CHAPTER 1

INTRODUCTION

Current internet users, especially on cellular networks, reach 3.7 exabytes per month and the volume is expected to exceed 30.6 exabytes by 2020 [41]. Indonesia is one of the countries with the highest number of internet users in the world and in December 2017 that is 143.3 million population is an active internet user out of a total of 260 million more population [2]. That makes the growth of Wireless Fidelity (WiFi) technology so rapid and popular [20]. Many WLAN Access Points (hotspots) have installed in public areas [20]. In designing or evaluating services that depend on WiFi infrastructures, such as the Internet of Things (IoT) services for smart cities, coverage and signal strength are very important [41] [20].

IEEE 802.11 standard technology has been used massively in a variety of environments (such as homes, offices, roads, campuses, etc.), where different devices (for example smartphones, laptops, tablets, wearables devices, etc.) use this standard as the main access method for connecting to the internet [16]. The technology most widely used for WiFi services is the IEEE 802.11 a / g / n / ac standard. The a / g / n / ac version of IEEE 802.11 technology does not focus on developing Internet of Things (IoT) specifications [16]. To support the Internet of Things (IoT) era, 802.11ah standard technology has developed, and the standard is intended to provide a low-cost mode of operation, with a wider coverage area, and can support thousands of devices per cell [16]. IEEE 802.11ah has a high data rate and uses a wider bandwidth compared to other technologies that support Low Power Wide Area (LPWA) [50].

One of the WiFi Hotspot services in Indonesia is WiFi.id owned by PT Telkom. WiFi.id is an internet network service for the public based on wireless or hotspots [9]. This study discusses the Techno-Economic Analysis of the Implementation of the IEEE 802.11ah Standard Network for Internet of Things Applications (Case Study: Smart Meters using WiFi.id Network in Bandung), with the aim of improving network quality in terms of coverage and capacity to increase efficiency the WiFi network and in order to support the Internet of Things (IoT) application service, especially for smart meter applications.

1.1 OBJECTIVE

The objectives to be achieved in this study are as follows:

- Techno-economic identification of the implementation of the IEEE 802.11ah standard network on the WiFi.id network in Bandung for smart meter applications.
- Perform technical needs calculations for the implementation of the IEEE 802.11ah standard network on the WiFi.id network in Bandung for smart meter applications.
- Perform sensitivity analysis of the implementation of the IEEE 802.11ah standard network on the WiFi.id network in Bandung for smart meter applications.
- Provide recommendations regarding the implementation of the IEEE 802.11ah standard network on the WiFi.id network in Bandung for smart meter applications.

1.2 IDENTIFICATION OF PROBLEMS

The identification of the problems in this study is as follows:

- IEEE 802.11ah has not included in the Internet of Things (IoT) and Low Power Wide Area (LPWA) standards in Indonesia. The IEEE 802.11ah standard can be used as a solution for the standardization of connectivity on the Internet of Things (IoT) networks and services, especially for smart meter applications.
- Coverage on conventional WiFi technology, namely 802.11 a / g / n / ac, is still limited and is still constrained by the obstacle.
- Implementation of the IEEE 802.11ah standard network for WiFi.id services in Bandung needs to be identified and analyzed so that the allocation of resources on the implementation of the network is efficient.

1.3 SCOPE OF WORK

The limitation problems in this study are as follows:

- It only discusses the design and simulation of the IEEE 802.11ah standard network for smart meter applications.

- Use atoll software to design and simulate IEEE 802.11ah network standards smart meter applications.
- Internet of Things (IoT) applications discussed by smart meters.
- Test parameters in this study are coverage and capacity smart meter IoT applications.
- Data about WiFi.id was obtained from PT Telkom Indonesia Witel Bandung.

1.4 RESEARCH METHOD

In this study, the authors conducted a Techno-Economic Analysis on the Implementation of the IEEE 802.11ah Standard Network (Case Study: Wifi.i in Bandung) with the aim of creating an efficient network, penetration of the WiFi.id market, which can support the Internet of Things (IoT) applications with better coverage than the previous technology. Network simulations are carried out to determine coverage prediction and capacity prediction from the implementation of the IEEE 802.11ah standard network while Net Present Value (NPV), Internal Rate of Return (IRR), and Sensitivity Analysis are conducted to find out Capital Expenditure (Capex) and Operational Expenditure (Opex).

1.5 HYPOTHESIS

The hypothesis in this study are as follows:

- The implementation of the IEEE 802.11ah standard network will result in network design, coverage prediction, and capacity prediction for smart meter applications.
- The implementation of IEEE 802.11ah standard WiFi technology for smart meter IoT applications will produce better coverage compared to conventional WiFi technology or previous WiFi technology.
- The implementation of the IEEE 802.11ah standard network smart meter IoT applications will result in Net Present Value (NPV), Internal Rate of Return (IRR), and Sensitivity Analysis.