MAWLANA BHASHANI SCIENCE AND TECHNOLOGY UNIVERSITY

Santosh,Tangail-1902

LAB REPORT

Lab No	: 03
Lab name	: Python for Networking
Course Title	: Network Planning and Designing Lab
Course Code	: ICT-3208

Submitted by,
Tanvir Ahmed
IT-18043
Farhana Afrin Shikha
IT-18038
3rd year 2nd semester
Dept. of ICT

Submitted to,
Nazrul Islam
Assistant professor
Dept. of ICT,
MBSTU

Lab 3: Python for Networking

1. Objectives

The objective of the lab 3 is to:

1. Install python and use third-party libraries
2. Interact with network interfaces using python
3. Getting information from internet using Python

2. Theory

Third-party libraries: Although the Python's standard library provides a great set of awesome functionalities, there will be times that you will eventually run into the need of making use of third party libraries. Can you imagine building a webserver from scratch? Or making a port to a database driver? Or, maybe, coming up with an image manipulation tool?. Third party libraries are welcome in a way that they prevent you from reinventing the something that exit. They save you time to focus on finishing and delivering your application.
The following is a list of those third-party libraries with their download URLs used in networking:

- ntplib: https://pypi.python.org/pypi/ntplib/
- diesel: https://pypi.python.org/pypi/diesel/
- nmap: https://pypi.python.org/pypi/python-nmap
- scapy: https://pypi.python.org/pypi/scapy
- netifaces: https://pypi.python.org/pypi/netifaces/
- netaddr: https://pypi.python.org/pypi/netaddr
- pyopenssl: https://pypi.python.org/pypi/pyOpenSSL
- pygeocoder: https://pypi.python.org/pypi/pygocoder
- pyyaml: https://pypi.python.org/pypi/PyYAML
- requests: https://pypi.python.org/pypi/requests
- feedparser: https://pypi.python.org/pypi/feedparser
- paramiko: https://pypi.python.org/pypi/paramiko/
- fabric: https://pypi.python.org/pypi/Fabric
- supervisor: https://pypi.python.org/pypi/supervisor
- xmlrpclib: https://pypi.python.org/pypi/xmlrpclib
- SOAPpy: https://pypi.python.org/pypi/SOAPpy
- bottlenose: https://pypi.python.org/pypi/bottlenose
- construct: https://pypi.python.org/pypi/construct/
- pyserial: https://pypi.python.org/pypi/pyserial

Networking Glossary: Before we begin discussing networking with any depth, we must define some common terms that you will see throughout this guide, and in other guides and

documentation regarding networking.
Connection: In networking, a connection refers to pieces of related information that are transferred through a network. This generally infers that a connection is built before the data transfer (by following the procedures laid out in a protocol) and then is deconstructed at the end of the data transfer.

Packet: A packet is, generally speaking, the most basic unit that is transfered over a network. When communicating over a network, packets are the envelopes that carry your data (in pieces) from one end point to the other. Packets have a header portion that contains information about the packet including the source and destination, timestamps, network hops, etc. The main portion of a packet contains the actual data being transfered. It is sometimes called the body or the payload.
Network Interface: A network interface can refer to any kind of software interface to networking hardware. For instance, if you have two network cards in your computer, you can control and configure each network interface associated with them individually.A network interface may be associated with a physical device, or it may be a representation of a virtual interface. The "loopback" device, which is a virtual interface to the local machine, is an example of this.

LAN: LAN stands for "local area network". It refers to a network or a portion of a network that is not publicly accessible to the greater internet. A home or office network is an example of a LAN.

WAN: WAN stands for "wide area network". It means a network that is much more extensive than a LAN. While WAN is the relevant term to use to describe large, dispersed networks in general, it is usually meant to mean the internet, as a whole. If an interface is said to be connected to the WAN, it is generally assumed that it is reachable through the internet.

Protocol: A protocol is a set of rules and standards that basically define a language that devices can use to communicate. There are a great number of protocols in use extensively in networking, and they are often implemented in different layers. Some low level protocols are TCP, UDP, IP, and ICMP. Some familiar examples of application layer protocols, built on these lower protocols, are HTTP (for accessing web content), SSH, TLS/SSL, and FTP. Port: A port is an address on a single machine that can be tied to a specific piece of software. It is not a physical interface or location, but it allows your server to be able to communicate using more than one application.

Firewall: A firewall is a program that decides whether traffic coming into a server or going out should be allowed. A firewall usually works by creating rules for which type of traffic is acceptable on which ports. Generally, firewalls block ports that are not used by a specific application on a server.

NAT: NAT stands for network address translation. It is a way to translate requests that are incoming into a routing server to the relevant devices or servers that it knows about in the LAN. This is usually implemented in physical LANs as a way to route requests through one IP address to the necessary backend servers.

VPN: VPN stands for virtual private network. It is a means of connecting separate LANs through the internet, while maintaining privacy. This is used as a means of connecting remote systems as if they were on a local network, often for security reasons.

Interfaces: Interfaces are networking communication points for your computer. Each interface is associated with a physical or virtual networking device. Typically, your server will have one configurable network interface for each Ethernet or wireless internet card you have.
In addition, it will define a virtual network interface called the "loopback" or localhost interface. This is used as an interface to connect applications and processes on a single computer to other applications and processes. You can see this referenced as the "lo" interface in many tools. Many times, administrators configure one interface to service traffic to the internet and another interface for a LAN or private network.

Protocols: Networking works by piggybacking a number of different protocols on top of each other. In this way, one piece of data can be transmitted using multiple protocols encapsulated within one another. We will talk about some of the more common protocols that you may come across and attempt to explain the difference, as well as give context as to what part of the process they are involved with. We will start with protocols implemented on the lower networking layers and work our way up to protocols with higher abstraction.

3. Methodology

Installing Python Third-party includes:
Python Third-party includes a setup.py file, it is usually distributed as a tarball (.tar.gz or .tar.bz2 file). The instructions for installing these generally look like:

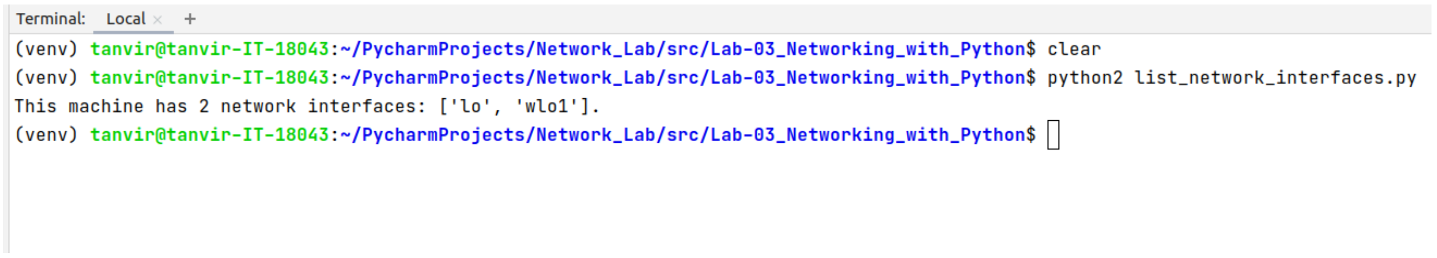
- Download the file from website.
- Extract the tarball.
- Change into the new directory that has been newly extracted.
- Run sudo python setup.py build
- Run sudo python setup.py install

4. Exercises

When importing a module if there is an error it means that the module needs to be installed.

Exercise 4.1: Enumerating interfaces on your machine
Create python scrip using the syntax below (save as list_network_interfaces.py):

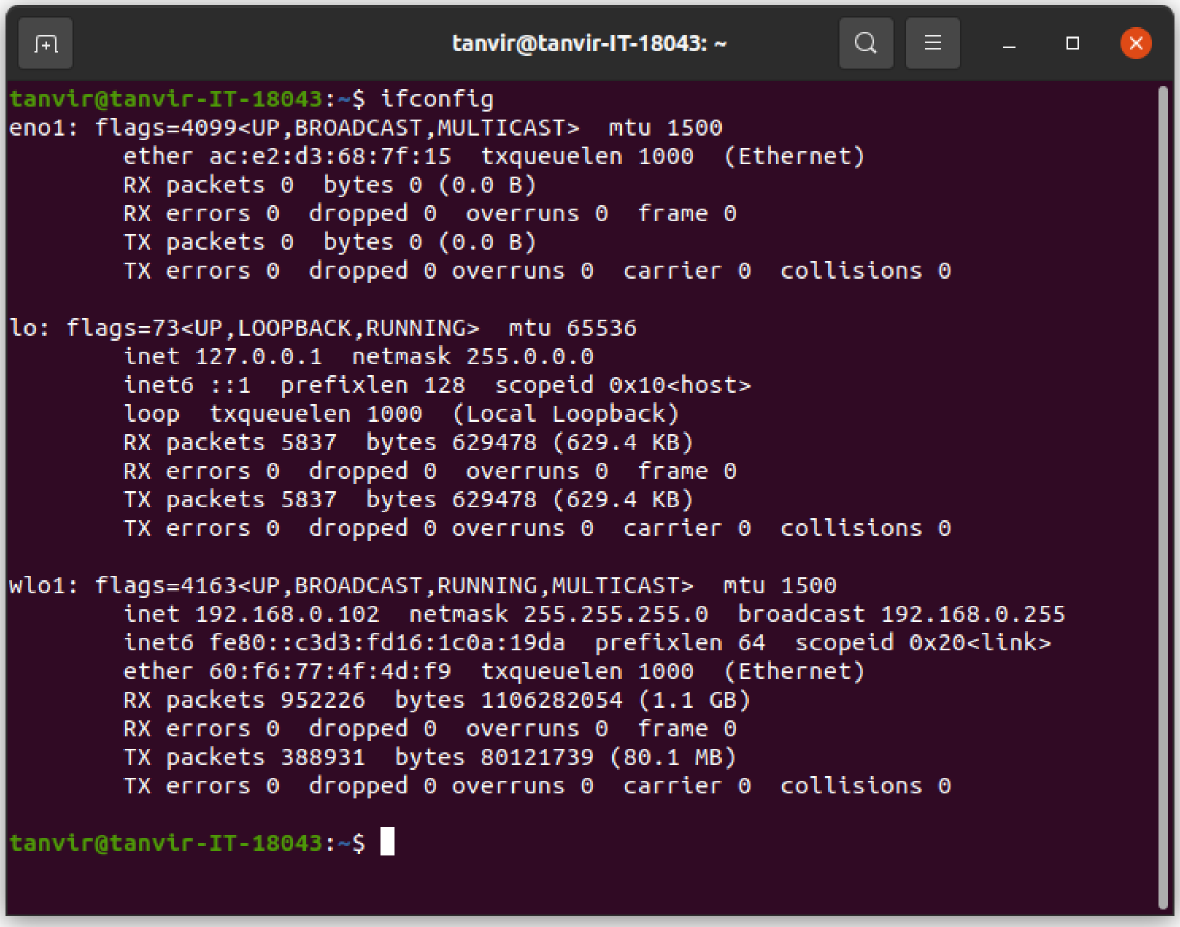
Run the script, which is the output?



Terminal: Local × +

```
(venv) tanvir@tanvir-IT-18043:~/PycharmProjects/Network_Lab/src/Lab-03_Networking_with_Python$ clear
(venv) tanvir@tanvir-IT-18043:~/PycharmProjects/Network_Lab/src/Lab-03_Networking_with_Python$ python2 list_network_interfaces.py
This machine has 2 network interfaces: ['lo', 'wlo1'].
(venv) tanvir@tanvir-IT-18043:~/PycharmProjects/Network_Lab/src/Lab-03_Networking_with_Python$ 
```

Verify the output using the command line ifconfig, which is the output?

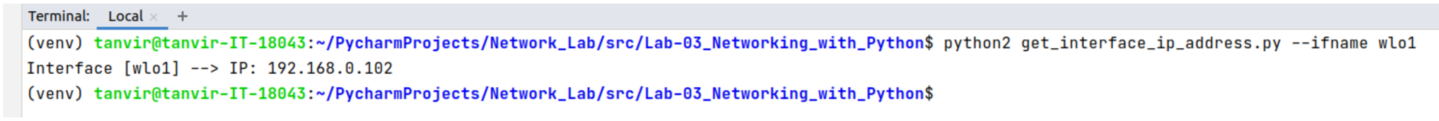


tanvir@tanvir-IT-18043: ~

```
tanvir@tanvir-IT-18043:~$ ifconfig
eno1: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether ac:e2:d3:68:7f:15  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 5837  bytes 629478 (629.4 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 5837  bytes 629478 (629.4 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.0.102  netmask 255.255.255.0  broadcast 192.168.0.255
        inet6 fe80::c3d3:fd16:1c0a:19da  prefixlen 64  scopeid 0x20<link>
        ether 60:f6:77:4f:4d:f9  txqueuelen 1000  (Ethernet)
        RX packets 952226  bytes 1106282054 (1.1 GB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 388931  bytes 80121739 (80.1 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

tanvir@tanvir-IT-18043:~$ 
```

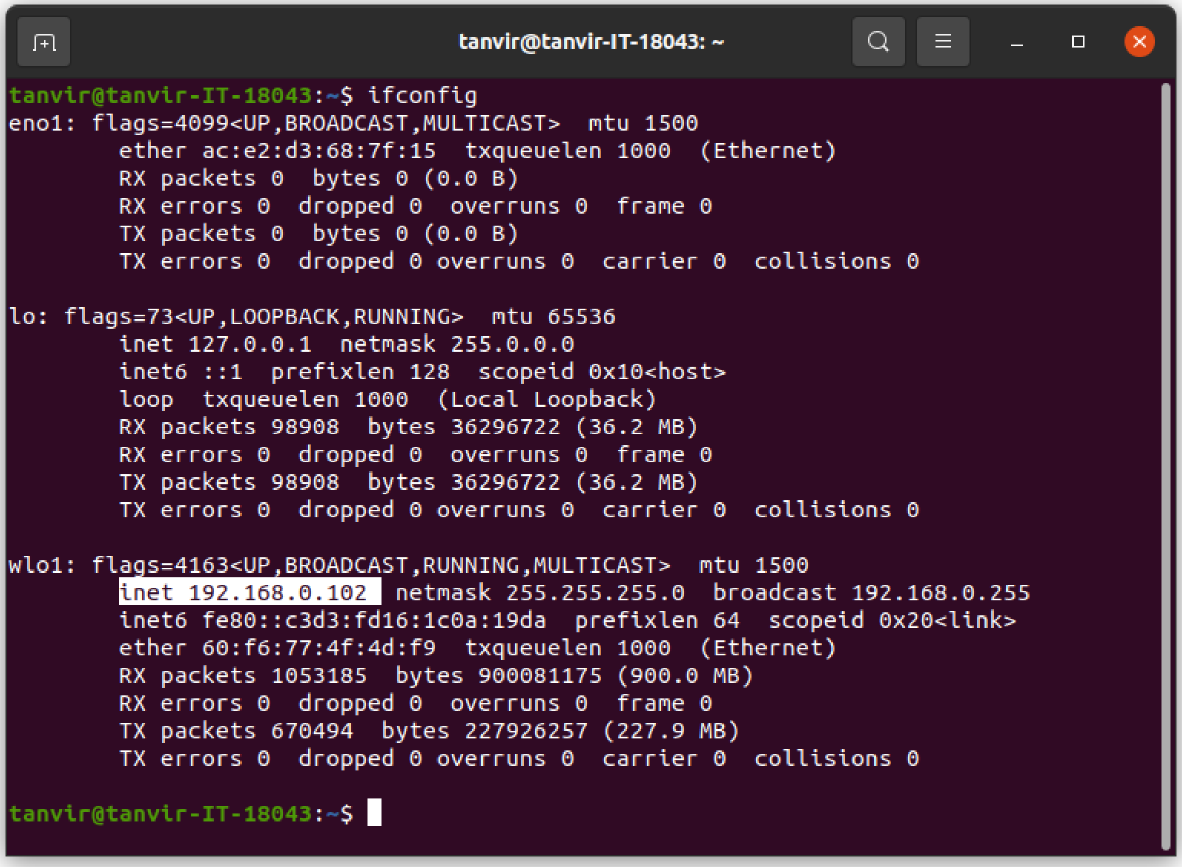
Exercise 4.2: Finding the IP address for a specific interface on your machine

Create python script using the syntax below (save as get_interface_ip_address.py):



```
(venv) tanvir@tanvir-IT-18043:~/PycharmProjects/Network_Lab/src/Lab-03_Networking_with_Python$ python2 get_interface_ip_address.py --ifname wlo1
Interface [wlo1] --> IP: 192.168.0.102
(venv) tanvir@tanvir-IT-18043:~/PycharmProjects/Network_Lab/src/Lab-03_Networking_with_Python$
```

Run the script, which is the output? Which variable do you need to provide? What is the purpose of parse module?

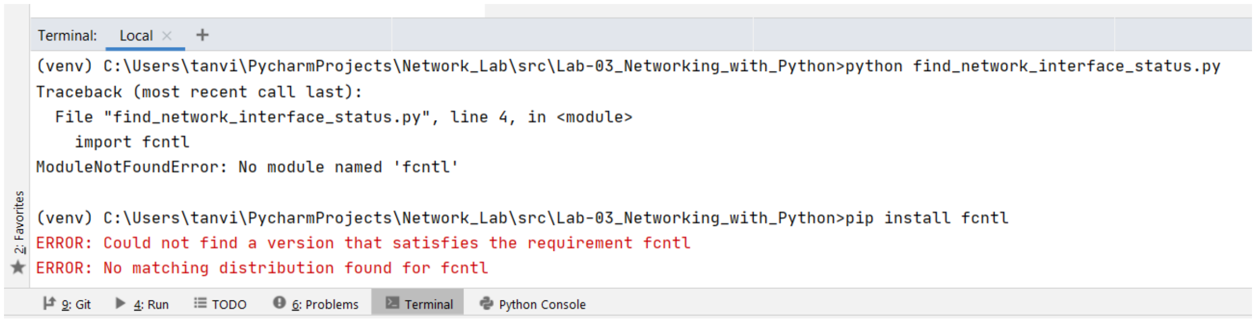


```
tanvir@tanvir-IT-18043:~$ ifconfig
eno1: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether ac:e2:d3:68:7f:15  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 98908  bytes 36296722 (36.2 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 98908  bytes 36296722 (36.2 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.0.102  netmask 255.255.255.0  broadcast 192.168.0.255
        inet6 fe80::c3d3:fd16:1c0a:19da  prefixlen 64  scopeid 0x20<link>
        ether 60:f6:77:4f:4d:f9  txqueuelen 1000  (Ethernet)
        RX packets 1053185  bytes 900081175 (900.0 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 670494  bytes 227926257 (227.9 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

tanvir@tanvir-IT-18043:~$
```

Exercise 4.3: Finding whether an interface is up on your machine

Create python script using the syntax below (save as find_network_interface_status.py):

Run the script providing the interface to be tested, which is the output? Write a script that provides the interfaces, IP and status (save as exercise43_solution.py)?

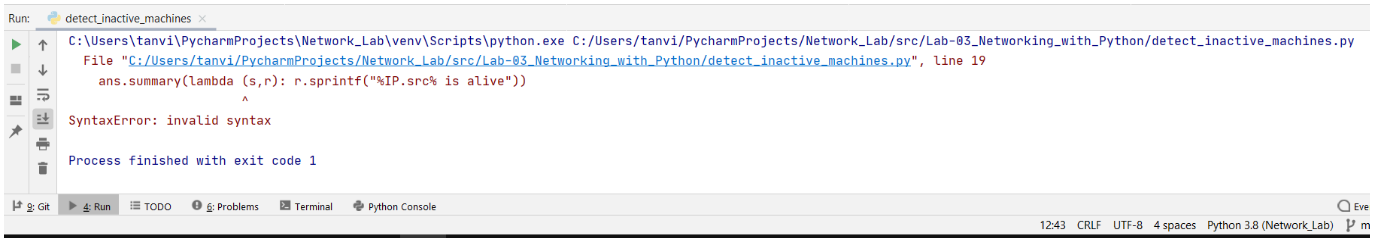


```
(venv) C:\Users\tanvi\PycharmProjects\Network_Lab\src\Lab-03_Networking_with_Python>python find_network_interface_status.py
Traceback (most recent call last):
  File "find_network_interface_status.py", line 4, in <module>
    import fcntl
ModuleNotFoundError: No module named 'fcntl'

(venv) C:\Users\tanvi\PycharmProjects\Network_Lab\src\Lab-03_Networking_with_Python>pip install fcntl
ERROR: Could not find a version that satisfies the requirement fcntl
ERROR: No matching distribution found for fcntl
```

Exercise 4.4: Detecting inactive machines on your network

Create python script using the syntax below (save as detect_inactive_machines.py):

Add a range of IP addresses and run the script, which is the output? Ask your tutor for help.



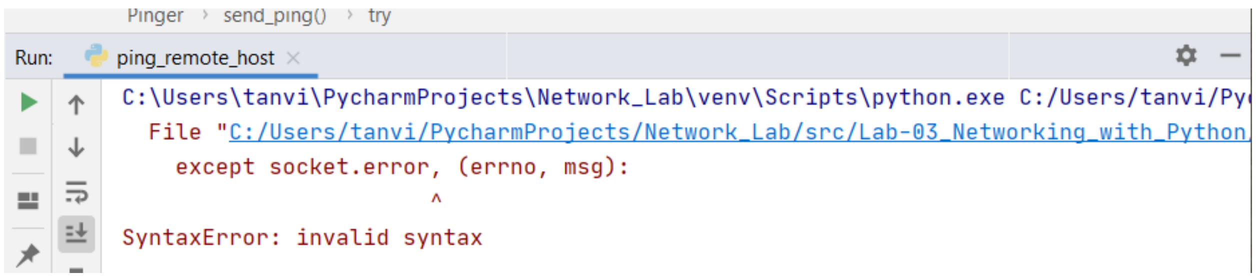
```
C:\Users\tanvi\PycharmProjects\Network_Lab\venv\Scripts\python.exe C:/Users/tanvi/PycharmProjects/Network_Lab/src/Lab-03_Networking_with_Python/detect_inactive_machines.py
  File "C:/Users/tanvi/PycharmProjects/Network_Lab/src/Lab-03_Networking_with_Python/detect_inactive_machines.py", line 19
    ans.summary(lambda (s,r): r.sprintf("%IP.src% is alive"))
                       ^
SyntaxError: invalid syntax

Process finished with exit code 1
```

Exercise 4.5: Pinging hosts on the network with ICMP

Create python script using the syntax below (save as ping_remote_host.py):

How many functions does the code have? Which is the command for running the script (Target host is WWW.GOOGLE.COM)?

Is there any error?
What is the solution? Which is the output?
Use the script using your own IP address? Which is the output?

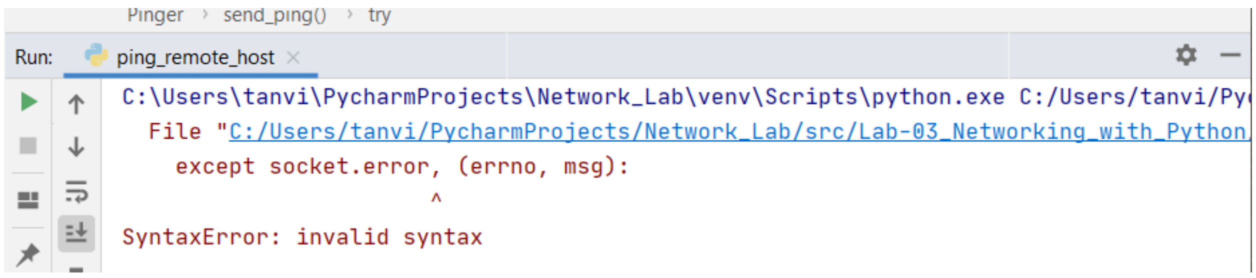


```
C:\Users\tanvi\PycharmProjects\Network_Lab\venv\Scripts\python.exe C:/Users/tanvi/Py
  File "C:/Users/tanvi/PycharmProjects/Network_Lab/src/Lab-03_Networking_with_Python
    except socket.error, (errno, msg):
                       ^
SyntaxError: invalid syntax
```

Exercise 4.6: Pinging hosts on the network with ICMP using pc resources

Create python scrip using the syntax below (save as ping_subprocess.py):

Add the IP address of your PC in the code and run the script, which is the output?
Test the script with the IP of you classmate?
What is the role of subprocess?

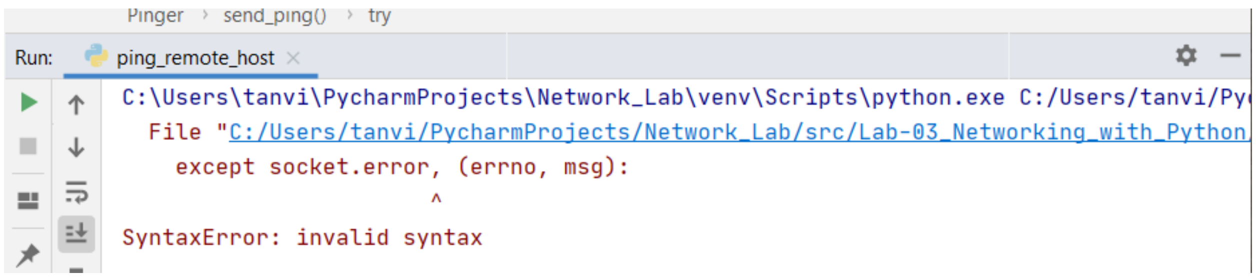


```
C:\Users\tanvi\PycharmProjects\Network_Lab\venv\Scripts\python.exe C:/Users/tanvi/Py
  File "C:/Users/tanvi/PycharmProjects/Network_Lab/src/Lab-03_Networking_with_Python
    except socket.error, (errno, msg):
                       ^
SyntaxError: invalid syntax
```

Exercise 4.7: Scanning the broadcast of packets

Create python script using the syntax below (save as broadcast_scanning.py):

Run the script, which is the output?

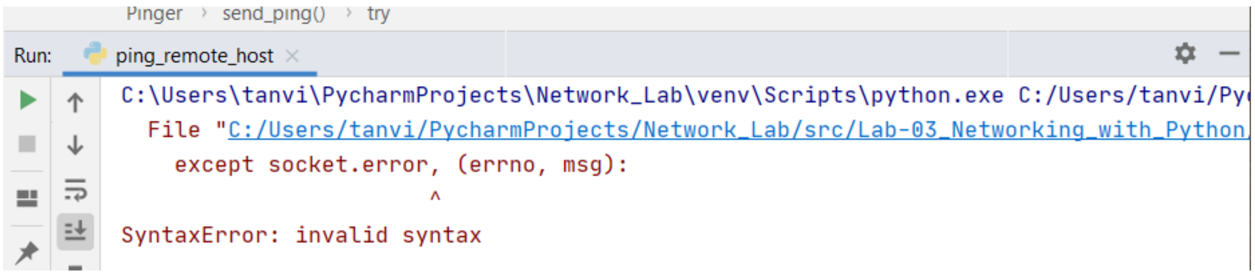


```
C:\Users\tanvi\PycharmProjects\Network_Lab\venv\Scripts\python.exe C:/Users/tanvi/Py
  File "C:/Users/tanvi/PycharmProjects/Network_Lab/src/Lab-03_Networking_with_Python
    except socket.error, (errno, msg):
                       ^
SyntaxError: invalid syntax
```

Exercise 4.8: Sniffing packets on your network

Tcpdump is a common packet analyzer that runs under the command line. It allows the user to display TCP/IP and other packets being transmitted or received over a network to which the computer is attached. Distributed under the BSD license,[3] tcpdump is free Software.

- o Open a linux terminal and check the usage of tcpdump using the command line tcpdum –help
- o Using tcpdump get the traffic present in the Ethernet interface of your pc (10 packet only), which is the command line?
- o Using the subprocess write a program for sniffing 1 packet of the Ethernet interface? (Save as packet_sniffer.py).

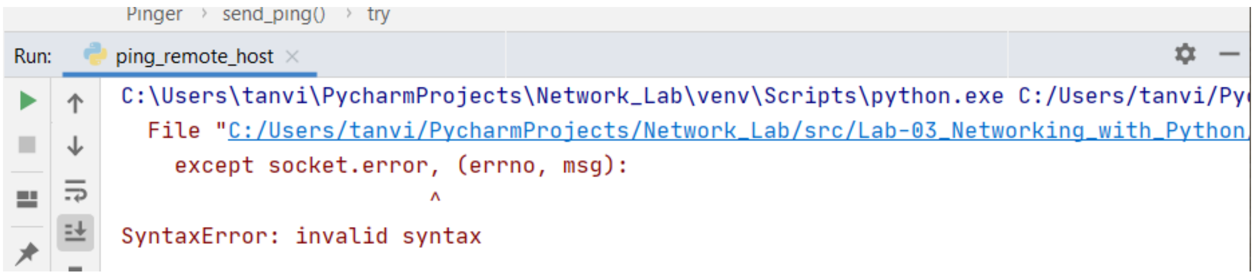


```
C:\Users\tanvi\PycharmProjects\Network_Lab\venv\Scripts\python.exe C:/Users/tanvi/Py
  File "C:/Users/tanvi/PycharmProjects/Network_Lab/src/Lab-03_Networking_with_Python
    except socket.error, (errno, msg):
                       ^
SyntaxError: invalid syntax
```

Exercise 4.9: Performing a basic Telnet
Create python script using the syntax below (save as echo_client.py):

Add the IP address of your PC in the code and run the script, which is the output?

- o Open a linux terminal and execute "telnet 'IP PC' port", what happen with the server Console?
- o Test the script with the IP of you classmate?



```
C:\Users\tanvi\PycharmProjects\Network_Lab\venv\Scripts\python.exe C:/Users/tanvi/Py
  File "C:/Users/tanvi/PycharmProjects/Network_Lab/src/Lab-03_Networking_with_Python
    except socket.error, (errno, msg):
                       ^
SyntaxError: invalid syntax
```