

Lab Assignment 2

Computer Network B Div

1. Understanding the concept of IP address, MAC address and port.

MAC & IP addresses

MAC address

A Media Access Control (MAC) address is a 48-bit (6 bytes) address that is used for communication between two hosts in an Ethernet environment. It is a hardware address, which means that it is stored in the firmware of the network card.

Every network card manufacturer gets a universally unique 3-byte code called the Organizationally Unique Identifier (OUI). Manufacturers agree to give all NICs a MAC address that begins with the assigned OUI. The manufacturer then assigns a unique value for the last 3 bytes, which ensures that every MAC address is globally unique.

MAC addresses are usually written in the form of 12 hexadecimal digits. For example, consider the following MAC address:

D8-D3-85-EB-12-E3

Every hexadecimal character represents 4 bits, so the first six hexadecimal characters represent the vendor (Hewlett Packard in this case).

How to find out your own MAC address?

If you are using Windows, start the Command Prompt (Start – Programs – Accessories – Command Prompt). Type the ipconfig/all command and you should see a field called Physical Address under the Ethernet adapter settings:

```
Command Prompt

C:\Users\user>ipconfig /all

Windows IP Configuration

Host Name . . . . . : WIN-7NHASUKCI7D
Primary Dns Suffix . . . . . :
Mode Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No
DNS Suffix Search List. . . . . : localdomain

Ethernet adapter Local Area Connection:

Connection-specific DNS Suffix . : localdomain
Description . . . . . : Intel(R) PRO/1000 MT Network Connection
Physical Address. . . . . : 00-0C-29-6C-F3-E5
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::b82d:1e2b:ed4d:b89d%11(Preferred)
IPv4 Address. . . . . : 10.10.100.131(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : Monday, March 25, 2013 2:34:36 PM
Lease Expires . . . . . : Monday, March 25, 2013 3:04:36 PM
Default Gateway . . . . . :
DHCP Server . . . . . : 10.10.100.254
DHCPv6 IAID . . . . . : 234884137
DHCPv6 Client DUID. . . . . : 00-01-00-01-18-C6-CD-56-00-0C-29-6C-F3-E5

DNS Servers . . . . . : 10.10.100.1
NetBIOS over Tcpip. . . . . : Enabled

Tunnel adapter isatap.localdomain:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . : localdomain
Description . . . . . : Microsoft ISATAP Adapter
Physical Address. . . . . : 00-00-00-00-00-00-E0
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . : Yes

C:\Users\user>
```

If you are using Linux, type the `ifconfig` command. You should see your MAC address referred to as HWaddress.

```
[root@localhost ~]# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0C:29:07:CB:15
          inet addr:10.10.200.130 Bcast:10.10.200.255 Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
          RX packets:434 errors:0 dropped:0 overruns:0 frame:0
          TX packets:252 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:37487 (36.6 KiB) TX bytes:33634 (32.8 KiB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1 Mask:255.0.0.0
          UP LOOPBACK RUNNING MTU:16436 Metric:1
          RX packets:100 errors:0 dropped:0 overruns:0 frame:0
          TX packets:100 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:6362 (6.2 KiB) TX bytes:6362 (6.2 KiB)
```

IP address

An IP address is a 32-bit number that identifies a host on a network. Each device that wants to communicate with other devices on a TCP/IP network needs to have an IP address configured. For example, in order to access the Internet, your computer will need to have an IP address assigned (usually obtained by your router from the ISP).

An IP address is usually written in the form of four decimal numbers separated by periods (e.g. 10.0.50.1). The first part of the address represents the network the device is on (e.g. 10.0.0.0), while the second part of the address identifies the host device (e.g. 10.0.50.1).

In contrast to MAC address, an IP address is a logical address. It can be configured manually or it can be obtained from a DHCP server.

NOTE

The term IP address is usually used for IPv4, which is the fourth version of the IP protocol. A newer version exists, IPv6, and uses 128-bit addressing.

Private IP addresses

There are three ranges of addresses that can be used in a private network (e.g. your home LAN). These addresses are not routable through the Internet.

Private addresses ranges are:

- 10.0.0.0 – 10.255.255.255
- 172.16.0.0 – 172.31.255.255
- 192.168.0.0 – 192.168.255.255

How to find out your IP address

If you are using Windows, start the Command Prompt (Start – Programs – Accessories – Command Prompt). Enter the ipconfig command. You should see a field called IP Address:

```
Command Prompt
C:\Users\user>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix  . : localdomain
    Link-local IPv6 Address . . . . . : fe80::b82d:1e2b:ed4d:b89d%11
    IPv4 Address. . . . . : 10.10.100.131
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :

Tunnel adapter isatap.localdomain:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : localdomain

C:\Users\user>
```

Linux users:

Enter ifconfig. You should see a field called inet addr:

```
[root@localhost ~]# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0C:29:07:CB:15
          inet addr:10.10.200.130  Bcast:10.10.200.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:0
          RX packets:434 errors:0 dropped:0 overruns:0 frame:0
          TX packets:252 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:37487 (36.6 KiB)  TX bytes:33634 (32.8 KiB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:100 errors:0 dropped:0 overruns:0 frame:0
          TX packets:100 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:6362 (6.2 KiB)  TX bytes:6362 (6.2 KiB)
```

How to check ip adress

Windows 10 Instructions:

Right click the windows button in the lower left of your screen.

Select command prompt from the list.

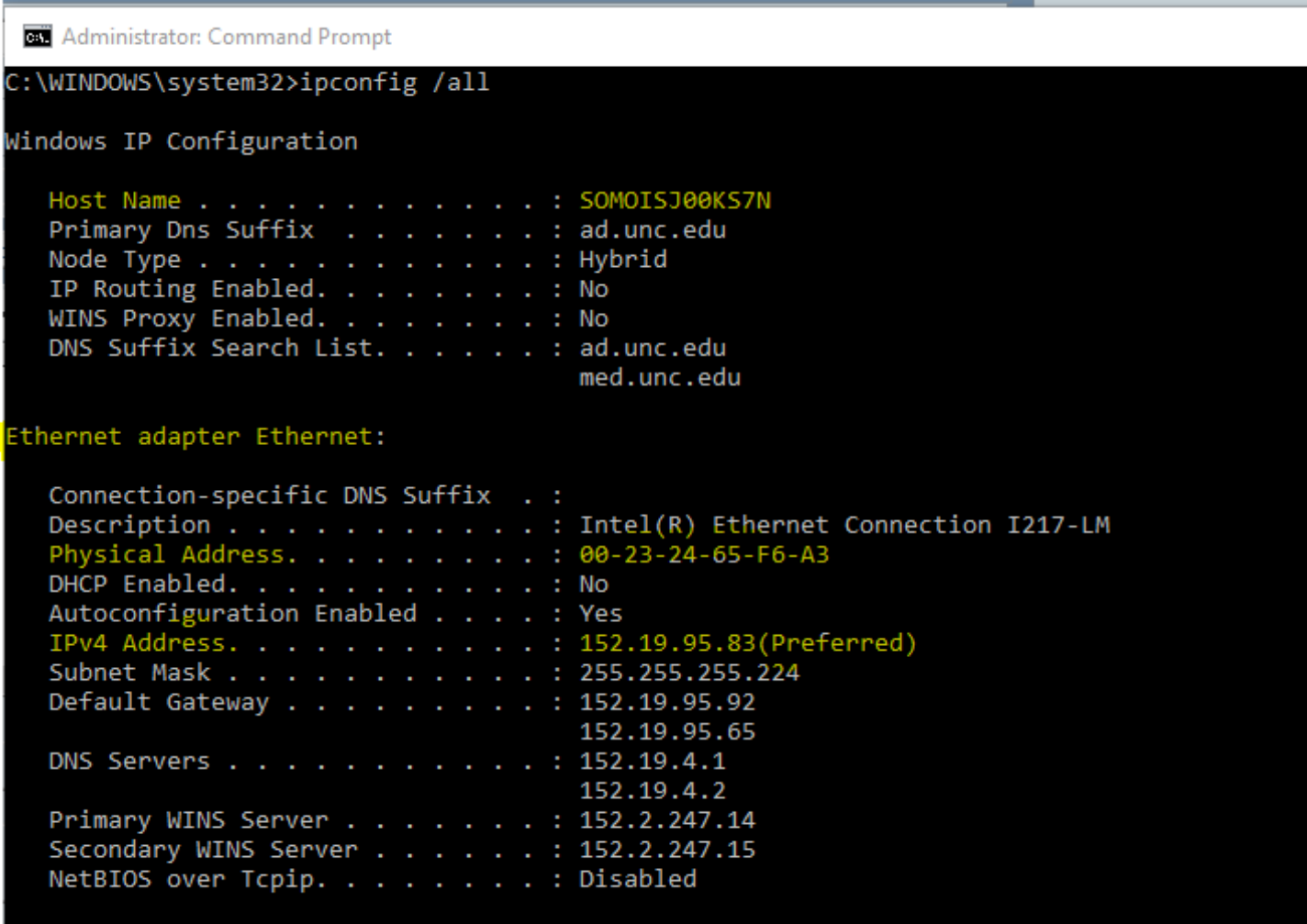
A black and white window will open where you will **type ipconfig /all** and press enter.

There is a space between the command **ipconfig** and the switch of **/all**.

When a technician requests the IP address of your Ethernet card, the information that follows after the title of Ethernet Local Area Adapter gigabit connection. Your IP address will be the IPv4 address.

The wireless card information will follow the title of Wireless Lan adapter connection. Any description that includes the word 'Virtual' is not the information that is needed for creating an internet connection for you.

Command Prompt Window:

A screenshot of a Windows Command Prompt window titled "Administrator: Command Prompt". The command "C:\WINDOWS\system32>ipconfig /all" has been entered. The output shows "Windows IP Configuration" followed by system-wide settings like Host Name (SOM0ISJ00KS7N), Primary Dns Suffix (ad.unc.edu), and Node Type (Hybrid). Below this, the "Ethernet adapter Ethernet:" section is highlighted, showing details for the Intel(R) Ethernet Connection I217-LM, including its physical address (00-23-24-65-F6-A3), IPv4 address (152.19.95.83), subnet mask, default gateway, and DNS servers.

```
Administrator: Command Prompt
C:\WINDOWS\system32>ipconfig /all

Windows IP Configuration

    Host Name . . . . . : SOM0ISJ00KS7N
    Primary Dns Suffix . . . . . : ad.unc.edu
    Node Type . . . . . : Hybrid
    IP Routing Enabled. . . . . : No
    WINS Proxy Enabled. . . . . : No
    DNS Suffix Search List. . . . . : ad.unc.edu
                                     med.unc.edu

Ethernet adapter Ethernet:

    Connection-specific DNS Suffix . : 
    Description . . . . . : Intel(R) Ethernet Connection I217-LM
    Physical Address. . . . . : 00-23-24-65-F6-A3
    DHCP Enabled. . . . . : No
    Autoconfiguration Enabled . . . . : Yes
    IPv4 Address. . . . . : 152.19.95.83(Preferred)
    Subnet Mask . . . . . : 255.255.255.224
    Default Gateway . . . . . : 152.19.95.92
                                152.19.95.65
    DNS Servers . . . . . : 152.19.4.1
                                152.19.4.2
    Primary WINS Server . . . . . : 152.2.247.14
    Secondary WINS Server . . . . . : 152.2.247.15
    NetBIOS over Tcpip. . . . . : Disabled
```

Linux based system

Find Your IP Address From the Command Line

There are a few different commands you can use to check your IP address. To run these commands, start by opening a terminal window/command line.

Using the hostname Command

One way to check your IP address from the command-line is by using the following command:

```
hostname -I
```

The system will display your internal IP address.

```
CentOS Linux 7 (Core)  
Kernel 3.10.0-1062.1.1.el7.x86_64 on an x86_64  
  
localhost login: dejan  
Password:  
Last login: Thu Oct 3 09:54:00 on tty1  
[dejan@localhost ~]$ hostname -I  
10.0.2.15  
[dejan@localhost ~]$
```

Using the ip addr Command

Check your ip address with the **ip addr** command:

```
ip addr
```

The system will scan your hardware, and display the status for each network adapter you have. Look for an entry that says **link/ether**. Below it, you should see one of the following:

```
inet 192.168.0.10/24  
  
inet6 fe80::a00:27ff:fe76:1e71/64
```

```
dejan@localhost ~1$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:85:11:cd brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global noprefixroute dynamic enp0s3
        valid_lft 86320sec preferred_lft 86320sec
    inet6 fe80::7943:61cc:9904:9ae9/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
dejan@localhost ~1$
```

The entries will include one for a wired (Ethernet) adapter and a wireless (Wi-Fi) adapter. You may also have an entry for a virtual adapter. Generally, only one entry will have an IP address listed – that is the one you will want.

2. Understand and compare below commands.

1. Ping

[Ping](#) is a command-line utility, available on virtually any operating system with network connectivity, that acts as a **test to see if a networked device is reachable**.

The ping command sends a request over the network to a specific device. A successful ping results in a response from the computer that was pinged back to the originating computer.

How does Ping work?

The Ping utility uses the echo request, and echo reply messages within the Internet Control Message Protocol (ICMP), an integral part of any IP network. When a ping command is issued, an **echo request packet** is sent to the address specified. When the remote host receives the echo request, it responds with an **echo reply packet**.

By default, the ping command sends several echo requests, typically four or five. The result of each echo request is displayed, showing whether the request

received a successful response, how many bytes were received in response, the Time to Live (TTL), and how long the response took to receive, along with statistics about packet loss and round trip times.

Example:

```
ping 168.93.37.2
```

```
ping ftp.microsoft.com
```

2. Telnet

What is Telnet?

In a nutshell, Telnet is a computer protocol that was built for interacting with remote computers.

The word “Telnet” also refers to the command-line utility “telnet”, available under Windows OS and Unix-like systems, including Mac, Linux, and others. We will use the term “Telnet” mostly in the context of the telnet client software.

Telnet utility allows users to test connectivity to remote machines and issue commands through the use of a keyboard. Though most users opt to work with graphical interfaces, Telnet is one of the simplest ways to check connectivity on certain ports.

Using Telnet to Test Open Ports

One of the biggest perks of Telnet is with a simple command you can test whether a port is open. Issuing the Telnet command **telnet [domainname or ip] [port]** will allow you to test connectivity to a remote host on the given port.

Issue the following command in the Command Prompt:

```
telnet [domain name or ip] [port]
```


Put the IP address or domain name of the server you're trying to connect to in place of [domain name or ip], and replace the second brackets with the port number on the remote machine, connection to which you want to test.

For example, to verify connection to 192.168.0.10 on port 25, issue the command:

```
telnet 192.168.0.10 25
```

If the connection succeeds, a blank screen will show up, meaning that the computer port is open.

A failed connection will be accompanied by an error message. It can indicate either a closed port or the fact that the indicated remote server is not listening on the provided port.

Example

telnet rpc.acronis.com 443

A screenshot of a Windows command prompt window. The title bar reads "Administrator: C:\Windows\system32\cmd.exe". The window content shows the following text:

```
Microsoft Windows [Version 6.1.7601]  
Copyright (c) 2009 Microsoft Corporation. All rights reserved.  
  
C:\Users\test>telnet rpc.acronis.com 443
```

The rest of the window is black, indicating the telnet connection is either in progress or has failed without output.

Loopback

A loopback address is a special IP address, 127.0.0.1, reserved by InterNIC for use in testing network cards. This IP address corresponds to the software loopback interface of the network card, which does not have hardware associated with it, and does not require a physical connection to a network. The loopback address allows for a reliable method of testing the functionality of an Ethernet card and its drivers and software without a physical network. It also allows information technology professionals to test IP software without worrying about broken or corrupted drivers or hardware.

To test a network card using the loopback address, you can use the [TCP/IP](#) utility Ping. The best way to do this is with the Ping utility that comes with most

operating systems. This is a simple command-line utility that will try to communicate to an IP address.

Once you are at a command prompt, enter the following:

```
ping 127.0.0.1
```

If the command is successful, the Ping utility will return results similar to the following. The exact information returned will vary depending on your operating system:

```
Pinging 127.0.0.1 with 32 bytes of data:
```

```
Reply from 127.0.0.1: bytes=32 time<10ms TTL=128
```

```
Reply from 127.0.0.1: bytes=32 time<10ms TTL=128
```

```
Reply from 127.0.0.1: bytes=32 time<10ms TTL=128
```

```
Reply from 127.0.0.1: bytes=32 time<10ms TTL=128
```

```
Ping statistics for 127.0.0.1:
```

```
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

```
Approximate round trip times in milli-seconds:
```

```
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

This indicates that the network card and drivers are functioning properly. If the Ping utility is not able to get a return on the network card, this may indicate either a driver problem, or a physical problem with the card.