Project Proposal

On

Computer Networks

Course Code: CSE - 3634

Team Name: Packet_Pioneers

Members:

Sheikh Mohammad Rajking (C221011)

Adri Shikar Barua (C221022)

Abu Tanvir Hasan Tanmoy (C221001)

1. Title: Energy Efficient WSN for Weather Monitoring in omnet++.

2. Introduction:

The aim of this project is to simulate a Wireless Sensor Network (WSN) using OMNeT++, an extensible, modular, component-based C++ simulation library and framework. We design a network consisting of 15 sensor nodes and two access points to study the internal module communication and evaluate energy consumption. The primary output is a graph showing the relationship between the number of sensor nodes and energy consumption, providing insight into scalability and efficiency.

3. Motivation:

With the rapid advancement of IoT and smart environments, Wireless Sensor Networks have become essential for monitoring and data collection. Understanding the behavior of WSNs under various configurations is crucial for optimizing performance and conserving energy. This project is driven by the need to design efficient network models that can be implemented in real-world applications like agriculture, health monitoring, and environmental tracking. OMNeT++ provides a powerful simulation environment to study such networks in a controlled and cost-effective manner.

4. Background:

OMNeT++ is widely used for simulating communication networks, including WSNs. It allows for building modular network topologies with customizable behavior. In this project, we create 15 sensor nodes and two access points within OMNeT++, define internal modules (such as energy model, communication module, and application logic), and simulate their interaction. Each node collects data and transmits it through access points, consuming energy in the process. The simulation results will be visualized using a graph plotting sensor nodes against energy usage.

5. Potential Outcomes:

Simulation of WSN: Develop a 15-node wireless sensor network with 2 access points in OMNeT++, focusing on data transmission, energy consumption, and node interaction.
The simulation will provide a realistic model for analyzing WSN behavior.

Energy Consumption Analysis: Implement a mechanism to accurately measure energy usage at each sensor node, capturing data at specific intervals to generate comprehensive visualizations, including energy consumption graphs.

Bottleneck Identification: Identify nodes with excessive energy drain or transmission delays, pinpointing potential areas for optimization to enhance network efficiency.

Scalability Insights: Assess the impact of increasing node count on energy usage and network performance, providing recommendations for optimizing node deployment and access point placement.

Framework for Expansion: Establish a foundational network model that can be adapted for more complex simulations, including additional nodes, routing protocols, or energy-saving algorithms, facilitating future research and practical deployment.

6. Conclusion:

This project successfully demonstrates the use of OMNeT++ for simulating wireless sensor networks. Through the creation of 15 sensor nodes and their interactions with access points, we gain valuable understanding of the energy consumption behavior in WSNs. The results highlight the importance of energy-efficient design in network deployment and provide a platform for further research and improvement.

7. References:

1. OMNeT++ Official Website – https://omnetpp.org

2. S. Tilak, N. B. Abu-Ghazaleh, and W. Heinzelman, *"A taxonomy of wireless micro-sensor network models,"* ACM SIGMOBILE Mobile Computing and Communications Review, 2002.

3. I. F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci, *"Wireless Sensor Networks: A Survey,"* Computer Networks, 2002.

4. M. Kirsche and M. Schnurbusch, *"A New IEEE 802.15.4 Simulation Model for OMNeT++ / INET,"* arXiv, 2014.

5. INET Framework for OMNeT++ – https://inet.omnetpp.org

6. Tutorials and GitHub Repositories on OMNeT++ WSN Simulations