

Chapter 14 - Communication Networks

Grading:

Notes: _____/20

Lesson Review: _____/20

Mnemonic: _____/20

Symmetric key/public key: _____/20

RJ 45 Wiring: _____/50

Networking Debrief: _____/20

Total points: _____/150

14.1 - Network Fundamentals Section

Essential Question

- Does analog music or digital music have better sound quality?

Section 14.1 Learning Goals

After completing this section, you will be able to:

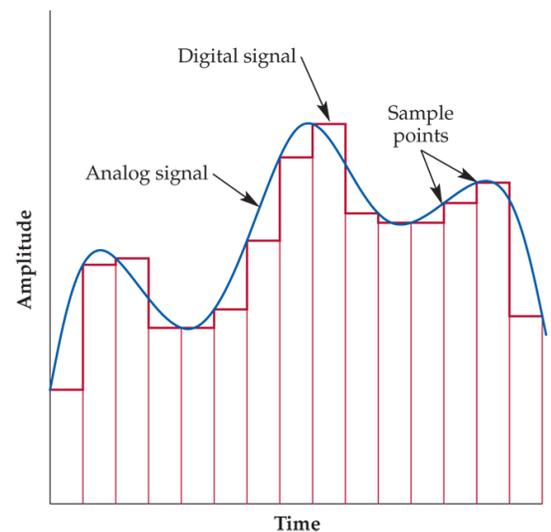
- Explain the difference between digital and analog signals.
- Discuss network connection technologies.

Competencies

- 6670.69 Investigate networks and their evolution.
- 6670.70 Explain basic networking concepts and different network structures.
- 6670.72 Describe the differences between analog and digital technology.

Terms

- analog
- bandwidth
- Bluetooth
- client
- digital
- Ethernet
- host
- hotspot
- hub
- network adapter
- Open Systems Interconnection (OSI) model
- port
- router
-
- Sampling
- switch
- transmission rate
- Wi-Fi



Digital Versus Analog

- **Analog** is a _____ signal that can vary over an

infinite range

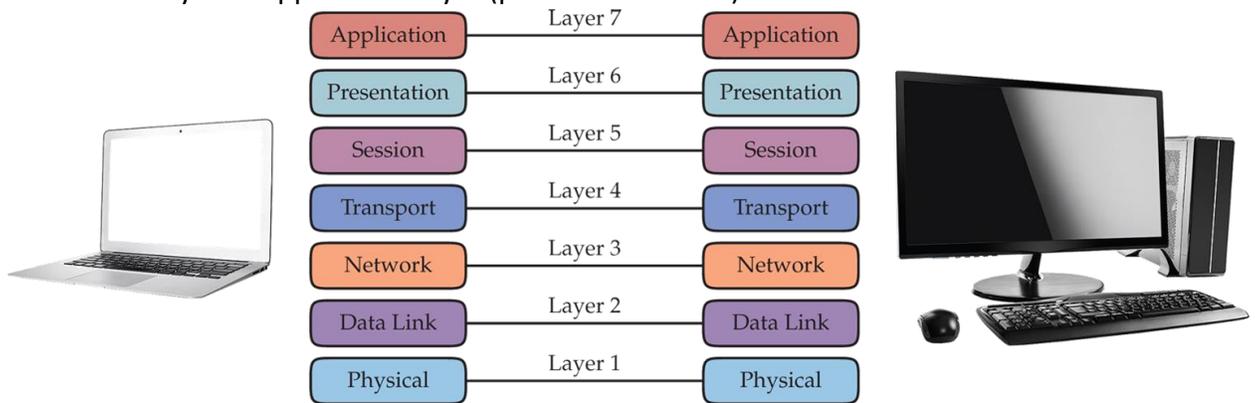
- **Digital** is a signal composed of discrete or _____ chunks of data
- **Sampling** is process of taking measurements along the analog signal to _____ it to a digital signal
- **Transmission rate** is the number of bits per _____ that can be sent between devices
 - Fiber optic: 73.7 trillion bits/second (Tbit/s)
 - Wi-Fi: 54 million bits/second (Mbit/s)
 - Bluetooth: 24 million bits/second (Mbit/s)
- **Bandwidth** is the _____ of data transfer

Network Connection Technologies

- **Ethernet** is a data transmission technology that creates a _____ connection between modems or routers and computers
- **Wi-Fi** uses a wireless router
 - Router is between the _____ and the computer
 - Transmissions are sent through the _____ to the computers with a Wi-Fi receiver
- Networking Hardware
 - **Host**
 - _____ computer dedicated to managing the communication tasks
 - Network that connects to the Internet
 - **Client**
 - Computer connected to and served by the host
 - _____ clients connected to the host
- Networking Hardware
 - Cable
 - Coaxial
 - Twisted pair
 - Optical fiber
 - **Router**
 - Sends data _____ between computer networks
 - Generally used for Internet applications
 - **Hub**
 - Common _____ point for devices in a network
 - Data available to all connection points
 - **Switch**
 - Network transmission device that checks and _____ packets between parts of the network
 - Determines which connection point should receive data
 - Networking Hardware
 - **Network Adapter**



- Provides the _____ between the computer and the network
- Ethernet adapter or network-interface cards
- Network Printer and Scanner
 - Must contain a _____ adapter
 - Number of users can be limited
- Network Architecture
 - Communication software is the _____ for most applications
- **OSI Model**
 - Open Systems Interconnection
 - _____ the functions of networking into layers
 - Same functions kept together for all networks
 - Creates smaller sections
- Network Architecture
- OSI Layers
 - Layer 1: Physical Layer (_____)
 - Layer 2: Data Link Layer (connected nodes)
 - Layer 3: Network Layer (transfer between nodes)
 - Layer 4: Transport Layer (reliability)
 - Layer 5: Session Layer (_____ between computers)
 - Layer 6: Presentation Layer (prepares data)
 - Layer 7: Application Layer (provides interface)



- Server Operating System
 - Specialized OS
 - Maintains _____ available to all computers
- Connection Technologies
 - **Ports** are _____ - or process-specific software communication endpoints
 - Uniquely identify different applications or processes
- **Bluetooth**
 - _____ wave-based wireless connection technology
 - _____ range, generally about 30 feet
 - Devices must be paired
- **Hotspots**

- Any LAN that is _____ to connection by roaming users
- Unsecured

Section 14.1 Review

1. True/False Channel capacity is also referred to as bandwidth.
2. True/False The host is the hub of the network.
3. True/False Any Wireless device is capable of using Bluetooth technology.
4. True/False A transmission rate is the number of bits per second that can be sent from one device to another.
5. True/False A network adapter provides the interface between the network and the Internet.
6. Which technology is capable of the highest transmission rate?
 - a. Fiber-optic cable
 - b. Bluetooth
 - c. Coaxial cable
 - d. Wi-Fi
7. What are the two computers that communicate with each other on a network?
 - a. Client, server
 - b. Desktop, notebook
 - c. Smartphone, tablet
 - d. Host, server
8. Which OSI layer contains the hardware?
 - a. Physical
 - b. Transport
 - c. Data Link
 - d. Session
9. What makes a computer a server?
 - a. Internet connectivity
 - b. Specialized software
 - c. Specialize hardware
 - d. Password protection
10. Arrange the OSI layers with layer 1 at the bottom and layer 7 at the top.

Transport	a.
Session	b.
Presentation	c.
Physical	d.

Network	e.
Data Link	f.
Application	g.

Application and Extension of Knowledge

1. Some people find it difficult to memorize the seven layers of the OSI model. There are several mnemonics, or memory devices that have been created to assist in the recall of the layer names. For example, All People Seem to Need Data Processing, where the first letter of each word stands for the layers. Create two original mnemonic devices that will help you recall the OSI layers in order. Create one for top-to-bottom order (layer 7 to layer 1) and one for bottom-to-top order (layer 1 to layer 7).

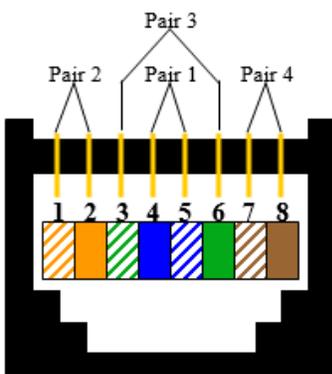
Mnemonic top-to-bottom	Mnemonic bottom-to-top

2. Research symmetric key and public key data encryption methods. Determine the functions of these encryption methods and how each affects the message verification process. Write a one-page paper describing your findings.
- Minimum of 2 paragraphs (5 sentences per paragraph)
 - Word of Google Docs
 - No bigger than 12-pt font (will receive a zero if do not follow this step). Bigger font does not get 2 paragraphs.
 - Email or share with teacher when done

RJ 45 Wiring Pinouts and Hints

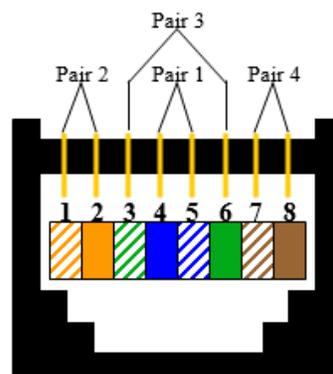
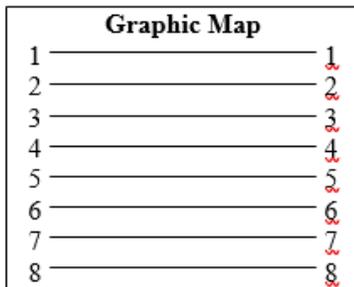
RJ-45 PINOUTS

Straight Through Cable



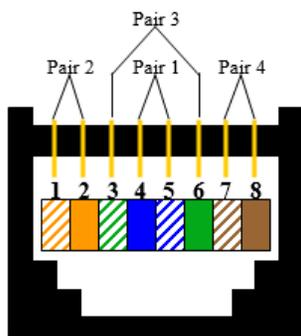
T568B

1	2	3	6	4	5	7	8
1	2	3	6	4	5	7	8



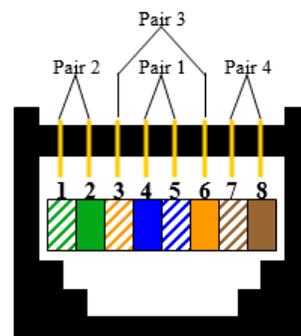
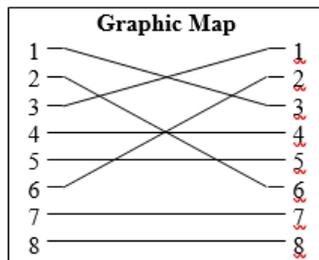
T568B

Cross Connect or Cross-Over Cable



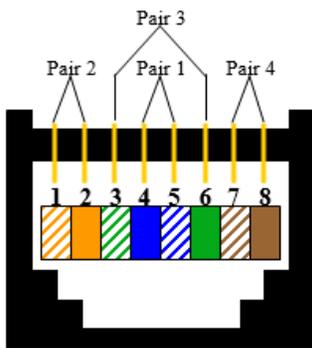
T568B

1	2	3	6	4	5	7	8
3	6	1	2	4	5	7	8



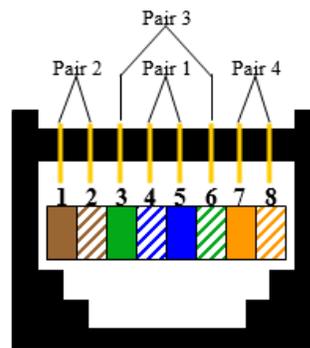
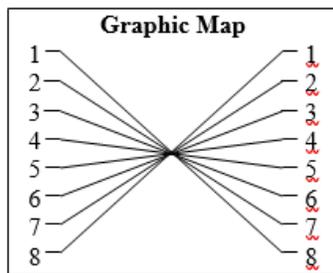
T568A

Roll-Over or Console Cable



T568B

1	2	6	3	5	4	7	8
8	7	3	6	4	5	2	1



STEP 1: Cut the outer jacket of the wire about 1.5" to 2" from the end. This will give you room to work with the wire pairs. Separate the pairs and align them in the order shown below. Begin flattening the wires into a "ribbon" as shown so that it will easily slip into the connector and into the individual channeled areas.



STEP 2: Once you have all the wires aligned and ready to insert, you must trim them to approximately 1/2" in order to have as little "untwisted" wire in the connection as possible. Category 5 specifications require a certain number of twists per inch and even the connector counts

STEP 3: Insert the wires into the connector making sure that each wire goes into its appropriate "channel" and extends all the way to the end of the the connector underneath the gold crimping connectors. Sometimes you can look at the end of the connector to see the copper wires if you're using solid copper cable. If the wires don't extend to the end of the connector, the crimp may not make contact.



STEP 4: Press the cable and the jacket into the connector firmly so that the jacket will be crimped by the plastic wedge near the rear of the connector, and insert it into your crimping tool and crimp the cable. **RE-CRIMP** the cable to make sure all connections are made.

STEP 5: Repeat steps 1 thru 4 for the other end of the cable for a standard Ethernet cable.

Tips when making a cable:

1. Use the Stripper to cut back the blue shielding in order to reveal the 4 twisted pairs.
2. Untwist the wires.
3. Arrange the wires in the correct order using the 568B standard.
4. Now use the scissors to trim back the wires so that they are the same height.
5. Carefully slide the RJ-45 connector over the wires. (Be sure the plastic clip is pointing down toward the ground). Hint: When the clip is down it's Orange to Brown!!!
6. Be sure all of the wires are touching the copper connectors and still in the right order!!!!!!
7. Be sure the Blue Shielding is inside the RJ-45 past the ridge.
8. Once everything is in place use the Crimping tool to clamp the RJ-45 to the Cat 5 Cable (Squeeze VERY hard).

Questions on next page

Networking Debrief

1. What was the most important thing you learned about making network cables?
2. What was the hardest thing to do?
3. What was the color order of the cables?
4. What is the name of the tool used to snap the cable in place?
5. What is the name of the connector used to attach to the end of the wire and into the computer?
6. What does it connect to in the back of your computer?
7. What is the unique network address burned into a component of your computer?
8. What is the name of the wire used to connect computers?