TTL Security Support for OSPFv3 on IPv6

The Time To Live (TTL) Security Support for Open Shortest Path First version 3 (OSPFv3) on IPv6 feature increases protection against OSPFv3 denial of service attacks.

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Restrictions for TTL Security Support for OSPFv3 on IPv6

- OSPFv3 TTL security can be configured for virtual and sham links only.
- OSPFv3 TTL security must be configured in IPv6 address family configuration mode (config-router-af). To enter IPv6 address family configuration mode you use the **address-family ipv6** command.
- Sham links must not be configured on the default Virtual Routing and Forwarding (VRF).

Prerequisites for TTL Security Support for OSPFv3 on IPv6

The TTL Security Support for OSPFv3 on IPv6 feature is available only on platforms with OSPFv3 routing capabilities.

Information About TTL Security Support for OSPFv3 on IPv6

OSPFv3 TTL Security Support for Virtual and Sham Links

In OSPFv3, all areas must be connected to a backbone area. If there is a break in backbone continuity, or the backbone is purposefully partitioned, you can establish a virtual link. The virtual link must be configured in the two devices you want to use to connect the partitioned backbone. The configuration information in each

device consists of the other virtual endpoint (the other Area Border Router [ABR]) and the nonbackbone area that the two devices have in common (called the transit area.) Note that virtual links cannot be configured through stub areas. Sham links are similar to virtual links in many ways, but sham links are used in Layer 3 Multiprotocol Label Switching (MPLS) VPN networks to connect provider edge (PE) routers across the MPLS backbone.

Note Multihop adjacencies such as virtual links and sham links use global IPv6 addresses that require you to configure TTL security to control the number of hops that a packet can travel.

If TTL security is enabled, OSPFv3 sends outgoing packets with an IP header TTL value of 255 and discards incoming packets that have TTL values less than the configurable threshold. Because each device that forwards an IP packet decreases the TTL value, packets received via a direct (one-hop) connection will have a value of 255. Packets that cross two hops will have a value of 254, and so on. The receive threshold is configured in terms of the maximum number of hops that a packet may have traveled. The value for this *hop-count* argument is a number from 1 to 254, with a default of 1.

To establish a virtual link or a sham link, use the **area virtual-link** or **area sham-link cost** commands respectively. To configure TTL security on a virtual link or a sham link, configure the **ttl-security** keyword and the *hop-count* argument in either command. Note that the *hop-count* argument value is mandatory in this case.

Note OSPFv3 TTL Security can be configured for virtual and sham links only, and must be configured in address family configuration (config-router-af) mode for IPv6 address families.

How to Configure TTL Security Support for OSPFv3 on IPv6

Configuring TTL Security Support on Virtual Links for OSPFv3 on IPv6

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router ospfv3** [*process-id*]
4. **address-family ipv6 unicast vrf** *vrf-name*
5. **area** *area-ID* **virtual-link** *router-id* **ttl-security hops** *hop-count*
6. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:**	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
	`Device> enable`	
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**router ospfv3** [*process-id*] **Example:** `Device(config)# router ospfv3 1`	Enables router configuration mode for the IPv4 or IPv6 address family.
Step 4	**address-family ipv6 unicast vrf** *vrf-name* **Example:** `Device(config-router)# address-family ipv6 unicast vrf vrf1`	Enters address family configuration mode for OSPFv3, specifies IPv6 unicast address prefixes, and specifies the name of the VRF instance to associate with subsequent address family configuration mode commands.
Step 5	**area** *area-ID* **virtual-link** *router-id* **ttl-security hops** *hop-count* **Example:** `Device(config-router-af)# area 1 virtual-link 10.1.1.1 ttl-security hops 10`	Defines an OSPFv3 virtual link and configures TTL security on the virtual link.
Step 6	**end** **Example:** `Device(config-router-af)# end`	(Optional) Returns to privileged EXEC mode.

Configuring TTL Security Support on Sham Links for OSPFv3 on IPv6

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router ospfv3** [*process-id*]
4. **address-family ipv6 unicast vrf** *vrf-name*
5. **area** *area-id* **sham-link** *source-address destination-address* **ttl-security hops** *hop-count*
6. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable**	Enables privileged EXEC mode.

	Command or Action	Purpose
	Example: `Device> enable`	• Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**router ospfv3** [*process-id*] **Example:** `Device(config)# router ospfv3 1`	Enables OSPFv3 router configuration mode for the IPv4 or IPv6 address family.
Step 4	**address-family ipv6 unicast vrf** *vrf-name* **Example:** `Device(config-router)# address-family ipv6 unicast vrf vrf1`	Enters address family configuration mode for OSPFv3, specifies IPv6 unicast address prefixes, and specifies the name of the VRF instance to associate with subsequent address family configuration mode commands.
Step 5	**area** *area-id* **sham-link** *source-address destination-address* **ttl-security hops** *hop-count* **Example:** `Device(config-router-af)# area 1 sham-link 2001:DB8:1::1 2001:DB8:0:A222::2 ttl-security hops 10`	Defines an OSPFv3 sham link and configures TTL security on the sham link.
Step 6	**end** **Example:** `Device(config-router-af)# end`	(Optional) Returns to privileged EXEC mode.

Configuration Examples for TTL Security Support for OSPFv3 on IPv6

Example: TTL Security Support on Virtual Links for OSPFv3 on IPv6

The following example shows how to configure TTL virtual link security:

```
Device> enable
Device# configure terminal
Device(config)# router ospfv3 1
Device(config-router)# address-family ipv6 unicast vrf vrf1
Device(config-router-af)# area 1 virtual-link 10.1.1.1 ttl-security hops 10
Device(config-router-af)# end
```

```
Device# show ospfv3 virtual-links
OSPFv3 1 address-family ipv6 (router-id 10.1.1.7)
Virtual Link OSPFv3_VL0 to router 10.1.1.2 is down
  Interface ID 23, IPv6 address ::
  Run as demand circuit
  DoNotAge LSA allowed.
  Transit area 1, Cost of using 65535
  Transmit Delay is 1 sec, State DOWN,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Strict TTL checking enabled, up to 10 hops allowed
```

Example: TTL Security Support on Sham Links for OSPFv3 on IPv6

The following example shows how to configure TTL sham link security:

```
Device> enable
Device# configure terminal
Device(config)# router ospfv3 1
Device(config-router)# address-family ipv6 unicast vrf vrf1
Device(config-router-af)# area 1 sham-link 2001:DB8:1::1 2001:DB8:0:A222::2 ttl-security
hops 10
Device(config-router-af)# end
Device#
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
OSPF commands	Cisco IOS IP Routing: OSPF Command Reference
IPv6 routing: OSPFv3	"IPv6 Routing: OSPFv3" module

MIBs

MIB	MIBs Link
No new or modified MIBs are supported, and support for existing MIBs has not been modified.	To locate and download MIBs for selected platforms, Cisco software 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 TTL Security Support for OSPFv3 on IPv6

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: TTL Security Support for OSPFv3 on IPv6

Feature Name	Software Releases	Feature Information
TTL Security Support for OSPFv3 on IPv6	Cisco IOS XE Release 3.7S	The TTL Security Support for OSPFv3 on IPv6 feature increases protection against OSPFv3 denial of service attacks. The following commands were introduced or modified by this feature: **area sham-link**, **area virtual-link**.

Table 2: TTL Security Support for OSPFv3 on IPv6

Feature Name	Software Releases	Feature Information
TTL Security Support for OSPFv3 on IPv6	Cisco IOS XE Release 17.4	This feature was introduced.