

IP Summary Address for RIPv2

This feature module describes the IP Summary Address feature for Routing Information Protocol, version 2. It includes information on the benefits of the new feature, supported platforms, related documents, and so forth.

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Feature Overview

The IP Summary Address for RIP feature enables Cisco routers running RIPv2 to advertise a summarized local IP address pool on a network access server so that the address pool can be provided to dialup clients. For example, if a local IP address pool of 10.1.1.1 to 10.1.1.254 is configured on the network access server, you could configure the **ip summary-address rip 10.1.1.0 255.255.255.0** command on the network access server port that provides addresses to dialup clients to cause the router to advertise 10.1.1.0/24 routes to dialup clients. Because a summary route is advertised, advertisement of the /32 host routes (installed when the dialup client connects) is suppressed so that the router does not advertise these routes to the network access server interface.

When RIP determines that a summary address is required in the RIP database, a summary entry is created in the RIP routing database. As long as there are “child” routes (routes that are created for any combination of the individual IP addresses contained within a summary address), this summary address, the address remains in the routing database. When the last child route is removed, the summary entry also is removed from the database. This method of handling database entries reduces the number of entries in the database because each child route is not listed in an entry, and the aggregate entry itself is removed when there are no longer any valid child routes for it.

RIPv2 route summarization requires that the lowest metric of the “best route” of an aggregated entry, or the lowest metric of all current child routes, be advertised. The best metric for aggregated summarized routes is calculated at route initialization or when there are metric modifications of specific routes at advertisement time, and not at the time the aggregated routes are advertised.

Benefits

Scalability

Using the summary IP address feature for RIP means that there is no entry for child routes in the RIP routing table, reducing the size of the table and allowing the router to handle more routes.

Efficiency

Summary IP address functions more efficiently than multiple individually advertised IP routes, because:

- The summarized routes in the RIP database are processed first.
- Any associated child routes that are included in a summarized route are skipped as RIP looks through the routing database, reducing the processing time required.

Restrictions

Autosummary will override the configured summary-address feature on a given interface except when both of the following are true:

- The configured interface summary-address and the IP address of the configured interface share the same major net (the classful, nonsubnetted portion of the IP address).
- Split horizon is not enabled on the interface.

If split horizon is enabled, neither an autosummary address nor the interface summary-address is advertised.

For example, in the following example configuration, the major net is 10.0.0.0. The 10 in the address defines a Class A address space, allowing space for 0.x.x.x unique hosts where x defines unique bit positions in the addresses for these hosts. The summary of the major net defines the prefix as implied by the class (A, B, or C) of the address, without any net mask.

In the following example, the summary address 10.2.0.0 overrides the autosummary address of 10.0.0.0, 10.2.0.0 is advertised out interface E1, and 10.0.0.0 is not advertised.

```
int E1
ip address 10.1.1.1 255.255.255.0
ip summary-address rip 10.2.0.0 255.255.0.0
no ip split-horizon

router rip
network 10.0.0.0
```

Autosummary addressing always summarizes to the classful address boundary, while the **ip summary-address** is summarized specifically on an interface. If autosummary addressing is enabled, autosummarization is the default behavior for interfaces on the router not associated with dial-in clients (the “backbone”), with OR without the ip summary-address interface subcommand present.

Each route summarization on an interface must have a unique major net, despite unique masks. The current summarization accepted by the parser takes precedence, and must be removed before another summarization sharing same major net can be applied.

Supernet advertisement (advertising any network prefix less than its classful major net) is not allowed, other than advertising a supernet learned in the routing tables. Supernets learned on any interface that is subject to configuration are still learned. For example, the following summarization is invalid:

```
int E1
..
ip summary-address rip 10.0.0.0 252.0.0.0 (invalid supernet summarization)
```

Each route summarization on an interface must have a unique major net, even if the subnet mask is unique. For example, the following is not permitted:

```
int E1
...
ip summary-address rip 10.1.0.0 255.255.0.0
ip summary-address rip 10.2.0.0 255.255.0.0 (or different mask)
```

Note The **ip summary-address eigrp** command uses other options that are not applicable to RIP. Do not confuse EIGRP summary-address with the new RIP command, **ip summary-address rip**.

Related Documents

- *Network Protocols Configuration Guide, Part 1*, Cisco IOS Release 12.0
- *Network Protocols Command Reference, Part 1*, Cisco IOS Release 12.0

Supported Platforms

- Cisco 1003
- Cisco 1004
- Cisco 1005
- Cisco 1600 series
- Cisco 2500 series
- Cisco 3600 series
- Cisco 3800 series
- Cisco 4000 series (Cisco 4000, 4000-M, 4500, 4500-M, 4700, 4700-M)
- Cisco 5200 series
- Cisco 7000 series
- Cisco 7200 series
- Cisco 7500 series
- Cisco AS5300

The IP Summary Address feature for RIPv2 runs on all platforms that support Cisco IOS Release 12.0.

Supported Standards, MIBs, and RFCs

Standards

No new or modified standards are supported by this feature.

MIBs

No new or modified MIBs are supported by this feature.

For descriptions of supported MIBs and how to use MIBs, see the Cisco MIB web site on CCO at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

RFCs

No new or modified RFCs are supported by this feature.

Configuration Tasks

See the following “Configuring IP Summary Address for RIPv2” section for configuration task for the IP Summary Address for RIPv2 feature. This task is required.

Configuring IP Summary Address for RIPv2

The **ip summary-address rip** command causes the router to summarize a given set of routes learned via RIPv2 or redistributed into RIPv2. Host routes are especially applicable for summarization. To configure IP summary addressing, complete the following steps, beginning in router configuration mode:

Step	Command	Purpose
1	Router config# rip	Enables RIP routing.
2	Router (config-if)# int e1	Enters interface configuration mode.
3	Router (config-if)# ip summary-address rip ip_address ip_network_mask	Specifies the IP address and network mask that identify the routes to be summarized.

Verifying IP Summary Addresses for RIP V2

You can verify which routes are summarized for an interface using the **show ip protocols** command. For example, the following shows potential summarizations and the associated interface summary-address/network mask for Ethernet interface 2:

```
router# show ip protocols
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 8 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Outgoing update filter list for all interfaces is
  Incoming update filter list for all interfaces is
  Redistributing: rip
  Default version control: send version 2, receive version 2
    Interface        Send  Recv  Triggered RIP  Key-chain
  Ethernet2          2     2
  Ethernet3          2     2
  Ethernet4          2     2
  Ethernet5          2     2
  Automatic network summarization is not in effect
  Address Summarization:
    12.11.0.0/16 for Ethernet2
```

You can check summary address entries in the RIP database. These entries will appear in the database only if there are relevant child routes being summarized. When the last child route for a summary address becomes invalid, the summary address is also removed from the routing table. The following example shows a summary address entry for route 12.11.0.0/16, with three child routes active:

```
router# show ip rip database
11.0.0.0/8      auto-summary
11.11.11.0/24   directly connected, Ethernet2
12.0.0.0/8      auto-summary
12.11.0.0/16    int-summary
^^^^^^^^^^^^^^^^
12.11.10.0/24   directly connected, Ethernet3
12.11.11.0/24   directly connected, Ethernet4
12.11.12.0/24   directly connected, Ethernet5
```

Configuration Examples

This section provides the following configuration examples:

- Configuration for IP Summary Address for RIPv2
- Incorrect Configuration without Unique Major Net Addresses

Configuration for IP Summary Address for RIPv2

In the following example the major net is 10.0.0.0. The summary address 10.2.0.0 overrides the autosummary address of 10.0.0.0, so that 10.2.0.0 is advertised out interface e1 and 10.0.0.0 is not advertised.

Note If split horizon is enabled, neither autosummary nor interface summary addresses (those configured with the **ip summary-address rip** command) are advertised.

```
router rip
router int e1
 ip address 10.1.1.1 255.255.255.0
 (config-if)# ip summary-address rip 10.2.0.0 255.255.0.0
no ip split-horizon

router rip
network 10.0.0.0

neighbor 2.2.2.2 peer-group mygroup
```

Incorrect Configuration without Unique Major Net Addresses

The following example is illegal, because both addresses to be summarized have the same major net. Each route summarization on an interface must have a unique major net, whether or not the addresses have unique address masks.

```
int E1
...
ip summary-address rip 10.1.0.0 255.255.0.0
ip summary-address rip 10.2.0.0 255.255.255.0
```

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.0 command reference publications.

- **ip summary-address rip**
- **show ip protocols**
- **show ip rip database**

In Cisco IOS Release 12.0(1)T or later, you can search and filter the output for **show** and **more** commands. This functionality is useful when you need to sort through large amounts of output, or if you want to exclude output that you do not need to see.

To use this functionality, enter a **show** or **more** command followed by the “pipe” character (**|**), one of the keywords **begin**, **include**, or **exclude**, and an expression that you want to search or filter on:

command | {begin | include | exclude} regular-expression

Following is an example of the **show atm vc** command in which you want the command output to begin with the first line where the expression “PeakRate” appears:

show atm vc | begin PeakRate

For more information on the search and filter functionality, refer to the Cisco IOS Release 12.0(1)T feature module titled *CLI String Search*.

ip summary-address rip

To configure a Cisco router running RIPv2 to advertise a summarized local IP address pool on a network access server so that the address pool can be provided to dialup clients and specify the IP address and network mask that identify the routes to be summarized, use the **ip summary-address rip** router configuration command.

ip summary-address rip *ip-address ip_network_mask*

Syntax Description

<i>ip-address</i>	IP address to be summarized.
<i>ip_network_mask</i>	IP network mask that drives route summarization for the specified IP address.

Defaults

No default behavior or values.

Command Modes

Router configuration.

Command History

Release	Modification
12.0(6)T	This command was introduced.

Usage Guidelines

The host name entries are not removed from NVRAM but are cleared in running memory.

Examples

In the following example the major net is 10.0.0.0. The summary address 10.2.0.0 overrides the autosummary address of 10.0.0.0, so that 10.2.0.0 is advertised out interface e1 and 10.0.0.0 is not advertised.

Note If split horizon is enabled, neither autosummary nor interface summary addresses (those configured with the **ip summary-address rip** command) are advertised.

```
router rip
router int e1
 ip address 10.1.1.1 255.255.255.0
 (config-if)# ip summary-address rip 10.2.0.0 255.255.0.0
no ip split-horizon

router rip
network 10.0.0.0

neighbor 2.2.2.2 peer-group mygroup
```

Related Commands

Command	Description
auto-summary	Restores the default behavior of automatic summarization of subnet routes into network-level routes.
ip split-horizon	Enables the split horizon mechanism, which blocks information about routes from being advertised by a router out of any interface from which that information originated.

show ip protocols

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

show ip protocols

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(6)T	Display of information about associated interface summary address and network masks was added.

Examples

The following example shows potential summarizations and the associated interface summary-address/network masks for Ethernet interface 2:

```
router# show ip prot
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 8 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Outgoing update filter list for all interfaces is
  Incoming update filter list for all interfaces is
  Redistributing: rip
  Default version control: send version 2, receive version 2
    Interface        Send  Recv  Triggered RIP  Key-chain
  Ethernet2          2     2
  Ethernet3          2     2
  Ethernet4          2     2
  Ethernet5          2     2
  Automatic network summarization is not in effect
  Address Summarization:
    12.11.0.0/16 for Ethernet2
```

Related Commands

Command	Description
ip summary-address rip	Specifies the IP address and network mask for the routes to be summarized.
show ip rip database	Displays summary address entries in the RIP routing database.

show ip rip database

To display summary address entries in the Routing Information Protocol (RIP) routing database entries if there are relevant routes being summarized based upon a summary address, use the **show ip rip database** EXEC command.

show ip rip database

Syntax Description

There are no arguments or keywords for this command.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
12.0(6)	This command was introduced.

Usage Guidelines

Summary address entries will appear in the database only if there are relevant child routes being summarized. When the last child route for a summary address becomes invalid, the summary address is also removed from the routing table.

Examples

The following example shows a summary address entry for route 12.11.0.0/16, with three child routes active:

```
router# show ip rip database
11.0.0.0/8      auto-summary
11.11.11.0/24   directly connected, Ethernet2
12.0.0.0/8      auto-summary
12.11.0.0/16    int-summary
^^^^^^^^^^^^^^^^
12.11.10.0/24   directly connected, Ethernet3
12.11.11.0/24   directly connected, Ethernet4
12.11.12.0/24   directly connected, Ethernet5
```

Related Commands

Command	Description
ip summary-address rip	Specifies the IP address and network mask that identify the routes to be summarized.
show ip protocols	Displays the parameters and current state of the active routing protocol process.