Project-Based Learning (PBL) statements

Environmental Monitoring

1. **IoT-Enabled Weather Station**: Use Raspberry Pi, DHT11, and MQTT for data collection and publish weather conditions to a cloud platform for remote access.
2. **Edge-Based Air Quality Monitoring**: Implement MQ2 and MQ9 sensors on NVIDIA Jetson Nano using CoAP protocol for low-latency real-time analytics.
3. **Smart Irrigation System**: Employ Soil Sensors and Rain Sensors, leveraging LoRaWAN for long-range, low-power communication with edge decision-making.
4. **Forest Fire Detection System**: Use Flame Sensors and MQTT-SN for lightweight data transmission to an edge server for rapid alerting.
5. **Flood Monitoring System**: Integrate Pressure Sensors with Raspberry Pi, using the MQTT protocol for real-time flood level updates to emergency systems.

Security and Surveillance

6. **RFID-Based Secure Access Control**: Combine RFID Tags, Fingerprint Module, and MQTT for secure, low-latency authentication and logging.
7. **IoT Home Security System**: Deploy PIR Sensors with CoAP for efficient event-based notifications to an edge gateway.
8. **Object Tracking System on Edge**: Use NVIDIA Jetson Nano, PIR Sensors, and MQTT for real-time object detection and motion tracking.
9. **Vehicle Theft Prevention**: Employ Doppler Radar with edge-based detection on Jetson Nano, using AMQP for message queuing and alerting.
10. **Edge-Powered Intrusion Detection System**: Integrate Ultrasonic Sensors with MQTT-SN for rapid event updates and edge decision-making.

Smart Home and Automation

11. **IoT-Enabled Smart Lighting**: Use PIR Sensors with Zigbee for local control and MQTT for remote configuration.
12. **Edge-Enhanced Appliance Automation**: Combine a 4-Channel Relay Card with CoAP for efficient device control and state reporting.
13. **Smart Curtain System**: Use a Servo Motor and MQTT-SN for lightweight edge-controlled automation.

14. **Gas Leak Detection System**: Integrate MQ6 Sensors and MQTT, publishing data to an edge gateway for rapid response.
15. **IoT-Based Energy Management**: Combine Ammeter and 2-Channel Relay Card with CoAP for monitoring and controlling home appliances.

Health and Safety

16. **Edge-Based Vibration Monitoring**: Use Vibration Sensors and MQTT to monitor machinery health, with local analytics on Raspberry Pi.
17. **Wearable Health Tracker**: Employ Nano BLE Sense with MQTT-SN for lightweight edge-based health data analytics.
18. **Fire Safety System**: Use Flame Sensors with CoAP for efficient local communication to edge servers.
19. **Temperature Monitoring for Healthcare**: Integrate Thermocouples and MQTT for real-time patient monitoring with edge decision-making.
20. **Edge-Based Workplace Safety System**: Combine Force and Pressure Sensors with AMQP for event-driven safety monitoring.

Transportation and Mobility

21. **IoT-Powered Traffic Management**: Use Doppler Radar and MQTT to monitor vehicle flow, with edge processing for congestion analytics.
22. **Smart Parking Assistant**: Integrate RFID Tags and Ultrasonic Sensors with MQTT-SN for lightweight parking spot detection.
23. **Vehicle Entry Automation**: Employ Solenoid and RFID Tags with CoAP for secure access control at entry points.
24. **Blind Spot Detection**: Combine Doppler Radar with AMQP for event-driven safety alerts and edge analytics.
25. **Train Arrival Tracking System**: Use RFID Tags and LoRaWAN for low-power, long-range train location updates to edge servers.

Agriculture

26. **Precision Farming System**: Use Soil Sensors and MQTT-SN for real-time soil moisture updates to an edge gateway.
27. **Livestock Health Monitoring**: Combine RFID Tags and Thermocouples with MQTT for edge-based livestock tracking.

28. **Smart Pest Control**: Deploy PIR Sensors with AMQP for event-based pest detection on the edge.
29. **Greenhouse Automation**: Use DHT11, Flame Sensors, and CoAP for dynamic environmental control.
30. **IoT-Enhanced Crop Monitoring**: Combine Nano BLE Sense and Accelerometer with MQTT for real-time crop health analysis.

Industrial Automation

31. **Edge-Based Conveyor Monitoring**: Use Pressure and Vibration Sensors with MQTT-SN for lightweight fault detection at the edge.
32. **Factory Asset Tracking**: Employ RFID Tags and AMQP for secure, event-driven tracking of industrial assets.
33. **IoT Assembly Line Control**: Integrate DC Motors and 4-Channel Relay Cards with CoAP for dynamic edge-based control.
34. **Predictive Maintenance**: Combine Thermocouples and Force Sensors with MQTT-SN for efficient local decision-making.
35. **Energy Optimization in Factories**: Use Ammeters and MQTT for real-time consumption data to edge analytics platforms.

Smart Cities

36. **IoT Waste Management**: Use Ultrasonic Sensors with MQTT-SN for bin level detection and edge-triggered notifications.
37. **Adaptive Street Lighting**: Deploy PIR Sensors and CoAP for energy-efficient, event-driven streetlight control.
38. **Noise Pollution Monitoring**: Use Nano BLE Sense and MQTT for localized noise level tracking.
39. **Smart Traffic Lights**: Combine Doppler Radar and AMQP for dynamic traffic signal control with edge processing.
40. **IoT Public Transport Tracker**: Use RFID Tags with LoRaWAN for real-time transport updates.

Education and Research

41. **Interactive Weather Lab**: Use Rain Sensors, Thermocouples, and MQTT for educational experiments on environmental monitoring.
42. **Edge-Based Robotic Arm Control**: Employ Servo Motors and Force Sensors with MQTT for dynamic edge-based movement control.

43. **IoT Energy Metering**: Integrate Ammeters with MQTT for educational real-time energy monitoring projects.
44. **Self-Learning Edge System**: Use Jetson Nano with Federated Learning for collaborative edge-based training.
45. **Sensor-Based Education Platform**: Combine Ultrasonic Sensors and CoAP for interactive learning.

Miscellaneous Applications

46. **Drone Surveillance System**: Use Accelerometer Sensors and MQTT for edge-based aerial inspections.
47. **IoT Flood Monitoring**: Integrate Pressure and Rain Sensors with MQTT-SN for real-time updates.
48. **IoT Appliance Health Check**: Combine Vibration Sensors and CoAP for lightweight monitoring.
49. **Edge-Powered Self-Healing Network**: Use Jetson Nano and MQTT for autonomous fault recovery.
50. **Blockchain-Integrated IoT System**: Combine LoRaWAN with blockchain for secure IoT data management.
