CHAPTER 1
INTRODUCTION

1.1 Background

The extensive presence of various things and objects connected to the Internet embodies the idea of IoT. IoT enables multiple sensors and devices (nodes) to be combined and communicate seamlessly with each other to share decisions and information. As the main component of the fast-emerging IoT, low power and lossy networks (LLN) play a critical role in reaching ever-present and widespread computation. However, due to wireless media, resource limitations, and a lack of physical safety, LLN is susceptible to all kinds of attacks. When sensitive data being sent, developing countermeasures against potential attacks is extremely important and challenging for reliable and secure communication.

Nodes have limited resources, and routing is a solution that is often needed to send packets between nodes along the most efficient path from source to destination and vice versa [1]. Also, the algorithm is known to use up most of the resources in CPU and memory, and it significantly affects the performance of limited resource devices used in LLN applications, where RPL is used [2]. RPL is well known as an effective Routing protocol for LLN due to its low power consumption for routing in networks with a significant amount of nodes.

This thesis is intended to simulate the RPL facing several kinds of attack scenario, which is Blackhole attack, Hello Flood attack, and Version Number Modification (VNM) attack in Cooja Simulator. By using these scenarios, the author intended to measure the impact they caused. In this thesis, one node is selected as an attacker in each different attack scenarios for this simulation and compared to a similar network running normally without a malicious node. An understanding of impact and behavior is required when measuring network performance. In addition, the Cooja simulator is a network simulator that is widely known because of its high accuracy compared to the real implementation, so it is used by the author. By extending Cooja's features, Cooja could measure and measure these disturbances more accurately and efficiently.

1.2 Objectives and Benefits

This thesis objective is to measure the performance of RPL against several kinds of attacks in Cooja simulator. While the ultimate objective of this thesis is a performance test, it also includes the comparison between each scenario and how they affect a WSN with RPL. This thesis also functions as a reference to how well WSN with RPL performs in real life.

1.3 Problem Formulation

Based on the background that proposed, it can be formulated some of the problems regarding this thesis:

1. How big of an impact each attack scenario will cause to WSN
2. How to design RPL using Cooja Simulator
3. How to analyze the performance of RPL based on the acquired data in simulation
4. How to reduce the impact caused by these scenarios?

1.4 Scope and Limitation

The boundary of the problem that this final project is:

1. The WSN simulated here didn't take accounts of the environmental situation like in real-life conditions.
2. This thesis only covers 3 types of attack in RPL which is Blackhole, Hello Flood, and Version attack
3. The experimental study is conducted as simulation by Cooja Simulator

1.5 Research Method

The research methods that conducted are experimental with steps such as:

1. Study of Literature

   This step decides references from journals, papers, and books related to WSN, and RPL published by IEEE
2. System Design

In this step, we will design the system scenarios that would be used in Cooja Simulator

3. Simulation

   This step is conducted using the designed scenarios in a Network simulation tool which is Cooja Simulator.

4. Analysis

   This step consists of collecting the data result from the simulation, which then, analyzing it to the desired parameters.

1.6 Structure of This Thesis

Chapter 2 LITERATURE REVIEW

This chapter describes the theories, tools, and equipment related to this research.

Chapter 3 SYSTEM DESIGN AND EXPERIMENTAL SETUP

This chapter describes system design and experimental setup

Chapter 4 RESULT AND ANALYSIS

This chapter describes the result and analysis of the proposed method.

Chapter 5 CONCLUSION AND SUGGESTION

This chapter describes the suggestion on how to improve the proposed method

1.7 Time Schedule

This subsection contains the implementation schedule of this thesis work. It is important to set several milestones to determine the achievement of the job. The implementation schedule is used as a reference to evaluate the stages of work as set forth in the established milestone.

Table 1.1 A Schedule for this proposal

Description	Duration	Due Date	Milestone
Study of literature	1 month	Oct-19	Block Diagram
Designing Simulation	1 month	Nov-19	Completed the simulation design
Simulation	2 months	Des 2019 – Jan 2020	Successfully simulate RPL
Measurement	2 months	Feb 2020 - March 2020	Analyzed the acquired data from simulation
Performance evaluation	4 months	Feb 2020 – Jun 2020	Thesis finish