# DESIGN AND CONFIGURATION OF WIRED AND WIRELESS LOCAL AREA NETWORK USING CISCO PACKET TRACER

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**ABSTRACT**

*Wired and wireless local area networks are widely used in university, library, coffee shop, hotel and enterprise networks to support network policies. The concepts of wired and wireless, advantages and disadvantages, main ideas, operations, applications and configurations are expressed. In wired local area network, DHCP, HTTP and HTTPS can be implemented on small local networks as well as large enterprise networks. Ethernet and Wi-Fi are the two main categories to enable LAN connections. Ethernet is connecting multiple devices such as computers, switches and routers provide a simple interface. Wi-Fi technologies can connect to the internet via an access point include desktops and laptops, smartphones and tablets. IEEE 802.3 is the standards for Ethernet and IEEE 802.11 is the standards for Wi-Fi.*

**Keyword:** - *DHCP, HTTP, HTTPS, Ethernet, Wi-Fi, IEEE 802.3 and IEEE 802.11.*

## 1. INTRODUCTION

Computer networks can be divided into two categories, local area networks (LANs) and wide area networks (WANs). Local area networks (LANs) are a group of computes and associated devices that share a common communication line or wireless link to a server. Cables, routers, switches and other components connect to internal servers and other local area network (LANs) via wide area networks (WANs).

DHCP (Dynamic Host Configuration Protocol) used to dynamically assign an Internet Protocol address to any device on a network can communicate using IP. HTTPS (Hypertext Transfer Protocol Secure) is an extension of HTTP (Hypertext Transfer Protocol) used for secure communication over a network and encrypted TLS (Transport Layer Security) or SSL (Secure Sockets Layer).

Cisco Packet Tracer is a multi-tasking network simulation software that can be used to perform and analyze various network activities such as implementation of different topologies allowed users to simulate the complete network by adding and connecting difference network devices. The configuration of cisco router used command line interface.

## 2.WIRED LOCAL AREA NETWORKS

Wired networks (Ethernet networks) are the most common type of local area network (LAN). Four common LAN topologies are bus, tree, ring and star.

### 2.1 Bus

Bus topology is characterized by the use of a multipoint medium. All stations attach, through appropriate hardware interfacing called a tap, directly to a linear transmission medium. Full duplex operation between the station and the tap allows data to be transmitted onto the bus and received from the bus.
A transmission from any station propagates the length of the medium in both directions and can be received by all other stations. At each end of the bus is a terminator, absorbs any signal, removing it from the bus.

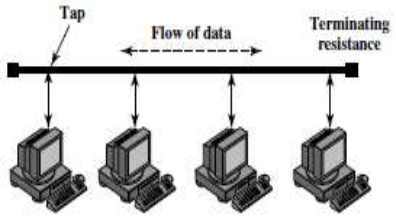



**Fig-1 Bus**

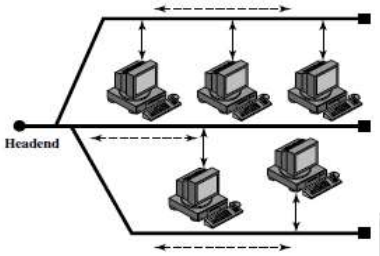



**Fig-2 Tree**

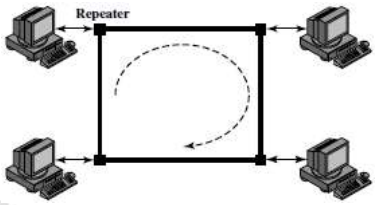



**Fig-3 Ring**

### 2.2 Tree

Tree topology is characterized by the use of a multipoint medium. The tree topology is a generalization of the bus topology. The transmission medium is a branching cable with no closed loops. The tree layout begins at a point called the *headend.* One or more cables start at the headend, and each of these may have branches. Additional branches to allow complex layouts. A transmission from any station propagates throughout the medium and can be received by all other stations.

### 2.3 Ring

In the **ring** topology, the network consists of a set of *repeaters* joined by point-to-point links in a closed loop. The repeater is a simple device, capable of receiving data on one link and transmitting them, bit by bit, on the other links are received. The links are unidirectional, data are transmitted in one direction only and circulate around the ring in one direction (clockwise or counterclockwise).

### 2.4 Star

In the **star** LAN topology, each station is directly connected to a common central node. Each station attaches to a central node via two point-to-point links, one for transmission and one for reception. There are two alternatives for the operation of the central node. One approach is for the central node to operate in a broadcast fashion.
A transmission of a frame from one station to the node is retransmitted on all of the outgoing links. The arrangement is physically a star but logically a bus. A transmission from any station is received by all other stations, and only one station at a time may successfully transmit. The central element is referred to as a **hub**.

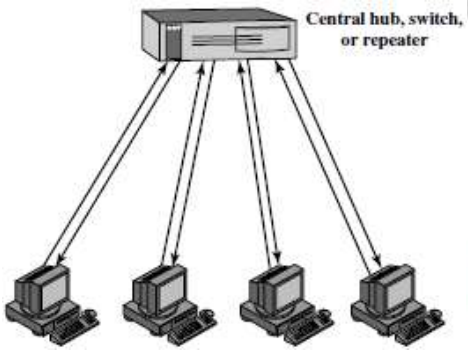



**Fig-4 Star**

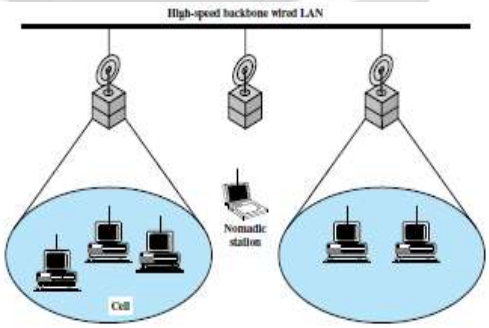



**Fig-5 Infrastructure wireless LAN**

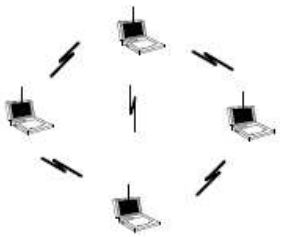


**Fig-6 Ad-hoc LAN**

## 3. WIRELESS LOCAL AREA NETWORKS

A wireless network uses for devices to be shared without networking cables. The two main types of wireless networking are peer to peer or ad-hoc and infrastructure.

### 3.1 Peer to peer or ad-hoc

A peer to peer or an ad-hoc wireless network consists of a number of computers each equipped with a wireless networking interface card. Each computer can communicated directly with all of the other wireless enable computers.

### 3.2 Insfrastructure

An instrastructure wireless network consists of a base station or an access point. An access point acts like a hub. Hub connect or bridge the wireless LAN to a wired LAN.

## 4.WIRELESS ACCESS POINT

Wireless access points (WAPs) are hardware devices on a local area network (LAN). WAPs are configured that allows wireless capable devices and wired networks to connect through a wireless standard. A wireless access point adds WI-Fi capability to a wired network onto an Ethernet LAN by bridging traffic from workstations.

## 5. WIRELESS ROUTER

A wireless router combines broadband capabilities as well as wireless access point features inside a single device. A wireless router connects a group of wireless stations to an adjacent wired LAN. A wireless router is a wireless access point combined with an Ethernet router. A wireless router forwards IP packets between wireless subnet and other subnet.

## 6. DESIGN AND CONFIGURATION OF WIRED AND WIRELESS LAN

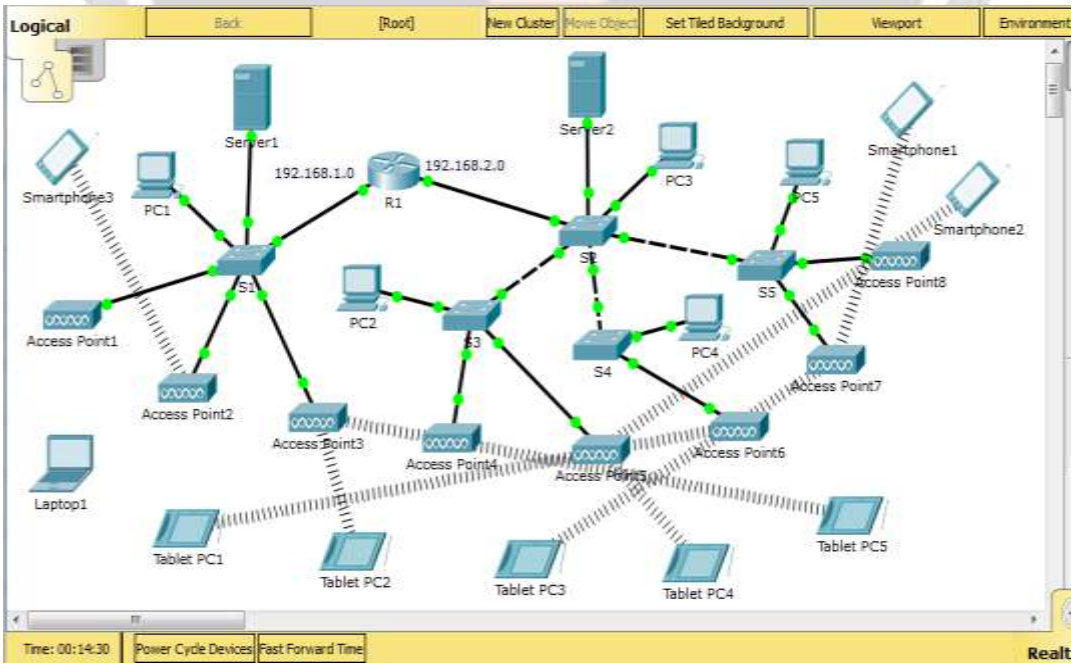



**Fig-7: A Wired and wireless local area network created using cisco packet tracer**

Fig-7 shows that the design of a wired and wireless local area network.

**Table-1: Addressing Table**

| Device | Interface | IP Address | Subnet Mask | Default Gateway |
|---|---|---|---|---|
| R1 | G0/0 | 192.168.1.0 | 255.255.255.0 | NA |
| | G0/1 | 192.168.2.0 | 255.255.255.0 | NA |
| Server1 | NIC | 192.168.1.100 | 255.255.255.0 | 192.168.1.0 |
| Server2 | NIC | 192.168.2.100 | 255.255.255.0 | 192.168.2.0 |

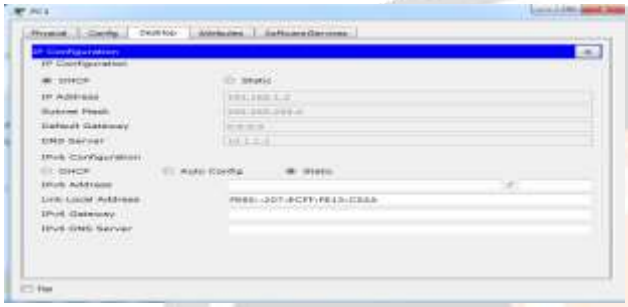


**Fig-8: IP address of PC1 from DHCP Server1**

**Fig-9: IP address of PC2 from DHCP Server2**

Fig-8 shows that the IP address of PC1 from DHCP Server1.
Fig-9 shows that the IP address of PC2 from DHCP Server2.

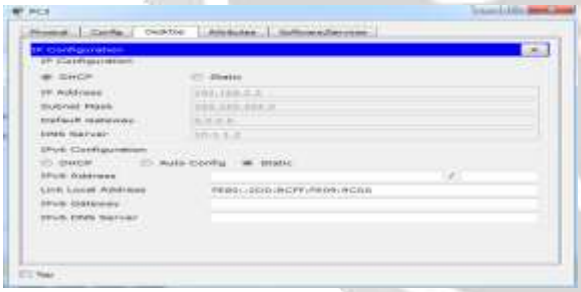


**Fig-10: IP address of PC3 from DHCP Server2**

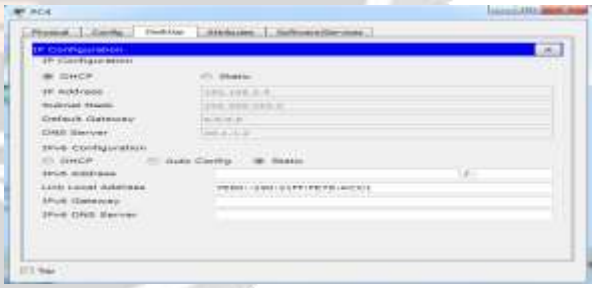


**Fig-11: IP address of PC4 from DHCP Server2**

Fig-10 shows that the IP address of PC3 from DHCP Server2.
Fig-11 shows that the IP address of PC4 from DHCP Server2.

**Fig-12: IP address of PC5 from DHCP Server2**

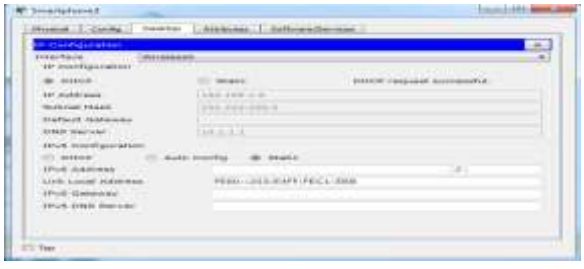


**Fig-13: IP address of Smartphone3 from DHCP Server1**

Fig-12 shows that the IP address of PC5 from DHCP Server2.
Fig-13 shows that the IP address of Smartphone3 from DHCP Server1.

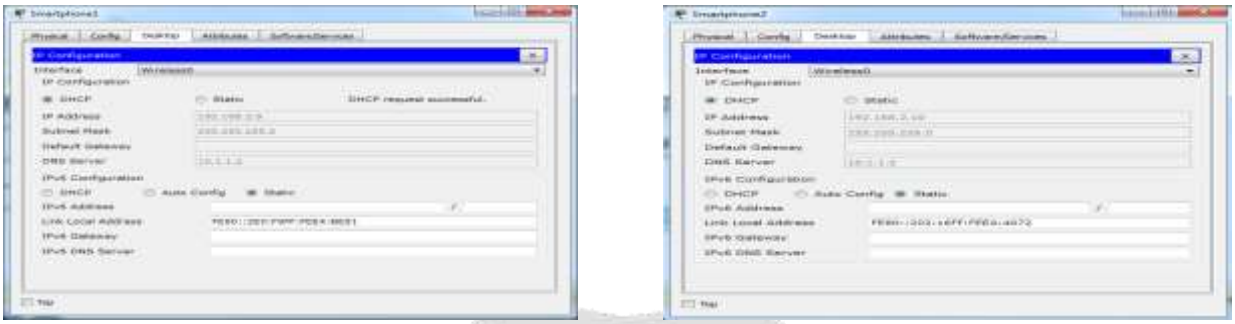


**Fig-14: IP address of Smartphone1 from DHCP Server2 Fig-15: IP address of Smartphone2 from DHCP Server2**

Fig-14 shows that the IP address of Smartphone1 from DHCP Server2.
Fig-15 shows that the IP address of Smartphone2 from DHCP Server2.

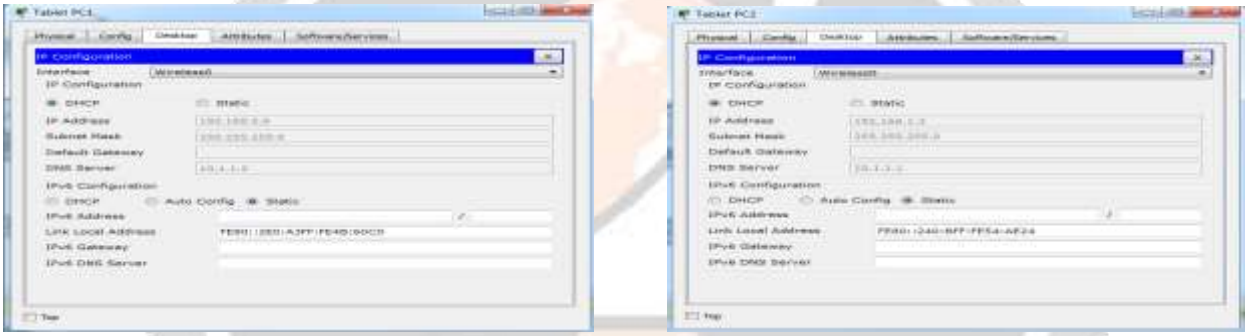


**Fig-16: IP address of Tablet PC1 from DHCP Server2 Fig-17: IP address of Tablet PC2 from DHCP Server1**

Fig-16 shows that the IP address of Tablet PC1 from DHCP Server2.
Fig-17 shows that the IP address of Tablet PC2 from DHCP Server1.

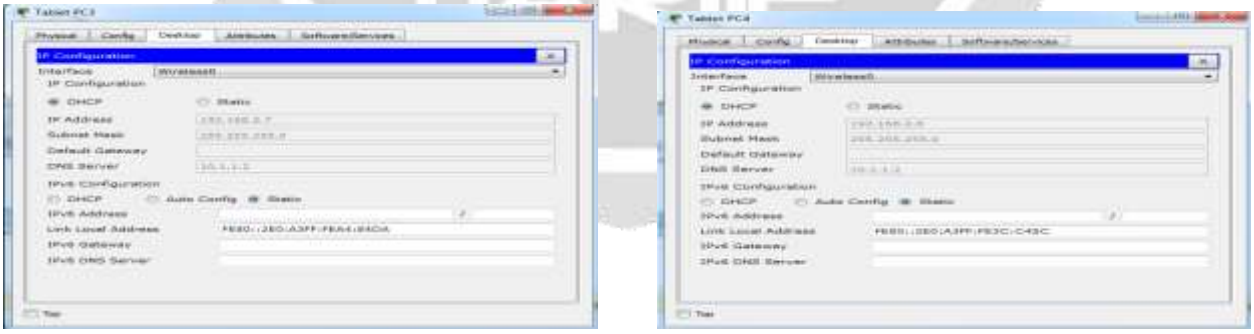


**Fig-18: IP address of Tablet PC3 from DHCP Server2 Fig-19: IP address of Tablet PC4 from DHCP Server2**

Fig-18 shows that the IP address of Tablet PC3 from DHCP Server2.
Fig-19 shows that the IP address of Tablet PC4 from DHCP Server2.

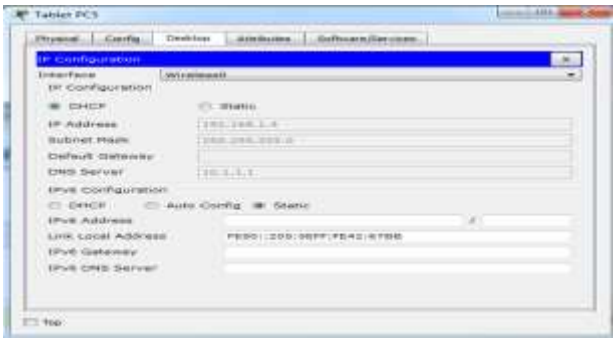


**Fig-20: IP address of Tablet PC5 from DHCP Server1**
Fig-20 shows that the IP address of Tablet PC5 from DHCP Server1.

**6.1 Build the Network and Configure Basic Device Settings**
**Step 1:** Cable the network.

**Step 2:** Initialize and reload the router.

**Step 3:** Configure basic settings for **router**.
i. Disable DNS lookup.
ii. Assign device name as shown in the topology.
iii. Assign **cisco** as the privileged EXEC password.
iv. Assign **class** as the console and **class** as vty passwords.
v. Configure a message of the day (MOTD) banner to warn users that unauthorized access is prohibited.
vi. Configure **logging synchronous** for the console line.
vii. Configure the IP address listed in the Addressing Table for all interfaces.
viii. Copy the running configuration to the startup configuration.

**Router R1 Configuration:**
Router>enable
Router#config t
i. Router(config)# no ip domain lookup
ii. Router(config)#hostname R1
iii. R1(config)#enable password cisco
iv. R1(config)#line console 0
R1(config-line)#password class
R1(config-line)#login
R1(config)#exit
R1(config)#line vty 0
R1(config-line)#password class
R1(config-line)#login
R1(config)#exit
v. R1(config)#banner motd #" unauthorized access is prohibited"#
vi. R1(config)#line console 0
R1(config-line)#logging synchronous
R1(config-line)#exit
vii. R1(config)#interface g0/0
R1(config-if)#ip address 192.168.1.0 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#interface g0/1
R1(config-if)#ip address 192.168.2.0 255.255.255.0
R1(config-if)#no shutdown

R1(config-if)#exit
viii R1#copy running-config startup-config

**Step 5:** Configure PC hosts and server.

**Step 5:** Test connectivity.

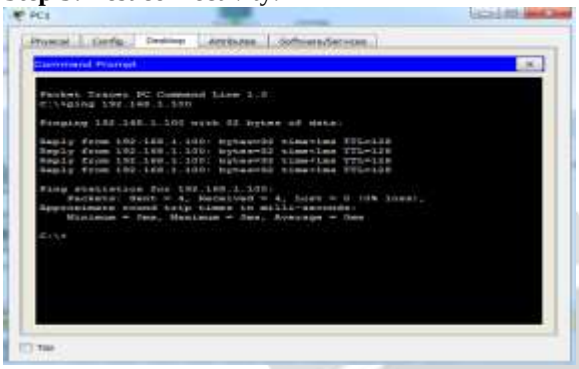


**Fig-21: Ping test from PC1 to Server1**

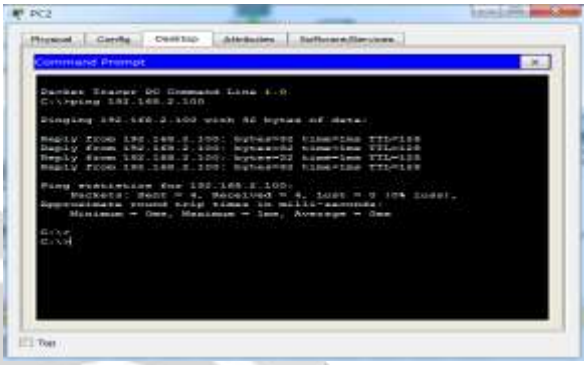


**Fig22: Ping test from PC2 to Server2**

Fig-21 shows that test connectivity to ping the IP address of Server1 from PC1.
Fig-22 shows that test connectivity to ping the IP address of Server2 from PC2.

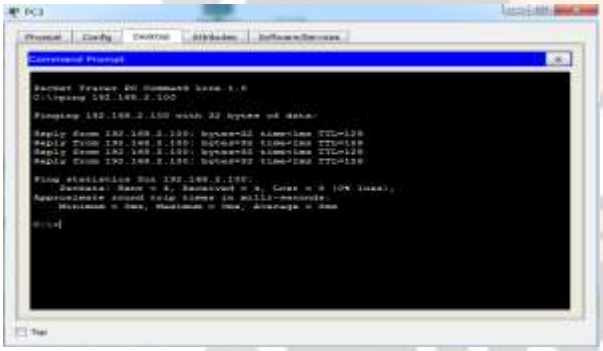


**Fig-23: Ping test from PC3 to Server2**

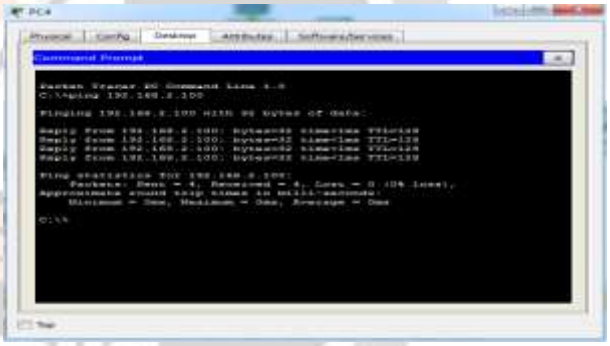


**Fig-24: Ping test from PC4 to Server2**

Fig-23 shows that test connectivity to ping the IP address of Server2 from PC3.
Fig-24 shows that test connectivity to ping the IP address of Server2 from PC4.

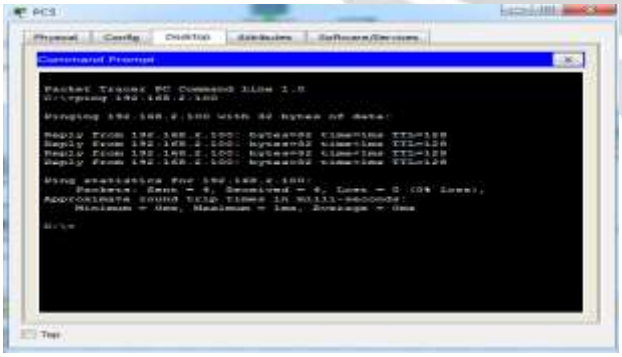


**Fig-25: Ping test from PC5 to Server2**

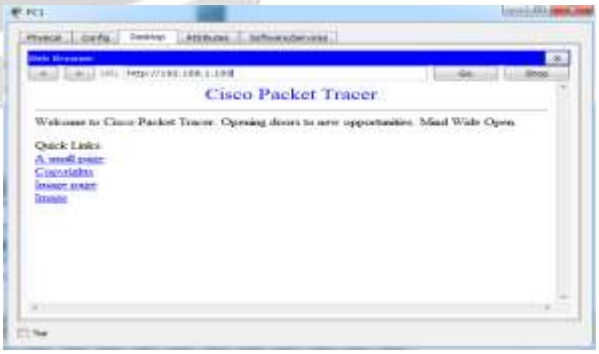
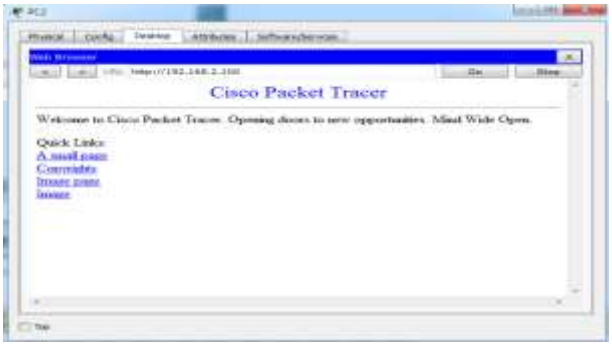



**Fig-26: Use PC1 to access web server Server1 from Web Browser**

Fig-25 shows that test connectivity to ping the IP address of Server2 from PC5.
Fig-26 shows that verify the web server from PC1 by accessing the web pages.



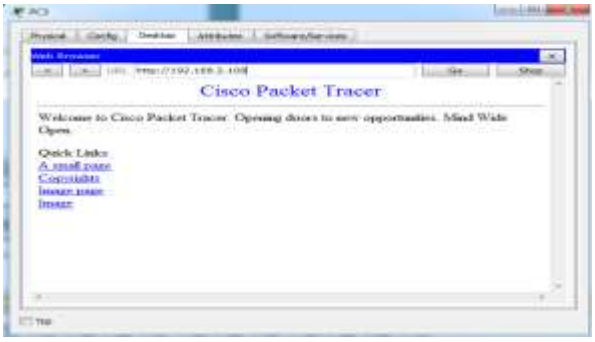




**Fig-27: Use PC2 to access web server Server2 from Web Browser Fig-28: Use PC3 to access web server Server2 from Web Browser**

Fig-27 shows that verify the web server from PC2 by accessing the web pages.
Fig-28 shows that verify the web server from PC3 by accessing the web pages.

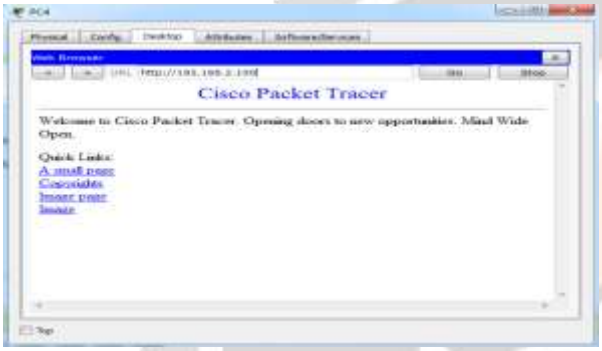




**Fig-29: Use PC4 to access web server Server2 from Web Browser Fig-30: Use PC5 to access web server Server2 from Web Browser**

Fig-29 shows that verify the web server from PC4 by accessing the web pages.
Fig-30 shows that verify the web server from PC5 by accessing the web pages.



**Fig-31: Use Smartphone3 to access web server Server1 from Web Browser Fig-32: Use Smartphone1 to access web server Server2 from Web Browser**

Fig-31 shows that verify the web server from Smartphone3 by accessing the web pages.
Fig-32 shows that verify the web server from Smartphone1 by accessing the web pages.

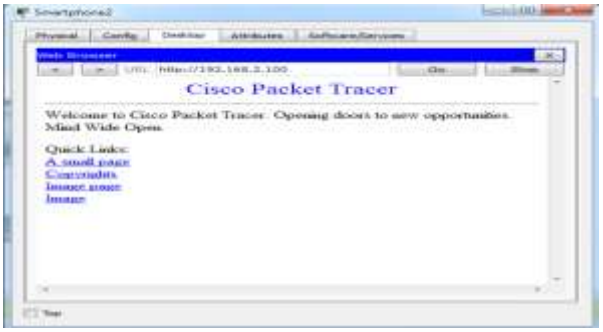




**Fig-33: Use Smartphone2 to access web server Server2 from Web Browser Fig-34: Use Tablet PC1 to access web server Server2 from Web Browser**

Fig-33 shows that verify the web server from Smartphone2 by accessing the web pages.
Fig-34 shows that verify the web server from Tablet PC1 by accessing the web pages.



**Fig-35: Use Tablet PC2 to access web server Server1 from Web Browser Fig-36: Use Tablet PC3 to access web server Server2 from Web Browser**

Fig-35 shows that verify the web server from Tablet PC2 by accessing the web pages.
Fig-36 shows that verify the web server from Tablet PC3 by accessing the web pages.



**Fig-37: Use Tablet PC4 to access web server Server2 from Web Browser Fig-38: Use Tablet PC5 to access web server Server1 from Web Browser**

Fig-37 shows that verify the web server from Tablet PC4 by accessing the web pages.
Fig-38 shows that verify the web server from Tablet PC5 by accessing the web pages.

## 7. ADVANTAGES AND DISADVANTAGES OF WIRELESS LAN

**Advantages**

Access Points give the freedom to scale the number of devices supported on network. Business-grade access points can be installed anywhere and can run an Ethernet cable. Power over Ethernet (PoE) is no need to run a separate power line. Additional standard features include Access Control List (ACL) support to limit guest access without network security.

**Disadvantages**

The typical range of a common 802.11g network is on the order of tens of meters. To obtain additional range, repeaters or additional access points will be purchased. So costs can add for these devices.

## 8. CONCLUSION

The utilization of wired and wireless local area networks provided simplify network management and improved network security. Wireless Technology provides many benefits like flexibility, portability and lower costs. Wi- Fi networks can be accessed with mobile smartphones, tablets and laptops.

## 9. ACKNOWLEDGEMENT

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