Network+
(N10-008)

Domain 1

Lesson 1

LK LearnKey

Fill-in-the-Blanks

Instructions: While watching Domain 1 Lesson 1, fill in the missing words according to the information presented by the instructor. [References are found in the brackets.]

1. Within the Open Systems Interconnection (OSI) model of networking, the physical layer is the layer in which data is transmitted from a _____ to a destination. [Layer 1 - Physical]
2. The main purpose of the data link layer is to get data to the _____ layer. [Layer 2 - Data link]
3. _____ help determine the best path for data to travel from a source to a destination. [Layer 3 - Network]
4. Layer 4 of the OSI model provides the means of data transportation between two _____ devices. [Layer 4 - Transport]
5. Layer 5 of the OSI model manages data _____ between two applications on two devices. [Layer 5 - Session]
6. Layer 6 of the OSI model converts _____ to a format that can be transmitted across a network. [Layer 6 - Presentation]
7. Layer 7 of the OSI model does not interact with a web browser but the _____ a web browser manages. [Layer 7 - Application and Protocols]
8. An Ethernet header is added to frames at layer _____ of the OSI model. [Ethernet Header]
9. Before a packet becomes a _____, an IP header is added to the packet. [IP Header]
10. A Transmission Control Protocol (TCP) header contains a source and destination port, a _____ number, and, if set, an acknowledgment number, for specific data. [TCP and UDP Headers]
11. TCP flags indicate the condition of a _____ between two devices. [TCP Flags]
12. A packet with a large length _____ could signal an attack. [Payload]
13. A maximum transmission unit (MTU) is necessary for preventing a data unit from causing noticeable delays in said data reaching its _____. [MTU]

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OSI Model

The Open Systems Interconnection (OSI) networking model defines how data goes from a source to a destination. The OSI model consists of seven layers. These layers, listed from bottom to top, are physical, data link, network, transport, session, presentation, and application.

Layer 1 of the OSI model, the physical layer, is the layer in which data is transmitted from a source to a destination.

The main job of layer 2, the data link layer, is to get data to the physical layer.

Layer 3, the network layer, is all about the mechanisms used for routing data from a source to a destination.

Layer 4, the transport layer, provides how data is transported between two network devices. This transport is done through error checking, service addressing, and segmentation.

Layer 5, the session layer, is responsible for managing data synchronization between two applications on two devices via sessions.

Layer 6, the presentation layer, converts data to a format that can be transmitted across a network. Without this conversion, data cannot be transmitted.

Layer 7, the application layer, covers the functionality of applications. If a service at this layer is not functioning, data cannot be processed downward through the OSI model at a source and transmitted to a destination.

It is important to know which protocols belong to which layers in the OSI model to troubleshoot any issues that may arise within the networking process.

Project Details

Project file
N/A

Estimated completion time
15 minutes

Video reference
Domain 1
Topic: OSI Model
Subtopic: Layer 1 - Physical; Layer 2 - Data Link; Layer 3 - Network; Layer 4 - Transport; Layer 5 - Session; Layer 6 - Presentation; Layer 7 - Application and Protocols

Objectives covered
1 Networking Fundamentals
1.1 Compare and contrast the Open Systems Interconnection (OSI) model layers and encapsulation concepts
1.1.1 OSI model
1.1.1.1 Layer 1 - Physical
1.1.1.2 Layer 2 - Data link
1.1.1.3 Layer 3 - Network
1.1.1.4 Layer 4 - Transport
1.1.1.5 Layer 5 - Session
1.1.1.6 Layer 6 - Presentation
1.1.1.7 Layer 7 - Application

Purpose

Upon completing this project, you will better understand OSI model layers.

Steps for Completion

1. Match the OSI model layers to their corresponding facts. Each layer will be used twice.

A. Layer 1 - Physical	E. Layer 5 - Session
B. Layer 2 - Data link	F. Layer 6 - Presentation
C. Layer 3 - Network	G. Layer 7 - Application
D. Layer 4 - Transport	

a. _____ This layer establishes a connection between two devices.

b. _____ One responsibility of this layer is data flow control, in which data is either buffered or windowed.

c. _____ This layer deals with any protocol leading to layer 1, including Layer 2 Tunneling Protocol (L2TP) and Spanning Tree Protocol (STP).

d. _____ This layer uses dynamic and static routing protocols.

e. _____ Any service protocol, such as HTTP and DNS, is defined at this layer.

	A. Layer 1 - Physical B. Layer 2 - Data link C. Layer 3 - Network D. Layer 4 - Transport	E. Layer 5 - Session F. Layer 6 - Presentation G. Layer 7 - Application

f. _____ Encryption protocols such as Transport Layer Security (TLS) operate at this layer.

g. _____ This layer could be a coaxial cable representing the medium on which data is transmitted as bits.

h. _____ This layer does not deal with a web browser itself but the protocol that a web browser manages.

i. _____ The two main protocols on this layer are User Datagram Protocol (UDP) and Transmission Control Protocol (TCP).

j. _____ Protocols such as NetBIOS, Network File System (NFS), and Server Message Block (SMB) function at this layer.

k. _____ Data encryption is performed on this layer.

l. _____ This layer identifies the topology used on a network.

m. _____ This layer handles address protocols such as Internet Protocol (IP) and Address Resolution Protocol (ARP).

n. _____ This layer handles errors in data transmission and contains two sublayers: the Media Access Control (MAC) layer and the Logical Link Control (LLC) layer.

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Data Encapsulation

Once users understand the OSI model, they should learn the process of data encapsulation. Data encapsulation is what happens to data as it goes through the OSI model from layer 7 down to layer 1. Headers are added to data as it moves from one layer to the next, each requiring headers. These headers consist of layer-specific information needed for data to reach its destination.

Some headers to understand are Ethernet, Internet Protocol (IP), Transmission Control Protocol (TCP), and User Datagram Protocol (UDP). An Ethernet header is added to frames at layer 2 of the OSI model.

Before a packet becomes a frame, an IP header is added to the packet at OSI model layer 3. Like the Ethernet header, an administrator can analyze data packets to ensure that IP address information, especially source information, is legitimate.

The first encapsulation step for transforming data into something that can be sent from a source to a destination is to add a TCP or UDP header to the data. TCP is a connection-oriented protocol, while UDP is a connectionless protocol. UDP uses less overhead than TCP and is well-suited for data that is not present, such as streaming data.

Other data encapsulation topics include TCP flags, payload, and maximum transmission unit (MTU). TCP flags indicate the state of a connection between two devices. The three most common flags are synchronization (SYN), acknowledgment (ACK), and connection termination (FIN).

Payload is the data portion of a packet. If the data is in plain text, hackers may be able to access that data. Data should be encrypted to avoid security breaches. A packet with a large length could be a sign of an attack.

An MTU defines the largest size a data unit can be passed from a source to a destination without being fragmented. An MTU helps administrators avoid creating delays in data travel speeds.

Project Details

Project file
1-wireshark.pcapng

Estimated completion time
15 minutes

Video reference
Domain 1
Topic: OSI Model
Subtopic: Ethernet Header; IP Header; TCP and UDP Headers; TCP Flags; Payload; MTU

Objectives covered
1 Networking Fundamentals
1.1 Compare and contrast the Open Systems Interconnection (OSI) model layers and encapsulation concepts
1.1.2 Data encapsulation and decapsulation within the OSI model context
1.1.2.1 Ethernet header
1.1.2.2 Internet Protocol (IP) header
1.1.2.3 Transmission Control Protocol (TCP)/User Datagram Protocol (UDP) headers
1.1.2.4 TCP flags
1.1.2.5 Payload
1.1.2.6 Maximum transmission unit (MTU)

Purpose

Upon completing this project, you will better understand OSI model headers and their use in data encapsulation.

Steps for Completion

1. Open the **1-wireshark.pcapng** file from your Domain 1 Student folder.
2. View the Ethernet header information on line 1.
3. Unfamiliar source MAC addresses are often linked to network attacks. What is the frame's Source MAC address?

   _____

4. View the Internet Protocol (IP) header information.
5. Time to Live dictates how long a packet can wait to transmit before failing. What is the data's Time to Live?

   _____

6. View the Transmission Control Protocol (TCP) header information.

7. Acknowledgment is necessary because layer 4 of the OSI model is responsible for handling errors in transport. What is the data's Acknowledgment number?

   _____

8. View the Transmission Control Protocol (TCP) flags.

9. SYN is the first step of a connection between two hosts. A SYN flag should only be on the _____ packet from a sender and a receiver of data.

10. View the Transmission Control Protocol (TCP) payload.

11. What is the length of the packet?

    _____

12. A typical MTU for Ethernet is _____ bytes plus an overhead of 18 bytes. If jumbo frames are being used, one might see lengths of up to _____.