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(54) **Title**: METHOD FOR PROVIDING PRINT SERVICE

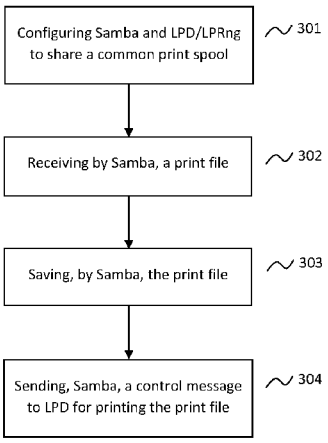

Fig. 3

(57) **Abstract**: It is provided a method for providing print service in an intermediate device connecting to a printer. The intermediate device uses Samba to receive a file to be print and LPD or LPRng to request the printer to print, characterized in that Samba and LPD or LPRng use a common print spool, the method comprises the steps of receiving, by Samba a file to be print; saving, by Samba the file with a first name in the common print spool; requesting, by Samba LPD or LPRng to use the saved file in the common print spool to instruct the printer to print without needing LPD or LPRng to save the file again in the common print spool.

WO 2012/162978 A1

METHOD FOR PROVIDING PRINT SERVICE

TECHNICAL FIELD

The present invention relates to data processing, and more particularly, relates to a method for providing print service.

BACKGROUND

Samba is a free software re-implementation, originally developed by Australian Andrew Tridgell, of the SMB (server message block)/CIFS (common Internet file system) networking protocol. Herein, the CIFS can be considered as an enhanced version of SMB. As of version 3, Samba provides file and print services for various Microsoft Windows clients and can integrate with a Windows Server domain, either as a Primary Domain Controller (PDC) or as a domain member. It can also be part of an Active Directory domain. Samba runs on most Unix and Unix-like systems, such as GNU/Linux, Solaris, AIX and the BSD variants, including Apple's Mac OS X Server (which was added to the Mac OS X client in version 10.2). Samba is standard on nearly all distributions of Linux and is commonly included as a basic system service on other Unix-based operating systems as well.

Samba allows file and print sharing between computers running Windows and computers running Unix. Samba sets up network shares for chosen Unix directories (including all contained subdirectories). These appear to Microsoft Windows users as normal Windows folders accessible via the network.

Samba services are implemented as two daemons:

- smbd, which provides the file and printer sharing services, and
- nmbd, which provides the NetBIOS-to-IP-address name service. NetBIOS over TCP/IP requires some method for mapping NetBIOS computer names to the IP addresses of a TCP/IP network.

Samba configuration is achieved by editing a single file (typically installed as /etc/smb.conf or /etc/samba/smb.conf). When it is correctly configured, it

allows that host to interact with a Microsoft Windows client or server as if it is a Windows file and print server. Samba provides seamless file and print services to SMB/CIFS clients. Client systems use the Common Internet File System (CIFS) protocol to request file and print services from server systems over a network. Below is a brief on SMB/CIFS and its commands.

The SMB/CIFS is a file sharing protocol. Client systems use this protocol to request file access services from server systems over a network. The SMB/CIFS Protocol is composed of, and driven by, SMB commands. The SMB commands are comprised of SMB messages exchanges between the client and the server. Below introduces some of the commands for file print.

SMB_COM_OPEN_PRINT_FILE: it creates a print queue spool file. And the spool file will be queued to the printer when it is closed.

SMB_COM_WRITE_ANDX: it is used to write bytes to a regular file, a named pipe, or a directly accessible I/O device such as a serial port (COM) or printer port (LPT). Besides, it can be used to write data to an open print queue spool file.

SMB_COM_WRITE_PRINT_FILE: it can be also used to write bytes to a print queue spool file. Since this command is deprecated, the SMB_COM_WRITE_ANDX command is usually used to write to an open print queue spool file.

SMB_COM_CLOSE: it is used by the client to close an instance of an object associated with a valid FID (file identifier), which identifies a file. After this command is used to close a specified or chosen print queue spool file, it causes the server to queue the file for printing.

SMB_COM_CLOSE_PRINT_FILE: it can be also used to close a print queue spool file. Similar to the SMB_COM_WRITE_PRINT_FILE, since this command is deprecated, SMB_COM_CLOSE is normally used to close a print queue spool file opened by SMB_COM_OPEN_PRINT_FILE.

The Line Printer Daemon protocol/Line Printer Remote protocol (or LPD/LPR) is a network protocol for submitting print jobs to a remote printer. The

original implementation of LPD was in the Berkeley printing system in the BSD UNIX operating system. The LPD Protocol Specification is documented in RFC 1179 (Line Printer Daemon Protocol, August 1990, edited by L. McLaughlin III). LPRng (line printer remote next generation) is a printing system compatible with the Berkeley printing system. It provides printer spooling and network print server functionality using the Line Printer Daemon protocol.

Samba and LPD/LPRng are used together in a single device to provide remote printing service. The single device could be a gateway, router etc. As shown in the Fig. 1, it normally connects to a print controlling device that wants to print files, e.g. a PC, and a printer via wired or wireless connection. Herein, the Samba is used for print sharing, and it is configured to use “add printer wizard” feature of Samba to guide the Windows user to install printer driver on the PC.

When the user selects a file on the PC for print, the print file is converted into print format by the printer driver on the PC. The print format can be any kind of page description language format that the OS can. Then the PC sends the formatted print file to Samba in the single device via local print service. To be specific, the client in the PC installs printer driver and converts the file chosen to be printed into a print format with the printer driver. And then, the client uses SMB_COM_OPEN_PRINT_FILE command to request to create a print queue spool file of Samba. After receiving the request, Samba creates a print queue spool file corresponding to a print job, which will be queued to the printer when closed and sends a response message to indicate the successful creation of the print queue spool file. After receiving the response message, the client uses SMB_COM_WRITE_ANDX to send data of the formatted file to Samba so as to request for printing. After receiving the request, Samba writes the received data of the formatted file into the print queue spool file. After receiving the response message indicating successful data writing from Samba, the client uses SMB_COM_CLOSE to request Samba to close the print queue spool file. After

receiving the request for closing, Samba saves the formatted file and uses lpr shell command to start the print job.

Herein, the lpr shell command is used on many Unix-like systems to assign print jobs to printer queues. Furthermore, LPRng project, Linux, Mac OS X and even Windows also provide such command with the same name. In above case, Samba can use "lpr -P%p %s" shell command in the LPRng project to send the print file to LPRng/LPD daemon via socket. The meaning of parameters in the command is as follow: %p indicates the name of the printer to use, and %s indicates the full pathname of the file on the Samba server to be printed.

Samba can use lpr, lpq lprm and lpc commands to communicate with LPRng daemon. Specifically, lpr is used to assign a print file to a print queue, lpq is used to show queue information, lprm is used to remove a chosen print file from the print queue, and lpc is used to control the print queue.

After LPD/LPRng receives the print file, it will create a print job to ask the printer to print.

When Samba and LPD/LPRng are both integrated in an intermediate device with limited storage space, e.g. a home gateway connecting to both a PC and a printer, it's desired to print file with possibly larger size.

SUMMARY

According to an embodiment of present invention, it is provided a method for providing print service in an intermediate device connecting to a printer. The intermediate device uses Samba to receive a file to be print and LPD or LPRng to request the printer to print, characterized in that Samba and LPD or LPRng use a common print spool, the method comprises the steps of receiving, by Samba a file to be print; saving, by Samba the file with a first name in the common print spool; requesting, by Samba LPD or LPRng to use the saved file in the common print spool to instruct the printer to print without needing LPD or LPRng to save the file again in the common print spool.

According to the aspect of present invention, it avoids duplicated copies of same print file in a device with limited storage space.

It is to be understood that more aspects and advantages of the invention will be found in the following detailed description of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the, illustrate embodiments of the invention together with the description which serves to explain the principle of the invention. Therefore, the invention is not limited to the embodiments. In the drawings:

Fig. 1 is a diagram showing a system structure;

Fig. 2 is a diagram showing Samba and LPD/LPRng each has a separate print spool in the system;

Fig. 3 is a flow chart showing a method for providing print service on the gateway according to an embodiment of present invention; and

Fig. 4 is a diagram showing Samba and LPD/LPRng have a common print spool according to the embodiment of present invention.

DETAILED DESCRIPTION

An embodiment of the present invention will now be described in detail in conjunction with the drawings. In the following description, some detailed descriptions of known functions and configurations may be omitted for clarity and conciseness.

The inventors use Samba and LPD/LPRng on an intermediate device, e.g. a home gateway, to provide print service. The system structure is the same as the Fig. 1 shows. The gateway connects to a printer and a PC, and it communicates with the printer and the PC by separately using LPD/LPRng and Samba. Besides, since the gateway is intended for low-end product, it normally has limited storage space so as to save cost. The print spools of both Samba

and LPD/LPRng are set to a volatile memory, e.g. RAM (random access memory). However, after the deployment of Samba and LPD/LPRng, the gateway with RAM allocated 10 MB for print spool cannot print a file of, for example, 8MB.

After a long time of study on how Samba and LPD/LPRng works, it's found that after LPD/LPRng receives lpr command that indicates the print file, it saves the print file again. As fig. 2 shows, Samba and LPD/LPRng each has a separate print spool. So for a single print file, it takes as twice as its size in the RAM. So in the following, Samba and LPD/LPRng are modified to avoid duplication of the print file in the RAM.

Fig. 3 shows a method for providing print service on the gateway according to an embodiment of present invention. Note LPRng is used in below embodiment.

In the step 301, Samba and LPRng are configured to share a common print spool in RAM as shown in Fig. 4. In a variant, the shared print spool can placed in a non-volatile storage, e.g. flash etc. Specifically, the path parameter in printers section of smb.conf file (i.e. Samba configuration file) is used to indicate the print spool location. Herein, it is set to /var/spool/samba. Meanwhile, the print spool location of LPRng is set to the same location as Samba, i.e. :sd parameter in printcap (i.e. LPRng's printer information file) is set to /var/spool/samba.

In the step 302, Samba receives a file for print from the PC. Since LPRng is modified not to format the file in this implementation, the print file needs converting to a format that is compatible with LPRng. The format conversion can be done by Samba. In a variant, the format conversion can be done by the printer driver of Windows before the print file is sent to Samba.

In the step 303, Samba saves the print file in the shared print spool. Herein, let's assume the file name of the print file saved by Samba is FILE1.

In the step 304, Samba sends a control message to request LPRng to print the print file saved by Samba.

--Before the introduction of the modification on lpr command and LPRng, we'd like to firstly introduce how current lpr command in the LPRng and LPRng daemon work. Lpr command calls Send_job function to transfer the print job to LPRng Daemon. In Send_job function, it sends two files to LPRng daemon, one is a control file which includes the print control info (details can be found in RFC1179), and the other is a data file (i.e. the print file that Samba saved in this example). Send_job function uses Send_data_files to transfer the data file (Send_job and Send_data_files functions are included in LPRng sendjob.c code file). And Send_data_files function will send file description information of the print file in Samba (e.g. file name, file size etc.)and the data of print file to LPRng daemon, and in addition, it tells the Receive_job function in LPRng daemon of a file name to be assigned to the print file in LPRng. Herein, the file name used in Send_data_files function is different from the name of the print file in Samba. In this example, file description information of the print file includes file name FILE1, and Send_data_files function tells Receive_job function to save the print file with file name of FILE2. At the side of LPRng daemon, it uses Receive_job function to receive the control file and the data file for printing the print file. And Receive_job function saves the control file and the data file with its name set to that used in Send_data files function in its print spool.

--In our modification, Send_data_files function is modified not send the print file to LPRng daemon, so Send_job function will only send file description information to LPRng daemon without sending the data of the print file. In addition, in order to avoid duplicated names in the share print spool, the print file FILE1 is renamed by Send_data_files function to a file name (i.e. FILE2 in above example) that it will be used in the Send_data_files function. At the side of LPRng daemon, the Receive_job function is modified to receive only the control file and file description information of the print file, and it uses the name (i.e. FILE2) carried in Send_data_files function to fill the file name in print job. And then the LPRng daemon sends the print job to the printer device.

In another variant, LPRng can be replaced with LPD.

A number of implementations have been described. Nevertheless, it will be understood that various modifications may be made. For example, elements of different implementations may be combined, supplemented, modified, or removed to produce other implementations. Additionally, one of ordinary skill will understand that other structures and processes may be substituted for those disclosed and the resulting implementations will perform at least substantially the same function(s), in at least substantially the same way(s), to achieve at least substantially the same result(s) as the implementations disclosed. Accordingly, these and other implementations shall fall in the scope of the invention.

CLAIMS

1. A method for providing print service in an intermediate device connecting to a printer, wherein, the intermediate device uses Samba to receive a file to be print and LPD or LPRng to request the printer to print, characterized in that Samba and LPD or LPRng use a common print spool, the method comprises the steps of

receiving, by Samba a file to be print;

saving, by Samba the file with a first name in the common print spool; and

requesting, by Samba LPD or LPRng to use the saved file in the common print spool to instruct the printer to print without needing LPD or LPRng to save the file again in the common print spool.

2. The method of the claim 1, wherein, the requesting step further includes

changing, by Samba the name of the file from the first name to a second name; and

sending, by Samba the second name to LPD or LPRng, wherein, LPD or LPRng uses the second name to request the printer to print the saved file in the common print spool.

3. The method of the claim 1, wherein, it further comprises converting the file to be print to a format that is compatible with LPD or LPRng before Samba requests LPD or LPRng for printing.

4. The method of the claim 3, wherein, the format conversion is done by Samba or it's done by other device before the file is sent to Samba.

5. The method of the claim 1, wherein, it further comprises configuring the configuration files of Samba and LPD or LPRng to use the common print spool.

6. The method of the claim 1, wherein, the common print spool is set to a volatile storage or non-volatile storage of the intermediate device that has limited storage space.

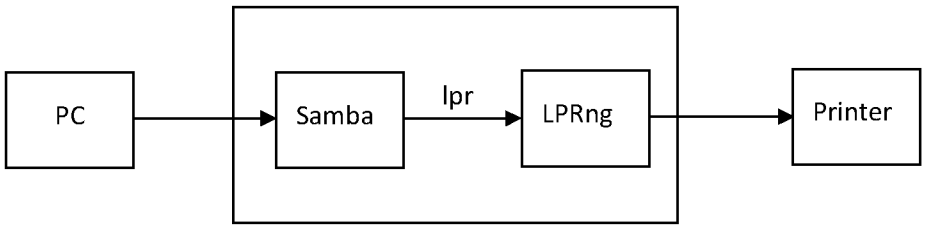
PC
Samba
lpr
LPRng
Printer

Fig. 1

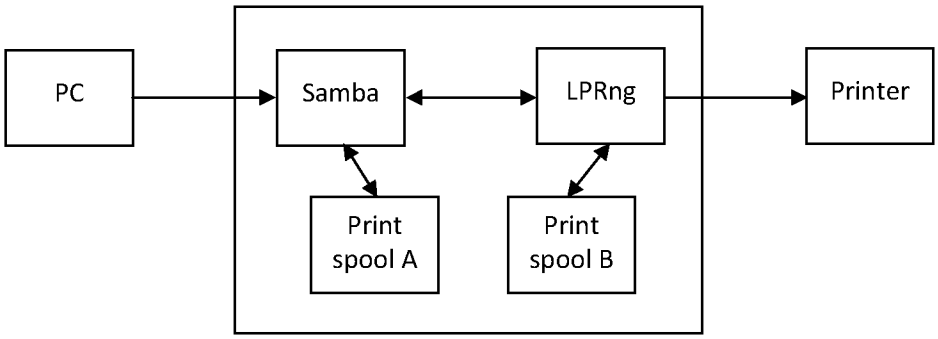
PC
Samba
LPRng
Printer
Print spool A
Print spool B

Fig. 2

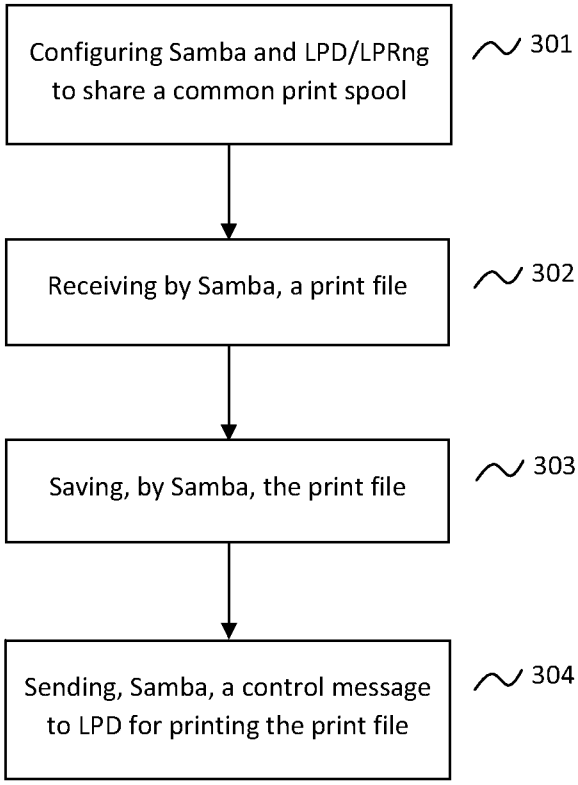
Configuring Samba and LPD/LPRng to share a common print spool
301
Receiving by Samba, a print file
302
Saving, by Samba, the print file
303
Sending, Samba, a control message to LPD for printing the print file
304

Fig. 3

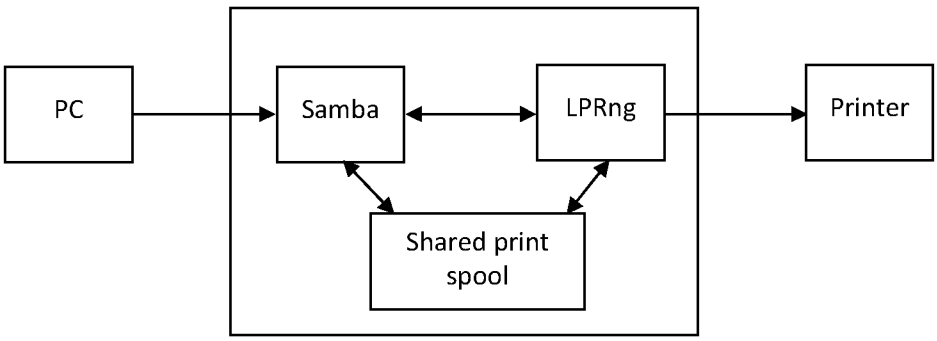
PC
Samba
LPRng
Printer
Shared print spool

Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2011/079700

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: G06F3/-, G06F15/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

VEN, CNABS, CNKI: print, SAMBA, LPD, LPRng, protocol, share, remote, linux, unix

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WANG Hai et al. Research of Share Files and Printers in Isomerous Network and Security Management of Samba, Computer Systems Applications, Aug. 2006, No.8, pages 80-88, ISSN 1003-3254	1-6
A	US2004073632A1 (SIMPSON S. S. et al.) 15 Apr. 2004(15.04.2004) the whole document	1-6

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 Jan. 2012(30.01.2012)	**23 Feb. 2012 (23.02.2012)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer LIU Yuan Telephone No. (86-10)62412079

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2011/079700

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
US2004073632A1	15.04.2004	None	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2011/079700

Continuation of : second sheet, A. CLASSFICATION OF SUBJECTMATTER:

G06F 3/12 (2006.01) i

G06F 15/16 (2006.01) i