



# SSG Interface Redundancy

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The SSG Interface Redundancy feature enables providers to configure the Cisco Service Selection Gateway (SSG) with redundant uplink interfaces to services and to the default network. This feature also supports the configuration of redundant downlink interfaces for nonoverlapping users configured with the port-bundle host key functionality. Interface redundancy benefits service providers as well as subscribers by helping prevent subscriber downtime due to interface failure.

## Feature History for the SSG Interface Redundancy Feature

Release	Modification
12.2(16)BX3	This feature was introduced on the Cisco 10000 series router.
12.3(8)T	This feature was integrated into Cisco IOS Release 12.3(8)T.

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## Contents

- [Prerequisites for SSG Interface Redundancy, page 2](#)
- [Restrictions for SSG Interface Redundancy, page 2](#)
- [Information About SSG Interface Redundancy, page 2](#)
- [How to Configure SSG Interface Redundancy, page 4](#)
- [Configuration Examples for SSG Interface Redundancy, page 8](#)
- [Additional References, page 10](#)
- [Command Reference, page 11](#)



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# Prerequisites for SSG Interface Redundancy

Before you can perform the tasks in this document, SSG must be enabled by use of the **ssg enable** command.

## Restrictions for SSG Interface Redundancy

The distance metric does not have any effect on services bound directly to broadcast interfaces by using the **ssg bind service** command. Upstream traffic is routed by the global routing table.

The weights for service bindings are used only for routing upstream traffic. SSG allows downstream traffic from services on the secondary uplink interfaces even when the primary is active.

## Information About SSG Interface Redundancy

Before you configure SSG interface redundancy, you should understand the following concepts:

- [SSG Interface Redundancy Overview, page 2](#)
- [SSG Uplink Interface Redundancy Topologies, page 3](#)

## SSG Interface Redundancy Overview

In SSG, each service is associated with an outbound interface. When a subscriber chooses to use a service, SSG connects the subscriber to the service through the associated outbound interface. SSG interface redundancy allows services to be associated with more than one interface to protect against link failures.

When redundant interfaces are configured for a service, the order in which SSG selects the interface to be used to reach a service depends on the distance metric that is assigned to the service binding. The interface for the service binding with the lowest metric is the primary interface. The interface for the service binding with the second-lowest weight is the secondary interface, and so on.

If a failure occurs on an active interface, SSG recognizes the failure and switches the service connection to the interface associated with the next-lowest metric. When the primary uplink interface or next hop becomes available again, SSG switches back to using the primary interface.

If a service is configured for multiple uplink interfaces, downstream traffic is allowed on all of the interfaces for any service bound to even one of those interfaces.

If a host has a connection that uses NAT to one of the services on a set of redundant uplink interfaces, all traffic from a user to any of the uplink interfaces uses NAT.

SSG interface redundancy can be configured for services, including open garden and walled garden services, and the default network. This feature is supported on all interfaces that support SSG, including subinterfaces and VLAN interfaces. Downlink interface redundancy is also supported for nonoverlapping users in port-bundle host key mode.

## SSG Uplink Interface Redundancy Topologies

The SSG Interface Redundancy feature supports uplink interface redundancy in the following network topologies:

[Multiple Next Hops per Service, page 3](#)

[Multiple Uplink Interfaces with a Single Next Hop, page 3](#)

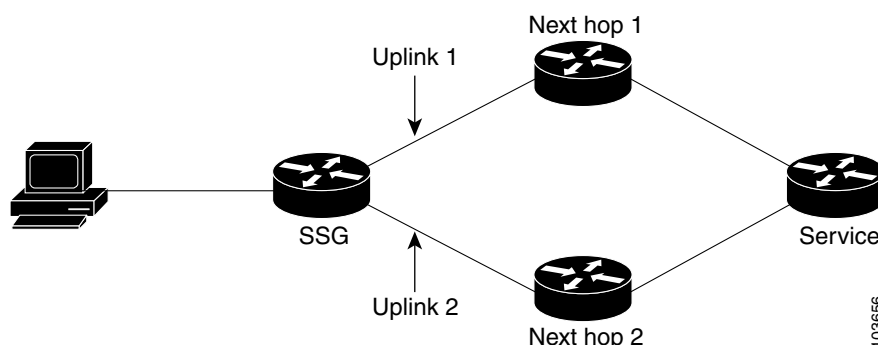
[Multiple Uplink Interfaces with No Next Hop, page 4](#)

[Combination of Directly Connected Uplink Interfaces and Interfaces with Next Hops, page 4](#)

### Multiple Next Hops per Service

Figure 1 shows an example of SSG interface redundancy configured to support multiple next-hop IP addresses per service. In this type of topology, each next hop is routable on a different uplink interface. SSG forwards traffic to the appropriate next hop on the basis of the distance metric assigned to it.

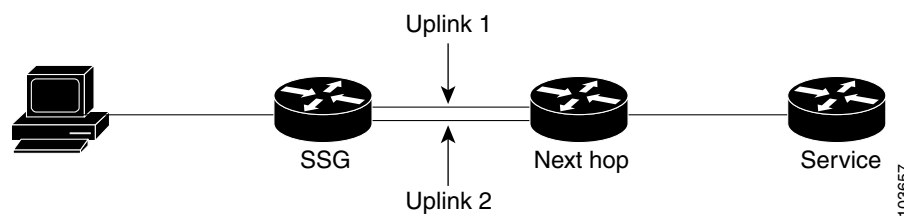
**Figure 1** Multiple Next Hops per Service: Sample Topology



### Multiple Uplink Interfaces with a Single Next Hop

Figure 2 shows an example of SSG interface redundancy configured to support multiple uplink interfaces that share a single next hop. In this type of topology, routing to the service is governed by the active route to the next-hop IP address.

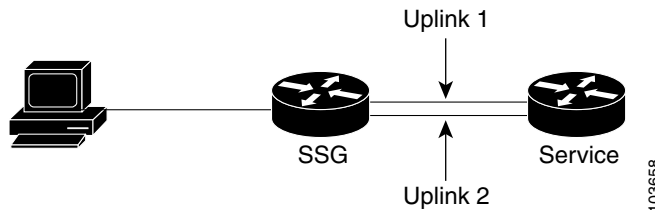
**Figure 2** Multiple Uplink Interfaces with a Single Next Hop: Sample Topology



## Multiple Uplink Interfaces with No Next Hop

Figure 3 shows an example of SSG interface redundancy configured to support multiple uplink interfaces that are directly connected to the service.

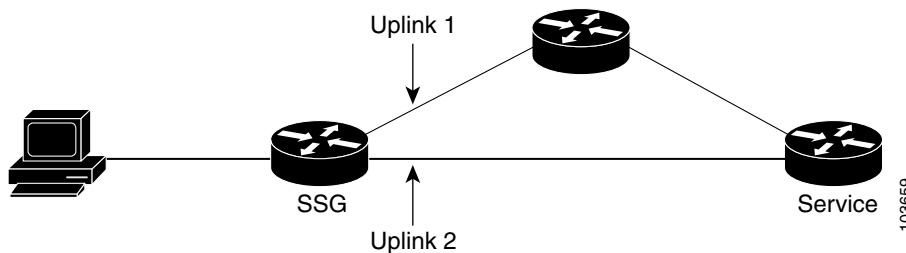
**Figure 3** *Multiple Uplink Interfaces with No Next Hop: Sample Topology*



## Combination of Directly Connected Uplink Interfaces and Interfaces with Next Hops

Figure 4 shows an example of SSG interface redundancy configured to support an uplink interface that is directly connected to the service and an uplink interfaces with a next hop.

**Figure 4** *Combination of Directly Connected Uplink Interfaces and Interfaces with Next Hops: Sample Topology*



## How to Configure SSG Interface Redundancy

This section contains the following procedures:

- [Grouping Redundant Uplink Interfaces, page 4](#)
- [Binding Services to Interfaces and Next-Hop IP Addresses, page 6](#)
- [Disabling Overlapping IP Address Support, page 7](#)

## Grouping Redundant Uplink Interfaces

When SSG interface redundancy is configured to support multiple uplink interfaces to a service, the interfaces must be grouped together so that they are treated similarly. Perform this task to group uplink interfaces.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip address** *ip-address mask*
5. **ssg direction uplink** [**member** *group-name*]
6. **exit**
7. For each uplink interface that you want to group together, repeat Steps 3 to 5.
8. **exit**
9. **show ssg service**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"><li>• If prompted, enter your password.</li></ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>interface</b> <i>type number</i>  <b>Example:</b> Router(config)# interface ethernet 1/0	Specifies an interface and enters interface configuration mode.
Step 4	<b>ip address</b> <i>ip-address mask</i>  <b>Example:</b> Router(config-if)# ip address 10.0.1.1 255.255.255.0	Sets the IP address for an interface.
Step 5	<b>ssg direction uplink</b> [ <b>member</b> <i>group-name</i> ]  <b>Example:</b> Router(config-if)# ssg direction uplink member service-groupA	Configures an interface as uplink and specifies that the uplink interface is a member of a group of uplink interfaces that reach the same service.
Step 6	<b>exit</b>  <b>Example:</b> Router(config-if)# exit	(Optional) Exits to global configuration mode.
Step 7	For each uplink interface that you want to assign to a group, repeat Steps 3 to 5.	

	Command or Action	Purpose
Step 8	<code>exit</code>  <b>Example:</b> Router(config)# exit	(Optional) Exits to privileged EXEC mode.
Step 9	<code>show ssg service</code>  <b>Example:</b> Router# show ssg service	(Optional) Displays information about SSG interfaces. <ul style="list-style-type: none"> <li>Use this command to display the uplink interfaces for a service.</li> </ul>

## Binding Services to Interfaces and Next-Hop IP Addresses

You can bind a service to an interface or next hop by using the command-line interface (CLI) . You can bind a service to a next hop by defining the next hop in the Next-Hop Gateway profile on the authentication, authorization, and accounting (AAA) server. Perform one of the following tasks to bind a service:

- [Binding Services by Using the Router's CLI, page 6](#)
- [Binding Services Using the Next-Hop Gateway Profile on the AAA Server, page 7](#)

### Binding Services by Using the Router's CLI

Perform this task to use the router's CLI to bind a service to an interface or next-hop IP address. You can bind a service to more than one interface or next hop to configure interface redundancy.

#### SUMMARY STEPS

- `enable`
- `configure terminal`
- `ssg enable`
- `ssg bind service service-name {ip-address | interface-type interface-number} [distance-metric]`
- `exit`
- `show ssg binding`

#### DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>If prompted, enter your password.</li> </ul>
Step 2	<code>configure terminal</code>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.

	Command or Action	Purpose
Step 3	<b>ssg enable</b>  <b>Example:</b> Router(config)# ssg enable	Enables SSG.
Step 4	<b>ssg bind service</b> <i>service-name</i> { <i>ip-address</i>   <i>interface-type interface-number</i> } [ <i>distance-metric</i> ]  <b>Example:</b> Router(config)# ssg bind service sample-service atm 1/.01	Specifies the interface for a service. <ul style="list-style-type: none"> <li>To bind a service to more than one interface for interface redundancy, you can enter this command more than once.</li> <li>To control the routing of upstream traffic, use the <i>distance-metric</i> argument. SSG uses the interface that has the lowest metric. The default value for the <i>distance-metric</i> is 0.</li> </ul>
Step 5	<b>exit</b>  <b>Example:</b> Router(config)# exit	Returns to privileged EXEC mode.
Step 6	<b>show ssg binding</b>  <b>Example:</b> Router# show ssg binding	Displays service names that have been bound to interfaces and the interfaces to which they have been bound.

## Binding Services Using the Next-Hop Gateway Profile on the AAA Server

SSG allows the next-hop IP addresses for services to be specified in Next-Hop Gateway profiles on the AAA server. A service profile contains a next-hop key. The next-hop key is associated with the next-hop IP address in the Next-Hop Gateway profile that is downloaded separately by SSG.

To associate a next-hop key with an IP address, use the Next-Hop Gateway Table Entry vendor-specific attribute (VSA) in the Next-Hop Gateway profile:

**Control-Info = "Gkey;ip\_address[;distance-metric]"**

<i>key</i>	Service name or key specified in the service profile
<i>ip_address</i>	IP address of the next hop for this service.
<i>distance-metric</i>	(Optional) Number to be used as the metric for determining the path for upstream traffic.

This attribute can be used more than once in a Next-Hop Gateway profile to associate a next-hop key with more than one IP address for redundancy.

## Disabling Overlapping IP Address Support

The SSG Port-Bundle Host Key feature enables subscribers to assign overlapping IP addresses and binds users to their respective downlink interfaces. Traffic from a user is not accepted if it arrives on any other interface. To enable subscriber-side interface redundancy when SSG port-bundle host key functionality

is configured and there are no overlapping IP host addresses, you must disable the interface binding for hosts by disabling overlapping IP address support. Perform this task to disable overlapping IP address support.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ssg enable**
4. **ssg port-map**
5. **no host overlap**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• If prompted, enter your password.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>ssg enable</b>  <b>Example:</b> Router(config)# ssg enable	Enables SSG.
Step 4	<b>ssg port-map</b>  <b>Example:</b> Router(config)# ssg port-map	Enables the SSG port-bundle host key and enters SSG port-map configuration mode.
Step 5	<b>no host overlap</b>  <b>Example:</b> Router(config-ssg-portmap)# no host overlap	Disables SSG support of overlapping host IP addresses.

# Configuration Examples for SSG Interface Redundancy

This section contains the following examples:

- [Service Bound to Multiple Uplink Interfaces: Example, page 9](#)
- [Service Bound to Next Hop with Multiple Uplink Interfaces: Example, page 9](#)

## Service Bound to Multiple Uplink Interfaces: Example

In the following example, a service called “sample-service” is bound to two uplink interfaces: ATM interface 1/0.1 is the primary interface, and ATM interface 1/0.2 is the secondary interface. Both interfaces are configured as members of “groupA”.

```
ssg bind service sample-service atm 1/0.1
ssg bind service sample-service atm 1/0.2 100
!
interface ATM 1/0.1 point-to-point
 ip address 10.1.0.1 255.255.0.0
 ssg direction uplink member groupA
!
interface ATM 1/0.2 point-to-point
 ip address 10.2.0.1 255.255.0.0
 ssg direction uplink member groupA
!
```

## Service Bound to Next Hop with Multiple Uplink Interfaces: Example

In the following example, a service called “sample-serviceA” is bound to next-hop gateway 10.1.1.1. Next-hop gateway 10.1.1.1 is reachable through two uplink interfaces: ethernet interface 1/0 and Ethernet interface 2/0. The group name “service-groupA” indicates that both interfaces share the same service (“sample-serviceA”).

For any services bound to either of the two interfaces, downstream traffic from the service is accepted on either interface.

```
!
ssg bind service sample-serviceA 10.1.1.1
!
interface ethernet 1/0
 ip address 10.0.1.1 255.255.255.0
 ssg direction uplink member service-groupA
!
interface ethernet 2/0
 ip address 10.0.2.1 255.255.255.0
 ssg direction uplink member service-groupA
!
ip route 10.1.1.1 255.255.255.255 eth 1/0 10
ip route 10.1.1.1 255.255.255.255 eth 2/0 20
!
```

## Additional References

The following sections provide references related to the SSG Interface Redundancy feature.

### Related Documents

Related Topic	Document Title
SSG commands	<i>Cisco IOS Wide-Area Networking Command Reference</i> , Release 12.3 T
SSG configuration tasks	“ <b>Broadband Access</b> ” section in the <i>Cisco IOS Wide-Area Networking Configuration Guide</i> , Release 12.3. SSG Features in Cisco IOS Release 12.3(4)T
SESM	<i>Cisco Subscriber Edge Services Manager</i> <i>Cisco Service Selection Dashboard</i>
RADIUS commands	<i>Cisco IOS Security Command Reference</i> , Release 12.3 T
RADIUS configuration tasks	<i>Cisco IOS Security Configuration Guide</i> , Release 12.3

### Standards

Standards	Title
No new or modified standards are supported by this feature. Support for existing standards has not been modified by this feature.	—

### MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature. Support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

### RFCs

RFCs	Title
No new or modified RFCs are supported by this feature. Support for existing RFCs has not been modified by this feature.	—

## Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	<a href="http://www.cisco.com/public/support/tac/home.shtml">http://www.cisco.com/public/support/tac/home.shtml</a>

## Command Reference

This section documents new and modified commands only.

- [host overlap](#)
- [ssg bind service](#)
- [ssg direction](#)

# host overlap

To enable SSG to support overlapping host IP addresses, use the **host overlap** command in SSG port-map configuration mode. To disable support for overlapping host IP addresses, use the **no** form of this command.

**host overlap**

**no host overlap**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Overlapping host IP addresses are supported by default when SSG port-bundle host key functionality is configured.

## Command Modes

SSG port-map configuration

## Command History

Release	Modification
12.3(8)T	This command was introduced.

## Usage Guidelines

The SSG Port-Bundle Host Key feature enables subscribers to have overlapping IP addresses. To enable subscriber-side interface redundancy when SSG port-bundle host key functionality is configured, overlapping IP address support must be disabled so that interface binding is not needed. Use the **no host overlap** command to disable overlapping IP address support.

## Examples

The following example shows how to disable support for overlapping hosts when the SSG Port-Bundle Host Key feature is configured:

```
Router(config)# ssg enable
Router(config)# ssg port-map
Router(ssg-port-map)# no host overlap
```

## Related Commands

Command	Description
<b>ssg port-map</b>	Enables the SSG Port-Bundle Host Key feature and enters SSG port-map configuration mode.

# ssg bind service

To specify the interface for a service, use the **ssg bind service** command in global configuration mode. To unbind the service and the interface, use the **no** form of this command.

```
ssg bind service service-name {ip-address | interface-type interface-number} [distance-metric]
```

```
no ssg bind service service-name {ip-address | interface-type interface-number} [distance-metric]
```

## Syntax Description

<i>service-name</i>	Service name.
<i>ip-address</i>	IP address of the next-hop router.
<i>interface-type</i>	Type of interface.
<i>interface-number</i>	Number of the interface.
<i>distance-metric</i>	(Optional) Metric to be used to determine the path for upstream traffic. The range is from 1 to 255. Default is 0.

## Defaults

A service is not bound to an interface.

## Command Modes

Global configuration

## Command History

Release	Modification
12.0(3)DC	This command was introduced on the Cisco 6400 node route processor.
12.2(4)B	This command was integrated into Cisco IOS Release 12.2(4)B.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.3(8)T	This command was modified to enable the configuration of interface redundancy for a service, and the <i>distance-metric</i> argument was added.

## Usage Guidelines

Use this command to bind a service to an interface. You can enter this command more than once in order to bind a service to more than one interface for interface redundancy.

Use the *distance-metric* argument to control the routing of upstream traffic. If more than one entry of the **ssg bind service** command for a service have the same metric, the upstream traffic will be load-balanced.

If a service is configured for multiple uplink interfaces, downstream traffic will be allowed on all the interfaces for any service bound to even one of those interfaces.

## Examples

The following example shows the interface for the service defined as “MyService”:

```
ssg bind service MyService ATM 0/0/0.10
```

The following example shows uplink interface redundancy configured for the service “sample-service”. ATM interface 1/0.1 is configured as the primary interface and ATM interface 1/0.2 as the secondary interface.

## ■ ssg bind service

```
ssg bind service sample-service atm 1/0.1
ssg bind service sample-service atm 1/0.2 100
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>clear ssg service</b>	Removes a service.
<b>show ssg binding</b>	Displays service names that have been bound to interfaces and the interfaces to which they have been bound.
<b>show ssg service</b>	Displays the information for a service.

# ssg direction

To configure an interface or range of subinterfaces as downlink or uplink, use the **ssg direction** command in interface configuration mode or subinterface configuration mode. To clear the directional specification, use the **no** form of this command.

```
ssg direction {downlink | uplink [member group-name]}
```

```
no ssg direction
```

## Syntax Description

<b>downlink</b>	Specifies the interface direction as downlink. A downlink interface is an interface to subscribers.
<b>uplink</b>	Specifies the interface direction as uplink. An uplink interface is an interface to services.
<b>member</b>	(Optional) Specifies that the uplink interface is a member of a group of uplink interfaces that reach the same services.
<i>group-name</i>	(Optional) Name of the group of uplink services.

## Defaults

An interface is neither uplink nor downlink.

## Command Modes

Interface configuration  
Subinterface configuration

## Command History

Release	Modification
12.2(16)B	This command was introduced.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.
12.3(8)T	The <b>member</b> keyword and <i>group-name</i> argument were added.

## Usage Guidelines

Service Selection Gateway (SSG) applies the concept of an interface direction, either uplink or downlink. It uses this direction when determining the forwarding path of an incoming packet. The **ssg direction** command allows you to specify a direction for an interface or a range of subinterfaces.

The **ssg direction** command allows you to configure the direction for a range of permanent virtual circuits (PVCs). All members of a range must have the same direction.

Before you can change a direction from uplink to downlink or vice versa, you must use the **no ssg direction** command to clear the direction.

The **ssg direction** command replaces the **ssg bind direction** command. If you reboot a router that uses an old configuration, the **ssg bind direction** commands will be converted to **ssg direction** commands until the **ssg bind direction** command is made obsolete. In a later release, the **ssg bind direction** command may no longer be supported.



### Note

An interface that does not exist will not be created as a result of the **ssg direction** command.

In cases where a service has a single next-hop IP address, the **ssg direction** uplink command can be used with the **member** keyword and *group-name* argument to group together uplink interfaces that share a common service and enable the interfaces to be treated similarly.

The group setting for an uplink interface cannot be changed when there are active services bound to that interface.

The **no** form of the **ssg direction** command can be used only when there are no active services bound to the uplink interface.

The command operates on a variety of interfaces, including async, group async, ATM, extended tag ATM (XTagATM), bridge group virtual (BVI), CTunnel, tunnel, dialer, IEEE 802.3 Ethernet, IEEE 802.3 Fast Ethernet, IEEE 802.3z GigabitEthernet, loopback, multilink Frame Relay (MFR) bundle, multilink group, Pragmatic General Multicast (PGM) Host (Vif), virtual access, virtual template, and virtual Token Ring.

## Examples

The following example sets the direction of a Fast Ethernet interface to downlink while in interface configuration mode:

```
ssg enable
interface FastEthernet 1/0
  ssg direction downlink
```

The next example creates a range called “MyRange” and sets the direction of all subinterfaces in the range to downlink while in subinterface configuration mode:

```
ssg enable
interface ATM 1/0.1 point-to-point
  range MyRange pvc 1/32 1/42
  ssg direction downlink
```

## Related Commands

Command	Description
<b>range pvc</b>	Defines a range of ATM PVCs.
<b>show ssg direction</b>	Displays the direction of all interfaces for which a direction has been specified.
<b>show ssg interface</b>	Displays SSG information about one or more interfaces.

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