VM Ware and Virtualization

csci E-63

32 vs 64 bit

- Please note that most recent version of VMWare Workstation requires a 64 bit operating system. Older Workstations 7 and 8 support both 32 bit and 64 bit.

- Also, you might be required to enable virtualization support on your BIOS.

What is Virtual Machine

- A virtual machine is an isolated software container that can run its own operating systems and applications as if it were a physical computer.
- A virtual machine behaves exactly like a physical computer and contains it own virtual (i.e. software-based) CPU, RAM hard disk and network interface card.
- An operating system can’t tell the difference between a virtual machine and a physical machine, nor can applications or other computers on a network.
- A virtual machine is composed entirely of software and contains no hardware components.

Characteristics of Virtualization

- Compatibility:
  - Virtual machines are compatible with all standard x86 computers
- Isolation:
  - Virtual machines are isolated from each other as if physically separated
- Encapsulation:
  - Virtual machines encapsulate a complete computing environment
- Hardware independence:
  - Virtual machines run independently of underlying hardware

Compatibility

- Just like a physical computer, a virtual machine hosts its own guest operating system and applications, and has all the components found in a physical computer:
  - motherboard,
  - VGA card,
  - network card controller.
- As a result, virtual machines are completely compatible with all standard x86 operating systems, applications and device drivers, so you can use a virtual machine to run all the same software that you would run on a physical x86 computer.

Isolation

- While virtual machines can share the physical resources of a single computer, they remain completely isolated from each other as if they were separate physical machines.
- If, for example, there are four virtual machines on a single physical server and one of the virtual machines crashes, the other three virtual machines remain available.
- Isolation is an important reason why the availability and security of applications running in a virtual environment is far superior to applications running in a traditional, non-virtualized system.

Encapsulation

- A virtual machine is essentially a software container that bundles or “encapsulates” a complete set of virtual hardware resources, as well as an operating system and all its applications, inside a software package.
- Encapsulation makes virtual machines incredibly portable and easy to manage.
- You can move and copy a virtual machine from one location to another just like any other software file, or save a virtual machine on any standard data storage medium, from a pocket-sized USB flash memory card to an enterprise storage area networks (SANs).

Hardware Independence

- Virtual machines are completely independent from their underlying physical hardware.
- We can configure a virtual machine with virtual components (eg, CPU, network card, SCSI controller) that are completely different from the physical components that are present on the underlying hardware.
- Virtual machines on the same physical server can even run different kinds of operating systems (Windows, Linux, etc).

  When coupled with the properties of encapsulation and compatibility, hardware independence gives you the freedom to move a virtual machine from one type of x86 computer to another without making any changes to the device drivers, operating system, or applications.
- Hardware independence also means that you can run a heterogeneous mixture of operating systems and applications on a single physical computer.

Why Use Virtual Machines

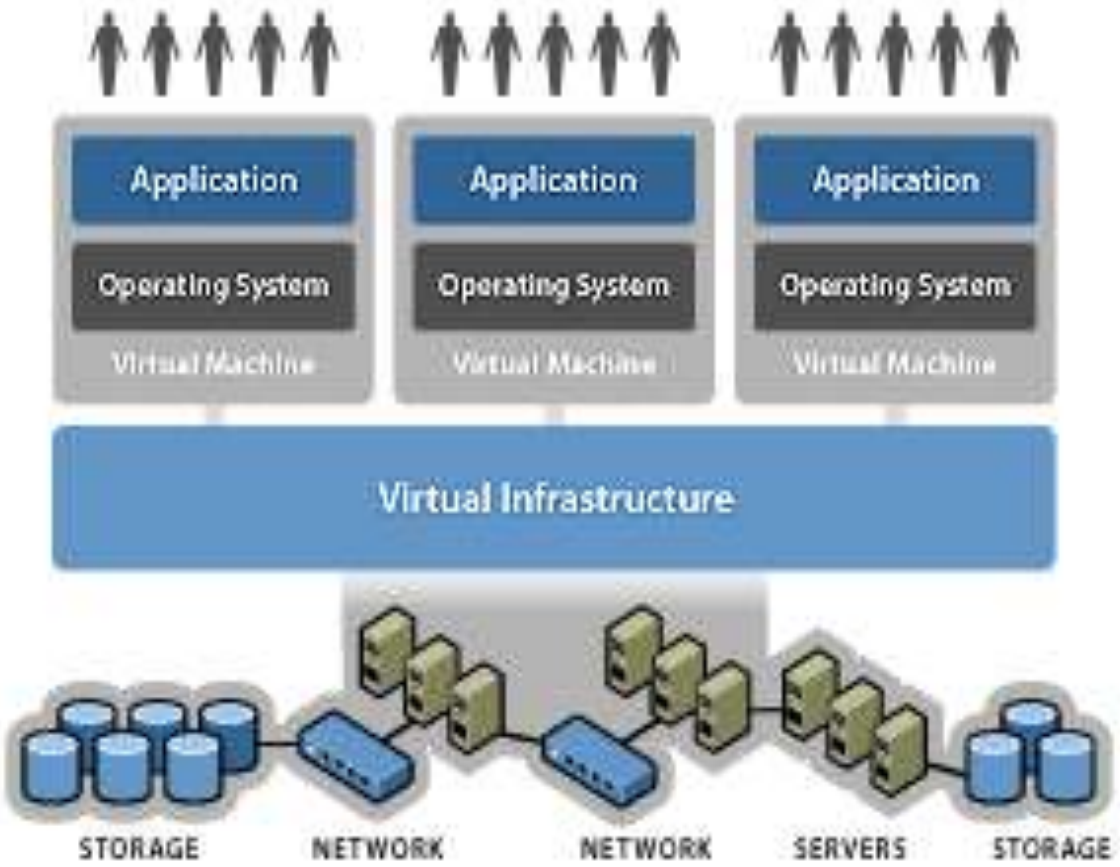
- Virtualization improves the efficiency and availability of resources and applications.
- Typically, internal resources are underutilized under the “one server, one application” model and IT administrators spend too much time managing servers.
- An automated datacenter, built on a VMware virtualization platform, lets you respond to market dynamics faster and more efficiently than ever before.
- Virtual infrastructure could deliver resources, applications—whole servers—when and where they are needed.
- It is possible to save 50-70% on overall IT costs by consolidating resource pools and delivering highly available applications relying on virtual machines.

What Could be done with VM-s

- Run multiple operating systems on a single computer including Windows, Linux and more.
- Let your Mac run Windows creating a virtual PC environment for all your Windows applications.
- Reduce capital costs by increasing energy efficiency and requiring less hardware and increasing your server to admin ratio
- Improved disaster recovery solutions and deliver high availability throughout the datacenter
- Improve enterprise desktop management & control with faster deployment of desktops and fewer support calls due to application conflicts

Virtual Infrastructure

- A virtual infrastructure lets you share your physical resources of multiple machines across your entire infrastructure.
- A virtual machine lets you share the resources of a single physical computer across multiple processes for maximum efficiency.
- Resources are shared across multiple virtual machines and applications.

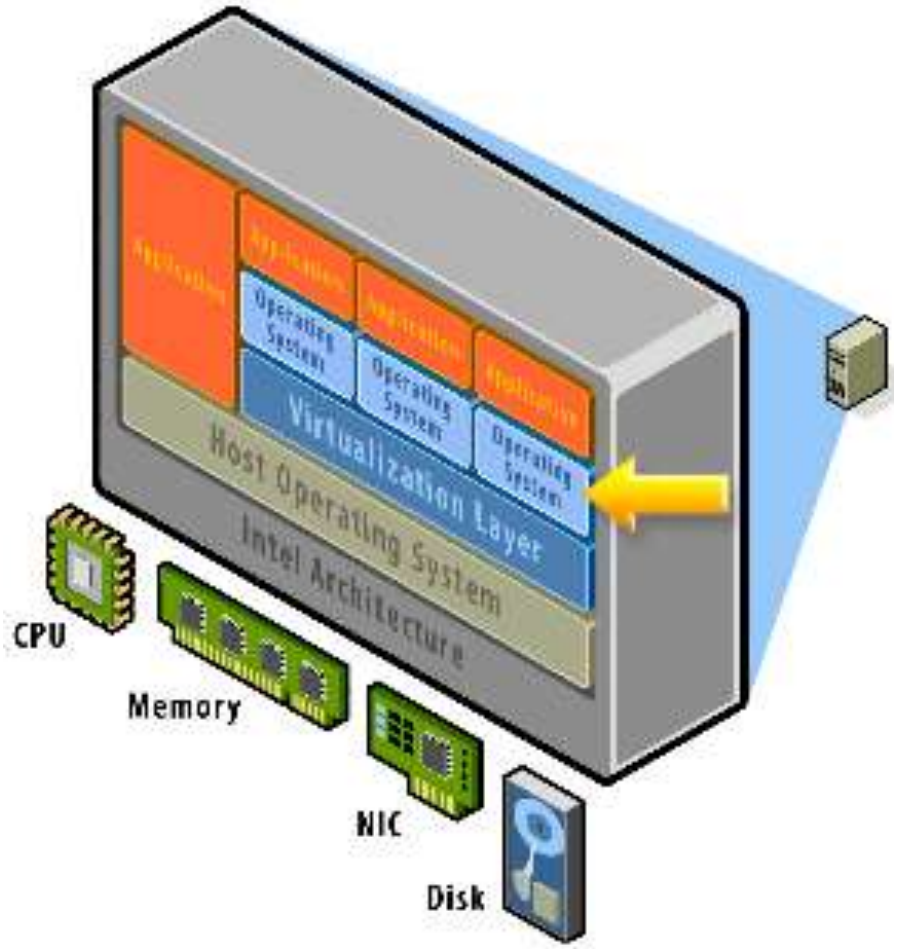


VMWare Workstation 7.0

- Workstation is an application that runs on a host operating system like Windows or Linux.
- Workstation lets you run several virtual machines with operating systems on top of it.
- Each operating system can have one or more applications running on it, just like a physical PC.

Mapping of Physical Resources

- The VMware virtualization layer maps the physical hardware resources to the virtual machine's resources, so each virtual machine has its own CPU, memory, disks, I/O devices, and so forth.
- Workstation can be installed on existing Windows or Linux systems, alongside other currently running applications
- Virtual machines added to an existing machine do not disrupt existing applications.



Who uses VM Workstations

- IT Administrators 51% of usage
- Developers 31%
- Sales, Training, Support 7%

New Features of Version 7.0

- Workstation 7.0 includes support for Windows 7 as both a guest and host operating system.
- Workstation 7.0 supports 3D acceleration and multi monitor display mode.
- You can stretch a virtual machine to span multiple monitors, or you can stretch multiple virtual machines so each machine displays on a separate monitor.
- The new Four-Way SMP Support With Multi-Core Options allows you to configure up to 4 processor cores per VM.
- Workstation 7.0 can create and run so secured virtual desktops (ACEs), including Pocket ACEs for easy, secure transport of your virtual machines on a thumb drive.

New Features of Version 7.0

- Conversion Wizard is included in Workstation, and can convert a physical computer into a virtual machine in minutes.
- The new integrated virtual debugger integrates with Visual Studio and Eclipse so we can deploy, run, and debug programs in a virtual machine directly from IDE.
- You can now record all virtual machine activity over a period of time.
- The record/replay feature captures the virtual machine state. One can stop playback and go live at any point in the recording.
- You can also pause any virtual machine running in Workstation 7.0 to free up system resources.
- Using `AutoProtect` snapshots, you can schedule the process of taking snapshots.

Registration Email

Subject: **An account has been created for you**

Harvard University – Extension School

Welcome,

An account has been created for you that provides access to academically priced software at significant savings.

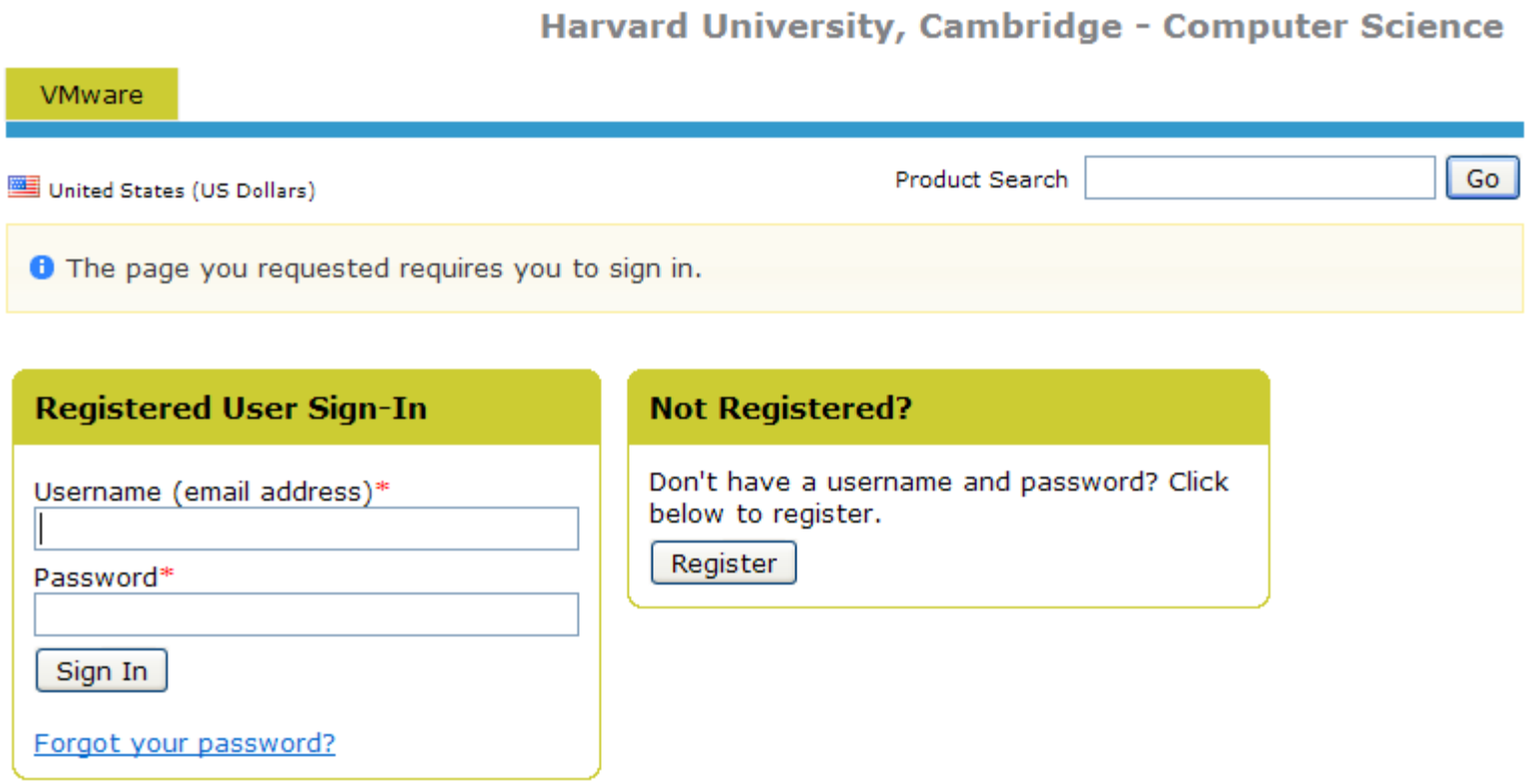
Complete Your Registration:
http://e5.onthehub.com/d.ashx?s=bwnxu504l4&u=dc2edb67-3c1d-e311-93f4-b8ca3a5db7a1

If you are redirected to your institution's internal sign-in page, use your institution credentials.
Once you have completed the registration process you can begin shopping.

If you have any questions, please see the Help section of the website.

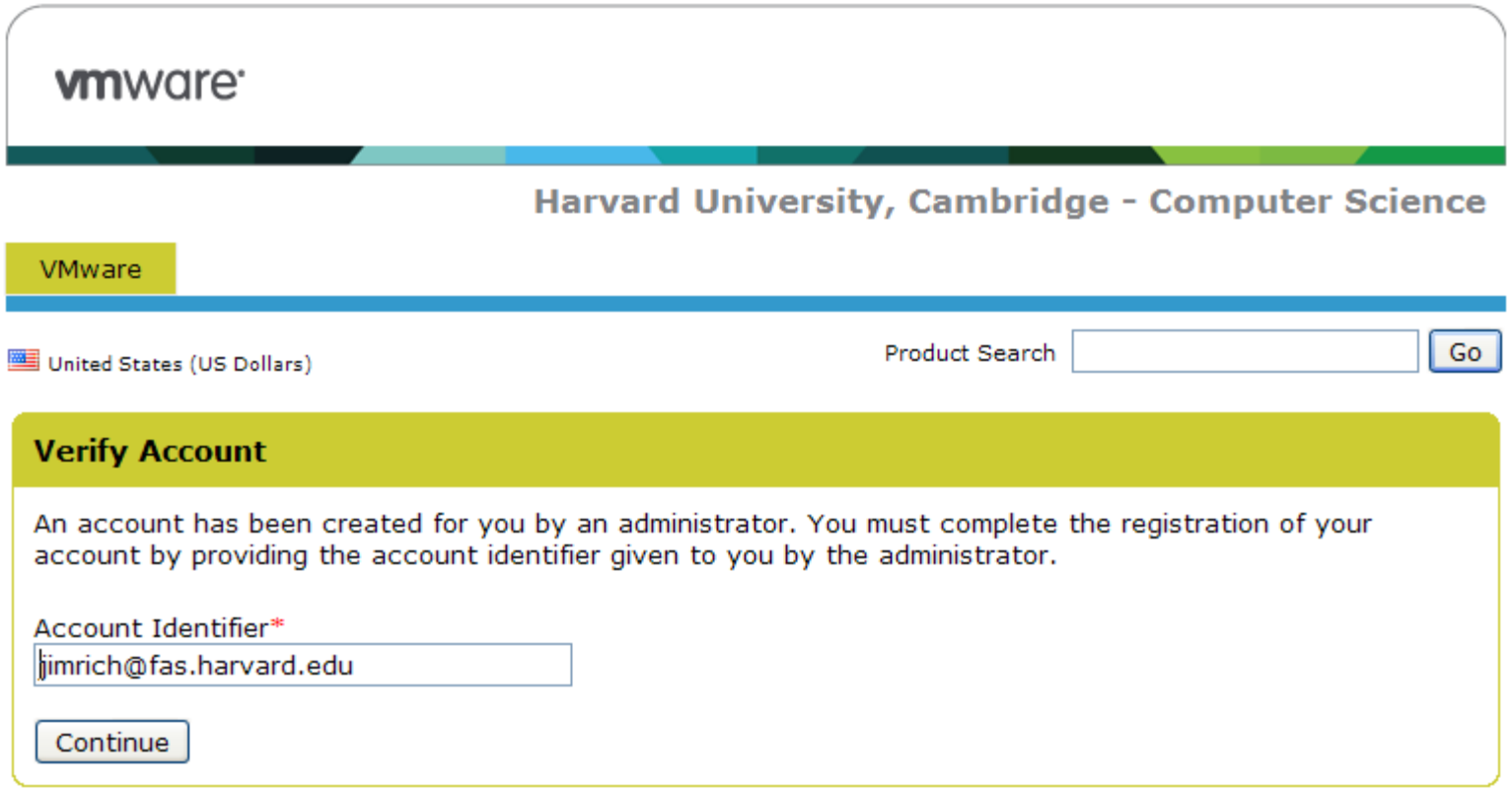
Thank you,
Harvard University - Extension School
http://e5.onthehub.com/d.ashx?s=xbe7lj5xpm

On First Visit, Select Register

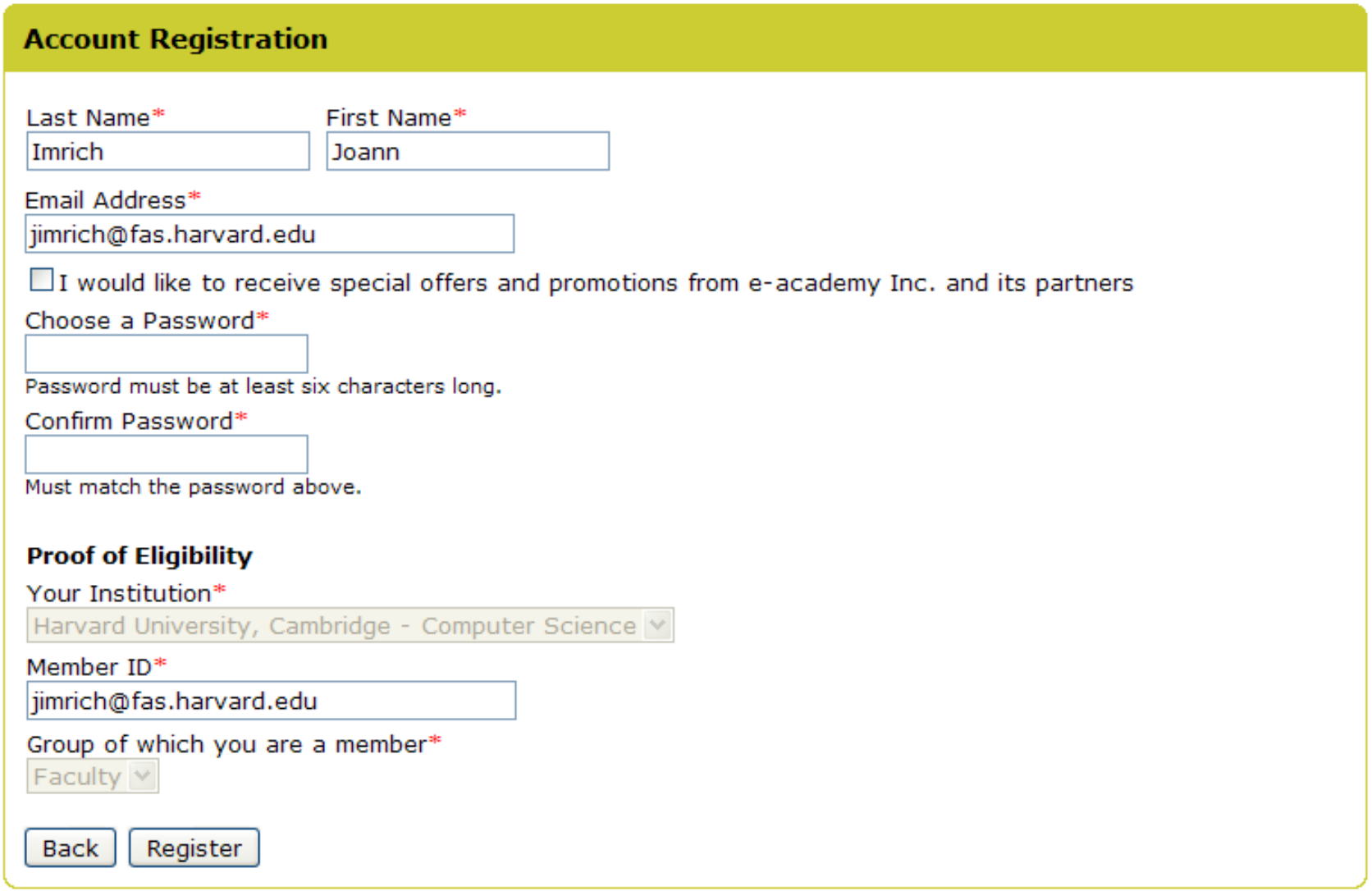


Use your email as Account Identifier, Continue

- Your email is the Account Identifier. Initiate the **registration**. If the system does not recognize your email, please, send us a note.

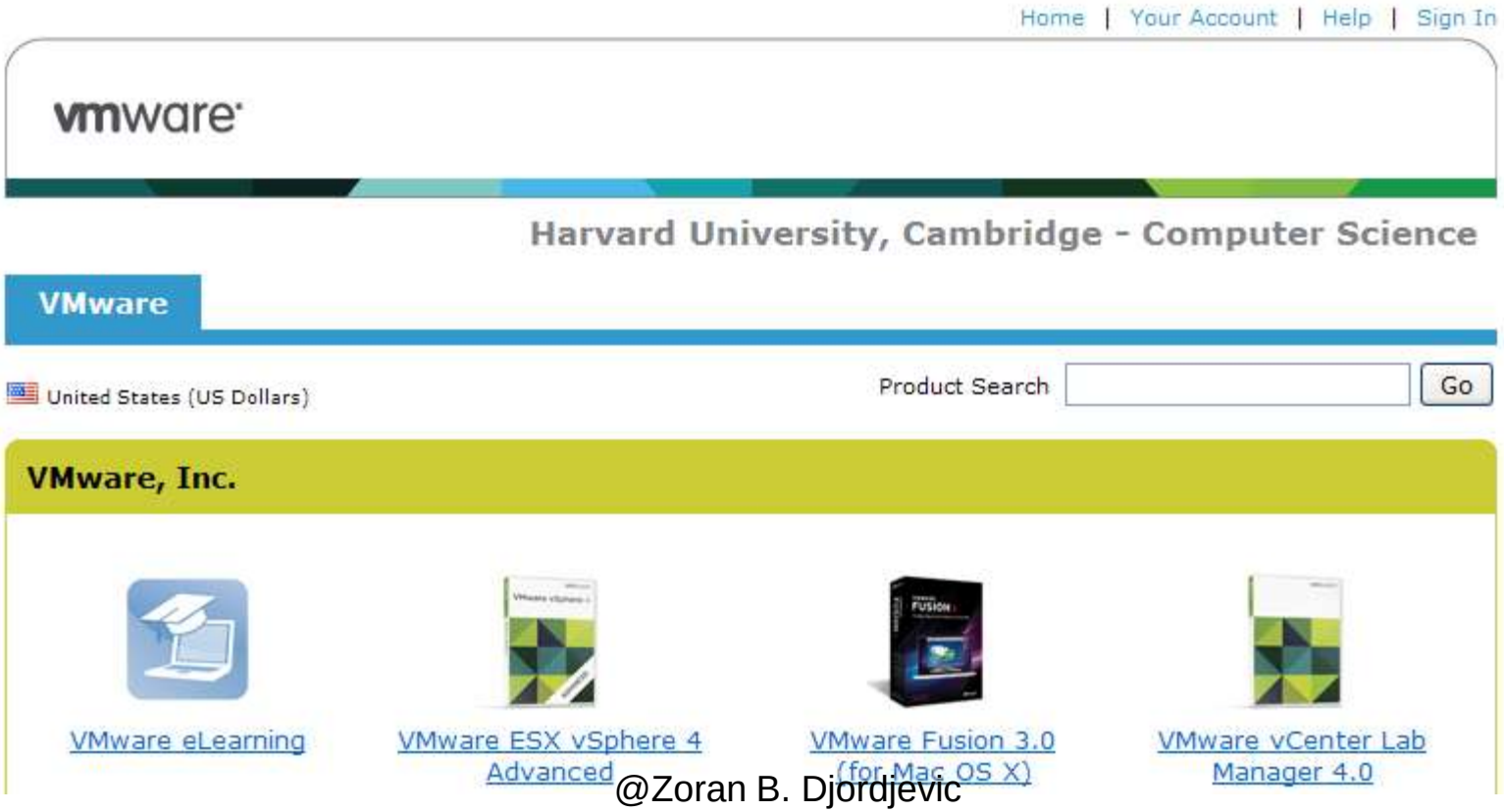


Account Registration Page, Register



Downloading and Installing VM Workstation

- Go to
- http://e5.onthehub.com/d.ashx?s=73rhz3ty49
- Click on Your Account



Web Store is Open, Purchase Workstation

- If you work with Windows 32 bit, please “purchase” VMware Workstation 7 for Windows. For 64 bit Windows take Workstation 10
- If you work with Linux, please purchase VMware Workstation for Linux.
- If you use 32 bit MAC, please purchase VMware Fusion 3 for Mac OS X. For 64 bit Mac, please take Fusion 6
- Other products in the store appear to be accessible as well. Price for a workstation is $0.00
- Your account page will show the serial number, which you will use to register the Workstation with the licensing server.

Notes on Installation

- To install Workstation on a Window's host, first, log on to the host as user Administrator or as a user who is a member of the Windows Administrators group.
- Run the installation wizard to accept the end user license agreement, select the folder in which to install the files, determine where you want workstation shortcuts displayed, and supply the Workstation serial number. Always select to install workstation as a set of small files rather than one large file. A large file (~20GB) can not be easily moved around.
- Note that if you are planning to install debuggers such as Eclipse or Microsoft Visual Studio, please install these programs before installing Workstation installer.

Notes on Installation

- To install Workstation on a Linux host, first log on with the user name you plan to use when you run Workstation and become root to perform the installation.
- Mount the package and use bundle to install the package.
- Use the configuration program to configure the installation of VMware Workstation. This program walks you through accepting the license agreement, choosing the installation folders, and setting up the virtual network.
- In addition to using this program the first time you install workstation, you must use it when you upgrade Workstation or the host operating system kernel.
- You also use it to reconfigure the networking options for Workstation—for example, to add or remove host-only networking.

Notes on Installation

- 2 gigabytes of physical memory is required.
- The memory requirement depends on the host operating system, plus the memory required for each guest operating system and for applications on the host and guest.
- The total amount of memory you can assign to all virtual machines running on a single host is limited only by the amount of RAM on the host.
- The maximum amount of memory for each virtual machine is 8 gigabytes.
- The virtual machines running under Workstation perform better if they have faster processors and more memory.

Notes on Installation

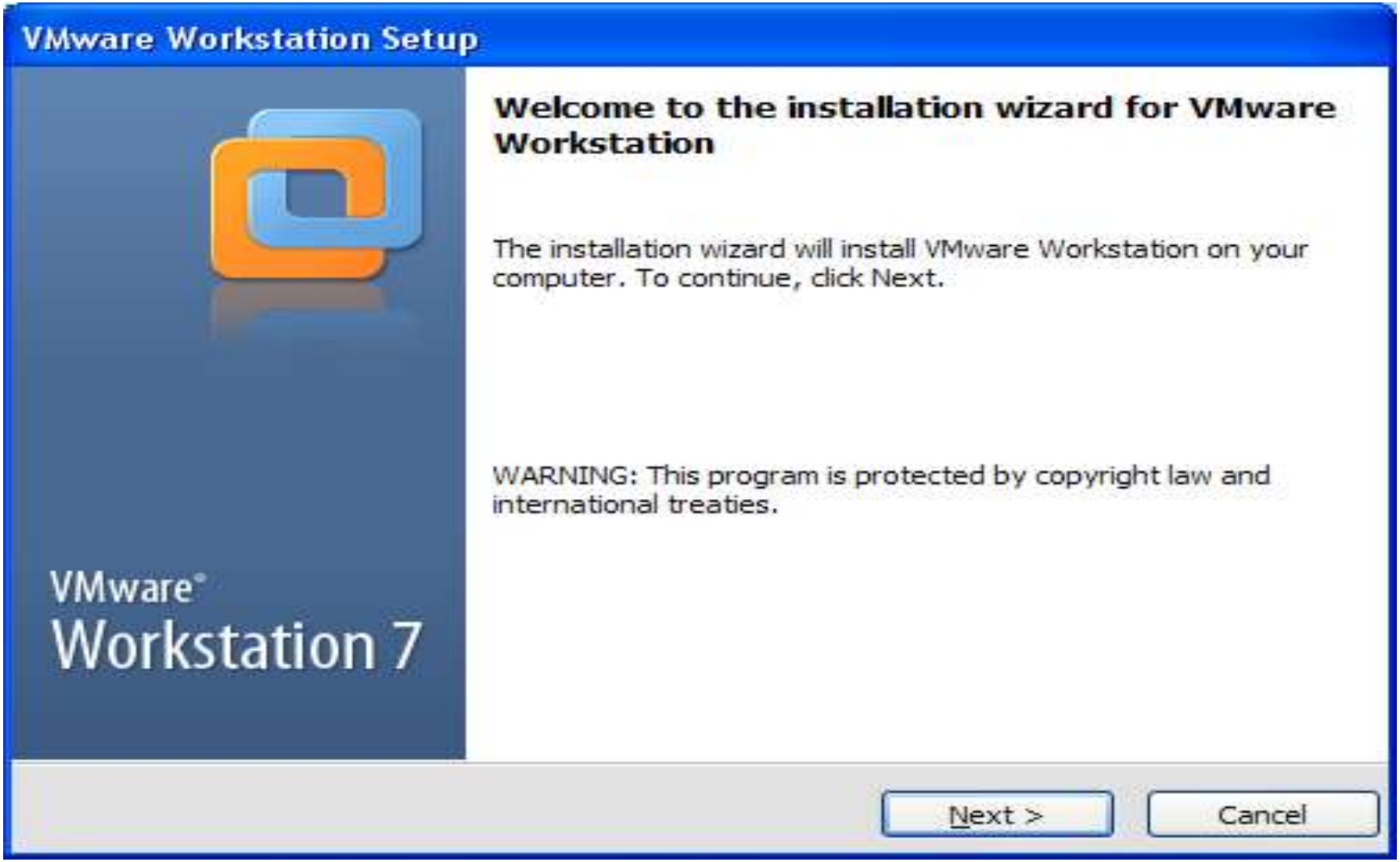
- Workstation 7.0 supports IDE and SCSI drives.
- For the basic installation of Workstation 7.0, the host machine must have a free disk space of 1.5 GB if the host operating system is Windows and 200MB in the case of Linux host operating system.
- The host machine should also have enough storage space for creating virtual machines and installing guest operating systems and applications.
- You can use any Ethernet interface card that the host operating system supports.
- VMware Workstation 7.0 can be installed on both the 32 bit and 64 bit versions of Microsoft Windows and Linux operating systems.

Coexistence with other VMware Software

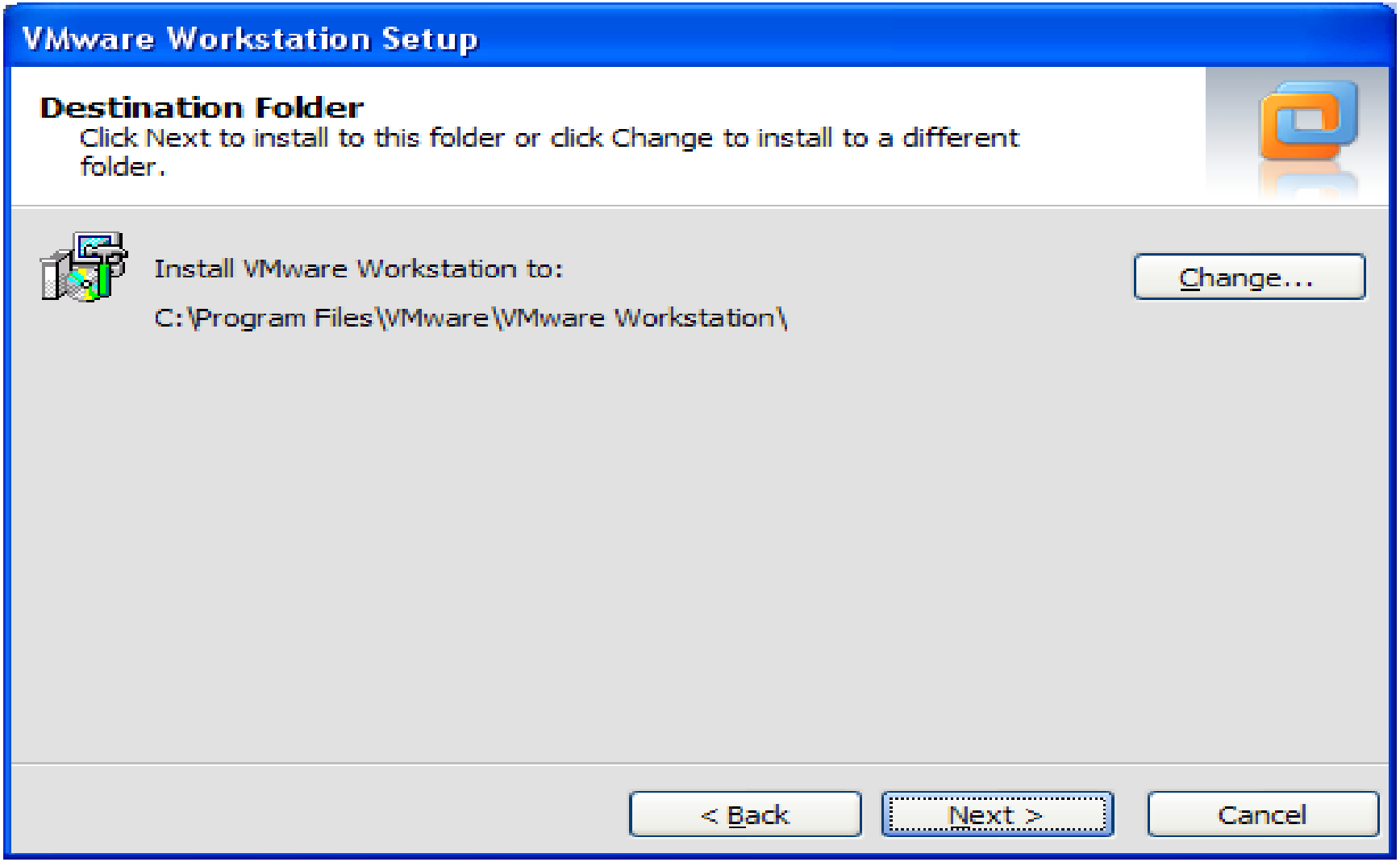
- You cannot have VMware Workstation installed on the same host machine with another VMware product, such as VMware Server.
- The only VMware products that can share a host machine with Workstation are the
  - VI client,
  - vSphere client software and
  - VMware Converter.

- Note that in the case of an earlier version of Workstation installed on your system, the installer removes that version before installing the new version.
- After the un-installation is complete, you might be prompted to restart your computer before the installer can install the new version.

Be Positive


VMware Workstation Setup
Welcome to the installation wizard for VMware Workstation
The installation wizard will install VMware Workstation on your computer. To continue, click Next.
WARNING: This program is protected by copyright law and international treaties.
VMware®
Workstation 7
Next >
Cancel

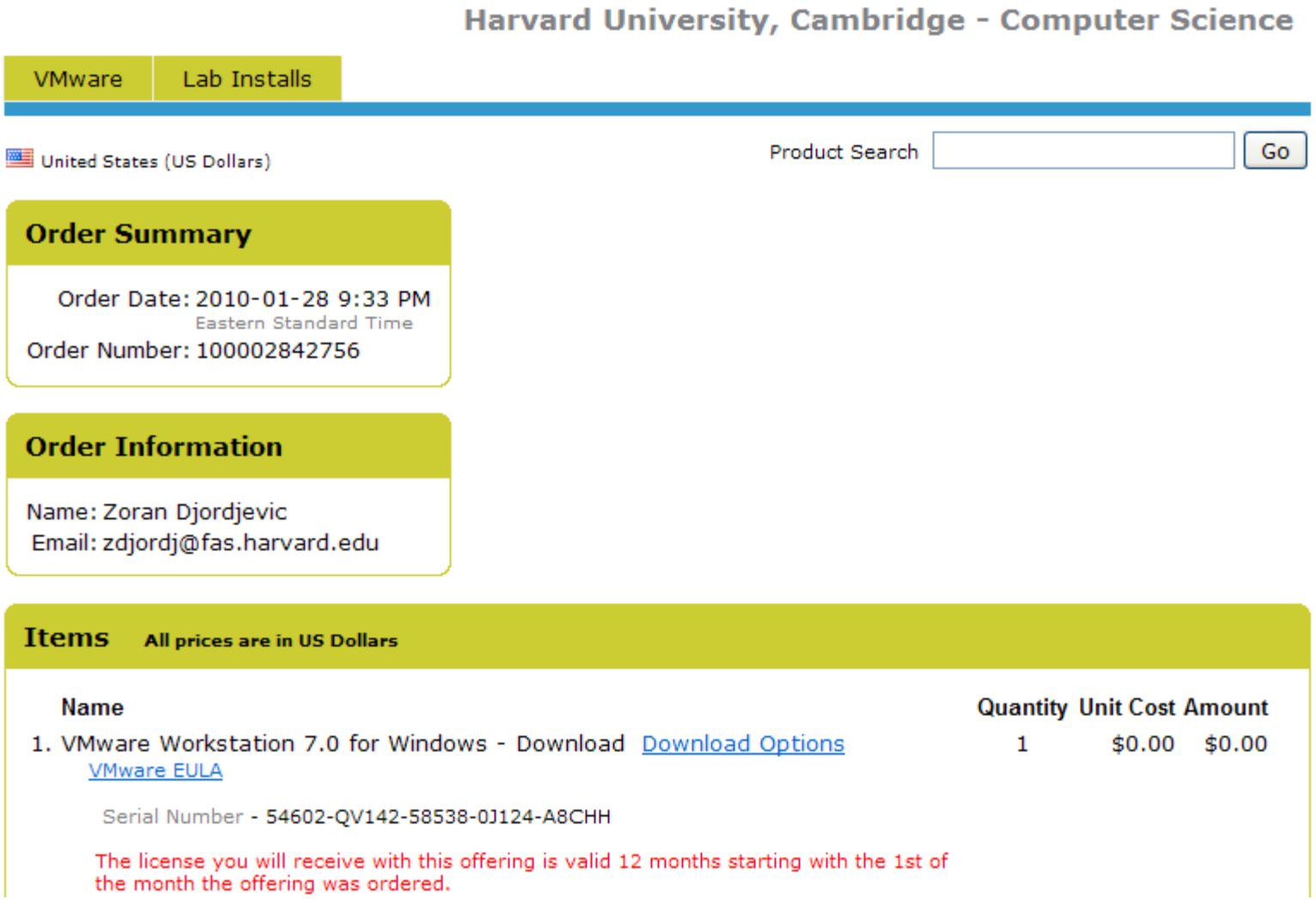
Click Next Most of the Time



Options

- You can choose to create shortcuts in the Desktop, Start Menu programs folder, and Quick Launch toolbar.
- The Windows security warning window appears when the installer tried installing “VMware, Inc. Network Service” . Note that you can enable the option “Always trust software from VMware, Inc”, if you keep getting the security warning window again and again.
- On the Registration you can enter the User Name, Company and Serial number.
- Note that you have the option of either validating the serial number or skip entering the serial number. If you enter the serial number, you must get it validated.
- The installation will proceed even If you skip entering the serial number. But you will be prompted to enter the serial number when you try to power on a virtual machine after creating it.
- “Setup Wizard Complete” screen appears. Click “Restart Now” to restart the host.

Your Account Page has Serial



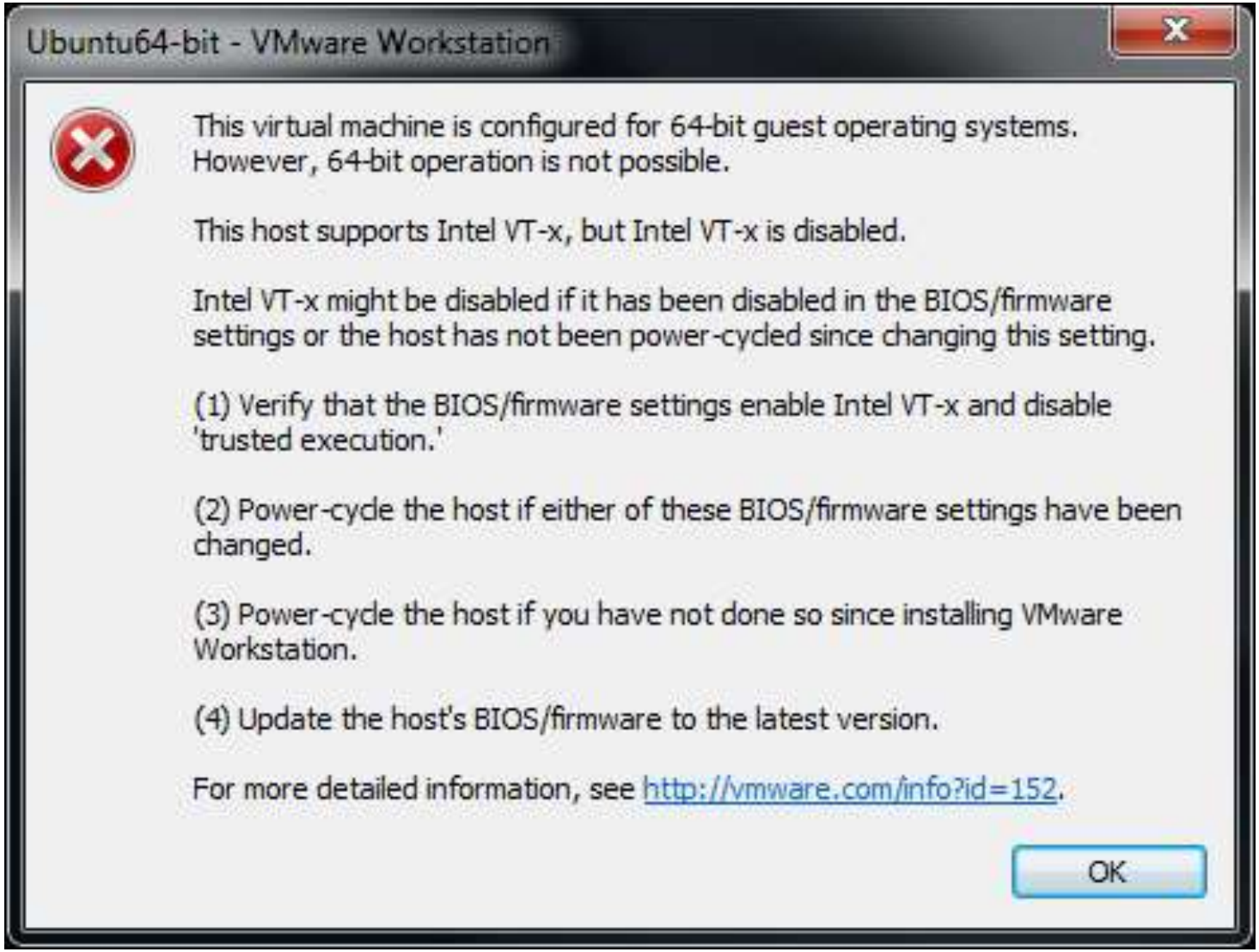
Navigating Workstation

- Once Workstation is installed you can use it to access and run virtual machines and teams of virtual machines. You can also switch easily from one virtual machine to another.
- To start Workstation on a Windows host, from the Start menu, select All Programs > Vmware >VMware Workstation.
- On a Linux host, type `vmware &` (space followed by ampersand,`&`), and press Enter.
- Once Workstation launches, the main part of the window displays either the home page, summary, console, or appliance view.

Issue with 64 Bit Support

- Virtual Machines requires processors with the Intel VT, AMD-V or VIA VT feature. Furthermore, the processor should have the virtualization setting enabled.
- Before you try to create 64 bit VM-s you should verify that your machine (CPU) is capable of supporting 64 bit VMs.
- It appears that some processors are not capable of doing it. For example, Intel Core Duo is not, while Intel Core 2 Duo is. Similarly on some other processor types, newer versions support virtualization, while older do no.
- It also appears that some machines have the virtualization support disabled at BIOS level.
- The problem is usually detected when you try to create a 64 bit VM and the Workstation issues an error message similar to the one on the next slide.

Error Message, Issues with 64 bit Support



Test your system with VMware Tool

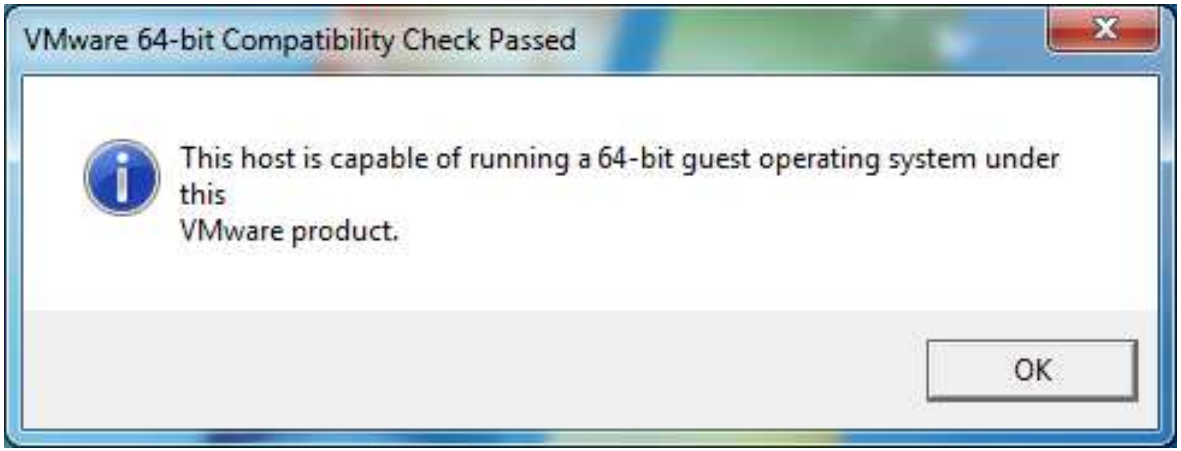
- VMware offers small programs for Windows and Linux OS

  `Vmware-guest64-check-5.5.0-18463.exe`

- that could examine your machine and tell you whether 64 bit virtualization is supported. You could download those programs from

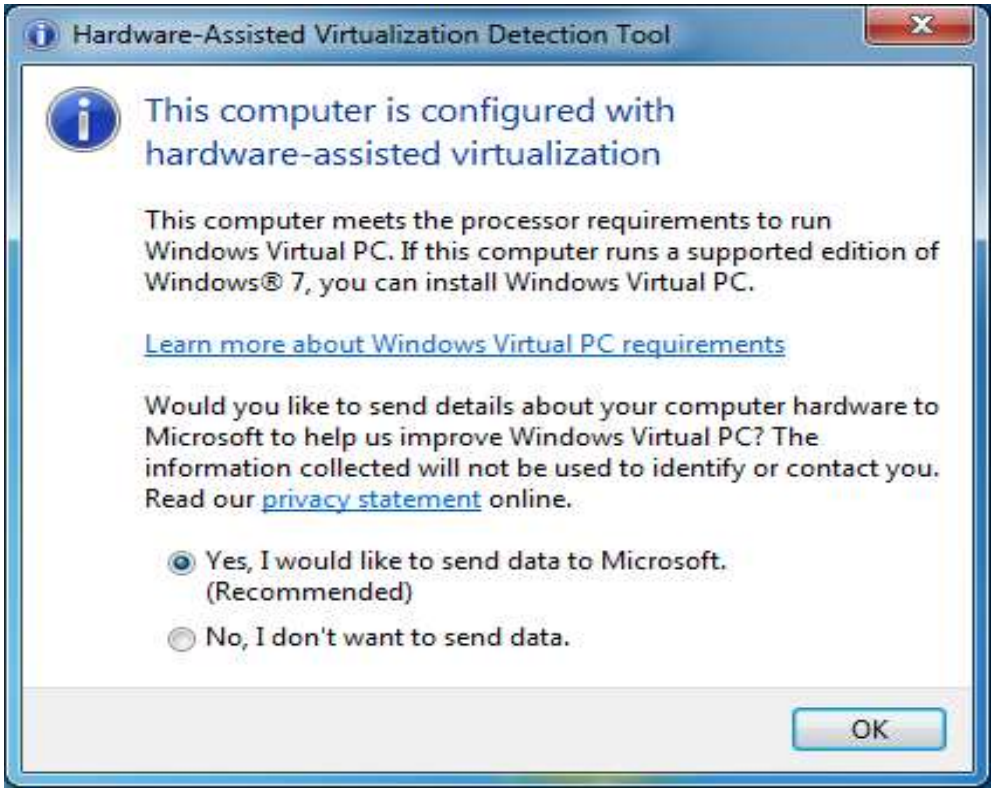
https://my.vmware.com/web/vmware/details/processor_check_5_5_dt/dCpiQGhkYmRAZQ==

A silly note: When downloading the above executable the resulting file would always have some long URL encoded extension. Just name the file as above. It will work. The output might look like this:



Test your system with Microsoft Tool

- Microsoft offers a similar program, the Hardware-assisted virtualization detection tool (HAV detection tool) that checks if your computer processor supports HAV. The tool also checks if this setting is enabled for the processor.
- When successful, the output of the tool looks like this



- You can download `havdetectiontool.exe` from: http://www.microsoft.com/en-us/download/details.aspx?id=592

Changing BIOS

- To change BIOS settings you have to interrupt normal startup. You do that by hitting Esc or one F-keys, or a special button on your machine.
- On my Lenovo laptop, the sequence is the following
  - Power up the machine
  - Hit `ThinkVantage` key to interrupt normal startup
  - Hit `F1` to select BIOS
  - Select Configure
  - Select CPU
  - Toggle Intel® Virtualization Technology to `Enable`
  - Toggle Intel® VT-d Features to `Enable`
  - Hit `F10` to Save and Exit

Changing BIOS

- On my HP laptop, I had to search for Virtualization radio button in GUI BIOS interface. I
  - Power up the machine
  - Hit `Esc(ape)` key to interrupt normal startup
  - Hit `F10` to select BIOS, a GUI tool opens
  - Select `System Configuration`
  - Select `Device Configuration`
  - Toggle `Virtualization Technology` to `Enable`
  - Select `Diskette` icon to save
  - Select `Yes` to save and `Exit`
- On your system it will be something similar.

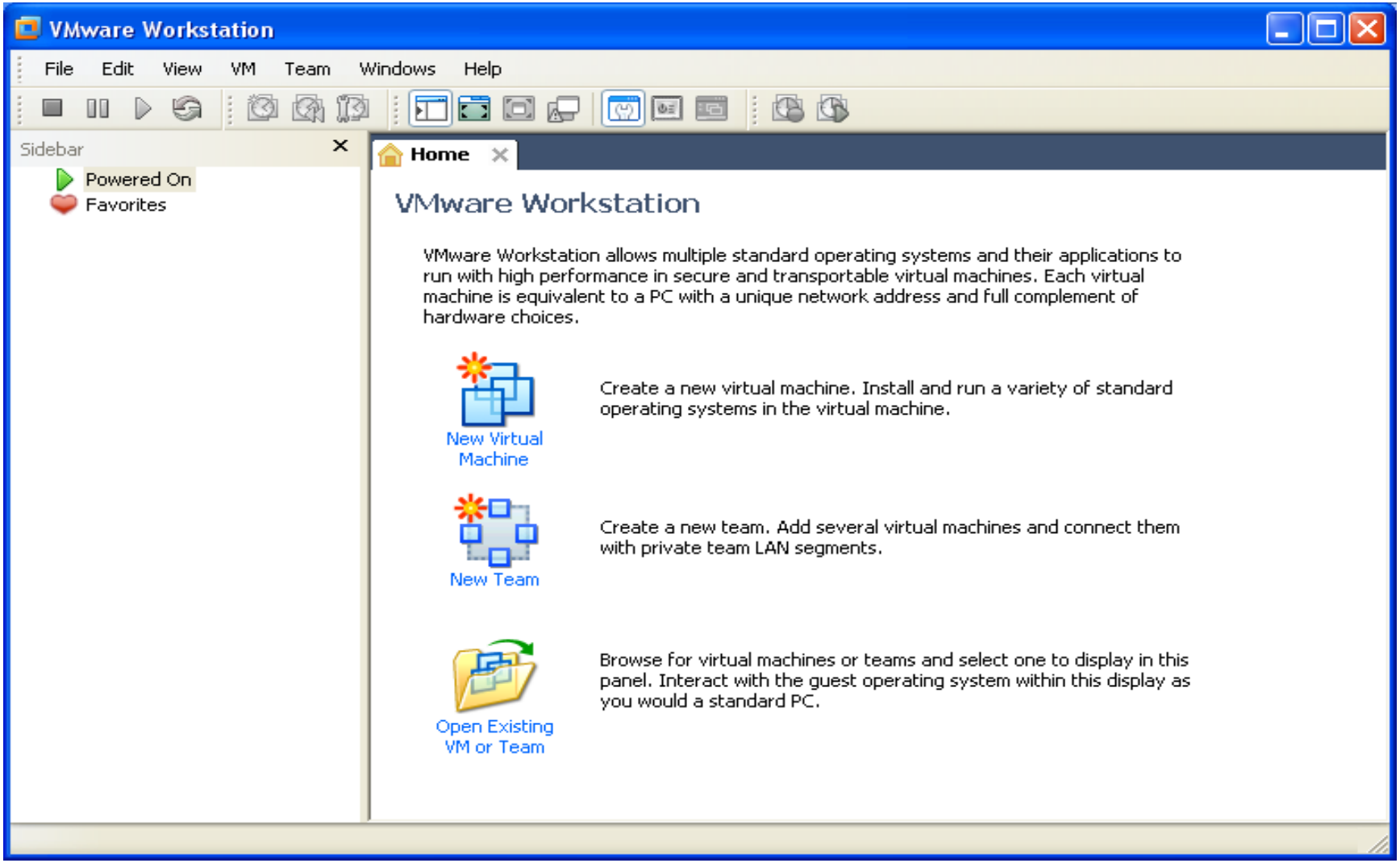
Place Your ISO Image on C-drive

- Please do place your downloaded Ubuntu or any other ISO file with your new operating system on your C: drive or whatever drive your OS resides on.
- I kept my ISO files on my external hard drive and I kept getting the same Virtualization error.

If issue is not resolved

- If changes in BIOS do not help and you continue getting the error when you try to create a 64 bit VM, you can try creating a VM with a 32 bit operating system.
- You can also move back to VMware Workstation 8 or Workstation 7 and hope that they will not generate the same error.

Workstation Console



Create a new virtual machine

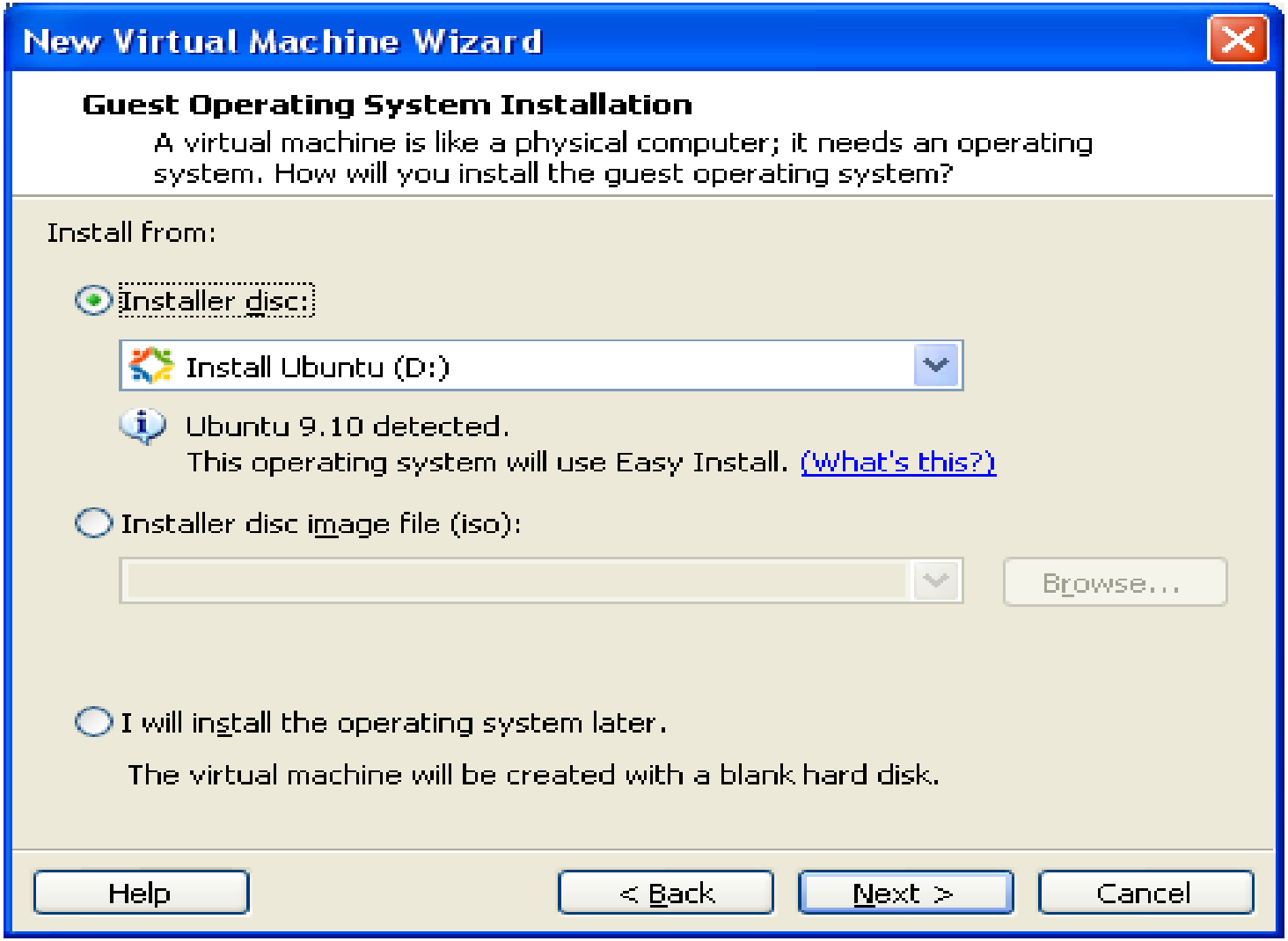
- To create a new virtual machine, you need the installation software for whatever operating system you want to run in that machine.
- We can choose Ubuntu, for example.

  http://www.ubuntu.com/GetUbuntu/download
- Once you download the distribution you might want to burn a CD, though you installer will read the ISO image file as well.

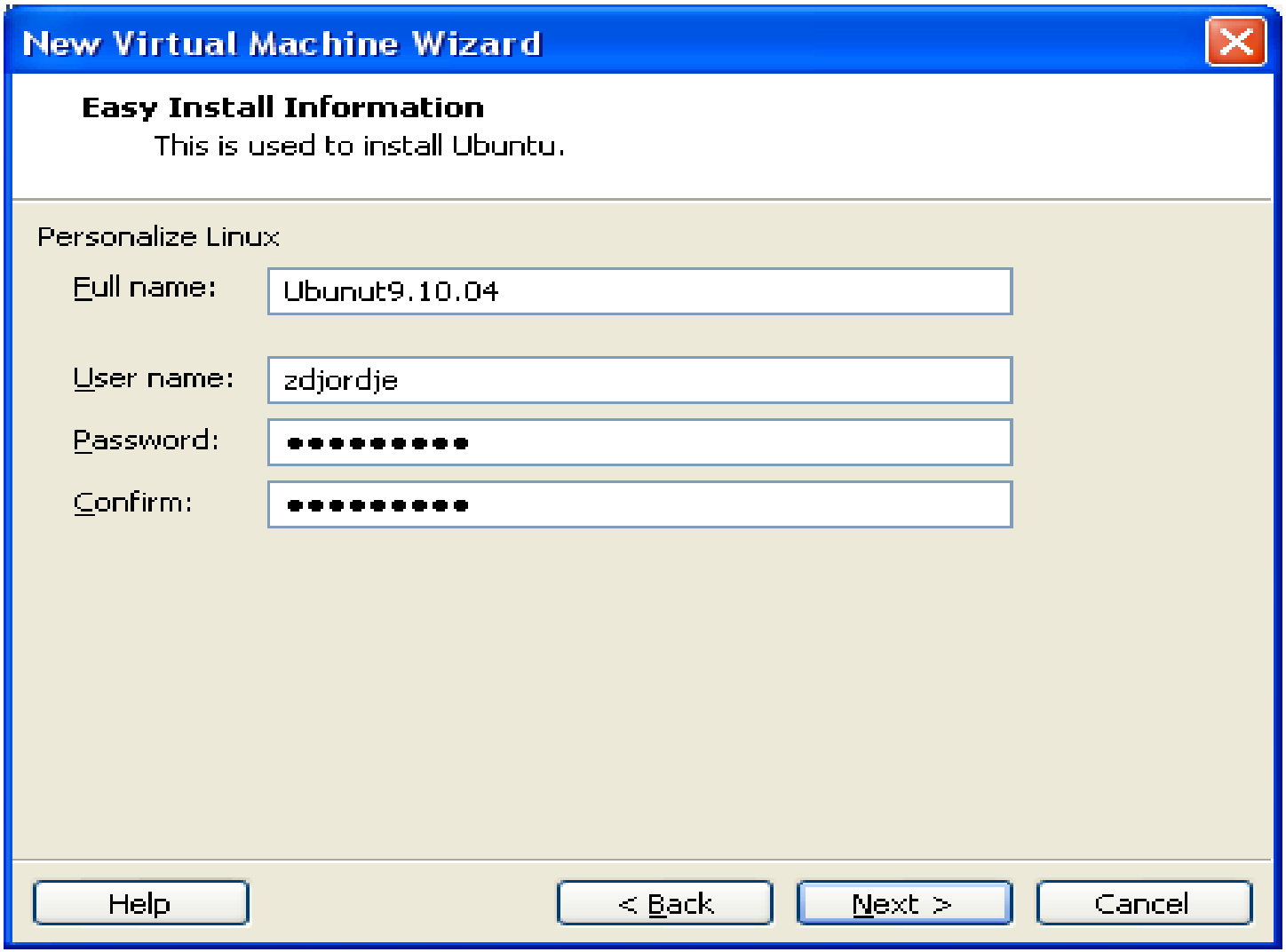
With Greetings from South Africa

Hit Create a New Virtual Machine

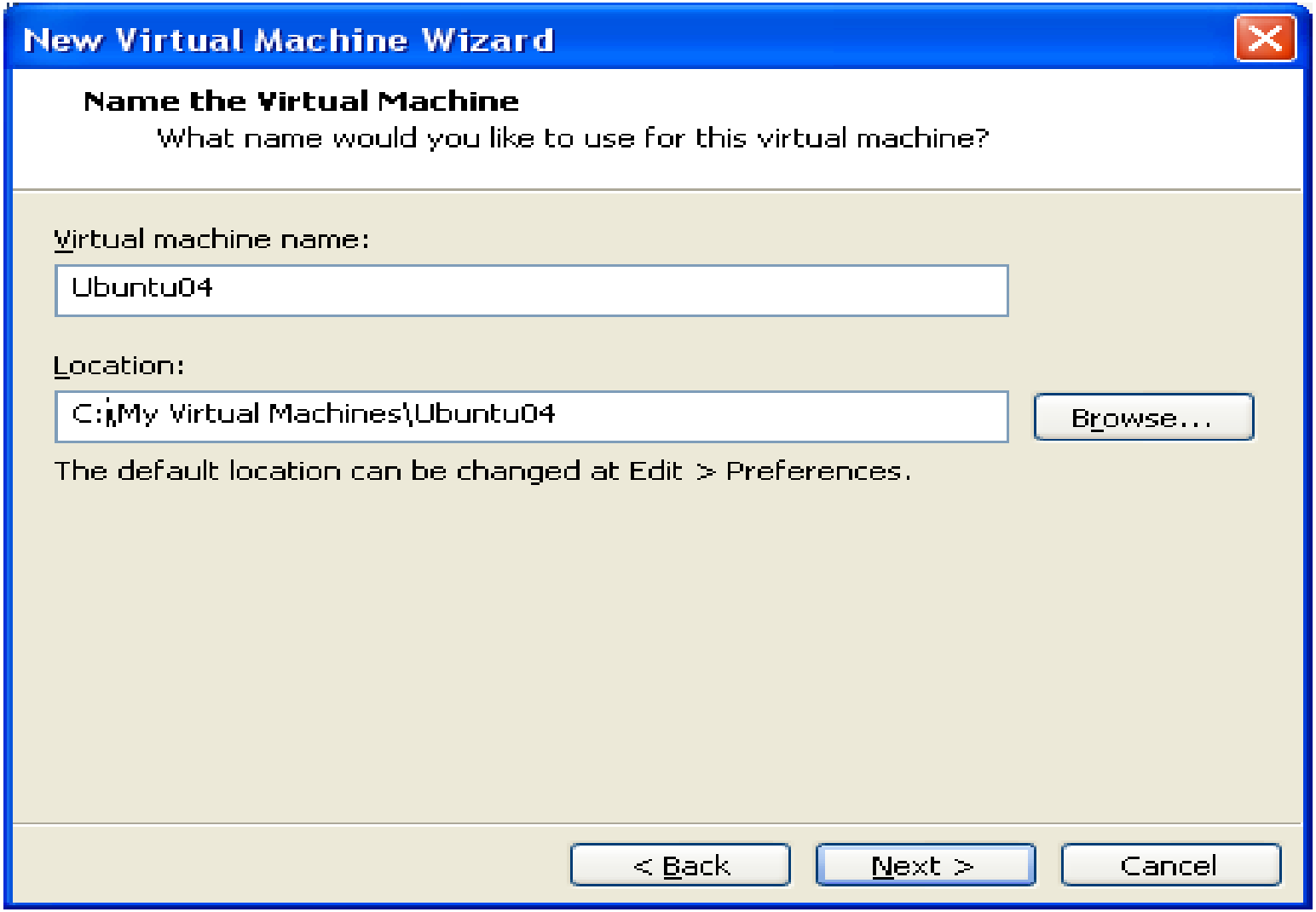
New Virtual Machine Wizard



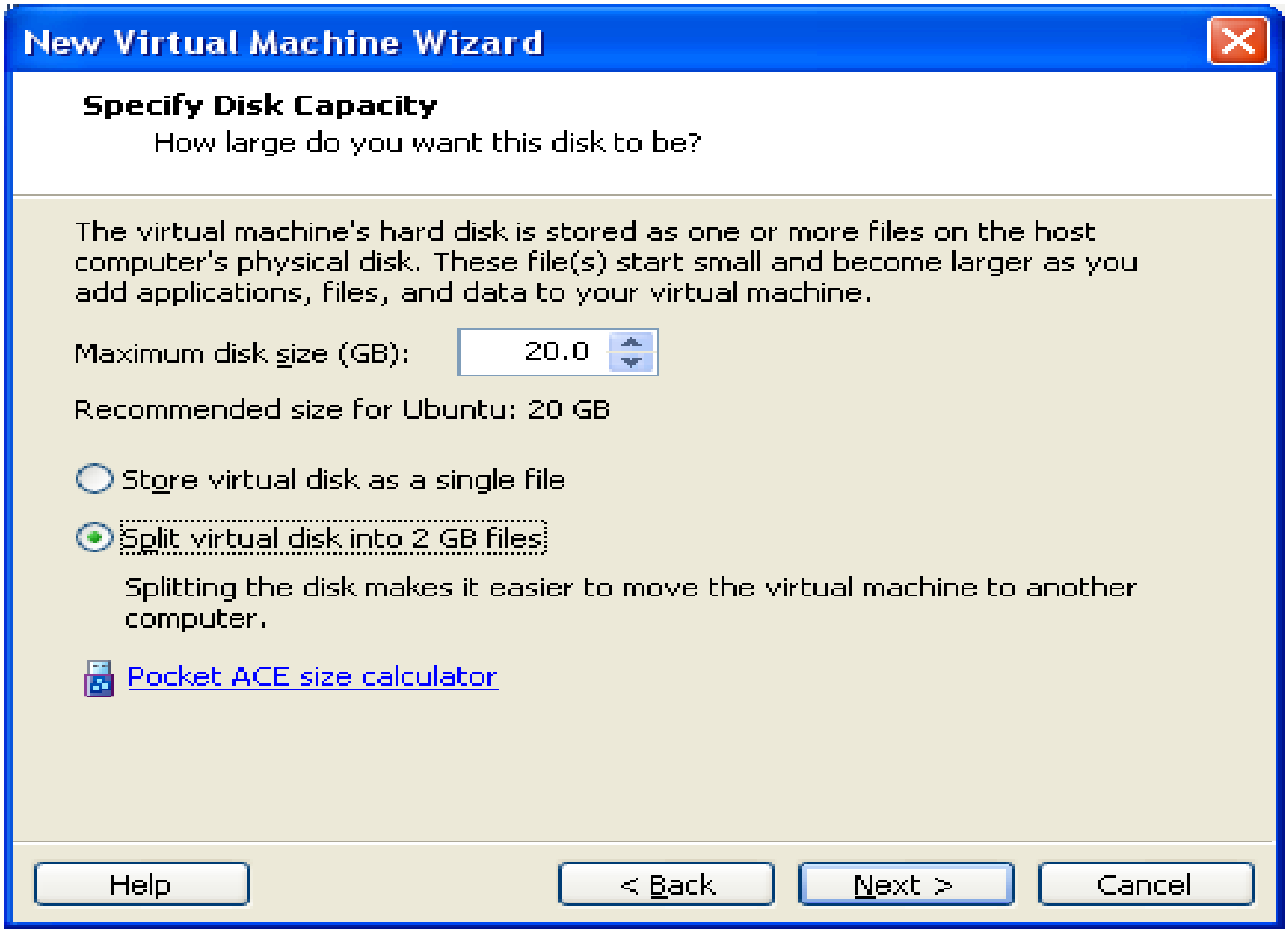
Create Administrative User



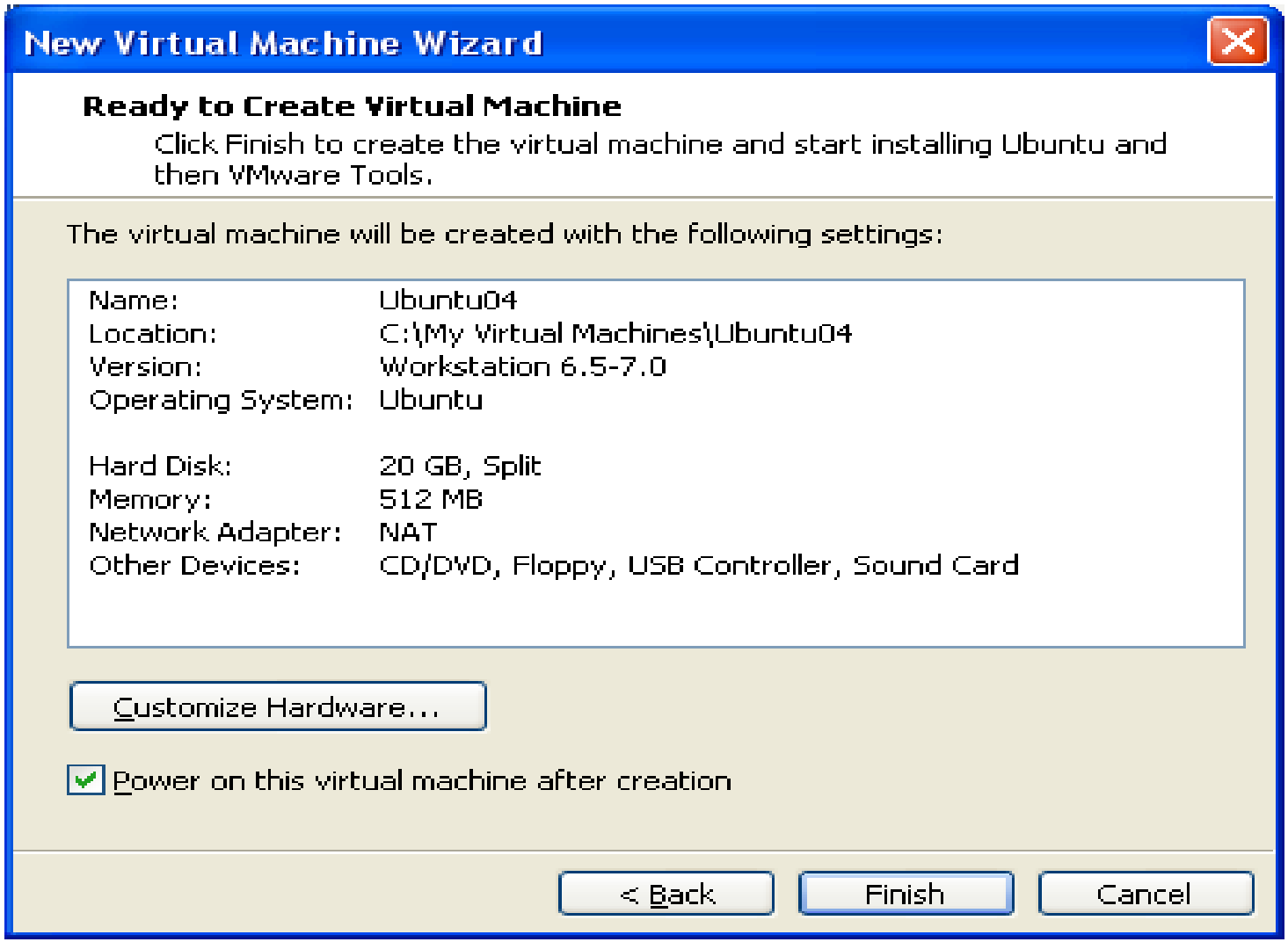
Name new Virtual Machine



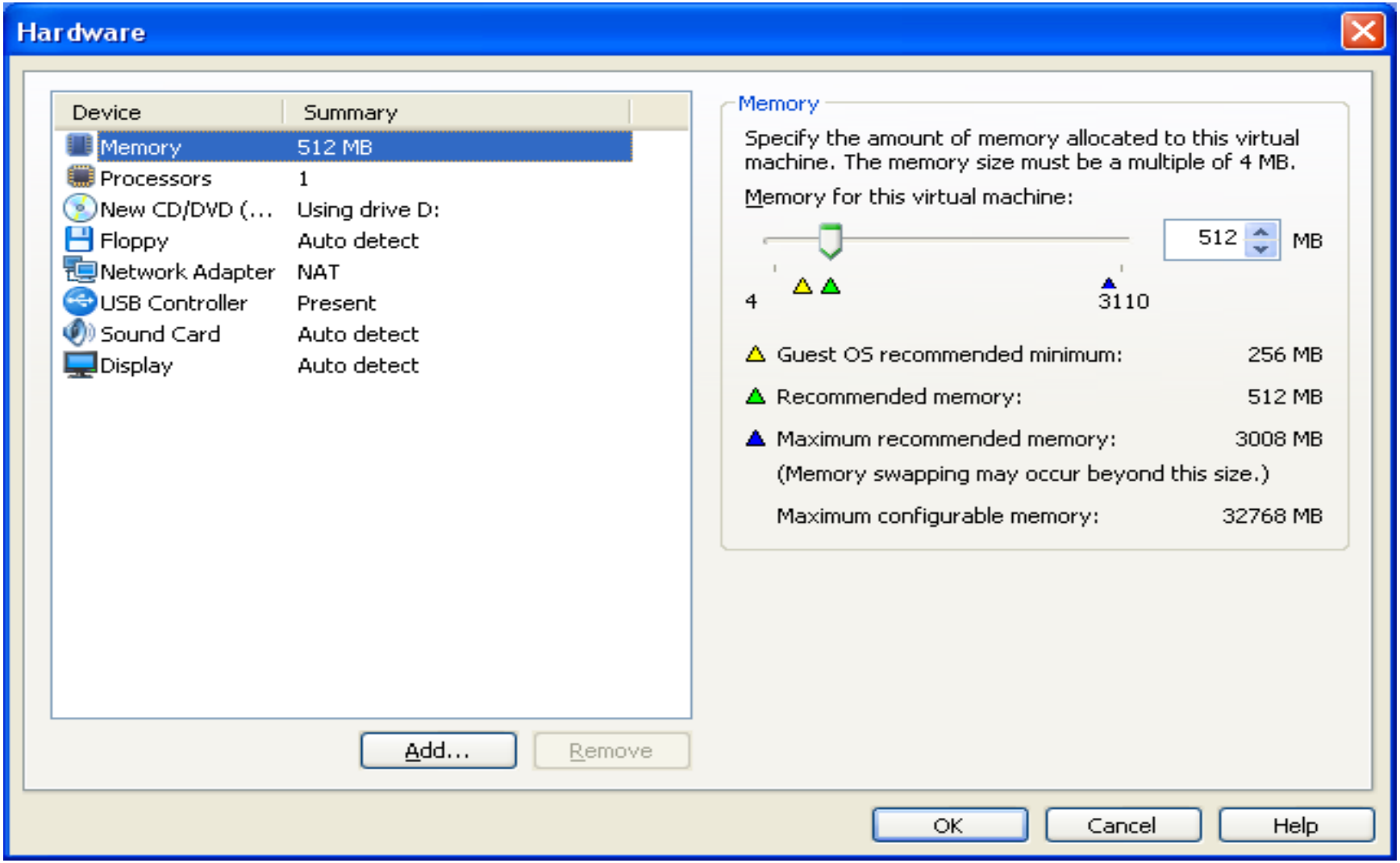
Specify Disk Capacity



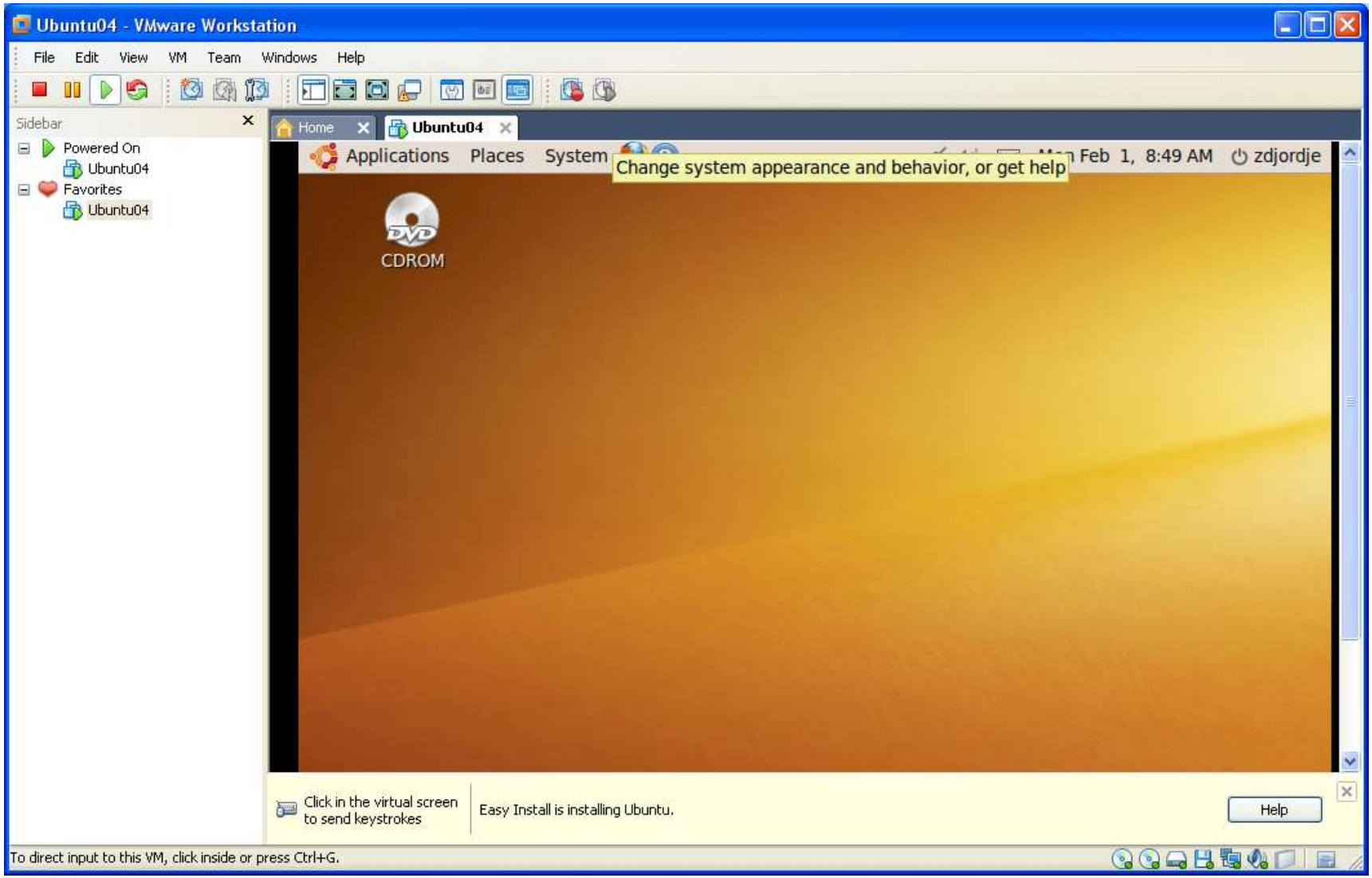
Before Finish, Click Customize Hardware



Select 512MB of Memory for Now



After a while, Ubuntu is installed, Login



Navigating The Console

- Once Workstation launches, the main part of the window displays either the home page, summary, console, or appliance view.
- Use the `View` menu on the toolbar to select the view.
- Each open virtual machine has its own tab. Click a tab to make that virtual machine active.
- Click the X to close the tab. Depending on how you configure Workstation, the virtual machine is then either powered off or continues to run in the background.
- The Workstation window has five toolbars for quick access to common commands: `Power, Snapshot, ACE, View, and Replay.`

Navigating The Console

- The sidebar lists virtual machines that are powered on.
- Right-click context menus allow you to perform many operations on a selected virtual machine.
- The Status bar area at the bottom of the window displays Workstation messages and an icon for each removable device.
- You can right-click an icon to disconnect it or edit its configuration.
- A note icon in the bottom right corner indicates whether any unread messages are present in the message log for the selected virtual machine. If the icon is dimmed, all messages have been read.

Edit Menu

Two important commands are on the `Edit` menu.

- Use the `Virtual Network Editor` to configure networks for each virtual machine.

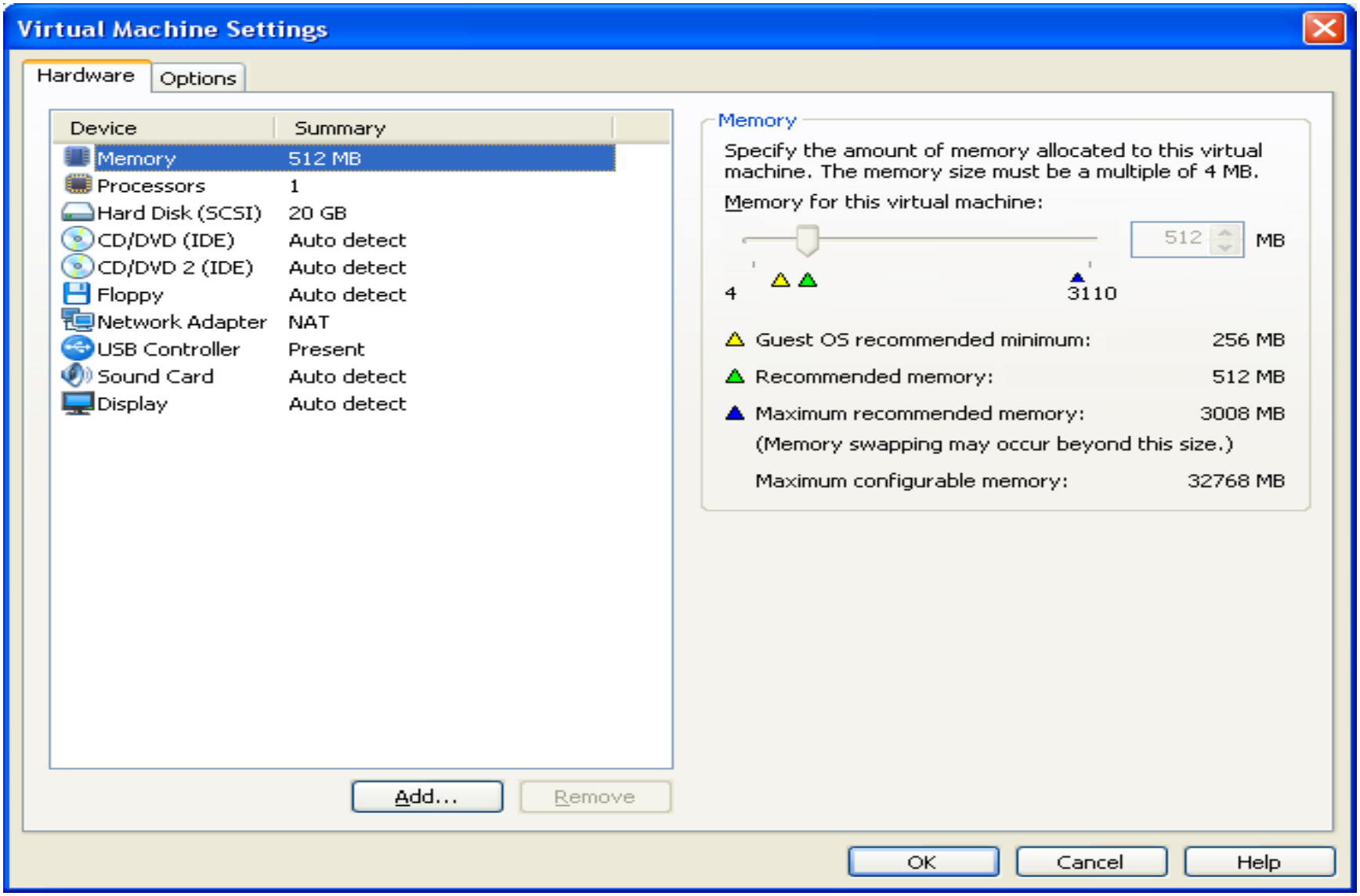
- The `Preferences` dialog box lets you change a number of settings that apply to VMware Workstation itself, no matter which virtual machine you are running.

VM Menu

The VM menu is where you find most of the virtual machine management commands.

- The `Power` commands allow you to Power on, off or suspend the virtual machine. Commands are also available to startup, shut down, suspend and restart the guest Operating system.
- `Removable Devices` shows a list of each of the removable devices for the virtual machine and allows you to manually connect, disconnect, and edit the properties of the device.
- The `Snapshot`, `Replay`, and `Clone` commands allow you to duplicate and preserve the state of a virtual machine.
- The VM menu also contains the commands to
  - Install VMware Tools,
  - Send the Control-Alt-Delete command or mouse focus to the virtual machine,
  - Capture a screen or create a movie of actions performed in the virtual machine,
  - View the message log, and
  - Modify the virtual machine *Settings*.

Virtual Machine Settings



Settings Dialogue

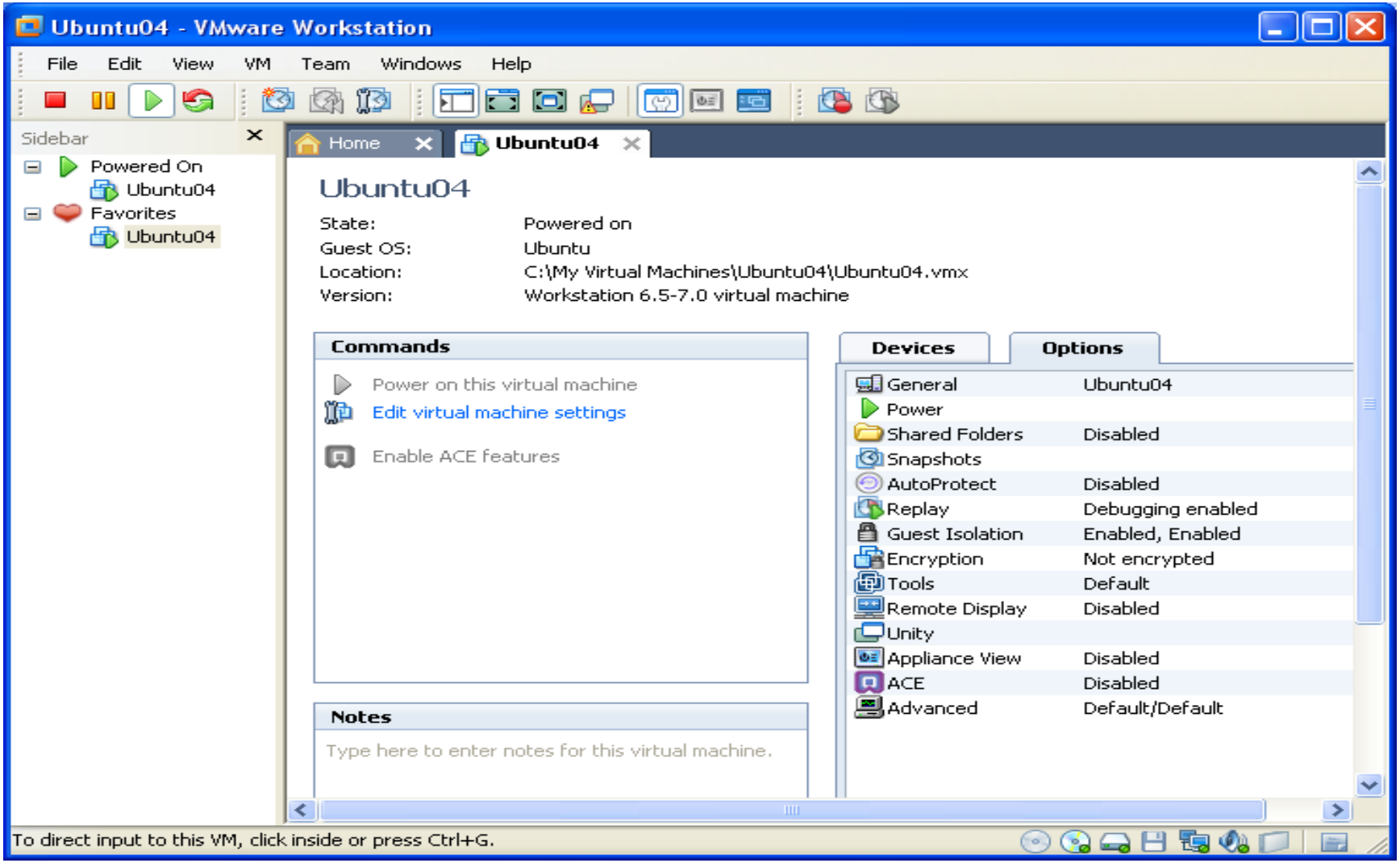
The Virtual Machine Settings dialog box includes two tabs.

- Use the `Hardware` tab to add, remove, and configure virtual devices for the selected virtual machine.
  - To add and remove hardware, and to change many of the configuration settings, you need to power off (but not close) the virtual machine before displaying this dialog box.
  - Workstation dims out the options that are not available due to the power state of the virtual machine.
- Use the `Options` tab to adjust characteristics of the virtual machine:

Options vs. Preferences

- Many options control interactions between the host and the guest operating system, such as how folders can be shared, how files are transferred, and what happens to a guest operating system when you exit Workstation.
- Some options let you override similar Preferences dialog box options.
- Preferences dialog box sets global preferences for all virtual machines, whereas Virtual Machine Settings are specific to the selected virtual machine. For example, you can use the Advanced option to override the process priorities set on the Priority tab in the Preferences dialog box.
- Some options let you change settings you might initially make when running the New Virtual Machine wizard to create a virtual machine. For example, you can use the General options to change the name of the virtual machine.
- The Team menu includes the commands necessary to set up and manage teams.

VM Options

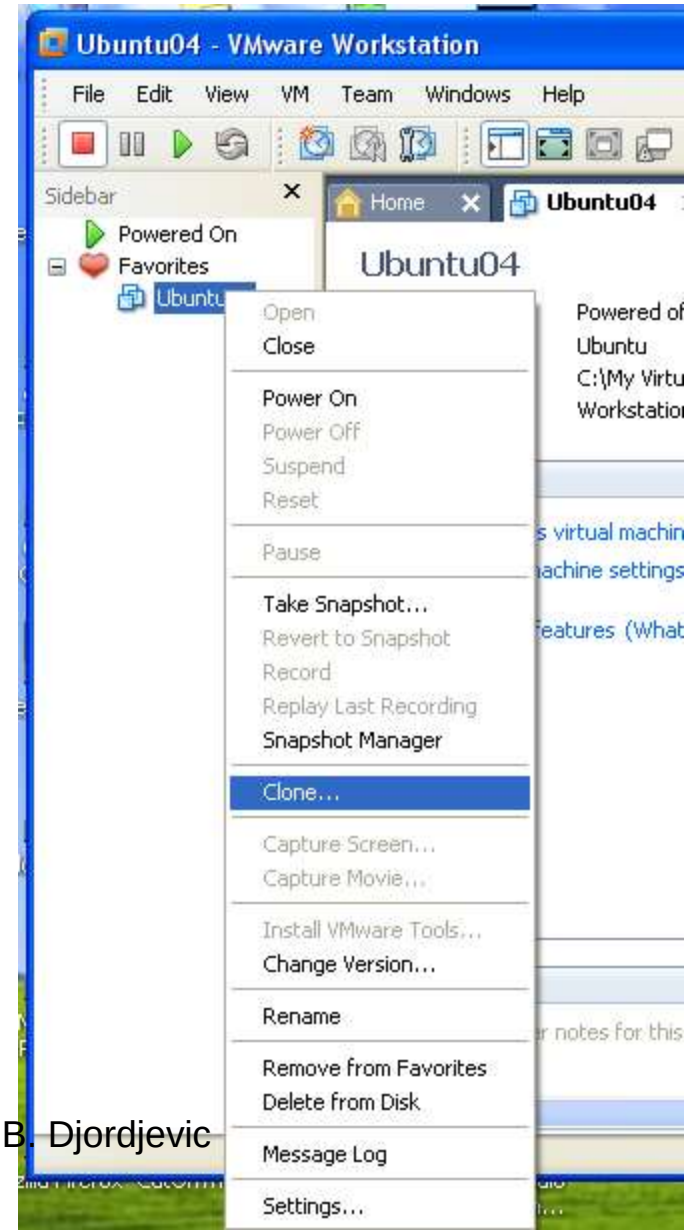

Ubuntu04 - VMware Workstation
File Edit View VM Team Windows Help
Sidebar
Powered On
Ubuntu04
Favorites
Ubuntu04
Home
Ubuntu04
Ubuntu04
State: Powered on
Guest OS: Ubuntu
Location: C:\My Virtual Machines\Ubuntu04\Ubuntu04.vmx
Version: Workstation 6.5-7.0 virtual machine
Commands
Power on this virtual machine
Edit virtual machine settings
Enable ACE features
Notes
Type here to enter notes for this virtual machine.
Devices
Options
General Ubuntu04
Power
Shared Folders Disabled
Snapshots
AutoProtect Disabled
Replay Debugging enabled
Guest Isolation Enabled, Enabled
Encryption Not encrypted
Tools Default
Remote Display Disabled
Unity
Appliance View Disabled
ACE Disabled
Advanced Default/Default
To direct input to this VM, click inside or press Ctrl+G.

Enable `Share Folders` Feature

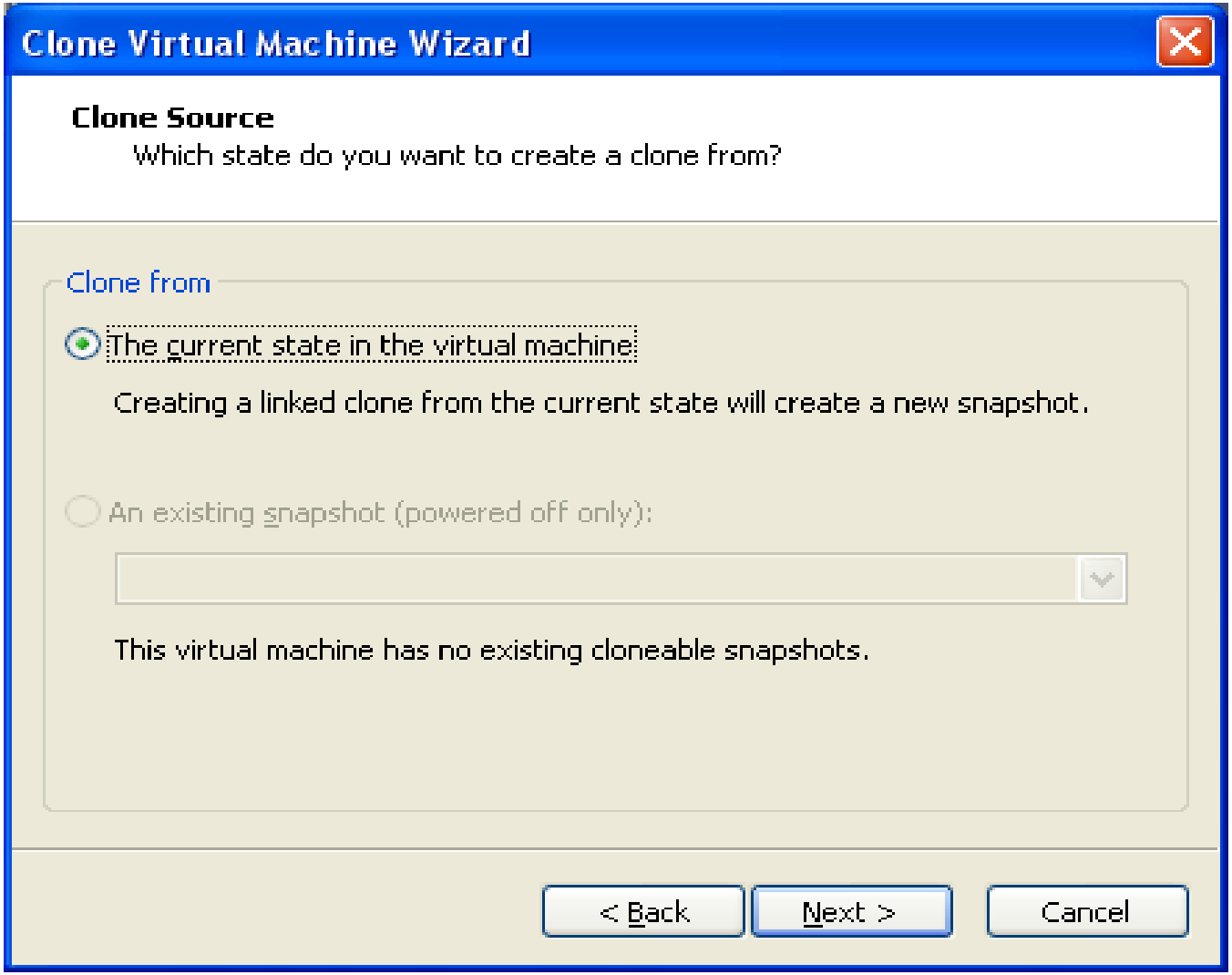
- Power of the VM you want to modify.
- Right click on the VM in the left side bar and Open VM
- Select `Edit virtual machine settings`
- Select `Options` tab
- Select `Shared Folders`
- Select `Always enabled`
- Your VM will now see the folder structure of your host machine.
- Do this only when you really need it. Your VM could as well damage your host OS if this feature is enabled.

Cloning a VM

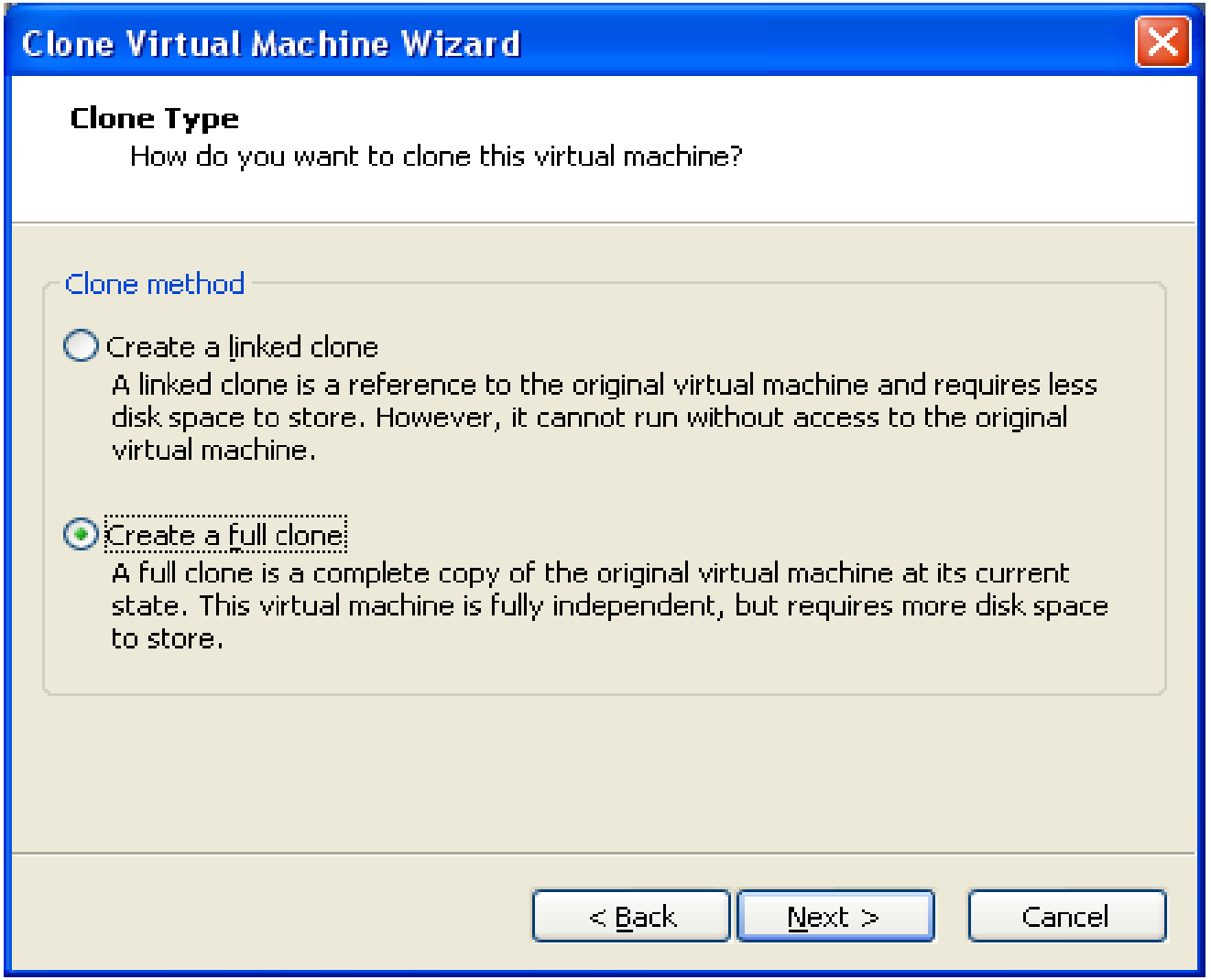
- You can create a new VM from the software distribution or by cloning it from an existing VM.
- You have to Open a VM and then right click on the VM name in left side bar.
- Select `Clone` from the menu.



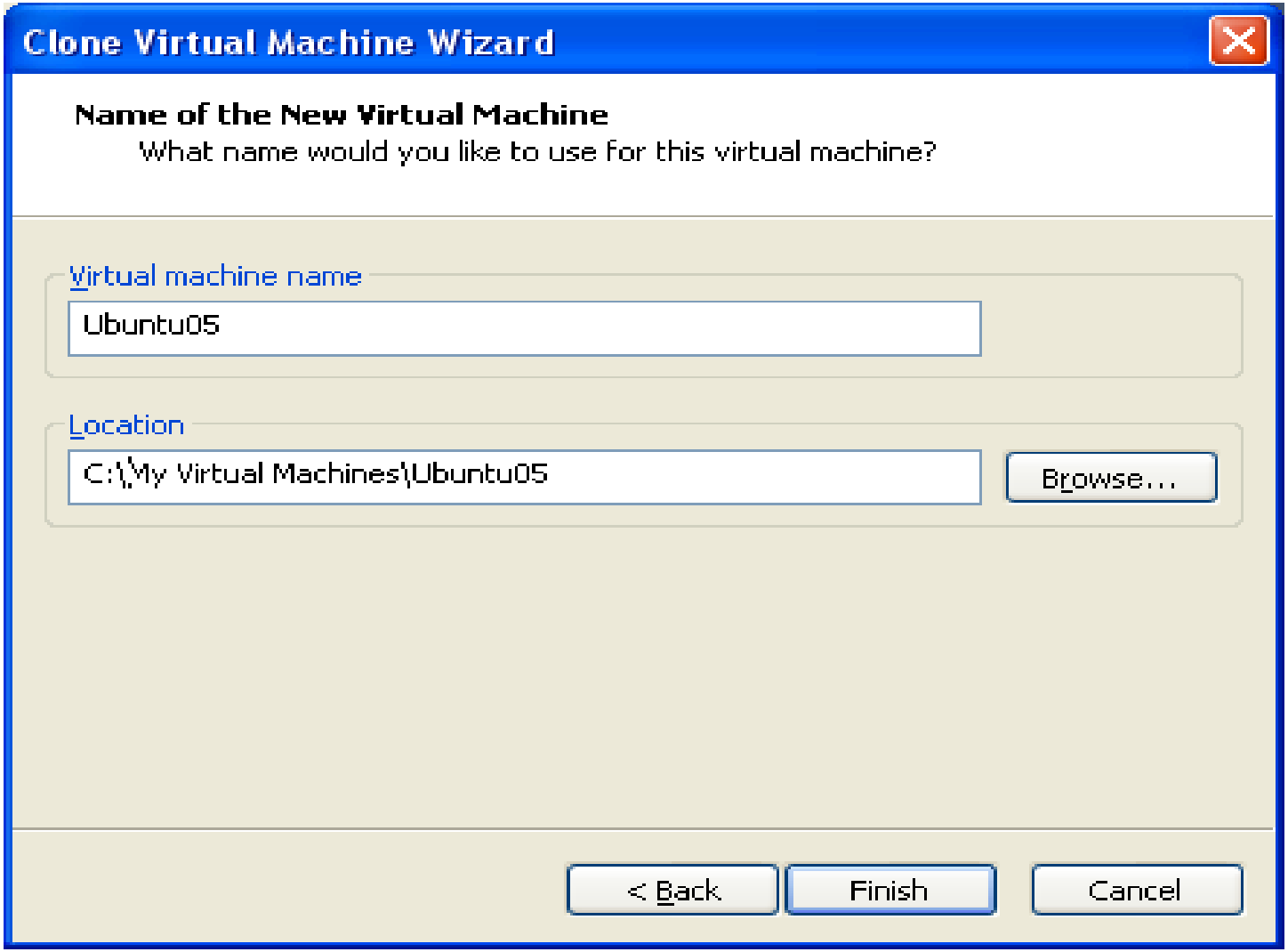
Click Next in the Clone Wizard



Full or Linked Clone



Name the Clone, Click Finish



You could get a VM from a friend

- For example if you go to

http://code.google.com/edu/parallel/tools/hadoopvm/index.html

- You could download a ready made virtual machine image with Ubuntu 7.xx OS and `Hadoop` software already installed.
- Download `hadoop-vmware.zip`, place it in a directory of choice and expand.
- Select Home tab and hit `Open an Existing VM or Team`
- In the directory where you expanded the archive select `image.vmx` file.
- Edit virtual machine settings and under `Options` give it a proper name, e.g. `ubuntuH07`
- You can power up the VM.
  - Users are `root/root` and `guest/guest`.

VMware Tools

VMware Tools include

- VMware Tools service
  - Linux: vmtoolsd
  - Windows: vmtoolsd.exe
- VMware Tools Device drivers
  - Linux and Solaris: vmhgfs
  - Windows: hgfs.sys
- VMware Tools user process
  - Linux: vmware-user
  - Windows: VMwareUser.exe
- VMware Tools Control panel
- Set of scripts

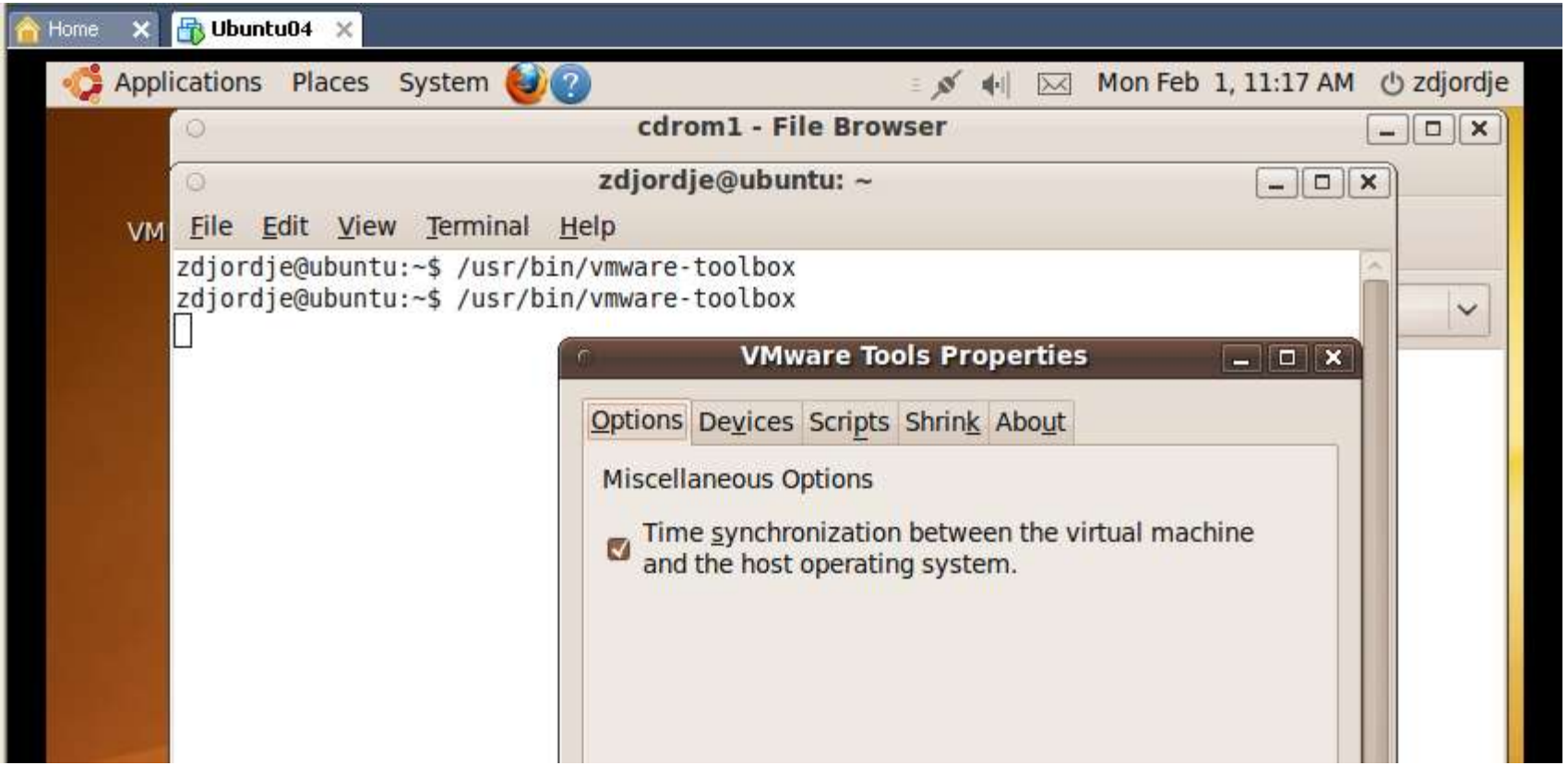
VMware Tools

- Usually you need to install VMware Tools in your guest operating system
- VMware Tools enhance the performance and manageability of the virtual machine.
- Power your VM and select
  - VM -> Install VM Tools
- The VMware Tools installation wizard automatically selects the VMware Tools version appropriate for the operating system running in the virtual machine.
- To check whether VMware Tools are installed go to VM menu. If `Install VMware Tools` is grayed out, you are done.

Activating VMware Toolbox, Linux

- On Linux VM-s open the command prompt window and type:

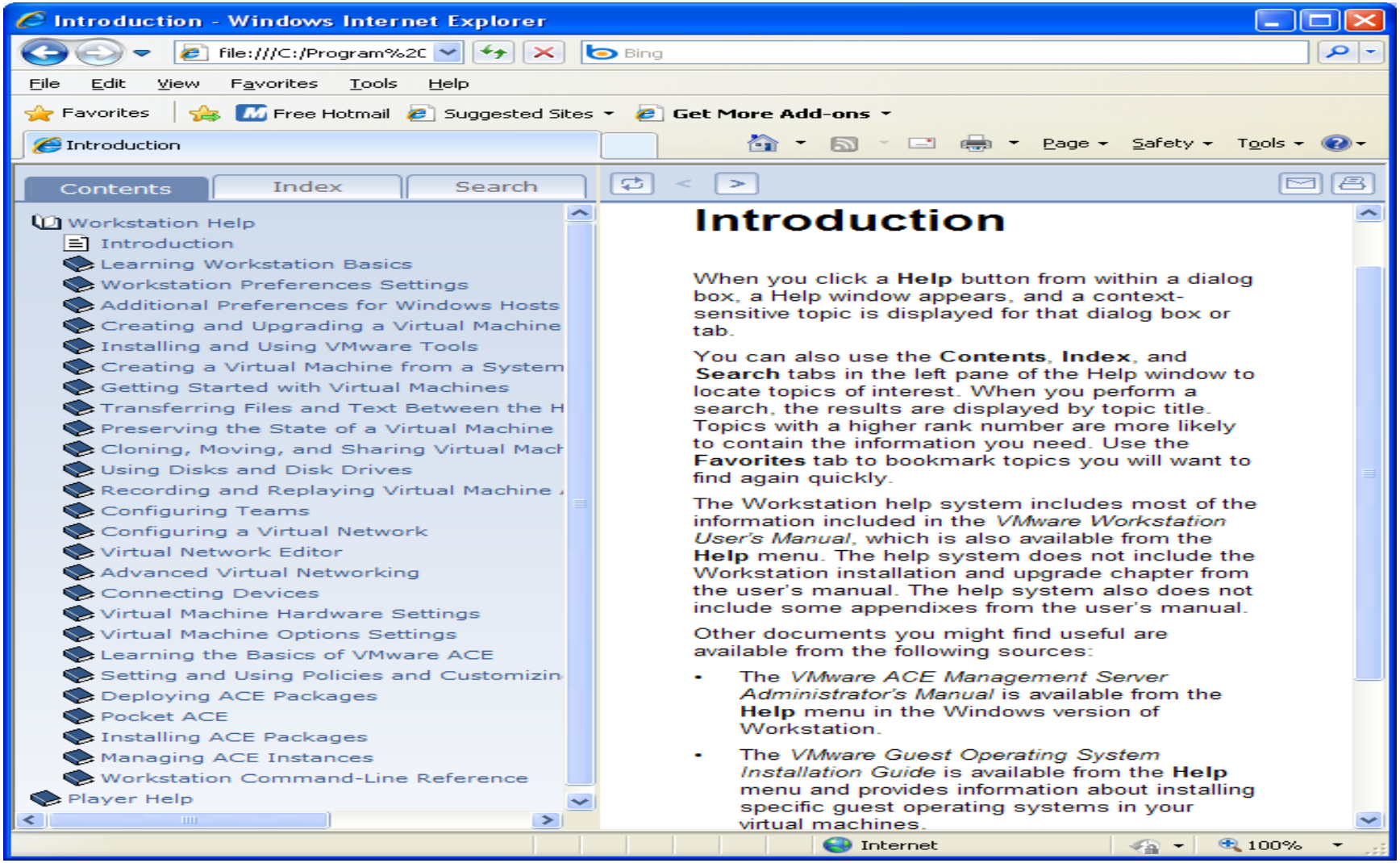
```
$/usr/bin/vmware-toolbox
```



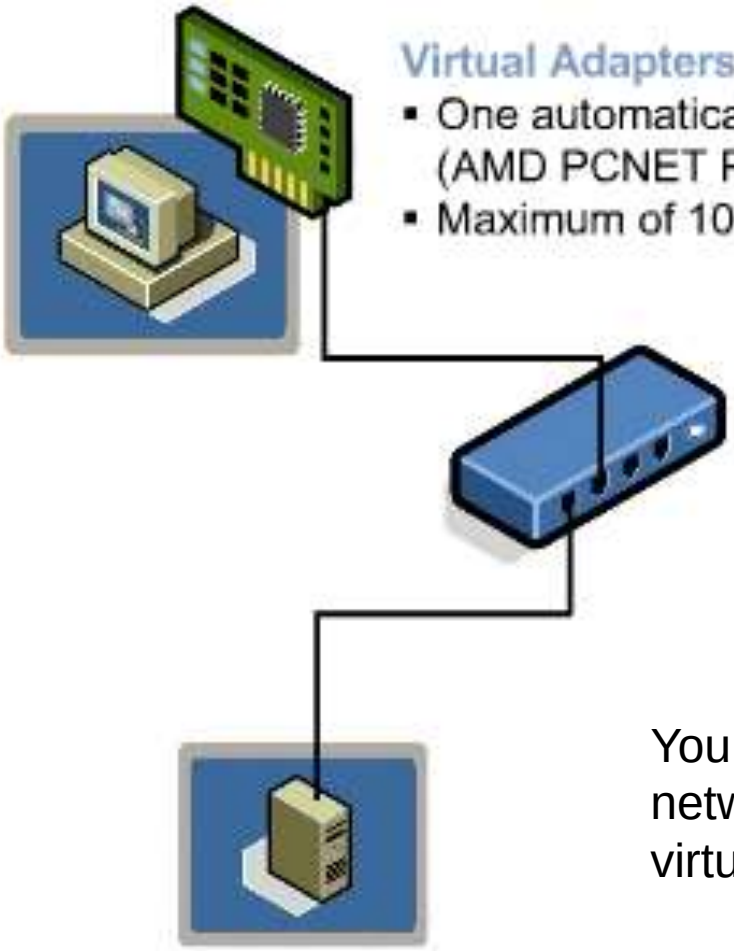
Activating VMware Toolbox, Windows

- If your guest operating system is Windows
- Use Windows Control Panel to display the taskbar icon
  - Go to **Start > Control Panel**.
  - Double-click the **VMware Tools** icon.
  - On the **Options** tab, select **Show VMware Tools in the taskbar** and click
  - **Apply**.

Help Menu -> Help Topics



Components of a Virtual Network



Virtual Adapters (NICs)

- One automatically set up for each new virtual machine (AMD PCNET PCI or Intel Pro/1000 MT)
- Maximum of 10

Virtual Switches

- Created as needed
- Maximum of 10 on Windows, 255 on Linux
- One or more virtual machines per switch
- Networks are named VMnet0, VMnet1, etc
- 3 switches and associated networks used for special configurations

You can create and configure up to 10 virtual network adapters in each Workstation by using the virtual machine settings editor.

DHCP Server

Provides IP address to virtual machines that are not bridged to an external network

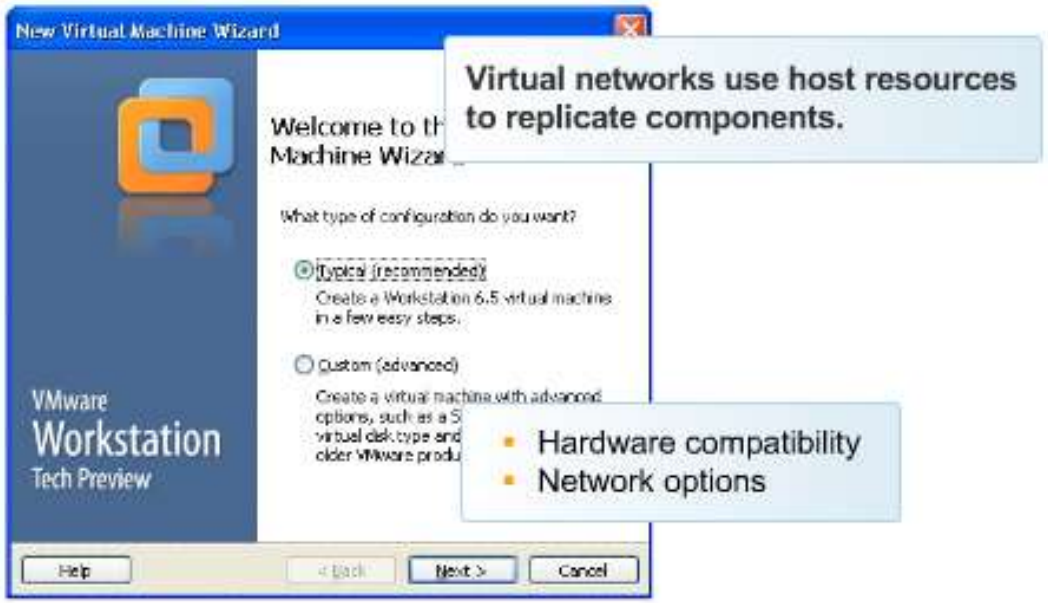
Setting Up Virtual Network

- Like a physical switch, a virtual switch lets you connect other networking components together.
- Workstation creates virtual switches as needed, up to a total of 10 virtual switches on Windows and 255 on Linux hosts. You can connect one or more virtual machines to the virtual Ethernet switch.
- Workstation supports three types of networks.
  - The bridged network (uses VMnet0 switch).
  - The host-only network (uses VMnet1 switch).
  - NAT (network address translation) network (VMnet8 switch).
- The other available networks are named VMnet2, VMnet3, VMnet4, and so on.
- For example, host-only and NAT configurations use the DHCP server.

Virtual Networking

- VMware Workstation provides virtual network components, using the resources of the host machine in place of physical device.
- This capability allows you to create fully operational virtual networks and gives maximum flexibility for architecture verification tests and troubleshooting.
- Virtual networks can have no connectivity to external networks if you choose to isolate them or full connectivity if you choose to allow them.
- The New Virtual Machine wizard allows you to select either a standard setup or a more advanced custom setup for hardware compatibility and networking.
- If you select the Typical setup path in the New Virtual Machine wizard, the wizard sets up network address translation (NAT) for the virtual machine.
- The Custom setup allows you to choose any of the common configurations: bridged networking, NAT, or host-only networking.
- The wizard connects the virtual machine to the appropriate virtual network automatically.

New Machine Wizard



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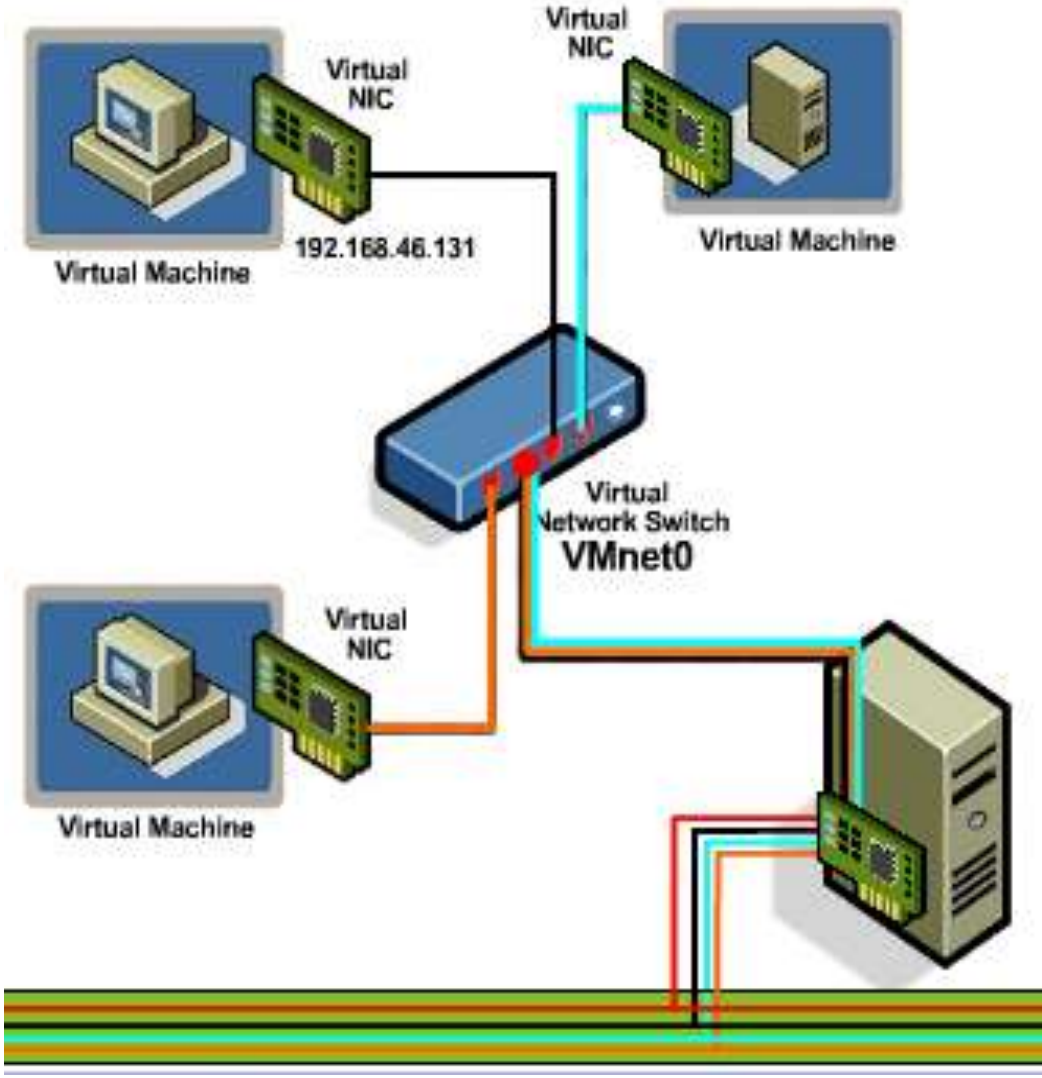
Bridged Networking

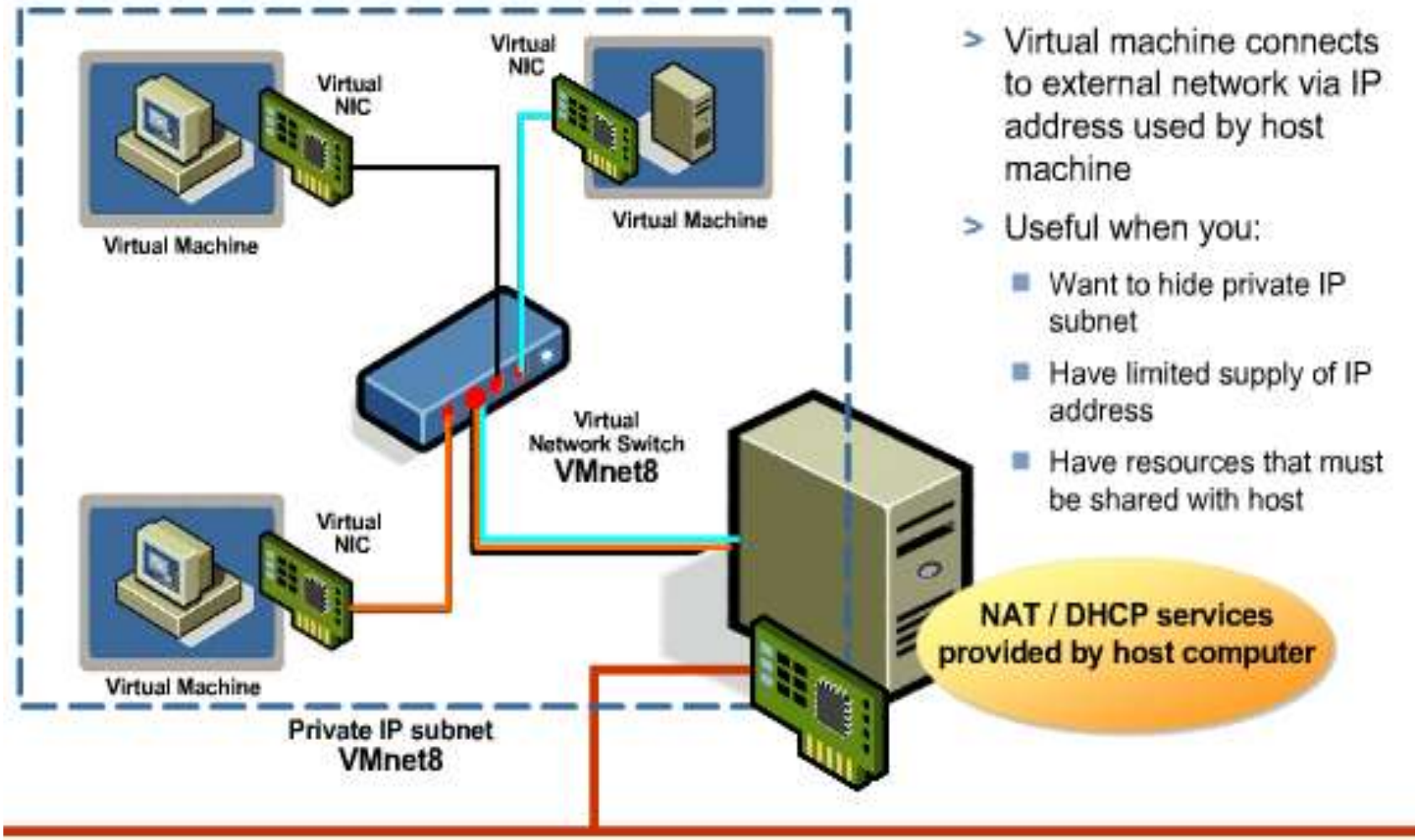


- Virtual machine runs on virtual network that is connected to a physical network
- Virtual machine appears as host on existing physical network
- Bridged networking is not recommended for wireless connections where the host needs to use the wireless NIC concurrently

Bridged Networking

- Bridged networking is the most commonly used network configuration.
- In Bridged configuration, the virtual machine runs on a virtual network that is connected to an existing physical network.
- The virtual machine appears as a full-fledged host on an existing physical network. In other words, the virtual machine becomes a peer of the host machine in the network. It can use printers, file servers, gateways, and any other services that are available on the network it is bridged to without being detected as a virtual machine.
- Likewise, any physical host or other virtual machine with proper connectivity can use the resources on a bridged virtual machine.
- Bridged networking works with both wired and wireless physical host network cards.
- This configuration is most useful when you want each virtual machine to appear on the network as a physical machine would appear.
- Bridged Networking uses the VMnet0 virtual switch by default

NAT Networking



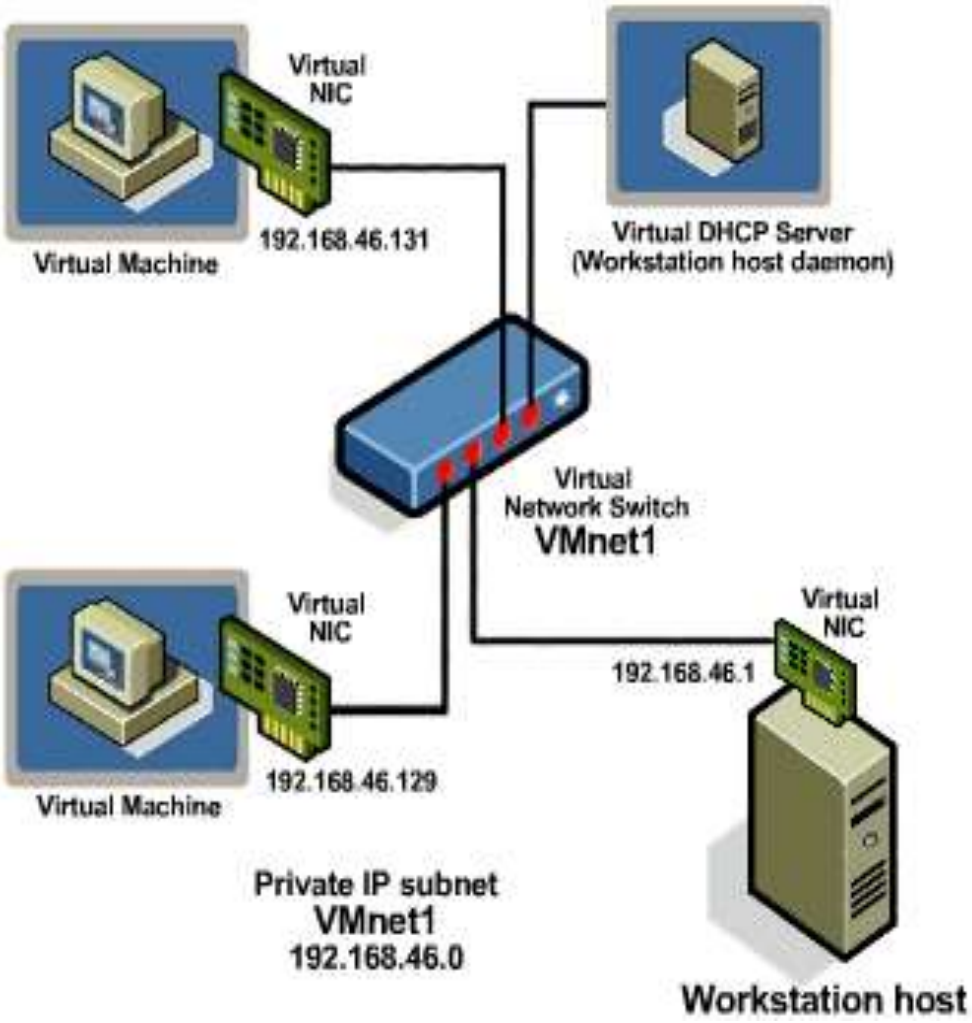
- Virtual machine connects to external network via IP address used by host machine
- Useful when you:
  - Want to hide private IP subnet
  - Have limited supply of IP address
  - Have resources that must be shared with host

NAT Networking

- In network address translation (or NAT) networking, the virtual machines connect to an external network via host network adapter sharing the IP and MAC address used by the host computer.
- A NAT virtual machine can transparently use any of the services available on the network, that is, the virtual machine can connect to printers, file servers, and so forth.
- You can use NAT networking to keep the private IP subnet hidden from the outside. You can also use it when you have a limited supply of globally routable IP addresses, or when you have resources that must be shared with the host such as printers, Internet connection, and so forth.
- NAT networking uses the VMnet8 virtual switch by default.

Host-Only Networking

- Virtual machine communicates with host and other virtual machines on host
- Cannot communicate with systems beyond host



Host-Only Networking

- When a virtual machine is configured for host-only networking, the virtual machine can communicate with the host operating system and other virtual machines set up to use host-only networking on that host.
- However, the virtual machine cannot communicate with any systems beyond the host machine without the use of a proxy server or IP masquerading NAT. In other words, the virtual machine's network world is wholly within your PC.
- Host-only networking uses Workstation’s DHCP daemon, which is installed on the host during Workstation installation.
- This network configuration is most useful when you are isolating the virtual machines from systems outside the host, when the host is not connected to any physical network, or when no Ethernet adapter is installed on the host machine.
- By default, host-only networking uses the VMnet1 virtual switch. However, you can modify that setting to fit whatever configuration you need.