

# User's Guide

Virtual Switch Extension for IBM BladeCenter,  
SmartConnect Version 41.1

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# Preface

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Virtual Switch Extension (VSE) for IBM BladeCenter, SmartConnect, is a simplified software image that can be run on a BNT 1/10Gb Uplink Ethernet Switch Module (GbESM). VSE SmartConnect software provides an easy-to-use graphical user interface (GUI) and a reduced function set to minimize networking mis-configuration.

This *User's Guide* describes how to configure and use the VSE SmartConnect software. Refer to the blade server chassis *Installation Guide* for details about how to install the switch module hardware.

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**Note** – When the term *switch* is used in this document, it specifically refers to a BNT 1/10Gb Uplink Ethernet Switch Module (GbESM) that is running VSE SmartConnect software.

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## Who Should Use This *User's Guide*

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This *User's Guide* is intended for server administrators who need to connect the blade switch to a data network. The administrator does not require extensive knowledge of Ethernet or IP networking concepts to install and configure the VSE SmartConnect software. The VSE SmartConnect software's static configuration provides basic connectivity to the data network.

## What You'll Find in This *User's Guide*

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This *User's Guide* will help the administrator plan, implement, and administer the VSE SmartConnect software. Where possible, each section provides feature overviews, usage examples, and configuration instructions.

### *Part 1: Basic Concepts and Configuration*

Part 1 of this *User's Guide* contains fundamental information necessary to use the VSE SmartConnect software. Chapters are arranged in the best order for making quickest use of the VSE SmartConnect software.

[Chapter 1, "VSE SmartConnect Software Operation,"](#) provides a general theory of operation for the VSE SmartConnect software.

[Chapter 2, "Getting Started with the Browser-Based Interface,"](#) provides an overview of the browser-based interface (BBI), the primary tool used to view and configure the VSE SmartConnect software.

The remaining chapters in this part describe key VSE SmartConnect software features, providing detail for their use and configuration. Features covered include switch virtualization for port groups, VLANs, trunking, failover, and stacking, the command-line interface, and methods for remote administration.

See ["Basic Concepts & Configuration" on page 11](#) for the complete description of the chapters in this part of the *User's Guide*.

### *Part 2: BBI Reference*

Part 2 of this *User's Guide* contains information about the settings and controls on each page of the browser-based interface (BBI) used for configuring and monitoring the switch.

[Chapter 7, "Understanding the Browser-Based Interface,"](#) starts Part 2 of this *User's Guide* and provides information about the BBI screen layout, menu system, and basic operation.

The remaining chapters are arranged in hierarchical order, as they appear in the BBI menu bar.

See ["BBI Reference" on page 87](#) for the complete description of the sections in this part of the *User's Guide*.

# Typographic Conventions

The following table describes the typographic styles used in this book.

**Table 1** Typographic Conventions

Typeface or Symbol	Meaning	Example
AaBbCc123	This type is used for names of commands, files, and directories used within the text.  It also depicts on-screen computer output and prompts.	View the <code>readme.txt</code> file.  Main#
<b>AaBbCc123</b>	This bold type appears in command examples. It shows text that must be typed in exactly as shown.	Main# <b>sys</b>
<AaBbCc123>	This italicized type appears in command examples as a parameter placeholder. Replace the indicated text with the appropriate real name or value when using the command. Do not type the brackets.  This also shows book titles, special terms, or words to be emphasized.	To establish a Telnet session, enter: host# <b>telnet</b> <IP address>  Read the <i>User's Guide</i> thoroughly.
[ ]	Command items shown inside brackets are optional and can be used or excluded as the situation demands. Do not type the brackets.	host# <b>ls</b> [-a]
AaBbCc123	This block type depicts menus, buttons, and other controls that appear in Web browsers and other graphical interfaces.	Click the <b>Save</b> button.

## How to Get Help

If help, service, or technical assistance is needed, see the blade server chassis software *Installation Guide* for the appropriate contact information.



# Part 1: Basic Concepts & Configuration

The chapters in this part of the *User's Guide* cover the following information:

- [Chapter 1, “VSE SmartConnect Software Operation,”](#) provides a general theory of operation for the VSE SmartConnect software.
- [Chapter 2, “Getting Started with the Browser-Based Interface,”](#) provides an overview of the browser-based interface (BBI) that enables the administrator to view and configure settings on the switch.
- [Chapter 3, “Switch Virtualization,”](#) describes how to use virtualization features to combine multiple ports to aggregate bandwidth between large-scale network devices, or segregate ports or virtual machines to form smaller, independent switch entities.
- [Chapter 4, “Stacking,”](#) describes how to configure the switch for stacking, which allows multiple switches to work together as a single unit.
- [Chapter 5, “Command Reference,”](#) provides an overview of menu commands that enable the administrator to view information and statistics about the switch, and to perform any necessary configuration.
- [Chapter 6, “Configuring Switch Access,”](#) describes different methods to access and manage the switch, including remote administration using the management system, RADIUS authentication, Secure Shell (SSH), and Secure Copy (SCP).



# CHAPTER 1

## VSE SmartConnect Software Operation

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### VSE SmartConnect Software Overview

---

The Virtual Switch Extension (VSE) for IBM BladeCenter, SmartConnect, provides a simple Ethernet interface option for connecting a blade server chassis to the network infrastructure. The administrative effort and network skills required to connect to the network are minimized. The number and type of configuration options on the VSE SmartConnect software are restricted to reduce the initial setup complexity and to minimize the impact on upstream networking devices.

The VSE SmartConnect software requires basic administration tasks similar to those required to connect a single multi-linked server to the network. Connecting the blade server chassis with up to fourteen (14) server blades becomes as easy as connecting a single server to the network.

The default network configuration of the VSE SmartConnect software consists of a single Virtual Switch Group (VSG). As the switch is configured, additional VSGs may be created, and switch resources (internal ports, external ports, and virtual machines) may be reassigned to take advantage of various switch virtualization features.

By default, all of the external uplink ports in each VSG are aggregated together into a static Link Aggregation Group (LAG, or trunk), which is fully compatible with Cisco EtherChannel technology. This configuration eliminates the need for Spanning Tree Protocol to prevent network loops among the individual links, since the uplink ports act as a single link.

The VSE SmartConnect software provides improved network reliability. By default, uplink ports participate in a static trunk so that if an individual link fails, the existing traffic is redirected to the remaining links. In addition to default static trunks, VSGs may be configured to use dynamic Link Aggregation Control Protocol (LACP) for their trunks.

The VSE SmartConnect software permits the uplink ports to auto-negotiate the flow-control settings of each link (the default setting). Port characteristics can also be configured to specified values. All of the trunked uplink ports in each VSG must be configured to the same port characteristics in order to participate (form an active link) in the trunk.

---

**Note** – In the default switch configuration in which all external ports (even those of different physical types) belong to one trunk, some external ports may be automatically disabled by the switch to satisfy general trunking restrictions. See [“Trunking Rules” on page 32](#) for details.

---

With Network Adaptor Teaming configured on the server blade Ethernet NICs, the servers can maintain redundant links to multiple switches within the blade chassis to provide enhanced reliability. The L2 Failover option allows the VSE SmartConnect software to disable the server-blade ports when all of its external uplinks are inactive. This causes the Network Adaptor Teaming software to failover to the other switch(es) in the blade server chassis.

The VSE SmartConnect software permits effective management of the server blades using the Serial Over LAN (SOL) feature over a VLAN dedicated to the blade chassis management system. If no external ports are enabled, Layer 2 Failover must be disabled to use SOL.

Most administrators will find the Browser-based Interface (BBI) adequate for configuring and using the VSE SmartConnect software. However, a command-line interface (CLI) is available for users familiar with the CLI, or who want to use scripting facilities. Other interface products, such as the IBM Director or Blade Harmony Manager, may also be used for managing some or all switch functions.



# VSE SmartConnect Software Quick Start

---

When VSE SmartConnect software is loaded, the default configuration allows the switch to function correctly with no configuration changes. The administrator must make some configuration changes to the upstream network device and the blades in the blade chassis, as described in the following sections.

## Configuring the Chassis Management System

The link through the management system is used to connect to the switch. The management system is also used to control several operational characteristics of the switch:

- Plug the Ethernet cable into the management system and verify the link.
- Verify access to the management system.
- Verify that the external ports are enabled.

## Configuring the Upstream Networking Device

If only one link is required to the switch, do the following:

- Plug in the Ethernet cable (straight through or crossover) that connects the switch to the upstream networking device.
- Configure the upstream networking device to transmit the desired data on a single untagged (native) VLAN.
- Verify that the upstream networking device is configured to auto-negotiate the link's speed, duplex and flow control. If fixed port characteristics are desired, configure the switch port characteristics using the appropriate BBI or CLI interfaces.

If more than one link is required to the switch, configure a static link aggregation group (also referred to as a trunk group or EtherChannel) to include all of the ports that are being connected.

## Configuring the Chassis Processor Blades

The operating system should be configured to have a single 802.1Q untagged interface. If two switches are used in the chassis, the server blades can be configured to support Network Adaptor Teaming Failover. For details, refer to the appropriate documentation for the operating system.



## CHAPTER 2

# Getting Started with the Browser-Based Interface

---

This chapter briefly describes the software features and requirements for the Browser-Based Interface (BBI), and explains how to access the BBI.

The BBI allows the administrator to perform basic configuration tasks quickly and easily. The command line interface provides more detailed configuration options for VSE SmartConnect software (see [“Command Reference” on page 57](#)).

## Requirements

---

- BNT 1/10Gb Uplink Ethernet Switch Module (GbESM)
- Installed VSE SmartConnect software
- PC or workstation with HTTP access to the switch’s management IP interface as configured using the management system
- Frame-capable Web browser, such as the following:
  - Netscape Navigator 4.7x or higher
  - Internet Explorer 6.0x or higher
  - Mozilla FireFox 1.0.4 or higher
- JavaScript enabled in the Web browser

## Web Browser Set Up

---

Most modern Web browsers work with frames and JavaScript by default, and require no additional set up. However, check the Web browser’s features and configuration to make sure frames and JavaScript are enabled.

---

**Note** – JavaScript is not the same as Java. Please make sure that JavaScript is enabled in the Web browser.

---

## Starting the BBI

---

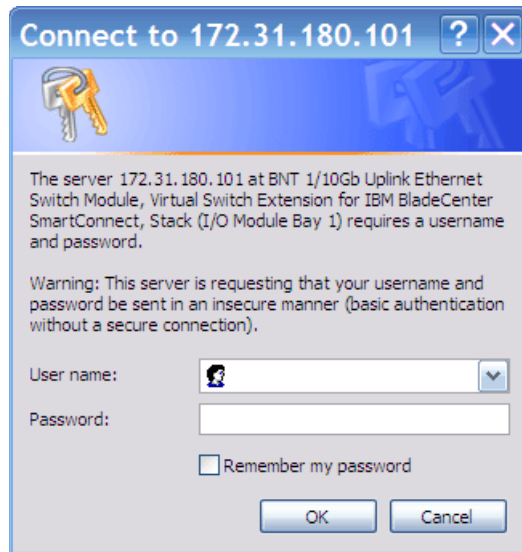
When the VSE SmartConnect software and browser set up is done, follow these steps to launch the VSE SmartConnect software BBI:

1. **Start the Web browser.**
2. **In the browser URL address window, specify the IP address of the target switch.**

If the switch is configured correctly for BBI access, the login prompt will appear.

3. **Log in to the switch.**

If the switch and browser are properly configured, the password prompt will appear:



**Figure 2-A** SmartConnect Login Prompt

---

**Note** – The sample screens that appear in this *User's Guide* might differ slightly from the screens displayed in any given system. Screen content varies based on the type of blade server chassis being used, the firmware versions and options that are installed, and the specific hardware and software of the system used for accessing the switch.

---

Enter the account name and password for the switch's administrator or user account. The default account name is **admin**, and the default password is **admin**.

---

**Note** – There may be a slight delay while the main BBI page is being initialized. Do not stop the browser while loading is in progress.

---

Once the administrator is properly logged in, the VSE SmartConnect software BBI appears in the Web browser's viewing window:

The screenshot displays the BBI interface with three main regions highlighted by blue callouts:

- Port Status:** Located at the top right, it shows a grid of port status icons for external ports (EXT1-EXT9) and internal ports (INT1-INT14). A blue circle highlights the EXT1 icon.
- Menus:** Located on the left side, it includes a sidebar menu with options like 'Virtual Switch Groups', 'Policies', 'System Settings', 'Boot Management', 'Information', and 'Statistics'. A blue circle highlights the 'Virtual Switch Groups' option.
- Configuration Window:** The main content area titled 'Virtual Switch Groups Membership'. It contains sections for 'External Port', 'Server Port', and 'Management Port', each with dropdown menus for group and trunk selection. A 'VM Preprovisioning' table is also visible at the bottom right. A blue circle highlights the 'Apply' button at the bottom of the configuration window.

**Figure 2-B** BBI Startup Screen

There are three main regions on the BBI screen:

- The port status area is used to view port status. Click a port icon to view details.
- The menus are used to select particular items or features to act upon.
- The configuration window is used to view and configure switch features.

See [“BBI Reference” on page 87](#) for general details on using the BBI.

## Updating the Software Image

---

The software image is the executable code running on the switch. Upgrading the software image on the switch typically involves the following actions:

- Load a new software image onto a FTP or TFTP server on the network, or onto a local computer.
- Transfer the newly loaded software image to the switch.
- Select the new software image to be run when the switch is next reset.
- Reset the switch.

### Loading the New Software Image

Use the BBI to determine which version of software is currently installed on the switch. On the BBI menu, choose **System Settings > Boot Management > General**. The resulting window displays the current software information.

If the switch requires a software update, the latest version of the VSE SmartConnect software is available from the support web site. Download the switch image and place it on a FTP or TFTP server, or on a local computer.

### Transferring the New Image to the Switch

The switch can store up to two different software images, called *image1* and *image2*, as well as boot software, called *boot*. When loading new software, the administrator must specify where it should be placed: either into *image1*, *image2*, or *boot*.

For example, if the active image is currently loaded into *image1*, best practice is to load the new software into *image2*. This allows the administrator to test the new software and reload the original active image (stored in *image1*), if needed.

---

**Note** – The switch image type is checked during the software download, to validate that the image is compatible. If the image is incompatible, an error message is displayed.

---

The BBI may be used for loading software onto the switch. The software image to load can reside in one of the following locations:

- FTP server
- TFTP server
- Local computer

Perform the following steps to load a software image:

1. **On the BBI, choose menu System Settings > Boot Management > General.**

The *Boot Management* window appears.

**Figure 2-C** Boot Management Window (shown with Stacking enabled)

2. Use the **Image to transfer** drop-down list to select the desired image.
3. In the **Update Image/Cfg** section, use the **Method to use for transfer** drop-down list to specify the desired method (such as TFTP, FTP, or HTTP).
4. **Get the image from the appropriate source:**
  - If transferring software from a TFTP server, enter the Server IP Address, and the Remote File Name. Then click **Get Image**.
  - If transferring software from a FTP server, enter the Server IP Address, and the Remote File Name. Also enter the FTP Username and FTP Password. Then click **Get Image**.
  - If transferring software from a local computer (HTTP), click **Browse**. In the File Upload dialog, select the desired file and click **OK**. Then click **Get Image**.

Once the image is transferred, the page refreshes to show the new software.

## Selecting a Software Image to Run

Perform the following steps to select which software image (*image1* or *image2*) desired to run after the next reboot.

1. **On the BBI, choose menu **System Settings > Boot Management > General**.**
2. **In the Boot Management page, use the **Image to boot** drop-down list to select the desired image.**

The VSE SmartConnect software can store two different types of software image, as follows:

- VSE SmartConnect software image
- BNT 1/10Gb Uplink Ethernet Switch Module (GbESM) image

This procedure can be used to change from one image type to the other. However, the configuration block for one image type is not compatible with the other type.

3. **If necessary, select an option from the **Next boot config block** drop-down list.**

If the software image type is changed, a compatible configuration block must be loaded or the configuration must be reset to factory defaults. It is recommended that both the active and backup configurations remain compatible with the active image type. For example, if a VSE SmartConnect software configuration file is in the *active config*, do not store a normal configuration file in the *backup config*.

---

**Note** – When resetting the switch to its factory default configuration, the switch will retain its stacking settings. To reconfigure or disable stacking, see [“Stacking” on page 43](#).

---

4. **Click **Apply** to submit the image and configuration changes to the switch.**  
The changes will remain pending until the switch is next reset.
5. **Click **Reboot the Module** to activate the new image file and configuration block.**

## Uploading a Software Image from the Switch

Software images can also be uploaded from the switch to a FTP or TFTP server. The same software can then be transferred to other compatible switches.

Perform the following steps to upload a software image from the switch to a FTP/TFTP server.

1. **On the BBI, choose menu **System Settings > Boot Management > General**.**  
In the Boot Management window, page appears.
2. **Use the **Image to transfer** drop-down list to select the desired image.**



3. **In the Update Image/Cfg section, use the Method to use for transfer drop-down list to specify the desired method.**
4. **Get the image from the appropriate source:**
  - If loading a software image to a TFTP server, enter the Server IP Address, and the Remote File Name. Then click Put Image.
  - If loading a software image to a FTP server, enter the Server IP Address, and the Remote File Name. Also enter the FTP Username and FTP Password. Then click Put Image.
  - If loading a software image to a local computer (HTTP), click Browse. In the File Upload dialog, select the desired file and click OK. Then click Put Image.

## Selecting a Configuration Block

---

When configuration changes are made to the switch, the administrator must save the changes so that they are retained beyond the next time the switch is reset. When the `save` command is issued, the new configuration changes are placed in the *active* configuration block. The previous configuration is copied into the *backup* configuration block.

There is also a *factory* configuration block. This holds the default configuration of the VSE SmartConnect software. Under certain circumstances, it may be desirable to reset the switch software to its default configuration.

Perform the following steps to select which configuration block the switch will load the next time it is reset:

1. **On the BBI, choose menu System Settings > Boot Management > General.**
2. **In the Boot Management window, select an option in the Next boot config block (*active, backup, or factory*).**

---

**Note** – When resetting the switch to its factory default configuration, the switch will retain its stacking settings. To reconfigure or disable stacking, see [“Stacking” on page 43](#).

---

3. **Click Apply to submit the configuration block changes to the switch.**  
The changes will remain pending until the switch is next reset.
4. **Click Reboot the Module to activate the new configuration block.**

## Resetting the Switch

---

The switch must be reset to make the software image file and configuration block changes active. To reset the switch module:

1. **On the BBI, choose menu System Settings > Boot Management > General.**

The Boot Management page appears.

2. **Click Reboot the Module.**

## CHAPTER 3

# Switch Virtualization

---

The following virtualization features are included in the VSE SmartConnect software:

- VMready

The switch's VMready software makes it *virtualization aware*. The switch automatically discovers the Virtual Machines (VMs) of hypervisors connected to internal ports on the switch. The VSE SmartConnect software accepts up to 1024 VMs.

- Virtual aggregation

Switch resources can be pooled together, combining their capacity while at the same time simplifying their management. This can be accomplished on a number of levels:

- *Grouping* multiple internal and external switch ports into a single, logical switching entity with shared bandwidth capacity. Up to 32 such Virtual Switch Groups (VSGs) can be configured on the switch or stack.
- *Trunking* multiple switch ports into a single, high-bandwidth link to other networking devices. Each VSG supports up to two external trunks which can be used independently, or as a primary and backup.
- *Stacking* multiple switches from the same or different chassis into a single super-switch. VSE SmartConnect software supports one stack with up to eight switches. Stacking also permits the use of up to 56 internal port trunks.

- Virtual segmentation

VSGs act as independent logical units. Traffic assigned to different VSGs is thoroughly separated within the switch, essentially dividing the switch into smaller switch entities.

VSG segmentation occurs internally within the switch, requiring no support changes to the broader network configuration (such as VLANs). Internal and external switch ports, as well as any attached VMs, can be independently assigned to VSGs.

- ServerMobility™

The ServerMobility feature allows server IP addresses to be assigned based on their physical location in a blade server chassis. Then, if a server fails, a replacement server (in the same or different slot) can assume the identity (and configuration) of the failed unit.

By combining virtualization features, VSE SmartConnect software provides a highly-flexible framework for allocating and managing switch resources.

## Virtual Switch Groups

---

Switch resources can be assigned to VSGs. Up to 32 VSGs are available. Each VSG behaves independently, which allows for segmenting the switch into smaller logical entities. Within each VSG, member ports can be aggregated into trunks, combining their bandwidth.

Two different types of resources can be assigned to VSGs:

- Ports (internal and external)
- VMs

### Port Groups

Each internal and external port can be independently assigned to one of the 32 available VSGs. Each VSG can contain multiple ports, but each port can belong to only one VSG.

VSGs for port groups must have the following characteristics:

- It is recommended that each VSG contain internal server ports *and* external ports for proper network operation.
- By default, all external ports in the same VSG are placed into one trunk to aggregate their bandwidth. For more information, see [“Trunking” on page 30](#).

For VSG port group and trunk configuration, see [“Assigning Ports to VSGs” on page 97](#).

### Virtual Machine Groups

The switch automatically discovers VMs that reside in the hypervisor directly connected to the switch. As with ports, VMs can be independently assigned to VSGs in order to group or separate them. Optionally, uplink ports can also be assigned to VSGs that include VMs.

The switch will accept a maximum of 1024 VMs. Once this limit is reached, the switch will reject additional VMs.

---

**Note** – In some rare situations, the switch may reject the addition of new VMs prior to reaching the 1024 VM limit. This can occur when the hash bucket corresponding to the new VM is already full. If this occurs, change the virtual machine's MAC address and retry the operation. The MAC address can usually be changed from the virtualization platform's management console (such as the VMware Virtual Center). This limitation is independent of whether switches are acting alone or as part of a stack.

---

VSGs containing VMs have the following characteristics:

- The VSG may consist of VMs and (optionally) external ports.
- Internal ports cannot be added to VSGs which contain VMs, and VMs cannot be added to VSGs which contain internal ports.
- The switch allows communication between VMs in the same group.
- The switch does not allow communication between VMs which are not in the same group. However, VMs which are in the same hypervisor may still communicate with each other even if they are not assigned to the same VSG on the switch.

For information on configuration, see [“Assigning Virtual Machines to VSGs” on page 97](#).

## Link Aggregation

The default network configuration of the VSE SmartConnect software places all ports into a single VSG, and aggregates all external ports together into a static Link Aggregation Group (LAG), also known as a *trunk* (see [“Trunking” on page 30](#)).

This configuration eliminates the need for Spanning Tree Protocol to prevent network loops, since the uplink ports act as a single link. Also, since all of the uplink ports in each VSG participate in a static LAG, if a link fails, the existing traffic is redirected to the other links.

To override default VSG assignments and trunk settings, see [“Assigning Ports to VSGs” on page 97](#)).

# VLANs

---

## Network Segmentation

Virtual Local Area Networks (VLANs) are commonly used to split up groups of network users into manageable broadcast domains, to create logical segmentation of workgroups, and to enforce security policies among logical segments.

By default, the VSE SmartConnect software treats all VLAN traffic as regular, untagged traffic (as if no VLAN is assigned), and does not use VLAN information for making decisions on whether to forward, drop, or segment traffic.

Switches with VSE SmartConnect software use VSGs to provide similar network segmentation functions without the need to alter the configuration of the broader network.

Though VSG numbers do not technically correlate to any specific VLAN IDs, if VSGs are used as a way to emulate VLANs in the switch, for ease of management the administrator can set the name of the VSG to reflect the equivalent VLAN identity.

## Port Access

VLAN security policies can be enforced for ports within VSGs by using Access Control Lists (ACLs). Port ACLs can be configured to consider a packet's VLAN ID for making decisions on whether to permit or deny the packet's ingress.

ACLs can be configured in the BBI through the Switch Policy menus (see [“Access Control Lists” on page 106](#) and [“Access Control List Sets” on page 111](#)), and applied to ports through the Virtual Switch Groups menu (see [“Virtual Switch Groups ACL QoS” on page 100](#)).

## Port-Based VLAN Tagging

Each internal and external port can be independently configured with a Port VLAN ID (PVID) for tagging purposes. Under specific circumstances, the configured VLAN ID will be added to or stripped from traffic passing through the switch.

- Upon the ingress of untagged packets:
  - If the PVID on the port is 0 (the default), the packets will remain untagged.
  - If the PVID on the port is set to any value other than 0, the switch will tag the packets, placing the port's VLAN identifier into the frame headers. One application of this feature is to set a VLAN for traffic outbound from servers that do not perform their own VLAN tagging.

- Upon the ingress of tagged packets:  
Packets which are already tagged for specific VLANs prior to reaching the switch are unchanged (retain their original tag), regardless of the PVID setting on the ingress port.
- Upon the egress of untagged packets:  
After ingress processing, if the packet is still untagged, it will remain untagged when egressing the port, regardless of the PVID setting on the egress port.
- Upon the egress of tagged packets (whether tagged prior to ingress, or as a result of ingress processing):
  - If the PVID on the egress port is different than that of packet's tag, the packet will remain unchanged upon egress, retaining its current tag.
  - If the PVID on the egress port matches the packet's tag, the VLAN tag will be stripped from the packet header. One application of this feature is to remove tags on traffic bound for servers that are not configured to support multiple VLANs.

PVIDs can be configured in the BBI through the *Switch Policy* menus (see [“Internal Port Settings” on page 102](#) and [“External Port Settings” on page 103](#)).

## Defined VLANs

The VSE SmartConnect software uses the following VLANs:

- The default VLAN is an untagged VLAN used for data traffic, and contains all external ports and internal server-blade ports.
- Individual VLANs can be specified for switch IP Interfaces and stack interface.
- If the stacking feature is enabled, VLAN 4090 is reserved for segmenting inter-switch stacking traffic. Though the default stacking VLAN can be changed, it is strongly recommended that the default VLAN 4090 be used and reserved solely for stacking.
- VLAN 4095 is used by the management network, which includes the management ports and (by default) the internal blade ports. This configuration allows Serial over LAN (SoL) management, a feature available on certain server blades. VLAN 4095 configuration cannot be modified.

## Trunking

---

Trunks provide super-bandwidth, multi-link connections between switch modules or other trunk-capable devices. A trunk is a group of ports that act together, combining their bandwidth to create a single, larger virtual link.

In the VSE SmartConnect software, trunks function as static Link Aggregation Groups (LAGs) that are compatible with Cisco's EtherChannel technology.

VSE SmartConnect software supports the following trunk types:

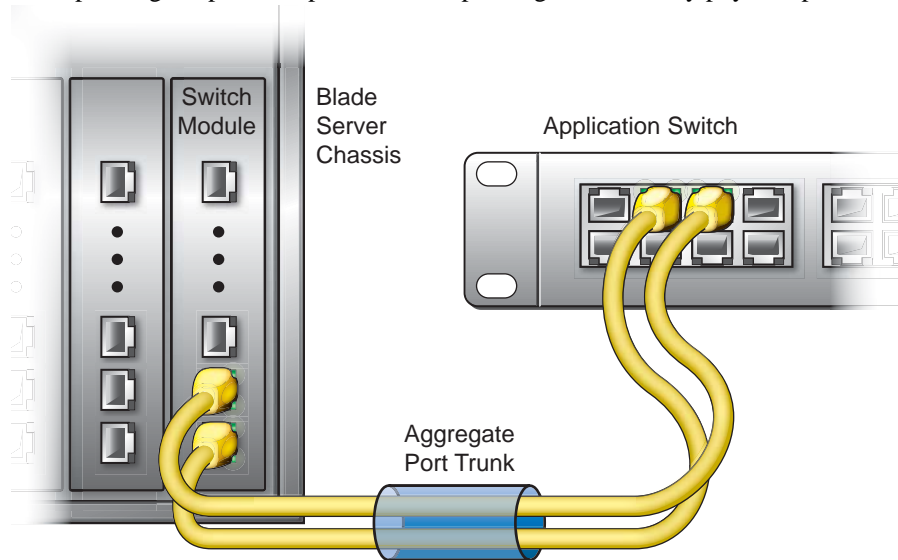
- Up to 64 external trunks (2 independent trunks for each of 32 VSGs)
- Up to 56 internal trunks are available when multiple switches are placed in a stacked configuration (see [“Stacking” on page 43](#)).

For additional limits, see [“Trunking Rules” on page 32](#).



## External Trunks

When using a VSG with multiple external ports, a trunk can be created between the switch module and another switch. A simple example is shown in [Figure 3-A](#). This provides a virtual link operating at up to 30G per second, depending on how many physical ports are combined.



**Figure 3-A** Trunking External Ports

The trunk is also useful for connecting a switch module to third-party devices that support link aggregation, such as Cisco routers and switches with EtherChannel technology (*not* ISL trunking technology) and Sun's Quad Fast Ethernet Adapter. The switch's trunking technology is compatible with these devices when they are configured manually.

Each VSG can have up to two external port trunks. Each of these trunks may consist of as many external ports as are available in the VSG. By default, the external ports for each VSG are placed into one of the VSG's available trunks. If all the switch ports belong to the same VSG (as with the factory default configuration), all external ports will be placed into the same trunk, though it is possible that not all links will be active (see [“Trunking Rules” on page 32](#)).

---

**Note** – Because all external ports in a VSG belong to the same trunk by default, external ports should not be used as regular IEEE 802.3 network links. Do not plug a workstation directly into one of the switch's active external ports unless it is the only device attached to these ports, or unless the port has been explicitly assigned to a VSG or trunk with no other active external ports.

---

To reconfigure the trunk assignment for each external port, see [“Virtual Switch Groups Membership” on page 97](#).

## Trunking Rules

The trunking feature operates according to specific rules of operation. When working with trunks, consider the following rules to determine how a trunk reacts in any network topology:

- Trunking to third-party devices must comply with Cisco® EtherChannel® technology.
- For any specific trunk, only one physical port type can be active at any given time. If ports of different types (such as 1G ports and 10G ports) are mixed in a trunk (as occurs in the default configuration), the switch uses the Best Link algorithm to select the best port type for trunk operation. The lower-speed trunk ports will be automatically disabled while the higher-speed ports are in operation.
- For any specific trunk, although any number of ports can be assigned to the trunk, a maximum of eight ports may have an active link at any given time. If more than eight ports are included in a trunk, the switch will automatically disable links on the extra trunk ports while eight ports are in operation.
- Each trunk may consist of internal ports only, or external ports only. Internal and external ports cannot be mixed in the same trunk.
- Each external trunk must consist of member ports belonging to only one VSG. External ports for different VSGs cannot be trunked together.
- Each external trunk must originate from one logical device (one switch or different switches in the same stack), and lead to one logical destination device (such as a switch, stack, or other network device).
- Internal trunks require that stacking is enabled.
- Internal trunks may have member ports belonging to one VSG or multiple VSGs.
- Each internal trunk may group internal ports from the same switch or multiple switches in a stack, and may lead to one or more network devices.
- Internal trunks do not support VMs that are assigned to VSGs. Trunking ports that include VSG-assigned VMs, or assigning VSGs to VMs on ports that are already part of an internal trunk, may cause unexpected behavior.

These rules apply to any switch when operating independently, or to the set as a whole when multiple switches are placed in a stacked configuration.

## Statistical Load Distribution

Network traffic is statistically distributed between external ports in a trunk. The switch uses the source and destination IP address information present in each transmitted IP frame to determine load distribution. If the frame is not an IP frame, then Layer 2 MAC addresses are used.

Each packet's particular combination of source and destination addresses results in selecting one line in the trunk for data transmission. If there are enough devices feeding the trunked lines, then traffic distribution becomes relatively even.

## Built-In Fault Tolerance

Since trunks are comprised of multiple physical links, each trunk is inherently fault tolerant. As long as one connection is available, the trunk remains active.

Statistical load distribution is maintained when a port in a trunk is lost or returned to service.

## Link Aggregation Control Protocol

Link Aggregation Control Protocol (LACP) is an IEEE 802.3ad standard for grouping several physical ports into one logical port (known as a dynamic trunk group or Link Aggregation Group) with any device that supports the standard. Please refer to IEEE 802.3ad-2002 for a full description of the standard.

The 802.3ad standard allows standard Ethernet links to form a single Layer 2 link using the Link Aggregation Control Protocol (LACP). If a link in a LACP trunk group fails, traffic is reassigned dynamically to the remaining link or links of the dynamic trunk.

To configure LACP for a VSG, choose **Virtual Switch Groups > Settings** in the BBI. The Link Aggregation Control Protocol field can be used to enable or disable LACP. When enabled, external ports in the VSG participate in LACP. When disabled (as by default), external ports in the VSG's external trunk act as a static trunk.

## Switch Failover

The primary application for switch failover is to support Network Adapter Teaming. With Network Adapter Teaming, the NICs on each server all share the same IP address and are configured into a team. One NIC is the primary link, and the other is a standby. For details, refer to "Configuring Teaming" in the *Broadcom NetXtreme™ Gigabit Ethernet Adapter User Guide*.

Switch failover is disabled by default, but can be enabled for any VSG. When enabled, switch failover works as follows:

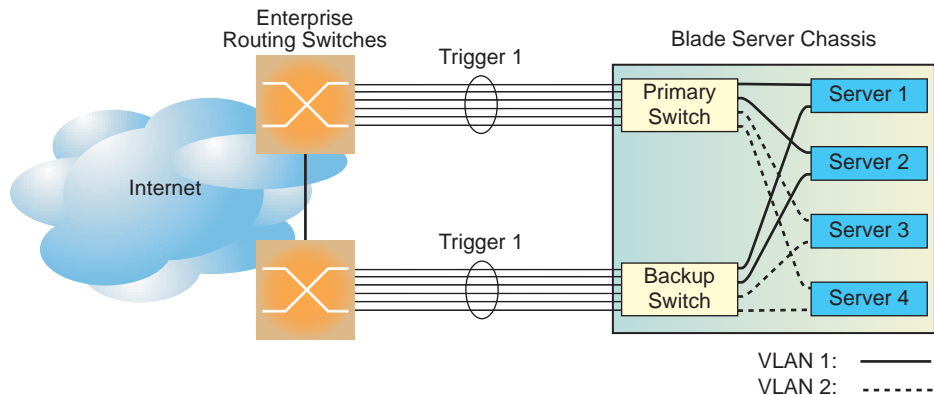
- If some (or all) of the links fail in the failover trigger, the switch disables all internal ports in the VSG. This causes the NIC team on the affected server blades to failover from the primary to the backup NIC. This process is called a failover event.
- When the appropriate number of links return to service, the switch enables the internal ports in the VSG. This causes the NIC team on the affected server blades to fail back to the primary switch (unless Auto-Fallback is disabled on the NIC team). The backup processes traffic until the primary's internal links come up, which takes up to five seconds.

### Setting the Number of Links to Trigger Failover

The Number of Links to Trigger Failover specifies the minimum number of operational links in the VSG that triggers a failover event. For example, if the limit is four, a failover event occurs when the number of operational links in the trigger is four or fewer. If the trigger number is set to zero (0), the switch triggers a failover event only when no links in the VSG are operational.

### Configuring Switch Failover

Figure 3-B is a simple example of switch failover. One switch is the primary, and the other is used as a backup. In this example, all external ports on the Primary Switch belong to a single VSG with switch failover enabled, and the number of links to trigger failover set to two. If two or fewer links in Trigger 1 remain active, the switch temporarily disables all internal server-blade ports. This action causes a failover event on Server 1 and Server 2.



**Figure 3-B** Basic Switch Failover

On the BBI, choose **Virtual Switch Groups > Settings** to enable Switch Failover and to configure the Number of Links to Trigger Failover.

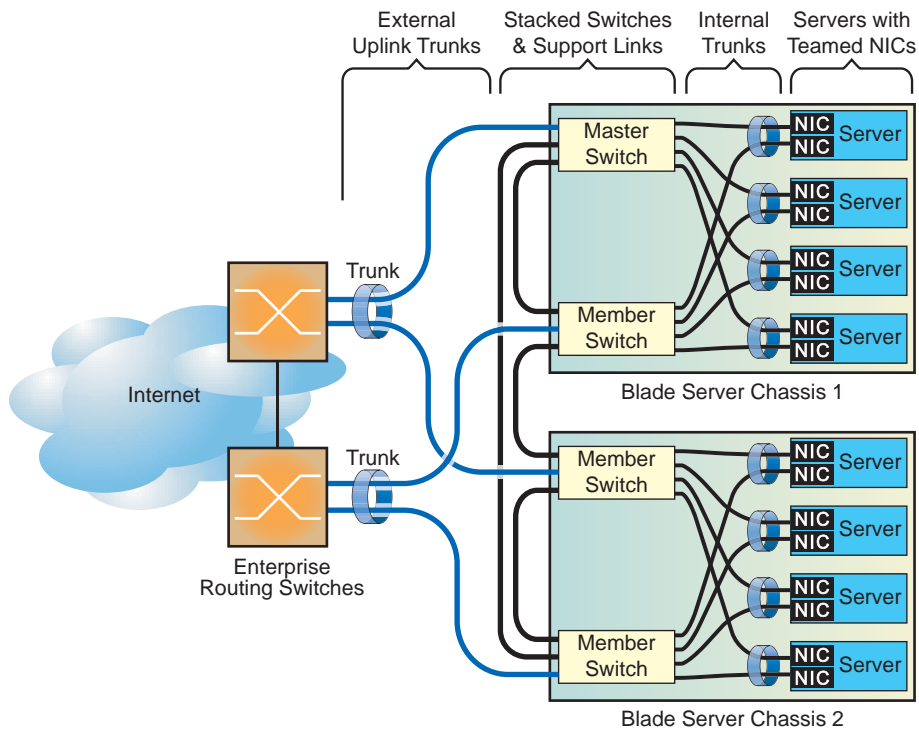
## Internal Trunks

Internal trunks allow for more granular high-availability options for the links between the servers and switches within a blade server chassis. Internal trunks have the following requirements:

- One or more blade servers in the blade chassis must be installed with multiple NICs and be configured for NIC Teaming. The actual number of supported NICs depends on the specific server and chassis model, and the capabilities of the NIC Teaming software.
- Multiple SmartConnect switches in the same blade chassis as the servers must be linked together as part of a stacked configuration (see [“Stacking” on page 43](#)). The number of SmartConnect switches installed in the chassis (and their slot locations) must coincide with the slots targeted by the blade servers' NICs.

For additional restrictions, see [“Trunking Rules” on page 32](#).

[Figure 3-C](#) shows a high-availability network combining external and internal trunks in a stacked switch configuration.



**Figure 3-C** Trunking Internal Ports

In [Figure 3-C](#), the two external trunks provide aggregation to the exterior network, and also high-availability in case any single uplink cable, external port, switch module, or blade chassis fails. On the service side of the network, each server includes two NICs which are automatically connected to each of the switch modules within its blade chassis. Both internal switch ports leading to each specific server are trunked together, despite belonging to different switches in the stack. Each server is configured for NIC Teaming so that if either NIC or switch module fails, the connection to the other switch is maintained using the same server IP address.

Alternate configurations are possible. Internal trunks do not require that trunked ports belong to the same VSG. Also, internal trunks may include multiple ports from any specific switch (individually or as part of the stack).

By default, all internal ports are excluded from trunks. To assign internal ports to trunks, see [“Internal Trunk ID” on page 102](#).

## IGMP Snooping

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IGMP Snooping allows the switch to forward multicast traffic only to those ports that request it. IGMP Snooping prevents multicast traffic from being flooded to all ports. The switch learns which server hosts are interested in receiving multicast traffic, and forwards it only to ports connected to those servers.

By default, the switch floods unregistered IP multicast (IPMC) packets to all ports.

On the BBI, choose **Virtual Switch Groups > Settings** to enable IGMP Snooping for the desired VSG. The default value for all VSGs is enabled.

## ServerMobility

---

The ServerMobility™ feature allows server IP addresses to be assigned based on their physical location in a blade server chassis. If a server fails, a replacement server can assume the identity of the failed unit. The replacement can be a new blade server placed into the slot of the failed unit, or it can be a backup server in another slot, that is activated to take over for the failed server.

The ServerMobility feature uses DHCP option 82 to support fixed server address allocation. When the switch relays a server's DHCP request, it inserts the chassis ID, slot number, and port number into the request, as follows:

- The chassis ID is encoded in the Agent circuit ID sub-option, in hexadecimal format, as follows:  
`59:49:00:c1:56:5f:11:db:a8:dd:ca:d0:a4:b3:de:4a`
- The slot number and port number are encoded in the Agent remote ID sub-option, in hexadecimal format. The following example shows how *Slot 1* and *Port Number 2* are configured in the Agent remote ID:  
`01:0:0:0:02`

The DHCP server must be configured to supply a reserved IP address for each server, based on the option 82 information.

---

**Note** – The ServerMobility feature operates independently of the SmartConnect features that may be installed on the chassis. ServerMobility should not be enabled on the switch if SmartConnect server failover features have already been enabled on the chassis management system.

---

## Configuring a Backup Server Port

If one server is configured as the backup to another server, the administrator may wish the two servers to use the same IP address, even though they are in different slots. To address this issue, configure a port as the backup port of another (active) port on the switch. The agent remote ID sub-option for packets received on the backup port will use the port number of its active port. If the active server goes down, the backup server will receive the same IP address as the active server.

The following configuration guidelines apply to ServerMobility backup ports:

- Both the active port and the backup port must have the ServerMobility feature enabled.
- The active port and the backup port must be in the same VSG.

## General Configuration

To configure the ServerMobility feature, choose Policies > Server Mobility > General Configuration.

### Server Mobility General Configuration

Server Mobility

Server Mobility State Disabled ▾

Relay on Non-Server-Mobility Ports Enabled ▾

Auto-Recovery State Disabled ▾

Auto-Recovery Failover Time (1-255) 5 sec

Set Server Mobility configuration to factory default

**Figure 3-D** ServerMobility General Configuration Window

The following table describes the general options for the ServerMobility feature.

**Table 3-1** ServerMobility General Configuration Fields

Field	Description
ServerMobility State	Enables or disables the ServerMobility feature on the switch.
Relay on Non-Server-Mobility Ports	Enables or disables BOOTP Relay for all ports that have the ServerMobility feature disabled.
Set ServerMobility configuration to factory default	Resets ServerMobility parameters to factory default values.



## Port Configuration

To configure ports for the ServerMobility feature, choose Policies > Server Mobility > Port Configuration.

Port	Port Server Mobility Mode	Port DHCP request filtering Mode	Backup Port
1	enabled	disabled	None
2	disabled	disabled	None
3	disabled	disabled	None
4	disabled	disabled	None
5	disabled	disabled	None
6	disabled	disabled	None
7	disabled	disabled	None
8	disabled	disabled	None

**Figure 3-E** ServerMobility Port Configuration Window

The following table describes the ServerMobility feature options for each port on the switch.

**Table 3-2** ServerMobility Port Configuration Fields

Field	Description
Port	Identifies each port in the switch.
Port ServerMobility Mode	Enables or disables the ServerMobility feature on the port. When enabled, DHCP option 82 information is forwarded to the DHCP server.
Port DHCP request filtering mode	Enables or disables filtering DHCP request information on the port. When enabled, DHCP requests from the blade server are filtered, so that the DHCP server receives only DHCP requests from the switch. <b>Note:</b> If the ServerMobility feature is enabled on a port, it is recommended that DHCP request filtering also be enabled.
Backup port	Selects a backup port. The blade server connected to the backup port acts as a backup to the server connected to this port. The backup server uses the same IP address as the active server.

**Note** – For port numbers, if the switch is part of a multi-switch stack, the displayed number indicates the Configured Switch number (*csnum*) followed by the port number. See “[Stacking Port Numbers](#)” on page 54 for more information.

## DHCP Server Configuration

To modify the DHCP server configuration, open the configuration file (**dhcpcd.conf**), and add new classes for server ports. Then define an IP address for each class.

For Linux DHCP servers, option 82 information is referenced by the following variables:

- `option agent.circuit-id`
- `option agent.remote-id`

These variables can be used in any expression allowed within a DHCP configuration file. To declare an explicit chassis, configure the chassis ID in `agent.circuit-id`.

This configuration declares a class for the server connected to port 8 of a switch in slot 1 of chassis 5949 00C1 565F 11DB A8DD CAD0 A4B3 DE4A

```
class "class-chassis1-slot1-port8"
{
match if option agent.circuit-id =
59:49:00:c1:56:5f:11:db:a8:dd:ca:d0:a4:b3:de:4a
and option agent.remote-id = 01:0:0:0:08; }
```

This configuration associates an IP address with the class declared above.

```
subnet 10.70.70.0 netmask 255.255.255.0 {
pool
{
allow members of "class-chassis1-slot1-port8"; range 10.70.70.10; }
}
```

In the following example, one new class is added to define server port 8, then an IP address is associated with the new class:

```
*****CLASS*****
# in this class I have defined a switch in chassis with ID
# 59:49:00:c1:56:5f:11:db:a8:dd:ca:d0:a4:b3:de:4a
# placed in slot 1 and blade server is connected in port 8

class "class-chassis1-slot1-port8"
{
match if option agent.circuit-id =
59:49:00:c1:56:5f:11:db:a8:dd:ca:d0:a4:b3:de:4a
and option agent.remote-id = 01:0:0:0:08; }

*****Range for that class*****
# for class-chassis1-slot1-port8 only one IP
# is defined (10.70.70.10)

subnet 10.70.70.0 netmask 255.255.255.0 {
pool
{
allow members of "class-chassis1-slot1-port8"; range 10.70.70.10; }
}
```

This example was performed with Internet Systems Consortium DHCP Server, version 3.0.4.



## CHAPTER 4

# Stacking

---

A *stack* is a group of up to eight switches with VSE SmartConnect software that work together as a unified system. A stack has the following properties, regardless of the number of switches included:

- The network views the stack as a single entity, and the stack is identified by a single network IP address.
- Switches in a stack may reside within a single blade server chassis, or in multiple chassis.
- The number of ports in a stack equals the total number of ports of all the switches that are part of the stack.
- The maximum number of Virtual Switch Groups (VSGs) remains 32 (the same as for a non-stacked switch), though the number of ports which can be placed in any VSG is equal to the total number of ports in the stack.
- The maximum number of Virtual Machines (VMs) remains 1024 (the same as for a non-stacked switch).
- The maximum number of external trunks remains 64 (2 for each of the 32 VSGs) though the number of ports which can participate in any trunk is equal to the total number of ports in the stack.
- The maximum number of internal trunks is 56.

The stack is managed through the Master switch. Use Telnet or the Browser-Based Interface (BBI) to access the Master, as follows:

- On any switch in the stack, connect to any external port that is not part of an active trunk (see the note on [page 31](#)), and use the IP address of the Master to access the Master switch.
- Use the management IP address assigned to the Master by the management system.

The Master switch pushes configuration changes and run-time information to the Member switches.

## Stacking Requirements

---

Before switch modules can form a stack, they must meet the following requirements:

- All switches must be the same type.
- All blade server chassis must be the same type or have the same number of server slots (for example, BCE and BCH chassis types are compatible for stacking).
- Each switch must be installed with VSE SmartConnect software. The same release version is not required, as the Master switch will push a firmware image to each differing switch in the stack.
- It is recommended that two 10Gb external ports on each switch are dedicated to stacking. External ports 17 and 18 are used by default, though this can be changed during configuration if necessary. The cables used for connecting the switches in a stack carry low-level, inter-switch communications critical to shared switching functions. Always maintain the stability of stack links in order to avoid internal stack reconfiguration.

## Stack Membership

---

A stack contains up to eight switches, interconnected by a stack trunk in a ring topology. With this topology, only a single stack link failure will be allowed. The stack contains one Master and one or more Members, as follows:

### *Master*

One switch controls the operation of the stack and is called the Master. The Master provides a single point to manage the stack. A stack must have one and only one Master. Firmware image, configuration information, and run-time data are kept by the Master and pushed to each switch in the stack.

### *Member*

Member switches can reside within a single blade server chassis or across multiple chassis. Members receive configuration changes, run-time information, and software updates from the Master.

### *Backup*

One member switch can be designated as a Backup to the Master. The Backup takes over control of the stack if the Master fails. Configuration information and run-time data are synchronized with the Master.

## Master and Backup Selection

A stack has only one Master and one Backup. The Master election is based on priority value and MAC address. If the priority values of two Current Masters are the same, then the one with lower MAC address becomes the Current Master for the stack. Priority is assigned internally by how the switch is configured and its changing role in the stack, as follows:

- Designated Master

A Designated Master boots up with priority base value of 150. If there is no Master for the stack, then it is promoted to 225, the highest priority value for stacking. If the Designated Master fails, then the Designated Backup becomes the new Master. When the Designated Master rejoins the stack, it has priority 175 as the Current Backup.

- Designated Backup

The Designated Backup boots up with priority base value of 125. When it joins a stack with an existing Master, it becomes the Current Designated Backup with priority value of 175. If it becomes the new Master, then its priority value is 200, for the role of Current Master.

- Members

Each Member has a priority value of 100. The Designated Master (150) and Designated Backup (125) can assume the role of Member, due to some stack event changes (for example, merging stacks), but they still carry their base priority values.

With the above priority scheme, the Current Designated Master (225) will never be replaced by another Designated Master (150), even if the joining Designated Master has a low MAC address. The election process also ensures that the Current Designated Master (225) remains the Current Master, even if another Current Master (originated from the same stack as Designated Backup with priority 200) joins the stack. The newly joined Master compares its configuration with the Current Master to determine if a reboot of itself is necessary.

Only the Designated Master can set the backup bit in the NVRAM of the Backup. The backup bit can be cleared by:

- By deleting or changing the Backup using the following command from the Designated Master: `/cfg/stack/backup`
- Another Backup is present in the same stack.
- The Current Designated Master reboots with boot config set to factory default.

So the Designated Backup that replaces a failed Current Master (becomes the new Current Master) keeps its backup bit on. This new Current Master cannot change the backup bit of another switch, because it is not the Designated Master.

Only the Designated Master can change the backup bit. So it is necessary to bring back the original Designated Master in order to make this change (`/c/stack/backup`). Because of the backup bit setting, the result of merging two stacks will always result in one Master and one Member at all times.

### *Master and Backup Behavior*

When a group of switches are rebooted in stacking mode, the Designated Master switch becomes the Master of the stack. If the Designated Master switch is not present, then all switches in the stack are placed in a WAITING state until a Master appears. During this WAITING period, all external and server ports of these Member switches are placed into operator-disabled state. Without the Master, a stack cannot respond correctly to a networking event.

When the Master switch is present, it controls operation of the stack. The configuration of the Master is pushed to the other switches in the stack.

If the Master switch fails, the Backup switch becomes the new Master and the stack continues to operate normally. If the Backup switch is not available, all the switches in the stack reboot and wait for a new stack to form.

After the Designated Master switch reboots, if another Master is already present in the stack, the Designated Master does not become the stack Master. Instead, the Designated Master becomes the Backup if instructed by the Current Master. It can become the Master only if the Current Master fails.



## Stack Member Numbers

---

Each switch in the stack has two numeric identifiers, as follows:

- Attached Switch number (*asnum*)  
The *asnum* identifies each switch based on its physical connection in relation to the Master.
- Configured Switch number (*csnum*):  
The *csnum* is configured by the stack administrator in order to create a logical grouping of switches and ports.

It is recommended that *asnum* 1 and *csnum* 1 be used for identifying the Master switch.

---

**Note** – By default, *csnum* 1 is assigned to the Master. If *csnum* 1 is not available, the lowest available *csnum* is assigned to the Master.

---

## Configuring a Stack

---

This section provides procedures for creating a stack of switch modules. The high-level procedure is as follows:

- Enable stacking on each switch.
- Designate one switch as the Master.
- Reboot all stack switches.
- Connect the stack trunk as shown in [Figure 4-A](#).
- Configure the Master interface.
- Configure additional stacking parameters on the Master.

## Configuring Each Switch

To pre-configure each Member switch for stacking, use the CLI to perform the following steps.

1. **Enable stacking on each Member switch module in the stack.**

```
>> /boot/stack/enable
```

2. **Configure the Stack Trunk ports (optional).**

Dedicate two external 10Gb ports on each switch to support stacking. It is recommended that the default stack ports be used (shown below).

```
>> Boot Stacking# stktrnk
Enter ports one per line, NULL at end:
> 17
> 18
>
A Reboot is required for the new settings to take effect
```

3. **Configure the stacking VLAN (optional).**

Although any VLAN may be defined for stack traffic, it is highly recommended that the default, VLAN 4090, be reserved for stacking (shown below).

```
>> Boot Stacking# vlan 4090
```

4. **Set the stacking mode.**

By default, each switch is set to member mode. However, one (and only one) switch must be set to master mode. Use the following CLI command on only the designated Master switch:

```
>> Boot Stacking# mode master
```

---

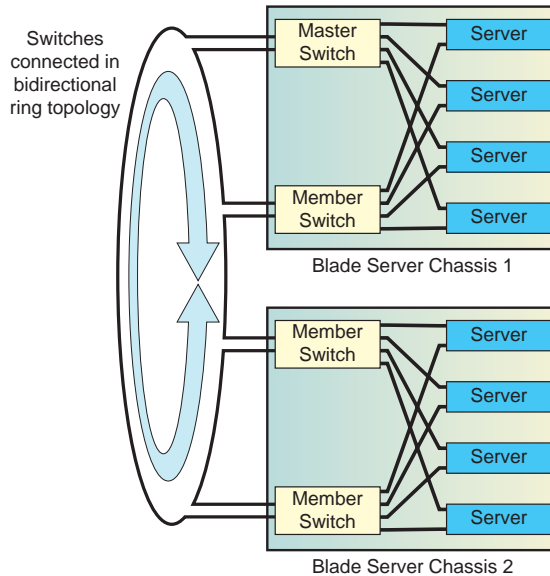
**Note** – If any Member switches are incorrectly set to master mode, use the **mode** Member command to set them back to Member mode.

---

5. **Reboot all of the stack switch modules.**

## 6. Physically connect the Stack Trunks in a bidirectional ring topology.

It is recommended that two 10Gb external ports on each switch are dedicated to stacking. As shown in [Figure 4-A](#), starting with the Master switch, connect each switch in turn to the next. Connect the last Member switch back to the Master to complete the ring.



**Figure 4-A** Example of Stacking Connections

Once the stack trunks are connected, the switches perform low-level stacking configuration.

---

**Note** – It is recommended not to disconnect and reconnect the stack links after the stack is formed. If the stack links are disconnected, stack operation can become unstable as the stack reconfigures, and traffic can be disrupted, causing data loss.

---

## 7. On the designated Master switch, configure the Master interface for the stack.

```
>> # cfg/stack/mif
>> Master Switch Interface# addr 10.10.1.1
>> Master Switch Interface# mask 255.255.0.0
>> Master Switch Interface# gw 10.10.20.2
```

---

**Note** – The `mif` menu is available only on the Master switch once the stacking mode has been set ([Step 4](#)) and the switch has been rebooted ([Step 5](#)).

---

## Additional Master Configuration

Once stacking is enabled on each switch, connect the stack trunk, and define the Master switch interface, use the BBI to access the Master switch using the internal management IP interface of the Master switch, and complete the configuration.

### Locating the Master Switch Internal Management IP Interface

To launch the BBI for the Master switch, use a Web browser to access the Master interface IP address configured in [Step 7](#) of the previous procedure.

Alternately, the Advanced Management Module can be used. To locate the IP address of the Master switch, go to the **System Status Summary > I/O Modules**, and use the address of the switch identified as the *master* in the *Stacking* column.

To launch the BBI from within the Advanced Management Module, go to **I/O Module Tasks > Configuration**, select the target switch and click **Advanced Configuration**. In the Advanced Configuration window, under **Start Telnet/Web Session**, click on the **Start Web Session** button.

### Viewing Stack Connections

From the Master switch BBI menu, choose **Information > Stack** and locate the Attached Switch Information. Make sure all of the stack switches are listed. If a switch is not listed, check the cables on the stack links, and make sure all stacking requirements are met, as listed in [“Stacking Requirements” on page 44](#).

<b>Attached Switch Information</b>					
<b>Attached Switch Number (asnum)</b>	<b>UUID</b>	<b>Bay Number</b>	<b>Configured Switch Number (csnum)</b>	<b>MAC</b>	<b>State</b>
1	594900c1565f11dba8ddcad0a4b3de4a	1	1	00:17:ef:cf:e5:00	IN_STACK
2	594900c1565f11dba8ddcad0a4b3de4a	2	Not configured	00:16:60:f9:33:00	ATTACH
3	d65f11a8ddcad0a17efcfe57efc3fbfcfe	1	Not configured	00:17:ef:c3:fb:00	ATTACH
4	d65f11a8ddcad0a17efcfe57efc3fbfcfe	2	Not configured	00:17:ef:cf:e2:00	ATTACH

**Figure 4-B** Attached Switch Information Window

## Binding Members to the Stack

Choose menu System Settings > Stacking > Switch Configuration. The Stack Switch Configuration window appears, as shown in [Figure 4-C](#).

**Stack Switch Configuration - Bind to Attached Switch Number (asnum)**

Stack Name

Master Switch 1

Backup Switch

Switch	Bind asnum	UUID	Bay Number	Delete
Switch 1	1	594900c1565f11dba8dd	1	<input type="checkbox"/>
Switch 2	4	594900c1565f11dba8dd	2	<input type="checkbox"/>
Switch 3	2	d65f11a8ddcad0a17efcf	3	<input type="checkbox"/>
Switch 4	3	d65f11a8ddcad0a17efcf	4	<input type="checkbox"/>

**Figure 4-C** Stack Switch Configuration Window

Each switch in the stack is represented by an Attached Switch Number (asnum) and a Configured Switch Number (cnum) as explained in “[Viewing Stack Connections](#)” on page 50. Both asnum 1 and cnum 1 are reserved for the Master.

- Select an attached switch in the Bind asnum drop-down list to bind the switch to its associated cnum.
- In the Backup Switch drop-down list, select a cnum for a Backup switch (optional) which will assume the Master role if the Master switch should fail.
- In the Stack Name field, enter a name for the stack (optional).

The UUID and Bay Number fields display information about the location of configured switches and are not configurable. The UUID is the Unit ID number of the blade server chassis where the switch resides, and the Bay Number is the switch's physical bay within the chassis.

Click **Apply** to make the changes active, and **Save** to retain changes beyond reboot cycles.

## Configuring an External IP Address for the Stack

Choose menu **System Settings > Stacking > IP Interfaces**. Use the Stack IP Interfaces window to configure a single IP interface for the stack. This interface is known at the Master interface and is shared by all switches in the stack.

**Stack IP Interfaces**

Master Switch Interface

IP Address	192.168.150.200
Subnet Mask	255.255.255.0
Group (1 - 32)	1
Smvlan (0 - 4094)	0
Default Gateway Address	192.168.150.254
Delete Interface	<input type="checkbox"/>

Backup Switch Interface

IP Address	0.0.0.0
Subnet Mask	0.0.0.0
Group (1 - 32)	1
Smvlan (0 - 4094)	0
Default Gateway Address	0.0.0.0
Delete Interface	<input type="checkbox"/>

Management IP Interface

**Figure 4-D** Stack IP Interfaces Configuration Window

Enter the following information for the Master Switch Interface:

- Master interface IP address and subnet mask
- Virtual Switch Group number
- VLAN number used for external access to the stack (rather than the internal VLAN 4090 used for inter-stack traffic)
- Default gateway IP address

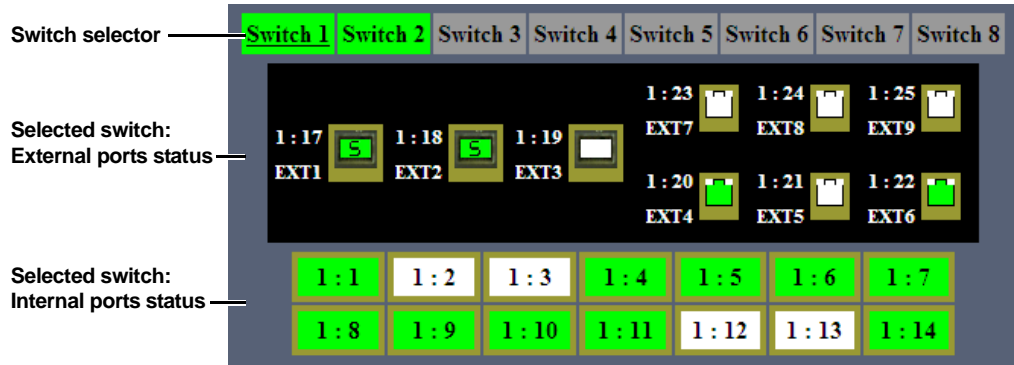
Click **Apply** to make the changes active, and **Save** to retain changes beyond reboot cycles.

**Note** – The Backup switch interface is provided for historical purposes only and should be left unconfigured. If a Backup switch interface is defined in this window, and the Master fails, the stack IP address will change to the IP address configured for the Backup switch interface.

## Managing a Stack

When switches are configured into a stack, the BBI displays information for the stack.

The BBI menu area displays the `csnum` for the Master and the Backup (if configured). The port status area display includes a switch selector and enhanced port displays, as shown below:



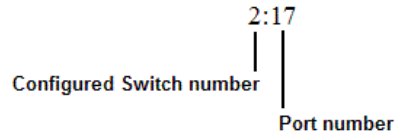
**Figure 4-E** Port Status with Stacking

Click a highlighted switch in the switch selector to display status information about ports in that switch. Click a port icon to display port statistics.

The following additional configuration changes occur when switches are stacked.

## Stacking Port Numbers

Once a stack is configured, the manner in which port numbers are displayed changes throughout the BBI. Instead of the single number, the `csnum` appears in front of each port number. For example:



This numbering change appears in the port status area at the top of the BBI, as well as on numerous configuration pages. For example:

- Virtual Switch Groups > Membership
- Policies > External Port Settings
- Policies > Internal Port Settings
- Policies > ServerMobility > Port Configuration

On these BBI configuration pages, the administrator can also select whether to display all ports for all switches, all present switches, all defined switches, or a specific `csnum`. To do this, make the appropriate selection from the View Ports drop-down list.

## Stacking Internal Port Settings

For each port in a stack, the following command is added to the Internal Port Settings window:

**Table 4-1** Additional Internal Port Settings for Stacking

Field	Description
Internal trunk id <1-56, 0 = none>	Configures the trunk ID for internal ports. Ports in the same VSG that have the same internal trunk ID form a trunk.

## Stacking VLANs

VLAN 4090 is the default VLAN reserved for stacking ports.

---

**Note** – Do not use VLAN 4090 for any purpose other than stacking.

---



## Stacking Boot Management

The Boot Management General window provides controls that allow the administrator to perform a reboot of individual switches in the stack, or the entire stack. The following table describes the stacking Reboot commands.

**Table 4-2** Stacking Boot Management buttons

Field	Description
Reboot Stack	Performs a software reboot/reset of all switches in the stack. The software image specified in the Image To Boot drop-down list becomes the active image.
Reboot Master	Performs a software reboot/reset of the Master switch. The software image specified in the Image To Boot drop-down list becomes the active image.
Reboot Switches	Performs a reboot/reset on selected switches in the stack. Select one or more switches in the drop-down list, and click <b>Reboot Switches</b> . The software image specified in the Image To Boot drop-down list becomes the active image.

The Update Image/Cfg section of the window applies to the Master. When a new software image or configuration file is loaded, the file first loads onto the Master, and the Master pushes the file to all other switches in the stack, placing it in the same software or configuration bank as that on the Master. For example, if the new image is loaded into image 1 on the Master switch, the Master will push the same firmware to image 1 on each Member switch.

## Upgrading Stack Software

Upgrade all stacked switches at the same time. The Master controls the upgrade process. Use the following procedure to perform a software upgrade.

1. **Load new software on the Master. Refer to “[Transferring the New Image to the Switch](#)” on page 20.**

The Master pushes the new software image to all Members in the stack, as follows:

- If the new software is loaded into image 1, the Master pushes the software into image 1 on all Members.
- If loaded into image 2, the Master pushes the software into image 2 on all Members.

The software push can take several minutes to complete.

**2. Verify that the software push is complete. Use either the CLI or the BBI:**

- From the BBI, go to **Information > Stack** and view the Image Push Status Information at the bottom of the page, or
- From the CLI, use following CLI command to verify the software push:  
**/info/stack/pushstat**

```
Image 1 transfer status info:
  Switch 00:16:60:f9:33:00:
    last receive successful
  Switch 00:17:ef:c3:fb:00:
    not received - file not sent or transfer in progress

Image 2 transfer status info:
  Switch 00:16:60:f9:33:00:
    last receive successful
  Switch 00:17:ef:c3:fb:00:
    last receive successful

Boot image transfer status info:
  Switch 00:16:60:f9:33:00:
    last receive successful
  Switch 00:17:ef:c3:fb:00:
    last receive successful

Config file transfer status info:
  Switch 00:16:60:f9:33:00:
    last receive successful
  Switch 00:17:ef:c3:fb:00:
    last receive successful
```

- 3. Reboot all switches in the stack. From the BBI, select **System Settings > Boot Management**. Click **Reboot Stack**.**
- 4. Once the switches in the stack have rebooted, verify that all of them are using the same version of firmware. Using the BBI, open **Information > Stack** and view the **Switch Firmware Versions Information**.**

## CHAPTER 5

# Command Reference

---

The VSE SmartConnect software provides a default configuration that is ready to perform basic switching functions. Some of the more advanced features, however, require administrative configuration before they can be used effectively.

The administrator can use the VSE SmartConnect software BBI to perform most basic configuration tasks. However, the command line interface is the most direct method for collecting information and making configuration changes. Using a basic terminal, the administrator is presented with a hierarchy of menus that enable one to view information and statistics about the switch, and to perform any necessary configuration.

The various commands have been logically grouped into a series of menus and sub-menus. Each menu displays a list of commands and sub-menus that are available, along with a summary of each command. Below each menu is a prompt where you can enter appropriate commands.

You can view configuration information for the switch in both the user and administrator command modes. This chapter discusses how to use the command line interface for the VSE SmartConnect software.

This chapter provides an overview of menu commands.

## CLI Menus

---

The Main Menu appears after a successful connection and login. The following table shows the Main Menu for the administrator login. Some features are not available under the user login.

```
[Main Menu]
info      - Information Menu
stats    - Statistics Menu
cfg      - Configuration Menu
oper     - Operations Command Menu
boot     - Boot Options Menu
maint    - Maintenance Menu
diff     - Show pending config changes [global command]
apply    - Apply pending config changes [global command]
save     - Save updated config to FLASH [global command]
revert   - Revert pending or applied changes [global command]
exit     - Exit [global command, always available]
```

### Menu Summary

#### ■ Information Menu

The Information Menu (/info) allows you to display information about the current status of the switch.

```
[Information Menu]
sys      - System Information Menu
l2       - Layer 2 Information Menu
l3       - Layer 3 Information Menu
link     - Show link status
port     - Show port information
transcvr - Show Port Transceiver status
group    - Show group information
dump     - Dump all information
```

### ■ Statistics Menu

The Statistics Menu (/stats) allows you to view performance statistics for the switch.

```
[Statistics Menu]
port      - Port Stats Menu
clrports  - Clear stats for all ports
l2        - Layer 2 Stats Menu
l3        - Layer 3 Stats Menu
mp        - MP-specific Stats Menu
ntp       - Show NTP stats
dump     - Dump all stats
```

### ■ Configuration Menu

The Configuration Menu (/cfg) allows an administrator to configure switch parameters. Configuration changes are not active until explicitly applied. You can save changes to non-volatile memory.

```
[Configuration Menu]
sys       - System-wide Parameter Menu
port     - Port Menu
global   - Global Menu
group    - Group Menu
pmirr    - Port Mirroring Menu
dump     - Dump current configuration to script file
ptcfg    - Backup current configuration to FTP/TFTP server
gtcfg    - Restore current configuration from FTP/TFTP server
```

### ■ Operations Menu

The Operations Menu (/oper) is used for making immediate, temporary changes to the operational configuration of the switch. For example, you can immediately disable a port (without the need to apply or save the change), with the understanding that when the switch is reset, the port returns to its normally configured operation.

```
[Operations Menu]
port     - Operational Port Menu
prm      - Protected Mode Menu
passwd   - Change current user password
clrlog   - Clear syslog messages
ntpreq   - Send NTP request
```

### ■ Boot Options Menu

The Boot Options Menu (/boot) is used for upgrading switch software, selecting configuration blocks, and for resetting the switch when necessary.

```
[Boot Options Menu]
  image - Select software image to use on next boot
  conf  - Select config block to use on next boot
  gting - Download new software image via FTP/TFTP
  ptimg - Upload selected software image via FTP/TFTP
  reset - Reset switch
  cur   - Display current boot options
```

To use the Boot Options Menu, you must be logged in as the administrator. The Boot Options Menu provides options for:

- Selecting a software image to be used when the switch is next reset
- Selecting a configuration block to be used when the switch is next reset
- Downloading or uploading a new software image to the switch via FTP/TFTP

### ■ Maintenance Menu

The Maintenance Menu (/maint) allows you to generate a dump of the critical state information, and to clear entries in the forwarding database and the ARP and routing tables.

```
[Maintenance Menu]
  sys      - System Maintenance Menu
  fdb     - Forwarding Database Manipulation Menu
  debug   - Debugging Menu
  arp     - ARP Cache Manipulation Menu
  igmp    - IGMP Multicast Group Menu
  uudmp   - Uuencode FLASH dump
  ptdmp   - Upload FLASH dump via FTP/TFTP
  cldmp   - Clear FLASH dump
  tsdmp   - Tech support dump
  pttsdmp - Upload tech support dump via FTP/TFTP
```

## Viewing, Applying, and Saving Changes

---

As you use the configuration menus to set parameters, the changes you make do not take effect immediately. All changes are considered “pending” until you explicitly apply them. Also, any changes are lost the next time the switch boots unless the changes are explicitly saved.

---

**Note** – Some operations can override the settings in the Configuration Menu. Therefore, settings you view in the Configuration Menu (for example, port status) might differ from run-time information that you view in the Information menu or on the management system. The Information Menu displays current run-time information of parameters.

---

While configuration changes are in the pending state, you can do the following:

- View the pending changes
- Apply the pending changes
- Save the changes to flash memory

### Viewing Pending Changes

You can view all pending configuration changes by entering **diff** at the menu prompt.

---

**Note** – The `diff` and `diff flash` commands are global commands. Therefore, you can enter them at any prompt in the CLI.

---

### Applying Pending Changes

To make your configuration changes active, you must apply them. To apply configuration changes, enter **apply** at any prompt in the CLI.

```
# apply
```

---

**Note** – The `apply` command is a global command. Therefore, you can enter **apply** at any prompt in the administrative interface.

---

## Saving the Configuration

In addition to applying the configuration changes, you can save them to flash memory on the switch.

---

**Note** – If you do not save the changes, they will be lost the next time the system is rebooted.

---

To save the new configuration, enter the following command at any CLI prompt:

```
# save
```

When you save configuration changes, the changes are saved to the *active* configuration block. The configuration being replaced by the save is first copied to the *backup* configuration block. If you do not want the previous configuration block copied to the backup configuration block, enter the following instead:

```
# save n
```

You can decide which configuration you want to run the next time you reset the switch. Your options include:

- The active configuration block
- The backup configuration block
- Factory default configuration

---

**Note** – When resetting the switch to its factory default configuration, the switch will retain its stacking settings. To reconfigure or disable stacking, see [“Stacking” on page 43](#).

---

You can view all pending configuration changes that have been applied but not saved to flash memory using the `diff flash` command. It is a global command that can be executed from any menu.



## CHAPTER 6

# Configuring Switch Access

---

The VSE SmartConnect software provides detailed commands for configuring system access and system management, and for viewing information and statistics. This chapter discusses VSE SmartConnect software access features, and how to secure the switch for remote administrators:

- “Management Module Setup” on page 63
- “Using Telnet” on page 67
- “Using the Browser-Based Interface” on page 68
- “Securing Access to the Switch” on page 70
  - “Setting Allowable Source IP Address Ranges” on page 71
  - “RADIUS Authentication and Authorization” on page 72
  - “TACACS+ Authentication” on page 74
  - “End User Access Control” on page 75
  - “Secure Shell and Secure Copy” on page 78

## Management Module Setup

---

The switch module is an integral subsystem within the overall blade server chassis system. The blade server chassis includes a management module as the central element for overall chassis management and control.

You can use the management module to configure and manage the switch. The switch communicates with the management module(s) through its internal port 15 (MGT), which you can access through the 100 Mbps Ethernet port on each management module. The factory default settings will permit *only* management and control access to the switch module through the management module, or the built-in serial port. You can use the four external Ethernet ports on the switch module for management and control of the switch by selecting this mode as an option through the management module configuration utility program (see the applicable blade server chassis *Installation and User’s Guide* publications for more information).

---

**Note** – Support for both management modules is included within the single management port (MGT). The MGT port dynamically connects to the active management module.

---

## Factory Default vs. MM Assigned IP Addresses

Each switch must be assigned its own Internet Protocol address, which is used for communication with a SNMP network manager or other transmission control protocol/Internet Protocol (TCP/IP) applications (for example, BootP or TFTP). The factory-default IP address is 10.90.90.9x, where *x* corresponds to the number of the bay into which the switch is installed (for additional information, see the *Installation Guide*). The management module assigns an IP address of 192.168.70.1xx, where *xx* corresponds to the number of the bay into which each switch is installed, as shown in the following table:

**Table 6-1** Switch IP Addresses, Based on Switch-Module Bay Numbers

Bay Number	Factory-Default IP Address	IP Address Assigned by MM
Bay 1	10.90.90.91	192.168.70.127
Bay 2	10.90.90.92	192.168.70.128
Bay 3	10.90.90.94	192.168.70.129
Bay 4	10.90.90.97	192.168.70.130

**Note** – Switch modules installed in Bay 1 and Bay 2 connect to server NICs 1 and 2, respectively. However, Windows operating systems using older I/O expansion adapters might show that switch modules installed in Bay 3 and Bay 4 connect to server NIC 4 and NIC 3, respectively.

## Configuring the Default Gateway

The default Gateway IP address determines where packets with a destination address outside the current subnet should be sent. Usually, the default Gateway is a router or host acting as an IP gateway to handle switch connections to other subnets of other TCP/IP networks. If you want to access the switch from outside your local network, use the management module to assign a default Gateway address to the switch. Choose **I/O Module Tasks > Configuration** from the navigation pane on the left, and enter the default Gateway IP address (for example, 192.168.70.125). Click **Save**.

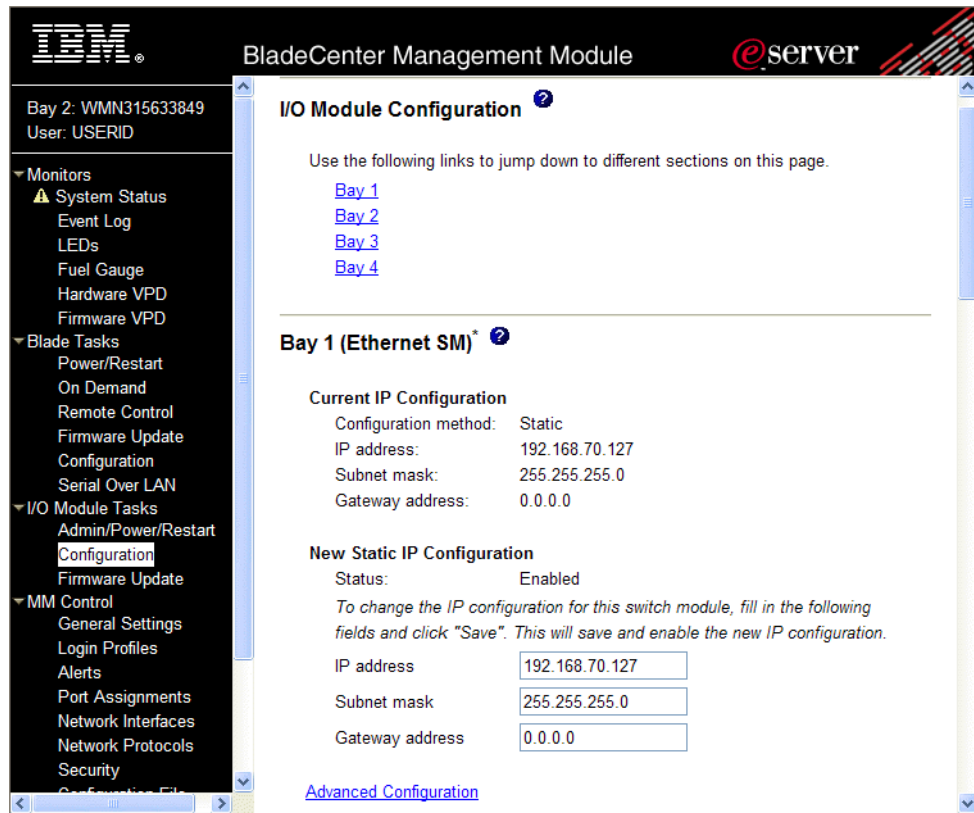
## Configuring Management Module for Switch Access

Complete the following initial configuration steps:

1. **Connect the Ethernet port of the management module to a 10/100 Mbps network (with access to a management station) or directly to a management station.**
2. **Access and log on to the management module, as described in the blade server chassis *Management Module User's Guide*.**

The management module provides the appropriate IP addresses for network access (see the applicable blade server chassis *Installation and User's Guide* publications for more information).

3. **Select I/O Module Tasks > Configuration on the menu on the left side of the blade server chassis Management Module window.**



**Figure 6-A** Switch Configuration in the Management Module Window

4. **You can use the default IP addresses provided by the management module, or you can assign a new IP address to the switch through the management module.**

You can assign this IP address through one of the following methods:

- Manually through the management module
- Automatically through the blade server chassis Configuration Wizard

---

**Note** – If you change the IP address of the switch, make sure that the switch and the management module both reside on the same subnet.

---

In **Advanced Configuration > Advanced Setup**, enable “Preserve new IP configuration on all switch resets,” to retain the switch’s IP interface when you restore factory defaults. This setting preserves the management port’s IP address in the management module’s memory, so you maintain connectivity to the management module after a reset.

You now can start a Telnet session, Browser-Based Interface (BBI) session, a Secure Shell session, or a secure HTTPS session to the switch.

5. **For HTTPS access, you must enable HTTPS on the switch. For example:**

```
>> /cfg/sys/access/https/access e
```

For more information about SSH access, refer to [“Secure Shell and Secure Copy” on page 78](#).

## Using Telnet

---

Telnet is used to access the switch's command-line interface. Telnet can be launched from the management system interface, or by using a local Telnet application on your workstation.

**Note** – If you cannot access the switch using Telnet or the Browser-Based Interface (BBI), try to ping the switch's IP address from management system. If the ping fails, the management system is not configured correctly.

---

To use Telnet from the management system, choose I/O Module Tasks > Configuration from the navigation pane on the left. Select a bay number and click Advanced Configuration > Start Telnet/Web Session > Start Telnet Session. A Telnet window opens a connection to the switch (requires Java 1.4 Plug-in).

To establish a Telnet connection with the switch from your workstation, you can run the Telnet program and issue the Telnet command, followed by the switch IP address. For example:

```
telnet 192.168.70.127
```

## Connect to the Switch via SSH

---

The SSH (Secure Shell) protocol enables you to securely log into another computer over a network to execute commands remotely. As a secure alternative to using Telnet to manage switch configuration, SSH ensures that all data sent over the network is encrypted and secure.

For more information, see [“Secure Shell and Secure Copy” on page 78](#). For more information on the command line interface (CLI), see [“Command Reference” on page 57](#).

## Using the Browser-Based Interface

Use the management system to access the switch through a Web session. Choose menu I/O Module Tasks > Configuration from the navigation pane on the left. Select a bay number and click Advanced Configuration > Start Telnet/Web Session > Start Web Session. A Web browser window opens a connection to the VSE SmartConnect software interface on the switch.

The switch's Browser-Based Interface (BBI) provides access to the common configuration, management and operation features through the Web browser.

### Access via HTTP

BBI access is enabled by default. To access the switch via the BBI, open a Web browser window and type in the URL using the IP interface address of the switch. For example:

```
http://192.168.70.127
```

### Access via HTTPS

BBI access via HTTPS is disabled by default. Use the following CLI command to enable HTTPS access:

```
>> /cfg/sys/access/https/access ena
```

Before you can access the BBI via HTTPS, you must generate a certificate to be used during the key exchange. Use the CLI command below to generate the HTTPS certificate. A default certificate is created the first time you enable HTTPS, but you can create a new certificate defining the information you want to be used in the various fields.

```
>> /cfg/sys/access/https/generate
Country Name (2 letter code) [ ]: <country code>
State or Province Name (full name) [ ]: <state>
Locality Name (eg, city) [ ]: <city>
Organization Name (eg, company) [ ]: <company>
Organizational Unit Name (eg, section) [ ]: <organizational unit>
Common Name (eg, YOUR name) [ ]: <name>
Email (eg, email address) [ ]: <email address>
Confirm generating certificate? [y/n]: y
Generating certificate. Please wait (approx 30 seconds)
restarting SSL agent
```

To access the switch via the BBI, open a Web browser window and type in the URL using the IP interface address of the switch. For example:

```
https://192.168.70.127
```

You can save the certificate to flash for use if the switch is rebooted. To save the certificate, use the following command:

```
>> /cfg/sys/access/https/certsave
```

When a client (such as a Web browser) connects to the switch, the client is asked to accept the certificate and can verify that the fields are what the client expected.

## Securing Access to the Switch

---

Secure management is needed for environments that perform significant management functions across the Internet. The following are some of the functions for secured management:

- Limiting management users to a specific IP address range. See [“Setting Allowable Source IP Address Ranges” on page 71](#)
- Authentication and authorization of remote administrators: see [“RADIUS Authentication and Authorization” on page 72](#)
- Encryption of management information exchanged between the remote administrator and the switch: see [“Secure Shell and Secure Copy” on page 78](#)

The following sections are addressed in this section:

- [“Setting Allowable Source IP Address Ranges” on page 71](#)
- [“RADIUS Authentication and Authorization” on page 72](#)
- [“TACACS+ Authentication” on page 74](#)
- [“Secure Shell and Secure Copy” on page 78](#)



## Setting Allowable Source IP Address Ranges

To limit access to the switch, you can set a source IP address (or range) that will be allowed to connect to the switch IP interface through Telnet, SSH, or the BBI. This also helps to prevent spoofing or attacks on the switch's TCP/IP stack.

When an IP packet reaches the switch, the source IP address is checked against the range of addresses defined by the management networks and masks (as defined in the `/cfg/sys/access/mgmt` menu).

If the source IP address of the host or hosts are within the defined ranges, they are allowed to attempt to log in. Any packet addressed to a switch IP interface with a source IP address outside these ranges are discarded.

## Configuring an IP Address Range for the Management Network

Configure the management network IP address and mask in the System Access Management Menu.

```
>> Main# /cfg/sys/access/mgmt/add
Enter Management Network Address: 192.192.192.0
Enter Management Network Mask: 255.255.255.128
```

In this example, the management network is set to 192.192.192.0 and management mask is set to 255.255.255.128. This defines the following range of allowed IP addresses: 192.192.192.1 to 192.192.192.127. The following source IP addresses are granted or not granted access to the switch:

- A host with a source IP address of 192.192.192.21 falls within the defined range and would be allowed to access the switch.
- A host with a source IP address of 192.192.192.192 falls outside the defined range and is not granted access. To make this source IP address valid, you would need to shift the host to an IP address within the valid range specified, or modify the management address to be 192.192.192.128. This would put the 192.192.192.192 host within the valid range allowed by the configured management network (192.192.192.128–255).

## RADIUS Authentication and Authorization

The VSE SmartConnect software supports the RADIUS (Remote Authentication Dial-in User Service) method to authenticate and authorize remote administrators for managing the switch. This method is based on a client/server model. The Remote Access Server (RAS)—the switch—is a client to the back-end database server. A remote user (the remote administrator) interacts only with the RAS, not the back-end server and database.

### Configuring RADIUS

1. In the BBI, choose **System Settings > Remote User Administration** to configure RADIUS authentication.
2. In the Radius section of the window, enter the **Primary Radius Server IP address** and **Radius secret**.
3. Select **enable** for the Radius option.
4. Click **Apply** to make your changes active, and **Save** to retain changes beyond reboot.

### User Accounts

The user accounts listed in [Table 6-2 on page 72](#) can be defined in the RADIUS server dictionary file.

**Table 6-2** User Access Levels

User Account	Description and Tasks Performed	Password
User	The User has no direct responsibility for switch management. The User can view all status information and statistics but cannot make any configuration changes to the switch.	user
Operator	The Operator manages all functions of the switch. The Operator can reset ports or the entire switch.	oper
Administrator	The Administrator has complete access to all menus, information, and configuration commands on the switch, including the ability to change both the user and administrator passwords.	admin

## RADIUS Attributes for VSE SmartConnect Software User Privileges

When the user logs in, the switch authenticates the appropriate level of access by sending the RADIUS access request (the client authentication request) to the RADIUS authentication server.

If the remote user is successfully authenticated by the authentication server, the switch verifies the privileges of the remote user and authorize the appropriate access. The administrator has an option to allow *backdoor* access via Telnet. By default, Telnet access is disabled.

---

**Note** – To obtain the RADIUS backdoor password for your switch, contact your Service and Support line.

---

All user privileges, other than those assigned to the Administrator, have to be defined in the RADIUS dictionary. RADIUS attribute 6 (built into all RADIUS servers) defines the administrator. The file name of the dictionary is RADIUS vendor-dependent. The following RADIUS attributes are defined for switch user privileges levels:

**Table 6-3** SmartConnect-Proprietary Attributes for RADIUS

User Name/Access	User-Service-Type	Value
User	<i>Vendor-supplied</i>	255
Operator	<i>Vendor-supplied</i>	252
Admin	<i>Vendor-supplied</i>	250

## TACACS+ Authentication

The switch supports authentication and authorization with networks using the Cisco Systems TACACS+ protocol. The switch functions as the Network Access Server (NAS) by interacting with the remote client and initiating authentication and authorization sessions with the TACACS+ access server. The remote user is defined as someone requiring management access to the switch either through a data or management port.

### TACACS+ Authentication Features

Authentication is the action of determining the identity of a user, and is generally done when the user first attempts to log in to a device or gain access to its services. The switch supports ASCII inbound login to the device. PAP, CHAP and ARAP login methods, TACACS+ change password requests, and one-time password authentication are not supported.

### Authorization

Authorization is the action of determining a user's privileges on the device, and usually takes place after authentication.

The mapping between TACACS+ authorization levels and switch management access levels is shown in [Table 6-4 on page 74](#). The authorization levels must be defined on the TACACS+ server.

**Table 6-4** SmartConnect-Proprietary Attributes for TACACS+

User Access Level	TACACS+ level
user	0
oper	3
admin	6

### Configuring TACACS+ Authentication

1. **On the BBI, choose *System Settings > Remote User Administration* to configure TACACS+ authentication.**
2. **In the Tacacs+ section of the window, enter the Tacacs+ Primary Server IP address and TACACS+ Secret.**
3. **Select *enable* for the Tacacs+ option.**
4. **Click *Apply* to make your changes active, and *Save* to retain changes beyond reboot.**

## End User Access Control

The administrator can define user accounts that permit end users to access the switch using the CLI commands. Once end-user accounts are configured and enabled, the switch requires user name/password authentication.

### Considerations for Configuring End User Accounts

- A maximum of 10 end-user IDs are supported on the switch.
- The switch does not automatically validate configurations.
- VSE SmartConnect software supports end-user support for Telnet access to the switch. As a result, only very limited access is granted to the primary administrator under the BBI mode of access.
- If RADIUS authentication is used, the user password on the Radius server overrides the user password on the switch. Also note that the password change command only modifies the switch password and has no effect on the user password on the Radius server. RADIUS authentication and user password cannot be used concurrently to access the switch.
- Passwords can be up to 15 characters in length for TACACS, RADIUS, Telnet, SSH, and Web access. Passwords for end-user accounts can be up to 128 characters.

## Configuring End-User Access Control

1. On the BBI, choose **System Settings > Local User Administration**.

### Local User Administration

**Built-in Users**

Username	Password	User Type	Enabled
admin	*****	administrator ▼	enable ▼
oper		operator ▼	disable ▼
user	*****	user ▼	enable ▼

**User Configuration**

Username	Password	User Type	Enabled
User1 :	<input type="text"/>	user ▼	disable ▼
User2 :	<input type="text"/>	user ▼	disable ▼
User3 :	<input type="text"/>	user ▼	disable ▼
User4 :	<input type="text"/>	user ▼	disable ▼
User5 :	<input type="text"/>	user ▼	disable ▼
User6 :	<input type="text"/>	user ▼	disable ▼
User7 :	<input type="text"/>	user ▼	disable ▼
User8 :	<input type="text"/>	user ▼	disable ▼
User9 :	<input type="text"/>	user ▼	disable ▼
User10 :	<input type="text"/>	user ▼	disable ▼

**Figure 6-B** Local User Administration Window

2. In the **User Configuration** section, enter a **Username** and **Password** for the account.
3. **Select the User Type.**

By default, the end user is assigned to the user access level (also known as Class of Service, or CoS). CoS for all user accounts have global access to all resources except for User CoS, which has access only to view resources that the user owns. Refer to [Table 6-2 on page 72](#).

4. **Select enable to allow the new user to access the switch.**
5. **Click Apply to make your changes active, and Save to retain changes beyond reboot.**

### Logging in to an End-User Account

Once an end-user account is configured and enabled, the user can login using the username/password combination. The level of access is determined by the Class of Service configured for the end-user account.

## Protected Mode

Protected Mode settings allow the switch administrator to block the management module from making configuration changes that affect switch operation. The switch retains control over those functions.

The following management module functions are disabled when Protected Mode is turned **on**:

- External Ports: Enabled/Disabled
- External management over all ports: Enabled/Disabled
- Restore Factory Defaults
- New Static IP Configuration

In this release, configuration of the functions listed above are restricted to the local switch when you turn Protected Mode **on**. In future releases, individual control over each function may be added.

---

**Note** – Before you turn Protected Mode on, make sure that external management (Telnet) access to one of the switch's IP interfaces is enabled: **System Settings > Global > Switch IP Interface**.

---

To configure Protected Mode, enable the functions for which you wish to secure local control, and set Local Protected Mode to **on**.

**Switch Protected Mode Configuration**

Local control of external management	Disabled
Local control of external ports	Disabled
Local control of factory default reset	Disabled
Local control of Mgmt VLAN interface	Disabled
Local protected mode	On <input type="button" value="v"/>

**Figure 6-C** Switch Protected Mode Configuration Window

If you lose access to the switch through the external ports, use the console port to connect directly to the switch, and configure an IP interface with Telnet access.

## Secure Shell and Secure Copy

Secure Shell (SSH) and Secure Copy (SCP) use secure tunnels to encrypt and secure messages between a remote administrator and the switch. Telnet does not provide this level of security. The Telnet method of managing a switch does not provide a secure connection.

**SSH** is a protocol that enables remote administrators to log securely into the switch over a network to execute management commands.

**SCP** is typically used to copy files securely from one machine to another. SCP uses SSH for encryption of data on the network. SCP is used to download and upload the switch configuration via secure channels.

The benefits of using SSH and SCP are listed below:

- Authentication of remote administrators
- Identifying the administrator using Name/Password
- Authorization of remote administrators
- Determining the permitted actions and customizing service for individual administrators
- Encryption of management messages
- Encrypting messages between the remote administrator and the switch
- Secure copy support

The switch supports SSH versions 1.5 and 2.0. and supports SSH clients version 1.5 - 2.x. The following SSH clients have been tested:

- SSH 1.2.23 and SSH 1.2.27 for Linux (freeware)
- SecureCRT 3.0.2 and SecureCRT 3.0.3 for Windows NT (Van Dyke Technologies, Inc.)
- F-Secure SSH 1.1 for Windows (Data Fellows)
- Putty SSH
- Cygwin OpenSSH
- Mac X OpenSSH
- Solaris 8 OpenSSH
- AxeSSH SSHPro
- SSH Communications Vandyke SSH A
- F-Secure



## Configuring SSH/SCP Features

SSH and SCP are disabled by default. Before you can use SSH commands, you must turn on SSH/SCP. Begin a Telnet session from the management system and enter the following CLI command:

```
>> # /cfg/sys/sshd/on (Turn SSH on)
Current status: OFF
New status: ON
```

### Enabling or Disabling SCP Apply and Save

Enter the following commands from the CLI to enable the SCP `putcfg_apply` and `putcfg_apply_save` commands:

```
>> # /cfg/sys/sshd/ena (Enable SCP apply and save)
SSHD# apply (Apply the changes to start generating RSA
host and server keys)

RSA host key generation starts
.....
.....
RSA host key generation completes (lasts 212549 ms)
RSA host key is being saved to Flash ROM, please don't reboot
the box immediately.
RSA server key generation starts
.....
.....
RSA server key generation completes (lasts 75503 ms)
RSA server key is being saved to Flash ROM, please don't reboot
the box immediately.
-----
Apply complete; don't forget to "save" updated configuration.

>> # /cfg/sys/sshd/dis (Disable SSH/SCP apply and save)
```

## Configuring the SCP Administrator Password

To configure the SCP Administrator password, first connect to the switch via the management system. For security reasons, the `scpadm` password may only be configured when connected through the management system.

To configure the password, enter the following command via the CLI. At factory default settings, the current SCP administrator password is `PASSWORD`.

```
>> /cfg/sys/sshd/scpadmin
Changing SCP-only Administrator password; validation required...
Enter current administrator password: <password>
Enter new SCP-only administrator password: <new password>
Re-enter new SCP-only administrator password: <new password>
New SCP-only administrator password accepted.
```

## Using SSH and SCP Client Commands

This section shows the format for using some client commands. For the examples below, the IP address of the switch is 205.178.15.100, the IP address of the management system is 205.178.15.157, and 1022 as the SSH port number.

### To Log In to the Switch:

Syntax:

```
ssh -l <username> <switch IP address>
or
ssh -p <SSH port number> -l <username> <Advanced MM IP address>
```

Example:

```
>> # ssh -l scpadmin205.178.15.100
or
>> # ssh -p 1022 -l scpadmin@205.178.15.157
```

*To Download the Switch Configuration Using SCP:*

Syntax:

```

scp <username>@<switch IP address>:getcfg <local filename>
  or
scp -p <SSH port number> <username>@<Advanced MM IP address>:getcfg <local filename>

```

Example:

```

>> # scp scpadmin@205.178.15.100:getcfg ad4.cfg
  or
>> # scp -p 1022 scpadmin@205.178.15.157:getcfg ad4.cfg

```

*To Upload the Configuration to the Switch:*

Syntax:

```

scp <local filename> <username>@<switch IP address>:putcfg
  or
scp -p <SSH port number> <local filename> <username>@<Advanced MM IP address>:putcfg

```

Example:

```

>> # scp ad4.cfg scpadmin@205.178.15.100:putcfg
  or
>> # scp -p 1022 ad4.cfg scpadmin@205.178.15.157:putcfg

```

## Apply and Save the Configuration

The `apply` and `save` commands are still needed after the last command (`scp ad4.cfg scpadmin@205.178.15.100:putcfg`).

Or, instead, you can use the following commands:

```
>> # scp ad4.cfg scpadmin@205.178.15.157 1022:putcfg_apply
>> # scp ad4.cfg scpadmin@205.178.15.157 1022:putcfg_apply_save
```

- The `diff` command is automatically executed at the end of `putcfg` to notify the remote client of the difference between the new and the current configurations.
- `putcfg_apply` runs the `apply` command after the `putcfg` is done.
- `putcfg_apply_save` saves the new configuration to the flash after `putcfg_apply` is done.
- The `putcfg_apply` and `putcfg_apply_save` commands are provided because extra `apply` and `save` commands are usually required after a `putcfg`; however, a SCP session is not in an interactive mode at all.

## SSH and SCP Encryption of Management Messages

The following encryption and authentication methods are supported for SSH and SCP:

Server Host Authentication: Client RSA authenticates the switch at the beginning of every connection

Key Exchange: RSA

Encryption: 3DES-CBC, DES

User Authentication: Local password authentication, RADIUS, SecurID  
(via RADIUS, TACACS+, for SSH only—does not apply to SCP)

## Generating RSA Host and Server Keys for SSH Access

To support the SSH server feature, two sets of RSA keys (host and server keys) are required. The host key is 1024 bits and is used to identify the SmartConnect. The server key is 768 bits and is used to make it impossible to decipher a captured session by breaking into the SmartConnect at a later time.

When the SSH server is first enabled and applied, the SmartConnect automatically generates the RSA host and server keys and is stored in the FLASH memory.

To configure RSA host and server keys, first connect to the switch through the management system or external Telnet connection, and enter the following commands to generate them manually.

```
>> # /cfg/sys/sshd/hkeygen           (Generates the host key)
>> # /cfg/sys/sshd/skeygen          (Generates the server key)
```

These two commands take effect immediately without the need of an `apply` command.

When the switch reboots, it retrieves the host and server keys from the FLASH memory. If these two keys are not available in the flash and if the SSH server feature is enabled, the switch automatically generates them during the system reboot. This process may take several minutes to complete.

The switch also can regenerate the RSA server key. To set the interval of RSA server key auto-generation, use this command:

```
>> # /cfg/sys/sshd/intrval <number of hours (0-24)>
```

A value of 0 (zero) denotes that RSA server key autogeneration is disabled. When greater than 0, the switch automatically generates the RSA server key every specified interval; however, RSA server key generation is skipped if the switch is busy doing other key or cipher generation when the timer expires.

---

**Note** – The SmartConnect performs only one session of key/cipher generation at a time. Thus, a SSH/SCP client will not be able to log in if the switch is performing key generation at that time, or if another client has logged in immediately prior. Also, key generation will fail if a SSH/SCP client is logging in at that time.

---

## SSH/SCP Integration with RADIUS Authentication

SSH/SCP is integrated with RADIUS authentication. After the RADIUS server is enabled on the switch, all subsequent SSH authentication requests will be redirected to the specified RADIUS servers for authentication. The redirection is transparent to the SSH clients.

## SSH/SCP Integration with TACACS+ Authentication

SSH/SCP is integrated with TACACS+ authentication. After the TACACS+ server is enabled on the SmartConnect, all subsequent SSH authentication requests will be redirected to the specified TACACS+ servers for authentication. The redirection is transparent to the SSH clients.

## SecurID Support

SSH/SCP can also work with SecurID, a token card-based authentication method. The use of SecurID requires the interactive mode during login, which is not provided by the SSH connection.

---

**Note** – There is no BBI support for SecurID because the SecurID server, ACE, is a one-time password authentication and requires an interactive session.

---

## Using SecurID with SSH

Using SecurID with SSH involves the following tasks.

- To log in using SSH, use a special user name, “ace,” to bypass the SSH authentication.
- After a SSH connection is established, you are prompted to enter the user name and password (the SecurID authentication is being performed now).
- Provide your user name and the token in your SecurID card as a regular Telnet user.

## Using SecurID with SCP

Using SecurID with SCP can be accomplished in two ways:

- Using a RADIUS server to store an administrator password.

You can configure a regular administrator with a fixed password in the RADIUS server if it can be supported. A regular administrator with a fixed password in the RADIUS server can perform both SSH and SCP with no additional authentication required.

- Using a SCP-only administrator password.

Use the `/cfg/sys/sshd/scpadm` command to bypass the checking of SecurID.

A SCP-only administrator's password is typically used when SecurID is used. For example, it can be used in an automation program (in which the tokens of SecurID are not available) to back up (download) the switch configurations each day.

---

**Note** – The SCP-only administrator's password must be different from the regular administrator's password. If the two passwords are the same, the administrator using that password will not be allowed to log in as a SSH user because the switch will recognize him as the SCP-only administrator. The switch allows only the administrator access to SCP commands.

---





# Part 2: BBI Reference

VSE SmartConnect software provides a graphical user interface that lets you remotely configure and manage switches through a Web browser.

Using the VSE SmartConnect software browser-based interface (BBI), you can:

- Divide the switch into multiple virtual switches.
- Group multiple physical ports together to aggregate the bandwidth between large-scale network devices.
- Set properties for internal and external switch ports and management ports.
- Configure Access Control Lists (ACLs), port mirroring, and other switch features.
- Examine a variety of switch information and statistics.

The following sections of this *User's Guide* contain information about the settings and controls on each page of the BBI used for configuring and monitoring the switch:

- [Chapter 7, “Understanding the Browser-Based Interface,”](#) provides information about the BBI screen layout and menu system, and describes how to make and save configuration settings.
- [Chapter 8, “Virtual Switch Groups,”](#) provides information for virtualizing the switch: dividing it into multiple virtual switches, defining VLANs, and grouping ports to aggregate bandwidth.
- [Chapter 9, “Switch Policies,”](#) provides information for configuring internal and external ports, port mirroring, and defining Access Control Lists (ACLs), quality of service (QoS), and ServerMobility.

- [Chapter 10, “System Settings,”](#) provides information for configuring management capabilities, local and remote user administration, time services, BOOTP, SSH and Telnet access, Syslog, and more.
- [Chapter 11, “Boot Management,”](#) provides information for loading switch software images, and for selecting which image and configuration files will be used.
- [Chapter 12, “Switch Information,”](#) described how to view and interpret detailed configuration and status information regarding a variety of switch features.
- [Chapter 13, “Switch Statistics,”](#) described how to view and interpret operational information regarding port and network activity and switch operational characteristics.

For initial setup of the BBI and access, see [Chapter 2, “Getting Started with the Browser-Based Interface.”](#)

## CHAPTER 7

# Understanding the Browser-Based Interface

---

The VSE SmartConnect software offers two user interfaces: a browser-based interface (BBI) and a command-line interface (CLI). The BBI allows you to perform basic switch configuration tasks quickly and easily using a standard Web browser. The CLI provides more detailed configuration options for VSE SmartConnect software.

This *User's Guide* covers primarily the usage of the VSE SmartConnect software BBI. For details on the initial setup and access to the BBI, see [Chapter 2, "Getting Started with the Browser-Based Interface."](#) For information about using the CLI, see [Chapter 5, "Command Reference."](#)

### The SmartConnect BBI Screen

The VSE SmartConnect software BBI has three major areas, as shown below and described in the following sections:

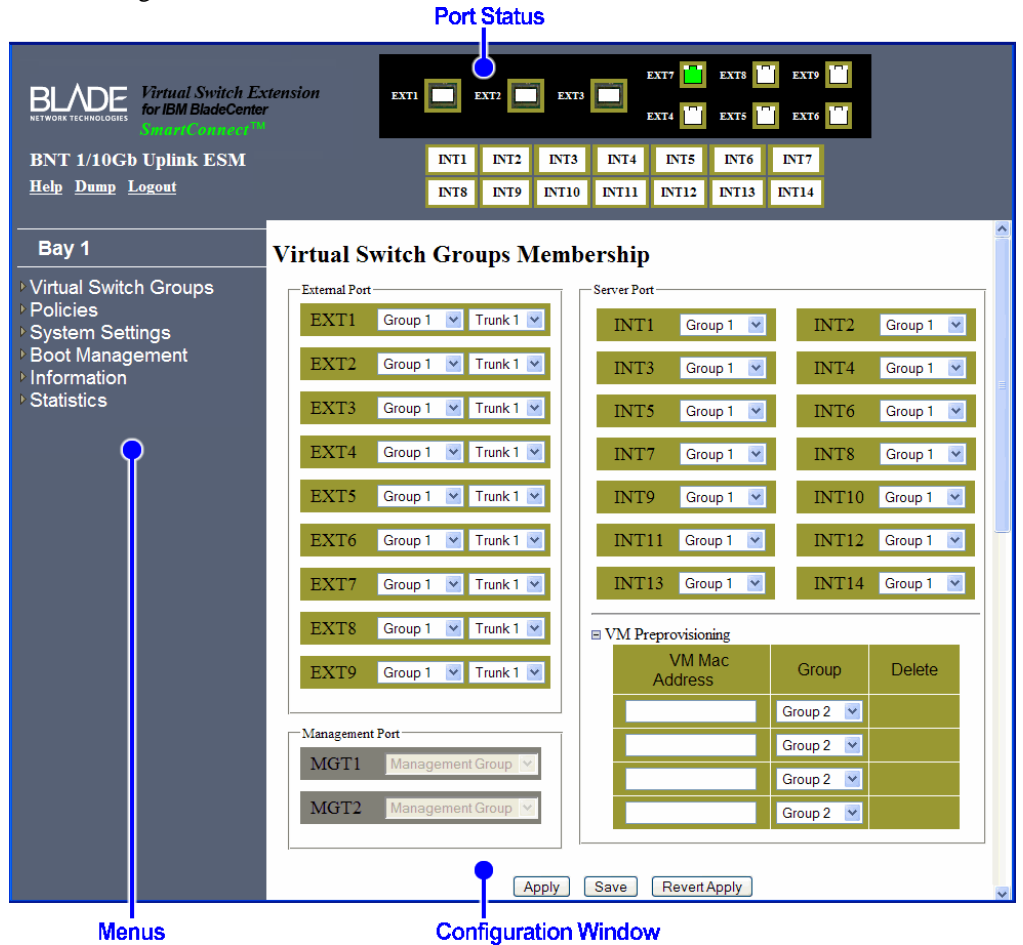


Figure 7-A Main VSE SmartConnect Software Screen

### Port Status Area

The port status area displays port icons representing each port in the switch. The border color of each icon indicates the Virtual Switch Group (VSG) to which the port belongs.

Each port's operational status is also displayed, as indicated by the port icon's interior color:

**Table 7-1** Port Status Colors

Color	Description
Grey	Disabled
Green	Active link
White	No link

Click on a port icon to display statistics for the port (see [“Switch Ports Statistics Summary”](#) on page 162).

Click on the background area outside a port to display IGMP statistics for the switch.

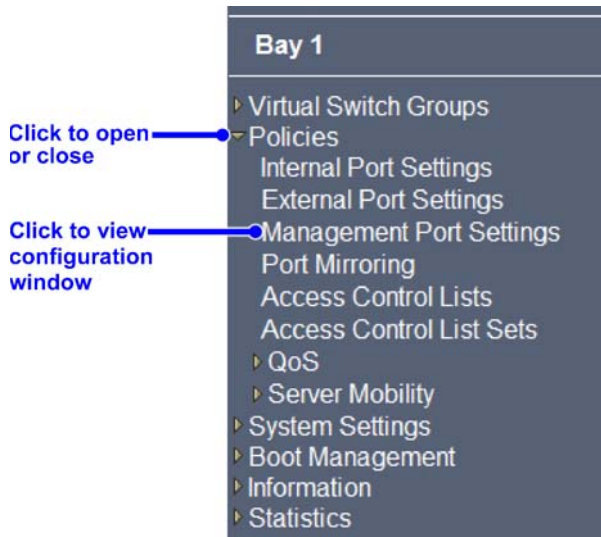
---

**Note** – The format used for depicting the port number depends on whether the switch is part of a multi-switch stack. If stacked, the Configured Switch number (c<sub>s</sub>num) is placed in front of the port number. For example, 1:3 indicates c<sub>s</sub>num 1, port 3. See [“Stacking Port Numbers”](#) on page 54 for more information.

---

### Menu Area

The menu area displays the switch type and the bay number where the switch resides. It also displays a list of menu items, arranged in a tree of feature folders (indicated with a small triangle) and feature names:



**Figure 7-B** VSE SmartConnect Software Menu Area

Click on a closed feature folder to open it and reveal its contents. Click on it again to close it. When a feature folder is open, click on any feature name display the corresponding information in the configuration area.

## Configuration Window

When you choose a feature name from the menu area, the corresponding configuration controls are displayed in the configuration window. Depending on the selected feature, the configuration window provides switch information or allows you to view and change the settings of the VSE SmartConnect software features.

If you use the configuration area to change the switch configuration, click on one of the buttons at the bottom of the window, as follows:

**Table 7-2** Configuration Buttons

Button	Description
Apply	When altering fields in the configuration area, your changes are “pending” and do not take effect until you click the <b>Apply</b> button. Once applied, all configuration changes take effect on the switch immediately. However, if you do not also save the changes, they will be lost the next time the switch is rebooted or whenever the <b>Revert Apply</b> command is given.
Save	Writes the applied configuration changes to non-volatile flash memory on the switch so that the configuration is retained beyond reboot or power cycles.
Revert Apply	Clears any unsaved configuration changes, whether applied or not. Use this command to return all configuration fields to their last saved state.

Some configuration screens have other buttons (such as **Delete**, **Clear**, or **Search**). The functions of these controls are described in the sections detailing each configuration page.

---

**Note** – In some instances where multiple BBI and/or CLI sessions are simultaneously applying and reverting configuration changes, the next use of the **Apply**, **Save**, or **Revert Apply** command may not function as expected unless another configuration item is updated.

---





## CHAPTER 8

# Virtual Switch Groups

---

Switch resources can be pooled or divided into logical units known as Virtual Switch Groups (VSGs). Up to 32 VSGs are available.

Two different types of resources can be assigned to VSGs:

- Ports (internal and external)
- Virtual Machines (VMs)

### *Port Groups*

Each internal and external port can be independently assigned to one of the 32 available VSGs. Each VSG can contain multiple ports, but each port can belong to only one VSG.

VSGs for port groups must have the following characteristics:

- It is recommended that each VSG contain at internal server ports *and* external ports for proper network operation.
- By default, all external ports in the same VSG are placed into one trunk to aggregate their bandwidth.

For VSG port group and trunk configuration, see [“Virtual Switch Groups Membership” on page 97](#).

---

**Note** – The port references that appear in this *User's Guide* might differ from your system. The number of ports is based on the type of blade server chassis, and the firmware versions and options installed.

---

## Virtual Machine Groups

The switch automatically discovers VMs that reside in the hypervisor directly connected to the switch. As with ports, VMs can be independently assigned to VSGs in order to group or separate them. Optionally, uplink ports can also be assigned to VSGs that include VMs.

The switch will accept a maximum of 1024 VMs. Once this limit is reached, the switch will reject additional VMs.

---

**Note** – In some rare situations, the switch may reject the addition of new VMs prior to reaching the 1024 VM limit. This can occur when the hash bucket corresponding to the new VM is already full. If this occurs, change the virtual machine's MAC address and retry the operation. The MAC address can usually be changed from the virtualization platform's management console (such as the VMware Virtual Center). This limitation is independent of whether switches are acting alone or as part of a stack.

---

VSGs containing VMs have the following characteristics:

- The VSG may consist of VMs and (optionally) external port.
- Internal ports cannot be added to VSGs which contain VMs, and VMs cannot be added to VSGs which contain internal ports.
- The switch allows communication between VMs in the same group.
- The switch does not allow communication between VMs which are not in the same group. However, VMs which are in the same hypervisor may still communicate with each other even if they are not assigned to the same VSG on the switch.

For information on configuration, see [“Assigning Virtual Machines to VSGs” on page 97](#).

## Link Aggregation

The default network configuration of the VSE SmartConnect software places all ports into a single VSG, and aggregates all external ports together into a static Link Aggregation Group (LAG, or trunk).

This configuration eliminates the need for Spanning Tree Protocol to prevent network loops, since the uplink ports act as a single link. Also, since all of the uplink ports in each VSG participate in a static LAG, if a link fails, the existing traffic is redirected to the other links.

To override default VSG assignments and trunk settings, see [“Assigning Ports to VSGs” on page 97](#).

# Virtual Switch Groups Membership

---

Use this window to group ports or virtual machines into VSGs.

## *Assigning Ports to VSGs*

Choose menu **Virtual Switch Groups > Membership** to select the VSG in the Group drop-down list for each of the external ports and internal server blade ports. Also in this configuration window, external ports can be assigned to a VSG trunk. Click **Apply** to make your changes active, and **Save** to retain changes beyond reboot.

To enable Layer 2 Failover, Link Aggregation Control Protocol (LACP), or IGMP Snooping for the VSG, choose menu **Virtual Switch Groups > Settings**.

## *Assigning Virtual Machines to VSGs*

Choose menu **Virtual Switch Groups > Membership**. Ports with VMs attached to them are noted with a plus (+) or minus (-) in front of the port designation. Click on the plus icon to reveal the list of VMs attached to the port, or on the minus icon to hide them.

When VMs are revealed, the VM Group field shows the VSG to which the VMs are assigned. To put a VM into a specific VSG, choose the desired group number from the list of available group numbers. To put a VM in a different VSG, choose the new group number. By default, all VMs are unassigned.

It is important to assign at least one uplink port to the VM group if the VMs in the group need to communicate with other servers connected to the network. It is not necessary to assign an uplink port to a VSG if the VMs in the group only communicate with each other.

---

**Note** – VMs may belong to the same or different group as the port to which they are attached. The regular (non-VM) port traffic always uses the VSG specified for the port, and the VM traffic always uses the VSG specified for the VM. If the two are different, their traffic is internally separated, as if occurring on individual switches with independent ports.

---

## *VM Pre-provisioning*

Use the VM Pre-Provision menu to add a VM in advance (prior to automatic discovery) into a group. Enter the MAC address of the VM and select the VSG to which it will be added. When the VM becomes active, it will be added to the selected group automatically.

## *Switch Management Ports*

This part of the window lists ports reserved for switch management access. Listed ports are shown as part of the “Management” group.

## Virtual Switch Groups Settings

---

Use this window to configure the following features for VSGs:

- Delete the settings VSGs
- Switch Failover
- Link Aggregation Control Protocol (LACP)
- IGMP Snooping
- BPDU policy

### *Delete Virtual Switch Group Settings*

Use the Delete drop-down list to remove all settings for a specific VSG or all VSGs. This resets all configured settings for selected VSGs to their factory default values, including all VSG-related settings made in other windows throughout the BBI. Ports assigned to the VSG will be reassigned to default VSG 1. VMs and ACLs assigned to the VSG will be de-assigned.

### *Switch Failover*

The primary application for Layer 2 failover is to support Network Adapter Teaming. With Network Adapter Teaming, all the NICs on each server share the same IP address, and are configured into a team. One NIC is the primary link, and the other is a standby link.

You can configure VSGs as failover trigger groups such that if some (or all) of the links fail in a group, the VSE SmartConnect software disables all internal ports. When the internal ports are disabled, it causes the NIC team on the affected server blades to failover from the primary to the backup NIC. This process is called a failover event.

When the appropriate number of links return to service, the VSE SmartConnect software enables the internal ports. This causes the NIC team on the affected server blades to fail back to the primary switch (unless Auto-Fallback is disabled on the NIC team). The backup switch processes traffic until the primary switch's internal links come up, which takes up to five seconds.

To configure Switch Failover (Layer 2 Failover) on a VSG:

1. **In the Switch Failover drop-down list, select enable.**
2. **In the Number of Links to Trigger Failover drop-down list, select the trigger value.**
3. **Click Apply at the bottom of the window to make the changes active, and Save to retain them beyond reboot and power cycles.**

### *Link Aggregation Control Protocol*

Link Aggregation Control Protocol (LACP) is an IEEE 802.3ad standard for grouping several physical ports into one logical port (known as a dynamic trunk group or Link Aggregation group) with any device that supports the standard. Please refer to IEEE 802.3ad-2002 for a full description of the standard.

The 802.3ad standard allows standard Ethernet links to form a single Layer 2 link using the Link Aggregation Control Protocol (LACP). If a link in a LACP trunk group fails, traffic is reassigned dynamically to the remaining link or links of the dynamic trunk.

To configure Link Aggregation Control Protocol on a VSG, select **enable** in the drop-down list. When disabled (as by default), external ports in the VSG's external trunk act as a static trunk. Click **Apply** to make the changes active, and **Save** to retain them beyond reboot.

### *IGMP Snooping*

To configure IGMP Snooping on a VSG, select **enable** in the drop-down list.

IGMP Snooping allows the switch to forward multicast traffic only to those ports that request it. IGMP Snooping prevents multicast traffic from being flooded to all ports. The switch learns which server hosts are interested in receiving multicast traffic, and forwards it only to ports connected to those servers.

### *BPDU Policy*

To configure the Spanning Tree BPDU policy for a VSG, select the desired policy, as follows:

- **drop:** If BPDUs are received on ports belonging to this group, the BPDUs are dropped.
- **guard:** If BPDUs are received on a port belonging to this group, the port is disabled.
- **flood:** If BPDUs are received on ports belonging to this group, the BPDUs are flooded on all ports in the group. Use this setting if the Switch Group's external ports are connected to upstream switches that have Spanning Tree enabled.

### *Reset to Default*

To reset items in this window for a specific VSG, select **Reset to default all group's settings**, and click **Apply**.

---

**Note** – This action will also de-assign any ACLs configured for the VSG.

---

*See also:*

- [“External Port Settings” on page 103](#)

## Virtual Switch Groups ACL QoS

---

Use this window to assign Access Control Lists (ACLs) or ACL Sets (group of ACLs) to a VSGs.

Assigning ACLs has the following prerequisites:

- A valid VSG must be configured (see [“Virtual Switch Groups Membership” on page 97](#)).
- A valid ACL or ACL set must be configured ([“ACL Configuration Table” on page 106](#) and [“Access Control List Sets” on page 111](#)).

Once prerequisites are met, an ACL or ACL Set can be applied to different port group combinations within a VSG, as follows:

- All Internal Ports
- All External Ports
- All ports in the Group

To add an ACL or ACL Set:

1. **Select the VSG from the ACL Config drop-down list.**
2. **Choose a port option in the Option drop-down list.**
3. **Click **Edit ACLs** to add an ACL to the VSG, or click **Edit ACL Sets** to add an ACL Set to the VSG.**

The ACLs Applied or ACL Sets Applied window will appear.

4. **Add or remove ACLs or ACL sets for the specified VSG ports.**
  - To add an ACL or ACL Set, select an item in the Available column and click Add.
  - To remove an ACL or ACL Set, select an item in the Group column and click Remove.
5. **Click **Apply** at the bottom of the window to make the changes active, and **Save** to retain them beyond reboot and power cycles.**

## CHAPTER 9

# Switch Policies

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Switch Policies include configuration windows for the following port and access related features:

- “Internal Port Settings” on page 102
- “External Port Settings” on page 103
- “Management Port Settings” on page 104
- “Port Mirroring” on page 105
- “Access Control Lists” on page 106
- “Access Control List Sets” on page 111
- “Quality of Service” on page 112
- “ServerMobility” on page 114™

## Internal Port Settings

Use this window to configure internal port settings.

**Table 9-1** Internal Port Settings Fields

Field	Description
Port	Displays the port number. This field is non-configurable. <b>Note:</b> If the switch is part of a multi-switch stack, the displayed number indicates the Configured Switch number ( <i>csnum</i> ) followed by the port number. See <a href="#">“Stacking Port Numbers” on page 54</a> for more information.
Group	Displays the current VSG for the port. To configure the VSG, see <a href="#">“Virtual Switch Groups Membership” on page 97</a> .
Enable	Set the operational status of the port: enable or disable.
Name	Set the port name which appears on information and statistics displays.
Flow Control	Select the flow control setting (rx, tx, both, none).
PVID	Select the Port VLAN Identifier (PVID). If a PVID is configured, when untagged traffic ingresses on the port, the configured VLAN tag will be automatically added. Upon egress, if the PVID of the egress port matches the packets's tag, the tag will be stripped from the packet.
Internal Trunk ID	Configures the trunk ID for internal ports. Ports in the same VSG that have the same internal trunk ID form a trunk. Specify a value between 1 and 56, or 0 (zero) for none. <b>Note:</b> This field is available only when stacking is configured.
DSCP Remarking	Enable or disable DiffServ Code Point (DSCP) remarking for the port (see <a href="#">“DiffServ Code Point QoS” on page 113</a> ).

### See also:

- [“Virtual Switch Groups Membership” on page 97](#)
- [“External Port Settings” on page 103](#)
- [“Port-Based VLAN Tagging” on page 28](#)
- [“Stacking” on page 43](#)
- [“DiffServ Code Point QoS” on page 113](#)



## External Port Settings

Use this window to configure external port settings.

**Table 9-2** External Port Settings Fields

Field	Description
Port	Displays the port number. This field is non-configurable. <b>Note:</b> If the switch is part of a multi-switch stack, the displayed number indicates the Configured Switch number (CSnum) followed by the port number. See <a href="#">“Stacking Port Numbers” on page 54</a> for details.
Group	Displays the current VSG for the port. To configure the VSG, see <a href="#">“Virtual Switch Groups Membership” on page 97</a> .
Name	Set the port name which appears on information and statistics displays.
Status	Set the operational status of the port: enable or disable.
Speed	Select the proper speed setting for the port. All external ports in the same VSG must have the same setting.
Duplex	Select the proper duplex setting for the port. All external ports in the same VSG must have the same setting.
Auto Negotiation	Select the proper auto-negotiation setting for the port. All external ports in the same VSG must have the same setting.
Flow Control	Select the flow control setting (rx, tx, both, none).
PVID	Select the Port VLAN Identifier (PVID). If a PVID is configured, when untagged traffic ingresses on the port, the configured VLAN tag will be automatically added. Upon egress, if the PVID of the egress port matches the packets's tag, the tag will be stripped from the packet.
ErrDisable Recovery	Enables or disables automatic recovery for the port when it becomes error-disabled. An error-disabled port is re-enabled by the switch only if this port setting is enabled and the global ErrDisable Recovery setting is also enabled (see <a href="#">“ErrDisable System Settings” on page 125</a> ).
DSCP Remarking	Enable or disable DiffServ Code Point (DSCP) remarking for the port (see <a href="#">“Diff-Serv Code Point QoS” on page 113</a> ).

**Note** – Some types of ports are pre-set for speed, duplex, and auto-negotiation. For these ports, settings are displayed but cannot be configured on this window.

*See also:*

- [“Virtual Switch Groups Membership” on page 97](#)
- [“Internal Port Settings” on page 102](#)
- [“Stacking” on page 43](#)

## Management Port Settings

---

Use this window to configure management port settings.

**Table 9-3** Management Port Settings Fields

Field	Description
Port	Displays the port number. This field is non-configurable. <b>Note:</b> If the switch is part of a multi-switch stack, the displayed number indicates the Configured Switch number ( <i>csnum</i> ) followed by the port number. See <a href="#">“Stacking Port Numbers” on page 54</a> for more information.
Group	Displays the VSG for the port. as “Management.”
Port Name	Set the port name which appears on information and statistics displays.
Status	Set the operational status of the port: enable or disable.
Speed and Duplex	Select the proper speed and duplex setting for the port.
Flow Control	Select the flow control setting (rx, tx, both, none).

*See also:*

- [“Virtual Switch Groups Membership” on page 97](#)
- [“Stacking” on page 43](#)

## Port Mirroring

---

Port mirroring allows you to attach a sniffer to a monitoring port that is configured to receive a copy of all packets forwarded from the mirrored port. SmartConnect enables you to mirror port traffic for all Layer 2 and Layer 3 traffic, including ports involved in VSG and stacking. Port mirroring can be used as a troubleshooting tool or to enhance the security of your network. For example, you can connect an IDS server to the monitor port to detect intruders attacking the network.

Consider the following guidelines while configuring port mirroring:

- SmartConnect does not support a single port being monitored by multiple ports.
- SmartConnect cannot mirror LACPDU and self-generated flow control packets.
- Ingress and egress traffic is duplicated and sent to the monitor port after processing.

---

**Note** – Among the egress ports, only one copy of broadcast and unknown unicast packets will go to the monitor port.

---

To configure port mirroring:

1. **At the top of the window, select a Monitor Port from the drop-down list.**
2. **For each port you wish to mirror:**
  - Select Enabled in the Mirrored drop-down list.
  - Select the port mirror Direction in the drop-down list.
3. **At the top of the window, select Enabled in the drop-down list.**
4. **Click Apply at the bottom of the window to make the changes active, and Save to retain them beyond reboot and power cycles.**

## Access Control Lists

---

Access Control Lists (ACLs) are used for limiting or permitting network traffic based on a variety of port, network, and traffic characteristics.

Use the [ACL Configuration Table](#) window to search for existing ACLs to view or edit, or to launch the window for configuring a new ACL.

Once ACLs or ACL sets are defined, see [“Virtual Switch Groups ACL QoS” on page 100](#) for assigning them to VSGs.

Also see [“Access Control List Sets” on page 111](#) for information on grouping ACLs together for quicker application.

### ACL Configuration Table

Use this screen to search for and select existing ACLs to view or edit, or to launch the window for configuring a new ACL.

#### *Searching for an Existing ACL*

**1. To search for existing ACLs, enter optional search parameters:**

- Set ID
- Switch Egress Port
- Source MAC address
- Destination MAC address
- VLAN ID
- Protocol type
- Source IP address
- Destination IP address
- TCP/UDP source port
- TCP/UDP destination port
- Filter action
- Statistics

Fields that have a value of “any” are ignored during the search.

**2. Choose a search operation:**

- **or**  
Search for ACLs specified in the search range that meet any of the criteria entered.
- **and**  
Search for ACLs specified in the search range that meet all of the criteria entered.

**3. Click Search to display ACLs that fit the range and meet the criteria entered.**

Select any displayed ACL to view or edit its configuration using the [Access Control List](#) configuration window.

*Adding a New ACL*

Click Add New ACL to display the [Access Control List](#) configuration window.

*See also:*

- [“Virtual Switch Groups Membership” on page 97](#)
- [“Access Control List Sets” on page 111](#)

## Add or Edit ACLs

This configuration window is used for modifying existing ACLs or defining new ACLs. This window is reached from the [ACL Configuration Table](#) window.

### Access Control List

Use these fields to configure basic ACL parameters

**Table 9-4** ACL Configuration Fields

Field	Description
ACL ID	Configures the ACL number.
Filter Action	Defines the filter action, as follows: <ul style="list-style-type: none"> <li>■ Permit</li> <li>■ Deny</li> <li>■ none</li> </ul>
Ethernet Packet Format	Defines the Ethernet format for the ACL.
Tagging Packet Format	Defines the tagging format for the ACL.
IP Packet Format	
Source MAC Address	Defines the source MAC address for this ACL.
Destination MAC address	Defines the destination MAC address for this ACL.
Ethernet Type	Defines the Ethernet type for this ACL.
VLAN ID	Defines a VLAN number and mask for this ACL. <b>Note:</b> When this field is set, the ACL will match incoming packets only when they are tagged. Untagged packets will not be matched.
802.1p Priority	Defines the 802.1p priority for the ACL. <b>Note:</b> When this field is set, the ACL will match incoming packets only when they are tagged. Untagged packets will not be matched.
Type of Service	Defines a Type of Service value for the ACL. For more information on ToS, see RFC 1340 and 1349.
Protocol	Defines an IP protocol for the ACL. If defined, traffic from the specified protocol matches this filter. Specify the protocol number. Some of the well-known protocols include: <ul style="list-style-type: none"> <li>■ 1: ICMP</li> <li>■ 2: IGMP</li> <li>■ 6: TCP</li> <li>■ 17: UDP</li> <li>■ 89: OSPF</li> <li>■ 112: VRRP</li> </ul>

**Table 9-4** ACL Configuration Fields (continued)

Field	Description
Source IP Address	Defines a source IP address for the ACL. If defined, traffic with this source IP address will match this ACL. Specify an IP address in dotted decimal notation.
Destination IP Address	Defines a destination IP address for the ACL. If defined, traffic with this destination IP address will match this ACL.
TCP/UDP Src Port	Defines a source port for the ACL. If defined, traffic with the specified TCP or UDP source port will match this ACL. Specify the port number. Some of the well known ports include: <ul style="list-style-type: none"> <li>■ 20: ftp-data</li> <li>■ 21: ftp</li> <li>■ 22: ssh</li> <li>■ 23: telnet</li> <li>■ 25: smtp</li> <li>■ 37: time</li> <li>■ 42: name</li> <li>■ 43: whois</li> <li>■ 53: domain</li> <li>■ 69: tftp</li> </ul>
TCP/UDP Dst Port	Defines a destination port for the ACL. If defined, traffic with the specified TCP or UDP destination port will match this ACL. Specify the port number, just as with sport above.
TCP Flags	Defines a TCP flag for the ACL.
Statistics	Enables or disables the statistics collection for the ACL.
Egress Port	Selects an egress port to add to the ACL. <b>Note:</b> The egress port ACL will not match a Layer 2 broadcast/Multi-cast or Destination Lookup Failure (DLF) packet. <b>Note:</b> If the egress port is a member of a trunk, the ACL will be applied for all ports in that trunk.

### ACL Metering Settings

The following table describes the ACL metering configuration controls:

**Table 9-5** ACL Metering Configuration Fields

Field	Description
Committed rate	Configures the committed rate, in Kilobits per second. The committed rate must be a multiple of 64.
Maximum burst size	Configures the maximum burst size, in Kilobits. Enter one of the following values for mbsize: 32, 64, 128, 256, 512, 1024, 2048, 4096
Set out-of-profile Drop or Pass	Configures the ACL Meter to either drop or pass out-of-profile traffic.
Enable	Enables or disables the ACL meter.

### ACL Remark Control

The following table describes the ACL remarking configuration controls:

**Table 9-6** ACL Remarking Configuration Fields

Field	Description
Set in-profile update DSCP enable	Enables or disables DiffServ Code Point (DSCP) updates for In-Profile packets.
Set in-profile update DSCP	Sets the DSCP of In-Profile packets to the selected value.
Set out-of-profile update DSCP enable	Enables or disables DSCP updates for Out-of-Profile packets.
Set out-of-profile update DSCP	Sets the DSCP of Out-of-Profile packets to the selected value.

#### See also:

- [“Virtual Switch Groups Membership” on page 97](#)
- [“Access Control List Sets” on page 111](#)



## Access Control List Sets

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Use this window to assign ACLs to a set for quicker application.

To search for an ACL Set, enter a range of ACL Set numbers in the From and To fields. Click **Search** to display ACL Sets that fit the range.

The following table describes the ACL Sets configuration controls:

**Table 9-7** ACL Sets Configuration Fields

Field	Description
Set ID	Assigns a numeric identifier to the ACL Set.
ACLs Available	Lists the ACLs that you can add to the ACL Set.
ACLs in Set	Lists the ACLs that belong to the ACL Set. Select an ACL number in the ACLs Available list, and click <b>Add</b> to add the ACL to the ACL Set. Select an ACL number in the ACLs in Set list, and click <b>Remove</b> to remove the ACL from the ACL Set.

*See also:*

- [“Virtual Switch Groups Membership” on page 97](#)
- [“Access Control Lists” on page 106](#)

## Quality of Service

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VSE SmartConnect software supports two types of Quality of Service (QoS) classifications:

- “IEEE 8021p for MAC-Level QoS” on page 112
- “DiffServ Code Point QoS” on page 113

### IEEE 8021p for MAC-Level QoS

VSE SmartConnect software supports the following configuration windows for IEEE 802.1p QoS classifications:

- “Priority CoS Configuration Table” on page 112
- “CoS Weight Configuration Table” on page 112
- “Port Priority Configuration” on page 112
- “Number of Cos Configuration” on page 112

#### Priority CoS Configuration Table

Use this window to map 802.1p priority to Class of Service queues (CoSq). For each 802.1p priority value (0-7), select a corresponding CoSq number.

#### CoS Weight Configuration Table

Use this window to configure the scheduling weight for each CoSq.

#### Port Priority Configuration

Use this window to configure the 802.1p priority for each switch port.

#### Number of Cos Configuration

Use this window to configure the number of Class of Service (CoS) queues available for use.

---

**Note** – If you change the number of CoS queues, you must **Save** the configuration and reset the switch for the change to take affect.

---

## DiffServ Code Point QoS

Use this configuration window to re-map DiffServ Code Point (DSCP) values.

**Table 9-8** DSCP Configuration Fields

Field	Description
DSCP	Lists the initial DSCP values.
New Mapped DSCP	Enter the new DSCP value to which the initial DSCP value will be mapped.

**See also:**

- [“Internal Port Settings” on page 102](#)
- [“External Port Settings” on page 103](#)
- [“IEEE 8021p for MAC-Level QoS” on page 112](#)

## ServerMobility

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The ServerMobility feature uses the DHCP Relay Agent information option (option 82) to support fixed server address allocation, based on host location. The Relay Agent information option allows the switch to append location information to packets sent to a DHCP server, as follows:

- Agent circuit ID sub-option encodes the chassis ID, in hexadecimal format. In the advanced management system, the chassis ID is displayed in the UUID field on the System Vital Product Data window (Monitors > Hardware VPD). The following example shows how the chassis ID is configured in the Agent circuit ID sub-option:  
4F:B2:F3:A8:6E:34:35:54:8B:0B:D8:2D:F2:B7:E9:49
- Agent remote ID sub-option encodes the switch slot number and the port ID that corresponds to the blade server, in hexadecimal. The following example shows how Slot ID 1 and Port Number 2 is configured in the Agent remote ID sub-option:  
01:0:0:0:02

VSE SmartConnect software provides the following ServerMobility configuration windows:

- [“ServerMobility General Configuration” on page 115](#)
- [“ServerMobility Port Configuration” on page 116](#)

## ServerMobility General Configuration

Use this window to configure global settings for the ServerMobility feature.

**Table 9-9** ServerMobility - General Configuration Fields

Field	Description
Server Mobility State	Enables or disables the ServerMobility feature on the VSE SmartConnect software.
Relay on Non-Server-Mobility Ports	Enables or disables BOOTP Relay for all ports that have ServerMobility disabled.
Server Mobility Scheme	<p>Selects the scheme to be used for encoding the option 82 information in the DHCP request packets, as follows:</p> <ul style="list-style-type: none"> <li>■ <b>Switch:</b> The switch name is encoded in the agent circuit ID sub-option.</li> <li>■ <b>Chassis:</b> The chassis ID is encoded as the agent circuit ID sub-option.</li> <li>■ <b>Vmac:</b> The virtual MAC address of the server blade port is encoded in the agent circuit ID sub-option.</li> </ul>
Auto-Recovery State	Enables or disables DHCP failover for the ServerMobility ports. When enabled, a backup blade server will get the same IP address as the active blade server if and when the active blade server goes down.
Auto_Recovery Failover Time	Sets the lease time for the temporary IP address assigned by the switch to a backup (standby) blade server while the active blade server is up.
Set Server Mobility configuration to factory default	Resets ServerMobility feature parameters to factory default values.

## ServerMobility Port Configuration

Use this window to configure ServerMobility feature settings for each port on the SmartConnect.

**Table 9-10** ServerMobility - Port Configuration Fields

Field	Description
Port	Identifies each port in the switch. <b>Note:</b> If the switch is part of a multi-switch stack, the displayed number indicates the Configured Switch number ( <i>csnum</i> ) followed by the port number. See <a href="#">“Stacking Port Numbers” on page 54</a> for more information.
Port ServerMobility Mode	Enables or disables the ServerMobility feature on the port. When enabled, DHCP option 82 information is forwarded to the DHCP server.
Port DHCP request filtering mode	Enables or disables filtering DHCP request information on the port. When enabled, DHCP requests from the blade server are filtered, so that the DHCP server receives only DHCP requests from the switch. <b>Note:</b> If the ServerMobility feature is enabled on a port, it is recommended that you also enable DHCP request filtering.
Backup port	Selects a backup port. The blade server connected to the backup port acts as a backup to the server connected to this port. The backup server uses the same IP address as the active server.

## CHAPTER 10

# System Settings

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The VSE SmartConnect software provides configuration windows for the following system settings:

- “[Management Settings](#)” on page 118 for SNMP and Syslog settings
- “[General Settings](#)” on page 119 for system idle and watchdog timer settings
- “[Local User Administration](#)” on page 120 for defining switch user accounts
- “[Remote User Administration](#)” on page 122 for defining switch access using RADIUS or TACACS+.
- “[Time Services Settings](#)” on page 124 for local time and time zones, and configuring NTP.
- “[ErrDisable System Settings](#)” on page 125
- “[Switch Protected Mode](#)” on page 125
- “[Management Network Settings](#)” on page 126 for defining the network through which switch management access is allowed.
- “[Bootstrap Protocol Settings](#)” on page 126 for BOOTP settings.
- “[SSH/Telnet Settings](#)” on page 127 for configuring Secure Shell and Telnet access settings
- “[Virtual Machine Group Settings](#)” on page 128 for enabling or disabling VM Groups, and for setting the VMware ESX heartbeat port.
- “[Syslog Settings](#)” on page 129 for setting the types of messages sent to the system log.
- “[Stacking Configuration](#)” on page 130 for binding individual switches to a stack, and for configuring the stack interface.

# Management Settings

---

Use this window to configure SNMP and System Log (syslog) settings.

## SNMP

SmartConnect supports SNMP-based network management. If you are running a SNMP network management station on your network, you can manage the SmartConnect using standard SNMP MIBs.

**Table 10-1** SNMP Management Fields

Field	Description
System Name	Defines the name for the system, up to 64 characters.
System Contact	Defines the name of the system contact, up to 64 characters.
System Location	Defines the name of the system location, up to 64 characters.
Read Community String	Defines the SNMP read community string, up to 32 characters. The read community string controls SNMP “get” access to the Virtual Switch Extension (VSE) for IBM BladeCenter, SmartConnect,. The default read community string is <i>public</i> .
Write Community String	Defines the SNMP write community string, up to 32 characters. The write community string controls SNMP “set” and “get” access to the Virtual Switch Extension (VSE) for IBM BladeCenter, SmartConnect,. The default write community string is <i>private</i> .

## System Log

VSE SmartConnect software uses system log files to transmit event messages and alerts across management host.

**Table 10-2** Management Fields

Field	Description
IP Address	Configures the IP address of the syslog host.
Severity	Configures the severity level of the syslog host. The default is 7, which means log all severity levels.
Facility	Configures the facility level of the first syslog host displayed. The default value is 0.

*See also:*

- [“Switch Protected Mode” on page 125](#)



## General Settings

---

Use this window to configure general switch settings.

**Table 10-3** General Configuration Fields

Field	Description
Idle Timeout	Sets the idle timeout for CLI sessions.
Enable/Disable Watchdog	Enables or disables the system watchdog. The system watchdog monitors system activity, and resets the switch if it becomes unresponsive.
Watchdog Timeout	Configures the watchdog reset interval, in seconds. A lower value means the switch resets after a shorter period of unresponsiveness.

## Local User Administration

---

VSE SmartConnect software provides three built-in (static) user accounts, and up to ten end-user accounts.

### *Built-In Users*

The following types of user accounts are always available:

- **User**  
The User has no direct responsibility for Virtual Switch Extension (VSE) for IBM BladeCenter, SmartConnect, management. He or she can view all status information and statistics but cannot make any configuration changes to the Virtual Switch Extension (VSE) for IBM BladeCenter, SmartConnect,.
- **Operator**  
The Operator manages various functions of the Virtual Switch Extension (VSE) for IBM BladeCenter, SmartConnect,. The operator can view all information and statistics and can reset ports.
- **Administrator**  
The super-user Administrator has complete access to all menus, information, and configuration commands on the Virtual Switch Extension (VSE) for IBM BladeCenter, SmartConnect,, including the ability to change both the user and administrator passwords.

**Table 10-4** Built-In User Administration Fields

Field	Description
Username	Displays the username for this user type.
Password	Sets the password for this user type, up to 15 characters.
User Type	Displays the authority level for the user type. SmartConnect defines these levels as: User, Operator, and Administrator, with User being the most restricted level.
Enabled	Enables or disables the user type.

## User Configuration

The administrator can define and manage up to ten end-user accounts. Depending on the user type specified for each account, the user can perform various operation tasks via the CLI commands. Once end-user accounts are configured and enabled, the VSE SmartConnect software requires username/password authentication.

**Table 10-5** Local User Administration Fields

Field	Description
Username	Defines the user name, up to eight characters.
Password	Sets the user password of up to 15 characters maximum.
User Type	Configures the user's authority level. SmartConnect defines these levels as: User, Operator, and Administrator, with User being the most restricted level.
Enabled	Enables or disables the user.

## Remote User Administration

---

Use this window to manage remote user authorization for RADIUS or TACACS+.

### RADIUS

VSE SmartConnect software supports the RADIUS (Remote Authentication Dial-in User Service) method to authenticate and authorize remote administrators for managing the switch. The VSE SmartConnect software acts as a RADIUS client and communicates to the RADIUS server which authenticates and authorizes a remote administrator.

**Table 10-6** RADIUS Fields

Field	Description
Radius	Enables or disables the RADIUS server.
Port	Displays the number of the User Datagram Protocol (UDP) port for RADIUS.
Radius Primary Server	Defines the primary RADIUS server IP address.
Radius Secondary Server	Defines the secondary RADIUS server IP address.
Radius Secret	Sets the shared secret between the Virtual Switch Extension (VSE) for IBM BladeCenter, SmartConnect, and the RADIUS server(s).
Radius timeout	Displays the amount of time, in seconds, before a RADIUS server authentication attempt is considered to have failed.
Radius retries	Displays the number of failed authentication requests before switching to a different RADIUS server.
Radius Backdoor for telnet/ssh/http/https	Displays the status of the RADIUS back door for Telnet/SSH/ HTTP/HTTPS.
Radius Secure Backdoor for telnet/ssh/http/https	Displays the status of the RADIUS back door using secure password for Telnet/SSH/ HTTP/HTTPS.

## TACACS+

VSE SmartConnect software supports authentication and authorization using the Cisco Systems TACACS+ protocol.

**Table 10-7** TACACS+ Fields

Field	Description
Tacacs+	Enables or disables the TACACS+ server.
Port	Displays the number of the TCP port for TACACS+.
Tacacs+ Primary Server	Defines the primary TACACS+ server IP address.
Tacacs+ Secondary Server	Defines the secondary TACACS+ server IP address.
Tacacs+ Secret	Sets the shared secret between the Virtual Switch Extension (VSE) for IBM BladeCenter, SmartConnect, and the TACACS+ server(s).
Tacacs+ timeout	Displays the amount of time, in seconds, before a TACACS+ server authentication attempt is considered to have failed.
Tacacs+ retries	Displays the number of failed authentication requests before switching to a different TACACS+ server.
Tacacs+ Backdoor for telnet/ssh/http/https	Displays the status of the TACACS+ back door for Telnet. This command does not apply when secure backdoor is enabled.
Tacacs+ Secure Backdoor for telnet/ssh/http/https	Displays the status of the TACACS+ back door using secure password for Telnet/SSH/ HTTP/HTTPS. This command does not apply when backdoor is enabled.
Tacacs+ password change	Enables or disables TACACS+ password change.
Tacacs+ command authorization	Displays the status of TACACS+ command authorization.
Tacacs+ command logging	Displays the status of TACACS+ command logging.
Tacacs+ new privilege level mapping	Displays the status of the TACACS+ new privilege-level mapping feature.

## Time Services Settings

Use this window to synchronize the SmartConnect's system clock to a Network Time Protocol (NTP) server.

### General Settings

**Table 10-8** Time Services General Settings Fields

Field	Description
Current Date	Configures the system date. The date reverts to its default value when the switch is reset.
Current Time	Configures the system time using a 24-hour clock format. The time reverts to its default value when the switch is reset.
Timezone Location	Configures the time zone where the Virtual Switch Extension (VSE) for IBM BladeCenter, SmartConnect, resides. You are prompted to select your location (continent, country, region) by the time zone wizard. Once a region is selected, the Virtual Switch Extension (VSE) for IBM BladeCenter, SmartConnect, updates the time to reflect local changes to Daylight Savings Time, etc.
DST for US	Enables or disables system Daylight Savings Time for USA prior to 2007.
Daylight Savings	Disables or enables daylight savings time in the system clock. When enabled, the Virtual Switch Extension (VSE) for IBM BladeCenter, SmartConnect, will add an extra hour to the system clock so that it is consistent with the local clock.

### NTP Settings

**Table 10-9** Time Services NTP Fields

Field	Description
Time Services	Enables or disables the NTP synchronization service.
Update Interval	Specifies the time interval the switch waits re-synchronize the Virtual Switch Extension (VSE) for IBM BladeCenter, SmartConnect, clock with the NTP server.
Primary Server	Configures the IP addresses of the primary NTP server to which you want to synchronize the switch clock.
Secondary Server	Configures the IP addresses of the secondary NTP server to which you want to synchronize the switch clock.

## ErrDisable System Settings

---

Use this window to configure the global ErrDisable settings.

**Table 10-10** ErrDisable Configuration Fields

Field	Description
Global ErrDisable Recovery	Enables or disables automatic recovery of error-disabled ports.
Global ErrDisable Timeout	Sets the time, in seconds, that the system waits before it automatically re-enables an error-disabled port.

## Switch Protected Mode

---

Protected Mode settings allow the SmartConnect administrator to block the management system from making configuration changes that affect SmartConnect operation. The SmartConnect retains control over those functions.

The following management system functions are disabled when Protected Mode is turned on:

- Local control of external management  
(External Ports: Enabled/Disabled)
- Local control of external ports  
(External management over all ports: Enabled/Disabled)
- Local control of factory default reset  
(Restore Factory Defaults)
- Local control of Management VLAN interface  
(New Static IP Configuration)

---

**Note** – Before you turn on Protected Mode, you must configure an IP interface to use for local SmartConnect management: **System Settings > Global > Switch IP Interface**.

---

To configure Protected Mode, enable the functions for which you wish to secure local control, and set Local Protected Mode to on.

In this release, configuration of the functions listed above are restricted to the local SmartConnect when set Protected Mode to on. In future releases, individual control over each function may be added.

## Management Network Settings

---

Use this window to add a defined network through which switch access is allowed through Telnet, SNMP, SSH, or the SmartConnect browser-based interface (BBI). A range of IP addresses is produced when used with a network mask address. Specify an IP address and mask address in dotted-decimal notation.

**Note:** If you configure the management network without including the switch interfaces, it will cause the Firewall Load Balancing health checks to fail and will create a “Network Down” state on the network.

**Table 10-11** Management Network Configuration Fields

Field	Description
Index	Displays the numeric ID of each management network entry.
Management Network Address	Configures the IP address of the management network.
Management Network Sub-net Mask	Configures the subnet mask of the management network.

## Bootstrap Protocol Settings

---

Use this window to configure BOOTP settings.

**Table 10-12** BOOTP Configuration Fields

Field	Description
BOOTP State	Globally enable or disable BOOTP relay on the switch.
BOOTP Server IP Address	Sets the IP address of the BOOTP server.
Secondary BOOTP Server IP Address	Sets the IP address of the second BOOTP server (optional).



## SSH/Telnet Settings

---

**Note** – For security purposes, the ability to change SSH and Telnet settings through the BBI is disabled by default and the fields in this window are subdued. To allow the BBI to make Telnet and SSH changes, use the following CLI command: `/cfg/sys/access/tsbbi enable`.

---

### Switch SSH Settings

Use these fields to configure Secure Shell (SSH) settings.

**Table 10-13** SSH Configuration Fields

Field	Description
SSH Time Interval	Set the interval for auto-generation of the RSA server key.
SSH Port	Sets the SSH server TCP port number.
SSH Generate Host Key	Generates the RSA host key.
SSH Generate Server Key	Generates the RSA server key.
SSH Server State	Enables or disables the SSH server.
SCP Admin Password	Set the administration password for SCP access.
SCP Apply and Save	Enables or disables SCP apply and save.

### Switch Telnet Settings

Use these fields to configure Telnet settings.

**Table 10-14** DSCP Configuration Fields

Field	Description
Telnet Access	Enables or disables Telnet access.
Telnet Port	Sets an optional telnet server TCP port number for cases where the server listens for telnet sessions on a non-standard port.

## Virtual Machine Group Settings

---

Use this window to configure VM Group settings.

**Table 10-15** VM Group Configuration Fields

Field	Description
Virtual Machine Groups	Enable or disable Virtual Machine Groups.
VMware ESX Service Console Heartbeat Port Number	The port number that the VMWare ESX server and VMware Virtual Console use to exchange heartbeat messages.

VSE SmartConnect software VMready can identify ESX Service Console interfaces connected to internal ports. The Virtual Switch Group Information window displays an asterisk ( \* ) in the IP Address field for ESX Service Console entries.

VMready identifies Service Consoles by listening to heartbeat communication packets periodically transmitted by the Service Consoles to the VMware Virtual Center. If the default values used for the heartbeat communication are changed in the VMware environment of a data center, use this window to set a new heartbeat port.

### *See also:*

- [“Virtual Switch Groups Membership” on page 97](#)

## Syslog Settings

---

Use this screen to control the types of activity messages logged by the system, and whether or not they are sent to the system console in addition to being appended to the system log file.

Available activity message types are as follows:

- Syslog of Console messages
- Syslog of System messages
- Syslog of Management messages
- Syslog of CLI messages
- Syslog of VLAN messages
- Syslog of SSH messages
- Syslog of NTP messages
- Syslog of IP messages
- Syslog of WEB messages
- Syslog of CFG messages
- Syslog of Stacking messages
- Syslog of TFTP messages
- Syslog of Virtual Machine (VM) messages

Each message type can be independently enabled or disabled.

## Stacking Configuration

---

Stacking allows up to eight switches to act as a single logical unit for aggregating bandwidth. Initial configuration of stacking is performed using a combination of CLI and BBI commands (see “Stacking” on page 43). The BBI provides the following stacking configuration options.

- “Stack Switch Configuration” on page 130
- “Stack IP Interfaces” on page 131
- “Managing a Stack” on page 53

### Stack Switch Configuration

The following settings are available for the overall stack:

**Table 10-16** Stack Switch Configuration Fields

Field	Description
Stack Name	Set a name for the stacked switch (optional).
Master Switch	Information showing the master switch. This field is non-configurable.
Backup Switch	The backup takes over control of the stack if the master fails. Configuration information and run-time data are synchronized with the master.

For each configured switch in the stack, the following fields are available:

**Table 10-17** Stack Switch Configuration Fields

Field	Description
Bind asnum	Select an attached switch number (asnum) from the drop-down menu to bind it the configured switch number ( <i>csnum</i> , shown in the title for each set of switch parameters).
UUID	This is the Unit ID number of the blade server chassis where the switch resides. This field is non-configurable.
Bay number	This is the bay number of the blade server chassis where the switch resides. This field is non-configurable.
Delete	To remove the target switch from the stack, check this box and click <b>Apply</b>

*See also:*

- “Stack IP Interfaces” on page 131
- “Managing a Stack” on page 53

## Stack IP Interfaces

Use the Stack IP Interfaces window to configure a single IP interface for the stack. This interface is known at the master interface and is shared by all switches in the stack.

Enter the following information for the master and backup stacking IP interfaces:

- IP address and subnet mask
- Group number
- VLAN number
- Default gateway IP address

Click **Apply** to make your changes active, and **Save** to retain changes beyond reboot cycles.

To delete an interface, check the appropriate **Delete** box and click **Apply**.

---

**Note** – If no Backup Switch Interface is configured, the Master Switch Interface is used if the backup takes over operation of the stack. Gratuitous ARP for the backup IP address is sent out to the network when a failover to the backup occurs.

---

This screen also displays information about the management IP interface:

- IP address and subnet mask
- Default gateway IP address
- Default VLAN number

### *See also:*

- [“Stack Switch Configuration” on page 130](#)
- [“Managing a Stack” on page 53](#)



## CHAPTER 11

# Boot Management

---

Use the Boot Management window to manage SmartConnect software. The Boot Management window allows you to perform the following tasks:

- **General Boot Settings:**
  - Select a software image to be used when the SmartConnect is next reset.
  - Select a configuration block to be used when the SmartConnect is next reset.
  - Download or upload a new software image to the SmartConnect via FTP/TFTP/HTTP.
- **Boot Schedule:** Set a time when the switch will next reset.

## General Boot Settings

---

Perform the following steps to load a software image to the SmartConnect:

1. **In the Image to transfer drop-down list, select the software image you wish to replace.**
2. **In the Update Image/Cfg section, perform the following steps:**
  - Select the method to use for transfer from the drop-down list.
  - Enter the appropriate information to use for the file transfer.
3. **Click Get Image.**

Once the image has loaded, the page refreshes to show the new software. To activate the new software, select the appropriate Image to boot, and click Reboot.

The following table describes the buttons on the Boot Management window.

**Table 11-1** Boot Management buttons

Field	Description
Reboot the Module	Performs a software reboot/reset. The software image specified in the Image to boot drop-down list becomes the active image.
Get Image	Loads the software image specified in the Remote File Name field to the switch. Places the software in the block specified in the Image to transfer drop-down list.
Put Image	Loads the software image specified in the Image to transfer drop-down list to the remote server. Places the software in the file name specified in the Remote File Name field.
Get Cfg	Loads a configuration file specified in the Remote File Name field from the remote server to the switch. Places the configuration file into the active configuration block.
Put Cfg	Loads the active configuration file to the remote server. Places the configuration into the file name specified in the Remote File Name field.
Put TS Dump	Loads the technical support dump file to the remote server. Places the dump into the file name specified in the Remote File Name field.
Put Crash Dump	Loads the switch system crash dump file to the remote server. Places the dump into the file name specified in the Remote File Name field.
Clear Crash Dump	Clears the switch system crash dump.

*See also:*

- [“Boot Schedule” on page 135](#)



## Boot Schedule

---

Use this window to configure the switch's boot scheduler.

**Table 11-2** Boot Schedule Fields

Field	Description
Enter day of the week for reboot	Configures the day of the week of the scheduled reboot.
Enter hour in 24-hour format (0...23)	Configures the hour of the scheduled reboot.
Enter minutes (0...59)	Configures the minute of the scheduled reboot.
Cancel scheduled reboot?	Select "cancel" if you want to cancel a scheduled reboot.
Currently scheduled reboot time	Displays the current scheduled time and date.

*See also:*

- ["General Boot Settings" on page 133](#)



## CHAPTER 12

# Switch Information

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The following windows display information about switch settings and operational status:

- “Access Control List Information” on page 138
- “Access Control List Sets Information” on page 138
- “ARP Cache Information” on page 139
- “Bootstrap Protocol Relay Information” on page 139
- “Forwarding Database Information” on page 140
- “Virtual Switch Group Information” on page 141
- “IGMP Information” on page 142
- “IP Information” on page 143
- “Link Status Information” on page 144
- “ServerMobility” on page 145
- “SNMPv3 Information” on page 147
- “Syslog Messages” on page 149
- “Port Transceiver Status” on page 150
- “Trunk Groups Information” on page 150
- “User Information” on page 151
- “Virtual Machine Group Information” on page 151

## Access Control List Information

---

Use this window to display Access Control List information.

This window displays a list of ACLs configured on the switch. To view configuration details of an ACL, click the ACL number.

### *See also:*

- [“Access Control Lists” on page 106](#)
- [“Access Control List Sets” on page 111](#)
- [“Virtual Switch Groups ACL QoS” on page 100](#)

## Access Control List Sets Information

---

Use this window to display ACL Set information.

This window displays a list of ACL Sets configured on the switch. To view configuration details of an ACL Set, click the Set number.

### *See also:*

- [“Access Control Lists” on page 106](#)
- [“Access Control List Sets” on page 111](#)
- [“Virtual Switch Groups ACL QoS” on page 100](#)

## ARP Cache Information

This window displays ARP cache information. The following table describes the ARP cache information fields.

**Table 12-1** ARP Cache Information Fields

Field	Description
Entry #	Displays the numeric identifier of the ARP entry.
IP Address	Displays the IP address of the ARP entry.
Flags	Displays the address status flag for the ARP entry.
MAC Address	Displays the MAC address of the ARP entry.
Group	Displays the Virtual Switch Group (VSG) of the ARP entry.
Vlan	Displays the VLAN number of the packet where the ARP entry request is received.
Port	Displays the source port number of the ARP entry. <b>Note:</b> If the switch is part of a multi-switch stack, the displayed number indicates the Configured Switch number ( <i>cnum</i> ) followed by the port number. See “ <a href="#">Stacking Port Numbers</a> ” on page 54 for more information.
Age	Displays the number of seconds before the ARP entry expires.

To clear the ARP cache, click Clear ARP Cache.

## Bootstrap Protocol Relay Information

The following table describes the BOOTP Relay information fields.

**Table 12-2** BOOTP Relay Information Fields

Field	Description
BOOTP State	Displays the BOOTP status (enabled or disabled).
BOOTP Server IP Address	Displays the IP address of the BOOTP server.
Secondary BOOTP Server IP Address	Displays the IP address of the secondary BOOTP server.

## Forwarding Database Information

---

The following table describes the FDB information fields.

**Table 12-3** FDB Information Fields

Field	Description
Entry #	Displays the numeric identifier of the FDB entry.
MAC Address	Displays the MAC address of the FDB entry.
Group	Displays the VSG number on which the MAC was learned. If the entry was learned on a management port, the field displays Mgmt.
Port	Displays the VLAN number of the FDB entry.
Trunk	Displays the trunk number of the FDB entry, if applicable.
State	Displays the port state of the FDB entry.

To clear FDB entries, show the entries and click **Clear**.

## Virtual Switch Group Information

The following table describes the VSG information fields.

**Table 12-4** Virtual Switch Group Information Fields

Field	Description
VM MAC Address	Displays a list of the MAC addresses of Virtual Servers that are members of the VSG. Optional.
Internal Ports	Displays a list of the internal port members in the VSG. Optional.
Ports in External Trunk 1	Displays a list of external ports that are members of the first external trunk of the VSG.
Ports in External Trunk 2	Displays a list of external ports that are members of the second external trunk of the VSG.
Oper Disabled External Ports	Displays a list of ports that were disabled due to trunk policy because of different type ports member in same external trunk or too many ports of same type member in same external trunk.
External Trunk	Displays a list of the list of ports which are members in the second external trunk of the group.
LACP	Displays the LACP status of the VSG (enabled or disabled).
IGMP	Displays the status of IGMP Snooping for the VSG (enabled or disabled).
Failover	Displays the Failover status of the VSG (enabled or disabled)
Failover Limit	Displays the number of ports in the VSG that must fail before Failover occurs.
BPDU Policy	Displays the BPDU Policy setting (drop, guard, or flood).
ACL SCM Group config	Displays the ACLs configured for the group.

**Note** – For port numbers, if a switch is part of a multi-switch stack, the displayed number indicates the Configured Switch number (*csnum*) followed by the port number. See [“Stacking Port Numbers” on page 54](#) for more information.

## IGMP Information

### *IGMP Multicast Groups*

The following table describes the IGMP Multicast Groups information fields.

**Table 12-5** IGMP Multicast Groups information

Field	Description
MCGroup	Displays the IP address of the IGMP Multicast Group.
Group	Displays the VSG number.
Vlan	Displays the VLAN number of the IGMP Multicast Group.
Port	Displays the port numbers of ports that carry IGMP Multicast traffic for the group. <b>Note:</b> If a switch is part of a multi-switch stack, the displayed number indicates the Configured Switch number ( <i>cnum</i> ) followed by the port number. See “Stacking Port Numbers” on page 54 for more information.
Version	Displays the IGMP version.
Expires	Displays the time remaining until a Mrouter port is deleted from the Multicast IGMP table.

### *IGMP Snooping Multicast Router Ports*

The following table describes the IGMP Multicast Router Ports information fields.

**Table 12-6** Mrouter Ports information

Field	Description
Group	Displays the VSG number.
VLAN	Displays the VLAN number of the IGMP Multicast Group.
Port	Displays the port numbers of ports that carry IGMP Multicast traffic for the group. <b>Note:</b> If a switch is part of a multi-switch stack, the displayed number indicates the Configured Switch number ( <i>cnum</i> ) followed by the port number. See “Stacking Port Numbers” on page 54 for more information.
Version	Displays the IGMP version.
Expires	Displays the time remaining until a Mrouter port is deleted from the Multicast IGMP table.
Max Query Resp. Time	Displays the snooped value of the Maximum Response Time in IGMP query packet.



# IP Information

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## *IP Interfaces*

The following table describes the IP information fields.

**Table 12-7** Interface information

Field	Description
Status	Shows the IP Interface status: enabled, disabled, or enabled but down.
IP Interface ID	Displays the numeric identifier of the IP Interface.
IP Address	Displays the IP address of the IP Interface.
Subnet Mask	Displays the Subnet Mask of the IP Interface.
Broadcast Address	Displays the IP Broadcast address for this IP Interface.
Group	Displays the VSG of the interface.
SMVLAN	Displays the VLAN number for this interface. Each interface can belong to one VLAN, although any VLAN can have multiple IP interfaces in it.

## *Default Gateways*

The following table describes the Default Gateway information fields.

**Table 12-8** Default Gateway information

Field	Description
Default Gateway ID	Displays the ID number of the default gateway.
IP Address	Displays the gateway IP address.
Status	Displays the operational status of the gateway (enabled or disabled).

## Link Status Information

---

The following table describes the Link Status information fields.

**Table 12-9** Link Status information

Field	Description
Port	Displays the port name and number. <b>Note:</b> If a switch is part of a multi-switch stack, the displayed number indicates the Configured Switch number ( <i>csnum</i> ) followed by the port number. See <a href="#">“Stacking Port Numbers” on page 54</a> for more information.
Speed	Displays the port speed.
Duplex	Displays the port duplex mode (half, full, or any)
Flow Control	Displays the port's flow control setting (yes or no)
Link	Displays the port's link status (up, down, disabled)

## ServerMobility

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These windows display information about the ServerMobility feature:

- [“ServerMobility General Information” on page 145](#)
- [“ServerMobility Port Information” on page 146](#)

### ServerMobility General Information

The following table describes the general ServerMobility information fields.

**Table 12-10** ServerMobility General information

Field	Description
ServerMobility settings	Displays the current ServerMobility status (enabled or disabled).
ServerMobility Encoding Scheme	Displays the current scheme used for encoding the Client Identifier (option 61) and Relay Agent Information (option 82) in DHCP request packets.
ServerMobility ports	Displays the ports that have ServerMobility enabled.
DHCP request filtering enabled ports	Displays the ports on which filtering of DHCP request information is enabled.
Relay on non-ServerMobility ports	Displays the current BOOTP relay status (enabled or disabled) for all ports that have ServerMobility disabled.
Active-Backup ports	Displays the active ServerMobility ports and their backup ports.
Auto-Recovery	Displays the current DHCP failover status (enabled or disabled) of ServerMobility ports.
Auto-Recovery Time	Displays the current lease time of the temporary IP addresses that are assigned by the switch to blade servers connected to a backup (standby) ServerMobility ports.

---

**Note** – For port numbers, if a switch is part of a multi-switch stack, the displayed number indicates the Configured Switch number (*csnum*) followed by the port number. See [“Stacking Port Numbers” on page 54](#) for more information.

---

*See also:*

- [“ServerMobility General Configuration” on page 115](#)
- [“ServerMobility Port Information” on page 146](#)

## ServerMobility Port Information

The following table describes the ServerMobility Port information fields.

**Table 12-11** Server Mobility Port information

Field	Description
client-id	Displays the client identifier value (option 61) that will be encoded by the switch in the DHCP request packets received on the port.
agent.circuit-id	Displays the relay agent circuit ID sub-option value that will be encoded in the DHCP request packets received on the port.
agent.remote-id	Displays the relay agent remote ID sub-option value that will be encoded in the DHCP request packets received on the port.
Server Mobility	Displays the current ServerMobility status of the port (enabled or disabled).
Filtering	Displays the current DHCP filtering status of the port (enabled or disabled).
Failover Port	Displays the backup port or the active port associated with the port.
Failover State	<p>Displays the current failover status of the port, as follows:</p> <ul style="list-style-type: none"> <li>■ active</li> <li>■ standby</li> <li>■ fail</li> </ul> <p>If the failover state of the port is <i>active</i>, DHCP requests received on the port will be relayed by the switch.</p> <p>If the failover state is <i>standby</i> or <i>fail</i>, the DHCP requests will not be relayed. The switch will respond to DHCP requests received on standby ports with a temporary IP address.</p>

### See also:

- [“ServerMobility General Configuration” on page 115](#)
- [“ServerMobility Port Information” on page 146](#)

## SNMPv3 Information

The following table describes the SNMPv3 information fields.

**Table 12-12** SNMPv3 information

Field	Description
Engine ID	Displays the unique identifier for the SNMP engine.
<b>usmUser Table</b>	
User Name	This text string represents the name of the user that you can use to access the switch.
Authentication Protocol	This indicates whether messages sent on behalf of this user can be authenticated, and if so, the type of authentication protocol which is used. VSE SmartConnect software supports two authentication algorithms: MD5 and HMAC-SHA.
Privacy Protocol	This indicates whether messages sent on behalf of this user are protected from disclosure, and if so, the type of privacy protocol which is used. VSE SmartConnect software supports DES algorithm for privacy.
<b>vacmAccess Table</b>	
Group Name	Displays the name of group.
Prefix	Displays the prefix that is configured to match the values.
Model	Displays the security model used, for example, SNMPv1, or SNMPv2 or USM.
Level	Displays the minimum level of security required to gain rights of access. For example, <i>noAuthNoPriv</i> , <i>authNoPriv</i> , or <i>authPriv</i> .
Match	Displays the match for the <i>contextName</i> . The options are: <i>exact</i> and <i>prefix</i> .
ReadV	Displays the MIB view to which this entry authorizes the read access.
WriteV	Displays the MIB view to which this entry authorizes the write access.
NotifyV	Displays the Notify view to which this entry authorizes the notify access.
<b>vacmViewTreeFamily Table</b>	
View Name	Displays the name of the view.
Subtree	Displays the MIB subtree as an OID string. A view subtree is the set of all MIB object instances which have a common Object Identifier prefix to their names.
Mask	Displays the bit mask.

**Table 12-12** SNMPv3 information (continued)

Field	Description
Type	Displays whether a family of <i>view subtrees</i> is included or excluded from the MIB view.
<b>vacmSecurityToGroup Table</b>	
Sec Model	Displays the security model used, which is any one of: <i>USM</i> , <i>SNMPv1</i> , <i>SNMPv2</i> , and <i>SNMPv3</i> .
User Name	Displays the name for the group.
Group Name	Displays the access name of the group.
<b>snmpCommunity Table</b>	
Index	Displays the unique index value of a row in this table.
Name	Displays the community string, for which a row in this table represents the configuration.
User Name	Displays the User Security Model (USM) user name.
Group Name	To be added
<b>snmpCommunity Table</b>	
Index	Displays the unique index value of a row in this table
Name	Displays the community string, which represents the configuration.
User Name	Displays the User Security Model (USM) user name.
Tag	Displays the community tag. This tag specifies a set of transport endpoints from which a command responder application accepts management requests and to which a command responder application sends a SNMP trap.
<b>snmpNotify Table</b>	
Name	The locally arbitrary, but unique identifier associated with this <i>snmpNotifyEntry</i> .
Tag	This represents a single tag value which is used to select entries in the <i>snmpTargetAddrTable</i> . Any entry in the <i>snmpTargetAddrTable</i> that contains a tag value equal to the value of this entry, is selected. If this entry contains a value of zero length, no entries are selected.
<b>snmpTargetAddr Table</b>	
Name	Displays the locally arbitrary, but unique identifier associated with this <i>snmpTargetAddrEntry</i> .
Transport Addr	Displays the transport addresses.
Port	Displays the SNMP UDP port number.

**Table 12-12** SNMPv3 information (continued)

Field	Description
Taglist	This column contains a list of tag values which are used to select target addresses for a particular SNMP message.
Params	The value of this object identifies an entry in the <i>snmpTargetParamsTable</i> . The identified entry contains SNMP parameters to be used when generating messages to be sent to this transport address.
<b>snmpTargetParams Table</b>	
Name	Displays the locally arbitrary, but unique identifier associated with this <i>snmpTargetParamsEntry</i> .
MP Model	Displays the Message Processing Model used when generating SNMP messages using this entry.
User Name	Displays the <i>securityName</i> , which identifies the entry on whose behalf SNMP messages will be generated using this entry.
Sec Model	Displays the security model used when generating SNMP messages using this entry. The system may choose to return an <i>inconsistentValue</i> error if an attempt is made to set this variable to a value for a security model which the system does not support.
Sec Level	Displays the level of security used when generating SNMP messages using this entry.

## Syslog Messages

This window lists the most recently logged system messages.

*See also:*

- [“Syslog Settings” on page 129](#)

## Port Transceiver Status

The following table describes the Transceiver information fields.

**Table 12-13** Transceiver information

Field	Description
Port	Displays the port number and SFP/XFP number.
Device	Displays the transmission media and device type for the port, as follows: <ul style="list-style-type: none"> <li>■ Media:               <ul style="list-style-type: none"> <li><input type="checkbox"/> CU (Copper SFP)</li> <li><input type="checkbox"/> FI (Fiber SFP)</li> <li><input type="checkbox"/> SR (Short Range XFP)</li> <li><input type="checkbox"/> LR (Long Range XFP)</li> </ul> </li> <li>■ Device: SFP or XFP module</li> </ul>
TX-Enable	Displays the transmission status of the module (enabled or disabled).
RX-Signal	Displays the link state of the module port (OK or LOST).
TX-Fault	Displays the fault status of the module (none or FAULT).

## Trunk Groups Information

The following table describes the Trunk Group (Portchannel) information fields.

**Table 12-14** Trunk Group information

Field	Description
Trunk Group	Displays the Trunk number.
Protocol	Displays the protocol used by the trunk (static or LACP)
Virtual Switch Group	Displays the VSG supported by the trunk.
Switch Port	Lists the port members of the trunk. <b>Note:</b> If a switch is part of a multi-switch stack, the displayed number indicates the Configured Switch number ( <i>csnum</i> ) followed by the port number. See “Stacking Port Numbers” on page 54 for more information.
Status	Displays the status of the trunk.



## User Information

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The following table describes the User information fields.

**Table 12-15** User Access information

Field	Description
User ID	Displays the numeric identifier for the user.
User Name	Displays the name of the user.
COS	Displays the Class of Service level for the user.
Password	Indicates whether a valid password is defined for the user.
Status	Displays whether the user is enabled or disabled.
Login	Displays the login status of the user (online or offline).

Built-in user accounts are always available. This page lists the built-in accounts, and displays the status (enabled or disabled) and whether a user is online or offline.

## Virtual Machine Group Information

---

The following table describes the VM Group information fields.

**Table 12-16** VM Group information

Field	Description
IP Address	Displays the IP address of the Virtual Machine.
MAC Address	Displays the MAC address of the Virtual Machine.
Port	Displays the switch port where the Virtual Machine is connected.
VLAN	Displays the VLAN of the Virtual Machine.
Group	Displays the VSG to which the Virtual Machine belongs.

*See also:*

- [“Assigning Virtual Machines to VSGs” on page 97](#)
- [“VM Pre-provisioning” on page 97](#)



## CHAPTER 13

# Switch Statistics

---

These windows provide collective packet and event counters for a variety of switch transactions:

- “Access Control List Statistics” on page 153
- “FDB Statistics” on page 154
- “Layer 3 Statistics” on page 154
- “IGMP Group Snooping Statistics Summary” on page 158
- “IP Statistics” on page 159
- “MP-Specific Information” on page 160
- “Network Time Protocol Statistics” on page 162
- “Port Statistics” on page 162

## Access Control List Statistics

---

The following table describes the ACL statistics fields.

**Table 13-1** ACL Statistics

Field	Description
ACL	Numeric identifier of each ACL.
Hits	Number of times the ACL was activated.
Clear	To be added

## FDB Statistics

---

The following table describes the Forwarding Database statistics fields.

**Table 13-2** FDB Statistics

Field	Description
current	Current number of entries in the Forwarding Database.
hiwat	Highest number of entries recorded at any given time in the Forwarding Database.

To clear FDB statistics, select **Clear** in the Clear FDB Statistics field and click **Submit**.

## Layer 3 Statistics

---

### *Address Resolution Protocol Statistics*

The following table describes the Address Resolution Protocol statistics fields.

**Table 13-3** ARP Statistics

Field	Description
Current Entries	The total number of outstanding ARP entries in the ARP table.
High Water Mark	The highest number of ARP entries ever recorded in the ARP table.
Maximum Entries	The maximum number of ARP entries that are supported.

To clear ARP statistics, select **clear** in the Clear ARP Statistics field and click **Submit**.

## ICMP Statistics

The following table describes the ICMP statistics fields.

**Table 13-4** ICMP Statistics

Field	Description
icmpInMsgs	The total number of ICMP messages which the entity (the switch) received. Note that this counter includes all those counted by <code>icmpInErrors</code> .
icmpInErrors	The number of ICMP messages which the entity (the switch) received but determined as having ICMP-specific errors (bad ICMP checksums, bad length, and so forth).
icmpInDestUnreachs	The number of ICMP Destination Unreachable messages received.
icmpInTimeExcds	The number of ICMP Time Exceeded messages received.
icmpInParmProbs	The number of ICMP Parameter Problem messages received.
icmpInSrcQuenchs	The number of ICMP Source Quench (buffer almost full, stop sending data) messages received.
icmpInRedirects	The number of ICMP Redirect messages received.
icmpInEchos	The number of ICMP Echo (request) messages received.
icmpInEchoReps	The number of ICMP Echo Reply messages received.
icmpInTimestamps	The number of ICMP Timestamp (request) messages received.
icmpInTimestampReps	The number of ICMP Timestamp Reply messages received.
icmpInAddrMasks	The number of ICMP Address Mask Request messages received.
icmpInAddrMaskReps	The number of ICMP Address Mask Reply messages received.
icmpOutMsgs	The total number of ICMP messages which this entity (the switch) attempted to send. Note that this counter includes all those counted by <code>icmpOutErrors</code> .
icmpOutErrors	The number of ICMP messages which this entity (the switch) did not send due to problems discovered within ICMP such as a lack of buffer. This value should not include errors discovered outside the ICMP layer such as the inability of IP to route the resultant datagram. In some implementations there may be no types of errors that contribute to this counter's value.
icmpOutDestUnreachs	The number of ICMP Destination Unreachable messages sent.
icmpOutTimeExcds	The number of ICMP Time Exceeded messages sent.
icmpOutParmProbs	The number of ICMP Parameter Problem messages sent.
icmpOutSrcQuenchs	The number of ICMP Source Quench (buffer almost full, stop sending data) messages sent.

**Table 13-4** ICMP Statistics (continued)

Field	Description
icmpOutRedirects	The number of ICMP Redirect messages sent. For a host, this object will always be zero, since hosts do not send redirects.
icmpOutEchos	The number of ICMP Echo (request) messages sent.
icmpOutEchoReps	The number of ICMP Echo Reply messages sent.
icmpOutTimestamps	The number of ICMP Timestamp (request) messages sent.
icmpOutTimestampReps	The number of ICMP Timestamp Reply messages sent.
icmpOutAddrMasks	The number of ICMP Address Mask Request messages sent.
icmpOutAddrMaskReps	The number of ICMP Address Mask Reply messages sent.

To clear ICMP statistics, select **clear** in the Clear ICMP Statistics field and click **Submit**.

### TCP Statistics

The following table describes the TCP statistics fields.

**Table 13-5** TCP Statistics

Field	Description
tcpRtoAlgorithm	The algorithm used to determine the <code>timeout</code> value used for retransmitting unacknowledged octets.
tcpRtoMin	The minimum value permitted by a TCP implementation for the retransmission <code>timeout</code> , measured in milliseconds. More refined semantics for objects of this type depend upon the algorithm used to determine the retransmission <code>timeout</code> . In particular, when the <code>timeout</code> algorithm is <code>rsre(3)</code> , an object of this type has the semantics of the <code>LBOUND</code> quantity described in RFC 793.
tcpRtoMax	The maximum value permitted by a TCP implementation for the retransmission <code>timeout</code> , measured in milliseconds. More refined semantics for objects of this type depend upon the algorithm used to determine the retransmission <code>timeout</code> . In particular, when the <code>timeout</code> algorithm is <code>rsre(3)</code> , an object of this type has the semantics of the <code>UBOUND</code> quantity described in RFC 793.
tcpMaxConn	The limit on the total number of TCP connections the entity (the switch) can support. In entities where the maximum number of connections is dynamic, this object should contain the value -1.
tcpActiveOpens	The number of times TCP connections have made a direct transition to the <code>SYN-SENT</code> state from the <code>CLOSED</code> state.
tcpPassiveOpens	The number of times TCP connections have made a direct transition to the <code>SYN-RCVD</code> state from the <code>LISTEN</code> state.

**Table 13-5** TCP Statistics (continued)

Field	Description
tcpAttemptFails	The number of times TCP connections have made a direct transition to the CLOSED state from either the SYN-SENT state or the SYN-RCVD state, plus the number of times TCP connections have made a direct transition to the LISTEN state from the SYN-RCVD state.
tcpEstabResets	The number of times TCP connections have made a direct transition to the CLOSED state from either the ESTABLISHED state or the CLOSE-WAIT state.
tcpInSegs	The total number of segments received, including those received in error. This count includes segments received on currently established connections.
tcpOutSegs	The total number of segments sent, including those on current connections but excluding those containing only retransmitted octets.
tcpRetransSegs	The total number of segments retransmitted - that is, the number of TCP segments transmitted containing one or more previously transmitted octets.
tcpInErrs	The total number of segments received in error (for example, bad TCP checksums).
tcpCurBuff	The total number of outstanding memory allocations from heap by TCP protocol stack.
tcpCurConn	The total number of outstanding TCP sessions that are currently opened.
tcpOutRsts	The number of TCP segments sent containing the RST flag.

To clear TCP statistics, select **clear** in the Clear TCP Statistics field and click **Submit**.

### UDP Statistics

The following table describes the UDP statistics fields.

**Table 13-6** UDP Statistics

Field	Description
udpInDatagrams	The total number of UDP datagrams delivered to the switch.
udpOutDatagrams	The total number of UDP datagrams sent from this entity (the switch).
udpInErrors	The number of received UDP datagrams that could not be delivered for reasons other than the lack of an application at the destination port.
udpNoPorts	The total number of received UDP datagrams for which there was no application at the destination port.

To clear UDP statistics, select **clear** in the Clear UDP Statistics field and click **Submit**.

## IGMP Group Snooping Statistics Summary

---

The following table describes the IGMP Snooping statistics fields.

**Table 13-7** IGMP Snooping Statistics

Field	Description
Group #	Displays the Switch Group number.
rxIgmpValidPkts	Total number of valid IGMP packets received
rxIgmpInvalidPkts	Total number of invalid packets received
rxIgmpGenQueries	Total number of General Membership Query packets received
rxIgmpReports	Total number of Membership Reports received

To clear IGMP statistics, select **clear** in the Clear IGMP Statistics field and click **Submit**.



## IP Statistics

The following table describes the Internet Protocol statistics fields.

**Table 13-8** IP Statistics

Field	Description
ipInReceives	The total number of input datagrams received from interfaces, including those received in error.
ipInHdrErrors	The number of input datagrams discarded due to errors in their IP headers, including bad checksums, version number mismatch, other format errors, time-to-live exceeded, errors discovered in processing their IP options, and so forth.
ipInAddrErrors	The number of input datagrams discarded because the IP address in their IP header's destination field was not a valid address to be received at this entity (the switch). This count includes invalid addresses (for example, 0.0.0.0) and addresses of unsupported Classes (for example, Class E). For entities which are not IP Gateways and therefore do not forward datagrams, this counter includes datagrams discarded because the destination address was not a local address.
ipForwDatagrams	The number of input datagrams for which this entity (the switch) was not their final IP destination, as a result of which an attempt was made to find a route to forward them to that final destination. In entities which do not act as IP Gateways, this counter will include only those packets, which were Source-Routed via this entity (the switch), and the Source-Route option processing was successful.
ipInUnknownProtos	The number of locally addressed datagrams received successfully but discarded because of an unknown or unsupported protocol.
ipInDiscards	The number of input IP datagrams for which no problems were encountered to prevent their continued processing, but which were discarded (for example, for lack of buffer space). Note that this counter does not include any datagrams discarded while awaiting re-assembly.
ipInDelivers	The total number of input datagrams successfully delivered to IP user-protocols (including ICMP).
ipOutRequests	The total number of IP datagrams which local IP user-protocols (including ICMP) supplied to IP in requests for transmission. Note that this counter does not include any datagrams counted in <code>ipForwDatagrams</code> .
ipOutDiscards	The number of output IP datagrams for which no problem was encountered to prevent their transmission to their destination, but which were discarded (for example, for lack of buffer space). Note that this counter would include datagrams counted in <code>ipForwDatagrams</code> if any such packets met this (discretionary) discard criterion.

Table 13-8 IP Statistics (continued)

Field	Description
ipOutNoRoutes	The number of IP datagrams discarded because no route could be found to transmit them to their destination. Note that this counter includes any packets counted in <code>ipForwDatagrams</code> , which meet this <i>no-route</i> criterion. Note that this includes any datagrams which a host cannot route because all of its default gateways are down.
ipReasmReqds	The number of IP fragments received which needed to be reassembled at this entity (the switch).
ipReasmOKs	The number of IP datagrams successfully re- assembled.
ipReasmFails	The number of failures detected by the IP re- assembly algorithm (for whatever reason: timed out, errors, and so forth). Note that this is not necessarily a count of discarded IP fragments since some algorithms (notably the algorithm in RFC 815) can lose track of the number of fragments by combining them as they are received.
ipFragOKs	The number of IP datagrams that have been successfully fragmented at this entity (the switch).
ipFragFails	The number of IP datagrams that have been discarded because they needed to be fragmented at this entity (the switch) but could not be, for example, because their <code>Don't Fragment</code> flag was set.
ipFragCreates	The number of IP datagram fragments that have been generated as a result of fragmentation at this entity (the switch).
ipRoutingDiscards	The number of routing entries, which were chosen to be discarded even though they are valid. One possible reason for discarding such an entry could be to free-up buffer space for other routing entries.
ipDefaultTTL	The default value inserted into the <code>Time-To-Live</code> (TTL) field of the IP header of datagrams originated at this entity (the switch), whenever a TTL value is not supplied by the transport layer protocol.
ipReasmTimeout	The maximum number of seconds, which received fragments are held while they are awaiting reassembly at this entity (the switch).

To clear IP statistics, select **clear** in the Clear IP Statistics field and click **Submit**.

## MP-Specific Information

These windows provide information about the switch's internal processors:

- [“CPU Utilization” on page 161](#)
- [“MP Packet Statistics” on page 161](#)

## CPU Utilization

The following table describes the CPU Utilization fields.

**Table 13-9** CPU Utilization

Field	Description
CpuUtil1Second	The utilization of MP CPU over 1 second. It shows the percentage.
CpuUtil4Seconds	The utilization of MP CPU over 4 seconds. It shows the percentage.
CpuUtil64Seconds	The utilization of MP CPU over 64 seconds. It shows the percentage.

## MP Packet Statistics

The following table describes the MP Packet statistics fields.

**Table 13-10** MP Packet Statistics

Field	Description
allocs	Total number of packet allocations from the packet buffer pool by the TCP/IP protocol stack.
frees	Total number of times the packet buffers are freed (released) to the packet buffer pool by the TCP/IP protocol stack.
mediums	Total number of packet allocations with size between 128 to 1536 bytes from the packet buffer pool by the TCP/IP protocol stack.
mediums hi-watermark	The highest number of packet allocation with size between 128 to 1536 bytes from the packet buffer pool by the TCP/IP protocol stack.
jumbos	Total number of packet allocation with size more than 1536 bytes from the packet buffer pool by the TCP/IP protocol stack.
jumbos hi-watermark	The highest number of packet allocations with more than 1536 bytes from the packet buffer pool by the TCP/IP protocol stack.
smalls	Total number of packet allocations with size less than 128 bytes from the packet buffer pool by the TCP/IP protocol stack.
smalls hi-watermark	The highest number of packet allocation with size less than 128 bytes from the packet buffer pool by the TCP/IP protocol stack.
pkt_hdrs	Total number of packet headers from the packet buffer pool by the TCP/IP protocol stack.
pkt_hdr hi-watermark	The highest number of packet headers from the packet buffer pool by the TCP/IP protocol stack.
failures	Total number of packet allocation failures from the packet buffer pool by the TCP/IP protocol stack.

## Network Time Protocol Statistics

---

The following table describes the NTP statistics fields.

**Table 13-11** NTP Statistics

Field	Description
Request Sent	The total number of NTP requests the switch sent to the primary NTP server to synchronize time.
Response Received	The total number of NTP responses received from the primary NTP server.
Updates	The total number of times the switch updated its time based on the NTP responses received from the primary NTP server.
Last update time	The time stamp showing the time when the switch was last updated.
Current system time	The current switch system time.

To clear these statistics, select **clear** in the Clear NTP Statistics field and click **Submit**.

## Port Statistics

---

### *Switch Ports Statistics Summary*

The following table describes the switch port statistics fields.

**Table 13-12** Port Statistics

Field	Description
Switch Port	Port identifier. <b>Note:</b> If a switch is part of a multi-switch stack, the displayed number indicates the Configured Switch number ( <i>csnum</i> ) followed by the port number. See <a href="#">“Stacking Port Numbers”</a> on page 54 for more information.
InOctets	The total number of octets received on the interface, including framing characters.
OutOctets	The total number of octets transmitted out of the interface, including framing characters.
Total Errors	The number of packets that could not be transmitted because of errors.

To clear port statistics, click **Clear all ports statistics**.

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