CHAPTER 1
PRELIMINARY

1.1 Background

The industrial revolution and scientific advances always give rise to new ideas for utilizing technology. Lately, innovations that continue to occur and run are in sensor technology that is used for various purposes such as periodic medical record monitoring, land or water surveillance, building security and operational efforts, early warning systems from disasters and other purposes [1]. Massive sensor utilization innovations are also widely carried out to monitor certain objects. This innovation is carried out by utilizing the concept of the Wireless Sensor Network (WSN) which deploys sensors in certain areas to be monitored for conditions (temperature, humidity, pressure, and others) [1][2].

WSN itself is a concept to define a collection of sensors that are interconnected or exchange information through a wireless network as depicted in figure 1.1 [3]. Sensors play a role in collecting observed data, but in WSN sensors also act as transceivers to forward data to end-users through certain nodes. Sensors have relatively simple computing capabilities because they usually have low device specifications. Because the data retrieval area is not always close to the power supply, sensor devices are also usually equipped with limited resources in the form of batteries embedded in them. [4]. Therefore, the sensor device must have a long active period so that the flow of information or data retrieval does not experience many delays.

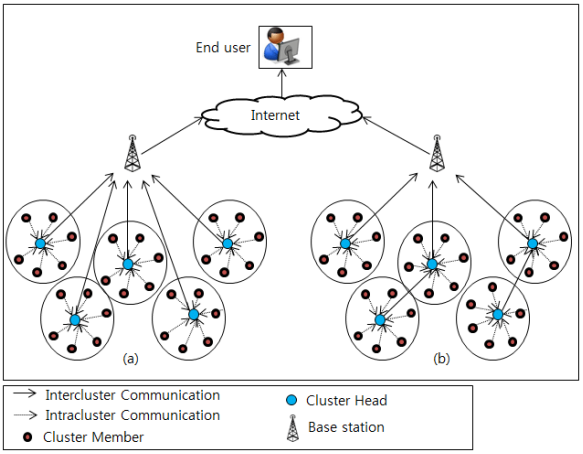

Figure 1.1 Overview of Wireless Sensor Network [5]

Based on the problem of power efficiency, WSN also continues to innovate to overcome it with various routing protocols classified into various types such as Data - centric routing protocol, Hierarchical routing protocol, Location-based, and others [6][2]. From these various classifications Hierarchical routing protocol is one type that is experiencing development, some examples of existing protocols in this type are LEACH, TEEN and APTEEN, and PEGASIS [2]. In this thesis, modifications will be made to one of the Hierarchical routing protocol namely (Low-Energy Adaptive Clustering Hierarchy) LEACH. LEACH is a routing protocol on WSN that works by creating sensor clusters with 1 cluster head as sensor/ node which is responsible for forwarding data to the base station in 1 round[7]. Modifications to the LEACH protocol will be carried out with the aim that the LEACH protocol has awareness of the residual energy of each node to transmit which is also called T-LEACH and can be run based on an event that occurs in observation data or is called event-driven LEACH. This will cause the data transmission that was previously performed every time to be carried out only at certain times so that it can extend the life of the battery and increase the efficiency of power use. [8][9][7]. Experiments will be carried out by utilizing MATLAB software to create network and protocol simulations according to the proposed solution. MATLAB will also be used to analyze solutions that have been applied to the WSN network so that they can be used as references for further research or innovation.

1.2 Problem Identification

The LEACH protocol has been used by WSN for a long time as a routing method, LEACH is also designed to save energy but unfortunately still needs modification to increase effectiveness in energy use. The modification that will be made in this thesis is to make LEACH an energy-aware protocol by determining the energy threshold for nodes that will become cluster heads and making LEACH a protocol that runs based on an event or event-driven protocol to carry out data transmission. To achieve this, it is necessary to solve the problem formulation as follows:

1. How to make LEACH an energy-aware protocol?
2. How to make LEACH an event-driven protocol?
3. How do energy-aware protocols and event-driven protocols affect LEACH?
4. To what extent is the power efficiency obtained from the energy-aware protocol and event-driven protocol in LEACH

1.3 Hypothesis

The main objective of this thesis is to modify LEACH into an energy-aware protocol and event-driven protocol to achieve increased power efficiency when compared to the LEACH protocol itself. With this aim, several hypotheses are obtained based on previous research that has been carried out as follows:

1. Power efficiency in the LEACH protocol can be achieved by limiting transmission only when there is a difference in the data of a round compared to rounds previous or event-driven protocols. This was mentioned by Heinzelman W in his research journal entitled " Energy-Efficient Communication Protocol for Wireless Microsensor Network " [7].

2. “Added power threshold to random cluster selection process head in the LEACH protocol can improve power efficiency in a network with a collection of sensors (WSN)”, this is evidenced by the simulation conducted by Hong J and Kook J in the journal entitled “T-LEACH: The method of threshold-based cluster head replacement for wireless sensor networks " [9]. This is also reinforced by the results of the simulation carried out by Neji W and Othman S in the " T-LEACH: Threshold sensitive Low Energy Adaptive Clustering Hierarchy for Wireless Sensor Networks” [8].

3. Based on these two points, this thesis will be modified by combining the energy-aware concept protocol and event-driven protocol in LEACH so that it becomes a new protocol called event-driven / event-based T-LEACH. With the event-driven T-LEACH protocol, it is expected that there will be an increase in power efficiency compared to LEACH on WSN.

1.4 Scope of Works

To maintain the direction and purpose of this thesis so as not to write a description beyond the needs of the thesis so it is necessary to have a clear scope of works, here are some points of the scope of works that will be carried out in this thesis:

1. Integrating energy-aware concepts protocol and event-driven protocol with LEACH to get the event-driven T-LEACH protocol
2. Simulation of the proposed solution, namely event-driven T-LEACH with a predetermined network model
3. Perform power efficiency analysis on event-driven T-LEACH
4. Perform power efficiency comparisons between LEACH and event-driven T-LEACH

1.5 Research Methodology

The methods used to complete this Final Project Proposal are:

1. **Literature Study**

   This is done by reading the existing literature, both from manuals and from other sources such as research journals. This step is done with the purpose of gaining insight so that become the subject of discussion .

2. **Identification of problems**

   problem identification to results analysis from insights that have been found in the study literature.

3. **Analyst a Problem**

   Analyze problems based on sources and observations of these problems.

4. **Solution Simulation**

   Doing simulation with destination find solution for solve problem that has been analyzed

5. **Stages of Testing Solutions and Analysts a**

   Solution found then tested to problem and more analyzed its effectiveness .

6. **Consultation**

   Consultations are carried out regularly with the supervisor in order to get instructions and obtain considerations regarding the final project.

1.6 Thesis Structure

The remainder of this thesis is structured as follows:

- **CHAPTER 2: STUDY OF LITERATURE**
- **CHAPTER 3: SYSTEM MODEL AND DESIGN**
- **CHAPTER 4: RESULTS AND ANALYSIS**
- **CHAPTER 5: CONCLUSION**