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JILID 1

MIGRATION OF WIRED NETWORK TO WIRELESS NETWORK TECHNOLOGIES

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ABSTRACT

Wireless technologies allow us to access an Internet, e-mail, printer, etc without to pull a cable through bricks wall or ceiling and across the office or campus to gain the data resources. Today, wireless devices from Palm Pilot to laptop computers to cellular phone with Internet capabilities are exploding in popularity. Wireless LANs use the 802.11 standard to move data through the air at maximum speed of about 11Mbps. Why do we need to migrate from wired network to wireless network? Wireless network offer at least four productivities such as mobility where users can access to real-time information anywhere at anytime in their organization, easy installation and eliminate the need to pull cable, reduced cost of installation which lower investments required for wireless network hardware and long-term cost benefits and wireless LAN able to support variety of network topologies and configurations are easily changed from peer-to-peer network to a small network. Many applications are made possible through the flexibility of wireless network such as universities, retail, health care and manufacturing. This paper will look into possibilities of implementing a wireless LANs network in FSKTM, UM.

Keywords: *Wireless LAN, 802.11 Standard and Wireless Applications*

INTRODUCTION

A wireless local area network (LAN) is a flexible data communications system implemented as an extension to, or as an alternative for a wired LAN. By using radio frequency (RF) technology, wireless LANs transmit and receive data over the air, minimizing the need for wired connections. Thus, wireless LANs combine data connectivity with user mobility. With wireless LANs, users can access shared information without looking for a place to plug in, and network managers can set up or augment networks without installing or moving wires.

Wireless LAN is a technology that is location-specific and connects a group of computers to network resources. The access points and client adapters that create a Wireless LAN can extend a wired network or link computers to create a separate network. Wireless connections all use some form of radio waves, called microwaves at the higher end, to carry data from a transmitter to a receiver. All wireless technologies use standard computer networking technology over a wireless medium; airwaves. Because signals are transmitted across space, there is no cable between network access points and therefore no monthly line charges for leasing a physical wire.

802.11 Standard   IEEE proposed a standard for wireless LANs (IEEE 802.11) two different ways to configure a network; Extended Service Set (ESS) and Basic Service Set (BSS) [5]. In the ESS is also called an 'Ad-Hoc' network, there is no structure to the network; there is no fixed point and usually every node is able to communicate with every other node which are the wireless stations connect to a wired network through an one or more access points. The access point is a bridge between a wired network and a wireless network. The second type of network is the BSS and also called an infrastructure that completely wireless network and is normally built up of PCs or notebooks with a wireless adapter card.

IEEE 802.11 Layers   The IEEE 802.11 standard specifies physical (PHY) and medium access control (MAC) layers of the network. The PHY layer handles transmission of data between nodes of the 2.4 GHz ISM band with both frequency-hopping and direct-sequence spread-spectrum at 1 Mbps with optional 2 Mbps throughput [2]. At the data link layer, 802.11 specify a MAC protocol based on carrier-sense-multiple-access with collision avoidance (CSMA/CA) [3]. In this protocol, when a node receives a packet to be transmitted, it first listens to ensure no other node is transmitting. If the channel is clear, it then transmits the packet, otherwise it will chooses a random time for a node to wait until it is allowed to transmit its packet.

Wireless LAN Technology IEEE 802.11 supports three basic topologies for Wireless LANs; which are the Independent Basic Service Set (IBSS), the Basic Service Set (BSS) and the Extended Service Set (ESS) [1]. IBSS configuration is analogous to a peer-to-peer network which is no single node is required to function as a server. Without an access point, users can build wireless ad hoc peer-to-peer networks for anytime and anywhere as illustrated in Figure 1. Generally, IBSS implementations cover a limited area and are not connected to any large network.

Figure 1. Peer-to-Peer Wireless Network

BSS configurations rely on an access point (AP) that acts as the logical server for a single wireless LAN cell or channel [6]. A cell is defined as the coverage area of one access point. An access point typically has an Ethernet port for connection to the wired network and an antenna for wireless communication. By communicating via an access point, computer users can take advantage to share file between two or more wireless equipment. Figure 2 illustrated BSS configurations.

Figure 2. BSS Configurations
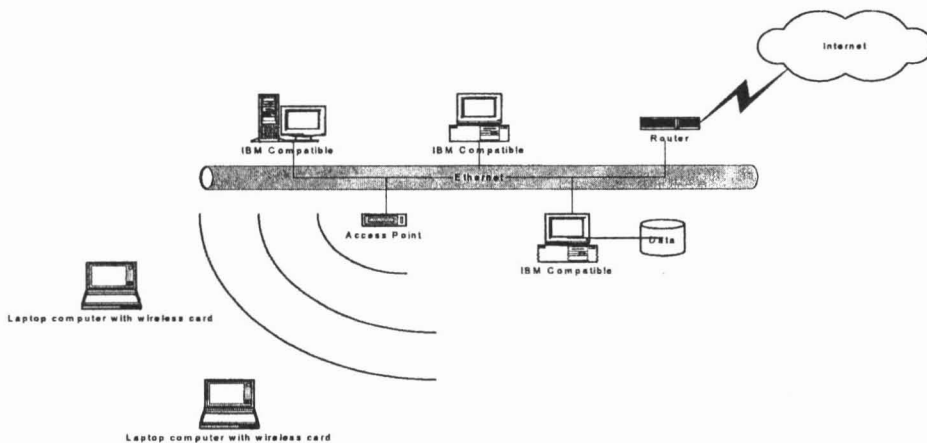
MATERIALS AND METHODS

The Figure 3 below is a network layout of Faculty of Science Computer and Information Technology (FSKTM) in University of Malaya. All the servers and PCs are connected via Local Area Network (LAN) through fiber optic backbone. The FSKTM's LANs are able to carry 1000Mbps of data to support the high data speed requirements including the Internet access via a JARING leased line. Due to the increase of FSKTM population, which will almost 10,000 staffs and students by 2005, it is expected that the number of applications on the LAN and the size of databases will be increased. If this scenario is not being addressed properly, it will be a major problem to the FSKTM network if the capacity of network is not upgraded to suit the major increase as mentioned above. As the result the accessing time is expected to be slow due to the bottleneck of the network.

Figure 3. FSKTM Network Layout
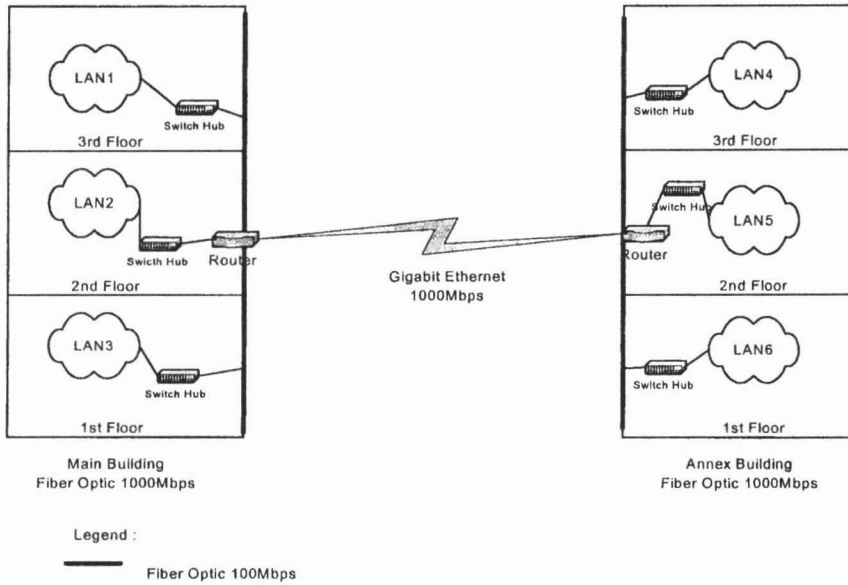
This paper is of interest to plan an implementation of wireless network in FSKTM environment. However, there are several alternative solutions that need to be considered to overcome the problems. FSKTM will continue with the existing wired network infrastructure and installing an access point fixed to the walls inside the buildings. The access point will cover the faculty in a single network, allowing users to roam across the access zones. The wireless connection will be about 200 times as fast as a typical modem, although not as fast as an Ethernet connection [4]. Wireless connections can be slow down when people are sharing the same access point, but adding more access point in the buildings can solve this. Figure 4 illustrated a proposed wireless network in FSKTM.

The wireless network environment that will be proposed at FSKTM, University of Malaya, is not to replace the existing network infrastructure but it is another way to have a better performance of network environment as a higher learning institution. The Figure 4 below illustrated the proposed FSKTM's wireless network. From the network diagram, each floor of a main building and Annex building will be installed an access point connected to the existing network connection. Through this connection, the access points are able to communicate with all of the devices connected to the FSKTM network.

Figure 4. Proposed FSKTM Wireless Network Environment
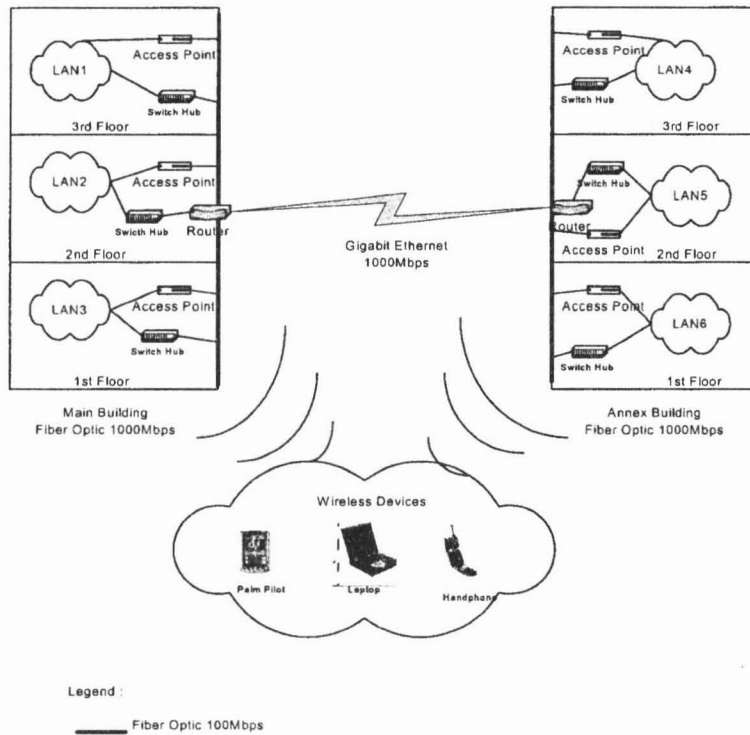
DISCUSSION

Wireless LAN applications offer computer users the reliable and high performance connectivity of wired LANs with flexibility, mobility and affordability of wireless. Wireless LAN networking is ideal for school and business environments. Wired network is costly and difficult to be implement but needs to be quickly set-up and configured. With wireless network there is no need to pull extra wires and break through walls, a LAN connection or temporary network can be established anywhere within an office, building or campus environment and mobile computer users able to access to email, the Internet connection, library databases and more. Wireless network allows freedom to organization to set up workspaces, classrooms and labs anywhere and redesign those spaces without worrying about where the computer outlets are. There are many applications are made possible through the wireless LANs. Doctors and nurses in hospitals can be more productive by using handheld or notebook computers to deliver patient information instantly. Students can access the Internet to consult the catalog of the library. Trade show and branch office workers minimize setup requirements by installing pre-configured wireless LANs needing no local MIS support. Senior executives in meeting can make quick decisions because they have real-time information at their fingertips, etc.

Today, wireless LANs are becoming more widely recognized as general-purpose connectivity for a broad range of business customers. Wireless LAN systems can provide users to real-time information anywhere in their organizations and the most important is wireless LAN can be configured in a variety of topologies to meet the needs of applications and installations. The key driven to this technology is the rapidly rising number of people who work at home or in mobile office connected virtually to the computer networks.

FSKTM is experimenting with wireless technology for its staffs and students. However this experiment is not completed yet and the researchers are working on the project to provide more computing environment as allowing the FSKTM residents to allocate computing resources more wisely.

REFERENCES

[1]   Angela Champness, *Understanding the benefits of IEEE 802.11*, 2002, Jan, 3. Available [Online], http://www.steinkuehler.de/wavelan_802_11_Benefits.htm.

[2]   Daniel L. Lough, T. Keith Blankenship, Kevin J. Krizman, *A Short Tutorial on Wireless LANs and IEEE 802.11.*   Available [Online], http://www.computer.org/students/looking/summer97/ieee802.htm, 2002, March, 20

[3]   M. Ciampa, *Guide to Designing and Implementing Wireless LANs*, Course Technology, Thomson Learning, 2001.

[4]   S. Carlson, *Drexel U. Will Offer Wireless Network Connections Across Campus*, Information Technology, 2000, June, 12.   Available [Online], http://chronicle.com/free/2000/06/2000061201t.htm

[5]   http://www.mouse.demon.nl/ckp/lanwan/iee80211.htm, *Wireless LAN*, 2001, October, 13.

[6]   http://www.wirelesslan.com/wireless/ What is a Wireless LAN?, 2001, July, 10