



Configuring Port Security

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Information About Port Security

Port security allows you to configure Layer 2 interfaces that permit inbound traffic from a restricted, secured set of MAC addresses. Traffic from secured MAC addresses is not allowed on another interface within the same VLAN. The number of MAC addresses that can be secured is configured per interface.

Secure MAC Address Learning

The following information describes secure MAC address learning:

- The process of securing a MAC address is called learning.
- The number of addresses that can be learned is restricted.
- Address learning can be accomplished on any interface where port security is enabled.

Static Method

- The static learning method allows you to manually add or remove secure MAC addresses to the running configuration of an interface. If you copy the running configuration to the startup configuration, static secure MAC addresses are persistent if the device restarts.
- A static secure MAC address entry remains in the configuration of an interface until you explicitly remove the address from the configuration.
- Adding secure addresses by the static method is not affected by whether dynamic or sticky address learning is enabled.

Dynamic Method

By default, when you enable port security on an interface, you enable the dynamic learning method. With this method, the device secures MAC addresses as ingress traffic passes through the interface. If the address is not yet secured and the device has not reached any applicable maximum, it secures the address and allows the traffic.

The device stores dynamic secure MAC addresses in memory. A dynamic secure MAC address entry remains in the configuration of an interface until one of the following events occurs:

- The VSM and VEM restarts.
- The interface restarts.
- The address reaches the age limit that you configured for the interface.
- You explicitly remove the address.

Sticky Method

- If you enable the sticky method, the device secures MAC addresses in the same manner as dynamic address learning. These addresses can be made persistent through a reboot by using the **copy run start** command to copy the running configuration to the startup configuration.
- Dynamic and sticky address learning are mutually exclusive. When you enable sticky learning on an interface, dynamic learning is stopped and sticky learning is used instead. If you disable sticky learning, dynamic learning is resumed.
- Sticky secure MAC addresses are not aged.
- A sticky secure MAC address entry remains in the configuration of an interface until you explicitly remove the address.

Dynamic Address Aging

MAC addresses that are learned by the dynamic method are aged and dropped when reaching the age limit. You can configure the age limit on each interface. The range is from 0 to 1440 minutes, where 0 disables aging.

There are two methods of determining the address age:

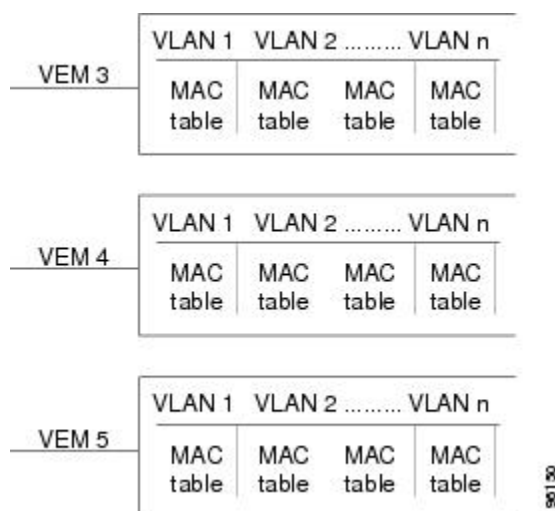
- **Inactivity**—The length of time after the device last received a packet from the address on the applicable interface.
- **Absolute**—The length of time after the device learned the address. This is the default aging method; however, the default aging time is 0 minutes, which disables aging.

Secure MAC Address Maximums

The secure MAC addresses on a secure port are inserted in the same MAC address table as other regular MAC addresses. If a MAC table has reached its limit, it does not learn any new secure MAC addresses for that VLAN.

The following figure shows that each VLAN in a VEM has a forwarding table that can store a maximum number of secure MAC addresses.

Figure 1: Secure MAC Addresses per VEM



Interface Secure MAC Addresses

By default, an interface can have only one secure MAC address. You can configure the maximum number of MAC addresses permitted per interface or per VLAN on an interface. Maximums apply to secure MAC addresses learned by any method: dynamic, sticky, or static.

The following limits can determine how many secure MAC address are permitted on an interface:

- **Device maximum**—The device has a nonconfigurable limit of 8192 secure MAC addresses. If learning a new address would violate the device maximum, the device does not permit the new address to be learned, even if the interface or VLAN maximum has not been reached.
- **Interface maximum**—You can configure a maximum number of secure MAC addresses for each interface protected by port security. The default interface maximum is one address for both access and trunk vethernet ports. Interface maximums cannot exceed the device maximum.

- **VLAN maximum**—You can configure the maximum number of secure MAC addresses per VLAN for each interface protected by port security. A VLAN maximum cannot exceed the interface maximum. VLAN maximums are useful only for trunk ports. There are no default VLAN maximums.

You can configure a VLAN and interface maximums per interface, as needed; however, when the new limit is less than the applicable number of secure addresses, you must reduce the number of secure MAC addresses first.

Security Violations and Actions

Port security triggers a security violation when either of the following occurs:

- Ingress traffic arrives at an interface from a nonsecure MAC address and learning the address would exceed the applicable maximum number of secure MAC addresses.

When an interface has both a VLAN maximum and an interface maximum configured, a violation occurs when either maximum is exceeded. For example, consider the following on a single interface configured with port security:

- VLAN 1 has a maximum of five addresses.
- The interface has a maximum of ten addresses.

A violation is detected when either of the following occurs:

- Five addresses are learned for VLAN 1 and inbound traffic from a sixth address arrives at the interface in VLAN 1.
- Ten addresses are learned on the interface and inbound traffic from an 11th address arrives at the interface.
- Ingress traffic from a secure MAC address arrives at a different interface in the same VLAN as the interface on which the address is secured.



Note

After a secure MAC address is configured or learned on one secure port, the sequence of events that occurs when port security detects that secure MAC address on a different port in the same VLAN is known as a MAC move violation.

When a security violation occurs on an interface, the action specified in its port security configuration is applied. The possible actions that the device can take are as follows:

- **Shutdown**—Shuts down the interface that received the packet triggering the violation. The interface is error disabled. This action is the default. After you reenables the interface, it retains its port security configuration, including its secure MAC addresses.

You can use the **errdisable** global configuration command to configure the device to reenables the interface automatically if a shutdown occurs, or you can manually reenables the interface by entering the shutdown and no shutdown interface configuration commands.

```
switch(config)# errdisable recovery cause psecure-violation
switch(config)# copy running-config startup-config
```

- **Protect**—Prevents violations from occurring. Address learning continues until the maximum number of MAC addresses on the interface is reached, after which the device disables learning on the interface and drops all ingress traffic from nonsecure MAC addresses.
- **Restrict**—Prevents violations from occurring. Address learning continues until the maximum number of MAC addresses on the interface is reached, after which the device disables learning on the interface and drops all ingress traffic from nonsecure MAC addresses and causes the security violation counter to increment.

A MAC Move Violation is triggered on the port that sees the MAC address that is already secured on another interface. If MAC A is secured on interface A, and then if ingress traffic arrives on interface B with the same source MAC as that of secured MAC A, then the action is applied to interface B that received the traffic. Interface B will be error disabled.

Port Security and Port Types

You can configure port security only on Layer 2 interfaces. Details about port security and different types of interfaces or ports are as follows:

- **Access ports**—You can configure port security on interfaces that you have configured as Layer 2 access ports. On an access port, port security applies only to the access VLAN.
- **Trunk ports**—You can configure port security on interfaces that you have configured as Layer 2 trunk ports. VLAN maximums are not useful for access ports. The device allows VLAN maximums only for VLANs associated with the trunk port.
- **SPAN ports**—You can configure port security on SPAN source ports but not on SPAN destination ports.
- **Ethernet Ports**—Port security is not supported on Ethernet ports.
- **Ethernet Port Channels**—Port security is not supported on Ethernet port channels.

Result of Changing an Access Port to a Trunk Port

When you change a Layer 2 interface from an access port to a trunk port, the device drops all secure addresses learned by the dynamic method. The device moves the addresses learned by the static or sticky method to the native trunk VLAN.

Result of Changing a Trunk Port to an Access Port

When you change a Layer 2 interface from a trunk port to an access port, the device drops all secure addresses learned by the dynamic method. It also moves all addresses learned by the sticky method on the native trunk VLAN to the access VLAN. The device drops secure addresses learned by the sticky method if they are not on the native trunk VLAN.

Guidelines and Limitations for Port Security

- Port security is not supported on the following:
 - Ethernet interfaces

- Ethernet port-channel interfaces
- Switched port analyzer (SPAN) destination ports
- Port security cannot be configured on interfaces with existing static MAC addresses.
- Port security cannot be enabled on interfaces whose VLANs have an existing static MAC address even if it is programmed on a different interface.

Default Settings for Port Security

Parameters	Default
Interface	Disabled
MAC address learning method	Dynamic
Interface maximum number of secure MAC addresses	1
Security violation action	Shutdown

Configuring Port Security

Enabling or Disabling Port Security on a Layer 2 Interface

You can enable or disable port security on a Layer 2 interface.

By default, port security is disabled on all interfaces.

Enabling port security on an interface also enables dynamic MAC address learning.

Before You Begin

- Log in to the CLI in EXEC mode.

Procedure

	Command or Action	Purpose
Step 1	switch# configure terminal	Enters global configuration mode.
Step 2	switch(config)# interface <i>type number</i>	Places you into interface configuration mode for the specified interface.
Step 3	switch(config-if)# [no] switchport port-security	Enables port security on the interface. Using the no option disables port security on the interface.

	Command or Action	Purpose
Step 4	switch(config-if)# show port-security address interface vethernet number	Displays the secure MAC address learnt on the interface.
Step 5	switch(config-if)# show port-security interface vethernet number	Displays the port security configuration on the interface.
Step 6	switch(config-if)# show running-config port-security	(Optional) Displays the port security configuration.
Step 7	switch(config-if)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to enable port security on a Layer 2 interface:

```
switch# configure terminal
switch(config)# interface vethernet 36
switch(config-if)# switchport port-security
switch(config-if)# show running-config port-security
interface Vethernet36
switchport port-security
switch(config-if)# show port-security address interface vethernet 36
Secure Mac Address Table
-----
Vlan Mac Address Type Ports Configured Age
(mins)
-----
2303 0050.5687.3C68 DYNAMIC Vethernet36 0
-----
switch(config-if)# show port-security interface vethernet 36
Port Security : Enabled
Port Status : Secure UP
Violation Mode : Shutdown
Aging Time : 0 mins
Aging Type : Absolute
Maximum MAC Addresses : 1
Total MAC Addresses : 1
Configured MAC Addresses : 0
Sticky MAC Addresses : 0
Security violation count : 0

switch(config-if)# copy running-config startup-config
```

Enabling or Disabling Sticky MAC Address Learning

You can enable or disable sticky MAC address learning.

Dynamic MAC address learning is the default on an interface.

By default, sticky MAC address learning is disabled.

Before You Begin

- Log in to the CLI in EXEC mode.
- Enable port security on the interface that you are configuring.

Procedure

	Command or Action	Purpose
Step 1	switch# configure terminal	Enters global configuration mode.
Step 2	switch(config)# interface type number	Places you into interface configuration mode for the specified interface.
Step 3	switch(config-if)# [no] switchport port-security mac-address sticky	Enables sticky MAC address learning on the interface. Using the no option disables sticky MAC address learning.
Step 4	switch(config-if)# show port-security address interface vethernet number	Displays the secure MAC address learnt on the interface.
Step 5	switch(config-if)# show port-security interface vethernet number	Displays the port security configuration on the interface.
Step 6	switch(config-if)# show running-config port-security	(Optional) Displays the port security configuration.
Step 7	switch(config-if)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to enable sticky MAC address learning:

```
switch(config)# interface Vethernet36
switch(config-if)# switchport port-security
switch(config-if)# switchport port-security mac-address sticky
switch(config-if)# switchport port-security mac-address 0050.5687.3C4B
switch(config)# show running-config port-security
interface Vethernet36
switchport port-security
switchport port-security mac-address sticky
switchport port-security mac-address 0050.5687.3C4B
switch(config)# show port-security address interface vethernet 36
Secure Mac Address Table
-----
Vlan Mac Address Type Ports Configured Age
(mins)
-----
2304 0050.5687.3C4B STICKY Vethernet36 0
-----
```

Adding a Static Secure MAC Address on an Interface

You can add a static secure MAC address on an interface.

By default, no static secure MAC addresses are configured on an interface.

Before You Begin

- Log in to the CLI in EXEC mode.
- Determine if the interface maximum has been reached for secure MAC addresses. You can use the **show port-security** command.
- Enable port security on the interface that you are configuring.

Procedure

	Command or Action	Purpose
Step 1	switch# configure terminal	Enters global configuration mode.
Step 2	switch(config)# interface <i>type number</i>	Places you into interface configuration mode for the specified interface.
Step 3	switch(config-if)# [no] switchport port-security mac-address <i>address</i> [vlan <i>vlan-ID</i>]	Configures a static MAC address for port security on the current interface. Use the vlan keyword if you want to specify the VLAN that traffic from the address is allowed on.
Step 4	switch(config-if)# show port-security address interface vethernet number	Displays the secure MAC address learnt on the interface.
Step 5	switch(config-if)# show port-security interface vethernet number	Displays the port security configuration on the interface.
Step 6	switch(config-if)# show running-config port-security	(Optional) Displays the port security configuration.
Step 7	switch(config-if)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to add a static secure MAC address on an interface:

```
switch# configure terminal
switch(config)# interface vethernet 36
switch(config-if)# switchport port-security mac-address 0019.D2D0.00AE
switch(config)# show running-config port-security
interface Vethernet36
switchport port-security
switchport port-security maximum 5
switchport port-security mac-address 0019.D2D0.00AE
switch(config)# show port-security address interface vethernet 36
Secure Mac Address Table
-----
Vlan Mac Address Type Ports Configured Age
(mins)
-----
2304 0019.D2D0.00AE STATIC Vethernet36 0
2304 0050.5687.3C4B DYNAMIC Vethernet36 0
-----
VLAN MAC Address Type Age Port Mod
switch(config-if)# copy running-config startup-config
```

Removing a Static or a Sticky Secure MAC Address from an Interface

You can remove a static or a sticky secure MAC address from a Layer 2 interface.

Before You Begin

- Log in to the CLI in EXEC mode.
- Enable port security on the interface that you are configuring.

Procedure

	Command or Action	Purpose
Step 1	switch# configure terminal	Enters global configuration mode.
Step 2	switch(config)# interface <i>type number</i>	Places you into interface configuration mode for the specified interface.
Step 3	switch(config-if)# no switchport port-security mac-address <i>address</i>	Removes the MAC address from port security on the current interface.
Step 4	switch(config-if)# show port-security address interface vethernet number	Displays the secure MAC address learnt on the interface.
Step 5	switch(config-if)# show port-security interface vethernet number	Displays the port security configuration on the interface.
Step 6	switch(config-if)# show running-config port-security	(Optional) Displays the port security configuration.
Step 7	switch(config-if)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to remove the MAC address from port security on the current interface:

```
switch(config-if)# interface Vethernet36
switch(config-if)# switchport port-security
switch(config-if)# switchport port-security maximum 5
switch(config-if)# show port-security address interface vethernet 36
Secure Mac Address Table
-----
Vlan Mac Address Type Ports Configured Age
(mins)
-----
2303 0050.5687.1111 STATIC Vethernet36 0
2303 0050.5687.3C4B DYNAMIC Vethernet36 0
-----
switch(config-if)# no switchport port-security mac-address 0050.5687.1111

switch(config-if)# show port-security address interface vethernet 36
Secure Mac Address Table
-----
Vlan Mac Address Type Ports Configured Age
(mins)
```

```
-----
2303 0050.5687.3C4B DYNAMIC Vethernet36 0
-----
```

Removing a Dynamic Secure MAC Address

You can remove a specific address learned by the dynamic method or remove all addresses learned by the dynamic method on a specific interface.

Before You Begin

Log in to the CLI in EXEC mode.

Procedure

	Command or Action	Purpose
Step 1	switch# configure terminal	Enters global configuration mode.
Step 2	switch(config)# clear port-security dynamic { interface vethernet <i>number</i> address <i>address</i> } [vlan <i>vlan-ID</i>]	Removes dynamically learned, secure MAC addresses, as specified. The keywords are as follows: <ul style="list-style-type: none"> • interface—Removes all dynamically learned addresses on the interface that you specify. • address—Removes the single, dynamically learned address that you specify. • vlan—Removes an address or addresses on a particular VLAN.
Step 3	switch(config)# show port-security address	(Optional) Displays secure MAC addresses.

This example shows how to remove a dynamically learned, secure MAC address:

```
switch(config)# show port-security address interface vethernet 36
Secure Mac Address Table
-----
Vlan Mac Address Type Ports Configured Age
(mins)
-----
2303 0000.1111.2224 STATIC Vethernet36 0
2303 0050.5687.3C4B DYNAMIC Vethernet36 0
-----

switch(config)# clear port-security dynamic interface vethernet 36
switch(config)# show port-security address interface vethernet 36
Secure Mac Address Table
-----
Vlan Mac Address Type Ports Configured Age
(mins)
-----
2303 0000.1111.2224 STATIC Vethernet36 0
-----
```

Configuring a Maximum Number of MAC Addresses

You can configure the maximum number of MAC addresses that can be learned or statically configured on a Layer 2 interface. You can also configure a maximum number of MAC addresses per VLAN on a Layer 2 interface. The largest maximum number of addresses that you can configure is 4096 addresses.

The secure MAC addresses share the Layer 2 Forwarding Table (L2FT). The forwarding table for each VLAN can hold up to 1024 entries.

By default, an interface has a maximum of one secure MAC address.

VLANs have no default maximum number of secure MAC addresses.

To remove all addresses learned by the dynamic method, use the **shutdown** and **no shutdown** commands to restart the interface.



Note

When you specify a maximum number of addresses that is less than the number of addresses already learned or statically configured on the interface, the command is rejected.

Before You Begin

- Log in to the CLI in EXEC mode.
- Enable port security on the interface that you are configuring.

Procedure

	Command or Action	Purpose
Step 1	switch# configure terminal	Enters global configuration mode.
Step 2	switch(config)# interface <i>type number</i>	Places you into interface configuration mode for the specified interface.
Step 3	switch(config-if)# [no] switchport port-security maximum <i>number</i> [vlan <i>vlan-ID</i>]	Configures the maximum number of MAC addresses that can be learned or statically configured for the current interface. The highest valid number is 4096. The no option resets the maximum number of MAC addresses to the default, which is 1. If you want to specify the VLAN that the maximum applies to, use the vlan keyword.
Step 4	switch(config-if)# show port-security address interface vethernet number	Displays the secure MAC address learnt on the interface.
Step 5	switch(config-if)# show port-security interface vethernet number	Displays the port security configuration on the interface.
Step 6	switch(config-if)# show running-config port-security	(Optional) Displays the port security configuration.

	Command or Action	Purpose
Step 7	switch(config-if)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration. Note The VLAN ID configuration is not supported on access port and is only applicable to trunk ports.

This example shows how to configure a maximum number of MAC addresses:

```
switch(config-if)# interface Vethernet36
switch(config-if)# switchport port-security
switch(config-if)# switchport port-security maximum 425
switch(config-if)# show port-security interface vethernet 36
Port Security : Enabled
Port Status : Secure UP
Violation Mode : Shutdown
Aging Time : 0 mins
Aging Type : Absolute
Maximum MAC Addresses : 425
Total MAC Addresses : 1
Configured MAC Addresses : 0
Sticky MAC Addresses : 0
Security violation count : 0
switch(config-if)# show running-config port-security
interface Vethernet36
    switchport port-security
    switchport port-security maximum 425
```

Configuring an Address Aging Type and Time

You can configure the MAC address aging type and the length of time used to determine when MAC addresses learned by the dynamic method have reached their age limit.

There are two methods for determining address aging:

- **Inactivity**—The length of time after the device last received a packet from the address on the applicable interface.
- **Absolute**—The length of time after the device learned the address. This is the default aging method; however, the default aging time is 0 minutes, which disables aging.

Before You Begin

- Log in to the CLI in EXEC mode.
- Enable port security on the interface that you are configuring.

Procedure

	Command or Action	Purpose
Step 1	switch# configure terminal	Enters global configuration mode.
Step 2	switch(config)# interface type number	Places you into interface configuration mode for the specified interface.
Step 3	switch(config-if)# [no] switchport port-security aging type {absolute inactivity}	Configures the type of aging that the device applies to dynamically learned MAC addresses. The no option resets the aging type to the default, which is absolute aging.
Step 4	switch(config-if)# [no] switchport port-security aging time minutes	Configures the number of minutes that a dynamically learned MAC address must age before the address is dropped. The maximum valid minutes is 1440. The no option resets the aging time to the default, which is 0 minutes (no aging).
Step 5	switch(config-if)# show port-security address interface vethernet number	(Optional) Displays the secure MAC address learnt on the interface.
Step 6	switch(config-if)# show port-security interface vethernet number	(Optional) Displays the port security configuration on the interface.
Step 7	switch(config-if)# show running-config port-security	(Optional) Displays the port security configuration.
Step 8	switch(config-if)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to configure an address aging type and time:

```

switch(config-if)# show running-config port-security
interface Vethernet36
    switchport port-security
    switchport port-security aging type inactivity
    switchport port-security aging time 120
switch(config-if)# interface Vethernet36
switch(config-if)# switchport port-security
switch(config-if)# switchport port-security aging type inactivity
switch(config-if)# switchport port-security aging time 120
switch(config-if)# show port-security address interface vethernet 36
Secure Mac Address Table
-----
Vlan Mac Address Type Ports Configured Age
(mins)
-----
2304 0050.5687.3C4B DYNAMIC Vethernet36 120
-----

switch(config-if)# show port-security interface vethernet 36
Port Security : Enabled
Port Status : Secure UP
Violation Mode : Shutdown

```

```

Aging Time : 120 mins
Aging Type : Inactivity
Maximum MAC Addresses : 1
Total MAC Addresses : 1
Configured MAC Addresses : 0
Sticky MAC Addresses : 0
Security violation count : 0

```

Configuring a Security Violation Action

You can configure how an interface responds to a security violation. You can configure the following interface responses to security violations:

- **protect**—Drops packets with unknown source addresses until you remove a sufficient number of secure MAC addresses to drop below the maximum value.
- **restrict**—Drops packets with unknown source addresses until you remove a sufficient number of secure MAC addresses to drop below the maximum value and causes the SecurityViolation counter to increment.
- **shutdown** (the default)—Puts the interface into the error-disabled state immediately and sends an SNMP trap notification.

Before You Begin

- Log in to the CLI in EXEC mode.
- Enable port security on the interface that you are configuring.

Procedure

	Command or Action	Purpose
Step 1	switch# configure terminal	Enters global configuration mode.
Step 2	switch(config)# interface <i>type number</i>	Places you into interface configuration mode for the specified interface.
Step 3	switch(config-if)# [no] switchport port-security violation {protect restrict shutdown}	<p>Configures the security violation action for port security on the current interface. The no option resets the violation action to the default, which is to shut down the interface.</p> <p>The keywords are as follows:</p> <ul style="list-style-type: none"> • protect—Drops packets with unknown source addresses until you remove a sufficient number of secure MAC addresses to drop below the maximum value • restrict—Drops packets with unknown source addresses until you remove a sufficient number of secure MAC addresses to drop below the maximum value, which increments the Security Violation counter.

	Command or Action	Purpose
		<ul style="list-style-type: none"> • shutdown (the default)—Puts the interface into the error-disabled state immediately and sends an SNMP trap notification and syslog event.
Step 4	switch(config-if)# show port-security address interface vethernet number	Displays the secure MAC address learnt on the interface.
Step 5	switch(config-if)# show port-security interface vethernet number	Displays the port security configuration on the interface.
Step 6	switch(config-if)# show running-config port-security	(Optional) Displays the port security configuration.
Step 7	switch(config-if)# copy running-config startup-config	(Optional) Copies the running configuration to the startup configuration.

This example shows how to configure a security violation action:

```
switch(config-if)# show running-config port-security
interface Vethernet36
  switchport port-security
  switchport port-security violation protect
switch(config-if)# interface Vethernet36
switch(config-if)# switchport port-security
switch(config-if)# switchport port-security violation protect
switch(config-if)# show port-security interface vethernet 36
Port Security : Enabled
Port Status : Secure UP
Violation Mode : Protect
Aging Time : 0 mins
Aging Type : Absolute
Maximum MAC Addresses : 1
Total MAC Addresses : 1
Configured MAC Addresses : 0
Sticky MAC Addresses : 0
Security violation count : 0
```

Recovering Ports Disabled for Port Security Violations

You can automatically recover an interface disabled for port security violations. To recover an interface manually from the error-disabled state, you must enter the **shutdown** command and then the **no shutdown** command.

Before You Begin

Log in to the CLI in EXEC mode.

Procedure

	Command or Action	Purpose
Step 1	switch# configure terminal	Enters global configuration mode.
Step 2	switch(config)# interface <i>type number</i>	Places you into interface configuration mode for the specified interface.
Step 3	switch(config-if)# errdisable recovery cause psecure-violation	Enables a timed automatic recovery of the specified port that is disabled for a port security violation.
Step 4	switch(config-if)# errdisable recovery interval <i>seconds</i>	Configures a timer recovery interval in seconds from 30 to 65535 seconds.

This example shows how to recover ports that are disabled for port security violations:

```
switch# configure terminal
switch(config)# interface vethernet 36
switch(config-if)# errdisable recovery cause psecure-violation
switch(config-if)# errdisable recovery interval 30
switch(config-if)# copy running-config startup-config
switch(config-if)# show errdisable recovery
ErrDisable Reason Timer Status
-----
link-flap disabled
dhcp-rate-limit disabled
arp-inspection disabled
security-violation disabled
psecure-violation enabled
failed-port-state enabled
ip-addr-conflict disabled

Timer interval: 30
```

Verifying the Port Security Configuration

Use the following commands to verify the configuration:

Command	Purpose
show running-config port-security	Displays the port security configuration.
show port-security	Displays the port security status.
show port-security address interface vethernet number	Displays the secure MAC address learnt on the interface.
show port-security interface vethernet number	Displays the port security configuration on the interface.

Displaying Secure MAC Addresses

Use the **show port-security address** command to display secure MAC addresses.

Use the **show port-security address interface vethernet id** command to display all secured MAC addresses on that interface.

Configuration Example for Port Security

This example shows a port security configuration for the vEthernet 36 interface with a VLAN and interface maximums for secure addresses. In this example, the interface is a trunk port. Additionally, the violation action is set to Protect.

```
switch# config terminal
switch(config)# interface vethernet 36
switch(config-if)# switchport port-security
switch(config-if)# switchport port-security maximum 10
switch(config-if)# switchport port-security maximum 7 vlan 10
switch(config-if)# switchport port-security maximum 3 vlan 20
switch(config-if)# switchport port-security violation protect
switch(config-if)# switchport mode trunk
switch(config-if)# show running-config interface vethernet 36
switchport port-security
switchport port-security maximum 10
switchport port-security maximum 7 vlan 10
switchport port-security maximum 3 vlan 20
switchport port-security violation protect
switchport mode trunk
```

The following example shows a port security configuration for the vEthernet 40 interface as an access port with an interface maximum set to 20, a violation set to restrict, an absolute timeout of 1 minute and a port security static MAC address of 0000.1111.5555:

```
switch# config terminal
switch(config)# interface vethernet 40
switch(config-if)# switchport port-security aging time 1
switch(config-if)# switchport port-security aging type absolute
switch(config-if)# switchport port-security
switch(config-if)# switchport port-security maximum 20
switch(config-if)# switchport port-security mac-address 0000.1111.5555
switch(config-if)# switchport port-security violation restrict
switch(config-if)# show running-config interface vethernet 40
switchport port-security aging time 1
switchport port-security aging type absolute
switchport port-security
switchport port-security maximum 20
switchport port-security mac-address 0000.1111.5555
switchport port-security violation restrict
switch(config-if)# show port-security interface vethernet 40
Port Security : Enabled
Port Status : Secure UP
Violation Mode : Restrict
Aging Time : 1 mins
Aging Type : Absolute
Maximum MAC Addresses : 20
Total MAC Addresses : 2
Configured MAC Addresses : 1
Sticky MAC Addresses : 0
Security violation count : 0
```

This example shows a port security configuration for the vEthernet 42 interface as an access port with a violation set to shutdown and MAC address learning set to sticky:

```
switch# config terminal
switch(config)# interface vethernet 42
switch(config-if)# switchport port-security
switch(config-if)# switchport port-security mac-address sticky
switch(config-if)# switchport port-security violation shutdown
switch(config-if)# show running-config interface vethernet 42
    switchport port-security
    switchport port-security mac-address sticky
    switchport port-security violation shutdown

switch(config-if)# show port-security interface vethernet 42
Port Security : Enabled
Port Status : Secure UP
Violation Mode : Shutdown
Aging Time : 0 mins
Aging Type : Absolute
Maximum MAC Addresses : 1
Total MAC Addresses : 1
Configured MAC Addresses : 0
Sticky MAC Addresses : 1
Security violation count : 0

switch(config-if)# show port-security address interface vethernet 42
Secure Mac Address Table
-----
Vlan Mac Address Type Ports Configured Age
(mins) -----
2303 0050.5687.3C68 STICKY Vethernet42 0
-----
```

Feature History for Port Security

This table only includes updates for those releases that have resulted in additions to the feature.

Feature Name	Releases	Feature Information
Port Security	4.0(4)SV1(1)	This feature was introduced.

