WEB-BASED DEVICE CONTROL AND COMMUNICATION VIA PARALLEL PORT

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WEB-BASED DEVICE CONTROL AND COMMUNICATION VIA PARALLEL PORT

MOHD RASHDAN BIN ABD RAHMAN

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

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2010

DECLARATION

I hereby declared that this project report entitled

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is written by me and is my own effort and that no part has been plagiarized

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ABSTRACT

Web-Based Device Control and Communication via Parallel Port is a development project that been create to find a prove and prepare another option for home electrical and electronic appliance users, and engineer to make a control and monitor electric and electronic devices that use the parallel port as the medium of communication. Due to the current market situation, trend and demands, users become more intense in making their life task much easier and simpler. The demands on controlling and monitoring electrical and electronic device have been increased day per day. To make it easier to manage and control, web-based technology has been selected for this project to make it different from other previous research. The unique part of this project is ad-hoc wireless technology has been applied in order to decrease messy wired and complexity setup problem that found from previous project. Also, less cost consumption for this project because of the parallel port usage and the uniqueness characteristic of this port that easy to program and faster in data transmission compare to its rival serial port.

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LIST OF ABBREVIATIONS

PSM		Projek Sarjana Muda
USB		Universal Serial Bus
PC		Personal Computer
CPU		Central Processing Unit
RAM	-	Random Access Memory
PHP		Hypertext Preprocessor
WAN		Wide Area Network
IT		Information Technology
IBM		International Business Machines
SPP		Standard Parallel Port
EPP		Enhanced Parallel Port
ECP		Extended Capabilities Port
D0-D7		Data pins 0 to 7 status
LPT		Line Print Terminal
I/O	-	Input Output
DDNS		Dynamic Domain Name Services
URL		Uniform Resource Locator
TCP/IP		Transmission Control Protocol / Internet Protocol

CHAPTER I

INTRODUCTION

1.1 Project background

The user acceptance for parallel port as a medium of data communication becomes increased day per day in engineering sector especially in electronic industry. There have a great demand for applications that can be remotely control any electric and electronic devices for this new era of information and data communication technology. PC Parallel port is one of the medium that use to communication between 2 nodes, such as in server-clients architecture. There has a major characteristic of parallel port even though the user acceptance for this technology become decreased nowadays, cause of a rise of new medium of communication technology such as firewire and Universal Serial Bus (USB) which is parallel port is able to handle data communication through it simultaneously using multiple line connection data transmission. Cause of this characteristic, its let the PC parallel port able to use for higher-speed peripheral that already been built in the most of electric and electronic devices.

The general idea of this project is to find a prove by doing some research and make the conclusion that the data communications can also be transmit and control through the parallel port. Besides, for this project, there will be an additional feature which is controlling the data communication via web. There was a lot of technology outside there that has been developed on which gave our daily task much faster and simpler. From that current situation and the needs of current market trend, this project has been choosing by mark the engineering sites which familiar with the

electric and electronic devices as the main target users. Web applications as mentioned above that will be use in this project are additional features for users to remotely monitoring the devices via parallel port through web.

Main objective of this project are to give a hand for engineering site to improve and enhance the technology for people's needs in manage electric and electronic devices in their daily life. For this project, there has a device that will be create. The function of this device is as a medium for data communication to electric and electronic devices that communicate through the parallel port. Device that wants to be creating for this project will contain a board that has central processing unit (CPU) which controls the operation of the device and performs its data processing, a RAM and hard disk that will control all the data storage and the main thing, parallel port that need to be programmed to communicate to other devices for engineering use.

For the first steps, as been suggested, PHP and visual C programming will be use as the languages that can change the parallel port function from communicate only to printer, to communicate to any other electric and electronic devices. This device also will act as a web server that can be access from any location via web. Additionally, device will contain wireless adapter to communicate to the Windows 2003 server (act as Access Point) using the Ad-Hoc technology. Windows server here will provide the connection from these devices throughout Wide Area Network (WAN) to let the device to be control and access via web from any location.

To make the technology becomes more simple and easy to use among users, this project decided to use a web based implementation which not only can be access by PC, but also can be access by mobile phone that have a Wi-Fi connections. This technology implementation will let user to access and control the communications remotely from anywhere as long as there have an internet connection.

1.2 Problem Statement

There has several problem previously that been taken as references for this project to be develop. The problem actually came from the current environment of engineering sites that contributed with the data communication and control technology. The problem can be said as common because when we look at this data communication and control technology, the problems or matters is nothing more except to make it more easier to communicate and control among user's and want to make the technology looks more intelligent than before.

For information, there is no projects that been developed before exactly the same with this project and that's why to catch up the exact problems that relate to this project become difficult to find unless the problem's come from other previous research or projects that have similarity with this project. For example, the problems about how data can be easy to send and receive between 2 nodes or others efficient way in finding the best communication and control technology for electric and electronic devices. These 2 common problems has been extract for this project to have a good reference in order to run in smoothly and will have the good output by the end.

The most common problems that been discovered from previous project and research is a high-cost in equipments, servicing and maintenance. Besides, the previous projects give users hard to manage their equipment because of sizing and not scalable. This project become as a idea to solve all of the problem by provide the scalable and efficient way for user's to manage and allows additional appliances to be added to it with no major changes to its core.

Besides, this project will provide low-cost solution for home automation or engineering sites to make a communication and control to their devices over the internet. By connect the appliance to an embedded controller by PC parallel port, and remotely monitor and control the appliances using the web browser, it will become the most effective way for user's in order to reduce the high-cost in equipment, servicing and maintenance.

1.3 Objectives

The idea of this project arise referring to the current demands in engineering sector which want to have the device that can remotely control the electric and electronic devices from anywhere. There have several objectives that have been lined-up for this project which is:-

i. To give an ease for user's to remotely control the electric and electronic devices anywhere they want as long as there have an internet connection.
ii. To make people's daily task much simpler and easier to manage.
iii. To give a hand for engineering site to improve and enhance the technology for people's needs in manage electric and electronic devices in their daily life.
iv. To increase accuracy, correctness and efficiency for people in manage their daily task.
v. To provide alternative features for user's to increase comfort in their daily task.

With the hand and device setup for this project, hopefully the objectives that been lined-up as above will be achieve in order to prove on how the data can be transmit and control over the PC parallel port. With this idea also, hopefully it can open wide the new era of data communication and control technology for engineering sites to enhance and migrate their current technology and also will give them another option on selecting the suitable communication interface for their need with the idea propose from this project.

1.4 Scopes

Scope of this project are to create a device that will be as medium between user's that can remote from anywhere using a web and electronic and electric devices via parallel port. The main thing here is:-

i. To prove that the sending data by the users remotely from web can also be transmitting using the parallel port.
ii. To analyze the truth of parallel port benefits and makes the conclusion about it.
iii. From the output, this project hope that it can give an idea for engineering sector regarding to their sector development in using web-base remote technology using parallel port.

There are two suggested operating system that will involve in this project which is Linux Ubuntu and Microsoft Windows Server 2003. The target users for this project will be the person from the engineering site and home user's to use this project in order to increase comfort in their daily task.

1.5 Project significance

The significance of this project is become important in order to enhance the technology used in people's daily task. Besides to give a hand for engineering sites as the main objectives of this project, the idea of this project hopefully can open wide the new era of data communication and control technology for engineering sites to enhance and migrate their current technology with the idea propose from this project. As we all known, there has many engineer and specialist outside there who has develop many project in electric and electronic project especially for home appliance. This project hopefully will give a hand to them in order to enhance the technology used for their project.

With the strong objectives and vision, this project confidence in changing people's daily task become more comfort and easy to manage in future. Besides, it

will promote and helping the IT sectors in Malaysia becomes more famous and keeps in-front in technology used among Asian-region country. Beyond to be advance country by year 2020, this project hopefully will take Malaysia sit same level with others advance country that is already established in technology used environment such as Japan, Korea and Singapore.

1.6 Expected Output

Expected output for this project as mention below:-

i. Users request web pages from web server (Linux Ubuntu)
ii. Server will response to the request and the website contain control needed (Forms, buttons, etc.) will appear at user's web browser.
iii. User presses some control button or send button on form.
iv. The user operation at step 3 causes the web browser to send the information to the web server and do the control function cooperation with Visual C program that contains in it.
v. A web server in that given address receives the data from user web browser, checks that it correct and sends in some way command to the actual hardware to do the control function that created by Visual C programs.

This web based architecture will be divided into 2 parts which is the web interface part (using php programming language) and the hardware (parallel port) controlling (using Visual C program).

To ensure the web server follow the project requirement, controlling web pages and some scripts need to be include on it to take the user's control. For this project PHP language will be choose as the language that will read the user's control and provide the web interfaces contribute with some Java Script in it to call the Visual C function in other web server directory to do the controlling. The Visual C language has been selected as the best approach to do the controlling function because it is lack-free feature than other language to do the actual direct hardware controlling process.

1.7 Conclusion

The main idea of this project is to create a control device that can control and communicate to any other devices through the parallel port. The purpose is to prove that the parallel port is a multipurpose use that not only connects to the printer, but it can communicate to other device than printer. It is suggested for the engineering use to make a control and connection to the electric and electronic devices such as television, lamp, washing machine and any other devices for home appliance.

This control device will act as web server to be access from outside by web and the entire data communication process will be control by user from web in different location. To test the data success in transmitting through the parallel port, LED tester will be use to act as electric or electronic device and as an indicator for give an output of the data communication.

CHAPTER II

LITURATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

Before we talk about the previous research for this project literature review, here will be a short brief about the basic of parallel port. Parallel ports were originally developed by IBM as a way to connect a printer to PC. When IBM was in the process of designing the PC, the company wanted the computer to work with printers offered by **Centronics**, a top printer manufacturer at the time. IBM decided not to use the same port interface on the computer that Centronics used on the printer **(Gy.Hudoba et.al, 2006)**.

Refer to Jeff Tyson (October 2000), "How Parallel Ports Work" retrieved on February 2010 from http://computer.howstuffworks.com/parallel-port.htm, instead, IBM engineers coupled a 25-pin connector, **DB-25**, with a 36-pin **Centronics** connector to create a special cable to connect the printer to the computer. Other printer manufacturers ended up adopting the **Centronics** interface, making this strange hybrid cable an unlikely de facto standard. When a PC sends data to a printer or other device using a parallel port, it sends 8 bits of data (1 byte) at a time. These 8 bits are transmitted **parallel** to each other, as opposed to the same eight bits being transmitted **serially** (all in a single row) through a serial port. The standard parallel port is capable of sending 50 to 100 kilobytes of data per second.

DB25		Centronics 36	
Pin	Signal	Pin	Signal
1	Strobe	1	Strobe
2	data0	2	data0
3	data1	3	data1
4	data2	4	data2
5	data3	5	data3
6	data4	6	data4
7	data5	7	data5
8	data6	8	data6
9	data7	9	data7
10	Acknowledge	10	Acknowledge
11	Busy	11	Busy
12	Paper End	12	Paper End
13	Select	13	Select
14	Auto Feed	14	Auto Feed
15	Error	15	Error
16	Init	16	Init
17	Select In	17	Select In
18	GND	18	GND
19	GND	19	GND
20	GND	20	GND
21	GND	21	GND
22	GND	22	GND
23	GND	23	GND
24	GND	24	GND
25	GND	25	GND
		26	GND
		27	GND
		28	GND
		29	GND
		30	GND
		31	Init
		32	Error
		33	Ground
		34	NC
		35	NC
		36	Select In

Figure 2-1 : The pins function between DB25 and Centronics 36

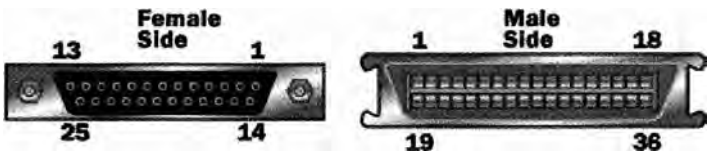

Figure 2-2: PC's parallel port for printing purpose

Figure 1 and 2 above are from the sources that retrieved from the websites that author by Jeff Tyson (October 2000), "Hows Parallel Ports Work", http://computer.howstuffworks.com/parallel-port.htm.

(1) In computers, ports are used mainly for two reasons: Device control and communication. We can program PC's Parallel ports for both. Parallel ports are mainly meant for connecting the printer to the PC. But we can program this port for many more applications beyond that. Parallel ports are easy to program and faster compared to the serial ports. But main disadvantage is it needs more number of transmission lines. Because of this reason parallel ports are not used in long distance communications.

Let us know the basic difference between working of parallel port and serial port. In serial ports, there will be two data lines: One transmission and one receive line. To send a data in serial port, it has to be sent one bit after another with some extra bits like start bit, stop bit and parity bit to detect errors. But in parallel port, all the 8 bits of a byte will be sent to the port at a time and an indication will be sent in another line. There will be some data lines, some control and some handshaking lines in parallel port. There was three bytes of data 01000101 10011100 10110011 is to be sent to the port. **(Harsha Perla, 2005-2007).**

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(1) The articles retrieved from "Parallel Port Programming", http://electrosoft.com/parallel authored by Harsha Perla (2005-2007). Harsha perla is a part of author for http://electrosoft.com which active on writing the technical articles that contributes programming, VLSI Verification, RTL design, Digital Communication, System Software, Design Automation and Digital Signal Processing.

2.2 Literature Review

Literature review is aims to review the critical points of current knowledge on a particular topic. Therefore, the purpose of the literature review is to find, read and analyze the literature or any works or studies related to this project. It is important to well understand about all information to be considered and related before develop this project.

For this project, some researchers have been done to understand the concept and purpose of device control and communications via parallel ports. It starts with the understand architecture of the pc's parallel port itself. How its work and the architecture of pins and its function are the main thing that have been considered before start to run this project.

It continues with analyze and do the research about what the suitable programming that can be use for parallel port controlling. By doing the research and collected the information from the previous research's and finding, this project success to collected several related programming sources that suit the pc's parallel port control program. All of the research that been take from previous paper's and finding will be discuss later under the previous research section.

2.2.1 Domain

The main focus of this project are to create a device that will be as a medium between user's that can remote from anywhere using a web and electronic and electric devices via parallel port. The main thing here is to prove that the sending data by the users remotely from web can be transmitting using the parallel port. Beside, the scope of this project also to analyze the truth of parallel port benefit and make the conclusion about it. From the output, this project hope that it can give an idea for engineering sector regarding to their sector development in using web-base remote technology using parallel port. There are two suggested operating system that will involve in this project which is Linux Ubuntu and Microsoft Windows Server 2003. The target users for this project will be the person from the engineering site

and home appliance user's to use this project in order to help them in their research that related with this technology besides to enhance their technology use for their sector.

2.2.2 Keyword

2.2.2.1 PC's Parallel Port

(2) Refer to Jeff Tyson (October 2000) the original specification for parallel ports was unidirectional, meaning that data only traveled in one direction for each pin. With the introduction of the PS/2 in 1987, IBM offered a new **bidirectional** parallel port design. This mode is commonly known as **Standard Parallel Port** (SPP) and has completely replaced the original design. Bidirectional communication allows each device to receive data as well as transmit it. Many devices use the eight pins (2 through 9) originally designated for data. Using the same eight pins limits communication to **half-duplex**, meaning that information can only travel in one direction at a time. But pins 18 through 25, originally just used as grounds, can be used as data pins also. This allows for **full-duplex** (both directions at the same time) communication **(Jeff Tyson, 2000)**

EPP					
Pin	EPP Signal	Pin	EPP Signal	Pin	EPP Signal
1	Write	10	Interrupt	19	Ground
2	Data 0	11	Wait	20	Ground
3	Data 1	12	Spare	21	Ground
4	Data 2	13	Spare	22	Ground
5	Data 3	14	Data Strobe	23	Ground
6	Data 4	15	Spare	24	Ground
7	Data 5	16	Reset	25	Ground
8	Data 6	17	Address Strobe		
9	Data 7	18	Ground		

Figure 2-3: Enhanced Parallel Port (EPP) pins function

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(2) The articles by Jeff Tyson are retrieved on February 2010 from "How Parallel Ports Work", from website, http://computer.howstuffworks.com/parallel.