



Darshan Institute of Engineering & Technology

Certificate

This is to certify that

Mr./Miss _____

Enrolment No. _____, B.Tech. CSE Semester 5th has satisfactorily completed the course in the Subject Computer Networks (2301CS501) in this Institute.

Submission Date: ___/___/___

Staff in Charge

Program Coordinator

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Date: 13/06/2024

Lab Practical #01:

Study of basic networking commands and IP configuration.

Practical Assignment #01:

1. Perform and explain various networking commands listed below:
 - i. ipconfig
 - ii. ping
 - iii. getmac
 - iv. systeminfo
 - v. traceroute / tracert
 - vi. netstat
 - vii. nslookup
 - viii. hostname
 - ix. pathping
 - x. arp

1. ipconfig**Description:**

ipconfig is a command-line utility in Windows operating systems used to display and manage the network configuration of a computer. It provides details about the IP address, subnet mask, default gateway, and other network information for each network adapter. Additionally, it allows users to release and renew DHCP-assigned IP addresses and manage DNS settings.

No.	Option	Description
1	/all	Display full configuration information.
2	/renew	Renew the IPv4 address for the specified adapter.
3	/release	Release the IPv4 address for the specified adapter.
4	/displaydns	Display the contents of the DNS Resolver Cache.
5	/flushdns	Purges the DNS Resolver cache.

Implementation:



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➤ ipconfig

```
cmd Select Command Prompt
C:\Users\i>ipconfig

Windows IP Configuration

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

Ethernet adapter VirtualBox Host-Only Network:
  Connection-specific DNS Suffix . :
  Link-local IPv6 Address . . . . . : fe80::9a9b:912a:eb3f:1333%5
  IPv4 Address. . . . . : 192.168.56.1
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . :

Wireless LAN adapter Local Area Connection* 1:
  Media State . . . . . : Media disconnected
  Connection-specific DNS Suffix . :

Wireless LAN adapter Wi-Fi:
  Connection-specific DNS Suffix . :
  Link-local IPv6 Address . . . . . : fe80::e5e0:642a:7caf:825b%2
  IPv4 Address. . . . . : 192.168.12.213
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . : 192.168.12.1

C:\Users\i>.
```

➤ ipconfig /all

```
cmd Command Prompt
C:\Users\i>ipconfig /all

Windows IP Configuration

  Host Name . . . . . : DESKTOP-8583IKB
  Primary Dns Suffix . . .
  Node Type . . . . . : Mixed
  IP Routing Enabled. . . . . : No
  WINS Proxy Enabled. . . . . : No

  Ethernet adapter Ethernet:
    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :
    Description . . . . . : Realtek PCIe FE Family Controller
    Physical Address. . . . . : 74-E6-E2-46-36-58
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . . : Yes

  Ethernet adapter VirtualBox Host-Only Network:
    Connection-specific DNS Suffix . :
    Description. . . . . : VirtualBox Host-Only Ethernet Adapter
    Physical Address. . . . . : 0A-00-27-00-00-05
    DHCP Enabled. . . . . : No
    Autoconfiguration Enabled . . . . . : Yes
    Link-local IPv6 Address . . . . . : fe80::9a9b:912a:eb3f:1333%5(PREFERRED)
    IPv4 Address. . . . . : 192.168.56.1(PREFERRED)
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :
    DHCPv6 IAID . . . . . : 705298471
    DHCPv6 Client DUID. . . . . : 00-01-00-01-22-23-C5-1E-74-E6-E2-46-36-58
    DNS Servers . . . . . : fec0:0:0:ffff::1%1
                           fec0:0:0:ffff::2%1
                           fec0:0:0:ffff::3%1
    NetBIOS over Tcpip. . . . . : Enabled

  Wireless LAN adapter Local Area Connection* 1:
    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :
    Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
    Physical Address. . . . . : 2E-33-7A-F7-F1-39
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . . : Yes
```



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➤ ipconfig /release

```
Command Prompt
C:\Users\li>ipconfig /release "Wi-Fi"
Windows IP Configuration

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

Ethernet adapter VirtualBox Host-Only Network:
  Connection-specific DNS Suffix . :
  Link-local IPv6 Address . . . . . : fe80::9a9b:912a:eb3f:1333%5
  IPv4 Address . . . . . : 192.168.56.1
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . :

Wireless LAN adapter Local Area Connection* 1:
  Media State . . . . . : Media disconnected
  Connection-specific DNS Suffix . :

Wireless LAN adapter Local Area Connection* 2:
  Media State . . . . . : Media disconnected
  Connection-specific DNS Suffix . :

Wireless LAN adapter Wi-Fi:
  Connection-specific DNS Suffix . :
  IPv6 Address . . . . . : 2409:4080:dec7:26f:309d:7389:4b04:b0a
  Temporary IPv6 Address . . . . . : 2409:4080:dec7:26f:2c1b:e6e9:87b0:d20c
  Link-local IPv6 Address . . . . . : fe80::e5e0:642a:7caf:825b%2
  Default Gateway . . . . . : fe80::54dc:b4ff:fed3:d649%2

C:\Users\li>
```

➤ ipconfig /renew

```
Command Prompt
C:\Users\li>ipconfig /renew "Wi-Fi"
Windows IP Configuration

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

Ethernet adapter VirtualBox Host-Only Network:
  Connection-specific DNS Suffix . :
  Link-local IPv6 Address . . . . . : fe80::9a9b:912a:eb3f:1333%5
  IPv4 Address . . . . . : 192.168.56.1
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . :

Wireless LAN adapter Local Area Connection* 1:
  Media State . . . . . : Media disconnected
  Connection-specific DNS Suffix . :

Wireless LAN adapter Local Area Connection* 2:
  Media State . . . . . : Media disconnected
  Connection-specific DNS Suffix . :

Wireless LAN adapter Wi-Fi:
  Connection-specific DNS Suffix . :
  IPv6 Address . . . . . : 2409:4080:dec7:26f:309d:7389:4b04:b0a
  Temporary IPv6 Address . . . . . : 2409:4080:dec7:26f:2c1b:e6e9:87b0:d20c
  Link-local IPv6 Address . . . . . : fe80::e5e0:642a:7caf:825b%2
  IPv4 Address . . . . . : 192.168.204.250
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . : fe80::54dc:b4ff:fed3:d649%2
  192.168.204.159

C:\Users\li>
```



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➤ ipconfig /displaydns

```
Command Prompt
C:\Users\i>ipconfig /displaydns
Windows IP Configuration

1.0.0.127.in-addr.arpa
-----
Record Name . . . . : 1.0.0.127.in-addr.arpa.
Record Type . . . . : 12
Time To Live . . . . : 551402
Data Length . . . . : 8
Section . . . . . : Answer
PTR Record . . . . : localhost

localhost
-----
Record Name . . . . : localhost
Record Type . . . . : 28
Time To Live . . . . : 1200
Data Length . . . . : 16
Section . . . . . : Question
AAAA Record . . . . : ::1

localhost
-----
Record Name . . . . : localhost
Record Type . . . . : 1
Time To Live . . . . : 1200
Data Length . . . . : 4
Section . . . . . : Question
A (Host) Record . . . : 127.0.0.1

C:\Users\i>
```

➤ ipconfig /flushdns

```
Select Command Prompt
C:\Users\i>ipconfig /flushdns
Windows IP Configuration

Successfully flushed the DNS Resolver Cache.

C:\Users\i>-
```



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2. ping

Description:

The ping command is a network utility used to test the reachability of a host on an IP network. It also measures the round-trip time for messages sent from the originating host to a destination computer. This command is useful for diagnosing network connectivity issues.

No.	Option	Description
1	-t	Ping the specified host until stopped. To see statistics and continue - type Control-Break. To stop - type Control-C.
2	-n count	Number of echo requests to send.
3	-l size	Send buffer size.
4	-4	Force using IPv4.
5	-i TTL	Time To Live.

Implementation:

➤ ping www.google.com

```
Windows PowerShell
Microsoft Windows [Version 10.0.19045.4291]
(c) Microsoft Corporation. All rights reserved.

C:\Users\i>ping www.google.com

Pinging www.google.com [2404:6800:4009:82a::2004] with 32 bytes of data:
Reply from 2404:6800:4009:82a::2004: time=115ms
Reply from 2404:6800:4009:82a::2004: time=74ms
Reply from 2404:6800:4009:82a::2004: time=117ms
Reply from 2404:6800:4009:82a::2004: time=92ms

Ping statistics for 2404:6800:4009:82a::2004:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 74ms, Maximum = 117ms, Average = 99ms

C:\Users\i>
```



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➤ ping www.google.com -t

```
>Select Command Prompt
C:\Users\i>ping www.google.com -t

Pinging www.google.com [2404:6800:4009:82a::2004] with 32 bytes of data:
Reply from 2404:6800:4009:82a::2004: time=870ms
Reply from 2404:6800:4009:82a::2004: time=798ms
Reply from 2404:6800:4009:82a::2004: time=732ms
Reply from 2404:6800:4009:82a::2004: time=990ms
Reply from 2404:6800:4009:82a::2004: time=626ms
Reply from 2404:6800:4009:82a::2004: time=644ms
Reply from 2404:6800:4009:82a::2004: time=830ms
Reply from 2404:6800:4009:82a::2004: time=769ms
Reply from 2404:6800:4009:82a::2004: time=1006ms
Reply from 2404:6800:4009:82a::2004: time=253ms
Reply from 2404:6800:4009:82a::2004: time=178ms
Reply from 2404:6800:4009:82a::2004: time=67ms
Reply from 2404:6800:4009:82a::2004: time=93ms
Reply from 2404:6800:4009:82a::2004: time=108ms
Reply from 2404:6800:4009:82a::2004: time=214ms
Reply from 2404:6800:4009:82a::2004: time=262ms
Reply from 2404:6800:4009:82a::2004: time=268ms
Reply from 2404:6800:4009:82a::2004: time=239ms
Reply from 2404:6800:4009:82a::2004: time=1095ms
Reply from 2404:6800:4009:82a::2004: time=674ms
Reply from 2404:6800:4009:82a::2004: time=594ms
Reply from 2404:6800:4009:82a::2004: time=501ms
Reply from 2404:6800:4009:82a::2004: time=1072ms
Reply from 2404:6800:4009:82a::2004: time=668ms

Ping statistics for 2404:6800:4009:82a::2004:
    Packets: Sent = 24, Received = 24, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 67ms, Maximum = 1072ms, Average = 560ms
Control-C
^C
C:\Users\i>
```

➤ ping www.google.com -n 10

```
>Select Command Prompt
C:\Users\i>ping www.google.com -n 10

Pinging www.google.com [2404:6800:4009:82a::2004] with 32 bytes of data:
Reply from 2404:6800:4009:82a::2004: time=142ms
Reply from 2404:6800:4009:82a::2004: time=79ms
Reply from 2404:6800:4009:82a::2004: time=1249ms
Reply from 2404:6800:4009:82a::2004: time=207ms
Reply from 2404:6800:4009:82a::2004: time=142ms
Reply from 2404:6800:4009:82a::2004: time=108ms
Reply from 2404:6800:4009:82a::2004: time=96ms
Reply from 2404:6800:4009:82a::2004: time=151ms
Reply from 2404:6800:4009:82a::2004: time=200ms
Reply from 2404:6800:4009:82a::2004: time=201ms

Ping statistics for 2404:6800:4009:82a::2004:
    Packets: Sent = 10, Received = 10, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 79ms, Maximum = 1249ms, Average = 257ms
C:\Users\i>
```



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➤ ping www.google.com -l 1000

```
Command Prompt
C:\Users\i>ping www.google.com -l 1000

Pinging www.google.com [2404:6800:4009:827::2004] with 1000 bytes of data:
Reply from 2404:6800:4009:827::2004: time=844ms
Reply from 2404:6800:4009:827::2004: time=130ms
Reply from 2404:6800:4009:827::2004: time=124ms
Reply from 2404:6800:4009:827::2004: time=136ms

Ping statistics for 2404:6800:4009:827::2004:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 124ms, Maximum = 844ms, Average = 308ms

C:\Users\i>
```

➤ ping www.google.com -4

```
Command Prompt
C:\Users\i>ping www.google.com -4

Pinging www.google.com [142.250.192.4] with 32 bytes of data:
Reply from 142.250.192.4: bytes=32 time=68ms TTL=54
Reply from 142.250.192.4: bytes=32 time=57ms TTL=54
Reply from 142.250.192.4: bytes=32 time=87ms TTL=54
Reply from 142.250.192.4: bytes=32 time=87ms TTL=54

Ping statistics for 142.250.192.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 57ms, Maximum = 87ms, Average = 74ms

C:\Users\i>
```

➤ ping -i 4 www.google.com

```
Command Prompt
C:\Users\i>ping -i 4 www.google.com

Pinging www.google.com [2404:6800:4009:827::2004] with 32 bytes of data:
Reply from 2404:6800:4009:827::2004: TTL expired in transit.

Ping statistics for 2404:6800:4009:827::2004:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```



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3. getmac

Description:

The getmac command is a command-line utility in Windows operating systems that displays the MAC addresses for network adapters on the system. The MAC address, or Media Access Control address, is a unique identifier assigned to network interfaces for communications at the data link layer of a network segment.

No.	Option	Description
1	/S system	Specifies the remote system to connect to.
2	/U [domain]\user	Specifies the user context under which the command should execute.
3	/V	Specifies that verbose output is displayed.
4	/FO format	Specifies the format in which the output is to be displayed. Valid values: "TABLE", "LIST", "CSV".
5	/NH	Specifies that the "Column Header" should not be displayed in the output. Valid only for TABLE and CSV formats.

Implementation:

➤ getmac

```
Command Prompt
C:\Users\i>getmac

Physical Address      Transport Name
=====
74-E6-E2-46-36-58    Media disconnected
2C-33-7A-F7-F1-39   \Device\Tcpip_{0134B6F2-3C30-41CE-A536-B0AAA0B9DD21}
0A-00-27-00-00-05   \Device\Tcpip_{2869F44D-AA1B-4915-8B00-7D9D61D6B283}

C:\Users\i>
```

➤ getmac /FO TABLE

```
Command Prompt
C:\Users\i>getmac /FO TABLE

Physical Address      Transport Name
=====
74-E6-E2-46-36-58    \Device\Tcpip_{DAC633D5-8A98-42B8-B678-927F03F8F244}
2C-33-7A-F7-F1-39   Media disconnected
2E-33-7A-F7-F9-39   \Device\Tcpip_{1EB77F20-4859-4C2B-9E65-462798A34EF7}
0A-00-27-00-00-05   \Device\Tcpip_{2869F44D-AA1B-4915-8B00-7D9D61D6B283}

C:\Users\i>
```



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➤ getmac /FO LIST

```
Command Prompt
C:\Users\i>getmac /FO LIST

Physical Address: 74-E6-E2-46-36-58
Transport Name: \Device\Tcpip_{DAC633D5-8A98-42B8-B678-927F03F8F244}

Physical Address: 2C-33-7A-F7-F1-39
Transport Name: Media disconnected

Physical Address: 2E-33-7A-F7-F9-39
Transport Name: \Device\Tcpip_{1EB77F20-4859-4C2B-9E65-462798A34EF7}

Physical Address: 0A-00-27-00-00-05
Transport Name: \Device\Tcpip_{2869F44D-AA1B-4915-8B00-7D9D61D6B283}

C:\Users\i>
```

➤ getmac /FO CSV

```
Command Prompt
C:\Users\i>getmac /FO CSV

"Physical Address","Transport Name"
"74-E6-E2-46-36-58","\\Device\\Tcpip_{DAC633D5-8A98-42B8-B678-927F03F8F244}"
"2C-33-7A-F7-F1-39","Media disconnected"
"2E-33-7A-F7-F9-39","\\Device\\Tcpip_{1EB77F20-4859-4C2B-9E65-462798A34EF7}"
"0A-00-27-00-00-05","\\Device\\Tcpip_{2869F44D-AA1B-4915-8B00-7D9D61D6B283}"

C:\Users\i>
```

➤ getmac /FO CSV /NH

```
Command Prompt
C:\Users\i>getmac /FO CSV /NH

"74-E6-E2-46-36-58","\\Device\\Tcpip_{DAC633D5-8A98-42B8-B678-927F03F8F244}"
"2C-33-7A-F7-F1-39","Media disconnected"
"2E-33-7A-F7-F9-39","\\Device\\Tcpip_{1EB77F20-4859-4C2B-9E65-462798A34EF7}"
"0A-00-27-00-00-05","\\Device\\Tcpip_{2869F44D-AA1B-4915-8B00-7D9D61D6B283}"

C:\Users\i>
```

➤ getmac /v

```
Command Prompt
C:\Users\i>getmac /v

Connection Name Network Adapter Physical Address      Transport Name
===== ===== ===== ===== ===== =====
Ethernet      Realtek PCIe FE 74-E6-E2-46-36-58  Media disconnected
Wi-Fi        Dell Wireless 1 2C-33-7A-F7-F1-39   \\Device\\Tcpip_{013486F2-3C30-41CE-A536-B0AAA0B9DD21}
Local Area Conn Microsoft Wi-Fi 2E-33-7A-F7-F9-39  Media disconnected
VirtualBox Host VirtualBox Host 0A-00-27-00-00-05   \\Device\\Tcpip_{2869F44D-AA1B-4915-8B00-7D9D61D6B283}

C:\Users\i>
```



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4. systeminfo

Description:

`systeminfo` is a command-line utility in Microsoft Windows that provides detailed information about the system's configuration. It gathers and displays various parameters related to the operating system, hardware, and software environment.

No.	Option	Description
1	/S system	Specifies the remote system to connect to.
2	/U [domain\]user	Specifies the user context under which the command should execute.
3	/P [password]	Specifies the password for the given user context. Prompts for input if omitted.
4	/FO format	Specifies the format in which the output is to be displayed. Valid values: "TABLE", "LIST", "CSV".
5	/NH	Specifies that the "Column Header" should not be displayed in the output. Valid only for "TABLE" and "CSV" formats.

Implementation:



DARSHAN INSTITUTE OF ENGINEERING & TECHNOLOGY

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➤ systeminfo

```
C:\Users\i>systeminfo

Host Name: DESKTOP-8583IKB
OS Name: Microsoft Windows 10 Home Single Language
OS Version: 10.0.19045 N/A Build 19045
OS Manufacturer: Microsoft Corporation
OS Configuration: Standalone Workstation
OS Build Type: Multiprocessor Free
Registered Owner: Windows User
Registered Organization:
Product ID: 00327-60000-00000-AA502
Original Install Date: 12-04-2021, 19:38:56
System Boot Time: 15-06-2024, 22:01:44
System Manufacturer: Dell Inc.
System Model: Inspiron 3543
System Type: x64-based PC
Processor(s): 1 Processor(s) Installed.
[01]: Intel64 Family 6 Model 61 Stepping 4 GenuineIntel ~2000 Mhz
BIOS Version: Dell Inc. A01, 04-11-2014
Windows Directory: C:\WINDOWS
System Directory: C:\WINDOWS\system32
Boot Device: \Device\HarddiskVolume2
System Locale: en-us;English (United States)
Input Locale: 00000409
Time Zone: (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi
Total Physical Memory: 8,107 MB
Available Physical Memory: 3,434 MB
Virtual Memory: Max Size: 13,483 MB
Virtual Memory: Available: 6,558 MB
Virtual Memory: In Use: 6,925 MB
Page File Location(s): C:\pagefile.sys
Domain: WORKGROUP
Logon Server: \\DESKTOP-8583IKB
Hotfix(s): 26 Hotfix(s) Installed.
[01]: KB5034466
[02]: KB5027122
[03]: KB4562830
[04]: KB4577586
[05]: KB4580325
[06]: KB5003791
[07]: KB5011048
[08]: KB5012170
[09]: KB5015684

C:\Users\i>
[06]: KB5003791
[07]: KB5011048
[08]: KB5012170
[09]: KB5015684
[10]: KB5033052
[11]: KB5036892
[12]: KB5007273
[13]: KB5011352
[14]: KB5011651
[15]: KB5014032
[16]: KB5014035
[17]: KB5014671
[18]: KB5015895
[19]: KB5016705
[20]: KB5018506
[21]: KB5020372
[22]: KB5022924
[23]: KB5023794
[24]: KB5026879
[25]: KB5037018
[26]: KB5005699
Network Card(s): 3 NIC(s) Installed.
[01]: Realtek PCIe FF Family Controller
    Connection Name: Ethernet
    Status: Media disconnected
[02]: Dell Wireless 1704 802.11b/g/n (2.4GHz)
    Connection Name: Wi-Fi
    DHCP Enabled: Yes
    DHCP Server: 192.168.142.170
    IP address(es)
        [01]: 192.168.142.250
        [02]: fe80::e5e0:642a:7caf:825b
        [03]: 2409:4080:deb2:751:3135:6f3d:befb:33d9
        [04]: 2409:4080:deb2:751:88ac:45db:5891:9ce0
[03]: VirtualBox Host-Only Ethernet Adapter
    Connection Name: VirtualBox Host-Only Network
    DHCP Enabled: No
    IP address(es)
        [01]: 192.168.56.1
        [02]: fe80::9a9b:912a:eb3f:1333
Hyper-V Requirements: VM Monitor Mode Extensions: Yes
                    Virtualization Enabled In Firmware: Yes
                    Second Level Address Translation: Yes
                    Data Execution Prevention Available: Yes
```



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➤ systeminfo /FH TABLE

```
C:\Users\i>systeminfo /FO TABLE

Host Name          OS Name           OS Version        OS Manufacturer      OS Configuration
OS Build Type     Registered Owner   System Manufacturer Registered Organization
Install Date      System Boot Time  System Directory  System Model       System Type
BIOS Version      Windows Directory System Directory  Boot Device       System Locale
Time Zone         Domain           Logon Server     Hotfix(s)        Processor(s)
Virtual Memory: In Use Page File Location(s)       Hyper-V Requirements
Input Locale      Network Card(s)

=====
DESKTOP-8583IK8      Microsoft Windows 10 Home Sing 10.0.19045 N/A Build 19045      Microsoft Corporation      Standalone Workstation
Multiprocessor Free Windows User
021, 19:38:56    19-06-2024, 11:53:29      Dell Inc.          Inspiron 3543 x64-based PC
Fami Dell Inc. A01, 04-11-2014      C:\WINDOWS          \Device\HarddiskVolume2      en-us;English (United States)
(UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi 8,107 MB      4,279 MB      13,483 MB      8,024 MB
5,459 MB      C:\pagefile.sys          WORKGROUP      \\DESKTOP-8583IKB 26 Hotfix(s) Instal, 4 NIC(s) Installed., [01]: Realtek PCIe FE
Family Controller, Connection Name: Ethernet, VM Monitor Mode Extensions: Yes, Virtualization Enabled In Firmware: Yes, Second Level Address Trans

C:\Users\i>
```

➤ systeminfo /FO CSV

```
C:\Users\li>systeminfo /FO CSV
"Host Name","OS Name","OS Version","OS Manufacturer","OS Configuration","OS Build Type","Registered Owner","Registered Organization","Product ID","Original Install Date
","System Boot Time","System Manufacture","System Model","System Type","Processor(s)","BIOS Version","Windows Directory","System Directory","Boot Device","System Local
e","Input Locale","Time Zone","Total Physical Memory","Available Physical Memory","Virtual Memory: Max Size","Virtual Memory: Available","Virtual Memory: In Use","Page
File Location(s)","Domain","Logon Server","Hotfix(s)","Network Card(s)" "Hyper V Requirements"
"DESKTOP-8583IKB","Microsoft Windows 10 Home Single Language","10.0.19045 N/A Build 19045","Microsoft Corporation","Standalone Workstation","Multiprocessor Free","Windo
ws User","08/27-60000-00000-AA502","12-04-2021, 19:58:37","19-06-2024, 11:53:29","Dell Inc.", "Inspiron 3543","x64-based PC","1 Processor(s) Installed,[01]: Intel®
Family 6 Model 61 Stepping 4 GenuineIntel ~2201 Mhz","Dell Inc. A01_04-11-2014","[C:\WINDOWS\c:\windows\system32]\Device\HarddiskVolume2","en-us;English (United Sta
tes)" , "000004000", "(UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi","8,107 MB", "4,173 MB", "13,483 MB", "7,901 MB", "5,582 MB", "[C:\pagefile.sys","WORKGROUP","\\DESKTOP-8583
IKB","26 Hotfix(s) Installed,[01]: KB5034466,[02]: KB5027122,[03]: KB4562838,[04]: KB4577586,[05]: KB4580325,[06]: KB50083791,[07]: KB5011048,[08]: KB5012170,[09]: KB50
1269,[10]: KB5033052,[11]: KB5036892,[12]: KB5007213,[13]: KB5011352,[14]: KB5014032,[15]: KB5014671,[16]: KB5015895,[19]: KB5016705,[20]: KB5018506,[21]: KB5028372,[22]: KB5029294,[23]: KB5023794,[24]: KB5026879,[25]: KB5037108,[26]: KB5005699,"4 NIC(s) Installed ,[01]: Realtek PCIe FE Family Control
ler, Connection Name: Ethernet, DHCP Enabled: Yes, DHCP Server: 10.20.1.1, IP address(es), [01]: 10.20.53.99, [02]: fe80::417e:b6f2
:[1733:1c48,[02]: Dell Wireless 1704 802.11b/g/n (2.4GHz), Connection Name: Wi-Fi, Status: Media disconnected,[03]: Microsoft Wi-Fi Direct Virtual Ada
pter, Connection Name: Local Area Connection 2, DHCP Enabled: No, IP address(es), [01]: 192.168.137.1, [02]: fe80::7000:2312:25c8:653c,[04]
: VirtualBox Host-Only Ethernet Adapter, Connection Name: VirtualBox Host-Only Network, DHCP Enabled: No, IP address(es), [01]: 192.168.56.1,
[02]: fe80::99b:912a:eb3f:1333","VM Monitor Mode Extensions: Yes, Virtualization Enabled In Firmware: Yes, Second Level Address Translation: Yes, Data Execution Prevent
ion Available: Yes"
C:\Users\li>
```

➤ systeminfo /NH

```
C:\Users\l1>systeminfo /FO CSV /NH

"DESKTOP-58531K8","Microsoft Windows 10 Home Single Language","10.0.18345 N/A Build 18345","Microsoft Corporation","Standalone Workstation","Multiprocessor Free","Windows User","Administrator","60000000000000000000000000000000","12-06-2024, 19:53:29","10:06-2024, 11:53:29","Dell Inc.","TipServer5542","64-bit PC","1 Processor(s) Installed,[0x1] Intel(R) Core(TM) i5 Model 6145U CPU @ 2.00GHz,4 GenerationIntel(R) Core(TM) i5 Model 6145U CPU @ 2.00GHz,4 Generation","C:\WINDOWS","C:\WINDOWS\system32","DeviceHARDdiskVolume2","en-us,English (United States)","00000000000000000000000000000000","[UTC+05:30] Chennai, Kolkata, Mumbai, New Delhi","8,107 MB","4,158 MB","13,483 MB","7,905 MB","$,578 MB","C:\pagefile.sys","WORKGROUP","[DESKTOP-58531K8]","26 Hotfix(s) Installed,[0x1] KB5084466,[0x2] KB5027122,[0x3] KB4562830,[0x4] KB4577586,[0x5] KB4580325,[0x6] KB5003791,[0x7] KB5011048,[0x8] KB5012170,[0x9] KB5015684,[10] KB5033052,[11] KB5036892,[13] KB5011352,[14] KB501651,[15] KB5014832,[16] KB5014035,[17] KB5014671,[18] KB5016705,[20] KB5016506,[21] KB5020372,[22] KB5022924,[23] KB5023794,[24] KB5026879,[25] KB5037018,[26] KB5005699","4 NIC(s) Installed,[0x1] Realtek PCIe FE Family Controller, Connection Name: Ethernet, DHCP Enabled: Yes, DHCP Server: 10.20.1.1, IP address(es), [0x1]: 10.20.53.99, [0x2]: fe80::417e:b6ff%1733:1c4,[0x3] Dell Wireless 1704 802.11b/g (2.4GHz), Connection Name: Wi-Fi, Status: Media disconnected,[0x3] Microsoft Wi-Fi Direct Virtual Adapter, Connection Name: Local Area Connection 2, DHCP Enabled: No, IP address(es), [0x1]: 192.168.137.1, [0x2]: fe80::7000:2312%5c:68c3,[0x4] VirtualBox Host Only Ethernet Adapter, Connection Name: VirtualBox Host-Only Network, DHCP Enabled: No, IP address(es), [0x1]: 192.168.56.1, [0x2]: fe80::9a9b:912a:6b5f:1353","VM Monitor Mode Extensions: Yes,Virtualization Enabled In Firmware: Yes,Second Level Address Translation: Yes,Data Execution Prevention Available: Yes

C:\Users\l1>
```



Date: 13/06/2024

5. traceroute/tracert

Description:

The tracert command (short for "trace route") is a network diagnostic tool available in Windows operating systems. It is used to determine the path packets take from your computer to a destination host. This command helps in identifying where in the network the issues are occurring, such as delays or failures in data transmission.

No.	Option	Description
1	-d	Do not resolve addresses to hostnames.
2	-h maximum_hops	Maximum number of hops to search for target.
3	-w timeout	Wait timeout milliseconds for each reply.
4.	-S srcaddr	Source address to use (IPv6-only).
5	-4	Force using IPv4.

Implementation:

➤ tracert www.google.com

```
Windows Command Prompt
C:\Users\i>tracert www.google.com

Tracing route to www.google.com [2404:6800:4009:82a::2004]
over a maximum of 30 hops:
1  2 ms    3 ms    2 ms  2409:4080:deb2:751::95
2  *        *        * Request timed out.
3  59 ms   49 ms   46 ms  2405:200:325:eeee:20::30
4  37 ms   48 ms   48 ms  2405:200:801:2e00::54
5  *        *        * Request timed out.
6  *        *        * Request timed out.
7  118 ms  142 ms  163 ms  2001:4860:1:1::2218
8  95 ms   83 ms   75 ms  2001:4860:1:1::2218
9  109 ms  85 ms   96 ms  2404:6800:8040::1
10 88 ms   95 ms   101 ms  2001:4860:0:1::15e
11 122 ms  74 ms   82 ms  2001:4860:0:1::78b6
12 88 ms   75 ms   74 ms  2001:4860::9:4001:67bd
13 104 ms  94 ms   77 ms  2001:4860:0:1::876b
14 106 ms  88 ms   82 ms  2001:4860:0:1::161
15 104 ms  96 ms   97 ms  bom12s17-in-x04.1e100.net [2404:6800:4009:82a::2004]

Trace complete.

C:\Users\i>
```



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➤ tracert -d www.google.com

```
Command Prompt
C:\Users\i>tracert -d www.google.com

Tracing route to www.google.com [2404:6800:4009:82a::2004]
over a maximum of 30 hops:

 1      4 ms      3 ms      2 ms  2409:4080:deb2:751::95
 2      *          *          * Request timed out.
 3    756 ms     60 ms     29 ms  2405:200:325:eeee:20::30
 4    45 ms      41 ms     34 ms  2405:200:801:2e00::54
 5      *          *          * Request timed out.
 6      *          *          * Request timed out.
 7    90 ms      76 ms     74 ms  2001:4860:1:1::2218
 8   101 ms      89 ms     91 ms  2001:4860:1:1::2218
 9   100 ms      89 ms     756 ms  2404:6800:812b::1
10   695 ms     162 ms    146 ms  2001:4860:0:1::53a4
11   137 ms      97 ms     82 ms  2001:4860:0:1::77dc
12   135 ms      98 ms     101 ms  2001:4860::9:4002:d931
13   113 ms      85 ms     178 ms  2001:4860:0:1::876b
14    88 ms      97 ms     100 ms  2001:4860:0:1::161
15   121 ms      83 ms     86 ms  2404:6800:4009:82a::2004

Trace complete.

C:\Users\i>
```

➤ tracert -h 3 www.google.com

```
Command Prompt
C:\Users\i>tracert -h 3 www.google.com

Tracing route to www.google.com [2404:6800:4009:82a::2004]
over a maximum of 3 hops:

 1      5 ms      3 ms      3 ms  2409:4080:deb2:751::95
 2      *          *          * Request timed out.
 3    553 ms     94 ms     47 ms  2405:200:325:eeee:20::30

Trace complete.

C:\Users\i>
```



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➤ tracert -w 3000 www.google.com

```
Command Prompt

C:\Users\i>tracert -w 3000 www.google.com

Tracing route to www.google.com [2404:6800:4009:82a::2004]
over a maximum of 30 hops:

 1   5 ms    4 ms    2 ms  2409:4080:deb2:751::95
 2   *         *         * Request timed out.
 3   59 ms   29 ms   42 ms  2405:200:325:eeee:20::30
 4   125 ms   150 ms   227 ms  2405:200:801:2e00::54
 5   *         *         * Request timed out.
 6   *         *         * Request timed out.
 7   124 ms   83 ms   71 ms  2001:4860:1:1::2218
 8   91 ms    75 ms   88 ms  2001:4860:1:1::2218
 9   85 ms    80 ms   73 ms  2404:6800:8040::1
10   111 ms   77 ms   75 ms  2001:4860:0:1::15e
11   103 ms   79 ms   77 ms  2001:4860:0:1::78b6
12   104 ms   93 ms   96 ms  2001:4860::9:4001:67bd
13   123 ms   91 ms   92 ms  2001:4860::9:4001:7734
14   114 ms   91 ms   85 ms  2001:4860:0:1::8769
15   120 ms   88 ms   85 ms  2001:4860:0:1::161
16   97 ms    105 ms  100 ms  bom12s17-in-x04.1e100.net [2404:6800:4009:82a::2004]

Trace complete.

C:\Users\i>
```

➤ tracert -S 2001:0db8:85a3:0000:0000:8a2e:0370:7334 ipv6.google.com

```
Command Prompt

C:\Users\i>tracert -S 2001:0db8:85a3:0000:0000:8a2e:0370:7334 ipv6.google.com

Tracing route to ipv6.l.google.com [2404:6800:4009:822::200e]
over a maximum of 30 hops:

 1  Transmit error: code 1214.

Trace complete.

C:\Users\i>
```



Date: 13/06/2024

➤ tracert -4 www.google.com

```
Command Prompt

C:\Users\i>tracert -4 www.google.com

Tracing route to www.google.com [142.250.192.4]
over a maximum of 30 hops:

 1   3 ms      2 ms      3 ms  192.168.142.170
 2   6 ms      6 ms      6 ms  192.0.0.1
 3   *          *          *      Request timed out.
 4   *          *          *      Request timed out.
 5   *          *          *      Request timed out.
 6   *          *          *      Request timed out.
 7   *          *          *      Request timed out.
 8   *          *          *      Request timed out.
 9   *          *          *      Request timed out.
10   *          *          *      Request timed out.
11   *          *          *      Request timed out.
12   *          *          *      Request timed out.
13  64 ms     76 ms     76 ms  bom12s14-in-f4.1e100.net [142.250.192.4]

Trace complete.

C:\Users\i>
```



Date: 13/06/2024

6. netstat

Description:

The netstat command is a network utility that displays network connections, routing tables, interface statistics, masquerade connections, and multicast memberships. It is available in various operating systems including Windows, Linux, and macOS. The command is useful for network troubleshooting and performance monitoring.

No.	Option	Description
1	-a	Displays all connections and listening ports.
2	-e	Displays Ethernet statistics. This may be combined with the -s option.
3	-f	Displays Fully Qualified Domain Names (FQDN) for foreign addresses.
4	-o	Displays the owning process ID associated with each connection
5	-r	Displays the routing table.

Implementation:

```
cmd Command Prompt
C:\Users\i>netstat
Active Connections

Proto Local Address      Foreign Address      State
TCP   127.0.0.1:49677    DESKTOP-8583IKB:49678 ESTABLISHED
TCP   127.0.0.1:49678    DESKTOP-8583IKB:49677 ESTABLISHED
TCP   127.0.0.1:49679    DESKTOP-8583IKB:49680 ESTABLISHED
TCP   127.0.0.1:49680    DESKTOP-8583IKB:49679 ESTABLISHED
TCP   192.168.142.250:49228 a23-63-110-88:https  CLOSE_WAIT
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49152 [64:ff9b::98c3:264c]:http  CLOSE_WAIT
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49221 whatsapp-cdn6-shv-01-pnq1:https  CLOSE_WAIT
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49222 whatsapp-cdn6-shv-01-pnq1:https  CLOSE_WAIT
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49223 whatsapp-cdn6-shv-01-bom1:https  CLOSE_WAIT
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49224 whatsapp-cdn6-shv-01-bom1:https  CLOSE_WAIT
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49225 [2405:200:1630:b57:face:b00c:3333:7029]:https  CLOSE_WAIT
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49231 [2405:200:1602::312c:7689]:https  CLOSE_WAIT
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49237 [2405:200:1602::312c:8244]:https  CLOSE_WAIT
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49242 [2606:2800:147:120f:30c:1ba0:fc6:265a]:https  CLOSE_WAIT
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49243 [2620:1ec:bdff:72]:https  CLOSE_WAIT
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49246 g2600-140f-d800-01ae-0000-0000-21cc:http  TIME_WAIT
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:65369 [2603:1040:a06:6::2]:https  ESTABLISHED
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:65472 [2603:1040:a06:6::2]:https  ESTABLISHED
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:65488 sg-in-f188:5228  ESTABLISHED
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:65534 [2405:200:1630:90::57]:https  CLOSE_WAIT

C:\Users\i>
```



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> netstat -a

```
C:\ Command Prompt
C:\Users\i>netstat -a

Active Connections

Proto Local Address          Foreign Address        State
TCP   0.0.0.0:135            DESKTOP-8583IKB:0    LISTENING
TCP   0.0.0.0:445            DESKTOP-8583IKB:0    LISTENING
TCP   0.0.0.0:5040           DESKTOP-8583IKB:0    LISTENING
TCP   0.0.0.0:8888           DESKTOP-8583IKB:0    LISTENING
TCP   0.0.0.0:33960          DESKTOP-8583IKB:0    LISTENING
TCP   0.0.0.0:49664          DESKTOP-8583IKB:0    LISTENING
TCP   0.0.0.0:49665          DESKTOP-8583IKB:0    LISTENING
TCP   0.0.0.0:49666          DESKTOP-8583IKB:0    LISTENING
TCP   0.0.0.0:49667          DESKTOP-8583IKB:0    LISTENING
TCP   0.0.0.0:49668          DESKTOP-8583IKB:0    LISTENING
TCP   0.0.0.0:49676          DESKTOP-8583IKB:0    LISTENING
TCP   127.0.0.1:1434         DESKTOP-8583IKB:0    LISTENING
TCP   127.0.0.1:23482        DESKTOP-8583IKB:0    LISTENING
TCP   127.0.0.1:27017        DESKTOP-8583IKB:0    LISTENING
TCP   127.0.0.1:49677        DESKTOP-8583IKB:49678 ESTABLISHED
TCP   127.0.0.1:49678        DESKTOP-8583IKB:49679 ESTABLISHED
TCP   127.0.0.1:49679        DESKTOP-8583IKB:49680 ESTABLISHED
TCP   127.0.0.1:49680        DESKTOP-8583IKB:0    LISTENING
TCP   127.0.0.1:58880        DESKTOP-8583IKB:0    LISTENING
TCP   192.168.56.1:139        DESKTOP-8583IKB:0    LISTENING
TCP   192.168.142.250:139    DESKTOP-8583IKB:0    LISTENING
TCP   192.168.142.250:49228  a23-63-110-88:https  CLOSE_WAIT
TCP   [::]:135               DESKTOP-8583IKB:0    LISTENING
TCP   [::]:445               DESKTOP-8583IKB:0    LISTENING
TCP   [::]:8080              DESKTOP-8583IKB:0    LISTENING
TCP   [::]:33060             DESKTOP-8583IKB:0    LISTENING
TCP   [::]:49664             DESKTOP-8583IKB:0    LISTENING
TCP   [::]:49665             DESKTOP-8583IKB:0    LISTENING
TCP   [::]:49666             DESKTOP-8583IKB:0    LISTENING
TCP   [::]:49667             DESKTOP-8583IKB:0    LISTENING
TCP   [::]:49668             DESKTOP-8583IKB:0    LISTENING
TCP   [::]:49676             DESKTOP-8583IKB:0    LISTENING
TCP   [::]:1434              DESKTOP-8583IKB:0    LISTENING
TCP   [::]:49669             DESKTOP-8583IKB:0    LISTENING
TCP   [::]:58880             DESKTOP-8583IKB:0    LISTENING
TCP   [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49152 [64:ff9b::98c3:264c]:http  CLOSE_WAIT
```

```
C:\ Select Command Prompt
TCP  [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49231 [2405:200:1602:312c:7689]:https  CLOSE_WAIT
TCP  [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49237 [2405:200:1602:312c:8244]:https  CLOSE_WAIT
TCP  [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49242 [2606:2800:147:120f:30c:1b@0:fc6:265a]:https  CLOSE_WAIT
TCP  [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49243 [2620:1ec:bdff:72]:https  CLOSE_WAIT
TCP  [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49247 WhatsApp-chrome-edge-shv-01-png1:https  TIME_WAIT
TCP  [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49248 WhatsApp-cdn-shv-01-bom1:https  ESTABLISHED
TCP  [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49249 WhatsApp-cdn-shv-01-bom1:https  ESTABLISHED
TCP  [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49250 WhatsApp-cdn-shv-01-bom1:https  ESTABLISHED
TCP  [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49251 [2405:200:1630:857:face:b0c:333:7c02]:https  ESTABLISHED
TCP  [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:49252 WhatsApp-Cdn-shv-01-bom1:https  ESTABLISHED
TCP  [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:65369 [2603:1040:a0:6:15:12]:https  ESTABLISHED
TCP  [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:65472 [2603:1040:a0:6:15:12]:https  ESTABLISHED
TCP  [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:65488 rg-in-f188:528  ESTABLISHED
TCP  [2409:4080:deb2:751:3135:6f3d:bebf:33d9]:65534 [2405:200:1630:90:57]:https  CLOSE_WAIT
UDP  0.0.0.0:123             *:*
UDP  0.0.0.0:5950            *:*
UDP  0.0.0.0:5353            *:*
UDP  127.0.0.1:1900          *:*
UDP  127.0.0.1:48300          *:*
UDP  127.0.0.1:48301          *:*
UDP  127.0.0.1:52915          *:*
UDP  127.0.0.1:54765          *:*
UDP  192.168.56.1:137          *:*
UDP  192.168.56.1:138          *:*
UDP  192.168.56.1:1900          *:*
UDP  192.168.56.1:52913          *:*
UDP  192.168.142.250:137          *:*
UDP  192.168.142.250:138          *:*
UDP  192.168.142.250:1900          *:*
UDP  192.168.142.250:52914          *:*
UDP  [::]:123               *:*
UDP  [::]:5353              *:*
UDP  [::]:5353              *:*
UDP  [::]:5353              *:*
UDP  [::]:5355              *:*
UDP  [::]:5355              *:*
UDP  [::]:1900              *:*
UDP  [::]:52912             *:*
UDP  [fe80::9a9b:912a:eb3f:1333%5]:1900  *:*
UDP  [fe80::9a9b:912a:eb3f:1333%5]:52910  *:*
UDP  [fe80::e5e0:642a:7caf:825b%2]:1900  *:*
UDP  [fe80::e5e0:642a:7caf:825b%2]:52911  *:*
```



Date: 13/06/2024

➤ netstat -e

```
Command Prompt
C:\Users\i>netstat -e
Interface Statistics

          Received          Sent
Bytes      423972885      58051882
Unicast packets    413994      224952
Non-unicast packets   63       3815
Discards           0           0
Errors             0           0
Unknown protocols   0           0

C:\Users\i>
```

➤ netstat -f

```
Command Prompt
C:\Users\i>netstat -f
Active Connections

  Proto Local Address        Foreign Address        State
  TCP   127.0.0.1:49677      DESKTOP-8583IKB:49678 ESTABLISHED
  TCP   127.0.0.1:49678      DESKTOP-8583IKB:49677 ESTABLISHED
  TCP   127.0.0.1:49679      DESKTOP-8583IKB:49680 ESTABLISHED
  TCP   127.0.0.1:49680      DESKTOP-8583IKB:49679 ESTABLISHED
  TCP   192.168.142.250:49228 a23-63-110-88.deploy.static.akamaitechnologies.com:https CLOSE_WAIT
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49152 [64:ff9b:98c3:264c]:http CLOSE_WAIT
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49231 [2405:200:1602::312c:7689]:https CLOSE_WAIT
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49237 [2405:200:1602::312c:8244]:https CLOSE_WAIT
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49242 [2606:2800:147:120f:30c:iba0:fcc:265a]:https CLOSE_WAIT
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49243 [2620:1ec:bdf::72]:https CLOSE_WAIT
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49248 whatsapp-cdn6-shv-01-bom1.fbcdn.net:https CLOSE_WAIT
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49249 whatsapp-cdn6-shv-01-bom1.fbcdn.net:https CLOSE_WAIT
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49250 whatsapp-cdn6-shv-01-pnq1.fbcdn.net:https CLOSE_WAIT
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49251 [2405:200:1630:b57:face:b00c:3333:7020]:https CLOSE_WAIT
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49252 whatsapp-cdn6-shv-01-pnq1.fbcdn.net:https CLOSE_WAIT
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49253 [64:ff9b:682e:a2e1]:https TIME_WAIT
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49254 [64:ff9b:98c3:264c]:http TIME_WAIT
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49255 a104-85-158-248.deploy.static.akamaitechnologies.com:http TIME_WAIT
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49256 [2606:2800:147:120f:30c:iba0:fcc:3001]:http TIME_WAIT
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:65369 [2603:1040:a06:6::2]:https ESTABLISHED
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:65472 [2603:1040:a06:6::2]:https ESTABLISHED
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:65488 sg-in-f188.1e100.net:5228 ESTABLISHED
  TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:65534 [2405:200:1630:90::57]:https CLOSE_WAIT

C:\Users\i>
```



Date: 13/06/2024

➤ netstat -o

```
cmd Select Command Prompt
C:\Users\li>netstat -o

Active Connections

Proto Local Address          Foreign Address        State      PID
TCP   127.0.0.1:49677        DESKTOP-8583IKB:49678 ESTABLISHED 4644
TCP   127.0.0.1:49678        DESKTOP-8583IKB:49677 ESTABLISHED 4644
TCP   127.0.0.1:49679        DESKTOP-8583IKB:49680 ESTABLISHED 4644
TCP   127.0.0.1:49680        DESKTOP-8583IKB:49679 ESTABLISHED 4644
TCP   192.168.142.250:49228  a23-63-110-88:https CLOSE_WAIT 7372
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49152  [64:ff9b:98c3:264c]:http CLOSE_WAIT 2912
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49231  [2405:200:1602::312c:7689]:https CLOSE_WAIT 6756
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49237  [2405:200:1602::312c:8244]:https CLOSE_WAIT 6756
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49242  [2606:2800:147:120f:30c:1ba0:fc6:265a]:https CLOSE_WAIT 6756
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49243  [2620:1ec:bdfe:72]:https CLOSE_WAIT 6756
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49249  whatsapp-cdn6-shv-01-bom1:https CLOSE_WAIT 14284
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49249  whatsapp-cdn6-shv-01-bom1:https CLOSE_WAIT 14284
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49249  whatsapp-cdn6-shv-01-pnq1:https CLOSE_WAIT 14284
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49251  [2405:200:1630:b57:face:b00c:333:7020]:https CLOSE_WAIT 14284
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49252  whatsapp-cdn6-shv-01-pnq1:https CLOSE_WAIT 14284
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49253  [64:ff9b:682e:a2e1]:https TIME_WAIT 0
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49254  [64:ff9b:98c3:264c]:http TIME_WAIT 0
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49255  a104-85-158-248:http TIME_WAIT 0
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:49256  [2606:2800:147:120f:30c:1ba0:fc6:3001]:http TIME_WAIT 0
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:65369  [2603:1040:a06:6::2]:https ESTABLISHED 3880
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:65472  [2603:1040:a06:6::2]:https ESTABLISHED 3880
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:65488  sg-in-f188:5228 ESTABLISHED 264
TCP   [2409:4080:deb2:751:3135:6f3d:befb:33d9]:65534  [2405:200:1630:90::57]:https CLOSE_WAIT 2912

C:\Users\li>
```

➤ netstat -r

```
cmd Command Prompt
C:\Users\li>netstat -r

Interface List
19...74 e6 e2 46 36 58 ....Realtek PCIe FE Family Controller
5...0a 00 27 00 00 05 ....VirtualBox Host-Only Ethernet Adapter
10...2e 33 7a f7 f1 39 ....Microsoft Wi-Fi Direct Virtual Adapter
4...2e 33 7a f7 f9 39 ....Microsoft Wi-Fi Direct Virtual Adapter #2
2...2c 33 7a f7 f1 39 ....Dell Wireless 1704 802.11b/g/n (2.4GHz)
1....00 00 00 00 00 00 ....Software Loopback Interface 1

IPv4 Route Table
Active Routes:
Network Destination      Netmask     Gateway       Interface Metric
  0.0.0.0          0.0.0.0  192.168.142.179 192.168.142.250    55
 127.0.0.0         255.0.0.0  On-link      127.0.0.1    331
 127.0.0.1         255.255.255.255  On-link      127.0.0.1    331
127.255.255.255  255.255.255.255  On-link      127.0.0.1    331
 192.168.56.0      255.255.255.0  On-link     192.168.56.1    281
 192.168.56.1      255.255.255.255  On-link     192.168.56.1    281
 192.168.56.255    255.255.255.255  On-link     192.168.56.1    281
 192.168.142.0      255.255.255.0  On-link     192.168.142.250    311
 192.168.142.250    255.255.255.255  On-link     192.168.142.250    311
 192.168.142.255    255.255.255.255  On-link     192.168.142.255    311
 224.0.0.0          240.0.0.0  On-link      127.0.0.1    331
 224.0.0.0          240.0.0.0  On-link     192.168.56.1    281
 224.0.0.0          240.0.0.0  On-link     192.168.142.250    311
255.255.255.255  255.255.255.255  On-link     127.0.0.1    331
 255.255.255.255  255.255.255.255  On-link     192.168.56.1    281
 255.255.255.255  255.255.255.255  On-link     192.168.142.250    311

Persistent Routes:
None

IPv6 Route Table
Active Routes:
If Metric Network Destination      Gateway
 2   71 ::/0          fe80::f0ff:a4ff:fea0:1b89
 1   311 ::/128        On-link
 2   71 2409:4080:deb2:751::/64  On-link
 2   311 2409:4080:deb2:751:3135:6f3d:befb:33d9/128
                                         On-link
 2   311 2409:4080:deb2:751:88ac:45db:5891:9ce0/128
                                         On-link
 5   281 fe80::/64        On-link
 2   311 fe80::/64        On-link
```



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```
Command Prompt
5 281 fe80::/64      On-link
2 311 fe80::/64      On-link
5 281 fe80::9a9b:912a:eb3f:1333/128
2 311 fe80::e5e0:642a:7caf:825b/128
1 331 ff00::/8       On-link
5 281 ff00::/8       On-link
2 311 ff00::/8       On-link

Persistent Routes:
None

C:\Users\i>
```

7. nslookup

Description:

The nslookup command is a network administration command-line tool used for querying the Domain Name System (DNS) to obtain domain name or IP address mapping information. It can be used to find the IP address associated with a domain name or the domain name associated with an IP address. This tool is useful for diagnosing DNS issues and verifying DNS configurations.

No.	Option	Description
1	-debug	Enables the display of debugging information
2	-type=any	Lookup for any record We can also view all the available DNS records using the -type=any option.
3	-type=SOA	Lookup for a soa record SOA record (start of authority), provides the authoritative information about the domain, the e-mail address of the domain admin, the domain serial number, etc...

Implementation:

➤ nslookup www.google.com

```
Command Prompt
C:\Users\i>nslookup www.google.com
Server: Unknown
Address: 10.20.1.1

Non-authoritative answer:
Name: www.google.com
Addresses: 2404:6800:4009:829::2004
          142.250.183.196

C:\Users\i>
```

➤ nslookup -type=any www.google.com

```
Command Prompt
C:\Users\i>nslookup -type=any www.google.com
Server: Unknown
Address: 192.168.204.159

Non-authoritative answer:
www.google.com internet address = 142.250.192.68
www.google.com AAAA IPv6 address = 2404:6800:4009:829::2004

C:\Users\i>
```



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➤ nslookup -type=SOA www.google.com

```
Command Prompt
C:\Users\i>nslookup -type=SOA www.google.com
Server: Unknown
Address: 192.168.204.159

google.com
    primary name server = ns1.google.com
    responsible mail addr = dns-admin.google.com
    serial = 646797294
    refresh = 900 (15 mins)
    retry = 900 (15 mins)
    expire = 1800 (30 mins)
    default TTL = 60 (1 min)

C:\Users\i>
```

➤ nslookup -debug www.google.com

```
Command Prompt
C:\Users\i>nslookup -debug www.google.com
-----
Got answer:
HEADER:
opcode = QUERY, id = 1, rcode = NXDOMAIN
header flags: response, want recursion, recursion avail.
questions = 1, answers = 0, authority records = 0, additional = 0

QUESTIONS:
159.204.168.192.in-addr.arpa, type = PTR, class = IN

-----
Server: Unknown
Address: 192.168.204.159

Got answer:
HEADER:
opcode = QUERY, id = 2, rcode = NOERROR
header flags: response, want recursion, recursion avail.
questions = 1, answers = 1, authority records = 0, additional = 0

QUESTIONS:
www.google.com, type = A, class = IN
ANSWERS:
-> www.google.com
    internet address = 142.250.183.68
    ttl = 6 (6 secs)

-----
Non-authoritative answer:
-----
Got answer:
HEADER:
opcode = QUERY, id = 3, rcode = NOERROR
header flags: response, want recursion, recursion avail.
questions = 1, answers = 1, authority records = 0, additional = 0

QUESTIONS:
www.google.com, type = AAAA, class = IN
ANSWERS:
-> www.google.com
    AAAA IPv6 address = 2404:6800:4009:822::2004
    ttl = 116 (1 min 56 secs)

-----
Name: www.google.com
Addresses: 2404:6800:4009:822::2004
          142.250.183.68
```



Date: 13/06/2024

8. hostname

Description:

The hostname command is a simple command-line utility used in various operating systems (Windows, Linux, macOS) to display or set the name of the current host system. The hostname is a unique identifier assigned to a machine on a network.

Implementation:

```
cmd Command Prompt
C:\Users\i>hostname
DESKTOP-8583IKB
C:\Users\i>
```



Date: 13/06/2024

9. pathping

Description:

The pathping command in Windows is a network diagnostic tool that combines the features of ping and tracert. It provides detailed information about network latency and packet loss along the route from the source to the destination. This tool is particularly useful for identifying problematic routers or links in a network path.

No.	Option	Description
1	-h maximum_hops	Maximum number of hops to search for target.
2	-n	Do not resolve addresses to hostnames.
3	q num_queries	Number of queries per hop.
4	-w timeout	Wait timeout milliseconds for each reply.
5	-4	Force using IPv4.

Implementation:

➤ pathping www.google.com

```
Command Prompt
C:\Users\i>pathping www.google.com
Tracing route to www.google.com [2404:6800:4002:826::2004]
over a maximum of 30 hops:
  0 DESKTOP-8583IKB [2409:4080:deb2:751:1408:7c17:ab64:f1b]
  1 2409:4080:deb2:751::79
  2 * * *
Computing statistics for 25 seconds...
      Source to Here   This Node/Link
Hop  RTT     Lost/Sent = Pct  Lost/Sent = Pct  Address
  0          0/ 100 =  0%          0/ 100 =  0%  DESKTOP-8583IKB [2409:4080:deb2:751:1408:7c17:ab64:f1b]
  1  66ms    0/ 100 =  0%    0/ 100 =  0%  2409:4080:deb2:751::79
Trace complete.

C:\Users\i>
```

➤ pathping -h 5 www.google.com

```
Command Prompt
C:\Users\i>pathping -h 5 www.google.com
Tracing route to www.google.com [2404:6800:4009:827::2004]
over a maximum of 5 hops:
  0 DESKTOP-8583IKB [2409:4080:deb2:751:1408:7c17:ab64:f1b]
  1 2409:4080:deb2:751::79
  2 * * *
Computing statistics for 25 seconds...
      Source to Here   This Node/Link
Hop  RTT     Lost/Sent = Pct  Lost/Sent = Pct  Address
  0          0/ 100 =  0%          0/ 100 =  0%  DESKTOP-8583IKB [2409:4080:deb2:751:1408:7c17:ab64:f1b]
  1  77ms    0/ 100 =  0%    0/ 100 =  0%  2409:4080:deb2:751::79
Trace complete.

C:\Users\i>
```



Date: 13/06/2024

➤ pathping -n www.google.com

```
C:\Users\i>pathping -n www.google.com

Tracing route to www.google.com [2404:6800:4009:827::2004]
over a maximum of 30 hops:
  0  2409:4080:deb2:751:1408:7c17:ab64:f1b
  1  2409:4080:deb2:751::79
  2  *      *      *
Computing statistics for 25 seconds...
      Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0          0/ 100 =  0%          2409:4080:deb2:751:1408:7c17:ab64:f1b
  1  66ms    0/ 100 =  0%    0/ 100 =  0%  2409:4080:deb2:751::79

Trace complete.

C:\Users\i>
```

➤ pathping -q 5 www.google.com

```
C:\Users\i>pathping -q 5 www.google.com

Tracing route to www.google.com [2404:6800:4009:827::2004]
over a maximum of 30 hops:
  0  DESKTOP-8583IKB [2409:4080:deb2:751:1408:7c17:ab64:f1b]
  1  2409:4080:deb2:751::79
  2  *      *      *
Computing statistics for 1 seconds...
      Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0          0/   5 =  0%          DESKTOP-8583IKB [2409:4080:deb2:751:1408:7c17:ab64:f1b]
  1  58ms    0/   5 =  0%    0/   5 =  0%  2409:4080:deb2:751::79

Trace complete.

C:\Users\i>
```

➤ pathping -w 3000 www.google.com

```
C:\Users\i>pathping -w 3000 www.google.com

Tracing route to www.google.com [2404:6800:4009:827::2004]
over a maximum of 30 hops:
  0  DESKTOP-8583IKB [2409:4080:deb2:751:1408:7c17:ab64:f1b]
  1  2409:4080:deb2:751::79
  2  *      *      *
Computing statistics for 25 seconds...
      Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0          0/ 100 =  0%          DESKTOP-8583IKB [2409:4080:deb2:751:1408:7c17:ab64:f1b]
  1  56ms    0/ 100 =  0%    0/ 100 =  0%  2409:4080:deb2:751::79

Trace complete.

C:\Users\i>
```



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➤ pathping -4 www.google.com

```
Command Prompt
C:\Users\i>pathping -4 www.google.com

Tracing route to www.google.com [142.250.192.4]
over a maximum of 30 hops:
 0  DESKTOP-8583IKB [192.168.142.250]
 1  192.168.142.170
 2  192.0.0.1
 3  *       *       *
Computing statistics for 50 seconds...
          Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
 0          0/ 100 =  0%      0/ 100 =  0%  DESKTOP-8583IKB [192.168.142.250]
 1  116ms    0/ 100 =  0%      0/ 100 =  0%  192.168.142.170
 2  87ms     0/ 100 =  0%      0/ 100 =  0%  192.0.0.1

Trace complete.

C:\Users\i>
```



Date: 13/06/2024

10.arp

Description:

The arp (Address Resolution Protocol) command in Windows is used to view and manipulate the ARP cache, which stores mappings of IP addresses to physical MAC addresses. This command is useful for diagnosing network issues and ensuring proper network configuration.

No.	Option	Description
1	-a	Displays current ARP entries by interrogating the current protocol data. If inet_addr is specified, the IP and Physical addresses for only the specified computer are displayed. If more than one network interface uses ARP, entries for each ARP table are displayed.
2	-v	Displays current ARP entries in verbose mode. All invalid entries and entries on the loop-back interface will be shown.
3	inet_addr.	Specifies an internet address

Implementation:

➤ arp

```
Command Prompt
C:\Users\i>arp
Displays and modifies the IP-to-Physical address translation tables used by
address resolution protocol (ARP).

ARP -s inet_addr eth_addr [if_addr]
ARP -d inet_addr [if_addr]
ARP -a [inet_addr] [-N if_addr] [-v]

-a      Displays current ARP entries by interrogating the current
       protocol data. If inet_addr is specified, the IP and Physical
       addresses for only the specified computer are displayed. If
       more than one network interface uses ARP, entries for each ARP
       table are displayed.
-g      Same as -a.
-v      Displays current ARP entries in verbose mode. All invalid
       entries and entries on the loop-back interface will be shown.
inet_addr      Specifies an internet address.
-N if_addr     Displays the ARP entries for the network interface specified
               by if_addr.
-d      Deletes the host specified by inet_addr. inet_addr may be
       wildcarded with * to delete all hosts.
-s      Adds the host and associates the Internet address inet_addr
       with the Physical address eth_addr. The Physical address is
       given as 6 hexadecimal bytes separated by hyphens. The entry
       is permanent.
eth_addr      Specifies a physical address.
if_addr       If present, this specifies the Internet address of the
               interface whose address translation table should be modified.
               If not present, the first applicable interface will be used.

Example:
> arp -s 157.55.85.212 00-aa-00-62-c6-09 .... Adds a static entry.
> arp -a          .... Displays the arp table.

C:\Users\i>
```



Date: 13/06/2024

➤ arp -a

```
Command Prompt
C:\Users\i>arp -a

Interface: 192.168.204.250 --- 0x2
 Internet Address Physical Address Type
 192.168.204.159      56-dc-b4-d3-d6-49 dynamic
 192.168.204.255      ff-ff-ff-ff-ff-ff 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

Interface: 192.168.56.1 --- 0x5
 Internet Address Physical Address Type
 192.168.56.255      ff-ff-ff-ff-ff-ff 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

C:\Users\i>
```

➤ arp -a

```
Command Prompt
C:\Users\i>arp -a 192.168.204.159

Interface: 192.168.204.250 --- 0x2
 Internet Address Physical Address Type
 192.168.204.159      56-dc-b4-d3-d6-49 dynamic

C:\Users\i>
```

➤ arp -a -v

```
Command Prompt
C:\Users\i>arp -a -v

Interface: 127.0.0.1 --- 0x1
 Internet Address Physical Address Type
 224.0.0.22            static
 224.0.0.251           static
 224.0.0.252           static
 239.255.255.250       static

Interface: 192.168.204.250 --- 0x2
 Internet Address Physical Address Type
 192.168.32.201        00-00-00-00-00-00 invalid
 192.168.204.159       56-dc-b4-d3-d6-49 dynamic
 192.168.204.255       ff-ff-ff-ff-ff-ff 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

Interface: 0.0.0.0 --- 0xffffffff
 Internet Address Physical Address Type
 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

Interface: 192.168.56.1 --- 0x5
 Internet Address Physical Address Type
 169.254.169.254       00-00-00-00-00-00 invalid
 192.168.56.255       ff-ff-ff-ff-ff-ff 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

Interface: 0.0.0.0 --- 0xffffffff
 Internet Address Physical Address Type
 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

Interface: 0.0.0.0 --- 0xffffffff
 Internet Address Physical Address Type
 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
```

Date: 27/06 /2024

Lab Practical #02:

Study of different types of network cables & connectors and crimping a LAN.

Practical Assignment #02:

1. List various networks cable. Also, write short description.
2. Difference between guided and unguided media.
3. Give cross-wired cable and straight through cable diagram (Color Code wise).

1. List various networks cable and connectors. Also, write short description.

a) Twisted Pair Cable:

o Description:

Twisted-pair Category 5e cables, also called CAT5e, are the industry standard for unshielded twisted-pair cables (UTP) for in-home and small business networking. Cables that are manufactured to prevent electromagnetic interference are shielded twisted-pair, or STP cables. CAT5e cables have an Ethernet capability of up to 1,000 megabits per second (Mbps) and can often carry infrared (IR or remote) control signals, eliminating the need for a separate IR network. They connect phones, computer networks, home automation networks and audio/video distribution systems.

CAT5e cables typically consist of four pairs of wire (eight total conductors) wrapped in a single jacket. In addition, Category 6, or CAT6 cable, is a standardized twisted pair network cable designed to meet more stringent standards for crosstalk and system noise than CAT5e. Older categories, such as CAT5, have reduced transmission rates.

o Diagram:



b) Coaxial Cable:

o Description:

Coaxial cables are metallic cables most often used to carry television signals and connect video equipment. They provide protection from electromagnetic interference, allowing signals with low power to be transmitted over longer distances. They feature a central bayonet wire

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conductor covered with a dielectric or non-conducting insulator surrounded by mesh or a metal sheath. These components are then covered by a thin plastic layer for protection.

Sometimes called “coax,” they often carry infrared (IR or remote) control signals, eliminating the need for a separate IR network. While no longer installed for the purpose, coax was among the first Ethernet network cable types.

Coaxial cable conductors carry electromagnetic signals and can come either in single-core or multi-core models. While a single-core coaxial cable has only one central metal, multi-core cables have many metal wires.

Coaxial cables were used in the earlier days of computer networks.

- **Diagram:**



c) Fiber Optic Cable:

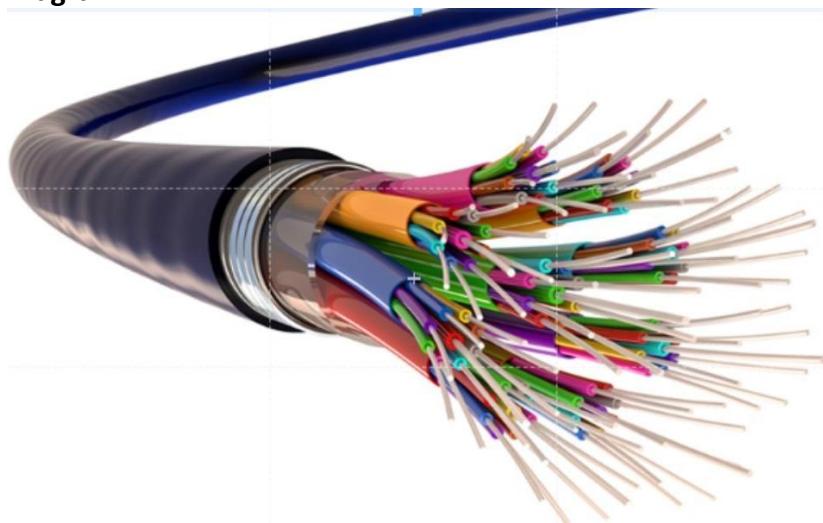
- **Description:**

Fiber optic cables use glass or plastic threads to transmit data quickly and efficiently using pulses of light rather than electrical signals. Apart from connecting components in home theaters, they are not as readily available for residential use as are coax and CAT5e. They transmit data at higher rates than coaxial or twisted-pair cables.

Optical audio cables may be used for phones, computer networks and cable television. They have less signal loss than copper and deliver clearer phone conversations or television reception. Multi-mode fiber is designed to carry data over shorter distances by using several rays of light at the same time.

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- **Diagram:**



d) BNC connectors:

- **Description:**

BNC(Bayonet Neill-Concelman) connectors are a type of F-series connectors commonly found in households. This type of connector for RG59 or RG6 coaxial cable is used for cable television equipment, broadcast TV antennas and CCTV security camera installations. They are easy to connect and disconnect from equipment and provide inexpensive, stable connections to these communications devices and other cables.

To install a BNC connector, use a stripping tool to remove protective shields from the cable. The connector is pushed onto the end and then squeezed around the conductive material using a special compression crimper.

Twist-on F-connectors are also available for making quick and easy repairs to TV equipment without the need for special tools.

- **Diagram:**



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e) RJ45 connector:

- Description:

RJ45 connectors are used for CAT6 cables and CAT5e cables. These connectors for twisted-pair Ethernet cables are similar in appearance to a standard telephone cord connector. They are wider, however, because they have eight conductors compared to only four conductors on a telephone jack.

To install these types of wiring connectors, a stripping tool is used to expose the twisted pairs of wires from the cable, which are then positioned into the appropriate slots on the terminal plug. The connector is then crimped to the cable using a crimping tool.

- Diagram:



f) Fiber optic connector:

- Description:

Fiber optic connectors require different types of connectors from those used with coax or twisted-pair cables, such as CAT5e. These types of connectors in networking must align glass fibers with precision to allow for communication. If you choose to use optical cable over twisted pair Ethernet, you may need to install a special adapter in your computer to utilize various fiber optic cable connector types.

The type of wiring connector used depends on the style of jack in the peripheral device.

- SC connectors: A push-pull latching mechanism in SC connectors provides quick insertion and removal while also ensuring a positive connection.
- ST connectors: ST connectors were among the first connectors in networking fiber optic cable. These use a plug and socket, which is locked in place with a twist-style bayonet lock.
- LC connectors: LC-type connectors have a squarish duplex configuration. Installation of this small form factor (SFF) connector is quick for rapid repair of replacement needs.

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- **Diagram:**



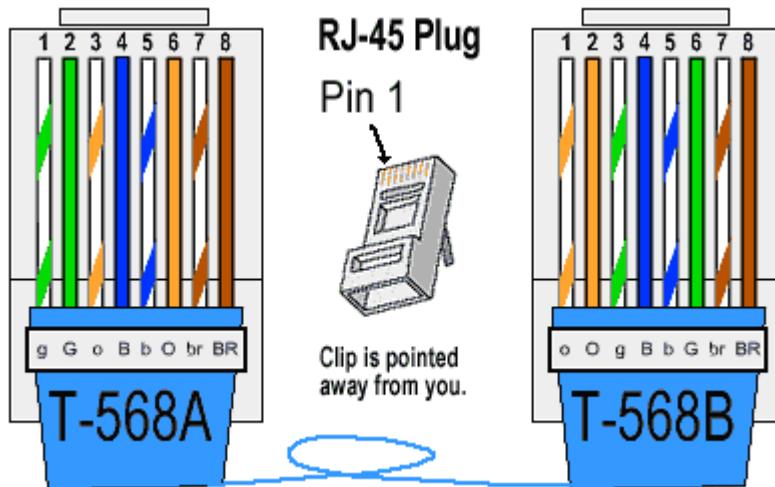
2. Difference between guided and unguided media.

Guided Media	Unguided Media
Also called Wired communication.	Also called wireless communication.
Signal energy propagates through wires in guided media.	Signal energy propagates thought the air in unguided media.
It is cost effective.	It is quiet expensive.
It is best for shorter distances.	It would be better for longer distances.
Point-to-Point connection	Suited for radio broadcasting in all directions.
Examples of guided media are Twisted Pair cables, Coaxial cables, and Fiber Optic cables.	Examples of unguided media are microwave, radio wave, infrared waves.

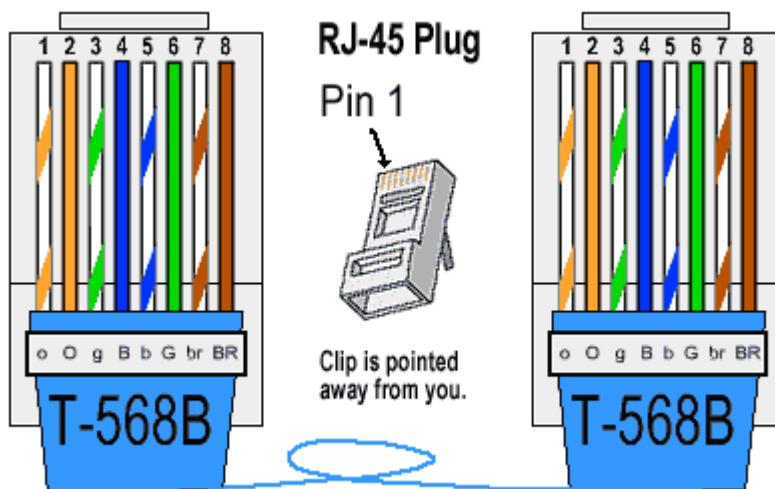
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3. Give cross-wired cable and straight through cable diagram (Color Code wise).

a) Cross-wired Cable Diagram (Color Code)



b) Straight Through Cable Diagram (Color Code)



**Date: 07/07/2024****Lab Practical #03:**

Study of different network devices in detail.

Practical Assignment #03:

1. Give difference between below network devices.

- Hub and Switch
- Switch and Router
- Router and Gateway

2. Working of below network devices:

- Switch
- Router
- Gateway

Hub and Switch

No.	Hub	Switch
1	Hubs function on Physical layer of the OSI framework.	Switches function on Data Link layer of the OSI framework.
2	Hubs are less intelligent devices and always send all information to all connected devices.	Switches record MAC addresses in a table to learn which devices to transmit information to.
3	Hubs group Ethernet devices on a LAN, broadcasting all data to all devices.	Switches connect devices to a singular LAN to transmit data from one device to another.
4	Hubs operate at half duplex, making them slower and forcing devices to share bandwidth equally.	Switches can operate at full duplex or half duplex, using all available bandwidth, creating faster and more efficient networks.
5	Hubs send information using bits.	Switches send information using data packets.
6	Hub have 4/12 ports.	Switch can have 24 to 48 ports.
7	Hub cannot be used as a repeater.	Switch can be used as a repeater.
8	In hub, Packet filtering is not provided.	In switch, Packet filtering is provided.
9	Speed of original hub 10Mbps and modern internet hub is 100Mbps.	Maximum speed is 10Mbps to 100Mbps.

Switch and Router

No.	Switch	Router
1	It connects multiple networked devices in the network.	It connects multiple switches & their corresponding networks.
2	It works on the data link layer of the OSI model.	It works on the network layer of the OSI model.
3	It is used within a LAN.	It can be used in LAN or MAN.
4	A switch cannot perform NAT or Network Address Translation.	A router can perform Network Address Translation.
5	The switch takes more time while making complicated routing decisions.	A router can take a routing decision much faster than a switch.



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6	It provides only port security.	It provides security measures to protect the network from security threats.
7	It works in either half or full-duplex transmission mode.	It works in the full-duplex transmission mode. However, we can change it manually to work on half-duplex mode.
8	Switches can only work with the wired network.	Routers can work with both wired & wireless networks.
9	Switches are available with different ports, such as 8, 16, 24, 48, and 64.	A router contains two ports by default, such as Fast Ethernet Port. But we can also add the serial ports explicitly.
10	It uses the CAM (Content Addressable Memory) table for the source and destination MAC address.	It uses the routing table to get the best route for the destination IP.

Router and Gateway

No.	Router	Gateway
1	Usually, routers run on the 3rd layer of the protocol and transmit the packets from one system to another. A router chooses the network's path to transport the data packets.	Gateway interprets the network system as endpoints from one packet to another.
2	It is available only to dedicated applications	It is hosted on the dedicated application, physical servers, and virtual applications
3	It routes the data packets via similar networks.	It connects two dissimilar networks.
4	It is deployed on the router hardware in a specific appliance.	The gateway is deployed as the virtual or physical server or the specific appliance.
5	It can operate only on 3 and 4 layers.	It can operate only on the 5 layers.
6	Router supports dynamic routing.	Gateway doesn't support dynamic routing.
7	The additional features provided by a router are Wireless networking, Static routing, NAT, DHCP server etc.	The additional features provided by a gateway are network access control, protocol conversion etc.

Working of below network devices:

1. Switch

The Switch is a network device that is used to segment the networks into different subnetworks called subnets or LAN segments. It is responsible for filtering and forwarding the packets between LAN segments based on MAC address.

Switches have many ports, and when data arrives at any port, the destination address is examined first and some checks are also done and then it is processed to the devices. Different types of communication are supported here like unicast, multicast, and broadcast communication.



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- It operates in Data Link Layer in OSI Model.
- It performs error checking before forwarding data.
- It transfers the data only to the device that has been addressed.
- It operates in full duplex mode.
- It allocates each LAN segment a limited bandwidth.
- It uses Unicast (one-to-one), multicast (one-to-many), and broadcast (one-to-all) transmission modes.
- Packet Switching techniques are used to transfer data packets from source to destination.
- Switches have a more significant number of ports.

• Working :

When the source wants to send the data packet to the destination, the packet first enters the switch and the switch reads its header and finds the MAC address of the destination to identify the device then it sends the packet out through the appropriate ports that lead to the destination devices.

Switch establishes a temporary connection between the source and destination for communication and terminates the connection once the conversation is done. Also, it offers full bandwidth to network traffic going to and from a device simultaneously to reduce collision.

2. Router

A router is a device that connects two or more packet-switched networks or subnetworks. It serves two primary functions: managing traffic between these networks by forwarding data packets to their intended IP addresses, and allowing multiple devices to use the same Internet connection.

There are several types of routers, but most routers pass data between LANs (local area networks) and WANs (wide area networks). A LAN is a group of connected devices restricted to a specific geographic area. A LAN usually requires a single router.

• Working :

A router works by using a protocol called the Internet Protocol (IP), which is a set of rules that govern how data is transmitted across the internet. When a device on your network sends data, the data is broken up into small packets, which are then sent to the router.

The router then examines the destination IP address of the packet to determine where it should be sent. If the destination IP address is on your network, the router sends the packet directly to the device with that IP address. If the destination IP address is not on your network, the router sends the packet to the modem, which then sends the packet to the internet.



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In addition to directing traffic between devices, a router also performs other important functions, such as providing [security for your network](#). Routers often include features such as firewalls and network address translation (NAT), which help protect your network from unauthorised access.

[Routers](#) connect computers and other devices to the Internet. A router acts as a dispatcher, choosing the best route for your information to travel. It connects your business to the world, protects information from security threats, and can even decide which computers get priority over others.

3. Gateway

A gateway is a [network node](#) used in telecommunications that connects two networks with different transmission [protocols](#) together. Gateways serve as an entry and exit point for a network as all data must pass through or communicate with the gateway prior to being routed. In most [IP](#)-based networks, the only traffic that does not go through at least one gateway is traffic flowing among nodes on the same local area network ([LAN](#)) segment. The term default gateway or network gateway may also be used to describe the same concept.

- **Working :**

All networks have a boundary that limits communication to devices that are directly connected to it. Due to this, if a network wants to communicate with devices, nodes or networks outside of that boundary, they require the functionality of a gateway. A gateway is often characterized as being the combination of a [router](#) and a modem.

The gateway is implemented at the edge of a network and manages all data that is directed internally or externally from that network. When one network wants to communicate with another, the data packet is passed to the gateway and then routed to the destination through the most efficient path. In addition to routing data, a gateway will also store information about the host network's internal paths and the paths of any additional networks that are encountered.

Gateways are basically protocol converters, facilitating compatibility between two protocols and operating on any layer of the open systems interconnection ([OSI](#)) model.

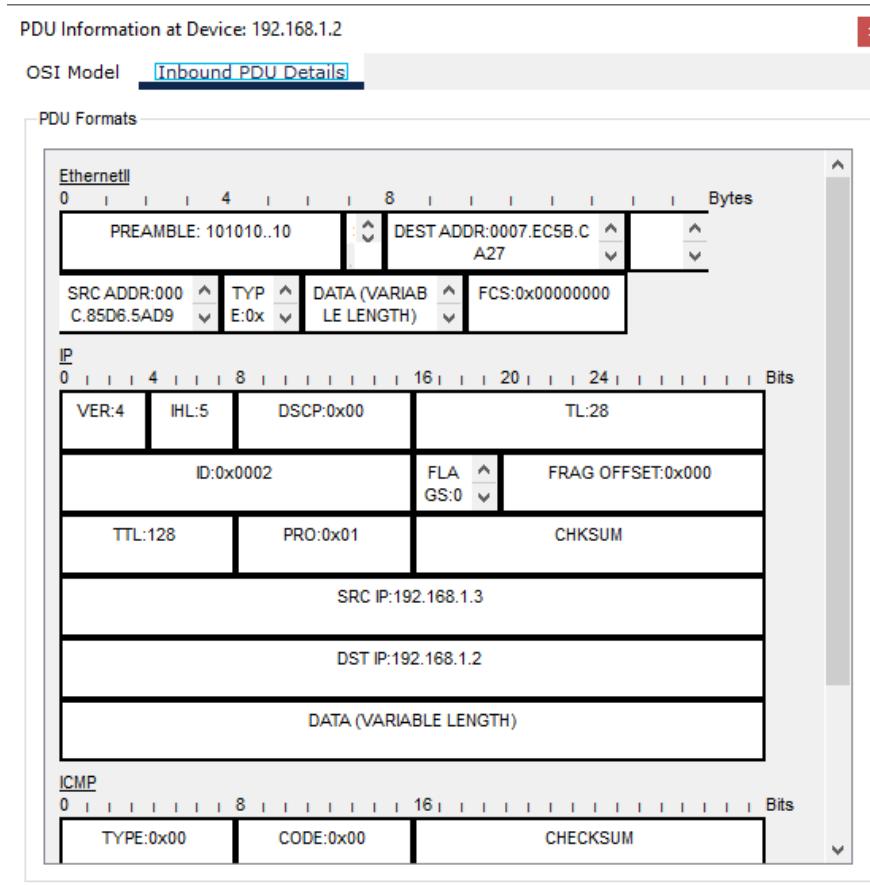
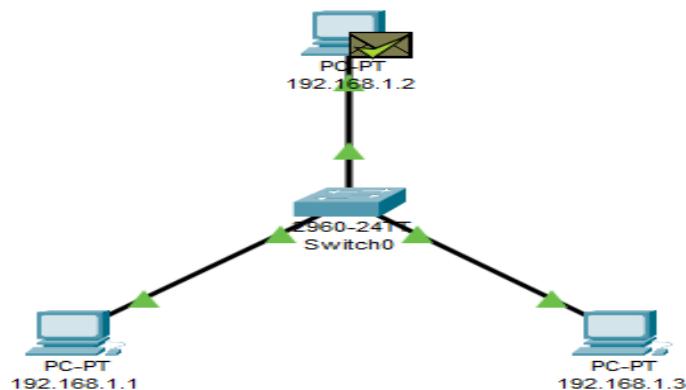
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Lab Practical #04:

Installation of Network Simulator (Packet Tracer) and Implement different LAN topologies.

Practical Assignment #04:

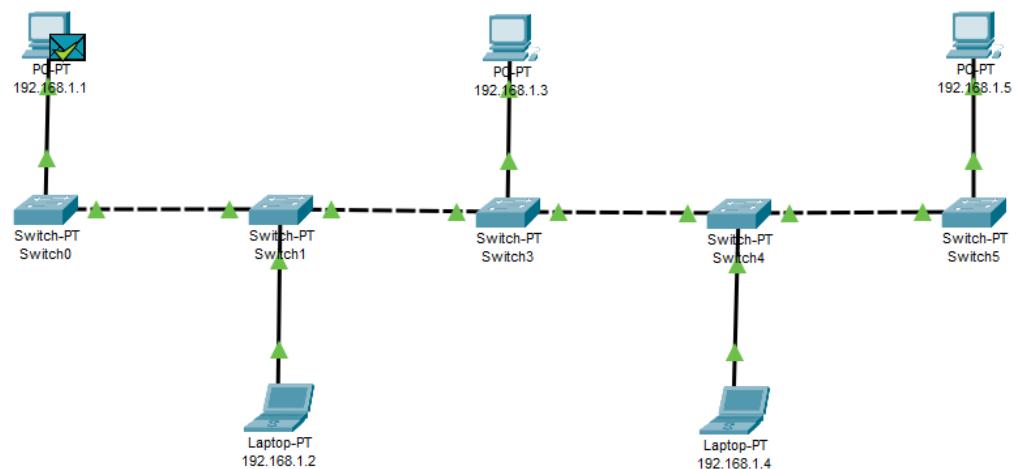
- Create a simple network with switch and two or more pc. Also check connectivity between them using ping command or PDU utility.



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2. Implement different topologies in packet tracer.

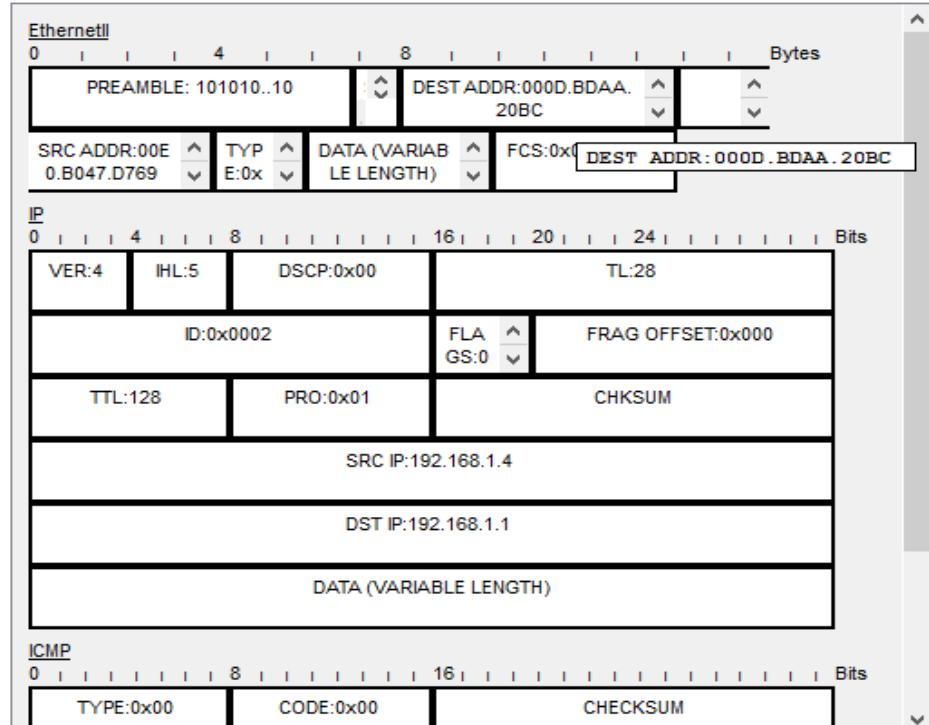
a. Bus

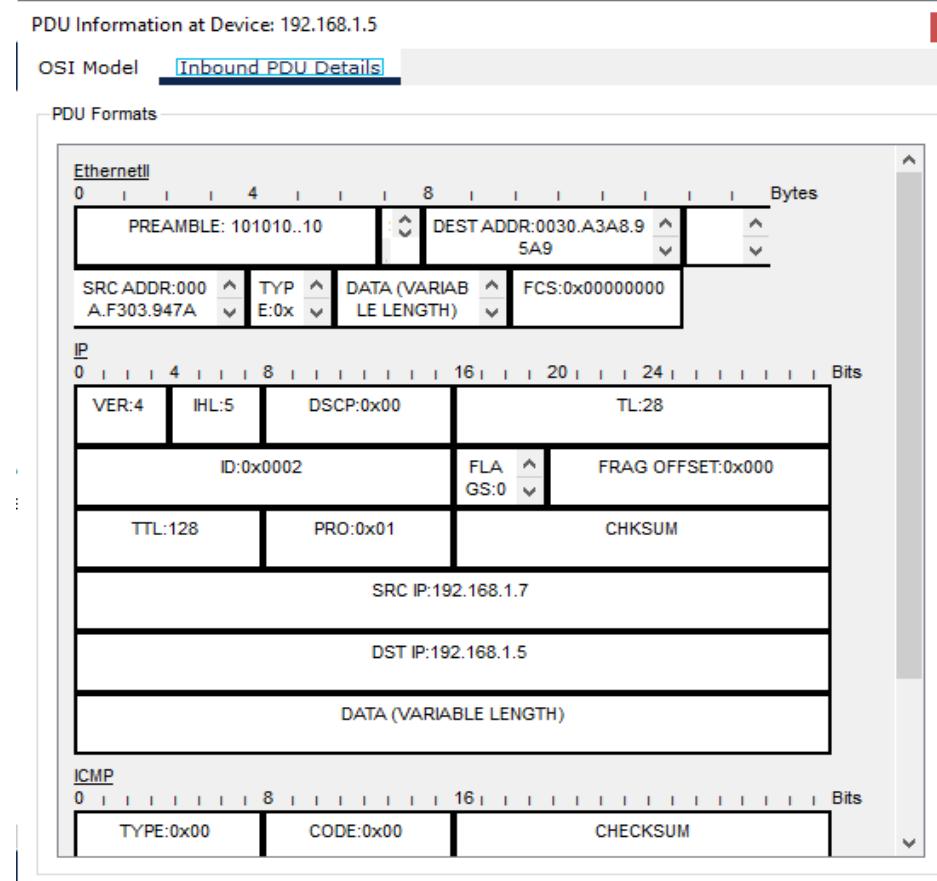
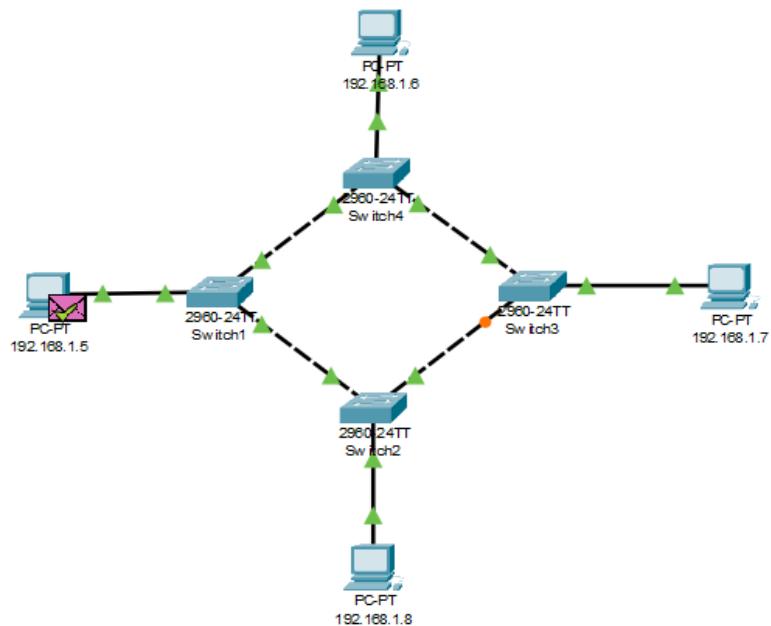


PDU Information at Device: 192.168.1.1

OSI Model Inbound PDU Details

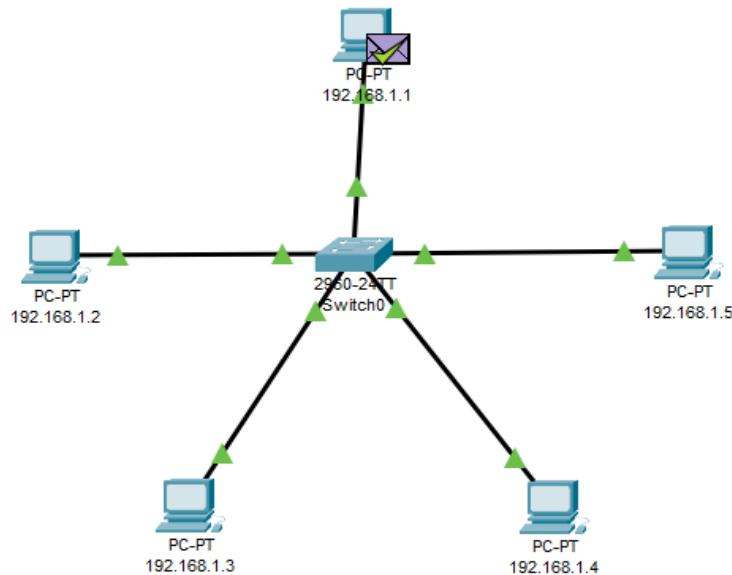
PDU Formats



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b. Ring


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c. Star

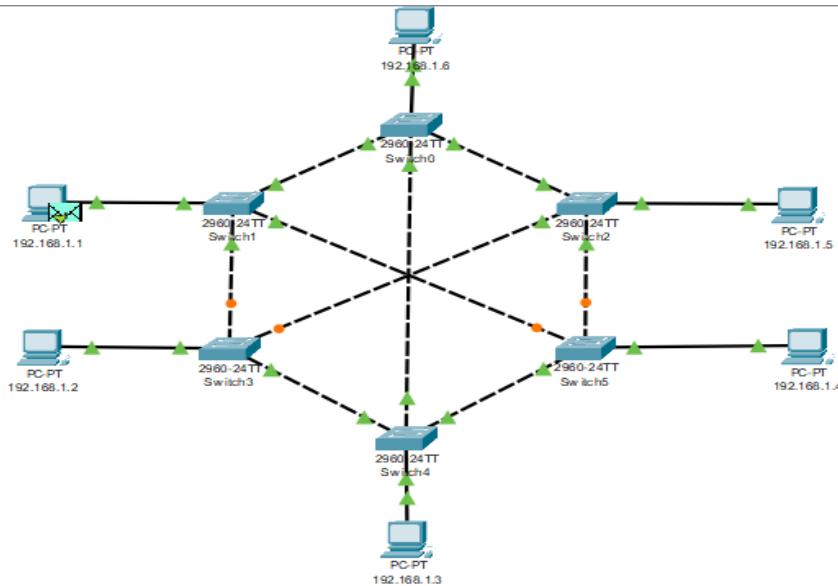
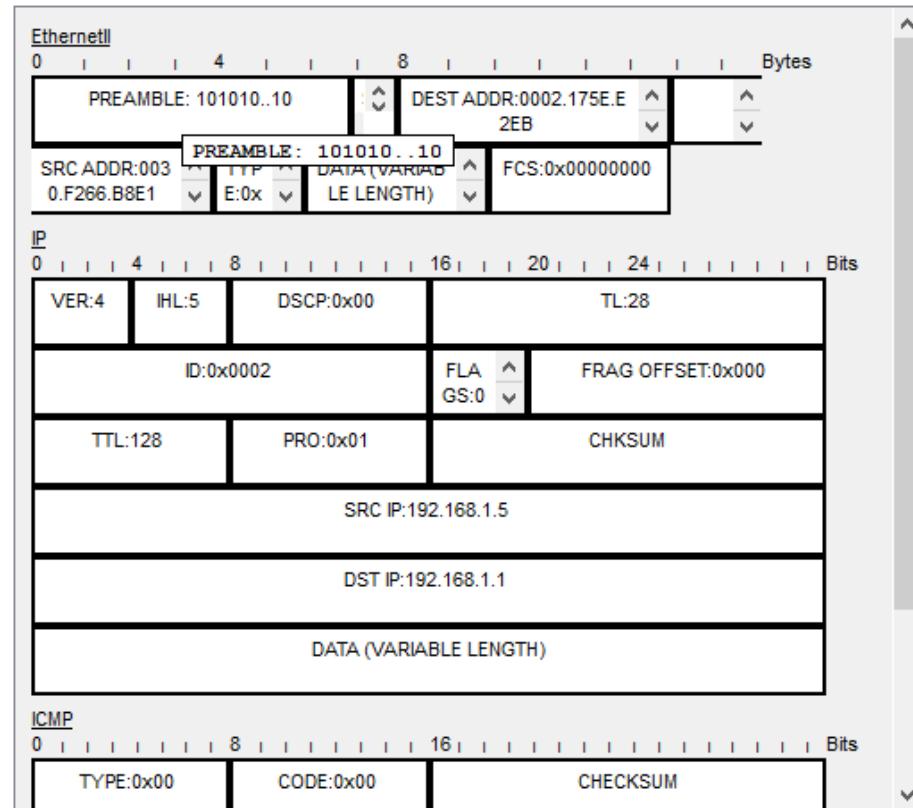


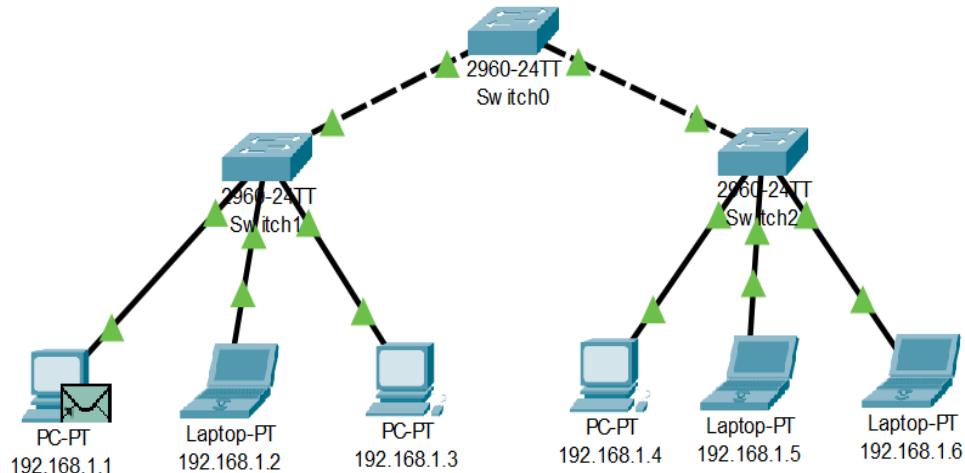
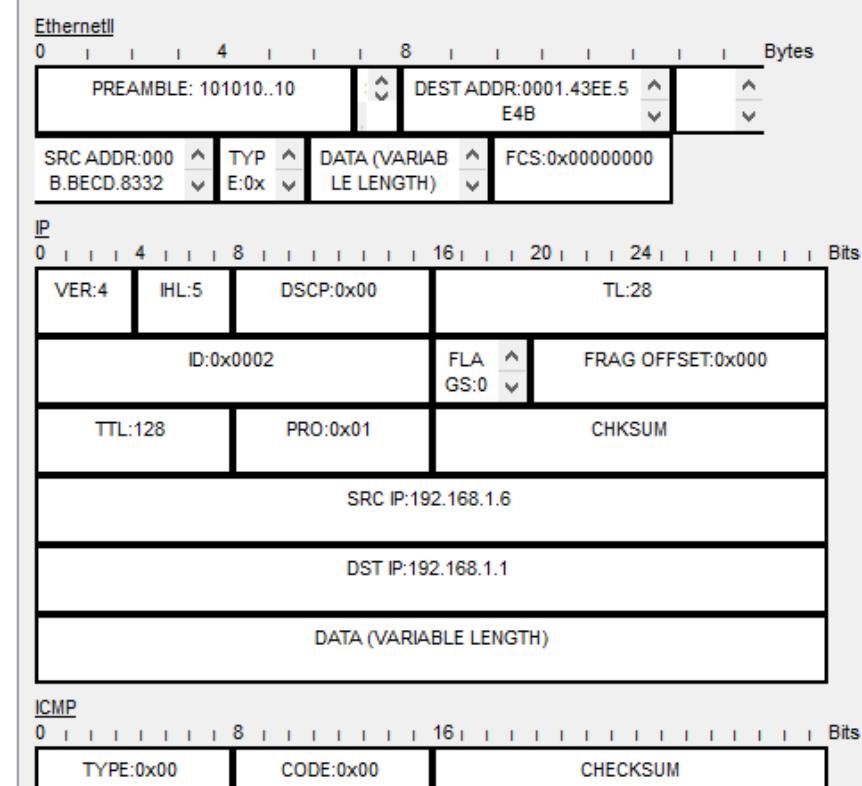
PDU Information at Device: 192.168.1.1

OSI Model Inbound PDU Details

PDU Formats

EthernetII		Bytes	
PREAMBLE: 101010..10		DEST ADDR: 0001.634C.D 26A	
SRC ADDR: 003 0.A333.29B6		TYP E: 0x E: 0x	DATA (VARIABLE LENGTH)
		FCS: 0x00000000	
IP		Bits	
VER: 4	IHL: 5	DSCP: 0x00	TL: 28
ID: 0x0002	FLA GS: 0	FRAG OFFSET: 0x000	
TTL: 128	PRO: 0x01	CHKSUM	
SRC IP: 192.168.1.3			
DST IP: 192.168.1.1			
DATA (VARIABLE LENGTH)			
ICMP		Bits	
TYPE: 0x00	CODE: 0x00	CHECKSUM	

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d. Mesh

PDU Information at Device: 192.168.1.1
OSI Model Inbound PDU Details
PDU Formats


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e. Tree

PDU Information at Device: 192.168.1.1
OSI Model [Inbound PDU Details](#)
PDU Formats


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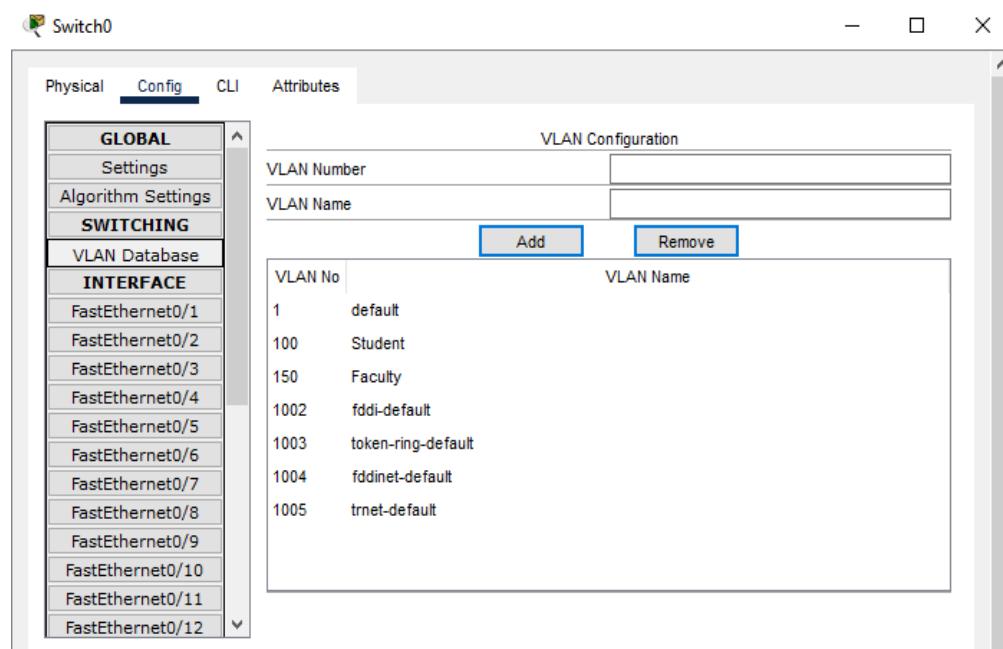
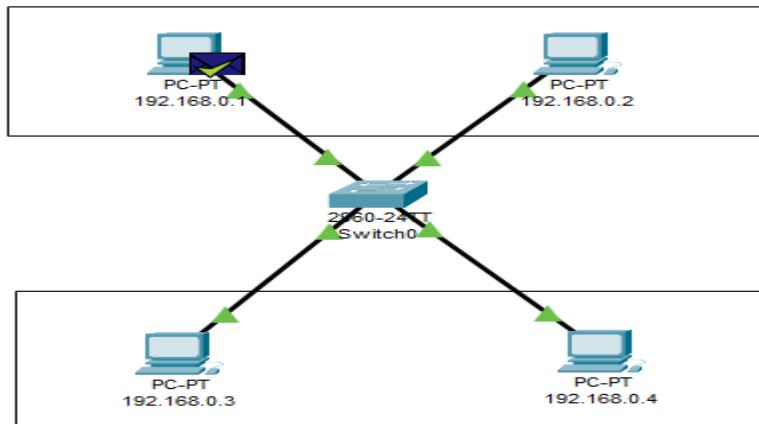
Lab Practical #05:

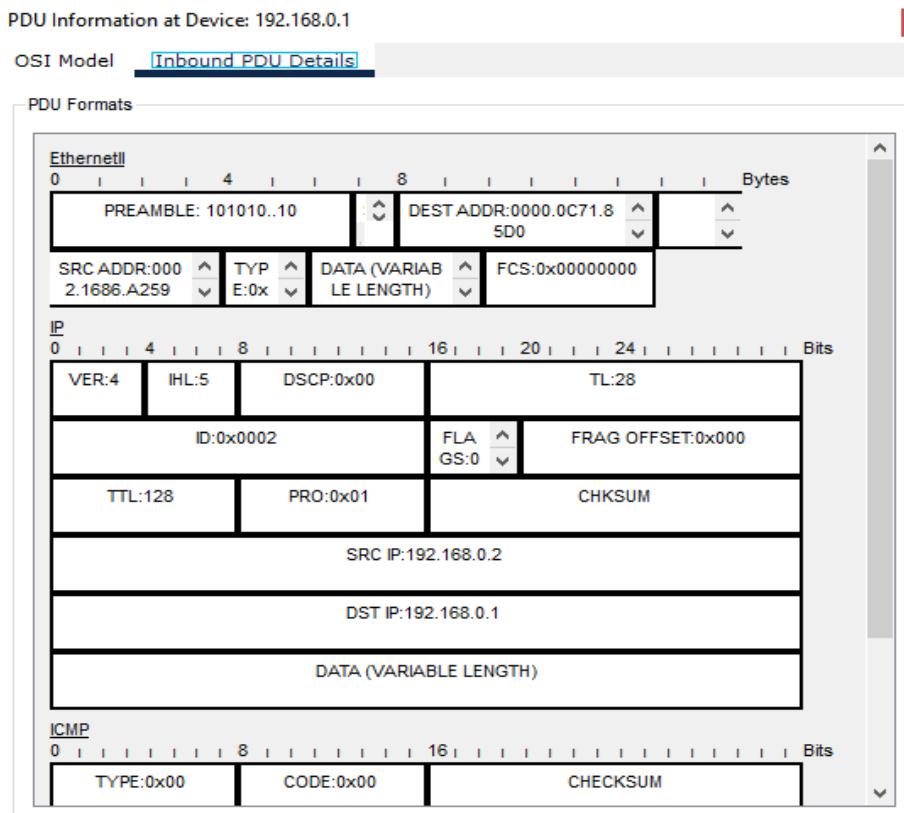
Study the concept of VLAN using packet tracer.

Practical Assignment #05:

1. Implement the different network structures in VLAN and VLAN trunking. Also check connectivity between them using ping command or PDU utility.

Example-1



Date: 24/07/2024


➤ Steps

Step 1: Set Up the Network Devices

1. Add a Switch: - Drag and drop a switch onto the workspace from the "Switches" section.
2. Add PCs: - Drag and drop four PCs onto the workspace from the "End Devices" section.

Step 2: Assign IP Addresses to PCs

- o Click on PC to open its configuration window.
- o Go to Config tab and after go to FastEthernet0.
- o Now set the IP address and set Subnet Mask.
- o Click on Setting and set Display Name same as your IP Address.
- o Do these for all other PCs.

Step 3: Connect the PCs to the Switch

- o Use the "Copper Straight-Through" cable to connect each PC to the switch.
- o Connect 192.168.0.1 to port FastEthernet0/1.
- o Connect 192.168.0.2 to port FastEthernet0/2.
- o Connect 192.168.0.3 to port FastEthernet0/3.
- o Connect 192.168.0.4 to port FastEthernet0/4.

Step 4: Configure the VLANs

1. Open the Switch Configuration:
 - o Click on the switch to open its configuration window.
 - o Go to the "Config" tab.
2. Create VLANs:
 - o In the "VLAN Database" section, add VLAN 100 and name it "Students".
 - o Add VLAN 150 and name it "Faculty".



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3. Assign Ports to VLANs:

- o In the "Interface" section, select FastEthernet0/1.
 - Set the "VLAN ID" to 100.
- o Select FastEthernet0/2.
 - Set the "VLAN ID" to 100.
- o Select FastEthernet0/3.
 - Set the "VLAN ID" to 150
- o Select FastEthernet0/4.
 - Set the "VLAN ID" to 150.

Step 5: Verify the VLAN Configuration

1. Verify VLANs on the Switch:

- o Go to the "VLAN Database" section in the switch configuration and ensure VLAN 100 and VLAN 150 are listed with the correct ports.

2. Test Connectivity:

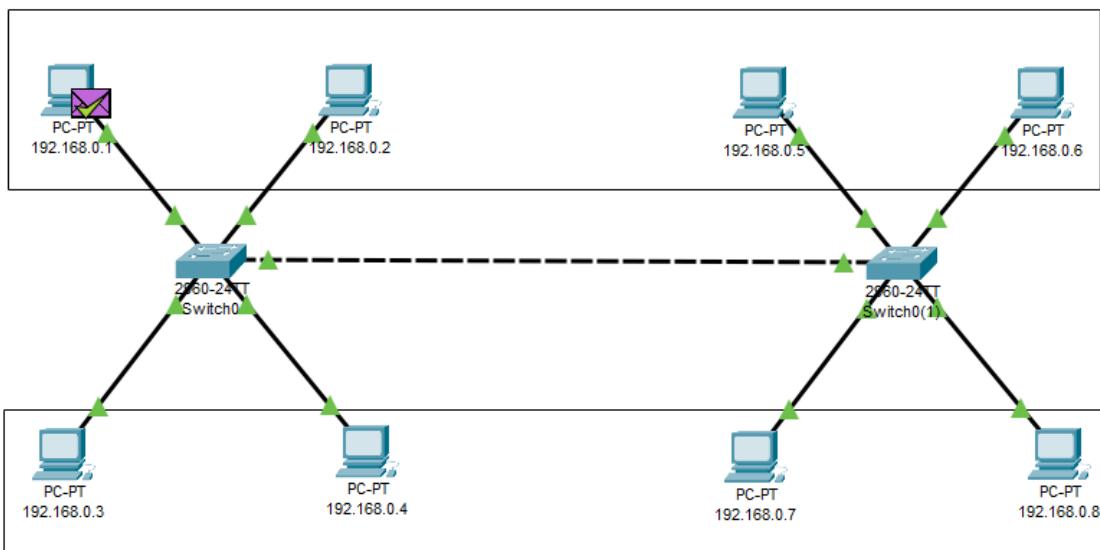
- o Send a Message (PDU) from PC 192.168.0.1 to the 192.168.0.2 if Message was send successfully then VLAN is works.
- o Send a Message (PDU) from 192.168.0.1 to the 192.168.0.2 if Message was failed then VLAN is not works.

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Example-2

➤ Steps

- Take 8 pc and assign Ip address and label to each pc.
- Take 2 Switch and Make 2 Lan with 4 pc each.
- Now there is local area network but We need to implement Virtual Lan database
- for implement Virtual Lan we need to configure Virtual Lan database in configure
- Section in switch.
- Make 2 New Virtual Lan configuration with unique Virtual Lan number and name.
- Now check the Port where the pc is connected and open that port configuration
- in switch and set Virtual Lan to access mode and select your Virtual Lan database
- name in dropdown.
- Now we need to connect both Switch but here we need to give Virtual Lan mode
- to trunk because there are number different Virtual Lan signal travel threw it.
- Now you configure two Virtual Lan in different local area network





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Semester 5th | Practical Assignment | Computer Networks (2301CS501)

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Switch0

Physical Config CLI Attributes

VLAN Configuration

VLAN No	VLAN Name
1	default
100	Student
150	Faculty
1002	fddi-default
1003	token-ring-default
1004	fddinet-default
1005	trnet-default

PDU Information at Device: 192.168.0.1

OSI Model Inbound PDU Details

PDU Formats

EthernetII

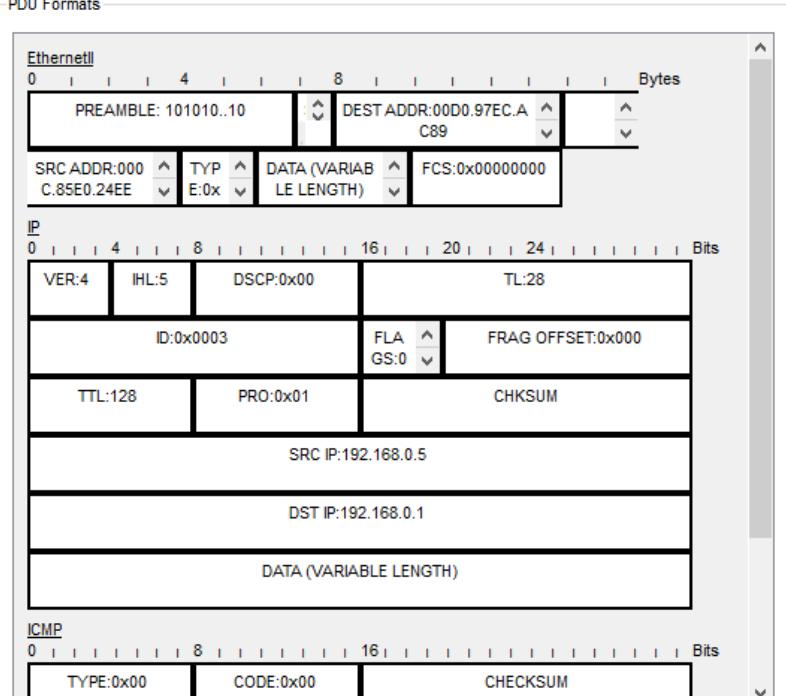
PREAMBLE: 101010..10	DEST ADDR: 00D0.97EC.A C89	
SRC ADDR: 00 C.85E0.24EE	TYP E:0x DATA (VARIABLE LENGTH)	FCS: 0x00000000

IP

VER:4	IHL:5	DSCH:0x00	TL:28
ID: 0x0003	FLA GS:0	FRAG OFFSET: 0x000	
TTL:128	PRO: 0x01	CHKSUM	
SRC IP: 192.168.0.5			
DST IP: 192.168.0.1			
DATA (VARIABLE LENGTH)			

ICMP

TYPE: 0x00	CODE: 0x00	CHECKSUM
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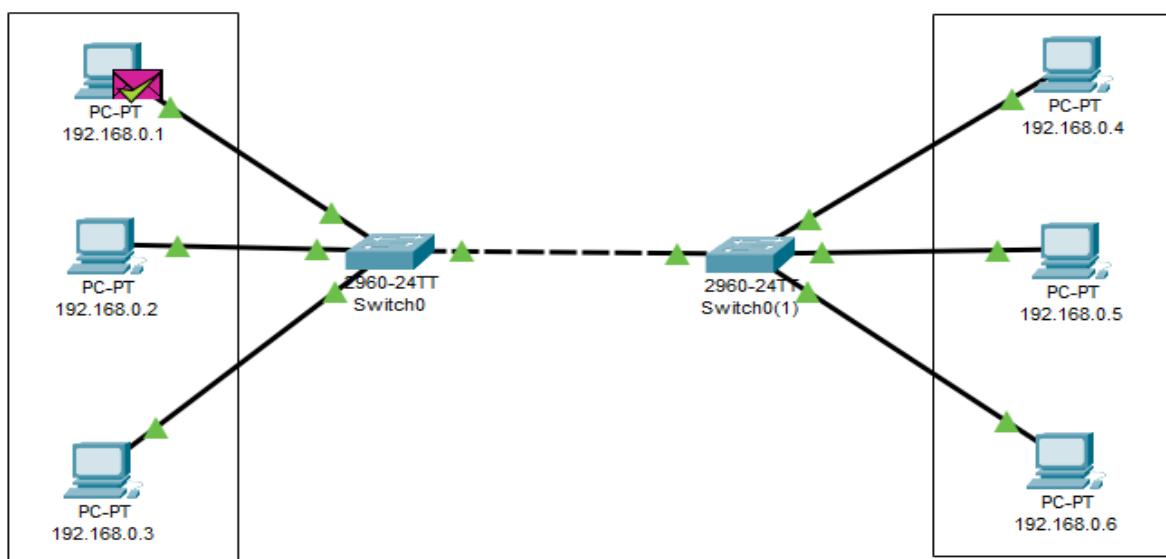


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Example-3

➤ Steps

- Take 6 pc and assign Ip address and label to each pc.
- Take 2 Switch and Make 2 Lan with 3 pc each.
- Now there is local area network first for Group-1(Students) and second for Group2(Faculty) but We need to implement Virtual Lan database for implement Virtual
- Lan we need to configure Virtual Lan database in configure Section in switch.
- Make 2 New Virtual Lan configuration with unique Virtual Lan number and name.
- Now check the Port where the pc is connected and open that port configuration
- in switch and set Virtual Lan to access mode and select your Virtual Lan database
- name in dropdown.
- Now we need to connect both Switch but here we need to give Virtual Lan mode
- to trunk because there are number different Virtual Lan signal travel throuw it.
- Now you configure two Virtual Lan in different local area network.





DARSHAN INSTITUTE OF ENGINEERING & TECHNOLOGY

Semester 5th | Practical Assignment | Computer Networks (2301CS501)

Date: 24/07/2024

Switch0

Physical Config CLI Attributes

VLAN Configuration

VLAN No	VLAN Name
1	default
100	Student
150	Faculty
1002	fddi-default
1003	token-ring-default
1004	fddinet-default
1005	trnet-default

PDU Information at Device: 192.168.0.1

OSI Model Inbound PDU Details

PDU Formats

Ethernet II

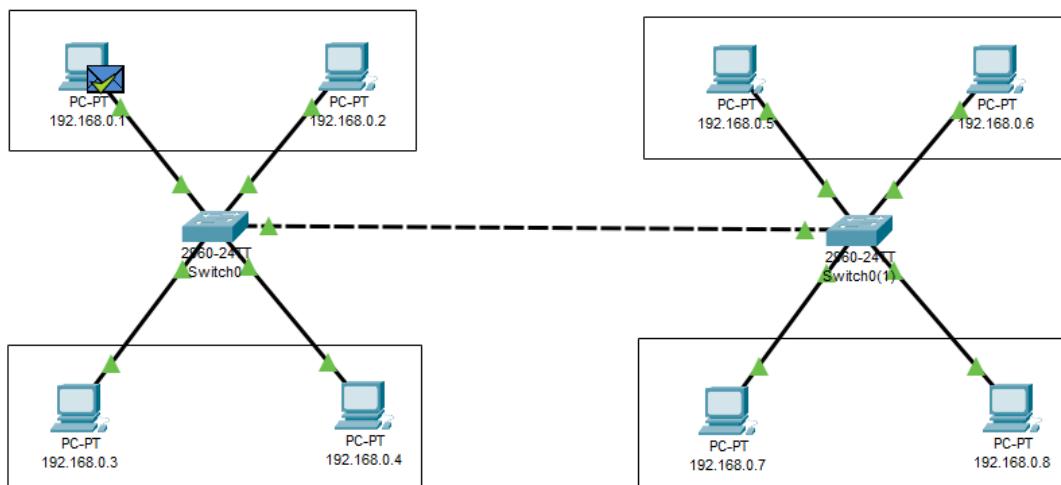
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Date: 24/07/2024

Example-4

➤ Steps

- Take 8 pc and assign Ip address and label to each pc.
- Take 2 Switch and Make 2 Lan with 4 pc each.
- Now there is local area network and group in to Group-1(Student), Group2(Faculty), Group-3(Student2) and Group-4(Faculty2) but We need to implement Virtual Lan database for implement Virtual Lan we need to configure Virtual Lan database in configure Section in switch.
- Make 4 New Virtual Lan configuration with unique Virtual Lan number and name.
- Now check the Port where the pc is connected and open that port configuration in switch and set Virtual Lan to access mode and select your Virtual Lan database name in dropdown.
- Now we need to connect both Switch but here we need to give Virtual Lan mode to trunk because there are number different Virtual Lan signal travel threw it.
- Now you configure two Virtual Lan in different local area network.





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Semester 5th | Practical Assignment | Computer Networks (2301CS501)

Date: 24/07/2024

Switch0

Physical Config CLI Attributes

GLOBAL

Settings

Algorithm Settings

SWITCHING

VLAN Database

INTERFACE

FastEthernet0/1

FastEthernet0/2

FastEthernet0/3

FastEthernet0/4

FastEthernet0/5

FastEthernet0/6

FastEthernet0/7

FastEthernet0/8

FastEthernet0/9

FastEthernet0/10

FastEthernet0/11

FastEthernet0/12

VLAN Configuration

VLAN Number:

VLAN Name:

Add Remove

VLAN No	VLAN Name
1	default
100	Student
150	Faculty
200	Student2
300	Faculty2
1002	fddi-default
1003	token-ring-default
1004	fddinet-default
1005	trnet-default

PDU Information at Device: 192.168.0.1

OSI Model Inbound PDU Details

PDU Formats

Ethernet II

PREAMBLE: 101010..10				DEST ADDR:000C.851B.3	693
SRC ADDR:00D 0.5829.3AE8	TYP E:0x	DATA (VARIABLE LENGTH)	FCS:0x00000000		

IP

VER:4	IHL:5	DSCP:0x00	TL:28
ID:0x0002		FLA GS:0	FRAG OFFSET:0x000
TTL:128	PRO:0x01	CHKSUM	
SRC IP:192.168.0.2			
DST IP:192.168.0.1			
DATA (VARIABLE LENGTH)			

ICMP

TYPE:0x00	CODE:0x00	CHECKSUM
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Date: 13/08/2024

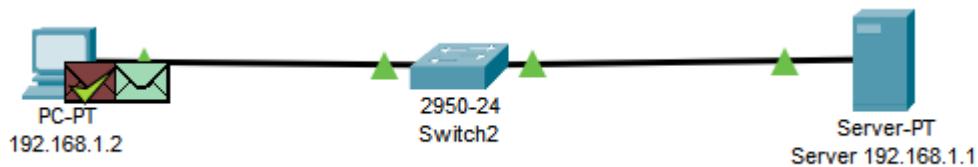
Lab Practical #06:

Study the application layer protocol DNS, DHCP, FTP.

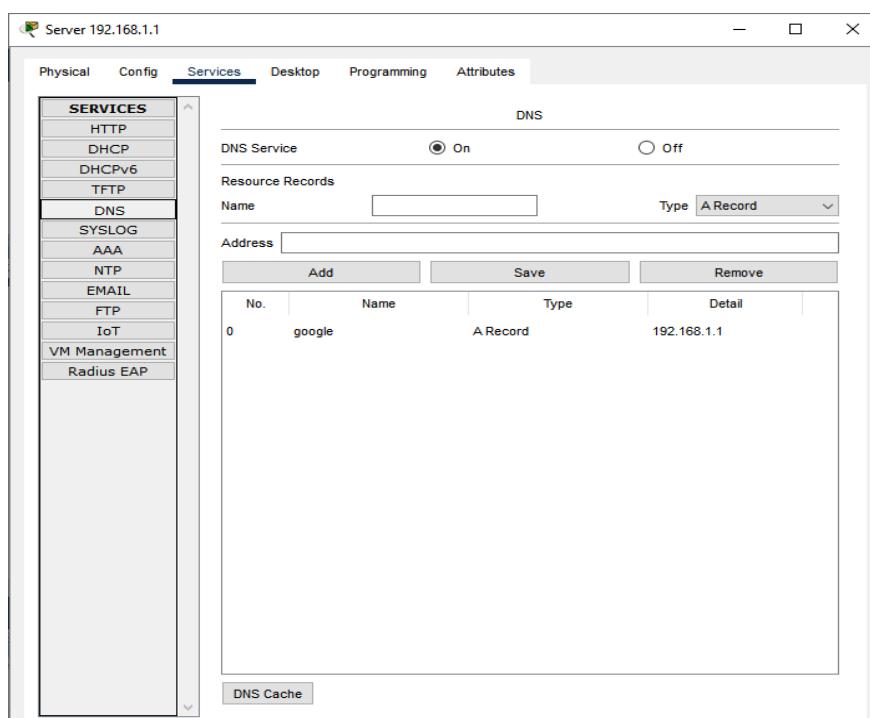
Practical Assignment #06:

1. Implement the application layer protocol DNS, DHCP, and FTP. Also check connectivity between them using ping command or PDU utility.

DNS(Domain Name System) :

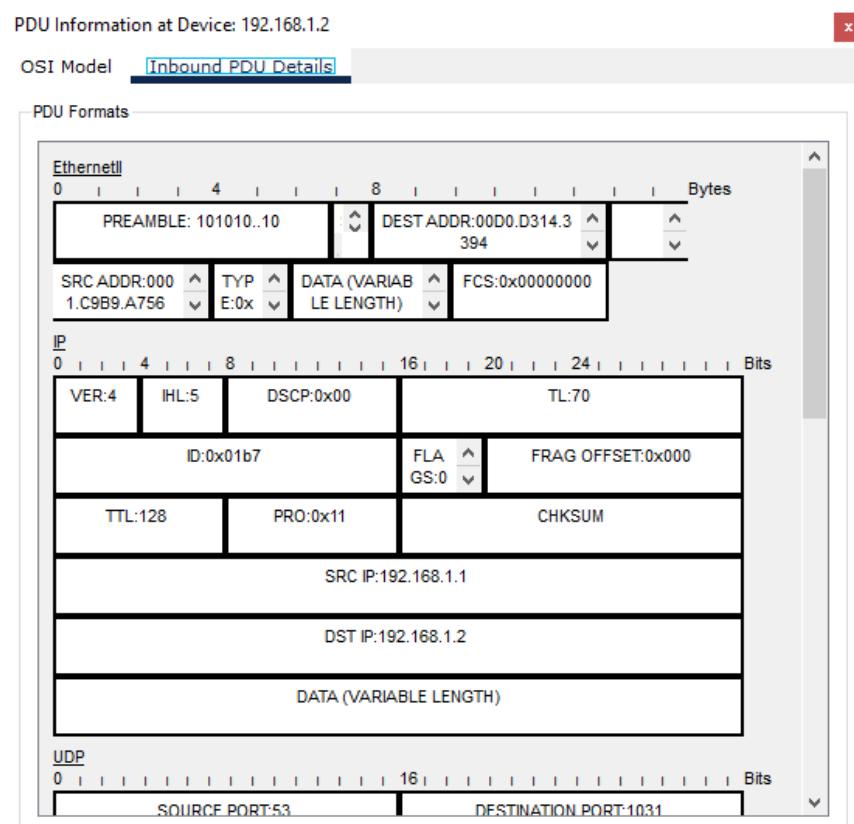
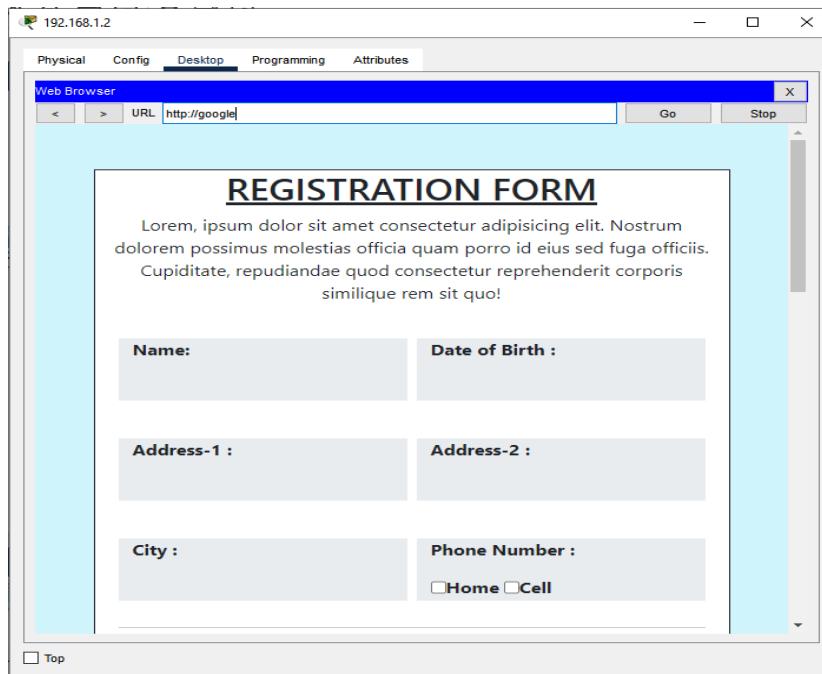


- Make a network displayed as per the above image.
- Assign **192.168.1.1** IP address to Server and assign **192.168.1.2** IP address to PC.
- Click on **Server(192.168.1.1)** and choose **Services**
- Now Choose **DNS** from the left side.
- Now click **On the** radio button as per the below image.
- Fill out **google** in Name textbox and **192.168.1.1** in Address textbox. Click on the Add button.



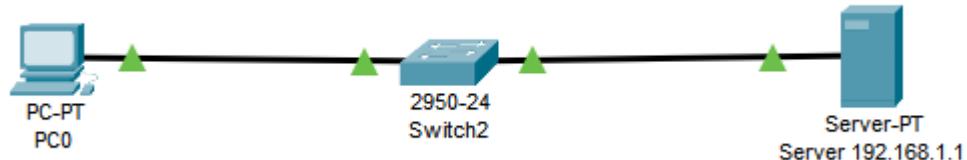
Date: 13/08/2024

- Click on **192.168.1.2(PC)** and choose **Desktop** then choose **web browser** from it.
 - Enter <http://google> in the URL textbox and click on Go.
 - After some time output will be displayed.

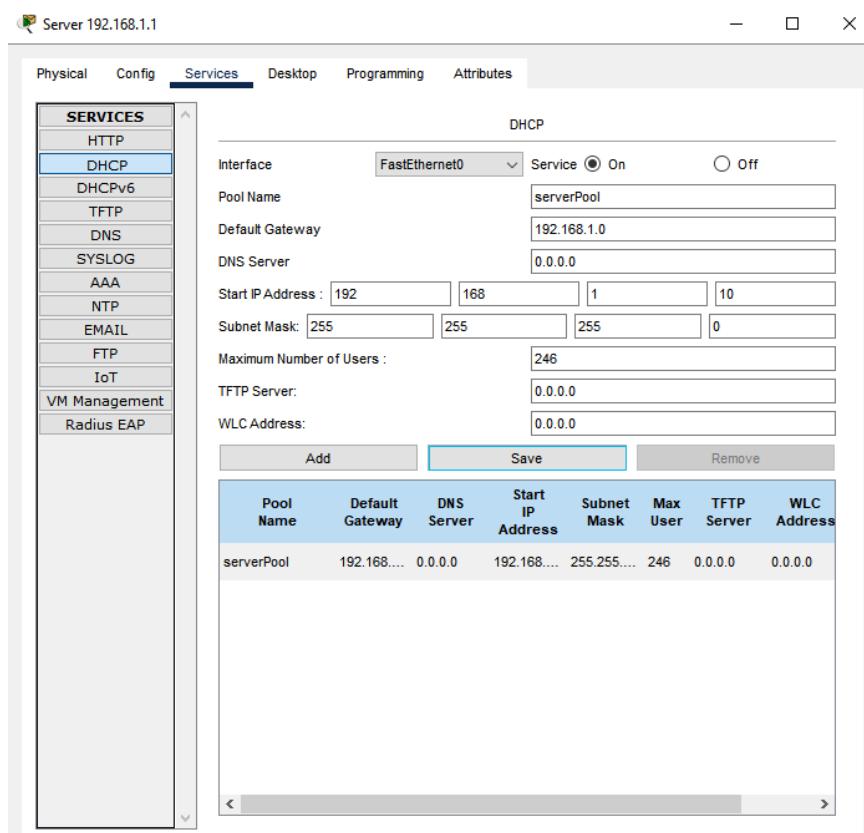


Date: 13/08/2024

DHCP(Dynamic Host Configuration Protocol) :



- Make a network displayed as per the above image.
- Assign **192.168.1.1** IP Address to Server.
- Click on Server(**192.168.1.1**) and choose Services
- Now Choose **DHCP** from the left side.
- Now select the **On** radio button of Service as per the below image.
- Enter **Default Gateway, Start IP Address, Subnet Mask, and Maximum Number of Users** as per the below image.
- Click on the Add button.
- Your added serverPool will displayed below.



- Click on **PC0** and choose **Config**.
- Choose **FastEthernet0** from the left side.

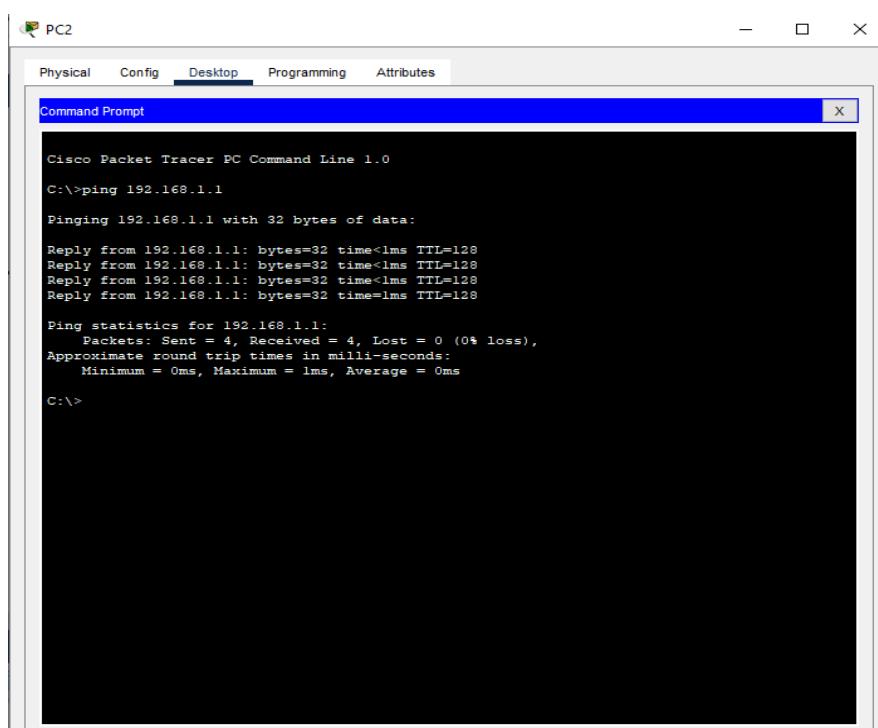
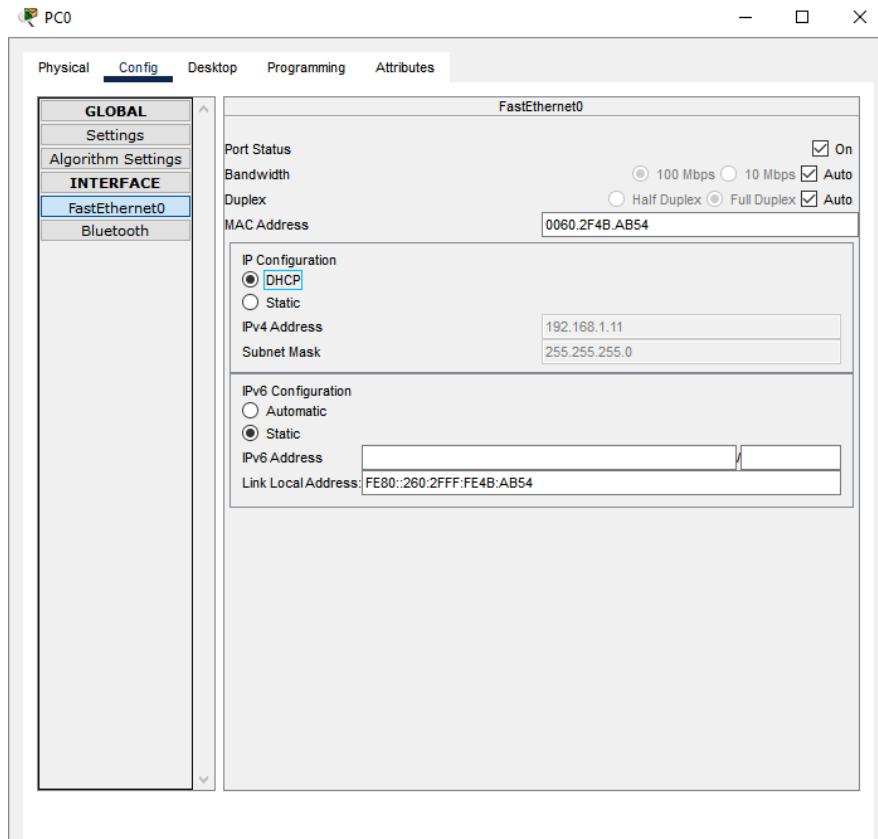


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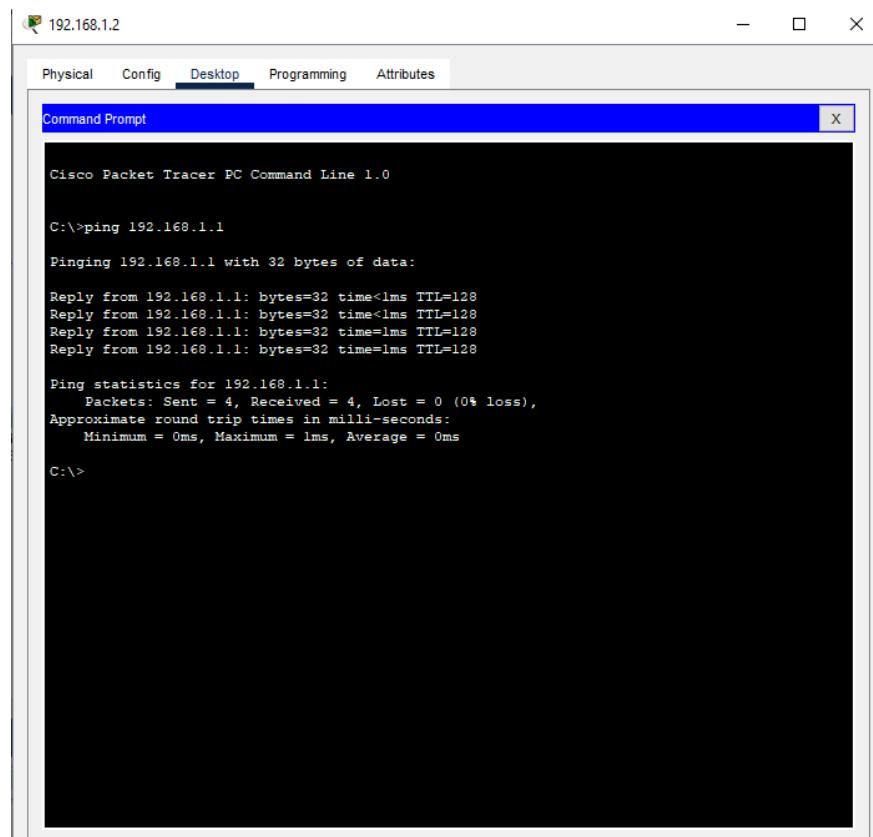
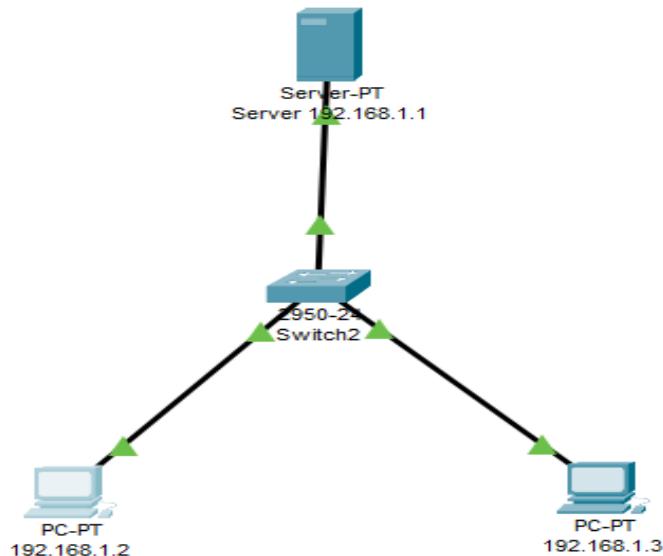
Date: 13/08/2024

- In the **IP Configuration tab** select **DHCP** after some time server will automatically assign the IP Address from a given range.



Date: 13/08/2024

FTP(File Transfer Protocol) :



```
C:\>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time<1ms TTL=128

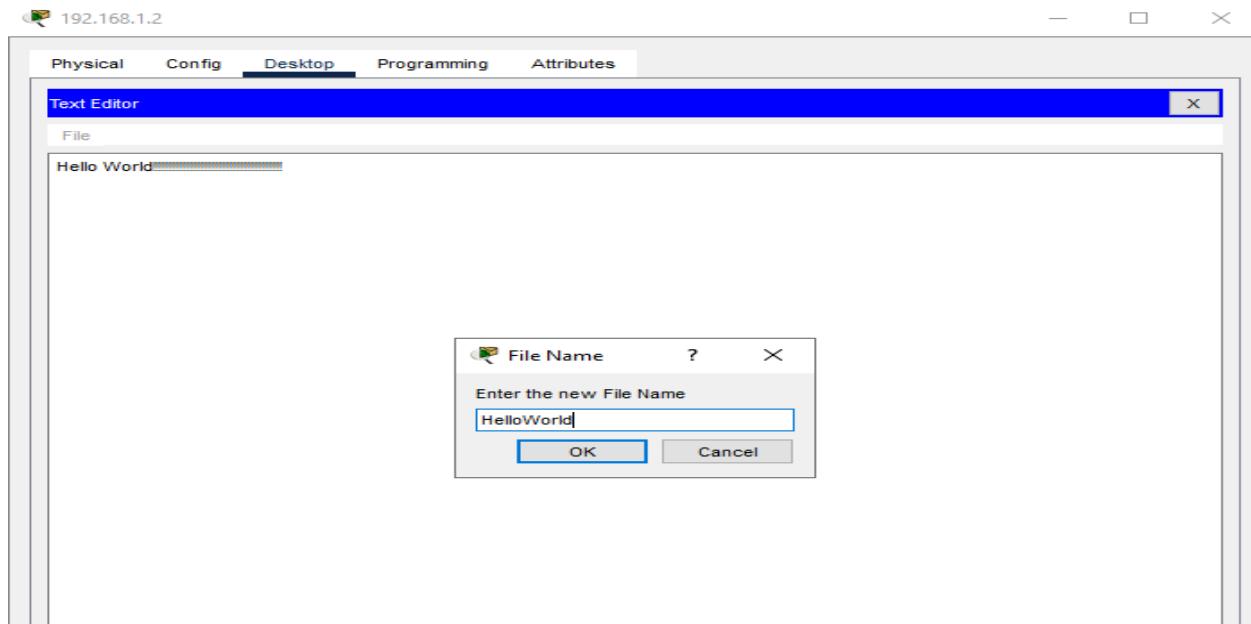
Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

- Click on 192.168.1.2 choose desktop and select Text Editor
- Make new text file named “HelloWorld.txt”



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- Now again click on **192.168.1.2** and choose **desktop** and select **Command Prompt**.
 - Write [ftp 192.168.1.1](ftp://192.168.1.1) in Command Prompt.
 - Enter **Username** and **Password**.
 - Write "?" to display all ftp related options.
-
- Now write "**put HelloWorld.txt**" to upload file on server.
 - Now write "**dir**" to check file uploaded to server or not.



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```
C:\>ftp 192.168.1.1
Trying to connect...192.168.1.1
Connected to 192.168.1.1
220- Welcome to PT Ftp server
Username:662
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>?
?
cd
delete
dir
get
help
passive
put
pwd
quit
rename
ftp>put HelloWorld.txt
Writing file HelloWorld.txt to 192.168.1.1:
File transfer in progress...

[Transfer complete - 47 bytes]

47 bytes copied in 0.079 secs (594 bytes/sec)
ftp>dir
Listing /ftp directory from 192.168.1.1:
0 : HelloWorld.txt
1 : asa842-k8.bin
2 : asa923-k8.bin
3 : c1841-advipservicesk9-mz.124-15.T1.bin
4 : c1841-ipbase-mz.123-14.T7.bin
5 : c1841-ipbasek9-mz.124-12.bin
6 : c1900-universalk9-mz.SPA.165-3.M4a.bin
47
5571584
30468096
33591768
13832032
16599160
33591768
```

- Write “quit” to close ftp service.
- Now click on 192.168.1.3 and choose **desktop** and select **Command Prompt**.
- Write [**ftp 192.168.1.1**](#) in Command Prompt.
- Enter **Username** and **Password**.
- Write “get HelloWorld.txt” to download file from server.
- Write “quit” to close ftp service.
- Write “dir” to check required file downloaded or not.



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```
Cisco Packet Tracer PC Command Line 1.0
C:\>ftp 192.168.1.1
Trying to connect...192.168.1.1
Connected to 192.168.1.1
220- Welcome to PT Ftp server
Username:662
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>
ftp>get HelloWorld.txt

Reading file HelloWorld.txt from 192.168.1.1:
File transfer in progress...

[Transfer complete - 47 bytes]

47 bytes copied in 0 secs
ftp>quit

221- Service closing control connection.
C:\>
C:\>dir

Volume in drive C has no label.
Volume Serial Number is 5E12-4AF3
Directory of C:\

1/1/1970  5:30 PM           47      HelloWorld.txt
1/1/1970  5:30 PM           26      sampleFile.txt
                           73 bytes                2 File(s)
C:\>
```



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Lab Practical #07:

Study Client-Server Socket programming - TCP & UDP

Practical Assignment #07:

- 1. Write a C/Java code for TCP Server-Client Socket Programming.**
- 2. Write a C/Java code for UDP Server-Client Socket Programming.**

1. For TCP Server-Client:

TCP Server Program:

```
import java.io.BufferedReader;
import java.io.IOException;
import java.io.InputStreamReader;
import java.io.PrintWriter;
import java.net.ServerSocket;
import java.net.Socket;

public class TCPServer {
    public static void main(String[] args) {
        ServerSocket serverSocket = null;
        Socket clientSocket = null;
        BufferedReader in = null;
        PrintWriter out = null;

        try {
            // Creating server socket
            serverSocket = new ServerSocket(Integer.parseInt(args[0]));
            System.out.println("Server is running on port " + args[0]);
            // Accepting client connection
            clientSocket = serverSocket.accept();
            System.out.println("Client connected");
            // Getting input and output streams
            in = new BufferedReader(new InputStreamReader(clientSocket.getInputStream()));
            out = new PrintWriter(clientSocket.getOutputStream(), true);

            String messageFromClient = in.readLine();
            System.out.println("Received message: " + messageFromClient);
        } catch (IOException e) {
            e.printStackTrace();
        }
    }
}
```



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```
// Sending message to client
out.println("Server received your message: " + messageFromClient);

} catch (Exception e) {
    e.printStackTrace();
}

} finally {
    try {
        if (in != null)
            in.close();
        if (out != null)
            out.close();
        if (clientSocket != null)
            clientSocket.close();
        if (serverSocket != null)
            serverSocket.close();
    } catch (IOException e) {
        e.printStackTrace();
    }
}
}
```

TCP Client Program:

```
import java.io.BufferedReader;
import java.io.IOException;
import java.io.InputStreamReader;
import java.io.PrintWriter;
import java.net.Socket;

public class TCPClient {
    public static void main(String[] args) {
        Socket socket = null;
        BufferedReader in = null;
        PrintWriter out = null;

        try{
            // Creating client socket
```



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```
socket = new Socket(args[0],Integer.parseInt(args[1]));

// Setting up input and output streams
in = new BufferedReader(new InputStreamReader(socket.getInputStream()));
out = new PrintWriter(socket.getOutputStream(), true);

//sending response from server
String messageFromServer = in.readLine();
System.out.println("Message fro server: " + messageFromServer);
} catch(IOException e){
    e.printStackTrace();
} finally{
    try {
        if (in != null)
            in.close();
        if (out != null)
            out.close();
        if (socket != null)
            socket.close();
    } catch (IOException e) {
        e.printStackTrace();
    }
}
}
```

2. For UDP Server-Client:

UDP Server Program:

```
import java.net.DatagramPacket;
import java.net.DatagramSocket;
import java.net.InetAddress;

public class UDPServer {
    public static void main(String[] args) {
        DatagramSocket socket = null;
        try {
```



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```
socket = new DatagramSocket(8080);
byte[] receiveBuffer = new byte[1024];
byte[] sendBuffer;

while (true) {
    DatagramPacket receivePacket = new DatagramPacket(receiveBuffer, receiveBuffer.length);
    socket.receive(receivePacket);
    String clientMessage = new String(receivePacket.getData(), 0, receivePacket.getLength());
    System.out.println("Client: " + clientMessage);

    InetAddress clientAddress = receivePacket.getAddress();
    int clientPort = receivePacket.getPort();

    String serverMessage = "Hello from server";
    sendBuffer = serverMessage.getBytes();
    DatagramPacket sendPacket = new DatagramPacket(sendBuffer, sendBuffer.length, clientAddress,
                                                    clientPort);
    socket.send(sendPacket);
}

} catch (Exception e) {
    e.printStackTrace();
} finally {
    if (socket != null && !socket.isClosed()) {
        socket.close();
    }
}
}
```

UDP Client Program:

```
import java.net.DatagramPacket;
import java.net.DatagramSocket;
import java.net.InetAddress;

public class UDPClient {
    public static void main(String[] args) {
        DatagramSocket socket = null;
```



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Semester 5th | Practical Assignment | Computer Networks (2301CS501)

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```
try {
    socket = new DatagramSocket();
    InetAddress serverAddress = InetAddress.getByName("localhost");
    byte[] sendBuffer;
    byte[] receiveBuffer = new byte[1024];

    String clientMessage = "Hello from client";
    sendBuffer = clientMessage.getBytes();
    DatagramPacket sendPacket = new DatagramPacket(sendBuffer, sendBuffer.length, serverAddress, 8080);
    socket.send(sendPacket);

    DatagramPacket receivePacket = new DatagramPacket(receiveBuffer, receiveBuffer.length);
    socket.receive(receivePacket);
    String serverMessage = new String(receivePacket.getData(), 0, receivePacket.getLength());
    System.out.println("Server: " + serverMessage);
} catch (Exception e) {
    e.printStackTrace();
} finally {
    if (socket != null && !socket.isClosed()) {
        socket.close();
    }
}
```



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Lab Practical #08:

Study Packet capture and header analysis by Wireshark (HTTP, TCP, UDP, IP, etc.)

Practical Assignment #08:

1. Explain usage of Wireshark tool.

Wireshark is a network protocol analyzer that captures and inspects data traveling across a network in real-time. It's an essential tool for network administrators, cybersecurity professionals, and developers for troubleshooting, analysis, and monitoring of network traffic.

How to Use :

- Install Wireshark:** First, download and install Wireshark from the official website.
- Select a Network Interface:** When you open Wireshark, you'll see a list of network interfaces (like Wi-Fi, Ethernet). These represent the different connections your computer is using. Choose the one you want to monitor (e.g., your Wi-Fi connection).
- Start Capturing Packets:** Click the "Start Capturing Packets" button (the blue shark fin icon). Wireshark will begin recording all the network traffic passing through the selected interface.
- Analyze the Data:** As Wireshark captures packets, you'll see them listed in real-time with details like the source and destination IP addresses, protocols used, and data. You can stop the capture at any time to analyze the data more closely.
- Use Filters:** Wireshark lets you apply filters to narrow down the data. For example, you can filter by IP address, protocol, or even specific data within the packets.
- Save and Export:** Once you've captured the data you need, you can save it for future analysis or export it in various formats

Usage:

- Packet Capture:** Wireshark listens to a network connection in real time and then grabs entire streams of traffic – quite possibly tens of thousands of packets at a time.
- Filtering:** Wireshark is capable of slicing and dicing all of this random live data using filters. By applying a filter, you can obtain just the information you need to see.
- Visualization:** Wireshark, like any good packet sniffer, allows you to dive right into the very middle of a network packet. It also allows you to visualize entire conversations and network streams.
- Network Troubleshooting:** Identify and diagnose issues like slow network performance, packet loss, or connectivity problems by analyzing packet data.
- Protocol Analysis:** Examine how specific protocols (e.g., HTTP, DNS, TCP) operate on the network, helping in debugging and understanding network communication.



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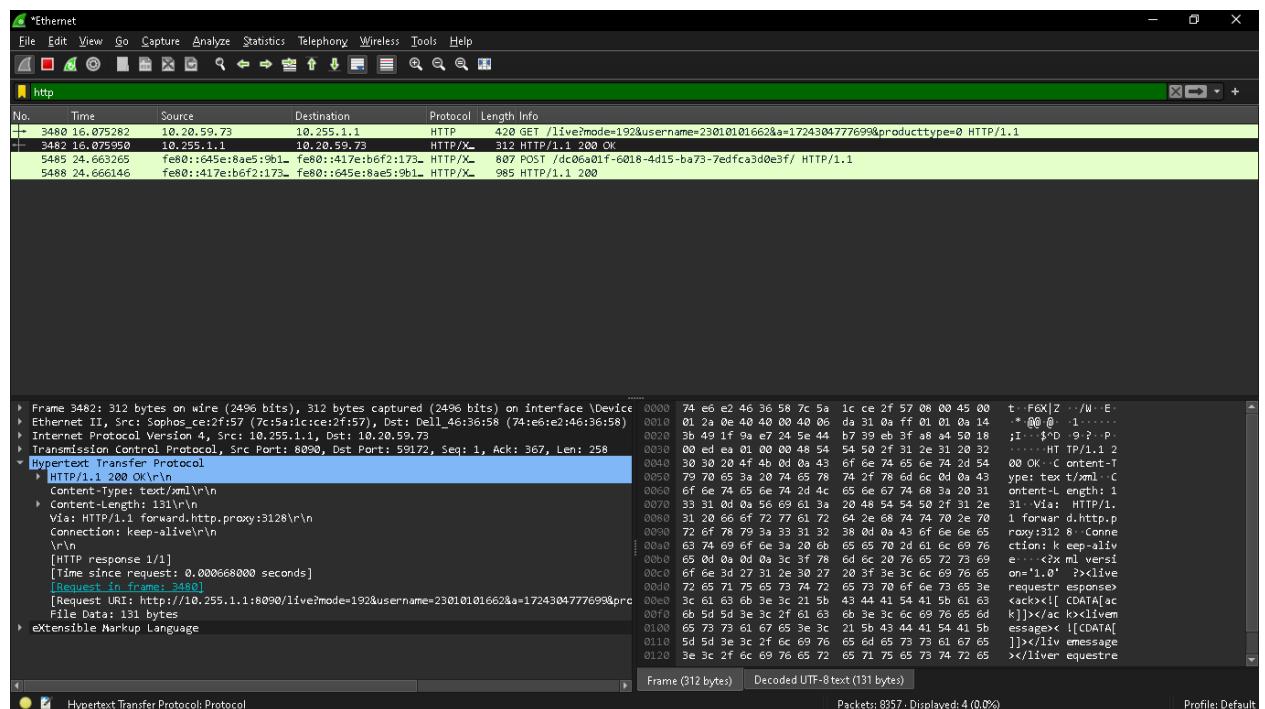
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- **Security Monitoring:** Detect unauthorized access, malware activity, or unusual traffic patterns that could indicate a security breach.
- **Application Performance Tuning:** Monitor and optimize the performance of networked applications by analyzing the communication between client and server.
- **VoIP Analysis:** Capture and analyze Voice over IP (VoIP) traffic to troubleshoot call quality issues and inspect SIP and RTP protocols.
- **Network Forensics:** Investigate network incidents, such as data breaches or cyberattacks, by reviewing captured packet data for evidence.
- **Learning and Education:** Study network protocols, packet structures, and traffic patterns to enhance your understanding of networking concepts.
- **Bandwidth Usage Analysis:** Monitor and analyze network bandwidth consumption to identify heavy bandwidth users or applications.
- **Network Mapping:** Visualize the flow of data across the network, helping in understanding network topology and device communication.
- **Compliance Auditing:** Ensure that network communications adhere to organizational policies and regulatory requirements by capturing and inspecting relevant traffic.

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2. Packet capture and header analysis by Wireshark (HTTP, TCP, UDP, IP, etc.)

- **HTTP :**



The screenshot shows an active Wireshark session on the "Ethernet" interface. The packet list pane highlights a POST request at index 3482. The details pane shows the request's structure:

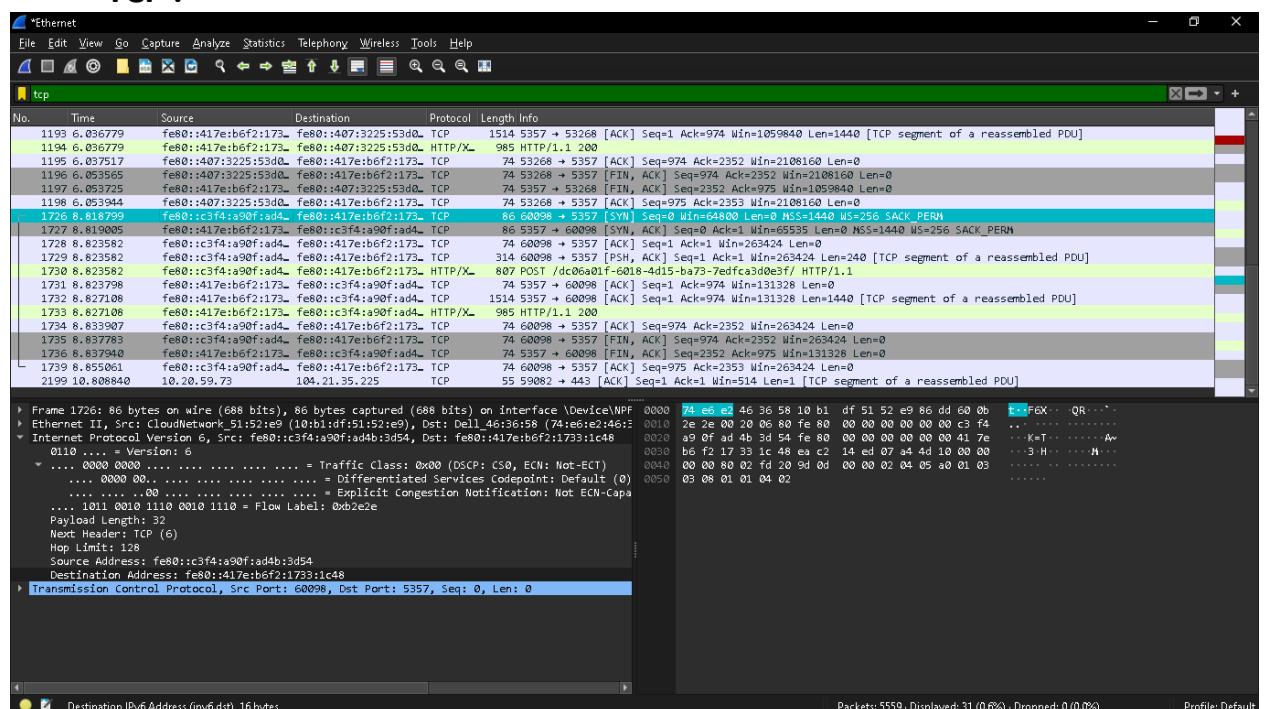
```

Frame 3482: 312 bytes on wire (2496 bits), 312 bytes captured (2496 bits) on interface *Device
Ethernet II, Src: Saphos (c2:f5:7c), Dst: Dell_46:36:58 (74:e6:e2:46:36:58)
Internet Protocol Version 4, Src: 10.255.1.1, Dst: 10.20.59.73
Transmission Control Protocol, Src Port: 8090, Dst Port: 59172, Seq: 1, Ack: 367, Len: 258
HTTP/1.1 200 OK\r\n
Content-Type: text/xml\r\n
Content-Length: 131\r\n
Via: HTTP/1.1 forward, http.proxy:3128\r\n
Connection: keep-alive\r\n
\r\n
[HTTP response 1/1]
[Time since request: 0.000668000 seconds]
[Request in frame: 3480]
[Request URI: http://10.255.1.1:8090/live?mode=192&username=23010101662&a=1724304777699&producttype=0]
[File Data: 131 bytes]
extensible Markup Language

```

The bytes pane shows the raw hex and ASCII data of the XML payload.

- **TCP :**



The screenshot shows an active Wireshark session on the "Ethernet" interface. The packet list pane highlights a POST request at index 1198. The details pane shows the request's structure:

```

Frame 1198: 86 bytes on wire (688 bits), 86 bytes captured (688 bits) on interface *Device\WIF
Ethernet II, Src: CloudNetwork_51:52:e9 (10:b1:df:51:52:e9), Dst: Dell_46:36:58 (74:e6:e2:46:36:58)
Internet Protocol Version 6, Src: fe80::c3f4:a90f:ad4b:3d54, Dst: fe80::417e:b6f2:1733:1c48
Transmission Control Protocol, Src Port: 60098, Dst Port: 5357, Seq: 0, Len: 0
HTTP/1.1 200 OK\r\n
Content-Type: text/xml\r\n
Content-Length: 131\r\n
Via: HTTP/1.1 forward, http.proxy:3128\r\n
Connection: keep-alive\r\n
\r\n
[HTTP response 1/1]
[Time since request: 0.000668000 seconds]
[Request in frame: 1198]
[Request URI: http://10.20.59.73:5357/live?mode=192&username=23010101662&a=1724304777699&producttype=0]
[File Data: 131 bytes]
extensible Markup Language

```

The bytes pane shows the raw hex and ASCII data of the XML payload.



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● UDP :

The screenshot shows a list of UDP frames captured on the "Ethernet" interface. The frames are listed by number, time, source, destination, protocol, and length. Most frames are standard queries from various hosts to port 1947. One frame (No. 5448) is a DHCPv6 Solicit message. The details pane shows the raw hex and ASCII data for each frame, and the bytes pane shows the raw bytes.

No.	Time	Source	Destination	Protocol	Length Info
5439	24.565599	10.20.59.146	239.255.255.250	SSDP	218 M-SEARCH * HTTP/1.1
5441	24.519433	10.20.53.148	239.255.255.250	SSDP	217 M-SEARCH * HTTP/1.1
5442	24.523615	fe80::b852:75d3:7ddc:ff02::1:3	LLNMR	95 Standard query 0x0bd7 A desktop-p6q8s11	
5443	24.524080	10.20.04.13	224.0.0.252	LLNMR	75 Standard query 0x0bd7 A desktop-p6q8s11
5444	24.524302	fe80::b852:75d3:7ddc:ff02::1:3	LLNMR	95 Standard query 0x6e62 AAAA desktop-p6q8s11	
5445	24.524302	10.20.24.13	224.0.0.252	LLNMR	75 Standard query 0x6e62 AAAA desktop-p6q8s11
5446	24.534979	fe80::77aa:aaac:ffff:ff99:ff02::1:2	DHCPv6	150 Solicit IID: 0x1753b0 CID: 0x001000012c3f8ebec0ff36a0859	
5447	24.561074	10.20.54.200	10.20.255.255	NBNS	92 Name query NB 10.04<0>
5448	24.561486	10.20.59.111	235.255.255.255	UDP	82 53826 -> 1947 Len=40
5449	24.562967	fe80::2c19:7add:571_	ff02::1:3	LLNMR	88 Standard query 0x3le2 AAAA 05_18_08
5450	24.562967	fe80::2c19:7add:571_	ff02::1:3	LLNMR	88 Standard query 0xb4b4 A 05_18_08
5451	24.563341	10.20.28.8	224.0.0.252	LLNMR	68 Standard query 0x3le2 AAAA 05_18_08
5452	24.563341	10.20.28.8	224.0.0.252	LLNMR	68 Standard query 0xb4b4 A 05_18_08
5453	24.564582	10.20.2.15	224.0.0.251	NONS	71 Standard query 0x0000 A 10_04_local, "QN" question
5454	24.564582	10.20.2.15	224.0.0.251	NONS	71 Standard query 0x0000 AAAA 10_04.local, "QN" question
5455	24.565663	fe80::419d:830d:766_	ff02::1:3	LLNMR	85 Standard query 0xfe14 A 10_04
5456	24.565663	10.20.2.15	224.0.0.252	LLNMR	65 Standard query 0xfe14 A 10_04
5457	24.565663	fe80::419d:830d:766_	ff02::1:3	LLNMR	85 Standard query 0xc401 AAAA 10_04
5458	24.565663	10.20.2.15	224.0.0.252	LLNMR	65 Standard query 0xc401 AAAA 10_04
5460	24.566769	fe80::9445:5117:ed83:	ff02::1:3	LLNMR	95 Standard query 0x270f A desktop-p6q8s11

● IP :

The screenshot shows a list of IP frames captured on the "Ethernet" interface. The frames are listed by number, time, source, destination, protocol, and length. Most frames are standard queries from various hosts to port 1947. One frame (No. 32) is a DHCPv4 request. The details pane shows the raw hex and ASCII data for each frame, and the bytes pane shows the raw bytes.

No.	Time	Source	Destination	Protocol	Length Info
27	0.093593	10.20.28.11	224.0.0.252	LLNMR	68 Standard query 0xb6f9 A 05_18_11
30	0.106635	10.20.25.14	224.0.0.252	LLNMR	75 Standard query 0xb5b9 A desktop-p6q8s11
31	0.106635	10.20.25.14	224.0.0.252	LLNMR	75 Standard query 0xe6a5 AAAA desktop-p6q8s11
32	0.112072	10.20.60.18	224.0.0.120	IPv4	178 Unassigned (153)
33	0.112072	10.20.60.18	224.0.0.120	IPv4	178 Unassigned (153)
34	0.113136	10.20.20.19	224.0.0.120	IPv4	178 Unassigned (153)
37	0.133451	10.20.07.32	224.0.0.252	LLNMR	68 Standard query 0xb0b5 AAAA 05_17_34
38	0.133451	10.20.27.32	224.0.0.252	LLNMR	68 Standard query 0xf3e8 A 05_17_34
39	0.145991	10.20.28.1	239.255.255.250	SSDP	217 M-SEARCH * HTTP/1.1
41	0.147164	10.20.27.28	224.0.0.252	LLNMR	68 Standard query 0x4492 A 05_17_28
42	0.147456	10.20.27.28	224.0.0.252	LLNMR	68 Standard query 0x735d AAAA 05_17_28
44	0.168424	10.20.45.12	239.255.255.250	SSDP	217 M-SEARCH * HTTP/1.1
46	0.204205	10.20.50.26	239.255.255.250	SSDP	217 M-SEARCH * HTTP/1.1
48	0.229049	10.20.2.19	224.0.0.251	NONS	71 Standard query 0x0000 A 10_04_local, "QN" question
49	0.229049	10.20.2.19	224.0.0.251	NONS	71 Standard query 0x0000 AAAA 10_04_local, "QN" question
51	0.229782	10.20.2.19	224.0.0.252	LLNMR	65 Standard query 0xahd0 A 10_04
53	0.229782	10.20.2.19	224.0.0.252	LLNMR	65 Standard query 0x8c8b AAAA 10_04
54	0.236013	169.254.173.156	224.0.0.251	NONS	299 Standard query response 0x0000 PTR, cache flush HP_8._dosvc._tcp.local SRV, cache flush 0 0 7680 HP_8.local
55	0.236517	10.20.3.20	10.20.255.255	NBNS	92 Name query NB 10.04<0>
56	0.238664	169.254.173.156	224.0.0.251	NONS	246 Standard query response 0x0000 SRV, cache flush 0 0 7680 HP_8.local TXT, cache flush A, cache flush 169.25

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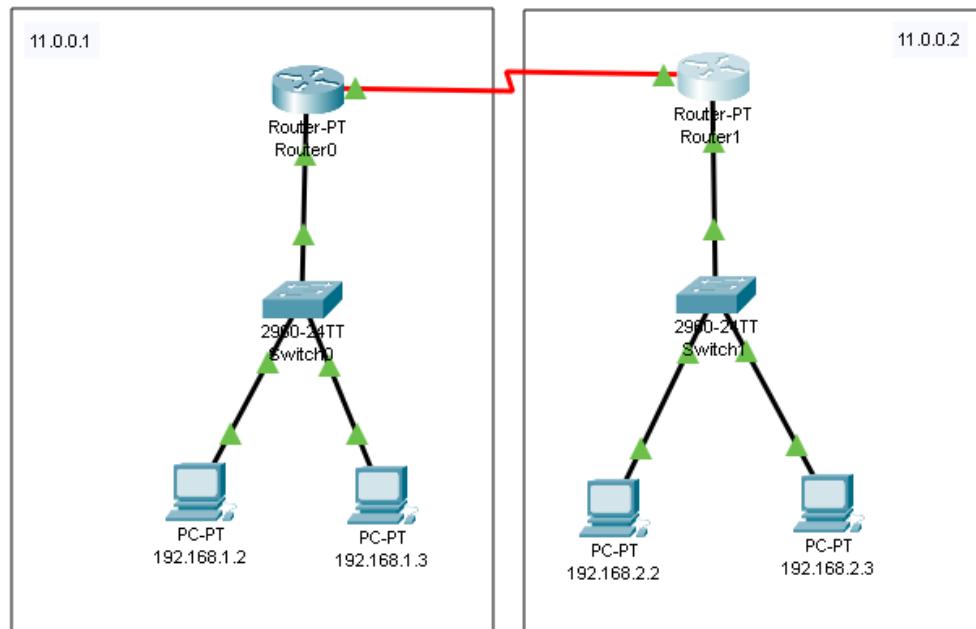
Lab Practical #10:

Study the concept of routing using packet tracer. (Static Routing)

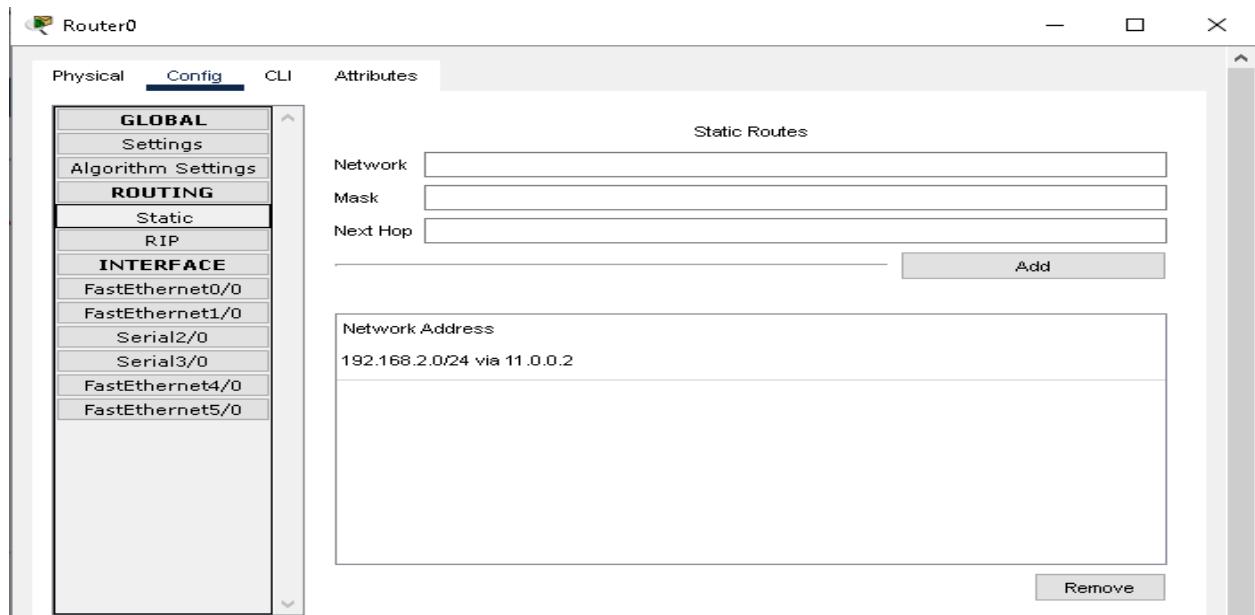
Practical Assignment #10:

1. Connect the two different networks based on the calculated IP addresses and subnet using a packet tracer.

Router

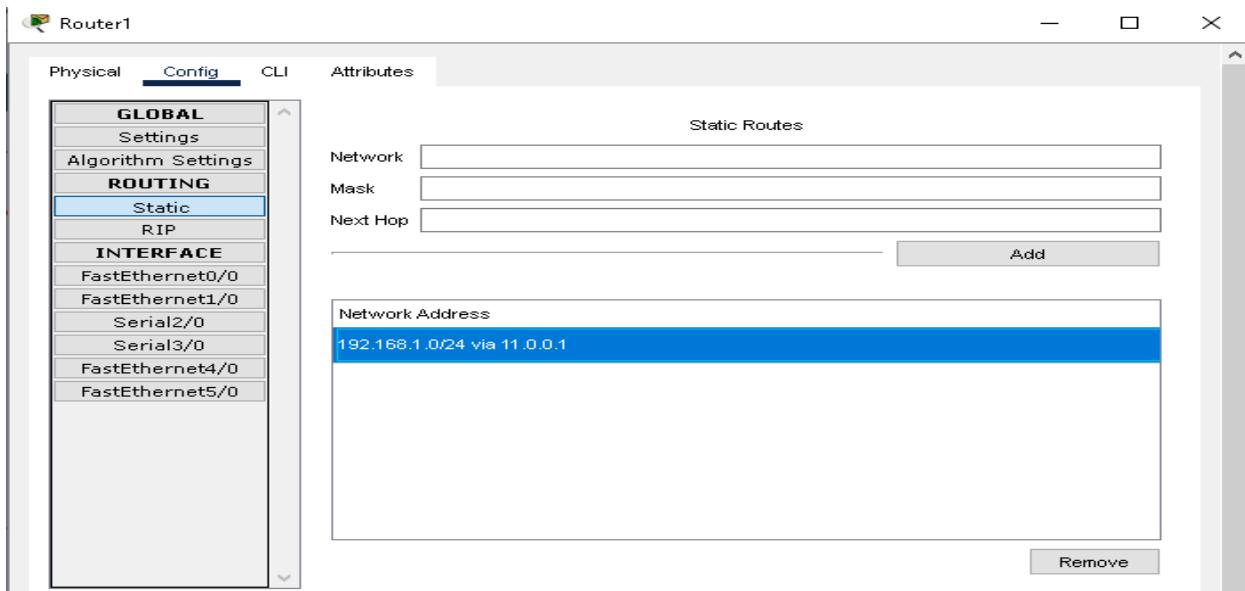


• Router0 :



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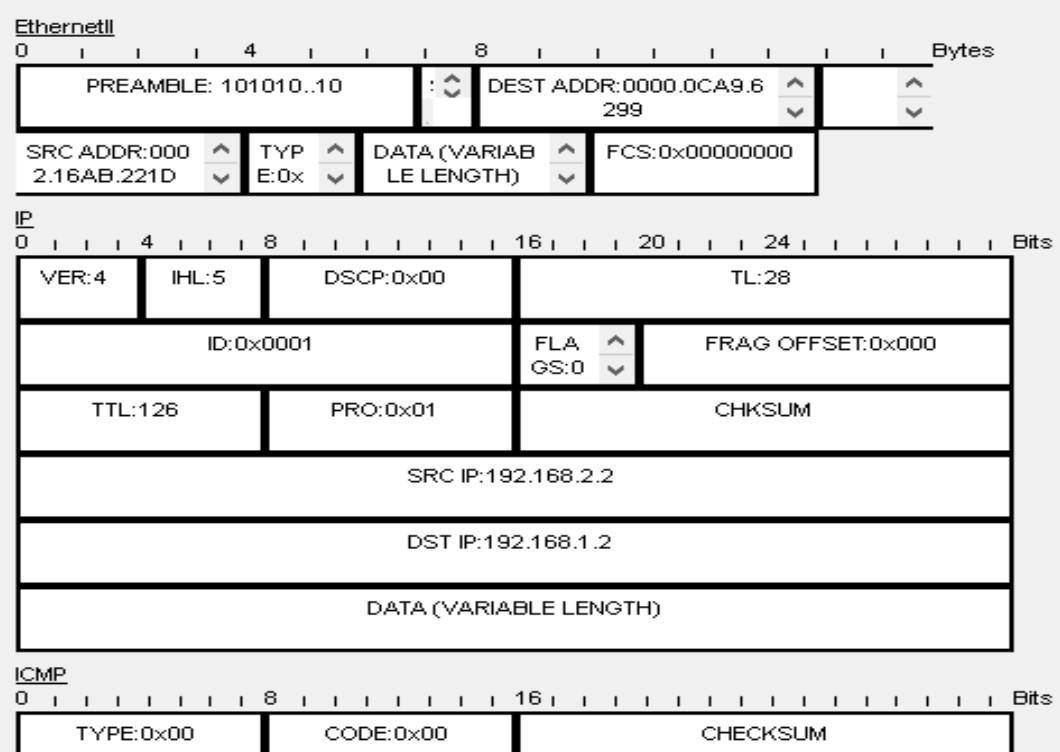
• Router1 :



PDU Information at Device: 192.168.1.2

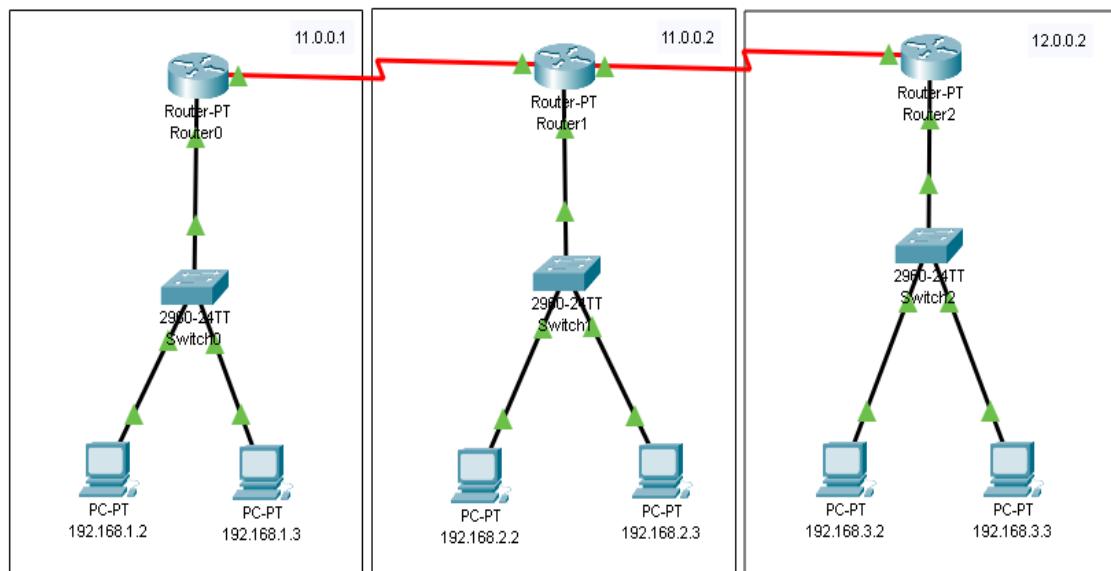
OSI Model Inbound PDU Details

PDU Formats

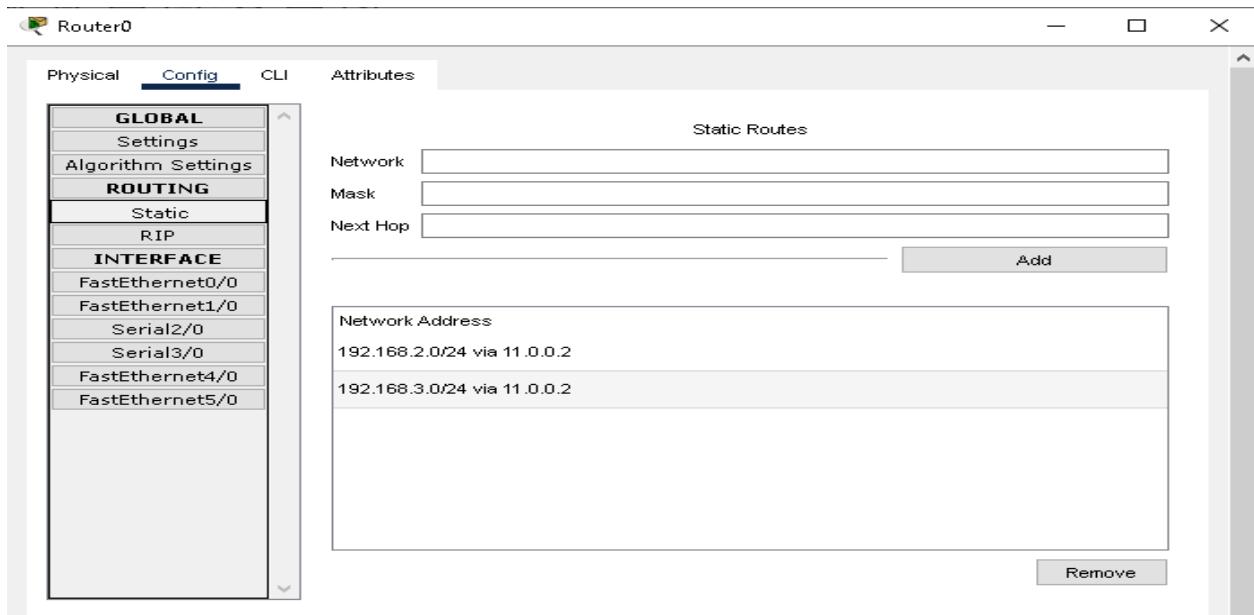


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2. Connect the three different networks based on the calculated IP addresses and subnet using a packet tracer.

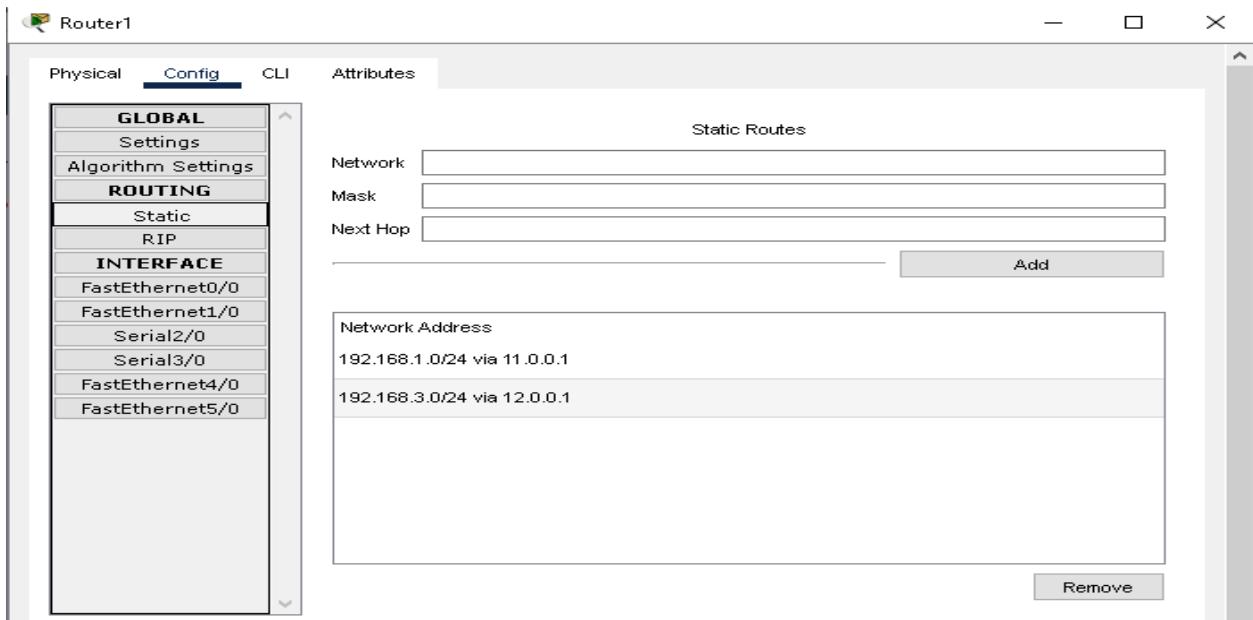


● Router0 :

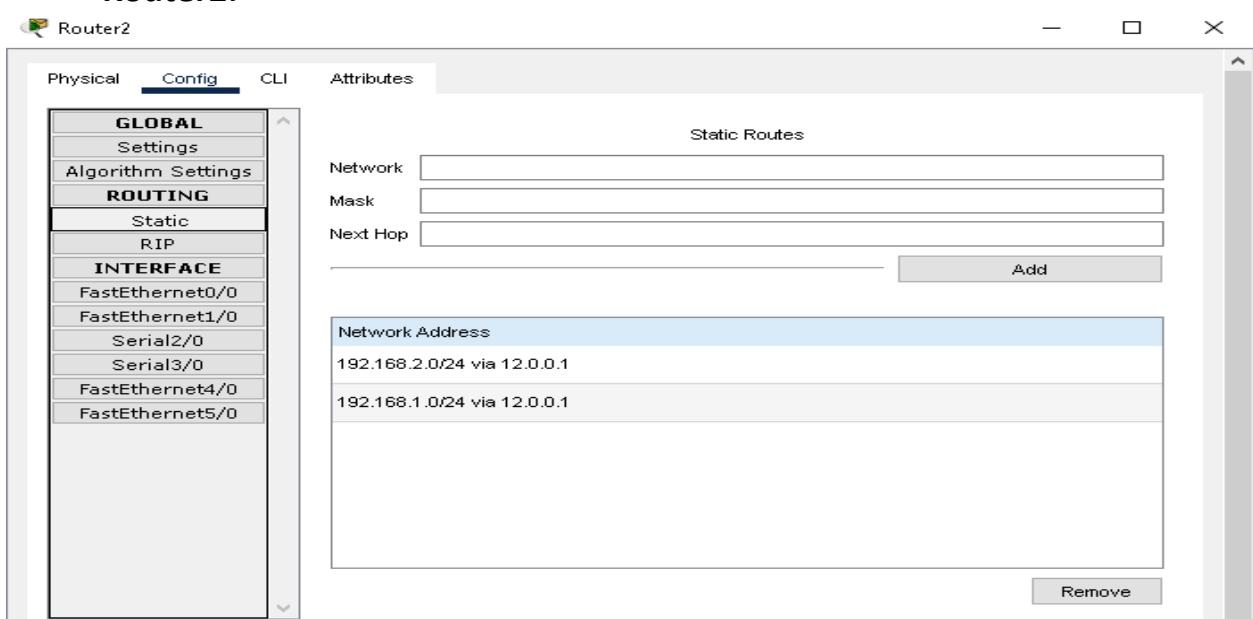


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● Router1 :



● Router2:





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PDU Information at Device: 192.168.1.2

OSI Model Inbound PDU Details

PDU Formats

EthernetII

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	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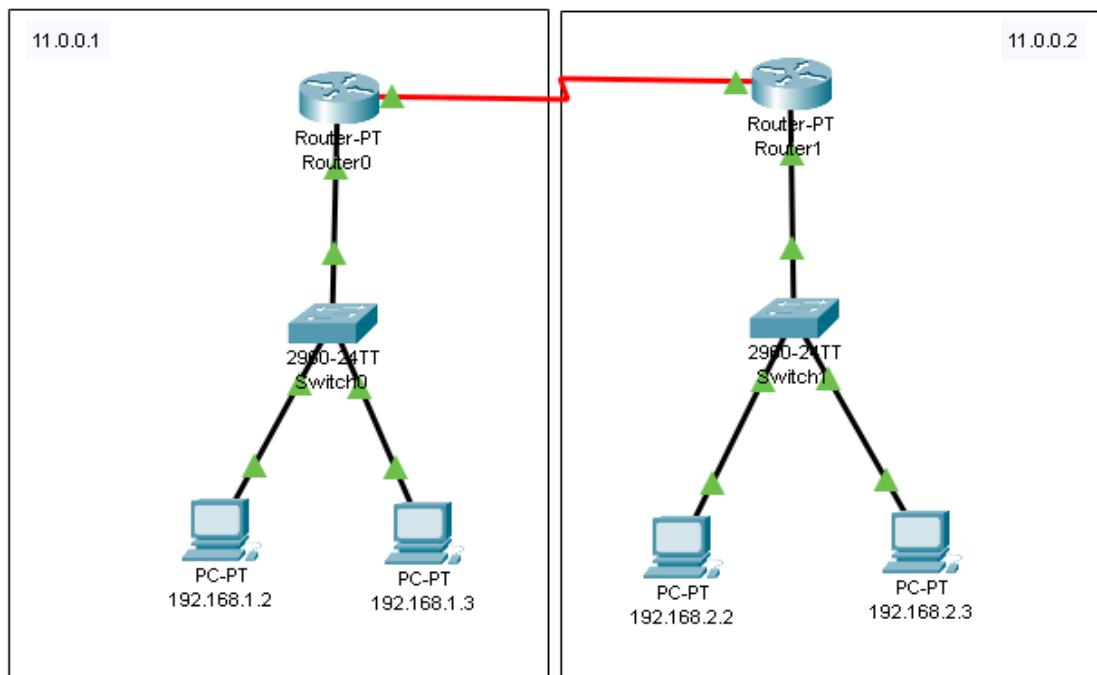
Date: 19/09/2024

Lab Practical #11:

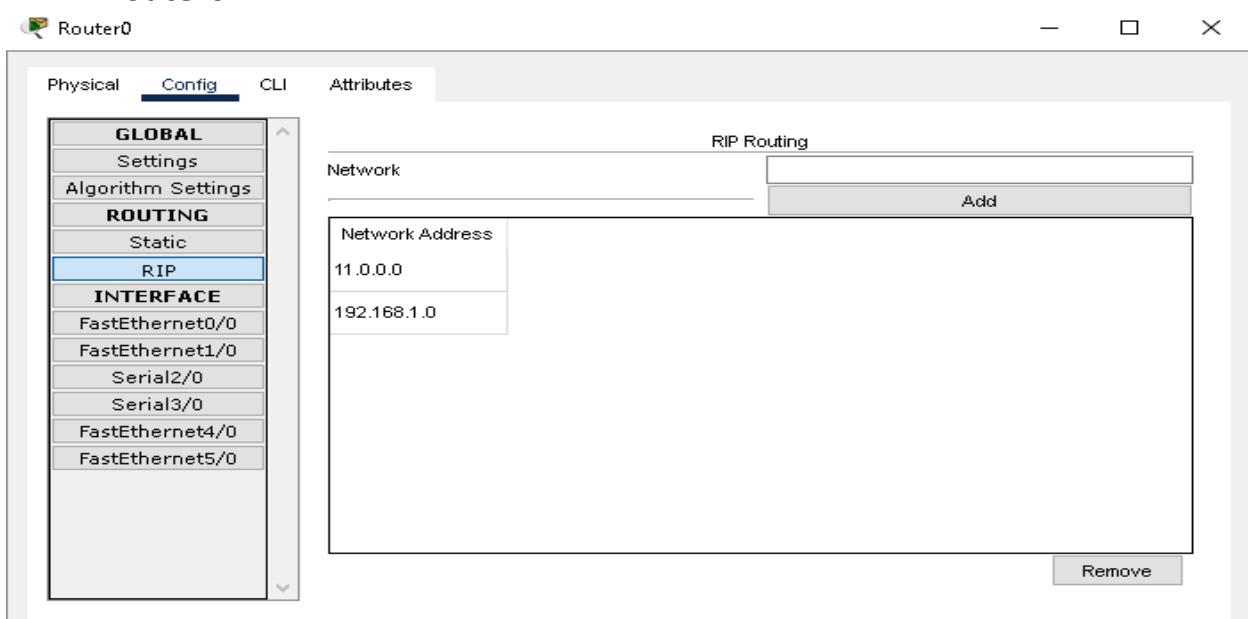
Study the concept of routing using packet tracer. (Dynamic Routing)

Practical Assignment #11:

1. Connect the two different networks based on the calculated IP addresses and subnet using a packet tracer.

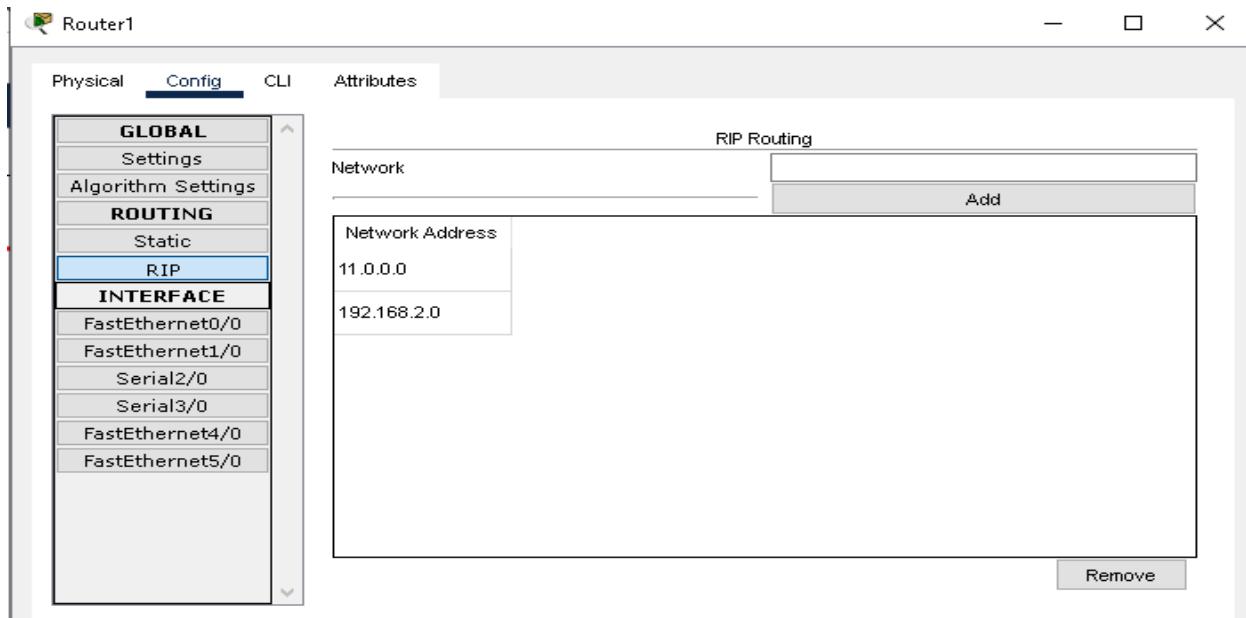


• Router0 :

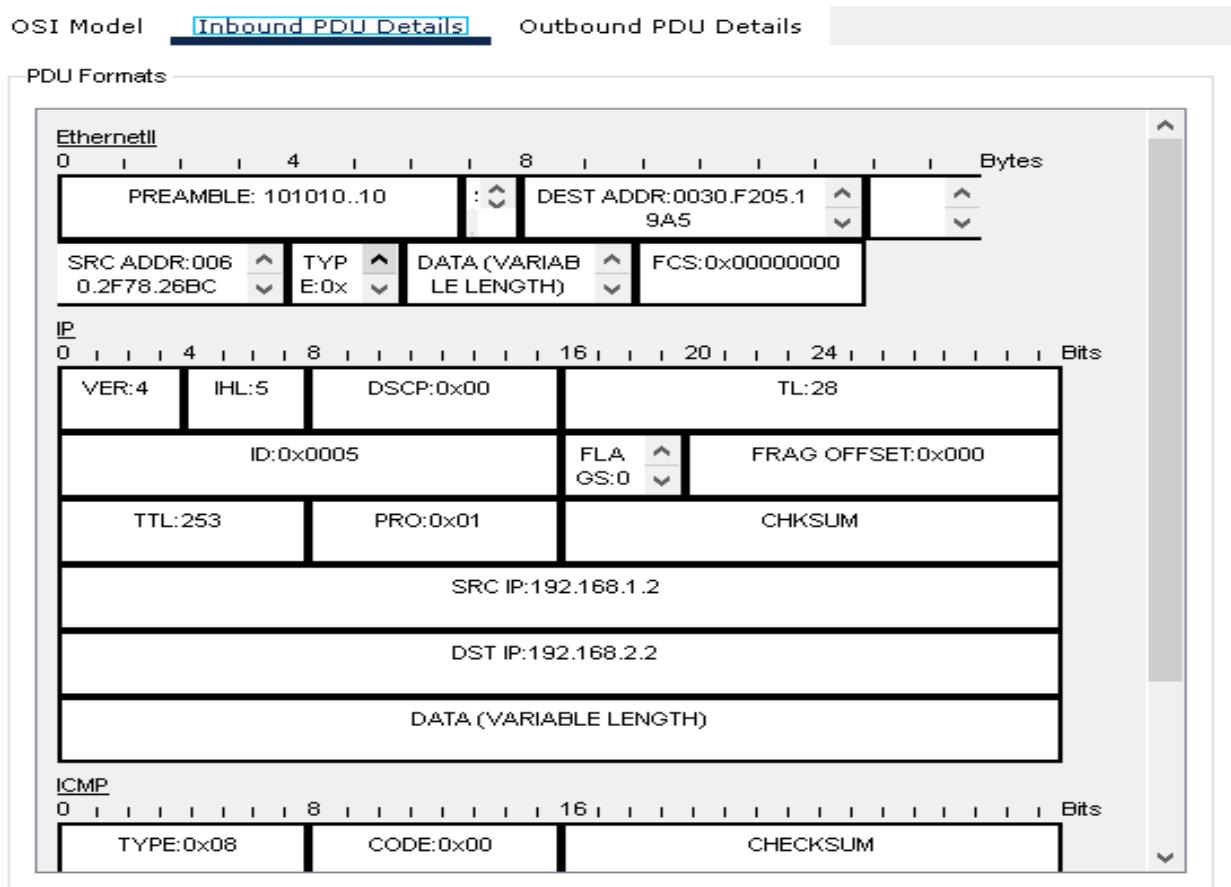


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● Router1 :

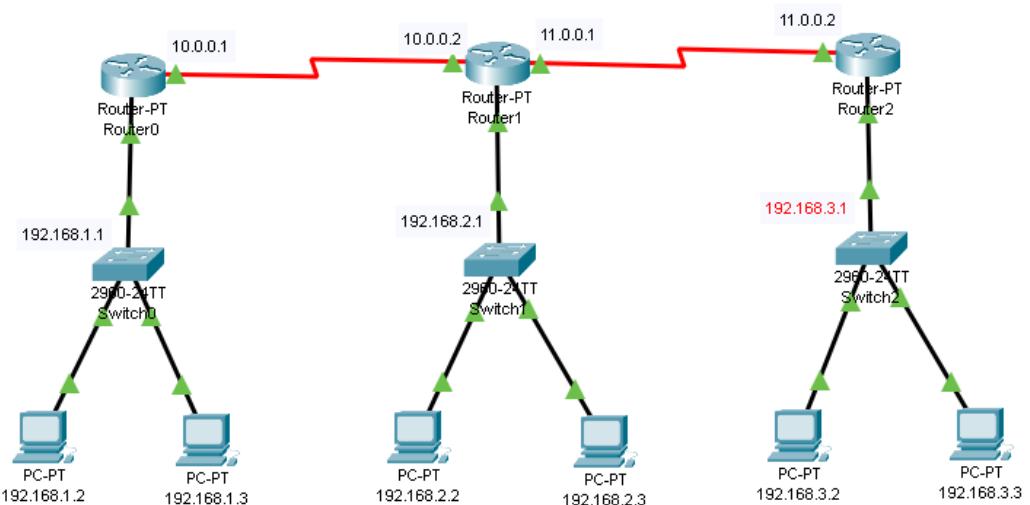


PDU Information at Device: 192.168.2.2

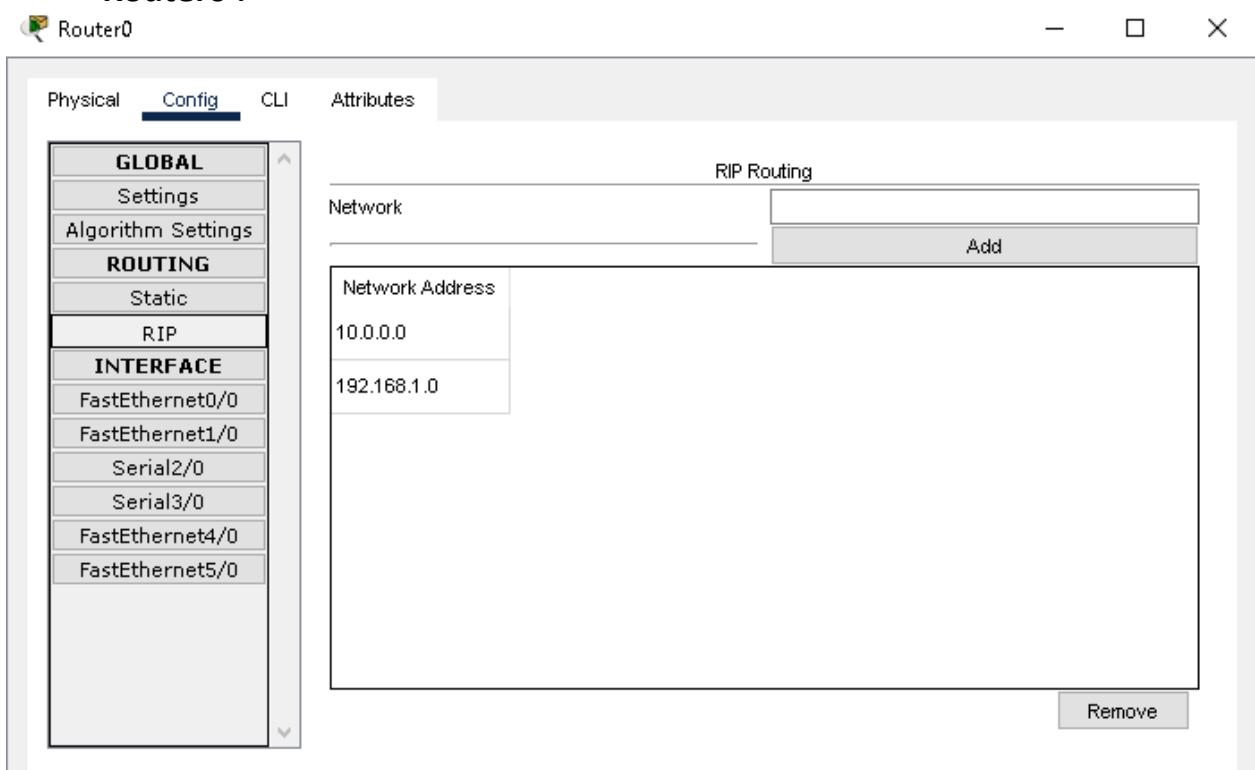


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2. Connect the three different networks based on the calculated IP addresses and subnet using a packet tracer.

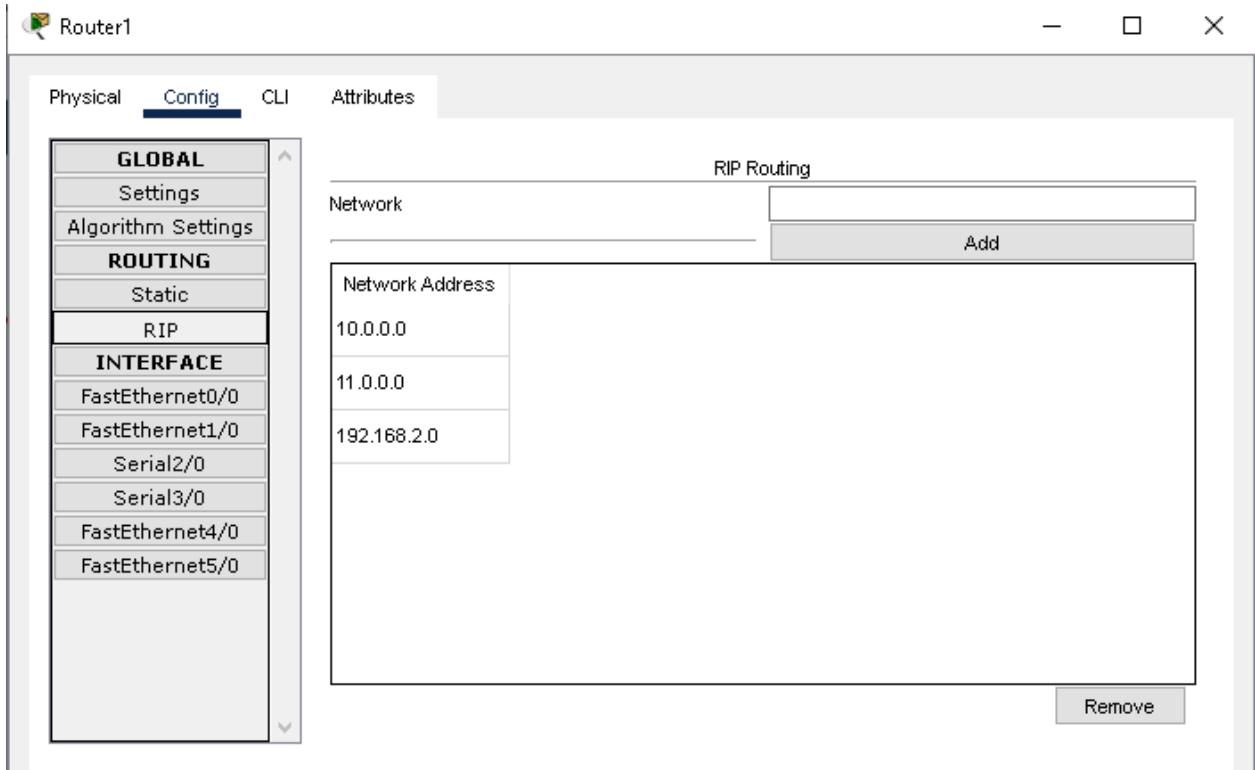


● Router0 :

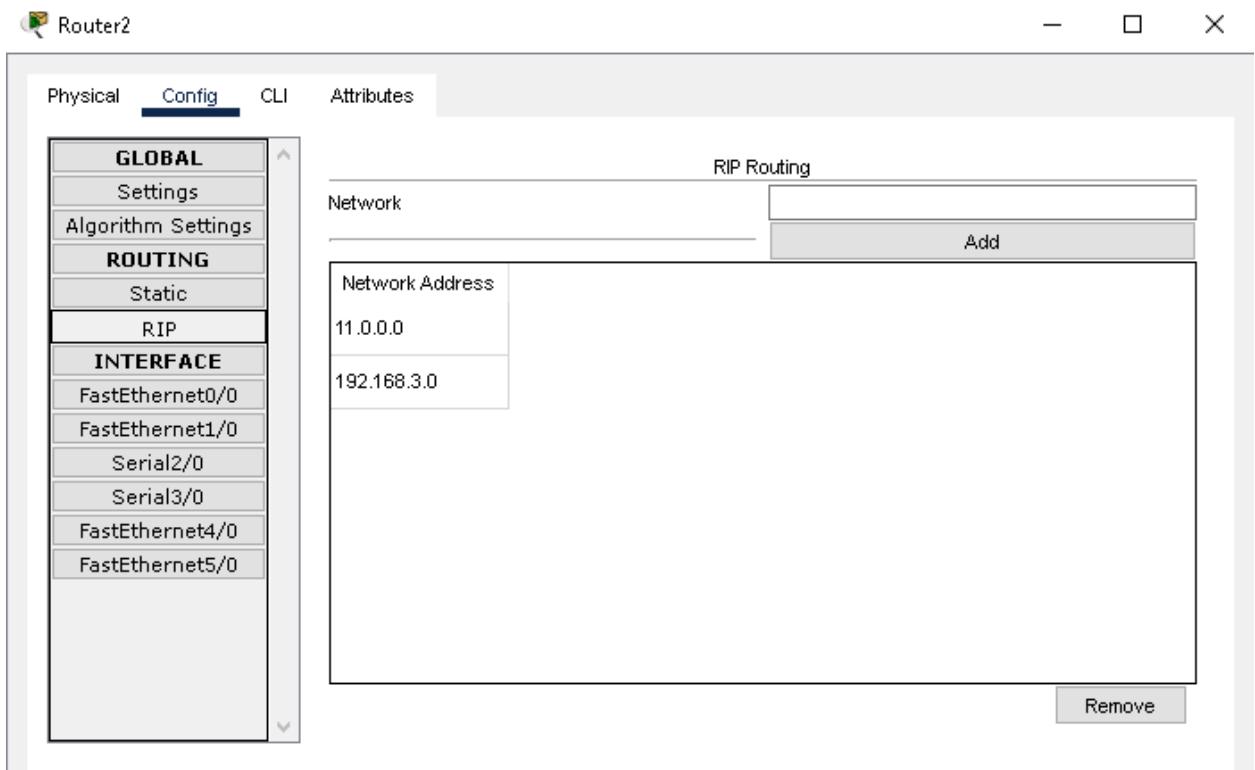


Date: 19/09/2024

● Router1 :



● Router2 :





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- ping 192.168.3.3 :

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.3.3

Pinging 192.168.3.3 with 32 bytes of data:

Reply from 192.168.3.3: bytes=32 time=36ms TTL=125
Reply from 192.168.3.3: bytes=32 time=11ms TTL=125
Reply from 192.168.3.3: bytes=32 time=11ms TTL=125
Reply from 192.168.3.3: bytes=32 time=16ms TTL=125

Ping statistics for 192.168.3.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 36ms, Average = 18ms

C:\>ping 192.168.3.2

Pinging 192.168.3.2 with 32 bytes of data:

Reply from 192.168.3.2: bytes=32 time=18ms TTL=125
Reply from 192.168.3.2: bytes=32 time=11ms TTL=125
Reply from 192.168.3.2: bytes=32 time=15ms TTL=125
Reply from 192.168.3.2: bytes=32 time=18ms TTL=125

Ping statistics for 192.168.3.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 18ms, Average = 15ms

C:\>|
```



Date: 20/09/2024

Lab Practical #12:

To develop network using distance vector routing protocol and link state routing protocol.

Practical Assignment #12:**1. C/Java Program: Distance Vector Routing Algorithm using Bellman Ford's Algorithm.**

```
import java.util.Arrays;
public class DistanceVectorRouting {

    private static final int V = 5; // Number of vertices (or routers)
    private static final int INF = 999; // Infinity representation

    static class Node {
        int[] distance = new int[V];
        int[] nextHop = new int[V];
    }

    public static void bellmanFord(int[][] graph) {
        Node[] routingTable = new Node[V];

        for (int i = 0; i < V; i++) {
            routingTable[i] = new Node();
            for (int j = 0; j < V; j++) {
                routingTable[i].distance[j] = graph[i][j];
                routingTable[i].nextHop[j] = j;
            }
        }

        // Relax all edges V-1 times (Bellman-Ford)
        for (int k = 0; k < V - 1; k++) {
            for (int i = 0; i < V; i++) {
                for (int j = 0; j < V; j++) {
                    for (int v = 0; v < V; v++) {
                        if (routingTable[i].distance[v] > graph[i][j] + routingTable[j].distance[v]) {
                            routingTable[i].distance[v] = graph[i][j] + routingTable[j].distance[v];
                            routingTable[i].nextHop[v] = j;
                        }
                    }
                }
            }
        }

        // Print the final routing table
        for (int i = 0; i < V; i++) {
```



DARSHAN INSTITUTE OF ENGINEERING & TECHNOLOGY

Semester 5th | Practical Assignment | Computer Networks (2301CS501)

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```
System.out.println("Routing table for router " + (i+1) + ":");
System.out.println("Destination\tNext Hop\tDistance");
for (int j = 0; j < V; j++) {
    System.out.println(j + "\t" + routingTable[i].nextHop[j] + "\t" + routingTable[i].distance[j]);
}
System.out.println();
}

public static void main(String[] args) {
    int[][] graph = {
        {0, 2, INF, 1, INF},
        {2, 0, 3, INF, INF},
        {INF, 3, 0, 2, 1},
        {1, INF, 2, 0, 3},
        {INF, INF, 1, 3, 0}
    };
    bellmanFord(graph);
}
}
```



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2. C/Java Program: Link state routing algorithm.

```
import java.util.Arrays;

public class LinkStateRouting {

    private static final int V = 5; // Number of vertices (or routers)
    private static final int INF = 9999; // Infinity

    int minDistance(int[] dist, boolean[] sptSet) {
        int min = INF, min_index = -1;

        for (int v = 0; v < V; v++) {
            if (!sptSet[v] && dist[v] <= min) {
                min = dist[v];
                min_index = v;
            }
        }
        return min_index;
    }

    void dijkstra(int[][] graph, int src) {
        int[] dist = new int[V];
        boolean[] sptSet = new boolean[V];

        Arrays.fill(dist, INF);
        Arrays.fill(sptSet, false);

        dist[src] = 0;

        for (int count = 0; count < V - 1; count++) {
            int u = minDistance(dist, sptSet);

            sptSet[u] = true;

            for (int v = 0; v < V; v++) {
                if (!sptSet[v] && graph[u][v] != 0 && dist[u] != INF && dist[u] + graph[u][v] < dist[v]) {
                    dist[v] = dist[u] + graph[u][v];
                }
            }
        }

        System.out.println("Vertex \t Distance from Source " + src);
        for (int i = 0; i < V; i++) {
            System.out.println(i + " \t\t " + dist[i]);
        }
    }
}
```



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```
}
```

```
public static void main(String[] args) {
    int[][] graph = {
        {0, 2, INF, 1, INF},
        {2, 0, 3, INF, INF},
        {INF, 3, 0, 2, 1},
        {1, INF, 2, 0, 3},
        {INF, INF, 1, 3, 0}
    };

    LinkStateRouting lsr = new LinkStateRouting();
    lsr.dijkstra(graph, 0);
}
```

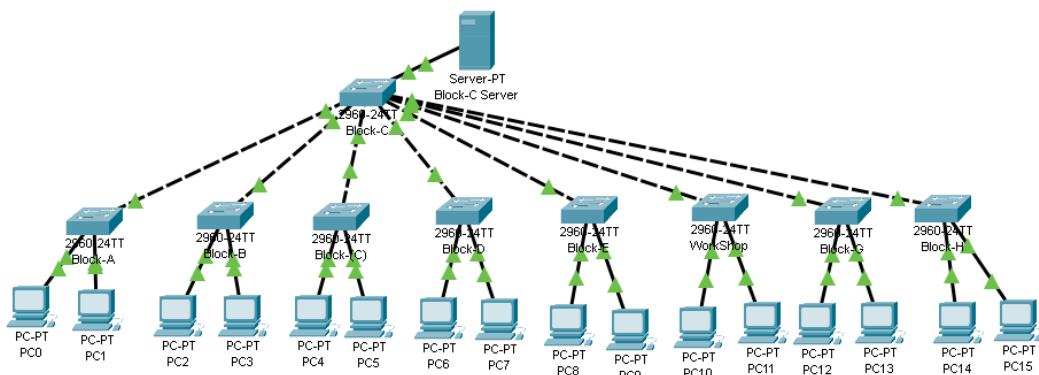
Date: 12/09/2024

Lab Practical #13:

Study & Survey of Institute organization network infrastructure.

Practical Assignment #13:

1. Identify type of network in your institute. Draw a design of network in your institute (Any Lab/Floor/Building).



➤ Explanation :

- Above Diagram is the network of Darshan University
- C - Block is the designated primarily to Computer Department and the Server Room is located here
- Through Air-fiber on the terrace of C - Block we are receiving internet connection from the ISP from Madhapar Chawk, Rajkot
- Each Block of Darshan University is connected to server room which is located at Block-C
- Through a L-3/L-2 Switch placed in each lab connected directly to server room provides ethernet Connection to each Computer in lab.
- In some labs we have WiFi-6E routers available for extra connectivity
- For more security Sophos is implemented.
- Sophos provides firewall protection, Intrusion detection and prevention to protect from cyber threats.
- When we want to use Internet then we need to connect to Sophos using userid and password.
- Here we have our Fiber Optic Switch which is used to connect to the ISP and to provide Fast Internet to all other blocks



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2. List how many network devices and types of cable used and give its details.

- Network type : LAN
- Network Devices :
 - **Sophos:** for firewall and gateway
 - **L-3 Switch:** used to connect each block and ISP from C-Block to provide internet to each block.
 - **Router:** used for wireless connectivity to each block.
 - **L-2 Switch:** used to connect each Computer in labs of each block to use internet service.
 - **Wireless APs:** wireless Access Points are used to provide connectivity in H Block
 - **Uninterruptible Power Supplies(UPS):** provide backup power to critical devices in case of outages.
 - **Antennas:** used to connect to the ISP which is located 18 km far from Darshan University
 - **Servers:** to store data centrally
 - **Cables:** twisted pair cable and fiber optic cable
 - **Connectors:** RJ45
- Darshan University pay 12 lakh INR , which covers the usage and maintenance of ISP connection.