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Lab report no   : 07

Lab report name   : Python for networking

Objectives:

Learn how to find
✓ finding network interfaces
✓ interfacing ip address
✓ interfacing status

Theory:

What is a network interface?

Ans:

A *network interface* is the point of interconnection between a computer and a private or public network. A network interface is generally a network interface card (NIC), but does not have to have a physical form. Instead, the network interface can be implemented in software. For example, the loopback interface (`127.0.0.1` for IPv4 and `::1` for IPv6) is not a physical device but a piece of software simulating a network interface. The loopback interface is commonly used in test environments.

Why it is relevant and necessaryto communicate using sockets?

Ans:

Sockets provide the programmer with a facility to allow their applications to communicate over a network. This lesson shows how to use sockets to allow to LiveCode apps to talk to each other as well as providing an example of how LiveCode apps can share data with Java apps. Servers are accessed via socket addresses, a combination of the server's IP address (or domain name) and a port number. The port can be thought as a connection point on the sever, like USB or Firewire ports, with each port

serving a specific purpose. For example, web pages are served on port 80 (HTTP) , emails are sent via port 25 (SMTP).

Once two machines are connected, they can then communicate streams of bytes with each other. It's up to the client and server to format these byte streams into structured data chunks. A simple example would be an echo sever, which receives a stream of bytes from a client, assumes they form an ascii string and sends the string back to the client.

As noted previously, sockets use IP based networks. There are a range of transport layers that can be used on top of IP. In this lesson we will consider TCP sockets.

How many network interface that you find in your pc?

Ans:

1. Wireless

2. Ethernet

3. Loopback

Enumerating interfaces on your machine:

Code:

```python
import ifaddr

adapters = ifaddr.get_adapters()

for adapter in adapters:
    print ("IPs of network adapter " +
adapter.nice_name)
    for ip in adapter.ips:
        print ("   %s/%s" % (ip.ip, ip.network_prefix))
```

output:
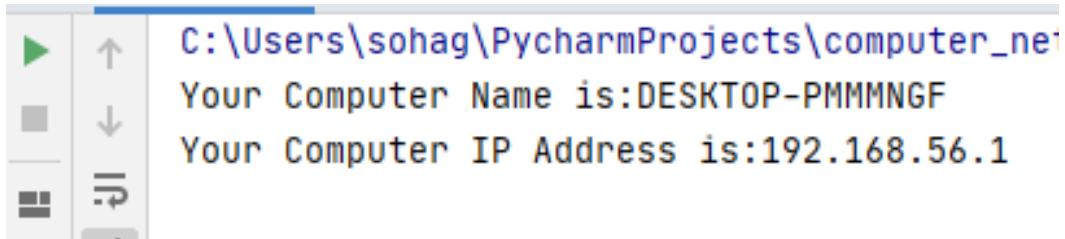
```
C:\Users\sohag\PycharmProjects\computer_networking\venv\Scripts
IPs of network adapter Realtek PCIe FE Family Controller
    ('fe80::6557:daec:a489:858d', 0, 7)/64
    169.254.133.141/16
IPs of network adapter Microsoft Wi-Fi Direct Virtual Adapter
    ('fe80::fc05:8e33:8009:ee0e', 0, 6)/64
    169.254.238.14/16
IPs of network adapter VirtualBox Host-Only Ethernet Adapter
    ('fe80::655e:dcb8:721a:9b9b', 0, 9)/64
    192.168.56.1/24
IPs of network adapter Intel(R) Dual Band Wireless-AC 3168
    ('fe80::900d:d1d3:29ca:f5d5', 0, 10)/64
    192.168.1.4/24
IPs of network adapter Software Loopback Interface 1
    ('::1', 0, 0)/128
    127.0.0.1/8
IPs of network adapter Microsoft ISATAP Adapter
    ('fe80::5efe:c0a8:3801', 0, 4)/128
IPs of network adapter Microsoft Teredo Tunneling Adapter
    ('2001:0:2851:782c:482:2b6c:98ab:7a34', 0, 0)/64
    ('fe80::482:2b6c:98ab:7a34', 0, 8)/64
IPs of network adapter Microsoft ISATAP Adapter #2
    ('fe80::5efe:c0a8:104', 0, 2)/128
```

Python program to find IP Address:

Code:

```python
import socket
hostname = socket.gethostname()
IPAddr = socket.gethostbyname(hostname)
print("Your Computer Name is:" + hostname)
print("Your Computer IP Address is:" + IPAddr)
```

output:

```
    C:\Users\sohag\PycharmProjects\computer_ne
    Your Computer Name is:DESKTOP-PMMMNGF
    Your Computer IP Address is:192.168.56.1
```

Checked using terminal:

```
sohag@sohag-17060:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.0.2.15  netmask 255.255.255.0  broadcast 10.0.2.255
        inet6 fe80::a008:618e:b3ef:3581  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:b5:42:46  txqueuelen 1000  (Ethernet)
        RX packets 27386  bytes 27895191 (27.8 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 8776  bytes 555282 (555.2 KB)
        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 206  bytes 17634 (17.6 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 206  bytes 17634 (17.6 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

## Extracting MAC address using Python:
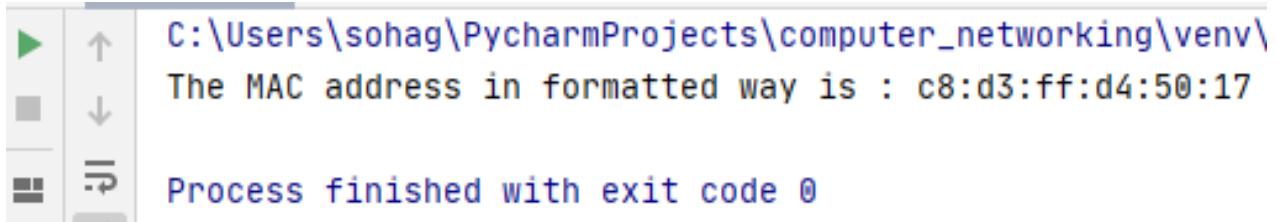
Code:

```
import uuid
```

```
# joins elements of getnode() after each 2 digits.

print ("The MAC address in formatted way is : ",
end="")
print (':'.join(['{:02x}'.format((uuid.getnode() >>
ele) & 0xff)
for ele in range(0,8*6,8)][::-1]))
```
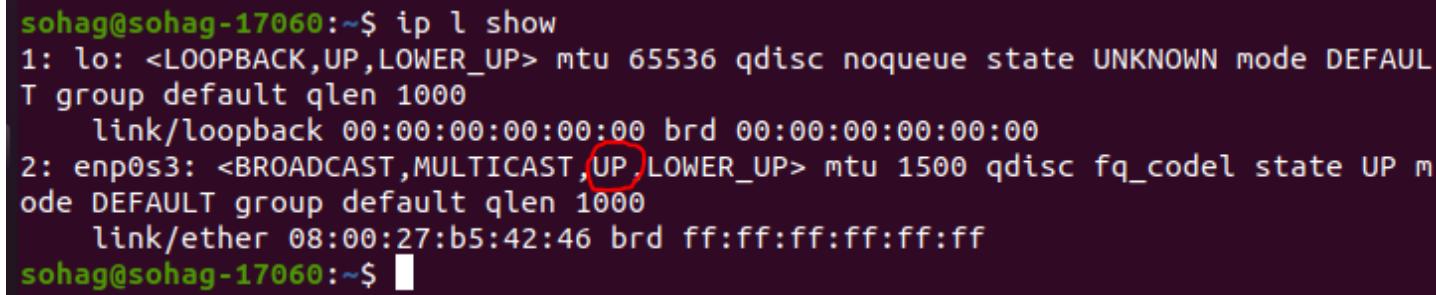
output:

```
C:\Users\sohag\PycharmProjects\computer_networking\venv\
The MAC address in formatted way is : c8:d3:ff:d4:50:17

Process finished with exit code 0
```

Checked whether an interface is up on your machine:

```
sohag@sohag-17060:~$ ip l show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAUL
T group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP m
ode DEFAULT group default qlen 1000
    link/ether 08:00:27:b5:42:46 brd ff:ff:ff:ff:ff:ff
sohag@sohag-17060:~$
```

Write a script that provides the interfaces, IP and status.

Ans:

```python
import sys
import socket
import fcntl
import struct
import array
import argparse
import nmap
SIOCGIFCONF = 0x8912 #from C library sockios.h
STUCT_SIZE_32 = 32
STUCT_SIZE_64 = 40
PLATFORM_32_MAX_NUMBER = 2**32
DEFAULT_INTERFACES = 8
SAMPLE_PORTS = '21-23'
def list_interfaces():
    interfaces = []
    max_interfaces = DEFAULT_INTERFACES
    is_64bits = sys.maxsize > PLATFORM_32_MAX_NUMBER
    struct_size = STUCT_SIZE_64 if is_64bits else STUCT_SIZE_32
    sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
    while True:
        bytes = max_interfaces * struct_size
        interface_names = array.array('B', '\0' * bytes)
        sock_info = fcntl.ioctl(sock.fileno(), SIOCGIFCONF, struct.pack('iL',bytes,
interface_names.buffer_info()[0]))
        outbytes = struct.unpack('iL', sock_info)[0]
        if outbytes == bytes:
            max_interfaces *= 2
        else:
            break
    namestr = interface_names.tostring()
    for i in range(0, outbytes, struct_size):
        interfaces.append((namestr[i:i + 16].split('\0', 1)[0]))
    return interfaces
def get_ip_address(ifname):
    s = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
    return socket.inet_ntoa(fcntl.ioctl(s.fileno(), 0x8915,struct.pack('256s',
ifname[:15]))[20:24])
```

```python
def get_interface_status(ifname):
    sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
    ip_address = socket.inet_ntoa(fcntl.ioctl(sock.fileno(),
    0x8915,struct.pack('256s', ifname[:15]))
    [20:24])
    nm = nmap.PortScanner()
    nm.scan(ip_address, SAMPLE_PORTS)
    return nm[ip_address].state()
if __name__ == '__main__':
    interfaces = list_interfaces()
    print("This machine has %s network interfaces: %s." % (len(interfaces),
    interfaces))
    i = 0
    while i < len(interfaces):
        print("Interface [%s] --> IP: %s" %
        (interfaces[i],get_ip_address(interfaces[i])))
        print("Interface [%s] is: %s" % (interfaces[i],
        get_interface_status(interfaces[i]))
        i = i + 1
```

Display Hostname and IP address in Python
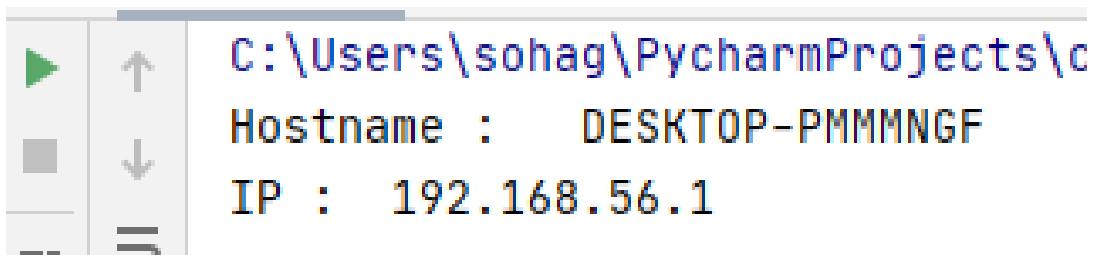
Code:

```python
def get_Host_name_IP():
    try:
        host_name = socket.gethostname()
        host_ip = socket.gethostbyname(host_name)
        print("Hostname :  ", host_name)
        print("IP : ", host_ip)
    except:
        print("Unable to get Hostname and IP")
get_Host_name_IP()
```

output:

```
C:\Users\sohag\PycharmProjects\c
Hostname :    DESKTOP-PMMMNGF
IP :   192.168.56.1
```

Conclusion: I have paid a lot of efforts to do all the lab task that are given above. Although I give so many error when I run this program. After all, I finally able to run these program and able to see interfaces ,interfaces ip addresses,interfaces status.