



**DESIGN OF FIBER-TO-THE-HOME (FTTH) ACCESS  
NETWORK WITH REDUNDANCY FOR TAMAN IMPIAN  
CHEMOR IPOH BASED ON GIS**

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**TECHNOLOGY (TELECOMMUNICATION) WITH HONOURS**

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**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DESIGN OF FIBER-TO-THE-HOME (FTTH) ACCESS  
NETWORK WITH REDUNDANCY FOR TAMAN  
IMPIAN CHEMOR IPOH BASED ON GIS**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Telecommunication) with Honours.

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REDUNDANCY FOR TAMAN IMPIAN CHEMOR IPOH BASED ON GIS

Sesi Pengajian: 2020/2021 SEMESTER I

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## APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:



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## ABSTRAK

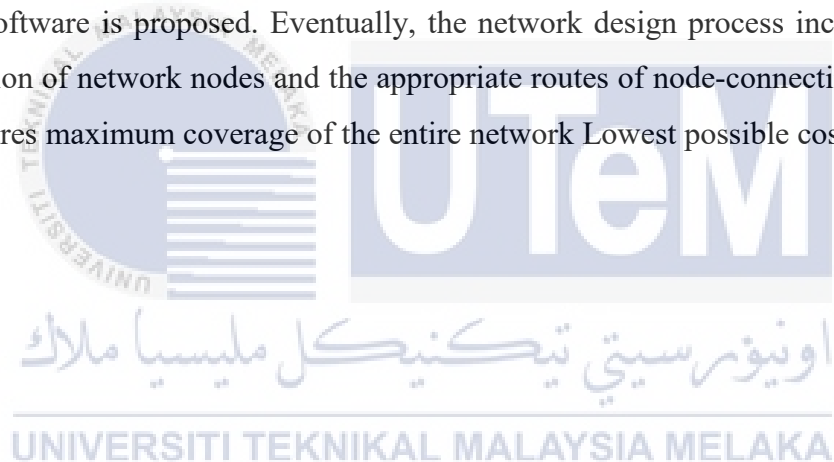
Rangkaian akses Fiber-to-the-home (FTTH), merujuk kepada sambungan kabel fiber optik untuk kediaman, pejabat dan kediaman individu. Ia berdasarkan komunikasi gentian optik dan dapat menghantar banyak maklumat digital seperti telefon bimbit, video dan data dengan lebih berkesan daripada kabel tembaga konvensional. Manfaat utama FTTH adalah bahawa ia memberikan kelajuan sambungan yang lebih cepat dan lebih banyak sokongan daripada konduktor pasangan berpintal, DSL atau rangkaian lain. FTTH adalah satu-satunya teknologi dengan lebar jalur yang mencukupi untuk memenuhi permintaan pelanggan, baik sekarang dan masa depan. Dalam makalah ini kami telah mengetengahkan kelebihan FTTH dengan kelebihan dan prospek masa depan dalam pembangunan infrastruktur pada tembak-menembak di Ipoh yang mempunyai pangkalan pengguna yang besar. Pendekatan mudah untuk mendapatkan pelaksanaan terbaik perisian reka bentuk rangkaian berasaskan GIS dicadangkan. Akhirnya, proses reka bentuk rangkaian merangkumi memutuskan pengedaran nod rangkaian dan laluan kabel penyambung nod yang sesuai dengan cara yang memastikan liputan maksimum seluruh rangkaian Zon kos serendah mungkin.

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## ABSTRACT

Fiber to home (FTTH) access network refers to fiber optic cable connections for individual homes, offices and residences. It is based on optical fiber communications and can transmit much digital information such as cell phones, video and data more effectively than conventional copper cables. The main benefit of FTTH is that it provides much faster connection speeds and more support than twisted pair conductors, DSLs or other networks. Fiber to home is the only technology with sufficient bandwidth to meet customer demand, both now and in the future. In this paper we have highlighted the advantages of FTTH with redundancy and future prospects in infrastructure development at a shootout in Ipoh which has a large user. A simple approach to get the best implementation of GIS-based network design software is proposed. Eventually, the network design process includes deciding the distribution of network nodes and the appropriate routes of node-connecting cables in a way that ensures maximum coverage of the entire network Lowest possible cost zone.





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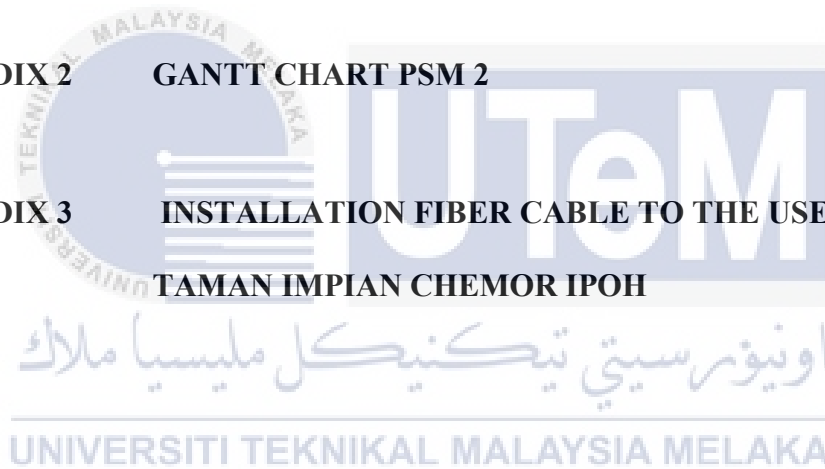
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## LIST OF SYMBOLS

|             |   |                     |
|-------------|---|---------------------|
| <b>Km</b>   | - | Kilometer           |
| <b>M</b>    | - | Meter               |
| <b>L</b>    | - | Length              |
| <b>Mbps</b> | - | Megabits per second |
| <b>dB</b>   | - | Desibel             |



# CHAPTER 1

## INTRODUCTION

### 1.0 Introduction

In this globalization, the Internet offers great opportunities for work, relaxation, communication, and sharing of information. The rise of the internet and its increasing popularity has contributed to a more consistent change to the world and society. Therefore, there should opening up a new virtual world and communicating easily and quickly. Online communication is not only needed for successful people but also for students and users of all ages. The increasing number of users has resulted in limited internet access and some areas do not have sufficient internet access. All users need a higher speed internet to access stable networks and internet connections. Therefore, telecommunications companies need to focus more on designing internet networks with reference to network efficiency, internet stabilization and installation costs to meet consumer needs.

### 1.1 Background Study

According to Akshay Mukesh Kanal (2012), Home-based fiber network integration can more easily accommodate future bandwidth applications and applications than other network architectures. However, the cost of capital to install local access networks is very high. As such, providers and newcomers want to develop a network that will potentially meet the bandwidth and application requirements for the

next ten or even twenty years, which will be able to accommodate as capacity increases. FTTH has the advantage of great capabilities and flexibility over other telecommunications networks.

In addition, fiber optic cables have a higher bandwidth capacity (especially upstream) than other transmitting media. The FTTH network provides a flexible and seamless communication infrastructure, along with the Internet anywhere easier and faster. Optical fiber technology enables focusing on the physical layer of the network in a manner similar to how the Internet Protocol allows for the focus on the logical layer of communication infrastructure. In tandem with the increase in Internet usage has also led to increased demand for residential bandwidth.

## 1.2 Problem Statement

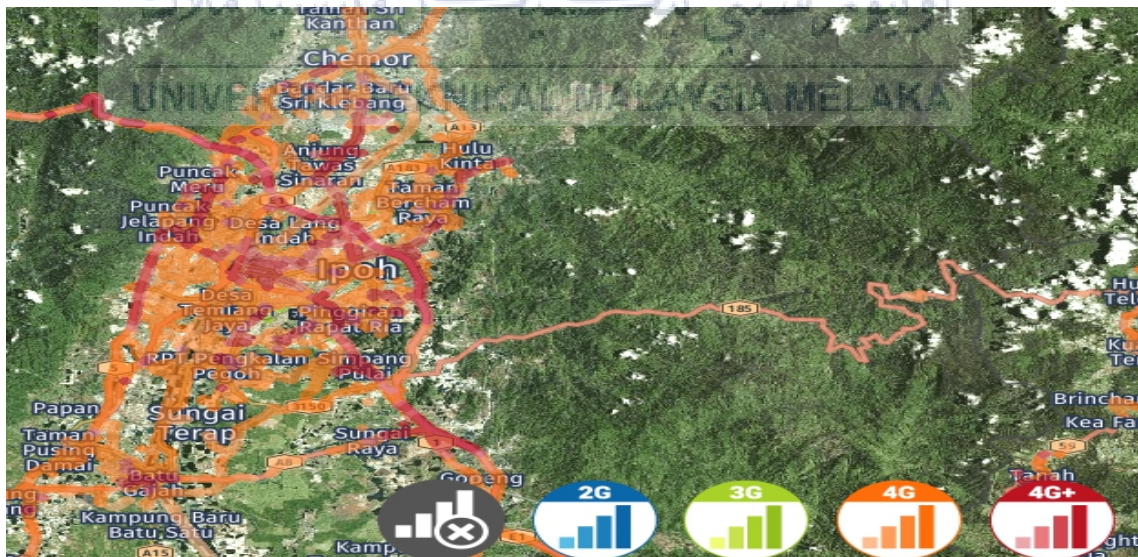


Figure 1.1: Cellular data network in Ipoh, Perak

In this project, Taman Chemor Impian, Ipoh Perak are selected to prove the effectiveness of using GIS for the planning and design of fiber-to-the-home (FTTH) access network. However, this kind of application can only be used by some parties. As a result, the project has been using a similar application to GIS which is Google maps. In figure 1.1 shown the coverage map at Chemor, Perak show the coverage for data network only 4G. It's not enough to support the quantity of subscribers nowadays. Thus, growing demand for home internet network installation by customer.

The demand for high-speed internet access has increased dramatically due to the need for multimedia application directly to the desktop. Traffic pattern in access networks have evolved from voice and text oriented services to video and image based services. In figure 2 shows the trend of demand for internet, worldwide. This trend will require new access network that will support high-speed <100 Mbps, symmetric and guaranteed bandwidth for future video services with high-definition TV quality (Lee et al., 2006).

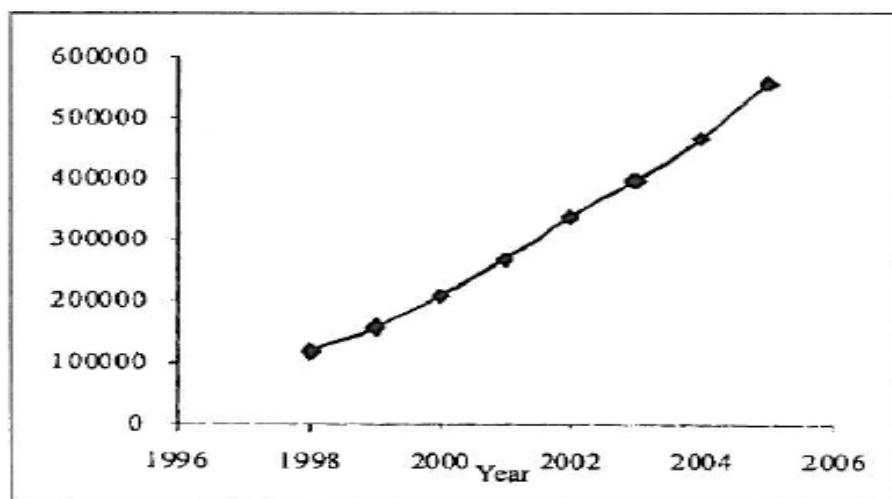


Figure 1.2: The growth in the number of user on the Internet (Lee et al., 2006)

### 1.3 Objectives

1. To design of fiber-the-home (FTTH) with redundancy at the selected area using GIS.
2. To estimate cost of installation using normal or with redundancy.
3. To analyze the performance simulation of FTTH devices based on Optisystem.

### 1.4 Scope of Work

In this project, a small population area was selected to undergo the FTTH internet access test with the redundancy. For more precisely the software used is the Geographic Information System for automatic planning of FTTH access networks. This method can indicate the area needed to read geographical data for FTTH installations. GIS is often used to design, review and optimize data as it is a systematic approach to setting up infrastructure for network access. Therefore, Geographical Information Systems (GIS) is well suited for the tools used for FTTH network analysis. After the process of establishing the FTTH connection in GIS, it is transferred and analyzed using Optisystem where it calculates Q-Factor values and BER values. Power link approximation analysis is used to determine the performance of network installations before operating them on the device.

## 1.5 Summary

In this chapter, the design of network and simulation result will be minimize the cost installation instead optimize the efficiency and stability of internet connection. Before designing the network on Optisystem software, FTTH network architecture was required using Google maps and Google earth pro as methods to facilitate installation work. Next, by using Optisystem of the FTTH network design will be analysis the performance the FTTH network. The aim of this project to adjust whether the system is running well or not.



## CHAPTER 2

### LITERATURE REVIEW

#### 2.0 Introduction

This chapter will highlight on the theory and information about the scope of this project based the review from the related literature journals. The information that studied from the related journal are the process design of FTTH network access using GIS and FTTH implementation. This project will be expressed through this chapter which consist of explanation for the suitable method used to design FTTH with the OptiSystem software.

#### 2.1 Geographic Information System (GIS)

##### 2.1.1 Introduction

The Geographic Information System ( GIS) is a computer system designed to collect, store, query, analyze and view geospatial data. Geospatial data describes the location of spatial features and their attributes. A GIS includes the hardware , software , data, people, and organizational components. In the 1980s GIS flourished, prompted by the introduction of personal computers (PCs) and graphical user interfaces. Now GIS is an essential tool in resource management, emergency planning, crime analysis, public health, land record management, precision farming and many other fields. An significant trend is the convergence of GIS desktops and web and mobile technologies, which has already resulted in