



Linux+ Base Pod Installation and Configuration Guide

This document provides detailed guidance on performing the installation and configuration of the Linux+ Base Pod on a NETLAB+ system. The Linux+ Base Pod is one of 2 pods used to support Linux+ Labs.

The Linux+ Install Pod is required for Labs 1a and 1b of Series 1, where installation of the OS is performed. All other Linux+ labs are supported using the Linux+ Base Pod. If you plan to include Lab 1a and Lab 1b of Series 1 as part of your course, you will need to also install the Linux+ Install Pod. Please refer to the [NETLAB+ Linux+ Install Pod Installation and Configuration Pod Guide](#) for details.

Document Version: 2013-08-28 (Beta)

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The development of this document is funded by the Department of Labor (DOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT) Grant No. TC-22525-11-60-A-48; The National Information Security, Geospatial Technologies Consortium (NISGTC) is an entity of Collin College of Texas, Bellevue College of Washington, Bunker Hill Community College of Massachusetts, Del Mar College of Texas, Moraine Valley Community College of Illinois, Rio Salado College of Arizona, and Salt Lake Community College of Utah. This work is licensed under the Creative Commons Attribution 3.0 Unported License. To view a copy of this license, visit <http://creativecommons.org/licenses/by/3.0/> or send a letter to Creative Commons, 444 Castro Street, Suite 900, Mountain View, California, 94041, USA.



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1 Introduction

This document provides detailed guidance on performing the installation and configuration of the Linux+ Base Pod on the NETLAB+ system. The Linux+ Base Pod is one of 2 pods used to support Linux+ Labs.

1.1 About the Linux+ Course

The Linux+ course equips trainees with the knowledge and understanding of methods, tools and techniques used to administer Linux machines. This course is designed to prepare students for LPIC1 exams 101 and 102.

1.2 Using NETLAB+ to Deliver Linux+

NDG has partnered with the National Information, Security & Geospatial Technologies Consortium (NISGTC) to enable NETLAB+ support of the Linux+ course. The use of NETLAB+ provides an enormous opportunity for educational organizations seeking a scalable, cost effective solution to offer access to the technology required to introduce students to Linux+.

1.3 Introducing the Linux+ Base Pod

The Linux+ Base Pod is a 100% virtual machine pod consisting of 4 virtual machines. Linked together through virtual networking, these 4 virtual machines provide the environment for a student or team to perform the Linux+ labs.

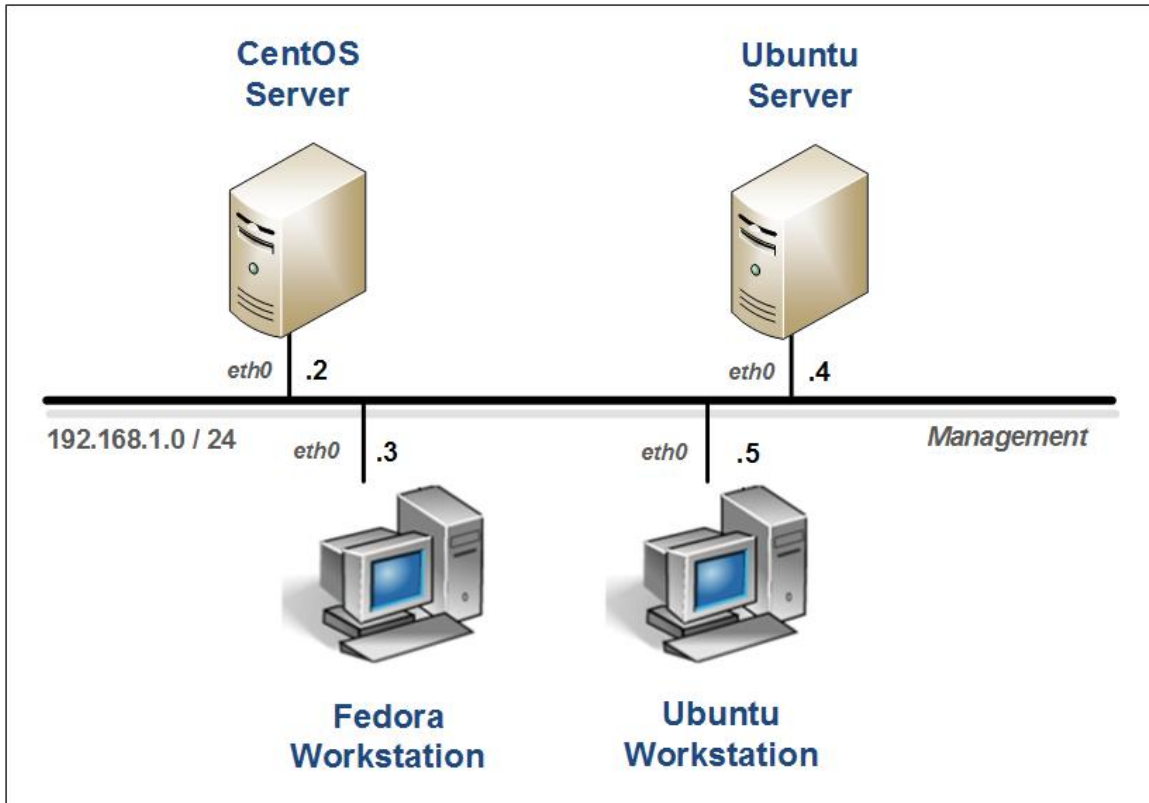


Image Name	Virtual Machine Name
NISGTC_Linux+_Master_CentOS_Server	CentOS Server
NISGTC_Linux+_Master_Fedora_Workstation	Fedora Workstation
NISGTC_Linux+_Master_Ubuntu_Server	Ubuntu Server
NISGTC_Linux+_Master_Ubuntu_Workstation	Ubuntu Workstation

2 Planning

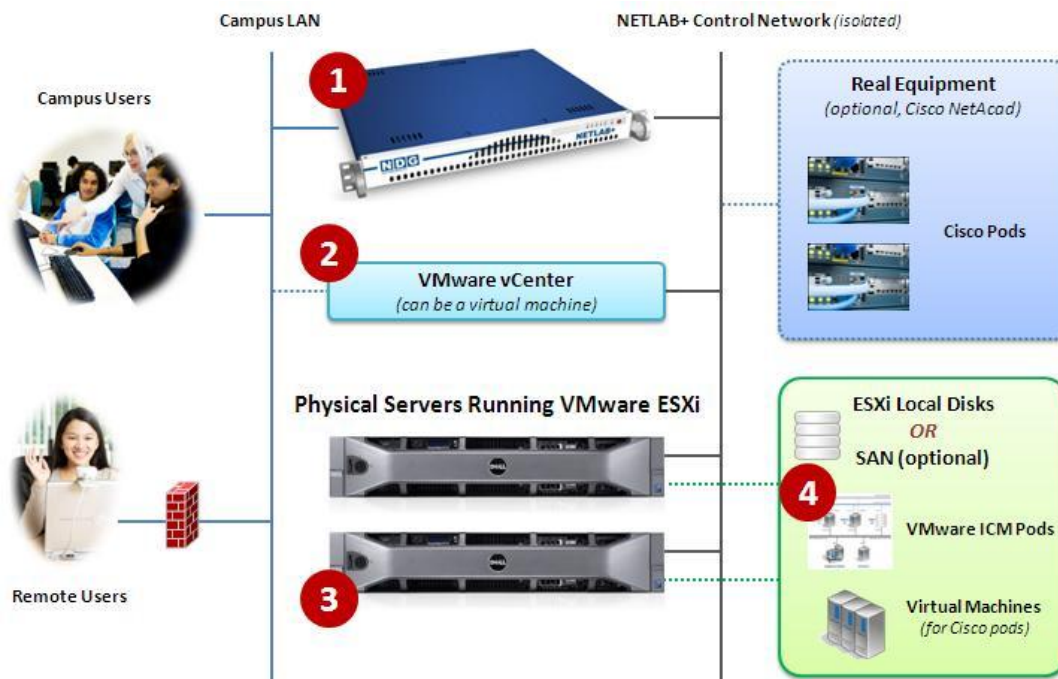
This guide provides specific information pertinent to delivering the Linux+ course. The [NETLAB+ Remote PC Guide Series](#) provides the prerequisite guidance for setting up your VMware infrastructure, including:

- An introduction to virtualization using NETLAB+.
- Detailed setup instructions for standing up VMware vCenter and VMware ESXi.
- Virtual machine and virtual pod management concepts using NETLAB+.

This document assumes that you have set up virtual machine infrastructure in accordance with the [NETLAB+ Remote PC Guide Series](#). The planning information below refers to specific sections in the Remote PC Guide when applicable.

2.1 Linux+ Environment

The following diagram depicts four major components that make up the Linux+ training environment.



1. The NETLAB+ server provides the user interface for student and instructor access, an interface to manage virtual machines, and software features to automate pod creation. This document assumes you have already setup your NETLAB+ server.
2. VMware vCenter is used to manage your physical VMware ESXi servers, to create virtual machines, and to take snapshots of virtual machines.

- NETLAB+ communicates with vCenter to perform automated tasks and virtual machine management.
3. Physical VMware ESXi servers host the virtual machines in your pods. The host server's capabilities are discussed in section [2.5](#).
 4. The Linux+ Base Pod consists of 4 virtual machines that reside on your ESXi host(s).

2.2 Setup Tasks

The following is a summary of the setup tasks in this document.

1. Obtain virtual machine packages (OVF/OVA).
2. Deploy virtual machines for the Master Pod.
3. Attach virtual machines to NETLAB+.
4. Replicate Linux+ pods using the pod cloning feature.
5. Assign Linux+ pods to students or instructors.

2.3 Linux+ Base Pod Creation Workflow

The following list is an overview of the Linux+ Base Pod setup process.

1. The Linux+ virtual machine packages are distributed by CSSIA.
2. Master VMs are created from the deployed virtual machines. The master VMs are added to a Master pod. A *Golden_Snapshot* of the Master pod is taken, which becomes the foundation to clone Linux+ User pods.
3. The NETLAB+ pod cloning feature is used to quickly create copies from the Linux+ Master Pod on the first VMware host.
4. A full replica of the Linux+ Master Pod on Host A is made on Host B, using the NETLAB+ Pod Cloning Feature.
5. The cloning feature is used to quickly create Linux+ pods from the Linux+ Master Pod on Host B.

2.4 Pod Resource Requirements

The Linux+ course will consume 27 GB of storage per each user pod instance.

Be aware that this does not include Labs 1a and 1b of Series 1, which are supported by the Linux+ Install Pod. Please refer to the [NETLAB+ Linux+ Install Pod Installation and Configuration Pod Guide](#) for details.

Details of the storage requirements for each of the lab virtual machines are provided in the tables below.

Virtual Machine	Initial Master Pod (using full clones) GB
CentOS Server	11.5
Fedora Workstation	3.5
Ubuntu Server	2.5
Ubuntu Workstation	3.5
Total Recommended	189

2.5 ESXi Host Server Requirements

The number of **active** pods that can be used simultaneously depends on the NETLAB+ product edition and the number of VMware ESXi host servers meeting the hardware requirements specifications (see link below).

For current ESXi server requirements refer to the following URL:

http://www.netdevgroup.com/support/remote_pc.html#vm_host_server_specifications.

2.6 NETLAB+ Requirements

Installation of Linux+ Base Pods as described in this guide requires that your NETLAB+ system is equipped with NETLAB+ version 2011.R5 or later.

Please refer to the [NETLAB+ Remote PC Guide Series](#).

2.7 Software Requirements

For the purpose of software licensing, each virtual machine is treated as an individual machine, PC or server. Please refer to the specific vendor license agreements (and educational discount programs, if applicable) to determine licensing requirements for your virtual machines' software, operating system and applications.

The virtual infrastructure software required for standing up this pod is in the following table.

Virtual Infrastructure Requirements	
Software	Version
vSphere ESXi	5.1
vCenter Server	5.1

2.8 Networking Requirements

To accommodate the movement of large VMs, OVF/OVAs and ISO disk images from one host to another, a Gigabit Ethernet switch is recommended to interconnect your NETLAB+, vCenter Server system and ESXi host systems.

Two standard networking models are used to interconnect your servers, which are described in detail in the *Networking Models* section of the [Remote PC Guide Series – Volume 1](#).

3 Obtaining Software and Licenses

3.1 Downloading OVF Files

The virtual machines are made available as Open Virtualization Format (OVF) or Open Virtualization Archive (OVA) files. These files are available for download from CSSIA.

To request access to the preconfigured virtual machine templates from CSSIA:

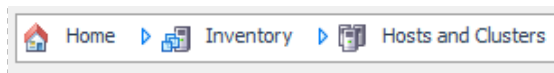
1. Go to the CSSIA Resources page: <http://www.cssia.org/cssia-resources.cfm>.
2. Select **VM Image Sharing Agreement – Image Sharing Agreement**.
3. Select **VM Image Sharing Agreement** to open the request form.
4. Complete and submit your access request by following the instructions on the request form.
5. CSSIA will email a link, along with a username and password to access the download server. Access to the download server is provided only to customers who are current with their NETLAB+ support contract and are participants in the appropriate partner programs (i.e. Cisco Networking Academy, VMware IT Academy, and/or EMC Academic Alliance).
6. Once access to the download server has been established, the virtual machines can be deployed directly to the vCenter Server by clicking on File > Deploy OVF Template in the vClient window and copying the link into the location field.
7. The deployment will start after the username and password are entered.
8. Each virtual machine is deployed individually.

4 Linux+ Master Pod Configuration

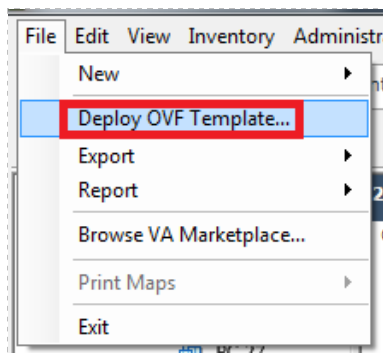
4.1 Deploying Virtual Machine OVF/OVA Files

The OVF/OVA files that you downloaded from CSSIA must be deployed to your host server.

1. Open the vClient on your administration machine where you downloaded the files from NDG. Connect to your vCenter Server.
2. Select **Hosts and Clusters** in the address bar.



3. Click on the first ESXi Host Server.
4. Click on **File -> Deploy OVF Template**.



5. Click on **Browse** and locate the OVF/OVA files you downloaded from CSSIA. Click **Next** to continue.
6. On the OVF Template Details window, click **Next**.
7. On the Name and Location window, change the name to **Linux+_Master_CentOS_Server** (change the name to correspond to the virtual machine that is being imported using *Linux+_Master_* as the prefix). Click **Next**.
8. On the Datastore window, select the appropriate **datastore** for your system and click **Next**.
9. On the Disk Format window, select **Thin provisioned format** and click **Next**.
10. On the Network Mapping window, select **SAFETY NET**. Click **Next**.

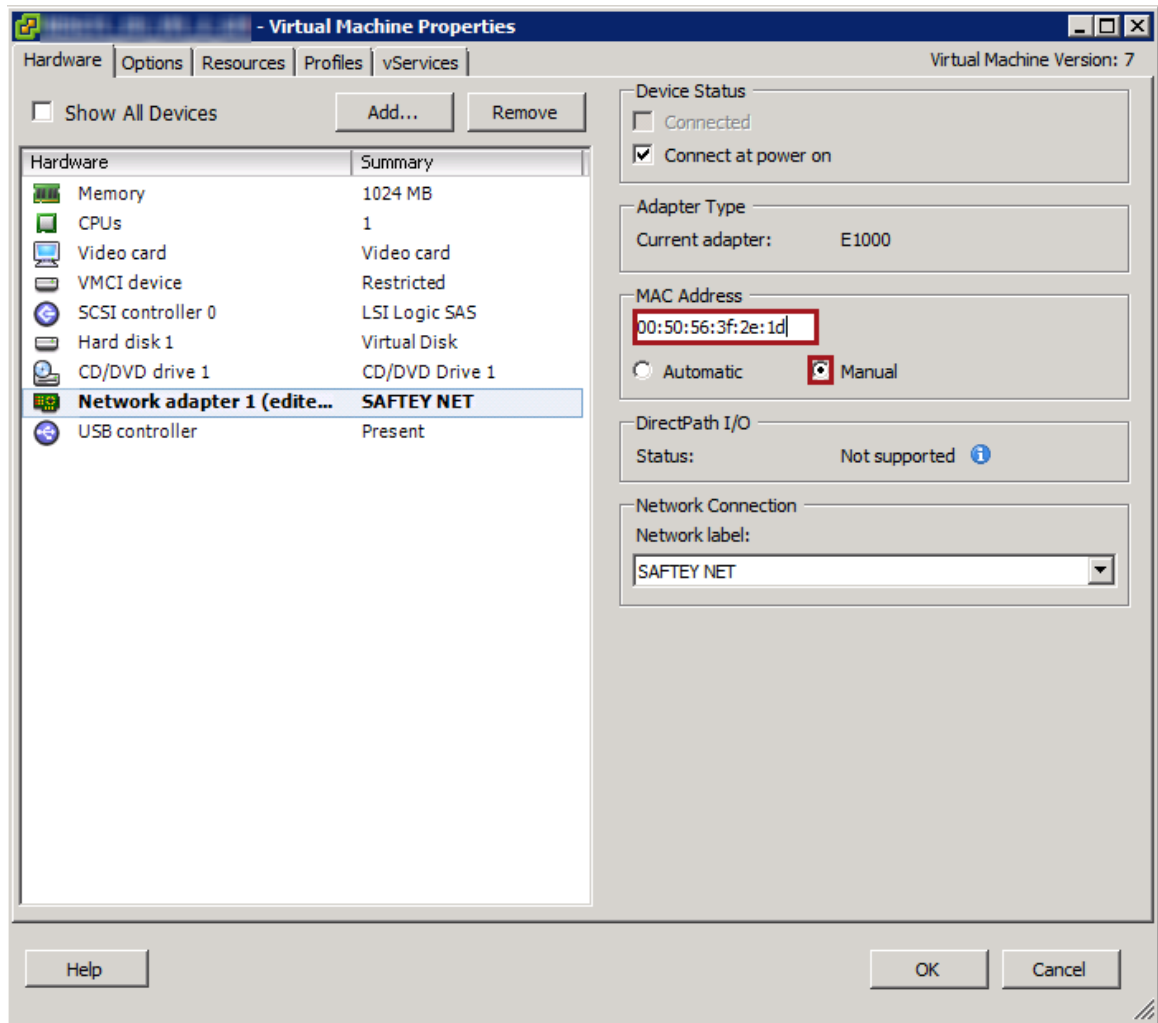
If SAFETY NET is not available, please refer to the [NETLAB+ Remote PC Guide - Volume 3](#) for the installation and configuration of the virtual network.

Network mapping is handled automatically by the NETLAB+ system during pod creation.

- For each of the images being deployed, use the MAC addresses in the following table and statically apply them to the NIC of the associated virtual machine.

Virtual Machine	MAC Address
CentOS Server	00:50:56:90:18:18
Fedora Workstation	00:50:56:90:37:de
Ubuntu Server	00:50:56:90:36:ec
Ubuntu Workstation	00:50:56:90:97:94

To change the MAC address select the Network adapter and click on the **Manual** radio button and type in the MAC Address from the table above in the **MAC Address** text box.



- On the Ready to Complete window, confirm the information and click **Finish**.
- vCenter will begin deploying the virtual machine. This may take some time depending on the speed of your connection, HDDs, etc. When completed, click on **Close**.

14. Repeat steps 4 – 13 for each of the downloaded files then continue to the next section.

4.2 NETLAB+ Virtual Machine Infrastructure Setup

The NETLAB+ Virtual Machine Infrastructure setup is described in the following sections of the [Remote PC Guides for NETLAB+](#):

- *Registering a Virtual Datacenter in NETLAB+*
- *Adding ESXi hosts in NETLAB+*
- *Proactive Resource Awareness*

It is important to configure Proactive Resource Awareness to maximize the number of active pods per physical ESXi host.

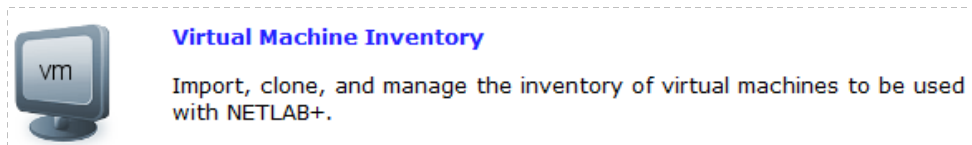
4.3 NETLAB+ Virtual Machine Inventory Setup

This section will guide you in adding your templates to the Virtual Machine Inventory of your NETLAB+ system.

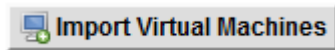
1. Login into your NETLAB+ system using the administrator account.
2. Select the Virtual Machine Infrastructure link.



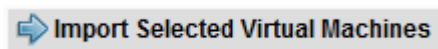
3. Click the Virtual Machine Inventory link.



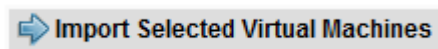
4. Click the Import Virtual Machines button.



5. Select the check box next to your Linux+ virtual machines and click Import Selected Virtual Machines.



6. When the Configure Virtual Machines window loads, you can set your virtual machine parameters.
 - a. Check the drop down box for the correct operating system for each imported virtual machine.
 - b. Add any comments for each virtual machine in the box to the right.
 - c. Verify your settings and click Import Selected Virtual Machines.



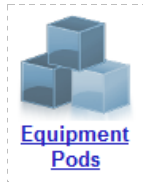
- d. Click OK when the virtual machines have finished loading.
 - e. Verify that your virtual machines show up in the inventory.

For additional information, please refer to the [NETLAB+ Remote PC Guide Volume 3](#).

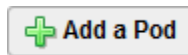
4.4 Installing the Linux+ Master Pod

This section will assist you in adding the Linux+ Master Pod to your NETLAB+ system.

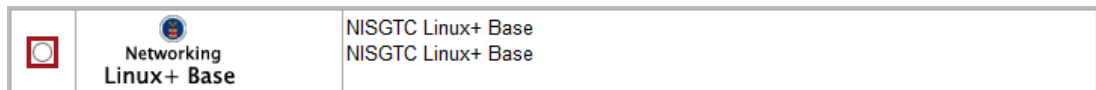
1. Login into NETLAB+ with the administrator account.
2. Select the **Equipment Pods** link.



3. Create a new pod by scrolling to the bottom and clicking the **Add a Pod** button.



4. On the New Pod Wizard page click **Next**.
5. Then select the **Linux+ Base** radio button and click **Next**.



6. Select a Pod ID and click **Next**.

It is best practice to use a block of sequential ID numbers for the number of Linux+ Base pods you are going to install. The Pod ID number determines the order in which the Linux+ Base pods will appear in the scheduler.

7. Type in **Linux+_Master** for the Pod Name and click **Next**.
8. To finalize the wizard click **OK**.

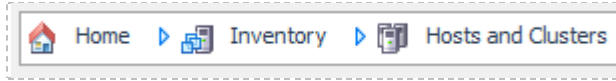
For additional information, please refer to the [NETLAB+ Administrator Guide](#).

4.5 Create Snapshots for the Linux+ Master Virtual Machines

In order to proceed with pod cloning, snapshots must be created for the Linux+ Base Master virtual machines.

Verify that all VMs are powered off before taking snapshots.

1. Open the vClient on your management workstation. Connect to your vCenter Server.
2. Select **Hosts and Clusters** in the address bar.



3. Right-click on each virtual machine and select **Snapshot > Take Snapshot**.
4. Enter **Golden_Master** as the Snapshot Name.
5. Enter a description. It is a good idea to include the date in the description for later reference.
6. Click **OK**.
7. Repeat Steps 3-6 for the remaining virtual machines in the pod.
8. When all tasks have completed, log out of the vClient software.

4.6 Update the Linux+ Master Pod

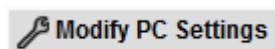
1. Update the Linux+ Master Pod on your NETLAB+ system.
 - a. Login into NETLAB+ with the administrator account.
 - b. Select the **Equipment Pods** link.



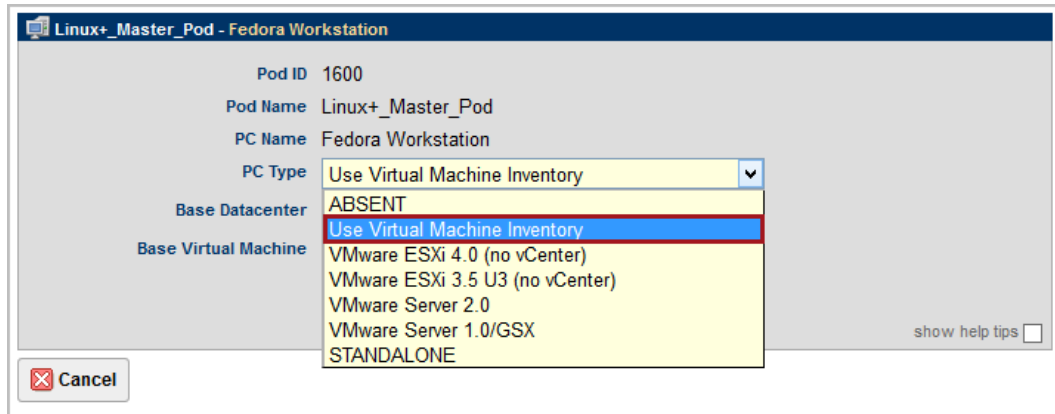
2. Click on the Magnifying Glass icon next to VMV-ESXi. Please note that your PC IDs will not match the graphic below.

POD 4000 - PCs AND SERVERS (click the GO buttons to reconfigure)						
GO	NAME	PC ID	STATUS	TYPE / VM	OPERATING SYSTEM	
	Fedora Workstation	5907	ONLINE	ABSENT		
	Ubuntu Workstation	5908	ONLINE	ABSENT		
	CentOS Server	5909	ONLINE	ABSENT		
	Ubuntu Server	5910	ONLINE	ABSENT		

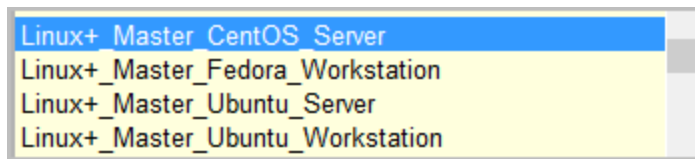
3. Click on Modify PC Settings.



4. Change the PC Type drop down box to **Use Virtual Machine Inventory**.



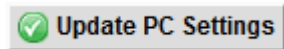
5. In the Base Virtual Machine window, select your Linux+ virtual machine to associate with the spot held for it in the pod.



6. Update **Base Snapshot** to your *Golden_Master* snapshot.
7. Change **Shutdown Preference** to the associative entry from the table below:

Virtual Machine	Shutdown Preference
CentOS Server	Graceful Shutdown from Operating System
Fedora Workstation	Graceful Shutdown from Operating System
Ubuntu Server	Graceful Shutdown from Operating System
Ubuntu Workstation	Graceful Shutdown from Operating System

8. Review the information on the screen and click **Update PC Settings**.



9. Click on **Show Pod**.
10. Repeat steps 2-9 for all virtual machines in the pod.

Make sure the pod status is **Offline** prior to continuing. The cloning process requires the pod be offline, and since this is our master pod used for cloning other pods with, we will keep it offline to create the instructor and student pods.

5 Pod Cloning

This section will help you create multiple Linux+ student pods. The following sections describe the NETLAB+ pod cloning feature used to create student pods on one or two host systems.

5.1 Linked Clones and Full Clones

NETLAB+ can create *linked clones* or *full clones*.

A **linked clone** (or linked virtual machine) is a virtual machine that shares virtual disks with the parent (or master) virtual machine in an ongoing manner. This conserves disk space, and allows multiple virtual machines to use the same software installation. Linked clones can be created very quickly because most of the disk is shared with the parent VM.

A **full clone** is an independent copy of a virtual machine that shares nothing with the parent virtual machine after the cloning operation. Ongoing operation of a full clone is entirely separate from the parent virtual machine.

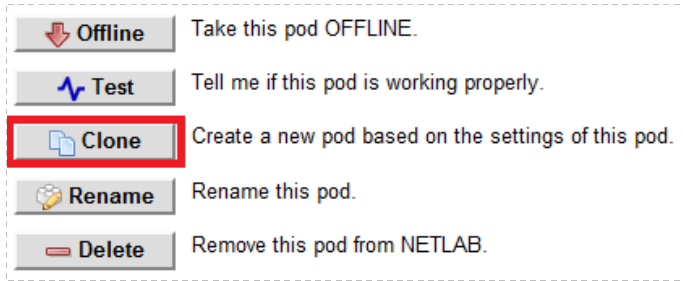
5.2 Creating User Pods on the First Host

The following section describes how to create Linux+ user pods on the same VMware Host system that holds your Master Pod's virtual machines. In this scenario, we will create linked virtual machines using the NETLAB+ pod cloning utility.

1. Login into NETLAB+ with the administrator account.
2. Select the **Equipment Pods** link.



3. Click on your Linux+ Master Pod.
4. Click the Clone button to create a new pod based on the settings of this pod.



5. Select the New Pod ID. It is advised to keep the pods in numerical order. If the pod IDs are not in numerical order, they will not show up in the scheduler in numerical order.
6. Click **Next**.
7. Enter a New Pod Name. For example, **Linux+_Pod_01**. Click **Next**.
8. When the action has finished processing, you are presented with a settings screen.

PC Name	Source Virtual Machine	Source Snapshot	Clone Name	Clone Type	Clone Role	Runtime Host or Group	Clone Datastore	Storage Allocation
Fedora Workstation	Linux+_Master_Fedora_Workstation	Golden_Master	Linux+_Pod_01 Fedora Works	Linked	Normal	Host 209.114.126.6	NFS	On Demand
Ubuntu Workstation	Linux+_Master_Ubuntu_Workstation	Golden_Master	Linux+_Pod_01 Ubuntu Works	Linked	Normal	Host 209.114.126.6	NFS	On Demand
CentOS Server	Linux+_Master_CentOS_Server	Golden_Master	Linux+_Pod_01 CentOS Serve	Linked	Normal	Host 209.114.126.6	NFS	On Demand
Ubuntu Server	Linux+_Master_Ubuntu_Server	Golden_Master	Linux+_Pod_01 Ubuntu Server	Linked	Normal	Host 209.114.126.6	NFS	On Demand

Buttons: Clone Pod, Previous, Cancel

9. The three key columns for this Master Pod clone are Source Snapshot, Clone Type and Clone Role. The following settings should be applied to all virtual machines:
 - a. Source Snapshot should be set to the **Golden_Master** snapshot you created previously.
 - b. Under Clone Type, click the dropdown menu and verify that **Linked** is selected.
 - c. Under Clone Role, click the dropdown menu and verify that **Normal** is selected.
10. When you are done changing settings, Click **Clone Pod**. This should complete within a minute as we are creating linked virtual machines.
11. When the pod clone process is finished, click **OK**.
12. Now we must snapshot the virtual machines. The follow procedure needs to be done for each virtual machine in the pod.
 - a. Under NETLAB+ Administration click on the **Virtual Machine Infrastructure** icon.



- b. On the Virtual Machine Infrastructure page, click on the **Virtual Machine Inventory** hyperlink.







Virtual Machine Inventory

Import, clone, and manage the inventory of virtual machines to be used with NETLAB+.

- c. In the virtual machine inventory, identify the virtual machines that are associated with the pod you created. Click on the **hyperlink** for the virtual machine you wish to create a snapshot on.

The name of the virtual machine is created by combining the pod name and the name of the virtual machine in the pod design.

 Linux+_Pod_01 CentOS Server	Linux	Normal	NDGNL01	209.114.126.6		1	2048	1601	Linux+_Pod_01
 Linux+_Pod_01 Fedora Workstation	Linux	Normal	NDGNL01	209.114.126.6		1	2048	1601	Linux+_Pod_01
 Linux+_Pod_01 Ubuntu Server	Linux	Normal	NDGNL01	209.114.126.6		1	1024	1601	Linux+_Pod_01
 Linux+_Pod_01 Ubuntu Workstation	Linux	Normal	NDGNL01	209.114.126.6		1	1024	1601	Linux+_Pod_01

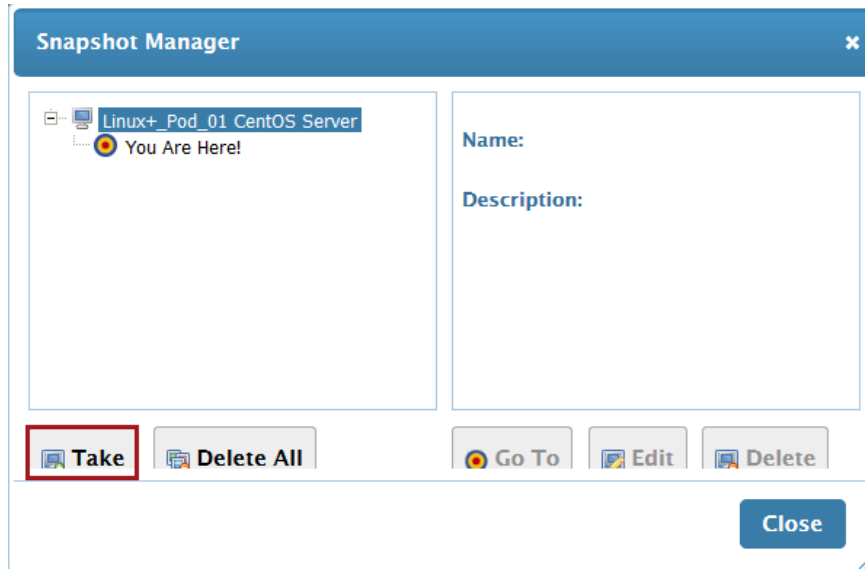
- d. On the Showing VM form, click on the **Snapshots** button.

Showing VM Linux+_Pod_01 CentOS Server

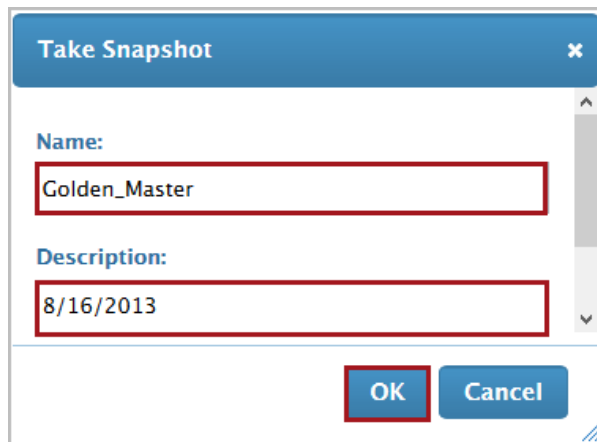
Virtual Machine Name	Linux+_Pod_01 CentOS Server	Rename
Operating System	Linux	
Role	Normal	Change Role
Datacenter	NDGNL01	
Runtime Host	209.114.126.6	
Host Group	n/a	
CPUs	1	
Memory (MB)	2048	
Pod ID	1601	
Pod Name	Linux+_Pod_01	
PC Name	CentOS Server	
Parent	Linux+_Master_CentOS_Server	
Parent Snapshot	Golden_Master	
Children	0	
Datacenter Unique Identifier	5010d05b-1c69-d3f4-212d-be767c97a861	
Datacenter Storage Location	[NFS] Linux+_Pod_01 CentOS Server/Linux+_Pod_01 CentOS Server.vmx	
Comments		

Edit	Change virtual machine parameters.
Clone	Clone this virtual machine.
Snapshots	Manage this virtual machine's snapshots.
Remove	Remove this virtual machine from the NETLAB+ inventory (and optionally from the datacenter).
Exit	Return to inventory.

- e. A Snapshot Manager window will appear. In the Snapshot Manager window, click on the **Take** button.



- f. In the Take Snapshot popup window, enter **Golden_Master** in the **Name** field, enter the *current date* in the **Description** field, then click the **OK** button.



- g. The snapshot is now created. Click the **Close** button in the Snapshot Manager window.
 - h. On the Showing VM form click the **Exit** button to return to the Virtual Machine Inventory.
13. If you want to dedicate this pod to a particular class, team, or student, use the Pod Assignment feature. For details, see the [Pod Assignment Guide](#).
 14. Click the **Online** Button in the Pod Management page to activate the pod.

The user pod can now be reserved. When the reservation becomes active, NETLAB+ will automatically configure virtual machines and virtual networking for your new Linux+ pod.

The Golden Snapshot is the starting point for all Linux+ pods. We recommend that you reserve the 1st Linux+ pod and conduct some Linux+ labs to make sure the Golden Snapshot is correct. You should correct any defects on the Linux+ Master pod and Golden Snapshot before creating additional pods.

You may repeat the pod cloning process to create up to 15 more Linux+ user pods on this host.

Time Saver: If you clone the 1st Linux+ user pod instead of the Master pod, the defaults will all be set correctly, and you will not have to change the Clone Type and Clone Role each time. NETLAB+ will still assume you want to link to the Master VMs as Masters are ranked higher than Normal or Persistent VMs in the default pod cloning selections.

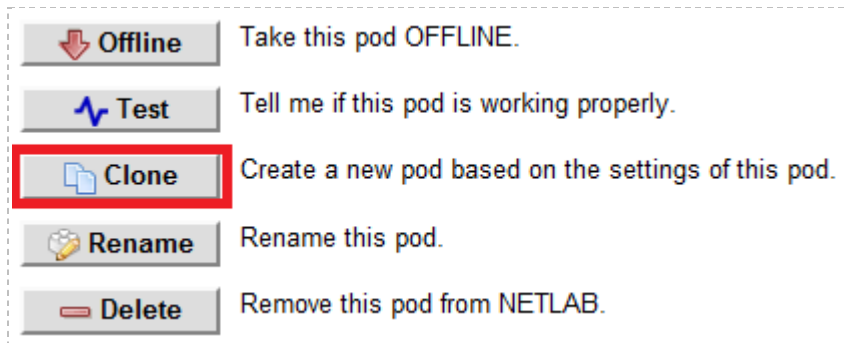
5.3 Copying Your Master Pod to the Second Host

For this task, we will use the pod cloning utility to copy our Master Pod to the 2nd host.

1. Login into NETLAB+ with the administrator account.
2. Select the **Equipment Pods** link.



3. Click on your Linux+ Master Pod that was created on the 1st VMware host server.
4. Click the Clone button to create a new pod based on the settings of this pod.



5. Select the New Pod ID.

It is advised to keep the pods in numerical order. If the pod IDs are not in numerical order, they will not show up in the scheduler in numerical order.

6. Click **Next**.
7. Enter a New Pod Name. For example, **Linux+_Master_Pod_02**. Click **Next**.
8. When the action has finished processing, you are presented with a settings screen.

PC Name	Source Virtual Machine	Source Snapshot	Clone Name	Clone Type	Clone Role	Runtime Host or Group	Clone Datastore	Storage Allocation
Fedora Workstation	Linux+_Master_Fedora_Workstation	Golden_Master	Linux+_Master_Pod_02 Fedora	Linked	Normal	Host 209.114.126.6	NFS	On Demand
Ubuntu Workstation	Linux+_Master_Ubuntu_Workstation	Golden_Master	Linux+_Master_Pod_02 Ubuntu	Linked	Normal	Host 209.114.126.6	NFS	On Demand
CentOS Server	Linux+_Master_CentOS_Server	Golden_Master	Linux+_Master_Pod_02 CentOS	Linked	Normal	Host 209.114.126.6	NFS	On Demand
Ubuntu Server	Linux+_Master_Ubuntu_Server	Golden_Master	Linux+_Master_Pod_02 Ubuntu	Linked	Normal	Host 209.114.126.6	NFS	On Demand

9. The four key columns for this Master Pod clone are Source Snapshot, Clone Type and Clone Role, and Runtime Host.
 - a. Source Snapshot should be set to the **Golden_Master** snapshot you created previously.
 - b. Under Clone Type, click the dropdown menu and verify that **Full** is selected.
 - c. Under Clone Role, click the dropdown menu and select **Master**.
 - d. Under Runtime Host, select the 2nd host system (which should be different than the system you are cloning from).
10. When you are done changing settings, Click **Clone Pod**. This may take up to 30 minutes as full copies are being made. You may navigate away from the cloning progress screen, and then later return to the pod to check progress.

The NETLAB+ software does not clone the snapshots of the Linux+ Master VMs. It is necessary to login into your Management Workstation and create the snapshots manually as you did in section 4.5.

11. When the cloning process is complete, you should create a Golden_Snapshot on each virtual machine in the 2nd Master pod.

5.4 Creating User Pods on the Second Host

To create user pods on the second host, repeat the steps to create User pods on the first host (section 5.2), substituting the 2nd Master pod (created in the previous section) as the cloning source.

6 Assigning Pods to Students, Teams , or Classes

Please refer to the [Pod Assignment Guide](#) for details on using the Pod Assignment feature.