

USB Wireless Print Server

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Network Division has been developing new products based on the leading technologies of the times since it released Multi Protocol Print Server KP-501. This time, Network Division developed a USB wireless print server by applying the USB (Universal Serial Bus) which is now the standard interface of Windows and the wireless LAN technology that is expanding its market steadily in recent years. A print server means a product which has the function of transmitting data between a personal computer and a printer.

Key Words: USB Wireless Print Server, IEEE802.11b, USB1.1, Multi Protocol

1. Introduction

In the network world, new technologies are introduced so frequently that the years in this world are “dog year”. Network Division has been constantly developing new products based on the leading technologies of the times since it released Multi Protocol Print Server KP-501 in November, 1994. Network

Division put IEEE802.11b Print Server KP-611Air on the world market for the first time in December 2000 and developed a USB print server in 2001 by applying the wireless technology used for KP-611Air. (Fig. 1)



Fig. 1 USB wireless print server

2. What is a USB wireless print server?

The USB print server we developed has the following advantages over the printer servers introduced in the past; Since the wireless LAN is applied, the printers can be arranged freely and the user is free of troublesome setting of network cables. Since the USB is applied, each server can output data to up to three printers. Since the USB cable can be connected and disconnected freely even during operation, the user can handle the server easily.

2.1 Application of USB

The USB wireless print server is conformed to USB1.1, which is an interface standard for connecting various peripheral devices such as mice, keyboards, hard disks, etc. by common connectors, and which has come into wide use after installed to Windows 98. It can connect up to 127 devices through hubs and has the hot plug function to recognize devices by plug-and-play operation. Since it is installed to almost 100% of the current personal computers, it is assumed to be the standard interface. Accordingly, some of the latest printers employ the USB as the standard interface. Expecting that the USB will replace the Centronics interface used up to now as the standard printer interface for the easiness of handling, we have developed the USB wireless print server. The theoretical maximum transmission rate of USB1.1 is 12 Mbps.

2.2 Conformance to IEEE802.11b

The USB wireless print server conforms to IEEE802.11b standard for wireless LAN which is spreading rapidly. The maximum data transmission rate of this server is 11 Mbps, which is very practical, considering that the transmission rate

of the current wired LAN is 10 – 100 Mbps. For security, this server can use the WEP cryptography with 40-bit/128-bit keys. There are three communication modes of Infrastructure mode, Adhoc mode, and 802.11Adhoc mode in IEEE802.11b. In the Infrastructure mode, communication can be made with wired LAN through an access point (Fig. 2). In the 802.11Adhoc and Adhoc modes, one-to-one communication is possible (Fig. 3). The USB wireless print server makes it possible to lay out the printers freely by using IEEE802.11b having the above features.

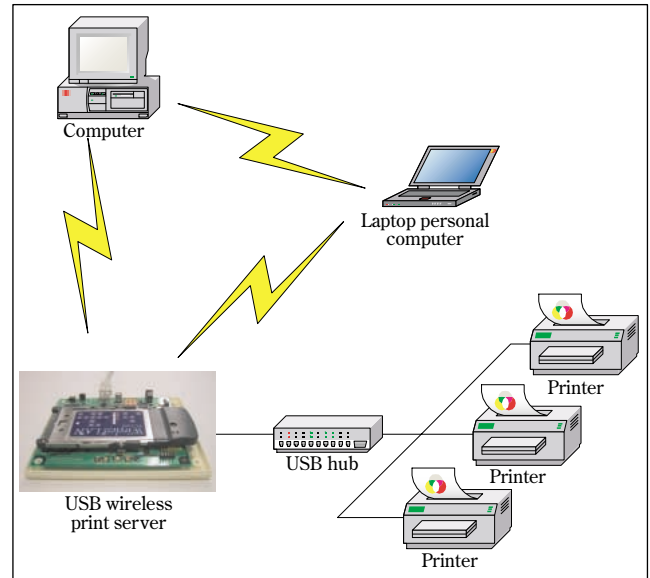


Fig. 3 802.11AdHoc/AdHoc mode

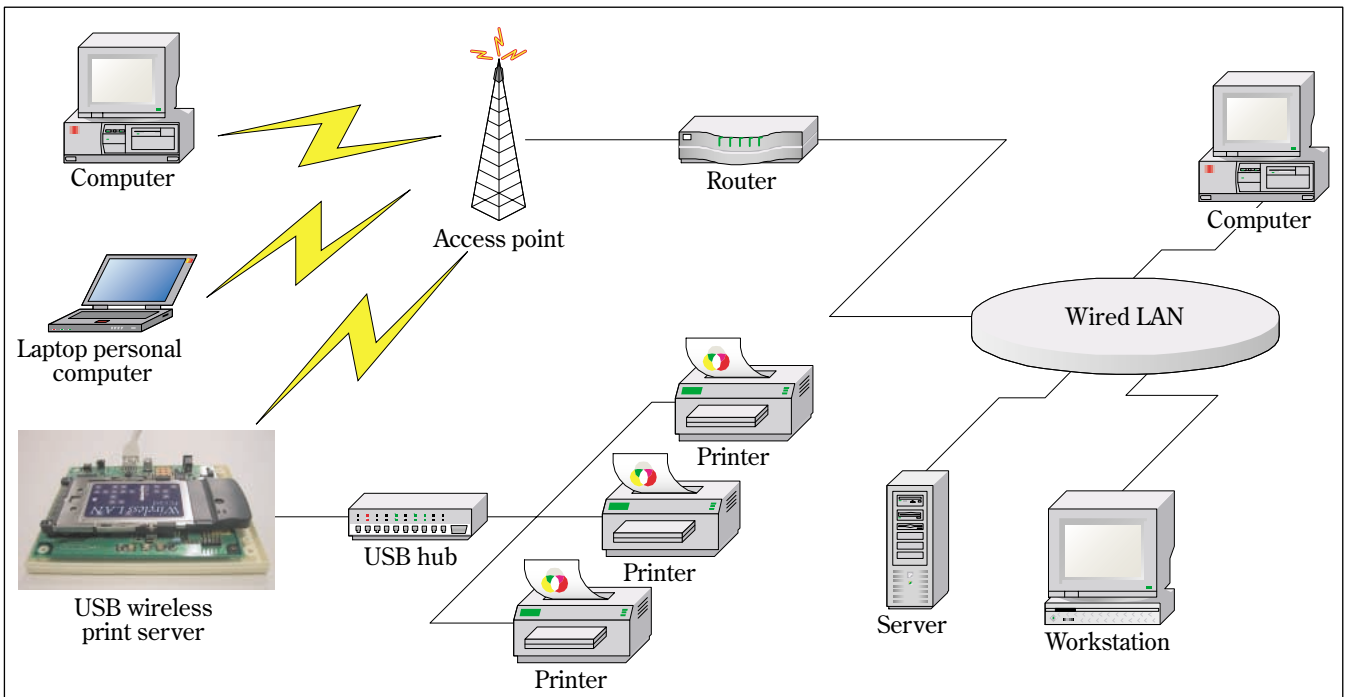


Fig. 2 Infrastructure mode

2.3 Multi protocol system

The USB wireless print server is usable with the major operation systems such as Windows, Unix, Linux, etc. As print protocols, LPR, PORT9100, and NetBEUI are applicable. The version can be increased with the HTTP protocol and various items can be set with browsers (Fig. 4). The user can control the print server with only the browsers without installing a special tool.



Fig. 4 WEB screen

3. Technological improvement

3.1 Problems

A conventional multi-port print server which uses a parallel interface has multiple parallel interfaces in it, thus the combination of each printer port and each printer is fixed. For example, when the personal computer in Fig. 5 prints with printer 2, it should output the print data to port 2 of the print server.

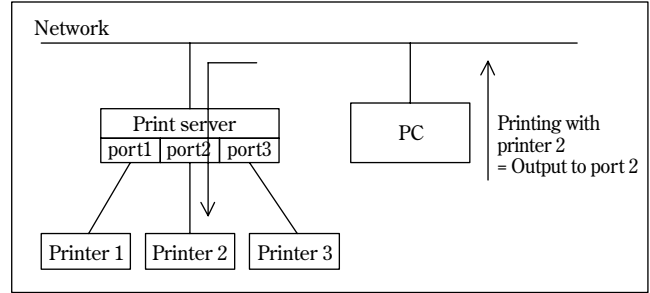


Fig. 5 Configuration of parallel interface

On the other hand, the USB wireless print server is connected through USB hub to multiple printers. The USB is so designed that the devices can be connected and disconnected at any time. Accordingly, a problem occurs if the printers are distinguished by the physical information that which points of the USB those printers are connected. For this reason, the USB uses device addresses to distinguish the connected printers. Each time the print server recognizes a printer, it sets a new device address to that printer. Since the same printer is not always given the same device address, however, a method of distinguishing the printer to be used is necessary. An example of concrete problems is given below. In Fig. 6, the personal computer outputs the data to port 2 to print them with printer 2 having device address 2. If device address 2 is set to printer 3 after the printers are turned on, however, the data output to port 2 to be printed with printer 2 are sent to printer 3.

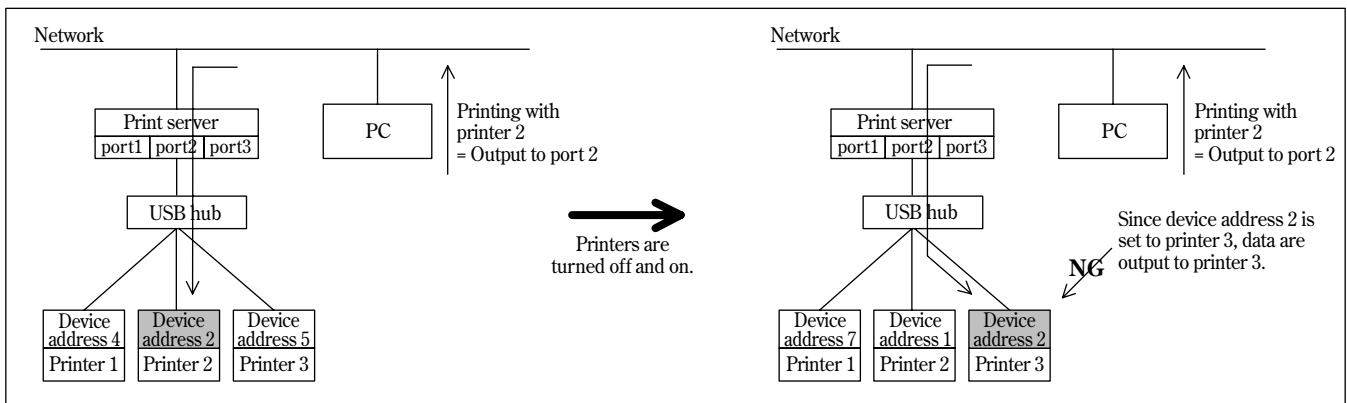


Fig. 6 Problem of multi-port system

3.2 Solution

To solve the above problem, we set a correspondence table in the print server so that the print server can automatically recognize correspondence between the ports and printers from the printer information (serial Nos. and model names). A concrete example is shown in Fig. 7. In this figure, the information of printer 2 connected to port 2 is saved in the

correspondence table. After the printers are turned off and on, the print server can judge from the saved information of printer 2 that the printer having device address 1 is printer 2 connected to port 2. Since the personal computer can output the print data to printer 2 in this way, the user can connect the printers to the USB hub and disconnect them and turn the printers on and off freely without checking any particular items.

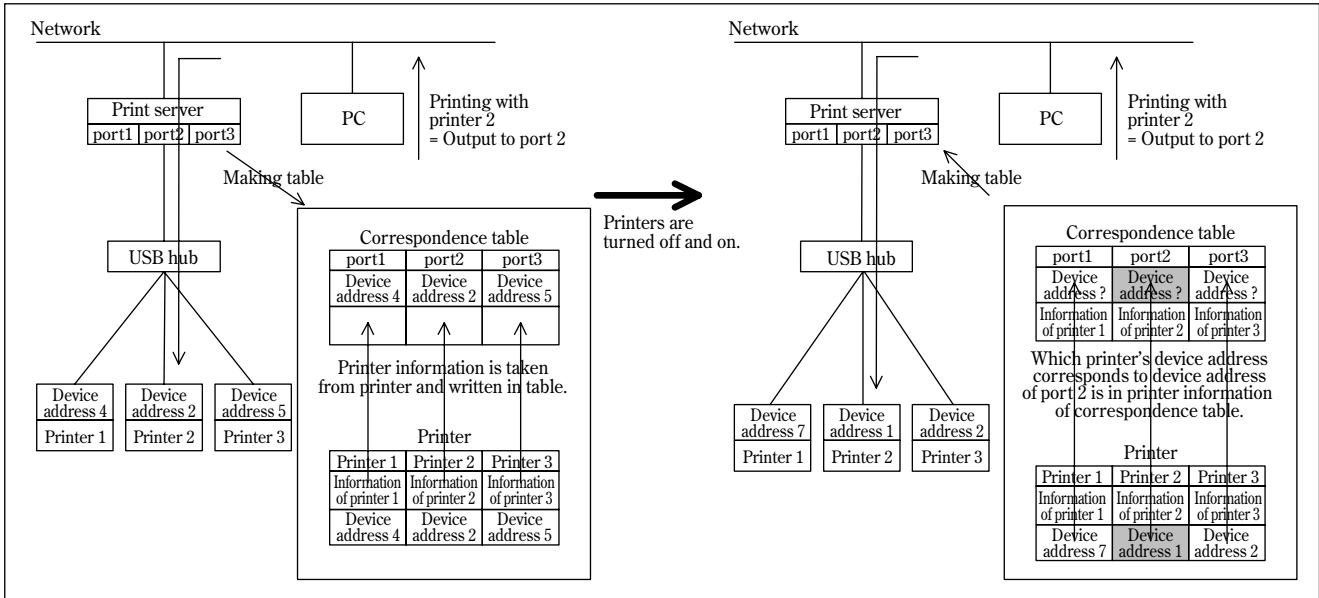


Fig. 7 Correspondence between printers and ports by use of correspondence table

4. Main specifications

See Table 1.

Table 1 Main specifications

Software specifications

	Applicable systems	Applicable protocols	Applicable commands/Operation modes
UNIX	SunOS 4.1.1/4.1.2/4.1.3/4.1.4 Solaris 2.0/2.1/2.2/2.3/2.4/2.5/2.6/7 AIX 3.2.3/4.1.2 HP-UX 8.0/9.0/10.0/10.2/11 OSF1 EWS-UX 9.2RevB, UX/4800 NEWS OS 4.2.1 CSF SCO-UNIX ULTRIX VMS UnixWare Linux	TCP UDP IP ARP RARP BOOTP ICMP SNMP HTTP	LPD PING lpr lp lpstat
MS-Windows	Windows95/98/Me, NT3.5.1/4.0/2000	DHCP, WINS TCP, PORT9100 IP, UDP ICMP, ARP SNMP, HTTP	TCP/IP print PING
	Windows95/98/Me, NT3.5.1/4.0/2000	TCP/IP NetBEUI	Microsoft network LANManager

Hardware specifications

Item	Specification
Network interface	IEEE802.11b (1M/2M/5.5M/11Mbps)
Printer interface	USB1.1
Power source	AC100 V - 240 V 50/60 Hz adapter
Power consumption	5W
Outside dimensions	148 (W) x 124 (D) x 30 (H) mm
Weight	250 g (Excluding AC adapter)
Standard	VCCI ClassB

Wireless LAN card specifications

Item	Specification
Frequency band	2.4 GHz band
Number of channels	14 channels
MODEM method	DS-SS method
Data transmission rate	1M/2M/5.5M/11Mbps Automatic selection
Communication distance	Outdoor: 100 m - 300 m
	Indoor: 35 m - 100 m
Security	WEP 40 bit, ESS-ID

5. Development in future

5.1 Application of USB2.0

USB2.0 has the theoretical maximum transmission rate of 480 Mbps, which is 40 times as high as the maximum transmission rate of 12 Mbps of USB1.1. For this high transmission rate, we expect that USB2.0 will solve the problem of transmission rate of the print data that are increasing more and more because of image data, etc. Since USB2.0 can use the cables and connectors for USB1.1, it requires less investment. Furthermore, since Intel announced in November 2001 that it would release the chip set of USB2.0 in 2002, we suppose that USB2.0 will spread rapidly in 2002. We intend to apply USB2.0 immediately and hold a dominant position technically.

5.2 Application of IEEE802.11a

Since IEEE802.11a uses radio waves in the 5-GHz frequency band, it is not affected by other wireless devices which mainly use radio waves of 2.4 GHz. In addition, since it has the maximum transmission rate of 54 Mbps, it is suitable for transmission of large data. As the broadband systems are being introduced now, IEEE802.11a seems to spread rapidly. We intend to make up a system to apply IEEE802.11a soon.

Introduction of the writers



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[A few words from the writers]

The performance and functions of both network and printer have been improved quickly in these several years. We have been applied the latest technologies of both of them to the print server for the ease of handling. We will continue developing and selling products which can supply our customers with the latest technologies.