

CHAPTER 1

INTRODUCTION

1.1 Background

Especially with the presence of Fiber To The Home (FTTH) technology in Indonesia, the penetration of Fixed Broadband usage is still at 21.31% [1] . Where this figure is still relatively low, therefore the Indonesian government is trying to present Fixed Access Wireless (FWA) technology which will be auctioned at a frequency of 1,432 - 1,512 GHz by the Ministry of Communication and Digital in 2025 in Indonesia. FWA technology is expected to have a speed of 100 Mbps, a new technology in Indonesia that aims to accelerate the increase in penetration of Fixed Broadband usage in Indonesia [2]. Where this 5G FWA technology is expected to be able to provide accelerated development to cover areas that have not been served by fiber optics or FTTH XG-PON technology and provide cheaper services and have a speed of 100 Mbps [3].

Fiber to the Home (FTTH) is a solution that connects users' homes directly to the fiber optic network, providing very high internet speeds and large capacity. XG-PON (10 Gigabit Passive Optical Network) technology is a development of GPON technology, which can provide larger network capacity with speeds of up to 10 Gbps. This technology is very suitable to accommodate the growing data needs [4].

Meanwhile, FWA 5G with a frequency of 1.4 GHz offers a more flexible and efficient solution, especially for areas that are difficult to reach by cable networks. Kominfo chooses 1.4 GHz frequency with 80 Mhz bandwidth to maximize the implementation of 5G FWA technology because this frequency can provide large capacity. In this study, planning network development in Gorontalo, the selection of this technology must consider existing regulations, especially in terms of the use of 1.4 GHz frequency recommended by KOMINFO, as well as the need to provide network capacity that meets the demands of the local community [2].

FTTH network design is carried out using XG-PON technology by creating cable paths and determining devices by considering the parameters of Link Power Budget (LPB), Bit Error Rate (BER), Signal to Noise Ratio (SNR) and Q-Factor

and conduct performance simulations using software. And the Design of 5G FWA network with frequency 1,4 GHz at Bandwidth 30, 50 and 80 MHz, with parameters of Secondary Synchronization - Signal to Noise and Interference Ratio (SS-SINR), Secondary Synchronization - Received Reference Signal Power (SS-RSRP), and Throughput and perform performance simulation using software. FTTH network planning uses XG-PON, while FWA 5G NR with a frequency of 1.4 GHz in this thesis will be carried out in suburban areas in the Hutuo, Dutulanaa, and Bulota areas in Gorontalo.

1.2 Problem Formulation

In the end of the task this writer formulates the problem as follows:

1. In the regions of Hutuo, Dutulanaa, and Bulota in Gorontalo, FTTH XG-PON and 5G FWA network infrastructures have not yet been deployed.
2. To what extent can 5G FWA technology operating at the 1.4 GHz frequency and FTTH XG-PON infrastructure effectively address regional internet access demands, as evaluated through software-based performance analysis?
3. What are the estimated timelines and implementation phases required for deploying the XG-PON FTTH network compared to 5G FWA within the designated study area?
4. How the cost analysis of implementing the XG-PON FTTH (Fiber To The Home) network compared to 5G FWA (Fixed Wireless Access) can be the basis for informative decision-making in meeting the internet access needs of customers in the Hutuo, Dutulanaa, and Bulota areas, Gorontalo?

1.3 Scope of Problem

In writing this final assignment, the discussion of the problems will be limited as follows:

1. FTTH and FWA network design only applies to parts of Hutuo, Dutulanaa, and Bulota in Gorontalo.

2. Security issues will not be discussed.
3. Simulation design FTTH network uses device soft Optysistem 7.0 and FWA uses application device Atoll 3.4 software.
4. Technologies compared Study This only will be comparing two technologies main, namely Fixed Wireless Access (FWA) 5G frequency 1.4 GHz and Fiber to the Home (FTTH) XG-PON. Technology others, such as cable copper, will no be discussed in this study.
5. The aspects tested in the FTTH XG-PON research used the Link Budget and Signal-to-Noise Ratio (SNR) parameters as size quality signal, Bit Error Rate (BER). While For 5G FWA research with 1.4 GHz frequency using SS-SINR, SS-RSRP, and Throughput parameters. Others factors such as the influence of weather or policy government in this study will not be discussed.
6. Research location focused on Hutuo, Dutulanaa, and Bulota in Gorontalo as studies case, with consider characteristics geographic and demographic area that which influences development infrastructure communication. Research in this No will expand coverage to other areas in Indonesia.
7. BoQ Analysis is not yet of course can use the price that has been writer include.
8. The implementation of this research was in the suburban areas, namely Hutuo, Dutulanaa and Bulota sub-districts, in Gorontalo.

1.4 Objective

This This study aims to evaluate the potential of FTTH XG-PON and 5G FWA operating at the 1.4 GHz frequency as viable solutions for accelerating fixed broadband deployment in Indonesia, with a particular focus on the Hutuo, Dutulanaa, and Bulota regions of Gorontalo. The analysis encompasses technical performance, implementation timelines, and the investment costs required to effectively meet local internet access demands.

In writing this thesis, the writer uses several stages method research, as follows:

1. Literature study

Literature discussion theoretically originates from books, scientific journals, notes and electronic sources from the internet so that must get clear references so that result in proper and appropriate design and analysis.

2. Stage Design

Do design and discussion with lecturer mentor during task end This use designing FTTH and FWA in Gorontalo.

3. Problem Analysis

Analysis problem based on source literature.

4. Design Systems and Network Analysis

Analysis problem based on source literature and analysis results implementation to get data.

5. Results

The results obtained were written on paper.

1.5 Writing Systematics

In general, the systematics for writing this final assignment are as follows:

CHAPTER I INTRODUCTION

This chapter contains the background, objectives, problem formulation, problem limitations, research methods and writing systematics.

CHAPTER II THEORETICAL BASIS

This chapter contains theoretical aspects related to FTTH and FWA network design so that it can assist in writing this thesis.

CHAPTER III SYSTEM DESIGN

This chapter discusses the design of FTTH and FWA networks, number of customers, device data information and device placement.

CHAPTER IV SYSTEM DESIGN ANALYSIS

This chapter discusses how the results of the calculations and simulations designed can be compared and meet the standards of good quality feasibility in a network.

CHAPTER V CONCLUSION AND SUGGESTIONS

This chapter discusses the conclusions in designing FTTH and FWA networks using 5G technology in Gorontalo. and constructive suggestions for development.