CCNA 200-301

Lesson 4

- Ethernet LAN

Ethernet LAN (Local Area Network)

Ethernet is a family of LAN standard that is known by IEEE (Institute of Electrical and Electronics Engineers).

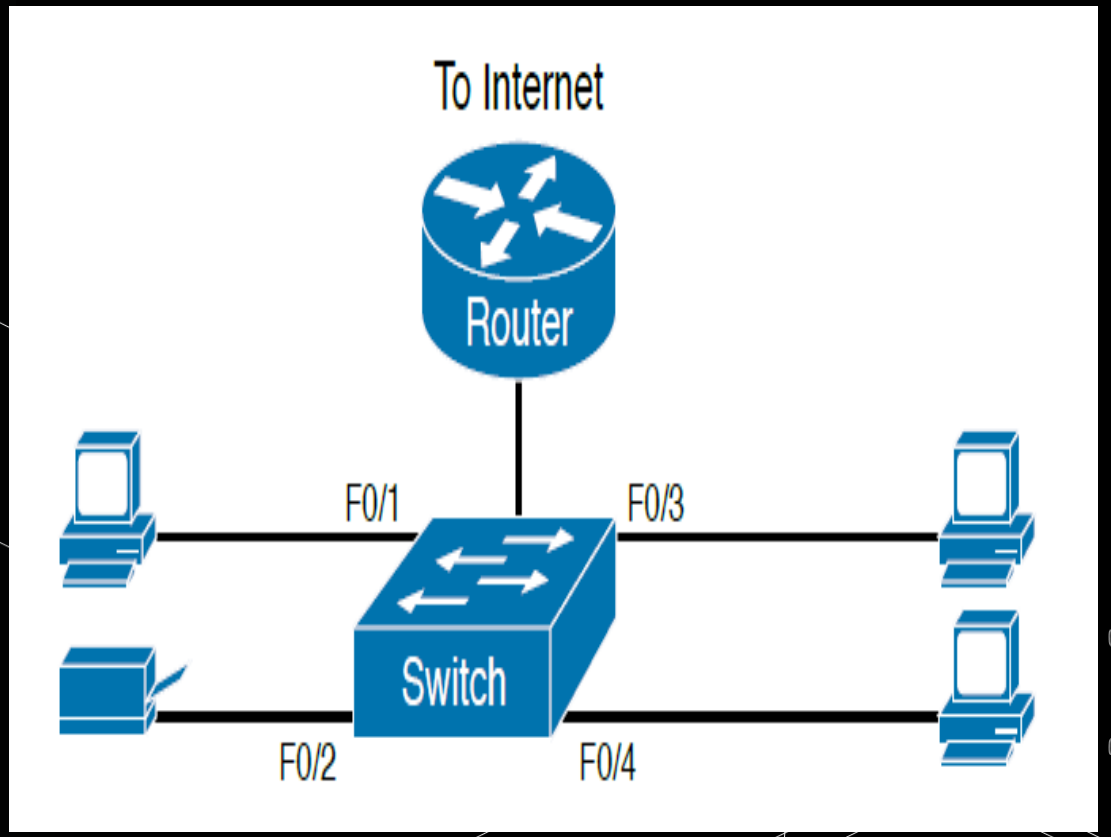
SOHO – Small Office/Home Office topology.

One Layer 2 switch

A number of hosts (computers, printers, etc)

Cables

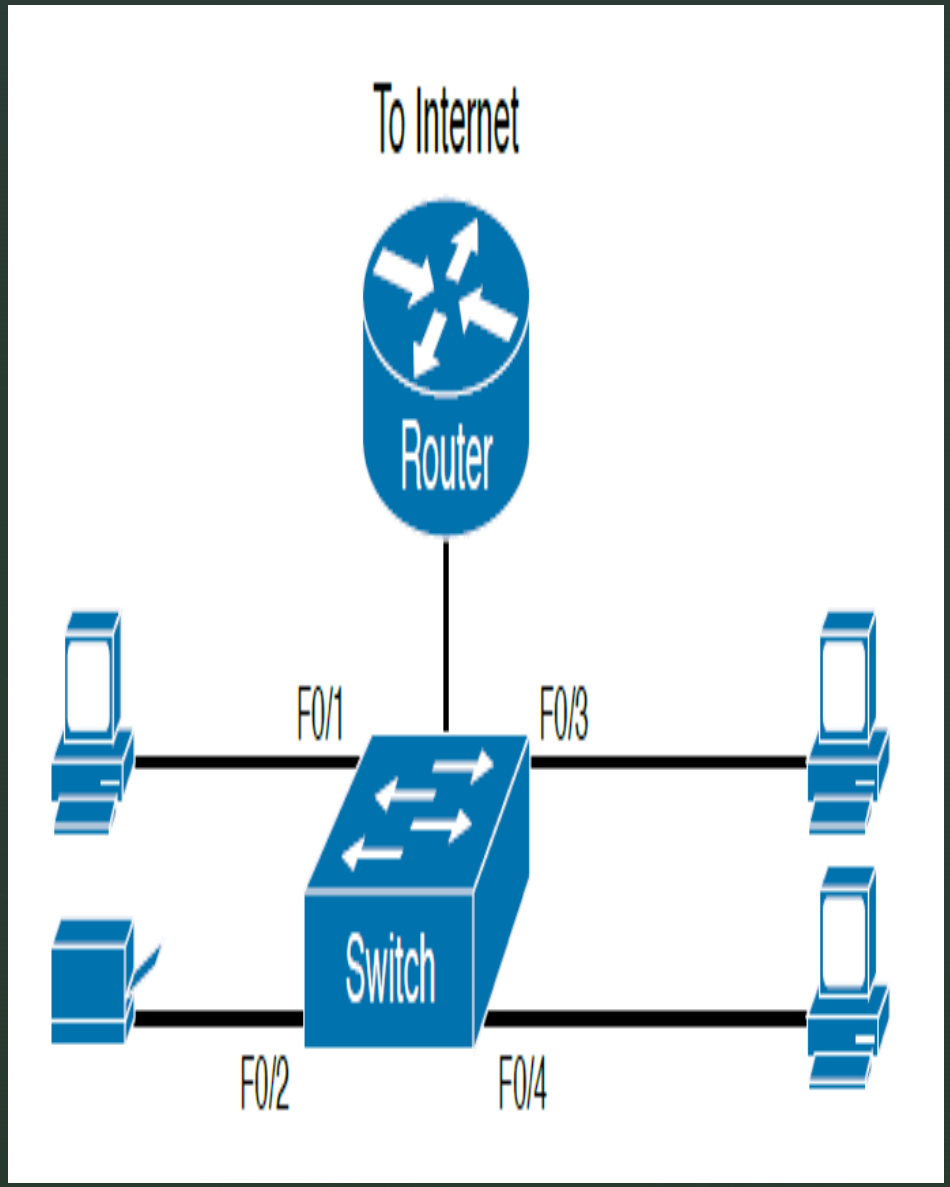
Router – for connecting outside world.



SOHO cont.

In our example, switch and router are separate devices, but today's SOHO network has one device that combines all functions into one.

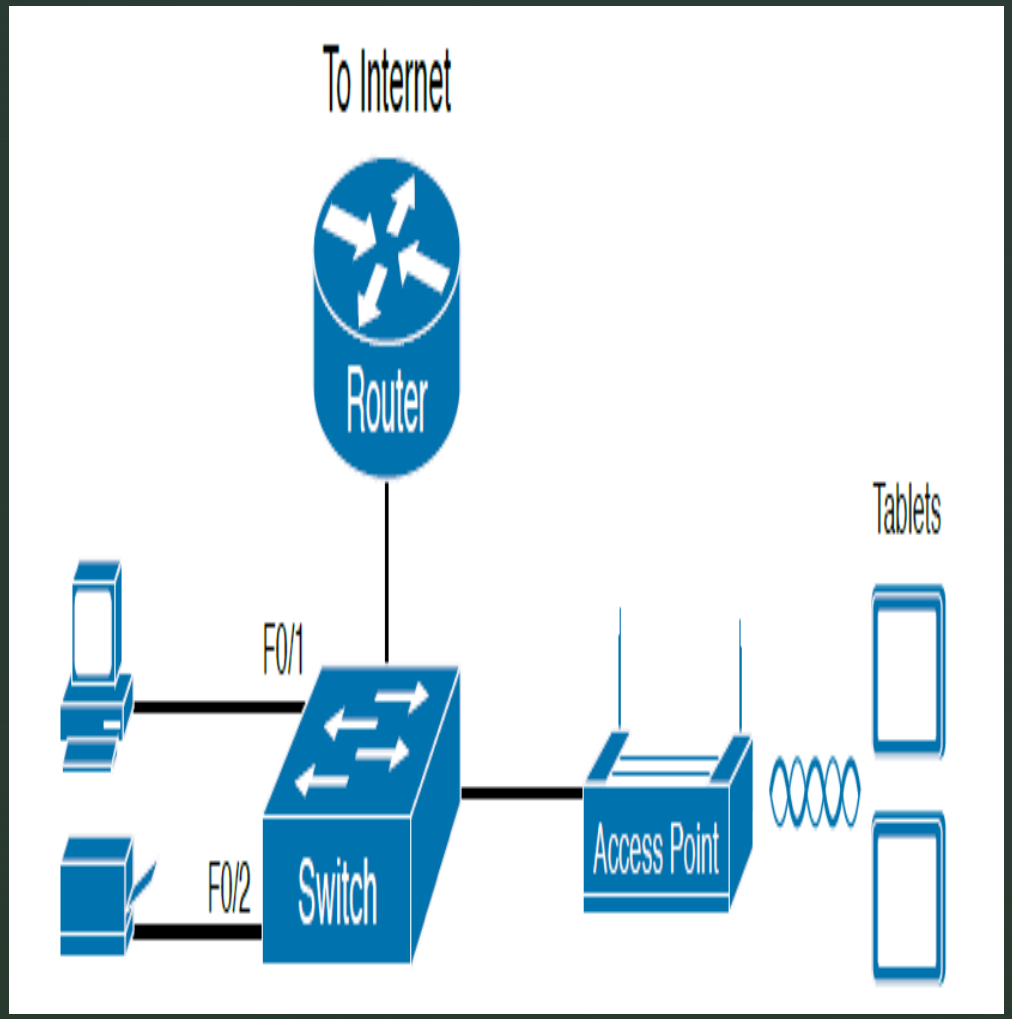
In our case we can use multi-layer switch to reduce cost.



SOHO cont. wireless feature

In typical SOHO network we need access point to provide wireless devices to get internet gain.

In modern SOHO design consists of only wireless router that support all functions.



Typical Enterprise LAN

Let’s suppose a building with three floors.

In order to build typical Enterprise LAN we need the followings:

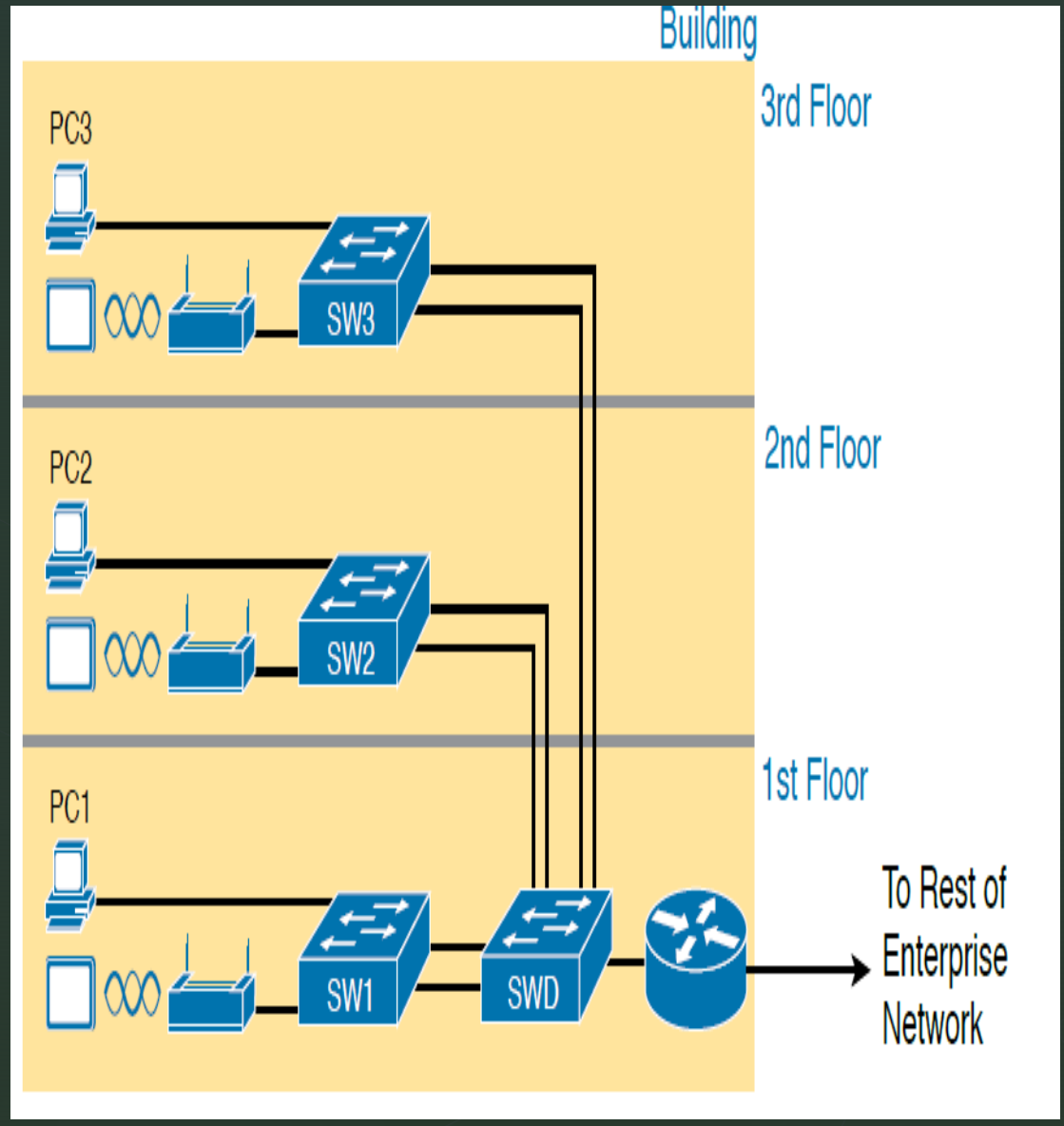
1 Router,

1 Distribution Switch.

3 Access switch for users,

3 Access Point for wireless users.

Typical Enterprise LAN is similar to SOHO but a larger scale.



Types of Ethernet

In order to make physical layer of networking we need to recognize the types of communication links. IEEE defines formal standards for communication links. But we also have informal names.

The suffix in the end of informal name means types of Ethernet.

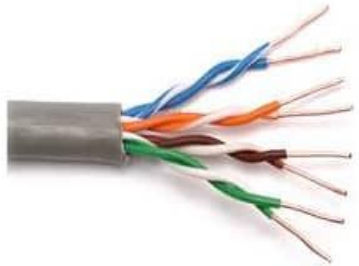
T – means UTP (Un-Twisted Pair).

X – means Fiber Optic.

Speed	Common Name	Informal IEEE Standard Name	Formal IEEE Standard Name	Cable Type, Maximum Length
10 Mbps	Ethernet	10BASE-T	802.3	Copper, 100 m
100 Mbps	Fast Ethernet	100BASE-T	802.3u	Copper, 100 m
1000 Mbps	Gigabit Ethernet	1000BASE-LX	802.3z	Fiber, 5000 m
1000 Mbps	Gigabit Ethernet	1000BASE-T	802.3ab	Copper, 100 m
10 Gbps	10 Gig Ethernet	10GBASE-T	802.3an	Copper, 100 m

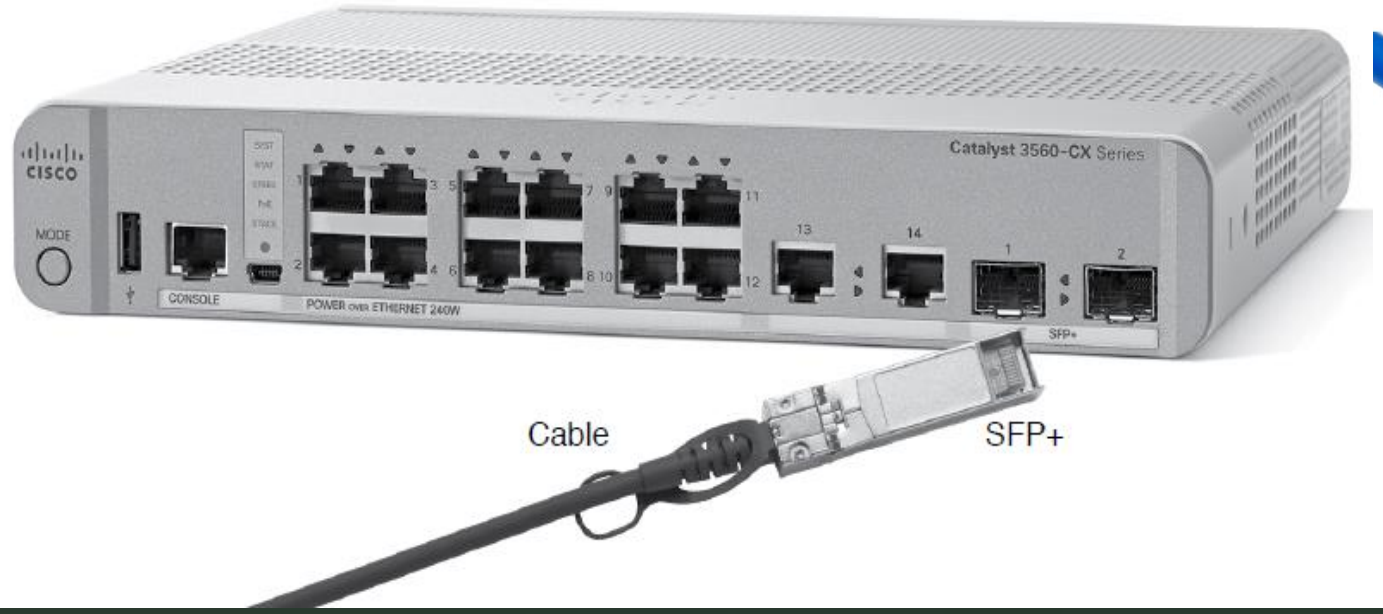
UTP vs STP vs Fiber Optic

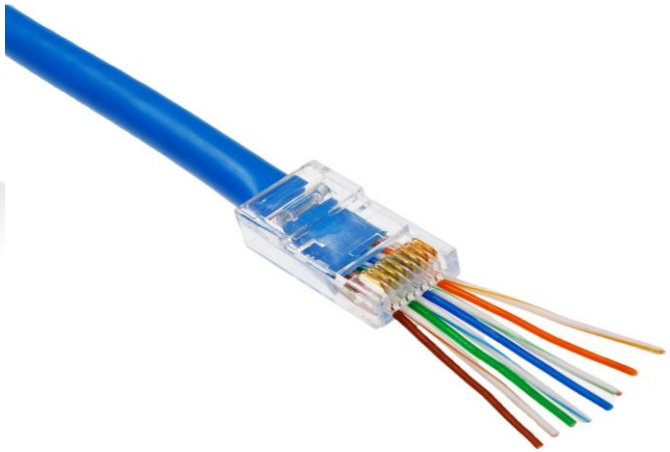
- UTP has no protecting layer over twisted pairs.
- STP has protecting layer over twisted pair.
- As a connector for UTP, RJ45 is used
- Fiber optic is also using connecter, called SFP (Small Form Pluggable).



UTP Cable

STP Cable

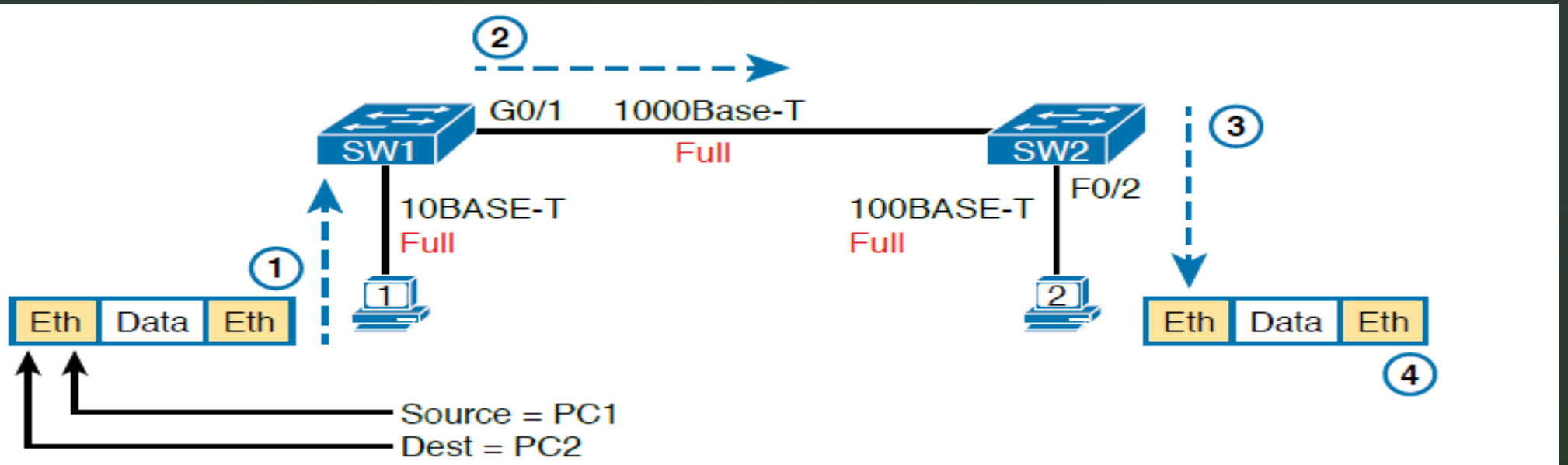




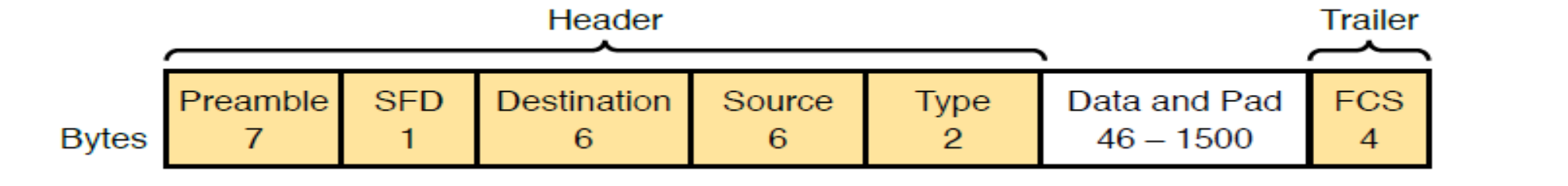
Data Transmission in Ethernet Network

In the next image represents data transmission between PC1 and PC2. Sw1 receives frame and forwards to Sw2. In its turn Sw2 forwards frame to PC2. Data Link layer puts its header and trailer to frame.

What is the meaning FULL ? – Explanation is After one slide.



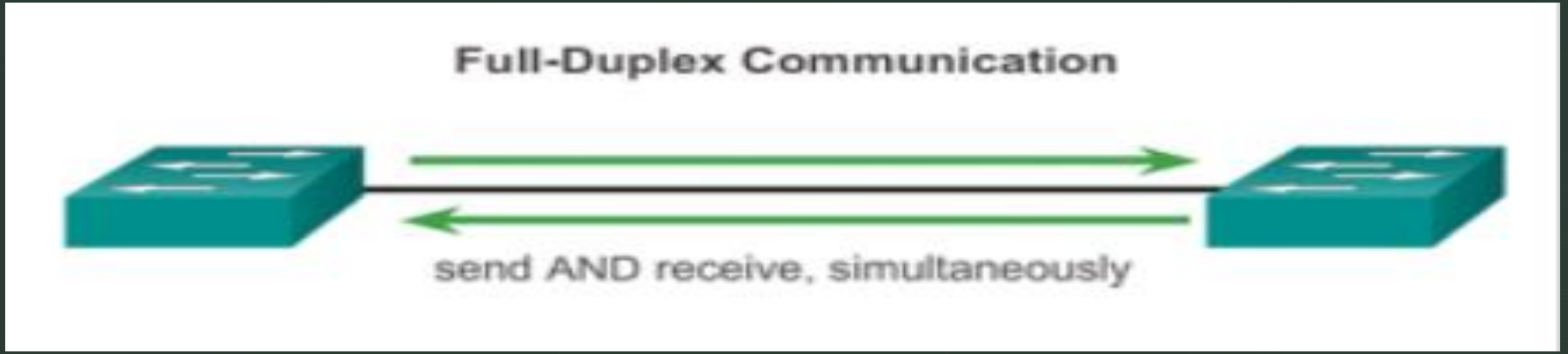
Ethernet Header and Trailer.

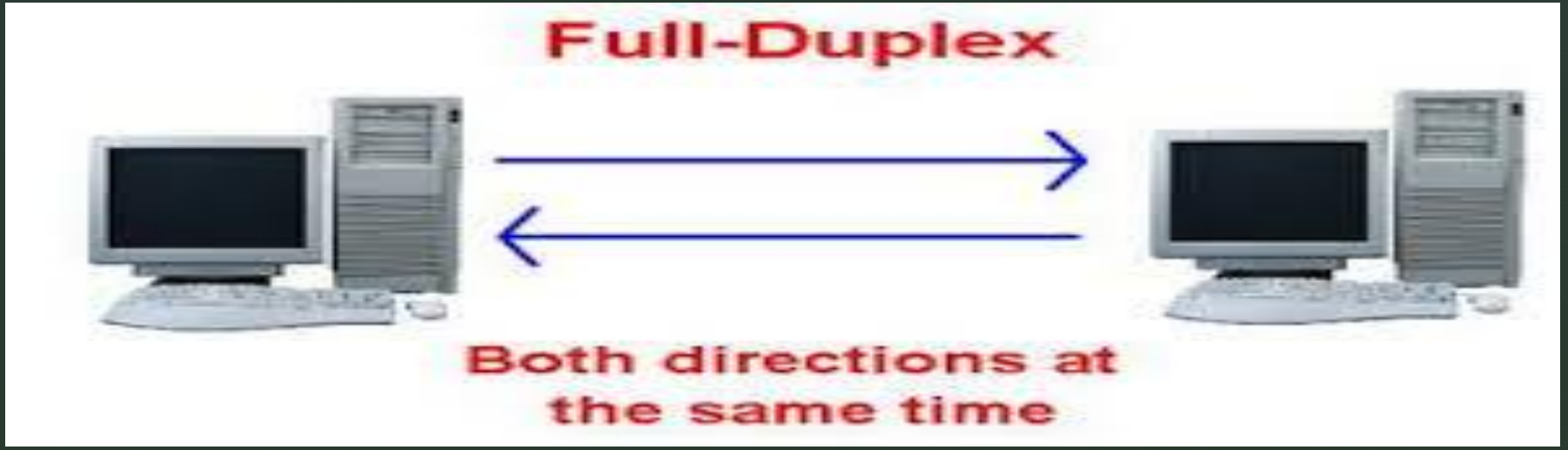


- Preamble – This is a pattern of alternative 0's and 1's which indicates starting of the frame and allow sender and receiver to establish bit synchronization,
- SFD – Start Frame Delimiter-represents that the frame starts,
- Destination – Destination MAC address,
- Source – Source MAC address,
- Type – shows IP addressing type (IPv4 or IPv6)
- Data – Data size
- FCS (Frame Check Sequence) – it is used error detection.

Full and Half Duplex on Ethernet LAN

Full duplex means that the device or NIC sends and receives frame at the same time.



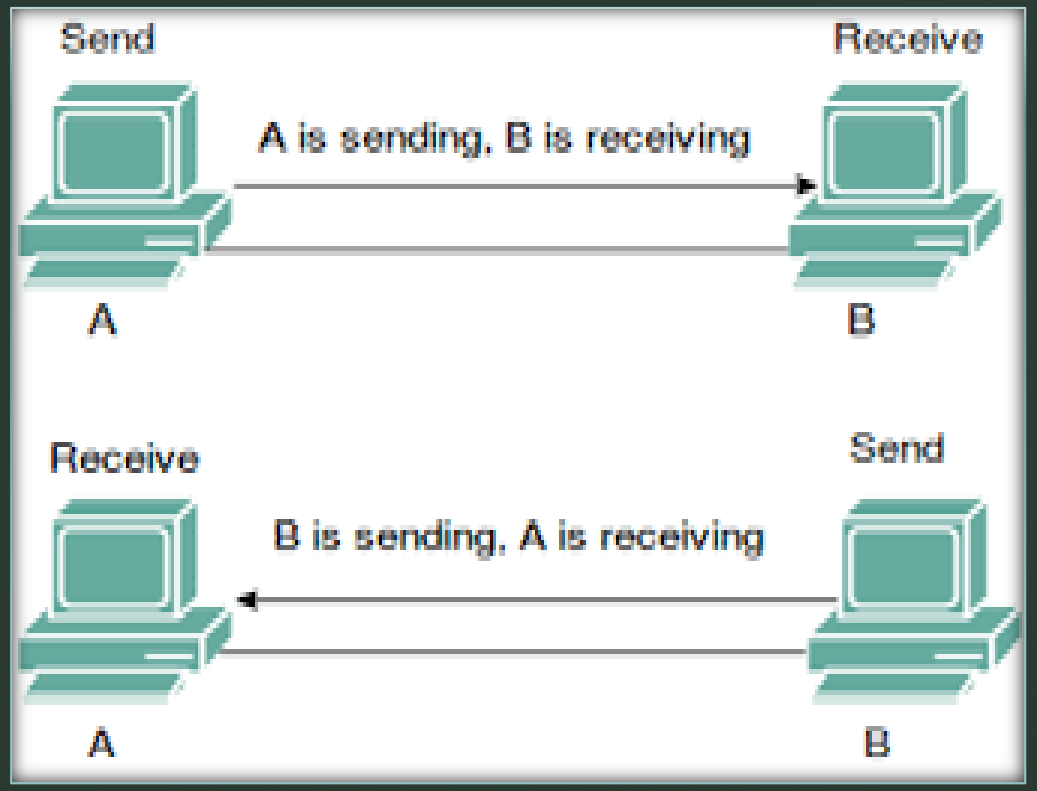


Full and Half Duplex on Ethernet LAN cont.

Half duplex: The device must wait to send if it is currently receiving a frame; in other words, it cannot send and receive at the same time.

How devices detect whether frame is in communication link ?

ANSWER : CSMA/CD – algorithm.



Full and Half Duplex on Ethernet LAN cont.

Let’s focus on the topology. It is half duplex topology, if the two hosts send at the same time there is collision.

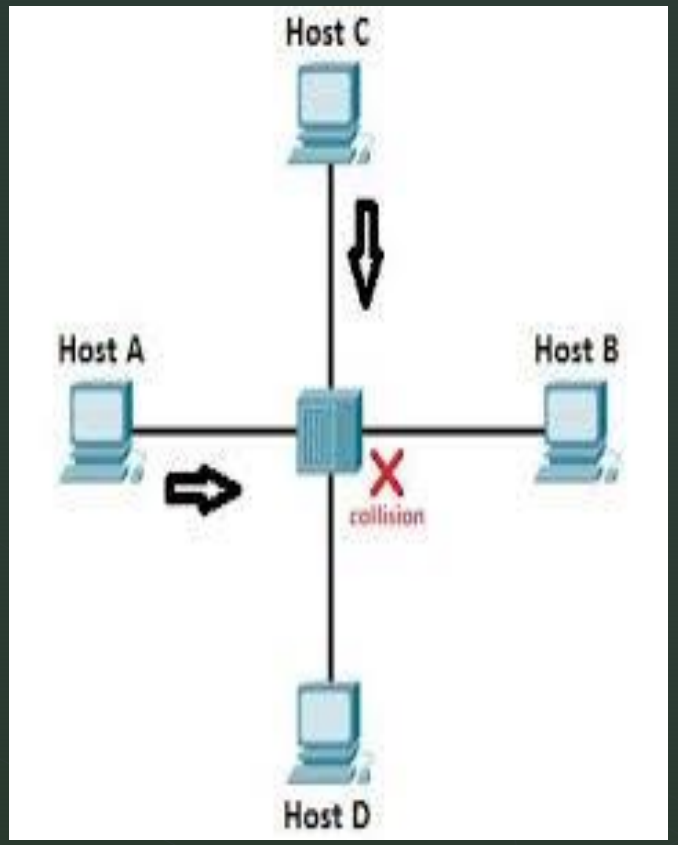
In half-duplex ethernet LAN, CSMA/CD algorithm is used.

CSMA/CD – Carrier Sense Multiple Access/Collision Detection.

The host that wants to send frame listen whether is busy or not? If the link is free it can send in other case it can not.

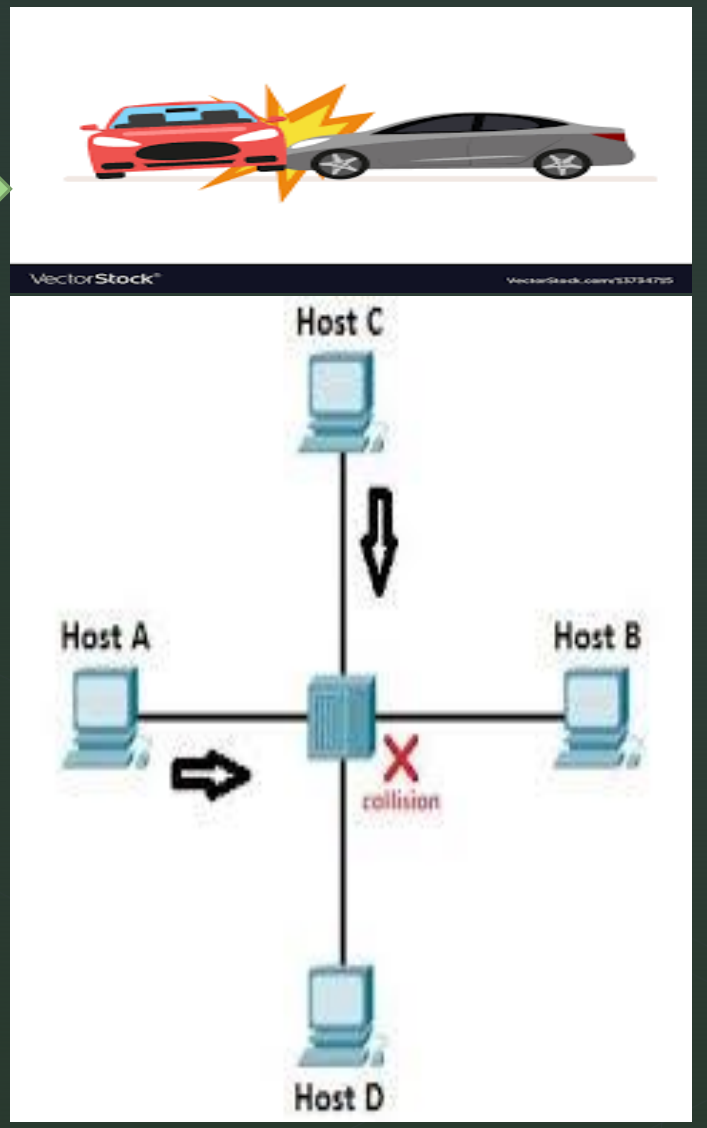
What will happen if two hosts send at the same time?

Of course, COLLISION



Full and Half Duplex on Ethernet LAN cont.

COLLISION



- When there is collision the sending hosts let other hosts know with the JAMMING singal. After getting jamming signal all host in collision domain waits while a random time and the listens the link again.

Ethernet switches support full-duplex, however hubs don’t support full duplex.

Practical view on simulator – Packet Tracer…

That is all for Lesson 4

The key is :

Learn

Repeat

Practice

You will be able to reach your goals.

GOOD LUCK !!!!!...