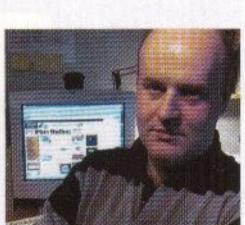
LINUX & WINDOWS

Linux for Windows users

An introduction to disk partitioning and running Linux alongside or on top of Microsoft Windows.



Frank Charlton
Frank has worked with PCs since the early 1980s, and has been using and writing about Linux since he discovered the first versions on Atari and Amiga. He is a regular contributor to *PC PLUS* where some of this material has appeared previously.

This six-page beginners' tutorial looks at the work involved in preparing hard drive partitions to accept a fresh Linux installation, both on stand-alone machines and PCs where Linux is forced to share disk space with Windows. However, if the idea of plonking Linux onto your new Windows machine is too scary to contemplate, the third section deals with variants of Linux which run at the same time as Windows in ways that don't require any hard drive manipulation whatsoever.

Despite the inclusion of partitioning utilities either alongside or within modern Linux distros, the thorny issue of drive partitioning is still something of a hot topic for many Linux novices. Back in the mists of time, performing a new installation was not a job for the faint-hearted. The original installation programs for early distributions like Red Hat and Slackware were completely text driven, and there were none of the concessions toward ease of use and friendliness that we take for granted these days.

Original Linux installation programs simply assumed two basic things about potential users: that they knew how to manually partition a drive and make space available, and that they had already done it before going anywhere near the Linux installer itself. Most operations were carried out using arcane MS-DOS tools like *FIPS*, a tool that split and resized existing Windows partitions to make room for Linux. Thankfully, the Linux market has changed a lot in the last couple of years: every Linux distribution worth a Linux novice's attention has managed to come up with some way of making the task of partitioning drives as painless and transparent as possible.

Before we begin, there's one thing we can't stress clearly enough – back up your system before you begin if you're intending to install on a system that already has Windows running on it. Read exactly how and why you should back your system up before you proceed in the boxout on the right. It's important, and *Linux Format* cannot be held responsible if you fail to act on the advice and lose important data.

Back up, back up, back up!
Make a copy of all your old data

An image back-up tool such as *Norton Ghost* is useful – it can even back up your Linux partitions once you've finished!

Things can – and at some stage, probably will – go wrong. Even a perfect installation, which is carried out with the utmost time and care, can fall victim to circumstances beyond your control. If you're in the middle of performing a critical operation such as resizing and restructuring your Windows partitions and you suffer a simple power failure, the end result is likely to be the complete loss of your data. Add the human error factor – we all click the wrong button sometimes – and you can see the potential for tears when installing a new OS.

Don't let this put you off! All this talk of disaster and data loss can easily be avoided by making a backup of your system before you even take the Linux installation CDs from their cases.

Backups come in two basic flavours – file and image. A normal file backup is one carried out by a program like *Microsoft Backup* or *Dantz Retrospect*, where each and every file is copied and saved. This is fine for normal disaster prevention, but won't always protect against the sort of situation we're discussing here, where complete partition loss can occur. A better option is a tool such as *Norton Ghost* or *PowerQuest DriveImage*. These tools take a complete snapshot or image of the contents of your drive, complete with all partition information. If the worst happens, you can restore your PC to its exact pre-disaster state. If you have a removable media drive then back up to that – even a CD writer will do if you have enough blank discs.

Partitioning your hard disk
Making room for Linux

Generally, partitioning solutions fall into two camps – those which are executed outside of the Linux installer itself, and those which are internal routines carried out as part of the installation process. The former usually takes the form of a well-established Windows utility, often a cut-down version of best sellers like PowerQuest's Partition Magic. If your chosen distro follows this route, we can assure you that there is very little chance of anything cataclysmic happening to your data should problems arise. First of all, these programs are commercial quality, and generally undergo rigorous testing before they reach the release stage. Secondly, without being too patronising, their Windows heritage means they're usually extremely well protected against the curse of user error, so that plenty of warnings are given even if you try to overwrite your main Windows boot partition.

Essential links

The Linux Partitioning Mini-FAQ http://kmself.home.netcom.com/Linux/FAQs/partition.html.
Slightly out of date, but still contains useful information.
Experts Exchange www.experts-exchange.com/Operating_Systems/Linux/Q_20173134.html
Some excellent user-contributed advice concerning practical partitioning issues.
The Linux Filesystem Explained www.freeos.com/articles/3102/
Slightly technical, but a good primer on what the various parts of the filesystem actually are.
The LILO bootloader www.linux-tutorial.info/cgi-bin/display.pl?68&0&0&0&3
A terrible URL to try typing correctly, but an excellent explanation of the default Linux boot manager.

The second method can always be thought of as an unknown quantity to some extent, and we certainly can't blame anyone for feeling a little cautious when allowing an unknown program to run riot across precious hard drive partitions. All we can say to offer an element of reassurance, is that we've happily allowed many a Linux distribution to carry out the necessary partition manipulation without a single disastrous occurrence, both on our own machines and those belonging to friends and colleagues.

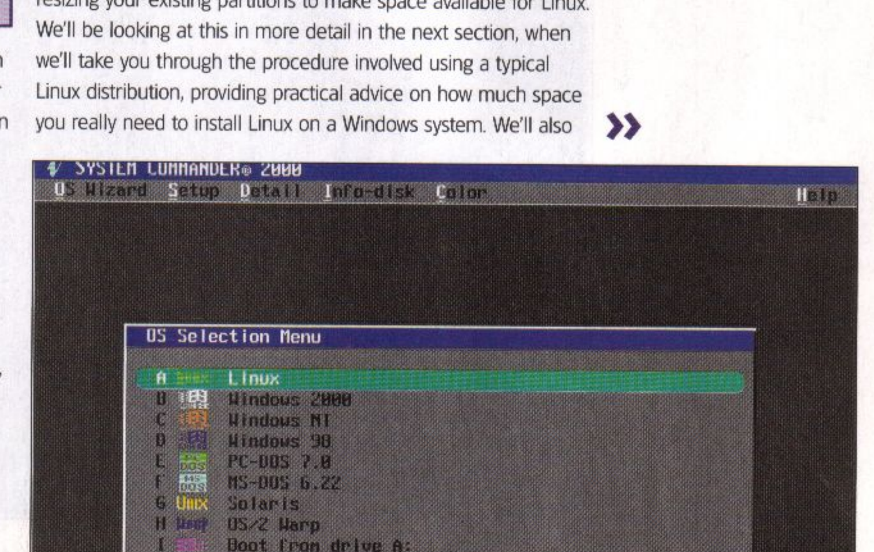
When the time comes to actually carrying out the partition jiggling, there are a number of things to think about. If you're planning on installing Linux as the sole operating system on a PC, then your worries amount to exactly zero. Wipe the entire hard drive, and sit back and watch as your chosen distribution's installer happily hogs every acre of disk space as the new home for Linux. For that matter, this approach is often the best way to go if you're nervous about tinkering with the default settings of a shop-bought PC which came with Windows pre-installed – dig that old PC out of the loft, or pick up an older model at a ridiculously cheap price and let it become your dedicated Linux workstation. Linux is a lot happier with older hardware than Windows will ever be, and even a knockdown old Pentium will happily run most distros without the slightest hint of a problem.

Dual booting

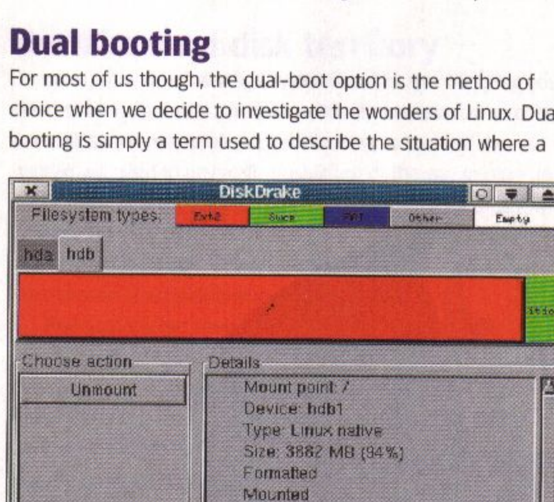
For most of us though, the dual-boot option is the method of choice when we decide to investigate the wonders of Linux. Dual booting is simply a term used to describe the situation where a PC plays host to more than one operating system, and can boot into either without one interfering with the other.

It's likely that your PC manufacturer has already partitioned the entire hard drive surface, formatted it and handed it on a plate to MS Windows. In cases like this, there are two ways to proceed. The first and probably most sensible is to install a second hard drive mechanism, and give that entirely over to Linux. In this case, the Linux installer doesn't need to touch your existing Windows partitions at all, and will partition and format the new mechanism for you. The pros are obvious – keeping the operating systems completely separate reduces the chance of misfortune either during installation or later on. In addition, it takes away the grief of interfering with your Windows partitions.

The second method is only slightly more risky, and involves resizing your existing partitions to make space available for Linux. We'll be looking at this in more detail in the next section, when we'll take you through the procedure involved using a typical Linux distribution, providing practical advice on how much space you really need to install Linux on a Windows system. We'll also »



If you want to dual or multi-boot more than one OS, you'll need a boot manager



Many Linux distributions come with their own internal disk and partition manipulation utilities

Mount points explained
'Fake' directories = more advanced functionality than MS Windows!

Windows and Linux handle disk drives and partitions differently. Since the early days of MS-DOS, Windows has always used a specific method of referring to and accessing hard drives and partitions, which we know as the drive letter method. When Windows loads, it assigns a letter to each drive on the system, whether it's a physical hard drive, partition, CD-ROM, floppy or other removable media drive. The hard drive the PC boots from is always labelled as **C:**, and the floppy can always be accessed via **A**. It's an easy system to get to grips with, and while it's not necessarily that efficient in advanced terms, it gets the job done and ensures an easy life. For most of us.

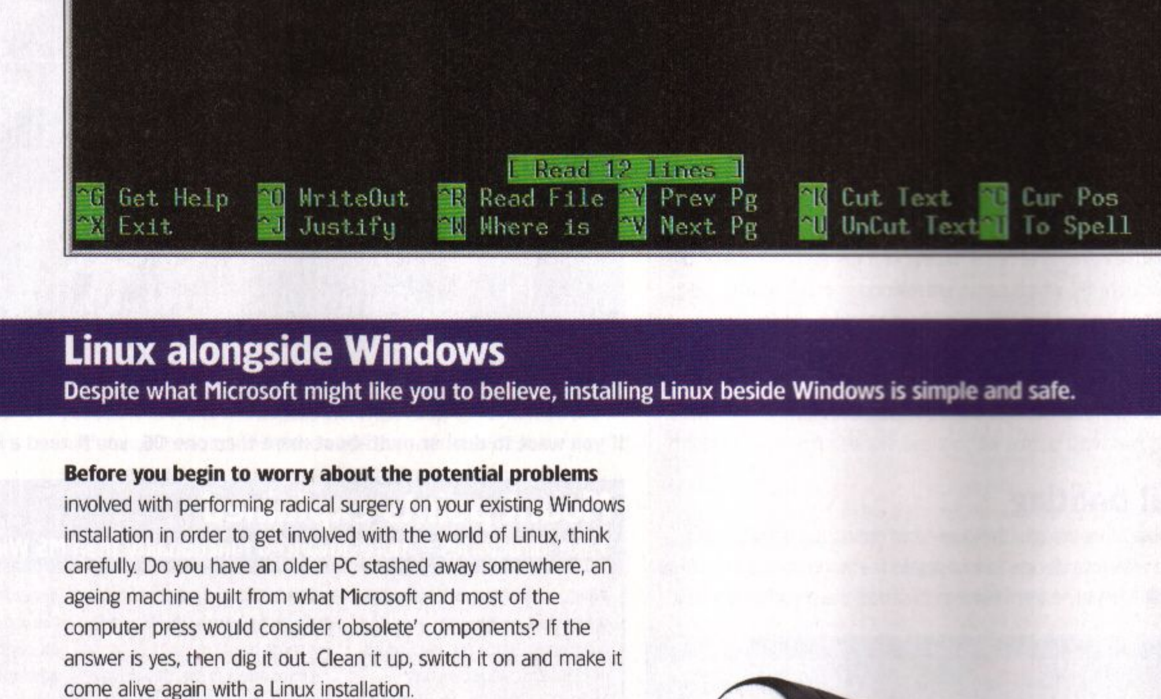
Linux doesn't use this drive letter access model. Rather, it uses something called **mount points**. This is an issue that confuses many of us when we're making the first tentative steps into the Linux world. To put it simply, a mount point is essentially a fake directory in the Linux file hierarchy that actually leads to a physical disk or partition. When you create a shortcut to a drive in Windows and place it on your Desktop, it's a similar arrangement.

While Windows places itself and just about everything else including the Program Files directory on the boot drive, Linux doesn't. The Linux filesystem is much more advanced, and allows for complete configuration. With a normal Linux installation, the installer will recommend that you place some parts of the filesystem on different partitions – at the very least, **/usr** and **/home** should be separate. When you're looking at the root directory of a Linux system, you'd see usr and home as two directories. Moving into these folders actually takes you to separate partitions, but Linux does this with such ease and transparency that you're never aware of it – nor need you be.

« be discussing the various boot managers available that handle the task of choosing which operating system to boot when you switch on. Every Linux distro comes with one or more included, but there are some very good commercial equivalents available which can make the experience a lot more pleasurable.

Finally, there is another option to consider – using a version of Linux which doesn't require any kind of partition manipulation at all, and actually runs from within Windows, making use of the standard Windows filesystem. There are dedicated distros available that do this, as well as solutions like *Virtual PC* and *VMWare* (see page 18) which act as a host for the alien operating system of your choice. We'll examine this more in the last section.

The file /etc/fstab is where the mount points are actually configured – but don't edit by hand unless you know what you're doing.

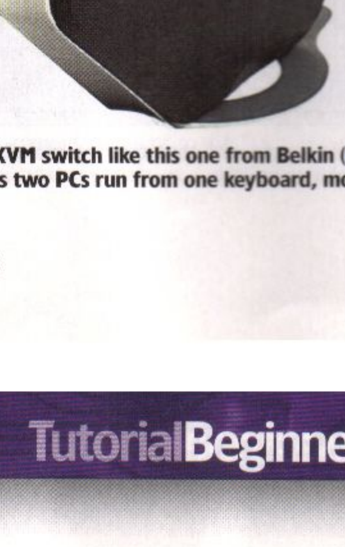


Linux alongside Windows
Despite what Microsoft might like you to believe, installing Linux beside Windows is simple and safe.

Before you begin to worry about the potential problems involved with performing radical surgery on your existing Windows installation in order to get involved with the world of Linux, think carefully. Do you have an older PC stashed away somewhere, an ageing machine built from what Microsoft and most of the computer press would consider 'obsolete' components? If the answer is yes, then dig it out. Clean it up, switch it on and make it come alive again with a Linux installation.

Using a stand-alone PC

Linux in its most basic form will run on the oldest machines – well, almost. The original versions of the operating system were designed for much older processors than the 2GHz monsters you see in shops these days, and Linux will still run perfectly well on older hardware. Many of us who've been using PCs for years have older machines using 486 or even 386 processors gathering dust in lofts and storage boxes, and these can make ideal test-bed machines for the start of a Linux hobby. As long as they have the basic required hardware – a working base unit with processor and hard drive, a monitor and input devices – then there's no reason for them to sit dormant. If you're not going to use your old PC for Linux, your local Linux User Group can probably put you in touch with a charity who will be grateful of your hardware donation!



A KVM switch like this one from Belkin (www.belkin.com) lets two PCs run from one keyboard, mouse and monitor

If you're short on desk space, then pick up a KVM switching device – with one of these, your old machine can share keyboard, mouse and monitor with your new one, switching over whenever you like.

If you don't have an old machine but like the idea of leaving your shiny new Windows PC well alone, then pick one up second-hand. As well as the obvious approach of finding an old machine at a computer fair, many outlets now refurbish and sell older machines at very low prices, advertising them as 'Internet Ready PCs'. Generally, you can pick up an older first-generation Pentium machine complete with refurbished 14-inch monitor, keyboard and mouse for around £150. Buy a KVM switch and just the base unit and you can expect to pay even less.

Armed with a stand-alone PC, you can happily devote the whole thing to Linux. Whichever distribution you opt for, the installer will provide an option to format the entire hard drive and claim the space for itself. In this case, you can go with the recommended partition options all the way, since there are no concerns about leaving space for Windows.

Using an existing Windows PC

For those of us without the resources, space or desire for setting up a separate Linux machine, the only option is to install Linux on the same machine as Windows – unless you're feeling brave enough to do away with Microsoft completely, that is!

Running more than one operating system on the same PC is of course entirely possible, and no matter what Microsoft would like us to think, it's neither especially difficult or detrimental to Windows itself. The process is known as 'dual booting', since the two operating systems exist side-by-side and you choose which one to boot your PC into whenever you switch on. While both operating systems will to some extent be aware of the other's existence, on a correctly set-up dual boot system you can happily use either without fear of one interfering with the other.

Most modern off-the-shelf PCs come with a single hard drive installed, which is usually very large and offers much more space than you actually need for Windows. Whether Windows needs it or not is neither here nor there at this point though, since it will have claimed it all for itself.

Reclaim hard disk territory

To install Linux on an average system like this, the first thing you need to do is fight with Windows a little and reclaim some of that idle disk space. You can't just tell Windows to back off though; instead will need to physically push it out of the way in order to get some space back. Basically, there are two ways you can achieve this – by using a stand-alone third-party application such as *PartitionMagic* from PowerQuest, or by entrusting the task to your chosen Linux distribution.

Both approaches have advantages and disadvantages. Using a partitioning tool yourself gives a greater degree of control and flexibility, but allowing the Linux installer to do it makes for an easier life if you're not sure exactly what you're doing. From the standpoint of a complete novice to both Linux and performing surgery on disk partitions, we'd go for the latter option and use the tools built into your Linux distro's installation program. These have been tested to death, and offer just as much safety as the proprietary third-party application route, so you can trust them.

Most Linux installers will offer different degrees or classes of installation, depending on what you want your new operating system to do. These range from a bare minimum console-only installation to a full-blown graphical Windows replacement OS, complete with almost every application you can imagine. Which one you opt for is entirely up to you, but remember this – you can always add more applications to your Linux system at a later date, and it's best to make sure you have some spare space on your hard disk to play with when the time comes.

Essential links

POWERQUEST www.powerquest.com
Home of the company behind back-up tool *DriveImage* and partition tool *PartitionMagic*. If you have an older version, you may need to upgrade, especially if you use Win XP.
SYMANTEC www.symantec.com
Stop here for information on *Norton Ghost*, the award-winning image back-up and restoration tool.
OPEN WATERS www.openwaters.net/linux/
For information on dual booting with Windows XP.
ZDNET www.zdnet.com.au/itmanager/technology/story/0,2000029587,20265546,00.htm
For info on using Linux on a machine hosting Microsoft's newest OS.

Partitioning for Linux

At the most absolutely basic level, you will need a minimum of two partitions to install Linux. One will hold the OS itself, and the other will act as swap space. While Windows uses normal disk space to hold the swap files used by virtual memory, Linux doesn't and requires a dedicated partition. Your installer will recommend how much space to use, but don't go for anything less than twice the amount of the physical memory your PC has – it's better to have too much swap space than too little.

Ideally, you'll go with more than one filesystem partition, though. If you can afford the space, go for three – swap, main filesystem and a home partition. This system will be suggested by your installer anyway, since keeping the /home directory hierarchy separate from the system files improves reliability and performance. If anything should happen to the main filesystem, your user data files are safe on a discrete partition and you can even reinstall the OS without losing personal files. Again, it's pointless us giving exact figures here, as it will depend entirely on factors including how much drive space you have to play with and how many users will be requiring accounts on your Linux system.

Go with the recommendations of your chosen distro's installation program and you won't go far wrong. »

A tool such as *PartitionMagic* is essential if you want full control over how much space both Windows and Linux can use

Linux on top of Windows
Safe solutions where Linux requires no disk manipulation

So far, we've looked at the work involved in preparing hard drive partitions to accept a fresh Linux installation, both on stand-alone machines and PCs where Linux is forced to share disk space with Windows. However, there are other ways that you can investigate, learn about and use Linux – ways that don't require any hard drive manipulation whatsoever. In this section, we're examining these alternative solutions – variants of Linux that run at the same time as Windows.

It's standard practice for a computer – any computer, and not just the PC – to run one operating system at a time. After all, the OS is the control program that provides the entire working environment, so why would you possibly want to run more than one concurrently?

There are actually many reasons for wanting to do this, but for the purposes of this article, the answer can be reduced to a single word – convenience. As we've seen, installing Linux onto a PC that already hosts Windows is a process fraught with potential problems. Even a smooth installation can mean time and drive space invested on an OS that you might not even like – after all, there's a vast choice of Linux distributions out there. So, surely you shouldn't have to commit to a full install every time you want to try one out for size. In many cases, you don't have to.

Tinkering with Linux

Essentially there are two ways to tinker with Linux without carving up your drive partitions or installing an extra hard disk. The first is to use an OS hosting device – a virtual machine, effectively – to run another OS on top of Windows. The second is to use a customised Linux distribution that's built specifically to run on top of your existing Windows system. There are pros and cons to both of these approaches, which we'll be examining here.

Customised distros

A while ago, a few clever programmers cottoned on to the concept that not everyone is willing or able to go through the process of re-partitioning their hard drive and installing an alien operating system.

***Topologilinux* is more flexible than *WinLinux*; it will even happily sit on top of newer versions of Windows, such as XP.**

WinLinux 2003 might look like an ordinary Linux desktop, but this is Linux running full-screen on top of Windows 98.

To the sheer horror of many hardcore Linux aficionados, a new breed of distribution was born – a version of Linux that ran on top of Windows, and didn't require specific drive partitions formatted with the Linux file system.

Most of these Windows/Linux variants operate under the same principle. A large file is created on the Windows drive, which acts as a virtual hard drive, and the customised distro is installed inside that 'container' file. Once this is done, the version of Linux is booted-up as easily as any Windows application, by simply launching it from the Desktop. Depending on the distribution, it may then run inside a window, take over the entire screen, or offer the possibility of both. Either way, you have a full version of Linux, which thinks it's running from dedicated drive partitions but is easily accessible without the usual boot manager.

The advantages of this approach are obvious. Firstly, you don't need to worry about dividing up or re-partitioning your hard disk. Secondly, you don't need to leave Windows during the initial installation process, or use custom boot disks or CDs to install. Finally, you don't ever need to leave your Windows environment to enter Linux, since the whole thing is done within the confines of Microsoft's OS. For many novices, these reasons alone are enough to investigate this type of user-friendly Linux distro, and a number of them have appeared over the last couple of years.

Running one OS on top of another isn't without its pitfalls, though. To begin with – no matter what the manufacturer's blurb may tell you – this type of Linux is never as fast in use as a real installation to dedicated partitions. The Linux filesystem is effectively emulated inside the large container file, which lives on a drive that uses the standard Windows filesystem – it isn't hard to see that writing a file to disk effectively means two sets of operating system calls. Having said that, as long as you're using a reasonably fast PC the difference is not huge – and if you've never experienced a genuine Linux installation you'd be none the wiser anyway. With these points in mind, it's time to look at some of the commercially available distributions that are able to run on top of Windows.

WINLINUX 2003 Probably the best known of all the Windows-hosted Linux distributions is *WinLinux*, now in its 2003 version. WinLinux has been around for quite a while, and has proven itself to be very stable indeed.

The latest release is a variant of Red Hat 7.3 using kernel release 2.4.18, and comes with the latest version of KDE 3. Installation is ludicrously simple, since it all runs from a standard Windows install program. There are no difficult technical questions to be answered, and you can have the entire thing up and running as quickly as you would any normal Windows application – it really is that simple. Hardware detection is performed automatically, and your Windows settings cloned as accurately as they can be.

As long as your hardware is supported by Linux *per se*, *WinLinux* will identify and configure it without you having to.

Why go all the way?
Other ways of running Windows apps on Linux

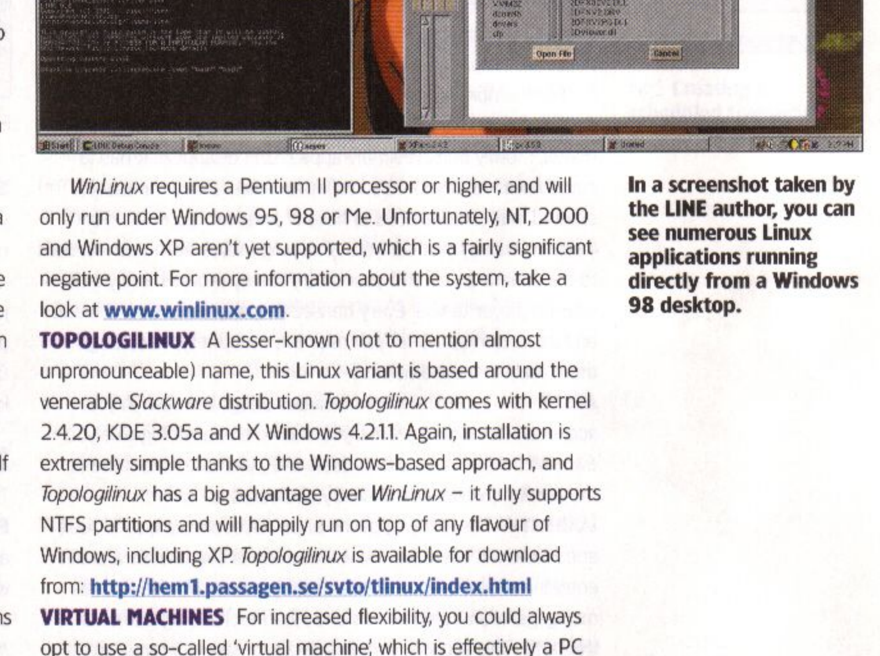
In an ideal world, applications written for specific operating systems would happily run under any other OS.

If you read *LXF* issue 42's six-page feature, you'll know about WINE, the project that enables you to run Windows programs directly from your Linux desktop. It's not an emulator as such (as the recursive WINE is Not an Emulator name affirms), but rather an implementation of the Windows API, which sits on top of Linux.

Amazingly enough, a project to perform exactly the opposite is also underway. LINE – guess what the acronym stands for – is dedicated to making it possible to run Linux programs directly from Windows without requiring Linux itself to be installed. Like WINE, LINE is what's known as a 'compatibility layer', which intercepts system calls from Linux applications and translates them into the Windows equivalent, if possible. Also like WINE, it's still in development and won't run any Linux commands or applications directly out of the box.

At the moment, LINE is alpha software, meaning it hasn't even reached the less flaky beta test stage yet. Unless you're technically proficient with Linux, we wouldn't recommend you tinker too much with LINE just yet. It's fresh but unstable, and likely to fail unless you have the knowledge to pursue a particular solution.

So why feature LINE in a Linux tutorial aimed at the beginner? In a word, potential. We first featured WINE many moons ago in its infancy, and even getting a simple application like Notepad to run was a chore. WINE has now evolved into a mature product, and comes ready-to-use with many Linux distros. With support from the active developer community, we expect LINE to progress along the same lines. Operating system convergence and cross-compatibility is a hot topic for the future, and you can read more about LINE at http://line.sourceforge.net.



In a screenshot taken by the LINE author, you can see numerous Linux applications running directly from a Windows 98 desktop.

WinLinux requires a Pentium II processor or higher, and will only run under Windows 95, 98 or Me. Unfortunately, NT, 2000 and Windows XP aren't yet supported, which is a fairly significant negative point. For more information about the system, take a look at **www.winlinux.com**.

TOPOLOGILINUX A lesser-known (not to mention almost unpronounceable) name, this Linux variant is based around the venerable *Slackware* distribution. *Topologilinux* comes with kernel 2.4.20, KDE 3.05a and X Windows 4.2.11. Again, installation is extremely simple thanks to the Windows-based approach, and *Topologilinux* has a big advantage over *WinLinux* – it fully supports NTFS partitions and will happily run on top of any flavour of Windows, including XP. *Topologilinux* is available for download from: **http://hem1.passagen.se/svto/tlinux/index.html**

VIRTUAL MACHINES For increased flexibility, you could always opt to use a so-called 'virtual machine', which is effectively a PC within a PC. Using a system like this, you can play host to just about any operating system you like, and can have as many as you need sat alongside each other, disk space permitting. This approach offers supreme flexibility, giving you the chance to investigate more than one Linux distribution at the same time before making your mind up. You can also choose to use any distro you like, and you're not locked to one particular vendor, as you would be with proprietary solutions such as *WinLinux*.

VMWARE The original and most successful commercial virtual machine, *VMWare* has been around for a long time. And justifiably so, since it's a superb product. Install VMWare, set up a couple of virtual machines using the wizards, and install your chosen distros just as if you were sat at a completely separate PC.

However, you really do need a fast PC with lots of memory to get the best from *VMWare* (or indeed any virtual machine). The system will run on slower machines, but you won't get an awful lot of work done, as even simple tasks like clicking between apps can take more venerable systems an age to process. *VMWare* isn't cheap either, but you can request a demo key, which gives you free access to the full program for a limited time. If your hardware is up to the task, give it a try. LXF

Essential links

WINAXE www.xwinpro.com/x-windows-on-windows.html
WinaXE is another implementation of Linux that sits on top of Windows, and offers full support for all versions of Windows.
WINE www.winehq.com
See how work on running Windows apps on Linux is progressing.
VMWARE www.vmware.com
Download an evaluation copy of this superb virtual machine and request a demo key.
CONNECTIX VIRTUAL PC www.connectix.com
Another very smooth virtual machine from the company sued by Sony for its PlayStation-on-PC software a while back. Solid, flexible and well worth a look if you're willing to break the Open Source tenets and spend a little money on this worthwhile application.