Assignment Group-A_1

Problem Definition:

Setup a wired LAN using Layer 2 Switch. It includes preparation of cable, testing of cable using line tester, configuration machine using IP addresses, testing using PING utility and demonstrating the PING packets captured traces using Wireshark Packet Analyzer Tool.

1. Apparatus (Components):

RJ-45 connector, Crimping Tool, Twisted pair Cable (Cat6), Line Tester, HTTP Server (Apache) with Website pages of your Institute, Four Client Nodes with Wi-Fi Support, Wireshark Protocol Analyzer tool on all nodes, Layer-II Switch, Layer-III IP Switch, Wi-Fi Access Point.

2. Prerequisite:

1. Networking Components: Switch, Router, etc.
2. Command: Ping
3. Wireshark Tool
4. IP Addressing

3. Learning Objectives:

- Students will able to setup wired and Wi-Fi network
- Learn to setup wired and Wi-Fi office/organization network

4. Theory

Cable Preparation

The cable will be constructed using either TIA/EIA T568A or T568B standards for Ethernet, which determines the color wire to be used on each pin.

Straight-through patch cables are normally used to connect a host directly to a hub or switch or to a wall plate in an office area. With a straight-through cable, the color of wireused by pin 1 on one end is the same color used by pin 1 on the other cable end, and similarlyfor the remaining seven pins.

With a **crossover cable** the second and third pairs on the RJ-45 connector at one end of the cable are reversed at the other end. The pin-outs for the cable are the T568A standard on one end and the T568B standard on the other end. Crossover cables are normally used to connect hubs and switches or can be used to directly connect two hosts to create a simple network.

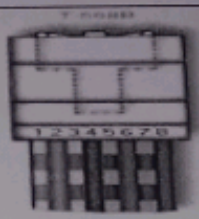
TIA/EIA 568A and 568B Wiring Standards

Pin Diagram TIA/EIA 568-A

PIN	F()	Pair	Polarity	COLOR	A
1	Rx	3	Rx+	Green/White	G
2	Rx	3	RX-	Green	G
3	Tx	2	Tx+	Orange/White	O
4	-	1	Not Used	Blue	B
5	-	1	Not Used	Blue/White	B
6	Tx	2	Tx-	Orange	O
7	-	4	Not Used	Brown/White	B
8	-	4	Not Used	Brown	B

Pin Diagram TIA/EIA 568-B

PIN	F()	Pair	Polarity	COLOR	A
1	Tx	2	Tx+	Orange/White	O
2	Tx	2	Tx-	Orange	O
3	Rx	3	Rx+	Green/White	G
4	-	1	Not Used	Blue	B
5	-	1	Not Used	Blue/White	B
6	Rx	3	Rx-	Green	G
7	-	4	Not Used	Brown/White	B
8	-	4	Not Used	Brown	B

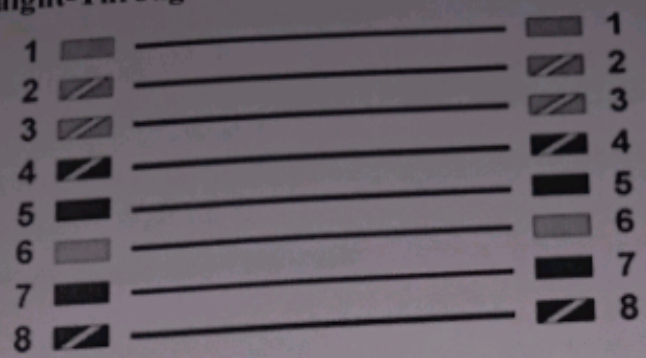


Prepare and test an Ethernet straight-through and Crossover patch cable

Paring Rules and Color Code:-

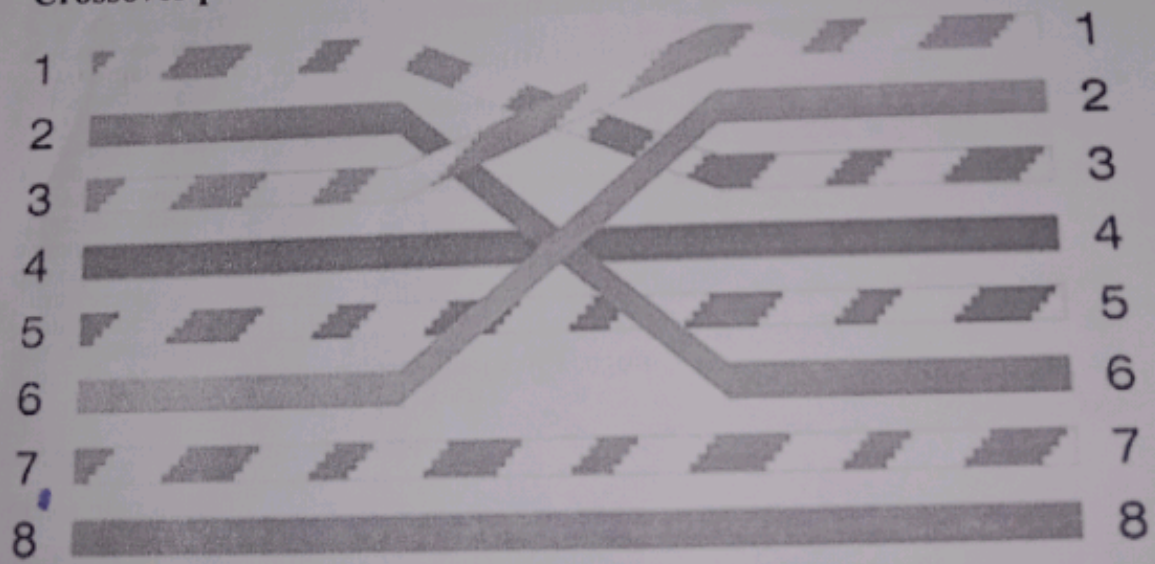
The CAT 5 Cable consist of 8 wires which comes pares of White/Blue, Blue, White/Orange, Orange, White/Green, Green, White/Brown, Brown and they are coded for **Straight** and **Cross** combinations respectively.

Straight-Through Cables:



Straight-through cable is a type of CAT5 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. It is one of the most common types of network cable

Crossover patch cable:



A Crossover cable is a type of CAT 5 where one end isT568A configuration and the other end as T568BConfiguration. 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 receive signals. It is widely used to connect two devices of the same type: e.g., two computers or two switches to each other.

Connections among devices:-

Node to Node -	Straight – Cross,
Switch to Node	-Straight – Straight,
Switch to Switch	-Straight – Cross.

Step 1: Obtain and prepare the cable

- Determine the length of cable required. This could be the distance from a computer toa switch or between a device and an RJ-45 outlet jack.
- Using wire strippers, remove 5.08 cm (2 in.) of the cable jacket from both ends of thecable.

Step 2: Prepare and insert the wires

- Determine which wiring standard will be used. Circle the standard. [T568A | T568B] and locate the correct table or figure from the "Wire Diagrams" based on the wiring standard used.
- Spread the cable pairs and arrange them roughly in the desired order based on the standard chosen.
- Untwist a short length of the pairs and arrange them in the exact order needed by the standard moving left to right starting with pin 1.
- It is very important to untwist as little as possible. The twists are important because they provide noise cancellation
- Straighten and flatten the wires between your thumb and forefinger. Ensure the cable wires are still in the correct order as the standard.
- Cut the cable in a straight line to within 1.25 to 1.9 cm (1/2 to 3/4 in.) from the edgeof the cable jacket. If it is longer than this, the cable will be susceptible to crosstalk (the interference of bits from one wire with an adjacent wire).
- The key (the prong that sticks out from the RJ-45 connector) should be on the underside pointing downward when inserting the wires. Ensure the wires are in order from left to right starting with pin 1. Insert the wires firmly into the RJ-45 connector until all wires are pushed as far as possible into the connector

Step 3: Inspect, crimp, and re-inspect

- Visually inspect the cable and ensure the right color codes are connected to the correctpin numbers.
- Visually inspect the end of the connector. The eight wires should be pressed firmlyagainst the end of the RJ-45 connector. Some of the cable jacket should be inside the first portion of theconnector. This provides strain relief for the cable. If the cable jacket is not far

enough inside the connector, it mayeventually cause the cable to fail.

- If everything is correctly aligned and inserted properly, place the RJ-45 connector andcable into the
  crimper. The crimper will push two plungers down on the RJ-45 connector.
- Visually re-inspect the connector. If improperly installed, cut the end off and repeatthe process.

Step 4: Terminate the other cable end

- Use the previously described steps to attach an RJ-45 connector to the other end of thecable.
- Visually re-inspect the connector. If improperly installed, cut the end off and repeatthe process.

Step 5: Test the cable

- Use the cable to connect a PC to a network.
- Visually check the LED status lights on the NIC card. If they are on (usually green oramber) the cable
  is functional.
- On the PC, open the command prompt.
- Type ifconfig
- Write down the default gateway IP address.
- Or you can use line tester to test the prepared cable.

Network Devices

1. Repeater:

Functioning at Physical Layer. A repeater is an electronic device that receives a signal and retransmits it at a higher level and/or higher power, or onto the other side of an obstruction,so that the signal can cover longer distances. Repeater have two ports ,so cannot be use to connect for more than two devices.

2. Hub:

An Ethernet hub, active hub, network hub, repeater hub, hub or concentrator is a device for connecting multiple twisted pair or fiber optic Ethernet devices together and making them actas a single network segment. Hubs work at the physical layer (layer 1) of the OSI model. The device is a form of multiport repeater. Repeater hubs also participate in collision detection, forwarding a jam signal to all ports if it detects a collision.

3. Switch:

A network switch or switching hub is a computer networking device that connects network segments. The term commonly refers to a network bridge that processes and routes data at thedata link layer (layer 2) of the OSI model. Switches that

additionally process data at the network layer (layer 3 and above) are often referred to as Layer 3 switches or multilayer switches.

4. Bridge:

A network bridge connects multiple network segments at the data link layer (Layer 2) of the OSI model. In Ethernet networks, the term bridge formally means a device that behaves according to the IEEE 802.1D standard. A bridge and switch are very much alike; a switch being a bridge with numerous ports. Switch or Layer 2 switch is often used interchangeably with bridge. Bridges can analyze incoming data packets to determine if the bridge is able to send the given packet to another segment of the network.

5. Router:

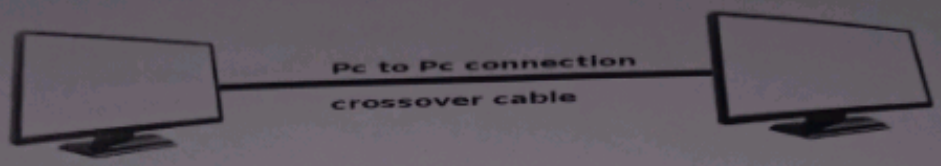
A router is an electronic device that interconnects two or more computer networks, and selectively interchanges packets of data between them. Each data packet contains address information that a router can use to determine if the source and destination are on the same network, or if the data packet must be transferred from one network to another. Where multiple routers are used in a large collection of interconnected networks, the routersexchange information about target system addresses, so that each router can build up a table showing the preferred paths between any two systems on the interconnected networks.

6. Gate Way:

In a communications network, a network node equipped for interfacing with another network that uses different protocols. A gateway may contain devices such as protocol translators, impedance matching devices, rate converters, fault isolators, or signal translators as necessaryto provide system interoperability. It also requires the establishment of mutually acceptable administrative procedures between both networks. A protocol translation/mapping gateway interconnects networks with different network protocol technologies by performing therequired protocol.

Building and Testing of Wired Network

1. Crossover Cable



IP Address: 192.168.1.2
Subnet Mask: 255.255.255.0
Gateway: 192.168.1.1

ping 192.168.1.3

IP Address: 192.168.1.3
Subnet Mask: 255.255.255.0
Gateway: 192.168.1.1

ping 192.168.1.2

Connect two machines using crossover cable and configure it using ip address, subnet mask and gateway address as shown in figure. Ping from both the machines and capture ICMP packets in Wireshark tool.

2. Setting Up LAN using Straight-Through Cable

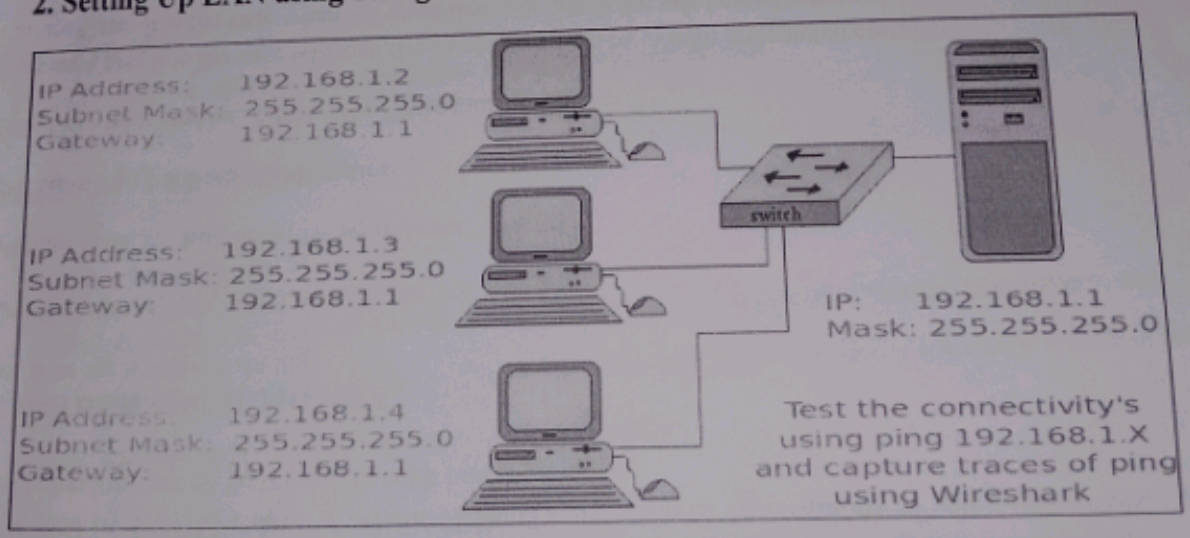


Figure 1

Connect four machines using Straight-Through cable to switch and router and then configure all using ip address, subnet mask and gateway address as shown in figure. Ping all the machines and capture ICMP packets in Wireshark tool.

Conclusion:

Hence, we have designed wired and wireless LAN using crossover and straight-through cable, andcaptured the ICMP, HTTP packets in Wireshark.