

CAMPUS NETWORK ARCHITECTURE USING CISCO PACKET TRACER

Akshay Ziradkar¹, Neha Mahendrakar², Akshay Palande³, Prof. Rajashri Sonawale⁴

^{1,2,3}Student, Dept. of Computer Engineering, M.G.M. College of Engineering and Technology, Kamothe, Maharashtra, India

⁴Prof. Dept. of Computer Engineering, M.G.M College of Engineering and Technology, Kamothe, Maharashtra, India

Abstract - A Campus network is an important part of campus life and network security is essential for a campus. Campus network faces challenges to address core issues of security which are governed by network architecture. Secured network protects an institution from security attacks associated with network. A college network has a number of uses, such as teaching, learning, research, management, e-library, result publishing and connection with the external users. Network security will prevent the college network from different types of threats and attacks. A hierarchical architecture of the campus network is configured with different types of security issues for ensuring the quality of service. In this project, a tested and secure network design is proposed based on the practical requirements and this proposed network infrastructure is realizable with adaptable infrastructure.

Keywords: - Campus Network, Security, LAN, WAN, Security Threats, Network Attacks, VPN, DHCP, OSPF.

1. INTRODUCTION

This College Network Architecture is about designing a topology of a network that is a LAN (Local Area Network) for a College in which various computers of different departments are set up so that they can interact and communicate with each other by interchanging data. To design a networking architecture for a college which connect various departments to each other's, it puts forward communication among different departments. CNA is used to design a systematic and well-planned topology, satisfying all the necessities of the college (i.e. client). CNA come up with a network with good performance. CNA is also providing security and authentication to forbid unauthorized logins. Cisco Packet Tracer (CPT) is a multi-tasking network simulation software that can be used to perform and analyze various network activities such as implementation of different topologies, selection of optimum path based on various routing algorithms, creation of appropriate servers, subnetting, and analysis of various network configuration and troubleshooting commands. In order to start communication between end user devices and to design a network, we need to select appropriate networking devices like routers, switches, make physical connection by connecting 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 the network.

2. PROBLEM STATEMENT

When network device communicates with many other devices, the workload required of the CPUs on the device can be burdensome. For example, in a large flat (switched) network, broadcast packets are burdensome. As such the modular nature of the hierarchical design model is to enable accurate capacity planning within each layer of the hierarchy, thus reducing wasted bandwidth. Network management responsibility and network management system should be distributed to the different layers of a modular network architecture to control management costs.

3. METHODOLOGY

In order to design campus network, I used Cisco packet tracer. Packet Tracer is based on three learning principles: learning is active, learning is social, and learning is contextual. Hence, it is meant to facilitate the creation of engaging, collaborative, and localized instructional materials. Packet Tracer may be used in a variety of ways:

- Group work
- Class work, Homework, and Distance Learning
- Formative assessment
- Hands-on lab reinforcement
- Lecture demonstrations
- Modeling and visualization of networking device algorithms and networking protocols

- Case studies
- Multi-user cooperative and competitive activities
- Competitions
- Problem-solving activities in concept-building, skill-building, design, and troubleshooting.

Four problem types are well-supported by Packet Tracer:

- Concept-builders (model-building inquiries leading to student-created explanations and animations of networking concepts)
- Skill-builders (algorithmic problem solving in support of the development of networking procedural knowledge)
- Design challenges (constraint-based problems with multiple correct solutions)
- Troubleshooting challenges (diagnosing, isolating, and fixing the simulated network from a previously bugged network file)

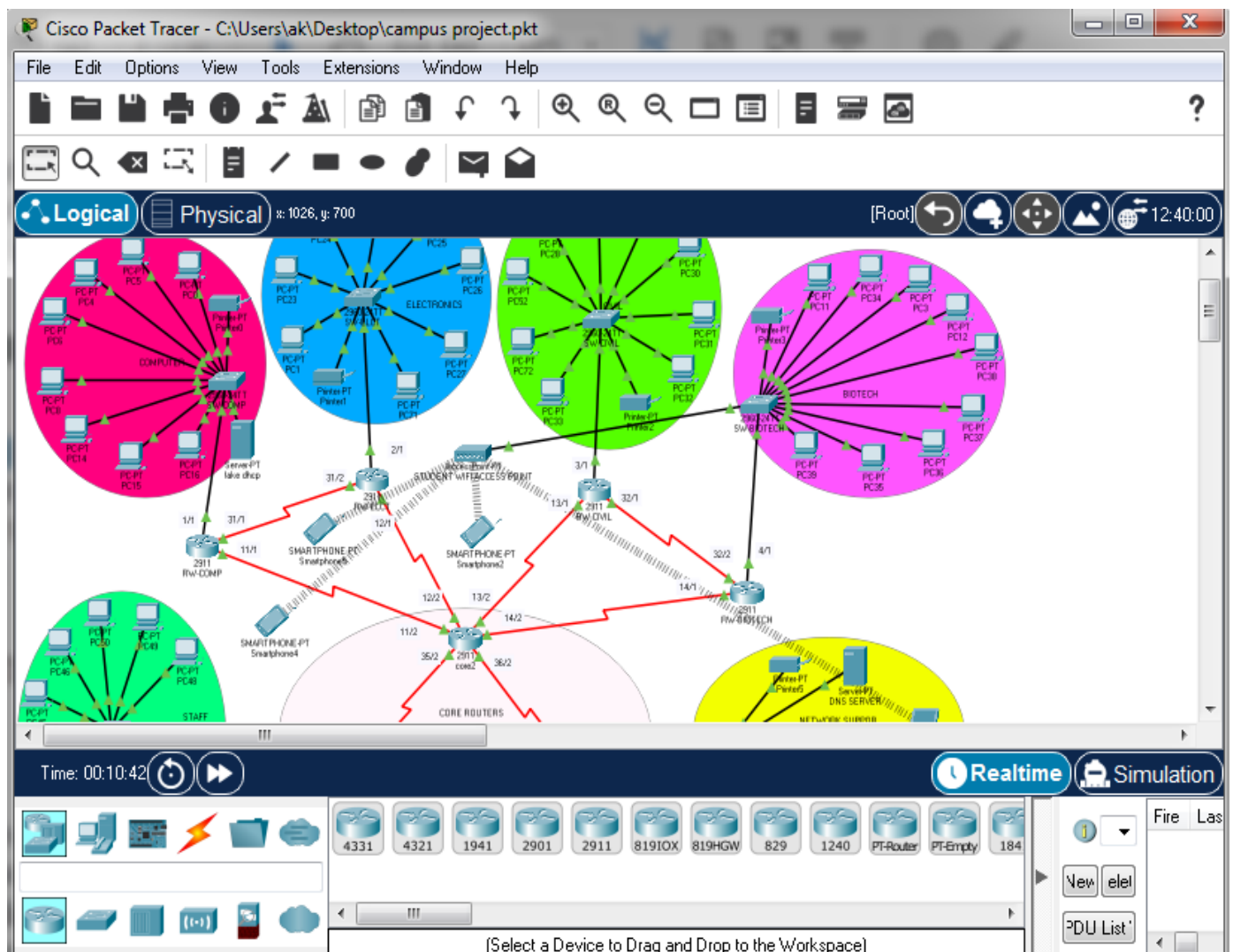


Fig. 1: First Lookup of Cisco Packet Tracer

4. IMPLEMENTATION

To implement campus network design, different networking device are used, those devices are Cisco 2911 router, Cisco 2811 router, 2960 switch, DHCP server, DNS server, Cisco Access Point PT, Computers, Laptops, Wireless Printers and Smartphone's, CAT 5 Serial cables, CAT 5 Cross cables & CAT 5 Straight through cable also included in this design. Furthermore, about the device is elaborated in table 1.

Table -1: Device Used for Design

NO	DEVICE	FUNCTION
1	Cisco 2911 router	Core connection
2	Cisco 2811 router	Outdoor & ISP
3	Cisco 2960 switch	Department connection
4	DHCP server	DHCP Access
5	DNS server	College website access
6	Cisco Access Point	Wi-Fi Access
7	Computers	User Access
8	Laptops	User Access
9	Wireless Printers	User Access
10	CAT5 SERIAL,CROSS, STRIGHT CABLE	LAN Connectivity

4.1 PROPOSED ARCHITECTURE

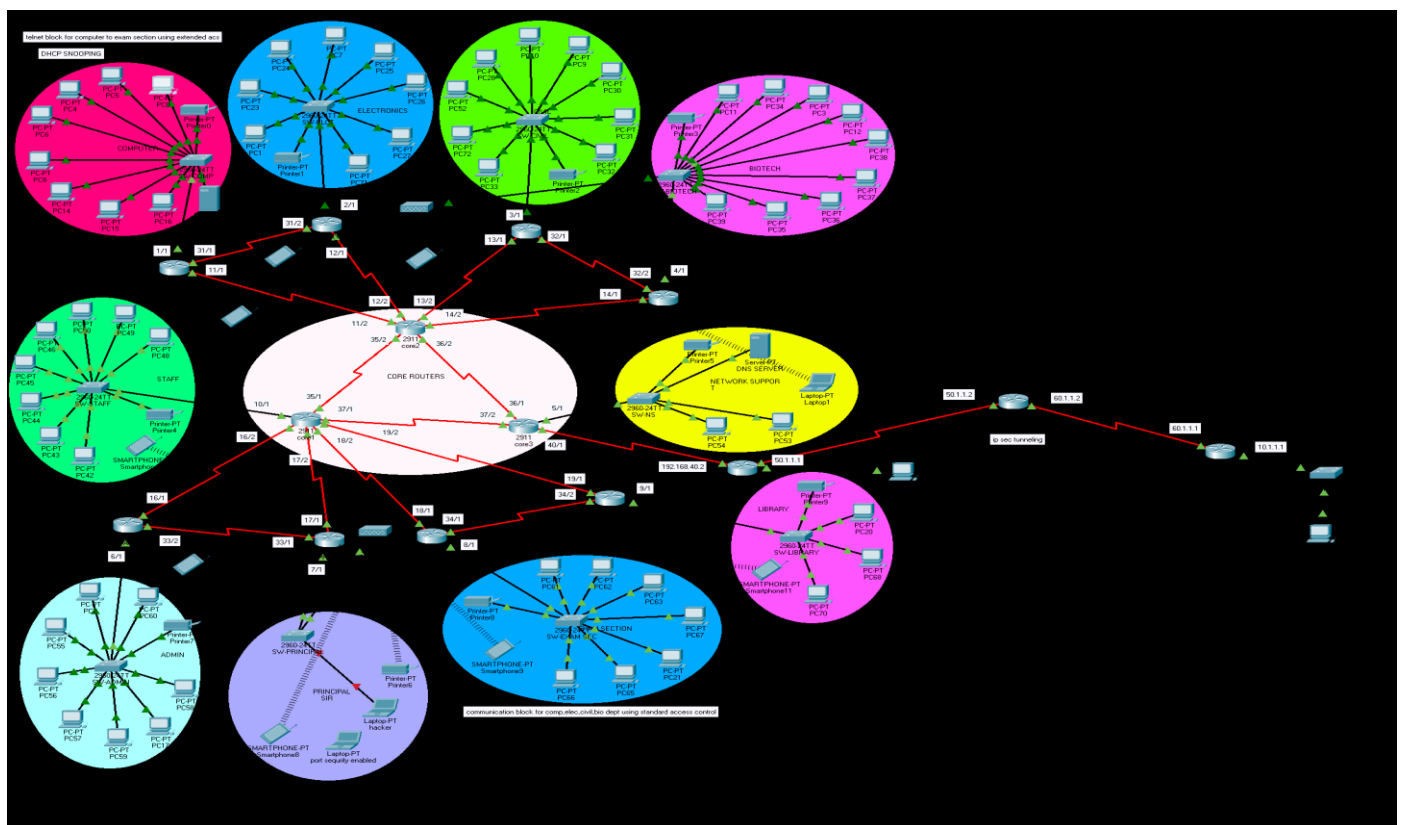


Fig. 2: Network Architecture Design

4.2 Device Configuration

To implement the campus network design on Cisco packer tracer, I used class C IP address that is 192.168.0.0/24 subnet and this subnet divided into eight subnets from these eight subnets, I used four of them and the rest are reserved for future scalability.

• Core Router

Current configuration : 2157 bytes

```
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption

!
hostname RW-CORE_2

!
enable password mgmctet
!
no ip cef
no ipv6 cef
!
username admin password 0 mgmctet
!
license udi pid CISCO2911/K9 sn FTX1524JPU6-

!
ip ssh version 2
ip domain-name mgmctet.in
!
spanning-tree mode rapid-pvst
spanning-tree portfast default
!
interface GigabitEthernet0/0
no ip address
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/2
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
```

```
ip address 192.168.11.2 255.255.255.0
clock rate 2000000
!
interface Serial0/0/1
ip address 192.168.12.2 255.255.255.0
clock rate 2000000
!
interface Serial0/1/0
ip address 192.168.13.2 255.255.255.0
!
interface Serial0/1/1
ip address 192.168.14.2 255.255.255.0
!
interface Serial0/2/0
ip address 192.168.36.2 255.255.255.0
clock rate 2000000
!
interface Serial0/2/1
ip address 192.168.35.2 255.255.255.0
clock rate 2000000
!
interface Vlan1
no ip address
shutdown
!
router ospf 1
log-adjacency-changes
network 192.168.11.0 0.0.0.255 area 0
network 192.168.12.0 0.0.0.255 area 0
network 192.168.13.0 0.0.0.255 area 0
network 192.168.14.0 0.0.0.255 area 0
network 192.168.35.0 0.0.0.255 area 0
network 192.168.36.0 0.0.0.255 area 0
network 192.168.50.0 0.0.0.255 area 0
!
ip classless
!
ip flow-export version 9
!
!
no cdp run
!
banner motd ^C
#####
#####
#####
#####

YOU ARE ACCESSING A RESTRICTED SYSTEM.
DISCONNECT IMMEDIATELY IF YOU ARE NOT AN
AUTHORISED USER!
```

```
#####  
#####  
#####  
#####^C  
!  
line con 0  
password mgmctet  
login  
!  
line aux 0  
!  
line vty 0 3  
password mgmctet  
login  
line vty 4  
password mgmctet  
login local  
line vty 5 15  
password mgmctet  
login  
!  
end
```

• Distribution Layer Device Switch

```
Current configuration : 1922 bytes  
!  
version 12.2  
no service timestamps log datetime msec  
no service timestamps debug datetime msec  
no service password-encryption  
!  
hostname SW-COMPUTER  
!  
enable secret 5 $1$mErR$1YR/p/HarXPXMi.bwfKRp1  
!  
ip ssh version 2  
ip domain-name mgmctet.in  
!  
username admin privilege 1 password 0 mgmctet  
!  
!  
no ip dhcp snooping information option  
ip dhcp snooping  
!  
spanning-tree mode pvst  
spanning-tree portfast default  
spanning-tree extend system-id  
!  
interface FastEthernet0/1  
!  
interface FastEthernet0/2  
!  
interface FastEthernet0/3  
!  
interface FastEthernet0/4  
!
```

```
interface GigabitEthernet0/1  
ip dhcp snooping trust  
!  
interface GigabitEthernet0/2  
switchport mode trunk  
!  
interface Vlan1  
ip address 192.168.1.10 255.255.255.0  
!  
ip default-gateway 192.168.1.1  
!  
banner motd ^C  
#####  
#####  
#####  
#####  
  
YOU ARE ACCESSING A RESTRICTED SYSTEM.  
DISCONNECT IMMEDIATELY IF YOU ARE NOT AN  
AUTHORISED USER!  
  
#####  
#####  
#####  
#####^C  
!  
!  
!  
!  
!  
line con 0  
password mgmctet  
login  
!  
!  
!  
!  
!  
line vty 0 3  
password mgmctet  
login  
line vty 4  
password mgmctet  
login local  
line vty 5 15  
password mgmctet  
login  
!  
!  
end
```

• **Device Setup**

After configuration is done the device get IP address dynamically and IOE device registered to IOE server or home gateway.

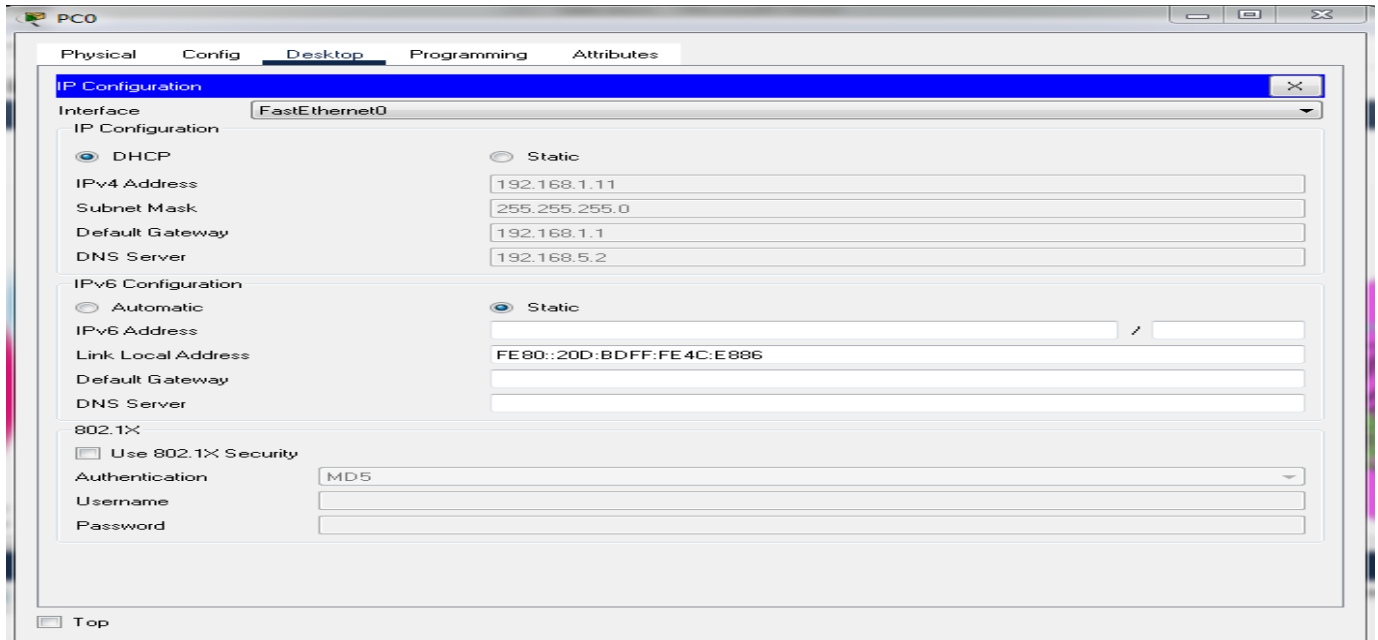


Fig. 3: Dynamic IP address Access

• **Access Point Connection**

After configuration done Smartphone will able to access wireless network.

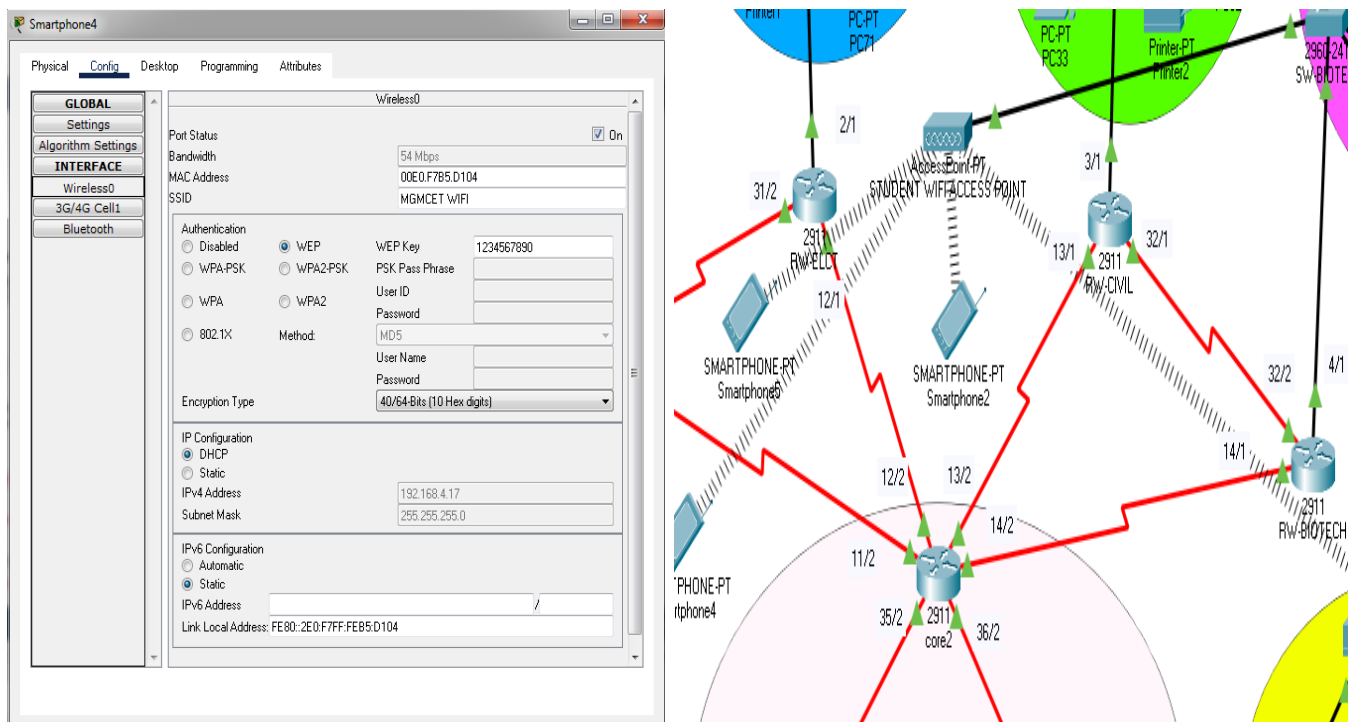


Fig. 4: Wireless Network Access through Smartphone

- **DNS ACCESS**

DNS Access through computer web browser.

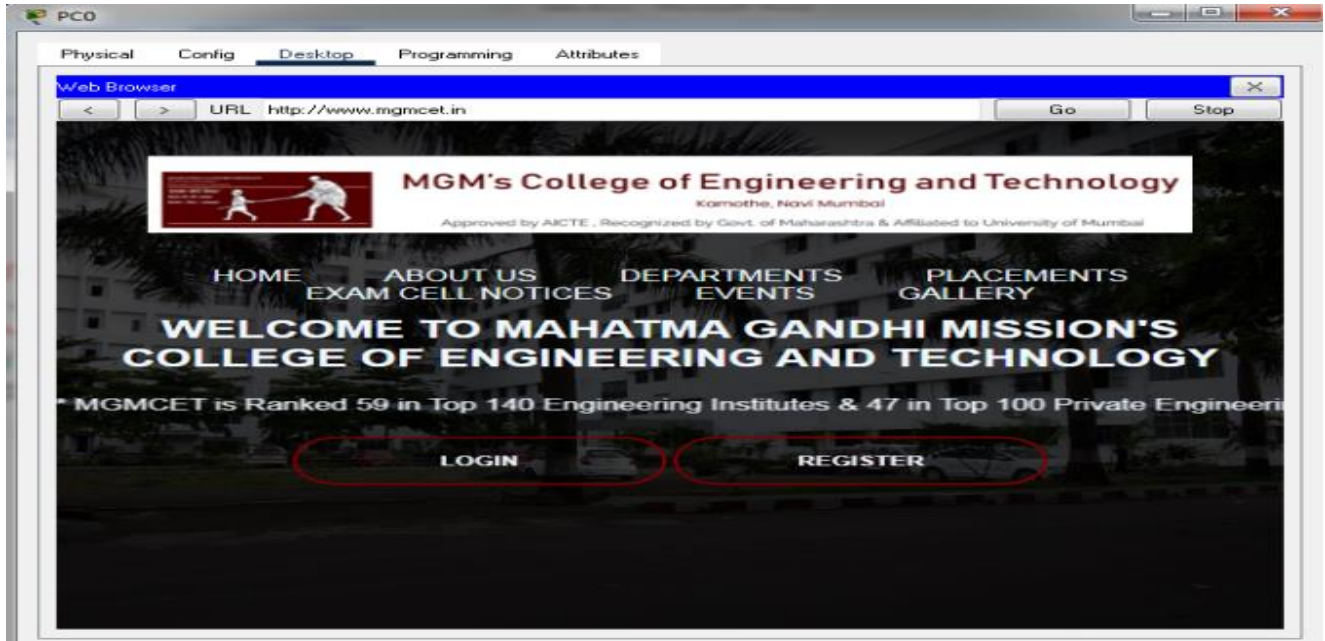


Fig. 5: DNS Access

5. CONCLUSION

To improve the campus network service, this paper proposed Campus Architecture Design by assimilating internet of thing device with classically network device. Each smart device registered to IOT server or home getaway and controlled by legitimate user. This design also include Hierarchical Network Design as a hierarchical design is used to group devices into multiple layers. This paper also presents about interconnect different IOE device and control them by coding. To design the proposed campus network design, I used Cisco packet tracer simulator software.

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