Print Serving Solutions Using Samba and CUPS

Michael MacIsaac - IBM - mikemac@us.ibm.com
Tuesday February 24th, 4:30 PM
SHARE Session 9208

Abstract

Samba is often mentioned with 'File and Print', but is most often used for file serving. A true print server must 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?

- 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)

- 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

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- 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)


- 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
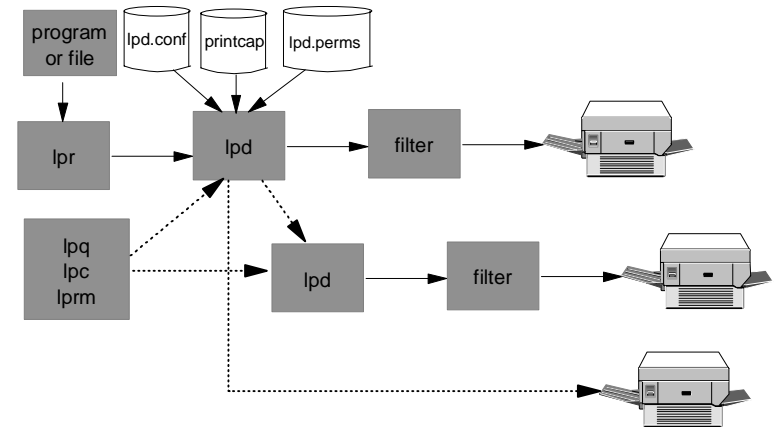
PDQ - "Print, don't queue"

- 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 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)

- 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
```

See http://your.server.name:631/documentation.html
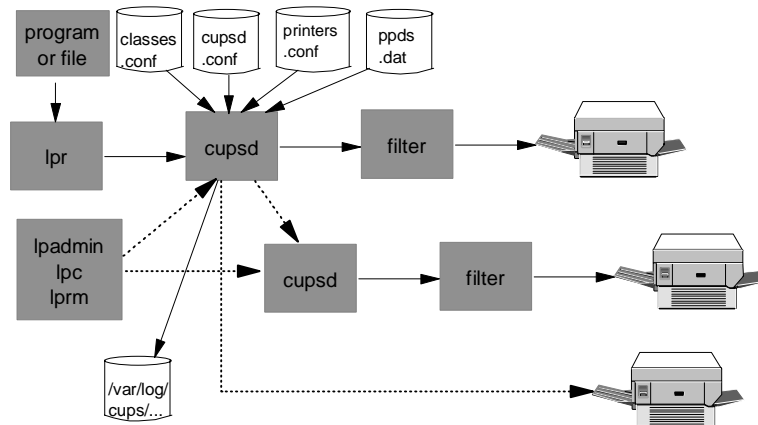
- Verify the CUPS installation - SLES-8

```
# 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

Documentation - Common UNIX Printing System - Mozilla

File Edit View Go Bookmarks Tools Window Help

Back ▼ Forward ▼ Reload Stop   http://9.117.119.67:631/documentation.html ▼   Search Print ▼

ESP   Administration   Classes   Help   Jobs   Printers   Software

Documentation

The following documentation for CUPS is available on this server:

- Whitepaper - An Overview of the Common UNIX Printing System (HTML | PDF)
- Software Users Manual (HTML | PDF)
- Software Administrators Manual (HTML | PDF)
- Software Programmers Manual (HTML | PDF)
- Configuration Management Plan (HTML | PDF)
- CUPS Implementation of IPP (HTML | PDF)
- Interface Design Description (HTML | PDF)
- Software Design Description (HTML | PDF)
- Software Performance Specification (HTML | PDF)
- Software Version Description (HTML | PDF)
- Software Security Report (HTML | PDF)
- Software Translation Guide (HTML | PDF)

http://9.117.119.67:631/overview.html

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

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
  ```

- 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
```

- Can be uploaded from Windows or loaded on Linux
- On Linux the **cupsaddsmb** command is used:
  - Get Windows Adobe PS drivers at
    http://www.adobe.com/support/downloads/detail.jsp?ftpID=1500
  - Download aps426eng.exe, winsteng.exe run on Win2K - will populate:
    C:\WINNT\system32\spool\drivers\w32x86\2
  - Ftp from DOS to Linux in /usr/share/cups/drivers - from winsteng.exe:
    ADOBEPS5.DLL, ADOBEPSU.DLL, ADOBEPSU.HLP, DEFPRTR2.PPD
  - From aps426eng.exe extract:
    ADFONTS.MFM, ADOBEPS4.DRV, ADOBEPS4.HLP, ICONLIB.DLL, PSMON.DLL
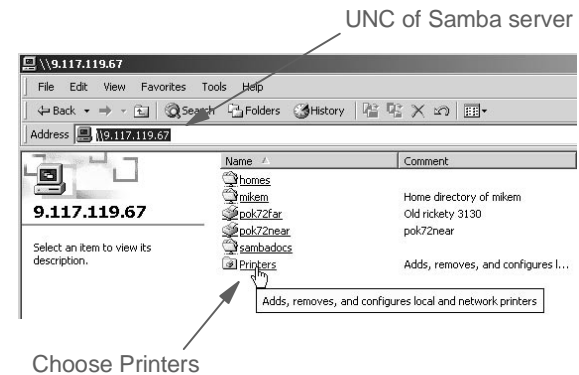 - Run **cupsaddsmb** using the printer admin user

```
# ls /var/lib/samba/drivers/W32X86/
# cupsaddsmb -U mikem -a
Password for mikem required to access localhost via SAMBA:
# ls /var/lib/samba/drivers/W32X86/
2/
# ls /var/lib/samba/drivers/W32X86/2
ADOBEPS5.DLL   ADOBEPSU.HLP  poknp24b.PPD
ADOBEPSU.DLL   poknp24a.PPD  poknp24c.PPD
```

- 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")

UNC of Samba server

Choose Printers

Solution - Upload printer driver (cont'd)

S H A R E
Technology · Connections · Results

Printers on 9.117.119.67

File Edit View Favorites Tools Help

Back → Search Folders

Address Printers on 9.117.119.67 Go

Name	Documents	Status	Comment
Add Printer			
pok72far	8	Ready	Old ricket
pok72near	0	Ready	pok72nea

Open
Connect...

Pause Printing
Cancel All Documents

Sharing...

Create Shortcut
Delete
Rename

Properties

Right-click printer

Printer Properties

⚠ Device settings cannot be displayed. The driver for the specified printer is not installed. Only spooler properties will be displayed. Do you want to install the driver now?

Yes   No

Displays the properties of the selected items.

Choose No

Solution - Upload printer driver (cont'd)

S H A R E
Technology · Connections · Results

pok72near on 9.117.119.67 Properties

General | Sharing | Ports | Advanced | Security

🖨 pok72near

Location:

Comment: pok72near

Model:

Print Test Page

OK   Cancel   Apply

Advanced tab

pok72near on 9.117.119.67 Properties

General | Sharing | Ports | Advanced | Security

⦿ Always available
○ Available from 12:00 AM To 12:00 AM

Priority: 1

Driver: ▼ New Driver...

⦿ Spool print documents so program finishes printing faster
  ○ Start printing after last page is spooled
  ⦿ Start printing immediately
○ Print directly to the printer

☐ Hold mismatched documents
☐ Print spooled documents first
☐ Keep printed documents
☑ Enable advanced printing features

Print Processor...   Separator Page...

OK   Cancel   Apply

There should be no driver

Solution - Upload printer driver (cont'd)

S H A R E
Technology · Connections · Results

Add Printer Driver Wizard

Add Printer Driver Wizard
The manufacturer and model indicate which driver to use.

Select the manufacturer and model of the printer driver which you wish to add. If your printer driver is not listed, you can click Have Disk, to use a vendor-supplied printer driver.

Manufacturers: Printers:
Agfa   AGFA-AccuSet v52.3
Alps   AGFA-AccuSetSF v52.3
Apollo   AGFA-AccuSet 800
Apple   AGFA-AccuSet 800SF v52.3
APS-PS   AGFA-AccuSet 800SF v2013.108
AST   AGFA-AccuSet 1000
AT&T   AGFA-AccuSet 1000SF v52.3

Have Disk...

< Back   Next >   Cancel

File chooser to drivers

Solution - Upload printer driver (cont'd)

S H A R E
Technology · Connections · Results

Install From Disk

Insert the manufacturer's installation disk into the drive selected, and then click OK.

OK
Cancel

Copy manufacturer's files from:
A:\ ▼ Browse...

.inf file - file name will vary

Locate File

Look in: 3130NTPSdrivers ▼

History
Desktop
My Computer
My Network P...

NTPRINT.INF

File name: NTPRINT.INF ▼ Open
Files of type: Setup Information (*.inf) ▼ Cancel

Choose printer model

Respecify NTPRINT.INF

Printer Drivers for Windows NT 4.0 x86

The file '*.inf' on Windows 2000 Server CD-ROM is needed.

OK

Cancel

Type the path where the file is located, and then click OK.

Copy files from:

rs\3130printer\3130ntpsdrivers\\printers\NT4\38B

Browse...

Add Printer Driver Wizard

Add Printer Driver Wizard
The manufacturer and model indicate which driver to use.

Select the manufacturer and model of the printer driver which you wish to add. If your printer driver is not listed, you can click Have Disk, to use a vendor-supplied printer driver.

Printers:
IBM 3130 02D PS Printer
IBM 3130 03S PS Printer
IBM 3130 02S PS Printer
IBM 3130 01S PS Printer

Have Disk...

< Back   Next >   Cancel

Add Printer Driver Wizard

Completing the Add Printer Driver Wizard

You have successfully completed the Add Printer Driver wizard.

You are about to add the following drivers:

IBM 3130 02D PS Printer, Intel, Windows NT 4.0 or 2000

To close this wizard, click Finish.

< Back   Finish   Cancel

Digital Signature Not Found

The Microsoft digital signature affirms that software has been tested with Windows and that the software has not been altered since it was tested.

The software you are about to install does not contain a Microsoft digital signature. Therefore, there is no guarantee that this software works correctly with Windows.

Printers

If you want to search for Microsoft digitally signed software, visit the Windows Update Web site at http://windowsupdate.microsoft.com to see if one is available.

Do you want to continue the installation?

Yes   No   More Info

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\...)

Copying Files...

PSCRIPT.DLL
To \\9.117.119.70\print$\W32X86

Cancel

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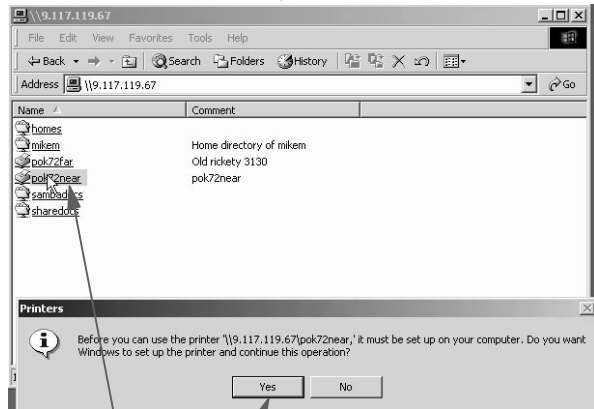
Choose printer, choose Yes, and you're done!

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/cd1/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
  - 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
    - ***Watch for a new Printing Redpaper!!***
    - *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
      ```

- 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
    ```