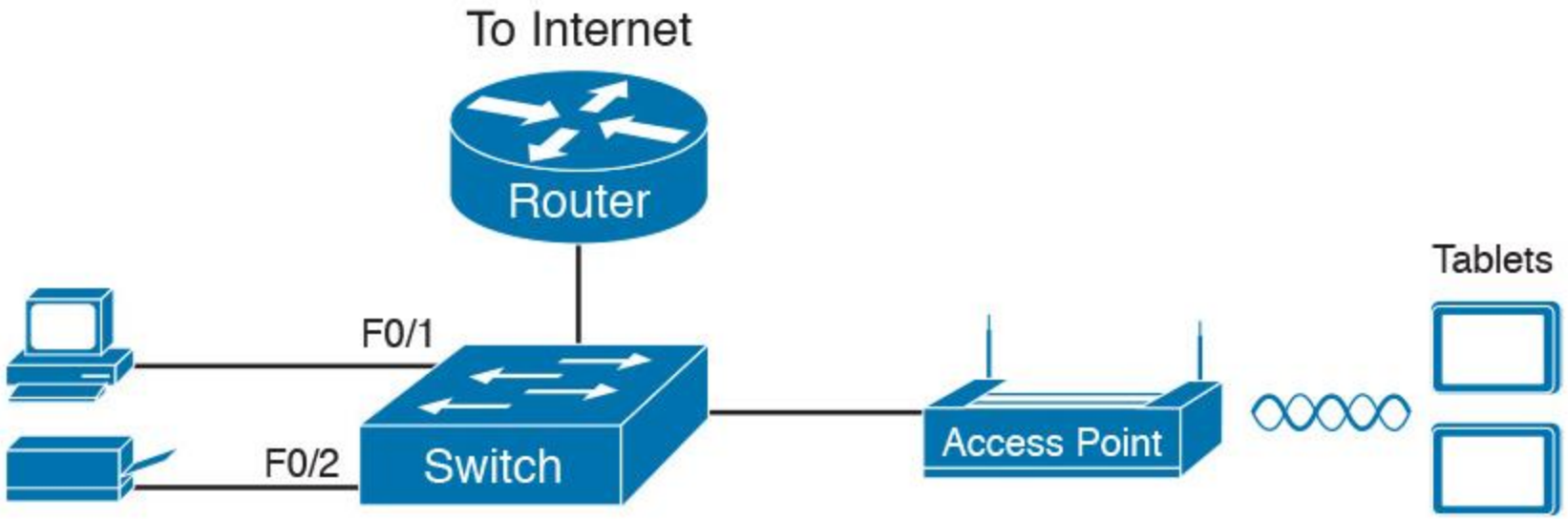
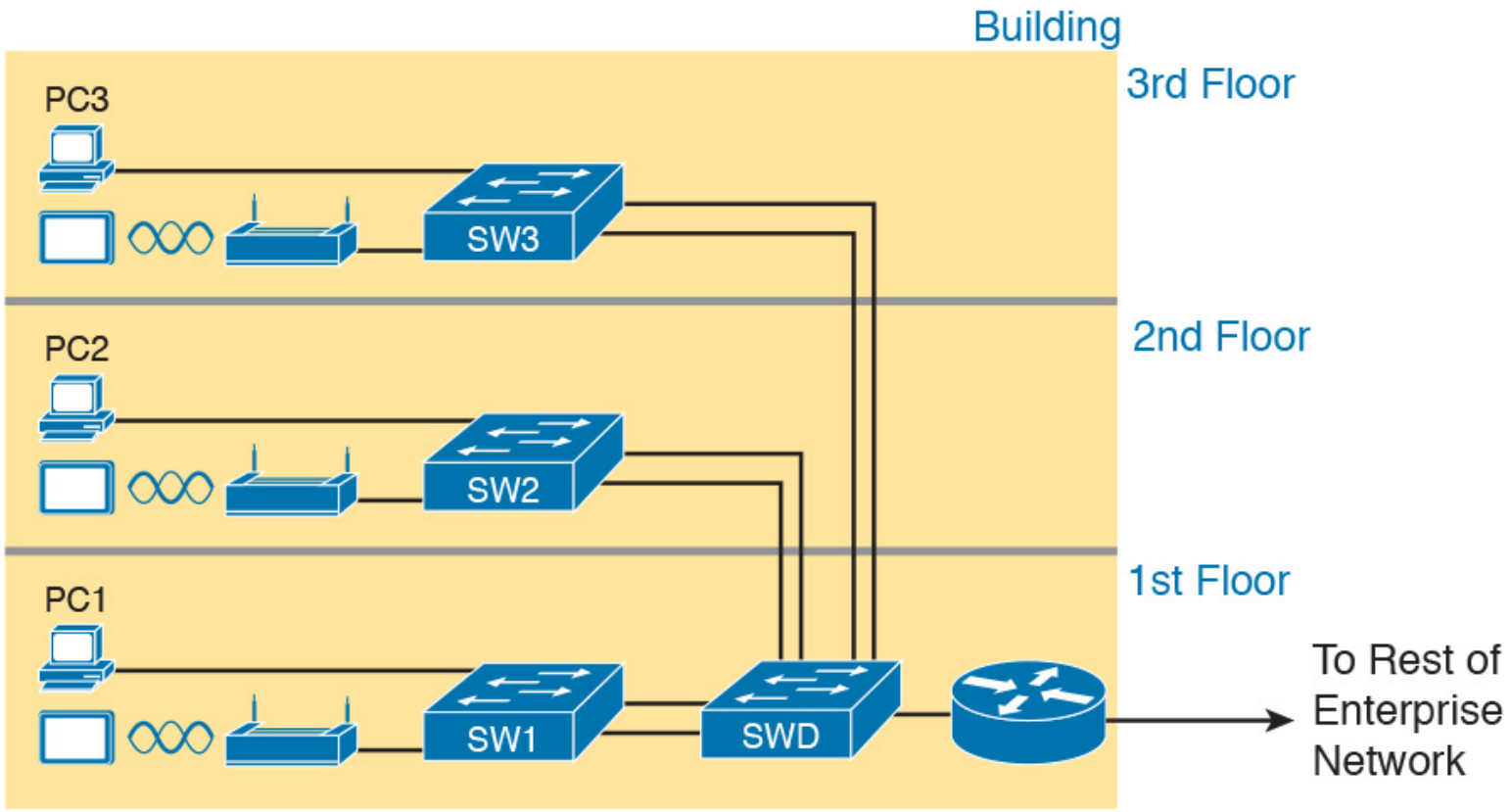
FUNDAMENTALS OF ETHERNET LANs

Overview of LANs (SOHO LANs)



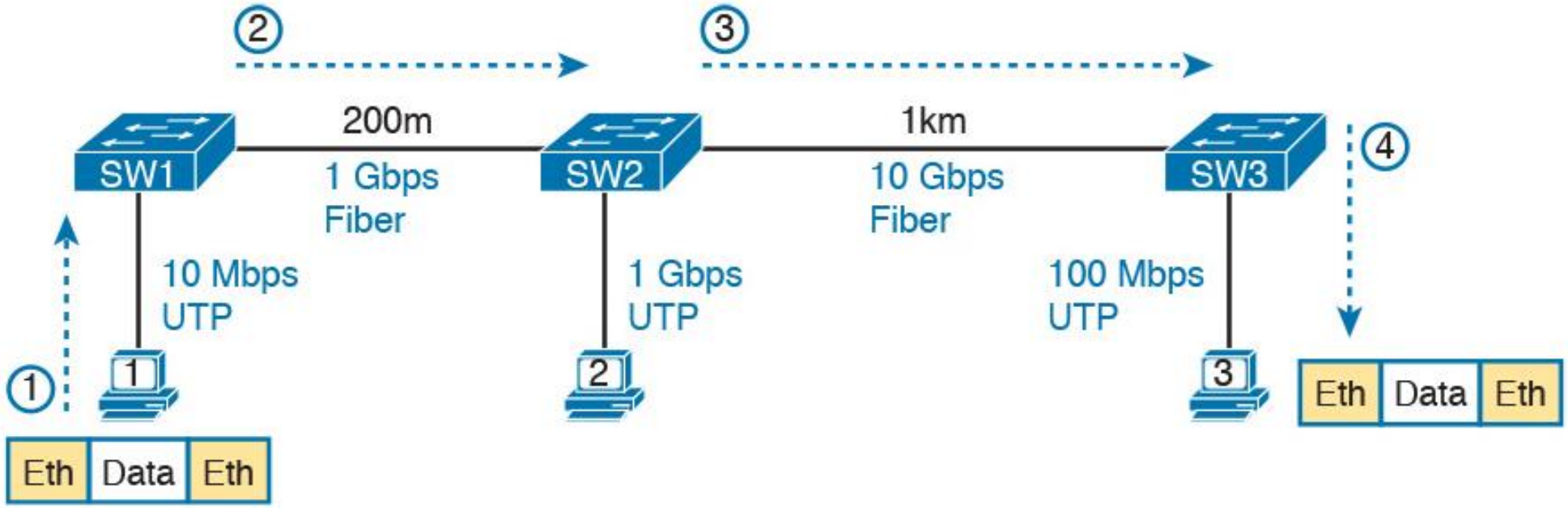
Overview of LANs (ENTERPRISE LANs)



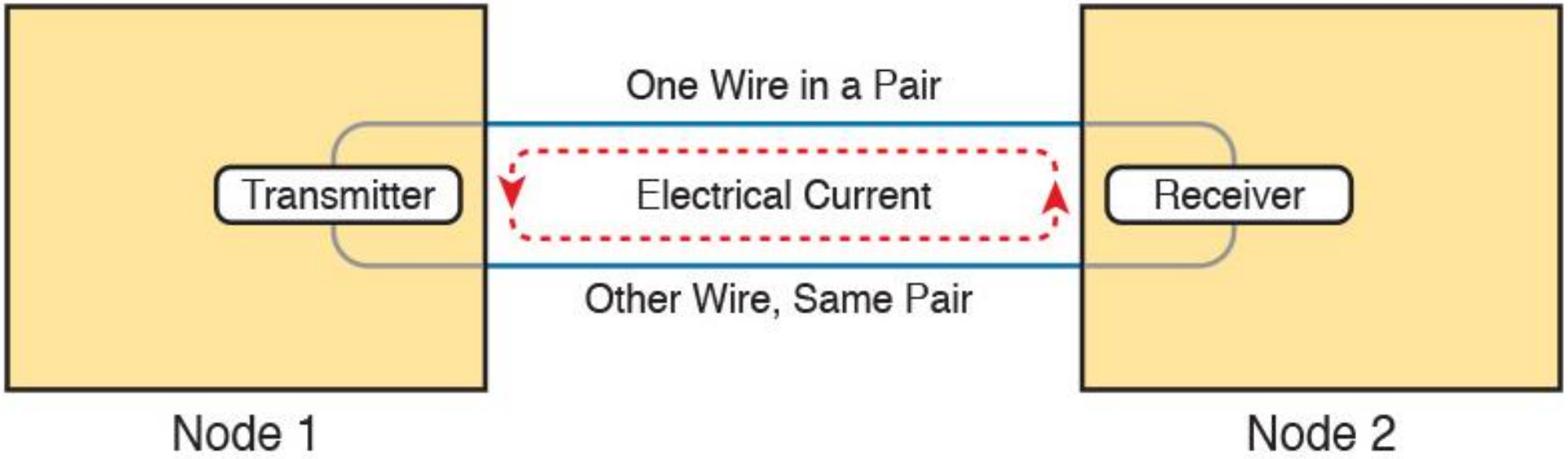
Overview of LANs
Variety of Ethernet Physical Layer Standards

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

Overview of LANs
Behavior over All Links Using Data Link Layer

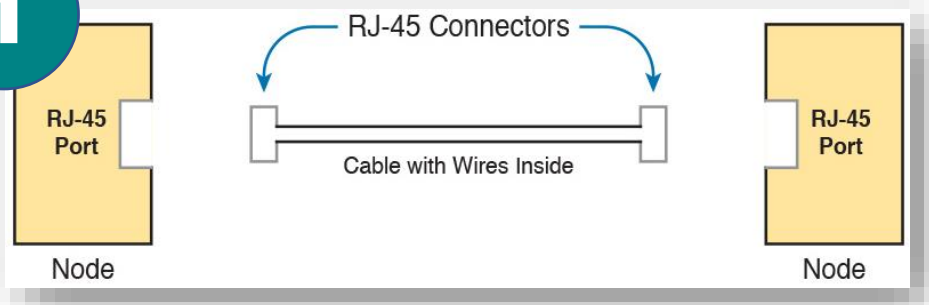


Building Physical Ethernet Networks with UTP
Transmitting Data Using Twisted Pairs



Building Physical Ethernet Networks with UTP
Breaking Down a UTP Ethernet Link

1



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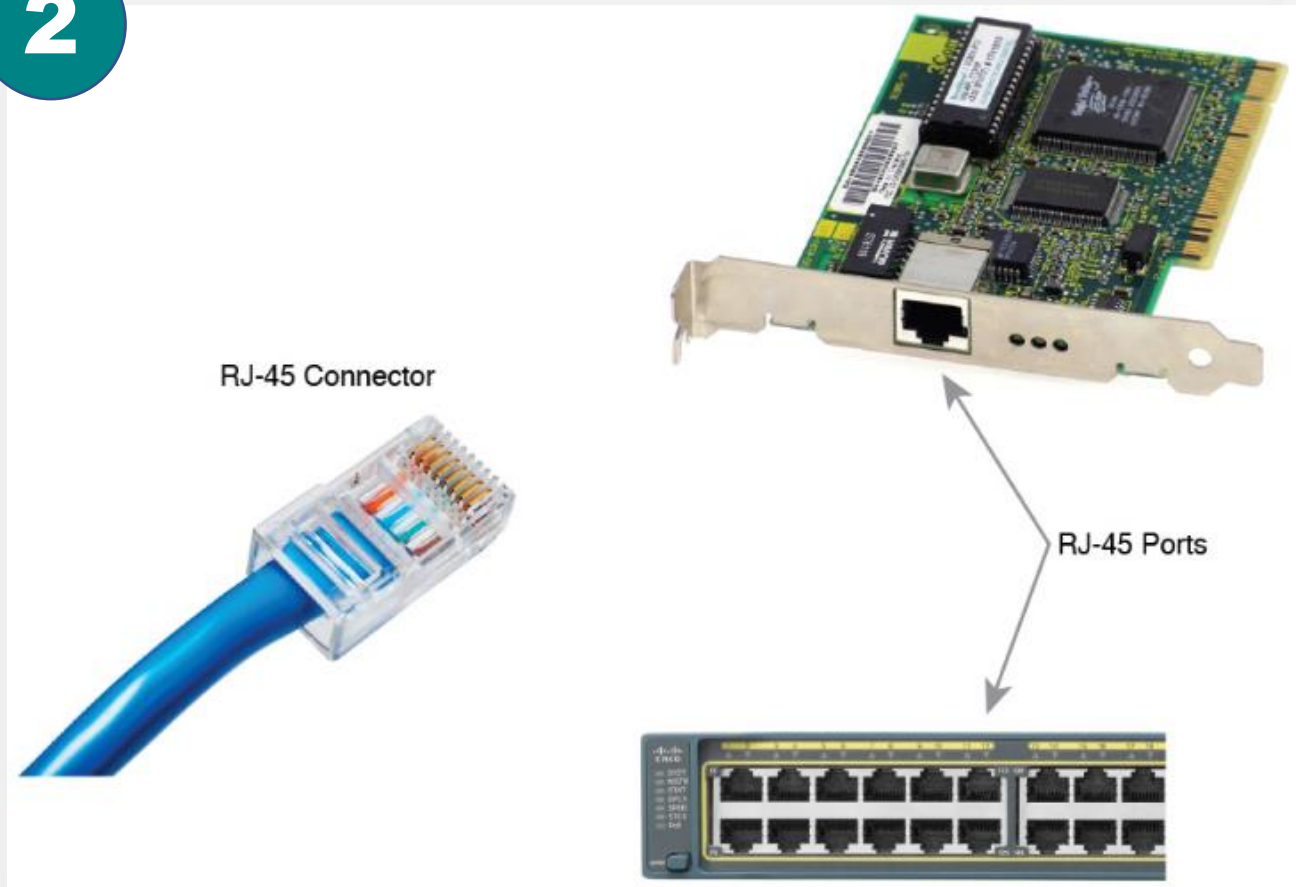

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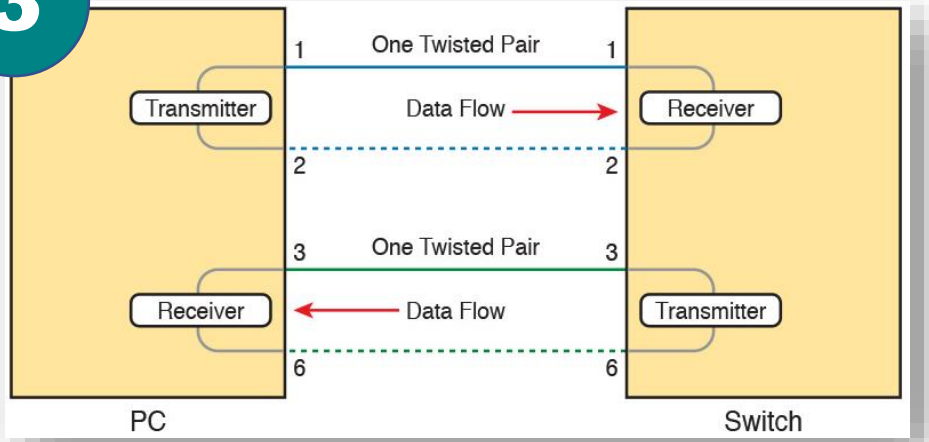
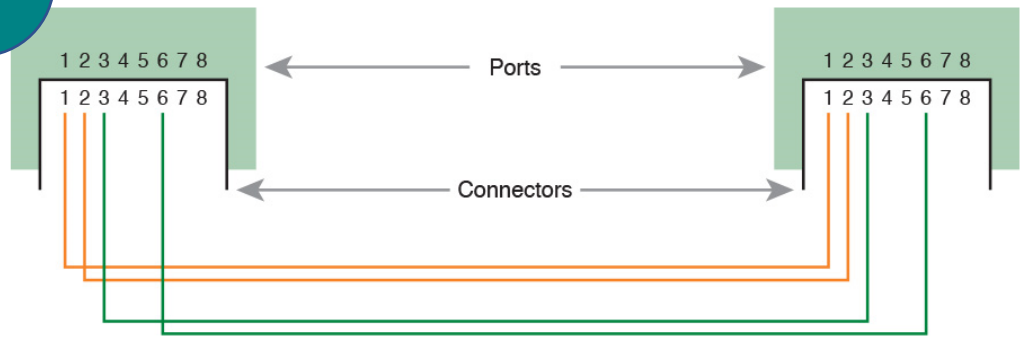


Building Physical Ethernet Networks with UTP Straight-Through and Crossover Cable

1



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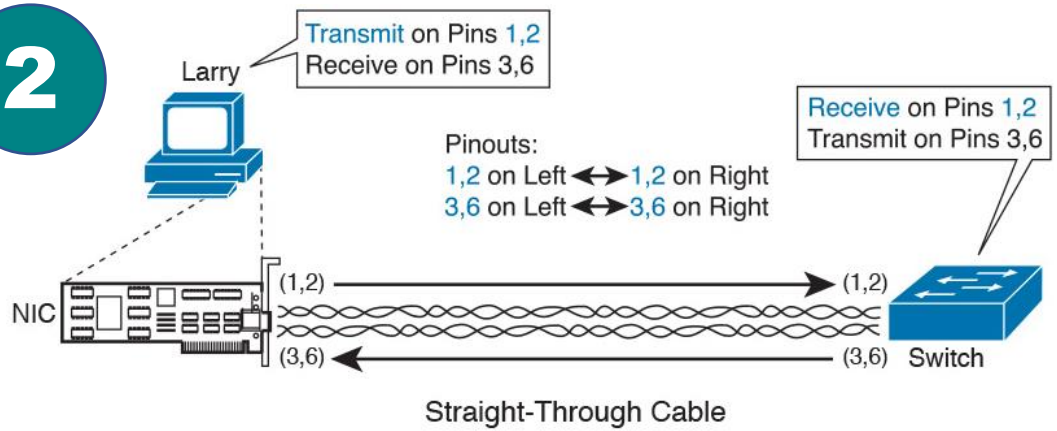

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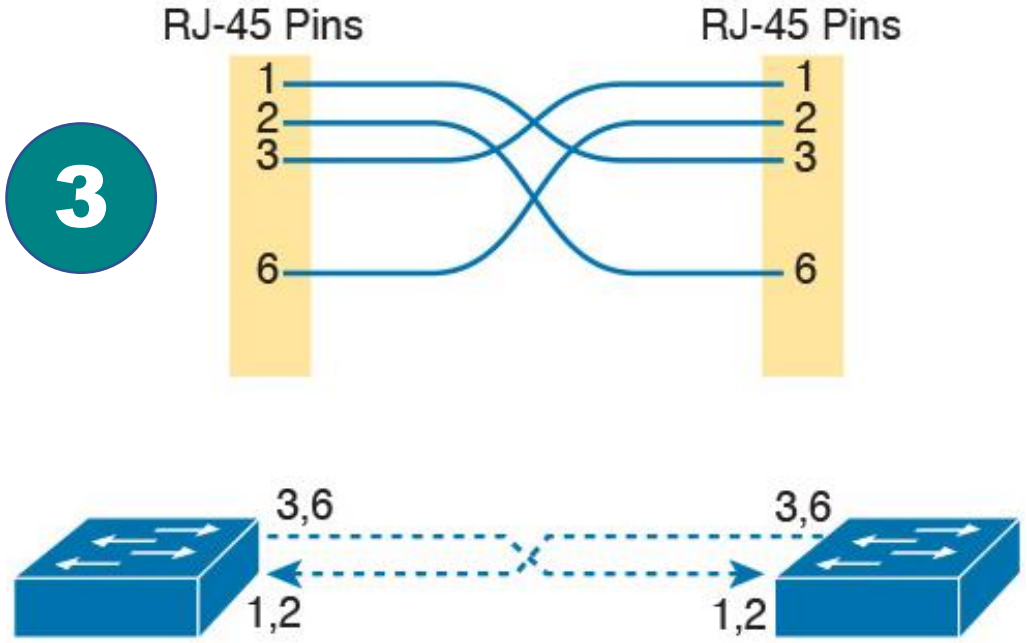
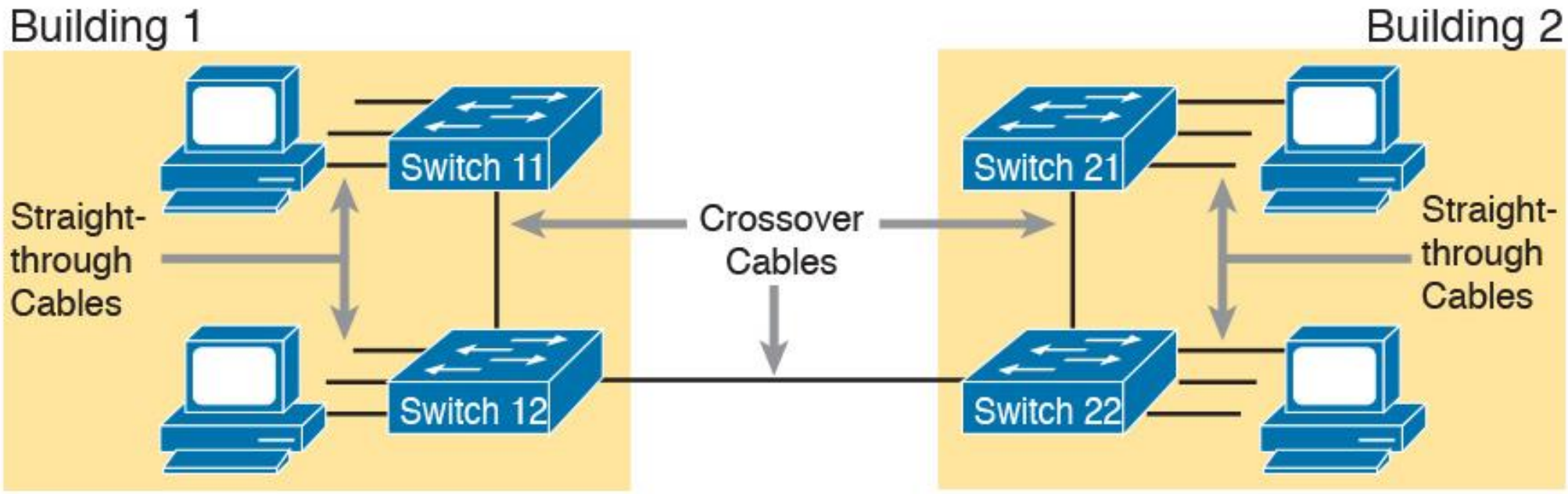


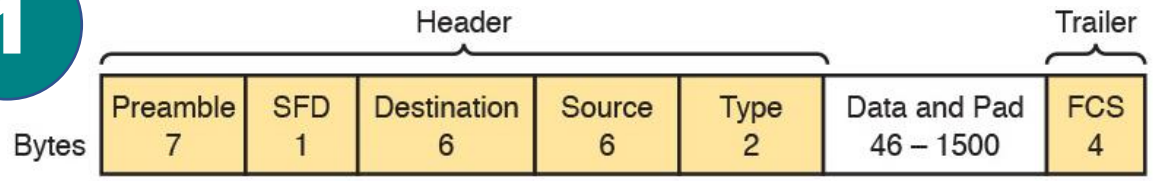
Building Physical Ethernet Networks with UTP Straight-Through and Crossover Cable



* Auto-MDIX Feature

Sending Data in Ethernet Networks
Ethernet Data-Link Protocols

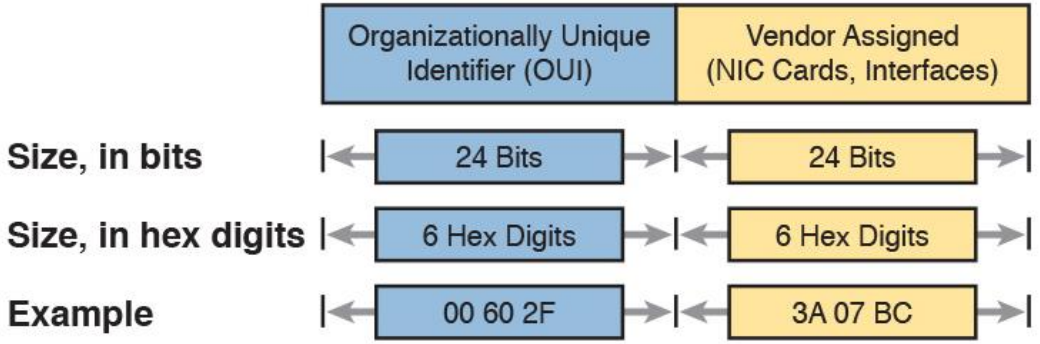
1



Field	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 whether the frame experienced transmission errors.

* The IEEE 802.3 specification limits the data portion of the 802.3 frame to a minimum of 46 and a maximum of 1500 bytes. The term *maximum transmission unit* (MTU) defines the maximum Layer 3 packet that can be sent over a medium. Because the Layer 3 packet rests inside the data portion of an Ethernet frame, 1500 bytes is the largest IP MTU allowed over an Ethernet.

2



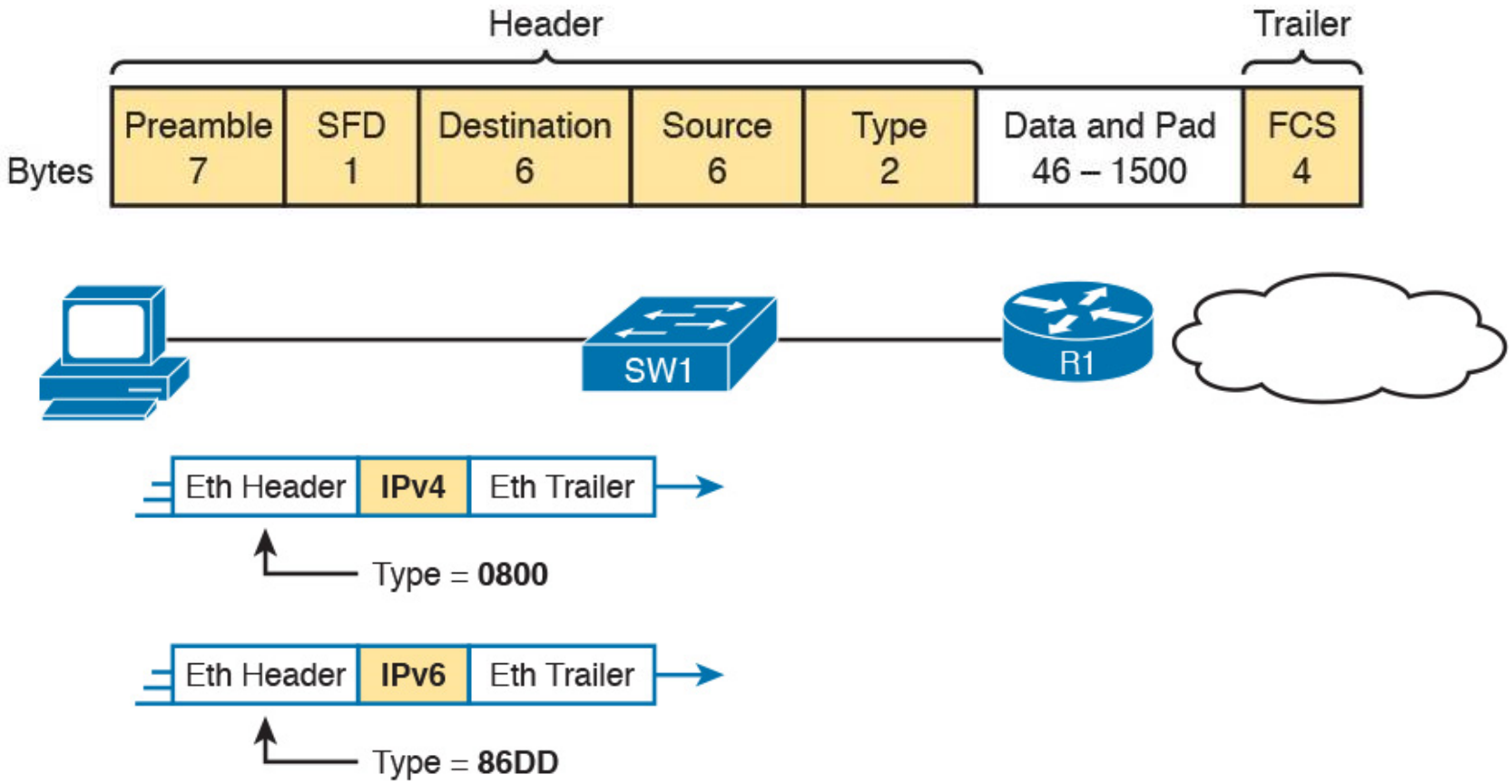
3

MAC address: **0000.0C12.3456**

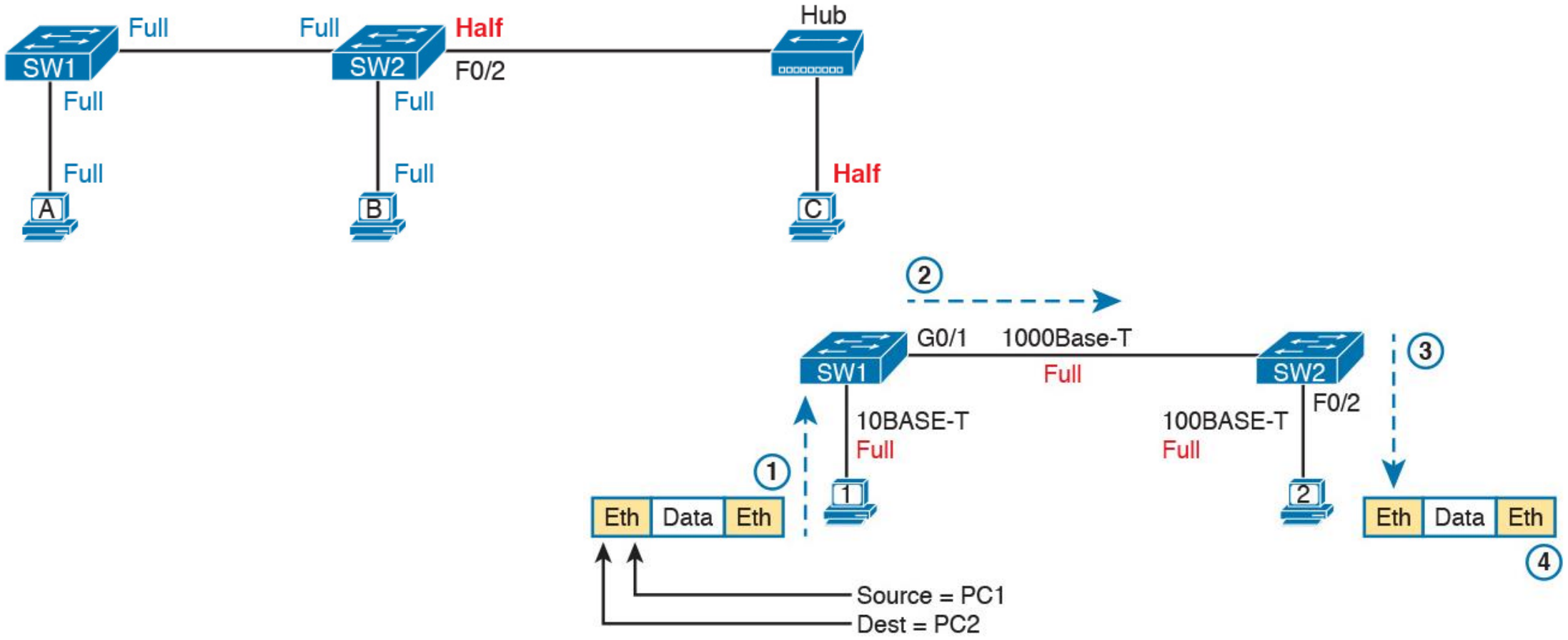
Sending Data in Ethernet Networks
Ethernet Data-Link Protocols

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 address 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.

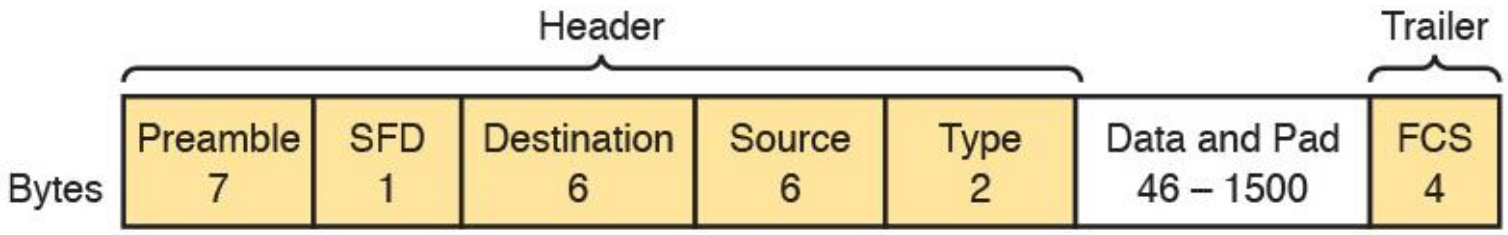
Sending Data in Ethernet Networks
Ethernet Type Field

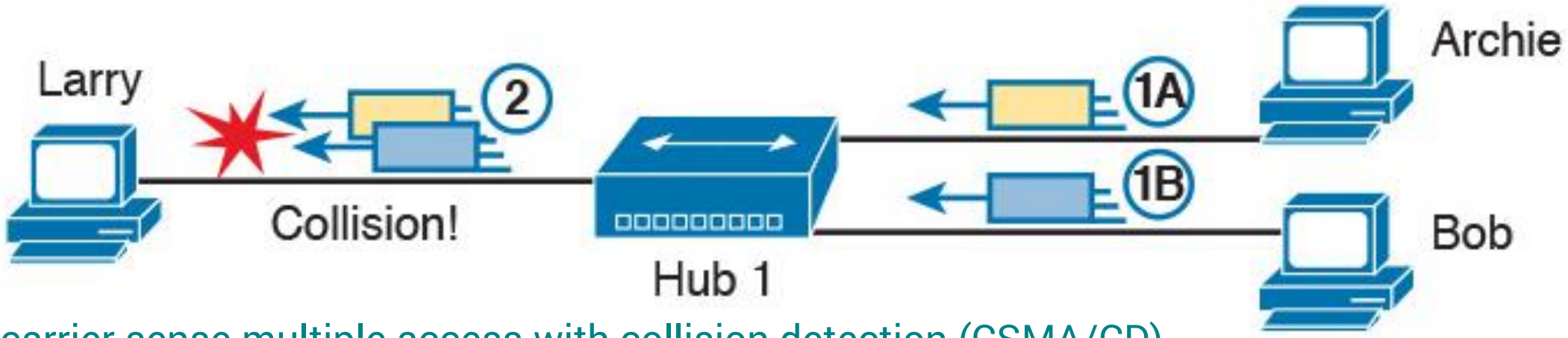


Sending Data in Ethernet Networks
Full Duplex, Half Duplex



Sending Data in Ethernet Networks
Error Detection, Collision





carrier sense multiple access with collision detection (CSMA/CD)