redistribute (IP)

To redistribute routes from one routing domain into another routing domain, use the **redistribute** command in router configuration mode. To disable redistribution, use the **no** form of this command.

redistribute *protocol* [*process-id*] {**level-1** | **level-1-2** | **level-2**} [*as-number*] [**metric** {*metric-value* | **transparent**}] [**metric-type** *type-value*] [**match** {**internal** | **external 1** | **external 2**}]
[**tag** *tag-value*] [**route-map** *map-tag*] [**subnets**]

no redistribute *protocol* [*process-id*] {**level-1** | **level-1-2** | **level-2**} [*as-number*] [**metric** {*metric-value* | **transparent**}] [**metric-type** *type-value*] [**match** {**internal** | **external 1** | **external 2**}] [**tag** *tag-value*] [**route-map** *map-tag*] [**subnets**]

Syntax Description

protocol	Source protocol from which routes are being redistributed. It can be one of the following keywords: **bgp**, **connected**, **eigrp**, **isis**, **mobile**, **ospf**, **static** [**ip**], or **rip**. The **static** [**ip**] keyword is used to redistribute IP static routes. The optional **ip** keyword is used when redistributing into the Intermediate System-to-Intermediate System (IS-IS) protocol. The **connected** keyword refers to routes that are established automatically by virtue of having enabled IP on an interface. For routing protocols such as Open Shortest Path First (OSPF) and IS-IS, these routes will be redistributed as external to the autonomous system.
process-id	(Optional) For the **bgp** or **eigrp** keyword, this is an autonomous system number, which is a 16-bit decimal number. For the **isis** keyword, this is an optional *tag* value that defines a meaningful name for a routing process. You can specify only one IS-IS process per router. Creating a name for a routing process means that you use names when configuring routing. For the **ospf** keyword, this is an appropriate OSPF process ID from which routes are to be redistributed. This identifies the routing process. This value takes the form of a nonzero decimal number. For the **rip** keyword, no *process-id* value is needed.
level-1	Specifies that for IS-IS Level 1 routes are redistributed into other IP routing protocols independently.
level-1-2	Specifies that for IS-IS both Level 1 and Level 2 routes are redistributed into other IP routing protocols.
level-2	Specifies that for IS-IS Level 2 routes are redistributed into other IP routing protocols independently.
as-number	(Optional) Autonomous system number for the redistributed route.
metric *metric-value*	(Optional) When redistributing from one OSPF process to another OSPF process on the same router, the metric will be carried through from one process to the other if no metric value is specified. When redistributing other processes to an OSPF process, the default metric is 20 when no metric value is specified.

transparent	(Optional) Causes RIP to use the routing table metric for redistributed routes as the RIP metric.
metric-type *type-value*	(Optional) For OSPF, the external link type associated with the default route advertised into the OSPF routing domain. It can be one of two values: • **1**—Type 1 external route • **2**—Type 2 external route If a **metric-type** is not specified, the Cisco IOS software adopts a Type 2 external route. For IS-IS, it can be one of two values: • **internal**—IS-IS metric that is < 63. • **external**—IS-IS metric that is > 64 < 128. The default is **internal**.
match {**internal** | **external 1** | **external 2**}	(Optional) For the criteria by which OSPF routes are redistributed into other routing domains. It can be one of the following: • **internal**—Routes that are internal to a specific autonomous system. • **external 1**—Routes that are external to the autonomous system, but are imported into OSPF as Type 1 external route. • **external 2**—Routes that are external to the autonomous system, but are imported into OSPF as Type 2 external route.
tag *tag-value*	(Optional) 32-bit decimal value attached to each external route. This is not used by OSPF itself. It may be used to communicate information between Autonomous System Boundary Routers (ASBRs). If none is specified, then the remote autonomous system number is used for routes from Border Gateway Protocol (BGP) and Exterior Gateway Protocol (EGP); for other protocols, zero (0) is used.
route-map	(Optional) Route map that should be interrogated to filter the importation of routes from this source routing protocol to the current routing protocol. If not specified, all routes are redistributed. If this keyword is specified, but no route map tags are listed, no routes will be imported.
map-tag	(Optional) Identifier of a configured route map.
subnets	(Optional) For redistributing routes into OSPF, the scope of redistribution for the specified protocol.

Command Default

Route redistribution is disabled.
protocol: No source protocol is defined.
process-id: No process ID is defined.
metric *metric-value*: 0
metric-type *type-value*: Type 2 external route
match internal | external: Internal, external 1, external 2
external: Internal
tag *tag-value*: If no value is specified, the remote autonomous system number is used for routes from

BGP and EGP; for other protocols, the default is 0.
route-map *map-tag*: If the **route-map** keyword is not entered, all routes are redistributed; if no *map-tag* value is entered, no routes are imported.
subnets: No subnets are defined.

Command Modes

Router configuration
Address family configuration

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)T	Address family configuration mode was added.
12.0(22)S	Address family support under EIGRP was added in Cisco IOS Release 12.0(22)S.
12.2(15)T	Address family support under EIGRP was added in Cisco IOS Release 12.2(15)T.
12.2(18)S	Address family support under EIGRP was added.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

Changing or disabling any keyword will not affect the state of other keywords.

A router receiving a link-state protocol with an internal metric will consider the cost of the route from itself to the redistributing router plus the advertised cost to reach the destination. An external metric only considers the advertised metric to reach the destination.

Routes learned from IP routing protocols can be redistributed at Level 1 into an attached area or at Level 2. The **level-1-2** keyword allows both Level 1 and Level 2 routes in a single command.

Redistributed routing information must be filtered by the **distribute-list out** router configuration command. This guideline ensures that only those routes intended by the administrator are passed along to the receiving routing protocol.

Whenever you use the **redistribute** or the **default-information** router configuration commands to redistribute routes into an OSPF routing domain, the router automatically becomes an ASBR. However, an ASBR does not, by default, generate a *default route* into the OSPF routing domain.

When routes are redistributed into OSPF from protocols other than OSPF or BGP, and no metric has been specified with the **metric-type** keyword and *type-value* argument, OSPF will use 20 as the default metric. When routes are redistributed into OSPF from BGP, OSPF will use 1 as the default metric. When routes are redistributed from one OSPF process to another OSPF process, Autonomous system (AS) external and not-so-stubby-area (NSSA) routes will use 20 as the default metric. When intra-area and inter-area routes are redistributed between OSPF processes, the internal OSPF metric from the redistribution source process is advertised as the external metric in the redistribution destination process. (This is the only case in which the routing table metric will be preserved when routes are redistributed into OSPF.)

When routes are redistributed into OSPF, only routes that are not subnetted are redistributed if the **subnets** keyword is not specified.

Routes configured with the **connected** keyword affected by this **redistribute** command are the routes not specified by the **network** router configuration command.

You cannot use the **default-metric** command to affect the metric used to advertise **connected** routes.

Note The **metric** value specified in the **redistribute** command supersedes the **metric** value specified using the **default-metric** command.

Default redistribution of IGPs or EGP into BGP is not allowed unless the **default-information originate** router configuration command is specified.

Examples

The following example shows how OSPF routes are redistributed into a BGP domain:

```
router bgp 109
 redistribute ospf
```

The following example causes Enhanced Interior Gateway Routing Protocol (EIGRP) routes to be redistributed into an OSPF domain:

```
router ospf 110
 redistribute eigrp
```

The following example causes the specified EIGRP process routes to be redistributed into an OSPF domain. The EIGRP-derived metric will be remapped to 100 and RIP routes to 200.

```
router ospf 109
 redistribute eigrp 108 metric 100 subnets
 redistribute rip metric 200 subnets
```

The following example configures BGP routes to be redistributed into IS-IS. The link-state cost is specified as 5, and the metric type will be set to external, indicating that it has lower priority than internal metrics.

```
router isis
 redistribute bgp 120 metric 5 metric-type external
```

In the following example, network 172.16.0.0 will appear as an external link-state advertisement (LSA) in OSPF 1 with a cost of 100 (the cost is preserved):

```
interface ethernet 0
 ip address 172.16.0.1 255.0.0.0
 ip ospf cost 100
interface ethernet 1
 ip address 10.0.0.1 255.0.0.0
!
router ospf 1
 network 10.0.0.0 0.255.255.255 area 0
 redistribute ospf 2 subnet
router ospf 2
 network 172.16.0.0 0.255.255.255 area 0
```

Related Commands

Command	Description
address-family ipv4 (BGP)	Places the router in address family configuration mode for configuring routing sessions such as BGP, RIP, or static routing sessions that use standard IPv4 address prefixes.
address-family vpnv4	Places the router in address family configuration mode for configuring routing sessions such as BGP, RIP, or static routing sessions that use standard VPNv4 address prefixes.
default-information originate (BGP)	Allows the redistribution of network 0.0.0.0 into BGP.
default-information originate (IS-IS)	Generates a default route into an IS-IS routing domain.
default-information originate (OSPF)	Generates a default route into an OSPF routing domain.
distribute-list out (IP)	Suppresses networks from being advertised in updates.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
show route-map	Displays all route maps configured or only the one specified.

route-map (IP)

To define the conditions for redistributing routes from one routing protocol into another, or to enable policy routing, use the **route-map** command in global configuration mode and the **match** and **set** command in route-map configuration modes. To delete an entry, use the **no** form of this command.

route-map *map-tag* [**permit | deny**] [*sequence-number*]

no route-map *map-tag* [**permit | deny**] [*sequence-number*]

Syntax Description

map-tag	Defines a meaningful name for the route map. The **redistribute** router configuration command uses this name to reference this route map. Multiple route maps may share the same map tag name.
permit	(Optional) If the match criteria are met for this route map, and the **permit** keyword is specified, the route is redistributed as controlled by the set actions. In the case of policy routing, the packet is policy routed. If the match criteria are not met, and the **permit** keyword is specified, the next route map with the same map tag is tested. If a route passes none of the match criteria for the set of route maps sharing the same name, it is not redistributed by that set. The **permit** keyword is the default.
deny	(Optional) If the match criteria are met for the route map and the **deny** keyword is specified, the route is not redistributed. In the case of policy routing, the packet is not policy routed, and no further route maps sharing the same map tag name will be examined. If the packet is not policy routed, the normal forwarding algorithm is used.
sequence-number	(Optional) Number that indicates the position a new route map will have in the list of route maps already configured with the same name. If given with the **no** form of this command, the position of the route map should be deleted.

Defaults

No default is available.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Use route maps to redistribute routes or to subject packets to policy routing. Both purposes are described in this section.

Redistribution

Use the **route-map** global configuration command, and the **match** and **set** route-map configuration commands, to define the conditions for redistributing routes from one routing protocol into another. Each **route-map** command has a list of **match** and **set** commands associated with it. The **match** commands specify the *match criteria*—the conditions under which redistribution is allowed for the current **route-map** command. The **set** commands specify the *set actions*—the particular redistribution actions to perform if the criteria enforced by the **match** commands are met. The **no route-map** command deletes the route map.

The **match** route-map configuration command has multiple formats. The **match** commands can be given in any order, and all **match** commands must "pass" to cause the route to be redistributed according to the *set actions* given with the **set** commands. The **no** forms of the **match** commands remove the specified match criteria.

Use route maps when you want detailed control over how routes are redistributed between routing processes. The destination routing protocol is the one you specify with the **router** global configuration command. The source routing protocol is the one you specify with the **redistribute** router configuration command. See the "Examples" section for an illustration of how route maps are configured.

When you are passing routes through a route map, a route map can have several parts. Any route that does not match at least one **match** clause relating to a **route-map** command will be ignored; that is, the route will not be advertised for outbound route maps and will not be accepted for inbound route maps. If you want to modify only some data, you must configure a second route map section with an explicit match specified.

Policy Routing

Another purpose of route maps is to enable policy routing. Use the **ip policy route-map** command, in addition to the **route-map** command, and the **match** and **set** commands to define the conditions for policy routing packets. The **match** commands specify the conditions under which policy routing occurs. The **set** commands specify the routing actions to perform if the criteria enforced by the **match** commands are met. You might want to policy route packets some way other than the obvious shortest path.

The *sequence-number* argument works as follows:

1. If no entry is defined with the supplied tag, an entry is created with the *sequence-number* argument set to 10.
2. If only one entry is defined with the supplied tag, that entry becomes the default entry for the following **route-map** command. The *sequence-number* argument of this entry is unchanged.
3. If more than one entry is defined with the supplied tag, an error message is printed to indicate that the *sequence-number* argument is required.

If the **no route-map** *map-tag* command is specified (with no *sequence-number* argument), the whole route map is deleted.

Examples

The following example redistributes Routing Information Protocol (RIP) routes with a hop count equal to 1 into Open Shortest Path First (OSPF). These routes will be redistributed into OSPF as external link-state advertisements (LSAs) with a metric of 5, metric type of Type 1, and a tag equal to 1.

```
router ospf 109
 redistribute rip route-map rip-to-ospf

route-map rip-to-ospf permit
 match metric 1
 set metric 5
 set metric-type type1
 set tag 1
```

Related Commands

Command	Description
ip policy route-map	Identifies a route map to use for policy routing on an interface.
match as-path	Matches a BGP autonomous system path access list.
match community-list	Matches a BGP community.
match interface (IP)	Distributes any routes that have their next hop out one of the interfaces specified.
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match ip next-hop	Redistributes any routes that have a next hop router address passed by one of the access lists specified.
match ip route-source	Redistributes routes that have been advertised by routers and access servers at the address specified by the access lists.
match length	Bases policy routing on the Level 3 length of a packet.
match metric (IP)	Redistributes routes with the metric specified.
match route-type (IP)	Redistributes routes of the specified type.
match tag	Redistributes routes in the routing table that match the specified tags.
set as-path	Modifies an autonomous system path for BGP routes.
set automatic-tag	Automatically computes the tag value.
set community	Sets the BGP communities attribute.
set default interface	Indicates where to output packets that pass a match clause of a route map for policy routing and have no explicit route to the destination.
set interface	Indicates where to output packets that pass a match clause of a route map for policy routing.
set ip default next-hop verify-availability	Indicates where to output packets that pass a match clause of a route map for policy routing and for which the Cisco IOS software has no explicit route to a destination.
set ip next-hop	Indicates where to output packets that pass a match clause of a route map for policy routing.
set level (IP)	Indicates where to import routes.
set local-preference	Specifies a preference value for the autonomous system path.

Command	Description
set metric (BGP, OSPF, RIP)	Sets the metric value for a routing protocol.
set metric-type	Sets the metric type for the destination routing protocol.
set next-hop	Specifies the address of the next hop.
set tag (IP)	Sets a tag value of the destination routing protocol.
set weight	Specifies the BGP weight for the routing table.
show route-map	Displays all route maps configured or only the one specified.

send-lifetime

To set the time period during which an authentication key on a key chain is valid to be sent, use the **send-lifetime** key chain key configuration command. To revert to the default value, use the **no** form of this command.

send-lifetime *start-time* {**infinite** | *end-time* | **duration** *seconds*}

no send-lifetime [*start-time* {**infinite** | *end-time* | **duration** *seconds*}]

Syntax Description

start-time	Beginning time that the key specified by the **key** command is valid to be sent. The syntax can be either of the following: *hh*:*mm*:*ss Month date year* *hh*:*mm*:*ss date Month year* *hh*—hours *mm*—minutes *ss*—seconds *Month*—first three letters of the month *date*—date (1-31) *year*—year (four digits) The default start time and the earliest acceptable date is January 1, 1993.
infinite	Key is valid to be sent from the *start-time* value on.
end-time	Key is valid to be sent from the *start-time* value until the *end-time* value. The syntax is the same as that for the *start-time* value. The *end-time* value must be after the *start-time* value. The default end time is an infinite time period.
duration *seconds*	Length of time (in seconds) that the key is valid to be sent.

Defaults

Forever (the starting time is January 1, 1993, and the ending time is infinite)

Command Modes

Key chain key configuration

Command History

Release	Modification
11.1	This command was introduced.

Usage Guidelines

Specify a *start-time* value and one of the following values: **infinite**, *end-time*, or **duration** *seconds*.

We recommend running Network Time Protocol (NTP) or some other time synchronization method if you intend to set lifetimes on keys.

If the last key expires, authentication will continue and an error message will be generated. To disable authentication, you must manually delete the last valid key.

Examples

The following example configures a key chain called trees. The key named chestnut will be accepted from 1:30 p.m. to 3:30 p.m. and be sent from 2:00 p.m. to 3:00 p.m. The key named birch will be accepted from 2:30 p.m. to 4:30 p.m. and be sent from 3:00 p.m. to 4:00 p.m. The overlap allows for migration of keys or discrepancies in the set time of the router. There is a 30-minute leeway on each side to handle time differences.

```
interface ethernet 0
 ip rip authentication key-chain trees
 ip rip authentication mode md5
!
router rip
 network 172.19.0.0
 version 2
!
key chain trees
 key 1
 key-string chestnut
 accept-lifetime 13:30:00 Jan 25 1996 duration 7200
 send-lifetime 14:00:00 Jan 25 1996 duration 3600
 key 2
 key-string birch
 accept-lifetime 14:30:00 Jan 25 1996 duration 7200
 send-lifetime 15:00:00 Jan 25 1996 duration 3600
```

Related Commands

Command	Description
accept-lifetime	Sets the time period during which the authentication key on a key chain is received as valid.
key	Identifies an authentication key on a key chain.
key chain	Enables authentication for routing protocols.
key-string (authentication)	Specifies the authentication string for a key.
show key chain	Displays authentication key information.

set automatic-tag

To automatically compute the tag value, use the **set automatic-tag** command in route-map configuration mode. To disable this function, use the **no** form of this command.

set automatic-tag

no set automatic-tag

Syntax Description

This command has no arguments or keywords.

Defaults

This command is disabled by default.

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

You must have a match clause (even if it points to a "permit everything" list) if you want to set tags.

Use the **route-map** global configuration command, and the **match** and **set** route-map configuration commands, to define the conditions for redistributing routes from one routing protocol into another. Each **route-map** command has a list of **match** and **set** commands associated with it. The **match** commands specify the *match criteria*—the conditions under which redistribution is allowed for the current **route-map** command. The **set** commands specify the *set actions*—the particular redistribution actions to perform if the criteria enforced by the **match** commands are met. The **no route-map** command deletes the route map.

The **set** route-map configuration commands specify the redistribution *set actions* to be performed when all the match criteria of a route map are met. When all match criteria are met, all set actions are performed.

Examples

The following example configures the Cisco IOS software to automatically compute the tag value for the Border Gateway Protocol (BGP) learned routes:

```
route-map tag
 match as path 10
 set automatic-tag
!
router bgp 100
 table-map tag
```

Related Commands

Command	Description
match as-path	Matches a BGP autonomous system path access list.
match community-list	Matches a BGP community.
match interface (IP)	Distributes any routes that have their next hop out one of the interfaces specified.
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match ip next-hop	Redistributes any routes that have a next hop router address passed by one of the access lists specified.
match ip route-source	Redistributes routes that have been advertised by routers and access servers at the address specified by the access lists.
match metric (IP)	Redistributes routes with the metric specified.
match route-type (IP)	Redistributes routes of the specified type.
match tag	Redistributes routes in the routing table that match the specified tags.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
set as-path	Modifies an autonomous system path for BGP routes.
set community	Sets the BGP communities attribute.
set level (IP)	Indicates where to import routes.
set local-preference	Specifies a preference value for the autonomous system path.
set metric (BGP, OSPF, RIP)	Sets the metric value for a routing protocol.
set metric-type	Sets the metric type for the destination routing protocol.
set next-hop	Specifies the address of the next hop.
set tag (IP)	Sets a tag value of the destination routing protocol.
set weight	Specifies the BGP weight for the routing table.
show route-map	Displays all route maps configured or only the one specified.

set default interface

To indicate where to output packets that pass a match clause of a route map for policy routing and have no explicit route to the destination, use the **set default interface** command in route-map configuration mode. To delete an entry, use the **no** form of this command.

set default interface *interface-type interface-number* [*...interface-type interface-number*]

no set default interface *interface-type interface-number* [*...interface-type interface-number*]

Syntax Description

interface-type	Interface type, used with the interface number, to which packets are output.
interface-number	Interface number, used with the interface type, to which packets are output.

Defaults

This command is disabled by default.

Command Modes

Route-map configuration

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

An ellipsis (...) in the command syntax indicates that your command input can include multiple values for the *interface-type interface-number* arguments.

Use this command to provide certain users a different default route. If the Cisco IOS software has no explicit route for the destination, then it routes the packet to this interface. The first interface specified with the **set default interface** command that is up is used. The optionally specified interfaces are tried in turn.

Use the **ip policy route-map** interface configuration command, the **route-map** global configuration command, and the **match** and **set** route-map configuration commands to define the conditions for policy routing packets. The **ip policy route-map** command identifies a route map by name. Each **route-map** command has a list of **match** and **set** commands associated with it. The **match** commands specify the *match criteria*—the conditions under which policy routing occurs. The **set** commands specify the *set actions*—the particular routing actions to perform if the criteria enforced by the **match** commands are met.

The set clauses can be used in conjunction with one another. They are evaluated in the following order:

1. **set ip next-hop**
2. **set interface**
3. **set ip default next-hop**
4. **set default interface**

Examples

In the following example, packets that have a Level 3 length of 3 to 50 bytes and for which the software has no explicit route to the destination are output to Ethernet interface 0:

```
interface serial 0
 ip policy route-map brighton
!
route-map brighton
 match length 3 50
 set default interface ethernet 0
```

Related Commands

Command	Description
ip policy route-map	Identifies a route map to use for policy routing on an interface.
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match length	Bases policy routing on the Level 3 length of a packet.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
set interface	Indicates where to output packets that pass a match clause of route map for policy routing.
set ip default next-hop verify-availability	Indicates where to output packets that pass a match clause of a route map for policy routing and for which the Cisco IOS software has no explicit route to a destination.
set ip next-hop	Indicates where to output packets that pass a match clause of a route map for policy routing.

set interface

To indicate where to output packets that pass a match clause of a route map for policy routing, use the **set interface** command in route-map configuration mode. To delete an entry, use the **no** form of this command.

set interface *interface-type interface-number* [*...interface-type interface-number*]

no set interface *interface-type interface-number* [*...interface-type interface-number*]

Syntax Description

interface-type	Interface type, used with the interface number, to which packets are output.
interface-number	Interface number, used with the interface type, to which packets are output.

Defaults

This command is disabled by default.

Command Modes

Route-map configuration

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

An ellipsis (...) in the command syntax indicates that your command input can include multiple values for the *interface-type interface-number* arguments.

Use the **ip policy route-map** interface configuration command, the **route-map** global configuration command, and the **match** and **set** route-map configuration commands to define the conditions for policy routing packets. The **ip policy route-map** command identifies a route map by name. Each **route-map** command has a list of **match** and **set** commands associated with it. The **match** commands specify the *match criteria*—the conditions under which policy routing occurs. The **set** commands specify the *set actions*—the particular routing actions to perform if the criteria enforced by the **match** commands are met.

If the first interface specified with the **set interface** command is down, the optionally specified interfaces are tried in turn.

The set clauses can be used in conjunction with one another. They are evaluated in the following order:

1. **set ip next-hop**
2. **set interface**
3. **set ip default next-hop**
4. **set default interface**

A useful next hop implies an interface. As soon as a next hop and an interface are found, the packet is routed.

Specifying the **set interface null 0** command is a way to write a policy that the packet be dropped and an “unreachable” message be generated.

Note The **set interface** command is supported only over a point-to-point link, unless a route-cache entry exists using the same interface specified in the **set interface** command in the route map.

Examples

In the following example, packets with a Level 3 length of 3 to 50 bytes are output to Ethernet interface 0:

```
interface serial 0
 ip policy route-map testing
!
route-map testing
 match length 3 50
 set interface ethernet 0
```

Related Commands

Command	Description
ip policy route-map	Identifies a route map to use for policy routing on an interface.
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match length	Bases policy routing on the Level 3 length of a packet.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
set default interface	Indicates where to output packets that pass a match clause of a route map for policy routing and have no explicit route to the destination.
set ip default next-hop verify-availability	Indicates where to output packets that pass a match clause of a route map for policy routing and for which the Cisco IOS software has no explicit route to a destination.
set ip next-hop	Indicates where to output packets that pass a match clause of a route map for policy routing.

set ip default next-hop

To indicate where to output packets that pass a match clause of a route map for policy routing and for which the Cisco IOS software has no explicit route to a destination, use the **set ip default next-hop** command in route-map configuration mode. To delete an entry, use the **no** form of this command.

set ip default next-hop *ip-address* [*...ip-address*]

no set ip default next-hop *ip-address* [*...ip-address*]

Syntax Description

ip-address	IP address of the next hop to which packets are output.The next hop must be an adjacent router.

Defaults

This command is disabled by default.

Command Modes

Route-map configuration

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

An ellipsis (...) in the command syntax indicates that your command input can include multiple values for the *ip-address* argument.

Use this command to provide certain users a different default route. If the software has no explicit route for the destination in the packet, then it routes the packet to this next hop. The first next hop specified with the **set ip default next-hop** command needs to be adjacent to the router. The optional specified IP addresses are tried in turn.

Use the **ip policy route-map** interface configuration command, the **route-map** global configuration command, and the **match** and **set** route-map configuration commands to define the conditions for policy routing packets. The **ip policy route-map** command identifies a route map by name. Each **route-map** command has a list of **match** and **set** commands associated with it. The **match** commands specify the *match criteria*—the conditions under which policy routing occurs. The **set** commands specify the *set actions*—the particular routing actions to perform if the criteria enforced by the **match** commands are met.

The set clauses can be used in conjunction with one another. They are evaluated in the following order:

1. **set ip next-hop**
2. **set interface**
3. **set ip default next-hop**
4. **set default interface**

Note The **set ip next-hop** and **set ip default next-hop** are similar commands but have a different order of operations. Configuring the **set ip next-hop** command causes the system to use policy routing first and then use the routing table. Configuring the **set ip default next-hop** command causes the system to use the routing table first and then policy route the specified next hop.

Examples

The following example provides two sources with equal access to two different service providers. Packets arriving on asynchronous interface 1 from the source 10.1.1.1 are sent to the router at 172.16.6.6 if the software has no explicit route for the destination of the packet. Packets arriving from the source 10.2.2.2 are sent to the router at 172.17.7.7 if the software has no explicit route for the destination of the packet. All other packets for which the software has no explicit route to the destination are discarded.

```
access-list 1 permit ip 10.1.1.1 0.0.0.0
access-list 2 permit ip 10.2.2.2 0.0.0.0
!
interface async 1
 ip policy route-map equal-access
!
route-map equal-access permit 10
 match ip address 1
 set ip default next-hop 172.16.6.6
route-map equal-access permit 20
 match ip address 2
 set ip default next-hop 172.17.7.7
 route-map equal-access permit 30
 set default interface null0
```

Related Commands

Command	Description
ip policy route-map	Identifies a route map to use for policy routing on an interface.
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match length	Bases policy routing on the Level 3 length of a packet.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
set default interface	Indicates where to output packets that pass a match clause of a route map for policy routing and have no explicit route to the destination.
set interface	Indicates where to output packets that pass a match clause of route map for policy routing.
set ip next-hop	Indicates where to output packets that pass a match clause of a route map for policy routing.

set ip default next-hop verify-availability

To configure a router, for policy routing, to check the CDP database for the availability of an entry for the default next hop that is specified by the **set ip default next-hop** command, use the **set ip default next-hop verify-availability** route map configuration command. To disable this function, use the no form of this command.

set ip default next-hop verify-availability

no set ip default next-hop verify-availability

Syntax Description

This command has no arguments or keywords.

Defaults

This command is disabled by default.

Command Modes

Route-map configuration

Command History

Release	Modification
12.1(1.05)T	This command was introduced.

Usage Guidelines

Use this command to force the configured policy routing to check the CDP database to determine if an entry is available for the next hop that is specified by the **set ip default next-hop** command. This command is used to prevent traffic from being "black holed" if the configured next hop becomes unavailable.

Examples

The following example :

```
Router(config-route-map)# set ip default next-hop verify-availability
```

Related Commands

Command	Description
set ip next-hop verify-availability	Configures policy routing to verify if the next hops of a route map are CDP neighbors before policy routing to those next hops.
set ip next-hop	Indicates where to output packets that pass a match clause of a route map for policy routing.

set ip next-hop

To indicate where to output packets that pass a match clause of a route map for policy routing, use the **set ip next-hop** command in route-map configuration mode. To delete an entry, use the **no** form of this command.

set ip next-hop *ip-address* [*...ip-address*]

no set ip next-hop *ip-address* [*...ip-address*]

Syntax Description

ip-address	IP address of the next hop to which packets are output. The next hop must be an adjacent router.

Defaults

This command is disabled by default.

Command Modes

Route-map configuration

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

An ellipsis (...) in the command syntax indicates that your command input can include multiple values for the *ip-address* argument.

Use the **ip policy route-map** interface configuration command, the **route-map** global configuration command, and the **match** and **set** route-map configuration commands to define the conditions for policy routing packets. The **ip policy route-map** command identifies a route map by name. Each **route-map** command has a list of **match** and **set** commands associated with it. The **match** commands specify the *match criteria*—the conditions under which policy routing occurs. The **set** commands specify the *set actions*—the particular routing actions to perform if the criteria enforced by the **match** commands are met.

If the interface associated with the first next hop specified with the **set ip next-hop** command is down, the optionally specified IP addresses are tried in turn.

The set clauses can be used in conjunction with one another. They are evaluated in the following order:

1. **set ip next-hop**
2. **set interface**
3. **set ip default next-hop**
4. **set default interface**

Note The **set ip next-hop** and **set ip default next-hop** are similar commands but have a different order of operations. Configuring the **set ip next-hop** command causes the system to use policy routing first and then use the routing table. Configuring the **set ip default next-hop** command causes the system to use the routing table first and then policy route the specified next hop.

Examples

In the following example, packets with a Level 3 length of 3 to 50 bytes are output to the router at IP address 10.14.2.2:

```
interface serial 0
 ip policy route-map thataway
!
route-map thataway
 match length 3 50
 set ip next-hop 10.14.2.2
```

Related Commands

Command	Description
ip policy route-map	Identifies a route map to use for policy routing on an interface.
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match length	Bases policy routing on the Level 3 length of a packet.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
set default interface	Indicates where to output packets that pass a match clause of a route map for policy routing and have no explicit route to the destination.
set interface	Indicates where to output packets that pass a match clause of route map for policy routing.
set ip default next-hop verify-availability	Indicates where to output packets that pass a match clause of a route map for policy routing and for which the Cisco IOS software has no explicit route to a destination.

set ip next-hop verify-availability

To configure policy routing to verify if the next hops of a route map are Cisco Discovery Protocol (CDP) neighbors before policy routing to those next hops, use the **set ip next-hop verify-availability** command in route-map configuration mode.

set ip next-hop verify-availability

Syntax Description

This command has no arguments or keywords.

Defaults

This command is disabled by default.

Command Modes

Route-map configuration

Command History

Release	Modification
12.0(3)T	This command was introduced.

Usage Guidelines

One example of when you might configure this command is if you have some traffic traveling via a satellite to a next hop. It might be prudent to verify that the next hop is reachable before trying to policy route to it.

This command has the following restrictions:

- It causes some performance degradation.
- CDP must be configured on the interface.
- The next hop must be a Cisco device with CDP enabled.
- It is supported in process switching and Cisco express forwarding (CEF) policy routing, but not available in dCEF, due to the dependency of the CDP neighbor database.

If the router is policy routing packets to the next hop and the next hop happens to be down, the router will try unsuccessfully to use Address Resolution Protocol (ARP) for the next hop (which is down). This behavior will continue forever.

To prevent this situation, use this command to configure the router to first verify that the next hops of the route map are the CDP neighbors of the router before routing to those next hops.

This command is optional because some media or encapsulations do not support CDP, or it may not be a Cisco device that is sending the router traffic.

If this command is set and the next hop is not a CDP neighbor, the router looks to the subsequent next hop, if there is one. If there is none, the packets simply are not policy routed.

If this command is not set, the packets are either successfully policy routed or remain forever unrouted.

If you want to selectively verify availability of only some next hops, you can configure different route map entries (under the same route map name) with different criteria (using access list matching or packet size matching), and use the **set ip next-hop verify-availability** command selectively.

Examples

The following example configures Policy Routing with CEF. Policy routing is configured to verify that next hop 50.0.0.8 of the route map named test is a CDP neighbor before the router tries to policy route to it.

If the first packet is being policy routed via route map test sequence 10, the subsequent packets of the same flow always take the same route map test sequence 10, not route map test sequence 20, because they all match or pass the access list 1 check.

```
ip cef
interface ethernet0/0/1
 ip route-cache flow
 ip policy route-map test
route-map test permit 10
 match ip address 1
 set ip precedence priority
 set ip next-hop 50.0.0.8
 set ip next-hop verify-availability
route-map test permit 20
```

Related Commands

Command	Description
show route-map ipc	Displays counts of the one-way route map IPC messages sent from the RP to the VIP when NetFlow policy routing is configured.

set ip precedence

To set the precedence value in the IP header, use the **set ip precedence** command in route-map configuration mode. To instruct the router to leave the precedence value alone, use the **no** form of this command.

set ip precedence *number* | *name*

no set ip precedence

Syntax Description

number | *name*	Number or name that sets the precedence bits in the IP header. The number and its corresponding name are as follows, from least important to most important:

Number	Name
0	**routine**
1	**priority**
2	**immediate**
3	**flash**
4	**flash-override**
5	**critical**
6	**internet**
7	**network**

Defaults

This command has no default behavior.

Command Modes

Route-map configuration

Command History

Release	Modification
11.0	This command was introduced.

Usage Guidelines

You can set the precedence using either a number or the corresponding name.

Note Setting the precedence bit affects weighted fair queueing (WFQ). It acts as a multiplier on the WFQ weighting, using a formula of 4096 divided by the IP Precedence value plus 1. For more information, see the **fair-queue** command.

The way the network gives priority (or some type of expedited handling) to the marked traffic is through the application of WFQ or weighted random early detection (WRED) at points downstream in the network. Typically, you would set IP precedence at the edge of the network (or administrative domain) and have queueing act on it thereafter. WFQ can speed up handling for high precedence traffic at congestion points. WRED ensures that high precedence traffic has lower loss rates than other traffic during times of congestion.

The mapping from keywords such as **routine** and **priority** to a precedence value is useful only in some instances. That is, the use of the precedence bit is evolving. The customer can define the meaning of a precedence value by enabling other features that use the value. In the case of Cisco high-end Internet quality of service (QoS), IP precedences can be used to establish classes of service that do not necessarily correspond numerically to better or worse handling in the network. For example, IP Precedence 2 can be given 90 percent of the bandwidth on output links in the network, and IP Precedence 6 can be given 5 percent using the distributed weight fair queueing (DWFQ) implementation on the Versatile Interface Processors (VIPs).

Use the **route-map** global configuration command with **match** and **set** route-map configuration commands to define the conditions for redistributing routes from one routing protocol into another, or for policy routing. Each **route-map** command has a list of **match** and **set** commands associated with it. The match commands specify the match criteria—the conditions under which redistribution or policy routing is allowed for the current **route-map** command. The **set** commands specify the set actions—the particular redistribution or policy routing actions to perform if the criteria enforced by the match commands are met. The **no route-map** command deletes the route map.

The **set** route-map configuration commands specify the redistribution set actions to be performed when all the match criteria of a route map are met. When all match criteria are met, all set actions are performed.

Examples

The following example sets the IP Precedence value to 5 (critical) for packets that pass the route map match:

```
interface serial 0
 ip policy route-map texas
!
route-map texas
 match length 68 128
 set ip precedence 5
```

Related Commands

Command	Description
fair-queue (WFQ)	Enables WFQ for an interface.
ip policy route-map	Identifies a route map to use for policy routing on an interface.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.

set level (IP)

To indicate where to import routes, use the **set level** command in route-map configuration mode. To delete an entry, use the **no** form of this command.

set level {**level-1** | **level-2** | **level-1-2** | **stub-area** | **backbone**}

no set level {**level-1** | **level-2** | **level-1-2** | **stub-area** | **backbone**}

Syntax Description

level-1	Imports routes into a Level 1 area.
level-2	Imports routes into a Level 2 subdomain.
level-1-2	Imports routes into Level 1 and Level 2.
stub-area	Imports routes into an Open Shortest Path First (OSPF) not-so-stubby area (NSSA) area.
backbone	Imports routes into an OSPF backbone area.

Defaults

This command is disabled by default.

For Intermediate System-to-Intermediate System (IS-IS) destinations, the default value is **level-2**. For OSPF destinations, the default value is **backbone**.

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Use the **route-map** global configuration command, and the **match** and **set** route-map configuration commands, to define the conditions for redistributing routes from one routing protocol into another. Each **route-map** command has a list of **match** and **set** commands associated with it. The **match** commands specify the *match criteria*—the conditions under which redistribution is allowed for the current **route-map** command. The **set** commands specify the *set actions*—the particular redistribution actions to perform if the criteria enforced by the **match** commands are met. The **no route-map** command deletes the route map.

The **set** route-map configuration commands specify the redistribution *set actions* to be performed when all the match criteria of a route map are met. When all match criteria are met, all set actions are performed.

Examples

In the following example, routes will be imported into the Level 1 area:

```
route-map name
 set level level-1
```

Related Commands

Command	Description
match as-path	Matches a BGP autonomous system path access list.
match community-list	Matches a BGP community.
match interface (IP)	Distributes any routes that have their next hop out one of the interfaces specified.
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match ip next-hop	Redistributes any routes that have a next hop router address passed by one of the access lists specified.
match ip route-source	Redistributes routes that have been advertised by routers and access servers at the address specified by the access lists.
match metric (IP)	Redistributes routes with the metric specified.
match route-type (IP)	Redistributes routes of the specified type.
match tag	Redistributes routes in the routing table that match the specified tags.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
set as-path	Modifies an autonomous system path for BGP routes.
set community	Sets the BGP communities attribute.
set local-preference	Specifies a preference value for the autonomous system path.
set metric (BGP, OSPF, RIP)	Sets the metric value for a routing protocol.
set metric-type	Sets the metric type for the destination routing protocol.
set next-hop	Specifies the address of the next hop.
set tag (IP)	Sets a tag value of the destination routing protocol.
set weight	Specifies the BGP weight for the routing table.
show route-map	Displays all route maps configured or only the one specified.

set local-preference

To specify a preference value for the autonomous system path, use the **set local-preference** command in route-map configuration mode. To delete an entry, use the **no** form of this command.

set local-preference *number-value*

no set local-preference *number-value*

Syntax Description

number-value	Preference value. An integer from 0 to 4294967295.

Defaults

Preference value of 100

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

The preference is sent only to all routers in the local autonomous system.

You must have a match clause (even if it points to a "permit everything" list) if you want to set tags.

Use the **route-map** global configuration command, and the **match** and **set** route-map configuration commands, to define the conditions for redistributing routes from one routing protocol into another. Each **route-map** command has a list of **match** and **set** commands associated with it. The **match** commands specify the *match criteria*—the conditions under which redistribution is allowed for the current **route-map** command. The **set** commands specify the *set actions*—the particular redistribution actions to perform if the criteria enforced by the **match** commands are met. The **no route-map** command deletes the route map.

The **set** route-map configuration commands specify the redistribution *set actions* to be performed when all the match criteria of a route map are met. When all match criteria are met, all set actions are performed.

You can change the default preference value with the **bgp default local-preference** command.

Examples

The following example sets the local preference to 100 for all routes that are included in access list 1:

```
route-map map-preference
 match as-path 1
 set local-preference 100
```

Related Commands

Command	Description
bgp default local-preference	Changes the default local preference value.
match as-path	Matches a BGP autonomous system path access list.
match community-list	Matches a BGP community.
match interface (IP)	Distributes any routes that have their next hop out one of the interfaces specified.
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match ip next-hop	Redistributes any routes that have a next hop router address passed by one of the access lists specified.
match ip route-source	Redistributes routes that have been advertised by routers and access servers at the address specified by the access lists.
match metric (IP)	Redistributes routes with the metric specified.
match route-type (IP)	Redistributes routes of the specified type.
match tag	Redistributes routes in the routing table that match the specified tags.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
set as-path	Modifies an autonomous system path for BGP routes.
set automatic-tag	Automatically computes the tag value.
set community	Sets the BGP communities attribute.
set level (IP)	Indicates where to import routes.
set metric (BGP, OSPF, RIP)	Sets the metric value for a routing protocol.
set metric-type	Sets the metric type for the destination routing protocol.
set next-hop	Specifies the address of the next hop.
set origin (BGP)	Sets the BGP origin code.
set tag (IP)	Sets a tag value of the destination routing protocol.
set weight	Specifies the BGP weight for the routing table.

set metric (BGP, OSPF, RIP)

To set the metric value for a routing protocol, use the **set metric** command in route-map configuration mode. To return to the default metric value, use the **no** form of this command.

set metric *metric-value*

no set metric *metric-value*

Syntax Description

metric-value	Metric value; an integer from –294967295 to 294967295. This argument applies to all routing protocols except Interior Gateway Routing Protocol (IGRP) and Enhanced Interior Gateway Routing Protocol (EIGRP).

Defaults

The dynamically learned metric value.

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

We recommend that you consult your Cisco technical support representative before changing the default value.

Use the **route-map** global configuration command, and the **match** and **set** route-map configuration commands, to define the conditions for redistributing routes from one routing protocol into another. Each **route-map** command has a list of **match** and **set** commands associated with it. The **match** commands specify the *match criteria*—the conditions under which redistribution is allowed for the current **route-map** command. The **set** commands specify the *set actions*—the particular redistribution actions to perform if the criteria enforced by the **match** commands are met. The **no route-map** command deletes the route map.

The **set** route-map configuration commands specify the redistribution *set actions* to be performed when all the match criteria of a route map are met. When all match criteria are met, all set actions are performed.

Examples

The following example sets the metric value for the routing protocol to 100:

```
route-map set-metric
 set metric 100
```

Related Commands

Command	Description
match as-path	Matches a BGP autonomous system path access list.
match community-list	Matches a BGP community.
match interface (IP)	Distributes any routes that have their next hop out one of the interfaces specified.
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match ip next-hop	Redistributes any routes that have a next hop router address passed by one of the access lists specified.
match ip route-source	Redistributes routes that have been advertised by routers and access servers at the address specified by the access lists.
match metric (IP)	Redistributes routes with the metric specified.
match route-type (IP)	Redistributes routes of the specified type.
match tag	Redistributes routes in the routing table that match the specified tags.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
set as-path	Modifies an autonomous system path for BGP routes.
set community	Sets the BGP communities attribute.
set level (IP)	Indicates where to import routes.
set local-preference	Specifies a preference value for the autonomous system path.
set metric-type	Sets the metric type for the destination routing protocol.
set next-hop	Specifies the address of the next hop.
set tag (IP)	Sets a tag value of the destination routing protocol.
set weight	Specifies the BGP weight for the routing table.
show route-map	Displays all route maps configured or only the one specified.

set metric-type

To set the metric type for the destination routing protocol, use the **set metric-type** command in route-map configuration mode. To return to the default, use the **no** form of this command.

set metric-type {**internal** | **external** | **type-1** | **type-2**}

no set metric-type {**internal** | **external** | **type-1** | **type-2**}

Syntax Description

internal	Intermediate System-to-Intermediate System (IS-IS) internal metric, or IGP metric as the MED for BGP.
external	IS-IS external metric.
type-1	Open Shortest Path First (OSPF) external Type 1 metric.
type-2	OSPF external Type 2 metric.

Defaults

This command is disabled by default.

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Use the **route-map** global configuration command with **match** and **set** route-map configuration commands to define the conditions for redistributing routes from one routing protocol into another. Each **route-map** command has a list of **match** and **set** commands associated with it. The **match** commands specify the *match criteria*—the conditions under which redistribution is allowed for the current **route-map** command. The **set** commands specify the *set actions*—the particular redistribution actions to perform if the criteria enforced by the **match** commands are met. The **no route-map** command deletes the route map.

The **set** route-map configuration commands specify the redistribution *set actions* to be performed when all the match criteria of a route map are met. When all match criteria are met, all set actions are performed.

Note This command is not supported for redistributing routes into Border Gateway Protocol (BGP).

Examples

The following example sets the metric type of the destination protocol to OSPF external Type 1:

```
route-map map-type
 set metric-type type-1
```

Related Commands

Command	Description
match as-path	Matches a BGP autonomous system path access list.
match community-list	Matches a BGP community.
match interface (IP)	Distributes any routes that have their next hop out one of the interfaces specified.
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match ip next-hop	Redistributes any routes that have a next hop router address passed by one of the access lists specified.
match ip route-source	Redistributes routes that have been advertised by routers and access servers at the address specified by the access lists.
match metric (IP)	Redistributes routes with the metric specified.
match route-type (IP)	Redistributes routes of the specified type.
match tag	Redistributes routes in the routing table that match the specified tags.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
set as-path	Modifies an autonomous system path for BGP routes.
set automatic-tag	Automatically computes the tag value.
set community	Sets the BGP communities attribute.
set level (IP)	Indicates where to import routes.
set local-preference	Specifies a preference value for the autonomous system path.
set metric (BGP, OSPF, RIP)	Sets the metric value for a routing protocol.
set next-hop	Specifies the address of the next hop.
set tag (IP)	Sets a tag value of the destination routing protocol.
set weight	Specifies the BGP weight for the routing table.
show route-map	Displays all route maps configured or only the one specified.

set next-hop

To specify the address of the next hop, use the **set next-hop** command in route-map configuration mode. To delete an entry, use the **no** form of this command.

set next-hop *next-hop*

no set next-hop *next-hop*

Syntax Description

next-hop	IP address of the next hop router.

Defaults

Default next hop address.

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

You must have a match clause (even if it points to a "permit everything" list) if you want to set tags.

Use the **route-map** global configuration command, and the **match** and **set** route-map configuration commands, to define the conditions for redistributing routes from one routing protocol into another. Each **route-map** command has a list of **match** and **set** commands associated with it. The **match** commands specify the *match criteria*—the conditions under which redistribution is allowed for the current **route-map** command. The **set** commands specify the *set actions*—the particular redistribution actions to perform if the criteria enforced by the **match** commands are met. The **no route-map** command deletes the route map.

The **set** route-map configuration commands specify the redistribution *set actions* to be performed when all the match criteria of the router are met. When all match criteria are met, all set actions are performed.

Examples

In the following example, routes that pass the access list have the next hop set to 172.160.70.24:

```
route-map map_hop
 match address 5
 set next-hop 172.160.70.24
```

Related Commands

Command	Description
match as-path	Matches a BGP autonomous system path access list.
match community-list	Matches a BGP community.
match interface (IP)	Distributes any routes that have their next hop out one of the interfaces specified.
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match ip next-hop	Redistributes any routes that have a next hop router address passed by one of the access lists specified.
match ip route-source	Redistributes routes that have been advertised by routers and access servers at the address specified by the access lists.
match metric (IP)	Redistributes routes with the metric specified.
match route-type (IP)	Redistributes routes of the specified type.
match tag	Redistributes routes in the routing table that match the specified tags.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
set as-path	Modifies an autonomous system path for BGP routes.
set automatic-tag	Automatically computes the tag value.
set community	Sets the BGP communities attribute.
set level (IP)	Indicates where to import routes.
set local-preference	Specifies a preference value for the autonomous system path.
set metric (BGP, OSPF, RIP)	Sets the metric value for a routing protocol.
set metric-type	Sets the metric type for the destination routing protocol.
set tag (IP)	Sets a tag value of the destination routing protocol.
set weight	Specifies the BGP weight for the routing table.
show route-map	Displays all route maps configured or only the one specified.

set tag (IP)

To set a tag value of the destination routing protocol, use the **set tag** command in route-map configuration mode. To delete the entry, use the **no** form of this command.

set tag *tag-value*

no set tag *tag-value*

Syntax Description

tag-value	Name for the tag. Integer from 0 to 4294967295.

Defaults

If not specified, the default action is to *forward* the tag in the source routing protocol onto the new destination protocol.

Command Modes

Route-map configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Use the **route-map** global configuration command, and the **match** and **set** route-map configuration commands, to define the conditions for redistributing routes from one routing protocol into another. Each **route-map** command has a list of **match** and **set** commands associated with it. The **match** commands specify the *match criteria*—the conditions under which redistribution is allowed for the current **route-map** command. The **set** commands specify the *set actions*—the particular redistribution actions to perform if the criteria enforced by the **match** commands are met. The **no route-map** command deletes the route map.

The **set** route-map configuration commands specify the redistribution *set actions* to be performed when all the match criteria of a route map are met. When all match criteria are met, all set actions are performed.

Examples

The following example sets the tag value of the destination routing protocol to 5:

```
route-map tag
 set tag 5
```

Related Commands

Command	Description
match as-path	Matches a BGP autonomous system path access list.
match community-list	Matches a BGP community.
match interface (IP)	Distributes any routes that have their next hop out one of the interfaces specified.
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match ip next-hop	Redistributes any routes that have a next hop router address passed by one of the access lists specified.
match ip route-source	Redistributes routes that have been advertised by routers and access servers at the address specified by the access lists.
match metric (IP)	Redistributes routes with the metric specified.
match route-type (IP)	Redistributes routes of the specified type.
match tag	Redistributes routes in the routing table that match the specified tags.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
set as-path	Modifies an autonomous system path for BGP routes.
set automatic-tag	Automatically computes the tag value.
set community	Sets the BGP communities attribute.
set level (IP)	Indicates where to import routes.
set local-preference	Specifies a preference value for the autonomous system path.
set metric (BGP, OSPF, RIP)	Sets the metric value for a routing protocol.
set metric-type	Sets the metric type for the destination routing protocol.
set next-hop	Specifies the address of the next hop.
set tag (IP)	Sets a tag value of the destination routing protocol.
set weight	Specifies the BGP weight for the routing table.
show route-map	Displays all route maps configured or only the one specified.

show ip cache policy

To display the cache entries in the policy route cache, use the **show ip cache policy** command in EXEC mode.

show ip cache policy

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
11.3	This command was introduced.

Examples

The following is sample output from the **show ip cache policy** command:

```
Router# show ip cache policy

Total adds 10, total deletes 10

Type Routemap/sequence      Age       Interface       Next Hop
NH   george/10              00:04:31  Ethernet0       172.110.1.2
Int  george/30              00:01:23  Serial4         172.110.5.129
```

Table 52 describes the significant fields shown in the display.

Table 52 show ip cache policy Field Descriptions

Field	Description
Total adds	Number of times a cache entry was created.
total deletes	Number of times a cache entry or the entire cache was deleted.
Type	"NH" indicates the **set ip next-hop** command. "Int" indicates the **set interface** command.
Routemap	Name of the route map that created the entry; in this example, george.
sequence	Route map sequence number.
Age	Age of the cache entry.
Interface	Output interface type and number.
Next Hop	IP address of the next hop.

Related Commands

Command	Description
ip route-cache	Configures the router to export the flow cache entry to a workstation when a flow expires.

show ip local policy

To display the route map used for local policy routing, if any, use the **show ip local policy** command in EXEC mode.

show ip local policy

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.

Examples

The following is sample output from the **show ip local policy** command:

```
Router# show ip local policy

Local policy routing is enabled, using route map equal
route-map equal, permit, sequence 10
  Match clauses:
    length 150 200
  Set clauses:
    ip next-hop 10.10.11.254
  Policy routing matches: 0 packets, 0 bytes
route-map equal, permit, sequence 20
  Match clauses:
    ip address (access-lists): 101
  Set clauses:
    ip next-hop 10.10.11.14
  Policy routing matches: 2 packets, 172 bytes
```

Table 53 describes the significant fields shown in the display.

Table 53 show ip local policy Field Descriptions

Field	Description
route-map equal	The name of the route map is equal.
permit	The route map contains permit statements.
sequence	The sequence number of the route map, which determines in what order it is processed among other route maps.
Match clauses:	Clauses in the route map that must be matched to satisfy the permit or deny action.
Set clauses:	Set clauses that will be put into place if the match clauses are met.
Policy routing matches: packets	Number of packets that meet the match clauses.
bytes	Number of bytes in the packets that meet the match clauses.

Related Commands

Command	Description
ip local policy route-map	Identifies a route map to use for local policy routing.
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match length	Bases policy routing on the Level 3 length of a packet.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
set default interface	Indicates where to output packets that pass a match clause of a route map for policy routing and have no explicit route to the destination.
set interface	Indicates where to output packets that pass a match clause of route map for policy routing.
set ip default next-hop verify-availability	Indicates where to output packets that pass a match clause of a route map for policy routing and for which the Cisco IOS software has no explicit route to a destination.
set ip next-hop	Indicates where to output packets that pass a match clause of a route map for policy routing.

show ip policy

To display the route map used for policy routing, use the **show ip policy** command in EXEC mode.

show ip policy

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.

Examples

The following is sample output from the **show ip policy** command:

```
Router# show ip policy

Interface      Route map
local          equal
Ethernet0      equal
```

The following is sample output from the **show route-map** command, which relates to the preceding sample display:

```
Router# show route-map

route-map equal, permit, sequence 10
  Match clauses:
    length 150 200
  Set clauses:
    ip next-hop 10.10.11.254
  Policy routing matches: 0 packets, 0 bytes
route-map equal, permit, sequence 20
  Match clauses:
    ip address (access-lists): 101
  Set clauses:
    ip next-hop 10.10.11.14
  Policy routing matches: 144 packets, 15190 bytes
```

Table 54 describes the significant fields shown in the display.

Table 54 show ip policy Field Descriptions

Field	Description
route-map equal	The name of the route map is equal.
permit	The route map contains permit statements.
sequence	Sequence number of the route map, which determines in what order it is processed among other route maps.

Table 54 show ip policy Field Descriptions (continued)

Field	Description
Match clauses:	Clauses in the route map that must be matched to satisfy the permit or deny action.
Set clauses:	Set clauses that will be put into place if the match clauses are met.
Policy routing matches: packets	Number of packets that meet the match clauses.
bytes	Number of bytes in the packets that meet the match clauses.

Related Commands

Command	Description
match ip address	Distributes any routes that have a destination network number address that is permitted by a standard or extended access list, and performs policy routing on packets.
match length	Bases policy routing on the Level 3 length of a packet.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
set default interface	Indicates where to output packets that pass a match clause of a route map for policy routing and have no explicit route to the destination.
set interface	Indicates where to output packets that pass a match clause of route map for policy routing.
set ip default next-hop verify-availability	Indicates where to output packets that pass a match clause of a route map for policy routing and for which the Cisco IOS software has no explicit route to a destination.
set ip next-hop	Indicates where to output packets that pass a match clause of a route map for policy routing.

show ip protocols

To display the parameters and current state of the active routing protocol process, use the **show ip protocols** command in EXEC mode.

show ip protocols

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

The information displayed by the **show ip protocols** command is useful in debugging routing operations. Information in the Routing Information Sources field of the **show ip protocols** output can help you identify a router suspected of delivering bad routing information.

Examples

The following is sample output from the **show ip protocols** command, showing Interior Gateway Routing Protocol (IGRP) processes:

```
Router# show ip protocols

Routing Protocol is "igrp 109"
  Sending updates every 90 seconds, next due in 44 seconds
  Invalid after 270 seconds, hold down 280, flushed after 630
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Default networks flagged in outgoing updates
  Default networks accepted from incoming updates
  IGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  IGRP maximum hopcount 100
  IGRP maximum metric variance 1
  Redistributing: igrp 109
  Routing for Networks:
    172.160.72.0
  Routing Information Sources:
    Gateway         Distance      Last Update
    172.160.72.18         100      0:56:41
    172.160.72.19         100      6d19
    172.160.72.22         100      0:55:41
    172.160.72.20         100      0:01:04
    172.160.72.30         100      0:01:29
  Distance: (default is 100)

Routing Protocol is "bgp 1878"
  Sending updates every 60 seconds, next due in 0 seconds
  Outgoing update filter list for all interfaces is 1
  Incoming update filter list for all interfaces is not set
  Redistributing: igrp 109
```

```
IGP synchronization is disabled
Automatic route summarization is enabled
Neighbor(s):
  Address          FiltIn FiltOut DistIn DistOut Weight RouteMap
  192.108.211.17                1
  192.108.213.89                1
  198.6.255.13                  1
  172.160.72.18                  1
  172.160.72.19
  172.160.84.17                  1
Routing for Networks:
  192.108.209.0
  192.108.211.0
  198.6.254.0
Routing Information Sources:
  Gateway         Distance      Last Update
  172.160.72.19          20      0:05:28
Distance: external 20 internal 200 local 200
```

Table 55 describes the significant fields shown in the display.

Table 55 show ip protocols Field Descriptions for IGRP Processes

Field	Description
Routing Protocol is “igrp 109”	Specifies the routing protocol used.
Sending updates every 90 seconds	Specifies the time between sending updates.
next due in 44 seconds	Precisely when the next update is due to be sent.
Invalid after 270 seconds	Specifies the value of the invalid parameter.
hold down for 280	Specifies the current value of the hold-down parameter.
flushed after 630	Specifies the time (in seconds) after which the individual routing information will be thrown (flushed) out.
Outgoing update ...	Specifies whether the outgoing filtering list has been set.
Incoming update ...	Specifies whether the incoming filtering list has been set.
Default networks	Specifies how these networks will be handled in both incoming and outgoing updates.
IGRP metric	Specifies the value of the K0-K5 metrics, and the maximum hop count.
Redistributing	Lists the protocol that is being redistributed.
Routing	Specifies the networks for which the routing process is currently injecting routes.
Routing Information Sources	Lists all the routing sources the Cisco IOS software is using to build its routing table. For each source, you will see the following displayed: • IP address • Administrative distance • Time the last update was received from this source

The following is sample output from the **show ip protocols** command, showing EIGRP process 77:

```
Router# show ip protocols

Routing Protocol is "eigrp 77"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Redistributing: eigrp 77
  Automatic network summarization is in effect
  Routing for Networks:
    172.180.0.0
  Routing Information Sources:
    Gateway         Distance      Last Update
    172.180.81.28          90      0:02:36
    172.180.80.28          90      0:03:04
    172.180.80.31          90      0:03:04
  Distance: internal 90 external 170
```

Table 56 describes the significant fields shown in the display.

Table 56 show ip protocols Field Descriptions for EIGRP Process 77

Field	Description
Routing Protocol is “eigrp 77”	Name and autonomous system number of the currently running routing protocol.
Outgoing update filter list for all interfaces...	Indicates whether a filter for outgoing routing updates has been specified with the **distribute-list out** command.
Incoming update filter list for all interfaces...	Indicates whether a filter for incoming routing updates has been specified with the **distribute-list in** command.
Redistributing: eigrp 77	Indicates whether route redistribution has been enabled with the **redistribute** command.
Automatic network summarization...	Indicates whether route summarization has been enabled with the **auto-summary** command.
Routing for Networks:	Networks for which the routing process is currently injecting routes.
Routing Information Sources:	Lists all the routing sources that the Cisco IOS software is using to build its routing table. The following is displayed for each source: • IP address • Administrative distance • Time the last update was received from this source
Distance: internal 90 external 170	Internal and external distances of the router. Internal distance is the degree of preference given to EIGRP internal routes. External distance is the degree of preference given to EIGRP external routes.

The following is sample output from the **show ip protocols** command, showing Intermediate System-to-Intermediate System (IS-IS) processes:

```
Router# show ip protocols

Routing Protocol is "isis"
  Sending updates every 0 seconds
  Invalid after 0 seconds, hold down 0, flushed after 0
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Redistributing: isis
  Address Summarization:
    None
  Routing for Networks:
    Serial0
  Routing Information Sources:
  Distance: (default is 115)
```

The following is sample output from the **show ip protocols** command, showing Routing Information Protocol (RIP) processes:

```
Router# show ip protocols

Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 2 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Redistributing: rip
  Default version control: send version 2, receive version 2
    Interface        Send  Recv   Key-chain
    Ethernet0        2     2      trees
    Fddi0            2     2
  Routing for Networks:
    172.19.0.0
    2.0.0.0
    10.3.0.0
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 120)
```

show ip route

To display the current state of the routing table, use the **show ip route** command in EXEC mode.

show ip route [[*ip-address* [*mask*] [**longer-prefixes**]] | [*protocol* [*process-id*]] | [**list** access-list-number | access-list-name]]

Syntax Description

ip-address	(Optional) Address about which routing information should be displayed.
mask	(Optional) Argument for a subnet mask.
longer-prefixes	(Optional) Specifies that only routes matching the *ip-address* and *mask* pair should be displayed.
protocol	(Optional) Name of a routing protocol, or the keyword **connected**, **static**, or **summary**. If you specify a routing protocol, use one of the following keywords: **bgp**, **egp**, **eigrp**, **hello**, **igrp**, **isis**, **ospf**, and **rip**.
process-id	(Optional) Number used to identify a process of the specified protocol.
list	(Optional) The **list** keyword is required to filter output by an access list name or number.
access-list-name	(Optional) Filters the displayed output from the routing table based on the specified access list name.
access-list-number	(Optional) Filters the displayed output from the routing table based on the specified access list number.

Command Modes

EXEC

Command History

Release	Modification
9.2	This command was introduced.
10.0	The “D—EIGRP, EX—EIGRP, N1—OSPF NSSA external type 1 route” and “N2—OSPF NSSA external type 2 route” codes were added to the command output.
10.3	The *process-id* argument was added.
11.0	The **longer-prefixes** keyword was added.
11.1	The “U—per-user static route” code was added to the command output.
11.2	The “o—on-demand routing” code was added to the command output.
11.3	The output from the **show ip route** *ip-address* command was enhanced to display the origination of an IP route in Intermediate System-to-Intermediate System (IS-IS) networks.
12.0(1)T	The “M—mobile” code was added to the command output.
12.0(3)T	The “P—periodic downloaded static route” code was added to the command output.
12.0(4)T	The “ia—IS-IS” code was added to the command output.

Examples

The following is sample output from the **show ip route** command when entered without an address:

```
Router# show ip route

Codes: I - IGRP derived, R - RIP derived, O - OSPF derived,
       C - connected, S - static, E - EGP derived, B - BGP derived,
       * - candidate default route, IA - OSPF inter area route,
       i - IS-IS derived, ia - IS-IS, U - per-user static route,
       o - on-demand routing, M - mobile, P - periodic downloaded static route,
       D - EIGRP, EX - EIGRP external, E1 - OSPF external type 1 route,
       E2 - OSPF external type 2 route, N1 - OSPF NSSA external type 1 route,
       N2 - OSPF NSSA external type 2 route

Gateway of last resort is 10.119.254.240 to network 10.140.0.0

O E2 172.150.0.0 [160/5] via 10.119.254.6, 0:01:00, Ethernet2
E    172.17.10.0 [200/128] via 10.119.254.244, 0:02:22, Ethernet2
O E2 172.70.132.0 [160/5] via 10.119.254.6, 0:00:59, Ethernet2
O E2 10.130.0.0 [160/5] via 10.119.254.6, 0:00:59, Ethernet2
E    172.30.0.0 [200/128] via 10.119.254.244, 0:02:22, Ethernet2
E    10.129.0.0 [200/129] via 10.119.254.240, 0:02:22, Ethernet2
E    172.80.129.0 [200/128] via 10.119.254.244, 0:02:22, Ethernet2
E    10.10.0.0 [200/128] via 10.119.254.244, 0:02:22, Ethernet2
E    172.60.139.0 [200/129] via 10.119.254.240, 0:02:23, Ethernet2
E    172.90.208.0 [200/128] via 10.119.254.244, 0:02:22, Ethernet2
E    192.84.148.0 [200/129] via 10.119.254.240, 0:02:23, Ethernet2
E    192.168.223.0 [200/128] via 10.119.254.244, 0:02:22, Ethernet2
E    192.44.236.0 [200/129] via 10.119.254.240, 0:02:23, Ethernet2
E    10.141.0.0 [200/129] via 10.119.254.240, 0:02:22, Ethernet2
E    141.140.0.0 [200/129] via 10.119.254.240, 0:02:23, Ethernet2
```

The following is sample output that includes IS-IS Level 2 routes learned:

```
Router# show ip route

Codes: I - IGRP derived, R - RIP derived, O - OSPF derived,
       C - connected, S - static, E - EGP derived, B - BGP derived,
       * - candidate default route, IA - OSPF inter area route,
       i - IS-IS derived, ia - IS-IS, U - per-user static route,
       o - on-demand routing, M - mobile, P - periodic downloaded static route,
       D - EIGRP, EX - EIGRP external, E1 - OSPF external type 1 route,
       E2 - OSPF external type 2 route, N1 - OSPF NSSA external type 1 route,
       N2 - OSPF NSSA external type 2 route

Gateway of last resort is not set

     172.180.0.0 is subnetted (mask is 255.255.255.0), 3 subnets
C       172.180.64.0 255.255.255.0 is possibly down,
          routing via 0.0.0.0, Ethernet0
i L2    172.180.67.0 [115/20] via 172.180.64.240, 0:00:12, Ethernet0
i L2    172.180.66.0 [115/20] via 172.180.64.240, 0:00:12, Ethernet0
```

Table 57 describes the significant fields shown in the displays.

Table 57 show ip route Field Descriptions

Field	Description
O	Indicates protocol that derived the route. Possible values include the following: I—Interior Gateway Routing Protocol (IGRP) derived R—Routing Information Protocol (RIP) derived O—Open Shortest Path First (OSPF) derived C—connected S—static E—Exterior Gateway Protocol (EGP) derived B—Border Gateway Protocol (BGP) derived D—Enhanced Interior Gateway Routing Protocol (EIGRP) EX—EIGRP external i—IS-IS derived ia—IS-IS M—mobile P—periodic downloaded static route U—per-user static route o—on-demand routing
E2	Type of route. Possible values include the following: *—Indicates the last path used when a packet was forwarded. It pertains only to the nonfast-switched packets. However, it does not indicate which path will be used next when forwarding a nonfast-switched packet, except when the paths are equal cost. IA—OSPF interarea route E1—OSPF external type 1 route E2—OSPF external type 2 route L1—IS-IS Level 1 route L2—IS-IS Level 2 route N1—OSPF not-so-stubby area (NSSA) external Type 1 route N2—OSPF NSSA external Type 2 route
172.150.0.0	Indicates the address of the remote network.
[160/5]	The first number in the brackets is the administrative distance of the information source; the second number is the metric for the route.
via 10.119.254.6	Specifies the address of the next router to the remote network.
0:01:00	Specifies the last time the route was updated, in hours:minutes:seconds.
Ethernet2	Specifies the interface through which the specified network can be reached.

When you specify that you want information about a specific network displayed, more detailed statistics are shown. The following is sample output from the **show ip route** command when entered with the address 10.119.0.0:

```
Router# show ip route 10.119.0.0

Routing entry for 10.119.0.0 (mask 255.255.0.0)
   Known via "igrp 109", distance 100, metric 10989
   Tag 0
   Redistributing via igrp 109
   Last update from 10.108.35.13 on TokenRing0, 0:00:58 ago
   Routing Descriptor Blocks:
   * 10.108.35.13, from 10.108.35.13, 0:00:58 ago, via TokenRing0
      Route metric is 10989, traffic share count is 1
      Total delay is 45130 microseconds, minimum bandwidth is 1544 Kbit
      Reliability 255/255, minimum MTU 1500 bytes
      Loading 2/255, Hops 4
```

When an IS-IS router advertises its link-state information, it includes one of its own IP addresses to be used as the originator IP address. When other routers calculate IP routes, they can store the originator IP address with each route in the routing table.

The following example shows the output from the **show ip route** command when looking at an IP route generated by IS-IS. Each path that is shown under the Routing Descriptor Blocks report displays two IP addresses. The first address (10.22.22.2) is the next hop address, the second is the originator IP address from the advertising IS-IS router. This address helps you determine where a particular IP route has originated in your network. In the example the route to 10.0.0.1/32 was originated by a router with IP address 223.191.255.247.

```
Router# show ip route 10.0.0.1

Routing entry for 10.0.0.1/32
    Known via "isis", distance 115, metric 20, type level-1
    Redistributing via isis
    Last update from 223.191.255.251 on Fddi1/0, 00:00:13 ago
    Routing Descriptor Blocks:
    * 10.22.22.2, from 223.191.255.247, via Serial2/3
       Route metric is 20, traffic share count is 1
       223.191.255.251, from 223.191.255.247, via Fddi1/0
       Route metric is 20, traffic share count is 1
```

Compare the report using the **show ip route** command with an IP address to the following report using the **show ip route isis** command:

```
Router# show ip route isis

10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
  i L1    10.0.0.1/32 [115/20] via 10.22.22.2, Serial2/3
                [115/20] via 223.191.255.251, Fddi1/0
    22.0.0.0/24 is subnetted, 2 subnets
i L1    22.22.23.0 [115/20] via 223.191.255.252, Fddi1/0
```

Table 58 describes the significant fields shown when using the **show ip route** command with an IP address (previous displays).

Table 58 show ip route with Address Field Descriptions

Field	Description
Routing entry for 10.119.0.0 (mask 255.255.0.0)	Network number and mask.
Known via ...	Indicates how the route was derived.
distance	Administrative distance of the information source.
Tag	Integer that is used to implement the route.
Redistributing via ...	Indicates the redistribution protocol.
Last update from 10.108.35.13 on ...	Indicates the IP address of a router that is the next hop to the remote network and the router interface on which the last update arrived.
0:00:58 ago	Specifies the last time the route was updated, in hours:minutes:seconds.
Routing Descriptor Blocks:	Displays the next hop IP address followed by the information source.
10.108.35.13, from 10.108.35.13, 0:00:58 ago	Indicates the next hop address, the address of the gateway that sent the update, and the time that has elapsed since this update was received, in hours:minutes:seconds.
from...via ...	The first address is the next hop IP address, and the other is the information source. This report is followed by the interface for this route.
Route metric	This value is the best metric for this routing descriptor block.
traffic share count	Number of uses for this routing descriptor block.
Total delay	Total propagation delay (in microseconds).
minimum bandwidth	Minimum bandwidth encountered when sending data along this route.
Reliability 255/255	Likelihood of successful packet transmission expressed as a number from 0 to 255 (255 is 100 percent reliability).
minimum MTU	Smallest maximum transmission unit (MTU) along the path.
Loading 2/255	Effective bandwidth of the route in kbps/255 is saturation.
Hops	Number of hops to the destination or to the router where the route first enters IGRP.

The following is sample output using the **longer-prefixes** keyword. When the **longer-prefixes** keyword is included, the address and mask pair becomes the prefix, and any address that matches that prefix is displayed. Therefore, multiple addresses are displayed.

In the following example, the logical AND operation is performed on the source address 128.0.0.0 and the mask 128.0.0.0, resulting in 128.0.0.0. Each destination in the routing table is also logically ANDed with the mask and compared to that result of 128.0.0.0. Any destinations that fall into that range are displayed in the output.

```
Router# show ip route 128.0.0.0 128.0.0.0 longer-prefixes

Codes: I - IGRP derived, R - RIP derived, O - OSPF derived,
       C - connected, S - static, E - EGP derived, B - BGP derived,
       * - candidate default route, IA - OSPF inter area route,
       i - IS-IS derived, ia - IS-IS, U - per-user static route,
       o - on-demand routing, M - mobile, P - periodic downloaded static route,
       D - EIGRP, EX - EIGRP external, E1 - OSPF external type 1 route,
       E2 - OSPF external type 2 route, N1 - OSPF NSSA external type 1 route,
       N2 - OSPF NSSA external type 2 route

Gateway of last resort is not set

S    10.134.0.0 is directly connected, Ethernet0
S    10.10.0.0 is directly connected, Ethernet0
S    10.129.0.0 is directly connected, Ethernet0
S    172.30.0.0 is directly connected, Ethernet0
S    172.40.246.0 is directly connected, Ethernet0
S    172.20.97.0 is directly connected, Ethernet0
S    172.50.88.0 is directly connected, Ethernet0
S    172.19.141.0 is directly connected, Ethernet0
S    172.60.138.0 is directly connected, Ethernet0
S    192.44.237.0 is directly connected, Ethernet0
S    192.168.222.0 is directly connected, Ethernet0
S    172.90.209.0 is directly connected, Ethernet0
S    10.145.0.0 is directly connected, Ethernet0
S    10.141.0.0 is directly connected, Ethernet0
S    10.138.0.0 is directly connected, Ethernet0
S    10.128.0.0 is directly connected, Ethernet0
     172.19.0.0 255.255.255.0 is subnetted, 1 subnets
C       172.19.64.0 is directly connected, Ethernet0
     172.110.0.0 is variably subnetted, 2 subnets, 2 masks
C       172.110.232.32 255.255.255.240 is directly connected, Ethernet0
S       172.110.0.0 255.255.0.0 is directly connected, Ethernet0
Router#
```

Related Commands

Command	Description
show interfaces tunnel	Displays a list of tunnel interface information.
show ip route summary	Displays the current state of the routing table in summary format.

show ip route profile

To display routing table change statistics, use the **show ip route profile** command in EXEC mode.

show ip route profile

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
12.0	This command was introduced.

Usage Guidelines

Use this command in combination with the **ip route profile** global configuration command to validate the routing table change statistics.

Examples

The following example shows the frequency of routing table changes in a 5-second sampling interval. In this example, the Prefix add change occurred 22 times in one interval and 24 times in another interval. The output represents this with a Fwd-path change value of 2 and a Prefix add value of 2:

```
Router# show ip route profile
-----------------------------------------------------------------------
Change/    Fwd-path    Prefix    Nexthop    Pathcount    Prefix
interval   change       add       Change      Change        refresh
-----------------------------------------------------------------------
0           87           87         89          89            89
1           0            0          0           0             0
2           0            0          0           0             0
3           0            0          0           0             0
4           0            0          0           0             0
5           0            0          0           0             0
10          0            0          0           0             0
15          0            0          0           0             0
20          2            2          0           0             0
25          0            0          0           0             0
```

Table 59 describes the significant fields shown in the display.

Table 59 show ip route profile Field Descriptions

Field	Description
Change/interval	Represents the frequency buckets. A Change/interval of 20 represents the bucket that is incremented when a particular event occurs 20 times in a sampling interval. It is very common to see high counters for the Change/interval bucket for 0. This counter represents the number of sampling intervals in which there were no changes to the routing table. Route removals are not counted in the statistics, only route additions.
Fwd-path change	Number of changes in the forwarding path. This value represents the accumulation of Prefix add, Nexthop change, and Pathcount change.
Prefix add	A new prefix was added to the routing table.
Nexthop change	A prefix is not added or removed, but the next hop changes. This statistic is only seen with recursive routes that are installed in the routing table.
Pathcount change	The number of paths in the routing table has changed. This change is the result of an increase in the number of paths for an Interior Gateway Protocol (IGP).
Prefix refresh	Indicates standard routing table maintenance. The forwarding behavior was not changed.

Related Commands

Command	Description
ip route profile	Enables IP routing table statistics collection

show ip route summary

To display the current state of the routing table, use the **show ip route summary** command in EXEC mode.

show ip route summary

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.

Examples

The following is sample output from the **show ip route summary** command:

```
Router# show ip route summary

Route Source    Networks    Subnets     Overhead    Memory (bytes)
connected       0           3           126         360
static          1           2           126         360
igrp 109        747         12          31878       91080
internal        3                                   360
Total           751         17          32130       92160
```

Table 60 describes the significant fields shown in the display.

Table 60 show ip route summary Field Descriptions

Field	Description
Route Source	Routing protocol name, or the **connected, static,** or **internal** keyword. “Internal” indicates those routes that are in the routing table that are not owned by any routing protocol.
Networks	Number of prefixes that are present in the routing table for each route source.
Subnets	Number of subnets that are present in the routing table for each route source, including host routes.
Overhead	Any additional memory involved in allocating the routes for the particular route source other than the memory specified in the Memory field.
Memory	Number of bytes allocated to maintain all the routes for the particular route source.

Related Commands

Command	Description
show ip route	Displays the current state of the routing table.

show ip route supernets-only

To display information about supernets, use the **show ip route supernets-only** privileged command in EXEC mode.

show ip route supernets-only

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.

Examples

The following is sample output from the **show ip route supernets-only** command. This display shows supernets only; it does not show subnets.

```
Router# show ip route supernets-only

Codes: I - IGRP derived, R - RIP derived, O - OSPF derived
       C - connected, S - static, E - EGP derived, B - BGP derived
       i - IS-IS derived, D - EIGRP derived
       * - candidate default route, IA - OSPF inter area route
       E1 - OSPF external type 1 route, E2 - OSPF external type 2 route
       L1 - IS-IS level-1 route, L2 - IS-IS level-2 route
       EX - EIGRP external route

Gateway of last resort is not set

B    172.160.0.0 (mask is 255.255.0.0) [20/0] via 172.160.72.30, 0:00:50
B    192.0.0.0 (mask is 255.0.0.0) [20/0] via 172.160.72.24, 0:02:50
```

Table 61 describes the significant fields shown in the display.

Table 61 show ip route supernets-only Field Descriptions

Field	Description
B	Border Gateway Protocol (BGP) derived, as shown in list of codes.
172.160.0.0 (mask is 255.255.0.0)	Supernet IP address.
[20/0]	Administrative distance (external/internal).
via 172.160.72.30	Next hop IP address.
0:00:50	Age of the route (how long ago the update was received).

show key chain

To display authentication key information, use the **show key chain** command in EXEC mode.

show key chain [*name-of-chain*]

Syntax Description

name-of-chain	(Optional) Name of the key chain to display, as named in the **key chain** command.

Defaults

Information about all key chains is displayed.

Command Modes

EXEC

Command History

Release	Modification
11.1	This command was introduced.

Examples

The following is sample output from the **show key chain** command:

```
Router# show key chain

Key-chain trees:
    key 1 -- text "chestnut"
        accept lifetime (always valid) - (always valid) [valid now]
        send lifetime (always valid) - (always valid) [valid now]
    key 2 -- text "birch"
        accept lifetime (00:00:00 Dec 5 1995) - (23:59:59 Dec 5 1995)
        send lifetime (06:00:00 Dec 5 1995) - (18:00:00 Dec 5 1995)
```

Related Commands

Command	Description
accept-lifetime	Sets the time period during which the authentication key on a key chain is received as valid.
key	Identifies an authentication key on a key chain.
key chain	Enables authentication for routing protocols.
key-string (authentication)	Specifies the authentication string for a key.
send-lifetime	Sets the time period during which an authentication key on a key chain is valid to be sent.

show route-map

To display configured route maps, use the **show route-map** command in EXEC mode.

show route-map [*map-name*]

Syntax Description

map-name	(Optional) Name of a specific route map.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.

Examples

The following is sample output from the **show route-map** command:

```
Router# show route-map

route-map abc, permit, sequence 10
  Match clauses:
    tag 1 2
  Set clauses:
    metric 5
route-map xyz, permit, sequence 20
  Match clauses:
    tag 3 4
  Set clauses:
    metric 6
```

Table 62 describes the significant fields shown in the display.

Table 62 show route-map Field Descriptions

Field	Description
route-map	Name of the route map.
permit	Indicates that the route is redistributed as controlled by the set actions.
sequence	Number that indicates the position a new route map is to have in the list of route maps already configured with the same name.
Match clauses tag	Match criteria—conditions under which redistribution is allowed for the current route map.
Set clauses metric	Set actions—the particular redistribution actions to perform if the criteria enforced by the **match** commands are met.

Related Commands

Command	Description
redistribute (IP)	Redistributes routes from one routing domain into another routing domain.
route-map (IP)	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.

show route-map ipc

To display counts of the one-way route map interprocess communication (IPC) messages sent from the rendezvous point (RP) to the Versatile Interface Processor (VIP) when NetFlow policy routing is configured, use the **show route-map ipc** command in EXEC mode.

show route-map ipc

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
12.0(3)T	This command was introduced.

Usage Guidelines

This command displays the counts of one-way route map IPC messages from the RP to the VIP when NetFlow policy routing is configured. If you execute this command on the RP, the messages are shown as "Sent." If you execute this command on the VIP console, the IPC messages are shown as "Received."

Examples

The following is sample output from the **show route-map ipc** command when it is executed on the RP:

```
Router# show route-map ipc

Route-map RP IPC Config Updates Sent
Name: 4
Match access-list: 2
Match length: 0
Set precedence: 1
Set tos: 0
Set nexthop: 4
Set interface: 0
Set default nexthop: 0
Set default interface: 1
Clean all: 2
```

The following is sample output from the **show route-map ipc** command when it is executed on the VIP:

```
VIP-Slot0# show route-map ipc

Route-map LC IPC Config Updates Received
Name: 4
Match access-list: 2
Match length: 0
Set precedence: 1
Set tos: 0
Set nexthop: 4
Set interface: 0
Set default nexthop: 0
Set default interface: 1
Clean all: 2
```

Table 63 describes the significant fields shown in the first display.

Table 63 show route-map ipc Field Descriptions

Field	Description
Route-map RP IPC Config Updates Sent	IPC messages are being sent from the RP to the VIP.
Name:	Number of IPC messages sent about the name of the route map.
Match access-list:	Number of IPC messages sent about the access list.
Match length:	Number of IPC messages sent about the length to match.
Set precedence:	Number of IPC messages sent about the precedence.
Set tos:	Number of IPC messages sent about the type of service (ToS).
Set nexthop:	Number of IPC messages sent about the next hop.
Set interface:	Number of IPC messages sent about the interface.
Set default nexthop:	Number of IPC messages sent about the default next hop.
Set default interface:	Number of IPC messages sent about the default interface.
Clean all:	Number of IPC messages sent about clearing the policy routing configuration from the VIP. When distributed Cisco express forwarding (DCEF) is disabled and reenabled, the configuration related to policy routing must be removed (cleaned) from the VIP before the new information is downloaded from the RP to the VIP.

Related Commands

Command	Description
set ip next-hop verify-availability	Configures policy routing to verify if the next hops of a route map are CDP neighbors before policy routing to that next hop.

traffic-share min

To configure traffic to use minimum cost routes, when there are multiple routes that have different cost routes to the same destination network, use the **traffic-share min across-interfaces** command in router configuration mode. To disable this function, use the **no** form of this command.

traffic-share min {**across-interfaces**}

no traffic-share min {**across-interfaces**}

Syntax Description

This command has no arguments or keywords.

Defaults

Traffic is configured to use minimum cost paths.

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.
11.0(3)	This command became protocol independent when the **across-interfaces** keyword was added.

Usage Guidelines

The **traffic-share min** command causes the Cisco IOS software to divide traffic only among the routes with the best metric. Other routes will remain in the routing table, but will receive no traffic. Configuring this command with the **across-interfaces** keyword allows you to configure multi-interface load splitting on different interfaces with equal cost paths.

Examples

In the following example, multi-interface load splitting is configured on different interfaces with equal cost paths:

```
router ospf 5
 traffic-share min across-interfaces
```