# CCENT Study Guide

## Chapter 2

## Ethernet Networking and Data Encapsulation

# Chapter 2 Objectives

- The CCENT Topics Covered in this chapter include:
- ✓ **Network Fundamentals**
- 1.6 Select the appropriate cabling type based on implementation
- requirements
- 1.4 Compare and contrast collapsed core and three-tier
- architectures
- ✓ **LAN Switching Technologies**
-  2.2 Interpret Ethernet frame format

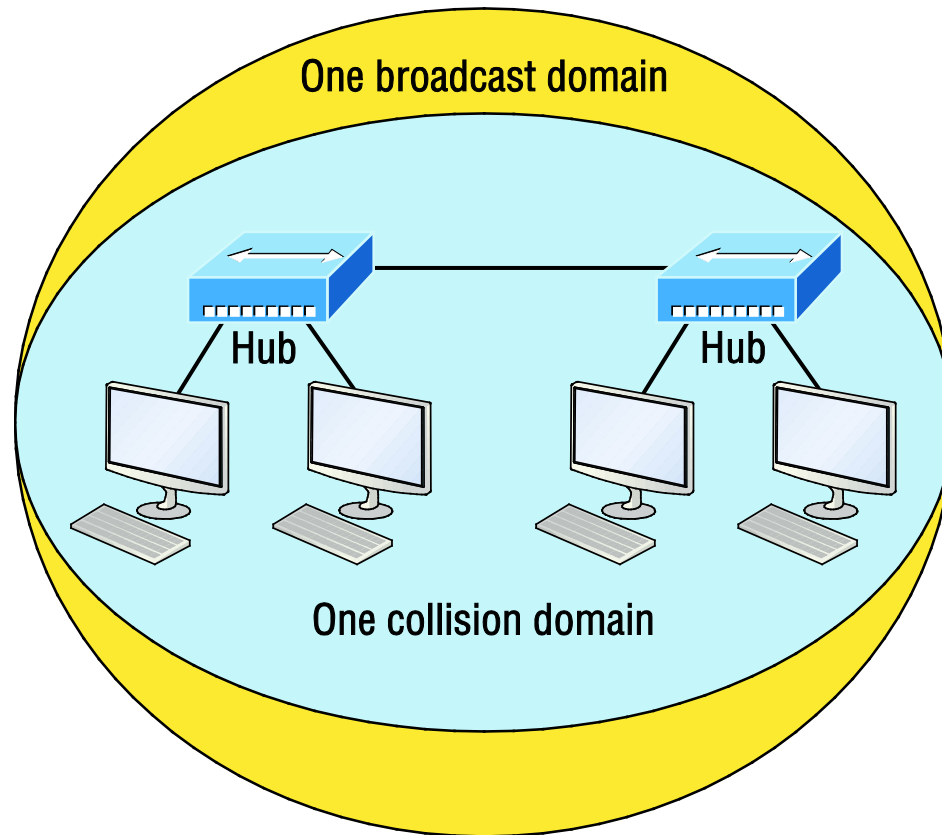# Figure 2.1: Legacy collision domain design



Figure 2.1 shows an old, legacy network that's a single collision domain where only one host can transmit at a time.

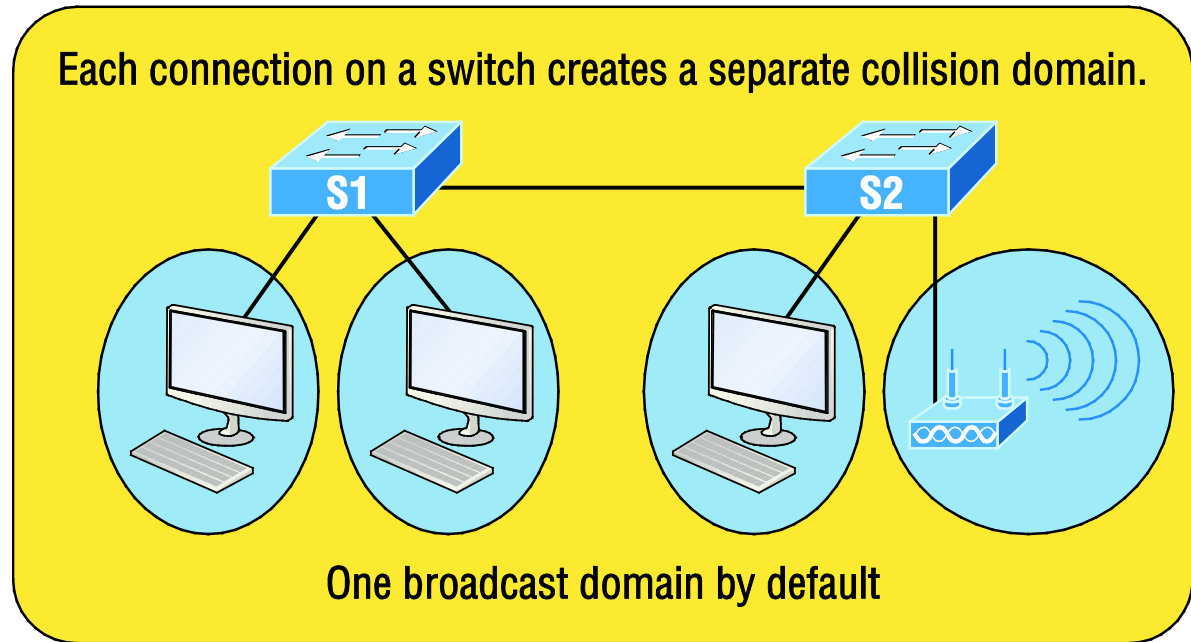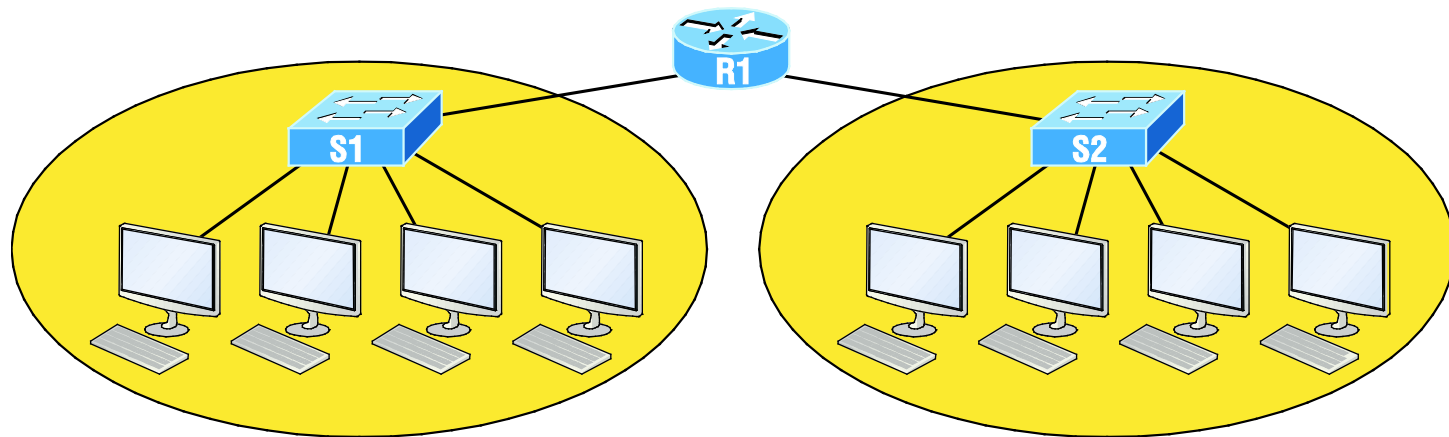# Figure 2.2: A typical network you'd see today



Figure 2.2 shows a typical network design still used today, and see if it's any better.
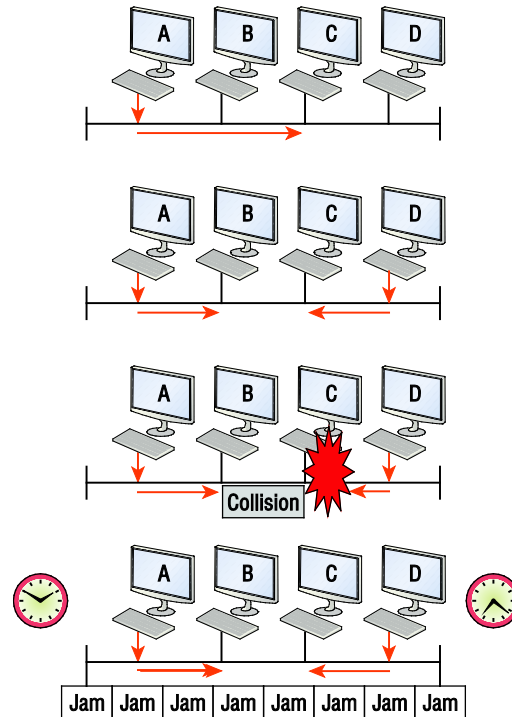
# Figure 2.3: A router creates broadcast domain boundaries.



Two broadcast domains. How many collision domains do you see?

Figure 2.3 shows how a router would create a broadcast domain boundary.

# Figure 2.4: CSMA/CD



When a host wants to transmit over the network, it first checks for the presence of a digital signal on the wire. If all is clear and no other host is transmitting, the host will then proceed with its transmission.
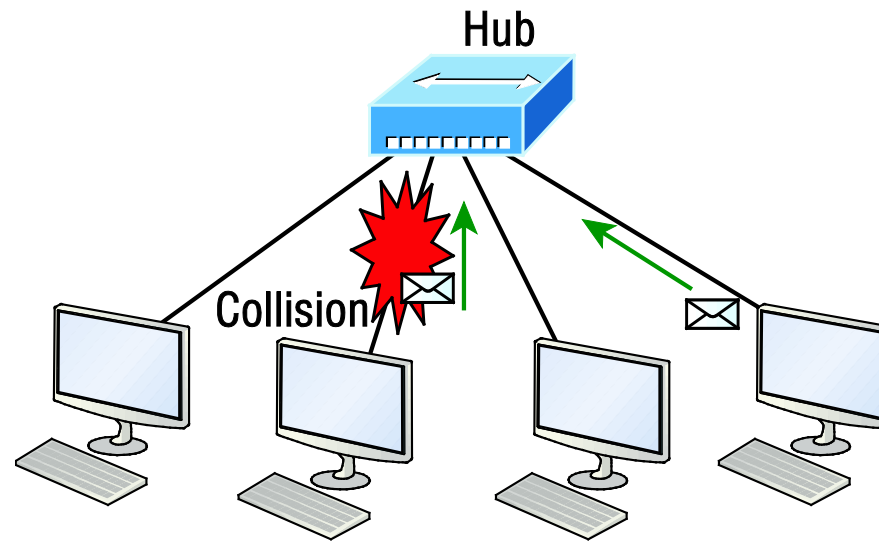
# Figure 2.5: Half-duplex example



Figure 2.5 shows a network with four hosts connected to a hub.
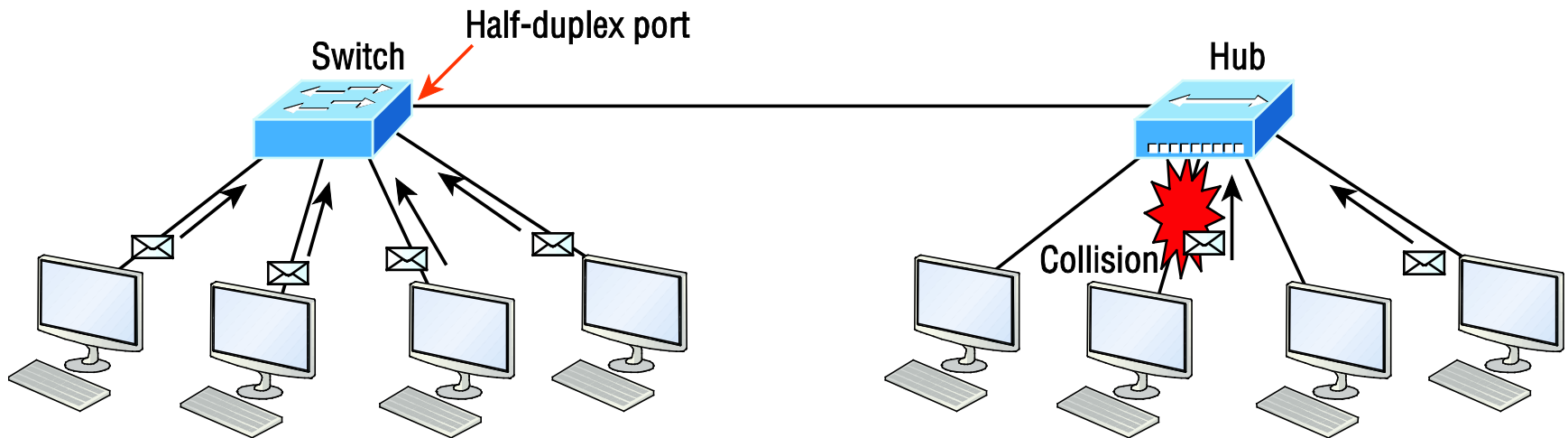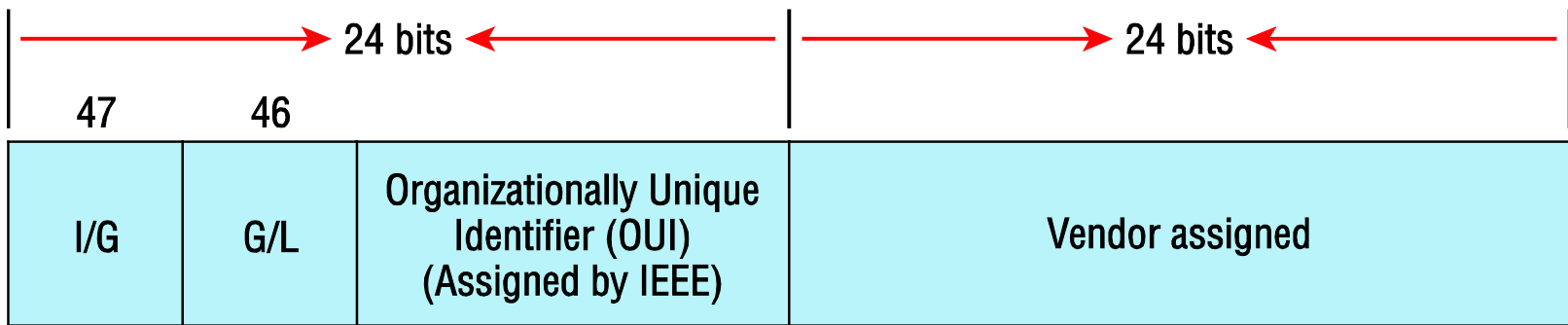
# Figure 2.6: Full-duplex example



Figure 2.6 shows four hosts connected to a switch, plus a hub, and definitely try not to use hubs if you can help it!
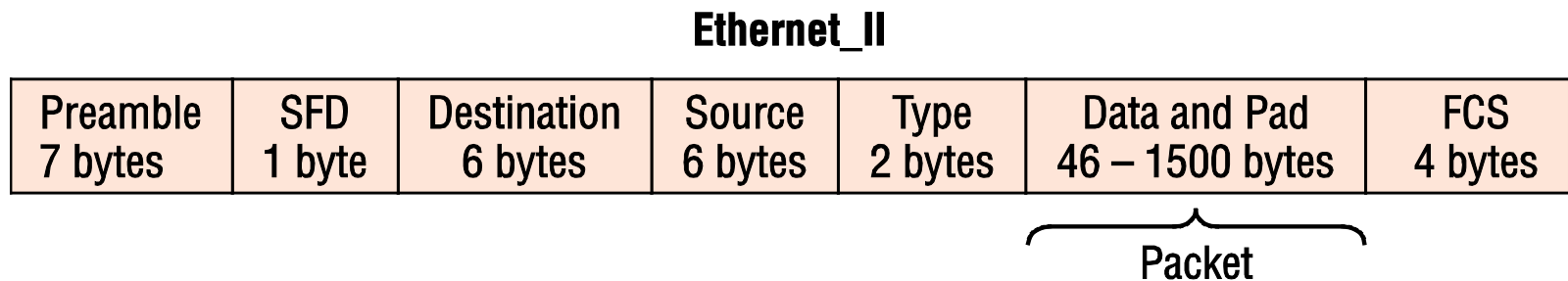
# Figure 2.7: Ethernet addressing using MAC addresses

| I/G | G/L | Organizationally Unique Identifier (OUI) (Assigned by IEEE) | Vendor assigned |
|-----|-----|-----|-----|

← 24 bits → ← 24 bits →

47 46

Example: 0000.0c12.3456

Figure 2.7 shows the 48-bit MAC addresses and how the bits are divided.

# Figure 2.8: Typical Ethernet frame format

**Ethernet_II**

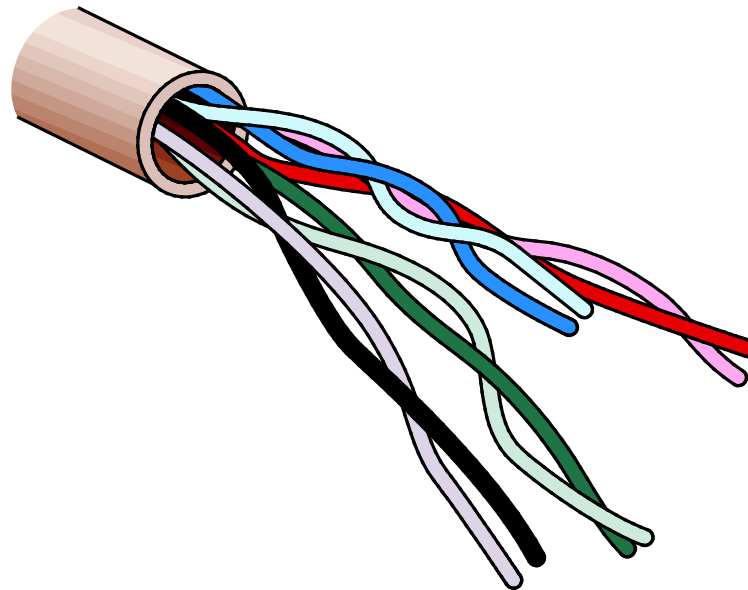| Preamble 7 bytes | SFD 1 byte | Destination 6 bytes | Source 6 bytes | Type 2 bytes | Data and Pad 46 – 1500 bytes | FCS 4 bytes |
|---|---|---|---|---|---|---|

Packet

The function of Ethernet stations is to pass data frames between each other using a group of bits known as a MAC frame format. This provides error detection from a cyclic redundancy check (CRC). But remember—this is error detection, not error correction. An example of a typical Ethernet frame used today is shown in Figure 2.8.

# Figure 2.9: Category 5 Enhanced UTP cable

A discussion about Ethernet cabling is an important one, especially if you are planning on taking the Cisco exams. You need to really understand the following three types of cables:

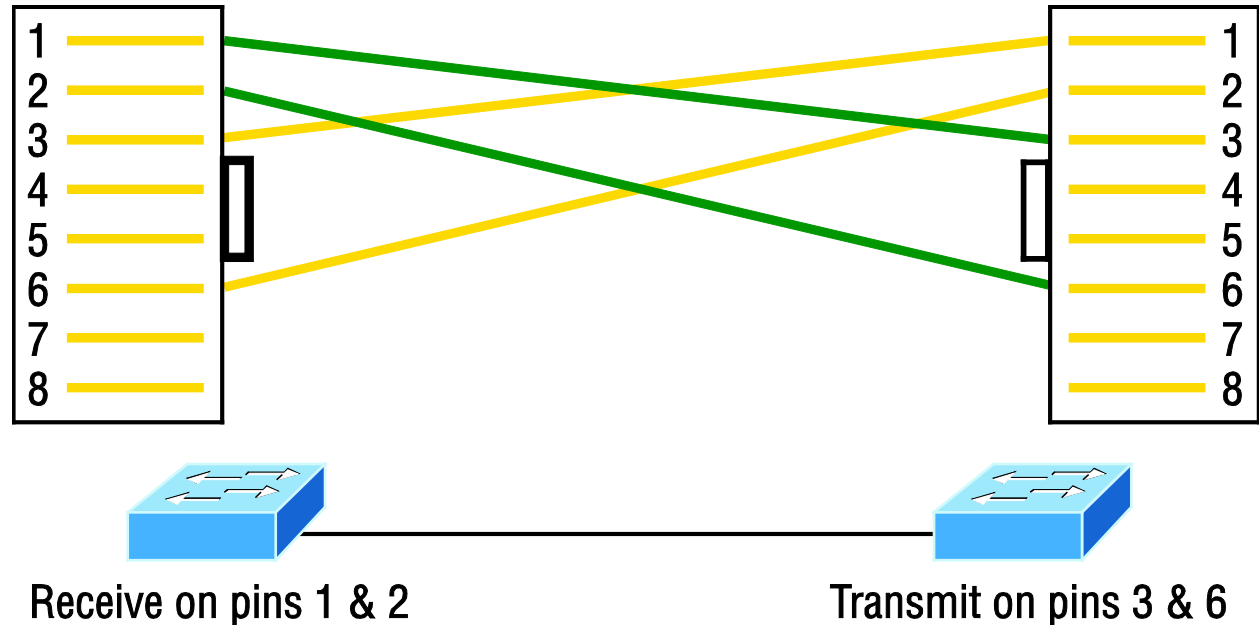- Straight-through cable
- Crossover cable
- Rolled cable

We will look at each in the following sections, but first, let's take a look at the most common Ethernet cable used today, the category 5 Enhanced Unshielded Twisted Pair (UTP), shown in Figure 2.9.
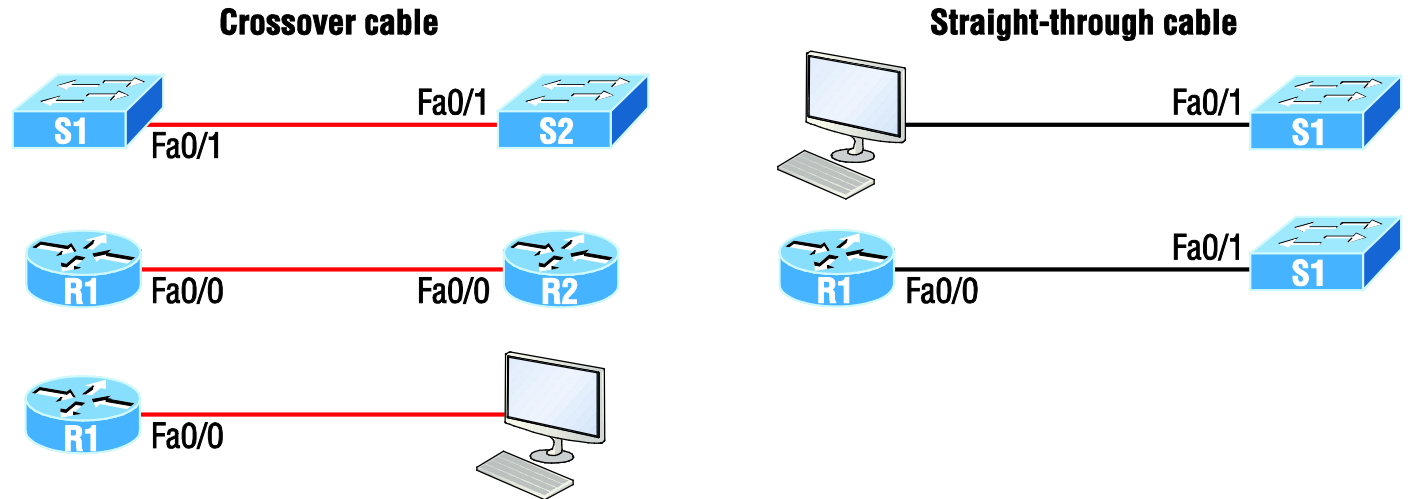
# Figure 2.10: Straight-through Ethernet cable



Transmit on pins 1 & 2
Receive on pins 3 & 6

Receive on pins 1 & 2
Transmit on pins 3 & 6
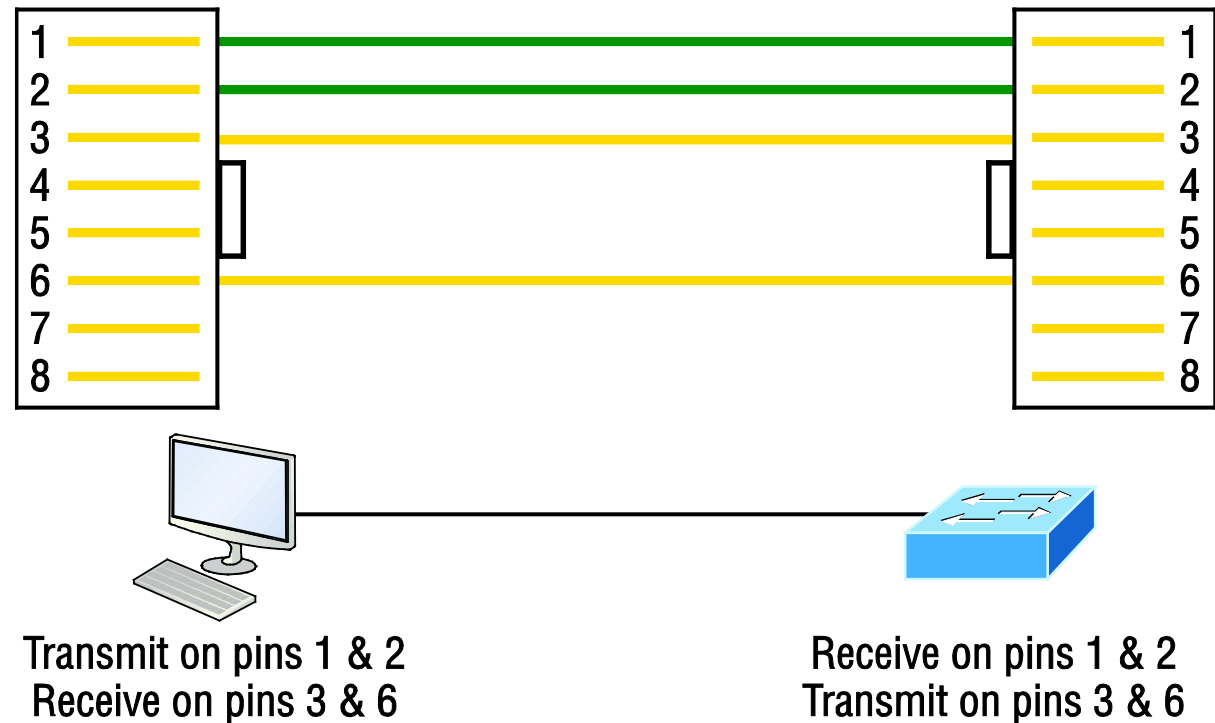
# Figure 2.11: Crossover Ethernet cable



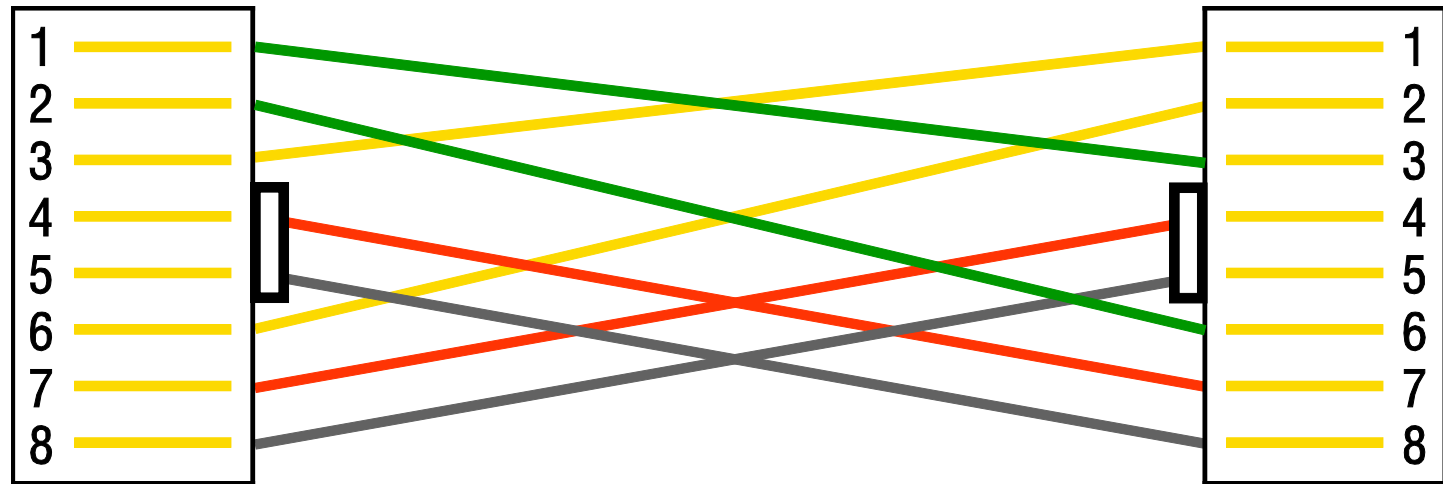Receive on pins 1 & 2          Transmit on pins 3 & 6

Notice that instead of connecting 1 to 1, 2 to 2, and so on, here we connect pins 1 to 3 and 2 to 6 on each side of the cable.

# Figure 2.12: Typical uses for straight-through and cross-over Ethernet cables
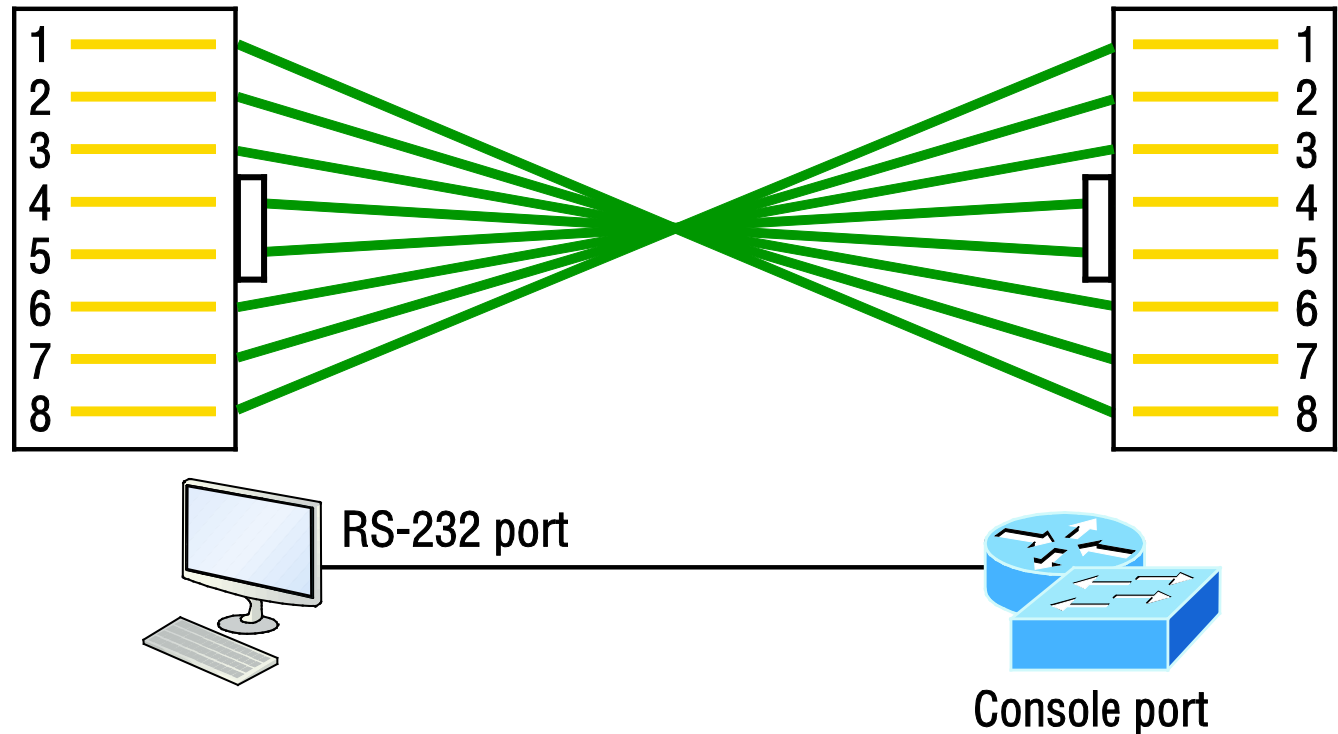
# Figure 2.13: UTP Gigabit crossover Ethernet cable

For a straight-through cable it's still 1 to 1, 2 to 2, and so on up to pin 8. And in creating the gigabit crossover cable, you'd still cross 1 to 3 and 2 to 6, but you would add 4 to 7 and 5 to 8—pretty straightforward!
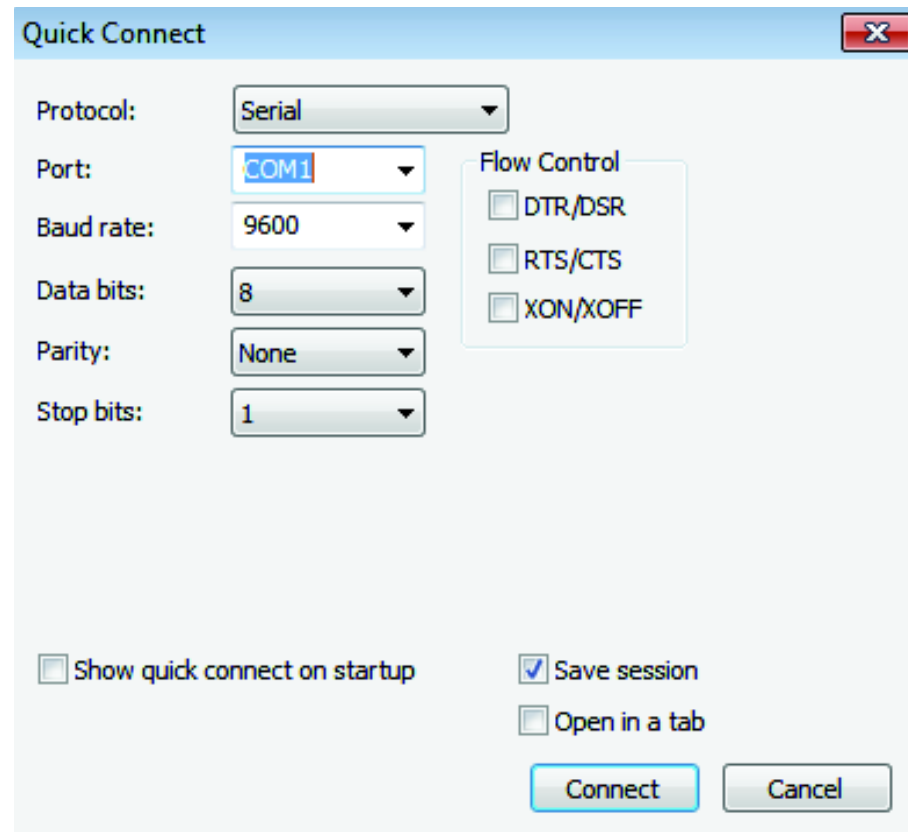
# Figure 2.14: Rolled Ethernet cable



These are probably the easiest cables to make because you just cut the end off on one side of a straight-through cable, turn it over, and put it back on—with a new connector, of course!

# Figure 2.15: Configuring your console emulation program

Notice that Bit Rate is set to 9600, Data Bits to 8, Parity to None, and Flow Control is set to None.

# Figure 2.16: A Cisco 2960 console connections

Notice there are two console connections on this new switch—a typical original RJ45 connection, and the newer mini type-B USB console.

Remember that the new USB port supersedes the RJ45 port if you just happen to plug into both at the same time, and the USB port can have speeds up to 115,200 Kbps, which is awesome if you have to use Xmodem to update an IOS.
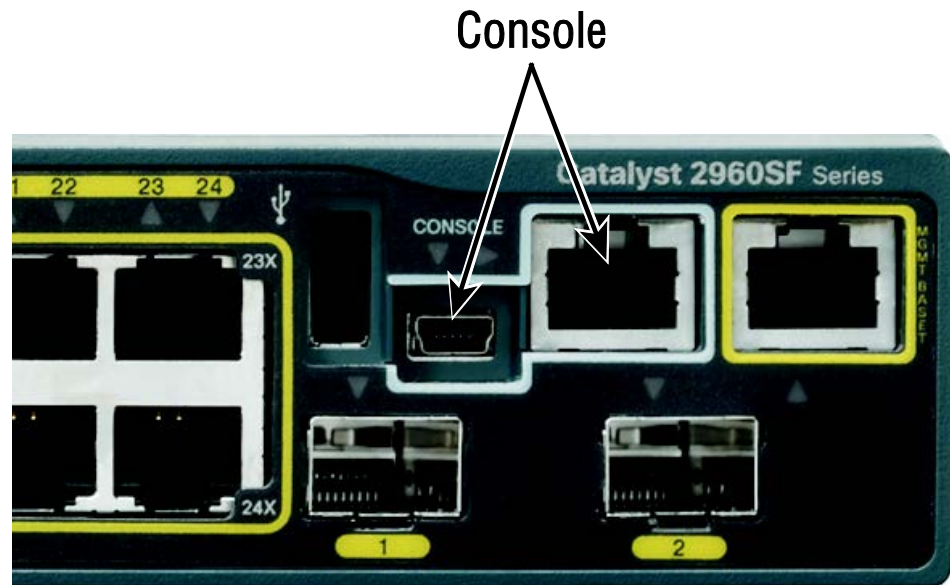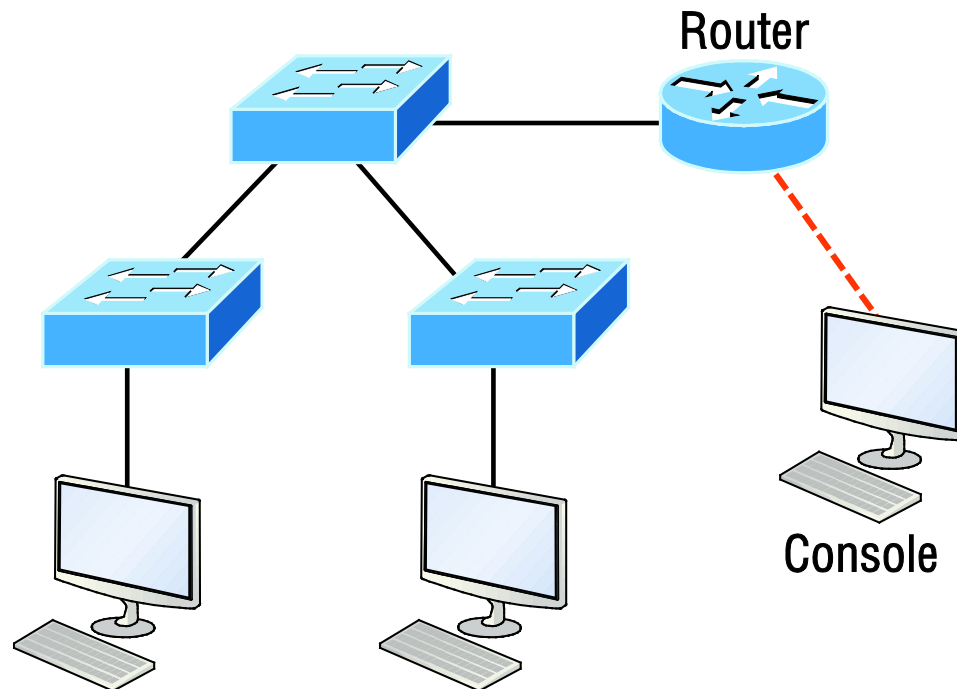
# Figure 2.17: RJ45 UTP cable question #1

Now that you've seen the various RJ45 unshielded twisted-pair (UTP) cables, what type of cable is used between the switches in Figure 2.17?
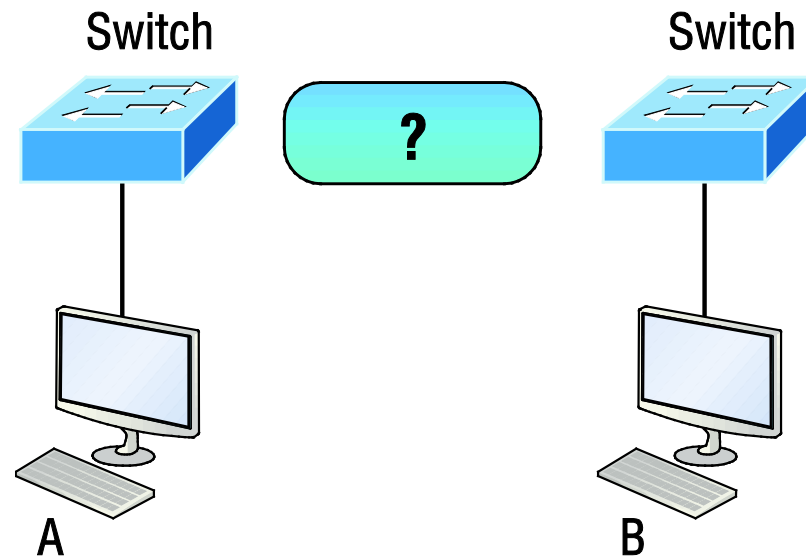
# Figure 2.18: RJ45 UTP cable question #2

What types of cables are used in the network shown in Figure 2.18?
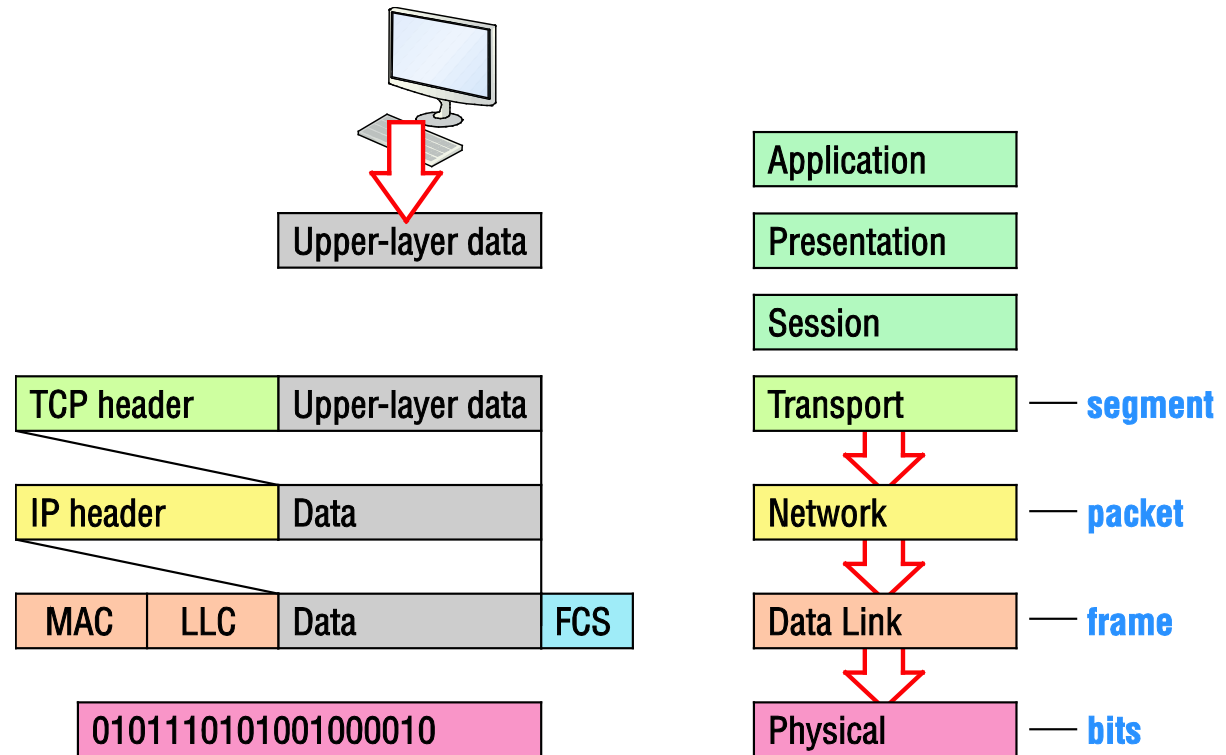
# Figure 2.21: Data encapsulation



Figure 2.21 shows the PDUs and how they attach control information to each layer. This figure demonstrates how the upper-layer user data is converted for transmission on the network.

# Written Labs and Review Questions

- – Read through the Exam Essentials section together in class.

- – Open your books and go through all the written labs and the review questions.

- – Review the answers in class.