Installing Prometheus and Grafana on Ubuntu and Monitoring System Metrics

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Contents

1 Introduction

This document provides a detailed guide to installing Prometheus and Grafana on an Ubuntu system using a Bash script. It also includes step-by-step instructions for configuring these tools to monitor CPU utilization, Disk I/O metrics, Network In, and Network Out. The instructions are designed for Ubuntu 20.04 or later, ensuring compatibility with modern systems.

2 Prerequisites

Before proceeding, ensure the following:

- Ubuntu 20.04 or later installed.
- Root or sudo privileges.
- Internet connectivity for downloading packages.
- Basic familiarity with terminal commands.

3 Bash Script for Installation

The following Bash script automates the installation of Prometheus, Node Exporter (for system metrics), and Grafana on Ubuntu.

```
#!/bin/bash

# Exit on any error
set -e

# Update system packages
echo "Updating system packages..."
sudo apt-get update -y
sudo apt-get upgrade -y

# Install prerequisites
sudo apt-get install -y wget curl gnupg2 software-properties-common

# Install Prometheus
echo "Installing Prometheus..."
PROMETHEUS_VERSION="2.47.0"
wget https://github.com/prometheus/prometheus/releases/download/v${
    PROMETHEUS_VERSION}/prometheus-${PROMETHEUS_VERSION}.linux-amd64.tar
    .gz
tar xvfz prometheus-${PROMETHEUS_VERSION}.linux-amd64.tar.gz
sudo mkdir -p /etc/prometheus /var/lib/prometheus
sudo mv prometheus-${PROMETHEUS_VERSION}.linux-amd64/prometheus /usr/
    local/bin/
sudo mv prometheus-${PROMETHEUS_VERSION}.linux-amd64/promtool /usr/
    local/bin/
sudo mv prometheus-${PROMETHEUS_VERSION}.linux-amd64/prometheus.yml /
    etc/prometheus/
sudo mv prometheus-${PROMETHEUS_VERSION}.linux-amd64/consoles /etc/
    prometheus/
```

```
sudo mv prometheus-${PROMETHEUS_VERSION}.linux-amd64/console_libraries /etc/prometheus/
rm -rf prometheus-${PROMETHEUS_VERSION}.linux-amd64*

# Create Prometheus user and set permissions
sudo useradd --no-create-home --shell /bin/false prometheus
sudo chown -R prometheus:prometheus /etc/prometheus /var/lib/prometheus
sudo chown prometheus:prometheus /usr/local/bin/prometheus /usr/local/bin/promtool

# Create Prometheus systemd service
echo "Creating Prometheus systemd service..."
cat <<EOF | sudo tee /etc/systemd/system/prometheus.service
[Unit]
Description=Prometheus Monitoring
Wants=network-online.target
After=network-online.target

[Service]
User=prometheus
Group=prometheus
Type=simple
ExecStart=/usr/local/bin/prometheus \
    --config.file /etc/prometheus/prometheus.yml \
    --storage.tsdb.path /var/lib/prometheus/ \
    --web.console.templates=/etc/prometheus/consoles \
    --web.console.libraries=/etc/prometheus/console_libraries

[Install]
WantedBy=multi-user.target
EOF

# Install Node Exporter
echo "Installing Node Exporter..."
NODE_EXPORTER_VERSION="1.6.1"
wget https://github.com/prometheus/node_exporter/releases/download/v${NODE_EXPORTER_VERSION}/node_exporter-${NODE_EXPORTER_VERSION}.linux-amd64.tar.gz
tar xvfz node_exporter-${NODE_EXPORTER_VERSION}.linux-amd64.tar.gz
sudo mv node_exporter-${NODE_EXPORTER_VERSION}.linux-amd64/node_exporter /usr/local/bin/
rm -rf node_exporter-${NODE_EXPORTER_VERSION}.linux-amd64*

# Create Node Exporter user and systemd service
sudo useradd --no-create-home --shell /bin/false node_exporter
sudo chown node_exporter:node_exporter /usr/local/bin/node_exporter

cat <<EOF | sudo tee /etc/systemd/system/node_exporter.service
[Unit]
Description=Node Exporter
Wants=network-online.target
After=network-online.target

[Service]
User=node_exporter
Group=node_exporter
Type=simple
ExecStart=/usr/local/bin/node_exporter
```

```
[Install]
WantedBy=multi-user.target
EOF

# Install Grafana
echo "Installing Grafana..."
sudo apt-get install -y adduser libfontconfig1
wget https://dl.grafana.com/oss/release/grafana_9.5.2_amd64.deb
sudo dpkg -i grafana_9.5.2_amd64.deb
rm grafana_9.5.2_amd64.deb

# Start and enable services
sudo systemctl daemon-reload
sudo systemctl start prometheus
sudo systemctl enable prometheus
sudo systemctl start node_exporter
sudo systemctl enable node_exporter
sudo systemctl start grafana-server
sudo systemctl enable grafana-server

echo "Installation complete!"
echo "Prometheus is running on http://localhost:9090"
echo "Node Exporter is running on http://localhost:9100"
echo "Grafana is running on http://localhost:3000 (default login: admin
   /admin)"
```

Listing 1: install_prometheus_grafana.sh

3.1 Executing the Script

1. Save the script as `install_prometheus_grafana.sh`.
2. Make it executable:

```
chmod +x install_prometheus_grafana.sh

```

3. Run the script with sudo privileges:

```
sudo ./install_prometheus_grafana.sh

```

4 Configuring Prometheus for Metrics Collection

Edit the Prometheus configuration file to include Node Exporter as a scrape target.

1. Open the Prometheus configuration file:

```
sudo nano /etc/prometheus/prometheus.yml

```

2. Update the `scrape_configs` section to include Node Exporter:

```
scrape_configs:
  - job_name: 'prometheus'
    static_configs:
      - targets: ['localhost:9090']
  - job_name: 'node_exporter'
    static_configs:
      - targets: ['localhost:9100']

```

3. Save the file and restart Prometheus:

```
sudo systemctl restart prometheus

```

5 Setting Up Grafana

1. Access Grafana at `http://localhost:3000`.
2. Log in with default credentials (username: admin, password: admin). Change the password when prompted.
3. Add Prometheus as a data source:
   - Navigate to `Configuration > Data Sources > Add data source`.
   - Select `Prometheus`.
   - Set the URL to `http://localhost:9090` and save.

6 Monitoring System Metrics

Node Exporter collects system metrics, which can be visualized in Grafana. Below are the steps to create dashboards for CPU utilization, Disk I/O, Network In, and Network Out.

6.1 CPU Utilization

1. In Grafana, create a new dashboard (`Dashboards > New Dashboard`).
2. Add a new panel and configure the query:
   - Data Source: Prometheus.
   - Metric: `100 - (avg by(instance) (rate(node`$_{cpu}_{seconds}_{total}mode = "idle"[5m]))*100).$ *This query calculates the average CPU usage across all cores.*
3. Set the panel title to `CPU Utilization (%)` and adjust the visualization (e.g., Time Series).

6.2 Disk I/O Metrics

1. Add a new panel for Disk I/O.
2. Configure queries:

- Read I/O: `rate(node`$_{disk_{read_{bytes_{total}}}}[5m])$.$WriteI/O$: `rate(node`$_{disk_{written_{bytes_{total}}}}[5m])$.

3. Set the panel title to `Disk I/O (Bytes/s)` and use a Time Series visualization.

6.3 Network In/Out Metrics

1. Add a new panel for Network metrics.
2. Configure queries:

- Network In: `rate(node`$_{network_{receive_{bytes_{totaldevice}}}} = "eth0"[5m])$.$NetworkOut$: `rate(node`$_{network_{transmit_{bytes_{totaldevice}}}} = "eth0"[5m])$.

3. Replace `eth0` with the appropriate network interface (check using `ifconfig` or `ip a`).
4. Set the panel title to `Network In/Out (Bytes/s)` and use a Time Series visualization.

7 Importing a Prebuilt Dashboard (Optional)

1. Import the Node Exporter Full dashboard (ID: 1860) from `https://grafana.com/grafana/dashboards/1860`.
2. In Grafana, go to `Dashboards > Import`, enter the dashboard ID, and select the Prometheus data source.
3. This dashboard includes preconfigured panels for CPU, Disk, and Network metrics.

8 Troubleshooting

- Check service status:

```
sudo systemctl status prometheus
sudo systemctl status node_exporter
sudo systemctl status grafana-server

```

- View logs for errors:

```
journalctl -u prometheus
journalctl -u node_exporter
journalctl -u grafana-server

```

- Ensure ports 9090 (Prometheus), 9100 (Node Exporter), and 3000 (Grafana) are open.

9 Conclusion

This guide provides a complete workflow for installing Prometheus and Grafana on Ubuntu, configuring them to collect system metrics, and visualizing CPU utilization, Disk I/O, and Network In/Out metrics in Grafana. By following these steps, you can set up a robust monitoring solution for your Ubuntu system.