



## When to Use a Print Server

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### **Abstract**

This paper provides information about the advantages of using a print server as compared to using direct printing with Microsoft Windows operating systems.

The information contained in this paper applies to the following operating systems:

- Microsoft Windows 2000 Server
- Microsoft Windows XP
- Microsoft Windows Server 2003
- Microsoft Windows codenamed "Longhorn"

The current version of this paper is maintained on the Web at:

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

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## Contents

<b>Introduction</b> .....	<b>1</b>
<b>Direct IP Printer Sharing</b> .....	<b>2</b>
<b>Print Server Features</b> .....	<b>3</b>
Point and Print.....	3
Print queue management.....	3
Prioritization and scheduling .....	3
Administration.....	4
User permissions and Group Policy.....	4
Microsoft Active Directory printer integration .....	5
Printer availability .....	5
Print server clustering.....	5
Printer pooling .....	5
Printer device availability .....	5
Server-side processing .....	6
Auditing and tracking .....	6
<b>Print Server Scenarios</b> .....	<b>7</b>
Managing print jobs.....	7
Job prioritization .....	7
Print spooling .....	7
Resource security and driver management .....	8
Printer downtime .....	8
<b>Related Links</b> .....	<b>10</b>

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## Introduction

End users may connect and print to shared printers in several ways. For example, Microsoft Windows supports sharing printers using a direct Internet Protocol (IP) connection. Microsoft Windows 2000 and later versions of Windows also support sharing printers by using the print server feature of those operating systems.

A small office may have several users sharing a printer attached directly to the office data network. In this type of environment, each user often acts as the administrator of an individual machine or there is a single person who performs computer administration and management tasks in addition to their other responsibilities. With no existing server and limited network traffic, a direct IP connection may be the least expensive way to configure and share a printer.

Some offices with shared printers may already have a computer running Windows 2000 Server, or later version of Windows, acting as a file or mail server. Because the print server function is included as a part of these operating systems, it may be worth considering sharing the printer by using the print server rather than the direct IP connections to help reduce the overall administrative overhead.

A larger office may have an individual or a team of individuals whose primary job is system administration and whose primary responsibility is the maintenance and support of the organization's computers and data network. Frequently in organizations of this size, users are discouraged, if not prohibited, from installing or modifying their computer configuration. The administrative tools and features, such as Point and Print, provided by the print server may be of considerable benefit in this environment.

Using direct IP connections to share printers may be sufficient for the printing needs of a small office or in those office configurations are not large enough, or complex enough, to require a dedicated system administrator. However, as offices and users grow, there likely will come a time when sharing printers using print servers will be more effective and less complicated than sharing them using direct IP connections. Using a print server to share and manage printers, offers many advantages to both the end user and the administrator as the number of users grows and may also offer a way to avoid many of the problems experienced with direct IP printer connections in larger environments.

This paper describes some of the problems that may be experienced when sharing printers by using direct IP printer connections. While you may not currently be experiencing these problems, understanding them may help you to avoid them in the future. This paper also describes some of the key features and benefits of using a print server to manage shared printers. Understanding the benefits a print server may offer and what problems to watch for will help you determine when using a print server will be the better of the two options.

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**Note:**

Unless otherwise specified, throughout this document, the term *print server* refers to the print server provided by Windows 2000 Server and Windows Server 2003.

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## Direct IP Printer Sharing

Stand-alone printers connected directly to an internal data network and not another computer may be shared simply by having more than one computer define a connection to the printer and install its software. This configuration results from a user opening the Add Printer wizard on their computer and creating a connection to such a shared printer. The simplicity of this type of printer access makes it a very practical and inexpensive printing solution for a small office.

As the number of users or printers in an office increases, the complications and side-effects of using the direct IP sharing configuration may start to interfere with the productivity of the office. Further, if the office installs a computer running Windows 2000 Server, or a later version of Microsoft Windows, to act as a file, mail, or database server for the office, they will then have the printer server software available to them as well. Sharing printers using the print server functionality provided with the operating system can help avoid any problems the users might experience with their direct IP printer connections.

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## Print Server Features

A print server helps reduce administrative and management workload by centralizing local and remote printer management at the print server. It also simplifies many of the labor intensive functions experienced by users when using direct IP printer connections. This section describes the key print server features and their benefits to both the administrator and the end user.

### Point and Print

Point and Print allows a user to create a new connection to a shared printer without requiring the user to install any software for that printer. Point and Print downloads the printer files and configuration information automatically when a user installs the printer. Point and Print will update the user's printer software as the printer software is updated on the server.

Point and Print also updates printer driver configurations when they change. For example, the administrator might install a new printer option such as a duplexer or a stapler. After the administrator reconfigures the driver to use the new feature, Point and Print will update the configuration for each user of that printer.

In contrast, those users with a direct IP connection to a shared printer must have that printer's current version of the printer software available to them, as well as the permission to install and configure that software on their computer. This process may be manageable and actually quite reasonable in a small office, but as the number of users or printers grows, distributing and updating this software for each potential printer user can become a difficult task.

In addition, Point and Print can help you avoid security issues because users do not need Administrator access to their machines in order to install the software for a new printer. Point and Print installs the software on the user's machine automatically in a limited system context, which protects against security issues that take advantage of a user running with Administrator access.

Users connecting to shared printers using direct IP connections must have Administrator or Power User<sup>1</sup> access to their system in order to install the necessary printer software. These elevated levels of access may allow virus software running on the machine to cause severe damage to users' systems and, in the worst case, to other computers on the network.

### Print queue management

A print server facilitates print queue management, supports performance monitoring, and enables the prioritization and scheduling of jobs in the print queue.

#### Prioritization and scheduling

The print server allows prioritization of print jobs. Print jobs and print queues may be assigned priorities such that the more critical print jobs are printed before those less critical. When several logical printers are configured to send print jobs to a single physical printer, the administrator can establish a different default priority for each print queue. Users send lower-priority jobs to the less critical print queue thereby avoiding disruption of higher priority print jobs. Using a print queue also enables users to

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<sup>1</sup> Power Users running Windows XP also require the Load/Unload Drivers privilege to install printer driver software.

schedule print jobs at the most convenient time, thereby allowing more efficient use of printing resources. For example, users may schedule large print jobs for printing after normal office hours.

## Administration

Administrators and users with the necessary permissions may view and control print jobs in a print queue. Direct IP printers lack a process by which print jobs across users may be prioritized, while print servers provide additional control over print jobs in a print queue, and support remote printer management with the following features:

- **Remote port administration**  
The printer configuration features found in the Printers and Faxes folder<sup>2</sup> enable an administrator to manage and configure local, standard TCP/IP, and LPRMON printer ports on any computer running Windows 2000 or a later version of Microsoft Windows.
- **Print queue performance monitoring**  
Windows 2000 Server provides a Print Queue object for System Monitor that monitors local and remote printer performance. The Print Queue object provides counters that track a variety of printer performance metrics such as bytes printed per second, job errors, and total pages printed.
- **Driver administration**  
Administrators may view and manage printer drivers locally and remotely. Administrators may also see the currently installed drivers and what versions and architectures they support.

## User permissions and Group Policy

The print server enables an administrator to selectively manage and control access to each printer and print queue. Printer permissions control which printing tasks a user is able to perform on any given printer managed by the print server.

The three levels of printer permissions are:

- **Print**  
The Print permission allows a user to print documents, pause, resume, start, and cancel their own documents, as well as connect to a printer. By default, this permission is given to members of the *Everyone* group when a print queue is created.
- **Manage Documents**  
The Manage Documents permission grants the ability to control job settings for all documents as well as pause, restart, and delete all documents. The system administrator assigns this permission to users, as it is needed.
- **Manage Printer**  
The Manage Printer permission grants the ability to pause and restart the printer, change spooler settings, share a printer, adjust printer permissions, and change printer properties. The system administrator assigns this permission to users, as it is needed.

The ability to grant access to a printer on a per-user or a per-group basis makes it possible to serve printers in sensitive areas, limiting access to the printer without sacrificing the ability to manage the printer from a central location.

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<sup>2</sup> In Windows XP and Windows Server 2003, these features are found in the Printers and Faxes folder. In Windows 2000 Server, they are found in the Printers folder.

## Microsoft Active Directory printer integration

Microsoft Active Directory® provides the easiest way to manage, locate, and connect to printers in a Windows 2000 Server-based domain. Each time you use the Add Printer wizard to add and share a printer, you have the option of listing the printer in the domain as an Active Directory object. Direct IP printers are neither searchable nor discoverable in the Active Directory.

Listing printers in Active Directory enables Active Directory client computers—computers running Windows NT Server 4.0 and later, as well as Windows 95 and later versions of Windows—to locate and connect to the most convenient printer. The administrator can control printer visibility, thereby protecting sensitive printers by applying permissions to the printer Active Directory object.

## Printer availability

Using a print server increases printer availability to the end user and clustering print servers increases print server availability. Printer pooling also increases the availability of the printers served by a print queue.

## Print server clustering

Clustering is the ability to group two or more computers together such that one computer can serve as a backup to the others in the cluster. If one computer in a cluster becomes unavailable, another computer in the cluster handles the functions of the first one. The transfer of control from one computer to another in the cluster is transparent to the user. Print servers provide the highest level of printer availability in a cluster by transparently shifting print server functions from one computer to another in the cluster when a computer is taken offline.

Clustering print servers allows system and printer maintenance to be performed on an individual print server computer without interrupting the availability of the print server to the end user.

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**Note:**

Windows 2000 Server does not support clustering. It is available with Windows 2000 Advanced Server, Windows 2000 Datacenter Server, Windows Server 2003, Enterprise Edition, and Windows Server 2003, Datacenter Edition.

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## Printer pooling

Printer pooling allows several identical printers to appear to the end user as one logical printer, thereby providing additional printer capacity and availability to the end user. Configuring several printers to act as one through printer pooling allows individual printers to be serviced while the other printers in the pool continue to print. The printer pool also allows print jobs to be distributed across the different printers in the pool for greater overall printing throughput.

With direct IP printing, there is only one physical printer for each logical connection. If a direct IP printer goes down, each user of that printer may need to manually find and connect to another printer, install any required printer software then resubmit the print job.

## Printer device availability

A print server eliminates the competition for a printer device experienced when multiple users are trying to print directly to a shared printer using a direct IP printer connection. With some direct connect methods, only one user connection to a printer device is possible at a time. Having multiple users

attempting to connect to the printer in this way produces excessive network traffic and event log entries placing an additional load on the end user's machine.

Printers in a printer pool or on a clustered server appear to the end user as a single logical device. As printers in a pool or servers in a cluster become available or unavailable, the end user sees no change in logical address or device availability. Direct IP printers, however, are tied directly to their IP address. When the address of the printer is changed or the printer goes offline, all users connected to that printer may need to manually find and connect to another printer.

### **Server-side processing**

With a print server, the end user's print job is often more quickly spooled to the print server than it is to the printer itself. When processing a print job to a directly connected printer, the end user's machine must use CPU resources during the entire period necessary to process the print job. The less time this process takes, the sooner the end user can return to work. The larger the print job, the more obvious the difference between direct printing and printing through a print server is to the user. In the worst case, users printing large jobs at the end of the day may need to leave their computers running while the jobs are processed and printed or start over on the next day. With a print server, once the job has been spooled to the print server, the end user can shutdown his or her machine.

### **Auditing and tracking**

Managing printers with a print server allows the system administrator to track usage and monitor errors from a single point. This greatly simplifies tracking and reporting printer usage for chargeback, error tracking, maintenance and other purposes.

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## Print Server Scenarios

This section presents scenarios that illustrate some of the problems which may be experienced when using direct IP printers and how a print server may help address those problems.

### Managing print jobs

A user sends a print job to a printer directly using a direct IP printer connection. For some reason, that job causes the printer to stop responding. If the printer does not provide an internal web page or has stopped responding to any other connection, there is no way for another user or an administrator to tell who sent the job. Somehow, the system administrator must determine who submitted the job because only that user is able to cancel the job from the print queue on their machine. In the worst case, if the user is unavailable, all users trying to use that printer would have to wait for the user's return before the print job could be deleted. The printer may also need to be reset, potentially causing other print jobs to be lost.

Had that same user sent the same job to a printer served by a print server, the system administrator, or a user with Manage Documents permission to the printer, could delete the job from the queue and more quickly allow other users to use the printer. The system administrator could also identify the user and alert them of the problem. Because the unprinted documents are in a print queue on the print server, they will not be lost when the printer is reset.

### Job prioritization

A user must print a presentation on the company's shared color printer for an important client who is waiting in a conference room. At the same time, another user is printing the flyers to the office picnic on the same printer. With a direct IP printer connection, the user, whose client is impatiently waiting, must wait until the printer becomes available after it finishes printing the office picnic flyers. If a print server served this printer, it would be a simple matter to pause the current print job and queue the presentation for priority printing.

When a shared printer has to serve many users using a direct IP printer connection, it is impossible to schedule one print job ahead of another. If some users of the printer need priority access to print a document immediately, they may not be able to do so using a direct IP printer connection. Using a print server makes providing this type of priority access to a printer very easy to implement.

### Print spooling

Trouble may arise when many people need to print large jobs at the same time on a shared printer using a direct IP printer connection. Without an automatic way to process and queue the print jobs, each user must wait for the printer to be available before they can finish printing their job. Each user of a shared printer using a direct IP connection must first wait for the printer to be free and then wait again while the print job is printed. With a print server, each user simply prints their job to the print server where it is spooled and printed as soon as the printer is ready, without requiring the user to wait by his or her computer until the job has finished printing. In fact, once their print job has been spooled on the print server, the user can shutdown the computer.

Competition for a printer occurs when many people are trying to print directly to a shared printer using a direct IP connection. As a result, some or all of the users of that printer may experience less than

optimal overall performance. Without an effective queuing system, each user is forced to wait until the printer is available. A print server eliminates this bottleneck by queuing each job on the print server, thereby freeing the user's computer more quickly.

## **Resource security and driver management**

In an organization that limits user access to User-level permissions and uses a shared printer with a direct IP connection, a privileged user, such as an administrator, must install and update the printer software on each computer. This may not be a problem in small office, but as the office grows, so does the administrative workload.

Using a direct IP connection to connect to a printer requires a privileged user to install the necessary printer software on their machine. This means the user must run with Administrator or Power User permissions to add the printer, exposing the computer to a potential security issue, or a user with the necessary permissions must come to the machine.

Further, it is difficult to protect or restrict printers made available for this type of access. Users are able to print on any printer to which they can connect. Problems may arise when unauthorized users connect to and use printers set aside for a specific use such as printing checks or forms. Using printers incorrectly can waste letterhead, special forms, envelopes and other resources as well as block the printer from its intended use.

Printer driver software and configurations may need to be updated from time to time in order to resolve problems or to improve functionality. In an environment where users use direct IP connections to the shared printers, the system administrator must make each user aware of these changes so the users can either install those changes or wait for the service technicians to install them. With direct IP connections, this is very difficult since there is no way to track which computers are connected to which printers.

Point and Print, provided by the Windows print server, uses secure access and privileged accounts to install and update the printer software and configuration files on the computers using the updated printer. Consequently, the user does not need Administrator access to use the printer, nor do they need to worry about updating any printer software. Likewise, the system administrator does not need to worry about some computers not receiving the updated software.

## **Printer downtime**

In an office where users connect to a shared printer using a direct IP connection, printer maintenance can be a challenge. Either the office must go without the printer for the time required to perform the maintenance, or the maintenance must be scheduled for a time when the office is not using the printer. Either way is inconvenient for someone. With a print server using print spooling, printer pooling or both, the printer could be taken offline with little noticeable impact to the users.

When the system administrator takes a printer offline for service or replacement, users using direct IP connections to that printer may need to manually find and reconnect to a new printer or wait until the printer comes back online. They must also install the correct software for the new printer if it is of a different type than the original printer. After the original printer has been repaired, the user will need to be notified again in order that they may manually reconnect to it.

Printers in a printer pool may be taken offline and even physically replaced while the other printers in the pool continue to process print jobs. With print spooling, and with or without printer pooling, users

may continue to submit print jobs while the physical printer is offline. The print jobs will simply be spooled in the print queue until the printer is ready. When the printer has been returned to service, the spooled print jobs will begin printing. It is possible to perform printer maintenance and replacement without the users ever knowing the printer was taken offline.

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## Related Links

See the following resources for further information:

Microsoft Windows Hardware and Driver Central at <http://www.microsoft.com/whdc/default.mspx>.

Windows Server 2003 Print Server Portal at <http://www.microsoft.com/printserver>.

For the latest information about Windows Server 2003, see the [Windows Server 2003 Web site](http://www.microsoft.com/windowsserver2003) at <http://www.microsoft.com/windowsserver2003>.



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