Experiment No. 5

Title: Classification of IP addressing.

Batch:A2   **Roll No.:16010421063**   **Experiment No.: 5**

Aim: To write a program to identify the class to which a given IP Address belong to.

___

Resources Used: Java/C/Python

___

Theory:

A Computer at one place in the world needs to communicate with another computer somewhere else in the world. Usually computers communicate through the Internet. The packet transmitted by the sending computer may pass through several LANs and WANs before reaching the destination computer. For this level of communication, we need a global addressing scheme called as Logical addressing. Today we use the term IP Address to mean a logical address in the network layer of the TCP/IP protocol suite.

IP address is 32 bit long. The IP addresses are unique and universal. There are two prevalent notations: Binary notation and Dotted –Decimal notation. In binary notation ,the IP address is displayed as 32 bits..Each octet is often referred to as a byte. So it is referred to as 32 bit addressor 4-byte address.. To make it more compact and easier to read, Internet addresses are usually written in decimal form with a decimal point separating the byte

Number of IP Addresses per Device: Any device that has data sent to it at the network layer will have at least one IP address: one per network interface. This means that normal hosts such as computers and network-capable printers usually get one IP address, while routers get more than one IP address. Some special hosts may have more than one IP address if they are multihomed - connected to more than one network. Lower-level network interconnection devices such as repeaters, bridges and switches don't require an IP address because they pass traffic based on layer two (data link layer) addresses. Network segments connected by bridges and switches form a single broadcast domain and any devices on them can send data to each other directly without routing. To the Internet Protocol, these devices are "invisible", they are no more significant than the wires that connect devices together (with a couple of exceptions).

"CLASSFUL" IP Address Classification:
In Classful addressing, the address space is split into five classes: A, B, C, D, E. Each class occupies some part of the address space.as shown in Table 1. Looking at only the first few bits of any IP address

would tell the router where to "draw the line" between the network ID and host ID., and thus what to do with the datagram. The number of bits the router needs to look at may be as few as one or as many as four, depending on what it finds when it starts looking.

Netid and Hostid

In classful addressing, an IP address in Class A, B, or C is divided into netid and host id. These parts are of varying lengths, depending on the class of the address. In class A, one byte defines the netid and three bytes define the host id. In class B, two bytes define the netid and two bytes define the host id. In class C, three bytes define the netid and one byte defines the host id.

Class A addresses were designed for large scale organizations with a large number of attached hosts or routers.
Class B addresses were designed for mid size organizations with tens of thousands of attached hosts or routers.
Class C addresses were designed for small organizations with a small number of attached hosts or routers.
Class D network addresses are used by multicasting. Multicasting is a method of reducing network traffic. Rather than send a separate datagram to each host if multiple host require the same information, a special multicast address can be used where one datagram is read by many hosts.
Class E Addresses were reserved for future use.

Table 1

	s IP Address Range	Net mask
A	0.0.0.0 to 127.255.255.255	255.0.0.0
B	128.0.0.0 to 191.255.255.255	255.255.0.0
C	192.0.0.0 to 223.255.255.255	255.255.255.0
D	224.0.0.0 to 239.255.255.255	-
E	240.0.0.0 to 255.255.255.255	-

Algorithm

The algorithm used corresponds to the system used to divide the address space; it involves four very basic steps (see Figure 1 below)
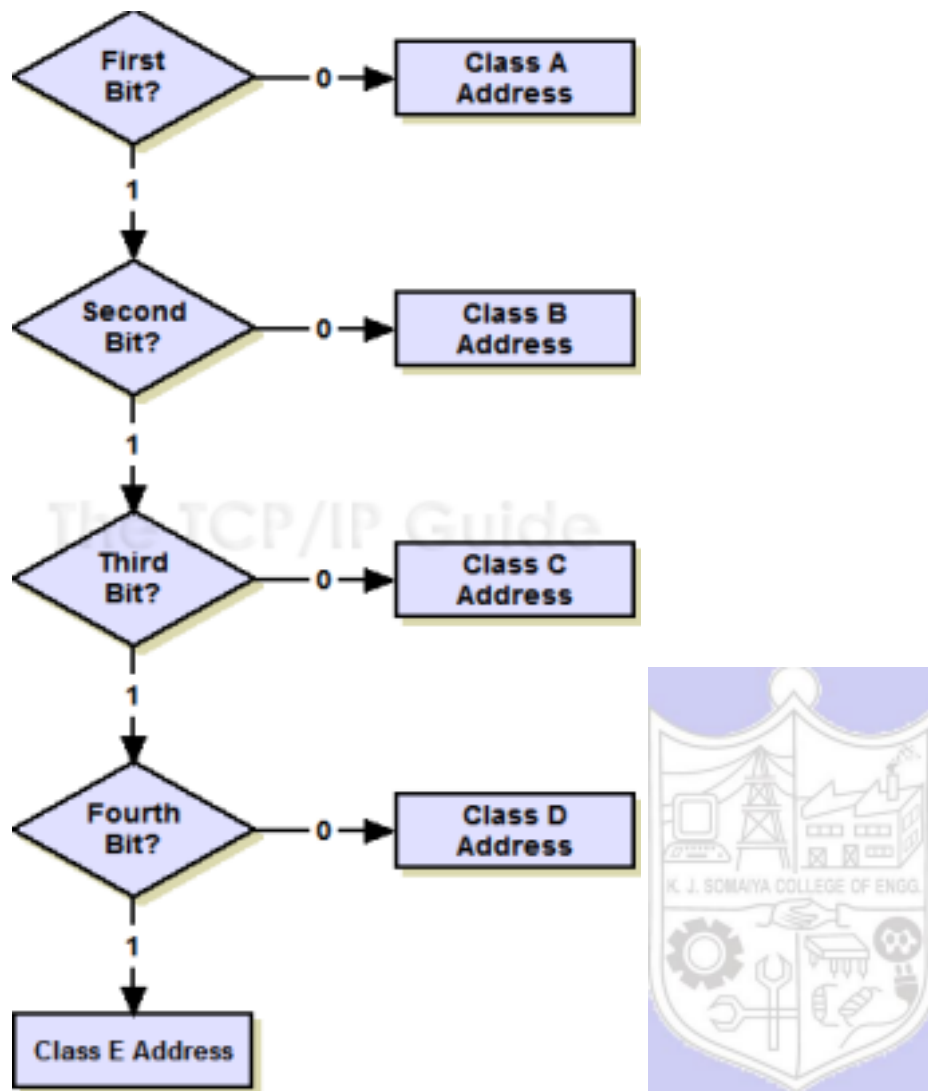
Figure 1: Class determination algorithm for "Classful" IP addresses The

algorithm takes as input the first byte of the IP address in binary form

1. If the first bit is a "0", it's a class A address and we're done. (Half the address space has a "0" for the first bit, so this is why class A takes up half the address space.) If it's a "1", continue to step two.

2. If the second bit is a "0", it's a class B address and we're done. (Half of the remaining non-class-A addresses, or one quarter of the total.) If it's a "1", continue to step three.

3. If the third bit is a "0", it's a class C address and we're done. (Half again of what's left, or one eighth of the total.) If it's a "1", continue to step four.

4. If the fourth bit is a "0", it's a class D address. (Half of the remainder, or one sixteenth of the address space.) If it's a "1", it's a class E address. (The other half, one sixteenth.)

Activity:

1. The program should accept the input IP address in dotted decimal form. 2.
Convert this address into binary form and apply the classification algorithm. 3.
Display the class of IP address as the output.

Program:

```python
# Code by Arya Nair
def checkIP():
    ip=input("Enter IP: ")
    lengthIP=len(ip)
    if(lengthIP>15 or lengthIP<7):
        print("Invalid IP")
        return
    try:
        arrIP=list(map(int,ip.split('.')))
    except:
        print("Enter only numbers")
        return

    for i in arrIP:
        if(i<0 or i>255):
            print("Invalid IP")
            return

    first=f'{arrIP[0]:08b}'
    if(first[0]=='0'):
        print("This is a class A IP")
    elif(first[1]=='0'):
        print("This is a class B IP")
    elif(first[2]=='0'):
        print("This is a class C IP")
    elif(first[3]=='0'):
        print("This is a class D IP")
    else:
        print("This is a class E IP")
    return


if __name__=='__main__':
    checkIP()
```

Output:

```
PS D:\SY-IT-A1_45> & C:/Users/EXAM/AppData/Local/Programs/Python/Python310/python.exe d:/SY-IT-A1_45/exp5.py
Enter IP: 125.17.16.127
This is a class A IP
PS D:\SY-IT-A1_45> & C:/Users/EXAM/AppData/Local/Programs/Python/Python310/python.exe d:/SY-IT-A1_45/exp5.py
Enter IP: 172.17.16.127
This is a class B IP
PS D:\SY-IT-A1_45> & C:/Users/EXAM/AppData/Local/Programs/Python/Python310/python.exe d:/SY-IT-A1_45/exp5.py
Enter IP: 195.17.16.127
This is a class C IP
PS D:\SY-IT-A1_45> & C:/Users/EXAM/AppData/Local/Programs/Python/Python310/python.exe d:/SY-IT-A1_45/exp5.py
Enter IP: 225.17.16.127
This is a class D IP
PS D:\SY-IT-A1_45> & C:/Users/EXAM/AppData/Local/Programs/Python/Python310/python.exe d:/SY-IT-A1_45/exp5.py
Enter IP: 245.17.16.127
This is a class E IP
PS D:\SY-IT-A1_45>
```

```
PS D:\SY-IT-A1_45> & C:/Users/EXAM/AppData/Local/Programs/Python/Python310/python.exe d:/SY-IT-A1_45/exp5.py
Enter IP: 245.17
Invalid IP
PS D:\SY-IT-A1_45> & C:/Users/EXAM/AppData/Local/Programs/Python/Python310/python.exe d:/SY-IT-A1_45/exp5.py
Enter IP: 245.17.16.12A
Enter only numbers
PS D:\SY-IT-A1_45> & C:/Users/EXAM/AppData/Local/Programs/Python/Python310/python.exe d:/SY-IT-A1_45/exp5.py
Enter IP: 245.260.16.12A
Enter only numbers
PS D:\SY-IT-A1_45> & C:/Users/EXAM/AppData/Local/Programs/Python/Python310/python.exe d:/SY-IT-A1_45/exp5.py
Enter IP: 245.17.16.1267
Invalid IP
PS D:\SY-IT-A1_45>
```

Questions:

1) **Which OSI layer corresponds to IP Layer?**
Ans. The Internet Layer of the TCP/IP model aligns with the Layer 3 (Network) layer of the OSI model. This is where IP addresses and routing live.

2) **Compare IPv4 and IPv6 header**
Ans. The main difference between IPv4 and IPv6 Header is that the source and destination addresses of IPv4 header are 32 bit long while the source and destination addresses of IPv6 header are 128 bits long

3) What is fragmentation?
Ans IP fragmentation is an Internet Protocol (IP) process that breaks packets into smaller pieces (fragments), so that the resulting pieces can pass through a link with a smaller maximum transmission unit (MTU) than the original packet size. The fragments are reassembled by the receiving host.

4) What is Subnetting?
Ans A subnetwork or subnet is a logical subdivision of an IP network. The practice of dividing a network into two or more networks is called subnetting. Computers that belong to the same subnet are addressed with an identical most-significant bit-group in their IP addresses

5) What is Supernetting?
Ans Supernetting is the opposite of Subnetting. In subnetting, a single big network is divided into multiple smaller subnetworks. In Supernetting, multiple networks are combined into a bigger network termed as a Supernetwork or Supernet.

Outcomes:
CO2: Enumerate the layers of OSI model and TCP/IP model,their functions and Protocols
CO3: Build skills of subnetting and routing mechanisms

Conclusion: Successfully understood various classifications of IP address and wrote a python script to check the classification of the given IP.

_____

Grade: AA / AB / BB / BC / CC / CD /DD

Signature of faculty in-charge with date

References:

Books/ Journals/ Websites:
1) Behrouz A Forouzan, Data Communication and Networking, Tata Mc Graw hill, India, 4th Edition
2) A. S. Tanenbaum," Computer Networks", 4th edition, Prentice Hall