

Remote PC Guide for VMware Implementation Using ESXi Version 3.5/4.01

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This guide is a primer for adding remotely accessible PC or servers into your NETLAB Academy Edition[®] or NETLAB Professional Edition[®] equipment pods using the <u>VMware Inc.</u> virtualization product ESXi.

This guide covers features available in NETLAB+ version **2010.R5** and later. The details of this guide are specific to **VMware ESXi.**

Documentation for interfacing with other versions of VMware virtualization products can be found in their respective *Remote PC Guide for VMware Implementation* guides.

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Part 1	Background	6
1.1	What is a Remote PC?	6
1.2	What Can Users Do With a Remote PC?	7
1.3	What is a Virtual Machine?	8
1.4	What Does ESXi Provide?	9
1.5	How Do NETLAB+ and ESXi Servers Work Together?	11
Part 2	Planning	13
2.1	What Software Is Required?	13
2.1	1 Product Licensing	14
2.1	2 VMware Hosting Product Comparison	15
2.1	3 NETLAB+ Support Summary for ESXi	16
2.1	4 NETLAB+ Known Issues for ESXi	17
2	2.1.4.1 NETLAB+ Does Not Currently Integrate with vCenter	17
2	2.1.4.2 No Built-In USB Support For Virtual Machines	17
2	2.1.4.3 Continuous High CPU Utilization Causes Timeouts	17
2	2.1.4.4 NETLAB+ Not Tested With All Guest Operating Systems	17
2	2.1.4.5 NETLAB+ Does Not Support Novell Netware	18
2	2.1.4.6 Mouse Cursor and VMware Tools	18
2	2.1.4.7 Installing an Operating System on a Virtual Machine using the NETLAB	+
F	Remote PC Viewer	18
2.1	5 Upgrading From VMware Server To ESXi	18
2.2	ESXi Host Hardware Requirements	19
2.3	How Many ESXi Server Host Systems Do I Need?	22
2.4	Management Station Requirements	27
2.4	.1 VMware Infrastructure Client (VI Client) Requirements	27
2.4	.2 vSphere Client Requirements	28
Part 3	ESXi Host System Setup	29
3.1	Installing ESXi Server.	29
3.2	Setup Using the ESXi Management Console	32
3.2	.1 Configuring the Administrative Password	32
3.3	ESXi Host Connectivity Using the IMAN Networking Model	32
3.4	Configuring the Outside Interface	35
3.5	Verifying and Managing the ESXi Host Using VI Client	35
3.5	5.1 Entering the ESXi License Key	38
3.6	Configuring the Inside Interface	39
3.6	Understanding VLAN 1 and Bridged VLANs	40
3.6	5.2 Adding a Virtual Switch	41
3	8.6.2.1 Selecting the VMkernel Connection Type	41
3	3.6.2.2 Selecting the Network Adapter	42
3	3.6.2.3 Selecting Connection Settings	42
3	8.6.2.4 Finishing the Configuration of the Virtual Switch	44
3.6	Adding a VLAN3 Placeholder	45
3	3.6.3.1 Selecting the Network Connection Type	45
3	3.6.3.2 Selecting the Network Adapter	45
4	3.6.3.3 Selecting Connection Settings	46
10/22/202	10 Page 2 of	128



3	.6.3.4	Finishing the Configuration of the VLAN3 Placeholder	47
3.6	.4	Establishing the Inside Connection	48
3	.6.4.1	Allocating a Reserved Port on Control Switch for Inside Conne	ction 48
3	.6.4.2	Configuring a Reserved Control Switch Port for Inside Connect	tion 49
3	.6.4.3	Configuring Trunking Between Multiple Control Switches	49
3	.6.4.4	Connecting the Inside Interface and Verify Link	50
3.7	Crea	ting a NETLAB+ User Account	
3.8	Crea	ting the NETLAB VM Role	
3.9	Assie	ning Permissions to the NFTLAB+ User Account	
Part 4	Addi	ng Virtual Machines	
4.1	Crea	ting a New Virtual Machine Using the VI Client	
4.1	.1	Selecting the Custom Configuration Option	
4.1	.2	Providing a Name for Your Virtual Machine	
4.1	.3	Selecting a Datastore	59
4 1	4	Selecting the Guest Operating system	59
4 1	5	Selecting the Number of Processors	60
4.1	6	Configuring the Memory Size	61
4.1 / 1	.0	Choosing Network Connections	62
4.1 / 1	., צ	Selecting the I/O Adapter Types	63
4.1	.0 0	Creating a Virtual Hard Disk	
4.1 / 1	10	Specifying Advanced Options	
4.1	.10	Vorifying the Settings	
4.1	. Incta	Verifying the Settings	
4.2	Edi+i	nning a Guest Operating System	
4.5	Eulu	ng the virtual CD/DVD Device	
4.4		aning viviware roois	
4.5	Setti	ng the virtual Machine Display Properties for Remote Access	
4.6	Adju	sting visual Effects	
4.7	Disa	bling the Desktop Background	
4.8		ng Software Applications	
4.9	таки	ng a Shapshot of Your Virtual Machine and Managing Shapshots	
4.10	ĸ	emote PC Settings (for New Pods)	
4.11	IV C	100ITYING PC Settings	
4.12	C	onfiguring Remote Display Options	
4.13	V	erify the Virtual Machine	
Part 5	Conr	necting Virtual Machines to Real Lab Devices	
5.1	Dete	rmining Which VLAN Numbers Are Used by Your Pod	
5.1	.1	Determining VLANs Example 1 – Cuatro Router Pod	
5.1	.2	Determining VLANs Example 2 – Cuatro Switch Pod	
5.2	Crea	ting VLAN Adapters using VI Client	
5.2	.1	Selecting the Virtual Machine Connection Type	
5.2	.2	Selecting the Network Adapter	
5.2	.3	Selecting Connection Settings	
5.2	.4	Finishing the Configuration of the VLAN Adapter	
5.3	Conf	iguring Virtual Machines to use the correct VLAN Adapter	100
5.4	Dele	ting the Placeholder VLAN 3	102
10/22/201	.0		Page 3 of 128



Part 6	Verifyi	ng Connectivity and Troubleshooting	. 104
6.1	Verifyi	ng Connectivity Between Virtual Machines and Lab Gear	. 104
6.2	Review	and Modify VM Settings For an Existing Virtual Machine	. 109
6.3	The M	ost Frequently Encountered ESXi Issues	. 112
Append	lix A	Copying VMDK File to Clone Virtual Machines	. 116
Append	lix B	Contacting NDG for Technical Support	. 127
Append	lix C	Upgrading from VMware Server 1.x, 2.x, or GSX to VMware ESXi	. 128



OBJECTIVES

PART 1 - Background

- What is a remote PC?
- What can users do with a remote PC?
- What is a virtual machine?
- What does ESXi provide?
- How does NETLAB+ integrate with ESXi?

PART 2 – Planning

- What software is needed?
- What hardware is needed?
- How many ESXi host servers do I need?

PART 3 – VMware Server Setup

- Install ESXi
- Create NETLAB+ management account
- Configure physical networks
- Install VMware Infrastructure Client
- Prepare for virtual networking

PART 4 – Adding Virtual Machines

- How do I add a virtual machine to my ESXi server?
- How do I make a virtual machine accessible to NETLAB+ users?

PART 5 – Connecting Virtual Machines to Real Lab Devices

- Connecting to an External Network
- Creating VLAN interfaces

PART 6 – Verifying Connectivity and Troubleshooting

- Verifying Connectivity Between Virtual Machines and Lab Gear
- Identify and resolve the most frequently encountered issues.



Part 1 Background

This section builds a fundamental understanding of how remote PCs, virtualization and NETLAB+ work together.

Objectives

- What is a remote PC?
- What can users do with a remote PC?
- What is a virtual machine?
- What does ESXi provide?
- How does NETLAB+ integrate with ESXi?

1.1 What is a Remote PC?

A *remote PC* is a personal computer or server that can be remotely accessed from another PC. *Remote access* allows a user to have full access to the keyboard, video, and mouse of the remote PC. NETLAB+ provides built-in client software for remote access, which is loaded automatically via the user's web browser.





1.2 What Can Users Do With a Remote PC?

Users can remotely access the keyboard, video, and mouse of a virtual machine. NETLAB+ also provides special features such as shared simultaneous access, interfacing with real lab equipment (routers, switches, and firewalls), remotely powering a PC on or off, and restoring the PC to a clean state. This offers a wide range of possibilities. Here are a few scenarios that are being used today.

- **Application Service**. Provides students with access to real operating systems and application software, without distributing software or licenses.
- **Distance Learning.** Provides remote instructor-led training by allowing simultaneous shared access to remote PCs and remote servers. Several users can connect to and share the remote PC's graphical user interface at the same time. Using NETLAB+, students can observe what the instructor is doing on the remote PC, and vice-versa.
- **Resource Scheduling.** Provides controlled, scheduled usage to limited hardware resources.
- License Management. Limits the number of licensed operating systems or software applications that can be used at the same time.
- Online General IT Training. Provides on-line access to real operating systems and real application software. Using NETLAB+, remote PCs can be completely isolated from production networks, providing a safe environment for instructors and students to do things that are not typically allowed on production networks. Students can safely experience administrative privileges in complex computing environments. You can now provide labs that are not practical for students to set up at home, or scenarios that would be too difficult to set up by new IT students.
- **Online Lab Delivery.** Provides remote delivery of student assignments and lab work.
- **Online Network Training.** Provides online delivery of network training. Remote PCs can be interface with real lab equipment, such as routers, switches, and firewalls, all of which can be accessed remotely using NETLAB+.
- Online Security Training. Provides online delivery of security training. Using NETLAB+, remote PCs can be completely isolated from production networks, providing a safe environment for instructors and students to do things that are not typically allowed on production networks. This might include configuring PCs and lab devices using administrator privileges, installing new software, capturing



network traffic, experimenting with firewalls and VPNs, running malicious software, and scanning networks. At the end of the lab reservation, NETLAB+ will undo any changes.

1.3 What is a Virtual Machine?

In NETLAB+, a virtual machine is a remote PC or remote server that runs on virtualized hardware. Although the hardware is virtualized, real operating systems and real application software can still be used; virtual hardware appears to be real as far as the software is concerned. In fact, the software running on a virtual machine is allowed to execute instructions directly on the real CPU. This provides relatively good performance, comparable to actual hardware in most cases. A special process known as the *hypervisor* manages workload among virtual machines to ensure that each application has time to execute.

The result is that virtualization allows you to host real operating systems and real application software with fewer hardware resources.



To implement virtual machines, the NETLAB+ software interfaces with third party virtualization products that run on separate servers (not on the NETLAB+ server). This guide is specific to ESXi, from VMware Inc.



NETLAB+ provides remote PC access solutions for both virtual machines and real *standalone* PCs. However, due to the rapid progress of virtualization technology and the numerous benefits it provides, NDG recommends that all new remote PCs be implemented using virtual machines. New development and support for standalone PC interfacing is no longer provided by NDG.

1.4 What Does ESXi Provide?

VMware ESXi provides *virtualization server* software. The software abstracts computing resources so that several PCs or servers can run on the same physical server.

Each NETLAB+ remote PC or remote server runs inside of a virtual machine. ESXi provides virtual CPU, virtual memory, virtual disk drives, virtual networking interface cards, and other virtual hardware for each virtual machine. ESXi also provides the concept of a virtual networking switch. Virtual switches can be connected to real networks via host network adapters, allowing virtual machines to connect to real networks.





1.5 How Do NETLAB+ and ESXi Servers Work Together?

NETLAB+ interfaces with ESXi virtualization servers using protocols and application programming interfaces (API) to incorporate virtual machines (PCs and servers) into the lab environment, and make them remotely accessible in an easy-to-use, intuitive way. It also facilities sharing so that multiple users can access the keyboard, video and mouse of a virtual machine simultaneously.



Here is list of features and benefits provided by NETLAB+, working in conjunction with VMware virtualization servers.

- The keyboard, video and mouse of each virtual machine can be accessed without a "backdoor" network or interface on the virtual machine. Access to a virtual machine is proxied through NETLAB+ and the virtualization host system, similar to KVM-over-IP hardware solutions.
- No special client software (other than Java) is required on the user's computer. NETLAB+ will download its remote PC access application to the client whenever the user clicks on a PC.



- Multiple users can share access to a virtual machine simultaneously.
- NETLAB+ *multiplexes* virtual machine traffic using a single IP address and two TCP ports. It also provides a front-end to the virtual machine environment, so that virtualization servers and virtual machines do not have to be placed on production networks. This significantly increases security and eases firewall administration.
- If the user has a valid lab reservation, NETLAB+ will proxy client access to the keyboard, video and mouse of the virtual machine. This access is terminated when the lab reservation completes, ensuring that users of different reservations do not interfere with each other.
- NETLAB+ supports *revert to snapshot*. Changes to a virtual machine can be discarded at the end of a lab reservation, returning the PC to a clean state.
- Users can have administrative privileges on a virtual machine without risk.
- Users may power on, power off, and revert to clean state (scrub) from the NETLAB+ web interface.
- Users can shutdown and reboot a virtual machine during the lab, without losing changes.
- Virtual network interfaces on a virtual machine can be tied to real networks in the lab. NETLAB+ provides the framework to separate lab networks from real networks in a secure manner.

Virtualization using ESXi is performed on separate physical servers, not included with NETLAB+. You can interface with multiple ESXi servers if necessary.



Part 2 Planning

This section discusses the software and hardware requirements for planning a remote PC deployment using ESXi.

Objectives

- What software is required?
- What hardware is required?
- How many ESXi host servers do I need?

2.1 What Software Is Required?



Refer to the numbered diagram above.

- (1) Your NETLAB+ server must be running version **2009.R1** or later to interface with ESXi.
- (2) Each virtualization server requires either VMware ESXi Installable (software downloadable from <u>http://www.vmware.com</u>) or VMware ESXi Embedded (software pre-installed in flash memory by a PC hardware vendor). Other



VMware products are supported (see the table below). All examples and procedures in this guide are specific to ESXi.

(3) Each virtual machine requires a copy of a supported operating system. In ESXi and NETLAB+ terms, this is called a *guest operating system*. Please refer to the ESXi documentation to determine which operating systems versions are currently supported. NETLAB+ has been tested with Microsoft Windows and Linux operating systems.

Novell Netware is known to have problems with cursor updates, and is therefore not supported at this time.

(4) Each virtual machine can run application programs. These are installed on each virtual machine the same way you install software on a real PC.

2.1.1 **Product Licensing**

For the purpose of software licenses, each virtual machine is treated as an independent real PC or server. Please refer to the specific vendor license agreements (and educational discount programs, if applicable) to determine licensing requirements for your virtual machine's software, server software, operating systems, and application programs.



2.1.2 VMware Hosting Product Comparison

The following table compares NETLAB+ support and features for selected VMware hosting products. This guide is specific to **ESXi.** Should you decide to use one of the other listed products with NETLAB+, please switch to the respective <u>NETLAB+ Remote PC</u> <u>Guide</u> specific to the VMware product.

VMware ESXi 4.1 is not supported. Please do not upgrade your systems to VMware ESXi 4.1. NDG is working to resolve known issues concerning the use of ESXi 4.1 and plans to support this version in a future software release.

Product	VMware ESXi		VMware Server		VMware GSX
VMware Version	3.5 U3/U4/U5	4.01	2.x	1.x	3.x
NETLAB+ Support	Supported	Supported	Supported	Deprecated	Deprecated (2)
Minimum NETLAB+ Version	2009.R1	2009.R1	2009.R1	4.0.11	3.7.0
Architecture	Hypervisor	Hypervisor	Hosted	Hosted	Hosted
Minimum VMware Version Required	3.5 U3	4.01	2.0	1.0.3	3.1
VMware Versions Tested by NDG	3.5 U3/U4/U5	4.01	2.0	1.0.3 1.0.6 1.0.7	3.1 3.2
Host Operating System Required	No	No	Windows	Windows	Windows
Windows Server O/S Versions Tested	n/a	n/a	2003	2003 2000	2003 2000
Linux Server O/S Versions Tested	n/a	n/a	n/a (1)	n/a (1)	n/a (1)
NETLAB+ Feature Support:					
Remote PC Viewer	Yes	Yes	Yes	Yes	Yes
• Power On / Off	Yes	Yes	Yes	Yes	Yes
 Revert to Snapshot (scrub) 	Yes	Yes	Yes	Yes	Yes
USB Support within VM	No	No	Yes	Yes (USB 1.1)	

(1) VMware Server for Linux or VMware GSX for Linux is not currently supported or documented by NDG. However, you may run Linux as a *guest operating system* on virtual machines.

(2) VMware GSX has been replaced by VMware Server 1.x and VMware Server 2.x. 10/22/2010



2.1.3 NETLAB+ Support Summary for ESXi

	VMware ESXi 3.5	VMware ESXi 4.01
NETLAB+ Support Status	Supported	Supported
Minimum NETLAB+ Version Required	NETLAB+ 2009.R1	NETLAB+ 2009.R1
ESXi Minimum Version Required	ESXi version 3.5 U3	ESXi version 4.01
ESXi Versions Tested	ESXi version 3.5 U3/U4/U5	ESXi version 4.01
Guest Operating Systems Tested ^(1, 2)	Windows XP (x86, 32-bit)	Windows XP (x86, 32-bit)
Maximum Number of Running Virtual Machines (on each ESXi server host)	Varies with CPU and Hardware ³	Varies with CPU and Hardware ⁴
NETLAB+ Supported Features	Remote PC Viewer Power On Power Off Revert to Snapshot (scrub)	Remote PC Viewer Power On Power Off Revert to Snapshot (scrub
USB Support for Virtual Machines	No (a separate USB-over-IP solution is required to support USB devices)	No (a separate USB-over-IP solution is required to support USB devices)

(1) Please refer to the VMware Guest Operating System Installation Guide for specific product support, installation instructions and known issues.

(2) Older 32-bit processors will only support 32-bit guest operating systems. A 64-bit processor is required for 64-bit guest operating systems.

(3) NDG currently recommends no more than 4 running VMs per CPU core. VMware configuration maximums can be found at

<u>http://www.vmware.com/pdf/vi3_35/esx_3/r35u2/vi3_35_25_u2_config_max.pdf</u>. CAUTION: The numbers within this document are absolute maximums, not recommended values.

(4) NDG currently recommends no more than 8 running VMs per CPU core. VMware configuration maximums can be found at

<u>http://www.vmware.com/pdf/vsphere4/r40/vsp_40_config_max.pdf</u> CAUTION: The numbers within this document are absolute maximums, not recommended values.



2.1.4 NETLAB+ Known Issues for ESXi

In this section, we will discuss several known issues encountered when ESXi with NETLAB+.

2.1.4.1 NETLAB+ Does Not Currently Integrate with vCenter

NETLAB+ communicates directly with VMware ESXi hosts. Integration with vCenter and other VI Infrastructure components is planned.

2.1.4.2 No Built-In USB Support For Virtual Machines

A separate USB-over-IP solution is needed for virtual machines to access physical USB devices. Alternatively, VMware Server 2.0 supports USB 2.0 pass-through from host to virtual machine.

2.1.4.3 Continuous High CPU Utilization Causes Timeouts

Continuous high CPU utilization at or near capacity on all processor cores may cause API connection timeouts. This in turn may cause automated operations performed in NETLAB+ to fail.

Causes. Running too many active virtual machines on one server, and/or using a server with inadequate hardware resources.

Workaround #1. Add additional ESXi servers and divide the workload.

Workaround #2. Upgrade server CPU and memory. Additional CPU speed, processor cores and memory are usually helpful. See the hardware discussion in the later section for additional guidance.

2.1.4.4 NETLAB+ Not Tested With All Guest Operating Systems

VMware provides a <u>Guest Operating System Installation Guide</u> that contains a list of supported guest operating systems and the known issues for each. Not all operating systems in this document have been tested with NETLAB+.

We recommend that you thoroughly test each unique guest operating system in the NETLAB+ environment prior to production deployment. In particular, you should install the VMware Tools on the guest operating system, and then use the NETLAB+ Remote PC



Viewer to test for proper functioning of the keyboard, mouse, mouse cursor, and screen updates.

2.1.4.5 NETLAB+ Does Not Support Novell Netware

Novell Netware as a guest operating system is not supported by NETLAB+ at this time. There are known issues with cursor updates, making remote access unusable.

2.1.4.6 Mouse Cursor and VMware Tools

To use the mouse of a virtual machine from NETLAB+, VMware Tools must be installed and running on the virtual machine.

2.1.4.7 Installing an Operating System on a Virtual Machine using the NETLAB+ Remote PC Viewer

Normally you install an operating system and VMware Tools on a virtual machine using the VI or vSphere client before making the virtual machine available to NETLAB+ users.

In some cases you may wish to allow NETLAB+ users to install the operating system as part of a training exercise using the NETLAB+ Remote PC Viewer Application. In this case, the operating system installation must be performed using keyboard commands and shortcuts. The mouse cursor will not work properly during operating system installs because VMware Tools is not installed during the process (see 2.1.4.6).

2.1.5 Upgrading From VMware Server To ESXi

The management interfaces, APIs, and virtual machine settings for ESXi are significantly different from VMware Server 1.x and VMware Server 2.x, which has required NDG to develop this separate guide.

Configuration changes to both NETLAB+ and virtual machine settings are required when upgrading from VMware Server to ESXi. Appendix C documents the necessary changes.



2.2 ESXi Host Hardware Requirements

At this point, you have decided that ESXi is the appropriate product to host your virtual machines. (If not, please switch to the respective NETLAB+ guide that matches the specific VMware product.)

Henceforth, a reference to **"ESXi"**, **"ESXi host system"** and **"ESXi server"** in this document refers to a server running VMware's ESXi virtualization software.

Next, we will explore hardware requirements. The <u>VMware Hardware Compatibility</u> <u>Guide</u> provides a convenient reference to review hardware compatibility for your specific version of ESXi.

- If you are using VMware ESXi version 3.5, you may also consult the Requirements section of the <u>ESX Server 3i Installable Setup Guide</u> or the <u>ESX</u> <u>Server 3i Embedded Setup Guide</u>, depending on the version you have chosen. This is important, particularly if you wish to run 64-bit guest operating systems. (Be aware that VMware has made some recent changes to product names; some VMware documentation refers to ESXi by its old product name, ESX Server 3i).
- If you are using VMware ESXi 4.01, you may refer to the requirements section of the <u>ESXi Installable and vCenter Server Setup Guide</u> or the <u>ESXi Embedded and</u> <u>vCenter Server Setup Guide</u> depending on the version you have chosen. This is important, particularly if you wish to run 64-bit guest operating systems.

Remote PCs are implemented on one or more ESXi host systems (separate from the NETLAB+ server). The table below contains a list of recommended hardware for an ESXi server.

Servers that do not meet the minimum requirements listed may work, but may encounter performance issues and/or lack support for certain guest operating systems.

VMware ESXi only supports hardware RAID. If you are upgrading from VMware Server to VMware ESXi, be sure the RAID controller is supported by ESXi. Please note that the "on-board" RAID in many motherboards is actually software RAID (or "fake" RAID), because the actual RAID functions are performed by device drivers running on the host operating system. You can **potentially** run your SATA drives in a non-RAID configuration. More information regarding limitations is available in the <u>VMware</u> <u>Knowledge Base</u>. These options should only be considered by those seeking to make use of existing equipment. If you are purchasing new equipment, following the requirements in the <u>current test platform</u> section is your best option.





	Recommended Minimum / Features	Notes
Processor(s) ^{1, 2}	 x86-64 compatible (Intel, AMD) 4 or more cores 2.33 Ghz per core Intel-specific features: Intel 64 (formerly EM64T)^{1,2} Intel VT-x (Vanderpool) AMD-Specific Features: AMD64 revision D or later^{1,2} AMD-V (virtualization) 	 Examples that meet the minimum: Intel Xeon E5520 (Quad core)⁵ Intel Xeon E5410 (Quad core)⁴ Please search the <u>VMware Hardware</u> <u>Compatibility Guide</u> for supported processors.
Memory Disk ³	Up to 6TB 3TB RAID1	Install enough memory the maximum number of running virtual machines and the host. See note 3 below concerning RAID. VMware ESXi also supports external iSCSI and NAS storage arrays. Please search the <u>VMware Hardware</u> <u>Compatibility Guide</u> for supported processors.
Network Interfaces	 Dual (2) 100/1000 Ethernet with 802.1q Supported Interfaces: Intel server adapter (825XX chipset) with Advanced Network Support (ANS) features 	Please search the <u>VMware</u> <u>Hardware Compatibility Guide</u> for supported processors.

(1) x86-64 should not be confused with the Intel <u>Itanium</u> (formerly *IA-64*) architecture, which is not compatible on the native instruction set level with the x86 or x86-64 architecture.

(2) VMware provides a standalone utility that you can use without ESXi to perform the same check and determine whether your CPU is supported for ESXi virtual machines with 64-bit guest operating systems. You can download the 64-bit processor check utility from http://www.vmware.com/download.

(3) VMware ESX/ESXi only supports hardware RAID. If you are upgrading from VMware Server to VMware ESXi (or ESX in the future), be sure the RAID controller is supported by ESX/ESXi. Please note that the "onboard" RAID in many motherboards is actually software RAID (or "fake" RAID), because the actual RAID functions are performed by device drivers running on the host operating system. You can **potentially** run your SATA drives in a non-RAID configuration. More information regarding limitations is available in the <u>VMware Knowledge Base</u>. These options should only be considered by those seeking to make use of 10/22/2010 Page 20 of 128



existing equipment. If you are purchasing new equipment, following the requirements in the <u>current test</u> <u>platform</u> section is your best option.

⁴This hardware was used by NDG as the 2009 test platform.

⁵This hardware was used by NDG as the 2010 test platform. In the future, the E5520 will be the minimum processor that may be used to support the VMware IT Academy Program ICM course.



2.3 How Many ESXi Server Host Systems Do I Need?

The number of ESXi host systems and memory requirements vary based on the lab topologies and number of pods you want to implement.

As a general planning and budget guideline, NDG recommends no more than 10 to 12 virtual machines per server with hardware meeting the requirements in section 2.2. More virtual machines may be possible for certain workload types and/or high-end hardware.

Each virtual machine uses CPU cycles and memory on the server. The table below shows a hypothetical allocation of processor cores for virtual machines and other system tasks. You do not actually configure this; ESXi will do this dynamically based on workload.

CPU Core #1 (2.33 GHz)	VM1 VM2 VM3 VM4
CPU Core #2 (2.33 GHz)	VM5 VM6 VM7 VM8
CPU Core #3 (2.33 GHz)	VM9 VM10 VM11 VM12
CPU Core #4 (2.33 GHz)	ESXi and API processes

If you have more than one ESXi host server, consider spreading the VMs from each pod across all of host servers. This will evenly spread the load on critical system resources for each ESXi host (processing and memory).

Running too many virtual machines may starve the host and/or ESXi Server APIs. This may lead to timeouts and task automation failures in NETLAB+.

✓ If a single ESXi host is shared among multiple pods and the ESXi host does not meet the requirements from section 2.2, users from one pod may notice a substantial delay when the reservation begins/ends from another shared pod. When a reservation begins, NETLAB+ instructs the ESXi host server to power on or resume all Virtual Machines represented in that lab topology. When this occurs, the ESXi host may experience a high CPU load for several minutes. This can result in sub-optimal and even unresponsive communications for those NETLAB+ users logged in from a different pod, accessing virtual machines hosted by the same ESXi server.



Step-By-Step Guidance

Step 1. Carefully study your lab topologies and determine the number of virtual machines required by each pod. The requirements for several NETLAB_{AE} pods shown below assume that you are implementing all PCs supported by the pod.

The following table shows some of the pods that support virtual machines in NETLAB_{AE}. For an updated list of NETLAB_{AE} topologies, please view the <u>lab topologies page</u>.

	Maximum Virtual Machines
Multi-purpose Academy Pod(MAP)	3
Basic Router Pod v2 (BRPv2)	4
Basic Switch Pod v2 (BSPv2)	3
Cuatro Router Pod (CRP)	5
Cuatro Switch Pod (CSP)	4
LAN Switching Pod (LSP)	4
Network Fundamentals Pod (NFP)	5 required 2 optional
Network Security Pod 2.0 (NSP)	7

Step 2. Add up the number of virtual machines used by each pod you are implementing. For example:

Pod Name	Туре	Virtual Machines
POD 1	Basic Router Pod Version 2	4
POD 2	Basic Router Pod Version 2	4
POD 3	Basic Router Pod Version 2	4
POD 4	Basic Router Pod Version 1	0 (n/a)
POD 5	Basic Switch Pod Version 2	3
POD 6	Network Security Pod (2.0)	7
Total		22



Step 3. Assign each pod that supports PCs to an ESXi host server. Note, POD4 does not support PCs and uses no ESXi host resources.

ESXi Host #1 – Example				
Pod	Туре	Virtual Machines		
POD 1	Basic Router Pod Version 2	4		
POD 2 Basic Router Pod Version 2		4		
POD 3 Basic Router Pod Version 2		4		
Total		12		

ESXi Host #2 - Example				
Pod	Туре	Virtual Machines		
POD 5	Basic Switch Pod Version 2	3		
POD 6	Network Security Pod (2.0)	7		
Total 10				



Step 4. Based on the pod type and curriculum requirements, determine which guest operating system you will use on each virtual machine. Tabulate the operating system and memory requirements for the virtual machines. You should allocate the same amount of memory as you would if standing up a real PC. The following would represent typical choices for ESXi Host 1 in the previous example.

VMware Host System #1 - Example				
Pod	PC Name	Operating System	Memory (MB)	
POD 1	PC1a	Windows XP	128	
POD 1	PC1b	Windows XP	128	
POD 1	PC2	Windows XP	128	
POD 1	PC3	Windows XP	128	
POD 2	PC1a	Windows XP	128	
POD 2	PC1b	Windows XP	128	
POD 2	PC2	Windows XP	128	
POD 2	PC3	Windows XP	128	
POD 3	PC1a	Windows XP	128	
POD 3	PC1b	Windows XP	128	
POD 3	PC2	Windows XP	128	
POD 3	PC3	Windows XP	128	
Total		1536 (2GB) *		

* At least 4GB per server is now recommended to support recent mainstream operating system requirements with greater memory requirements.



Step 5. Translate the requirements from steps 1 through 4 into an itemized list for each server. The two VMware host systems in the previous examples would require the following items.

VMware Host System #1 - Example						
Quantity	Item	Role				
1	 Server Intel Core i7 920 (2.93 GHz X 4 cores) 4GB (recommended) 2 x 320GB Hard Disks with RAID1 support Dual (2) Intel Network Interfaces with 802.1q VLAN tag support 	server hardware				
1	ESXi	virtual machine software				
12	Windows XP (Home or Pro)	guest operating systems				

VMware Host System #2 - Example						
Quantity	Item	Role				
1	 Server Intel Core i7 920 (2.93 GHz X 4 cores) 4GB (recommended) 2 x 320GB Hard Disks with RAID1 support Dual (2) Intel Network Interfaces with 802.1q VLAN tag support 	server hardware				
1	ESXi	virtual machine software				
5	Windows XP (Home or Pro)	guest operating systems				
3	Windows 2000 Server	guest operating systems				
2	Linux	guest operating systems				



2.4 Management Station Requirements

It is also necessary to have at least one other computer to act as a management station. This computer must be running Windows, have network access to the ESXi server, and have Internet access.

The management software you use will depend upon the version of ESXi you have selected:

• If you are using VMware ESXi 3.5, the VMware Infrastructure Client software will be installed on this machine (see section 3.5). In this guide, the majority of screenshots show the use of the VMware Infrastructure Client. Please refer to the requirements in section 2.4.1.

If you are using VMware ESXi 4.01, the VMware vSphere Client will be installed on this machine. Since the majority of screenshots in this guide depict the use of the VMware Infrastructure Client, you will see minor differences between your system and the screenshots in this guide. Please refer to the requirements in section 2.4.2. The functionality is the same for both software versions. References to the VMware Infrastructure Client (VI Client) throughout this guide apply to both the VMware Infrastructure Client (ESXi 3.5) and the VMware vSphere Client (ESXi 4.01) except where indicated otherwise.

2.4.1 VMware Infrastructure Client (VI Client) Requirements

If you are using VMware ESXi 3.5, you will install VMware Infrastructure Client software as your management station on a machine meeting the following requirements:

Hardware Requirement

- **Processor** 266MHz or higher Intel or AMD x86 processor (500MHz recommended).
- **Memory** 256MB RAM minimum, 512MB recommended.
- **Disk Storage** 150MB free disk space required for basic installation. You must have 55MB free on the destination drive for installation of the program, and you must have 100MB free on the drive containing your %temp% directory.
- **Networking** Gigabit Ethernet recommended.

Software Requirements

• The VMware Infrastructure Client (VI Client) is designed for 32-bit versions of the Windows operating systems.



• The VI Client requires the Microsoft .NET 2.0 Framework, which will be automatically installed if it is not present on the system.

2.4.2 vSphere Client Requirements

If you are using VMware ESXi 4.01 you will install vSphere Client software as your management station on a machine meeting the following requirements:

Hardware Requirements

- **Processor** 266MHz or faster Intel or AMD processor (500MHz recommended).
- Memory 200MB RAM
- **Disk Storage** 1GB free disk space is required for a complete installation, which includes the following components:
 - Microsoft .NET 2.0
 - Microsoft .NET 3.0 SP1
 - Microsoft Visual J#
 - vSphere Client 4.0
 - vSphere Host Update Utility 4.0
- You must also have 400MB free on the drive that has your %temp% directory.
- If all of the prerequisites are already installed, 300MB of free space is required on the drive that has your %temp% directory, and 450MB is required for the vSphere Client 4.0.
- Networking Gigabit connection recommended.

Software Requirements

- The vSphere Client requires the Microsoft .NET 3.0 SP1 Framework. If your system does not have it installed, the vSphere Client installer installs it.
- For a list of supported operating systems, see the *Compatibility Matrixes* on the VMware vSphere documentation Web site. Getting Started with ESXi Installable VMware,



Part 3 ESXi Host System Setup

This section describes the initial preparation of an ESXi host system. After ESXi is installed and configured, virtual machines can be added (as *guests*) and integrated into the overall NETLAB+ system.

Objectives

- Install ESXi Server
- Become Familiar with the ESXi management console
- Learn about the IMAN networking model.
- Configure the Outside Interface
- Install VMware Infrastructure Client software
- Configure the Inside Interface

All tasks in this section are performed on **separate dedicated servers** that you provide. Do not perform any of the tasks in this section on the NETLAB+ server appliance, as this will delete the NETLAB+ software, requiring you to return it to the factory for reinstallation.

3.1 Installing ESXi Server

ESXi is available embedded in server hardware, or may be installed from a CD. When downloading ESXi, it is important to select a version that is compatible with NETLAB+. **Currently, the latest supported version is 4.01.**

Please do not upgrade your systems to VMware ESXi 4.1. NDG is working to resolve known issues concerning the use of ESXi 4.1 and plans to support this version in a future software release.

Instructions for downloading ESXi:

- 1. Please visit VMware's page for registration of VMware vSphere Hypervisor. This will include access to ESXi: <u>https://www.vmware.com/tryvmware/</u>
- 2. In order to obtain a free download, you must register. Login if you already have a VMware account.



- 3. After accepting the license agreement, you will receive a link via email that will bring you to the VMware vSphere Hypervisor Product License and Download page.
- 4. The page includes your license key for ESXi. Please make note of your license key, as you will need it in order to continue using ESXi beyond the evaluation period (see section 3.5.1).

Licensing Download Information			
Licensing			
ESXI			
This license key is only valid for VMware ESXi 4.1 and later. Option 1: VMware Go			

Although it is indicated that the license key is valid for 4.1 and later, the license key is valid for use with your download of 4.01.

5. Scroll down the page to locate the download for **ESXi 4.0** and follow the download procedure.

Version History - VMware ESXi 4.0 Update 1					
ESXi 4.0 Update 1 Installable (CD ISO) 11/19/09 4.0 Update 1 353 MB Binary (.iso)	Start Download Manager Image: Comparison of the second start				



 To patch from 4.0 U1 to U2, use the Host Update Utility, which is packaged with the vSphere client. For more information, refer to VMware's vSphere Upgrade Guide for details:

http://www.vmware.com/pdf/vsphere4/r40/vsp 40 upgrade guide.pdf

If you are using VMware ESXi 4.01, please review the information in the <u>Getting Started</u> <u>with ESXi Server Installable</u> guide. You may use this guide as a reference for ESXi 4.01 Installable and ESXi 4.01 Embedded versions, with the exception that using **ESXi Installable requires performing the installation procedure detailed on page 7**, *Install ESXi 4.0*.

If you are using VMware ESXi 3.5, please review the information in the <u>Getting Started</u> <u>with ESX Server 3i Installable</u> guide. You may use this guide as a reference for ESXi 3.5 Installable and ESXi 3.5 Embedded versions, with the exception that using **ESXi Installable requires performing the installation procedure detailed on page 4,** *Installing ESX Server 3i*.



3.2 Setup Using the ESXi Management Console

Following installation, power on the ESXi host (with a keyboard and monitor connected). When the ESXi host is powered on for the first time, it enters a boot-up phase during which system network and storage devices are configured with defaults. After the host completes the boot-up phase, the direct console appears on the attached monitor. In the subsection below, details are provided on configuring the administrative password. Additional setup tasks needed in order to configure the outside interface will be discussed in section 3.4.

3.2.1 Configuring the Administrative Password

The administrative username for the ESXi host is **root**. By default, the administrative password is *null*.

To configure a password for the ESXi server:

- 1. Press F2 to display the default configuration of the host.
- 2. Press F2 again, to display options to customize system options.
- 3. Select the **Configure Root Password** option.
- 4. When prompted for the old password, press enter.
- 5. Enter a new password.
- 6. Confirm the new password.
- 7. Make note of the password for future use.

3.3 ESXi Host Connectivity Using the IMAN Networking Model

Several types of network communication occur to and from the ESXi host system.

- **KVM.** Provides remote Keyboard/Video/Mouse access to virtual machines, via the NETLAB+ server.
- **API.** Provides an interface for NETLAB+ to query and control virtual machines (status, power on, power off, and revert to snapshot).
- Bridging (optional). Allows virtual machines to connect to real lab devices such as routers, switches, and firewalls. This is accomplished by connecting ESXi virtual machines to a virtual switch, then connecting the virtual switch to Virtual LANs (VLAN) behind NETLAB+ control switches. Although not documented in this guide, physical network adapters (NICs) on the VMware host system may be directly connected to lab devices as an alternative to VLANs, for special applications that require a more direct path between a virtual machine and external lab device.



• **Remote Management.** The ESXi host server and virtual machines are managed using the VMware infrastructure client, which you will install (see section 3.5).

NDG has developed a networking model, *Inside Networking with External Management* (IMAN) to facilitate this communication. IMAN is the only networking model recommended for use with ESXi. If you are upgrading from VMware Server 2.x or VMware Server 1.x, you may be familiar with the *Inside Networking with High Security* (ISEC) and *Outside Networking with External Management* (OMAN) models. These models are not recommended for use with ESXi.

Networking Model	IMAN Recommended for ESXi	ISEC	OMAN
Security	Very Good	Excellent	Good, with proper diligence in firewall configuration
Manage VMware hosts and virtual machines from VI Client	Yes	No	Yes
Required number of Ethernet ports in each VMware server	2	1	2
Requires 802.1q VLAN support on inside interface	Yes	Yes	Yes
Requires 802.1q support on outside interface	No	n/a	No
Requires native (untagged) VLAN 1 support on inside interface	Yes	Yes	No
KVM and API traffic flow	Inside network (control switches)	Inside network (control switches)	Outside network (user LAN)

The Inside Networking model with External Management (IMAN) provides a balance between security and manageability. All virtual machine traffic (Bridging), KVM, and automation traffic (API) remain behind the NETLAB+ inside interface (i.e. the control switches). The outside interface on each ESXi server provides a path for remote management of the VMware host system and virtual machines (via VI Client).





IMAN Features

 Provides a practical method for managing ESXi host systems and virtual machines, while keeping most NETLAB+ and lab communication safely on a private network.

IMAN Requirements

• Each ESXi Server requires two Ethernet interfaces.



3.4 Configuring the Outside Interface

In this section, we will perform tasks required to enable connectivity through the outside interface. The outside interface is used for external management of the ESXi server. This interface is referred to as the *Management Network* in VMware documentation.

To provide network access through the outside interface to your ESXi host, you have two options:

- Use the default DHCP (Dynamic Host Configuration Protocol) configured IP settings
- Configure a static IP address.

Use of a static IP address is highly recommended so that references to the IP address can be made without concern of future changes.

If you are using ESXi 3.5, the *Configuring Management Network* section of the <u>Getting</u> <u>Started with ESX Server 3i Installable</u> guide includes details on configuring static IP settings.

If you are using ESXi 4.01, the *Configuring IP Settings for ESXi* section of the <u>Getting</u> <u>Started with ESXi Server Installable</u> guide includes details on configuring static IP settings.

3.5 Verifying and Managing the ESXi Host Using VI Client

As discussed in section 2.4, if you are using ESXi 4.01, you will use the vSphere client, instead the VMware Infrastructure Client (VI Client) as described this section. The functionality is the same for both software versions.

For details on installing the vSphere client, please refer to the *Install the vSphere Client* section of the <u>Getting Started with ESXi Server Installable</u> guide.

You will manage your ESXi host using the VMware Infrastructure Client (VI Client). This client software may be installed on any windows based computer on your network that has access to your ESXi server through the outside interface (see section 3.4).

Open a web browser and enter the IP address of your ESXi server. If you have properly configured your outside interface, you will view the ESXi server's static web page.







Select the **Download VMware Infrastructure Client** link to download the client software. Download and run the executable file on your local machine. The installation wizard will guide you through the installation process.
NETLAB+ Remote PC Guide for VMware Implementation Using ESXi Version 3.5/4.01





Enter the outside network address of the host, **root** as the user name, and password (if configured) to login to VMware Infrastructure Client (VI Client). The inside interface tasks in section 3.6 will be completed using the VI Client.

🕝 VMware Infrastructu	re Client 🛛 🔀
Mware Infra	structure Client
To directly manage a single To manage multiple hosts, VirtualCenter Server.	e host, enter the IP address or host name. enter the IP address or name of a
IP address / <u>N</u> ame:	10.0.0.30
<u>U</u> ser name:	root
Password:	******
	Login <u>C</u> lose <u>H</u> elp



During initial login, a security warning may be displayed. This security-warning message occurs because the VI Client detected a certificate signed by the ESXi host itself (default setting). For highly secure environments, certificates generated by trusted third-party are recommended. You can set up third party certificates later if you choose.

3.5.1 Entering the ESXi License Key

It is necessary to enter a license key in order to continue using ESXi beyond the evaluation period. If the key is not entered, you will be unable to use ESXi when the evaluation period is over. See section 3.1 for details on obtaining a license key.

The screen-shots shown here may vary slightly from your system, depending on the version of ESXi you are using.

1. Using the vSphere Client, select **Configuration > Licensed Features** and click **Edit** next to **ESX Server License Type**.

Getting Started Summary Virtual	Machines Resource Allocation Performance Configuration Local Use
Hardware	Licensed Features
Health Status	ESX Server License Type Edit.
Processors	
Memory	Product: vSphere 4 Enterprise Plus Licensed for 2 physical CPUs (1- License Key:
Storage	Expires: 3/21/2011
Networking	Product Features:
Storage Adapters	Up to 8-way virtual SMP
Network Adapters	vCenter agent for ESX Server
Advanced Settings	VMsafe
Power Management	dvFilter VMware HA
Software	Hot-Pluggable virtual HW vMotion
Licensed Features	VMware FT Data Recovery



2. Select the option to **Assign a New License Key to this host**, enter the license key, and select OK.

Produce		Available
Evaluation N	/lode	
O (No Licer	nse Key)	
Add Lice	ense Key	
New license <u>k</u> ey:	:	
looian o nou lioo	nse key to this host	
kssign a <u>n</u> ew lice		
Enter Key		
Enter <u>K</u> ey		
Enter <u>K</u> ey		
Enter <u>K</u> ey Enter <u>K</u> ey uct: - acity: -		
Enter <u>K</u> ey Enter <u>K</u> ey uct: - city: - able: -		
Enter <u>K</u> ey Enter <u>K</u> ey uct: - acity: - es: -		

3.6 Configuring the Inside Interface

All virtual machine traffic (Bridging), KVM, and automation traffic (API) will take place through the inside interface using the IMAN networking mode. The Inside Interface is configured using VI Client.

- ESXi 3.5 users, please use the *ESX Server 3i Configuration Guide*, chapter 2, *Networking*, as a reference to aid in understanding the concepts and terminology involved.
- ESXi 4.01 users, please use the *ESXi Configuration Guide*, chapter 2, *Networking*, as a reference to aid in understanding the concepts and terminology involved.



3.6.1 Understanding VLAN 1 and Bridged VLANs

The number of physical adapters required is greatly reduced by using VLANs. In the IMAN model, *VLAN 1* is used to transport KVM and API traffic between NETLAB+ and the ESXi host. *Bridged* VLANs are used to transport network data between virtual machines and real lab equipment. The Inside Physical Interface runs 802.1q and acts as container for VLANs. VLAN 1 corresponds to the native (untagged) VLAN on the control switch.



3.6.2 Adding a Virtual Switch

Select the Configuration tab on VI Client and click on the **Networking** section. You will see that your first virtual switch has been assigned a VMkernel Port, **Management Network**. This represents the connection you have established through the outside interface to allow you to use VI Client to manage your ESXi server. A virtual switch must be added for the inside connection. Select **Add Networking** to start the **Add Network Wizard**.

esxi.intranet VMware ESX Server 3i, 3.5.0, 123629			
Getting Started Summary	Virtual Machines Resource Allocation Performance Configuratio	n 🛛	
Networking	Refresh Add Networkin	ıg	
Virtual Switch: vSwitch0	Remove Properties	^	
VMkernel Port Management Network 10.0.0.30	Physical Adapters		
<	1111	>	

3.6.2.1 Selecting the VMkernel Connection Type

Use the VMkernel connection type for the Inside Interface.

🖉 Add Network Wizard		×
Connection Type Networking hardware ca	n be partitioned to accommodate each service requiring connectivity.	
Connection Type Network Access Connection Settings Summary	Connection Types Virtual Machine Add a labeled network to handle virtual machine network traffic. VMkernel The VMkernel The VMkernel TCP/IP stack handles traffic for the following ESX services: VMware VMotion, iSCSI, NFS and host management.	
Help	≤Back Next ≥ Cancel	



3.6.2.2 Selecting the Network Adapter

As noted in the hardware requirements (section 2.2), your server must have at least 2 NIC cards. The Inside Interface and Outside Interface must be on different virtual switches. In this example, vmnic1 has been selected for the inside interface, (the outside interface is on vmnic0, as shown in section 3.4).

The selection and number of network adapters on your system will vary depending on your hardware selections.

🖉 Add Network Wizard				_ 🗆 🔀
VMkernel - Network A The VMkernel reache	ccess is networks through uplink adapters attached	to virtual switches.		
Connection Type Network Access	Select which virtual switch will handle th using the unclaimed network adapters	he network traffic for thi listed below.	is connection. You may also create a new	v virtual switch
Connection Settings Summary	Create a virtual switch	Speed	Networks	
	🖂 🗐 vmnic3	down		
	mic2	down		
	Vmnic1	100 Full		
	C Use vSwitch0	Speed	Networks	
	m 📰 vmnic0	1000 Full	10.0.0.24-10.0.0.27	
	Preview:			
	VMkernel VMkernel	Physical Adapt	ers c1	
Неір	,		≤Back Next ≥	Cancel

3.6.2.3 Selecting Connection Settings

Enter **"Untagged NETLAB Inside Interface"** as the Network Label. The **VLAN ID** should be set to **"0"**.

Configure the TCP/IP settings for the Inside Interface using the table on the next page.

- Do not use the same IP address on more than one server.
- Do not use 169.254.0.254 (this is assigned to the NETLAB+ server)



NETLAB+ Remote PC Guide for VMware Implementation Using ESXi Version 3.5/4.01

🖉 Add Network Wizard 📃 🗆 🔯			
VMkernel - Connection Set Use network labels to iden	ttings tify Wikernel connections while managing your hosts and datacenters.		
Connection Type Network Access Connection Settings Summary	Port Group Properties Network Label: Untagged NETLA8 Inside Interface ULAN ID (Optional): Use this port group for VMotion		
	C Obtain IP settings automatically IV Use the following IP settings: IP Address: Subnet Mask: VMkernel Default Gateway: 10 0 10 0		
	Preview:		
	VMkamel Pert Untagged NETLAB Inside Interfa 169.254.0.251		
Help	≤Back Next ≥	Cancel	

Use this table to select the appropriate IP settings.

ESXi Host Server > Untagged NETLAB Inside Interface > TCP/IP Properties			
IP Configuration Interface	VLAN 1 (untagged VLAN sub-interface)		
IP Address	169.254.0.250	1 st server	
	169.254.0.251	2 nd server	
	169.254.0.252	3 rd server	
	169.254.0.253	4 th server	
	169.254.0.254	NETLAB+ DO NOT USE	
	169.254.0.240	5 th server	
	 169.254.0.249	 14 th server	
Subnet Mask	255.255.255.0		
Default Gateway	None (leave blank)		
Preferred DNS Server	None (leave blank)		
Alternate DNS Server	None (leave blank)		

3.6.2.4 Finishing the Configuration of the Virtual Switch

Select **Finish** to complete the configuration process.

🖉 Add Network Wizard		
Ready to Complete Verify that all new and	i modified virtual switches are configured appropriately.	
Connection Type Host networking will include the following new and modified v5witches: Network Access Preview:		
<u>Connection Settings</u> Summary	Unkernel Port Unkagged NETLA8 Inside Interfa Physical Adapters wmnic1 169.254.0.251	
Help	≤ Back Einish Cancel	

Your new virtual switch is now displayed on the networking page. Notice the \times mark displayed near vmnic1, this indicates that the connection has not yet been physically cabled. Cable your connection and the \times will be removed.

esxi.intranet ¥Mware ESX Server 3i, 3.5.0, 123629		
Getting Started Summary	Virtual Machines 🔨 Resource Allocation 🔨 Performan <	
Networking	Refresh	
Virtual Switch: vSwitch0	Remove Properties	
VMkernel Port Management Network 10.0.0.30	Physical Adapters	
Virtual Switch: vSwitch1	Remove Properties	
VMkemel Port Untagged NETLAB Inside I 169.254.0.251	nterfa 👷 Physical Adapters	



3.6.3 Adding a VLAN3 Placeholder

Add a VLAN3 placeholder, which will serve as the first virtual machine network connection type. This placeholder is necessary since at least one VM network connection type must be present prior to adding your first virtual machine (see Part 4). It will not be possible to create a virtual network adapter for your virtual machines without this placeholder.

Placeholder VLAN3 also serves as an example of how you will later add VLAN adapters for your pod VMs (section 5.2). After you have added VMs and pod VLANs to the Inside Interface, you may delete this placeholder (section 5.4).

Begin by selecting Add Networking to start the Add Network Wizard.

esxi.intranet ¥Mware ESX Ser	ver 3i, 3.5.0, 123	629		
Getting Started Summary N	Virtual Machines 🔍	Resource Allocation	Performance	Configuration 🛛
Networking			Refresh	Add Networking

3.6.3.1 Selecting the Network Connection Type

Use the Virtual Machine connection type for VLAN3.

(🖉 Add Network Wizard 👘	
	Connection Type Networking hardware can	be partitioned to accommodate each service requiring connectivity.
	Connection Type Network Access Connection Settings Summary	Connection Types Virtual Machine Add a labeled network to handle virtual machine network traffic. VMkernel The VMkernel TCP/IP stack handles traffic for the following ESX services: VMware VMotion, iSCSI, NFS and host management.
	Help	≤Back: Next ≥ Cancel

3.6.3.2 Selecting the Network Adapter

Placeholder VLAN3 must be assigned to use the same virtual switch as the Inside Interface. In this example, vmnic1 was selected for the Inside Interface (see section 3.6.2.2); therefore, the VLAN3 placeholder must also be assigned to vmnic1.

The selection and number of network adapters on your system will vary depending on your hardware selections.

🖉 Add Network Wizard	🖉 Add Network Wizard 📃 🗔 🔀				
Virtual Machines - Neto Virtual machines read	work Access h networks through uplink adapters atta	ched to virtual switches.			
Connection Type Network Access	Select which virtual switch will han using the unclaimed network adap	dle the network traffic for thi ters listed below.	is connection. You may also create a ne	w virtual switch	
Connection Settings	U Lreate a virtual switch	opoed	1000010	^	
Summary	🖂 🖼 vmnic3	down			
	🕅 🛄 vmnic2	down			
	C Use vSwitch0	Speed	Networks		
	m 📰 vmnic0	1000 Full	10.0.0.25-10.0.0.25	=	
	Use vSwitch1	Speed	Networks		
	🕅 👪 vmnic1	100 Full		*	
	Preview:				
	- Virtual Machine Port Group	👳 🔶 Physical	Adapters		
	VMkemel Port Unkagged NETLAB Inside In 169-254.0.251	iterfa 👳 🖕			
Help			≤Back Next ≥	Cancel	

3.6.3.3 Selecting Connection Settings

Assign "VLAN3 Placeholder" as the Network Label. Enter "3" as the VLAN ID.

🖉 Add Network Wizard 📃 🗔 🔀					
Virtual Machines - Connection Settings Use network labels to identify migration compatible connections common to two or more hosts.					
Connection Type Port Group Properties Network Access Network Label: VLAN3 Placeholder 3					
	Preview:				
	Virtual Machine Port Group VLAN3 Placeholder VLAN3 Placeholder VLAN3 VMixemel Port Untagged NETLAB Inside Interfa				
Help	≤Back Next ≥	Cancel			



3.6.3.4 Finishing the Configuration of the VLAN3 Placeholder

Select **Finish** to complete the configuration process.

🖉 Add Network Wizard		_ 🗆 🛛		
Ready to Complete Verify that all new and modified virtual switches are configured appropriately.				
Connection Type Host networking will include the following new and modified v5witches: Network Access Preview:				
Summary	Virtual Machine Port Group VLAN3 Placeholder VLAN3 Virkemel Port Unkagged NETLAB Inside Interfa 9			
Help	≤ Back Einish	Cancel		

The **VLAN3 placeholder** is now displayed on the networking page. Note that VLAN3 is on the same virtual switch as the Inside Interface.

), 123	629	
ies	Resource Allocation Performance	Configuration Users & Groups Events Permissions
Nel	tworking	
Virt	ual Switch: vSwitch0	Remove Properties
P	VMkernel Port Management Network Q	Physical Adapters
Virt	ual Switch: vSwitch1	Remove Properties
Ŗ	VMkernel Port Untagged NETLAB Inside Interfa 169.254.0.251	Physical Adapters wmnic1 100 Full
Ŗ	Virtual Machine Port Group VLAN3 Placeholder VLAN 3	



3.6.4 Establishing the Inside Connection

In this section, you will establish a connection between the ESXi host inside port and NETLAB+ server.

Objectives

- Select a reserved control switch and port.
- Configure the control switch port.
- Bring up the link.
- Verify ESXi host system can connect to NETLAB+ using VLAN 1.

3.6.4.1 Allocating a Reserved Port on Control Switch for Inside Connection

There are several issues to keep in mind when selecting a reserved port. Remember that reserved ports operate in VLAN 1, so there are no consecutive port requirements. Typically, when installing control devices, it is desirable to connect NETLAB+, access servers, switched outlet devices, and all other control switches to Control Switch 1, in a hub and spoke fashion. Please refer to the *Installing the Control Plane* section of the *NETLAB+ Installation Guide* for detailed discussion of reserved ports and control devices.

For each ESXi server you install, the inside connection may be located on any reserved port that is available on a control switch. In most cases, you may have more than one control switch and ESXi server. If this is the case, you should try to select a reserved port from the same control switch where the pods associated with the ESXi server reside. In some circumstances, your ESXi server may be hosting several pods. Consequently, the reserved port may be located on a different control switch, if all links between control switches are also configured as 802.1q trunks and all VLANs are allowed. The most important factor would be keeping the pod gear communication and ESXi server communication located on one or two control switches.



3.6.4.2 Configuring a Reserved Control Switch Port for Inside Connection

One reserved port on the control switch connects to an 802.1q NIC card on the ESXi server. This allows devices in the pod to communicate with virtual machines. The reserved port should be configured as an 802.1q trunk port.

Once you have allocated a reserved port on the control switch, connect the ESXi server inside NIC using a straight through CAT5 cable. Configure the switch port as a trunk.

Example switch port configuration. Interface number will vary.

```
interface FastEthernet0/23
description inside connection for ESXi Server #1
switchport mode trunk
switchport nonegotiate
no switchport access vlan
no shutdown
```

The control switch console password is **router**. The enable secret password is **cisco**. These passwords are used by NETLAB+ automation and technical support - please do not change them.

3.6.4.3 Configuring Trunking Between Multiple Control Switches

If the reserved port selected for your ESXi server is on a different control switch than the lab equipment pods it is serving, you must ensure that inter-switch links between control switches are configured in trunking mode. Some switch models will automatically form trunks. However, it is recommended that both sides be manually configured as trunk ports per the configuration commands below.

Example switch port configuration. Interface number will vary.

```
interface FastEthernet0/24
description Trunk to control switch #2
switchport mode trunk
switchport nonegotiate
no switchport access vlan
no shutdown
```



3.6.4.4 Connecting the Inside Interface and Verify Link

After you have configured the reserved the port as described in the previous section, verify your cabling between the reserved port and the ESXi server inside NIC. Check the interface status of the reserved port:

```
netlab-cs1#show interfaces FastEthernet 0/23
FastEthernet0/23 is up, line protocol is up (connected)
```



3.7 Creating a NETLAB+ User Account

A NETLAB+ user account must be created on the ESXi host, using VI Client. NETLAB+ will use this account to control virtual machines through the VMware API.

Users & Groups \rightarrow View **Users** \rightarrow *Right-Click* on the page \rightarrow **Add**

esxi.intranet VMware E5X Server 3i, 3.5.0, 123629				
Getting Started Summary Virtual Machines Resource Allocation Performance Configuration Users & Groups Events Permissions				
View: Us	ers Groups			
UID	User	Name		
2	daemon	daemon		
65534	nfsnobody	Anonymous NFS User		
0	root	Administrator		
	esxi.intran Gatting Sta /iew: Us UID 2 65534 0	Essi.intranet VMware ESX Server 3i, 3.5.0, 1 Getting Started Summary Virtual Machines View: Users Groups UID User 2 daemon 65534 nfsnobody 0 root		

The recommended login is **netlab**. You may also enter a user name (optional). You must enter a password for this account. We recommend choosing a strong password.

Make note of the login and password you assign to this user account. You will need to enter this information as PC configuration settings in section 4.10.

🕝 A dd New Us	er	
User Information	on	
Login:	netlab	UID:
User Name:	netlab api	
	User name and UID are o	ptional
Enter passwo	rd	
Password:	****	
Confirm:	****	
	ship	
Group:		Add
	•	Remove
		OK Cancel



3.8 Creating the NETLAB VM Role

Roles are a combination of access permissions that can be assigned to a user or group. VI Client includes several preconfigured roles, including Administrator. You will create a role that will be assigned to your NETLAB+ user account (section 3.7). Assigning this role, with the proper access permissions configured, will allow NETLAB+ to access virtual machines through the VMware API.

Administration \rightarrow Roles \rightarrow *Right-Click* on the page \rightarrow Add

inventory	Administration			ø	
🛓 🕈 Add Role	🛓 Add Role 🏦 Clone Role				
Holes Syste Roles	em Logs	Usage	: Administrator		
Name			ha-folder-root		
No Access			🤱 root		
Read-Only		i	🚑 dcui		
Administrator					

Add the **"NETLAB VM Role"** role and select the **Virtual Machine** checkbox. This will enable permissions for the **NETLAB VM Role** for all virtual machine permission subcategories.



NETLAB+ Remote PC Guide for VMware Implementation Using ESXi Version 3.5/4.01

Name NETLAB VM Role Privileges Use the checkboxes below to enable or disable permissions available to this role. Select a unique name for the role and click OK. Image: Select a unique name for the role and click OK. Image: Select a unique name for the role and click OK. Image: Select a unique name for the role and click OK. Image: Select a unique name for the role and click OK. Image: Select a unique name for the role and click OK. Image: Select a unique name for the role and click OK. Image: Select a privilege to view its description Image: Select a privilege to view its description	Add Role	
Privileges Use the checkboxes below to enable or disable permissions available to this role. Select a unique name for the role and click OK. All Privileges All Privileges Global Global	Enter Name: NETLAB VM Role	
All Privileges Global Folder Datacenter Datastore Datastore Network Host Virtual Machine Virtual Machine Y Inventory Y Interaction Y Configuration Y State Y Provisioning Description: Select a privilege to view its description	Privileges Use the checkboxes below to enable role. Select a unique name for the rol	or disable permissions available to this e and click OK.
Global ➡ Global ➡ Datacenter ➡ Datastore ➡ Network ➡ Host ➡ Ø Inventory ➡ Ø Configuration ➡ Ø State ➡ Ø Provisioning ➡ Ø Resource	En 🗹 All Privileges	
Datacenter Datastore Network Host Virtual Machine Vi		
Image: Constant of a state Image: Configuration	Datacenter	
Help		
Virtual Machine Inventory Interaction Of Configuration Of Configuration Of Configuration Provisioning Resource		
Help	🖻 🗹 Virtual Machine	
Configuration State Provisioning Resource Description: Select a privilege to view its description		
Image: State Image: Provisioning Image: Provisioning <td>🕀 🗹 Configuration</td> <td></td>	🕀 🗹 Configuration	
Provisioning Resource Description: Select a privilege to view its description	🕀 🗹 State	
Description: Select a privilege to view its description		
Help OK	Description: Select a privilege to a	view its description
Help	boochpilonn boloccia privilogo to	norries description
Help OK Cascal		
LIEU LODGOL	Help	or Caral

3.9 Assigning Permissions to the NETLAB+ User Account

Assign virtual machine permissions to the NETLAB+ user account created in section 3.7 by assigning it to the role created in section 3.8.

esxi.intranet YMware ESX Server 3i, 3.5.0, 123629				
Getting Started Summary Virtual Machines	Resource Allocation Performance	Configuration Users & Groups Events Permissions		
User/Group	Role	Defined in		
💄 dcui	Administrator	This object		
🚨 root	Administrator	This object		

➢ Permissions → Right-Click on the page → Add Permission → Add → select netlab user



NETLAB+ Remote PC Guide for VMware Implementation Using ESXi Version 3.5/4.01

one or more of	the names and assign a	role.		
Licers and Grou		🖉 Select Users		
These users an object accordin	d groups can interact wi g to the selected role.	Select users and groups to Check Names feature to va	include in this role. You can also manually ente alidate your entries against the directory.	r names and use the
		Domain: (serv	ver)	
Name	Role	1,		
		Users and Groups		
		Show Users First	·	Search
		Name	Description	
		2 root	Administrator	
		8 nobody	Nobody	3
		8 nfsnobody	Anonymous NFS User	L
		💄 dcui	DCUI User	
		🔒 daemon	daemon	
		👗 netlab	api client	
		Add		
		Users:		
	Add	Groups:		
		aroups.	to an heat a second second second second	
Help		Note: Separa	te multiple names with semicolons.	
		Check Names		

The **netlab** user name will now appear in the users and groups list of the assign permissions page. Select the **NETLAB VM Role**, which has all virtual machine permissions, as defined in section 3.8.



🖉 Assign Permissions 🛛 🔀				
To assign a permission to an individual or group of users, add their names to the Users and Groups list below. Then select one or more of the names and assign a role.				
Users and Groups These users and groups can interact with the currer object according to the selected role.	Assigned Role Selected users and groups can interact with the current object according to the chosen role and privileges.			
Name Role Propaga	e NETLAB VM Role			
A netlab NETLAB VM Ro Yes	All Privileges Global Folder Datacenter Datastore Datastore Host Virtual Machine Virtual Machine Yinturation State Your State Provisioning Description: Select a privilege to view its description			
Add Remove	Propagate to Child Objects			
Help	OK Cancel			

Select **OK** to assign the **NETLAB VM Role**. You will see the User/Role assignment displayed.

	esxi.intranet YMware ESX Server 3i, 3.5.0, 123629				
l	Gett	ing Started Summary Virtual Machines	Resource Allocation Performance	Configuration Users & Groups Events Permissions	
1	User	Group	Role	Defined in	
I	2	netlab	NETLAB VM Role	This object	
	۵.	dcu	Administrator	This object	
	8	root	Administrator	This object	



Part 4 Adding Virtual Machines

This section explains how to configure a new ESXi virtual machine and the proper settings required for NETLAB+. Repeat this process for each new virtual machine.

After completing preparation of each host server as described in Part 3, virtual machines can be added (as *guests*) and integrated into the overall NETLAB+ system.

Objectives

- Add virtual machines to the ESXi server host system.
- Make virtual machines accessible to NETLAB+ users.

The process outlined in this section must be followed for each virtual machine added to the system.

4.1 Creating a New Virtual Machine Using the VI Client

In section 3.5, you downloaded the VMware Infrastructure client to a machine connected to your outside interface. Enter the outside network address of the host, use **root** as the user name, and password (if configured).

🕝 VMware Infrastructu	re Client	
Mware Infra	structure Client	
To directly manage a singl To manage multiple hosts, VirtualCenter Server.	e host, enter the IP address or host na enter the IP address or name of a	me.
IP address / <u>N</u> ame:	10.0.030	
<u>U</u> ser name:	root	
Password:	****	
	Login <u>C</u> lose	<u>H</u> elp

The **Getting Started** tab includes a **Basic Tasks** section. Select the **Create a new virtual machine** option. The subsections below will provide information on each step you will need to follow using the **New Virtual Machine Wizard.**



4.1.1 Selecting the Custom Configuration Option

Select the **Custom** option for your virtual machine configuration.

🕗 New Virtual Machine W	izard 📃 🔍
Select the Appropriate Co How would you prefer to	nfiguration Virtual Machine Version: 4 configure your virtual machine?
Wizard Type Name and Location Datastore Guest Operating System CPUs Memory Network I/O Adapters Select a Disk Ready to Complete	Virtual Machine Configuration
Help	_≤Back Next ≥ Cancel



4.1.2 **Providing a Name for Your Virtual Machine**

You will be prompted to enter a name for your new virtual machine.

Choose a name for the virtual machine very carefully. Here are two recommended naming conventions to consider:

- [VM NAME] = [POD_X_PC_Y]: If you do not plan on moving virtual machines from one pod to another, we recommend that you include the NETLAB+ pod number and/or PC ID in the name.
- [VM NAME] = [SERVER_X_VM_Y]: Another, more flexible naming convention would include the ESXi server number and virtual machine number. This method would be useful if you are going to be moving virtual machines from one pod type to another.

New Virtual Machine W	/izard
What do you want to cal	I this virtual machine and where do you want it located? Virtual Machine Version: 4
Wizard Type	Provide a name for the new virtual machine and select its location in the inventory panel below. Virtual machine names can contain up to 80 characters, but they must be unique within each inventory folder.
Datastore	
Guest Operating System	Name:
CPUs	NETLAB Server 3 VM 2
Memory	here a start a
Network	Virtual machine folders are unavailable when connected directly to the bost
I/O Adapters	virtual machine routers are unavailable when connected directly to the host.
Select a Disk	
Ready to Complete	
Help	≤ Back Next ≥ Cancel

Since we have established a direct connection to the host, we will not be prompted to enter an inventory location. Select **Next** to continue.



4.1.3 Selecting a Datastore

Virtual machine files are stored in a *datastore*. Select a datastore for the virtual machine that will be adequate to store the guest operating system and all of its software applications for pod labs.

🖉 New Virtual Machine W	izard					
Choose a Datastore for th Where do you want to sto	e Virtual Machine ore the virtual machin	e files?			١	Virtual Machine Version: 4
Wizard Type Name and Location Datastore Guest Operating System CPUs	Select a datastore in which to store the files for the virtual machine. It is advisable to choose a datastore that is large enough to accomodate the virtual machine and all its virtual disk files, so that they may all reside in the same place.					
Memory	Name	Capacity	Free	Туре	Access	
Network	[datastore1]	143.75 GB	133.80 GB	VMFS	Single host	
I/O Adapters Select a Disk Ready to Complete						
Help				<u> </u>	Back Next	≥ Cancel

4.1.4 Selecting the Guest Operating system

The Guest Operating system and version of your choice that you will install on the virtual machine must be selected.

In this example, Microsoft Windows Server 2003 is selected as the Guest Operating System.



NETLAB+ Remote PC Guide for VMware Implementation Using ESXi Version 3.5/4.01

🖉 New Virtual Machine Wiz	zard 📃 🗆 🔀
Choose the Guest Operatin What Guest operating syst	g System Virtual Machine Version: 4 em do you plan to use with this virtual machine?
Wizard Type Name and Location Datastore Guest Operating System CPUs Memory Network I/O Adapters Select a Disk Ready to Complete	Guest Operating System: Microsoft Windows Linux Novell NetWare Solaris Other Version: Note: The selection on this page allows the wizard to provide defaults for various virtual machine parameters suitable for the guest OS you intend to install. Your selection is also recorded as part of the virtual machine's configuration to allow hosts to optimize scheduling and other handing of the virtual machine for the targeted guest OS. This wizard does not install any guest OS for you.
Help	≤ Back Next ≥ Cancel

4.1.5 Selecting the Number of Processors

Selecting the default value of **1** for number of processors in the virtual machine is typically sufficient, depending on the applications you will run on the virtual machine.

🖉 New Virtual Machine W	izard		_ 🗆 🔀
Virtual CPUs Configure the number of	virtual processors in the virtual machine.		Virtual Machine Version: 4
Wizard Type Name and Location Datastore Guest Operating System CPUs Memory Network I/O Adapters Select a Disk Ready to Complete	Number of virtual processors:	1	
Help		<u>≤</u> Back	Next ≥ Cancel

4.1.6 Configuring the Memory Size

Choose the amount of physical memory that will be allocated to the virtual machine. In most cases, you may use the default settings for memory. If memory space is a concern, you may need to select a value closer to the recommended minimum. Please make sure you do not oversubscribe system resources (see section 2.1.4.3)

🕝 New Virtual Machine Wi	zard				_ 🗆 🗙
Memory Configure the virtual machi	ne's memory size.			Virtual N	lachine Version: 4
Wizard Type Name and Location Datastore Guest Operating System CPUs Memory Network I/O Adapters Select a Disk Ready to Complete	Specify the amount of memory allocated to The memory size must be a multiple of 4M Memory for this virtual machine: 4 655 To set the memory to one of the indicated click the colored triangle on the slider above below. A Guest OS recommended minimum Recommended memory Guest OS recommended maximum Maximum for best performance	o this virtual machin B. - 256 - 332 J values, you may ve or in the legend 128 MB 256 MB 4096 MB 4088 MB	ie. MB		
Help			<u>≤</u> Back	Next >	Cancel

4.1.7 Choosing Network Connections

In most cases, it will be necessary to connect a Network Interface Card (NIC) to the virtual machine. (If your equipment pod will consist of only one individual PC, a Network Adapter is not necessary and number of NICs may be set to "None").

Establishing networking connections will be handled as a separate task in Part 5. For now, use the VLAN3 placeholder as your selection.

🖉 New Virtual Machine Wi	zard 📃 🖂 🖂 🖂 🖂
Choose Networks Which network connections	will be used by the virtual machine? Virtual Machine Version: 4
Wizard Type Name and Location Datastore Guest Operating System CPUs Memory Network I/O Adapters Select a Disk Ready to Complete	Create Network Connections How many NICs do you want to connect? I Connect at Power On NIC 1: VLAN3 Placeholder Flexible Adapter choice can affect both networking performance and migration compatibility. Consult the VMware KnowledgeBase for more information on choosing among the network adapters supported for various guest operating systems and hosts.
Help	≤Back Next ≥ Cancel



4.1.8 Selecting the I/O Adapter Types

In most cases, you may use the default setting for I/O adapter types. Be aware also of any requirements due to your selection of guest operating system (section 4.1.4).

🖉 New Virtual Machine Wi	zard	
Select I/O Adapter Types Which I/O Adapter Types	would you like to use?	Virtual Machine Version: 4
Wizard Type Name and Location Datastore Guest Operating System CPUs Memory Network I/O Adapters Select a Disk Ready to Complete	Storage Adapter Types IDE Adapter: Standard ATAPI SCSI Adapter: O BusLogic @ LSI Logic	
Help		≤Back Next ≥ Cancel

4.1.9 Creating a Virtual Hard Disk

Use the default settings to **Create a new virtual disk** for your virtual machine.

🕝 New Virtual Machine Wi	zard 📃 🗌 🗌 🔀
Select a Disk Which disk do you want to	Virtual Machine Version: 4
Wizard Type Name and Location Datastore Guest Operating System CPUs Memory Network I/O Adapters Select a Disk Disk Capacity Advanced Options Ready to Complete	A virtual disk is composed of one or more files on the host file system. Together these files appear as a single hard disk to the guest operating system. Select the type of disk to use from the choices below. Disk Create a new virtual disk Choose this option to create a new virtual disk. Use an existing virtual disk Choose this option to reuse a previously configured virtual disk. Choose this option to reuse a previously configured virtual disk. C Raw Device Mappings Give your virtual machine direct access to SAN. This option allows you to use existing SAN commands to manage the storage and continue to access it using a datastore. Do not create disk
Help	<u>≤</u> Back Next ≥ Cancel



Specify the disk capacity for this virtual machine. Select a disk size that will be adequate to store the guest operating system and all of its software applications for pod labs. The example below shows a selection of 8GB; your requirements may vary.

🔗 New Virtual Machine Wi	zard	
Specify Disk Capacity and How large do you want thi	Location s disk to be and where should it be located?	Virtual Machine Version: 4
Wizard Type Name and Location Datastore Guest Operating System CPUs Memory Network I/O Adapters Select a Disk Disk Capacity Advanced Options Ready to Complete	Disk Capacity Disk Size: 8 + GB + Location • Store with the <u>virtual machine</u> • Specify a <u>d</u> atastore Datastore:	Browse
Help		≤Back Next ≥ Cancel

4.1.10 Specifying Advanced Options

In most cases, you may use the default settings for the **Advanced Options**.

⁹ The use of SCSI drivers in a Windows XP or Windows Server 2003 virtual machine requires a special SCSI driver. You may <u>download the driver from the VMware website</u>.

🖉 New Virtual Machine Wi	zard	_ 🗆 🛛
Specify Advanced Options These advanced options d	o not usually need to be changed.	Artual Machine Version: 4
Wizard Type Name and Location Datastore Guest Operating System CPUs Memory Network VO Adapters Select a Disk Disk Capacity Advanced Options Ready to Complete	Specify the advanced options for this virtual disk. These options do not normally nee to be changed. Virtual Device Node SCSI (0:0) Mode Independent Independent Independent Changes are immediately and permanently written to the disk. Nonpensistent Changes to this disk are discarded when you power off or revert to the snapshot.	d
Help	≤ Back Next	≥ Cancel



4.1.11 Verifying the Settings

Review the configuration settings displayed on the page and select **Finish.**

🖉 New Virtual Machine Wi	izard		🛛 🔀
Ready to Complete New V Are these the options you	irtual Machine I want to use?		Virtual Machine Version: 4
Wizard Type Name and Location Datastore	When you click Finish, The virtual machine w	, a task will be started that will create the new virtual machin ill be created with the following options:	ië.
Guest Operating System CPUs Memory Network 1/O Adapters Select a Disk Disk Capacity Advanced Options Ready to Complete	Name: Host/Cluster: Resource Pool: Datastore: Guest OS: Virtual CPUs: Memory NICs: SCSI Adapter Type: Create disk: Disk capacity: Datastore: Virtual Device Node: Disk mode:	NETLAB_SERVER_VM_2 esxi.intranet Resources datastore1 Microsoft Windows Server 2003, Standard Edition (32-bit) 1 256 MB XXX NW2.Summary.None not found XXX LSI Logic New virtual disk 8 GB datastore1 SCSI (0:0) Persistent	
	 Edit the virtual ma Creation of the virtual ma System. You will make the virtual make	chine settings before submitting irtual machine does not include any automatic installation of need to install the guest OS just as you would on a new phys	the guest operating sical computer.
Help		≤Back	nish Cancel

Your virtual machine will now be listed in the virtual machine inventory.

finventory	Administration	
	F C	
E B esxii N 20 X	otranet ETLAB_Server_3_VM_2 P Pro Template VM	esxi.intranet VMware E5X Server 3i, 3.5.0, 123629 Getting Started Summary Virtual Machines Resource Allocation Per 4 D What is a Host?
🐖 Tasks		A host is a computer that uses virtualization software, such



4.2 Installing a Guest Operating System

After you have configured the virtual machine settings, you must install an operating system on the virtual machine. Refer to VMware's <u>Basic System Administration Guide</u> for ESXi, Chapter 10, Creating Virtual Machines, for details on the procedure to install a guest operating system.

4.3 Editing the Virtual CD/DVD Device

You may have configured your virtual machine to access a physical CD/DVD drive or access an ISO image in order to install the guest operating system. In the process, you may have enabled the **Connect at Power On** setting. For optimal pod performance, please verify the **Connect at Power On** option is **Unchecked**.

This setting must be edited **after** installing the guest operating system.

1. From the VI Client, **Getting Started** tab, select the virtual machine from the inventory list and select **Edit virtual machine settings.**





Select the CD/DVD drive in the hardware list. **Uncheck** the **Connect at power on** box. This is necessary to prevent the virtual machine from attempting to connect to the ESXi host's CD/DVD device, which could result in undesired properties or boot errors. You may also point the CD/DVD device connection to a unique ISO image on the local ESXi host. If you choose this option, make sure each VM you create does not point to the same ISO file. Otherwise, you may see some undesired properties or boot errors.

NETLAB_Server_3_VM_2 - V	irtual Machine Properties	
Hardware Options Resources		Virtual Machine Version: 4
Hardware Hardware Hardware Hardware CPUs Floppy Drive 1 CD/DVD Drive 1 (edited) Network Adapter 1 SCSI Controller 0 Hard Disk 1	Summary 256 MB 1 Client Device [datastore1] winxpo Pod1 VLAN 101 LSI Logic Virtual Disk	
Add Remove		C IDE (0:0) CD/DVD Drive 1
Help		OK Cancel



4.4 Installing VMware Tools

Installation of VMware Tools is required to ensure optimal performance and proper NETLAB+ operation.

VMware Tools must be installed **after** installing the guest operating system (see section 4.2).

Your virtual machine must be powered on to install VMware Tools. Select the virtual machine in the inventory list, and click **Power on the virtual machine** on the **Getting Started** tab.



The option to install VMware tools will now be available. Select the virtual machine in the inventory list, *right-click* on the page, and select **Install/Upgrade VMware Tools.**



NETLAB+ Remote PC Guide for VMware Implementation Using ESXi Version 3.5/4.01

File Edit View Inventory Admi	inistration Plugins Help				
Inventory Administration		Description			
🔷 🔶 🖬 🚺 🕨	🌀 뒴 Connect Floppy 1	🕙 Connect CD/DVD 1			
esxi.intranet NETLAB_Server_3_VM_2					
Tasks	Power On Power Off Suspend Reset Shut Down Guest Restart Guest Snapshot Add Permission	Ctrl+B Ctrl+E Ctrl+Z Ctrl+R			
	Open Console Send Ctrl+Alt+Del Answer Question Report Performance Install/Upgrade VMware Tools Edit Settings				

Assuming you have completed the installation of the guest operating system as described in section 4.1.4, you may proceed with the install of VMware Tools.





4.5 Setting the Virtual Machine Display Properties for Remote Access

For optimal performance and minimal bandwidth consumption, we recommend using the lowest possible resolution setting. The use of **800 x 600** provides a good fit on a typical laptop screen without the need to scroll the display.

It is possible, however, that your applications may require a higher resolution, such as 1024 x 768.

32-bit color is required. Display update problems have been observed with the 16-bit setting.

The following task assumes a virtual machine running a Windows XP operating system. Adjust accordingly for other operating systems.

To set the screen resolution and color quality:

- Boot the virtual machine.
- **Right-click** on the display and select **Properties**.
- Click on the Desktop tab.
- Click on the Settings tab.
- Set screen resolution to your desired resolution (800 x 600 is used in this example).
- Set color quality to **32-bit** (required).



NETLAB+ Remote PC Guide for VMware Implementation Using ESXi Version 3.5/4.01

Display Properties
Themes Desktop Screen Saver Appearance Settings
Display: [Default Monitor] on VMware SVGA II
Screen resolution Less More 800 by 600 pixels
Troubleshoot Advanced
OK Cancel Apply



4.6 Adjusting Visual Effects

Visual effects must be adjusted to provide minimal bandwidth utilization and to ensure the responsiveness of the remote experience.

The following task assumes a virtual machine running a Windows XP operating system. Adjust accordingly for other operating systems.

Adjust the visual effects:

- Right-click on My Computer and select Properties.
- Click on the Advanced tab.
- Click the Settings button for Performance.
- Click the Visual Effects tab.
- > Select the radio button to **Adjust for best performance.**
- Click **Ok** to accept changes.


4.7 Disabling the Desktop Background

The desktop background must be set to **None** to provide minimal bandwidth utilization and to ensure the responsiveness of the remote experience.

- Boot the virtual machine.
- *Right-click* on the display and select **Properties**.
- Click on the **Desktop** tab.
- Select **None** for the Background.

isplay Propertie	s 2
Themes Desktop	Screen Saver Appearance Settings
	.0
Bac <u>kg</u> round:	<u>B</u> rowse
Autumn Autumn	Position:
Bliss	<u>C</u> olor:
Customize Desi	<top< td=""></top<>
	OK Cancel Apply



4.8 Adding Software Applications

You may now add new software to your virtual machine as required by the lab exercises you plan to use on your pods.

4.9 Taking a Snapshot of Your Virtual Machine and Managing Snapshots

Each time you make changes or install new applications on a virtual machine, be sure to take a new *Snapshot*. Any changes made to the virtual machine by lab users will be lost when the virtual machine guest operating system reverts to the snapshot:

- At the end of a lab reservation.
- When a user selects Scrub from the NETLAB+ Action tab.

If you do not take a new snapshot after modifying the configuration file, your changes will be lost the next time the snapshot reverts. Your changes will also be lost if the virtual machine is not powered off when the configuration file is edited.

DO NOT take a Snapshot of a Virtual Machine when it is either turned on or suspended. Make sure VM is powered off each time you take a new Snapshot.

With the virtual machine powered off, select the virtual machine in the inventory list and select the **Take Snapshot** toolbar button.





Enter a Name and Description for your snapshot.

🖉 Take Virtual Machine Snapshot 💦 🗖 🗖 🔀					
Name					
After_guest_os_install					
Description					
Snapshot after install of guest OS.					
Spanshot the virtual machine's memory					
	ne s memory				
ОК	Cancel	Help			

ESXi can maintain multiple snapshots of your virtual machine. Use the **Snapshot Manager** to manage snapshots.



In this example, we see that three snapshots have been taken of this virtual machine (after installing the guest operating system, after configuring the remote display commands, and after installing an application).



NETLAB+ Remote PC Guide for VMware Implementation Using ESXi Version 3.5/4.01

Snapshots for NETLAB_Server_3_VM_2	
NETLAB_Server_3_VM_2 After_guest_os_install Onfiguration commands completed After Xwire Application Installed O You are here	Name After Xwire Application Installed Description Snapshot after installing Xwire application
Go to Delete Delete All	Edit
	Close Help

Be aware of features available using the Snapshot Manager.

- The **You Are Here** icon represents the current operational state of the virtual machine. Each time you take a new snapshot, the Current Snapshot state is updated. NETLAB+ will revert to the current snapshot.
- **Delete** commits the snapshot data to the parent and removes the selected snapshot.
- **Delete All** commits all the immediate snapshots before the **You Are Here** current active state to the base disk and removes all existing snapshots for that virtual machine.
- **Go To** allows you to select the position of the current operational state of the virtual machine. You may maintain multiple snapshots and control which snapshot NETLAB+ will use by using **Go To** in order to modify the position of **You Are Here**, which indicates the current operational state of the VM.



Example:

A nine-week Advanced IT course is taught where the files and applications required are different for each 3-week period. Snapshots are created with the appropriate configuration for each 3-week period. The **You Are Here** icon is placed at the snapshot for Weeks 1-3 at the beginning of the course.

At the end of the first three weeks, the **Go To** command is used to select the snapshot for Weeks 4-6.

Snapshots for NETLAB_Server_3_VM_2		X
METLAB_Server_3_VM_2 Advanced IT Weeks 1-3 You are here Advanced IT Weeks 4-6 Advanced IT Weeks 7-9	Name Advanced IT Weeks 4-6 Description weeks 4-6	
Go to Delete Delete All	Edit	
	Close Help	

The position of the You Are Here indicator has been changed. NETLAB+ will now use the snapshot created for Weeks 4-6.

Snapshots for NETLAB_Server_3_VM_2	Z
NETLAB_Server_3_VM_2 Advanced IT Weeks 1-3 Advanced IT Weeks 4-6 You are here Advanced IT Weeks 7-9	Name Advanced IT Weeks 4-6 Description weeks 4-6
Go to Delete Delete All	Edit
	Close Help



4.10 Remote PC Settings (for New Pods)

Remote PCs are part of a lab topology, so they must be configured in NETLAB+ when a new equipment pod is added. All settings (except ID) can be modified later. Remote PCs are only available in pods where the network topology indicates the existence of lab PCs.

Remote PC settings will appear in the New Pod Wizard when you add an equipment pod that supports remote PCs. Each PC has an ID, type, access method, and operating system setting. All settings (except ID) can be modified later. To modify existing PCs, skip ahead to section 4.11.

REMOTE PC SETT	INGS				
PC NAME	ID	PC / VIRTUAL MACHINE TY	PE	ACCESS	OPERATING SYSTEM
DC A	15 💌	VMware ESXi 4.0 (no vCenter)	1	VNC 💌	Windows 7
🛄 РС В	16 💌	ABSENT VMware ESXi 4.0 (no vCenter) VMware ESXi 3.5 U3 (no vCenter)		VNC 💌	Windows Server 2008
PC C	17 💌	VMware Server 2.0 VMware Server 1.0/GSX		VNC 💌	Linux
		STANDALONE			
📣 Next	🧼 E	Back 🛛 🔀 Cancel			

For **PC/Virtual Machine Type**, use the **VMware ESXi 3.5 U3 (no vCenter)** or **VMware ESXi 4.0 (no vCenter)**. The 4.0 setting is available in NETLAB+ version 2010.R3. If you do not see this setting (because you are using an earlier version NETLAB+) please select the ESXi 3.5 U3 setting, even when using ESXi 4.01..

The **Access** setting, VNC, allows direct access to the PC's keyboard, video and mouse using the VNC protocol. This setting cannot be altered when ESXi has been selected as the PC/Virtual Machine Type.

The **Operating System** setting specifies an OS for this PC. The availability of a selection does not guarantee compatibility with all labs.



NETLAB+ will prompt for additional settings on the next page.

VMVA	VM/VARE VIRTUAL MACHINE SETTINGS							
PC ID	PC NAME	IP ADDRESS	USERNAME	PASSWORD	CONFIGURATION FILE			
1	PC A	169.254.1.253	netlab	strongpassword	[datastore1] Pod_4/winXPpro.vmx			
2	📮 РС В	169.254.1.253	netlab	strongpassword	[datastore1] Pod_4/win2003.vmx			
3	📮 PC C	169.254.1.253	netlab	strongpassword	[datastore1] Pod_4/lin.vmx			
	Next 🔄 Back 🔀 Cancel							

Each virtual machine requires four ESXi-specific settings.

- The **IP Address** setting is used to connect to the ESXi host system. This is the IP address used for KVM and API traffic flow. Use the inside network address of the VMware server.
- **Username** specifies an operating system account on the ESXi host system. NETLAB+ will use this account to login to the ESXi host and control virtual machines through the VMware API (see section 3.7).
- **Password** specifies the password associated with the host account (see section 3.7).
- **Configuration File** Enter the relative path of the virtual machine configuration file on the ESXi host, including datastore. This file name is typically in the form of [datastore] <*pc name*>/<*operating system*>.vmx.

To find the name of a virtual machine configuration file:

1. From the VI Client, **Getting Started** tab, select the virtual machine from the inventory list and select **Edit virtual machine settings.**



NETLAB+ Remote PC Guide for VMware Implementation Using ESXi Version 3.5/4.01



2. Select the Options tab to display the Virtual Machine Configuration File.





You can copy and paste the full pathname of a VM Configuration file from the VM configuration screen into the NETLAB+ virtual machine settings **Configuration File Name** field.

The use of relative path names is specific to ESXi and VMware Server 2.x. VMware server 1.0 and GSX require absolute path names. If you are upgrading from VMware Server 1.0 or GSX, you must change your configuration file path names to use relative path names, as shown in the example above. Please refer to Appendix C for details on upgrading to VMware ESXi.



4.11 Modifying PC Settings

To modify PC settings, or convert an existing PC to use ESXi:

- 1. Take the pod offline.
- 2. Select the PC from the Pod Management page.

	POD 1	0.1 - PCs AND SERVERS		(click the	GO buttons to reconfigure)			
l	GO	NAME	PC ID	STATUS	TYPE	ACCESS	CONTROL IP	OPERATING SYSTEM
	٩	PC1a	200	ONLINE	VMVVARE Server 1.0/GSX	VNC	10.0.0.26	Windows XP
	٩	PC1b	201	ONLINE	VMVVARE Server 2.0	VNC	169.254.0.250	Windows XP
	Q	PC2	202	ONLINE	ABSENT	NULL		
	٩,	📮 РСЗ	203	ONLINE	VMVVARE ESXi 3.5 U3	VNC	10.0.0.30	Windows XP

- 3. Change Type to VMWARE ESXi 3.5 U3 (if it is not the current setting).
- 4. Specify the VMware settings (described in section 4.10).

POD 1 - PC 203	
PC ID	203
PC Name	PC3
Туре	VMWARE ESXI 3.5 U3
∨Mware Host IP Address	10.0.0.30
∨Mware Host Username	netlab
∨Mware Host Password	strongpassword
VMware Guest Configuration File	[datastore1] XP Pro Template VM/XP Pro Template VM.vn
VMware Guest Operating System	Windows XP
VMware Guest VNC Settings	RemoteDisplay.vnc.enabled = "true" RemoteDisplay.vnc.port = "6103"
Access Method	
Admin Status	ONLINE 💌
Options	✓ revert to snapshot during scrub operation

If you want NETLAB+ to return the PC to a clean state after a lab reservation, make sure "revert to snapshot" is checked.

4.12 Configuring Remote Display Options

To allow NETLAB+ users to access the keyboard, video, and mouse of a virtual machine, you must add two **RemoteDisplay** statements to the virtual machine's configuration file.

- 1. Access the detailed remote PC settings from the NETLAB+ Pod Management page (as described in section 4.10).
- 2. Obtain the VMware Guest VNC Settings (automatically computed by NETLAB+). The settings for this example are highlighted in the picture below (your settings will vary).

POD 1 - PC 203				
PC ID	203			
PC Name	PC3			
Туре	VMWARE ESXi 3.5 U3			
∨Mware Host IP Address	10.0.0.30			
∨Mware Host Username	netlab			
∨Mware Host Password	strongpassword			
VMware Guest Configuration File	[datastore1] XP Pro Template VM/XP Pro Template VM.vn			
VMware Guest Operating System	Windows XP			
VMware Guest VNC Settings	RemoteDisplay.vnc.enabled = "true" RemoteDisplay.vnc.port = "6103"			
Access Method				
Admin Status	ONLINE 🔽			
Options	✓ revert to snapshot during scrub operation			

- 3. From the VMware management console, make sure the PC is powered **OFF or suspended**.
- 4. Access the Edit Settings for the virtual machine. On the Options tab in the Advanced section, select General. The **Configuration Parameters** button will be displayed.



5. Select Configuration Parameters.





6. Add the two VMware guest VNC settings as configuration parameters.

🛿 Configuration Parameters 🛛 🔀					
Modify or add configuration parameters as needed for experimental features or as instructed by technical support. Entries cannot be removed.					
Name 🗠	Value				
deploymentPlatform	windows				
nvram	NETLAB_SERVER_3_VM_2.nvram				
snapshot.action	keep				
virtualHW.productCompatibility	hosted				
vmware.tools.internalversion	-1				
vmware.tools.requiredversion	7302				
vmware.tools.installstate	none				
vmware.tools.lastInstallStatus.res	unknown				
RemoteDisplay.vnc.enabled	true				
RemoteDisplay.vnc.port	6103				
	III				
	Add Row				
	OK Cancel Help				

7. Take a new snapshot of your virtual machine (see section 4.9).

If you do not take a new snapshot after modifying the configuration file, your changes will be lost the next time the snapshot reverts. Your changes will also be lost if the virtual machine is not powered off when the configuration file is edited.



4.13 Verify the Virtual Machine

After your virtual machine is configured, perform the following tasks to verify the API is functioning.

The Pod Test only verifies the remote display parameters and the function of the VMware API. The Pod Test does not test network connectivity to networking gear such as routers, switches and firewalls. The process required to bridge your virtual machines to real networks and real lab equipment (such as routers, switches, and firewalls) is described in detail in Part 5.

Pod Test Admin				NETLAB+ 2009.R1 administrator		
TESTING POD 5						
DEVICE	TYPE	TEST	STATUS	DETAILS		
Standalone PC	VMware ESXi 3.5 U3		PASSED	1 test(s) passed, device looks good		
POD TEST LOG [00:18] POD 5 PASSED [00:15] PC17: Testing virtual machine and VMware VIX API - PASS TESTING POD 5, Standalone Computer Pod, Support for 1 PC						

- 1. Run a pod test. NETLAB+ will check your settings and verify that the API is working.
- 2. Bring the pod back online.
- 3. Login to an instructor account and create a lab reservation to test your virtual machine(s).
- 4. On the **Status** tab, your virtual machines should be online.

Topology	Action	Status	Conn	ections	Load	Save	Exercise
Device	Туре	Pov	wer U	sers	Status		
ROUTER1	Cisco 26	21XM 🔘	<u>ON</u> 1		booting th	ie device	
ROUTER2	Cisco 26	21XM 🔘	<u>ON</u> 1		booting th	ie device	
BB	Windows	XP 🔘	<u>on</u> 0		online		
PC_1					not implei	mented in tl	nis pod
IS_1					not implei	mented in tl	nis pod
PC_2					not imple	mented in tl	nis pod
IS_2	Windows	s XP 🛛 🥥	<u>on</u> 0		online		
	С	lick on th	ne devic	e name	to open	a connect	tion



5. Open a connection to the PC by clicking on the device in the topology tab, status tab, or connections tab. This will bring up the NETLAB+ Remote PC viewer (assuming you have Java installed).

								^	I
84 T	1								
My L	ocuments								
My	Sin Computer								
5.5.									
му	Places								
	2								
Re	cycle Bin								
	\bigcirc								
II F	nternet Volorer								
							1	•	
<			_				>		
Ν	Standalone PC	Windows XP	POD 5		<u>Refresh</u>	Send Ctrl-Att-Del	Connecte	ed	



6. Test the VMware API. **Power off** the machine from the **Action** tab.

Lab Acces	55							
MyNETLAB	: Logo	out						🔏 janedoe
ALERTS 🔴					P	DD 1	16 minutes remaining	I'M DONE
Topology	Ac	tion	Status	Connectio	ons	Load	Save	
	NAME	TYPE		ACTION			ACTION ON ENTIRE POD	
	R1	Cisco	2501	-select-		~	-select-	~
	R2	Cisco	2501	-select-		~		
	R3	Cisco	2501	-select-		~		
	PC1a	Windo	ws XP	-select-		~		
	PC1b	Windo	ws XP	eelect				
				power off		-		
For auto	omated ers, sw	opera /itches	ations to s, and fi	scrub device ewans.	9	I	use the following passw	ords for
console	cisco	en.	able sec	ret: class				

If you had a connection open, it should drop. If you reconnect, NETLAB+ should know the PC is powered off (by obtaining the status of the virtual machine via the VMware API).

📮 PC1a
CONNECTION FAILED
The PC is turned OFF.
 Power ON the PC from the Action tab.
🛃 Try Again 🛛 🔀 Close This Window

7. From the **Action tab**, power the virtual machine back **ON**. Wait a minute for the machine to startup. You should now be able to reconnect.



Test the scrub device/snapshot feature. Make some changes to the PC (i.e. move some icons around and create some files). Select Scrub Device on the Action tab. The PC will reboot and your connection will drop (this is normal). Wait a minute for the machine to restart. You should now be able to reconnect, and your previous changes should be gone.



Part 5 Connecting Virtual Machines to Real Lab Devices

This section focuses on the establishing communication between virtual machines and lab devices in the topology. You can skip this section if your virtual machines do not need to communicate with lab equipment and/or external networks on separate VLANs.

Virtual LANs (VLANs) are used to bridge your virtual machines to real lab equipment (such as routers, switches, and firewalls). These VLANs are implemented on control switches and managed by the NETLAB+ software.





The following objectives will make more sense after you have added a new equipment pod.

Objectives

- Determine which VLAN numbers are used by your pod.
- Create the proper VLAN adapter.
- Bind each VLAN adapter to the Inside Interface.
- Take a final snapshot to save changes made to the VM configuration.

5.1 Determining Which VLAN Numbers Are Used by Your Pod

The VLAN adapters you must create for you virtual machines will vary based on which pods you have added to your NETLAB+ server.

A VLAN Pool is the consecutive range of VLANs used by NETLAB+. Each pod has a unique VLAN pool and the actual VLAN numbers will be unique for each pod. You must determine which VLAN numbers used by NETLAB+ must be trunked to the VMware host.

There are resources available to assist you in determining which VLAN numbers are used:

- If you are implementing a standard NETLAB+ Academy Edition[®] pod, you may refer to the *Configuring VMware and Virtual Machines* section of the appropriate <u>pod-specific guide</u> to obtain this information, including the VLAN Offset Reference Table specific to your pod. The examples in the subsections below provide more detail regarding this process.
- If you are implementing a custom pod design, consult with the individual who created the pod design and refer to the *Pod Design Theory* section of the <u>NETLAB+ Pod Design Guide</u> for additional information.

ESXi virtual network adapters and virtual LAN adapters are used to connect virtual machines to the pod. Each VLAN adapter will be connected to the virtual switch configured for the inside interface. Depending on the pod design, some virtual machines may share the same VLAN.

5.1.1 Determining VLANs Example 1 – Cuatro Router Pod

In this example, we see that a Cuatro Router Pod requires **8 consecutive ports** on a supported control switch.



Ports are labeled **+0** to **+7** in the diagram and are relative to the *base port*. Using SNMP, NETLAB_{AE} will automatically setup VLANs and configure ports on the control switch. These VLANs are depicted as letters "A" through "H" and represent one subnet in the topology. Each NETLAB_{AE} pod has a unique *VLAN pool* and the actual VLAN numbers will be unique for each NETLAB_{AE} pod.

Step 1. Determine the Base VLAN for the pod.

The base VLAN and VLAN pool numbers are displayed on the Pod Management page in the Control Switch table. Please see the *Verifying Your Settings* section of the <u>NETLAB+</u> <u>Administrator Guide</u> for details on accessing the Pod Management page to find the base VLAN number for your pod.

An example of the VLAN pool information available on the Pod Management page. In this example, pod 7 uses VLANs 160-167. The base VLAN is 160. Your VLAN numbers will vary.

POD 7 - CONTROL SWITCH					
SWITCH ID	POD PORT RANGE	BASE VLAN	VLAN POOL		
2	1-8	160	160-167		



Step 2. Determine the actual VLAN number for each virtual network.

Add the base VLAN to the offsets in the table below. In this example, the **VLAN Offset Reference Table** from the <u>NETLAB_{AE} Cuatro Router Pod Guide</u> is used. Consult the appropriate <u>pod-specific guide</u> to obtain the information for your pod.

Using ESXi, all VLAN adapters will be connected to a single virtual switch. The information in the Virtual Switch (VMnet) column is relevant only when using VMware Server 1.0/GSX and VMware Server 2.0.

The base VLAN value used below (160) is an example, the base VLAN of your pod will vary.

Virtual Machines	Virtual Switch (VMnet)	Offset (add to base VLAN)	Actual VLAN	Example
PC1a PC1b	R1 VMnet	+ 0	=	160 + 0 = <mark>16</mark> 0
PC2	R2 VMnet	+ 2	=	160 + 2 = <mark>162</mark>
PC3	R3 VMnet	+ 4	=	160 + 4 = <mark>16</mark> 4
PC4	R4 VMnet	+6	=	160 + 6 = <mark>166</mark>

VLAN Offset Reference Table – Cuatro Router Pod

In this example, we have determined that we must create VLAN adapters for VLANs 160, 162, 164, and 166.

5.1.2 Determining VLANs Example 2 – Cuatro Switch Pod

In this example, we see that a Cuatro Switch Pod requires **4 consecutive ports** on a supported control switch.



Ports are labeled **+0** to **+3** in the diagram and are relative to the *base port*. Using SNMP, NETLAB_{AE} will automatically setup VLANs and configure ports on the control switch. These VLANs are depicted as letters "A" through "D" and represent one subnet in the topology. Each NETLAB_{AE} pod has a unique *VLAN pool* and the actual VLAN numbers will be unique for each NETLAB_{AE} pod.

Step 1. Determine the Base VLAN for the pod.

The base VLAN and VLAN pool numbers are displayed on the Pod Management page in the Control Switch table. Please see the *Verifying Your Settings* section of the <u>NETLAB+</u> <u>Administrator Guide</u> for details on accessing the Pod Management page.

An example of the VLAN pool information available on the Pod Management page, your VLAN numbers will vary.

POD 10 - CONTROL SWITCH					
SWITCH ID	POD PORT RANGE	BASE VLAN	VLAN POOL		
2	9-12	190	190-193		

In this example, Pod 10 uses VLANs 190-193. The base VLAN is 190.



Step 2. Determine the actual VLAN number for each virtual network.

Add the base VLAN to the offsets in the table below. In this example, the **VLAN Offset Reference Table** from the <u>NETLAB_{AE} Cuatro Switch Pod Guide</u> is used. (Consult the appropriate <u>pod-specific guide</u> to obtain the information for your pod).

Using ESXi, all VLAN adapters will be connected to a single virtual switch. The information in the Virtual Switch (VMnet) column is relevant only when using VMware Server 1.0/GSX and VMware Server 2.0.

The base VLAN value used below (190) is an example, the base VLAN of your pod will vary.

Virtual Machines	Virtual Switch (VMnet)	Offset (add to base VLAN)	Actual VLAN	Example
Host A	ALS1 VMnet	+ 0	=	190 + 0 = <mark>190</mark>
Host B	ALS 2 VMnet	+ 1	=	190 + 1 = <mark>191</mark>
Host C	DLS 1 VMnet	+ 2	=	190 + 2 = <mark>192</mark>
Host D	DLS 2 VMnet	+ 3	=	190 + 3 = <mark>193</mark>

VLAN Offset Reference Table – Cuatro Switch Pod

In this example, we have determined that we must create VLAN adapters for VLANs 190, 191, 192, and 193.



5.2 Creating VLAN Adapters using VI Client

Based on the VLAN numbers identified in the previous section, follow the steps described in the subsections below to create each of the VLAN adapters required. You will create a VLAN sub-interface on the **Inside Physical Interface** (container interface). Begin by selecting **Add Networking** to start the **Add Network Wizard**.

esxi.intranet ¥Mware ESX Server 3i, 3.5.0, 123629		
Getting Started Summary Virtual Machines Resource Allocation	Performance	Configuration 🛛
Networking	Refresh	Add Networking

5.2.1 Selecting the Virtual Machine Connection Type

🖉 Add Network Wizard - O X **Connection Type** Networking hardware can be partitioned to accommodate each service requiring connectivity. **Connection Type** Connection Types Network Acces **Connection Settings** G. Virtual Machine Summary. Add a labeled network to handle virtual machine network traffic. VMkernel The VMkernel TCP/IP stack handles traffic for the following ESX services: VMware VMotion, iSCSI, NPS and host management. ≤ Back Next \geq Cancel Help

Use the Virtual Machine connection type for your VLAN adapter.

5.2.2 Selecting the Network Adapter

The VLAN adapter must be assigned to use the same virtual switch as the Inside Interface (section 3.6.2.2) and placeholder VLAN3 (section 3.6.3.3). In this example, vmnic1 was selected for the Inside Interface.

Using ESXi, all VLAN adapters are added to the same virtual switch as the Inside Interface.

The selection and number of network adapters on your system will vary depending on your hardware selections.

🖉 Add Network Wizard				🛛
Virtual Machines - Netw Virtual machines reach	rork Access a networks through uplink adapters attached	to virtual switches.		
Connection Type Network Access	Select which virtual switch will handle th using the unclaimed network adapters I	ne network traffic for thi Isted below.	is connection. You may also create a ne	w virtual switch
Connection Settings	C Create a virtual switch	Speed	Networks	^
Summary	🖂 🔛 vmnic2	down		
	mag vmnic3	down		
	C Use vSwitch0	Speed	Networks	1
	mic0	1000 Full	10.0.0.1-10.0.0.254	
	Use vSwitch1	Speed	Networks	
	Vmnic1	100 Full		~
	Preview:			
	- Virtual Machine Port Group Virtual Machine Network	Physical	Adapters	^
	Virtual Machine Port Group			
	VLAN3 Placeholder VLAN 3	<u>.</u> +		
	VMkernel Port			=
	Untagged NETLAB Inside Interfa 169.254.0.251	<u>Q</u> +		
	,			
Help			<u>≤</u> Back Next ≥	Cancel



5.2.3 Selecting Connection Settings

Use a descriptive name such as *Pod id + VLAN number* as the **Network Label**. Enter the **VLAN number** as the **VLAN ID**.

In this example, the network adapter was assigned a Network Label of Pod 1 VLAN 100.

🖉 Add Network Wizard	
Virtual Machines - Conn Use network labels to i	ection Settings dentify migration compatible connections common to two or more hosts.
Connection Type Network Access Connection Settings Summary	Port Group Properties Network Label: VLAN ID (Optional): 100
	Preview: Virtual Machine Port Group Podi VLAN 100 VLAN 100 Virtual Machine Port Group VLAN3 Placeholder VLAN3 Placeholder VLAN3 VM/kemel Port Untagged NETLAB Inside Interfa
Неір	_≤Back Next ≥ Cancel

5.2.4 Finishing the Configuration of the VLAN Adapter

Select **Finish** to complete the configuration process.



NETLAB+ Remote PC Guide for VMware Implementation Using ESXi Version 3.5/4.01

🖉 Add Network Wizard		_ 🗆 🔀
Ready to Complete Verify that all new and	d modified virtual switches are configured appropriately.	
Connection Type Network Access	Host networking will include the following new and modified vSwitches: Preview:	
Connection Settings Summary	Virtual Machine Port Group Pod1 VLAN 100 VLAN 100	
	Virtual Machine Port Group VLAN3 Placeholder VLAN 3	
	- VMkernel Port Untagged NETLAB Inside Interfa 👳	
Help		Cancel

The VLAN adapter is now displayed on the networking page, on the same virtual switch as the Inside Interface and placeholder VLAN3. Return to section 5.2 and repeat this process for each VLAN adapter necessary for your system.

esxi.intranet VMware ESX Server 3i, 3.5.0, 123629					
Ge	tting Started Summary Virtual M	achines 🔍 Resource Allocation 🔍 Perform	ance Configuration		
Net	working	Refres	h Add Networkin		
Virtu	al Switch: vSwitch0	Remove Properties			
þ	VMkernel Port Management Network 10.0.0.30	Physical Adapters			
Virtu	ial Switch: vSwitch1	Remove Properties			
₽ ⊡	Virtual Machine Port Group Pod1 VLAN 100 1 virtual machine(s) VLAN ID 100 XP Pro Template VM	Physical Adapters	₽		
₽ ⊡	Virtual Machine Port Group VLAN3 Placeholder 1 virtual machine(s) VLAN ID 3 ESXI VM Example with NetAdapte				
þ	VMkemel Port Untagged NETLAB Inside Interfa 169.254.0.251	2			



5.3 Configuring Virtual Machines to use the correct VLAN Adapter

Each virtual machine must be configured to use the appropriate VLAN adapter. Recall from section 4.1.7 that virtual machines were initially assigned placeholder VLAN3 as a network adapter. This setting must be edited for each VM, from the selection of VLAN adapters created in section 5.2.

1. From the VI Client, **Getting Started** tab, select the virtual machine from the inventory list and select **Edit virtual machine settings.**





 On the Hardware tab, select Network Adapter 1. Replace the current Network Connection of VLAN3 Placeholder with the appropriate VLAN adapter for this VM. Refer to section 5.1 to verify the appropriate VLAN adapter selection for the VM.

@ N	ETLAB_Server_3_VM_2 - V	irtual Machine Properties	
Hard	ware Options Resources		Virtual Machine Version: 4
	Aware Memory CPUs Floppy Drive 1 CD/DVD Drive 1 Network Adapter 1 SCST Concreter 0 Hard Disk 1	Summary 256 MB 1 Client Device VLANS Placeholder CST cogn Virtual Disk	Device Status Connected Connected Current adapter Type Current adapter: Address Address Automatic Automatic Manual Network Connection Network label: Pod1 VLAN 100 Pod1 VLAN 100 Pod1 VLAN 100 Pod1 VLAN 101 Pod1 VL
	Add Remove		
	Help		OK Cancel

3. Your VLAN adapter selection is now shown on the Hardware tab.

Hardware Options Resources					
Hard	ware	Summary			
	Memory	256 MB			
	CPUs	1			
	Floppy Drive 1	Client Device			
Ō,	CD/DVD Drive 1	Client Device			
-	Network Adapter 1	Pod1 VLAN 101			
9	SCSI Controller U	LOT LOGIC			
	Hard Disk 1	Virtual Disk			
L					

4. Take a final snapshot of your virtual machine (see section 4.9).



5.4 Deleting the Placeholder VLAN 3

Recall from section 3.6.3 that VLAN 3 was created as a temporary placeholder. This placeholder was necessary since at least one VM network connection type must be present prior to adding your first virtual machine. In section 5.3, each virtual machine was configured to use the appropriate VLAN adapter. Placeholder VLAN3 is no longer in use and may now be deleted.

1. Select the option to display the **Properties** for the virtual switch of your Inside Interface.

Getting Started Summary Virtual Machines Resource Allocation Performance Configuration				
Networking				
/irtual Switch: vSwitch0	Remove Properties			
VMkemel Port Management Network 10.0.0.30	Physical Adapters			
/irtual Switch: vSwitch1	Remove Properties			
Virtual Machine Port Group Pod1 VLAN 104 2 virtual machine(s) VLAN ID 104 XP Pro Template VM ESXi VM Example with NetAdapte	Physical Adapters wmnic1 100 Full IC			
Virtual Machine Port Group VLAN3 Placeholder VLAN 3	<u>♀</u> +			
Untagged NETLAB Inside Interfa 169.254.0.251	<u>9</u> +			
Pod1 VLAN 100 VLAN 100	Q.+			
 ✓ Virtual Machine Port Group Pod1 VLAN 101 □ virtual machine(s) VLAN ID 101 	Q.			
NETLAB_Server_3_VM_2				



2. Select VLAN3 Placeholder from the list displayed on the Ports tab and click Remove.

Configuration Summary					
	1 1	vSwitch	56 Ports		
	0	Pod1 VLAN 104	Virtual Machine Port Group		
	Θ	VLAN3 Placeholder	Virtual Machine Port Group		
	0	Untagged NETLAB	VMotion and IP Storage Port		
	0	Pod1 VLAN 100	Virtual Machine Port Group		
	<u> </u>	Pod1 VLAN 101	Virtual Machine Port Group		
	<				
Add Edit Remove					

3. Select **Yes** to confirm the deletion.

Confirm Remove 🛛 🔀				
⚠	Are you sure you want to remove VLAN3 Placeholder?			
	Yes			



Part 6 Verifying Connectivity and Troubleshooting

This section provides guidance on common troubleshooting issues associated with the implementation of ESXi with NETLAB+ and guidance on verifying connectivity after installation. Please review the material in this section prior to contacting NDG for customer support (see Appendix B).

Objectives

- Verifying connectivity between virtual machines and lab gear.
- Reviewing and/or modifying virtual machine settings for existing virtual machines.
- Identify and resolve the most frequently encountered issues.

6.1 Verifying Connectivity Between Virtual Machines and Lab Gear

We strongly encourage verifying the connectivity between your virtual machines and lab gear after completing the processes outlined in Part 5, using the method described in this section.

The troubleshooting methods shown here can also aid you in determining why a remote PC in a NETLAB+ pod is having network connectivity problems.

Verify that your pod is online (see the *Equipment Pods* section of the <u>NETLAB+</u> <u>Administrator Guide</u>) and that the pod passes the pod test (see section 4.13).

The example below illustrates a NETLAB_{AE} BRPv2 topology installed as Pod #5 on Control Switch #4:

BRPv2 Lab Device	Device Port	Control Switch #4 Port	NETLAB+ Pod VLAN
Router 1	fa 0/0	fa 0/1	140
	fa 0/1	fa 0/2	141
PC1a	virtual NIC	fa 0/23	140
PC1b	virtual NIC	fa 0/23	140
Router 2	fa 0/0	fa 0/3	142
	fa 0/1	fa 0/4	143
PC2	virtual NIC	fa 0/23	142
Router 3	fa 0/0	fa 0/5	144
	fa 0/1	fa 0/6	145
PC3	virtual NIC	fa 0/23	144



In order to test the connectivity between remote PCs and neighboring lab devices, using the above example, you may follow these steps, using an Instructor Account (see the *Manage Accounts* section of the <u>NETLAB+ Administrator Guide</u>).

- 1. Make a lab reservation.
- 2. Configure IP addresses on the remote PCs and neighboring lab devices you will be testing.
- 3. In the example above, PC1a and PC1b should share the same VLAN adapter, so they should be able to ping each other. If they cannot ping each other, then you should review the following:
 - What VLAN adapter are PC1a and PC1b using? (refer to 5.3).
 - Is there a firewall installed or enabled on the virtual machine?
- 4. To verify the connectivity between remote PCs and neighboring lab devices, you should test the following:
 - Ping from PC1a to R1 and vice versa.
 - Ping from PC1b to R1 and vice versa.
 - Ping from PC2 to R2 and vice versa.
 - Ping from PC3 to R3 and vice versa.
- 5. If you can ping from a remote PC to a neighboring lab device, but cannot ping from the lab device to the remote PC, then you may want to determine if there is a firewall installed or enabled on the virtual machine.
- 6. If any of the tests from step 4 completely fail (you cannot ping from remote PC to neighboring lab device and vice versa), then you will need to analyze the network traffic on the control switch. Using the above example, perform the following steps:
 - Connect a PC or terminal to the console port of the control switch.
 - Type "show vlan" or "show vlan brief" to view the VLAN status on the control switch.



The control switch console password is **router**. The enable secret password is **cisco**. These passwords are used by NETLAB+ automation and technical support - please do not change them.

Connected to 169.254.1.14. Escape character is '^]'. User Access Verification Password: netlab-cs4>en assword: netlab-cs4#show vlan VLAN Name Status Ports default active Fa0/14, Fa0/15, Fa0, Fa0/18, Fa0/19, Fa0, Fa0/22, Fa0/24, Gi0, NETLAB 3 active NETLAB 11 active NETLAB 12 active NETLAB 13 3 active .40 NETLAB 140 active Fa0/1 Fa0/2141 NETLAB 141 active Fa0/3 142 NETLAB 142 active Fa0/4 .43 NETLAB 143 active NETLAB 144 Fa0/5 active 44

During a lab reservation, you will notice the active lab ports and their VLAN assignments. From the example above, Pod #5 is a BRPv2 installed on ports fa0/1 through fa0/6 on Control Switch #4. The base VLAN for this pod is 140.

active

Fa0/6

• On the control switch, type **"show interfaces trunk"** to view the trunk information.

.45

NETLAB 145



NETLAB+ Remote PC Guide for VMware Implementation Using ESXi Version 3.5/4.01

netlab-cs4#show interfaces trunk					
Port Fa0/23	Mode on	Encapsulatior 802.1q	n Status trunking	Native vlan 1	
Port FaO/23	Vlans allo 140,142,	wed on trunk 144			
Port Fa0/23	Vlans al. 140,142,	lowed and active i 144	.n management	domain	
Port FaO/23	Vlans in 140,142,	spanning tree for 144	warding state	and not pruned	

This command will reveal whether or not you have properly configured the control switch port that connects to the VMware trunking port. The following shows the proper configuration for the example above on port 23 of Control Switch #4.

```
netlab-cs4#show running-config interface fastEthernet 0/23
Building configuration...
Current configuration : 252 bytes
1
interface FastEthernet0/23
description trunk to VMware 10.0.0.25
switchport trunk encapsulation dot1q
switchport trunk allowed vlan 140,142,144
switchport trunk pruning vlan none
switchport mode trunk
switchport nonegotiate
no ip address
end
```



• On the control switch, type "show mac-address-table dynamic". Use the MAC address table to verify: 1) whether the MAC addresses of the remote PCs are in the table and 2) if these MAC addresses are in the correct VLANs.

netlab-cs4#show mac-address-table dynamic Mac Address Table					
Vian	Mac Address	туре	Ports		
140	0000.0c5d.150e	DYNAMIC	Fa0/1		
140	000c.291d.6ee8	DYNAMIC	Fa0/23		
140	000c.292f.57f2	DYNAMIC	Fa0/23		
142	000c.291f.6542	DYNAMIC	Fa0/23		
142	0010.7b81.aae0	DYNAMIC	Fa0/3		
144	0000.0c76.bd12	DYNAMIC	Fa0/5		
144	000c.29c1.1bc7	DYNAMIC	Fa0/23		
1	000d.60£3.1757	DYNAMIC	Fa0/24		
1	0050.5000.1109	DYNAMIC	Fa0/24		
1	00c0.b763.c4ce	DYNAMIC	Fa0/24		
1	00c0.b7a3.1def	DYNAMIC	Fa0/24		
Total	Mac Addresses for	this criteri	.on: 11		

- 7. If any of the tests from step 4 completely fail (you cannot ping from the remote PC to a neighboring lab device and vice versa), and the MAC address of a remote PC is either:
 - a. Not in the correct VLAN or
 - b. Does not show up in the control switch MAC address table, then please review the VLAN and settings for your NETLAB+ pod very carefully. Refer to Part 5 for complete details.

Possible error conditions include:

- An incorrect VLAN ID was entered when creating a VLAN interface.
- No VLAN or an incorrect VLAN was mapped using VI Client
- The control switch port (for the Inside Connection) is not trunking or not allowing the correct VLANs.

If you are in the process of installing a new NETLAB_{AE} pod on your NETLAB+ system, please return now to the respective <u>pod-specific guide</u> for your pod. The final chapters, *Testing the Pod*, and *Finishing Up* provide details that will allow you ensure your pod is installed properly and ready for use.


6.2 Review and Modify VM Settings For an Existing Virtual Machine

Section 4.1 outlined the creation of new virtual machines using the VI Client. This section describes how to verify and/or modify the VM settings of an existing virtual machine for integration with NETLAB+.

From the VI Client, **Getting Started** tab, select the virtual machine from the inventory list and select **Edit virtual machine settings.**



The current hardware settings, including the Network Adapter are available on the **Hardware** tab. See section 5.3 for details on selecting the network adapter.

The settings shown are for example purposes only, your settings will vary.



NETLAB+ Remote PC Guide for VMware Implementation Using ESXi Version 3.5/4.01

Summary 256 MB	Virtual Machine Version:
Summary 256 MB	Device Status
1 Client Device Client Device Pod1 YLAN 101 LSI Logic Virtual Disk	Connect at power on Adapter Type Current adapter: Flexible MAC Address Address Automatic Automatic Network Connection Network label: Pod1 VLAN 101
	or l court l
	Client Device Client Device Pod1 VLAN 101 LSI Logic Virtual Disk

Verify that the Connect at Power on setting of the CD/DVD drive is **Unchecked**. You may also point the CD/DVD device connection to a unique ISO image on the local ESXi host. If you choose this option, make sure each VM you create does not point to the same ISO file. Otherwise, you may see some undesired properties or boot errors.





The settings on the Options tab include the Virtual Machine Name, Configuration File, and your selection of guest operating system.

WETLAB_Server_3_VM_2 - Virtual Machine Properties - 0 Hardware Options Resources Virtual Machine Version: 4 Virtual Machine Name Settings Summary NETLA8_Server_3_VM_2 General Options NETLAB_Server_3_... VMware Tools System Default Power Management Standby Virtual Machine Configuration File Advanced [datastore1] NETLAB_Server_3_VM_2/NETLAB_Server_3_VM_2.vm General Normal CPUID Mask Expose Nx flag to ... Virtual Machine Working Location Delay 0 ms Boot Options [datastore1] NETLA8_Server_3_VM_2 Paravirtualization Disabled Fibre Channel NPIV None Virtualized MMU Automatic Guest Operating System Swapfile Location Use default settings Microsoft Windows C Linux Novell Netware Solaris C Other Version: Microsoft Windows Server 2003, Standard Edition (32-bit) ٠ Cancel Help OK

The file names shown here are for example purposes, your selections may vary.



6.3 The Most Frequently Encountered ESXi Issues

If you are experiencing problems with your virtual machines or they are not passing the pod test, please review the following symptoms and resolutions carefully:

1. **Symptom:** The user runs a pod test and the results indicate that the remote display settings are missing or misconfigured.

Additional information regarding error conditions is available by selecting the hyperlinked text within the details section of the pod test results.

Pod Test			-	NETLAB+ 2009.R1			
Admin				admin			
TESTING POD 5							
DEVICE	TYPE	TEST	TEST STATUS DET/				
Standalone PC	\MMVAREESXi3.5U3	VMTEST	FAILED	Configuration parameter RemoteDisplay.vnc.enabled i or is set to false, should be set to true <u>VM_REMOTE_DISPLAY_VNC_NOT_ENABLED error</u> (r for help) <u>VM_REMOTE_DISPLAY_VNC_PORT_NOT_SET error</u> i for help)			
POD TEST LOG							
[00:22] POD 5 FAILED [00:19] PC17: Testing is not set or is set to fr	virtual machine and VM alse, should be set to tr	ware VIX API - ue, VM_REMOT	FAIL, Configura E DISPLAY VN	tion parameter RemoteDisplay.vnc.enabled			

Resolution: Each virtual machine allocated for a NETLAB+ pod for remote PC access should have the VNC settings saved into the VMX file. This procedure is described in section 4.12.



2. Symptom: You are unable to ping lab gear from the virtual machine.

Resolutions: See section 6.1 for an example of a troubleshooting scenario.

- a. Each virtual machine should be mapped to the proper VLAN adapter. Reference section 5.3 for full details.
- b. Disable built-in firewalls on the virtual machine (Windows firewall, for example).

😸 Windows Firewall
General Exceptions Advanced
Your PC is not protected: turn on Windows Firewall
Windows Firewall helps protect your computer by preventing unauthorized users from gaining access to your computer through the Internet or a network.
🎯 O <u>D</u> n
This setting blocks all outside sources from connecting to this computer, with the exception of those selected on the Exceptions tab.
□ Don't allow exceptions
Select this when you connect to public networks in less secure locations, such as airports. You will not be notified when Windows Firewall blocks programs. Selections on the Exceptions tab will be ignored.
🛞 ⊙ DĨt

3. **Symptom:** A Pod test failure indicates API-Fail incorrect user or password.

Pod Test	Pod Test NETLAB+ 2009					
Admin ar						
TESTING POD 5						
DEVICE TYPE TEST STATUS DETAILS						
Standalone PC MMVARE ESXI 3.5 U3 VMTEST FAILED Incorrect user or password VM USER PERMISSIONS error (click link for help) status=fail error="host connect failed" vix_error= permissions in host operating system" vix_errcode="VIX_E_HOST_USER_PERMISSIONS (3 host="169.254.0.250" port="8333"						
POD TEST LOG [00:05] POD 5 FAILED [00:05] POD 5 FAILED [00:02] PC17: Testing virtual machine and VMware VIX API - FAIL, Incorrect user or password, VM_USER_PERMISSIONS error, status=fail error="host connect failed" vix_error="Insufficient permissions in host operating system" vix_errocode="VIX_E_HOST_USER_PERMISSIONS (3014)" host="169.254.0.250" port="8333" TESTING POD 5, Standalone Computer Pod, Support for 1 PC						

Resolution: Make certain you have created the management account (section 3.7) and you added to proper permissions (section 3.9).

4. **Symptom:** My keyboard and/or mouse are behaving very erratically (sub as, double letters, or the mouse is very jumpy) when using the NETLAB+ Remote PC viewer.

Resolution: Each virtual machine should have **VMware Tools** installed. Refer to section 4.4 for details.

5. **Symptom:** I am using a non-Windows guest operating system, and I cannot get the mouse to behave properly.

Resolution: Some guest operating systems, such as Linux, require very specific steps to install VMware Tools properly. For example, most Linux VMs require you to run a configuration script to complete the VMware Tools installation. Do not assume that VMware Tools is properly installed without reviewing the guidelines as per the VMware documentation:

http://kb.vmware.com/selfservice/dynamickc.do?externalId=340&sliceId=2&command=show&forward=nonthreadedKC&kcId=340.



6. **Symptom:** You are in a NETLAB+ reservation and the Remote PC viewer is slightly sluggish in performance.

Resolution: Each virtual machine should be adjusted for optimum remote display access (see section 4.5):

- a. Minimal screen resolution with 32-bit color quality (see sections 4.5).
- b. Do not use a graphical background. The desktop background should be plain or none (see section 4.7).
- c. Adjust the visual effects for best performance (each O/S may have different settings, see section 4.6).
- 7. **Symptom:** Your virtual machines are giving an "UNKNOWN" status from the Status tab of a lab reservation in NETLAB+.

Resolution: Review the following potential causes:

a. We recommend no more than 10 to 12 virtual machines, per server that meets the minimum requirements in section 2.2. Each virtual machine uses CPU cycles and memory on the server. As a simple rule of thumb, divide the processor clock speed by the number of virtual machines to determine the speed of each virtual machine in a heavily loaded environment (i.e. all pods are running at the same time and users are working on the PCs). For example, a 3GHz processor could run 10 virtual machines at 300MHz each.

If your VMs are running in a heavily loaded environment, the VMware daemon process may stall, hang, or become unresponsive. This could cause requests from the NETLAB+ server to be ignored. This would give an "UNKNOWN" status for your remote PCs from the Status tab of a lab reservation in NETLAB+.

- b. Each virtual machine should have their virtual CD/DVD device disabled, (section 4.3).
- c. Verify each VM setting from section 6.2.



Appendix A Copying VMDK File to Clone Virtual Machines

Once you have successfully created a single virtual machine, you may clone this VM to create new VMs as a short cut. This would essentially save the time it takes to install a new guest operating system and VMware Tools.

Each guest operating system is fully functional and must meet the vendor's licensing requirements (see section 2.1.1).

This short cut is useful only if your NETLAB+ pod VMs will have similar virtual machine settings:

- VM memory size (can be adjusted easily after new copy is created)
- VM hard disk size (cannot be adjusted easily)
- VM Operating System (this must be the same if you are cloning)

Where sure to copy the first VM's VMDK after you have added VMware tools, and all other applications that you want on the VM. This will allow you to avoid making multiple changes on every VM.

The following steps highlight the procedure for cloning your virtual machine to create new VMs. It is assumed you have successfully created a single VM as per Part 4.

1. Proceed through the steps outlined in section 4.1 to create a new virtual machine, with the exception of the option selected in step 4.1.9. Instead, use the **Do not create disk** option for this clone virtual machine. This option is used since we are going to copy and paste the first VM's VMDK file into the new VM datastore directory.



2. Locate the **datastore** of the clone virtual machine on the **Summary** tab.





NETLAB+ Remote PC Guide for VMware Implementation Using ESXi Version 3.5/4.01

3. Double-click to open the **Datastore Browser**

Image: Search Image: Constraint of the search Image: Constraint of the search Image: Search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search Image: Constraint of the search	🛃 Datastore Browser - [data:	tore1]	
Folders Search [datastore1] / Image: Search Name Size Image: Search XP Pro Template VM Image: Search Image: Search Image: Search Image: Search Image: Search XP Pro Template VM Image: Search Image: Search Image: Search Image: Search Image: Search XP Pro Template VM Image: Search Image: Search Image: Search Image: Search Image: Search I	B 🖟 💋 🛢 🛢	🗟 🗙 🙆	
Name Size XP Pro Template VM XP Pro Template VM Clone 1 XP Pro VM Clone 1 XP Pro VM Clone 2 XP Pro VM Clone 2 XP Pro VM	Folders Search	[datastore1] /	
	Clone 2 XP Pro VM	Name XP Pro Template VM Clone 1 XP Pro VM Clone 2 XP Pro VM	Size Type Fold Fold Fold

4. Navigate to the first VM that was installed and locate the VMDK file.

🕑 Datastore Browser - [datastore1]		
🗗 🕼 💋 🛢 🛢 🗦 🕽	(@	
Folders Search	[datastore1] XP Pro Template ¥M	
	Name	Size T🔺
- 🥟 XP Pro Template VM	Vmware-50.log	30.20 KB 🛛 🛛
Clone 1 XP Pro VM	📇 🛛 XP Pro Template VM. vmdk	8,388,608.00 KB V
Clone 2 XP Pro VM	📒 vmware-48.log	76.50 KB 🛛
	Vmware-47.log	37.42 KB 🛛
	👔 XP Pro Template VM.nvram	8.48 KB N
	vmware-46.log	39.22 KB V
	vmware-49.log	30.66 KB V
	vmware-51.log	32.52 KB V
	👘 XP Pro Template VM.vmx	2.24 KB V
	📇 XP Pro Template VM-00000	33,792.00 KB V 🚽
1 object selected 8.00 GB		



5. Copy the VMDK file.

🛃 Datastore Brow	vser - [data:	store1]				Ľ
B 🕅 💋	P	🗟 🗙	0			
Folders Search			[datastore1] XP Pro Template ¥M	1		
□- 1			Name		Size	T▲
👘 🦳 🥟 XP Pro 1	Template VM		📒 vmware-50.log	30.	20 KB	٧
Clone 1	XP Pro VM		📇 XP Pro Template VM.vmdk	Add to Inventory	KB	٧
👘 👘 Clone 2	XP Pro VM		Vmware-48.log	Go to Folder	КB	V
			Vmware-47.log		— KB	V
			XP Pro Template VM.nvram	Cut	KB	Ν
			vmware-46.log	Сору	K B	V
1			vmware-49.log	Pasce	KB	
			umware-51.log	Download	KB	۷
			🖆 XP Pro Template VM.vmx	Move to	KB	۷
			AP Pro Template VM-00000	Rename	KB	¥ 🚽
			I∎ I I I I I I I I I I I I I I I I I I	New Folder		
1 object selected	8.00 GB			Delete from Disk		

6. Navigate to the clone VM directory. Notice there is no VMDK file (because in step 1 we did not create a disk). Paste the VMDK file into this directory.

	🛃 Datastore Browser - [datastore:]	
	a 🖪 📁 🎙 🛢 🗟	S (2)	
17	Folders Search	[datastore1] Clone 2 XP Pro ¥M	
ł.	🖃 🗗 🗍	Name	Size Type
	🛛 💋 XP Pro Template VM	📔 👘 Clone 2 XP Pro VM.vmx	1.04 KB Virtu
ł.	Clone 1 XP Pro VM	Clone 2 XP Pro VM.vmxf	0.27 KB File
		Clone 2 XP Pro VM.vmsd	0.00 KB File
		Add to Inventory Go to Folder	
		Cut	
		Сору	
i.		Paste	
		Download Move to Rename	Þ



NETLAB+ Remote PC Guide for VMware Implementation Using ESXi Version 3.5/4.01

It may take several minutes to copy and paste this file.

🕜 Copying	
Copying 1 file(s)	
To [datastore1] Clone 2 XP Pro VM/	
	Cancel
11 minute(s) and 24 second(s) remaining	

The file will be listed in the directory when the copy/paste is complete.

🛃 Datastore Browser - [datastore1]							
16 🕅 📁 🛢 🛢 🖒	3						
Folders Search [datastore1] Clone 2 XP Pro VM							
	Name	Size Type					
🛛 🃁 XP Pro Template VM	👘 Clone 2 XP Pro VM.vmx	1.04 KB Virtu					
Clone 1 XP Pro VM	🐣 XP Pro Template VM.vmdk	8,388,608.00 KB Virtu					
Clone 2 XP Pro VM	Clone 2 XP Pro VM.vmxf	0.27 KB File					
	Clone 2 XP Pro VM.vmsd	0.00 KB File					
J		F					
1 object selected 8.00 GB							



7. Navigate to the clone VM properties and click on Add hardware.

rdware Summary	County the second of second states the third between
Memory 256 MB	machine. The memory size must be a multiple of 4MB.
CPUs 1 Floppy Drive 1 Client Device CD/DVD Drive 1 Client Device Network Adapter 1 VLAN3 Placeholder	Memory for this virtual machine: 256 Image: 0 4 65532 To set the memory to one of the indicated values, you may click the colored triangle on the slider above or in the legend below. A Guest OS recommended minimum 128 MB A Recommended memory 256 MB A Guest OS recommended maximum 4086 MB Maximum for best performance 4088 MB

8. We will now add a hard disk.

Add Hardware Wizard		X
Select Device Type What sort of device do	you wish to add to your virtual machine?	
Device Type Select a Disk Disk Capacity Advanced Options Ready to Complete	Choose the type of device you wish to add.	



9. Select the **Use an existing virtual disk** option, since we will select the VMDK file that was pasted as the virtual disk for this clone.

Add Hardware Wizard Select a Disk Which disk do you wan	t to use?
Device Type Select a Disk Select Existing Disk Advanced Options Ready to Complete	A virtual disk is composed of one or more files on the host file system. Together these files appear as a single hard disk to the guest operating system. Select the type of disk to use from the choices below. Disk Create a new virtual disk Choose this option to create a new virtual disk. Choose this option to create a new virtual disk. Choose this option to reuse a previously configured virtual disk. Choose this option to reuse a previously configured virtual disk. CRew Device Mappings Give your virtual machine direct access to SAN. This option allows you to use existing SAN commands to manage the storage and continue to access it using a datastore.
Help	≤Back Next ≥ Cancel

10. Browse to the VMDK file that was pasted into the clone directory.

🚱 Add Hardware Wizard		X
Select Existing Disk Which existing disk do you	want to use as this virtual disk?	
Device Type Select a Disk Select Existing Disk Advanced Options Ready to Complete	Disk File Path	Browse



11. Selecting browse will display the **Browse Datastores** page.

🚱 Browse Datastore	5		
Look in: Datastore	s	t.	
Name	Capacity	Free space	
datastore1	143.75 GB	135.17 GB	
Files of type:	Compatible Virtual Disk	s (*.vmdk, *.dsk, *. 💌	Open Cancel

12. Make sure to pick the correct directory.

🛃 Browse Datastore	5	
Look in: datastore		E
Name	File Size	Last Modified
💋 💋 XP Pro Templat	e VM	
🔰 💋 Clone 1 XP Pro	VM	
💋 Clone 2 XP Pro	VM	
Filos of huppy		Open
Hies or type:	Compatible Virtual Disks (*.vmdk, *	*.dsk, *. 🗾 🛛 Cancel
		1.



13. Select the VMDK file.

2	Browse Data	astores				_ 0	×
	Look in: Cla	one 2 XP Pro VM		•	E		
- F	Name		File Size		Last Modif	ied	
	📇 🛛 XP Pro T	emplate VM	8 GB		4/3/2009	11:22:56 AM	
F	iles of type:	Compatib	le Virtual Dis	ks (*.vmdk, *	*.dsk, *. 💌	OK Cancel	

14. Select Next to continue with the Add Hardware Wizard.

🛃 Add Hardware Wizard			×
Select Existing Disk Which existing disk do you	i want to use as this virtual disk?		
Device Type Select a Disk Select Existing Disk Advanced Options Ready to Complete	Disk File Path [datastore1] Clone 2 XP Pro VM/XP Pro Template VM.v	Browse	
Help	<u>≤</u> Back	Next ≥	Cancel

15. Keep the default **Advanced Options** (these should match the first VM). The following screenshot is an example and may be different for your ESXi server (depending on the hardware platform used).

🚱 Add Hardware Wizard		X
Specify Advanced Option These advanced options	ns do not usually need to be changed.	
Device Type Select a Disk Select Existing Disk Advanced Options Ready to Complete	Specify the advanced options for this virtual disk. These options do not normally need to be changed. Virtual Device Node SCST (0:0) Mode Independent Independent disks are not affected by snapshots. Persistent Changes are immediately and permanently written to the disk. Notpersistent Changes to this disk are discarded when you power off or revert to the snapshot.	
Help	≤Back Next ≥ Cance	

16. Click on **Finish** to complete clone VM.

🚱 Add Hardware Wizard				×
Ready to Complete Review your selected option	ns and click Finish to cor	nplete the wizard.		
Device Type Select a Disk	The new device will he	ave the following option	ns:	
Select Existing Disk Advanced Options Ready to Complete	Hardware Type: Greate disk: Virtual Device Node: Disk file path: Disk mode:	Hard Disk Use existing disk SCSI (0:0) [datastore1] Clone 2 : Persistent	XP Pro VM/XP Pro Template VM.vmdk	
Help			<u>≤</u> Back <u>E</u> nish Cano	el



17. The hard disk and controller will now appear on the hardware list.

🛃 Clo	one 2 XP Pro VM - Virtual Mach	ine Properties	
Hardy	ware Options Resources		Virtual Machine Version: 4
Hard	ware	Summary	Disk File
	Memory	256 MB	[datastore1] Clone 2 XP Pro VM/XP Pro Template VM.vmdk
	CPUs	1	
8	Floppy Drive 1	Client Device	Capacity
	CD/DVD Drive 1	Client Device	Disk Size (GB): 8.00
-	Network Adapter 1	VLAN3 Placeholder	Maximum Size (GB):
0	New SCSI Controller (add	BusLogic	New Size:
	New Hard Disk (adding)	Virtual Disk	
			Virtual Device Node
			SCS1(0-0)
			13631(0.0)
			Mode
			I_ Independent
			Independent disks are not affected by snapshots.
			C Persistent
			Changes are immediately and permanently written to
			me disk.
			 Nonpersistent
			Changes to this disk, are discarded when you power off or revert to the snapshot.
-			
	Add Remove		
	нөр		OK Cancel

18. Your new clone VM should now boot immediately into the same state as the first VM (depending on what stage you copied the VMDK).



Appendix B Contacting NDG for Technical Support

If you need to contact NDG for support, please be aware that VMware ESXi is a third party product. NDG cannot transfer a customer to the VMware help desk, but we will do our best to help you setup and operate a remotely accessible PC or server using supported VMware virtualization products on your NETLAB+ system under the following guidelines:

- 1. The NETLAB+ administrator has thoroughly studied the NDG documentation including this guide, and attempted to install Virtual Machines (VMs) based on NDG recommendations.
- 2. Remote access to both the VMware ESXi and NETLAB+ server provides the most effective way for NDG to assists customers.
 - a. NDG provides up to 2 hours of support assistance for customers with current NETLAB+ support agreements if remote access is enabled.
 - b. Remote access to the NETLAB+ server is provided via SSH (preferred) or Telnet. Please reference the NDG <u>CSS whitepaper</u> for port details.
 - c. We request that the NETLAB+ administrator be present while NDG is providing assistance.



Appendix C Upgrading from VMware Server 1.x, 2.x, or GSX to VMware ESXi

1. Modify the **PC Type** setting to **VMware ESXi 3.5 U3**. This value is must be set for each virtual machine that you are upgrading to VMware Server 2.x. Please refer to 4.11 for details.

POD 1 - PC 203	
PC ID	203
PC Name	PC3
Туре	VMWARE ESXi 3.5 U3
∨Mware Host IP Address	10.0.30
∨Mware Host Username	netlab
VMware Host Password	NETLAB.API.10.0.030
VMware Guest Configuration File	[datastore1] XP Pro Template VM/XP Pro Template VM.vn
VMware Guest Operating System	Windows XP 💌
VMware Guest VNC Settings	RemoteDisplay.vnc.enabled = "true" RemoteDisplay.vnc.port = "6103"
Access Method	
Admin Status	ONLINE 🔽
Options	✓ revert to snapshot during scrub operation

If you are upgrading from VMware Server 1.0 or GSX you must modify the value of the VMware Guest Configuration file to the format of a relative path name. This file name is typically in the form of [datastore]<*pc name*>/<*operating system*>.vmx. Example: [standard] POD_1 PC_3/winXPpro.vmx. Please refer to 4.11 for details.

The use of relative path names is specific to VMware Server 2.x and ESXi. VMware server 1.0 and GSX require absolute path names. If you are upgrading from VMware Server 1.0 and GSX, you must change your configuration file path names to use relative path names, as shown in the example above.

3. Run at pod test to verify the function of the API, see section 4.13.