Exercise 1: Prometheus and Grafana Installation

Here's a complete guide to **install Prometheus and Grafana** using:

- ✅ **Installation packages** (native install on your OS)
- ✅ **Docker Desktop** (easier, isolated, and portable)

🔧 OPTION 1: Native Installation (Installation Package)

🚀 A. Install Prometheus

✅ Step 1: Download

- Go to: https://prometheus.io/download/
- Download the **latest Prometheus** package for your OS.
- Extract it to a folder (e.g., C:\Prometheus or /opt/prometheus).

✅ Step 2: Configure prometheus.yml

Example:

```
global:
  scrape_interval: 15s

scrape_configs:
  - job_name: 'spring-boot'
    metrics_path: '/actuator/prometheus'
    static_configs:
      - targets: ['localhost:8080']
```

Place it in the extracted folder.

✅ Step 3: Run Prometheus

./prometheus --config.file=prometheus.yml

Prometheus UI: http://localhost:9090

🚀 B. Install Grafana

✅ Step 1: Download

- Go to: https://grafana.com/grafana/download
- Download the installer for your OS (Windows .msi, macOS .dmg, or Linux package).

✅ Step 2: Install

Follow installer instructions. On Linux:

sudo apt install -y ./grafana-*.deb

sudo systemctl start grafana-server

sudo systemctl enable grafana-server

✅ Step 3: Access Grafana

Go to:

http://localhost:3000

- Default login: **admin / admin**
- Add **Prometheus** as a data source: http://localhost:9090

🐳 OPTION 2: Docker Desktop (Recommended for Simplicity)

✅ Step 1: Create prometheus.yml

```
global:
  scrape_interval: 15s

scrape_configs:
  - job_name: 'spring-boot'
    metrics_path: '/actuator/prometheus'
    static_configs:
      - targets: ['host.docker.internal:8080']  # Use IP if on Linux
```

Save it as prometheus.yml.

✅ Step 2: Run Prometheus in Docker

docker pull prom

```
docker run -d \
  --name prometheus \
  -p 9090:9090 \
  -v "$PWD/prometheus.yml":/etc/prometheus/prometheus.yml \
  prom/prometheus
```

On Windows: Use "D:/path/to/prometheus.yml" with forward slashes.

✅ Step 3: Run Grafana in Docker

```
docker run -d \
```

```
--name grafana \
-p 3000:3000 \
grafana/grafana
```

✅ Step 4: Configure Grafana

1. Go to: http://localhost:3000
2. Login: **admin / admin**
3. Add **Prometheus** as a data source:
   - URL: http://host.docker.internal:9090 (or IP if on Linux)

🔍 Access Summary

Service	Port	URL
Prometheus	9090	http://localhost:9090
Grafana	3000	http://localhost:3000

Exercise 2: Spring Boot Application with Prometheus

Create a **Spring Boot application** with a @RestController that displays **"Hello World"**, and integrates **Prometheus** metrics.

✅ 1. Create Spring Boot Project

Use https://start.spring.io or your IDE.

✅ **Choose:**

- **Project:** Maven or Gradle
- **Language:** Java
- **Dependencies:**
  - Spring Web
  - Spring Boot Actuator
  - Micrometer Prometheus

Download and unzip the project.

✅ 2. Create HelloController

Create a controller that returns "Hello World":

```
package com.example.demo;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.RestController;
@RestController
public class HelloController {

   @GetMapping("/hello")
   public String hello() {
      return "Hello World";
   } }
```

✅ 3. Configure Prometheus Metrics

📄 application.properties (or use YAML)

```
# Expose Prometheus endpoint
management.endpoints.web.exposure.include=health,info,prometheus
management.endpoint.prometheus.enabled=true
```

Optional: Change server port if needed

server.port=8080

You can also use application.yml if preferred.

✅ 4. Run Your Application

Use your IDE or terminal:

./mvnw spring-boot:run

Or if Gradle:

./gradlew bootRun

Check these URLs:

- http://localhost:8080/hello → should return **Hello World**
- http://localhost:8080/actuator/prometheus → should show raw Prometheus metrics

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✅ 5. Set Up Prometheus (in Docker)

📄 Create prometheus.yml

```
global:
  scrape_interval: 15s

scrape_configs:
  - job_name: 'spring-boot'
    metrics_path: '/actuator/prometheus'
    static_configs:
      - targets: ['host.docker.internal:8080']  # use your actual host IP if on Linux
```

Put this file in a folder, e.g., D:/Demo/

🐳 Run Prometheus Container

docker run --name prometheus -d -p 9090:9090 -v "D:/Demo/prometheus.yml":/etc/prometheus/prometheus.yml prom/prometheus

- Prometheus UI: http://localhost:9090
- Status → Targets → should show Spring Boot target as **UP**

✅ 6. View Metrics in Prometheus

In Prometheus UI:

1. Type a metric like:
2. http_server_requests_seconds_count
3. Click **Execute**
4. Switch to **Graph** tab to visualize it

✅ Bonus: Add a Custom Metric (Optional)

```
import io.micrometer.core.instrument.Counter;
import io.micrometer.core.instrument.MeterRegistry;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.RestController;

@RestController
public class HelloController {

    private final Counter helloCounter;

    public HelloController(MeterRegistry registry) {
        this.helloCounter = registry.counter("custom_hello_requests_total");
    }

    @GetMapping("/hello")
    public String hello() {
        helloCounter.increment();
        return "Hello World";
    }
}
```

Now check custom_hello_requests_total in Prometheus after calling /hello.

Exercise 3 – Configure Grafana with Datasources and Dashboards for Prometheus

To sign in to Grafana for the first time:

1. Open your web browser and go to http://localhost:3000/.

   The default HTTP port that Grafana listens to is 3000 unless you have configured a different port.
2. On the sign-in page, enter admin for both the username and password.
3. Click **Sign in**.

   If successful, you'll see a prompt to change the password.
4. Click **OK** on the prompt and change your password.

Add a data source

Before you can create your first dashboard, you need to add your data source.

To add a data source:

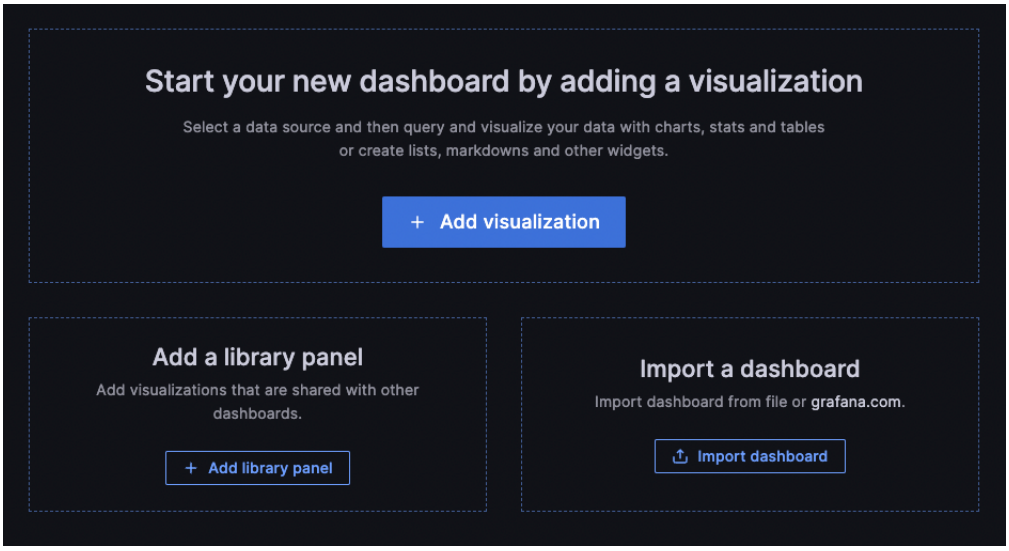
1. Click **Connections** in the left-side menu.
2. Enter the name of a specific data source in the search dialog. You can filter by **Data source** to only see data sources.
3. Click the data source you want to add.
4. Configure the data source following instructions specific to that data source.

Create a dashboard

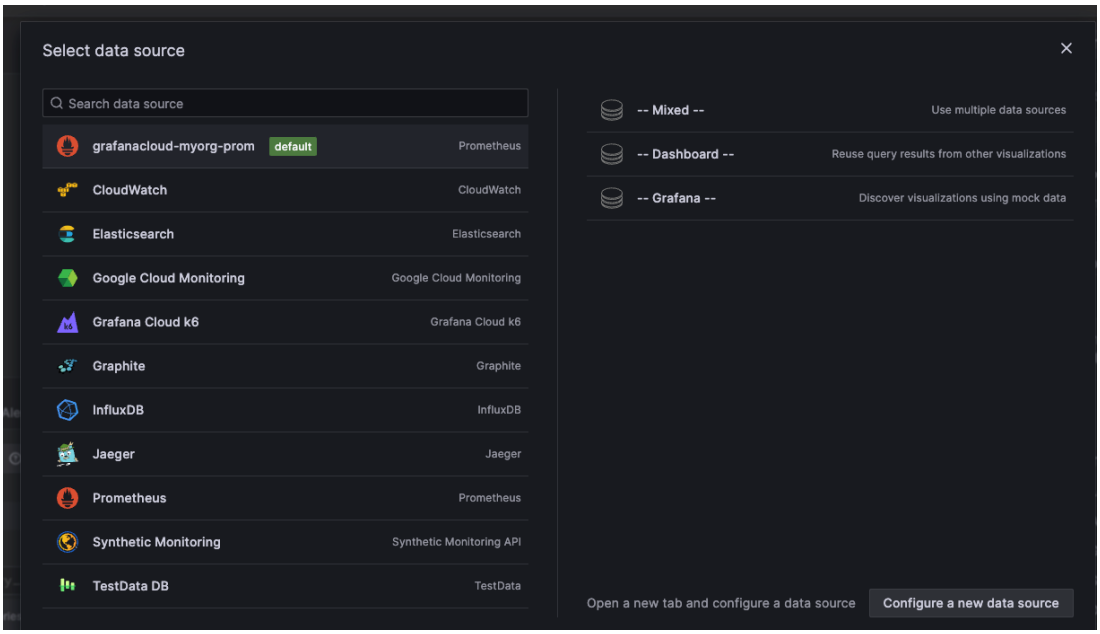
If you've already set up a data source that you know how to query, refer to Create a dashboard instead.

To create your first dashboard using the built-in -- Grafana -- data source:

1. Click **Dashboards** in the main menu.
2. On the **Dashboards** page, click **New** and select **New Dashboard** from the drop-down menu.
3. On the dashboard, click **+ Add visualization**.



4. In the dialog box that opens, click -- Grafana --:



This configures your query and generates the Random Walk dashboard.

5. Click **Refresh** to query the data source.
6. When you've finished editing your panel, click **Save dashboard**.
   Alternatively, click **Back to dashboard** if you want to see your changes applied to the dashboard first. Then click **Save dashboard** when you're ready.
7. Add a descriptive title for the dashboard, or have Grafana create one using generative AI features, and then click **Save**.
8. Click **Back to dashboard** and then **Exit edit**.