



IPv6 First-Hop Security Configuration Guide, Cisco IOS Release 15M&T

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CONTENTS

CHAPTER 1

IPv6 RA Guard 1

Finding Feature Information 1

Restrictions for IPv6 RA Guard 1

Information About IPv6 RA Guard 2

 IPv6 Global Policies 2

 IPv6 RA Guard 2

How to Configure IPv6 RA Guard 3

 Configuring the IPv6 RA Guard Policy on the Device 3

 Configuring IPv6 RA Guard on an Interface 5

Configuration Examples for IPv6 RA Guard 6

 Example: IPv6 RA Guard Configuration 6

 Example: Configuring IPv6 ND Inspection and RA Guard 6

Additional References 7

Feature Information for IPv6 RA Guard 8

CHAPTER 2

IPv6 RFCs 9



CHAPTER

1

IPv6 RA Guard

The IPv6 RA Guard feature provides support for allowing the network administrator to block or reject unwanted or rogue router advertisement (RA) guard messages that arrive at the network device platform.

- [Finding Feature Information, page 1](#)
- [Restrictions for IPv6 RA Guard, page 1](#)
- [Information About IPv6 RA Guard, page 2](#)
- [How to Configure IPv6 RA Guard, page 3](#)
- [Configuration Examples for IPv6 RA Guard, page 6](#)
- [Additional References, page 7](#)
- [Feature Information for IPv6 RA Guard, page 8](#)

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see [Bug Search Tool](#) and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

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

Restrictions for IPv6 RA Guard

- The IPv6 RA Guard feature does not offer protection in environments where IPv6 traffic is tunneled.
- This feature is supported only in hardware when the ternary content addressable memory (TCAM) is programmed.
- This feature can be configured on a switch port interface in the ingress direction.
- This feature supports host mode and router mode.

- This feature is supported only in the ingress direction; it is not supported in the egress direction.
- This feature is not supported on EtherChannel and EtherChannel port members.
- This feature is not supported on trunk ports with merge mode.
- This feature is supported on auxiliary VLANs and private VLANs (PVLANS). In the case of PVLANS, primary VLAN features are inherited and merged with port features.
- Packets dropped by the IPv6 RA Guard feature can be spanned.
- If the **platform ipv6 acl icmp optimize neighbor-discovery command** is configured, the IPv6 RA Guard feature cannot be configured and an error message will be displayed. This command adds default global Internet Control Message Protocol (ICMP) entries that will override the RA guard ICMP entries.

Information About IPv6 RA Guard

IPv6 Global Policies

IPv6 global policies provide storage and access policy database services. IPv6 ND inspection and IPv6 RA guard are IPv6 global policies features. Every time an ND inspection or RA guard is configured globally, the policy attributes are stored in the software policy database. The policy is then applied to an interface, and the software policy database entry is updated to include this interface to which the policy is applied.

IPv6 RA Guard

The IPv6 RA Guard feature provides support for allowing the network administrator to block or reject unwanted or rogue RA guard messages that arrive at the network device platform. RAs are used by devices to announce themselves on the link. The IPv6 RA Guard feature analyzes these RAs and filters out RAs that are sent by unauthorized devices. In host mode, all RA and router redirect messages are disallowed on the port. The RA guard feature compares configuration information on the Layer 2 (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.

How to Configure IPv6 RA Guard

Configuring the IPv6 RA Guard Policy on the Device

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `ipv6 nd rguard policy policy-name`
4. `device-role {host | router}`
5. `hop-limit {maximum | minimum limit}`
6. `managed-config-flag {on | off}`
7. `match ipv6 access-list ipv6-access-list-name`
8. `match ra prefix-list ipv6-prefix-list-name`
9. `other-config-flag {on | off}`
10. `router-preference maximum {high | low | medium}`
11. `trusted-port`
12. `exit`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p><code>enable</code></p> <p>Example:</p> <pre>Device> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	<p><code>configure terminal</code></p> <p>Example:</p> <pre>Device# configure terminal</pre>	<p>Enters global configuration mode.</p>
Step 3	<p><code>ipv6 nd rguard policy <i>policy-name</i></code></p> <p>Example:</p> <pre>Device(config)# ipv6 nd rguard policy policy1</pre>	<p>Defines the RA guard policy name and enters RA guard policy configuration mode.</p>

	Command or Action	Purpose
Step 4	device-role {host router} Example: Device(config-ra-guard)# device-role router	Specifies the role of the device attached to the port.
Step 5	hop-limit {maximum minimum limit} Example: Device(config-ra-guard)# hop-limit minimum 3	(Optional) Enables verification of the advertised hop count limit. <ul style="list-style-type: none"> • If not configured, this check will be bypassed.
Step 6	managed-config-flag {on off} Example: Device(config-ra-guard)# managed-config-flag on	(Optional) Enables verification that the advertised managed address configuration flag is on. <ul style="list-style-type: none"> • If not configured, this check will be bypassed.
Step 7	match ipv6 access-list ipv6-access-list-name Example: Device(config-ra-guard)# match ipv6 access-list list1	(Optional) Enables verification of the sender's IPv6 address in inspected messages from the configured authorized device source access list. <ul style="list-style-type: none"> • If not configured, this check will be bypassed.
Step 8	match ra prefix-list ipv6-prefix-list-name Example: Device(config-ra-guard)# match ra prefix-list listname1	(Optional) Enables verification of the advertised prefixes in inspected messages from the configured authorized prefix list. <ul style="list-style-type: none"> • If not configured, this check will be bypassed.
Step 9	other-config-flag {on off} Example: Device(config-ra-guard)# other-config-flag on	(Optional) Enables verification of the advertised "other" configuration parameter.
Step 10	router-preference maximum {high low medium} Example: Device(config-ra-guard)# router-preference maximum high	(Optional) Enables verification that the advertised default router preference parameter value is lower than or equal to a specified limit.
Step 11	trusted-port Example: Device(config-ra-guard)# trusted-port	(Optional) Specifies that this policy is being applied to trusted ports. <ul style="list-style-type: none"> • All RA guard policing will be disabled.
Step 12	exit Example: Device(config-ra-guard)# exit	Exits RA guard policy configuration mode and returns to global configuration mode.

Configuring IPv6 RA Guard on an Interface

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ipv6 nd rguard attach-policy** [*policy-name* [vlan {add | except | none | remove | all} vlan [*vlan1*, *vlan2*, *vlan3*...]]]
5. **exit**
6. **show ipv6 nd rguard policy** [*policy-name*]
7. **debug ipv6 snooping rguard** [*filter* | *interface* | *vlanid*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	interface <i>type number</i> Example: Device(config)# interface fastethernet 3/13	Specifies an interface type and number, and places the device in interface configuration mode.
Step 4	ipv6 nd rguard attach-policy [<i>policy-name</i> [vlan {add except none remove all} vlan [<i>vlan1</i> , <i>vlan2</i> , <i>vlan3</i> ...]]] Example: Device(config-if)# ipv6 nd rguard attach-policy	Applies the IPv6 RA Guard feature to a specified interface.
Step 5	exit Example: Device(config-if)# exit	Exits interface configuration mode.

	Command or Action	Purpose
Step 6	show ipv6 nd raguard policy [<i>policy-name</i>] Example: Device# show ipv6 nd raguard policy raguard1	Displays the RA guard policy on all interfaces configured with the RA guard.
Step 7	debug ipv6 snooping raguard [<i>filter interface vlanid</i>] Example: Device# debug ipv6 snooping raguard	Enables debugging for IPv6 RA guard snooping information.

Configuration Examples for IPv6 RA Guard

Example: IPv6 RA Guard Configuration

```

Device(config)# interface fastethernet 3/13

Device(config-if)# ipv6 nd raguard attach-policy

Device# show running-config interface fastethernet 3/13

Building configuration...
Current configuration : 129 bytes
!
interface FastEthernet3/13
 switchport
 switchport access vlan 222
 switchport mode access
 access-group mode prefer port
 ipv6 nd raguard
end

```

Example: Configuring IPv6 ND Inspection and RA Guard

This example provides information about an interface on which both the Neighbor Discovery Inspection and RA Guard features are configured:

```

Device# show ipv6 snooping capture-policy interface ethernet 0/0

Hardware policy registered on Ethernet 0/0
Protocol Protocol value Message Value Action Feature
ICMP 58 RS 85 punt RA Guard
punt ND Inspection
ICMP 58 RA 86 drop RA guard
punt ND Inspection
ICMP 58 NS 87 punt ND Inspection
ICM 58 NA 88 punt ND Inspection

```

ICMP 58 REDIR 89 drop RA Guard
punt ND Inspection

Additional References

Related Documents

Related Topic	Document Title
IPv6 addressing and connectivity	<i>IPv6 Configuration Guide</i>
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
IPv6 commands	<i>Cisco IOS IPv6 Command Reference</i>
Cisco IOS IPv6 features	Cisco IOS IPv6 Feature Mapping

Standards and RFCs

Standard/RFC	Title
RFCs for IPv6	<i>IPv6 RFCs</i>

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for IPv6 RA Guard

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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

Table 1: Feature Information for IPv6 RA Guard

Feature Name	Releases	Feature Information
IPv6 RA Guard	12.2(33)SX14 12.2(50)SY 12.2(54)SG 15.0(2)SE 15.0(2)SG 15.2(4)S 15.2(4)M Cisco IOS XE Release 3.8S Cisco IOS XE Release 3.2SE Cisco IOS XE Release 3.2SG	The IPv6 RA Guard feature provides support for allowing the network administrator to block or reject unwanted or rogue router advertisement (RA) guard messages that arrive at the network device platform. The following commands were introduced or modified: debug ipv6 snooping raguard , device-role , hop-limit , ipv6 nd raguard attach-policy , ipv6 nd raguard policy , managed-config-flag , match ipv6 access-list , match ra prefix-list , other-config-flag , router-preference maximum , show ipv6 nd raguard policy .



CHAPTER 2

IPv6 RFCs

Standards and RFCs

RFCs	Title
RFC 1195	<i>Use of OSI IS-IS for Routing in TCP/IP and Dual Environments</i>
RFC 1267	<i>A Border Gateway Protocol 3 (BGP-3)</i>
RFC 1305	<i>Network Time Protocol (Version 3) Specification, Implementation and Analysis</i>
RFC 1583	<i>OSPF version 2</i>
RFC 1772	<i>Application of the Border Gateway Protocol in the Internet</i>
RFC 1886	<i>DNS Extensions to Support IP version 6</i>
RFC 1918	<i>Address Allocation for Private Internets</i>
RFC 1981	<i>Path MTU Discovery for IP version 6</i>
RFC 2080	<i>RIPng for IPv6</i>
RFC 2281	<i>Cisco Hot Standby Router Protocol (HSRP)</i>
RFC 2332	<i>NBMA Next Hop Resolution Protocol (NHRP)</i>
RFC 2373	<i>IP Version 6 Addressing Architecture</i>
RFC 2374	<i>An Aggregatable Global Unicast Address Format</i>
RFC 2375	<i>IPv6 Multicast Address Assignments</i>
RFC 2401	<i>Security Architecture for the Internet Protocol</i>

RFCs	Title
RFC 2402	<i>IP Authentication Header</i>
RFC 2404	<i>The Use of Hash Message Authentication Code Federal Information Processing Standard 180-1 within Encapsulating Security Payload and Authentication Header</i>
RFC 2406	<i>IP Encapsulating Security Payload (ESP)</i>
RFC 2407	<i>The Internet Security Domain of Interpretation for ISAKMP</i>
RFC 2408	<i>Internet Security Association and Key Management Protocol</i>
RFC 2409	<i>Internet Key Exchange (IKE)</i>
RFC 2427	<i>Multiprotocol Interconnect over Frame Relay</i>
RFC 2428	<i>FTP Extensions for IPv6 and NATs</i>
RFC 2460	<i>Internet Protocol, Version 6 (IPv6) Specification</i>
RFC 2461	<i>Neighbor Discovery for IP Version 6 (IPv6)</i>
RFC 2462	<i>IPv6 Stateless Address Autoconfiguration</i>
RFC 2463	<i>Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification</i>
RFC 2464	<i>Transmission of IPv6 Packets over Ethernet</i>
RFC 2467	<i>Transmission of IPv6 Packets over FDDI</i>
RFC 2472	<i>IP Version 6 over PPP</i>
RFC 2473	<i>Generic Packet Tunneling in IPv6 Specification</i>
RFC 2474	<i>Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers</i>
RFC 2475	<i>An Architecture for Differentiated Services Framework</i>
RFC 2492	<i>IPv6 over ATM</i>
RFC 2545	<i>Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing</i>

RFCs	Title
RFC 2590	<i>Transmission of IPv6 Packets over Frame Relay Specification</i>
RFC 2597	<i>Assured Forwarding PHB</i>
RFC 2598	<i>An Expedited Forwarding PHB</i>
RFC 2640	<i>Internet Protocol, Version 6 Specification</i>
RFC 2684	<i>Multiprotocol Encapsulation over ATM Adaptation Layer 5</i>
RFC 2697	<i>A Single Rate Three Color Marker</i>
RFC 2698	<i>A Two Rate Three Color Marker</i>
RFC 2710	<i>Multicast Listener Discovery (MLD) for IPv6</i>
RFC 2711	<i>IPv6 Router Alert Option</i>
RFC 2732	<i>Format for Literal IPv6 Addresses in URLs</i>
RFC 2765	<i>Stateless IP/ICMP Translation Algorithm (SIIT)</i>
RFC 2766	<i>Network Address Translation-Protocol Translation (NAT-PT)</i>
RFC 2858	<i>Multiprotocol Extensions for BGP-4</i>
RFC 2893	<i>Transition Mechanisms for IPv6 Hosts and Routers</i>
RFC 3056	<i>Connection of IPv6 Domains via IPv4 Clouds</i>
RFC 3068	<i>An Anycast Prefix for 6to4 Relay Routers</i>
RFC 3095	<i>RObust Header Compression (ROHC): Framework and Four Profiles: RTP, UDP, ESP, and Uncompressed</i>
RFC 3107	<i>Carrying Label Information in BGP-4</i>
RFC 3137	<i>OSPF Stub Router Advertisement</i>
RFC 3147	<i>Generic Routing Encapsulation over CLNS</i>
RFC 3152	<i>Delegation of IP6.ARPA</i>
RFC 3162	<i>RADIUS and IPv6</i>

RFCs	Title
RFC 3315	<i>Dynamic Host Configuration Protocol for IPv6 (DHCPv6)</i>
RFC 3319	<i>Dynamic Host Configuration Protocol (DHCPv6) Options for Session Initiated Protocol (SIP) Servers</i>
RFC 3392	<i>Capabilities Advertisement with BGP-4</i>
RFC 3414	<i>User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)</i>
RFC 3484	<i>Default Address Selection for Internet Protocol version 6 (IPv6)</i>
RFC 3513	<i>Internet Protocol Version 6 (IPv6) Addressing Architecture</i>
RFC 3576	<i>Change of Authorization</i>
RFC 3587	<i>IPv6 Global Unicast Address Format</i>
RFC 3590	<i>Source Address Selection for the Multicast Listener Discovery (MLD) Protocol</i>
RFC 3596	<i>DNS Extensions to Support IP Version 6</i>
RFC 3633	<i>DHCP IPv6 Prefix Delegation</i>
RFC 3646	<i>DNS Configuration options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6)</i>
RFC 3697	<i>IPv6 Flow Label Specification</i>
RFC 3736	<i>Stateless DHCP Service for IPv6</i>
RFC 3756	<i>IPv6 Neighbor Discovery (ND) Trust Models and Threats</i>
RFC 3759	<i>RObust Header Compression (ROHC): Terminology and Channel Mapping Examples</i>
RFC 3775	<i>Mobility Support in IPv6</i>
RFC 3810	<i>Multicast Listener Discovery Version 2 (MLDv2) for IPv6</i>
RFC 3846	<i>Mobile IPv4 Extension for Carrying Network Access Identifiers</i>

RFCs	Title
RFC 3879	<i>Deprecating Site Local Addresses</i>
RFC 3898	<i>Network Information Service (NIS) Configuration Options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6)</i>
RFC 3954	<i>Cisco Systems NetFlow Services Export Version 9</i>
RFC 3956	<i>Embedding the Rendezvous Point (RP) Address in an IPv6 Multicast Address</i>
RFC 3963	<i>Network Mobility (NEMO) Basic Support Protocol</i>
RFC 3971	<i>SEcure Neighbor Discovery (SEND)</i>
RFC 3972	<i>Cryptographically Generated Addresses (CGA)</i>
RFC 4007	<i>IPv6 Scoped Address Architecture</i>
RFC 4075	<i>Simple Network Time Protocol (SNTP) Configuration Option for DHCPv6</i>
RFC 4087	<i>IP Tunnel MIB</i>
RFC 4091	<i>The Alternative Network Address Types (ANAT) Semantics for the Session Description Protocol (SDP) Grouping Framework</i>
RFC 4092	<i>Usage of the Session Description Protocol (SDP) Alternative Network Address Types (ANAT) Semantics in the Session Initiation Protocol (SIP)</i>
RFC 4109	<i>Algorithms for Internet Key Exchange version 1 (IKEv1)</i>
RFC 4191	<i>Default Router Preferences and More-Specific Routes</i>
RFC 4193	<i>Unique Local IPv6 Unicast Addresses</i>
RFC 4214	<i>Intra-Site Automatic Tunnel Addressing Protocol (ISATAP)</i>
RFC 4242	<i>Information Refresh Time Option for Dynamic Host Configuration Protocol for IPv6 (DHCPv6)</i>
RFC 4282	<i>The Network Access Identifier</i>
RFC 4283	<i>Mobile Node Identifier Option for Mobile IPv6</i>

RFCs	Title
RFC 4285	<i>Authentication Protocol for Mobile IPv6</i>
RFC 4291	<i>IP Version 6 Addressing Architecture</i>
RFC 4292	<i>IP Forwarding Table MIB</i>
RFC 4293	<i>Management Information Base for the Internet Protocol (IP)</i>
RFC 4302	<i>IP Authentication Header</i>
RFC 4306	<i>Internet Key Exchange (IKEv2) Protocol</i>
RFC 4308	<i>Cryptographic Suites for IPsec</i>
RFC 4364	<i>BGP MPLS/IP Virtual Private Networks (VPNs)</i>
RFC 4382	<i>MPLS/BGP Layer 3 Virtual Private Network (VPN) Management Information Base</i>
RFC 4443	<i>Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification</i>
RFC 4552	<i>Authentication/Confidentiality for OSPFv3</i>
RFC 4594	<i>Configuration Guidelines for DiffServ Service Classes</i>
RFC 4601	<i>Protocol Independent Multicast - Sparse Mode (PIM-SM): Protocol Specification</i>
RFC 4610	<i>Anycast-RP Using Protocol Independent Multicast (PIM)</i>
RFC 4649	<i>Dynamic Host Configuration Protocol for IPv6 (DHCPv6) Relay Agent Remote-ID Option</i>
RFC 4659	<i>BGP-MPLS IP Virtual Private Network (VPN) Extension for IPv6 VPN</i>
RFC 4724	<i>Graceful Restart Mechanism for BGP</i>
RFC 4798	<i>Connecting IPv6 Islands over IPv4 MPLS Using IPv6 Provider Edge Routers (6PE)</i>
RFC 4818	<i>RADIUS Delegated-IPv6-Prefix Attribute</i>
RFC 4861	<i>Neighbor Discovery for IP version 6 (IPv6)</i>

RFCs	Title
RFC 4862	<i>IPv6 Stateless Address Autoconfiguration</i>
RFC 4884	<i>Extended ICMP to Support Multi-Part Messages</i>
RFC 4885	<i>Network Mobility Support Terminology</i>
RFC 4887	<i>Network Mobility Home Network Models</i>
RFC 5015	<i>Bidirectional Protocol Independent Multicast (BIDIR-PIM)</i>
RFC 5059	<i>Bootstrap Router (BSR) Mechanism for Protocol Independent Multicast (PIM)</i>
RFC 5072	<i>IPv6 over PPP</i>
RFC 5095	<i>Deprecation of Type 0 Routing Headers in IPv6</i>
RFC 5120	<i>M-ISIS: Multi Topology (MT) Routing in Intermediate System to Intermediate Systems (IS-ISs)</i>
RFC 5130	<i>A Policy Control Mechanism in IS-IS Using Administrative Tags</i>
RFC 5187	<i>OSPFv3 Graceful Restart</i>
RFC 5213	<i>Proxy Mobile IPv6</i>
RFC 5308	<i>Routing IPv6 with IS-IS</i>
RFC 5340	<i>OSPF for IPv6</i>
RFC 5460	<i>DHCPv6 Bulk Leasequery</i>
RFC 5643	<i>Management Information Base for OSPFv3</i>
RFC 5838	<i>Support of Address Families in OSPFv3</i>
RFC 5844	<i>IPv4 Support for Proxy Mobile IPv6</i>
RFC 5845	<i>Generic Routing Encapsulation (GRE) Key Option for Proxy Mobile IPv6</i>
RFC 5846	<i>Binding Revocation for IPv6 Mobility</i>
RFC 5881	<i>Bidirectional Forwarding Detection (BFD) for IPv4 and IPv6 (Single Hop)</i>

RFCs	Title
RFC 5905	<i>Network Time Protocol Version 4: Protocol and Algorithms Specification</i>
RFC 5969	<i>IPv6 Rapid Deployment on IPv4 Infrastructures (6RD) -- Protocol Specification</i>
RFC 6105	<i>IPv6 Router Advertisement Guard</i>
RFC 6620	<i>FCFS SAVI: First-Come, First-Served Source Address Validation Improvement for Locally Assigned IPv6 Addresses</i>