Learning Guide Unit 4

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Description

Learning Guide Unit 4

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Overview

UNIT 4: Wireless Link-Layer protocols

Topics

- IEEE 802.11n (MIMO Wi-Fi)
- WiMAX (IEEE 802.16)
- ZigBee (IEEE 802.15.4)
- Bluetooth
- HTTP and TCP packet analysis in Wireshark

Learning Objectives

By the end of this Unit, you will be able to:

1. Differentiate between Bluetooth and Zigbee technologies.
2. Explain WiMAX and MIMO Wi-Fi technologies and their applications.
3. Analyze the HTTP and TCP traffic flow in a network.

Tasks

- Read through the Learning Guide and the Reading Assignment
- Complete the Discussion Assignment by posting in the Discussion Forum
- Respond to three of your fellow classmates' posts in the Discussion Forum
- Complete and submit the Written Assignment
- Complete and submit the Learning Journal
- Take and submit the Self-Quiz

Introduction

With the advent of the Internet of Things (IoT) and advancements in autonomous systems and smart homes/cities, the use of wireless link-layer protocols in communications have become rather pervasive in today's world. In this Unit, we will delve into the exciting world of wireless link layer protocols and examine major wireless protocols such as ZigBee, MIMO Wi-Fi, and the Bluetooth family of protocols. We shall also explore current and emerging use cases for this unique set of protocols. Finally, you will be introduced to the analysis of TCP and HTTP packets in Wireshark.

Reading Assignment

As you read through the learning resource consider the following:

- *How can filtering packets in Wireshark help troubleshoot network issues?*
- *What are the main differences between IPv4 and IPv6, and why are public or temporary addresses used in each protocol?*
- *How do ZigBee and Bluetooth differ in terms of functionality, performance, and suitability for IoT applications?*

Read

1. *Wireshark display filter syntax and reference*. Wireshark .
    - *Read this document to learn how to write an expression to filter packets in Wireshark.*

2. *Digi International. (2021, March 5). Zigbee vs. Bluetooth: Choosing the right protocol for your IoT application*.
    - *Read the article for a detailed comparison between ZigBee and Bluetooth wireless protocols*

3. *IPv4 vs IPv6 - Understanding the differences*. (n.d.). NetworkAcademy.io.
    - *Read this article to understand why and when an IPv4 or IPv6's public or temporary addresses exist or are used.*

4. *IPv6 on Windows*. (n.d.). NetworkAcademy.io.
    - *Read this article to understand why IPv6's public or temporary addresses are used.*

5. Noworatzky, D. (2021, July 14). *What's so great about WiMAX*. TeleDynamics.
    - Read the article for an overview of WiMAX and its use cases.

6. Oliveira, L., Rodrigues, J. J. P.C., Kozlov, S. A., Rabêlo, R. A. L., & de Albuquerque, V. H. (2019). MAC layer protocols for internet of things: A survey. *Future Internet 2019*, *11*(1), 16.
    - Read the document for an extensive review of wireless link layer protocols classified into three major groups namely: short-range protocols, near-field communications protocols, and long-range protocols. Focus reading on IEEE 802.11n (MIMO Wi-Fi), IEEE 802.16 (WiMAX), IEEE 802.15.4 (ZigBee), and Bluetooth.

7. Ray, B. (2019, November 11). *Examining 5 IEEE protocols - ZigBee, WiFi, Bluetooth, BLE, and WiMax*. iot for all.
    - Read the article for a brief overview of wireless link-layer protocols including ZigBee, WiFi, Bluetooth, BLE, and WiMax.

Discussion Assignment

Discuss the differences between Bluetooth and Zigbee technologies. Share your thoughts on which technology you believe is better suited for Internet of Things (IoT) applications and explain your reasoning.

Your Discussion should be a minimum of 200 words in length.

In your responses to your peers, compare and contrast your answer to those of your peers.

Written Assignment

You are a network engineer who has been assigned a new client company. Your senior network engineer has informed you that you will be tasked with analyzing the HTTP and TCP traffic flow in the client's network. This information will be used to improve the performance, security, and general management of the client's network. Your specific tasks are listed below:

1. Start Wireshark capture.

2. Open a web browser and visit http://www.example.com/

3. Stop the Wireshark capture and answer the following questions with screenshots attached for each:

    a. Identify the TCP 3-way handshake interaction.

    b. What is the MAC address of your PC as shown in Wireshark?

    c. Which vendor manufactured the network card on your PC? Use the PC MAC address as shown in Wireshark.

    d. What is the MAC address of your gateway device as shown in Wireshark?

    e. What is the IP address of your PC as shown in Wireshark?

    f. What version of HTTP is captured?

    g. What is your PC's operating system (OS) platform as shown in Wireshark?

    h. What language is your PC's browser configured to as shown in Wireshark?

4. You are to save and submit your Wireshark capture file. Add screenshots for all questions from 3a-3h along with their answers in MS Word or PDF file and submit the same.

Refer to this manual for step by step instruction on the assignment.

You will be assessed on:

- Your submission of the appropriate capture file for the Wireshark capture file aspect.
- Your submission of a screenshot showing the http 3-way handshake interaction for the TCP 3-way handshake interaction aspect.
- Your submission of a screenshot showing the MAC address of the PC in Wireshark for the PC's MAC address aspect.
- Your submission of a screenshot showing the Vendor/Manufacturer name and details for the PC's Network card manufacturer aspect.
- Your submission of a screenshot highlighting the MAC address of the gateway device as shown in Wireshark for the MAC address of the gateway device aspect.
- Your submission of a screenshot showing the IP address of the PC as shown in Wireshark for the PC's IP address aspect.
- Your submission of a screenshot showing the version of HTTP captured in Wireshark for the HTTP version aspect.
- Your submission of a screenshot showing the PC's operating system (OS) platform in Wireshark for the PC's operating system (OS) platform aspect.
- Your submission of a screenshot showing the browser language in Wireshark for the PC's browser language configuration aspect.

Reference

Example Domain. (n.d.). Example. https://www.example.com/

Learning Journal

Imagine you are a network engineer working for a company that is in the process of deciding on the best wireless technology for their new office building. The building is quite large, and the company wants to ensure that the wireless network will provide high-speed internet access to all employees, regardless of where they are located within the building.

Task

You have been tasked with researching the WiMAX and MIMO Wi-Fi technologies and presenting a brief overview description of each, along with some possible use cases. Your research will be used to help the company make an informed decision about the best technology to use.

The Learning Journal entry should be a minimum of 200 words and not more than 750 words. Use APA citations and references if you use ideas from the readings or other sources.

Self-Quiz

The Self-Quiz gives you an opportunity to self-assess your knowledge of what you have learned so far.

The results of the Self-Quiz do not count towards your final grade, but the quiz is an important part of the University's learning process and it is expected that you will take it to ensure understanding of the materials presented. Analyzing your results will help you perform better on future Graded Quizzes and the Final Exam.

Please access the Self-Quiz on the main course homepage; it will be listed inside the Unit.

Checklist

- Read through the Learning Guide and the Reading Assignment
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