COS 301 CAPSTONE PROJECT

Defendr User Manual

Advance & Dark nITes

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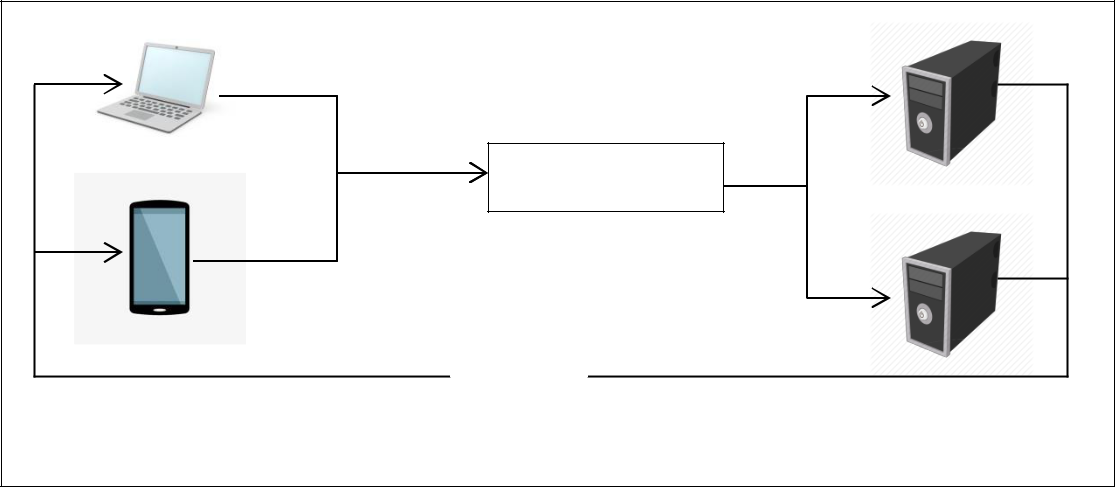
# Introduction

## System Overview

The purpose of this system is to protect third party applications from malicious users. The system implements this by detecting DDOS attacks and dropping the packets that are associated with an attack. It also provides load balancing features to control the load for each pool of resources that it is connected to.

The user interacts with the system via an intuitive graphical user interface where the user can to add and remove IP addresses to a white- and blacklist, see packets that traversed the system, view metrics (such as drop rates, packet sizes etc.) and remove and add back-end applications.

## System Configuration



|  |  |  |
| --- | --- | --- |
|  | Request |  |
|  | Defendr Server |  |
|  | Request |  |
|  | Forward |  |
|  | Answer |  |
| Third party’s client | Servers |  |
|  |  |

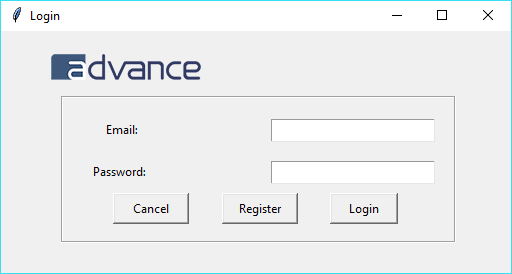
There are three main components in this system, namely: servers on which back-end applications run, normal devices that the client uses to connect to the third party application and a server on which Defendr executes. The servers on which back-end applications run and the normal devices that the client uses to connect to the third party application is beyond the scope of this user manual. Defendr runs on a server that intercepts the packages after they have left the third party’s client , but before they reach the application.

# Installation

1. The entire Defendr package can be found on <https://github.com/cos301-2019-se/Defendr.git>
2. Open the terminal
3. Type the following commands:
   * sudo nano /etc/ld.so.conf
4. In the ld.so.conf file type this in: ”include /usr/local/lib”
5. Navigate into the root Defendr Folder
6. Open the terminal
7. Run the command: “chmod +x installcommands.sh”
8. Run the command: “./installcommands.sh”
9. Follow instructions on the screen

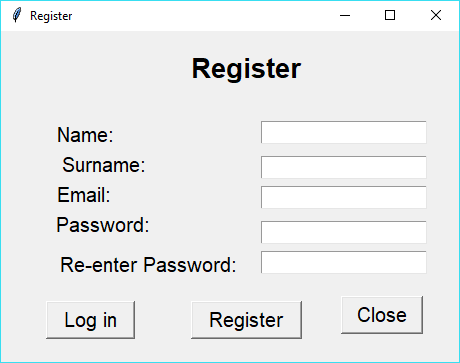
# Getting Started

* 1. Signing in

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After the program installs, this window will appear on the screen. For first time users of the system; please click on the register button to register yourself as a user of the system as explained in section 2.2. Otherwise, log in with your credentials.

* 1. Registering



This window is for registering new users to the system. A user will be requested to fill in:

* His/Her name
* Surname
* A valid Email address
* A Password and
* Confirm password

Please note that the password must contain:

* An uppercase character
* A lowercase character
* A symbol and
* A number

After the user has completed their details, they will have to click the register button. This will register the user by default as a non-admin user unless they are the first user of the system. Once registration is successful, the user will be directed to the home screen. The login button will return the user to the login window, whilst the close button will close the system.

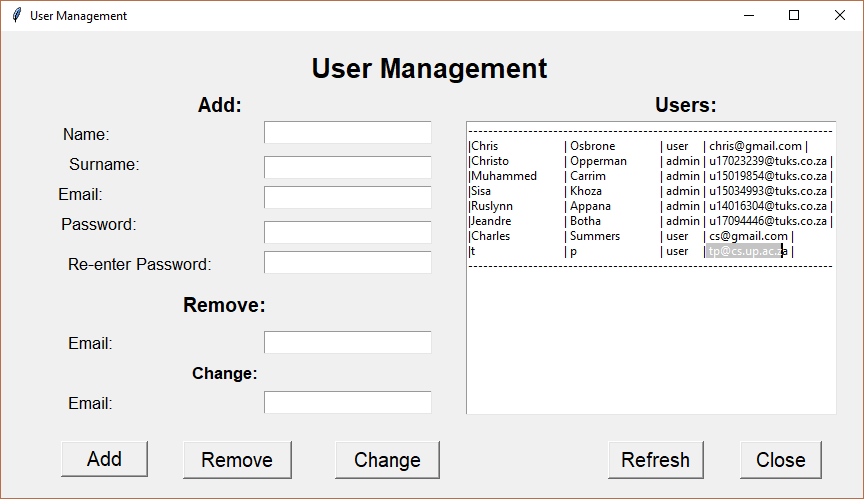
# Using the System

* 1. Exploring the home window



After successfully signing in as described in *2. Getting started*, the home window will open. This is the main hub of the application, from here a user can navigate to the IP List window, Logs window, metrics window or user management window.

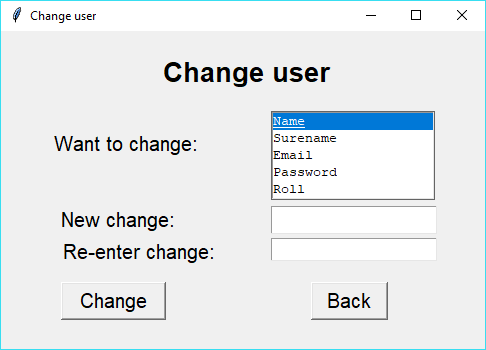
* **To view and add blacklisted ips,** click on the IP List icon.
* **To view system logs,** click on the Logging icon.
* **To view the system metrics,** click on the Metrics icon.
* **To log out,** click the Logout button.
* **To open the user management plane,** click the Users button. (admin only)
  1. Managing users



The user management plane has four main functions:

1. adding new users
2. removing users
3. changing a user’s details and
4. displaying all users.

* **To display all registered users,** click the refresh button.
* **To add a new user,** fill in the aforementioned details in Section 2.2 and then click on the Add button to complete the adding process.
* **To remove a user,** provide the e-mail address of the user that needs to be removed in the Email field under the Remove heading and click the Remove button.
* **To change a user’s details**, insert the e-mail address of the user that needs to be changed in the Email field under the Change heading and click on the change button which will open the change user window.
* **To go back to the main page,** click on Close button**.**
  1. Changing user details



This window allows the user to change specific details for user accounts, such as name, surname, e-mail address, password and the role of the user.

* **To change user detail,** select desired field from the list of fields, then enter the new value for the given field in the New change fields and re-enter the value in the Re-enter change filed. Now click the Change button to make the change.
* **To return to the user management plane,** click the Back button
  1. IP blacklisting



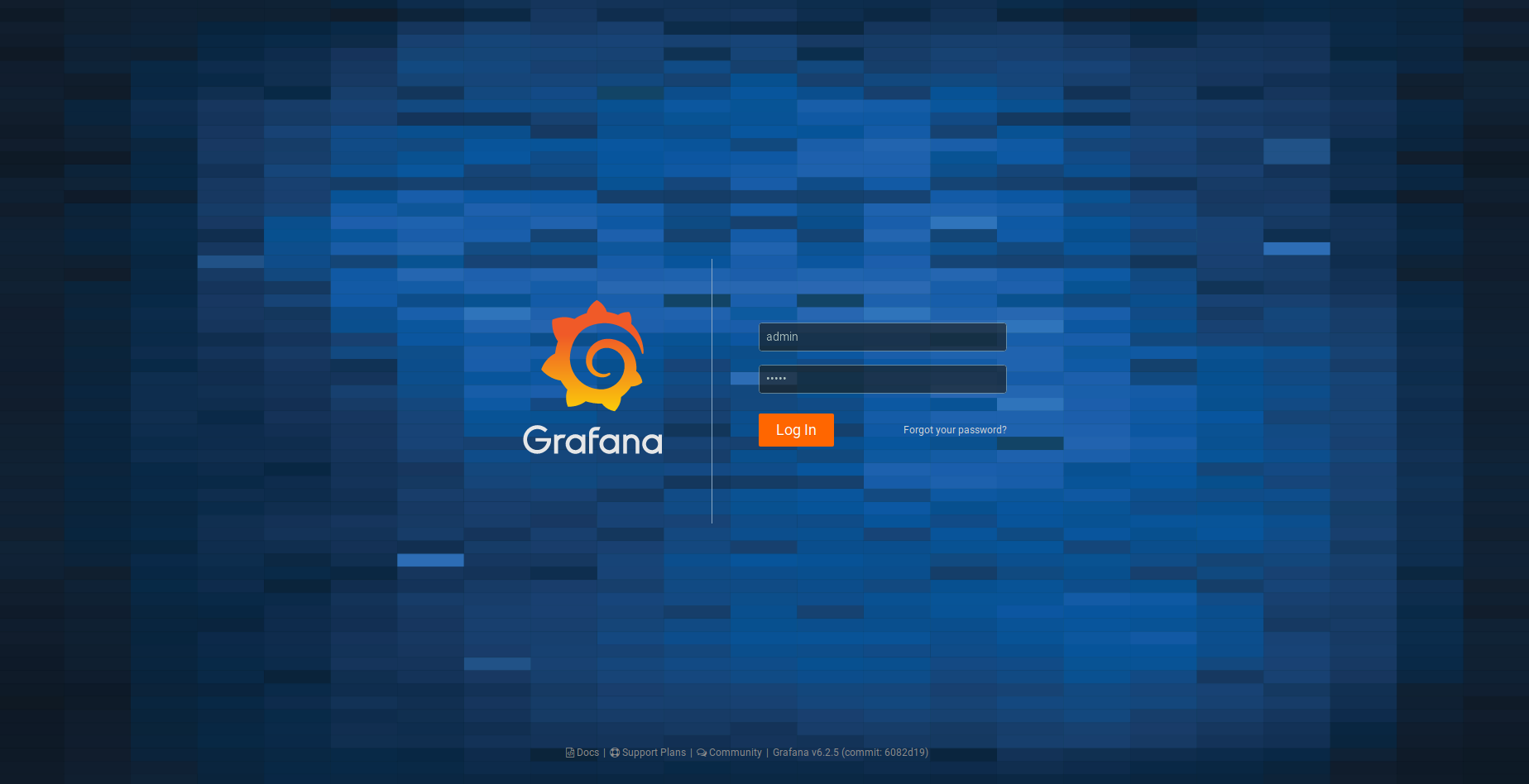
* **To manually blacklist ip address,** enter the ip address to be blacklisted in the field next to the Add IP button then click on Add IP.
* **To remove a blacklisted ip address,** enter the ip address to be removed from the blacklist in the field next to the Add IP button then click on Remove IP.
* **To view currently blacklisted ip addresses,** click List Blacklisted.
* **To log out**, click Logout.
* **To go back to the main window,** click Back
* **To close defender,** click Close
  1. Viewing traffic logs



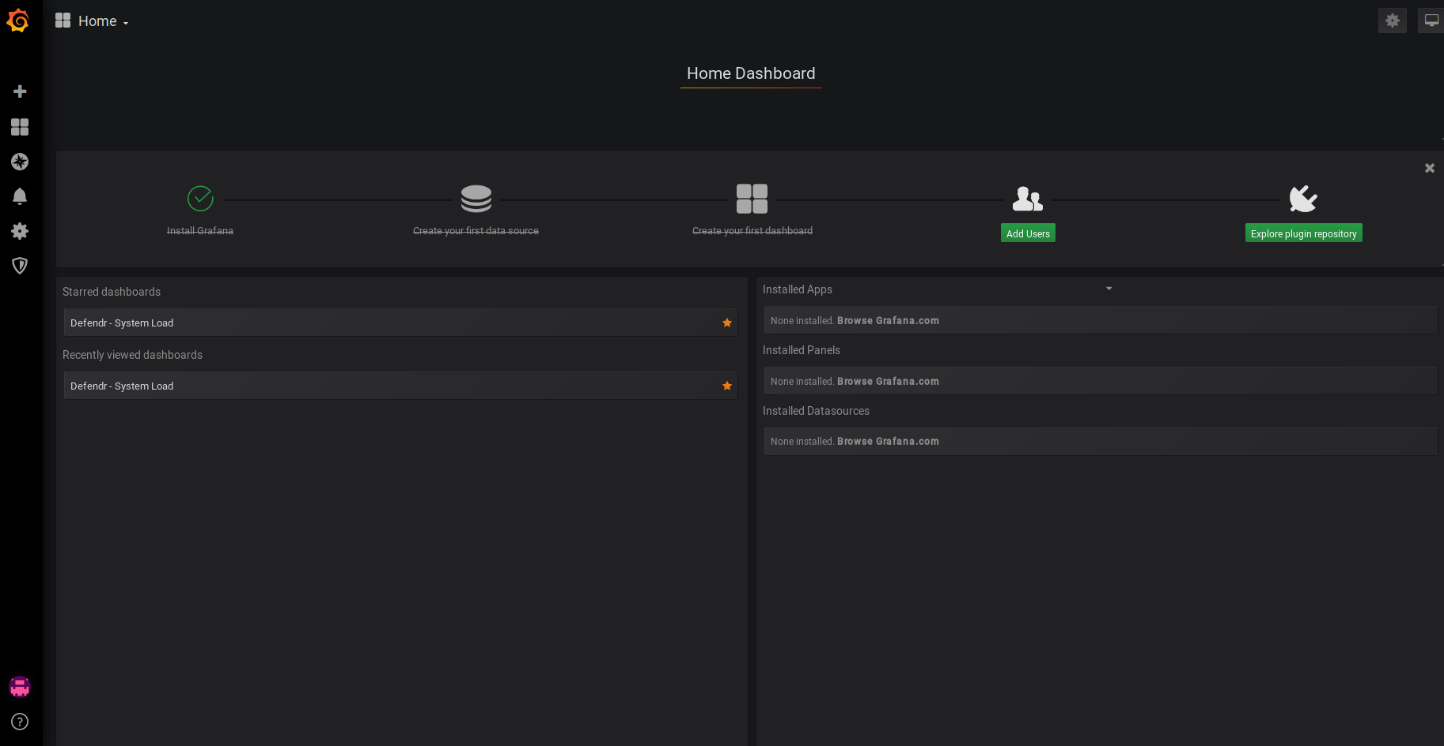
This window enables the user to see either all the packets that went through the system or packets for specific IP addresses.

* **To view all incoming packets,** leavethe search field empty and click Search.
* **To view packets with a specific source ip address,** enter the desired ip address in the search field and click Search.
* **To log out**, click Logout.
* **To go back to the main window,** click Back
  1. Viewing System metrics

The metrics window has jurisdiction over system load and individual resource monitoring.

- Sign-in

On click of the Metrics button (as shown in Section 3.1) a Grafana sign-in page will open in a browser. The default username is ***admin***,and the default password is ***admin***. You will be prompted to provide a more secure password at the first successful sign-in.

- **B/G)Home Dashboard**

C

G

B

F

E

D

A

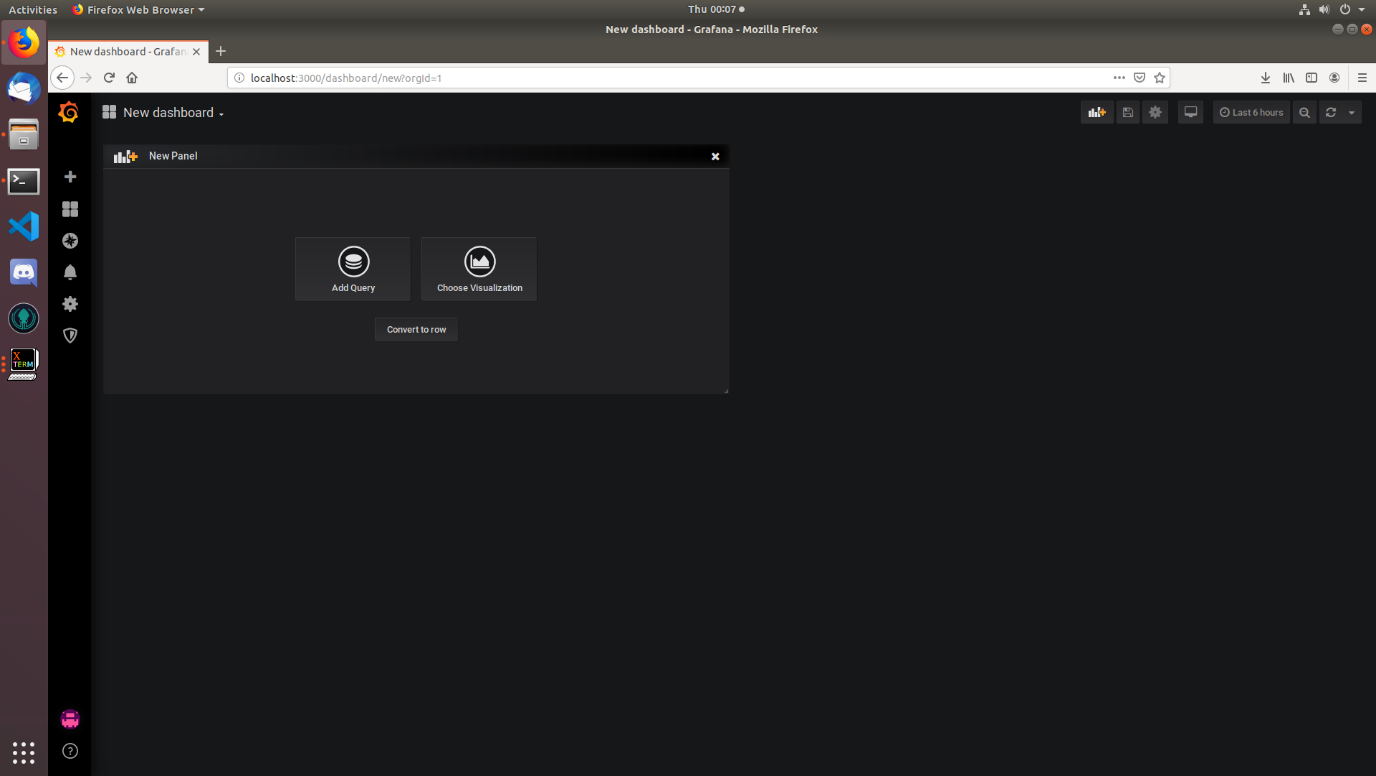
The dashboard is a centralised portal to access metrics and configuration:

1. Create > Dashboard, Folder, Import
2. Dashboards > Home, Manage, Playlists, Snapshots
3. Explore
4. Alerting > Alert Rules, Notifications Channels
5. Configuration > Data Sources, Users, Teams, Plugins, Preferences, API Keys
6. Server Admin > Users, Orgs, Settings, Stats
7. Dashboards

**-** **G) Defendr – System Load**

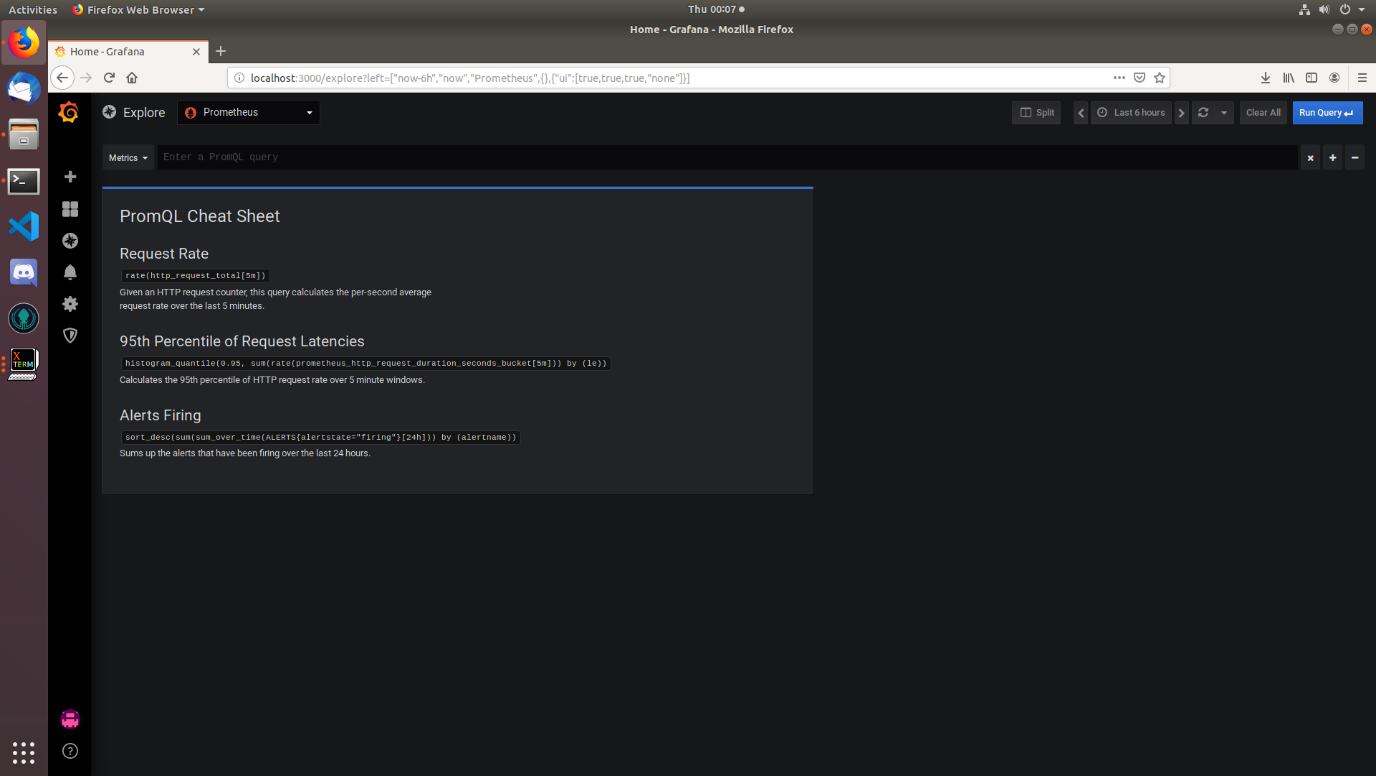
This window is the ***Defendr -System Load.*** This page will display the usage statistics as provided by the Prometheus and its exporters. This enables a unified monitoring tool for system load statistics.

**- A) New dashboard**



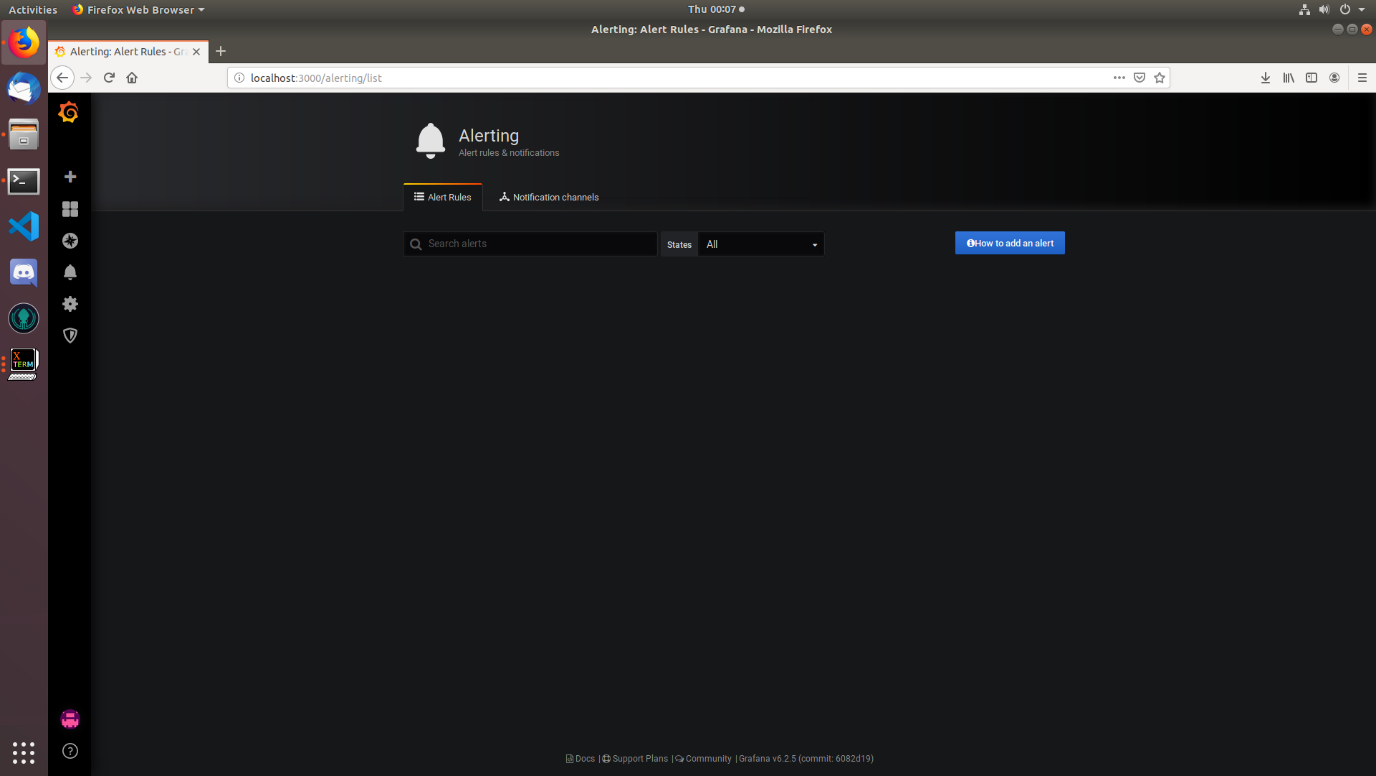
The **New Dashboard** page allows a user to create and customise a new dashboard. It also allows the querying of data from a data source.

**- C) Explore**



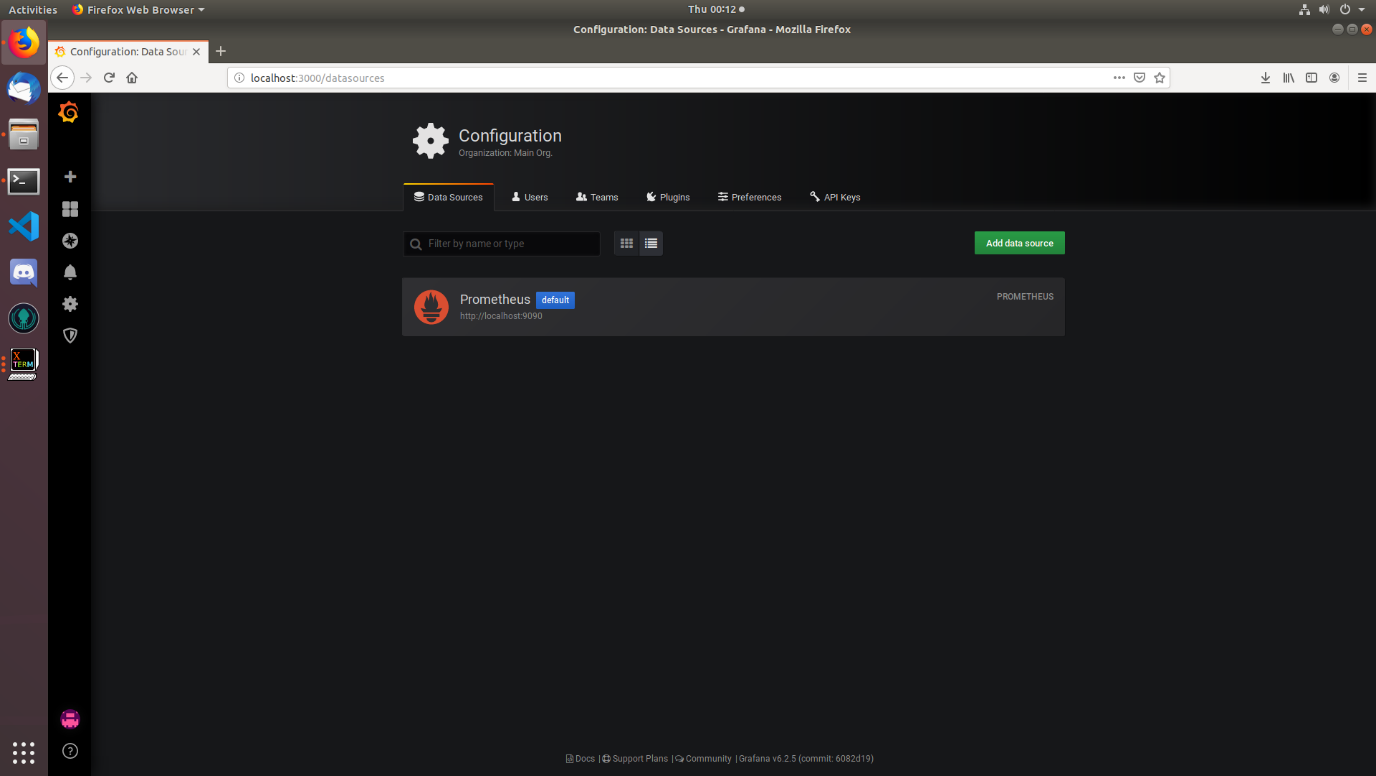
Explore is an information hub that give a user tips to better benefit from Grafana.

**- D) Alerting**



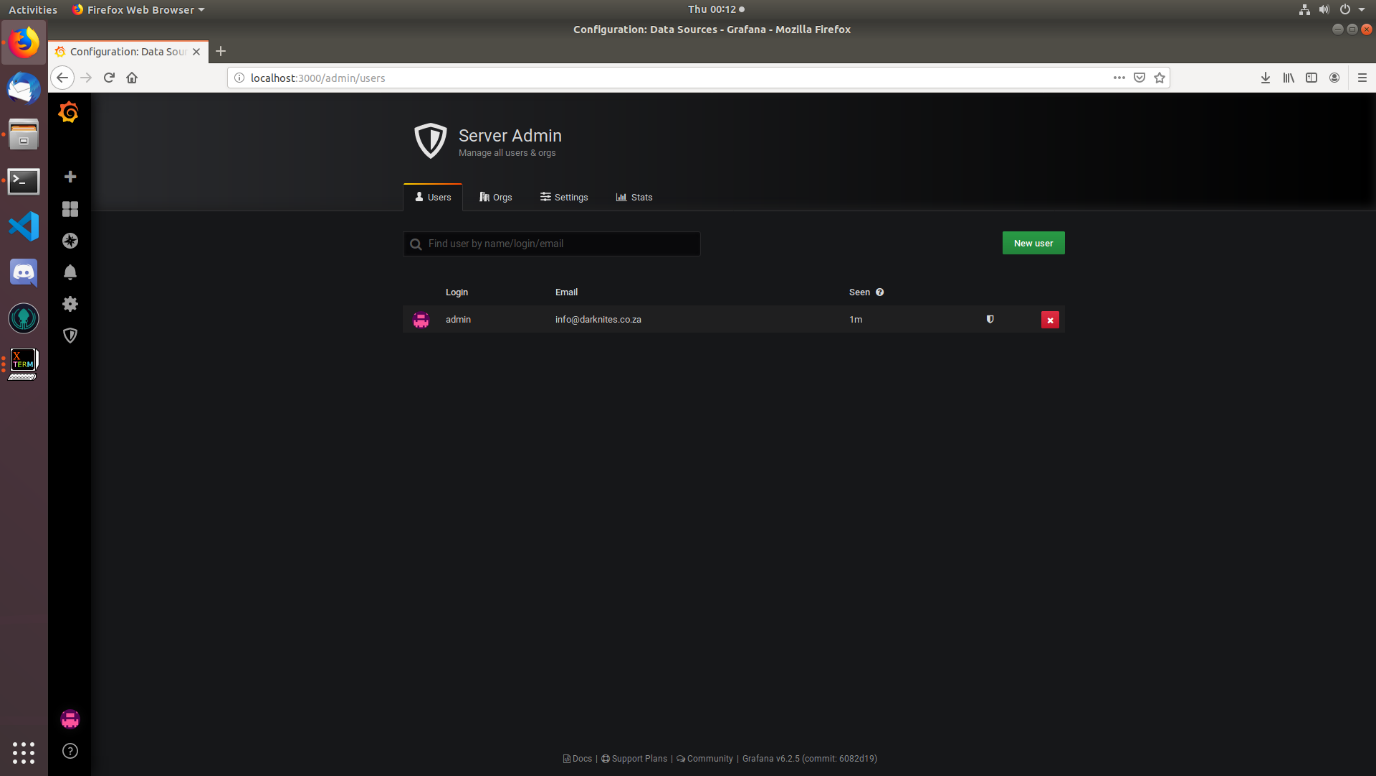
Alerting is a featured provided by Grafana to allow real-time updates to another communication channel, e.g. e-mail, Slack, Webhook etc., based on rules attached to a dashboard. One such example could be when the system is under a greater-than-normal network load.

**- E) Configuration**



The **Configuration** page allows a user to add and remove other metrics reporting systems that Grafana can gather data from to graph. At current Prometheus will be visible by default.

**- F) Server Admin**



**Server Admin** is a page to carry out administrative tasks on Grafana. The system administrator will be able to

* create or remove users
* establish organisations (user privileges)
* change settings view Grafana logs.
  1. Load balancing

Load balancing will automatically start when the Defendr application in installed

* 1. Adding service backends

To add a new backend:

1. Start up the desired machine that contains the service instance.
2. Copy the “serviceInstance” folder from the downloaded Defendr package to any location on the machine.
3. Open navigate to serviceInstance/src/main/recources/
4. Open the file application.properties.
5. Change the property “app.name” to the applications ip address.
6. Change the property “client.instance\_id” to the machine’s own ip address.
7. Return to the “serviceInstance” root folder : serviceInstance/
8. Open the command line terminal in this location. (rightclick in the folder and click on “Open Terminal Here”)
9. In the command line terminal type “grade clean build” without the qoutations and press enter.
10. After the build finishes, in the terminal, type “java -jar build/libs/serviceInstance.jar” without quotations and press enter.
11. The backend will now automatically register itself with the Defendr application.

# Troubleshooting

4.1 Missing bpf maps

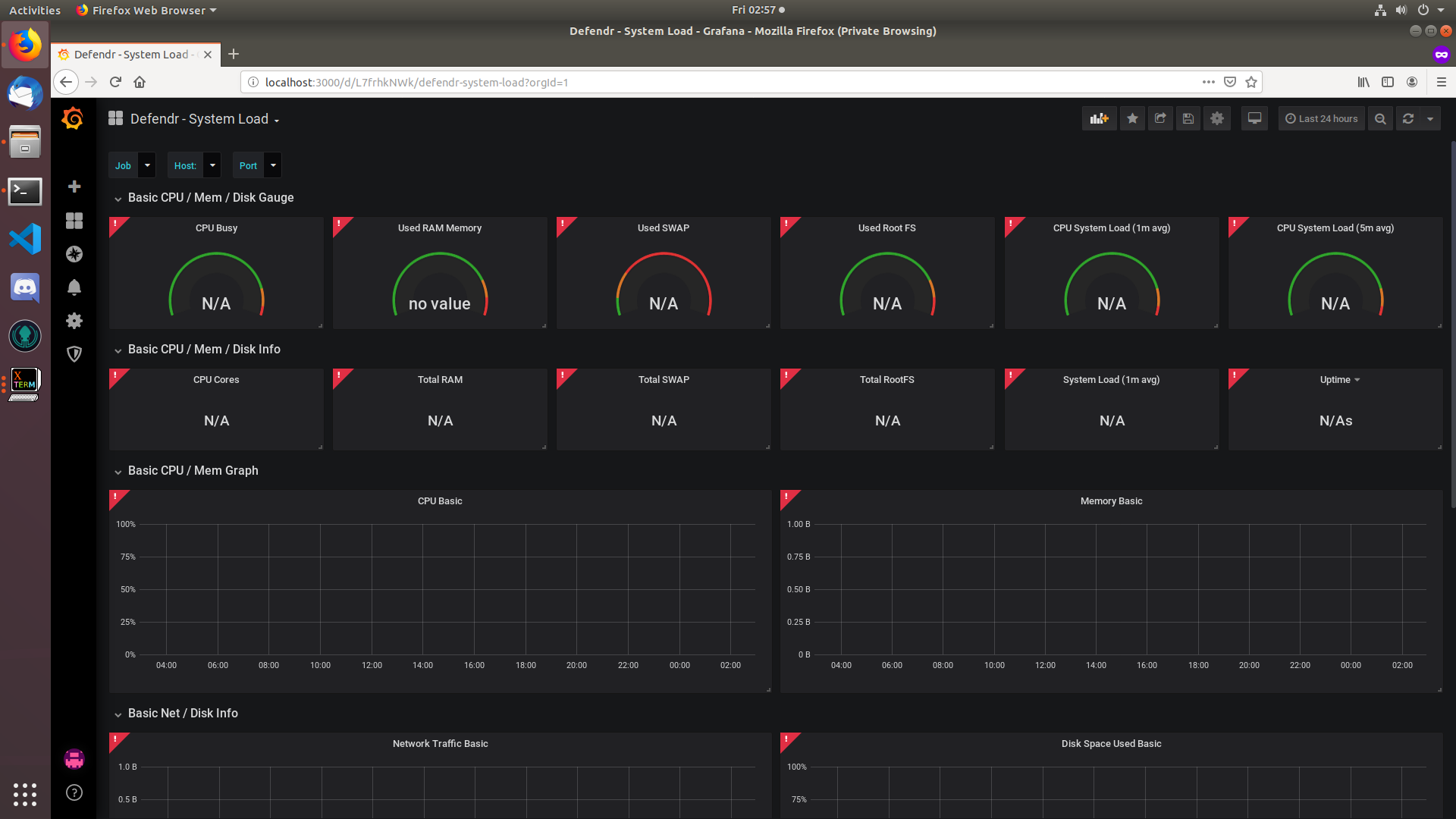
In the unlikely event that the following error appears in a pop up terminal while opening the Defendr aplication



Mount the bpf file system by entering the the command “sudo mount -t bpf bpf /sys/fs/bpf/” without the quotations within the terminal and press enter. If confronted with a request for the user password, enter the server password obtained from the server admin and press enter. The applicstion can now be safely restarted.

In the event that the system interface becomes unresponsive the interface can simply be closed without doing any harm and restarted. This will not affect the system in any way.

4.2 Grafana is not showing any data

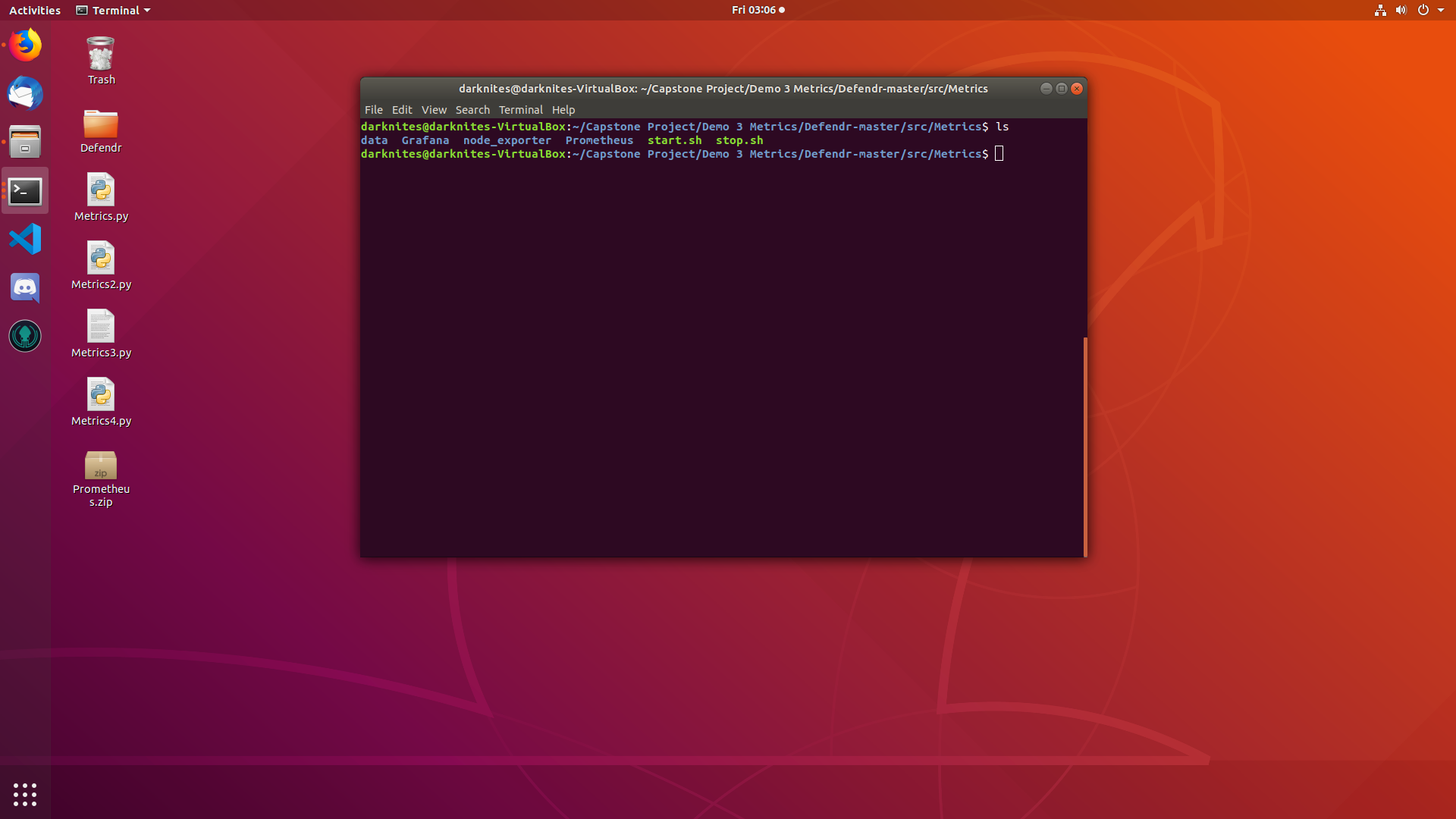
At time an improper start-up of a server may cause a disruption in the proper display of metrics. This may be due to delays or disruptions in service start-ups. A Defendr restart may cause the system to return to normal functionality, however for persistent cases more steps can be taken to investigate and remediate.

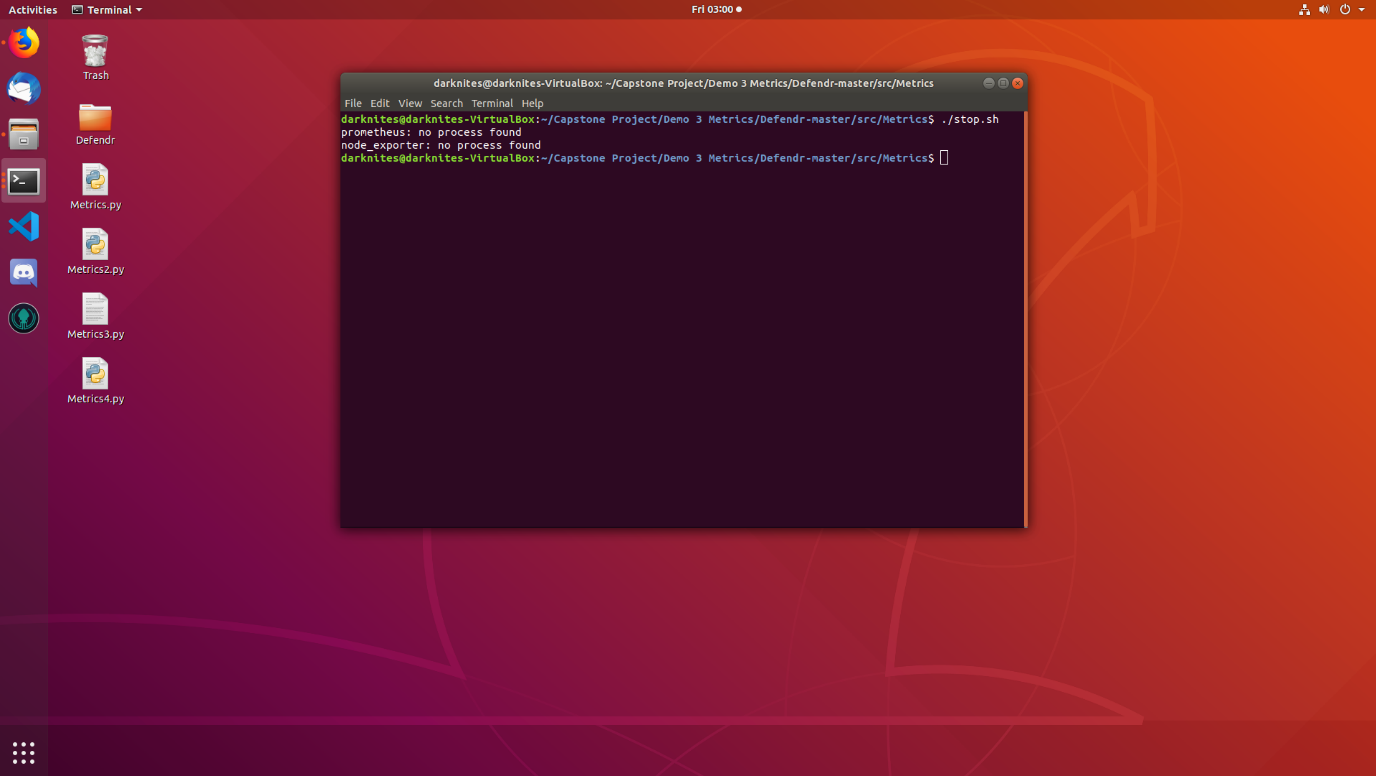
To determine the cause, open a browser and navigate to:

* <http://localhost:9190>\*
* http://localhost:9090\*
* <http://localhost:3000>\*

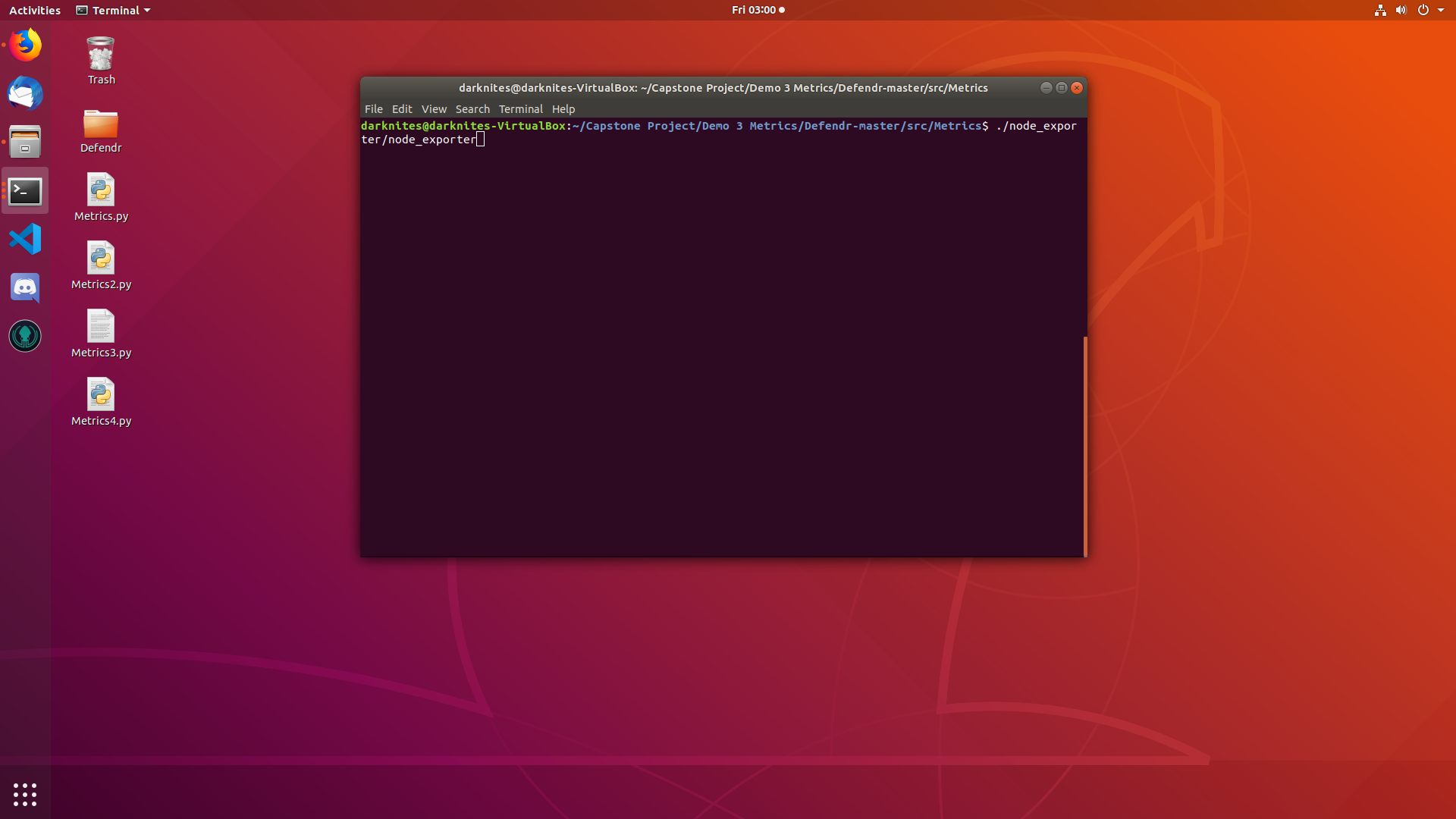
\*curl <address> can be used in terminal as well

If no response is received, please try the following:

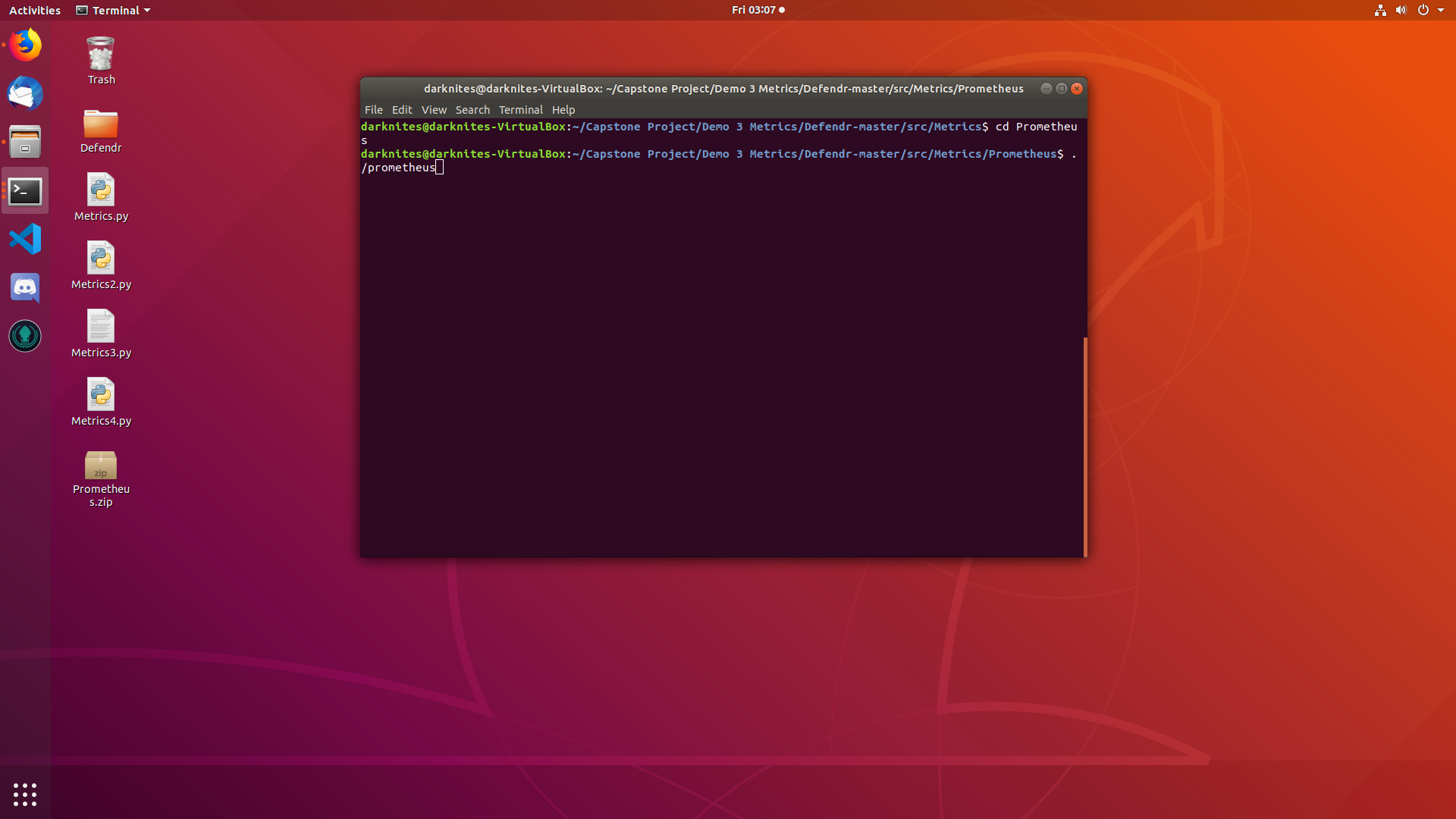
* Open a terminal in “/Defendr/src/Interfaces/Metrics”. This is the working directory and all the following commands, unless otherwise stated, will start here. 
* Enter “./stop.sh”. Any rouge servers will stop. If a no process message appears, that just means the particular service was not running.

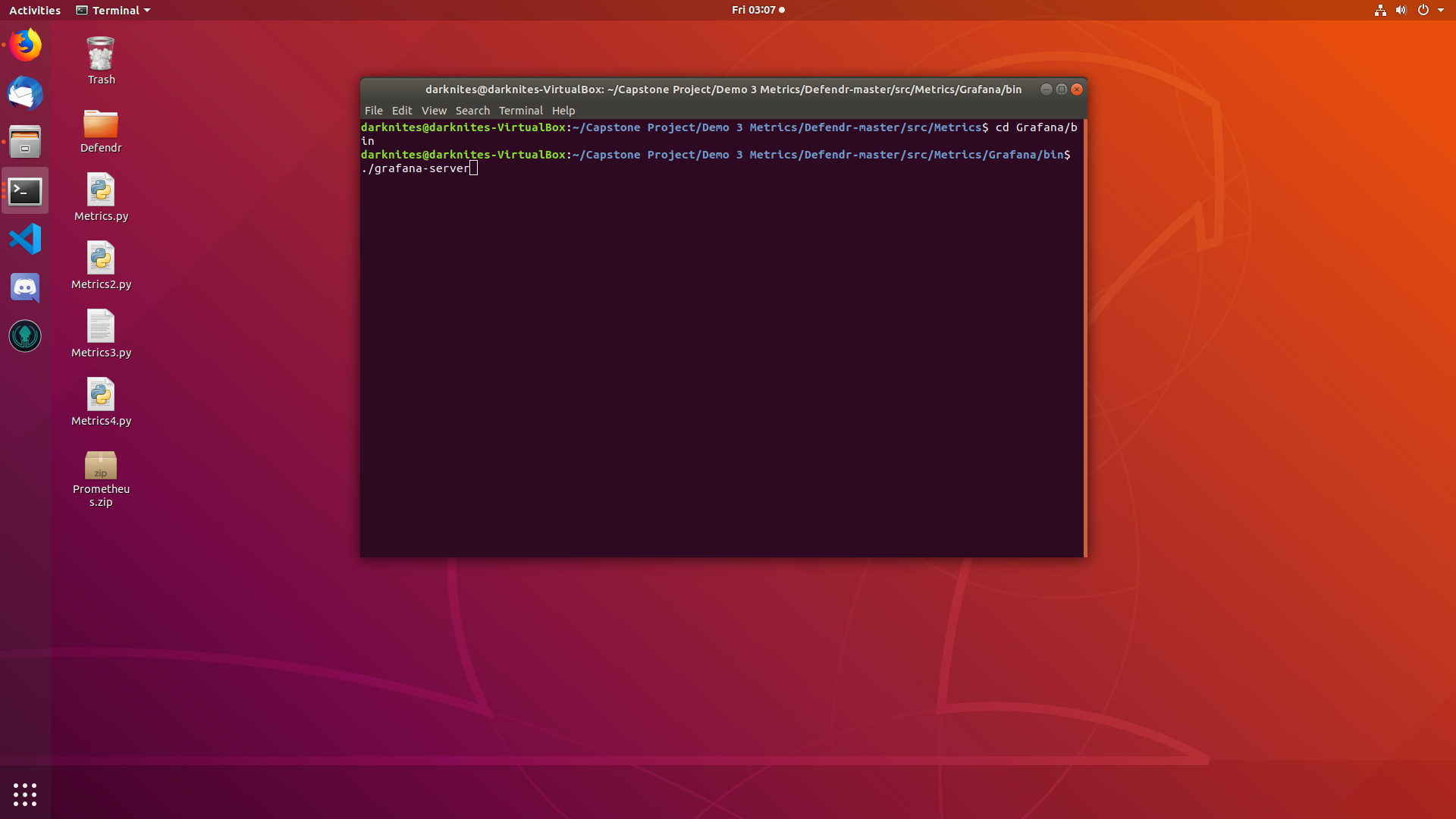


* Open a terminal and enter “./node\_exporter/node\_exporter”. Allow 5 seconds.



* Open a terminal and enter “cd Prometheus”. Then enter “./prometheus”. Allow 5 seconds.



* Open a terminal and enter “cd Grafana/bin”. Then enter “./grafana-server”. Allow 5 seconds. 
* Open a browser, and navigate to “<http://localhost:3000>”



Provided the above services started with no errors, Grafana log-in should be displayed and metrics accessible again.