

term ip netmask-format

To specify the format in which netmasks are displayed in **show** command output, use the **term ip netmask-format** command in EXEC configuration mode. To restore the default display format, use the **no** form of this command.

term ip netmask-format { **bitcount** | **decimal** | **hexadecimal** }

no term ip netmask-format [**bitcount** | **decimal** | **hexadecimal**]

Syntax Description

bitcount	Number of bits in the netmask.
decimal	Netmask dotted decimal notation.
hexadecimal	Netmask hexadecimal format.

Defaults

Netmasks are displayed in dotted decimal format.

Command Modes

EXEC

Command History

Release	Modification
10.3	This command was introduced.

Usage Guidelines

IP uses a 32-bit mask that indicates which address bits belong to the network and subnetwork fields, and which bits belong to the host field. This range of IP addresses is called a *netmask*. By default, **show** commands display an IP address and then its netmask in dotted decimal notation. For example, a subnet would be displayed as 131.108.11.55 255.255.255.0.

However, you can specify that the display of the network mask appear in hexadecimal format or bit count format instead. The hexadecimal format is commonly used on UNIX systems. The previous example would be displayed as 131.108.11.55 0FFFFFFF00.

The bitcount format for displaying network masks is to append a slash (/) and the total number of bits in the netmask to the address itself. The previous example would be displayed as 131.108.11.55/24.

Examples

The following example specifies that network masks for the session be displayed in bitcount notation in the output of **show** commands:

```
term ip netmask-format bitcount
```

threshold metric

To set a threshold metric other than the default value, use the **threshold metric** command in tracking configuration mode. To disable the threshold metric, use the **no** form of this command.

threshold metric {**up** *number* | **down** *number*}

no threshold metric {**up** *number* | **down** *number*}

Syntax Description	up	down
	Specifies the up threshold. The state is up if the scaled metric for that route is less than or equal to the up threshold. The default up threshold is 254.	Specifies the down threshold. The state is down if the scaled metric for that route is greater than or equal to the down threshold. The default down threshold is 255.
	<i>number</i>	Threshold value. Range is from 0 to 255.

Defaults No threshold is configured.

Command Modes Tracking configuration

Command History	Release	Modification
	12.2(15)T	This command was introduced.

Usage Guidelines This command is available only to IP-route threshold metric objects tracked by the **track ip route metric threshold** global configuration command.

The default up and down threshold values are 254 and 255, respectively. With these values, IP-route threshold tracking gives the same result as IP-route reachability tracking.

Examples In the following example, the tracking process is tracking the IP-route threshold metric. The metric default value is changed to 16 for the up threshold and to 20 for the down threshold.

```
track 1 ip route 10.22.0.0/16 metric threshold
  threshold metric up 16 down 20
  delay down 20
```

Related Commands	Command	Description
	track ip route	Tracks the state of IP routing and enters tracking configuration mode.

threshold percentage

To set a threshold percentage for a tracked object in a list of objects, use the **threshold percentage** command in tracking configuration mode. To disable the threshold percentage, use the **no** form of this command.

threshold percentage {*up number* | *down number*}

no threshold percentage {*up number* | *down number*}

Syntax Description	up	Specifies the up threshold.
	down	Specifies the down threshold.
	<i>number</i>	Threshold value. Range is from 0 to 100.

Defaults No threshold percentage is configured.

Command Modes Tracking configuration

Command History	Release	Modification
	12.3(8)T	This command was introduced

Usage Guidelines When you configure a tracked list using the **track *object-number* list** command, there are two keywords available: **boolean** and **threshold**. If you specify the **threshold** keyword, you can specify either the **percentage** or **weight** keywords. If you specify the **percentage** keyword, then the **weight** keyword is unavailable. If you specify the **weight** keyword, then the **percentage** keyword is unavailable.

You should configure the “up” percentage first. The valid range is from 1 to 100. The down percentage depends on what you have configured for up. For example, if you configure 50 percent for up, you will see a range from 0 to 49 percent for down.

Examples In the following example, the tracked list 11 is configured to measure the threshold using an “up” percentage of 50 and a “down” percentage of 32.

```
track 11 list threshold percentage
  object 1
  object 2
  threshold percentage up 50 down 32
```

Related Commandse	Command	Description
	threshold weight	Sets a threshold weight for a tracked object in a list of objects.

threshold weight

To set a threshold weight for a tracked object in a list of objects, use the **threshold weight** command in tracking configuration mode. To disable the threshold weight, use the **no** form of this command.

threshold weight { **up** *number* | **down** *number* }

no threshold weight { **up** *number* | **down** *number* }

Syntax Description

up	Specifies the up threshold.
down	Specifies the down threshold.
<i>number</i>	Threshold value. Range is from 1 to 255.

Defaults

No threshold weight is configured.

Command Modes

Tracking configuration

Command History

Release	Modification
12.3(8)T	This command was introduced.

Usage Guidelines

When you configure a tracked list of objects using the **track *object-number* list** command, there are two keywords available: **boolean** and **threshold**. If you specify the **threshold** keyword, you can specify either the **percentage** or **weight** keywords. If you specify the **weight** keyword, then the **percentage** keyword is unavailable. If you specify the **percentage** keyword, then the **weight** keyword is unavailable.

You should configure the “up” weight first. The valid range is from 1 to 255. The available “down” weight depends on what you have configured for the “up” weight. For example, if you configure 25 for up, you will see a range from 0 to 24 for down.

Examples

In the following example, the tracked list 12 is configured to measure a threshold using a specified weight.

```
track 12 list threshold weight
  object 1
  object 2
  threshold weight up 35 down 22
```

Related Commands

Command	Description
threshold percentage	Sets a threshold percentage for a tracked object in a list of objects

track interface

To configure an interface to be tracked and to enter tracking configuration mode, use the **track interface** command in global configuration mode. To remove the tracking, use the **no** form of this command.

track *object-number* **interface** *type number* {**line-protocol** | **ip routing**}

no track *object-number* **interface** *type number* {**line-protocol** | **ip routing**}

Syntax Description		
	<i>object-number</i>	Object number that represents the interface to be tracked. Range is from 1 to 500.
	<i>type number</i>	Interface type and number to be tracked. No space is required between the values.
	line-protocol	Tracks the state of the interface line protocol.
	ip routing	Tracks whether IP routing is enabled, whether an IP address is configured on the interface, and whether the interface state is up, before reporting to the tracking client that the interface is up.

Defaults No interface is tracked.

Command Modes Global configuration

Command History	Release	Modification
	12.2(15)T	This command was introduced.

Usage Guidelines This command reports a state value to clients. A tracked IP-routing object is considered up when the platform is routing IP, the interface line protocol is up, and IP routing is enabled and active on the interface.

Tracking the IP-routing state of an interface (using the **track interface ip routing** command) can be more useful in some situations than just tracking the line-protocol state (using the **track interface line-protocol** command).

Examples In the following example, the tracking process is configured to track the IP-routing capability of serial interface 1/0:

```
track 1 interface serial1/0 ip routing
```

Related Commands	Command	Description
	show track	Displays HSRP tracking information.

track ip route

To track the state of an IP route and to enter tracking configuration mode, use the **track ip route** command in global configuration mode. To remove the tracking, use the **no** form of this command.

```
track object-number ip route ip-address/prefix-length { reachability | metric threshold }
```

```
no track object-number ip route ip-address/prefix-length { reachability | metric threshold }
```

Syntax Description		
<i>object-number</i>	Object number that represents the object to be tracked. Range is from 1 to 500.	
<i>ip-address</i>	IP subnet address to the route that is being tracked.	
<i>/prefix-length</i>	The number of bits that comprise the address prefix. A slash must precede the value.	
reachability	Tracks whether the route is reachable.	
metric threshold	Tracks the threshold metric. The default up threshold is 254 and the default down threshold is 255.	

Defaults The route to the subnet address is not tracked.

Command Modes Global configuration

Command History	Release	Modification
	12.2(15)T	This command was introduced.

Usage Guidelines A tracked IP-route object is considered up and reachable when a routing-table entry exists for the route and the route is not inaccessible.

To provide a common interface to tracking clients, route metric values are normalized to the range of 0 to 255, where 0 is connected and 255 is inaccessible. The resulting value is compared against threshold values to determine the tracking state as follows:

- State is up if the scaled metric for that route is less than or equal to the up threshold.
- State is down if the scaled metric for that route is greater than or equal to the down threshold.

The tracking process uses a per-protocol configurable resolution value to convert the real metric to the scaled metric. The metric value communicated to clients is always such that a lower metric value is better than a higher metric value.

Use the **threshold metric** tracking configuration command to specify a threshold metric other than the default threshold metric.

Examples In the following example, the tracking process is configured to track the reachability of 10.22.0.0/16:

```
track 1 ip route 10.22.0.0/16 reachability
```

In the following example, the tracking process is configured to track the threshold metric using the default threshold metric values:

```
track 1 ip route 10.22.0.0/16 metric threshold
```

Related Commands

Command	Description
show track	Displays HSRP tracking information.
threshold metric	Sets a threshold metric other than the default value.

track list

To specify a list of objects to be tracked and the thresholds to be used for comparison, use the **track list** command in global configuration mode. To disable the tracked list, use the **no** form of this command.

```
track object-number list { boolean { and | or } } | { threshold { weight | percentage } }
```

```
no track object-number list { boolean { and | or } } | { threshold { weight | percentage } }
```

Syntax Description	
<i>object-number</i>	Object number of the object to be tracked. Range is from 1 to 500.
boolean	State of the tracked list is based on a boolean calculation. The keywords are as follows: <ul style="list-style-type: none"> and—Specifies that the list is “up” if <i>all</i> objects are up, or “down” if <i>one or more</i> objects are down. For example when tracking two interfaces, “up” means that <i>both</i> interfaces are up, and “down” means that <i>either</i> interface is down. or—Specifies that the list is “up” if <i>at least one</i> objects is up. For example, when tracking two interfaces, “up” means that <i>either</i> interface is up, and “down” means that <i>both</i> interfaces are down.
threshold	State of the tracked list is based on a threshold. The keywords are as follows: <ul style="list-style-type: none"> percentage—Specifies that the threshold is based on a percentage. weight—Specifies that the threshold is based on a weight.

Defaults	
	The list is not tracked.

Command Modes	
	Global configuration

Command History	Release	Modification
	12.3(8)T	This command was introduced.

Examples A track list object may be configured to track two serial interfaces when both serial interfaces are “up” and when either serial interface is “down,” for example:

```
track 1 interface serial2/0 line-protocol
track 2 interface serial2/1 line-protocol
track 100 list boolean and
  object 1
  object 2
```

A track list object may be configured to track two serial interfaces when either serial interface is “up” and when both serial interfaces are “down,” for example:

```
track 1 interface serial2/0 line-protocol
track 2 interface serial2/1 line-protocol
track 101 list boolean or
```

```
object 1
object 2
```

A track list object may be configured to track two serial interfaces when both serial interfaces are “up” and when both serial interface is “down,” for example:

```
track 1 interface serial2/0 line-protocol
track 2 interface serial2/1 line-protocol
track 102 threshold weight
  object 1 weight 10
  object 2 weight 10
threshold weight up 20 down 0
```

The configuration shown above provides some hysteresis in case one of the serial interfaces is flapping.

Related Commands

Command	Description
show track	Displays tracking information.
track object	Tracks an object for a tracked list as to the up and down object states.
track list threshold percentage	Tracks a list of objects as to the up and down object states using a threshold percentage.
track list threshold weight	Tracks a list of objects as to the up and down object states using a threshold weight.
threshold weight	Specifies a threshold weight for a tracked list.

track resolution

To specify resolution parameters for a tracked object, use the **track resolution** command in global configuration mode. To disable this functionality, use the **no** form of this command.

```
track resolution ip route { eigrp resolution-value | isis resolution-value | ospf resolution-value |
static resolution-value }
```

```
no track resolution ip route { eigrp resolution-value | isis resolution-value | ospf resolution-value
| static resolution-value }
```

Syntax Description	ip route	<p>IP route for metric resolution for a specified track. The keywords and arguments are as follows:</p> <ul style="list-style-type: none"> • eigrp—EIGRP routing protocol. The <i>resolution-value</i> argument has a range from 256 to 40000000. • isis—ISIS routing protocol. The <i>resolution-value</i> argument has a range from 1 to 1000. • ospf—OSPF routing protocol. The <i>resolution-value</i> argument has a range from 1 to 1562. • static—Static route. The <i>resolution-value</i> argument has a range from 1 to 100000.
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Defaults The track ip route metric resolution default values are used.

Command Modes Global configuration

Command History	Release	Modification
	12.3(8)T	This command was introduced.

Usage Guidelines The **track ip route** command causes tracking of a route in the routing table. If a route exists in the table, the metric value is converted into a number in the range from 0 to 255. The metric resolution for the specified routing protocol is used to do the conversion. There are default values for the metric resolution but the track resolution command can be used to change the metric resolution default values.

Examples In the following example, the EIGRP routing protocol has a resolution value of 280.

```
track resolution ip route eigrp 280
```

Related Commands

Command	Description
show track	Displays tracking information.
track object	Tracks an object for a tracked list as to the up and down object states.
track list threshold percentage	Specifies a percentage threshold for a tracked list.
track list threshold weight	Specifies a weight threshold for a tracked list.
threshold weight	Specifies a threshold weight for a tracked list.
threshold percentage	Specifies a threshold percentage for a tracked list.

track rtr

To track the state of a Service Assurance Agent (SAA) operation and to enter tracking configuration mode, use the **track rtr** command in global configuration mode. To remove the tracking, use the **no** form of this command.

```
track object-number rtr saa-id {state | reachability}
```

```
no track object-number rtr saa-id {state | reachability}
```

Syntax Description

<i>object-number</i>	Object number representing the object to be tracked. The range is from 1 to 500.
<i>saa-id</i>	Service Assurance Agent router ID number.
state	Tracks operation return code.
reachability	Tracks whether the route is reachable.

Defaults

SAA tracking is disabled.

Command Modes

Global configuration

Command History

Release	Modification
12.3(4)T	This command was introduced.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.

Usage Guidelines

Every SAA operation maintains an operation return-code value. This return code is interpreted by the tracking process. The return code may return OK, OverThreshold, and several other return codes. Different operations may have different return-code values, so only values common to all operation types are used.

Two aspects of an SAA operation can be tracked: state and reachability. The difference between these relates to the acceptance of the OverThreshold return code. [Table 51](#) shows the state and reachability aspects of SAA operations that can be tracked.

Table 51 Comparison of State and Reachability Operations

Tracking	Return Code	Track State
State	OK	Up
	(everything else)	Down
Reachability	OK or over threshold	Up
	(everything else)	Down

In the following example, the tracking process is configured to track the state of SAA router 2.

```
track 1 rtr 2 state
```

In the following example, the SAA tracking process is configured to track the reachability of SAA router 3.

```
track 2 rtr 3 reachability
```

track timer

To specify the interval in which the tracking process polls the tracked object, use the **track timer** command in tracking configuration mode. To disable this functionality, use the **no** form of this command.

track timer {**interface** | **ip route**} *seconds*

no track timer {**interface** | **ip route**} *seconds*

Syntax Description		
	interface	Tracks the specified interface.
	ip route	Tracks the specified IP route.
	<i>seconds</i>	Interval (in seconds) in which the tracking process polls the object. The range is from 1 to 3000. The interface polling interval default is 1 second, and the IP-route polling interval default is 15 seconds.

Defaults If you do not use the **track timer** command to specify a polling interval, a tracked object will be tracked at the default polling interval.

Command Modes Tracking configuration

Command History	Release	Modification
	12.2(15)T	This command was introduced.

Examples In the following example, the tracking process is configured to poll the tracked interface every 3 seconds:

```
track timer interface 3
```

transmit-interface

To assign a transmit interface to a receive-only interface, use the **transmit-interface** command in interface configuration mode. To return to normal duplex Ethernet interfaces, use the **no** form of this command.

transmit-interface *type number*

no transmit-interface

Syntax Description

<i>type</i>	Transmit interface type to be linked with the (current) receive-only interface.
<i>number</i>	Transmit interface number to be linked with the (current) receive-only interface.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Receive-only interfaces are used commonly with microwave Ethernet links.

Examples

The following example specifies Ethernet interface 0 as a simplex Ethernet interface:

```
interface ethernet 1
 ip address 128.9.1.2
 transmit-interface ethernet 0
```

update arp

To secure dynamic Address Resolution Protocol (ARP) entries in the ARP table to their corresponding DHCP bindings, use the **update arp** command in DHCP pool configuration mode. To disable this command and change secure ARP entries to dynamic ARP entries, use the **no** form of this command.

update arp

no update arp

Syntax Description

This command has no keywords or arguments.

Defaults

No default behavior or values.

Command Modes

DHCP pool configuration

Command History

Release	Modification
12.2(15)T	This command was introduced.

Usage Guidelines

The **update arp** DHCP pool configuration command is used to secure ARP table entries and their corresponding DHCP leases. However, existing active leases are not secured. These leases will remain insecure until they are renewed. When the lease is renewed, it is treated as a new lease and will be secured automatically. If this feature is disabled on the DHCP server, all existing secured ARP table entries will automatically change to dynamic ARP entries.

This command can be configured only under the following conditions:

- DHCP network pools in which bindings are created automatically and destroyed upon lease termination or when the client sends a DHCPRELEASE message.
- Directly connected clients on LAN interfaces and wireless LAN interfaces.

The configuration of this command is not visible to the client. When this command is configured, secured ARP table entries that are created by a DHCP server cannot be removed from the ARP table by the **clear arp-cache** command. This is designed behavior. If a secure ARP entry created by the DHCP server must be removed, the **clear ip dhcp binding** command can be used. This command will clear the DHCP binding and secured ARP table entry.



Note

This command does not secure ARP table entries for BOOTP clients.

Examples

The following example configures the Cisco IOS DHCP server to secure ARP table entries to their corresponding DHCP leases within the DHCP pool named WIRELESS-POOL:

```
Router(config)# ip dhcp pool WIRELESS-POOL
Router(dhcp-config)# update arp
```

```
Router (dhcp-config) # exit
```

Related Commands

Command	Description
accounting (DHCP)	Enables DHCP accounting for the specified server group.
aaa accounting	Enables AAA accounting of requested services for billing or security purposes when you use RADIUS or TACACS+.
aaa group server	Groups different server hosts into distinct lists and distinct methods.
aaa new-model	Enables the AAA access control model.
aaa session-id	Specifies whether the same session ID will be used for each AAA accounting service type within a call or whether a different session ID will be assigned to each accounting service type.
clear arp-cache	Deletes all dynamic entries from the ARP cache.
clear ip dhcp binding	Deletes an automatic address binding from the Cisco IOS DHCP Server database.
ip dhcp database	Configures a Cisco IOS DHCP Server to save automatic bindings on a remote host called a database agent.
ip dhcp pool	Configures a DHCP address pool on a Cisco IOS DHCP Server and enters DHCP pool configuration mode.
ip radius source-interface	Forces RADIUS to use the IP address of a specified interface for all outgoing RADIUS packets.
radius-server host	Specifies a RADIUS server host.
radius-server retransmit	Specifies the number of times that Cisco IOS will look for RADIUS server hosts.
show ip dhcp binding	Displays address bindings on the Cisco IOS DHCP server.
show ip dhcp server statistics	Displays Cisco IOS DHCP server statistics.

update dns

To dynamically update the Domain Name System (DNS) with address (A) and pointer (PTR) Resource Records (RRs) for some address pools, use the **update dns** command in global configuration mode. To disable dynamic updates, use the **no** form of this command.

update dns [both | never] [override] [before]

no update dns [both | never] [override] [before]

Syntax Description		
both	(Optional) Dynamic Host Configuration Protocol (DHCP) server will perform Dynamic DNS (DDNS) updates for both PTR (reverse) and A (forward) RRs associated with addresses assigned from an address pool.	
never	(Optional) DHCP server will not perform DDNS updates for any addresses assigned from an address pool.	
override	(Optional) DHCP server will perform DDNS updates for PTR RRs associated with addresses assigned from an address pool, even if the DHCP client has specified in the fully qualified domain name (FQDN) option that the server should not perform updates.	
before	(Optional) DHCP server will perform DDNS updates before sending the DHCP ACK back to the client. The default is to perform updates after sending the DHCP ACK.	

Defaults No updates are performed.

Command Modes Global configuration

Command History	Release	Modification
	12.3(8)YA	This command was introduced.
	12.3(14)T	This command was integrated into Cisco IOS Release 12.3(14)T.

Usage Guidelines If you configure the **update dns both override** command, the DHCP server will perform DDNS updates for both PTR and A RRs associated with addresses assigned from an address pool, even if the DHCP client specified in the FQDN that the server should not.

If the server is configured using this command with or without any of the other keywords, and if the server does not see an FQDN option in the DHCP interaction, then it will assume that the client does not understand DDNS and act as though it were configured to update both A and PTR records on behalf of the client.

Examples The following example shows how to configure the DHCP to never update the A and PTR RRs:

```
update dns never
```

Related Commands

Command	Description
debug dhcp	Displays debugging information about the DHCP client and monitors the status of DHCP packets.
debug ip ddns update	Enables debugging for DDNS updates.
debug ip dhcp server	Enables DHCP server debugging.
host (host-list)	Specifies a list of hosts that will receive DDNS updates of A and PTR RRs.
ip ddns update hostname	Enables a host to be used for DDNS updates of A and PTR RRs.
ip ddns update method	Specifies a method of DDNS updates of A and PTR RRs and the maximum interval between the updates.
ip dhcp client update dns	Enables DDNS updates of A RRs using the same hostname passed in the hostname and FQDN options by a client.
ip dhcp-client update dns	Enables DDNS updates of A RRs using the same hostname passed in the hostname and FQDN options by a client.
ip dhcp update dns	Enables DDNS updates of A and PTR RRs for most address pools.
ip host-list	Specifies a list of hosts that will receive DDNS updates of A and PTR RRs.
show ip ddns update	Displays information about the DDNS updates.
show ip ddns update method	Displays information about the DDNS update method.
show ip dhcp server pool	Displays DHCP server pool statistics.
show ip host-list	Displays the assigned hosts in a list.

utilization mark high

To configure the high utilization mark of the current address pool size, use the **utilization mark high** command in DHCP pool configuration mode. To remove the high utilization mark, use the **no** form of this command.

utilization mark high *percentage-number*

no utilization mark high *percentage-number*

Syntax Description

<i>percentage-number</i>	Percentage of the current pool size.
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Defaults

The default high utilization mark is 100 percent of the current pool size.

Command Modes

DHCP pool configuration

Command History

Release	Modification
12.2(8)T	This command was introduced.

Usage Guidelines

The current pool size is the sum of all addresses in all the subnets in the pool. If the utilization level exceeds the configured high utilization mark, the pool will schedule a subnet request.

This command cannot be used unless the **autogrow size** option of the **origin** command is configured.

Examples

The following example sets the high utilization mark to 80 percent of the current pool size:

```
utilization mark high 80
```

Related Commands

Command	Description
origin	Configures an address pool as an on-demand address pool.
utilization mark low	Configures the low utilization mark of the current address pool size.

utilization mark low

To configure the low utilization mark of the current address pool size, use the **utilization mark low** command in DHCP pool configuration mode. To remove the low utilization mark, use the **no** form of this command.

utilization mark low *percentage-number*

no utilization mark low *percentage-number*

Syntax Description

<i>percentage-number</i>	Percentage of the current pool size.
--------------------------	--------------------------------------

Defaults

The default low utilization mark is 0 percent of the current pool size.

Command Modes

DHCP pool configuration

Command History

Release	Modification
12.2(8)T	This command was introduced.

Usage Guidelines

The current pool size is the sum of all addresses in all the subnets in the pool. If the utilization level drops below the configured low utilization mark, a subnet release is scheduled from the address pool. This command cannot be used unless the **autogrow** *size* option of the **origin** command is configured.

Examples

The following example sets the low utilization mark to 20 percent of the current pool size:

```
utilization mark low 20
```

Related Commands

Command	Description
origin	Configures an address pool as an on-demand address pool.
utilization mark high	Configures the high utilization mark of the current address pool size.

virtual

To configure virtual server attributes, use the **virtual** virtual server configuration command. To remove the attributes, use the **no** form of this command.

```
virtual ip-address {tcp | udp} port-number [service service-name]
```

```
no virtual
```

Syntax Description	
<i>ip-address</i>	IP address for this virtual server instance, used by clients to connect to the server farm.
tcp	Performs load balancing for only TCP connections.
udp	Performs load balancing for only UDP connections.
<i>port-number</i>	<p>(Optional) IOS SLB virtual port (the TCP or UDP port number or port name). If specified, only the connections for the specified port on the server are load balanced. The ports and the valid name or number for the <i>port-number</i> argument are as follows:</p> <ul style="list-style-type: none"> • Domain Name System: dns 53 • File Transfer Protocol: ftp 21 • HTTP over Secure Socket Layer: https 443 • Mapping of Airline Traffic over IP, Type A: matip-a 350 • Network News Transport Protocol: nntp 119 • Post Office Protocol v2: pop2 109 • Post Office Protocol v3: pop3 110 • Simple Mail Transport Protocol: smtp 25 • Telnet: telnet 23 • World Wide Web (HTTP): www 80 <p>Specify a port number of 0 to configure an all-port virtual server (that is, a virtual server that accepts flows destined for all ports).</p>
service	(Optional) Couple connections associated with a given service, such as HTTP or Telnet, so all related connections from the same client use the same real server.
<i>service-name</i>	(Optional) Type of connection coupling. Currently, the only choice is ftp . Couple FTP data connections with the control session that created them.

Defaults No default behavior or values.

Command Modes SLB virtual server configuration

Command History

Release	Modification
12.0(7)XE	This command was introduced.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.

Usage Guidelines

The **no virtual** command is allowed only if the virtual server was removed from service by the **no inservice** command.

For some applications, it is not feasible to configure all the virtual server TCP or UDP port numbers for the IOS SLB feature. To support such applications, you can configure IOS SLB virtual servers to accept flows destined for all ports. To configure an all-port virtual server, specify a port number of **0**.

**Note**

In general, you should use port-bound virtual servers instead of all-port virtual servers. When you use all-port virtual servers, flows can be passed to servers for which no application port exists. When servers reject these flows, IOS SLB might fail the server and remove it from load balancing.

Examples

The following example specifies that the virtual server with the IP address 10.0.0.1 performs load balancing for TCP connections for the port named www. The virtual server processes HTTP requests.

```
ip slb vserver PUBLIC_HTTP
virtual 10.0.0.1 tcp www
```

Related Commands

Command	Description
ip slb vserver	Identifies a virtual server.
show ip slb vservers	Displays information about the virtual servers.

vrf

To associate the on-demand address pool with a VPN routing and forwarding instance (VRF) name, use the **vrf** command in DHCP pool configuration mode. To remove the VRF name, use the **no** form of this command.

vrf *name*

no vrf *name*

Syntax Description	<i>name</i>	Name of the VRF to which the address pool is associated.
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Defaults	No default behavior or values
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Command Modes	DHCP pool configuration
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Command History	Release	Modification
	12.2(8)T	This command was introduced.

Usage Guidelines	Associating a pool with a VRF allows overlapping addresses with other pools that are not on the same VRF. Only one pool can be associated with each VRF. If the pool is configured with the origin dhcp command or origin aaa command, the VRF information is sent in the subnet request. If the VRF is configured with an RFC 2685 VPN ID, the VPN ID will be sent instead of the VRF name.
-------------------------	--

Examples	The following example associates the on-demand address pool with a VRF named red:
-----------------	---

```
ip dhcp pool red_pool
  origin dhcp subnet size initial 24 autogrow 24
  utilization mark high 85
  utilization mark low 15
  vrf red
```

Related Commands	Command	Description
	origin	Configures an address pool as an on-demand address pool.

vrrp authentication

To authenticate Virtual Router Redundancy Protocol (VRRP) packets received from other routers in the group, use the **vrrp authentication** command in interface configuration mode. To disable VRRP authentication, use the **no** form of this command.

```
vrrp group authentication {text-string | text text-string | md5 {key-string [0 | 7 | key-string] | key-chain key-chain}
```

```
no vrrp group authentication {text-string | text text-string | md5 {key-string [0 | 7 | key-string] | key-chain key-chain}
```

Syntax Description

<i>group</i>	Virtual router group number for which authentication is being configured. The group number is configured with the vrrp ip command.
<i>text-string</i>	Plain text authentication.
text <i>text-string</i>	Plain text authentication. The <i>text-string</i> argument is the authentication string and can be up to eight alphanumeric characters.
md5	Message Digest 5 (MD5) authentication. The arguments and keywords are as follows: <ul style="list-style-type: none"> • key-string—Authentication string. The optional argument and keywords are as follows: <ul style="list-style-type: none"> – 0—(Optional) The key is unencrypted. – 7—(Optional) The key is encrypted. – <i>key-string</i>—Up to 64 characters. It is recommended that the string be at least 16 characters. No prefix to the <i>key-string</i> argument means that the key is unencrypted. • key-chain—Authentication using a live key and key ID. The <i>key-chain</i> argument specifies a string, and must match the assigned key-chain name using the key chain command. <p>Note The key-string authentication method is encrypted if the service password-encryption command has been specified.</p>

Defaults

VRRP authentication is disabled.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(18)ST	This command was introduced.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.3(14)T	The md5 , key-string , 0 , 7 , and key-chain keywords were added. The <i>text-string</i> , <i>key-string</i> , and <i>key-chain</i> arguments were added.

Usage Guidelines

When a VRRP packet arrives from another router in the VRRP group, its authentication string is compared to the string configured on the local system. If the strings match, the message is accepted. If they do not match, the packet is discarded.

All routers within the group must be configured with the same authentication string.

**Note**

Plain text authentication is not meant to be used for security. It simply provides a way to prevent a router that does not belong to a configured VRRP group from participating in it.

Examples

The following example shows how to configure an authentication text string of x30dn78k:

```
vrrp 1 authentication x30dn78k
```

The following example shows how to configure an MD5 key string:

```
interface Ethernet0/1
  description ed1-cat5a-7/10
  vrrp 1 ip 10.21.0.10
  vrrp 1 priority 110
  vrrp 1 authentication md5 key-string f00c4s
```

The key ID for key-string authentication is always zero. If a key chain is configured with a key ID of zero, then the following configuration will work:

Router 1

```
key chain vrrp1
  key 0
  key-string 54321098452103ab
!
interface Ethernet0/1
  vrrp 1 ip 10.21.0.10
  vrrp 1 authentication md5 key-chain vrrp1
```

Router 2

```
interface Ethernet0/1
  vrrp 1 ip 10.21.0.10
  vrrp 1 authentication md5 key-string 54321098452103ab
```

Related Commands

Command	Description
key chain	Enables authentication for routing protocols.
service password-encryption	Encrypts passwords.
vrrp ip	Enables VRRP and identifies the IP address of the virtual router.

vrrp description

To assign a description to the Virtual Router Redundancy Protocol (VRRP) group, use the **vrrp description** command in interface configuration mode. To remove the description, use the **no** form of this command.

vrrp *group* **description** *text*

no vrrp *group* **description**

Syntax Description

<i>group</i>	Virtual router group number.
<i>text</i>	Text (up to 80 characters) that describes the purpose or use of the group.

Defaults

There is no description of the VRRP group.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(18)ST	This command was introduced.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.

Examples

The following example enables VRRP on Ethernet interface 0. VRRP group 1 is described as Building A — Marketing and Administration.

```
interface ethernet 0
 ip address 10.0.1.1 255.255.255.0
!
vrrp 1 ip 10.0.1.20
vrrp 1 description Building A - Marketing and Administration
```

Related Commands

Command	Description
vrrp ip	Enables VRRP and identifies the IP address of the virtual router.

vrrp ip

To enable the Virtual Router Redundancy Protocol (VRRP) on an interface and identify the IP address of the virtual router, use the **vrrp ip** command in interface configuration mode. To disable VRRP on the interface and remove the IP address of the virtual router, use the **no** form of this command.

```
vrrp group ip ip-address [secondary]
```

```
no vrrp group ip ip-address [secondary]
```

Syntax Description

<i>group</i>	Virtual router group number.
<i>ip-address</i>	IP address of the virtual router.
secondary	(Optional) Indicates additional IP addresses supported by this group.

Defaults

VRRP is not configured on the interface.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(18)ST	This command was introduced.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.

Usage Guidelines

Configure this command once without the **secondary** keyword to indicate the virtual router IP address. If you want to indicate additional IP addresses supported by this group, then do so and include the **secondary** keyword.

Note that removing the VRRP configuration from the IP address owner and leaving the IP address of the interface active is considered a misconfiguration because duplicate IP addresses on the LAN will result.

Examples

The following example enables VRRP on Ethernet interface 0. The VRRP group is 1. IP address 10.0.1.20 is the address of the virtual router.

```
interface ethernet 0
 ip address 10.0.1.1 255.255.255.0
 ip address 10.0.2.1 255.255.255.0 secondary
!
 vrrp 1 ip 10.0.1.20
 vrrp 1 ip 10.0.2.20 secondary
```

Related Commands

Command	Description
show vrrp	Displays a summary or detailed status of one or all configured VRRP groups.

vrrp preempt

To configure the router to take over as master virtual router for a Virtual Router Redundancy Protocol (VRRP) group if it has higher priority than the current master virtual router, use the **vrrp preempt** command in interface configuration mode. To disable this function, use the **no** form of this command.

```
vrrp group preempt [delay minimum seconds]
```

```
no vrrp group preempt
```

Syntax Description	group	Virtual router group number of the group for which preemption is being configured. The group number is configured with the vrrp ip command.
	delay minimum seconds	(Optional) Number of seconds that the router will delay before issuing an advertisement claiming master ownership. The default delay is 0 seconds.

Defaults	Enabled
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Command Modes	Interface configuration
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Command History	Release	Modification
	12.0(18)ST	This command was introduced.
	12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
	12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
	12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines	By default, the router being configured with this command will take over as master virtual router for the group if it has a higher priority than the current master virtual router. You can configure a delay, which will cause the VRRP router to wait the specified number of seconds before issuing an advertisement claiming master ownership.
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Note	The router that is the IP address owner will preempt, regardless of the setting of this command.
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Examples	The following example configures the router to preempt the current master virtual router when its priority of 200 is higher than that of the current master virtual router. If the router preempts the current master virtual router, it waits 15 seconds before issuing an advertisement claiming it is the master virtual router.
----------	---

```
vrrp 1 preempt delay minimum 15
vrrp 1 priority 200
```

■ vrrp preempt

Related Commands	Command	Description
	vrrp ip	Enables VRRP and identifies the IP address of the virtual router.
	vrrp priority	Sets the priority level of the router within a VRRP group.

vrrp priority

To set the priority level of the router within a Virtual Router Redundancy Protocol (VRRP) group, use the **vrrp priority** command in interface configuration mode. To remove the priority level of the router, use the **no** form of this command.

vrrp group priority level

no vrrp group priority level

Syntax Description	group	Virtual router group number.
	level	Priority of the router within the VRRP group. The range is from 1 to 254. The default is 100.

Defaults *level: 100*

Command Modes Interface configuration

Command History	Release	Modification
	12.0(18)ST	This command was introduced.
	12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
	12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.

Usage Guidelines Use this command to control which router becomes the master virtual router.

Examples The following example configures the router with a priority of 254:

```
vrrp 1 priority 254
```

Related Commands	Command	Description
	vrrp ip	Enables VRRP and identifies the IP address of the virtual router.
	vrrp preempt	Configures the router to take over as master virtual router for a VRRP group if it has higher priority than the current master virtual router.

vrrp shutdown

To disable the Virtual Router Redundancy Protocol (VRRP) group on an interface, use the **vrrp shutdown** command in interface configuration mode.

vrrp group shutdown

Syntax Description	<i>group</i>	Virtual router group number.
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Defaults	Enabled
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Command Modes	Interface configuration
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Command History	Release	Modification
	12.3(11)T	This command was introduced.

Usage Guidelines When a VRRP group has been configured using the **vrrp group ip** command, the protocol is fully operational. The **vrrp shutdown** command is not displayed on the router, and to disable the protocol for one group, you must explicitly specify the group using the **vrrp shutdown** command.

Examples The following example shows how to disable one VRRP group on Ethernet interface 0/1 (group 1) while retaining the VRRP group on Ethernet interface 0/2 (group 2).

```
interface ethernet0/1
 ip address 10.0.1.1 255.255.255.0
 vrrp 1 ip 10.0.1.254
 vrrp 1 shutdown
!
interface ethernet0/2
 ip address 10.0.42.1 255.255.255.0
 vrrp 2 ip 10.0.42.254
```

Related Commands	Command	Description
	show vrrp	Displays a summary or detailed status of one or all configured VRRP groups.

vrrp timers advertise

To configure the interval between successive advertisements by the master virtual router in a Virtual Router Redundancy Protocol (VRRP) group, use the **vrrp timers advertise** command in interface configuration mode. To restore the default value, use the **no** form of this command.

```
vrrp group timers advertise [msec] interval
```

```
no vrrp group timers advertise [msec] interval
```

Syntax Description		
	<i>group</i>	Virtual router group number.
	msec	(Optional) Changes the unit of the advertisement time from seconds to milliseconds. Without this keyword, the advertisement interval is in seconds.
	<i>interval</i>	Time interval between successive advertisements by the master virtual router. The unit of the interval is in seconds, unless the msec keyword is specified. The default is 1 second.

Defaults *interval*: 1 second

Command Modes Interface configuration

Command History	Release	Modification
	12.0(18)ST	This command was introduced.
	12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
	12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.

Usage Guidelines The advertisements being sent by the master virtual router communicate the state and priority of the current master virtual router.

Examples The following example configures the master virtual router to send advertisements every 4 seconds:

```
vrrp 1 timers advertise 4
```

Related Commands	Command	Description
	vrrp ip	Enables VRRP and identifies the IP address of the virtual router.
	vrrp timers learn	Configures the router, when it is acting as backup virtual router for a VRRP group, to learn the advertisement interval used by the master virtual router.

vrrp timers learn

To configure the router, when it is acting as backup virtual router for a Virtual Router Redundancy Protocol (VRRP) group, to learn the advertisement interval used by the master virtual router, use the **vrrp timers learn** command in interface configuration mode. To prevent the local router from learning the advertisement interval of the master virtual router, use the **no** form of this command.

vrrp group timers learn

no vrrp group timers learn

Syntax Description	<i>group</i>	Virtual router group number to which the command applies.
Defaults	Disabled; the local router calculates the downtime of the master virtual router based on the advertisement interval of the local router as configured by the vrrp timers advertise command.	
Command Modes	Interface configuration	
Command History	Release	Modification
	12.0(18)ST	This command was introduced.
	12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
	12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
Usage Guidelines	If this command is configured, when the local router is acting as a backup virtual router for the group, it will learn the advertisement interval of the current master virtual router from its master advertisements. The local router will use that value to calculate how long it should wait before deciding that the master virtual router has gone down. This command synchronizes timers with the current master virtual router.	
Examples	The following example configures the router, when it is acting as backup virtual router, to learn the advertisement interval from the advertisements of the current master virtual router: vrrp 1 timers learn	
Related Commands	Command	Description
	vrrp ip	Enables VRRP and identifies the IP address of the virtual router.
	vrrp timers advertise	Configures the interval between successive advertisements by the master virtual router in a VRRP group.

vrrp track

To configure the Virtual Router Redundancy Protocol (VRRP) to track an object, use the **vrrp track** command in interface configuration mode. To disable the tracking, use the **no** form of this command.

```
vrrp [group-number] track object-number [decrement priority]
```

```
no vrrp [group-number] track object-number [decrement priority]
```

Syntax Description		
<i>group-number</i>	(Optional) Group number to which the tracking applies.	
<i>object-number</i>	Object number in the range from 1 to 500 representing the object to be tracked.	
decrement <i>priority</i>	(Optional) Amount by which the priority for the router is decremented (or incremented) when the tracked object goes down (or comes back up). The default value is 10. Decrements can be set to any value between 1 and 255.	

Defaults The default decrement value is 10. The range is from 1 and 255.

Command Modes Interface configuration

Command History	Release	Modification
	12.3(2)T	This command was introduced.

Usage Guidelines You can configure VRRP to track specific objects, such as an interface or IP route, that can alter the priority level of a virtual router for a VRRP group. The tracked objects are first defined using the **track interface** or **track ip route** global configuration command. The client process, in this case VRRP, registers interest in tracking these objects and can then be notified when the tracked object changes state.

Examples In the following example, the tracking process is configured to track the IP routing capability of serial interface 1/0. VRRP on Ethernet interface 0/0 then registers with the tracking process to be informed of any changes to the IP routing state of serial interface 1/0. If the IP state on serial interface 1/0 goes down, then the priority of the VRRP group is reduced by 10.

If both serial interfaces are operational, then Router A will be the master virtual router because it has the higher priority.

However, if IP routing on serial interface 1/0 in Router A fails, then the HSRP group priority will be reduced and Router B will take over as the master virtual router, thus maintaining a default virtual gateway service to hosts on the 10.1.0.0 subnet.

Router A Configuration

```
!
track 100 interface serial1/0 ip routing
!
```

```
interface Ethernet0/0
  ip address 10.1.0.21 255.255.0.0
  vrrp 1 ip 10.1.0.1
  vrrp 1 priority 105
  vrrp 1 track 100 decrement 10
```

Router B Configuration

```
!
track 100 interface serial1/0 ip routing
!
interface Ethernet0/0
  ip address 10.1.0.22 255.255.0.0
  vrrp 1 ip 10.1.0.1
  vrrp 1 priority 100
  vrrp 1 track 100 decrement 10
```

Related Commands

Command	Description
track interface	Configures an interface to be tracked.
track ip route	Tracks the state of an IP route.

weight

To specify the capacity of a real server relative to other real servers in the server farm, use the **weight** real server configuration command. To restore the default weight value, use the **no** form of this command.

weight *weighting-value*

no weight

Syntax Description	<i>weighting-value</i>	Weighting value to use for real server predictor algorithm. Valid values range from 1 to 155. The default weighting value is 8.
---------------------------	------------------------	---

Defaults The default weighting value is 8.

Command Modes SLB real server configuration

Command History	Release	Modification
	12.0(7)XE	This command was introduced.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.	

Examples The following example specifies the relative weighting values of three real servers as 16, 8 (by default), and 24, respectively:

```
ip slb serverfarm PUBLIC
real 10.10.1.1First real server
weight 16Assigned weight of 16
inserviceEnabled
exit
real 10.10.1.2Second real server
inserviceEnabled; default weight
exit
real 10.10.1.3Third real server
weight 24Assigned weight of 24;
```

Related Commands	Command	Description
		real
	show ip slb reals	Displays information about the real servers.
	show ip slb serverfarms	Displays information about the server farm configuration.

■ weight