EAST WEST UNIVERSITY

# PROJECT REPORT

Course Name: **COMPUTER NETWORKS.**

Course Code: **CSE 405**

Semester: **SUMMER 2020**

Section: **01**

## Submitted To

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# I. INTRODUCTION

A computer network is a group of devices connected with each other through a transmission medium such as wires, cables etc. These devices can be computers, printers, scanners, Fax machines etc.

The purpose of having computer network is to send and receive data stored in other devices over the network. These devices are often referred as nodes.

There are five basic components of a computer network:

- Message: It is the data or information which needs to be transferred from one device to another device over a computer network.
- Sender: Sender is the device that has the data and needs to send the data to other device connected to the network.
- Receiver: A receiver is the device which is expecting the data from other device on the network.
- Transmission media: In order to transfer data from one device to another device we need a transmission media such as wires, cables, radio waves etc.
- Protocol: A protocol is a set of rules that are agreed by both sender and receiver, without a protocol two devices can be connected to each other but they cannot communicate. In order to establish a reliable communication or data sharing between two different devices we need set of rules that are called protocol. For example, http and https are the two protocols used by web browsers to get and post the data to internet, similarly smtp protocol is used by email services connected to the internet.

# II. REQUIREMENTS

My task is to create a complete model of a complex network by discovering the interconnectivity of the systems and subnetworks, which will reflect the INTERNATIONAL Apollo University's structure and facilities, features within the network will include the followings:

- Web page of the university will reflect International Apollo University's web page.
- DNS sever needs to be installed to locate webserver - meaning people will browse University's web site with the following address: http://www.apollointernational.edu
- Among the hosts wireless links to the networks are available.
- University's full network has covered its six campuses with six routers, connectivity between routers are mesh (complex).
- Connectivity between all the hosts needs to be established.

While designing, keep the issue of future expansion/growth in mind for each of the subnets (if required) and preserve spaces. It is compulsory to incorporate wireless devices along with wired hosts in the LAN as well. In the physical design, it is a good practice to have a server room where all the servers are positioned in one LAN segment.

# III. DESIGN SPECIFICATIONS

I am designing this project by using simulation tool (Cisco Packet Tracer). In the simulation tool, I use some Network devices such as (Routers, Switches, Wireless Devices etc.) also for End Devices I use

(PCs, Laptops, Servers etc. For connectivity purposes, I use Copper Straight – Through, Serial DCE & DTE etc.
Tool models that I use for designing this project are briefly given below:

- **Network Devices:**
    1. Routers:
       To connect the entire campus, there are design aesthetics that I have to connect six campuses concurrently. So, I am using six *PT-Router*'s to connect six campuses respectively with mash(complex) connectivity. Connection between routers in my design are:

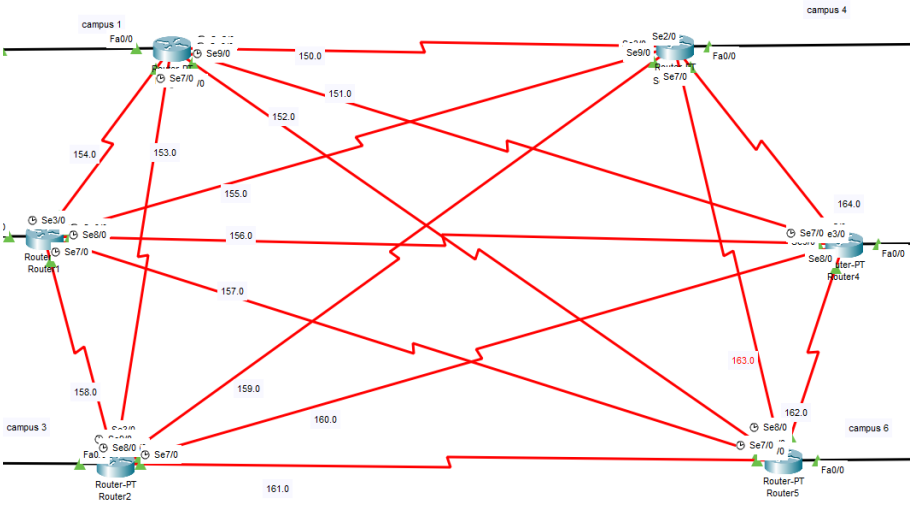
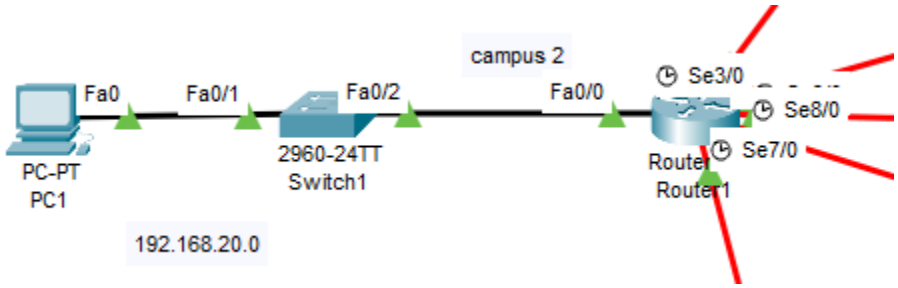
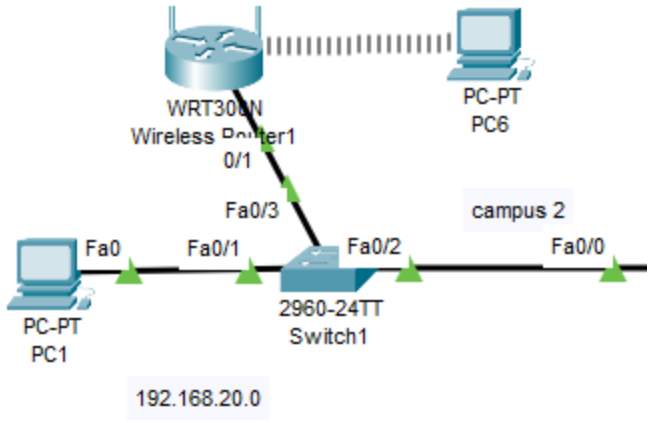



Fig.: mesh(complex) connectivity between Six Routers.

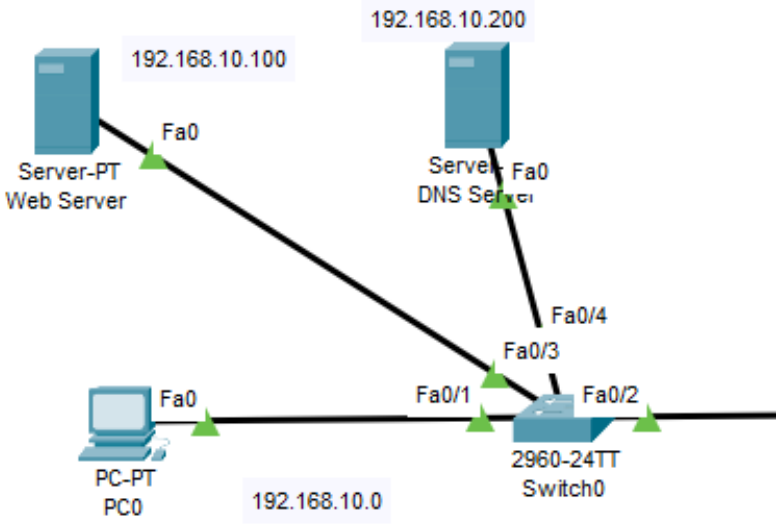
    2. Switches:
       To connect every device, classrooms, labs, employee PCs, library and other administrative and academic wings that used for a campus, I use *2960-24TT* switches. Figure:



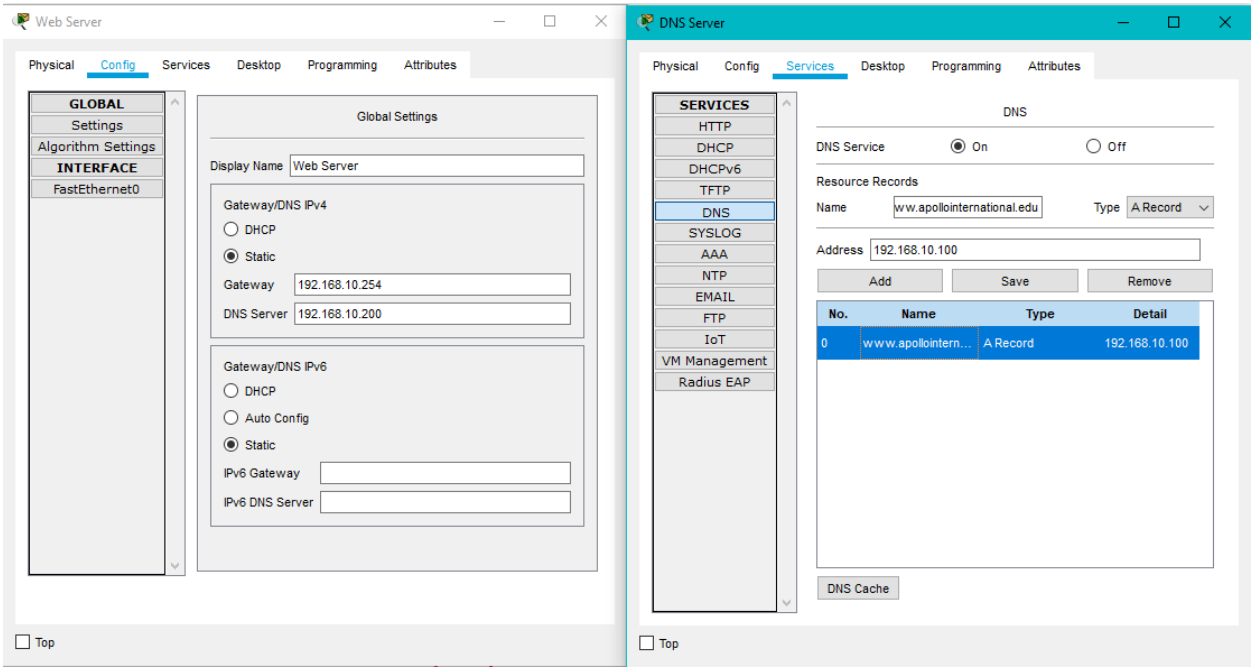

    3. Wireless Devices:
       To wirelessly connected the entire campus, I use *WRT300N* wireless devices. Figure:




- **End Devices:**
    1. PC – Multiple users' private computers.
    2. Laptop – Multiple users' Laptops.
    3. Servers – To connect every six campuses into one single network and to locate the webserver, I use two servers from Cisco Packet Tracer. One is for Webserver and other is for DNS server. Here is the diagram,



And here is the config of Web-server and services of DNS server:



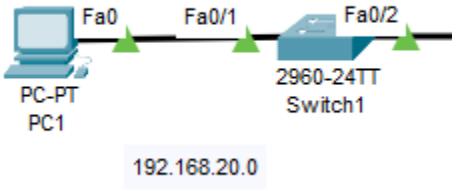

- **Connectivity:**

1. Copper Straight – Through Cable:

   Straight-through cable is a type of twisted pair copper wire cable for local area network (LAN) use for which the RJ-45 connectors at each end have the same pinout (i.e., arrangement of conductors). It is identical to crossover cable, except that in the latter the wires on the cable are crossed over so that the receive signal pins on the connector on one end are connected to the transmit signal pins on the connector on the other end.

   Straight-through cable is also commonly referred to as patch cable. However, this might be confusing in some situations because patch cable also has a broader definition that emphasizes the fact that there is a connector on each end rather than the equality (or lack thereof) of the pinouts.

Straight-through cable is used to connect computers and other end-user devices (e.g., printers) to networking devices such as hubs and switches. It can also be used to directly connect like devices (e.g., two hubs or two switches) if the cable is plugged into an uplink port on one (but not both) of the devices. Crossover cable is used to connect two like devices without the use of an uplink port. I use this cable for connect two different devices such as PC and switches. Figure:




2. Serial DCE & DTE:
   One side of the link (DCE), has to transmit the clock signal, which controls the data rate, and the other side (DTE) receives the clock signal. The difference between the two cables in packet tracer is,
   - With the DCE cable, (red zigzag with clock) the side you click first will be the DCE, the second will be DTE.
   - With the DTE cable (red zigzag no clock) the side you click first will be DTE, the second will be DCE.

   So, I use these cables to connect between Routers and to establish mesh(complex) connectivity.

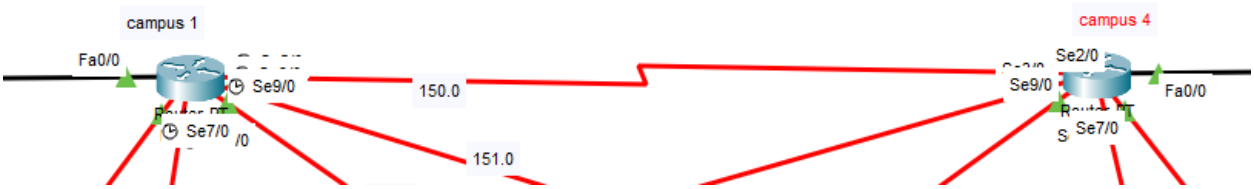
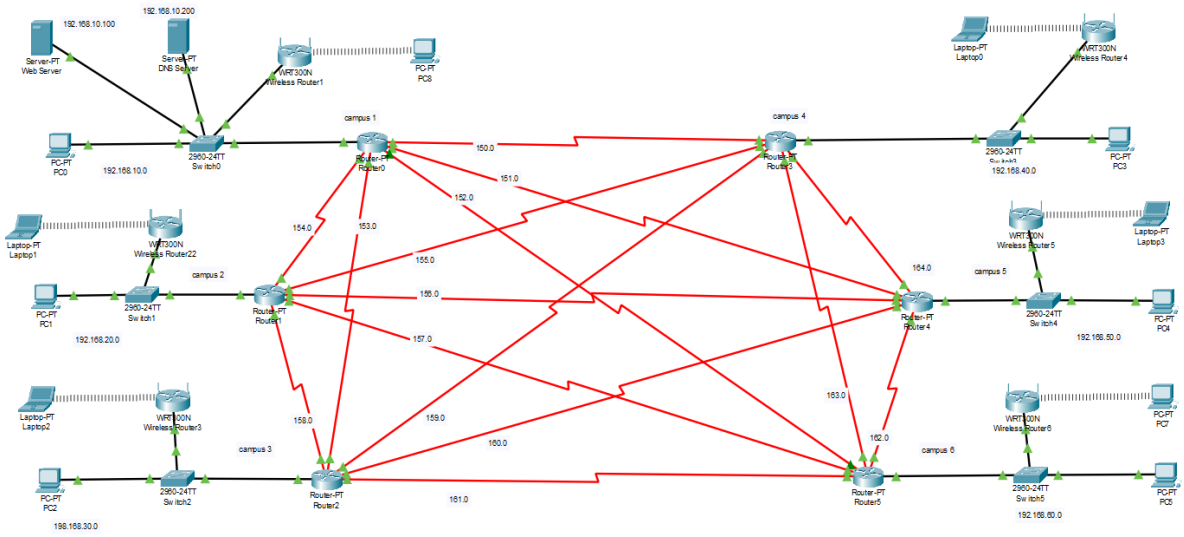


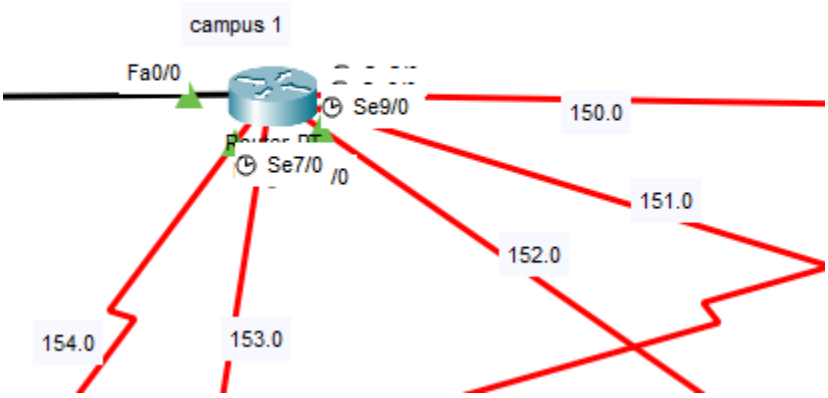

Fig.: Serial DCE and DTE connection between campus 1 to campus 4 Routers.

## IV. PHYSICAL DIAGRAM



## V. CODES TO CONFIGURE NETWORK

I have used CLI to configure Routers in the mesh network. The are six routers in the Network. So, I have to configure manually one by one. Now, I am giving a fig. that represents Router 1,




So, there are six serial ports that's connected to switch 1 and rest of five ports are connected to Routers (2,3,4,5, and 6). Now, I am showing the CLI code to configure Router 1,

*Commands:*

```
enable

config t

interface fa0/0

ip address 192.168.10.254 255.255.255.0

no shut
```

```
[press enter]
do wr
exit
interface se2/0
ip address 192.168.150.1 255.255.255.0
clock rate 64000
no shut
do wr
exit
interface se3/0
ip address 192.168.151.1 255.255.255.0
clock rate 64000
no shut
do wr
exit
interface se8/0
ip address 192.168.152.1 255.255.255.0
clock rate 64000
no shut
do wr
exit
interface se7/0
ip address 192.168.153.1 255.255.255.0
clock rate 64000
no shut
do wr
exit
interface se6/0
ip address 192.168.154.1 255.255.255.0
clock rate 64000
no shut
do wr
exit
```

Similar procedure I'm following for Router 2,3,4,5 and 6 as well. After configuring all the Routers then I implement OSPF Routing algorithm to ensure the shortest path for a network. Now the implementation commands of OSPF Routing Algorithm that I use in CLI module for Router – 1 is given below:

```
enable
config t
router ospf 1
network 192.168.10.0 0.0.0.255 area 1
network 192.168.150.0 0.0.0.255 area 1
network 192.168.151.0 0.0.0.255 area 1
network 192.168.152.0 0.0.0.255 area 1
network 192.168.153.0 0.0.0.255 area 1
network 192.168.154.0 0.0.0.255 area 1
exit
exit
```

Similar procedure I'm following for Router 2,3,4,5 and 6 as well.

## VI. DESIGN ISSUES

I am using Class – C IP Addresses for configuring my network. We know, the first octet of Class C IP address has its first 3 bits set to 110, that is – (**110**00000 – **110**11111). In decimal notation i.e., (192-223).

Class C IP addresses range from 192.0.0.x to 223.255.255.x. The default subnet mask for Class C is 255.255.255.x.

Class C gives 2097152 ($2^{21}$) Network addresses and 254 ($2^{8}$-2) Host addresses.

Class C IP address format is: 110NNNNN. NNNNNNNN. NNNNNNNN. HHHHHHHH (N= Network and H= Host).

## VII. LIMITATIONS

There are lots of limitation that I faced to design this network.

- Cisco Packet Tracer can not show the actual simulation message for pinging between devices for the first plenty of tries. Every time it shows the Failed to ping message.
- I can't configure the Bonus features for this network due to lack of knowledge.

## VIII. ACKNOWLEDGEMENT

I thank Mr. Anisur Rahman (Asst. Professor, Department of Computer Science and Engineering, East West University, Dhaka, Bangladesh) for helping us to understand and complete this project.

## IX. CONCLUSION

Configuring six routers in this Network would have been much complex, If I didn't connect each of routers in mesh(complex). Also, OSPF routing algorithm makes this network system easier to config.