Deploying a print server

Installing, sharing, monitoring, and managing a single network print device is relatively simple, but when you are responsible for dozens or even hundreds of print devices on a large enterprise network, these tasks can be overwhelming.

Understanding the Windows print architecture

It is important to understand the terms Microsoft uses when referring to the components of the network printing architecture. Printing in Microsoft Windows typically involves the following four components:

- **Print device** A *print device* is the actual hardware that produces hard-copy documents on paper or other print media. Windows Server 2012 R2 supports both local print devices, which are attached directly to computer ports, and network interface print devices, which are connected to the network either directly or through another computer.
- **Printer** In Windows, a *printer* is the software interface through which a computer communicates with a print device. Windows Server 2012 R2 supports numerous physical interfaces, including Universal Serial Bus (USB), IEEE 1394 (FireWire), parallel (LPT), serial (COM), Infrared Data Access (IrDA), Bluetooth ports, and network printing services such as LPR, Internet Printing Protocol (IPP), and standard TCP/IP ports.
- **Print server** A *print server* is a computer (or standalone device) that receives print jobs from clients and sends them to print devices that are either attached locally or connected to the network.
- **Printer driver** A *printer driver* is a device driver that converts the print jobs generated by applications into an appropriate string of commands for a specific print device. Printer drivers are designed for a specific print device and provide applications with access to all the print device's features.

Understanding Windows printing

These four components work together to process the print jobs produced by Windows applications and turn them into hard-copy documents, as shown in Figure 2-12.

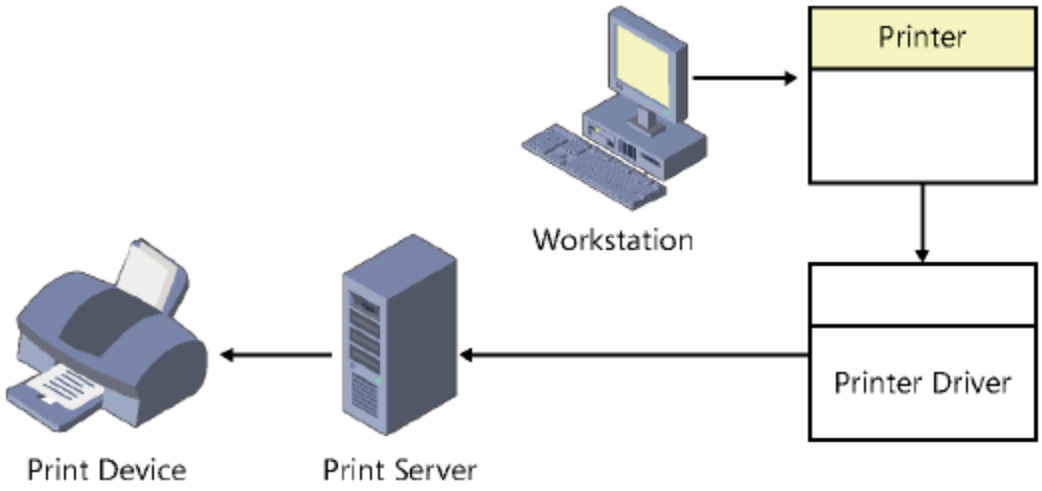

FIGURE 2-12 The Windows print architecture

Before you can print documents in Windows, you must install at least one printer. To install a printer in Windows, you must do the following:

- Select the print device's specific manufacturer and model.
- Specify the port (or other interface) the computer will use to access the print device.
- Supply a printer driver created specifically for that print device.

When you print a document in an application, you select the printer that will be the destination for the print job.

The printer is associated with a printer driver that takes the commands generated by the application and converts them into a printer control language (PCL), a language understood by the printer. PCLs can be standardized, like the PostScript language, or they can be proprietary languages developed by the print device manufacturer.

The printer driver enables you to configure the print job to use the various capabilities of the print device. These capabilities are typically incorporated into the printer's Properties sheet. For example, your word-processing application does not know if your print device is color or monochrome or if it supports duplex printing. The printer driver provides support for print device features such as these.

After the printer processes a print job, it stores the job in a print queue, known as a *spooler*. Depending on the arrangement of the printing components, the spooled jobs might be in PCL format, ready to go to the print device, or in an interim format, in which case the printer driver must process the spooled jobs into the PCL format before sending them to the device. If other jobs are waiting to be printed, a new job might wait in the spooler for some time. When the server finally sends the job to the print device, the device reads the PCL commands and produces the hard-copy document.

Windows printing flexibility

The flexibility of the Windows print architecture is manifested in the different ways you can deploy the four printing components. A single computer can perform all the roles (except for the print device, of course) or you can distribute those roles across the network. The following sections describe four fundamental configurations that are the basis of most Windows printer deployments:

- Direct printing
- Locally attached printer sharing
- Network-attached printing
- Network-attached printer sharing

You can scale these configurations up to accommodate a network of virtually any size.

DIRECT PRINTING

The simplest print architecture consists of one print device connected to one computer, also known as a locally attached print device, as shown in Figure 2-13. When you connect a print device directly to a Windows Server 2012 R2 computer and print from an application running on that system, the computer supplies the printer, printer driver, and print server functions.

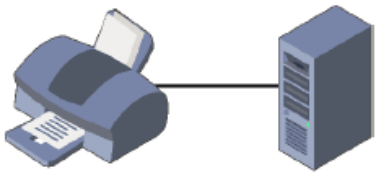

FIGURE 2-13 A locally attached print device

LOCALLY ATTACHED PRINTER SHARING

In addition to printing from an application running on that computer, you can also share the printer (and the print device) with other users on the same network. In this arrangement, the computer with the locally attached print device functions as a print server. Figure 2-14 shows the other computers on the network, which are known as the print clients.

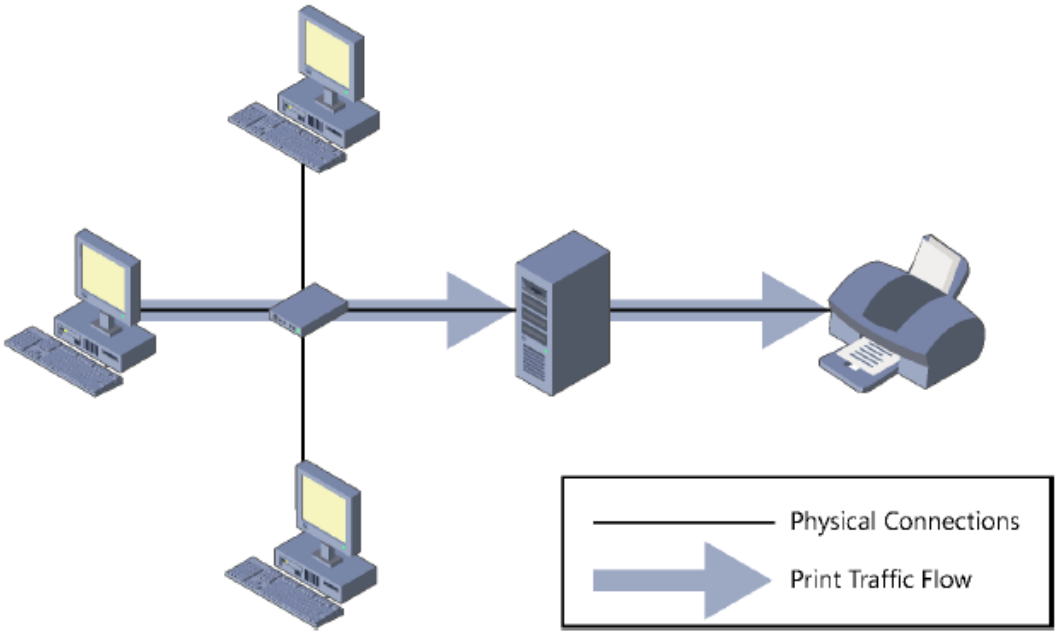

FIGURE 2-14 Sharing a locally attached printer

In the default Windows Server 2012 R2 printer-sharing configuration, each client uses its own printer and printer driver. As before, the application running on the client computer sends the print job to the printer and the printer driver renders the job, based on the capabilities of the print device.

The main advantage of this printing arrangement is that multiple users, located anywhere on the network, can send jobs to a single print device connected to a computer functioning as a print server. The downside is that processing the print jobs for many users can impose a significant burden on the print server. Although any Windows computer can function as a print server, you should use a workstation for this purpose only when you have no more than a handful of print clients to support or you have a very light printing volume.

NETWORK-ATTACHED PRINTING

The printing solutions discussed thus far involve print devices connected directly to a computer using a USB or other port. Print devices do not necessarily have to be attached to computers, however. You can connect a print device directly to the network instead. Many print device models are equipped with network interface adapters, enabling you to attach a standard network cable. Some print devices have expansion slots into which you can install a network printing adapter you have purchased separately. Finally, for print devices with no networking capabilities, standalone network print servers are available, which connect to the network and enable you to attach one or more print devices. Print devices so equipped have their own IP addresses and typically have an embedded web-based configuration interface.

With network-attached print devices, the primary deployment decision the administrator must make is to decide which computer will function as the print server. One simple (but often impractical) option is to let each print client function as its own print server, as shown in Figure 2-15. Each client processes and spools its own print jobs, connects to the print device by using a TCP (Transmission Control Protocol) port, and sends the jobs directly to the device for printing.

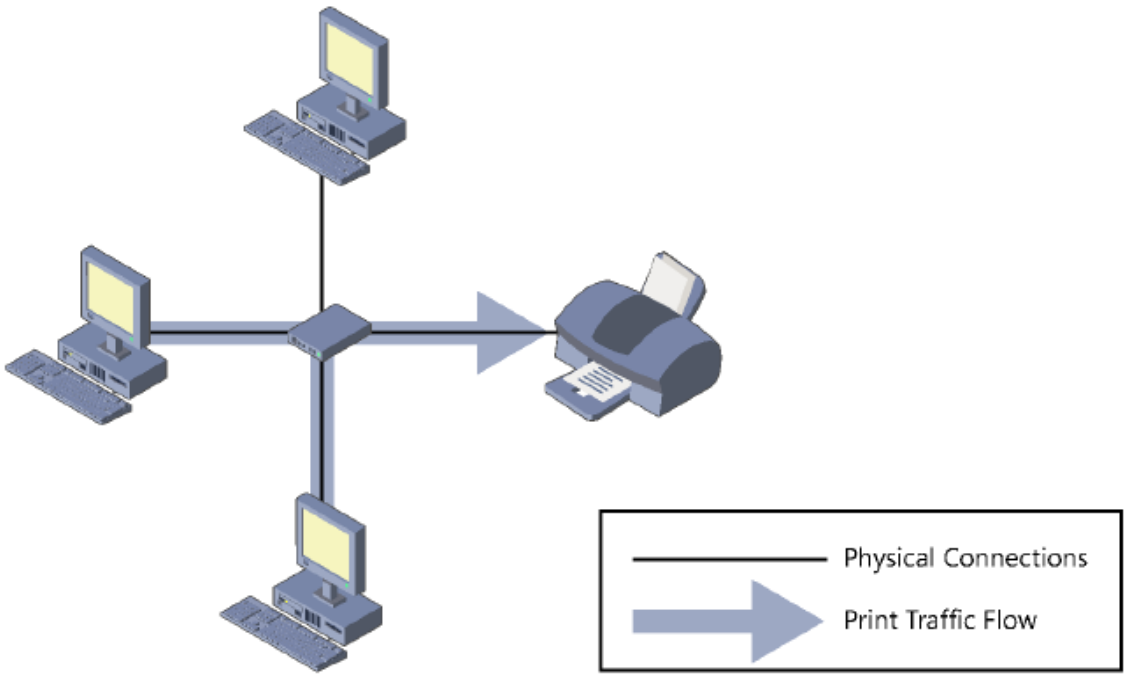

FIGURE 2-15 A network-attached print device with multiple print servers

Even individual end users with no administrative assistance will find this arrangement simple to set up. However, the disadvantages are many, including the following:

- Users examining the print queue see only their own jobs.
- Users are oblivious of the other users accessing the print device. They have no way of knowing what other jobs have been sent to the print device or how long it will be until the print device completes their jobs.
- Administrators have no way of centrally managing the print queue because each client has its own print queue.
- Administrators cannot implement advanced printing features, such as printer pools (covered later in this section) or remote administration.
- Error messages appear only on the computer that originated the job that the print device is currently processing.
- All print job processing is performed by the client computer rather than being partially offloaded to an external print server.

For these reasons, this arrangement is suitable only for small workgroup networks that do not have dedicated administrators supporting them.

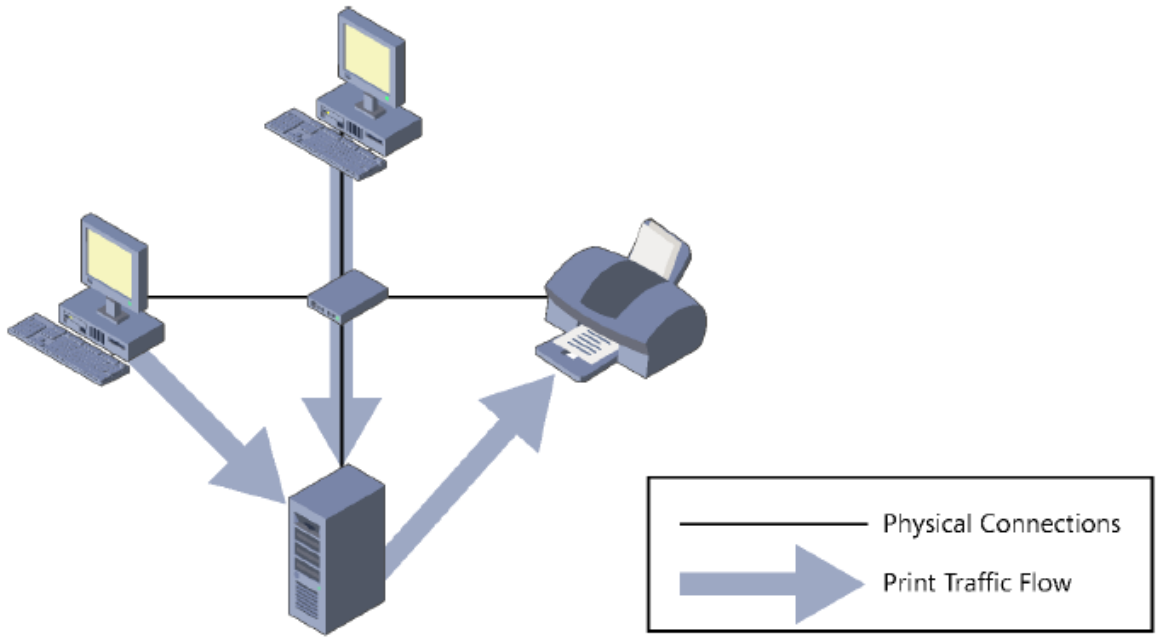

FIGURE 2-16 A network-attached print device with a single shared print server

With this arrangement, virtually all the disadvantages of the multiple print server arrangement become advantages:

- All the client jobs are stored in a single print queue, so users and administrators can see a complete list of the jobs waiting to be printed.
- Part of the job-rendering burden is shifted to the print server, returning control of the client computer to the user more quickly.
- Administrators can manage all the queued jobs from a remote location.
- Print error messages appear on all client computers.
- Administrators can implement printer pools and other advanced printing features.
- Administrators can manage security, auditing, monitoring, and logging functions from a central location.

ADVANCED PRINTING CONFIGURATIONS

Administrators can use the four configurations described in the previous sections as building blocks to create printing solutions for their networks. Many possible variations can be used to create a network printing architecture that supports your organization's needs. Some of the more advanced possibilities are as follows:

- You can connect a single printer to multiple print devices, creating what is called a *printer pool*. On a busy network with many print clients, the print server can distribute large numbers of incoming jobs among several identical print devices to provide more timely service and better fault tolerance.
- You can connect multiple print devices that support different paper forms and various paper sizes to a single printer, which will distribute jobs with different requirements to the appropriate print devices.
- You can connect multiple printers to a single print device. By creating multiple printers, you can configure different priorities, security settings, auditing, and monitoring parameters for different users. For example, you can create a high-priority printer for company executives and a lower-priority printer for junior users. This ensures that the executives' jobs get printed first, even if the printers are connected to the same print device.

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