



# EMC ISM Pod

## Installation and Configuration Guide

Document Version: **2012-07-09**

Installation of EMC ISM virtual pods as described this guide, requires that your NETLAB+ system is equipped with software version NETLAB+ version 2011.R5 or later. Previous versions of NETLAB+ do not support the use of VMware ESXi 4.1 U2 on **physical** host servers, which is required to support the installation and use of EMC ISM virtual pods on NETLAB+.

**Please verify that your NETLAB+ system is running NETLAB+ version 2011.R5 or later, prior to upgrading your VMware ESXi servers to version 4.1 U2 as detailed in this guide.**

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## 1 Introduction

This document provides detailed guidance on performing the installation and configuration of the EMC Information Storage and Management (ISM) pod on the NETLAB+ system.

### 1.1 About the EMC Information Storage and Management Course (ISM)

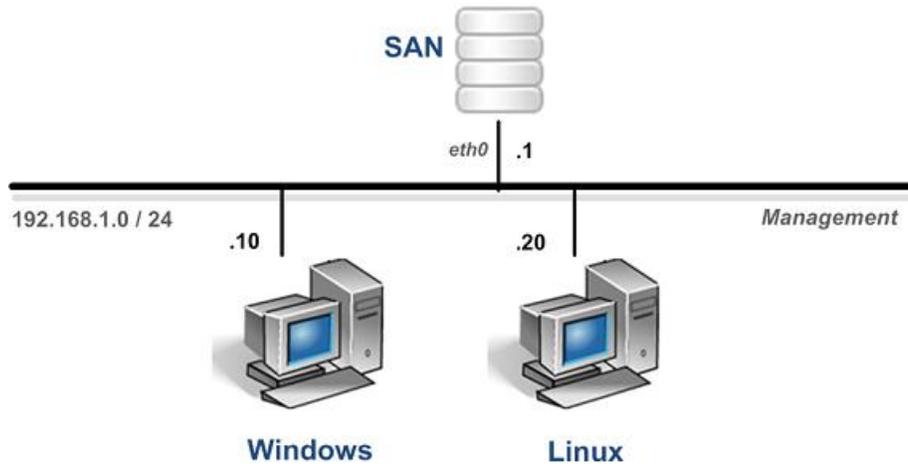
The ISM course will equip trainees with the knowledge, skills, and abilities to build and run a storage area network environment. The ISM course discusses the installation and configuration of Openfiler, an open source storage management appliance. It also focuses on the management of the storage area network for security vulnerabilities. This course will help to prepare IT professionals to achieve basic understanding of storage area networks, deployment considerations, and possible security vulnerabilities to prevent.

### 1.2 Using NETLAB+ to Deliver ISM

NDG has partnered with the EMC Academic Alliance to enable NETLAB+ support of the EMC Information Storage and Management (ISM) 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 in order to introduce students to storage area network technologies and equip them with a valuable platform to learn basic concepts.

### 1.3 Introducing the ISM Pod

The NDG ISM pod is a 100% virtual machine pod consisting of three virtual machines. Linked together through virtual networking, these three virtual machines provide the environment for a student or team to perform the EMC ISM labs.



| Virtual Machine | Role                                      |
|-----------------|---|
| SAN             | Openfiler Storage Area Network appliance. |
| Windows         | A Windows client.                         |
| Linux           | A Linux client.                           |

Each ISM pod runs inside a single physical VMware ESXi server. Using the NDG recommended hardware specifications, you can host up to 16 active ISM pods on a single physical ESXi server.

## 2 Planning

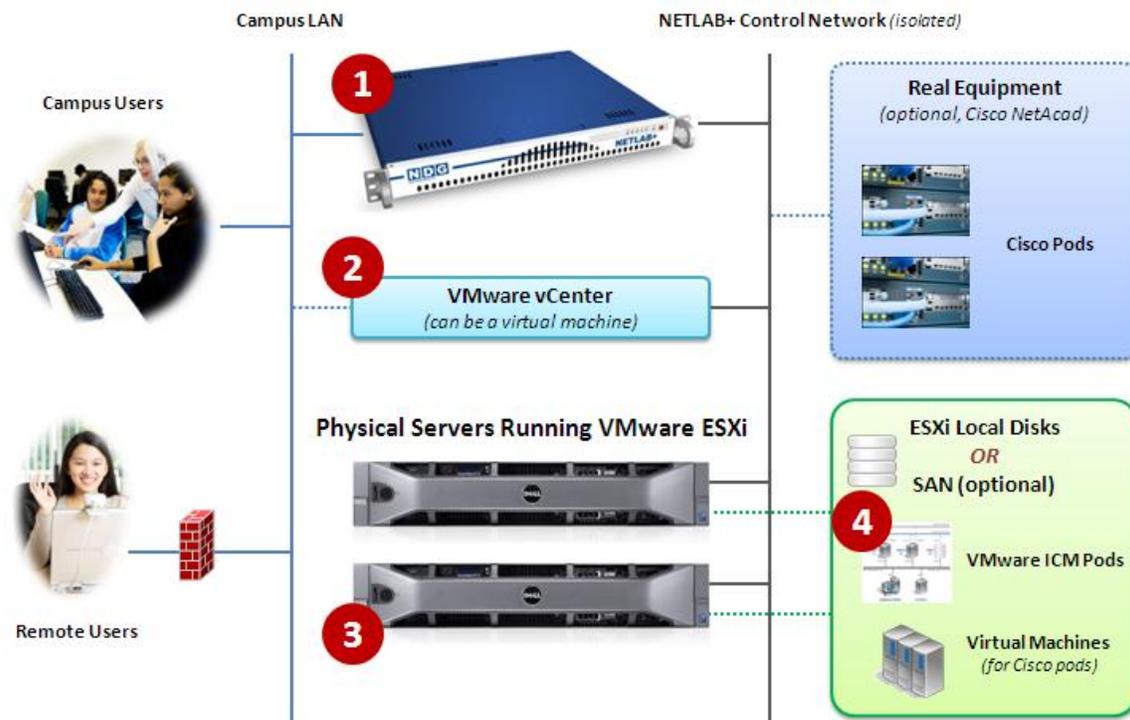
This guide provides specific information pertinent to delivering the ISM course. The [Remote PC Guide for VMware Implementation Using ESXi versions 4.01 and 4.1 U2 with vCenter](#) provides prerequisite guidance for setting up your VMware infrastructure, including:

- 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 you have set up virtual machine infrastructure in accordance with the [Remote PC Guide](#). The planning information below refers to specific sections in the Remote PC Guide when applicable.

### 2.1 ISM Environment

The following diagram depicts four major components that make up the ISM 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 ISM 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 ISM pods. The two hosts servers depicted can run up to 32 active ISM pods.
4. ISM pods consist of three virtual machines that reside on your physical ESXi host server disks.

## 2.2 Setup Tasks

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

1. Obtain software and templates.
2. Configure templates for Master Pod.
3. Attach templates to NETLAB.
4. Replicate EMC ISM pods using the pod cloning feature.
5. Assign EMC ISM pods to students or instructors using Pod Assigner.

## 2.3 ISM Pod Creation Workflow

The following list is an overview of the ISM pod setup process. This assumes you do not have a Storage Area Network (SAN) and you will be storing EMC ISM pods on each VMware server's local disk. SAN storage for virtual machines is not currently supported by NETLAB+.

1. Virtual machine templates for SAN, Windows, and Linux VMs are distributed by CSSIA and installed on vCenter.

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. Follow the instructions to complete and submit the form.
- 
2. Master VMs are created from each template VM. The master VMs are added to a Master pod. A *Golden\_Snapshot* of the Master pod is taken, which becomes the foundation to clone EMC ISM User pods.
  3. The NETLAB+ pod cloning feature is used to quickly create copies from the EMC ISM Master Pod on the first VMware host.
  4. A full replica of the EMC ISM 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 EMC ISM pods from the EMC ISM Master Pod on Host B.

Without a Storage Area Network (SAN), EMC ISM pods on Host B cannot be linked to Host A. This is because Host B cannot access Host A's local disks (and vice-versa). Therefore, we create one Master EMC ISM Pod per host. SAN storage for virtual machines is not currently supported by NETLAB+.

## 2.4 ESXi Host Server Requirements

The number of **active** ISM 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 below. The following table shows the number of **active** pods (students or teams) that can be scheduled at the same time. **You may provision more ISM pods than the active limit.**

| NETLAB+ Edition      | Number of VMware ESXi Servers | Active ISM Pods |
|----------------------|-------------------------------|-----------------|
| Academy Edition      | 1                             | 16              |
| Professional Edition | 2                             | 32              |

For more information regarding ESXi hardware requirements see the *VMware ESXi Host Requirements* and sections of the [Remote PC Guide](#).

The ESXi host server setup is covered in detail in the *VMware ESXi Server Setup* section of the [Remote PC Guide](#).

## 2.5 NETLAB+ Requirements

Installation of EMC ISM pods as described in this guide requires that your NETLAB+ system is equipped with NETLAB+ software version 2011.R5 or later.

Previous versions of NETLAB+ do not support the use of VMware ESXi 4.1 U2 on the physical host servers, which is required to support the installation and use of EMC ISM Pods on NETLAB+.

Please verify that your NETLAB+ system is running NETLAB+ version **2011.R5** or later, prior to upgrading your VMware ESXi servers to version 4.1 U2 as detailed in this guide.

## 2.6 vCenter Server Requirements

Starting with software version 2011.R1V, NETLAB+ provides a Virtual Machine Inventory feature that can communicate with VMware vCenter Server. This software has many features to assist the administrator with installing and configuring the ISM Pod.

VMware vCenter 4.1 is a required component for the NETLAB+ infrastructure to manage ISM virtual pods and ISM course delivery.

For more information regarding vCenter Server requirements, please see the *VMware vCenter Server Requirements* section of the [Remote PC Guide](#).

The vCenter Server setup is covered in detail in the *VMware vCenter Server Setup* section of the [Remote PC Guide](#).

## 2.7 Software Requirements

This documentation reflects using ESXi 4.1U2 for the physical host servers. Although the NETLAB+ system software will work with ESXi 4.01 servers, 4.1 U2 is required for the ISM course and ISM pod deployment.

**Currently, ESXi 5.0 is not supported for use on the physical host servers.**

For the purpose of software licensing, each virtual machine is treated as an individual 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, server software, operating systems, and applications.

The following software is used to host and manage VMs in the NETLAB+ infrastructure.

| NETLAB+ Infrastructure | Software                      | Source                                |
|------------------------|-------------------------------|---------------------------------------|
| Physical ESXi Hosts    | VMware ESXi 4.1 U2            | VMware Academic Program Store website |
| vCenter Server         | Windows Server 2008 R2 64-bit | MSDN-AA or retail                     |
|                        | Microsoft SQL Server 2008 R2  | MSDN-AA or retail                     |
|                        | VMware vCenter 4.1            | VMware Academic Program Store website |

The following software is required for virtual machines inside the ISM pod.

| Lab Virtual Machines | Software                      | Source for OVF Template VM |
|----------------------|-------------------------------|----------------------------|
| SAN                  | Openfiler                     | CSSIA                      |
| Windows              | Windows Server 2003 R2 32-bit | CSSIA via MSDN-AA          |
| Linux                | Ubuntu Desktop 32-bit         | CSSIA                      |

The **SAN** virtual machine is downloaded from CSSIA. It already contains the ISO necessary for installation during the labs. During deployment, you will set a fixed MAC address on the Ethernet interface.

The **Windows** virtual machine is downloaded from CSSIA. It already has Windows Server 2003 R2 installed, which is licensed through the MSDN-AA program. No additional setup is necessary.

The **Linux** virtual machine is downloaded from CSSIA. It already has Ubuntu Desktop installed and configured. During deployment, you will set a fixed MAC address on the Ethernet interface.

## 2.8 Networking Requirements

To accommodate the movement of large VMs 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.

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

## 2.9 Using Storage Area Networks

NDG performs all testing on servers with Internal Direct Attached Storage (i.e. RAID arrays and RAID controllers directly attached to each ESXi host server). This is the configuration that most academic institutions are likely to find affordable and adopt.

A Storage Area Network (SAN) is a dedicated network that provides access to consolidated, block level data storage that can be used for disk storage in a VMware vSphere environment.

**Currently NDG does not provide benchmarks, guidance or troubleshooting for SAN configurations.** Our documentation may show an optional SAN in the environment; however this is not a recommendation or requirement to deploy a SAN.

**NDG benchmarks and capacity planning guidance do not account for the additional latencies introduced by SAN.**

- When compared to Direct Attached Storage, a SAN may introduce additional I/O latency between ESXi server and disk. Therefore, a SAN may reduce the number of active VMs you can run on an ESXi host.
- If you deploy a SAN, you should perform your own benchmarks and determine the number of active VMs you can host on your ESXi server. Your mileage may vary.
- Always configure NETLAB+ Proactive Resource Awareness to ensure that the number of VMs that can be activated will remain within your predetermined performance limits.

## 2.10 ISM Pod Storage Requirements

You should budget **8 gigabytes** for each ISM master pod and **4 gigabytes** each user pod instance.

The datastore containing an ISM pod must be accessible to the VMware host to which it is assigned, as either directly attached local storage or a Storage Area Network (SAN).

Details of the storage requirements for each of the lab virtual machines in the ISM pod are provided in the table below. Some fluctuation in the numbers may occur.

| Lab Virtual Machines     | Master Pod at Lab 0<br>(using full clones) | User Pod after Last Lab<br>(using linked clones) |
|--------------------------|--|--|
| SAN                      | 400 MB                                     | 3.5 GB   |
| Windows                  | 3.96 GB                                    | 4.06 GB  |
| Linux                    | 3.45 GB                                    | 3.53 GB  |
| <b>Total Recommended</b> | <b>8.00 GB</b>                             | <b>12.00 GB</b>                                  |

## 3 Obtaining Software and Licenses

The license and software information for your physical ESXi hosts can be found in the *VMware ESXi* section of the [Remote PC Guide](#).

### 3.1 Downloading OVF files

NDG has created virtual machine template files (OVF files) for the virtual machines **SAN**, **Windows**, and **Linux** in ISM pods. These files are available through CSSIA (see section [2.3](#)).

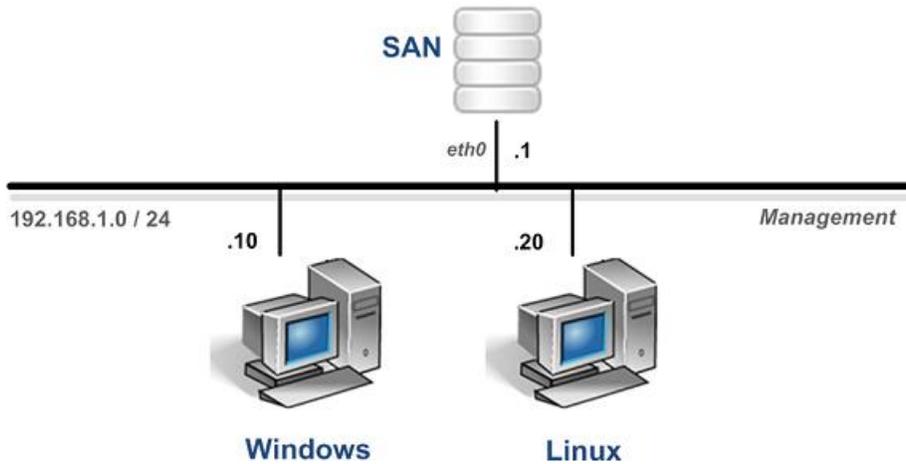
It is recommended that you request the preinstalled EMC ISM virtual machines from CSSIA.

Due to the size of the OVF templates, it is advisable to download these files to a system that resides on the same network as your VM infrastructure.

## 4 EMC ISM Master Pod Configuration

This section will walk you through creating and adding a Master EMC ISM Pod to the NETLAB+ system. The Master EMC ISM Pod will be used to quickly create copies of the ISM pod that can be assigned to classes and students.

Below is a pod topology diagram that will be referenced during this installation and configuration. The EMC ISM Pod consists of three virtual machines: a SAN server, a Windows client, and a Linux client.



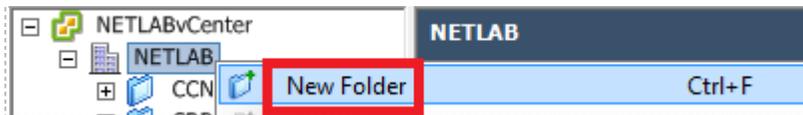
## 4.1 Deploying Virtual Machine Templates (OVF Files)

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

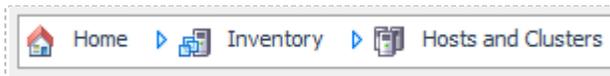
1. Open the vClient on your administration machine where you downloaded the files from NDG. Connect to your vCenter Server.
2. Select **VMs and Templates** in the address bar.



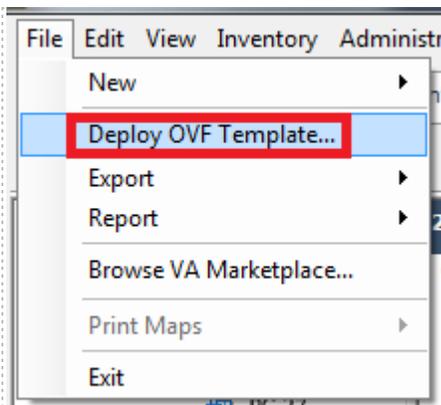
3. Right-click on the **NETLAB** datastore, and select **New Folder**.



4. Name the new folder “**ISM Pod Templates**”. This is where we will store the virtual machine templates as a backup.
5. Select **Hosts and Clusters** in the address bar.



6. Click on the first ESXi Host Server.
7. Click on **File -> Deploy OVF Template**.



8. Click on **Browse** and locate the **EMC\_ISM\_Master\_SAN\_XXXXXX.ovf** file you downloaded from CSSIA. Click **Next** to continue.

9. On the OVF Template Details window, click **Next**.
10. On the Name and Location window, change the name to **ISM\_Master\_SAN\_template** and select the **ISM Pod Templates** folder you created earlier. Click **Next**.
11. On the Datastore window, select the appropriate datastore and click **Next**.
12. On the Disk Format window, select **Thin provisioned format** and click **Next**.
13. On the Network Mapping window, leave the default networks. Click **Next**.

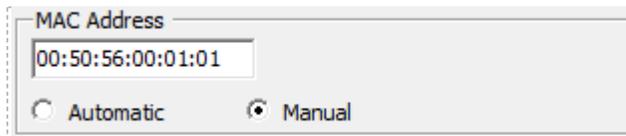
Network mapping is handled automatically by the NETLAB+ system during pod creation.

14. On the Ready to Complete window, confirm the information and click **Finish**.
15. 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**.
16. Repeat steps 6-15 for the remaining Windows and Linux OVF files. Be sure to choose **Thin Provisioned format** when prompted and change the names to **ISM\_Master\_Windows\_template** and **ISM\_Master\_Linux\_template**.

## 4.2 Modify SAN and Linux Virtual Machine Settings

Modify the virtual machine settings for the SAN appliance.

1. Right click the **ISM\_Master\_SAN\_template** virtual machine in the inventory and select **Edit Settings**.
2. Click on the network adapter.
3. When the right panel updates, select **Manual** under the **MAC address** settings and enter **00:01:01**.



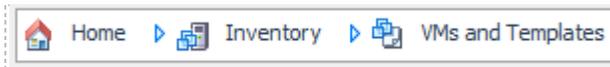
If this step is skipped, cloned instances of this virtual machine may not function properly.

4. Click **OK**.
5. Repeat steps 1 -4 for **ISM\_Master\_Linux\_template** virtual machine and use the MAC address **00:50:56:00:01:20**.

### 4.3 Convert Virtual Machines to Templates

The deployed OVF files will be displayed in your host server's inventory as Virtual Machines and should be converted into templates. This will ensure that the original OVF files are not accidentally modified.

1. Select **VMs and Templates** in the address bar.



1. Right-click on your **ISM\_Master\_Linux\_template** virtual machine and choose **Template > Convert to Template**.
2. Right-click on your **ISM\_Master\_SAN\_template** virtual machine and choose **Template > Convert to Template**.
3. Right-click on your **ISM\_Master\_Windows\_template** virtual machine and choose **Template > Convert to Template**.
4. When the tasks complete, you should have three templates and no virtual machines in your inventory.

Aside from the configuration of your master lab virtual machines, all remaining virtual machine management for the ISM Pods will be conducted through your NETLAB+ system.

### 4.4 NETLAB+ Virtual Machine Infrastructure Setup

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

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

It is important to configure Proactive Resource Awareness to limit the number of active ISM pods per physical ESXi host. The following values are recommended to achieve a 16 to 1 ISM pod-to-host ratio using physical servers that meets or exceed the NDG recommended specifications for ISM delivery.

|                      |                              |
|----------------------|------------------------------|
| Maximum Running VMs  | 48                           |
| Maximum Virtual CPUs | 48                           |
| Maximum Memory Usage | 28672 Megabytes <sup>1</sup> |

<sup>1</sup>This number may be slightly larger than physical memory for ISM. In practice, the maximum memory used under peak conditions will be 10% to 20% less than physical due to VMware memory management techniques.

## 4.5 NETLAB+ Virtual Machine Inventory Setup

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

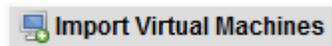
1. Login into your NETLAB+ system using the administrator account.
2. Select the Virtual Machine Infrastructure link.



3. Click the Virtual Machine Inventory link.



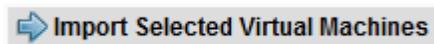
4. Click the Import Virtual Machines button.



5. Select the check box next to your ISM Template SAN, Windows and 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.

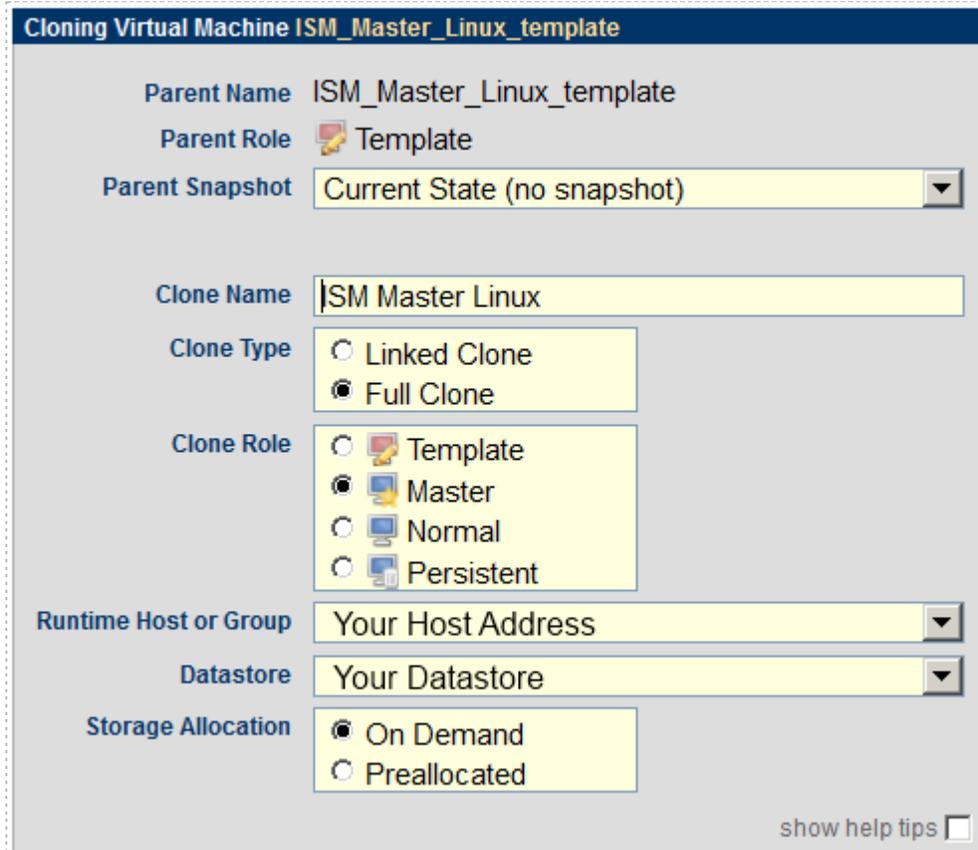
## 4.6 Create Master ISM Virtual Machines for Pod Configuration

This section will assist you in creating master ISM virtual machines. These VMs will be used in section 5 for software configuration.

1. Click **ISM\_Master\_Linux\_template**.
2. Click the **Clone** button.



3. Use **ISM Master Linux** as the Clone Name.
4. Select the radio button next to **Full Clone** in the Clone Type box.
5. Select the radio button next to **Master** in the Clone Role box.
6. Select your first host server and datastore from the drop down boxes.
7. Verify that your settings resemble the picture below.



**Cloning Virtual Machine ISM\_Master\_Linux\_template**

Parent Name ISM\_Master\_Linux\_template

Parent Role  Template

Parent Snapshot Current State (no snapshot) ▼

Clone Name ISM Master Linux

Clone Type  Linked Clone  
 Full Clone

Clone Role   Template  
  Master  
  Normal  
  Persistent

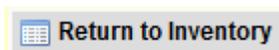
Runtime Host or Group Your Host Address ▼

Datastore Your Datastore ▼

Storage Allocation  On Demand  
 Preallocated

show help tips

8. Click **OK**.
9. Click **Return to Inventory**.



10. Repeat steps 1-9 for the SAN and Windows templates, assigning the following clone names (case sensitive):

- **ISM Master SAN**
- **ISM Master Windows**

Some cloning processes will take longer than others, depending on your network connection and hard drive speeds.

#### 4.7 Install the Master EMC ISM Pod

This section will assist you in adding the EMC ISM Pod to your NETLAB+ system.

1. Add an EMC ISM Pod to your NETLAB+ system.
  - a. Login into NETLAB+ with the administrator account.
  - b. Select the **Equipment Pods** link.

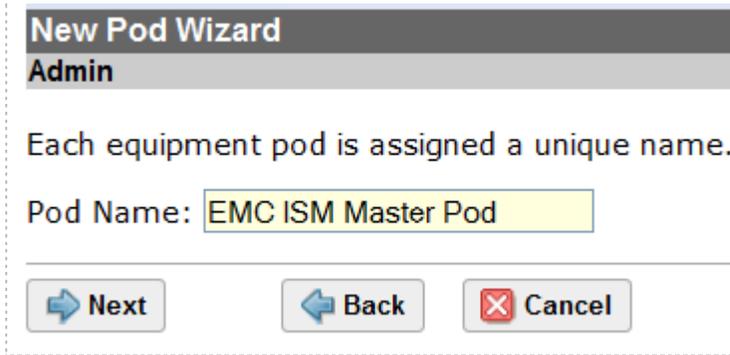


- c. Select **Add a Pod**.

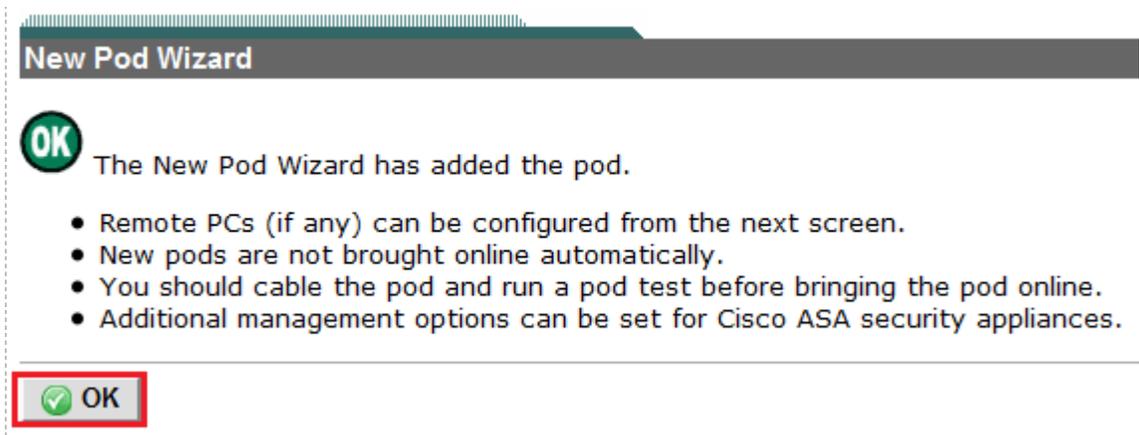


- d. The New Pod Wizard will now help you add an equipment pod to your system.
2. Add an EMC ISM Pod.
    - a. In the New Pod Wizard, click **Next** to continue.
    - b. When prompted, select the **EMC ISM Pod** and click **Next** to continue.
  3. Select a Pod ID number. It is best practice to use a block of sequential ID numbers for the number of ISM pods you are going to install. The Pod ID number determines the order in which the ISM pods will appear in the scheduler. Click **Next** to continue.

- Assign the pod a unique Pod Name. Click **Next** to continue.



- The wizard will add the pod to NETLAB+. When completed, click **OK** to finish.

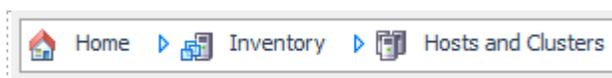


#### 4.8 Create Snapshots for the ISM Master VMs.

In order to proceed with pod cloning, snapshots must be created for the three ISM Master virtual machines.

Verify that all VMs are powered off before taking snapshots.

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



- Right-click on the virtual machine, **ISM Master Linux** and select **Snapshot > Take Snapshot**.
- 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 **ISM Master SAN** and **ISM Master Windows**.
8. When all tasks have completed, log out of the vClient software.
9. Update ISM Master Pod on your NETLAB+ system.
  - a. Login into NETLAB+ with the administrator account.
  - b. Select the **Equipment Pods** link.



10. Click on the Pod ID or magnifying glass for your ISM Master Pod.
11. Click on the Magnifying Glass icon next to the SAN. Please note that your PC IDs will not match the graphic below.

| POD 1000 - PCs AND SERVERS (click the GO buttons to reconfigure)                    |   |         |       |        |           |                  |
|---|---|---------|-------|--------|-----------|------------------|
| GO  |   | NAME    | PC ID | STATUS | TYPE / VM | OPERATING SYSTEM |
|  |  | SAN     | 4129  | ONLINE | ABSENT    |                  |
|  |  | Windows | 4130  | ONLINE | ABSENT    |                  |
|  |  | Linux   | 4131  | ONLINE | ABSENT    |                  |

12. Click on Modify PC Settings



13. Change the PC Type drop down box to **Use Virtual Machine Inventory**.
14. In the Base Virtual Machine window, select your **ISM Master SAN** virtual machine.
15. Update **Base Snapshot** to your *Golden\_Master* snapshot.
16. Review the information on the screen and click **Update PC Settings**.



17. Click on Show Pod.
18. Repeat steps 11-17 for the Windows and Linux virtual machines.
19. Make sure the pod status is Offline.

## 5 Pod Cloning

This section will help you create multiple ISM 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.

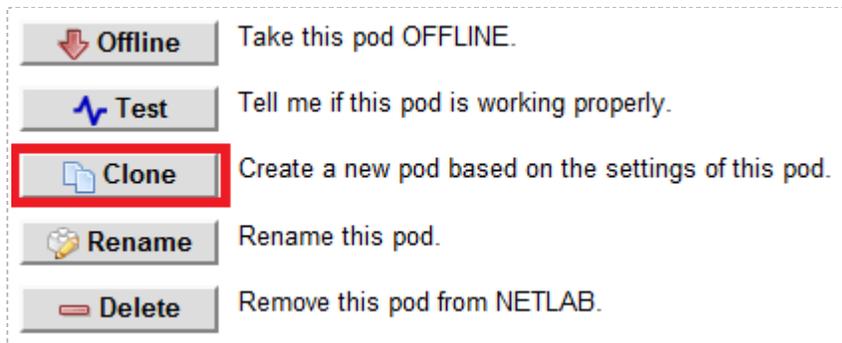
### 5.2 Creating User Pods on the First Host

The following section describes how to create ISM 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.

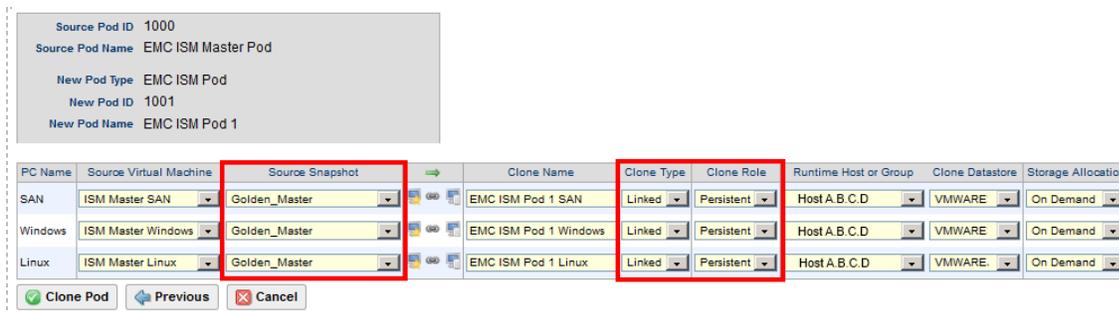
1. Login into NETLAB+ with the administrator account.
2. Select the **Equipment Pods** link.



3. Click on your ISM 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, EMC ISM Pod 1. Click **Next**.
8. When the action has finished processing, you are presented with a settings screen.



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 3 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 select **Persistent**. A persistent VM does not reset to a snapshot after each lab reservation. Since each ISM lab builds on the next, we want the state of each VM to persist from one lab reservation to the next.
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. 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](#).
13. 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 ISM pod.

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

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

**Time Saver:** If you clone the 1st ISM 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 Creating Pods on a Second VMware Host (Overview)

If you are planning to run 32 Pods you may need to create a Master Pod on your second host server. If you only have one host server, you may skip this section.

VMware ESXi servers can access virtual machines on a *shared datastore*, or *local datastore*.

A *shared datastore* is disk storage that resides on a Storage Area Network (SAN). All VMware hosts connect to the SAN via fiber or Ethernet.

A *local datastore* is disk storage that resides on each VMware hosts server. Only the host server itself can access its local datastore. Given two ESXi hosts (A and B), Host A cannot access Host B's local disks, and Host B cannot access Host A's local disks. In addition, you cannot create linked virtual machines on Host B, which share disks files on Host A (and vice-versa).

In summary, all pods that share local storage must reside on the same host. Therefore, if your Master Pod resides on the local datastore of the 1st VMware server, you will need to make a full copy that Master Pod on your 2nd VMware hosts server.

- User pods on the 1st host server will be linked to the Master Pod on the 1st host server.
- User pods on the 2nd host server will be linked to the Master Pod on the 2nd host server.

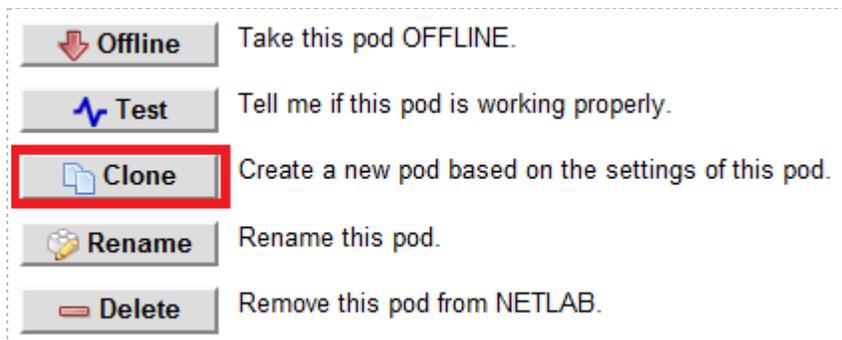
### 5.3.1 Copying Your Master Pod to the 2nd VMware ESXi Host

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 ISM 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, **EMC ISM Master Pod 2**. Click **Next**.

8. When the action has finished processing, you are presented with a settings screen.

Source Pod ID 1000  
 Source Pod Name EMC ISM Master Pod  
 New Pod Type EMC ISM Pod  
 New Pod ID 1002  
 New Pod Name EMC ISM Master Pod 2

| PC Name | Source Virtual Machine | Source Snapshot | Clone Name               | Clone Type | Clone Role | Runtime Host or Group | Clone Datastore | Storage Allocation |
|---------|------------------------|-----------------|--------------------------|------------|------------|-----------------------|-----------------|--------------------|
| SAN     | ISM Master SAN         | Golden_Master   | EMC ISM Master Pod 2 SAN | Full       | Master     | 2nd Host              | VMWARE3         | On Demand          |
| Windows | ISM Master Windows     | Golden_Master   | EMC ISM Master Pod 2 Win | Full       | Master     | 2nd Host              | VMWARE3         | On Demand          |
| Linux   | ISM Master Linux       | Golden_Master   | EMC ISM Master Pod 2 Lin | Full       | Master     | 2nd Host              | VMWARE3         | 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 ISM Master VMs. This is planned for a future software release. It is currently necessary to login into your Management Workstation and create the snapshots manually as you did in section [4.8](#).

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 up to 16 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 ISM Pods to Students, Teams and/or Classes

Please refer to the Pod Assignment Guide for details on using the Pod Assignment feature:

[http://www.netdevgroup.com/support/documentation/NETLAB\\_Pod\\_Assignment.pdf](http://www.netdevgroup.com/support/documentation/NETLAB_Pod_Assignment.pdf)

## 7 Known Issues

### 7.1 ESXi 5.0 Not Supported on Physical Host Servers

NDG currently requires **ESXi 4.1 U2** for the physical host servers that host ISM pods. Although the NETLAB+ system software will interoperate with ESXi 5.0, it should not be deployed at this time.

### 7.2 SAN Support

NDG performs all testing on servers with Internal Direct Attached Storage (i.e. RAID arrays and RAID controllers directly attached to each ESXi host server). This is the configuration that most academic institutions are likely to find affordable and adopt.

A Storage Area Network (SAN) is a dedicated network that provides access to consolidated, block level data storage that can be used for disk storage in a VMware vSphere environment.

**Currently NDG does not provide benchmarks, guidance or troubleshooting for SAN configurations.** Our documentation may show an optional SAN in the environment; however this is not a recommendation or requirement to deploy a SAN.

**NDG benchmarks and capacity planning guidance do not account for the additional latencies introduced by SAN.**

- When compared to Direct Attached Storage, a SAN may introduce additional I/O latency between ESXi server and disk. Therefore, a SAN may reduce the number of active VMs you can run on an ESXi host.
- If you deploy a SAN, you should perform your own benchmarks and determine the number of active VMs you can host on your ESXi server. Your mileage may vary.

- Always configure NETLAB+ Proactive Resource Awareness to ensure that the number of VMs that can be activated will remain within your predetermined performance limits.

NETLAB+ does not support load balancing among ESXi hosts at this time. The ISM pods currently will run on the same ESXi host regardless of load. Proactive load balancing among several hosts is a planned feature.

### **7.3 Automatic Snapshot after Cloning**

NETLAB+ does not automatically create a snapshot on the new virtual machine when cloning from a virtual machine snapshot point. This is planned feature.

### **7.4 Migration**

The current software release does not support migration of virtual machines from one host to another. This is a planned feature.