

**DEVELOPING A PC CONTROLLER APPLICATION USING
BLUETOOTH TECHNOLOGY**

Malek Ali Ahmad Fehaid

UNIVERSITI UTARA MALAYSIA

2008

PC
2008

**DEVELOPING A PC CONTROLLER APPLICATION USING
BLUETOOTH TECHNOLOGY**

A thesis submitted to the Graduate School in partial fulfillment of the
requirements for the degree Master of Science (Information Technology)
Universiti Utara Malaysia

By

Malek Ali Ahmad Fehaid (800300)



KOLEJ SASTERA DAN SAINS
(College of Arts and Sciences)
Universiti Utara Malaysia

PERAKUAN KERJA KERTAS PROJEK
(Certificate of Project Paper)

Saya, yang bertandatangan, memperakukan bahawa
(I, the undersigned, certify that)

MALEK ALI AHMAD FEHAID
(800300)

calon untuk Ijazah
(candidate for the degree of) **MSc. (Information Technology)**

telah mengemukakan kertas projek yang bertajuk
(has presented his/her project paper of the following title)

DEVELOPING A PC CONTROLLER APPLICATION
USING BLUETOOTH TECHNOLOGY

seperti yang tercatat di muka surat tajuk dan kulit kertas projek
(as it appears on the title page and front cover of project paper)

bahawa kertas projek tersebut boleh diterima dari segi bentuk serta kandungan
dan meliputi bidang ilmu dengan memuaskan.

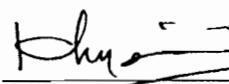
(that the project paper acceptable in form and content, and that a satisfactory
knowledge of the field is covered by the project paper).

Nama Penyelia Utama
(Name of Main Supervisor) **ASSOC. PROF. DR. WAN ROZAINI SHEIK OSMAN**

Tandatangan
(Signature) :  Tarikh (Date) : 11/11/08

ASSOC. PROF. DR. WAN ROZAINI SHEIK OSMAN
Director
ITU-UUM ASP COE
For Rural ICT Development
Information Technology Building
Universiti Utara Malaysia

Nama Penyelia Kedua
(Name of 2nd Supervisor): **MR. KHUZAIRI MOHD ZAINI**

Tandatangan
(Signature) :  Tarikh (Date) : 11/11/2008

**GRADUATE SCHOOL
UNIVERSITI UTARA MALAYSIA**

PERMISSION TO USE

In presenting this thesis in partial fulfillment of the requirements for a postgraduate degree from the Universiti Utara Malaysia, I agree that the University Library may make it freely available for inspection. I further agree that permission for copying of this thesis in any manner in whole or in part, for scholarly purposes may be granted by my supervisor(s) or in their absence by the Dean of the Graduate School. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to Universiti Utara Malaysia for any scholarly use which may be made of any material from my thesis.

Requests for permission to copy or to make other use of materials in this thesis, in whole or in part should be addressed to:

Dean of Graduate School

Universiti Utara Malaysia

06010 UUM Sintok

Kedah Darul Aman.

ABSTRACT

Wireless communications have become more common and reliable to use in many applications, and is still developing. There are many types of wireless network connection, and one of these is Bluetooth technology. The Bluetooth technology supports many features that replace wires with low cost and high speed transmission. It is difficult to manage the networked PCs manually; the best solution for this problem is an easier way to manage a network remotely. *PC Controller* is a program to control the network by using messages through Bluetooth technology. This study concerns primarily about how to design and develop a *PC Controller* Application.

ABSTRAK

Komunikasi tanpa wayar semakin menjadi suatu kebiasaan dan boleh dipercayai untuk digunakan dalam banyak aplikasi, dan ianya masih dalam proses pembangunan. Terdapat banyak jenis sistem perhubungan tanpa wayar, dan salah satu daripadanya ialah teknologi “Bluetooth”. Teknologi “Bluetooth” mampu untuk melaksanakan pelbagai perkara yang menggantikan wayar dengan kos yang rendah dan kelajuan pemindahan maklumat yang tinggi. Ianya adalah suatu yang sukar untuk menguruskan PC yang telah disistemkan secara manual; penyelesaian yang terbaik untuk masalah ini adalah suatu cara yang lebih mudah untuk menguruskan suatu sistem adalah secara kawalan jarak jauh. Pengawal PC merupakan suatu program yang mengawal sistem dengan menggunakan maklumat melalui teknologi “Bluetooth”. Kajian ini mengambil berat terutamanya tentang bagaimana untuk merangka dan membina sebuah pengaplikasian kawalan PC.

ACKNOWLEDGEMENT

Firstly I would like to state my sincere appreciation to my supervisors Assoc. Prof. Dr. Wan Rozaini Bt Sheik Osman, and Mr. Khuzairi Mohd Zaini for their patient guidance, encouragement, understanding, and excellent advice throughout this study.

I am also thankful to all my colleagues and friends at UUM, especially from the faculty of information technology for their help and support, with whom I shared pleasant times.

I would like to dedicate this work to my father and to the memory of my mother

Finally, I am deeply and forever indebted to the people in my life who touched my heart and gave me strength to move forward to something better. The people who inspire me to breathe, who encourage me to understand who I am, and who believe in me when no one else did. I am deeply devoted to my adoring fiancé, for the patience and confidence she had in me, throughout the times I was away from her.

TABLE OF CONTENTS

	Page
PERMISSION TO USE	i
ABSTRACT	ii
ABSTRAK	iii
ACKNOWLEDGMENTS	iv
TABLE OF CONTENTS	v
LIST OF FIGURES	viii
LIST OF TABLES	ix
LIST OF CHARTS	x
CHAPTER ONE: INTRODUCTION	
1.1 Introduction	1
1.2 Problem Statement	3
1.3 Research Questions:	3
1.4 Objectives	4
1.5 Scope	4
1.6 Significance	5
1.7 Report Structure	5
1.8 Summary	6
CHAPTER TWO: LITERATURE REVIEW	
2.1 Introduction	7
2.2 Implementation and Design of PC Control System Using Mobile-Based Database	7
2.2.1 System Overview	8
2.2.2 The Management System	10
2.2.3 WEB	10
2.2.4 Mobile	10
2.2.5 Database	11
2.3 PC Remote Shutdown Pro 5.0	11
2.4 Personal Area Networking (PAN)	12
2.5 Wireless Communication	13
2.5.1 Current Usage	13
2.5.2 Wireless Standards	14
2.5.2.1 IEEE 802.11 (Wi-Fi)	14
2.5.2.2 IrDA (Infrared Data Association)	15
2.5.2.3 DECT	16
2.5.2.4 DSRC	16
2.6 Comparison of Wireless Technologies	17
2.7 Bluetooth Technology	18
2.7.1 Bluetooth Networks	18
2.7.2 What is Bluetooth?	19
2.7.3 Bluetooth Architecture	20
2.7.4 Bluetooth Protocol	22
2.7.5 How Bluetooth Works	24

2.7.6	Bluetooth Technology Specifications	27
2.7.7	Bluetooth Security	28
2.7.8	Bluetooth Exchange Folder	29
2.7.9	Bluetooth Technology Strengths	30
2.7.10	Bluetooth Technology Weaknesses:	30
2.8	Technology Acceptance Model (TAM)	31
2.9	Summary	32
CHAPTER TREE: RESEARCH METHODOLOGY		
3.1	Introduction	33
3.2	Awareness of the Problem	35
	3.2.1 Interview	35
3.3	Suggestion	36
3.4	Development	36
3.5	Evaluation	37
3.6	Summary	38
CHAPTER FOUR: RESULT		
4.1	Introduction:	39
4.2	PC Controller Specification	39
	4.2.1 Bluetooth Exchange Folder	40
	4.2.2 Lists of Requirements	40
	4.2.2.1 Functional Requirements	40
	4.2.2.2 Software Requirements	41
	4.2.2.3 Hardware Requirements	42
4.3	System Design	42
4.4	Use Case Specifications	43
	4.4.1 Search Bluetooth	43
	4.4.2 Login	44
	4.4.3 Check connection	46
	4.4.4 Shutdown	47
	4.4.5 Logoff	49
	4.4.6 Read File	50
4.5	Sequence Diagrams:	52
	4.5.1 Search Bluetooth	52
	4.5.2 Login	53
	4.5.3 Check Connection	54
	4.5.4 Shutdown	55
	4.5.5 Logoff	56
	4.5.6 Read file	57
4.6	System Framework	58
	4.6.1 PC Controller Users	58
	4.6.2 Bluetooth serves	58
	4.6.3 System infrastructure	58
4.7	PC Controller System Implementation	60
	4.7.1 The Main screen For Server	60
	4.7.2 The Main Screen For Client	61

4.7.3	Mobile Search	61
4.7.4	Mobile Login	63
4.7.5	Server Login	64
4.7.6	The Actions	64
4.7.6.1	Check the Network Connection	65
4.7.6.2	Read Text Document and Views It	67
4.7.6.3	Logoff the computer	70
4.7.6.4	Shutdown the computer	71
4.8	Summary	72
CHAPTER FIVE: RESULT DISCUSSION		
5.1	Introduction	73
5.2	Evaluation Techniques	73
5.3	Evaluation Questionnaire	74
5.4	Data Analysis	74
5.5	Summary	83
CHAPTER SIX: CONCLUSION AND RECOMMENDED FURTHER STUDY		
6.1	Introduction	84
6.2	Contribution of Study	84
6.3	Problems and Limitations	85
6.4	Recommendations and Future Work	86
6.5	Conclusion	87
REFERENCES		
APPENDIX A: QUESTIONNAIRE		
APPENDIX B: COLLABORATION DIAGRAM		
APPENDIX C: THE CODE		
APPENDIX D: CLASS DIAGRAM		
APPENDIX E: PROGRAM USED AND PREVIOUS EXPERIMENT		

LIST OF FIGURES

	Page
Figure 1.1: Using Bluetooth	2
Figure 2.1: PC Control System Overview	8
Figure 2.2: Processing of User and File	9
Figure 2.3: Program operating	9
Figure 2.4: Personal Area Networking	12
Figure 2.5: Wireless Network	14
Figure 2.6: Ad Hoc Network	19
Figure 2.7: Bluetooth Architecture	21
Figure 2.8: Bluetooth Protocol Stack	23
Figure 2.9: Technology Acceptance Model	32
Figure 3.1: General Methodology of Design Research	34
Figure 4.1: Use Case Diagram	42
Figure 4.2: Search Bluetooth Diagram	43
Figure 4.3: Login Diagram	44
Figure 4.4: Check Connection Diagram	46
Figure 4.5: Shutdown Diagram	47
Figure 4.6: Logoff Diagram	49
Figure 4.7: Read File Diagram	50
Figure 4.8: Search Bluetooth Sequence Diagram	52
Figure 4.9: Login Sequence Diagram	53
Figure 4.10: Check Connection Sequence Diagram	54
Figure 4.11: Shutdown Sequence Diagram	55
Figure 4.12: Logoff Sequence Diagram	56
Figure 4.13: Read File Sequence Diagram	57
Figure 4.14: System Framework	59
Figure 4.15: System Main Screen for Server	60
Figure 4.16: System Main Screen for Client	61
Figure 4.17: Search Bluetooth in the Mobile	62
Figure 4.18: Mobile Login	63
Figure 4.19: Server Login	64
Figure 4.20: Mobile Actions.	64
Figure 4.21: Check Network Connection	65
Figure 4.22: Server Check Network Connection	66
Figure 4.23: Client Check Network Connection	67
Figure 4.24: Write Text Message	67
Figure 4.25: Read Text File and Show It in the Server	68
Figure 4.26: Read Text File and Show It in the Client	69
Figure 4.27: Logoff File.	70
Figure 4.28: Shutdown File.	71

LIST OF TABLES

	Page
Table 2.1: Comparison of Wireless Technologies	17
Table 2.2: Classes of Bluetooth wireless technology radio devices	26
Table 4.1: Functional Requirements	41
Table 5.1: Reliability Statistics	74
Table 5.2: Item Statistics	75
Table 5.3: Item Total Statistics	76
Table 5.4: Scale Statistics	76
Table 5.5: Gender	77
Table 5.6: Age	78
Table 5.7: Education	79
Table 5.8: Period	80
Table 5.9: Brand	81
Table 5.10: Descriptive Statistics (System Aspect)	82

LIST OF CHARTS

	Page
Chart 5.1: Gender	77
Chart 5.2: Age	78
Chart 5.3: Education	79
Chart 5.4: Period	80
Chart 5.5: Brand	81
Chart 5.6: System Aspect	83

CHAPTER 1

INTRODUCTION

1.1 Introduction

PC controller is a program to control the computer by using messages through Bluetooth technology. In *PC Controller*, there is a need to support the system with Bluetooth (embedded or USB dongle), to control the computer by sending files with certain names to the computer to take the desired action. The process starts when a user sends a message from his/her mobile phone to a target PC. After the message reaches at the destination it will trigger that specific file, while the *PC Controller* checks the arriving message according to their name and from there action will be taken.

The most common type of network connection is the wireless connection. However, Bluetooth technology supports many features that can replace the traditional wired network connections with a low cost, high speed transmission, low power, secure and robust standard for short range connectivity. The technology has been designed for ease of use, simultaneous voice and data and multi-point communications. It supports a range of 10 m, which can be increased up to 100 m with the use of an amplifier (Rumiana. et al., 2005).

The contents of
the thesis is for
internal user
only

specific files or send it to the students in easy way any time, and he can open his slides, view it, and move between it in easy way by his mobile from faraway distance, and use every application he may be need it in the class.

6.5 Conclusion

Controlling the network using Bluetooth technology provides a solution to control the network without wires, with low cost and high speed manner. Using Bluetooth technology makes the process unlimited because the divisions like walls can be passed and without need to have line of sight between the talking devices.

In *PC controller* application, the user can track all commands that sent to the computer through the rich text which shows all files that reached the folder. The user can send the commands and take the desired action from any device that is supported with Bluetooth technology, because of it is file transfer service, it is possible to use mobile phone or any computer to control the network. The user can guarantee the security, because the user must predefine the device which the user will send the files and give commands through it.

Visual c#.net is easy to use and provide the programmer with huge amount of libraries and built in functions that can use it. In this time it is possible to control the network in easy and interested way, from any computer or any mobile that supported by Bluetooth technology.

REFERENCES

Asahina .J, (2000), Bluetooth Protocol Stack, Troy XCD, Inc, from:
<www.troyxcd.com>

Bluetooth, (Aug, 2006) Basics of Bluetooth wireless technology
<<http://www.bluetooth.com/Bluetooth/Technology/Basics.htm>>

Broadcom Online, (March 2006). Basic Operations: Broadcom Wireless Adapter with Bluetooth® 2.0 + EDR Technology User Guide
<<http://update.broadcom.com/help/basic.htm>>

Burns .G, (2006) Bluetooth Wireless Technology over UWB Demonstrated at Bluetooth SIG All Hands Meeting

Chau .P.Y.K. (1996) “An Empirical Assessment of a Modified Technology Acceptance Model”, *Journal of Management Information Systems*, Vol.13 No.2, pp. 185-204.

Dasgupta .K, (2000), Bluetooth Protocol and Security Architecture Review, from :
<<http://www.cs.utk.edu/~dasgupta/bluetooth/>>

Davis .F .D, (1989). Perceived usefulness, perceived ease of use, and user acceptance. *MIS Quarterly*, 13 (3), 319-340.

Davis .F.D, Bagozzi .R.P, and Warshaw, P.R. (1989): User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management of Science*; Aug 1989; 35, 8; ABI/INFORM Global pg.984

Dideles .M (2004). Bluetooth: A Technical Overview. Retrieved 7 October 2008 from
<<http://www.acm.org/crossroads/xrds9-4/blue.html>>

Dursch .A & Yen .D .C & Shih. D. (December 2003) *Bluetooth technology: an exploratory study of the analysis and implementation frameworks*. Miami University, Oxford and National Yunlin University of Science and Technology, Yunlin, Taiwan.

Haataja and Keijo M.J. 2006. Security in Bluetooth, WLAN and IrDA: a comparison.
<<http://www.cs.uku.fi/research/publications/reports/A-2006-1.pdf>>

Hair. et al. (2006), Mobilkom Austria, 'Geschichte der Mobilkom', Press Release
Mobilkom Austria,. multivariate data analysis. Pearson prentice Hall Canada

Hattar. L, (2006), BLUETOOTH TECHNOLOGY/SECURITY, New York Institute of Technology (NYIT)

HP online, (2004), Hewlett-Packard Development Company, L.P.: Bluetooth wireless technology basics <h10032.www1.hp.com/ctg/Manual/c00186949.pdf>

IEEE online, (2004-Jan. 2005). What is Bluetooth?
<http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=1368913>

Informit Online, (Dec 2003). Introduction to Wireless Communication Systems:
Advanced Techniques for Signal Reception.
<<http://www.informit.com/articles/article.aspx?p=102255>>

Logear, (2000), Discover the world of Bluetooth technology from:
<www.iogear.com/guide/bluetoothguide.pdf>

Jakobsson .M and wetzel .S (2000), Security wireless in Bluetooth, USA

James .K, (2000), Bluetooth Architecture Overview
<http://www.intel.com/technology/itj/q22000/pdf/art_1.pdf>

Jaquier .C & Drapel .K (February 11, 2005), Using Bluetooth to Control a YaMoR Modular Robot, volum 1.0.

John .S, Robert .P, Edward .F, and Vijia .K, (2007), A Technology Review of Smart Sensors With Wireless Networks for Applications in Hazardous Work Environments

Kansal .A, (2002), A Bluetooth Primer

Karygiannis .T& Owens .L, (2002), Wireless Network Security: 802.11, Bluetooth and Handheld Devices

Kothari .R. (1985), Research Methodology: Methods and Techniques, Wiley Eastern, New Delhi

Law .C, Amar K. Mehta and Kai-yeung .S (2001) Performance of a new Bluetooth scatternet formation protocol

Lee, J .H & Bang H .J, (2006), Implementation and Design of PC Control System Using Mobile-Based Database

Magnuslator online, (August 22, 2007), from:<<http://www.magnuslator.com/weblog/>>

Mikhailenko .P .V, (2005). Developing Wireless Bluetooth Applications in J2ME. JDJ Volume 10, Issue <<http://java.sys-con.com/read/47688.htm>>

Misic .J & Misic .V .B & Chan .K .L. (February 2004) Performance of Bluetooth bridge scheduling algorithms, University of Manitoba, Canada & Hong King University of Science and Technology, China.

Nielsen .J. (June 26, 2006). Quantitative Studies: How Many Users to Test. Alertbox Retrieved 18 August, 2008, from
http://www.useit.com/alertbox/quantitative_testing.html

Nokia Online, (April 2003) Bluetooth Technology Overview.
<www.forum.nokia.com>.

Nordbotten .N .A & Aakvaag .N .D. (2004) Methods for service discovery in Bluetooth scatternets. Simula Research Laboratory, Lysaker & AAB Corporate Research, Billingstad, Norway.

Point .J.C, Ulbrich .M and Van .D .P, (2005), BROADBAND in Europe for All: A Multidisciplinary Approach, BREAD

Price .M, (2007) Fundamentals of Wireless Networking. New York: McGraw-hill/Irwin.

Rabaey .J et al., (2000) "PicoRadio Supports Ad Hoc Ultra-Low Power Wireless Networking", IEEE Computer, Vol. 33, No. 7, pp. 42-48.

Rathi .S, (2000), Infrastructure: Bluetooth Protocol Architecture, Dedicated Systems Magazine

Rhodes .C, (2007), Bluetooth Security, from:
www.infosecwriters.com/text_resources/pdf/Bluetooth_CRhodes.pdf

Rodrin .D, (2006), PERSONAL WIRELESS COMMUNICATIONS

Rumiana .K, Ani .B, Vesselin .G, and Ivilin .S.(2005). Application of Wireless Protocols Bluetooth and ZigBee in Telemetry System Development.
<<http://www.iit.bas.bg/PECR/55/30-38.pdf>>

Sahbudin .R .K, Azhar .N, aris .I and Jeet .G .K, (2005), home and office environments using Bluetooth technology

Samppa .R, (1999), Wireless Communications in the Information Society

Sand, K. (1999) Telecommunications Software and Multimedia Laboratory Helsinki University of

Siegemund .F & Rohs .M. (2003) "Rendezvous Layer Protocols for Bluetooth-Enabled Smart Devices", *Personal and Ubiquitous Computing Journal*.

Silva .C (2006), Healthcare Computing & information management: IP DECT-the mobile technology of now. British journal, 23, 6

Softsea online. (2006). PC Remote Shutdown Pro.
http://www.softsea.com/review/PC-Remote-Shutdown_Pro.htm

Song. A, (2001), Piconet II - Ad Hoc Multihop Wireless Networking Pico Communications OnLine, White Paper: Bluetooth and Bluetooth Internet Access Points. <www.picocommunications.com>.

Trap17 Online, (Aug 2006). Bluetooth Technology explained - An Overview of Bluetooth. <http://www.trap17.com/index.php/bluetooth-technology_explained_t40377.html>

Vainio .J .T. 2000. Bluetooth Security.
<http://www.niksula.hut.fi/~jiitv/bluesec.html>.

Vaishnavi .V and Kuechler .B (2004). Design Research in information system..
<http://www.isworld.org/Researchdesign/drisISworld.htm>

Verint,(2007), Nextiva Wireless Intelligent Edge Devices: An Introduction to Wireless Video

Whyte .W, (2005), Safe at Any Speed: Dedicated Short Range Communications (DSRC) and On-road Safety and Security

Zimmermann .L, (2004), Multimedia Applications in Education Conference (MApEC)