Exercise: Choosing the Right WiFi Standard for an IoT Project

Objective

Your task is to **analyze and select** the most appropriate WiFi standard from the list below for a specific IoT use case. You'll justify your choice by comparing trade-offs related to bandwidth, power efficiency, interference, and deployment environment.

Available Standards for Comparison

Standard	Year	Frequency Bands	Max Data Rate	Modulation	Notes
802.11b	1999	2.4 GHz	11 Mbps	DSSS	Long range, low data rate, legacy devices
802.11n	2009	2.4 & 5 GHz	600 Mbps	OFDM + MIMO	Well supported, decent range, higher throughput
802.11ax	2019	2.4 / 5 / 6 GHz	9.6 Gbps	OFDMA + 1024-QAM	Efficient, modern, good for dense IoT environments

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Instructions

1. Read one of the **scenarios** below.
2. Compare the **three WiFi standards** based on their suitability for that use case.

3. Prepare a short presentation that:
4. Justifies your chosen standard
5. Describes the limitations or overkill of the others
6. Considers power consumption, range, bandwidth, and cost

Scenario A: Smart Greenhouse Monitoring System

A greenhouse system includes:

- ~50 wireless sensors measuring temperature, humidity, and CO_2
- An edge controller that collects and uploads data every 30 seconds
- Power is limited: many sensors run on batteries or solar
- There are very few nearby WiFi networks (minimal interference)
- The setup is mostly static — sensors don't move

Considerations:

- Power efficiency is critical
- Low data throughput is acceptable
- Range matters more than speed
- Device cost must be minimized

Scenario B: Industrial Warehouse Automation

This system features:

- AGVs (Automated Guided Vehicles) that move across a large floor
- 10+ HD surveillance cameras streaming video to a local NVR
- Dozens of sensors and access control points (RFID, doors, etc.)
- Many workers' phones and laptops connected to the same network
- Strong AP coverage across the warehouse
- Security and real-time performance are important

Considerations:

- High traffic, multi-device environment

- Real-time responsiveness needed
- AP handoff / roaming may occur
- Performance and scalability are critical

Bonus Challenge

For advanced students: Consider what changes if the greenhouse is in a city (dense WiFi interference), or if the warehouse is split across two buildings.