



Study Guide
Lab Guide

VMware ESXi 6 Hypervisor

A step by step approach to successful virtualization
planning, deployment and administration.

Featuring VMware vSphere with

VMware ESXi™ 6.0,

and related products

March 2015



VMware ESXi 6 Hypervisor

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Ninth edition updated for vSphere 6.0, March 2016

To find out more about our products and services including consulting services, renting our remote lab facilities, running your own VMware class or custom training and content solutions, please visit our website www.esxlab.com or e-mail the author: larry.karnis@esxlab.com.

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Time Line & Table of Contents

Topics & Labs

Chapter 1 - Install and Configure Standalone ESXi

Lab 0 - Remote Lab Access

Lab 1 - Install and Configure ESXi 6

Chapter 2 - Virtual & Physical Networking

Lab 2 - Virtual Switches and Virtual Networking

Chapter 3 - Connecting to and Using NAS Shared Storage

Lab 3 - Network File System

Chapter 4 - Virtual Hardware and Virtual Machines

Lab 4 - Install and Configure Virtual Machines

Appendix

Appendix 1 - Definitions & Acronyms



Author's Note

Twenty five years ago, I started my IT career as a UNIX/C programmer. By 1992, I was working as a very busy UNIX administrator so I gave up the safety of full time work for consulting. As a hedge against down time, I contacted a major training company and offered my services. Soon, I was teaching their UNIX and C programming classes (very popular at the time). Over time, my love of UNIX morphed into a love of Linux so by 2002 I was teaching Linux for RedHat.

In 2004, I had the very good fortune to be contacted by VMware. Would I like a job working as a trainer? I said "no" and asked if they wanted a contractor. They said no. I had this conversation with VMware three times in 2004 until they finally agreed to hire me as a contractor. I sat the ESX I & II classes and earned my VMware Certified Professional on ESX 2.0 (VCP# 993).

I worked as a contract resource for VMware for about 4 years. I got to watch ESX grow from a niche product used primarily for testing into a full blown production platform. VMware was a young, company creating technical magic (VMotion was absolutely unbelievable in 2003). IMHO, their software magicians were, and still are without equal. They have since delivered Storage VMotion, High Availability, DRS clusters, Fault Tolerant VMs and much, much more.

In 2008, I left VMware to work again as an independent. I enjoy training and was still a huge advocate of VMware's technology, so I decided to start a company to provide vendor independent VMware training courses that anyone could run. The result is this book set.

This Study Guide fully explains how each vSphere feature works. The accompanying Lab Guide takes you through the mechanics. Each lab starts at the very beginning and takes you through all the steps needed to complete the job. There is no magic in this course because nothing is done for you. In most cases, you can perform the labs at work exactly the same way and get the same result (just be careful and don't break anything!).

Developing courseware is much like developing software (my first job). You write, re-write, review, edit update, test until you truly believe that it is bug free. The reality is that bugs exist - and no doubt, some are still lurking in this book set. If you find one, please let me know. I'll fix the issue and the next version of the courseware will be better for your input. As a bonus, I will provide a free ESXLab Certified Virtualization Specialist exam voucher to the first person who reports each unique bug

VMware vSphere has rekindled my love of IT, and I've seen it do the same for others. Demand for VMware vSphere skills is growing - and so will your career once you master VMware vSphere 6.0. My hope is that this class will help you get there much faster.

A handwritten signature in black ink that reads "Larry Karnis".

Larry Karnis

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VMware ESXi 6 Hypervisor - Author's Note

vSphere 6 was officially announced at VMworld, summer of 2014. After extensive (but insufficient) internal and open Beta testing, it was released to the world in late March 2015. I tracked the open Beta, tested the software and considered how to update my training for this new release. There were exciting new features and major improvements but also many bugs - some of which were significant.

With much hope, I started working on the General Availability (GA) release in early April 2015. I wasn't sure what it would include because VMware often doesn't lock down features until the very last minute. After a few weeks of testing the result was a mixed bag of awesomeness and disappointment.

What was awesome was VMware's abandonment of license based restrictions on the sizes of VMs. Suddenly, all versions of vSphere could make VMs with up to 128 vCPU cores (assuming you had 128+ pCPU cores to hand out). vSphere 5.5 and earlier limited low cost licenses to just 8 vCPU cores, thereby handing a huge advantage to Microsoft and Hyper-V (who had no vCPU core restrictions). Also, awesome were the additions of graceful All Paths Down and Permanent Device Loss handling in vSphere HA and Fault Tolerance. These changes result in much better fault management and better overall availability. Fault Tolerance scalability improvements (to 4 vCPU cores) was also welcome as earlier editions were restricted to 1 vCPU core.

I am happy to introduce this condensed - getting started book that covers how to install and configure ESXi 6 onto a PC server, how to configure ESXi 6 networking, how to connect to NFS file shares and how to create, configure and run Virtual Machines. These are the first things that all aspiring VMware administrators need to know - and I am pleased you have selected this guide to help you get started on your journey.

I hope you enjoy this course. Please e-mail me (larry.karnis@esxlab.com) if you would like to provide feedback, suggest improvements or to let me know what you think.

Larry

Larry Karnis
June, 2016

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VMware ESXi



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ESXi-1

Notes

Installing and Configuring ESXi

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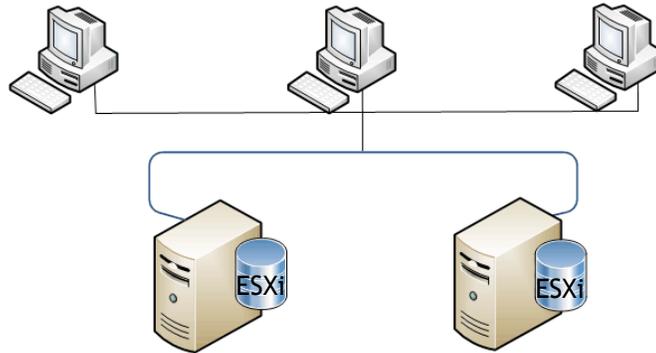
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Stand Alone ESXi

- ⇒ ESXi Overview
- ⇒ ESXi Installation Procedures
 - Perform the initial install
 - Post-install steps
 - Configure Networking, Time Services, Security
- ⇒ Best Practices

Notes

Project Plan

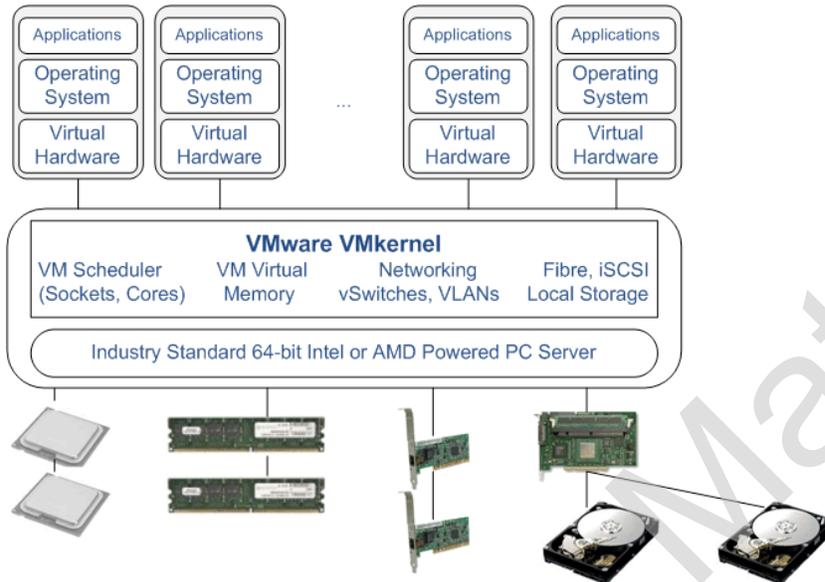


- ➔ By the end of this chapter, we will have
 - Installed ESXi onto a stand alone server
 - Partitioned local storage for ESXi, VM use
 - Connected to ESXi using the vSphere Client

Notes

Our first step in this class is to install ESXi onto stand alone PC servers and then connect to those newly installed ESXi hosts using the vSphere Client and SSH. In future chapters we will add to our original implementation. Our ultimate objective is a scalable, highly redundant, load balanced Virtual Infrastructure implementation that supports a large community of Windows 2003 / 2008 / 2012, desktop, Linux and other VMs.

ESXi Block Diagram



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ESXi-4

Notes

VMware ESXi is a bare-metal virtualization hypervisor solution. As such, it must install on an industry standard PC server. Please check VMware's Hardware Compatibility Guide (portal on www.VMware.com web site) for the most up to date list of supported PC servers.

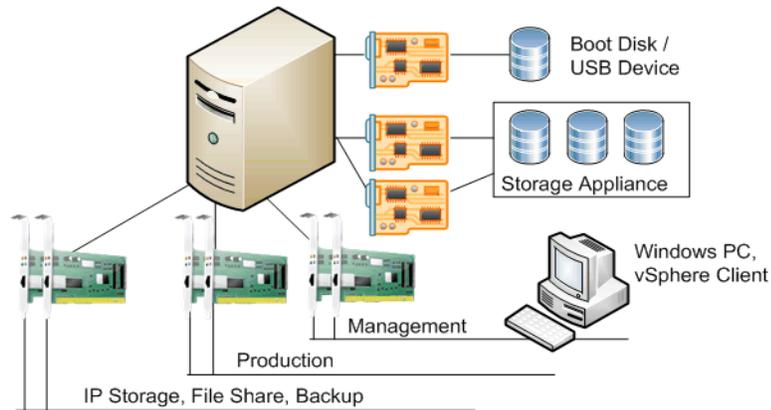
Because it owns the hardware, ESXi is in full control of resource assignments to running VMs. The VMkernel, allocates hardware resources on an as-needed basis. In this way, the VMkernel can prevent idling VMs from wasting CPU cycles that could otherwise be used by busy VMs. Likewise, the VMkernel keeps track of needed RAM, not just requested or allocated RAM. It can dynamically re-assign RAM to memory starved VMs, thereby ensuring that VMs get the memory they need to run.

Installing and Configuring ESXi

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Scaling Up Networks, Storage



➤ Networking

- Use multiple physical, virtual LAN segments
- Use NIC teams

➤ Shared SAN Storage

- Centralizes storage capacity, mgt, performance
- Fast storage networks
 - 8/16Gb Fibre, 10Gb iSCSI
- Multiple storage paths

Notes

As your ESXi deployment matures (technically) you will want to introduce:

- Different LAN (virtual or physical) segments to isolate network traffic to improve both security and performance. You could use different LAN segments for things like IP Storage, Management and production systems
- Shared storage solutions including iSCSI, Fibre SAN and NFS shares
- Hardware redundancy in the form of multipath storage solutions and teamed NIC configurations
- You may even wish to consider a Boot From SAN or boot from USB/SD card solution so you don't need to provision and configure local storage.

Boot from SAN is available on supported Fibre SAN controllers and also with iSCSI SAN controllers (using iSCSI hardware initiators).

ESXi Server Hardware

⇒ CPUs

- Max 480 pCPU cores
- Intel Core 2 Xeons or newer
 - 2-18 cores/CPU
 - Hyperthreading
- All AMD Opteron
 - 2-16 cores/CPU
- Non Uniform Memory
 - Up to 16 NUMA nodes
- Memory
 - 4GB to boot, 12TB max
 - .5% RAM for VMkernel
 - VMs compete for all remaining RAM

⇒ Networking

- Up to 24, 1Gb NICs
- Up to 16, 10Gb NICs
- Up to 4, 40Gb NICs
 - Mellanox ConnectX-3 Host Channel Ctlrs

⇒ Storage

- Local SAS, SATA, SSD volumes
- Infiniband, iSCSI, Fibre, SANs
- NFS File Shares
 - No native SMB/CIFS support

Notes

ESXi is capable of using the largest PC server hardware platforms. Apart from what is stated above, ESXi is limited to:

- No more than 480 CPU cores (includes Hyperthreaded logical processors) for CPU scheduling purposes
- A maximum of up to 6TB. This increases to 12TB for specialized high end servers.

Furthermore the following implementation limitations need to be considered:

- ESXi supports a modest selection of 10Gb Ethernet and 40Gb Infiniband controllers
- Jumbo Frames supported, which may improve software iSCSI I/O performance.

Notes about Local Storage

- ESXi requires enterprise class storage controllers. This means that it usually doesn't work with embedded SATA controllers found on desktop motherboards
- ESXi has support for controllers from LSI Logic, Adaptec and many others. Most
- vendor branded controllers (Dell PERC, HP Smart Array, IBM ServeRAID, etc.) are
- made by (i.e.: rebranded from) either LSI Logic or Adaptec
- Legacy HP Smart Array controllers have significant limitations you should know about:

1. They may refuse to boot off a local storage volume that is >2TB in size
2. They may refuse to use disk that do not carry HP's brand even if HP OEM's the drive. This means that generic Seagate, Western Digital, Hitachi, etc. enterprise drives (that work fine) may be rejected by HP controllers and/or storage shelves

Installing and Configuring ESXi

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ESXi Embedded, Installable

- ➔ **ESXi Embedded**
 - Burned into flash on the motherboard
 - Host boots ESXi after POST
 - Boots from flash drive
 - ESXi configuration can reside on local storage or retrieved from the network via Host Profiles / Auto Deploy
- ➔ **ESXi Installable**
 - Local disks
 - RAID, JBOD
 - Can run from SSDs
 - USB / Flash boot
 - No RAID controller
 - No hard disks
 - Install, boot from USB, SD flash storage
 - Easy to duplicate
 - Most servers have internal USB or SD card sockets so the device cannot be accidentally removed

Notes

JBOD - Just a Bunch of Disk. Physical disks in a non-RAID configuration.

ESXi comes in two forms - Embedded and Installable. Embedded is baked into firmware on the motherboard of select PC servers. This lets you boot your server without any local storage.

ESXi Installable is a version of ESXi that can be installed onto local storage, USB memory keys or SAN storage. It is installed from CD media that you can download from www.vmware.com.

ESXi does away with the Service Console found in ESX 4.1 and older. This provides a smaller, leaner hypervisor than full ESX. It is also more secure because there is less software (to exploit) and fewer services running on ESXi than there is on ESX.

ESXi Install Steps

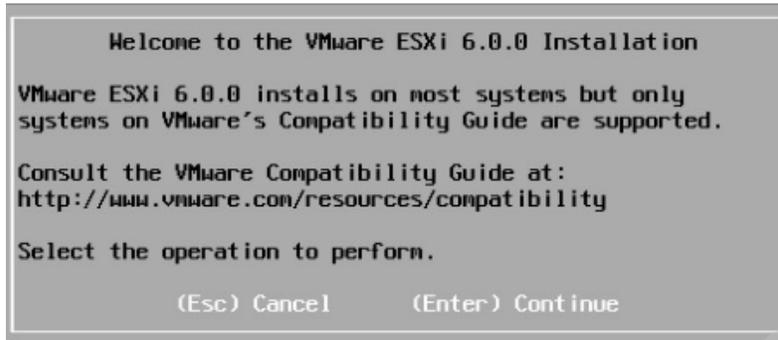
- ⇒ **Install steps...**
 - Boot your server from ESXi install media
 - Accept the EULA
 - Select target disk for installation
 - Select keyboard language
 - Set the root (administrator) password
 - Agree to partition and format disk
 - Reboot server when install complete
- ⇒ **Post install steps... log in to DCUI and**
 - Select NIC(s) for management traffic
 - Set static IP, host name, domain name
 - Test network configuration
 - Review (enable) local, remote Tech Support

Notes

DCUI - Direct Console User Interface

This is the Yellow & Grey screen on the console of your ESXi host once it is fully booted.

ESXi Boot Screen



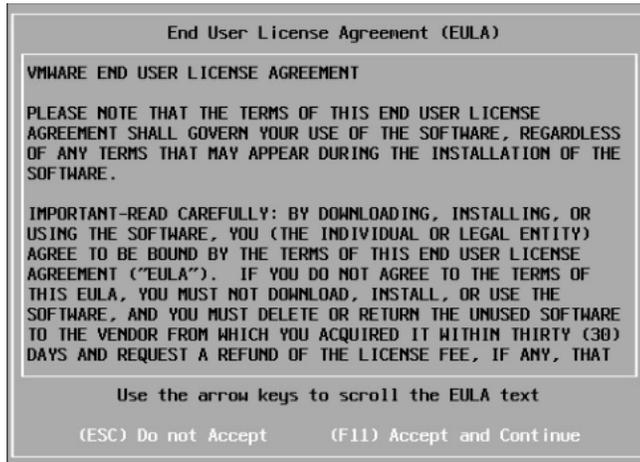
- ➔ To begin your ESXi install, boot from CD
 - Hit ENTER to launch the installer

Notes

ESXi is installed in text mode - so your PC server doesn't need to have graphics capability.

VMware makes it possible to set up an install server for ESXi so you can perform network based installs.

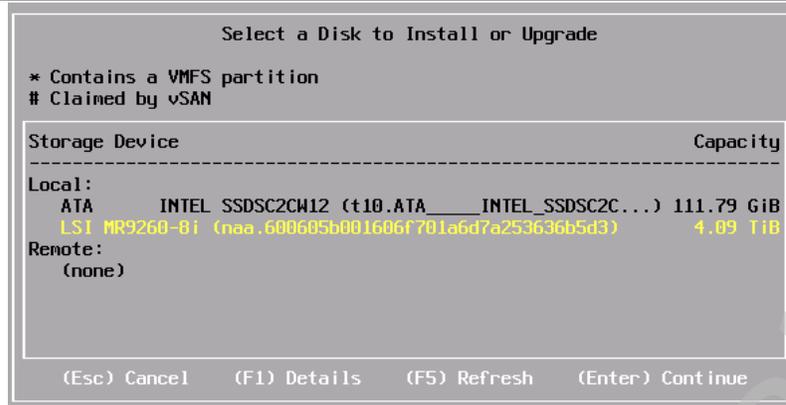
Accept the VMware EULA



- ➔ You must accept the VMware End User License Agreement before you install ESXi
- Hit F11 to proceed to the next step

Notes

Select the Target Volume

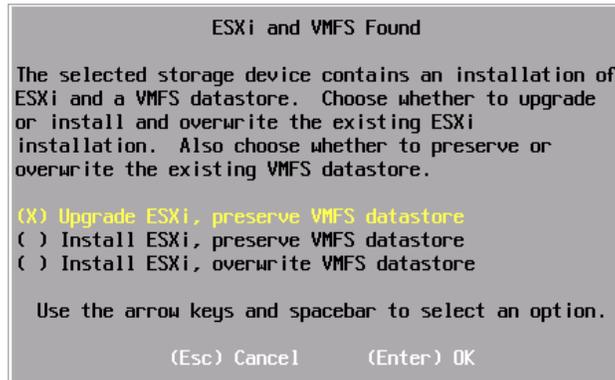


- ➔ Installer displays available storage volumes
 - Categorized as Local or Remote
 - Local - RAID, JBOD volumes on your ESXi host
 - Remote - Fibre or iSCSI SAN LUNs accessible via hardware SAN controllers

Notes

In the above screen shot, the ESXi 6.0 installer detected a local SATA based Intel SSD and a 4.09 TB local RAID array on an LSI Logic hardware RAID controller. Since our intent is to use the SSD as a hardware based Read cache (see Performance chapter), we'll select the RAID set as the install target for ESXi

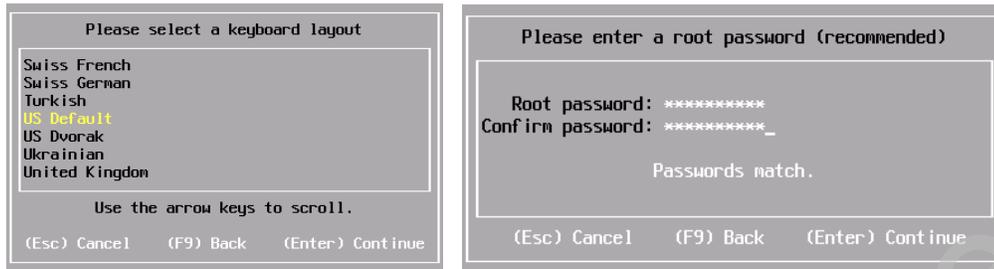
Performing an In-Place Upgrade



- ➔ You can upgrade ESXi 5.x hosts to ESXi 6.0 by performing an in-place upgrade
 - Preserves local VMFS contents
 - Preserves ESXi host configuration
 - Preserves VMs, storage settings, etc.

Notes

Keyboard, root Password



➔ Next, you specify:

- Keyboard layout being used
- The password for the ESXi 6.0 **root** (local administrator) account
 - The only supported way to reset the root password for ESXi 6.0 is to re-install ESXi!

Notes

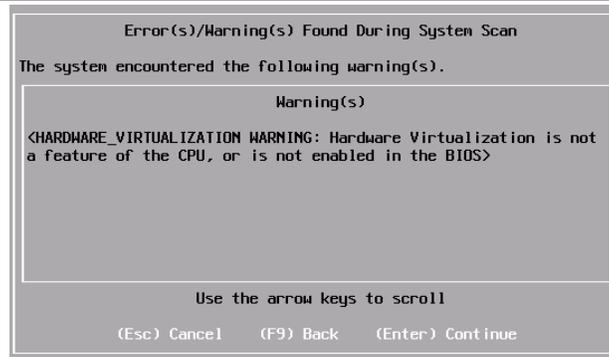
VMware has no supported password reset tool for ESXi. Officially, the only way to reset the root password is to re-install the entire operating system.

However, there are community developed procedures that appear to work. If you need to recover the root password for ESXi and have some Linux administrator and command line skill, please visit

http://www.vm-help.com/esx/esx3i/Reset_root_password.php

The procedures in this blog have been tested on ESXi 3, 4 and 5.x and *should* work in vSphere 6.0. Note that these procedures appear to work for ESXi.

Hardware Virtualization Assist



- ➔ All Xeon/Opteron CPUs made after 2007 have (at least) some hardware virtualization assist features
 - Intel VT technology, AMD-V
 - Always enable all H/W virtualization features

Notes

Virtualization abstracts the physical hardware to the VM. The VM guest operating system normally expects to own all hardware and also expect to be able to execute privileged CPU instructions that are not available to applications. If ESXi allowed guest operating systems full access to these privileged instructions, then the guest OS could manipulate hardware directly, possibly interfere with virtual memory page translation tables and perform other operations that could compromise the ESXi host. To avoid this problem, VMware blocked guest OS' from privileged/dangerous instructions and CPU features - and provides this capability through software that emulates (and controlled) what the guest OS could do. This worked but adds overhead to some operations.

Intel and AMD have virtualization hardware assist technology in their CPUs, offering sophisticated memory management capabilities, better hardware emulation features and other improvements that dramatically reduced the overhead of virtualization while maintaining compatibility with Guest OS'.

ESXi probes physical CPUs for Intel VT or AMD-V technology and will not install or run if the feature is not present or enabled, so please be sure to turn on this feature in your machine's BIOS.

For more information see: http://en.wikipedia.org/wiki/X86_virtualization

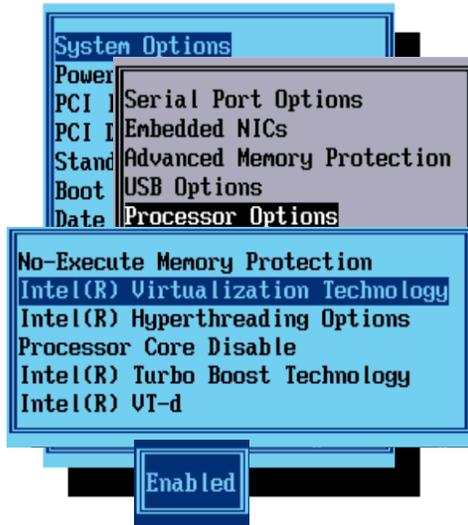
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Hardware Virtualization Assist

ROM-Based Setup Utility, Version 3.00
Copyright 1982, 2011 Hewlett-Packard



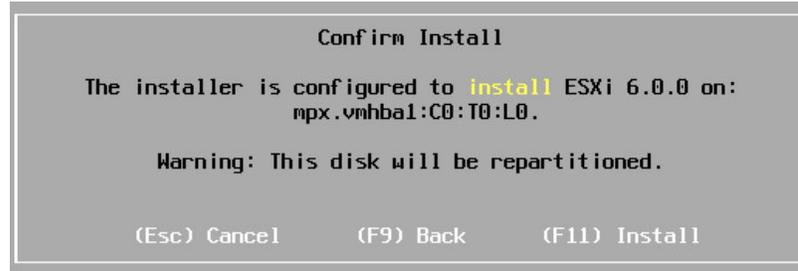
- ⇒ Hides privileged CPU instructions from the Guest OS
 - Restrict guest OS physical hardware access
 - Intel VT, AMD-V
- ⇒ I/O Memory Management
 - Gives Guest OS access to RAM on adapter cards
 - Includes NICs, Video Cards
 - Called device Passthrough
 - VMware calls it DirectPath
 - Requires Intel VT-d, AMD-Vi support on physical CPUs

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ESXi-15

Notes

Ready to Install



- ➔ The installer is ready to proceed...
 - Selected volume is re-partitioned, formatted
 - All existing partitions on the selected volume are deleted (unless you are upgrading)
 - All local storage is used for ESXi
 - No partition customization options are available

Notes

The installer will now install ESXi onto your selected storage volume. To do this, the installer:

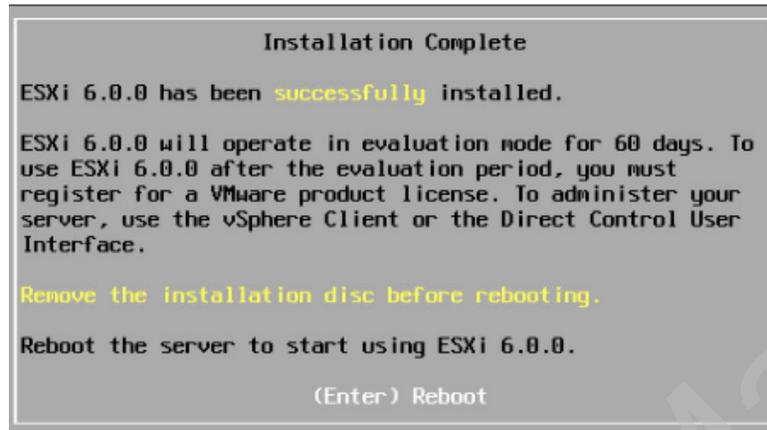
- Wipes all partitions on the selected target storage volume
- Creates partitions as needed (normally 8 partitions are created)

Useful information about the installation disk:

- ESXi consumes about 4GB of disk space in overhead. The rest is for VM use
- partition 4 is the boot partition and is located at the front of the disk (behind the Master Boot Record and partition table)
- partitions 2 and 4, 5, 6 & 8 are for ESXi use and occupy the front of the disk
- partition 7 is a vmkcore partition (partition code 0xfc) and is a ESXi partition used to hold crash dumps
- partition 3 consumes all remaining disk space and is partitioned and formatted as a VMware File System (VMFS)

Note: ESXi 6.0 can install on > 2TB volumes. ESXi(i) 4.1 and earlier cannot. Be aware that some vendor supplied RAID controllers (e.g.: older HP gear) cannot use a greater than 2TB volume as a boot volume.

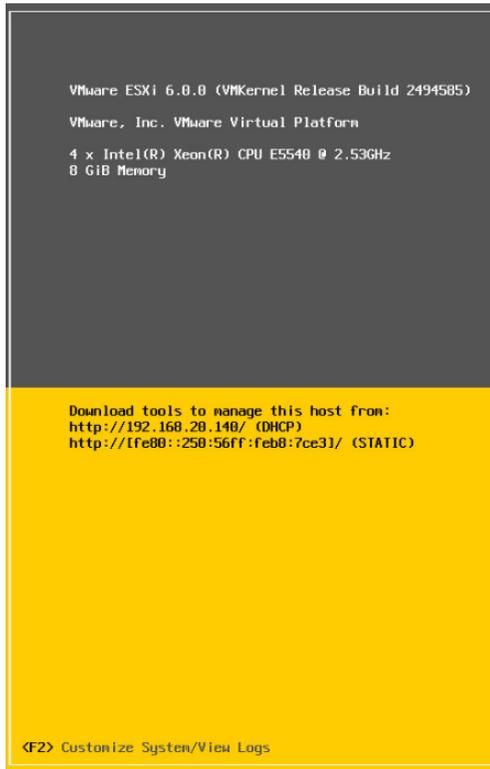
Installation Completed



- ➔ Once your installation has completed, hit **Enter** to reboot to ESXi

Notes

It only takes about 5-10 minutes to install ESXi 6.0 onto your PC server. The install proceeds non-interactively. A status indicator updates a percent completed horizontal bar.



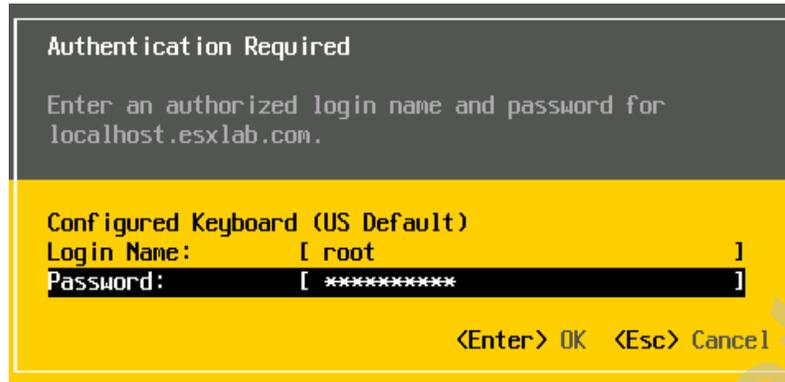
ESXi 6.0 DCUI

- ➔ ESXi Direct Console User Interface
 - Simple BIOS like interface
- ➔ ESXi configuration
 - Default – FQDN and IP properties acquired via DHCP
 - Use **F2** at the boot screen to set up your ESXi 6.0 host
 - Use **F12** to shutdown or reboot your host

Notes

ESXi has a simple, BIOS-like interface called the Direct Console User Interface (DCUI). The DCUI makes it very easy to configure. To configure your ESX host... simply hit F2 at the greeter screen and update your host configuration.

Log In for the First Time



- ⇒ The administrator account for ESXi is **root**
 - The root password is set during install
 - Do not lose the root password – there is no easy way to recover it!

Notes

The ESXi administrator account is root (the traditional Linux administrator account). When you install ESXi, the system defaults to:

- The root password is set during installation
- IP properties set via DHCP
- No command line access (either locally or remotely)

In the next few slides, we will discuss how to change these values.

ESXi System Customization Menu



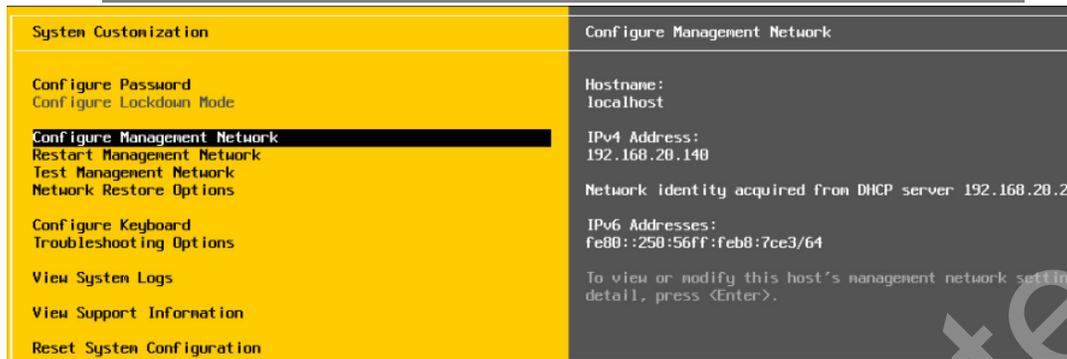
- ➔ Configure ESXi via a simple text interface
 - Current menu item settings displayed on the right side of the screen
 - Hit **Enter** to activate a menu function

Notes

The ESXi configuration menu is a simple text interface where you complete your server's customizations.

Use the up/down arrows to move to a function. When a function is highlighted, its properties and the command keys used to modify that function are displayed on the right.

Default Management IP Settings



- ➔ ESXi hosts uses DHCP on first install
 - Host name, domain name and the IP address is assigned using an IP address out of the DHCP lease pool
 - Example above reclaims a desktop PC lease!
 - ESXi needs static IP properties

Notes

You must set the IP properties of your ESXi host before you can manage it. Select **Configure Management Network** to set the:

- Fully Qualified Domain Name (FQDN)
- IP address
- Netmask
- Default Gateway

and other properties.

You can set these values statically or dynamically using DHCP. If you use DHCP, you must configure your DHCP servers to send static properties to a host. To do this, configure your DHCP server with the MAC address of your ESXi host management NIC and then set the static properties to server whenever that NIC broadcasts for a DHCP lease.

Configure Management Network

Configure Management Network	Network Adapters
<ul style="list-style-type: none"> Network Adapters VLAN (optional) IPv4 Configuration IPv6 Configuration DNS Configuration Custom DNS Suffixes 	<p>vmnic0 (Chassis slot a0; function 0)</p> <p>The adapters listed here provide the connection to and from this host. When used, connections will be fault-tolerant and traffic will be load-balanced.</p>

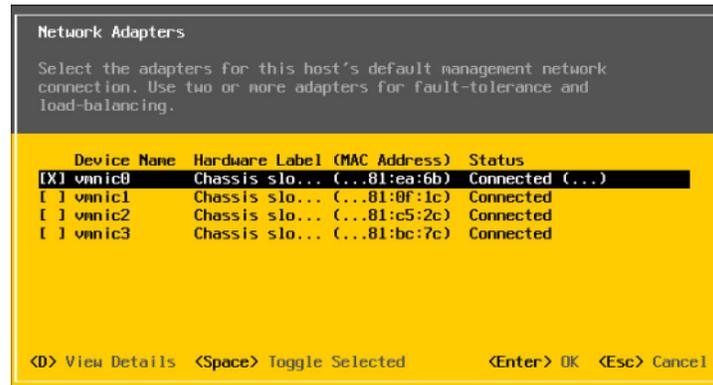
- ➔ Configure Management Network menu let's you set key network properties
 - NIC used to carry Management traffic
 - IP V4, IP V6 properties
 - DNS settings
 - DNS domain search list

Notes

It is a best practice to use static network settings for your ESXi host. To complete this task, you must:

1. Select the correct NIC for management networking
2. Set a static IP address and Netmask and Default Gateway values
3. Identify your local DNS server(s) and the default DNS search domains

Select Management NIC(s)



- ➔ Physical NICs carry ESXi network traffic (VM, mgt., cluster, replication, FT, etc.)
 - Select **Network Adapters** to view/change NICs
 - Avoid disconnected NICs
 - Means they have no link to the physical switch

Notes

You manage your ESXi host through your network. To communicate with your ESXi host (using either the vSphere Client directly or vCenter indirectly), you must have network connectivity to it.

Since modern PC servers may have many NICs and these NICs may be connected into different physical and/or virtual LAN segments, you may have to select the correct physical NIC (rather than the default NIC) before you can manage your machine.

NIC Teams

The Network Adapters screen lets you review and select the NIC or NICs you wish to use to carry network traffic. If you select more than one physical NIC, you automatically create a NIC team. NIC teams afford better speed and redundancy.

Tip

It can be difficult (or impossible) to tell which RJ45 jack is associated with which MAC address. A simple way of selecting the correct physical NIC(s) is to unplug all NICs from their switch except for the NICs you wish to use for management. Then use the Status column (Connected means the NIC has a link to the switch) to determine which NICs you should for management.

Network Adapter Details

The screenshot shows the 'Network Adapters' configuration screen in ESXi. It prompts the user to select adapters for the default management network connection. A table lists available adapters, with 'vmnic0' selected. A secondary window shows the 'Adapter Details' for 'vmnic0', including its hardware label, MAC address, connection status, and the vSwitch it is used by.

Device Name	Hardware Label (MAC Address)	Status
[X] vmnic0	Chassis slot... (...b8:7c:e3)	Connected (...)
[] vmnic1	Chassis s...	
[] vmnic2	Chassis s...	
[] vmnic3	Chassis s...	

Adapter Details	
Device Name:	vmnic0
Hardware Label:	Chassis slot 20; function 0
MAC Address:	00:50:56:B1:ea:6b
Connection Status:	Connected
Used By:	vSwitch0

- ➔ ESXi now exposes underlying network adapter card details
 - Highlight the desired adapter and hit D
 - Add-on NICs have a Chassis slot number

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ESXi-24

Notes

ESXi 6.0 makes it easier to identify onboard NICs from add-on NICs. In previous versions of ESXi, all NICs were reported in the order they were discovered during a boot up PCI bus scan. Normally, onboard NICs were discovered first - but this was not guaranteed. This could lead to problems trying to identify how vmnic# (alias for physical nic #) mapped to physical NICs.

With ESXi 6.0, VMware now identifies NICs as follows:

- If the Hardware Label values starts with N/A, then the NIC is on the motherboard
- If the Hardware label value starts Chassis slot... then the NIC is an add on NIC

For NICs on the motherboard, the NIC labeled NIC 1 will show up first, then NIC 2 and so on.

For add-on NICs, port 1 will show up first and then ports 2-4 (if the card is a dual/quad NIC)

IPv4 Configuration

```

IPv4 Configuration

This host can obtain network settings automatically if your network
includes a DHCP server. If it does not, the following settings must be
specified:

( ) Disable IPv4 configuration for management network
( ) Use dynamic IPv4 address and network configuration
(o) Set static IPv4 address and network configuration:

IPv4 Address          [ 192.168.20.52 ]
Subnet Mask           [ 255.255.255.0 ]
Default Gateway       [ 192.168.20.1  ]

<Up/Down> Select  <Space> Mark Selected          <Enter> OK  <Esc> Cancel
  
```

- ⇒ **Best Practice - use Static IP properties**
 - No chance your server could lose its assigned lease and therefore it's IP address
 - Static IPs required for vCenter Management

Notes

Complete this form to set your ESXi host management NIC IP properties.

vCenter cannot manage an ESXi host whose IP address changes. For this reason it is best to give all of your ESXi, ESXi hosts fixed IP properties.

You must select **Set static IP addresses...** and complete all three fields to complete your static IP address properties assignment.

IPV6 Configuration

The screenshot displays the ESXi configuration interface for IPv6. On the left, a yellow sidebar menu includes 'Configure Management Network', 'Network Adapters (VLAN (optional))', 'IPv4 Configuration', 'IPv6 Configuration', 'DNS Configuration', and 'Custom DNS Suffixes'. The main window shows 'IPv6 Configuration' with the following details:

- IPv6 Configuration
- IPv6 is enabled.
- Automatic
- IPv6 Addresses:

A detailed configuration window is overlaid, showing the following options:

- Disable IPv6 (restart required)
- Use dynamic IPv6 address and network configuration
 - Use DHCPv6
- Set static IPv6 address and network configuration

Static address fields:

- Static address #1 []
- Static address #2 []
- Static address #3 []
- Default gateway []

Navigation instructions: <Up/Down> Select, <Space> Mark Selected, <Enter> OK, <Esc> Cancel

- ➔ ESXi 6.0 supports IPV6
- Multiple IP address policies supported

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ESXi-26

Notes

ESXi 6.0 supports IP V6. You can assign IP V6 addresses:

- Via DHCP
- Self generated via ICMP stateless configuration

You can assign up to 3 static IPV6 addresses to your ESXi host.

Installing and Configuring ESXi

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DNS Configuration

DNS Configuration

This host can only obtain DNS settings automatically if it also obtains its IP configuration automatically.

() Obtain DNS server addresses and a hostname automatically
 (o) Use the following DNS server addresses and hostname:

Primary DNS Server	[192.168.20.2]
Alternate DNS Server	[]
Hostname	[esxi1_]

<Up/Down> Select <Space> Mark Selected <Enter> OK <Esc> Cancel

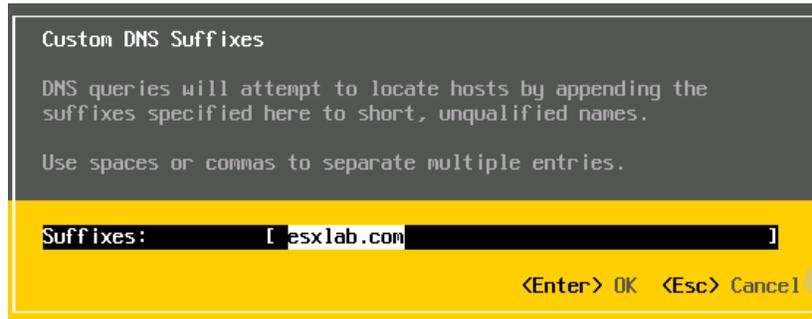
- ⇒ You must set DNS server and host name
- Enter the IP of your DNS server(s)
 - Enter the host name of your ESXi host
 - The domain name is set in DNS Suffixes

Notes

ESXi and vCenter require DNS services to function properly. So it is critical that you have DNS name servers set up and accessible from your local LAN segment.

It is a best practice to have both primary and secondary DNS servers available... but ESXi will function with just primary DNS.

Custom DNS Suffixes



- ➔ DNS suffixes help resolve host names
 - DNS look ups that contain only a host name append domain suffixes from this list, before a DNS look up is attempted
 - Use spaces, commas to separate multiple domains

Notes

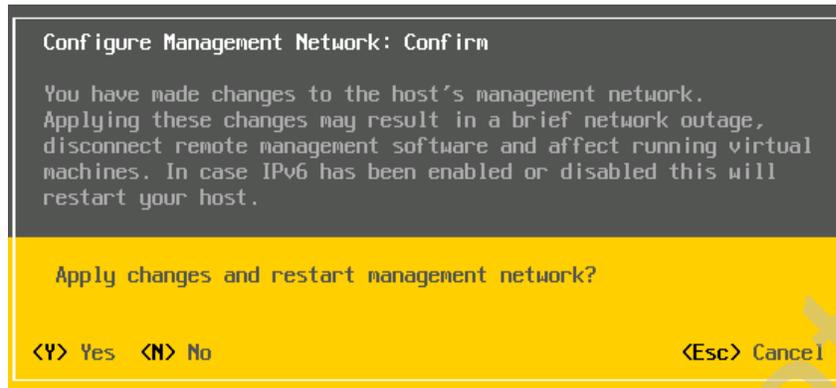
DNS Suffixes are used to enable DNS to look up the IP address of a host specified only by its host name (and not qualified with a domain name). An example might be a look up request for a host called esxi5.

DNS needs a full domain name. Custom Suffixes will append domain names from the list set on this screen to simple host names and then perform a DNS query. This continues until either:

- a matching FQDN is found and its IP address is returned
- no matching FQDN is found and all suffix Domain names have been tried

It is a good practice to add at least one domain name (the primary domain name for your organization) to this list!

Apply Network Changes



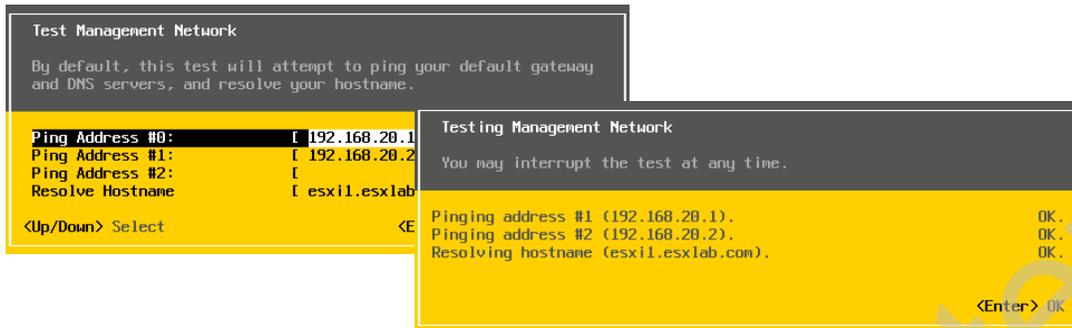
- ⇒ Network changes are applied en mass
 - NIC, IP and DNS changes are activated by restarting Management Network services

Notes

All network changes are applied at one time when you leave the Configure Management Network sub-menu. First the new settings are applied to the appropriate configuration files and then the ESXi hosts' management network is brought down and back up again. For this reason it is best to be at the physical server's console when updating management networking properties.

You should be brought back to the System Customization menu. Your network changes should be visible.

Test Management Network



- ➔ Basic connectivity test with Ping, DNS
 - Pings gateway, DNS server
 - Tries to resolve the server's FQDN
- ➔ Each test reports OK or Fail
 - Do not proceed until all tests pass!
 - Verify your DNS server is ping-able

Notes

Local/Remote Troubleshooting

Troubleshooting Mode Options	ESXi Shell
Enable ESXi Shell	ESXi Shell is Disabled
Enable SSH	Change current state of the ESXi Shell
Modify ESXi Shell timeout	
Restart Management Agents	

- ➔ **Troubleshooting Options** - enables command line access to your ESXi host
 - **ESXi Shell** – Command line access from the physical server console
 - **SSH** – Secure Shell access to your server
 - Default is *Disabled* for both services
 - You may need to turn on to allow VMware or partner access (e.g.: during a support call)

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ESXi-31

Notes

Troubleshooting Options enables functions used by support providers who are comfortable working on the ESXi command line. By default, all local and remote command line access to your ESXi host is disabled - so you can only access your ESXi host through:

- the vSphere client pointed directly at your ESXi host
- vCenter if vCenter has management control over your ESXi host
- The VMware Management Assistant service (VMA), if installed

Enabling ESXi Shell allows direct physical console command line access. Support personnel who have access to the physical console directly or via remote console services such as Dell DRAC (Dell Remote Access Controller), HP ILO (Integrated Lights Out) or IBM Integrated Management Module (MM) would be able to log in to your server.

Enabling SSH activates the Secure Shell Daemon (sshd) and supports network based administrator access to your box without the need for remote console services.

Warning

Enabling SSH enables direct root access to your ESXi host through a TCP/IP connection. This is a potential security threat. Turn on this feature only if needed. If this feature is turned on, set a strong root password.

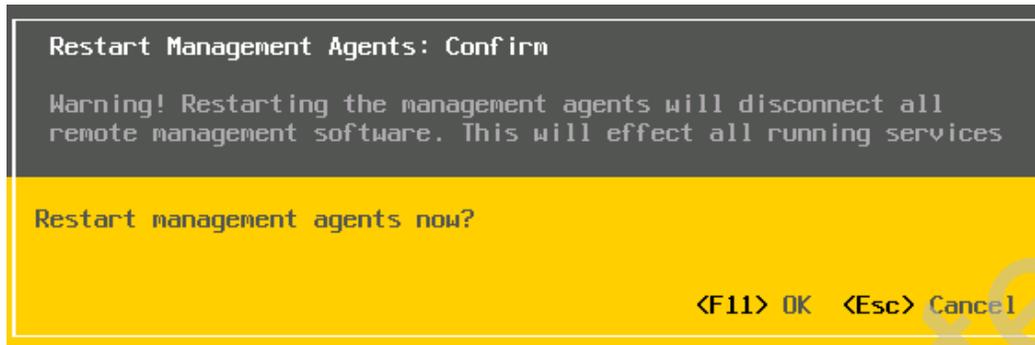
Never expose your machine to an untrusted network like the Internet - especially if SSH is turned on!

Installing and Configuring ESXi

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Restart Management Agents



- ➔ ESXi uses agents (services) to communicate with vCenter / vSphere Client
 - If agents fail, your server is unmanageable
 - Use this feature to reset management agents
 - Does not interfere with running VMs

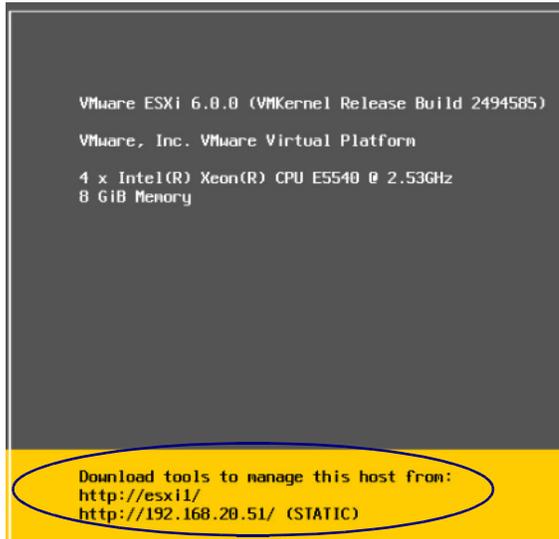
Notes

It may happen that the management agents (services) on your ESXi host become unstable or crash. If this occurs, your ESXi host will not respond to vCenter or the vSphere client. In vCenter your host will grey out and report as disconnected.

You could reboot the ESXi host but that would bring down all running VMs. A more acceptable option is to simply restart the management agents on your ESXi host.

This function can be done at any time. Any connected vSphere Client sessions will be closed. Once this function completes, your host should become active in vCenter and should accept direct vSphere Client login requests.

ESXi Ready for Service



➔ ESXi server is ready for use

- Additional hot keys are active
 - **Alt-F1** – command line access to your machine (if enabled)
 - **Alt-F2** – this screen
 - **Alt-F12** – VMkernel log records
- Use the vSphere Client to manage ESXi

Notes

Once ESXi has rebooted, it is managed via VMware's vSphere Client. You can download the vSphere Client from www.vmware.com/download.

There are additional hot keys active on the ESXi console:

Alt-F1 - first command line log in screen

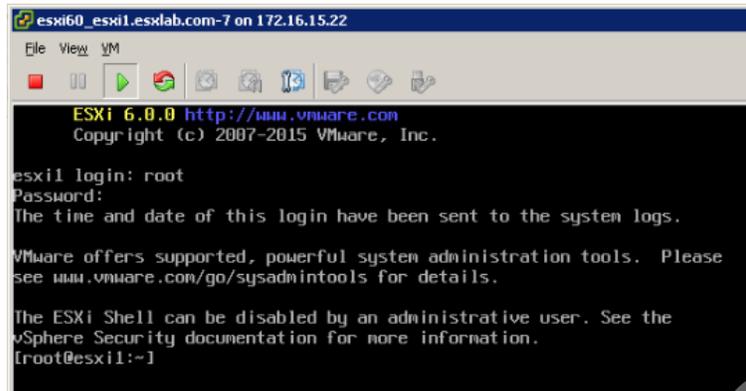
Alt-F2 - the ESXi greeter screen (screen shot above)

Alt-F3 to Alt-F10 - no function

Alt-F11 - Grey status screen/greeter screen with no F-key prompts

Alt-F12 - VMkernel log dump

Alt-F1 ESXi Command Line Login



```

esxi60_esxi1.esxlab.com-7 on 172.16.15.22
File View VM
ESXi 6.0.0 http://www.vmware.com
Copyright (c) 2007-2015 VMware, Inc.

esxi login: root
Password:
The time and date of this login have been sent to the system logs.

VMware offers supported, powerful system administration tools. Please
see www.vmware.com/go/sysadmintools for details.

The ESXi Shell can be disabled by an administrative user. See the
vSphere Security documentation for more information.
[root@esxi1:~]

```

- ➔ Hit **Alt-F1** to view the ESXi host command line login screen (if console login enabled)
 - Log in to ESXi with any local account
 - Only account present by default is **root**
 - ESXi allows direct root logins!

Notes

ESXi supports both local and remote command line access (must be enabled using the DCUI → Troubleshooting). These services are off by default.

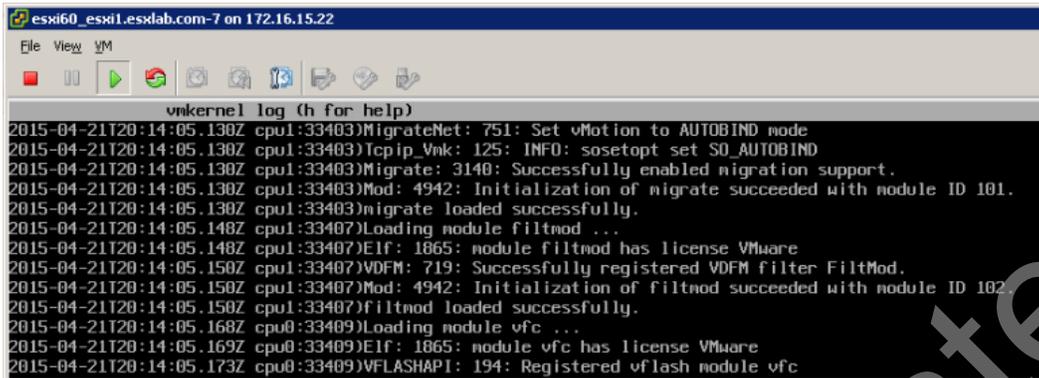
Allowing direct console or network Secure Shell (SSH) command line logins enables direct ESXi host administration without the need for vSphere Client or Web Client. The environment is similar to a Linux style machine.

One thing to note is that ESXi will allow direct root logins both on the console and via SSH. This is a security concern because it means that anyone in possession of (or who can guess) the root password can take control of your machine.

It is best to leave these services disabled - so they cannot be abused. You can turn these services on (as needed) through the DCUI.

Please note that ESXi will do exactly what you tell it (via the command line) without the normal 'are you sure?' prompts. This tool is suitable for those who are comfortable administering Linux servers from the command line and who also have knowledge and experience with ESXi added tools and commands.

Alt-F12 VMkernel Log Entries



```

esxi60_esxi1.esxlab.com-7 on 172.16.15.22
File View VM
vmkernel log (h for help)
2015-04-21T20:14:05.130Z cpu1:33403)MigrateNet: 751: Set vMotion to AUTOBIND mode
2015-04-21T20:14:05.130Z cpu1:33403)Tcpip_Vmk: 125: INFO: ssetopt set SO_AUTOBIND
2015-04-21T20:14:05.130Z cpu1:33403)Migrate: 3140: Successfully enabled migration support.
2015-04-21T20:14:05.130Z cpu1:33403)Mod: 4942: Initialization of migrate succeeded with module ID 101.
2015-04-21T20:14:05.130Z cpu1:33403)migrate loaded successfully.
2015-04-21T20:14:05.148Z cpu1:33407)Loading module filtmod ...
2015-04-21T20:14:05.148Z cpu1:33407)Elf: 1865: module filtmod has license VMware
2015-04-21T20:14:05.150Z cpu1:33407)VDFM: 719: Successfully registered VDFM filter FilMod.
2015-04-21T20:14:05.150Z cpu1:33407)Mod: 4942: Initialization of filtmod succeeded with module ID 102.
2015-04-21T20:14:05.150Z cpu1:33407)filtmod loaded successfully.
2015-04-21T20:14:05.168Z cpu0:33409)Loading module vfc ...
2015-04-21T20:14:05.169Z cpu0:33409)Elf: 1865: module vfc has license VMware
2015-04-21T20:14:05.173Z cpu0:33409)VFLASHAPI: 194: Registered vflash module vfc

```

- ➔ Hit **Alt-F12** to view the VMkernel log file
 - Displays the most recent VMkernel log contents
 - Look here to see detailed error messages
 - File - /var/log/vmkernel.log on the command line

Notes

The VMkernel records detailed log entries into a file called /var/log/vmkernel.log. You can view this file by logging into the local console or SSH (as root) and issuing the command:

```
# less /var/log/vmkernel.log
```

You can also see the host management agent logs or vCenter logs by typing the following commands (respectively)

```
# less /var/log/hostd.log
# less /var/log/vpxa.log
```

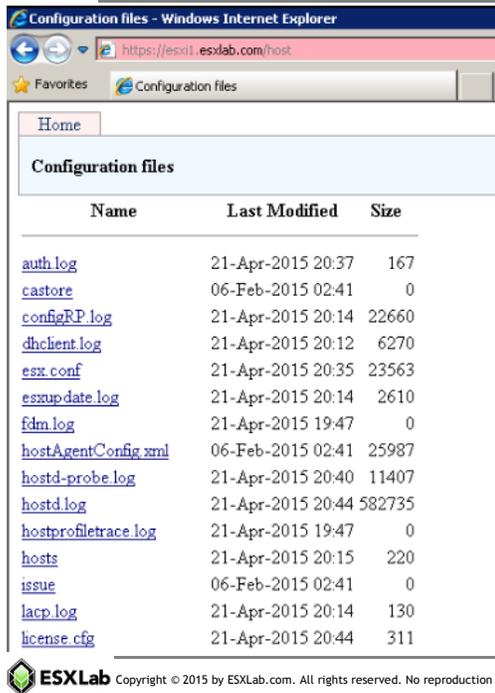
You can see the most recent entries by hitting the Alt-F12 keys on your machine's console. This display shows one screen full of the most current additions to the VMkernel log file. You should check this file if you are troubleshooting problems and need more information than is available in the vSphere client.

Hit **Alt-F2** to go back to the ESXi greeter screen when done.

Note

All command line commands entered using any command line tools are logged to /var/log messages. In this way, it is possible to reproduce the activities of prior command line sessions.

Browse Host Log/Config Files



Name	Last Modified	Size
auth.log	21-Apr-2015 20:37	167
castore	06-Feb-2015 02:41	0
configRP.log	21-Apr-2015 20:14	22660
dhcpclient.log	21-Apr-2015 20:12	6270
esx.conf	21-Apr-2015 20:35	23563
esxupdate.log	21-Apr-2015 20:14	2610
fdm.log	21-Apr-2015 19:47	0
hostAgentConfig.xml	06-Feb-2015 02:41	25987
hostd-probe.log	21-Apr-2015 20:40	11407
hostd.log	21-Apr-2015 20:44	582735
hostprofiletrace.log	21-Apr-2015 19:47	0
hosts	21-Apr-2015 20:15	220
issue	06-Feb-2015 02:41	0
lACP.log	21-Apr-2015 20:14	130
license.cfg	21-Apr-2015 20:44	311

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➔ You can use a web browser to view ESXi host log files, configuration files, etc.

➔ Browse to:

- **https://..FQDN../host** or **https://..Host-IP../host**
- Log in as **root**
- Click file to view current contents
- Log out of web viewer when finished

ESXi-36

Notes

VMware makes log files and configuration files available for review in a number of different ways. The approach (above) is to use a web browser to log in to and view ESXi host configuration/web files.

VMware has a good knowledge base article on the files available using this approach here - <http://kb.vmware.com/kb/2004201>

Login with vSphere Client



- Launch vSphere Client
 - ESXi host IP or FQDN
 - User name (root), password
- vSphere Client
 - MS Windows only tool
 - Uses MS Visual C#, J#
 - Needed for direct ESXi host management
 - Supports all features of vSphere 5.0
 - Not being updated with features added in 5.1-6.0
 - Cannot view/set advanced features added to 5.1-6.0

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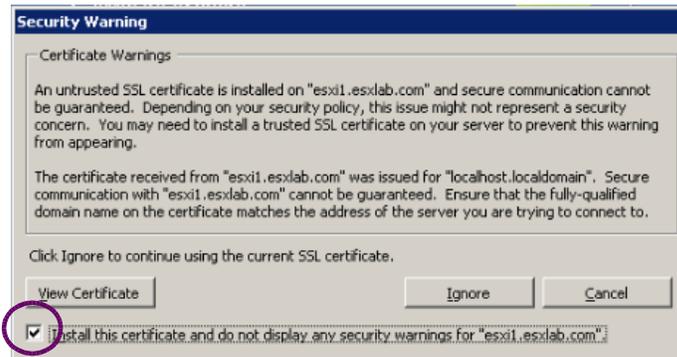
ESXi-37

Notes

You manage your ESXi host directly with the vSphere Client. This is a separate download and install available from VMware (<http://www.vmware.com/download>). Alternatively, you can just point your web browser over to your ESXi host and follow the vSphere Client download link found there.

All VMware client to server connections are encrypted using strong encryption. The encrypted link is set up before any data is exchanged between the client and the back end server.

Security Warning



- ⇒ All VMware software connections use 256-bit block, AES symmetric key ciphers
 - ESXi uses self-signed Digital Certificates
 - No Certificate Granting Authority to verify authenticity
- ⇒ Since host is local, ignore warning
 - Check *Install this certificate...*

Notes

ESXi uses self-signed digital certificates to support end-to-end encryption. All communications between VMware client and VMware server software is encrypted using strong encryption.

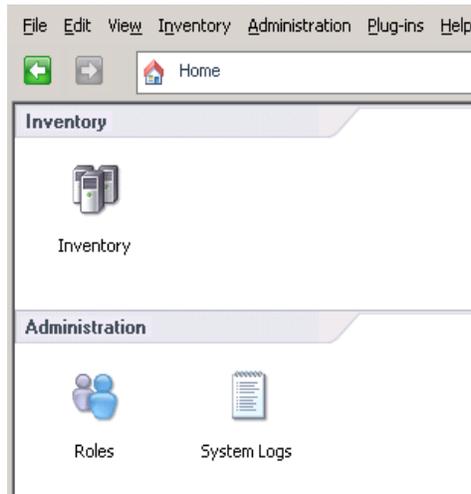
Since self-signed digital certificates cannot be independently verified by a 3rd party Certificate Granting Authority (CA), a warning is issued. It is (usually) safe to permanently disregard this warning.

It is possible to acquire an SSL certificate from a Certificate Authority (CA) and then install that certificate onto your ESXi host. This would eliminate the warning messages because a trusted certificate can be used to verify that the host is who it says it is.

Normally trusted certificates are used on Internet facing hosts to ensure the integrity of web requests (e.g.: for secure banking/payment systems, etc.). Since your ESXi hosts won't be directly on the Internet, there is no need (and no benefit) to purchasing a trusted certificate for your machine.

CA generated certificates are also a good idea (and may be mandatory) in organizations where security is critical. Such organizations will run their own Certificate Authority and will have policies that all servers on their internal network **must** use digital certificates created by and verifiable from the central CA.

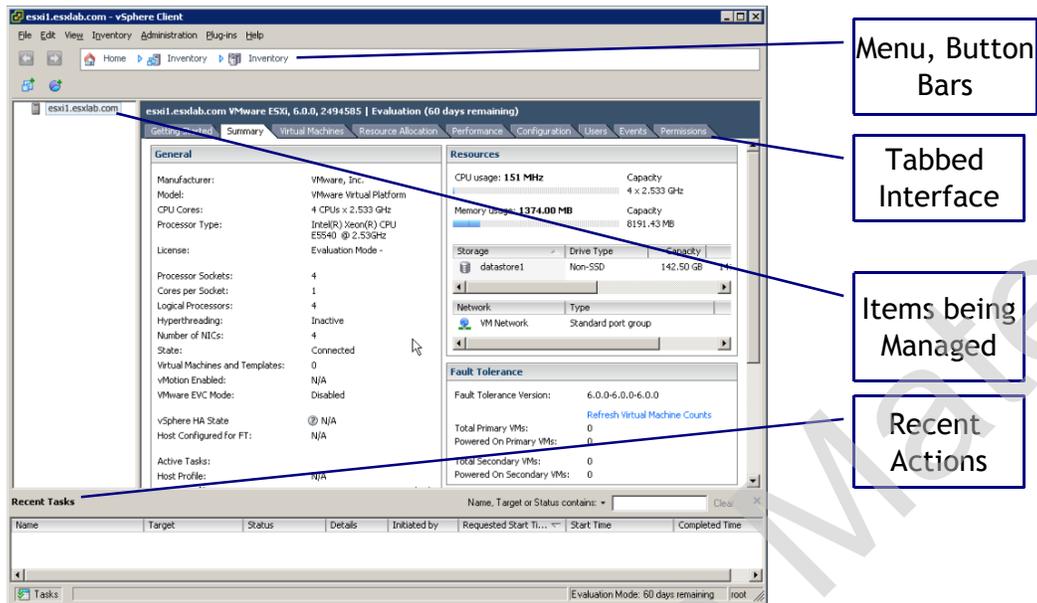
vSphere Client > ESXi Host



- vSphere Client presents a task launch page
 - **Inventory** – work with your ESXi host
 - **Roles** – define user categories
 - **System Logs** – review, save ESXi log files

Notes

vSphere Client > Inventory



➤ 4 Sections: Menus, Inventory, Tabs, Recent Tasks

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ESXi-40

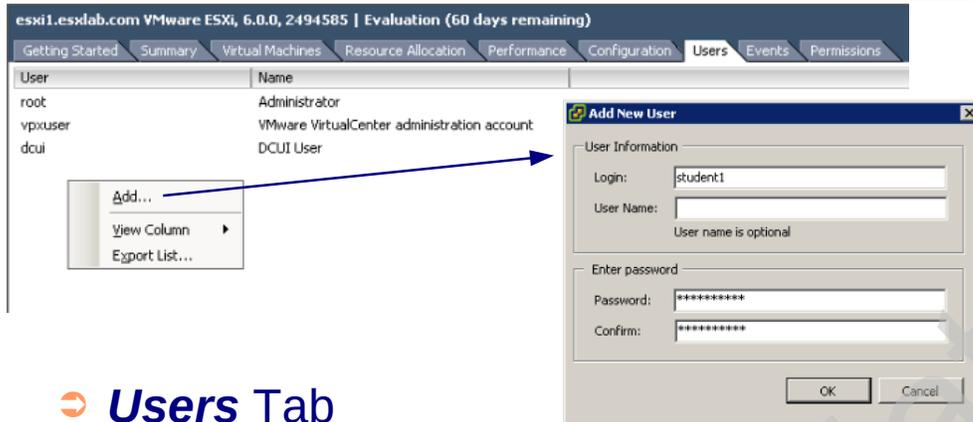
Notes

By default, the vSphere Client warns you whenever any command line service is enabled. To avoid the distraction, we have manually turned off these warnings. Since granting command line access is normally not a good idea, presenting these warnings makes sense.

There are some situations where you want to enable command line access and don't want to be bothered about the fact that these service(s) are turned on. To disable command line warning in the vSphere Client, please check out the following Knowledge Base article:

kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=2003637

Creating Local ESXi Users



➔ Users Tab

- Manage locally defined ESXi host users
 - Scope is the host on which the user/group is defined
- Right click on background > click *Add...*
 - Set user login, name, password
- Can no longer make local groups in vSphere 6

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ESXi-41

Notes

You can create local ESXi user accounts with passwords to allow for local authentication (for both the vSphere client and Local/Remote Troubleshooting - if enabled). To do this click on the **Local Users & Groups** tab and then right-click the background and select **Add...** You can make new groups by clicking the **Groups** button and then right-clicking the background.

Best Practice

You would create local accounts only if you do not have an Active Directory service available. Otherwise, it is a best practice to join an AD domain and use domain accounts.

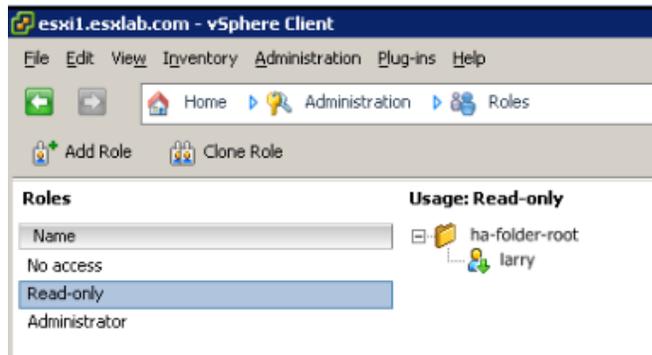
Tip

To command line log into ESXi over the network (from Windows, ESXi Remote Troubleshooting Mode must be enabled) download the **putty** Secure Shell terminal emulator at <http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>



Roles

ESXi Host Roles



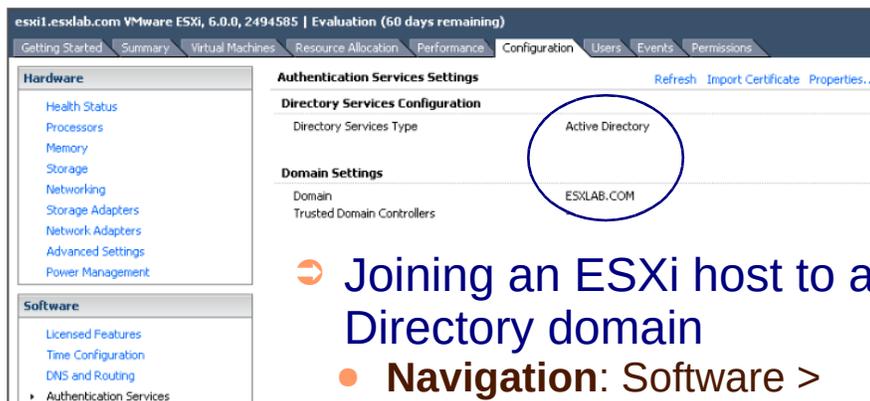
- ➔ Roles determine privileges by user, group
 - Default role: **No access** – no rights on ESXi host
 - **Read-only**: look but cannot modify
 - **Administrator**: full control of local ESXi host
 - **root** for ESXi, **DCUI** (local configuration) and **vpuser** (for vCenter) hold the Administrator role

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ESXi-42

Notes

Joining ESXi to an AD Domain



- ➔ **Joining an ESXi host to an Active Directory domain**
 - **Navigation:** Software > Authentication Services > Properties...
 - Specify domain, domain user name, password with rights to add hosts to the domain

Notes

ESXi 6.0 can join an Active Directory domain. AD authentication allows you to set up access rules for ESXi login without having to create local user accounts on ESXi. To join an ESXi host to an AD domain, you must have a domain account with Add Host to Domain privileges set.

FYI

Joining an AD domain is the first step to allowing AD defined users to access ESXi directly. The second step is to select inventory items (your ESXi host, folders, VMs, Resource Pools) and assign these users rights on these items. Without specific permission assignments, AD based users will not be able to interact with ESXi - as the default permission for all AD users is **No Access**.

Physical CPU Properties

- ➔ Click Configuration > Processors
- Review CPU socket, core, Hyperthreading status matches expectations

Notes

ESXi reports on the properties of the CPUs found in your server, including:

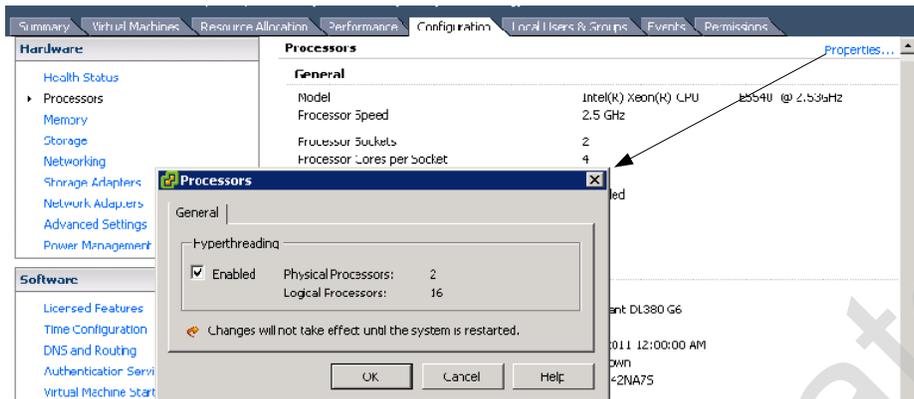
- The make/model of the machine
- Make/model and speed of the CPUs
- Number of populated sockets
- Number of cores in the CPU
- Number of Logical Processors (sockets * cores * HT logical processors)
- Presence/Absence of Hyperthreading (Intel CPUs only)
- Presence/Absence of power management capabilities (newer CPUs only)

If you have Intel CPUs and Hyperthreading is reporting N/A you should check to see if Hyperthreading is active. To do this, click:

Properties > Hyperthreading > Enabled

This will turn on Hyperthreading support even if the machine's BIOS is set to disable it. You will need to reboot ESXi for this change to take effect.

Enable / Verify Hyperthreading



- ➔ Hyperthreading lets one core work on two tasks (VM vCPU cores) in lock step
 - Check to ensure it is enabled in BIOS/UEFI

Notes

Note: Hyperthreading is not supported on virtual ESXi hosts.

Hyperthreading is a feature baked into Intel CPUs that allows a single CPU Core to work on two tasks in lock step. The idea is to keep the CPU core busy by giving it a 2nd task when the Core would otherwise be idle waiting on a physical memory fetch (after a local Cache miss)

Hyperthreading provides a modest increase in performance under typical workloads (usually 5% to 20% increase over the same workloads on the same CPUs with Hyperthreading turned off).

Hyperthreading is especially useful when the VMkernel uses it to provide some CPU service to low priority VMs or VMs that would otherwise just run their Idle task (because they have nothing better to do).

If you use PC Servers powered with Intel CPUs, you should:

- Verify that Hyperthreading is available on your CPU
- Verify that Hyperthreading is turned on in your physical machine's BIOS
- Verify that ESXi recognizes that Hyperthreading is available and that ESXi will use Hyperthreading

Physical Memory Properties

The screenshot shows the VMware ESXi Configuration page for a host named 'esxi1.esxlab.com'. The 'Configuration' tab is selected, and the 'Memory' section is expanded. The 'Physical' memory properties are displayed as follows:

Physical	
Total	8191.4 MB
System	38.4 MB
Virtual Machines	8153.0 MB

- ➔ Click Configuration > Memory to review host RAM configuration.
 - **System** (VMkernel) reserves 0.5% of RAM
 - Only 38.4MB used for 8GB server
 - E.g.: 323.7MB used for 64GB server
 - Max 384MB RAM dedicated to VMkernel use
 - All remaining memory is available for VM use

Notes

ESXi uses memory in 2 ways:

1. For the VMkernel hypervisor (approximately 40MB), and
2. For virtual machines (all remaining RAM).

ESXi needs a minimum of 2GB of RAM or it will refuse to run. Adding more RAM means more room for VMs to run which should result in good performance as your VM population and RAM requirements grow.

ESXi is very frugal and hands out memory to VMs only when needed and only for as long as needed. We will explore ESXi memory scavenging techniques later in this class.

Review/Set Time Configuration

esxi1.esxlab.com VMware ESXi, 6.0.0, 2494585 | Evaluation (60 days remaining)

Getting Started Summary Virtual Machines Resource Allocation Performance Configuration Users Events Permissions

Hardware

- Health Status
- Processors
- Memory
- Storage
- Networking
- Storage Adapters
- Network Adapters
- Advanced Settings
- Power Management

Software

- Licensed Features
- Time Configuration
- DNS and Routing

Time Configuration Refresh Properties..

General

Date & Time	17:38 4/21/2015
NTP Client	Running
NTP Servers	0.us.pool.ntp.org

- ➔ Configuration > Software > Time Configuration
- ➔ ESXi owns the hardware clock
 - Provides clock services to VMs
 - Use Network Time Protocol to ensure a very accurate clock
 - Use Properties... to enable/configure NTP

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Notes

ESXi uses Network Time Protocol to ensure that its clock remains accurate. This is important because the ESXi host provides clock services to all VMs it runs. So, any clock drift in the ESXi host will result in clock drift in VMs. If VM clocks drift by more than 5 minutes they may not be able to join or remain members of Active Directory domains.

Click the **Properties...** link to review and configure NTP.

Best Practice

Always set your server's BIOS clock to UTC. That way, VMs will get a UTC clock and can then set their local time zone to any region they like.

If you set the hardware clock to your local time, then VMs must all operate in your local time zone only (because they cannot calculate time zone offsets from any time zone other than UTC).

Licensed Features in ESXi 6.0

License options

- **Evaluation Mode**
 - 60-day evaluation
 - Cannot be extended
 - All features available
- **License Key**
 - 25 character code
 - Get from VMware
 - Enables entitled licensed features
 - Click **Edit...** to add an ESXi license
- **License entitlements can also be obtained from vCenter**

Notes

ESXi installs with an unrestricted use 60-day evaluation license. This eliminates the need to contact VMware for temporary evaluation licenses.

ESXi can be activated using a stand alone host license. A host license is issued on a host by host basis and unlocks access to feature entitlements purchased for that host. Alternatively, ESXi can draw a license entitlement for needed features from vCenter.

System Health Status

The screenshot shows the vSphere Client interface for 'esxi1.esxlab.com'. The 'Configuration' tab is active, and the 'Health Status' section is expanded. The left sidebar lists various hardware and software components. The main pane shows a tree view of sensors under 'Processors', including CPU sockets and cache levels, all showing a 'Normal' status with green checkmarks.

- ➔ Click **Configuration > Health Status** to review host hardware health
 - Uses CIM to poll hardware
 - Reports configuration, properties, issues
 - Issues propagate up to the ESXi host

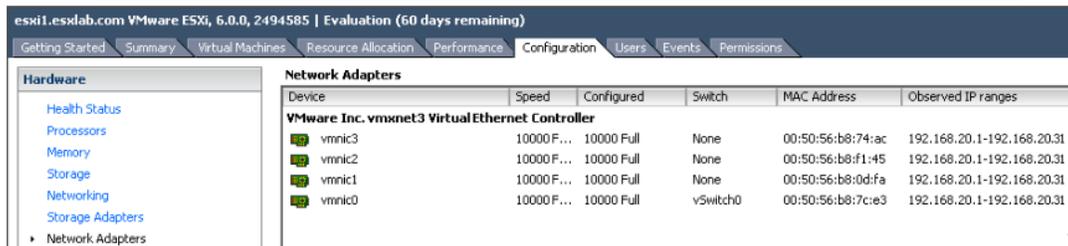
Notes

The vSphere Client can report on most aspects of your system's hardware health including:

- CPU sockets, cores and cache size
- Power supply, motherboard, CPU and add-on card temperatures
- Fan location, health and speed
- Hardware firmware and driver health including chipset, NIC, storage controller, BIOS functionality
- Power supply count and health (connected, disconnected, missing, etc.) and
- System boards.

Use this view to get a quick assessment of your server's physical health.

Physical Network Adapters



esxi1.esxlab.com VMware ESXi, 6.0.0, 2494585 | Evaluation (60 days remaining)

Getting Started Summary Virtual Machines Resource Allocation Performance Configuration Users Events Permissions

Hardware

Health Status
Processors
Memory
Storage
Networking
Storage Adapters
Network Adapters

Network Adapters

Device	Speed	Configured	Switch	MAC Address	Observed IP ranges
VMware Inc. vmxnet3 Virtual Ethernet Controller					
vmnic3	10000 F...	10000 Full	None	00:50:56:b8:74:ac	192.168.20.1-192.168.20.31
vmnic2	10000 F...	10000 Full	None	00:50:56:b8:f1:45	192.168.20.1-192.168.20.31
vmnic1	10000 F...	10000 Full	None	00:50:56:b8:0d:fa	192.168.20.1-192.168.20.31
vmnic0	10000 F...	10000 Full	vSwitch0	00:50:56:b8:7c:e3	192.168.20.1-192.168.20.31

- ➔ All pNICs recognized by ESXi are displayed in the Network Adapters view
 - Speed, Assigned vSwitch, physical MAC address and Observed IP ranges reported
 - Observed IP range - helps you determine which sub-net a physical NIC can see – and consequently what traffic it should carry

Notes

Observed IP Ranges

This value displays the IP address range observed by ESXi as frames flow through each physical NIC. Here's what it's used for.

In most corporate networks, different physical LAN segments are used to isolate different types of traffic such as Production traffic, storage traffic, management traffic, back up traffic, etc. It is a common practice to use different sub-net address blocks for each physical segment.

For example, your company may subnet its network traffic as follows:

10.1.0.0/16 - Production traffic including servers

10.2.0.0/16 - Desktop PCs and printers

172.16.0.0/16 - Management LAN segment for direct PC server management

192.168.50.0/24 - Back Up LAN

192.168.100.0/24 - IP Storage LAN (for iSCSI servers)

In the above scheme, if a physical NIC reported Observed IPs in the 10.1/16 range, you would know it was physically connected to the management LAN. If another physical NIC reported Observed IPs in the 192.168.100/24 range, then it should be used to carry back up traffic.

DNS and Routing Settings

The screenshot shows the ESXi Configuration page for 'esxi1.esxlab.com VMware ESXi, 6.0.0, 2494585 | Evaluation (60 days remaining)'. The 'Configuration' tab is selected, and the 'DNS and Routing' section is expanded. The settings are as follows:

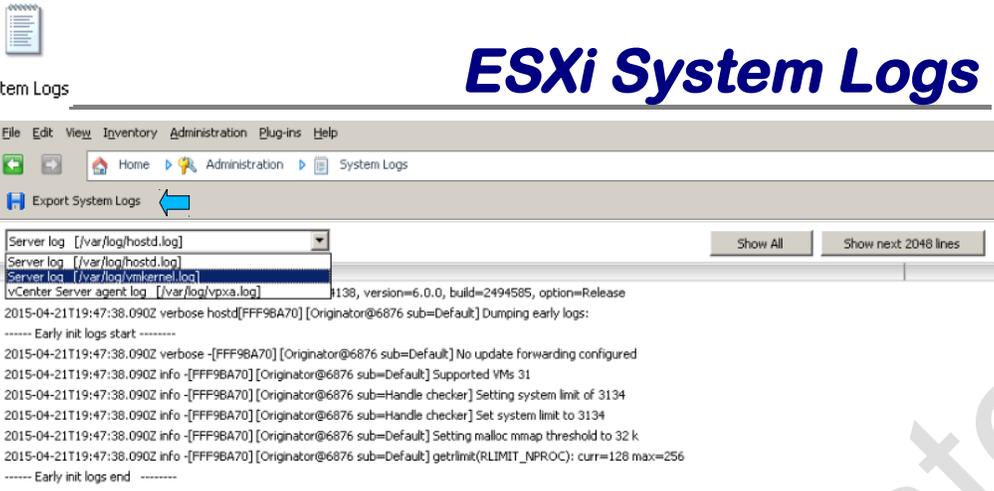
DNS and Routing	
Host Identification	
Name	esxi1
Domain	esxlab.com
DNS Servers	
Method	Static
Preferred DNS Server	192.168.20.2
Alternate DNS Server	
Search Domains	
esxlab.com	
Default Gateways	
VMkernel	192.168.20.1

- ➔ Configuration > DNS and Routing to review ESXi management settings:
 - Verify Host, Fully Qualified Domain Name, IP address, DNS IP and Gateway
 - Click **Properties...** link to make corrections

Notes

It is important that your management network settings are correct. After installation, it is a good idea to review these settings and fix any errors you find.

Click Properties... to edit network settings for the management network. You may need to reboot your ESXi host before these changes take effect.



ESXi System Logs

System Logs

File Edit View Inventory Administration Plug-ins Help

Home Administration System Logs

Export System Logs

Server log [/var/log/hostd.log] Show All Show next 2048 lines

Server log [/var/log/hostd.log]

Server log [/var/log/vmkernel.log]

vCenter Server agent log [/var/log/vpxa.log] #138, version=6.0.0, build=2494585, option=Release

```

2015-04-21T19:47:38.090Z verbose hostd[FFF9BA70] [Originator@6876 sub=Default] Dumping early logs:
----- Early init logs start -----
2015-04-21T19:47:38.090Z verbose -[FFF9BA70] [Originator@6876 sub=Default] No update forwarding configured
2015-04-21T19:47:38.090Z info -[FFF9BA70] [Originator@6876 sub=Default] Supported VMs 31
2015-04-21T19:47:38.090Z info -[FFF9BA70] [Originator@6876 sub=Handle checker] Setting system limit of 3134
2015-04-21T19:47:38.090Z info -[FFF9BA70] [Originator@6876 sub=Handle checker] Set system limit to 3134
2015-04-21T19:47:38.090Z info -[FFF9BA70] [Originator@6876 sub=Default] Setting malloc mmap threshold to 32 k
2015-04-21T19:47:38.090Z info -[FFF9BA70] [Originator@6876 sub=Default] getrlimit(RLIMIT_NPROC): curr=128 max=256
----- Early init logs end -----

```

➔ Review, save ESXi system logs

- Home > Administration > System Logs
- hostd.log: host management service log
 - Licensing, cluster mgt., vCenter mgt., etc.
- Use Export System Logs to save log files locally as text files

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Notes

Sizing ESXi CPU, Memory

- ⇒ pCPU cores service vCPU cores
 - vCPU cores slightly slower than pCPUs
 - About 2-5% slower than physical CPU cores due to virtualization overhead
 - Maximize pCPU cores, speed, cache size
 - Intel Hyperthreading will help... but modestly
 - No physical core restrictions in vSphere 5.x or 6.0
- ⇒ **Memory**
 - Need 4GB RAM to install/boot ESXi
 - The VMkernel uses approximately 0.5% of RAM
 - All remaining RAM free for VM use
 - VMs given RAM as needed, not declared
 - 20%-40% memory over commit is reasonable

Notes

Sizing ESXi Storage, NICs

⇒ Storage Controllers

- ESXi is multipath aware:
 - Improve reliability through path redundancy
 - Default is active/standby multipathing
 - Enable active/active multipathing if your SAN supports it
 - SAN vendor supplied multipath drivers supported
 - Should provide best storage I/O performance, reliability

⇒ Virtual and Physical Networking

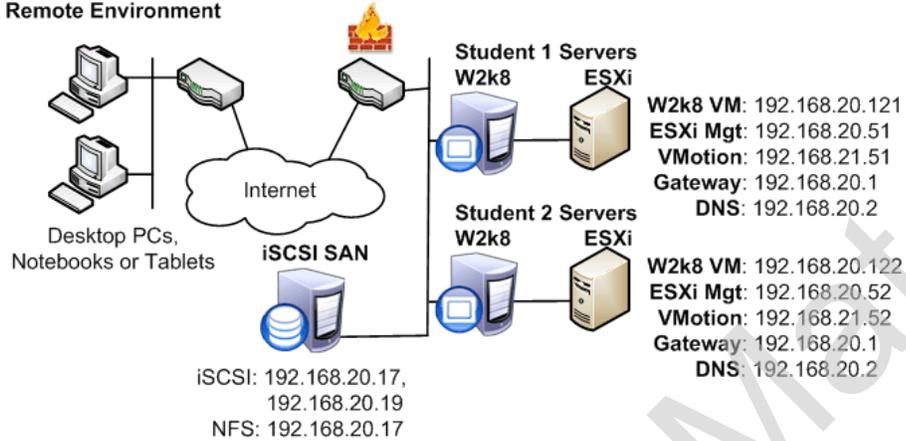
- Virtual Switches use pNICs as uplinks
 - pNIC uplinks vSwitch to physical LAN segments
- vNIC traffic consumes CPU cycles
 - Faster ESXi CPUs give faster vNIC speed
 - Benchmark network performance before deploying network heavy production workloads

Notes

RDP, Web Remote Lab Access

ESXLab.com Remote Lab Environment

Remote Environment



- ➔ Remote lab access via RDP or HTTP
- Web Portal – access through locked firewalls

Notes

Install ESXi 6.0 Lab

- ➔ In this lab we will install ESXi 6.0
 - Install onto a dedicated server
 - Connect to our remote lab access machine
 - Install and configure ESXi
 - Configure ESXi networking with the DCUI
 - Perform post-install configuration using vSphere Client

Notes

Review & Questions

- ⇒ VMware ESXi 6.0
 - Enterprise class server virtualization
 - Installs on bare hardware
 - ESXi is managed through vSphere Client
 - Simple Menu/Item/Tab interface
 - Needs Windows PC with MS .Net framework
 - For best results:
 - Size ESXi to your expected VM needs
 - Plan, perform ESXi installs with care
 - Expect growth in VM population



Notes

ESXLab Remote Lab Access

Hands On Lab

Overview

In this lab, we will learn:

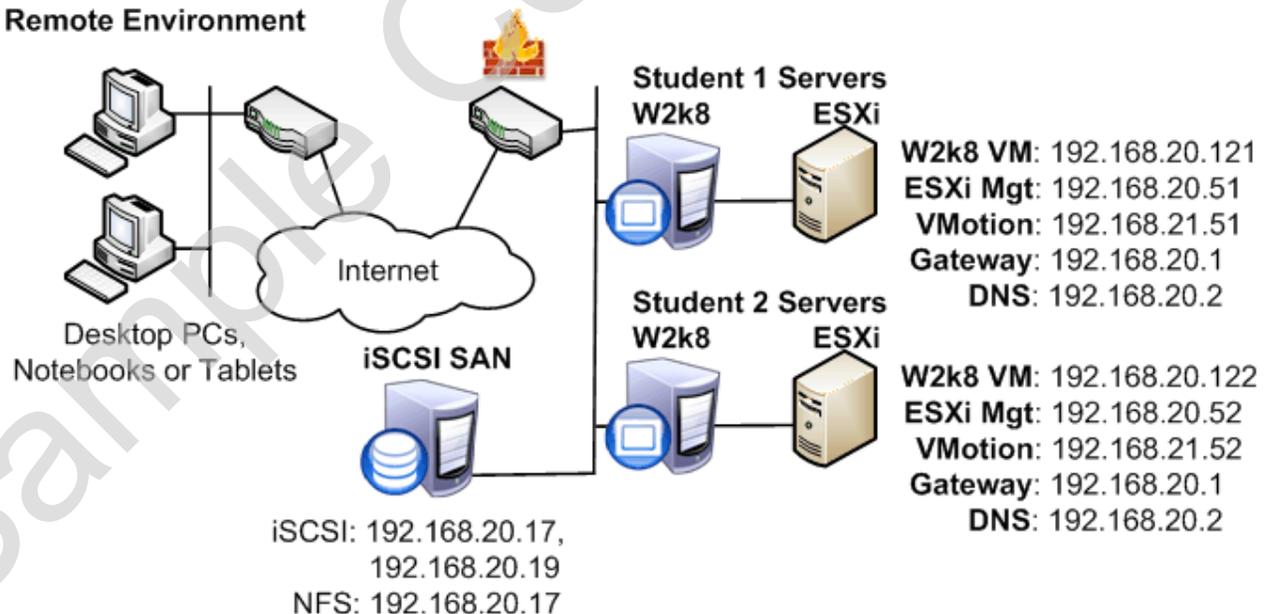
1. The layout of our remote access lab environment
2. How to access your remote access lab environment using the ESXLab Web Portal
3. How to access your remote lab environment using Microsoft RDP
4. How to troubleshoot remote lab access using ESXLab's web portal

Part 1 – Server Pod Layout

ESXLab.com provides remote server pods that are permanently housed in a Class-A data center. Instructors using our remote server pods are provided with a *Lab Access* document that gives access details. Alternatively, your instructor may provide you with other information for performing your labs.

ESXLab.com Remote Lab Environment

Remote Environment



ESXLab - Remote Lab Access Instructions

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July, 2015

For Evaluation Only. Please distribute freely

Part 2 – Accessing Your Lab via the ESXLab Web Portal

ESXLab.com provides lab access through an easy to use Web Portal solution. Our web portal uses standard HTTP and HTTPS ports (80 or 443). The advantage of this access solution is that you may access your labs through any gateway/firewall service that allows access to the Internet. If you are instructed not using our Web Portal, please go to **Lab 1 - Part 3**.

Your instructor will inform you if you will be using the ESXLab Remote Lab Web Portal service. If so, your instructor will provide you with the ESXLab.com:

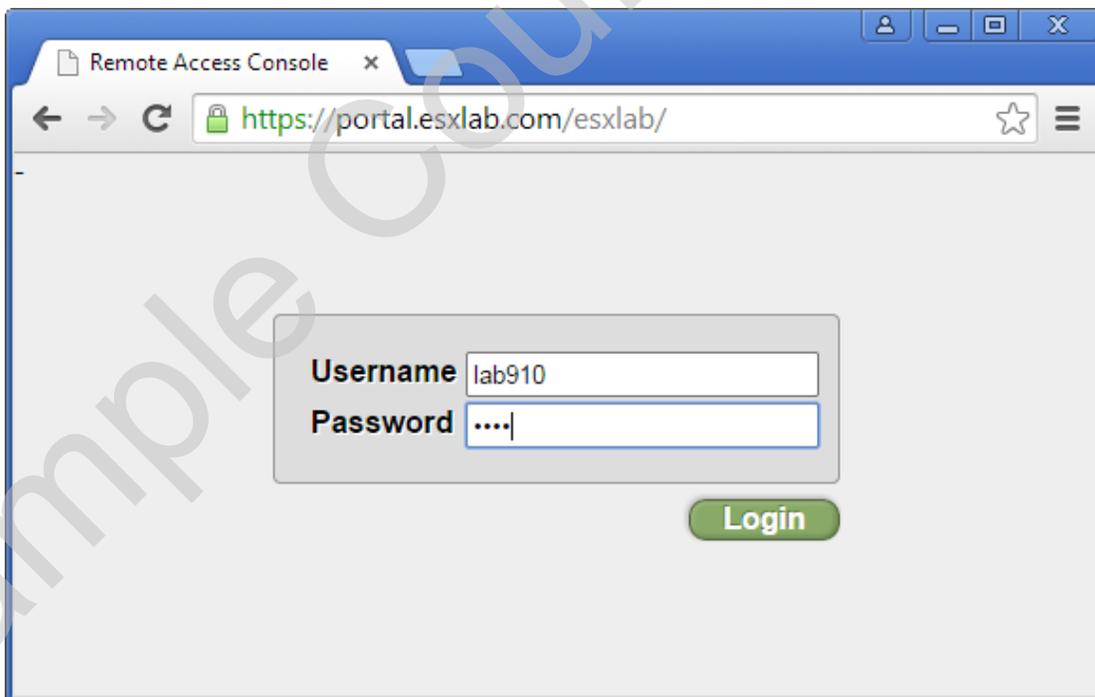
Web Portal URL: <https://portal.esxlab.com>

Web Portal User Name: _____ (provided by ESXLab)

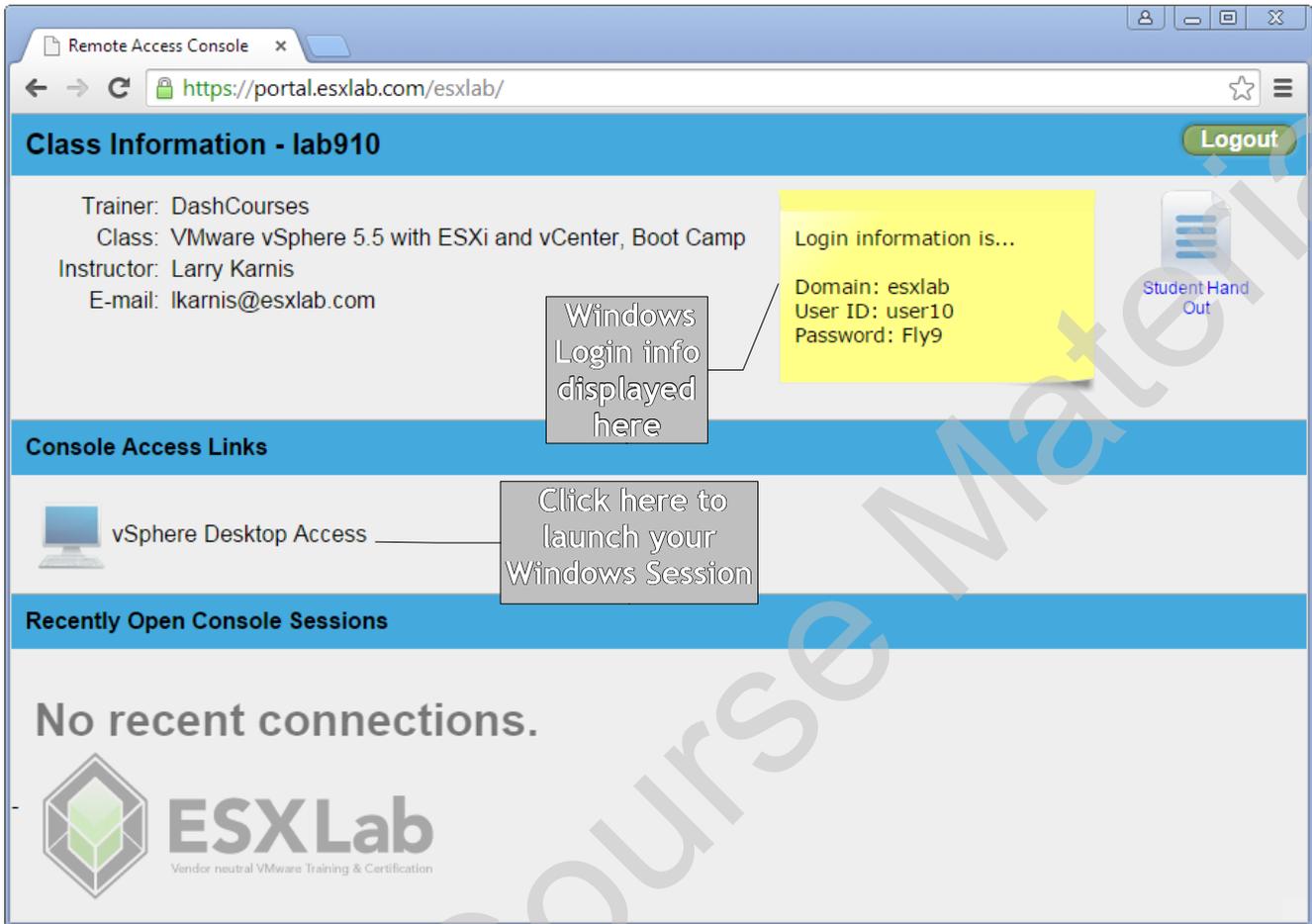
Web Portal Password: _____ (provided by ESXLab)

If you are accessing the ESXLab.com remote lab environment through our web portal, please:

- Open an HTML 5 enabled web browser (e.g.: Internet Explorer 9 or recent FireFox, Chrome or Safari)
- Browse to the ESXLab.com Web Portal URL (<https://portal.esxlab.com>)
- Log in with your provided user name and password or e-mail ESXLab to arrange for a lab rental



This takes you to your remote lab environment (a Windows Server 2008 desktop)



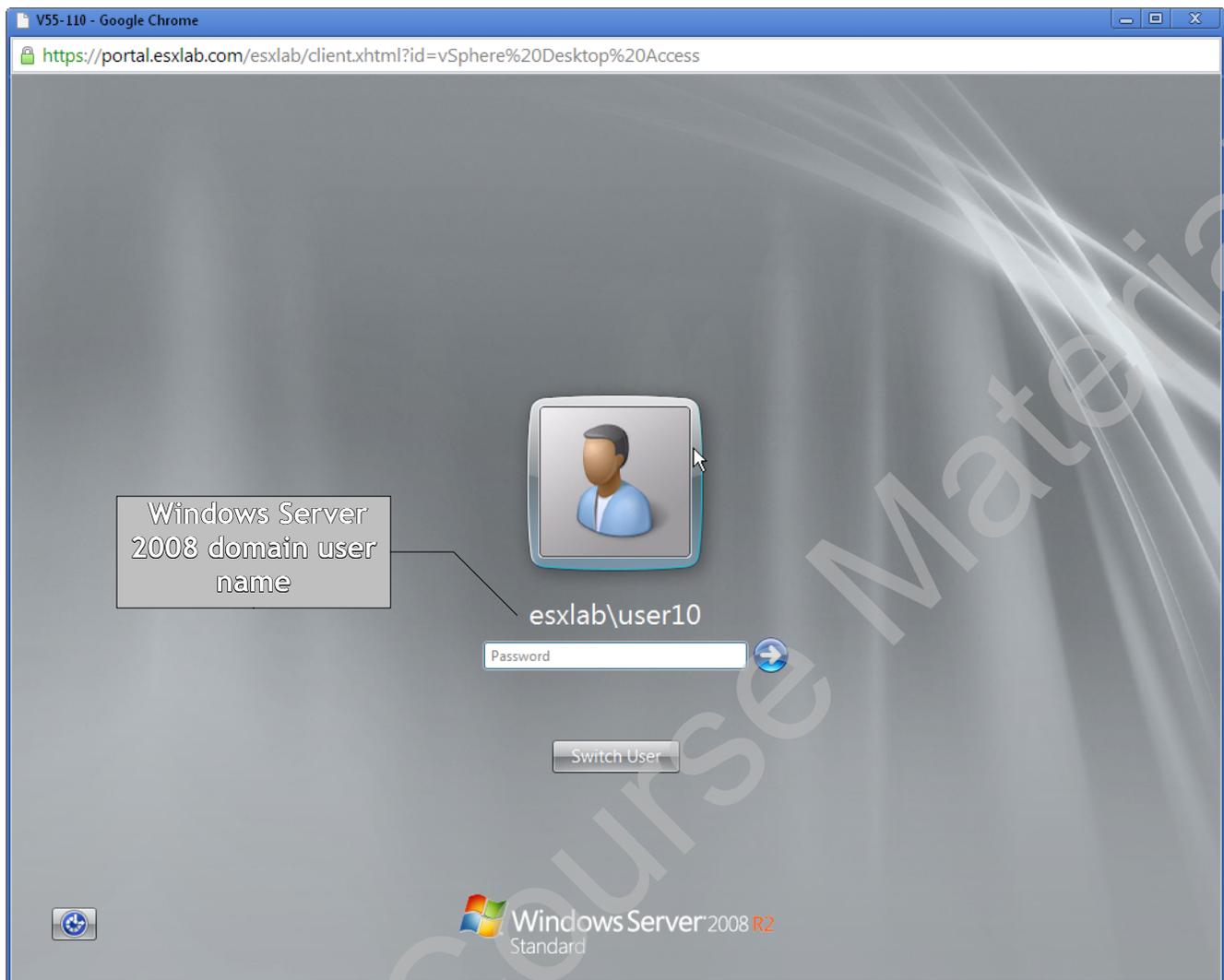
Click the vSphere Desktop Access icon:



This launches your Windows Server 2008 remote lab access desktop. Please log in to Windows Server 2008 with the domain user name and password provided by your instructor (or by ESXLab)

My Domain User Name: _____ (typically esxlab\user_)

My Domain Password: _____



Compare the Windows Server 2008 domain user name displayed to the one you were assigned.

If the account names (domain or user name) differ:

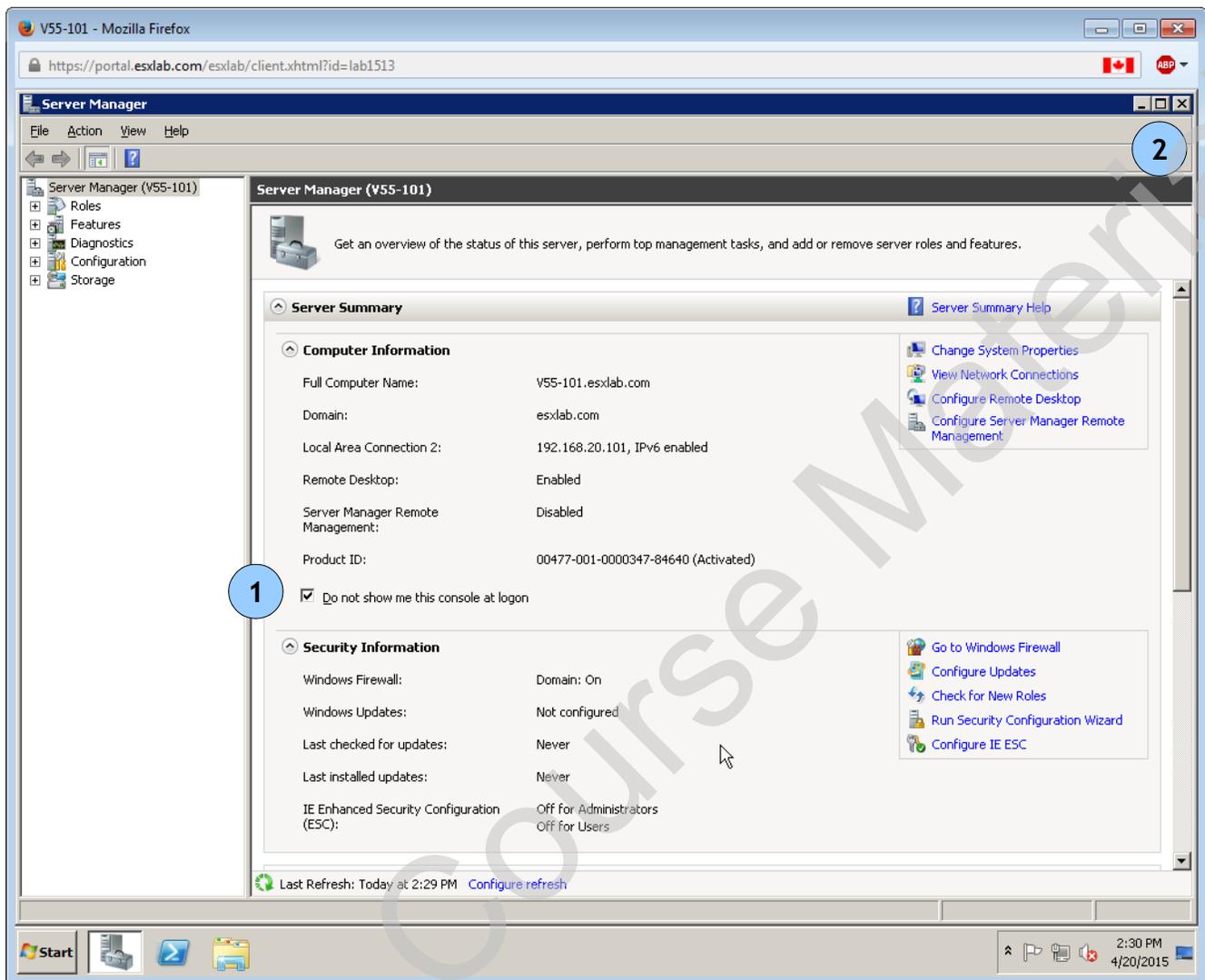
- Click the **Switch User** button and select **Other User**.
- Enter your assigned domain account **user name** (in the form esxlab\user__)
- Enter your assigned **password**

If your displayed and assigned domain user name match

- Enter your assigned **password**

Then, click the icon to log in to Windows Server.

You should be immediately logged in to Windows Server 2008. You may see



If you see the Server Manager application pop up, please:

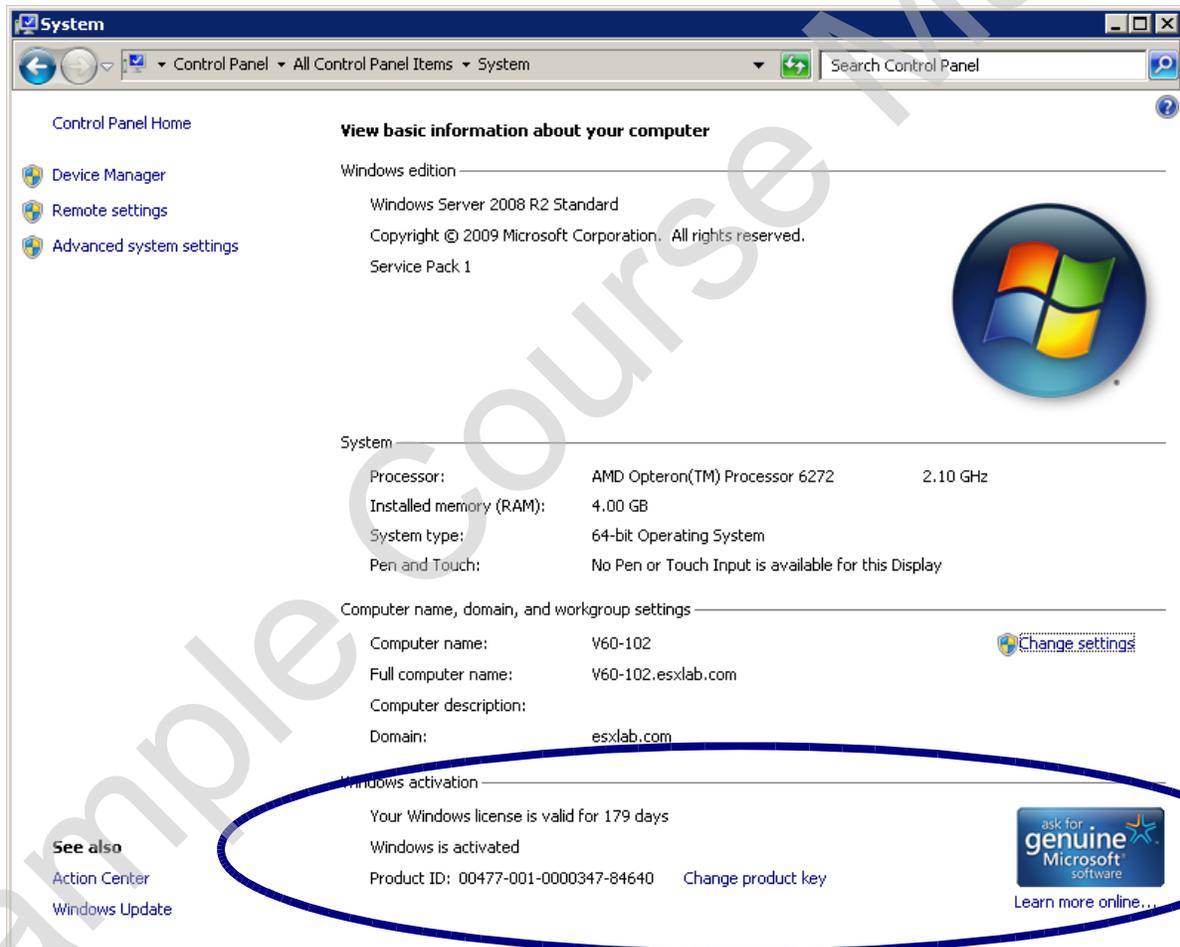
1. Check **Do not show me this console at logon**
2. Close Server Manager

Activate Windows

Your remote lab server has an unactivated/trial Windows license. Activating your Windows system will allow it to function in evaluation mode for 180 days. To activate Windows, please:

- Click **Start** → **Control Panel**
- Click the **View by** drop down and click **Large Icons**
- Find and click the **System** icon
- Scroll to the bottom of the window and click **Activate Windows**
- **Activate Windows online**

After a short wait, you should get a notice that Windows has been activated for 180 days of use. You should see:



- Please close **Control Panel**

If you do not activate Windows, you will encounter problems after 7 days of use.

Change Screen Resolution (Optional)

Please check to see if you are using a high(er) resolution local display. If you have a display capable of showing 1280×1024, 1600×1050 or full 1080p (1920×1080), you should change the screen resolution of your remote session to take advantage of this extra resolution.

- Right-click your Windows Server 2008 remote access desktop → **Screen Resolution**
- Adjust the screen resolution to 1280×1024 (or higher)
- Click **OK**
- If everything is OK, in the *Display Update* pop up, click **Keep Changes**. If not, try a different resolution until you find one that works for you

Changing resolution does not change the size of your remote desktop pop up window. To do that, please grab any corner of your remote desktop pop up and drag it to make the window as large as you like. You will note that the remote desktop image becomes easier to read as you increase the size of the window.



If you encounter problems accessing or using our Web Portal, please review the ESXLab Troubleshooting material in Part 4 of this lab.

When you are satisfied, please proceed to **Lab 2**.

Part 3 (Optional) – Lab Access via Microsoft Remote Desktop

To test connectivity to our remote access server pods using Microsoft Remote Desktop, you will receive 2 pieces of information:

- The Pod Number you will be connecting to (e.g.: `pod11.esxlab.com`): _____
- The Port Number of the machine you will connect to (e.g.: `2001`): _____

Depending on which version of Windows you are using, Microsoft Terminal Services is also known as Remote Desktop Protocol (RDP) or Remote Desktop Connection (RDC). To access our remote server pods, it is critical that your network firewall systems allow outbound MS Terminal Services connections. To simplify student access to our server pods, we have set up custom firewall rules to provide direct student desktop/lab server terminal services connections via a single IP address using non-standard ports. Each student gets a dedicated Virtual Machine (VM) running Windows 2008/2003 server (inside a server pod) to complete labs.

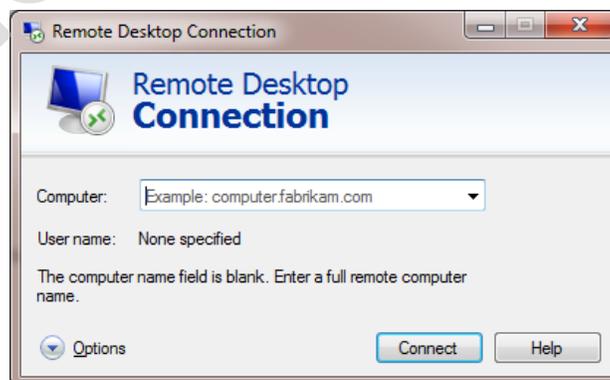
We make these VMs available for MS Terminal Services access on non-standard ports. For example, if you are assigned to Pod 11 and port 2001, you would perform an RDP connectivity test to that VM using the following RDP connection string:

`pod11.esxlab.com:2001`

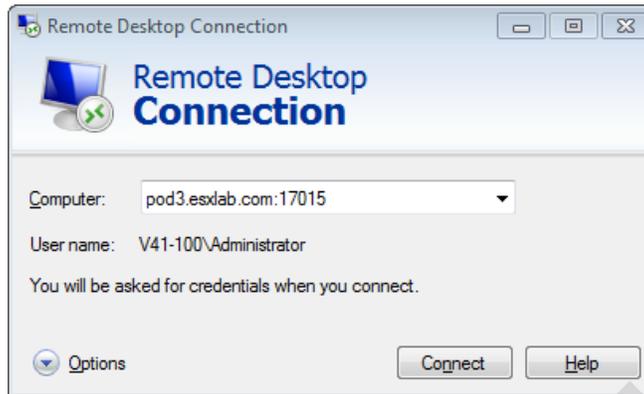
To perform an RDP connectivity test, complete the following steps on Windows: Log in to your local Windows desktop Launch the Microsoft Remote Desktop Connection application.

Note: The Remote Desktop Application may be reached using one or more of the following sequences:

- Start → Programs → Accessories → Communications → Remote Desktop Connection
- Start → Programs → Accessories → Remote Desktop Connection
- Start → All Programs → Accessories → Remote Desktop Connection
- Start → Run → `mstsc.exe` → OK



Next, type in the server pod *Fully Qualified Domain Name (FQDN)* and port number of the server pod you are testing. The format should always be Pod-FQDN:port_number (as provided by ESXLab.com):



On the log in screen you should see something like:



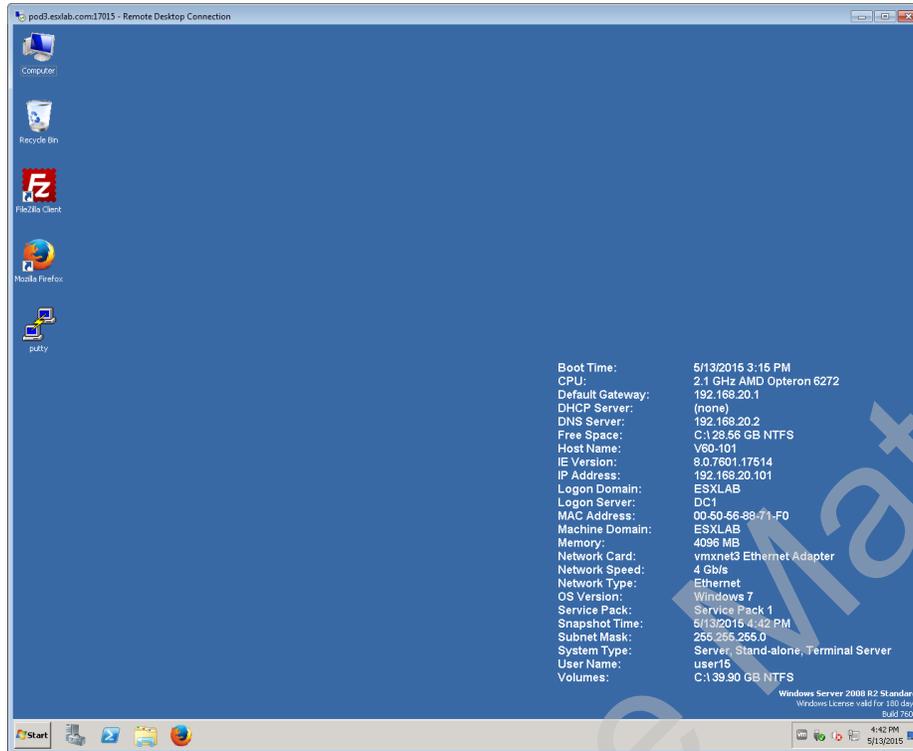
- Click **Use another account**
- Enter your domain **user name** and **password** provided by ESXLab or your instructor

You should be presented with an RDP security warning screen:



- Click **Yes** to dismiss the warning.

Finally, you should be presented with a Windows desktop.



Troubleshooting Microsoft RDP Connections

Firewall Issues

You are most likely to encounter firewall issues when you test connectivity from a site with strong network security. Security sensitive customers (financial institutions, health care, law enforcement, military, etc.) often institute strict Internet access policies that prevent direct outbound MS Terminal Services connections.

If you experience problems, please let us know as soon as possible so we can arrange for alternative remote server pod access via our Web Access Portal (see Part 2 of this Lab).

Please continue on to Lab 2.

Part 4 – ESXLab's Web Portal – Troubleshooting

Network Bandwidth

When connecting to ESXLab's web portal, you should use a quality broadband Internet connection with:

- A minimum download speed of 1Mbps
- A minimum upload speed of .5Mbps
(connections speeds are per-person if you are using our labs as part of a class)
- A wired connection or a wireless connection with good signal strength (3 bars or better)
- A network that is not being simultaneously being used for BitTorrent downloads, YouTube videos, major file downloads or other bandwidth hogging activities

Poor quality networks or network congestion is the primary cause of connection issues customers experience when using our web portal.

On the next page is a list of common problems and their solutions...

Problems and Solutions

There are a number of things that can go wrong using our remote lab web portal. Most are caused by poor quality networks on the client (i.e.: your) side or are session timeouts.

First Thing to Try

If you are having issues with our portal, the first thing to try is to completely log out and log back in again:

- Close your remote lab pop up window
- Log out of the web portal
- Close the browser tab
- Open a new browser tab and browse to <https://portal.esxlab.com>
- Log back in with your user name and password

Log Out When Finished

Our web portal has a built in auto-logout feature. If you leave a session too long, your remote lab access pop up may stop responding. To fix:

- Close the remote lab access pop up
- Re-launch your remote lab access pop up
- If that doesn't work, please log out of the main web portal, log back in and try again

Browsers

Pop Ups

Our web portal relies on the ability to launch pop ups. If you have a pop up blocker turned on, you may not be able to launch your remote lab access pop up. Either turn off your pop up blocker or use a different browser (that allows pop ups).

HTML 5 Support

You must use an HTML 5 compliant browser to use our web portal. We recommend FireFox because it works with the fewest issues. You can also use IE 9 or newer, or the latest versions of Chrome or Opera.

FireFox

Update FireFox to version 37 or newer. Unless you have add-ons or extensions enabled that interfere with HTML 5, Firefox should work fine.

Internet Explorer

IE 9 or newer works fine but may not allow you to resize the remote lab Windows Server 2008 window. So, if you increase the resolution of the remote session, the window gets harder to read.

Chrome

Also works well. The only issue we've encountered with Chrome is that, in certain cases, Chrome changes the mouse in the remote lab window to a dot ('.') making it almost impossible to see.

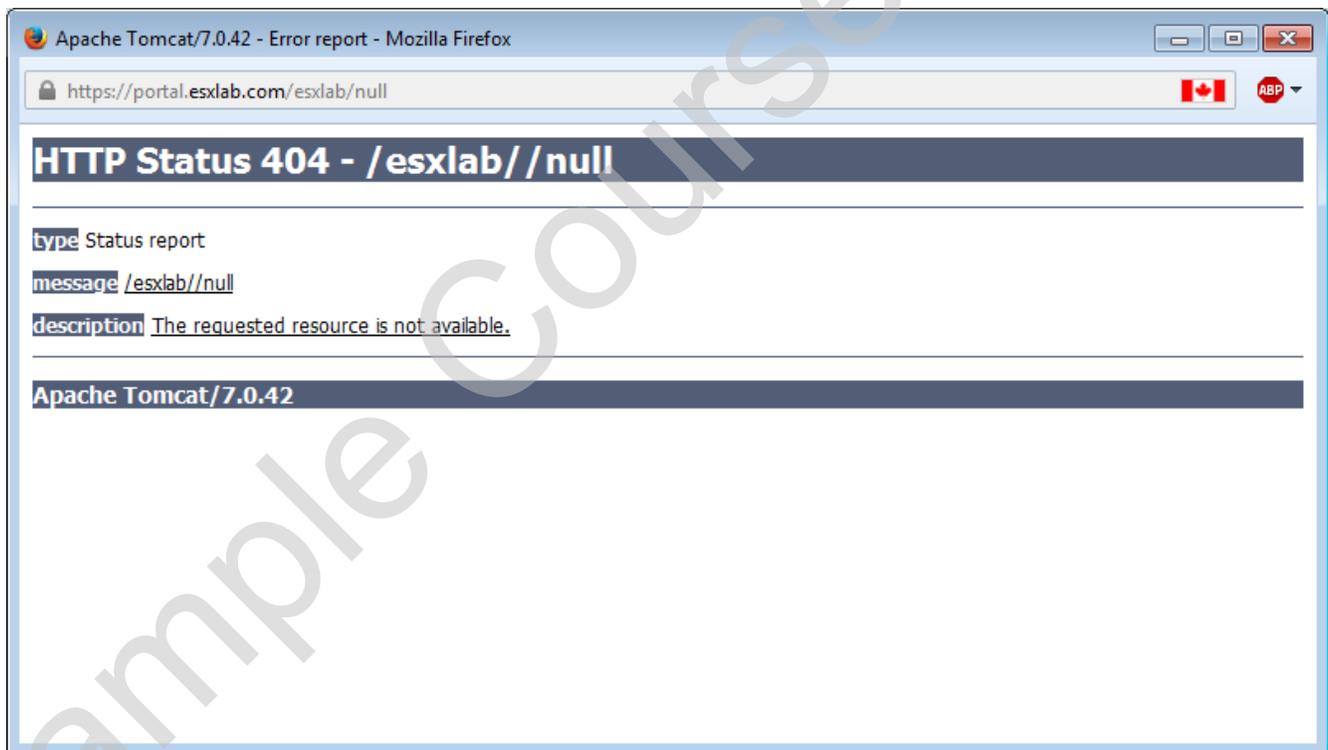
Most Common Problems

Problem: The mouse in my remote session has stopped responding

Solutions: Please try these things in the order presented

1. If you have a VM console open, it may be trapping the mouse. Try hitting **Ctrl-Alt** (at least 2-3 times) to release the mouse
2. If your remote Windows session is getting Disconnected; close the pop up and try relaunching
3. If you are still having problems, try logging out of the portal and logging back in again
4. If you are still having problems, try using a wired Internet connection (instead of wireless)
5. Still having issues? Try closing programs on your local desktop to free up system resources (CPU and memory). Or try rebooting your PC
6. Try connecting to our portal using a browser with only 1 tab open

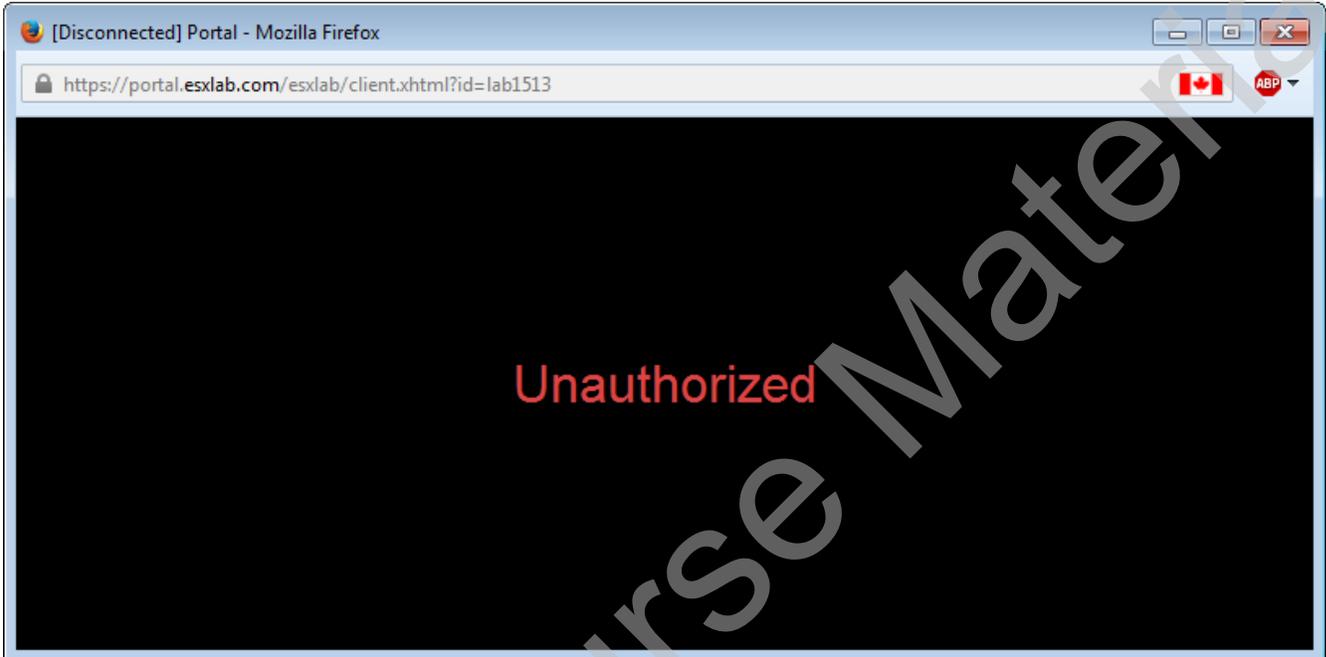
Problem: I get an **HTTP Status 404** error (see screen shot)



Solutions: This occurs when you try to launch a remote lab pop up window when you already have a remote lab pop up open. To fix:

- Close this window
- Switch to your main ESXLab web portal window
- Click your vSphere Desktop Access link to launch a fresh remote lab pop up window

Problem: My remote lab window says Unauthorized (see screen shot below)



Solutions: Your session has timed out due to inactivity.

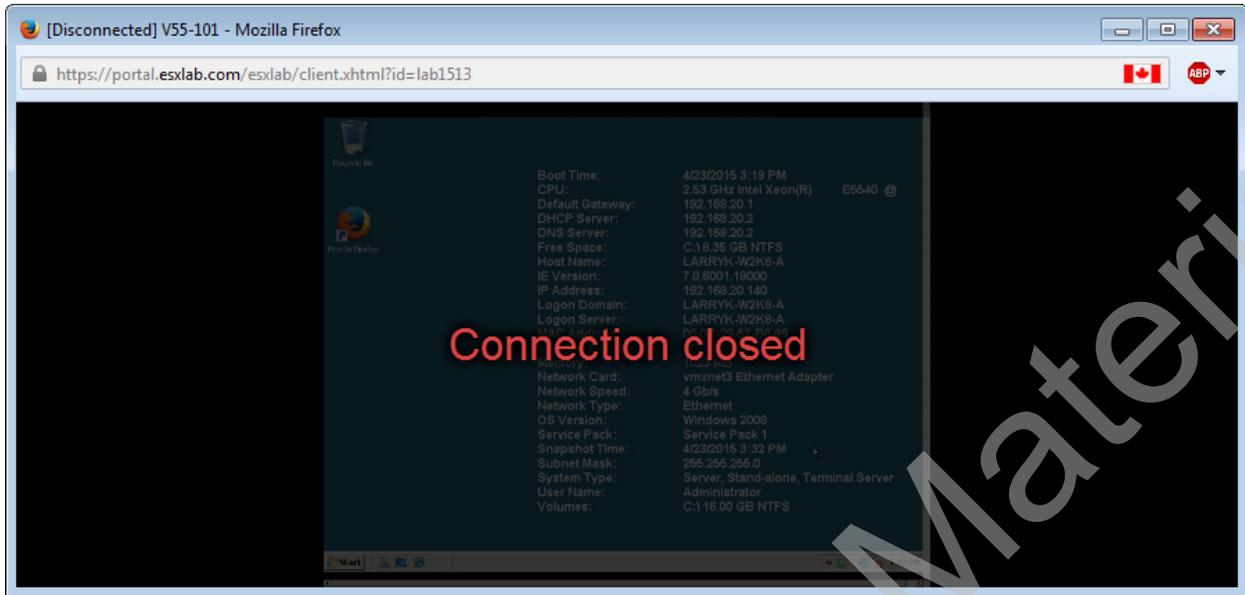
- Close the pop up
- Log completely out of the portal and then log back in again. You must click the green Logout button (upper right hand corner) and then re-authenticate
- Re-launch the remote lab pop up window

Problem: My remote lab window is greyed out and says Disconnected

Solutions: This usually caused by network (speed, congestion, high packet loss) issues.

- Try using a wired network instead of a wireless connection
- Look at the wireless network signal strength and move to a location where you get the most bars
- DO NOT use a cell phone data service. These have speed and quality issues and are NOT suitable for using our web portal

Problem: My remote lab window is greyed out and says **Connection closed**



Solutions: This is usually caused by Windows issues on the W2k8 remote desktop such as

- Windows rebooted. Please wait a few minutes for the reboot to complete and then try again

Install and Configure ESXi 6.0

Hands On Lab

Overview

In this lab, you will:

- Install ESXi 6.0 Update 1b onto a server using remote console services
- Set fixed IP address properties for management
- Install the vSphere Client on your remote desktop
- Access your ESXi host via the vSphere Client application
- Review your servers hardware and default configuration
- Create a non-privileged account for local access
- Connect to Active Directory and enable an AD account
- Configure your server to synchronize its time with an NTP time server

Part 1 – Access your Virtual ESXi Hosts

On first connection to your remote access Windows Server 2008 VM, you may see a number of pop ups. Dismiss them as follows:

- Click **Agree** on the *BGIInfo* license pop up
- Close the *Server Manager* pop up window

Install vSphere Client 5.1

In this class you will be using virtual ESXi hosts. We need to connect to our virtual ESXi hosts, power them on and perform an install. Your dedicated ESXi host is a virtual machine that resides on one of ESXLab.com's infrastructure servers. To access it, you must install vSphere Client for vSphere 5.1. Let's do that now:

- Open **Internet Explorer** in your W2k8 R2 remote lab access desktop
- Dismiss any start up messages or prompts to upgrade Internet Explorer by clicking **Ask Me Later**
- Browse to <http://pod.esxlab.com>
- On the *Problem with this Website...* page, click **Continue to this website (not recommended)**
- Look under the *Getting Started* heading, click the **Download vSphere Client** link
- On the *File Download - Security Warning* pop up, click **Run**

- On the *User Account Control* pop up, click **Yes**
- Please minimize all programs so that you can see your remote desktop

After 30-60 seconds to unpack the install bundle, the *VMware vSphere Client 5.x Install Shield* wizard starts. Please complete the wizard as follows:

VMware vSphere Client 5.x InstallShield Wizard	Select English (United States)
	Click OK
Welcome to the Installation Wizard for VMware vSphere 5.1	Click Next >
End-User Patent Agreement (may not be present)	Click Next >
End User License Agreement	Check I agree to the terms in the license agreement
	Click Next >
Destination Folder	Click Next >
Ready to Install the Program	Click Install
Installation Completed	Click Finish

- Close the **Internet Explorer** window that is minimized to your desktop



Right-click the **vSphere Client** icon → **Open**

Connect to your infrastructure server as follows:

IP address / Name	pod.esxlab.com
User Name	user_ (where _ is your unique, user number assigned by your instructor or by ESXLab. Note, you can get your assigned user_ user name from the Yellow Sticky Note on your remote access lab web portal.)
Password	Enter the password assigned by your instructor or ESXLab (also on the Yellow Sticky Note)
	Click Login
Security Warning	Check Install this certificate and do not display...
	Click Ignore

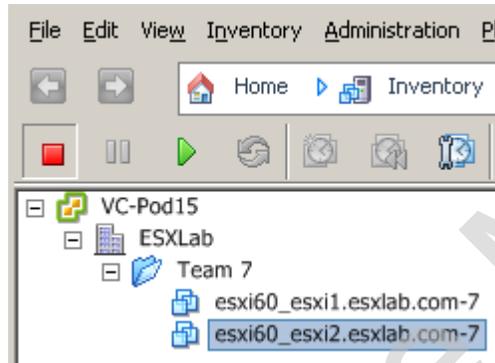
- Navigate to the **Home** view (**View** menu item → **Home**)



Look for the *Inventory* category and click **VMs and Templates**

VMs and
Templates

- Expand the inventory hierarchy on the left until you see 2 **ESXi** hosts



Self Study

If you are working on our labs by yourself, please complete the remainder of this lab (to install ESXi 6.0) on both machines.

Team Study

If you are working in a team of 2 people, please install ESXi 6.0 onto your assigned server:

- Click your server in inventory
If you are using ESXi1, click `esxi60_esxi1.esxlab.com-#`
If you are using ESXi2, click `esxi60_esxi2.esxlab.com-#`
- Click the **Summary** tab
- Right-click your **ESXi** host in inventory → **Open Console**
- Move the ESXi host console window to the upper left hand corner of your remote lab access screen
- Click the green **Power On** button to power on your ESXi host



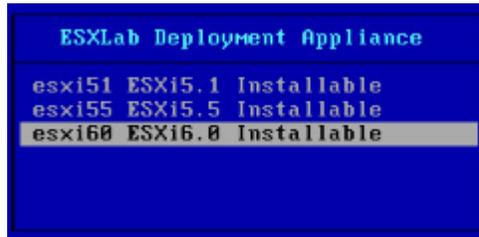
Your machine will power on and complete its Power On Self Test (POST).

Please watch your ESXi host power up (but do not interact with it just yet).

Part 2 – Install ESXi

Because our servers are off site, we must install ESXi without using the CD/DVD reader. We will use PXE (Pre-boot eXecution Environment, pronounced *pixie*) network boot services.

You should get a PXE network boot menu:



- Click in the **console window**
- Hit the ↓ (Down Arrow) key on your keyboard to the **esxi60 ESXi6.0 Installable** item
- Hit **ENTER** to network boot from ESXi 6.0 install media

If you accidentally select some other option, please:



- Click the **Reset** button on the VM console window
- When your virtual ESXi host starts its Power On Self Test, click in the console window, hit **ESC**, select **Item 4** (to network boot) and re-launch the installer

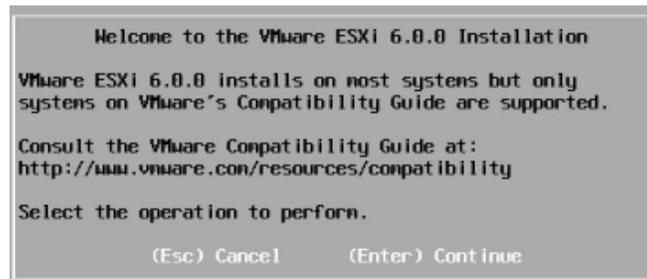


Once you click in the console window, your mouse pointer will disappear and your keyboard will be locked to the console window. To release the mouse and keyboard from the ESXi host remote console window, please hit **Ctrl-Alt**

Please wait for the ESXi installer to boot and launch...

Welcome to the VMware ESXi 6.0 Installation

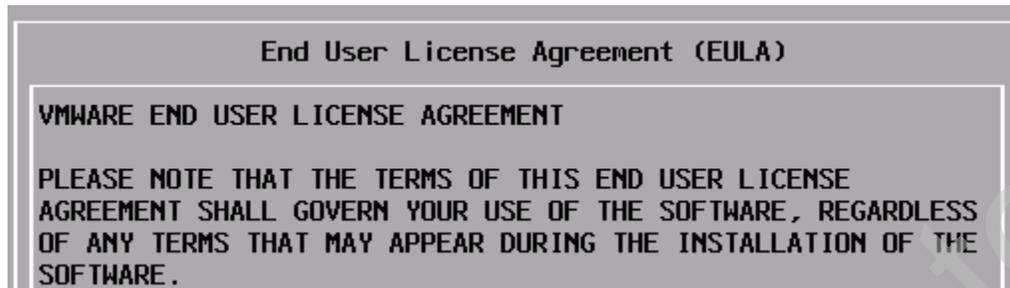
The ESXi 6.0 installer will boot and run. The machine will initialize and then launch the installer:



Please hit **ENTER** to continue.

End User License Agreement

You must accept the EULA before continuing the install:



Hit **F11** to accept the *EULA* and continue

Select a Disk

The installer then presents you with a roster of visible storage volumes, organized into **Local** (SAS RAID) and **Remote** (Fibre, iSCSI SAN) volumes.



Please hit **Enter** to give the installer permission to wipe and use the local storage volume.

Note: The ESXi installer uses 100% of the selected disk (and does not give you the chance to change/edit partitions on the selected volume) ESXi and VMFS volumes created.

Keyboard Layout

ESXi 6.0 can work with international keyboards... but we will use the default US keyboard

- Please hit **Enter** to accept the **US default** keyboard layout

Note: We have not specifically tested our labs with non-US keyboards. If you have a non-US keyboard, please select the correct keyboard type for your hardware. You may also have to update the keyboard settings for your remote access lab desktop.

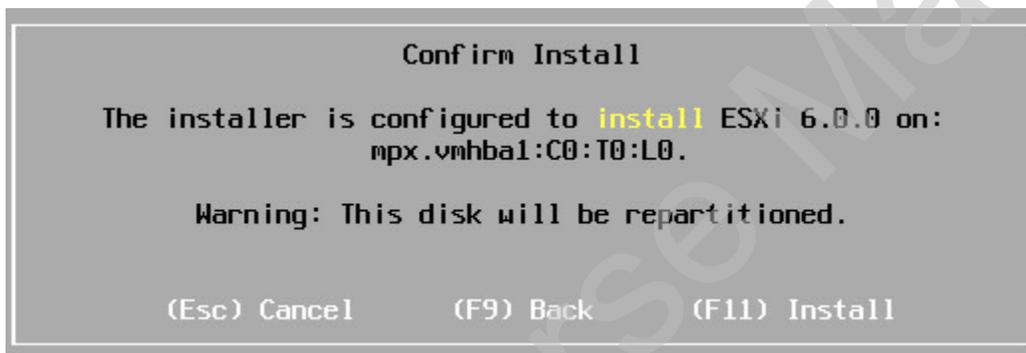
Root Password

Next, you need to set the root (administrator) password:

- Type **esxlab.com** as the root password (**DO NOT DEVIATE OR WE CAN'T SUPPORT YOU. We cannot reset your ESXi password for you so please write it down**)
- Hit the **Tab** key
- Type **esxlab.com** again to confirm your password
- Look for the message below that says the passwords match
- Hit **Enter** to continue

Confirm Install

ESXi will now install on your local server...



Please hit **F11** to proceed with the install. The installer downloads and installs ESXi onto your server. Progress is displayed as the install proceeds:



Depending on the speed of your server's storage, it may take 3-10+ minutes to install ESXi.

Installation Complete

When your ESXi installation has finished you will see the following:

Appendix 1 – Definitions & Acronyms

AD	Active Directory Microsoft's proprietary implementation of enterprise directory services based on Kerberos and X.500 (Lightweight Directory Access Protocol or LDAP). Very popular in Microsoft shops and used to implement enterprise wide directory services including common user and group definitions and authentication.
AKA	Also Known As
AMD	Advanced Micro Devices A manufacturer of physical CPUs and other computer components. AMD developed the Opteron family of x86 compatible CPUs that compete directly with Intel's Xeon processors.
APD	All Paths Down A situation where an ESXi host has lost all connectivity to a needed SAN LUN. That is, no healthy path to the needed LUN is available. APD result in the immediate failure of all VMs that were using the now-inaccessible LUN.
App	Application Any application or service installed on or enabled on an operating system intended to provide services to other operating systems, applications or directly to end users.
AS	Antispam
Auto Deploy	A mechanism that allows ESXi hosts to acquire their ESXi OS image, base configuration and cluster configuration from a central service. Auto Deploy depends on DNS/DHCP to provide fixed IP addresses to ESXi hosts, TFTP to download the base ESXi OS image, Host Profiles to create and maintain Configuration Rulesets, PXE to provide network boot services, Image Builder to create custom ESXi boot images and the Auto Deploy service to create/edit/update Auto Deploy
AV	Antivirus
BIOS	Basic Input/Output System A low level of firmware supplied on a PC server or VM virtual motherboard that can do basic I/Os to/from keyboard, mouse, CD/DVD, USB ports and disk storage.
CAL	Client Access License A license required by a vendor whenever that vendor's client software wishes to communicate with the vendor's server software. Most often found in, but not exclusive to, Microsoft deployments.
cciss	Compaq Computer Intelligent Storage System The name assigned by HP to the universal driver for their Smart Array family of embedded SCSI/SAS and legacy IDA RAID controllers. This controller driver has a built in limit of 2TB per storage volume. ESXi installed on an HP SmartArray controller with a >2TB RAID volume will fail to install and/or boot
CDP	Cisco Discovery Protocol A Cisco defined protocol used to publish network device properties. CDP is partially implemented in VMware virtual switches.
CIM	Common Information Model An industry standard defined and published by the Distributed Management Task Force that allows hardware makers to create discoverable hardware, properties and attributes. The standard also specifies how hardware is discovered, it's properties probed and values associated with those properties made available to software. VMware uses CIM to discover hardware on PC servers and to also monitor the health of its own software.
Core	A independent CPU processing resource that the VMkernel can use to run VMs. Modern CPUs offer

either two or four CPU Cores per CPU package.

CPU	<p>Central Processing Unit</p> <p>That component of a computer that runs operating systems and applications. The CPU is usually a separate device that is installed into a socket on the computer's motherboard.</p>
Datastore	<p>A storage volume suitable for use by ESXi. VMware currently supports connections to storage volumes on (fibre/iSCSI) SANs formatted VMFS and to NFS shares.</p>
DC	<p>Domain Controller</p> <p>A Microsoft service that manages item defined within a domain or domains. Such items usually include users, groups, servers, PCs and services. Domain Controllers support centralized user management and authentication.</p>
DCUI	<p>Direct Console User Interface</p> <p>The limited console user interface provided by ESXi. DCUI sessions let you set base properties for your ESXi host including host name, IP properties, remote/local Troubleshooting mode, etc.</p>
Dev	<p>Development</p> <p>Any server, VM or resource used to support application development.</p>
DHCP	<p>Dynamic Host Configuration Protocol</p> <p>A industry standard protocol for leasing out IP properties such as IP address, netmask, gateway, FQDN, DNS server, etc.</p>
DMZ	<p>Demilitarized Zone</p> <p>A term commonly used to describe a network LAN segment that sits between trusted Internal networks and untrusted (i.e.: Internet facing) segments. Typically servers and services that reside on DMZ networks interact with peers on untrusted networks (accepting only specific protocol and port traffic), validate/verify that traffic in some way and then forward valid requests to internal servers/services for further processing</p>
DNS	<p>Dynamic Name Resolution Services</p> <p>Software that can map fully qualified host names to IP address or IP addresses back to fully qualified host names.</p>
DR	<p>Disaster Recovery</p> <p>Refers to any plans, procedures, server, infrastructure, etc. Specifically intended to help an organization recover for a catastrophic IT failure.</p>
DRAC	<p>Dell Remote Access Controller</p> <p>A management console built into most Dell PC servers. DRAC permits out of band management including power on/off/suspend/resume and reset, remote consoles, virtual CD/DVD devices, hardware status, etc.</p>
DRS	<p>Distributed Resource Scheduler</p> <p>VirtualCenter add on that enables automated VMotion including Initial Placement and Dynamic Load Balancing.</p>
DSA	<p>Deploy, Secure, Analyze</p> <p>An advanced class offered by VMware to students who already have a good knowledge of the basics of VMware ESX and VirtualCenter</p>
ESX	<p>ESX is the name given to VMware's enterprise server virtualization software. While not strictly an acronym (because VMware doesn't admit that it stands for anything in particular), it is speculated that it actually stands for Enterprise Server eXecutive.</p>
ESXi	<p>ESX embedded</p> <p>A version of ESX that is either burned directly into flash memory on the PC server motherboard or loaded onto and booted from USB memory keys. This version of ESX lacks a Service Console and must be managed directly by the VI Client.</p>
EVC	<p>VMware Enhanced VMotion Compatibility</p>

EVC is used to abstract different CPU models within the same processor family to a common base set of features (instruction sets, status bits, virtual hardware assist, etc.). VMware created EVC so that VMotion could be supported across similar - but not identical CPUs.

ext3	Extended Type 3 File System A filesystem driver native to RedHat Linux implementations. This is the default file system type for Service Console file systems.
Fault Tolerance	A VM hot-replication/synchronization technology that replicates the CPU/Memory/Network state of a running VM onto a second ESXi host (where both hosts are members of an HA cluster).
FCoE	Fibre Channel over Ethernet An industry standard that encapsulates Fibre Channel frames over (typically) 10GB Ethernet. This allows network (Ethernet) and storage (Fibre Channel) traffic to run over the same network at enhanced speed (vs. 8GB Fibre).
FQDN	Fully Qualified Domain Name
GB	Gigabyte 1 billion bytes.
gb	Gigabit 1 billion bits. Usually used in reference to high speed network devices that transmit data one bit at a time.
GC	Abbreviation for Guided Consolidation Guided Consolidation is a tool to quickly and easily find, monitor and ultimately migrate physical Windows servers into virtual machines. Guided Consolidation is a vCenter feature.
GMT	Greenwich Mean Time
GPT	GUID Partition Table An industry standard for creating partition tables on storage devices (spinning disks and SSDs). GPT partitions use 64-bit block addresses (rather than 32-bit blocks for MBR partitions) so they can describe partitions as large as 9.4 Zetabytes (rather than 2TB for MBR partitions)
GRUB	Grand Unified Boot Loader The default boot loader used by RedHat Linux and operating systems based on RedHat Linux. The ESX Service Console uses GRUB as its default boot loader.
GUID	Globally Unique Identifier A (usually) generated unique reference number used as an identifier for some component of hardware or software. GUIDs are usually stored as 128-bit values, and are commonly displayed as 32 hexadecimal (base 16) digits
HA	High Availability Clusters VirtualCenter add on that enables automatic placement and restart of VMs that fail whenever the host they are running on fails.
HEC	Hardware Execution Context The VMkernel divides physical CPU resources (sockets, cores and hyperthreaded logical processors into independent processing elements - called HECs. When a VM needs to run, the VMkernel must service its virtual CPUs with an equal number of HECs.
Host Profiles	ESXi host configuration ruleset management system that allows you to harvest configuration rulesets from existing ESXi hosts, review them, edit them, attach rulesets to new ESXi hosts, scan for configuration compliance and remediate any non-compliance configurations.
Hot-Add	Also called Hot-Plug The ability to add hardware to a virtual machine without having to power down the VM first. Without specifically enabling CPU/Memory Hot-plug, you can hot add NICs, USB controllers and virtual disks to VMs. By enabling Hot-Add on VMs running modern operating systems, you can also hot-add Memory (W2k3/RedHat Linux 5 and newer) and CPU (W2k8/W7 and RHEL 6 and newer)

HW	Hardware General reference made to computer hardware. It is typically used in reference to either VM or ESX server hardware.
Hyper-V	Virtualization technology developed by Microsoft that is based in part on Xen open source virtualization. Hyper-V is Microsoft's enterprise virtualization product and is only available on Windows Server 2008. Currently Hyper-V lacks VM hot migration, any form of clustering and many other advanced features currently available from VMware. Hyper-V does have Quick Migration, which acts more like cluster fail over/fail back. Quick Migration does cause VM outages and client disconnects.
IDE	Integrated Drive Electronics A disk interface popular with PCs and PC servers and available on VM virtual hardware. This interface is being replaced by SATA.
ILO	Integrated Lights-Out A management console built into HP/Compaq servers.
IET	iSCSI Enterprise Target An open source implementation of server-side iSCSI that allows an operating system to present iSCSI LUNs to iSCSI client systems including Windows, Linux and ESX.
ILO	Integrated Lights Out Remote management hardware/software built into HP server products. ILO permits out of band management including power on/off/suspend/resume and reset, remote consoles, virtual CD/DVD devices, hardware status, etc.
I/O	Input/Output Any event in the computer that either requests input from a device or requests the device to complete an output. Keyboards and mice are input devices, screens are output devices and disks, floppies, CD/DVDs and networks are input/output devices.
iSCSI	SCSI over IP iSCSI is a block mode storage protocol that enables the exchange of volume based SCSI storage I/Os over an Ethernet, TCP/IP network.
ISOs	A generic term used to reference files that contain rips of CD or DVD media. These images can be created using popular PC CD/DVD software such as Roxio, Nero and many others. ISO images can be mounted on virtual CD/DVD devices and used as if they were actual physical media.
KB	Kilobyte A unit of measure applied to files. By convention it is 1,024 bytes.
Kb	Kilobit 1,024 bits of data. Kb is usually used in reference to devices that transmit one bit at a time rather than bytes at a time (i.e.: Ethernet networks)
LAN	Local Area Network Generic reference to an Ethernet network segment that is usually composed of one or more Ethernet switches
LUN	Logical Unit Number A small positive integer number used by SANs and ESX hosts to uniquely identify a storage volume.
Mainten- ance Mode	A special operational mode of an ESXi host used to place the host into a state that facilitates updates, patches and changes. A host that has successfully entered maintenance mode is not able to power on, run or accept inbound VM Vmotions.
MB	Megabyte 1,024,000 bytes.
Mb	Megabit

1,024,000 bits. Usually used in conjunction with devices that transmit one bit at a time at very high speed (e.g.: Ethernet networks)

MBR	<p>Master Boot Record</p> <p>A very small amount of storage reserved at the front of a storage volume. If used, the MBR contains secondary boot loader instructions used to help boot an operating system.</p>
MMU	<p>Memory Management Unit</p> <p>A CPU hardware subsystem that translates virtual memory references to physical memory references.</p>
mpx.	<p>MPX</p> <p>The MPX label is an ESXi host generated path to a LUN. MPX paths are Hardware Runtime Paths that include the controller, channel, target and LUN number for a datastore. MPX device labels may be in either of the following format:</p> <p>mpx.vmhba<ctlr #>:C<channel #>:T<target#>:L<LUN #> - specifies an entire volume, or</p> <p>mpx.vmhba<ctlr #>:C<channel #>:T<target#>:L<LUN #>:P<partition #> - specifies a partition on a volume</p>
MS	<p>Microsoft</p>
MSCS	<p>Microsoft Cluster Services</p> <p>Cluster technology used to build highly available servers and applications. MSCS is distributed free with Microsoft Windows Enterprise and Data center editions and is not available on Microsoft Standard edition. Also referred to as Microsoft Fail Over Clusters in W2k8 or later</p>
MSI	<p>A self extracting executable file format used by Microsoft to distribute applications.</p>
MTU	<p>Maximum Transfer Unit</p> <p>The maximum size data payload an Ethernet packet can carry. Traditionally, this has been 1,500 bytes. However, with the advent of the Jumbo Frames Ethernet enhancement, the new MTU size is 9,000 bytes. Jumbo Frames were invented, in part, to make TCP/IP and Ethernet more efficient at transferring 8k disk block to/from iSCSI nodes.</p>
naa	<p>Network Addressing Authority (NAA)</p> <p>A number used to uniquely identify a LUN number. Typical format is naa.<lun identifier>. An example might be: naa.6006016094602800364ce22e3825e011</p>
NAS	<p>Network Attached Storage</p> <p>A generic term for LAN based file shares such as Windows file shares or Linux file shares.</p>
NAT	<p>Network Address Translation</p> <p>A standard for mapping IP addresses from one segment to another. Often found in firewall devices so that internal, non-routable IP addresses can be mapped to Internet facing IP addresses.</p>
NFS	<p>Network File System</p> <p>A client/server file sharing protocol popular on Linux and UNIX machines. An ESX host can define, connect to and use NFS shares as general purpose datastores.</p>
NIC	<p>Network Interface Card</p> <p>Any card or device that interconnects a PC or PC server to an Ethernet network.</p>
NMP	<p>Native Multipath Plugin</p> <p>A pluggable storage subsystem that allows for dynamically selectable Path Selection Policies (PSP). Native Multipathing is responsible for physical device and path claim management. It also associates physical paths with storage volumes and completes I/Os to storage volumes.</p>
NTFS	<p>Windows NT File System</p> <p>The native file system included with 32 and 64-bit Microsoft Windows operating systems. NTFS is a journaled file system which makes it very resilient to crashes and OS lock ups. Considered proprietary to Microsoft but there are now highly reliable open source implementations</p>

available.

NTP	<p>Network Time Protocol</p> <p>An industry standard protocol for synchronizing PC clocks to highly accurate time sources over the Internet.</p>
NUMA	<p>Non-Uniform Memory Architecture</p> <p>A processor/memory architecture that specifies that each CPU has its own memory controller and local bank of memory. The advantage of NUMA systems is that CPUs can access local memory at full speed (without having to contend with other CPUs). This provides significant improvements in memory scalability over Intel's shared memory architecture. NUMA is championed by Advanced Micro Devices.</p>
NX/XD	<p>No Execute/Execute Disable</p> <p>A feature found on modern x86 CPUs (late 2006 or newer) that prevent viruses from overwriting a subroutine's return address on the stack. NX/XD must either be present on all CPUs or absent on all CPUs in a VMotion cluster. Alternatively, you can mask away this feature on a per VM basis (VM > Edit Settings > Options)</p>
O/S	<p>Operating System</p> <p>Generally refers to an operating that is (or will be) installed onto a Virtual Machine.</p>
ODBC	<p>Open Database Connectivity</p> <p>A database client to database server network connectivity standard that lets client software connect to, authenticate, query and manipulate data in a SQL database.</p>
Openfiler	<p>An open source project based on Linux, IET, Samba and other projects. Openfiler is pre-built OS load or Virtual Machine that provides SMB, NFS and iSCSI server services. Openfiler is managed through a simple web interface. Can be downloaded for free at www.openfiler.com.</p>
OVA	<p>Open Virtual Machine Archive</p> <p>A vendor neutral archive (a single file that contains multiple files) used to package an OVF VM into one a file. See OVF</p>
OVF	<p>Open Virtual Machine Format</p> <p>A vendor neutral VM format that reduces a VM down to a configuration file (.vmx file) and a virtual disk (.vmdk file). Used to facilitate easy export and import of VMs across multiple platforms.</p>
P2V	<p>Physical 2 Virtual (migration)</p> <p>The act of migrating an operating system and application from a physical server to a virtual machine. This process is greatly facilitated by VMware's Converter Enterprise VirtualCenter module.</p>
Page Fault	<p>A memory management state that arises when a VM attempts to reference a page of memory that is not physically resident. The VMkernel will fetch the page from disk if this is the first time the page was referenced or if the page was previously pushed to disk due to memory resource contention.</p>
Page Fault Delta	<p>The change in memory pages either fetched or pushed to disk per unit of time. This metric (visible in Task Manager's Processes tab) is useful when investigating memory performance issues.</p>
PC	<p>Personal Computer</p> <p>Generic reference to industry standard PCs/PC servers that use x86 CPUs from Intel or AMD.</p>
PCI	<p>Peripheral Component Interconnect</p> <p>A PC 32-bit/64-bit bus standard for PCs and PC servers</p>
pCPU	<p>Physical CPU</p> <p>A physical processor package installed into a processor socket in your PC server.</p>
PCI-e / PCIe	<p>PCI-Express</p> <p>A new, higher speed standard for PCI adapter cards. PCI-E card slots are commonly found on both</p>

	PCs and PC servers
PCI-X	A legacy 64-bit PCI adapter standard commonly found in PC servers
PDL	Permanent Device Loss A situation where an ESXi host loses access to a SAN LUN. This can happen when a SAN administrator removes permission for an ESXi hosts to access a SAN LUN that it was previously using. PDL situations result in the immediate failure of all VMs that were using the lost LUN.
PERC	PowerEdge RAID Controller Name given by Dell to its family of local SCSI/SAS RAID storage controllers. Dell OEM's these from both Adaptec and LSILogic so different versions of PERC controllers may have different performance characteristics and may require different device drivers.
pGPU	Physical Graphics Processing Unit A physical graphics adapter card added to your PC server. VMware supports a limited number of NVIDIA Quadro and GRID pGPUs as well as some AMD FireGL Pro cards.
pRDM	Physical Raw Device Map A method for presenting a SAN LUN directly to a VM by using a virtual disk to act as a storage I/O proxy for the backing physical LUN. The VMkernel passes all SCSI storage commands directly to the backing storage volume so virtual disk operations (like snapshotting) are not supported.
PSA	Pluggable Storage Architecture A layer of software found in the VMkernel that manages storage multipath plugins. PSA allows for VMware developed and 3 rd party developed multipath driver solutions. One benefit of PSA is that storage plugins can be dynamically loaded and unloaded, allowing administrators to change multipath policies on the fly.
PSC	Platform Service Controller A set of services including Inventory Service and VMware Single Sign On that provides infrastructure services to vCenter Server instances
QA	Quality Assurance A generic term to indicate any resources or processes involved with software, application or virtualization testing, validation and compliance.
QoS	Quality of Service A TCP/IP protocol that provides priority packet transfer and possibly bandwidth reservation to ensure that certain protocols receive a predictable amount of network bandwidth.
Quiesce	To temporarily pause/suspend operations in order to safely complete an action. VMware Tools has the ability to quiesce a VM in advance of a snapshot operation. This operation causes the guest OS to temporarily suspend running all OS tasks and services, post all pending writes to disk, inform the VMkernel that the VM is paused in a safe state and then resume running guest OS tasks/services once the VMkernel indicates that the snapshot operation has completed
RAID	Redundant Array of Inexpensive Disks Any one of a number of strategies used to aggregate storage devices (e.g.: hard disk drives). RAID volumes are created to improve the storage capacity, performance and/or redundancy beyond what can be provided by an individual storage device.
RAM	Random Access Memory Temporary program, data storage hardware that can interact with physical CPUs at high speed.
RBAC	Role Based Access Controls Access management using privileges (rights to do something) and Roles (named sets of privileges).
RDM	Raw Device Map A virtual disk (.vmdk file) that acts as a proxy for a backing physical LUN. RDMs allow VMs to gain direct access to a SAN LUN without needing to have SAN controllers in the VM.

RHEL	RedHat Enterprise Linux A family of Linux releases from RedHat specifically intended for business use.
Resource Pool	A Resource Container (that acts like a folder) that enables batch CPU/memory delegations from a parent object. Parents can be standalone ESXi hosts, ESXi hosts in a DRS cluster or another Resource Pool. Resource Pools are not supported on ESXi hosts that are members of HA (but not DRS) clusters.
ROI	Return on Investment The amount of time required to recoup an investment based on the received benefits of that investment, such as improved efficiencies, cost reduction, improved service, etc.
Role	A named set of ESXi/vCenter privileges that allow permissions to be delegated in an easy, effective manner.
RPO	Recovery Point Objective vSphere Replication policy that sets the amount of time between snapshot/sync/commit cycles between the primary VM and the replicated VM
RMM	Remote Management Module Integrated out-of-band management controller that is a 'baked in' component of modern IBM X-series PC servers. This product replaces the legacy IBM Remote Server Assistant (RSA) controller found in older IBM X-Series PC servers.
RSA	Remote Server Assistant A legacy out-of-band management console built into many older IBM X-Series PC servers.
RTT	Round Trip Time Time required for a packet to travel from a source host to a destination host and back again.
SAN	Storage Area Network A centralized storage appliance that lets administrators create RAID sets out of physical disks and then present those RAID sets to hosts connected to the storage network.
SAS	Serial Attach SCSI A extension to the SCSI block mode storage protocol that allows SCSI disk I/O requests to be carried over the physical SATA interface.
SATA	Serial ATA A hardware and software protocol for connecting SATA compliant hard disk drives to SATA storage controllers. SATA storage controllers and disks are popular in desktop PCs and notebooks.
SCSI	Small Computer Systems Interface A block mode storage protocol used between storage controllers and storage devices/volumes. The protocol covers the rules for requesting and replying to storage I/O transactions.
sd	A generic name used by Linux to refer to storage devices such as SCSI volumes, SAS volumes SCSI/SAS RAID volumes, SAN LUNs, etc.
SDRS	Storage DRS A data store cluster technology that provides storage load balancing for volume capacity and I/O bandwidth/latency
ServerRAID	Name given to a family of local SCSI/SAS RAID controllers from IBM
Shares	A scheduling weight used by ESXi to determine the relative importance of a VM when assigning CPU resources, Memory resources and (optionally) disk I/O bandwidth.
SIMD	Single Instruction, Multiple Data Name for a family of x86 instructions whose primary use is to improve the performance of multimedia operations. Also used in operating system software RAID drivers.
SIOC	Storage I/O Control A mechanism available in vSphere Enterprise + only that allows administrators to assign datastore

shares to VMs. When the ESXi host detects that the storage controller used to access the datastore is experience queuing that exceeds a preset threshold (usually 30ms), the storage controller driver will switch to priority based I/O queuing (based on share value) from its default of first-come/first-served I/O queuing.

SLA	<p>Service Level Agreement</p> <p>Any agreement between the Virtual Infrastructure administrator and the user community that covers availability of service, allocation of resources, etc. A typical SLA will specify maximum allowed down time per month, maintenance windows, minimum resources allocated to the client, back up responsibilities, etc.</p>
SMB	<p>Server Message Block</p> <p>A client/server file sharing protocol originally specified by Digital Equipment Corporation but taken over by Microsoft as the basis for their LANManager suite of products. SMB is the native file sharing protocol for all Windows file shares including shares offered by Windows Server products.</p>
SMB	<p>Small to Medium Business</p> <p>A generic term to indicate incorporated businesses that are larger than sole proprietorships. SMBs are any business with revenue in the range of about \$1 million to about \$500 million per year.</p>
SMTP	<p>Simple Mail Transfer Protocol</p> <p>A low level text mode protocol used in the exchange of e-mail messages.</p>
SNMP	<p>Simple Network Management Protocol</p> <p>A family of protocols designed to enable Ethernet networking monitoring and management.</p>
SP	<p>Storage Processor</p> <p>A SAN hardware component that provides an interface to the storage network.</p>
SQL	<p>Structured Query Language</p> <p>Usually this acronym is used as a generic reference to relational database software that implements the Structured Query Language standard.</p>
SSD	<p>Solid State Drive</p> <p>A class of storage devices that use flash memory instead of spinning platters for data storage and retrieval. ESXi can use SSD devices (once formatted as a VMFS datastore) for Host Caching (caching frequently read VM data locally to reduce backing storage read requests) and host based swap file storage (so that VM paging I/Os do not compete with application I/Os back to central storage).</p>
SSE	<p>Streaming SIMD Instructions</p> <p>A family of multimedia instructions. Currently available in 4 families called; SSE, SSE2, SSE3, SSE4.1. All CPUs in VMotion peers must have the same SSE instruction level support.</p>
SSH	<p>Secure Shell</p> <p>A command line access tool that uses strong encryption between the SSH server (such as an ESXi host) and the SSH Client (which is freely available - search for putty). SSH command line access can be used for host troubleshooting, management, file manipulation, etc. By default, ESXi disables SSH access.</p>
SSO	<p>Single Sign On</p> <p>A separate directory query and session management service used by vSphere 5.1 to handle authentication.</p>
SVM / SVMotion	<p>Storage VMotion</p> <p>The ability to hot migrate a VMs virtual disk from one datastore to another. Used to move the constituent files that make up a VM while the VM is running.</p>
SW	<p>Software</p> <p>Used whenever the details of the actual software being discussed are not relevant. Usually implies VM operating system or application software.</p>

UEFI	<p>Unified Extensible Firmware Interface</p> <p>A software specification and standard that specifies a layer of software that sits between computer hardware and an installed operating system. UEFI software is replacing (and is backward compatible with) BIOS systems used to configure PCs and PC server hardware.</p>
USB	<p>Universal Serial Bus</p> <p>A serial interface standard that supports high speed serial connection to devices along a shared bus. ESX VMs have very limited support for USB devices.</p> <p>Version 7 virtual hardware officially supports USB devices.</p>
UTC	<p>Universal Coordinated Time</p> <p>See GMT.</p>
UTM	<p>Unified Threat Management</p> <p>Generic name for a class of physical or virtual appliances that provide a suite of network perimeter defenses possibly including anti-virus, anti-Spam, firewall, proxy services and more.</p>
UUID	<p>Universally Unique Identifier</p> <p>Typically a hash code that uniquely identifies a piece of hardware from all other hardware. UUIDs are used on (virtual) motherboards, SAN LUNs, etc. to ensure that there is no chance that two different hardware devices could ever be viewed as the same device.</p>
V2V	<p>Virtual to Virtual (migration)</p> <p>The act of migrating a virtual machine from one virtualization platform to another. V2V migrations can be done between VMware products (e.g.: from VMware Workstation to VMware ESX) or from non-VMware products to VMware (e.g.: Microsoft Virtual PC/Server VMs to ESX VMs).</p>
VAAI	<p>VMware APIs for Array Integration</p> <p>A set of storage primitives that allow an ESXi host to offload disk operations to a back end SAN (that supports VAAI). Operations that can be passed to the SAN include disk block copy and disk block zero. The benefit is that ESXi delegates the operation to the SAN who completes the task. The benefit is lower ESXi overhead and faster I/O operations.</p>
VAMI	<p>VMware Appliance Management Interface</p> <p>A web management portal supported by VMware virtual appliances (e.g.: vCenter Server Appliance, vSphere Replication Appliance, VMware Data Protection Appliance). The VAMI interface supports basic configuration, product update and operational tasks only.</p>
VAPD	<p>vSphere APIs for Data Protection</p> <p>A set of APIs provided by ESXi used to enable efficient VM replication and backup</p>
VC	<p>VirtualCenter / vCenter</p> <p>VirtualCenter / vCenter is a separately licensed product that acts as a management proxy for VMs and ESX hosts. VC provides a single view on all virtual infrastructure, rapid deployment through VM clones and templates, alarms and alerts, performance monitoring, VM and ESX tuning and much more.</p>
VCB	<p>VMware Consolidated Backup</p> <p>A VMware legacy product that is used to create hot, snapshot based backups using the SAN storage network rather than a general purpose Ethernet network. Requires a separate PC server running Windows 2003 and a physical SAN connection. Not distributed in vSphere 5 and newer.</p>
vCenter	<p>The new name (as of vSphere 4) for VMware's VirtualCenter virtualization management console.</p>
vCenter Server HeartBeat	<p>A tool for linking 2+ vCenter Servers into a redundant configuration. Idea is to replicate the primary vCenter server to a secondary instance and then keep both systems in synch. Benefit is that users can log in to either vCenter server to manage the same inventory.</p>
vCLI	<p>VMware Command Line Interface</p> <p>A service you can download and install on either Windows or Linux that gives you command line access to ESXi hosts. Great tool for scripting.</p>

VCP	<p>VMware Certified Professional</p> <p>An entry level certificate offered by VMware that demonstrates basic proficiency in VMware ESX and VirtualCenter. To obtain VCP, a candidate must first sit a VMware authorized class and then pass an on line exam with a score of 70% or higher.</p>
vCPU	<p>Virtual CPU</p> <p>A virtual CPU resource present in a VM. When a VM runs, the VMkernel must find a physical CPU resource (usually a CPU core) for each vCPU defined at the hardware level of a VM.</p>
vCSA	<p>vCenter Server Appliance</p> <p>A Linux based VM that includes vCenter Server functionality along with Inventory Service, Single Sign-on and the PostgreSQL database. Enables vCenter functionality without the need to buy a Windows 2003/2008 license.</p>
VDI	<p>Virtual Desktop Infrastructure</p> <p>Building and running desktop operating systems (Windows XP, Windows 7, Windows 8) in a Virtualized environment</p>
vDS	<p>vSphere Distributed Switch</p> <p>A VMware vSphere virtual switch that is created, managed, monitored, etc. by vCenter. vDS can be pushed to member ESXi hosts where the assigned host(s) see and can use all defined ports and port groups on the vDS. This feature is only available in vSphere Enterprise+</p>
vFRC	<p>vFlash Read Cache</p> <p>New caching technology introduced into ESXi in vSphere 5.5 that uses local SATA/SAS SSDs and is used to create pools of high speed read caches for VM and ESXi I/O read acceleration.</p>
VI	<p>Virtual Infrastructure</p> <p>A generic term that encompasses VMware's virtualization products. In the context of this class, it would imply VMware ESX, VirtualCenter and the VI Client along with any servers, storage and networks dedicated to run this software.</p>
VI Client	<p>Virtual Infrastructure Client</p> <p>A VMware supplied MS Windows application that acts as a front end user interface tool for managing standalone ESX hosts and VirtualCenter.</p>
VLAN	<p>Virtual LAN (segment)</p> <p>A VLAN is a virtual LAN segment imposed on a physical LAN segment through the addition of four additional bytes to a network packet that identifies the VLAN segment number. Devices that share the same physical LAN segment but used different VLAN numbers (tags or IDs) are treated as if they were on separate LAN segments and consequently cannot exchange packets without the support of a router.</p>
VM	<p>Virtual Machine</p> <p>An object created, managed and run by ESX that uses software to faithfully emulate all of the hardware found in a generic PC server, including an Intel BX/ZX motherboard, chip set, keyboard controller, mouse controller, floppy controller, IDE controller, CD/DVD device, PCI bus, 2D frame buffer video controller, virtual SCSI HBAs, virtual SCSI disks and virtual NICs</p>
vMA	<p>Virtual Management Appliance</p> <p>An OVF formatted VM distributed by VMware that provides vCLI functions for ESX/ESXi and vCenter.</p>
vmhba	<p>VMware Host Bus Adapter</p> <p>A generic name use by the VMkernel to reference Fibre, iSCSI, local SCSI and local SAS storage controller without making reference to the physical details of the controller (e.g.: make and model). vmhba numbers are assigned in the order the physical storage controllers are found during a PCI bus scan performed at ESX boot time.</p>
VMFS	<p>VMware File System</p> <p>A filesystem driver, and partition type code, developed by VMware. VMFS provides a very low</p>

overhead, hierarchical file system that is safe for true concurrent access by multiple ESX hosts at the same time.

vmkcore	A partition created during ESX install that is intended to hold VMkernel crash dumps. This partition should never be more than 110MB in size.
vmnic	A naming convention used by the VMkernel to assign generic names (vmnic#) to physical NICs on the ESX host. VM
VMotion	A separately licensed product that enables hot VM migration (move a VM while it is running) between ESX hosts. VMotion requires VirtualCenter for configuration and management purposes. Individual ESX hosts must be licensed for VMotion before they can use this feature.
VMware Tools	A collection of guest OS level drivers optimized to work with VMware virtual hardware. VMware Tools also includes a communications back channel to the VMkernel to allow the VMkernel to query the state/status of the VM, send commands and receive command results
vNIC	Virtual NIC A software object that faithfully emulates the behavior of a generic PC NIC (usually a vNIC emulates an AMD PCNet/32 physical NIC).
vSphere	The name VMware has adopted for version 4 of their Virtual Infrastructure product suite. It includes ESX 4 and vCenter 4.
vRDM	Virtual Raw Device Map A raw device map that is managed by the ESXi host VMkernel. This allows virtual disk operations (such as snapshotting) to be performed on the RDM.
vShield Zones	VMware network firewall technology for virtual switches
vSS	vSphere Standard Switch A virtual switch that is created, managed, etc. within a single ESXi hosts. This type of vSwitch is available in all ESXi editions (free and commercial).
vSwitch	Virtual Switch A software object created and maintained by the VMkernel that faithfully acts like an Ethernet switch for VMs and their virtual NICs (vNICs).
VSMP	Virtual Symmetric Multi-Processing The ability to run a VM with two or four, single/dual/quad core virtual CPUs rather than with the default of a single core virtual CPU.
vSphere	A name VMware uses for all of the products included in their fourth general release of their enterprise virtualization suite. It includes vCenter (was VirtualCenter), vNetwork (network distributed switches), ESX, etc.
VUM	VMware Update Manager An ESXi host patching and updating tool
W2k / W2k3	Windows 2000/2003 Server. Any version.
W2k8 / W2k8 R2	Windows Server 2008 (any version) or Windows Server 2008 R2 (any version)
WoL	Wake on LAN. A power saving technique that can wake up a host that is in power stand-by mode simply by sending a message to the host's network card.
workload	A term used throughout this class to refer to an Operating System and any applications running on that operating system. This term is usually used when the details of the specific operating system and application are not relevant to the discussion.
XenServer	A hypervisor virtual machine software product from Citrix. Xen Server includes many advanced

features like Live Migration (Citrix' term for hot migration). Some releases of Xen are free while more advanced releases cost money.

x86 Reference to the instruction set common to all Intel/AMD compatible CPUs.

x86_64 Reference to the now industry standard 64-bit x86 instructions originally specified by AMD for their 64-bit Opteron server and Athlon desktop processors and adopted and enhanced by Intel for their Xeon server and desktop CPUs

Sample Course Material