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B. Tech Computer Science and Engineering
Sub: CN

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PRACTICAL 3

Aim: To Design and configure a network using Dynamic Host Configuration Protocol (DHCP).

Scenario:

Mr. Jason has hired a new network admin and asked him to create a network for his company. He has given him the liberty to erase all the previous network setup and create a new one as per his understanding and expertise. Below are the details provided by Mr. Jason to the network admin.

- 1) The company has 3 departments – Admin, HR, Sales. 2) Each department have 10 users (add at least 3 devices in each network)
- 3) The networking device available in the organization is 3 DNS servers, 2 DHCP servers, 3 routers and 3 switches.
- 4) All the users should get the IP address dynamically.
- 5) The organization has their own inbuilt Domain Name Server (DNS) which will have the details of the website that the user can access. 6) The users of the company are allowed to access only mentioned websites in the office premises. The list of the website is mentioned below:

Admin – google, yahoo, cisco
HR – google, cisco
Sales – google

Help the admin to create the network and establish the connection between the devices.

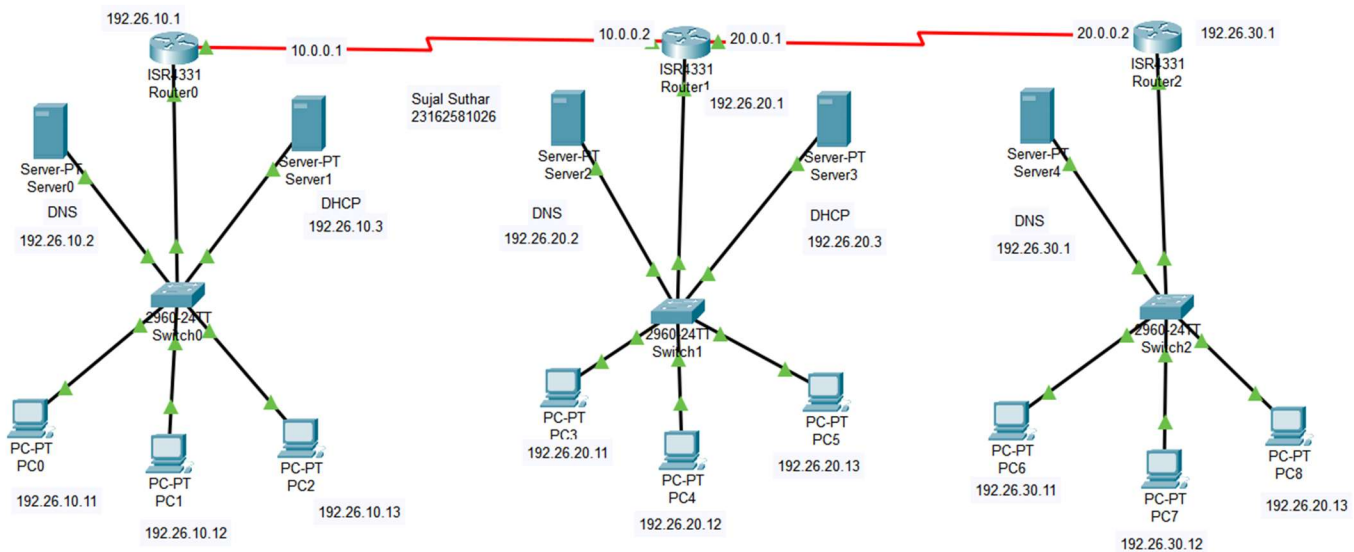
Procedure:

- 1) Create network as given below
- 2) Configure IP address (Routers, DNS servers, DHCP servers)
- 3) Configure dynamic routing table (RIP in routers)
- 4) Configure DNS service
- 5) Configure WEB service by hosting websites
- 6) Configure DHCP server
- 7) Configure IP-Helper command to appropriate interface of a router
- 8) Set PC to get IP address based on DHCP

Note:

Make sure last two digits of your enrollment numbers appears in network IP address that must be visible in snapshot of the cisco packet tracer. i.e. 192.XX.XX.10.1 (XX indicates last two digits of your enrollment no.)

○ Main configuration



IP configuration of routers:

Router0

Physical Config CLI Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0/0

GigabitEthernet0/0/1

GigabitEthernet0/0/2

Serial0/1/0

Serial0/1/1

Serial0/2/0

Serial0/2/1

GigabitEthernet0/0/0

Port Status ☒ On

Bandwidth ☐ 1000 Mbps ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 0030.F21D.5501

IP Configuration

IPv4 Address 192.26.10.1

Subnet Mask 255.255.255.0

Tx Ring Limit 10

Equivalent IOS Commands

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up

Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#
```

☐ Top

Router0

Physical

Config

CLI

Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0/0

GigabitEthernet0/0/1

GigabitEthernet0/0/2

Serial0/1/0

Serial0/1/1

Serial0/2/0

Serial0/2/1

Serial0/1/0

Port Status

Duplex

Clock Rate

IP Configuration

IPv4 Address

Subnet Mask

Tx Ring Limit

Full Duplex

2000000

10.0.0.1

255.0.0.0

10

On

Equivalent IOS Commands

Router(config-if)#exit

Router(config)#interface Serial0/2/0

Router(config-if)#

Router(config-if)#exit

Router(config)#interface Serial0/2/1

Router(config-if)#

Router(config-if)#exit

Router(config)#interface Serial0/1/1

Router(config-if)#

Router(config-if)#exit

Router(config)#interface Serial0/1/0

Router(config-if)#

Top

Router1

PhysicalConfigCLIAttributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0/0

GigabitEthernet0/0/1

GigabitEthernet0/0/2

Serial0/1/0

Serial0/1/1

Serial0/2/0

Serial0/2/1

GigabitEthernet0/0/0

Port Status

☐ 1000 Mbps☒ 100 Mbps☐ 10 Mbps

☐ Half Duplex☒ Full Duplex

☒ On

☒ Auto

Bandwidth

☐ 1000 Mbps☒ 100 Mbps☐ 10 Mbps

Duplex

☐ Half Duplex☒ Full Duplex

☒ Auto

MAC Address0010.113D.A101

IP Configuration

IPv4 Address192.26.20.1

Subnet Mask255.255.255.0

Tx Ring Limit10

Equivalent IOS Commands

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up

Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0/0
Router(config-if)#
```

☐ Top

Router1

PhysicalConfigCLIAttributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0/0

GigabitEthernet0/0/1

GigabitEthernet0/0/2

Serial0/1/0

Serial0/1/1

Serial0/2/0

Serial0/2/1

Serial0/1/0

Port Status

On

Duplex

Full Duplex

Clock Rate

2000000

IP Configuration

IPv4 Address

10.0.0.2

Subnet Mask

255.0.0.0

Tx Ring Limit

10

5 of 11 pages

Router1

PhysicalConfigCLIAttributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0/0

GigabitEthernet0/0/1

GigabitEthernet0/0/2

Serial0/1/0

Serial0/1/1

Serial0/2/0

Serial0/2/1

Serial0/1/1

Port Status

On

Duplex

Full Duplex

Clock Rate

2000000

IP Configuration

IPv4 Address

20.0.0.1

Subnet Mask

255.0.0.0

Tx Ring Limit

10

Router2

Physical

Config

CLI

Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0/0

GigabitEthernet0/0/1

GigabitEthernet0/0/2

Serial0/1/0

Serial0/1/1

Serial0/2/0

Serial0/2/1

GigabitEthernet0/0/0

Port Status

1000 Mbps

☒ 100 Mbps

10 Mbps

☒ On

Bandwidth

Auto

Duplex

Half Duplex

☒ Full Duplex

☒ Auto

MAC Address

0002.1778.4701

IP Configuration

IPv4 Address

192.26.30.1

Subnet Mask

255.255.255.0

Tx Ring Limit

10

Router2

Physical

Config

CLI

Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0/0

GigabitEthernet0/0/1

GigabitEthernet0/0/2

Serial0/1/0

Serial0/1/1

Serial0/2/0

Serial0/2/1

Serial0/1/0

Serial0/1/0

Port Status

On

Duplex

Full Duplex

Clock Rate

2000000

IP Configuration

IPv4 Address

20.0.0.2

Subnet Mask

255.0.0.0

Tx Ring Limit

10

○ IP Config of DNS Servers:

Server0

Physical Config Services Desktop Programming Attributes

IP Configuration X

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.26.10.2

Subnet Mask 255.255.255.0

Default Gateway 192.26.10.1

DNS Server 192.26.10.2

Server2

Physical Config Services Desktop Programming Attributes

IP Configuration X

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.26.20.2

Subnet Mask 255.255.255.0

Default Gateway 192.26.20.1

DNS Server 192.26.20.2

Server4

Physical Config Services Desktop Programming Attributes

IP Configuration X

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.26.30.2

Subnet Mask 255.255.255.0

Default Gateway 192.26.30.1

DNS Server 192.26.30.2

IPv6 Configuration

○ IP Config of DHCP Servers:

Server1

Physical Config Services Desktop Programming Attributes

IP Configuration X

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.26.10.3

Subnet Mask 255.255.255.0

Default Gateway 192.26.10.1

DNS Server 192.26.10.2

Server3

Physical Config Services Desktop Programming Attributes

IP Configuration X

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.26.20.3

Subnet Mask 255.255.255.0

Default Gateway 192.26.20.1

DNS Server 192.26.20.2

○ RIP Config of Routers:

Router0

Physical **Config** CLI Attributes

GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0/0

Network

Network Address
10.0.0.0
192.26.10.0

Router1

Physical **Config** CLI Attributes

GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0/0
GigabitEthernet0/0/1

RIP Routing

Network

Add

Network Address
10.0.0.0
20.0.0.0
192.26.20.0

Router2

Physical **Config** CLI Attributes

GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE

RIP Routing

Network

Add

Network Address
20.0.0.0
192.26.30.0

○ DNS Service config:

Server0

Physical Config **Services** Desktop Programming Attributes

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

IoT

VM Management

Radius EAP

DNS

DNS Service ☒ On ☐ Off

Resource Records

Name Type **A Record** ▾

Address

Add

Save

Remove

No.	Name	Type	Detail
0	cisco.com	A Record	192.26.30.2
1	google.com	A Record	192.26.10.2
2	yahoo.com	A Record	192.26.20.2

Server2

Physical Config **Services** Desktop Programming Attributes

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

IoT

VM Management

Radius EAP

DNS

DNS Service ☒ On ☐ Off

Resource Records

Name Type **A Record** ▾

Address

Add

Save

Remove

No.	Name	Type	Detail
0	cisco.com	A Record	192.26.30.2
1	google.com	A Record	192.26.10.2

Server4

Physical

Config

Services

Desktop

Programming

Attributes

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

IoT

VM Management

Radius EAP

DNS

DNS Service

On

Off

Resource Records

Name

Type

A Record

Address

Add

Save

Remove

No.	Name	Type	Detail
0	google.com	A Record	192.26.10.2

Config of web service:

Server0

Physical

Config

Services

Desktop

Programming

Attributes

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

IoT

VM Management

Radius EAP

File Name:

index.html

<html>

<hr>

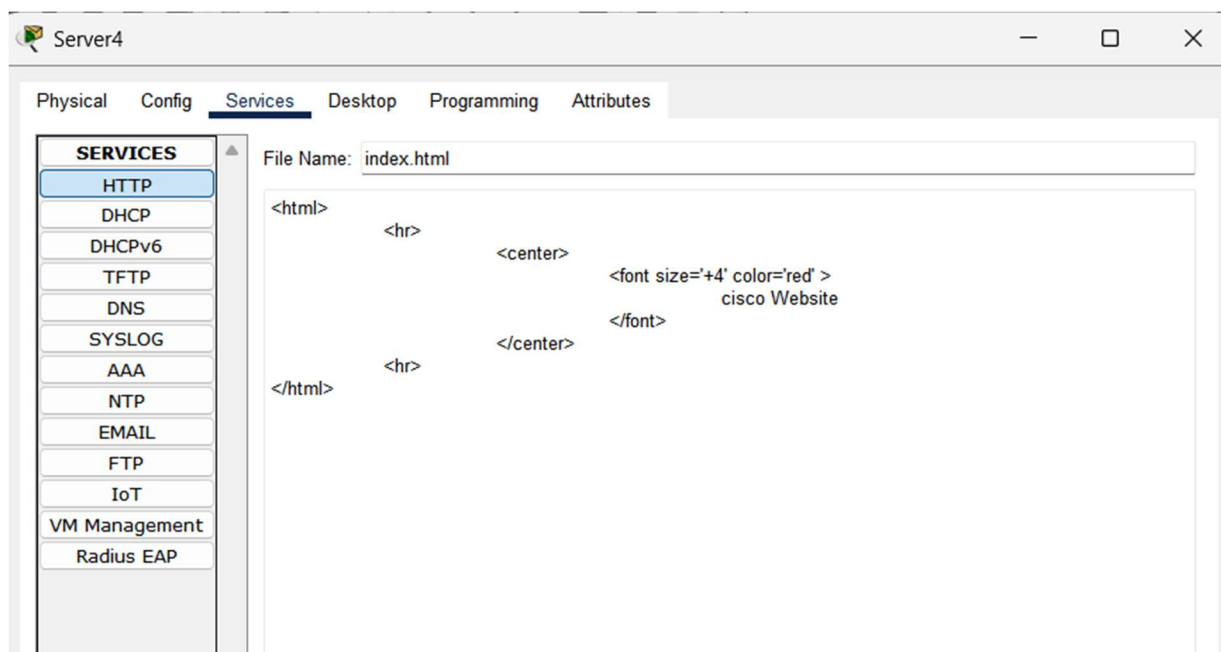
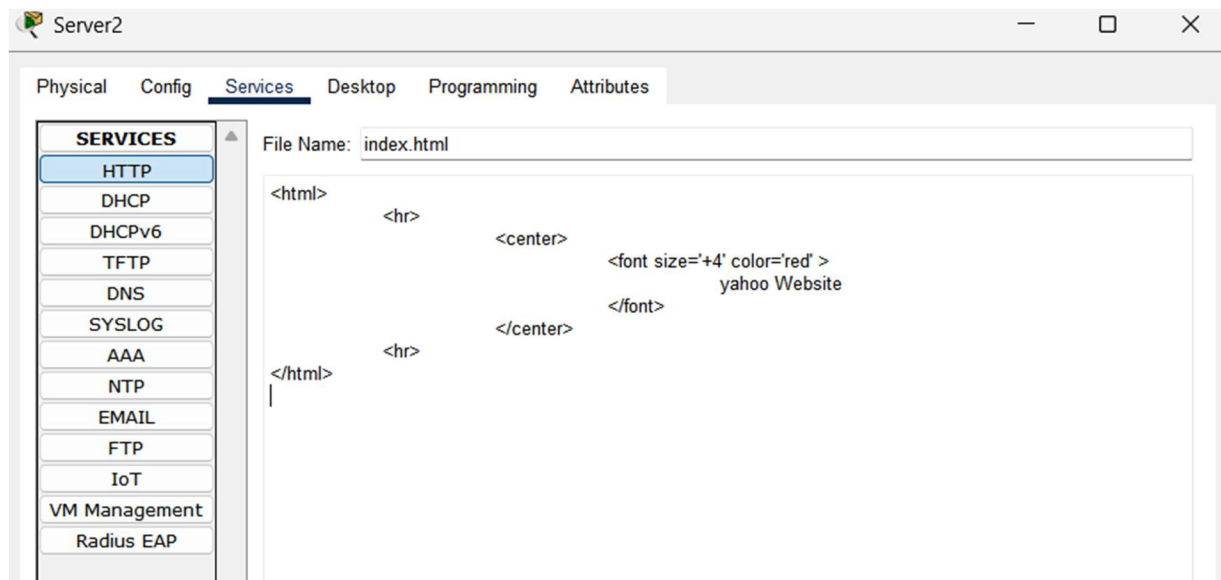
<center>

google Website

</center>

<hr>

</html>



Config of DHCP Server:

Server1

Physical Config **Services** Desktop Programming Attributes

SERVICES

- HTTP
- DHCP**
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT
- VM Management
- Radius EAP

DHCP

Interface: FastEthernet0 Service: ☒ On ☐ Off

Pool Name: serverPool

Default Gateway: 192.26.10.1

DNS Server: 192.26.10.2

Start IP Address: 192 26 10 11

Subnet Mask: 255 255 255 0

Maximum Number of Users: 20

TFTP Server: 0.0.0.0

WLC Address: 0.0.0.0

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
serverPool	192.26.10.1	192.26.10.2	192.26.10.11	255.255.2...	20	0.0.0.0	0.0.0.0
serverPool1	192.26.30.1	192.26.30.2	192.26.30.11	255.255.2...	20	0.0.0.0	0.0.0.0

Server3

Physical Config **Services** Desktop Programming Attributes

SERVICES

- HTTP
- DHCP**
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT
- VM Management
- Radius EAP

DHCP

Interface: FastEthernet0 Service: ☒ On ☐ Off

Pool Name: serverPool

Default Gateway: 192.26.20.1

DNS Server: 192.26.20.2

Start IP Address: 192 26 20 11

Subnet Mask: 255 255 255 0

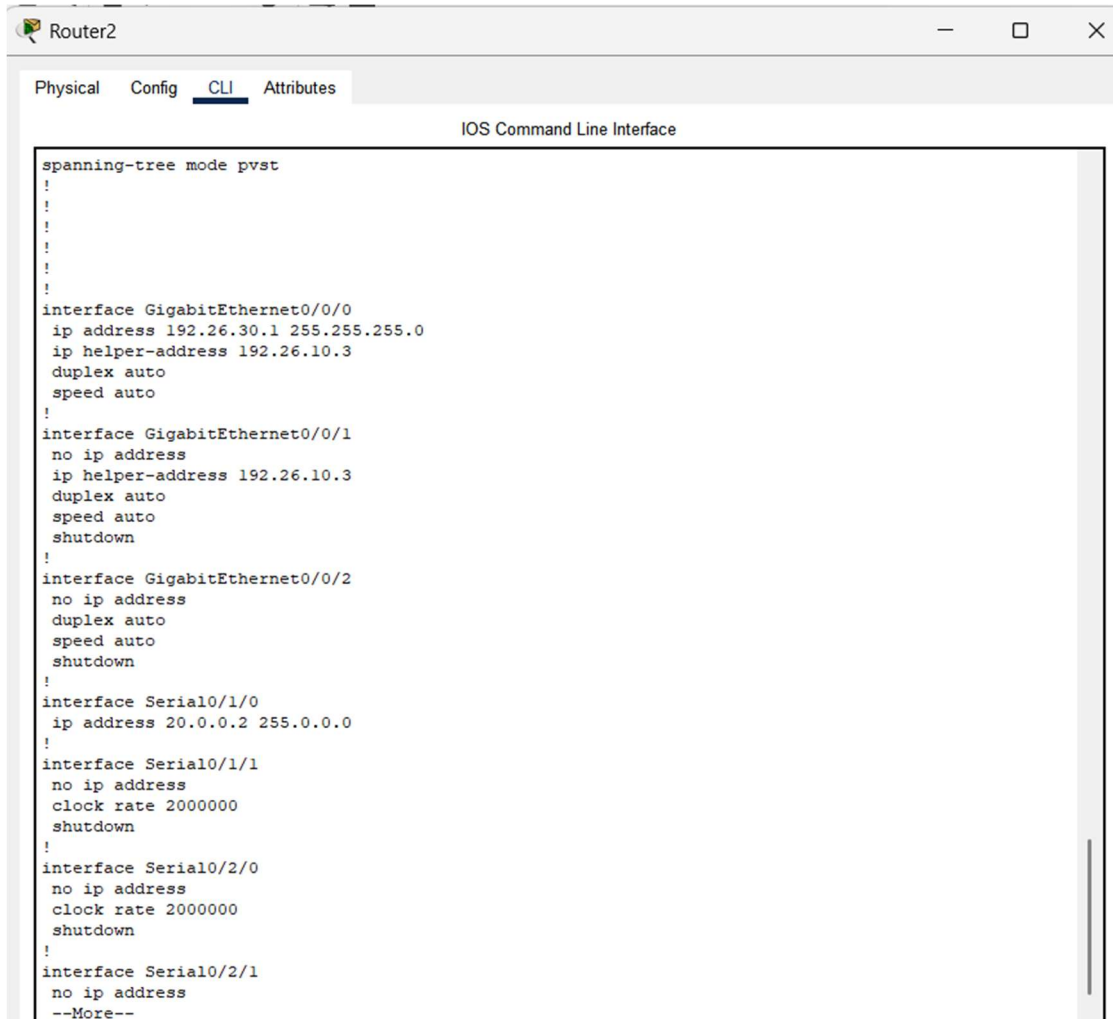
Maximum Number of Users: 20

TFTP Server: 0.0.0.0

WLC Address: 0.0.0.0

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
serverPool	192.26.20.1	192.26.20.2	192.26.20.11	255.255.2...	20	0.0.0.0	0.0.0.0

○ Configuring ip helper:

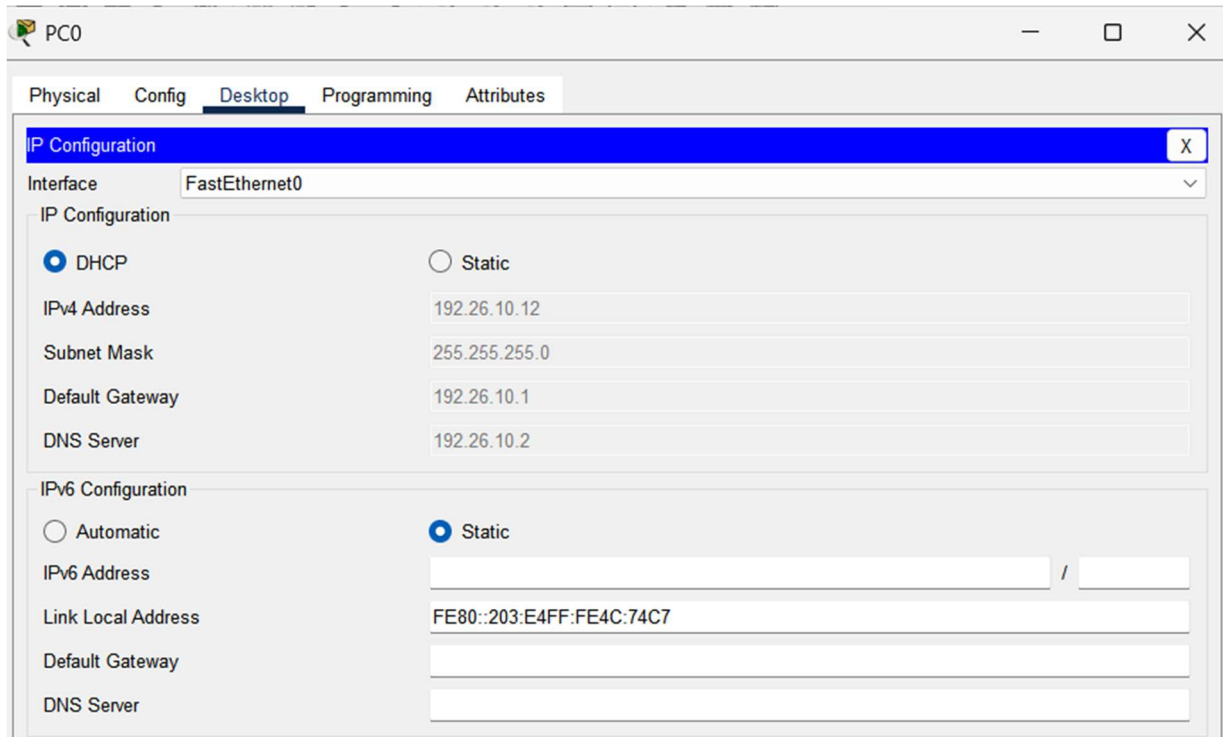


```
Router2
Physical Config CLI Attributes
IOS Command Line Interface

spanning-tree mode pvst
!
!
!
!
!
!
interface GigabitEthernet0/0/0
ip address 192.26.30.1 255.255.255.0
ip helper-address 192.26.10.3
duplex auto
speed auto
!
interface GigabitEthernet0/0/1
no ip address
ip helper-address 192.26.10.3
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/0/2
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/1/0
ip address 20.0.0.2 255.0.0.0
!
interface Serial0/1/1
no ip address
clock rate 2000000
shutdown
!
interface Serial0/2/0
no ip address
clock rate 2000000
shutdown
!
interface Serial0/2/1
no ip address
--More--
```

Setting all PC to configure themselves on DHCP type IP

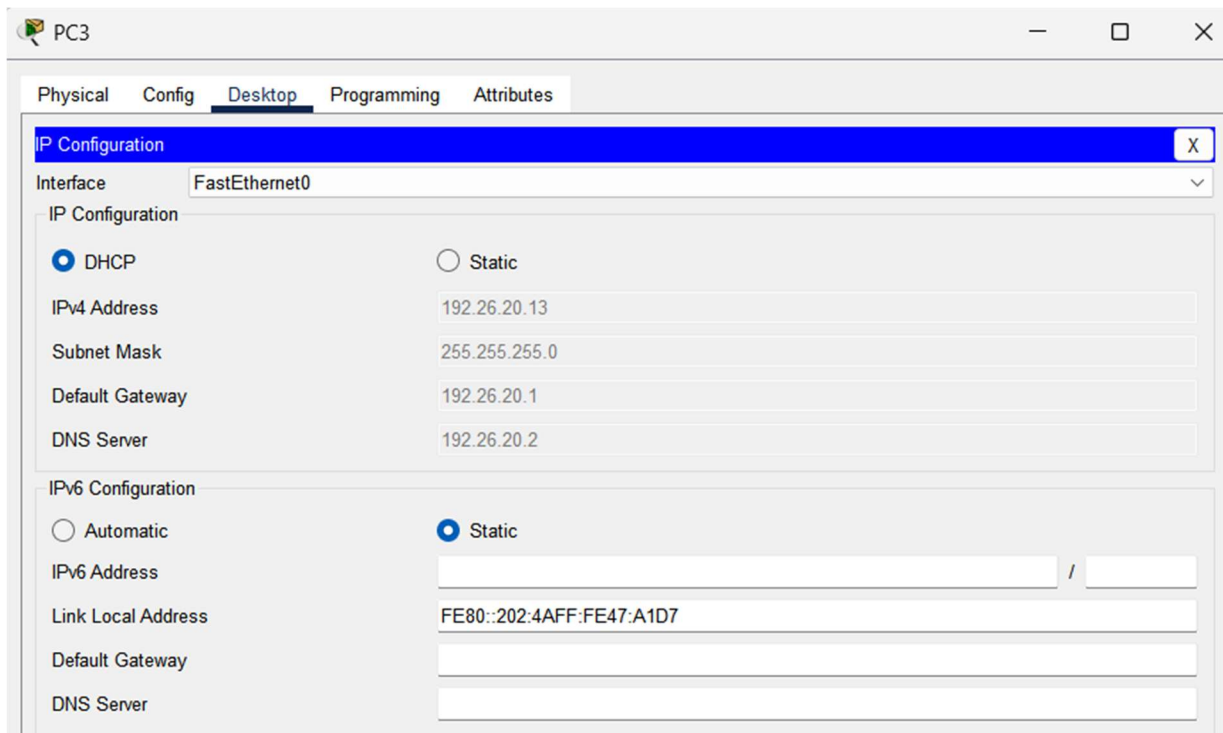
- **PC0**



The screenshot shows the configuration window for PC0. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Interface' is 'FastEthernet0'. The 'DHCP' radio button is selected, and the 'Static' radio button is unselected. The fields for IPv4 Address, Subnet Mask, Default Gateway, and DNS Server are populated with the values 192.26.10.12, 255.255.255.0, 192.26.10.1, and 192.26.10.2 respectively. The 'IPv6 Configuration' section shows the 'Static' radio button selected, and the 'Link Local Address' field is populated with FE80::203:E4FF:FE4C:74C7.

Field	Value
Interface	FastEthernet0
IP Configuration	<input checked="" type="radio"/> DHCP <input type="radio"/> Static
IPv4 Address	192.26.10.12
Subnet Mask	255.255.255.0
Default Gateway	192.26.10.1
DNS Server	192.26.10.2
IPv6 Configuration	<input type="radio"/> Automatic <input checked="" type="radio"/> Static
IPv6 Address	
Link Local Address	FE80::203:E4FF:FE4C:74C7
Default Gateway	
DNS Server	

- **PC3**

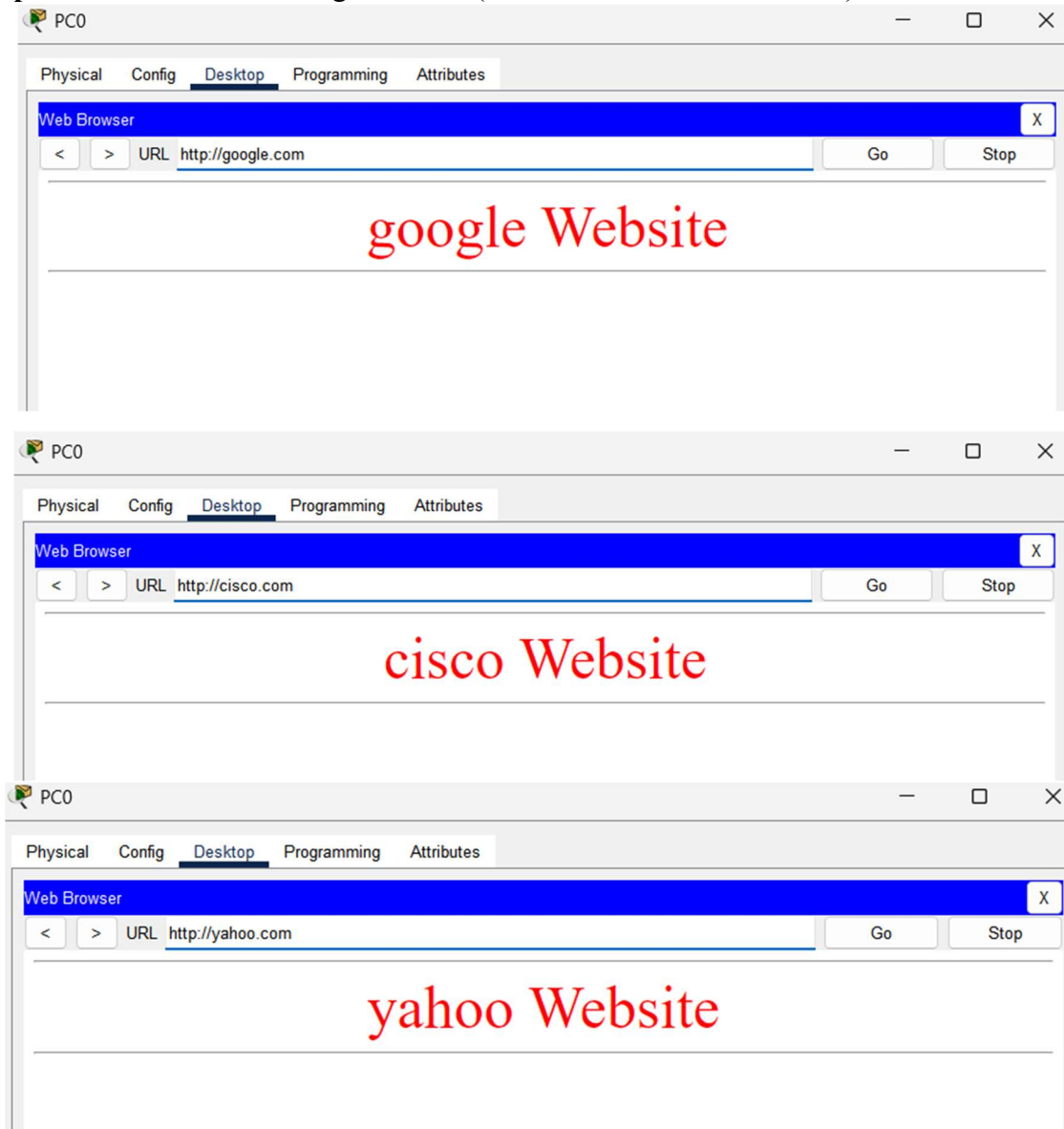


The screenshot shows the configuration window for PC3. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Interface' is 'FastEthernet0'. The 'DHCP' radio button is selected, and the 'Static' radio button is unselected. The fields for IPv4 Address, Subnet Mask, Default Gateway, and DNS Server are populated with the values 192.26.20.13, 255.255.255.0, 192.26.20.1, and 192.26.20.2 respectively. The 'IPv6 Configuration' section shows the 'Static' radio button selected, and the 'Link Local Address' field is populated with FE80::202:4AFF:FE47:A1D7.

Field	Value
Interface	FastEthernet0
IP Configuration	<input checked="" type="radio"/> DHCP <input type="radio"/> Static
IPv4 Address	192.26.20.13
Subnet Mask	255.255.255.0
Default Gateway	192.26.20.1
DNS Server	192.26.20.2
IPv6 Configuration	<input type="radio"/> Automatic <input checked="" type="radio"/> Static
IPv6 Address	
Link Local Address	FE80::202:4AFF:FE47:A1D7
Default Gateway	
DNS Server	

- Now we search for a domain website from a pc in a different domain, and see if we can access the web page

Output: Here we are accessing from PC0(which can access all websites):



Conclusion:

In the previous practicals, IP addresses were manually assigned to each PC, which is a time-consuming and inefficient process. To overcome this, the DHCP (Dynamic Host Configuration Protocol) is used. A DHCP server automatically provides IP addresses to devices from a predefined range whenever they join the network. This automation ensures that devices receive valid IP configurations without the need for manual setup, making network management much simpler and more efficient.