Assignment 1

★ Different types of Cables

1) Copper Straight Through Cable →

- **Description** → A copper straight-through cable is perhaps one of the most commonly used network cables. It's characterized by the same pin configuration at both ends, meaning the wires in the cable are connected straight through from one end to the other. It connects two different types of devices.
- **Use-Cases** → i) Connecting a PC to a switch or hub,
  ii) Linking a router to a switch to enable communication between different network segments.

2) Copper Crossover Cable →

- **Description** → Copper crossover cables, on the other hand, feature different pin configurations at each end. These cables are designed for connecting similar devices directly to each other, bypassing the need for intermediary networking equipment.
- **Use-Cases** → i) Connecting two PCs directly without a switch or hub.
  ii) Creating a direct link between two switches for redundancy or high-speed interconnection.

3) Fiber-Optic Cable →

- **Description** → Fiber-Optic cables stand out in the world of networking for their use of light signals instead of electrical signals. They offer high bandwidth, immunity to electromagnetic interference & extended transmission distances.
- **Use Cases** → i) High speed, long-distance connections in data centers & telecommunications,
  ii) Environments with high levels of electromagnetic interference.

☆ Connection Between Similar Systems

In Cisco networking, when connecting two similar devices, a copper crossover cable is used to ensure proper communication. The key concept behind this is the T568A & T568B wiring standards, which define how the pins are arranged in the RJ45 connectors.

- **When to Use a Crossover Cable?**

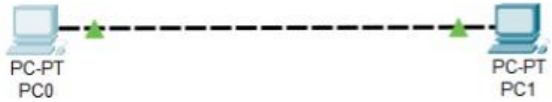
→ A crossover cable is used when connecting similar devices, such as:

i) Switch to Switch
ii) Router to Router
iii) PC to PC
iv) Hub to Hub

This is necessary because similar devices transmit & receive data on the same pins. A crossover cable swaps the transmit (Tx) & receive (Rx) pairs, enabling proper communication.

- **Example** → In the given example shown in the printout →

i) First I have connected two PCs with the help of copper crossover cable.
ii) Then I have configured the IP statically on the both systems.
iii) Then using the "ping" command from the command prompt I have pinged / sent packets from one system & got the reply from other system.
iv) Atlast using "arp -a" command I have displayed the Internet address & physical address of the receiver device.



PC0

Physical Config Desktop Programming Attributes

Command Prompt X

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 100.100.100.2

Pinging 100.100.100.2 with 32 bytes of data:

Reply from 100.100.100.2: bytes=32 time<1ms TTL=128
Reply from 100.100.100.2: bytes=32 time<1ms TTL=128
Reply from 100.100.100.2: bytes=32 time<1ms TTL=128
Reply from 100.100.100.2: bytes=32 time<1ms TTL=128

Ping statistics for 100.100.100.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>arp -a
  Internet Address      Physical Address      Type
  100.100.100.2         0002.4a83.2a12        dynamic

C:\>
```

✱ Switch & Server

a) **Switch** → A switch is a networking device that operates at Data link layer of the OSI model & is used to connect multiple devices within a LAN. It forwards data based on MAC addresses, ensuring efficient communication within the network.

- Key Features :→
  - i) MAC address learning & forwarding.
  - ii) VLAN support for network segmentation.
  - iii) Spanning Tree Protocol for loop prevention.
  - iv) Layer 3 switching (In some advanced models).

b) **Server** → A server refers to a system that provides resources, services, or applications to clients within the network. It can be a DNS server, DHCP server, Web server, File Server etc. Servers are crucial for centralized management & ensuring smooth network operations.

- Key Features :→
  - i) Provides services like file sharing, authentication & hosting.
  - ii) Can be connected to a switch for client-communication.
  - iii) Requires IP addressing (Static or DHCP-assigned)

✯ Connection Between Two Different Systems

A copper straight-through cable is used to connect different types of networking devices because it follows the same wiring standard on both ends (T568A to T568A or T568B to T568B). This ensures proper data transmission between devices that communicate on different Tx/Rx pairs.

- **When to use a copper straight-through cable ?**

→ A copper straight-through cable is used when connecting different devices, such as :→

i) PC to switch,
ii) PC to router,
iii) Switch to router.
iv) Hub to router, etc.

- **Example** → In the given example shown in the printout →

i) first I have connected two PCs, one laptop & one server using a switch (PT switch 4 channel) with copper straight through cable between PC & switch, Laptop & switch, & between the server & switch.

ii) Then I have configured the IP addresses statically on every system.

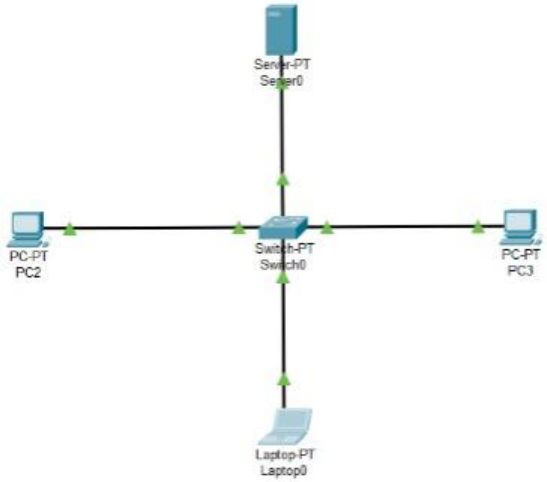
iii) Then opening command prompt of the laptop, I have pinged the two PCs & the server from the laptop & sent packets & got reply from the other systems.

iv) Atlast using "arp -a" command I have displayed all the internet addresses & physical addresses of all other receiver devices.

Cisco Packet Tracer

File Edit Options View Tools Extensions Window Help

Logical Physical x: 1397, y: 355



Time: 00:15:05

Copper Straight-Through

Scenario 0

New Delete

Toggle PDU List Window

Fire

Laptop0

Physical Config Desktop Programming Attributes

Command Prompt X

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 100.100.100.1

Pinging 100.100.100.1 with 32 bytes of data:

Reply from 100.100.100.1: bytes=32 time<1ms TTL=128
Reply from 100.100.100.1: bytes=32 time<1ms TTL=128
Reply from 100.100.100.1: bytes=32 time<1ms TTL=128
Reply from 100.100.100.1: bytes=32 time<1ms TTL=128

Ping statistics for 100.100.100.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 100.0.0.1

Pinging 100.0.0.1 with 32 bytes of data:

Reply from 100.0.0.1: bytes=32 time<1ms TTL=128
Reply from 100.0.0.1: bytes=32 time<1ms TTL=128
Reply from 100.0.0.1: bytes=32 time<1ms TTL=128
Reply from 100.0.0.1: bytes=32 time<1ms TTL=128

Ping statistics for 100.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 100.0.0.3

Pinging 100.0.0.3 with 32 bytes of data:

Reply from 100.0.0.3: bytes=32 time<1ms TTL=128
Reply from 100.0.0.3: bytes=32 time<1ms TTL=128
Reply from 100.0.0.3: bytes=32 time<1ms TTL=128
Reply from 100.0.0.3: bytes=32 time<1ms TTL=128

Ping statistics for 100.0.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>arp -a
  Internet Address      Physical Address      Type
  100.0.0.1             00d0.ff37.9a10        dynamic
  100.0.0.3             0030.f204.b7e4        dynamic
  100.100.100.1         00d0.5817.0219        dynamic

C:\>
```

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