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Best of Both Worlds: Making Windows and Linux Play Together

Best of Both Worlds:
Making Windows and Linux Play Together

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Introduction

Jamie looks for ways to reduce costs and improve efficiency in his business. His staff uses Microsoft operating systems exclusively, but he is tempted to move them onto Linux platforms. In his environment he can save tens of thousands of dollars in licensing fees. Plus he believes his current hardware will support Linux, whereas the next MS upgrade will cost him memory and cpu upgrades to meet necessary response times. At the same time, he fears everything he saves in bottom-line dollars will be lost in productivity costs if Linux-based applications don't perform as well as the staff's current programs.

Patricia works in an environment where some users run on Microsoft Windows operating systems and others utilize UNIX® and Linux operating systems. Her users need to be able to access and edit all the existing documents (primarily word processing, spreadsheets, and e-mail) from both environments.

Daniel jumped on the Linux bandwagon years ago. But even so, there are times when he needs to run applications that are only available under Windows.

Microsoft and UNIX-like operating systems co-exist for a variety of reasons. And even though many users have only one computer at their desk, they still want to have the facilities of both Windows and *nix[1] available at the same time. As many companies jump on the *nix bandwagon, there is almost always a need to maintain Windows capabilities as well. This paper will explore a number of options that exist in the market today that may allow users to have their cake and eat it, too. It will describe options (some free, some costly) that will permit users to choose the best of both worlds.

The Issues

There are three main issues that concern users as they move between Windows and *nix environments:

- Operating System Differences
- Availability of Applications
- Sharing Files

This paper will focus on options that make these issues less of a concern. Let's start by looking at a UNIX user, George, who is told to migrate to Windows XP. This command line guru will be tremendously more productive and happy if he can still utilize his favorite UNIX commands in this new operating system environment.

Operating System Differences

George has invested over ten years into UNIX and is now required to use Windows as his desktop platform. He

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1. The designation "*nix" will be used throughout this paper to describe UNIX/Linux operating systems.

is proficient in the use of command-line tools to quickly perform searches, edits, and data transformations. Commands like sed, awk, grep, find, and vi are his friends. Can he use these tools in his new environment? Certainly!

Cygwin

With a little bit of web-browsing, George could discover that he could download individual tools that work natively on Windows such as grep, awk, gawk (GNU's awk), and vim (enhanced vi). But other tools, like sed, may not be available. A more comprehensive solution would be to install Cygwin. This product provides a UNIX-like environment under a Windows O/S. For command-line users it provides a terminal interface that looks and acts like a UNIX shell.

Cygwin can be downloaded freely from www.cygwin.com.

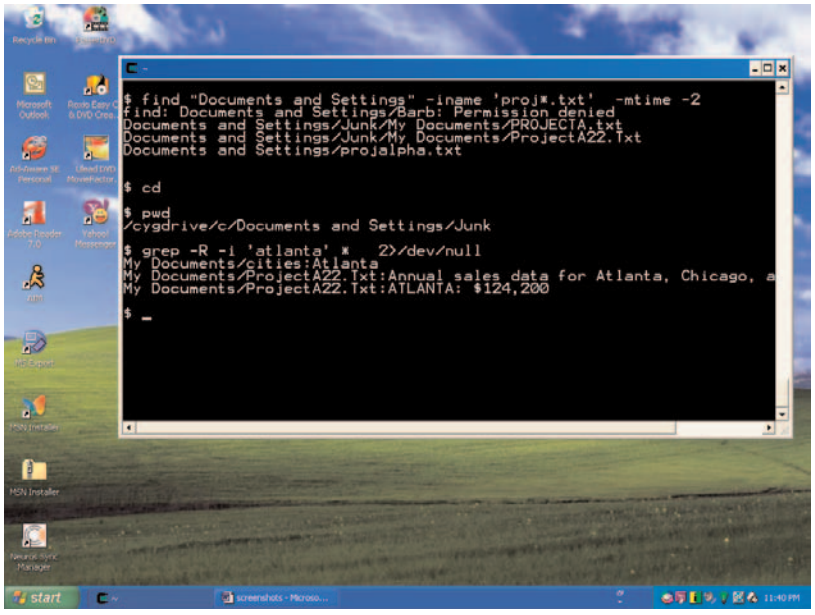
For example, if George wanted to find a file related to ProjectAlpha, he would use the find command. If he wanted to find any file beginning with PROJA and ending with .TXT that had been modified within the last two days. The following command could be done to locate these files:

```
find 'c:/Documents and Settings' -iname 'proja*.txt' -mtime -2
```

If George wanted to search through all subfolders (subdirectories) to find every line of any file that contained 'atlanta' in upper or lower case he could use this command:

```
grep -R -i 'atlanta' *
```

In addition, the user has a bash shell available to him so that he can write scripts (similar to batch files) utilizing all these *nix commands. Following is a screenshot[2] of a cygwin text window executing these commands.



Other users may need access to graphical Unix tools that run under X Windows (like FrameMaker, GIMP, etc.) but have a Windows workstation at their desks. For these users, Cygwin also provides an X Server similar to

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2. Due to file-size constraints and the number of screenshots included in this paper, a lower resolution is used. The purpose of the screenshots is to give a visual representation of the products, but the actual commands are explained in the text.

commercial products like Hummingbird's eXceed and Reflections/X. Such packages allow a remote *nix server to run graphical applications and redirect them to the screen of the MS Windows user. The MS Windows user can interact with mouse and keyboard just as if the application were running natively under Windows.
In this screenshot, I am running the xcalc (X Calculator) in cygwin-X and it is executing on my Windows XP machine. The other X Windows applications (the frozen-bubble game and the clock) are executing on a remote Linux machine that is displaying them on this screen. But from a user perspective, all three X applications work as if they were executing locally.

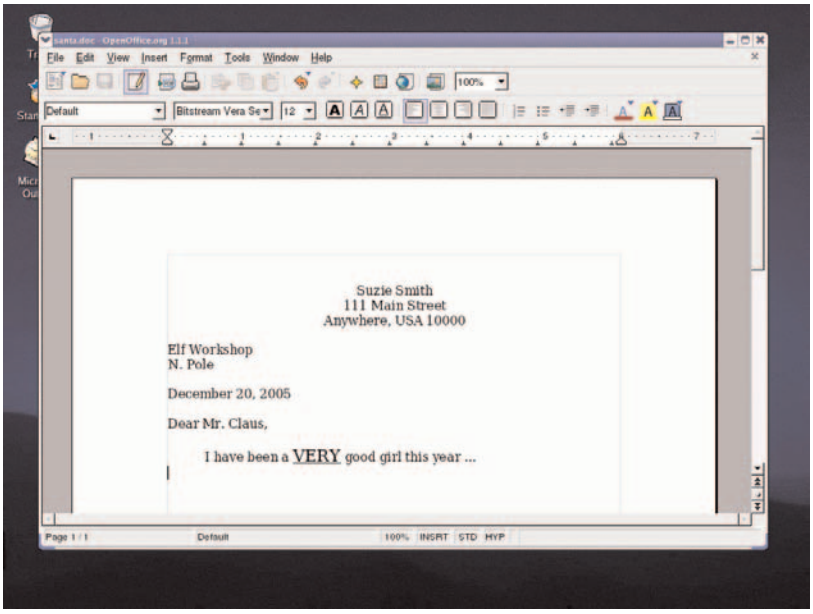


Access to Applications

Now let's look at a common issue in the reverse direction. A Windows user has been asked to move to a Linux desktop and has very valid concerns. She thinks, 'I have hundreds of documents in Microsoft Office formats. Are these documents still readable from this Linux environment? Can I edit them? Can I create new documents that will be compatible with people using MS Office?'

Linux fans, or those with a Sun Microsystems background, might tell you to use OpenOffice or StarOffice. These products contain office automation software that is compatible with MS Office products. There is a word processor that can save in .doc format, a spreadsheet program that can save in .xls format, a presentation program that can save in .ppt format, etc. OpenOffice is an open source product and is completely free. Most desktop-oriented Linux distributions already include it during a standard installation. Here is an example of what the word processor application looks like:

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The controls are similar enough to MS Word that most users will have no trouble doing basic word processing operations.

The next question to ask is, "Are documents created by OpenOffice truly compatible with MS Office?" The answer is, "It depends." Every file I have saved from an OpenOffice product has come up flawlessly in MS Office. The reverse has not always been true. Although OpenOffice renders most MS Office files correctly, it does not implement the more complex features.

Windows Applications from Linux

Whenever I need to render someone else's MS Office document and have it look flawless, I often choose to run the MS Office suite directly. There are a couple ways this can be done from Linux. In this section, I'd like to focus on ways to run a Windows application under Linux vs. running the entire Windows operating systems. (In a following section I will discuss how to create "virtual machines" that run Windows under Linux.)
Two common ways to execute Windows applications under a Linux environment are WINE and its commercial derivative, CrossOver Office. These products do NOT require a Windows operating system license or media because they run natively under Linux and UNIX environments. However, users would still be required to purchase appropriately license application software like MS Office.

WINE

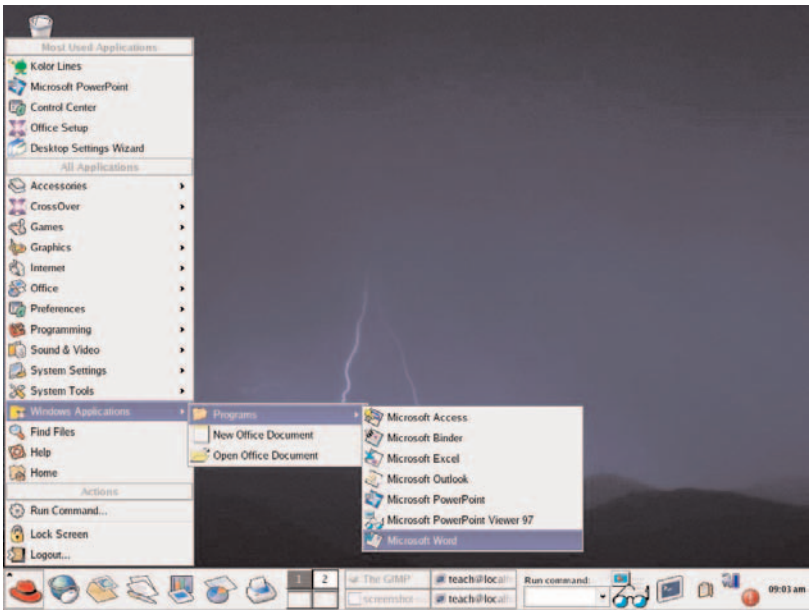
WINE is an open source project that seeks to create the Windows API on top of X Windows, and by inference, Linux and UNIX environments. WINE stands for "WINE Is Not an Emulator." This project allows Windows applications to be run directly in Linux, Solaris, and several other *nix operating systems.
As users test applications using WINE, the applications are rated. If an application installs and runs "virtually flawless" on an out-of-the-box Wine installation, it makes the Gold list. Examples of Gold list products include Microsoft Money and Frontpage. However, WINE's web site states:
"WINE is still under development, and it is not yet suitable for general use."
—Source: http://www.winehq.com

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For this reason, it is probably not a good option for many users, even though the free price tag makes it attractive. More information can be found on www.winehq.com.

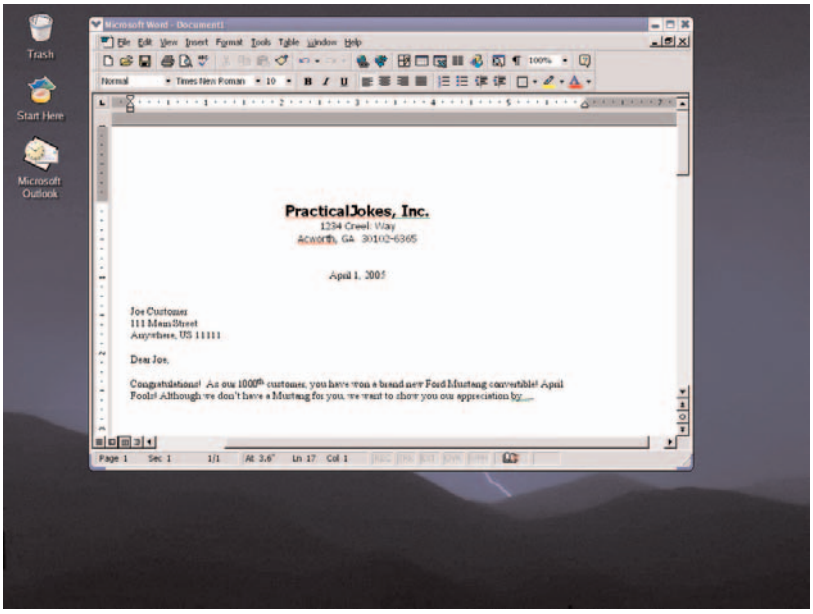
CrossOver Office

Of more interest might be Codeweavers' product, CrossOver Office. This product is a commercial implementation of WINE. The developers at Codeweavers have zeroed in on fine-tuning the API so that it supports popular Windows applications such as the MS Office suite, Quicken, iTunes, Dreamweaver, etc. In order to use these applications, a user must first purchase CrossOver Office. If the Windows application is a commercial product, the user would also need to purchase a legally licensed version (such as MS Office). Savings can come, however, because the user does NOT have to purchase a Microsoft Windows operating system.
Once a Windows application has been installed through CrossOver office, it is automatically added to the menu. The following screenshot shows how a user could bring up Microsoft Word. Notice also on the panel at the bottom of the screen is the PowerPoint Viewer icon (the glasses). This can be selected to run the PowerPoint Viewer. Icons can also be put on the desktop just as in Windows.



After selecting Microsoft Word, a new window pops up and looks just as it would in Windows. Here is an example of a MS Word document being edited directly in Linux:

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CrossOver Office's main appeal is that it runs the "actual" Windows executables. I have been using CrossOver Office for two years and have been very pleased with the results. The initial installation could be more straightforward, but it is getting better with each release.

Today many applications work extremely well, but some features cause errors or are not implemented in the APIs yet. As users and corporations test Windows applications in CrossOver Office, they are rated Gold, Silver, or Bronze depending on the compatibility. The following website allows users to see the compatibility of favorite Windows applications: http://www.codeweavers.com/compatibility/search.
Codeweavers has made a bold statement on their compatibility page:
"We are confident that Wine has matured to the point that CrossOver will run 95% of all Windows applications by the end of 2005."
—http://www.codeweavers.com/compatibility>

For more information, see www.codeweavers.com.

Access to Applications – Linux Applications from Windows

Now let's move to a scenario where a user's primary desktop is Windows, but that user desires to run a specific program from the Linux world. It is a program that is not supplied with the MS Windows operating system.

Sourceforge.net

One of the first places to investigate is sourceforge.net. This site is a repository for over 100,000 open source products. Very often the desired program is available for both Linux and Windows operating systems. For example, suppose a user desires to use the UNIX text editor, vi. There is a free open source product called vim that is vi on steroids. It looks and acts like vi, but has several additional user conveniences. There is even a graphical version of this tool called "gvim" that incorporates the keyboard controls of vi plus allows users to

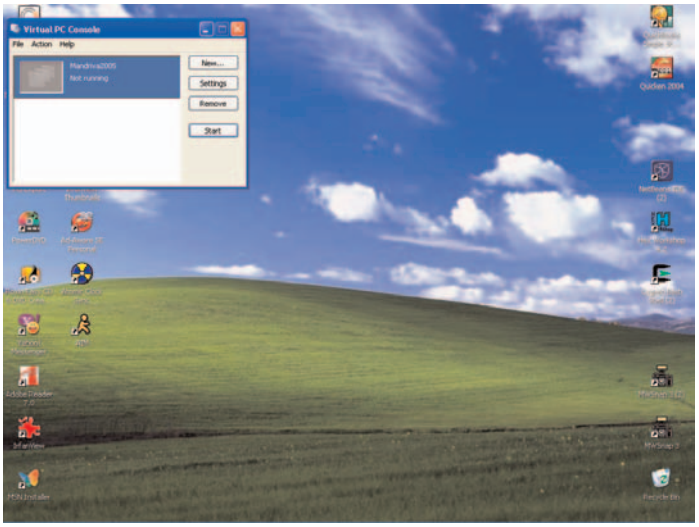
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utilize a mouse for pull-down menus, cut-and-paste, etc. This product is available for Windows 98/2000/ME/XP in addition to dozens of *nix variants. Many other favorite tools of UNIX users are available directly in Windows such as grep, awk, gawk, and perl. These are all command line oriented, but there are tens of thousands of graphical tools as well.

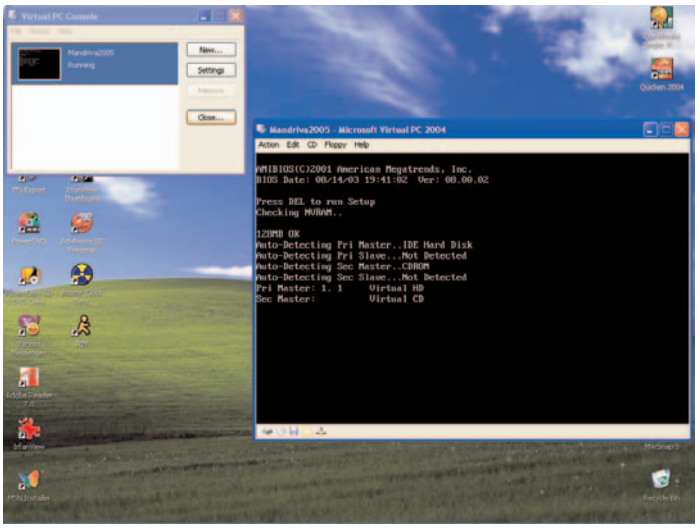
Virtual Machines

Virtual PC

If the application or tool is not natively available for Windows, then environments exist that create a "virtual machine" that runs Linux under Windows. One of these products is sold by Microsoft and is called Virtual PC. The following screenshot shows a Windows XP desktop with Virtual PC installed. I defined a virtual machine called Mandriva2005 (Mandriva is the newest Linux from Mandrake/Connectiva). After configuring the Virtual Machine by assigning it memory and disk space, the machine is started by selecting the Start button.

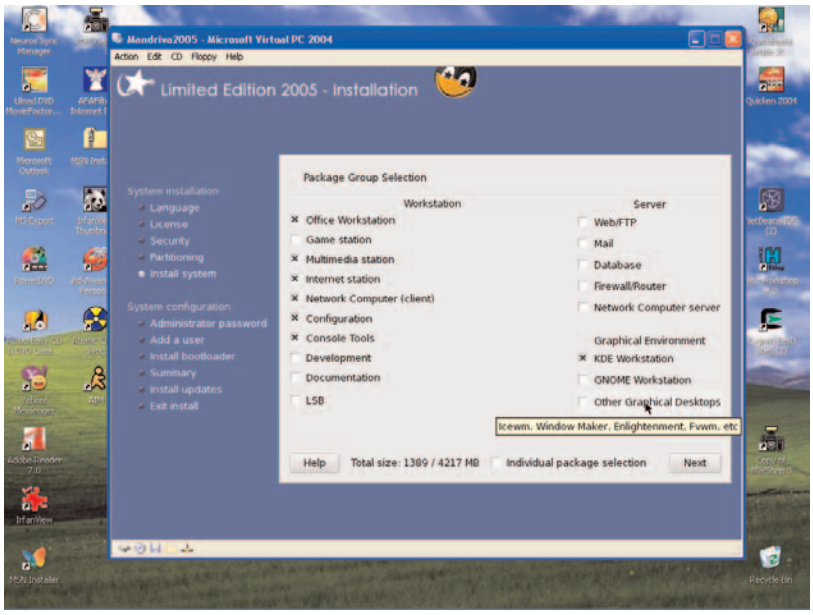


The Mandriva2005 virtual machine will display the BIOS messages and will look and act like a different CPU.

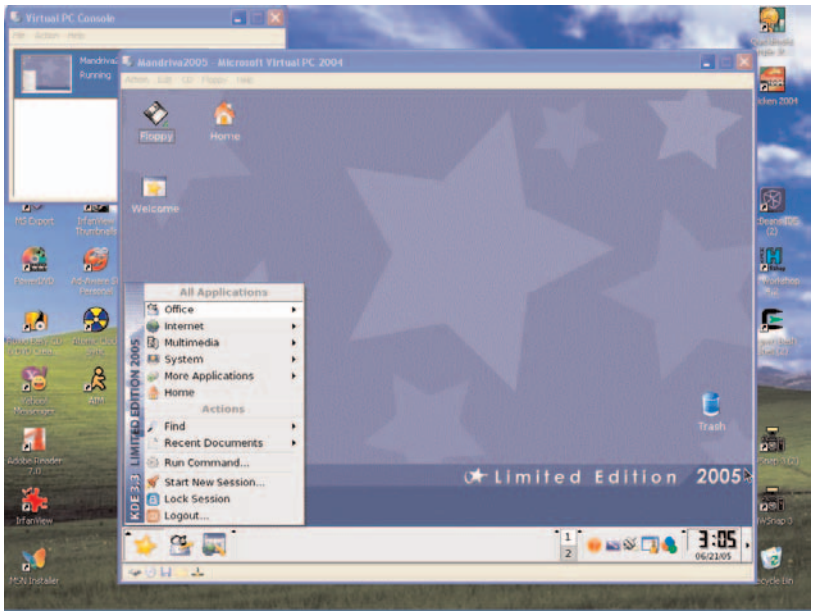


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In the example below, I "booted the virtual machine" from a DVD with a Mandriva image on it. During the installation process, hardware and networking devices are configured as if this were a natively booted operating system.

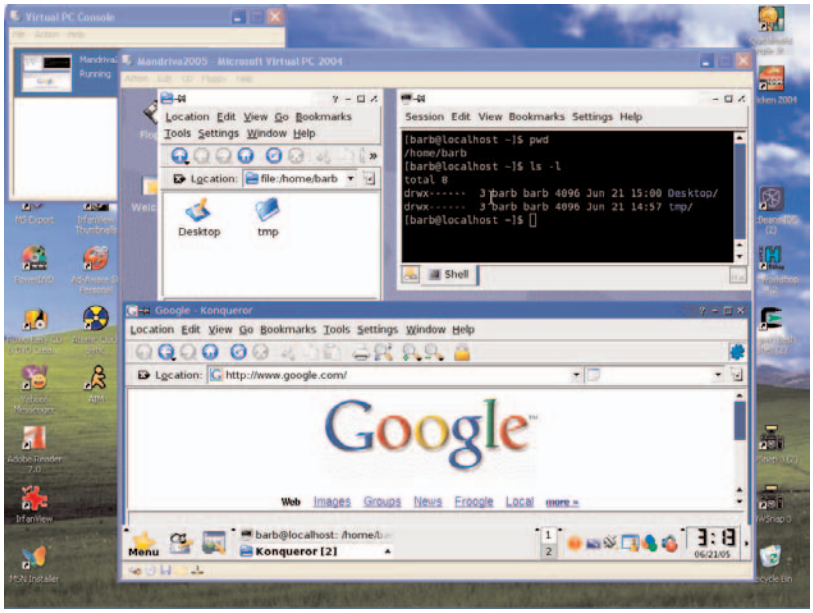


Once the virtual machine has been created and installed, it can be restarted at any time through the Virtual PC Console. It consumes a memory and CPU resources, so runs more slowly than a native operating system, but it is fully functional.



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The following screen shot shows a UNIX command-line shell, a file manager, and a browser window. The virtual machine is set to get an address via DHCP and to use a dynamically provided DNS server. The virtual machine also includes a virtual Ethernet interface that allows users to access networks as if each Virtual Machine were a physical machine.



VMware

A second option available to Windows users would be VMware products. VMware, Inc. is a specialist in Virtual Machine technology. They claim to be the "Global Leader in Virtual Infrastructure Software for Industry-Standard Systems," and everyone I know in the industry would agree. Although VMware offers an extensive suite of enterprise products, this paper focuses on desktop interoperability, so I'll only describe VMware Workstation.

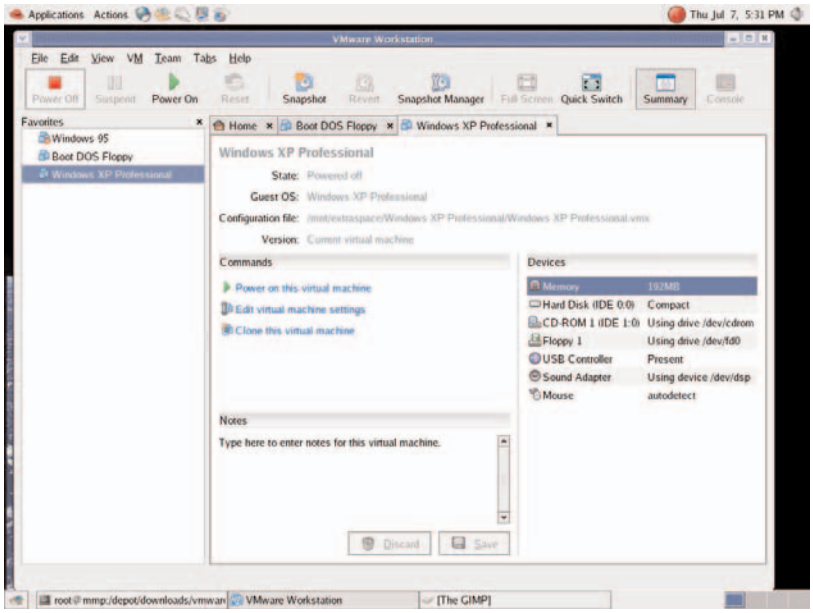
VMware Workstation installs on an individual workstation and is similar in scope to Microsoft's Virtual PC. After installing VMware Workstation on the desktop host, additional "virtual machines" can be created that each run their own operating system. MS Virtual PC only installs on Windows operating systems and the virtual machines are only "officially" designed to run Microsoft operating systems (Linux has to be installed under the generic "other" category). VMware Workstation may be installed on either a Windows or a Linux desktop host (be careful when purchasing to select the appropriate choice.) It is marketed to support virtual machines running Microsoft Windows, Linux, Free BSD, Novell NetWare, and Solaris X86 platforms. Much greater flexibility can be obtained by using the enterprise solutions, but that is beyond the scope of this paper.

When VMware is installed on a Windows operating system, Virtual Machines can be created under it that run additional Windows, Linux, Solaris x86, etc. After the initial setup, it would act much like Virtual PC where Linux would be running inside of a window.

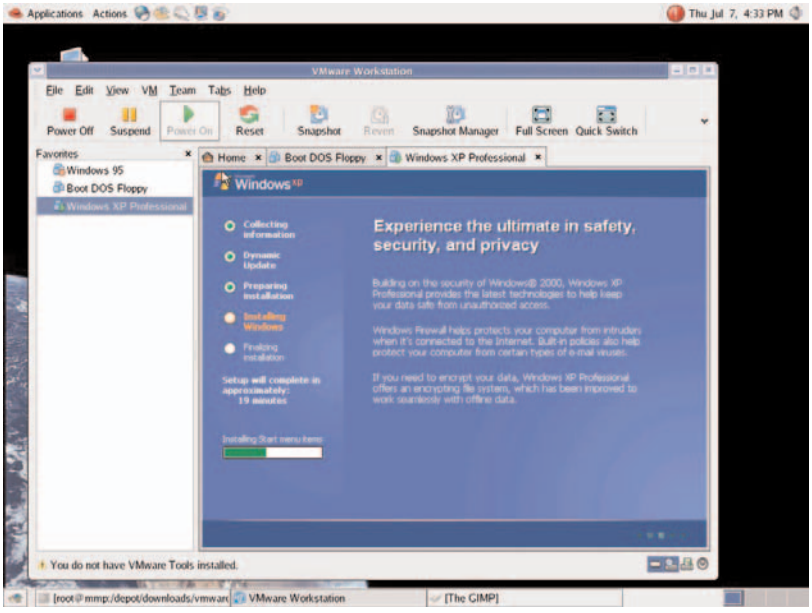
VMware can also be installed under Linux. The setup screens look the same whether the host operating system is Linux or Windows.

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Following is a screenshot of VMware running under Fedora Core 3. The first screenshot displays the Windows XP Professional Virtual Machine parameters (in addition, the user reserves disk space and controls memory usage for each VM.)

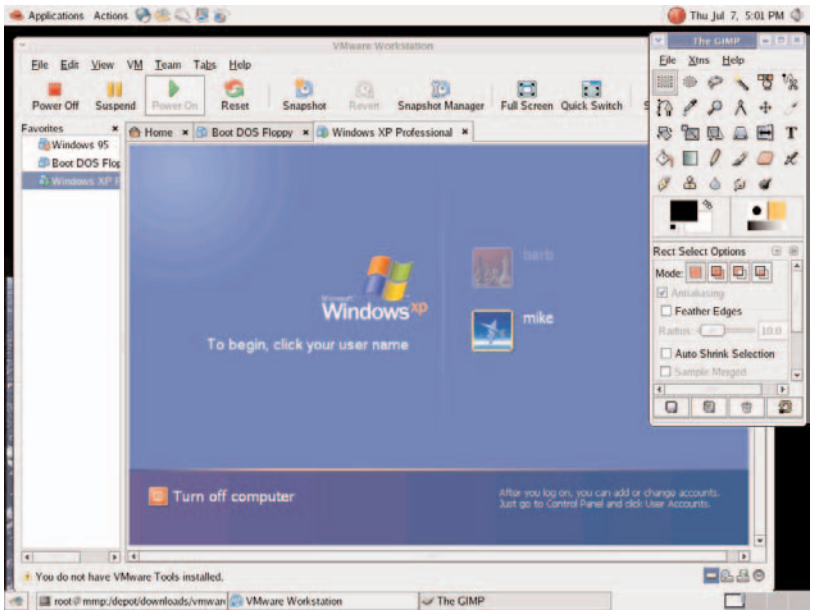


After setting up the parameters of the Virtual Machine, the user then selects the "Power On" button. I placed the Windows XP Pro CD in the drive before pressing the "Power On" button, and the virtual machine "booted" from the CD.

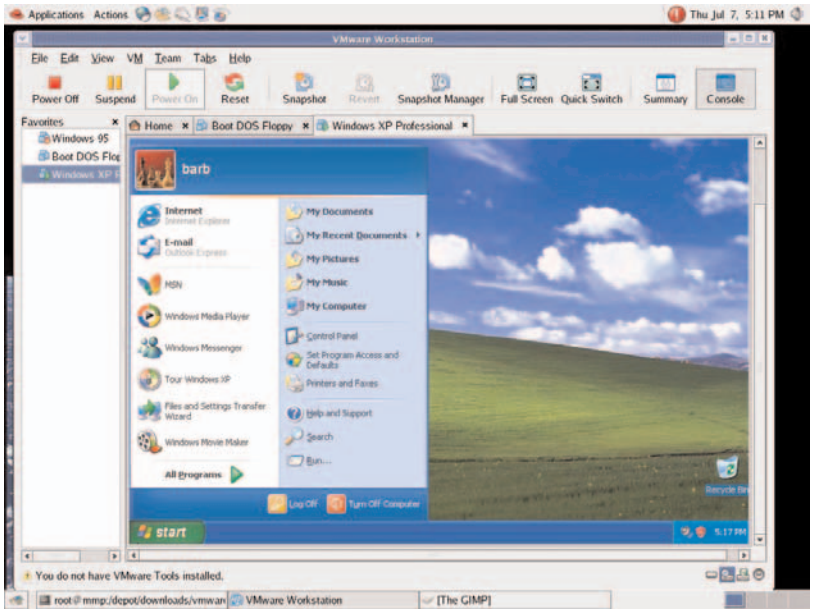


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After stepping through the installation process, the virtual machine called "Windows XP Professional" rebooted to a standard login screen.



Inside this window is a fully functional Windows XP environment. Since VMware emulates at the hardware level, it runs applications the most seamlessly with very few compatibility issues (primarily related to non-standard hardware components.)



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VMware provides an excellent environment for running non-native programs. The speed and compatibility are impressive. The trade-off is the cost. Costs include VMware software, the legitimate installation media and licensing for the virtual machine operating systems, and software and licensing for applications. A typical scenario might have Linux loaded as the host O/S (free), with MS Windows XP Pro and MS Office loaded under the VM. In addition, the machine may need a memory upgrade to maintain good performance characteristics. Without discounts, these costs could add up to as much as $1000. See www.vmware.com for more information.

Win4Lin and QEMU

There's one more virtual machine option I want to mention. Let's consider, once again, a Linux user who needs to run Windows programs. Two commercial options presented so far include Crossover Office and VMware. A third alternative is Win4Lin or Win4LinPro.

Win4Lin provides products that use a virtual computing environment (VCE) to run Windows under a Linux platform. The older version of Win4Lin supports Win95 and Win98 applications beautifully. I used this product for several years to run MS Office applications, and the performance was excellent. It gave me complete compatibility in running my Windows applications with a Windows 98 operating system under Linux.

In 2005 a new version was released called Win4LinPro that supports Windows 2000 and Windows XP. My personal experience with attempting to install Windows XP Pro was not pretty. My Celeron 2.66 Ghz desktop machine was running Fedora Core 2 and took about eight hours to install Windows XP, and still produced several unrecoverable errors. Although Win4LinPro claims to make more efficient use of memory and resources than VMware, my experience did not meet these expectations. The original Win4Lin product was very stable and efficient with computing resources, so I'm sure that Win4LinPro will continue to improve in the coming months, but still seems to be in the early stages. Win4Lin suggests using an accelerator (see below), but it is not part of the shipped product.

The Win4Lin products install using the UNIX command line (they do not have a graphical user interface). As with all these virtual machine solutions, Win4Lin users must own legitimately licensed MS Windows installation media in addition to legally licensed versions of each of the desired Windows applications.

Win4LinPro is based upon an open source virtual computing environment called QEMU. A secondary component, KQEMU, is a free accelerator that provides both performance and compatibility enhancements to QEMU. Win4LinPro suggests users download and install this component from open source repositories, but it is not part of the Win4LinPro package.
For more information see: www.win4lin.com.

Sharing Files and Remote Login

We have explored a number of methods that allow users to utilize their favorite operating system commands and applications. Two other common communications between UNIX and Windows desktops are file sharing and remote logins. As a user moves to a new operating system platform, she must often maintain the ability to login remotely or transfer files from the original operating system.

Telnet

When a Windows user needs to log into a Linux or UNIX box, the traditional way to do so is the telnet command. It is executed by typing:

```
telnet unixhost
```

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The unixhost will then prompt for a username and password. Once this challenge has been authenticated, the user may execute any command line tools available to that user. The main limitation of telnet is that it transfers all data in "clear text", in other words unencrypted. Therefore, the commands, the computer response, the username, and password can be snooped by anyone who has a network connection.

Ftp

File sharing is probably even more popular than remote login. TCP/IP networking standards make it relatively easy to offer basic networking services across heterogeneous environments. The original ftp program provides remote file transfer capabilities. Current Windows distributions include a ftp command that is available from the command prompt. For example, from the DOS Command prompt a user can type ftp unixhost to initiate a file transfer connection with a remote unixhost. Ftp is also built-in to webbrowsers, so if users want to access an ftp site, they can simply point their browser to ftp://ftp.some.ftpsite.com. There are dozens of shareware and freeware clients that make ftp even easier to use.

Putty

Although there is a telnet client built into Windows, it offers minimal customizations. Many users have found more feature-rich software through open source and shareware facilities. One of the favorites for telnet sessions is putty. Not only does putty offer telnet, but it also offers the encrypted communications of ssh. When ssh is used to accomplish remote logins, all, including usernames and passwords, will be encrypted. So snooping programs will not be able to read the communications. For more information see the developer's home page: <http://www.chiark.greenend.org.uk/%7Esgtatham/putty/>.

Ssh/scp/pscp

Putty contains several components including ssh and a command line secure copy command called pscp (the UNIX equivalent is scp). This tool is preferred by many users because it encrypts the communications and has command syntax that can be easily scripted. Copying a file from one machine to another is a simple pscp/scp command. In the following example, a user on a Windows hosts wants to send FILE1.TXT to unixhost using the permissions of user "bob" and placing the file in the temporary directory called /tmp.

```
pscp FILE1.TXT bob@Linuxhost:/tmp
```

For other options (including graphical user interfaces that do scp), see : http://www.jfitz.com/tips/ssh_for_windows.html.

From the Linux/UNIX side, this command might be:

```
scp PCUSER@pchosts:FILE1.TXT /tmp
```

These commands will prompt the user for a password and then transfer the file (encrypted) across the network to keep it from snooping eyes.

Samba

Setup

While ftp, telnet, and ssh provide great file transfer and virtual terminal support, most of these products require Windows users to either learn a command line interface or install additional software. This is not reasonable in many environments. Many Windows users are not permitted to install additional software to their

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turn-key environments. In these situations, it is often up to the *nix users to make their resources transparently available to the Windows users. This can be done with Samba. Samba is an open source product that attempts to make *nix machines look like nodes on a standard Windows Network that is using the SMB protocol. Although Samba can provide several networking services, I'll limit this discussion to facilitating file transfer capabilities without installing any software on Windows desktops.

In the first scenario, let's suppose that a Linux machine has a directory it would like to share with the Windows clients. The directory is located in /video/recordings. On the Linux machine, a file called smb.conf is edited to create the "share." Here are examples of lines that would define a share called "Videos" and make it easily available to the Windows workgroup called ACME.

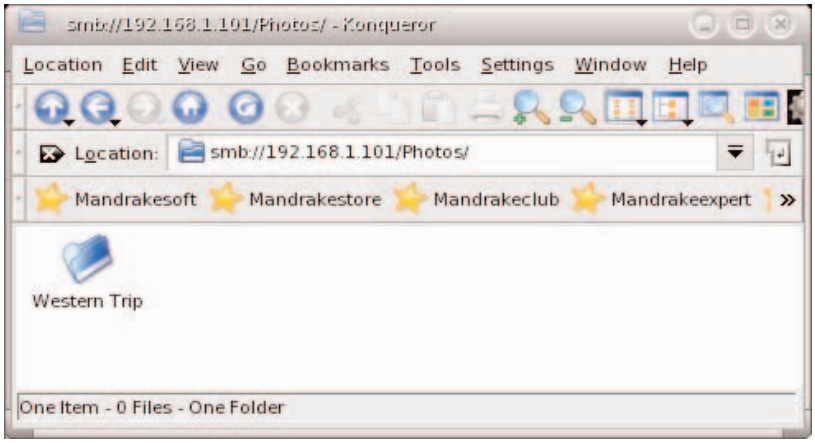
```
workgroup = ACME

# This section creates a share called Videos
[ Videos]
comment = MythTv Recordings
path = /video/recordings
browseable = yes
public = yes
read only = yes
```

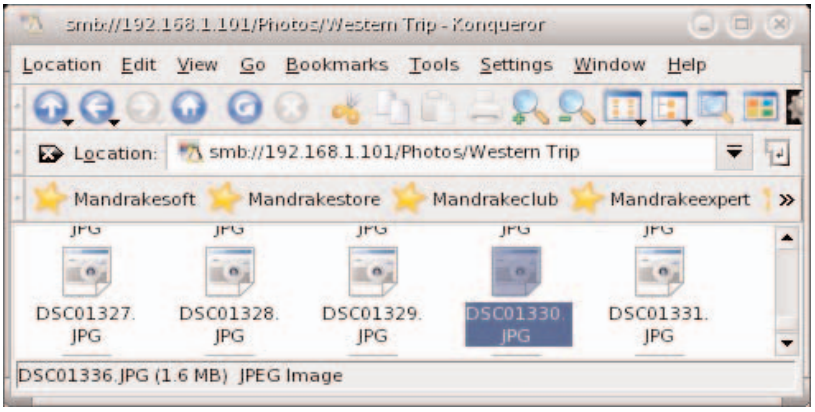
This machine is now added to the workgroup ACME and should appear in the network neighborhood of all the PCs in that workgroup. The icons will look and behave like those of any Windows machines and Windows shares. Clicking on the host icon will show that a share is available called [Videos] and files can be dropped into and out of this folder using normal Windows methods. Samba allows much more fine-grained control limiting certain users, forcing passwords, etc., but that is beyond the scope of this paper.

Konqueror

Now how about the other direction? What if a share has been exported on Windows, and a Linux machine wants to access it? The easiest way is to use a Linux browser that understands the samba protocol, such as Konqueror. In the Location field, instead of entering something like **http://www.google.com**, enter: **smb://winhost:/sharename**



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If required, a password will be requested, then the share will show up like any local folder. Files can be dropped and clicked as usual.

Mounting

Another way Linux can access Windows shares is to mount the Windows share so it looks like part of the UNIX file system. Only the system administrator with root privilege can generally execute this mount. The commands would look something like:

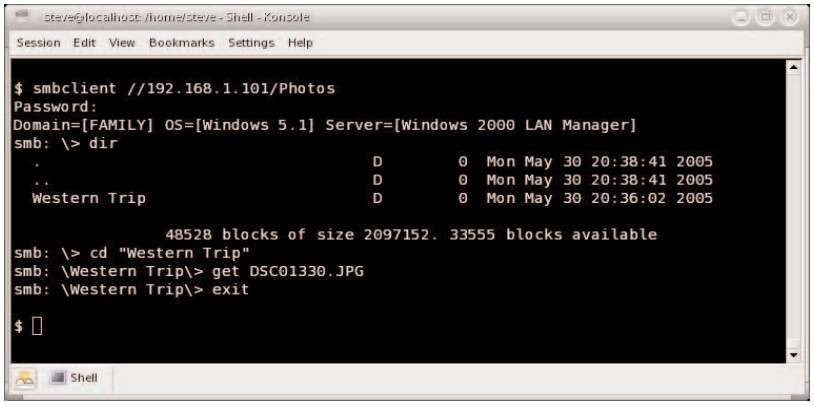
```
# mkdir /mnt/photos
# mount -t smb 192.168.1.101:/Photos /mnt/photos # or
# mount -t smb winhost:/Photos /mnt/photos
```

Now any Linux command that accesses the directory /mnt/photos will actually be accessing files on winhost. To copy the DSC0300.JPG file, a *nix user could either use the file manager (drop and click between folders) or execute a copy command like:

```
# cp /mnt/photos/DSC01330.JPG /tmp
```

Smbclient

A third option would be to use smbclient to transfer the files via an interface that looks much like the command-line ftp interface:



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These three Samba examples all share the same data, but each uses a different interface to do so. It highlights what this paper has been communicating all along that there are many options available for interconnectivity.

Summary

Windows operating systems and Linux operating systems are both common in today's desktop environments. Each has its own strengths and weaknesses, but the biggest productivity factor is the familiarity that a particular user has with one of these environments. Although a homogenous environment with identical operating systems is the easiest to configure, manage, and maintain, it is not always the best choice.

When outside influences force users to change from one environment to the other, many users are under the impression that choosing Windows means losing Linux conveniences or choosing Linux means losing Windows conveniences. This is not necessarily true. Although it will take some time, effort, or money, environments can be created that allow the users to maintain functionality with their platform of choice. This paper has provided a wide sampling of options that are available for users who are determined to enjoy "The Best of Both Worlds."

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About the Author

Barbara Fox is President of MultiMedia Productions, Inc. She has supported UNIX systems for 20 years as a Support Engineer, Senior Systems Engineer, and Consultant. She also teaches training courses on UNIX/Linux Systems Administration, Networking, Scripting, and Security.

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