Unicast Reverse Path Forwarding for IPv6

The Unicast Reverse Path Forwarding(uRPF) for IPv6 feature mitigates problems caused by malformed or forged (spoofed) IPv6 source addresses that pass through an IPv6 device.

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.

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.

Prerequisites for Unicast Reverse Path Forwarding for IPv6

- Enable Cisco Express Forwarding switching or distributed Cisco Express Forwarding switching in the device. There is no need to configure the input interface for Cisco Express Forwarding switching. As long as Cisco Express Forwarding is running on the device, individual interfaces can be configured with other switching modes.
- Cisco Express Forwarding must be configured globally in the device. uRPF will not work without Cisco Express Forwarding.

- uRPF should not be used on interfaces that are internal to the network. Internal interfaces are likely to have routing asymmetry; this means that there are multiple routes to the source of a packet. uRPF should be applied only where there is natural or configured symmetry.

  For example, devices at the edge of the network of an ISP are more likely to have symmetrical reverse paths than devices that are in the core of the ISP network. Devices that are in the core of the ISP network have no guarantee that the best forwarding path out of the device will be the path selected for packets returning to the device. Therefore, we do not recommend that you apply uRPF where there is a chance of asymmetric routing. Place uRPF only at the edge of a network or, for an ISP, at the customer edge of the network.

Information About Unicast Reverse Path Forwarding for IPv6

Unicast Reverse Path Forwarding

Use the Unicast Reverse Path Forwarding for IPv6 feature to mitigate problems caused by malformed or spoofed IPv6 source addresses that pass through an IPv6 device. Malformed or forged source addresses can indicate denial-of-service (DoS) attacks based on source IPv6 address spoofing.

When uRPF is enabled on an interface, the device examines all packets received on that interface. The device verifies that the source address appears in the routing table and matches the interface on which the packet was received. This "look backward" ability is available only when Cisco Express Forwarding is enabled on the device; this is because the lookup relies on the presence of the Forwarding Information Bases (FIBs). Cisco Express Forwarding generates the FIB as part of its operation.

Note uRPF is an input function and is applied only on the input interface of a device at the upstream end of a connection.

The uRPF feature verifies whether any packet received at a device interface arrives on one of the best return paths to the source of the packet. The feature performs a reverse lookup in the Cisco Express Forwarding table. If uRPF does not find a reverse path for the packet, uRPF can drop or forward the packet, depending on whether an access control list (ACL) is specified. If an ACL is specified, then when (and only when) a packet fails the uRPF check, the ACL is checked to verify if the packet should be dropped (using a deny statement in the ACL) or forwarded (using a permit statement in the ACL). Regardless of whether a packet is dropped or forwarded, the packet is counted in the global IP traffic statistics for uRPF drops and in the interface statistics for uRPF.

If no ACL is specified, the device drops the forged or malformed packet immediately and no ACL logging occurs. The device and interface uRPF counters are updated.

uRPF events can be logged by specifying the logging option for the ACL entries. Log information can be used to gather information about the attack, such as source address and time.

Note With uRPF, all equal-cost "best" return paths are considered valid. uRPF works in cases where multiple return paths exist, provided that each path is equal to the others in terms of the routing cost (number of hops, weights, and so on) and as long as the route is in the FIB.

How to Configure Unicast Reverse Path Forwarding for IPv6

Configuring Unicast RPF

Before You Begin

To use uRPF, enable Cisco Express Forwarding switching or distributed Cisco Express Forwarding switching in the device. There is no need to configure the input interface for Cisco Express Forwarding switching. As long as Cisco Express Forwarding is running on the device, individual interfaces can be configured with other switching modes.

Note Cisco Express Forwarding must be configured globally in the device. uRPF does not work without Cisco Express Forwarding.

Note uRPF should not be used on interfaces that are internal to the network. Internal interfaces are likely to have routing asymmetry, meaning that there are multiple routes to the source of a packet. uRPF should be applied only where there is natural or configured symmetry.

For example, devices at the edge of the network of an ISP are more likely to have symmetrical reverse paths than devices that are in the core of the ISP network. Devices that are in the core of the ISP network have no guarantee that the best forwarding path out of the device will be the path selected for packets returning to the device. Therefore, we do not recommend that you apply uRPF where there is a chance of asymmetric routing. It is simplest to place uRPF only at the edge of a network or, for an ISP, at the customer edge of the network.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ipv6 verify unicast source reachable-via** {**rx** | **any**} [**allow-default**] [**allow-self-ping**][*access-list-name*]

DETAILED STEPS

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

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Device(config)# interface GigabitEthernet 0/0`	Specifies an interface type and number, and places the device in interface configuration mode.
Step 4	**ipv6 verify unicast source reachable-via** {**rx** | **any**} [**allow-default**] [**allow-self-ping**][*access-list-name*] **Example:** `Device(config-if)# ipv6 verify unicast source reachable-via any`	Verifies that a source address exists in the FIB table and enables uRPF. "rx" is for strict mode and "any" is for loose mode.

Configuration Examples for Unicast Reverse Path Forwarding for IPv6

Example: Configuring Unicast Reverse Path Forwarding for IPv6

```
Device# show ipv6 traffic
IPv6 statistics:
  Rcvd:  0 total, 0 local destination
         0 source-routed, 0 truncated
         0 format errors, 0 hop count exceeded
         0 bad header, 0 unknown option, 0 bad source
         0 unknown protocol, 0 not a router
         0 fragments, 0 total reassembled
         0 reassembly timeouts, 0 reassembly failures
         0 unicast RPF drop, 0 suppressed RPF drop
  Sent:  0 generated, 0 forwarded
         0 fragmented into 0 fragments, 0 failed
         0 encapsulation failed, 0 no route, 0 too big
```

Additional References

Related Documents

Related Topic	Document Title
Cisco Express Forwarding for IPv6	Implementing IPv6 Addressing and Basic Connectivity Guide, *IPv6 Configuration Guide*
Cisco IOS voice configuration	Cisco IOS Voice Configuration Library
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
IPv6 commands, including voice commands	Cisco IOS IPv6 Command Reference
Cisco Unified Border Element configuration	Cisco Unified Border Element Configuration Guide
SIP Configuration Guide	SIP Configuration Guide
Troubleshooting and debugging guides	Cisco IOS Debug Command Reference Troubleshooting and Debugging VoIP Call Basics

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 Unicast Reverse Path Forwarding for 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: Feature Information for Unicast Reverse Path Forwarding for IPv6

Feature Name	Releases	Feature Information
Unicast Reverse Path Forwarding for IPv6		Use the uRPF feature to mitigate problems caused by malformed or spoofed IPv6 source addresses that pass through an IPv6 device. Malformed or forged source addresses can indicate DoS attacks based on source IPv6 address spoofing. The following commands were introduced or modified: **ipv6 verify unicast source reachable-via**, **show ipv6 traffic**.