

## **1. Identification of different types of Network cables, devices and install.**

Network cable acts like a medium through which information travels from one network device to the other. The type of cable selected for a network depends on the network's size, topology, and procedure. The various three types of network cables

*i. Coaxial Cable:* It has a single copper conductor in the middle. A plastic layer provides insulation between the braided metal shield and center conductor. The metal shield blocks outer interference from motors, fluorescent lights, and other computers.

Coaxial cabling is extremely resistant to signal obstruction though it is complex to install. It can handle great cable lengths between network devices than the twisted pair cable.

*ii. Fiber Optic Cable:* Fiber optic cabling consists of a center glass core surrounded by many layers of protective materials. It removes the problem of electrical obstruction by transmitting light rather than electronic signals. This makes them perfect for certain atmospheres which contain huge amount of electrical interference. It has become the standard for connecting networks between buildings because of its resistance to lighting and moisture.

*iii. Twisted Pair:* There are two primary types of twisted-pair cabling Shielded Twisted Pair (STP) and Unshielded Twisted Pair (UTP). In both cases, the cabling is made up of pairs of wires twisted around each other.

**Shielded Twisted Pair (STP) Cable:** It is a special kind of copper telephone wiring used in business installations. An external shield which functions as a ground is added to the normal twisted pair telephone wires. Shielded cables can help in expanding the distance between the cables

**Unshielded Twisted Pair (UTP):** It is the most admired type of network cable in the world. UTP cable is used for both conventional telephone and computer networking.

*The various wiring schemes for UTP are:*

- CAT1 which is used for telephone wire. .
- CAT2 supports speeds up to 4 Mbps and used frequently for token ring networks.
- CAT3 and CAT4 are both used for Token Ring networks for higher network speeds.
- CAT5 wire is now replaced by the CAT5e designs providing an enhanced crosstalk specification allowing it to support speeds up to 1 Gbps. It is the most used network cabling specification in the world.
- CAT6 support speeds of 1 Gbps for length up to 100 meters and 10 Gbps up to 55 meters.
- The CAT7 is a fresh copper cable pattern which can support speeds of 10Gbps and length up to 100 meters

## 2. Implementing the cross-wired cable and straight through cable using crimping tool.

**Aim :** Implementing the cross-wired cable and straight through cable using crimping tool.

**Tools:** RJ-45 connectors, Crimping Tool, Ethernet cable

### **Description:**

Student need to arrange an ethernet cable of their own so that they can understand the arrangement of color coding for the straight through and cross-wired cable connections.

**Procedure :** To do these practical following steps should be done.

- i. Start by stripping off about 2 inches of the plastic jacket off the end of the cable. Be very careful at this point, as to not nick or cut into the wires, which are inside. Doing so could alter the characteristics of your cable, or even worse render is useless. Check the wires, one more time for nicks or cuts, if there are any, just whack the whole end off, and start over.
- ii. Spread the wires apart, but be sure to hold onto the base of the jacket with you other hand. You do not want the wires to become untwisted down inside the jacket. Category 5 cable must only have  $\frac{1}{2}$  of an inch of 'untwisted' wire at the end, otherwise it will be out of spec. at this point, you obviously have ALOT more than  $\frac{1}{2}$  of an inch of un-twisted wire.
- iii. You have 2 end jacks, which must be installed on your cable. If you are using a pre-made cable, with one of the ends whacked off, you only have one end to install the crossed over end. Below as two diagrams, which show how you need to arrange the cables for each type of cable end. Decide at this point which end you are making and examine the associated picture below.
- iv. Insert the cables into RJ-45 jack in desired order (straight through or cross-wired) as indicated in picture and use crimping tool to fix the connections.



Figure: RJ-45 Connector



Figure: Crimping tool for RJ-45 connector

RJ45 Pin # (END 1)	Wire Color	Diagram End #1	RJ45 Pin # (END 2)	Wire Color	Diagram End #2
1	White/Orange		1	White/Green	
2	Orange		2	Green	
3	White/Green		3	White/Orange	
4	Blue		4	White/Brown	
5	White/Blue		5	Brown	
6	Green		6	Orange	
7	White/Brown		7	Blue	
8	Brown		8	White/Blue	

Figure:  
you below to

wired connection

Diagram shows  
prepare cross

RJ45 Pin # (END 1)	Wire Color	Diagram End #1	RJ45 Pin # (END 2)	Wire Color	Diagram End #2
1	White/Orange		1	White/Green	
2	Orange		2	Green	
3	White/Green		3	White/Orange	
4	Blue		4	White/Brown	
5	White/Blue		5	Brown	
6	Green		6	Orange	
7	White/Brown		7	Blue	
8	Brown		8	White/Blue	

Figure: Diagram shows you how to prepare straight through wired connection

### 3. Configuration of network devices : HUB, switch and Routers.

**Aim :** Configuring the network devices : HUB, switch and Routers.

**Procedure :** To do these practical following steps should be done.

**Hub :** An Ethernet hub, active hub, network hub, repeater hub, hub or concentrator is a device for connecting multiple twisted pair or fiber optic Ethernet devices together and making them act as a single network segment. Hubs work at the physical layer (layer1) of the OSI model. The device is form of multiport repeater. Repeater hubs also participate in collision detection, forwarding a jam signal to all ports if it detects a collision.

**Switch :** A network switch or switching hub is a computer networking device that connects network segments. The term commonly refers to a network bridge that processes and routes data at the data link layer (layer 2 ) of the OSI model. Switches that additionally process data at the network layer (layer 3 and aboe) are often referred to as Layer 3 switches or multilayer switches.

**Routers :** A router is an electronic device that interconnects two or more computer networks, and selectively interchanges packets of data between them each data packet contains address information that a router can use to determine if the source and destination are on the same network, or if the data packet must be transferred from one network to another. Where multiple routers are used in a large collection of interconnected networks, the routers exchange information about target system addresses, so that each router can build up a table showing the preferred paths between any two systems on the interconnected networks.

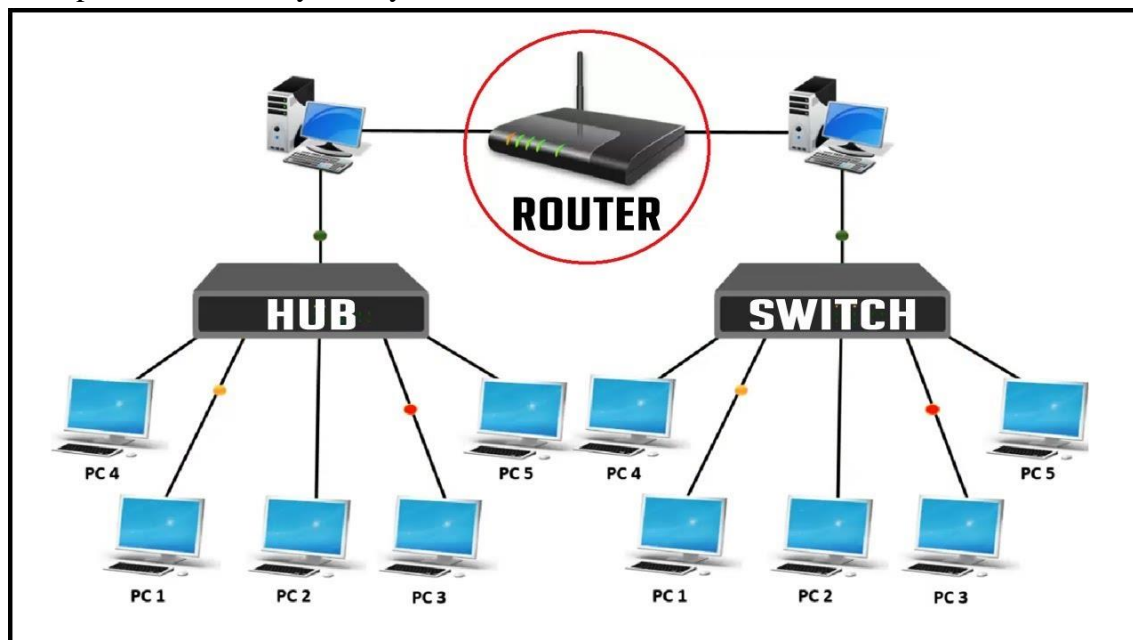


Figure: Hub, Switch Router

#### 4. Connect the computers in Local Area Network.

Aim : Connect the computers in Local Area Network

**Procedure :** *On the host computer, follow these steps to share the internet connection:*

- i. Log on to the host computer as Administrator or as Owner.
- ii. Click start, and then click control panel.
- iii. Click network and internet connections.
- iv. Click network connections.
- v. Right click the connection that you use to connect to the internet.
- vi. Click properties and Click the advanced tab.
- vii. Under Internet connection sharing, select the allow other network users to connect through this computers internet connection check box.
- viii. If you are sharing a dial-up internet connection, select the establish a dial-up connection wherever a computer on my network attempts to access the internet check box if you want to permit your computer to automatically connect to the internet.
- ix. Click ok you receive the following message.
- x. When internet connection sharing is enabled, your LAN adapter will be set to use IP address 192.168.0.1. your computer may lose connectivity with other computers on your network. If these other computers have static IP addresses, it is a a good idea to set them to obtain their IP addresses automatically. Are you sure you want to enable internet connection sharing ?
- xi. Click Yes : The connection to the internet is shared to other computer on the LAN. The network adapter that is connected to the LAN is configured with a static IP address of 192.168.0.1 and a subnet mask of 255.255.255.0.

***On the client computer***

- i. Log on to the client computer as administrator or as owner.
- ii. Click start, and then click control panel.
- iii. Click network and internet connections.
- iv. Click network connections.
- v. Right-click local area connection and then click properties.
- vi. Click the general tab, click internet protocol (TCP/IP) in the connection uses the following items list, and then click properties.
- vii. In the internet protocol(TCP/IP) properties dialog box, click obtain an IP address automatically (if it is not already selected), and then click OK
- viii. IP address 192.168.31.202
- ix. Subnet mask 255.255.255.0
- x. Default gateway 192.168.31.1
- xi. In the Local Area Connection Properties dialog box, click ok.
- xii. Quit control panel.

## 5. Establish peer to peer network connection using two systems using switch in a LAN.

**Aim :** Establish peer to peer network using switch in a LAN

**Procedure :**

- i. Start by stripping off about 2 inches of the plastic jacket off the end of the cable. Be very careful at this point, as to not nick or cut into the wires, which are inside. Doing so could alter the characteristics of your cable, or even worse render it useless. Check the wires, one more time for nicks or cuts, if there are any, just whack the whole end off, and start over.
- ii. Spread the wires apart, but be sure to hold onto the base of the jacket with you other hand. You do not want the wires to become untwisted down inside the jacket. Category 5 cable must only have  $\frac{1}{2}$  of an inch of 'untwisted' wire at the end, otherwise it will be out of spec. at this point, you obviously have ALOT more than  $\frac{1}{2}$  of an inch of un-twisted wire.
- iii. You have 2 end jacks, which must be installed on your cable. If you are using a pre-made cable, with one of the ends whacked off, you only have one end to install the crossed over end. Below as two diagrams, which show how you need to arrange the cables for each type of cable end. Decide at this point which end you are making and examine the associated picture below.

RJ45 Pin # (END 1)	Wire Color	Diagram End #1
1	White/Orange	
2	Orange	
3	White/Green	
4	Blue	
5	White/Blue	
6	Green	
7	White/Brown	
8	Brown	

***On the host computer, follow these steps to share the internet connection:***

- i. Log on to the host computer as Administrator or as Owner.
- ii. Click start, and then click control panel.
- iii. Click network and internet connections.
- iv. Click network connections.
- v. Right click the connection that you use to connect to the internet.
- vi. Click properties.
- vii. Click the advanced tab.

- viii. Under Internet connection sharing, select the allow other network users to connect through this computers internet connection check box.
- ix. If you are sharing a dial-up internet connection, select the establish a dial-up connection wherever a computer on my network attempts to access the internet check box if you want to permit your computer to automatically connect to the internet.
- x. Click ok you receive the following message.
- xi. When internet connection sharing is enabled, your LAN adapter will be set to use IP address 192.168.0.1. your computer may lose cnnectiveity with other computers on your network. If these other computers have static IP addresses, it is a agood idea to set them to obtain their IP addresses automatically. Are you sure you want to enable internet connection sharing ?
- xii. Click Yes : The connection to the internet is shared to other computer on the LAN. The network adapter that is connected to the LAN is configured with a static IP address of 192.168.0.1 and a subnet mask of 255.255.255.0.

***On the client computer***

- i. Log on to the client computer as administrator or as owner.
- ii. Click start, and then click control panel.
- iii. Click network and internet connections.
- iv. Click network connections.
- v. Right-click local area connection and then click properties.
- vi. Click the general tab, click internet protocol (TCP/IP) in the connection uses the following items list, and then click properties.
- vii. In the internet protocol(TCP/IP) properties dialog box, click obtain an IP address automatically (if it is not already selected), and then click OK
- viii. IP address 192.168.31.202
- ix. Subnet mask 255.255.255.0
- x. Default gateway 192.168.31.1
- xi. In the Local Area Connection Properties dialog box, click ok.
- xii. Quit control panel.



## 6. Design and configure different classes of IP, subnet mask and default gateway in a system in LAN (TCP/IP configuration).

**Aim :** Designing and configuring different classes of IP, subnet mask and default gateway in LAN

**Procedure :** Following is required to be study under this classification of IP address : As shown table we can find how the IP addresses are classified and when they are used.

Class	Address Range	Supports
Class A	1.0.0.1 to 126.255.255.254	Supports 16 million hosts on each of 127 networks.
Class B	128.1.0.1 to 191.255.255.254	Supports 65,000 hosts on each of 16,000 networks.
Class C	192.0.1.1 to 223.255.254.254	Supports 254 hosts on each of 2 million networks.
Class D	224.0.0.0 to 239.255.255.255	Reserved for multicast groups
Class E	240.0.0.0 to 254.255.255.254	Reserved.

**Sub Netting:** IP Subnetting is a process of dividing a large IP network in smaller IP networks. In Subnetting we create multiple small manageable networks from a single large IP network.

**Super Netting:** 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 Supernet or Supernet.

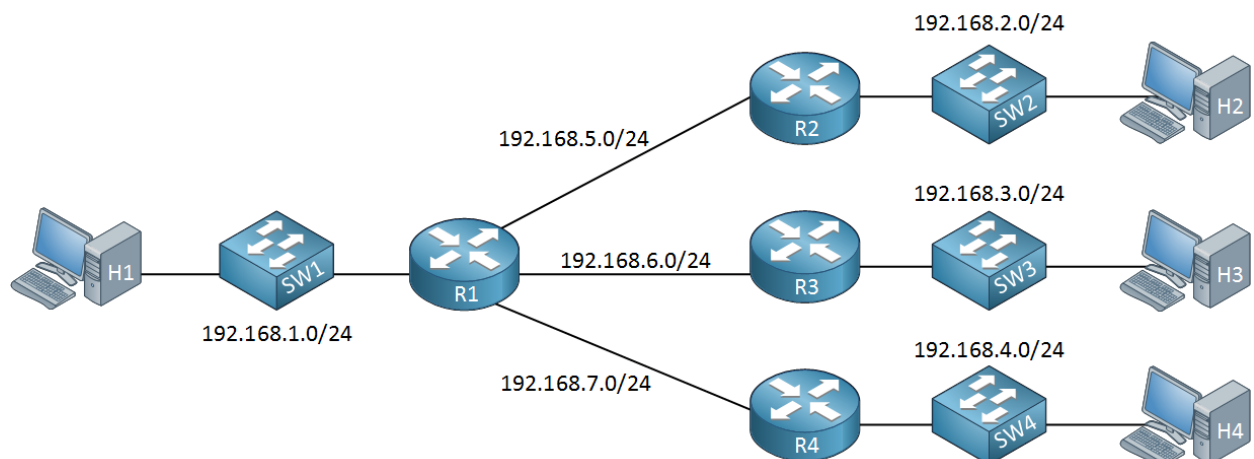


Figure: Subnetting



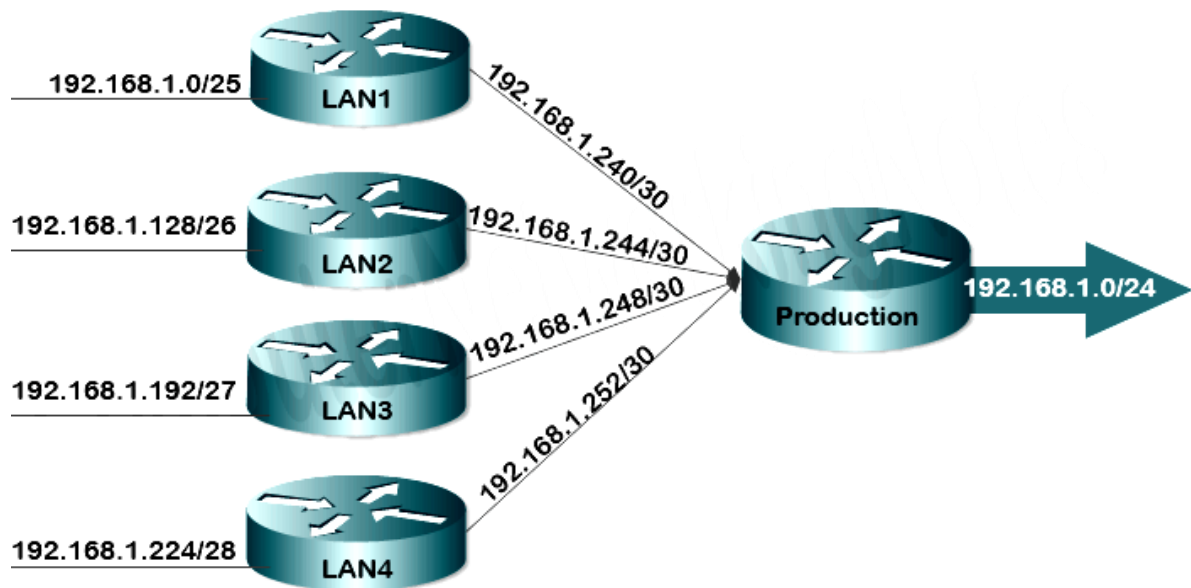


Figure: 8 subnets are summarized in single subnet.

## 7. Usage of basic network commands and Network configuration commands IP config, Ping, Tracer and Net stat utilities to debug the network issues

**Aim :** Usage of basic network commands and configuration commands (IPconfig, Ping, Tracer and net stat)

- **Ipconfig:** Displays all current TCP/IP network configuration values and refreshes Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) settings. This command is most useful on computers that are configured to obtain an IP address automatically. This enables users to determine which TCP/IP configuration values have been configured by DHCP, Automatic Private IP Addressing (APIPA), or an alternate configuration.

### Syntax

```
ipconfig [/all] [/renew [Adapter]] [/release [Adapter]] [/flushdns] [/displaydns]
[/registerdns] [/showclassid Adapter] [/setclassid Adapter [ClassID]]
```

### Examples:

ipconfig	To display the basic TCP/IP configuration for all adapters
ipconfig /all	To display the full TCP/IP configuration for all adapters
ipconfig /renew "Local Area Connection"	To renew a DHCP-assigned IP address configuration for only the Local Area Connection adapter
ipconfig /flushdns	To flush the DNS resolver cache when troubleshooting DNS name resolution problems
ipconfig /showclassid Local	To display the DHCP class ID for all adapters with names that start with Local
ipconfig /setclassid "Local Area Connection" TEST	To set the DHCP class ID for the Local Area Connection adapter to TEST

- **Ping:** Verifies IP-level connectivity to another TCP/IP computer by sending Internet Control Message Protocol (ICMP) Echo Request messages. The receipt of corresponding Echo Reply messages are displayed, along with round-trip times. Ping is the primary TCP/IP command used to troubleshoot connectivity, reachability, and name resolution.

### Syntax

```
ping
```

- **Tracert:** Determines the path taken to a destination by sending Internet Control Message Protocol (ICMP) Echo Request messages to the destination with incrementally increasing Time to Live (TTL) field values.

### Syntax

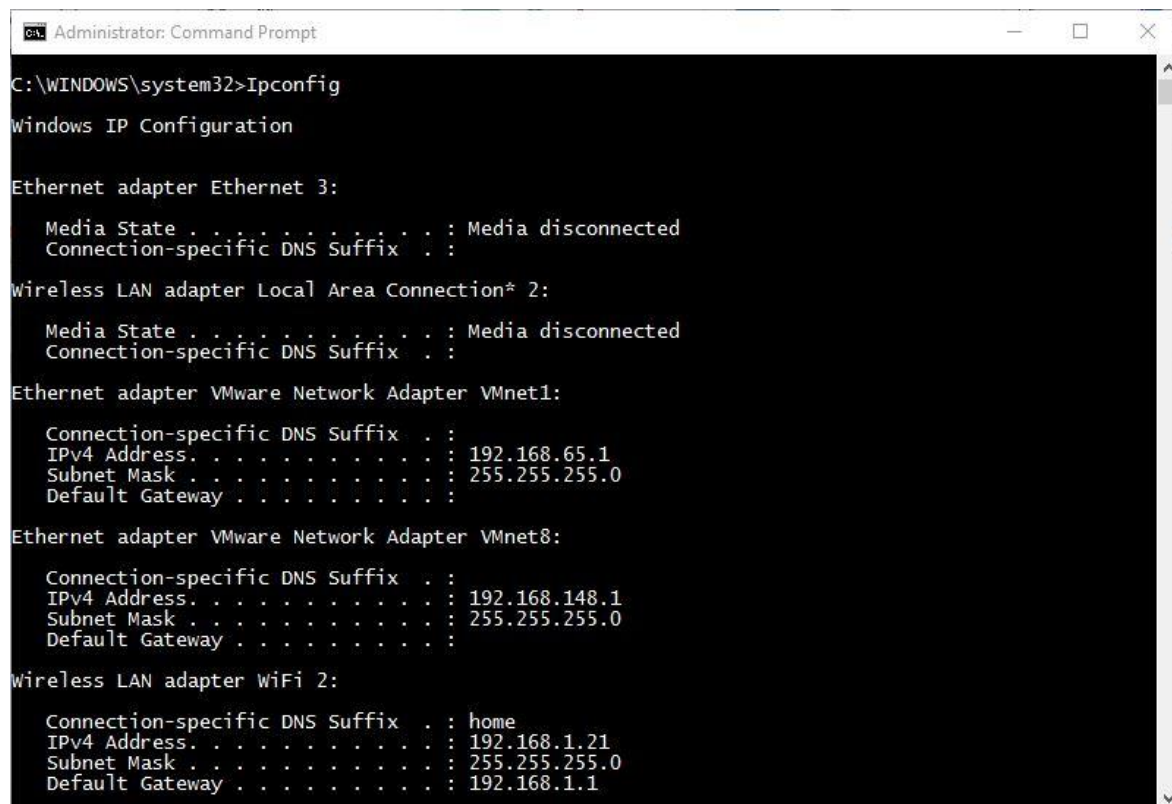
```
tracert
```

- **Netstat:** Displays active TCP connections, ports on which the computer is listening, Ethernet statistics, the IP routing table, IPv4 statistics (for the IP, ICMP, TCP, and UDP protocols), and IPv6 statistics (for the IPv6, ICMPv6, TCP over IPv6, and UDP over IPv6 protocols).

### Syntax

```
netstat [-a] [-e] [-n] [-o] [-p Protocol] [-r] [-s] [Interval]
```

parameters	
-a	Displays all active TCP connections and the TCP and UDP ports on which the computer is listening.
-e	Displays Ethernet statistics
-n	Displays active TCP connections
-o	Displays active TCP connections and includes the process ID (PID) for each connection. This parameter can be combined with -a, -n, and -p.
-p	Shows connections for the protocol specified by Protocol.
-s	Displays statistics by protocol.
-r	Displays the contents of the IP routing table. This is equivalent to the route print command.
Interval	Redisplays the selected information every Interval seconds. Press CTRL+C to stop the redisplay.
/?	- Displays help at the command prompt.



```

Administrator: Command Prompt
C:\WINDOWS\system32>Ipconfig

Windows IP Configuration

Ethernet adapter Ethernet 3:

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

Wireless LAN adapter Local Area Connection* 2:

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

Ethernet adapter VMware Network Adapter VMnet1:

    Connection-specific DNS Suffix  . :
    IPv4 Address. . . . . : 192.168.65.1
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :

Ethernet adapter VMware Network Adapter VMnet8:

    Connection-specific DNS Suffix  . :
    IPv4 Address. . . . . : 192.168.148.1
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :

Wireless LAN adapter WiFi 2:

    Connection-specific DNS Suffix  . : home
    IPv4 Address. . . . . : 192.168.1.21
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.1.1
  
```

```

C:\Users\LxsoftWin>netstat
Active Connections

```

Proto	Local Address	Foreign Address	State
TCP	127.0.0.1:49159	LxsoftWin-PC:56051	ESTABLISHED
TCP	127.0.0.1:49159	LxsoftWin-PC:56297	ESTABLISHED
TCP	127.0.0.1:49160	LxsoftWin-PC:49259	ESTABLISHED
TCP	127.0.0.1:49160	LxsoftWin-PC:55384	ESTABLISHED
TCP	127.0.0.1:49160	LxsoftWin-PC:55392	ESTABLISHED
TCP	127.0.0.1:49160	LxsoftWin-PC:55394	ESTABLISHED
TCP	127.0.0.1:49160	LxsoftWin-PC:55395	ESTABLISHED
TCP	127.0.0.1:49160	LxsoftWin-PC:55401	ESTABLISHED
TCP	127.0.0.1:49160	LxsoftWin-PC:55406	ESTABLISHED
TCP	127.0.0.1:49160	LxsoftWin-PC:55407	ESTABLISHED
TCP	127.0.0.1:49160	LxsoftWin-PC:55408	ESTABLISHED
TCP	127.0.0.1:49163	LxsoftWin-PC:49164	ESTABLISHED
TCP	127.0.0.1:49164	LxsoftWin-PC:49163	ESTABLISHED
TCP	127.0.0.1:49165	LxsoftWin-PC:49166	ESTABLISHED
TCP	127.0.0.1:49166	LxsoftWin-PC:49165	ESTABLISHED
TCP	127.0.0.1:49167	LxsoftWin-PC:49168	ESTABLISHED
TCP	127.0.0.1:49168	LxsoftWin-PC:49167	ESTABLISHED
TCP	127.0.0.1:49259	LxsoftWin-PC:49160	ESTABLISHED
TCP	127.0.0.1:51259	LxsoftWin-PC:51260	ESTABLISHED
TCP	127.0.0.1:51260	LxsoftWin-PC:51259	ESTABLISHED
TCP	127.0.0.1:55361	LxsoftWin-PC:55362	ESTABLISHED
TCP	127.0.0.1:55362	LxsoftWin-PC:55361	ESTABLISHED
TCP	127.0.0.1:55384	LxsoftWin-PC:49160	ESTABLISHED
TCP	127.0.0.1:55392	LxsoftWin-PC:49160	ESTABLISHED
TCP	127.0.0.1:55394	LxsoftWin-PC:49160	ESTABLISHED
TCP	127.0.0.1:55395	LxsoftWin-PC:49160	ESTABLISHED
TCP	127.0.0.1:55401	LxsoftWin-PC:49160	ESTABLISHED
TCP	127.0.0.1:55406	LxsoftWin-PC:49160	ESTABLISHED
TCP	127.0.0.1:55407	LxsoftWin-PC:49160	ESTABLISHED
TCP	127.0.0.1:55408	LxsoftWin-PC:49160	ESTABLISHED
TCP	127.0.0.1:56051	LxsoftWin-PC:49159	ESTABLISHED
TCP	127.0.0.1:56297	LxsoftWin-PC:49159	ESTABLISHED
TCP	192.168.42.171:55097	server-52-222-136-39:https	CLOSE_WAIT

```

C:\Users\LxsoftWin>ping google.com

Pinging google.com [172.217.24.238] with 32 bytes of data:
Reply from 172.217.24.238: bytes=32 time=1451ms TTL=53
Reply from 172.217.24.238: bytes=32 time=599ms TTL=53
Reply from 172.217.24.238: bytes=32 time=1438ms TTL=53
Reply from 172.217.24.238: bytes=32 time=1656ms TTL=53

Ping statistics for 172.217.24.238:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 599ms, Maximum = 1656ms, Average = 1286ms

C:\Users\LxsoftWin>

```

```

C:\Users\LxsoftWin>tracert www.google.in

Tracing route to www.google.in [2404:6800:4002:804::2003]
over a maximum of 30 hops:
  0  1 ms  <1 ms  <1 ms  2405:205:1506:8af7::2a84:b8a0
  1  *      *      *      Request timed out.
  2  472 ms 1839 ms *      2405:200:319:168::2
  3  1085 ms 829 ms 790 ms 2405:200:801:1600::91
  4  391 ms 1084 ms 1572 ms 2405:200:801:300::75
  5  2239 ms 1030 ms 1681 ms 2001:4860:1:1::1b6
  6  *      1022 ms 1179 ms 2001:4860:0:11de::1
  7  1009 ms 1253 ms 1623 ms 2001:4860:0:1::3d
  8  1170 ms 885 ms 1437 ms de103s09-in-x03.1e100.net [2404:6800:4002:804::2003]

Trace complete.

C:\Users\LxsoftWin>

```

## **8. Transfer files between systems in LAN, install Printer in a LAN and share the printer in a network.**

**Aim :** Transfer files between systems and installation of printer and sharing printer in a LAN.

**Procedure :** Follow the steps ;

### **To transfer files between systems in LAN.**

- i. Log on the system.
- ii. Open computer explorer.
- iii. Select the file has to transfer.
- iv. Right click on it and press copy option.
- v. Select network in the explorer.
- vi. Select the computer name where to transfer the selected file in the LAN.
- vii. Double click on the system name.
- viii. Open the folder/drive where has to transfer.
- ix. Right click and press on paste option.

### **On the system where the printer connected.**

#### **To install printer :**

- i. Log on the system.
- ii. Connect the printer in USB connection.
- iii. Do not switch on the printer.
- iv. Insert the CD of the printer driver software.
- v. Open My computer/ explore computer.
- vi. Select CD drive and double click on it.
- vii. Double click on setup exe. File.
- viii. It will leads to installation process.
- ix. When it asks for the printer connection, switch on the printer.
- x. The installation process completes and shows the printer is successfully installed.
- xi. Press OK button.

#### **To share the printer :**

- i. Log on to the system where the printer is connected.
- ii. Press on start button.
- iii. Select option devices and printers.
- iv. Select installed printer on the system.
- v. Right click on the printer.
- vi. Go to properties option.
- vii. Select sharing menu.
- viii. In the option “share the printer as” select the printer name.

- ix. Check on the option share.
- x. Press ok button.

**On the system where the printer has to shared.**

- i. Log on to the system.
- ii. Press on start button.
- iii. Select option devices and printer.
- iv. Click on the add printer button.
- v. Click on search printer on network.
- vi. Select the printer name in the list.
- vii. Press OK button.

## **9. Install and configure wireless NIC and transfer files between systems wireless LAN.**

**Aim :** Installation and configuring wireless NIC and transfer files between systems in LAN.

**Procedure :** Follow the steps :

### **On the server system :**

- i. Connection the wireless NIC to the server system.
- ii. Switch on the server system.
- iii. Insert the Driver software CD of wireless NIC.
- iv. Installation process starts and go on clicking Next button.
- v. When installation process completes press on finish button.
- vi. Select the icon present on the right bottom side of desktop.
- vii. Double click on it.
- viii. Choose settings button.
- ix. Set the IP address and configure the settings.
- x. Press OK button.

### **On the client system :**

- i. Connection the wireless NIC to the server system.
- ii. Switch on the client system.
- iii. Insert the Driver software CD of wireless NIC.
- iv. Installation process starts and go on clicking Next button.
- v. When installation process completes press on finish button.
- vi. Select the icon present on the right bottom side of desktop.
- vii. Double click on it.
- viii. Choose settings button.
- ix. Set the IP address and configure the settings.
- x. Press OK button.

### **Transfer the files :**

#### **To transfer files between systems in wireless LAN.**

- i. Log on the system.
- ii. Open computer explorer.
- iii. Select the file has to transfer.
- iv. Right click on it and press copy option.
- v. Select network in the explorer.
- vi. Select the computer name where to transfer the selected file in the LAN.
- vii. Double click on the system name.
- viii. Open the folder/drive where has to transfer.
- ix. Right click and press on paste option.