CCN Lab
Experiment - 1

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Aim: Study different types of Network cables and Practically implement the cross-wired cable and straight through cable using a clamping tool. Study of Networking Devices.

Apparatus (Components): RJ-45 connector, Climping Tool, Twisted-pair Cable

Hardware Requirement: RJ-45 connector, Climping Tool, Twisted-pair Cable

Software Requirement: Command Prompt And Packet Tracer.

Procedure: To do these practical following steps should be done:

1. Start by stripping off about 2 inches of the plastic jacket off the end of the cable. Be very careful at this point, as to not nick or cut into the wires, which are inside. Doing so could alter the characteristics of your cable, or even worse render is useless. Check the wires, one more time for nicks or cuts. If there are any, just whack the whole end off, and start over.

2. Spread the wires apart, but be sure to hold onto the base of the jacket with your other hand. You do not want the wires to become untwisted down inside the jacket. Category 5 cable must only have 1/2 of an inch of 'untwisted' wire at the end; otherwise, it will be 'out of spec'. At this point, you have ALOT more than 1/2 of an inch of un-twisted wire.

3. You have 2 end jacks, which must be installed on your cable. If you are using a pre-made cable, with one of the ends whacked off, you only have one end to install - the crossed over end. Below are two diagrams, which show how you need to arrange the cables for each type of cable end. Decide at this point which ends you are making and examine the associated picture below.

Theory:

Part I: Diagram shows you how to prepare Cross wired connection

RJ45 Pin # (END 1)	Wire Color	Diagram End #1	RJ45 Pin # (END 2)	Wire Color	Diagram End #2
1	White/Orange		1	White/Green	
2	Orange		2	Green	
3	White/Green		3	White/Orange	
4	Blue		4	White/Brown	
5	White/Blue		5	Brown	
6	Green		6	Orange	
7	White/Brown		7	Blue	
8	Brown		8	White/Blue	

The diagram shows you how to prepare straight through a wired connection

RJ45 Pin # (END 1)	Wire Color	Diagram End #1	RJ45 Pin # (END 2)	Wire Color	Diagram End #2
1	White/Orange		1	White/Green	
2	Orange		2	Green	
3	White/Green		3	White/Orange	
4	Blue		4	White/Brown	
5	White/Blue		5	Brown	
6	Green		6	Orange	
7	White/Brown		7	Blue	
8	Brown		8	White/Blue	

1.Twisted Pair :

Twisted pair cable is the most common type of network medium used in LANs. A transmission media consists of color-coded pairs of two shielded or unshielded insulated copper wires which are arranged in a spiral pattern. The spiral pattern is an important aspect of twisted-pair cables to minimize crosstalk or interference between adjoining wires. The advantage of using twisted pair cables are:

1. It is lighter, thinner, and more flexible. Easy to install

2. It is inexpensive

There are two varieties of twisted pair cabling, they are:

1.Unshielded Twisted Pair (UTP)

2.Shielded Twisted Pair (STP)

Unshielded Twisted Pair (UTP):

Unshielded twisted pair (UTP) cabling consists of two unshielded wires twisted around each other that contain no shielding. It is commonly used in telephone wires and is common for computer networking because of the high flexibility of the cables. It is a plastic connector that looks like a large telephone-style connector. The standard connector for unshielded twisted pair cabling is the RJ-45 connector.

Shielded Twisted Pair(STP):

Shielded Twisted-Pair cabling is usually used in several network types. STP cable usually contains four pairs of twisted copper wires. It is different from UTP in that the twisted pairs are in

a shield with electrically grounded woven copper mesh separating them from the cable"s outer sheath. It is suitable for environments with electrical interference. The essence of the shielding is to provide resistance to external Electromagnetic Interference (EMI) and to prevent crosstalk.

2. Fiber Optic Cable:

Fiber optic cable is the standard cable for connecting networks between buildings due to its resistance to the effect of moisture and lightening. This technology is popular for LAN but it is expensive and fragile too. The fiber optic cable is designed to carry laser light to a long distance at a high speed rather than transmitting electronic signals. It carries the digital data signals in the form of modulated pulses of light. This is a relatively safe way to send the data because electrical impulses are not carried over the fiber optic cable.

3. CRIMPER:

A crimper is a jawed device that looks like a pair of pliers. It has a set of dies in it that enables you to squeeze the two halves of an RJ-45 connector together with the wires inside. The wire is stripped off a cable and is out in the bottom half of the connector at both ends. The other half of the connector on the top of the wires squeezes the handles of the crimper to lock the two halves together. Crimping has two types of cables, they are:

1.Straight-through Cable

2.Cross over Cable

A Straight-through cable is a Cat 5 cable that has similar wiring at both ends. It is a standard network cable that connects a computer to a network device like a network hub, a network switch, and network routers. A straight-through cable has each internal twisted pair of wires connected to the same pin number at each end. The twisted-pair wires must be twisted throughout the entire length of the cable. If the colors on both ends are in the same order, it is a straight-through cable. The straight-through cable is used to connect:

Host to switch or hub

Router to switch or hub

Part II: Study of following Network Devices in Detail

- Repeater
- Hub
- Switch
- Bridge
- Router
- GateWay

Apparatus (Software): No software or hardware needed.

Procedure: The following should be done to understand this practical.

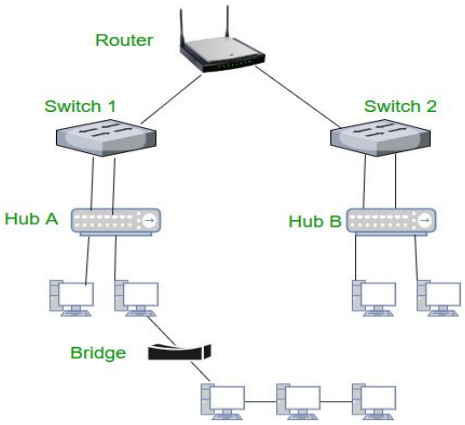
1. **Repeater:** Repeaters are network devices operating at the physical layer of the OSI model that amplify or regenerate an incoming signal before retransmitting it. They are incorporated in networks to expand their coverage area. They are also known as signal boosters.

2. **Hub:** An Ethernet hub, active hub, network hub, repeater hub, multiport repeater, or simply hub is a network hardware device for connecting multiple Ethernet devices and making them act as a single network segment. It has multiple input/output (I/O) ports, in which a signal

introduced at the input of any port appears at the output of every port except the original incoming.[1] A hub works at the physical layer (layer 1) of the OSI model.[2] A repeater hub also participates in collision detection, forwarding a jam signal to all ports if it detects a collision. In addition to standard 8P8C ("RJ45") ports, some hubs may also come with a BNC or an Attachment Unit Interface (AUI) connector to allow connection to legacy 10BASE2 or 10BASE5 network segments.
`Types of Hub

- Active Hub:- These are the hubs that have their power supply and can clean, boost, and relay the signal along with the network. It serves both as a repeater as well as a wiring center. These are used to extend the maximum distance between nodes.
- Passive Hub:- These are the hubs that collect wiring from nodes and power supply from an active hub. These hubs relay signals onto the network without cleaning and boosting them and can't be used to extend the distance between nodes.
- Intelligent Hub:- It works like active hubs and includes remote management capabilities. They also provide flexible data rates to network devices. It also enables an administrator to monitor the traffic passing through the hub and to configure each port in the hub.

3. **Switch:** Switches are networking devices operating at layer 2 or a data link layer of the OSI model. They connect devices in a network and use packet switching to send, receive, or forward data packets or data frames over the network. A switch has many ports, to which computers are plugged in.



4. **Bridge:** A bridge operates at the data link layer. A bridge is a repeater, with add on the functionality of filtering content by reading the MAC addresses of source and destination. It is also used for interconnecting two LANs working on the same protocol. It has a single input and single output port, thus making it a 2 port device.

5. **Router:** A router is a device like a switch that routes data packets based on their IP addresses. The router is mainly a Network Layer device. Routers normally connect LANs and WANs and have a dynamically updating routing table based on which they make decisions on routing the data packets. Router divide broadcast domains of hosts connected through it.
6. **Gateway:** A gateway, as the name suggests, is a passage to connect two networks that may work upon different networking models. They work as messenger agents that take data from one system, interpret it, and transfer it to another system. Gateways are also called protocol converters and can operate at any network layer. Gateways are generally more complex than switches or routers.

Conclusion: Hence, from this experiment, we learn about different types of network cables and the types of connections namely: cross and straight. We see the practical implementation of these cables. In the second part we learn about various networking devices such as routers, hubs, gateways, etc. thus is experiment makes us learn about the basic components required for networking.

References:

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3. https://www.makeuseof.com/tag/ethernet-crossover-cable/