

## BORANG PENGESAHAN STATUS TESIS

JUDUL: Implementation of Wireless Network at USM Engineering Campus's Hostel  
SESI PENGAJIAN: 2007/2008  
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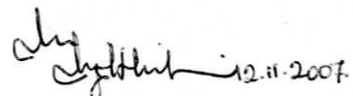
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**IMPLEMENTATION OF WIRELESS NETWORK AT USM ENGINEERING  
CAMPUS'S HOSTEL**

**HALINA BINTI ABDUL HALIM**

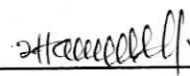
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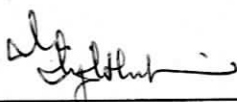
**FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY  
UNIVERSITI TEKNIKAL MALAYSIA MELAKA  
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**DECLARATION**

I hereby declare that this project report entitled  
**IMPLEMENTATION OF WIRELESS NETWORK AT USN ENGINEERING  
CAMPUS'S HOSTEL**

is written by me and is my own effort and that no part has been plagiarized  
with out citations.

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SUPERVISOR :  Date: 5<sup>th</sup> November 2007  
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## DEDICATION

I would like to address special appreciation to my helpful lecturers, beloved parents and my family for their loving and pray and also my friends that help me so much and supporting me while I am doing my PSM 2.

## ACKNOWLEDGEMENT

I would like to express my gratitude to my supervisor, Encik Nur Azman bin Abu for his full guided and gave an advice and commendatory foreword of my tasks and project for the details feedback that enable to improve my knowledge and skill. I am especially grateful to Encik Shahrul Ismi bin Mohd Akhir, IT Executive from University Sains Malaysia Engineering Campus on his help. Next, I wish to express my sincere appreciation to my lectures that always teach and gave me a support and knowledge. I want to thanks to my friends because always help me and also share everything that we learned together. Lastly, I want to give a special word of thanks to my family members because always give me the best in everything and support me on what am I doing and never stop to praying my success.

## ABSTRACT

PSM is the project that must be done for all students. This project can be assumed as the tough project during the study period. PSM project must be done after finishing the Industrial Training. During industrial training, student may find out the problem occurred in the real life environment. After that, student may use develop a project to solve the problems. The project can be making as a PSM project. As for this PSM's project, I would like to implement the wireless network at USM Engineering campus's hostel. Wireless network is a new technology used to solve the wired network. This network can allow user to connect to the network without cable connection. This project is to solve the current network at the hostel. There are no wireless network implement at the campus's hostel. So, user has a limitation to connect to the network. With wireless network, user can connect to the internet everywhere as long as still in the coverage area. The expected output for this project is to provide the wireless network to the user.

## ABSTRAK

PSM adalah projek yang mesti dilakukan oleh semua pelajar. Projek ini boleh dianggap sebagai projek yang terbesar sepanjang tempoh pembelajaran. Projek PSM ini mesti dilakukan selepas pelajar menamatkan latihan industri. Semasa tempoh latihan industri, pelajar mungkin berhadapan dengan pelbagai masalah persekitaran. Oleh itu, pelajar mungkin akan membangunkan projek untuk menyelesaikan masalah tersebut. Projek tersebut boleh dijadikan sebagai projek PSM. Untuk projek ini, saya ingin membangunkan rangkaian tanpa wayar di Asrama Kampus Kejuruteraan USM. Rangkaian tanpa wayar adalah teknologi terkini yang digunakan untuk mengatasi masalah rangkaian dengan wayar. Rangkain tanpa wayar membenarkan pengguna mengakses internet serta rangkaian tanpa memerlukan sambungan kabel. Projek ini boleh menyelesaikan masalah rangkaian dengan wayar. Rangkaian semasa yang terdapat pada asrama adalah rangkaian dengan wayar. Ini menyebabkan pengguna mempunyai had untuk mengakses internet serta rangkaian. Dengan rangkaian tanpa wayar, pengguna boleh mengakses internet di mana sahaja selagi berada di kawasan yang mempunyai jangkauan.

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**LIST OF ABBREVIATIONS**

USM	-	Universiti Sains Malaysia
AP	-	Access Point
LAN	-	Local Area Network
WLAN	-	Wireless Local Area Network
HTTP	-	Hyper Text Transfer Protocol
TCP	-	Transmission Control Protocol
E-mail	-	Electronic Mail
VLAN	-	Virtual Local Area Network

## **CHAPTER I**

### **INTRODUCTION**

#### **1.1 Project Background**

USM Engineering Campus located at Nibong Tebal, Pulau Pinang is chosen as a place to make a research and implement a final project. From the site view, hostel buildings are taken as a case study. It is because the current network for hostel buildings is using wired network. So this project is to upgrade without changing the current network by add the wireless network. The implementation of wireless network can support many users in any places around the hostel buildings. So it will make easy to user to access an internet.

There are 6 hostel buildings and the implement is to all buildings. There are 2 types of building. 3 building have 3 wings where and another 3 buildings have 2 wings. Each building has 4 floor levels.

#### **1.2 Problem Statements**



The main problem of wired network is it only supports one user in a room. There are three users in a room. This caused a problem to the other user to access an internet and the network. The connection is very limited.

Other than that, wired network only support user in a room. User cannot access an internet in the study room or everywhere they want.

By using wireless, users do not need any cable to connect a computer or laptop to the network. They just turn on the computer or laptop and they can connect to internet or network anytime and anyplace.

Sometimes, the port may have a problem. The problem may occur to the cables that connect the port in the room to the switch. If the problem happened, it may take a few days to solve the problem.

### **1.3 Objectives**

- To make all users in hostel can connect to the network and internet.
- To increase the mobility user.
- User can access an internet or network even the problem occurred to the wired network which is cable from switch to port in the room has a problem.

### **1.4 Scope**

The scope for this project is all the hostel's building. There are 6 hostel buildings where 3 buildings have 3 wings and another 3 buildings have 2 wings. The 3 wings buildings have 180 rooms per building which have 540 users. The 2 wings buildings have 120 rooms per building which have 360 users. Each building has 4 levels and each room has 3 users. Entire hostel buildings are taken to implement the wireless network because there is no wireless network now.

## **1.5 Project Significance**

This project will give a benefit to user. Users at hostel can access an internet anytime they want. They also can access anywhere as long as they are still around the hostel area. They still can connect to network even their switch's port cannot properly work.

## **1.6 Expected Output**

The expect output from this project is wireless implementation in the hostel buildings. User may connect to the network either inside or outside the room. Wireless networking for small area offers computer connectivity with no strings attached.

## **1.7 Conclusion**

The summarization of this project is to implement a wireless network in a hostel building. The existing network is a wired network. There are many problems occur with the existing network. The problems of wired network may be solve by add the new network. This will make easy to administrator and user.

After get a project, first thing to do is conduct a site survey to understand the needs of users in the current environment. By performing a site survey, the appropriate technologies to apply; obstacles to avoid, eliminate, or work around; coverage patterns to adopt; and amount of capacity need can be identified.

## **CHAPTER II**

### **LITERATURE REVIEW AND PROJECT METHODOLOGY**

#### **2.1 Introduction**

To continue the report for project “Implementation of Wireless Network at USM Engineering Campus's Hostel “, literature review is important in order to study the basic about the subject of the project. Literature review is a process to search, collect, analyze and concluded all debates and issues raised in the work that been done in the past. It also provide the examples, case studies and other relevant work that have done by other people in the past, it gives the chance to investigate areas and read the subject that user may not have thought about before. The literature review focuses on the various theory and basic network knowledge used in the project. Project methodology will discuss detail about type of methodology, techniques, hardware or software requirements and project planning to develop the project, so that the planning for the project proposed to meet project objectives, scopes and requirements.

#### **2.2 Facts and Finding**

### **2.2.1 Domain**

The domains that related to this project through the research and reference are wireless LAN, wireless design, wireless installation and wireless simulation.

#### **2.2.1.1 Wireless LAN**

According to Matthew S. Gast (2006). "Wireless Network". 2<sup>nd</sup> Edition. USA, a wireless LAN is a data transmission system designed to provide location-independent network access between computing devices by using radio waves rather than a cable infrastructure. The major motivation and benefit from wireless LAN is increased mobility. Network users can move about almost without restriction and access LAN from nearly anywhere.

In the corporate enterprise, wireless LAN are usually implemented as the final link between the existing wired network and a group of client computers, giving these users wireless access to the full resources and services of the corporate network across a building or campus setting.

This is because wireless does not need any cable to connect computer or laptop to the network. User just turn on their computer or laptop and they can connect to internet or network anytime and anyplace. No wired are required to use a wireless network.

#### **2.2.1.2 Wireless Network Design**

To design and implement wireless network, the wireless network will meet the capacity and quality of service (QoS) expectations must be sure. To create a wireless LAN network design, the thing to consider are the context of the wireless network location, the wireless signal coverage and the network's required capacity based on the number of users and the types of applications.

As state at White Paper; Planning a Wireless Network (2006) produced by Hewlett-Packard, the first issue to consider is the context of the wireless network design. The context are including the composition and contents of the facility, such as the location of walls, doors, stairwells, windows and partitions, the construction of those materials and electronic interferers. These factors can have significant impact on wireless signals, allowing them to spill outside the building, weakening them, causing interference or even blocking them entirely creating dead zones.

According to White Paper; How to make your Wireless LAN Work (2006), the capacity must be more considered in designing the wireless LANs. Wireless network capacity is the maximum amount of data or number of users that can simultaneously be on the network. The more users on the network, the more data network to carry. If the amount of data the network must carry exceeds its capacity, problems such as packet loss, timeouts, or loss of connectivity will occur. Because each AP has a maximum bandwidth, the total bandwidth divides across the number of users currently using that AP. Each new wireless device connecting to the AP causes the total bandwidth available for each user to shrink. This is especially critical when users add high bandwidth applications such as streaming media. To design it, I have to consider the number of user the network will service, the user locations and the applications they will use.

### **2.2.1.3 Wireless Installation**

This project is to extend the wired LAN with a wireless LAN. The most important things to consider before installation are location, number of user and type of application. The way Wi-Fi networking works, computers closer to the router (generally in the same room or in "line of sight") realize better network speed than computers further away.

Gerraughty and Shanafelt in preceding the conference (2005) said the planning of a wireless LAN installation involves establishing a schedule and assigning resources. I'll need to accomplish some up front coordination to ensure that the installation is completed on schedule. When considering the installation schedule, the time of installation must be

calculated. The best approach is to install access points and the distribution system during operational downtimes.

The article also state that the installation locations of access points have significant impact on performance. The site survey will spot potential sources of RF interference and provide a basis for determining the most effective installation locations for access points. When deciding where to place an access point, the most important things to consider are coverage and performance requirements. For best signal propagation results, mount the access points as high as possible.

The distribution system includes Ethernet switches and possibly routers along with Category 5 twisted pair cabling that runs to each access point. The main idea is to identify each end of the cable by some number scheme that lets me know which access point is dealing with when connecting the wire to a patch panel and rewiring or troubleshooting the system in the future.

To install the access point, the access point should be place in the planned location. The location will be identifying during design process. Then, connect the power adapter to the access point, and to a power outlet. After that, raise the antennas to a vertical position. After complete the installation, the access point should be power on.

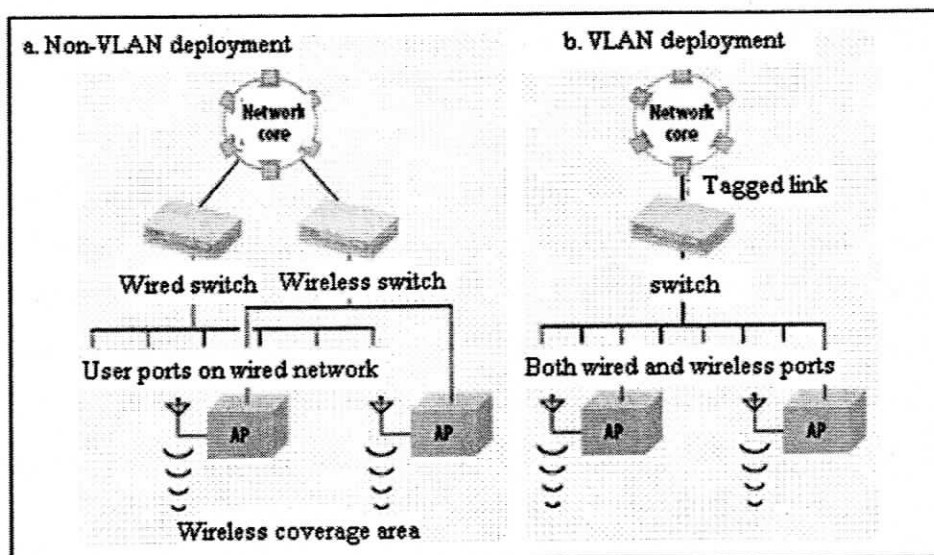


Figure 2.2: Physical topologies for 802.11 network deployment

Figure 2.2 shows the connection between wired and wireless network. Access point are attached to the switch's port.

#### 2.2.1.4 Wireless Simulation

After the installation task complete, the simulation of the new network must be done. This is to see the performance of the network either it is good or not. To make the wireless simulation, the features of the simulator must be considered. According to White Paper; A Simulator for analyzing the throughput of IEEE 802.11b Wireless LAN Systems (2005) produced by Srinivasan Vasudevan, the following are some of the features of the simulator.

- a) The location of the WLAN node can be specified. Cartesian coordinates are used to locate the users with the access point at the origin.
- b) The traffic of individual users can be modeled in the system. The packet arrival rate and packet length distributions of the traffic can be specified in the model.
- c) The throughput calculation is dependent on the path loss and partition losses in the channel.
- d) The simulator is provided with the information about the building materials between the line of sight of the access point and WLAN node and also the distance between the WLAN node and Access Point (AP).

This is to make sure that the simulation can give the actual result of the wireless performance.

As state at White Paper; Effects of Detail in Wireless Network Simulation (2005) wrote by Nirupama Bulusu and friends, a common goal is to infuse the simulation with as much detail as possible to provide a realistic simulation. This approach is attractive: a fully realistic simulation ought to be able to reproduce the results of laboratory experiments or network use by end-users. Failing to implement details guarantees that they won't be reflected in a simulation; for example a wireless propagation model that doesn't consider concurrent transmissions will not model the hidden terminal effect. Furthermore, details at multiple protocol levels can reveal important interactions between layers.

### 2.2.2 Existing System

Existing network is using a wired LAN and there are many differences between these networks. These are in term of ease of installation, total cost, reliability, performance and security as state from Mitchell (2007). The article said that wired LAN use Ethernet cables and network adapters. Although two computers can be directly wired to each other using an Ethernet crossover cable, wired LAN generally also require central devices like hubs, switches, or routers to accommodate more computers. In term of installation, wired LAN used an Ethernet cables. The cable must be run from each computer to another computer or to the central device. It can be time-consuming and difficult to run cables under the floor or through walls, especially when computers sit in different rooms.

### 2.2.3 Technique

The current network is using a wired network. Wired network used a cable to connect the computer to the USM's network. To upgrade the current network by add the wireless network.

For wireless, there are two ways to install an access point, either indoor or outdoor. The placement of antennas outdoors presented several challenges. The first task was to specify and purchase the antenna equipment needed for the installation. The white paper write by Radionet group (2007) said that the outdoor placement can support large-scale network. Large-scale networks mean literally longrange distances between base stations and end users. Technical differences between indoor office networks and largescale outdoor networks are comparable with differences between office LAN network and cellular phone networks. In radio access networks built for mobile phone services larger scale is achieved by using base station sites, higher transmitting powers, antennas, sectored coverage areas and backhaul connections to link base stations to backbone networks. These kinds of infrastructure level functionalities are built with equipment designed for this kind of use. Larger scale networking is often described with