Print Solutions Using Samba and CUPS

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SHARE Session 9325

Abstract

Samba is often mentioned with "File and Print", but is most often used for file serving. A true print server must be first be set up on Linux before Samba can act as a print "middle-man" between Windows and Linux. This presentation discusses available print servers and focuses on the Common UNIX Print Server (CUPS) as a solution. The integration of Samba with the print server and the more advanced topic of uploading and automatic downloading of print drivers are discussed. Additionally, an easily implemented and often overlooked function, Samba as a time server, is discussed. Code and command examples are supplied that you can easily take back home and use with your Linux on zSeries images.

Outline for this hour

- Introductions
- Overview of Samba printing
- Samba print solutions!
  - Set up the CUPS print server
  - Samba-enable the print server
  - Upload printer drivers
  - Automatic download of printer drivers
  - Accounting
- Samba as a time server
- Documentation and resources
- Questions

Introductions - Who am I, Who are you?

- Who am I?
  - Michael MacIsaac, 17 years with IBM
    - 10 years programmer (Fortran, C, C++)
    - 7 years with S/390 (Linux tech support, ITSO project lead)
  - Linux (open source/freeware) advocate
  - e-mail - mikemac@us.ibm.com
- Who are you?
  - Linux servers in production?
  - Linux on your desktop?

Overview - A multitude of printing variables

- Technology
  - Line printer - character based (old)
  - All Points Addressable
    - Dot matrix, ink ribbon (old)
    - Ink-jet (expensive cartridges)
    - Laser (common)
- Command language types
  - PCL - Printer Control Language - 5e vs. 6 - Bottom line found on the web: "From what I understand, PCL5e is the gold standard PCL which has evolved over the years from DOS versions. PCL6 is a redesigned PCL optimized for the MS Windows GUI environment. It's a little more efficient than PCL5e, but has more compatibility problems."
  - PostScript - levels 1, 2 and 3
  - AFP - Advanced Function Printing - mainframe
  - GDI ("Winprinter") very little intelligence
  - ASCII with escape commands (old)

Overview - Printing variables (cont'd)

- Attachment types
  - Parallel port
  - USB
  - Network attached
    - IP Network-attached
    - HP JetDirect NIC-attached
  - Mainframe channel attached (no driver for Linux for zSeries)
- Protocols
  - Line Printer Daemon (lpd)
  - socket - communicate directly with a printer on a specific socket
  - Internet Printing Protocol (IPP)
  - Intelligent Printer Data Stream (IPDS) - mainframe printers

Overview - Printing variables (cont'd)

- Features
  - Speed (usually measured in pages per minute)
  - Resolution (usually mesured in dots per inch)
  - Memory
  - "Sidedness" - simplex or duplex
  - Orientation - Landscape or portrait
  - I/O devices - Input/Output/Auxilliary trays, envelope feeder
  - Stapler
  - Paper jam remedy technology
  - Ink (toner/cartridge) technology
  - Printer head cleaning/alignment technology
  - Machine status technology - lights, buttons, displays
  - Paper size/type
    - cut sheet (common) letter - 8.5" x 11" and A4 - 210 x 297 mm
    - continuous feed (old)

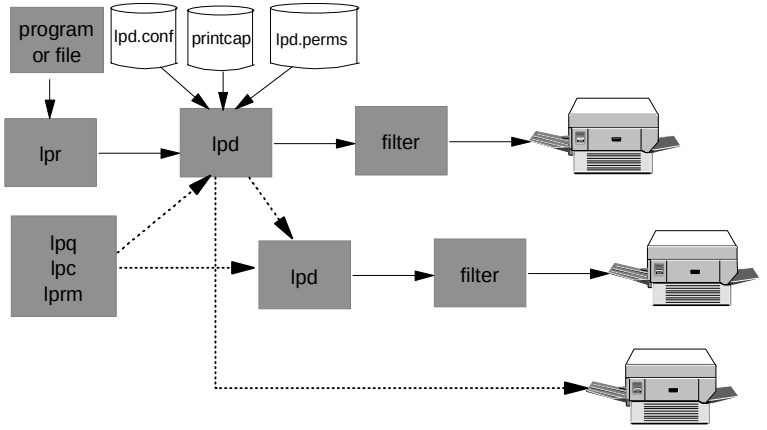
Overview - Printing variables (cont'd)

- Other terminology and concepts
  - Print Queues - usually FIFO
    - External to printer
    - Internal to printer
  - Print jobs
  - Printer class (pool) - a group of printers
  - Filters - software to modify one print type to another
  - "Backends" - software to send the filtered print data to the printer
  - Drivers - software to interface with the hardware (printers)

Overview - Print servers for Linux

- Print servers available to UNIX
  - lpd - line printer daemon (old)
  - LPRng - lpr next generation
    - http://www.lprng.com/
    - Good manual: *Printing Cookbook*, by Patrick Powell
  - PDQ
    - http://pdq.sourceforge.net/
  - CUPS - Common UNIX Printing System
    - Based on the IPP (Internet Printing Protocol)
    - Installed standard with SuSE SLES-8

LPRng - block diagram



See http://www.lprng.com/PrintingCookbook/index.html

PDQ - "Print, don't queue"

- PDQ has an interesting premise:
  - "Printers have gotten cheaper, and workstations have gotten faster, so that the [UNIX] model of queueing, accounting, and nonlocal processing is obsolete. Most casual UNIX users regard lp and lpr as black holes to which print jobs disappear, and may or may not emerge."
  - From the README file in the package:

```
Try http://feynman.tam.uiuc.edu/ for documentation. This site
will probably only be around until I get my degree, say May 2000.
Past that, you are on your own...
```

- Imprints - a similarly staffed project?
  - From the Samba HOWTO collection: "Uploading of printer drivers via the Windows NT Add Printer Wizard (APW) or the Imprints tool set (refer to http://imprints.sourceforge.net)."
  - Found on Web: "As of June 16, 2002 (quite a bit earlier actually), the Imprints project is in need of a new maintainer. The most important skill is decent perl coding and an interest in MS-RPC based printing using Samba. If you wich to volunteer, please coordinate your efforts on the samba-technical mailing list."

CUPS Overview

- The Common UNIX Printing System (CUPS) is:
  - A cross-platform printing solution for all UNIX environments.
  - Based on the "Internet Printing Protocol (IPP)
  - Provides complete printing services to most PostScript and raster printers.
  - Provided under the GNU GPL
- UNIX has had a "printing problem" for years
  - Too many UNIX variants
  - lpr/lpd are very basic
  - Too much printing software
- CUPS hopes to solve this problem (by adding more software:)
- With SuSE SLES-8, CUPS comes installed (/etc/cups, ...) with many printer drivers (/usr/share/cups/model) installed

CUPS and Samba licenses

- CUPS and Samba are shipped under GNU General Public License (GPL)
  - You can run, copy and modify the software
  - You can redistribute and charge $$ for the software
  - You cannot add restrictions to the software
  - You must make the source code available
  - If you include software which is GPL'd, your software must also carry the GPL (viral nature)

CUPS commands

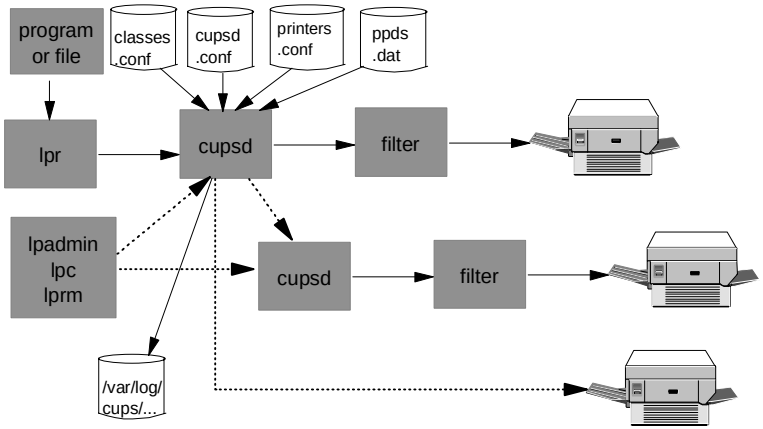
- System commands (in /usr/sbin):

```
accept       accept print jobs to the specified destinations.
cupsaddsmb   export printers to samba for windows clients
cupsd        the cups daemon - Web browser listening on port 631 (ipp)
lpadmin      set default, create or delete cups printers and classes
lpinfo       show available devices or drivers
lpmove       move a job to a new destination
reject       symbolic link to accept
lpc          line printer control program
```

- User commands (in /usr/bin):

```
cups-config  query various CUPS configuration values
cancel       cancel jobs
disable      Symbolic link to accept
enable       Symbolic link to accept
lp           print files
lpoptions    display or set printer options and defaults
lppasswd     add, change, or delete digest passwords
lpstat       print cups status information
lpq          show printer queue status
lpr          print files
lprm         cancel print jobs
```

CUPS - block diagram



See http://your.server.name:631/documentation.html

Solution - Set up CUPS print server

- Verify the CUPS installation - SLES-8

```
# rpm -qa | grep cups
cups-libs-1.1.15-40
cups-client-1.1.15-40
cups-1.1.15-40
cups-drivers-1.1.15-45
cups-drivers-stp-1.1.15-45
cups-devel-1.1.15-40
```

- Backup then "distill" cupsd.conf so you can read it easily

```
# cd /etc/cups
# cp cupsd.conf cupsd.conf.orig
# egrep  -v '^#|^$' cupsd.conf.orig > cupsd.conf
# wc cupsd*
     16      35     269 cupsd.conf
    752    3124   19684 cupsd.conf.orig
```

- Modify cupsd.conf - comment out "Deny from all", turn up logging

```
# vi cupsd.conf       # make changes
# egrep 'LogL|Deny From' cupsd.conf
LogLevel debug
#Deny From All
#Deny From All
```

Solution - Set up CUPS print server (cont'd)

- "Bill of Materials" - CUPS and a working network printer:
  - IP address of the printer
  - LPD queue name - internal to the printer
  - Drivers, PPD file for the printer
- If not Add a PPD file to /usr/share/cups/model

```
# cp 313002d.ppd /usr/share/cups/model/IBM/
# gzip /usr/share/cups/model/IBM/313002d.ppd
```

- Start CUPS

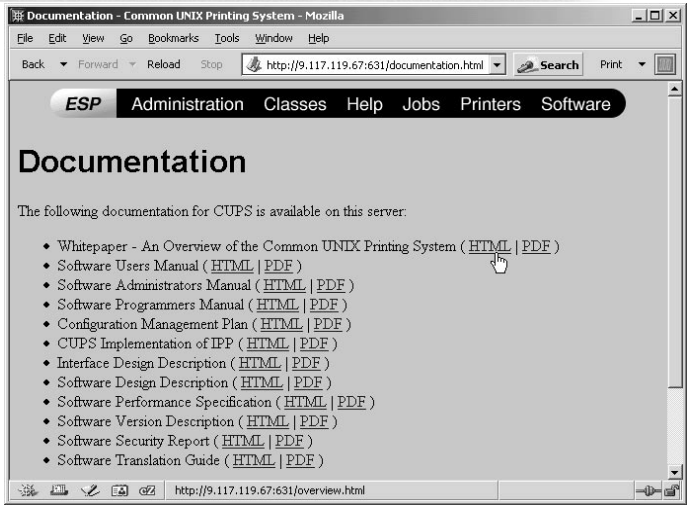
```
# rccups status
Checking for cupsd:                                    unused
# rccups start
Starting cupsd                                         done
```

- Set CUPS to start at boot time

```
# chkconfig cups
cups  off
# chkconfig cups on
```

- Add a printer - this can be done via:
  - The command line
  - The CUPS Web interface
  - YaST2

CUPS Web interface - documentation



Solution - set up CUPS print server (cont'd)

- Add a printer via the lpadmin command

```
# lpadmin -p pok72far -E -v lpd://9.117.118.9/afccu2 -m
IBM/313002d.ppd.gz
   -p -> printer will be named pok72far
   -E -> printer will be enabled
   -v -> device URI to use the LPD queue //<host>/<queue name>
   -m -> PPD file to use relative to /usr/share/cups/model
```

- Add a cover sheet attribute

```
# lpadmin -p pok72far -o job-sheets-default=standard
```

- A good command when something doesn't work right:

```
# tail --follow /var/log/cups/error_log
```

- View printer status

```
# lpc status
pok72far:
        printer is on device 'lpd' speed -1
        queuing is enabled
        printing is enabled
        no entries
        daemon present
```

- Look at /etc/cups/printers.conf and the /etc/cups/ppd/ directory
- Print a file from Linux (and run to the printer with fingers crossed)

Solution - Samba-enable print server

- Add parameters, printers and print$ sections to smb.conf

```
# cd /etc/samba
# vi smb.conf     # add global parameters and the [printers] section
[global]
        ...
        netbios name = mp3klnx3
        interfaces = 9.117.119.67/24    # needed with CTC interfaces
        printcap name = cups
        printer admin = mikem
        printing = cups
[printers]
        path = /var/lib/samba/printers
        create mask = 0600
        printable = Yes
        browseable = No
[print$]
        path = /var/lib/samba/drivers
        write list = mikem
        create mask = 0664
        directory mask = 0775
```

Solution - Samba-enable print server (cont'd)

- Be sure a Linux and Samba user exists with same credentials as desktop

```
# useradd mikem
# mkdir /home/mikem
# chown mikem.users /home/mikem
# passwd mikem
...
# smbpasswd -a mikem
...
```

- Add printer admin to ntadmin group and create printers directory

```
# cd /var/lib/samba
# ls -ld drivers
drwxrwxr-x    7 root     ntadmin       168 Feb 13 15:36 drivers/
# usermod -G ntadmin mikem
# cd /var/lib/samba
# mkdir printers
```

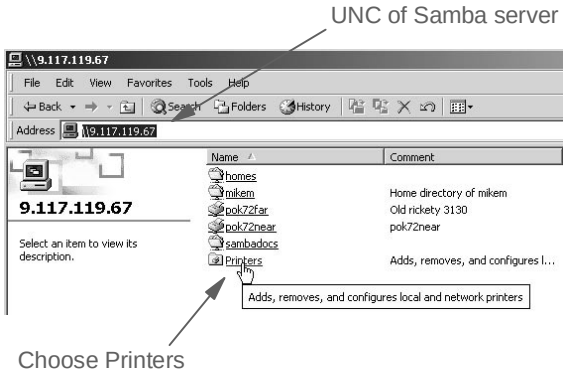
- Start Samba (or restart smb if running)

```
# rcnmb start
Starting Samba classic NMB daemon                          done
# rcsmb start
Samba SMB: Waiting for cupsd to get ready                  done
Starting Samba classic SMB daemon                          done
```

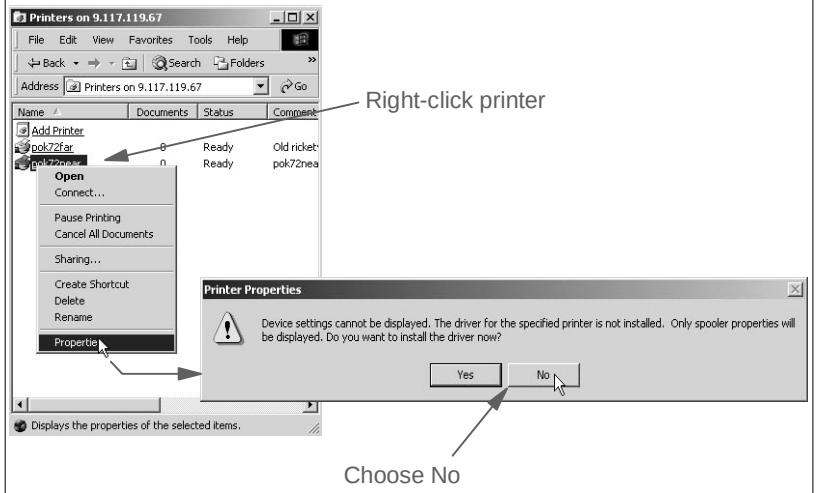
Solution - Upload printer driver

- Windows offers the ability to upload printer drivers to the file server
  - Windows NT/2K/XP x86 directory [print$]/W32X86
  - Windows 95/98/ME directory [print$]/WIN40
  - Also, drivers for Windows running on Alpha, MIPS, PowerPC"
- When uploaded to Windows/Samba print server, Windows clients can add the printer without needing the drivers (this is cool)
- Samba offers this function too, but it's **tricky** and can be **buggy**.
- My findings (others may have had more success):
  - SLES-7 standard Samba 2.2.0: DOES NOT WORK
  - SLES-7 w/custom Samba 2.2.5: DOES NOT WORK
  - SLES-8 standard Samba 2.2.5: WORKS!
  - SLES-8 w/custom Samba 2.2.8pre1: Upload works but not download
- Let's clear up the tricky part ...
  - Start from any Windows explorer ("My Computer")

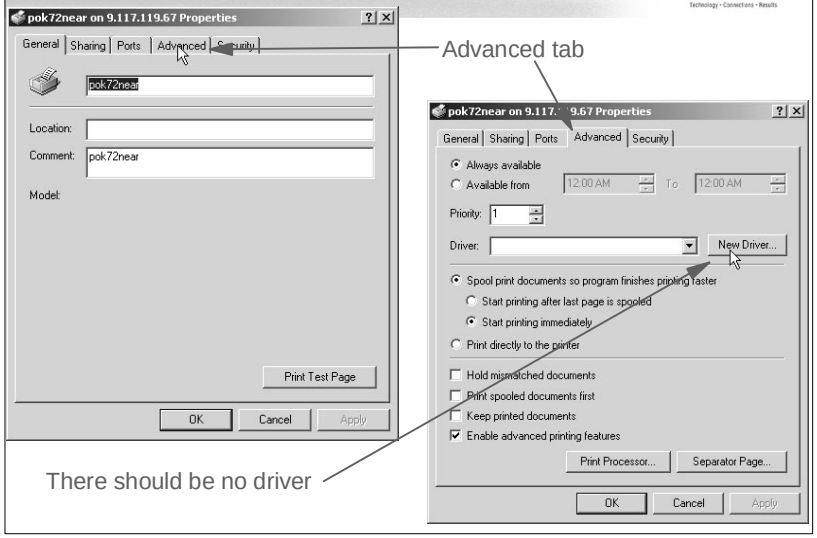
Solution - Upload printer driver (cont'd)



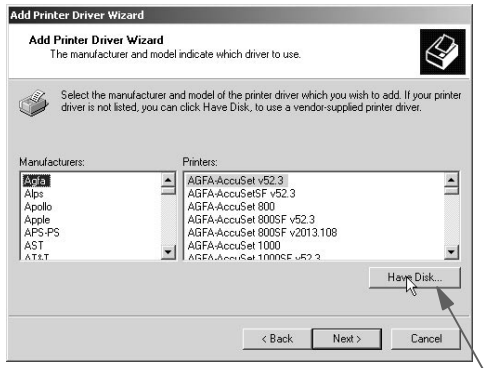
Solution - Upload printer driver (cont'd)



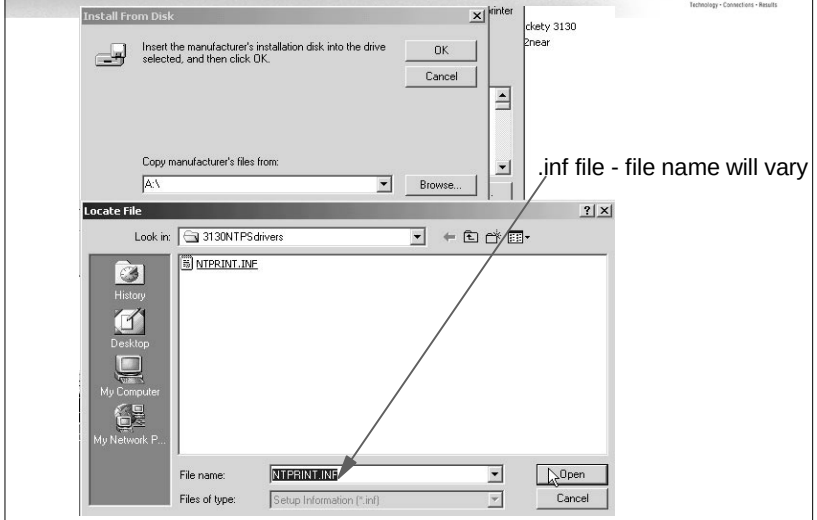
Solution - Upload printer driver (cont'd)



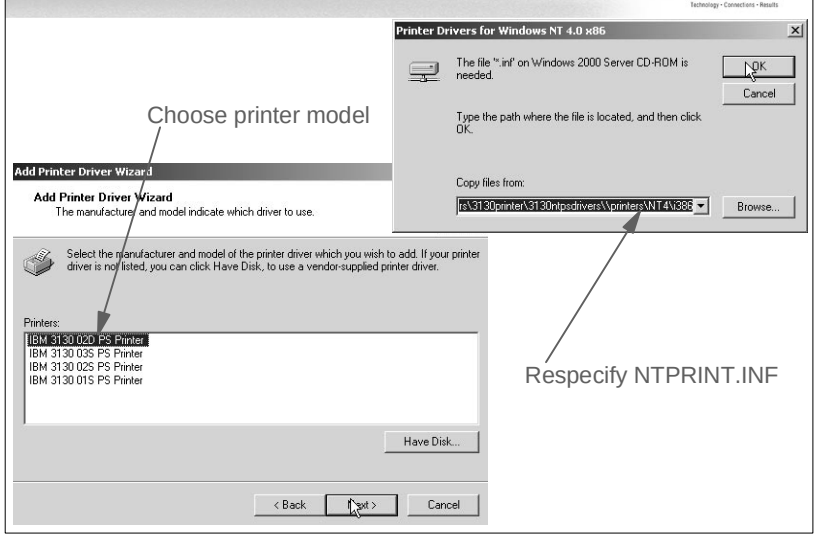
Solution - Upload printer driver (cont'd)



Solution - Upload printer driver (cont'd)



Solution - Upload printer driver (cont'd)



Solution - Upload printer driver (cont'd)

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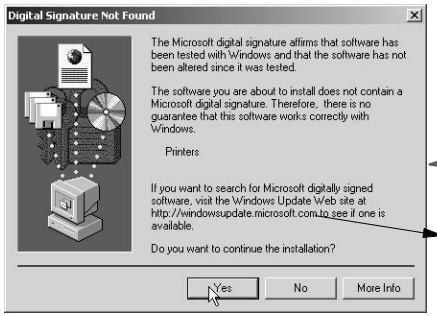
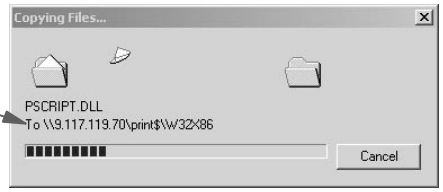


FUD?

"Thank you for your interest in Windows Update
You need to be running a version of Internet Explorer 5 or higher in order to use Windows Update.
Download the latest version of Internet Explorer?"

This is what you want to see
(not to C:\WINNT\...)



Solution - Upload printer driver (cont'd)

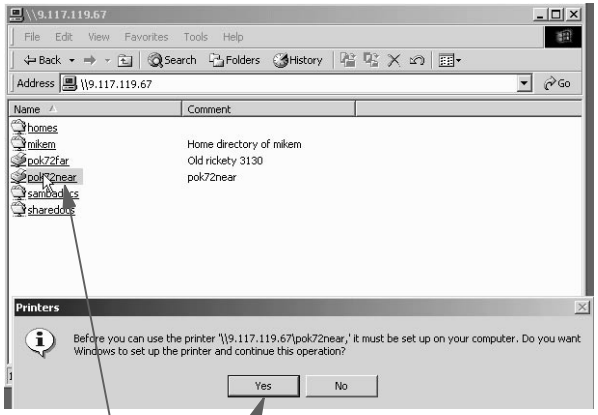
- Now back on Linux - the drivers have been uploaded

```
# cd /var/lib/samba/drivers/W32X86
# ls
2/
# cd 2
# ls
313002D.PPD  PSCRIPT.DLL  PSCRIPT.HLP  PSCRPTUI.DLL
# file *
313002D.PPD:  PPD file, ve
PSCRIPT.DLL:  MS Windows PE 32-bit Intel 80386 native DLL
PSCRIPT.HLP:  MS Windows Help Data
PSCRPTUI.DLL: MS Windows PE 32-bit Intel 80386 native DLL
```

- The cupsaddsmb command performs same function from Linux
  - Create a directory /etc/cups/drivers and populate it with drivers
  - Run **cupsaddsmb** and the files are migrated to Samba's [print$]/path

Solution - Automatic download of drivers

Once the driver is uploaded, adding the printer is simple:



Choose printer, choose Yes, and you're done!

Solution - Samba as a time server

- Linux server must first be a time client
- Overall steps:
  - Be sure xntp is installed

```
# rpm -qa | egrep 'xntp|libcap'
# cd /mnt/cdl/suse/s390
# ls -l xntp* libcap*
-r--r--r--     root    56957 Nov  5 21:34 libcap-1.92-28.s390.rpm
-r--r--r--     root   374424 Nov  5 22:51 xntp-4.1.1-52.s390.rpm
-r--r--r--     root  1106456 Nov  5 22:51 xntp-doc-4.1.1-52.s390.rpm
# rpm -Uvh xntp-4.1.1-52.s390.rpm xntp-doc-4.1.1-52.s390.rpm \
  libcap-1.92-28.s390.rpm
...
# SuSEconfig
```

  - Set up the NTP service:

```
# chkconfig xntpd
xntpd  off
# chkconfig xntpd on
# ls -l /etc/init.d/rc5.d/*ntp*
lrwxrwxrwx root 8 Feb 12 13:38 /etc/init.d/rc5.d/K09xntpd -> ../xntpd*
lrwxrwxrwx root 8 Feb 12 13:38 /etc/init.d/rc5.d/S13xntpd -> ../xntpd*
```

Solution - Samba as a time server (cont'd)

- Distill comments from NTP configuration file (optional):

```
# cp ntp.conf ntp.conf.orig
# egrep -v '^$|^#' ntp.conf.orig | tee ntp.conf
server 127.127.1.0              # local clock (LCL)
fudge  127.127.1.0 stratum 10   # LCL is unsynchronized
driftfile /var/lib/ntp/ntp.drift # path for drift file
logfile   /var/log/ntp          # alternate log file
```

- Set up time servers (assumes access to Internet)
  - See http://www.eecis.udel.edu/~mills/ntp/clock1a.html for public time servers

```
# cat ntp.conf
server    clock.llnl.gov
server    tock.usno.navy.mil
driftfile /var/lib/ntp/ntp.drift # path for drift file
logfile   /var/log/ntp          # alternate log file
```

- Start time server

```
# rcxntpd status
Checking for network time protocol daemon (NTPD):               unused
# rcxntpd start
Try to get initial date and time via NTP from
  clock.llnl.gov tock.usno.navy.mil                             done
Starting network time protocol daemon (NTPD)                    done
```

Solution - Samba as a time server (cont'd)

- Check that server is talking to time servers (wait 64 seconds)

```
# ntpq
ntpq> peers
     remote           refid      st t when poll delay   offset  jitter
==============================================================================
*ntp1.usno.navy. .USNO.           1 u   36   64 21.098   -4.321   2.270
+clock.via.net   .GPS.            1 u   32   64 79.086   -5.215   0.785
+dns.cit.cornell ntp0.usno.navy. 2 u   43   64 19.957   -7.438   1.823
ntpq> q
```

- Check the state of your new time server

```
# ntptrace localhost
localhost: stratum 2, offset 0.000040, synch distance 0.02551
ntp1.usno.navy.mil: stratum 1, offset -0.009210, synch distance
  0.00018, refid 'USNO'
```

- You can now synchronize Windows desktops two ways:
  - At boot time:
    - Put a settime.bat file in the startup folder which has one line:

```
net time \\9.117.119.67 /set /yes
```

  - At network logon time (if Samba is set up as a PDC)
    - Put the above line in the smb.conf "logon script"

Documentation and resources

- Documentation
  - SuSE docs, including Samba docs

```
[sharedocs]
        path = /usr/share/doc/packages
```

  - CUPS Web server

```
http://your.server.name:631/documentation.html
```

  - *Using Samba*, Jay Ts, Robert Eckstein, David Collier-Brown (2nd ed)
  - SWAT - includes *Using Samba* (1st edition) on line
  - *SAMBA Essentials for Windows Administrators*, Gary Wilson
  - Redbooks
    - *Linux for S/390*

```
http://www.redbooks.ibm.com/abstracts/sg244987.html
```

    - *Linux for zSeries and S/390: Distributions*

```
http://www.redbooks.ibm.com/abstracts/sg246264.html
```

    - *Understanding LDAP* , SG24-4986

```
http://www.redbooks.ibm.com/abstracts/sg244986.html
```

Documentation and resources (cont'd)

- Web sites
  - Linuxvm.org - the Linux on zSeries portal:
    `http://linuxvm.org`
  - DeveloperWorks - IBM Boeblingen
    `http://www10.software.ibm.com/developerworks/opensource/linux390/index.shtml`
  - ISV applications for Linux on zSeries:
    `http://www.ibm.com/servers/eserver/zseries/solutions/s390da/linuxproduct.html`
  - z/VM and Linux:
    `http://www.vm.ibm.com/linux`
  - linux-390 archives:
    `http://www.marist.edu/htbin/wlvindex?linux-390`
  - z/VM publications:
    `http://www.vm.ibm.com/pubs/`
- Mailing lists
  - linux-390 mailing list (subscribe at bottom of page)
    `http://www.marist.edu/htbin/wlvindex?linux-390`
  - Samba mailing list (this host or other mirror)
    `http://us2.samba.org/samba/archives.html`

Questions ??