



CISNTWK-11
Microsoft Windows Server

Printing and Network Print Services

Terminology

- **Printer** ← **Software**
 - Software interface between the Operating System and the *Print Device*
 - Users “submit” to the *Printer* and/or “connect” to the *Printer*
 - Note that this term is often confusing (this is Microsoft’s terminology)
- **Print Device** ← **Hardware**
 - The actual hardware device that produces the printed documents
 - Note that this term is often confusing (this is Microsoft’s terminology)
 - most everyone else refers to this as the “printer”
- **Print Server**
 - The “Server” computer that links the *Print Device(s)* on the network and manages sharing those devices with computers on the network
 - receives the documents (print jobs) from client computers
 - You set up and share *Printers* on *Print Servers*

- **Printer Driver**
 - Translates the output text and graphics to the *Print Device*'s printer language
 - PostScript
 - Printer Control Language (PCL)
 - This makes it possible for a print device to print a document
 - Usually specific for each manufacturer and model number
- **Printer Port**
 - The interface through which a computer communicates with a *Print Device*
 - A *Port* can be ...
 - locally attached to the computer
 - a conduit to a network-attached device
- **Queue**
 - A group of documents waiting to be printed
 - this is a storage area placed on a hard disk
 - usually associated with spooling
 - Non Microsoft environments often “submit” to a *Queue*
 - such as Novell NetWare

- Creating a Printer
 - The process of naming, defining settings for, installing drivers for, and linking a printing device to the network
 - Accomplished via
 - Windows Server 2008
 - **Control Panel -> Printers -> Add Printer -> Add a local printer**
 - Windows Server 2003
 - **Control Panel -> Printers and Faxes-> Add Printer -> Local Printer**
 - Windows 2000 Server
 - **Control Panel -> Printers -> Add Printer -> Local Printer**
 - Windows NT 4 Server
 - **Control Panel -> Printers -> Add Printer -> My Computer**
 - This will establish a “Print Server” on the computer where this is done

- Connecting to a Printer
 - The process of attaching to a network Share
 - that resides on the computer that “Creating a Printer” was performed at
 - This can be accomplished via
 - Windows Server 2008
 - **Control Panel -> Printers -> Add Printer -> Add a network, wireless or Bluetooth printer**
 - Windows Server 2003
 - **Control Panel -> Printers and Faxes -> Add Printer ->Network printer**
 - Windows 2000 Server
 - **Control Panel -> Printers -> Add Printer ->Network printer**
 - Windows NT 4 Server
 - **Control Panel -> Printers -> Add Printer ->Network printer server**

- Connecting to a Printer
 - On Windows NT family, can also be established via “point and print”
 - for Windows Server 2008, Windows 7, and Windows Vista
 - from “Network”, drag the Printer Share to your “Printers” folder
 - for Windows Server 2003, Windows XP, and Windows 2000
 - from “My Network Places”, drag the Printer Share to your “Printers” folder
 - for Windows NT
 - from “Network Neighborhood”, drag the Printer Share to your “Printers” folder
 - On Windows 2008, Windows 2003, and Windows 2000 Domains
 - you can connect to a Printer using Active Directory
 - assuming the printer has been published in Active Directory
 - If the client computer is Windows NT family, or Windows 95 (or later)
 - the printer drivers will be automatically installed

- The *Print Device* (physical printer) is connected directly to a computer via
 - Parallel port (lpt1:, lpt2:, etc.)
 - this is polled and not interrupt driven on Windows NT ¹
 - this prevents hardware conflicts with ISA devices that share an Interrupt Request (IRQ)
 - Sound Blaster (compatible) sound cards have historically done this
 - the implementation is **very inefficient** and generally best to avoid on Servers
 - assuming you have printers utilizing the parallel port interface
 - with Windows 2000 (and later)
 - the default behavior is polled (as with Windows NT) ¹
 - you can use “Device Manager” to configure the parallel port to be interrupt driven
 - assuming specific conditions are met
 - Serial port (com1:, com2:, etc.)
 - generally offers low data rates
 - this interface is used for (very) old printers

¹ See “Resources” slide for details (refer to Microsoft Knowledge Base article “103411”)

Printer Port Types - Local (continued)

- The *Print Device* (physical printer) is connected directly to a computer via
 - USB port
 - available on Windows 2000 (and later)
 - IEEE 1394 (“Fire wire”) port
 - available on Windows 2000 (and later)
 - Infrared Data Association (IrDA) port
 - available on Windows 2000 (and later)
 - generally offers low data rates
 - SCSI port
 - extremely rare on PCs

Printer Port Types - Network

- The *Print Device* (physical printer) is connected to a network
 - The physical printer must have a
 - Network Interface Card (NIC)
 - HP JetDirect, for example
 - network connection
 - Windows NT family can act as a *Print Server* for the networked *Print Device*
 - **This is almost always the best approach for printing on Windows Server**

- The following networking protocols may be used (for supporting foreign operating systems “printing” solutions)
 - **TCP/IP**
 - interface is based on the Unix Line Printer Daemon (LPD)
 - Berkeley style (BSD) Daemons only ¹
 - not System V (SysV)
 - to print to a Unix printer
 - with Windows Server 2008, it *may* require the Server Feature “LPR Port Monitor” to be installed
 - with Windows 2000 (and later), it is provided as part of the TCP/IP protocol stack
 - using the Standard Port Monitor (SPM)
 - with Windows NT, requires the networking service “*Microsoft TCP/IP Printing*”
 - for Windows Server 2008 to receive a print job from a Unix client
 - requires the Server Role “Print Services -> LPD Service” to be installed
 - for Windows Server 2003 and Windows 2000 Server to receive a print job from a Unix client
 - requires the print service “*Print Services for Unix*”

¹ Implementation is based on “Request For Comment (RFC) 1179”: [ftp://ftp.rfc-editor.org/in-notes/rfc1179.txt](http://ftp.rfc-editor.org/in-notes/rfc1179.txt)

Network Printing Solutions (continued)

- The following networking protocols may be used (for supporting foreign operating systems “printing” solutions)
 - **IPX/SPX** ¹ (Microsoft’s “NWLink” protocol)
 - is used to send print documents to a Novell NetWare Print Server / Print Queue
 - on Windows Server 2003
 - requires the networking client “*Client Services for NetWare*”
 - although the name is similar to Windows “Professional”
 - it is a superset of the functions offered by the Windows “Professional”
 - it is similar to “*Gateway (and Client) Services for NetWare*” on Windows 2000
 - on Windows 2000 Server and Windows NT Server
 - requires the networking client/service “*Gateway (and Client) Services for NetWare*”
 - on Windows XP Professional, 2000 Professional and NT Workstation
 - requires the networking client “*Client Services for NetWare*”
 - this is a subset of “*Gateway (and Client) Services for NetWare*”
 - “*Gateway (and Client) Services for NetWare*”
 - also supports being a gateway for Windows clients to print to a NetWare Print Queue
 - without having to load any special protocols or services on the Windows clients

Network Printing Solutions (continued)

- The following networking protocols may be used (for supporting foreign operating systems “printing” solutions)
 - **AppleTalk**¹
 - Apple’s printing solution for Macintosh computers
 - available with the Server family products only
 - the Server can receive print jobs from Macintosh computers
 - on Windows Server 2003 and Windows 2000 Servers
 - requires the print service “*Print Services for Macintosh*”
 - on Windows NT Servers
 - requires the networking service “*Services for Macintosh*”

¹ This protocol is not available on Windows Server 2008

Network Printing Solutions (continued)

- **Internet Printing**
 - Available on Windows 2000 (and later)
 - Sends print document using Hypertext Transfer Protocol (HTTP)
 - users submit the print document through the use of a Uniform Resource Locator (URL)
 - Requires an Internet Printing Protocol (IPP) v1.0 compliant Print Server
 - *Microsoft Internet Information Services (IIS)*
 - Windows Server 2008, Windows 7, and Windows Vista
 - Windows Server 2003, Windows XP Professional, Windows 2000 Server family
 - *Microsoft Peer Web Services (PWS)*
 - Windows 2000 Professional
 - On Windows Server 2008
 - requires the Server Role “Print Services -> Internet Printing” to be installed

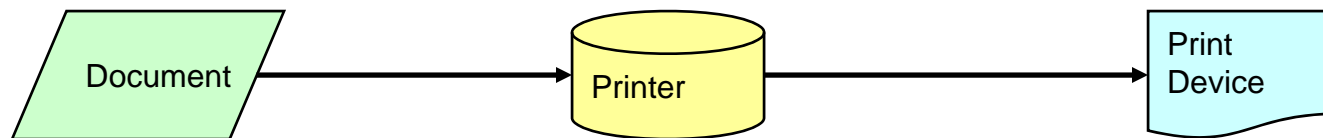
Network Printing Solutions (continued)

- Data Link Control (**DLC**) protocol may be used as a “special case”
 - Supported by HP JetDirect devices
 - Protocol is **not** routable, but is bridgeable
 - With Windows 2000 and Windows NT, only supported with a single NIC
 - Be cautious when configuring the DLC protocol to use “Continuous Timers”
 - this will prevent other *Print Servers* from printing to this *Print Device*
 - the DLC protocol should instead be configured to be “Job Based”
 - This protocol has been removed from Windows XP (and later)
 - although an unsupported version is available from Microsoft for Windows XP only

Printing Models

Single Printer to single Print Device

This is the most widely used printing model

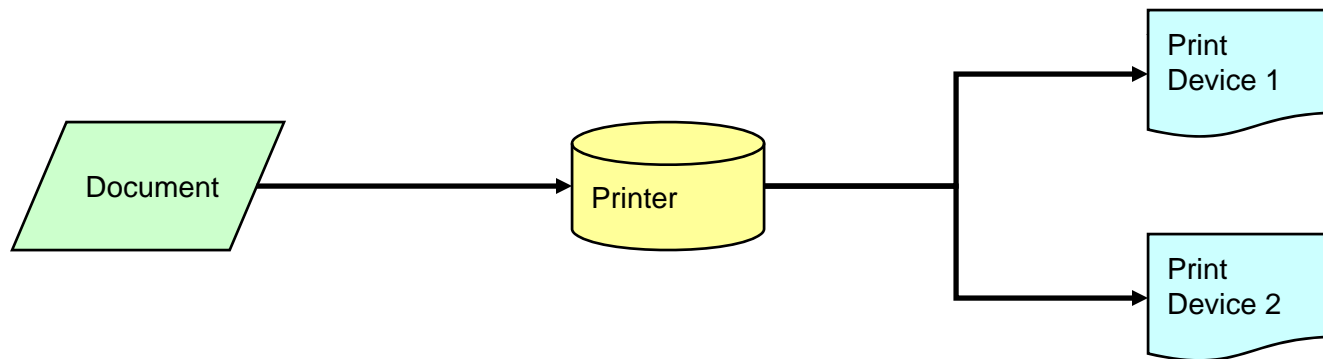


Printing Models (continued)

Single Printer to multiple identical Print Devices

This is known as printer pooling

Note - print devices must use the same printer driver

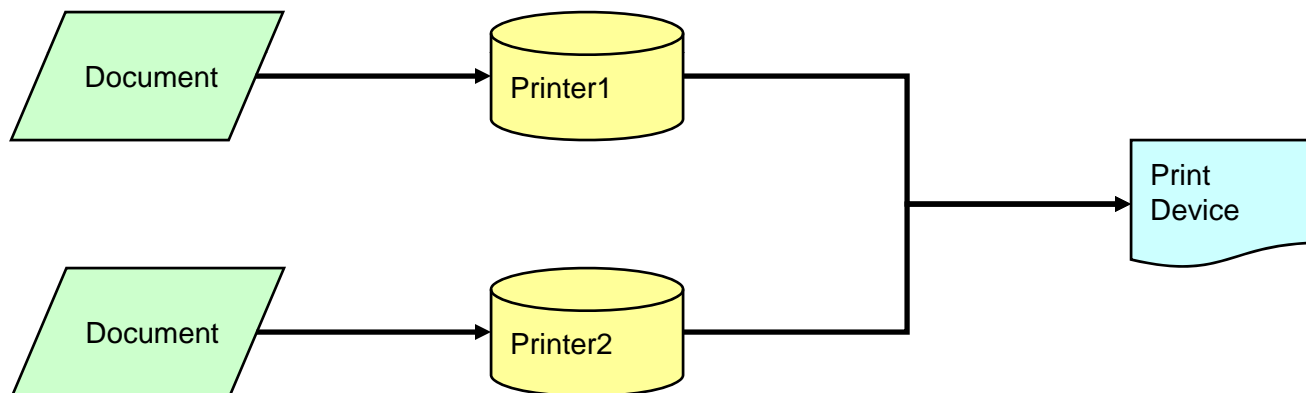


Multiple Printers to single Print Device

Used for multiple printer languages (non auto-switching printer devices)

Used for establishing priorities for printing

Used for deferred printing



- Printer Share name
 - For Windows NT family clients
 - the Share name may be up to 80 characters, including spaces and special characters
 - For compatibility with Windows 9x clients
 - limit Share name to 12 alphanumeric characters
 - For compatibility with DOS and Windows 3.x clients
 - limit Share name to 8 alphanumeric characters
 - you may optionally include a 1 to 3 character extension
- On Windows 7 Professional/Enterprise, Windows Vista Business/Enterprise, Windows XP Professional, Windows 2000 Professional, and NT Workstation
 - A maximum of 10 concurrent connections are supported to a share
- On Windows Server (any version)
 - There are no concurrent connection limitations

- The following permissions are supported for Printers
 - **No Access** ¹
 - the Printer is not available for use
 - **Print**
 - users may connect to the printer and send documents (print) to the Printer
 - **Manage Documents**
 - control settings for print jobs (documents)
 - pause, resume, restart, cancel, or rearrange the print order of print jobs (documents)
 - **Manage Printers** ²
 - perform any configuration or management functions on the Printer
 - can change permissions for the Printer or delete the Printer
 - **Full Control** ¹
 - perform any configuration or management functions on the Printer
 - can change permissions for the Printer or delete the Printer
 - includes the “*Manage Documents*” and “*Print*” permissions

¹ This permission is available on Windows NT and is implied on Windows 2000 (and later)

² This permission is available only on Windows 2000 (and later)

- When a Printer is shared, the following default permissions are established
 - Administrators: Print, Manage Documents, and Manage Printers ¹
 - CREATOR OWNER: Manage Documents
 - Everyone: Print
 - Power Users: Print, Manage Documents, and Manage Printers ^{1 2 4}
 - Print Operators: Print, Manage Documents, and Manage Printers ^{1 3}
 - Server Operators: Print, Manage Documents, and Manage Printers ^{1 3}

¹ “Manage Printers” is available on Windows 2000 (and later)

On Windows NT, this is equivalent to the permissions “Full Control”

² This is established only on non-Domain Controllers

³ This is established only in a Domain environment when the *Printer* is located on a Domain Controller or a member Server in an Active Directory Domain

⁴ This has been removed from Windows Server 2008, Windows 7, and Windows Vista

- When creating a Printer on a Windows 2000 (and later) Computer in a Windows 2008, Windows 2003 or Windows 2000 Domain environment
 - A “printer” object (technically a printQueue object) will *usually* be created within Active Directory
 - this is known as “*Printer Publishing*”
 - this will occur automatically when a printer is shared by a Print Server
 - The printer object is placed in the Print Server’s “Computer” object within Active Directory
 - If a Print Server disappears from the network, its printers are removed from Active Directory
- To control “*Printer Publishing*” after a *Printer* has been established
 - Use the “List in the Directory” check box on the printer’s “Sharing” tab
- When a printer is published in Active Directory, Active Directory client users can:
 - Browse for printers published in Active Directory using specific search criteria
 - location of the printer
 - printer capabilities (color printing, resolution, paper size, stapling, duplexing, etc.)
 - Submit jobs to those printers
 - Install the printer drivers directly from the server

- The local (computer-wide) “Print Server” supports the following options
 - Establish and configure “Forms” for use by a Printer
 - Change the default Spool location for **all** Printers
 - the default Spool location is “%SystemRoot%\System32\Spool\Printers”
 - an individual Printer’s spool location can be changed via a Registry setting ¹
 - Enable logging (in the event log file) of submitted print jobs
 - Enable notification when a submitted print job has finished printing
- Individual Printers support the following options
 - Advanced (Windows 2000 and later) / General (Windows NT)
 - separator pages
 - print processor and data types (Raw, Raw FF, Enhanced Meta File (EMF), Text)
 - Advanced (Windows 2000 and later) / Scheduling (Windows NT)
 - when the printer is available for printing (users can still “submit” when unavailable)
 - establishing a priority [1 to 99; 99 is highest priority]
 - generally only works with multiple Printers pointing to the same Print Device
 - disposition of print jobs
 - spooling options

¹ See “Resources” slide for details (refer to Microsoft Knowledge Base article “123747”)

- You need to be a member of one or more of the following Groups to install a printer
 - Administrators
 - Print Operators (Domain environment)
 - Server Operators (Domain environment)
 - Power Users (Windows family up to Windows Server 2003)
- With Windows Vista (and later), standard users can install a printer on their computer
 - Assuming they have not been blocked from doing this with Group Policy
- With Windows Server 2003 and Windows XP, you must have the **“Load and unload device drivers”** User Right (privilege)
 - In order to install a local printer
 - or a locally installed print server
 - By default, the following Groups have membership to this User Right
 - Administrators
 - Print Operators
 - only on Active Directory Domain Controllers running Windows Server 2003 and Windows Server 2008

- To establish a “*Printer*” and a “*Print Server*”
 - From “Control Panel->Printers->Add Printer [and Faxes] -> [Add a] Local Printer / My Computer”
 - select the printer port(s)
 - how this computer “connects” to or “sees” the Print Device
 - ports are used even if the Print Device is connected to the network
 - select the printer manufacturer and model number
 - for the printer driver(s)
 - establish the name for Printer
 - establish the Share name for Printer
 - this is what is visible via “Network”, “My Network Places”, and “Network Neighborhood”
 - this is what is used on a “net use” command
 - add any additional drivers
 - for other versions of windows
 - by default, a driver that is compatible with the version of Windows that is running will be installed
 - and possibly earlier versions of Windows
 - establish any specific properties for the Printer
 - permissions, scheduling, separator pages, print processor
 - device settings for the Print Device

Print Server Support for Windows Versions

- When a Print Server is established, an appropriate print driver is installed onto the Print Server
 - This driver is used by the client computer to submit print jobs to the Print Server
 - Additional print drivers can be installed onto the Print Server
 - to “match” the client computer Operating System that is submitting the print jobs
- Over time, Microsoft has developed different print driver types (or versions) to support the various versions of Windows
 - The type 0, 1, and 2 drivers are known as kernel mode drivers
 - these drivers load and run in kernel address space
 - and are therefore part of Operating System
 - if these drivers fail, they will cause the Windows Operating System to “crash” (or blue-screen)
 - The type 3 drivers are known as user mode drivers
 - these drivers are hosted (run) inside the “Spooler” Service
 - if these drivers fail, the “Spooler” Service will “crash”
 - but the Operating System will remain running
 - and the “Spooler” Service can simply be restarted

Print Server Support for Windows Versions (continued)

- The following table shows the print driver types supported by Windows
 - This detail appears to be poorly documented by Microsoft

Version of Windows	Supports Type 0 Drivers	Supports Type 1 Drivers	Supports Type 2 Drivers	Supports Type 3 Drivers
Windows NT 3.1	Yes			
Windows NT 3.5x	Yes	Yes		
Windows NT 4.0	Yes	Yes	Yes	
Windows 2000	Yes	Yes	Yes	Yes
Windows XP			Yes	Yes
Windows Server 2003			Yes ¹	Yes
Windows Vista				Yes
Windows Server 2008				Yes

¹ By default, type 2 drivers are not allowed. To enable support for type 2 drivers requires the Group Policy setting “Disallow installation of printers using kernel-mode drivers” to be disabled within “Computer Configuration -> Administrative Templates -> Printers”

Print Server Support for Windows Versions (continued)

- The following table shows the client versions of windows that are supported by the Print Server
 - Note that additional drivers may need to be installed on the Print Server

Client version of Windows submitting print jobs	Windows NT 4 Server	Windows 2000 Server	Windows Server 2003	Windows Server 2008
Windows 9x	Yes	Yes	Yes	
Windows NT 4.0	Yes	Yes	Yes ¹	
Windows 2000	Yes ²	Yes	Yes	Yes
Windows XP	Yes ²	Yes ²	Yes	Yes
Windows Server 2003	Yes ^{1 2}	Yes ²	Yes	Yes
Windows Vista		Yes ²	Yes ²	Yes
Windows Server 2008		Yes ²	Yes ²	Yes

Print Server supports print jobs from this client

- By default, type 2 drivers are not allowed. To enable support for type 2 drivers requires the Group Policy setting "Disallow installation of printers using kernel-mode drivers" to be disabled within "Computer Configuration -> Administrative Templates -> Printers"
- This is "in theory". Depending upon the specific print driver, this may not be supported

- To support legacy DOS printing (non Windows aware applications)
 - NET USE LPT<n>: \\ServerName\PrinterShare [/PERSISTENT: { NO | YES }]
 - This is sometimes useful when you have a “printer language ready” document
 - COPY /B FileToPrint LPT<n>
- Printer Drivers for client computers
 - If the client computer is running Windows NT family or Windows 9x
 - the driver will be downloaded automatically from the Print Server when a user connects to the Printer for the first time
 - when the printer driver is updated on the Printer Server, the client computer will receive the updated driver automatically
 - this works reliably only with Windows NT family
 - this printing model is completely transparent on Windows NT family
 - it is less so on Windows 9x
 - For other client operating systems, the printer driver will need to be installed manually on the client computer

- When a printer is installed on Windows Server, a Share named “Print\$” will automatically be created
 - This is a hidden share
 - The purpose of the share is to facilitate the automatic installation of printer drivers on the client computers
 - The Share (by default) is located at:
 - **%SystemRoot%\System32\Spool\Drivers**
- The “Print\$” Share will have the following default permissions
 - Administrators: Full Control
 - Everyone: Read
 - Print Operators: Full Control ¹
 - Power Users: Full Control ^{2 3}
 - Server Operators: Full Control ¹

¹ This is established only in a Domain environment when the *Printer* is located on a Domain Controller

² This is established only on non-Domain Controllers

³ This has been removed from Windows Server 2008, Windows 7, and Windows Vista

Printing Changes with Vista and Server 2008

- The following key enhancements have been made to printing in Windows Vista (and Windows Server 2008) as compared to earlier versions of Microsoft Windows
 - Built-in support for the XML Paper Specification (XPS)
 - Client Side Rendering (CSR)
 - by default, Windows Vista renders print jobs on the client rather than the print server
 - this can reduce CPU and memory load on the print server
 - this can reduce network traffic with the print server with some print drivers
 - Non Administrator printer installation
 - standard users can install printers on their computers without requiring administrative permissions
 - assuming they have not been blocked from doing this with Group Policy

Printing Changes with Vista and Server 2008 (continued)

- The following key enhancements have been made to printing in Windows Vista (and Windows Server 2008) as compared to earlier versions of Microsoft Windows
 - Print Management MMC
 - a new printer management MMC that allows administrators to manage printers, print servers, and print jobs across an enterprise
 - this was introduced with Windows Server 2003 R2, and been enhanced in Vista and Server 2008
 - for Windows Server 2008
 - requires the Server Role “Print Services -> Print Server” to be installed
 - Deploying and managing printers using Group Policy
 - this was introduced with Windows Server 2003 R2, but has been enhanced in Vista
 - Assigning printers based on their location (using Group Policy)
 - this allows laptop users to migrate between sites, and to automatically print at each site

- Microsoft Knowledge Base (KB)
<http://support.microsoft.com>
(select “Advanced Search” and enter the “Article ID” for the search)
 - **“Description of the Point and Print Restrictions policy setting in Windows Server 2003 and Windows XP”**
 - Article ID: 319939
 - **“How to add printers with no user interaction in Windows”**
 - Article ID: 189105
 - **“How to add printers with no user interaction in Windows XP”**
 - Article ID: 314486
 - **“How to back up and then restore printers when you upgrade from Windows Server 2003 to Windows Server 2008”**
 - Article ID: 938923
 - **“HOW TO: Configure Internet Printing in Windows Server 2003”**
 - Article ID: 323428
 - **“How to Create Custom Separator Page Files”**
 - Article ID: 102712

- Microsoft Knowledge Base (KB)
<http://support.microsoft.com>
(select “Advanced Search” and enter the “Article ID” for the search)
 - **“How To Install and Configure a File and Print Server in Windows Server 2003”**
 - Article ID: 325860
 - **“HOW TO: Migrate a Printer Server Configuration Between Windows NT 4.0 or Windows 2000 Computers with the Printer Migrator 2000 Tool”**
 - Article ID: 315983
 - **“How to troubleshoot general printing problems in Windows Server 2003 when you use Office products”**
 - Article ID: 870968
 - **“How to troubleshoot network printing problems in Windows XP”**
 - Article ID: 314073
 - **“Moving the Windows Default Paging and Spool File”**
 - Article ID: 123747
 - **“New TCP/IP Printing Options in the Windows Standard Port Monitor”**
 - Article ID: 246868

- Microsoft Knowledge Base (KB)
<http://support.microsoft.com>
(select “Advanced Search” and enter the “Article ID” for the search)
 - **“Non-Administrators Cannot Remap an LPT Port to a Network Printer”**
 - Article ID: 313644
 - **“Print Spooler Support on Microsoft Windows 2000 Server Cluster”**
 - Article ID: 228904
 - **“Printers that were installed in Windows XP no longer appear to be installed after you upgrade the computer to Windows Vista”**
 - Article ID: 931477
 - **“Problems Searching for Published Printers by Server Name”**
 - Article ID: 278504
 - **“Publishing a Printer in Windows Active Directory”**
 - Article ID: 234619
 - **“Requirements for Proper function of the Directory Services Printer Pruner in the enterprise”**
 - Article ID: 246269

- Microsoft Knowledge Base (KB)
<http://support.microsoft.com>
(select “Advanced Search” and enter the “Article ID” for the search)
 - **“The standard port monitor for TCP/IP in Windows Server 2003”**
 - Article ID: 814586
 - **“Troubleshooting Printing Problems in Windows”**
 - Article ID: 163551
 - **“Troubleshooting Windows Print Server Alteration of Print Jobs”**
 - Article ID: 132460
 - **“Unexpected paper size is used when you print to a printer that is not the default printer”**
 - Article ID: 270138
 - **“Using Group Policies to Control Printers in Active Directory”**
 - Article ID: 234270
 - **“White Paper: Terminal Services and Printing”**
 - Article ID: 818758

- Microsoft Knowledge Base (KB)
<http://support.microsoft.com>
(select “Advanced Search” and enter the “Article ID” for the search)
 - **“Windows NT Parallel Ports Do Not Use Interrupts”** ¹
 - Article ID: 103411
 - **“Windows NT Uses DLC for IBM Connectivity and Network Printing”** ²
 - Article ID: 102450
 - “Windows Server 2008-based and Windows Vista-based clients do not receive Print Job cancelation notifications, and multiple print jobs may be pending in the print queue”
 - Article ID: 948613
 - **“You Are Prompted for Administrator Credentials When You Try to Install a Plug and Play Printer”**
 - Article ID: 326473
 - **“You cannot print an EMF file that is larger than 2 GB in Windows XP and Windows Server 2003”**
 - Article ID: 904563

¹ This article also applies to Windows 2000 and later (contrary to what the title implies)

² This article also applies to Windows 2000 (contrary to what the title implies)

- Microsoft Knowledge Base (KB)
<http://support.microsoft.com>
(select “Advanced Search” and enter the “Article ID” for the search)
 - **“You receive an error message when you try to install a shared network printer on a Windows Server 2003-based or Windows XP SP1-based computer”**
 - Article ID: 888046

- **Microsoft Windows Server 2008 and Windows Vista resources**
 - **“Plug and Play Device Driver Deployment in Windows Vista and Windows Server 2008”**
 - http://www.microsoft.com/whdc/driver/install/PnP_drv-deploy.msp
 - **“Print Services Role”**
 - <http://technet.microsoft.com/en-us/library/cc732378.aspx>
 - **“Printer Installation in Windows Vista”**
 - <http://www.microsoft.com/whdc/xps/pkginstall.msp>
 - **“Step-by-Step Guide for Configuring a Two-Node Print Server Failover Cluster in Windows Server 2008”**
(part of Windows Server 2008 Step-by-Step Guides)
 - <http://www.microsoft.com/downloads/details.aspx?FamilyId=518D870C-FA3E-4F6A-97F5-ACAF31DE6DCE&displaylang=en>
 - **“Windows Point and Print Technical Overview”**
 - <http://www.microsoft.com/windowsserver2003/techinfo/overview/pointandprint.msp>
[x](#)
 - **“Windows Vista Print Management Step by Step Guide”**
 - <http://technet.microsoft.com/en-us/library/cc766105.aspx>

- **Microsoft Windows Server 2003 resources**

<http://www.microsoft.com/windows2003>

(select “Technical Resources -> Technical Overviews”,
then choose “Index of Windows Server 2003 Technical Articles”)

- **“Effectively Using Internet Printing Protocol (IPP) Printing”**
 - select the section “Print Services”
- **“Migrating and Consolidating Print Servers”**
 - select the section “Print Services”
- **“Printer Connectivity Technical Overview”**
 - select the section “Print Services”
- **“Print Server Upgrade, Migration, and Interoperability”**
 - select the section “Print Services”
- **“PrintUI.DLL User's Guide and Reference”**
 - select the section “Print Services”
- **“Technical Overview of Windows Server 2003 Print Services”**
 - select the section “Print Services”
- **“Windows Point and Print Technical Overview”**
 - select the section “Print Services”

- **Microsoft Windows 2000 Server resources**
 - “*File and Print Services Technical Overview*”
 - <http://www.microsoft.com/technet/archive/windows2000serv/evaluate/featfunc/fileprin.msp>
 - “*Integration of Windows 2000 Printing with Active Directory*” white paper ¹
 - <http://whitepapers.zdnet.co.uk/0,1000000651,260006471p,00.htm>
 - “*Securing Windows 2000 File and Print Resources*” white paper ¹
 - <http://www.blacksheepnetworks.com/security/resources/w2k/hardenw2k/SecNetRes.doc>

¹ This has been removed from Microsoft’s Web site, but a copy of the original document can be found here