start to visualize data by building a dashboard, or by querying data in the Explore view.
Delete
Save & test

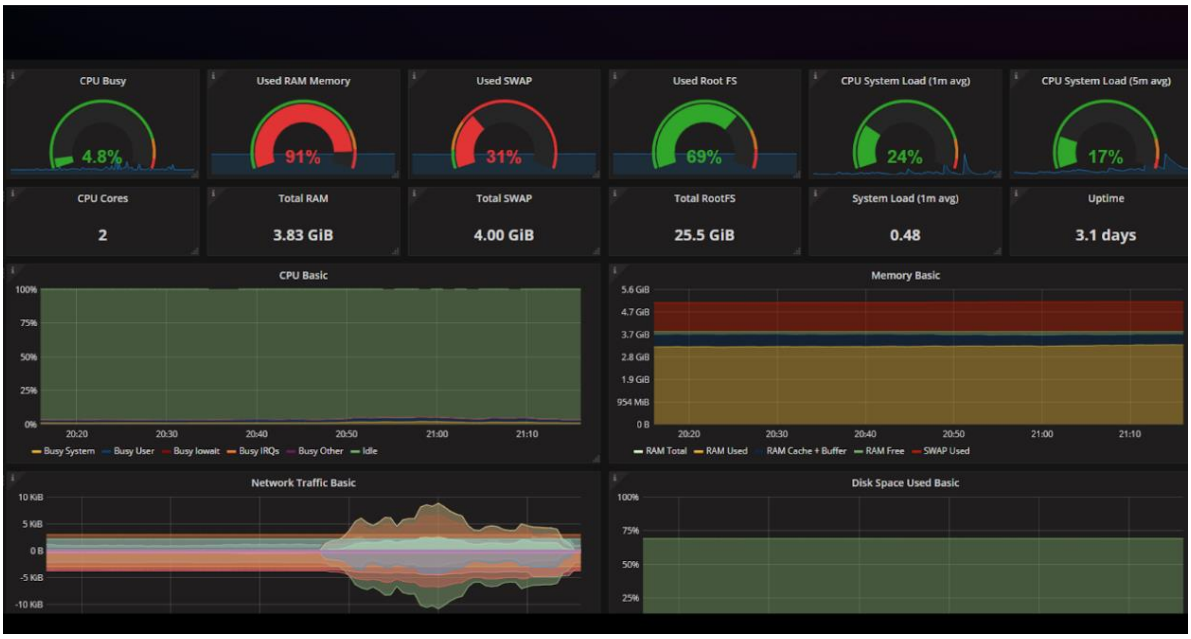

Home › Dashboards › Jenkins: Performance and Health Overview
Search or jump to...
Edit
Export
Share
Last 30 minutes
Refresh
Processing speed
N/A
Job queue duration
No data
Queued rate
N/A
JVM free memory
N/A
Memory Usage
N/A
Jenkins health
No data
JVM Uptime
N/A
Jenkins nodes offline
No data
CPU Usage
N/A
Total Jobs
None!
Sucessful Jobs
No data
Aborted Jobs
No data
Unstable Jobs
No data
Failed Jobs
No data
Jenkins queue size
None!


Host Metrics
Last 30 days
Host
All
Node Exporter
Overview
Node Exporter
Time
alias
env
instance
version
Value
2018-12-27 10:51:36
fchiorascu-2
prod
10.100.0.99:9100
0.17.0
1.00
2018-12-27 10:51:36
fchiorascu-3
prod
10.100.0.100:9100
0.17.0
1.00
2018-12-27 10:51:36
fchiorascu-4
prod
10.100.0.10:9100
0.17.0
1.00
2018-12-27 10:51:36
prometheus
prod
localhost:9100
0.17.0
1.00
Uptime (time)
Downtime


localhost:9090/graph?g0.expr=rate(node_network_receive_bytes_total%5B1m%5D)&g0.tab=0&g0.stacked=0&g0.show_exemplars=0&g0.range_input=1h&g0.end_input=2025-03...
Prometheus
Alerts
Graph
Status
Help
Use local time
Enable query history
Enable autocomplete
Enable highlighting
Enable linter
rate(node_network_receive_bytes_total[1m])
Execute
Table
Graph
1h
2025-03-22 10:16:05
Res. (s)
Show Exemplars
Click: select series, CTRL + click: toggle multiple series


Prometheus
Alerts
Graph
Status
Help
Use local time
Enable query history
Enable autocomplete
Enable highlighting
Enable linter
rate(node_cpu_seconds_total{mode="system"}[1m])
Execute
Table
Graph
1h
2025-03-22 10:16:05
Res. (s)
Show Exemplars


Prometheus
Alerts
Graph
Status
Help
Use local time
Enable query history
Enable autocomplete
Enable highlighting
Enable linter
node_load15
Execute
Table
Graph
Show Exemplars
Remove Panel
Add Panel


CPU Busy
4.8%
Used RAM Memory
91%
Used SWAP
31%
Used Root FS
69%
CPU System Load (1m avg)
24%
CPU System Load (5m avg)
17%
CPU Cores
2
Total RAM
3.83 GiB
Total SWAP
4.00 GiB
Total RootFS
25.5 GiB
System Load (1m avg)
0.48
Uptime
3.1 days
CPU Basic
Busy System
Busy User
Busy Iowait
Busy IRQs
Busy Other
Idle
Memory Basic
RAM Total
RAM Used
RAM Cache + Buffer
RAM Free
SWAP Used
Network Traffic Basic
Disk Space Used Basic