

Send document comments to vsg-docfeedback@cisco.com.



Cisco Virtual Security Gateway for Nexus 1000V Series Switch Configuration Guide, Release 4.2(1)VSG1(1)

April 11, 2014

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
<http://www.cisco.com>
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

Text Part Number: OL-24378-01

THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS MANUAL ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY PRODUCTS.

THE SOFTWARE LICENSE AND LIMITED WARRANTY FOR THE ACCOMPANYING PRODUCT ARE SET FORTH IN THE INFORMATION PACKET THAT SHIPPED WITH THE PRODUCT AND ARE INCORPORATED HEREIN BY THIS REFERENCE. IF YOU ARE UNABLE TO LOCATE THE SOFTWARE LICENSE OR LIMITED WARRANTY, CONTACT YOUR CISCO REPRESENTATIVE FOR A COPY.

The Cisco implementation of TCP header compression is an adaptation of a program developed by the University of California, Berkeley (UCB) as part of UCB's public domain version of the UNIX operating system. All rights reserved. Copyright © 1981, Regents of the University of California.

NOTWITHSTANDING ANY OTHER WARRANTY HEREIN, ALL DOCUMENT FILES AND SOFTWARE OF THESE SUPPLIERS ARE PROVIDED "AS IS" WITH ALL FAULTS. CISCO AND THE ABOVE-NAMED SUPPLIERS DISCLAIM ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OR ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE.

IN NO EVENT SHALL CISCO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF CISCO OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Cisco and the Cisco Logo are trademarks of Cisco Systems, Inc. and/or its affiliates in the U.S. and other countries. A listing of Cisco's trademarks can be found at www.cisco.com/go/trademarks. Third party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1005R)

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

Cisco Virtual Security Gateway for Nexus 1000V Series Switch Configuration Guide, Release 4.2(1)VSG1(1)
© 2011 Cisco Systems, Inc. All rights reserved.



Preface	v
Audience	v
Document Organization	v
Document Conventions	vi
Related Documentation	vii
Cisco Virtual Security Gateway Documentation	vii
Cisco Virtual Network Management Center Documentation	vii
Cisco Nexus 1000V Series Switch Documentation	viii
Obtaining Documentation and Submitting a Service Request	viii

CHAPTER 1

Cisco Virtual Security Gateway Overview	1-1
Information About the Cisco Virtual Security Gateway	1-1
Overview	1-1
Product Architecture	1-2
Trusted Multitenant Access	1-4
Dynamic (Virtualization-Aware) Operation	1-4
Cisco Virtual Security Gateway Configuration for the Network	1-5
Setting Up Cisco VSGs and VLANs	1-5
Cisco VSG Configuration Overview	1-6
Cisco Nexus 1000V Series Switch VSM	1-7
Port Profile	1-7
Virtual Security Gateway	1-7
Security Profile	1-7
Firewall Policy	1-8
Service Firewall Logging	1-9
Sequence in Configuring a Cisco VSG	1-9

CHAPTER 2

Cisco Virtual Security Gateway Command-Line Interface	2-1
Information About the CLI Prompt	2-1
Command Modes	2-2
Information About Command Modes	2-2
EXEC Command Mode	2-3
Global Configuration Command Mode	2-3

- Exiting a Configuration Mode 2-3
- Command Mode Summary 2-4
- Saving CLI Configuration Changes 2-4
 - Running Configuration 2-4
 - Startup Configuration 2-4
 - Copying the Running Configuration to the Startup Configuration 2-5
- Special Characters 2-5
- Keystroke Shortcuts 2-5
- Abbreviating Commands 2-7
- Using the no Form of a Command 2-7
- Using Help 2-7

CHAPTER 3

Configuring the Cisco Virtual Security Gateway Port Profile on the Cisco Nexus 1000V Series Switch 3-1

- Configuring the Cisco VSG Port Profile on the Cisco Nexus 1000V Series Switch VSM for Protection from Service Loss 3-1
- Verifying the Cisco VSG Configuration 3-4
- Where to Go Next 3-4

CHAPTER 4

Cisco Virtual Security Gateway System Management 4-1

- Information About VSG System Management 4-1
- Changing the Cisco VSG Instance Name 4-2
- Configuring a Message of the Day 4-2
- Verifying the Configuration 4-3
 - Verifying the Software and Hardware Versions 4-3
 - Verifying the Running Configuration 4-4
 - Comparing the Startup and Running Configurations 4-6
 - Displaying Interface Configurations 4-7
 - Displaying a Brief View of a Specific Interface Configuration 4-7
 - Displaying a Detailed View of a Specific Interface Configuration 4-8
 - Displaying a Brief View of All Interfaces 4-9
 - Verifying the Running Configuration for All Interfaces 4-9
- Saving a Configuration 4-10
- Erasing a Configuration 4-11
- Displaying a Cisco VSG Instance 4-11
- Navigating the File System 4-12
 - Specifying File Systems 4-12
 - Identifying Your Current Working Directory 4-13

Changing Your Directory	4-13
Listing the Files in a File System	4-14
Identifying Available File Systems for Copying Files	4-15
Using Tab Completion	4-16
Copying and Backing Up Files	4-17
Creating a Directory	4-18
Removing an Existing Directory	4-18
Moving Files	4-19
Deleting Files or Directories	4-19
Compressing Files	4-20
Uncompressing Files	4-21
Directing Command Output to a File	4-22
Verifying a Configuration File Before Loading	4-23
Reverting to a Previous Configuration	4-24
Displaying Files	4-24
Displaying File Contents	4-25
Displaying Directory Contents	4-25
Displaying File Checksums	4-26
Displaying the Last Lines in a File	4-27
Displaying the Current User Access	4-27
Sending a Message to Users	4-28

CHAPTER 5**Cisco Virtual Security Gateway High Availability 5-1**

Information About High Availability	5-1
Redundancy	5-2
Isolation of Processes	5-2
Cisco VSG Failover	5-3
System-Control Services	5-3
System Manager	5-4
Persistent Storage Service	5-4
Message and Transaction Service	5-4
HA Policies	5-4
Cisco VSG HA Pairs	5-5
Cisco VSG Roles	5-5
HA Pair States	5-5
Cisco VSG HA Pair Synchronization	5-5
Cisco VSG HA Pair Failover	5-6
Failover Characteristics	5-6

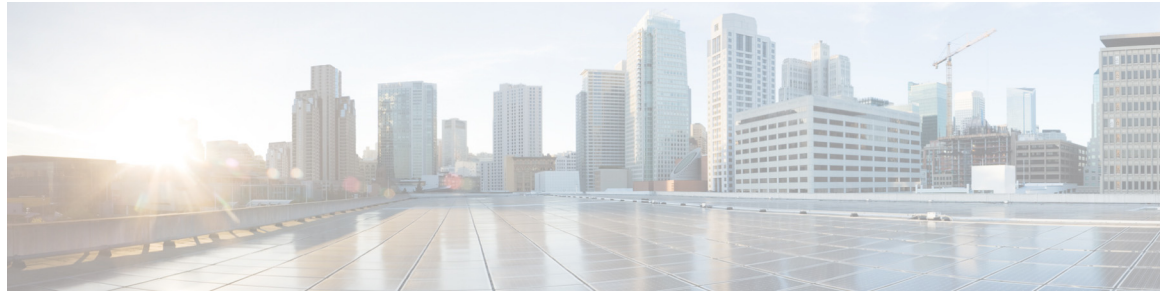
- Automatic Failover 5-6
- Manual Failover 5-7
- Cisco VSG HA Guidelines and Limitations 5-7
- Changing the Cisco VSG Role 5-7
- Configuring a Failover 5-9
 - Guidelines and Limitations 5-9
 - Verifying that a Cisco VSG Pair is Ready for a Failover 5-9
 - Manually Switching the Active Cisco VSG to Standby 5-10
- Assigning IDs to HA Pairs 5-12
- Pairing a Second Cisco VSG with an Active Cisco VSG 5-13
 - Changing the Standalone Cisco VSG to a Primary Cisco VSG 5-13
 - Verifying the Change to a Cisco VSG HA Pair 5-15
- Replacing the Standby Cisco VSG in an HA Pair 5-15
- Replacing the Active Cisco VSG in an HA Pair 5-16
- Verifying HA Status 5-17

CHAPTER 6

Cisco Virtual Security Gateway Firewall Profiles and Policy Objects 6-1

- Information About Cisco VSG Firewall Policy Objects 6-1
- Cisco VSG Prerequisites, Guidelines, and Limitations 6-1
- Default Settings 6-2
- Cisco VSG Firewall Policy Objects 6-2
 - Zones 6-3
 - Object Groups 6-3
 - Rules 6-3
 - Policies 6-4
 - Cisco Virtual Security Gateway Attributes 6-4
 - Information About Attribute Name Notations 6-4
 - Attribute Classes 6-5
 - Security Profiles 6-7
 - Viewing Security Profiles and Policies on the Cisco VNMC and the Cisco VSG 6-8
- Service Firewall Logging 6-10
- Verifying the Cisco VSG Configuration 6-11
- Configuration Limits 6-12

INDEX



Preface

This preface describes the audience, organization, and conventions of the *Cisco Virtual Security Gateway for Nexus 1000V Series Switch Configuration Guide, Release 4.2(1)VSG1(1)*. It also provides information about how to obtain related documentation.

This preface includes the following sections:

- [Audience, page v](#)
- [Document Organization, page v](#)
- [Document Conventions, page vi](#)
- [Related Documentation, page vii](#)
- [Obtaining Documentation and Submitting a Service Request, page viii](#)

Audience

This publication is for those who have an understanding of virtualization and experience with using VMware tools to create virtual machines and have the following responsibilities:

- Security Administration—Define and administer security policies and rules.
- Network Administration—Manage and associate the security policies to particular port profiles.
- ESX Server Administration—Select the appropriate port-group (Cisco Nexus 1000V equivalent port-profile) for the particular virtual machines (VM).



Note

Knowledge of VMware vNetwork Distributed Switch is not a prerequisite.

Document Organization

This document is organized as follows:

Chapter and Title	Description
Chapter 1, “Cisco Virtual Security Gateway Overview”	Provides an overview of the Cisco Virtual Security Gateway.
Chapter 2, “Cisco Virtual Security Gateway Command-Line Interface”	Describes how to use the CLI on a Cisco Virtual Security Gateway.

Chapter and Title	Description
Chapter 3, “Configuring the Cisco Virtual Security Gateway Port Profile on the Cisco Nexus 1000V Series Switch”	Describes how to configure the Cisco Virtual Security Gateway port profile on the Cisco Nexus 1000V Series switch for protecting network traffic.
Chapter 4, “Cisco Virtual Security Gateway System Management”	Describes CLI configurable aspects of the Cisco Virtual Security Gateway.
Chapter 5, “Cisco Virtual Security Gateway High Availability”	Describes Cisco Virtual Security Gateway high availability concepts and configuration.
Chapter 6, “Cisco Virtual Security Gateway Firewall Profiles and Policy Objects”	Describes how to verify Cisco Virtual Security Gateway firewall policy configurations.

Document Conventions

Command descriptions use these conventions:

Convention	Description
boldface font	Commands and keywords are in boldface.
<i>italic font</i>	Arguments for which you supply values are in italics.
{ }	Elements in curly brackets are required.
[]	Elements in square brackets are optional.
[x y z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.

Screen examples use these conventions:

screen font	Terminal sessions and information that the switch displays are in screen font.
boldface screen font	Information that you must enter is in boldface screen font.
<i>italic screen font</i>	Arguments for which you supply values are in italic screen font.
< >	Nonprinting characters, such as passwords, are in angle brackets.
[]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

This document uses the following conventions:



Note

Means reader *take note*. Notes contain helpful suggestions or references to material not covered in the manual.



Caution

Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

Related Documentation

This section contains information about the documentation available for Cisco Virtual Security Gateway and related products.

Cisco Virtual Security Gateway Documentation

The following Cisco Virtual Security Gateway for the Nexus 1000V Series Switch documents are available on Cisco.com at the following url:

http://www.cisco.com/en/US/products/ps13095/tsd_products_support_series_home.html

- *Cisco Virtual Security Gateway for Nexus 1000V Series Switch Release Notes, Release 4.2(1)VSG1(1)*
- *Cisco Virtual Security Gateway, Release 4.2(1)VSG1(1) and Cisco Virtual Network Management Center, Release 1.0.1 Installation Guide*
- *Cisco Virtual Security Gateway for Nexus 1000V Series Switch License Configuration Guide, Release 4.2(1)VSG1(1)*
- *Cisco Virtual Security Gateway for Nexus 1000V Series Switch Configuration Guide, Release 4.2(1)VSG1(1)*
- *Cisco Virtual Security Gateway for Nexus 1000V Series Switch Command Reference, Release 4.2(1)VSG1(1)*
- *Cisco Virtual Security Gateway for Nexus 1000V Series Switch Troubleshooting Guide, Release 4.2(1)VSG1(1)*

Cisco Virtual Network Management Center Documentation

The following Cisco Virtual Network Management Center documents are available on Cisco.com at the following url:

http://www.cisco.com/en/US/products/ps11213/tsd_products_support_series_home.html

- *Release Notes for Cisco Virtual Network Management Center, Release 1.0.1*
- *Cisco Virtual Security Gateway, Release 4.2(1)VSG1(1) and Cisco Virtual Network Management Center, Release 1.0.1 Installation Guide*
- *Cisco Virtual Network Management Center CLI Configuration Guide, Release 1.0.1*
- *Cisco Virtual Network Management Center GUI Configuration Guide, Release 1.0.1*
- *Cisco Virtual Network Management Center XML API Reference Guide, Release 1.0.1*

Cisco Nexus 1000V Series Switch Documentation

The Cisco Nexus 1000V Series Switch documents are available on Cisco.com at the following url:
http://www.cisco.com/en/US/products/ps9902/tsd_products_support_series_home.html

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>

Subscribe to the *What's New in Cisco Product Documentation* as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS version 2.0.



Cisco Virtual Security Gateway Overview

This chapter provides an overview of the Cisco Virtual Security Gateway (VSG) features for the Cisco Nexus 1000V Series switch software.

This chapter includes the following sections:

- [Information About the Cisco Virtual Security Gateway, page 1-1](#)
- [Cisco Virtual Security Gateway Configuration for the Network, page 1-5](#)

Information About the Cisco Virtual Security Gateway

This section provides an overview of the Cisco VSG for the Cisco Nexus 1000V Series switch and includes the following sections:

- [Overview, page 1-1](#)
- [Product Architecture, page 1-2](#)
- [Trusted Multitenant Access, page 1-4](#)
- [Dynamic \(Virtualization-Aware\) Operation, page 1-4](#)

Overview

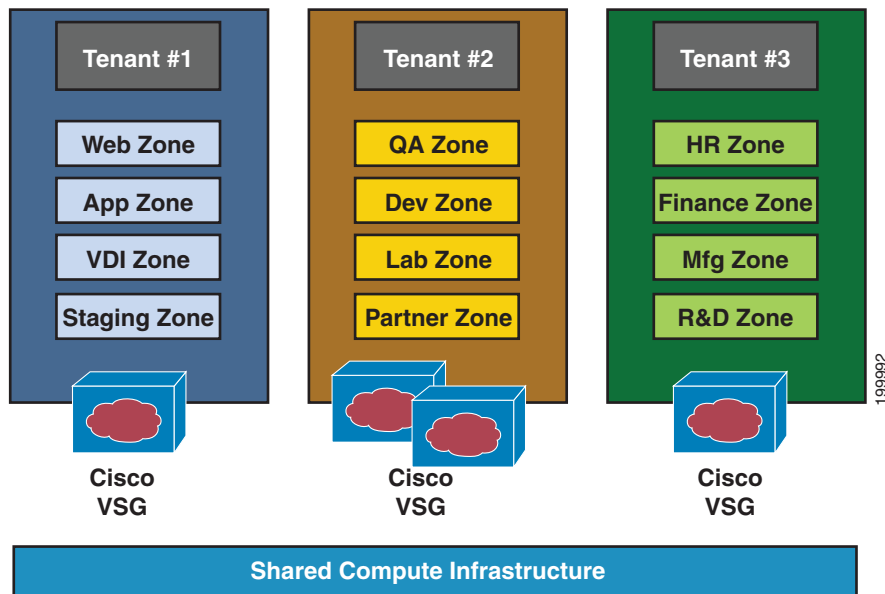
The Cisco Virtual Security Gateway (VSG) is a virtual firewall appliance that provides trusted access to virtual data center and cloud environments. The Cisco VSG enables a broad set of multitenant workloads that have varied security profiles to share a common compute infrastructure in a virtual data center private cloud or in a public cloud. By associating one or more virtual machines (VMs) into distinct trust zones, the Cisco VSG ensures that access to trust zones is controlled and monitored through established security policies.

Integrated with the Cisco Nexus 1000V Series switch and running on the Cisco NX-OS operating system, the Cisco VSG provides the following benefits (see [Figure 1-1](#)):

- **Trusted Multitenant Access**—Granular, zone-based control and monitoring with context-aware security policies applied in a multitenant (scale-out) environment to strengthen regulatory compliance and simplify audits. Security policies are organized into security profile templates to simplify their management and deployment across many Cisco VSGs.
- **Dynamic operation**—On-demand provisioning of security templates and trust zones during VM instantiation and mobility-transparent enforcement and monitoring as live migration of VMs occur across different physical servers.

- Nondisruptive administration—Administrative segregation across security and server teams while enhancing collaboration, eliminating administrative errors, and simplifying audits.

Figure 1-1 *Trusted Zone-Based Access Control Using Per-Tenant Enforcement with the Cisco VSG*



The Cisco VSG provides the following advantages:

- Enhances compliance with industry regulations
- Simplifies audit processes in virtualized environments
- Reduces cost by securely deploying a broad set of virtualized workloads across multiple tenants on a shared compute infrastructure, whether in virtual data centers or private/public cloud computing environments

Product Architecture

The Cisco VSG operates with the Cisco Nexus 1000V distributed virtual switch in the VMware vSphere hypervisor, and the Cisco VSG leverages the virtual network service datapath (vPath) that is embedded in the Nexus 1000V Virtual Ethernet Module (VEM) (see [Figure 1-2](#)). vPath steers traffic, whether external to VM or VM to VM, to the Cisco VSG of a tenant. Initial packet processing occurs in the Cisco VSG for policy evaluation and enforcement. Once the policy decision is made, the Cisco VSG off-loads the policy enforcement of remaining packets to vPath. vPath supports the following features:

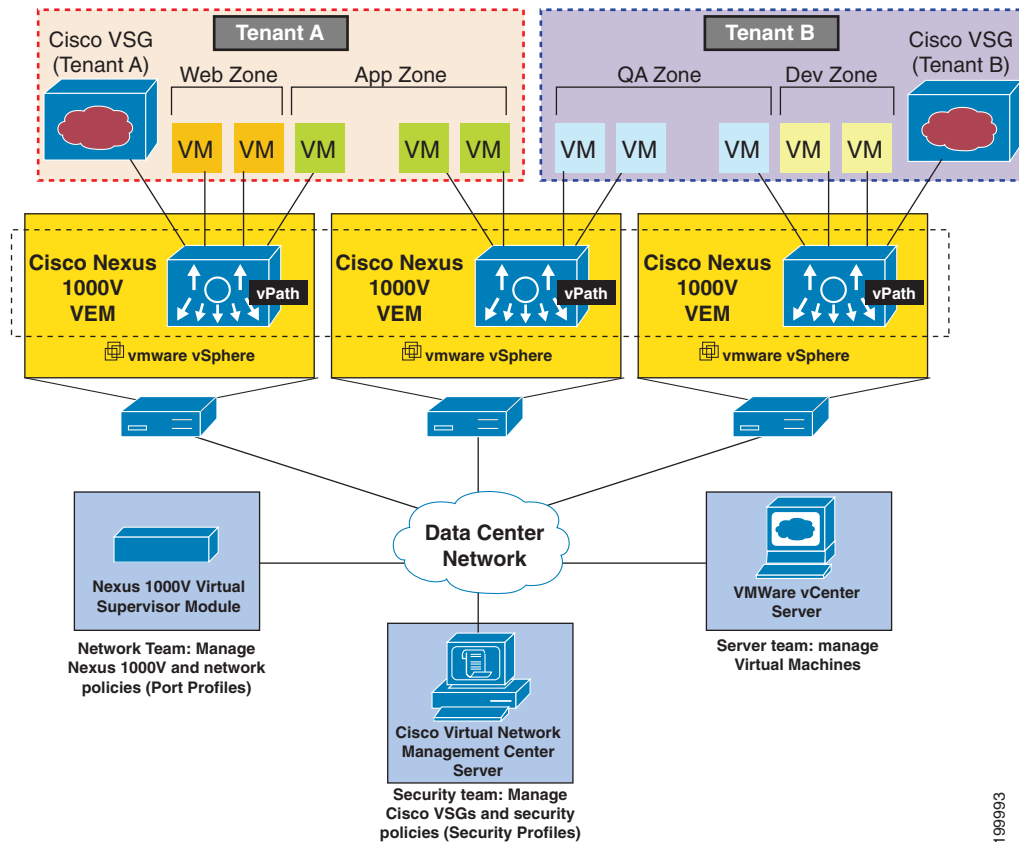
- Intelligent interception and redirection—Tenant-aware flow classification and subsequent redirection to a designated Cisco VSG tenant
- Fast-path off-load—Per-tenant policy enforcement of flows off-loaded by the Cisco VSG to vPath

The Cisco VSG and Nexus 1000V VEM provide the following benefits (see [Figure 1-3](#)):

- Efficient deployment—Each Cisco VSG can protect access and traffic across multiple physical servers, which eliminates the need to deploy one virtual appliance per physical server.

- Performance optimization—By off-loading fast-path to one or more Cisco Nexus 1000V VEM vPath modules, the Cisco VSG enhances network performance through distributed vPath-based enforcement.
- Operational simplicity—The Cisco VSG can be transparently inserted in one-arm mode without the need for creating multiple switches or temporarily migrating VMs to different switches or servers. Zone scaling is based on a security profile, not on vNICs that are limited for the virtual appliance. Zone scaling simplifies physical server upgrades without compromising security and incurring application outage.
- High availability—For each tenant, the Cisco VSG can be deployed in an active-standby mode to ensure a highly available operating environment, with vPath redirecting packets to the standby Cisco VSG when the primary Cisco VSG is unavailable.
- Independent capacity planning—The Cisco VSG can be placed on a dedicated server that is controlled by the security operations team so that maximum compute capacity can be allocated to application workloads. Capacity planning can occur independently across server and security teams, and operational segregation across security, network, and server teams can be maintained.

Figure 1-2 Cisco Virtual Security Gateway Deployment Topology



Trusted Multitenant Access

You can transparently insert a Cisco VSG into the VMware vSphere environment where the Cisco Nexus 1000V distributed virtual switch is deployed. One or more instances of the Cisco VSG is deployed on a per-tenant basis, which allows a high scale-out deployment across many tenants. Tenants are isolated from each other, so no traffic can cross tenant boundaries. You can deploy the Cisco VSG at the tenant level, at the virtual data center (vDC) level, and at the vApp level.

As VMs are instantiated for a given tenant, their association to security profiles and zone membership occurs immediately through binding with the Cisco Nexus 1000V port profile. Each VM is placed upon instantiation into a logical trust zone (see [Figure 1-2](#)). Security profiles contain context-aware rule sets that specify access policies for traffic that enters and exits each zone. In addition to VM and network contexts, security administrators can also use custom attributes to define zones directly through security profiles. Controls are applied to zone-to-zone traffic as well as to external-to-zone (and zone-to-external) traffic. Zone-based enforcement can occur within a VLAN also, as a VLAN often identifies a tenant boundary. The Cisco VSG evaluates access control rules and then, if configured, off-loads enforcement to the Cisco Nexus 1000V VEM vPath module. The Cisco VSG can permit or deny access and optional access logs can be generated. The Cisco VSG also provides policy-based traffic monitoring capability with access logs.

A Cisco VSG tenant can protect its VMs that span multiple hypervisors. Each tenant can also be assigned an overlapping (private) IP address space, which is important in multitenant cloud environments.

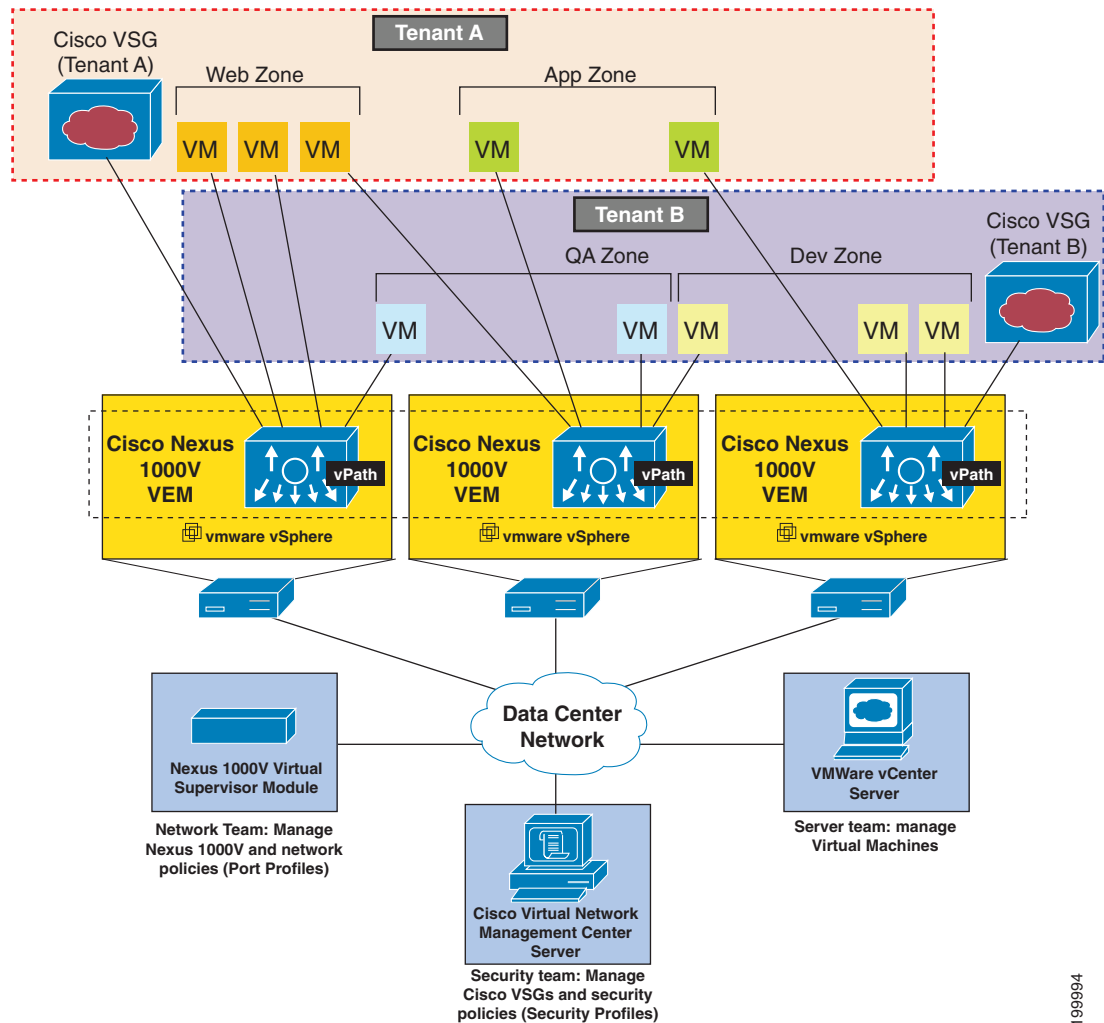
Dynamic (Virtualization-Aware) Operation

A virtualization environment is dynamic, where frequent additions, deletions, and changes occur across tenants and across VMs. Additionally, live migration of VMs can occur due to manual or programmatic vMotion events. [Figure 1-3](#) shows how a structured environment (see [Figure 1-2](#)) can change over time due to this dynamic VM environment.

The Cisco VSG operating with the Cisco Nexus 1000V (and vPath) supports a dynamic VM environment. Typically, when you create a tenant on the Cisco Virtual Network Management Center (VNMC) with the Cisco VSG (standalone or active-standby pair), associated security profiles are defined that include trust zone definitions and access control rules. Each security profile is bound to a Cisco Nexus 1000V port profile (authored on the Cisco Nexus 1000V Virtual Supervisor Module (VSM) and published to the VMware Virtual Center). When a new VM is instantiated, the server administrator assigns port profiles to the virtual Ethernet port of the VM. Because the port profile uniquely refers to a security profile and VM zone membership, security controls are immediately applied. A VM can be repurposed by assigning a different port profile or security profile.

As vMotion events are triggered, VMs move across physical servers. Because the Cisco Nexus 1000V ensures that port profile policies follow the VMs, associated security profiles also follow these moving VMs, and security enforcement and monitoring remain transparent to vMotion events.

Figure 1-3 Cisco VSG Security in a Dynamic VM Environment, Including VM Live Migration



199994

Cisco Virtual Security Gateway Configuration for the Network

This section describes the Cisco Virtual Security Gateway configuration for your network and includes the following sections:

- [Setting Up Cisco VSGs and VLANs](#), page 1-5
- [Cisco VSG Configuration Overview](#), page 1-6
- [Sequence in Configuring a Cisco VSG](#), page 1-9

Setting Up Cisco VSGs and VLANs

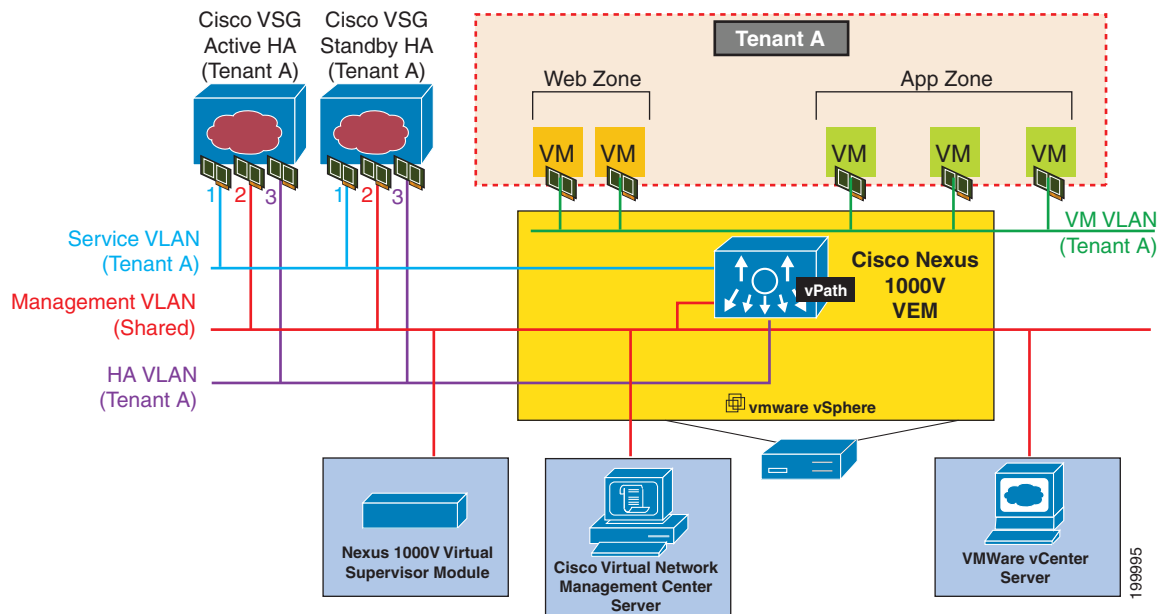
The Cisco VSG is set up so that VMs can reach a Cisco VSG irrespective of its location. The vPath component in the Cisco Nexus 1000V VEM intercepts the packets from the VM and sends them to the Cisco VSG for further processing.

Figure 1-4 shows a Cisco VSG. In the figure, the Cisco VSG has connectivity to three different VLANs (Management VLAN, Service VLAN, and HA VLAN). A Cisco VSG is configured with three vNICs with each of the vNICs connected to one of the VLANs. The VLAN functions are as follows:

- The Management VLAN connects management platforms such as the VMware vCenter, the Cisco Virtual Network Management Center, and the Cisco Nexus 1000V VSM and the managed Cisco VSGs.
- The Service VLAN provides communications between the Cisco Nexus 1000V VEM and Cisco VSGs. All the Cisco VSGs are part of the Service VLAN and the VEM uses this VLAN for its interaction with Cisco VSGs.
- The HA VLAN is the heart-beat mechanism and identifies the master-slave relationship.

You can allocate one or more VM Data VLAN(s) for VM-to-VM communications. In a multitenant environment, the Management VLAN is shared among all the tenants, and the Service VLAN, HA VLAN, and VM Data VLAN are allocated on a per-tenant basis. However, when VLAN resources become scarce, you may decide to use a single VLAN for Service and HA functions.

Figure 1-4 Cisco Virtual Security Gateway VLAN Usages



Cisco VSG Configuration Overview

This section provides an overview of the Cisco VSG configuration and includes the following topics:

- [Cisco Nexus 1000V Series Switch VSM, page 1-7](#)
- [Port Profile, page 1-7](#)
- [Virtual Security Gateway, page 1-7](#)
- [Security Profile, page 1-7](#)
- [Firewall Policy, page 1-8](#)

When you install a Cisco VSG on a virtualized data center network, you must change the configuration of the Cisco Nexus 1000V Series switch VSM and the configuration of the Cisco VSG itself.

Cisco Nexus 1000V Series Switch VSM

The VSM controls multiple VEMs as one logical modular switch. Instead of physical line-card modules, the VSM supports VEMs running in software inside servers. Configurations are performed through the VSM and automatically propagated to the VEMs. Instead of configuring soft switches inside the hypervisor on one host at a time, you can define configurations for immediate use on all VEMs being managed by the VSM.

Port Profile

In the Cisco Nexus 1000V Series switch, you use port profiles to configure interfaces. Through a management interface on the VSM, you can assign a port profile to multiple interfaces—providing all of them with the same configuration. Changes to the port profile can be propagated automatically to the configuration of any interface assigned to it.

In the VMware vCenter Server, a port profile is represented as a port group. The vEthernet or Ethernet interfaces are assigned in the vCenter Server to a port profile for the following functions:

- To define port configuration by policy.
- To apply a single policy across many ports.
- To support both vEthernet and Ethernet ports.

Port profiles that are not configured as uplinks can be assigned to a VM virtual port. When binding with a security profile and a Cisco VSG IP address, a VM port profile can be used to provision security services (such as for VM segmentation) provided by a Cisco VSG.

Virtual Security Gateway

The Cisco VSG for the Cisco Nexus 1000V Series switch is a virtual firewall appliance that provides trusted access to the virtual data center and cloud environments. Administrators can install a Cisco VSG on a host as a service VM and configure it with security profiles and firewall policies in order to provide VM segmentation and other firewall functions to protect the access to VMs.

Security Profile

The Cisco Nexus 1000V Series switch port profile dynamically provisions network parameters for each VM. The same policy provisioning carries the network service configuration information so that each VM is dynamically provisioned with the network service policies when the VM is attached to the port profile. This process is similar to associating ACL or QoS policies in the port profile. The information related to network service configuration is created in an independent profile called the security profile and is attached to the port profile. The security administrator creates the security profile in the Cisco VSG, and the network administrator associates it to an appropriate port profile in VSM.

The security profile defines custom attributes that can be used to write policies. All the VMs tagged with a given port profile inherit the firewall policies and custom attributes defined in the security profile associated with that port profile. Each custom attribute is configured as a name value pair, such as state = CA. The network administrator also binds the associated Cisco VSG for a given port profile. The Cisco VSG associated with the port profile enforces firewall policies for the network traffic of the application VMs bound to that port profile. The same Cisco VSG is used irrespective of the location of the

application VM. As a result, the policy is consistently enforced even during the Vmotion procedures. You can also bind a specific policy to a service profile so that if any traffic is bound to a service profile, the policy associated with that service profile is executed. Both the service plane and the management plane support multitenancy requirements. Different tenants can have their own Cisco VSG (or set of Cisco VSGs), enforcing the policy defined by them. The vPath in each ESX host can intelligently redirect tenant traffic to the appropriate Cisco VSG.

Firewall Policy

A firewall policy is used to enforce network traffic on a Cisco VSG. A key component operating on the Cisco VSG is the policy engine. The policy engine uses the policy as a configuration and executes it when enforced against the network traffic that is received on the Cisco VSG.

A policy is bound to a Cisco VSG by using a set of indirect associations. The security administrator can configure a security profile and then refer to a policy name within the security profile. The security profile is associated with a port profile that has a reference to a Cisco VSG.

A policy is constructed using the following set of policy objects:

- [Object Groups, page 1-8](#)
- [Zones, page 1-8](#)
- [Rules, page 1-8](#)
- [Actions, page 1-8](#)
- [Policies, page 1-9](#)

Object Groups

An object group is a set of conditions relevant to an attribute. As object groups and zones can be shared between various rules with different directions, the attributes used in an object group condition should not have a directional sense and must be neutral. An object group is a secondary policy object that assists in writing firewall rules. A rule condition can refer to an object group by using an operator.

Zones

A zone is a logical group of VMs or hosts. Zones simplify policy writing by allowing users to write policies based on zone attributes using zone names. The zone definitions map the VMs to the zones. The logical group definition can be based on the attributes associated with a VM or a host, such as VM attributes defined in the vCenter. Zone definitions can be written as condition-based subnet and endpoint IP addresses.

Because zones and object groups can be shared between various rules with different directions, the attributes used in an object group should not have a directional sense and must be neutral.

Rules

Firewall rules can consist of multiple conditions and actions. Rules can be defined in a policy as a condition-based subnet or endpoint IP addresses and VM attributes.

Actions

Actions are the result of a policy evaluation. You can define and associate one or more of the following actions within a specified rule:

- Permit

- Drop packet
- Log
- Inspection

Policies

A policy enforces network traffic on a Cisco VSG. A key component operating on the Cisco VSG is the policy engine. The policy engine takes the policy as configuration and executes it when enforced against the network traffic that is received on the Cisco VSG. A policy is constructed by using the following set of policy objects:

- Rules
- Conditions
- Actions
- Object-groups
- Zones

A policy is bound to a Cisco VSG by using a set of indirect associations. The security administrator can configure a security profile and then refer to a policy name within the security profile. The security profile is associated with a port profile that has a reference to a Cisco VSG.

Service Firewall Logging

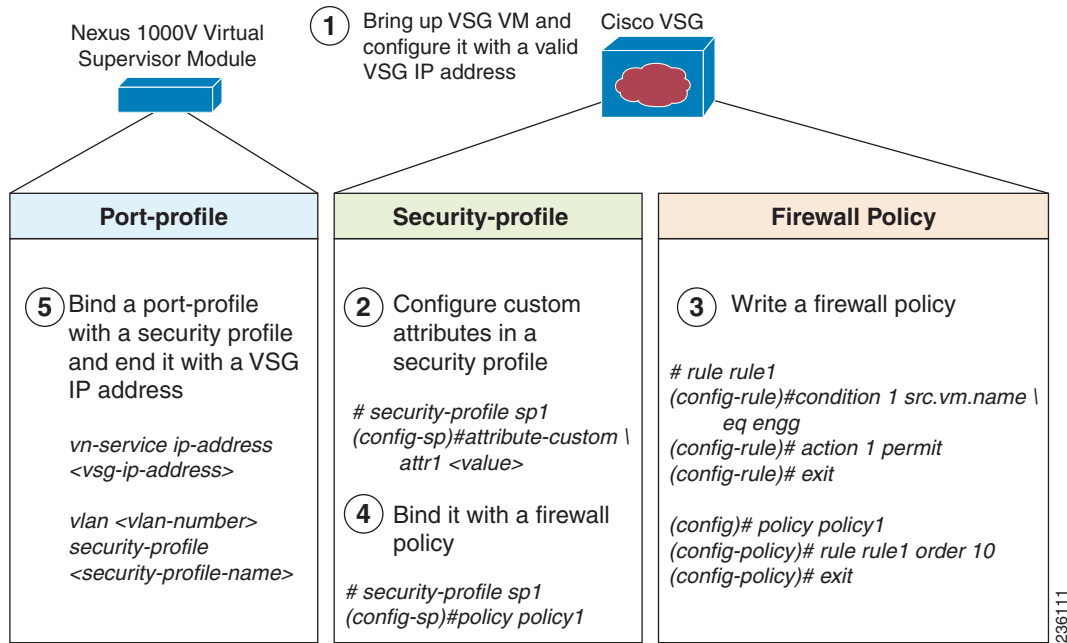
The service firewall log is a tool to test and debug the policy. During a policy evaluation, the policy engine displays the policy results of a policy evaluation. Both the users and the policy writer benefit from this tool when troubleshooting a policy.

Sequence in Configuring a Cisco VSG

This section is an overview of the sequence to follow in configuring a Cisco VSG:

1. Install and set up a Cisco VSG service VM and configure the Cisco VSG with a valid IP address.
2. As administrator, if you plan to use custom attributes in the firewall policy, create a set of custom attributes in a security profile configuration on the Cisco VSG.
3. As administrator, write a firewall policy on the Cisco VSG by using appropriate policy objects such as object-group, zones, rules, conditions, actions, and policies.
4. After the firewall policy is created, as administrator, bind the policy to the security profile previously created. This step is done with the security profile management interface.
5. After the security profile and firewall policy are fully developed, as administrator, you can bind the security profile with the VM port profiles that demand access protection provided by the Cisco VSG through the port profile management interface on the VSM. As administrator, you must also bind the Cisco VSG with the set of VM port profiles.

Figure 1-5 Cisco Virtual Security Gateway Configuration Flow





Cisco Virtual Security Gateway Command-Line Interface

This chapter describes the Cisco Virtual Security Gateway (VSG) command-line interface (CLI).

This chapter includes the following sections:

- [Information About the CLI Prompt, page 2-1](#)
- [Command Modes, page 2-2](#)
- [Special Characters, page 2-5](#)
- [Keystroke Shortcuts, page 2-5](#)
- [Abbreviating Commands, page 2-7](#)
- [Using the no Form of a Command, page 2-7](#)
- [Using Help, page 2-7](#)



Note

Information about the Cisco VSG CLI is provided in this chapter. For information about the Cisco Nexus 1000V Series switch CLI, see the Cisco Nexus 1000V Series switch documentation.

Information About the CLI Prompt

Once you have successfully accessed the system, the CLI prompt displays in the terminal window of your console port or remote workstation, as follows:

```
switch#
```

You can change this switch prompt to another name or leave it as it is.

```
vsg# configure  
vsg(config)# switchname vsg100  
vsg100(config)# exit  
vsg100#
```

From the CLI prompt, you can do the following:

- Use CLI commands for configuring features.
- Access the command history.
- Use command parsing functions.

Command Modes

This section includes the following topics:

- [Information About Command Modes, page 2-2](#)
- [EXEC Command Mode, page 2-3](#)
- [Global Configuration Command Mode, page 2-3](#)
- [Exiting a Configuration Mode, page 2-3](#)
- [Command Mode Summary, page 2-4](#)

Information About Command Modes

The CLI is divided into command modes that define the actions available to the user. Command modes are “nested” and are accessed in sequence. When you first log in, you are placed in CLI EXEC mode.

As you navigate from EXEC mode to global configuration mode, a larger set of commands is available to you. To transition to global configuration mode, enter the following command:

```
config t
```

[Table 2-1](#) shows how command access builds from user EXEC to global configuration mode.

Table 2-1 Accessing the Global Configuration Mode

Command Mode	Prompt	Description
EXEC	vsg#	<ul style="list-style-type: none"> • Connect to remote devices. • Temporarily change terminal line settings. • Do basic tests. • List system information (show).
Global configuration	vsg(config)#	Includes access to EXEC commands. <ul style="list-style-type: none"> • Connect to remote devices. • Temporarily change terminal line settings. • Perform basic tests. • List system information (show).

All commands in EXEC command mode are accessible from the global configuration command mode. For example, the **show** commands are available from any command mode.

EXEC Command Mode

When you first log in, you are placed into EXEC mode. The commands available in EXEC mode include the **show** commands that display device status and configuration information, the **clear** commands, and other commands that perform actions that you do not save in the device configuration.

Global Configuration Command Mode

Global configuration mode provides access to the widest range of commands, including those commands used to make configuration changes that are saved by the device and can be stored and applied when the device is rebooted.


Commands entered in global configuration mode update the running configuration file as soon as they are entered, but must also be saved into the startup configuration file by using the following command:

copy running-config startup-config

In global configuration mode, you can access protocol-specific, platform-specific, and feature-specific configuration modes.

Exiting a Configuration Mode

To exit from any configuration mode, use one of the following commands:

Command	Purpose
exit Example: vsg(config-rule)# exit vsg(config)#	Exits from the current configuration command mode and returns to the previous configuration command mode.
end Example: vsg(config)# end vsg#	Exits from the configuration command mode and returns to EXEC mode.
Ctrl-z Example: vsg(config)# ^z vsg#	Exits the current configuration command mode and returns to EXEC mode.  Caution If you press Ctrl-Z at the end of a command line in which a valid command has been typed, the CLI adds the command to the running configuration file. We recommend that you exit a configuration mode using the exit or end command.

Command Mode Summary

Table 2-2 summarizes information about command modes.

Table 2-2 Command Mode Summary

Mode	Access Method	Prompt	Exit Method
EXEC	From the login prompt, enter your username and password.	VSG#	To exit to the login prompt, use the exit command.
Global configuration	From EXEC mode, enter the command, configure .	VSG(config)#	To exit to EXEC mode, use the end or exit command or press Ctrl-Z .
Zone configuration	From global configuration mode, enter the command, zone zone-name .	VSG(config-zone)#	To exit to global configuration mode, use the exit command. To exit to EXEC mode, use the end command or press Ctrl-Z .
Data0 interface configuration	From global configuration mode, enter the command interface data0	VSG(config-if)#	To exit to global configuration mode, use the exit command. To exit to EXEC mode, use the end command or press Ctrl-Z .

Saving CLI Configuration Changes

This section describes how to save CLI configuration changes and includes the following topics:

- [Running Configuration, page 2-4](#)
- [Startup Configuration, page 2-4](#)
- [Copying the Running Configuration to the Startup Configuration, page 2-5](#)

Running Configuration

The running configuration is the configuration that is currently running on the device. It includes configuration changes from commands entered since the last time the device was restarted. If the device is restarted, the running configuration is replaced with a copy of the startup configuration. Any changes that were made to the running configuration but were not copied to the startup configuration are discarded.

Startup Configuration

The startup configuration is the configuration that is saved and that will be used by the device when you restart it. When you make configuration changes to the device, they are automatically saved in the running configuration. If you want configuration changes saved permanently, you must copy them to the startup configuration so that they are preserved when the device is rebooted or restarted.

Copying the Running Configuration to the Startup Configuration

To copy changes you have made to the running configuration into the startup configuration so that they are saved persistently through reboots and restarts, use the following command:

	Command	Purpose
Step 1	<pre>copy running-config startup-config</pre> <p>Example: vsg(config)# copy running-config startup-config</p>	(Optional) Saves the running configuration persistently through reboots and restarts by copying it to the startup configuration.

Special Characters

Table 2-3 lists the characters that have special meaning in text strings and should be used only in regular expressions or other special contexts.

Table 2-3 Special Characters

Character	Description
	Vertical bar
< >	Less than or greater than

Keystroke Shortcuts

Table 2-4 lists command key combinations that can be used in both EXEC and configuration modes.

Table 2-4 Keystroke Shortcuts

Key(s)	Description
Ctrl-A	Moves the cursor to the beginning of the line
Ctrl-B	Moves the cursor one character to the left. When you enter a command that extends beyond a single line, you can press the Left Arrow or Ctrl-B keys repeatedly to scroll back toward the system prompt and verify the beginning of the command entry, or you can press the Ctrl-A key combination.
Ctrl-C	Cancels the command and returns to the command prompt.
Ctrl-D	Deletes the character at the cursor.
Ctrl-E	Moves the cursor to the end of the line.
Ctrl-F	Moves the cursor one character to the right.
Ctrl-G	Exits to the previous command mode without removing the command string.
Ctrl-K	Deletes all characters from the cursor to the end of the command line.
Ctrl-L	Redisplays the current command line.
Ctrl-R	Redisplays the current command line.

Table 2-4 Keystroke Shortcuts (continued)

Key(s)	Description
Ctrl-T	Transposes the character to the left of the cursor with the character located to the right of the cursor.
Ctrl-U	Deletes all characters from the cursor to the beginning of the command line.
Ctrl-W	Deletes the word to the left of the cursor.
Ctrl-X, H	Lists history. When using this key combination, press and release the Ctrl and X keys together before pressing H.
Ctrl-Y	Recalls the most recent entry in the buffer (press keys simultaneously).
Ctrl-Z	Ends a configuration session, and returns you to EXEC mode. When used at the end of a command line in which a valid command has been typed, the resulting configuration is first added to the running configuration file.
↑	Displays the previous command in the command history.
↓	Displays the next command in the command history.
← →	Moves your cursor through the command history directionally to locate a command string.
?	Displays a list of available commands.
Tab	<p>Completes the word for you after you enter the first characters of the word and then press the Tab key. All options that match are presented.</p> <p>Used to complete:</p> <ul style="list-style-type: none"> • Command names • Scheme names in the file system • Server names in the file system • File names in the file system <p>This example shows how to use the tab keystroke:</p> <pre>vsg(config)# xm<Tab> vsg(config)# xml <Tab> vsg(config)# xml server</pre> <p>This example shows how to use the tab keystroke:</p> <pre>vsg(config)# vn<Tab> vnm-policy-agent vns-binding vsg(config)# security-pr<Tab> vsg(config)# security-profile</pre>

Abbreviating Commands

You can abbreviate commands and keywords by entering the first few characters of a command. The abbreviation must include enough characters to make it unique from other commands or keywords. If you are having trouble entering a command, check the system prompt and enter the question mark (?) for a list of available commands. You might be in the wrong command mode or using incorrect syntax.

Table 2-5 lists examples of command abbreviations.

Table 2-5 Examples of Command Abbreviations

Command	Abbreviation
configure	conf
copy running-config startup-config	copy run start
show running-config	sho run

Using the no Form of a Command

Almost every configuration command has a **no** form that can be used to disable a feature or function. For example, to remove a VLAN, use the **no vlan** command. To reenable it, use the **vlan** command form.

For example, if you use the **boot** command in global configuration mode, you can then use the **no boot** command to undo the results:

```
vsg(config)# boot system bootflash: svsl.bin
vsg(config)# no boot system bootflash: svsl.bin
```

Using Help

The CLI provides the following help features (see Table 2-6 and Table 2-7).

Table 2-6 CLI Help Features

Feature	Description
?	Type the question mark (?) to list the valid input options.
^	The CLI prints the caret (^) symbol below a line of syntax to point to an input error in the command string, keyword, or argument.
↑	Use the up arrow to have the CLI display the previous command you entered so that you can correct an error.

The example in Table 2-7 describes how to use syntax error isolation and context-sensitive help.

Table 2-7 Using Syntax Error Isolation and Context-Sensitive Help on the CLI

	Command	Purpose
Step 1	<p>show interface ?</p> <p>Example: vsg# show interface ? <CR> > Redirect it to a file >> Redirect it to a file in append mode brief Show brief info of interface capabilities Show interface capabilities information counters Show interface counters data Data interface debounce Show interface debounce time information description Show interface description ethernet Ethernet IEEE 802.3z fcoe (no abbrev) Show FCoE info for interface loopback Loopback interface mac-address Show interface MAC address mgmt Management interface port-channel Port Channel interface snmp-ifindex Show snmp ifindex list status Show interface line status switchport Show interface switchport information transceiver Show interface transceiver information trunk Show interface trunk information vethernet Virtual ethernet interface virtual Show virtual interface information Pipe command output to filter</p>	Displays the optional parameters used with the show interface command in EXEC mode.
Step 2	<p>show interface module ?</p> <p>Example: vsg# show interface module ? ^ Invalid command (interface name) at '^' marker. ? vsg#</p>	Displays an invalid command error message and points (^) to the syntax error.
Step 3	<p>Ctrl-P or the Up Arrow</p> <p>Example: vsg# <Ctrl-P> vsg# show interface data0</p>	Displays the previous command you entered so that you can correct the error.
Step 4	<p>show interface data ?</p> <p>Example: vsg# show interface data ? <0-0> Data interface number vsg#</p>	Displays the syntax for showing a data interface (data0).

Table 2-7 Using Syntax Error Isolation and Context-Sensitive Help on the CLI (continued)

Command	Purpose
<p>Step 5 <code>show interface data0</code></p> <p>Example:</p> <pre>vsg# show interface data0 control0 is up Hardware: Ethernet, address: 0050.5691.53b6 (bia 0050.5691.53b6) MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec, reliability 255/255, txload 1/255, rxload 1/255 Encapsulation ARPA full-duplex, 1000 Mb/s Auto-Negotiation is turned on 1 minute input rate 1920 bits/sec, 0 packets/sec 1 minute output rate 24 bits/sec, 0 packets/sec Rx 91082 input packets 0 unicast packets 2935 multicast packets 88147 broadcast packets 20642956 bytes Tx 21968 output packets 0 unicast packets 21968 multicast packets 0 broadcast packets 5228289 bytes vsg#</pre>	<p>Displays the data interface (data0).</p>



Configuring the Cisco Virtual Security Gateway Port Profile on the Cisco Nexus 1000V Series Switch

This chapter describes the Cisco Virtual Security Gateway (VSG) for the Cisco Nexus 1000V Series switch licensing and configuration requirements on the Cisco Nexus 1000V Series switch and includes the following section:

- [Configuring the Cisco VSG Port Profile on the Cisco Nexus 1000V Series Switch VSM for Protection from Service Loss, page 3-1](#)

For additional details about the Cisco Nexus 1000V Series switch port profiles, see the *Cisco Nexus 1000V Port Profile Configuration Guide, Release 4.2(1)SVI(4)*.

Configuring the Cisco VSG Port Profile on the Cisco Nexus 1000V Series Switch VSM for Protection from Service Loss

You can configure the `vn-service` parameter in the port profile on the Virtual Supervisor Module (VSM) for protection from service loss.

BEFORE YOU BEGIN

You have the Cisco VSG software installed and the basic installation completed. For details, see the *Cisco Virtual Security Gateway, Release 4.2(1)VSG1(1)* and *Cisco Virtual Network Management Center, Release 1.0.1 Installation Guide*.

You must have the `NEXUS_VSG_SERVICES_PKG` license installed on the Cisco Nexus 1000V Series switch. Ensure that you have enough licenses to cover the number of ESX hosts (VEMs) you want to protect.

The data IP address and management IP addresses should be configured. To configure the data IP address, see the *Cisco Virtual Security Gateway, Release 4.2(1)VSG1(1)* and *Cisco Virtual Network Management Center, Release 1.0.1 Installation Guide*.

You have completed creating the Cisco VSG port profiles for the service and HA interface.

You are logged in to the Cisco Nexus 1000V Series switch CLI in EXEC mode.

SUMMARY STEPS

1. **configure**
2. **port-profile** *port-profile-name*
3. **switchport mode access**
4. **switchport access vlan** *vlan-id*
5. **no shutdown**
6. **vn-service ip-address** *ip-address* **vlan** *vlan-id* **mgmt-ip-address** *ip-address* [**fail** { **open** | **close** }] [**security-profile** *name*]
7. **vmware port-group**
8. **state enabled**
9. (Optional) **copy running-config startup-config**
10. **exit**

DETAILED STEPS

	Command	Purpose
Step 1	configure Example: n1000v# configure n1000v(config)#	Places you in global configuration mode.
Step 2	port-profile <i>port-profile-name</i> Example: n1000v(config-port-prof)# port-profile host-profile n1000v(config-port-prof)#	Enters the port profile configuration mode for the named port profile. If the port profile does not exist, it is created using the following characteristics: <i>port-profile-name</i> —The port profile name can be up to 80 alphanumeric characters and must be unique for each port profile on the Cisco VSG.
Step 3	switchport mode access Example: n1000v(config-port-prof)# switchport mode access n1000v(config-port-prof)#	Designates that the new port profile is used as an access port.
Step 4	switchport access vlan <i>vlan-id</i> Example: n1000v(config-port-prof)# switchport access vlan 2000 n1000v(config-port-prof)#	Specifies the access VLAN for the new port profile. <i>vlan-id</i> —The VLAN ID is a unique identifier from 0 through 4096.
Step 5	no shutdown Example: n1000v(config-port-prof)# no shutdown n1000v(config-port-prof)#	Enables all ports in the new port profile.

	Command	Purpose
Step 6	<p>vn-service ip-address ip-address vlan vlan-id mgmt-ip-address ip-address [fail {open close}] [security-profile name]</p> <p>Example: n1000v(config-port-prof)# vn-service ip 100.1.1.100 vlan 1000 mgmt-ip 10.10.10.11 profile vnsp-1 n1000v(config-port-prof)#</p>	<p>Configures the IP, VLAN, management IP, and profile for the Cisco VSG, and optionally allows a fail safe configuration.</p> <p>Note If you do not pick a security profile name, the default name is assumed. The security profile name must match the security profile created on the Cisco VSG.</p> <p>Note The IP address must match the data interface (data0) IP address on the Cisco VSG.</p> <p>Note The management IP address must match the management IP address that you entered when installing or configuring your Cisco VSG settings.</p>
Step 7	<p>vmware port-group</p> <p>Example: n1000v(config-port-prof)# vmware port-group n1000v(config-port-prof)#</p>	Designates the port profile as a VMware port group.
Step 8	<p>state enabled</p> <p>Example: n1000v(config-port-prof)# state enabled n1000v(config-port-prof)#</p>	Sets the port profile state to enabled.
Step 9	<p>copy running-config startup-config</p> <p>Example: n1000v(config-port-prof)# copy running-config startup-config n1000v(config-port-prof)#</p>	(Optional) Saves configuration changes.
Step 10	<p>exit</p> <p>Example: n1000v(config-port-prof)# exit n1000v(config)#</p>	Exits the configuration mode.

Verifying the Cisco VSG Configuration

To display information related to a Cisco VSG, perform one of the following tasks on the Cisco Nexus 1000V Series switch CLI:

Command	Purpose
show license usage Example: vsg# show license usage	Displays a table with the Cisco VSG license usage information for the Cisco Nexus 1000V Series switch.
show license usage NEXUS_VSG_SERVICES_PKG Example: vsg# show license usage NEXUS_VSG_SERVICES_PKG	Displays the usage information for the license package NEXUS_VSG_SERVICES_PKG.
show vnsstate {statistics brief {detail [{{vlan vlan-num [ip ip-addr]} module module-num}}]} Example: vsg# show vnsstate statistics detail vlan 1	Displays configuration information, MAC address, state of associated Cisco VSG and Virtual Ethernet Module (VEM), Veths to which Cisco VSGs are bound, and Virtual Service Node (VSN) statistics for all VEM modules associated with Cisco VSGs.

For detailed information about the fields in the output from these commands, see the *Cisco Nexus 1000V Command Reference, Release 4.2(1)SVI(4)*.

Where to Go Next

After you have completed configuring the Cisco VSG port profile on the Cisco Nexus 1000V Series switch for protection, you may proceed to assign port profiles to your VMs for Cisco VSG firewall protection on the vCenter.



Cisco Virtual Security Gateway System Management

This chapter describes system management on the Cisco Virtual Security Gateway (VSG).

This chapter includes the following sections:

- [Information About VSG System Management, page 4-1](#)
- [Changing the Cisco VSG Instance Name, page 4-2](#)
- [Configuring a Message of the Day, page 4-2](#)
- [Verifying the Configuration, page 4-3](#)
- [Saving a Configuration, page 4-10](#)
- [Erasing a Configuration, page 4-11](#)
- [Displaying a Cisco VSG Instance, page 4-11](#)

Information About VSG System Management

The Cisco Virtual Security Gateway (VSG) enables you to use command-line interface (CLI) configuration commands to do standard system management functions such as the following:

- Changing the hostname
- Configuring messages of the day
- Displaying, saving, and erasing configuration files
- Providing a single interface to all file systems including
 - Flash memory
 - FTP and TFTP
 - Running configuration
 - Any other endpoint for reading and writing data
- Identifying users connected to the VSG
- Sending messages to single users or all users

Changing the Cisco VSG Instance Name

You can change the Cisco VSG instance name or prompt. If you have multiple instances of Cisco VSGs, you can use this procedure to uniquely identify each Cisco VSG.

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- You are logged in to the CLI in global configuration mode.

PROCEDURE

	Command	Purpose
Step 1	configure Example: vsg# configure	Places you in global configuration mode.
Step 2	hostname <i>host-name</i> Example: vsg(config)# hostname vsg100	Changes the host prompt. The host-name argument maximum is 32 alphanumeric characters.

This example shows how to change the hostname (name of the VSG):

```
vsg# configure
vsg(config)# hostname metro
vsg(config)# exit
metro#
```

Configuring a Message of the Day

You can configure a message of the day (MOTD) to display at the login prompt.

- The banner message can be up to 40 lines with up to 80 characters per line.
- Use the following guidelines when choosing your delimiting character:
 - Do not use the delimiting-character in the message string.
 - Do not use " and % as delimiters.
- The following tokens can be used in the the message of the day:
 - `$(hostname)` displays the host name for the switch.
 - `$(line)` displays the vty or tty line or name.

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- You are logged in to the CLI in configuration mode.

PROCEDURE

	Command	Purpose
Step 1	configure Example: vsg# configure	Places you in global configuration mode.
Step 2	banner motd [<i>delimiting-character message delimiting-character</i>] Example: vsg(config)# banner motd #Hello#	Configures an MOTD with the following limits: <ul style="list-style-type: none"> • Up to 40 lines • Up to 80 characters per line • Enclosed in a delimiting character, such as # • Can span multiple lines • Can use tokens
Step 3	show banner motd Example: vsg(config)# show banner motd	Displays the configured banner message.

This example shows how to configure an MOTD:

```
vsg# configure
vsg(config)# banner motd #December 12, 2010 Welcome to the VSG#
vsg(config)# show banner motd
December 12, 2010 Welcome to the VSG
vsg(config)#
```

Verifying the Configuration

This section includes the following topics on viewing the Cisco VSG configuration:

- [Verifying the Software and Hardware Versions, page 4-3](#)
- [Verifying the Running Configuration, page 4-4](#)
- [Comparing the Startup and Running Configurations, page 4-6](#)
- [Displaying Interface Configurations, page 4-7](#)

Verifying the Software and Hardware Versions

You can view the versions of software and hardware on your system.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI in any command mode.

PROCEDURE

	Command	Description
Step 1	show version Example: vsg# show version	Displays the versions of system software and hardware that are currently running on the VSG.

This example shows how to display and verify the system software and hardware version information for your VSG:

```
vsg# show version
Cisco Nexus Operating System (NX-OS) Software
TAC support: http://www.cisco.com/tac
Copyright (c) 2002-2010, Cisco Systems, Inc. All rights reserved.
The copyrights to certain works contained herein are owned by
other third parties and are used and distributed under license.
Some parts of this software are covered under the GNU Public
License. A copy of the license is available at
http://www.gnu.org/licenses/gpl.html.

Software
  loader:      version unavailable [last: image booted through mgmt0]
  kickstart:  version 4.2(1)VSG1(1) [build 4.2(1)VSG1(0.398)]
  system:     version 4.2(1)VSG1(1) [build 4.2(1)VSG1(0.398)]
  kickstart image file is: [not present on supervisor]

kickstart compile time: 12/12/2010 17:00:00
system image file is:   bootflash:/nexus-1000v-mz.VSG1.0.398.bin
system compile time:   12/12/2010 17:00:00 [12/12/2010 13:03:38]

Hardware
cisco Nexus 1000VF Chassis ("Nexus VSN Virtual Firewall")
Intel(R) Xeon(R) CPU          with 1944668 kB of memory.
Processor Board ID T5056BB0072

Device name: vsg
bootflash:   2059572 kB

Kernel uptime is 1 day(s), 5 hour(s), 47 minute(s), 4 second(s)

plugin
  Core Plugin, Virtualization Plugin, Ethernet Plugin
```

Verifying the Running Configuration

You can view the configuration currently running on the system.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI in any command mode.

PROCEDURE

	Command	Description
Step 1	show running-config Example: vsg# show running-config	Displays the versions of system software and hardware that are currently running on the VSG.

This example shows how to display the versions of system software and hardware running on the VSG:

```
vsg# show running-config
```

```
!Command: show running-config
!Time: Sun Dec 12 17:42:59 2010

version 4.2(1)VSG1(1)
no feature telnet
no feature http-server

username admin password 5 $1$RU5OIPU7$SYvoK9S5rOMRE9WBWZLsA. role network-admin

banner motd #Nexus VSN#

ssh key rsa 2048
ip domain-lookup
ip domain-lookup
hostname vsg
snmp-server user admin network-admin auth md5 0x5ed3cfea7c44550ac3d18475f28b118b priv
0x5ed3cfea7c44550ac3d18475f28b118b localizedkey

vrf context management
 ip route 0.0.0.0/0 10.193.72.1
vlan 1
port-channel load-balance ethernet source-mac
port-profile default max-ports 32

vdc vsg id 1
 limit-resource vlan minimum 16 maximum 2049
 limit-resource monitor-session minimum 0 maximum 2
 limit-resource vrf minimum 16 maximum 8192
 limit-resource port-channel minimum 0 maximum 768
 limit-resource u4route-mem minimum 32 maximum 32
 limit-resource u6route-mem minimum 16 maximum 16
 limit-resource m4route-mem minimum 58 maximum 58
 limit-resource m6route-mem minimum 8 maximum 8

interface mgmt0
 ip address 10.193.73.118/21

interface data0
 ip address 118.1.1.1/8
 line console
 boot kickstart bootflash:/nexus-1000v-kickstart-mzg.VSG1.0.1.bin sup-1
 boot system bootflash:/nexus-1000v-mzg.VSG1.0.1.bin sup-1
 boot kickstart bootflash:/nexus-1000v-kickstart-mzg.VSG1.0.1.bin sup-2
 boot system bootflash:/nexus-1000v-mzg.VSG1.0.1.bin sup-2
 ha-pair id 23

security-profile sp1
 policy pl
 rule r1
```

```

    action 10 permit
policy p1
    rule r1 order 10
vnm-policy-agent
    policy-agent-image
    registration-ip 0.0.0.0
    shared-secret *****
    log-level info

vsg#

```

Comparing the Startup and Running Configurations

You can view the differences between the startup configuration and running configuration.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI in any command mode.

PROCEDURE

	Command	Description
Step 1	show running-config diff Example: vsg# show running-config diff	Displays the difference between the startup configuration and the running configuration.

This example shows how to display the difference between the startup configuration and the running configuration:

```

vsg# show running-config diff
*** Startup-config
--- Running-config
*****
*** 14,34 ****
    banner motd #Nexus VSG#

    ssh key rsa 2048
    ip domain-lookup
    ip domain-lookup
! switchname G-VSG-116-1
    snmp-server user admin network-admin auth md5 0x5ed3cfea7c44550ac3d18475f28b118b priv
0x5ed3cfea7c44550ac3d18475f28b118b localizedkey
    snmp-server user vsnbetauser network-admin auth md5 0x11d89525029e4148a2a494a8e131f9ed
priv 0x11d89525029e4148a2a494a8e131f9ed localizedkey

    vrf context management
        ip route 0.0.0.0/0 10.193.72.1
    vlan 1
    port-channel load-balance ethernet source-mac
    port-profile default max-ports 32

! vdc G-VSG-116-1 id 1
    limit-resource vlan minimum 16 maximum 2049
    limit-resource monitor-session minimum 0 maximum 2

```



```

        limit-resource vrf minimum 16 maximum 8192
        limit-resource port-channel minimum 0 maximum 768
        limit-resource u4route-mem minimum 32 maximum 32
    --- 13,33 ---
    banner motd #Nexus VSG#

    ssh key rsa 2048
    ip domain-lookup
    ip domain-lookup
    ! hostname vsg
    snmp-server user admin network-admin auth md5 0x5ed3cfea7c44550ac3d18475f28b118b priv
0x5ed3cfea7c44550ac3d18475f28b118b localizedkey
    snmp-server user vsnbetauser network-admin auth md5 0x11d89525029e4148a2a494a8e131f9ed
priv 0x11d89525029e4148a2a494a8e131f9ed localizedkey

    vrf context management
        ip route 0.0.0.0/0 10.193.72.1
    vlan 1
    port-channel load-balance ethernet source-mac
    port-profile default max-ports 32

    ! vdc vsg id 1
        limit-resource vlan minimum 16 maximum 2049
        limit-resource monitor-session minimum 0 maximum 2
        limit-resource vrf minimum 16 maximum 8192
        limit-resource port-channel minimum 0 maximum 768
        limit-resource u4route-mem minimum 32 maximum 32
vsg#

```

Displaying Interface Configurations

This section includes the following procedures:

- [Displaying a Brief View of a Specific Interface Configuration, page 4-7](#)
- [Displaying a Detailed View of a Specific Interface Configuration, page 4-8](#)
- [Displaying a Brief View of All Interfaces, page 4-9](#)
- [Verifying the Running Configuration for All Interfaces, page 4-9](#)

Displaying a Brief View of a Specific Interface Configuration

You can display a brief view of a specific interface configuration.

BEFORE YOU BEGIN

Before using this procedure, you must know or do the following:

- You are logged in to the CLI in any command mode.

PROCEDURE

	Command	Description
Step 1	<code>show interface {type} {name} brief</code> Example: <code>vsg# show interface brief</code>	Displays a brief view of a specific interface configuration.

The following example shows how to display a brief view of a specific interface configuration:

```
vsg# show interface brief
```

```
-----
Port      VRF      Status IP Address      Speed  MTU
-----
mgmt0    --      up      10.193.73.10    1000  1500
-----

Port      VRF      Status IP Address      Speed  MTU
-----
data0    --      up      10.10.10.10     1000  1500
vsg#
-----
```

Displaying a Detailed View of a Specific Interface Configuration

You can display a detailed view of a specific interface configuration.

BEFORE YOU BEGIN

Before using the command in this section, you must know or do the following:

- You are logged in to the CLI in any command mode.

PROCEDURE

	Command	Description
Step 1	<code>show interface {type} {name}</code> Example: vsg# show interface mgmt 0	Displays a detailed version of a specific interface connection.

This example shows how to display a detailed version of a specific interface connection:

```
vsg# show interface mgmt 0
mgmt0 is up
  Hardware: Ethernet, address: 0050.5689.3321 (bia 0050.5689.3321)
  Internet Address is 172.23.232.141/24
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA
  full-duplex, 1000 Mb/s
  Auto-Negotiation is turned on
    4961 packets input, 511995 bytes
    0 multicast frames, 0 compressed
    0 input errors, 0 frame, 0 overrun, 0 fifo
    245 packets output, 35853 bytes
    0 underrun, 0 output errors, 0 collisions
    0 fifo, 0 carrier errors
vsg#
```

Displaying a Brief View of All Interfaces

You can display a brief view of all interfaces.

BEFORE YOU BEGIN

Before using this procedure, you must know or do the following:

- You are logged in to the CLI in any command mode.

PROCEDURE

	Command	Description
Step 1	<code>show interface brief</code>	Displays a brief view of all interfaces.
	Example: <code>vsg# show interface brief</code>	

The following example shows how to display a brief view of all the interfaces on the VSG:

```
vsg# show interface brief
```

```
-----
Port      VRF      Status IP Address      Speed  MTU
-----
mgmt0     --       up    10.23.232.141   1000   1500
-----
Ethernet  VLAN    Type Mode   Status Reason          Speed  Port
Interface                                Ch #
-----
Eth3/2    1       eth trunk up     none           1000 (D) --
Eth3/3    262    eth access up     none           1000 (D) --
-----
Interface  VLAN    Type Mode   Status Reason          MTU
-----
Veth81    630    virt access up     none           1500
Veth82    630    virt access up     none           1500
Veth224   631    virt access up     none           1500
Veth225   1       virt access nonPcpt nonParticipating 1500
vsg#
```

Verifying the Running Configuration for All Interfaces

You can verify the running configuration for all interfaces.



Note

The output for the command, `show running-config interface` differs from that of the command, `show interface`.

BEFORE YOU BEGIN

Before using this procedure, you must know or do the following:

- You are logged in to the CLI in any command mode.

PROCEDURE

	Command	Description
Step 1	show running-config interface Example: vsg# show running-config interface	Displays the running configuration for all interfaces on your system.

This example shows how to display the running configuration for all the interfaces on your VSG:

```
vsg# show running-config interface

!Command: show running-config interface
!Time: Sun Dec 12 16:29:08 2010

version 4.2(1)VSG1(1)

interface mgmt0
  ip address 10.193.73.10/16

interface data0
  ip address 10.10.10.10/24

vsg#
```

Saving a Configuration

You can save the running configuration to the startup configuration, so that your changes are retained in the startup configuration file the next time that you start up your Cisco VSG.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI in any command mode.

PROCEDURE

	Command	Description
Step 1	copy running-config startup-configure Example: vsg# copy running-config startup-configure	Saves the running configuration to the startup configuration.

This example shows how to save the running configuration to your startup configuration:

```
vsg(config)# copy running-config startup-config
[#####] 100%
vsg(config)#
```

Erasing a Configuration

You can erase a startup configuration.



Caution

The **write erase** command erases the entire startup configuration with the exception of loader functions.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI.
- The following parameters are used with this command:
 - **boot**—Erases the boot variables and the mgmt0 IP configuration.
 - **debug**—Erases the debug configuration.

PROCEDURE

	Command	Description
Step 1	write erase [boot debug] Example: vsg# write erase debug	Erases the existing startup configuration and reverts all settings to their factory defaults. The running configuration is not affected.

This example shows how to erase a debug startup configuration:

```
vsg(config)# write erase debug
Warning: This command will erase the startup-configuration.
Do you wish to proceed anyway? (y/n) [y]
[#####] 100%
vsg(config)#
```

Displaying a Cisco VSG Instance

You can display a Cisco VSG instance.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI.

PROCEDURE

	Command	Description
Step 1	show vsg Example: vsg# show vsg	Displays the particulars of the Cisco VSG—including the model, the high availability (HA) ID, the Cisco VSG software version and build, and the Cisco Virtual Network Management Center (VNMC) IP address. The running configuration is not affected.

This example shows how to display the Cisco VSG model, HA ID, software version and build, and the Cisco VNMC IP address:

```
vsg# show vsg
Model: VSG
HA ID: 10
VSG Software Version: 4.2(1)VSG1(1) build [4.2(1)VSG1(0.396)]
VNMC IP: 10.193.20.12
vsg#
```

Navigating the File System

This section describes how to navigate the file system.

This section includes the following topics:

- [Specifying File Systems, page 4-12](#)
- [Identifying Your Current Working Directory, page 4-13](#)
- [Changing Your Directory, page 4-13](#)
- [Listing the Files in a File System, page 4-14](#)
- [Identifying Available File Systems for Copying Files, page 4-15](#)
- [Using Tab Completion, page 4-16](#)

Specifying File Systems

The syntax for specifying a file system is `<file system name>:[//server/]`. [Table 4-1](#) describes the file system syntax.

Table 4-1 File System Syntax Components

File System Name	Server	Description
bootflash:	sup-active sup-local sup-1 module-1	Internal memory located on the active supervisor used for storing system images, configuration files, and other miscellaneous files. Virtual Firewall CLI defaults to the bootflash: file system.
	sup-standby sup-remote sup-2 module-2	Internal memory located on the standby supervisor used for storing system images, configuration files, and other miscellaneous files.
volatile:	—	Volatile random-access memory (VRAM) located on a supervisor module used for temporary or pending changes.

Identifying Your Current Working Directory

You can display the directory name of your current location in the CLI.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI.

PROCEDURE

	Command	Purpose
Step 1	<code>pwd</code> Example: <code>vsg# pwd</code>	Displays the directory name of your current location in the CLI.

This example shows how to display the directory name of your current location in the VSG CLI:

```
vsg# pwd
bootflash:
```

Changing Your Directory

You can change directories in the CLI.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI in any command mode.
- The Cisco VSG CLI defaults to the bootflash: file system.



Note Any file saved in the volatile: file system is erased when the VSG reboots.

PROCEDURE

	Command	Purpose
Step 1	<code>pwd</code> Example: <code>vsg# pwd</code>	Displays the directory name of your current CLI location.
Step 2	<code>cd <i>directory name</i></code> Example: <code>vsg# cd bootflash:</code>	Changes your CLI location to the specified directory.

This example shows how to display the directory name of your current VSG CLI location and how to change your CLI location to the specified directory:

```
vsg# pwd
bootflash:
vsg# cd volatile:
vsg# pwd
volatile:
vsg#
```

Listing the Files in a File System

You can display the contents of a directory or file.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI in any command mode.

PROCEDURE

Step	Command	Purpose
Step 1	<code>dir [<i>directory</i> <i>filename</i>]</code> Example: <code>vsg# dir TenantA/</code>	Displays the contents of a directory or file. Ending an argument with a slash indicates a directory and will display the contents of that directory.

This example shows how to display the contents of a directory:

```
vsg# dir lost+found/
 49241      Jul 01 09:30:00 2008  diagclient_log.2613
 12861      Jul 01 09:29:34 2008  diagmgr_log.2580
    31       Jul 01 09:28:47 2008  dmesg
 1811      Jul 01 09:28:58 2008  example_test.2633
    89       Jul 01 09:28:58 2008  libdiag.2633
 42136     Jul 01 16:34:34 2008  messages
    65       Jul 01 09:29:00 2008  otm.log
```



```

741      Jul 01 09:29:07 2008  sal.log
87       Jul 01 09:28:50 2008  startupdebug

```

```

Usage for log://sup-local
 51408896 bytes used
158306304 bytes free
209715200 bytes total
vsg#

```

Identifying Available File Systems for Copying Files

You can identify the file systems that you can copy to or from.

BEFORE YOU BEGIN

Before using this procedure, you must know or do the following:

- You are logged in to the CLI in EXEC mode.

PROCEDURE

	Command	Purpose
Step 1	copy ? Example: vsg# copy ?	Displays the source file systems available to the copy command.
Step 2	copy filename ? Example: vsg# copy filename ?	Displays the destination file systems available to the copy command for a specific file.

This example shows how to display the source file systems available to the **copy** command.

```

vsg# copy ?
bootflash: Select source filesystem
core: Select source filesystem
debug: Select source filesystem
ftp: Select source filesystem
licenses Backup license files
log: Select source filesystem
nvram: Select source filesystem
running-config Copy running configuration to destination
scp: Select source filesystem
sftp: Select source filesystem
startup-config Copy startup configuration to destination
system: Select source filesystem
tftp: Select source filesystem
volatile: Select source filesystem

```

This example shows how to display the destination file systems available to the **copy** command for the specific file named.

```

vsg# copy filename ?
bootflash:      Select destination filesystem
debug:          Select destination filesystem
ftp:            Select destination filesystem
log:            Select destination filesystem

```

```

modflash:      Select destination filesystem
nvram:         Select destination filesystem
running-config Copy from source to running configuration
scp:          Select destination filesystem
sftp:         Select destination filesystem
startup-config Copy from source to startup configuration
system:       Select destination filesystem
tftp:         Select destination filesystem
volatile:     Select destination filesystem

```

Using Tab Completion

You can have the CLI complete a partial file name in a command.

BEFORE YOU BEGIN

Before using this procedure, you must know or do the following:

- You are logged in to the CLI in EXEC mode.

PROCEDURE

	Command	Purpose
Step 1	<pre>show file filesystem name: partial filename <Tab></pre> <p>Example: vsg# show file bootflash:sanfrancisc </p>	<p>Completes the file name when Tab is pressed, if the characters you typed are unique to a single file.</p> <p>If not, the CLI lists a selection of file names that match the characters you typed.</p> <p>You can then retype enough characters to make the file name unique; and CLI completes the file name for you.</p>
Step 2	<pre>show file bootflash:c <Tab></pre> <p>Example: vsg# show file bootflash:c </p>	<p>Completes the file name for you.</p>

This example shows how you can display a selection of available files when you press Tab after you have typed enough characters that are unique to a file or set of files:

```

VSG# show file bootflash:nex<Tab>
bootflash:nexus-1000v-dplug-mzg.VSG1.0.1.bin
bootflash:nexus-1000v-kickstart-mzg.VSG1.0.1.bin
bootflash:nexus-1000v-mzg.VSG1.0.1.bin
bootflash:nexus-1000v-mzg.VSG1.0.2.bin

```

This example shows how a command is completed when you press the Tab key when you have already entered the first unique characters of a command.

```

vsg# show file bootflash:c<Tab>
-----BEGIN RSA PRIVATE KEY-----
MIICXgIBAAKBgQDSq93Br1Hcg3bX1jXDMY5c9+yZSST3VhuQBqogvCPDGeLecA+j
...
...
vsg#

```

Copying and Backing Up Files

You can copy a file, such as a configuration file, to save it or reuse it at another location. If your internal file systems are corrupted, you could potentially lose your configuration. Save and back up your configuration files periodically. Also, before installing or migrating to a new software configuration, back up the existing configuration files.

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- You are logged in to the CLI in any command mode.
- If you are copying to a remote location, make sure that your device has a route to the destination. Your device and the remote destination must be in the same subnetwork if you do not have a router or default gateway to route traffic between subnets.
- Using the **ping** command, make sure that your device has connectivity to the destination.
- Make sure that the source configuration file is in the correct directory on the remote server.
- Make sure that the permissions on the source file are set correctly. Permissions on the file should be set to world-read.



Note

Use the **dir** command to ensure that enough space is available in the destination file system. If enough space is not available, use the **delete** command to remove unneeded files.

PROCEDURE

	Command	Purpose
Step 1	copy <i>[source filesystem:] filename</i> <i>[destination filesystem:] filename</i> Example: vsg# copy system:running-config tftp://10.10.1.1./home/configs/vsg2.cfg	Copies a file from the specified source location to the specified destination location.

This example shows how a file is copied from a specified source location and moved to a specified destination location:

```
vsg# copy system:running-config tftp://10.10.1.1/home/configs/vsg3-run.cfg
Enter vrf (If no input, current vrf 'default' is considered):
Trying to connect to tftp server.....
Connection to Server Established.
TFTP put operation succesful
vsg#
```

Creating a Directory

You can create a directory at the current directory level or at a specified directory level.

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- You are logged in to the CLI in any command mode.

PROCEDURE

	Command	Purpose
Step 1	<pre>mkdir {bootflash: debug: volatile:} <i>directory-name</i></pre> <p>Example: vsg# mkdir bootflash:new-directory</p>	Creates a directory at the current directory level.

This example shows how to create a directory called test in the bootflash: directory:

```
vsg# mkdir bootflash:test
vsg#
```

This example shows how to create a directory called test at the current directory level:

```
vsg# mkdir test
vsg#
```

Removing an Existing Directory

You can remove an existing directory from the flash file system.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI.
- This command is only valid on flash file systems.
- Before you can remove it, the directory must be empty.

PROCEDURE

	Command	Purpose
Step 1	<pre>rmdir {bootflash: debug: volatile:} <i>directory</i></pre> <p>Example: vsg# rmdir bootflash:new-directory</p>	Removes a directory as long as the directory is empty.

This example shows how to remove the directory called test in the bootflash: directory:

```
vsg# rmdir bootflash:test
vsg#
```

This example shows how to remove the directory called test at the current directory level:

```
vsg# rmdir test
vsg#
```

Moving Files

You can move a file from one location to another location.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI.
- The copy does not complete if there is not enough space in the destination directory.



Caution

If a file with the same name already exists in the destination directory, that file is overwritten by the file that you move.

PROCEDURE

	Command	Purpose
Step 1	<pre>move {source path and filename} {destination path and filename}</pre> <p>Example: vsg# move bootflash:file1 bootflash:mystuff/file1 </p>	Moves a directory.

This example shows how to move a file from one directory to another in the same file system:

```
vsg# move bootflash:samplefile bootflash:mystorage/samplefile
```

This example shows how to move a file from one directory to another in the current file system:

```
vsg# move samplefile mystorage/samplefile
```

Deleting Files or Directories

You can delete files or directories on a Flash memory device.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- If you try to delete the configuration file or image specified by the CONFIG_FILE or BOOTLDR environment variable, the system prompts you to confirm the deletion.
- If you try to delete the last valid system image specified in the BOOT environment variable, the system prompts you to confirm the deletion.

PROCEDURE

	Command	Purpose
Step 1	delete [bootflash: debug: log: volatile:] <i>filename or directory name</i> Example: vsg# delete log:test-log	Deletes a specified file or directory and everything in the directory.

This example shows how to delete the named file from the current working directory:

```
vsg# delete bootflash:dns_config.cfg
```

This example shows how to delete the named directory and its contents:

```
vsg# delete log:my-log
```

Compressing Files

You can compress (zip) a specified file using LZ77 coding.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI.

PROCEDURE

	Command	Purpose
Step 1	show <i>command</i> > [<i>path</i>] <i>filename</i> Example: vsg# show pwd > pwdfile	Directs show command output to a file.
Step 2	dir Example: vsg# dir	Displays the contents of the current directory, including the new file created in the first step.
Step 3	gzip [<i>path</i>] <i>filename</i> Example: vsg# gzip bootflash:errorsfile	Compresses the specified file.

This example shows how to display and then compress a specified file:

```
vsg# show system internal sysmgr event-history errors > errorsfile
vsg# dir
 1480264   Nov 03 08:38:21 2001  1
    77824   Dec 08 11:17:45 2001  accounting.log
    4096    Nov 30 14:35:15 2001  core/
    3220    Dec 09 16:33:05 2001  errorsfile
    4096    Nov 30 14:35:15 2001  log/
 16384    Nov 03 08:32:09 2001  lost+found/
    7456    Dec 08 11:17:41 2001  mts.log
```

```

1480264      Nov 03 08:33:27 2001 nexus-1000v-dplug-mzg.VSG1.0.1.bin
20126720     Nov 03 08:33:27 2001 nexus-1000v-kickstart-mzg.VSG1.0.1.bin
45985810     Dec 01 14:30:00 2001 nexus-1000v-mzg.VSG1.0.1.bin
46095447     Dec 07 11:32:00 2001 nexus-1000v-mzg.VSG1.0.396.bin
   1714      Dec 08 11:17:33 2001 system.cfg.new
   4096      Nov 03 08:33:54 2001 vdc_2/
   4096      Nov 03 08:33:54 2001 vdc_3/
   4096      Nov 03 08:33:54 2001 vdc_4/

```

```

Usage for bootflash://
 631246848 bytes used
5772722176 bytes free
6403969024 bytes total

```

This example shows how to compress the specified file:

```

vsg# gzip bootflash:errorsfile
vsg# dir
 1480264      Nov 03 08:38:21 2001 1
   77824      Dec 08 11:17:45 2001 accounting.log
   4096       Nov 30 14:35:15 2001 core/
   861        Dec 09 16:33:05 2001 errorsfile.gz
  4096       Nov 30 14:35:15 2001 log/
 16384       Nov 03 08:32:09 2001 lost+found/
   7456       Dec 08 11:17:41 2001 mts.log
 1480264     Nov 03 08:33:27 2001 nexus-1000v-dplug-mzg.VSG1.0.1.bin
20126720     Nov 03 08:33:27 2001 nexus-1000v-kickstart-mzg.VSG1.0.1.bin
45985810     Dec 01 14:30:00 2001 nexus-1000v-mzg.VSG1.0.1.bin
46095447     Dec 07 11:32:00 2001 nexus-1000v-mzg.VSG1.0.396.bin
   1714      Dec 08 11:17:33 2001 system.cfg.new
   4096      Nov 03 08:33:54 2001 vdc_2/
   4096      Nov 03 08:33:54 2001 vdc_3/
   4096      Nov 03 08:33:54 2001 vdc_4/

```

```

Usage for bootflash://
 631246848 bytes used
5772722176 bytes free
6403969024 bytes total
vsg#

```

Uncompressing Files

You can uncompress (unzip) a specified file that is compressed using LZ77 coding.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI.

PROCEDURE

	Command	Purpose
Step 1	gunzip <i>[path] filename</i> Example: vsg# gunzip bootflash:errorsfile.gz	Uncompresses the specified file.
Step 2	dir Example: vsg# dir	Displays the contents of a directory, including the newly uncompressed file.

This example shows how to uncompress a specified file:

```
vsg# gunzip bootflash:errorsfile.gz
vsg# dir bootflash:
 1480264   Nov 03 08:38:21 2001  1
    77824   Dec 08 11:17:45 2001  accounting.log
    4096    Nov 30 14:35:15 2001  core/
    3220    Dec 09 16:33:05 2001  errorsfile
    4096    Nov 30 14:35:15 2001  log/
   16384   Nov 03 08:32:09 2001  lost+found/
    7456    Dec 08 11:17:41 2001  mts.log
   1480264 Nov 03 08:33:27 2001  nexus-1000v-dplug-mzg.VSG1.0.1.bin
  20126720 Nov 03 08:33:27 2001  nexus-1000v-kickstart-mzg.VSG1.0.1.bin
  45985810 Dec 01 14:30:00 2001  nexus-1000v-mzg.VSG1.0.1.bin
  46095447 Dec 07 11:32:00 2001  nexus-1000v-mzg.VSG1.0.396.bin
    1714    Dec 08 11:17:33 2001  system.cfg.new
    4096    Nov 03 08:33:54 2001  vdc_2/
    4096    Nov 03 08:33:54 2001  vdc_3/
    4096    Nov 03 08:33:54 2001  vdc_4/
```

```
Usage for bootflash://sup-local
 631246848 bytes used
 5772722176 bytes free
 6403969024 bytes total
```

Directing Command Output to a File

You can direct command output to a file.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI in any command mode.

PROCEDURE

	Command	Purpose
Step 1	show running-config > [<i>path</i> <i>filename</i>] Example: vsg# show running-config > bootflash:vsg1-run.cfg	Directs the output of the command to a path and file name.

This example shows how to direct the output of the command to the file vsg1-run.cfg in the volatile: directory:

```
vsg# show running-config > volatile:vsg1-run.cfg
```

This example shows how to direct the output of the command to the file vsg2-run.cfg in the bootflash: directory:

```
vsg# show running-config > bootflash:vsg2-run.cfg
```

Verifying a Configuration File Before Loading

You can verify the integrity of an image before loading it.


Note

The **copy** command can be used for both the system and kickstart images.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI in any command mode.

PROCEDURE

	Command	Purpose
Step 1	copy <i>source path and file</i> system:running-config Example: vsg# copy tftp://10.10.1.1./home/configs/vsg1-run.cfg system:running-config	Copies the source file to the running configuration.
Step 2	show version image [bootflash: modflash: volatile:] Example: vsg# show version image	Validates the specified image.

This example shows how to copy the source file to the running configuration:

```
vsg# copy tftp://10.10.1.1/home/configs/vsg1-run.cfg system:running-config
```

This example shows how to validate the specified image:

```
vsg# show version image bootflash:nexus-1000v-mz.VSG1.0.401.bin
  image name: nexus-1000v-mz.VSG1.0.401.bin
  bios:      version unavailable
  system:    version 4.2(1)VSG1(1) [build 4.2(1)VSG1(0.401)]
  compiled:  12/9/2010 2:00:00 [12/09/2010 15:20:50]
vsg#
```

Reverting to a Previous Configuration

You can recover your configuration from a previously saved version.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI in any command mode.



Note

Each time that a **copy running-config startup-config** command is used, a binary file is created and the ASCII file is updated. A valid binary configuration file reduces the overall boot time significantly. A binary file cannot be uploaded, but its contents can be used to overwrite the existing startup configuration. The **write erase** command clears the binary file.

PROCEDURE

	Command	Purpose
Step 1	copy running-config bootflash: <i>{filename}</i> Example: vsg# copy running-config bootflash:Jan24-running	Reverts to a snapshot copy of a previously saved running configuration (binary file).
Step 2	copy bootflash: {filename} startup-configure Example: vsg# copy bootflash:my-configure startup-configure	Reverts to a configuration copy that was previously saved in the bootflash: file system (ASCII file).

This example shows how to revert to a snapshot copy of a previously saved running configuration:

```
vsg# copy running-config bootflash:January03-Running
```

This example shows how to revert to a configuration copy that was previously saved in the bootflash: directory:

```
vsg# copy bootflash:my-configure startup-configure
```

Displaying Files

This section describes how to display information about files and includes the following topics:

- [Displaying File Contents, page 4-25](#)

- [Displaying Directory Contents, page 4-25](#)
- [Displaying File Checksums, page 4-26](#)
- [Displaying the Last Lines in a File, page 4-27](#)

Displaying File Contents

You can display the contents of a specified file.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI in EXEC mode.

PROCEDURE

	Command	Purpose
Step 1	show file [bootflash: debug: volatile:] <i>filename</i> Example: vsg# show file bootflash:sample_file.txt	Displays the contents of the specified file.

The following example shows how to displays the contents of the specified file:

```
vsg# show file bootflash:sample_file.txt
security-profile sp1
  policy p1
  rule r1
    action 10 permit
  policy p1
    rule r1 order 10
vsg#
```

Displaying Directory Contents

You can display the contents of a directory or file system.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI in EXEC mode.

PROCEDURE

	Command	Purpose
Step 1	pwd Example: vsg# pwd	Displays the current working directory.
Step 2	dir Example: vsg# dir	Displays the contents of the directory.

This example shows how to display your current working directory:

```
vsg# pwd
bootflash:
```

This example shows how to display the contents of a directory:

```
vsg# dir
Usage for volatile://
      0 bytes used
 20971520 bytes free
 20971520 bytes total
vsg#
```

Displaying File Checksums

You can display checksums for checking file integrity.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI in EXEC mode.

PROCEDURE

	Command	Purpose
Step 1	show file filename [cksum md5sum] Example: vsg# show file bootflash:sample_file.txt cksum	Provides the checksum or Message-Digest Algorithm 5 (MD5) checksum of the file for comparison with the original file. MD5 is an electronic fingerprint for the file

This example shows how to provide the checksum or MD5 checksum of the file for comparison with the original file.

```
vsg# show file bootflash:sample_file.txt cksum
750206909
vsg#
```

This example shows how to provide the Message-Digest Algorithm 5 (MD5) checksum of the file:

```
vsg# show file bootflash:sample_file.txt md5sum
```

```
aa163ec1769b9156614c643c926023cf
vsg#
```

Displaying the Last Lines in a File

You can display the last lines of a specified file.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI in EXEC mode.

PROCEDURE

	Command	Purpose
Step 1	tail {path}[filename] {number-of-lines} Example: vsg# tail bootflash:errorsfile 5	Displays the requested number of lines from the end of the specified file. The range for the number-of-lines argument is from 0 to 80.

This example shows how to display the requested number of lines from the end of a specified file:

```
vsg# tail bootflash:errorsfile 5
(20) Event:E_DEBUG, length:34, at 171590 usecs after Tue Jul 1 09:29:05 2008
[102] main(326): stateless restart
vsg#
```

Displaying the Current User Access

You can display all users currently accessing the Cisco VSG.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI in EXEC mode.

PROCEDURE

	Command	Description
Step 1	show users Example: vsg# show users	Displays a list of users who are currently accessing the Cisco VSG.

This example shows how to display a list of users who are currently accessing the Cisco VSG:

```
vsg# show users
NAME      LINE      TIME      IDLE      PID COMMENT
```

```

admin pts/0 Jul 1 04:40 03:29 2915 (::ffff:64.103.145.136)
admin pts/2 Jul 1 10:06 03:37 6413 (::ffff:64.103.145.136)
admin pts/3 Jul 1 13:49 . 8835 (171.71.55.196)*
vsg#

```

Sending a Message to Users

You can send a message to all active users currently using the Cisco VSG.

BEFORE YOU BEGIN

Before using this command, you must know or do the following:

- You are logged in to the CLI.

PROCEDURE

	Command	Description
Step 1	send { <i>session device</i> } <i>line</i> Example: vsg# send System Shutdown in 10 Minutes	Sends a message to users currently logged in to the system. <ul style="list-style-type: none"> • session: sends the message to a specified pts/tty device type. • <i>line</i> is a message of up to 80 alphanumeric characters.

This example shows how to send a message to all users:

```

vsg# send Hello. Shutting down the system in 10 minutes.
Broadcast Message from admin@vsg (/dev/pts/34) at 8:58 ...
Hello. Shutting down the system in 10 minutes.
vsg#

```



Cisco Virtual Security Gateway High Availability

This chapter describes high availability (HA) concepts and features for the Cisco Virtual Security Gateway (VSG).

This chapter includes the following sections:

- [Information About High Availability, page 5-1](#)
- [System-Control Services, page 5-3](#)
- [Cisco VSG HA Pairs, page 5-5](#)
- [Cisco VSG HA Pair Failover, page 5-6](#)
- [Cisco VSG HA Guidelines and Limitations, page 5-7](#)
- [Changing the Cisco VSG Role, page 5-7](#)
- [Configuring a Failover, page 5-9](#)
- [Assigning IDs to HA Pairs, page 5-12](#)
- [Pairing a Second Cisco VSG with an Active Cisco VSG, page 5-13](#)
- [Replacing the Standby Cisco VSG in an HA Pair, page 5-15](#)
- [Replacing the Active Cisco VSG in an HA Pair, page 5-16](#)
- [Verifying HA Status, page 5-17](#)

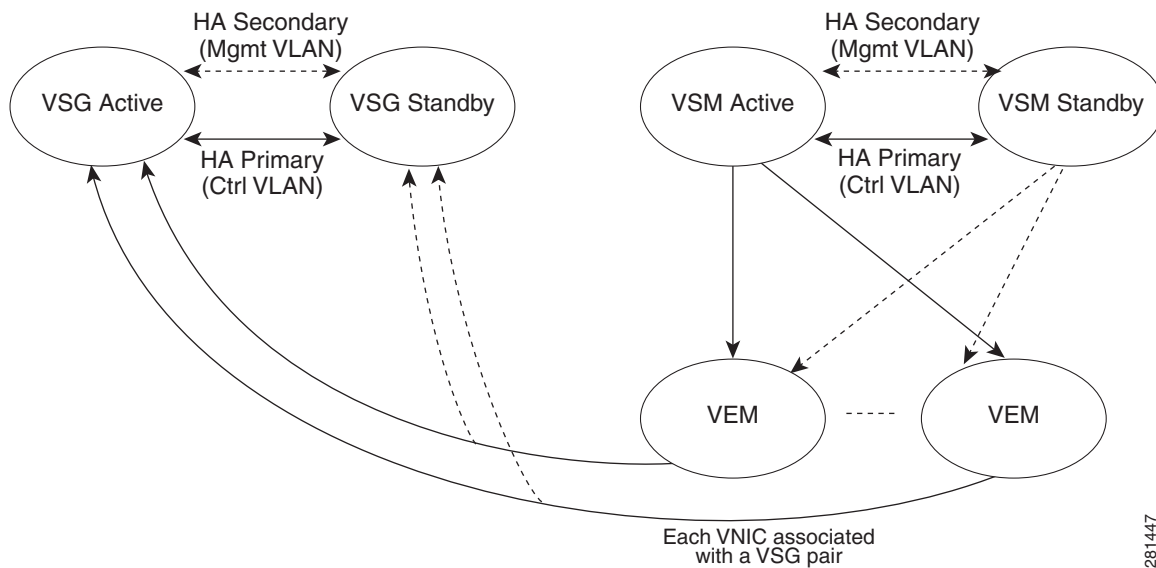
Information About High Availability

Cisco VSG HA is a subset of the Cisco NX-OS HA. Redundancy or HA is provided by one active Cisco VSG and one standby Cisco VSG. The active Cisco VSG runs and controls all the system applications. Applications are started and initialized in standby mode on the standby Cisco VSG as they are synchronized and updated on the active Cisco VSG. When a failover occurs, the standby Cisco VSG takes over for the active Cisco VSG. The following HA features minimize or prevent traffic disruption in the event of a failure:

- Redundancy—HA pairing of devices
- Isolation of processes—Software component isolation
- Supervisor and Cisco VSG failover—HA pairing of the active/standby VSG

Figure 5-1 shows the Cisco VSG HA model.

Figure 5-1 Cisco VSG High Availability



This section includes the following topics:

- [Redundancy, page 5-2](#)
- [Isolation of Processes, page 5-2](#)
- [Cisco VSG Failover, page 5-3](#)

Redundancy

Cisco VSG redundancy is equivalent to HA pairing. The possible redundancy states are active and standby. An active Cisco VSG is paired with a standby Cisco VSG. HA pairing is based on the Cisco VSG ID. Two Cisco VSGs that are assigned the identical ID are automatically paired. All processes running in the Cisco VSG are data path critical. If one process fails in an active Cisco VSG, a failover to the standby Cisco VSG occurs instantly and automatically.

Isolation of Processes

The Cisco VSG software contains independent processes, known as services, that perform a function or set of functions for a subsystem or feature set. Each service and service instance runs as an independent, protected process. This way of operating provides a highly fault-tolerant software infrastructure and fault isolation between services. A failure in a service instance does not affect any other services that are running at that time. Additionally, each instance of a service can run as an independent process, which means that two instances of a routing protocol can run as separate processes.

Cisco VSG Failover

When a failover occurs, the Cisco VSG HA pair configuration allows uninterrupted traffic forwarding by using a stateful failover. For information about a Cisco VSG failover, see the “[Cisco VSG HA Pair Failover](#)” section on page 5-6.

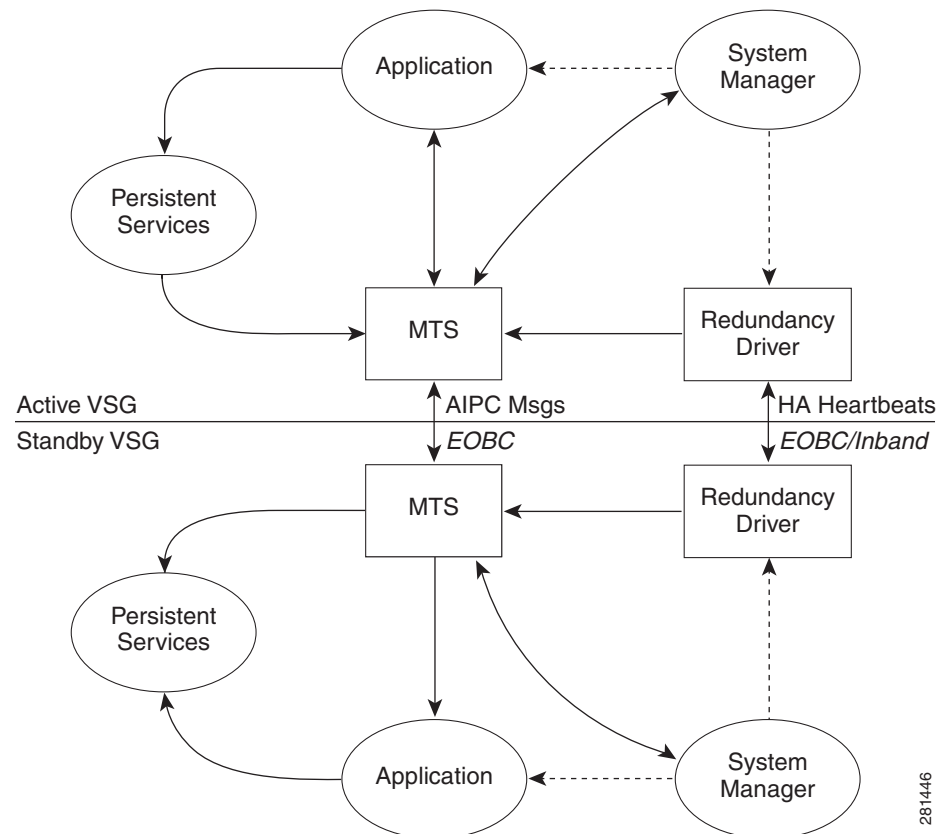
System-Control Services

The Cisco VSG allows stateful restarts of most processes and services. Back-end management of processes, services, and applications is handled by the following high-level system-control services:

- System Manager
- Persistent Storage Service
- Message and Transaction Service
- HA Policies

Figure 5-2 shows the system-control services.

Figure 5-2 System-Control Services



This section includes the following topics:

- [System Manager, page 5-4](#)
- [Persistent Storage Service, page 5-4](#)

- [Message and Transaction Service, page 5-4](#)
- [HA Policies, page 5-4](#)

System Manager

The System Manager (SM) directs overall system function, service management, and system health monitoring, and enforces high-availability policies. It is responsible for launching, stopping, monitoring, and restarting services. The SM is also responsible for initiating and managing the synchronization of service states and supervisor states.

Persistent Storage Service

The Persistent Storage Service (PSS) stores and manages the operational run-time information and configuration of platform services. The PSS component works with system services to recover states if a service restart occurs. It functions as a database of state and run-time information, which allows services to make a checkpoint of their state information whenever needed. A restarting service can recover the last known operating state that preceded a failure.

Each service that uses PSS can define its stored information as private (it can be read only by that service) or shared (the information can be read by other services). If the information is shared, the service can specify that it is local (the information can be read only by services on the same supervisor) or global (it can be read by services on either supervisor or on modules).

Message and Transaction Service

The message and transaction service (MTS) is a high-performance interprocess communications (IPC) message broker that specializes in high-availability semantics. The MTS handles message routing and queuing between services on and across modules and between supervisors. The MTS facilitates the exchange of messages, such as event notification, synchronization, and message persistency, between system services and system components. The MTS can maintain persistent messages and logged messages in queues for access even after a service restart.

HA Policies

The Cisco NX-OS software usually allows each service to have an associated set of internal HA policies that define how a failed service is restarted. When a process fails on a device, System Manager either performs a stateful resart, a stateless restart, or a failover.

**Note**

For a Cisco VSG, only processes borrowed by a Cisco VSG from a VSM restart. Processes native to a Cisco VSG, such as policy engine or inspect, do not restart. A failed native Cisco VSG process causes an automatic failover.

Cisco VSG HA Pairs

For Cisco VSG HA pairs, the following characteristics apply:

- Redundancy is provided by one active Cisco VSG and one standby Cisco VSG.
- The active Cisco VSG runs and controls all the system applications.
- Applications are started and initialized in standby mode on the standby Cisco VSG.
- Applications are synchronized and updated on the standby Cisco VSG.
- When a failover occurs, the standby Cisco VSG takes over for the active Cisco VSG.

This section includes the following topics:

- [Cisco VSG Roles, page 5-5](#)
- [HA Pair States, page 5-5](#)
- [Cisco VSG HA Pair Synchronization, page 5-5](#)

Cisco VSG Roles

The Cisco VSG roles are as follows:

- Standalone—This role does not interact with other Cisco VSGs. You assign this role when there is only one Cisco VSG in the system. This role is the default.
- Primary—This role coordinates the active/standby state with the secondary Cisco VSG. It takes precedence during bootup when negotiating the active/standby mode. That is, if the secondary Cisco VSG does not have the active role at bootup, the primary Cisco VSG takes the active role. You assign this role to the first Cisco VSG that you install in an HA Cisco VSG system.
- Secondary—This role coordinates the active/standby state with the primary Cisco VSG. You assign this role to the second Cisco VSG that you add to a Cisco VSG HA pair.

HA Pair States

The Cisco VSG HA pair states are as follows:

- Active—This state indicates the Cisco VSG is active and controls the system. It is visible to the user through the **show system redundancy status** command.
- Standby—This state indicates that the Cisco VSG has synchronized its configuration with the active Cisco VSG so that it is continuously ready to take over in case of a failure or manual switchover.

Cisco VSG HA Pair Synchronization

The active and standby Cisco VSGs automatically synchronize when the internal state of one is active and the internal state of the other is standby.

If the output of the **show system redundancy status** command indicates that the operational redundancy mode of the active Cisco VSG is none, then the active and standby Cisco VSGs are not yet synchronized.

This example shows the internal state of Cisco VSG HA pair when they are synchronized:

```
vsg# show system redundancy status
Redundancy role
-----
      administrative:  primary
      operational:    primary

Redundancy mode
-----
      administrative:  HA
      operational:    HA

This supervisor (sup-1)
-----
      Redundancy state:  Active
      Supervisor state:  Active
      Internal state:    Active with HA standby

Other supervisor (sup-2)
-----
      Redundancy state:  Standby
      Supervisor state:  HA standby
      Internal state:    HA standby
vsg#
```

Cisco VSG HA Pair Failover

The Cisco VSG HA pair configuration allows uninterrupted traffic forwarding using stateful failover when a failure occurs. The pair operates in an active/standby capacity in which only one is active at any given time, while the other acts as a standby backup. The two Cisco VSGs constantly synchronize the state and configuration in order to provide a stateful failover of most services.

This section includes the following topics:

- [Failover Characteristics, page 5-6](#)
- [Automatic Failover, page 5-6](#)
- [Manual Failover, page 5-7](#)

Failover Characteristics

A failover occurs when the active Cisco VSG fails and it has the following characteristics:

- It is stateful, or nondisruptive, because control traffic is not affected.
- It does not disrupt data traffic because the Virtual Ethernet Modules (VEMs) are not affected.

Automatic Failover

When a stable standby Cisco VSG detects that the active Cisco VSG has failed, it initiates a failover and transitions to active. When a failover begins, another failover cannot be started until a stable standby Cisco VSG is available. If a standby Cisco VSG that is not stable detects that an active Cisco VSG has failed, then instead of initiating a failover, it tries to restart the pair.

Manual Failover

Before you can initiate a manual failover from the active to the standby Cisco VSG, the standby Cisco VSG must be stable. To find out if it is, see the [“Verifying that a Cisco VSG Pair is Ready for a Failover” section on page 5-9](#). Once you have verified that the standby Cisco VSG is stable, you can manually initiate a failover. To find out if it is, see the [“Manually Switching the Active Cisco VSG to Standby” section on page 5-10](#). Once a failover process begins, another failover process cannot be started until a stable standby Cisco VSG is available.

Cisco VSG HA Guidelines and Limitations

HA pairs have the following configuration guidelines and limitations:

- Although primary and secondary Cisco VSGs can reside in the same host, to improve redundancy install them in separate hosts and, if possible, connect them to different upstream switches.
- The console for the standby Cisco VSG is available through the vSphere client or by using the **attach module** [1 | 2] command depending on whether the primary is active or not, but configuration is not allowed and many commands are restricted. The **attach module** [1 | 2] command must be executed at the console of the active Cisco VSG.

Changing the Cisco VSG Role

You can change the role of a Cisco VSG to one of the following after it is already in service:

- Standalone
- Primary
- Secondary

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:



Caution

Changing the role of a Cisco VSG can result in a conflict between the pair. If a primary and secondary see each other as active at the same time, the system resolves this problem by resetting the primary Cisco VSG. If you are changing a standalone Cisco VSG to a secondary Cisco VSG, be sure to first isolate it from the other Cisco VSG in the pair to prevent any interaction with the primary Cisco VSG during the change. Power the Cisco VSG off before reconnecting it as standby.

- You are logged into the CLI in EXEC mode.
- To activate a change from a primary to a secondary Cisco VSG, you must reload the primary Cisco VSG by doing one of the following:
 - Enter the **reload** command.
 - Power the Cisco VSG off and then on from the vSphere Client.
- A change from a standalone to a primary Cisco VSG takes effect immediately.

To change a standalone Cisco VSG to a secondary Cisco VSG, see the [“Pairing a Second Cisco VSG with an Active Cisco VSG”](#) section on page 5-13.

SUMMARY STEPS

1. **system redundancy role {standalone | primary | secondary}**
2. **show system redundancy status**
3. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	system redundancy role {standalone primary secondary} Example: vsg# system redundancy role primary	Specifies the HA role of a Cisco VSG.
Step 2	show system redundancy status Example: vsg# show system redundancy status	(Optional) Displays the current redundancy status for the Cisco VSG(s).
Step 3	copy running-config startup-config Example: vsg# copy running-config startup-configure	(Optional) Saves the running configuration persistently through reboots and restarts by copying it to the startup configuration.

EXAMPLES

This example shows how to specify the HA role of a Cisco VSG:

```
vsg# system redundancy role standalone
vsg#
```

This example shows how to display the system redundancy status of a standalone Cisco VSG:

```
vsg# show system redundancy status
Redundancy role
-----
      administrative:  standalone
      operational:    standalone
```

```
Redundancy mode
-----
      administrative:  HA
      operational:    None
```

```
This supervisor (sup-1)
-----
      Redundancy state: Active
      Supervisor state: Active
      Internal state: Active with no standby
```

```
Other supervisor (sup-2)
-----
      Redundancy state: Not present
vsg#
```

This example shows how to copy the running configuration to the startup configuration:

```
vsg# copy running-config startup-config
[#####] 100%
vsg#
```

Configuring a Failover

This section includes the following topics:

- [Guidelines and Limitations, page 5-9](#)
- [Verifying that a Cisco VSG Pair is Ready for a Failover, page 5-9](#)
- [Manually Switching the Active Cisco VSG to Standby, page 5-10](#)

Guidelines and Limitations

Follow these guidelines when doing a failover:

- When you manually initiate a failover, system messages are generated that indicate the presence of two Cisco VSGs and identify which one is becoming active.
- A failover can only be done when both Cisco VSGs are functioning.

Verifying that a Cisco VSG Pair is Ready for a Failover

You can verify that both an active and standby Cisco VSG are in place and operational before proceeding with a failover.

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- You are logged into the CLI in EXEC mode.
- If the standby Cisco VSG is not in a stable state (the state must be **ha-standby**), then a manually initiated failover cannot be done.

PROCEDURE

	Command	Purpose
Step 1	<pre>show system redundancy status</pre> <p>Example: vsg# show system redundancy status</p>	<p>Displays the current redundancy status for the Cisco VSG(s).</p> <p>If the output indicates the following, then you can proceed with a system failover, if needed.</p> <ul style="list-style-type: none"> • The presence of an active Cisco VSG • The presence of a standby Cisco VSG in the HA standby redundancy state

EXAMPLES

This example shows how to verify that a Cisco VSG pair is ready for a failover:

```
vsg# show system redundancy status
Redundancy role
-----
      administrative:  primary
      operational:    primary

Redundancy mode
-----
      administrative:  HA
      operational:    None

This supervisor (sup-1)
-----
      Redundancy state:  Active
      Supervisor state:  Active
      Internal state:    Active with no standby

Other supervisor (sup-2)
-----
      Redundancy state:  Active
      Supervisor state:  Active
      Internal state:    Active with no standby
```

Manually Switching the Active Cisco VSG to Standby

You can manually switch an active Cisco VSG to standby in an HA pair.

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- You are logged in to the active Cisco VSG CLI in EXEC mode.
- You have completed the steps in the [“Verifying that a Cisco VSG Pair is Ready for a Failover” section on page 5-9](#) and have found the system to be ready for a failover.
- A failover can be performed only when two Cisco VSGs are functioning.
- If the standby Cisco VSG is not in a stable state, then you cannot initiate a manual failover. You will see the following error message:

```
Failed to switchover (standby not ready to takeover in vdc 1)
```

- Once you enter the **system switchover** command, you cannot start another failover process on the same system until a stable standby Cisco VSG is available.
- Any unsaved running configuration that was available in the active Cisco VSG is still unsaved in the new active Cisco VSG. You can verify this unsaved running configuration by using the **show running-config diff** command. Save that configuration, if needed, as you would do in the other Cisco VSG by entering the **copy running-config startup-config** command.

SUMMARY STEPS

1. **system switchover**
2. (Optional) **show running-config diff**

3. **configure**4. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	system switchover Example: vsg# system switchover	Initiates a manual failover from the active Cisco VSG to the standby Cisco VSG. Note Once you enter this command, you cannot start another failover process on the same system until a stable standby Cisco VSG is available. Note Before proceeding, wait until the switchover completes and the standby supervisor becomes active.
Step 2	show running-config diff Example: vsg# show running-config diff	(Optional) Verifies the difference between the running and startup configurations. Any unsaved running configuration in an active Cisco VSG is also unsaved in the Cisco VSG that becomes active after failover. Save that configuration in the startup if needed.
Step 3	configure Example: vsg# configure	Places you in global configuration mode.
Step 4	copy running-config startup-config Example: vsg# copy running-config startup-config	(Optional) Saves the running configuration persistently through reboots and restarts by copying it to the startup configuration.

EXAMPLES

This example shows how to switch an active Cisco VSG to the standby Cisco VSG and displays the output that appears on the standby Cisco VSG as it becomes the active Cisco VSG:

```
vsg# system switchover
-----
2011 Jan 18 04:21:56 n1000v %$ VDC-1 %$ %SYSMGR-2-HASWITCHOVER_PRE_START:
This supervisor is becoming active (pre-start phase).
2011 Jan 18 04:21:56 n1000v %$ VDC-1 %$ %SYSMGR-2-HASWITCHOVER_START:
This supervisor is becoming active.
2011 Jan 18 04:21:57 n1000v %$ VDC-1 %$ %SYSMGR-2-SWITCHOVER_OVER: Switchover completed.
2011 Jan 18 04:22:03 n1000v %$ VDC-1 %$ %PLATFORM-2-MOD_REMOVE: Module 1 removed (Serial
number )
```

This example shows how to display the difference between the running and startup configurations:

```
vsg# show running-config diff
*** Startup-config
--- Running-config
*****
*** 1,38 ****
    version 4.0(4)SV1(1)
    role feature-group name new
    role name testrole
    username admin password 5 $1$S7HvKc5G$aguYqH10dPtBJAhEPwyl role network-admin
    telnet server enable
    ip domain-lookup
```

This example shows how to copy the running configuration to the startup configuration:

```
vsg# configure
vsg(config)# copy running-config startup-config
[#####] 100%
vsg(config)#
```

Assigning IDs to HA Pairs

You can create Cisco VSG HA pairs. Each HA pair is uniquely identified by an identification (ID) called an HA pair ID. The configuration state synchronization between the active and standby Cisco VSGs occurs between those Cisco VSG pairs that share the same HA pair ID.

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- You are logged in to the CLI in configuration mode.

SUMMARY STEPS

- configure
- ha-pair id

DETAILED STEPS

	Command	Purpose
Step 1	configure Example: vsg# configure	Places you in global configuration mode.
Step 2	ha-pair id {number} Example: vsg(config-svs-domain)# ha-pair id 10	Assigns an ID to an HA pair.

EXAMPLES

This example shows how to assign an ID to an HA pair:

```
vsg# configure
vsg(config)# ha-pair id 10
vsg(config)#
```

Pairing a Second Cisco VSG with an Active Cisco VSG

You can change a standalone Cisco VSG into an HA pair by adding a second Cisco VSG.

This section includes the following topics:

- [Changing the Standalone Cisco VSG to a Primary Cisco VSG, page 5-13](#)
- [Verifying the Change to a Cisco VSG HA Pair, page 5-15](#)

BEFORE YOU BEGIN

Before adding a second Cisco VSG to a standalone system, you must know or do the following:

- You are logged into the CLI in EXEC mode.
- Although primary and secondary Cisco VSGs can reside in the same host, to improve redundancy install them in separate hosts and, if possible, connect them to different upstream switches.
- When installing the second Cisco VSG, assign it with the secondary role.
- Set up the port groups for the dual Cisco VSG VMs with the same parameters in both hosts.
- After the secondary Cisco VSG is paired, the following occurs automatically:
 - The secondary Cisco VSG is reloaded and added to the system.
 - The secondary Cisco VSG negotiates with the primary Cisco VSG and becomes the standby Cisco VSG.
 - The standby Cisco VSG synchronizes its configuration and state with the primary Cisco VSG.

Changing the Standalone Cisco VSG to a Primary Cisco VSG

You can change the role of a Cisco VSG from standalone to primary in a Cisco VSG HA pair.

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- You are logged into the CLI in EXEC mode.
- A change from a standalone to a primary takes effect immediately.

SUMMARY STEPS

1. **system redundancy role primary**
2. **show system redundancy status**
3. **configure**
4. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	system redundancy role primary Example: vsg# system redundancy role primary	Changes the standalone Cisco VSG to a primary Cisco VSG. The role change occurs immediately.
Step 2	show system redundancy status Example: vsg# show system redundancy status	Displays the current redundancy state for the Cisco VSG.
Step 3	configure Example: vsg# configure	Places you in global configuration mode.
Step 4	copy running-config startup-config Example: vsg(config)# copy running-config startup-config	(Optional) Saves the running configuration persistently through reboots and restarts by copying it to the startup configuration.

EXAMPLES

This example shows how to change the standalone Cisco VSG to a primary Cisco VSG:

```
vsg# system redundancy role primary
vsg#
```

This example shows how to display the current system redundancy status for a Cisco VSG:

```
vsg# show system redundancy status
Redundancy role
-----
      administrative:  primary
      operational:    primary

Redundancy mode
-----
      administrative:  HA
      operational:    None

This supervisor (sup-1)
-----
      Redundancy state:  Active
      Supervisor state:  Active
      Internal state:    Active with no standby

Other supervisor (sup-2)
-----
      Redundancy state:  Not present
```

This example shows how to copy the running configuration to the startup configuration:

```
vsg# configure
vsg(config)# copy running-config startup-config
[#####] 100%
vsg(config)#
```

Verifying the Change to a Cisco VSG HA Pair

You can verify a change from a single Cisco VSG to a Cisco VSG HA pair.

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- You are logged into the CLI in EXEC mode.
- You have already changed the single Cisco VSG role from standalone to primary. See the [“Changing the Standalone Cisco VSG to a Primary Cisco VSG”](#) section on page 5-13.

PROCEDURE

	Command	Purpose
Step 1	show system redundancy status Example: vsg# show system redundancy status	Displays the current redundancy status for Cisco VSGs in the system.

EXAMPLES

This example shows how to display the current redundancy status for Cisco VSGs in the system. In this example, the primary and secondary Cisco VSGs are shown following a change from a single Cisco VSG system to a dual Cisco VSG system.

```
vsg# show system redundancy status
Redundancy role
-----
administrative: primary
operational: primary
Redundancy mode
-----
administrative: HA
operational: HA
This supervisor (sup-1)
-----
Redundancy state: Active
Supervisor state: Active
Internal state: Active with HA standby
Other supervisor (sup-2)
-----
Redundancy state: Standby
Supervisor state: HA standby
Internal state: HA standby
```

Replacing the Standby Cisco VSG in an HA Pair

You can replace a standby/secondary Cisco VSG in an HA pair.



Note

Equipment Outage—This procedure requires that you power down and reinstall a Cisco VSG. During this time, your system will be operating with a single Cisco VSG.

-
- Step 1** Power off the standby Cisco VSG.
- Step 2** Install the new Cisco VSG as a standby, with the same domain ID as the existing Cisco VSG. After the new Cisco VSG is added to the system, it synchronizes with the existing Cisco VSG.
-

Replacing the Active Cisco VSG in an HA Pair

You can replace an active/primary Cisco VSG in an HA pair.

BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- You are logged into the CLI in EXEC mode.
- You must configure the port groups so that the new primary Cisco VSG cannot communicate with the secondary Cisco VSG or any of the VEMs during setup. Cisco VSGs with a primary or secondary redundancy role have built-in mechanisms for detecting and resolving the conflict between two Cisco VSGs in the active state. In order to avoid these mechanisms during the configuration of the new primary Cisco VSG, you must isolate the new primary Cisco VSG from the secondary Cisco VSG.



Note

Equipment Outage—This procedure requires powering down and reinstalling a Cisco VSG. During this time, your system will be operating with a single Cisco VSG.

-
- Step 1** Power off the active Cisco VSG.
The secondary Cisco VSG becomes active.
- Step 2** On a vSphere Client, change the port group configuration for the new primary Cisco VSG to prevent communication with the secondary Cisco VSG and the VEMs during setup.
- Step 3** Install the new Cisco VSG as the primary, with the same domain ID as the existing Cisco VSG.
- Step 4** On the vSphere Client, change the port group configuration for the new primary Cisco VSG to permit communication with the secondary Cisco VSG and the VEMs.
- Step 5** Power up the new primary Cisco VSG.
The new primary Cisco VSG starts and automatically synchronizes all configuration data with the secondary, which is currently the active Cisco VSG. Because the existing Cisco VSG is active, the new primary Cisco VSG becomes the standby Cisco VSG and receives all configuration data from the existing active Cisco VSG.
-

Verifying HA Status

You can display and verify the HA status.

PROCEDURE

	Command	Purpose
Step 1	show system redundancy status	Displays the HA status of the system.
	Example: vsg# show system redundancy status	

EXAMPLES

This example shows how to display the system redundancy status:

```
vsg# show system redundancy status
Redundancy role
-----
administrative: primary
operational: primary
Redundancy mode
-----
administrative: HA
operational: HA
This supervisor (sup-1)
-----
Redundancy state: Active
Supervisor state: Active
Internal state: Active with HA standby
Other supervisor (sup-2)
-----
Redundancy state: Standby
Supervisor state: HA standby
Internal state: HA standby
```

This example shows how to display the state and start count of all processes:

```
vsg# show processes
PID      State  PC          Start_cnt  TTY  Process
-----  -----
1        S      b7f8a468   1          -    init
2        S      0          0          1    -    ksoftirqd/0
3        S      0          0          1    -    desched/0
4        S      0          0          1    -    events/0
5        S      0          0          1    -    khelper
10       S      0          0          1    -    kthread
18       S      0          0          1    -    kblockd/0
35       S      0          0          1    -    khubd
188      S      0          0          1    -    pdflush
189      S      0          0          1    -    pdflush
190      S      0          0          1    -    kswapd0
191      S      0          0          1    -    aio/0
776     S      0          0          1    -    kseriod
823     S      0          0          1    -    kide/0
833     S      0          0          1    -    ata/0
837     S      0          0          1    -    scsi_eh_0
1175    S      0          0          1    -    kjournald
```

1180	S	0	1	-	kjournald
1740	S	0	1	-	kjournald
1747	S	0	1	-	kjournald
1979	S	b7f6c18e	1	-	portmap
1992	S	0	1	-	nfsd
1993	S	0	1	-	nfsd
1994	S	0	1	-	nfsd
1995	S	0	1	-	nfsd
1996	S	0	1	-	nfsd
1997	S	0	1	-	nfsd
1998	S	0	1	-	nfsd
1999	S	0	1	-	nfsd
2000	S	0	1	-	lockd
2001	S	0	1	-	rpciod
2006	S	b7f6e468	1	-	rpc.mountd
2012	S	b7f6e468	1	-	rpc.statd
2039	S	b7dd2468	1	-	sysmgr
2322	S	0	1	-	mping-thread
2323	S	0	1	-	mping-thread
2339	S	0	1	-	stun_kthread
2340	S	0	1	-	stun_arp_mts_kt
2341	S	0	1	-	stun_packets_re
2376	S	0	1	-	redun_kthread
2377	S	0	1	-	redun_timer_kth
2516	S	0	1	-	sf_rdn_kthread
2517	S	b7f37468	1	-	xinetd
2518	S	b7f6e468	1	-	tftpd
2519	S	b79561b6	1	-	syslogd
2520	S	b7ecc468	1	-	sdwrapd
2522	S	b7da3468	1	-	platform
2527	S	0	1	-	ls-notify-mts-t
2541	S	b7eabbe4	1	-	pfm_dummy
2549	S	b7f836be	1	-	klogd
2557	S	b7c09be4	1	-	vshd
2558	S	b7e4f468	1	-	stun
2559	S	b7b11f43	1	-	smm
2560	S	b7ea1468	1	-	session-mgr
2561	S	b7cd1468	1	-	psshelper
2562	S	b7f75468	1	-	lmgrd
2563	S	b7e6abe4	1	-	licmgr
2564	S	b7eb5468	1	-	fs-daemon
2565	S	b7e97468	1	-	feature-mgr
2566	S	b7e45468	1	-	confcheck
2567	S	b7ea9468	1	-	capability
2568	S	b7cd1468	1	-	psshelper_gsvc
2576	S	b7f75468	1	-	cisco
2583	S	b779f40d	1	-	clis
2586	S	b76e140d	1	-	port-profile
2588	S	b7d07468	1	-	xmlma
2589	S	b7e69497	1	-	vnm_pa_intf
2590	S	b7e6e468	1	-	vmm
2591	S	b7b9c468	1	-	vdc_mgr
2592	S	b7e73468	1	-	ttyd
2593	R	b7edb5f5	1	-	sysinfo
2594	S	b7d07468	1	-	sksd
2596	S	b7e82468	1	-	res_mgr
2597	S	b7e49468	1	-	plugin
2598	S	b7bb9f43	1	-	npacl
2599	S	b7e93468	1	-	mvsh
2600	S	b7e02468	1	-	module
2601	S	b792c40d	1	-	fwm
2602	S	b7e93468	1	-	evms
2603	S	b7e8d468	1	-	evmc
2604	S	b7ec4468	1	-	core-dmon

2605	S	b7e11468	1	-	bootvar
2606	S	b769140d	1	-	ascii-cfg
2607	S	b7ce5be4	1	-	securityd
2608	S	b77de40d	1	-	cert_enroll
2609	S	b7ce2468	1	-	aaa
2611	S	b7b0bf43	1	-	l3vm
2612	S	b7afef43	1	-	u6rib
2613	S	b7afc43	1	-	urib
2615	S	b7e05468	1	-	ExceptionLog
2616	S	b7daa468	1	-	ifmgr
2617	S	b7ea5468	1	-	tcap
2621	S	b763340d	1	-	snmpd
2628	S	b7f02d39	1	-	PMon
2629	S	b7c00468	1	-	aclmgr
2646	S	b7b0ff43	1	-	adjmgr
2675	S	b7b0bf43	1	-	arp
2676	S	b793b896	1	-	icmpv6
2677	S	b79b2f43	1	-	netstack
2755	S	b77ac40d	1	-	radius
2756	S	b7f3ebe4	1	-	ip_dummy
2757	S	b7f3ebe4	1	-	ipv6_dummy
2758	S	b78e540d	1	-	ntp
2759	S	b7f3ebe4	1	-	pktmgr_dummy
2760	S	b7f3ebe4	1	-	tcpudp_dummy
2761	S	b784640d	1	-	cdp
2762	S	b7b6440d	1	-	dcos-xinetd
2765	S	b7b8f40d	1	-	ntpd
2882	S	b7dde468	1	-	vsim
2883	S	b799340d	1	-	ufdm
2884	S	b798640d	1	-	sal
2885	S	b795940d	1	-	pltfm_config
2886	S	b787640d	1	-	monitor
2887	S	b7d71468	1	-	ipqosmgr
2888	S	b7a4827b	1	-	igmp
2889	S	b7a6640d	1	-	eth-port-sec
2890	S	b7b7e468	1	-	copp
2891	S	b7ae940d	1	-	eth_port_channel
2892	S	b7b0a468	1	-	vlan_mgr
2895	S	b769540d	1	-	ethpm
2935	S	b7d3a468	1	-	misp
2938	S	b590240d	1	-	vms
2940	S	b7e8d468	1	-	vsn_service_mgr
2941	S	b7cc0468	1	-	vim
2942	S	b7d57468	1	-	vem_mgr
2943	S	b7d25497	1	-	policy_engine
2944	S	b7e6a497	1	-	inspect
2945	S	b7d33468	1	-	aclcomp
2946	S	b7d1c468	1	-	sf_nf_srv
2952	S	b7f1deee	1	-	tthttpd.sh
2955	S	b787040d	1	-	dcos-tthttpd
3001	S	b7f836be	1	1	getty
3003	S	b7f806be	1	S0	getty
3004	S	b7f1deee	1	-	gettylogin1
3024	S	b7f836be	1	S1	getty
15497	S	b7a3840d	1	-	in.dcos-telnetd
15498	S	b793a468	1	20	vsh
19217	S	b7a3840d	1	-	in.dcos-telnetd
19218	S	b7912eee	1	21	vsh
19559	S	b7f5d468	1	-	sleep
19560	R	b7f426be	1	21	more
19561	R	b7939be4	1	21	vsh
19562	R	b7f716be	1	-	ps
-	NR	-	0	-	tacacs
-	NR	-	0	-	dhcp_snoop

■ Verifying HA Status

```
      -   NR      -           0   - installer
      -   NR      -           0   - ippool
      -   NR      -           0   - nfm
      -   NR      -           0   - private-vlan
      -   NR      -           0   - scheduler
      -   NR      -           0   - vbuilder
vsg#
```



Cisco Virtual Security Gateway Firewall Profiles and Policy Objects

This chapter describes the Cisco Virtual Security Gateway (VSG) firewall profiles and policy objects. This chapter includes the following sections:

- [Information About Cisco VSG Firewall Policy Objects, page 6-1](#)
- [Cisco VSG Prerequisites, Guidelines, and Limitations, page 6-1](#)
- [Default Settings, page 6-2](#)
- [Cisco VSG Firewall Policy Objects, page 6-2](#)
- [Service Firewall Logging, page 6-10](#)
- [Verifying the Cisco VSG Configuration, page 6-11](#)
- [Configuration Limits, page 6-12](#)

Information About Cisco VSG Firewall Policy Objects

Use the Cisco Virtual Network Management Center (VNMC) to do all configuration and management of your Cisco VSG.



Note

When the policy-agent (PA) is installed, the command-line interface (CLI) is unavailable for configuring policy-related objects on the Cisco VSG. When the PA is uninstalled (removed), you can again configure the policies (and policy objects) from the CLI; however, we recommend that you use the Cisco VNMC for all configuration and management of your VSG firewall policy objects.

Cisco VSG Prerequisites, Guidelines, and Limitations

Cisco VSG policy objects have the following prerequisites:

- You must have the NEXUS_VSG_SERVICES_PKG license installed on the Cisco Nexus 1000V Series switch.
- Ensure that you have enough licenses to cover the number of ESX hosts (VEMs) you want to protect.
- Create port profiles for the service and HA interfaces of Cisco VSG on Virtual Supervisor Module (VSM).

- You have the Cisco VSG software installed and the basic installation completed. For details, see the *Cisco Virtual Security Gateway, Release 4.2(1)VSG1(1) and Cisco Virtual Network Management Center, Release 1.0.1 Installation Guide*.
- The data IP address and management IP addresses must be configured. To configure the data IP address, see the *Cisco Virtual Security Gateway, Release 4.2(1)VSG1(1) and Cisco Virtual Network Management Center, Release 1.0.1 Installation Guide*.
- You have the attribute details required for your security policies.
- You are logged in to the Cisco VSG CLI in EXEC mode.

The Cisco VSG has the following configuration guidelines and limitations:

- The Management VLAN must be on the VM network vSwitch
- The HA and Service VLANs are configured on the uplink ports. (They are not required to be on the system VLAN.)
- Do not configure the same network IP address on the management and data interfaces (data0) of the Cisco VSG.

For any configuration and management tasks, the following requirements must be met:

- Your Cisco VSG software must be operating with three network adapters. The network labels are as follows:
 - Service (Eth0) as your port-profile
 - Mgmt (Eth1) as your management VLAN
 - HA (Eth2) as your port-profile
- You have the Cisco VSG VM powered on and the data interface IP address (for data0) and management interface IP address configured.

See the *Cisco Virtual Security Gateway, Release 4.2(1)VSG1(1) and Cisco Virtual Network Management Center, Release 1.0.1 Installation Guide*, for details about assigning network labels to the network adapters.

Default Settings

Table 6-1 lists the default setting for the Cisco VSG parameters.

Table 6-1 Default Parameter

Parameters	Default
rule policy object	drop

Cisco VSG Firewall Policy Objects

This section includes the following topics:

- [Zones, page 6-3](#)
- [Object Groups, page 6-3](#)
- [Rules, page 6-3](#)
- [Policies, page 6-4](#)

- [Security Profiles, page 6-7](#)

Zones

A zone is a logical group of virtual machines (VMs) or hosts. Zones simplify policy writing by allowing users to write policies based on zone attributes using zone names. The zone definitions map the VMs to the zones. The logical group definition can be based on the attributes associated with a VM or a host, such as VM attributes defined in the vCenter. Zone definitions can be written as condition-based subnet and endpoint IP addresses.

Because zones and object groups can be shared between various rules with different directions, the attributes used in an object group should not have a directional sense and must be neutral attributes.

This example shows how the zone is expressed in the **show running-config** command output:

```
vsg# show running-config zone zone1
zone zone1
  condition 1 net.ip-address eq 1.1.1.1
  condition 2 net.port eq 80
```

Object Groups

An object group is a set of conditions that are relevant to an attribute. Because object groups and zones can be shared between various rules with different directions, the attributes used in an object group condition should not have a directional sense and must be neutral. An object group is a secondary policy object that assists in writing firewall rules. A rule condition can refer to an object group by using an operator.

This example shows how the object groups are expressed in the **show running-config** command output:

```
vsg# show running-config object-group g1
object-group g1 net.port
  match 1 eq 80
  match 2 eq 443
```

Rules

Firewall rules can consist of multiple conditions and actions. Rules can be defined in a policy as a condition-based subnet or endpoint IP addresses and VM attributes.

Actions are the result of a policy evaluation. You can define and associate one or more of the following actions within a specified rule:

- Permit
- Drop packet
- Log
- Inspection

This example shows how the rule is expressed in the **show running-config** command output:

```
vsg# show running-config rule r2
rule r2
  condition 1 dst.net.ip-address eq 2.2.2.2
  condition 2 src.net.ip-address eq 1.1.1.1
  condition 3 src.net.port eq 100
  condition 4 dst.net.port eq 80
```

```
condition 5 net.protocol eq 6
action 1 permit
```

Policies

Firewall policies bind rules to a given policy, creating a rank among the rules. A policy enforces network traffic on a Cisco VSG and is constructed by using the following set of policy objects:

- Rules
- Conditions
- Actions
- Object-groups
- Zones

A policy is bound to a Cisco VSG using a set of indirect associations. The security administrator can configure a security profile and then refer to a policy name within the security profile. The security profile is associated with a port profile that has a reference to a Cisco VSG.

This example shows how the policy is expressed in the **show running-config** command output:

```
vsg# show running-config policy p2
policy p2
  rule r2 order 10
```

This example shows how conditions are expressed in the **show running-config** command output:

```
condition 1 dst.net.ip-address eq 2.2.2.2
condition 2 src.net.ip-address eq 1.1.1.1
```

This example shows how an action is expressed in the **show running-config** command output:

```
action 1 permit
```

Cisco Virtual Security Gateway Attributes

This section describes Cisco Virtual Security Gateway attributes.

This section includes the following topics:

- [Information About Attribute Name Notations, page 6-4](#)
- [Attribute Classes, page 6-5](#)

Information About Attribute Name Notations

This section includes the following topics:

- [Directional Attributes, page 6-5](#)
- [Neutral Attributes, page 6-5](#)

Directional Attributes

A firewall policy is direction sensitive. An attribute in a rule condition requires that you have specified if the attribute is relevant to a source or a destination. The prefixes src., dst., or an attribute name are used to provide the sense of direction.

Neutral Attributes

Because object groups and zones can be shared between various rules with different directions, the attributes used in an object group should not have a directional sense. Attributes without a directional sense (that do not provide a direction prefix such as src. or dst.) are called neutral attributes.

Two rule conditions with different directions can share the same object group definition. A neutral attribute and net.ip-address used in the object-group can be associated with the directional attributes, such as src.net.ip-address and dst.net.ip-address, used in the different rules.

Attribute Classes

Cisco VSG attributes are classified into the following classes:

- [Network Attributes, page 6-5](#)
- [VM Attributes, page 6-5](#)
- [Zone Attributes, page 6-7](#)

Attributes are used in configuring policy rules and conditions, or zone definition. Zones can be defined using VM attributes.

Network Attributes

This section describes the VSG network attributes (see [Table 6-2](#)).

Table 6-2 Network Attributes

Description	Name
Source IP address	src.net.ip-address
Source port	src.net.port
Destination IP address	dst.net.ip-address
Destination port	dst.net.port
IP address ¹	net.ip-address
Port ¹	net.port
IP Protocols 9 ¹	net.protocol
Ethertype of the Layer 2 frame ¹	net.ethertype

1. Neutral attribute

VM Attributes

The VM attributes are attributes that are related to the virtual machine infrastructure and include the following classes of VM attributes:

- Virtual infrastructure attributes—These attributes are obtained from the VMware vCenter and are mapped to the names listed in [Table 6-3](#).
- Port profile attributes—These attributes are associated with port profiles.
- Custom attributes—These attributes can be configured under a service profile.

[Table 6-3](#) describes the VM attributes supported.

Table 6-3 VM Attributes

Description	Name
Name of VM	src.vm.name dst.vm.name vm.name ¹
Name of the host parent (ESX host)	src.vm.host-name dst.vm.host-name vm.host-name ¹
Full name of OS guest (includes the version)	src.vm.os-fullname dst.vm.os-fullname vm.os-fullname ¹
Name of associated virtual application	src.vm.vapp-name dst.vm.vapp-name vm.vapp-name ¹
Name of associated cluster	src.vm.cluster-name dst.vm.cluster-name vm.cluster.name ¹
Inventory path of the VM	src.vm.inventory-path dst.vm.inventory-path vm.inventory-path ¹
Name of the port profile associated with the specific vNIC	src.vm.portprofile-name dst.vm.portprofile-name vm.portprofile-name ¹
Custom attributes from the security profile of the associated port group.	src.vm.custom.xxx dst.vm.custom.xxx vm.custom.xxx ¹
Note For every unique custom-attribute xxx, the synthesized attribute name is src.vm.custom.xxx or dst.vm.custom.xxx. The policy uses the synthesized attribute name.	

1. Neutral attributes

Custom VM attributes are user-defined attributes that can be configured under a service profile.

This example shows how to verify the VM attributes on a Cisco VSG using the **show vsg vm** command:

```
vsg# show vsg vm

VM uuid          : 421c2a2d-5e7c-3bdb-51e7-f7528163b021
VM attributes :
  name           : centos5.3_3_vem1_clone
  vapp-name      : apps
  os-fullname    : red hat enterprise linux 4 (32-bit)
  tools-status   : installed
  host-name      : 10.193.75.20
  cluster-name   : dc_dm1_clu1
```

Zone Attributes

Table 6-4 lists the zone attributes supported by the Cisco VSG.

Table 6-4 Zone Attributes

Description	Name
Zone name. This is a multi-valued attribute and can belong to multiple zones at the same time.	src.zone.name dst.zone.name zone.name ¹

1. Neutral attribute

Security Profiles

The security profile defines custom attributes that can be used to write policies. All the VMs tagged with a given port profile inherit the firewall policies and custom attributes defined in the security profile associated with that port profile. Each custom attribute is configured as a name value pair such as state = CA.

This example shows how to verify the security profile on a Cisco VSG using the **show vsg security-profile brief** command:

```
vsg_d3338(config-vnm-policy-agent)# show vsg security-profile brief
-----
Security-Profile Name      VNISP ID      Policy Name
-----
default@root              1             default@root
sp10@root/tenant_d3338    9             ps9@root/tenant_d3338
sp9@root/tenant_d3338    10            ps9@root/tenant_d3338
sp2@root/tenant_d3338    11            ps1@root/tenant_d3338
sp1@root/tenant_d3338    12            ps1@root/tenant_d3338
```

This example shows how to verify the security profile on a Cisco VSG using the **show vsg security-profile** command:

```
vsg_d3338(config-vnm-policy-agent)# show vsg security-profile
VNISP          : sp10@root/tenant_d3338
VNISP id      : 9
Policy Name    : ps9@root/tenant_d3338
Policy id     : 3
Custom attributes :
  vnsporg      : root/tenant_d3338

VNISP          : default@root
```

```

VNSP id          : 1
Policy Name      : default@root
Policy id        : 1
Custom attributes :
    vnsporg      : root

VNSP             : sp1@root/tenant_d3338
VNSP id          : 12
Policy Name      : ps1@root/tenant_d3338
Policy id        : 2
Custom attributes :
    vnsporg      : root/tenant_d3338
    location     : losangeles
    color9       : test9
    color8       : test8
    color7       : test7
    color6       : test6
    color5       : test5
    color4       : test4
    color3       : test3
    color2       : test2
    color13      : test13
    color12      : test12
    color11      : test11
    color10      : test10
    color1       : test1
    color        : red

VNSP             : sp2@root/tenant_d3338
VNSP id          : 11
Policy Name      : ps1@root/tenant_d3338
Policy id        : 2
Custom attributes :
    vnsporg      : root/tenant_d3338
    location     : sanjose
    color        : blue

VNSP             : sp9@root/tenant_d3338
VNSP id          : 10
Policy Name      : ps9@root/tenant_d3338
Policy id        : 3
Custom attributes :
    vnsporg      : root/tenant_d3338

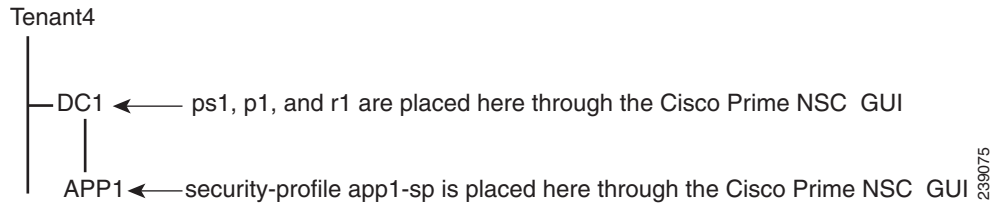
```

Viewing Security Profiles and Policies on the Cisco VNMC and the Cisco VSG

The Cisco VNMC GUI provides a view of the Cisco VSG security policy objects. The policy objects shown in the Cisco VNMC GUI are not necessarily shown in the same organizational path location as they appear in the Cisco VSG CLI when you enter the **show running-config** command.

For example, in the Cisco VNMC GUI, if the virtual data center DC1 is under the tenant and the application APP1 is under DC1, the `vnsp app1-sp` in the APP1 level is pointing to the policy set `ps1` at the DC level.

Figure 6-1 shows the Cisco VNMC GUI organization structure.

Figure 6-1 Cisco VNMC Organizational Hierarchy for a Tenant, Data Center, and Application

```

security-profile app1-sp@root/tenant4/DC1/APP1
  policy ps1@root/tenant4/DC1/APP1
  custom-attribute loc "sunnyvale"
  
```

The output of the **show running-config** command shows that the policy set and its objects are resolved from the APP1 level where the security profile is defined. The actual location of the objects in the Cisco VNMC GUI is at the DC1 level.

```

policy ps1@root/tenant4/DC1/APP1
rule p1/r1@root/tenant4/DC1/APP1 order 101
  
```

The policy object DNs that are shown in the Cisco VSG **show running-config** command output are shown with a DN relative to where they are resolved *from*. The policy object DNs are not where the actual policy objects are in the Cisco VNMC organizational hierarchy.

However, security-profiles are shown with the DN where the actual security profile is created on the Cisco VNMC organizational hierarchy.

Policy objects are resolved upwards from where the security-profile is located in the Cisco VNMC organizational hierarchy.

EXAMPLE

In the following example, the VSG is configured with the following specifications:

- The security profile (VNSP) sp1 has policy-set ps1 in which there is a policy p1 that includes a rule, r1.
- The policy-set ps1 is located at root in the organization tree on the Cisco VNMC.
- The policy p1 is located at root in the organization tree on the Cisco VNMC.
- The rule r1 is placed in the policy p1 on the Cisco VNMC (the Cisco VNMC does not allow you to create a rule object in and of itself).
- The security profile sp1 is placed in tenant_d3337/dc1 on the VNMC.

All Cisco VSGs in the tenant_d3337 have the following **show-running config** command output (this configuration is replicated to all Cisco VSGs in the leaf path):

```

security-profile sp1@root/tenant_d3337/dc1
  policy ps1@root/tenant_d3337/dc1
  custom-attribute vnsorg "root/tenant_d3337/dc1"

policy p1@root/tenant_d3337/dc1
rule p1/r1@root/tenant_d3337/dc1 order 101
  
```



Note

The policy objects above do not actually exist at the DC1 level of the organization tree on the Cisco VNMC, but are resolved from that location in the Cisco VNMC organization tree.

Service Firewall Logging

You can use the service firewall log to test and debug the firewall policies. During a policy evaluation, the policy engine displays the policy results of a policy evaluation. Both the users and the policy writer benefit from this tool when troubleshooting a policy.

BEFORE YOU BEGIN

Before beginning this procedure, you must do or know the following:

- Your Cisco VSG software must be operating with three network adapters. Assign the network labels as follows:
 - Service (Eth0) as your port profile
 - Mgmt (Eth1) as your management VLAN
 - HA (Eth2) as your port profile

See the *Cisco Virtual Security Gateway, Release 4.2(1)VSG1(1)* and *Cisco Virtual Network Management Center, Release 1.0.1 Installation Guide* for details about assigning network labels to the network adapters.

- You have the Cisco VSG VM powered on and the data interface IP (for data0) and management interface IP configured.

SUMMARY STEPS

1. **configure**
2. **service-firewall logging enable**
3. **logging monitor *level***
4. (Optional) **copy running-config startup-config**
5. **exit**

DETAILED STEPS

	Command	Purpose
Step 1	configure Example: vsg# configure	Places you in global configuration mode.
Step 2	service-firewall logging enable Example: vsg(config)# service-firewall logging enable	Enables the service for firewall logging.
Step 3	logging monitor <i>level</i> Example: vsg(config)# logging monitor 6	Sets the service firewall logging level to 6 to log all traffic flow.

	Command	Purpose
Step 4	copy running-config startup-config Example: vsg(config)# copy running-config startup-config	(Optional) Saves configuration changes.
Step 5	exit Example: vsg(config)# exit	Exits the configuration mode.

Verifying the Cisco VSG Configuration

To display the Cisco VSG configuration, use the **show running-config** command.

```
vsg# show running-config
```

```
!Command: show running-config
!Time: Wed Jan 26 15:39:57 2011

version 4.2(1)VSG1(1)
feature telnet
no feature http-server

username admin password 5 $1$CbPcXmpk$131YumYWi00X/EY1qYsFB. role network-admin

banner motd #Nexus VSN#

ssh key rsa 2048
ip domain-lookup
ip domain-lookup
hostname vsg
snmp-server user admin auth md5 0x0b4894684d52823092c7a7c0b87a853d priv
0x0b4894684d52823092c7a7c0b87a853d localizedkey engineID 128:0:0:9:
3:0:0:0:0:0:0

vrf context management
 ip route 0.0.0.0/0 10.193.72.1
vlan 1
port-channel load-balance ethernet source-mac
port-profile default max-ports 32

vdc vsg id 1
 limit-resource vlan minimum 16 maximum 2049
 limit-resource monitor-session minimum 0 maximum 2
 limit-resource vrf minimum 16 maximum 8192
 limit-resource port-channel minimum 0 maximum 768
 limit-resource u4route-mem minimum 32 maximum 32
 limit-resource u6route-mem minimum 16 maximum 16
 limit-resource m4route-mem minimum 58 maximum 58
 limit-resource m6route-mem minimum 8 maximum 8

interface mgmt0
 ip address 10.193.73.185/21

interface data0
 cli alias name ukickstart copy
 scp://user@172.71.12.77/ws/sjc/baselard_latest/build/images/gdb/nexus-1000v-kickstart-mzg.
 VSG1.1.bi
 n bootflash:ukickstart
```

```

cli alias name udplug copy
scp://user@172.71.12.77/ws/sjc/baselard_latest/build/images/gdb/nexus-1000v-dplug-mzg.VSG1
.1.bin bootfl1
cli alias name udplug copy
scp://user@172.71.12.77/ws/sjc/baselard_latest/build/images/gdb/nexus-1000v-dplug-mzg.VSG1
.1.bin bootfl1
ash:dplug
cli alias name uimage copy
scp://user@172.71.12.77/ws/sjc/baselard_latest/build/images/gdb/nexus-1000v-mzg.VSG1.1.bin
bootflash:ud
ayak_bin
line console
boot kickstart bootflash:/ukickstart sup-1
boot system bootflash:/user_bin sup-1
boot kickstart bootflash:/ukickstart sup-2
boot system bootflash:/user_bin sup-2
mgmt-policy TCP permit protocol tcp
    ha-pair id 25

security-profile profile1
    policy p2

security-profile profile2
    policy p1
    custom-attribute state "texas"
object-group g1 net.port
    match 1 eq 80
    match 2 eq 443
zone zone1
    condition 1 net.ip-address eq 1.1.1.1
    condition 2 net.port eq 80
    condition 2 net.port eq 80
rule r2
    condition 1 dst.net.ip-address eq 2.2.2.2
    condition 2 src.net.ip-address eq 1.1.1.1
    condition 3 src.net.port eq 100
    condition 4 dst.net.port eq 80
    condition 5 net.protocol eq 6
    action 1 permit
rule r5
    condition 1 net.ethertype eq 0x800
    action 1 inspect ftp
rule r6
rule r7
policy p2
    rule r2 order 10
policy p1
    rule r2 order 10
service firewall logging enable
vnm-policy-agent
    registration-ip 10.193.73.190
    shared-secret *****
    log-level info

vsg#

```

Configuration Limits

This section lists the maximum configuration limits for configuring the Cisco VSG.

Table 6-5 *Maximum Configuration Limits*

Feature	Maximum Limits
Zones in Cisco VSG	512 counts
Rules per policy	1024 counts
Policy set per Cisco VSG	16 counts
Object Group in Cisco VSG	512
Total number of conditions	16K
Maximum rules per Cisco VSG	1024



A

- access control rule [1-4](#)
- access logs [1-4](#)
- ACL [1-7](#)
- action
 - drop packet [1-8, 6-3](#)
 - inspection [1-8, 6-3](#)
 - log [1-8, 6-3](#)
 - permit [1-8, 6-3](#)
- active-standby mode [1-3](#)
- active-standby pair [1-4](#)
- administrator [1-9](#)
 - network [1-7](#)
 - security [1-7, 1-8](#)
- attribute
 - custom [1-7, 6-6, 6-7](#)
 - neutral [1-8, 6-3](#)
 - port-profile [6-6](#)
 - virtual infrastructure [6-6](#)

B

- backing up files [4-17](#)
- banner message
 - configuring [4-2](#)

C

- capacity planning [1-3](#)
- Cisco Nexus 1000V Series switch [1-1](#)
- Cisco NX-OS [1-1](#)
- Cisco VNMC [6-1](#)

CLI

- Cisco VSG [2-1](#)
- command modes [2-2](#)
- EXEC command mode [2-3](#)
- prompt [2-1](#)
- cloud environments [1-1](#)
- command
 - directing output to a file [4-22](#)
 - no form [2-7](#)
 - special characters [2-5](#)
- command-line interface (See CLI) [2-1](#)
- command mode
 - summary [2-4](#)
- command modes [2-2](#)
- command shortcuts [2-5](#)
- compliance [1-2](#)
- compute infrastructure [1-2](#)
- configuration
 - clearing [4-11](#)
 - data0 interface [2-4](#)
 - displaying [4-3](#)
 - global [2-4](#)
 - rolling back to previous [4-24](#)
 - running [2-4](#)
 - saving [4-10](#)
 - startup [2-4](#)
 - zone [2-4](#)
- configuration files
 - backing up [4-17](#)
 - copying [4-17](#)
 - deleting [4-19](#)
 - downloading [4-17](#)
- context-sensitive help [2-7](#)

copying files [4-17](#)
 current directory
 changing [4-13](#)
 displaying [4-13](#)
 custom attributes [1-4, 1-7, 1-9, 6-6, 6-7](#)

D

data0 interface
 configuration [2-4](#)
 data interface [6-2](#)
 debug [1-9, 6-10](#)
 dedicated server [1-3](#)
 directories
 creating [4-18](#)
 deleting [4-18, 4-19](#)
 display current [4-13](#)
 listing files [4-14](#)
 moving files [4-19](#)
 drop packet [1-9, 6-3](#)

E

environment
 structured [1-4](#)
 VM [1-4](#)
 ESX [1-8](#)
 ESX host [6-1](#)
 Ethernet [1-7](#)

F

failure, switchover [5-10](#)
 files
 compressing [4-20](#)
 copying or backing up [4-17](#)
 deleting [4-19](#)
 displaying checksums [4-26](#)

displaying contents [4-25](#)
 displaying last lines [4-27](#)
 moving [4-19](#)
 uncompressing [4-20](#)

file systems
 changing directories [4-13](#)
 creating directories [4-18](#)
 deleting directories [4-18](#)
 displaying current directory [4-13](#)
 listing files [4-14](#)
 specifying [4-12](#)
 firewall policy [1-7, 1-9, 6-7](#)
 firewall policy objects [6-1](#)
 firewall rule [1-8, 6-3](#)

G

global configuration [2-4](#)

H

heart-beat mechanism [1-6](#)
 help [2-7](#)
 context-sensitive [2-7](#)
 high availability [1-3](#)
 displaying status [5-17](#)
 host [1-8, 6-3](#)
 hypervisor [1-2, 1-7](#)

I

inspection [1-9, 6-3](#)
 interface
 management [1-7](#)
 IP address [1-8, 6-3](#)
 VSG [1-7](#)

K

keyboard shortcuts [2-5](#)

L

line-card modules [1-7](#)

log [1-9, 6-3](#)

logical modular switch [1-7](#)

M

management interface [1-7](#)

master-slave relationship [1-6](#)

message and transaction service. See MTS

MTS

description [5-4](#)

N

network administrator [1-7](#)

neutral attribute [1-8, 6-3](#)

NX-OS [1-1](#)

NX-OS high availability

description [5-1](#)

O

object group [1-8, 6-3](#)

operational segregation [1-3](#)

P

permit [1-8, 6-3](#)

persistent storage service. See PSS

physical line-card modules [1-7](#)

policy

ACL [1-7](#)

engine [1-9](#)

QoS [1-7](#)

policy decision [1-2](#)

policy enforcement [1-2](#)

policy engine [1-9](#)

policy evaluation [1-8, 1-9, 6-3, 6-10](#)

policy name [1-8, 1-9, 6-4](#)

policy object [1-9](#)

action [1-9, 6-4](#)

condition [1-9, 6-4](#)

object group [1-9, 6-4](#)

rule [1-9, 6-4](#)

zone [1-9, 6-4](#)

port group [1-7](#)

port profile [1-4, 1-7, 1-9, 6-7](#)

VM [1-7](#)

port-profile attributes [6-6](#)

primary role, VSM [5-7](#)

primary VSG [1-3](#)

PSS

global and local synchronization [5-4](#)

private and shared [5-4](#)

Q

QoS [1-7](#)

R

related documents [i-vii](#)

restartability

infrastructure [5-3](#)

role, VSM

primary [5-7](#)

secondary [5-7](#)

standalone [5-7](#)

rule condition [1-8, 6-3](#)

rule policy object [6-2](#)

rules [1-8, 6-3](#)
 running configuration [2-4](#)

S

secondary role, VSM [5-7](#)
 security administrator [1-7](#)
 security operations team [1-3](#)
 security policies [1-1](#)
 security profile [1-4, 1-7, 6-7](#)
 security profile templates [1-1](#)
 security services [1-7](#)
 segmentation
 VM [1-7](#)
 service firewall log [1-9, 6-10](#)
 soft switch [1-7](#)
 standalone role, VSM [5-7](#)
 standby VSG [1-3](#)
 startup configuration [2-4](#)
 structured environment [1-4](#)
 subnet [1-8, 6-3](#)
 supervisor module
 role
 secondary [5-7](#)
 supervisor modules
 replacing standby supervisor [5-15, 5-16](#)
 role
 primary [5-7](#)
 standalone [5-7](#)
 switchovers [5-10](#)
 guidelines [5-9](#)
 syntax error isolation [2-7](#)

T

tenant traffic [1-8](#)
 traffic [1-4](#)
 external-to-zone [1-4](#)

 policy-based [1-4](#)
 zone-to-external [1-4](#)
 zone-to-zone [1-4](#)

trust-zone
 definition [1-4](#)
 trust zones [1-1](#)

U

users
 displaying [4-27](#)
 sending messages [4-28](#)
 using help [2-7](#)

V

vApp [1-4](#)
 vCenter [1-8, 6-3](#)
 vDC [1-4](#)
 VEM [1-2](#)
 vEthernet [1-7](#)
 virtual data center [1-1, 1-2, 1-4](#)
 Virtual Ethernet Module (See VEM) [1-2](#)
 virtual Ethernet port [1-4](#)
 virtual infrastructure attributes [6-6](#)
 virtualization [1-4](#)
 virtual machine (See VM) [1-1](#)
 Virtual Network Management Center (See Cisco VNMC) [6-1](#)
 virtual network service datapath [1-2](#)
 virtual port [1-7](#)
 Virtual Security Gateway (See Cisco VSG) [1-1](#)
 Virtual Supervisor Module [1-4](#)
 virtual switch [1-4](#)
 VLAN [1-4](#)
 Data [1-6](#)
 HA [1-6](#)
 Management [1-6](#)
 management [6-2](#)

- Service [1-6](#)
- VM [1-1](#)
 - port profile [1-7](#)
 - segmentation [1-7](#)
- VM Data VLAN [1-6](#)
- Vmotion [1-8](#)
- vMotion [1-4](#)
- VM-to-VM communication [1-6](#)
- VMware [1-2](#)
- VMware vCenter Server [1-7](#)
- VMware Virtual Center [1-4](#)
- vNIC [1-3](#)
- volatile:
 - switch reboots [4-14](#)
- vPath [1-2, 1-8](#)
- VSG
 - firewall policy object [6-1](#)
 - IP address [1-7](#)
- VSG CLI [2-1](#)
- VSG configuration [1-9](#)
- VSM [1-7](#)
- VSMs
 - manual switchover [5-10](#)
- vSphere [1-2, 1-4](#)
- vSwitch [6-2](#)

Z

- zone [1-8, 6-3](#)
 - configuration [2-4](#)
- zone attribute [1-8, 6-3](#)
- zone membership [1-4](#)
- zone-to-zone traffic [1-4](#)

