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# **CCBOOTCAMP's<sup>®</sup> Comprehensive ICND1 Study Guide With Sample Questions**

**Interconnecting Cisco Networking Devices  
Part 1 (ICND1)**

Cisco Exam 640-822

A Unique Study Guide format that compresses important need-to-know-information into short easy-to-read segments followed with pertinent practice questions. Each Module is then followed with relevant Sample Exam Questions. The Answer Key is included but located at the end of the study guide to facilitate a *No Peek* study habit.

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**CCBOOTCAMP®'s Comprehensive ICND1 Study Guide With Sample Questions  
First Edition**

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## Module 1 – Exploring the Functions of a Network

### Exploring the Functions of Networking

#### What is a Network?

A network is a connected collection of devices and end systems, such as computers and servers, which can communicate with each other. Networks carry data in many types of environments, including homes, small businesses, and large enterprises. A main office can have hundreds or even thousands of people who depend on network access to do their jobs. A main office may use several connected networks, which can span many floors in an office building or cover a campus that contains several buildings.

1. Which three statements about networks are accurate? (Choose three)
  - A. Networks are used to transmit data in many kinds of environments, including homes, small businesses, and large enterprises.
  - B. A main office can have hundreds or even thousands of people who depend on network access to do their jobs.
  - C. A network is a connected collection of devices that can communicate with each other.
  - D. A main office usually has one large network to connect all users.
  - E. The purpose of a network is to create a means to provide all workers with access to all information and components that are accessible by the network.
  - F. Remote locations cannot connect to a main office through a network.

#### Common Physical Components of a Network

**Routers:** Routers interconnect networks and choose the best paths between networks.

2. What is the purpose of a router?
  - A. to interconnect networks and choose the best paths between them
  - B. to provide the connection points for the media
  - C. to serve as the end point in the network, sending and receiving data
  - D. to provide the means by which the signals are transmitted from one networked device to another

**Switches:** Switches are devices that provide network attachment to the end systems and intelligent switching of the data within the local network.

3. What is the purpose of a switch?
  - A. to connect separate networks and filter the traffic over those networks so that the data is transmitted through the most efficient route
  - B. to choose the path over which data is sent to its destination
  - C. to serve as the end point in the network, sending and receiving data
  - D. to provide network attachment to the end systems and intelligent switching of the data within the local network

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**Interconnections:** Interconnections consist of components that provide a means for data to travel from one point to another point in the network.

4. What is the purpose of network interconnections?
  - A. to connect separate networks and filter the traffic over those networks so that the data is transmitted through the most efficient route
  - B. to choose the path over which data is sent to its destination
  - C. to provide a means for data to travel from one point to another in the network
  - D. to provide network attachment to the end systems and intelligent switching of the data within the local network

### Resource-Sharing Functions and Benefits

Networks allow end users to share both information and hardware resources. The major resources that are shared in a computer network include the following:

- Data and applications
  - Resources
  - Network storage
  - Backup devices
5. Which resource is not sharable on a network?
    - A. memory
    - B. applications
    - C. peripherals
    - D. storage devices

### Network User Applications

The most common network user applications include the following:

- E-mail
  - Web browser
  - Instant messaging
  - Collaboration
  - Database
6. Which three of the following are common network applications? (Choose three.)
    - A. e-mail
    - B. collaboration
    - C. graphics creation
    - D. databases
    - E. word processing
    - F. spreadsheets

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## Characteristics of a Network

Networks can be described and compared according to network performance and structure, as follows:

- **Speed:** Speed is a measure of how fast data is transmitted over the network. A more precise term would be data rate.
- **Cost:** Cost indicates the general cost of components, installation, and maintenance of the network.
- **Security:** Security indicates how secure the network is, including the data that is transmitted over the network. The subject of security is important and constantly evolving. You should consider security whenever you take actions that affect the network.
- **Availability:** Availability is a measure of the probability that the network will be available for use when it is required. For networks that are meant to be used 24 hours a day, 7 days a week, 365 days a year, availability is calculated by dividing the time it is actually available by the total time in a year and then multiplying by 100 to get a percentage.
- **Scalability:** Scalability indicates how well the network can accommodate more users and data transmission requirements. If a network is designed and optimized for just the current requirements, it can be very expensive and difficult to meet new needs when the network grows.
- **Reliability:** Reliability indicates the dependability of the components (routers, switches, PCs, and so on) that make up the network. This is often measured as a probability of failure, or mean time between failures (MTBF).
- **Topology:** In networks, there are two types of topologies: the physical topology, which is the arrangement of the cable, network devices, and end systems (PCs and servers), and the logical topology, which is the path that the data signals take through the physical topology.

7. Match each network characteristic to its definition.

- \_\_\_ 1. speed
- \_\_\_ 2. cost
- \_\_\_ 3. security
- \_\_\_ 4. availability
- \_\_\_ 5. scalability
- \_\_\_ 6. reliability
- \_\_\_ 7. topology

- A. indicates how easily users can access the network
- B. indicates how dependable the network is
- C. indicates the protection level of the network itself and the data that is transmitted
- D. indicates how fast data is transmitted over the network
- E. indicates how well the network can accommodate more users or data transmission requirements
- F. indicates the structure of the network
- G. indicates the general price of components, installation, and maintenance of the network

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## Physical vs. Logical Topologies

The physical topology of a network refers to the physical layout of the devices and cabling. You must match the appropriate physical topology to the type of cabling (twisted pair, coaxial, fiber, and so on) that will be installed.

8. Which statement about physical networking topologies is accurate?
- A. A physical topology defines the way in which the computers, printers, network devices, and other devices are connected.
  - B. There are two primary categories of physical topologies: bus and star.
  - C. A physical topology describes the paths that signals travel from one point on a network to another.
  - D. The choice of a physical topology is largely influenced by the type of data to be transmitted over the network.

The logical topology of a network refers to the logical paths that the signals use to travel from one point on the network to another; that is, the way in which data accesses the network media and transmits packets across it.

9. Which statement about logical topologies is accurate?
- A. A logical topology defines the way in which the computers, printers, network devices, and other devices are connected.
  - B. A logical topology depends solely on the type of computers to be included in the network.
  - C. A logical topology describes the paths that the signals travel from one point on a network to another.
  - D. A network cannot have different logical and physical topologies.

Each type of network has both a physical and a logical topology. A physical topology describes the layout for wiring the physical devices, while a logical topology describes how information flows through a network.

- In a physical **bus** topology, a single cable effectively connects all the devices.
- In a physical **star** topology, each device in the network is connected to the central device with its own cable.
- In a **ring** topology, all the hosts are connected in the form of a ring or circle.
- In a **dual-ring** topology, there are two rings to provide redundancy in the network.
- In a **full-mesh** topology connects all devices to each other.
- In a **partial-mesh** topology, at least one device has multiple connections to all other devices.

10. Match each topology type to its correct description.

- \_\_\_\_ 1. All of the network devices connect directly to each other in a linear fashion.
- \_\_\_\_ 2. All of the network devices are directly connected to one central point with no other connections between them.
- \_\_\_\_ 3. All of the devices on a network are connected in the form of a circle.
- \_\_\_\_ 4. Each device has a connection to all of the other devices.
- \_\_\_\_ 5. At least one device maintains multiple connections to other devices.

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\_\_\_\_ 6. This design adds redundancy to the network.

- A. star
- B. bus
- C. mesh
- D. ring
- E. partial-mesh
- F. dual-ring

## Securing the Network

### Need for Network Security

Because there is no outside connectivity with a closed network, networks designed in this way can be considered safe from outside attacks. However, internal threats still exist. The CSI in San Francisco, California, estimates that 60 to 80 percent of network misuse comes from inside the enterprise where misuse has taken place.

11. What is the main threat to a closed network?

- A. a deliberate attack from outside
- B. a deliberate or accidental attack from inside
- C. misuse by customers
- D. misuse by employees

Hackers have discovered more network vulnerabilities, and hacking tools have become easier to use. You can now download applications that require little or no hacking knowledge to implement. Applications intended for troubleshooting and maintaining and optimizing networks can, in the wrong hands, be used maliciously and pose severe threats.

12. Which two factors have recently influenced the increase in threats from hackers? (Choose two.)

- A. Hacker tools require more technical knowledge to use.
- B. Hacker tools have become more sophisticated.
- C. The number of reported security threats has remained constant year to year.
- D. Hacker tools require less technical knowledge to use.

### Reconnaissance Attacks

Reconnaissance is the unauthorized discovery and mapping of systems, services, or vulnerabilities. Reconnaissance is also known as information gathering and, in most cases, precedes an actual access or DoS attack.

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13. Which of the following four attacks is classified as an access attack?

- A. password attacks
- B. DoS
- C. Trojan horse
- D. Love Bug

## Understanding the Host-to-host Communications Model

### The OSI Reference Model

The OSI reference model has seven numbered layers, each illustrating a particular network function. The OSI model defines the network functions that occur at each layer. More importantly, the OSI model facilitates an understanding of how information travels throughout a network. In addition, the OSI model describes how data travels from application programs (for example, spreadsheets) through a network medium, to an application program located in another computer, even if the sender and receiver are connected using different network media.

14. Which two statements about the purpose of the OSI model are accurate? (Choose Two)

- A. The OSI model defines the network functions that occur at each layer.
- B. The OSI model facilitates an understanding of how information travels throughout a network.
- C. The OSI model ensures reliable data delivery through its layered approach.
- D. The OSI model allows changes in one layer to affect the other layers.

### The OSI Model Layers and Their Functions

Each OSI layer has a specific function and associated software or devices. This topic describes each layer and its functions.

- The **physical** layer defines the electrical, mechanical, procedural, and functional specifications for activating, maintaining, and deactivating the physical link between end systems.
- The **data link** layer defines how data is formatted for transmission and how access to the physical media is controlled.
- The **network** layer provides connectivity and path selection between two host systems that may be located on geographically separated networks.
- The **transport** layer segments data from the system of the sending host and reassembles the data into a data stream on the system of the receiving host.
- The **session** layer establishes, manages, and terminates sessions between two communicating hosts.
- The **presentation** layer ensures that the information sent at the application layer of one system is readable by the application layer of another system.
- The **application** layer provides network services to the applications of the user, such as e-mail, file transfer, and terminal emulation.

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15. Match each OSI layer to its function.

- \_\_\_ 1. physical
- \_\_\_ 2. data link
- \_\_\_ 3. network
- \_\_\_ 4. transport
- \_\_\_ 5. session
- \_\_\_ 6. presentation
- \_\_\_ 7. application

- A. provides connectivity and path selection between two host systems that may be located on geographically separated networks
- B. ensures that the information sent at the application layer of one system is readable by the application layer of another system
- C. defines how data is formatted for transmission and how access to the network is controlled
- D. segments data from the system of the sending host and reassembles the data into a data stream on the system of the receiving host
- E. defines the electrical, mechanical, procedural, and functional specifications for activating, maintaining, and deactivating the physical link between end systems
- F. provides network services to the applications of the user, such as e-mail, file transfer, and terminal emulation
- G. establishes, manages, and terminates sessions between two communicating hosts and also synchronizes dialogue between the presentation layers of the two hosts and manages their data exchange

## Encapsulation

The information sent on a network is referred to as data or data packets. If one computer wants to send data to another computer, the data must first be packaged by a process called encapsulation. Encapsulation wraps data with the necessary protocol information before network transit. As the data moves down through the layers of the OSI model, each OSI layer adds a header (and a trailer, if applicable) to the data before passing it down to a lower layer. The headers and trailers contain control information for the network devices and receiver to ensure proper delivery of the data and to ensure that the receiver can correctly interpret the data.

- **Step 1** The user data is sent from an application to the application layer.
- **Step 2** The application layer adds the application layer header (Layer 7 header) to the user data. The Layer 7 header and the original user data become the data that is passed down to the presentation layer.
- **Step 3** The presentation layer adds the presentation layer header (Layer 6 header) to the data. This then becomes the data that is passed down to the session layer.
- **Step 4** The session layer adds the session layer header (Layer 5 header) to the data. This then becomes the data that is passed down to the transport layer.
- **Step 5** The transport layer adds the transport layer header (Layer 4 header) to the data. This then becomes the data that is passed down to the network layer.

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- **Step 6** The network layer adds the network layer header (Layer 3 header) to the data. This then becomes the data that is passed down to the data link layer.
- **Step 7** The data link layer adds the data link layer header and trailer (Layer 2 header and trailer) to the data. A Layer 2 trailer is usually the frame check sequence (FCS), which is used by the receiver to detect whether the data is in error. This then becomes the data that is passed down to the physical layer.
- **Step 8** The physical layer then transmits the bits onto the network media.

16. Arrange the steps of the data encapsulation process in the correct order.

- \_\_\_ 1. Step 1
- \_\_\_ 2. Step 2
- \_\_\_ 3. Step 3
- \_\_\_ 4. Step 4
- \_\_\_ 5. Step 5
- \_\_\_ 6. Step 6
- \_\_\_ 7. Step 7
- \_\_\_ 8. Step 8

- A. The presentation layer adds the presentation layer header (Layer 6 header) to the data. This then becomes the data that is passed down to the session layer.
- B. The session layer adds the session layer header (Layer 5 header) to the data. This then becomes the data that is passed down to the transport layer.
- C. The application layer adds the application layer header (Layer 7 header) to the user data. The Layer 7 header and the original user data become the data that is passed down to the presentation layer.
- D. The network layer adds the network layer header (Layer 3 header) to the data. This then becomes the data that is passed down to the data link layer.
- E. The transport layer adds the transport layer header (Layer 4 header) to the data. This then becomes the data that is passed down to the network layer.
- F. The user data is sent from an application to the application layer.
- G. The data link layer adds the data link layer header and trailer (Layer 2 header and trailer) to the data. A Layer 2 trailer is usually the frame check sequence, which is used by the receiver to detect whether the data is in error. This then becomes the data that is passed down to the physical layer.
- H. The physical layer then transmits the bits onto the network media.

## De-Encapsulation

When the remote device receives a sequence of bits, the physical layer at the remote device passes the bits to the data link layer for manipulation. This process is referred to as de-encapsulation.

17. At which layer does de-encapsulation first occur?

- A. application
- B. data link
- C. network
- D. transport

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## Peer-to-Peer Communication

- During the process of peer-to-peer communication, the protocols at each layer exchange packets of information called protocol data units (PDUs) between peer layers.
- These data packets originate at a source on a network and then travel to a destination. Each layer depends on the OSI layer below it to provide a service. To perform its service function, the lower layer uses encapsulation to put the protocol data unit (PDU) from the upper layer into lower layer data field. Each layer then adds whatever headers the layer needs to perform its function. As the data moves down from Layer 7 through Layer 2 of the OSI model, additional headers are added.
- The network layer provides a service to the transport layer, and the transport layer presents data to the network subsystem. The network layer moves the data through the Internet by encapsulating the data and attaching a header to create a packet (the Layer 3 PDU). The header contains information required to complete the transfer, such as source and destination logical addresses.
- The data link layer provides a service to the network layer by encapsulating the network layer packet in a frame (the Layer 2 PDU). The frame header contains the physical addresses required to complete the data link functions, and the frame trailer contains the FCS.
- The physical layer provides a service to the data link layer, encoding the data-link frame into a pattern of 1s and 0s (bits) for transmission on the medium (usually a wire) at Layer 1.

18. Match each layer with the function it performs in peer-to-peer communication.

- \_\_\_\_ 1. network layer
- \_\_\_\_ 2. data link layer
- \_\_\_\_ 3. physical layer

- A. encapsulates the network layer packet in a frame
- B. moves the data through the internetwork by encapsulating the data and attaching a header to create a packet
- C. encodes the data-link frame into a pattern of 1s and 0s (bits) for transmission on the medium (usually a wire)

## TCP/IP Suite

The TCP/IP suite was developed at approximately the same time as the OSI model. Like the OSI model, the TCP/IP suite is a means of organizing components in an order that reflects their functions in relation to one another. The components, or layers, of the TCP/IP stack are as follows:

**Network access layer:** This layer covers the same processes as the two lower OSI layers:

- **Physical layer:** The physical layer defines the electrical, mechanical, procedural, and functional specifications for activating, maintaining, and deactivating the physical link between end systems. Characteristics such as voltage levels, timing of voltage changes, physical data rates, maximum transmission distances, physical connectors, and other similar attributes are defined by physical layer specifications.
- **Data link layer:** The data link layer defines how data is formatted for transmission and how access to the network is controlled.