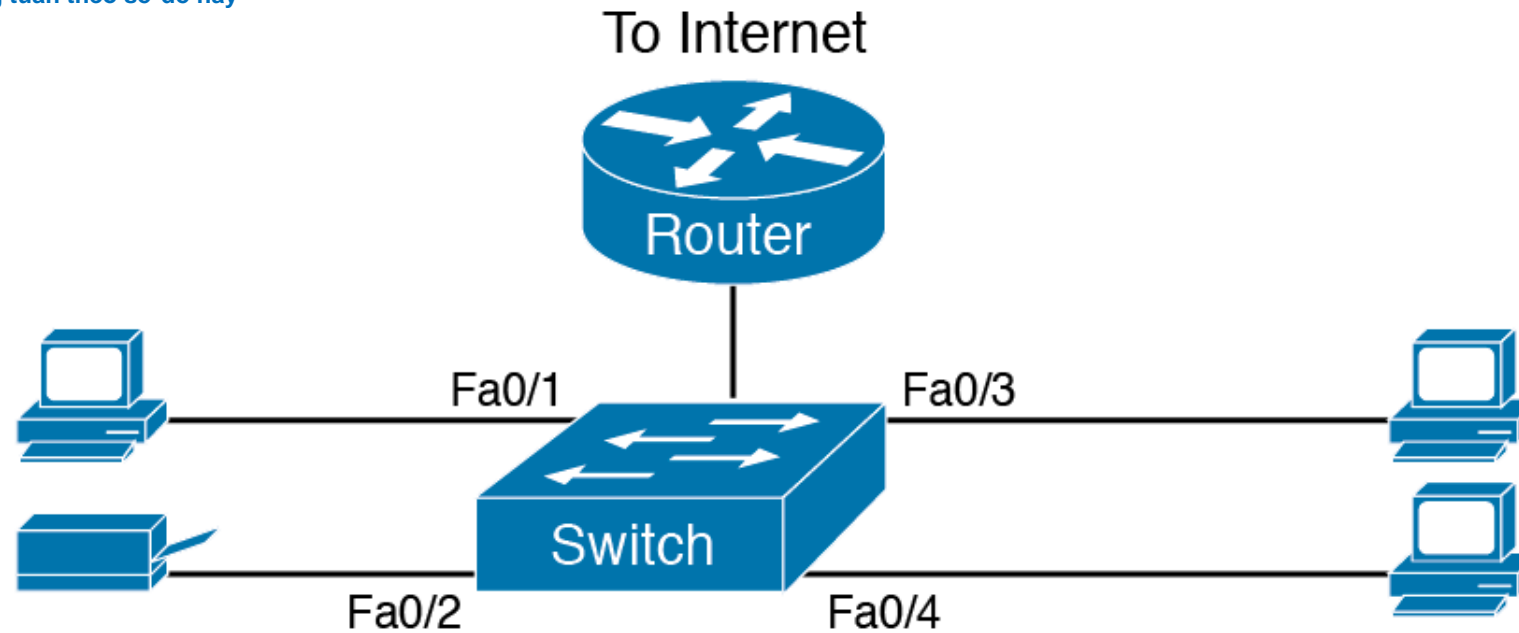


# **Chương 1: Giới thiệu tổng quan**

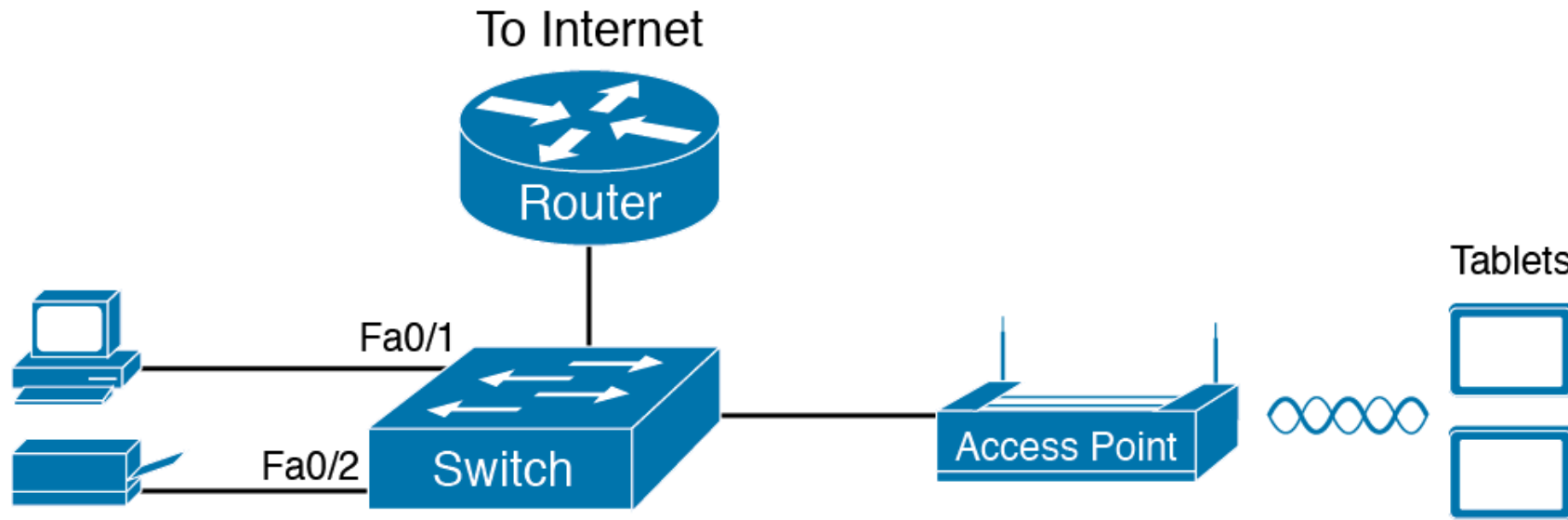
**123043 – Thiết kế mạng**

# Small-Office / Home-Office LAN (SOHO)

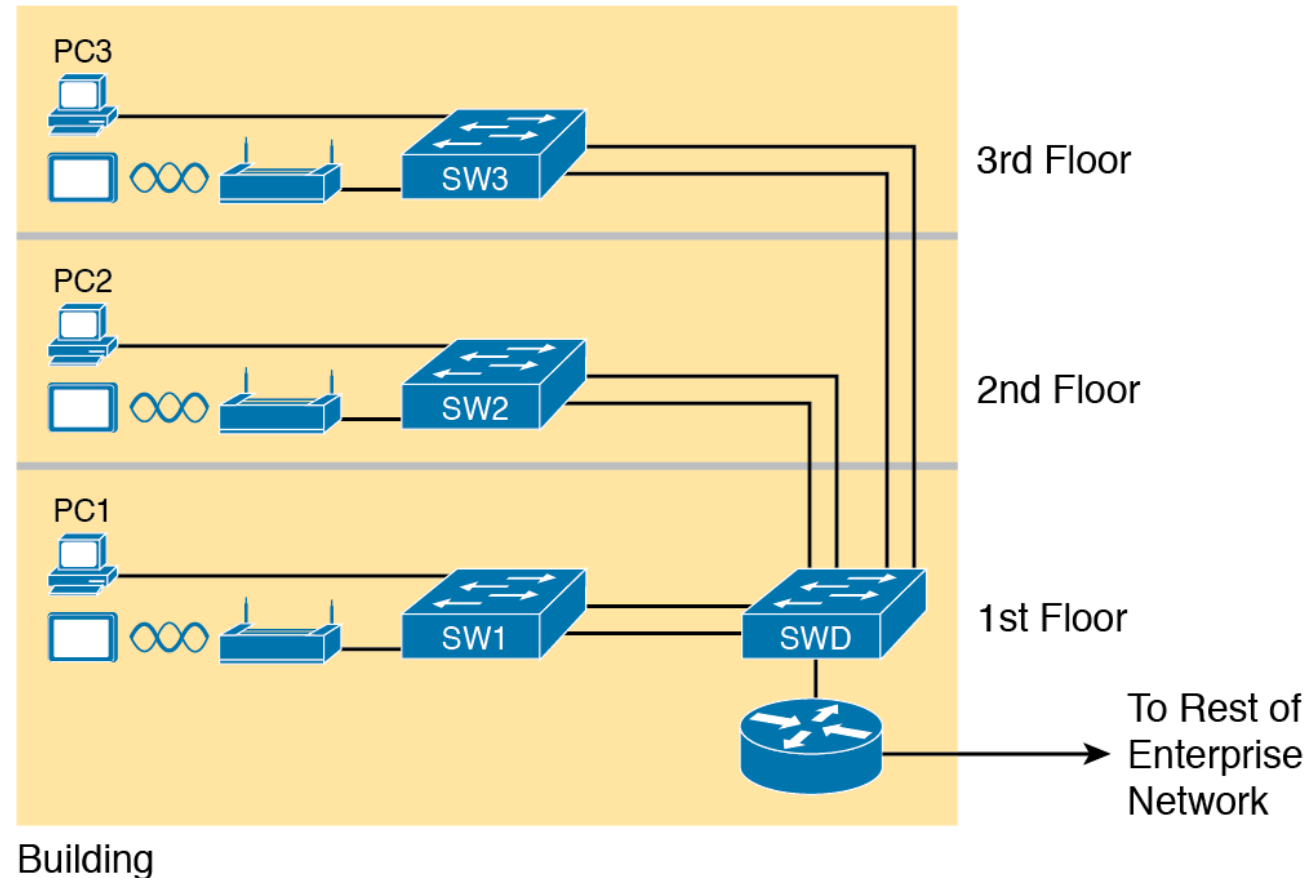
cho dù hệ thống có lớn thì cũng tuân theo sơ đồ này



## Small Wired and Wireless SOHO LAN



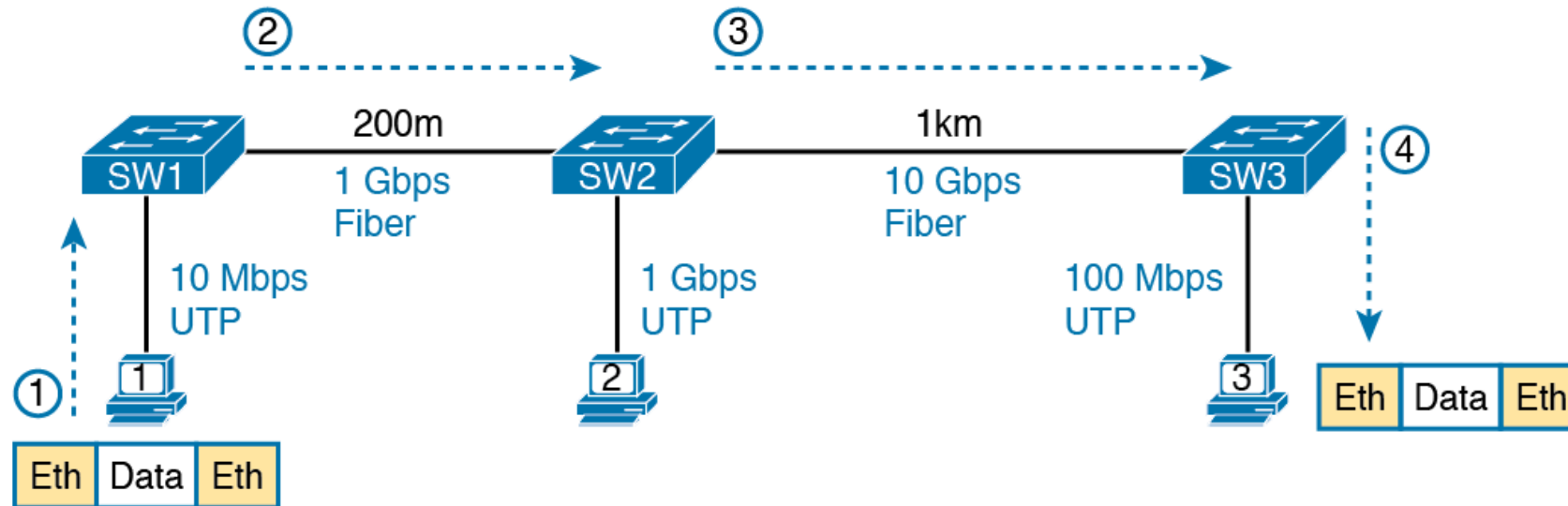
## Single-Building Enterprise Wired and Wireless LAN



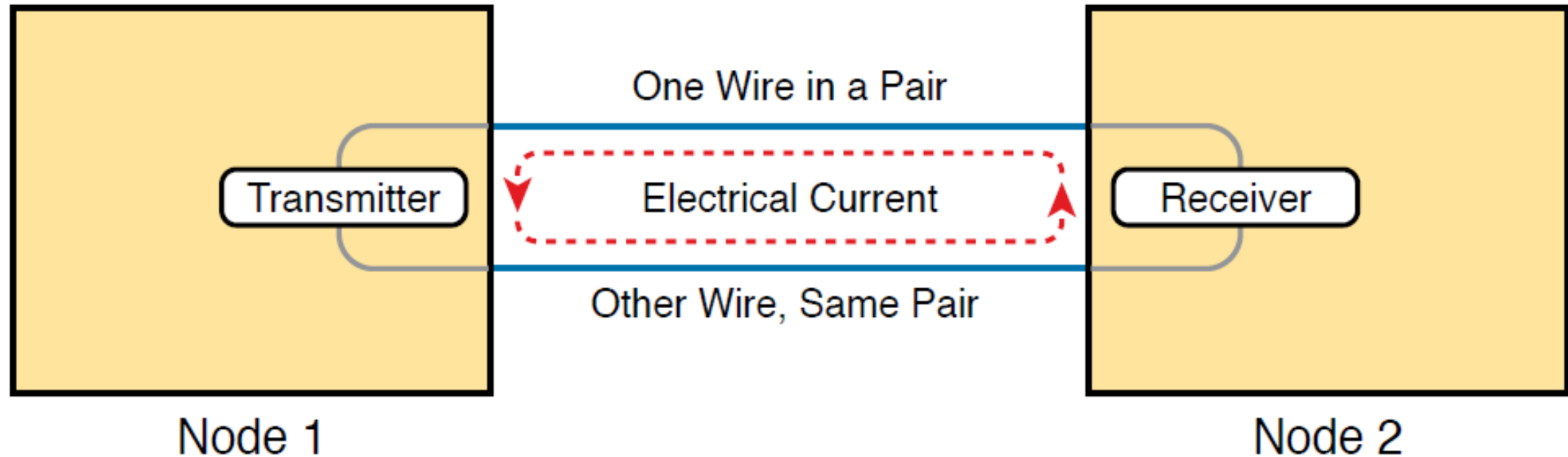
# Types of Ethernet

Speed	Common Name	Informal IEEE Standard Name	Formal IEEE Standard Name	Cable Type, Maximum Length
10 Mbps	Ethernet	10BASE-T	802.3	Copper, 100m
100 Mbps	Fast Ethernet	100BASE-T	802.3u	Copper, 100m
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

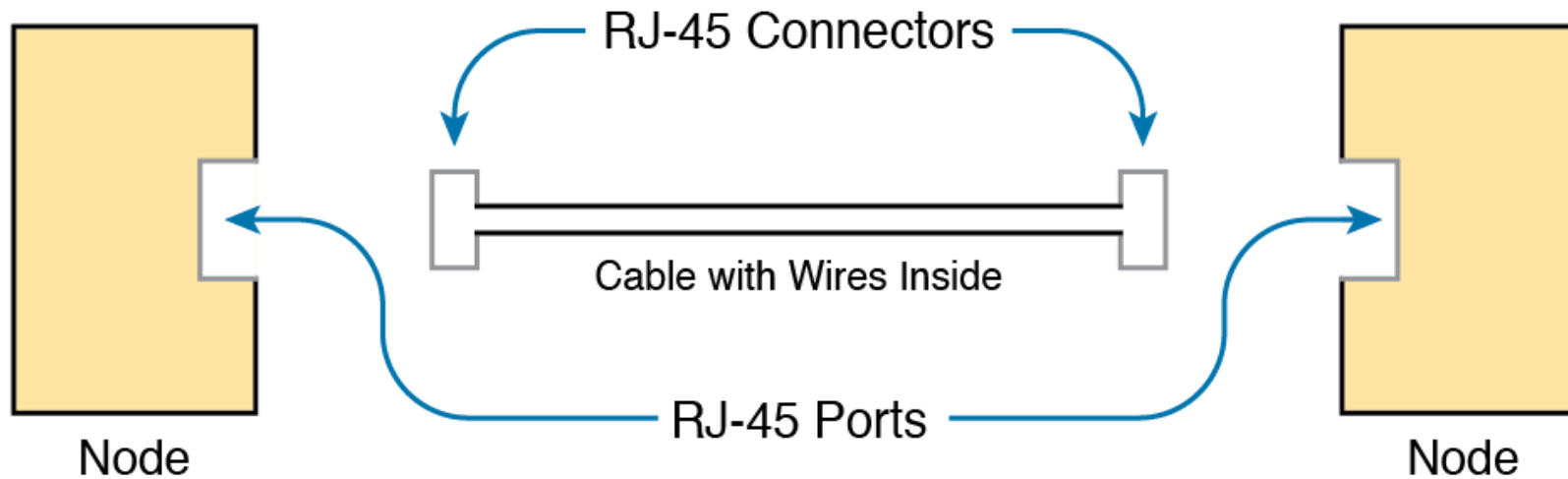
## Ethernet LAN Forwards a Data Link Frame Over Many Types of Links



## Creating One Electrical Circuit over One Pair to Send in One Direction

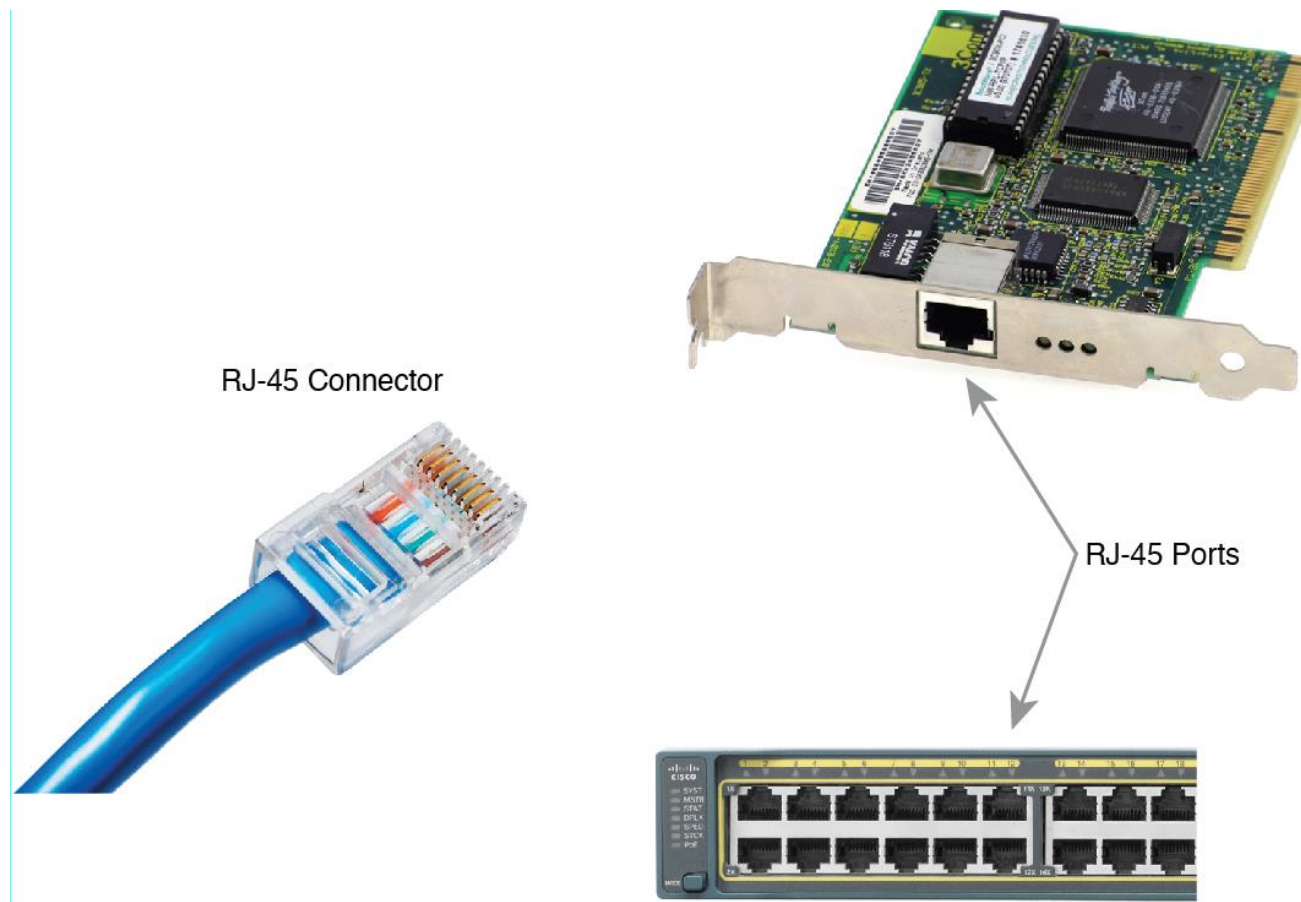


## Basic Components of an Ethernet Link



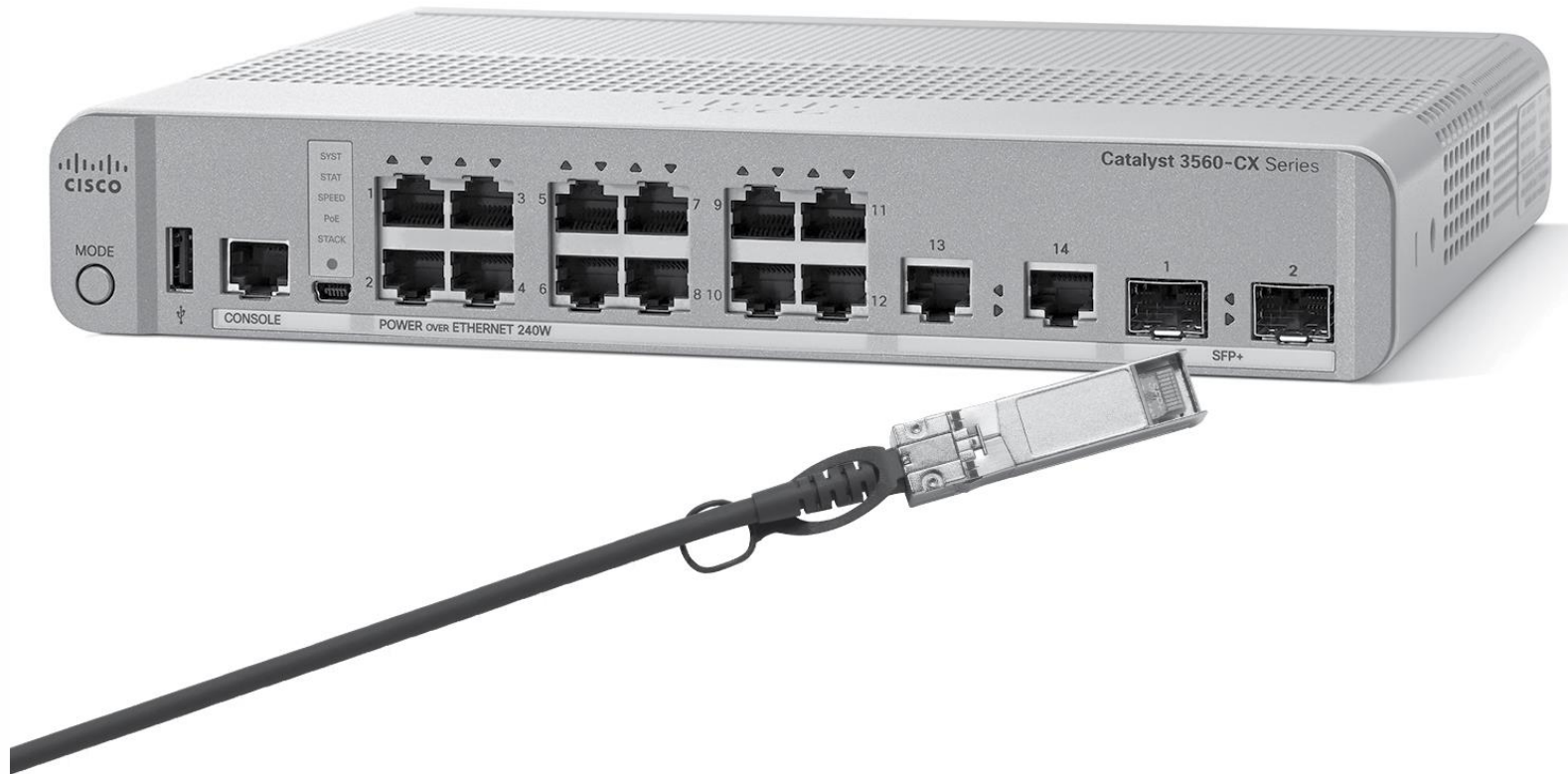


# RJ-45 Connectors and Ports

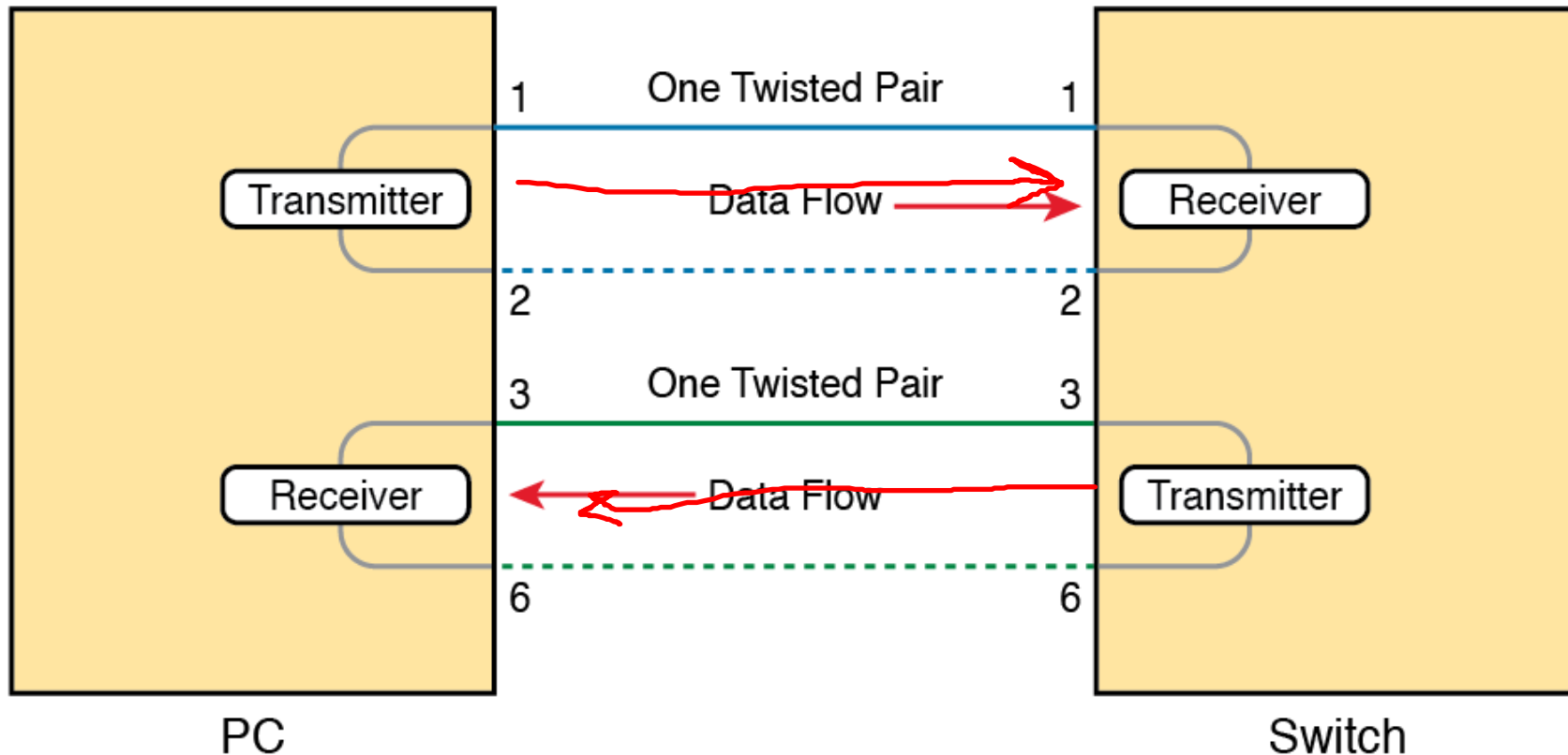


# 10-Gbps SFP+ with Cable Sitting Just Outside a Catalyst 3560CX Switch

có dấu cộng => 10Gb  
không có dấu cộng => 1Gb hoặc 10Mb

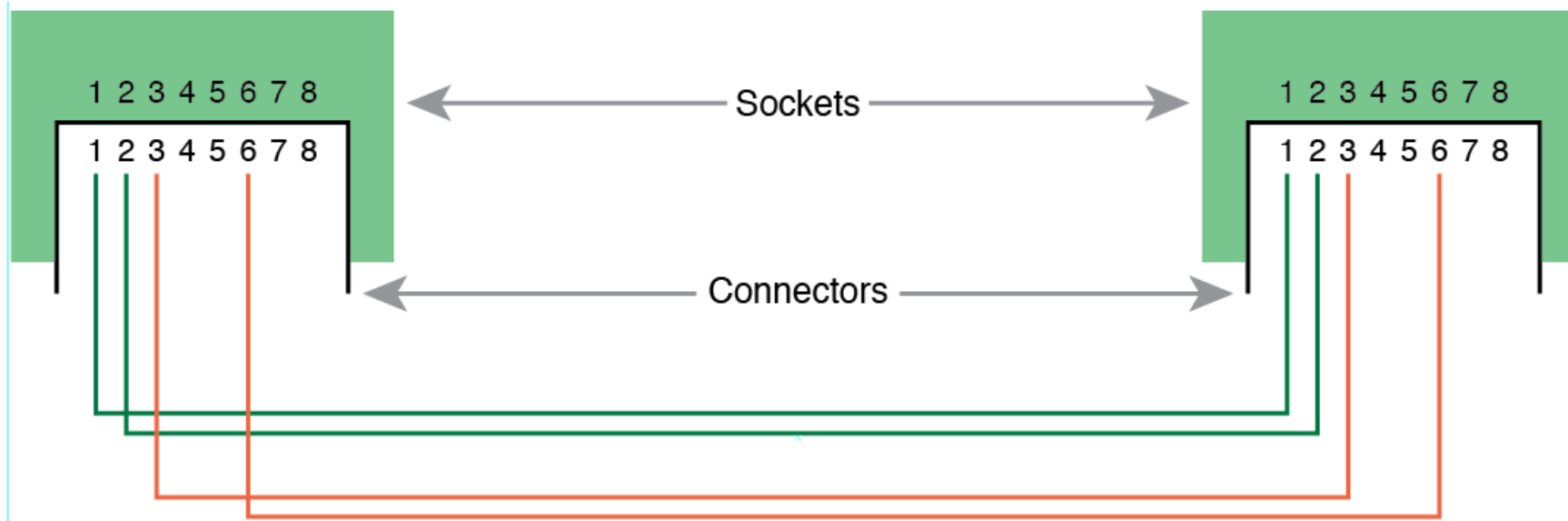


## Using one Pair for Each Transmission Direction with 10- and 100-Mbps Ethernet

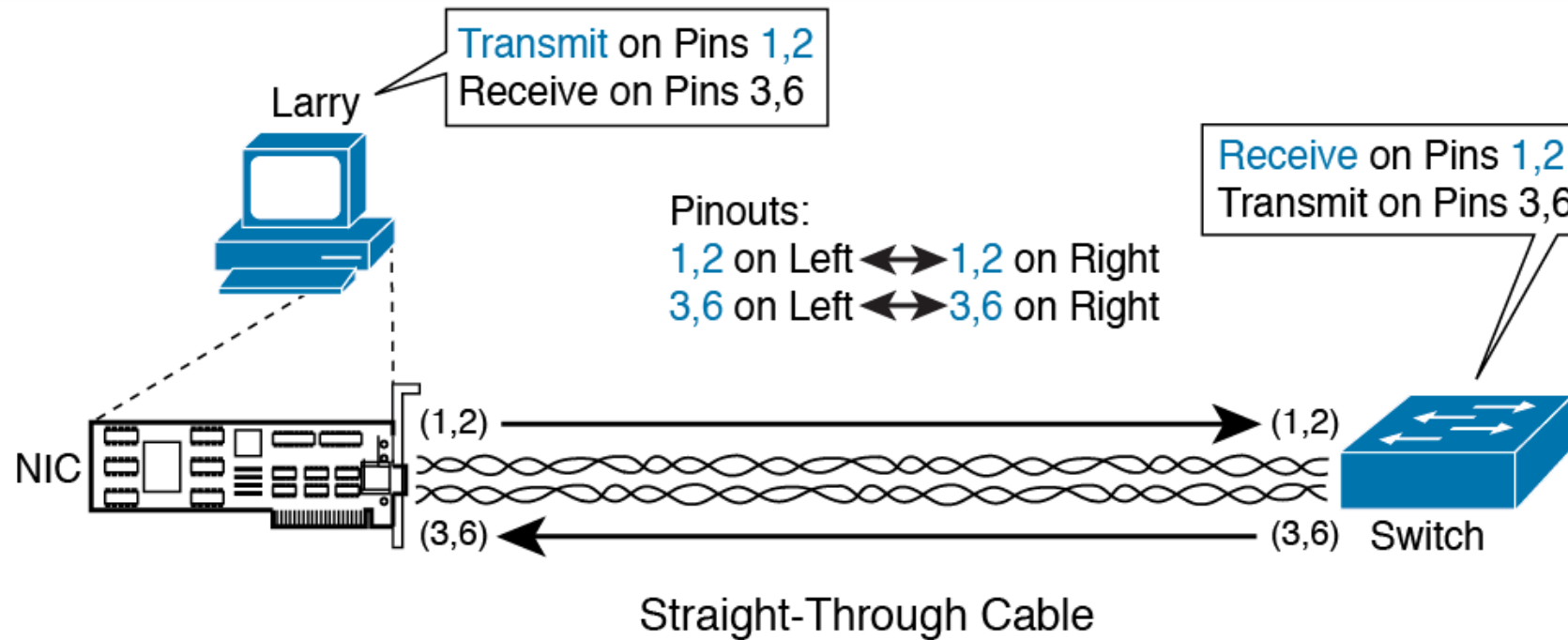


# 10Base-T and 100Base-T Straight-Through Cable Pinout

1 nối với 1, 2 nối với 2, 3 nối với 3, 6 nối với 6  
4,5,7,8 dự phòng  
hiện nay 4,5,7,8: chuyển tín hiệu điện và tín hiệu mạng



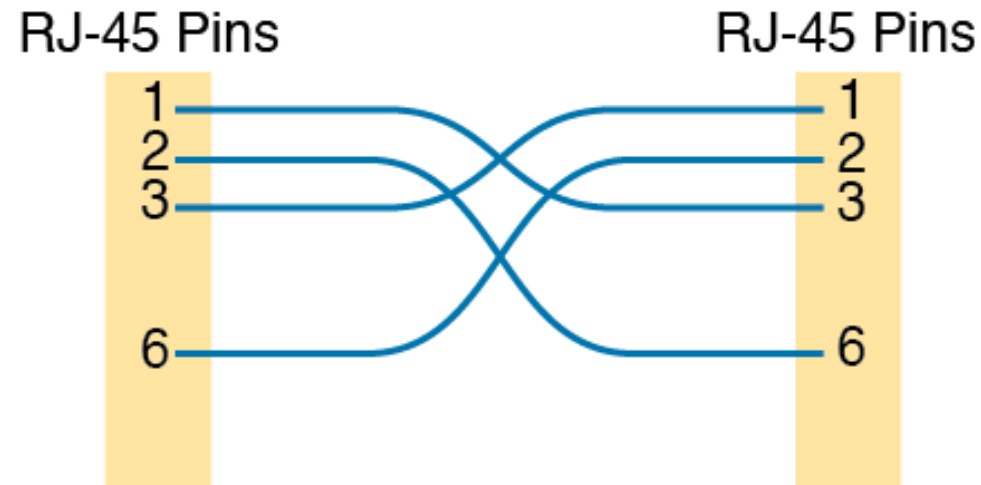
# Ethernet Straight-Through Cable Concept



# Crossover Ethernet Cable

cáp chéo

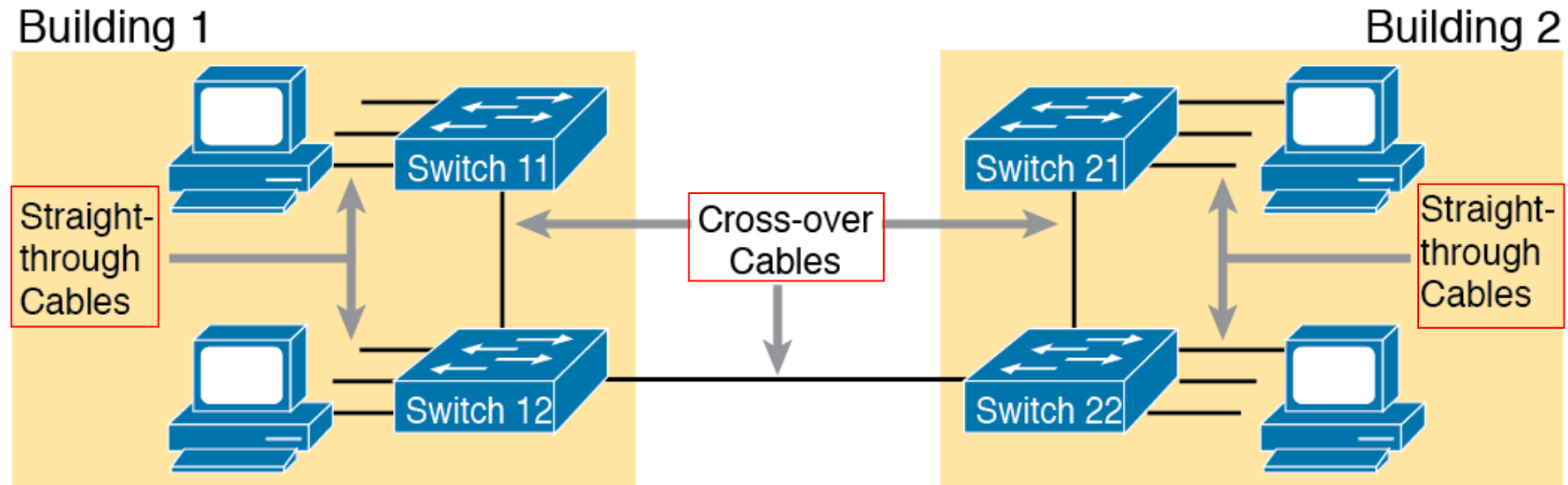
1 nối với 3, 2 nối với 6 và 6 nối với 2



1, 2 nhận  
4,6 truyền  
2 thiết bị giống nhau phải bắt cáp chéo nhau  
nếu truyền thẳng: truyền đi với truyền, nhận đi với nhận

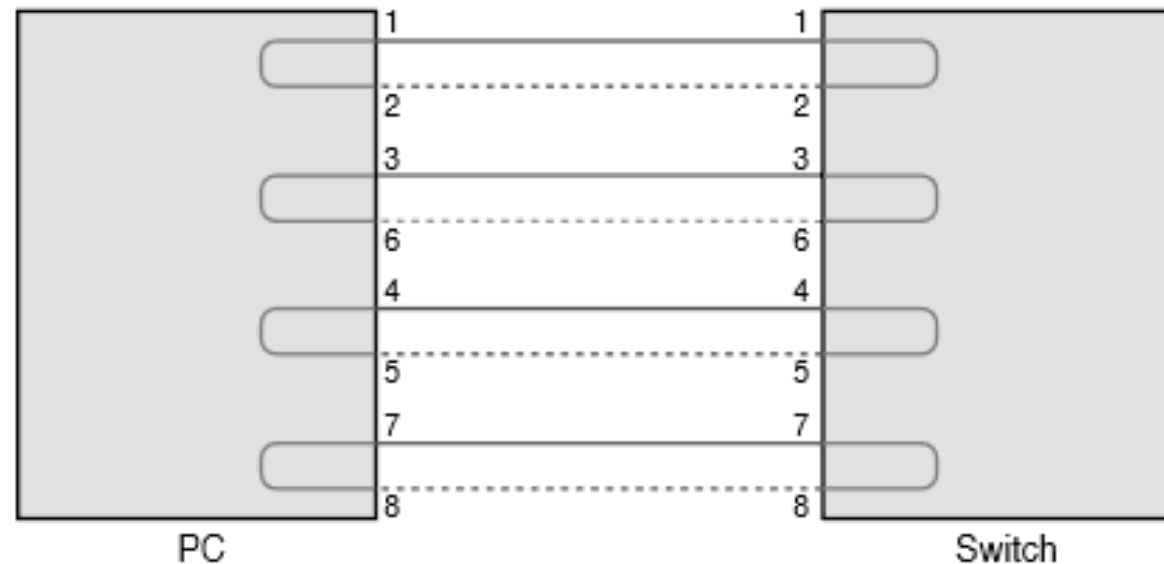


## Typical Uses for Straight-Through and Crossover Ethernet Cables





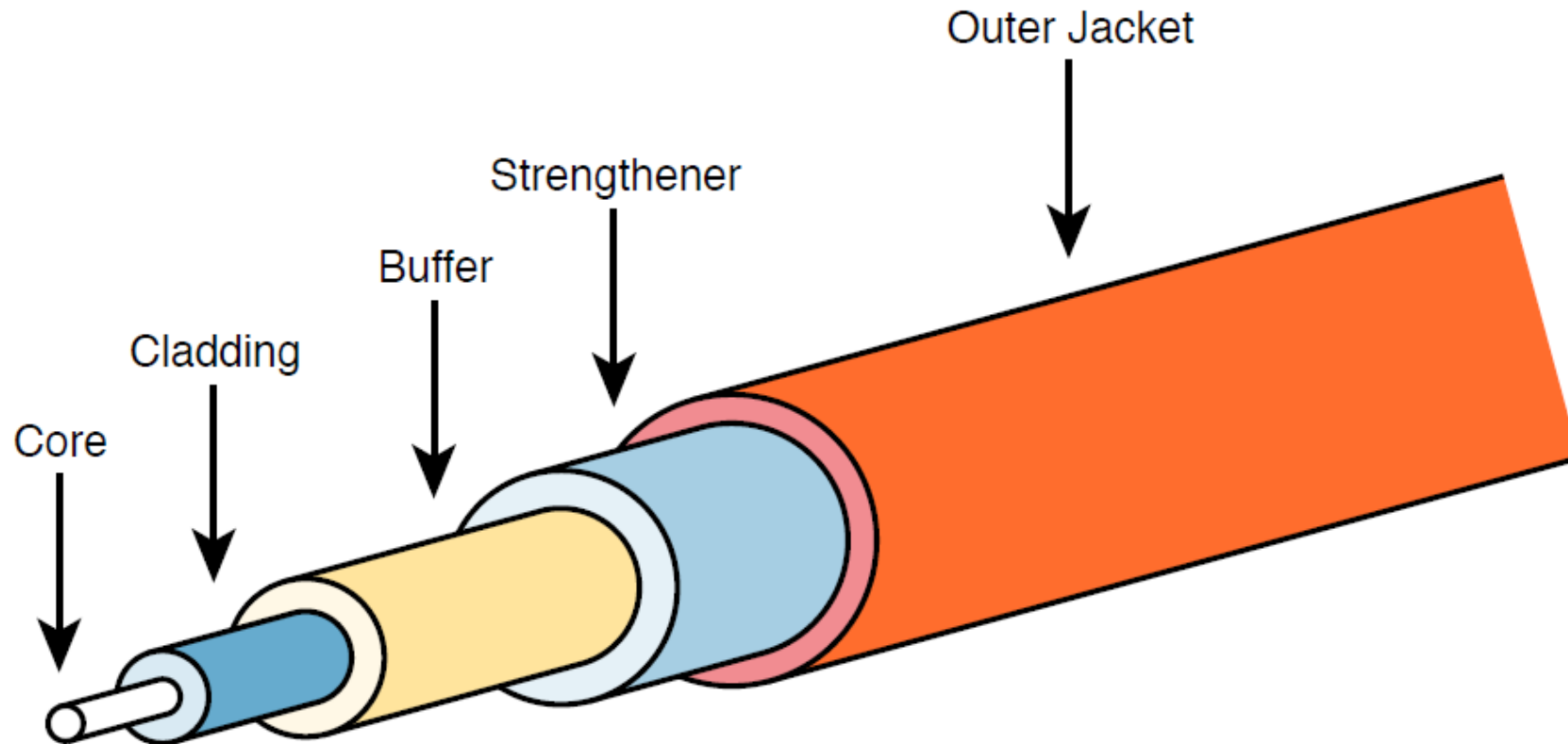
## Four-Pair Straight-Through Cable to 1000BASE-T



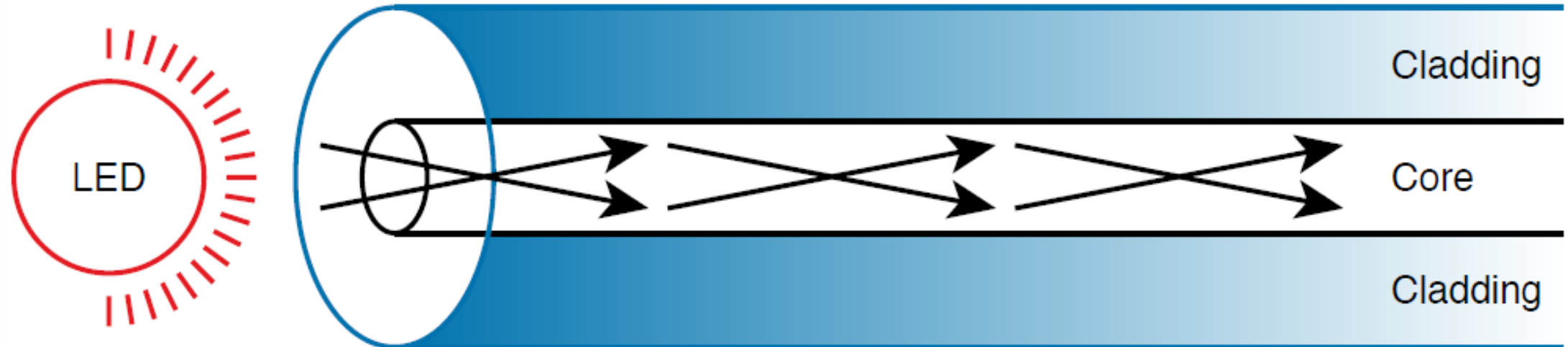


## Components of a Fiber-Optic Cable

cáp quang



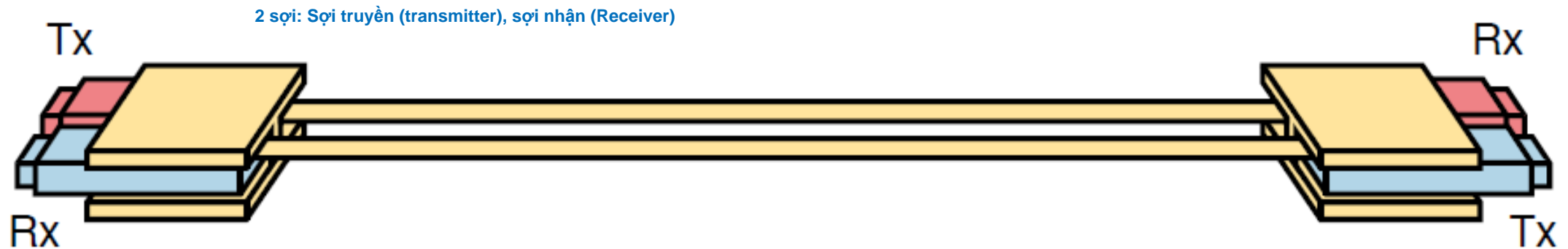
# Transmission on Multimode Fiber with Internal Reflection



# Transmission on **Single-Mode** Fiber with Laser Transmitter



## Two Fiber Cables with Tx Connected to Rx on Each Cable



# A Sampling of IEEE 802.3 10-Gbps Fiber Standards

Có nhiều loại cáp quang, tương ứng chi phí sẽ khác nhau

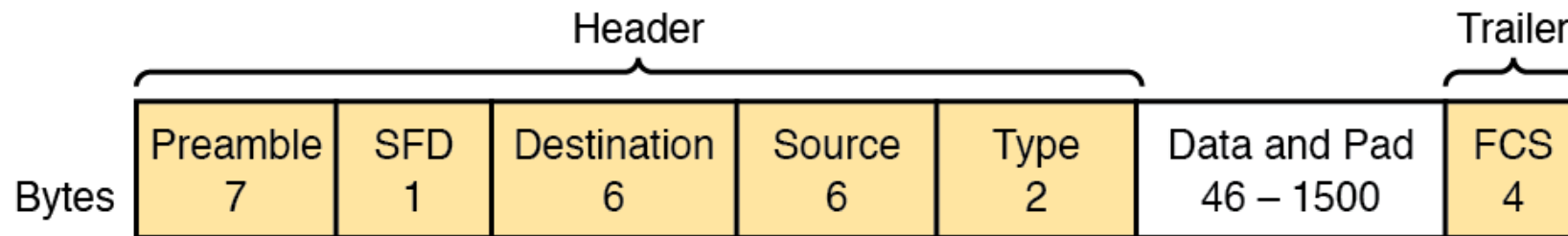
Standard	Cable Type	Max Distance*
10GBASE-S	MM	400m
10GBASE-LX4	MM	300m
10GBASE-LR	SM	10km
10GBASE-E	SM	30km

\* The maximum distances are based on the IEEE standards with no repeaters.

# Comparisons Between UTP, MM, and SM Ethernet Cabling

Criteria	UTP	Multimode	Single-mode
Relative Cost of Cabling	Low	Medium	Medium
Relative Cost of a Switch Port	Low	Medium	High
Approximate Max Distance	100m	500m	40km
Relative Susceptibility to Interference	Some	None	None
Relative Risk of Copying from Cable Emissions	Some	None	None

## Commonly Used Ethernet Frame Format

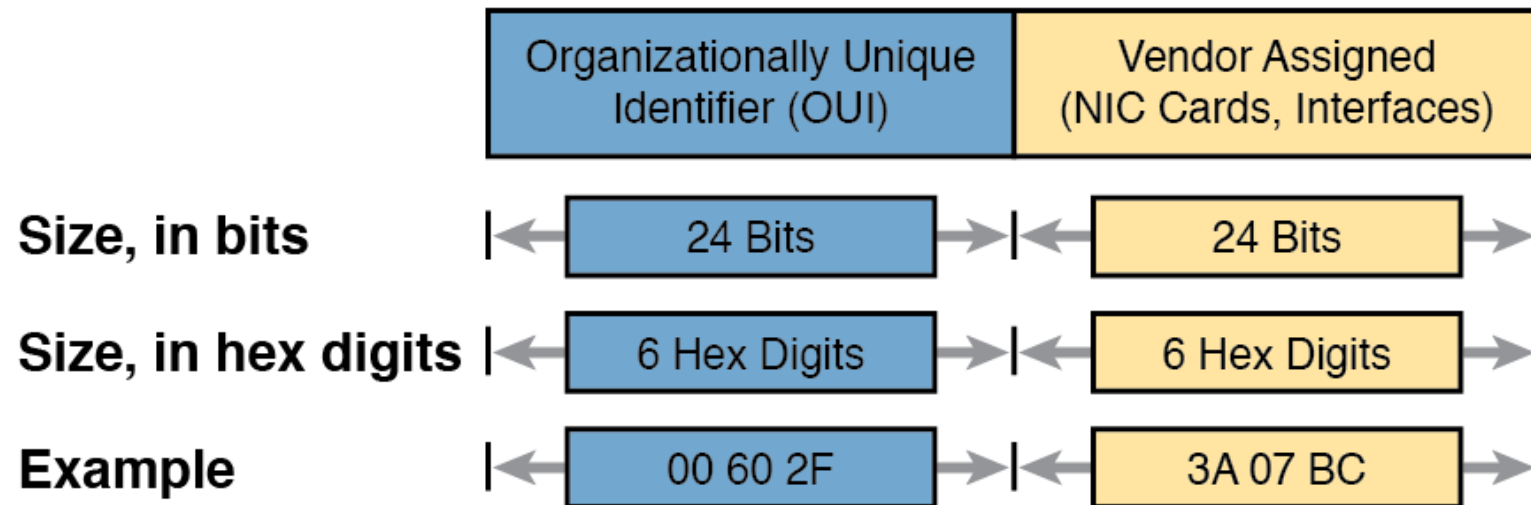


# IEEE 802.3 Ethernet Header and Trailer Fields

Field	Field Length in Bytes	Description
Preamble	7	Synchronization
Start Frame Delimiter (SFD)	1	Signifies that the next byte begins the Destination MAC Address field.
Destination MAC address	6	Identifies the intended recipient of this frame.
Source MAC address	6	Identifies the sender of this frame.
Type	2	Defines the type of protocol listed inside the frame; today, most likely identifies IP Version 4 (IPv4) or IP Version 6 (IPv6).
Data and Pad	46-1500	Holds data from a higher layer, typically an L3PDU (usually an IPv4 or IPv6 packet). The sender adds padding to meet the minimum length requirement for this field (46 bytes).
Frame Check Sequence (FCS)	4	Provides a method for the receiving NIC to determine if the frame experienced transmission errors



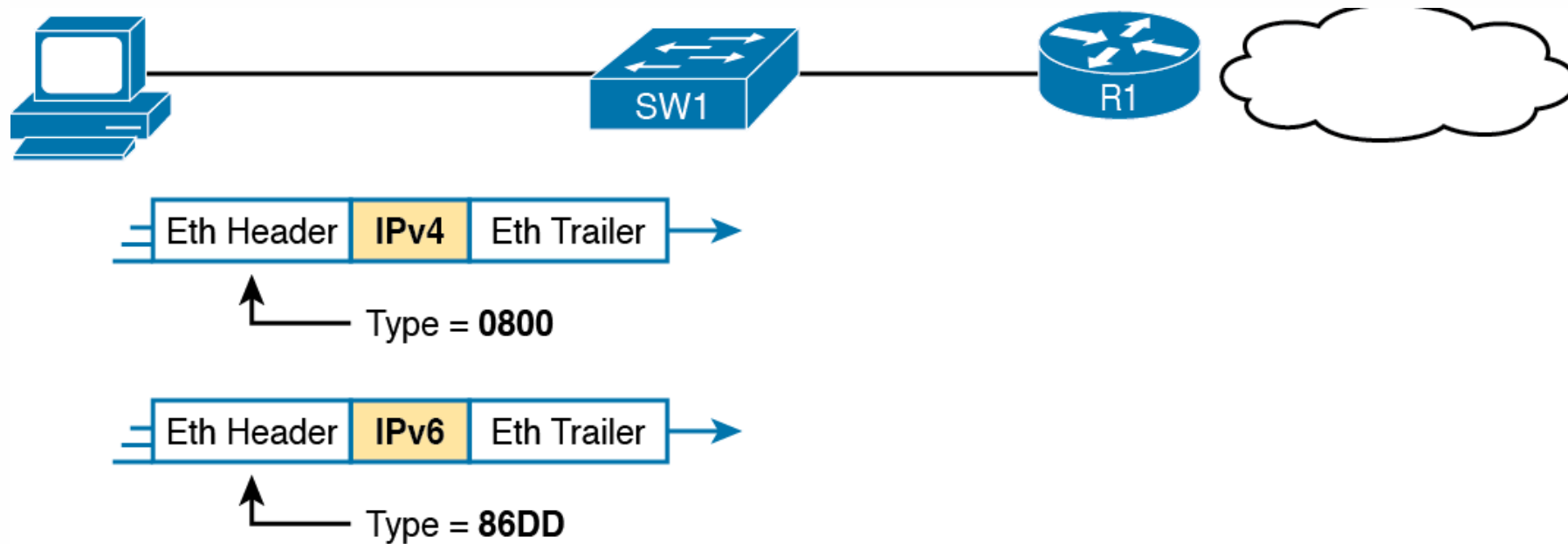
## Structure of Unicast Ethernet Addresses



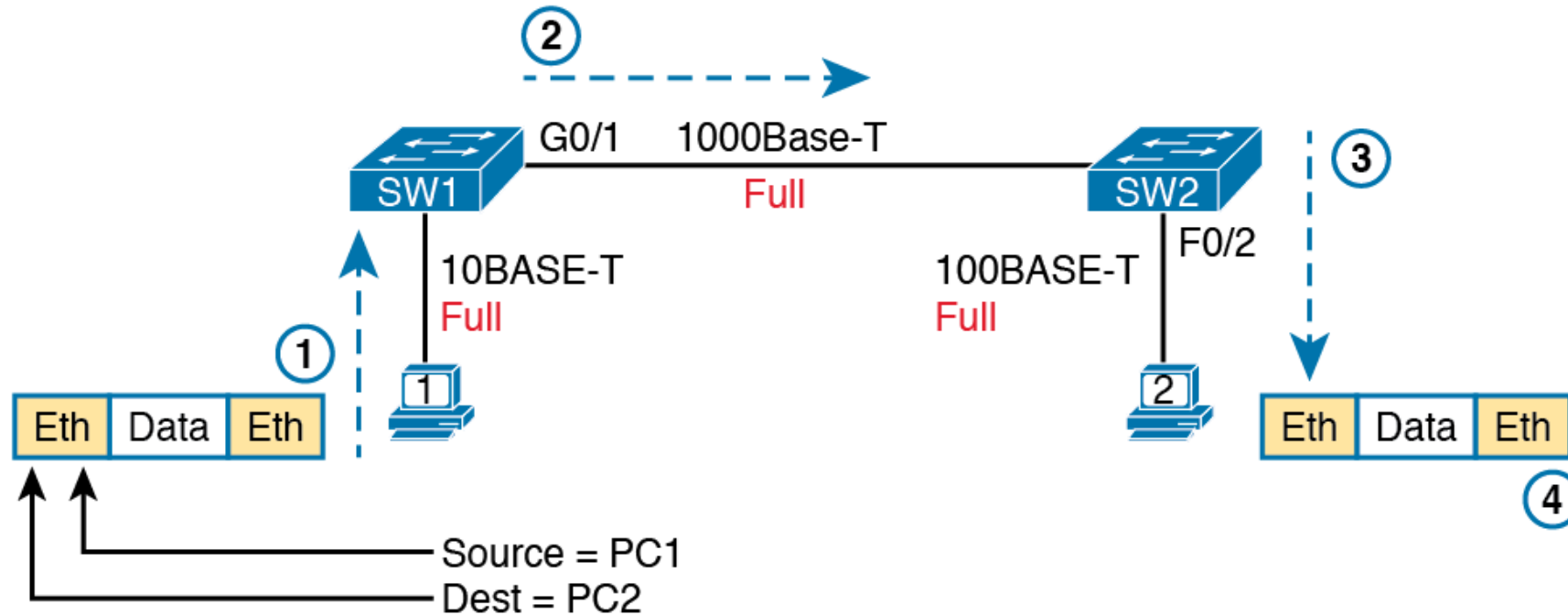
# LAN MAC Address Terminology and Features

LAN Addressing Term or Feature	Description
MAC	Media Access Control. 802.3 (Ethernet) defines the MAC sublayer of IEEE Ethernet.
Ethernet address, NIC address, LAN address	Other names often used instead of MAC address. These terms describe the 6-byte address of the LAN interface card.
Burned-in address	The 6-byte address assigned by the vendor making the card.
Unicast address	A term for a MAC that represents a single LAN interface.
Broadcast address	An address that means “all devices that reside on this LAN right now.”
Multicast address	On Ethernet, a multicast address implies some subset of all devices currently on the Ethernet LAN.

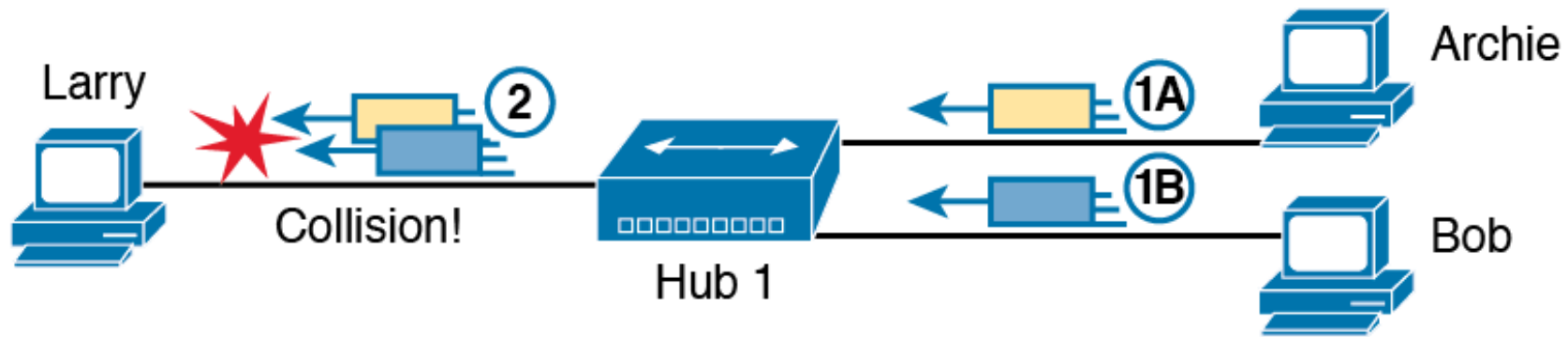
## Use of Ethernet Type Field



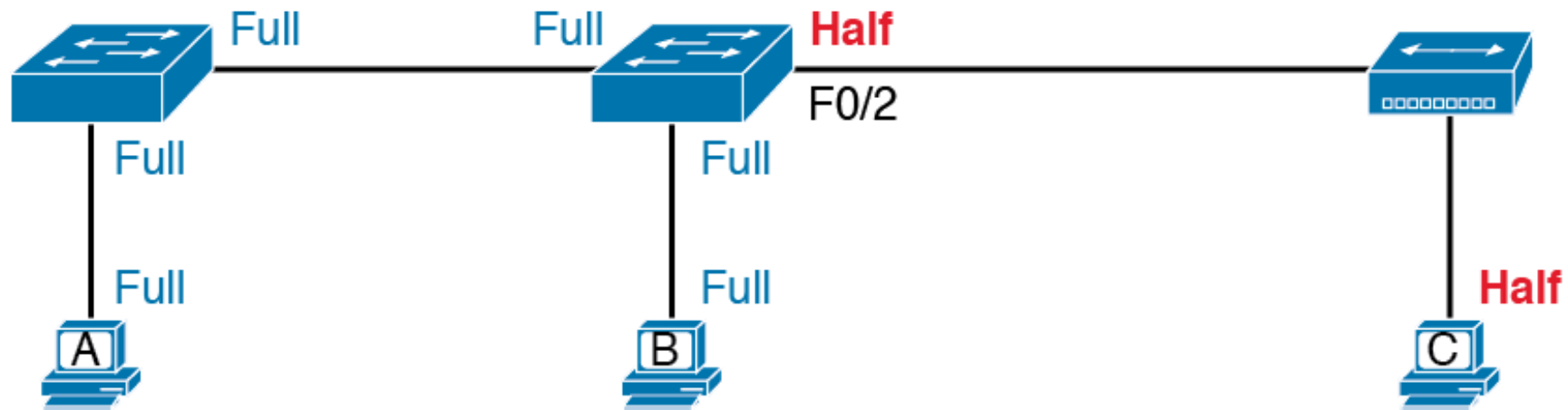
## Example of Sending Data in a Modern Ethernet LAN



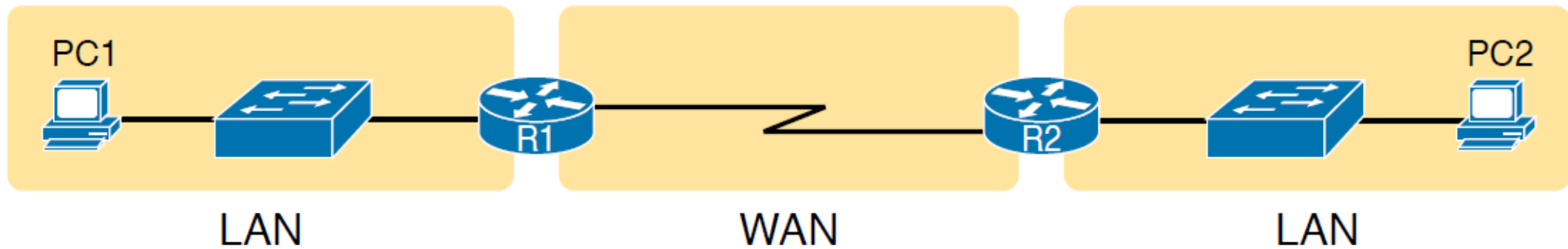
## A Collision Occurring Because of LAN Hub Behavior



## Full and Half Duplex in an Ethernet LAN

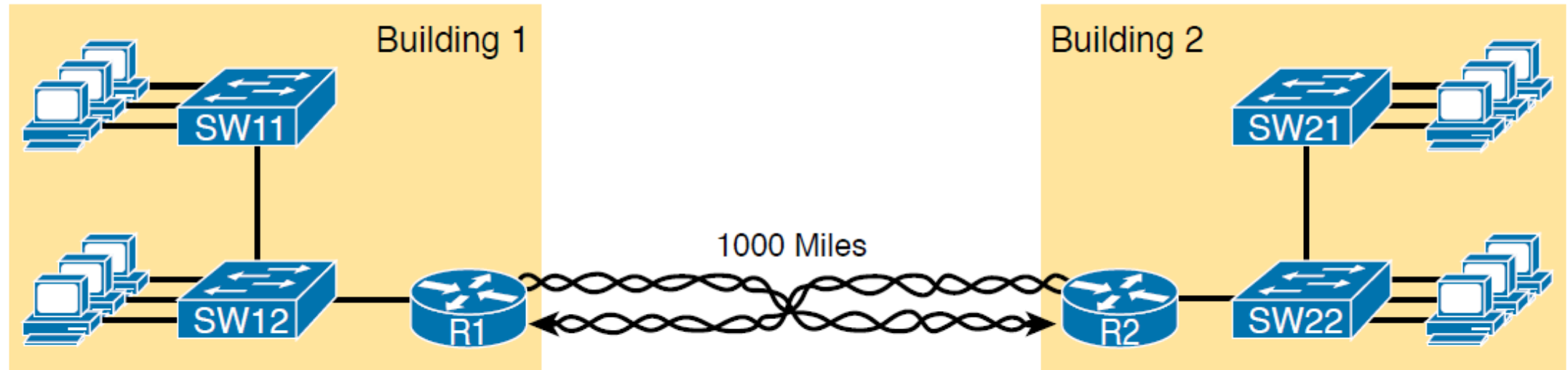


## Leased-Line WANs



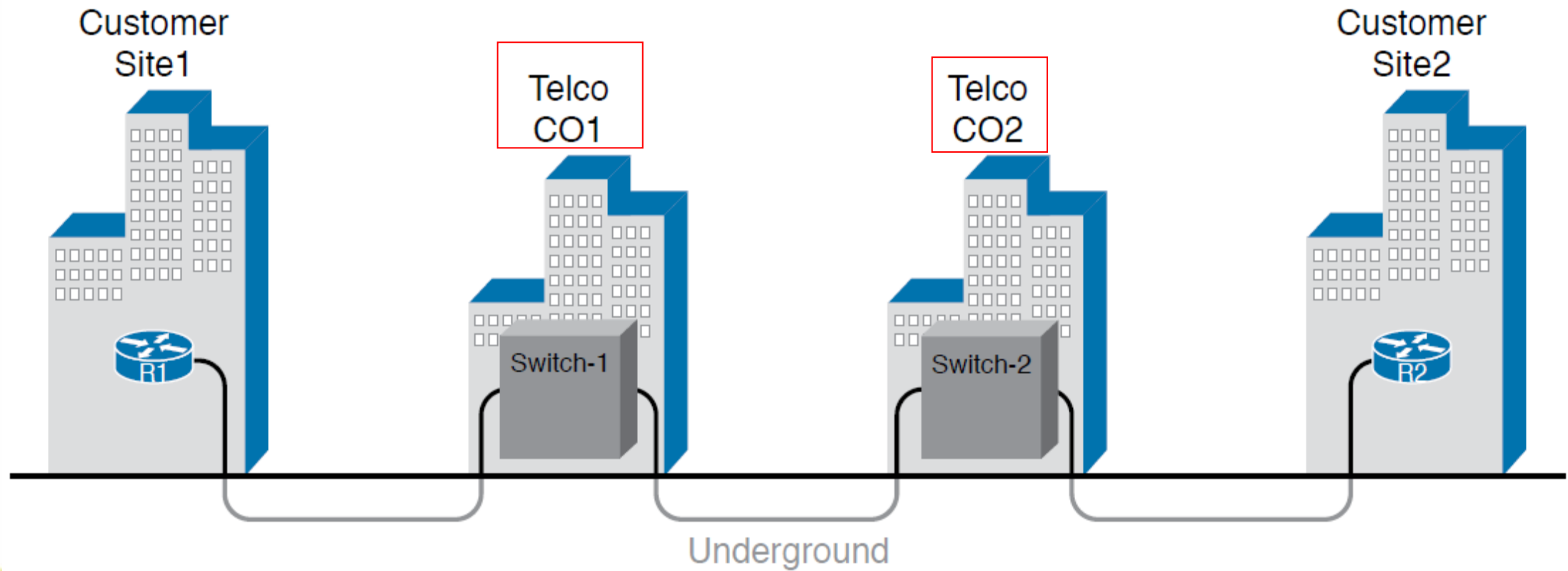
*Small Enterprise Network with One Leased Line*

## Physical Details of Leased Lines

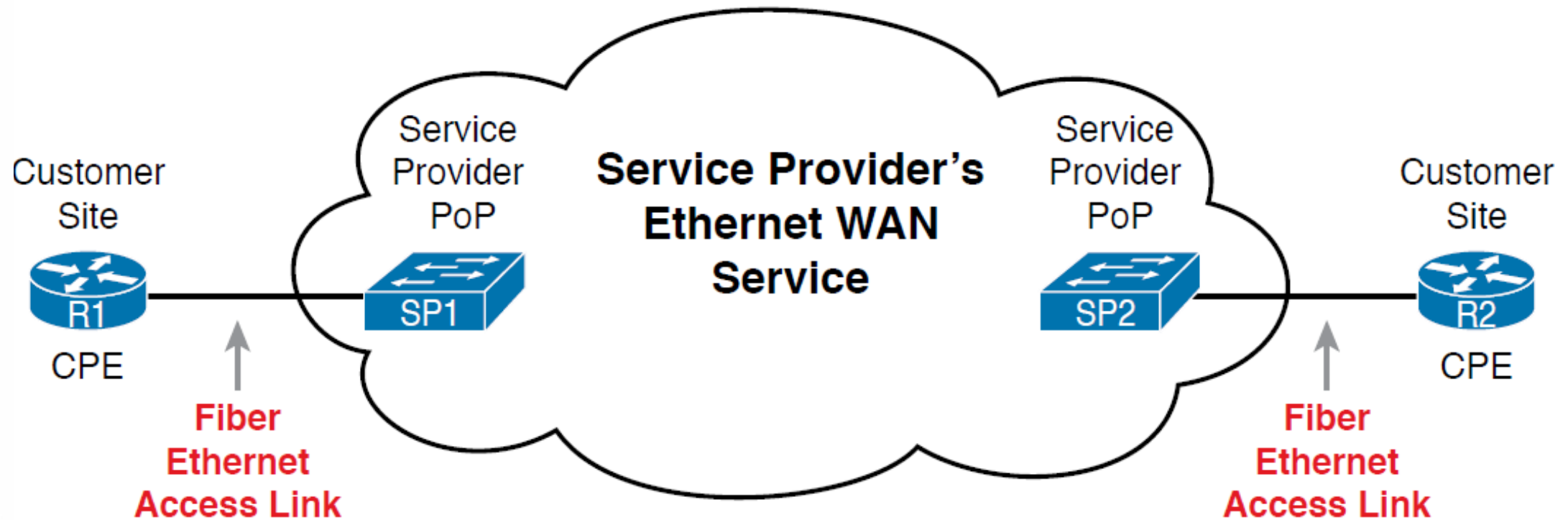




## Possible Cabling Inside a Telco for a Short Leased Line



## Fiber Ethernet Link to Connect a CPE Router to a Service Provider's WAN



## Tài liệu tham khảo

CCNA 200-301 Official Cert Guide Library, 1e by Wendell Odom, Bradley Edgeworth