IPv6 Segment Routing on Cisco cBR

In Cisco Converged Broadband Router, IPv6 Segment Routing is available as a sub mode of IPv6 address configuration.

Your software release may not support all the features that are documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. The Feature Information Table at the end of this document provides information about the documented features and lists the releases in which each feature is supported.

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Hardware Compatibility Matrix for the Cisco cBR Series Routers

Note The hardware components that are introduced in a given Cisco IOS-XE Release are supported in all subsequent releases unless otherwise specified.

Table 1: Hardware Compatibility Matrix for the Cisco cBR Series Routers

Cisco CMTS Platform	Processor Engine	Interface Cards
Cisco cBR-8 Converged Broadband Router	**Cisco IOS-XE Release 16.5.1 and Later Releases** Cisco cBR-8 Supervisor: • PID—CBR-SUP-250G • PID—CBR-CCAP-SUP-160G	**Cisco IOS-XE Release 16.5.1 and Later Releases** Cisco cBR-8 CCAP Line Cards: • PID—CBR-LC-8D30-16U30 • PID—CBR-LC-8D31-16U30 • PID—CBR-RF-PIC • PID—CBR-RF-PROT-PIC • PID—CBR-CCAP-LC-40G • PID—CBR-CCAP-LC-40G-R • PID—CBR-CCAP-LC-G2-R • PID—CBR-SUP-8X10G-PIC • PID—CBR-2X100G-PIC Digital PICs: • PID—CBR-DPIC-8X10G • PID—CBR-DPIC-2X100G Cisco cBR-8 Downstream PHY Module: • PID—CBR-D31-DS-MOD Cisco cBR-8 Upstream PHY Modules: • PID—CBR-D31-US-MOD

Note Do not use DPICs (8X10G and 2x100G) to forward IP traffic, as it may cause buffer exhaustion, leading to line card reload.

The only allowed traffic on a DPIC interface is DEPI, UEPI, and GCP traffic from the Cisco cBR-8 router to Remote PHY devices. Other traffic such as DHCP, SSH, and UTSC should flow via another router, since DPICs cannot be used for normal routing.

Information about IPv6 Segment Routing

IPv6 Segment Routing (SR) is an SDN technology supporting IPv6 forwarding. In SR, a source or edge router performs source routing of traffic and encodes it as a segment list in an IPv6 routing extension header. The network is not required to maintain a per-application or per-flow state.

Any IPv6 capable node in a network may forward IPv6 traffic with an SR extension header to the first segment in the segment list without supporting IPv6 Segment Routing (SRv6).

At the node that hosts the current segment in the segment list, SRv6 is configured to modify the destination address of the traffic containing the SR extension header and destined to that segment ID. As part of SRv6 final processing, the next segment ID in the SR extension header is written to the destination address of the packet and a lookup is performed to forward the traffic to the new destination address.

The forwarding and SRv6 end processing continues at nodes hosting the segment IDs in the SR extension header until the last segment in the list is removed and the traffic is delivered to its ultimate destination.

Restriction for Configuring IPv6 Segment Routing

Configuring duplicate IPv6 addresses on the same interface is not allowed.

How to Configure IPv6 Segment Routing

Configuring IPv6 Segment Routing on cBR

To configure IPv6 segment routing, use the following procedure.

1. Enter segment-routing sub mode when configuring an IPv6 address on an interface.

```
enable
configure terminal
interface type [slot_#/]port_#
ipv6 address ipv6_address_prefix/prefix_length
ipv6 address ipv6_address_prefix/prefix_length segment-routing
```

2. Define a local prefix as an SID

```
ipv6-sr prefix-sid
exit
```

Verifying IPv6 Segment Routing Configuration

The following example shows how to verify SRv6 configuration:c

```
Router#sh run
*Oct 17 13:13:23.975: %SYS-5-CONFIG_I: Configured from console by console
Router#sh run | sec Ether
interface Ethernet0/0
 no ip address
 shutdown
```

```
ipv6 address 2001::2001/64 segment-routing >>>>>>>
 ipv6-sr prefix-sid >>>>>>>
```

Configure Multiple IPv6 Addresses for Segment Routing

To configure multiple IPv6 addresses for SRv6 under the same interface, use the following commands.

1. Enter segment-routing sub mode when configuring an IPv6 address on an interface.

```
enable
configure terminal
interface type [slot_#/]port_#
ipv6 address ipv6_address_prefix/prefix_length segment-routing
```

2. Define a local prefix as an SID.

```
ipv6-sr prefix-sid
exit
```

Verifying IPv6 Segment Routing Configuration on Multiple IPv6 Addresses

The following example shows how to verify SRv6 configuration for multiple IPv6 addresses:

```
Router#sh run | sec Ether
interface Ethernet0/0
 no ip address
 shutdown
 ipv6 address 2001:db8:110::/64 segment-routing  >>> submode 1
  ipv6-sr prefix-sid
 ipv6 address 2001:db9:111::/64 segment-routing  >>> submode 2
  ipv6-sr prefix-sid
interface Ethernet0/1
 no ip address
 shutdown
interface Ethernet0/2
 no ip address
 shutdown
interface Ethernet0/3
 no ip address
 shutdown
interface Ethernet1/0
 no ip address
 shutdown
interface Ethernet1/1
 no ip address
 shutdown
interface Ethernet1/2
```

Disabling Prefix SID

To disable the local prefix SID associated to the segment ID, use the following commands.

```
enable
configure terminal
interface type [slot_#/]port_#
ipv6 address ipv6_address_prefix/prefix_length segment-routing
no ipv6-sr prefix-sid
end
```

Verifying whether Prefix SID is Disabled

The following example shows how to verify whether the prefix SID is disabled:

```
Router#sh run | sec Ether
interface Ethernet0/0
 no ip address
 shutdown
 ipv6 address 110::110/64 segment-routing >>> "ipv6-sr prefix sid" is no longer present
ipv6 address 111::111/64 segment-routing
ipv6-sr prefix-sid
```

Disabling SRv6 for a Prefix-SID

To disable SRv6 configuration for an IPv6 address and remove the IPv6 address, use the following command:

```
enable
configure terminal
interface type [slot_#/]port_#
no ipv6 address ipv6_address_prefix/prefix_length segment-routing
end
```

Verifying whether SRv6 is Disabled and Prefix SID Removed

The following example shows how to verify whether SRv6 is disabled and the prefix SID is removed for the prefix SID.

```
Router#sh run |
*Oct 17 13:17:51.523: %SYS-5-CONFIG_I: Configured from console by console
Router#sh run | sec Ether
interface Ethernet0/0
 no ip address
 shutdown
 ipv6 address 110::110/64 segment-routing
ipv6 address 111::111/64 segment-routing is entirely removed from ethernet0/0
```

Configuration Examples

This section provides examples for IPv6 Segment Routing.

Example: Configuring IPv6 Segment Routing on Cisco cBR

```
Router#conf terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#inter Ether0/0
Router(config-if)#ipv6 address 110::110/64 ?
  anycast
  eui-64
  segment-routing
  <cr>
Router(config-if)#ipv6 address 110::110/64 segment-routing
Router(config-if-sr-ipv6)#?
ipv6 address segment-routing mode configuration commands:
  default  Set a command to its defaults
  exit     Exit from SR submode
  ipv6-sr  Request options specific to IPV6 segment-routing
```

```
  no       Negate a command or set its defaults
Router(config-if-sr-ipv6)#ipv6-sr ?
  prefix-sid  Set host prefix as IPv6 SR identifier prefix-sid
Router(config-if-sr-ipv6)#ipv6-sr prefix-sid
Router(config-if-sr-ipv6)#exit
Router(config-if)#exit
Router(config)#exit
Router#
```

Example: Configure Multiple IPv6 Addresses for SRv6

```
Router#conf terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#inter Ether 0/0
Router(config-if)# ipv6 address 110::110/64 segment-routing
Router(config-if)# ipv6 address 111::111/64 segment-routing
Router(config-if-sr-ipv6)#ipv6-sr prefix-sid
Router(config-if-sr-ipv6)#end
```

Example: Disabling Prefix SID

```
Router#conf terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#inter Ether0/0
Router(config-if)#inter Ether0/0
Router(config-if)#ipv6 address 110::110/64 segment-routing
Router(config-if-sr-ipv6)#no ipv6-sr prefix-sid
Router(config-if-sr-ipv6)#end
```

Example: Disabling SR with an Active Prefix SID

```
Router#conf terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#inter Ether0/0
Router(config-if)#no ipv6 address 111::111/64 segment-routing
Router(config-if)#end
```

Feature Information for IPv6 Segment Routing

Note The following table lists the software release in which a given feature is introduced. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Table 2: Feature Information for IPv6 Segment Routing

Feature Name	Releases	Feature Information
IPv6 Segment Routing	Cisco IOS XE Fuji 16.7.1	This feature was integrated into Cisco IOS XE Fuji 16.7.1 on theCisco cBR Series Converged Broadband Routers.