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# Configuring IPv6 static routing

## About IPv6 static routing

Static routes are manually configured and cannot adapt to network topology changes. If a fault or a topological change occurs in the network, the network administrator must modify the static routes manually. IPv6 static routing works well in a simple IPv6 network.

## Configuring an IPv6 static route

1. Enter system view.

```
system-view
```

2. Configure an IPv6 static route.

Public network:

```
ipv6 route-static ipv6-address prefix-length { interface-type  
interface-number [ next-hop-address ] | next-hop-address |  
vpn-instance d-vpn-instance-name next-hop-address } [ permanent ]  
[ preference preference ] [ tag tag-value ] [ description text ]
```

By default, no IPv6 static route is configured.

VPN:

```
ipv6 route-static vpn-instance s-vpn-instance-name ipv6-address  
prefix-length { interface-type interface-number [ next-hop-address ] |  
next-hop-address [ public ] | vpn-instance d-vpn-instance-name  
next-hop-address } [ permanent ] [ preference preference ] [ tag  
tag-value ] [ description text ]
```

By default, no IPv6 static route is configured.

3. (Optional.) Set the default preference for IPv6 static routes.

```
ipv6 route-static default-preference default-preference
```

The default setting is 60.

## Deleting IPv6 static routes

### About deleting IPv6 static routes

To delete an IPv6 static route, use the **undo ipv6 route-static** command. To delete all IPv6 static routes including the default route, use the **delete ipv6 static-routes all** command.

### Procedure

1. Enter system view.

```
system-view
```

2. Delete all IPv6 static routes, including the default route.

```
delete ipv6 [ vpn-instance vpn-instance-name ] static-routes all
```

# Configuring BFD for IPv6 static routes

## About BFD for IPv6 static routes

BFD provides a general purpose, standard, and medium- and protocol-independent fast failure detection mechanism. It can uniformly and quickly detect the failures of the bidirectional forwarding paths between two routers for protocols, such as routing protocols and MPLS. BFD for IPv6 static routes tests the reachability of the next hop for each IPv6 static route. If a next hop is unreachable, BFD deletes the associated IPv6 static route.

For more information about BFD, see *High Availability Configuration Guide*.

## Restrictions and guidelines for BFD

Enabling BFD for a flapping route could worsen the situation.

## Configuring bidirectional control mode

### About bidirectional control mode

To use BFD bidirectional control detection between two devices, enable BFD control mode for each device's static route destined to the peer.

To configure a static route and enable BFD control mode, use one of the following methods:

- Specify an output interface and a direct next hop.
- Specify an indirect next hop and a BFD packet source address for the static route.

### Configuring BFD control mode for an IPv6 static route (direct next hop)

1. Enter system view.

```
system-view
```

2. Configure BFD control mode for an IPv6 static route.

```
ipv6 route-static [ vpn-instance s-vpn-instance-name ] ipv6-address  
prefix-length interface-type interface-number next-hop-address bfd  
control-packet [ bfd-source ipv6-address ] [ preference preference ]  
[ tag tag-value ] [ description text ]
```

By default, BFD control mode for an IPv6 static route is not configured.

### Configuring BFD control mode for an IPv6 static route (indirect next hop)

1. Enter system view.

```
system-view
```

2. Configure BFD control mode for an IPv6 static route.

```
ipv6 route-static [ vpn-instance s-vpn-instance-name ] ipv6-address  
prefix-length [ vpn-instance d-vpn-instance-name ] { next-hop-address  
bfd control-packet bfd-source ipv6-address } [ preference preference ]  
[ tag tag-value ] [ description text ]
```

By default, BFD control mode for an IPv6 static route is not configured.

# Configuring single-hop echo mode

## About single-hop echo mode

With BFD echo mode enabled for a static route, the output interface sends BFD echo packets to the destination device, which loops the packets back to test the link reachability.

## Restrictions and guidelines

Do not use BFD for a static route with the output interface in spoofing state.

## Procedure

1. Enter system view.

```
system-view
```

2. Configure the source address of echo packets.

```
bfd echo-source-ipv6 ipv6-address
```

By default, the source address of echo packets is not configured.

The source address of echo packets must be a global unicast address.

For more information about this command, see *High Availability Command Reference*.

3. Configure BFD echo mode for an IPv6 static route.

```
ipv6 route-static [ vpn-instance s-vpn-instance-name ] ipv6-address  
prefix-length interface-type interface-number next-hop-address bfd  
echo-packet [ bfd-source ipv6-address ] [ preference preference ] [ tag  
tag-value ] [ description text ]
```

By default, BFD echo mode for an IPv6 static route is not configured.

The next hop IPv6 address must be a global unicast address.

# Display and maintenance commands for IPv6 static routing

Execute **display** commands in any view.

Task	Command
Display IPv6 static route next hop information.	<b>display ipv6 route-static nib</b> [ nib-id ] [ <b>verbose</b> ]
Display IPv6 static routing table information.	<b>display ipv6 route-static routing-table</b> [ <b>vpn-instance</b> vpn-instance-name ] [ ipv6-address prefix-length ]
Display IPv6 static route information.	<b>display ipv6 routing-table protocol</b> <b>static</b> [ inactive   <b>verbose</b> ]

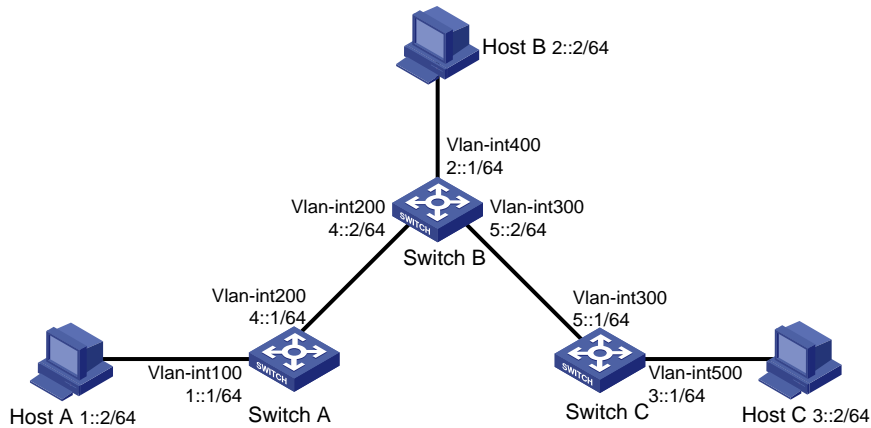
## IPv6 static routing configuration examples

### Example: Configuring basic IPv6 static route

#### Network configuration

As shown in [Figure 1](#), configure IPv6 static routes so that hosts can reach one another.

**Figure 1 Network diagram**



## Procedure

1. Configure the IPv6 addresses for all VLAN interfaces. (Details not shown.)
2. Configure IPv6 static routes:
  - # Configure a default IPv6 static route on Switch A.

```
<SwitchA> system-view
[SwitchA] ipv6 route-static :: 0 4::2
```
  - # Configure two IPv6 static routes on Switch B.

```
<SwitchB> system-view
[SwitchB] ipv6 route-static 1:: 64 4::1
[SwitchB] ipv6 route-static 3:: 64 5::1
```
  - # Configure a default IPv6 static route on Switch C.

```
<SwitchC> system-view
[SwitchC] ipv6 route-static :: 0 5::2
```
3. Configure the IPv6 addresses for all the hosts and configure the default gateway of Host A, Host B, and Host C as 1::1, 2::1, and 3::1.

## Verifying the configuration

```
# Display the IPv6 static route information on Switch A.
[SwitchA] display ipv6 routing-table protocol static

Summary count : 1

Static Routing table status : <Active>
Summary count : 1

Destination: ::/0                                     Protocol : Static
NextHop      : 4::2                                   Preference: 60
Interface   : Vlan200                                Cost       : 0
Static Routing table status : <Inactive>
Summary count : 0

# Display the IPv6 static route information on Switch B.
[SwitchB] display ipv6 routing-table protocol static

Summary count : 2
```

```
Static Routing table status : <Active>
Summary count : 2
```

```
Destination: 1::/64          Protocol : Static
NextHop      : 4::1          Preference: 60
Interface   : Vlan200        Cost      : 0
```

```
Destination: 3::/64          Protocol : Static
NextHop      : 5::1          Preference: 60
Interface   : Vlan300        Cost      : 0
```

```
Static Routing table status : <Inactive>
Summary count : 0
```

# Use the **ping** command to test the reachability.

```
[SwitchA] ping ipv6 3::1
Ping6(56 data bytes) 4::1 --> 3::1, press CTRL_C to break
56 bytes from 3::1, icmp_seq=0 hlim=62 time=0.700 ms
56 bytes from 3::1, icmp_seq=1 hlim=62 time=0.351 ms
56 bytes from 3::1, icmp_seq=2 hlim=62 time=0.338 ms
56 bytes from 3::1, icmp_seq=3 hlim=62 time=0.373 ms
56 bytes from 3::1, icmp_seq=4 hlim=62 time=0.316 ms

--- Ping6 statistics for 3::1 ---
5 packet(s) transmitted, 5 packet(s) received, 0.0% packet loss
round-trip min/avg/max/std-dev = 0.316/0.416/0.700/0.143 ms
```

## Example: Configuring BFD for IPv6 static routes (direct next hop)

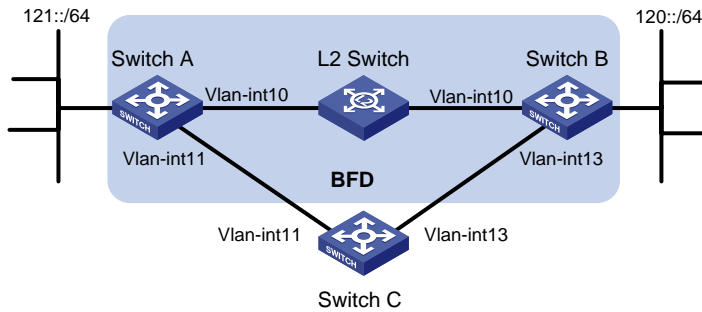
### Network configuration

As shown in [Figure 2](#):

- Configure an IPv6 static route to subnet 120::/64 on Switch A.
- Configure an IPv6 static route to subnet 121::/64 on Switch B.
- Enable BFD for both routes.
- Configure an IPv6 static route to subnet 120::/64 and an IPv6 static route to subnet 121::/64 on Switch C.

When the link between Switch A and Switch B through the Layer 2 switch fails, BFD can detect the failure immediately, and Switch A and Switch B can communicate through Switch C.

**Figure 2 Network diagram**



**Table 1 Interface and IP address assignment**

Device	Interface	IPv6 address
Switch A	Vlan-int10	12::1/64
Switch A	Vlan-int11	10::102/64
Switch B	Vlan-int10	12::2/64
Switch B	Vlan-int13	13::1/64
Switch C	Vlan-int11	10::100/64
Switch C	Vlan-int13	13::2/64

**Procedure**

1. Configure IPv6 addresses for interfaces. (Details not shown.)
2. Configure IPv6 static routes and BFD:

# Configure IPv6 static routes on Switch A and enable BFD control mode for the static route that traverses the Layer 2 switch.

```
<SwitchA> system-view
[SwitchA] interface vlan-interface 10
[SwitchA-vlan-interface10] bfd min-transmit-interval 500
[SwitchA-vlan-interface10] bfd min-receive-interval 500
[SwitchA-vlan-interface10] bfd detect-multiplier 9
[SwitchA-vlan-interface10] quit
[SwitchA] ipv6 route-static 120:: 64 vlan-interface 10 12::2 bfd control-packet
[SwitchA] ipv6 route-static 120:: 64 10::100 preference 65
[SwitchA] quit
```

# Configure IPv6 static routes on Switch B and enable BFD control mode for the static route that traverses the Layer 2 switch.

```
<SwitchB> system-view
[SwitchB] interface vlan-interface 10
[SwitchB-vlan-interface10] bfd min-transmit-interval 500
[SwitchB-vlan-interface10] bfd min-receive-interval 500
[SwitchB-vlan-interface10] bfd detect-multiplier 9
[SwitchB-vlan-interface10] quit
[SwitchB] ipv6 route-static 121:: 64 vlan-interface 10 12::1 bfd control-packet
[SwitchB] ipv6 route-static 121:: 64 vlan-interface 13 13::2 preference 65
[SwitchB] quit
```

# Configure IPv6 static routes on Switch C.

```
<SwitchC> system-view
[SwitchC] ipv6 route-static 120:: 64 13::1
[SwitchC] ipv6 route-static 121:: 64 10::102
```

## Verifying the configuration

# Display the BFD sessions on Switch A.

```
<SwitchA> display bfd session
```

```
Total Session Num: 1      Up Session Num: 1      Init Mode: Active
```

```
IPv6 Session Working Under Ctrl Mode:
```

```
Local Discr: 513          Remote Discr: 33
Source IP: 12::1
Destination IP: 12::2
Session State: Up        Interface: Vlan10
Hold Time: 2012ms
```

The output shows that the BFD session has been created.

# Display IPv6 static routes on Switch A.

```
<SwitchA> display ipv6 routing-table protocol static
```

```
Summary count : 1
```

```
Static Routing table status : <Active>
```

```
Summary count : 1
```

```
Destination: 120::/64          Protocol : Static
NextHop      : 12::2            Preference: 60
Interface   : Vlan10           Cost      : 0
```

```
Direct Routing table status : <Inactive>
```

```
Summary count : 0
```

The output shows that Switch A communicates with Switch B through VLAN-interface 10. The link over VLAN-interface 10 fails.

# Display IPv6 static routes on Switch A again.

```
<SwitchA> display ipv6 routing-table protocol static
```

```
Summary count : 1
```

```
Static Routing table status : <Active>
```

```
Summary count : 1
```

```
Destination: 120::/64          Protocol : Static
NextHop      : 10::100         Preference: 65
Interface   : Vlan11          Cost      : 0
```

```
Static Routing table status : < Inactive>
```

```
Summary count : 0
```



The output shows that Switch A communicates with Switch B through VLAN-interface 11.

## Example: Configuring BFD for IPv6 static routes (indirect next hop)

### Network configuration

As shown in [Figure 3](#):

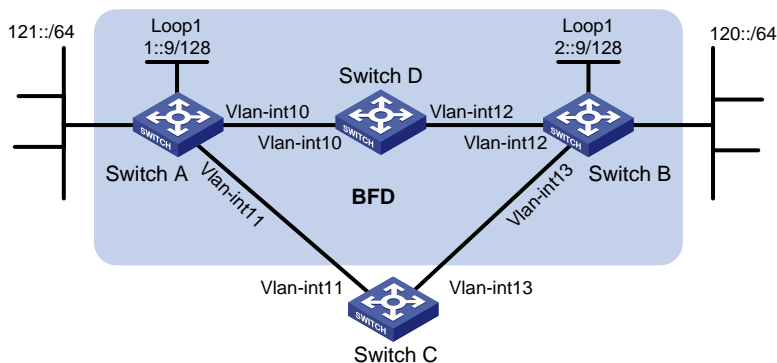
- Switch A has a route to interface Loopback 1 (2::9/128) on Switch B, and the output interface is VLAN-interface 10.
- Switch B has a route to interface Loopback 1 (1::9/128) on Switch A, and the output interface is VLAN-interface 12.
- Switch D has a route to 1::9/128, and the output interface is VLAN-interface 10. It also has a route to 2::9/128, and the output interface is VLAN-interface 12.

Configure the following:

- Configure an IPv6 static route to subnet 120::/64 on Switch A.
- Configure an IPv6 static route to subnet 121::/64 on Switch B.
- Enable BFD for both routes.
- Configure an IPv6 static route to subnet 120::/64 and an IPv6 static route to subnet 121::/64 on both Switch C and Switch D.

When the link between Switch A and Switch B through Switch D fails, BFD can detect the failure immediately and Switch A and Switch B can communicate through Switch C.

**Figure 3 Network diagram**



**Table 2 Interface and IP address assignment**

Device	Interface	IPv6 address
Switch A	Vlan-int10	12::1/64
Switch A	Vlan-int11	10::102/64
Switch A	Loop1	1::9/128
Switch B	Vlan-int12	11::2/64
Switch B	Vlan-int13	13::1/64
Switch B	Loop1	2::9/128
Switch C	Vlan-int11	10::100/64
Switch C	Vlan-int13	13::2/64

Device	Interface	IPv6 address
Switch D	Vlan-int10	12::2/64
Switch D	Vlan-int12	11::1/64

## Procedure

1. Configure IPv6 addresses for interfaces. (Details not shown.)
2. Configure IPv6 static routes and BFD:

# Configure IPv6 static routes on Switch A and enable BFD control packet mode for the IPv6 static route that traverses Switch D.

```
<SwitchA> system-view
[SwitchA] bfd multi-hop min-transmit-interval 500
[SwitchA] bfd multi-hop min-receive-interval 500
[SwitchA] bfd multi-hop detect-multiplier 9
[SwitchA] ipv6 route-static 120:: 64 2::9 bfd control-packet bfd-source 1::9
[SwitchA] ipv6 route-static 120:: 64 10::100 preference 65
[SwitchA] ipv6 route-static 2::9 128 12::2
[SwitchA] quit
```

# Configure IPv6 static routes on Switch B and enable BFD control packet mode for the static route that traverses Switch D.

```
<SwitchB> system-view
[SwitchB] bfd multi-hop min-transmit-interval 500
[SwitchB] bfd multi-hop min-receive-interval 500
[SwitchB] bfd multi-hop detect-multiplier 9
[SwitchB] ipv6 route-static 121:: 64 1::9 bfd control-packet bfd-source 2::9
[SwitchB] ipv6 route-static 121:: 64 13::2 preference 65
[SwitchB] ipv6 route-static 1::9 128 11::1
[SwitchB] quit
```

# Configure IPv6 static routes on Switch C.

```
<SwitchC> system-view
[SwitchC] ipv6 route-static 120:: 64 13::1
[SwitchC] ipv6 route-static 121:: 64 10::102
```

# Configure IPv6 static routes on Switch D.

```
<SwitchD> system-view
[SwitchD] ipv6 route-static 120:: 64 11::2
[SwitchD] ipv6 route-static 121:: 64 12::1
[SwitchD] ipv6 route-static 2::9 128 11::2
[SwitchD] ipv6 route-static 1::9 128 12::1
```

## Verifying the configuration

# Display the BFD sessions on Switch A.

```
<SwitchA> display bfd session
```

```
Total Session Num: 1      Up Session Num: 1      Init Mode: Active
```

```
IPv6 Session Working Under Ctrl Mode:
```

```
Local Discr: 513
```

```
Remote Discr: 33
```

```
Source IP: 1::9
```

```
Destination IP: 2::9
Session State: Up Interface: N/A
Hold Time: 2012ms
```

The output shows that the BFD session has been created.

# Display the IPv6 static routes on Switch A.

```
<SwitchA> display ipv6 routing-table protocol static
```

```
Summary count : 1
```

```
Static Routing table status : <Active>
```

```
Summary count : 1
```

```
Destination: 120::/64 Protocol : Static
NextHop : 2::9 Preference: 60
Interface : Vlan10 Cost : 0
```

```
Static Routing table status : <Inactive>
```

```
Summary count : 0
```

The output shows that Switch A communicates Switch B through VLAN-interface 10. The link over VLAN-interface 10 fails.

# Display IPv6 static routes on Switch A again.

```
<SwitchA> display ipv6 routing-table protocol static
```

```
Summary count : 1
```

```
Static Routing table status : <Active>
```

```
Summary count : 1
```

```
Destination: 120::/64 Protocol : Static
NextHop : 10::100 Preference: 65
Interface : Vlan11 Cost : 0
```

```
Static Routing table status : <Inactive>
```

```
Summary count : 0
```

The output shows that Switch A communicates with Switch B through VLAN-interface 11.

# Configuring an IPv6 default route

A default IPv6 route is used to forward packets that match no entry in the routing table.

A default IPv6 route can be configured in either of the following ways:

- The network administrator can configure a default route with a destination prefix of `::/0`. For more information, see "[Configuring IPv6 static routing](#)."
- Some dynamic routing protocols (such as OSPFv3, IPv6 IS-IS, and RIPng) can generate a default IPv6 route. For example, an upstream router running OSPFv3 can generate a default IPv6 route and advertise it to other routers. These routers install the default IPv6 route with the next hop being the upstream router. For more information, see the respective chapters on those routing protocols in this configuration guide.