Configuring IPv6 First Hop Security

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Prerequisites for First Hop Security in IPv6

- You have configured the necessary IPv6 enabled SDM template.
- You should be familiar with the IPv6 neighbor discovery feature. For information, see the "Implementing IPv6 Addressing and Basic Connectivity" chapter of the Cisco IOS IPv6 Configuration Library on Cisco.com.

Restrictions for First Hop Security in IPv6

The following restrictions apply when applying FHS policies to EtherChannel interfaces (Port Channels):

- An FHS policy can be attached to a Layer 2 EtherChannel interface or to VLANs in an EtherChannel Group.

- An FHS policy cannot be attached to a Layer 3 EtherChannel interface.

- A physical port with an FHS policy attached cannot join an EtherChannel group.

- An FHS policy cannot be attached to an physical port when it is a member of an EtherChannel group.

Information about First Hop Security in IPv6

First Hop Security in IPv6 (FHS IPv6) is a set of IPv6 security features, the policies of which can be attached to a physical interface, an EtherChannel interface, or a VLAN. An IPv6 software policy database service stores and accesses these policies. When a policy is configured or modified, the attributes of the policy are stored or updated in the software policy database, then applied as was specified. The following IPv6 policies are currently supported:

- IPv6 Snooping Policy—IPv6 Snooping Policy acts as a container policy that enables most of the features available with FHS in IPv6.

- IPv6 Binding Table Content—A database table of IPv6 neighbors connected to the switch is created from information sources such as Neighbor Discovery (ND) protocol snooping. This database, or binding, table is used by various IPv6 guard features (such as IPv6 ND Inspection) to validate the link-layer address (LLA), the IPv4 or IPv6 address, and prefix binding of the neighbors to prevent spoofing and redirect attacks.

- IPv6 Neighbor Discovery Inspection—IPv6 ND inspection learns and secures bindings for stateless autoconfiguration addresses in L2 neighbor tables. IPv6 ND inspection analyzes neighbor discovery messages in order to build a trusted binding table database and IPv6 neighbor discovery messages that do not conform are dropped. An ND message is considered trustworthy if its IPv6-to-Media Access Control (MAC) mapping is verifiable.

- IPv6 Router Advertisement Guard—The IPv6 Router Advertisement (RA) guard feature enables the network administrator to block or reject unwanted or rogue RA guard messages that arrive at the network switch platform. RAs are used by routers to announce themselves on the link. The RA Guard feature analyzes the RAs and filters out bogus RAs sent by unauthorized routers. In host mode, all router advertisement and router redirect messages are disallowed on the port. The RA guard feature compares configuration information on the L2 device with the information found in the received RA frame. Once the L2 device has validated the content of the RA frame and router redirect frame against the configuration, it forwards the RA to its unicast or multicast destination. If the RA frame content is not validated, the RA is dropped.

- IPv6 DHCP Guard— The IPv6 DHCP Guard feature blocks reply and advertisement messages that come from unauthorized DHCPv6 servers and relay agents. IPv6 DHCP guard can prevent forged messages from being entered in the binding table and block DHCPv6 server messages when they are received on ports that are not explicitly configured as facing a DHCPv6 server or DHCP relay. To use this feature, configure a policy and attach it to an interface or a VLAN. To debug DHCP guard packets, use the **debug ipv6 snooping dhcp-guard** privileged EXEC command.

How to Configure an IPv6 Snooping Policy

Beginning in privileged EXEC mode, follow these steps to configure IPv6 Snooping Policy :

SUMMARY STEPS

1. **configure terminal**
2. **ipv6 snooping policy** *policy-name*
3. {[**default**] | [**device-role** {**node** | **switch**}] | [**limit address-count** *value*] | [**no**] | [**protocol** {**dhcp** | **ndp**}] | [**security-level** {**glean** | **guard** | **inspect**}] | [**tracking** {**disable** [**stale-lifetime** [*seconds* | **infinite**] | **enable** [**reachable-lifetime** [*seconds* | **infinite**] }] | [**trusted-port**] }
4. **end**
5. **show ipv6 snooping policy** *policy-name*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** Switch# **configure terminal**	Enters the global configuration mode.
Step 2	**ipv6 snooping policy** *policy-name* **Example:** Switch(config)# **ipv6 snooping policy example_policy**	Creates a snooping policy and enters IPv6 Snooping Policy Configuration mode.
Step 3	{[**default**]	[**device-role** {**node**	**switch**}]	[**limit address-count** *value*]	[**no**]	[**protocol** {**dhcp**	**ndp**}]	[**security-level** {**glean**	**guard**	**inspect**}]	[**tracking** {**disable** [**stale-lifetime** [*seconds*	**infinite**]	**enable** [**reachable-lifetime** [*seconds*	**infinite**] }]	[**trusted-port**] } **Example:** Switch(config-ipv6-snooping)# security-level inspect **Example:** Switch(config-ipv6-snooping)# trusted-port	Enables data address gleaning, validates messages against various criteria, specifies the security level for messages. • (Optional) **default**—Sets all to default options. • (Optional) **device-role** {**node**]	**switch**}—Specifies the role of the device attached to the port. Default is **node**. • (Optional) **limit address-count** *value*—Limits the number of addresses allowed per target. • (Optional) **no**—Negates a command or sets it to defaults. • (Optional) **protocol** {**dhcp**	**ndp**}—Specifies which protocol should be redirected to the snooping feature for analysis. The default, is **dhcp** and **ndp**. To change the default, use the **no protocol** command. • (Optional) **security-level** {**glean**|**guard**|**inspect**}—Specifies the level of security enforced by the feature. Default is **guard.** **glean**—Gleans addresses from messages and populates the binding table without any verification.

	Command or Action	Purpose
		guard—Gleans addresses and inspects messages. In addition, it rejects RA and DHCP server messages. This is the default option. **inspect**—Gleans addresses, validates messages for consistency and conformance, and enforces address ownership. • (Optional) **tracking** {**disable** | **enable**}—Overrides the default tracking behavior and specifies a tracking option. • (Optional) **trusted-port**—Sets up a trusted port. It disables the guard on applicable targets. Bindings learned through a trusted port have preference over bindings learned through any other port. A trusted port is given preference in case of a collision while making an entry in the table.
Step 4	**end** **Example:** `Switch(config-ipv6-snooping)# exit`	Exits configuration modes to Privileged EXEC mode.
Step 5	**show ipv6 snooping policy** *policy-name* **Example:** `Switch#show ipv6 snooping policy example_policy`	Displays the snooping policy configuration.

What to Do Next

Attach an IPv6 Snooping policy to interfaces or VLANs.

How to Attach an IPv6 Snooping Policy to an Interface

Beginning in privileged EXEC mode, follow these steps to attach an IPv6 Snooping policy on an interface or VLAN:

SUMMARY STEPS

1. **configure terminal**
2. **interface** Interface_type *stack/module/port*
3. **switchport**
4. **ipv6 snooping** [**attach-policy** *policy_name* [**vlan** {*vlan_id* \| **add** *vlan_ids* \| **except***vlan_ids* \| **none** \| **remove** *vlan_ids*}] \| **vlan** {*vlan_id* \| **add** *vlan_ids* \| **except***vlan_ids* \| **none** \| **remove** *vlan_ids* \| **all**}]
5. **do show running-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** Switch# **configure terminal**	Enters the global configuration mode.
Step 2	**interface** Interface_type *stack/module/port* **Example:** Switch(config)# **interface gigabitethernet 1/1/4**	Specifies an interface type and identifier; enters the interface configuration mode.
Step 3	**switchport** **Example:** Switch(config-if)# **switchport**	Enters the Switchport mode. **Note** To configure Layer 2 parameters, if the interface is in Layer 3 mode, you must enter the switchport interface configuration command without any parameters to put the interface into Layer 2 mode. This shuts down the interface and then re-enables it, which might generate messages on the device to which the interface is connected. When you put an interface that is in Layer 3 mode into Layer 2 mode, the previous configuration information related to the affected interface might be lost, and the interface is returned to its default configuration. The command prompt displays as (config-if)# in Switchport configuration mode.
Step 4	**ipv6 snooping** [**attach-policy** *policy_name* [**vlan** {*vlan_id* | **add** *vlan_ids* | **except***vlan_ids* | **none** | **remove** *vlan_ids*}] | **vlan** {*vlan_id* | **add** *vlan_ids* | **except***vlan_ids* | **none** | **remove** *vlan_ids* | **all**}] **Example:** Switch(config-if)# **ipv6 snooping** or Switch(config-if)# **ipv6 snooping attach-policy example_policy** or Switch(config-if)# **ipv6 snooping vlan 111,112** or Switch(config-if)# **ipv6 snooping attach-policy example_policy vlan 111,112**	Attaches a custom ipv6 snooping policy to the interface or the specified VLANs on the interface. To attach the default policy to the interface, use the **ipv6 snooping** command without the **attach-policy** keyword. To attach the default policy to VLANs on the interface, use the **ipv6 snooping vlan** command. The default policy is, security-level **guard**, device-role **node**, protocol **ndp** and **dhcp.**
Step 5	**do show running-config** **Example:** Switch#(config-if)# **do show running-config**	Verifies that the policy is attached to the specified interface without exiting the interface configuration mode.

How to Attach an IPv6 Snooping Policy to a Layer 2 EtherChannel Interface

Beginning in privileged EXEC mode, follow these steps to attach an IPv6 Snooping policy on an EtherChannel interface or VLAN:

SUMMARY STEPS

1. **configure terminal**
2. **interface range** *Interface_name*
3. **ipv6 snooping** [**attach-policy** *policy_name* [**vlan** {*vlan_ids* | **add** *vlan_ids* | **except** *vlan_ids* | **none** | **remove** *vlan_ids* | **all**}] | **vlan** [{*vlan_id*s | **add** *vlan_ids* | **except***vlan_ids* | **none** | **remove** *vlan_ids* | **all**}]
4. **do show running-config interface***portchannel_interface_name*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** Example: Switch# **configure terminal**	Enters the global configuration mode.
Step 2	**interface range** *Interface_name* Example: Switch(config)# **interface range Po11**	Specify the port-channel interface name assigned when the EtherChannel was created. Enters the interface range configuration mode. **Tip** Enter the **do show interfaces summary** command for quick reference to interface names and types.
Step 3	**ipv6 snooping** [**attach-policy** *policy_name* [**vlan** {*vlan_ids*	**add** *vlan_ids*	**except** *vlan_ids*	**none**	**remove** *vlan_ids*	**all**}]	**vlan** [{*vlan_id*s	**add** *vlan_ids*	**except***vlan_ids*	**none**	**remove** *vlan_ids*	**all**}] Example: Switch(config-if-range)# **ipv6 snooping attach-policy example_policy** or Switch(config-if-range)# **ipv6 snooping attach-policy example_policy vlan 222,223,224** **or** Switch(config-if-range)#**ipv6 snooping vlan 222, 223,224**	Attaches the IPv6 Snooping policy to the interface or the specified VLANs on that interface. The default policy is attached if the **attach-policy** option is not used.

	Command or Action	Purpose

Step 4	**do show running-config interface***portchannel_interface_name*
	
	Example:
	`Switch#(config-if-range)#  do show running-config`
	`int po11`
		Confirms that the policy is attached to the specified interface without exiting the configuration mode.

How to Attach an IPv6 Snooping Policy to VLANs Globally

Beginning in privileged EXEC mode, follow these steps to attach an IPv6 Snooping Policy to VLANs across multiple interfaces:

SUMMARY STEPS

1. **configure terminal**
2. **vlan configuration** *vlan_list*
3. **ipv6 snooping** [**attach-policy** *policy_name*]
4. **do show running-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Switch# configure terminal`	Enters the global configuration mode.
Step 2	**vlan configuration** *vlan_list* **Example:** `Switch(config)#  vlan configuration 333`	Specifies the VLANs to which the IPv6 Snooping policy will be attached ; enters the VLAN interface configuration mode.

Step 3	**ipv6 snooping** [**attach-policy** *policy_name*]
	
	Example:
	`Switch(config-vlan-config)#ipv6 snooping`
	`attach-policy example_policy`
		Attaches the IPv6 Snooping policy to the specified VLANs across all switch and stack interfaces. The default policy is attached if the **attach-policy** option is not used. The default policy is, security-level **guard**, device-role **node**, protocol **ndp** and **dhcp.**

Step 4	**do show running-config** **Example:** `Switch#(config-if)#  do show running-config`	Verifies that the policy is attached to the specified VLANs without exiting the interface configuration mode.

How to Configure the IPv6 Binding Table Content

Beginning in privileged EXEC mode, follow these steps to configure IPv6 Binding Table Content :

SUMMARY STEPS

1. **configure terminal**

2. [**no**] **ipv6 neighbor binding** [**vlan** *vlan-id* {*ipv6-address* **interface** interface_type *stack/module/port hw_address* [**reachable-lifetimevalue** [*seconds* | **default** | **infinite**] | [**tracking**{ [**default** | **disable**] [**reachable-lifetimevalue** [*seconds* | **default** | **infinite**] | [**enable** [**reachable-lifetimevalue** [*seconds* | **default** | **infinite**] | [**retry-interval** {*seconds*| **default** [**reachable-lifetimevalue** [*seconds* | **default** | **infinite**] }]

3. [**no**] **ipv6 neighbor binding max-entries** *number* [**mac-limit** *number* | **port-limit** *number* [**mac-limit** *number*] | **vlan-limit** *number* [[**mac-limit** *number*] | [**port-limit** *number* [**mac-limit***number*]]]]

4. **ipv6 neighbor binding logging**

5. **exit**

6. **show ipv6 neighbor binding**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Switch# configure terminal`	Enters the global configuration mode.
Step 2	[**no**] **ipv6 neighbor binding** [**vlan** *vlan-id* {*ipv6-address* **interface** interface_type *stack/module/port hw_address* [**reachable-lifetimevalue** [*seconds*	**default**	**infinite**]	[**tracking**{ [**default**	**disable**] [**reachable-lifetimevalue** [*seconds*	**default**	**infinite**]	[**enable** [**reachable-lifetimevalue** [*seconds*	**default**	**infinite**]	[**retry-interval** {*seconds*| **default** [**reachable-lifetimevalue** [*seconds*	**default**	**infinite**] }] **Example:** `Switch(config)#  ipv6 neighbor binding`	
Step 3	[**no**] **ipv6 neighbor binding max-entries** *number* [**mac-limit** *number*	**port-limit** *number* [**mac-limit** *number*]	**vlan-limit** *number* [[**mac-limit** *number*]	[**port-limit** *number* [**mac-limit***number*]]]] **Example:** `Switch(config)#  ipv6 neighbor binding max-entries 30000`	Specifies the maximum number of entries that are allowed to be inserted in the binding table cache.

	Command or Action	**Purpose**
Step 4	**ipv6 neighbor binding logging** **Example:** Switch(config)# **ipv6 neighbor binding logging**	Enables the logging of binding table main events.
Step 5	**exit** **Example:** Switch(config)# **exit**	Exits global configuration mode, and places the router in privileged EXEC mode.
Step 6	**show ipv6 neighbor binding** **Example:** Switch# **show ipv6 neighbor binding**	Displays contents of a binding table.

How to Configure an IPv6 Neighbor Discovery Inspection Policy

Beginning in privileged EXEC mode, follow these steps to configure an IPv6 ND Inspection Policy:

SUMMARY STEPS

1. **configure terminal**
2. **[no]ipv6 nd inspection policy** *policy-name*
3. **device-role** {**host** | **monitor** | **router** | **switch**}
4. **drop-unsecure**
5. **limit address-count** *value*
6. **sec-level minimum** *value*
7. **tracking** {**enable** [**reachable-lifetime** {*value* | **infinite**}] | **disable** [**stale-lifetime** {*value* | **infinite**}]}
8. **trusted-port**
9. **validate source-mac**
10. **no** {**device-role** | **drop-unsecure** | **limit address-count** | **sec-level minimum** | **tracking** | **trusted-port** | **validate source-mac**}
11. **default** {**device-role** | **drop-unsecure** | **limit address-count** | **sec-level minimum** | **tracking** | **trusted-port** | **validate source-mac**}
12. **do show ipv6 nd inspection policy** *policy_name*

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**configure terminal** **Example:** Switch# **configure terminal**	Enters the global configuration mode.
Step 2	**[no]ipv6 nd inspection policy** *policy-name* **Example:** Switch(config)# **ipv6 nd inspection policy example_policy**	Specifies the ND inspection policy name and enters ND Inspection Policy configuration mode.
Step 3	**device-role** {**host** | **monitor** | **router** | **switch**} **Example:** Switch(config-nd-inspection)# **device-role switch**	Specifies the role of the device attached to the port. The default is **host**.
Step 4	**drop-unsecure** **Example:** Switch(config-nd-inspection)# **drop-unsecure**	Drops messages with no or invalid options or an invalid signature.
Step 5	**limit address-count** *value* **Example:** Switch(config-nd-inspection)# **limit address-count 1000**	Enter 1−10,000.
Step 6	**sec-level minimum** *value* **Example:** Switch(config-nd-inspection)# **limit address-count 1000**	Specifies the minimum security level parameter value when Cryptographically Generated Address (CGA) options are used.
Step 7	**tracking** {**enable** [**reachable-lifetime** {*value* | **infinite**}] | **disable** [**stale-lifetime** {*value* | **infinite**}]} **Example:** Switch(config-nd-inspection)# **tracking disable stale-lifetime infinite**	Overrides the default tracking policy on a port.
Step 8	**trusted-port** **Example:** Switch(config-nd-inspection)# **trusted-port**	Configures a port to become a trusted port.
Step 9	**validate source-mac** **Example:** Switch(config-nd-inspection)# **validate source-mac**	
Step 10	**no** {**device-role** | **drop-unsecure** | **limit address-count** | **sec-level minimum** | **tracking** | **trusted-port** | **validate source-mac**} **Example:** Switch(config-nd-inspection)# **no validate source-mac**	Remove the current configuration of a parameter with the **no** form of the command.

	Command or Action	Purpose
Step 11	**default** {**device-role** | **drop-unsecure** | **limit address-count** | **sec-level minimum** | **tracking** | **trusted-port** | **validate source-mac**} **Example:** `Switch(config-nd-inspection)# default limit address-count`	Restores configuration to the default values.
Step 12	**do show ipv6 nd inspection policy** *policy_name* **Example:** `Switch(config-nd-inspection)# do show ipv6 nd inspection policy example_policy`	Verifies the ND Inspection Configuration without exiting ND inspection configuration mode.

How to Attach an IPv6 Neighbor Discovery Inspection Policy to an Interface

Beginning in privileged EXEC mode, follow these steps to attach an IPv6 ND Inspection policy to an interface or VLANs on an interface :

SUMMARY STEPS

1. **configure terminal**
2. **interface** Interface_type *stack/module/port*
3. **ipv6 nd inspection** [**attach-policy** *policy_name* [**vlan** {*vlan_ids* \| **add** *vlan_ids* \| **except** *vlan_ids* \| **none** \| **remove** *vlan_ids* \| **all**}] \| **vlan** [{*vlan_id*s \| **add** *vlan_ids* \| **except***vlan_ids* \| **none** \| **remove** *vlan_ids* \| **all**}]
4. **do show running-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Switch# configure terminal`	Enters the global configuration mode.
Step 2	**interface** Interface_type *stack/module/port* **Example:** `Switch(config)#  interface gigabitethernet 1/1/4`	Specifies an interface type and identifier; enters the interface configuration mode.
Step 3	**ipv6 nd inspection** [**attach-policy** *policy_name* [**vlan** {*vlan_ids* | **add** *vlan_ids* | **except** *vlan_ids* | **none** | **remove** *vlan_ids* | **all**}	Attaches the Neighbor Discovery Inspection policy to the interface or the specified VLANs on that interface. The default policy is attached if the **attach-policy** option is not used.

Command or Action	Purpose
]	**vlan** [{*vlan_id*s	**add** *vlan_ids*	**except***vlan_ids*	**none**	**remove** *vlan_ids*	**all**}] **Example:** Switch(config-if)# **ipv6 nd inspection attach-policy example_policy** or Switch(config-if)# **ipv6 nd inspection attach-policy example_policy vlan 222,223,224** **or** Switch(config-if)# **ipv6 nd inspection vlan 222, 223,224**	
Step 4	**do show running-config** **Example:** Switch#(config-if)# **do show running-config**	Verifies that the policy is attached to the specified interface without exiting the interface configuration mode.

How to Attach an IPv6 Neighbor Discovery Inspection Policy to a Layer 2 EtherChannel Interface

Beginning in privileged EXEC mode, follow these steps to attach an IPv6 Neighbor Discovery Inspection policy on an EtherChannel interface or VLAN:

SUMMARY STEPS

1. **configure terminal**
2. **interface range** *Interface_name*
3. **ipv6 nd inspection** [**attach-policy** *policy_name* [**vlan** {*vlan_ids* | **add** *vlan_ids* | **except** *vlan_ids* | **none** | **remove** *vlan_ids* | **all**}] | **vlan** [{*vlan_id*s | **add** *vlan_ids* | **except***vlan_ids* | **none** | **remove** *vlan_ids* | **all**}]
4. **do show running-config interface***portchannel_interface_name*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** Switch# **configure terminal**	Enters the global configuration mode.

	Command or Action	**Purpose**
Step 2	**interface range** *Interface_name* **Example:** `Switch(config)#  interface range Po11`	Specify the port-channel interface name assigned when the EtherChannel was created. Enters the interface range configuration mode. **Tip** Enter the **do show interfaces summary** command for quick reference to interface names and types.

Step 3	**ipv6 nd inspection** [**attach-policy** *policy_name* [**vlan** {*vlan_ids* | **add** *vlan_ids* | **except** *vlan_ids* | **none** | **remove** *vlan_ids* | **all**}] | **vlan** [{*vlan_ids* | **add** *vlan_ids* | **except***vlan_ids* | **none** | **remove** *vlan_ids* | **all**}]
	
	Example:
	`Switch(config-if-range)# ipv6 nd inspection attach-policy example_policy`
	
	`or`
	
	`Switch(config-if-range)# ipv6 nd inspection attach-policy example_policy vlan 222,223,224`
	
	or
	
	`Switch(config-if-range)#ipv6 nd inspection vlan 222, 223,224`
		Attaches the ND Inspection policy to the interface or the specified VLANs on that interface. The default policy is attached if the **attach-policy** option is not used.

Step 4	**do show running-config interface***portchannel_interface_name* **Example:** `Switch#(config-if-range)#  do show running-config int po11`	Confirms that the policy is attached to the specified interface without exiting the configuration mode.

How to Attach an IPv6 Neighbor Discovery Inspection Policy to VLANs Globally

Beginning in privileged EXEC mode, follow these steps to attach an IPv6 ND Inspection policy to VLANs across multiple interfaces:

SUMMARY STEPS

1. **configure terminal**
2. **vlan configuration** *vlan_list*
3. **ipv6 nd inspection** [**attach-policy** *policy_name*]
4. **do show running-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** Switch# **configure terminal**	Enters the global configuration mode.
Step 2	**vlan configuration** *vlan_list* **Example:** Switch(config)# **vlan configuration 334**	Specifies the VLANs to which the IPv6 Snooping policy will be attached ; enters the VLAN interface configuration mode.
Step 3	**ipv6 nd inspection** [**attach-policy** *policy_name*] **Example:** Switch(config-vlan-config)#**ipv6 nd inspection attach-policy example_policy**	Attaches the IPv6 Neighbor Discovery policy to the specified VLANs across all switch and stack interfaces. The default policy is attached if the **attach-policy** option is not used. The default policy is, device-role **host**, no drop-unsecure, limit address-count disabled, sec-level minimum is disabled, tracking is disabled, no trusted-port, no validate source-mac.
Step 4	**do show running-config** **Example:** Switch#(config-if)# **do show running-config**	Confirms that the policy is attached to the specified VLANs without exiting the configuration mode.

How to Configure an IPv6 Router Advertisement Guard Policy

Beginning in privileged EXEC mode, follow these steps to configure an IPv6 Router Advertisement policy :

SUMMARY STEPS

1. **configure terminal**
2. [**no**]**ipv6 nd raguard policy** *policy-name*
3. [**no**]**device-role** {**host** | **monitor** | **router** | **switch**}
4. [**no**]**hop-limit** {**maximum** | **minimum**} *value*
5. [**no**]**managed-config-flag** {**off** | **on**}
6. [**no**]**match** {**ipv6 access-list** *list* | **ra prefix-list** *list*}
7. [**no**]**other-config-flag** {**on** | **off**}
8. [**no**]**router-preference maximum** {**high** | **medium** | **low**}
9. [**no**]**trusted-port**
10. **default** {**device-role** | **hop-limit** {**maximum** | **minimum**} | **managed-config-flag** | **match** {**ipv6 access-list** | **ra prefix-list** } | **other-config-flag** | **router-preference maximum** | **trusted-port**}
11. **do show ipv6 nd raguard policy** *policy_name*

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**configure terminal** **Example:** Switch# **configure terminal**	Enters the global configuration mode.
Step 2	[**no**]**ipv6 nd raguard policy** *policy-name* **Example:** Switch(config)# **ipv6 nd raguard policy example_policy**	Specifies the RA Guard policy name and enters RA Guard Policy configuration mode.
Step 3	[**no**]**device-role** {**host** | **monitor** | **router** | **switch**} **Example:** Switch(config-nd-raguard)# **device-role switch**	Specifies the role of the device attached to the port. The default is **host**.
Step 4	[**no**]**hop-limit** {**maximum** | **minimum**} *value* **Example:** Switch(config-nd-raguard)# **hop-limit maximum 33**	(1–255) Range for Maximum and Minimum Hop Limit values. Enables filtering of Router Advertisement messages by the Hop Limit value. A rogue RA message may have a low Hop Limit value (equivalent to the IPv4 Time to Live) that when accepted by the host, prevents the host from generating traffic to destinations beyond the rogue RA message generator. An RA message with an unspecified Hop Limit value is blocked. If not configured, this filter is disabled. Configure **minimum** to block RA messages with Hop Limit values lower than the value you specify. Configure **maximum** to block RA messages with Hop Limit values greater than the value you specify.
Step 5	[**no**]**managed-config-flag** {**off** | **on**} **Example:** Switch(config-nd-raguard)# **managed-config-flag on**	Enables filtering of Router Advertisement messages by the Managed Address Configuration, or "M" flag field. A rouge RA message with an M field of 1 can cause a host to use a rogue DHCPv6 server. If not configured, this filter is disabled. **On**—Accepts and forwards RA messages with an M value of 1, blocks those with 0. **Off**—Accepts and forwards RA messages with an M value of 0, blocks those with 1.
Step 6	[**no**]**match** {**ipv6 access-list** *list* | **ra prefix-list** *list*} **Example:** Switch(config-nd-raguard)# **match ipv6 access-list example_list**	Matches a specified prefix list or access list.

	Command or Action	Purpose
Step 7	[no]other-config-flag {on | off} **Example:** Switch(config-nd-raguard)# **other-config-flag on**	Enables filtering of Router Advertisement messages by the Other Configuration, or "O" flag field. A rouge RA message with an O field of 1 can cause a host to use a rogue DHCPv6 server. If not configured, this filter is disabled. **On**—Accepts and forwards RA messages with an O value of 1, blocks those with 0. **Off**—Accepts and forwards RA messages with an O value of 0, blocks those with 1.
Step 8	[no]router-preference maximum {high | medium | low} **Example:** Switch(config-nd-raguard)# **router-preference maximum high**	Enables filtering of Router Advertisement messages by the Router Preference flag. If not configured, this filter is disabled. • **high**—Accepts RA messages with the Router Preference set to high, medium, or low. • **medium**—Blocks RA messages with the Router Preference set to high. • **low**—Blocks RA messages with the Router Preference set to medium and high.
Step 9	[no]trusted-port **Example:** Switch(config-nd-raguard)# **trusted-port**	When configured as a trusted port, all attached devices are trusted, and no further message verification is performed.
Step 10	default {device-role | hop-limit {maximum | minimum} | managed-config-flag | match {ipv6 access-list | ra prefix-list } | other-config-flag | router-preference maximum| trusted-port} **Example:** Switch(config-nd-raguard)# **default hop-limit**	Restores a command to its default value.
Step 11	do show ipv6 nd raguard policy *policy_name* **Example:** Switch(config-nd-raguard)# **do show ipv6 nd raguard policy example_policy**	(Optional)—Displays the ND Guard Policy configuration without exiting the RA Guard policy configuration mode.

How to Attach an IPv6 Router Advertisement Guard Policy to an Interface

Beginning in privileged EXEC mode, follow these steps to attach an IPv6 Router Advertisement policy to an interface or to VLANs on the interface :

SUMMARY STEPS

1. **configure terminal**
2. **interface** Interface_type *stack/module/port*
3. **ipv6 nd raguard** [**attach-policy** *policy_name* [**vlan** {*vlan_ids* | **add** *vlan_ids* | **except** *vlan_ids* | **none** | **remove** *vlan_ids* | **all**}] | **vlan** [{*vlan_id*s | **add** *vlan_ids* | **except***vlan_ids* | **none** | **remove** *vlan_ids* | **all**}]
4. **do show running-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** Switch# `configure terminal`	Enters the global configuration mode.
Step 2	**interface** Interface_type *stack/module/port* **Example:** Switch(config)# `interface gigabitethernet 1/1/4`	Specifies an interface type and identifier; enters the interface configuration mode.
Step 3	**ipv6 nd raguard** [**attach-policy** *policy_name* [**vlan** {*vlan_ids*	**add** *vlan_ids*	**except** *vlan_ids*	**none**	**remove** *vlan_ids*	**all**}]	**vlan** [{*vlan_id*s	**add** *vlan_ids*	**except***vlan_ids*	**none**	**remove** *vlan_ids*	**all**}] **Example:** Switch(config-if)# `ipv6 nd raguard attach-policy example_policy` or Switch(config-if)# `ipv6 nd raguard attach-policy example_policy vlan 222,223,224` **or** Switch(config-if)# `ipv6 nd raguard vlan 222, 223,224`	Attaches the Neighbor Discovery Inspection policy to the interface or the specified VLANs on that interface. The default policy is attached if the **attach-policy** option is not used.
Step 4	**do show running-config** **Example:** Switch#(config-if)# `do show running-config`	Confirms that the policy is attached to the specified interface without exiting the configuration mode.

How to Attach an IPv6 Router Advertisement Guard Policy to a Layer 2 EtherChannel Interface

Beginning in privileged EXEC mode, follow these steps to attach an IPv6 Router Advertisement Guard Policy on an EtherChannel interface or VLAN:

SUMMARY STEPS

1. **configure terminal**
2. **interface range** *Interface_name*
3. **ipv6 nd raguard** [**attach-policy** *policy_name* [**vlan** {*vlan_ids* | **add** *vlan_ids* | **except** *vlan_ids* | **none** | **remove** *vlan_ids* | **all**}] | **vlan** [{*vlan_id*s | **add** *vlan_ids* | **except***vlan_ids* | **none** | **remove** *vlan_ids* | **all**}]
4. **do show running-config interface***portchannel_interface_name*

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**configure terminal** **Example:** `Switch# configure terminal`	Enters the global configuration mode.
Step 2	**interface range** *Interface_name* **Example:** `Switch(config)#  interface range Po11`	Specify the port-channel interface name assigned when the EtherChannel was created. Enters the interface range configuration mode. **Tip** Enter the **do show interfaces summary** command for quick reference to interface names and types.

Step 3	**ipv6 nd raguard** [**attach-policy** *policy_name* [**vlan** {*vlan_ids* | **add** *vlan_ids* | **except** *vlan_ids* | **none** | **remove** *vlan_ids* | **all**}] | **vlan** [{*vlan_id*s | **add** *vlan_ids* | **except***vlan_ids* | **none** | **remove** *vlan_ids* | **all**}]
	
	Example:
	`Switch(config-if-range)# ipv6 nd raguard attach-policy example_policy`
	
	`or`
	
	`Switch(config-if-range)# ipv6 nd raguard attach-policy example_policy vlan 222,223,224`
	
	or
	
	`Switch(config-if-range)#ipv6 nd raguard vlan 222, 223,224`
		Attaches the RA Guard policy to the interface or the specified VLANs on that interface. The default policy is attached if the **attach-policy** option is not used.

	Command or Action	Purpose
Step 4	**do show running-config interface***portchannel_interface_name* **Example:** `Switch#(config-if-range)# do show running-config int po11`	Confirms that the policy is attached to the specified interface without exiting the configuration mode.

How to Attach an IPv6 Router Advertisement Guard Policy to VLANs Globally

Beginning in privileged EXEC mode, follow these steps to attach an IPv6 Router Advertisement policy to VLANs regardless of interface:

SUMMARY STEPS

1. **configure terminal**
2. **vlan configuration** *vlan_list*
3. **ipv6 dhcp guard** [**attach-policy** *policy_name*]
4. **do show running-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Switch# configure terminal`	Enters global configuration mode.
Step 2	**vlan configuration** *vlan_list* **Example:** `Switch(config)# vlan configuration 335`	Specifies the VLANs to which the IPv6 RA Guard policy will be attached ; enters the VLAN interface configuration mode.
Step 3	**ipv6 dhcp guard** [**attach-policy** *policy_name*] **Example:** `Switch(config-vlan-config)#ipv6 nd raguard attach-policy example_policy`	Attaches the IPv6 RA Guard policy to the specified VLANs across all switch and stack interfaces. The default policy is attached if the **attach-policy** option is not used.
Step 4	**do show running-config** **Example:** `Switch#(config-if)# do show running-config`	Confirms that the policy is attached to the specified VLANs without exiting the configuration mode.

How to Configure an IPv6 DHCP Guard Policy

Beginning in privileged EXEC mode, follow these steps to configure an IPv6 DHCP (DHCPv6) Guard policy:

SUMMARY STEPS

1. **configure terminal**
2. **[no]ipv6 dhcp guard policy** *policy-name*
3. **[no]device-role** {**client** | **server**}
4. **[no] match server access-list** *ipv6-access-list-name*
5. **[no] match reply prefix-list** *ipv6-prefix-list-name*
6. **[no]preference**{ **max** *limit* | **min** *limit* }
7. **[no] trusted-port**
8. **default** {**device-role** | **trusted-port**}
9. **do show ipv6 dhcp guard policy** *policy_name*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** Switch# **configure terminal**	Enters the global configuration mode.
Step 2	**[no]ipv6 dhcp guard policy** *policy-name* **Example:** Switch(config)# **ipv6 dhcp guard policy example_policy**	Specifies the DHCPv6 Guard policy name and enters DHCPv6 Guard Policy configuration mode.
Step 3	**[no]device-role** {**client**	**server**} **Example:** Switch(config-dhcp-guard)# **device-role server**	(Optional) Filters out DHCPv6 replies and DHCPv6 advertisements on the port that are not from a device of the specified role. Default is **client**. • **client**—Default value, specifies that the attached device is a client. Server messages are dropped on this port. • **server**—Specifies that the attached device is a DHCPv6 server. Server messages are allowed on this port.
Step 4	**[no] match server access-list** *ipv6-access-list-name* **Example:** ;;Assume a preconfigured IPv6 Access List as follows: Switch(config)# **ipv6 access-list my_acls** Switch(config-ipv6-acl)# **permit host FE80::A8BB:CCFF:FE01:F700 any**	(Optional). Enables verification that the advertised DHCPv6 server or relay address is from an authorized server access list (The destination address in the access list is 'any'). If not configured, this check will be bypassed. An empty access list is treated as a permit all.

	Command or Action	Purpose
	`;;configure DCHPv6 Guard to match approved access list.` `Switch(config-dhcp-guard)# ` **`match server access-list my_acls`**	

Step 5	[**no**] **match reply prefix-list** *ipv6-prefix-list-name*
	
	Example:
	
	`;;Assume a preconfigured IPv6 prefix list as follows:`
	`Switch(config)# ` **`ipv6 prefix-list my_prefix permit 2001:0DB8::/64 le 128`**
	
	`;; Configure DCHPv6 Guard to match prefix`
	`Switch(config-dhcp-guard)# ` **`match reply prefix-list my_prefix`**
		(Optional) Enables verification of the advertised prefixes in DHCPv6 reply messages from the configured authorized prefix list. If not configured, this check will be bypassed. An empty prefix list is treated as a permit.

Step 6	[**no**]**preference**{ **max** *limit* | **min** *limit* } **Example:** `Switch(config-dhcp-guard)# ` **`preference max 250`** `Switch(config-dhcp-guard)#`**`preference min 150`**	Configure **max** and **min** when **device-role** is **server**to filter DCHPv6 server advertisements by the server preference value. The defaults permit all advertisements. **max** *limit*—(0 to 255) (Optional) Enables verification that the advertised preference (in preference option) is less than the specified limit. Default is 255. If not specified, this check will be bypassed. **min** *limit*—(0 to 255) (Optional) Enables verification that the advertised preference (in preference option) is greater than the specified limit. Default is 0. If not specified, this check will be bypassed.
Step 7	[**no**] **trusted-port** **Example:** `Switch(config-dhcp-guard)# ` **`trusted-port`**	(Optional) **trusted-port**—Sets the port to a trusted mode. No further policing takes place on the port. **Note** If you configure a trusted port then the device-role option is not available.
Step 8	**default** {**device-role** | **trusted-port**} **Example:** `Switch(config-dhcp-guard)# ` **`default device-role`**	(Optional) **default**—Sets a command to its defaults.
Step 9	**do show ipv6 dhcp guard policy** *policy_name* **Example:** `Switch(config-dhcp-guard)# ` **`do show ipv6 dhcp guard policy example_policy`**	(Optional) Displays the configuration of the IPv6 DHCP guard policy without leaving the configuration submode. Omitting the *policy_name* variable displays all DHCPv6 policies.

Example of DHCPv6 Guard Configuration

```
enable
configure terminal
ipv6 access-list acl1
 permit host FE80::A8BB:CCFF:FE01:F700 any
ipv6 prefix-list abc permit 2001:0DB8::/64 le 128
```

```
ipv6 dhcp guard policy pol1
 device-role server
 match server access-list acl1
 match reply prefix-list abc
 preference min 0
 preference max 255
 trusted-port
interface GigabitEthernet 0/2/0
 switchport
 ipv6 dhcp guard attach-policy pol1 vlan add 1
 vlan 1
  ipv6 dhcp guard attach-policy pol1
show ipv6 dhcp guard policy pol1
```

How to Attach an IPv6 DHCP Guard Policy to an Interface or a VLAN on an Interface

Beginning in privileged EXEC mode, follow these steps to configure IPv6 Binding Table Content :

SUMMARY STEPS

1. **configure terminal**
2. **interface** Interface_type *stack/module/port*
3. **ipv6 dhcp guard** [**attach-policy** *policy_name* [**vlan** {*vlan_ids* | **add** *vlan_ids* | **except** *vlan_ids* | **none** | **remove** *vlan_ids* | **all**}] | **vlan** [{*vlan_id*s | **add** *vlan_ids* | **except***vlan_ids* | **none** | **remove** *vlan_ids* | **all**}]
4. **do show running-config interface** Interface_type *stack/module/port*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** Switch# **configure terminal**	Enters the global configuration mode.
Step 2	**interface** Interface_type *stack/module/port* **Example:** Switch(config)# **interface gigabitethernet 1/1/4**	Specifies an interface type and identifier; enters the interface configuration mode.
Step 3	**ipv6 dhcp guard** [**attach-policy** *policy_name* [**vlan** {*vlan_ids*	**add** *vlan_ids*	**except** *vlan_ids*	**none**	**remove** *vlan_ids*	**all**}]	**vlan** [{*vlan_id*s	**add** *vlan_ids*	**except***vlan_ids*	**none**	**remove** *vlan_ids*	**all**}] **Example:** Switch(config-if)# **ipv6 dhcp guard attach-policy example_policy** or Switch(config-if)# **ipv6 dhcp guard attach-policy example_policy vlan 222,223,224**	Attaches the DHCP Guard policy to the interface or the specified VLANs on that interface. The default policy is attached if the **attach-policy** option is not used.

	Command or Action	Purpose
	or Switch(config-if)# `ipv6 dhcp guard vlan 222, 223,224`	
Step 4	**do show running-config interface** Interface_type *stack/module/port* **Example:** Switch#(config-if)# `do show running-config gig 1/1/4`	Confirms that the policy is attached to the specified interface without exiting the configuration mode.

How to Attach an IPv6 DHCP Guard Policy to a Layer 2 EtherChannel Interface

Beginning in privileged EXEC mode, follow these steps to attach an IPv6 DHCP Guard policy on an EtherChannel interface or VLAN:

SUMMARY STEPS

1. **configure terminal**
2. **interface range** *Interface_name*
3. **ipv6 dhcp guard** [**attach-policy** *policy_name* [**vlan** {*vlan_ids* | **add** *vlan_ids* | **except** *vlan_ids* | **none** | **remove** *vlan_ids* | **all**}] | **vlan** [{*vlan_id*s | **add** *vlan_ids* | **except***vlan_ids* | **none** | **remove** *vlan_ids* | **all**}]
4. **do show running-config interface***portchannel_interface_name*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** Switch# `configure terminal`	Enters the global configuration mode.
Step 2	**interface range** *Interface_name* **Example:** Switch(config)# `interface range Po11`	Specify the port-channel interface name assigned when the EtherChannel was created. Enters the interface range configuration mode. **Tip** Enter the **do show interfaces summary** command for quick reference to interface names and types.
Step 3	**ipv6 dhcp guard** [**attach-policy** *policy_name* [**vlan** {*vlan_ids* | **add** *vlan_ids* | **except** *vlan_ids* | **none** | **remove** *vlan_ids* | **all**}] | **vlan** [{*vlan_id*s | **add** *vlan_ids* | **except***vlan_ids* | **none** | **remove** *vlan_ids* | **all**}]	Attaches the DHCP Guard policy to the interface or the specified VLANs on that interface. The default policy is attached if the **attach-policy** option is not used.

	Command or Action	Purpose
	Example: Switch(config-if-range)# **ipv6 dhcp guard attach-policy example_policy** or Switch(config-if-range)# **ipv6 dhcp guard attach-policy example_policy vlan 222,223,224** **or** Switch(config-if-range)#**ipv6 dhcp guard vlan 222, 223,224**	
Step 4	**do show running-config interface**_portchannel_interface_name_ **Example:** Switch#(config-if-range)# **do show running-config int po11**	Confirms that the policy is attached to the specified interface without exiting the configuration mode.

How to Attach an IPv6 DHCP Guard Policy to VLANs Globally

Beginning in privileged EXEC mode, follow these steps to attach an IPv6 DHCP Guard policy to VLANs across multiple interfaces:

SUMMARY STEPS

1. **configure terminal**
2. **vlan configuration** _vlan_list_
3. **ipv6 dhcp guard** [**attach-policy** _policy_name_]
4. **do show running-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** Switch# **configure terminal**	Enters the global configuration mode.
Step 2	**vlan configuration** _vlan_list_ **Example:** Switch(config)# **vlan configuration 334**	Specifies the VLANs to which the IPv6 Snooping policy will be attached ; enters the VLAN interface configuration mode.

	Command or Action	Purpose
Step 3	**ipv6 dhcp guard** [**attach-policy** *policy_name*] **Example:** `Switch(config-vlan-config)#ipv6 dhcp guard attach-policy example_policy`	Attaches the IPv6 Neighbor Discovery policy to the specified VLANs across all switch and stack interfaces. The default policy is attached if the **attach-policy** option is not used. The default policy is, device-role **client**, **no** trusted-port.
Step 4	**do show running-config** **Example:** `Switch#(config-if)#  do show running-config`	Confirms that the policy is attached to the specified VLANs without exiting the configuration mode.

Additional References

Related Documents

Related Topic	Document Title
IPv6 network management and security topics	IPv6 Configuration Library, Cisco IOS XE Release 3SE (Catalyst 3850 Switches) http://www.cisco.com/en/US/docs/ios-xml/ios/ipv6/config_library/xe-3se/3850/ipv6-xe-3se-3850-library.html
IPv6 Command Reference	IPv6 Command Reference, Cisco IOS XE Release 3SE (Catalyst 3850 Switches) http://www.cisco.com/en/US/docs/ios-xml/ios/ipv6/command/ipv6-xe-3se-3850-cr-book.html

Error Message Decoder

Description	Link
To help you research and resolve system error messages in this release, use the Error Message Decoder tool.	https://www.cisco.com/cgi-bin/Support/Errordecoder/index.cgi

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/support