

# **Basic Switch Pod - Version 1**

# **Planning and Installation Guide**

For Cisco Networking Academy® CCNA 3.x Curriculum

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NETLAB Academy Edition features two variations of the Basic Switch Pod. You may implement either pod type based on available resources.

- Version 1 (this guide) does not support PCs.
- Version 2 (separate guide) supports remote PCs using VMware Server.

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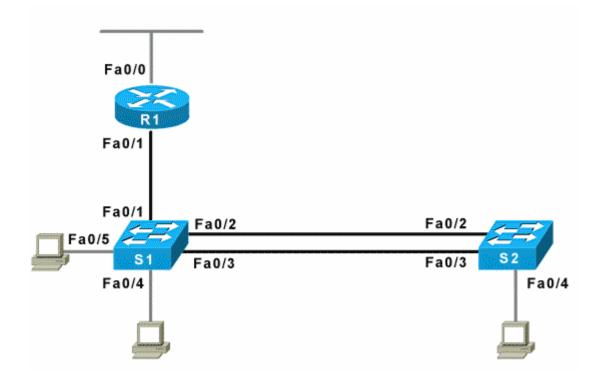
#### **PART 1 – PLANNING**

#### 1 Introduction

NETLAB Academy Edition<sup>®</sup> features three pods for use with the CCNA 3.x curriculum, Basic Router Pod, Basic Switch Pod, and Advanced Router Pod. This guide documents the NETLAB<sub>AE</sub> Basic Switch Pod, used with *CCNA 3.x Switch Labs*.

NETLAB Academy Edition features two variations of the Basic Switch Pod. You may implement either pod type based on available resources.

- Version 1 (this guide) does not support PCs.
- Version 2 (separate guide) supports remote PCs using VMware Server.



The Basic Switch Pod contains one router and two switches. You may have up to eight Basic Switch Pods per NETLAB<sub>AE</sub> system. The NETLAB<sub>AE</sub> Basic Switch Pod features direct access to the console of router R1, and switches S1 and S2.

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#### 1.1 Lab Orientation

This document assumes that you are familiar with the CCNA 3.x curriculum and labs.

#### 1.2 Deviations

Users often contact our technical support team for lab-related problems. Users are typically not aware that there are many NETLAB<sub>AE</sub> servers and may be easily confused by local deviations from the standard curriculum and labs.

If your NETLAB<sub>AE</sub> pods will be made accessible outside your local Academy, please be conservative in your 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<sub>AE</sub> *News and Announcements* feature to point users to your documentation.

# 2 Lab Device Requirements

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



The Basic Switch Pod includes one router, R1.



The Basic Switch Pod includes two switches, S1 and S2.

The following table depicts the interface requirements for each device:

Router	Ethernet Interfaces Required	Serial Interfaces Required	
R1	2	0	
S1	12	0	
S2	12	0	

The R1 Ethernet 0 interface must be a built-in interface, which is capable of activation from the ROM monitor mode. This interface connects to a control switch. All NETLAB<sub>AE</sub> supported routers have at least one Ethernet interface that meets this requirement.

The R1 Ethernet 1 interface connects to switch S1. This interface must support 802.1q to be compatible with trunking labs.

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NETLAB Academy Edition<sup>®</sup> has an interface name translation feature that allows configuration files to be loaded without errors on different router platforms. As a configuration is being loaded, NETLAB<sub>AE</sub> will substitute the correct interface names if necessary. To do this, NETLAB<sub>AE</sub> maintains a fixed table of interface names that should present on each router model. This may influence the selection of modular interface cards and slot placement within router R1. The NETLAB<sub>AE</sub> hardware support web pages depict the expected interface names for each router model.

NETLAB<sub>AE</sub> has been designed to support a broad range of hardware to allow great flexibility with equipment selection

Keep in mind that the hardware you select must meet both these requirements:

- 1. Supported by NETLAB<sub>AE.</sub>
- 2. Meet the specifications for the lab exercises of the curriculums your Academy wishes to implement.

Due to the dynamic nature of curriculum requirements, NDG makes no guarantee that every NETLAB<sub>AE</sub> supported device will meet all curriculum or lab requirements.

We strongly recommend that a knowledgeable person carefully study the curriculum and labs taught by your Academy before deploying a NETLAB<sub>AE</sub> lab bundle (pod) or specific Cisco equipment model. NDG makes no guarantee that every NETLAB<sub>AE</sub> supported device will meet all curriculum or lab requirements.

To aid in this study we recommend using the following resources:

 Review the information provided on the NETLAB<sub>AE</sub> website for information on NETLAB<sub>AE</sub> supported equipment and IOS images. Not all NETLAB<sub>AE</sub> supported equipment is an ideal choice for some of the Cisco Networking Academy curriculum modules or labs.

http://www.netdevgroup.com/netlab/hardware.htm

- Consult your Cisco Networking Academy Program contact.
- Consult your Cisco sales representative.

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# 3 Control Device Requirements

NETLAB<sub>AE</sub> control devices provide internal connectivity, console access, and managed power. Control devices are dynamically managed by NETLAB<sub>AE</sub> and are not accessible or configurable by end users.

⇒ Management of control devices is covered in the *NETLAB+ Administrator Guide*.

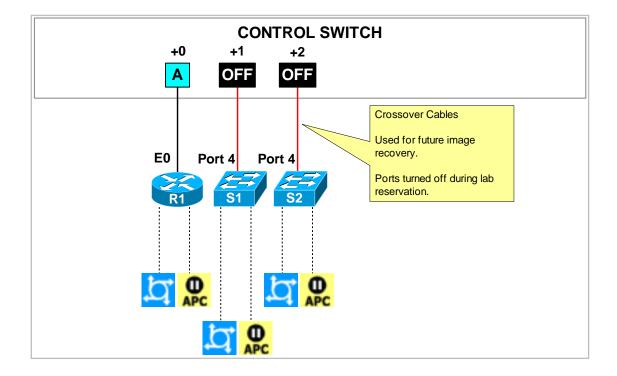
The Basic Switch Pod requires the following control device resources:

Control Device Resource	Quantity Required	
Control Switch	3 Consecutive ports	
Access Server	3 lines	
Switched Outlet Devices	3 outlets	

#### 3.1 Control Switch Overview



NETLAB<sub>AE</sub> uses a control switch to provide connectivity between devices in the Basic Switch Pod.



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The Basic Switch Pod requires 3 consecutive ports on a control switch.

Ports are labeled +0 to +2 in the diagram and are relative to the *base port* of your choice. As with all pods, you choose a base port for the Basic Switch Pod. To determine the actual port numbers, simply add the base port number chosen for this pod to the depicted relative port numbers. For example, if the base port is 5, the actual port numbers will be 5 to 7.

Using SNMP, NETLAB<sub>AE</sub> will automatically assign and program a VLAN on port +0. Each NETLAB<sub>AE</sub> 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.

Ports +1 and +2 are turned off during lab reservations. This may change in future versions of NETLAB<sub>AE</sub>, NDG currently uses ports +1 and +2 for troubleshooting switches S1 and S2, and as a network path for IOS image upgrades.

#### 3.2 **Access Server**



Access servers provide console connections to lab routers, lab switches, and lab firewall devices so that users can access these devices from  $NETLAB_{AE}$ . The Basic Switch Pod requires three access server ports. These ports provide console access to R1, S1 and S2.

#### 3.3 **Switched Outlets**



Switched outlets provide managed electrical power, allowing NETLAB<sub>AE</sub> and users to turn lab equipment on and off. The Basic Switch Pod requires a switched outlet for R1, S1 and S2.

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#### **PART 2 - IMPLEMENTATION**

# 4 Pre-requisites

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

## 4.1 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 Basic Switch Pod. Add control devices if necessary. Control device configuration is documented in the *NETLAB+ Administrator Guide*.

# 4.2 Upload IOS Images



Upload an IOS image for R1. NETLAB<sub>AE</sub> will recover the image on the router if it is erased from flash.

# 4.3 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.

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# 5 Adding the Pod

This section walks you through the process of adding a Basic Switch Pod using the NETLAB<sub>AE</sub> New Pod Wizard.

#### 5.1 Start the New Pod Wizard



Login to the administrator account.

Select Equipment Pods.

Select <u>Name All OFFLINE</u> if any of the pods are online. Caution: this will cancel any reservations in progress.

Select P Add a Pod.

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

#### 5.2 Add a Basic Switch Pod



When prompted, select Basic Switch Pod.

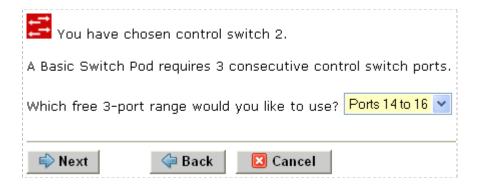
#### 5.3 Select Control Switch and Ports

A Basic Switch Pod requires 3 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.

CONTROL SWITCHES						
SELECT	SELECT ID SWITCH TYPE PORTS THAT ARE FREE		COMMENT			
INELIGIBLE	1	Catalyst 2950-24	PORT 7-8, 12, 16	NOT ENOUGH CONSECUTIVE PORTS		
<u>•</u>	2	Catalyst 2950-24	PORT 14-16	OK TO USE		
0	3	Catalyst 2950-24	PORT 9-16	OK TO USE		

Next, select the ports you want to use.

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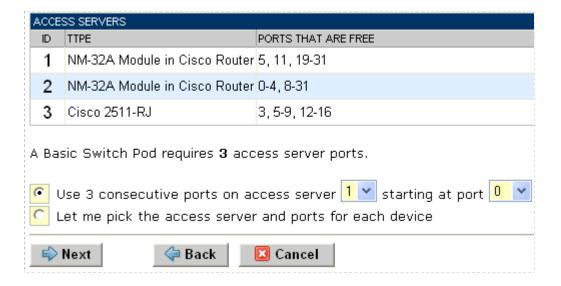
# 5.4 Select Access Server(s) and Ports

A Basic Switch Pod requires 3 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.

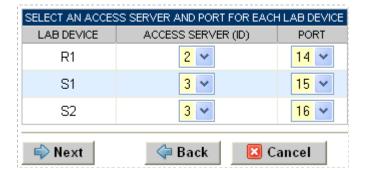
When specifying ports, use the port numbers shown on the access server itself. Some models start at port 1 (Cisco 2509 and 2511) and others start at port 0 (Cisco NM-16A and NM-32A modules).

NETLAB<sub>AE</sub> 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 device.



"Let me pick", allows you to make granular selections.

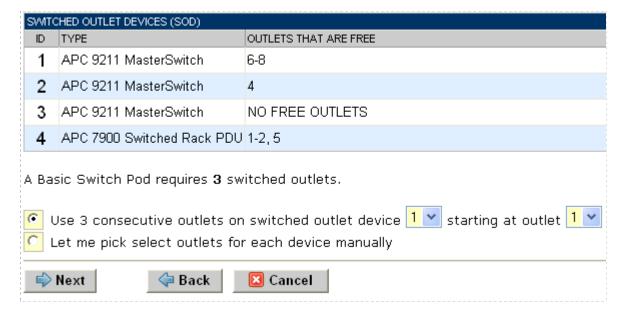
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#### 5.5 Select Switched Outlets

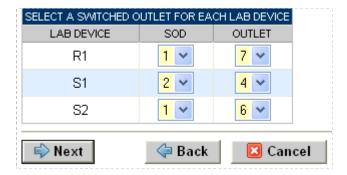
A Basic Switch Pod requires 3 switched outlets.

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.

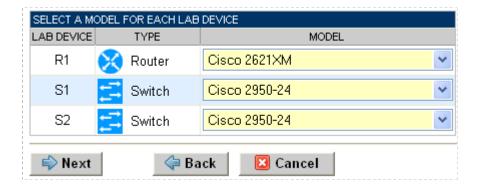
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# 5.6 Select Lab Device Types

Please specify a model for R1, S1 and S2.

- $\Rightarrow$  Your selections are used to assign the appropriate NETLAB<sub>AE</sub> device driver.
- ⇒ Improper selections may cause errors.
- $\Rightarrow$  NETLAB<sub>AE</sub> may offer selections that meet the port requirements, but do not support the curriculum. See section 2

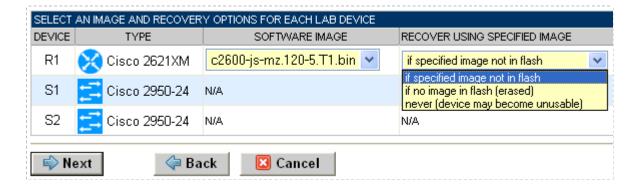


#### 5.7 Select Software Images and Recovery Options

NETLAB<sub>AE</sub> scrubs R1 at the end of lab reservation or upon request. During a scrub, NETLAB<sub>AE</sub> can recover an IOS image if it has been erased from flash.

For some lab devices, flash erasure is not possible. Lab devices for which flash erasure is not possible will not have flash recovery options.

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You have three choices for flash recovery:

Recovery Using Specified Image	During A Scrub Operation
If specified image not in flash	Restores the selected software image if that image is not in flash.
If no image in flash (erased)	Restores the selected software image if there are no .bin images in flash. No action is taken if flash contains a .bin image (even if it is not the specified one).
Never (device may become unusable)	$\label{eq:new_approx} \begin{split} \text{NETLAB}_{\text{AE}} & \text{ will take no action if the flash does not} \\ & \text{contain a bootable image. In this case, NETLAB}_{\text{AE}} \\ & \text{automated boot process will fail and manual} \\ & \text{restoration of IOS will be required.} \end{split}$

 $\Rightarrow$  If you select an automatic recovery option, you must also select a software image supported by the curriculum (see 2).

#### 5.8 Select a Pod ID

Each pod is assigned a unique numeric ID.



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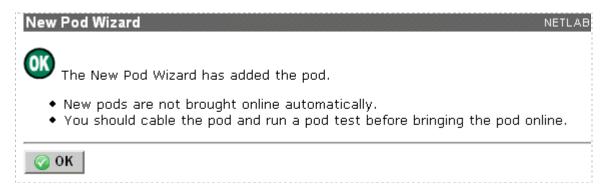
#### 5.9 Select a Pod Name

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



# 5.10 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 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<sub>AE</sub> will display the status of the pod and the high-level settings for each device, PC, and control switch.

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POD 8 - ROUTERS, SWITCHES, AND FIREWALLS (click on the GO buttons to reconfigure devices)							
GO	NAME	TYPE	ACCESS PORTS	SWITCHED APC OUTLETS	SOFTWARE IMAGE		
4	<b>₹</b> R1	Cisco 2621XM	AS 2 PORT 14	SOD 1 OUTLET 7	c2600-js-mz.120-5.T1.bin		
<b>4</b>	<b>ട</b> 51	Cisco 2950-24	AS 3 PORT 15	SOD 2 OUTLET 4	n/a		
4	🔀 S2	Cisco 2950-24	AS 3 PORT 16	SOD 1 OUTLET 6	n/a		

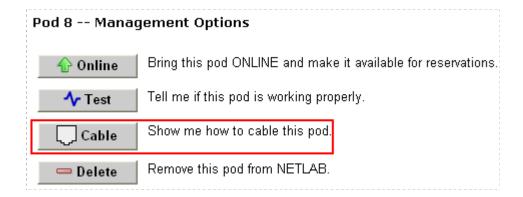
POD 8 - CONTROL SWITCH								
SWITCHID	POD PORT RANGE	BASE VLAN	VLAN POOL					
<u> 2</u>	14-16	170	170-172					

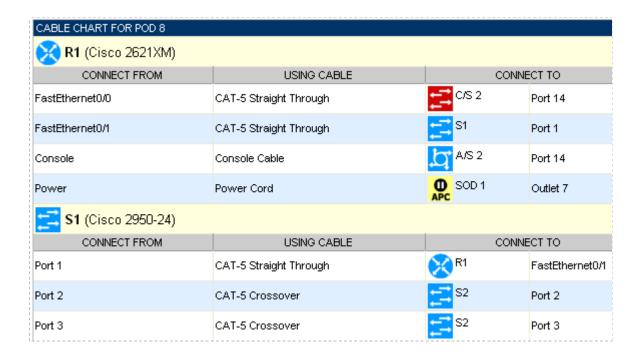
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#### 6 Cable the Pod

Use the NETLAB<sub>AE</sub> 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.





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# 7 Switch Configuration Tasks

The Basic 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.

# 7.1 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<sub>AE</sub>.

#### 7.2 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 (S1 and S2 in this case).

#### • spanning-tree bpdufilter enable

- o 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

- o 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.

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.

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Locate the 3 control switch ports connecting to S1 and S2. Refer to the cabling diagram if necessary (see section 6). The following commands must be manually added to each switch port.

Example switch port configuration. Interface numbers will vary.

```
interface FastEthernet0/2
  description port to S1 port 2 (PC1a)
  switchport mode access
  spanning-tree bpdufilter enable
  no cdp enable

interface FastEthernet0/3
  description port to S1 port 3 (PC1b)
  switchport mode access
  spanning-tree bpdufilter enable
  no cdp enable

interface FastEthernet0/4
  description port to S2 port 2 (PC2)
  switchport mode access
  spanning-tree bpdufilter enable
  no cdp enable
```

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

#### 7.3 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 Switches
- Cisco Catalyst 2950 Series Switches
- Cisco Catalyst 3550 Series Switches
- Cisco Catalyst 3560 Series Switches

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.

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#### 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:

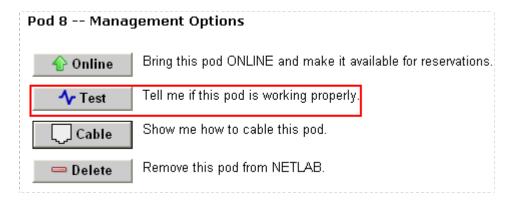
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- 1. Pod test fails with a message such as "unable to put the switch into monitor mode"
- 2. Lab automation such as scrub fails
- 3. Users cannot perform password recovery (automated or manual)

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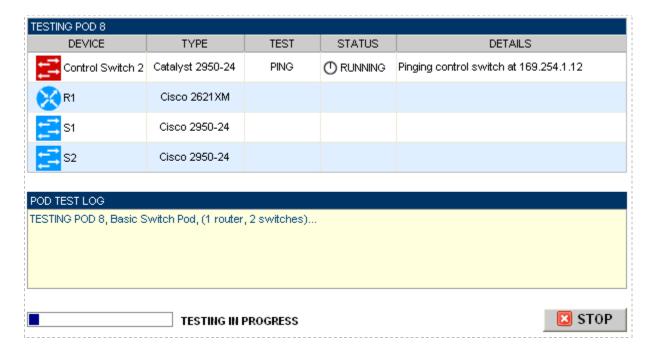
# 8 Testing the Pod

After all routers 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.



 $\Rightarrow$  Some tests may take a long time. During the BOOTIOS test, NETLAB<sub>AE</sub> 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.

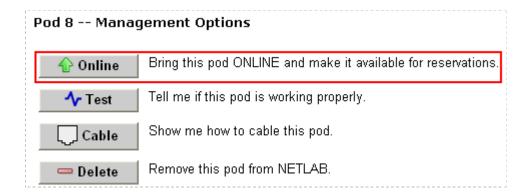


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# 9 Finishing Up

# 9.1 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 <u>Online</u> button under Management Options.



Alternatively, you can click <u>Pring All ONLINE</u> 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.

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EXIS1	TING	PODS (click on the GO button:	s to manage a pod)		
GO	ID	POD TYPE	POD NAME	STATUS	ACTIVITY
<u></u>	<u>1</u>	3 Routers	POD 1	OFFLINE	IDLE
Q	<u>2</u>	2 Firewall Routers PCs & Servers	POD 2	OFFLINE	IDLE
Q	3	1 Router 2 Switches	POD 3	OFFLINE	IDLE
Q	<u>4</u>	1 Router 2 Switches	POD 4	OFFLINE	IDLE
Q	<u>5</u>	ADVANCED ROUTER POD Frame / ISDN / Dial	POD 5	OFFLINE	IDLE
Q	<u>6</u>	ADVANCED ROUTER POD Frame / ISDN / Dial	Mars	OFFLINE	IDLE
<u> </u>	<u>7</u>	3 Routers 5 Switches	Bluestar	OFFLINE	IDLE
Q	8	1 Router 2 Switches	Redstar	OFFLINE	IDLE

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#### 9.2 Enable Basic Switch Pod and CCNA 3.x Exercises

To make the Basic Switch Pod and CCNA 3.x lab exercises available to classes and students, you must first enable CCNA 3.x in a new or existing class.

To add or edit class information, log into NETLAB<sub>AE</sub> using your instructor account. See the Instructor Accounts section of the *NETLAB+ Administrator Guide* for details.

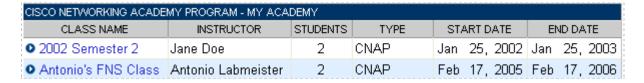


Select **Class** from the menu bar at the top of the MyNETLAB page, or the link in the body of the page.



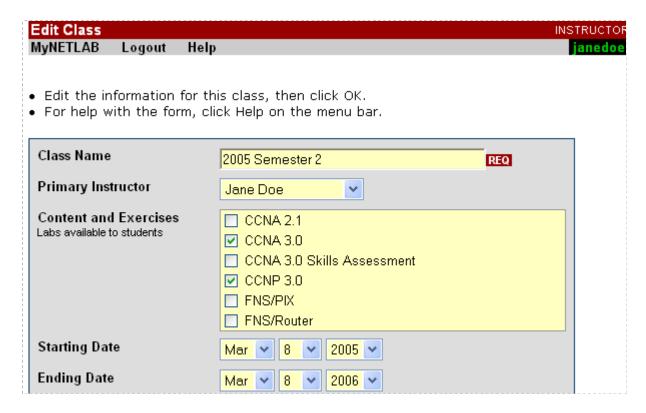
The Class Manager page will be displayed.

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



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 $\Rightarrow$  You may now enable more than one set of content. Previous NETLAB<sub>AE</sub> versions only allowed one content selection.



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#### 9.3 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.



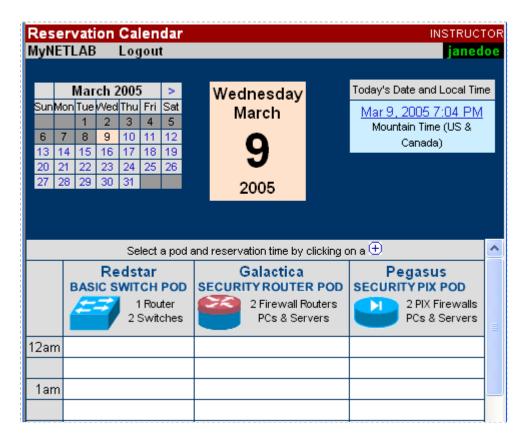
The Scheduler Options screen will be displayed. Detailed descriptions of the scheduler options are available by selecting **Help** on the menu bar. In this example, we will reserve an equipment pod for your own use.



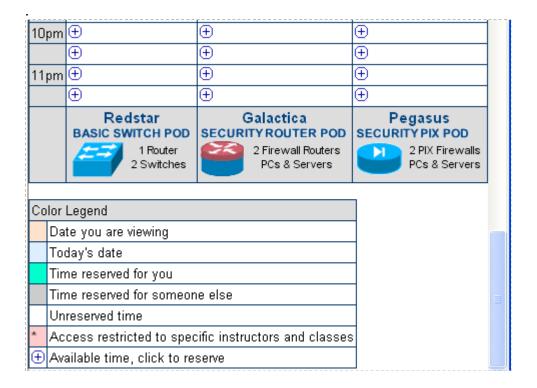
Select **OK** to proceed to the reservation calendar.

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

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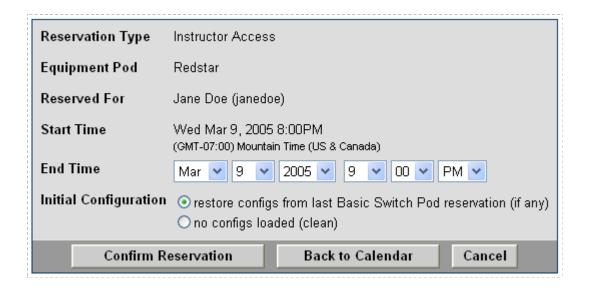


The reservation time area may be scrolled up and down. Scroll to the bottom to display the color legend.



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• Select an available time, and the Reserve Instructor Access Time 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*.

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