Hands-On Networking Fundamentals, Second Edition
Chapter 2 Solutions

Answers to the Chapter 2 Review Questions

1. You run a machine shop that houses many electrical machines, fans, and an air conditioning unit. All of these devices can contribute to which of the following that must be taken into consideration when designing a LAN? (Choose all that apply.)
   Answer: b. electromagnetic interference and c. radio frequency interference

2. Which of the following have been facilitated by the OSI model? (Choose all that apply.)
   Answer: a. the development of network hardware that uses common interfaces, b. enabling users to retain their investment in network devices by helping to ensure old equipment communicates with new equipment, and d. enabling different types of LANs and MANs to communicate

3. A wireless 2G network uses which of the following radio transmitted signals? (Choose all that apply.)
   Answer: d. digital

4. Which of the following fields would you find in a data link frame? (Choose all that apply.)
   Answer: a. address of the transmitting node, b. address of the receiving node, c. data, and d. end of frame designator

5. Which of the following is an IEEE standard for Ethernet? (Choose all that apply.)
   Answer: c. 802.3

6. On your network there is a NIC that is malfunctioning by transmitting many extra frames each time it communicates. Which of the following might help you identify which NIC is having problems so that you can replace it?
   Answer: a. physical address of the NIC

7. When your computer communicates with a server through the Physical layer (Physical layer to Physical layer), it uses which of the following?
   Answer: b. peer protocols

8. When you configure a computer's operating system to use data encryption for network communications, this occurs at which of the following OSI layers?
   Answer: c. Presentation

9. When you are purchasing a product through the Internet, which of the following can be used to encrypt your credit card number when you send it to the vendor?
   Answer: d. Secure Sockets Layer

10. You have just purchased an Apple iPad tablet so that you can download books, use mapping software, and access your e-mail through the Internet. Which of the following standards makes this possible through a wireless telecommunications network?
    Answer: a. IMT-2000

11. An Internet browser works at which of the following OSI layers?
    Answer: b. Application

12. What types of devices would you expect to see in a headend? (Choose all that apply.)
    Answer: a. cable connections, b. satellite dishes, c. antennas, and d. trunk lines

13. Which type of switching uses a store-and-forward communication method?

Answer: c. message

14. How is a collision determined on an Ethernet network?
     Answer: d. by signal strength

15. A 4G network has which of the following advantages over a 3G network? (Choose all that apply.)
     Answer: a. high-definition streaming video, b. better sound quality, c. faster possible data
     transmission rate, and d. improved security

16. You work in a community college system that consists of 15 community colleges throughout the state
     and a central administration center at one of the colleges. The central administration center processes
     the payroll and student information and needs to have communications of over 40 Mbps between it and
     the colleges. Which of the following would best provide this type of communications?
     Answer: c. T-3 or T-3C communications

17. You are working on security on your company's vice president's computer by closing unused ports for
     network communications. At what OSI layer are you working while closing the ports?
     Answer: c. Transport

18. Enhanced Data Rates for GSM Evolution (EDGE) as used on 3G networks employs which of the
     following?
     Answer: d. Time Division Multiple Access

19. Beaconing occurs on which type of network?
     Answer: b. Token Ring

20. You are working on an older network that still uses FDDI on the backbone to connect servers and
     network devices. What type of cable do you expect to see on the FDDI backbone?
     Answer: a. fiber-optic

Hands-On Projects Tips and Solutions for Chapter 2

Activity 2-1

In Step 5, the general reasons for standardization as provided by the ISO include:
- Product quality
- Environmental friendliness
- Safety
- Reliability
- Efficiency and interchangeability
- Economical cost

In Step 6, students should record four out of the following entities that benefit from standards:
- Businesses
- Innovators
- Customers
- Governments
- Trade officials
- Developing countries
- Consumers
- Everyone
- The planet

Activity 2-2

An optimal design for this project is a network that does not contain a network hub or switch and that is a legacy bus network consisting of coaxial cable connecting two or more workstations and servers. Another viable option is a network that uses unshielded twisted-pair cable and a hub or switch.

Yet another option is to use a wireless network and employ one or more wireless devices that you have already determined can cause interference, such as a specific cordless telephone or camera or a transmitter that you have obtained for this lab (talk to your school's amateur radio club for help).

One method for displaying EMI/RFI problems is to first download a file of moderate size before applying EMI/RFI to the cable (or wireless) segment and observing the time it takes to download the file. Then place the EMI/RFI source as close as possible to the cable segment (or wireless card) and observe and compare the time again.

Emphasize to the students that proper installation and placement of network media is vital to reliable and optimal network performance. Coaxial cable is more susceptible to EMI/RFI interference because of the cable design and individual interface design of the hardware logic contained in the network device. Unshielded twisted-pair cabling and the individual interface design of the associated hardware logic contained in the network device takes into account EMI/RFI or "noise" present on the cabling and can tolerate higher noise ratios by employing media filters and isolation transformers on each twisted-pair interface that acts as a filter to minimize EMI/RFI.

If your test network has an intelligent hub or switch that interconnects the workstations and servers, the easiest method for detecting problems will be to look for high error counts on the interface nearest the EMI/RFI source. You can observe these error counts on the hub or switch with the management software provided by the vendor or by utilizing the console port on the hub or switch.

This project also demonstrates that a network having two or more workstations or servers should be interconnected via a hub or switch, and if possible, an intelligent hub or switch, to allow for better troubleshooting tools and for easier resolution of problems.

Activity 2-3

This project illustrates valuable tools for your students to use in identifying address information for a NIC or WNIC in the Microsoft Windows, Linux, and Mac OS X Snow Leopard or Lion. If you have other devices running other operating systems on your network, you might have students use similar tools to provide this information. This is an example of why it is imperative that you have detailed documentation about your network so that when problems arise, the device or devices that are causing the problems can be quickly located and repaired. You might also emphasize that it is important to keep this information up to date as the network grows.

Most intelligent network devices, such as hubs, switches, and routers, will provide network management applications either locally or remotely that will allow you to view Layer 2 MAC addresses associated with individual interfaces to quickly locate devices connected to them. This will prove very useful in locating faulty devices on your network. This will also provide you with a tool for troubleshooting problems when you first connect a device to a switch or wireless access point so that you can make sure the switch or access point verifies the address associated with the device connected to the interface.

Activity 2-4
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This project enables students to view the SSL settings in Internet Explorer for Windows 7 or Server 2008/Server 2008 R2. Consider using this project to initiate a discussion about the value of network

security and encryption. You might also add a project in which students view how to set up encryption for a VPN or Web server, and discuss the different types of encryption.

In Step 5 the possible SSL options are:
- Use SSL 2.0
- Use SSL 3.0

In Step 6, students should note any other security options that are selected, such as checking for certificate revocation for a publisher or server.

Activity 2-5

In this project, students view the SSL option in Firefox.

In Step 5, the SSL version listed is SSL 3.0.

Activity 2-6

Students view the Microsoft redirector at work in this project.

In Step 5, students should notice which files and printers are shared.

As a supplement to the project, you might have students monitor the activities of the redirector in Windows Server 2008/Server 2008 R2 through Performance Monitor. They can do this by selecting to view the Redirector object and one or more of its counters. To access the Performance Monitor, click **Start**, point to **Administrative Tools**, and click **Reliability and Performance Monitor** in Server 2008 or **Performance Monitor** in Server 2008 R2. Click **Performance Monitor** in the tree in the left pane. Next, click the **plus sign** in Performance Monitor, select the **plus sign** in front of Redirector as the performance object, and select to view one or more counters. For example, you might have students monitor bytes total per second, so that students can view the total amount of activity handled by the redirector.

Activity 2-7

In this project, students use the *ping* utility in UNIX/Linux to explore the Application layer via their loopback connection. In Fedora and Red Hat Enterprise Linux, the loopback connection is typically configured automatically as local host when the operating system is installed—or students can use the loopback address 127.0.0.1.

Activity 2-8

In this project, students use the *ping* utility in Mac OS X Snow Leopard and Lion to explore the Application layer via their loopback connection, 127.0.0.1.

Activity 2-9

One of the first things that the student will notice when viewing one or more RFC documents is that there is a standard format for an RFC. This is important because it defines the way in which the document is created and submitted for universal understanding. The standard format and design of the document also presents a good example of why standards are important from the initial creation of an idea, to its development, and finally to its implementation. Standards are very important for all aspects of computing, especially networks, because of the need for standard protocols or communications

between networks. Many RFCs relate either directly or indirectly to networks, and the importance of these RFCs is that they define a standard structure for making network proposals, as well as for environments in which networks operate.

In Step 5, Steve Crocker wrote the RFC, which is called Host Software and was submitted on April 7, 1969.

Activity 2-10

In this project, students examine an Ethernet cabled LAN. They should observe the types of NICs used and the cable in use. They also should examine how the cable is distributed and the network device(s) used to connect the cable. After determining the topology and the key network elements, students should be able to deduce that the network uses Ethernet.

Activity 2-11

This project enables students to find out more about cable modems. *www.cable-modem.net* is a Web site that has received attention from the *Wall Street Journal* and other news media.

Cable TV does provide a means for WAN access in many areas and one that is relatively easy to install and maintain. Most providers install and configure the equipment necessary to make this connection possible. The providers also supply support and instructions for problem or service change resolution.

This access method is now widely available in areas that have one or more cable TV providers.

Solutions to the Case Project Assignments

In the following assignments, you consult for the newsroom of the *Franklin Daily Herald*, a newspaper in a Midwestern U.S. city that is still thriving because of its close ties to the community and first-rate reporting. All of the news reporters have laptop computers, and now their management has funded a project to network the entire newspaper building. Having a network that links all of the departments and enables company-wide exchange of information and Internet access will help position this newspaper to stay competitive with other news sources.

> **Commented [MP2]:** Added to match edit in main text. AU

Case Project 2-1: Expanding the Network Backbone

There is already a partial network backbone using Ethernet in the newspaper's building that joins some of the administrative and advertising offices. Prepare a report or slide show that explains why Ethernet is still a good choice for the network backbone.

Answer:

Ethernet is a good choice in this context for several reasons:
- Ethernet is the most popular cabled network transmission method and is a well-tested approach for a backbone. The majority of network vendors offer and support a huge array of Ethernet devices. This means the community college does not have to rely on only certain vendors and can take advantage of the best prices.
- The most popular LAN topology, the star-bus hybrid topology, can be used for Ethernet.
- Ethernet's popularity means that there are more network professionals trained in this technology than any other transmission method.
- There are many Ethernet transmission speeds from which to choose, which makes it easier to upgrade a network for more capacity (bandwidth). Ethernet also offers many expansion possibilities so that the network can grow as the student population grows.

- Standards exist for cabled Ethernet and for wireless communications that are fully compatible with Ethernet.
- The vast array of Ethernet vendors and device options makes an Ethernet network backbone relatively easy to expand.
- There are many options for connecting an Ethernet network to all types of WAN technologies.
- New standards are constantly evolving to broaden the capabilities of Ethernet.
- Ethernet devices and associated software can be used to help centralize the management of the network for better network function and faster response to problems.

Case Project 2-2: Creating a Network That Can Communicate with Other Networks

The management wants to know if there are any guarantees that the network you are proposing will communicate with other networks. What is your response?

Answer:

The existence of standards and standards organizations helps ensure that one network can communicate with another. For example, Ethernet is the IEEE 802.3 standard for networking. The IEEE is one of the major standards organizations. The IEEE is a professional society with scientific, technical, and educational members active in over 150 countries. The 802 standards committee and Project 802 have developed the 802 networking standards in use today. Ethernet is a particularly good choice for a network because there are many standards pertaining to Ethernet communications and many vendors who follow those standards throughout the world. Also, Ethernet is compatible with commonly used wireless technologies that might be used to connect some or all of the newspaper users to the network backbone.

Case Project 2-3: Questions About the OSI Model

Brett Mason, a new colleague with whom you are working at Network Design Consultants, is unsure about some aspects of the OSI model. He has a list of questions for you and asks that you develop a table that he can use as a reference for the answers. Create a table containing two columns and seven rows. Label the left column "Network Function," and label the right column "OSI Layer." Enter each of the following functions in its own row under the left column, and then specify the OSI layer that performs that function under the right column. Brett's questions about functions are as follows:

π   Which layer resizes frames to match the receiving network?

π   Which layer performs data compression?

π   Which layer ensures data is received in the order it was sent?

π   Which layer handles the data-carrying signal?

π   Which layer provides file transfer services?

π   Which layer enables routing?

π   Which layer enables the receiving node to send an acknowledgment?

Answer:

The communication with and understanding of a new employee in any organization is vital to the firm's success. Brett should thoroughly understand the technology and how it relates to the successful completion of the project. The creation and presentation of the table showing the relationship of the OSI model and the layer functionality's will be important for Brett in designing present and future projects. Directing Brett to other sources of information such as the regulatory organization's Web sites or documentation will also

help Brett understand better. Brett can visit the IEEE, IETF, and other network-related regulatory Web sites for further information. There are also many different trade periodicals that Brett can consult along with numerous training courses from several different training groups.

Function	OSI Layer
Resizes frames to match the receiving network	Transport
Performs data compression	Presentation
Ensures that data is received in the order it was sent	Transport
Handles the data-carrying signal	Physical
Provides file transfer services	Application
Enables routing	Network
Enables the receiving node to send acknowledgement	LLC at the Data Link layer for connection-oriented service and the Transport layer

Case Project 2-4: More Questions About the OSI Reference Model

Brett likes your table and has another question. He would like you to explain MAC addressing.

Answer:

Brett's MAC addressing question can be explained by the organizationally unique address assignment by the IEEE for each vendor company. Each network interface or NIC on a network device has a unique address that enables a frame to reach its destination. In this address, called the device or physical address, the first series of bytes identifies the NIC vendor and is a valuable tool for network administration. The student might recommend that Brett visit the IEEE Web site at *www.ieee.org* and follow the standards links to the organizational unique identifiers for a downloadable document with each vendor's address.

Case Project 2-5: Implementing T-carrier Communications

After the new network is installed, the newspaper is purchased by a newspaper chain and the coordinators of the purchase transition want to have T-carrier communications with the newsroom network. The *Franklin Daily Herald* management would like you to give them an executive overview explaining T-carrier communications and the possible options.

Answer:

As discussed in the text, a T-carrier line is a dedicated telephone line that can be used for data communications to connect two different locations for continuous point-to-point communications. For example, it is useful for joining business branches in different locations or business subsidiaries. T-carrier lines offer dependable service over very long distances. They are generally offered by telecommunications companies, such as RBOCs.

The available T-carrier speeds are outlined in Table 2-3 in the text, as replicated here:

T-Carrier	Data Transmission Rate	T-1 Switched Channels	Data Signal Level
Fractional T1	64 Kbps	1 of 24 T-1 subchannels	DS-0

T-1	1.544 Mbps	1	DS-1
T-1C	3.152 Mbps	2	DS-1C
T-2	6.312 Mbps	4	DS-2
T-3	44.736 Mbps	28	DS-3
T-3C	89.472 Mbps	56	DS-3C
T-4	274.176 Mbps	168	DS-4
T-5	400.352 Mbps	336	DS-5