



## **REPORT**

### **Design a full-fledged network for an organization with multiple subnets**

Course Title: **Computer Networks**

Course Code: **CSE 405**

Section: 3

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## **Table of Contents**

### **Title**

|  |       |
|--|-------|
| Introduction.....                      | 3     |
| Design Specification.....              | 3     |
| Requirement.....                       | 4     |
| Logical View.....                      | 4     |
| Network.....                           | 5     |
| Networks between routers.....          | 5     |
| Networks between Router and Hosts..... | 6     |
| Design Testing.....                    | 6     |
| Lines of Code.....                     | 7     |
| Router Interface Initializing.....     | 7-9   |
| Router Path Routing.....               | 10-11 |
| Limitation.....                        | 12    |
| Conclusion.....                        | 12    |

## **INTRODUCTION**

In the enterprise, there can be more than one branches where different branches have different networks to perform each individual task within all the branches. My job is to create a complete network system to perform the above task efficiently where all the branches will be connected with each other.

In this mini project a network has been designed for INTERNATIONAL Apollo University where six campuses will have an internally connection. The whole network design was developed using Cisco Packet Tracer network simulation program. In design all the campuses hold a specific network divided into two more subnetworks. These subnetworks will be used for the business processes like admissions, advising etc. and regular use of the university like in classroom or may be for students, teachers etc. The main campus will have a network only for the servers. Any user can also make a wireless connection for certain parts of information. There is also a website for this university. The DHCP server will provide all the important information to all hosts automatically. Any host of one campus will be able to communicate with other hosts of all campuses.

## **DESIGN SPECIFICATION**

- 6 Routers are connected by mesh connection
- 1 wireless router to get wireless access to the website by users
- Class A Network (with 8 bit subnetting) is used for only networks between router
- Class B Network (with 8 bit subnetting) is used for only networks of hosts
- Class C Network (with 3 bit subnetting) is used for only network of R1 (router)
- 11 switches to connect the hosts by LAN

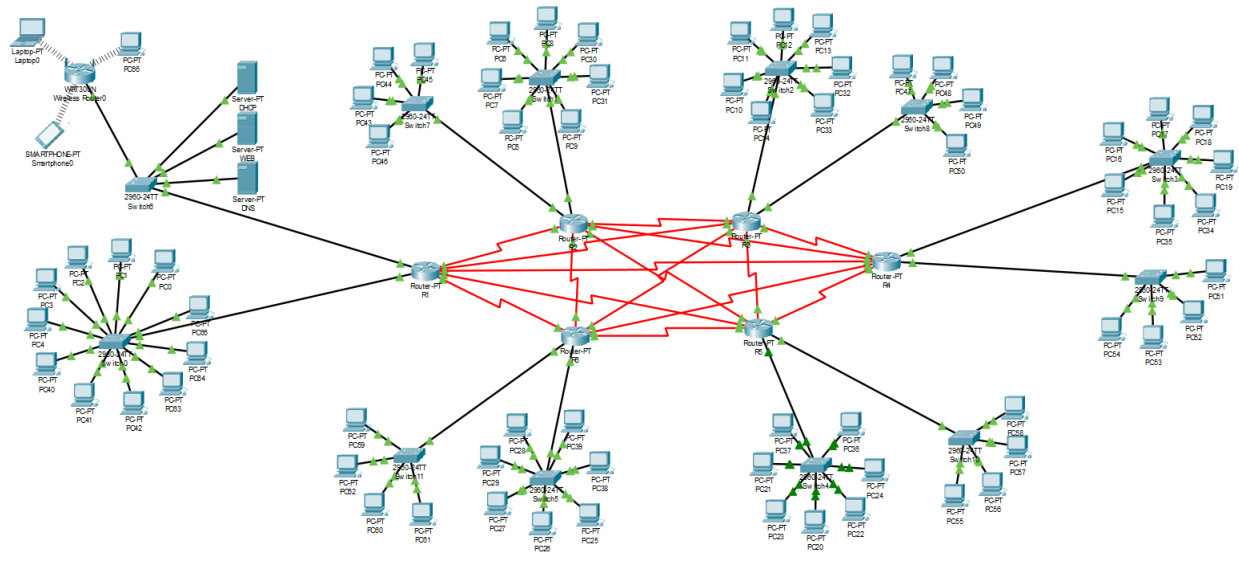
- Each switch is connected with only a router
- For every router there are two switches
- One switch makes connection between Admission, Advising, Result, Account hosts
- Another switch makes connection between Classroom, Lab, Employee, Student, Library, Help-Desk and Security hosts
- Here 1 host indicates all the host of that uses like 1 classroom PC represents all the PC which are used in classroom
- 1 DHCP Server to bring IP address for all the hosts automatically
- 1 WEB Server and 1 DNS Server for the website
- Serial DCE is used only between the routers
- Copper Straight-Through cable is used between router, switch and host

## **REQUIRMENT**

Tools had been used in Cisco Packet Tracer:

- 69 Hosts (67 PC, 1 Laptop, 1 Smartphone)
- 12 Switches (2960-24TT)
- 7 Routers (6 Router-PT)
- 1 Wireless Router (WRT300N)
- Two types of wire (Copper Straight-Through, Serial DCE)
- 3 Servers (DNS, WEB, DHCP)
- IP Address of 3 Classes with subnetting

## LOGICAL VIEW



## NETWORK

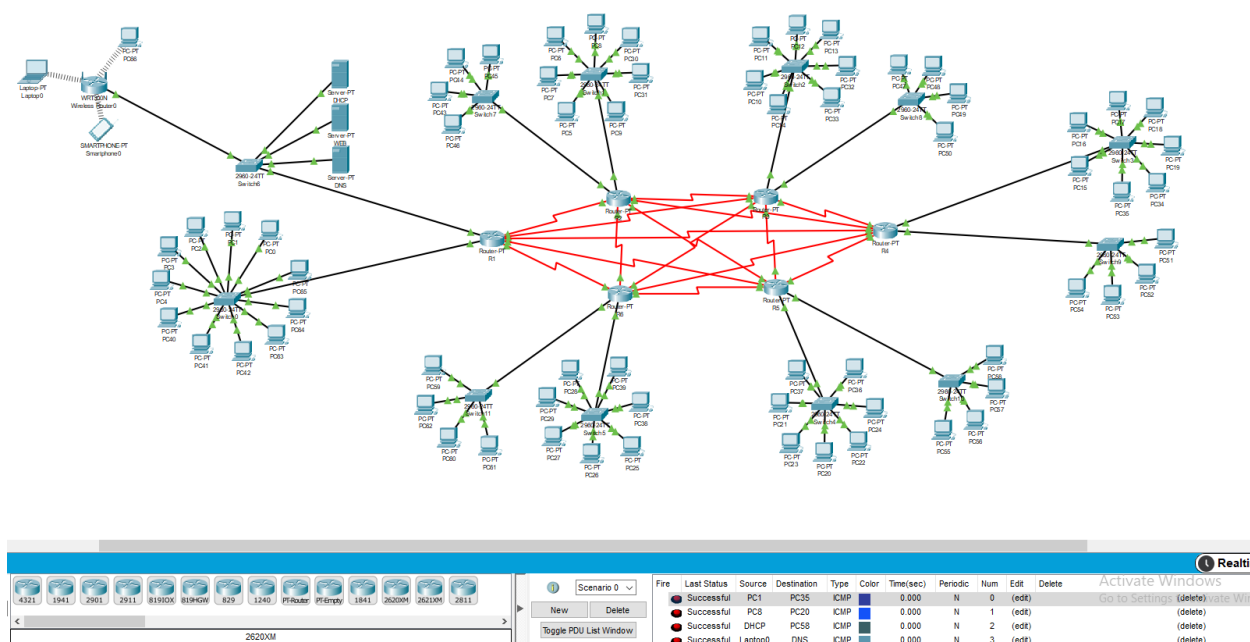
Networks have used between routers:

| Router 1 | Router 2 | Network    |
|----------|----------|------------|
| R1       | R2       | 120.1.0.0  |
| R1       | R3       | 120.2.0.0  |
| R1       | R4       | 120.3.0.0  |
| R1       | R5       | 120.4.0.0  |
| R1       | R6       | 120.5.0.0  |
| R2       | R3       | 120.9.0.0  |
| R2       | R4       | 120.8.0.0  |
| R2       | R5       | 120.7.0.0  |
| R2       | R6       | 120.6.0.0  |
| R3       | R4       | 120.12.0.0 |
| R3       | R5       | 120.11.0.0 |
| R3       | R6       | 120.10.0.0 |
| R4       | R5       | 120.14.0.0 |
| R4       | R6       | 120.13.0.0 |
| R5       | R6       | 120.15.0.0 |

### Networks have used between Router-Interfaces and Hosts:

| Router | Interface | Network       |
|--------|-----------|---------------|
| R1     | Fa0/0     | 192.168.10.64 |
| R1     | Fa1/0     | 192.168.10.32 |
| R2     | Fa0/0     | 128.0.10.0    |
| R2     | Fa1/0     | 128.0.11.0    |
| R3     | Fa0/0     | 128.0.20.0    |
| R3     | Fa1/0     | 128.0.21.0    |
| R4     | Fa0/0     | 128.0.30.0    |
| R4     | Fa1/0     | 128.0.31.0    |
| R5     | Fa0/0     | 128.0.40.0    |
| R5     | Fa1/0     | 128.0.41.0    |
| R6     | Fa0/0     | 128.0.50.0    |
| R6     | Fa1/0     | 128.0.51.0    |

## DESIGN TESTING



## LINES OF CODE

Codes for R1 (router) and R2 (router) interface initializing:

```
--Router 1
config t
interface se2/0
ip address 120.1.0.1 255.255.0.0
clock rate 64000
no shut
do wr
exit

config t
interface se6/0
ip address 120.2.0.1 255.255.0.0
clock rate 64000
no shut
do wr
exit

config t
interface se7/0
ip address 120.3.0.1 255.255.0.0
clock rate 64000
no shut
do wr
exit

config t
interface se8/0
ip address 120.4.0.1 255.255.0.0
clock rate 64000
no shut
do wr
exit

config t
interface se3/0
ip address 120.5.0.1 255.255.0.0
no shut
do wr
exit

config t
interface fa1/0
ip address 192.168.10.62 255.255.255.224
no shut
do wr
exit

config t
interface fa0/0
ip address 192.168.10.94 255.255.255.224
no shut
do wr
exit
```

```
--Router 2
config t
interface se2/0
ip address 120.1.0.2 255.255.0.0
no shut
do wr
exit

config t
interface se7/0
ip address 120.6.0.2 255.255.0.0
clock rate 64000
no shut
do wr
exit

config t
interface se8/0
ip address 120.7.0.2 255.255.0.0
clock rate 64000
no shut
do wr
exit

config t
interface se6/0
ip address 120.8.0.2 255.255.0.0
clock rate 64000
no shut
do wr
exit

config t
interface se3/0
ip address 120.9.0.2 255.255.0.0
clock rate 64000
no shut
do wr
exit

config t
interface fa0/0
ip address 128.0.10.254 255.255.255.0
no shut
do wr
exit

config t
interface fa1/0
ip address 128.0.11.254 255.255.255.0
no shut
do wr
exit
```

### Codes for R3 (router) and R4 (router) interface initializing:

```
--Router 3
config t
interface se2/0
ip address 120.9.0.3 255.255.0.0
no shut
do wr
exit

config t
interface se6/0
ip address 120.2.0.3 255.255.0.0
no shut
do wr
exit

config t
interface se8/0
ip address 120.10.0.3 255.255.0.0
clock rate 64000
no shut
do wr
exit

config t
interface se7/0
ip address 120.11.0.3 255.255.0.0
clock rate 64000
no shut
do wr
exit

config t
interface se3/0
ip address 120.12.0.3 255.255.0.0
clock rate 64000
no shut
do wr
exit

config t
interface fa0/0
ip address 128.0.20.254 255.255.255.0
no shut
do wr
exit

config t
interface fa1/0
ip address 128.0.21.254 255.255.255.0
no shut
do wr
exit
```

```
--Router 4
config t
interface se2/0
ip address 120.12.0.4 255.255.0.0
no shut
do wr
exit

config t
interface se7/0
ip address 120.8.0.4 255.255.0.0
no shut
do wr
exit

config t
interface se6/0
ip address 120.3.0.4 255.255.0.0
no shut
do wr
exit

config t
interface se8/0
ip address 120.13.0.4 255.255.0.0
clock rate 64000
no shut
do wr
exit

config t
interface se3/0
ip address 120.14.0.4 255.255.0.0
clock rate 64000
no shut
do wr
exit

config t
interface fa0/0
ip address 128.0.30.254 255.255.255.0
no shut
do wr
exit

config t
interface fa1/0
ip address 128.0.31.254 255.255.255.0
no shut
do wr
exit
```



### Codes for R5 (router) and R6 (router) interface initializing:

```
--Router 5
config t
interface se2/0
ip address 120.14.0.5 255.255.0.0
no shut
do wr
exit

config t
interface se7/0
ip address 120.11.0.5 255.255.0.0
no shut
do wr
exit

config t
interface se8/0
ip address 120.7.0.5 255.255.0.0
no shut
do wr
exit

config t
interface se6/0
ip address 120.4.0.5 255.255.0.0
no shut
do wr
exit

config t
interface se3/0
ip address 120.15.0.5 255.255.0.0
clock rate 64000
no shut
do wr
exit

config t
interface fa0/0
ip address 128.0.40.254 255.255.255.0
no shut
do wr
exit

config t
interface fa1/0
ip address 128.0.41.254 255.255.255.0
no shut
do wr
exit
```

```
--Router 6
config t
interface se2/0
ip address 120.15.0.6 255.255.0.0
no shut
do wr
exit

config t
interface se7/0
ip address 120.13.0.6 255.255.0.0
no shut
do wr
exit

config t
interface se6/0
ip address 120.10.0.6 255.255.0.0
no shut
do wr
exit

config t
interface se8/0
ip address 120.6.0.6 255.255.0.0
no shut
do wr
exit

config t
interface se3/0
ip address 120.5.0.6 255.255.0.0
clock rate 64000
no shut
do wr
exit

config t
interface fa0/0
ip address 128.0.50.254 255.255.255.0
no shut
do wr
exit

config t
interface fa1/0
ip address 128.0.51.254 255.255.255.0
no shut
do wr
exit
```

### Codes for R1 (router) and R2 (router) routing to other networks:

```

---Router 1
config t
ip route 120.9.0.0 255.255.0.0 120.1.0.2
ip route 120.8.0.0 255.255.0.0 120.1.0.2
ip route 120.7.0.0 255.255.0.0 120.1.0.2
ip route 120.6.0.0 255.255.0.0 120.1.0.2
ip route 120.10.0.0 255.255.0.0 120.2.0.3
ip route 120.11.0.0 255.255.0.0 120.2.0.3
ip route 120.12.0.0 255.255.0.0 120.2.0.3
ip route 120.13.0.0 255.255.0.0 120.3.0.4
ip route 120.14.0.0 255.255.0.0 120.3.0.4
ip route 120.15.0.0 255.255.0.0 120.4.0.5
ip route 128.0.10.0 255.255.255.0 120.1.0.2
ip route 128.0.20.0 255.255.255.0 120.2.0.3
ip route 128.0.30.0 255.255.255.0 120.3.0.4
ip route 128.0.40.0 255.255.255.0 120.4.0.5
ip route 128.0.50.0 255.255.255.0 120.5.0.6
ip route 128.0.11.0 255.255.255.0 120.1.0.2
ip route 128.0.21.0 255.255.255.0 120.2.0.3
ip route 128.0.31.0 255.255.255.0 120.3.0.4
ip route 128.0.41.0 255.255.255.0 120.4.0.5
ip route 128.0.51.0 255.255.255.0 120.5.0.6
exit

```

```

---Router 2
config t
ip route 120.2.0.0 255.255.0.0 120.9.0.3
ip route 120.10.0.0 255.255.0.0 120.9.0.3
ip route 120.11.0.0 255.255.0.0 120.9.0.3
ip route 120.12.0.0 255.255.0.0 120.9.0.3
ip route 120.3.0.0 255.255.0.0 120.8.0.4
ip route 120.13.0.0 255.255.0.0 120.8.0.4
ip route 120.14.0.0 255.255.0.0 120.8.0.4
ip route 120.4.0.0 255.255.0.0 120.7.0.5
ip route 120.15.0.0 255.255.0.0 120.7.0.5
ip route 120.5.0.0 255.255.0.0 120.6.0.6
ip route 192.168.10.32 255.255.255.224 120.1.0.1
ip route 192.168.10.64 255.255.255.224 120.1.0.1
ip route 128.0.20.0 255.255.255.0 120.9.0.3
ip route 128.0.30.0 255.255.255.0 120.8.0.4
ip route 128.0.40.0 255.255.255.0 120.7.0.5
ip route 128.0.50.0 255.255.255.0 120.6.0.6
ip route 128.0.21.0 255.255.255.0 120.9.0.3
ip route 128.0.31.0 255.255.255.0 120.8.0.4
ip route 128.0.41.0 255.255.255.0 120.7.0.5
ip route 128.0.51.0 255.255.255.0 120.6.0.6
exit

```

### Codes for R3 (router) and R4 (router) routing to other networks:

```

---Router 3
config t
ip route 120.1.0.0 255.255.0.0 120.9.0.2
ip route 120.6.0.0 255.255.0.0 120.9.0.2
ip route 120.7.0.0 255.255.0.0 120.9.0.2
ip route 120.8.0.0 255.255.0.0 120.9.0.2
ip route 120.3.0.0 255.255.0.0 120.2.0.1
ip route 120.4.0.0 255.255.0.0 120.2.0.1
ip route 120.5.0.0 255.255.0.0 120.2.0.1
ip route 120.13.0.0 255.255.0.0 120.10.0.6
ip route 120.15.0.0 255.255.0.0 120.10.0.6
ip route 120.14.0.0 255.255.0.0 120.11.0.5
ip route 192.168.10.32 255.255.255.224 120.1.0.1
ip route 192.168.10.64 255.255.255.224 120.1.0.1
ip route 128.0.10.0 255.255.255.0 120.9.0.2
ip route 128.0.30.0 255.255.255.0 120.12.0.4
ip route 128.0.40.0 255.255.255.0 120.11.0.5
ip route 128.0.50.0 255.255.255.0 120.10.0.6
ip route 128.0.11.0 255.255.255.0 120.9.0.2
ip route 128.0.31.0 255.255.255.0 120.12.0.4
ip route 128.0.41.0 255.255.255.0 120.11.0.5
ip route 128.0.51.0 255.255.255.0 120.10.0.6
exit

```

```

---Router 4
config t
ip route 120.9.0.0 255.255.0.0 120.12.0.3
ip route 120.2.0.0 255.255.0.0 120.12.0.3
ip route 120.10.0.0 255.255.0.0 120.12.0.3
ip route 120.11.0.0 255.255.0.0 120.12.0.3
ip route 120.1.0.0 255.255.0.0 120.8.0.2
ip route 120.6.0.0 255.255.0.0 120.8.0.2
ip route 120.7.0.0 255.255.0.0 120.8.0.2
ip route 120.4.0.0 255.255.0.0 120.3.0.1
ip route 120.5.0.0 255.255.0.0 120.3.0.1
ip route 120.15.0.0 255.255.0.0 120.13.0.6
ip route 192.168.10.32 255.255.255.224 120.3.0.1
ip route 192.168.10.64 255.255.255.224 120.3.0.1
ip route 128.0.10.0 255.255.255.0 120.8.0.2
ip route 128.0.20.0 255.255.255.0 120.12.0.3
ip route 128.0.40.0 255.255.255.0 120.14.0.5
ip route 128.0.50.0 255.255.255.0 120.13.0.6
ip route 128.0.11.0 255.255.255.0 120.8.0.2
ip route 128.0.21.0 255.255.255.0 120.12.0.3
ip route 128.0.41.0 255.255.255.0 120.14.0.5
ip route 128.0.51.0 255.255.255.0 120.13.0.6
exit

```

### Codes for R5 (router) and R6 (router) routing to other networks:

```

---Router 5
config t
ip route 120.12.0.0 255.255.0.0 120.14.0.4
ip route 120.8.0.0 255.255.0.0 120.14.0.4
ip route 120.3.0.0 255.255.0.0 120.14.0.4
ip route 120.13.0.0 255.255.0.0 120.14.0.4
ip route 120.9.0.0 255.255.0.0 120.11.0.3
ip route 120.2.0.0 255.255.0.0 120.11.0.3
ip route 120.10.0.0 255.255.0.0 120.11.0.3
ip route 120.1.0.0 255.255.0.0 120.7.0.2
ip route 120.6.0.0 255.255.0.0 120.7.0.2
ip route 120.5.0.0 255.255.0.0 120.4.0.1
ip route 192.168.10.32 255.255.255.224 120.4.0.1
ip route 192.168.10.64 255.255.255.224 120.4.0.1
ip route 128.0.10.0 255.255.255.0 120.7.0.2
ip route 128.0.20.0 255.255.255.0 120.11.0.3
ip route 128.0.30.0 255.255.255.0 120.14.0.4
ip route 128.0.50.0 255.255.255.0 120.15.0.6
ip route 128.0.11.0 255.255.255.0 120.7.0.2
ip route 128.0.21.0 255.255.255.0 120.11.0.3
ip route 128.0.31.0 255.255.255.0 120.14.0.4
ip route 128.0.51.0 255.255.255.0 120.15.0.6
exit

```

```

---Router 6
config t
ip route 120.14.0.0 255.255.0.0 120.14.0.4
ip route 120.11.0.0 255.255.0.0 120.14.0.4
ip route 120.7.0.0 255.255.0.0 120.14.0.4
ip route 120.4.0.0 255.255.0.0 120.14.0.4
ip route 120.3.0.0 255.255.0.0 120.11.0.3
ip route 120.8.0.0 255.255.0.0 120.11.0.3
ip route 120.12.0.0 255.255.0.0 120.11.0.3
ip route 120.9.0.0 255.255.0.0 120.7.0.2
ip route 120.2.0.0 255.255.0.0 120.7.0.2
ip route 120.1.0.0 255.255.0.0 120.4.0.1
ip route 192.168.10.32 255.255.255.224 120.5.0.1
ip route 192.168.10.64 255.255.255.224 120.5.0.1
ip route 128.0.10.0 255.255.255.0 120.6.0.2
ip route 128.0.20.0 255.255.255.0 120.10.0.3
ip route 128.0.30.0 255.255.255.0 120.13.0.4
ip route 128.0.40.0 255.255.255.0 120.15.0.5
ip route 128.0.11.0 255.255.255.0 120.6.0.2
ip route 128.0.21.0 255.255.255.0 120.10.0.3
ip route 128.0.31.0 255.255.255.0 120.13.0.4
ip route 128.0.41.0 255.255.255.0 120.15.0.5
exit

```

### Automatic IP addressing of hosts by DHCP for different interfaces of routers:

```

config t
interface (fastethernet interface of router)
ip helper-address 192.168.10.33
exit

```

## **LIMITATION**

- Wireless Device can only be used to check the website
- For each sector there is only one host instead of showing the all host like for multiple classroom hosts there is only one host had been shown
- From WEB Server user cannot get any service without accessing the website
- The design is not ready to use for practical scenario

## **CONCLUSION**

To design the network outlook for the university produces the base for all other important services like security of the network, wireless area network, operational efficiencies, secure classrooms etc. This design can be implemented by the other enterprises with similar design. Though it does not highlight the practical design for real life uses still it can be developed more by pushing the design with more complex network relevant to reality.