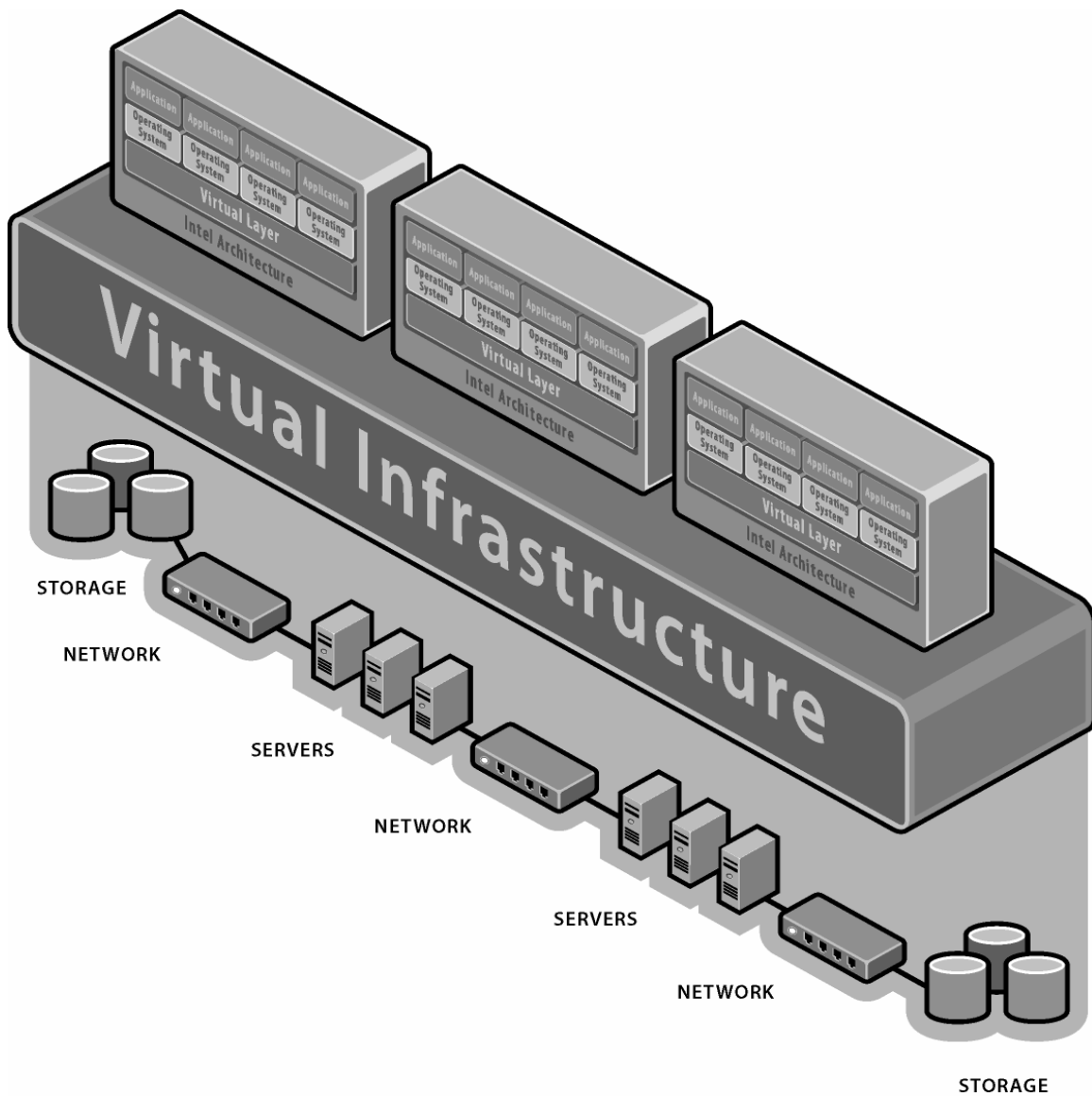


VMware ESX Server Lab



VMware ESX Server 2.1.1

Part 1: Installing ESX Server

In this lab, you will install and configure ESX Server v2.1.1 using the graphical interface, as well as create and configure a VM. Follow the steps below, and for more detailed information, refer to the *VMware ESX Server v2.1.1 Installation Guide* on the CD.

Use these license keys during this lab:

ESX: 5A2LA-04ZRA-DM214-4R5JE
SMP: 527JA-0DYHG-HPQ22-4H0R9

1. Boot your server from the ESX CD
2. At the boot prompt, press Enter to start the installation
3. Select Next at the *Welcome screen*
4. For *Installation Type*, select Custom
5. Keep defaults for the *Keyboard, Layout, Dead Keys, Mouse Configuration*
6. Accept the *End User License Agreement*
7. Use the supplied license keys
8. On the Device Allocation, use the following settings:
 - a. *Reserved Memory* = 192 MB
 - b. Make sure the ServeRAID controller is *Shared with Service Console*
 - c. Make sure one NIC is dedicated to the Service Console and one NIC is dedicated to the Virtual Machines
9. If you receive a message about the “Partition Table Unreadable”, select Yes to initialize the partition.
10. Select to *Automatically* partition the system drives. Select *Remove all partitions*. Select sda as the only *Installation Drive*.
11. Select Yes on the WARNING screen
12. Add a new partition. On the *Disk Setup* screen, select *New*, and define the partition as follows:
 - a. Mount point = /vmimages
 - b. Filesystem type = ext3
 - c. Deselect sdb
 - d. Size (MB) = 2000
 - e. Leave the rest of the fields default
 - f. This partition will be used to store Windows ISO images to install the VMs from
13. Add a new partition. On the *Partitioning* screen, select *New*, and define the partition as follows:
 - a. Mount point = /vmconfigs
 - b. Filesystem type = ext3
 - c. Deselect sdb
 - d. Size (MB) = 2000

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- e. Leave the rest of the fields default
 - f. This partition will be used to store the VM config files and the suspend files
14. Add a new partition. On the **Partitioning** screen, select **New**, and define the partition as follows:
- a. Leave the Mount point blank.
 - b. Filesystem type = vmfs2
 - c. Leave Size (MB) blank
 - d. Select “Fill to maximum allowable size”
 - e. Leave the rest of the fields default.
15. Press **Next** to continue.
16. On the **Network Configuration** screen, select **Static IP**. Then fill in the network information as follows (where x = student number):
- a. IP address = 10.10.10.x0 (e.g. team 1 would use 10.10.10.10, team 2 would use 10.10.10.20, etc)
 - b. Netmask = 255.0.0.0
 - c. The rest of the fields can be left blank because the lab does not have either a gateway or a DNS server.
17. Enter in a **Hostname** = studentx, where x = student number
18. Select an appropriate **Time Zone Selection**
19. For **Root Password**, enter in password (all lower case)
20. Next, select to **Add** a user to add a normal user account. Enter in information as follows (where x = student number):
- a. User ID = studentx
 - b. Password = password
21. Select Next, Next to continue the installation.
22. select **Next** to reboot, when prompted
23. After the ESX server fully boots, on your Windows management workstation, open Internet Explorer and enter in your ESX Server’s IP address in the Address field.
24. Log in as root.
25. On the Status Monitor page, notice both Warning messages. Add and Activate a small swap file. Then select to **Reconfigure** the network settings.
- a. Create a virtual Ethernet switch by clicking on “create.”
 - b. Give it an appropriate name, such as “Public”.
 - c. Bind the available physical adapter to the switch, and then select **Create Switch**.

Part 2: Create a VM

In this exercise, you will create a VM definition.

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1. First, you will create a Windows 2003 ISO image on the hard drive from which to install the VM. Follow these steps:
 - a. At the ESX Server machine, insert the Windows 2003 CD in the server's CD drive. Press ALT-F2, and then log in as root.
 - b. Mount the CD by typing
`mount /dev/cdrom`
 - c. Create the ISO by typing
`dd if=/dev/cdrom of=/vmimages/w2k03.iso`
 - d. Unmount the CD drive by typing
`umount /dev/cdrom`
 - e. Eject the CD by typing
`eject`
2. At the Windows management workstation, login at root, then select to **Add Virtual Machine**
3. Select the following options:
 - a. **Guest Operating System** = Microsoft Windows Server 2003, Standard Edition
 - b. **Display Name** to be "VM1 for Studentx" where x = student number
 - c. **Location** =
"/vmconfigs/vmware/winNetStandard/vm1/winNetStandard.vmx"
 - d. **Processors** = 2
 - e. **Memory** = 512
 - f. For **Virtual Disk**, select "Blank", for **VMware Disk Image**, type in "vm1.dsk", **Capacity** = "2000 MB", **Virtual Device** = "0:0", **Disk Mode** = "Persistent"
 - g. On the **Hardware** tab for the virtual machine, select to **Edit** the **DVD/CD-ROM Drive**. Uncheck the boxes for **Connected** and **Connect at Power On**
4. Close the window, and return to the main VMware Management window in Internet Explorer

Part 3: Start Virtual Machine

In this exercise, you will install the VM from an ISO image you created.

1. You first need to download and then install the Remote Console. On the main VM overview page. Select to **Download VMware Remote Console: Windows**, and then install the program, taking defaults.
2. Now, to the left of the VM name (should be **VM1 for studentx**), click on the down arrow that displays a drop down menu and select **Attach Remote Console**.
3. If you are using Windows 2003, you will need to change a setting in Internet Explorer. In IE, go to **Tools – Internet Options – Advanced**. Then, underneath the Browsing section, enable the setting **Notify when downloads complete**.

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4. Save the file to a temporary location. When the download completes, select to **Open** the file. This should bring up the VMware Remote Console.
5. Enter the correct password in the password dialog box.
6. Double-click on the **DVD/CD-ROM** line. Check the **Connect on power on** checkbox. Select **Use ISO Image** radio button, and then enter in **/vmimages/w2k03.iso** for the path. Then select **OK**.
7. Press the Power On button, and the VM should start booting.
8. Install Windows. When you get to the **Networking Settings** dialog, select **Custom** and assign a TCP/IP address of 10.10.10.x1, where x = student number, and a netmask of 255.0.0.0.

Part 4: File System Walkthrough

In this exercise, you will look at the ESX console OS's file system, noting important directories and files.

1. While Windows is installing, go to the ESX Server's command line. You can use this time to explore the various directories and files. This is a Linux command shell, so typical Linux commands will work.
2. Go the /vmfs directory. This is the directory tree where the VM files are stored.
`cd /vmfs`
3. The vmhba directory specifies a particular partition on a particular disk on a specific SCSI card in the server. The other directory is simply an alias (the logical volume name that you entered during ESX Server configuration) that points to the same directory as the vmhba path. Change to this directory and look at the VM file. "`cd vmhba2:0:0:7`". Note: Depending on what hardware you have, the vmhba path may be different. To do a file listing, type "`ls -l`". One file is the swap file you created for the VMs to use; the other is the vm file itself, vm1.dsk.
4. Using these 3 commands, `cd` and `ls`, navigate the file systems to view the following directories:
 - a. /etc, /etc/vmware, /etc/sysconfig, /etc/sysconfig/network-scripts
 - b. /root
 - c. /vmconfigs, /vmconfigs/vmware,
/vmconfigs/vmware/winNetStandard/vm1
 - d. /vmimages
5. To look at the contents of a file, use the following command:
`cat file_name`.
Look at the contents of the following files:
 - a. /vmconfigs/vmware/winNetStandard/vm1/winNetStandard.vmx
 - b. /etc/modules.conf
 - c. /etc/sysconfig/network-scripts/ifcfg-eth0

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- d. /etc/vmware/vmkmodule.conf

Part 5: Installing VMware Tools

In this exercise, you will install the VMware Tools into the VM. This is a very important step. You can learn more about the tools in the ESX documentation.

1. Once the VM is fully installed, you will need to install the VMware Tools into the VM. The VMware Tools provide a number of enhancements, like a better video driver, seamless mouse support, and a memory driver that let's ESX Server manage the VM memory better. To do so, do the following steps:
 - a. Log on to the Windows VM by typing `CTL-ALT-INSERT`
 - b. Then, to release the mouse from the VM, press `CTL-ALT`.
 - c. Go the *Settings* menu on the VMware Remote Console and select *VMware Tools Install*.
 - d. Install the Tools, taking defaults. Select *Typical Installation*. If you get a warning about not having digitally signed drivers, select *Yes* or *Continue Anyway* to install the driver. Select *Yes* to set hardware acceleration, and follow the instructions. Reboot Windows.

Part 6: Changing the Ethernet Driver

In this exercise, you will change the virtualized ethernet device that is presented to the VM. The driver you change to has better performance characteristics, but is not autodetected by Windows.

In the Windows VM, go to Device Manager and notice the type of Network adapter that is present. Also, notice the type of SCSI controller that is available. Neither of these 2 devices is actually physically on the server. The hardware presented to a VM is all virtual, allowing you to move VMs from one hardware platform to another without having to worry about hardware consistency.

In this section, you will change the type of Network Adapter presented to the VM. The new driver provides better performance, particularly with gigabit adapters.

1. Shut down the VM, and close the Remote Console.
2. Go back to IE on the management workstation, click on the VM name, and then click on the *Hardware* tab.
3. Next to *Network Adapter*, click on *Edit*. Next to *Virtual Device*, select *vmxnet* and then OK. This changes the type of virtual network adapter presented to the VM.
4. Start the Remote Console, log in, and start the VM.

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5. Because you changed the type of adapter presented to the VM, the driver will have to change.
6. After logging in to Windows, the New Hardware Wizard will start. Select to Install the software automatically and Windows will find the right driver.
7. Now, go back to Device Manager and notice that the Network Adapter has changed.
8. While you're in Device Manager, look at the other hardware categories to view the virtual devices.
9. Shutdown the VM when you're finished.

Part 7: Resource Management

In this exercise, you will modify the resources your VM uses. ESX Server gives the administrator control over how individual VMs utilize shared resources such as CPU, memory, and disk

1. Make sure your VM is not running.
2. To get a better explanation of the settings for this section, click the **Help** button on any screen.
3. On the **Status Monitor** tab, click on the VM name.
4. Click on the **CPU** tab. By clicking on **Edit** next to **Resource Settings**, you can change the amount of CPU a VM consumes, and which processors the VM can run on.
5. Click on the **Memory** tab. Next to **Resource Settings**, click **Edit** to change the memory settings for that particular VM.
6. Click on the **Disk** tab. Next to **Number of Shares**, click **Edit**. You can change the disk bandwidth associated with this VM for this disk. This will change the relative priority this VM receives when accessing this disk.
7. Click on the **Network** tab. Next to **Traffic Shaping**, click **Edit**. Here, you can enable traffic shaping to modify the network resources available to the VM.

Part 8: Exploring VMKfstools

In this section, you will learn about the vmkfstools command. Unfortunately, we do not have the equipment in this lab to utilize most of the options, but in a normal environment, these commands can be very useful. Learn about the options by typing any of the following commands (“vmkfstools”, “vmkfstools -help”, “man vmkfstools”) and then answer the questions below.

1. If you ran out of space to store VM files, what option would you use to extend a VMFS partition? _____
2. If the VM itself ran out of disk space, which option would you use to extend the .dsk file? _____

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3. If the ESX server was connected to a SAN, and you wanted to add additional disks that were assigned to the ESX server, which option would you use to force the HBA to re-scan without rebooting? _____
4. What are the differences between the `-l`, and `-P` options? Go ahead and run `vmkfstools` with these options (separately) to find out. When might you want to use these options?
5. If a VMFS partition on a SAN is shared between 2 or more ESX servers, how would you recover the partition if you start getting errors that the partition is locked? _____
6. Create a symbolic link to on of the `vmhba` paths by typing

```
vmkfstools -s dsk_space vmhba1:1:0:1
```

Part 9: Swapping NIC Cards

In this section, you will swap the ethernet card that is assigned to the console OS with the ethernet card assigned to the VMs.

1. From the ESX command line, run `“vmkpcidivy -i”`. Then do the following:
 - a. accept the default boot image configuration and keep the same name
 - b. don't change the amount of memory allocated to the Console OS.
 - c. when the first ethernet controller comes up, change it from `[c]` to `[v]` by typing `“v”`.
 - d. leave the SCSI controllers alone.
 - e. change the second ethernet controller to `[c]` by typing `“c”`.
 - f. save changes.
 - g. reboot the ESX server.
2. After the ESX server reboots, go to the Windows browser and try to connect to the ESX server. It shouldn't work.
3. Go back to the ESX server, and edit the `/etc/modules.conf` file by typing `“vi /etc/modules.conf”`
 - a. add a line that says `“alias eth0 driver”`, where *driver* is `e100`, `bcm5700`, `e1000`, or `3c59x`, depending on what PCI network card you have.
 - b. Note: depending on your hardware, you may not have to change the driver at all. Many servers will have a dual port controller, so both network ports would use the same driver.
 - c. comment out the original `“alias eth0 driver”` line by putting a `“#”` sign at the beginning of the line.
 - d. save and exit the file.
4. Type `“service network restart”` to restart the `“new”` network card.

Part 10: Setting Network Speed

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In many environments, the network card will not autonegotiate properly with the switches, and the line speed must be hard coded. To do so, follow these steps:

1. Edit `/etc/modules.conf`.
2. After the “alias `eth0 driver`” line, add an additional line with the appropriate options (these examples are for 100 Mbps Full Duplex)
 - a. `options e100 e100_speed_duplex=4`
 - b. `options e1000 Speed=100 Duplex=2`
 - c. `options bcm5700 auto_speed=0 line_speed=100 full_duplex=1`
 - d. `options 3c59x options=4 full_duplex=1`
3. Save and exit, then restart the network.
4. Run `mii-tool`, or look in the `/proc/net` directory to verify link speed.

Part 11: Command Line Administration

ESX provides a command line utility called `vmware-cmd` that allows an administrator to perform various operations on VMs. You will explore using this utility during this section.

1. List all the virtual machines on the ESX server: `vmware-cmd -l`
2. Get the state of the VMs returned: `vmware-cmd <vm-cfg-path> getstate`
3. Shutdown each virtual machine, utilizing the output of the previous command:
`vmware-cmd <vm-cfg-path> stop hard`
4. Unregister your VM: `vmware-cmd -s unregister <vm-cfg-path>`. Now look in the Windows browser to verify that the VM is no longer available. You may need to refresh your browser.
5. Re-register the VM: `vmware-cmd -s register <vm-cfg-path>`. Verify that the VM is now available.

Part 12: Editing Configuration Files

In this exercise, you will manually edit a VM configuration file through the MUI. You can also directly edit the configuration file through the command line. You will be adding a virtual serial port to the VM.

1. On the Windows workstation, connect to the ESX server. Make sure the VM is not running.
2. Click on the VM name to bring up the properties notebook
3. Click on the Options tab
4. At the bottom of the screen, under *Verbose Options*, click to ***add or modify configuration parameters directly***.
5. At the top of the page, click on ***Add...***
6. Under Option Name, put in `serial0.present`. For the value, put in `true`

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7. Now, in the same way, add in the following options names and values:
 - a. serial0.fileType device
 - b. serial0.fileName /dev/ttyS0
8. Now, start the VM and verify in Device Manager that there is now a serial port.
9. Go to the command line of the ESX server, go to the directory where the configuration file is stored, and look at the file. Verify you see the new lines in the file.

Part 13: Changing the ESX Server's Host Name

Occasionally, you will want to change the host name of the ESX server after you install it. You will need to change it in 3 places.

1. Type `hostname` to verify the current host name.
2. Edit `/etc/hosts`, and change the line with the correct IP address (10.10.10.x) to a new host name.
3. Edit `/etc/sysconfig/network`, and change the **HOSTNAME=** line to the same new name.
4. Edit `/usr/lib/vmware-mui/apache/conf/httpd.conf`, and change the **Server Name** line to the new name.