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UNIT 14: OSI Model

Estimated Time in Hours: 8

Big Idea(s) 2 Establishing Trust 3 Ubiquitous Computing	Enduring Understandings 3.1	Projects & Major Assignments - 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: <ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • Computer, lecture slides, projector, graphic organizers, access to Internet • Scope of the Internet: "Part 1: How big is the Internet?" <i>YouTube</i>, uploaded by Sebastian König, 4 July 2014, https://youtu.be/zl6B3KWRq8s 	<ul style="list-style-type: none"> • 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?

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<p>3.1.1 LO: Students will explain how devices use layers to communicate across the Internet and describe the purpose of the layers.</p>	<p>Interactive breakdown of the OSI model: “Cybersecurity Interactives.” E-Mate 2.0, <i>e-mate-bbc.org</i>, https://s3.amazonaws.com/e-mate2/Cybersecurity+Interactives/Cybersecurity+Interactives.html</p> <ul style="list-style-type: none"> • OSI Model explained: “OSI Model Explained Real World Example.” <i>YouTube</i>, uploaded by CertBros, 28 Sep 2016, https://youtu.be/LANW3m7UgWs 	<ul style="list-style-type: none"> • 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.
<p>3.1.1a: EK Networks carry two types of information, those that allow for the controlling of the data and the data itself.</p>		<ul style="list-style-type: none"> • 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 is mailed, the message you want to send is inside the envelope. The information outside the envelope (address & stamp) controls how the data is sent.

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<p>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.</p>		<ul style="list-style-type: none"> • 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.
<p>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.</p>		<ul style="list-style-type: none"> • 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?
<p>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.</p>		<ul style="list-style-type: none"> • 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.
<p>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</p>	<ul style="list-style-type: none"> • TCP vs UDP comparison: "TCP vs UDP Comparison." <i>YouTube</i>, uploaded by PowerCert Animated Videos, 15 Nov 2016, 	<ul style="list-style-type: none"> • 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.

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<p>a sending and receiving application.</p>	<p>https://youtu.be/uwoD5YsGACg</p>	<ul style="list-style-type: none"> • 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.
<p>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.).</p>	<ul style="list-style-type: none"> • OSI Layers in action: “Introduction to the OSI Model.” <i>NetworkLessons.com</i>, https://networklessons.com/tag/osi/introduction-to-the-osi-model 	<ul style="list-style-type: none"> • 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.
<p>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.</p> <p>2.2.2b EK: Good and elegant design involves using abstraction.</p>		<ul style="list-style-type: none"> • 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?

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<p>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.</p>		<ul style="list-style-type: none">• Explore a relevant career, such as IT auditor.
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