



# Configuring Port Security

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This chapter describes how to configure port security on Cisco NX-OS devices.

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## About Port Security

Port security allows you to configure Layer 2 physical interfaces and Layer 2 port-channel interfaces to allow inbound traffic from only a restricted set of MAC addresses. The MAC addresses in the restricted set are called secure MAC addresses. In addition, the device does not allow traffic from these MAC addresses on another interface within the same VLAN. The number of MAC addresses that the device can secure is configurable per interface.



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**Note** Unless otherwise specified, the term *interface* refers to both physical interfaces and port-channel interfaces; likewise, the term *Layer 2 interface* refers to both Layer 2 physical interfaces and Layer 2 port-channel interfaces.

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## Secure MAC Address Learning

The process of securing a MAC address is called learning. A MAC address can be a secure MAC address on one interface only. For each interface on which you enable port security, the device can learn a limited number

of MAC addresses by the static or dynamic methods. The way that the device stores secure MAC addresses varies depending upon how the device learned the secure MAC address.

## 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 unaffected if the device restarts.

A static secure MAC address entry remains in the configuration of an interface until one of the following events occurs:

- You explicitly remove the address from the configuration.
- You configure the interface to act as a Layer 3 interface.

Adding secure addresses by the static method is not affected by whether dynamic 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 device restarts
- The interface restarts
- The address reaches the age limit that you configured for the interface
- You explicitly remove the address
- You configure the interface to act as a Layer 3 interface

## Sticky Method

If you enable the sticky method, the device secures MAC addresses in the same manner as dynamic address learning, but the device stores addresses learned by this method in nonvolatile RAM (NVRAM). As a result, addresses learned by the sticky method persist through a device restart. Sticky secure MAC addresses do not appear in the running configuration of an interface.

Dynamic and sticky address learning are mutually exclusive. When you enable sticky learning on an interface, the device stops dynamic learning and performs sticky learning instead. If you disable sticky learning, the device resumes dynamic learning.

A sticky secure MAC address entry remains in the configuration of an interface until one of the following events occurs:

- You explicitly remove the address
- You configure the interface to act as a Layer 3 interface

## Dynamic Address Aging

The device ages MAC addresses learned by the dynamic method and drops them after the age limit is reached. You can configure the age limit on each interface. The range is from 0 to 1440 minutes, where 0 disables aging.

The method that the device uses to determine that the MAC address age is also configurable. The two methods of determining address age are as follows:

### Inactivity

The length of time after the device last received a packet from the address on the applicable interface.



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**Note** This feature is supported only on Cisco Nexus 9200 and 9300-EX Series switches.

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### 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.



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**Note** When the absolute aging time is configured, MAC aging occurs even when the traffic from the source MAC is flowing. However, during MAC aging and re-learn, there could be a transient traffic drop.

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## Secure MAC Address Maximums

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: static or dynamic.



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**Tip** To ensure that an attached device has the full bandwidth of the port, set the maximum number of addresses to one and configure the MAC address of the attached device.

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The following three limits can determine how many secure MAC addresses 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 1025 secure MAC addresses for each interface protected by port security. The default interface maximum is one address. 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 configured interface maximum. VLAN maximums are useful only for trunk ports. There are no default VLAN maximums.

You can configure 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 security violations when either of the following events occurs:

### MAC Count Violation

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

The device detects a violation when any of the following occurs:

- The device has learned five addresses for VLAN 1, and inbound traffic from a sixth address arrives at the interface in VLAN 1.
- The device has learned ten addresses on the interface, and inbound traffic from an eleventh address arrives at the interface.

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.

### Restrict

Drops ingress traffic from any nonsecure MAC addresses.

The device keeps a count of the number of dropped MAC addresses, which is called the security violation count. Address learning continues until the maximum security violations have occurred on the interface. Traffic from addresses learned after the first security violation is dropped.

### MAC Move Violation

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.

You see a mac move notification only when the the logging level of Layer2 Forwarding Module (L2FM) is increased to 4 or 5

When a MAC move violation occurs, the device increments the security violation counter for the interface, and irrespective of the violation mode configured, the interface is error disabled. If the violation mode is configured as Restrict or Protect, the violation is logged in the system log.

Because a MAC move violation results in the interface being error disabled, irrespective of the violation mode configured, we recommend using the **errdisable** command to enable automatic errdisable recovery.

## 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. VLAN maximums are not useful for access ports.

### Trunk Ports

You can configure port security on interfaces that you have configured as Layer 2 trunk 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 Port Channels

You can configure port security on Layer 2 Ethernet port channels in either access mode or trunk mode.

## Port Security and Port-Channel Interfaces

Port security is supported on Layer 2 port-channel interfaces. Port security operates on port-channel interfaces in the same manner as on physical interfaces, except as described in this section.

### General Guidelines

Port security on a port-channel interface operates in either access mode or trunk mode. In trunk mode, the MAC address restrictions enforced by port security apply to all member ports on a per-VLAN basis.

Enabling port security on a port-channel interface does not affect port-channel load balancing.

Port security does not apply to port-channel control traffic passing through the port-channel interface. Port security allows port-channel control packets to pass without causing security violations. Port-channel control traffic includes the following protocols:

- Port Aggregation Protocol (PAgP)
- Link Aggregation Control Protocol (LACP)
- Inter-Switch Link (ISL)
- IEEE 802.1Q

### Configuring Secure Member Ports

The port security configuration of a port-channel interface has no effect on the port security configuration of member ports.

### Adding a Member Port

If you add a secure interface as a member port of a port-channel interface, the device discards all dynamic secure addresses learned on the member port but retains all other port-security configuration of the member port in the running configuration. Static secure MAC addresses learned on the secure member port are also stored in the running configuration rather than NVRAM.

If port security is enabled on the member port and not enabled on the port-channel interface, the device warns you when you attempt to add the member port to the port-channel interface. You can use the **force** keyword with the **channel-group** command to forcibly add a secure member port to a nonsecure port-channel interface.

While a port is a member of a port-channel interface, you cannot configure port security on the member port. To do so, you must first remove the member port from the port-channel interface.

### Removing a Member Port

If you remove a member port from a port-channel interface, the device restores the port security configuration of the member port. Static secure MAC addresses that were learned on the port before you added it to the port-channel interface are restored to NVRAM and removed from the running configuration.



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**Note** To ensure that all ports are secure as needed after you remove a port-channel interface, we recommend that you closely inspect the port-security configuration of all member ports.

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### Removing a Port-Channel Interface

If you remove a secure port-channel interface, the following occurs:

- The device discards all secure MAC addresses learned for the port-channel interface, including static secure MAC addresses learned on the port-channel interface.
- The device restores the port-security configuration of each member port. The static secure MAC addresses that were learned on member ports before you added them to the port-channel interface are restored to NVRAM and removed from the running configuration. If a member port did not have port security enabled prior to joining the port-channel interface, port security is not enabled on the member port after the port-channel interface is removed.



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**Note** To ensure that all ports are secure as needed after you remove a port-channel interface, we recommend that you closely inspect the port-security configuration of all member ports.

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### Disabling Port Security

If port security is enabled on any member port, the device does not allow you to disable port security on the port-channel interface. To do so, remove all secure member ports from the port-channel interface first. After disabling port security on a member port, you can add it to the port-channel interface again, as needed.

## Port Type Changes

When you have configured port security on a Layer 2 interface and you change the port type of the interface, the device behaves as follows:

### Access Port to 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 method to the native trunk VLAN.

### Switched Port to Routed Port

When you change an interface from a Layer 2 interface to a Layer 3 interface, the device disables port security on the interface and discards all port security configuration for the interface. The device also discards all secure MAC addresses for the interface, regardless of the method used to learn the address.

### Routed Port to Switched Port

When you change an interface from a Layer 3 interface to a Layer 2 interface, the device has no port security configuration for the interface.

## Prerequisites for Port Security

Port security has the following prerequisites:

- You must globally enable port security for the device that you want to protect with port security.

## Default Settings for Port Security

This table lists the default settings for port security parameters.

Parameters	Default
Port security enablement globally	Disabled
Port security enablement per interface	Disabled
MAC address learning method	Dynamic
Interface maximum number of secure MAC addresses	1
Security violation action	Shutdown

## Guidelines and Limitations for Port Security

When configuring port security, follow these guidelines:

- Port security does not support switched port analyzer (SPAN) destination ports.
- Port security does not depend upon other features.

- Port security is supported for FEX interfaces only in non-vPC deployments on Cisco Nexus 9300-EX Series switches.
- There is no supported method of disabling the USB port on Cisco Nexus 9000 Series switches.
- After configuring the association between the primary and secondary VLANs and deleting the association, all static MAC addresses that were created on the primary VLANs remain on the primary VLAN only.




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**Note** In some cases, the configuration is accepted with no error messages, but the commands have no effect.

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After configuring the association between the primary and secondary VLANs:

- Static MAC addresses for the secondary VLANs cannot be created.
- Dynamic MAC addresses that learned the secondary VLANs are aged out.

## Guidelines and Limitations for Port Security on vPCs

Apart from the guidelines and limitations for port security, check that you can meet the following guidelines and limitations for port security on vPCs:

- Port security is not supported on FEX interfaces in vPC deployments.
- You must enable port security globally on both vPC peers in a vPC domain.
- You must enable port security on the vPC interfaces of both vPC peers.
- You must configure a static secure MAC address on the primary vPC peer. The static MAC address is synchronized with the secondary vPC peer. You can also configure a static secure MAC address on the secondary peer. The second static MAC address appears in the secondary vPC configuration but does not take effect.
- You must ensure that the maximum MAC count value remains the same for both primary and secondary vPC ports.
- On a secondary vPC port, there is no limit check for static MACs configured. Cisco recommends that you configure the same number of static MACs on a secondary vPC port as defined in the maximum MAC count.
- All learned MAC addresses are synchronized between vPC peers.
- Both vPC peers can be configured using the dynamic or static MAC address learning method. Cisco recommends that you configure both vPC peers using the same method. This helps prevent port shut down (errDisabled state) in certain cases, such as a vPC role change.
- Dynamic MAC addresses are dropped only after the age limit is reached on both vPC peers.
- You set the maximum number of secure MAC addresses on the primary vPC switch. The primary vPC switch does the count validation and disregards any maximum number settings on the secondary switch.
- You must configure the violation action on the primary vPC. When a security violation is triggered, the security action defined on the primary vPC switch occurs.



- You can use the **show vpc consistency-parameters id** command to verify that the configuration is correct on both vPC peers.
- While a switch undergoes an in-service software upgrade (ISSU), port security operations are stopped on its peer switch. The peer switch does not learn any new MAC addresses, and MAC moves occurring during this operation are ignored. When the ISSU is complete, the peer switch is notified and normal port security functionality resumes.
- ISSU to higher versions is supported; however, ISSU to lower versions is not supported.

## Configuring Port Security

### Enabling or Disabling Port Security Globally

You can enable or disable port security globally on a device. By default, port security is disabled globally.

When you disable port security, all port security configuration on the interface is ineffective. When you disable port security globally, all port security configuration is lost.

#### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b>  <b>Example:</b> switch# configure terminal switch(config)#	Enters global configuration mode.
<b>Step 2</b>	<b>[no] feature port-security</b>  <b>Example:</b> switch(config)# feature port-security	Enables port security globally. The <b>no</b> option disables port security globally.
<b>Step 3</b>	(Optional) <b>show port-security</b>  <b>Example:</b> switch(config)# show port-security	Displays the status of port security.
<b>Step 4</b>	(Optional) <b>copy running-config startup-config</b>  <b>Example:</b> switch(config)# copy running-config startup-config	Copies the running configuration to the startup configuration.

### 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.

When you disable port security on an interface, all switchport port security configuration for the interface is lost.

### Before you begin

You must have enabled port security globally.

If a Layer 2 Ethernet interface is a member of a port-channel interface, you cannot enable or disable port security on the Layer 2 Ethernet interface.

If any member port of a secure Layer 2 port-channel interface has port security enabled, you cannot disable port security for the port-channel interface unless you first remove all secure member ports from the port-channel interface.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> switch# configure terminal switch(config)#	Enters global configuration mode.
<b>Step 2</b>	Enter one of the following commands: <ul style="list-style-type: none"> <li>• <b>interface ethernet</b> <i>slot/port</i></li> <li>• <b>interface port-channel</b> <i>channel-number</i></li> </ul> <b>Example:</b> switch(config)# interface ethernet 2/1 switch(config-if)#	Enters interface configuration mode for the Ethernet or port-channel interface that you want to configure with port security.
<b>Step 3</b>	<b>switchport</b> <b>Example:</b> switch(config-if)# switchport	Configures the interface as a Layer 2 interface.
<b>Step 4</b>	<b>[no] switchport port-security</b> <b>Example:</b> switch(config-if)# switchport port-security	Enables port security on the interface. The <b>no</b> option disables port security on the interface.
<b>Step 5</b>	(Optional) <b>show running-config port-security</b> <b>Example:</b> switch(config-if)# show running-config port-security	Displays the port security configuration.
<b>Step 6</b>	(Optional) <b>copy running-config startup-config</b> <b>Example:</b> switch(config-if)# copy running-config startup-config	Copies the running configuration to the startup configuration.

## Enabling or Disabling Sticky MAC Address Learning

You can disable or enable sticky MAC address learning on an interface. If you disable sticky learning, the device returns to dynamic MAC address learning on the interface, which is the default learning method.

By default, sticky MAC address learning is disabled.

### Before you begin

You must have enabled port security globally.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> <pre>switch# configure terminal switch(config)#</pre>	Enters global configuration mode.
<b>Step 2</b>	Enter one of the following commands: <ul style="list-style-type: none"> <li>• <b>interface ethernet</b> <i>slot/port</i></li> <li>• <b>interface port-channel</b> <i>channel-number</i></li> </ul> <b>Example:</b> <pre>switch(config)# interface ethernet 2/1 switch(config-if)#</pre>	Enters interface configuration mode for the interface that you want to configure with sticky MAC address learning.
<b>Step 3</b>	<b>switchport</b> <b>Example:</b> <pre>switch(config-if)# switchport</pre>	Configures the interface as a Layer 2 interface.
<b>Step 4</b>	<b>[no] switchport port-security mac-address sticky</b> <b>Example:</b> <pre>switch(config-if)# switchport port-security mac-address sticky</pre>	Enables sticky MAC address learning on the interface. The <b>no</b> option disables sticky MAC address learning.
<b>Step 5</b>	(Optional) <b>show running-config port-security</b> <b>Example:</b> <pre>switch(config-if)# show running-config port-security</pre>	Displays the port security configuration.
<b>Step 6</b>	(Optional) <b>copy running-config startup-config</b> <b>Example:</b> <pre>switch(config-if)# copy running-config startup-config</pre>	Copies the running configuration to the startup configuration.

## Adding a Static Secure MAC Address on an Interface

You can add a static secure MAC address on a Layer 2 interface.



**Note** If the MAC address is a secure MAC address on any interface, you cannot add it as a static secure MAC address to another interface until you remove it from the interface on which it is already a secure MAC address.

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

### Before you begin

You must have enabled port security globally.

Verify that the interface maximum has not been reached for secure MAC addresses. If needed, you can remove a secure MAC address, or you can change the maximum number of addresses on the interface.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> <pre>switch# configure terminal switch(config)#</pre>	Enters global configuration mode.
<b>Step 2</b>	Enter one of the following commands: <ul style="list-style-type: none"> <li>• <b>interface ethernet</b> <i>slot/port</i></li> <li>• <b>interface port-channel</b> <i>channel-number</i></li> </ul> <b>Example:</b> <pre>switch(config)# interface ethernet 2/1 switch(config-if)#</pre>	Enters interface configuration mode for the interface that you specify.
<b>Step 3</b>	<b>[no] switchport port-security mac-address</b> <i>address [vlan vlan-ID]</i> <b>Example:</b> <pre>switch(config-if)# switchport port-security mac-address 0019.D2D0.00AE</pre>	Configures a static MAC address for port security on the current interface. Use the <b>vlan</b> keyword if you want to specify the VLAN that traffic from the address is allowed on.
<b>Step 4</b>	(Optional) <b>show running-config port-security</b> <b>Example:</b> <pre>switch(config-if)# show running-config port-security</pre>	Displays the port security configuration.
<b>Step 5</b>	(Optional) <b>copy running-config</b> <b>startup-config</b> <b>Example:</b> <pre>switch(config-if)# copy running-config startup-config</pre>	Copies the running configuration to the startup configuration.

## Removing a Static Secure MAC Address on an Interface

You can remove a static secure MAC address on a Layer 2 interface.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b>  <b>Example:</b> switch# configure terminal switch(config)#	Enters global configuration mode.
<b>Step 2</b>	Enter one of the following commands:  <ul style="list-style-type: none"> <li>• <b>interface ethernet</b> <i>slot/port</i></li> <li>• <b>interface port-channel</b> <i>channel-number</i></li> </ul> <b>Example:</b> switch(config)# interface ethernet 2/1 switch(config-if)#	Enters interface configuration mode for the interface from which you want to remove a static secure MAC address.
<b>Step 3</b>	<b>no switchport port-security mac-address</b> <i>address</i>  <b>Example:</b> switch(config-if)# no switchport port-security mac-address 0019.D2D0.00AE	Removes the static secure MAC address from port security on the current interface.
<b>Step 4</b>	(Optional) <b>show running-config port-security</b>  <b>Example:</b> switch(config-if)# show running-config port-security	Displays the port security configuration.
<b>Step 5</b>	(Optional) <b>copy running-config startup-config</b>  <b>Example:</b> switch(config-if)# copy running-config startup-config	Copies the running configuration to the startup configuration.

## Removing a Sticky Secure MAC Address

You can remove a sticky secure MAC address, which requires that you temporarily disable sticky address learning on the interface that has the address that you want to remove.

### Before you begin

You must have enabled port security globally.

**Procedure**

	<b>Command or Action</b>	<b>Purpose</b>
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> <pre>switch# configure terminal switch(config)#</pre>	Enters global configuration mode.
<b>Step 2</b>	Enter one of the following commands: <ul style="list-style-type: none"> <li>• <b>interface ethernet</b> <i>slot/port</i></li> <li>• <b>interface port-channel</b> <i>channel-number</i></li> </ul> <b>Example:</b> <pre>switch(config)# interface ethernet 2/1 switch(config-if)#</pre>	Enters interface configuration mode for the interface from which you want to remove a sticky secure MAC address.
<b>Step 3</b>	<b>no switchport port-security mac-address sticky</b> <b>Example:</b> <pre>switch(config-if)# no switchport port-security mac-address sticky</pre>	Disables sticky MAC address learning on the interface, which converts any sticky secure MAC addresses on the interface to dynamic secure MAC addresses.
<b>Step 4</b>	<b>clear port-security dynamic address</b> <i>address</i> <b>Example:</b> <pre>switch(config-if)# clear port-security dynamic address 0019.D2D0.02GD</pre>	Removes the dynamic secure MAC address that you specify.
<b>Step 5</b>	(Optional) <b>show port-security address interface</b> { <b>ethernet</b> <i>slot/port</i>   <b>port-channel</b> <i>channel-number</i> } <b>Example:</b> <pre>switch(config)# show port-security address interface ethernet 2/1</pre>	Displays secure MAC addresses. The address that you removed should not appear.
<b>Step 6</b>	(Optional) <b>switchport port-security mac-address sticky</b> <b>Example:</b> <pre>switch(config-if)# switchport port-security mac-address sticky</pre>	Enables sticky MAC address learning again on the interface.

## Removing a Dynamic Secure MAC Address

You can remove dynamically learned, secure MAC addresses.

### Before you begin

You must have enabled port security globally.

## Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b>  <b>Example:</b> switch# configure terminal switch(config)#	Enters global configuration mode.
<b>Step 2</b>	<b>clear port-security dynamic {interface ethernet slot/port   address address} [vlan vlan-ID]</b>  <b>Example:</b> switch(config)# clear port-security dynamic interface ethernet 2/1	Removes dynamically learned, secure MAC addresses, as specified.  If you use the <b>interface</b> keyword, you remove all dynamically learned addresses on the interface that you specify.  If you use the <b>address</b> keyword, you remove the single, dynamically learned address that you specify.  Use the <b>vlan</b> keyword if you want to further limit the command to removing an address or addresses on a particular VLAN.
<b>Step 3</b>	(Optional) <b>show port-security address</b>  <b>Example:</b> switch(config)# show port-security address	Displays secure MAC addresses.
<b>Step 4</b>	(Optional) <b>copy running-config startup-config</b>  <b>Example:</b> switch(config-if)# copy running-config startup-config	Copies the running configuration to the startup configuration.

## 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 on an interface is 1025 addresses. The system maximum number of addresses is 8192.

By default, an interface has a maximum of one secure MAC address. VLANs have no default maximum number of secure MAC addresses.



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

**Before you begin**

You must have enabled port security globally.

**Procedure**

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> <pre>switch# configure terminal switch(config)#</pre>	Enters global configuration mode.
<b>Step 2</b>	Enter one of the following commands: <ul style="list-style-type: none"> <li>• <b>interface ethernet</b> <i>slot/port</i></li> <li>• <b>interface port-channel</b> <i>channel-number</i></li> </ul> <b>Example:</b> <pre>switch(config)# interface ethernet 2/1 switch(config-if)#</pre>	Enters interface configuration mode, where <i>slot</i> is the interface that you want to configure with the maximum number of MAC addresses.
<b>Step 3</b>	<b>[no] switchport port-security maximum</b> <i>number [vlan vlan-ID]</i> <b>Example:</b> <pre>switch(config-if)# switchport port-security maximum 425</pre>	Configures the maximum number of MAC addresses that can be learned or statically configured for the current interface. The highest valid <i>number</i> is 1025. The <b>no</b> 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 <b>vlan</b> keyword.
<b>Step 4</b>	(Optional) <b>show running-config port-security</b> <b>Example:</b> <pre>switch(config-if)# show running-config port-security</pre>	Displays the port security configuration.
<b>Step 5</b>	(Optional) <b>copy running-config startup-config</b> <b>Example:</b> <pre>switch(config-if)# copy running-config startup-config</pre>	Copies the running configuration to the startup configuration.

## Configuring an Address Aging Type and Time

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

Absolute aging is the default aging type.

By default, the aging time is 0 minutes, which disables aging.



**Before you begin**

You must have enabled port security globally.

**Procedure**

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> <pre>switch# configure terminal switch(config)#</pre>	Enters global configuration mode.
<b>Step 2</b>	Enter one of the following commands: <ul style="list-style-type: none"> <li>• <b>interface ethernet</b> <i>slot/port</i></li> <li>• <b>interface port-channel</b> <i>channel-number</i></li> </ul> <b>Example:</b> <pre>switch(config)# interface ethernet 2/1 switch(config-if)#</pre>	Enters interface configuration mode for the interface that you want to configure with the MAC aging type and time.
<b>Step 3</b>	<b>[no] switchport port-security aging type</b> <b>{absolute   inactivity}</b> <b>Example:</b> <pre>switch(config-if)# switchport port-security aging type inactivity</pre>	Configures the type of aging that the device applies to dynamically learned MAC addresses. The <b>no</b> option resets the aging type to the default, which is absolute aging.
<b>Step 4</b>	<b>[no] switchport port-security aging time</b> <i>minutes</i> <b>Example:</b> <pre>switch(config-if)# switchport port-security aging time 120</pre>	Configures the number of minutes that a dynamically learned MAC address must age before the device drops the address. The maximum valid <i>minutes</i> is 1440. The <b>no</b> option resets the aging time to the default, which is 0 minutes (no aging).  <b>Note</b> For Cisco Nexus 9200 and 9300-EX Series switches, up to 2 minutes might be added to the configured aging time. For example, if you set the aging time to 10 minutes, the age out occurs between 10 and 12 minutes after traffic stops.
<b>Step 5</b>	(Optional) <b>show running-config port-security</b> <b>Example:</b> <pre>switch(config-if)# show running-config port-security</pre>	Displays the port security configuration.
<b>Step 6</b>	(Optional) <b>copy running-config startup-config</b> <b>Example:</b>	Copies the running configuration to the startup configuration.

	Command or Action	Purpose
	<code>switch(config-if)# copy running-config startup-config</code>	

## Configuring a Security Violation Action

You can configure the action that the device takes if a security violation occurs. The violation action is configurable on each interface that you enable with port security.

The default security action is to shut down the port on which the security violation occurs.

### Before you begin

You must have enabled port security globally.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> <code>switch# configure terminal</code> <code>switch(config)#</code>	Enters global configuration mode.
<b>Step 2</b>	Enter one of the following commands: <ul style="list-style-type: none"> <li>• <b>interface ethernet</b> <i>slot/port</i></li> <li>• <b>interface port-channel</b> <i>channel-number</i></li> </ul> <b>Example:</b> <code>switch(config)# interface ethernet 2/1</code> <code>switch(config-if)#</code>	Enters interface configuration mode for the interface that you want to configure with a security violation action.
<b>Step 3</b>	<b>[no] switchport port-security violation</b> <b>{protect   restrict   shutdown}</b> <b>Example:</b> <code>switch(config-if)# switchport</code> <code>port-security violation restrict</code>	Configures the security violation action for port security on the current interface. The <b>no</b> option resets the violation action to the default, which is to shut down the interface.
<b>Step 4</b>	(Optional) <b>show running-config port-security</b> <b>Example:</b> <code>switch(config-if)# show running-config</code> <code>port-security</code>	Displays the port security configuration.
<b>Step 5</b>	(Optional) <b>copy running-config startup-config</b> <b>Example:</b> <code>switch(config-if)# copy running-config</code> <code>startup-config</code>	Copies the running configuration to the startup configuration.

## Verifying the Port Security Configuration

To display the port security configuration information, perform one of the following tasks.

Command	Purpose
<code>show running-config port-security</code>	Displays the port security configuration.
<code>show port-security</code>	Displays the port security status of the device.
<code>show port-security interface</code>	Displays the port security status of a specific interface.
<code>show port-security address</code>	Displays secure MAC addresses.
<code>show vpc consistency-parameters vpc id</code>	Verifies configuration on both vPC peers.

## Displaying Secure MAC Addresses

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

## Configuration Example for Port Security

The following example shows a port security configuration for the Ethernet 2/1 interface with VLAN and interface maximums for secure addresses. In this example, the interface is a trunk port. Additionally, the violation action is set to Restrict.

```
feature port-security
interface Ethernet 2/1
  switchport
  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 restrict
```

## Configuration Examples for Port Security in a vPC Domain

The following example shows how to enable and configure port security on vPC peers in a vPC domain. The first switch is the primary vPC peer and the second switch is the secondary vPC peer. Before configuring port security on the switches, create the vPC domain and check that the vPC peer-link adjacency is established.

### Example: Configuring Port Security on an Orphan Port

```
primary_switch(config)# feature port-security
primary_switch(config-if)# int e1/1
primary_switch(config-if)# switchport port-security
primary_switch(config-if)# switchport port-security max 1025
primary_switch(config-if)# switchport port-security violation restrict
```

```

primary_switch(config-if)# switchport port-security aging time 4
primary_switch(config-if)# switchport port-security aging type absolute
primary_switch(config-if)# switchport port-security mac sticky
primary_switch(config-if)# switchport port-security mac-address 0.0.1 vlan 101
primary_switch(config-if)# switchport port-security mac-address 0.0.2 vlan 101
primary_switch(config-if)# copy running-config startup-config

secondary_switch(config)# feature port-security
secondary_switch(config)# int e3/1
secondary_switch(config-if)# switchport port-security
secondary_switch(config-if)# switchport port-security max 1025
secondary_switch(config-if)# switchport port-security violation restrict
secondary_switch(config-if)# switchport port-security aging time 4
secondary_switch(config-if)# switchport port-security aging type absolute
secondary_switch(config-if)# switchport port-security mac sticky
secondary_switch(config-if)# switchport port-security mac-address 0.0.1 vlan 101
secondary_switch(config-if)# switchport port-security mac-address 0.0.2 vlan 101
secondary_switch(config-if)# copy running-config startup-config

```

## Example: Configuring Port Security on the vPC Leg

```

primary_switch(config)# feature port-security
primary_switch(config-if)# int po10
primary_switch(config-if)# switchport port-security
primary_switch(config-if)# switchport port-security max 1025
primary_switch(config-if)# switchport port-security violation restrict
primary_switch(config-if)# switchport port-security aging time 4
primary_switch(config-if)# switchport port-security aging type absolute
primary_switch(config-if)# switchport port-security mac sticky
primary_switch(config-if)# switchport port-security mac-address 0.0.1 vlan 101
primary_switch(config-if)# switchport port-security mac-address 0.0.2 vlan 101
primary_switch(config-if)# vpc 10
primary_switch(config-if)# copy running-config startup-config

secondary_switch(config)# feature port-security
secondary_switch(config)# int po10
secondary_switch(config-if)# switchport port-security
secondary_switch(config-if)# switchport port-security max 1025
secondary_switch(config-if)# switchport port-security violation restrict
secondary_switch(config-if)# switchport port-security aging time 4
secondary_switch(config-if)# switchport port-security aging type absolute
secondary_switch(config-if)# switchport port-security mac sticky
secondary_switch(config-if)# switchport port-security mac-address 0.0.1 vlan 101
secondary_switch(config-if)# switchport port-security mac-address 0.0.2 vlan 101
secondary_switch(config-if)# vpc 10
secondary_switch(config-if)# copy running-config startup-config

```

## Additional References for Port Security

### Related Documents

Related Topic	Document Title
Layer 2 switching	<i>Cisco Nexus 9000 Series NX-OS Layer 2 Switching Configuration Guide</i>

**MIBs**

Cisco NX-OS provides read-only SNMP support for port security.

<b>MIBs</b>	<b>MIBs Link</b>
<b>CISCO-PORT-SECURITY-MIB</b>  <b>Note</b> Traps are supported for notification of secure MAC address violations.	To locate and download MIBs, go to the following URL: <a href="https://snmp.cloudapps.cisco.com/Support/SNMP/do/BrowseMIB.do?local=en&amp;step=2">https://snmp.cloudapps.cisco.com/Support/SNMP/do/BrowseMIB.do?local=en&amp;step=2</a>

