WIN4LIN 3.0
Operating Windows under Linux

GOOD THINGS ARE WORTH WAITING FOR

Emulations offer the possibility of quick access to Windows applications. Thomas Drilling takes a closer look at the new Win4Lin version 3.0

When we first looked at NeTraverse's (formerly Trelos) Win32 emulator Win4Lin 1.0 in last year, we were not overly impressed. Our tests of version 2.0 (available since the start of the year) in the May 2001 edition of Linux Magazine were also far from earth shattering.
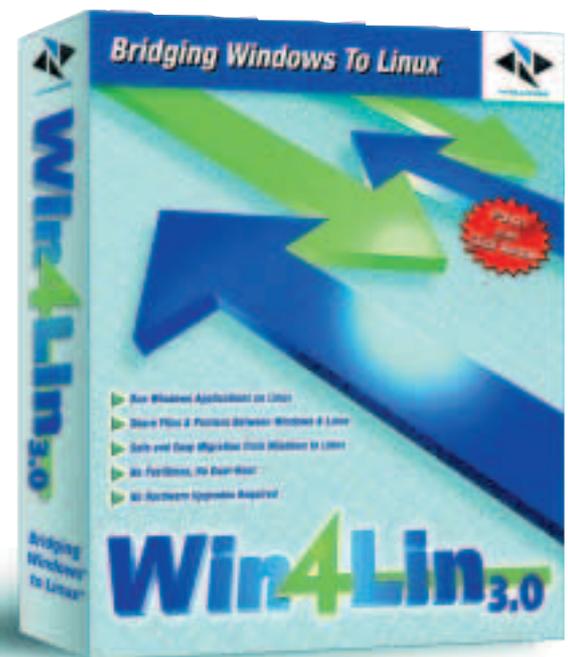
When we learned of the release of Win4Lin version 3.0, we were once more keen to put it to the test, to see whether it lived up to the promising reports that accompanied its release. Right from the start we could see that this had the right stuff to make VMware more than a little anxious.

Besides Win4Lin, VMware Express or Wine, many manufacturers foresee an enormous requirement for the use of native Windows applications under Linux. For this reason, they are making quite substantial technological investments. Although the fields of application may be targeted in slightly different directions from the above mentioned emulation concepts, the prevailing agreement is that there are more than a few Linux users who want to (or have to) occasionally execute Windows applications.

The starting point of a practical and functional emulation, in view of the performance available on home computers today, is not merely a dual-boot installation. An emulator puts Windows programs into a virtual machine and puts a safe and stable runtime environment at their disposal. In the inevitable eventuality of a Windows program crash, at worst you need only restart the emulator.

New with Win4Lin 3.0

Both version 1.0 (tested in issue 3 of Linux Magazine) and version 2.0 suffered due to their unreasonably complicated installation procedures, as well as due to their instabilities. This made normal, day-to-day work with the software only really possible with restrictions. At first glance, the new version has a new look with a graphical installation program as well as a set of detailed improvements concerning the hardware support of the host system (including SMP).

The stability of the new version is impressive. The annoying accompaniments of the previous versions have been done away with, such as the incorrect screen layout in the guest system window. Contrary to VMware, Win4Lin operates with complete transparency with regard to the data exchange and
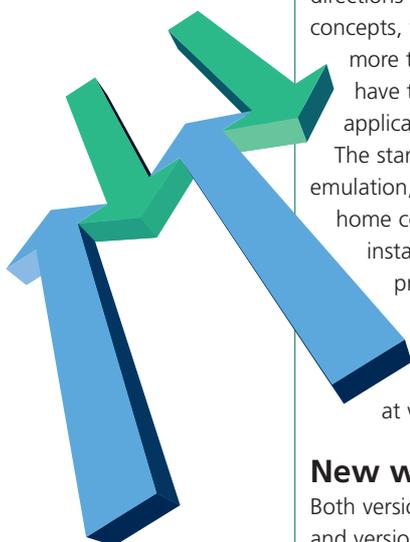
communication between the host and guest systems.

The user need not worry about any subsequent configuration, such as the installation of a virtual graphic support program onto the guest system, for example. Win4Lin, in guest operation, directly supports most performance characteristics of the host hardware. An example here is the practical performance of the 2D graphics, which has a resolution that directly matches the abilities of the physical graphics card. If you want similar functionality in VMware, a toolbox must be first installed.

The guest system's FAT32 filesystem is transparently shown in the host file system, i.e. it is displayed relative to any chosen directory position in the filesystem. A further innovation of Win4Lin 3.0 is a complete reworking of the network modes. This allows the full functionality of a genuine Winsock network between host and guest as well as the implementation of a virtual private network (VPN) between the guest Windows system and the Linux environment.

Concept

For users who are new to Win4Lin, it is useful to learn a little more about the operation or conception of the software prior to installation. From the user's point of view, Win4Lin 3.0 is in principle a Windows emulator that runs under Linux, which means that one basically uses Win4Lin to enable the execution of Windows applications on the Linux desktop.

The designation 'emulator', however, does not exactly hit the mark here, as neither Win4Lin nor its direct competitor VMware emulate the actual Windows 9x operating system. Rather, Win4Lin creates an environment within an X11 window, which makes the installation of Windows in an X11 or KDE window possible and necessary. The Windows operating system is not provided and must be explicitly installed after the installation of the Win4Lin environment. The user will therefore need his or her own copy of a Windows CD and the appropriate user license.

While VMware could be designated as a 'genuine' hardware emulator, one could call Win4Lin's concept a symbiosis between hardware emulation in the style of VMware, API emulation *à la* Wine and filesystem conversion. Regardless of how it is designated, Win4Lin is easier to use and more flexible than the competing products.

Following the installation of the host system and the subsequent installation of the Windows guest operating system, the Windows programs can be run by Win4Lin with breath-taking speed in a X11/KDE window directly on the Linux desktop. The real advantage is that Windows programs can save their data directly into the appropriate home directory of the Linux filesystem. This means that Win4Lin makes
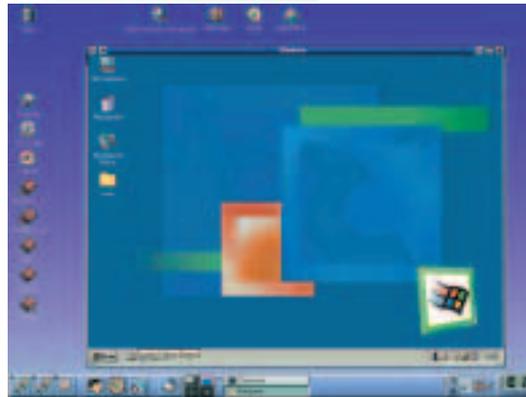

Figure 1: Windows Me running under Win4Lin without restricting the KDE window

the user files available parallel – both from a Win4Lin session and under Linux.

Core problems

Win4Lin displays enormous flexibility and performance, in particular concerning the above mentioned filesystem transparency between Linux and Windows. This performance is based on a specially modified kernel from NeTraverse, and as such, the installation of the software is unfortunately not the most simple of affairs. The difficulty is that Win4Lin's specially adapted kernel has to be integrated into the system.

Independent of whether you install Win4Lin directly from CD or with the help of the fully automatic Live-Installer (the latter is necessary if you use Win4Lin's 30 day download licence), there are three ways of putting a Win4Lin specific kernel into operation. The following kernel versions are all available in the download section of NeTraverse's Web site and on the CD:

● NeTraverse-enabled kernels are pre-compiled kernels for the most popular distributions and kernel versions. In each case, the RPM archives contain a finished kernel image.
● NeTraverse pre-patched generic kernels are patched kernel sources. In each case, the RPM

Data exchange

Although a network socket implementation is not fundamentally necessary for pure communication between host and guest, Win4Lin includes flexible network functionality, so that other hosts in the LAN can communicate with a Win4Lin Windows session. This also means that the network services or devices of the host system are available from a Win4Lin environment.

Another useful feature of Win4Lin is that the Windows CAB files from the installation CD need only be read in once during the Win4Lin installation and are stored directly in the Win4Lin shared directory in the host's Linux filesystem. You therefore do not need the CD to carry out a user specific installation of any future Windows 9x session. It is however unclear whether this method may be linked with hidden license violations.

Figure 2: One of the substantial improvements is the graphical installer

archives contain a tar.gz archive, which again contains the patched kernel sources and modules.
● NeTraverse patches are genuine kernel patches in the *.patch format, which one can apply to the earlier kernel sources as differences.

In the process of the installation discussed here, we will go through the simplest method first, i.e. the use of pre-compiled NeTraverse kernels. The NeTraverse server has the appropriate archives for the popular distributions of Mandrake, Red Hat and SuSE.

After unpacking the archives, the prepared kernel images land in the /boot directory and can thus be referenced directly in the local Lilo configuration. However, this simplification brings with it a certain degree of inflexibility i.e. the lack of available kernel sources allows no further adjustments to the prepared kernel.

Generic or prefabricated?

Another disadvantage of this prefabricated method is the fact that there is no guarantee that the kernel is up to date; this depends solely on the commitment of the good people at NeTraverse. At present, there is no prepared kernel for SuSE 7.2, although a SuSE 7.1-kernel (kernel 2.4.0) should be sufficient for normal users taking their first steps with Win4Lin. Those of you who need a newer kernel will have to use the more complicated method to access the generic NeTraverse kernel.

The NeTraverse-enabled kernels available online are normally more up to date. Although there was still no current SuSE 7.2 kernel (2.4.4) available at the time of testing, there was however a generic kernel of the version 2.4.5. The kernel sources supplied by NeTraverse allow more flexibility compared with the NeTraverse kernel images, because the kernel sources can be accordingly adapted to one's own needs.

The most attractive option for users who want to be able to adapt their own kernel for specific functions, is the NeTraverse Patches version. Users are

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You can naturally create your own appropriate boot disk if the local Lilo configuration is to remain untouched. After this, install the Win4Lin 3.0 application on your own. The package is present on the Win4Lin CD or on the NeTraverse server under /cdrom/ Win4Lin/ RPMS/ i386/ Win4Lin-5.2.0d-1.i386.rpm in the RPM format. However, the installation requires a correct licensing of the product.

For this reason, the win4lin-install installation script must be used for the installation of the RPM package. Apart from the licensing considerations mentioned in the above paragraph, this ensures that the software is unpacked at the intended directory positions, i.e. var/ win4lin or opt/ win4lin. Win4Lin cannot be used without a valid license file, and this also applies to the demo version.

After correct registration, the licence file is sent as an attachment by email is sent. This should be done prior to download. The license file is a simple ASCII file and must be saved under /var/ win4lin/ install/ license.lic before Win4Lin is started the first time. The above mentioned installation script automatically applies the license file. If you already installed the Win4Lin binary package Win4Lin-5.2.0d-1.i386.rpm with kpackage, you can copy the license file to the designated position by hand.

thereby able to operate Win4Lin without compromises.

Installation overview

The installation of Win4Lin has always been relatively complicated due to the core of the product, i.e. the adapted kernel. In the new version however, this has been decisively simplified. Installation now requires the following three steps:
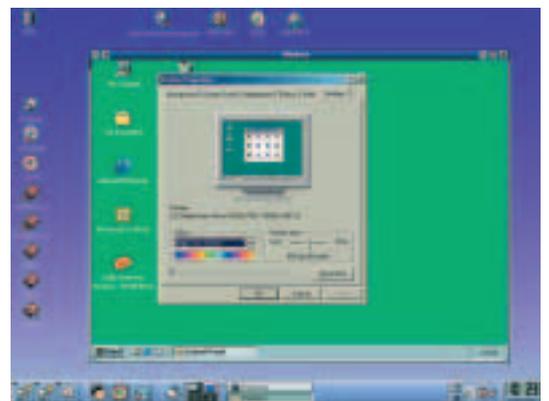

Figure 3: With Win4Lin display settings are easy to adjust

Figure 4: The installation is now menu driven and thus substantially simpler than in the previous versions

- Install a kernel adapted for Win4Lin, or integrate a present Win4Lin kernel into the existing Lilo boot management. Boot with the Win4Lin kernel. This step must be executed as root.
- Install the Win4Lin software, including licensing, with the help of the install-win4lin.sh script; read in the Windows CAB files from a Windows 9x installation CD; and then read in the Windows system files from a bootable Windows start disk with the help of the new win4lin-install graphical installation program. This step must be likewise executed as root.
  Please note: The new graphical installation program should not be mistaken for the installation script for the Win4Lin package. The win4lin-install program presumes that Win4Lin has already been successfully installed.
- Configure a user specific or system-wide Win4Lin session with the help of the menu-driven configuration tool winsetup. This is to be started as root for the system-wide part of the configuration, or user for the user specific part of the configuration.

After completing these three steps, you can start a Windows session at any time as a normal user by entering win in the command line (in a terminal). When starting win for the first time, a Windows box will be started and the necessary Windows 9x installation will be initiated (if the Windows CAB files were correctly installed in step 2). You can likewise complete the installation of the Windows CD during step 3 in the system-wide section with the help of winsetup.

Installation assistance

NeTraverse offers a variety of different installation options up to and including a completely automatic online installation including the download of the necessary kernel, program data and patches. For this reason, we cannot describe the installation in all its conceivable versions.
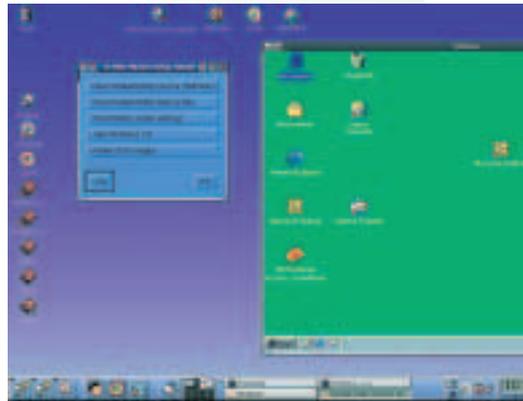
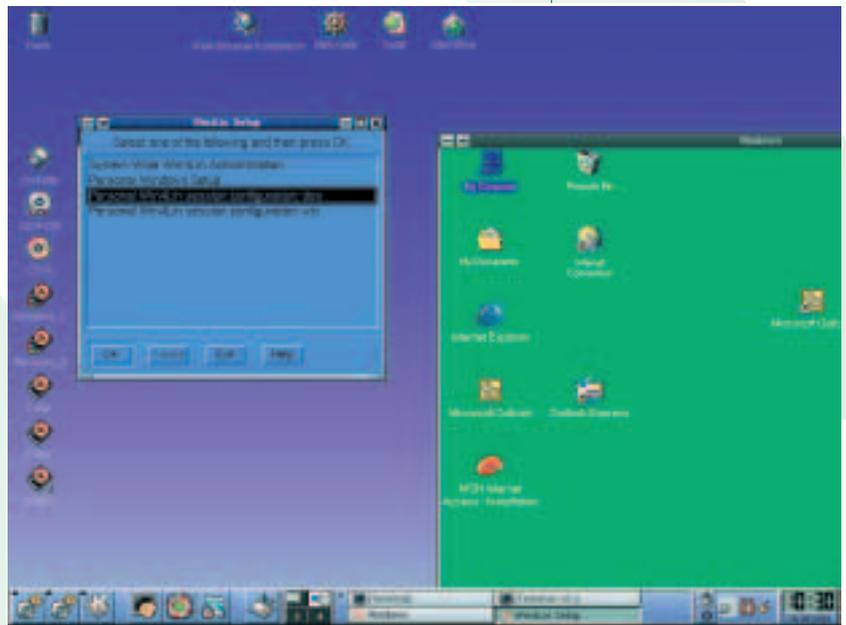All in all, NeTraverse seems to favour online

installation, since this gives the manufacturer the possibility of collecting registration data from the user. Apart from this, the installation script enables the analysis of one's own system environment and thus the automatic supply of the suitable kernel version.

For those of you who are seriously interested in carrying out the online installation, there is outstanding documentation to be found both online and offline. This provides detailed information about the operational sequence, so that you are completely informed as to what the installer does or which entry it expects at any given point during the installation process.

We will now demonstrate the simplest and fastest method of Win4Lin installation – using a Win4Lin program CD. We carried this out using the scheme described above, without the help of the CD installation documentation. Our test computer had a freshly installed SuSE version 7.2 operating system, plus online updates from 01.09.2001. Since the Win4Lin CD does not contain a suitable pre-compiled kernel image for SuSE 7.2, we simply installed the kernel image 2.4 for SuSE 7.1, which
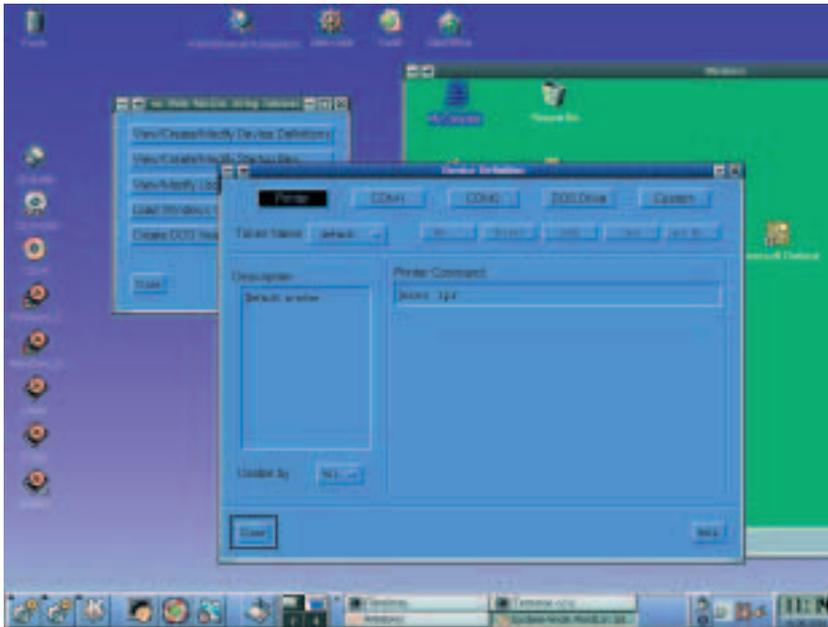
Figure 7: With the help of the menu-controlled tool winsetup a printer can be created for the guest system

this means a usable kernel image, win4lin, was put directly into the boot directory. This was then easily located and inserted into the Lilo configuration file /etc/ lilo.conf. The Win4Lin kernel was subsequently booted without a problem.

Graphical installation

Only after all the preparatory installation work is completed can the afore-mentioned graphical installation program be put into action. Newly developed for Win4Lin 3.0, the designation "installation program" is hardly appropriate here: The tool is less about the installation of the Win4Lin binaries and more about the set up of the guest environment for Windows 9x. You will find the program for example on the Win4Lin CD under /cdrom/ install-win4lin.

Those of you who have two CD drives (for example an additional CD writer) can start the program directly from CD, i.e. the Windows CD can be read in from the CD writer. In the first step, the graphical installer reads the CAB files from the Windows CD and stores these in a prepared Win4Lin drive on the hard disk. In the next step, a bootable Windows start disk is needed, from which the Win4Lin installer takes over the Windows system files. The preset configurations of a Windows session are thereby concluded and Win4Lin is operational. In the following step you will install the Windows 9x operating system.

Preparing a Windows session

Before Windows can be installed, a suitable system environment for the virtual system must be prepared. This involves fine-tuning the hardware emulation, and to do this, another configuration tool is used. The tool in question is the menu-driven winsetup application, and you can start this as either a normal user or as root from a terminal. This serves to set up the most important environment parameters for a local Windows session, such as the paths to the user directories and Windows system files, or the allocations of the machine files or the used devices of the host system. With the help of winsetup, you can also implement additional optimisation settings for the graphics support program. If you start winsetup as root, the settings will apply system-wide.

If you want to implement a user-specific configuration, you will need to operate winsetup as a user. After this, you can start a Windows session at any time by entering win. When you call up win for the first time, it will initiate a normal Windows installation in the exact same way as with a native installation.

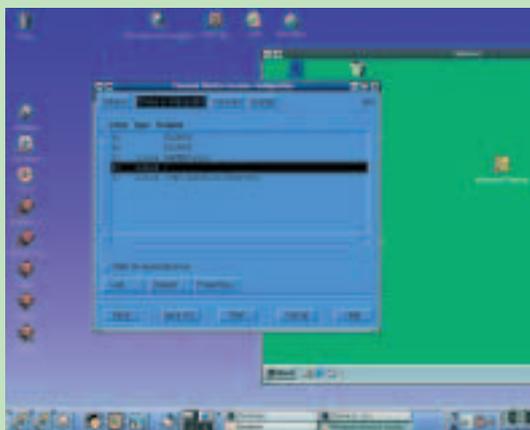But first back to winsetup. Configuration using winsetup is divided into a system-wide section (winsetup must be called up from root) and a user-

can be found on the CD as an RPM archive under /cdrom/ LINUX/ RPMS/ kernel-Win4Lin2-SuSE7.1_2.4.0-03.i386.rpm. The installation via RPM can be executed free of problems with kpackage. By

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Figure 8: Illustration of the drives under Windows and the paths in the filesystem

specific section. The latter helps each Win4Lin user configure his or her own personal Win4Lin session. In the system-wide section, the administrator can set up additional native DOS partitions or virtual DOS drives, such as the so-called 'Shared Drive' J:. More information on the drives provided by Win4Lin can be found in the following section of this article. Note that in the system-wide section of winsetup, there is yet another possibility of installing the Windows CD (CAB files).

Before you start to install Windows, you should adjust the paths and mappings to the personal drives as well as the Windows drives (C:) in the user-specific section of winsetup. These are found below $$HOME/ win directly in the Linux filesystem. To check, you can also have a look at the default specifications. You can then initiate a Windows installation as a normal user within the Win4Lin session with win.

Hard drive letters

The C: drive, under $$HOME/ win, in the Linux filesystem is directly addressable. Make sure that the authorisation details for the respective users work for this directory. If there is no longer enough space in the Linux filesystem for a standard Windows installation, this need not be a problem: Linux lets you spread the load with symbolic links to other partitions.

A J: drive also exists by default in each case. This stores the so-called DOS-shared drive and the Win4Lin system files for all users. The J: drive also contains the previously mentioned Windows CAB files from the installation CD, so that individual users can carry out further Windows installations on the basis of their respective personal drives. This can be done at any time without having to access to the Windows CD. The position of the J: drive is /var/ Win4Lin.

Besides the two floppy disk drives A: and B:, you can also configure access to a Linux CD-ROM drive (allocated the letter N:) in the system-wide Win4Lin configuration. Apart from this, it is also possible to create DOS sessions, or (if required) more native DOS partitions within the Win4Lin configuration. These DOS sessions are based on a so-called virtual device, similar to the VMware method.

The respective mappings can be produced with winsetup. In the default setting, Win4Lin establishes the virtual DOS device D: with a rudimentary DOS 7.0 system.

Working with a Windows session

The Windows installation under Win4Lin takes place in exactly the same way as with a native Windows installation. The simplest way to start the installation is to start winsetup as user (not as root) and therein select the Personal Win4Lin-Session... menu item. The personal drive is then booted with the help of the
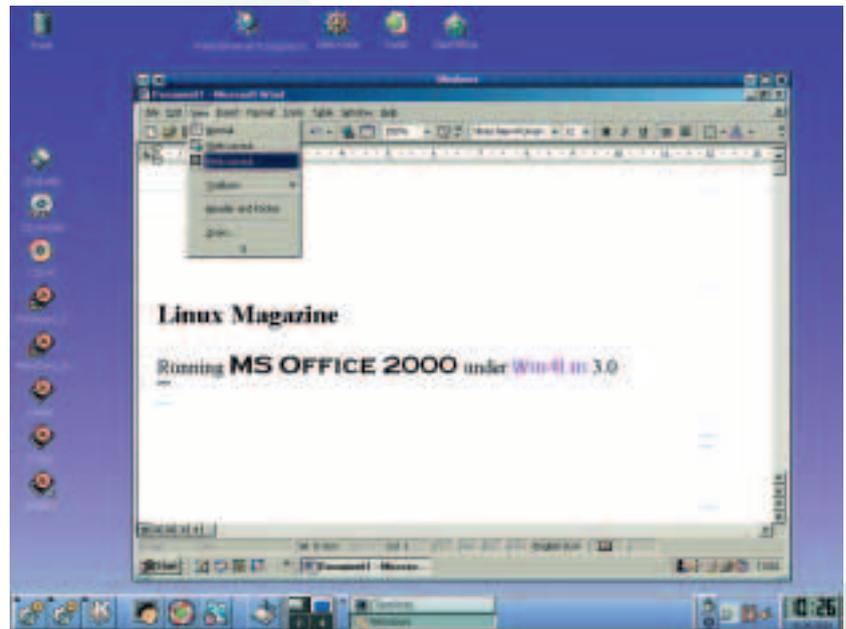

Start button. This checks if Windows is currently installed, and if not, automatically continues with the introduction of the Windows installation.

In practical use, Win4Lin 3.0 surprises with its considerable performance and, for an emulation, amazing stability. A complete Windows session is loaded and initialised with extreme speed – noticeably faster than with native Windows. Standard applications such as Microsoft Office 2000 can be operated with refreshing speed, even on a relatively slow 800MHz computer.

The rate of data transfer is also impressive because Win4Lin can access physical devices block-by-block. This applies whole-heartedly to Win4Lin's personal drives, which are physically displayed in the Linux filesystem. The performance is slower when using the virtual disk devices, which Win4Lin controls (as does its competitor VMware). This performance is however clearly faster than VMware and within the comfort level for practical use.

Surprisingly, the extremely high performance doesn't lead to any unpleasant side effects. Along with filesystem transparency, this is one of the primary development specifications at NeTraverse.

Figure 9: Classical Win32 standard applications such as Office 2000 run without a problem under Win4Lin

Summary

Win4Lin 3.0 gives Linux users the ability to access and operate classical Windows 32-bit applications such as MS Office or Intuit Quicken.

Win4Lin could be a very useful tool for developers, or other users who are absolutely dependent on the fast and flexible availability of both operating system platforms (cross development, Web developers, system administrators and software testers, for example). Win4Lin 3.0 gives users a functionally comparable to Vmware express, but is both cheaper and faster. Indeed, Win4Lin 3.0 (and also VMware express) may have reached the limit of what is currently technically feasible with Windows emulation.