

REQUIREMENT ANALYSIS FOR LAN IMPLEMENTATION IN KUSZA

A thesis submitted to the Faculty of Information Technology in partial
fulfillment of the requirements for the degree
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By

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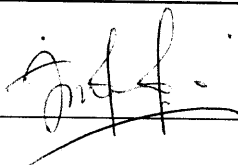
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ABSTRACT

The implementation of LAN technologies in universities and colleges campus area has been applied a few decades ago. Communications networks are core infrastructure for higher education, providing an essential foundation for all electronic teaching, research, library, and administrative services. LAN technology has helped to simplify networking by enabling multiple computer users to simultaneously share resources in a home or business, and is the perfect way to improve data connectivity. Hence, this project is to study the requirement analysis of LAN implementation in Kolej Ugama Sultan Zainal Abidin (KUSZA) concentrating on the new academic buildings which include the technology of the LAN, user community, and the applications for the users to access the campus network. This project also compares the technology between the wired-LAN and wireless LAN that suitable to the KUSZA environment.

ABSTRAK

Sejak beberapa dekad yang lalu, teknologi Rangkaian Kawasan Setempat atau *Local Area Network* (LAN) telah digunapakai di kampus universiti dan juga kolej. Rangkaian komunikasi merupakan teras infrastruktur kepada institusi pengajian tinggi yang merupakan asas penting untuk pengajaran, kajian, system perpustakaan dan perkhidmatan pentadbiran yang berasaskan komputer. Teknologi LAN telah menolong memudahkan sistem rangkaian komputer, di mana ianya membolehkan para pengguna komputer untuk berkongsi sumber samada di rumah atau untuk menguruskan perniagaan, dan ianya juga merupakan cara yang sempurna untuk memperbaiki perhubungan antara data. Oleh itu, projek ini dibuat untuk mengkaji keperluan analisis pelaksanaan LAN di Kolej Ugama Sultan Zainal Abidin (KUSZA) terutamanya ke atas bangunan akademik yang baru dibina di mana termasuklah akan penggunaan teknologi LAN, komuniti pengguna dan juga aplikasinya oleh pengguna untuk berhubung dengan rangkaian kampus. Projek ini juga akan membandingkan teknologi antara LAN berwayar dan LAN tanpa wayar yang bersesuaian dengan keadaan persekitaran KUSZA.

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CHAPTER 1

INTRODUCTION

A local area network (LAN) is usually privately owned and links the devices in a single office, building or campus (Forouzan, 2003). LAN is fast becoming indispensable for small and medium sized business for sharing information, applications and resources within a restricted geographical area. The linked computer and related equipments maybe anything from full-scale mainframe computing system to small desk top office workstations, terminals, peripherals, and etc. LANs are distinguished from other kinds of networks by three characteristics which are the size, the transmission technology, and the topology (Tanenbaum, 1996).

The implementation of LAN technologies in universities and colleges campus area has been applied a few decades ago. Communications networks are core infrastructure for higher education, providing an essential foundation for all electronic teaching, research, library, and administrative services. LAN technology has helped to simplify networking by enabling multiple computer users to simultaneously share resources in a home or business, and is the perfect way to improve data connectivity.

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BIBLIOGRAPHY

- Aber, R. (2003). A closer Look at Wireless LAN technologies. White Paper. Retrieved from http://www.cisco.com/warp/public/779/smbiz/community/ent_closer_wlan.html on April 25th, 2004.
- Allison R. (2001). Basic Network Design Methodology. Retrieved on March 15, 2004, from http://www.lucent.com/livlink/176525_Whitepaper.pdf
- Brown, K. S. and Orman, N. (2001). Wireless Standards Wars, Battle could Slow Goal of Seamless Connections. Retrieved from <http://www.bizjournals.com/sanjose/stories/2001/06/04/story7.html> on April 28th, 2004.
- Curtis G. and Cobham D. (2002). Business Information Systems: Analysis, Design and Practice. (4th ed.). Pearson Education Limited. Edinburgh.
- Dirvin, R. A. & Miller, A. R. (1986). The {MC68824} Token Bus Controller: VLSI for the factory LAN. *IEEE Micro (USA)*. Vol: 6(3), 15-25.
- Elmendorf, L. (2001). Wireless Networks: Panacea or the Next Hacker's Playground?. *GSEC Practical Assignment*. Retrieved from <http://www.sans.org/> on May 08th, 2004.
- Forouzan, B. A. (2003). Local Area Networks. McGraw-Hill Companies.
- Gandy M. (1986). Choosing a Local Area Network. NCC Publication. England.
- Geier, J. (2001). Wireless LANs, Second Edition. Sams Publishing. USA. Retrieved from <http://www.vicomsoft.com/knowledge/reference/wireless1.html>. on April 24th, 2004.
- J. Kurose, J. & Ross, K. (2002). Computer Networking: A Top-Down Approach Featuring the Internet. (2nd ed.). Addison-Wesley.
- Kane, J. & Yen, D. C. (March 2002). Breaking the Barriers of Connectivity: An Analysis of the Wireless LAN. *Computer Standards & Interfaces*. Vol: 24(1), 5-20.
- Kardach, J. (2000). Bluetooth Overview. Retrieved from http://cnscenter.future.co.kr/resource/hot-topic/wpan/00184r0P802-15_TG1-Bluetooth_IEEE- on May 08th, 2004.
- Lenzini, L. & Mingozi, E. (2001). Performance evaluation of capacity request and allocation mechanisms for HiperLAN2 wireless LANs. *Computer Networks*. Vol: 37(1), 5-15.

- Madron, T. W. (1994). *Local Area Networks: New Technologies, Emerging Standards* (3rd ed.). John Wiley & Sons, Inc. Canada.
- Mahan, R. E. (2001). *Security in Wireless Networks. Level One Security: Essentials Practical Assignment*. Retrieved from <http://www.sans.org/> on May 08th, 2004.
- Martin J. (1989). *Local Area Networks: Architectures and Implementations*. The ARBEN Group, Inc. United State of America.
- Mikkonen, J. & Nenonen, L. (1998). Wireless ATM MAC performance evaluation, a case study: HIPERLAN type 1 vs. modified MDR, *Mobile Networks and Applications*. Vol: 3(3), 247-259.
- Netgear. (2003). *Ten Easy Steps for Wireless LAN Security. Netgear Whitepaper*. Retrieved from <http://www.netgear.com> on May 05th, 2004.
- Oppenheimer, P. (2001). *Top-down Network Design: A System Analysis Approach to Enterprise Network Design*. Cisco System, Inc. US.
- Ow, E. T. (2001). IEEE 802.11b Wireless LAN: Security Risks. Retrieved from <http://www.sans.org/> on May 08th, 2004.
- Poole, J.B. (1998). *Education for An Information Ages: Teaching in Computerized Classroom*. United State of America: McGraw Hill.
- Quinn, L. B. (1997). *Fast Ethernet*. John Wiley and Son, Inc. Canada.
- Ratnesar R. (1998). Learning by Laptop. *Time*, 115. 2. (March, 2) Retrieved from <http://www.netgear.com> on May 05th, 2004.
- Rugg T. (1992). *LANTastic*. McGraw-Hill. United State of America
- Stargel, D. (2001). Wireless LANs and 802.1x. *As part of the Information Security Reading Room*. Retrieved from <http://www.sans.org/> on May 08th, 2004.
- Tanenbaum, A. S. (1996). *Computer Network*. Prentice Hall. New Jersey.
- Vicomsoft, (2002). *Wireless Networking Q & A. Whitepaper*. Retrieved from <http://www.vicomsoft.com/knowledge/reference/wireless1.html>. on April 24th, 2004.
- Williams, L. (2001). Videoconferencing Across the Curriculum. In Leask, M. (Eds.). *Issues in Teaching Using ICT*. New York: RoutledgeFalmer. 117-129.
- WLANA. (2001). Retrieved from <http://www.wlana.org/> on May 05th, 2004.