

**NST21022 - Practical  
for Network Switching  
and Routing**

Department of Information  
and Communication  
Technology

Faculty of Technology

**Lab sheet :05**

**Reg. Number: SEU/IS/20/ICT/084**

**Academic Year :2020/2021**

**Practical No :05**

## Title: Internet Protocol version 4 (IPv4) Subnet

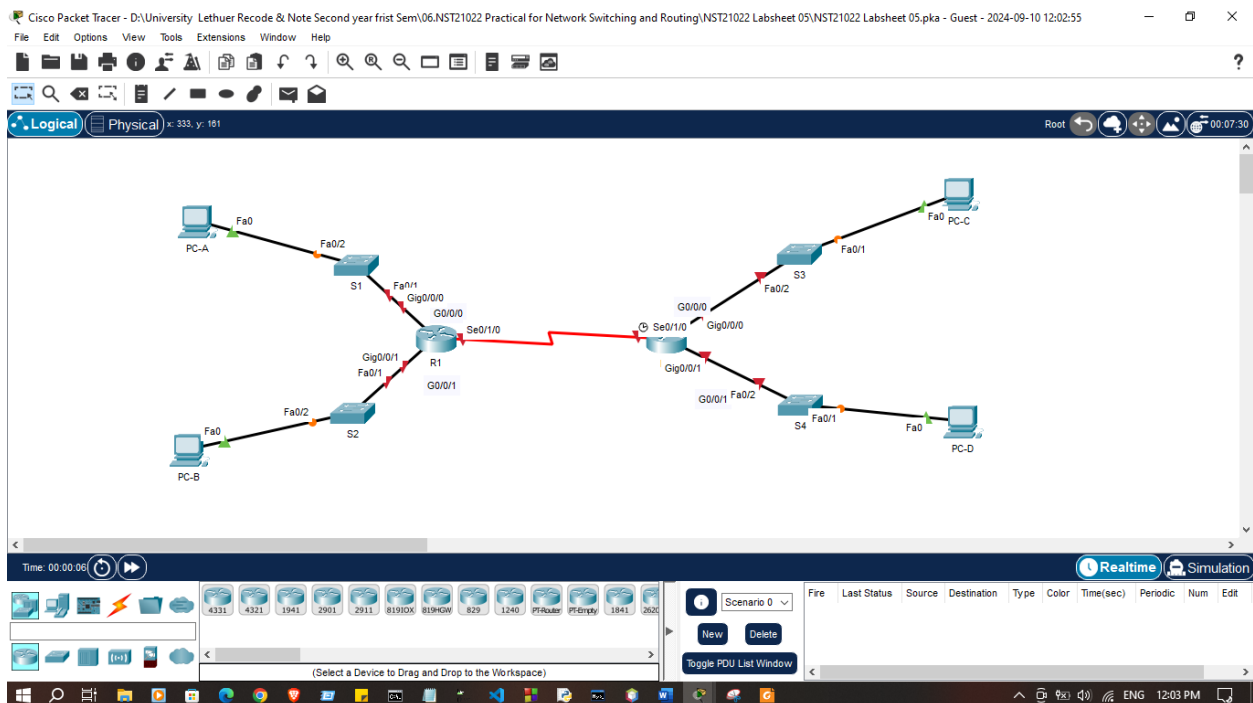
### Aim:

- IP addressing scheme.
- Getting familiar with IPv4 subnets
- Configure devices with IPv4 after subnetting.

### Task:

- Design an IP scheme.
- Subnet the IPv4 address
- Assign IP addresses to Network devices and verify connectivity

Use “NST21022 Lab sheet 05.pka” file



## Activities

### **Exercise 01:**

**Subnet the 192.168.1.0/24 network to the appropriate number of subnets.**

**1. Based on the topology, how many subnets were needed?**

- 5 subnets

**2. How many bits must be borrowed to support the number of subnets in the topology table?**

- 3 bit

**3. How many subnets does this create?**

- 8 subnets

### **Exercise 02: Fill the subnet table.**

Subnet Number	Network Address	First Usable Host Address	Last Usable Host Address	Broadcast Address
1	192.168.1.0	192.168.1.1	192.168.1.30	192.168.1.31
2	192.168.1.32	192.168.1.33	192.168.1.62	192.168.1.63
3	192.168.1.64	192.168.1.65	192.168.1.94	192.168.1.95
4	192.168.1.96	192.168.1.97	192.168.1.126	192.168.1.127
5	192.168.1.128	192.168.1.129	192.168.1.158	192.168.1.159
6	192.168.1.160	192.168.1.161	192.168.1.190	192.168.1.191
7	192.168.1.192	192.168.1.193	192.168.1.222	192.168.1.223
8	192.168.1.224	192.168.1.225	192.168.1.253	192.168.1.254

### **Exercise 03: Configure IP address according to following criteria.**

1. Assign the subnets to the network shown in the topology.

**a. Assign Subnet 1 to the LAN connected to the GigabitEthernet 0/0/0 interface of R1:**

```
Router(config-if)#
Router(config-if)#interface g0/0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.224
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up
```

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up

**b. Assign Subnet 2 to the LAN connected to the GigabitEthernet 0/0/1 interface of R1:**

```
Router(config-if)#interface g0/0/1
Router(config-if)#ip address 192.168.1.33 255.255.255.224
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
```

**c. Assign Subnet 3 to the LAN connected to the GigabitEthernet 0/0/0 interface of R2:**

```
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 192.168.1.65 255.255.255.224
Router(config-if)#no shutdown
```

**d. Assign Subnet 4 to the LAN connected to the GigabitEthernet 0/0/1 interface of R2:**

```
Router(config-if)#interface g0/0/1
Router(config-if)#ip address 192.168.1.97 255.255.255.224
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up
```

**e. Assign Subnet 5 to the WAN link between R1 to R2:**

```
Router(config-if)#interface s0/1/0
Router(config-if)#ip address 192.168.1.129 255.255.255.224
Router(config-if)#no shutdown
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
```

```
Router(config-if)#interface s0/1/0
Router(config-if)#ip address 192.168.1.158 255.255.255.224
Router(config-if)#no shutdown
```

2. Fill the addressing table using following guidelines:

- a. Assign the first usable IP addresses in each subnet to R1 for the two LAN link and WAN link.

```
IOS Command Line Interface

Router>enable
Router#configure terminal
Router(config)#
% Invalid input detected at '^' marker.

Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.224
Router(config-if)#interface g0/0/1
Router(config-if)#ip address 192.168.1.33 255.255.255.224
Router(config-if)#no shutdown
Router(config-if)#
% Invalid input detected at '^' marker.

Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up

Router(config-if)#
Router(config-if)#interface g0/0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.224
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up

Router(config-if)#interface s0/1/0
Router(config-if)#ip address 192.168.1.129 255.255.255.224
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
Router(config-if)#
```

- b. Assign the first usable IP addresses in each subnet to R2 for the LAN links, assign the last usable IP address for the WAN link.

```
IOS Command Line Interface

Press RETURN to get started!

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#interface g0/0/0
Router(config-if)#ip address 192.168.1.65 255.255.255.224
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up

Router(config-if)#interface g0/0/1
Router(config-if)#ip address 192.168.1.97 255.255.255.224
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up

Router(config-if)#interface s0/1/0
Router(config-if)#ip address 192.168.1.158 255.255.255.224
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up

Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up

04:09:46: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.1.33 on Serial0/1/0 from LOADING to FULL, Loading Done
```

c. Assign the second usable IP address in the attached subnets to the switches.

```
Switch>
Switch>en
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface vlan 1
Switch(config-if)#ip address 192.168.1.66
% Incomplete command.
Switch(config-if)#ip address 192.168.1.66 255.255.255.224
Switch(config-if)#no shutdown

Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

Switch(config-if)#interface vlan 1
Switch(config-if)#ip address 192.168.1.2 255.255.255.224
Switch(config-if)#no shutdown
Switch(config-if)#
```

Copy

Paste

```
Switch>en
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#interface vlan 1
Switch(config-if)#ip address 192.168.1.34 255.255.255.224
Switch(config-if)#no shutdown

Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

Switch(config-if)#
```

Copy

Paste

```
Switch>en
Switch#confin t
      ^
% Invalid input detected at '^' marker.

Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#interface vlan 1
Switch(config-if)#ip address 192.168.1.66 255.255.255.224
Switch(config-if)#no shutdown

Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

Switch(config-if)#
Switch#
%SYS-5-CONFIG_I: Configured from console by console
|
```

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 [Top](#)

```
Switch>en
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#interface vlan1
Switch(config-if)#ip address 192.168.1.98 255.255.255.224
Switch(config-if)#no shotdwon
      ^
% Invalid input detected at '^' marker.

Switch(config-if)#no shutdown

Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

Switch(config-if)#|
```

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d. Assign the last usable IP address to the PCs in each subnet

The screenshot shows a configuration window for a PC named 'PC-B'. The 'Desktop' tab is selected, and the 'IP Configuration' section is active. The interface is 'FastEthernet0'. Under 'IP Configuration', 'Static' is selected. The IPv4 Address is '192.168.1.62', Subnet Mask is '255.255.255.224', Default Gateway is '192.168.1.33', and DNS Server is '0.0.0.0'. Under 'IPv6 Configuration', 'Static' is selected. The IPv6 Address is empty, Link Local Address is 'FE80::20C:CFFF:FE73:E292', Default Gateway is empty, and DNS Server is empty. Under '802.1X', 'Use 802.1X Security' is unchecked, Authentication is 'MD5', Username is empty, and Password is empty. A 'Top' link is at the bottom left.

PC-B

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 192.168.1.62

Subnet Mask: 255.255.255.224

Default Gateway: 192.168.1.33

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::20C:CFFF:FE73:E292

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

[Top](#)

PC-C

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 192.168.1.94

Subnet Mask: 255.255.255.224

Default Gateway: 192.168.1.65

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::204:9AFF:FEA8:6061

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

☐ Top

PC-D

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.168.1.126

Subnet Mask 255.255.255.224

Default Gateway 192.168.1.97

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::203:E4FF:FE35:6952

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

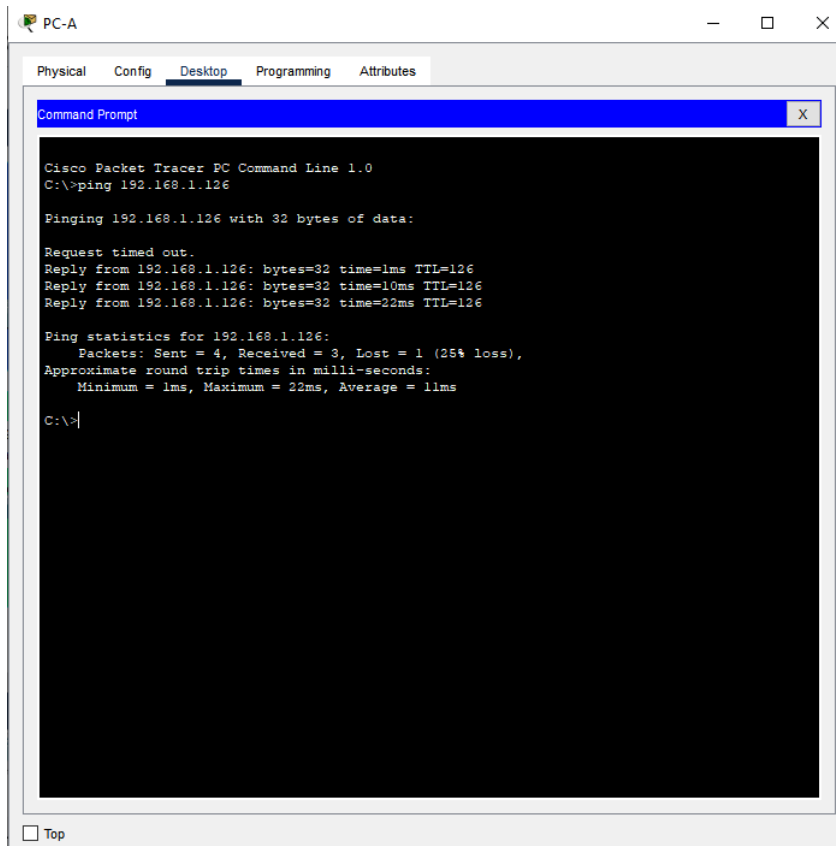
Password

☐ Top

### Addressing Table

Devices	Interfaces	IP Addresses	Subnet Mask	Default Gateway
R1	G0/0/0	192.168.1.1	255.255.255.0	
	G0/0/1	192.168.1.33	255.255.255.0	
	S0/1/1	192.168.1.129	255.255.255.0	
R2	G0/0/0	192.168.1.65	255.255.255.0	
	G0/0/1	192.168.1.97	255.255.255.0	
	S0/1/1	192.168.1.158	255.255.255.0	
S1	VLAN1	192.168.1.2	255.255.255.0	
S2	VLAN1	192.168.1.34	255.255.255.0	
S3	VLAN1	192.168.1.130	255.255.255.0	
S4	VLAN1	192.168.1.98	255.255.255.0	
PC-A	NIC	192.168.1.3	255.255.255.0	192.168.1.1
PC-B	NIC	192.168.1.34	255.255.255.0	192.168.1.33
PC-C	NIC	192.168.1.66	255.255.255.0	192.168.1.65
PC-D	NIC	192.168.1.98	255.255.255.0	192.168.1.97

### 03.Assign IP addresses to network devices and verify connectivity



Cisco Packet Tracer - D:\Second year first Sem Assignment & Labsheet\03.NST21022 Practical for Network Switching and Routing\NST21022 Labsheet 05\NST21022 Labsheet 05.pka - Guest - 2024-01-25 09:15:30

File Edit Options View Tools Extensions Window Help

Activity Results Time Elapsed: 14:33:50

Congratulations Guest! You completed the activity.

Overall Feedback **Assessment Items** Connectivity Tests

Expand/Collapse All Show Incorrect Items

Assessment Items	Status	Points	Component(s)	Feedback
Ports				
FastEthernet0				
IP Address	Correct	1	Ip	
Subnet Mask	Correct	1	Ip	
R1				
Ports				
GigabitEthernet0/0/0				
IP Address	Correct	1	Ip	
Port Status	Correct	1	Physical	
Subnet Mask	Correct	1	Ip	
GigabitEthernet0/0/1				
IP Address	Correct	1	Ip	
Port Status	Correct	1	Physical	
Subnet Mask	Correct	1	Ip	
Serial0/1/0				
IP Address	Correct	1	Ip	
Port Status	Correct	1	Physical	
Subnet Mask	Correct	1	Ip	
R2				
Ports				
GigabitEthernet0/0/0				
IP Address	Correct	1	Ip	
Port Status	Correct	1	Physical	
Subnet Mask	Correct	1	Ip	
GigabitEthernet0/0/1				
IP Address	Correct	1	Ip	
Port Status	Correct	1	Physical	
Subnet Mask	Correct	1	Ip	
Serial0/1/0				
IP Address	Correct	1	Ip	
Port Status	Correct	1	Physical	

Score : 42/42  
Item Count : 42/42

Component	Items/Total	Score
Ip	32/32	32/32
Physical	10/10	10/10

Close

## Discussion:

- In this lab session, we focused on understanding IPv4 subnetting and IP addressing schemes. We began by designing an IP scheme, which involved selecting a suitable network address and determining how many subnets and hosts per subnet were required. Next, we performed IPv4 subnetting, breaking down the main network into smaller, more manageable subnets. After creating the subnets, we assigned specific IP addresses to network devices such as PCs, routers, and switches. Finally, we verified connectivity by ensuring that devices could communicate with one another within their subnet as well as across different subnets, confirming that the IP scheme and subnetting were correctly configured. This session helped us grasp the importance of IP addressing and subnetting in efficient network management.