



H3C S5120-EI Series Ethernet Switches

Layer 3 IP Routing Configuration Guide

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Preface

The H3C S5120-EI documentation set includes 13 configuration guides, which describe the software features for the H3C S5120-EI Series Ethernet Switches and guide you through the software configuration procedures. These configuration guides also provide configuration examples to help you apply software features to different network scenarios.

This preface includes:

- Audience
- Conventions
- About the H3C S5120-EI Documentation Set
- Obtaining Documentation
- Documentation Feedback

Audience

This documentation is intended for:

Network planners

Field technical support and servicing engineers

Network administrators working with the S5120-EI series

Conventions

This section describes the conventions used in this documentation set.

Command conventions

Convention	Description
Boldface	Bold text represents commands and keywords that you enter literally as shown.
<i>italic</i>	<i>Italic</i> text represents arguments that you replace with actual values.
[]	Square brackets enclose syntax choices (keywords or arguments) that are optional.
{ x y ... }	Braces enclose a set of required syntax choices separated by vertical bars, from which you select one.
[x y ...]	Square brackets enclose a set of optional syntax choices separated by vertical bars, from which you select one or none.
{ x y ... } *	Asterisk marked braces enclose a set of required syntax choices separated by vertical bars, from which you select at least one.
[x y ...] *	Asterisk marked square brackets enclose optional syntax choices separated by vertical bars, from which you may select multiple choices or none.
&<1-n>	The argument or keyword and argument combination before the ampersand (&) sign can be entered 1 to n times.
#	A line that starts with a pound (#) sign is comments.

GUI conventions

Convention	Description
< >	Button names are inside angle brackets. For example, click <OK>.
[]	Window names, menu items, data table and field names are inside square brackets. For example, pop up the [New User] window.
/	Multi-level menus are separated by forward slashes. For example, [File/Create/Folder].

Symbols

Convention	Description
 Warning	Means reader be extremely careful. Improper operation may cause bodily injury.
 Caution	Means reader be careful. Improper operation may cause data loss or damage to equipment.
 Highlight	Means an action or information that needs special attention to ensure successful configuration or good performance.
 Note	Means a complementary description.
 Tip	Means techniques helpful for you to make configuration with ease.

Network topology icons

Convention	Description
	Represents a generic network device, such as a router, switch, or firewall.
	Represents a routing-capable device, such as a router or Layer 3 switch.
	Represents a generic switch, such as a Layer 2 or Layer 3 switch, or a router that supports Layer 2 forwarding and other Layer 2 features.

About the H3C S5120-EI documentation set

Category	Documents	Purposes
Product description and specifications	Marketing brochures	Describe product specifications and benefits.
	Technology white papers	Provide an in-depth description of software features and technologies.
	Card datasheets	Describe card specifications, features, and standards.
Hardware specifications and installation	Compliance and safety manual	Provides regulatory information and the safety instructions that must be followed during installation.
	Quick start	Guides you through initial installation and setup procedures to help you quickly set up and use your device with the minimum configuration.
	Installation guide	Provides a complete guide to hardware installation and hardware specifications.
	Card manuals	Provide the hardware specifications of cards.
	H3C Cabinet Installation and Remodel Introduction	Guides you through installing and remodeling H3C cabinets.
	H3C Pluggable SFP [SFP+][XFP] Transceiver Modules Installation Guide	Guides you through installing SFP/SFP+/XFP transceiver modules.
	Adjustable Slider Rail Installation Guide	Guides you through installing adjustable slider rails to a rack.
Software configuration	H3C High-End Network Products Hot-Swappable Module Manual	Describes the hot-swappable modules available for the H3C high-end network products, their external views, and specifications.
	Configuration guides	Describe software features and configuration procedures.
	Command references	Provide a quick reference to all available commands.
Operations and maintenance	Configuration examples	Describe typical network scenarios and provide configuration examples and instructions.
	System log messages	Explains the system log messages.
	Trap messages	Explains the trap messages.
	MIB Companion	Describes the MIBs for the software release.
	Release notes	Provide information about the product release, including the version history, hardware and software compatibility matrix, version upgrade information, technical support information, and software upgrading.
	Error code reference	Explains the error codes.

Obtaining documentation

You can access the most up-to-date H3C product documentation on the World Wide Web at <http://www.h3c.com>.

Click the links on the top navigation bar to obtain different categories of product documentation:

[\[Technical Support & Documents > Technical Documents\]](#) – Provides hardware installation, software upgrading, and software feature configuration and maintenance documentation.

[\[Products & Solutions\]](#) – Provides information about products and technologies, as well as solutions.

[\[Technical Support & Documents > Software Download\]](#) – Provides the documentation released with the software version.

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IP routing overview

Routing

Routers are responsible for forwarding data packets along networks. Upon receiving a packet, a router determines the optimal path based on the destination address. When the packet reaches the last router in the path, it then forwards the packet to the intended destination host.

Routing provides the path information for guiding the forwarded packets.



Note

The term *router* in this document refers to a router in a generic sense or a Layer 3 switch.

Routing table and FIB table

Routing table

The routing table plays a key role in route selection while the FIB table plays a key role in packet forwarding. Each router maintains a routing table and a FIB table.

Routes in a routing table can be divided into the following categories by origin:

- Direct routes: Routes discovered by data link protocols, also known as interface routes.
- Static routes: Routes that are manually configured.
- Dynamic routes: Routes that are discovered dynamically by routing protocols.



Note

Dynamic routing protocol is not supported on the S5120-EI Series Ethernet Switches.

Each entry in the FIB table specifies the physical interface to which a packet should travel: the next hop (the next router), or directly to its intended destination.

Introduction to routing table

Each router maintains a local routing table, and each routing protocol maintains a protocol routing table.

- Protocol routing table:

A protocol routing table stores routes discovered by the routing protocol.

A routing protocol can redistribute and advertise routes generated by other protocols. For example, OSPF can redistribute direct routes, static routes, and IS-IS routes to the OSPF routing table, and then advertise those routes.

- Local routing table:

A local routing table stores the routes found by all protocols and delivers the optimal routes to the FIB table to guide packet forwarding. The optimal route selection is based on the routing protocol preferences and route metrics.

Contents of a routing table

A routing table includes the following key items:

- Destination address: Destination IP address or destination network.
- Network mask: Specifies, in company with the destination address, the address of the destination network. A logical AND operation between the destination address and the network mask yields the address of the destination network. For example, if the destination address is 129.102.8.10 and the mask 255.255.0.0, the address of the destination network is 129.102.0.0. A network mask is made of a certain number of consecutive 1s. It can be expressed in dotted decimal format or by the number of the 1s.
- Outbound interface: Specifies the interface through which the IP packets are to be forwarded.
- IP address of the next hop: Specifies the address of the next router on the path. If only the outbound interface is configured, its address will be the IP address of the next hop.
- Priority for the route: Routes to the same destination but having different nexthops may have different priorities and be found by various routing protocols or manually configured. The optimal route is the one with the highest priority (with the smallest metric).

Routes can be divided into two categories by destination:

- Subnet routes: The destination is a subnet.
- Host routes: The destination is a host.

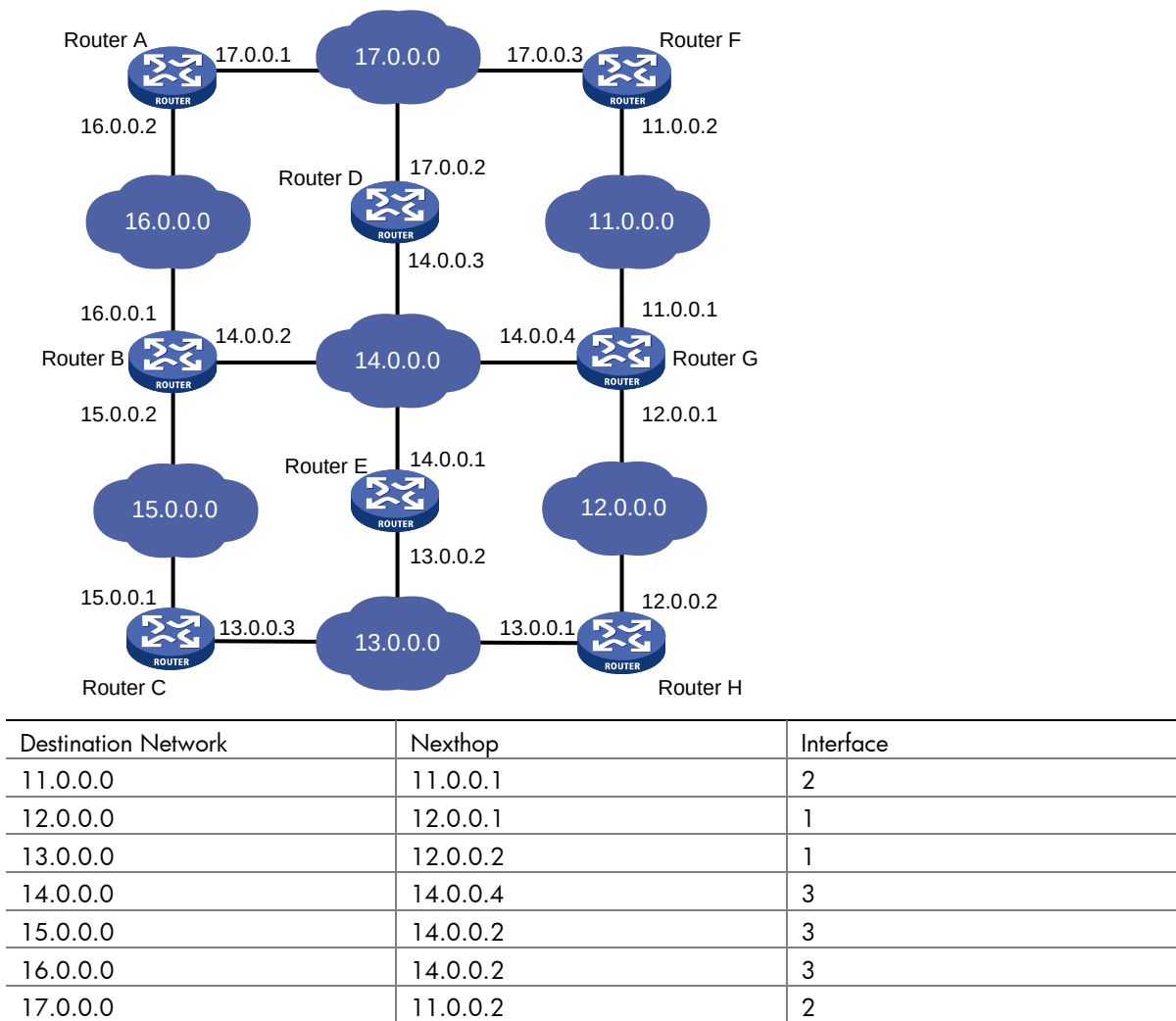
Based on whether the destination is directly connected to a given router, routes can be divided into:

- Direct routes: The destination is directly connected to the router.
- Indirect routes: The destination is not directly connected to the router.

To prevent the routing table from getting too large, you can configure a default route. All packets without matching any entry in the routing table will be forwarded through the default route.

In Figure 1, the IP address on each cloud represents the address of the network. Router G is connected to three networks and therefore has three IP addresses for its three physical interfaces. Its routing table is shown under the network topology.

Figure 1 A sample routing table



Routing protocol overview

Static routing and dynamic routing

Static routing is easier to configure and requires fewer system resources. It works well in small, stable networks with simple topologies. Its major drawback is that you must reconfigure it whenever the network topology changes; it cannot self-adjust to network changes.

Dynamic routing is based on dynamic routing protocols, which can detect network topology changes and recalculate the routes accordingly; therefore, dynamic routing is suitable for large networks. Its disadvantages are that it is difficult to configure, imposes higher requirements on the system, and consumes network resources.

Routing protocols and routing priority

Different routing protocols may find different routes to the same destination. However, not all of those routes are optimal. At a particular moment, only one protocol can uniquely determine the current optimal route to the destination. For the purpose of route selection, each routing protocol (including static routes) is assigned a priority. The route found by the routing protocol with the highest priority is preferred.

The following table lists some routing protocols and the default priorities for routes found by them:

Routing approach	Priority
DIRECT	0
STATIC	60
UNKNOWN	256



Note

- The smaller the priority value, the higher the priority.
- The priority for a direct route is always 0, which you cannot change. Any other type of routes can have their priorities manually configured.
- Each static route can be configured with a different priority.
- IPv4 and IPv6 routes have their own respective routing tables.

Displaying and maintaining a routing table

To do...	Use the command...	Remarks
Display brief information about the active routes in the routing table	display ip routing-table [verbose { begin exclude include } <i>regular-expression</i>]	Available in any view
Display information about routes to the specified destination	display ip routing-table <i>ip-address</i> [<i>mask-length</i> <i>mask</i>] [longer-match] [verbose]	Available in any view
Display information about routes with destination addresses in the specified range	display ip routing-table <i>ip-address1</i> { <i>mask-length</i> <i>mask</i> } <i>ip-address2</i> { <i>mask-length</i> <i>mask</i> } [verbose]	Available in any view
Display routes of a routing protocol	display ip routing-table protocol <i>protocol</i> [inactive verbose]	Available in any view
Display statistics about the network routing table	display ip routing-table statistics	Available in any view
Clear statistics for the routing table	reset ip routing-table statistics protocol { all <i>protocol</i> }	Available in user view
Display brief IPv6 routing table information	display ipv6 routing-table	Available in any view
Display verbose IPv6 routing table information	display ipv6 routing-table verbose	Available in any view
Display routing information for a specified destination IPv6 address	display ipv6 routing-table <i>ipv6-address</i> <i>prefix-length</i> [longer-match] [verbose]	Available in any view
Display IPv6 routing information of a routing protocol	display ipv6 routing-table protocol <i>protocol</i> [inactive verbose]	Available in any view
Display IPv6 routing statistics	display ipv6 routing-table statistics	Available in any view
Display IPv6 routing information for an IPv6 address range	display ipv6 routing-table <i>ipv6-address1</i> <i>prefix-length1</i> <i>ipv6-address2</i> <i>prefix-length2</i> [verbose]	Available in any view
Clear specified IPv6 routing table	reset ipv6 routing-table statistics protocol {	Available in

To do...	Use the command...	Remarks
statistics	all <i>protocol</i> }	user view

Static routing configuration

Introduction

Static route

A static route is manually configured, but if a network's topology is simple, you only need to configure static routes for the network to function. The proper configuration and usage of static routes can improve network performance and ensure bandwidth for important network applications.

The disadvantage of using static routes is that they cannot adapt to network topology changes. If a fault or a topological change occurs in the network, the routes will be unreachable and the network breaks. In the event of a fault or topological change, the network administrator has to modify the static routes manually.



Note

The term *router* in this document refers to a router in a generic sense or a Layer 3 switch.

Default route

If the packet's destination address fails to match any entry in the routing table, the packet is discarded.

After a default route is configured on a router, any packet whose destination IP address matches no entry in the routing table can be forwarded to a designated upstream router.

A router selects the default route only when it cannot find any matching entry in the routing table.

- If the destination address of a packet fails to match any entry in the routing table, the router selects the default route to forward the packet.
- If there is no default route and the destination address of the packet fails to match any entry in the routing table, the packet will be discarded and an ICMP packet will be sent to the source to report that the destination or the network is unreachable.

You can configure a default route with both the destination and mask being 0.0.0.0. The router forwards any packet whose destination address fails to match any entry in the routing table to the next hop of the default static route.

Application environment of static routing

Before configuring a static route, you need to know the following concepts:

- Destination address and mask:
In the **ip route-static** command, an IPv4 address is in dotted decimal format and a mask can be either in dotted decimal format or in the form of mask length (the number of consecutive 1s in the mask).
- Output interface and next hop address:

While configuring a static route, you can specify either the output interface or the next hop address depending on the specific occasion. For a NULL0 interface, if the output interface has already been configured, there is no need to configure the next hop address

In fact, all the route entries must have a next hop address. When forwarding a packet, a router first searches the routing table for the route to the destination address of the packet. The system can find the corresponding link layer address and forward the packet only after the next hop address is specified. The next hop address can not be a local interface IP address; otherwise, the route configuration will not take effect.

- Other attributes:

You can configure different preferences for different static routes so that route management policies can be applied more flexibly.

Configuring a static route

Configuration prerequisites

Before configuring a static route, complete the following tasks:

- Configure the physical parameters for related interfaces
- Configure the link-layer attributes for related interfaces
- Configure the IP addresses for related interfaces

Configuration procedure

Follow these steps to configure a static route:

To do...	Use the command...	Remarks
1. Enter system view	system-view	—
2. Configure a static route	ip route-static <i>dest-address</i> { <i>mask</i> <i>mask-length</i> } { <i>next-hop-address</i> <i>interface-type interface-number</i> [<i>next-hop-address</i>] } [preference <i>preference-value</i>] [<i>description description-text</i>]	Required By default, preference for static routes is 60 and no description information is configured.
3. Configure the default preference for static routes	ip route-static default-preference <i>default-preference-value</i>	Optional 60 by default



Note

- When configuring a static route, the static route does not take effect if you specify the next hop address first and then configure it as the IP address of a local interface.
- If you do not specify the preference when configuring a static route, the default preference will be used. Reconfiguring the default preference applies only to newly created static routes.
- If the destination IP address and mask are both configured as 0.0.0.0 with the **ip route-static** command, the route is the default route.

Detecting reachability of the static route's nexthop

If a static route fails due to a topology change or a fault, the connection will be interrupted. To improve network stability, the system needs to detect reachability of the static route's next hop and switch to a backup route once the next hop is unreachable.

Following method can be used to detect reachability of the static route's next hop.

Detecting nexthop reachability through track

If you specify the nexthop, but not the outgoing interface when configuring a static route, you can associate the static route with a track entry to check the static route validity:

- When the track entry is positive, the static route's nexthop is reachable and the static route takes effect.
- When the track entry is negative, the static route's nexthop is unreachable and the static route is invalid. For details about track, refer to *Track Configuration* in the *High Availability Configuration Guide*.

Network requirements

To detect the reachability of a static route's nexthop through a Track entry, you need to create a Track first. For detailed Track configuration procedure, refer to *Track Configuration* in the *High Availability Configuration Guide*.

Configuration procedure

Follow these steps to detect the reachability of a static route's nexthop through Track:

To do...	Use the command...	Remarks
1. Enter system view	system-view	—
2. Associate the static route with a track entry	ip route-static <i>dest-address</i> { <i>mask</i> <i>mask-length</i> } <i>next-hop-address</i> track <i>track-entry-number</i> [preference <i>preference-value</i>] [description <i>description-text</i>]	Required Not configured by default



Note

- To configure this feature for an existing static route, associate the static route with a track entry. For a non-existent static route, configure it and associate it with a Track entry.
- If a static route needs route recursion, the associated track entry must monitor the nexthop of the recursive route instead of that of the static route; otherwise, a valid route may be mistakenly considered invalid.

Displaying and maintaining static routes

To do...	Use the command...	Remarks
Display the current configuration information	display current-configuration	
Display the brief information of the IP routing table	display ip routing-table	Available in any view
Display the detailed information of the IP routing table	display ip routing-table verbose	

To do...	Use the command...	Remarks
View information of static routes	display ip routing-table protocol static [inactive verbose]	
Delete all the static routes	delete static-routes all	Available In system view

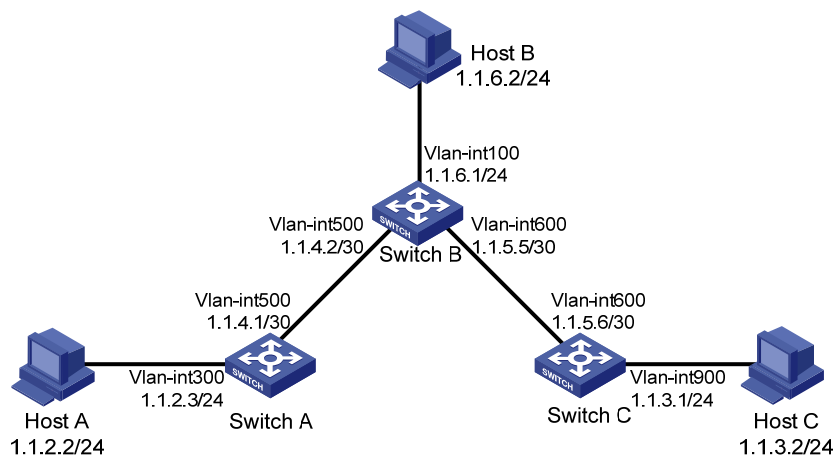
Static route configuration example

Basic static route configuration example

Network requirements

The IP addresses and masks of the switches and hosts are shown in Figure 2. Static routes are required for interconnection between any two hosts.

Figure 2 Network diagram for static route configuration



Configuration procedure

1. Configuring IP addresses for interfaces (omitted)
2. Configuring static routes

Configure a default route on Switch A.

```
<SwitchA> system-view
[SwitchA] ip route-static 0.0.0.0 0.0.0.0 1.1.4.2
```

Configure two static routes on Switch B.

```
<SwitchB> system-view
[SwitchB] ip route-static 1.1.2.0 255.255.255.0 1.1.4.1
[SwitchB] ip route-static 1.1.3.0 255.255.255.0 1.1.5.6
```

Configure a default route on Switch C

```
<SwitchC> system-view
```

```
[SwitchC] ip route-static 0.0.0.0 0.0.0.0 1.1.5.5
```

3. Configure the hosts.

The default gateways for hosts A, B and C are 1.1.2.3, 1.1.6.1 and 1.1.3.1, respectively. The configuration procedure is omitted.

4. Display the configuration.

Display the IP routing table of Switch A.

```
[SwitchA] display ip routing-table
```

Routing Tables: Public

Destinations : 7 Routes : 7

Destination/Mask	Proto	Pre	Cost	NextHop	Interface
0.0.0.0/0	Static	60	0	1.1.4.2	Vlan500
1.1.2.0/24	Direct	0	0	1.1.2.3	Vlan300
1.1.2.3/32	Direct	0	0	127.0.0.1	InLoop0
1.1.4.0/30	Direct	0	0	1.1.4.1	Vlan500
1.1.4.1/32	Direct	0	0	127.0.0.1	InLoop0
127.0.0.0/8	Direct	0	0	127.0.0.1	InLoop0
127.0.0.1/32	Direct	0	0	127.0.0.1	InLoop0

Display the IP routing table of Switch B.

```
[SwitchB] display ip routing-table
```

Routing Tables: Public

Destinations : 10 Routes : 10

Destination/Mask	Proto	Pre	Cost	NextHop	Interface
1.1.2.0/24	Static	60	0	1.1.4.1	Vlan500
1.1.3.0/24	Static	60	0	1.1.5.6	Vlan600
1.1.4.0/30	Direct	0	0	1.1.4.2	Vlan500
1.1.4.2/32	Direct	0	0	127.0.0.1	InLoop0
1.1.5.4/30	Direct	0	0	1.1.5.5	Vlan600
1.1.5.5/32	Direct	0	0	127.0.0.1	InLoop0
127.0.0.0/8	Direct	0	0	127.0.0.1	InLoop0
127.0.0.1/32	Direct	0	0	127.0.0.1	InLoop0
1.1.6.0/24	Direct	0	0	1.1.6.1	Vlan100
1.1.6.1/32	Direct	0	0	127.0.0.1	InLoop0

Use the **ping** command on Host B to check reachability to Host A, assuming Windows XP runs on the two hosts.

```
C:\Documents and Settings\Administrator>ping 1.1.2.2
```

Pinging 1.1.2.2 with 32 bytes of data:

```
Reply from 1.1.2.2: bytes=32 time=1ms TTL=255
```

```
Reply from 1.1.2.2: bytes=32 time=1ms TTL=255
```

```
Reply from 1.1.2.2: bytes=32 time=1ms TTL=255
```

Reply from 1.1.2.2: bytes=32 time=1ms TTL=255

Ping statistics for 1.1.2.2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 1ms, Average = 1ms

Use the **tracert** command on Host B to check reachability to Host A.

[HostB] tracert 1.1.2.2

Tracing route to 1.1.2.2 over a maximum of 30 hops

1	<1 ms	<1 ms	<1 ms	1.1.6.1
2	<1 ms	<1 ms	<1 ms	1.1.4.1
3	1 ms	<1 ms	<1 ms	1.1.2.2

Trace complete.

IPv6 static routing configuration

Introduction to IPv6 static routing

A static route is manually configured and works well in simple networks. Proper configuration and use can improve network performance and ensure enough bandwidth for high priority applications.

Unfortunately, static routes also have shortcomings. Any topology changes require manual configuration and modification to the corresponding static routes.



Note

The term *router* in this document refers to either a router in a generic sense or a Layer 3 switch running routing protocols.

Features of IPv6 static routes

Similar to IPv4 static routes, IPv6 static routes work well in simple IPv6 network environments.

The major difference between these two resides in the destination and next hop addresses. IPv6 static routes use IPv6 addresses whereas IPv4 static routes use IPv4 addresses.

Default IPv6 route

An IPv6 static route with a destination prefix of **::/0** is a default IPv6 route. The default route is used to forward packets that match no specific routes in the routing table.

Configuring an IPv6 static route

In small IPv6 networks, IPv6 static routes can be used to forward packets. In comparison to dynamic routes, it helps to save network bandwidth.

Configuration prerequisites

- Configuring parameters for the related interfaces
- Configuring link layer attributes for the related interfaces
- Enabling IPv6 packet forwarding
- Ensuring that the neighboring nodes are IPv6 reachable

Configuring an IPv6 static route

To do...	Use the commands...	Remarks
1. Enter system view	system-view	—
2. Configure an IPv6 static route	ipv6 route-static <i>ipv6-address prefix-length</i> [<i>interface-type interface-number</i>] <i>nexthop-address</i> [<i></i>]	Required The default preference of

To do...	Use the commands...	Remarks
	preference <i>preference-value</i>]	IPv6 static routes is 60.

Displaying and maintaining IPv6 static routes

To do...	Use the command...	Remarks
Display IPv6 static route information	display ipv6 routing-table protocol static [inactive verbose]	Available in any view
Remove all IPv6 static routes	delete ipv6 static-routes all	Available in system view



Note

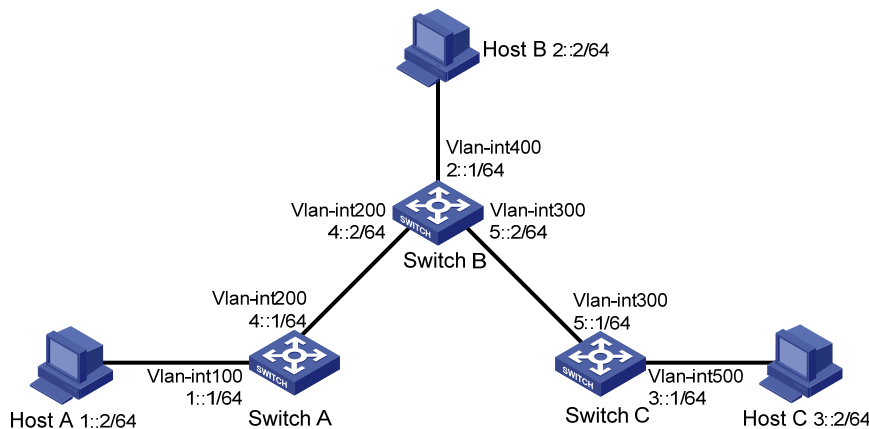
- Use the **undo ipv6 route-static** command to delete a single IPv6 static route. The **delete ipv6 static-routes all** command deletes all IPv6 static routes including the default route.
- For more information about the **display ipv6 routing-table protocol static** [**inactive** | **verbose**] command, refer to *IP Routing Table Commands* in the *Layer 3 - IP Routing Command Reference*.

IPv6 static routing configuration example

Network requirements

With IPv6 static routes configured, all hosts and switches can interact with each other.

Figure 3 Network diagram for static routes



Configuration procedure

1. Configure the IPv6 addresses of all VLAN interfaces (Omitted)
2. Configure IPv6 static routes.

Configure the default IPv6 static route on SwitchA.

```
<SwitchA> system-view
[SwitchA] ipv6 route-static :: 0 4::2
```

Configure two IPv6 static routes on SwitchB.

```
<SwitchB> system-view
[SwitchB] ipv6 route-static 1:: 64 4::1
[SwitchB] ipv6 route-static 3:: 64 5::1
```

Configure the default IPv6 static route on SwitchC.

```
<SwitchC> system-view
[SwitchC] ipv6 route-static :: 0 5::2
```

3. Configure the IPv6 addresses of hosts and gateways.

Configure the IPv6 addresses of all the hosts based upon the network diagram, configure the default gateway of Host A as 1::1, that of Host B as 2::1, and that of Host C as 3::1.

4. Display configuration information

Display the IPv6 routing table of SwitchA.

```
[SwitchA] display ipv6 routing-table
```

Routing Table :

Destinations : 5 Routes : 5

Destination	: :: /128	Protocol	: Static
NextHop	: FE80::510A:0:8D7:1	Preference	: 60
Interface	: Vlan-interface200	Cost	: 0

Destination	: ::1/128	Protocol	: Direct
NextHop	: ::1	Preference	: 0
Interface	: InLoop0	Cost	: 0

Destination	: 1:: /64	Protocol	: Direct
NextHop	: 1::1	Preference	: 0
Interface	: Vlan-interface100	Cost	: 0

Destination	: 1::1/128	Protocol	: Direct
NextHop	: ::1	Preference	: 0
Interface	: InLoop0	Cost	: 0

Destination	: FE80::/10	Protocol	: Direct
NextHop	: ::	Preference	: 0
Interface	: NULL0	Cost	: 0

Verify the connectivity with the **ping** command.

```
[SwitchA] ping ipv6 3::1
```

```
PING 3::1 : 56 data bytes, press CTRL_C to break
```

```
Reply from 3::1
bytes=56 Sequence=1 hop limit=254 time = 63 ms
Reply from 3::1
bytes=56 Sequence=2 hop limit=254 time = 62 ms
Reply from 3::1
bytes=56 Sequence=3 hop limit=254 time = 62 ms
Reply from 3::1
bytes=56 Sequence=4 hop limit=254 time = 63 ms
Reply from 3::1
bytes=56 Sequence=5 hop limit=254 time = 63 ms

--- 3::1 ping statistics ---
 5 packet(s) transmitted
 5 packet(s) received
 0.00% packet loss
round-trip min/avg/max = 62/62/63 ms
```

Obtaining support for your product

Register your product

Warranty and other service benefits start from the date of purchase, so it is important to register your product quickly to ensure you get full use of the warranty and other service benefits available to you.

Warranty and other service benefits are enabled through product registration. Register your product at **<http://www.h3cnetworks.com>**, go to **Support, Product Registration**. Support services are based on accounts that you create or have authorization to access. First time users must apply for a user name and password that provides access to a number of eSupport features including Product Registration, Repair Services, and Service Request. If you have trouble registering your product, please contact 3Com Global Services for assistance.

Purchase value-added services

To enhance response times or extend warranty benefits, contact 3Com or your authorized reseller. Value-added services like ExpressSM and GuardianSM can include 24x7 telephone technical support, software upgrades, onsite assistance or advance hardware replacement. Experienced engineers are available to manage your installation with minimal disruption to your network. Expert assessment and implementation services are offered to fill resource gaps and ensure the success of your networking projects. More information on 3Com maintenance and Professional Services is available at **<http://www.h3cnetworks.com>**.

Contact your authorized reseller or 3Com for a complete list of the value-added services available in your area.

Troubleshoot online

You will find support tools posted on the web site at **<http://www.h3cnetworks.com/>** under **Support, Knowledgebase. The Knowledgebase** helps you troubleshoot H3C products. This query-based interactive tool contains thousands of technical solutions.

Access software downloads

Software Updates are the bug fix / maintenance releases for the version of software initially purchased with the product. In order to access these Software Updates you must first register your product on the web site at <http://www.h3cnetworks.com>, go to **Support, Product Registration**.

First time users will need to apply for a user name and password. A link to software downloads can be found at <http://www.h3cnetworks.com>, under **Support, Drivers and downloads**.

Software Upgrades are the software releases that follow the software version included with your original product. In order to access upgrades and related documentation you must first purchase a service contract from 3Com or your reseller.

Telephone technical support and repair

To enable telephone support and other service benefits, you must first register your product at <http://www.h3cnetworks.com/>

Warranty and other service benefits start from the date of purchase, so it is important to register your product quickly to ensure you get full use of the warranty and other service benefits available to you.

When you contact 3Com for assistance, please have the following information ready:

- Product model name, part number, and serial number
- Proof of purchase, if you have not pre-registered your product
- A list of system hardware and software, including revision level
- Diagnostic error messages
- Details about recent configuration changes, if applicable

To send a product directly to 3Com for repair, you must first obtain a return authorization number (RMA). Products sent to 3Com, without authorization numbers clearly marked on the outside of the package, will be returned to the sender unopened, at the sender's expense. If your product is registered and under warranty, you can obtain an RMA number online at <http://www.h3cnetworks.com> under **support, Repair & Replacement Request**. First time users will need to apply for a user name and password.

Contact us

3Com offers telephone, e-mail and internet access to technical support and repair services. To access these services for your region, use the appropriate telephone number, URL or e-mail address.

Find a current directory of contact information posted on the web site at <http://www.h3cnetworks.com> under **Support, Technical Support Contact**.

Acronyms

[A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#) [H](#) [I](#) [K](#) [L](#) [M](#) [N](#) [O](#) [P](#) [Q](#) [R](#) [S](#) [T](#) [U](#) [V](#) [W](#) [X](#) [Z](#)

Acronym	Full spelling
#	Return
10GE	Ten-GigabitEthernet
A	Return
AAA	Authentication, Authorization and Accounting
ABC	Activity Based Costing
ABR	Area Border Router
AC	Alternating Current
ACK	Acknowledgement
ACL	Access Control List
ACS	Auto-Configuration Server
ADSL	Asymmetric Digital Subscriber Line
AES	Advanced Encryption Standard
AF	Assured Forwarding
AFI	Address Family Identifier (and Authority and Format Identifier)
ALG	Application Layer Gateway
AM	Accounting Management
AMB	Active Main Board
ANSI	American National Standard Institute
AP	Access Point
ARP	Address Resolution Protocol
AS	Autonomous System
ASBR	Autonomous System Boundary Router
ASCII	American Standard Code for Information Interchange
ASE	Application Service Element or Autonomous System External
ASIC	Application Specific Integrated Circuit
ASM	Any-Source Multicast
ASN	Auxiliary Signal Network
AT	Advanced Technology
AT	Adjacency Table
ATM	Asynchronous Transfer Mode

Acronym	Full spelling
AUX	Auxiliary (port)
AVF	Active Virtual Forwarder
B Return	
BAS	Broadband access server
BC	Bearer Control
BDR	Backup Designated Router
BE	Best Effort
BFD	Bidirectional Forwarding Detection
BGP	Border Gateway Protocol
BIMS	Branch Intelligent Management System
BOOTP	Bootstrap Protocol
BPDU	Bridge Protocol Data Unit
BRI	Basic Rate Interface
BSR	Bootstrap Router
BT	BitTorrent
BS	BSR State
BT	Burst Tolerance
C Return	
C-BSR	Candidate Bootstrap Router
C-RP	Candidate Rendezvous Point
CA	Call Appearance
CA	Certificate Authority
CAR	Committed Access Rate
CBS	Committed Burst Size
CBT	Core-Based Tree
CBQ	Class Based Queuing
CBR	Constant Bit Rate
CBT	Core-Based Tree
CCITT	International Telephone and Telegraph Consultative Committee
CCM	Continuity Check Message
CDP	Cisco Discovery Protocol
CE	Customer Edge, Customer Edge Device
CF-Card	Compact Flash Card
CFD	Connectivity Fault Detection
CFM	Configuration File Management

Acronym	Full spelling
CHAP	Challenge Handshake Authentication Protocol
CIDR	Classless Inter-Domain Routing
CIR	Committed Information Rate
CIST	Common and Internal Spanning Tree
CLI	Command Line Interface
CLV	Code/Length/Value
CLNP	Connectionless Network Protocol
CPE	Customer Premise Equipment
CPOS	Channelized POS
CPS	Certification Practice Statement
CPU	Central Processing Unit
CQ	Custom Queuing
CR	Carriage Return
CRC	Cyclic Redundancy Check
CRL	Certificate revocation list
CR-LSP	Constraint-based Routing LSP
CR-LDP	Constraint-based Routing LDP
CSMA/CD	Carrier Sense Multiple Access/Collision Detect
CSNP	Complete Sequence Number Packet
CSPF	Constraint Shortest Path First
CST	Common Spanning Tree
CT	Call Transfer
CV	Connectivity Verification
CVLAN	Customer Virtual Local Area Network
D Return	
DAD	Duplicate Address Detection
DAR	Deeper Application Recognition
DCE	Data Circuit-terminal Equipment
DD	Database Description
DDN	Digital Data Network
DES	Data Encryption Standard
DHCP	Dynamic Host Configuration Protocol
DiffServ	Differentiated Service
DIS	Designated Intermediate System
DLCI	Data Link Connection Identifier

Acronym	Full spelling
DLDAP	Device Link Detection Protocol
DN	Distinguished name
DNS	Domain Name System
DoD	Downstream on Demand
DoS	Denial of Service
DR	Designated Router
DSA	Digital Signature Algorithm
DSCP	Differentiated Services Code point Priority
DSP	Digital Signal Processor (and Domain Specific Part)
DSTE	DiffServ Aware TE
DTE	Data Terminal Equipment
DU	Downstream Unsolicited
DUID	DHCP Unique Identifier
DUID-LL	DUID Based Link Layer Address
D-V	Distance Vector Routing Algorithm
DVMRP	Distance Vector Multicast Routing Protocol
DWDM	Dense Wavelength Division Multiplexing
E Return	
EACL	Enhanced ACL
EAD	Endpoint Admission Defense
EAP	Extensible Authentication Protocol
EAPOL	Extensible Authentication Protocol over LAN
EAPOR	EAP over RADIUS
EBGP	External Border Gateway Protocol
EBS	Excess Burst Size
EF	Expedited Forwarding
EGP	Exterior Gateway Protocol
ES	End System
ES-IS	End System-Intermediate System
F Return	
FCoE	Fabric Channel over Ethernet
FC	Forwarding Class
FCS	Frame Check Sequence
FDB	Forwarding Database
FDDI	Fiber Distributed Data Interface

Acronym	Full spelling
FDI	Forward Defect Indication
FEC	Forwarding Equivalence Class
FFD	Fast Failure Detection
FF	Fixed filter
FG	Forwarding Group
FIB	Forwarding information base
FIFO	First In First Out
FQDN	Full Qualified Domain Name
FR	Frame Relay
FRR	Fast Reroute
FRTT	Fairness Round Trip Time
FSM	Finite State Machine
FT	Functional Test
FTP	File Transfer Protocol
G Return	
GARP	Generic Attribute Registration Protocol
GE	Gigabit Ethernet
GR	Graceful Restart
GRE	Generic Routing Encapsulation
GTS	Generic Traffic Shaping
GVRP	GARP VLAN Registration Protocol
H Return	
HA	High Availability
HABP	HW Authentication Bypass Protocol
HDLC	High-level Data Link Control
HEC	Header Error Control
HMAC	Hash-based Message Authentication Code
HO-DSP	High Order Part of Domain Specific Part
HoPE	Hierarchy of PE
HoVPN	Hierarchy of VPN
HQoS	Hierarchical Quality of Service
HSB	Hot Standby
HTTP	Hyper Text Transport Protocol
HTTPS	HTTP Security
H-VPLS	Hierarchy of VPLS

Acronym	Full spelling
HVRP	Hierarchy VLAN Register Protocol
HWTACACS	HUAWEI Terminal Access Controller Access Control System
I Return	
IA	Incoming Access or Identity Association
IANA	Internet Assigned Number Authority
IBGP	Internal Border Gateway Protocol
IBM	International Business Machines
ICMP	Internet Control Message Protocol
ICPIF	Calculated Planning Impairment Factor
ICMPv6	Internet Control Message Protocol for IPv6
ID	Identification/Identity
IDI	Initial Domain Identifier
IDP	Initial Domain Part
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IGMP	Internet Group Management Protocol
IGMP-Snooping	Internet Group Management Protocol Snooping
IGP	Interior Gateway Protocol
IIH	IS-to-IS Hello Protocol Data Unit
ILM	Incoming Label Map
ILS	Internet Locator Service
iMC	Intelligent Management Center
IN	Intelligent Network
IntServ	Integrated Service
IP	Internet Protocol
IPC	Inter-Process Communication
IPng	IP Next Generation
IPSec	IP Security
IPTN	IP Phone Telephony Network
IPv6	Internet protocol version 6
IPX	Internet Packet Exchange
IRDP	ICMP Router Discovery Protocol
IRF	Intelligent Resilient Framework or Intermediate Routing Function
IS	Intermediate System
ISATAP	Intra-Site Automatic Tunnel Addressing Protocol

Acronym	Full spelling
ISDN	Integrated Services Digital Network
IS-IS	Intermediate System-to-Intermediate System intra-domain routing information exchange protocol
ISO	International Organization for Standardization
ISP	Internet service provider
ISSU	In Service Software Upgrade
IST	Internal Spanning Tree
ITU-T	International Telecommunication Union - Telecommunication Standardization Sector
K Return	
KB	Kilobyte
KEK	Key-encrypting key
L Return	
L2TP	Layer 2 Tunneling Protocol
L2VPN	Layer 2 Virtual Private Network
L3VPN	Layer 3 Virtual Private Network
LACP	Link Aggregation Control Protocol
LACPDU	Link Aggregation Control Protocol Data Unit
LAN	Local Area Network
LAPB	Link Access Procedure, Balanced
LB	Loopback
LBM	Loopback Message
LBR	Loopback Reply
LCP	Link Control Protocol
LDAP	Lightweight Directory Access Protocol
LDP	Label Distribution Protocol
LER	Label Edge Router
LFIB	Label Forwarding Information Base
LIB	Label Information Base
LLC	Link Layer Control
LLDP	Link Layer Discovery Protocol
LLDPDU	Link Layer Discovery Protocol Data Units
LLS	Link-Local Signaling
LLSP-CDP	Link Layer Discovery Protocol-Cisco Discovery Protocol
LOC	Loss of continuity
LOG	Call Logging

Acronym	Full spelling
LR	Line Rate
LRTT	Loop Round Trip Time
LS	Link State
LSA	Link State Advertisement
LSAck	Link State Acknowledgment
LSDB	Link State Database
LSP	Label Switch Path (and Link State Packet)
LSPAGENT	Label Switched Path AGENT
LSPDU	Link State Protocol Data Unit
LSPM	Label Switch Path Management
LSR	Link State Request or Label Switching Route
LSR	Label Switch Router
LSR-ID	Label Switch Router Identity
LSU	Link State Update
LT	Linktrace
LTM	Lintrace Message
LTR	Linktrace Reply Message
LVF	Listening Virtual Forwarder
M Return	
MA	Maintenance Association
MAC	Media Access Control
MAD	Multi-Active Detection
MAFV	MAC-based Auth-Fail VLAN
MAN	Metropolitan Area Network
MaxBC	Max Bandwidth Constraints
MBGP	Multicast Border Gateway Protocol
MCE	Multi-VPN instance Customer Edge
MD	Multicast Domain, Maintenance Domain
MD5	Message-Digest 5
MDI	Medium Dependent Interface
MDS	Message-Digest Algorithm 5
MDT	Multicast Distribution Tree
MD5	Message-Digest Algorithm 5
MED	Multi-Exit Discriminator
MEP	Maintenance Association End Point

Acronym	Full spelling
MFF	MAC Forced Forwarding
MGV	Mac-based guest VLAN
MIB	Management Information Base
MIP	Maintenance Association Intermediate Point
MLD	Multicast Listener Discovery Protocol
MLD-Snooping	Multicast Listener Discovery Snooping
MMC	Meet-Me Conference
MODEM	Modulator/Demodulator
MOS	Mean Opinion Scores
MP	Multilink PPP, Maintenance Point
MP-BGP	Multiprotocol extensions for BGP-4
MPE	Middle-level PE
MP-group	Multilink Point to Point Protocol group
MPLS	Multiprotocol Label Switching
MPLSFW	Multi-protocol Label Switch Forward
MPM	Multicast Port Management
MSC	Mobile Switching Center
MSDP	Multicast Source Discovery Protocol
MSOH	Multiplex Section Overhead
MSTI	Multi-Spanning Tree Instance
MSTP	Multiple Spanning Tree Protocol
MT	Multicast Tunnel
MTBF	Mean Time Between Failure
MTI	Multicast Tunnel Interface
MTTR	Mean Time To Repair
MTU	Maximum Transmission Unit
MVRF	Multicast VPN Routing and Forwarding
N Return	
NA	Neighbor Advertisement
NAPT	Network Address Port Translation
NAPT-PT	Network Address Port Translation – Protocol Translation
NAS	Network Access Server
NAT	Net Address Translation
NBMA	Non Broadcast Multi-Access
NBT	NetBIOS over TCP/IP

Acronym	Full spelling
NCP	Network Control Protocol
ND	Neighborhood discovery
NDA	NetStream Data Analyzer
NDC	Network Data Collector
NDP	Neighbor Discovery Protocol
NET	Network Entity Title
NetBIOS	Network Basic Input/Output System
NHLFE	Next Hop Label Forwarding Entry
NLB	Network Load Balancing
NLPID	Network Layer Protocol Identifier
NLRI	Network Layer Reachability Information
NMS	Network Management Station
NPDU	Network Protocol Data Unit
NPE	Network Provider Edge
NQA	Network Quality Analyzer
NS	Neighbor Solicitation
NSAP	Network Service Access Point
NSC	NetStream Collector
N-SEL	NSAP Selector
NSR	Non-Stop Routing
NSSA	Not-So-Stubby Area
NTDP	Neighbor Topology Discovery Protocol
NTK	Need to Know
NTP	Network Time Protocol
○ Return	
OAM	Operation Administration and Maintenance
OAMPDU	OAM Protocol Data Units
OC-3	OC-3
OID	Object Identifier
OL	Optical Line
OOB	Out of Band
OS	Operating system
OSI	Open Systems Interconnection
ORF	Outbound Route Filter
OSPF	Open Shortest Path First

Acronym	Full spelling
OUI	Organizationally Unique Identifier
P Return	
P	Provider
P2MP	Point to MultiPoint
P2P	Point To Point
PAP	Password Authentication Protocol
PAFV	Port-based Auth-Fail VLAN
PBR	Policy-Based Route
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PD	Powered Device, Prefix Delegation or Pure Data
PDU	Protocol Data Unit
PE	Provider Edge, Provider Edge Device
PGV	Port-based Guest VLAN
PHP	Penultimate Hop Popping
PHY	Physical Layer
PIM	Protocol Independent Multicast
PIM-DM	Protocol Independent Multicast-Dense Mode
PIM-SM	Protocol Independent Multicast-Sparse Mode
PIR	Peak Information Rate
PKCS	Public Key Cryptography Standards
PKI	Public Key Infrastructure
PLR	Point of Local Repair
PMTU	Path MTU
PoE	Power over Ethernet
POP	Point Of Presence
POS	Packet Over SDH
PPP	Point-to-Point Protocol
PPTP	Point to Point Tunneling Protocol
PPVPN	Provider-provisioned Virtual Private Network
PQ	Priority Queuing
PRC	Primary Reference Clock
PRI	Primary Rate Interface
PS	Protection Switching
PSE	Power Sourcing Equipment

Acronym	Full spelling
PSNP	Partial Sequence Number Packet
PTMP or P2MP	Point-to-Multipoint
PTP or P2P	Point-to-Point
PVC	Permanent Virtual Channel
PW	Pseudo wires
PXE	Pre-boot Execution Environment
Q Return	
QACL	QoS/ACL
QinQ	802.1Q in 802.1Q
QoS	Quality of Service
QQIC	Querier's Query Interval Code
QRV	Querier's Robustness Variable
R Return	
RA	Registration Authority or Router Advertisement
RADIUS	Remote Authentication Dial in User Service
RALM	RADIUS Authenticated Login using MAC-address
RAM	Random-Access Memory
RD	Routing Domain
RD	Router Distinguisher
RED	Random Early Detection
RFC	Request For comments
RIB	Routing Information Base
RID	Router ID
RIP	Routing Information Protocol
RIPng	RIP next generation
RM	Route Management
RMON	Remote Monitoring
ROM	Read Only Memory
RP	Rendezvous Point
RPC	Remote Procedure Call
RPF	Reverse Path Forwarding
RPR	Resilient Packet Ring
RPT	Rendezvous Point Tree
RR	Route Reflector
RRPP	Rapid Ring Protection Protocol

Acronym	Full spelling
RRPPD	Rapid Ring Protection Protocol Data Unit
RS	Router Solicitation
RSA	Revest-Shamir-Adleman Algorithm
RSB	Reservation State Block
RSOH	Regenerator Section Overhead
RSTP	Rapid Spanning Tree Protocol
RSVP	Resource Reservation Protocol
RSVP-TE	Resource Reservation Protocol – Traffic Engineering
RT	Route Target
RTCP	Real-time Transport Control Protocol
RTE	Route Table Entry
RTP	Real-time Transport Protocol
RTP	Real-time Transport Protocol
S Return	
SA	Source Active or Suppress Advertisement
SAFI	Subsequent Address Family Identifier
SBM	Sub-network Bandwidth Management
SCEP	Simple Certificate Enrollment Protocol
SCFF	Single Choke Fairness Frame
SD	Signal Degrade
SDH	Synchronous Digital Hierarchy
SE	Shared explicit
SEL	Selector
SETS	Synchronous Equipment Timing Source
SF	Sampling Frequency
SFM	Source-Filtered Multicast
SFTP	Secure FTP
SHA1	Secure Hash Algorithm 1
Share-MDT	Share-Multicast Distribution Tree
SIP	Session Initiation Protocol
Site-of-Origin	Site-of-Origin
SLA	Service Level Agreement
SMB	Standby Main Board
SMTP	Simple Mail Transfer Protocol
SNAP	Sub Network Access Point

Acronym	Full spelling
SNMP	Simple Network Management Protocol
SNP	Sequence Number Packet
SNPA	Sub-network Points of Attachment
SOH	Section Overhead
SONET	Synchronous Optical Network
SOO	Site-of-Origin
SP	Strict Priority Queuing
SPE	Superstratum PE/Service Provider-end PE
SPF	Shortest Path First
SPT	Shortest Path Tree
SRPT	Sub-ring Packet Tunnel
SRPU	Switching and Routing Processing Unit
SSH	Secure Shell
SSM	Synchronization Status Marker
SSM	Source-Specific Multicast
ST	Shared Tree
STelnet	Secure Telnet
STM-1	SDH Transport Module -1
STM-16	SDH Transport Module -16
STM-16c	SDH Transport Module -16c
STM-4c	SDH Transport Module -4c
STP	Spanning Tree Protocol
SVC	Signaling Virtual Connection
SVLAN	Service Provider Virtual Local Area Network
Switch-MDT	Switch-Multicast Distribution Tree
SYN	Synchronize
T Return	
TA	Terminal Adapter
TACACS	Terminal Access Controller Access Control System
TDM	Time Division Multiplexing
TCP	Transmission Control Protocol
TCN	Topology Change Notification
TE	Traffic Engineering
TEDB	Traffic Engineering Database
TFTP	Trivial File Transfer Protocol

Acronym	Full spelling
TLS	Transparent LAN Service
TLV	Type-Length-Value
ToS	Type of Service
TP	Traffic Policing
TPID	Tag Protocol Identifier
TRIP	Trigger RIP
TS	Traffic Shaping
TTL	Time to Live
TTY	True Type Terminal
U Return	
U/L	Universal/Local
UDP	User Datagram Protocol
UPE	Under-layer PE or User-end PE
URL	Uniform Resource Locators
URPF	Unicast Reverse Path Forwarding
USM	User-Based Security Model
V Return	
VBR	Variable Bit Rate
VCI	Virtual Channel Identifier
VE	Virtual Ethernet
VF	Virtual Forwarder
VFS	Virtual File System
VLAN	Virtual Local Area Network
VLL	Virtual Leased Lines
VOD	Video On Demand
VoIP	Voice over IP
VOS	Virtual Operate System
VPDN	Virtual Private Dial-up Network
VPDN	Virtual Private Data Network
VPI	Virtual Path Identifier
VPLS	Virtual Private Local Switch
VPN	Virtual Private Network
VRID	Virtual Router ID
VRRP	Virtual Router Redundancy Protocol
VSI	Virtual Switch Interface

Acronym	Full spelling
VT	Virtual Tributary
VTY	Virtual Type Terminal
W Return	
WAN	Wide Area Network
WFQ	Weighted Fair Queuing
WINS	Windows Internet Naming Service
WLAN	Wireless Local Area Network
WRED	Weighted Random Early Detection
WRR	Weighted Round Robin
WTR	Wait-to-Restore
WWW	World Wide Web
X Return	
XGE	Ten-GigabitEthernet
Z Return	
ZBR	Zone Border Router

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