How to display figures and experiment results in a VM without any desktop environment

Hello everyone,

I was asked about how to present figures and experiment results in a VM without any desktop environment.
One common practice is to use Jupyter Notebook. Jupyter is a python environment that allows you to create scientific documents through your web browser.
You can follow these steps to get Jupyter up and running in your VM:

First install pip3, python's package manager:

```
sudo apt install python3-pip
```

Then using pip3, install Jupyter package:

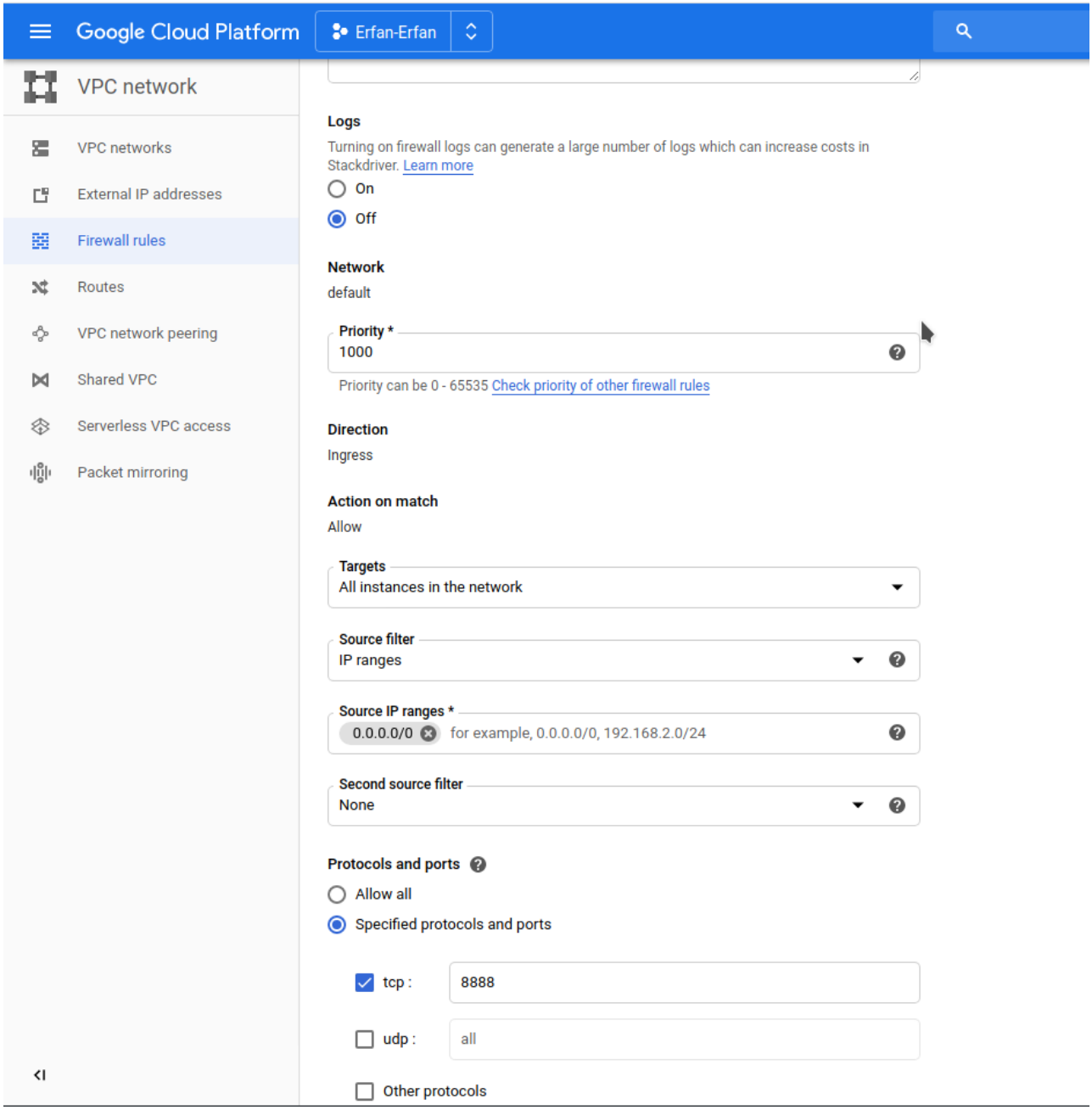
```
pip3 install jupyter
```

Now to verify the installation run the following command to set a password for your Jupyter server:

```
~/.local/bin/jupyter-notebook password
```

Enter your new password twice and you're done installing Jupyter.

Now we should enable port 8888 on the GCP firewall to be able to access the Jupyter notebook. Go to your GCP console and find Firewall rules from Network > VPC Network in the left pane.
Create a new rule by entering the following details:
Name: Jupyter
Direction: Ingress
Action: Allow
Targets: **All instances in the network**
Source IP Ranges: **0.0.0.0/0**
Protocols and Ports: Check **TCP** and enter **8888**
Click **create**.



To get you started with creating a notebook file, download a sample Jupyter file:

```
wget https://raw.githubusercontent.com/eka-foundation/numerical-computing-is-fun/master/notebooks/numerical-computing-is-fun-1.ipynb
```

You will notice that a file called **numerical-computing-is-fun-1.ipynb** is downloaded to your VM.

To view and edit this file in your browser, run it with Jupyter command as follows

```
~/.local/bin/jupyter-notebook numerical-computing-is-fun-1.ipynb --ip=0.0.0.0
```

Now open your web browser and type in the external IP address of your VM followed by the jupyter port:

```
http://<VM IP address>:8888
```

You should be able to see a password prompt. Enter the password you have set previously and log in.
Select the **numerical-computing-is-fun-1.ipynb** file from the list and you will see a simple editor displaying the contents of the file you just downloaded. You can double click on each section to modify it as you wish.

Adding a figure to your notebook is simple. Supposing that you have an image file called **figure1.jpg** in the same directory that you downloaded the ipynb file into, add:

```
<img width='250px' src='figure1.jpg'>
```

Click Run and you should see the image displayed.
Don't forget to save the file as you modify it!

Now whenever you generate new figures, plots, data files, the ipynb script will automatically be updated. You can also use python code inside your notebook to process and display the data.

Have fun using it!
Erfan (e.sharafzadeh@jhu.edu)