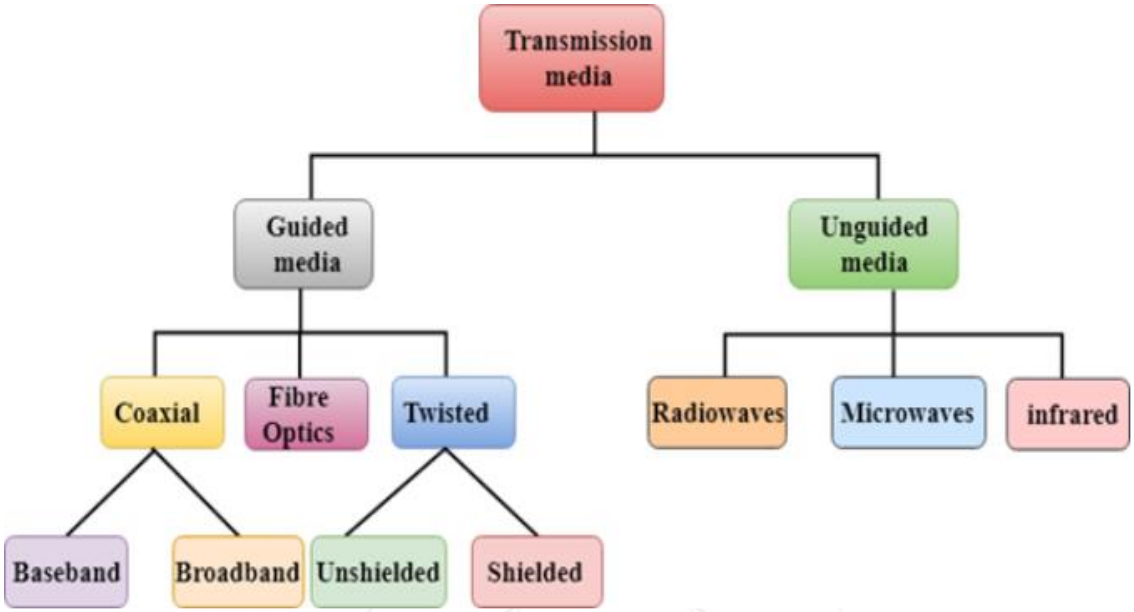
EXPERIMENT-1

AIM : Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.

APPARATUS (Components): RJ-45 connector, Clamping Tool, Twisted pair Cable

DESCRIPTION : Network cables are essential components of data communication and play a critical role in connecting various devices to create networks. Different types of network cables are designed to meet specific needs, offering varying levels of speed, reliability, and flexibility. Here's an overview of some common types of network cables:



Coaxial Cable:

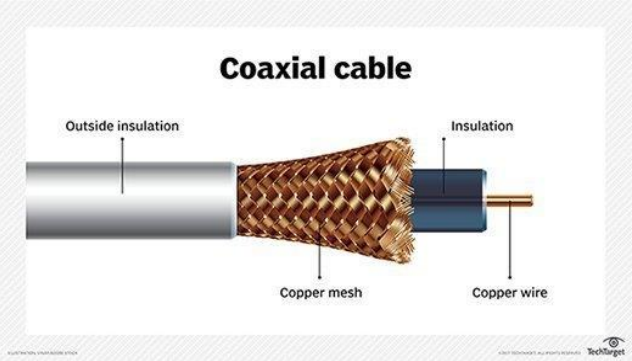
- Coaxial cables are commonly used for cable television (CATV) and broadband internet connections.
- They are capable of carrying a wide range of frequencies and can offer high-speed data transmission.

  Baseband Transmission:

  Baseband transmission sends a single digital signal over a coaxial cable.
  - It utilizes the entire bandwidth of the cable for this one signal.
  - Commonly used in digital data applications like Ethernet networks.
  - Signal quality degrades over longer cable lengths due to signal attenuation.
  - Unsuitable for sharing the cable with multiple signals or channels.

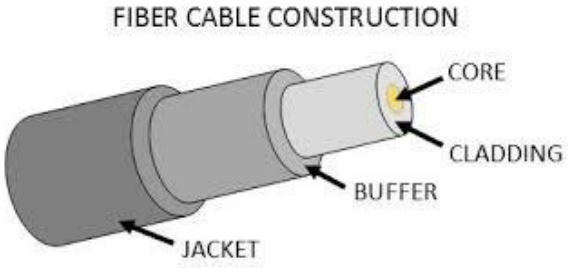
Broadband Transmission: Broadband transmission allows multiple analog signals or channels to coexist on the same coaxial cable.

- Different signals occupy distinct frequency bands within the cable's available spectrum.
- Used in applications like cable television (CATV), satellite TV, and broadband internet.
- The cable's wider bandwidth supports simultaneous transmission of multiple channels without interference.



Fiber Optic Cable (Single-mode and Multi-mode):

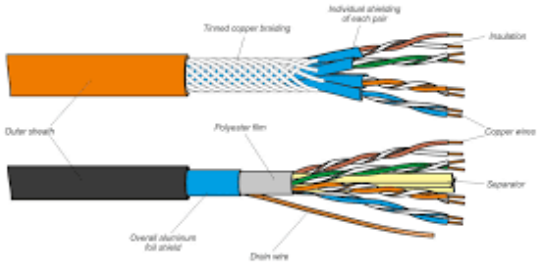
- Fiber optic cables use light signals to transmit data, providing very high-speed and long-distance communication.
- Single-mode fiber: Suitable for long-distance, high-bandwidth applications and can transmit data over vast distances.
- Multi-mode fiber: Used for shorter distances, typically within buildings, and supports lower data rates than single-mode fiber.



Twisted Pair Cable (Unshielded and Shielded):

- Twisted pair cables are used for various applications, including telephone lines and Ethernet.
- Unshielded Twisted Pair (UTP): Commonly used for Ethernet connections, available in Cat 5e, Cat 6, and higher categories.Shielded Twisted Pair (STP): Provides

additional shielding to reduce electromagnetic interference and is used in environments with high interference potential.



Twisted pair cable	Co-axial cable	Optical fiber
1. Transmission of signals takes place in the electrical form over the metallic conducting wires.	1. Transmission of signals takes place in the electrical form over the inner conductor of the cable.	1. Signal transmission takes place in an optical forms over a glass fiber.
2. In this medium the noise immunity is low.	2. Coaxial having higher noise immunity than twisted pair cable.	2. Optical fiber has highest noise immunity as the light rays are unaffected by the electrical noise.
3. Twisted pair cable can be affected due to external magnetic field.	3. Coaxial cable is less affected due to external magnetic field.	3. Not affected by the external magnetic field.
4. Cheapest medium.	4. Moderate Expensive.	4. Expensive
5. Low Bandwidth.	5. Moderately high bandwidth.	5. Very high bandwidth
6. Attenuation is very high.	6. Attenuation is low.	6. Attenuation is very low.
7. Installation is easy.	7. Installation is fairly easy.	7. Installation is difficult.

NETWORK DEVICES :

1. **Repeater:**Functioning at Physical Layer.A **repeater** is an electronic device that receives a signal and retransmits it at a higher level and/or higher power, or onto the other side of an obstruction, so that the signal can cover longer distances. Repeater have two ports ,so cannot be use to connect for more than two devices

2. **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 (layer 1) of the OSI model. The device is a form of multiport repeater. Repeater hubs also participate in collision detection, forwarding a jam signal to all ports if it detects a collision.

3. **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 above) are often referred to as Layer 3 switches or multilayer switches.

4. **Bridge:** A **network bridge** connects multiple network segments at the data link layer (Layer 2) of the OSI model. In Ethernet networks, the term *bridge* formally means a device that behaves according to the IEEE 802.1D standard. A bridge and switch are very much alike; a switch being a bridge with numerous ports. *Switch* or *Layer 2 switch* is often used interchangeably with *bridge*.Bridges can analyze incoming data packets to determine if the bridge is able to send the given packet to another segment of the network.

5. **Router:** 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.

6. **Gate Way:** In a communications network, a network node equipped for interfacing with
another network that uses different protocols.

- A gateway may contain devices such as protocol translators, impedance matching devices, rate converters, fault isolators, or signal translators as necessary to provide system interoperability. It also requires the establishment of mutually acceptable administrative procedures between both networks.
- A protocol translation/mapping gateway interconnects networks with different network protocol technologies by performing the required protocol conversions.

PROCEDURE : To do these practical following steps should be done:

1. 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.

2. Spread the wires apart, but be sure to hold onto the base of the jacket with your other hand. You do not want the wires to become untwisted down inside the jacket. Category 5 cable must only have 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 1/2 of an inch of un-twisted wire.

3. 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 are 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.

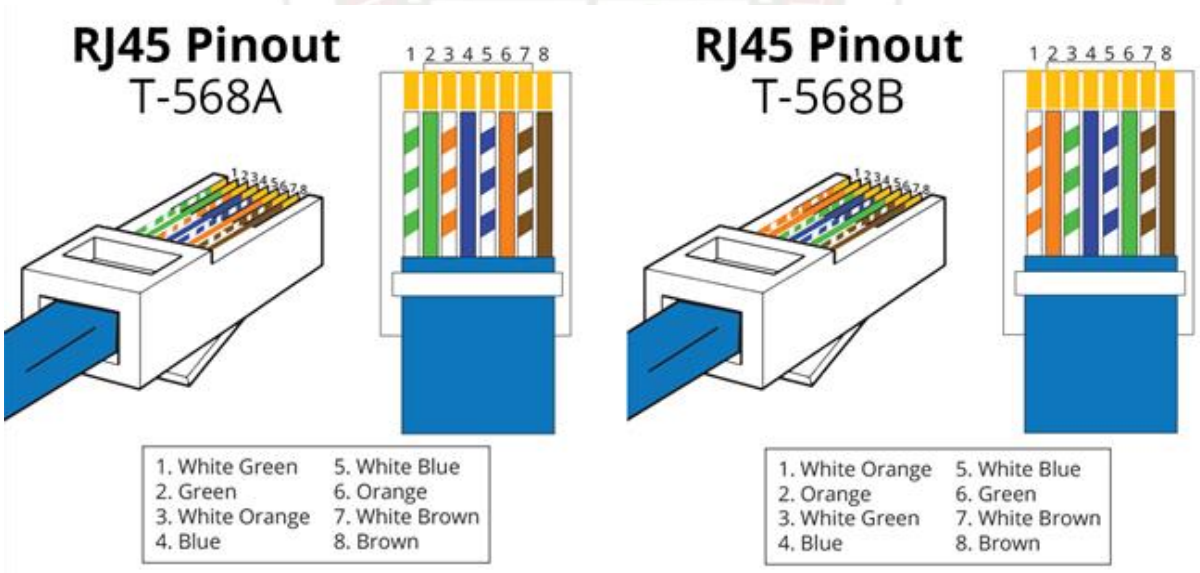
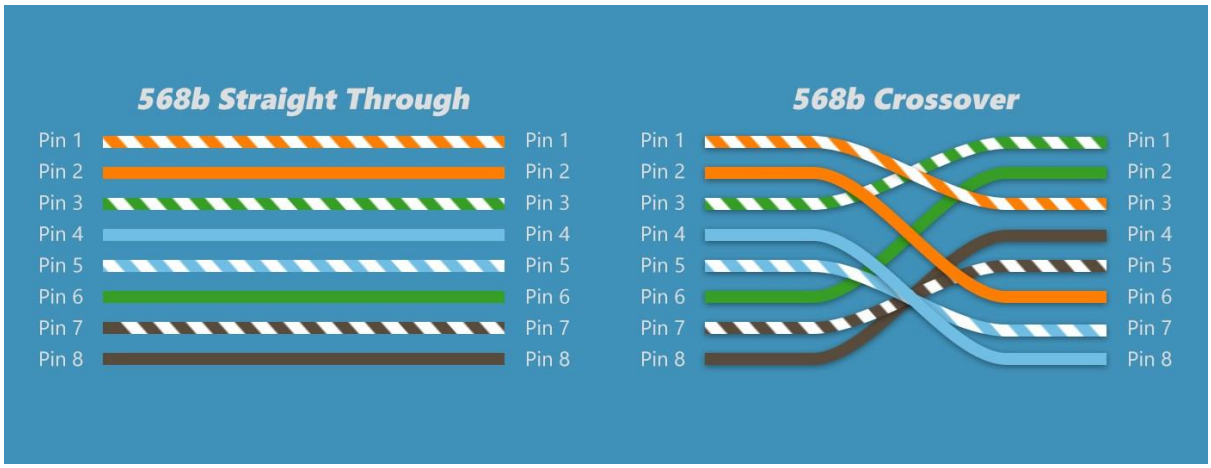


Diagram of Cross wired connection and straight through wired connection



OUTPUT : Cross wired cable and straight through cable connections were implemented successfully.

EXPERIMENT -2

AIM: To study of basic network command and Network configuration commands

COMPONENTS:

- Command prompt

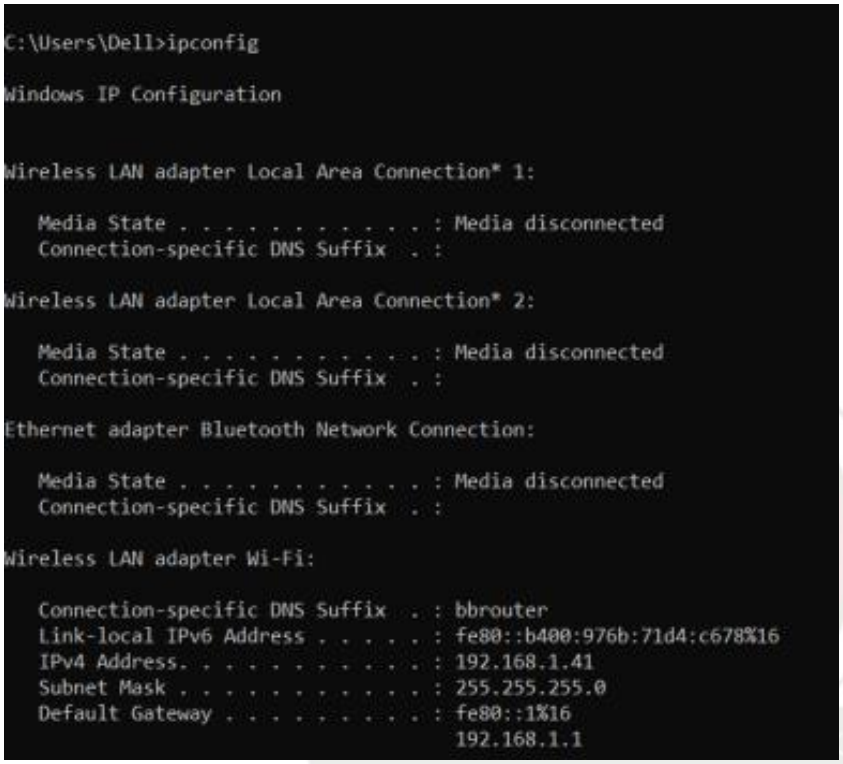
DESCRIPTION: **Ping : ping** is a command-line utility that checks the connection between your device and a target host by sending small packets and measuring the response time. It helps troubleshoot network issues and assesses the reachability and performance of a networked device. Syntax: ping [hostname or IP address]

```
C:\Users\Dell>ping google.com

Pinging google.com [142.250.183.174] with 32 bytes of data:
Reply from 142.250.183.174: bytes=32 time=446ms TTL=57
Reply from 142.250.183.174: bytes=32 time=62ms TTL=57
Reply from 142.250.183.174: bytes=32 time=61ms TTL=57
Reply from 142.250.183.174: bytes=32 time=222ms TTL=57

Ping statistics for 142.250.183.174:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 61ms, Maximum = 446ms, Average = 197ms
```

getmac: getmac is a Windows command that retrieves the Media Access Control (MAC) addresses for all network interfaces on your computer. It displays the physical hardware addresses, aiding in network identification and troubleshooting. This command is useful for verifying device connections and ensuring network security.
Syntax: getmac

```
C:\Users\Dell>getmac

Physical Address    Transport Name
=================== ============================================================
4C-44-5B-0C-43-74   \Device\Tcpip_{DD5109BC-4609-4D3B-A423-90DAED44CDBD}
4C-44-5B-0C-43-78   Media disconnected
```

Ipconfig: ipconfig is a command that provides information about the network configuration of your computer. Running it in the Command Prompt displays details such as the IP address, subnet mask, and default gateway for all network interfaces. This command is useful for diagnosing and managing network settings on a system.
Syntax: ipconfig



tracert: tracert is a command-line tool used to trace the route that data packets take from your computer to a destination IP address or hostname. It provides a list of all the routers (hops) in the path, along with their response times, aiding in diagnosing network connectivity issues. The command is valuable for analyzing the network path and identifying potential points of failure**.**
Syntax: tracert [www.example.com]

```
C:\Users\Dell>tracert instagram.com

Tracing route to instagram.com [163.70.140.174]
over a maximum of 30 hops:

  1    49 ms     8 ms    39 ms  Earth-2022.bbrouter [192.168.1.1]
  2   119 ms     *      934 ms  172.16.92.1
  3    22 ms     *        *     static-202-65-134-5.pol.net.in [202.65.134.5]
  4   112 ms    41 ms    54 ms  static-182.pol.net.in [202.65.136.182]
  5     *       13 ms    17 ms  198.18.152.29
  6   637 ms     *      240 ms  ae1.pr02.hyd1.tfbnw.net [157.240.82.174]
  7   107 ms   152 ms   103 ms  po202.asw03.hyd1.tfbnw.net [129.134.96.224]
  8    46 ms    48 ms    30 ms  psw01.hyd1.tfbnw.net [129.134.115.158]
  9   344 ms   263 ms   468 ms  173.252.67.9
 10   474 ms   468 ms    20 ms  instagram-p42-shv-01-hyd1.fbcdn.net [163.70.140.174]

Trace complete.
```

Nslookup: nslookup is a command-line tool for querying Domain Name System (DNS) to obtain information about domain names, IP addresses, and mail exchange servers. It helps troubleshoot and verify DNS-related issues by providing detailed domain information and resolving DNS queries. The command is useful for network administrators and individuals seeking to inspect or troubleshoot DNS configurations.
Syntax: nslookup [www.example.com]

```
C:\Users\Dell>nslookup youtube.com
Server:  Earth-2022.bbrouter
Address:  192.168.1.1

DNS request timed out.
    timeout was 2 seconds.
Non-authoritative answer:
Name:    youtube.com
Addresses:  2404:6800:4009:82f::200e
          142.250.182.206


C:\Users\Dell>nslookup
Default Server:  Earth-2022.bbrouter
Address:  192.168.1.1
```

Ipconfig/all: ipconfig /all shows comprehensive details about your computer's network interfaces, including IP addresses, DHCP settings, and MAC addresses, aiding in thorough network configuration analysis.
Syntax: ipconfig/all

```
C:\Users\Dell>ipconfig/all

Windows IP Configuration

   Host Name . . . . . . . . . . . . : sushma
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Hybrid
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No
   DNS Suffix Search List. . . . . . : bbrouter

Wireless LAN adapter Local Area Connection* 1:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
   Physical Address. . . . . . . . . : 4C-44-5B-0C-43-75
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Local Area Connection* 2:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Microsoft Wi-Fi Direct Virtual Adapter #2
   Physical Address. . . . . . . . . : 4E-44-5B-0C-43-74
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
```

```
Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . : bbrouter
   Description . . . . . . . . . . . : Intel(R) Wi-Fi 6 AX201 160MHz
   Physical Address. . . . . . . . . : 4C-44-5B-0C-43-74
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::b400:976b:71d4:c678%16(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.1.41(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : 18 November 2023 17:47:38
   Lease Expires . . . . . . . . . . : 19 November 2023 18:44:12
   Default Gateway . . . . . . . . . : fe80::1%16
                                       192.168.1.1
   DHCP Server . . . . . . . . . . . : 192.168.1.1
   DHCPv6 IAID . . . . . . . . . . . : 172770395
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-2B-5E-A4-CD-4C-44-5B-0C-43-74
   DNS Servers . . . . . . . . . . . : 192.168.1.1
   NetBIOS over Tcpip. . . . . . . . : Enabled

Ethernet adapter Bluetooth Network Connection:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Bluetooth Device (Personal Area Network)
   Physical Address. . . . . . . . . : 4C-44-5B-0C-43-78
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
```

Hostname: The hostname command in the Command Prompt displays the name of the computer on a system. Running hostname without any additional parameters shows the computer's host name. This command is useful for quickly identifying the name assigned to a computer within a network environment.

Syntax: hostname

```
C:\Users\Dell>hostname
sushma
```

Address resolution protocol (ARP):

The arp command in the Command Prompt is used to display and manage the Address Resolution Protocol (ARP) cache. Running arp -a shows a list of IP addresses and their corresponding Media Access Control (MAC) addresses. This command is useful for troubleshooting and verifying the mapping of IP addresses to MAC addresses on a local network.

Syntax: arp -a

```
C:\Users\Dell>arp -a

Interface: 192.168.1.41 --- 0x10
  Internet Address      Physical Address      Type
  192.168.1.1           bc-62-d2-e4-2b-80     dynamic
  224.0.0.2             01-00-5e-00-00-02     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static
```

Systeminfo: systeminfo is a Windows command that provides detailed information about your computer's configuration, including OS version, build, and installation date. Running systeminfo /s [hostname] retrieves system details from a remote computer. This command is valuable for obtaining a comprehensive overview of a system's hardware and software specifications.

Syntax: systeminfo

```
C:\Users\Dell>systeminfo

Host Name:                 SUSHMA
OS Name:                   Microsoft Windows 11 Home Single Language
OS Version:                10.0.22000 N/A Build 22000
OS Manufacturer:           Microsoft Corporation
OS Configuration:          Standalone Workstation
OS Build Type:             Multiprocessor Free
Registered Owner:          Dell
Registered Organization:   N/A
Product ID:                00342-42611-63816-AAOEM
Original Install Date:     17-06-2022, 20:06:27
System Boot Time:          27-10-2023, 07:49:01
System Manufacturer:       Dell Inc.
System Model:              Inspiron 15 5518
System Type:               x64-based PC
Processor(s):              1 Processor(s) Installed.
                           [01]: Intel64 Family 6 Model 140 Stepping 2 GenuineIntel ~2496 Mhz
BIOS Version:              Dell Inc. 2.18.0, 13-03-2023
Windows Directory:         C:\Windows
System Directory:          C:\Windows\system32
Boot Device:               \Device\HarddiskVolume1
System Locale:             en-us;English (United States)
Input Locale:              00004009
Time Zone:                 (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi
Total Physical Memory:     16,123 MB
Available Physical Memory: 7,267 MB
Virtual Memory: Max Size:  18,555 MB
Virtual Memory: Available: 8,492 MB
Virtual Memory: In Use:    10,063 MB
Page File Location(s):     C:\pagefile.sys
Domain:                    WORKGROUP
Logon Server:              \\SUSHMA
Hotfix(s):                 8 Hotfix(s) Installed.
                           [01]: KB5028947
                           [02]: KB5030650
                           [03]: KB5027125
                           [04]: KB5011048
                           [05]: KB5012170
                           [06]: KB5031358
                           [07]: KB5028319
                           [08]: KB5031591
Network Card(s):           2 NIC(s) Installed.
                           [01]: Intel(R) Wi-Fi 6 AX201 160MHz
                                 Connection Name: Wi-Fi
                                 DHCP Enabled:    Yes
                                 DHCP Server:     192.168.1.1
                                 IP address(es)
                                 [01]: 192.168.1.41
                                 [02]: fe80::b400:976b:71d4:c678
                           [02]: Bluetooth Device (Personal Area Network)
                                 Connection Name: Bluetooth Network Connection
                                 Status:          Media disconnected
Hyper-V Requirements:      VM Monitor Mode Extensions: Yes
                           Virtualization Enabled In Firmware: Yes
                           Second Level Address Translation: Yes
                           Data Execution Prevention Available: Yes
```

Netstat: netstat is a command that provides a snapshot of active network connections and listening ports, aiding in network monitoring and troubleshooting.
Syntax: netstat

```
C:\Users\Dell>netstat

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    127.0.0.1:56282        sushma:56284           ESTABLISHED
  TCP    127.0.0.1:56284        sushma:56282           ESTABLISHED
  TCP    127.0.0.1:56294        sushma:56299           ESTABLISHED
  TCP    127.0.0.1:56299        sushma:56294           ESTABLISHED
  TCP    127.0.0.1:57289        sushma:56281           TIME_WAIT
  TCP    127.0.0.1:57292        sushma:56281           TIME_WAIT
  TCP    127.0.0.1:57298        sushma:56281           TIME_WAIT
  TCP    127.0.0.1:57302        sushma:56281           TIME_WAIT
  TCP    192.168.1.41:49510     20.198.118.190:https   ESTABLISHED
  TCP    192.168.1.41:56224     13.73.252.139:8883     ESTABLISHED
  TCP    192.168.1.41:56348     whatsapp-cdn-shv-01-hyd1:https  ESTABLISHED
  TCP    192.168.1.41:56383     20.198.118.190:https   ESTABLISHED
  TCP    192.168.1.41:56432     91:7500                ESTABLISHED
  TCP    192.168.1.41:56577     a182-18-179-81:http    TIME_WAIT
  TCP    192.168.1.41:56775     se-in-f188:5228        ESTABLISHED
  TCP    192.168.1.41:56780     a182-18-179-74:http    TIME_WAIT
  TCP    192.168.1.41:56809     ec2-52-35-109-173:https  CLOSE_WAIT
  TCP    192.168.1.41:56868     a184-28-173-145:https  CLOSE_WAIT
  TCP    192.168.1.41:56869     a184-28-173-145:https  CLOSE_WAIT
  TCP    192.168.1.41:56870     a184-28-173-145:https  CLOSE_WAIT
  TCP    192.168.1.41:56871     a184-28-173-145:https  CLOSE_WAIT
  TCP    192.168.1.41:56872     a184-28-173-145:https  CLOSE_WAIT
  TCP    192.168.1.41:56873     a184-28-173-145:https  CLOSE_WAIT
  TCP    192.168.1.41:56875     a184-28-173-121:https  CLOSE_WAIT
  TCP    192.168.1.41:56876     a184-28-173-121:https  CLOSE_WAIT
  TCP    192.168.1.41:56877     a184-28-173-121:https  CLOSE_WAIT
  TCP    192.168.1.41:56878     a184-28-173-121:https  CLOSE_WAIT
  TCP    192.168.1.41:56886     13.107.4.254:https     ESTABLISHED
  TCP    192.168.1.41:56890     a23-65-124-80:https    CLOSE_WAIT
  TCP    192.168.1.41:56891     a23-65-124-80:https    CLOSE_WAIT
  TCP    192.168.1.41:56892     a23-65-124-80:https    CLOSE_WAIT
  TCP    192.168.1.41:56893     a23-65-124-80:https    CLOSE_WAIT
  TCP    192.168.1.41:56894     a23-65-124-80:https    CLOSE_WAIT
  TCP    192.168.1.41:56895     a23-65-124-80:https    CLOSE_WAIT
  TCP    192.168.1.41:56896     a23-65-124-80:https    CLOSE_WAIT
  TCP    192.168.1.41:56897     a23-65-124-80:https    CLOSE_WAIT
  TCP    192.168.1.41:56898     a23-65-124-80:https    CLOSE_WAIT
  TCP    192.168.1.41:56899     a23-65-124-80:https    CLOSE_WAIT
  TCP    192.168.1.41:56900     a23-65-124-80:https    ESTABLISHED
  TCP    192.168.1.41:56901     a23-65-124-80:https    CLOSE_WAIT
  TCP    192.168.1.41:57142     ec2-13-126-70-76:https  ESTABLISHED
```

Pathping: pathping is a command that combines the functionalities of **tracert** and **ping** to analyze the route to a destination and measure packet loss. Running this command displays detailed information about each hop, including round-trip times and packet loss percentages. This command is useful for diagnosing network issues and assessing the performance of individual network segments. Syntax: pathping [www.example.com]

```
C:\Users\Dell>pathping facebook.com

Tracing route to facebook.com [163.70.140.35]
over a maximum of 30 hops:
  0  sushma.bbrouter [192.168.1.41]
  1  Earth-2022.bbrouter [192.168.1.1]
  2  172.16.92.1
  3     *     static-202-65-134-5.pol.net.in [202.65.134.5]
  4  static-182.pol.net.in [202.65.136.182]
  5  198.18.152.29
  6  ae1.pr02.hyd1.tfbnw.net [157.240.82.174]
  7  po202.asw01.hyd1.tfbnw.net [129.134.96.208]
  8  psw02.hyd1.tfbnw.net [129.134.115.157]
  9  157.240.38.141
 10  edge-star-mini-shv-01-hyd1.facebook.com [163.70.140.35]

Computing statistics for 250 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                           sushma.bbrouter [192.168.1.41]
                                 1/ 100 =  1%   |
  1   66ms     3/ 100 =  3%     2/ 100 =  2%  Earth-2022.bbrouter [192.168.1.1]
                                 0/ 100 =  0%   |
  2   67ms     1/ 100 =  1%     0/ 100 =  0%  172.16.92.1
                                 0/ 100 =  0%   |
  3   47ms     2/ 100 =  2%     1/ 100 =  1%  static-202-65-134-5.pol.net.in [202.65.134.5]
                                 0/ 100 =  0%   |
  4   56ms     2/ 100 =  2%     1/ 100 =  1%  static-182.pol.net.in [202.65.136.182]
                                 0/ 100 =  0%   |
  5   61ms     4/ 100 =  4%     3/ 100 =  3%  198.18.152.29
                                 0/ 100 =  0%   |
  6   48ms     1/ 100 =  1%     0/ 100 =  0%  ae1.pr02.hyd1.tfbnw.net [157.240.82.174]
                                 0/ 100 =  0%   |
  7   57ms     3/ 100 =  3%     2/ 100 =  2%  po202.asw01.hyd1.tfbnw.net [129.134.96.208]
                                 0/ 100 =  0%   |
  8   71ms     1/ 100 =  1%     0/ 100 =  0%  psw02.hyd1.tfbnw.net [129.134.115.157]
                                 0/ 100 =  0%   |
  9   60ms     1/ 100 =  1%     0/ 100 =  0%  157.240.38.141
                                 0/ 100 =  0%   |
 10   55ms     1/ 100 =  1%     0/ 100 =  0%  edge-star-mini-shv-01-hyd1.facebook.com [163.70.140.35]

Trace complete.
```

Color: The color command in the Command Prompt is used to set the text and background color. Running color [hex] changes the console color, where hex is a combination of two hexadecimal digits. This command enhances visual distinction in the Command Prompt interface for improved readability.

Syntax: color [attr]

```
C:\Users\Dell>color help
Sets the default console foreground and background colors.

COLOR [attr]

  attr        Specifies color attribute of console output

Color attributes are specified by TWO hex digits -- the first
corresponds to the background; the second the foreground.  Each digit
can be any of the following values:

    0 = Black       8 = Gray
    1 = Blue        9 = Light Blue
    2 = Green       A = Light Green
    3 = Aqua        B = Light Aqua
    4 = Red         C = Light Red
    5 = Purple      D = Light Purple
    6 = Yellow      E = Light Yellow
    7 = White       F = Bright White

If no argument is given, this command restores the color to what it was
when CMD.EXE started.  This value either comes from the current console
window, the /T command line switch or from the DefaultColor registry
value.

The COLOR command sets ERRORLEVEL to 1 if an attempt is made to execute
the COLOR command with a foreground and background color that are the
same.

Example: "COLOR fc" produces light red on bright white
```

```
C:\Users\Dell>color 49

C:\Users\Dell>color 0F
```

CONCLUSION : Network commands were demonstrated successfully.

EXPERIMENT-3

AIM: To study the network of IP

DESCRIPTION:

➢ IP addresses (Internet Protocol addresses) are numerical labels assigned to devices on a computer network. They serve as unique identifiers for each device, allowing data to be routed accurately across the internet or local network.

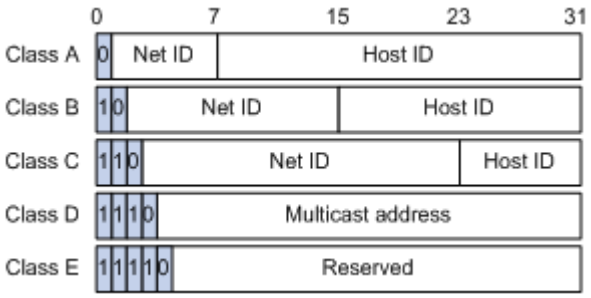
➢ There are two main formats of IP addresses - IPv4 and IPv6.

- IPv4 addresses are 32-bit numerical labels written in the format of four sets of numbers separated by dots (e.g., 192.168.1.1).
- IPv6 addresses are 128-bit alphanumeric strings, providing a vastly larger pool of possible unique addresses.

➢ IP addresses can be categorized as private or public.

- Private IP addresses are used within a local network and are not directly accessible from the internet.
- Public IP addresses are assigned by Internet Service Providers (ISPs) and are used for communication over the internet.

➢ IP addresses are often divided into subnets to improve network efficiency and organization. Subnetting allows for the creation of smaller, more manageable network segments within a larger network, enhancing security and performance. IP addresses are classified into 5 classes. They are: A,B,C,D,E



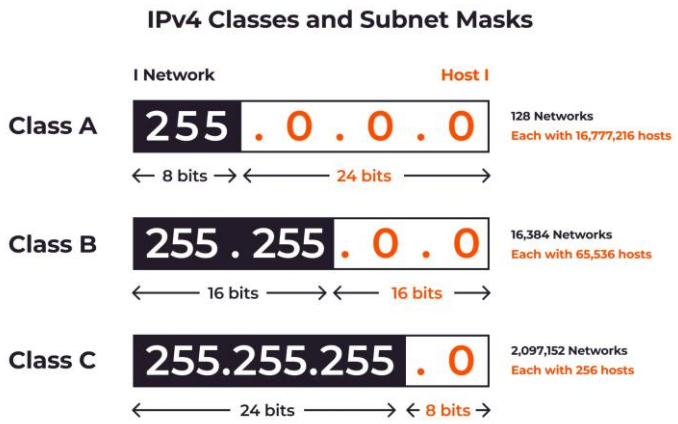
IP addresses range Table

Class	IP address ranges
A	1.0.0.1 to 126.255.255.254
B	128.1.0.1 to 191.155.255.254
C	192.0.1.1 to 223.255.254.254
D	224.0.0.0 to 239.255.255.255
E	240.0.0.0 to 254.255.255.254

Special purpose IP addresses:

- ➢ Reserved for private use
  - 10.x.x.x(Class A)
  - 172.16.x.x – 172.31.x.x(Class B)
  - 192.168.x.x(Class C)
- ➢ Loopback/Local address
  - 127.0.0.0 – 127.255.255.255
- ➢ Default network
  - 0.0.0.0
- ➢ Limited broadcast
  - 255.255.255.255

Subnet Mask : A subnet mask is a 32-bit address that segregates an IP address into network bits that identify the network and host bits that identify the host device operating on that network. It encapsulates a range of IP addresses that a subnet can use, wherein the subnet refers to a smaller network within a more extensive network.



EXPERIMENT-4

AIM: To connect devices in a single LAN. Demonstration of using switch and hub.

DESCRIPTION:

Hub: A hub in networking is a basic device that connects multiple network devices within a local area network. It operates at the physical layer, broadcasting data to all connected devices, creating a single collision domain.

Switch: A switch is a device operating at the data link layer, connecting devices within a local network. It uses MAC addresses for efficient packet switching, forwarding data only to the intended device. Switches support VLANs, full-duplex communication, and can be either managed or unmanaged, making them integral for creating efficient and scalable network.

Comparison of Hub & Switch

Sr No	Hub	Switch
1	It is a broadcast device.	It is a point to point device.
2	It operates at physical layer.	It operates at datalink layer.
3	It is not an intelligent device.	It is an intelligent device.
4	It simply broadcasts the incoming packet.	It uses switching table to find the correct destination.
5	It cannot be used as a repeater.	It can be used as a repeater.
6	Not a sophisticated device.	It is a sophisticated device.
7	Not very costly.	Costly.

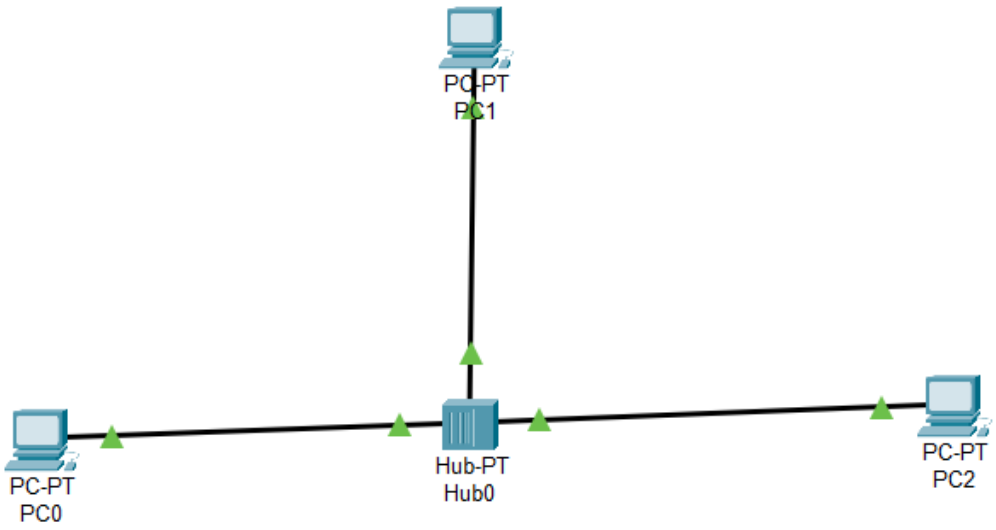
PROCEDURE:

- ➢ Drag and drop devices from the device panel onto the workspace. Devices include pcs, switches, hubs and routers
- ➢ Name the PCs as PC0, PC1, PC2
- ➢ Use Ethernet cables to connect PCs and other end devices to switch ➢ Double-click on each end device (PC or server) to open the configuration window.

- ➢ Go to the "Desktop" tab and click on the "IP Configuration" icon.
- ➢ Assign IP addresses to each device in the same subnet. Ensure that the subnet mask is the same for all devices.
- ➢ Click on a switch or hub to open its configuration window.
- ➢ Optionally, you can change the name of the switch or hub for clarity.
- ➢ No additional configuration is needed for basic LAN connectivity.

DIAGRAM:

Using Hub,

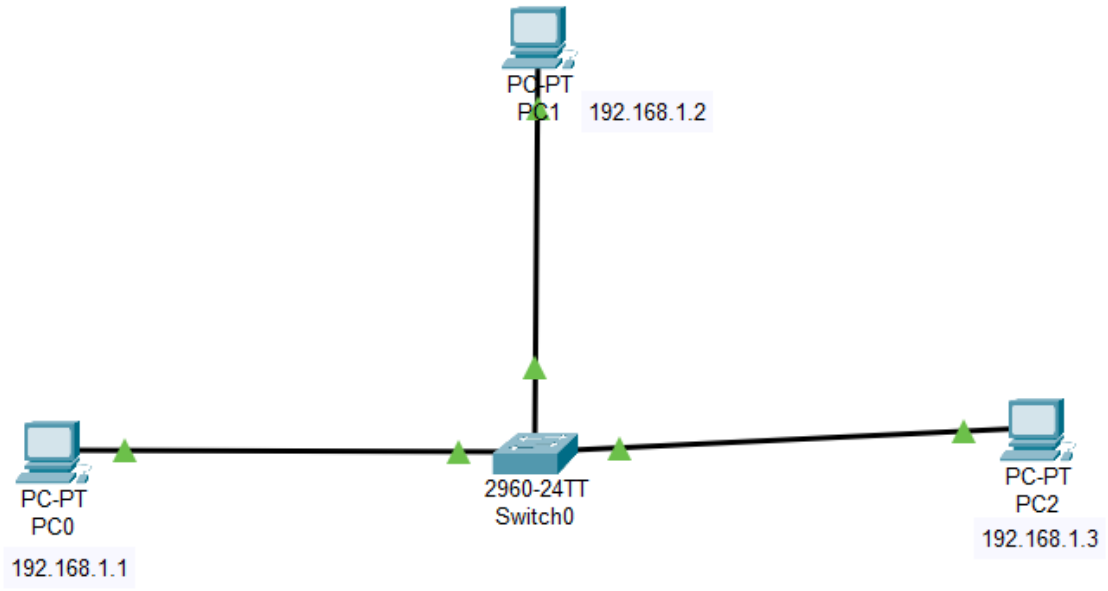


OUTPUT:

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	PC1	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC2	PC1	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC0	PC2	ICMP		0.000	N	2	(edit)	(delete)

DIAGRAM:

Using Switch,



OUTPUT:

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	PC2	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC1	PC0	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC1	PC2	ICMP		0.000	N	2	(edit)	(delete)

Message was successfully sent from one device to another device through switch and hub.

EXPERIMENT - 5

AIM: To demonstrate message passing from one LAN to another LAN UsingRouter.

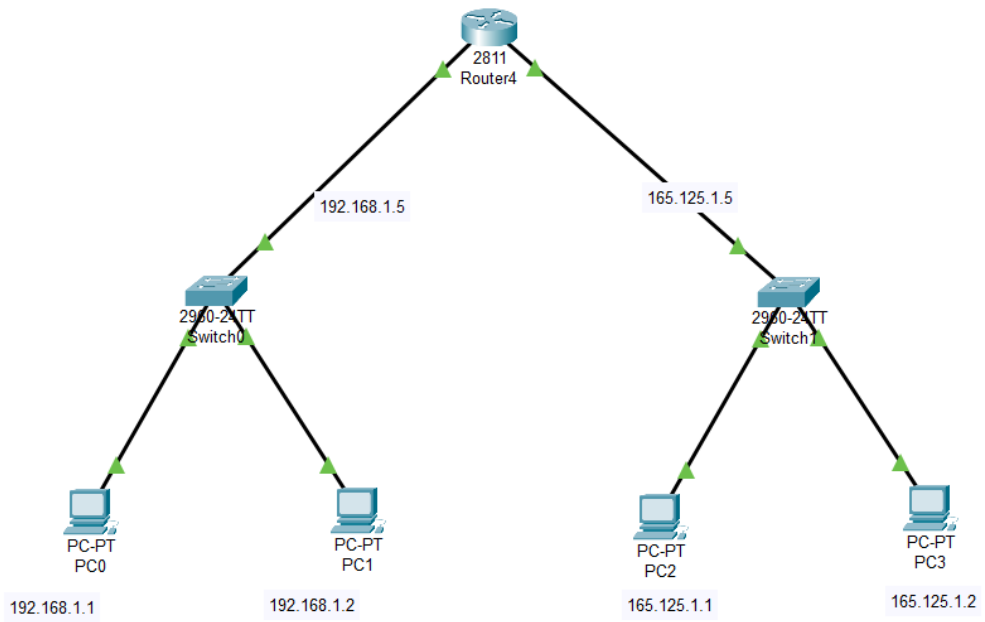
DESCRIPTION:

Switch: A switch is a device operating at the data link layer, connecting devices within a local network. It uses MAC addresses for efficient packet switching, forwarding data only to the intended device. Switches support VLANs, full-duplex communication, and can be either managed or unmanaged, making them integral for creating efficient and scalable network.
Router: A router in a network connects and routes data between different networks, operates at the network layer, assigns IP addresses, enhances security through features like NAT, and uses dynamic routing protocols for efficient data transmission. It plays a crucial role in interconnecting networks and managing traffic flow.

PROCEDURE:

- ➢ Open Cisco Packet Tracer and create a network topology with at least two LANs connected by a router.
- ➢ Place devices (PCs, routers, and switches) onto the workspace and connect them using appropriate cables.
- ➢ Assign unique IP addresses to devices within each LAN. Ensure that devices in the same LAN share the same subnet.
- ➢ In LAN 1, assign IP addresses like 192.168.1.1, 192.168.1.2 to PCs and default gateway 192.168.1.5
- ➢ In LAN 2, assign IP addresses like 165.125.1.1, 165.125.1.2 to PCs and default gateway 165.125.1.5
- ➢ Click on the router to open its configuration window.
- ➢ Configure IP addresses on the router interfaces that connect to each LAN. Use IP addresses from the respective subnets.
- ➢ On the interface connected to LAN 1, set the IP address to 192.168.1.5, and on the interface connected to LAN 2, set it to 165.125.1.5

DIAGRAM:



OUTPUT:

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	PC2	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC1	PC3	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC1	PC2	ICMP		0.000	N	2	(edit)	(delete)

Packet was successfully sent from one LAN to another.

EXPERIMENT-6

AIM: To create a VLAN using a Physical LAN under single switch**.**

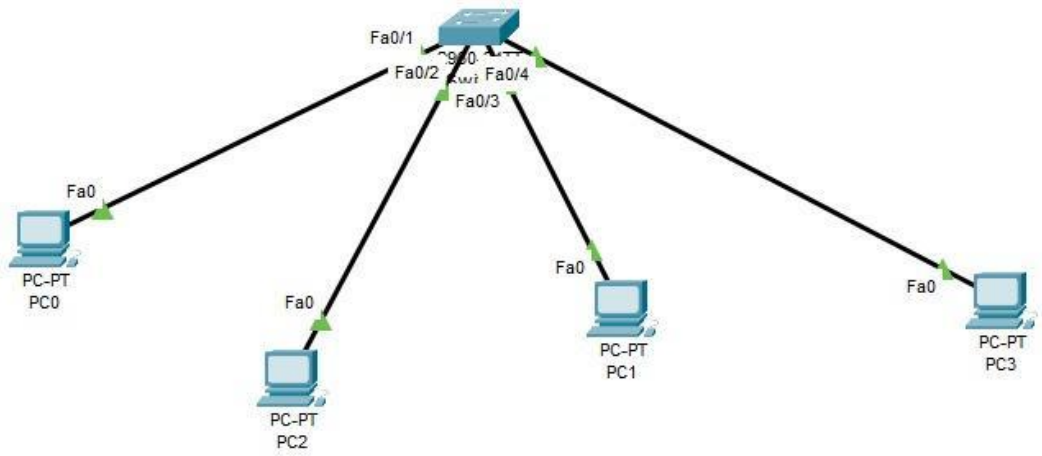
DESCRIPTION:
A VLAN (Virtual Local Area Network) is a logical network created within a physical network, allowing devices to communicate as if they are on the same network segment regardless of physical location. VLANs enhance network security, efficiency, and flexibility by segregating broadcast domains. Switches are commonly used to implement VLANs, and devices within the same VLAN share the same VLAN ID.

PROCEDURE:

- ➢ Open Cisco Packet Tracer and create a network topology with at least two LANs.
- ➢ Place devices (PCs and switch) onto the workspace and connect them using appropriate cables.
- ➢ Assign unique IP addresses to devices within each LAN. Ensure that devices in the same LAN share the same subnet.
- ➢ In VLAN 2, assign IP addresses like 192.168.1.1, 192.168.1.2, 192.168.1.3 to PCs and in VLAN 3, assign IP addresses like 192.168.1.1, 192.168.2.1, 192.168.2.2, 192.168.2.3 to PCs.
- ➢ Click on the switch and open its configuration window.
- ➢ Go to Config →VLAN DATABASE → Add the VLAN NO and VLAN NAME as VLAN2 and VLAN3.
- ➢ Go to the interface configuration mode for the ports you want to assign to the VLAN.
- ➢ Open each interface and assign the VLAN NO.

```
Device Name: Switch0
Custom Device Model: 2960 IOS15
Hostname: Switch

Port                Link   VLAN   IP Address          MAC Address
FastEthernet0/1     Up     2      --                  0000.0C98.9C01
FastEthernet0/2     Up     2      --                  0000.0C98.9C02
FastEthernet0/3     Up     1      --                  0000.0C98.9C03
FastEthernet0/4     Up     1      --                  0000.0C98.9C04
FastEthernet0/5     Down   1      --                  0000.0C98.9C05
FastEthernet0/6     Down   1      --                  0000.0C98.9C06
FastEthernet0/7     Down   1      --                  0000.0C98.9C07
FastEthernet0/8     Down   1      --                  0000.0C98.9C08
FastEthernet0/9     Down   1      --                  0000.0C98.9C09
FastEthernet0/10    Down   1      --                  0000.0C98.9C0A
FastEthernet0/11    Down   1      --                  0000.0C98.9C0B
FastEthernet0/12    Down   1      --                  0000.0C98.9C0C
FastEthernet0/13    Down   1      --                  0000.0C98.9C0D
FastEthernet0/14    Down   1      --                  0000.0C98.9C0E
FastEthernet0/15    Down   1      --                  0000.0C98.9C0F
FastEthernet0/16    Down   1      --                  0000.0C98.9C10
FastEthernet0/17    Down   1      --                  0000.0C98.9C11
FastEthernet0/18    Down   1      --                  0000.0C98.9C12
FastEthernet0/19    Down   1      --                  0000.0C98.9C13
FastEthernet0/20    Down   1      --                  0000.0C98.9C14
FastEthernet0/21    Down   1      --                  0000.0C98.9C15
FastEthernet0/22    Down   1      --                  0000.0C98.9C16
FastEthernet0/23    Down   1      --                  0000.0C98.9C17
FastEthernet0/24    Down   1      --                  0000.0C98.9C18
GigabitEthernet0/1  Down   1      --                  0000.0C98.9C19
GigabitEthernet0/2  Down   1      --                  0000.0C98.9C1A
Vlan1               Down   1      <not set>           0005.5EA6.A06C

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Switch0
```

DIAGRAM:



OUTPUT:

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC0	PC2	ICMP		0.000	N	2	(ed
	Successful	PC1	PC3	ICMP		0.000	N	3	(ed
	Failed	PC0	PC3	ICMP		0.000	N	4	(ed

EXPERIMENT-7

AIM: To demonstrate the inter VLAN networking.

DESCRIPTION:

A VLAN (Virtual Local Area Network) is a logical network created within a physical network, allowing devices to communicate as if they are on the same network segment regardless of physical location. VLANs enhance network security, efficiency, and flexibility by segregating broadcast domains. Switches are commonly used to implement VLANs, and devices within the same VLAN share the same VLAN ID.

PROCEDURE:

- ➢ Open Cisco Packet Tracer and create a network topology with at least two LANs using router.
- ➢ Place devices (PCs, switch and router) onto the workspace and connect them using appropriate cables.
- ➢ Assign unique IP addresses to devices within each LAN. Ensure that devices in the same LAN share the same subnet.
- ➢ In VLAN 2, assign IP addresses like 192.168.1.1, 192.168.1.2 to PCs and default gateway as 192.168.1.5
- ➢ In VLAN 3, assign IP addresses like 192.168.1.1, 192.168.2.1, 192.168.2.2to PCs and default gateway as 192.168.2.5.
- ➢ Click on the switch and open its configuration window.
- ➢ Go to Config →VLAN DATABASE → Add the VLAN NO and VLAN NAME as VLAN2 and VLAN3.
- ➢ Go to the interface configuration mode for the ports you want to assign to the VLAN.
- ➢ Open each interface and assign the VLAN NO.
- ➢ And then make the port mode to trunk for switch port which is connected to the router.

Commands in CLI, at the Router:

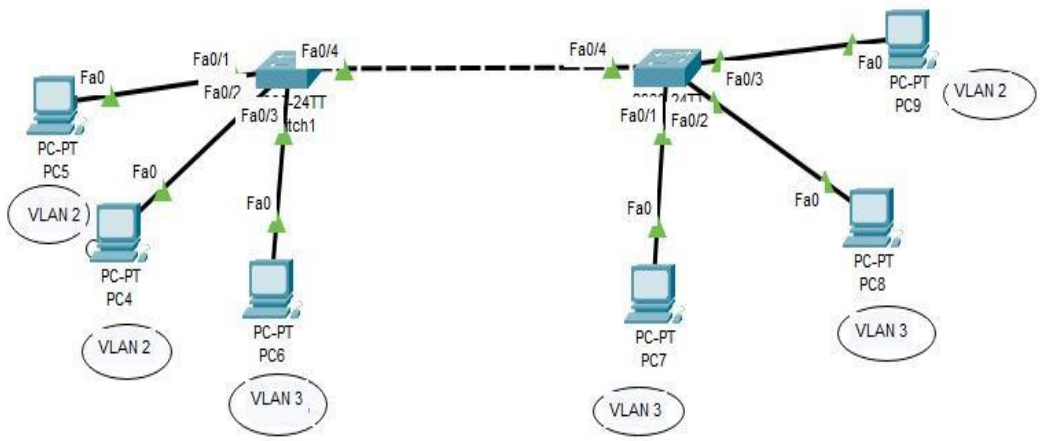
- int fa 0/0
- no shutdown
- int fa 0/0. 2(2 is the VLAN NO)
- encapsulation dot1Q 2 (2 is the VLAN NO)
- ip add 192.168.1.5 255.255.255.0
- (where 192.168.1.5 is the default gateway and 255.255.255.0 is the subnet mask)

CLI (COMMAND LINE INTERFACE):

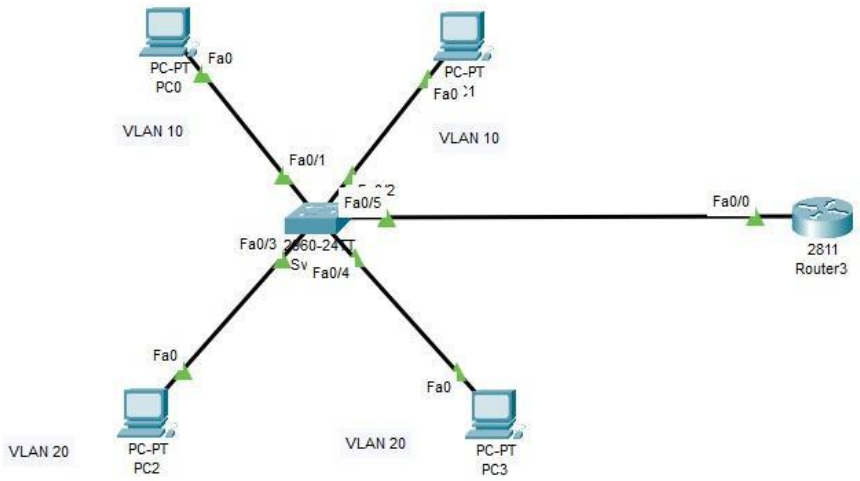
```
Router(config)#interface FastEthernet0/0
Router(config-if)#int fa 0/0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
int fa 0/0.2
Router(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.2, changed state to up
encapsulation dot1Q 2
Router(config-subif)#ip add 192.168.1.5  255.255.255.0
Router(config-subif)#int fa 0/0
Router(config-if)#no shutdown
Router(config-if)#int fa 0/0.3
Router(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.3, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.3, changed state to up
encapsulation dot1Q 3
Router(config-subif)#ip add 192.168.2.5  255.255.255.0
Router(config-subif)#ex
Router(config)#ex
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

DIAGRAM:

Within a LAN PC's under 2 switches :



Among different Physical LAN's:




```
Device Name: Switch0
Custom Device Model: 2960 IOS15
Hostname: Switch

Port                Link   VLAN   IP Address         MAC Address
FastEthernet0/1     Up     10     --                 00D0.5842.9801
FastEthernet0/2     Up     10     --                 00D0.5842.9802
FastEthernet0/3     Up     20     --                 00D0.5842.9803
FastEthernet0/4     Up     20     --                 00D0.5842.9804
FastEthernet0/5     Up     --     --                 00D0.5842.9805
FastEthernet0/6     Down   1      --                 00D0.5842.9806
FastEthernet0/7     Down   1      --                 00D0.5842.9807
FastEthernet0/8     Down   1      --                 00D0.5842.9808
FastEthernet0/9     Down   1      --                 00D0.5842.9809
FastEthernet0/10    Down   1      --                 00D0.5842.980A
FastEthernet0/11    Down   1      --                 00D0.5842.980B
FastEthernet0/12    Down   1      --                 00D0.5842.980C
FastEthernet0/13    Down   1      --                 00D0.5842.980D
FastEthernet0/14    Down   1      --                 00D0.5842.980E
FastEthernet0/15    Down   1      --                 00D0.5842.980F
FastEthernet0/16    Down   1      --                 00D0.5842.9810
FastEthernet0/17    Down   1      --                 00D0.5842.9811
FastEthernet0/18    Down   1      --                 00D0.5842.9812
FastEthernet0/19    Down   1      --                 00D0.5842.9813
FastEthernet0/20    Down   1      --                 00D0.5842.9814
FastEthernet0/21    Down   1      --                 00D0.5842.9815
FastEthernet0/22    Down   1      --                 00D0.5842.9816
FastEthernet0/23    Down   1      --                 00D0.5842.9817
FastEthernet0/24    Down   1      --                 00D0.5842.9818
GigabitEthernet0/1  Down   1      --                 00D0.5842.9819
GigabitEthernet0/2  Down   1      --                 00D0.5842.981A
Vlan1               Down   1      <not set>          000C.CF67.900D

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Sv
```

```
Device Name: Router3
Custom Device Model: 2811 IOS15
Hostname: Router

Port                Link   VLAN   IP Address          IPv6 Address                            MAC Address
FastEthernet0/0     Up     --     <not set>           <not set>                               00E0.F918.8E01
FastEthernet0/0.10  Up     --     192.1.1.1/24        <not set>                               00E0.F918.8E01
FastEthernet0/0.20  Up     --     192.1.2.1/24        <not set>                               00E0.F918.8E01
FastEthernet0/1     Down   --     <not set>           <not set>                               00E0.F918.8E02
Vlan1               Down   1      <not set>           <not set>                               00D0.BC34.7AA5

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Router3
```

PC2 PC3

OUTPUT:

ire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC0	PC2	ICMP		0.000	N	0	(edit)

Packet was successfully sent from one VLAN to another.

EXPERIMENT-8

AIM: To connect two or more local area networks and explore various sub-netting options.

DESCRIPTION: Subnetting is the process of creating a subnetwork (also known as a subnet) within a network. Network interfaces and devices within a subnet can communicate with each other directly. Routers facilitate communication between different subnets.

- By removing the need for extra routers, subnetting makes network traffic simpler. This makes sure the data being transmitted can get to its destination as fast as possible, eliminating or avoiding any potential diversions that may slow it down.
- By isolating or removing vulnerable network regions and making it harder for intruders to move through a company's network, subnetting helps the network managers in reducing network-wide risks.
- The main network is divided into smaller subnets through the process of subnetting, and the goal of these smaller, linked networks is to split the large network into a collection of smaller, less-busy networks. Subnets reduce the need for traffic to use unnecessary routes, which speeds up the network.

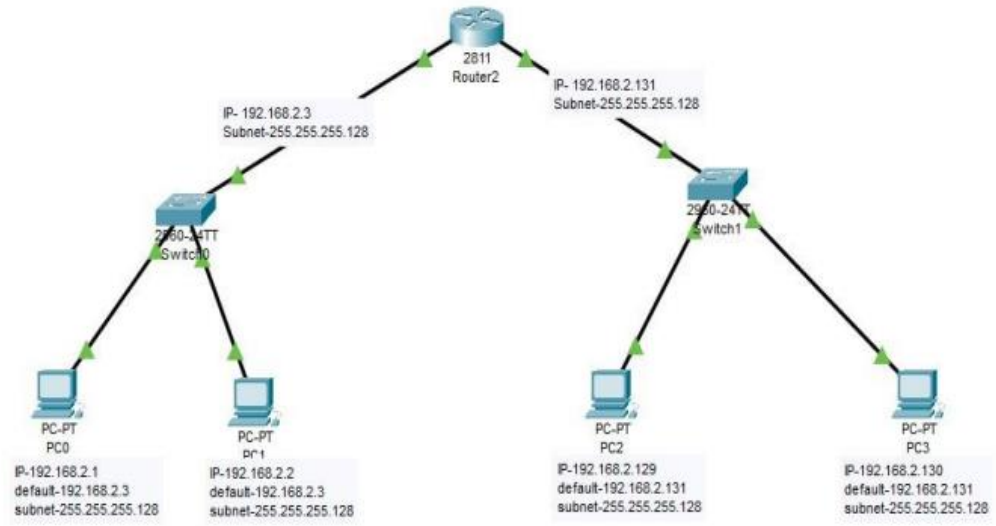
PROCEDURE:

- Open Cisco Packet Tracer and create a network topology with at least two LANs using router.
- Place devices (PCs, switch and router) onto the workspace and connect them using appropriate cables.
- Assign unique IP addresses to devices within each LAN. Ensure that devices in the same LAN share the same subnet.
- In LAN 2, assign IP addresses like 192.168.2.1, 192.168.2.2 to PCs, default gateway as 192.168.2.3 and subnet as 255.255.255.128
- In LAN 3, assign IP addresses like 192.168.2.129, 192.168.2.130, PCs and default

gateway as 192.168.2.131 and subnet as 255.255.255.128

- Click on the router to open its configuration window.
- Configure IP addresses on the router interfaces that connect to each LAN. Use IP addresses from the respective subnets.
- On the interface connected to LAN 2, set the IP address to 192.168.2.3, and on the interface connected to LAN 3, set it to 165.125.2.131 and subnet as 255.255.255.128

DIAGRAM:



OUTPUT:

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC1	PC3	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC1	PC2	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC0	PC2	ICMP		0.000	N	2	(edit)	(delete)

EXPERIMENT -9

AIM: To configure Static routing.

DESCRIPTION: Static routing is a routing protocol that helps to keep your network organized and to optimize routing performance. It enables the router to assign a specific path to each network segment and to keep track of network changes. This helps to improve network stability and continuity. This adds security because a single administrator can only authorize routing to particular networks.

PROCEDURE:

- Open Cisco Packet Tracer and create a network topology with at least two LANs connected by a router.
- Place devices (PCs, routers, and switches) onto the workspace and connect them using appropriate cables.
- Assign unique IP addresses to devices within each LAN. Ensure that devices in the same LAN share the same subnet.
- In LAN 1, assign IP addresses like 192.168.1.1, 192.168.1.2 to PCs and default gateway 192.168.1.3
- In LAN 2, assign IP addresses like 165.125.2.1, 165.125.2.2 to PCs and default gateway 165.125.2.3
- Click on the router to open its configuration window.
- Go to config→static and enter the network, mask and next hop addresses

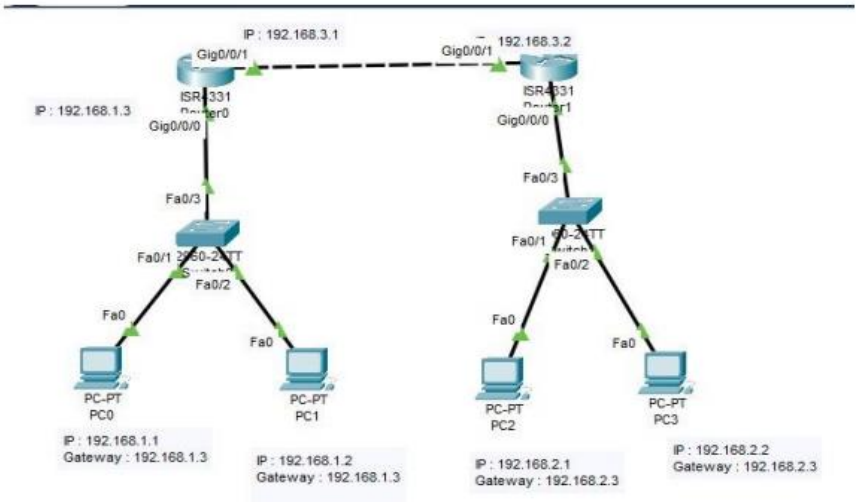
Laboratory Record **Roll No.: 160121749006**

Of : COMPUTER NETWORKS **Experiment No.:**

Sheet No.:

Date.:

DIAGRAM:



OUTPUT:

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	PC2	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC1	PC3	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC0	PC2	ICMP		0.000	N	2	(edit)	(delete)
	Successful	PC1	PC3	ICMP		0.000	N	3	(edit)	(delete)