IMPLEMENTING WIRELESS NETWORK AT UNIVERSITI TEKNOLOGI MARA (UiTM) CAMPUS ALOR GAJAH, MELAKA USING OPNET MODELER

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This report is submitted in partial fulfillment of the requirements for the Bachelor of Computer Science (Computer Networking)

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DECLARATION

I hereby declare that this project entitled

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is written by me and is my own effort and that no part has been plagiarized without citations.

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DEDICATION

To my beloved Family, I love you all. To My Supervisor, Thank you so much for the assist and help.

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ACKNOWLEDGEMENTS

In the name of Allah the Almighty and most Merciful.

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ABSTRACT

This project is about Implementating Wireless Network at Universiti Teknologi Mara (UiTM) campus Alor Gajah Using Opnet Modeler. This document records the process of development or simulation for implementing wireless network at UiTM campus Alor Gajah. Current network in this campus is wired network which inconvenience for student who want to access the network and Internet. This problem arise especially when the student trying to access the network or Internet after office hour because all labs is closed. In the other hand, the staff also have the problem if their want to access the network outside their office. Another problem in the current wired network is it is difficult to expand as it will involve a lot of cost such as time and money. The propose solution for this project is to simulate and analyze the performance of current network at UiTM campus Alor Gajah. After that, the current network will be enhanced by adding wireless network on it and then being simulated to see the effect of the new design compared to the current network. The expected output of this project is the simulation results which include delay, throughput and utilization of both network designs. Rapid Application Development was chosen as the methodology for this project because this project was developed to respond to the need to deliver the system immediately. The software requirement on this project is OPNET Modeler for simulation and analysis. This project will benefit both parties as it make accessing Internet at UiTM campus Alor Gajah much easier.

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ABSTRAK

Projek ini adalah tentang pelaksanaan rangkaian tanpa wayar di Universiti Teknologi Mara (UiTM) kampus Alor Gajah dengan menggunakan Opnet Modeler (*Implementating Wireless Network at Universiti Teknologi Mara (UiTM) campus Alor Gajah Using Opnet Modeler*). Dokumen ini merekodkan segala proses pembangunan atau simulasi untuk melaksanakan rangkaian tanpa wayar di UiTM kampus Alor Gajah. Rangkaian sedia ada di kampus ini adalah rangkaian berwayar yang menyukarkan pelajar untuk mengakses rangkaian dan Internet. Masalah ini berlaku terutamanya apabila pelajar ingin mengakses rangkaian atau Internet selepas waktu pejabat disebabkan makmal-makmal telah ditutup pada waktu tersebut. Selain daripada itu, staf juga menghadapi masalah jika mereka ingin mengakses rangkaian atau Internet di luar pejabat mereka. Masalah lain pada rangkaian berwayar sedia ada adalah ianya sukar untuk dikembangkan kerana melibatkan kos yang tinggi seperti masa dan wang. Penyelesaian untuk masalah ini adalah dengan membuat simulasi dan menganalisis prestasi rangkaian sedia ada di kampus ini. Selepas itu, rangkaian sedia ada akan dibuat penambahbaikan dengan menambah rangkaian tanpa wayar padanya dan kemudian dibuat simulasi untuk melihat kesannya berbanding rangkaian sedia ada. Keputusan yang dijangkakan daripada projek ini adalah keputusan simulasi yang merangkumi *delay, throughput* dan *utilization* untuk kedua-dua rekabentuk rangkaian. Projek ini akan menggunakan *Rapid Application Development* kerana projek ini perlu disiapkan dengan secepat mungkin. Perisian Opnet Modeler akan digunakan untuk simulasi dan analisis. Projek ini akan menguntungkan kedua-dua belah pihak di mana akses internet di UiTM campus Alor Gajah akan lebih memudahkan.

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CHAPTER 1

INTRODUCTION

1.1 Project Background

This project is to implement wireless network at Universiti Teknologi Mara (UiTM) campus Alor Gajah through simulation and it consists of be a network design of the new network (wireless) and merge with the existing network design. The implementation and testing for this project will cover for certain area like hostel area, cafeteria and library. These include simulation for certain data or performance. UiTM campus Alor Gajah is one of the UiTM campuses in Malaysia. So the target user of this project is student and staff on this campus to facilitate the student and staff to using Internet at their campus area.

The current network that exists in UiTM campus Alor Gajah is all wired network. This mean the staff and student connect to each other by unshielded twisted pair cable. This project will benefit the student and staff more as their just need to have laptop with the wireless card to access to the network or Internet within their campus area. The additional network design needed as new network device added to the current network. As the current network exists, the implementation will need to be setup without disturbing existing network especially at the peak hour of usage.

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1.2 Problem Statement

This project is about implementation wireless at UiTM campus Alor Gajah in the existing wired network due to some problems. The major problem is inconvenience student to access Internet every time at their campus area. As a student, there is need to access the Internet when doing assignment or project to do some research. The current network is all wired and the availability of the accessing the Internet is limited as the computer lab that provide the Internet access only available for certain period. Mostly the student prefer to access Internet during night as their normally start doing their work at night but the lab only open during day time only. Another problem that normally occurs is when there is an event held at the building that does not have the network and there is need to access the network or the Internet. It will be costly and waste of time if all the time if there is an event, their need to pull the cable from the existing network. It also makes the visitor of the event difficult to access the Internet when needed. The wired network has a limited access as the wired is depending on the switch that place and the cable.

The second problem to implement wireless at this place is difficulty expandability with using wired network. In terms of expandability, the wired network can be say has limited expandability. This is because the wired network needs to deploy more switches and more cabling need to be lay to support increasing user. As the wireless network, the expandability is wide. It can be done by increase the total Internet Protocol (IP) address it can support or just change the antenna to the more powerful antenna.

Problem that less important is low mobility when students and staff want used Internet at everywhere within their campus area. Without the wireless networks, students cannot access the Internet outside their normal work environment.

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1.3 Objective

- To analyze existing network design in UiTM campus Alor Gajah.

This is important as before the merging of the new network and existing network. The analysis will provide important data to produce good result for the merging.

- To enhance the network design in UiTM campus Alor Gajah through simulation.

New network design will be needed as before any implementation of the wireless network. This enhanced network design will give how the network needs to be implementing either in physical design or in the logical design. The analysis also needed to determine the best location and place to put the access point.

- Simulate the current and new network for UiTM campus Alor Gajah.

The simulation on the current and new wireless network need to be done before any implementation can be made. The simulation will help on the implementation of the wireless network. The data needed in this simulation is the probability of any problem that can occur during the implementation and the performance of the network. This is important as the data will show the possibility of problem and the performance of network. With this data, the implementation of wireless network can be decided whether it can be done or not.

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1.4 Scope

- Target user – students UiTM campus Alor Gajah

The main target user of the project is the students of UiTM campus Alor Gajah besides lecturer and staff. The students will use the new wireless network as alternative medium to access the network and Internet. As before the only way to access the network and Internet is using wired network. This will give the user second choice to access the network and Internet.

- UiTM campus Alor Gajah network

On this project, UiTM campus Alor Gajah wants to provide a hotspot to their user. This made by providing the wireless access to the user as the user sometimes change their location to access or using nomad style accessing. The adding of wireless network to the existing network will make this possible. This also expands the network in UiTM campus Alor Gajah as there are 2 type of network operating in the campus.

- Analysis – simulation for existing network and new wireless network.

The simulation is done to check any problem that can occur in the wireless network. This can be done by using Opnet Modeler or other simulation software to simulate the environment at UiTM campus Alor Gajah. There will be various type of parameter will be set to make the analysis such as delay, throughput and utilization. Using the result from the simulation, conclusion can be made either the wireless network can be implement without major interruption from the existing network.

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- No security features.

The security features are not implemented in this project. As the wireless network will be simulate and implement, there will be need on security features but will not covered in the security features in wireless for this project. The focus of this project is to simulate and providing solution on adding wireless network at UiTM campus Alor Gajah without touching any on the wireless security features.

1.5 Project Signification

In this project, the student and the staff of UiTM campus Alor Gajah will get the most of the benefit. This is because the original purpose of doing this project is to provide a hotspot at this place to access the Internet or the network resources. As an example, student can access the Internet while their eating at the cafeteria if the cafeteria is installed with the wireless network or their can just access the network in their room at their hostel. As for the staff, the benefit is just like the student. As the result, the main objective of UiTM campus Alor Gajah's administration to provide the easy to access the network can be achieved.

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1.6 Expected Output

The expected output in this project is the result and analysis of the simulation has been made. The simulation result is to check any problem will occur on the wireless network so the action to avoid or minimized the problem can be made. Another output is the network design of the wireless network at UiTM campus Alor Gajah. The new network design of the network UiTM campus Alor Gajah is one of the outputs that will be produce in this project. The network design will shown the physical and logical design on the new network at UiTM campus Alor Gajah that been made. The last expected output is the data on analysis of the existing network. The data actually will be used to design the new network and the placement of the hardware.

1.7 Conclusion

As a conclusion, the purpose of this project is to do an analysis of the existing network design, to make a simulation to check any problem probability that can occur and the creating of new network design also the implementation of the wireless network. As the UiTM campus Alor Gajah want to provide wireless network to their student and staff as a hotspot, the case study will benefit the UiTM campus Alor Gajah and many people.

Through out this chapter, the objective, scope, project significant and expected output have been defined. The next chapter will discuss on literature review, fact and finding, project requirement, milestone and methodology that will be used on this project as well as the project step, technology and many more will be described.

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CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

A literature review is a body of text that aims to review the critical points of current knowledge on a particular topic. Most often associated with science-oriented literature, such as a thesis, the literature review usually precedes a research proposal, methodology and results section. Its ultimate goal is to bring the reader up to date with current literature on a topic and forms the basis for another goal, such as the justification for future research in the area. A good literature review is characterized by: a logical flow of ideas; current and relevant references with consistent, appropriate referencing style; proper use of terminology and an unbiased and comprehensive view of the previous research on the topic.

The methodology set for a project presents the complete breakdown structure for project analysis. It tells which activities and tasks are needed for the successful completion of a project. Also, it helps to know the way to complete any activity involved in the project. It tells who is supposed to complete it, how and when. It also includes templates to help you with the completion of every project efficiently and quickly. The methodology provides you with a road map to deliver a successful project. This helps to be on the right track by adoption of processes to monitor the delivery.

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Thus, methodology is everything about the project. The difference in methodologies can be noticed by the criticality, team size and optimized quality. Methodology differs for different projects and there are different biases of different authors, which are based on their experiences and principles. The important variables that determine the selection of a methodology are project priorities, criticality of the project and distribution. Therefore with have used applicable methodology project it can help, manage and maintain their system development.

2.2 Literature Review

2.2.1 Domain

Every project has its own domain. In this project, the domain for the project is networking concept and simulation. To be specific, these projects focus on wireless simulation. That mean, this project will have output of simulation on how to implement the wireless networking. Also the simulation will cover the problem that can occur in implementing wireless and can be as references to implementing the wireless network.

2.2.2 Keyword

2.2.2.1 Implementing Wireless

Peter Rysavy (1998) stated that 'Wireless communications allows us to live and work in ways never before possible, offering us flexibility, mobility and a link to our environment that is almost magical. Anybody that uses cordless or cellular phones, pagers, TV remote controls, keyless car entry, or garage door openers will readily agree.

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While telecommunications and computer networking have vastly increased our options on how and what we communicate, they have physically constrained us by leashing us with a physical wire to the network. But wireless communications brings us back to a form of communications that is inherently natural to us. As creatures we do not like to be physically constrained. Human speech itself, despite its limited range, is wireless.' This means that this wireless network is so useful to mankind because everyone could surf the internet or can control something wherever they stay.

According to Nettech System Incorporated (1999), it state that 'Implementing a wireless solution represents a significant challenge for most businesses because they have not yet acquired the knowledge and expertise necessary to understand the challenges at hand or have the technology available to overcome those challenges. Developing a wireless solution that will succeed in the field requires more than simply putting a desktop application on a mobile computer. Wireless computing is an entirely new paradigm of computing and communication. Unlike a traditional LAN environment, a wireless solution needs to contend with the harshest of environments-- from varying coverage conditions to extreme weather conditions to narrower bandwidth to higher latencies-- making designing a good solution challenging. Wireless solutions also need to address the unique needs of mobile workers. On the road, mobile workers only want access to specific information, and they don't want to surf for it or take a long time booting up a computer. Mobile users also want to use different devices and have information formatted appropriately for each. However, they do need data to be synchronized between devices so they don't have to spend a lot of time managing their data.' This means that every aspect needs to be done properly because any simple mistake can provide to disaster to the whole network.

In 1997, when the Institute of Electrical and Electronic Engineering (IEEE) created the first WLAN standard they called it 802.11. Because it could only support a maximum bandwidth of 2Mbps – far too slow for most of today's application – ordinary

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802.11 wireless products are no longer being manufactured. The next wireless information was 802.11b, which support bandwidth of up to 11 Mbps, followed by the creation of 802.11g, which supports bandwidth up to 125Mbps and signals in a regulated 5GHz range. Synopsis of the three primary 802.11 standard:

i) **802.11b:** This technology support bandwidth up to 11Mbps, which is comparable to the speed of traditional Ethernets. 802.11 b uses the same 2.4 GHz radio signaling as an original 802.11 standard. Because it is an unregulated frequency, 802.11 b devices run the risk of incurring interference from appliances that use the same 2.4 GHz range, such as microwaves and cordless phones. However, if you install 802.11 b devices out of range of other appliances, you can avoid the interference. Some manufacturers prefer using unregulated frequencies, such as 802.11 b to lower their production costs. On the negative side, 802.11 b is relatively slow and supports fewer simultaneous users.

ii) **802.11a** (not recommended for most wireless users): IEEE created 802.11a at the sometime at made 802.11b. 802.11a supports bandwidth up to 54 Mbps and signals in a regulated 5 GHz range. This higher frequency limits the range of 802.11a in comparison to 802.11b and due to this higher cost it's used primarily in the business sector rather than in homes. 802.11a's higher frequency also causes its signal to have difficulty penetrating walls and other obstructions. This is because they utilize different frequencies, 802.11a and 802.11b devices are incompatible with each other.

iii) **802.11g:** This technology supports of up to 125 Mbps, uses the 2.4 GHz frequency and is backwards compatible with 802.11b devices. 802.11g supports more simultaneous users, offers the best signal range and is not easily obstructed.

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