IPv6 Router Advertisement Throttler

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The IPv6 Router Advertisement Throttler limits the amount of multicast Router Advertisements (RAs) circulating on the wireless network. The IPv6 RA throttler tracks router solicitations (RSs) and converts multicast RAs into multiple unicast RAs to forward to RS originators.

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.

Information About the IPv6 Router Advertisement Throttler

IPv6 RA Throttler Overview

The IPv6 Router Advertisement Throttler limits the amount of multicast Router Advertisements (RAs) circulating on the wireless network. The IPv6 RA throttler tracks router solicitations (RSs) and converts multicast RAs into multiple unicast RAs to forward to RS originators.

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Scalability Feature: IPv6 RA Throttler

Data center networks with large numbers of devices face a number of scale challenges, such as effective and efficient address resolution. For example, in wireless Layer 2 domains, bandwidth may be constrained, and the amount of control traffic generated by protocols such as IPv6 Neighbor Discovery (ND) or Multicast Listener Discovery (MLD) can quickly become prohibitive.

By snooping control traffic and maintaining a binding table that stores all active devices and their addresses on the link, the amount of control traffic flooded on the Layer 2 domain can be greatly reduced. Throttling occurs when the same message is sent multiple times from several devices that do not interact with each other, but they all interact with one or more common devices (e.g., the local device). The Layer 2 device can eliminate some of these messages without any adverse consequences for the protocol itself.

IPv6 RA Throttler Parameter Inheritance

The IPv6 RA throttler allows an inheritance process by which a parameter that is not defined at a certain hierarchical level is inherited from the level above it. A parameter is defined at a given level if a policy is attached at that level and the parameter in that policy is set to a value other than **inherit**.

Level inheritance is as follows:

- PORT inherits from VLAN.
- VLAN inherits from BOX.

The levels are defined as follows:

- DEFAULT. A policy always exists implicitly at this level. The default policy fields are set as follows:

Field	Parameter
throttle-period	600 seconds, or 10 minutes.
max-through	10 RAs per VLAN per 10 minutes.
allow	at-least 1 at-most 1 - 1 RA per device per 10 minutes.
interval-option	passthrough - RAs are not throttled with the interval option.
medium-type	wire (port only) - The port is wireless.

- VLAN: At the VLAN level, only one policy may be attached per VLAN.
- PORT: At the PORT level, a policy can be attached to the port. Only one such policy is allowed per port per VLAN.

Note   Policies must be attached at the VLAN or BOX level as well as at the PORT level for IPv6 RA throttler to operate at the PORT level.

IPv6 RA Throttler Command Precedence Rules

The **allow at-least** and **allow at-most** values applied at the VLAN level are the default for all devices in the VLAN. The values can be overridden on a per-port basis by applying another policy on the a specified port.

When you apply a policy on a port, any value that is not configured in that policy is inherited from the VLAN configuration. If the value is not configured in the VLAN policy, then the value is set to its default.

The **max-through** and **medium-type** commands are ignored by a VLAN or VLANs.

If your deployment has the same setting for the **allow at-least** and **allow at-most** values for all devices on all ports, then you need only to apply the policy on the relevant VLAN or VLANs. If some of wired ports in the deployment are connection wireless access points, then a policy with only the medium type configured needs to be applied on those specific ports.

Rules that are configured at the command-line interface (CLI) are applied in the following order:

1 Maximum pending hosts: If more than 35 hosts are pending, the RA throttler stops "remembering" them one by one and multicasts the next RA to all devices, including wireless devices.
2 RA interval option: If the RA has an interval option, then the **interval-option** command setting applies first. If the **interval-option throttle** command setting is configured, then this step is ignored. The default is to pass through all RAs with an interval option; that is, not to multicast the next RA to all devices, including wireless devices.
3 Per-device at-least setting: If the device that issued the RA has not yet sent the number of RAs configured by the **allow at-least** command, then the RA is multicast to all hosts, including hosts on wireless devices.
4 Per-device at-most setting: If the device that issued the RA has sent the number of RAs configured by the **allow at-most** command, then the RA is throttled. That is, the RA is multicast to all wired hosts and to wireless hosts with pending router solicitations (RSs) or reassociations.
5 Per VLAN: If the per-VLAN limit per the **max-through** command setting has been reached, then the message is throttled; otherwise, it is passed to all devices, including wireless devices.

How to Configure the IPv6 Router Advertisement Throttler

Configuring the IPv6 RA Throttler Policy

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ipv6 nd ra-throttle policy** *policy-name*
4. **allow** {**at-least** {*al-value* | **no-limit** }} | {**at-most** {*am-value* | **no-limit**}} | {**inherited**}
5. **interval-option** {**ignore** | **inherit** | **pass-through** | **throttle**}
6. **max-through** {*mt-value* | **inherit** | **no-limit**}
7. **medium-type** {**access-point** | **wired**}
8. **throttle-period** {*seconds* | **inherit**}

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**ipv6 nd ra-throttle policy** *policy-name* **Example:** `Device(config)# ipv6 nd ra-throttle policy policy1`	Defines the RA throttler policy name and enters IPv6 RA throttle policy configuration mode.
Step 4	**allow** {**at-least** {*al-value*	**no-limit** }}	{**at-most** {*am-value*	**no-limit**}}	{**inherited**} **Example:** `Device(config-nd-ra-throttle)# allow at-least 2 at-most 2`	Limits the number of multicast RAs per device per throttle period in an RA throttler policy.
Step 5	**interval-option** {**ignore**	**inherit**	**pass-through**	**throttle**} **Example:** `Device(config-nd-ra-throttle)# interval-option inherit`	Adjusts the IPv6 RA interval in an RA throttler policy.

Command or Action	Purpose
Step 6 **max-through** {*mt-value* | **inherit** | **no-limit**} **Example:** Device(config-nd-ra-throttle)# max-through 25	Limits multicast RAs per VLAN per throttle period.
Step 7 **medium-type** {**access-point** | **wired**} **Example:** Device(config-nd-ra-throttle)# medium-type wired	Indicates whether a device is wired or wireless.
Step 8 **throttle-period** {*seconds* | **inherit**} **Example:** Device(config-nd-ra-throttle)# throttle-period 300	Configures the throttle period in an IPv6 RA throttler policy.

Attaching the IPv6 RA Throttler Policy to a VLAN or VLANs

You must create an IPv6 RA throttler policy before attaching it to a VLAN or VLANs. See the previous step to create an IPv6 RA throttler policy.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **vlan configuration**
4. **ipv6 nd ra-throttle attach-policy**

DETAILED STEPS

Command or Action	Purpose
Step 1 **enable** **Example:** Device> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2 **configure terminal** **Example:** Device# configure terminal	Enters global configuration mode.

Command or Action	Purpose
Step 3 **vlan configuration** **Example:** `Device(config)# vlan configuration vlan1`	Configures a VLAN or a collection of VLANs and enters VLAN configuration mode.
Step 4 **ipv6 nd ra-throttle attach-policy** **Example:** `Device(config-vlan-config)# ipv6 nd ra-throttle attach-policy policy1`	Attaches an IPv6 RA throttler policy to a VLAN or a collection of VLANs.

Attaching the IPv6 RA Throttler Policy to a Port

- You must create an IPv6 RA throttler policy before attaching it to a port. See the previous step to create an IPv6 RA throttler policy.
- Policies must be attached at the VLAN or BOX level as well as at the PORT level for the IPv6 RA throttler to operate at the PORT level.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ipv6 nd ra-throttle attach-policy**

DETAILED STEPS

Command or Action	Purpose
Step 1 **enable** **Example:** `Device> enable`	Enables privileged EXEC mode. - Enter your password if prompted.
Step 2 **configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

Command or Action	Purpose
Step 3 **interface** *type number* **Example:** `Device(config)# interface ethernet0/0`	Specifies an interface type and number, and places the device in interface configuration mode.
Step 4 **ipv6 nd ra-throttle attach-policy** **Example:** `Device(config-if)#`	Attaches an IPv6 RA throttler policy to a Layer 2 interface.

Configuration Examples for IPv6 Router Advertisement Throttler

Example: IPv6 RA Throttler Policy Configuration

```
Device# show ipv6 nd ra-throttle policy policy2

Policy policy2 configuration:
        The throttle period will be coalesced and default to 600 seconds
        Applied to a port, this policy indicates a wired interface
        The maximum number of unthrottled RAs is configured on the vlan and defaults to
10
        The min and max numbers of unthrottled RAs per router will be coalesced and
default to 1
        The behaviour upon RAs with an RFC 3775 interval option will be coalesced and
default to passthrough

Policy applied on the following interfaces:
  Et0/0               vlan all
Policy applied on the following vlans:
  10,12-17
```

Example: IPv6 RA Throttler VLAN Configuration

```
Device# show ipv6 nd ra-throttler vlan vlan1

general information for vlan vlan1
==================================

 RAs             last period    this period     overall
 passed_through 1               1               2
 throttled      4               2               6

 no pending host

current Policy is tutu coalesced as:

  throttle-period 90 seconds remaining 48
  max-through 0
```

```
allow at-least 1 at-most 1
interval-option passthrough
```

Additional References

Related Documents

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

Standards and RFCs

Standard/RFC	Title
RFCs for IPv6	*IPv6 RFCs*

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 Router Advertisement Throttler

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*

Feature Name	Releases	Feature Information
IPv6 Router Advertisement Throttler	Cisco IOS XE Release 3.2SE	The IPv6 Router Advertisement Throttler feature limits the amount of multicast RAs circulating on the wireless network. The IPv6 RA throttler tracks RSs and converts multicast RAs into multiple unicast RAs to forward to RS originators. The following commands were introduced or modified: **allow**, **interval-option**, **ipv6 nd ra-throttle attach-policy**, **ipv6 nd ra-throttle policy**, **max-through**, **medium-type**, **show ipv6 nd ra-throttler interface**, **show ipv6 nd ra-throttler policy**, **show ipv6 nd ra-throttler vlan**, **throttle-period**, **vlan configuration**.