UNIT 14: OSI Model

Estimated Time in Hours: 8

Big Idea(s)	Enduring Understandings	Projects & Major Assignments
2 Establishing Trust 3 Ubiquitous Computing	3.1	- Compare and contrast TCP and UDP and research their use cases. - Use Wireshark to examine the layers of the OSI model in network packets.

Guiding Questions:

- Why is the OSI Model broken into separate layers?
- What are some connection mediums used at the physical layer?
- What is the difference between TCP and UDP?
- When are TCP connections used?
- When are UDP connections used?
- How is the OSI model an abstraction and how is that useful?

Learning Objectives & Respective Essential Knowledge Statements	Materials	Instructional Activities and Classroom Assessments
3.1 EU: The Internet is a large, globally distributed network that is divided into layers, governed by protocols, and connects a wide variety of devices.	• Computer, lecture slides, projector, graphic organizers, access to Internet • Scope of the Internet: "Part 1: How big is the Internet?" *YouTube*, uploaded by Sebastian König, 4 July 2014, https://youtu.be/zl6B3KWRq8s	• Show the linked YouTube video to demonstrate the scope of the Internet. • Ask students how these computers are connected. How are all the communications managed?

3.1.1 LO: Students will explain how devices use layers to communicate across the Internet and describe the purpose of the layers.	Interactive breakdown of the OSI model: "Cybersecurity Interactives." E-Mate 2.0, *e-mate-bbc.org*, https://s3.amazonaws.com/e-mate2/Cybersecurity+Interactives/Cybersecurity+Interactives.html • OSI Model explained: "OSI Model Explained | Real World Example." *YouTube*, uploaded by CertBros, 28 Sep 2016, https://youtu.be/LANW3m7UgWs	• Describe how we use models to describe and standardize how information travels from one computer to another. Compare the OSI model to the TCP/IP model. This unit will focus on the OSI model. • Review mnemonics for memorizing the stages: "Please, Don't Need Those Stupid Packets Anyway." Ask students to create their own mnemonic. • Show the interactive breakdown of the stages of the OSI model (linked to the left). • The OSI Model video can either be shown as a preview, post-lesson review, or in pieces at the specific layers.
3.1.1a: EK Networks carry two types of information, those that allow for the controlling of the data and the data itself.		• Explain how some network traffic controls how traffic is transported across on a network. Packets use headers to classify the kind of information it carries and to pass information across all layers. • Students may understand an analogy to the mail system. When a letter it mailed, the message you want to send is inside the envelope. The information outside the envelope (address & stamp) controls how the data is sent.

3.1.1b EK: Physical links include optical cables that send signals using light, cables that send signals using electrical pulses, and wireless networks that send signals over radio waves.		• Describe how the physical layer is what carries everything from point-to-point. • Show students cables, network cards, Wi-Fi access points, etc. Making this into a show-and-tell of the physical layer will make the experience more memorable. • Ask students to explain why this layer is an important one to begin with.
3.1.1c EK: Link layer protocols such as Ethernet, Wi-Fi (e.g., 802.11), and Bluetooth are specific to the physical layer connection and describe how the signals are used to exchange data between the devices.		• Explain how the link layer protocols support the physical layer. • Ask students why it is important for the OSI model to include protocols that support the physical layer. Does the physical layer have any digital aspects?
3.1.1d EK: The network layer connects different types of physical/link layer networks into a single global Internet that transmits data from one computer to another using packets and logical addressing.		• Be sure to note that the network layer is where computers talk to each other. This handles the routing and connection between systems. • Without the network layer, the Internet would not exist.
3.1.1e EK: Once a packet arrives at a device, the transport layer uses port numbers to determine which application (web browser, email app, game, etc.) receives the packet, allowing for the reliable delivery of data between	• TCP vs UDP comparison: "TCP vs UDP Comparison." *YouTube*, uploaded by PowerCert Animated Videos, 15 Nov 2016,	• The transport layer helps ensure your data is transported from computer A to computer B in one piece. • Explain the TCP and UDP protocols here. Show the linked YouTube video with a video viewing guide.

a sending and receiving application.	https://youtu.be/uwoD5YsGACg	• Task students with researching the difference between TCP and UDP. • When should TCP be used? What is its advantage? • When should UDP be used? What is its advantage? • Port numbers should also be taught here and framed as the method used to make sure specific applications get the data they need.
3.1.1f EK: Internet and device applications (web, text messaging, games, etc.) follow protocols at the application layer (e.g. http, sms, proprietary protocols, etc.).	• OSI Layers in action: "Introduction to the OSI Model." *NetworkLessons.com*, https://networklessons.com/tag/osi/introduction-to-the-osi-model	• If teaching the OSI model, this should cover layers 5-7 (session, presentation, and application). In TCP/IP, this is solely the application layer. • This layer handles things like e-mail, web browsing, file transfers, etc. • Have students use a tool like Wireshark to view the different layers in action. The link to the left has a guide for this.
2.2.2 LO: Students will use the principle of abstraction to represent complicated concepts more simply and to allow solutions to be transferred to other contexts. 2.2.2b EK: Good and elegant design involves using abstraction.		• Explain how the OSI model uses abstraction to categorize the layers. In real application, the layers are a bit muddled and tend to represent the TCP/IP model. • How can the OSI model as an abstraction assist with troubleshooting network and communication problems?

8.1.1h EK: Cybersecurity events have led to the development of various cybersecurity career paths and various needs in order to prepare people for these new types of jobs.		• Explore a relevant career, such as IT auditor.