

# Print Solutions Using Samba

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SHARE Session 9321

## Abstract

This session picks up where "File Solutions Using Samba" leaves off. Samba is often mentioned with "File and Print", but most often it is used for file serving. In fact a true print server must be set up before Samba can act as a print "middle-man" between Windows and the Linux print server. Other print topics are a few general Samba topics are also addressed:

- Printing overview - Samba is a file server, but is it really a print server?
- Printing alphabet soup - lpr, LPRng, PDQ, CUPS, ESP Pro, imprints, OmniDriver,...
- Printing permutations and one solution addressed
- Automatic download of print drivers
- Samba as a time server
- Future Samba features

## Outline for this hour



- Introductions and overview of Samba printing
- Samba print solutions!
  - Set up a print server - CUPS
  - Samba-enable the print server
  - Upload printer drivers
  - Automatic download of printer drivers
  - Accounting?
  - Samba as a time server
- Samba 3.0 features
- Documentation and resources

## Introductions - Who am I?



- Michael MacIsaac
  - 16 years with IBM
    - 10 years programmer (Fortran, C, C++)
    - 6 years with S/390
  - Led teams to produce redbooks in 2001:
    - Linux on zSeries and S/390: Distributions
    - Linux on zSeries and S/390: ISP/ASP solutions
  - zSeries Linux technical support
    - Talk to customers, client reps
    - Teach IBMers and Business Partners
  - Linux (open source/freeware) advocate
  - e-mail - [mikemac@us.ibm.com](mailto:mikemac@us.ibm.com)

## Introductions - Who are you?



- What is your professional area?
  - Marketing/sales
  - Technical
  - Management
- How is Linux in your enterprise?
  - Some in test only
  - Some in production
  - Majority of servers in production
- How is printing done in your enterprise
  - Local printers (on desktop + parallel/USB cable)
  - IS maintained printers with
    - job done notification
    - accounting reports
- What is your desktop?
  - Windows
  - Linux

## 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 measured 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)



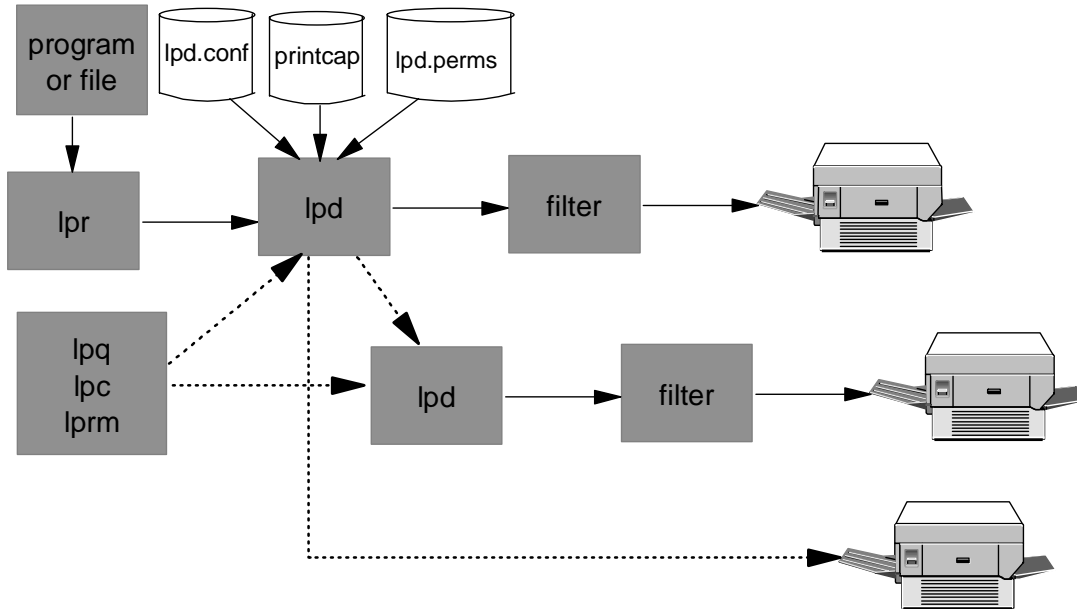
- Other terminology and concepts
  - Print Queues - usually FIFO
    - External to printer
    - Internal to printer
  - Print jobs
  - Printer class (pool) - a group of printers
  - Filters - software to modify one print type to another
  - "Backends" - software to send the filtered print data to the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



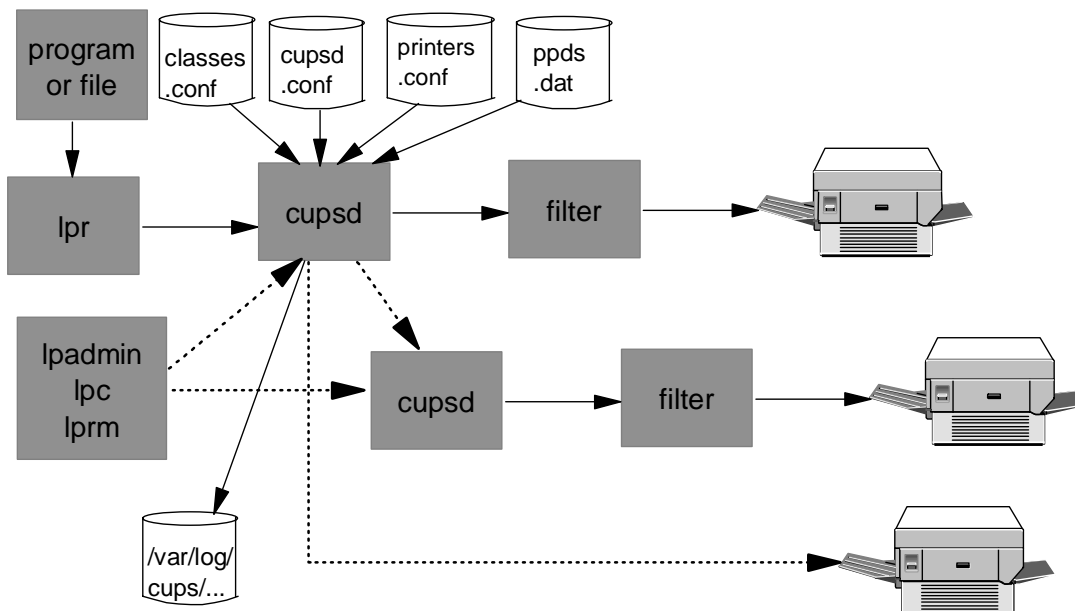
- System commands (in /usr/sbin):

|            |   |
|------------|---|
| 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 a print server - CUPS



- 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 a print server - CUPS (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 - listening on port 631



Common UNIX Printing System - Mozilla

File Edit View Go Bookmarks Tools Window Help

Back Forward Reload Stop <http://9.117.119.67:631/> Search Print

**ESP** Administration Classes Help Jobs Printers Software

[Do Administration Tasks](#)

[Manage Printer Classes](#)

[On-Line Help](#)

[Manage Jobs](#)

[Manage Printers](#)

[Download the Current CUPS Software](#)

http://9.117.119.67:631/admin

## 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 a print server - CUPS (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)

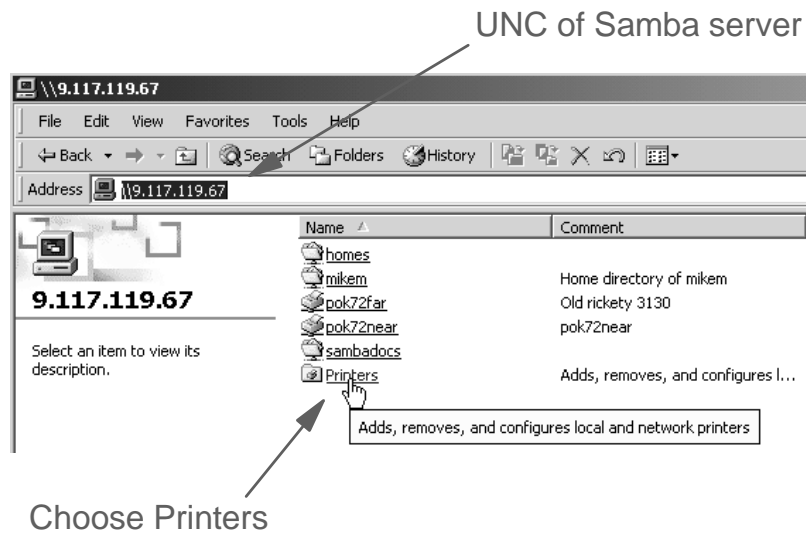
```
# rcnmb start
Starting Samba classic NMB daemon                                done
# rcsmb start
Samba SMB: Waiting for cupsd to get ready                        done
Starting Samba classic SMB daemon                                done
```

## Solution - Upload printer driver

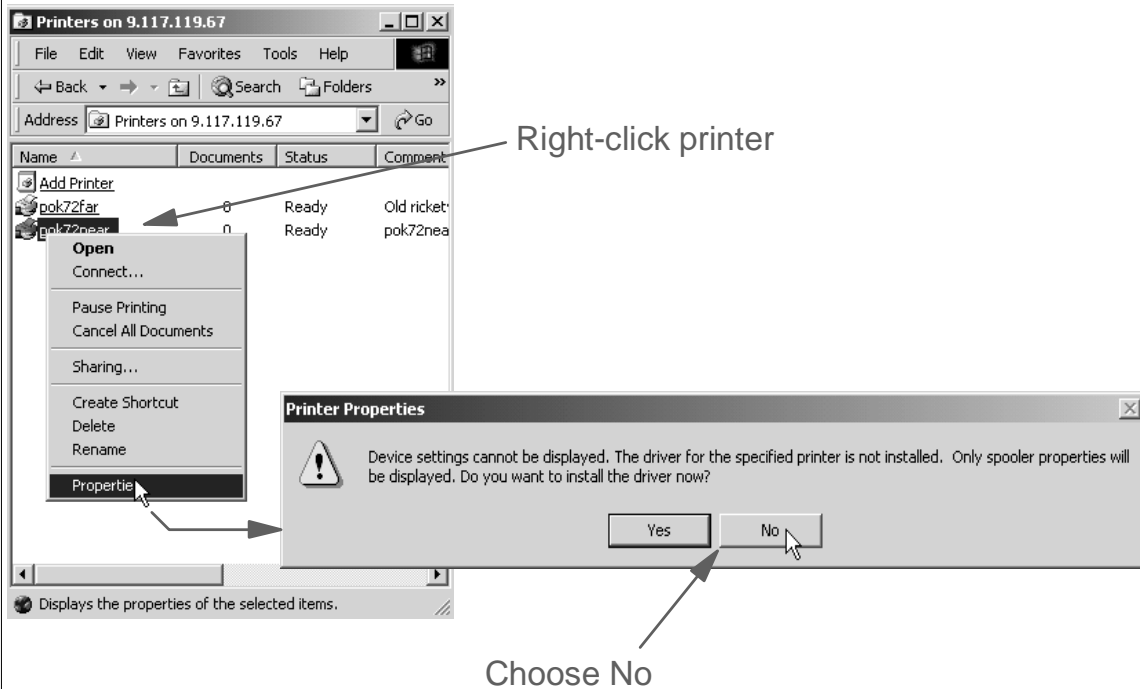


- Windows offers the ability to upload printer drivers to the file server
  - Windows NT/2K/XP x86 directory [print\$]/W32X86
  - Windows 95/98/ME directory [print\$]/WIN40
  - Also, drivers for Windows running on Alpha, MIPS, PowerPC"
- When uploaded to Windows/Samba print server, Windows clients can 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)



Advanced tab

There should be no driver

## Solution - Upload printer driver (cont'd)



Add Printer Driver Wizard

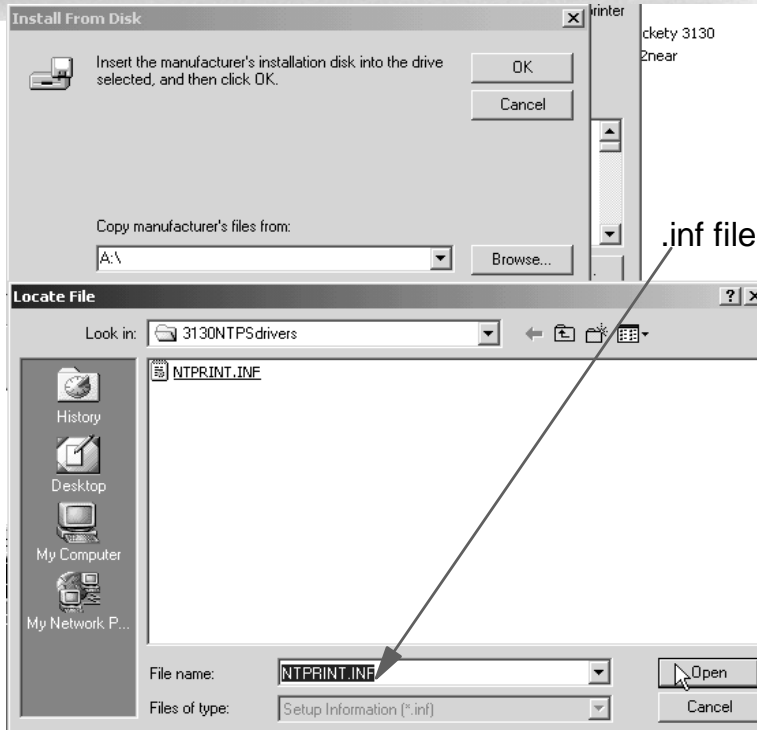
The manufacturer and model indicate which driver to use.

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.

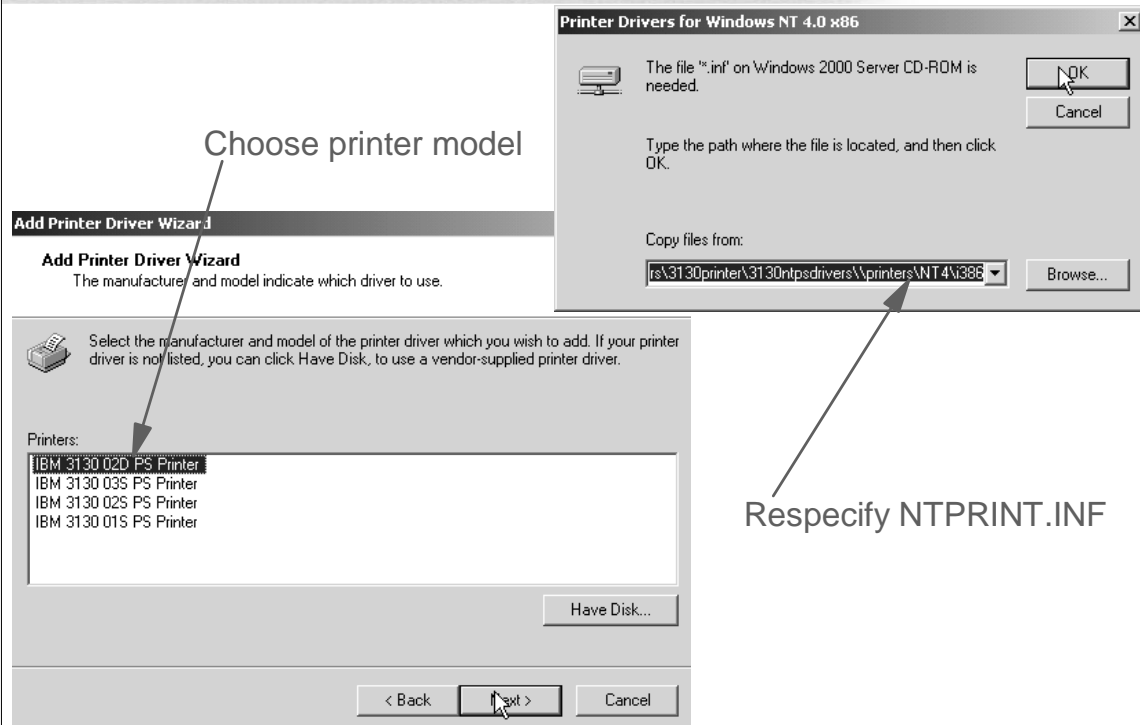
| Manufacturers: | Printers:                    |
|----------------|------------------------------|
| Agfa           | AGFA-AccuSet v52.3           |
| Alps           | AGFA-AccuSetSF v52.3         |
| Apollo         | AGFA-AccuSet 800             |
| Apple          | AGFA-AccuSet 800SF v52.3     |
|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

File chooser to drivers

## Solution - Upload printer driver (cont'd)



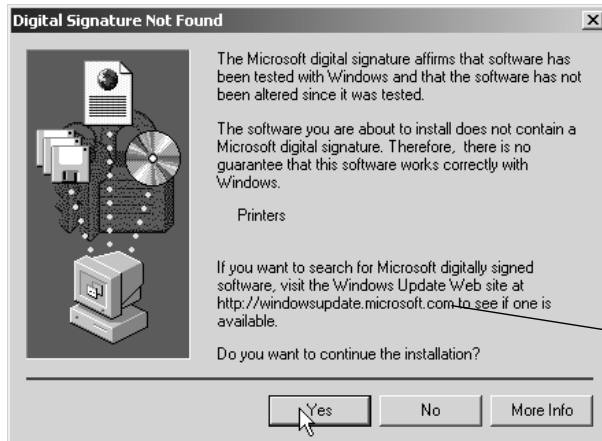
## Solution - Upload printer driver (cont'd)



## Solution - Upload printer driver (cont'd)



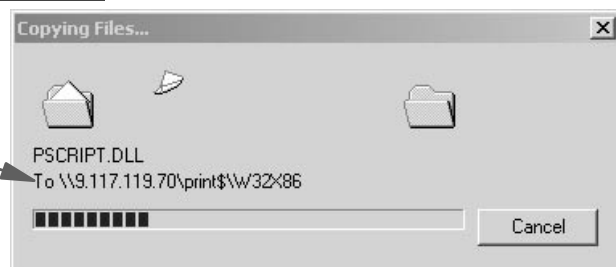
## Solution - Upload printer driver (cont'd)



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

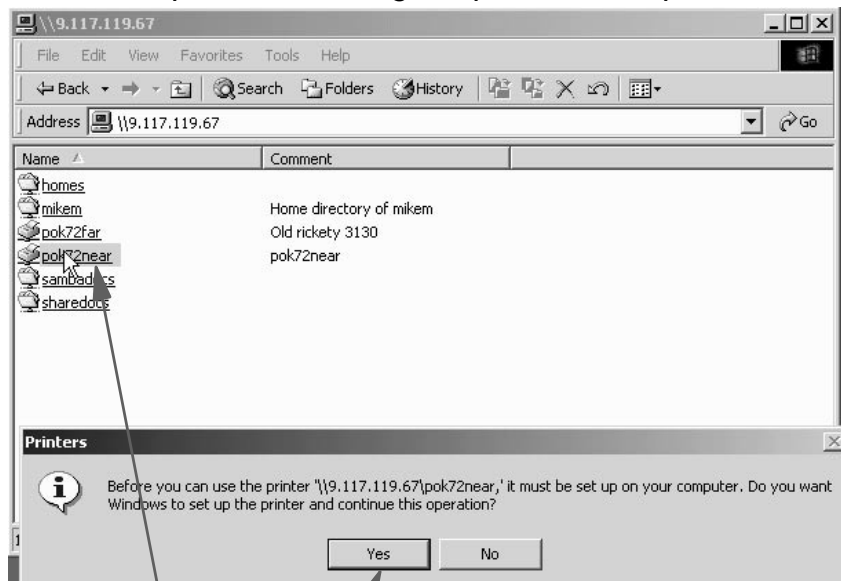
```
# cd /var/lib/samba/drivers/W32X86
# ls
2/
# cd 2
# ls
313002D.PPD  PSCRIPT.DLL  PSCRIPT.HLP  PSCRPTUI.DLL
# file *
313002D.PPD:  PPD file, ve
PSCRIPT.DLL:  MS Windows PE 32-bit Intel 80386 native DLL
PSCRIPT.HLP:  MS Windows Help Data
PSCRPTUI.DLL: MS Windows PE 32-bit Intel 80386 native DLL
```

- 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
- For documentation see: \\your.samba\sharedocs\xntp-doc\html\index.htm
- 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
...
```

- 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"

## Omni Print Driver project

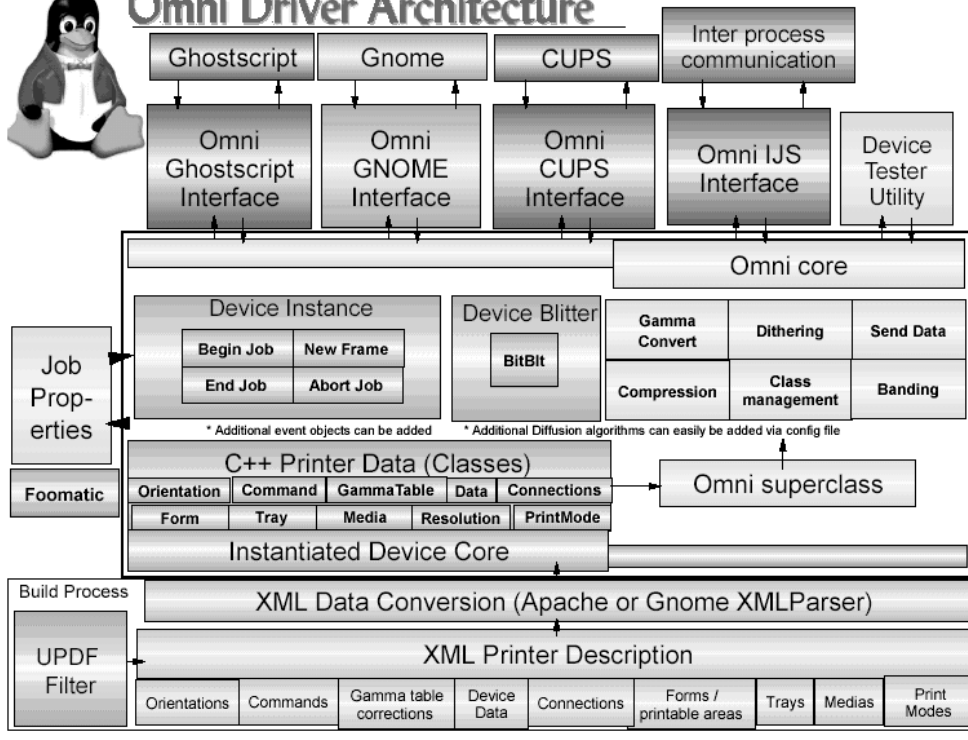


- The Omni Print Driver project
  - Simplifies printer driver development by abstracting specific print functions into objects.
  - Human editable device descriptions in XML files which provides the capability of creating new devices by editing the XML descriptions.
  - These XML files are converted into C++ objects which are then used to drive the device
  - The future will provide a user interface for creating a new device
  - See: <http://www.ibm.com/linux/lrc/projects/omni/>

# Omni Print Driver project (cont'd)



## Omni Driver Architecture



# Samba futures - Linux vs. 390 mentality



- What's wrong with this picture?

(from WHATSNEW-2.2.8pre1.txt):

What's new in Samba 2.2.8pre1 - 3rd February 2003

=====

This is a non-production, preview release of the upcoming Samba 2.2.8 distribution. This preview release is for testing purposes only and should not be installed in production environments.

The purpose of this preview release to make numerous bugs fixes for Samba 2.2.7a available to the Samba community. Please report testing results of this release to the Samba mailing list <samba@samba.org>.

## Samba futures - Samba 3.0



- Samba 3.0 roadmap (due 2H 2003?) See:  
<http://us1.samba.org/samba/devel/roadmap-3.html>
- UNICODE support
- Windows 2000 AD client support
- winbind dual-daemon implementation
- pluggable passdb support
- Windows NT 4.0 Style Trust Relationship
- NTLMv2
- One Time Migration script from a Windows NT 4.0 PDC to a Samba PDC
- Winbind working with Samba PDC
- Loadable RPC implementations
- hook for utilizing a centralized winbind id map database
- Group Mapping support(privileges need some work, etc...)
- Publishing printers in AD (probably will make 3.0 but will not delay release) in-progress

## 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 ??

