Cuatro Switch Pod

Planning and Installation Guide

For Cisco Networking Academy® CCNA & CCNP Curriculum

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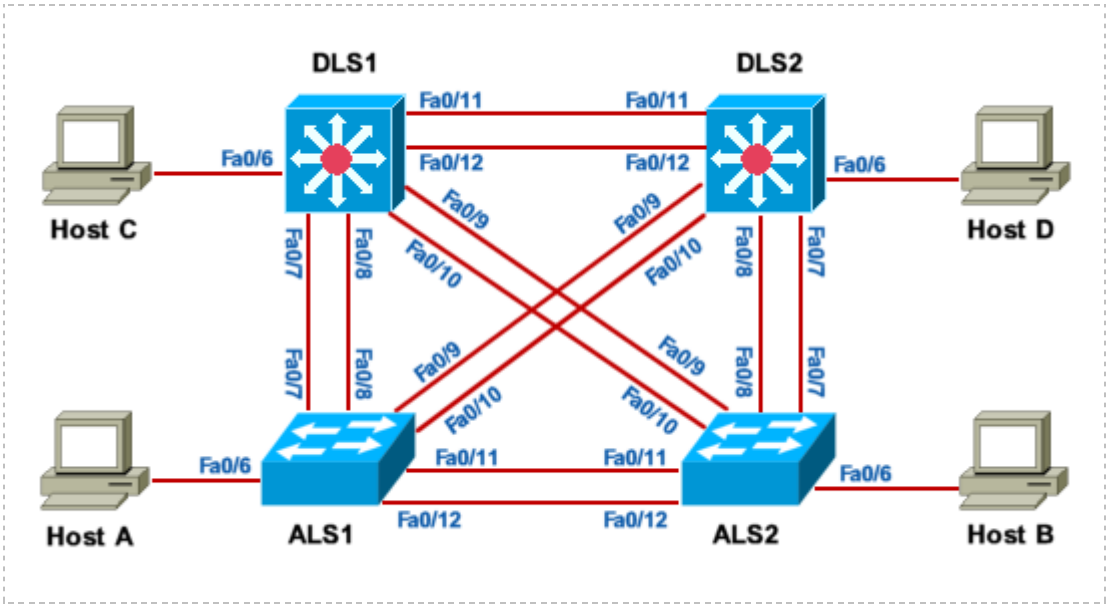
PART 1 – PLANNING

1 Introduction

The NETLAB$_{AE}$ Cuatro Switch Pod is a versatile 4-switch pod that supports many CCNP lab exercises.



You may have up to eight (8) Cuatro Switch Pods per NETLAB$_{AE}$ system.

The Cuatro Switch Pod features direct access to switch consoles. Integration with a separate VMware Server supports up to four (4) virtual PCs. NETLAB$_{AE}$ can provide remote access to the keyboard, video, and mouse of the VMware virtual machines in the pod.

NETLAB$_{AE}$ users in a team or instructor-led class can share access to a device console or PC.

1.1 Deviations

Remote users may get confused by local deviations from the standard curriculum and labs. The curriculum is relatively complex and offers many opportunities to "make adjustments to the labs". If your NETLAB$_{AE}$ pods will be made accessible outside your local Academy, you should carefully consider the impact of deviations and substitutions.

Even if your user community is local or relatively small, we recommend that you (1) document the specifics of your pods and (2) use the NETLAB$_{AE}$ *News and Announcements* feature to point users to your documentation.

1.2 Remote PC Support

A Cuatro Switch Pod supports up to 4 remote PCs. NETLAB$_{AE}$ allows three alternative settings for each:

- **Direct/VMware**. The PC is implemented as a VMware virtual machine.
  - Users can control the keyboard, video, and mouse.
  - Users can power on, shutdown, reboot, and revert to a clean state.
  - Users can have administrator rights.
- **Indirect**. The PC is implemented, but not managed by NETLAB$_{AE}$.
  - Users may be able to interact with the PC, but cannot access the keyboard, video, or mouse through NETLAB$_{AE}$.
- **Absent**. The PC is not implemented.

These options are explained in the *NETLAB+ Remote PC Guide for VMware Implementation*. Direct/VMware offers complete administrative access on the remote PC. To learn more about VMware Server, please visit http://www.netdevgroup.com/ae/vmware.htm.

Direct/Standalone mode, as described in the *NETLAB+ Remote PC Guide for Standalone Implementation*, is not supported on this pod.

1.3 Dynamic Topologies

The Cuatro Switch Pod features dynamic topologies. NETLAB$_{AE}$ can alter the topology and reposition PCs by manipulating VLANs on the control switch. This is done automatically based on the selected lab exercise. Instructors can change exercises and topologies during instructor led class reservations.

2 Lab Device Requirements

Lab devices are part of the topology and users can interact with them either directly or indirectly.

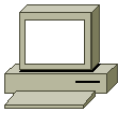
The equipment listed in subsequent sections is derived from the official Academy spreadsheet **CCNPConfigurationandPricingGuide.xls** (November 2006).

Other equipment may work if it is supported by NETLAB$_{AE}$ and can meet the minimum requirements for feature sets, interfaces, IOS, RAM, and Flash. A list of NETLAB$_{AE}$ supported lab equipment can be found on the NDG website. Please note, compatibility with NETLAB$_{AE}$ does not guarantee compatibility with the Academy labs.

2.1 Switches DLS1, DLS2, ALS 1 and ALS 2

Switch Name	Recommended Switch	Description
DLS1, DLS2	Cisco 3560	Catalyst 3560 24*10/100 Ethernet ports + 2 Small Form Factor Pluggable (SFP) uplink fiber ports - Enhanced Multilayer Image
	Cisco 3560 POE	Catalyst 3560 24*10/100 Ethernet ports with 802.3af & Cisco pre-standard POE + 2 Small Form Factor Pluggable (SFP) uplink fiber ports - Enhanced Multilayer Image
ALS1, ALS2	Cisco 2960	Catalyst 2960 24*10/100 Ethernet ports + 2 1000/100/10 Ethernet fixed uplink ports - LAN Base Image

The global command **boot enable-break** must be enabled on all switches for proper operation. Please see refer to section 8.



2.2 PCs and Servers

A Cuatro Switch Pod supports 4 VMware Server virtual machines. VMware Server is installed on a separate server.

The following operating system choices are typical based on the curriculum. These choices are not mandatory; you can make substitutions provided:

(1) VMware Server supports the operating system (as a "guest").
(2) Your choices are compatible with the curriculum.

Virtual Machine	Recommended O/S	Functions
A	Windows XP	Student PC, client activities
B	Windows XP	Student PC, client activities
C	Windows XP	Student PC, client activities
D	Windows XP	Student PC, client activities

3 Control Device Requirements

NETLAB$_{AE}$ *control devices* provide internal connectivity, console access, and managed power. Control devices are dynamically managed by NETLAB$_{AE}$ and are not accessible or configurable by lab users.

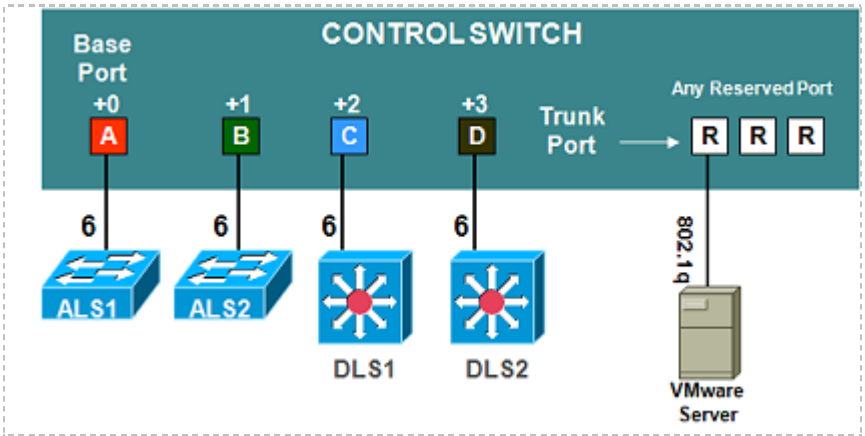
The *NETLAB+ Administrator Guide* explains how to add, change, or delete control devices.

A Cuatro Switch Pod requires the following control device resources:

Control Device Resource	Quantity Required
Control Switch	**4** consecutive ports **1** reserved port (VMware server)
Access Server	**4** lines
Switched Outlet Devices	**4** outlets

3.1 Control Switch Overview

NETLAB$_{AE}$ uses a control switch to provide connectivity between devices in a Cuatro Switch Pod and VMware server(s). This pod requires **4 consecutive ports** on a supported control switch (other than a Catalyst 1900 series).



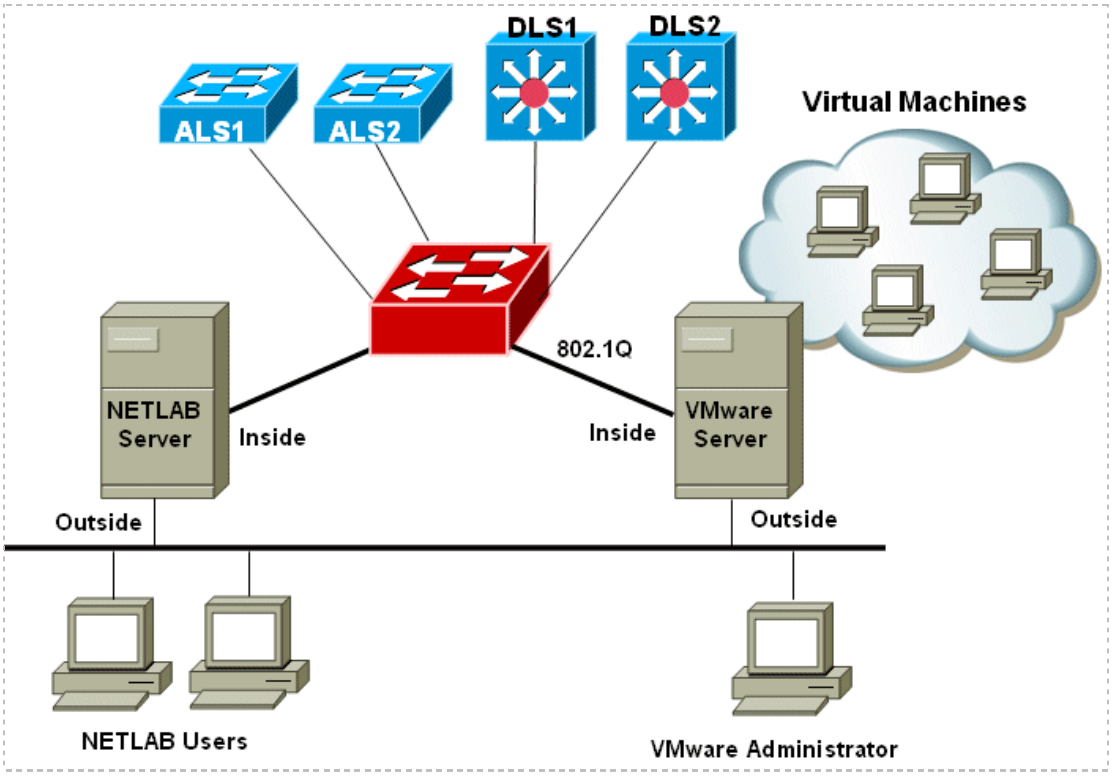
Ports are labeled **+0** to **+3** in the diagram and are relative to the *base port*. These ports must be consecutive on the same control switch. As with all pods, you choose a base port for the pod during pod installation (section 5). A control switch can support multiple pods. To determine the actual port numbers used for this pod, add the base port number to the relative port numbers shown in the diagram. For example, if the base port is 5, the actual port numbers will be 5 to 8.

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. This is to avoid conflict between pods.

One "reserved" port on the control switch connects to an 802.1q NIC card on the VMware Server. This allows devices in the pod to communicate with virtual machines.

The reserved port may be located on a different control switch, provided that all links between control switches are also configured as 802.1q trunks and all VLANs are allowed. You may also have more than one VMware Server and virtual machines in the pod can be located on different VMware Servers. For more details, please see section 7.

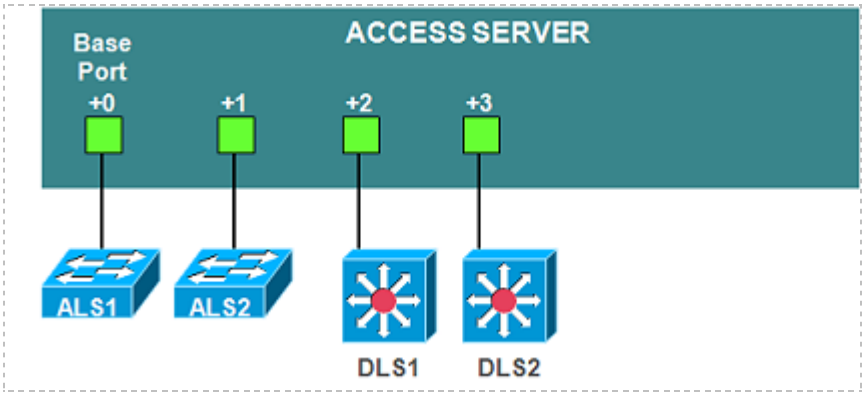


3.2 Access Server Ports

Access servers provide console connections to lab switches so that users can access them from NETLAB$_{AE}$. Users do not communicate directly with the access server. Rather, all connections are proxied through NETLAB$_{AE}$.

A Cuatro Switch Pod requires **4** access server ports.

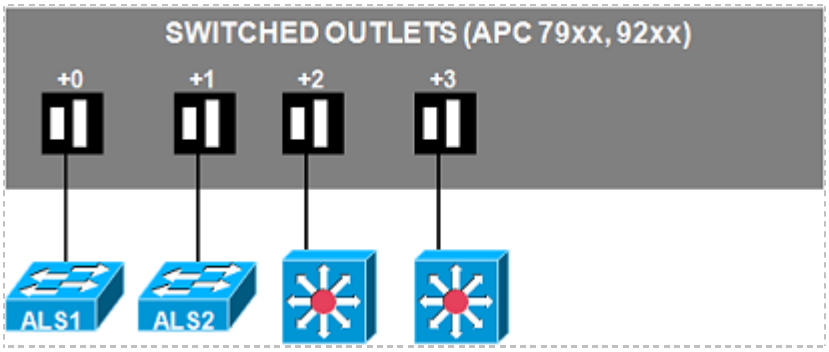
These ports do not have to be consecutive, and can span multiple access servers.



3.3 Switched Outlets

Switched outlets provide managed electrical power, allowing NETLAB$_{AE}$ and users to turn lab equipment on and off. A Cuatro Switch Pod requires **4** switched outlets, one for each switch.

Outlets do not have to be consecutive and may span multiple switched outlet devices (i.e. APC7900 or APC7920).



PART 2 – IMPLEMENTATION

4 Pre-requisites

This section covers tasks that should be executed prior to adding a Cuatro Switch Pod.

4.1 Understanding VMware Server and Virtual Machines

The *NETLAB+ VMware PC Remote Guide* contains essential information for setting up a VMware Server and virtual machines. It should be used in conjunction with this guide.

4.2 Setup Control Devices

Using the guidelines in section 3, decide which control switch ports, access server ports, and switched outlets you will use for your Cuatro Switch Pod. Add control devices if necessary. Control device configuration is documented in the *NETLAB+ Administrator Guide.*

4.3 Upload IOS Images

Upload the IOS images for the lab routers. NETLAB$_{AE}$ will recover these images on the devices if they are erased from flash.

4.4 Disable User Logins (optional)

You must take all equipment pods offline to add pods or configure control devices. You may wish to disable user logins during this time.

5 Adding the Pod

This section walks you through the process of adding a Cuatro Switch Pod using the NETLAB$_{AE}$ New Pod Wizard.

5.1 Start the New Pod Wizard

Login to the administrator account.

Select Equipment Pods.

Select Take All OFFLINE if any of the pods are online. Caution: this will cancel any reservations in progress.

Select Add a Pod.

The New Pod Wizard will now help you add an equipment pod to your system.

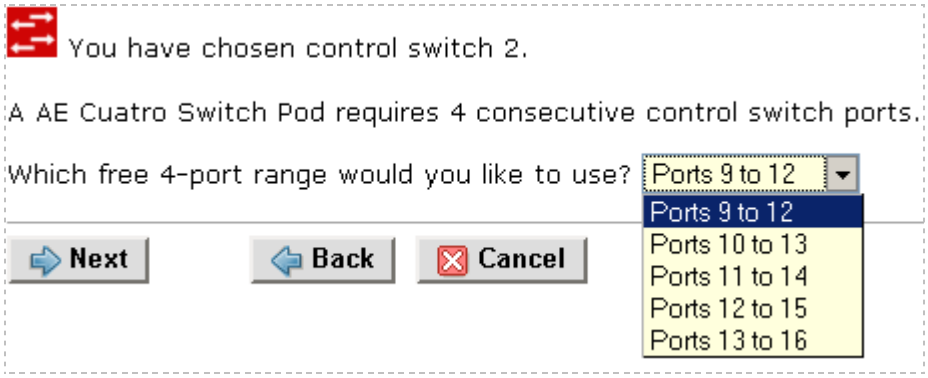
5.2 Add a Cuatro Switch Pod

When prompted, select the Cuatro Switch Pod .

5.3 Select Control Switch and Ports

A Cuatro Switch Pod requires **4 consecutive** control switch ports. NETLAB$_{AE}$ will present a list of the control switches on your system. Switches that meet the port requirement can be selected. Choose one control switch for your new pod.

Next, select the ports you want to use.



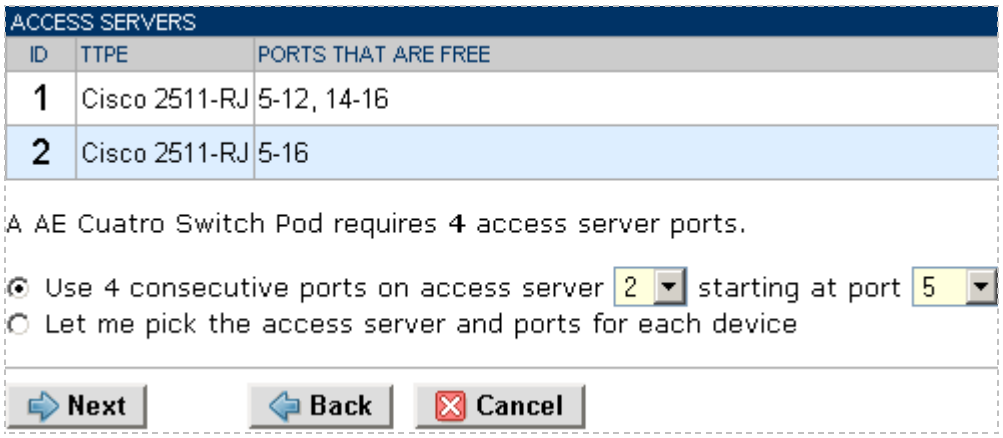
5.4 Select Access Server(s) and Ports

A Cuatro Switch Pod requires **4** access server ports.

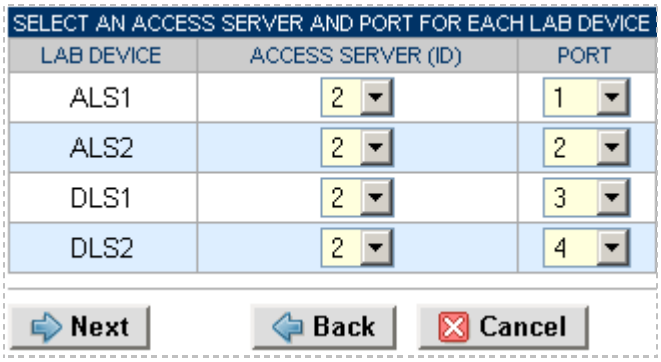
It is a good idea to use consecutive ports on one access server if possible. This practice will make it easier to cable and troubleshoot. If consecutive ports are not available, you can use non-consecutive ports, on different access servers if necessary.

Use the physical port numbers shown on the access server. Some models start at port 1 (Cisco 2509 and 2511) and others start at port 0 (Cisco NM-16A and NM-32A modules).

NETLAB$_{AE}$ allows you to choose consecutive ports on one access server, or you can choose "Let me pick" to select an access server and port for each switch.



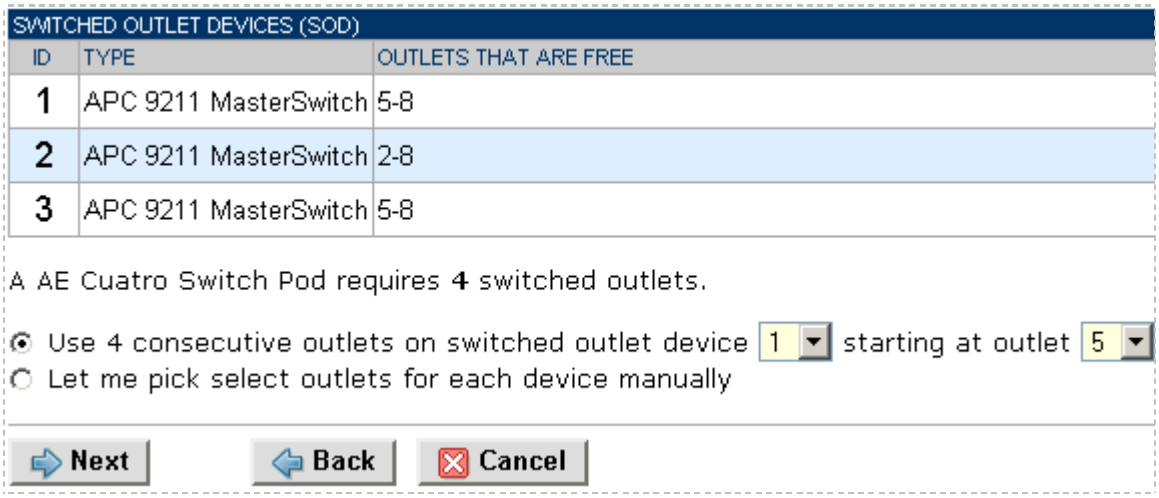
"Let me pick", allows you to make granular selections and split ports among several access servers.



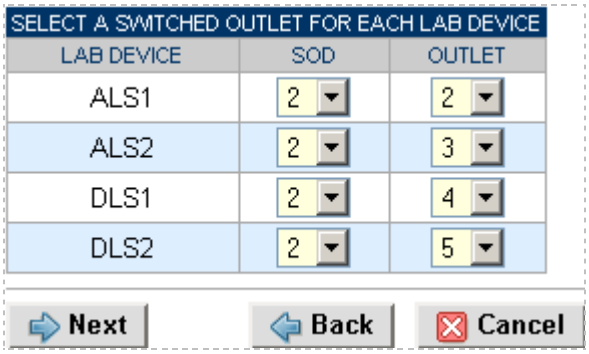
5.5 Select Switched Outlets

A Cuatro Switch Pod requires **4 switched outlets**.

It is a good idea to use consecutive outlets on one switched outlet device (SOD) if possible. This practice will make it easier to cable and troubleshoot. If consecutive outlets are not available, you may use non-consecutive outlets, spanning multiple SODs if necessary.



"Let me Pick", will allow you to make granular selections.



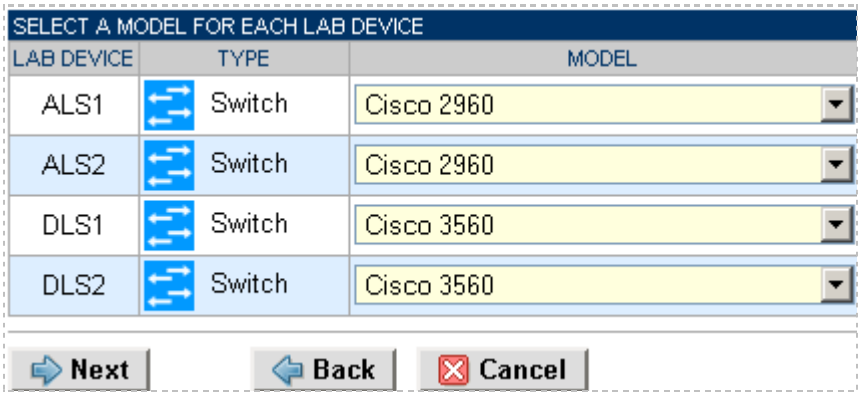
5.6 Select Device Types

Select the switch models you are going to deploy.

⇒ Your selections are used to assign the appropriate NETLAB$_{AE}$ device driver.

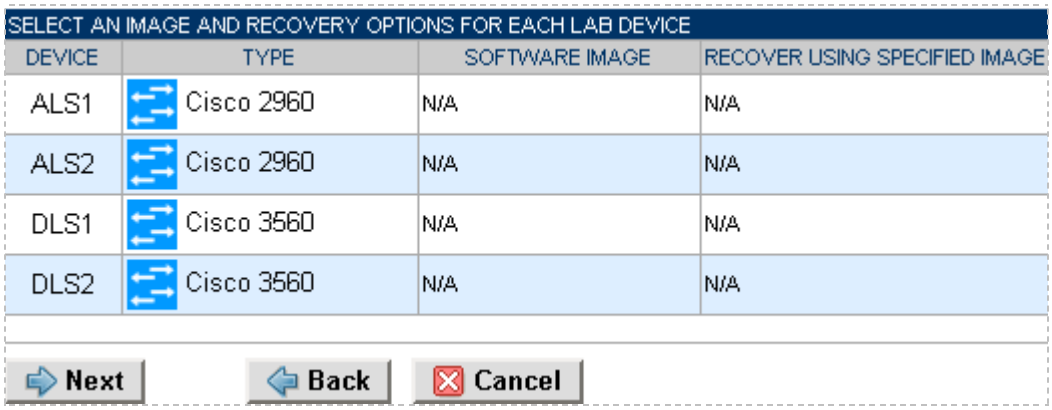
⇒ Improper selections may cause errors.

⇒ NETLAB$_{AE}$ may offer selections that do not support the curriculum. See section 2 for a list of recommended devices for this pod.



5.7 Select Software Images and Recovery Options

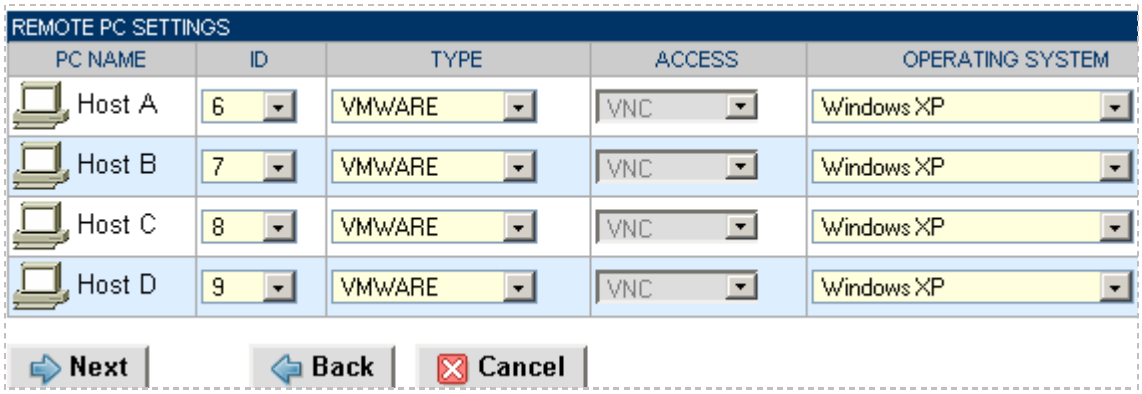
Cisco' switches do not provide a way for recovering IOS by using a LAN interface. Therefore, due to that limitation NETLAB+ does not offer the option for recovering IOS images on a switch at this time.



5.8 Select PC Options

In this task, you will select an ID, type, access method, and operating system for your PCs and servers.

The example below shows the typical settings for a VMware Server setup.

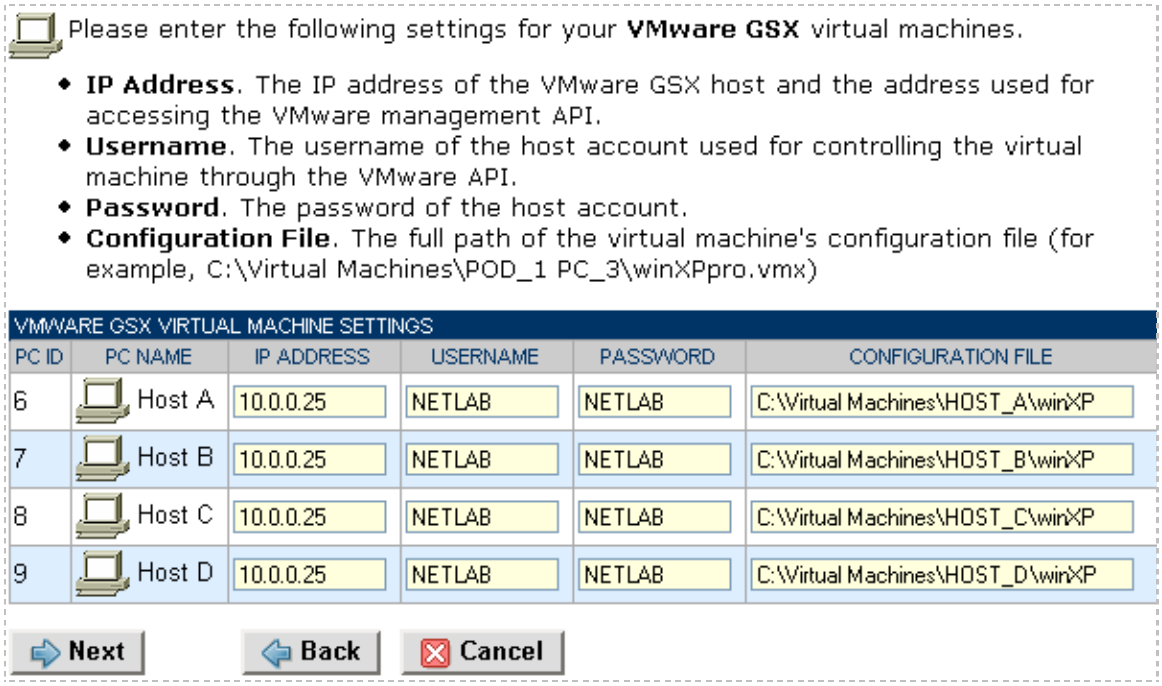


The following TYPE and ACCESS combinations correspond to the documentation.

The default TYPE setting is STANDALONE. This setting is not supported in the Cuatro Switch Pod. You must change the default setting.

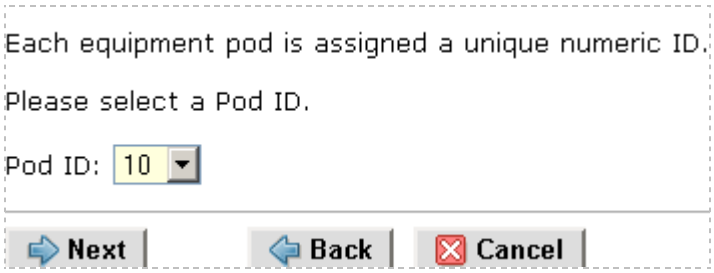
To implement…	Set TYPE to…	Set ACCESS to…
Direct/VMware	VMWARE	VNC
Direct/Standalone (not supported in this pod)	STANDALONE	VNC
Indirect	(any)	INDIRECT
Absent (no PC)	ABSENT	n/a

5.9 VMware Settings



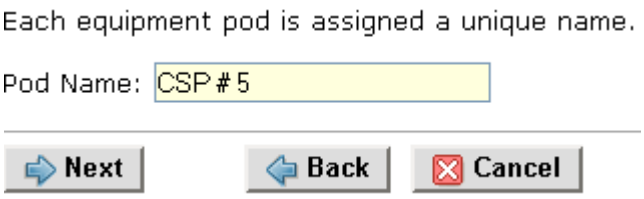
5.10 Select a Pod ID

Each pod is assigned a unique numeric ID.



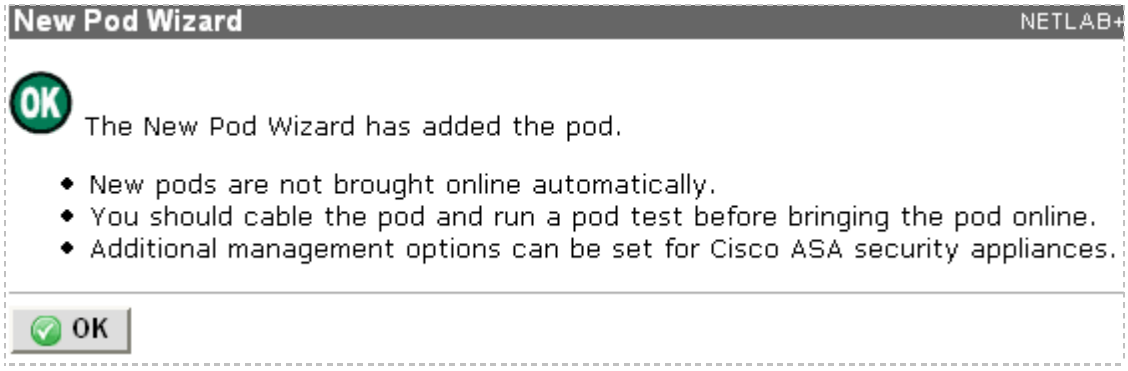
5.11 Select a Pod Name

Each pod can have a unique name. This name will appear in the scheduler, along with the pod type.



5.12 Verify Your Settings

At this point NETLAB$_{AE}$ has added the pod to its database. However, the pod has not been brought online yet. You will want to cable up the pod, configure PCs, and run a pod test before bringing the pod online. These tasks are discussed in the remaining sections.



After you click OK, the new pod will appear in the list of equipment pods. Click on the magnifier button or pod ID to manage you new pod.

NETLAB$_{AE}$ will display the status of the pod and the high-level settings for each device, PC, and control switch.

POD 10 - STATUS

POD ID	POD NAME	STATUS	ACTIVITY	POD TYPE
10	CSP #5	OFFLINE	IDLE	CUATRO SWITCH POD 4 switches 4 PCs

POD 10 - ROUTERS, SWITCHES, AND FIREWALLS (click on the GO buttons to reconfigure devices)

GO	NAME	TYPE	ACCESS PORTS	SWITCHED OUTLETS	SOFTWARE IMAGE
	ALS1	Cisco 2960	AS 1 PORT 5	SOD 1 OUTLET 5	n/a
	ALS2	Cisco 2960	AS 1 PORT 6	SOD 1 OUTLET 6	n/a
	DLS1	Cisco 3560	AS 1 PORT 7	SOD 1 OUTLET 7	n/a
	DLS2	Cisco 3560	AS 1 PORT 8	SOD 1 OUTLET 8	n/a

POD 10 - PCs AND SERVERS (click the GO buttons to reconfigure)

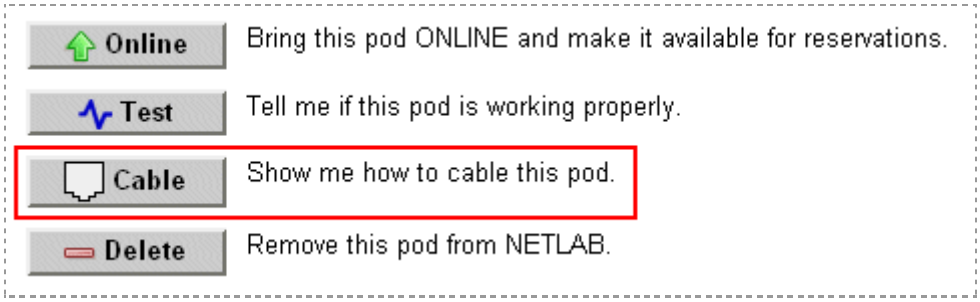
GO	NAME	PC ID	STATUS	TYPE	ACCESS	CONTROL IP	OPERATING SYSTEM
	Host A	6	ONLINE	VMWARE	VNC	10.0.0.25	Windows XP
	Host B	7	ONLINE	VMWARE	VNC	10.0.0.25	Windows XP
	Host C	8	ONLINE	VMWARE	VNC	10.0.0.25	Windows XP
	Host D	9	ONLINE	VMWARE	VNC	10.0.0.25	Windows XP

POD 10 - CONTROL SWITCH

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

6 Cable the Pod

Use the NETLAB$_{AE}$ cable chart feature to help you connect the lab devices in your pod. The chart is generated in real-time and contains port-specific information based on your current lab device and control device settings. The cable chart function is accessed from the pod management page.



CABLE CHART FOR POD 10

ALS1 (Cisco 2960)

CONNECT FROM	USING CABLE	CONNECT TO	
FastEthernet 0/6	CAT-5 Crossover	C/S 2	Port 9
FastEthernet 0/7	CAT-5 Crossover	DLS1	FastEthernet 0/7
FastEthernet 0/8	CAT-5 Crossover	DLS1	FastEthernet 0/8
FastEthernet 0/9	CAT-5 Crossover	DLS2	FastEthernet 0/9
FastEthernet 0/10	CAT-5 Crossover	DLS2	FastEthernet 0/10
FastEthernet 0/11	CAT-5 Crossover	ALS2	FastEthernet 0/11
FastEthernet 0/12	CAT-5 Crossover	ALS2	FastEthernet 0/12
Console	Console Cable	A/S 1	Port 5
Power	Power Cord	SOD 1	Outlet 5

ALS2 (Cisco 2960)

CONNECT FROM	USING CABLE	CONNECT TO	
FastEthernet 0/6	CAT-5 Crossover	C/S 2	Port 10
FastEthernet 0/7	CAT-5 Crossover	DLS2	FastEthernet 0/7
FastEthernet 0/8	CAT-5 Crossover	DLS2	FastEthernet 0/8
FastEthernet 0/9	CAT-5 Crossover	DLS1	FastEthernet 0/9
FastEthernet 0/10	CAT-5 Crossover	DLS1	FastEthernet 0/10
FastEthernet 0/11	CAT-5 Crossover	ALS1	FastEthernet 0/11
FastEthernet 0/12	CAT-5 Crossover	ALS1	FastEthernet 0/12
Console	Console Cable	A/S 1	Port 6
Power	Power Cord	SOD 1	Outlet 6

The cable chart is continued on the next page.

DLS1 (Cisco 3560)

CONNECT FROM	USING CABLE	CONNECT TO	
FastEthernet 0/6	CAT-5 Crossover	C/S 2	Port 11
FastEthernet 0/7	CAT-5 Crossover	ALS1	FastEthernet 0/7
FastEthernet 0/8	CAT-5 Crossover	ALS1	FastEthernet 0/8
FastEthernet 0/9	CAT-5 Crossover	ALS2	FastEthernet 0/9
FastEthernet 0/10	CAT-5 Crossover	ALS2	FastEthernet 0/10
FastEthernet 0/11	CAT-5 Crossover	DLS2	FastEthernet 0/11
FastEthernet 0/12	CAT-5 Crossover	DLS2	FastEthernet 0/12
Console	Console Cable	A/S 1	Port 7
Power	Power Cord	SOD 1	Outlet 7

DLS2 (Cisco 3560)

CONNECT FROM	USING CABLE	CONNECT TO	
FastEthernet 0/6	CAT-5 Crossover	C/S 2	Port 12
FastEthernet 0/7	CAT-5 Crossover	ALS2	FastEthernet 0/7
FastEthernet 0/8	CAT-5 Crossover	ALS2	FastEthernet 0/8
FastEthernet 0/9	CAT-5 Crossover	ALS1	FastEthernet 0/9
FastEthernet 0/10	CAT-5 Crossover	ALS1	FastEthernet 0/10
FastEthernet 0/11	CAT-5 Crossover	DLS1	FastEthernet 0/11
FastEthernet 0/12	CAT-5 Crossover	DLS1	FastEthernet 0/12
Console	Console Cable	A/S 1	Port 8
Power	Power Cord	SOD 1	Outlet 8

Virtual machine information will not appear on the cable chart. Refer to section 7 for configuration instructions**.**

The switch ports shown in the cable guidance are based on Cisco Catalyst 3560 and Catalyst 2960 switches.

7 Configuring VMware and Virtual Machines

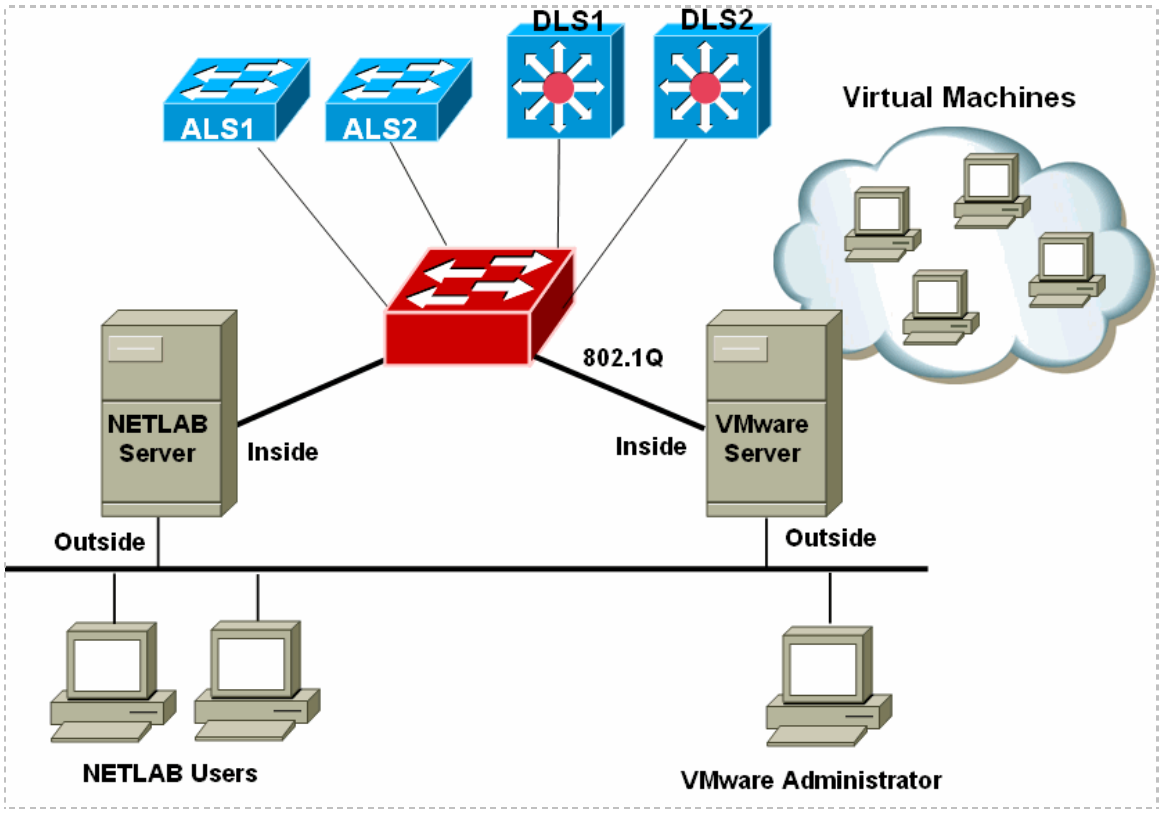
The *NETLAB+ VMware Remote PC Guide* explains how to set up VMware Server and virtual machines. Please review the pod-specific information in this section and apply it to the general information in the *NETLAB+ VMware Remote PC Guide*. Please note, only the sections referring to VMware are relevant; a Cuatro Switch Pod does not support standalone PC's.

After you load applications or make changes to a PC, be sure to take a VMware snapshot. NETLAB$_{AE}$ instructs VMware to "revert" to the snapshot at the end of each lab reservation. Any changes made after a snapshot are lost.

The IP addresses and/or default gateways of each PC may vary. Depending on your snapshots, the student may need to adjust IP settings to reflect the lab.

7.1 Connecting Virtual Machines to the Pod

Virtual Machines must communicate with switches in the pod. Control switches provide the connection point. In the recommended configuration (below), the VMware server is equipped with an inside and outside interface. The inside interface is configured for 802.1Q connects to a reserved port on a control switch. Traffic between virtual machines and devices in the pod traverse the VMware server inside interface. Preferably, the VMware server should connect to the same control switch as the pod.

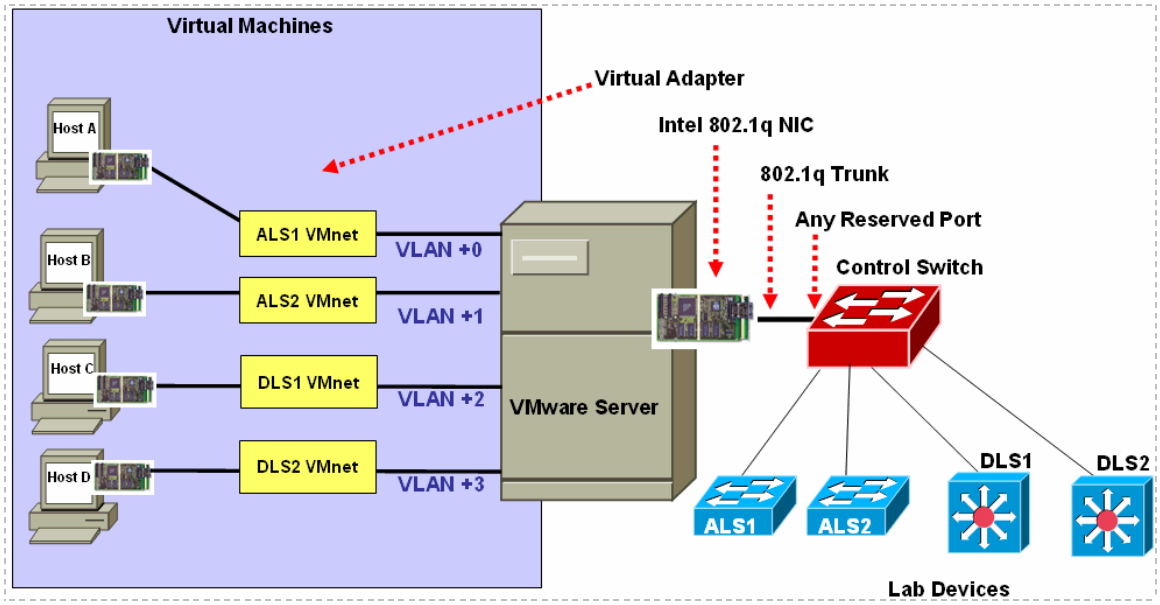


7.2 VMware Virtual Switches and VLANs

VMware Server virtual network adapters and virtual LAN switches (VMnets) are used to connect virtual machines to the pod. Cuatro Switch Pod uses **4 VMnets** in the required configuration. Since VMware Server supports 10 virtual switches, it is possible to host up to 2 complete Cuatro Switch Pods on a single VMware Server.

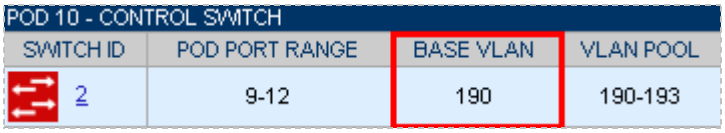
Each virtual switch is mapped to a specific VLAN and bound to the VMware inside 802.1Q NIC card. The actual VLAN numbers used are based on the pod's ID number.

PC1a and PC1b share a common VMnet and VLAN.



Each NETLAB$_{AE}$ pod is automatically assigned a pool of unique VLAN numbers. You must determine which VLAN numbers correspond to each virtual switch on the VMware server.

First, determine the base VLAN for the pod you are setting up. This is shown on the pod management page. From the administrative account, go to Equipment Pods and select the pod from the list. Obtain the BASE VLAN from the CONTROL SWITCH table.



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.

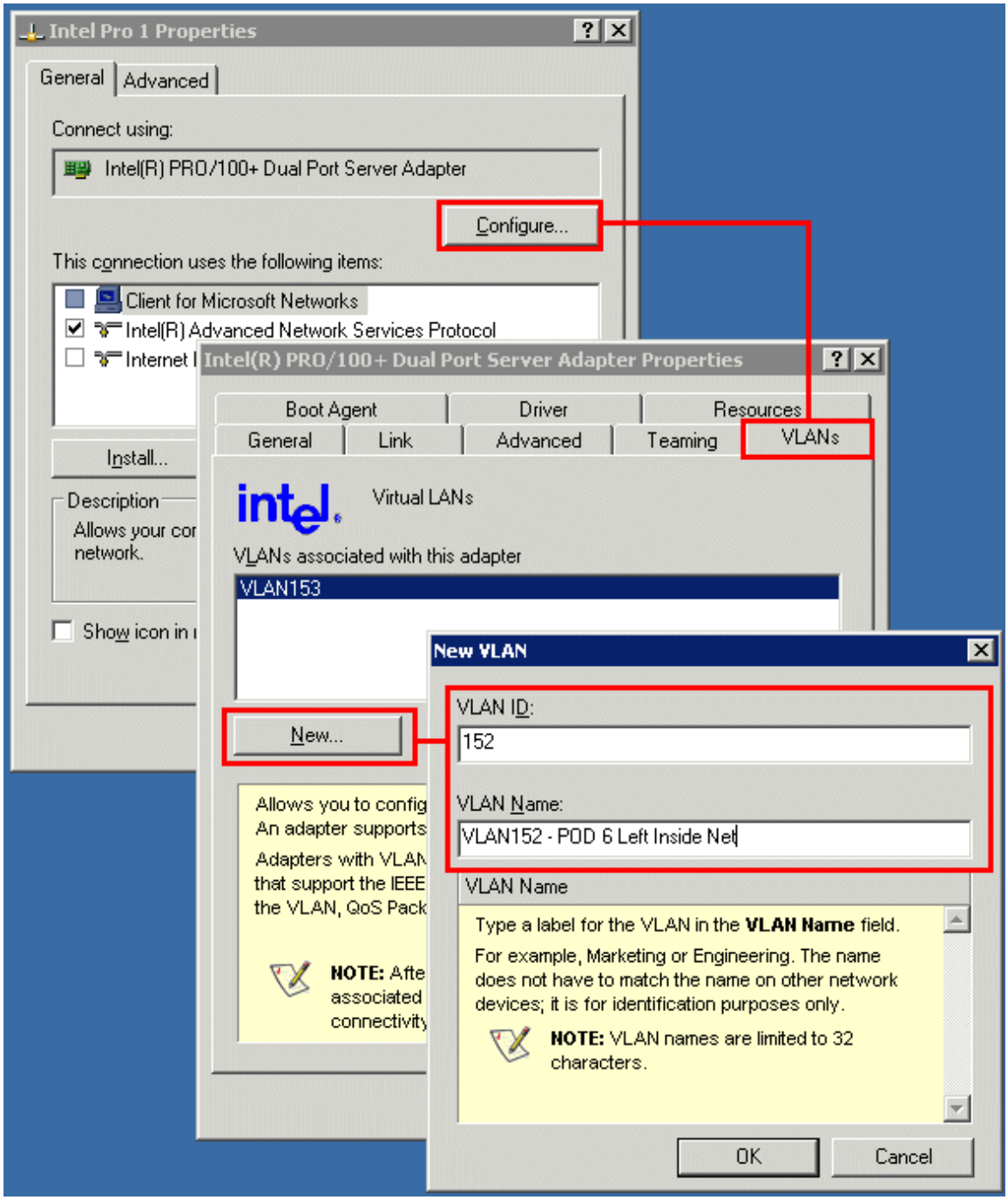
Next, determine the actual VLAN number for each virtual network by adding the base VLAN to the offsets in the table below.

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

7.3 Configure VMware Server Inside Port

Refer to section 6 of the *NETLAB+ Remote PC Guide for VMware Implementation.* Create the VLANs (calculated above) on the VMware server's inside 802.1Q NIC.

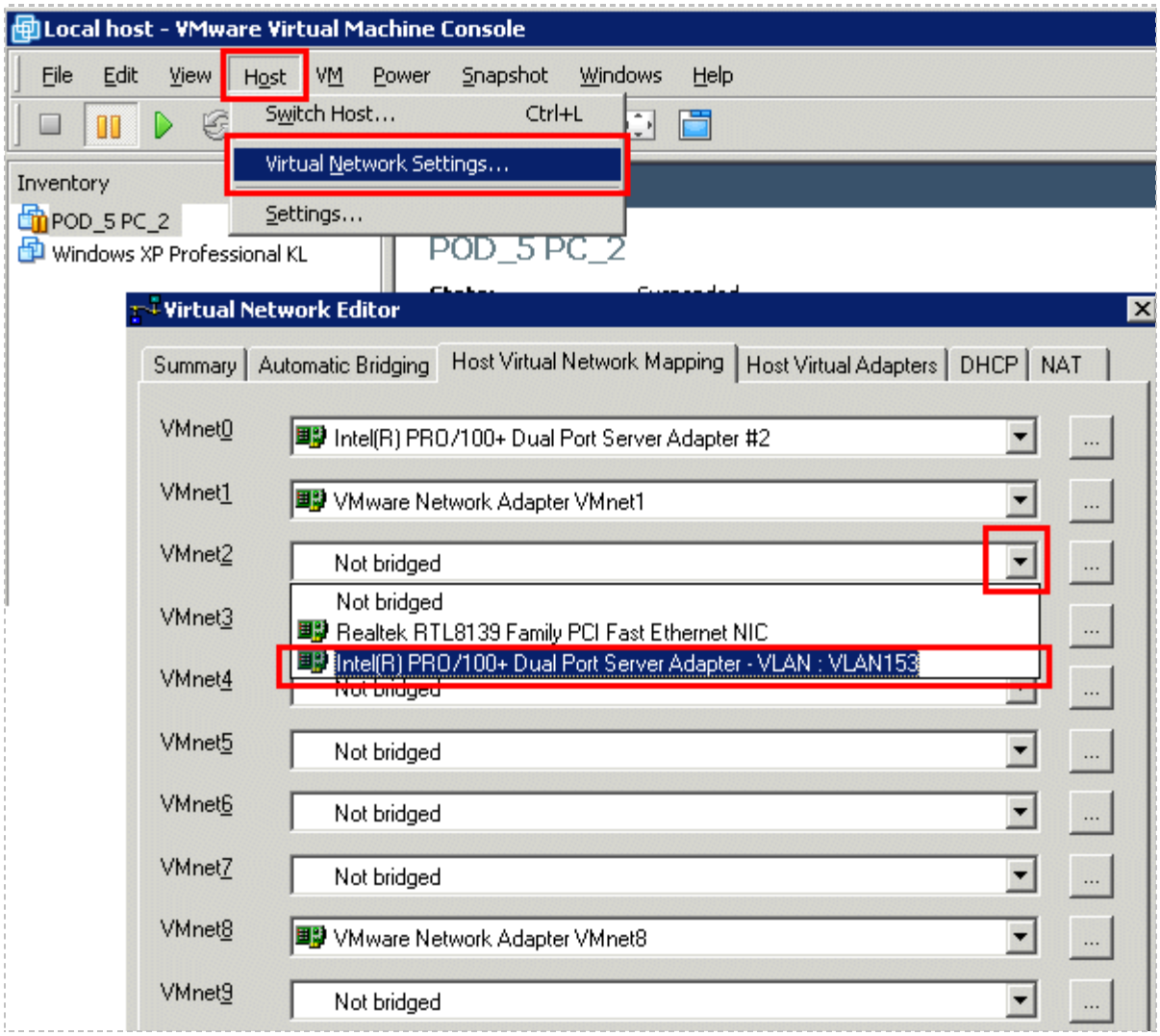
Be sure to **uncheck** TCP/IP and Client for Microsoft Networks from each VLAN subinterface. Only the VMware bridge protocol should be checked.



7.4 Create Virtual Switches (VMnet)

Refer to section 6 of the *NETLAB+ Remote PC Guide for Vmware Implementation.* Create the virtual switches and bind them to the VLANs created in the previous section.

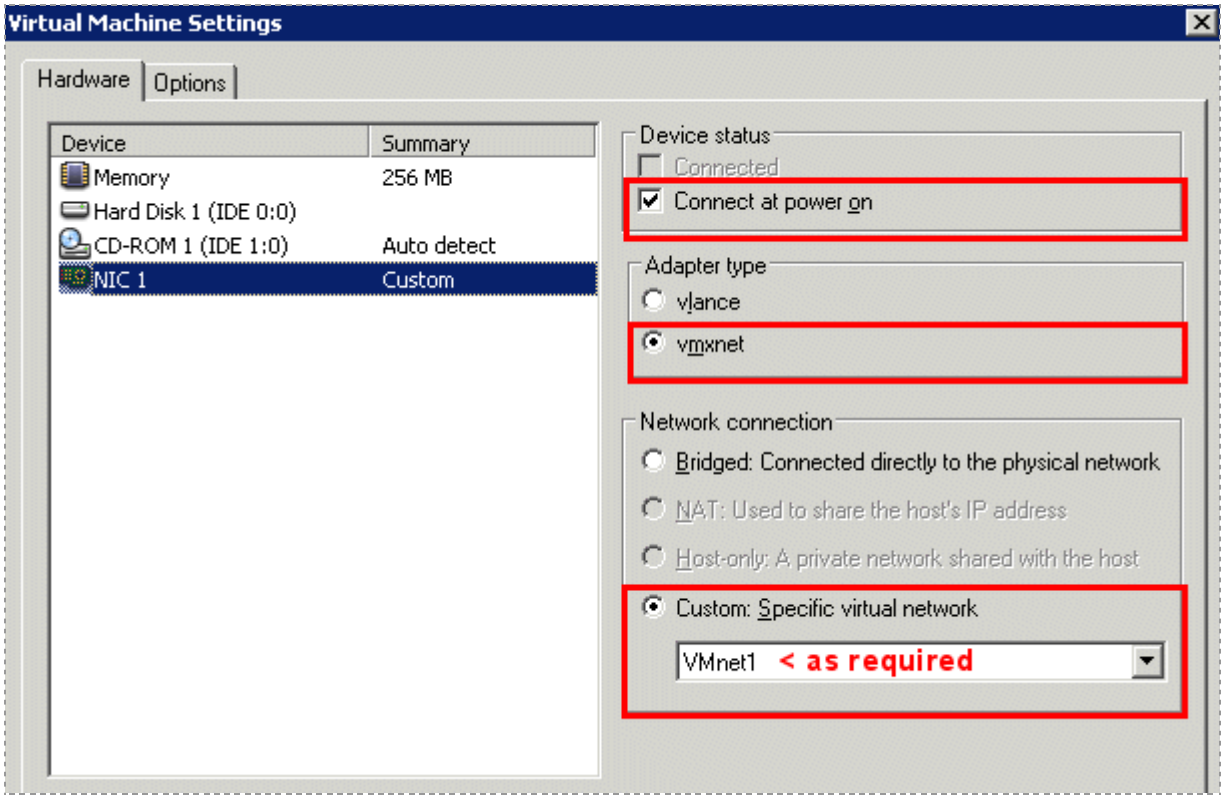
It does not matter which VMnet number you use. By default, VMnet0, VMnet1, and VMnet8 are reserved for special functions in VMware. However, you can convert these into ordinary VMnets to use with pods. This is explained in Appendix A of the *NETLAB+ Remote PC Guide for VMware Implementation.*



7.5 Binding Virtual Machines to Virtual Switches (VMnet)

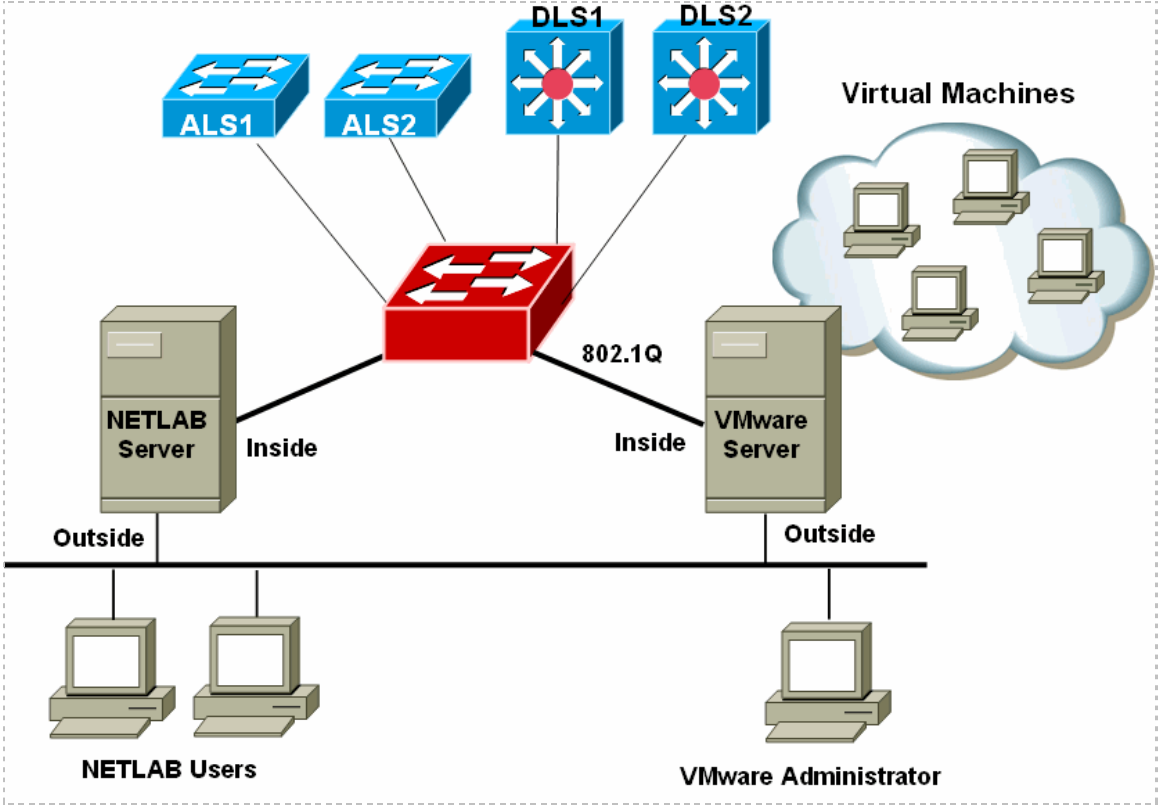
Refer to section 7 of the *NETLAB+ Remote PC Guide for VMware Implementation.* In the last section, you associated a specific VLAN with a virtual switch (VMnet). When you create a virtual machine, you must bind it to the correct virtual switch (and by association, VLAN).

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



7.6 Configuring the Control Switch for VMware

One "reserved" port on the control switch connects to an 802.1q NIC card on the VMware 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 VMware Server inside NIC using a straight through CAT5 cable. Configure the switch port as a trunk and allow only the VLANs that were bound to the VMnets. If your VMware server hosts virtual machines for more than one pod, allow all the relevant VLANs for each pod.

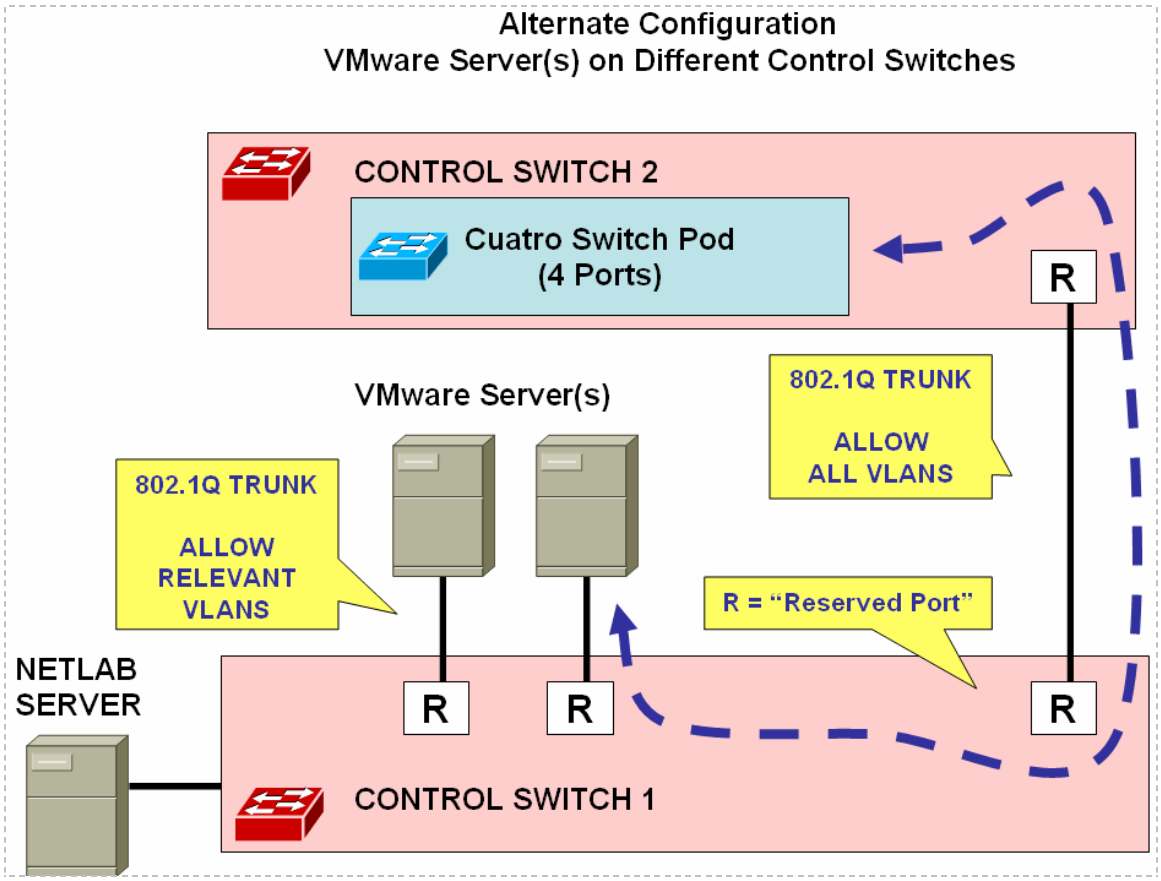
The control switch console password is **router**. The enable secret password is **cisco**. These passwords are used by NETLAB+ automation and technical support - please do not change them.

Example switch port configuration. Interface number and VLANs will vary.

```
interface FastEthernet0/23
 switchport mode trunk
 switchport trunk allowed vlan 190,191,192,193
 switchport nonegotiate
 no switchport access vlan
 no shutdown
```

7.7 VMware Server(s) on Different Control Switch

The reserved port may be located on a different control switch, provided that all links between control switches are also configured as 802.1q trunks and all VLANs are allowed. You may also have more than one VMware Server. Virtual machines in the pod can be located on different VMware servers.



Ports connecting to VMware servers should only allow the VLANs associated with the pods being served. In addition, "switchport nonegotiate" should be used to suppress Dynamic Trunk Protocol (DTP):

```
interface FastEthernet0/23
 switchport mode trunk
 switchport trunk allowed vlan 190,191,192,193
 switchport nonegotiate
 no switchport access vlan
 no shutdown
```

Ports connecting control switches together, allow all VLANs and DTP:

```
interface FastEthernet0/24
 switchport mode trunk
 no switchport access vlan
 switchport trunk allowed vlan all
 no shutdown
```

8 Switch Configuration Tasks

Cuatro Switch Pod requires additional switch configution tasks for successful operation. Using Hyperterm or other terminal, connect to the console port of the control switch in which the Basic Switch Pod is connected. The following passwords are used on the control switch.

Console login password	**router**
Enable secret password	**cisco**

Please do not change the passwords – they are used NETLAB+ automation and technical support.

8.1 Verify Control Switch IOS Version

Each control switch should be running **IOS 12.1(22)EA2 or later**. Earlier versions may have defects that affect NETLAB$_{AE}$.

8.2 Configure Control Switch Ports

There are three essential commands that must be manually configured on each control switch port that connects to a lab switch (ALS1, ALS2, DLS 1 and DLS2 in this case).

- **spanning-tree bpdufilter enable**
  - Instructs control switch port not to send and receive spanning tree BPDU frames to and from the lab switch.
  - Spanning tree in the lab must not mingle with spanning tree on the control switch. This would cause several undesirable effects in both the lab and on the control switches.

- **switchport mode access**
  - Prevents the link from becoming a trunk port.
  - The labs will not work as designed if the link between control switch and lab switch is trunking.
  - Trunking on ports that should be access ports, combined with BPDU filtering, creates loops that are not prevented by spanning-tree.

- **no cdp enable**
  - Disabling CDP is not critical, but will hide the control switch from lab switch users performing CDP commands.

- **switchport nonegotiate**
  - Prevents the interface from sending DTP messages.
  - Disabling DTP messages is not critical, but will hide the control switch' MAC address from lab switches when users performing commands to see the CAM table.

- **no keepalive**
  - Prevents the interface from sending L2 keepalive messages.
  - Disabling L2 keepalives messages is not critical, but will hide the control switch' MAC address from lab switches when users performing commands to see the CAM table.

Do not omit these commands! Without them, loops will form causing high CPU utilization, error-disabled ports, and connectivity loss. These commands are specific to switch pods and are not automatically configured.

Locate the 4 control switch ports connecting to ALS1, ALS2, DLS1 and DLS2. Refer to the cabling diagram if necessary (section 6). The following commands must be manually added to each switch port.

Example switch port configuration. Interface numbers will vary.

```
interface FastEthernet0/9
 description port to ALS1 port 9 (Host A)
 switchport mode access
 spanning-tree bpdufilter enable
 switchport nonegotiate
 no keepalive
 no cdp enable

interface FastEthernet0/10
 description port to ALS2 port 10 (Host B)
 switchport mode access
 spanning-tree bpdufilter enable
 switchport nonegotiate
 no keepalive
 no cdp enable

interface FastEthernet0/11
 description port to DLS1 port 11(Host C)
 switchport mode access
 spanning-tree bpdufilter enable
 switchport nonegotiate
 no keepalive
 no cdp enable

interface FastEthernet0/12
 description port to DLS2 port 12 (Host D)
 switchport mode access
 spanning-tree bpdufilter enable
 switchport nonegotiate
 no keepalive
 no cdp enable
```

Note: if the control switch does not recognize the **spanning-tree bpdufilter** command, make sure the switch is running at least 12.1(22)EA2.

8.3 Initial Lab Switch Setup

Several switch models are subject to a common problem when used as a **lab switch**. These include (but not limited to):

- Cisco Catalyst 2900 XL Series
- Cisco Catalyst 2950 Series
- Cisco Catalyst 2960 Series
- Cisco Catalyst 3550 Series
- Cisco Catalyst 3560 Series

By default, these switches will not respond to a console break signal the same way routers do. There are two *environment variables* which affect this: **Enable Break** and **BOOT path-list**.

The following procedure explains how to check these variables and set them so that the console port will respond to a break signal.

When to Use

You must initialize the environment variables when:

- Installing a lab switch for the first time .
- The Enable Break environment variable is set to "no".
- The BOOT path-list environment variable is set.

This procedure does not apply to control switches.

Determining the Boot Status

From the enable mode, issue the following IOS command.

```
Lab_Sw# show boot

BOOT path-list:      flash:c2950-i6q412-mz.121-22.EA4.bin
Config file:         flash:config.text
Private Config file: flash:private-config.text
Enable Break:        no
Manual Boot:         no
```

Setting Up the Environment

Follow this procedure if Enable Break is set to “no” and/or the boot path-list is set to an image.

```
Lab_Sw# configure terminal
Lab_Sw(config)# boot enable-break
Lab_Sw(config)# no boot system
Lab_Sw(config)# end
Lab_Sw# copy run start
Lab_Sw# show boot

BOOT path-list:

Config file:          flash:config.text
Private Config file:  flash:private-config.text
Enable Break:         yes
Manual Boot:          no
```

Verification

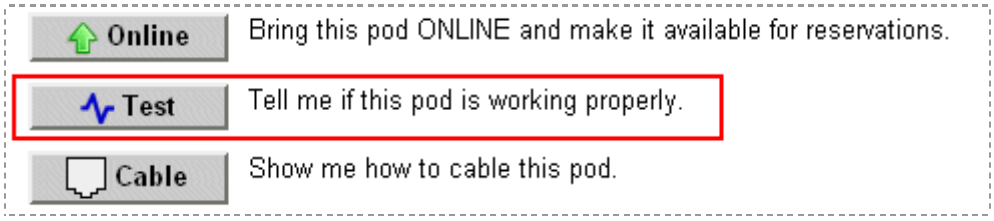
With Enable Break set to "yes" and removal of a BOOT path-list, a pod test should pass.

If the environment variables are not set correctly, you may experience one of the following symptoms:

1. Pod test fails with a message such as "unable to put the switch into monitor mode"
2. Lab automation such as scrub fails
3. Users cannot perform password recovery (automated or manual)

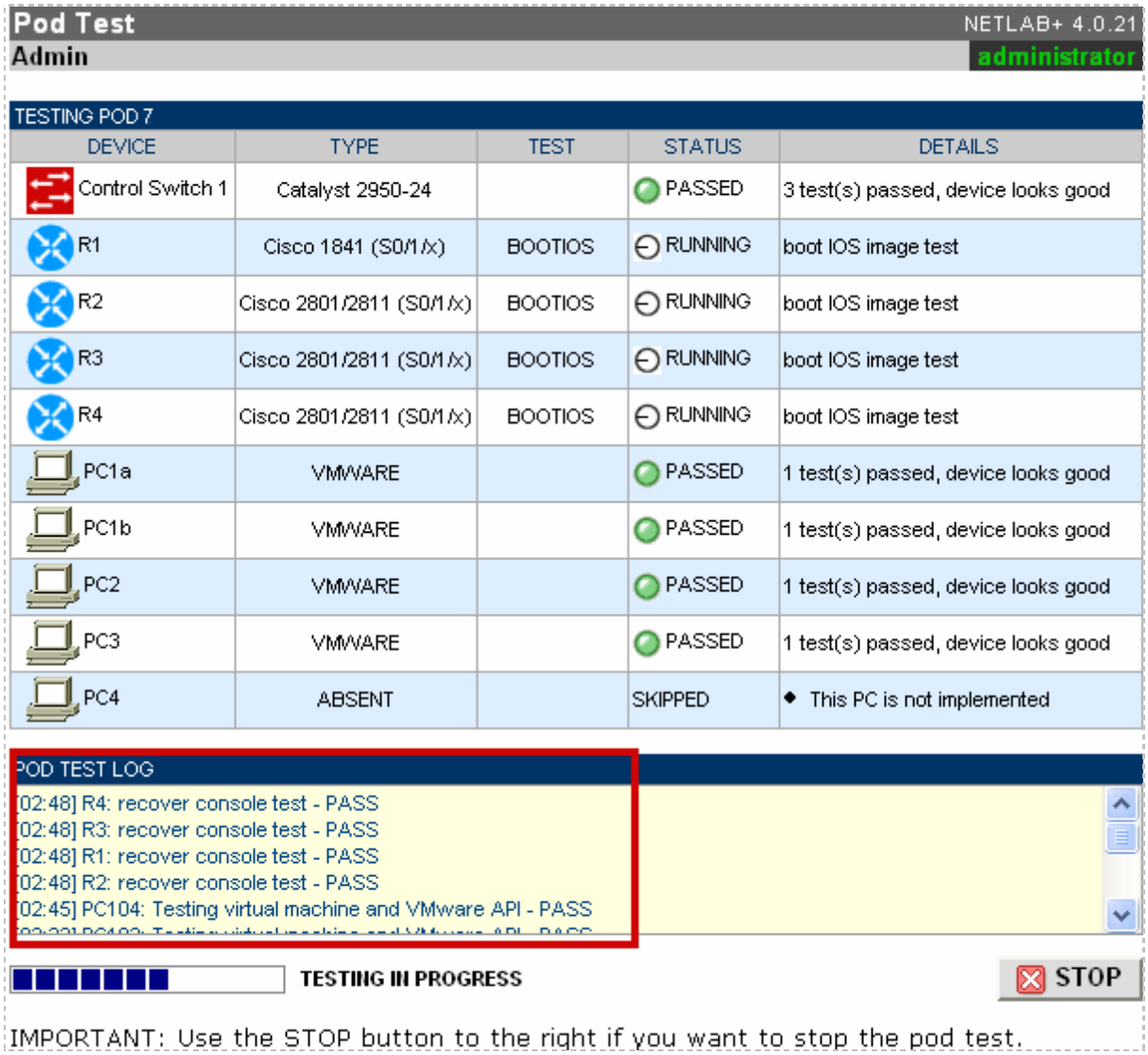
9 Testing the Pod

After all switches and virtual machines have been installed, you should run a pod test to verify that your pod is working. The pod test will detect common configuration and cabling problems.



Some tests may take a long time. During the BOOTIOS test, NETLAB$_{AE}$ may have to load the specified IOS image if it is not in flash. Some images are very large and can take up to 30 minutes to program into flash memory.

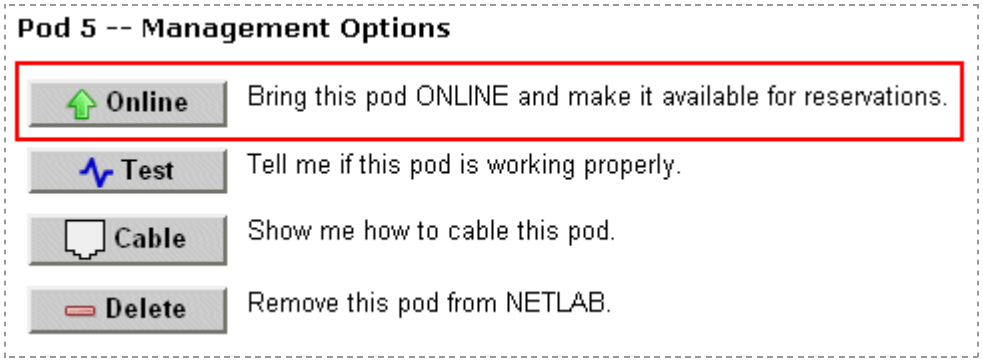
If you cannot resolve an issue and decide to contact technical support, please cut and paste the text from the POD TEST LOG and include with your e-mail.



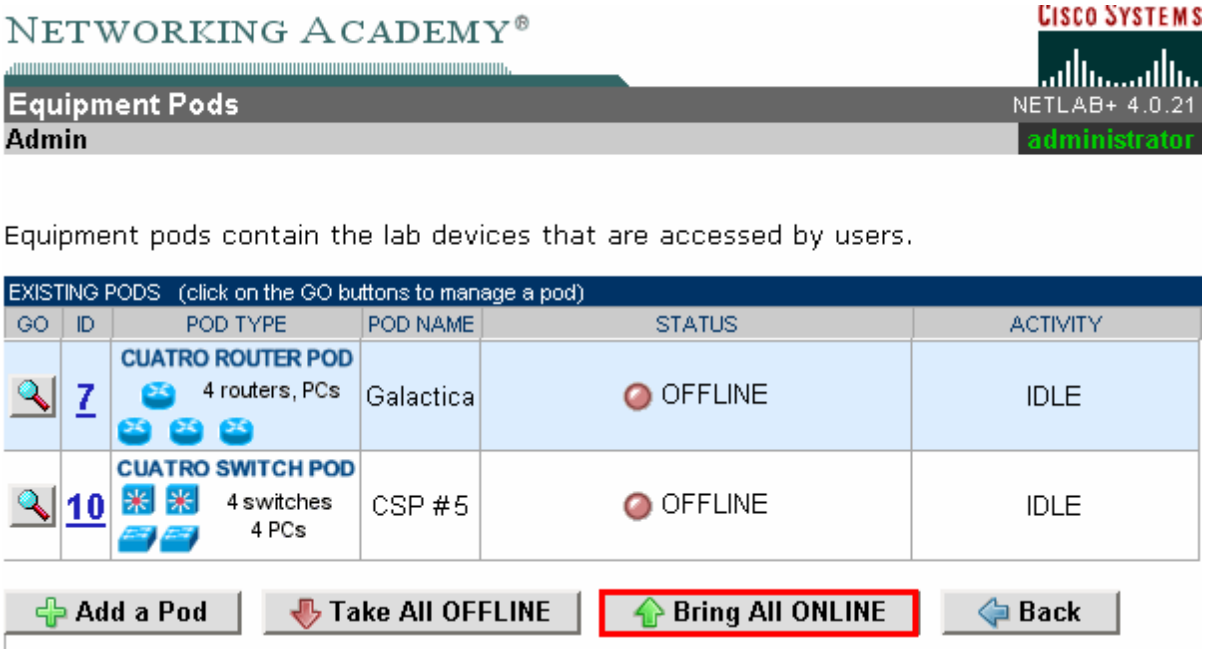
10 Finishing Up

10.1 Bring the Pod(s) Back Online

Now you can bring the pod online and make it available for lab reservations. You can bring just this pod online by clicking the Online button under Management Options.



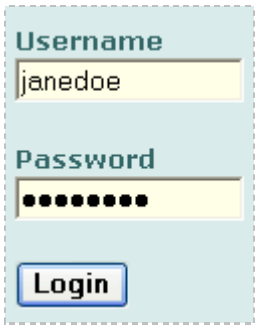
Alternatively, you can click Bring All ONLINE on the Equipment Pods page. Choose this option when you have no more additions or modifications to pods or control devices and you wish to put all pods into service.



10.2 Enable Cuatro Switch Pod Exercises

To make Cuatro Switch Pod available to classes and students, you must enable the corresponding lab exercise content in each new or existing class.

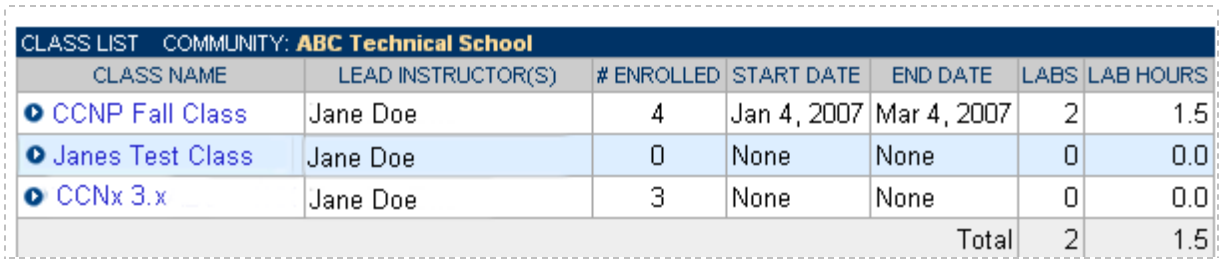
To add or edit class information, log into NETLAB$_{AE}$ using your instructor account. See the Instructor Accounts section of the *NETLAB+ Administrator Guide* for details.



Select **Class** from the menu bar at the top of the MyNETLAB page, or the link in the body of the page.

The Class Manager page will be displayed.

Select to add a new class or select an existing class from the class list by clicking on a class name.

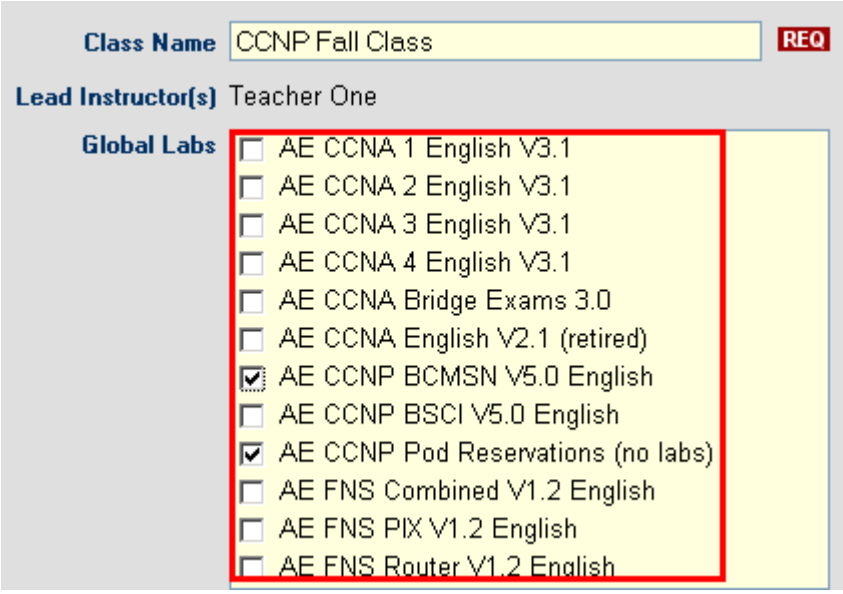


CLASS LIST COMMUNITY: **ABC Technical School**

CLASS NAME	LEAD INSTRUCTOR(S)	# ENROLLED	START DATE	END DATE	LABS	LAB HOURS
CCNP Fall Class	Jane Doe	4	Jan 4, 2007	Mar 4, 2007	2	1.5
Janes Test Class	Jane Doe	0	None	None	0	0.0
CCNx 3.x	Jane Doe	3	None	None	0	0.0
				Total	2	1.5

In the global labs section of the class settings, check the labs that you wish to make available to your class.

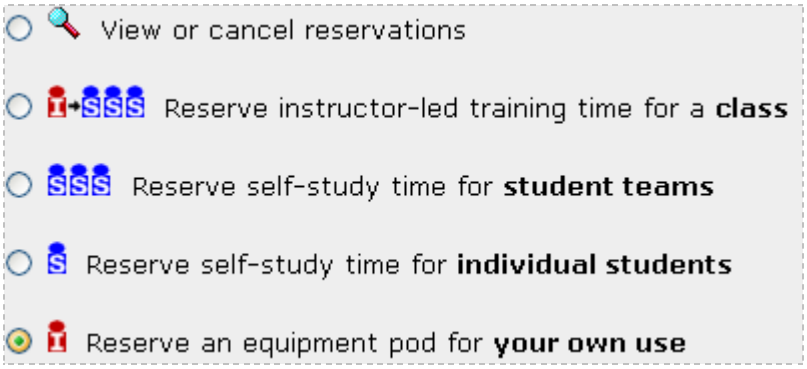
These selections determine whether the Cuatro Switch Pod is made available for student, team, or ILT reservations for this class.



10.3 Schedule a Lab Reservation for Your New Pod

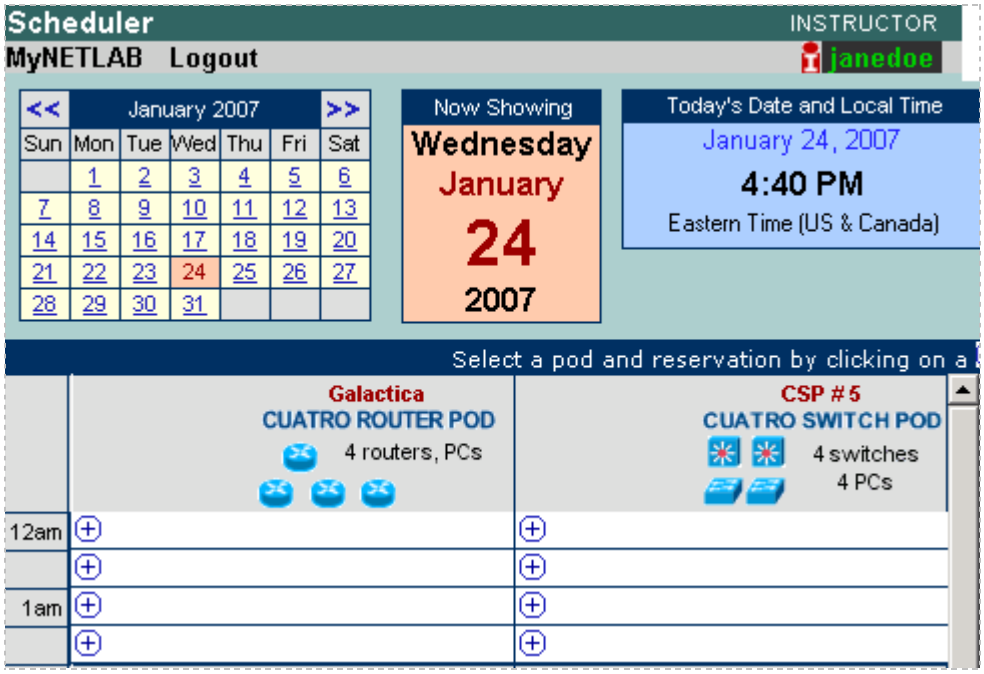
To schedule a lab reservation, select **Scheduler** from the menu bar or the link on the body of the MyNETLAB page.

The Scheduler Options screen will be displayed. Detailed descriptions of the scheduler options are available by selecting **Help** on the menu bar. In this example, we will reserve an equipment pod for your own use.



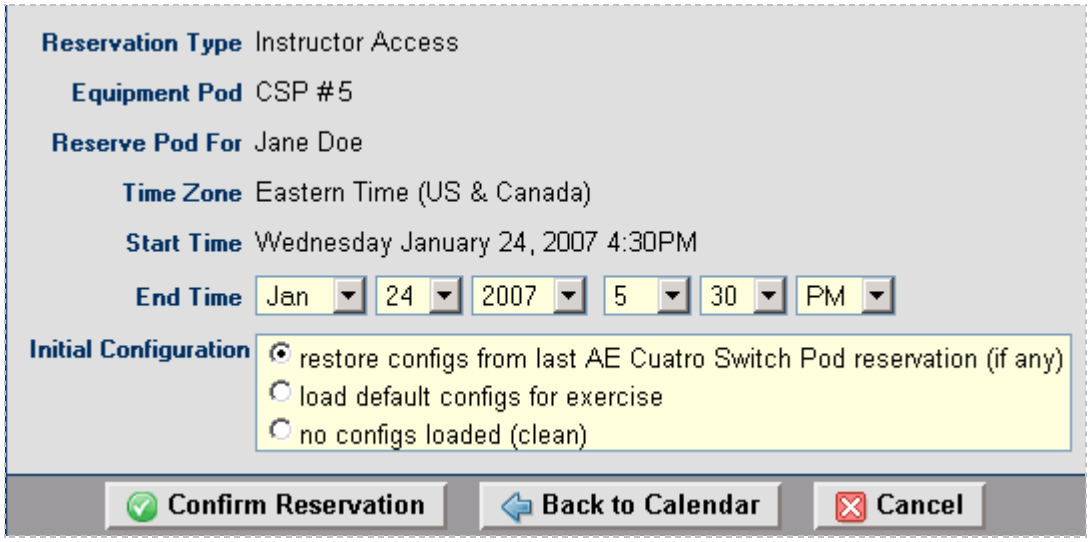
Select **OK** to proceed to the reservation calendar.

The selection of pods depicted may be different from the pods available at your site.

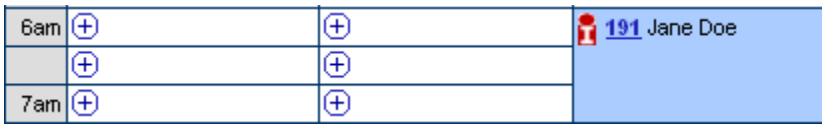


The reservation time area may be scrolled up and down.

⊕ Select an available time, and the confirmation page will be displayed.



Review the details of the reservation and select **Confirm Reservation**. You can return to the reservation calendar to see your lab reservation on the time reservation portion. Remember, you may need to scroll the page to see your information.



For more information on scheduling reservations, see the Scheduler section of the *NETLAB+ Instructor Guide*.