Design and Simulation of Campus Area Network Using Cisco Packet Tracer

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Abstract: Today, the importance of information and accessing information is increasing rapidly. With the advancement of technology, computers have entered in many areas of our lives. Computer networks and communication fields have become extremely important in our society. A campus area network is a very important part of campus life. Campus area network is a set of virtual local area network (VLAN), which covers the entire campus. It supports difference service such as connect user to internet, data sharing among user, accessing different web service for different functionalities. So, in this paper, to design the campus area network using a network simulator tool i.e. Cisco Packet Tracer.

Keywords: Router, Switch, Server, Simulation tool, VLAN, Smart Device

1. INTRODUCTION

Nowadays network is a strategic instrument that must be accessible anytime from anywhere. Computer network can be defined as a number of computer systems and other computing hardware devices that linked together for sharing information within an organization in form massages, sharing files, databases and so forth that may be in one building or spread over large campus [2][6][7].

Campus area network design is proposed the method to design campus network by networking device, to facilitate different activities in campus network. This design includes hierarchical network design, it is used to cluster devices into multiple networks layers [1]. The networks are structured in a layered approach, those are core layer, distribution layer and access layer. Each layer has their own functionalities that are core layer: connect distribution layer to the internet, distribution layer: interconnects the smaller local networks, access layer: provides connectivity for network hosts, smart things and end devices.

In this paper, a campus area network is designed using Cisco Packet Tracer (CPT). Cisco Packet Tracer is a multi-tasking network simulation software[8][9] that can be used to perform and analyze various network activities such as implementation of different topologies, select optimum path based on various routing algorithms, creation of suitable servers, sub netting and analyze various network configuration and troubleshooting commands[5]. In order to start communication between end user devices and to design a network, we need to select appropriate networking devices [3][4] like routers, switches and make physical connection by connection cables to serial and Fast Ethernet ports from the component list of packet tracer. Networking devices are costly so it is better to perform first on packet tracer to understand the concept and behavior of networking.

2. PROPOSED SYSTEM

In this proposed system we design a campus area network design for the better use of network components in the campus. Thus, we use network device like routers, switches, access points, servers, end devices like computers laptops etc. According to the network environment, we can draw the campus area network topology. Among them, we use the router to connect with the Internet. The configurations to be made on the switch are, making some ports access ports and configuring a default-gateway, creating VLANs and assigning switch ports to the VLANs. The campus area network topology is shown in figure 1. This system used of hierarchical design make the network structure clear, can be implemented at different levels of different difficultly management, reducing management costs.

3. IMPLEMENTATION OF THE CAMPUS AREA NETWORK

To implement campus network design different networking devices used are router (used to connect campus area network to the internet), layer 2 and layer 3 switches (used to distribute access to the lower layer and used to perform inter-VLAN routing), central office server (used to connected cellular system to the router), cell tower (provide cellular system coverage for different user), some smart devices (smart phone, tablet and so on), hosts (PC) (connect to access layer) and cables also included in this design using cisco packet tracer. The following figure shows the logical network diagram that connected each other using wireless and wireless medium.

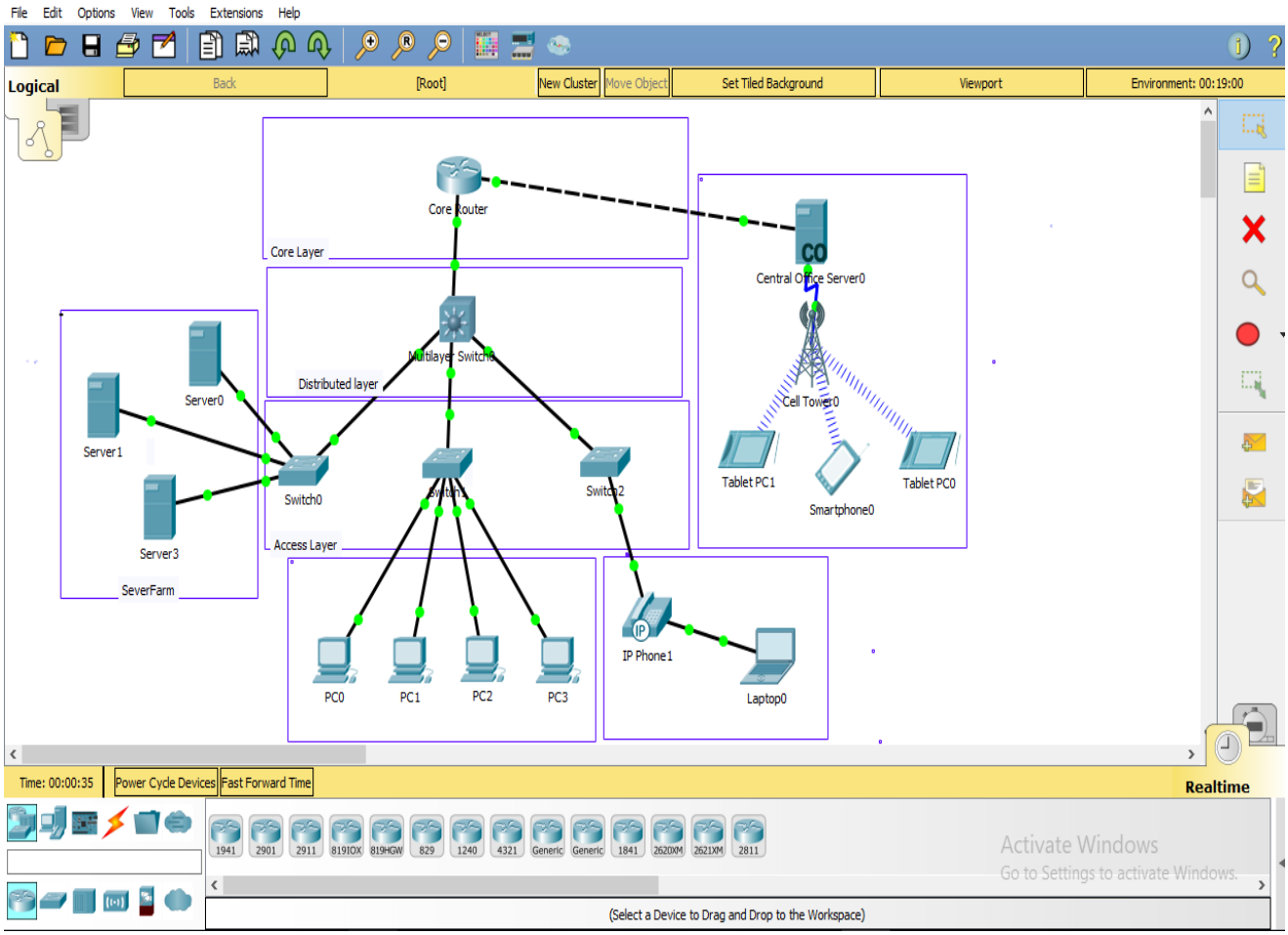

Figure 1. Campus Area Network Architecture

3.1 Device Configuration and Setup

To implement the campus area network design on here using class A IP address that is 10.10.10.0/24 subnet. After configuration is done the device get IP address dynamically. The hierarchical design is used to group devices into multiple layers, and hence we have been effectively used the hierarchical design. and finally to design the proposed system, the cisco packet tracer simulator software is been used.

3.1.1 Core Router Configuration

```
Building configuration...
Current configuration : 1015 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname CoreRouter
!
ip dhcp excluded-address 209.165.10.225 209.165.10.229
!
ip dhcp pool OK
network 209.165.10.224 255.255.255.224
default-router 209.165.10.225
dns-server 10.10.10.50
!
ip cef
no ipv6 cef
!
license udi pid CISCO1941/K9 sn FTX1524JT5G
spanning-tree mode pvst
!
interface GigabitEthernet0/0
ip address 10.10.10.1 255.255.255.224
duplex auto
speed auto
!
interface GigabitEthernet0/1
ip address 209.165.10.225 255.255.255.224
duplex auto
speed auto
!
interface Vlan1
no ip address
shutdown
!
ip classless
ip route 10.10.10.0 255.255.255.0 10.10.10.2
ip route 10.10.10.0 255.255.255.224 10.10.10.2
!
ip flow-export version 9
!
line con 0
password 7 0822455D0A16
login
!
line aux 0
```

```
!
line vty 0 4
password 7 0822455D0A16
login local
line vty 5 15
password 7 0822455D0A16
login local
!
end
```

3.1.2 Distribution Layer Device: Multilayer Switch Configuration

```
Building configuration...
Current configuration : 2556 bytes
!
version 12.2(37)SE1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname MultilayerSwitch
!
ip dhcp excluded-address 10.10.10.96 10.10.10.99
ip dhcp excluded-address 10.10.10.128 10.10.10.130
ip dhcp excluded-address 10.10.10.33 10.10.10.35
ip dhcp excluded-address 10.10.10.64 10.10.10.68
!
ip dhcp pool Student
network 10.10.10.96 255.255.255.224
default-router 10.10.10.97
dns-server 10.10.10.50
ip dhcp pool Guest
network 10.10.10.128 255.255.255.224
default-router 10.10.10.129
dns-server 10.10.10.50
ip dhcp pool ServerFarm
network 10.10.10.32 255.255.255.224
default-router 10.10.10.33
dns-server 10.10.10.50
ip dhcp pool Admin
network 10.10.10.64 255.255.255.224
default-router 10.10.10.65
dns-server 10.10.10.50
!
spanning-tree mode pvst
!
interface FastEthernet0/1
!
interface FastEthernet0/2
switchport access vlan 10
switchport mode access
switchport nonegotiate
!
interface FastEthernet0/3
switchport access vlan 20
switchport mode access
switchport nonegotiate
!
interface FastEthernet0/4
```

```
switchport access vlan 30
switchport mode access
switchport nonegotiate
!
interface FastEthernet0/5
switchport access vlan 40
switchport mode access
switchport nonegotiate
!
interface Vlan1
no ip address
shutdown
!
interface Vlan10
mac-address 0002.16a4.4c01
ip address 10.10.10.33 255.255.255.224
!
interface Vlan20
mac-address 0002.16a4.4c02
ip address 10.10.10.65 255.255.255.224
!
interface Vlan30
mac-address 0002.16a4.4c03
ip address 10.10.10.97 255.255.255.224
!
interface Vlan40
mac-address 0002.16a4.4c04
ip address 10.10.10.129 255.255.255.224
!
ip classless
ip route 209.165.10.224 255.255.255.224 10.10.10.1
!
ip flow-export version 9
!
line con 0
password cisco
login
!
line aux 0
!
line vty 0 4
password cisco
login
line vty 5 15
password cisco
login
!
end
```

3.1.3 Phone Configuration

The configuration of telephone service must be defined the maximum number of the directory numbers, maximum number of phone IP address source, automatically assign number to bottom phones and gave the number of each phone.

```
Telephony-service
telephony-service
max-dn5
```

```
ip source-address 10.10.10.100 port 2000
auto assign 1 to 10
!
ephone-dn 1
number 12345
!
```

3.1.4 Device Setup

After configuration is done the device get IP address dynamically.

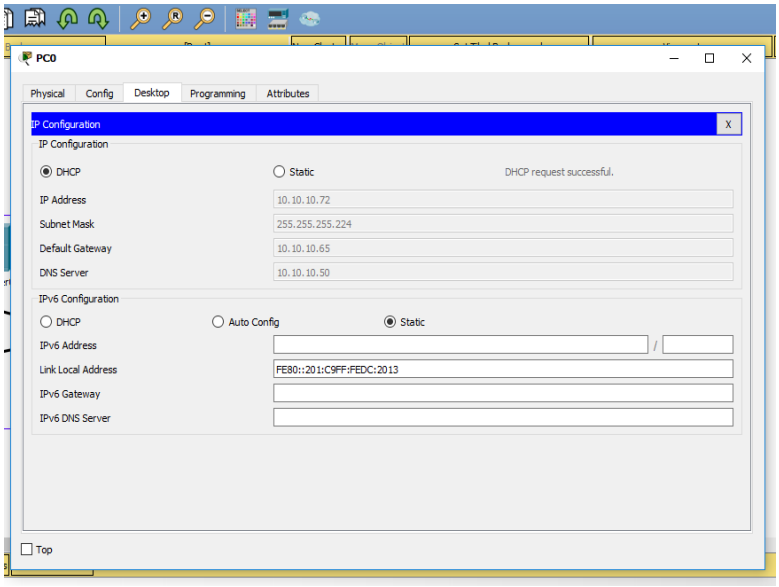

Figure 2. PC Gets Dynamically IP Address

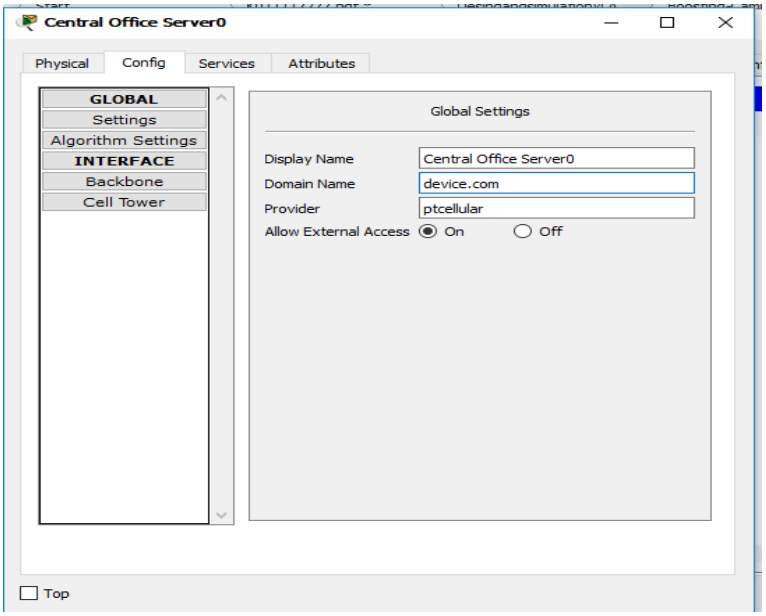

Figure 3. Central office server configuration

IV. CONCLUSION

In this paper described campus area network design approved by network device using Cisco packet tracer simulator software. This design also the hierarchical network design as a hierarchical design is used to group device into multiple layers. This is easily achievable as network scalability and performance using the hierarchical design, which has been adequately provided for**.**

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