Tribhuvan University

Institute of Engineering

Pulchowk Campus

A Lab Report on: #1

Study of Network Devices and Cables,

Computer Network

Submitted By:

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Title:

Study of Network Devices and Cables

Objectives:

The objectives of Lab1 are as follows:

- To be familiar with different network devices: repeater, hub, bridge, switch, router etc.
- To be familiar with UTP cable, RJ-45 connector and colour coding of UTP network cable
- To be familiar with preparation of straight through and crossover cables and their uses

Required Tools:

- Repeater
- Hub
- Bridge
- Switch
- Router
- UTP Cables
- Registered Jack(RJ45 connector)
- Cable cutter
- Cable clamper

Procedure:

The lab was completed in three phases.

- **To be familiar with different network devices: repeater, hub, bridge, switch, router etc.**
  We learned about the appearance and functioning of different network devices.
- **To be familiar with UTP cable, RJ-45 connector and colour coding of UTP network cable**
  We were provided with CAT6 UTP with twisted pair cables visible and learned about the functioning of each wire. Similarly, structure of RJ-45 and the colour codes of UTP cables were also studied.
- **To be familiar with preparation of straight through and crossover cables and their uses**
  The given cables were cut and twisted pairs were untwisted. Then both straight through ans crossover cables were prepared.

Observation:

Following things were observed:

- The functions of various network devices are:
  - Repeater: A repeater receives a signal and retransmits it.
  - Hub: A hub is a repeater with multiple ports.
  - Bridge: A bridge connects two segment of a network together.
  - Switch: A switch forwards signal to a specific host.
  - Router: A router is a wireless device for sending and receiving data packets.
- The colour coding of UTP network cable was:

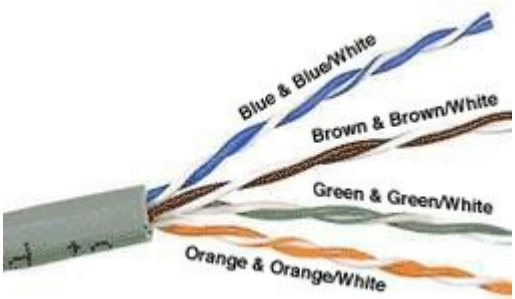

Figure 1: Internal Cable Structure and Colour Coding

The cable had 8 coloured wires which were twisted into 4 pairs. One wire in pair was solid and another wire in the pair was white with stripes of first wire.

- Preparation of straight through and crossover cables included(T568B standard):

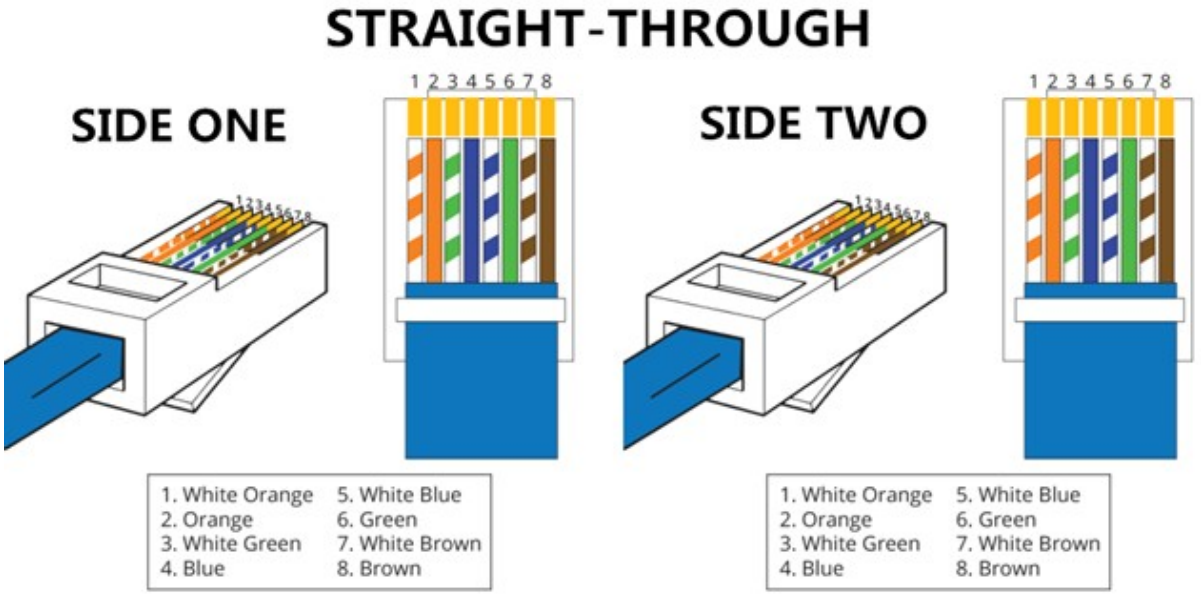

Figure 2: Preparation of straight through cable

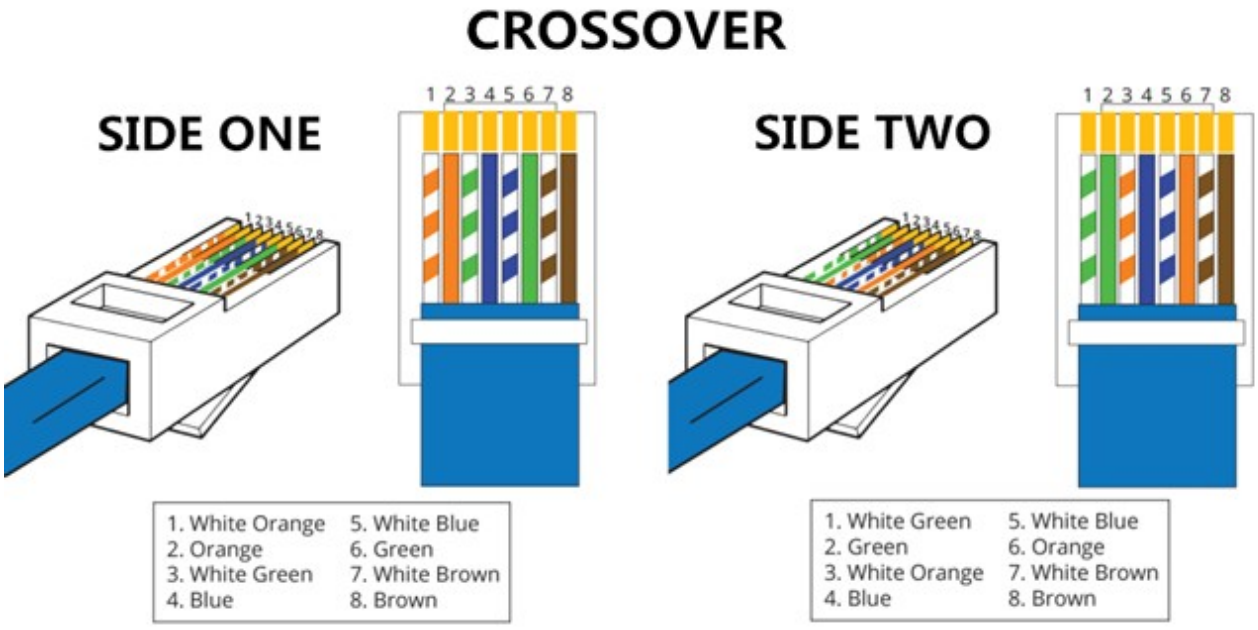

Figure 3: Preparation of crossover cable

- The uses of straight through cables are:
  - Switch to router
  - Switch to PC
  - Hub to PC
- The uses of crossover cables are:
  - Switch to switch
  - Switch to hub
  - Hub to hub
  - Router to router
  - PC to PC

Conclusion:

In this way “Lab1: Study of Network Devices and Cables” was completed after studying about different network devices, UTP cables, straight through connection and crossover connection.

Exercises:

1. List out the devices that can work up to physical, data link, network and application layer.
Ans:
The devices that work on physical. Data link, network and application layer are:

- Physical Layer
  - Repeaters
  - Hubs
  - Cables
  - Modems
- Data link Layer
  - Bridges
  - Switches
  - Network Interface Cards(NICs)
- Network Layer
  - Routers
  - Bridge routers(Brouters)
- Application Layer
  - PC
  - Server
  - Gateways
  - Firewall

2. Compare the devices (showing the similarities as well as differences):
Ans:
a. Repeater and Hub
The similarities are:

- They work in physical layer.
- They extend the length of cable.

The differences are:

Repeater	Hub
Repeater has two ports.	A hub is a multi-port repeater.
A repeater regenerates input signal.	A hub doesn't necessary regenerate signals.
A repeater only extends signal inside same network.	A hub can connect multiple nodes in star topology.
A repeater doesn't reduce collision domain.	A hub reduces collision domain.

b. Bridge and switch
The similarities are:

- They work in data-link layer.
- They have multiple ports.

The differences are:

Bridge	Switch
A bridge can connect fewer LANs as compared to switch.	A switch can connect more LANs than bridge.
Bridges do not have buffers.	A switch has a buffer for each link connected to it.
Bridges do not perform error checking.	Switches perform error checking.
Bridges can be classified as: • Simple bridge • Multi port bridge • Transparent bridge	Switches can be classified as: • Store and forward switch • Cut through switch

c. Repeater and bridge

The similarities are:

- They extend the length of cable.
- A bridge can be considered as a smart repeater which retransmits signal only when necessary.

The differences are:

Repeater	Bridge
A repeater works in physical layer.	A bridge works in data-link layer.
A repeater has two ports.	A bridge is a multi-port device.
A repeater cannot understand complete frames.	A bridge can understand complete frames.
A repeater cannot perform packet filtering.	A bridge can filter packets.

d. Hub and switch

The similarities are:

- They have multiple ports.
- They are used to transmit signals in LAN.
- They can connect multiple networks.

The differences are:

Hub	Switch
A hub operates on physical layer	A switch operates on data-link layer.
A hub can only broadcast signals.	A switch can unicast, multicast and broadcast signals.
A hub transmits signals in half duplex mode.	A switch transmits signals in full duplex mode.
A hub has no packet filtering.	A switch has packet filtering.

e. Switch and router

The similarities are:

- They can connect multiple networks.
- They can be considered as intelligent device.
- They transmit signals only when necessary.

The differences are:

Switch	Router
A switch operates in data-link layer.	A router operates in network layer.
A switch is used only on LAN.	A router can be used in LAN as well as MAN.
A switch is mainly used to connect devices.	A router is mainly used to connect networks.
A switch sends data in the form of frames and packets.	A router sends data in the form of packets.

3. Explain the colour coding standards of UTP cable.

Ans:

In the Unshielded Twisted Pair (UTP) cable, there are 4 twisted pairs with 8 wires. Each pair is represented by its unique colour. One wire in pair was solid and another wire in the pair was white with stripes of first wire. For example, an orange coloured twisted pair would have a wire of orange colour and another wire of while colour with a strip of orange colour on it. This colour coding assists in wiring. It mainly helps to differentiate straight through and crossover connection.

4. Where do you need straight-through and cross-over cable? Discuss briefly.

Ans:

Straight through cable is used to connect dissimilar devices. The uses of straight through cables are:

- Switch to router
- Switch to PC
- Hub to PC

Crossover cable is used to connect similar devices. The uses of crossover cables are:

- Switch to switch
- Switch to hub
- Hub to hub
- Router to router
- PC to PC