Kathmandu University

Department of Computer Science and Engineering

Dhulikhel, Kavre

Lab Report

"Data Communication and Networking"

[COMP 232]

(2nd Year/ 2nd Semester in Computer Science)

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LAB 1: STRAIGHT AND CROSSOVER CABLE CONNECTION

Although wireless connectivity and mobility has taken over the world, there are still many doubts over it about the security and functionality of wireless network. Wired network provides reliability, stability, speed, security, and also the cost of it is less compared to wireless network. However, cable connection cannot be used for long distance communication.

For wired network connection, an ethernet cable is used between two devices. Ethernet cable is made up of four two paired cables. Each of the pairs are twisted on each other to cancel our interference from nearby digital devise. It is a two-way cable hence it can send and receive on both sides. They have endpoints using a connector known as RJ45 connector.

Ethernet cables are categorized as Cat 5, Cat 5e, Cat 6, and UTP cable. Cat 5 cable can support a 10/100 Mbps ethernet network and Cat 5e and Cat 6 cable can support a 10/100/1000 Mbps ethernet network.

1.1 Straight Through Cable

Straight through cable is a type of Cat 5 with RJ-45 connectors at each end, and each has the same pin out. It is in accordance with either the T568A or T568B standards. It uses the same color code throughout the LAN for consistency. This type of twisted-pair cable is used in LAN to connect a computer or a network hub such as a router.

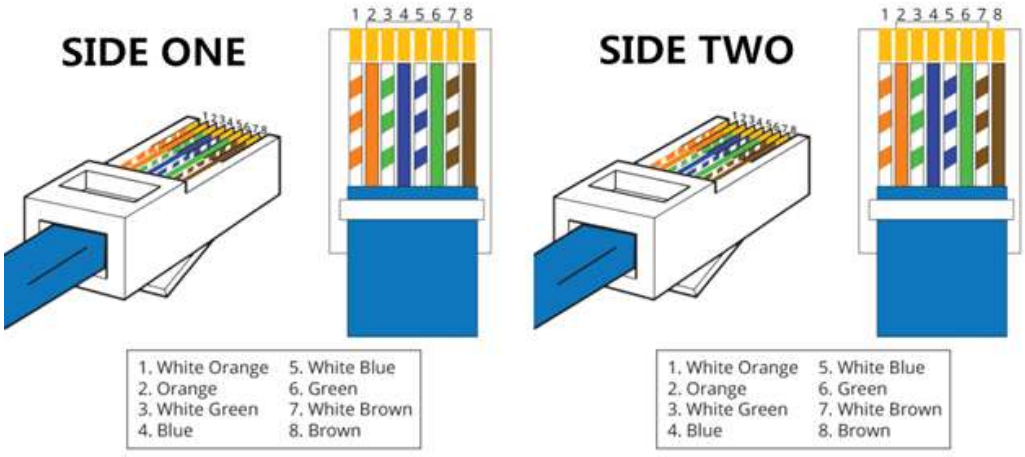


Figure 1: Straight-Through Cable Connection

To make a cable a straight through wire cable, we need to follow following steps:

- First, cut a 3 feet section of the CAT5 cable with scissors.
- Strip both ends of the cable about a half inch with the help of wire strippers.
- Cut the strengthening strands with scissors.
- Untwist the four strands of wires and straighten them out.
- Put the wires in the correct order and cut the wires down again so they are just long enough to go into the RJ45 connector.
- Slide on the RJ45 making sure that the wires reach to the end of the connector.
- Use the clamping tool to clamp the wires to the connector
- Repeat the process again for the other end of the cable

1.2 Crossover Cable

Crossover Ethernet cable is a type of CAT 5 where one end ins T568A configuration and the other end is T568B configuration. In this type of cable connection, Pin 1 is crossed with Pin 3, and Pin 2 is crossed with Pin 6. Crossover cable is used to connect two or more computing devices. The internal wiring of crossover cables reverses the transmission and receives signals. It is widely used to connect two devices of the same type: e.g., two computers or two switches to each other.

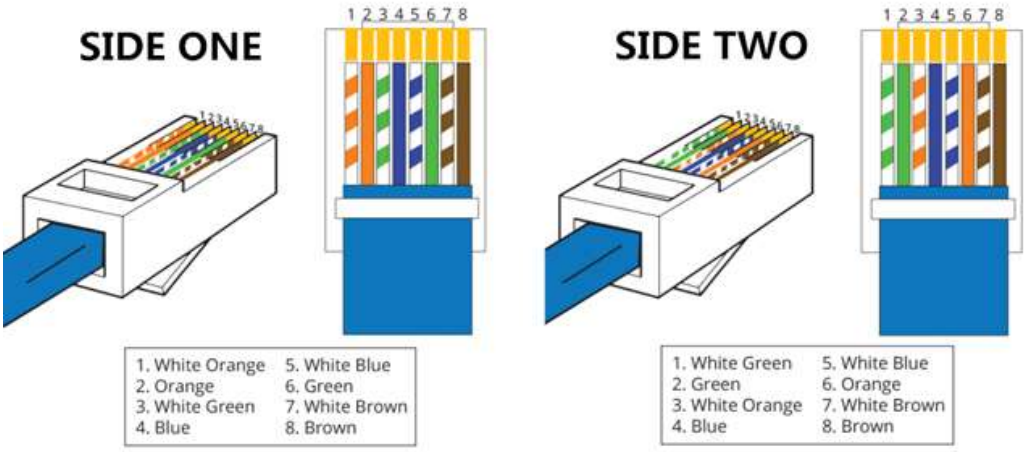


Figure 2: Crossover Cable Connection

To make a cable a cross-over cable, we need to follow the following steps:

- Follow the same steps exactly as straight wire cable
- Make sure one end of the wire is in an RJ45A connection and the other ends is in an RJ45B connector.

1.3 Connection Table

	Hub	Switch	Router	PC
Hub	Crossover	Crossover	Straight	Straight
Switch	Crossover	Crossover	Straight	Straight
Router	Straight	Straight	Crossover	Crossover
PC	Straight	Straight	Crossover	Crossover

LAB 2: PACKET TRACER

Packet Tracer is a cross-platform visual simulation tool designed by Cisco Systems that allows users to create network apologies and imitate modern computer networks. The software allows users to simulate the configuration of Cisco routers and switches using a simulated command line interface. Packet Tracer makes use of a drag and drop user interface, allowing users to add and remove simulated network devices as they see fit.

2.1 Tools Used in Cisco Packet Tracer

2.1.1 End Devices

- **PC**: A Personal Computer is a digital device used to connect to the internet. It provides the human user with access to I/O tools with moderately powerful processors to process the input. A modern PC is a multipurpose machine hence can be used to connect to the internet, write word documents, draw images, edit videos and more. Hence this versatility has led a PC to be the interface for the global population to get connected to each other.

2.1.2 Network Devices

- **Switch**: Switch is a device in a computer network that connects other devices together. Multiple data cables are plugged into a switch to enable communication between different networked devices. It uses MAC addresses to forward data at the data link layer of the OSI model. It also manages the flow of data across a network by transmitting the received network packet only to the one or more devices for which the packet is intended.

- **Router**: Router is a networking device used to connect devices in multiple networks. As the name suggests the router routes the packet by sending the packet through the optimal path to reach the destination. It also decides the path of data transmission based on the addresses mentioned in the sent packets, its routing table and different routing algorithms.

2.1.3 Connectors:

- **Copper Cross-Over:** A crossover ethernet cable is a form of ethernet connection that is used to directly link computing devices. It is used usually when we need to connect different devices.

- **Copper Straight Through:** A straight through cable is a form of twisted pair connection that connects a computer to a network hub such as a router in a local area network. It is used usually when we need to connect similar devices.

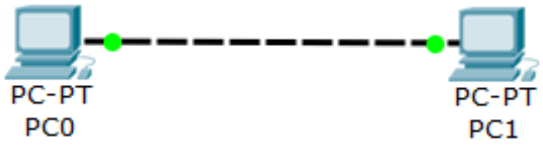
2.2 Visualization of Network

2.2.1 PC-PC Connection

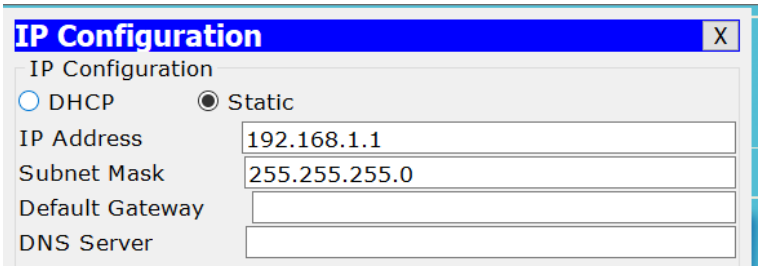
To visualize the network for PC-PC connection we need to follow the following procedure.

1. Drag two PC's (PC-PT) from tools to the canvas.

2. Connect them using Crossover cable by selecting the crossover cable from tools.

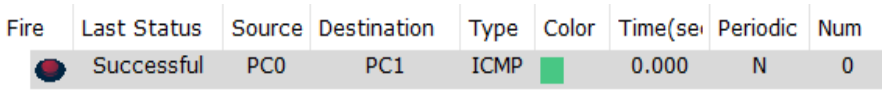


3. Setup the IP addresses and the Subnet Masks for both the PC's.



4. Add a simple Protocol Data Unite (PDU) in one PC and recover it from another.

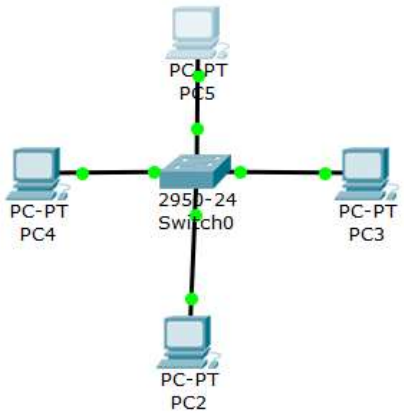
5. Check for status.



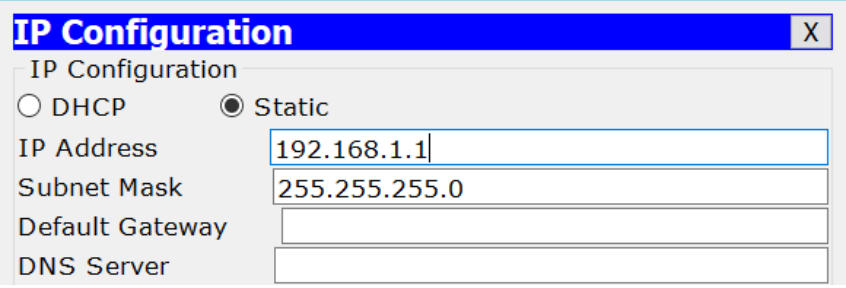
2.2.2 PC-Switch

To visualize the network for PC-Switch connection we need to follow the following procedure.

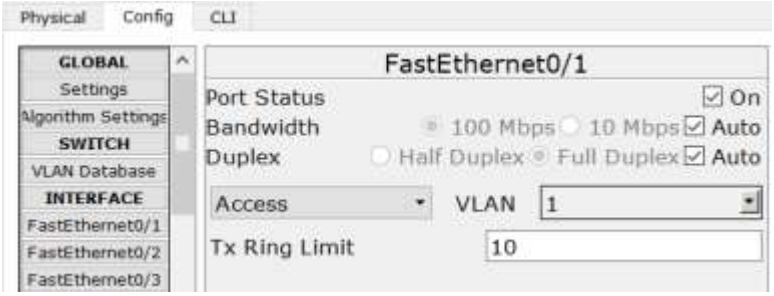
1. Drag 4 PCs (PC-PT) from tools to the canvas.
2. Connect the PCs to the Switch individually using Straight Through Cable selecting it from tools.



3. Setup the IP addresses and the Subnet Masks for all the PCs.



4. Turn the ports on for the Switch.



5. Add a simple Protocol Data Unit (PDU) in one PC and recover it from another.

6. Check for status.

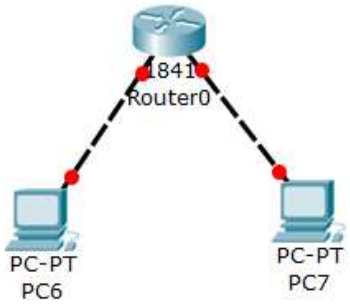
Fire	Last Status	Source	Destination	Type	Color	Time(se	Periodic	Num
	Successful	PC2	PC3	ICMP		0.000	N	0

2.2.3 Router Configuration:

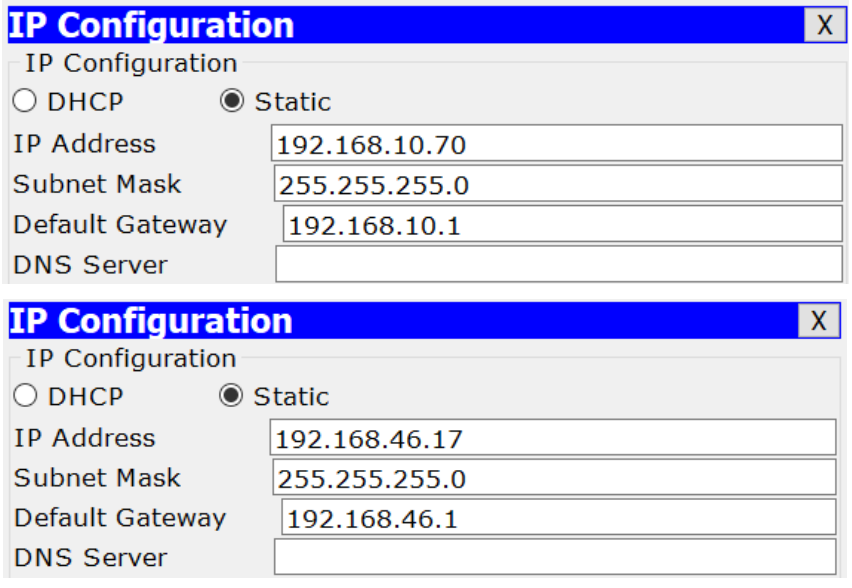
To configure the router connection in CISCO packet tracer we need to follow the following steps:

1. Drag 2 PCs and one Router to the canvas.

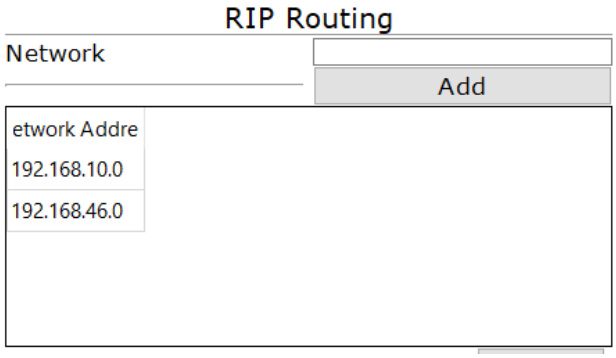
2. Connect the PCs to the Router individually using Crossover Cable.



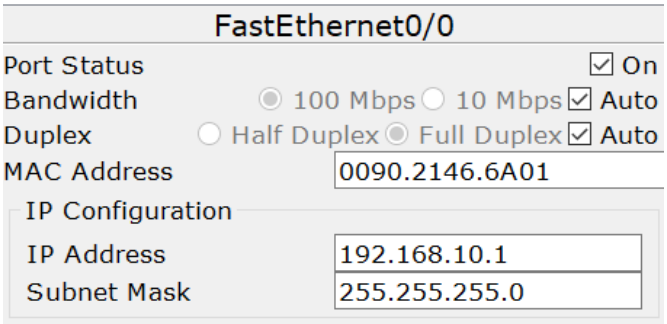
3. Setup the IP addresses, Subnet Masks and the Default Gateways for both the PCs such that they are in different networks.



4. Add Network Addresses to RIP Routing.

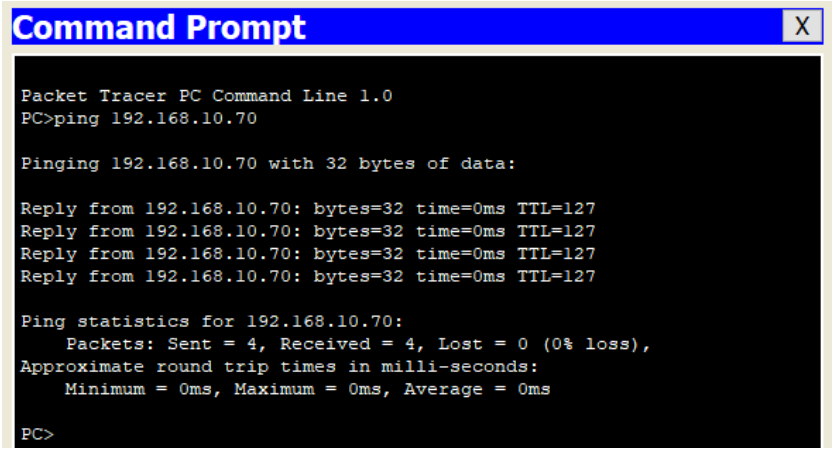


5. Add IP Address and Subnet Mask to both Fast Ethernet ports 0/0 and 0/1 and turn them on.



6. Add a simple PDU (Protocol data unit) in one PC and recover it from another.

7. Check for status.



LAB 3: PACKET TRACER

3.1 Tools Used:

DNS: Domain Name System (DNS) Server is a server that is especially used to match website hostnames to their corresponding IP address. It contains a database of public IP addresses and their corresponding domain names.

Web Server: A web server is the hosting server which serves content to the clients. It has many types like mainframe, caching and so on. Websites buy server space on web servers and buy domain names to point to the said server. The DNS server then points to the actual web server which hosts the content when a client on the network asks for content from the said website.

3.2 DNS and Web Server:

To configure DNS and Web Server we need to follow the following steps:

1. Add a PC, a Switch and two Servers ("Web Server" and "DNS Server").

2. Connect the PC to the Switch and the Servers to the Switch using Straight Through Cable.

3. We provide the same IP address and DNS address to the DNS Server i.e., 192.168.1.1. Similarly, Web Client and Web Server are given their own IP address i.e., 192.168.1.2 & 192.168.1.3 but their DNS address is given the IP address of the DNS Server.

Figure 3: DNS IP configuration

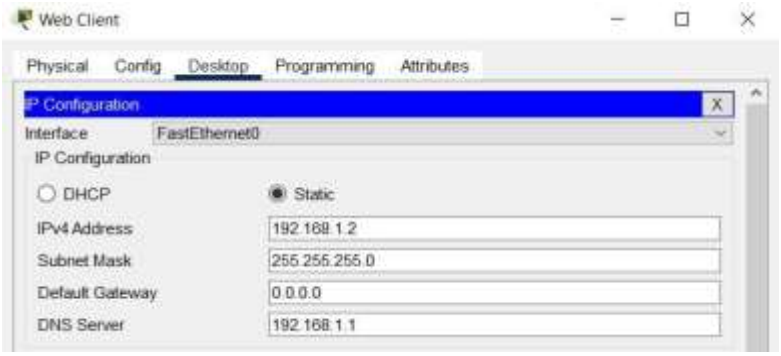


Figure 4: Client PC IP configuration

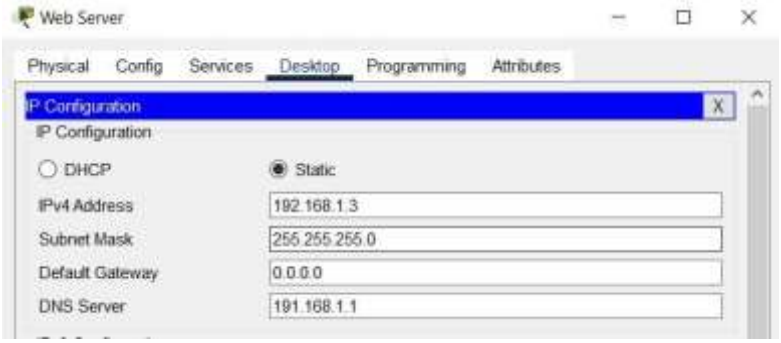
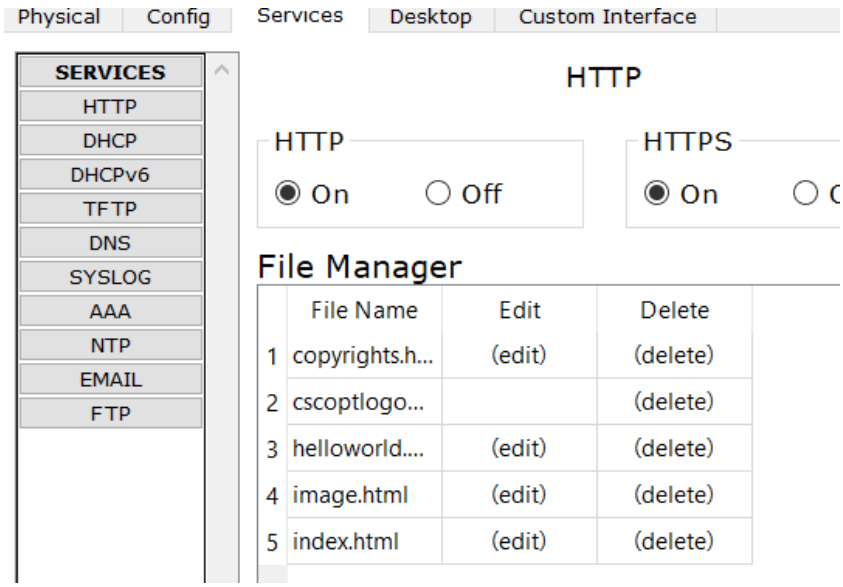
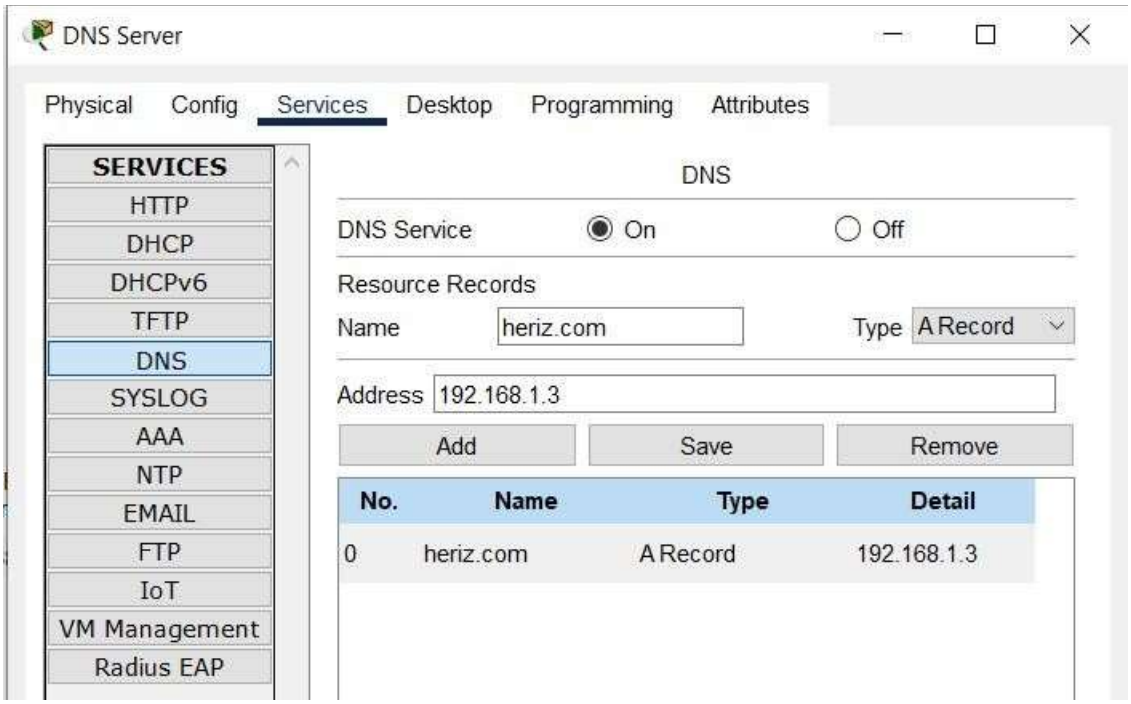


Figure 5: Web Server IP configuration

4. Configure the Web Server by going to HTTP services and creating your own HTML file named index.html. The contents of the HTML file can be whatever you want to display.



5. Configure the DNS server by going to DNS services and enabling the DNS Service radio button. Then we create our webpage name e.g., heriz.com whose IP address links to the previous Web server IP address. In this way we are connecting index.html to domain name heriz.com.



6. To test our connection, we go to our PC (Web Client) and in the Web Browser we search our domain name heriz.com or go to its IP address 192.168.1.3. We can simulate our connection during this process and we can find that the switch goes to the DNS server to look for the IP address of heriz.com. After getting the IP address switch goes to the respective Web Client to get the contents.

3.3 DHCP Protocol

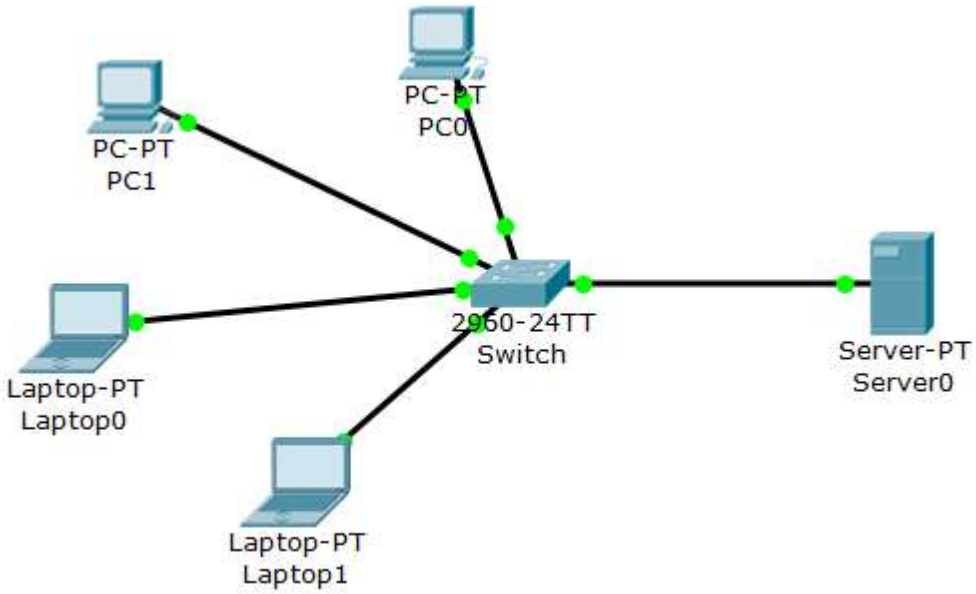
A DHCP Server is a network server that automatically provides and assigns IP addresses, default gateways and other network parameters to client devices. It relies on the standard protocol known as Dynamic Host Configuration Protocol or DHCP to respond to broadcast queries by clients. A DNS server provides the clients with the domain name to IP conversion, the DHCP provides the IP to each node connecting to the internet/network.

Every computer on a network has an IP address that can be assigned either statically or dynamically. In a static IP address, the user assigns a computer with an IP address manually. In a large network it is a tedious task to manually assign IP addresses to each device and there is a chance of duplicate IP addresses. A dynamic IP is where a computer gets an IP address automatically from a DHCP server along with subnet mask, default gateway and DNS server. DHCP server assigns the IP address as a lease to make sure DHCP server doesn't run out of IP addresses.

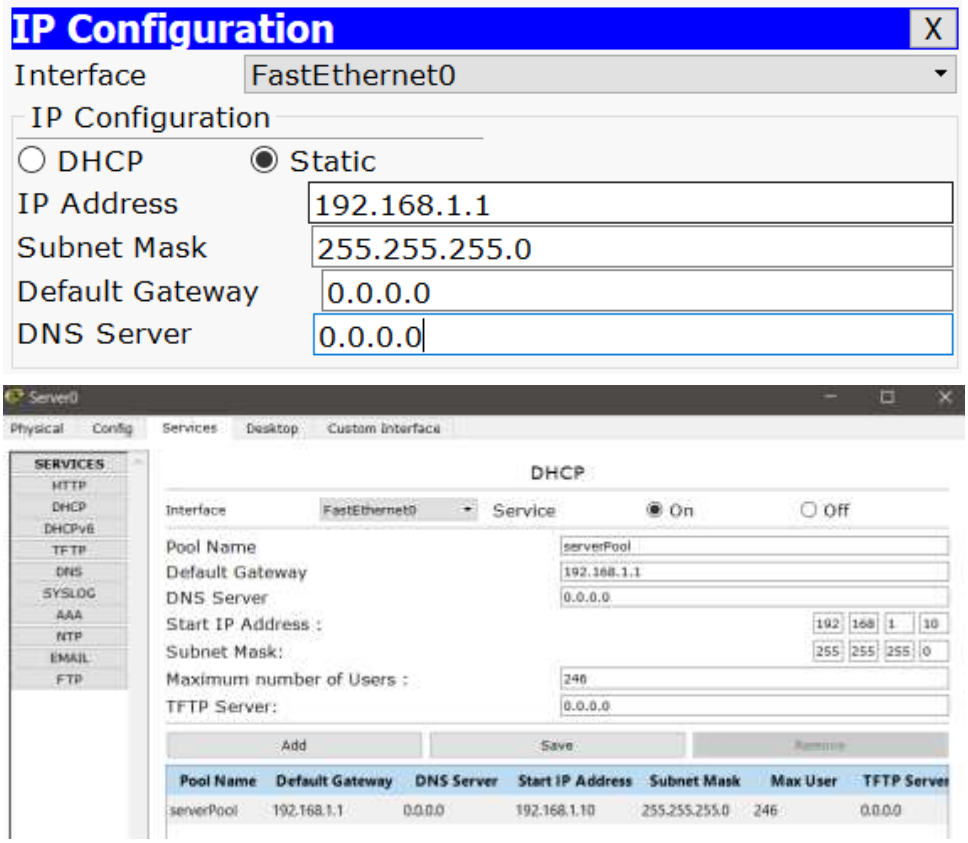
Procedure:

1. Drag some client devices into the canvas along with a switch and a server.

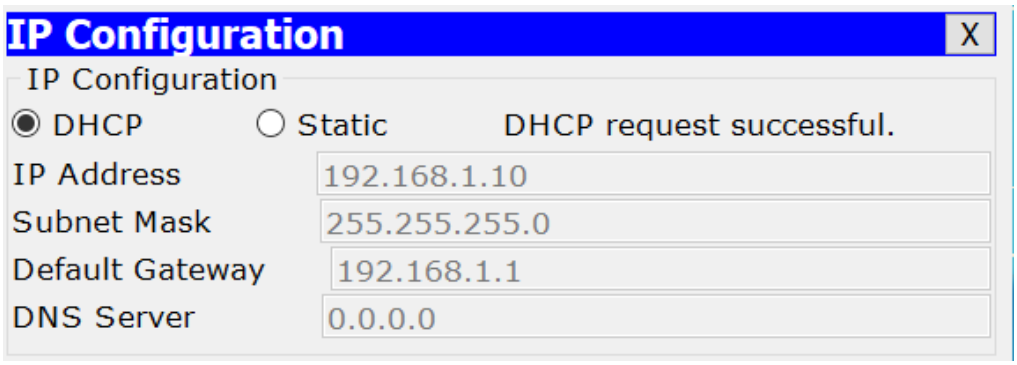
2. Connect the client devices to the switch and the switch to the server with Straight Through cable.



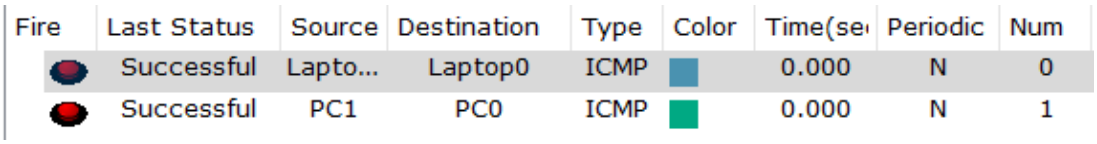
3. Provide IP configuration for our DHCP server i.e., IP 192.168.1.1. Create and configure a DHCP pool for each network that will obtain IP configuration from the DHCP server. In DHCP Services, enable the DHCP button and provide the Default Gateway the same previous DHCP IP address. Then, set the starting IP address and maximum number of users that can be assigned those IP addresses at a time.



4. After creating a DHCP pool, we go to the IP configuration of all LAN devices and turn DHCP addressing on. This requests an IP address from the pool and assigns the necessary details itself. Note: IP address changes at a certain interval to make sure the router won't run out of IP addresses and old assigned addresses are reset.



5. Test the connection by passing packets from one PC to another.



Fire	Last Status	Source	Destination	Type	Color	Time(se	Periodic	Num
	Successful	Lapto...	Laptop0	ICMP		0.000	N	0
	Successful	PC1	PC0	ICMP		0.000	N	1

References

How do I configure a DHCP server using CLI commands on my managed switch? | Answer | NETGEAR Support. (n.d.). Www.Kb.Netgear.Com. https://kb.netgear.com/21987/How-do-I-configure-a-DHCP-server-using-CLI-commands-on-my-managed-switch

A. (2019, April 24). *Cable Difference: Straight Through vs Crossover Cable*. Fiber Optic Cabling Solutions. Retrieved April 21, 2022, from https://www.cables-solutions.com/difference-between-straight-through-and-crossover-cable.html

Williams, L. (2022, March 5). *Straight Through Cables vs Crossover Cables: Key Difference*. Guru99. Retrieved April 21, 2022, from https://www.guru99.com/difference-between-straight-through-crossover-cables.html