Microsoft Virtual PC 2007 Technical Reference

By

Steve Jain

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http://vpc.essjae.com

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Background

Before getting started, a little background information regarding Virtual PC should help in understanding the whole process.

Virtual PC emulates a standard 32-bit x86-based PC. All of the basic hardware components are emulated except the processor, which is virtualized. What this means that all VMs will have an identical set of hardware, regardless of the physical computer's hardware.   Again, the exception is the processor or CPU, which is virtualized, or in other words, if the physical PC has an AMD Opteron CPU, so will all the VMs running on that computer. However, if a VM is moved to a physical PC with an Intel Pentium IV CPU, the CPU in the VM will change to a P4. Depending on the OS installed in the VM, this can cause some issues and may require the OS to be repaired or reinstalled so the correct kernel is installed.

Emulated Devices in Virtual Machines

Component or Device	Virtual machine emulated hardware
BIOS	AMI BIOS
Chipset	Intel 440BX
Sound card	Creative Labs Sound Blaster 16 ISA Plug and Play
Network adapter	Intel/DEC 21140A 10/100
Video card	S3 Trio 32/64 PCI (8 MB Video RAM with VM Additions)

Terminology

HOST PC

The physical PC may also be referred to as the **host PC**. This is the physical computer that the Virtual PC application is installed on.

GUEST PC or **Virtual Machine (VM)**

The guest PC or VM runs inside of Virtual PC and is the "virtual" or emulated computer hardware that an OS will be installed on. A VM consists of two files, a Virtual Hard Disk (.VHD) and a Virtual Machine Configuration (.VMC). The .VHD is the virtual hard drive and the OS and software that will be installed in the VM will be stored here. To the host PC, this is simply a file, like a Word document or an MP3 file. To the VM, it will appear to be the first hard drive on the system (C:) drive. The .VMC file is simply a configuration file that contains all the information on the settings of the VM, like its name, RAM assigned, .VHD name and other configuration parameters.

Host-Key

The **host-key or hostkey** is a user-defined key that allows you to regain control of the mouse when it is captured by a VM and allows special key combinations to be passed to the VM. The default **hostkey** is the **right-ALT** key. To pass the key combination of **CTRL+ALT+DEL** to a VM, the **hostkey+DEL** combination is used instead. Another useful combination is **hostkey+R.**   This is equivalent to a hard reset on a physical computer. The **hostkey** allows special key combinations to be passed to the VM. A table of additional **host-key** combinations is listed in the VPC Help.

Virtual PC Toolbar

Located in the lower left corner of the VM's window, the VPC Toolbar items provide information about the status of your VM, from left to right: Hard Drive, CD/DVD-ROM, Floppy Disk, Shared Folders, and Network. The toolbar offers several handy options through context menus, accessed by right-clicking the icon. CD/DVD ISO images or floppy disk (VFD) images can also be easily mounted in the VM by dragging the disk image and dropping it on the appropriate VPC toolbar icon. See the Virtual PC help for more information. To release a CD/DVD or floppy disk image right-click the appropriate icon and select **Release** *diskname*.

When a CD/DVD or Floppy disk or image is mounted, the icon will no longer be grayed out.

Virtual Machine Additions (VMA)

The Virtual Machine Additions provide the following on Windows 9x and above OSes:

- Improved performance on Windows 9x
- Mouse Integration between host PC and VM—without mouse integration, the cursor must be manually released via the *host-key* and tracking issues may occur with remote viewing software
- Drag and drop support and Shared Folders
- Time synchronization between VM and host PC—keeps the VM's clock updated
- Cut and paste support between VM and host PC—allows ACSII plain text and bitmap images to be pasted into the VM
- Custom Windows desktop resizing—VM's screen resolution can be adjusted by dragging the edges of the window. Dragging the window edge or corner while holding the CTRL key allows restricts the resolutions to standard sizes (800x600, 1024x768, up to 1600x1200)

Virtual Disk Wizard

The Virtual Disk Wizard (VDW) allows you to create and edit virtual floppy disks and virtual hard disks. To access it, click **File→Virtual Disk Wizard** from the Virtual PC Console. A quick time-saver is to create a single blank floppy, call it **blank.vfd** and store it in an easy to access location. Then whenever a new blank VFD is needed, simply make a copy and rename it. To create blank virtual floppy disks (VFD):

1. **VDW:** Click **Next** to start.
2. **VDW: Disk Options:** Create a new virtual disk, click **Next**.
3. **VDW: Virtual Disk Type:** Select **A virtual floppy disk** and click **Next.**
4. **VDW: Virtual Floppy Disk Options:** Specify a name and location, and click **Next.**
5. **VDW:** Click **Finish** to create the VFD.
6. **VDW:** When the VFD is created, click **OK.**

Another great product for working with VFDs and VHDs is Winimage. (http://www.winimage.com). Winimage can create VFDs from existing floppy disks.

Getting Started

When running Virtual PC 2007 (VPC) the first time, two windows will appear: the **Virtual PC Console** and the **New Virtual Machine Wizard**. Before VPC can be used, a new virtual machine (VM) will need to be created or imported.

Creating a new Virtual Machine

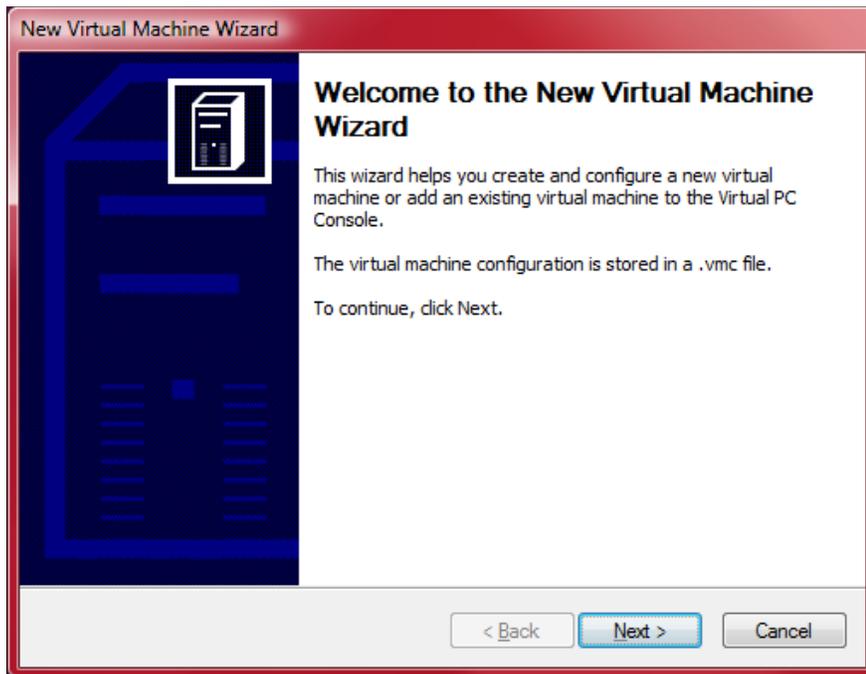To create or add a new VM, use the **New Virtual Machine Wizard (NVMW)**.

Figure 1: New Virtual Machine Wizard

1. **New Virtual Machine Wizard:** Click **Next** to start the wizard.
2. **NVMW:Options:** The next screen will present you with options to
   a. Create a virtual Machine—this should be used when installing a new VM.
      Note: After the VM is created, an OS must still be installed.
   b. Use default settings and create a virtual machine—this will create a default VM, but the VM will not have a virtual hard drive (VHD) or an OS.
   c. Add an existing virtual machine – existing or pre-created VMs can be imported
      Note: the following steps assume that a new VM is being created.

   Click **Next** to continue.

3. **NVMW: VM Name and Location:** Here is where the name of the VM is entered and an alternate location from the default. The default location is the **My Virtual Machines** folder under the current User's **(My) Documents** folder. Click **Next** to continue.
4. **NVMW: Operating System:** Selecting an OS, allows the NVMW to recommend the appropriate setting needed for the OS. For example, selecting **OS/2** will limit RAM to 64MB and the VHD to 2GB. Selecting an OS is not required and does not affect what is actually installed in the VM. **Windows XP** could be selected as the OS and then a Linux OS could be installed without issue in the VM. The exception here is Window

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Vista and Windows Server 2008. The .vmc file is specially modified by adding a compatible sound card. The drivers for this sound card are provided via the VM Additions. Click **Next** to continue.

5. **NVMW: Memory:** The amount of memory assigned to the VM is configured here. It is also possible to modify the amount of RAM assigned to VM after it is created. For installation of older OSes, it is usually better to leave the RAM at the default and then increase the RAM, if necessary, after the OS has been successfully installed. Click **Next** to continue.

6. **NVMW: Virtual Hard Disk Options:** This is where the VHD is either assigned or created. Depending on the choice different options will follow. Select the appropriate choice and click **Next** to continue.

7. **NVMW: Virtual Hard Disk Location:** The default location of a new VHD is in the same folder as the .VMC file created in step 3. After creating a new VHD or browsing and selecting an existing VHD, click **Next** to continue.

8. **Finished!** The VM has been completed. Now it's time to put the VM to use and install the OS. Click **Finish** to complete the wizard.

The previous steps listed are used when creating a VM to for any OS.

Windows 98

Create a Virtual Machine

Using the same steps as outlined in the Getting Started section:

1. From the **Virtual PC Console, click** the **New…** to start the **New Virtual Machine Wizard**.
2. **New Virtual Machine Wizard** : Click **Next** to start the wizard.
3. **NVMW: Options:** If creating a Windows 98 VM from scratch select the first option below, if using the pre-made Windows 98 VM from http://vpc.essjae.com/Win98SE.zip select the last option below.
   a. Create a virtual Machine—this should be used when installing a new VM.
      Note: After the VM is created, an OS must still be installed.
   b. Add an existing virtual machine – existing or pre-created VMs can be imported
      Note: the following steps assume that a new VM is being created. (See the addendum at the end of the Installing Windows 98 section.
4. **NVMW: VM Name and Location:** For the purpose of this guide, Windows 98SE will be used as the name
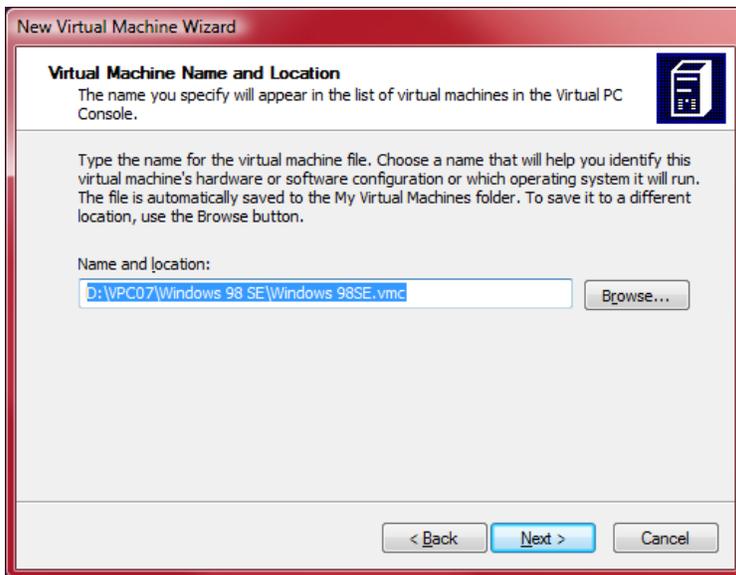

Figure 2: VM Name Location

and the location for the VM will be D:\VPC07\Windows 98 SE\Windows 98SE. If the location does not exist, you will be prompted to create it. Click **Next** to continue.
5. **NVMW: Operating System:** Since the VM's name was descriptive, the NVMW has an idea of what OS will be installed and will recommend the RAM and VHD size. Click **Next** to continue.
6. **NVMW: Memory:** Here is where the amount of memory can be assigned to the VM. Generally, for older OSes like Windows 98 and Windows NT, the initial OS installation should be done using the recommended amount of RAM. If additional RAM is required by the VM, this setting can be changed at a later time. For our Windows 98 VM, the NVMW recommends 64MB of RAM. Click **Next** to continue.
7. **NVMW: Virtual Hard Disk Options:** It is possible to use an existing virtual hard drive, or create a new one. In this case, a new hard disk will be created. Select **A new virtual hard disk** and **c**lick **Next** to continue.
8. **NVMW: Virtual Hard Disk Location:** By default, the location of the VHD will be the same as the .VMC that was created in step 4 previously. It is also possible here to modify the size of the VHD created. For a

Windows 98 installation, the default is a 16GB VHD.   The defaults are fine for this installation. Click **Next** to continue.

Note: It is important to remember that the size of the VHD cannot be changed after it is created. Also, remember that the actual amount of disk space that can be used by the OS is also limited by the OS in some cases.

9. **Finished!** The VM has been completed. Now it's time to put the VM to use and install the OS. Click **Finish** to complete the wizard. The figure below shows the completed VM in the VPC Console.
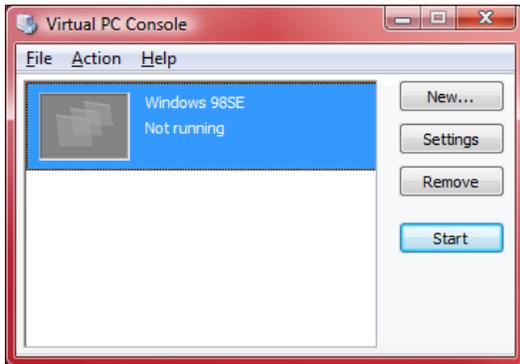

Figure 3: VPC Console with Win98 VM

Now the OS must be installed. Windows 98, like many older OSes, requires a bootable floppy disk to start the installation and prepare the VHD for the OS. It is possible to use a real Windows 98 startup floppy, or a virtual floppy disk (VFD) image. A Windows 98 Emergency Boot Disk is available here: http://vpc.essjae.com/win98EBD.zip. A Windows 98 CD-ROM and license key will also be needed to complete the installation.

Note: To use serial (COM) or parallel (LPT) ports in the guest PC, these should be enabled before installing the VM's operating system to allow the ports to be properly detected and installed. To enable serial or parallel ports:

1. The guest PC must be turned off and display **Not Running** in the **Virtual PC Console**, if it is **Running** or **Saved**, settings cannot be changed.
2. Select the VM from the PC List and click **Settings**.
3. Select the port you want to enable (**COM1**, **COM2**, **LPT1**)
4. For **LPT1**, select **Physical parallel port** and select a host parallel port to emulate.
5. For **COM** ports, select **Physical serial port** and pick the host COM port to emulate. **Wait for modem command to open port** should only be selected if using a modem.
6. Click **OK** to close PC Settings.

Install the Windows 98 Operating System

10. **Virtual PC Console:** Select **Windows 98SE** and click **Start**.

11. After the initial POST screen, the PXE boot agent will appear and if it does not find a boot server, the next screen will show an error.
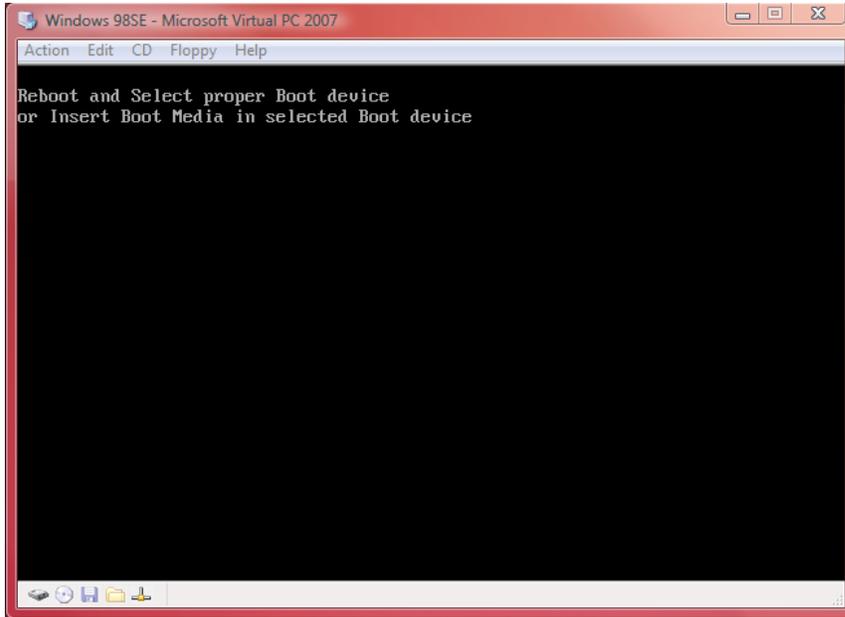
This is to be expected because the hard drive is empty. The first thing that needs to be done is to capture a floppy disk, either real or virtual.

    a. If a physical Windows 98 floppy disk is being used, insert the disk in the host PC's drive. Next, right-click the Floppy icon on the VPC Toolbar and click **Control Physical Drive A:** and this will capture the host PC's floppy drive.

    b. If a VFD is being used, simply drag and drop it onto the Floppy icon in the VPC Toolbar, this will mount the VFD. Alternately, right-click the Floppy icon, and click **Capture Floppy Disk Image**, browse to the disk's location and click **Open.**
Make sure that the VM's window is active (click the window) and press E**nter**. This will cause the VM to begin to read the Win98 boot disk.

12. Once the floppy begins booting, a menu will appear with regards to CD-ROM support. At this point, CD support is not needed because a reboot will be needed before the CD-ROM is required. Press **Enter** to continue.
Note: These instructions assume the use of a Windows 98 EBD, a normal Windows 98 Startup Disk may offer different menu options.
13. Once at the A:> prompt, type **fdisk** and press **Enter**. Press **Enter** again to enable large disk support.
14. **FDISK Options:** Press **Enter** to create a DOS partition.
15. **Create DOS Partition or Logical DOS Drive:** Press **Enter** again to create a Primary DOS Partition.
16. **Create Primary DOS Partition:** Press **Enter** again to use the maximum available size. Once completed, press **ESC** to exit FDISK.
17. The VM needs to be reset, press the *hostkey+***DEL,** to send a **CTRL+ALT+DEL** (soft reset) to the VM and restart it. *Hostkey+***R** will also reset the computer, but this would be a hard reset.
18. During boot, select the option to **Start computer with CD-ROM support** and press **Enter**.
19. At the A:> prompt, type **format c:**, and press **Enter.**   Press **Y**, then **Enter** to proceed with the format.

Note: As long as the commands are executed INSIDE the VM's window and not on the host PC, the host PC's physical drive will not be affected.

20. After the format is complete, enter a volume label and press **Enter**, or press **Enter** alone for no label**.**
21. At the A:> prompt, type **C:** and press **Enter**.
22. To avoid potential installation issues, create a Win98 directory on the C: drive and copy the Win98 directory contents from the Windows 98 CD-ROM to it. Type **md win98** and press **Enter**. Type **cd win98** and press **Enter**.
23. The CD-ROM needs to be mounted before the files can be copied. Insert the physical CD-ROM in the host PC's drive, then right-click the CD icon in the VPC Toolbar and click **Use Physical Drive X:**, where X is the host PC's CD/DVD drive where the Windows 98 CD-ROM is located. If using an ISO image, drag and drop the ISO file onto the CD icon to mount it, or right-click the CD icon and select **Capture ISO Image** to browse for the ISO's location. The CD-ROM or ISO is correctly mounted when the CD icon in the VPC Toolbar is no longer grayed out.
24. If using the Windows 98 EBD virtual floppy, the CD-ROM drive inside the VM will be D:, if a standard Windows 98 Startup Disk is used, the default drive letter for the CD-ROM is E:. To verify the CD-ROM drive letter, type **D:** or **E:** and press **Enter**. If an error is returned, the drive letter is incorrect and another drive letter should be tried.
25. After verifying the CD-ROM drive letter, change back to C:\Win98. Type **C:** and press **Enter**.
26. Copy the files from X:\Win98 to C:\Win98, where X is the drive letter determined in step 24 above. Type **copy x:\win98*.*** and press **Enter.**
27. Once all the files have been copied, type **setup.exe /is** and press **Enter.** The /is switch skips the scandisk portion of the setup. This isn't necessary since the hard drive doesn't need to be checked for errors since it's simply a file on the host PC's physical hard drive.
28. Eject the floppy disk or release the floppy image. Leaving the floppy in the drive will prevent Windows setup from continuing on its first reboot.
29. **Windows 98 Setup:** Click **Continue** to begin.
30. **Windows 98 Setup Wizard: License Agreement:** Click **I accept…** and click **Next**.
31. **Windows 98 Setup: Windows Product Key:** Enter the product key here and click **Next.**
32. **Windows 98 Setup Wizard: Select Directory:** To use the default **C:\Windows**, click **Next**.
33. **Windows 98 Setup Wizard: Setup Options:** Click **Next** to use the **Typical** setup**.**
34. **Windows 98 Setup Wizard: User Information:** Enter a name, company is optional, and click **Next.**
35. **Windows 98 Setup Wizard: Windows Components:** Click **Next** to install the most common components.
36. **Identification:** Enter a computer name, workgroup (optional) and description (optional) and click **Next**.
37. **Windows 98 Setup Wizard: Establishing your Location** Select the appropriate country or region from the list and click **Next** to continue.
38. **Windows 98 Setup Wizard: Startup Disk:** Click **Next** to launch the Startup Disk Wizard.
    a. Insert Disk:
        i. To cancel and not make a Startup Disk, click **Cancel**.
        ii. To create a Startup Disk, insert a blank floppy disk or capture a floppy disk image (.VFD) using the VPC Toolbar and click **OK** to continue.
        iii. Remove the floppy disk, or release the disk image and click **OK** to continue.
39. **Windows 98 Setup Wizard: Start Copying Files:** click **Next** to begin copying the Windows 98 files to the guest PC.

40. **Windows 98 Setup:** Click **OK** to restart the computer after removing any floppy disks, floppy disk images, or CD-ROMs before restarting the Windows 98 guest PC.
41. **Restart Computer:** When Setup has finished copying files, click **Restart Now** or wait and let Setup restart the guest PC.
42. **Date/Time Properties:** Select the correct **Time Zone**
    a. Click **Date & Time** to verify the date and time, adjust if necessary.
    b. Click **Close**.
43. **Enter Network Password:** The Windows 98 installation is nearly complete. There is no password set up yet. Click **OK** to log onto Windows 98.
44. Windows will finalize the installation and boot to the desktop. Installation is complete.
45. Click **Close** to close the **Welcome to Windows 98** screen.

Install the VM Additions

46. Before installing any Windows Updates, the next step is to install the VM Additions and get additional performance from the VM. If the mouse pointer is captured in the VM, press the *host-key* to release it. Click **Action→Install or Update Virtual Machine Additions** from the Windows 98 VM window menu.
47. Click **Continue** to begin the installation.
48. **Virtual Machine Additions (VMA):** Click **Next** to begin the installation.
49. **VMA:** Click **Finish** to complete the installation.
50. **VMA:** Click **Yes** to restart the VM. After restarting the VMA will be loaded and there should be a noticeable improvement in performance.

A VM should be treated the same as a physical machine and should be updated and protected. If a VM will be exposed to the Internet or external data sources, it should have an anti-virus program. The host PC's AV program will not protect the VM. Free AV software that works well in VMs is available from Grisoft and Avast. Please consult the vendor's licensing to verify that you qualify.

Connecting to the Internet

Note: The following assumes the network the VM is in is a LAN type environment that includes DNS and DHCP servers.

51. Double-click the **Connect to the Internet** icon on the desktop.
52. **Internet Connection Wizard (ICW):** Select **I want to set up my Internet connection manually…**, and click **Next**.
53. **ICW:** Select **I connect through a LAN** and click **Next**.
54. **ICW: Local area network Internet configuration:** Click **Next** to accept the default, unless the environment requires the manual configuration of proxy.
55. **ICW: Set Up Your Internet Mail Account:** Click **No**, then click **Next** to continue.
56. **ICW:** Click **Finish** to complete the wizard.
57. Update Internet Explorer to version 6. Windows Update requires a later version than is included with Windows 98. IE6 for Windows 98 can be downloaded individually from Microsoft here: http://www.microsoft.com/downloads/details.aspx?FamilyID=1e1550cb-5e5d-48f5-b02b-20b602228de6&DisplayLang=env
Note: Since the VMA are installed, it is possible to download the IE6 installer on the host PC and drag and drop it onto the Windows 98 desktop.

58. After installing IE6 and rebooting, Windows Update will function correctly.
59. Click **Start➔Windows Update** and update Windows 98. Follow the on-screen instructions to complete Windows Update.
60. Finished!

Adding a Second Hard Drive to a Windows 98 VM

1. Completely shut down the Windows 98 VM. It cannot be running, paused or in a Saved State.
2. Select the VM from the Virtual PC Console and click **Settings**.
3. Click to select **Hard Disk 2.**
4. Click **Virtual Disk Wizard** to create a new hard disk.
   a. **Virtual Disk Wizard:** Click **Next** to begin
   b. **VDW: Disk Options:** Click **Next** to **Create a new virtual disk**.
   c. **VDW: Virtual Disk Type:** Select **A virtual hard disk** and click **Next**.
   d. **VDW: Virtual Hard Disk Location: Browse** to the location the new disk will be located and enter a name, or manually enter a name and location. Click **Save**, then click **Next**.
      Note: Placing the disk in the same location as the original VHD and VMC simplifies management.
   e. **VDW: Virtual Hard Disk Options:** Select the appropriate disk type and click **Next**.
      Note: The most common type used is usually **Dynamically expanding** or **Fixed size**.
   f. **VDW: Virtual Hard Disk Size:** If the size needs to be adjusted, enter the correct size, otherwise click **Next** to continue.
      Note: The amount of disk space the drive can see is dependent upon the VM's OS.
   g. **VDW: Completing the Virtual Disk Wizard:** Click **Finish**.
   h. Click **Close** to close the **Virtual Disk Wizard** pop-up.
5. Select **Virtual Hard disk file**:, then click **Browse**.
6. Browse to the location of the newly created VHD and select it. Click **Open.**
   Note: The new VHD can also be dragged and dropped into the **Virtual Hard disk file** text box.
7. Click **Ok.** The second VHD had been added to the VM.
   Now that the VHD has been added, it must be partitioned and formatted for Windows 98 to see it.
8. When turning on the VM, after the RAM amount is displayed, press **F8**, several times to enter the **Windows 98 Startup Menu**.
9. Using the arrow keys, select **5. Command prompt only** and press **Enter**.
10. At the C:> prompt, type **fdisk** and press **Enter**.
11. Press **Enter** to enable large disk support.
12. **FDISK Options:**
    a. Select **5. Change current fixed disk drive** and press **Enter**.
    b. Enter **2** and press **Enter**.
    c. Select **1. Create DOS partition or Logical DOS Partition** and press **Enter.**
    d. Select **1. Create Primary DOS Partition** and press **Enter**.
    e. When prompted to use the maximum available size, press **Enter**.
    f. Press **Esc** to continue.
    g. Press **Esc** to exit.
    h. Press **Esc** to exit FDISK.
13. Press *hostkey+R* or *hostkey+DEL* to restart the VM.
14. After booting to the Windows 98 desktop, open **My Computer** or **Windows Explorer**.

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15. A new hard drive should appear, **D:**. Right-click **D:** and select **Format**.
16. **Format – (D:):** Click **Full**, then click **Start** to begin the format.
17. Click **OK** to accept the format warning and begin the format.
18. **Format Results:** Click **Close**.
19. Click **OK**, to close the Scandisk notice. Scandisk should not be necessary since the VHD is not a physical drive and should not have any bad sectors.
20. Close the **Windows Help** window.
21. Click **Close** to exit the **Format** applet.
22. Finished!

Addendum

If using the Win98SE.ZIP bundle:

1. Extract the ZIP file. Move the **Win98SE** directory to the desired location.
2. From the **Virtual PC Console**, click **New.**
3. **NVMW:** Click **Next**.
4. **NVMW: Options:** Select **Add an existing virtual machine** and click **Next**.
5. **NVMW: Existing Virtual Machine Name and Location:** Browse to location from step 1 above, or drag and drop the Win98SE Package.vmc into the **Name and location** field. Click **Next**
6. **NVMW:** Uncheck **When I click Finish, open Settings** and click **Finish**.
7. Continue at step 10 on page 9 under Installing Windows 98

Windows NT 4 Workstation

Create a Virtual Machine

Using the same steps as outlined in the Getting Started section:

1. From the **Virtual PC Console, click** the **New…** to start the **New Virtual Machine Wizard**.
2. **New Virtual Machine Wizard** : Click **Next** to start the wizard.
3. **NVMW: Options:** Select **Create a virtual Machine**, then click **Next.**
4. **NVMW: VM Name and Location:** For the purpose of this guide, Windows 95 will be used as the name
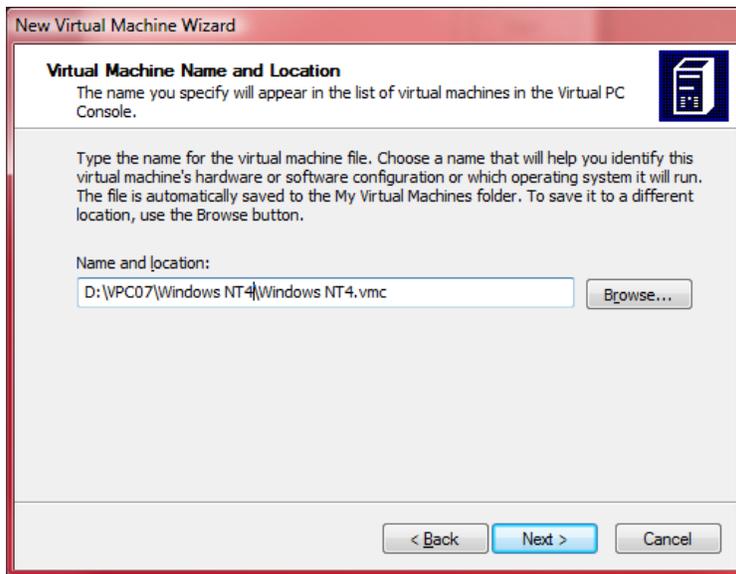
   and the location for the VM will be D:\VPC07\Windows NT4\Windows NT4. If the location does not exist, you will be prompted to create it. Click **Next** to continue.
5. **NVMW: Operating System:** Since Windows NT was a descriptive name, the operating system recommended is **Windows NT**. Click **Next** to continue.
6. **NVMW: Memory:** Here is where the amount of memory can be assigned to the VM. Generally, for older OSes like Windows 98 and NT, the initial OS installation should be done using the recommended amount of RAM. If additional RAM is required by the VM, this setting can be changed at a later time. Click **Next** to continue.
7. **NVMW: Virtual Hard Disk Options:** It is possible to use an existing virtual hard drive, or create a new one. In this case, a new hard disk will be created. Select **A new virtual hard disk** and **c**lick **Next** to continue.
8. **NVMW: Virtual Hard Disk Location:** By default, the location of the VHD will be the same as the .VMC that was created in step 4 previously. It is also possible here to modify the size of the VHD created. Since Windows NT was selected for installation, the default is a 8GB VHD.   Click **Next** to continue.
   Note: It is important to remember that the size of the VHD cannot be changed after it is created. Also, remember that the actual amount of disk space that can be used by the OS is also limited by the OS in some cases, as mentioned above.

9. **Finished!** The VM has been completed. Now it's time to put the VM to use and install the OS. Click **Finish** to complete the wizard. The figure below shows the completed VM in the VPC Console.
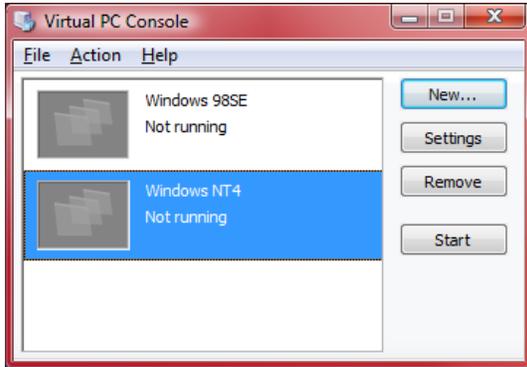

Figure 6: VPC Console with Win98 VM

Install the Windows NT 4 Workstation Operating System

Now the OS must be installed. Windows NT 4 can be installed via a bootable CD-ROM or via 3 boot floppies.

Installing Windows NT via bootable CD-ROM:

10. Insert the Windows NT CD-ROM in the host PC, select **Windows NT 4** and click **Start**.
11. If using an ISO image, click **Start** and then mount the ISO image by either dragging and dropping the ISO image to the CD-ROM tray icon, or by right-clicking the CD-ROM icon and clicking **Select CD Image to Capture**, browse to the correct location, select the ISO, then click **Open**.
12. If the **Argon PXE Boot Agent** message is displayed, reset the guest PC to boot from the ISO image, press *hostkey*+**R**, or *hostkey*+**DEL** to reset the guest PC.
13. If the CD-ROM is bootable, the Windows setup will begin loading.
14. **Welcome to Setup:** Press **Enter** to continue the installation., Skip to step 23.
15. If the CD-ROM is not bootable, see the next step:

Starting the Windows NT installation from floppy disk:

16. Windows NT should include 3 floppy disks to begin the Windows NT setup. These disks can also be created manually.
    a. See the Microsoft KB article: http://support.microsoft.com/kb/131735
17. Start up the Windows NT guest by selecting it from the PC List and clicking **Start Up.**
18. **Insert/mount the Windows NT 4 CD-ROM and the** *Windows NT Workstation Setup Boot Disk*
19. **At the prompt, insert** *Windows NT Workstation Setup Disk #2* and press **Enter**.
20. **Welcome to Setup:** Press **Enter** to continue the installation.
21. Press **Enter** to begin Setup's mass storage device detection.
22. At the prompt, insert *Windows NT Workstation Setup Disk #3* and press **Enter**.

Common Windows NT installation procedures:

23. **IDE CD-ROM (ATAPI 1.2)/PCI IDE Controller**: Press **Enter** to continue.
24. Setup may inform you that your disk has more than 1024 cylinders, press **Enter** to continue.
25. Setup may warn you that your hard disk is new or been erased, press **C** to continue setup.
26. **Windows NT Licensing Agreement:** Press **PAGE_DOWN** to reach the end of the agreement. If you agree to the licensing, press **F8**.
27. Press **Enter** to accept the hardware and software components determined by Windows Setup.

28. Windows NT 4 Setup will not accept and install on a system partition greater than 4GB. If you have created a larger custom disk image, you will need to create a partition on it using Windows Setup that is 4GB or less.
29. Creating a partition:
30. Press **c** to **Create Partition**
31. **Enter a partition size of 4GB or less and press Enter**.
32. Press **Enter** to install Windows on the selected partition.
33. **Partition format**: you have the option to format it with FAT or NTFS. Select **NTFS** and press **Enter**.
    a. Formatting with FAT will limit the boot partition to 2GB, regardless of the disk image's size. If you created a partition larger than 2GB, it should be formatted with NTFS.
    b. Follow the on-screen instructions required to complete the format, if necessary.
34. **Install location**: the default location for Windows NT is the *\winnt* directory. To accept the default, press **Enter**.
35. Press **Enter** to allow Setup to perform an exhaustive examination of the hard drive.
36. When prompted that the first portion of Setup is complete, remove any floppy disk, floppy disk images, CD-ROMs, or .ISO images and press **Enter** to restart the guest PC.
37. **Insert Disk**: Insert or mount the Windows NT CD-ROM or .ISO Image and click **OK**.
38. **Files Needed:** Click **OK** to continue the installation.
    a. This may not occur on all installations.
39. **Windows NT Setup:** Click **Next** to continue.
40. **Setup Options:** Select **Typical** and click **Next**.
41. **Name and Organization:** Enter your **Name** and **Organization**. Click **Next**.
42. **Registration:** Enter your **CD Key** and click **Next**.
43. **Computer Name:** Enter the **Name** the guest PC will be identified with. This should be a unique name.
44. **Administrator Account:** Enter a **Password** for the Administrator account and confirm the password.
45. **Emergency Repair Disk:** If you would like to create an ERD, click **Yes** and follow the on-screen instructions, otherwise select **No** and click **Next**. An ERD can be created after the installation has completed also.
46. **Windows NT Components:** Click **Next** to **Install the most common components (recommended)**.
47. **Windows NT Setup:** Click **Next** to continue.
48. **Windows NT needs to know how this computer should participate on a network:** Click **Next** to accept the default **This computer will participate on a network**.
49. **Network Adapter:** Click **Start Search** to locate the network adapter. Setup should locate the **DEC PCI Fast Ethernet DECchip 21140**. Click **Next**.
50. **Network Protocol:** Click **Next** to accept the default protocol of TCP/IP.
51. Click **Next** to install selected components.
52. **DEC DECchip 21140 Based Adapter Setup:** Click **Continue** to accept the default network adapter settings.
53. **TCP/IP Setup:** If you have a DHCP server on your network, are using Shared Networking, or are unsure, click **Yes**, otherwise click **No**. If you click **No**, you will need to manually enter in the correct TCP/IP information for your network. DHCP settings can also be changed after the installation completes.
54. Click **Next** to start the network.
55. Setup will now allow you to either have Windows NT join a domain or a workgroup. If you are unsure, click **Next** and join the default **Workgroup**: Workgroup.
    a. To join a domain, click **Domain** and enter in the domain you wish to join.
    b. If a computer account needs to be created, select **Create a Computer Account in the Domain**. You will need network administrative privileges to add an account to the domain.
    c. Enter a domain **User Name** and **Password** with the add workstations to the specified domain. Click **OK**.
56. Click **Finish** to continue.
57. **Date/Time Properties:** Select the correct time zone and click **Close**.
58. **Detected Display:** Click **OK**.

59. **Display Properties:** Select a **Color Palette** and **Desktop Area** and click **Test**.
60. **Testing Mode:** Click **OK**.
61. **Testing Mode:** If you saw the test bitmap, click **Yes**, otherwise click **No** and adjust your **Desktop Area** and/or **Color Palette.**
62. **Display Settings:** Click **OK** to save the display settings.
63. **Display Properties:** Click **OK** to continue.
64. **Windows NT Setup:** Click **Restart Computer** to complete the installation are reboot the guest PC. Make sure to remove the CD-ROM or ISO image before restarting.

Installing the VPC Additions in Windows NT 4

1. Windows NT service packs should be installed prior to installing the VM Additions.
2. Log on to Windows with local Administrator rights.
3. Once Windows has finished loading and at the desktop, press the *hostkey* to release the mouse and click **Action** from the Windows NT guest's menu bar.
4. Select **Install or Update Virtual Machine Additions**. This will launch a Setup Wizard to guide you through installing the VPC Additions in Windows.
   a. *VMNAME*: Click **Continue** to mount the VM Additions ISO.
5. **Welcome:** Click **Next** to begin.
6. **Setup Completed:** click **Finish** to restart the Windows NT VM and reboot with the VM Additions.
7. **Virtual Machine Additions:** Click **Yes** to restart.

Windows 2000 Professional

Create a Virtual Machine

Using the same steps as outlined in the Getting Started section:

1. **New Virtual Machine Wizard:** Click **Next** to start the wizard.
2. **NVMW:Options:** The next screen will present you with options to
   a. Create a virtual Machine—this should be used when installing a new VM.
      Note: After the VM is created, an OS must still be installed.
   b. Use default settings and create a virtual machine—this will create a default VM, but the VM will not have a virtual hard drive (VHD) or an OS.
   c. Add an existing virtual machine – existing or pre-created VMs can be imported
      Note: the following steps assume that a new VM is being created.

   Click **Next** to continue.

3. **NVMW: VM Name and Location:** For this Windows 2000 VM, the location used was **D:\VPC07\Windows 2000\Windows 2000.vmc**. Click **Next** to continue.
   a. If the folder does not exist, you will be prompted to create the folder, click **Yes** to do so.
4. **NVMW: Operating System:** Since a descriptive name was used, **Windows 2000** was selected. Click **Next** to continue.
5. **NVMW: Memory:** The amount of memory assigned to the VM is configured here. It is also possible to modify the amount of RAM assigned to VM after it is created. For this installation, memory was increased to 256MB. Additional memory can be assigned if necessary. Click **Next** to continue.
6. **NVMW: Virtual Hard Disk Options:** This is where the VHD is either assigned or created. Depending on the choice different options will follow. Select the appropriate choice and click **Next** to continue.
7. **NVMW: Virtual Hard Disk Location:** The default location of a new VHD is in the same folder as the .VMC file created in step 3. After creating a new VHD or browsing and selecting an existing VHD, click **Next** to continue. The size of the VHD cannot be changed after it is created. If a larger disk is required, it should be configured now.
8. **Finished!** The VM has been completed. Now it's time to put the VM to use and install the OS. Click **Finish** to complete the wizard.

   Note: To use serial (COM) or parallel (LPT) ports in the guest PC, these should be enabled before installing the VM's operating system to allow the ports to be properly detected and installed. To enable serial or parallel ports:
   7. The guest PC must be turned off and display **Not Running** in the **Virtual PC Console**, if it is **Running** or **Saved**, settings cannot be changed.
   8. Select the VM from the PC List and click **Settings**.
   9. Select the port you want to enable (**COM1**, **COM2**, **LPT1**)
   10. For **LPT1**, select **Physical parallel port** and select a host parallel port to emulate.
   11. For **COM** ports, select **Physical serial port** and pick the host COM port to emulate. **Wait for modem command to open port** should only be selected if using a modem.
   12. Click **OK** to close PC Settings.

Install the Windows 2000 Professional Operating System

Installing Windows 2000 via bootable CD-ROM:

9. Insert the Windows 2000 CD-ROM in the host PC.
    a. If using an ISO image, click **Start** and then mount the ISO image.
    b. If the **Argon PXE Boot Agent** message is displayed, reset the guest PC to boot from the ISO image, press *hostkey*+**R**, or *hostkey*+**DEL** to reset the guest PC.
    c. Click **Start**. If the CD-ROM is bootable, when prompted, press any key to boot from the CD-ROM. Skip to step 11.
    d. If the CD-ROM is not bootable, see the next step:

Starting the Windows 2000 installation from Floppy disk:

10. Windows 2000 CD-ROMs include 4 floppy disk images for booting. These images can be directly mounted in Virtual PC and booted from. The floppy disk images are located in the **BOOTDISK** directory of the Windows 2000 CD-ROM, the files are: **cdboot1.img**, **cdboot2.img**, **cdboot3.img**, and **cdboot4.img**.
    a. Copy the four boot disk images to an easily accessible location, like the desktop, on the host machine.
    b. Click **Start** and mount the first disk image, **cdboot1.img**. If the Argent is displayed, press the **Enter** key and another message should be displayed, **Reboot and Select proper Boot device or Insert Boot Media in selected boot device**. Press **Enter** again and the guest should begin booting off the floppy disk image. Alternately, press the *hostkey*+**R** to restart the system with the floppy disk image.
    c. Verify that the Windows 2000 CD-ROM or ISO image is mounted in the guest PC. Follow the on-screen prompts and mount the remaining three floppy disk images when asked.
    Note: After setup copies files from the CD-ROM, be sure to remove the floppy disk image before rebooting.
11. **Welcome to Setup:** Press **Enter** to set up Windows 2000.
12. **Windows 2000 Licensing Agreement:** Read the license agreement, press **F8** to accept the license and continue the installation.
13. Press **Enter** to start the partition setup.
    a. Use the arrow keys to select an alternate option: **Format the partition using NTFS file system, Format the partition using the FAT file system, or Convert the partition to NTFS.** To install Windows 2000 on an NTFS partition, select **Format the partition using the NTFS file system** and press **Enter**.
14. **Regional Settings:** Click **Next** to accept the default settings and continue.
    a. Click **Customize** to change the system locale, user locale, and/or the keyboard layout.
15. **Personalize Your Software:** enter a name and optionally an organization. Click **Next** to continue.
16. **Your Product Key:** Enter the 25-character Product key from the Windows 2000 Certificate of Authenticity. Click **Next** to continue.
17. **Computer Name and Administrator Password:** Setup will suggest a computer name, or enter a custom name. Enter an Administrator password and confirm it. Click **Next** to continue.
18. **Date and Time Settings:** Verify the correct date and time are displayed, click **Next** to continue.
19. **Network Settings:** Select **Typical Settings** and click **Next** to continue.
20. **Workgroup or Computer Domain:** Select whether this Windows 2000 installation will be part of a domain or workgroup. Click **Next** to continue.
    Note: It is also possible to join the Windows 2000 guest to a domain after the installation has completed. To join a domain, a user account with permissions to add a computer account to the domain is necessary. Select **No, this computer is not on a network, or is on a network without a domain** and click **Next**.

21. **Completing the Windows 2000 Setup Wizard:** remove or release and CD-ROM or ISO image and click **Finish** to restart Windows 2000.
22. **Welcome to the Network Identification Wizard:** click **Next** to continue.
23. **Users of This Computer:** select an option for logging in. Select **Users must enter a user name and password to use this computer** and click **Next**.
24. **Completing the Network Identification Wizard:** click **Finish.**

Installing the VPC Additions in Windows 2000 Professional

1. Windows service packs should be installed prior to installing the VM Additions. Installing a service pack after the VM Additions may require the VM Additions to be reinstalled.
2. Log on to Windows with local Administrator rights.
3. Once Windows has finished loading and at the desktop, press the *hostkey* to release the mouse and click **Action** from the Windows 2000 guest's menu bar.
4. Select **Install or Update Virtual Machine Additions**. This will launch a Setup Wizard to guide you through installing the VPC Additions in Windows.
    a. *VMNAME*: Click **Continue** to mount the VM Additions ISO.
5. **Welcome:** Click **Next** to begin.
6. **Setup Completed:** click **Finish** to restart the Windows 2000 VM and reboot with the VM Additions.
7. **Virtual Machine Additions:** Click **Yes** to restart.

Windows XP Professional

Create a Virtual Machine

Using the same steps as outlined in the Getting Started section:

1. **New Virtual Machine Wizard:** Click **Next** to start the wizard.
2. **NVMW:Options:** The next screen will present you with options to
   a. Create a virtual Machine—this should be used when installing a new VM.
      Note: After the VM is created, an OS must still be installed.
   b. Use default settings and create a virtual machine—this will create a default VM, but the VM will not have a virtual hard drive (VHD) or an OS.
   c. Add an existing virtual machine – existing or pre-created VMs can be imported
      Note: the following steps assume that a new VM is being created.

   Click **Next** to continue.

3. **NVMW: VM Name and Location:** For this Windows XP VM, the location used was **D:\VPC07\Windows XP\Windows XP.vmc**. Click **Next** to continue.
   a. If the folder does not exist, you will be prompted to create the folder, click **Yes** to do so.
4. **NVMW: Operating System:** Since a descriptive name was used, **Windows XP** was selected. Click **Next** to continue.
5. **NVMW: Memory:** The amount of memory assigned to the VM is configured here. It is also possible to modify the amount of RAM assigned to VM after it is created. For this installation, memory was increased to 384MB. Additional memory can be assigned if necessary. Click **Next** to continue.
6. **NVMW: Virtual Hard Disk Options:** This is where the VHD is either assigned or created. Depending on the choice different options will follow. Select the appropriate choice and click **Next** to continue.
7. **NVMW: Virtual Hard Disk Location:** The default location of a new VHD is in the same folder as the .VMC file created in step 3. After creating a new VHD or browsing and selecting an existing VHD, click **Next** to continue. The size of the VHD cannot be changed after it is created. If a larger disk is required, it should be configured now.
8. **Finished!** The VM has been completed. Now it's time to put the VM to use and install the OS. Click **Finish** to complete the wizard.

   Note: To use serial (COM) or parallel (LPT) ports in the guest PC, these should be enabled before installing the VM's operating system to allow the ports to be properly detected and installed. To enable serial or parallel ports:
   - The guest PC must be turned off and display **Not Running** in the **Virtual PC Console**, if it is **Running** or **Saved**, settings cannot be changed.
   - Select the VM from the PC List and click **Settings**.
   - Select the port you want to enable (**COM1**, **COM2**, **LPT1**)
   - For **LPT1**, select **Physical parallel port** and select a host parallel port to emulate.
   - For **COM** ports, select **Physical serial port** and pick the host COM port to emulate. **Wait for modem command to open port** should only be selected if using a modem.
   - Click **OK** to close PC Settings.

Installing Windows XP Professional

9. Insert the Windows XP CD-ROM in the host PC and click **Start**.
   a. If using an ISO image, click **Start** and then mount the ISO image.
   b. When prompted, press any key to boot from the CD-ROM.
10. **Welcome to Setup:** Press **Enter** to begin the installation.
11. **Windows XP Licensing Agreement:** Read the license agreement, press **F8** to accept the license and continue the installation.
12. Press **Enter** to begin the partitioning.
    a. Use the arrow keys to select an option: **Format the partition using NTFS file system (Quick), Format the partition using the FAT file system (Quick), Format the partition using NTFS file system, Format the partition using the FAT file system, or Convert the partition to NTFS.** To install Windows XP on an NTFS partition, select **Format the partition using the NTFS file system (Quick)** and press **Enter**.
13. **Regional and Language Settings:** Click **Next** to accept the default settings and continue.
    a. Click **Customize** to change the regional and language settings, if necessary.
    b. Click **Details** to change the text input language and method, if necessary.
14. **Personalize Your Software:** enter a name and optionally an organization. Click **Next** to continue.
15. **Your Product Key:** Enter the 25-character Product key from the Windows XP Certificate of Authenticity. Click **Next** to continue.
16. **Computer Name and Administrator Password:** Setup will suggest a computer name, or enter a custom name. Enter an Administrator password and confirm it. Click **Next** to continue.
17. **Date and Time Settings:** Verify the correct date and time are displayed, click **Next** to continue.
18. **Network Settings:** Select **Typical Settings** and click **Next** to continue.
19. **Workgroup or Computer Domain:** Select whether this Windows XP installation will be part of a domain or workgroup. Click **Next** to continue.
    Note: It is also possible to join the Windows XP guest to a domain after the installation has completed. To join a domain, a user account with permissions to add a computer account to the domain is necessary.
20. **Display Settings:** Click **Ok** to continue.
21. **Monitor Settings:** Click **Ok** if the text box is readable.
22. **Welcome to Microsoft Windows:** Click **Next** to continue.
    Note: Depending the SP level of XP you're installing the following screens may or may not appear.
23. **Help protect your PC:** Select one of the options and click **Next.**
24. **Checking Internet connectivity:** If there is no Internet connection, click **Skip.**
25. **How will this computer connect to the Internet:** Select the type of connection you have and click **Next**, or click **Skip** to cancel.
26. **Ready to Activate Windows:** Select **Yes** or **No** and click **Next**.
27. **Register with Microsoft:** Select whether or not to register with Microsoft and click **Next.**
28. **Who will use this computer:** Enter at least one name and click **Next.**
29. Click **Finish** to complete setup.

Installing the VPC Additions in Windows XP Professional

1. Windows service packs should be installed prior to installing the VM Additions. Installing a service pack after the VM Additions may require the VM Additions to be reinstalled.
2. Log on to Windows with local Administrator rights.
3. Once Windows has finished loading and at the desktop, press the *hostkey* to release the mouse and click **Action** from the Windows XP guest's menu bar.

4. Select **Install or Update Virtual Machine Additions**. This will launch a Setup Wizard to guide you through installing the VPC Additions in Windows.
    a. *VMNAME*: Click **Continue** to mount the VM Additions ISO.
5. **Welcome:** Click **Next** to begin.
6. **Setup Completed:** click **Finish** to restart the Windows XP VM and reboot with the VM Additions.
7. **Virtual Machine Additions:** Click **Yes** to restart.

Linux Installation Notes:

With so many different GNU/Linux, *nix, BSD, and related distributions, this section will only focus on the specific changes or selections that need to be accounted for when installing in VPC.

CentOS 5.0

Create a VM using the standard method, *Creating a new Virtual Machine*, shown on page 6. Since Linux is an unsupported guest in VPC, the operating system selection **Other** should be chosen. During installation, some Linux distributions have a problem with large amounts of memory when running under VPC. In general, keep the allocated RAM to 512MB or less for installation. Additional RAM can be allocated later, if necessary. For the installation used for this guide, 512MB was used.

The VHD size should be considered carefully also, since it cannot be increased from its maximum size. Note that the maximum size of the VHD is the number listed in the textbox across from **Virtual hard disk size**, not the **Maximum virtual hard disk size** shown above. **Maximum virtual hard disk size** is the limit of the largest VHD that may be created and in order to create a disk with that size as its maximum, that number 130,557 must be entered into **Virtual hard disk size**.

After the VM has been created, start the VM. Since VPC can use ISOs directly, there is no need to burn the ISO after download. The ISO image will also perform much faster than a physical disc.

1. Start the VM by selecting the CentOS VM and clicking **Start**, or by double-clicking the VM from the VM List.
2. Mount the ISO.
    a. Select the ISO with the mouse, drag and drop it on the CD-ROM icon in the VPC Toolbar
    b. Right-click the CD-ROM icon and click **Capture ISO image**. Browse to the ISO's location and click **Open**.
3. Restart the VM. Press *hostkey+DEL* or *hostkey+R.*
4. Type **linux text** to install in text mode. The default color depth for CentOS 5 is 24bit, which VPC is incapable of displaying.
5. Install CentOS using whatever selections or packages desired. Keep in mind that additional packages can be installed after the installation is complete and the graphics is properly configured.
6. After finishing the install and rebooting, login as root.
7. Edit the xorg.conf file located in the etc/X11 folder, type **vi /etc/X11/xorg.conf** and press **Enter.**
8. Locate the **Section "Screen"** and change the **24** under **DefaultDepth** to **16.** Also, change the **24** to **16** under the **Subsection "Display"** - **Depth**.
9. Restart the OS, type **shutdown -r -t 00 now**
10. Login again as root and type **startx** to launch the GUI.
11. To have X launch automatically, edit **/etc/inittab** and change the id:X:initdefault where X is the value listed in the file for X11.

Tips

Keyboard/Mouse Capture

A very useful and neat feature of VPC is that as long as the VM's window is in focus, it is possible to type into the VM and the mouse will remain un-captured. This is very handy when moving between multiple windows and saves an extra keystroke by avoiding the *hostkey* to release the mouse pointer. Of course, once the mouse is "clicked-in" to the VM, the *hostkey* must be used to release both the mouse and keyboard. This works great when installing a new OS, while doing other work.

Pasting Text into a VM during installation (w/o Additions)

Text can be directly pasted into a VM using the Edit-->Paste option from the menu. This works great for entering in Windows COA product keys. Simply delete any spaces or dashes in the key, copy it via CTRL+C, then make sure the cursor in the VM is in the correct entry box, and click **Edit-->Paste**. The text is then entered via a "typing" method, where each character is "typed" into the VM by VPC.

Upgrading an OS in a VM

Before upgrading an OS inside a VM, make sure to remove the VM Additions of the current OS before the upgrade is started. After the upgrade is complete, reinstall the VM Additions for the newly upgraded OS. Not removing the VM Additions may cause problems with the upgraded OS and the VM Additions for the old OS may not be able to be uninstalled.

Virtual Disk Wizard: Maximum Virtual Hard Disk Size

The maximum size of the VHD is the number listed in the textbox across from **Virtual hard disk size**, not the **Maximum virtual hard disk size** shown above. **Maximum virtual hard disk size** is the limit of the largest VHD that may be created and in order to create a disk with that size as its maximum, that number 130,557 must be entered into **Virtual hard disk size**.

Figure 7: Virtual Disk Wizard

Hardware Virtualization Notes

If you're running supported OSes, like the various versions of Windows, the main benefit you get from Hardware Virtualization. Once you've installed the VM Additions, HV doesn't play much of a role. If you're using unsupported OSes, like GNU/Linux based OSes, HV will help since there are no VM Additions that provide any performance increases.

If you're running another VM product, like VM Ware Workstation, or Innotek VirtualBox, only one of these applications can use HV at a time. for example, if you're running VPC and VMW Workstation, you should disable HV on any guests you're running in VPC, otherwise when both applications attempt to use HV, the host OS will crash.

Emulated Video Card and GNU/Linux

The video card in VPC cannot emulate 24bit color depth. As such, many newer GNU/Linux distributions will not be installable due to video distortion. Changing the color depth to 16 or 32bit will resolve this issue. In some cases, this can be done at the initial installation screen, but a text installation may be required if the distribution cannot run in a lower color depth. Once example of this is Ubuntu, which even in the Safe Mode graphics installation still uses a 24bit color depth.

Notes:

Version 0.1-October 24th, 2006—initial version: background, terminology, VDW, creating a VM, installing Win98

Version 0.11-March 11th, 2007—corrected grammatical errors, added "installing a 2nd VHD in Win98"

Version 0.50-October 2007--added new content, WinNT, Win2000, Tips.