Configuring Storm Control

This chapter describes how to configure port-based traffic control on the Catalyst 4500 series switch.

This chapter consists of these sections:

Note For complete syntax and usage information for the switch commands used in this chapter, first look at the *Cisco Catalyst 4500 Series Switch Command Reference* and related publications at this location:

http://www.cisco.com/en/US/products//hw/switches/ps4324/index.html

If the command is not found in the *Catalyst 4500 Command Reference*, it will be found in the larger Cisco IOS library. Refer to the *Cisco IOS Command Reference* and related publications at this location:

http://www.cisco.com/en/US/products/ps6350/index.html

About Storm Control

This section contains the following subsections:

Storm control prevents LAN interfaces from being disrupted by a broadcast storm. A broadcast storm occurs when broadcast packets flood the subnet, creating excessive traffic and degrading network performance. Errors in the protocol-stack implementation or in the network configuration can cause a broadcast storm.

Note Storm control and Multicast storm control are supported in hardware on all ports on the WS-X4516, WS-X4013+10GE, WS-X4516-10GE, WS-C4948, WS-C4948-10GE, WS-C4900M, WS-C4948E, WS-X45-Sup6-E, and WS-X45-Sup6L-E. In contrast, the supervisor engines WS-X4515, WS-X4014, and WS-X4013+ support storm control in hardware on non-blocking gigabit ports and in software on all other ports, implying that the counters for these interfaces are approximate and computed.

Hardware-Based Storm Control Implementation

Broadcast suppression uses filtering that measures broadcast activity in a subnet over a one-second interval and compares the measurement with a predefined threshold. If the threshold is reached, further broadcast activity is suppressed for the duration of the interval. Broadcast suppression is disabled by default.

Figure 50-1 shows the broadcast traffic patterns on a LAN interface over a given interval. In this example, broadcast suppression occurs between times T1 and T2 and between T4 and T5. During those intervals, the amount of broadcast traffic exceeded the configured threshold.

Figure 50-1   Storm Control Example—Hardware-based Implementation
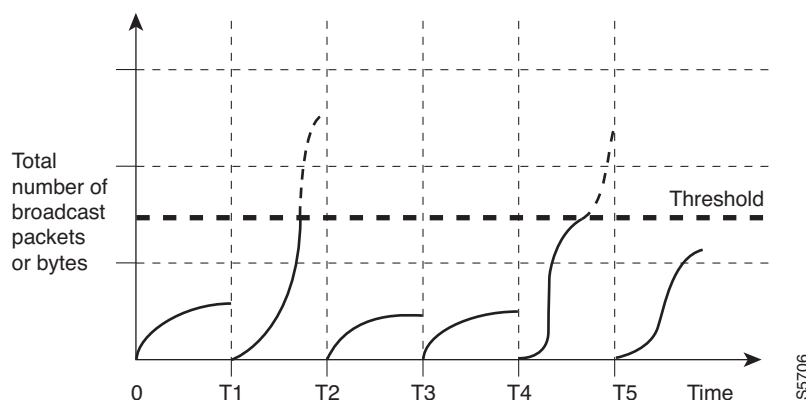
The broadcast suppression threshold numbers and the time interval combination make the broadcast suppression algorithm work with different levels of granularity. A higher threshold allows more broadcast packets to pass through.

Broadcast suppression on the Catalyst 4500 series switches (Catalyst 4900M, Catalyst 4948E, Supervisor Engine 6-E, and Supervisor Engine 6L-E) is implemented in hardware. The suppression circuitry monitors packets passing from a LAN interface to the switching bus. If the packet destination address is broadcast, then the broadcast suppression circuitry tracks the current count of broadcasts within the one-second interval, and when a threshold is reached, it filters out subsequent broadcast packets.

Because hardware broadcast suppression uses a bandwidth-based method to measure broadcast activity, the most significant implementation factor is setting the percentage of total available bandwidth that can be used by broadcast traffic. Because packets do not arrive at uniform intervals, the one-second interval during which broadcast activity is measured can affect the behavior of broadcast suppression.

Software-Based Storm Control Implementation

When storm control is enabled on an interface, the switch monitors packets received on the interface and determines whether the packets are broadcast. The switch monitors the number of broadcast packets received within a one-second time interval. When the interface threshold is met, all incoming data traffic on the interface is dropped. This threshold is specified as a percentage of total available bandwidth that can be used by broadcast traffic. If the lower threshold is specified, all data traffic is forwarded as soon as the incoming traffic falls below that threshold.

Enabling Broadcast Storm Control

To enable storm control, perform this task:

	Command	Purpose
Step 1	Switch# **configure terminal**	Enters global configuration mode.
Step 2	Switch(config)# **interface** *interface-id*	Enters interface configuration mode and enter the port to configure.
Step 3	Switch(config-if)# **storm-control broadcast level [*high level*]** [*lower level*]	Configures broadcast storm control. Specifies the upper threshold levels for broadcast traffic. The storm control action occurs when traffic utilization reaches this level. (Optional) Specifies the falling threshold level. The normal transmission restarts (if the action is filtering) when traffic drops below this level for interfaces that support software-based suppression. **Note** The **lower level** keyword does not apply to Supervisor Engine 6E implementations. **Note** For ports that perform hardware-based suppression, the lower threshold is ignored.
Step 4	Switch(config-if)# **storm-control action** {**shutdown** | **trap**}	Specifies the action to be taken when a storm is detected. The default is to filter out the broadcast traffic and not to send out traps. The **shutdown** keyword sets the port to error-disable state during a storm. If the recover interval is not set, the port remains in shutdown state. **Note** The **trap** keyword generates an SNMP trap when a storm is detected. This keyword is available but not supported in Cisco IOS Release 12.1(19)EW.
Step 5	Switch(config-if)# **exit**	Returns to configuration mode.
Step 6	Switch(config)# **end**	Returns to privileged EXEC mode.
Step 7	Switch# **show storm-control** [**interface**] **broadcast**	Displays the number of packets suppressed.
Step 8	Switch# **copy running-config startup-config**	(Optional) Saves your entries in the configuration file.

The following example shows how to enable storm control on interface:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface fa3/1
Switch(config-if)# storm-control broadcast level 50
Switch(config-if)# end

Switch# show storm-control //Supervisor Engine 6-E
Interface  Filter State   Broadcast Multicast Level
---------  -------------  --------- --------- -----
Fi3/1      Forwarding     Enabled   Disabled  50.00%

Switch# show int fa2/1 capabilities //Supervisor Engine 6-E
FastEthernet2/1
  Model:                WS-X4148-RJ45V-RJ-45
  Type:                 10/100BaseTX
  Speed:                10,100,auto
  Duplex:               half,full,auto
  Auto-MDIX:            no
  Trunk encap. type:    802.1Q
  Trunk mode:           on,off,desirable,nonegotiate
  Channel:              yes
  Broadcast suppression: percentage(0-100), hw
  Multicast suppression: percentage(0-100), hw <===== unique to Sup Engine 6-E systems
  Flowcontrol:          rx-(none),tx-(none)
  VLAN Membership:      static, dynamic
  Fast Start:           yes
  CoS rewrite:          yes
  ToS rewrite:          yes
  Inline power:         yes (Cisco Voice Protocol)
  SPAN:                 source/destination
  UDLD:                 yes
  Link Debounce:        no
  Link Debounce Time:   no
  Port Security:        yes
  Dot1x:                yes
  Maximum MTU:          1552 bytes (Baby Giants)
  Multiple Media Types: no
  Diagnostic Monitoring: N/A
```

Enabling Multicast Storm Control

This section includes these topics:

Note   Beginning with Cisco IOS Release 12.2(18)EW, the counters displayed with the **show interface counters storm-control** command includes any multicast packets that were dropped.

Enabling Multicast Suppression on Catalyst 4900M, Catalyst 4948E, Supervisor Engine 6-E, and Supervisor Engine 6L-E

Catalyst 4900M, Catalyst 4948E, Supervisor Engine 6-E, and Supervisor Engine 6L-E support per-interface multicast suppression. This allows you to subject incoming multicast and broadcast traffic on an interface to suppression.

> **Note** Multicast and broadcast suppression share a common threshold per interface.
> Multicast suppression takes effect *only* if broadcast suppression is enabled.
> Disabling broadcast suppression on an interface also disables multicast suppression.

To enable multicast suppression, perform this task:

	Command	Purpose
Step 1	Switch# **configure terminal**	Enters global configuration mode.
Step 2	Switch(config)# **interface** *interface-id*	Enters interface configuration mode and enter the port to configure.
Step 3	Switch(config-if)# **storm-control broadcast include multicast**	Enables multicast suppression.
Step 4	Switch(config-if)# **exit**	Returns to configuration mode.
Step 5	Switch(config)# **end**	Returns to privileged EXEC mode.
Step 6	Switch# **show storm-control**	Verifies the configuration.

The following example shows how to enable multicast suppression on ports that have broadcast suppression already enabled:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# int fa3/1
Switch(config-if)# storm-control broadcast include multicast
Switch(config-if)# end
Switch#
Switch# show storm-control
Interface  Filter State   Broadcast Multicast Level
---------  -------------  --------- --------- -----
Fi3/1      Forwarding     Enabled   Enabled   50.00%
```

Enabling Multicast Suppression on the WS-X4515, WS-X4014, and WS-X4013+ Supervisor Engines

Hardware does not provide support for multicast suppression on the WS-X4515, WS-X4014, and WS-X4013+ supervisor engines. One consequence of using software-based broadcast suppression on these modules is that all incoming data packets are dropped. Irrespective of your selecting to configure broadcast suppression only, multicast packets are filtered as well on stub and blocking gigabit ports. The non blocking gigabit ports that do provide broadcast suppression in hardware also do not filter multicast packets.

Enabling Multicast Suppression on All Other Supervisor Engines

Multicast suppression can be enabled on a WS-X4516, WS-X4013+10GE, WS-X4516-10GE, WS-C4948, and WS-C4948-10GE supervisor engines for all ports that have storm control enabled. Multicast suppression applies to all ports that have broadcast suppression configured on them. It also applies to ports that are configured for broadcast storm-control in the future; you cannot suppress multicast traffic only.

Separate thresholds cannot be provided for broadcast and/or multicast traffic. The threshold you configure for broadcast suppression applies to both the incoming multicast traffic and broadcast traffic.

To enable multicast suppression on WS-X4516, WS-X4013+10GE, WS-X4516-10GE, and WS-C4948 supervisor engines, perform this task:

	Command	Purpose
Step 1	Switch# **configure terminal**	Enters global configuration mode.
Step 2	Switch(config)# **interface** *interface-id*	Enters interface configuration mode and enter the port to configure.
Step 3	Switch(config-if)# **storm-control broadcast include multicast**	Enable multicast suppression.
Step 4	Switch(config-if)# **exit**	Returns to configuration mode.
Step 5	Switch(config)# **end**	Returns to privileged EXEC mode.

The following example shows how to enable multicast suppression on ports that have broadcast suppression already enabled:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# storm-control broadcast include multicast
Switch(config)# end
Switch#
```

Disabling Broadcast Storm Control

To disable storm control, perform this task:

	Command	Purpose
Step 1	Switch# **configure terminal**	Enters global configuration mode.
Step 2	Switch(config)# **interface** *interface-id*	Enters interface configuration mode and enter the port to configure.
Step 3	Switch(config-if)# **no storm-control broadcast level**	Disables port storm control.
Step 4	Switch(config-if)# **no storm-control action** {**shutdown**	**trap**}	Disables the specified storm control action and returns to default filter action.
Step 5	Switch(config-if)# **exit**	Returns to configuration mode.
Step 6	Switch(config)# **end**	Returns to privileged EXEC mode.

	Command	Purpose
Step 7	Switch# **show storm-control broadcast**	Verifies your entries.
Step 8	Switch# **copy running-config startup-config**	(Optional) Saves your entries in the configuration file.

The following example shows how to disable storm control on interface.

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# int fa3/1
Switch(config-if)# no storm-control broadcast level
Switch(config-if)# end
Switch# show storm-control //Supervisor Engine 2+ to V-10GE
Interface  Filter State   Upper    Lower    Current
---------  -------------  -------  -------  -------
Switch#

Switch# show storm-control //Supervisor Engine 6-E
Interface Filter State Broadcast Multicast Level
--------- ------------- --------- --------- -----
Switch#
```

Disabling Multicast Storm Control

To disable multicast suppression on WS-X4516, WS-X4515, WS-X4014, and WS-X4013+ supervisor engines, perform the following task:

	Command	Purpose
Step 1	Switch# **configure terminal**	Enters global configuration mode.
Step 2	Switch(config)# **interface** *interface-id*	Enters interface configuration mode and enter the port to configure.
Step 3	Switch(config-if)# [**no**] **storm-control broadcast include multicast**	Enables multicast suppression.
Step 4	Switch(config-if)# **end**	Returns to configuration mode.
Step 5	Switch(config)# **end**	Returns to privileged EXEC mode.

To disable multicast suppression on the Catalyst 4900M, Catalyst 4948E, Supervisor Engine 6-E, or Supervisor Engine 6L-E, perform this task:

	Command	Purpose
Step 1	Switch# **configure terminal**	Enters global configuration mode.
Step 2	Switch(config)# [**no**] **storm-control broadcast include multicast**	Enables and disables multicast suppression.
Step 3	Switch(config-if)# **no storm-control broadcast level**	Disables port storm control (broadcast and multicast).
Step 4	Switch(config-if)# **end**	Returns to configuration mode.
Step 5	Switch(config)# **end**	Returns to privileged EXEC mode.

Displaying Storm Control

✎ **Note**   Use the **show interface capabilities** command to determine the mode in which storm control is supported on an interface.

The following example shows an interface that supports broadcast suppression in software (sw):

```
Switch# show int fa2/1 capabilities
FastEthernet2/1
  Model:                WS-X4148-RJ45V-RJ-45
  Type:                 10/100BaseTX
  Speed:                10,100,auto
  Duplex:               half,full,auto
  Auto-MDIX:            no
  Trunk encap. type:    802.1Q
  Trunk mode:           on,off,desirable,nonegotiate
  Channel:              yes
  Broadcast suppression: percentage(0-100), hw
  Multicast suppression: percentage(0-100), hw <=====unique to Sup Engine 6-E
  Flowcontrol:          rx-(none),tx-(none)
  VLAN Membership:      static, dynamic
  Fast Start:           yes
  CoS rewrite:          yes
  ToS rewrite:          yes
  Inline power:         yes (Cisco Voice Protocol)
  SPAN:                 source/destination
  UDLD:                 yes
  Link Debounce:        no
  Link Debounce Time:   no
  Port Security:        yes
  Dot1x:                yes
  Maximum MTU:          1552 bytes (Baby Giants)
  Multiple Media Types: no
  Diagnostic Monitoring: N/A
```

✎ **Note**   Use the **show interfaces counters storm-control** command to display a count of discarded packets.

```
Switch# show interfaces counters storm-control
Port          Broadcast   Multicast       Level     TotalSuppressedPackets
Fa2/1          Enabled    Disabled       10.00%            46516510
Gi3/1          Enabled     Enabled       50.00%                   0
```

The following example shows the output of the **show storm-control** command:

```
Switch# show storm-control  //Supervisor Engine 2+ to V-10GE
Interface  Filter State  Upper   Lower   Current
---------  -------------  -------  -------  -------
Gi4/4      Forwarding     2.00%   2.00%   N/A
Switch
```

✎ **Note**   In the previous example, "current" represents the percentage of traffic suppressed at a given instant, and the value is N/A for ports that perform suppression in hardware.

```
Switch# show storm-control  //Supervisor Engine 6-E
Interface  Filter State  Broadcast Multicast Level
---------  -------------  --------- --------- -----
Fa2/1      Blocking       Enabled   Disabled  10.00%
Gi3/1      Link Down      Enabled   Enabled   50.00%
```