VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

COMPUTER NETWORKS

Submitted by

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(1BM20CS108)

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

B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
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October-2022 to Feb-2023

B. M. S. College of Engineering,

Bull Temple Road, Bangalore 560019

(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 **PRAJWAL PATIL (1BM20CS108),** who is bona fide student at **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. 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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BMSCE, Bengaluru

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Expt I:

Hub and Switch

10/11/22

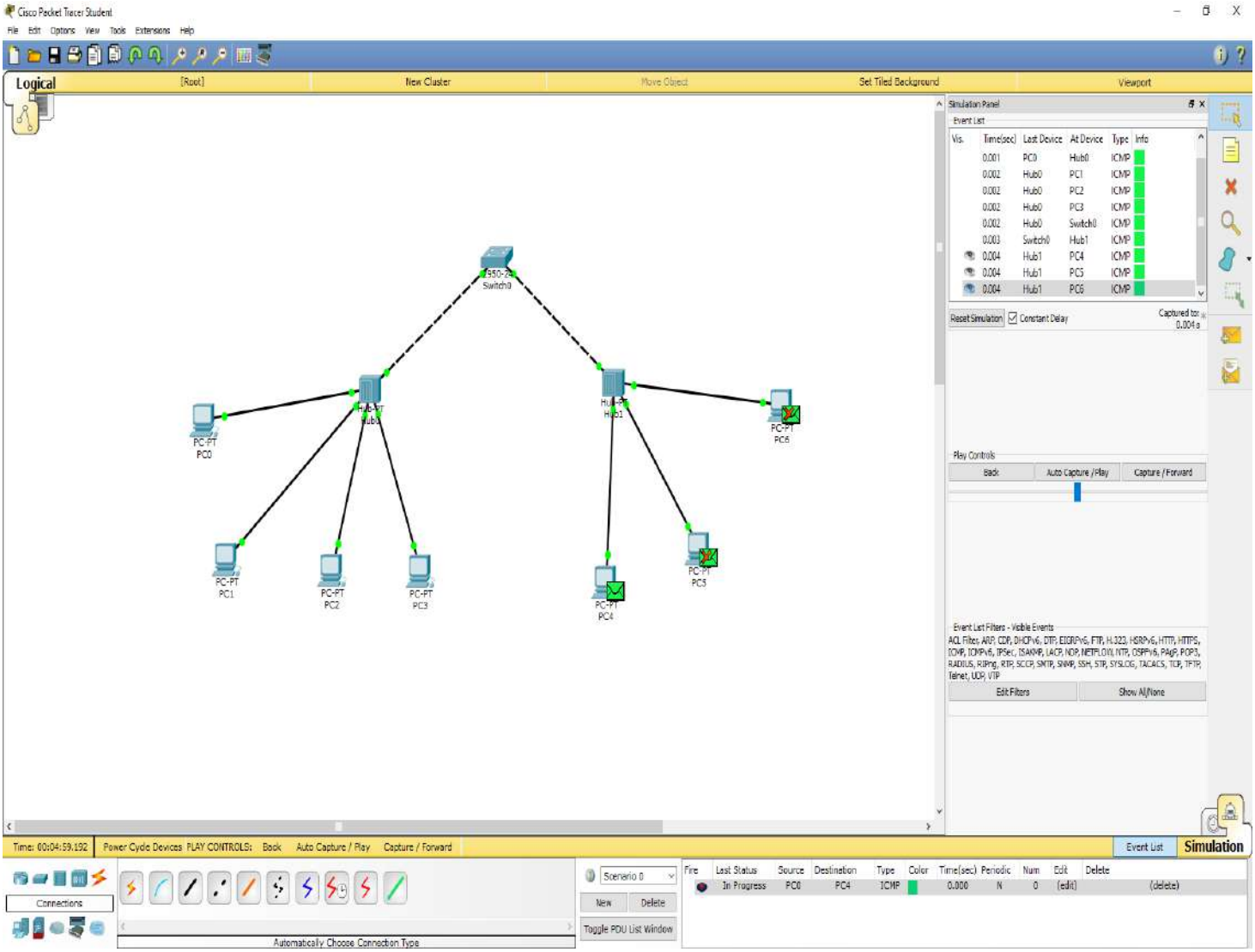
Aim:- Implementing Star topology using hubs and switches

Procedure:
1) End devices are connected through the hub
2) hubs are connected by using switch
3) IP address of end devices are configured
4) Connection b/w all devices are checked through ping
5) A simple PDU file is transmited b/w a source and destination.

Topology: Star topology

Result: message transmission between any devices is successful.

Observation:
1) PDU is first sent to the hub
2) Hub will broadcast to all the devices connected to it, if any of the recieving device is destination it will read message otherwise discard it.
3) inicially switch will broadcast to all the ports. Later on fill the details of ip address & ports in a table. And later on this table is used to broad cast a message do particular port.


Cisco Packet Tracer Student
File Edit Options View Tools Extensions Help
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
Switch0
Hub0
Hub1
PC0
PC1
PC2
PC3
PC4
PC5
PC6
Simulation Panel
Event List
Vis. Time(sec) Last Device At Device Type Info
0.001 PC0 Hub0 ICMP
0.002 Hub0 PC1 ICMP
0.002 Hub0 PC2 ICMP
0.002 Hub0 PC3 ICMP
0.002 Hub0 Switch0 ICMP
0.003 Switch0 Hub1 ICMP
0.004 Hub1 PC4 ICMP
0.004 Hub1 PC5 ICMP
0.004 Hub1 PC6 ICMP
Reset Simulation
Constant Delay
Play Controls
Back
Auto Capture / Play
Capture / Forward
Event List Filters - Visible Events
Edit Filters
Show All/None
Time: 00:04:59.192
Power Cycle Devices
PLAY CONTROLS:
Back
Auto Capture / Play
Capture / Forward
Event List
Simulation
Connections
Automatically Choose Connection Type
Scenario 0
New
Delete
Toggle PDU List Window
Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit Delete
In Progress PC0 PC4 ICMP 0.000 N 0 (edit) (delete)

Exp 2:-

17/11/22

Aim:- Configuring IP address to routers in packet tracer, Explore ping . responses destination unreachable , reply , request , timed out

Procedure:- 1) End devices are connected to router
2) IP address is configured to end devices
3) Config IP Addr & Subnet mask using commands enable, Config terminal, interface fa0/0, ip address 10.0.0.2 255.0.0.0 , no shout down
4) Gateway is configured for end devices
5) End devices and interfaces are pinged to check connection

Topology :- Star topology

Result :- Successfully pinged end devices

PC > ping 10.0.0.1

Pinging 10.0.0.1 bytes=32 time<1ms TTL=128

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1 bytes=32 time=6ms TTL=128
Reply from 10.0.0.1 bytes=32 time=2ms TTL=128
Reply from 10.0.0.1 bytes=32 time=5ms TTL=128
Reply from 10.0.0.1 bytes=32 time=3ms TTL=128

Ping statistics for 10.0.0.1:
Packets: sent=4, Received=4, Lost=0 (0% Loss),
Approximate round trip times in milli-seconds:
Minimum: 2ms maximum: 6ms Average = 4ms

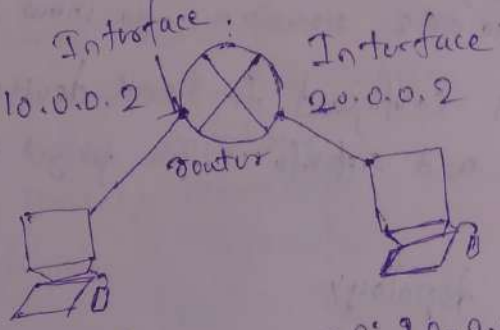
PC > ping 20.0.0.1

Pinging 20.0.0.1 with 32 byte of data:

Request timed out:
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 20.0.0.1:

Packets: Sent = 4, Received = 0, lost = 4 (100% lo



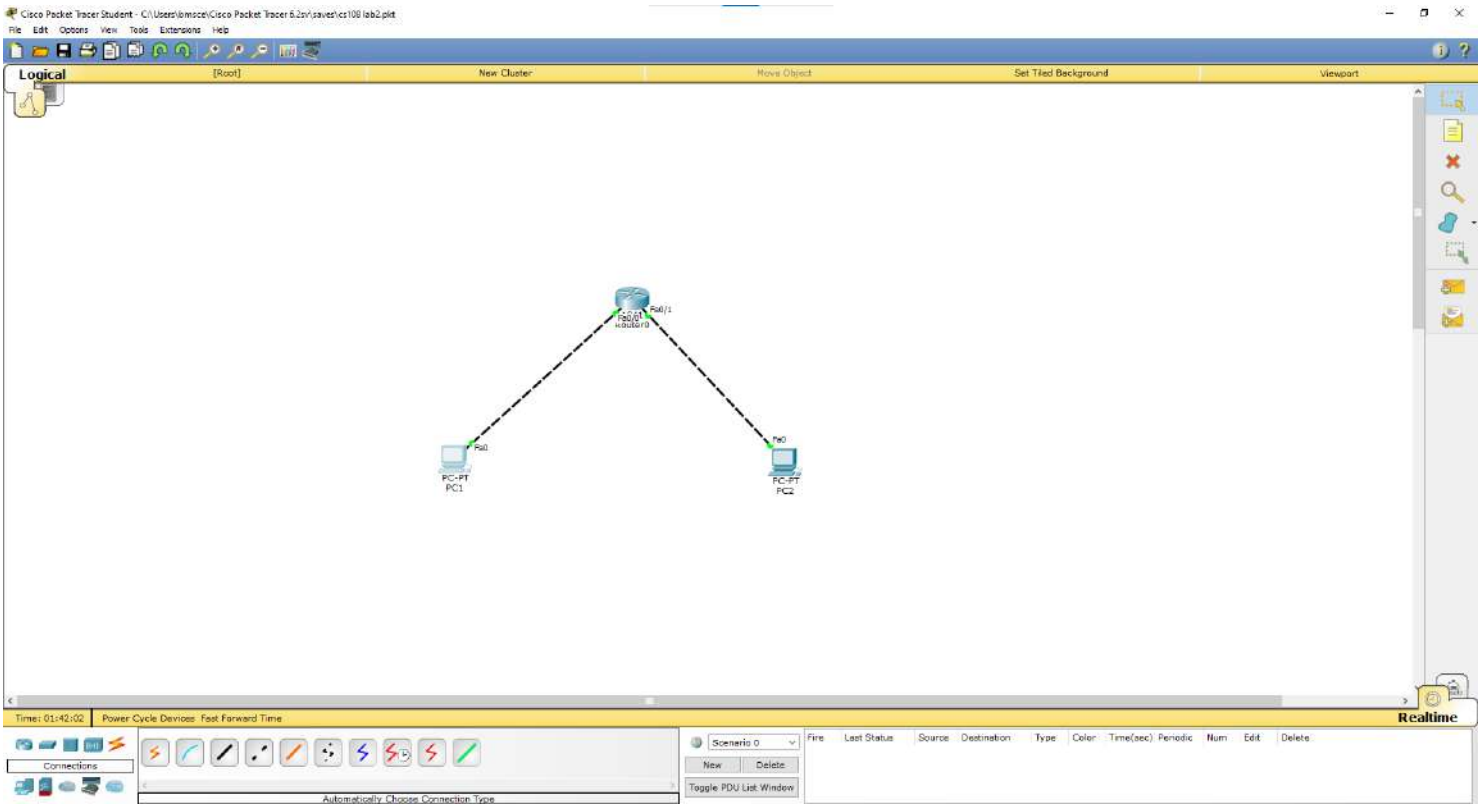
IP: 10.0.0.1
Gateway: 10.0.0.2

IP: 20.0.0.1
Gateway: 20.0.0.2

Observation :-

- When we configure both end devices and router with appropriate ip address and by configuring subnet mask of interface of router as 255.0.0.0 and Gateway of PC0 is set as 10.0.0.2 which is of Fa0/0 interface followed by same for PC1. the
Then we could SUCCESSfully ping.

When gateway of end devices is not configured then we get request time out.

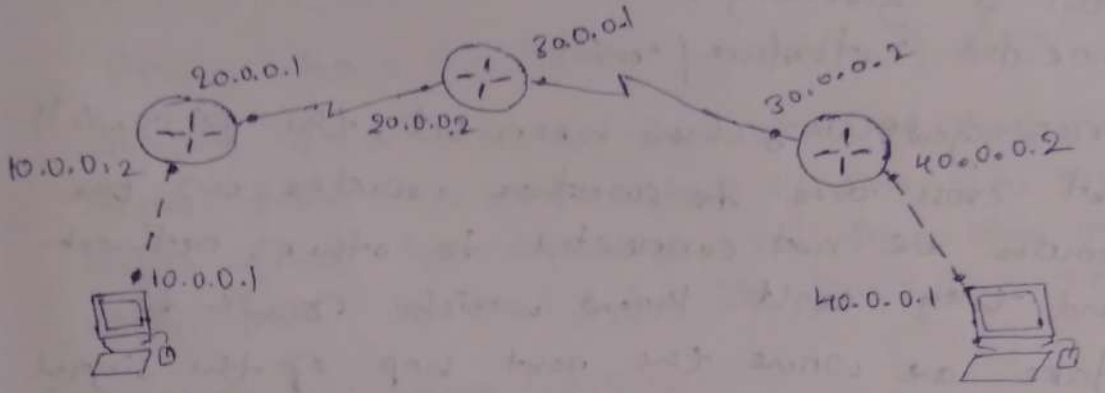

Cisco Packet Tracer Student - C:\Users\bmsce\Cisco Packet Tracer 6.2sv\saves\cs108 lab2.pkt
File Edit Options View Tools Extensions Help
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
Fa0/1
Fa0
Fa0
PC-PT
PC1
PC-PT
PC2
Time: 01:42:02
Power Cycle Devices Fast Forward Time
Realtime
Connections
Automatically Choose Connection Type
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color
Time(sec)
Periodic
Num
Edit
Delete

Exp:- 5

24/11/22

Aim:- Configuring Static Default route to route

Topology:- Star topology



Procedure

→ 2 router are connected to 2 end devices and a router is used to connect orther ~~two~~ two routers using serial DCE connection.

→ Configure IP addres for end devices (PC-PT) & for interfaces of routers

→ Configured Gateway addres of end devices as ip addres of connected router interface.

→ Configure IP addres between routes using serial 2/0, serial 3/0 interfaces

→ ~~when~~ we could configure IP addres using there commands

enable ; configure terminal ; interface se2/0 or interface se 3/0 ; ip address 20.0.0.1 255.0.0.0
no shoutdown ;
exit.

→ A ping is sent from end device to a routers not connected it. we get destination host unreachable.

→ So we go to each routes and route it to all other networks not directly connected to it using commands

ip route 30.0.0.0 255.0.0.0 20.0.0.2

Observation.

→ A ping does doesn't cross the interface until a gateway it has been set to the connected interface / router

→ Once gateway has been set, the ping will not cross over to another router as the routers are not connected to other network and they can't know which route to take are where the next hop of the signal is done.

→ The router are configured with ip-route where network name, subnet mask, & next hop to reach the network

Result:- A succesful ping menage has been sent over the end devices that are connected to different routers/networks

Output:-

```
PC> ping 20.0.0.1

Pinging 20.0.0.1 with 32 byte of data

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 20.0.0.1
Packets: Sent = 4 Received = 0 Lost = 4 (100% loss)
```

⇒ PC> Ping 30.0.0.1

Pinging 30.0.0.1 with 32 bytes of data

Destination host not reachable.

⇒ 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=12ms TTL=125
Reply from 40.0.0.1: bytes=32 time=20ms 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 = 20ms, Average = 12ms

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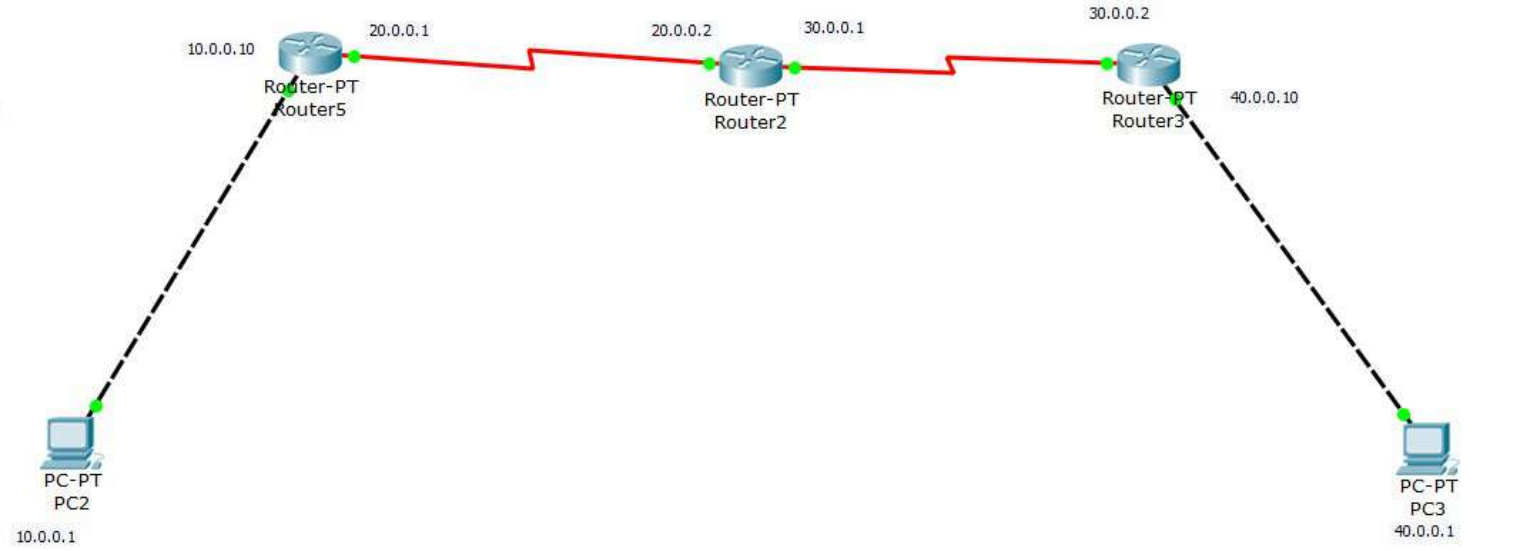
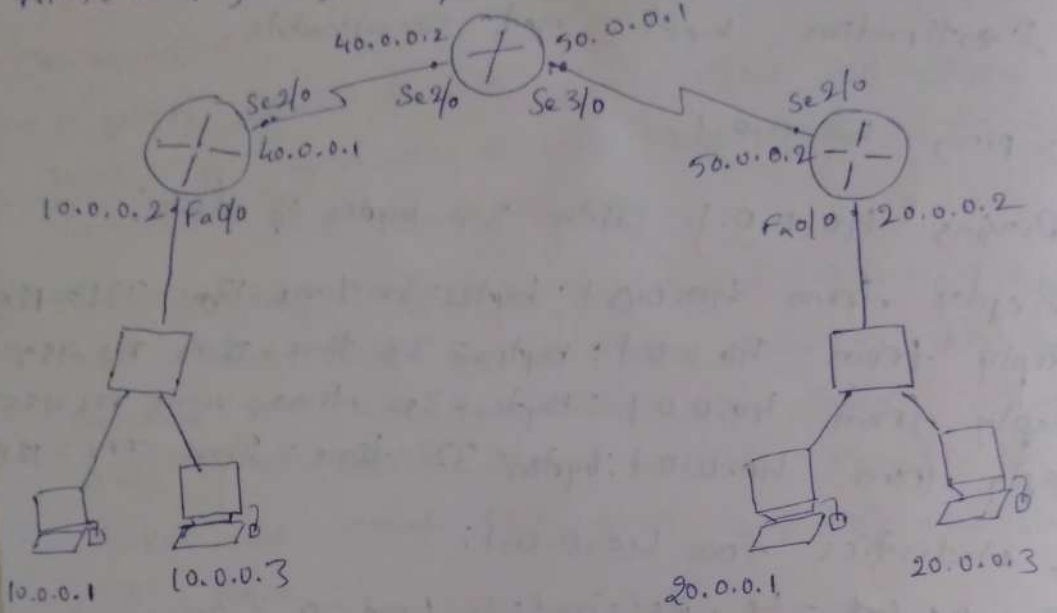
1/12/2022


10.0.0.10
20.0.0.1
20.0.0.2
30.0.0.1
30.0.0.2
40.0.0.10
Router-PT
Router5
Router-PT
Router2
Router-PT
Router3
PC-PT
PC2
10.0.0.1
PC-PT
PC3
40.0.0.1

1/12/22

LAB-4

→ Aim: Configuring default route to routers.



Procedure:

⇒ A topology is created using three routers, two switches & four end devices

→ Default gateways and unique IP Address were configured for each PC

→ IP address were configured for each interface using CLI

→ default route was configured using commands

enable,

config terminal

ip route 0.0.0.0 0.0.0.0 40.0.0.2

Observations:

1) Pinging PC-4 from PC-0 gave request time out.
2) Configured default gateway and pinged again and got Request timed out.

→ Ping will not cross over the router i.e to a different network without setting the default route.

4) A ping doesnot cross the interface until a gate way is set. to the end device to corresponding interface of router

5) once gateway is set, pinging the a ~~ae~~ interface in a different Network will give a ~~dege~~. destination host unreachable.

6) After setting default route to all routers & succesfull ping was obtained.

Result:- Successfully pinged end devices

Outputs

PC> ping 20.0.0.1

Pinging 20.0.0.1 with 32 bytes of data.

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 20.0.0.1:
Packets: sent = 4 Received = 0 ; Loss = 4 (100% loss)

Pc> ping 20.0.0.3

Pinging 20.0.0.3 with 32 bytes of data.
Reply from 10.0.0.2: Destination host unreach.h
Request timed out.
Reply from 10.0.0.2: Destination host unreachable.
Reply from 10.0.0.2: Destination host unreachble.

Ping statistics for 20.0.0.3:
Packets: Sent = 4, Received = 0, Loss = 4 (100% los

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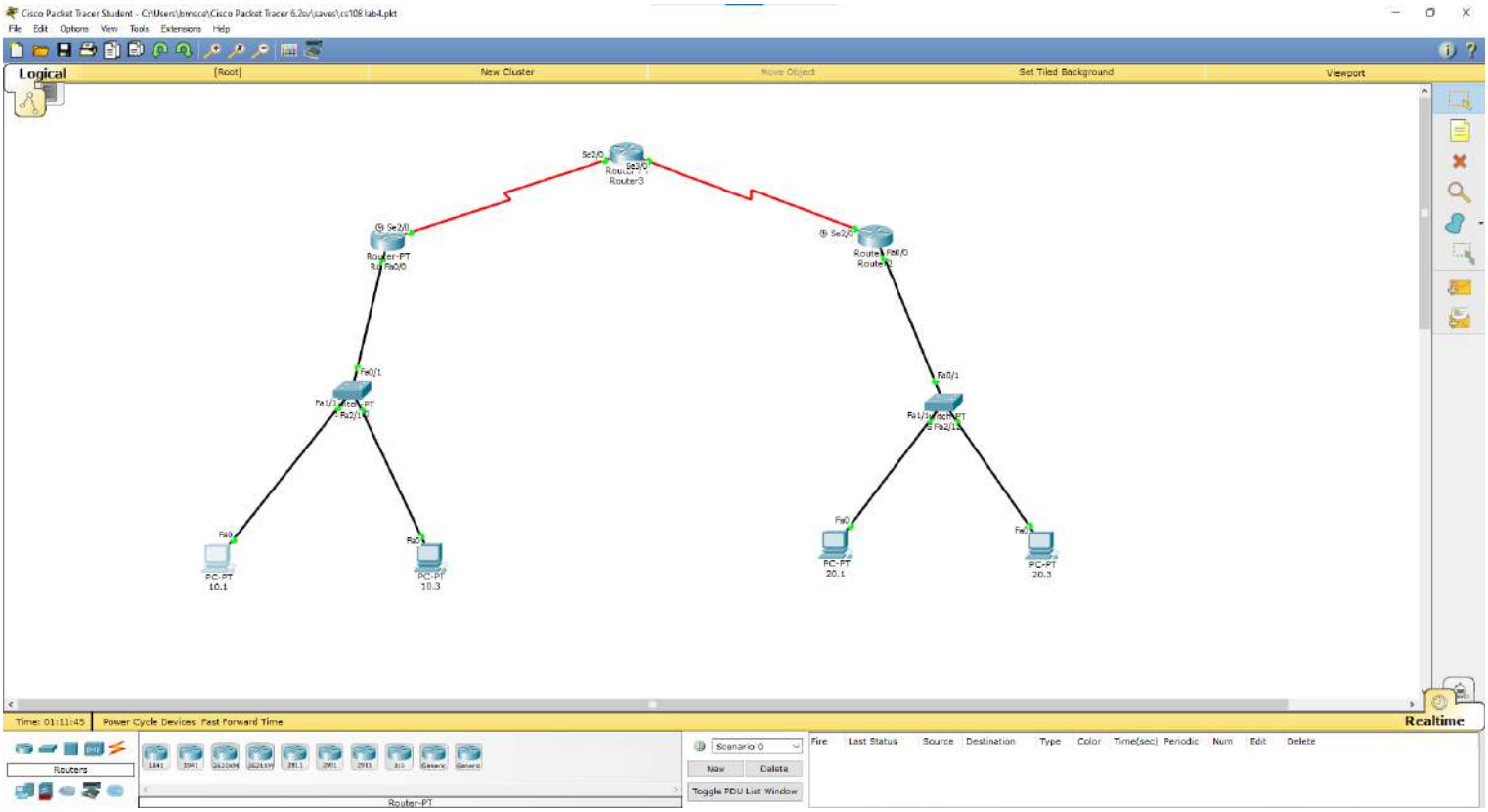
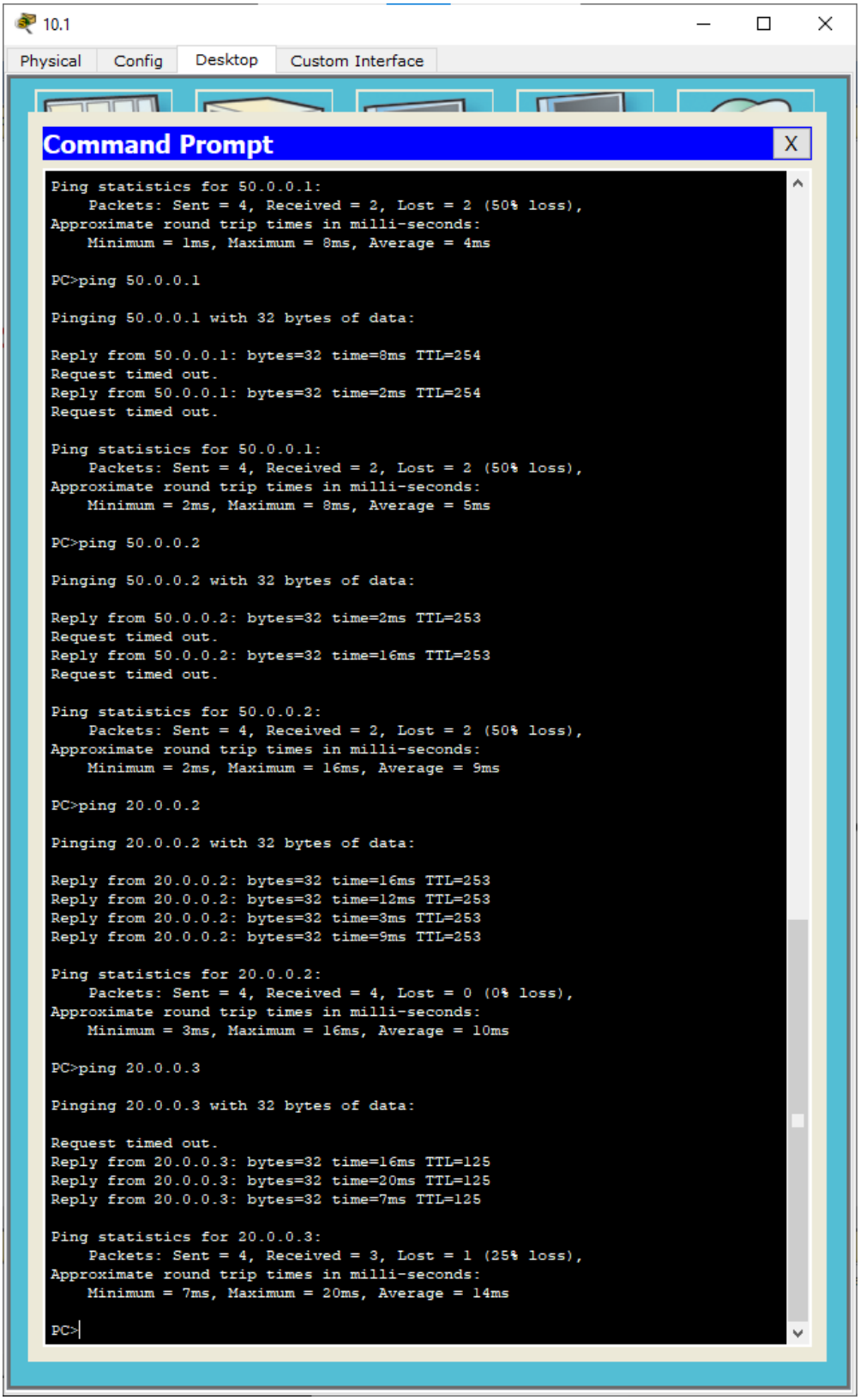
1/12/2022

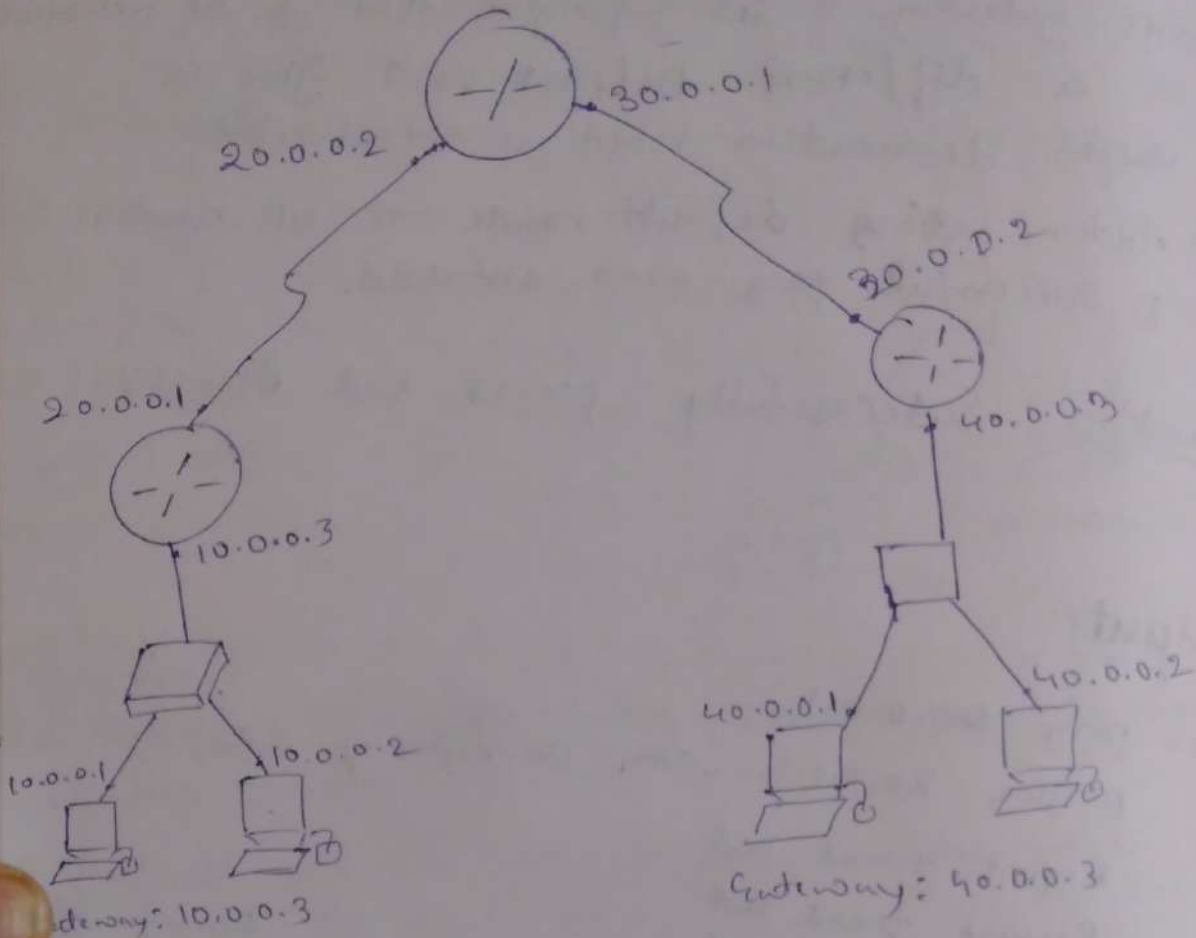

Cisco Packet Tracer Student - C:\Users\bmccc\Cisco Packet Tracer 6.2sv\saves\cs108 lab4.pkt
File Edit Options View Tools Extensions Help
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
Router3
Router-PT
Router1
Fa0/1
Fa0/0
PC-PT
10.1
PC-PT
10.3
PC-PT
20.1
PC-PT
20.3
Time: 01:11:45
Power Cycle Devices Fast Forward Time
Realtime
Routers
Router-PT
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color
Time(sec)
Periodic
Num
Edit
Delete


10.1
Physical
Config
Desktop
Custom Interface
Command Prompt
X
Ping statistics for 50.0.0.1:
Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 8ms, Average = 4ms
PC>ping 50.0.0.1
Pinging 50.0.0.1 with 32 bytes of data:
Reply from 50.0.0.1: bytes=32 time=8ms TTL=254
Request timed out.
Reply from 50.0.0.1: bytes=32 time=2ms TTL=254
Request timed out.
Ping statistics for 50.0.0.1:
Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),
Approximate round trip times in milli-seconds:
Minimum = 2ms, Maximum = 8ms, Average = 5ms
PC>ping 50.0.0.2
Pinging 50.0.0.2 with 32 bytes of data:
Reply from 50.0.0.2: bytes=32 time=2ms TTL=253
Request timed out.
Reply from 50.0.0.2: bytes=32 time=16ms TTL=253
Request timed out.
Ping statistics for 50.0.0.2:
Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),
Approximate round trip times in milli-seconds:
Minimum = 2ms, Maximum = 16ms, Average = 9ms
PC>ping 20.0.0.2
Pinging 20.0.0.2 with 32 bytes of data:
Reply from 20.0.0.2: bytes=32 time=16ms TTL=253
Reply from 20.0.0.2: bytes=32 time=12ms TTL=253
Reply from 20.0.0.2: bytes=32 time=3ms TTL=253
Reply from 20.0.0.2: bytes=32 time=9ms TTL=253
Ping statistics for 20.0.0.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 3ms, Maximum = 16ms, Average = 10ms
PC>ping 20.0.0.3
Pinging 20.0.0.3 with 32 bytes of data:
Request timed out.
Reply from 20.0.0.3: bytes=32 time=16ms TTL=125
Reply from 20.0.0.3: bytes=32 time=20ms TTL=125
Reply from 20.0.0.3: bytes=32 time=7ms TTL=125
Ping statistics for 20.0.0.3:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 7ms, Maximum = 20ms, Average = 14ms
PC>

8/12/22

Lab - 5

Aim:- Configuring RIP routing Protocol to routers



Procedure:-

→ Three routers are connected to 2 switches which are then connected to end devices.

→ Configure end devices and interface of routers

→ Configure IP address with following command

enable
configure terminal
interface Se 2/0
ip address 20.0.0.1 255.0.0.0
no shutdown
exit

→ Configure gateway of end devices with ip address of that network interface with router.

→ In Order to establish default route across route ip route is configure using command.

~~Router(config) ip router 20.00.0 0.0.0.0 20.0.0.0~~

→ To configure RIP protocol among router serial DCE connections, we run following commands.

Router(config) # router rip

Router(config-router) # network 10.0.0.0

Router(config-router) # network 20.0.0.0

→ For every serial DCE connection, to configure RIP with defined clock rate

encapsulation PPP

clock rate 64000

→ A ping has been sent from soure to destination.

Observation:

Ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data.

Reply from 40.0.0.1 : bytes = 32 time = 19ms TTL = 253

Reply from 40.0.0.1 : bytes = 32 time = 13ms TTL = 253

Reply from 40.0.0.1 : bytes = 32 time = 13ms TTL = 253

Reply from 40.0.0.1 : bytes = 32 time = 16ms TTL = 253

Ping statistics for 40.0.0.1:

Packets : Sent = 4, Recived = 4, Lost = 0 (0% Loss)

Approximate round trip times in milli-seconds:

Minimum = 13ms Maximum = 19s Average = 15

→ Since RIP protocol has been established, ~~It~~ is not necessary to set default IP route.

→ Before RIP was set

Ping 10.0.0.1 → 40.0.0.1 ⇒ Destination host unreachable

Before RIP

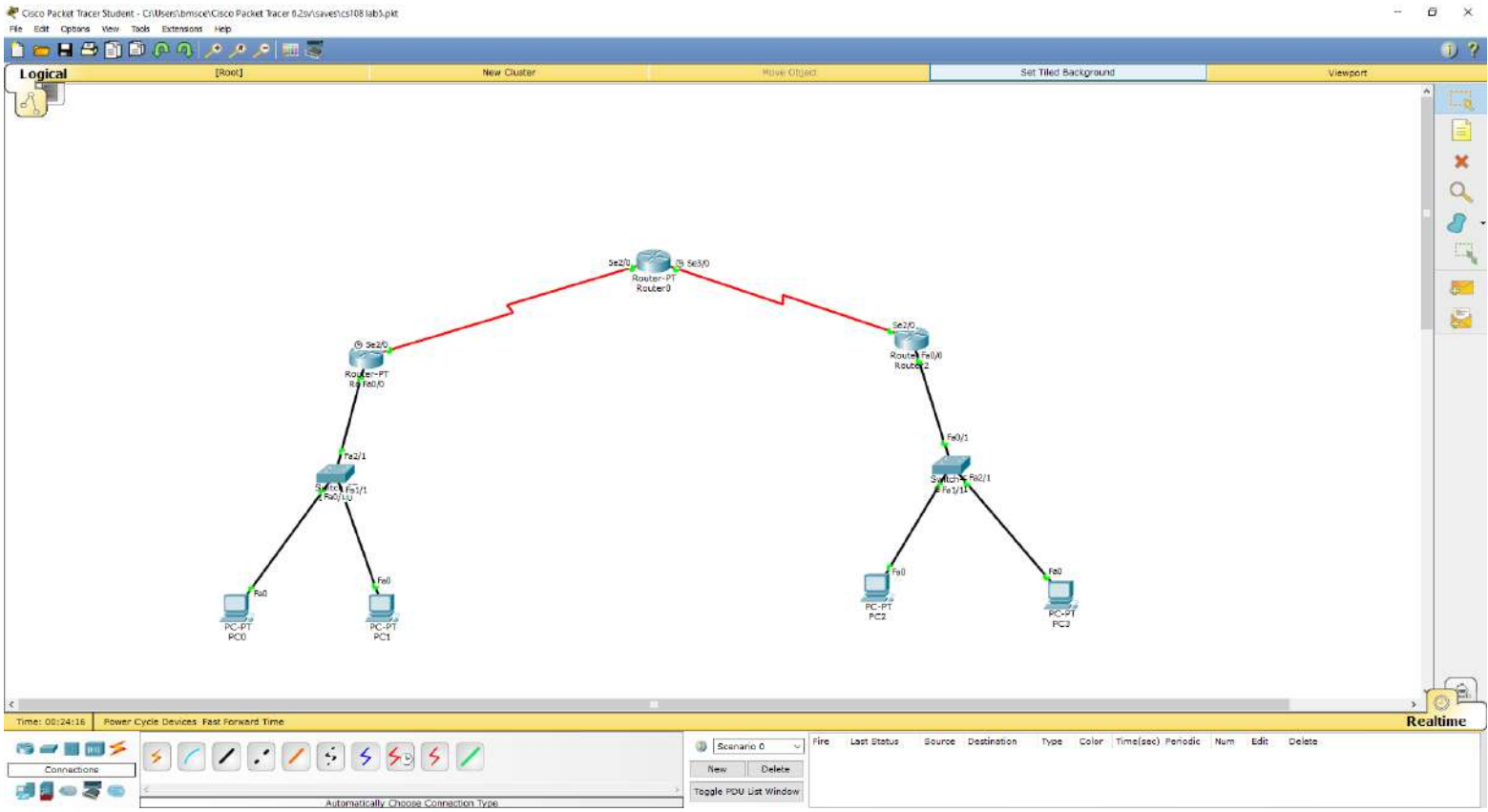
ping 10.0.0.1 → 20.0.0.1 Request timed Out.

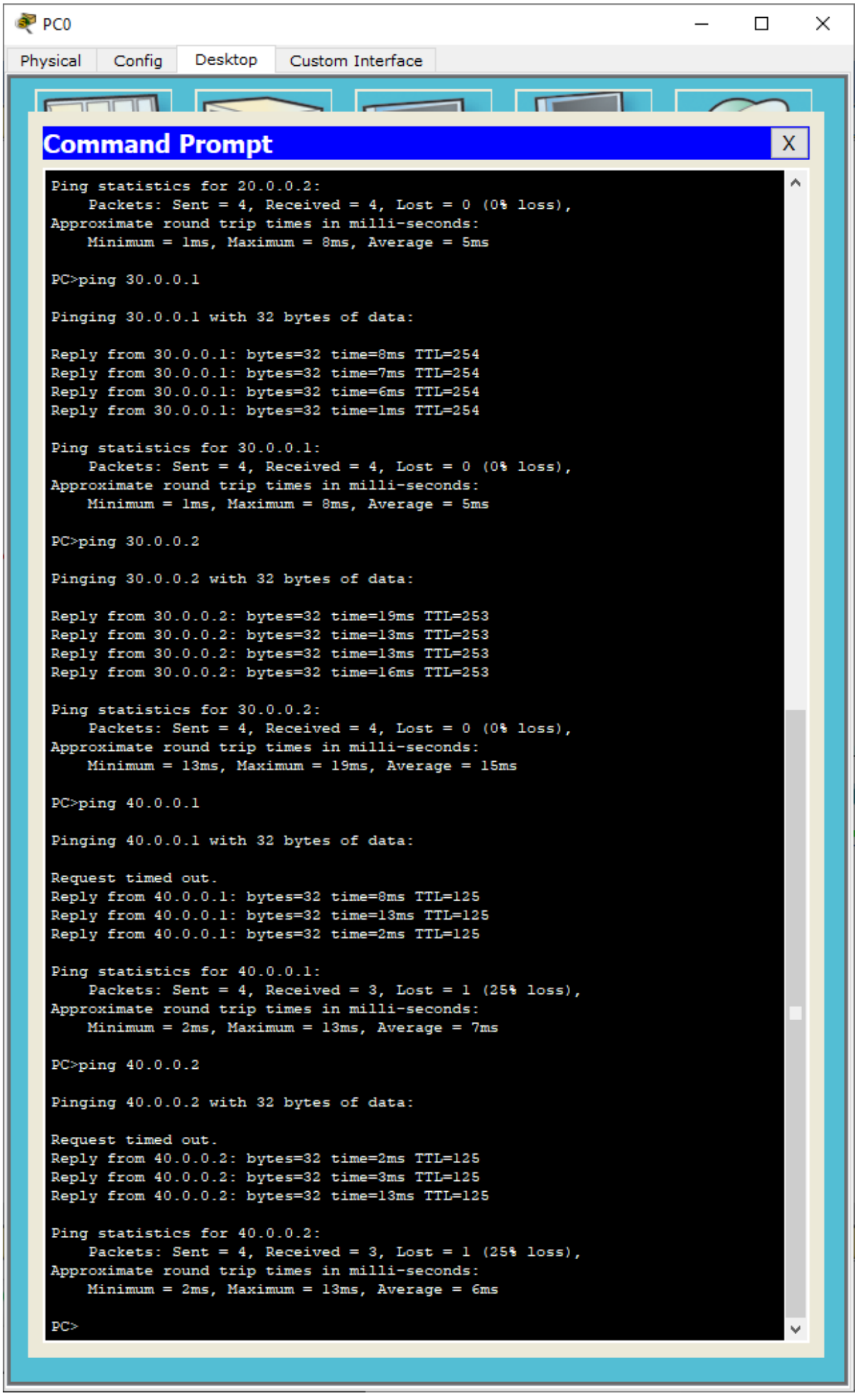
only on correctly configure gateway and protocol is reply received properly

Result:- RIP (routing information protocol) is established network

Note:- Even on proper connection and configuration The first packet of first inter network ping is timed out as switches have not learnt network yet.

Neelima
8/12/2022


Cisco Packet Tracer Student - C:\Users\bmsce\Cisco Packet Tracer 8.2sv\saves\cs108 lab3.pkt
File Edit Options View Tools Extensions Help
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
Router-PT
Router0
Router1
Router2
Switch0
Switch1
PC-PT
PC0
PC1
PC2
PC3
Time: 00:24:16
Power Cycle Devices Fast Forward Time
Realtime
Connections
Automatically Choose Connection Type
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color
Time(sec)
Periodic
Num
Edit
Delete

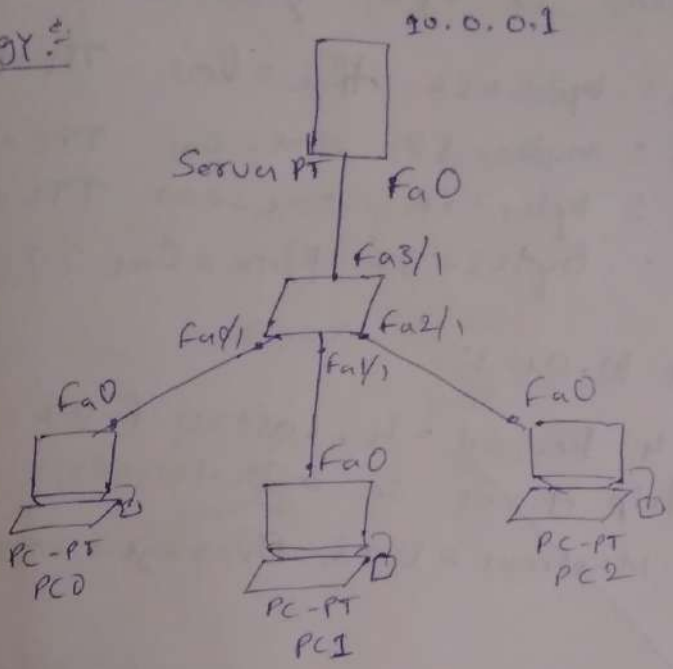

PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
X
Ping statistics for 20.0.0.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 8ms, Average = 5ms
PC>ping 30.0.0.1
Pinging 30.0.0.1 with 32 bytes of data:
Reply from 30.0.0.1: bytes=32 time=8ms TTL=254
Reply from 30.0.0.1: bytes=32 time=7ms TTL=254
Reply from 30.0.0.1: bytes=32 time=6ms TTL=254
Reply from 30.0.0.1: bytes=32 time=1ms TTL=254
Ping statistics for 30.0.0.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 8ms, Average = 5ms
PC>ping 30.0.0.2
Pinging 30.0.0.2 with 32 bytes of data:
Reply from 30.0.0.2: bytes=32 time=19ms TTL=253
Reply from 30.0.0.2: bytes=32 time=13ms TTL=253
Reply from 30.0.0.2: bytes=32 time=13ms TTL=253
Reply from 30.0.0.2: bytes=32 time=16ms TTL=253
Ping statistics for 30.0.0.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 13ms, Maximum = 19ms, Average = 15ms
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=8ms TTL=125
Reply from 40.0.0.1: bytes=32 time=13ms 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 = 13ms, Average = 7ms
PC>ping 40.0.0.2
Pinging 40.0.0.2 with 32 bytes of data:
Request timed out.
Reply from 40.0.0.2: bytes=32 time=2ms TTL=125
Reply from 40.0.0.2: bytes=32 time=3ms TTL=125
Reply from 40.0.0.2: bytes=32 time=13ms TTL=125
Ping statistics for 40.0.0.2:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 2ms, Maximum = 13ms, Average = 6ms
PC>

Lab - 6

15/12/22

Aim: Configuring DHCP server

Topology:



Procedure:

1) A server is connected to a switch which in turn is connected to a three end devices.
2) IP addres of Servers is configured to 10.0.0.1
3) Select Server goto DHCP in Services turn service 'on'.
4) Set start IP Addres to 10.0.0.2 and save
5) Go to Select end devices one by one and goto config and change IP configuration from Static to DHCP
6) end device ato automatically get assigned a IP Addres

Observation:

DHCP (Dynamic host configuration protocal) allocates a ip Addres to end devices linked to the server that provides DHCP services.

Dynamic IP addres is set to end devices when DHCP is initialised n served.

RARP (reverse addres resolution protocal) is used to assign IP address of devices if mac address is known.

PC> ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

Reply from 10.0.0.3: bytes=32 time=0ms TTL=128
Reply from 10.0.0.3: bytes=32 time=0ms TTL=128
Reply from 10.0.0.3: bytes=32 time=0ms TTL=128
Reply from 10.0.0.3: bytes=32 time=0ms TTL=128

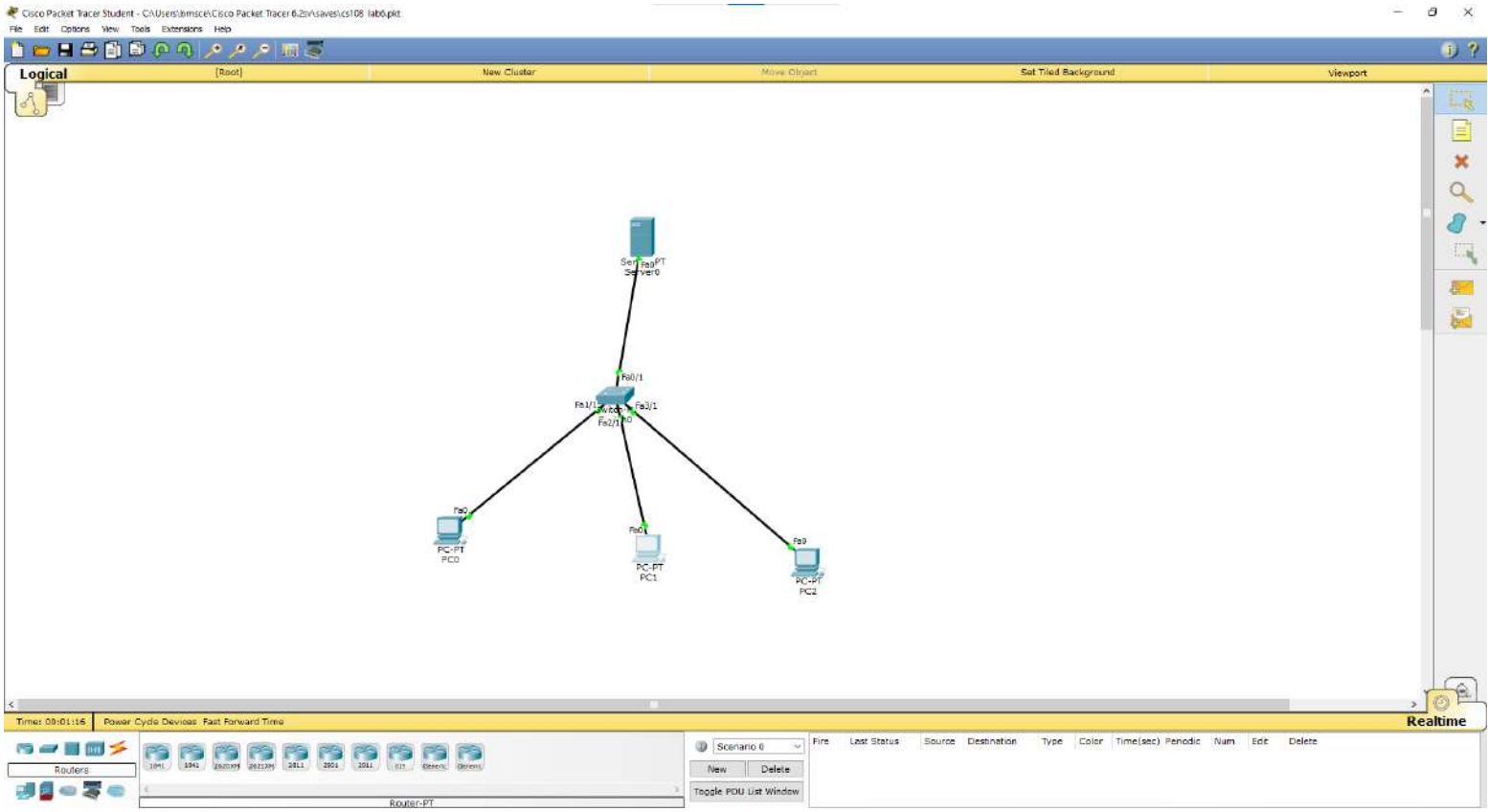
Ping statistics for 10.0.0.3:

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

Aproximate round trip times in milli-seconds:

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

Aleeking
15/12/2022

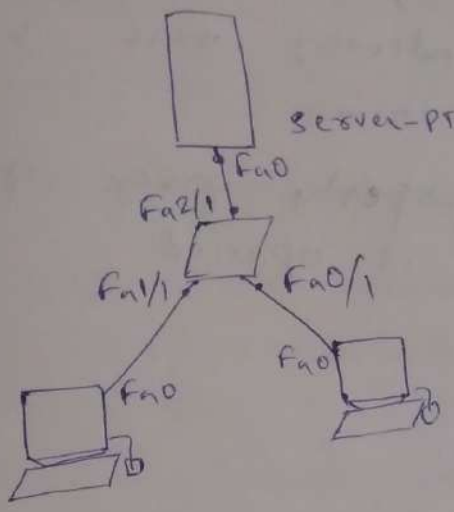

Cisco Packet Tracer Student - C:\Users\bmsce\Cisco Packet Tracer 6.2sv\saves\cs108 lab6.pkt
File Edit Options View Tools Extensions Help
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
Server-PT Server0
Fa0/1
Fa1/1
Switch0
Fa3/1
Fa2/1
Fa0
PC-PT PC0
Fa0
PC-PT PC1
Fa0
PC-PT PC2
Time: 00:01:16
Power Cycle Devices Fast Forward Time
Realtime
Routers
Router-PT
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color
Time(sec)
Periodic
Num
Edit
Delete

Exp-7

Aim:- Configuring Web Server and DNS server

15/12/22

Topology:-



Procedure:-

1) A Server is connected to a switch which in turn is connected to two end devices
2) IP Address of Server is configured to 10.0.0.1
3) IP Address of end devices is configured
4) Click on Server set HTTP to ON
5) Select DNS in left menu of services in Server
6) Give a name to the server and set Address to ip Address of server.
7) Set DNS services to ON and Select 'Add'
8) Go to one of end device goto Desktop > web browser. and browse for server name.

Observation:-

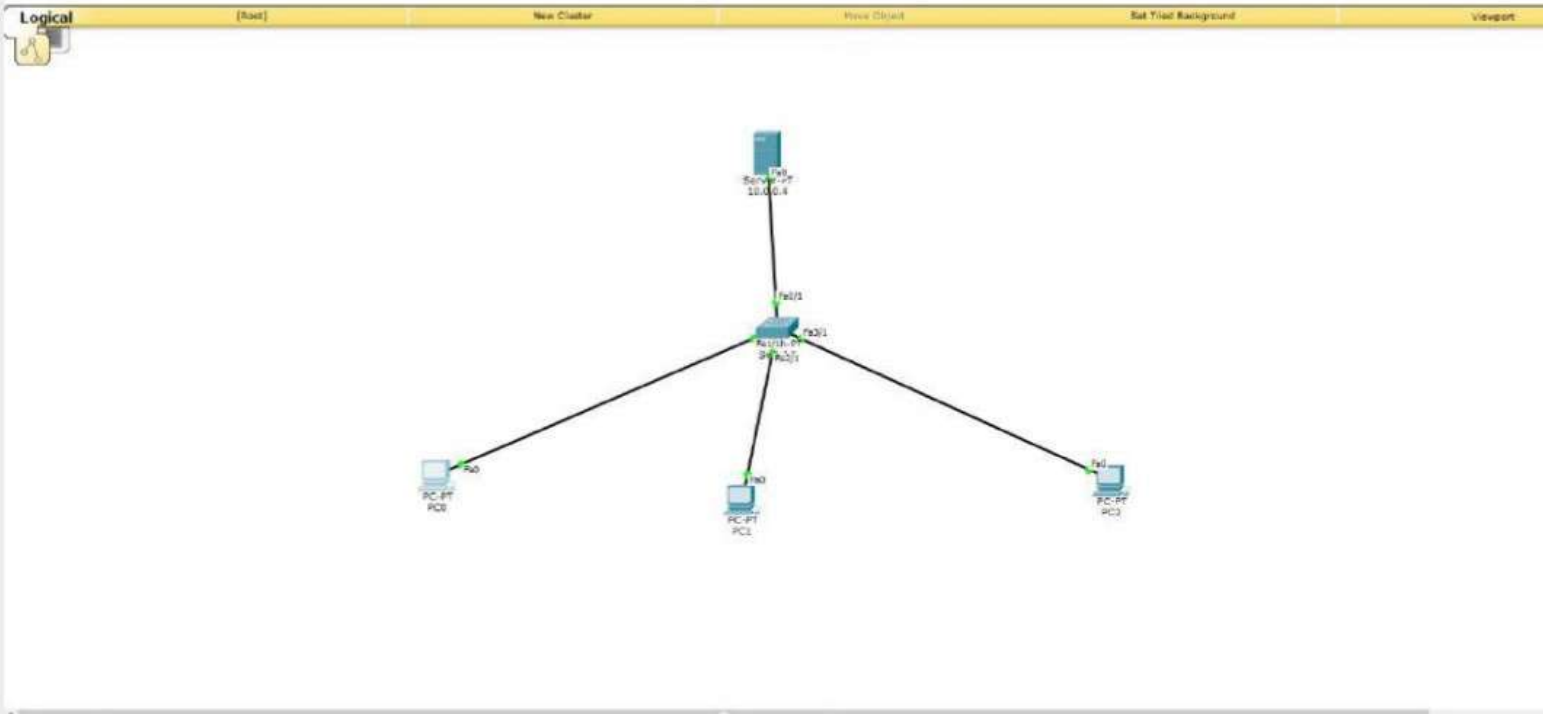
1) DNS server maps domain name with ip address of the server.

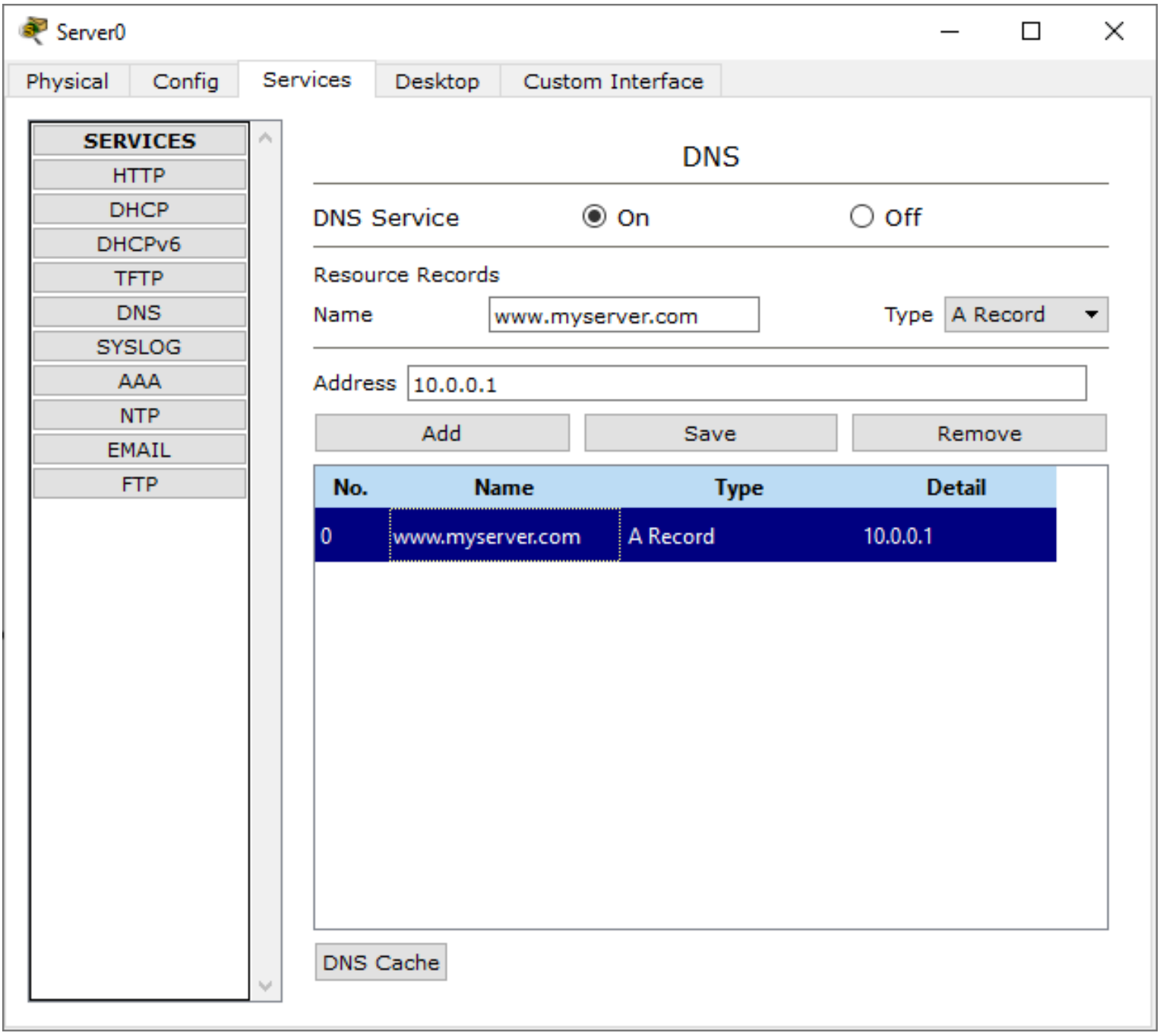
2) Web browser module is opened in the end device and the set domain name (www.bmsce.com) is entered.

→ If the system/server has'it been configured properly, ie set DNS server and default gateway the host unresolved is shown.

→ If configured properly page of cisco packet tracer is opened.

Neelima
05/12/2022


Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
Fa0
Server-PT
10.0.0.4
Fa0/1
Fa0/2
Fa0/3
Fa0
PC-PT
PC0
Fa0
PC-PT
PC1
Fa0
PC-PT
PC2


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
www.myserver.com
Type
A Record
Address
10.0.0.1
Add
Save
Remove
No.
Name
Type
Detail
0
www.myserver.com
A Record
10.0.0.1
DNS Cache

29/12/22

Write program for error detection using CRC 16-bit.

```
#include <bits/stdc++.h>
using namespace std;
const string g = "1000100000010000";
bool receiverSide(string codeWord){
    int i,j, divisions = codeWord.length()-g.length()+1;
    bool flag = true;
    for( i=0; i<divisions; i++){
        if (codeWord[i] == '1'){
            for( j=0; j<g.length(); j++){
                if (codeWord[i+j] == g[j])
                    codeWord[i+j] = '0';
                else codeWord[i+j] = '1';
            }
        }else{
            for (j=0; j<g.length(); j++){
                if (codeWord[i+j] == '0')
                    codeWord[i+j] = '0';
                else codeWord[i+j] = '1';
            }
        }
        if (codeWord[i] == '1') {
            flag = false
        }
    }
    cout << "\nCodeWord:" << codeWord;
    return flag;
}
int main() {
    String data;
    Cout << "Enter data:";
    cin >> data;
    temp = data;
    Cout
```

```
for(i=0; i< g.length(); i++){
    data.push_back('0');

int no_of_divisions = data.length() - g.length() + 1;

for(i=0; i< no_of_divisions ; i++){
    if (data[i] == '1'){
        for(j=0 ; j< g.length(); j++)
            if ( data[i+j] == g[j])
                data[i+j] = '0';
            else data[i+j] = '1';
    }
    else {
        for (j=0; j< g.length(); j++)
            if (data[i+j] == '0')
                data[i+j] = '0';
            else data[i+j] = '1';

for( i = rem.length(); i< data.length(); i++)
    rem.push_back(data[i]);
```

Output :

3
1
1
1

1 1 0 1 1 0 0 0 0 0 1 1 0 0 0 1 1

0 0 1 0 0 0 0 1 0 0 0 0 0 0

12/1/2023

```
Enter the DATA: 10001000000100001


  *****
 Sender Side :
 Encoded Data:100010000001000011110
  *****
 Receiver Side :
After division:00000000000000000000  flag:1
Process finished.
```

Leaky Bucket.

5/1/23

```
#include <iostream>
using namespace std;
int main() {
  cout<<"Enter bucket size"<<endl;
  int bucket_size;
  int output rate, input rate, choice;
  cin>> bucketSize;
  cout<<" Enter packet size "<<endl;
  cin>> output rate;
  do{
    cout<<" Enter packet size "<<end;
    cin>> input packet;
    if (input packet <= bucket size) {
      if (filled + input packet > bucket size)
        cout<<" packet to bing for bucket"
      else
        filled = filled + input bucket;
    } else {
      cout<<"packet is too biag for bucket";
    }
    if (filled <= output rate)
      filled = 0;
    else
      filled = filled - output rate;
    cout<<"Amount of bucket. filled "<< filled;
    cout<<" Do you want to enter another packet";
    cin>> choice;
  } while(choice == 9);
}
```

output:

Enter bucket size : 500
Enter output rate : 50
Enter packet size : 200
Packet to big for bucket
Enter paket size : 200.
pucket filled : 150
Do you want to Enter packet (9: yes, 8: No): 9
Enter packet size : 250.
bucket size : 350.
Do you want to Enter packet (9: yes, 8: No): 9
Enter paket size: 250.
Packet too big for bucket
Amount of bucket filled. 300.

NLA
12/1/2023

```
Enter size of bucket:400
Enter output rate:42
Enter number of iterations:3

Enter packet size60

 Added to bucket
 Current bucket contents:60
Enter packet size300

 Added to bucket
 Current bucket contents:318
Enter packet size600

 Frame size is greater than bucket size

Process finished.
```

Bellman ford

```
#include <stdio.h>
#include <iostream.h>
#define MAX 10;
using namespace std;

typedef struct edge {
    int src;
    int dest;
    int wt;
} edge;
void bellman_ford (int nv, edge e[], int src_graph){
    int u,v,wt, i, j=0;
    int dis [max];
    for (i=0; i<nv; i++) {
        dis[i]=999;
    } dis[src_graph]= 0;
    for (i=0; i<nv-1; i++){
        for (j=0; j<no; j++){
            u = e[j].src;
            v = e[j].dest;
            weight = e[j].wt;
            if (dis[u]!=999 && dis[u]+weight<dis[v])
                dis[v] = dis[u]+weight;
        } }
    }
for (j=0; j<ne; j++) {
    u = e[j].src;
    v = e[j].dest;
    weight=e[j].wt;
    if (dis[u]+weight <dis[v])
        cout <<"Negative cycle Present";
}
cout <<" vertex" << " Distance from Source";
for (i=1 ; i<=nv ; i++)
    cout <<"\n" << i << "\t" << dis[i];
}
```

```
Enter the number of vertices: 4
Enter the source vertex of the graph: 1

Enter no. of edges: 5

For edge 1=>
Enter source vertex :1
Enter destination vertex :2
Enter weight :4

For edge 2=>
Enter source vertex :1
Enter destination vertex :3
Enter weight :5

For edge 3=>
Enter source vertex :3
Enter destination vertex :2
Enter weight :7

For edge 4=>
Enter source vertex :2
Enter destination vertex :4
Enter weight :7

For edge 5=>
Enter source vertex :4
Enter destination vertex :3
Enter weight :-15


NEGATIVE CYCLE PRESENT..!!
```

Dijkstra

```
#include<stdio.h>
#define INF 999
#define MAX 10

void dijkstra (int G[MAX][MAX], int n, startnode){
    int cost[MAX][MAX], distance[MAX], pred[MAX];
    int visited[MAX], count, mindistance, nextnode, i, j;
    for(i=0; i<n; i++)
        for(j=0; j<n; j++)
            if (G[i][j] ==0)
                cost[i][j] = infinity;
            else
                cost[i][j] = infinity;
    for(i=0; i<n; i++) {
        distance[i] = cost[start_node][i];
        pred[i] = startnode; visited[i]=0;
    }
    distance[start_node] =0;
    visited[startnode]= 1;
}
for(i=0; i<n; i++)
    if (i != startnode)
        printf("Distance of node %d=%d", i, distance[i]);
        printf(" Path = %d", i);
            j = i;
        do {
            j = pred[j]
            printf(" <- %d", j);
        } while( j!= start_node);
    }
}
```

```
int main() {
    int G[max][max], i, j, n, v;
    printf("Enter no of vertices");
    scanf("%d", &n);
    printf("Enter adjacent matrix");
    for(i=0; i<n; i++)
        for(j=0; j<n; j++)
            scanf("%d", &G[i][j]);
    printf("Enter starting node:");
    scanf("%d", &v);
    dijkstra(G, n, v);
    return 0;
}
```

Output: Enter no of vertices: 4

Enter adjacency matrix:

0	5	4	999
5	0	6	3
999	3	1	6
2	0	1	4

Enter the starting node: 1

Distance of node 0 = 5

Path = 0 ← 1

Distance of node 2 = 4

Path = 2 ← 3 ← 1

Distance of node 3 = 3

Path 3 ← 1

```
Enter the no. of vertices: 5

Enter the adjacency matrix:
0 3 1 0 0
3 0 7 5 1
1 7 0 2 0
0 5 2 0 7
0 1 0 7 0

Enter the starting node: 0

Distance of 1 = 3
Path = 1 <-0
Distance of 2 = 1
Path = 2 <-0
Distance of 3 = 3
Path = 3 <-2 <-0
Distance of 4 = 4
Path = 4 <-1 <-0
```