VISVESVARAYA TECHNOLOGICAL UNIVERSITY

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LAB REPORT
on

COURSE TITLE

Submitted by

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in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING

B.M.S. COLLEGE OF ENGINEERING
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B. M. S. College of Engineering,

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(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled “LAB COURSE **COMPUTER NETWORKS**” carried out by **SWATI A FIRANGI (1BM20CS167),** who is a bonafide student of **B. M. S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2022-23. The Lab report has been approved as it satisfies the academic requirements in respect of a **Computer Networks - (20CS5PCCON)** work prescribed for the said degree.

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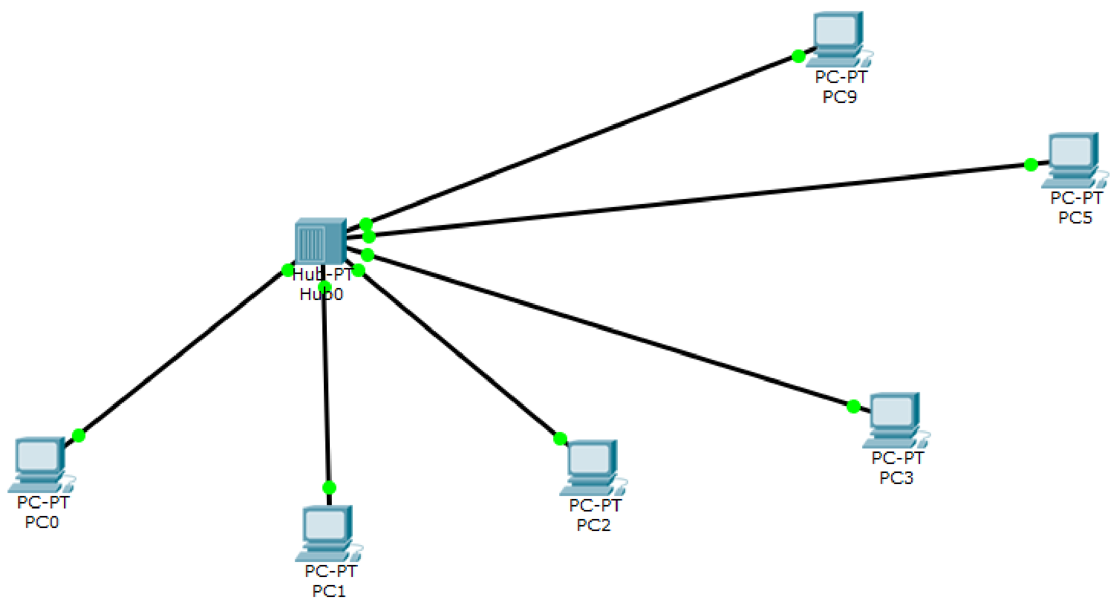
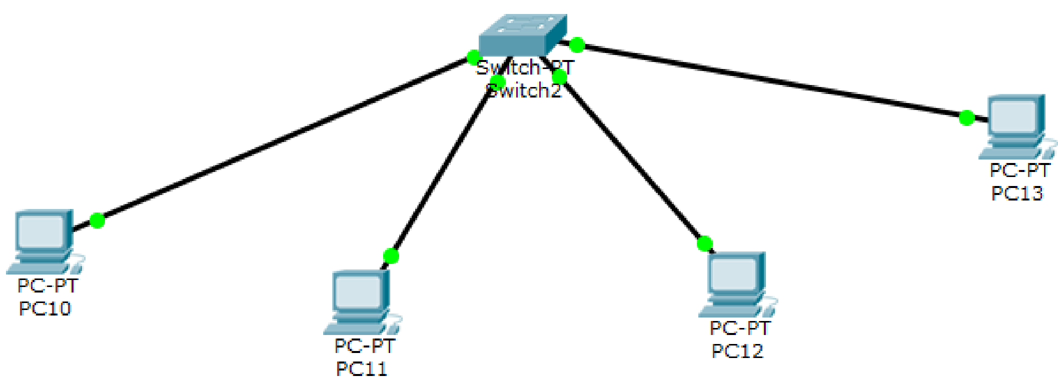
LAB 01 : Creating a topology and simulate sending a simple PDU from source to destination using hub and switch as connecting devices.

Simple PDU using Hub



Simple PDU using Switch



Procedure:

(1) PC and Hub as connecting devices.

(i) Add atleast four PCs to the network. Set IP addresses of all the PCs in the network.

(ii) Add a Generic Hub to the network.

(iii) Connect the PCs and Hub using Copper Straight through wire.

(iv) Once the connection is established, send a simple PDU from one PC to other PC and run for Simulation mode.

(v) In real time mode, ping PC2, where the four replies are received from other PCs to the particular PC through the Hub.

(2) PC and Switch as connecting devices.

(i) Add PCs to the network. Set IP addresses of all the PCs in the ~~work~~ network by clicking on the PC and going to FastEthernet0 integer in the Config tab.

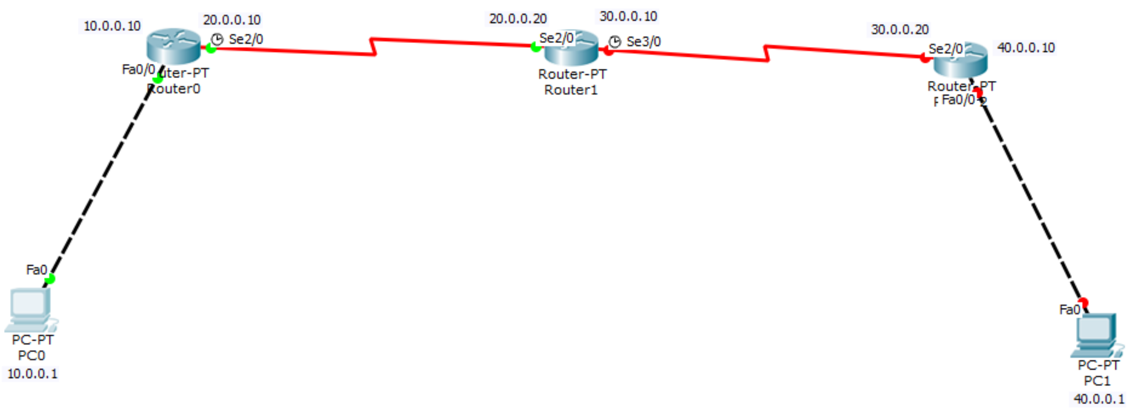
(ii) Add a generic server to the network.

(iii) Connect the PCs and the Switch using Copper Straight through wire.

(iv) Once the connection is established, send a simple PDU from one PC to other PC and run for Simulation mode.

(v) In real time mode, ping a PC, where it four replies are received from other PCs to the particular PC through the Hub.

LAB 02 : Configuring IP address to Routers in Packet Tracer. Explore the following messages: Ping Responses, Destination unreachable, Request timed out, Reply



Procedure :

Procedure :

1. Add ~~all th~~ three routers : Router0, Router1 and Router2 and ~~end~~ devices PCs : PC0 and PC1
2. Connect PC0 and Router0, ~~with~~ and PC1 and Router 2 with copper cross over wire. → fastethernet 0/0.
3. Connect Router0 to Router1 and Router1 to Router2 using Serial DCE connectors → serial 2/0 and serial 3/0 connection.
4. Set all the IP addresses, subnet mask = 255.0.0.0 (for all PCs) and gateways accordingly.

PC0 ⇒ IP addr = 10.0.0.1, gateway 10.0.0.10

Router0 ⇒ gateway1 = 10.0.0.10 and gateway2 = 20.0.0.10

Router1 ⇒ gateway1 = 20.0.0.20 and gateway2 = 30.0.0.10

Router2 ⇒ gateway1 = 30.0.0.20 and gateway2 = 40.0.0.10

PC1 ⇒ IP addr = 40.0.0.1, gateway = 40.0.0.10.

CLI commands for Router0 :

```
Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface fastethernet0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shut

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

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
%IP-4-DUPADDR: Duplicate address 10.0.0.1 on FastEthernet0/0, sourced by 0010.114B.2791
exit
Router(config)#interface serial2/0
Router(config-if)#ip address 20.0.0.10 255.0.0.0
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
Router#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
```

Teaching the Router0 about the 30.0.0.0 and 40.0.0.0 networks :

```
Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
C    20.0.0.0/8 is directly connected, Serial2/0
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 30.0.0.0 255.0.0.0 20.0.0.20
Router(config)#ip route 40.0.0.0 255.0.0.0 20.0.0.20
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
C    20.0.0.0/8 is directly connected, Serial2/0
S    30.0.0.0/8 [1/0] via 20.0.0.20
S    40.0.0.0/8 [1/0] via 20.0.0.20
```

Similarly, this is done for Router1 for 10.0.0.0 and 40.0.0.0 networks, Router2 for 10.0.0.0 and 20.0.0.0 networks.

Pinging all the routers and PC1 from PC0

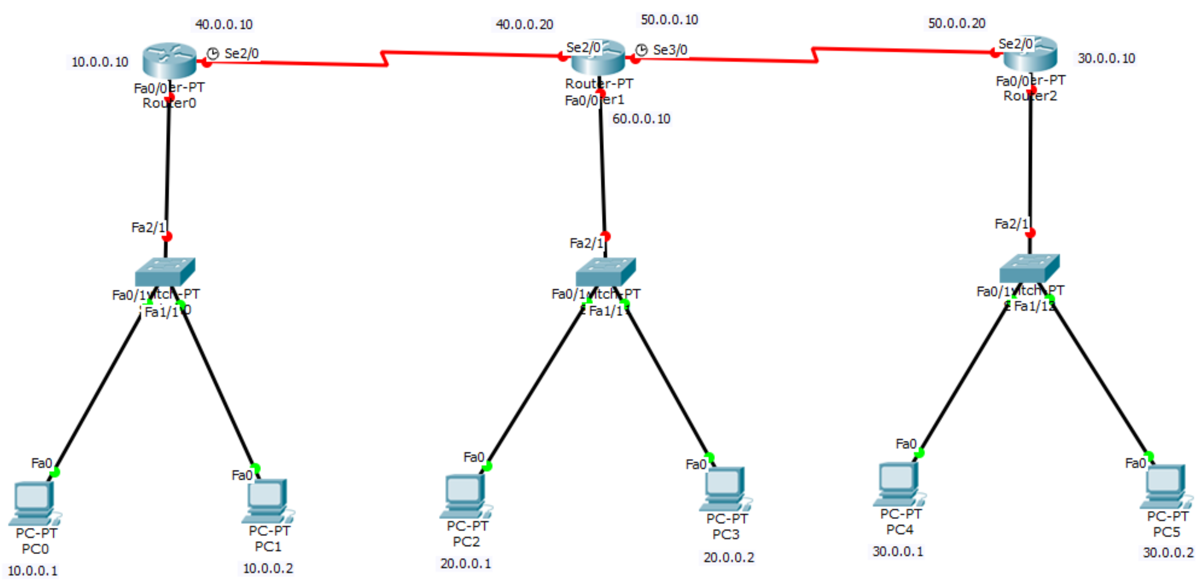
```
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.10

Pinging 10.0.0.10 with 32 bytes of data:

Reply from 10.0.0.10: bytes=32 time=1ms TTL=255
Reply from 10.0.0.10: bytes=32 time=0ms TTL=255
Reply from 10.0.0.10: bytes=32 time=0ms TTL=255
Reply from 10.0.0.10: bytes=32 time=0ms TTL=255

Ping statistics for 10.0.0.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

```
PC>ping 20.0.0.10

Pinging 20.0.0.10 with 32 bytes of data:

Reply from 20.0.0.10: bytes=32 time=0ms TTL=255
Reply from 20.0.0.10: bytes=32 time=0ms TTL=255
Reply from 20.0.0.10: bytes=32 time=0ms TTL=255
Reply from 20.0.0.10: bytes=32 time=0ms TTL=255

Ping statistics for 20.0.0.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC>ping 20.0.0.20

Pinging 20.0.0.20 with 32 bytes of data:

Reply from 20.0.0.20: bytes=32 time=1ms TTL=254
Reply from 20.0.0.20: bytes=32 time=3ms TTL=254
Reply from 20.0.0.20: bytes=32 time=3ms TTL=254
Reply from 20.0.0.20: bytes=32 time=1ms TTL=254

Ping statistics for 20.0.0.20:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 3ms, Average = 2ms

PC>ping 30.0.0.10

Pinging 30.0.0.10 with 32 bytes of data:

Reply from 30.0.0.10: bytes=32 time=22ms TTL=254
Reply from 30.0.0.10: bytes=32 time=3ms TTL=254
Reply from 30.0.0.10: bytes=32 time=1ms TTL=254
Reply from 30.0.0.10: bytes=32 time=13ms TTL=254

Ping statistics for 30.0.0.10:
```

```
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 22ms, Average = 9ms

PC>ping 30.0.0.20

Pinging 30.0.0.20 with 32 bytes of data:

Reply from 30.0.0.20: bytes=32 time=13ms TTL=253
Reply from 30.0.0.20: bytes=32 time=15ms TTL=253
Reply from 30.0.0.20: bytes=32 time=23ms TTL=253
Reply from 30.0.0.20: bytes=32 time=2ms TTL=253

Ping statistics for 30.0.0.20:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 23ms, Average = 13ms

PC>ping 40.0.0.10

Pinging 40.0.0.10 with 32 bytes of data:

Reply from 40.0.0.10: bytes=32 time=29ms TTL=253
Reply from 40.0.0.10: bytes=32 time=19ms TTL=253
Reply from 40.0.0.10: bytes=32 time=14ms TTL=253
Reply from 40.0.0.10: bytes=32 time=21ms TTL=253

Ping statistics for 40.0.0.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 14ms, Maximum = 29ms, Average = 20ms

PC>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data:

Request timed out.
Reply from 40.0.0.1: bytes=32 time=28ms TTL=125
Reply from 40.0.0.1: bytes=32 time=15ms TTL=125
```

```
Reply from 40.0.0.1: bytes=32 time=2ms TTL=125

Ping statistics for 40.0.0.1:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 28ms, Average = 15ms

PC>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data:

Reply from 40.0.0.1: bytes=32 time=3ms TTL=125
Reply from 40.0.0.1: bytes=32 time=2ms TTL=125
Reply from 40.0.0.1: bytes=32 time=4ms TTL=125
Reply from 40.0.0.1: bytes=32 time=2ms TTL=125

Ping statistics for 40.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 4ms, Average = 2ms
```

LAB 03 : Configuring default route to the Router



Procedure:

1) Add all three routers: Router0, Router1 and Router2 and end devices PCs: PC0 and PC1.

2) Connect PC0 and Router0, and PC1 and Router2 with copper cross over wire as a fastethernet connection.

3) Connect Router0 to Router1, and Router1 to Router2 using Serial DCE connection named as serial2/0 and serial3/0 connections.

4) Set all the IP address, subnet mask = 255.0.0.0 for all PCs and gateways accordingly.

PC0 ⇒ IP addr. = 10.0.0.1 and gateway = 10.0.0.10

Router0 ⇒ gateway1 = 10.0.0.10, gateway2 = 20.0.0.10

Router1 ⇒ gateway1 = 20.0.0.20, gateway2 = 30.0.0.10

Router2 ⇒ gateway1 = 30.0.0.20, gateway2 = 40.0.0.10

5) Set up the connection between Router0 and PC0, Router0 and Router1, Router1 and Router2, and Router2 and PC1 using CLI commands.

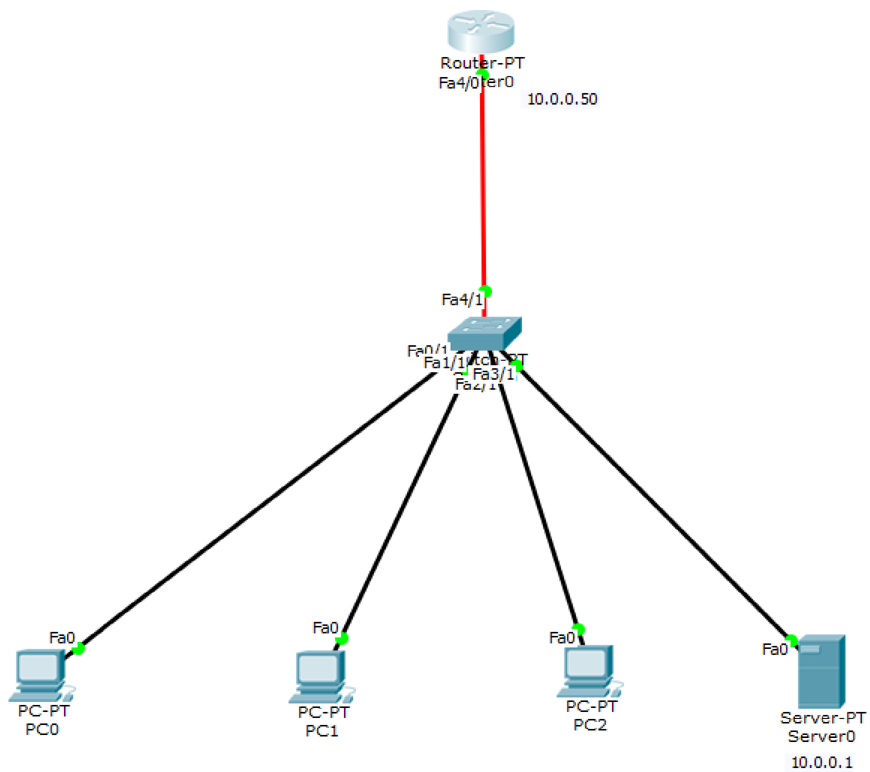
Router0 :

```
Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface fastethernet0/0
Router(config-if)#ip address 10.0.0.10 255.0.0.0
Router(config-if)#no shut

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

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to
up
exit
Router(config)#interface serial2/0
Router(config-if)#ip address 40.0.0.10 255.0.0.0
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
Router#
```

The above is done for Router1 and Router2. Teaching the router about other networks using Default Routing:

```
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 0.0.0.0 0.0.0.0 40.0.0.20
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 40.0.0.20 to network 0.0.0.0

C    10.0.0.0/8 is directly connected, FastEthernet0/0
C    40.0.0.0/8 is directly connected, Serial2/0
S*   0.0.0.0/0 [1/0] via 40.0.0.20
Router#
```

LAB 04 : Configuring DHCP within a LAN in a packet Tracer



Procedure:

(1) Set up the Router connected to a switch using Serial DCE connection at Fa4/0 & Fa4/1 ports. Connect 3 PCs - PC0, PC1, and PC2 and a Server to the switch using Copper Straigh Through wire.

(2) ~~Establish the IP address & Router~~ Set up the server connections with default gateway = 10.0.0.50 and DNS Server = 10.0.0.1, in Services Settings

(3) Set the start IP address to 10.0.0.2 and the subnet mask to 255.0.0.0. The TFTP server should be same as the DNS server. Here, TFTP server is with IP address 10.0.0.1. All these settings are added the server pool. The DHCP is toggled to 'On'

(4) In Server settings with 'Config' tab, select 'Static' IP configuration and set the IP address to 10.0.0.1 & submet mask to 255.0.0.0

Date :
Page No. :

(5) Setting up the Router: Router is connected to the switch but without ~~station~~ y

Router > enable

Router# config t

Router (config)# interface fastethernet 4/0

Router (config-if)# ip address 10.0.0.50 255.0.0.0.

Router (config-if)# no shut

Router (config-if)# exit

(6) Dynamic IP address set up for the SQs.

(i) PC0.

→ Click on PC0, it shows '~~National College~~' it set up box. Click 'Desktop' tab and click 'IP configuration' for dynamic IP address assignment.

→ Select DHCP option radiobutton and this automatically updates the IP address with parameters as same as the server.

→ PC0 gets an IP address of 10.0.0.2.

(ii) PC1

→ Click on PC1, and select ~~Desktop~~ DHCP option. PC1 gets an IP address of 10.0.04

(iii) ~~PC2 on PC1~~ PC2

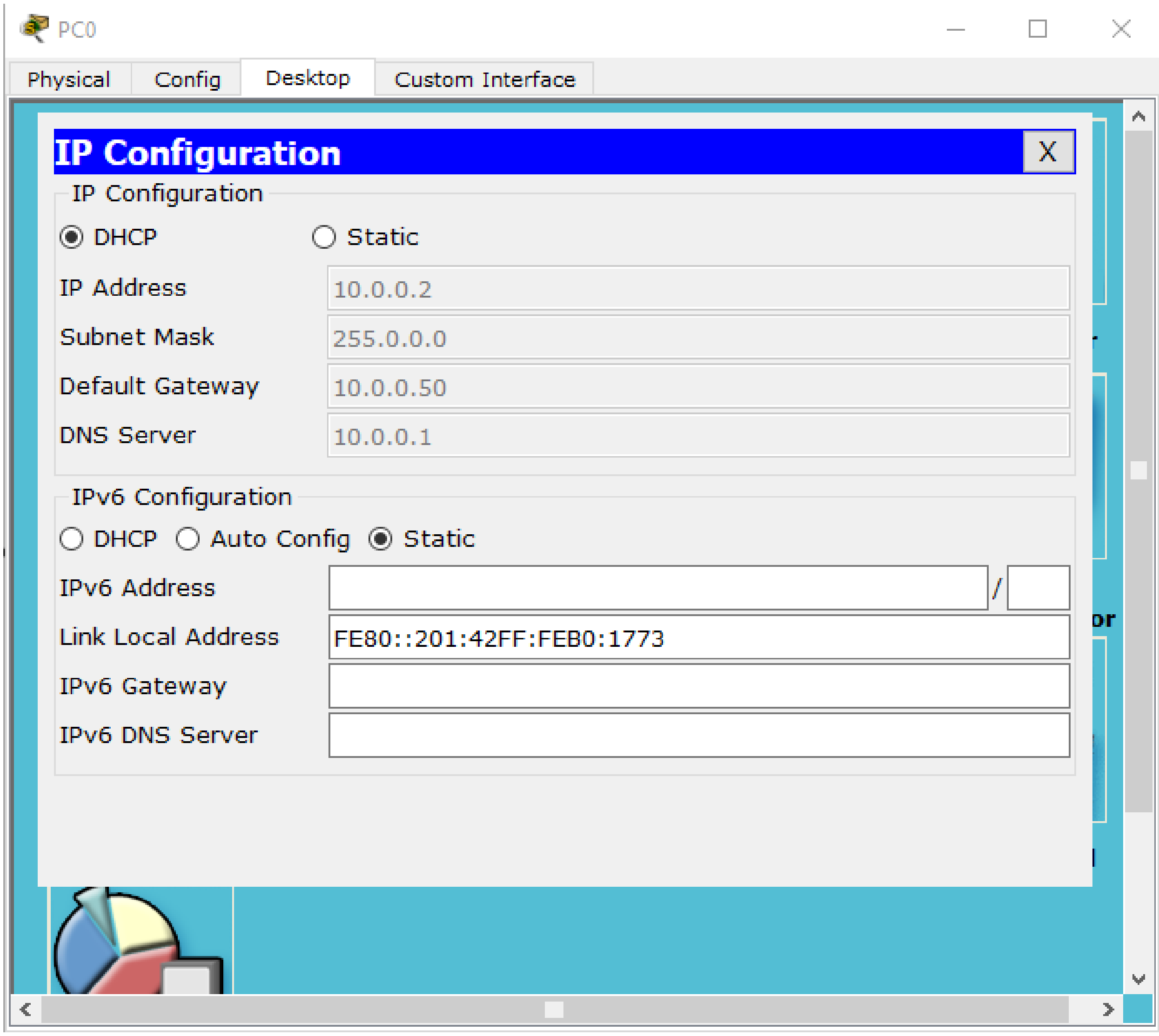
→ Click on PC2 and select the Desktop tab and select using the make implentation

~~ii~~ (6) To check the connection, we try to test the set up ~~consists using~~ by pinging the PC = 10.0.0.4 from the ~~server~~ ~~PC~~ PC : 10.0.0.1

Commands for setting up the router:

```
         --- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: no


Press RETURN to get started!



Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface fastethernet4/0
Router(config-if)#ip address 10.0.0.50 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet4/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet4/0, changed state to up
exit
Router(config)#
```

Dynamic IP address set up for PCs



Pinging PC2 to PC0

Packet Tracer PC Command Line 1.0

PC>ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time=0ms TTL=128

Reply from 10.0.0.4: bytes=32 time=0ms TTL=128

Reply from 10.0.0.4: bytes=32 time=0ms TTL=128

Reply from 10.0.0.4: bytes=32 time=0ms TTL=128

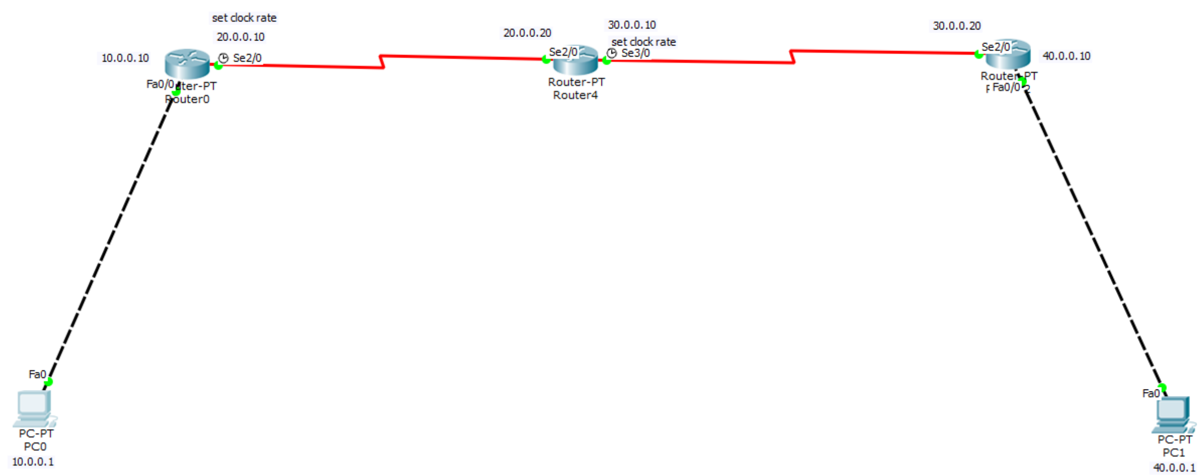
Ping statistics for 10.0.0.4:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 0ms, Average = 0ms

LAB 05 : Configuring RIP Routing Protocol in Routers



Procedure:

(1) Set up the ~~B~~ 3 Routers : Router0, Router1, Router2 and 2 PCs : PC0 and PC1. Connect the Routers with Serial DCE and

(2) connect PC0 and Router0 with Copper Cross-over, similar to PC1 and Router2.

(3) ~~S~~. Set the IP address of ~~PC0 as 10.0.~~ PCs as follows

PC0 : 10.0.0.1

PC1 : 40.0.0.1

and set the gateways of the Router as follows.

Router0 : 10.0.0.10 and 20.0.0.10

Router1 : ~~20.0.0.20~~ 20.0.0.20 and 30.0.0.10

Router 2 : 30.0.0.20 and 40.0.0.10.

(4) Setting up the PC and Router connections in the CLI

Setting up the Router settings - Router 0

```
Continue with configuration dialog? [yes/no]: n


Press RETURN to get started!



Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface fastethernet0/0
Router(config-if)#ip address 10.0.0.10 255.0.0.0
Router(config-if)#no shut

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

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to
up

Router(config-if)#exit
Router(config)#interface serial2/0
Router(config-if)#ip address 20.0.0.10 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#clock rate 6400
Unknown clock rate
Router(config-if)#clock rate 64000
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#router rip
Router(config-router)#metwork 10.0.0.0
                      ^
% Invalid input detected at '^' marker.

Router(config-router)#network 10.0.0.0
Router(config-router)#network 20.0.0.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
Router#
```

Similarly, the above commands are executed for Router1 and Router2

Pinging the PCs after all connections

Packet Tracer PC Command Line 1.0

PC>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data:

Request timed out.

Reply from 40.0.0.1: bytes=32 time=12ms TTL=125

Reply from 40.0.0.1: bytes=32 time=6ms TTL=125

Reply from 40.0.0.1: bytes=32 time=14ms TTL=125

Ping statistics for 40.0.0.1:

Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),

Approximate round trip times in milli-seconds:

Minimum = 6ms, Maximum = 14ms, Average = 10ms

PC>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data:

Reply from 40.0.0.1: bytes=32 time=17ms TTL=125

Reply from 40.0.0.1: bytes=32 time=10ms TTL=125

Reply from 40.0.0.1: bytes=32 time=17ms TTL=125

Reply from 40.0.0.1: bytes=32 time=7ms TTL=125

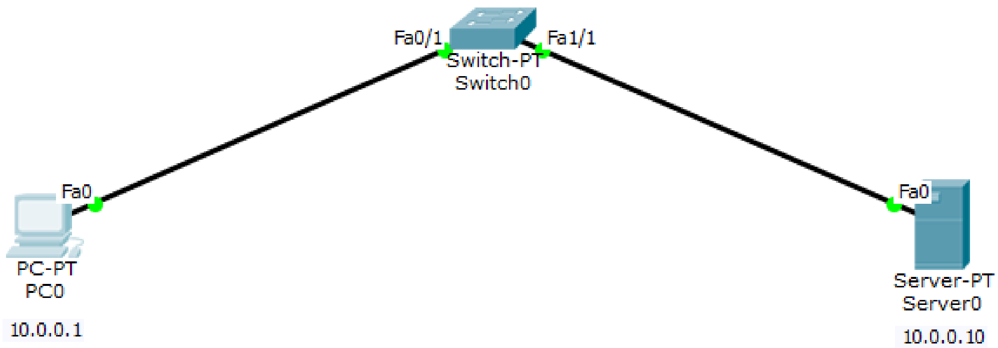
Ping statistics for 40.0.0.1:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 7ms, Maximum = 17ms, Average = 12ms

LAB 06 : Demonstration of WEB server and DNS using Packet Tracer



Procedure:

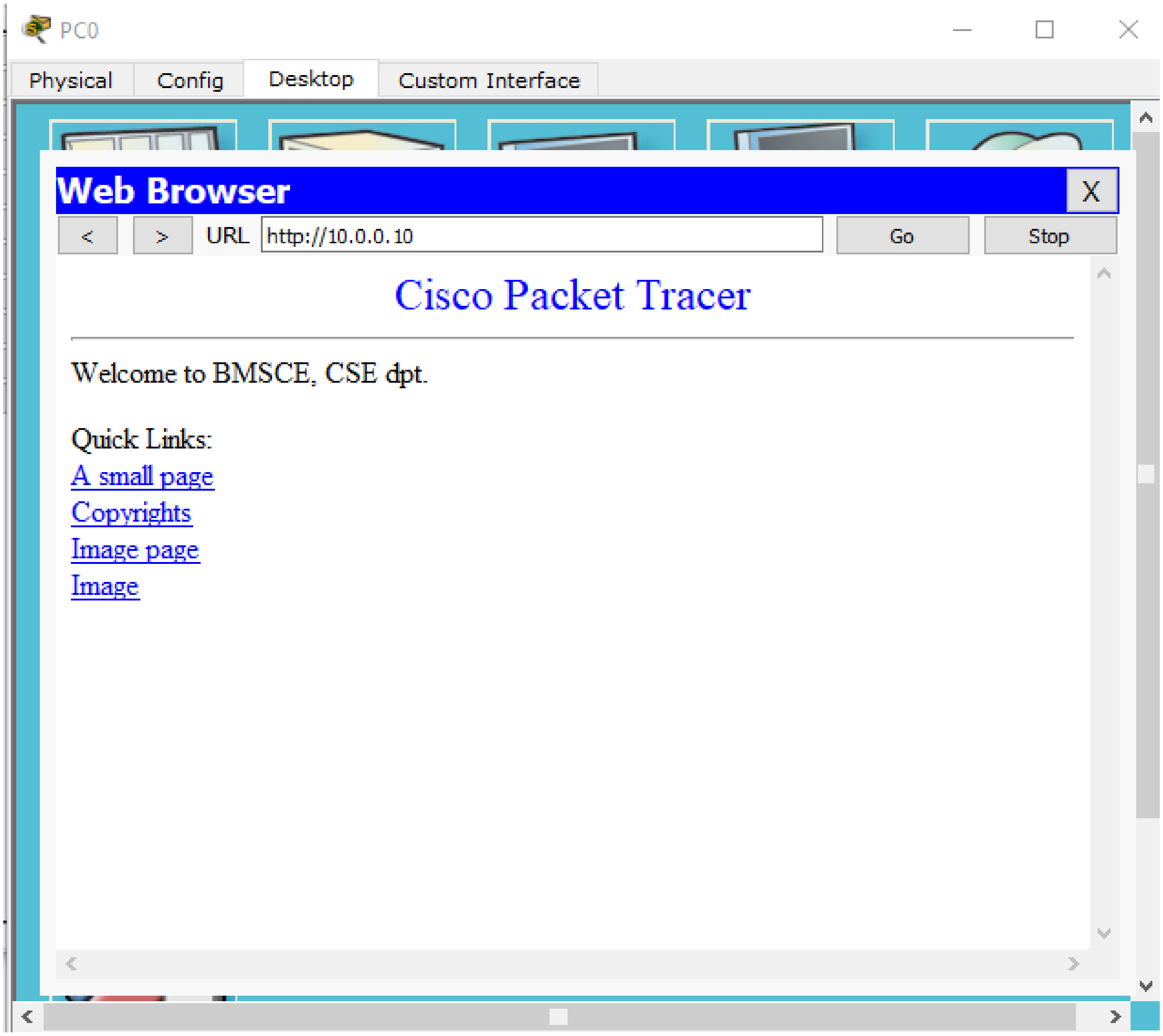
(1) Add PC, ~~an~~ switch and Server with IP address of the PC as 10.0.0.1 and IP address of 10.0.0.10.

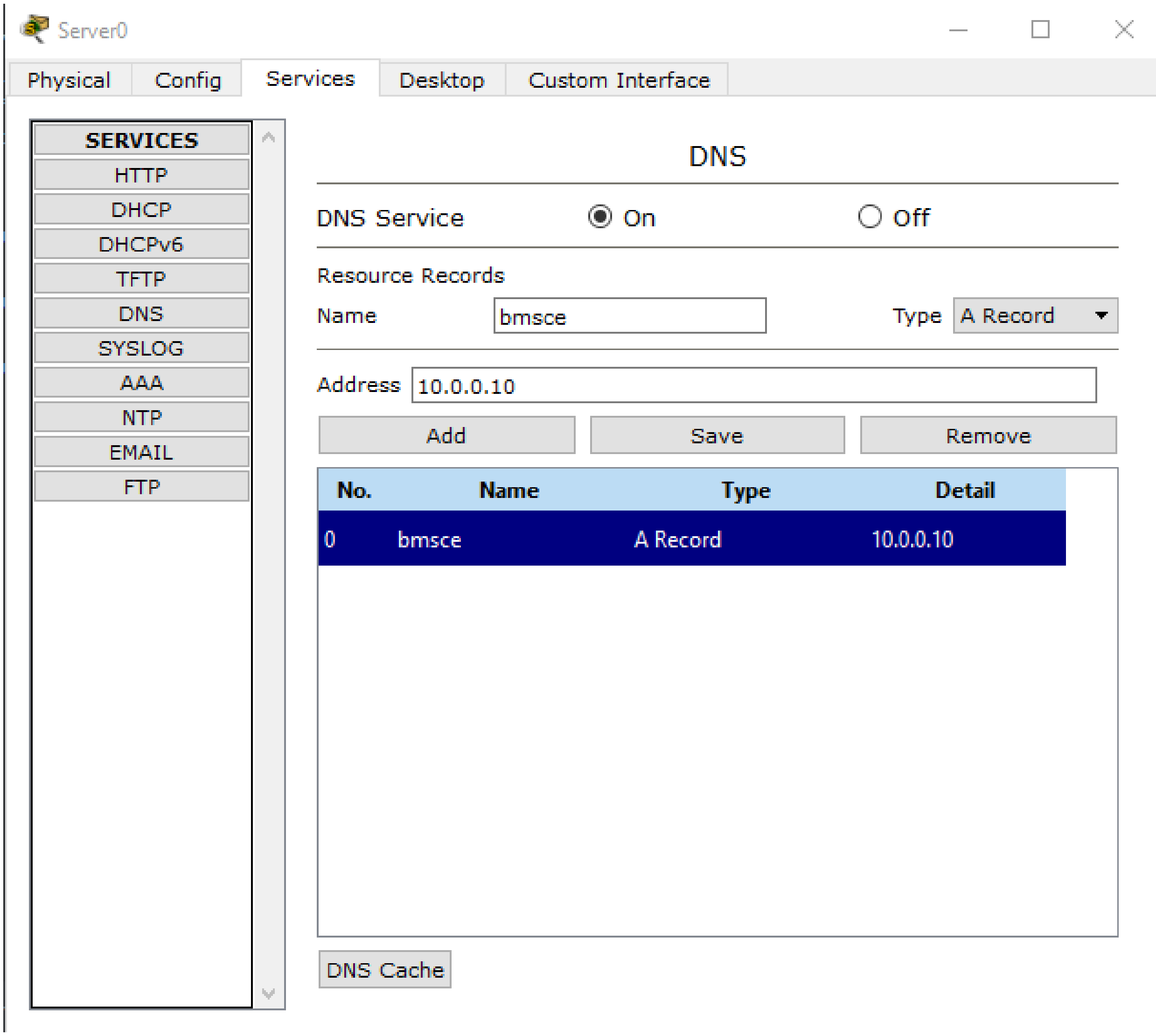
(2) Select PC, choose Desktop tab, ~~an~~ choose Web Browser and enter 10.0.0.10 IP address which displays the home page/ index page.

(3) Select server, choose Services tab, select HTTP and switch it on click the edit button for index.html and edit the file

(4) switch DNS on, and add a domain name - bmsce with the address 10.0.0.10

(5) search for the domain name in the web browser of the PC which displays the index.html.


PC0
Physical
Config
Desktop
Custom Interface
Web Browser
X
<
>
URL
http://10.0.0.10
Go
Stop
Cisco Packet Tracer
Welcome to BMSCE, CSE dpt.
Quick Links:
A small page
Copyrights
Image page
Image


Server0
Physical
Config
Services
Desktop
Custom Interface
SERVICES
HTTP
DHCP
DHCPv6
TFTP
DNS
SYSLOG
AAA
NTP
EMAIL
FTP
DNS
DNS Service
On
Off
Resource Records
Name
bmsce
Type
A Record
Address
10.0.0.10
Add
Save
Remove
No.
Name
Type
Detail
0
bmsce
A Record
10.0.0.10
DNS Cache

CYCLE 2

LAB 07 : Write a program for error detecting code using CRC-CCITT (16-bits).

```
#CRC at receiver and sender - binary division


def xor(a, b):

  result = []

  for i in range(1, len(b)):

    if a[i] == b[i]:

      result.append('0')

    else:

      result.append('1')

  return ''.join(result)


def mod2div(dividend, divisor):

  pick = len(divisor)

  tmp = dividend[0 : pick]

  while pick < len(dividend):

    if tmp[0] == '1':

      tmp = xor(divisor, tmp) + dividend[pick]

    else:

      tmp = xor('0'*pick, tmp) + dividend[pick]

    pick += 1

  if tmp[0] == '1':

    tmp = xor(divisor, tmp)

  else:

    tmp = xor('0'*pick, tmp)

  checkword = tmp
```

```python
  return checkword


def encodeData(data, key):

  l_key = len(key)

  appended_data = data + '0'*(l_key-1)

  remainder = mod2div(appended_data, key)

  codeword = data + remainder

  print("Remainder : ", remainder)

  print("Encoded Data (Data + Remainder) : ",

    codeword)


data = "100100"

key = "10001000000100001"

encodeData(data, key)


#Output:


#remainder: 0110010011100110

#encoded data (dataword appended with remainder): 1001000110010011100110
```

LAB 08 : Write a program for distance vector algorithm to find suitable path for transmission.

```
/*
Distance Vector Routing in this program is implemented using Bellman Ford
Algorithm:-
*/
#include<stdio.h>
struct node
{
    unsigned dist[20];
    unsigned from[20];
}rt[10];
int main() {
    int costmat[20][20];
    int nodes,i,j,k,count=0;
    printf("\nEnter the number of nodes : ");
    scanf("%d",&nodes);//Enter the nodes
    printf("\nEnter the cost matrix :\n");
    for(i=0;i<nodes;i++)
    {
        for(j=0;j<nodes;j++)
        {
            scanf("%d",&costmat[i][j]);
            costmat[i][i]=0;
            rt[i].dist[j]=costmat[i][j];//initialise the distance equal to
cost matrix
            rt[i].from[j]=j;
        }
```

```
    }
        do
        {
            count=0;
            for(i=0;i<nodes;i++)//We choose arbitary vertex k and we 
calculate the direct distance from the node i to k using the cost matrix
            //and add the distance from k to node j
            for(j=0;j<nodes;j++)
            for(k=0;k<nodes;k++)
                if(rt[i].dist[j]>costmat[i][k]+rt[k].dist[j])
                {//We calculate the minimum distance
                    rt[i].dist[j]=rt[i].dist[k]+rt[k].dist[j];
                    rt[i].from[j]=k;
                    count++;
                }
        }while(count!=0);
        for(i=0;i<nodes;i++)
        {
            printf("\n\n For router %d\n",i+1);
            for(j=0;j<nodes;j++)
            {
                printf("\t\nnode %d via %d Distance %d 
",j+1,rt[i].from[j]+1,rt[i].dist[j]);
            }
        }
    printf("\n\n");
    //getch();
}
```

OUTPUT:

Enter the number of nodes : 3

Enter the cost matrix :

0 2 7

2 0 1

7 1 0

For router 1

node 1 via 1 Distance 0

node 2 via 2 Distance 2

node 3 via 2 Distance 3

For router 2

node 1 via 1 Distance 2

node 2 via 2 Distance 0

node 3 via 3 Distance 1

For router 3

node 1 via 2 Distance 3

node 2 via 2 Distance 1

node 3 via 3 Distance 0

LAB 09 : Implement Dijkstra’s algorithm to compute the shortest path for a given topology.

```
#include<stdio.h>

void dijkstras();
int c[10][10], n, src;

void main() {
    int i,j;

    printf("\nEnter the num of vertices: \t");
    scanf("%d", &n);
    printf("\nEnter the cost matrix: \n");
    for(i = 1; i <= n; i++) {
    for(j = 1; j <= n; j++) {
        scanf("%d", &c[i][j]);
    }
    }
    printf("\nEnter the source node: \t");
    scanf("%d", &src);
    dijkstras();

}

void dijkstras() {
    int vis[10], dist[10], u, j, count, min;
    for(j = 1; j <= n; j++) {
```

```
    dist[j] = c[src][j];
}
for(j = 1; j <= n; j++) {
    vis[j] = 0;
}
dist[src] = 0;
vis[src] = 1;
count = 1;
while(count != n) {
    min = 9999;
    for(j = 1; j <= n; j++) {
        if(dist[j] < min && vis[j] != 1) {
            min = dist[j];
            u = j;
        }
    }
    vis[u] = 1;
    count++;
    for(j = 1; j <= n; j++) {
        if(min + c[u][j] < dist[j] && vis[j] != 1) {
            dist[j] = min + c[u][j];
        }
    }
}
printf("\nThe shortest distance is: \n");
for(j = 1; j <= n; j++) {
    printf("\n%d----->%d = %d", src, j, dist[j]);
```

```
    }
}
```

OUTPUT:

Enter the num of vertices:	4

Enter the cost matrix:

0 9999 4 2

1 0 4 2

5 8 0 9999

2 9999 9999 0

Enter the source node:	2

The shortest distance is:

2----->1 = 1

2----->2 = 0

2----->3 = 4

2----->4 = 2

LAB 10 : Write a program for congestion control using Leaky bucket algorithm.

```
import time


class Packet:
    def __init__(self, id, size):
        self.id = id
        self.size = size

    def getSize(self):
        return self.size
```

```
    def getId(self):
        return self.id


class LeakyBucket:
    def __init__(self, leakRate, size):
        self.leakRate = leakRate
        self.bufferSizeLimit = size
        self.buffer = []
        self.currBufferSize = 0


    def addPacket(self, newPacket):
        if self.currBufferSize + newPacket.getSize() >
self.bufferSizeLimit:
            print("Bucket is full. Packet rejected.")
            return
        self.buffer.append(newPacket)
        self.currBufferSize += newPacket.getSize()
        print("Packet with id = " + str(newPacket.getId()) +  " added to
bucket.")


    def transmit(self):
        if len(self.buffer) == 0:
            print("No packets in the bucket.")
            return


        n = self.leakRate
        while len(self.buffer) > 0:
            topPacket = self.buffer[0]
```

```
            topPacketSize = topPacket.getSize()

            if topPacketSize > n:

                 break


            n = n - topPacketSize

            self.currBufferSize -= topPacketSize

            self.buffer.pop(0)

            print("Packet with id = " + str(topPacket.getId()) + "
transmitted.")




if __name__ == '__main__':

    bucket = LeakyBucket(1000, 10000)

    bucket.addPacket(Packet(1, 200))

    bucket.addPacket(Packet(2, 500))

    bucket.addPacket(Packet(3, 400))

    bucket.addPacket(Packet(4, 500))

    bucket.addPacket(Packet(5, 200))

    while True:

        bucket.transmit();

        print("Waiting for next tick.");

        time.sleep(1)
```

OUTPUT :

```
Packet with id = 1 added to bucket.

Packet with id = 2 added to bucket.

Packet with id = 3 added to bucket.

Packet with id = 4 added to bucket.
```

```
Packet with id = 5 added to bucket.
Packet with id = 1 transmitted.
Packet with id = 2 transmitted.
Waiting for next tick.
Packet with id = 3 transmitted.
Packet with id = 4 transmitted.
Waiting for next tick.
Packet with id = 5 transmitted.
Waiting for next tick.
No packets in the bucket.
Waiting for next tick.
No packets in the bucket.
```

LAB 11 : Using TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.

clienttcp.py

```
from socket import *


serverName = "10.124.7.76"

serverPort = 12000

clientSocket = socket(AF_INET, SOCK_STREAM)

clientSocket.connect((serverName, serverPort))


sentence = input("Enter file name: ")


clientSocket.send(sentence.encode())

filecontents = clientSocket.recv(1024).decode()

print("From Server: ", filecontents)
```

```
clientSocket.close()
```

servertcp.py

```
from socket import *

serverName = "10.124.7.76"
serverPort = 12000
serverSocket = socket(AF_INET, SOCK_STREAM)
serverSocket.bind((serverName, serverPort))
serverSocket.listen(1)

print("The server is ready to receive")

while 1:
    connectionSocket, addr = serverSocket.accept()
    sentence = connectionSocket.recv(1024).decode()

    file = open(sentence, "r")
    l = file.read(1024)
    print("Recieved from client: ", l)

    connectionSocket.send(l.encode())
    file.close()
    connectionSocket.close()
```

a.txt

hello world

OUTPUT :

Enter file name: a.txt

From server:

The server is ready to receive

Received from client: hello world

LAB 12 : Using UDP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.

udpClient.py

```
from socket import *


serverName = "127.0.0.1"

serverPort = 12000

clientSocket = socket(AF_INET, SOCK_DGRAM)


sentence = input("Enter file name: ")

clientSocket.sendto(bytes(sentence, "utf-8"), (serverName, serverPort))

filecontents, serverAddress = clientSocket.recvfrom(2048)


print("From Server: ", filecontents.decode())


clientSocket.close()
```

udpServer.py

```
from socket import *

serverPort = 12000
serverSocket = socket(AF_INET, SOCK_DGRAM)
serverSocket.bind(("127.0.0.1", serverPort))

print("The server is ready to receive")

while 1:
    sentence, clientAddress = serverSocket.recvfrom(2048)

    file = open(sentence, "r")
    l = file.read(2048)

    serverSocket.sendto(bytes(l, "utf-8"), clientAddress)
    print("Sent back to client: ", l)
    file.close()
```

b.txt

hello world

OUTPUT :

Enter the file name: b.txt

From server:

The server is ready to receive

Sent back to client: hello world