



VMLite Inc.
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Consumer Virtualization: Virtual Computers for Everyone

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Introduction

While a lot of us know that the most successful technology IPO in recent years is Google's IPO, only a few know that the second most successful one is from a company called VMWare. VMWare develops virtualization technology that creates *Virtual Computers*, or more formally *Virtual Machines (VM)* that run within another computer. Its technology has found widespread use in large data centers that serve most of the Internet traffic. The technology has attracted significant attention from industrial titans such as Intel, Microsoft, Sun, etc. Despite the tremendous success in enterprises, very few personal computer users know virtualization, nor do they know that it is a useful technology that could fundamentally change how they use computers. In short, few think that virtualization has serious value outside of company IT environment.

At VMLite, we see endless potential that virtualization technology could benefit regular PC users. With virtualization, you finally have a way to browse the Internet without worrying about virus infections. You could turn one personal computer into multiple *virtual computers*, one used for work, another for entertainment, yet another could be used for web browsing. You can bring your computer to an earlier, healthy state after the machine is infected by viruses or has crashed. It is also possible to *run* your old PC with Windows 2000 or XP operating system on a newly bought computer that runs Windows Vista, or even Windows 7. In this case you are running your old PC within a new PC, not merely

copying files from the old machine and opening them on the new computer. In addition, you can copy files and applications in your virtual computer to a USB drive, and access files and run applications when you are on a public PC or someone else's computer. That is to say, you can carry your virtual computer in your pocket. The list of potential applications goes on.

So what is virtualization? What is Virtual Machine and Virtual Machine Lite (VMLite)? How does VMLite bring all the seemingly powerful features to average PC users? This white paper attempts to address these questions from average computer users' perspective.

What is Virtualization?

Computers run software programs. The operating system on a computer manages the programs running on the computer. On the other hand, the operating system is by itself another piece of special program. A natural question to ask is, can we ask the operating system on a computer to run another operating system?

The answer to this question is surely yes, and that is the basic idea of virtualization ---- to run a guest operating system inside your host operating system. More accurately, we should have used the term *platform virtualization*, but for the purpose of explaining consumer virtualization, using the term virtualization would suffice.

Figure 1 shows you a screenshot of running a guest Windows XP operating system within the primary Windows 7 operating system (*the host OS*). Note that now you have two sets of Windows interface displayed ---- two start menus, two sets of desktop icons, two task bars, etc. In the following screenshot, the front windows is from the guest OS.

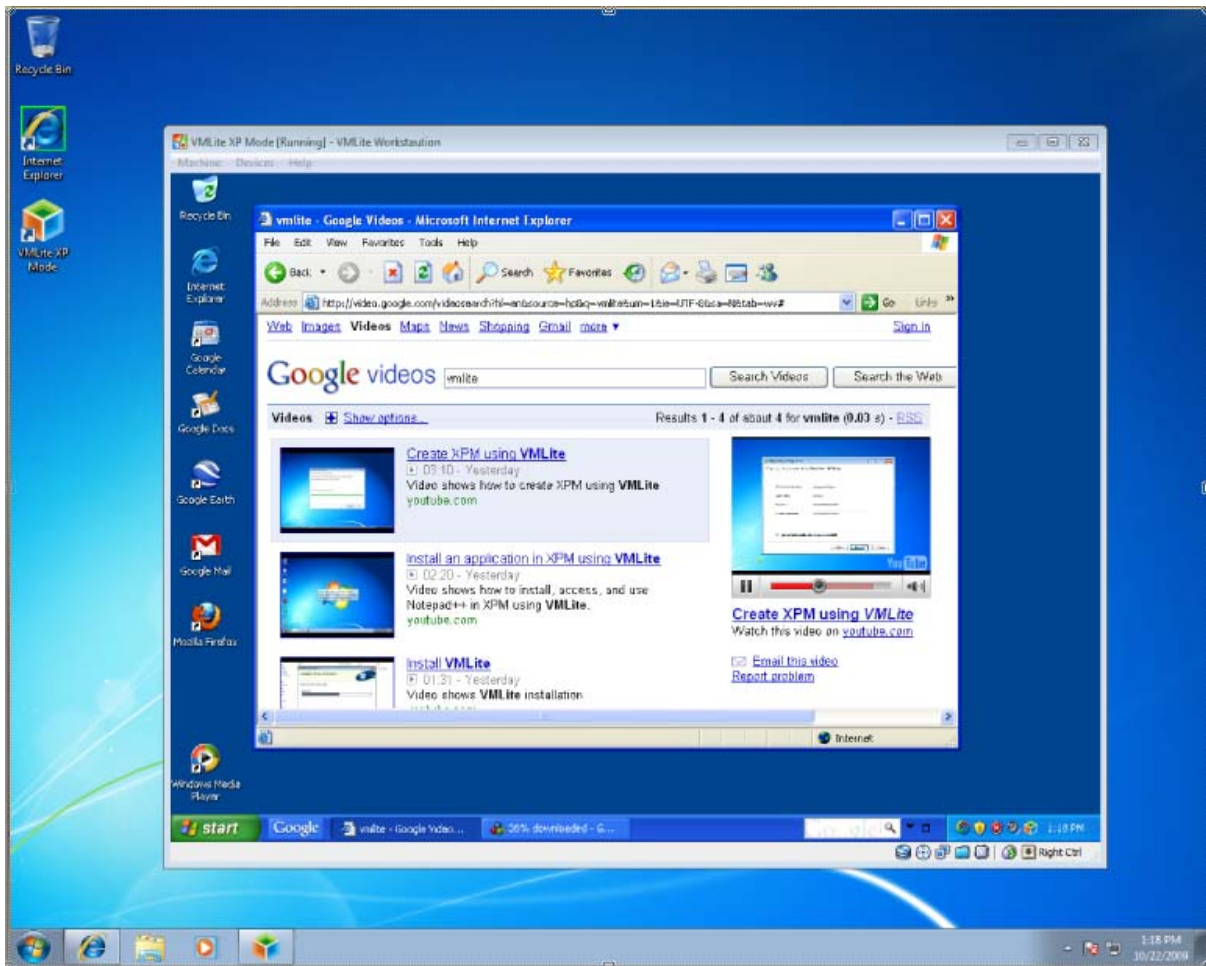


Figure 1: Running a guest Windows XP within the host Windows 7 OS

The guest operating system in this example is running like other applications (such as Microsoft Word or Acrobat Reader), and can be closed by clicking the 'x' button at the top-right corner of the window. This second Windows is just like your primary Windows: you can run web browser, Word, or other applications, and you can print or use a USB drive. In this sense, it is as if you had a second computer, except that this computer is virtual. You are also able to start multiple virtual computers on a single PC.

You can run the guest OS in a full-screen mode, taking most of the screen space so that you are working solely on your virtual computer. You can also run it in seamless mode (Figure 2), where applications installed for the virtual computer can be launched through the host machine's Start menu. In addition, starting your virtual computer is just a breeze and is not more difficult than starting other Windows applications on your desktop: you start it from Windows Start menu or double-click the VMLite application icon on the desktop.

The rest of this document shows you the benefits of working on virtual computer(s) in addition to your physical computer.

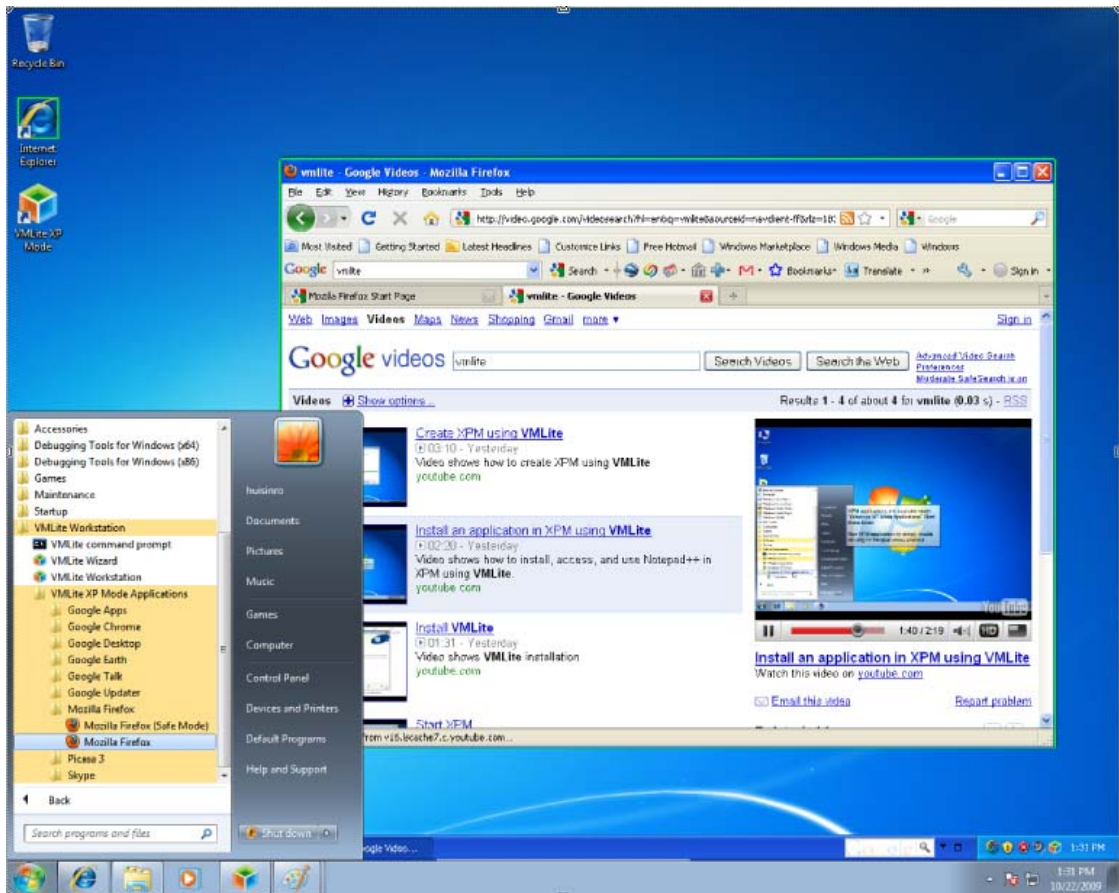


Figure 2: Running a guest XP OS in seamless mode on Windows 7

Beyond Microsoft XP Mode

Microsoft rolled out its next generation of operating system Windows 7 on October 22. A big concern from Microsoft is that applications you bought before for Windows 2000, XP or Vista may not work on Windows 7. There are several reasons why this may be the case. First, it takes time for software vendors to test and roll out fixes to their applications on Windows 7. Second, Microsoft has changed the internals of its OS since Vista. As a result, customers already complained that some of their XP applications do not run in Windows Vista. Chances are, they will not work in Windows 7. More importantly, for average computer users, you just do not

want to buy another copy of a software program that you bought in the past.

Microsoft provides a solution in Windows 7 to address this problem, even though the solution is broken in most cases. By using virtualization technology, Microsoft allows you to run a virtual machine with XP operating system within Microsoft 7. You can visit Microsoft XP Mode website to download and install the necessary software.

The catch for the Microsoft solution is that it only works for advanced machines. We have said that running a guest OS within a host OS is achievable, but it is not easy if we do not get some help from chip makers such as Intel and AMD. Indeed, Microsoft's virtualization solution only works on Intel processors that support VT-x, and AMD

processors that support AMD-V. If you have a desktop PC, there is a very high chance that your machine does not have the advanced hardware. The chance is even higher if you have a laptop. As one enterprise user put, “we just purchased four new Dell machines for Windows 7 only to find that the processors inside do not support Intel VT and hence are not supported by Windows XP Mode.” If you are an average PC user, you are probably out of luck.

Another limitation of Microsoft XP Mode is that it only supports Windows XP in certain versions of Windows 7. If your host

OS is Windows Vista, or your guest OS is Windows Vista, you are again out of luck.

VMLite goes beyond XP mode by supporting all major processors from more than 30 OEMs. The chance that you find your processor not supported is minimal.

In addition, VMLite supports a wide spectrum of Windows operating systems. Your guest OS could be Windows 7, Vista, XP, or even Windows 98/95. Your host operating system could be Windows XP, Vista or Windows 7. Microsoft, on the other hand, only supports running Windows XP within Windows 7.

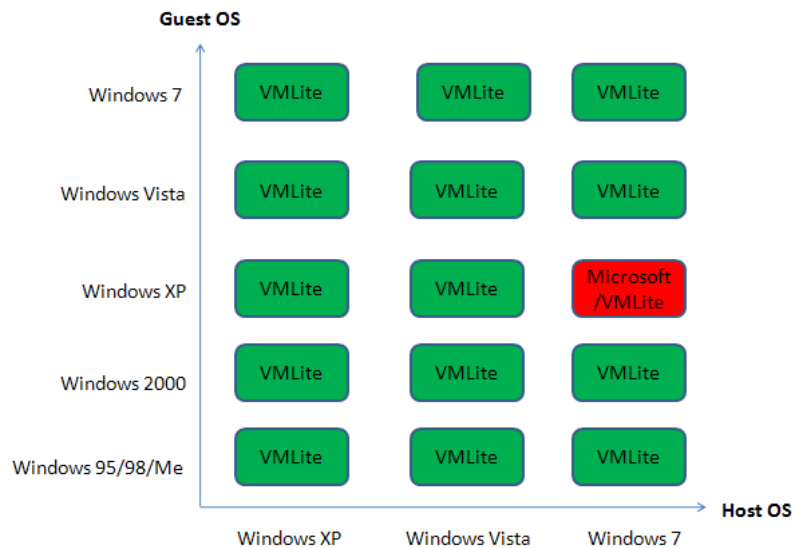


Figure 3: Comparison between VMLite XP Mode and Microsoft XP Mode

It is particularly interesting in Figure 3 that you can run Windows XP on Windows XP, or Windows 7 on Windows 7. In such cases VMLite does not need to use a different copy of Windows operating system, and can take advantage of what you already get to create multiple virtual machines. VMLite-generated virtual machines are light-weight, not requiring as much resources as VMWare would require. The “Lite” in VMLite exists primarily for this reason.

Another interesting point is that your host operating system does not need to be newer than your guest operating system. Even if your host system runs Windows XP, you can run a virtual machine with Vista or Windows 7 OS. This is very useful for those who want to try out the newer version of the operating system without actually installing on the host machine. On the other hand, you can try your legacy applications in the virtual computer. If they all work well, you can safely upgrade to a newer operating system.

In addition, VMLite supports Windows 98/95, opening up the door for running all your legacy applications on a newer machine.

Secure Internet Access

Spyware and viruses infect a machine by inserting or modifying files or system resources such as Windows registry. Conventional security software defends a computer by filtering out malicious content. It checks each incoming message or web page for potentially suspicious content. To flag a program as a spyware or virus, the virus protection program needs to first know that the program is malicious. From time to time, the virus protection software connects to a server to retrieve information about newly discovered viruses. When a

new virus is created, chances are that the protection program does not know it and cannot protect your machine.

Once you have a virtual computer generated by VMLite, you can browse the Internet, read your emails, or do other work on the Internet without exposing your host computer to viruses or other malicious programs. A virtual machine on your host computer is living in isolation. On one hand, it is like a full-blown computer where you see files, registry and other computer resources as usual; on the other hand, these are virtualized resources such that even if they are infected, it poses no threat to the host computer. These virtual machines can be trashed, and a new one can often be created in half a minute. That is, a conventional virus protection program tries to detect viruses. A VMLite-generated virtual computer allows the viruses in but keeps them in a sandbox. You can delete the sandbox if it is infected with spyware or viruses, leaving the host OS unaffected.

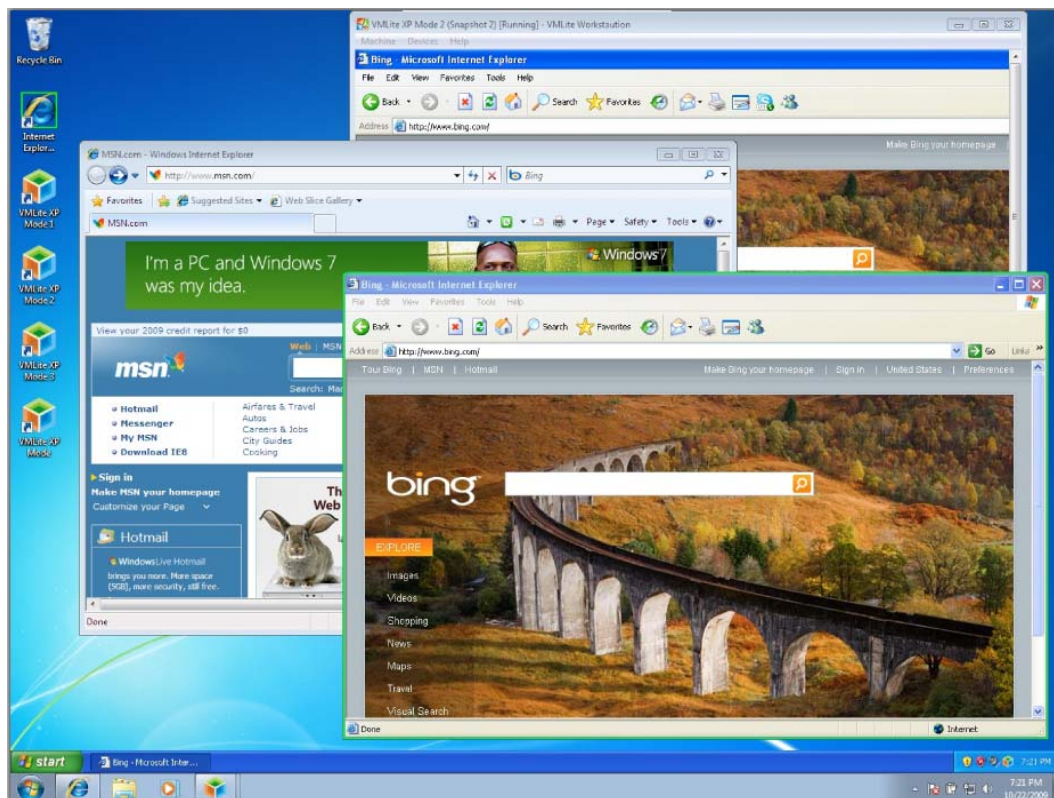


Figure 4: Secure web browsing on a virtual computer.

Now imagine how VMLite can help you (and your family) access the Internet:

- If you are concerned that viruses may infect your PC, you can do your web browsing in a VMLite-generated virtual computer.
- If you do not want others to see your browsing history, you can browse in a VMLite-generated virtual computer and then trash it.
- If you listen to/download music online, watch/download movies online, or participate in file/music/video sharing by running P2P applications such as BitTorrent, etc. you can run them in a virtual computer without worrying about infecting the host machine.

When it comes to Web browsing, VMLite goes one step further to remove the need to start a virtual machine. Instead, it creates a sandboxed browser and gives you a

browser icon with a green border on the desktop (Figure 4). You can start web browsing without explicitly starting a virtual computer by clicking on the browser icon. When the browser is closed, all the browsing history, cookies, etc., as well as potential viruses are automatically cleaned up to ensure that the host PC is intact.

Multiple Virtual Computers

A unique advantage with a VMLite-generated virtual computer is that when it is shut down, it remembers its state. Next time you bring up the instance, you are brought back to exactly the place where you leave last time. Think about what this means: if you are watching a YouTube movie and you exit the virtual computer, you can continue watching the movie when you come back next time, instead of restart from the beginning. This is in sharp contrast with what you do today on a physical PC: if you shut down computer at night and come back the next morning, you lost your working environment.

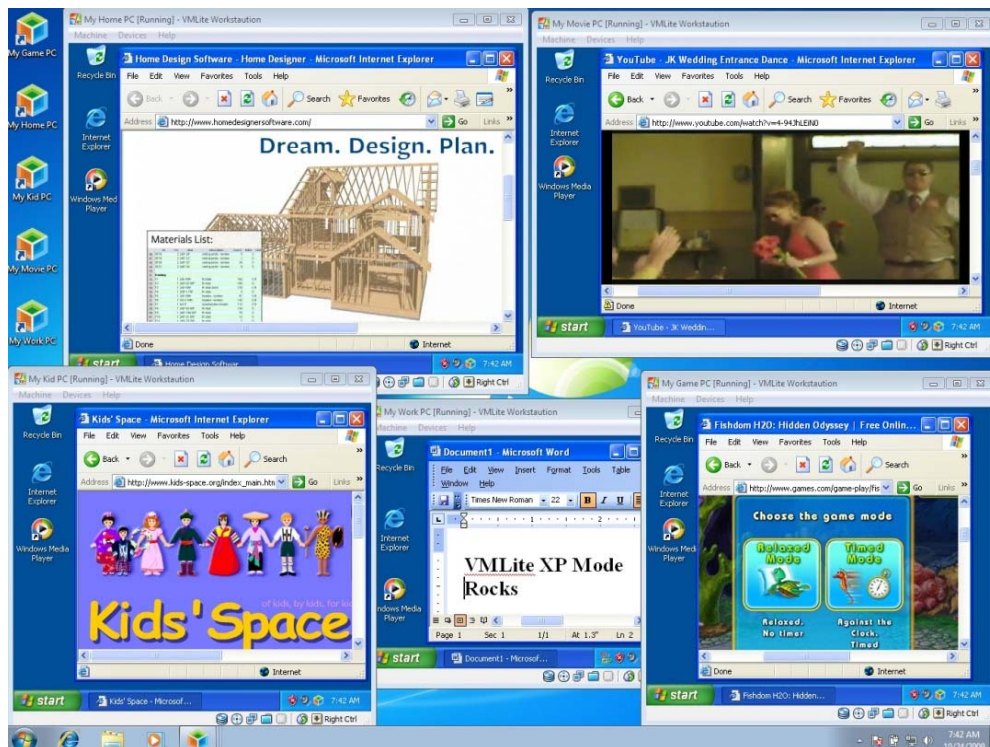


Figure 5: Five virtual computers running concurrently.

This unique advantage, when combined with the capability to create multiple virtual computers, leads to a very powerful computing environment. In Figure 5, 5 virtual computers are created on a single PC. They are My Work PC, My Home PC, My Game PC, My Movie PC, and My Kid's PC. Each virtual computer

provides an independent working environment with different desktop shortcuts. All 5 virtual computers can run concurrently, but in real life, you probably run one at a time. Figure 6 shows such as case where only My Kid's PC is running.

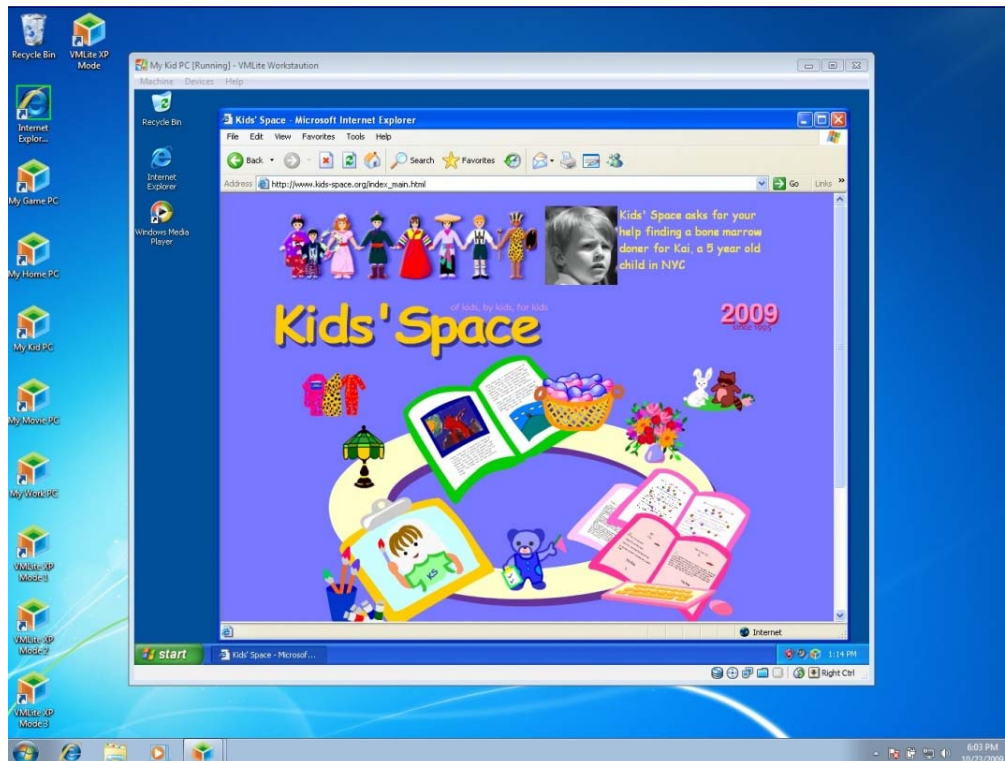


Figure 6: My Kid's PC running in Windows 7. The VMLite buttons on the desktop are My Game PC, My Home PC, My Kid's PC, My Movie PC, My Work PC, etc.

Easy Recovery

Most of us at some point wanted to recover our PC by setting it to a previously healthy state. This could happen after a system crash, a virus attack, or after we installed some software programs that slowed down the computer. Recovery is often easily said than done. It is not uncommon to re-install the whole system sometimes. Before doing so, people scramble to find a way to make sure all the data on the hard drive are

backed up. And the re-install process is tedious.

Alternatives exist but either take up a lot of space, a lot of time, or wipe out recent work. For example, it takes hours and a lot of disk space (i.e., about half to equal size of space that the system resides) to use VMWare to take a snapshot as recovery point. Some PC Manufacturers provide built-in recovery files to set a PC to clean factory state. Customers, however, have to reinstall all programs and copy their data back to the machine.

Due to VMLite's lightweight yet powerful backup feature, it takes only seconds, not hours, to take a

snapshot and save as a recovery point for the host system. To go back to a recovery point as defined by any of the snapshots taken before, it only takes another few seconds. Therefore, you can bring your computer to an earlier, healthy state fast and easily, after the machine is infected by viruses or has crashed.

Given the prevalence of malwares and viruses, the danger of never-ending security loopholes on Windows, and the overhead of managing the never-ending security patches, it is much easier, if not critical, to have virtualized environments separated from the host computer. For home use, each VMLite XP Mode can be used as a ghost substitute of the underlying machine to protect it against malwares, because the registry, files and folders on the host are intact. In case of

system crash or malware attack, one can just shutdown or kill the current VXP instance, and go back to any snapshot preset.

My Old PC is Alive!

Over the years we buy new computers and retire old ones. When we retire old computers, we take pains to preserve data on the computers. Some go into each folder on the computer, looking for files that are potentially useful; some take backups of all the files in the old computer. Some forget to copy the archived email files, while others search the Internet to find out how to save and restore bookmarks. Even if you create a complete backup, you may have to import some of the exported files (such as Outlook email) painfully, to just look for an old email. In particular, you backed your data up, but you lost your applications and environment.

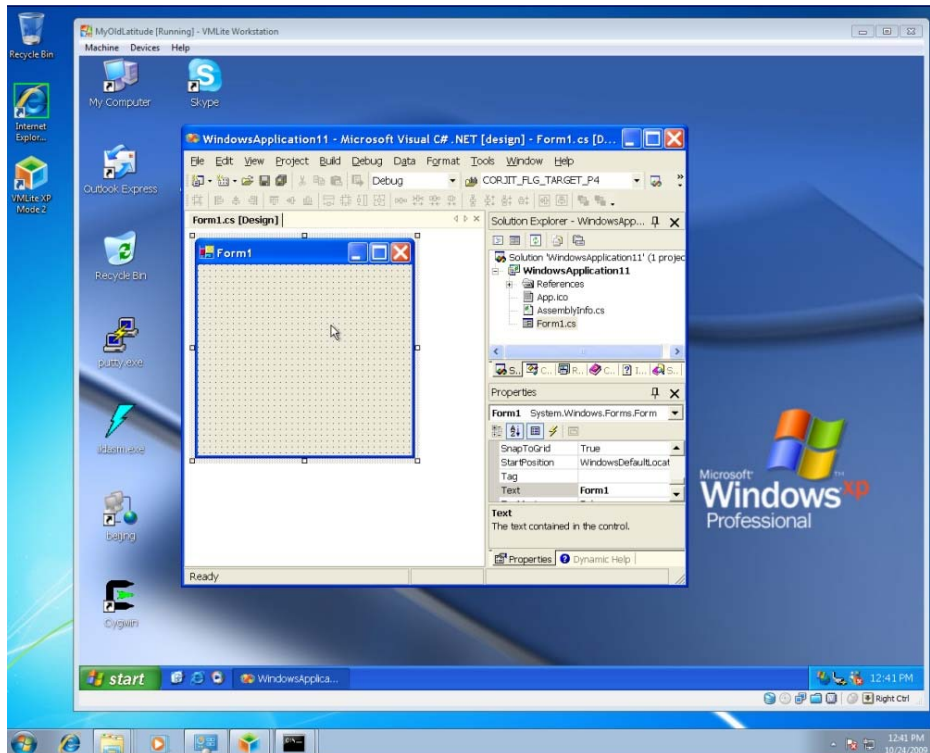


Figure 7: Running an old Dell PC (Windows XP OS) in a Windows 7 machine.

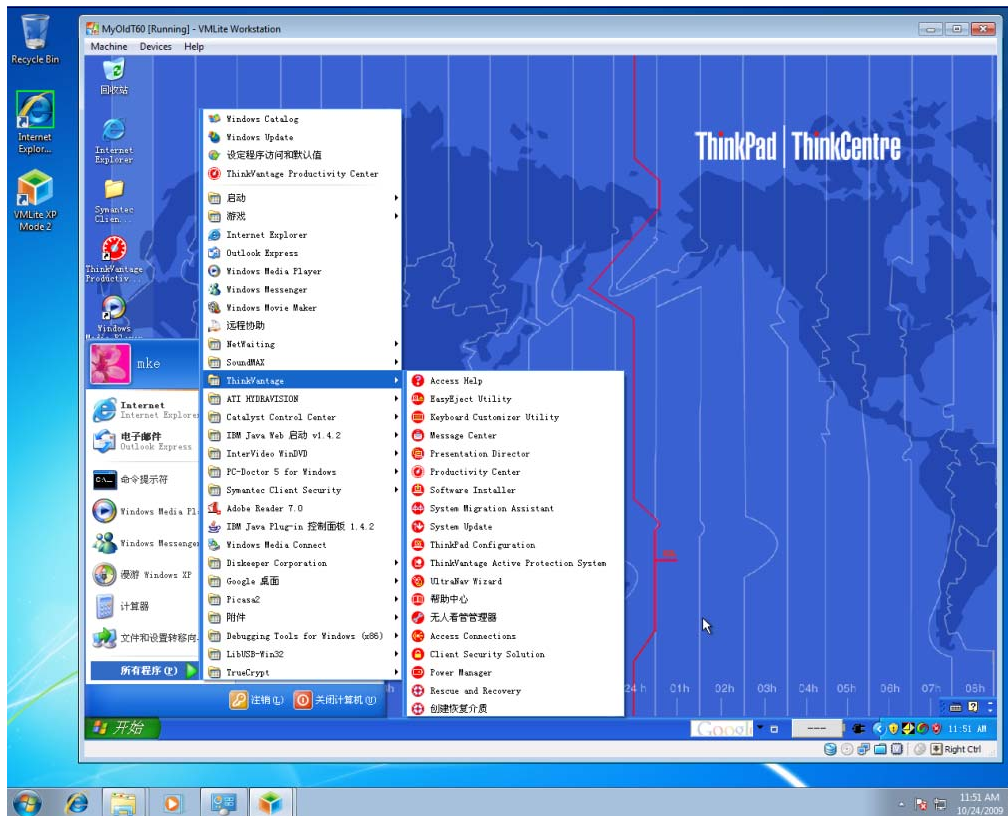


Figure 8: Running an old ThinkPad (Windows XP OS) in a Windows 7 machine.

What if you can retire your physical computer but still keep a virtual one? You not only get all your data, but also your applications. More importantly, you retain a familiar working environment ---- your desktop settings, your registry, your old mail application, bookmarks, to name just a few. The warm feeling of working with a familiar environment and the peace of mind that the solution brings to you, is another reason why VMLite can bring value to average PC user.

Here are the simple steps it takes to have your old PC up and running in your new PC, using VMLite:

- Get an external hard drive that can hold all the data on your old PC.
- Copy a simple VMLite program to the hard drive and connect the hard drive to the old PC.

- Run the copied VMLite program, which will convert your old PC to a file accessible from your new PC.
- Once the conversion is done, connect the hard disk to your new PC, and start running and enjoying your old PC!

A similar but interesting use for VMLite is to use it to create a backup of your Netbook computer, and run it on your desktop PC. Instead of your old PC being alive on your computer, your Netbook is alive now in a different environment.

Virtual Computer in My Pocket

These days we use USB storage devices to carry our files around. Such a device could be a memory stick, a portable hard drive or even an iPhone. We still need a host computer to view our files, be it a computer in library, an Internet Café, a public kiosk, or someone else's computer. There is no guarantee that such a foreign computer has the



software program, or sometimes the right version of a software application to view our files. We end up with a dilemma: exactly at a time we want to view a file away from home, we find out that the host computer does not have the right software.

With VMLite technology, you can solve this problem and fit a virtual computer in your pocket. As we have explained, a virtual computer behaves just like a physical one on which you can install software or set up working environments including desktop settings. After you have done with installing your favorite software programs, using VMLite, you can store this virtual computer as file(s) to a portable hard disk or a memory stick. When you go to another computer, as long as it runs a recent Windows operating system, you can plug in the hard drive and start running your applications.

One unique characteristics of VMLite is that it only needs to store a (small) subset of Windows system files to run a virtual computer. This reduces the storage requirements and allows to storing only your applications (and a few system files) to a USB drive.

Summary

In this article, we showed you several examples about how virtualization, in particular VMLite, could change the way an average PC user uses computer. Hopefully by now, you are convinced that virtualization technology is not just for IT professionals. The convenience that VMLite brings to an average user is unparalleled from conventional software applications, or from enterprise virtualization vendors such as VMWare. As memory capacity and processor speed improves at an unprecedented rate, most of us now deserve to have multiple computers, physical or virtual.