Virtualisation: if you could turn back time…

Virtualisation is the running of one operating system (OS) – complete with settings, files and applications – on another. If your library offers customer access to PCs, then with virtualisation you can provide a clean copy of Windows – or for that matter Linux – every morning, untouched by any changes made by users during the previous day. Each PC can be set up to provide exactly the same interface. And virtual OS files can be moved or copied to different host PCs, so users can enjoy the same experience regardless of how computers are added or swapped around.

In an earlier article (OC v. 21 3 – *Linux Revisited*) I described some of the ways in which a computer owner could have two or more operating systems (OSs) running on their PC. These include:

- Dual booting – having each OS on a separate hard disk or a separate partition of the same hard disk, and starting up the PC in one or the other.

- Booting from a CD or DVD which contains a copy ('image') of the other operating system.

- Booting from a USB memory stick which contains an image of the other operating system.

All of these require the PC to be rebooted, which can be a slow process. Dual booting also allows either OS to modify the hardware, raising the possibility that viruses or other malware could get in and damage both systems. The CD/DVD option doesn't allow for files to be stored or for the OS to be updated online. High-density USB memory sticks are still relatively expensive.

Virtualisation overcomes these difficulties. Under virtualisation, one operating system can be run within an application by another. The internal, or 'guest' OS, thinks it's running on a smaller, slightly slower PC, but in fact all of its communications with the hardware are mediated through the external, 'host' OS. The guest OS can be stopped or started at any time, and a 'snapshot' of its current state can be taken. The entire OS, including all its internal settings, files and applications, can then be restored to the snapshot state at any time in the future.

A guest OS has no direct access to the hardware so it can't affect the host in any way. When not in use it is stored as a file on the hard disk. Starting up a virtual OS is much faster than rebooting, and several different OSs can be stored and called up on the same PC. As well as a safe 'sandbox' for experimentation and malware testing, it also provides a way in which users can select and use whatever software is best and most familiar for them.

[Figure 1: Linux (OpenSUSE) running on Windows XP…]

Virtualisation systems

To install a virtual OS you will need virtualisation software, a copy of the OS itself on CD or DVD, and enough room on the host hard disk to store the guest OS itself along with any user files. Ten gigabytes per OS is the recommended minimum. In theory

you can work in both OSs simultaneously, but in practice it will depend on your hardware specs and the requirements of both the host and guest OSs. Installing and setting up OSs can be a lengthy procedure, and is best done when there are no other demands on the PCs.

Virtualisation software is still relatively new, and it may require some research and effort to get running on your system. I looked into four free virtualisation systems, for both Windows and Linux OSs. First, the failures:

Microsoft Virtual PC 2007

Virtualisation software for (some) Windows-based systems. Easy to find and download, well documented and relatively quick to install – but useless to me since it wouldn't run on Windows XP Home edition. It's possible that with a bit of research I could have found a workaround, but by this time I already had VMware up and running satisfactorily and didn't feel the need to pursue other options. Virtual PC 2007 is obtainable as a 30 Mb download from the Microsoft Download Centre.

QEMU

A virtualisation program for Linux hosts. Qemu is available as a download from http://fabrice.bellard.free.fr/qemu. Users can also obtain an 'accelerator' kernel component which supposedly makes it work faster. I was unable to install either QEMU or the accelerator, but other people have been more successful.

Xen

A nice name, for another popular Linux virtualisation client. Xen (ww.xensource.com) comes bundled with the Novell OpenSUSE Linux distro, but despite many attempts I was unable to get OpenSUSE to boot and run as a host system. I tried downloading Xen separately and adapting it to run on Ubuntu Linux (Dapper Drake version) but without success.

And the winner:

VMware Server and Player

The VMware company (www.vmware.com) provides a range of virtualisation and other software on a commercial basis. Two free virtualisation programs provide an introduction to the company and its products. Both are available for Windows and Linux systems. VMware has an elegant website and excellent documentation for its products. I downloaded and tried:

- VMware Server – this is designed to let users design their own environment for the guest OS. Settings such as available memory, hard disk size, and accessible hardware can be established (and changed) by the user before or after installing the guest OS. These can then be tweaked to improve the performance of the guest OS if necessary. VMware Server is a 146Mb download and requires users to register and supply an email address.

- VMware Player – a more basic application which only allows the user to download and 'play' pre-written server environment files. Fortunately there are many of these on the Web, covering the most widely-used OSs. There are also websites which allow the user to 'roll their own' image files from a

limited choice of settings. It is much smaller, but also requires user registration.

[Figure 2: …and Windows XP running on Linux (Ubuntu)]

VMware Server – hosting Windows on Linux

I installed a VMware Server on an older PC running Ubuntu Linux 6.06 ('Dapper Drake') and had it up and running relatively quickly. I was able to create an environment for Windows XP fairly easily, but actually installing Windows XP was a different story: it took many attempts before the OS was finally loaded and operational. It was very gratifying – but a little disconcerting – to eventually see Windows running in a window of its own. After this it ran without problems. It occupies about 10 Gb on the disk, which I took the option of dividing into five files of 2 Gb each, for backup purposes.

Loading the VMware Server and 'booting up' Windows from the image takes about two minutes. 'Suspending' (freezing) the guest takes about 10 seconds and resuming it again from where it left off takes about 20 seconds. I am able to connect to the Internet from the guest OS via cable to a router and an ADSL modem, but I can't access the other PCs on the (Windows) network – disappointing but hardly surprising, since the host OS can't do it either. There is a small decrease in speed for some applications but others actually seem to run faster, perhaps because they are working from memory rather than the hard disk. A small set of VMware utilities can be downloaded and installed on the host OS to provide some extra functions, but these are not essential. The guest system accurately recognises and uses the host sound card.

As indicated, the host OS can be run in a window of its own or expanded to occupy the full screen. Double-clicking on the window takes the user into the guest OS – in other words, redirects the mouse and keyboard input to the guest. In full screen view it is possible for a user to work on the PC all day without ever knowing it is a virtual OS – unless they inadvertently press the Ctrl-Alt key combination and it changes back to a window.

Saving a snapshot of the state of the OS took about a minute. Reverting to the snapshot took about the same length of time. This will obviously vary according to the number and size of the files involved. The free Server only supports one snapshot at a time, but the VMware commercial products allow for unlimited numbers.

After my Linux experiment I reversed the procedure and used VMware for Windows on a Windows XP host to run Linux, again without any problems.

VMware Player – hosting Linux on Windows

I used the VMware player on my main Windows XP computer to try and host the OpenSUSE version of Linux that I hadn't yet been able to get running in its own right. The VMware Player for Windows XP is a download of about 4Mb, and comes (like the VMware Server) with an installer which adds it to the Programs menu. It doesn't include any image files, but these can be downloaded from sources on the Web such as www.thoughtpolice.co.uk/vmware. Because most Linux distributions are non-commercial, they can be legally included in these bundles, removing the need for the user to install them separately. However, I couldn't find an image for OpenSUSE, so I elected to 'roll my own' via www.easyvmx.com. This required me to answer a

few questions about the host and guest systems and my hardware, and produced a small image file for me (about 4 Kb) which I could then download. Opening this in the Player then allowed me to install OpenSUSE into the environment from a DVD.

The installation worked first time and I was reasonably happy with the result, although the Player offers many fewer configuration options than the Server. The Player also lacks the Snapshot and Suspend options. For these reasons I can't recommend the Player for serious use, but for someone who wants a quick 'out-of-the-box' solution it should work well. OpenSUSE ran smoothly as a guest, with the full screen view showing a toolbar along the top where users can choose which hardware devices to make accessible. Again, there was no network connection, and – probably because I made a wrong answer in creating the image – no sound.

Later I installed the VMware Server on this PC and was able to open the same guest image using that, although sound was still a problem. It is not possible to have both the Server and the Player installed on the same PC.

Obviously VMware would like users to go on to their commercial software, and given the care and effort they have put into their free offerings I would have no hesitation in doing so.

Conclusion

The more I tinker with virtualisation the more uses I can see for it. As a computer trainer it would be a real comfort to know that all my students are starting with exactly the same system; as a consultant it would be very useful to have a 'clean' operating system to start from when I need to analyse a PC and diagnose problems. There are plenty of things that can be done in Windows that can't yet be done in Linux, and an increasing number of things that can be done in Linux but can't be done in Windows. Virtualisation opens up a world of choices while allowing for firm control. That's got to be a good thing.