ScrewDrivers™ v4
Printing Unleashed

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Abstract

Printing is a complex process with many possible points of failure. The application, user, operating system, and print device must all work in conjunction to produce the expected physical output. Configuring and administering a printer and print process in a Microsoft Windows workstation environment is a complex task. Printing in a server-based computing (Microsoft Terminal Server, Citrix Metaframe/Presentation Server, Ericom WebConnect) environment causes a number of additional problems. In this paper, a solution from triCerat called ScrewDrivers is presented which solves many of the administrative problems related to printing in such an environment, while also providing users with a better-quality experience.

1   Introduction

At a high level, it is easy to see the major points of failure when printing in a Terminal Services environment. First, thousands of printer models have been commercially available throughout the last decade and each printer model could have many different device driver versions. Any combination of printer models and drivers may exist in a single business environment. In addition, thousands of applications are commercially available, along with numerous Operating System versions within just the Microsoft Windows platform. All of those variables combine with the added complexity of a client-server environment, in which administrative control over the client machine is not guaranteed.

Users will want to print from any computing environment which contains data valuable to their business or profession. If printing is unavailable, fails, or is a hassle to setup then the user will not be satisfied and the business will be adversely affected. In addition, if the fidelity of the print job is not maintained, then the printout itself could be rendered useless. Users demand that all of their documents print as expected. In many cases, such as with checks or   contracts, the printout must be 100% correct everytime. For these reasons, it is just as critical to provide users with a reliable printing solution as it is to provide them with reliable application access.

Many administrators overlook the fact that access to the application is only half of the battle. Once the application environment is up and running, they are inundated with printing problems. The existing solutions provided with Microsoft Windows Terminal Services and Citrix Metaframe/Presentation Server can provide minimal printing functionality for standardized environments. However, for a typical environment the built-in solutions quickly fade in effectiveness.

At this time, none of the server based computing platform vendors provides the technology businesses require in a robust printing system. To meet these needs, triCerat has developed ScrewDrivers. The ScrewDrivers technology can provide users with access to the full functionality of their client printers, while at the same time reducing the management required and increasing the reliability of the server and its print process.

2   What is Printing?

Printing, in the context in which we are concerned, is the act of transferring data from the computer screen to a piece of paper. In a Microsoft Windows environment, a complete technical description of printing would take an entire book. For the purpose of this paper we will simplify the description down to the key parts.

In a typical workstation environment, an application is first installed on the operating system. Next a device driver must be installed for the printer that is connected to the workstation. The application then displays data through the GDI (Graphical Device Interface) and allows the user to manipulate the data. When it is time to print, the user selects the printer and the data is transferred from the GDI into the Print Spooler. The spooler caches the graphical commands and sends them to the device driver for the printer that the user selected. The device driver receives those commands and translates them into a format that the printer understands. As the commands are translated, the driver forwards them to the printer through a data port such as LPT1 or a USB port. The printer receives the commands and translates them into mechanical operations which deposit ink onto a piece of paper.

In a terminal server environment, the application is installed on the terminal server (the user connects to the terminal server to run the application). The device driver is still installed on the workstation. What is the print process now? The answer is that the device driver must also be installed on the Terminal Server, and then the server relies on the built-in mechanisms to "auto-create" the printer on the server. The user can then print to that printer and the print job is sent through the device driver on the server and down to the client machine.

3   Built-in Solutions

3.1   Microsoft Windows Terminal Server

As of Windows 2003, Microsoft began offering an auto-creation technology. This technology will look at the printers installed on the client workstation, and if a device driver is installed on the server which matches that on the client, then a copy of the printer

is created on the server. The user can then print to that copy and the print job is transferred through an RDP virtual channel to the client machine.

As of Windows 2003 SP1, Microsoft added a fallback driver which will create a "dummy" printer for any printer whose driver does not exist on the Terminal Server. The dummy printer can be set to either be based on the Postscript or PCL printer language (or you can create both). The problem is that many printers do not support either of those languages, and even if the printer does, it is up to the user to pick and choose through experimentation to find out which one works.

Neither solution built into the standard Windows Terminal Server is robust enough to solve the problems in a typical environment. In addition it requires manufacturer drivers on the server, which decreases server stability and increases server resource usage.

3.2   Citrix Metaframe/Presentation Server

In the latest version of Citrix Metaframe (Presentation Server 4) there are two methods to choose from which can help with some of the printing problems.

The first method is similar to the Microsoft auto-creation process described above. Citrix provides some additional management of the process, but there is still the administrative burden of maintaining manufacturer printer drivers on your server.

The other available method is the Citrix UPD (Universal Printer Driver). The UPD is a generic printer driver that intercepts the communication between the GDI and the Print Spooler. This data is intercepted in the EMF format and is then transferred to the client machine, where it is rendered to the local printer driver. The benefit of this solution is that there is no need to install manufacturer drivers on the Terminal Server. However, the EMF format has known limitations as it was not designed to be a high fidelity, portable format. In addition, the UPD requires Windows 2000 or later client machines. The UPD will also not be viable if the environment contains standard Windows Terminal Servers without Citrix and/or are requires applications that do not communicate with the Print Spooler using EMF.

The Citrix EMF based UPD technology produces very inconsistent results and is therefore not reliable for production environments. At best, administrators should see the Citrix UPD as a fallback similar to the Microsoft fallback driver, which means that manufacturer drivers still need to be installed on the Terminal Server. As stated before, this decreases stability, increases resource usage, and adds management overhead.

4   ScrewDrivers

4.1   Overview

ScrewDrivers eliminates the need for manufacturer drivers to be installed on the Terminal Server or Citrix server. It is a real-time, virtual printer driver, designed from the ground up to run in a multi-user environment. ScrewDrivers provides a uniform solution across Terminal Server farms by providing support for both the RDP and ICA protocol through a client-side virtual channel plug-in.

ScrewDrivers uses a patent-pending process to query the local client's printers and create virtualized printers on the Terminal Server. When the user prints to one of these printers, the print process that is used is the standard which is built into Windows. The driver on the server translates the GDI commands into a custom designed format called TMF (triMeta), which natively supports streaming and compression. The print job is streamed to the client machine, where it is then rendered to the client's printer.

It is important to note that the client printer's standard printer features such as page sizes, trays, and resolutions are reproduced by the virtual printer on the server. These properties are reflected on the server so that the user has a seamless transition to the Terminal Services environment. The printer name also takes a familiar form, so no user training is required to recognize the printers when running from an application hosted remotely.

4.2   Server Support

The ScrewDrivers server software and printer driver can be installed on any Windows 2000 or Windows 2003 Server, including 64bit editions of Windows 2003 Server. It operates over RDP, ICA (Metaframe 1.8 and later), or TCP/IP. In addition, there is a "Server Lite" version that can be installed on an XP Workstation if you utilize the XP Remote Desktop feature and require a printer to be available remotely.

4.3   Client Support

The standard RDP or ICA plug-in is supported on all Win32 based client operating systems. These include Windows 98, Me, NT4, 2000, and XP. It can also run on a Windows 2000 or 2003 Server, and operate in passthrough-server mode. Windows XP x64 and 2003 x64 are also supported.

Thin Clients that use Windows XP Embedded are supported as long as there is enough disk space on the embedded machine to spool the entire print job locally. Other thin clients and non-Windows operating systems are supported artificially if you use the ScrewDrivers Print Server Service and therefore map the local printer to a Win32-based print server.

4.4   64-Bit

ScrewDrivers allows you to support any combination of 64 and 32 bit client and workstation. You can connect from a 64 bit client to a 32 bit server, or from a 32 bit client to a 64 bit server. If you are running a 64 bit client and do not have a printer driver for 64 bit yet, all you have to do is setup a 32 bit print server and map your printer to it. Then the ScrewDrivers Print Server software can connect that printer to your Terminal Server (or even to your XP Workstation and then to your Terminal Server).

4.5   triMeta Print Job Format

ScrewDrivers transfers print jobs in one of two formats. The primary format is a proprietary format called triMeta, short for triCerat MetaFile (TMF). This is a vector based format which has been tuned specifically for efficiency in a real-time data stream. What this means is that once you start to print on the Terminal Server, the print job will be compressed and streamed to the client, and therefore the printing can start on the client almost immediately. You do not have to wait for entire pages or entire

documents to print on the server before they are transferred to the client and printed again to the local printer.

The other print job format is actually a pass-through format. If an application is forced to output postscript data, and your client printer can support receiving postscript data directly, then ScrewDrivers will allow this data to pass over the wire and out to the local printer. The data will still be compressed, therefore taking advantage of our compression and bandwidth control algorithms.

4.6   Printer Creation Features

The ScrewDrivers software will query all standard Windows printer features. This means it will query what paper a device supports, what resolutions, trays, color, etc. Occasionally a printer will have additional features that Microsoft has not incorporated into their printer specification. If this is the case, the RDP or ICA client plug-in can display a second print dialog during the print process. What this means is that once you've printed from your application on the Terminal Server, another print dialog will pop up on your client machine which will then let you select the printer-specific properties. One example would be if you have a plotter and need to associate ink with a pen in the plotter.

Printers are named based on a standard naming scheme or based on a custom naming scheme that the administrator can define. This means that you don't have to have a convoluted manufacturer-defined name for each of your printers. You could put the user name or workstation name in front of every printer that gets created, so that users can more easily select the printer they want. Printers are also created with session-level security, so a user can only see the printers that were created for that specific terminal services session.

Another feature of the printer creation is the ability to select which printers are created. On an initial install, the ScrewDrivers server will only query the local default printer. You can change this to specify that all local printers are to be built, or just a specific number. There are also options for how to handle different types of printers, how to handle the default printer, etc. You can even monitor the client machine throughout an active session and detect when the local default printer has been changed or if a printer has been added or removed from the local workstation. This is especially helpful if your environment is setup for pass-through, which means that your users connect to a Terminal Server desktop and then open another desktop or a published application. Without ScrewDrivers, there is no way for the published application to know if the user disconnects from the first desktop and reconnects from another client workstation.

In addition to the server-side features, each user has access to a control panel applet on the client which lets them specify what printers are to be added to the server. They can specific priority, spoof their default printer, and deny printers from being created.

4.7   Workflow Features

ScrewDrivers includes features that are useful when you are implementing a printing workflow. From the ScrewDrivers printer properties you can specify to export a print job to a format such as PDF or Bitmap. You can even export directly to the client machine, or export and print at the same time.

It is also possible to launch an application on the server or client side once printing has completed. All of these features can be disabled or locked down to prevent or force certain behaviors.

5   Conclusion

Application access is only half the battle when designing a Terminal Services or Citrix Metaframe environment. Businesses must be able to print reliably and consistently. Problems with printing are the number one issue administrators face when implementing server based computing.

ScrewDrivers eliminates the printing problems associated with server based computing. ScrewDrivers simplifies printing administration in a Terminal Services environment, and at the same time increases user satisfaction. The protocol agnostic technology was designed specifically for a multi-user client-server environment, thereby increasing reliability and decreasing overall resource usage on your Terminal Servers. Once you install ScrewDrivers, printing will no longer have *you* on a leash.

6   Acknowledgements

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7   References

- Microsoft Developer Network Library
- Microsoft DDK's
- Microsoft Online Documentation & Knowledgebase
- Citrix Online