Configuring Port-Based Traffic Control

This chapter describes how to configure the port-based traffic control features on your Catalyst 3550 switch.

Note For complete syntax and usage information for the commands used in this chapter, refer to the command reference for this release.

This chapter consists of these sections:

Configuring Storm Control

These sections include storm control configuration information and procedures:

Understanding Storm Control

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

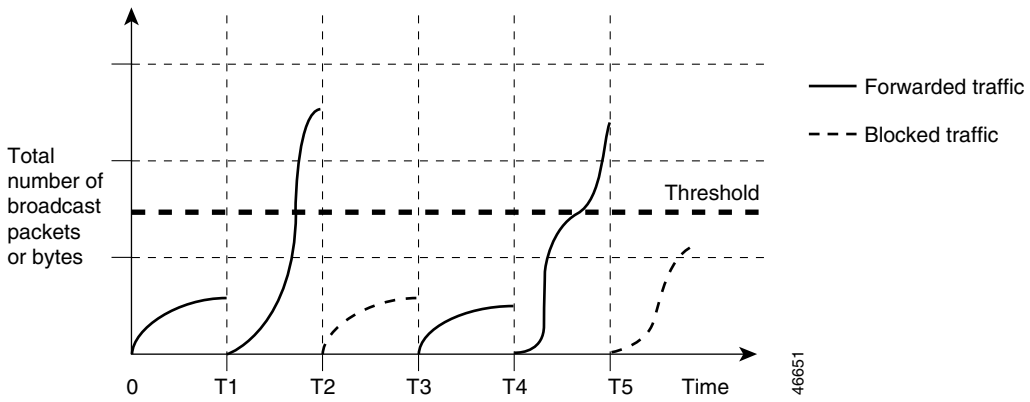
Storm control (or traffic suppression) monitors incoming traffic statistics over a time period and compares the measurement with a predefined suppression level threshold. The threshold represents the percentage of the total available bandwidth of the port. The switch supports separate storm control thresholds for broadcast, multicast, and unicast traffic. If the threshold of a traffic type is reached, further traffic of that type is suppressed until the incoming traffic falls below the threshold level.

Note When the rate of multicast traffic exceeds a set threshold, all incoming traffic (broadcast, multicast, and unicast) is dropped until the level drops below the threshold level. Only spanning-tree packets are forwarded. When broadcast and unicast thresholds are exceeded, traffic is blocked for only the type of traffic that exceeded the threshold.

When storm control is enabled, the switch monitors packets passing from an interface to the switching bus and determines if the packet is unicast, multicast, or broadcast. The switch monitors the number of broadcast, multicast, or unicast packets received within the 1-second time interval, and when a threshold for one type of traffic is reached, that type of traffic is dropped. This threshold is specified as a percentage of total available bandwidth that can be used by broadcast (multicast or unicast) traffic.

The graph in Figure 21-1 shows broadcast traffic patterns on an interface over a given period of time. The example can also be applied to multicast and unicast traffic. In this example, the broadcast traffic being forwarded exceeded the configured threshold between time intervals T1 and T2 and between T4 and T5. When the amount of specified traffic exceeds the threshold, all traffic of that kind is dropped for the next time period. Therefore, broadcast traffic is blocked during the intervals following T2 and T5. At the next time interval (for example, T3), if broadcast traffic does not exceed the threshold, it is again forwarded.

Figure 21-1 Broadcast Storm Control Example



The combination of the storm-control suppression level and the 1-second time interval control the way the storm control algorithm works. A higher threshold allows more packets to pass through. A threshold value of 100 percent means that no limit is placed on the traffic. A value of 0.0 means that all broadcast, multicast, or unicast traffic on that port is blocked.

Note Because packets do not arrive at uniform intervals, the 1-second time interval during which traffic activity is measured can affect the behavior of storm control.

The switch continues to monitor traffic on the port, and when the utilization level is below the threshold level, the type of traffic that was dropped is forwarded again.

You use the **storm-control** interface configuration commands to set the threshold value for each traffic type.

Note Before Cisco IOS Release 12.1(8)EA1, you set up storm control threshold values by using the **switchport broadcast**, **switchport multicast**, and **switchport unicast** interface configuration commands. These commands are now obsolete, replaced by the **storm-control** interface configuration commands.

Default Storm Control Configuration

By default, unicast, broadcast, and multicast storm control is disabled on the switch: that is, the suppression level is 100 percent (no limit is placed on the traffic).

Enabling Storm Control

You enable storm control on an interface and enter the percentage of total available bandwidth that you want to be used by a particular type of traffic; entering 100 percent allows all traffic. However, because of hardware limitations and the way in which packets of different sizes are counted, threshold percentages are approximations. Depending on the sizes of the packets making up the incoming traffic, the actual enforced threshold might differ from the configured level by several percentage points.

Note Storm control is supported only on physical interfaces; it is not supported on EtherChannel port channels even though the command is available in the CLI.

Beginning in privileged EXEC mode, follow these steps to enable a particular type of storm control:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *interface-id*	Specify the type and number of the physical interface to configure, for example, **gigabitethernet0/1**, and enter interface configuration mode.
Step 3	**storm-control broadcast level** *level* [*.level*]	Specify the broadcast traffic suppression level for an interface as a percentage of total bandwidth. The level can be from 1 to 100; the optional fraction of a level can be from 0 to 99. A threshold value of 100 percent means that no limit is placed on broadcast traffic. A value of 0.0 means that all broadcast traffic on that port is blocked.
Step 4	**storm-control multicast level** *level* [*.level*]	Specify the multicast traffic suppression level for an interface as a percentage of total bandwidth. The level can be from 1 to 100; the optional fraction of a level can be from 0 to 99. A threshold value of 100 percent means that no limit is placed on broadcast traffic. A value of 0.0 means that all multicast traffic on that port is blocked.

	Command	Purpose
Step 5	**storm-control unicast level** *level* [.*level*]	Specify the unicast traffic suppression level for an interface as a percentage of total bandwidth. The level can be from 1 to 100; the optional fraction of a level can be from 0 to 99. A threshold value of 100 percent means that no limit is placed on broadcast traffic. A value of 0.0 means that all unicast traffic on that port is blocked.
Step 6	**end**	Return to privileged EXEC mode.
Step 7	**show storm-control** [*interface-id*] [**broadcast** | **multicast** | **unicast**]	Verify the storm control suppression levels set on the interface for the specified traffic type. If you do not enter a traffic type, broadcast storm control settings appear.
Step 8	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

To disable storm control, use the **no storm-control broadcast level**, **no storm-control multicast level**, or **no storm-control unicast level** interface configuration command. This example shows how to set the multicast storm control level at 70.5 percent on Fast Ethernet interface 17 and verify the configuration:

```
Switch# configure terminal
Switch(config)# interface fastethernet0/17
Switch(config-if)# storm-control multicast level 70.5
Switch(config-if)# end
Switch# show storm-control fastethernet0/17 multicast
Interface  Filter State   Level    Current
---------  -------------  -------  -------
Fa0/17     Forwarding      70.50%    0.00%
```

Disabling Storm Control

Beginning in privileged EXEC mode, follow these steps to disable storm control on an interface:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *interface-id*	Specify the type and number of the physical interface to configure, for example **gigabitethernet0/1**, and enter interface configuration mode.
Step 3	**no storm-control broadcast level**	Disable broadcast storm control on the interface.
Step 4	**no storm-control multicast level**	Disable multicast storm control on the interface.
Step 5	**no storm-control unicast level**	Disable unicast storm control on the interface.
Step 6	**end**	Return to privileged EXEC mode.
Step 7	**show storm-control** [*interface-id*] [**broadcast** | **multicast** | **unicast**]	Verify that there are no storm control suppression levels set on the interface for the specified traffic type. If you do not enter a traffic type, broadcast storm control settings appear.
Step 8	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

This example shows how to disable the multicast storm control on Fast Ethernet interface 17 and verify the configuration:

```
Switch# configure terminal
Switch(config)# interface fastethernet0/17
Switch(config-if)# no storm-control multicast level
Switch(config-if)# end
```

```
Switch# show storm-control fastethernet0/17 multicast
Interface  Filter State   Level    Current
---------  -------------  -------  -------
Fa0/17     inactive       100.00%  N/A
```

Configuring Protected Ports

Some applications require that no traffic be forwarded between ports on the same switch so that one neighbor does not see the traffic generated by another neighbor. In such an environment, the use of protected ports ensures that there is no exchange of unicast, broadcast, or multicast traffic between these ports on the switch.

Protected ports have these features:

- A protected port does not forward any traffic (unicast, multicast, or broadcast) to any other port that is also a protected port. Traffic cannot be forwarded between protected ports at Layer 2; all traffic passing between protected ports must be forwarded through a Layer 3 device.
- Forwarding behavior between a protected port and a nonprotected port proceeds as usual.
- Protected ports are supported on 802.1Q trunks.

The default is to have no protected ports defined.

Note The protected port feature is not compatible with fallback bridging. When fallback bridging is enabled, it is possible for packets to be forwarded from one protected port on a switch to another protected port on the same switch if the ports are in different VLANs.

Note There could be times when unknown unicast or multicast traffic from a nonprotected port is flooded to a protected port because a MAC address has timed out or has not been learned by the switch. Use the **switchport block unicast** and **switchport block multicast** interface configuration commands to guarantee that no unicast or multicast traffic is flooded to the port in such a case.

You can configure protected ports on a physical interface (for example, Gigabit Ethernet 0/1) or an EtherChannel group (for example, port-channel 5). When you enable protected ports for a port channel, it is enabled for all ports in the port-channel group.

Beginning in privileged EXEC mode, follow these steps to define a port as a protected port:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *interface-id*	Specify the type and number of the physical interface to configure, for example **gigabitethernet0/1**, and enter interface configuration mode.
Step 3	**switchport protected**	Configure the interface to be a protected port.
Step 4	**end**	Return to privileged EXEC mode.
Step 5	**show interfaces** *interface-id* **switchport**	Verify your entries.
Step 6	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

To disable protected port, use the **no switchport protected** interface configuration command.

This example shows how to configure Gigabit Ethernet interface 0/1 as a protected port and verify the configuration:

```
Switch# configure terminal
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# switchport protected
Switch(config-if)# end
Switch# show interfaces gigabitethernet0/1 switchport
Name: Gi0/1
Switchport: Enabled

<output truncated>

Protected: True
Unknown unicast blocked: disabled
Unknown multicast blocked: disabled
```

Configuring Port Blocking

By default, the switch floods packets with unknown destination MAC addresses to all ports. If unknown unicast and multicast traffic is forwarded to a protected port, there could be security issues.

To prevent unknown unicast or multicast traffic from being forwarded from one port to another, you can configure a port (protected or nonprotected) to block unknown unicast or multicast packets.

Note Blocking unicast or multicast traffic is not automatically enabled on protected ports; you must explicitly configure it.

Blocking Flooded Traffic on an Interface

Note The interface can be a physical interface (for example, Gigabit Ethernet 0/1) or an EtherChannel group (for example, port-channel 5). When you block multicast or unicast traffic for a port channel, it is blocked on all ports in the port channel group.

Beginning in privileged EXEC mode, follow these steps to disable the flooding of multicast and unicast packets to an interface:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *interface-id*	Specify the type and number of the physical interface to configure, for example **gigabitethernet0/1**, and enter interface configuration mode.
Step 3	**switchport block multicast**	Block unknown multicast forwarding to the port.
Step 4	**switchport block unicast**	Block unknown unicast forwarding to the port.
Step 5	**end**	Return to privileged EXEC mode.

	Command	Purpose
Step 6	**show interfaces** *interface-id* **switchport**	Verify your entries.
Step 7	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

To return the interface to the default condition where no traffic is blocked, use the **no switchport block** {**multicast** | **unicast**} interface configuration commands.

This example shows how to block unicast and multicast flooding on Gigabit Ethernet interface 0/1 and verify the configuration:

```
Switch# configure terminal
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# switchport block multicast
Switch(config-if)# switchport block unicast
Switch(config-if)# end
Switch# show interfaces gigabitethernet0/1 switchport
Name: Gi0/1
Switchport: Enabled

<output truncated>

Protected: True
Unknown unicast blocked: enabled
Unknown multicast blocked: enabled
```

Resuming Normal Forwarding on a Port

Beginning in privileged EXEC mode, follow these steps to resume normal forwarding on a port:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *interface-id*	Specify the type and number of the physical interface to configure, for example **gigabitethernet0/1**, and enter interface configuration mode.
Step 3	**no switchport block multicast**	Enable unknown multicast flooding to the port.
Step 4	**no switchport block unicast**	Enable unknown unicast flooding to the port.
Step 5	**end**	Return to privileged EXEC mode
Step 6	**show interfaces** *interface-id* **switchport**	Verify your entries.
Step 7	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

Configuring Port Security

You can use the port security feature to restrict input to an interface by limiting and identifying MAC addresses of the stations allowed to access the port. When you assign secure MAC addresses to a secure port, the port does not forward packets with source addresses outside the group of defined addresses.

This section includes information about these topics:

Understanding Port Security

This section includes information about:

Secure MAC Addresses

You can configure these types of secure MAC addresses:

- Static secure MAC addresses—These are manually configured by using the **switchport port-security mac-address** *mac-address* interface configuration command, stored in the address table, and added to the switch running configuration.
- Dynamic secure MAC addresses—These are dynamically learned, stored only in the address table, and removed when the switch restarts.
- *Sticky* secure MAC addresses—These can be dynamically learned or manually configured, stored in the address table, and added to the running configuration. If these addresses are saved in the configuration file, the interface does not need to dynamically relearn them when the switch restarts. Although sticky secure addresses can be manually configured, we do not recommend it.

You can configure an interface to convert the dynamic MAC addresses to sticky secure MAC addresses and to add them to the running configuration by enabling *sticky learning*. To enable sticky learning, enter the **switchport port-security mac-address sticky** interface configuration command. When you enter this command, the interface converts all the dynamic secure MAC addresses, including those that were dynamically learned before sticky learning was enabled, to sticky secure MAC addresses.

The sticky secure MAC addresses do not automatically become part of the configuration file, which is the startup configuration used each time the switch restarts. If you save the sticky secure MAC addresses in the configuration file, when the switch restarts, the interface does not need to relearn these addresses. If you do not save the configuration, they are lost.

If sticky learning is disabled, the sticky secure MAC addresses are converted to dynamic secure addresses and are removed from the running configuration.

The maximum number of available MAC addresses on a secure port or VLAN is determined by the active Switch Database Management (SDM) template. See the "Optimizing System Resources for User-Selected Features" section on page 7-27 for more information about configuring an SDM template.

Security Violations

It is a security violation when one of these situations occurs:

- The maximum number of secure MAC addresses have been added to the address table, and a station whose MAC address is not in the address table attempts to access the interface.
- An address learned or configured on one secure interface is seen on another secure interface in the same VLAN.

You can configure the interface for one of three violation modes, based on the action to be taken if a violation occurs:

- protect—When the number of secure MAC addresses reaches the limit allowed on the port, packets with unknown source addresses are dropped until you remove a sufficient number of secure MAC addresses or increase the number of maximum allowable addresses. You are not notified that a security violation has occurred.

  Note We do not recommend enabling the **protect** mode on a trunk port. The **protect** mode disables learning when any VLAN reaches its maximum limit, even if the port has not reached its maximum limit.

- restrict—When the number of secure MAC addresses reaches the limit allowed on the port, packets with unknown source addresses are dropped until you remove a sufficient number of secure MAC addresses or increase the number of maximum allowable addresses. In this mode, you are notified that a security violation has occurred. Specifically, an SNMP trap is sent, a syslog message is logged, and the violation counter increments.
- shutdown—In this mode, a port security violation causes the interface to immediately become error-disabled, and turns off the port LED. It also sends an SNMP trap, logs a syslog message, and increments the violation counter. When a secure port is in the error-disabled state, you can bring it out of this state by entering the **errdisable recovery cause** *psecure-violation* global configuration command, or you can manually re-enable it by entering the **shutdown** and **no shutdown** interface configuration commands. This is the default mode.

Table 21-1 shows the violation mode and the actions taken when you configure an interface for port security.

Table 21-1 Security Violation Mode Actions

Violation Mode	Traffic is forwarded[1]	Sends SNMP trap	Sends syslog message	Displays error message[2]	Violation counter increments	Shuts down port
protect	No	No	No	No	No	No
restrict	No	Yes	Yes	No	Yes	No
shutdown	No	Yes	Yes	No	Yes	Yes

1. Packets with unknown source addresses are dropped until you remove a sufficient number of secure MAC addresses.
2. The switch will return an error message if you manually configure an address that would cause a security violation.

Default Port Security Configuration

Table 21-2 shows the default port security configuration for an interface.

Table 21-2 Default Port Security Configuration

Feature	Default Setting
Port security	Disabled.
Maximum number of secure MAC addresses	One.
Violation mode	Shutdown.
Sticky address learning	Disabled.
Port security aging	Disabled. Aging time is 0. When enabled, the default **type** is **absolute**.

Port Security Configuration Guidelines

Follow these guidelines when configuring port security:

- Port security can only be configured on static access ports, trunk ports, or 802.1Q tunnel ports.
- A secure port cannot be a dynamic access port.
- A secure port cannot be a destination port for Switched Port Analyzer (SPAN).
- A secure port cannot belong to a Fast EtherChannel or Gigabit EtherChannel port group.
- You cannot configure static secure or sticky secure MAC addresses on a voice VLAN.
- When you enable port security on an interface that is also configured with a voice VLAN, you must set the maximum allowed secure addresses on the port to at least two.
- If any type of port security is enabled on the access VLAN, dynamic port security is automatically enabled on the voice VLAN.
- When a voice VLAN is configured on a secure port that is also configured as a sticky secure port, all addresses seen on the voice VLAN are learned as dynamic secure addresses, and all addresses seen on the access VLAN (to which the port belongs) are learned as sticky secure addresses.
- The switch does not support port security aging of sticky secure MAC addresses.
- The **protect** and **restrict** options cannot be simultaneously enabled on an interface.

Enabling and Configuring Port Security

Beginning in privileged EXEC mode, follow these steps to restrict input to an interface by limiting and identifying MAC addresses of the stations allowed to access the port:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *interface-id*	Specify the type and number of the physical interface to configure, for example **gigabitethernet0/1**, and enter interface configuration mode.
Step 3	**switchport mode** {**access** | **trunk**}	Set the interface mode as **access** or **trunk**; an interface in the default mode (dynamic desirable) cannot be configured as a secure port.
Step 4	**switchport port-security**	Enable port security on the interface.
Step 5	**switchport port-security maximum** *value* [**vlan** [*vlan-list*]]	(Optional) Set the maximum number of secure MAC addresses for the interface. The maximum number of available addresses is determined by the active Switch Database Management (SDM) template. The default is 1. (Optional) For trunk ports, you can set the maximum number of secure MAC addresses on a VLAN: • **vlan**—set a per-VLAN maximum value. • **vlan** *vlan list*—set a per-VLAN maximum value on a range of VLANs separated by a hyphen or a series of VLANs separated by a comma. For nonspecified VLANs, the per-VLAN maximum value is used. If no per-VLAN maximum value is entered, the default value is used.

	Command	Purpose
Step 6	**switchport port-security violation** {**protect** | **restrict** | **shutdown**}	(Optional) Set the violation mode, the action to be taken when a security violation is detected, as one of these: • **protect**—When the number of secure MAC addresses reaches the limit allowed on the port, packets with unknown source addresses are dropped until you remove a sufficient number of secure MAC addresses or increase the number of maximum allowable addresses. You are not notified that a security violation has occurred. **Note** We do not recommend enabling the **protect** mode on a trunk port. The **protect** mode disables learning when any VLAN reaches its maximum limit, even if the port has not reached its maximum limit. • **restrict**—When the number of secure MAC addresses reaches the limit allowed on the port, packets with unknown source addresses are dropped until you remove a sufficient number of secure MAC addresses or increase the number of maximum allowable addresses. In this mode, you are notified that a security violation has occurred. Specifically, an SNMP trap is sent, a syslog message is logged, and the violation counter increments. • **shutdown**—In this mode, a port security violation causes the interface to immediately become error-disabled, and turns off the port LED. It also sends an SNMP trap, logs a syslog message, and increments the violation counter. **Note** When a secure port is in the error-disabled state, you can bring it out of this state by entering the **errdisable recovery cause** *psecure-violation* global configuration command, or you can manually re-enable it by entering the **shutdown** and **no shutdown** interface configuration commands.
Step 7	**switchport port-security mac-address** *mac-address* [**vlan** *vlan-id*]	(Optional) Enter a static secure MAC address for the interface, repeating the command as many times as necessary. You can use this command to enter the maximum number of secure MAC addresses. If you configure fewer secure MAC addresses than the maximum, the remaining MAC addresses are dynamically learned. (Optional) On a trunk port, you can specify the VLAN ID along with the MAC address. If no VLAN ID is specified, the native VLAN is used. **Note** If you enable sticky learning after you enter this command, the secure addresses that were dynamically learned are converted to sticky secure MAC addresses and are added to the running configuration.
Step 8	**switchport port-security mac-address sticky**	(Optional) Enable sticky learning on the interface.
Step 9	**end**	Return to privileged EXEC mode.
Step 10	**show port-security**	Verify your entries.
Step 11	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

To return the interface to the default condition as not a secure port, use the **no switchport port-security** interface configuration command. If you enter this command when sticky learning is enabled, the sticky secure addresses remain part of the running configuration but are removed from the address table. All addresses are now dynamically learned.

To return the interface to the default number of secure MAC addresses, use the **no switchport port-security maximum** *value* interface configuration command.

To return the violation mode to the default condition (shutdown mode), use the **no switchport port-security violation** {**protect** | **restrict**} interface configuration command.

To disable sticky learning on an interface, use the **no switchport port-security mac-address sticky** interface configuration command. The interface converts the sticky secure MAC addresses to dynamic secure addresses.

To delete a static secure MAC address from the address table, use the **clear port-security configured address** *mac-address* privileged EXEC command. To delete all the static secure MAC addresses on an interface or a VLAN, use the **clear port-security configured interface** *interface-id* privileged EXEC command.

To delete a dynamic secure MAC address from the address table, use the **clear port-security dynamic address** *mac-address* privileged EXEC command. To delete all the dynamic addresses on an interface or a VLAN, use the **clear port-security dynamic interface** *interface-id* privileged EXEC command.

To delete a sticky secure MAC addresses from the address table, use the **clear port-security sticky address** *mac-address* privileged EXEC command. To delete all the sticky addresses on an interface or a VLAN, use the **clear port-security sticky interface** *interface-id* privileged EXEC command.

This example shows how to enable port security on Fast Ethernet port 1 and to set the maximum number of secure addresses to 50. The violation mode is the default, no static secure MAC addresses are configured, and sticky learning is enabled.

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface fastethernet0/1
Switch(config-if)# switchport mode access
Switch(config-if)# switchport port-security
Switch(config-if)# switchport port-security maximum 50
Switch(config-if)# switchport port-security mac-address sticky
Switch(config-if)# end
Switch# show port-security interface fastethernet0/1
Port Security              : Enabled
Port Status                : Secure-up
Violation Mode             : Shutdown
Aging Time                 : 20 mins
Aging Type                 : Inactivity
SecureStatic Address Aging : Enabled
Maximum MAC Addresses      : 50
Total MAC Addresses        : 11
Configured MAC Addresses   : 0
Sticky MAC Addresses       : 11
Last Source Address        : 0000.0000.0000
Security Violation Count   : 0
```

This example shows how to configure a static secure MAC address on Fast Ethernet port 12, enable sticky learning, and verify the configuration:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface fastethernet0/12
Switch(config-if)# switchport mode access
Switch(config-if)# switchport port-security
Switch(config-if)# switchport port-security mac-address 0000.02000.0004
```

```
Switch(config-if)# switchport port-security mac-address sticky
Switch(config-if)# end
Switch# show port-security address
=          Secure Mac Address Table
------------------------------------------------------------------------
Vlan    Mac Address       Type                Ports   Remaining Age
                                                         (mins)
----    -----------       ----                -----   -------------
   1    0000.0000.000a    SecureDynamic       Fa0/1       -
   1    0000.0002.0300    SecureDynamic       Fa0/1       -
   1    0000.0200.0003    SecureConfigured    Fa0/1       -
   1    0000.0200.0004    SecureConfigured    Fa0/12      -
   1    0003.fd62.1d40    SecureConfigured    Fa0/5       -
   1    0003.fd62.1d45    SecureConfigured    Fa0/5       -
   1    0003.fd62.21d3    SecureSticky        Fa0/5       -
   1    0005.7428.1a45    SecureSticky        Fa0/8       -
   1    0005.7428.1a46    SecureSticky        Fa0/8       -
   1    0006.1218.2436    SecureSticky        Fa0/8       -
------------------------------------------------------------------------
Total Addresses in System :10
Max Addresses limit in System :6176
```

This example shows how to configure a maximum of eight secure MAC addresses on VLAN 5 on Fast Ethernet port 12 and verify the configuration:

```
Switch(config-if)# switchport port-security maximum 8 vlan 5
Switch(config-if)# end
Switch# show port-security interface fastethernet0/12 vlan
Default maximum: not set, using 6176
VLAN  Maximum    Current
    1    default          0
    5          8          0
```

Enabling and Configuring Port Security Aging

You can use port security aging to set the aging time for static and dynamic secure addresses on a port. Two types of aging are supported per port:

- Absolute—The secure addresses on the port are deleted after the specified aging time.
- Inactivity—The secure addresses on the port are deleted only if the secure addresses are inactive for the specified aging time.

Use this feature to remove and add PCs on a secure port without manually deleting the existing secure MAC addresses and to still limit the number of secure addresses on a port. You can enable or disable the aging of statically configured secure addresses on a per-port basis.

Beginning in privileged EXEC mode, follow these steps to configure port security aging:

	Command	Purpose
Step 1	**configure terminal**	Enter global configuration mode.
Step 2	**interface** *interface-id*	Specify the port on which you want to enable port security aging, and enter interface configuration mode. **Note** The switch does not support port security aging of sticky secure addresses.
Step 3	**switchport port-security aging** {**static** | **time** *time* | **type** {**absolute** | **inactivity**}}	Enable or disable static aging for the secure port, or set the aging time or type. Enter **static** to enable aging for statically configured secure addresses on this port. For *time*, specify the aging time for this port. The valid range is from 0 to 1440 minutes. If the time is equal to 0, aging is disabled for this port. For **type**, select one of these keywords: • **absolute**—Sets the aging type as absolute aging. All the secure addresses on this port age out after the specified time (minutes) lapses and are removed from the secure address list. **Note** The absolute aging time could vary by 1 minute, depending on the sequence of the system timer. • **inactivity**—Sets the aging type as inactivity aging. The secure addresses on this port age out only if there is no data traffic from the secure source addresses for the specified time period.
Step 4	**end**	Return to privileged EXEC mode.
Step 5	**show port-security** [**interface** *interface-id*] [**address**]	Verify your entries.
Step 6	**copy running-config startup-config**	(Optional) Save your entries in the configuration file.

To disable port security aging for all secure addresses on a port, use the **no switchport port-security aging time** interface configuration command. To disable aging for only statically configured secure addresses, use the **no switchport port-security aging static** interface configuration command.

This example shows how to set the aging time as 2 hours for the secure addresses on the Fast Ethernet interface 0/1:

```
Switch(config)# interface fastethernet0/1
Switch(config-if)# switchport port-security aging time 120
```

This example shows how to set the aging time as 2 minutes for the inactivity aging type with aging enabled for the configured secure addresses on the interface:

```
Switch(config-if)# switchport port-security aging time 2
Switch(config-if)# switchport port-security aging type inactivity
Switch(config-if)# switchport port-security aging static
```

You can verify the previous commands by entering the **show port-security interface** *interface-id* privileged EXEC command.

Displaying Port-Based Traffic Control Settings

The **show interfaces** *interface-id* **switchport** privileged EXEC command displays (among other characteristics) the interface traffic suppression and control configuration. The **show interfaces counters** privileged EXEC commands display the count of discarded packets. The **show storm-control** and **show port-security** privileged EXEC commands display those features.

To display traffic control information, use one or more of the privileged EXEC commands in Table 21-3.

Table 21-3 Commands for Displaying Traffic Control Status and Configuration

Command	Purpose
show interfaces [*interface-id*] **switchport**	Displays the administrative and operational status of all switching (nonrouting) ports or the specified port, including port blocking and port protection settings.
show storm-control [*interface-id*] [**broadcast** | **multicast** | **unicast**]	Displays storm control suppression levels set on all interfaces or the specified interface for the specified traffic type or for broadcast traffic if no traffic type is entered.
show interfaces [*interface-id*] **counters broadcast**	Displays the storm-control broadcast suppression discard counter with the number of packets discarded for all interfaces or the specified interface.
show interfaces [*interface-id*] **counters multicast**	Displays the storm-control multicast suppression discard counter with the number of packets discarded for all interfaces or the specified interface.
show interfaces [*interface-id*] **counters unicast**	Displays the storm-control unicast suppression discard counter with the number of packets discarded for all interfaces or the specified interface.
show port-security [**interface** *interface-id*]	Displays port security settings for the switch or for the specified interface, including the maximum allowed number of secure MAC addresses for each interface, the number of secure MAC addresses on the interface, the number of security violations that have occurred, and the violation mode.
show port-security [**interface** *interface-id*] **address**	Displays all secure MAC addresses configured on all switch interfaces or on a specified interface with aging information for each address.
show port-security [**interface** *interface-id*] **vlan**	Displays the maximum allowed number of secure MAC addresses for each VLAN and the number of secure MAC addresses on the VLAN.