**Measurement Based Modelling**

We are trying to model the delay between two networks. First of all, we will send the packets from the source machine to the destination machine. Then we will capture the packet data from both machines using Tshark. Then we will analyze the packet file to calculate the arrival curve and service curve.

**Note: Linux System is preferred for this modelling.**

**We need 2 Linux Machines for this modelling**

**1. Install Tshark on both Linux systems**

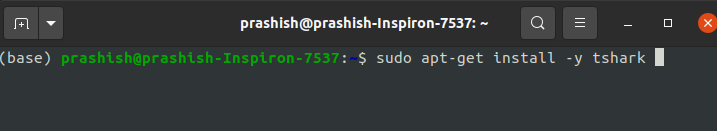
Tshark is a network analyzer tool that helps us to capture packet data from live network. It also enables us to read packets from a previously saved capture file. Tshark is a command line program. So, we will be able to capture packets from the terminal.

Run following command in terminal to install Tshark in both system:

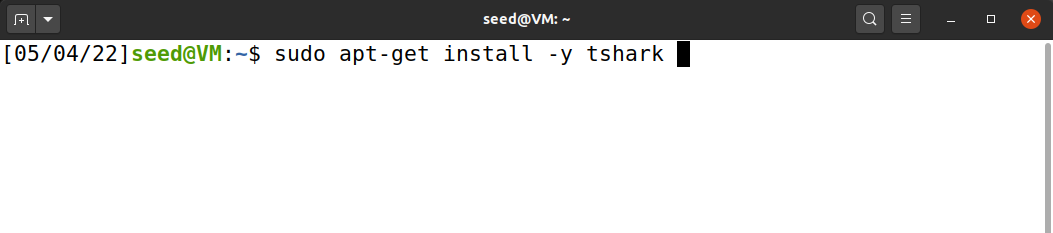
*sudo apt-get update –y*

*sudo apt-get install -y tshark*

**Machine 1:**



**Machine 2:**



**2. Download Files from the Portal into respective machines**

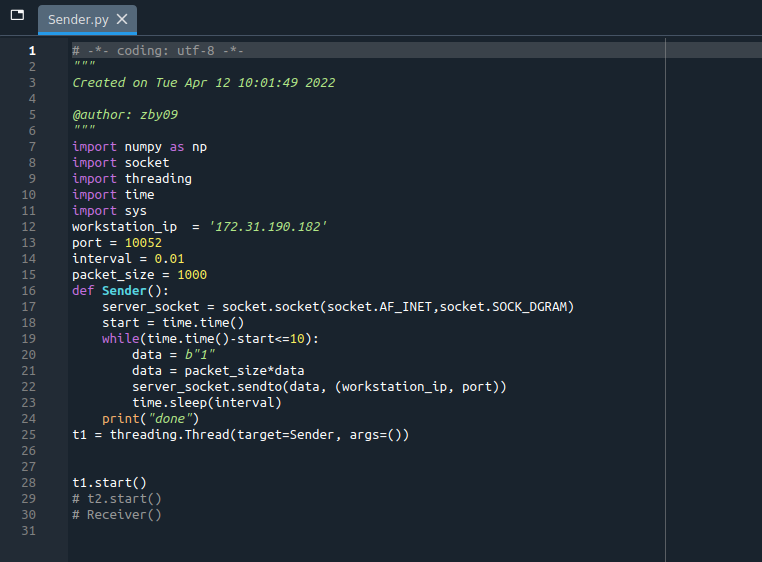
Download **Receiver.py** from the portal into the destination machine, and download **Sender.py** to the source machine.

Link: [Portal](http://www.google.com)

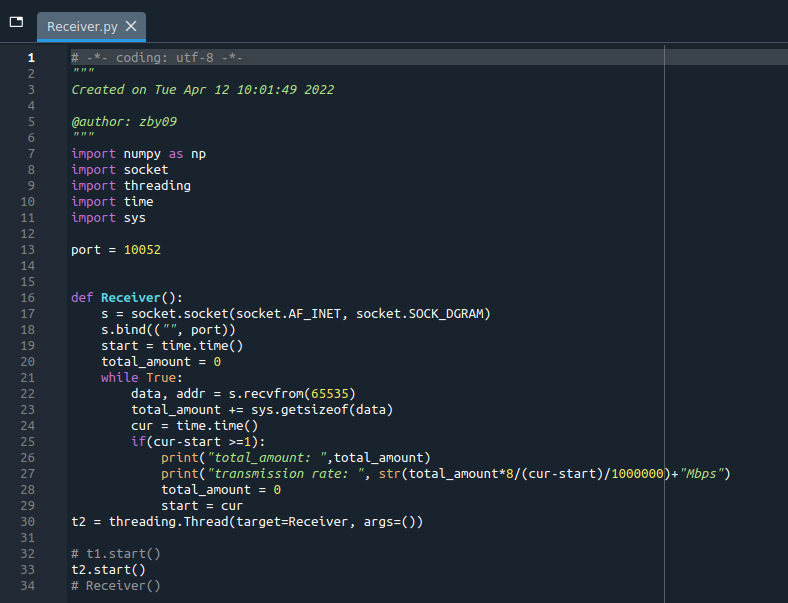
**3. Open Code in Python IDE**

Open the downloaded code from the portal into the IDE of choice. Here we imported the code inside **Spyder**.

**Sender.py** on source machine



**Receiver.py** on destination machine



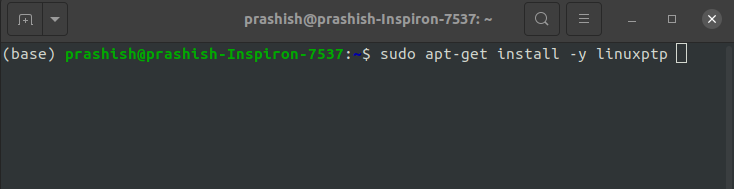
**4. Install PTP**

Since we are working on sending packets between two systems and computing the delay in the network. It is vital to keep the two system clocks synchronized and accurate. For this purpose, we will use PTP (Precision Time Protocol) which is capable of sub-microsecond accuracy.

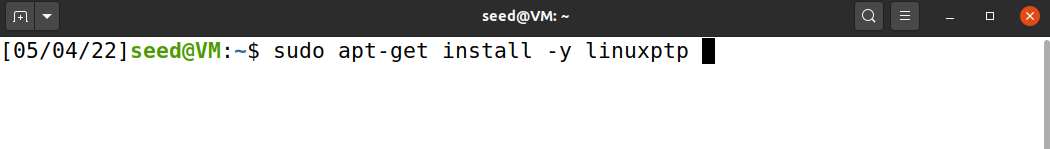
First, we will install PTP in both source and destination machine by running following command.

*sudo apt-get install -y linuxptp*

**Installing PTP on source machine.**



**Installing PTP on destination machine.**



**5. Enable PTP Synchronization**

PTP uses hardware time stamping by default. If both machines are connected using cable, we can try this. Otherwise, we can also use software time stamping.

To enable PTP synchronization on both source and destination machine run the following command in Linux terminal.

**For Hardware Time Stamping:**

*ptp4l -i eth3 -m*

**For Software Time Stamping:**

*ptp4l -i eth3 -m -S*

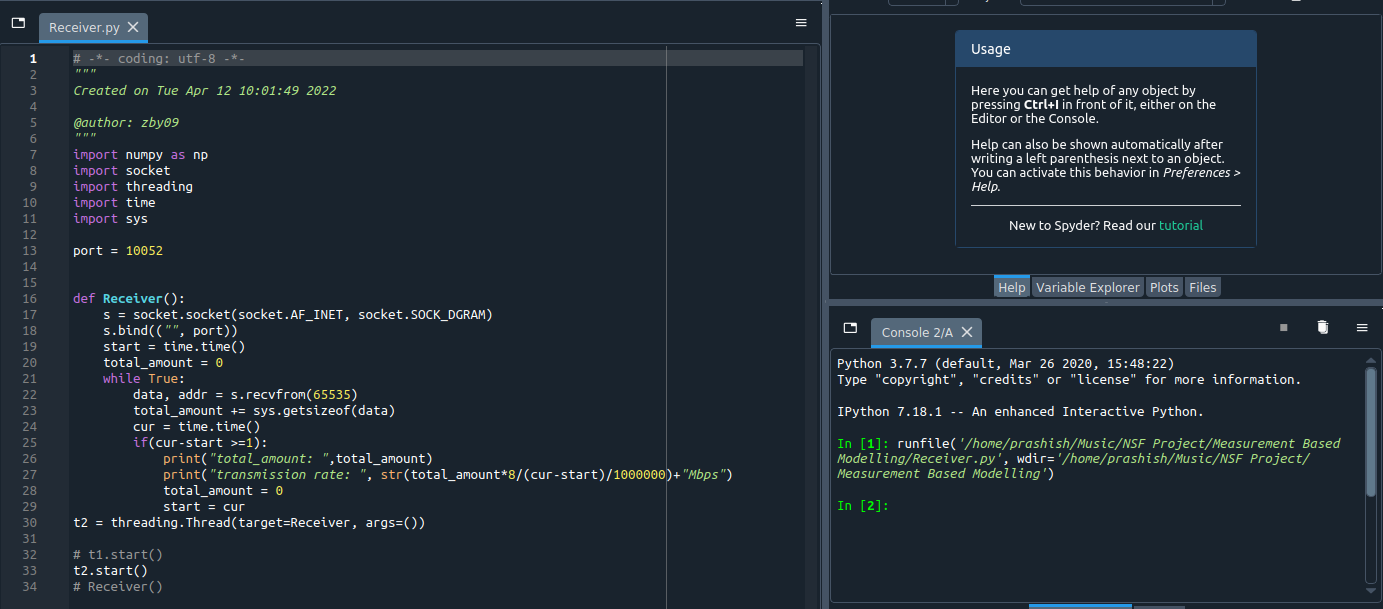
Note: In both commands, **eth3** is the interface you want to configure. You can use the interface of your own choice.

For more detailed info you can refer to this documentation.

Link: [Starting PTP](https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/6/html/deployment_guide/s1-starting_ptp4l)

**6. Run Receiver.py**

Run **Receiver.py** python file in destination machine.



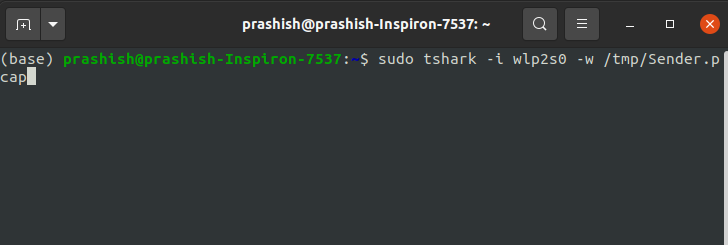
**7. Run Tshark on machines 1 and 2**

**tshark** [ **-i** <capture interface>|- ] [ **-w** <outfile>|- ]

where <capture interface> is the name of the interface and <outfile> is the name of a file.

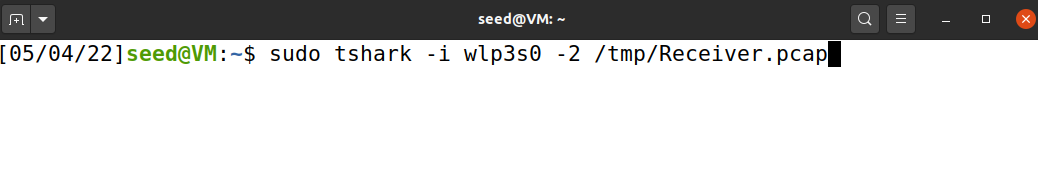
Execute the following command to run Tshark on Source Machine

*sudo tshark -i wlp2s0 -w /tmp/Sender.pcap*



Execute the following command to run Tshark on Destination Machine

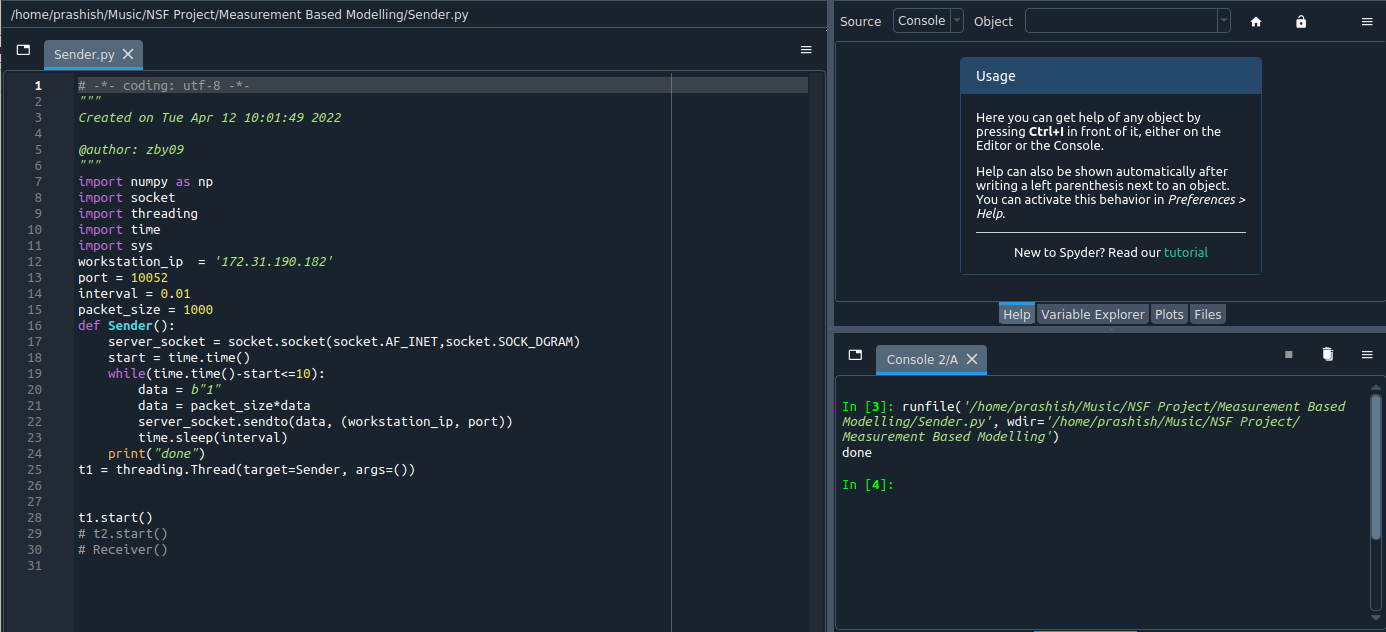
*sudo tshark -i wlp3s0 -2 /tmp/Receiver.pcap*



This will create **Sender.pcap** file on the source machine and **Receiver.pcap** file on destination machine.

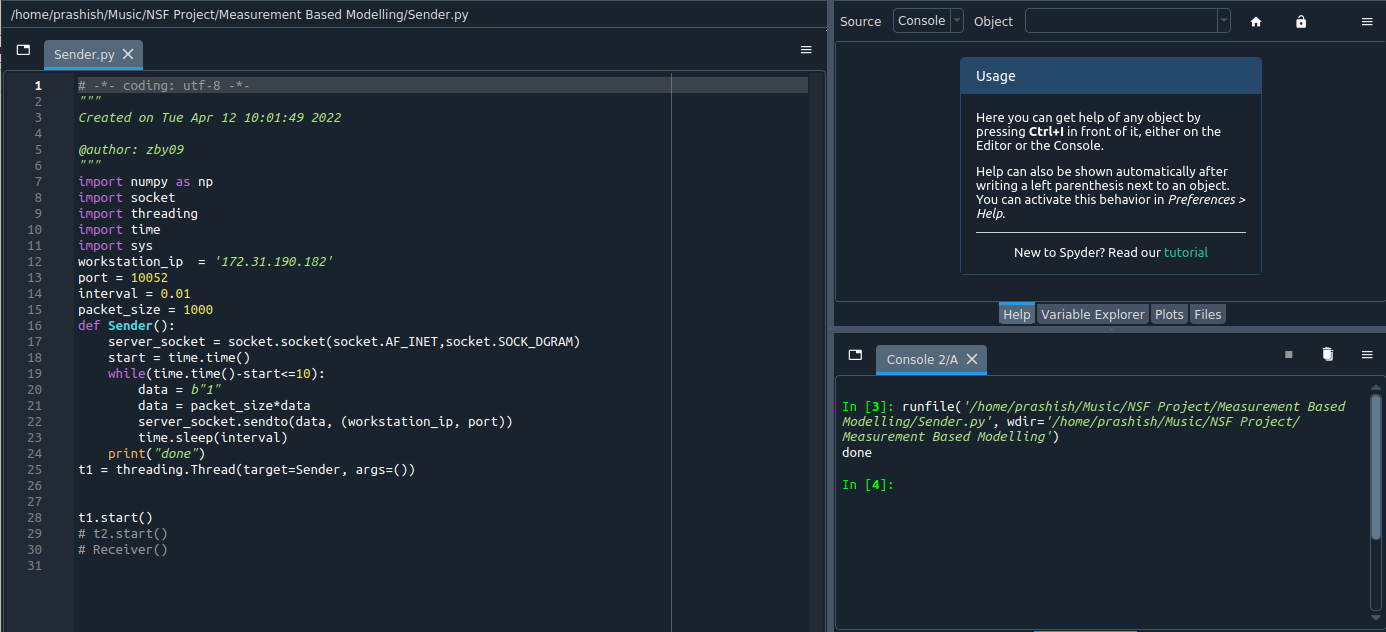
**8. Open Sender.py**

Inside **Sender.py** set the ip address of **workstation\_ip**  to ip address of the receiver machine.



**9.** **Run Sender.py**

Run **Sender.py** on source machine.



**10.Collect PCAP File**

Tshark has built the pcap file on both source machine and destination machine.

Collect those, **Sender.pcap** and **Receiver.pcap** file and copy them into 1 system. We will need these files to calculate the delay in the system.

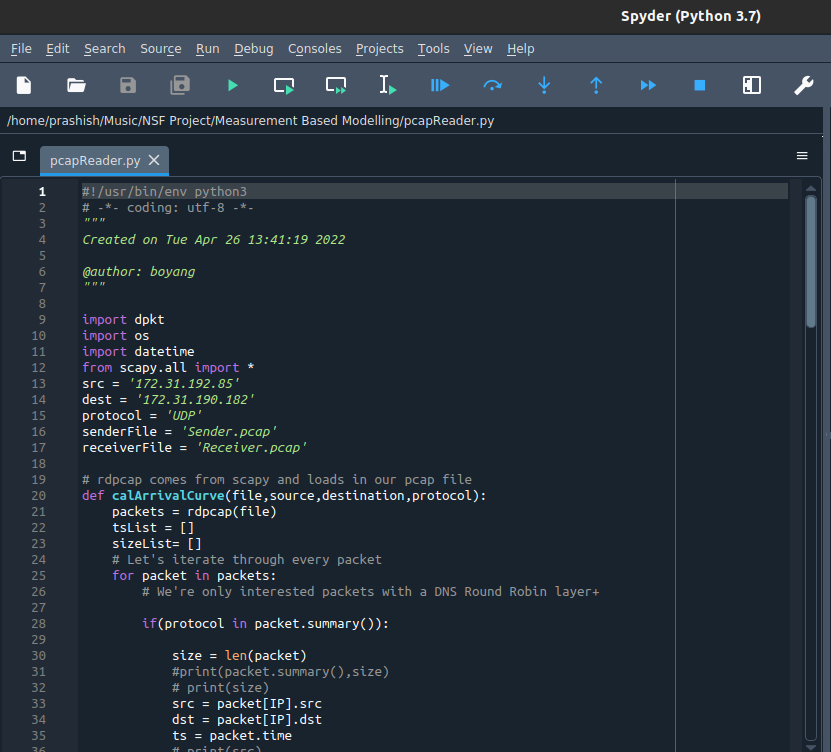
**11. Download pcapReader.py**

Download **pcapReader.py** from the portal. We will use this python script to compute the delay between 2 systems.

Link: [Portal](http://www.google.com)

**12. Open pcapReader.py**

Open the downloaded code from the portal into the IDE of choice. Here we imported the code inside **Spyder**.



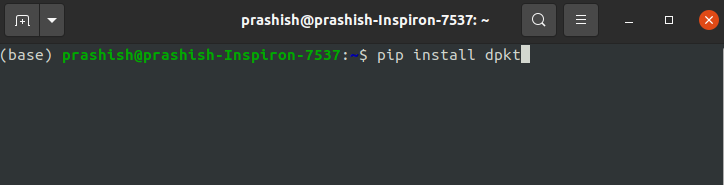
**13. Install required Python modules**

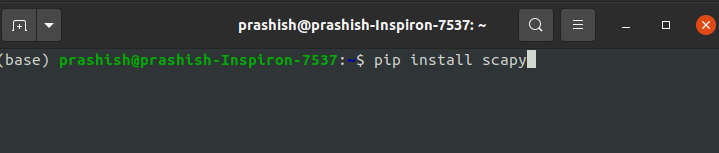
Install required python modules using following command.

E.g., To install **dpkt** and **Scapy.** Go to terminal and run following commands.

*Pip install dpkt*

*Pip install scapy*





**14. Run pcapReader.py**

Inside **pcapReader.py**

Set **src** to ip address of source machine.

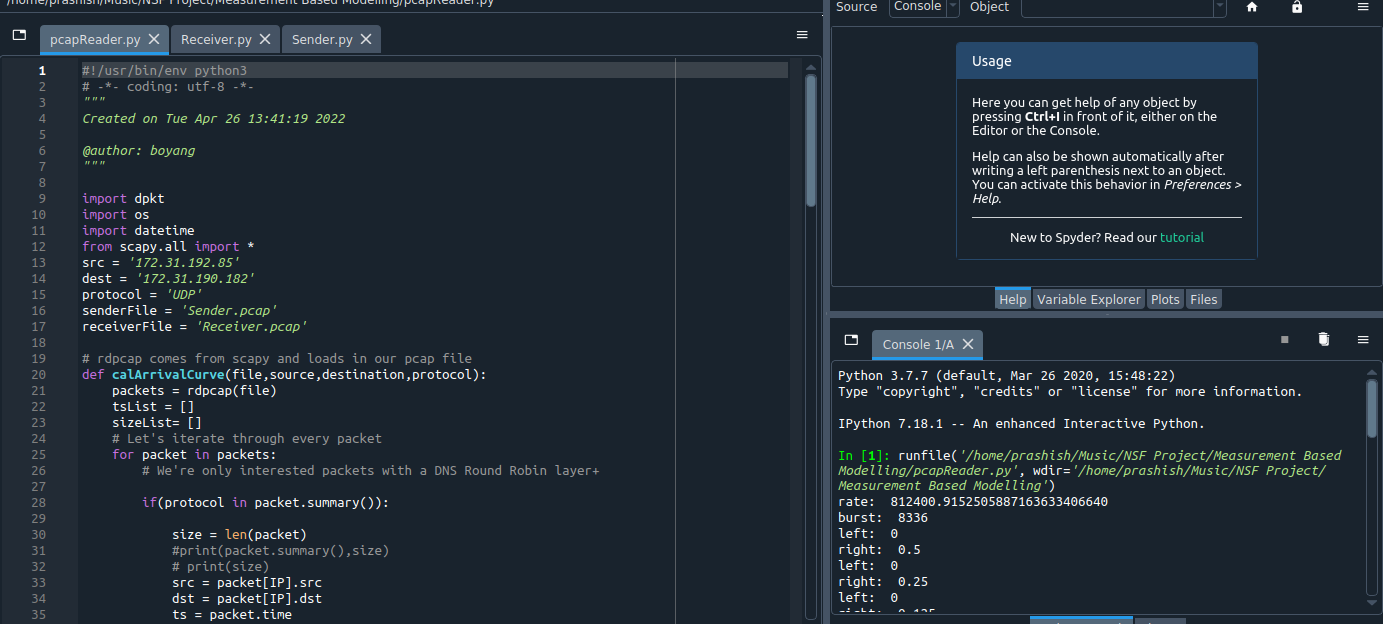
Set **dest** to ip address of destination machine.

Set **senderFile** to name of pcap file downloaded from the source machine.

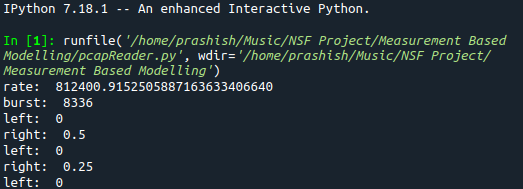
Set **receiverFile** to name of pcap file downloaded from the destination machine.

Then,

RUN **pcapReader.py.**



The result will display rate and burst of the arrival curve.



Similarly, the last line of results displays the delay i.e latency.

