



IBM i

Networking

OMPROUTED RIP and RIPng support

*7.1*







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**Note**

Before using this information and the product it supports, read the information in "Notices," on page 11.

This edition applies to IBM i 7.1 (product number 5770-SS1) and to all subsequent releases and modifications until otherwise indicated in new editions. This version does not run on all reduced instruction set computer (RISC) models nor does it run on CISC models.

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## OMPROUTED RIP and RIPng support

Routing Information Protocol (RIP) is the simplest routing protocol for exchanging routing information within an autonomous system (AS). Routing Information Protocol next generation (RIPng) is the latest version of RIP for networks that are based on Internet Protocol version 6 (IPv6). Both protocols are supported by the OMPROUTED server.

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### What's new for IBM i 7.1

Read about new or significantly changed information for the OMPROUTED and RIPng support topic collection.

Miscellaneous technical changes have been made since the previous publication.

#### How to see what's new or changed

To help you see where technical changes have been made, the information center uses:

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You can view and print a PDF file of this information.


To view or download the PDF version of this document, select RIP and RIPng support (about 157 KB).

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## OMPROUTED RIP and RIPng concepts

Routing Information Protocol (RIP) is the simplest routing protocol that uses a "distance vector" algorithm to determine the best routing path. It uses the number of hops, or hop count (also referred as the metric) to determine the best possible route to a host or network. RIP is designed as an Interior Gateway Protocol (IGP), a protocol for exchanging routing information within an autonomous system (AS).

RIPng is the latest RIP version. It is a routing protocol that exchanges routing information used to compute routes for IPv6 networks.

On a System i<sup>®</sup> platform, the OMPROUTED TCP/IP server provides support for the RIPng protocol, and for old RIPv1 and RIPv2 protocols that are also supported by the Route Daemon (RouteD) server. However, the RouteD server does not support RIPng to interact with IPv6 networks. You can use either the RouteD server or the OMPROUTED server to handle the IPv4 RIP versions, but you cannot use both of them at the same time.

*Table 1. TCP/IP protocols supported by the OMPROUTED and RouteD server*

TCP/IP protocols	OMPROUTED server	RouteD server
RIPv1	Support	Support
RIPv2	Support	Support
RIPng	Support	No support
OSPF Version 2 (IPv4)	Support	No support
OSPF Version 3 (IPv6)	Support	No support

Because there is no tool or automatic process available for exporting a RouteD configuration to an OMPROUTED RIP configuration, you must use CL commands to configure the OMPROUTED server for RIP and RIPng.

### **Related information:**

Open Shortest Path First support

RouteD

## RIP interfaces

For IBM<sup>®</sup> i, a RIP interface is an Internet address that represents a logical TCP/IP connection that is associated with an existing IBM i line description. The IP address of the associated interface is the one that is configured as the RIP interface.

Use the Add RIP Interface (ADDRIPIFC) command to set the different parameters needed by the OMPROUTED server to identify an interface as an usable RIP interface. For IBM i, the RIP interface identifier is an IPv4 address, an IPv6 address, or an alias name. For IPv4, the RIP interface identifier can also be a Point-to-Point Protocol (PPP) profile name.

RIPv1 (IPv4) uses broadcast messages to communicate with other routers. RIPv2 (IPv4) uses multicast functions when interfaces are attached to broadcast networks, such as Ethernet. For all RIP routers, these interfaces are joined to multicast address 224.0.0.9. Only the packets that are destined for the 224.0.0.9 IP address are received by interfaces that are joined to the multicast IP address. RIPng (IPv6) uses ff02::9 for the multicast address.

To identify IBM i TCP/IP interfaces that are valid RIP interfaces, use NETSTAT OPTION(\*IFC) for IPv4, or use NETSTAT OPTION(\*IFC6) for IPv6. If multiple RIP interface identifiers that belong to a common subnet are added to a RIP configuration, only one interface actually exchanges RIP information.

### **Related reference:**



“OMPROUTED RIP and RIPng commands” on page 8

Use control language (CL) commands to manage RIP attributes, interfaces, filters, accepted unconditional routes, and ignore neighbors. The CL configuration supports both RIP for IPv4 and RIPng for IPv6.

## Point-to-point links for RIP

A point-to-point connection is a serial link that connects two routers, making them RIP neighbors. Point-to-point connections are supported for IBM i in a RIP environment.

To configure RIP point-to-point links, a connection profile or a line description that represents a connection to a modem resource is required. The modem is in leased or switched mode.

Use the Add RIP Interface (ADDRIPIFC) command to add point-to-point interfaces to a RIP configuration by specifying the interface identifier (IFC) parameter, where *connection\_profile\_name* represents an existing profile from the connection profiles list:

```
ADDRIPIFC IFC(connection_profile_name)
```

You can use the Work with Point-to-Point TCP/IP (WRKTCPPTP) command to identify the existing PPP profile names for RIP interfaces. It is not required that a connection profile is active when a point-to-point connection is added to a configuration, but the connection profile must be active when the OMPROUTED RIP server is started.

### Related information:

Remote Access Services: PPP connections

## Send only

You can specify the Send only parameter in some RIP commands to include only certain types of routes in advertisements that are sent over RIP interfaces.

- To apply the Send only function to all RIP interfaces, specify the Send only parameter in the Change RIP Attributes (CHGRIPA) command:

```
CHGRIPA SNDONLY(send_only_value)
```

- To apply the Send only function to only a specific interface, specify the Send only parameter in the Add RIP Interfaces (ADDRIPIFC) command or the Change RIP Interfaces (CHGRIPIFC) command:

–

```
ADDRIPIFC IFC(IFC_ID) SNDONLY(send_only_value)
```

In this command, the *IFC\_ID* represents a valid interface identifier.

–

```
CHGRIPIFC IFC(IFC_ID) SNDONLY(send_only_value)
```

In this command, the *IFC\_ID* represents an interface identifier that is already added to the configuration.

### Related reference:

“OMPROUTED RIP and RIPng commands” on page 8

Use control language (CL) commands to manage RIP attributes, interfaces, filters, accepted unconditional routes, and ignore neighbors. The CL configuration supports both RIP for IPv4 and RIPng for IPv6.

## Default routes

The default route is used when the IP destination address for an incoming packet does not exist in that system, so the packet is forwarded to the default route. The OMPROUTED server sends the default routes based on some global parameters from the Change RIP Attributes (CHGRIPA) command.

A default route, also known as the gateway of last resort, is the route used by the router when the IP destination address from a certain packet is unknown.

For IPv4, the default route is 0.0.0.0/0. The OMPROUTED server sends the default routes based on these global parameters from the Change RIP Attributes (CHGRIPA) command: Condition (COND), Accept default (ACPDFT), and Cost (COST).

For IPv6, the default route is ::/0. The OMPROUTED server sends the default routes based on these global parameters from the Change RIP Attributes (CHGRIPA) command: IPv6 Condition (IP6COND), IPv6 Accept default (IP6ACPDFT), and IPv6 Cost (IP6COST).

**Related reference:**

“OMPROUTED RIP and RIPng commands” on page 8

Use control language (CL) commands to manage RIP attributes, interfaces, filters, accepted unconditional routes, and ignore neighbors. The CL configuration supports both RIP for IPv4 and RIPng for IPv6.

## RIP accepted routes

A network, a subnet (for IPv4), a prefix (for IPv6), or a host route (for both IPv4 and IPv6) can be accepted independently, regardless of whether its corresponding interface has the reception parameter enabled. If your RIP interface is configured not to receive any host routes, you can use the Add RIP Accepted Routes (ADDRIPACP) command to receive a host route as an exception.

For example, you can configure a RIP interface to reject any host routes by setting the Receive dynamic hosts (RCVDYNHOST) parameter to \*NO, and to accept only a certain host route by using the ADDRIPACP command.

```
ADDRIPIFC IFC(IFC_ID) RCVDYNHOST(*NO)
ADDRIPACP ADDR(9.9.9.9)
```

The *IFC\_ID* in the sample command represents a valid interface identifier. After running these commands, your system rejects all host routes that are received by the RIP interface (*IFC\_ID*) except for the host route 9.9.9.9. Any other host routes that are received by the RIP interface are discarded.

**Related reference:**

“OMPROUTED RIP and RIPng commands” on page 8

Use control language (CL) commands to manage RIP attributes, interfaces, filters, accepted unconditional routes, and ignore neighbors. The CL configuration supports both RIP for IPv4 and RIPng for IPv6.

## RIP filters

You can configure a RIP filter for OMPROUTED to send only certain RIP routing information to other routers, or to accept only certain information from other routers.

By using RIP filters, you can limit the amount of RIP routing information that is sent to the network, or that is maintained by the OMPROUTED server, or both of them. In addition, you can use RIP filters to hide destination addresses from portions of the network.

## Global filters

A global filter is the filter that applies to all RIP interfaces that you have configured. Global filters are set to be stand-alone in the OMPROUTED configuration file. To configure a global filter, you must set the Filter type parameter to no send (\*NOSND) or no receive (\*NORCV) in the ADD RIP Filter (ADDRIPFLT) command.

For example, if you want to hide the network 9.0.0.0 from other routers, you can configure a no send (\*NOSND) global filter in the OMPROUTED configuration file:

```
ADDRIPIFC IFC(IFC_ID)
ADDRIPFLT DEST('9.0.0.0') TYPE(*NOSND) SUBNETMASK('255.0.0.0')
```

The *IFC\_ID* in the preceding command represents a valid interface identifier.

## Interface filters

An interface filter is the filter that links to a specific RIP interface. To configure an interface filter, you must specify the RIP filter parameters when you add a RIP interface using the Add RIP Interface (ADDRIPFC) command, or change a RIP interface using the Change RIP Interface (CHGRIPFC) command.

For example, when you add a RIP interface and you want to hide the network 9.0.0.0 to the routers that are being communicated through this interface, use this command:

```
ADDRIPFC IFC(IFC_ID) FILTER(('9.0.0.0' *NOSND '255.0.0.0'))
```

The *IFC\_ID* in the preceding command represents a valid interface identifier.

## Blackhole filters

If you set the Destination route parameter to \*IPv4 or \*IPv6 in the global RIP filters commands (ADDRIPFLT, CHGRIPFLT, and RMVRIPFLT), or to an asterisk (\*) in the RIP interface commands (ADDRIPFC, CHGRIPFC, and RMVRIPFC), the filter that you are configuring is called a blackhole filter. A blackhole filter matches any destination and can filter all routes that are sent or received over the RIP interfaces. You must use the blackhole filters with either the additional send or receive filters to allow receive, or advertise certain routes over an interface or a set of interfaces

For example, you can use the following commands to create a global blackhole filter for IPv4:

```
ADDRIPFC IFC(IFC_ID)
ADDRIPFLT DEST(*IPV4) TYPE(*NOSND)
```

You can use the following command to create an interface blackhole filter:

```
ADDRIPFC IFC(IFC_ID) FILTER((* *NORCV))
```

In the preceding commands, the *IFC\_ID* represents a valid interface identifier.

**Note:** For the interface blackhole filters, the only values that you can use for the Filter type parameter is no receive (\*NORCV) or no send (\*NOSND). Otherwise, an error is sent to the user job log.

### Related reference:

“OMPROUTED RIP and RIPng commands” on page 8

Use control language (CL) commands to manage RIP attributes, interfaces, filters, accepted unconditional routes, and ignore neighbors. The CL configuration supports both RIP for IPv4 and RIPng for IPv6.

## Ignored RIP neighbors

If a router is configured as an ignored RIP neighbor, all RIP information table messages that are received from that router are blocked. Even though the incoming messages are blocked, the OMPROUTED server is still able to send routes to those neighbors. The ignored RIP neighbor configuration serves as a RIP input filter.

For example, you can use these commands to reject all RIP information received from the neighbor router 9.1.1.1.

```
ADDRIPFC IFC(IFC_ID)
ADDRIPIGN ADDR('9.1.1.1')
```

In the preceding commands, the *IFC\_ID* represents a valid interface identifier.

---

## OMPROUTED RIP and RIPng support tasks

Use this information to configure your system to participate in a RIP or RIPng network.

## Enabling TCP/IP for RIP and RIPng on IBM i

The IBM i TCP/IP interface must be enabled before using RIP or RIPng.

To enable TCP/IP for RIP or RIPng, follow these steps:

1. Use the various options of the Configure TCP/IP (CFGTCP) command to establish and start a TCP/IP interface.
2. Configure a RIP or RIPng interface based on the TCP/IP interface that you have configured.  
For detailed information about how to configure a RIP interface, see the Configuring IBM i for RIP and RIPng networking topic.
3. Use the Start TCP/IP Server (STRTCPSVR) command to start the server:

### **STRTCPSVR SERVER(\*OMPROUTED) INSTANCE(\*RIP)**

This command submits the QTOOROUTE job in the QSYSWRK subsystem. If you issue this command when the QTOOROUTE job is active, a message is sent to the user job log. The \*RIP value for the INSTANCE parameter specifies that the server only starts the RIP protocol. If you omit the INSTANCE parameter, both the OSPF and RIP protocols are started.

Once the OMPROUTED RIP server is active, use the following information to end or to restart the server, as needed.

- End a RIP or RIPng function using the following command:

### **ENDTCPSVR SERVER(\*OMPROUTED) INSTANCE(\*RIP)**

This command ends only the RIP or RIPng function from the QTOOROUTE job. The job is still active under the QSYSWRK subsystem.

If you omit the INSTANCE parameter, the QTOOROUTE job is ended. Therefore, both the OSPF and RIP protocols are ended immediately.

- Restart the OMPROUTED server using the following command:

### **STRTCPSVR SERVER(\*OMPROUTED) RESTART(\*OMPROUTED) INSTANCE(\*RIP)**

This command resubmits the QTOOROUTE job in the QSYSWRK subsystem. It reprocesses both the configuration and the index file to synchronize them. Unpredictable results occurs if these files are not synchronized. Importing only the config file from another system, for example, can cause the files to be desynchronized, and require that the server is restarted.

If you omit the INSTANCE parameter, the config and index files for both the OSPF and RIP protocols are reprocessed. Therefore, both protocols are ended and started again.

### **Related tasks:**

“Configuring IBM i for RIP and RIPng networking”

An OMPROUTED RIP or RIPng configuration can be as simple as a configuration with a RIP interface, or as complex as a configuration with RIP interfaces, ignored RIP neighbors, RIP accepted routes, and RIP filters.

### **Related information:**

TCP/IP setup

End TCP/IP Server (ENDTCPSVR)

Start TCP/IP Server (STRTCPSVR)

## Configuring IBM i for RIP and RIPng networking

An OMPROUTED RIP or RIPng configuration can be as simple as a configuration with a RIP interface, or as complex as a configuration with RIP interfaces, ignored RIP neighbors, RIP accepted routes, and RIP filters.

Before you can configure RIP or RIPng for your system, you must establish and start TCP/IP interfaces. See the TCP/IP setup topic for how to configure a TCP/IP interface.

The following sample IPv4 network includes one system that runs the RIP protocol, and three RIP routers, Reds, Twins, and Yankees, that are connected to the system.

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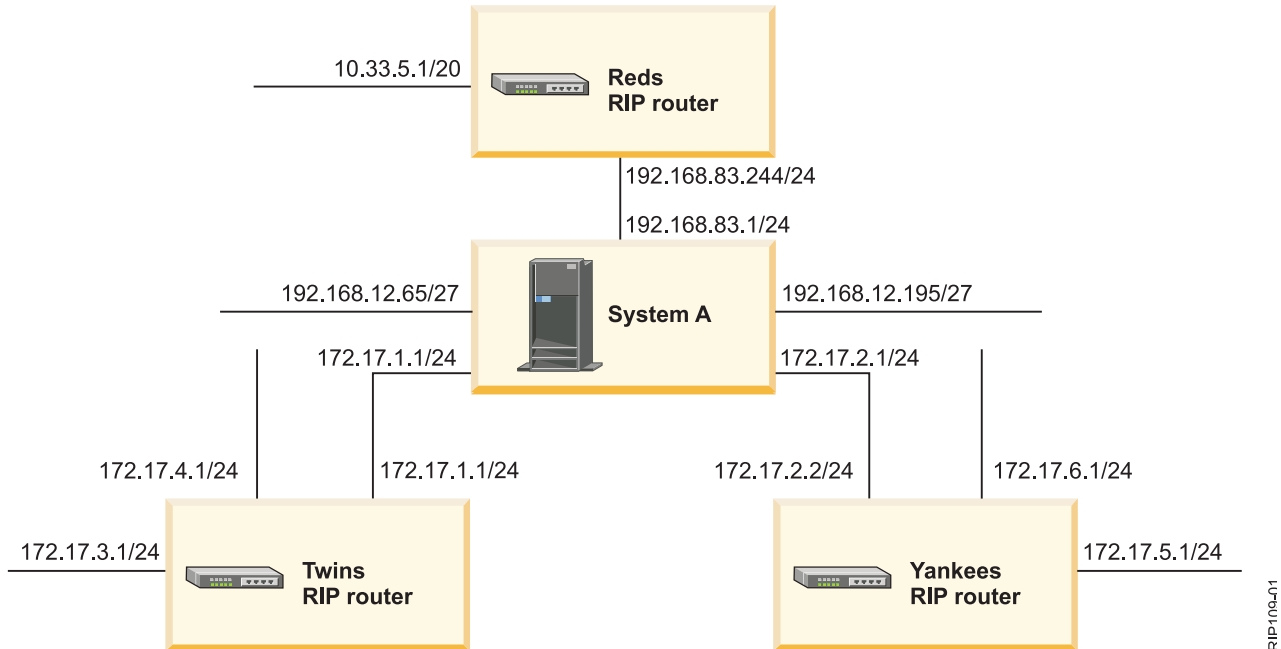


Figure 1. A RIP network configuration

Follow these steps to configure the system to participate in the RIP network.

1. Add RIP interfaces

Use the Add RIP Interface (ADDRIPICF) command to add the interfaces 192.168.12.65, 192.168.12.195, 192.168.83.1, 172.17.1.1, and 172.17.2.1 to the RIP routing protocol. These interfaces are already configured as TCP/IP interfaces. Set the Send default routes (SNDDFTRTE), Send static routes (SNDSTTRTE), and Send host routes (SNDHOSTRTE) parameters to \*YES.

```
ADDRIPICF IFC('192.168.12.65') SNDDFTRTE(*YES) SNDSTTRTE(*YES) SNDHOSTRTE(*YES)
ADDRIPICF IFC('192.168.12.195') SNDDFTRTE(*YES) SNDSTTRTE(*YES) SNDHOSTRTE(*YES)
ADDRIPICF IFC('192.168.83.1') SNDDFTRTE(*YES) SNDSTTRTE(*YES) SNDHOSTRTE(*YES)
ADDRIPICF IFC('172.17.1.1') SNDDFTRTE(*YES) SNDSTTRTE(*YES) SNDHOSTRTE(*YES)
ADDRIPICF IFC('172.17.2.1') SNDDFTRTE(*YES) SNDSTTRTE(*YES) SNDHOSTRTE(*YES)
```

2. Add ignored RIP neighbors

You might want to block the RIP information that is received from the Reds router for security reasons. Use the Add Ignored RIP Neighbor (ADDRIPIGN) command to isolate the Reds router:

```
ADDRIPIGN ADDR('192.168.83.244')
```

3. Add RIP accepted routes

By default, the Receive dynamic hosts (RCVDYNHOST) parameter of the ADDRIPICF command is set to \*NO. System A (RIP interface 172.17.1.1) is originally configured to reject any host routes. You might want to receive only the host route 172.17.3.1 if it's available (in this case, it's a route stored in Twins). Use the Add RIP Accepted Routes (ADDRIPACP) command to complete the task.

```
ADDRIPACP ADDR('172.17.3.1')
```

4. Add RIP filters

Your system can ignore a certain subnet route regardless of where it comes from. For example, you might want your system to receive any routes coming from the Yankees router, but reject any 172.17.5.X routes. Configure a no receive global filter by using the ADD RIP Filter (ADDRIPFLT) command to ignore the 172.17.5.X routes:

```
ADDRIPFLT DEST('172.17.5.0') TYPE(*NORCV)
```

To identify IBM i TCP/IP interfaces that can be configured as RIP interfaces, use NETSTAT OPTION(\*IFC) for IPv4, or use NETSTAT OPTION(\*IFC6) for IPv6. See the Enabling TCP/IP for RIP and RIPng on IBM i topic for starting and stopping TCP/IP information.

**Related tasks:**

“Enabling TCP/IP for RIP and RIPng on IBM i” on page 6  
 The IBM i TCP/IP interface must be enabled before using RIP or RIPng.

**Related information:**

Configuring i5/OS for OSPF networking  
 TCP/IP setup

## OMPROUTED RIP and RIPng commands

Use control language (CL) commands to manage RIP attributes, interfaces, filters, accepted unconditional routes, and ignore neighbors. The CL configuration supports both RIP for IPv4 and RIPng for IPv6.

### CL commands

The Configure Routing Protocols (CFGRTG) command displays a list of all the RIP commands on a system.

*Table 2. CL commands and supported functions for RIP*

CL name	CL command	Function
Change RIP Attributes	CHGRIPA	Set general RIP attributes.
Display RIP	DSPRIP	Show the current RIP configuration.
Add RIP Interface	ADDRIIFC	Add interfaces for RIP.
Remove RIP Interface	RMVRIIFC	Remove interfaces for RIP.
Change RIP Interface	CHGRIFC	Change interfaces for RIP.
Add RIP Accepted Route	ADDRIPACP	Add unconditional routes for RIP.
Remove RIP Accepted Route	RMVRIPACP	Remove unconditional routes for RIP.
Add RIP Filter	ADDRIPFLT	Add filters for RIP.
Change RIP Filter	CHGRIPFLT	Change filters for RIP.
Remove RIP Filter	RMVRIPFLT	Remove filters for RIP.
Add Ignored RIP Neighbor	ADDRIPIGN	Add ignored RIP neighbors.
Remove Ignored RIP Neighbor	RMVRIPIGN	Remove ignored RIP neighbors.

### Display RIP command

The Display RIP (DSPRIP) command displays the RIP configuration that is set in the configuration file. The DSPRIP command shows all the RIP configuration by calling all the panels in the following sequence:

1. Display RIP Information
2. Display RIP Interfaces
3. Display Accepted Routes

4. Display RIP filters
5. Display Ignored RIP Neighbors

The panels also have options to verify the RIPng configuration.

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