

NeTraverse Win4Lin Terminal Server 3.0

Installation and Operations Guide



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NeTraverse Inc.

Corporate Office

7000 Bee Caves Road, Suite 300

Austin, Texas 78746

www.netraverse.com

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Preface

Welcome to the family of NeTraverse customers, and thank you for purchasing our product. NeTraverse Win4Lin Terminal Server is the latest offering in our product suite, which provides users with the ability to run Windows applications on Linux, SCO UNIX, and other related platforms. NeTraverse Win4Lin Terminal Server is built on the same technology that powers NeTraverse Win4Lin as well as NeTraverse Merge. NeTraverse Merge has been in continuous use SCO for over fifteen years providing over 800,000 users with the ability to run Windows applications on SCO UNIX.

With NeTraverse Win4Lin Terminal Server, your Windows desktop is as close as your nearest network-connected computer. NeTraverse Win4Lin Terminal Server enables you to deliver Windows applications over a network on a thin or thick client, hosting multiple Windows users on a single, low-cost Linux server. This allows small and medium size business and departmental workgroups to provide users with access to the latest Windows productivity applications while centralizing administration and eliminating the need to upgrade each user's desktop PC.

At NeTraverse, we are committed to quality service and support. As part of this commitment, our Web site offers product updates, a support database, Frequently Asked Questions, and the option of contacting our professional support team. These product experts are the same people who help our corporate customers integrate NeTraverse solutions into their computing environments. The information on our Web site represents our collective knowledge gained from years of customer experience.

Ultimately, our objective is to provide the enterprise and user community with a seamless bridge from Windows to Linux. Enterprises and users are looking for ways to improve productivity and reduce the total cost of desktop ownership. NeTraverse Win4Lin Terminal Server provides users with Windows desktops throughout the enterprise with the security and performance of Linux.

Thank you again for purchasing NeTraverse Win4Lin Terminal Server—we look forward to hearing your comments and suggestions!

James P. Curtin
President and CEO
NeTraverse Inc.

INTRODUCTION

NeTraverse Win4Lin Terminal Server

- ▶ What is NeTraverse Win4Lin Terminal Server?
- ▶ How Does NeTraverse Win4Lin Terminal Server Work?
- ▶ System Requirements
- ▶ NeTraverse Win4Lin Terminal Server Limitations

What is NeTraverse Win4Lin Terminal Server?

NeTraverse Win4Lin Terminal Server allows organizations to deploy popular Windows applications on a Linux platform. This gives IT departments the freedom to incorporate multi-vendor, multi-platform networks without requiring users to leave the familiar Windows desktop environment. System administrators gain more flexibility and control in delivering Windows applications over a network.

NeTraverse Win4Lin Terminal Server brings the benefits of the server-based computing model to organizations by delivering centralized management, server deployment, and network integration. The momentum of server-based computing, particularly as a service in enterprise networks, will emerge as the dominant model of enterprise computing over the next decade. Linux is becoming a major platform in this infrastructure transformation.

The combination of Linux with NeTraverse Win4Lin Terminal Server provides an extremely affordable alternative to traditional IT solutions. In addition to the cost benefit associated with Linux, organizations can continue to use existing Windows licenses and hardware to access applications and files from any network-connected device, wired or wireless; thus realizing increased productivity in addition to leveraging an enterprise's existing hardware and software investment. These benefits impact the bottom line of the enterprise, reducing the Total Cost of Ownership (TCO™) and making desktop management more efficient and less complex.

Basic Architecture

NeTraverse Win4Lin Terminal Server enables Linux to deliver Windows applications over a network on a thin or thick client. With server-based computing, thin client or thick client devices have instant access to applications hosted on the server.

In the thick client model, NeTraverse Win4Lin Terminal Server uses the remote display capabilities of the X Window System to display applications on the user's desktop. Users are able to access their server desktop session via Telnet or another shell and export the X Windows display to their local machine.

The X Window System, also called the X Protocol, was developed to provide a graphical user interface transparent to the network and is able to support a wide variety of hardware platforms, languages, and operating systems. Rather than just directing the display to the local machine, the X Protocol specifies a client-server relationship at the application level. The X server manages a single keyboard, screen, and mouse. The client, also called the X client or the application, displays on the X server.

Any X Window System in conjunction with NeTraverse Win4Lin Terminal Server can both generate input and manage the output from the clients, thereby re-displaying Windows applications on the end client.

If the client cannot process X Protocol messages, then a different redisplay technology is required. Using NeTraverse Win4Lin Terminal Server with redisplay technologies such as VNC or Tarantella, users can access Windows applications remotely from almost any client device with a web browser such as Microsoft Internet Explorer or Netscape Navigator, with Java technology enabled.

New for version 3.0 is a native client for various platforms, which also allows printing to local client computer printer(s). These clients are available from:

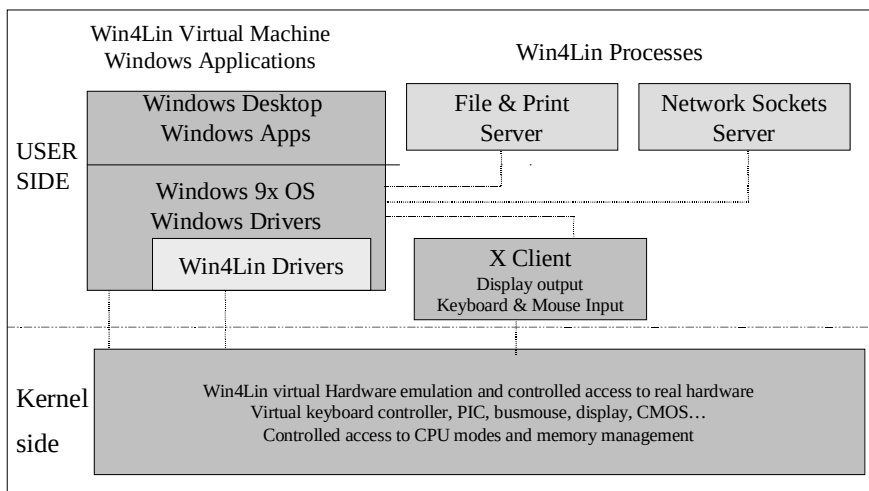
<http://www.netraverse.com/member/downloads/wtsclients/>

NeTraverse Win4Lin Terminal Server brings the benefits of this new Internet computing model to Windows 95/98/Me users delivering centralized management, server deployment, and network integration.

How Does NeTraverse Win4Lin Terminal Server Work?

NeTraverse Win4Lin Terminal Server consists of a set of server processes, kernel loadable modules and drivers. These components combine to create a closely integrated environment between Linux and Windows. The server processes provide mappings that enable Windows applications to utilize the underlying facilities of Linux, the file system, networking services, and access to other devices such as the display, keyboard, and mouse. The NeTraverse-enabled kernel and drivers implement low level interfaces that define a virtual machine environment which supports the execution of Windows as a Linux application. This results in lower system overhead, higher performance, and ease of use.

Win4Lin Server Package



Executing Windows under NeTraverse Win4Lin Terminal Server provides a number of additional benefits. The Windows installation is easily created, backed-up, replicated, and restored. Common Windows corruption problems are either avoided or easily recovered from the point of failure. By providing tight integration with both the Linux file system and network stack, there is no need to create separate partitions or configure additional networking services.

Layering Windows over the Linux file system and networking facilities enhances performance, strength, and security.

User Benefits

- Windows application support
- Limited need to re-train current Windows users
- High performance of Windows applications
- Increased stability and security

System Administrator Benefits

- Runs Windows 95/98/Me desktop to network-enabled computers on LANs

- Centralized file storage
- Centralized desktop administration
- Leverage thin client computing to extend current desktop life
- Single point software deployment
- Control access to applications using underlying Linux permissions

Enterprise Benefits

- Dramatically lower desktop Total Cost of Ownership (TCO)
- Gives users the power to access, create and store information anywhere and anytime
- Pooled computing resources
- Reduced operations cost
- Improved productivity

System Requirements

These requirements were developed using concurrent users. Depending on your applications, these requirements may need to be adjusted.

Supported Operating Systems

- Red Hat Linux
- Caldera OpenLinux and SCO Linux Server
- SuSE Linux
- Linux Mandrake
- LindowsOS
- Xandros Desktop
- Gentoo Linux
- Generic 2.6.x and 2.4.x Kernels (**2.2.x kernels are not supported**)

Additional kernels and distributions supported as released. Please check the NeTraverse website for additional information.

Base Service Installation Requirements

- A Pentium-class x86-compatible PC
- A Linux distribution with a NeTraverse-enabled kernel
- Win4Lin Installation Files (downloadable RPMs or ISO images)
- Microsoft Windows 95, 98, or Me CD and one license per user
- Microsoft Windows Boot Floppy (If the windows 95 or 98 CD is not bootable)

Hardware Session Requirements

Minimum recommended hardware configuration for 10 concurrent users:

- CPU: 1GHz Pentium III/AMD equivalent
- Memory: 768 MB RAM
- Storage: 30 GB
- Storage Type: SCSI/RAID

Minimum recommended hardware configuration for 25 concurrent users:

- CPU: dual 1GHz Pentium III/AMD equivalent
- Memory: 2 GB RAM
- Storage: 60 GB

- Storage Type: SCSI/RAID

Software Requirements

- X Windows system (i.e., Xfree86)
- X display manager
- SSH client and daemon (for remote access and management) is recommended
- VNC Server (check your Linux distribution's documentation, or visit the online home of VNC, <http://www.realvnc.com>)
- GNU Ghostscript (installed with most Linux distributions)
- GTK+ 1.2 runtime libraries (installed with most Linux distributions)

Client Requirements

- Network Connectivity to the LAN or WAN
- Native NeTraverse WTS Client ~or~ X server ~or~ X Window System (16-bit color recommended) ~or~ redisplay software client (such as VNC or Tarantella clients)

Current Limitations

- **Memory:** The maximum memory that can be assigned to NeTraverse Win4Lin Terminal Server is 128 MB per Windows session.
- **Sound:** Win4Lin provides support for PCM (Pulse Code Modulation) sound output only. PCM allows Windows .wav files as well as many multimedia players to play sound. Windows sound input, Midi, Mixer and CD players are not currently supported. Sound support on the client requires the use of network transparent sound daemons and special configuration.
- **Networking:** NeTraverse Win4Lin Terminal Server does not provide support for the NetBEUI or IPX networking protocols, within Windows.
- **Operating Systems:** Win4Lin supports only US, Western European, and some Eastern European versions of Windows 95, Windows 95 OSR2, Windows 98 SE, and Windows Me (French, Italian, German, Spanish, and US full, non-upgrade only at this time.) Media must be installable on any computer, and not tied to a machine-specific BIOS. Windows NT, Windows 2000, and Windows XP are not supported at this time. Win4Lin Terminal Server does not support “Companion” nor “Rescue” media. “Upgrade” media other than Windows 95 to Windows 98 is not supported either.
- **Devices:** Keyboard, mouse, sound, disk and display devices are supported in NeTraverse Win4Lin Terminal Server via the existing Linux drivers. Serial (COM) port and parallel port devices can be accessed via Win4Lin virtual device drivers. USB support is limited to keyboard, mouse, display, sound, printer, floppy, CD-ROM, and hard disks via the Linux driver for these devices
- **Video:** Current versions of NeTraverse Win4Lin Terminal Server do not support hardware acceleration for DirectX multimedia Application Programming Interface (API). Most games programmed for Windows use this API and may not perform well under Win4Lin. Additionally, DOS VGA (video graphics array) applications do not work with Win4Lin in DOS emulation mode. Currently only DirectX 8.0a, available for download from Microsoft, has been tested with Win4Lin Terminal Server, with software rendering only.
- **File Systems:** NeTraverse does not recommend using NFS, or other remote file systems, as the “C:\” drive in Windows. However, recent implementations of NFS are acceptable if absolutely required.

CHAPTER 1

1

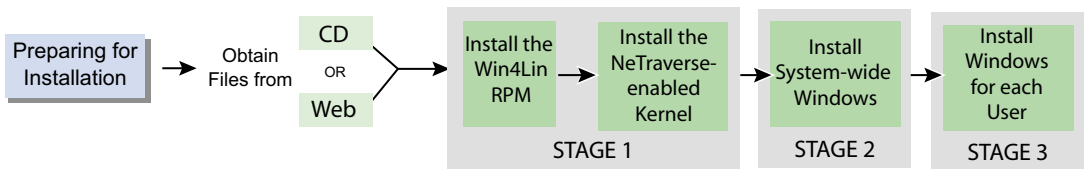
Installing NeTraverse Win4Lin Terminal Server

- ▶ Installation Overview
- ▶ Preparing for Installation
- ▶ Installation Using the Graphical Installer
- ▶ Using the Graphical Installer to Update Win4Lin
- ▶ Removing Win4Lin from the System
- ▶ Installation Hints

Installation Overview

This chapter will guide you through the installation of NeTraverse Win4Lin Terminal Server (Win4Lin). Installation is accomplished in three stages. During Stage 1, you will install the Win4Lin program file and NeTraverse-enabled kernel. During stage 2 the Windows system files are copied to disk. In the third stage, you will install Windows for each user individually. Installing and configuring the system for each user is covered in-depth in Chapter 2. .

THE NETRAVERSE WIN4LIN TERMINAL SERVER INSTALLATION PROCESS



This section assumes you are installing Win4Lin for the first time. For information on updating or removing Win4Lin, please see these sections later in this chapter.

Preparing for Installation

Before installing Win4Lin there are a few checklist items you should run through in order to ensure that the installation proceeds smoothly.

- ▶ Creating a Windows Boot Floppy
- ▶ Installing Windows from Upgrade Media
- ▶ Disabling Automounting/Supermount
- ▶ Choosing a Windows networking option

Creating a Windows Boot Floppy

If your Windows 95/98/Me installation CD is not bootable, you will need a Windows boot disk (floppy disk) for use during the installation process. The Windows version of this disk must match the version of your Windows installation CD. For example, if you are using a Windows 98 SE installation CD, you must also use a Windows 98 SE boot floppy. You can only create such a boot floppy on a Windows system that is running the version of Windows that exactly matches your Windows installation CD. If you already have a matching boot floppy for your Windows CDRom, you do not need to create another boot floppy.

To create a Windows boot floppy (if you don't already have one), follow these steps:

- 1 Double click on **My Computer**.
- 2 Double click on **Control Panel**.
- 3 Double click on **Add/Remove Programs**.
- 4 Click on the **Startup Disk** tab.
- 5 Insert a floppy in the drive.
- 6 Click the **Create Disk** button, and follow the instructions.

Installing Windows From Upgrade Media

If you have purchased a Windows upgrade (i.e., from Windows 95 to Windows 98, or Windows 98 to Windows 98 SE), you will need your Windows installation CD or floppy disks from that earlier version in order to install Win4Lin. Because you will be installing Windows from upgrade media (e.g., you bought the newer version as an upgrade package, rather than repurchasing the full product at a higher price), the Microsoft Installer used in the installation process will require proof that you purchased an earlier version. You will be asked to insert the CD or the first floppy disk from your earlier Windows version during the Win4Lin installation.

CD Automounting and Supermount

The GNOME and KDE graphical desktop environments are frequently configured to automatically mount your CD-ROM drive when you insert a CD, so that you can access the CD immediately without having to type a command or click an icon. This behavior is usually very convenient, but it interferes with the Win4Lin installation process. Even if you are not using GNOME or KDE, your system may be enabling automounting of CDs using other software.

The graphical installer will, in most cases, automatically disable automounting during installation. In a few situations, you may need to disable automounting manually before starting the installation process. (See the section entitled *Manually Disabling CD Automount* in Chapter 5 for details.)

If you use supermount, you must manually disable it prior to Stage 3: Personal Windows Installation.

Disable supermount with the command:

```
/etc/rc.d/init.d/amd stop
```

Choosing a Windows Networking Option

NeTraverse Win4Lin Terminal Server offers two ways of supporting the ability of Windows and Windows applications to access networks: WinSock and Virtual Networking (VNET).

During Stage 3 of installation, which installs Windows for each user, you will be asked which of these two options you wish to use. Not all users are required to have the same network option. Thus, you may have a group of users for whom WinSock is sufficient, and another group who require the additional functionality of VNET.

WinSock

WinSock redirects Windows networking operations to use the Linux implementation of TCP/IP communication protocols. With WinSock, you won't need to configure any networking settings. Most applications work with this option, but WinSock doesn't support Network Neighborhood and doesn't allow access to a Microsoft Exchange Server or Novell NetWare Server. The WinSock option supports the Winsock Version 2 interface.

Virtual Networking (VNET)

VNET provides Windows with access to a virtual network, accessed through a virtual network interface card (NIC). This virtual network forwards IP packets to the external network through the physical NIC that it shares with the Linux network protocols. VNET most closely duplicates native Windows networking and offers support for a wide range of networking applications, including easy access to file and printer sharing through Network Neighborhood. If you select this option, you may also need to configure your Windows network settings using the Network control panel in Windows.

VNET requires that you configure a unique IP address for your virtual network card. It can be a static address, or assigned through a DHCP server. No matter how the IP address is assigned, VNET requires a separate IP address per user.

Review the characteristics of each networking option as summarized in the following chart and decide which best fits your networking needs.

Applications Supported by This Networking Option								
Win4Lin Networking Option	Requires 2nd IP Address	Internet Explorer, Netscape Communicator	AOL, MSN, Chat, Instant Messenger	Microsoft Windows Network Neighborhood	Microsoft Exchange Server	Remote Login (Telnet, SSH)	Most Other Modern Networking Applications	Virtual Private Network (VPN)
WinSock	NO	YES	YES	NO	NO	YES	YES	NO
VNET	YES	YES	YES	YES	YES	YES	YES	YES

Not Sure Which Option to Use?

If you are uncertain which networking option will work best for you, we recommend that you initially choose WinSock. This option supports Internet browsing and many other networking applications, and lets you get up and running quickly. You can switch between networking options at any time using the win_network command. (For more information, see *Chapter 2 – Configuring NeTraverse Win4Lin Terminal Server*).

Please note: If you are using Windows 95 (classic—not OSR2), you cannot switch to WinSock from VNET except by reinstalling Windows. Thus if you will be installing Windows 95, you should probably choose WinSock for your initial installation unless you are certain that VNET will better meet your needs. (For more information on networking options, see *Chapter 2 – Configuring NeTraverse Win4Lin Terminal Server*).

Installation Using the Graphical Installer

NeTraverse Win4Lin Terminal Server comes with a graphical installer that automates the Win4Lin installation process. The installer requires a small amount of user interaction during the installation stages.

Installation Stage	Actions Performed During This Stage of Installation	You Must Complete This Stage As:
Stage 1: Package Installation	• Installs Win4Lin Application • Installs NeTraverse-Enabled Kernel • Updates Your Linux Bootloader to Use the NeTraverse-Enabled Kernel on Reboot	a root user
Stage 2: System-Wide Windows Installation	• Copies Windows Installation Files to Your Disk for Use in Personal Windows Installation	a root user
Stage 3: Personal Windows Installation	• Runs the Microsoft Installer to Set Up Windows in a User Account	each user you wish to install

This section of the chapter covers information about obtaining the graphical installer, and will guide you through its process to ensure a successful installation.

Where to Find the Graphical Installer

The first step in installing Win4Lin is to determine the quickest and easiest way to get a copy of the installer. You can download the installer from the NeTraverse web site at www.netraverse.com.

Stage 1 — Package Installation

Run the installer using the following commands:

- 1 Close any applications you may have running (you will need to reboot your system during the installation process).
- 2 Start the X Windows System, if necessary, by typing:

startx

- 3 Connect to the Internet if you want the installer to check for product updates or for new NeTraverse-enabled kernels on our web site. (*This is optional for CD-based installation, but required for installation via download.*)
- 4 Open a terminal window and become the root user by typing:

```
xhost +localhost
su - root
```

Run the installer by typing the command(s) appropriate to your situation:

If you already have a copy of the Win4Lin installer on your hard drive, type the following command:

```
/usr/bin/wts-install
```

If you are installing Win4Lin from a CD, type the following commands to run the installer from that CD:

For most Linux distributions:

```
mount -o exec /mnt/cdrom
cd /mnt/cdrom
./wts-install
```

For SuSE Linux:

```
mount -o exec /cdrom
cd /cdrom
./wts-install
```

If you downloaded Win4Lin from the NeTraverse web site, type the following commands to unpack the installer archive you previously downloaded from our Web site and then run the installer from disk:

```
cd directoryname
tar xzvf wts_installer.tgz
cd wts_installer
./wts-install
```

Where *directoryname* is the name of the directory into which you downloaded the installer archive.

- 5 Follow the on-screen instructions:
 - **Entering Your License Code**
You will be asked to enter the license code for your copy of Win4Lin during this stage of installation. The license code will be sent to you by email. Please type the license code exactly as it appears, omitting the hyphens.
 - **Unsupported Kernels**
The Win4Lin installer checks your system to determine if the Linux kernel you are presently using can be automatically updated to a NeTraverse-

enabled version. If you are using a kernel that you have modified, a kernel from a beta release version of Linux, or another unsupported kernel, you will see this message:

You do not appear to be running a standard kernel.

If you see this message, you will need to follow the instructions in the Release Notes or on our website (www.netraverse.com) to update your specific kernel to be NeTraverse-enabled. Once you have completed this procedure, you should restart the installation process at Stage 1.

- 6 At the conclusion of Stage 1, you will be prompted to reboot your system. If you are installing Win4Lin from CD, you may remove your Win4Lin Installation CD from your CD drive at this time. After rebooting, log in as the non-root user who will be using Win4Lin and proceed with Stage 2.

Stage 2 — System-Wide Windows Installation

In the second stage, the installer copies the Windows installation files from your Windows installation CD to your hard drive. Make sure there is no CD-ROM in use during this process. If you are installing via download, the graphical installer will download the Win4Lin program and kernel from the NeTraverse web site. Follow these steps to perform Stage 2:

- 1 Start the X Windows System, if necessary, by typing:


```
startx
```
- 2 Open a terminal window, and become the root user by typing:


```
xhost +localhost
su - root
```
- 3 Type the following command to run the Win4Lin installer from your hard drive:


```
/usr/bin/wts-install
```
- 4 Follow the instructions presented.
 - **Insert Boot Floppy**
If your Windows installation CD is not bootable, you will be prompted to insert a boot floppy during this stage. (For instructions on creating a boot floppy see *Creating a Windows Boot Floppy* in the *Preparing for Installation* section of this chapter.)
- 5 At the conclusion of Stage 2, you should proceed to Stage 3: Personal Windows Installation. You may remove your Microsoft Windows installation media at this time.

Stage 3 — Personal Windows Installation

This third and final stage of installation with the GUI runs the Microsoft Installer to perform a full Windows installation from the files copied to disk in Stage 2. This step creates the personal Windows environment in the home directory of each user you wish to configure. In order to ensure that all files are placed in the correct place, you must log in and run this last stage as the non-root user(s) who will be using Win4Lin and Windows.

- 1 Log on as the user for whom you wish to perform a personal Windows installation.
- 2 Start the X Windows system, if necessary, by typing:


```
startx
```
- 3 Open a terminal window, and type the following command to run the Win4Lin installer from your hard drive.


```
/usr/bin/wts-install
```
- 4 Follow the on-screen instructions.
 - **Windows Upgrade Proof of Purchase**
If you purchased a Windows upgrade, you will have to insert the CD or the first floppy from your earlier Windows version. If your earlier version is on floppy disks (very rare), select the Use Floppy Drive option when it appears.

Note: If you don't have a floppy drive on your system (e.g. a laptop with the floppy drive disconnected or removed), be sure Use Floppy Drive is not selected or your system may hang.

When asked for the path to your upgrade media, click the Browse button and then use the Drives drop-down menu to select the **N :** / drive (for CD) or the **A :** / drive (for floppy).
 - **Networking Style**
Win4Lin offers two ways of supporting the ability of Windows and Windows applications to access networks: WinSock and Virtual Networking (VNET). During this stage of installation you will be asked which of these two options you wish to use. If you are uncertain which networking option will work best for you, we recommend that you initially choose WinSock. You can switch between networking options at any time. (For more information on networking see Chapter 2 of this manual.)
- 5 Close Windows before proceeding.
- 6 At the conclusion of Stage 3, you may repeat this step for each user you wish to configure. Or, for more information on installing and configuring each user, proceed to Chapter 2.

Using the Graphical Installer to Update Win4Lin

Once you have installed any Win4Lin with the graphical installer, you will have a copy of the graphical installer on your hard drive. You can simply run this version of the installer to begin the update process to a newer version of Win4Lin. The older version of the installer always checks to see if a newer version of the installer is available for download and offers to automatically download it to your system and switch to the newer version for the remainder of the update process. To take advantage of Web-based updates, you will need to connect to the Internet. You also need to have registered your license before starting the update process.

Once you have reviewed the preparation issues, you are ready to begin the update process. Please see “Preparing for Installation” at the beginning of this chapter.

Updating Win4Lin

Follow these steps to update a previously installed version of Win4Lin to a newer version:

- 1 Close any applications you may have running, as you may need to reboot your system following the update process.
- 2 Start the X Windows System, if necessary, by typing:
- 3 Connect to the Internet so that the installer can check for product updates and new NeTraverse-enabled kernels on our web site.
- 4 Open a terminal window, and become the root user by typing:

```
startx
```

```
xhost +localhost
su - root
```

Run the installer by typing the command(s) appropriate to your situation:

If you already have a copy of the Win4Lin installer on your hard drive from a previous Win4Lin installation, type the following command:

```
/usr/bin/wts-install
```

If you are upgrading to a new version of Win4Lin from a CD, type the following commands to run the installer from that CD:

For most Linux distributions:

```
mount -o exec /mnt/cdrom
cd /mnt/cdrom
./wts-install
```

For SuSE Linux:

```
mount -o exec /cdrom
cd /cdrom
```

```
./wts-install
```

If you are upgrading via download, type the following commands to unpack the installer archive you previously downloaded from our Web site and then run the installer from disk:

```
cd directoryname
tar xzvf wts_installer.tgz
cd wts_installer
./wts-install
```

Where *directoryname* is the name of the directory into which you downloaded the installer archive.

- 5 Follow the on-screen instructions.
 - **Updating a Previous Version of Win4Lin**
If you have an earlier version of Win4Lin installed on your system, the Win4Lin installer will offer to remove it or update it. Choose the Update option to remove the previous version and continue the installation of the new version.
 - **Registering Your Copy of Win4Lin**
During the update process you will be required to register your copy of Win4Lin. If you do not wish to register now, you can register later at our Web site: www.netraverse.com. However, if you are installing Win4Lin via download rather than from CD-ROM, registration is required in order to proceed with installation.
 - **Entering Your License Codes**
If you have purchased additional client license codes, also called “bump” license codes, you will have the option of entering them at this time. You can add “bump” licenses at any time.
- 6 If you installed an updated NeTraverse-enabled kernel, you will need to reboot your system after completing the update process.

Removing Win4Lin From the System

A typical installation of Win4Lin is made up of several components, including:

- ▶ The NeTraverse-enabled kernel (usually located in `/boot`)
- ▶ The Win4Lin application files (located in `/opt/win4lin`)
- ▶ The Win4Lin system-wide configuration files and the Windows installation file (located in `/var/win4lin`)
- ▶ The personal user installations of Windows for each user (usually located in `$HOME/win`). This also includes any Windows applications that you might have installed and perhaps your data files if you placed them on the Windows `C:\` drive
- ▶ The personal My Documents folder containing user data files (which may be located in `$HOME/mydata` for new Win4Lin Windows installations)

Removing the Win4Lin application file and the Win4Lin kernel will not cause loss of user data. They may be reinstalled later and you will be able to reuse your Windows environment without having to reload the Windows installation files or reinstalling any personal copies of Windows.

If you remove the Win4Lin system-wide configuration files and the Windows installation files, then any system-wide configuration changes you have made will be lost. Should you want to reload Win4Lin, you would have to reload the same Windows media that you had previously loaded in order to make use of any personal Windows installations.

The Win4Lin installer does not remove the personal Windows installations. You can do this by removing the `$HOME/win` directory for each user, but note that all customizing made to Windows as well as any data files you stored on the `C:\` drive will be lost as well. Do this with utmost caution!

Removing Win4Lin Components

You can remove an installed version of Win4Lin using the graphical installer. When you first start the installer, it checks to see if Win4Lin is already installed on your system. If the installer finds a version of Win4Lin installed on your system, you are offered the choices of removing that version or updating it to a newer version. You may also remove Win4Lin manually. For more information on removing Win4Lin manually please see *Chapter 6: Troubleshooting NeTraverse Win4Lin Terminal Server*.

Follows these steps to remove Win4Lin from your system:

- 1 Close any applications you may have running.
- 2 Start the X Windows System (if not already running) by typing:
`startx`
- 3 Open a terminal window, and become root user by typing:

```
xhost +localhost  
su - root
```

- 4 In the terminal window, type the following commands to run the Win4Lin installer from disk:

```
/usr/bin/wts-install
```

- 5 Follow the on-screen instructions.

- **Options**

If you have an earlier version of Win4Lin installed on your system, the Win4Lin installer will offer to remove it or update it. You have 3 options for removing all or part of Win4Lin:

- Remove NeTraverse Win4Lin Terminal Server Package.
- Remove NeTraverse Win4Lin Terminal Server Package and Restore System Kernel.
- Restore system to pre-installation state.

- 6 If you chose to restore the system kernel, you will need to reboot your system after removing Win4Lin.

Installation Hints

This section addresses some situations you may encounter during the installation process. If you are having problems that are not detailed here you can refer to *Chapter 6: Troubleshooting NeTraverse Win4Lin Terminal Server* for more information.

Partial or Failed Installation

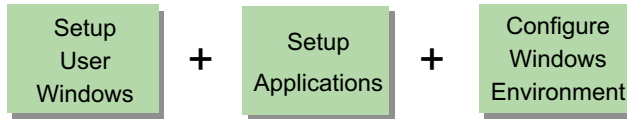
If your system should lock up or suffer a power failure during the installation of Win4Lin, you should first try to restart the installation process from the beginning. The graphical installer is designed to detect partial installations and to perform any cleanup required. If after an incomplete installation you find that the installer cannot complete the installation of Win4Lin successfully, you should try to manually remove any Win4Lin components that may have been installed before the process was interrupted. You should then be able to restart the installation process from the beginning (if you removed all components) or at the stage where the interruption occurred (if you removed just the components installed during that stage). For more information, see *Manually Removing Win4Lin Components* in *Chapter 6: Troubleshooting NeTraverse Win4Lin Terminal Server*.

Configuring NeTraverse Win4Lin Terminal Server

- ▶ Introduction
- ▶ User Windows Installation
- ▶ NeTraverse Win4Lin Terminal Server Default Configuration
- ▶ Configuring the Windows Network
- ▶ Printing From the Win4Lin Terminal Server Environment
- ▶ Devices
- ▶ Running Windows
- ▶ Resizing the Windows Desktop
- ▶ Installing Windows Applications
- ▶ Mapping Directories to Windows Drives
- ▶ Virus Protection
- ▶ Audio Server Support

Introduction

This chapter will guide you in setting up and configuring the Windows installations for the clients/end users on your system. This is composed of the following steps:



Before attempting to set up the clients on your system, you should take some time to read this chapter and learn how to perform important tasks such as installing applications, setting up printers, and allowing users to access hardware devices on the server. Once you are familiar with how to set up and use Win4Lin, then you can begin to use the recipes described in later chapters to automate and replicate the tools presented in this chapter.

Throughout this chapter, you will find information to help you understand how to configure your system for Win4Lin. Depending on the environment, you will be asked to enter Linux commands, configure Win4Lin parameters, or configure Windows settings. The screens below show examples of each configuration scenario.

Configuring Linux:



Configuring Win4Lin:



Configuring Windows:



User Windows Installation

If you didn't set up Windows for each user during Chapter 1, you can do so at this time. Follow the steps below to set up Windows manually or by using the graphical installer.

Installing Windows Manually

Once the Windows CD is loaded, you can then install Windows for each user.

- 1 Log on as the user for whom you wish to perform a personal Windows installation.
- 2 Start the X Window system, if necessary, by typing:
`startx`
- 3 Type the following command:

`win&`

The system will prompt you by stating that there is no installation of Windows and will ask if you wish to install it. Click on 'YES'. It should then start the Windows installation program. You will have to agree to the EULA and enter the Windows CD key.

- 4 Close Windows before proceeding.

Note: If a Windows 95 to 98 upgrade CD was loaded, you will need to provide qualifying media (a Windows 95 CD) during the personal Windows installation. It is best to insert the Windows 95 CD into the CD-ROM drive prior to starting the personal Windows installation so that the CD will be recognized.

Installing Windows With the Graphical Installer

As was described in Chapter 1, the third and final stage of installing with the GUI runs the Microsoft Installer to perform a full Windows installation from the files copied to disk in Stage 2 GUI. This step creates the personal Windows environment in the home directory of each user you wish to configure. In order to ensure that all files are placed in the correct place, you must log in and run this last stage as the non-root user who will be using Win4Lin and Windows. You have the option of installing additional users manually, as described above, or to continue to use the graphical installer as follows:

- 1 Log on as the user for whom you wish to perform a personal Windows installation.
- 2 Start the X Window system, if necessary, by typing:

`startx`

- 3 Open a terminal window, and type the following command to run the Win4Lin installer from your hard drive.

```
/usr/bin/wts-install
```

- 4 Follow the on-screen instructions.

- **Windows Upgrade Proof of Purchase**

If you purchased a Windows upgrade, you will have to insert the CD or the first floppy from your earlier Windows version. If your earlier version is on floppy disks (very rare), select the Use Floppy Drive option when it appears.

Note: If you don't have a floppy drive on your system (e.g. a laptop with the floppy drive disconnected or removed), be sure Use Floppy Drive is not selected or your system may hang.

When asked for the path to your upgrade media, click the Browse button and then use the Drives drop-down menu to select the **N : /** drive (for CD) or the **A : /** drive (for floppy).

- **Networking Style**

Win4Lin offers two ways of supporting the ability of Windows and Windows applications to access networks: WinSock and Virtual Networking (VNET). During this stage of installation you will be asked which of these two options you wish to use. If you are uncertain which networking option will work best for you, we recommend that you initially choose WinSock. You can switch between networking options at any time. (For more information on networking see Chapter 2 of this manual).

- 5 Close Windows before proceeding.
- 6 At the conclusion of Stage 3, you may repeat this step for each user you wish to configure.

NeTraverse Win4Lin Terminal Server Default Configuration

Installing Win4Lin on your computer creates a default configuration. This configuration can be modified or customized. Saving these customizations will then allow you to keep the modified configuration as your default.

The floppy drive(s):

NeTraverse Win4Lin Terminal Server automatically makes floppy drive(s) available as A and B.

Hard drive set-up:

NeTraverse Win4Lin Terminal Server configures several virtual hard drives on your existing physical hard drive.

Drive C

The personal applications drive: A conventional personal computer running native Windows is typically set up so that Windows, your applications, and your data files are stored on the **C:** Drive. NeTraverse Win4Lin Terminal Server provides a drive called **~/win (C:)** that functions the same as the Windows **C:** Drive. When you install a user NeTraverse Win4Lin Terminal Server session, a directory is created in the Linux file system under your personal home directory, usually **\$HOME/win**. This directory is the NeTraverse Win4Lin Terminal Server **~/win (C:)** drive. We recommend that you install your Windows applications on the **~/win (C:)** drive and store your data on the **~/mydata (D:)** drive.

Drive D

The personal data drive: NeTraverse Win4Lin Terminal Server 1.1 and later introduces a new default drive. The **~/mydata (D:)** drive in the NeTraverse Win4Lin Terminal Server Windows environment provides access to the Linux directory **\$HOME/mydata**. This drive setup provides an easy place to share or move files between the Linux environment and your NeTraverse Win4Lin Terminal Server Windows environment. When you install Windows, the directories **\$HOME/mydata** and **\$HOME/mydata/MyDocuments** are automatically created in your Linux file system. For Windows 98 and Me users, the desktop My Documents folder points to this new **D:\MyDocuments** directory instead of **C:\My Documents** directory.

Drive J

The shared drive: Drive **J:** is designated as the shared drive, for sharing files with other users who have set up NeTraverse Win4Lin Terminal Server sessions on the same computer. Drive **J:** contains the subdirectories **J:\share** and **J:\tmp**. By default, the NeTraverse Win4Lin Terminal Server Windows drive **J:\tmp** is the same directory as the Linux directory **/var/tmp**. Files in **/var/tmp** may be automatically and periodically deleted, so only temporary files should be placed in **J:\tmp**.

Drive N

The CD-ROM drive: For NeTraverse Win4Lin Terminal Server Windows sessions, Drive **N:** is set to the first accessible CD-ROM drive. This is the same CD-ROM drive that is accessed under linux via **/dev/cdrom**. If you have more than one you must manually configure the others.

Other Default Settings

The default RAM settings under NeTraverse Win4Lin Terminal Server are 16MB for Windows 95, 20 MB for Windows 98 FE, 24MB for Windows 98 SE, and 32MB for Windows Me.

The NeTraverse Win4Lin Terminal Server Windows configuration file is

```
$HOME/.merge/win.cfw.
```

Creating Alternative Configurations

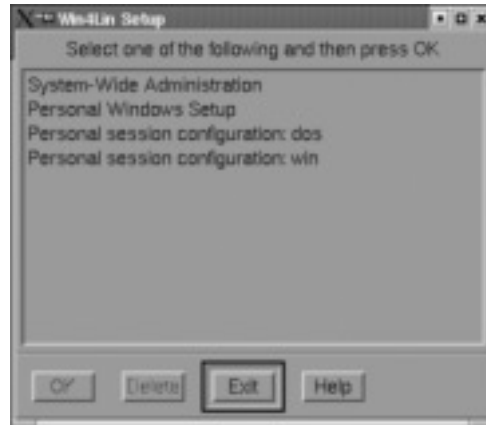
When you customize your Win4Lin configuration, you may not wish to have those customizations incorporated into your default configuration. Therefore, you can create additional environment configurations, which will enable you to run many different kinds of Windows sessions. You can create and name multiple configurations so that, for example, one set of devices is automatically available when you start Windows with one configuration and a different set of devices is available when you start Windows with another configuration.

To Create an Alternative Configuration:

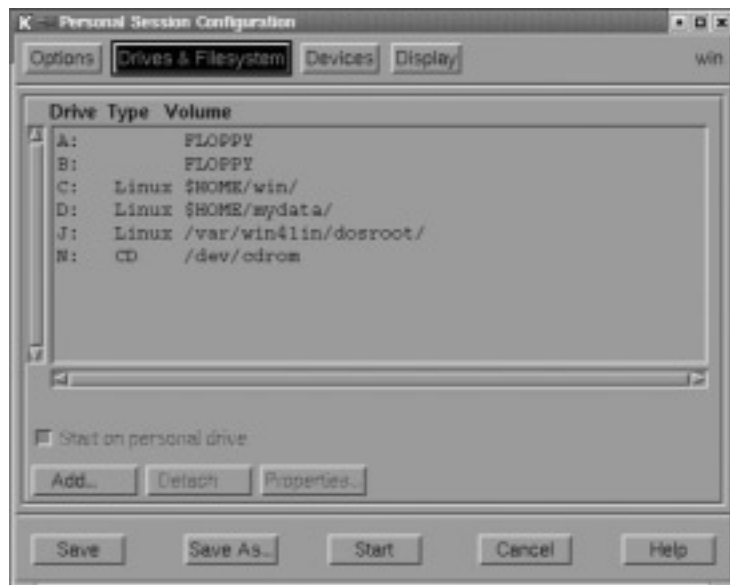
- 1 Log on as the user for whom you wish to configure this alternate configuration, and from a terminal window, type:

```
winsetup &
```

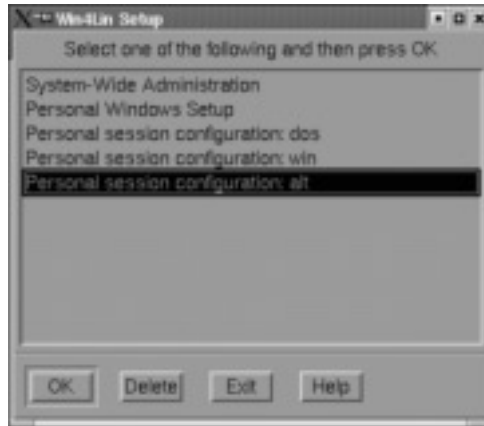
- 2 Choose **Personal Session Configuration: win** then click **OK**.



- 3 After customizing your configuration, choose **Save As** instead of **Save** so that you can use an alternate name.



- 4 Type the name you've chosen for your custom configuration in the text box of the **Selection** window and click **OK**. The name of your alternative configuration will now appear in the main window of the Win4Lin Setup utility.



To Start an Alternative Configuration:

Start a Win4Lin session with your alternative configuration by typing the following at a shell prompt:

```
win +kname
```

Where *name* is what you called your alternative configuration.

Configuring the Windows Network

During installation of each personal user Windows session, you had the option of choosing VNET networking option or WinSock networking option. This section provides information for configuring your network option.

What is WinSock?

WinSock provides the interface that most TCP/IP-based network applications, such as Internet Explorer and Netscape Navigator, use to access the network. The Win4Lin WinSock implementation is based on the WinSock 2 specification. WinSock does not provide the interface required to support Network Neighborhood, communications between Microsoft Outlook and Microsoft Exchange Server, and the Novell Client. If you require these, and have installed the WinSock networking option, then you will need to upgrade to the VNET networking option. (For more information, see *Switching from WinSock to VNET*, later in this section.)

What is VNET?

VNET stands for Virtual Network. VNET provides support for the native Windows WinSock 2 implementation and other important Windows networking features such as Network Neighborhood, communications with a Microsoft Exchange Server, and Novell Client support (IP only, not IPX.) VNET, therefore, allows access to a broader range of applications and gives you more powerful tools to manage your network.

VNET does not share the Linux TCP/IP network implementation, and therefore requires that each Win4Lin user session be provided with unique IP configuration information. This means that each user will require two IP addresses: one for the workstation and a second for the Windows session.

In most office environments, and some home environments, a second IP address can often be obtained through the use of a DHCP server, or by assigning a static IP address. If you do not have the use of a DHCP server, the second IP address either needs to be acquired from an Internet service provider, or assigned by the system administrator. If you have set up your own network, the IP Masquerade feature of your firewall must be enabled. If you do not have IP Masquerade enabled or cannot obtain a second IP address, the WinSock option would be the preferred choice.



TECH TIP

Protect Your System with a Firewall

If you are connected to the Internet with Linux and are *not* using a firewall, your system is vulnerable to hacker attacks. You should read the Firewall-HOWTO from the Linux Documentation Project (LDP) at www.linuxdocs.org.



TECH TIP

Using IP Masquerade with a Firewall

If you are using a firewall but do not know how to enable IP Masquerade, please consult the IP Masquerade HOWTO from the Linux Documentation Project (LDP) at www.linuxdocs.org.

Using VNET with a DHCP Server—Automatic IP Address Assignment

If you use a DHCP server, most of the required network settings will be supplied by that server during the startup of a Windows session. If your computer is part of a local area network (LAN) from which you would like to access other computers, you may wish to change the following settings:

Network Neighborhood Workgroup

The name of the group of computers which will share files and printers. The default setting for this field is **Workgroup**.

Computer Name

The name that you choose for your computer which will be seen by other computers on the network. The default setting for this field is your hostname and username separated by a dash (i.e., hostname-username).

Network Neighborhood Description

A brief description of your computer which will be seen by other computers on the network. The default setting for this field is the Windows session of username on hostname.

Network Neighborhood Logon Domain

The domain name of the Windows NT server that you would like to access (if any). You can leave the default setting of this field if you do not wish to access a Windows NT server. The default setting for this field is **Workgroup**.

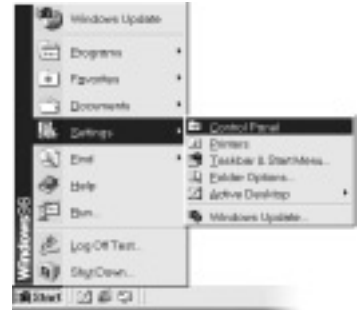
To change these network settings, follow these steps:

- 1 Start a Windows session by typing one of the following:

`win &` (runs in a window on your Linux desktop)
or

`fwin &` (runs in full screen mode)

- 2 Click **Start** -> **Settings** -> **Control Panel** and double-click on **Network**.
- 3 In the **Network** window, choose **File and printer sharing for Microsoft Networks**. Click **Properties**.



- 4 Click on **LM Announce** in the **Property** box of the **File and printer sharing for Microsoft Networks Properties** window. The LM Announce property should normally be set to **No**. If your LM Announce property requires a **Yes** value, then the shutdown of Windows may be quite slow. Check with your system administrator to determine which LM Announce property setting is correct.
- 5 Choose the correct setting from the **Value** drop down menu, then click **OK**.

- 6 Click on the **Identification** tab to set the **Network Neighborhood** properties, which include **Computer Name**, **Workgroup**, and **Computer Description**.



- 7 In the **Configuration** tab of the Network window, select **Client** for Microsoft Networks and click **Properties**, where you can set the Windows NT domain.
- 8 Click **OK**, then click **OK** again.
- 9 Click **Yes** when asked, “Do you want to restart your computer?”

Using VNET without a DHCP Server—Manual IP Address Assignment

If you are not using a DHCP server, you will need to manually configure your Windows network environment. **You will need to configure the following items for each user:**

IP Address

A unique IP address provided by your ISP or system administrator, or the IP address which you have set up for your private network. There is no default setting for this field.

IP Mask

If an ISP or system administrator has assigned your IP address(es), then they will provide the IP mask as well. If you are assigning an IP address within your private network, then the IP mask should be the IP mask of your private network. The default setting for this field is the IP mask of your configured Linux network.

Internet Name (Host)

The name you select for your computer. The default setting for this field is your hostname and username separated by a dash, i.e., hostname-username.

DNS Domain

If an ISP or system administrator has assigned your IP address(es), then they will provide the DNS domain as well. The default setting for this field is the DNS domain of your configured Linux network.

DNS Servers (Server Search Order)

If an ISP or system administrator has assigned your IP address(es), then they will also provide the DNS server address. The default setting for this field is the DNS server of your configured Linux network.

DNS Domain (Suffix) Search Order

If an ISP or system administrator has assigned your IP address(es), then they will also provide the DNS domain search order. The default setting for this field is the DNS domain search order of your configured Linux network.

Gateway Address

If an ISP or system administrator has assigned your IP address(es), then they will also provide the gateway address. If you have set up your own private network, then the gateway address is the address of the computer that should be contacted to request information from the Internet. The default setting for this field is the gateway address of your configured Linux network.

Network Neighborhood Workgroup

The name of the group of computers which will share files and printers. The default setting for this field is **Workgroup**

Network Neighborhood Name

The name that you choose for your computer which will be seen by other computers on the network. The default setting for this field is your hostname and username separated by a dash, i.e., **hostname-username**.

Network Neighborhood Description

A brief description of your computer which will be seen by other computers on the network. (The default setting for this field is the Windows session of username on hostname.)

Network Neighborhood Logon Domain

The domain name of the Windows NT server that you would like to access (if any). You can accept the default setting of this field if you do not wish to access a Windows NT server. The default setting for this field is **Workgroup**

To configure your Windows network environment, follow these steps:

- 1 Start a Windows session by typing one of the following:
 - `win &` (runs in a window on your Linux desktop)
 - or
 - `fwin &` (runs in full screen mode)

- 2 Click **Start -> Settings -> Control Panel** and double click on **Network**.
- 3 Select **TCP/IP** and click the **Properties** button.
- 4 Check **Specify an IP Address** in the **IP Address** tab and enter the IP address and subnet mask.



- 5 In the **DNS Configuration** tab, enter the required information for these fields:

- Host
- Domain
- DNS Server Search Order
- DNS Suffix Search Order

In the fields that have an **Add** button, you must enter the information and click **Add** to submit that information.

- 6 Click on the **Gateway** tab. Enter the gateway IP address in the **New Gateway Field** and submit with the **Add** button. Click **OK**.



- 7 In the **Network** window, choose **File and printer sharing for Microsoft Networks**. Click **Properties**. Click on the **LM Announce** in the **Property** box of the **File and printer sharing for Microsoft Networks** window.

The **LM Announce** property should normally be set to **No**. If your **LM Announce** property requires a **Yes** value, then the shutdown of Windows may be quite slow. Check with your system administrator to determine which **LM Announce** property setting is correct.

- 8 Click on the **Identification** tab to set up the **Network Neighborhood** properties, which include **Computer Name**, **Workgroup**, and **Computer Description**.
- 9 In the **Configuration** tab of the **Network** window, select **Client for Microsoft Networks** and click **Properties**, where you can set the **Windows NT Domain**.
- 10 Click **OK**, then click **OK** again.
- 11 Choose **YES** to “Do you want to restart your computer now?”



TECH TIP

Using IP Masquerade with a Firewall

If you are using a firewall but do not know how to enable IP forwarding, please consult the IP Masquerade HOWTO from the Linux Documentation Project (LDP) at www.linuxdocs.org.

Switching from WinSock to VNET

If you chose the Win4Lin WinSock network setup during installation you can reconfigure your network settings to use VNET.

To reconfigure your network settings, follow these steps:

- 1 Open a terminal window (as the **non-root** user who runs Windows) and type:


```
win_network -v
```

If VNET has not been configured, the `win_network` command will automatically start a Windows session. If VNET has already been configured, then you will need to start a Windows session.
- 2 In the **Network** (or Add New Hardware for Windows Me) window, click on the **Add...** button to bring up the **Select Network Component Type** window for installing network components.
 - Click on **Adapter**, then click **Add...**
 - In the **Select Network Adapters** window, choose **Merge NIC** from the **Manufacturers: List**.
 - Choose **Merge NIC** from the **Network Adapters** box, then click **OK**.

- Click **Add...** in the **Network** window, then click **Service** in the **Select Network Component Type** window. Click **Add...**
 - Choose **File and printer sharing for Microsoft Networks** in the **Select Network Service** window then click **OK**. Windows 95 users need to add the TCP/IP protocol.
 - Click **Add...** from the **Network** window.
 - Click **Protocol** in the **Select Network Component Type** window then click **Add...**
 - Choose **Microsoft** from the **Manufacturers: List** then choose **TCP/IP** from the **Network Protocols** box, then click **OK**.
- 3** Remove unnecessary protocols. If IPX or IPX/SPX is listed in the Network window, select the **IPX** entry and then click the **Remove** button. Remove the NetBEUI protocol as well.

Switching from VNET to WinSock

If, during the Win4Lin installation process, you chose the Win4Lin VNET network setup, you can reconfigure your network settings to use WinSock.

If you are using Windows 95 and wish to use WinSock 2, you will first need to download an update from Microsoft. The file is called `w95ws2setup.exe`, and should be placed in `/var/win4lin/dosroot/share` (owned by `root:root`, permissions `444`.) You will need to search <http://www.microsoft.com> for this file.

Reconfigure your network settings with the following command:

```
win_network -winsock2
```

If you are using Windows 98 or Me, no additional configuration is needed. If you are using Windows 95, follow the instructions provided by `win_network` displayed in the terminal window.



WARNING

Warning!

Windows 95 users cannot switch from VNET to WinSock. If you are using Windows 95 and have configured VNET you will need to remove your entire `$HOME/win` directory and re-install personal Windows for that user and select the winsock network option during that installation. You can remove your `$HOME/win` directory by typing these commands from a terminal window as the non-root user:

```
cd
rm -Rf win
```

IMPORTANT: These commands will remove all files, including data files that you have stored in your `$HOME/win` directory.

Printing From the Win4Lin Terminal Server Environment

Printing tasks are handled by the Linux operating system in which Win4Lin is installed. Win4Lin provides the interface between Windows and Linux. Therefore, you will be able to print from the Windows environment if your printer is set up properly for Linux.



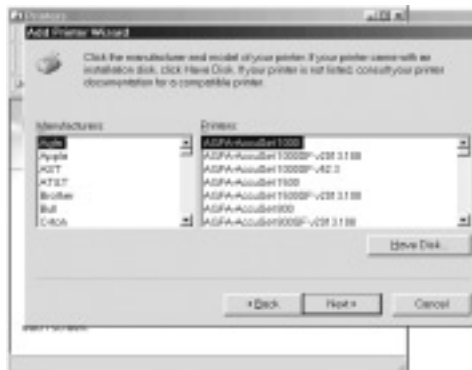
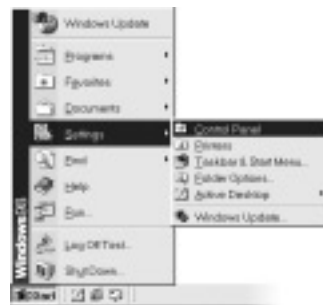
TECH ALERT

Be Careful How You Install Your Printer Drivers

Only use the printer installation wizard provided by the printer manufacturer if the procedure described below does not work. Many of these wizards attempt to access your computer hardware.

The preferred method of printing from the Windows environment is described in the following steps.

- 1 In Windows, click **Start ->Settings -> Control Panel**.
- 2 Double click on the **Printers** icon, then double click on the **Add Printer** icon.
- 3 Click **Next** until you are presented with a list of printers.
- 4 Select the correct manufacturer and printer. If the exact model of your printer is not listed, you may need to install the drivers provided for your specific printer. Click **Have Disk** and insert the installation media that came with your printer.



- 5 From the list of available ports, select **default-raw** to use the default Linux printer and click **Next**.
- 6 Click **Finish** to complete the installation after checking either **Yes** or **No** to print a test page.

**TECH ALERT****Printing Problems**

When you install a printer and print a test page, the system will appear to hang for a short period, and then the print request will fail. Just ignore this and click OK when asked if the test page printed correctly. Try printing again from an application. Printing should proceed normally. This type of problem is not unique to Win4Lin but may also be observed on native Windows systems when printing to some types of network printers. If, however, the printed output is not correct, try an alternate configuration by following the above six steps for Printing From the Win4Lin Environment and substituting default for default-raw in step 5.

**TECH TIP****Network Printer Setup**

If you have VNET networking installed, you have another option for setting up your printer. Any printers accessible through Network Neighborhood can be configured by double-clicking on Network Neighborhood on the Win4Lin Windows desktop and following the instructions.

Devices

Win4Lin supports many devices attached to a parallel or COM port. However, local devices connected to the server generally are only available to one user at a time. You will need to configure Win4Lin to access the peripheral devices. This is accomplished in one of two ways.

- ▶ Make access to the device the default configuration for Win4Lin.
- ▶ Save access to the device as an alternative configuration.



TECH ALERT

Device Access Limitation

A port can only be accessed by processes from one operating environment at a time. Therefore, if the Windows environment is accessing a port, then the Linux environment will not be able to access that port. For this reason, we recommend that you save any device configurations as alternative configurations, and not as your default.

Before you make a peripheral available to Win4Lin sessions, you should be aware of some limitations.

- ▶ Devices that are highly timing-dependent may fail in the Linux system's multi-tasking environment.
- ▶ Devices that need to be initialized or reset when the system is rebooted may fail since Windows is not started immediately after the system boots.
- ▶ Devices that are sensitive to various configuration changes may behave unpredictably whenever you add more users, change the load, tune Linux parameters, or add/subtract memory.
- ▶ Devices that use Plug-and-Play may not function with Win4Lin because some device parameters (such as I/O ports) might automatically be changed each time you reboot your computer.

Devices that Use the Serial (COM) Port

The serial (COM) ports can be shared among Linux and Windows processes. However, only processes from one environment, either Linux or Windows, can access a particular serial port at one time. Therefore, devices cannot be used by both Linux and Windows simultaneously.

To configure a serial (COM) port for an external device, you will need to:

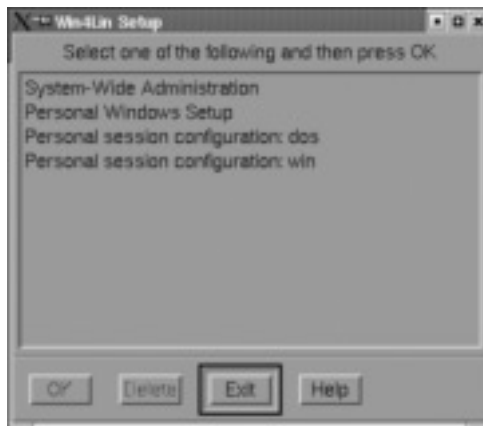
- Configure the device in Win4Lin
- Install a serial port under Windows

Configure the Device in Win4Lin

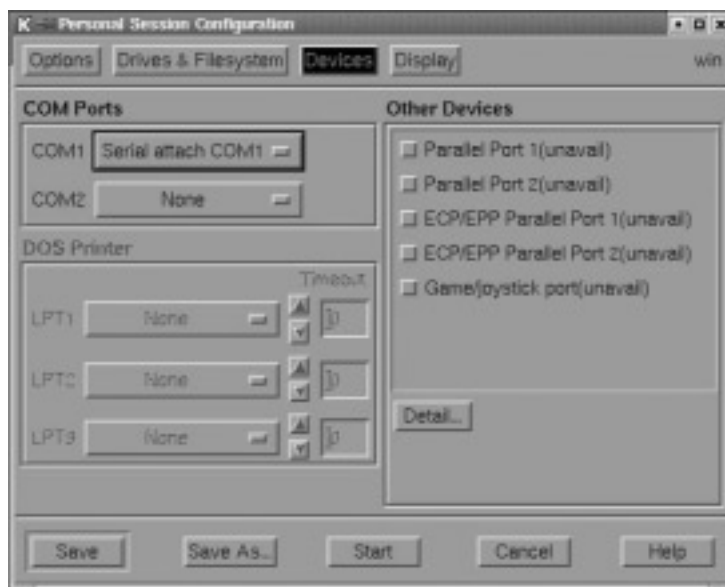
- 1 From a terminal window, type:

```
winsetup &
```

- 2 Choose **Personal session configuration: win** then click **OK**.



- 3 Click **Devices**. Under **COM Ports** choose **Serial attach COM1** from the drop down menu next to the **COM1** field. Click **Save** or **Save As** then **Exit**.



TECH ALERT

COM Port Configuration

A COM port should be configured only for the session requiring its use. You should not make the access to a COM port part of your default configuration.

Install a Serial Port under Windows

Now you must install a serial port under Windows. Restart your Win4Lin session and follow the steps below:

- 4 Click **Start -> Settings -> Control Panel.**
- 5 Double click on **Add New Hardware.**
- 6 Click **Next** until you are presented with a choice to select hardware from a list. Choose this option and click **Next.**
- 7 Select **Ports [COM & LPT]** from the hardware types list and click **Next.**
- 8 Select **Communications Port** and click **Next.**
- 9 Click **Next** then **Finish.**
- 10 Choose **Yes** to the question "Do you want to shut down your computer now?"
- 11 Start another Win4Lin session after the current session has completely shut down





TECH TIP

Interrupt Request (IRQ) and Input/Output Range (IO) Settings

Check that the IRQ and IO settings are correct:

- COM1: IRQ 4, 3F8-3FF
- COM2: IRQ 3, 2F8-2FF

Check that the IRQ and IO settings are correct by following these steps:

- 1** Click **Start -> Settings -> Control Panel**.
- 2** Double click on the System icon.
- 3** Click on the Device Manager tab.
- 4** Click on the plus sign (+) next to Ports.
- 5** Click on Communications Port (COM 1) then click Properties.
- 6** Click on the Resources tab in the Communications Port (COM 1) in the Properties window.
- 7** If the Input/Output settings under the Setting heading are incorrect, then click on the Change Setting... button.
- 8** Use the Value up or down arrows to select the correct setting and click OK.
- 9** If you receive the message, *This resource setting cannot be changed*, then sequentially select the Basic configurations from the pull down menu, Settings based on. Repeat Steps 7 and 8 until you are able to change the settings.



TECH TIP

COM Port Access at Startup

You can start a Win4Lin session with COM port access without having to set up the COM port in the Win4Lin Setup utility, by using the +a option:

win +acom1

Accessing the COM port in this manner is only temporary. Once you have ended the Win4Lin session, the next time you execute the **win** command without the **+a** option, your default configuration will be active.



TECH ALERT

Device File Permissions

Be sure that the serial port device file in Linux has proper read/execute permissions for the user using Win4Lin, by following these steps:

- 1 Open a terminal window and become the root user by typing:

```
su root
```

- 2 Change the device permissions by typing:

```
chmod 555 /dev/ttyS0
```

which will make your serial port accessible to a Windows session.

USB Devices

USB support is limited to keyboard, mouse, display, sound, printer, floppy, CD-ROM, and hard disks via the Linux drivers for these devices. Other common USB devices which are not currently supported in Win4Lin are scanners, digital cameras, sync devices for handheld devices, and MP3 players. These devices may be supported by Linux; however, Win4Lin will not recognize these as USB devices.

Devices that Use the Parallel Port

You may wish to use devices that require attachment to the parallel port. Using the parallel port in Win4Lin requires an extended setup procedure consisting of four phases:

- ▶ Determining the address and mode of your parallel port
- ▶ Making the parallel port accessible to all users
- ▶ Setting up the parallel port in your Win4Lin configuration
- ▶ Installing the Windows parallel port drivers

Determining the Address and Mode of Your Parallel Port

Your computer system BIOS setup utility typically sets a parallel port to one of three modes: standard, ECP and EPP.

A parallel port device may require a specific mode setting. If you need to change the settings of your parallel port, consult your computer hardware documentation. Changing these settings will involve altering the configuration of your system BIOS.

In most Linux distributions, to find the address and mode of your parallel port, open a terminal window and type the following:

```
cd /proc/sys/dev/parport0  
cat base-addr irq modes
```

The output of the previous command will be similar to the following:

```
888          1912
-1
PCSPP, EPP
```

The first number of the first line specifies the base address of the parallel port in decimal. It must be converted to hexadecimal, which in this case yields 378. The second line is the IRQ (-1 means none), and the third line lists the supported modes (PCSPP is equivalent to standard.)

If you receive the error message 'No such file or directory' then your parallel port is not setup in your Linux environment. Consult your Linux documentation to properly setup your parallel port.

Win4Lin defines four tokens, associated with the parallel port modes, which are used in the Win4Lin configuration of the parallel port.

- Standard Parallel Port 1 (token name **lpx1**)
- Standard Parallel Port 2 (token name **lpx2**)
- ECP/EPP Parallel Port 1 (token name **ecp1**)
- ECP/EPP Parallel Port 2 (token name **ecp2**)



TECH TIP

Win4Lin Does Not Support DMA

The use of an ECP mode parallel port may require DMA support, which is not supported by Win4Lin.

Making the Parallel Port Accessible to All Users

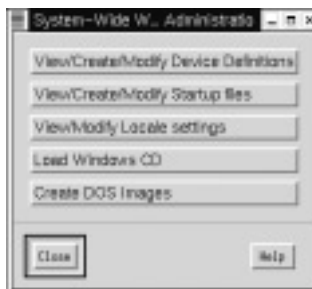
- 1 Open a terminal window and log in as root by typing:

```
xhost +localhost
su - root
```

- 2 Type:

```
winsetup &
```

- 3 Choose **System-wide Win4Lin Administration** and click **OK**.



- 4 Click **View/Create/Modify Device Definitions**.
- 5 Click **Custom**.

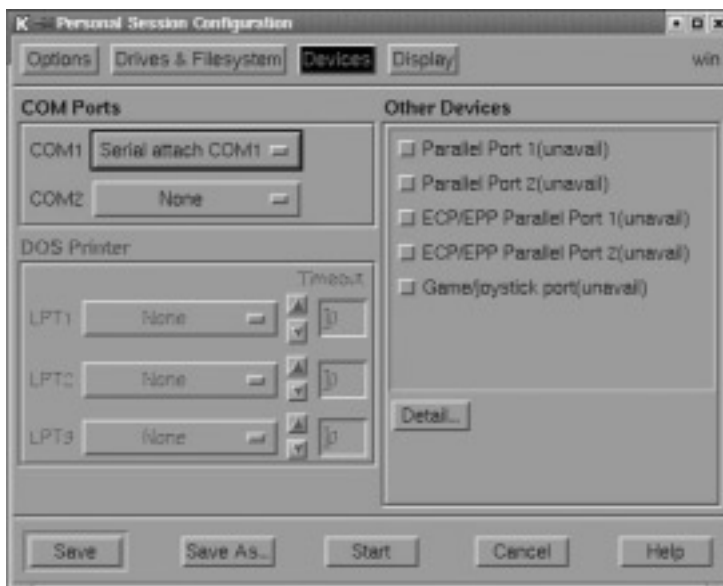


- 6 From the **Token Name** drop down menu, select the token name that is associated with the mode of your parallel port.
- 7 Be sure that **Usable By** is set to **All**.
- 8 Click **Save/Close/Close** and **Exit**.

Setting Up the Parallel Port in Your Win4Lin Configuration

- 1 From within a terminal window, type:

```
winsetup &
```
- 2 Click **Personal Win4Lin session configuration: win** then click **OK**.

3 Click **Devices**.4 In the **Other Devices** section, click the token name that is associated with the mode of your parallel port.5 Click **Save** then **Exit**.

TECH TIP

Parallel Port Access at Startup

You can start a Win4Lin session with parallel port access without having to set up the parallel port in your Win4Lin configuration. Use the `+a` option with the `win` command (using `lpx1` as an example):

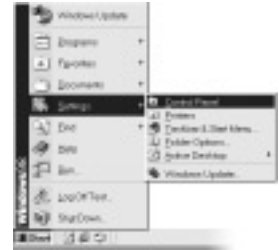
win +alpx1

Accessing the parallel port with the `+a` option is only temporary. Once you have ended the Win4Lin session that was started with the `+a` option, your default configuration will be active for your next session.

Installing the Windows Parallel Port Drivers

These steps may vary with different versions of Windows.

- 1 In Windows, click **Start -> Settings -> Control Panel**
- 2 Double click on the **Add New Hardware** icon.
- 3 In the **Add New Hardware Wizard** window, click **Next** until you are presented with the question, “Do you want Windows to search for your new hardware?”



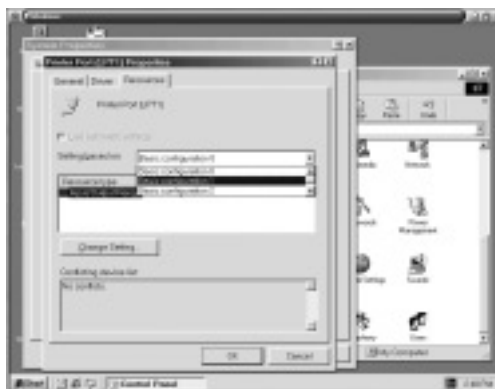
- 4 Select **No, I want to select the hardware from a list**. Then click **Next**.
- 5 In the list, **Hardware types**: select the entry **Ports (COM & LPT)** then click **Next**.
- 6 Referring to the information about your parallel port, which you determined in the section, *Determining the Address and Mode of Your Parallel Port*, select **ECP Printer Port** or **Printer Port** in the list of models, then click **Next**.
- 7 The port settings may be displayed under Settings. Confirm that these settings are as follows:
 - Parallel port 1: 0378 - 037A
 - Parallel port 2: 0278 - 027A
 If these settings are incorrect, then you will need to change them after the drivers are installed.
- 8 Click **Next**, then click **Finish**.
- 9 The drivers will install and you will be asked “Do you want to shut down the computer now?” If the parallel port values were correct, click **Yes**.

This completes the parallel port setup procedure, and you can now use your parallel port device. If the parallel port values were incorrect, click **No** and follow the steps below.

- 1 In the **Control Panel** window, double click on the **System** icon.
- 2 Click on the **Device Manager** tab.



- 3 You may need to click on the plus sign (+) next to **Ports** to see your printer port entry.
- 4 Select the parallel port that you installed in the previous section of this chapter and click **Properties**.
- 5 Click on the **Resources** tab in the **Printer Port Properties** window.



- 6 If the **Input/Output** settings under the Setting heading are incorrect, then click on the **Change Settings...** button.
- 7 Use the Value **Up** or **Down** arrows to select the correct setting and click **OK**. If you receive the message, “this resource setting cannot be changed”, then sequentially select the **Basic** configurations from the pull down menu, **Settings Based On**, and repeat Steps 6 and 7 until you are able to change the settings.

**TECH ALERT****Printer Configurations**

Do NOT use the steps above to configure your printer in Win4Lin. Accessing your printer in Win4Lin via the parallel port will prevent the Linux system from using the printer.

**TECH ALERT****Dongle-protected Software**

The parallel port can run in bi-directional mode, allowing you to run dongle-protected software. Note, however, that parallel port DMA and interrupts are not supported by Win4Lin.

Running Windows

Now that you have both Win4Lin and Windows installed, you can run Windows.

- 1 Log on as the user.
- 2 Type any of the following commands:

To start a Windows session as an application on your Linux desktop:

win

To start a Windows session in full screen mode:

fwin -auth



TECH TIP

Specify a Custom Windows Desktop Size

You can start a Windows session with a specific window size by using the `-g` option of the `win` command. To execute this command, type either:

win -g 1200x768

or

win --geometry 1200x768



TECH ALERT

KDE Window Size

If you are running Win4Lin under KDE version 2.x and cannot see your entire Windows desktop, you can override the incorrect window size that KDE chooses using an application called `kstart`, part of the KDE suite. Type this command from a terminal window:

kstart win --geometry 1152x864

Where `geometry` sets the geometry of the Windows window. If you are using at a screen resolution of 800x600 then this option should also be 800x600. Upgrading to KDE 2.1 or greater (www.kde.org) will also solve the KDE 2.0 window size problem.

Resizing the Windows Desktop

To change the size of your default Windows desktop, you can now simply drag the window to the desired size. Alternatively, you can change the screen resolution by following these steps

- 1 Right click on the Windows desktop and choose **Properties**:



- 2 Click on the **Settings** tab.



- 3 In the section named **Screen Area** move the slide bar to the desired screen resolution.
- 4 Click **Apply**.
- 5 You will be prompted to confirm your decision to resize your window. Click **OK**.
- 6 After your Windows desktop changes size, the Windows dialog box will ask you if you wish to keep these settings. Click **Yes**, then click **OK**.

Installing Windows Applications

You will use the familiar Windows desktop to install your favorite Windows applications. Installing Windows applications in Win4Lin is essentially the same as installing applications in native Windows. Most applications can be installed by clicking the **Start** button, choosing **Run**, and entering the name of the setup program as described in the application documentation. There are, however, some small but important differences.

By default your **C:** drive in Windows is labeled **~/win (C:)**. An application CD will not automatically execute when inserted into the CD-ROM drive as it does in native Windows. When attempting to access your CD-ROM drive or floppy drive(s), you may receive the message shown in the screen to the right:



Be sure the permissions of the Linux device files have been properly set by following these steps:

- 1 Open a terminal window and become the root user by typing:

```
su root
```

- 2 Change to the devices directory by typing:

```
cd /dev
```

- 3 Change the device permissions:

For CD-ROM device:

Identify the CD-ROM device file by typing:

```
ls -l cdrom
```

The output of this command shows the link that points to the actual device file (for example, **hdc**).

To make your CD-ROM device accessible to a Windows session, type:

```
chmod 555 device
```

Where **device** is the device file shown in the output of the **ls -l cdrom** command.

For floppy device(s):

- For Floppy A, type: **chmod 666 fd0**
- For Floppy B, type: **chmod 666 fd1**

**TECH TIP****Icons on Your Windows Desktop**

In Win4Lin you have to refresh the desktop or window to see the icons after an application is installed. To refresh the desktop, right click on an empty space on the Windows desktop, then choose Refresh from the menu

**TECH ALERT****Incorrect Installation Time**

The installation time reported by an application's installation wizard may be incorrect. You should not abort an installation based on this incorrect information.

Mapping Directories to Windows Drives

You can access Linux and native Windows drives from Windows under Win4Lin by mapping these into Windows drives via Winsetup. To do this, follow these steps:

- 1 Start **winsetup** & as your Windows user.
- 2 Click on **Personal Win4Lin session configuration:win** and click **OK**.
- 3 Click on **Drives and File Systems** and click **Add**. Note the drive letter that is being assigned, for example, **E:**
- 4 In the **Directory** text box, enter the full Linux path of Linux directory that you wish to use for sharing files and click **OK**. (e.g., **/home/username/directoryname/**)
- 5 Click **Save** then click **Exit**.
- 6 If the directory does not exist in the path given, create it using the **mkdir** command.
- 7 Restart your Windows session from the Windows Start button.

Files placed in this directory will be available in both Linux and Windows, and can be found under the drive letter assigned in step 3.

Virus Protection

Win4Lin installs Windows in a Linux environment, which provides greater virus protection than a stand-alone Windows installation. Many Windows viruses will have no effect on your system.

One way you can help protect yourself from viruses is to make backups of your Win4Lin directories. For example, you can use the following command to make a backup copy of your Win4Lin C : drive (usually \$HOME/win):

```
cd $HOME
tar czvf win.tgz win
```

The result will be a compressed tar archive of your win directory stored in the `win.tgz` file. The following are some examples of the types of Windows viruses that may or may not affect your Windows environment:

Boot Sector or Other Boot Time Viruses

Boot sector and boot time viruses have no effect on Windows under Win4Lin because Win4Lin has no boot sector for Windows. The DOS boot files are read-only and enforced by Linux file access permissions.

Filesystem Related Viruses

Windows uses filesystems called FAT32 and VFAT. Win4Lin installs Windows files on a subdirectory of the Linux Ext2 filesystem. Therefore, any virus that depends on the FAT32 or VFAT filesystem functionality will have no effect.

Executable File Viruses

Windows executable viruses do not affect Linux programs. However, executable file viruses may still affect your Windows environment, but damage should be limited.

Macro Viruses

Most macro viruses don't affect Linux applications, so damage is generally limited to Windows. Macro viruses are still a problem, but you can restrict the damage they cause. Make shared files un-writable by adjusting Linux file permissions.

Audio Server Support

Win4Lin Terminal Server supports popular audio servers used with KDE (aRts) and GNOME (Esound), as well as NeTraverse's Network Audio server (nnaudio). If you have installed Win4Lin Terminal Server without having a prior version installed, it was automatically configured to detect and use these audio servers when launched. If you upgraded from an earlier version of Win4Lin Terminal Server, some configuration will be required.

To have Win4Lin automatically detect which audio server to use, you will first need to log in as root. Next, edit the file `/etc/default/merge`, and change the `MERGE_AUDIO_PLUGIN` setting to read as follows:

```
MERGE_AUDIO_PLUGIN="auto"
```

To have Win4Lin Terminal Server use a specific audio server/format, you can set the `MERGE_AUDIO_PLUGIN` variable to one of the following values:

```
"/opt/win4lin/libossplugin.so"
```

This uses the OpenSound (or kernel) audio driver directly; use this option if you are not using KDE or GNOME, or have configured the respective KDE or GNOME audio server to "autosuspend." If you are using Alsa drivers, make sure that the OSS emulation module is loaded. Note that this option will only play sound on the server's audio device, as opposed to those on the client(s).

```
"/opt/win4lin/libesdplugin.so"
```

This uses the Esound audio server (most commonly used with GNOME, LTSP, etc.) Note that if the Esound audio server (`esd`) is not running, sound will not play under Windows.

```
"/opt/win4lin/libartsdplugin.so"
```

This uses the KDE aRts audio server. Note that if the aRts (`artsd`) audio server is not running, sound will not play under Windows.

```
"/opt/win4lin/libnnaudioplugin.so"
```

This uses the NeTraverse Network Audio (nnaudio) server, available from the NeTraverse website under the members area's "Download Miscellaneous Files" page. This audio server supports remote Linux, Solaris workstation, and SunRay client audio devices. Note that if the nnaudio server is not running, sound will not play under Windows.

In most cases it is best to set `MERGE_AUDIO_PLUGIN` to "auto" so that Win4Lin Terminal Server can automatically choose the audio option that is best for your environment. NeTraverse recommends having `MERGE_AUDIO_PLUGIN` set to "auto" at all times.

Note that if you have `MERGE_AUDIO_PLUGIN` set to “auto”, and Win4Lin Terminal Server detects that you are running Esound on a local display (if the `ESPEAKER` environment variable is not set), Win4Lin Terminal Server will suspend the Esound daemon and fall back to the OpenSound (or kernel) driver. This is because Esound does not allow Win4Lin Terminal Server to provide good audio/video synchronization when playing multimedia streams. If when you exit Win4Lin Terminal Server, you no longer hear sounds for GNOME events, you can easily resume the Esound audio server by opening a terminal window and running the following command:

```
esdctl resume
```

If you are using Esound on a remote display, such as with LTSP, and the `ESPEAKER` environment variable is set correctly, Win4Lin Terminal Server will honor this and just play through the remote Esound audio server. It will not suspend the server, and there will be no need to resume it upon Win4Lin Terminal Server exit. The same is also true if you explicitly set `MERGE_AUDIO_PLUGIN` to “/opt/win4lin/libesdplugin.so”

Administering NeTraverse Win4Lin Terminal Server

- ▶ Graphical Administration with the wtsadmin Tool
- ▶ Profile-based Provisioning
- ▶ Network Printing
- ▶ Fire wall Considerations

Graphical Administration with the wtsadmin Tool

The `wtsadmin` program (installed in `/usr/bin`) provides a graphical user interface (GUI) for most common administrative tasks. It behaves in a very adaptive manner, depending on what user is running it (root or not-root), whether or not Windows is installed for that user (if non-root), etc. The GUI functions similar to a “wizard”-style application, and provides clear, concise, step by step instructions and explanations for each chosen task. In future updates to WTS, more and more functionality will be available using the `wtsadmin` tool.

At the time of this writing, tasks available to the `root` user include:



Product Update/Licensing/Registration

Reload Windows Media

User Administration - to install/administer Windows for a non-root user

Advanced Configuration (runs `winsetup`) - for system-wide WTS settings

tasks available to non-root users include:



Change Networking Style - to VNET from Winsock and vice-versa

Backup Windows Installation C: - backs up to `${HOME}/win-BACKUP`

Restore Windows Installation's C: from Backup

Reinstall Windows - reinstalls the `win` configuration for the current user

Remove Windows installation

Advanced Configuration (runs `winsetup`) - for the current user's Windows settings

In non-root mode, `wtadmin` can also be used to install a Windows session for the first time utilizing the “wizard”-style user interface.

The `wtadmin` program is installed in `/usr/bin`, which means to run it, one can usually simply type:

```
wtadmin
```

If you run this command from an X Windows session (such as a GNOME or KDE desktop, etc.), be sure that the `${DISPLAY}` environment variable is set correctly. If you run it as root, should first run `xhost +localhost` to allow for **User Administration**.

NOTE: to start `wtadmin` from a remote NeTraverse WTS Client session, simply log in as root, and select the **NeTraverse Win4Lin Terminal Server Administration** session type when prompted. If you need to administer Windows settings for a non-root user, you can always choose the **User Administration** option from the menu and choose the appropriate user from the list.

Profile-based Provisioning

Profile-based provisioning allows a system administrator to quickly deploy and centrally manage an array of similar Windows desktop accounts. One or more master “profiles” must first be created, and then easily provisioned to any number of user accounts.

A master profile is simply a Windows installation plus applications and settings that provides a template, or “profile” for other user accounts to inherit from. This profile installation is then provisioned, or deployed, to any number of user accounts.

The main intent of this functionality is to provide a solution where many users must use the same applications, but each keep private copies of their documents. An example of this could be a call center, a branch office, or a corporate department.

By default, each user inheriting from a master profile account receives a read-only copy of Windows and its applications. The read-only files are actually symbolic links to their counterparts in the master profile account, which also saves substantial amounts of disk space. The user may save and keep documents on the D: drive (`${HOME}/mydata`), including the default My Documents folder. The C: drive (`${HOME}/win`), is quickly reconstructed (or “loaded”) on the fly each time Windows starts for this user. This ensures that each time the user logs in, their Windows application environment is reset to the master profile, resulting in less downtime, higher productivity, and lower support costs.

Example: Corporate Department

Consider the following example: a mid-sized corporation decides to migrate critical applications from a number of standalone Windows desktop computers to a Linux server running Win4Lin Terminal Server. This department runs a typical set of applications on its desktops, such as collaboration/groupware clients, accounting software, desktop publishing, etc. All desktops run a very similar set of applications, while at the same time users must store private documents that they create in their respective environment. The Department decides to migrate all the common applications from the desktop computers to the server computer, and use the existing desktop computers to serve as clients of this server. What’s more, each user may or may not have a printer connected to their desktop, and each user may use more than one computer to log on (such as a laptop/notebook while traveling, etc.) The goal is to centrally host and administer these common environments while preserving enough flexibility to allow users to store private documents, print anywhere they need to, and access their data from virtually anywhere they have a network connection.

The WTS setup will consist of a single master profile with multiple user accounts inheriting from it. The first step is to create all the Linux user accounts using the appropriate tools for that Linux distribution. The Linux commands `adduser` and

`useradd` are generally available as alternative to GUI methods. For the sake of illustration, we will assume that a “master profile” user account named `master` exists, as well as 5 accounts to deploy to: `john`, `mary`, `mike`, `jane`, `steve`. Consult the documentation of your particular Linux distribution for more information about adding user accounts.

Now that the users are created, it is time to install Windows for the master profile account. To do this, we log in to the server as `root`, and run:

```
wtsadmin
```

Note that we will assume that the base Win4Lin Terminal Server package is installed, and system-wide Windows media is loaded. From the menu, we select the **User Administration** option, and select the user `master` from the list. After clicking **Next**, we are informed that Windows will now be installed for this user. We click **Next** again and select the Winsock 2 networking option, since it is most appropriate for what we need for this particular case. We continue through the wizard until Windows begins to install. This process may take several minutes depending on the speed and capacity of the host computer.

Once the Windows installation completes, it is time to configure the Windows session. We log in as the user `master` and launch Windows using the `wln` command. At this time applications are installed and setup to fit the needs of the department. Once this task is complete, we shut down Windows and log in as `root` again.

Next, we designate the user account `master` as the master profile:

```
wts-make-profile master
```

From this point forward, any time Windows is used for this user account, the changes are recorded after shut down so they can propagate easily to user accounts inheriting from it. There are two things to note: first, it is very important that Windows be shutdown properly (using the **Start->Shutdown** method) for a master profile account. A small popup window reading “Updating Profile Information...” should appear briefly after shutdown to indicate that the changes are being exported. Second, it is very important that when the master profile session is in use, there are no inheriting sessions running. If the master profile Windows session is running, and a user attempts to start a session that inherits from it, the result will be an error. However, if there are inheriting sessions running, care must be taken not to start a session for the master profile account.

Now it is time to provision the master profile to multiple user accounts. Please note that Microsoft licensing typically requires that you have at least one (1) Windows license per user account. Alternatively, you may use a site license for Windows, if you purchased such a license. Please review the End User License Agreements of both your NeTraverse and Windows products for additional details.

We can provision accounts now, and later provision more from this master profile if needed, provided that we have enough Windows licenses. To provision this profile to the user accounts we need now:

```
wts-get-profile master john mary mike jane steve
```

At this point we have provisioned the 5 user accounts in a basic way. Each user's documents (on the D: drive by default) are preserved from session to session, while the Windows setup and its applications are reconstructed from the master profile's information each time a user session is launched. You will see a small popup that reads "Loading Profile Information..." briefly when starting these inheriting user accounts, which indicates that Windows and the applications are being reset to the state of the master profile installation.

To finish completely, the department has 2 more requirements. First, all users must have their passwords preserved. Windows stores password information for various things (web sites, Windows login, etc.) in `${HOME}/win/windows/*.PWL` files, which we want to preserve for each user. Note that preserving user password files also keeps Windows from repeatedly prompting for a startup password, so it is a good idea to do this for any installation. Second, the Department Manager's account, `john`, should allow the user to keep his own set of Internet Explorer Favorites in addition to what the master profile provides. Windows stores Internet Explorer Favorites as individual files in the directory `${HOME}/win/windows/Favorites/`. Here we have examples of both default and per-user settings for the master profile.

To preserve the user password files, we create a file called `preserve-files` in the default settings directory of the master profile account. The full path to this file, in this example, will be `~master/.merge-profile/default/preserve-files`. Note that `${HOME}/.merge-profile` is the top-level directory where all "meta" data (including rules) is stored for any master profile account. We will populate the file with the following line:

```
windows/*.PWL
```

Note that the above specified path/wildcard for the password files is relative to the `${HOME}/win` directory. The file needs to be world-readable, so we adjust the permissions accordingly

```
chmod 444 \
~master/.merge-profile/default/preserve-files
```

This global setting is now complete. Each time an inheriting user account logs in, their Windows passwords will be preserved from their previous session. Note that if we were to remove these global settings, all user passwords in inherited accounts would be lost the next time those users logged in. This is true for any file that is preserved.

To allow the user `john` to keep his own set of Internet Explorer Favorites in addition to what the master profile account provides, we create a per-user preserve setting for that user. The per-user settings are stored in a subdirectory of the `${HOME}/.merge-profile` directory called `users`, which has its own subdirectories named after the user accounts provisioned from this master profile. In our example, we will create the `preserve-files` file in the directory `~master/.merge-profile/users/john`. The file will contain two lines:

```
windows/*.PWL
windows/Favorites/
```

We need to specify the `windows/*.PWL` rule again since per-user settings completely override default settings. In this case, the per-user `preserve-files` for the user `john` takes precedence over the default `preserve-files` when that user logs in. Also note that since we want to preserve every file in the `windows/Favorites/` directory, we do not need to specify a wildcard, just a trailing `/` character. We also need to adjust the permissions of the user's settings file to be world-readable:

```
chmod 444 \
~master/.merge-profile/users/john/preserve-files
```

The behavior will be such that only user-specific favorites will be preserved, while any favorites defined in the master profile will be incorporated and kept up to date. To allow the user to keep their own complete set of favorites and not have any that are specified in the master profile, the same favorites rule can be placed in a file called `omit-files` in that user's settings directory of the master profile. This will "omit" linking any Favorites specified in the master profile, and the `preserve` rule we already wrote will keep the user's local Favorites from session to session.

Master Profile Settings (default and per-user)

As introduced above, the master profile account's home directory contains the following hierarchy after Windows is installed and designated a master profile:

```
.merge/
.merge-DO_NOT_DELETE/
    normal WTS user account directories, contain settings and logs;
    use the winsetup or wtadmin programs to edit these settings as the
    non-root master profile user
mydata/
    documents (drive D:) for the master profile; not inherited by other
    accounts since they keep their own private data
```

```
win/
    master profile Windows installation and applications (drive C:)
.merge-profile/
    master profile meta-data - default and per-user settings, etc.
```

The .merge-profile subdirectory contains the following hierarchy:

```
default/
    contains default rules that apply to all inheriting environments if
    per-user rules are not specified

users/<username>/
    each directory under users/ is named after the Linux username of an
    inheriting user account; these directories contain rules that apply to
    the user they are named after
```

File/Directory Rules

There are 3 types of file/directory rules in WTS: *omit*, *copy*, and *preserve*. As their names suggest, they either omit/copy certain files from the master profile instead of link, or preserve certain files in the user account. The precedence of these sets of rules is: *preserve*, *omit*, *copy*, in that order. Each set of rules is represented in one of 3 files, *preserve-files*, *omit-files*, or *copy-files*, for *preserve*, *omit*, or *copy*, respectively. Each rule is specified as a line in the respective text file, and can either be an exact file name/path, an exact directory name/path, or contain wild cards. Rules refer to paths that are relative from the `${HOME}/win` directory of the master profile account. Following is more detail on each type of rule:

Omit

Files or directories matching the *omit* rule will be omitted when the master profile is used to construct the inheriting user account's Windows session. For example, to omit Internet Explorer history and cookies from inheriting user accounts, the *omit-files* file should contain the following:

```
windows/History/
windows/Cookies/
```

Omit rules are not case sensitive. Following are the implicit (built-in) omit rules:

```
WINDOWS/TEMPORARY INTERNET FILES/
WINDOWS/HISTORY/
RECYCLED/
_RESTORE/
```

The implicit rules ensure that Internet Explorer disk cache and history, Files in the Recycle Bin, and (Windows Me only) “restore” files are not propagated from the master profile to inheriting user accounts.

Copy

Files or directories matching the *copy* rule will be copied instead of linked when the master profile is used to construct the inheriting user account's Windows session. This allows Windows to overwrite the contents of the specified files during the session. This is useful if certain applications have problems dealing with read-only files. For example, there is an implicit copy rule that makes a writable copy of the Windows registry files, since Windows needs to be able to write to the registry during the session. Of course once the session ends and the next session begins, the registry files are reset to match those of the master profile, as is desired. The `registry-settings` and `registry-import` files are used to adjust certain registry values (such as Windows Product Key, Default printer, Network user name, etc.) after the registry is reset to that of the master profile. This functionality is described later in this section. Note that this rule should be used with caution and care, as improper use can nullify the disk space savings potential of the Profile-based Provisioning technology.

Copy rules are not case sensitive. Following are the implicit (built-in) copy rules:

```
WINDOWS/SYSTEM.DAT
WINDOWS/USER.DAT
WINDOWS/SYSTEM.INI
WINDOWS/TASKS/SA.DAT
WINDOWS/SCHEDLOG.TXT
WINDOWS/ATMREG.ATM
WINDOWS/*.PWL
```

The implicit rules ensure that Windows can write to the registry, certain initialization files, Task Manager files, and password list files, and that Adobe Type Manager (if installed) can function.

Preserve

The *preserve* rule, unlike the others, applies to files in the inheriting profile's `${HOME}/win` directory rather than in the master profile account. This allows granular control of what private files the user is allowed to keep in the provisioned environment. If a file is to be preserved, it must either not be present in the master profile, or have been provisioned with a *copy* rule (see above.) For example, to preserve Windows passwords and Internet Explorer

Favorites in the provisioned user account, the `preserve-files` file should contain the following:

```
windows/*.PWL
windows/Favorites/
```

Note that this rule should be used with caution and care, as improper use can nullify much of the advantage of the Profile-based Provisioning technology. For instance, the Windows registry files (`windows/system.dat` and `windows/user.dat`) should never be preserved, as this would allow for the individual registries to corrupt and deviate over time, and not receive updates from the master profile correctly. In most cases a user account which would need to maintain its own registry is probably better suited as stand-alone (with its own full Windows installation) rather than provisioned from a master profile.

Unlike the others, the *preserve* rule is **case sensitive**, since it refers to files that are not potentially described in the profile information (i.e. files unique to the provisioned account.) There are no implicit *preserve* rules.

Registry Rules

Registry rules are used to make changes to an inheriting user account's Windows registry after the master profile information is loaded; this happens each time the provisioned user launches the inheriting Windows session. There are two types of registry rules: *settings* and *import*. Each set of rules is represented in one of 2 files, `registry-settings` or `registry-import`, for *settings* or *import*, respectively. Unlike the other types of rules, the Registry Rules can only be defined as per-user settings (in the `${HOME}/.merge-profile/users/<username>/` directory of the master profile account) rather than default settings (in the `${HOME}/.merge-profile/default/` directory.) Registry changes do not make sense as default settings since by default the registry should be that of the master profile. If registry changes are needed in the master profile for all user accounts, they should be made within a master profile Windows session as part of default configuration.

Settings

For convenience, the `registry-settings` file provides a high-level interface to some common Windows registry settings. For example, to set the Windows logon/network username to "john", the user's `registry-settings` file should contain the following:

```
Network.username="john"
```

Note that a default `registry-settings` file is automatically created for each provisioned user by `bywts-get-profile`. The default settings in this file are for the Windows Network Neighborhood "Computer Name" (if VNET is

used) and the above mentioned logon/network username. It is a good idea to review this file after the `wts-get-profile` operation for each provisioned user account in case the default values do not suit your network environment.

At the time of this writing, the following settings are available:

Network.Comment
Network.ComputerName
Network.IPDomainName
Network.NameServer
Network.Workgroup
Network.username

These settings apply to general network configuration in Windows. They are mostly relevant only if VNET is used. If the master profile uses VNET and obtains an IP address using DHCP, only `Network.ComputerName` and `Network.username` should be set. Note that the values of `Network.ComputerName` and `Network.Workgroup` are limited to 15 characters - this is a limitation of Windows.

Network0.DefaultGateway, Network1.DefaultGateway
Network0.IPAddress, Network1.IPAddress
Network0.IPMask, Network1.IPMask

These settings apply to either the first (0) or second (1) network “adapter” in Windows. A Windows installation configured with VNET at install time typically has the Merge/NIC (the virtual network “adapter” for VNET) as the first (0) “adapter.” Note that changing the network configuration with `win_network` or `wtsadmin` may cause the Merge/NIC to become the second (1) network “adapter.” The same may be true if **Dial-up Networking** is installed, or a 3rd party VPN access client is installed. These settings should be specified only if the master profile uses VNET and does not request an IP address with DHCP, but rather has static IP configuration. In most cases, it is strongly recommended that master profile VNET sessions automatically obtain IP configuration using DHCP. Also, unless absolutely required, master profile installations should be configured with Winsock for ultimate simplicity and scalability.

Printer.Default

This setting specifies the default printer in Windows for this user account. This is useful in the case where a custom printer driver must be used for a certain user. Any custom printer drivers must be installed in the master profile account, and this setting can be used to make sure each user gets the right default printer when they try to print from applications. The value of this

setting must match the exact name of a printer configured in Windows. The exact printer name can be seen in the **Printers** control panel (**Start->Settings->Printers.**) In most cases this setting is not needed since Win4Lin Terminal Server is capable of transparent network printing using the NeTraverse WTS Client on various client platforms. See the next section, entitled *Network Printing*, for details.

Windows.ProductKey

Windows.RegisteredOrganization

Windows.RegisteredOwner

These settings specify per-user Windows license/registration details. NeTraverse is not responsible for your compliance to Microsoft licensing terms. Consult your Microsoft Windows End User License Agreement for details specific to your software.

Import

For ultimate flexibility, the registry-import file specifies raw data to import into the Windows registry using the MS-DOS REGEDIT . EXE program. The only filtering performed on this file is converting it from UNIX/Linux text file format (LF newlines) to DOS text file format (CR/LF newlines); other than this, the data is passed in raw to REGEDIT . EXE . Typically, a Windows . REG file specifies this type of data. This file is imported after the registry *settings* (see above), if any. Please note that these types of registry edits are potentially dangerous and should be specified with caution and care. Consult Microsoft or 3rd-party Windows reference material for more information about the Windows registry.

Script Rules

If additional configuration is needed and is not possible with the types of rules/settings described to this point, *script* rules can be used. A script rule is simply a Linux script or executable binary file named either `preload-script` or `postload-script`. These scripts are executed before and after the user account is reconstructed from the master profile, respectively. Additionally, the `preload-script` runs before any other rules or settings are applied, while the `postload-script` runs after any other rules or settings are applied and just before Windows itself starts. In most cases, these scripts are not needed and should not be created. If you have special needs that would require such functionality, it is important to note that Win4Lin Terminal Server does not monitor nor restrict what the scripts do. The only restriction is that the scripts run as the provisioned user ID rather than the master profile user ID. The scripts are passed in the following environment variables:

```

MERGE_PROFILE_HOME
MERGE_PROFILE_DIR
MERGE_PROFILE_WIN
MERGE_PROFILE_DOTMERGE

```

Specify the `${HOME}`, `${HOME}/.merge-profile`, `${HOME}/win`, and `${HOME}/.merge` directories of the master profile account this user is inheriting from, respectively.

```

MERGE_PROFILE_TARGET_OLD
MERGE_PROFILE_TARGET_WIN
MERGE_PROFILE_TARGET_DOTMERGE

```

Specify the `${HOME}/win.profile-old`, `${HOME}/win`, and `${HOME}/.merge` directories of the current user account, respectively. The `${HOME}/win.profile-old` contains the previous contents of the current user account's `${HOME}/win` directory, from a prior session. Note that this directory will not contain preserved files when accessed from the `postload-script`, since the preserved files would have already moved to the `${HOME}/win` tree by this time.

As with all other rules and settings files, either default or per-user, the `preload-script` and `postload-script` files should be world readable. Additionally, they must be world-executable. The recommended file mode (set with `chmod`) for the scripts is 555.

Network Printing

Transparent network printing is possible to remote client printers when those computers run one of the NeTraverse WTS Clients, available from the Downloads section of the NeTraverse web site (www.netraverse.com) for various platforms. A user can connect to a Win4Lin Terminal Server computer from a client PC and enjoy automatic, transparent network printing regardless of what type of printer is attached to their PC. On the server side, the GNU `ghoscript`, or `gs` package must be installed, as well as a VNC server package (typically called `vnc-server`, or available from www.realvnc.com.) Most Linux distributions install this software by default. On the client side, the computer must be able to print text and graphics locally to its printer. Additionally, if that client PC runs a Windows operating system, the **Adobe Acrobat Reader**, version 3.0 or higher should be installed on it. This program can be downloaded free of charge from www.adobe.com, and is typically installed on most Windows PCs already.

There are 2 ports in Windows that can be used to print to a client's local printer. These ports are called `local` and `local-raw:`. The `local:` supports generic PostScript printer data only, while the `local-raw:` port allows Windows on the server to print directly to the client printer's native language. New Windows installation will have a generic PostScript printer configured on the `local:` port at install time. The driver used is the **Apple LaserWriter**, which is considered the most generic PostScript driver available on Windows. The WTS client will take care of converting the PostScript to the printer's native language as needed automatically, so in most cases, the default installed printer is sufficient for normal printing needs. If you require more precise control over the client printer, you can install the appropriate printer driver on the WTS Windows session and drive the client printer directly from the server via the `local-raw:` port.

Fire wall Configuration

If you plan on protecting the WTS computer with a software fire wall (using `iptables`), Win4Lin Terminal Server can automatically open the TCP/IP ports its clients need to connect to when the service starts up. To enable this, simply set the variable `MERGE_IPTABLES_TRUSTED_INTERFACE` to "all" or the name of a Linux network interface, in `/etc/default/merge`. To disable this feature, set the variable to "none". Note that the Win4Lin service must be restarted after changing `/etc/default/merge`, and there can be no Windows sessions running on the server when doing this:

```
/etc/rc.d/init.d/Win4Lin restart
```

If you would rather control the fire wall settings yourself or will need to open ports on an external fire wall or router device, here is a list of TCP service names (from `/etc/services`) and port numbers that should be open:

<code>nv-cdahub-sess</code>	(TCP/IP port 48602)
<code>nv-cdahub-data</code>	(TCP/IP port 48603)
<code>nv-mergevncd</code>	(TCP/IP port 48604)
* <code>nv-wts-gateway</code>	(TCP/IP port 48605)
* <code>nv-wts-gateway-ssl</code>	(TCP/IP port 48705)

* not used at the time of this writing, but planned for future WTS updates.
Consult the product release notes for the latest information.

Running NeTraverse Win4Lin Terminal Server Sessions from the Client

- ▶ Connecting via Secure Shell (SSH)
- ▶ Connecting Via Telnet
- ▶ Ending a Server Session
- ▶ Escaping from a Locked Windows Session

Connecting via Secure Shell (SSH)

This chapter covers the setup and usage of initiating a remote server session. The purpose of these methods is to provide users with a shell account on the NeTraverse server to which they can log in, redirect the X display to their local machine, and start a server session. This chapter will cover two mechanisms for doing this:

- Secure Shell
- Using Telnet (or other shell programs)

Method 1: Using Secure Shell

Preparing to Install

Installing Secure Shell is a quick and straightforward process. Prior to installation, you will need:

- A copy of SSH or OpenSSH
- Copies of SSH or OpenSSH are shipped with most Linux Distributions. If your distribution did not come with one, a free copy can be obtained from www.openssh.org
- SSH Installation Instructions

Installation

Step 1: Install the SSH Daemon on the server machine

Follow the instructions from the website (www.openssh.org), or your distribution on installing the ssh Daemon on your server machine, if it is not already installed. Typically, this involves the installation of the SSH server packages (RPM).

- 1 You must download the following RPMs (note: version number may differ, depending on distribution; however, it is strongly suggested that you download the latest version for your platform to ensure security and compatibility):

```
openssh-2.9p1-1-i386.rpm
openssh-askpass-2.9p1-1-i386.rpm
openssh-server-2.9p1-1-i386.rpm
```

- 2 To install these packages, in a console or x-terminal, as root user, type the following in this order:

```
rpm -ivh openssh-2.9p1-1-i386.rpm
rpm -ivh openssh-askpass-2.9p1-1-i386.rpm
rpm -ivh openssh-server-2.9p1-1-i386.rpm
```

Step 2: Install the SSH client on the client machine

Follow the instructions from the website (www.openssh.org), or your distribution on installing the SSH Daemon on your client machine, if it is not already installed. Typically, this involves the installation of the SSH client packages (RPM).

- 1 You must download the following RPMs (note: version number may differ, depending on distribution; however, it is strongly suggested that you download the latest version for your platform to ensure security and compatibility):

```
openssh-2.9p1-1-i386.rpm
openssh-askpass-2.9p1-1-i386.rpm
openssh-client-2.9p1-1-i386.rpm
```

- 2 To install these packages, in a console or x-terminal, as root user, type the following in this order:

```
rpm -ivh openssh-2.9p1-1-i386.rpm
rpm -ivh openssh-askpass-2.9p1-1-i386.rpm
rpm -ivh openssh-client-2.9p1-1-i386.rpm
```

Step 3: Configuring the SSH Daemon on the server machine

- 1 Follow the instructions from the website (www.openssh.org), or for your distribution to configure the SSH Daemon.
- 2 You must enable X11 Forwarding, which is done by setting the X11Forwarding Option to **Yes**. To do this, the following line must appear in your **sshd_config** file. To open the file in an editor type the following:

```
pico /etc/ssh/sshd_config
```

- 3 Look for the line X11Forwarding and make sure it is marked **yes**, as shown below:

```
X11Forwarding yes
```

This is the only line you need to configure. Save the file by pressing **Ctrl-x** (the ctrl and x buttons simultaneously); press **Y** when it prompts you to save the file. Finally, press enter to save the file as the default filename (**sshd_config**).

Step 4: Restart the SSH Daemon

After steps 1 and 2 are complete, restart the SSH daemon to allow changes to take effect. In your console or x-terminal, still as root, type the following:

```
/etc/init.d/sshd restart
```

Step 5: Install and configure the SSH client software on the client machines.

- 1 Follow the instructions from the website (www.openssh.org), or your distribution on installing and configuring the SSH client. If you want X11

forwarding to be turned on without a command line switch (to save time typing the command options every time you use SSH), be sure that the following line appears in your **ssh_config** file.

- 2 Open the file in an editor. For example, to open the file using pico, type the following:

```
pico /etc/ssh/ssh_config
```

- 3 Look for the line X11Forwarding and make sure it is set to yes, as shown below:

```
X11Forwarding yes
```

This should be the only line you need to configure. Save the file by pressing **Ctrl-x** (the ctrl and x buttons simultaneously); then, press **Y** when it prompts you to save the file. Finally, press enter to save the file as the default filename (**ssh_config**).

Step 6: Connecting to a session

Once the NeTraverse server and clients are configured with SSH daemon and client software respectively, clients can connect to a Win4Lin session on the server by opening an x-terminal window and issuing the following command:

```
$ ssh -X -f username@servername win
```

The user will then be prompted for a password. Once the password is entered, the Win4Lin session will start.

If you are not on a local network and you wish to use compression to improve performance, add the “-C” parm to the command:

```
$ ssh -X -f -C username@servername win
```

Connecting via Telnet (or other Shell Program)

SSH is the preferred method of connecting and redisplaying the application from a Linux based server to Linux based clients. However, in some cases, the client or the server will not have access to an SSH client. In these cases, the user can access the machine through another login shell and export the X display to their own personal X server. These instructions assume that:

- ▶ The NeTraverse server is configured to accept Telnet (or other shell) connections
- ▶ The client machine has appropriate Telnet (or other shell) client software installed
- ▶ The user is running a Local X server on the client machine

Instructions in this section detail the steps necessary to initiate a remote display using Telnet and a local X server.

Installation

Step 1: Start the Local X server

Users should start the local X server on the client machine before connecting to the NeTraverse Server. To do this, type the following:

```
startx
```

Step 2: Allow the local X server to accept connections from the NeTraverse Server

The Local X server should be configured to accept X client connections from the NeTraverse Server. Under Linux, this is accomplished most easily, or by issuing the following command in an x-terminal window:

```
]$ xhost + servername
```

Step 3: Connect to the NeTraverse server using Telnet (or other shell program)

To connect to your server, type the following in an x-terminal window:

```
telnet servername.com
```

Step 4: Start the session

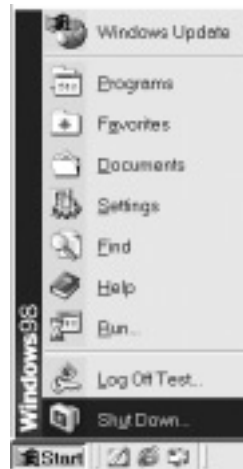
When the user is successfully logged into the NeTraverse server, he/she should start their individual session by setting the **Display** environment variable and then starting the server session. To do this, type the following (substituting the **name client_hostname** for the name of the client machine).

```
]$ export DISPLAY= client_hostname:0.0
$ win &
```

Ending a Server Session

To end a Win4Lin Windows session, follow these steps:

- 1 Click the **Start** button in Windows.
- 2 Choose **Shut Down...**
- 3 When prompted with the question, “What do you want the computer to do?” Choose **Shut Down**.
- 4 Click **OK**



Do Not Shut Down Your Win4Lin Windows Session Incorrectly!

Do NOT click the close button on your Windows desktop. Ending a Win4Lin Windows session in this manner bypasses the Windows shut down procedure and may prevent Windows from starting up properly in future sessions.

Recovering from a Locked Windows Session

If Windows does not respond to standard shut down procedure, you can force Windows to shut down. *(For more information, see the section **Recovering from a Locked Windows Session**.)*

Escaping From a Locked Windows Application

As in Windows, the CTRL + ALT + DEL key combination will also work to end a locked application in your Win4Lin Windows session.

Using CTRL+ALT+DEL

Several X Window System managers assign the CTRL+ALT+DEL key combination to execute certain Linux tasks (usually log off). In order to use the CTRL+ALT+DEL key combination in your Win4Lin Windows session, you may need to disable the command that is bound to the CTRL+ALT+DEL key combination in your X Window System manager. Please consult your window manager's documentation to determine how to customize key bindings.

Troubleshooting

- ▶ Troubleshooting NeTraverse Win4Lin Terminal Server
- ▶ Troubleshooting Windows
- ▶ Troubleshooting the Client

Troubleshooting NeTraverse Win4Lin Terminal Server

Manually Enabling BackingStore

When using Win4Lin, your display performance is affected by an X server setting called **backingstore**. In many distributions this setting is turned off by default, and may need to be turned on when using Win4Lin. If you experience screen/window refresh problems when running a Win4Lin session, you should enable (or disable if it's already enabled) **backingstore** by updating your XFree86 configuration file. Your XFree86 configuration file is located in `/etc/X11`. Version 4 of XFree86 uses a configuration file named **XF86Config-4**. Earlier versions of XFree86 use a file named **XF86Config**. Follow these steps to make the required changes:

- 1 Open a terminal window, and become root user by typing:

```
su - root
```

- 2 Locate your XFree86 configuration file:

```
cd /etc/X11
ls
```

If you see a file listed with the name **XF86Config-4**, you are using Version 4 of XFree86, and you should make the required changes in this file. If no file with this name is listed, then you are using an earlier version of XFree86, and you should make the changes in the file named **XF86Config**. (If you see both files listed, select the newer file: **XF86Config-4**.)

- 3 Make a backup copy of your XFree86 configuration file:

```
cp XF86Config-4 XF86Config-4.copy
```

or

```
cp XF86Config XF86Config.copy
```

- 4 Use the text editor of your choice to open the file, and look for a block of text that begins with the words **Section Device** which looks similar to this:

```
Section          "Device"
# no known options
Identifier       "ATI Rage Mobility M4 AGP"
Driver           "r128"
VendorName       "ATI Rage Mobility M4 AGP"
BoardName        "ATI Rage Mobility M4 AGP"
#BusID
EndSection
```

Note that the details of the **Device** section of your configuration file will vary according to the make and model of your display device (e.g., CRT or LCD), thus what you see in this section of your file will look somewhat different from the example.

- 5 Add a line just before the last line of the block to turn on the backing store option so that the text now looks like this:

```
Section "Device"
# no known options
Identifier    "ATI Rage Mobility M4 AGP"
Driver        "r128"
VendorName    "ATI Rage Mobility M4 AGP"
BoardName     "ATI Rage Mobility M4 AGP"
#BusID
Option "backingstore"
EndSection
```

- 6 Check to see if there are additional Section **Device** text blocks in your file, and update any you find in the same way (i.e., adding the Option **"backingstore"** line just ahead of the last line in the block). There should be one such block for each display on your system.
- 7 Save the file, log out of your current X session, and log back in. Changes made to the XFree86 configuration file take effect at the beginning of the next X session.
- 8 You can check to see if the change you made has taken effect as follows:

```
xdpyinfo | grep back
```

The output from this command will indicate whether the backing store option is on or off. If the BackingStore option is not set to on, you should check to see that the changes you made to your XFree86 configuration file were done exactly as specified above.

Manually Disabling CD Automount

The GNOME and KDE graphical desktop environments are frequently configured to automatically mount your CD-ROM drive when you insert a CD so that you can access the CD immediately without having to type a command or press a button. This behavior is usually very convenient, but it interferes with the Win4Lin installation process. Even if you are not using GNOME or KDE, your system may be enabling automounting of CDs using other software. In most cases the Win4Lin graphical installer can automatically disable auto mounting during installation. In a few situations, you may need to disable automounting manually before beginning the installation process.

Disabling CD Automount in GNOME

If you are using the GNOME desktop environment, perform the following steps to ensure that CD automounting is turned off:

- 1 Click on the foot icon in the GNOME Panel.
- 2 Choose **Programs -> Settings -> Peripherals -> CD Properties** from the menus that appear. (Note: If you cannot find **Programs** in the foot menu, skip it and go directly to **Settings**).
- 3 Unselect all options for both **Data CDs** and **Audio CDs**.
- 4 Choose **OK**. Then close the **Control Center** window.

To turn CD automounting back on following installation of Win4Lin, follow the same steps, but select (rather than deselect) each option you wish to enable.

Disabling CD Automount in KDE

If you are using the KDE desktop environment, perform the following steps to temporarily disable CD automounting:

- 1 Click on the **K** menu in the **KDE** panel. Choose **Utilities -> Konsole** to open a terminal window.
- 2 Type the following command:

```
killall autorun
```

This procedure disables the CD automounting for the current KDE session only. Once you log out and log into a new KDE session, the CD automounting will function as usual.

Disabling Other CD Automounting Software

Whether or not you are using the GNOME or KDE desktop environments, running other CD automounting software such as **autofs** and **amd** may cause you to be unable to install Win4Lin. If you are not sure whether **autofs** or **amd** is running, perform the following steps in order to ensure they are turned off:

- 1 Open a terminal window.
- 2 Become the root user by typing the following command:

```
su - root
```

- 3 Stop the **autofs** service:

```
/etc/rc.d/init.d/autofs stop
```

The message **No such file or directory** is a normal occurrence which means that **autofs** is not installed on your system. The message **FAILED** is a normal occurrence indicating that **autofs** is installed but was not running.

- 4 Stop the amd service:

```
/etc/rc.d/init.d/amd stop
```

As above, the message **No such file or directory** is a normal occurrence indicating that **amd** is not installed on your system. The message **FAILED** is a normal occurrence, which indicates that **amd** is installed but was not running.

Disabling Supermount

You must disable supermount prior to installing Windows, as supermount interferes with Win4Lin installation. Supermount should be disabled after the Stage 1 reboot, and before re-starting the NeTraverse Win4Lin Terminal Server installer.

Disable supermount with the command:

```
/etc/rc.d/init.d/amd stop
```

Manually Removing Win4Lin Components

If for some reason you are unable to remove Win4Lin from your system using the Win4Lin graphical installer, then you can use the following steps instead. You must become a root user to perform these operations. You should perform these steps in order, and make sure to reboot your system once you remove the NeTraverse-enabled kernel.

- 1 To remove the Win4Lin application files:

```
su - root
rpm -e Win4Lin
```

- 2 To remove your NeTraverse-enabled kernel:

```
rpm -qa | grep -i Kernel-Win4Lin
```

This command will display the name of the particular NeTraverse-enabled kernel RPM that was installed on your system.

```
rpm -e Kernel-Win4LinX
```

Where Kernel-Win4LinX is the output of the previous grep command. Please note: the X in the above command line should be replaced by the single digit that displays in the grep command after the “Win4Lin”. The RPM -qa command will display many other characters and digits after the digit represented by “X” in this example. Ignore them.

- 3 At this point you can reinstall Win4Lin without losing any configuration changes and without having to reload the Windows installation files (assuming you had previously installed Win4Lin successfully).
- 4 To remove the Win4Lin system-wide configuration files and the copy of the Windows installation files:

```
cd /
sh /var/win4lin/final_remove.sh
```

At this point, you can reinstall Win4Lin and reload the Windows media without losing the users personal Windows data files (assuming you had previously installed Win4Lin successfully).

- 5 To remove your personal Windows installation, any Windows applications that you have installed, and any data files you have created on your Windows **C:** drive:

```
cd ~username
rm -rf .merge win
```

Where *username* is the Linux username. The `rm` command will remove the files and directories associated with your **C:** drive. Note that you will not be prompted to confirm the removal of your files. Please make certain you want to do this before you execute the `rm` command.

- 6 To remove your My Document files which are, by default, located in **\$HOME/mydata** for new Windows installations:

```
cd ~username
rm -rf mydata
```

Again, *username* represents the Linux username and the `rm` command will remove the files and directories associated with the **D:** drive. Note that you will **not** be prompted to confirm the removal of the files. So, please make certain you wish to remove these files before you execute the `rm` command.

Troubleshooting Windows

LoadwindowsCD Errors

Cannot make DOS images

This error happens when Win4Lin cannot create the DOS images necessary to run Windows (or DOS). There are a number of reasons this could happen, including a bad boot disk or a disk of the incorrect DOS version. Another cause could be a bad copy from the Windows CD. This will sometimes also cause a **VM_DIED** error.

Installwindows Errors

Error 24: Windows Failed the Initial Install

This is a generic exit value when Win4Lin cannot install Windows. One of the known causes is if there is a problem with the Win4Lin license code. Another problem that causes this error is to be a bad Windows CD load (corruption/missed files, etc.).

Error 26: Failed to Patch krnl386.dll (or other file)

This error is only seen when a Windows installation fails, with an error message similar to “Not able to copy files.” The only solution is to reload the Windows CD and to try again. It is helpful to verify that the Windows CD is not scratched, smudged, or otherwise unreadable before re-trying.

Error 32: Cannot install Windows as root

Make sure that you are installing Windows as a regular user. Win4Lin does not allow a root user to install Windows.

Error 50: Windows not licensed on this system

This error is a result of problems with the Win4Lin license code. The program has not found the Win4Lin license code in the expected place. Please contact NeTraverse support.

Error 52: Cannot install this version of Windows now

This error indicates that a Windows 98 boot disk was used to try to install Windows 95. A similar error indicates if the reverse is true. Please ensure the correct Windows boot floppy is inserted in the floppy drive.

Errors When Running Windows

N:\is not accessible. The device is not ready.

When attempting to access your CD-ROM drive or floppy drive(s), you may receive a Windows popup error that says (for example, for the N:\CD-ROM drive):

N:\is not accessible.

The device is not ready.

First, be sure that the Linux file permissions on the device for the drive are properly set for user access. As root, cd to /dev and run the following command to look at the CD-ROM device:

```
ls -l /dev/cdrom
```

/dev/cdrom is a symbolic link to the actual hardware device that the CD-ROM is on. This will show you what the device is (say, /dev/hdc). Run the same command to see what the file permissions for **/dev/hdc** is:

```
ls -l /dev/hdc
```

The output will look like:

```
brw----- 1 root cdrom 22, 0 Jan 01 2001 /dev/hdc
```

This says that the CD-ROM drive is a block device (b), is read-write for the owner (rw-- owner root), is not accessible by the group (--), and not accessible by the world/all (---). To change this so that your user can access the CD-ROM, run the command (as root):

```
chmod a+r /dev/hdc
```

This will add the 'read' file permission for all users to the device.

For floppy drives, you can use a similar command to change the permissions on **/dev/fd0** or **/dev/fdl**:

```
chmod a+rw /dev/fd0
```

Changing the file permissions will usually solve access problems. However, if a user has a CD-R/RW or a DVD-ROM or another CD device that uses ide-scsi emulation under Linux to use, there may be problems accessing the device under Linux with the NeTraverse-enabled kernel. This is usually because the Netraverse-enabled kernel entry in **/etc/lilo.conf** does not have a line added to turn on ide-scsi support at boot time. To fix this, edit **/etc/lilo.conf** and add the following line to the win4lin option:

```
append= "ide-scsi"
```

Save and exit the file, then run **/sbin/lilo** to make sure the changes are read into the MBR. When the system is rebooted to the NeTraverse-enabled kernel again, the drive should be accessible once more.

EXIT_SIGNAL: dos: ERROR: Caught signal 11

This error could be due to a user's personal Windows drive (i.e., c:\drive) being set to a different drive letter. This error also occurs when trying to map a Zip drive into Windows.

The NDIS.VxD file is not present on your machine

If this were the only problem, you would usually receive a different error message (stating that Windows could not find a required driver file). The solution to this particular problem would be to open a Linux terminal and type the commands:

```
cd $HOME/win/windows
fixWindowsSymlinks
```

This should fix any problems you may have regarding a missing NDIS.VxD file.

The Windows Registry entry from NDIS is missing or corrupted.

This can happen if you do not have a correctly functioning “ed” program when you run “installwindows”, or if you attempted to install some networking capabilities in Windows under a Win4Lin that does not support them. The solution for this is to request a file called ndis.reg from NeTraverse Support when you get this error. They will attach it in an email and then you can go about fixing this error:

Save the ndis.reg file to your **\$HOME/win** directory

Start a DOS session by typing in a terminal shell:

```
dos+w
```

When the DOS session opens, you will see a **c:>** prompt. At the prompt type:

```
regedit ndis.reg
```

To quit the DOS session type:

```
quit
```

Windows should now load properly.

Bad Copy of NDIS.VxD

An incorrect version of NDIS.VxD is in the file system hierarchy due to users loading, unloading, installing, and uninstalling different versions of Windows at the same time (Win95 Classic with Win95 OSR2, or Win98 with Win98 SE). The extreme solution of this is to remove all vestiges of Windows.

Open a shell terminal and type **su root**. Then when prompted to, type in your root password.

Find each users **\$HOME/win** and **\$HOME/.merge** directories and remove them.

Remove Win4Lin by typing:

```
rpm -e Win4Lin
```

Run the uninstall script by typing:

```
sh /opt/win4lin/final_remove.sh
```

Reinstall the Win4Lin RPM by typing:

```
rpm -ivh xxx.rpm
```

where “xxx” represents the name of your Win4Lin installation and version.

Choose a version of Windows you would like to work with and then type **loadwindowsCD** to install Windows.

Problems with DOS

There may also be a problem caused by switching DOS versions. If, for example, you installed Windows with one DOS version and then unloaded the CD with the **unloadwindowsCD** command, then later **loadwindowsCD** with a different version of Windows then you might see this error as well.

Diagnosing the Problem

Essential to help diagnose this problem is to retrieve the contents of the **\$HOME/win/.boot/info.txt** file as well as the following (as the Win4Lin user):

```
cd $HOME/win  
find . -name ndis.vxd -print
```

Troubleshooting the Client

Remote X-display

X talks via the X11 protocol, which is typically set to port 6000. The X display manager communication protocol (XDMCP) is additionally used when bootstrapping an X session of a remote host. Typically, this is set to port 177.

In any event, you must ensure that the X11 port is stable and unblocked, and that the server and client use the same port number. If you plan to bootstrap remote X sessions, the same is true for the XDMCP port. If these conditions are not met, the X client application will not be able to communicate with the server. There will be no remote display.