Chapter 8

Configuring DVMRP

E-series routers support Distance Vector Multicast Routing Protocol (DVMRP) on VRs to forward multicast datagrams through a network. DVMRP is an interior gateway protocol that supports operations within an autonomous system, but not between autonomous systems. The multicast backbone of the Internet, MBone, uses DVMRP to forward multicast datagrams. This chapter describes how to configure DVMRP on E-series routers; it contains the following sections:

Overview

NOTE: PIM has gained general acceptance among a large number of multicast-enabled networks. We recommend that you use PIM rather than DVMRP for applications that are not otherwise required to run DVMRP.

DVMRP is a dense-mode multicasting protocol and therefore uses a broadcast and prune mechanism. The protocol builds a source-rooted tree (SRT) in a similar way to PIM dense mode. DVMRP routers flood datagrams to all interfaces except the one that provides the shortest unicast route to the source. DVMRP uses pruning to prevent unnecessary sending of multicast messages through the SRT.

A DVMRP router sends prune messages to its neighbors if it discovers that:

- The network to which a host is attached has no active members of the multicast group.
- All neighbors, except the next-hop neighbor connected to the source, have pruned the source and the group.

When a neighbor receives a prune message from a DVMRP router, it removes that neighbor from its (S,G) pair table, which provides information to the multicast forwarding table.

When a host on a previously pruned branch attempts to join a multicast group, it sends an IGMP message to its first-hop router. The first-hop router then sends a graft message upstream.

Identifying Neighbors

In this implementation of DVMRP, a *neighbor* is a directly connected DVMRP router. When you enable DVMRP on an interface, the associated VR adds information about local networks to its DVMRP routing table. The VR then sends probe messages periodically to learn about neighbors on each of its interfaces. To ensure compatibility with other DVMRP routers that do not send probe messages, the VR also updates its DVMRP routing table when it receives route report messages from such routers.

Advertising Routes

As its name suggests, DVMRP uses a distance-vector routing algorithm. Such algorithms require that each router periodically inform its neighbors of its routing table. DVMRP routers advertise routes by sending DVMRP report messages. For each network path, the receiving router picks the neighbor advertising the lowest cost and adds that entry to its routing table for future advertisement.

The cost, or metric, for this routing protocol is the hop count back to the source. The hop count for a network device is the number of routers on the route between the source and that network device.

Table 7 shows an example of the routing table for a DVMRP router.

Table 7: Sample Routing Table for a DVMRP Router

Source Subnet	Subnet Mask	From Router	Metric	Time Before Entry Is Deleted from Routing Table	Input Port	Output Port
143.2.0.0	255.255.0.0	143.32.44.12	4	85	3/0	4/0, 4/1
143.3.0.0	255.255.0.0	143.2.55.23	2	80	3/1	4/0, 4/1
143.4.0.0	255.255.0.0	143.78.6.43	3	120	3/1	4/0, 4/1

The DVMRP router maintains an (S,G) pair table that provides information to the multicast forwarding table. The (S,G) pair table is based on:

- Information from the DVMRP routing table
- Information learned from prune messages
- If IGMP and DVMRP are on the same interface, group information learned from IGMP

The (S,G) pair table includes a route from each subnetwork that contains a source to each multicast group of which that source is a member. These routes can be static or learned routes. Table 8 shows an example of the (S,G) pair table for DVMRP.

Table 8: Sample DVMRP (S,G) Pair Table

Source Subnet	Multicast Group	Time Before Entry Is Deleted from Routing Table	Input Port	Output Port
143.2.0.0	230.1.2.3	85	3/0	4/0, 4/1
	230.2.3.4	75	3/0	4/0, 4/1
	230.3.4.5	60	3/0	4/1
	230.4.5.6	90	[a]	4/0
143.3.0.0	230.1.2.3	80	3/1	4/0, 4/1

a.No value for the input port indicates that the interface is associated with a protocol other than DVMRP.

Platform Considerations

For information about modules that support DVMRP on the ERX-7xx models, ERX-14xx models, and the ERX-310 router:

- See *ERX Module Guide, Table 1, Module Combinations* for detailed module specifications.
- See *ERX Module Guide, Appendix A, Module Protocol Support* for information about the modules that support DVMRP.

For information about modules that support DVMRP on the E120 router and the E320 router:

- See *E120 and E320 Module Guide, Table 1, Modules and IOAs* for detailed module specifications.
- See *E120 and E320 Module Guide, Appendix A, IOA Protocol Support* for information about the modules that support DVMRP.

References

For more information about DVMRP, see the following resource:

- Distance Vector Multicast Routing Protocol—draft-ietf-idmr-dvmrp-v3-11.txt (April 2004 expiration)

Before You Begin

You can configure multicasting on IPv4 and IPv6 interfaces.

For information about configuring IP interfaces, see *JUNOSe IP, IPv6, and IGP Configuration Guide, Chapter 1, Configuring IP*. For information about configuring IPv6 interfaces, see *JUNOSe IP, IPv6, and IGP Configuration Guide, Chapter 2, Configuring IPv6*.

For information about configuring multicast on IPv6 interfaces, see *Chapter 10, Configuring IPv6 Multicast*.

Enabling DVMRP on a VR

By default, DVMRP is enabled on the router. To enable DVMRP on a VR:

1. Enable multicast routing.

   host1(config)#**ip multicast-routing**

2. (Optional) Create a VR or access a VR context.

   host1(config)#**virtual-router boston**

NOTE: If you do not specify a VR, you can configure DVMRP on the default router.

You must enable and configure DVMRP on one or more interfaces for DVMRP to function. See *Activating DVMRP on an Interface* on page 141. You can also set DVMRP limits for the VR; see *Configuring DVMRP Limits* on page 141.

Activating DVMRP on an Interface

By default, DVMRP is not activated on an interface. Configuring any DVMRP parameter on an interface automatically activates DVMRP on that interface. You can also activate DVMRP on an interface and use the default parameters.

ip dvmrp

- Use to activate DVMRP on an interface.
- This command automatically creates and enables DVMRP processing on the current VR.
- Issuing this command identifies this interface as one that DVMRP owns.
- Example

  host1:boston(config-if)#**ip dvmrp**

- Use the **no** version to remove DVMRP from an interface.

Configuring DVMRP Limits

You can configure DVMRP and IGMP on the same interface. If you configure DVMRP and IGMP on an interface, the router determines that DVMRP owns the interface.

NOTE: You cannot configure DVMRP and PIM on the same interface.

When you have enabled DVMRP processing on a VR, you can configure the following settings for that VR:

- The number of routes that the VR advertises on each interface.
- A maximum number of DVMRP routes at which the router generates a system log warning message and an SNMP trap.

ip dvmrp route-hog-notification

- Use to set the number of DVRMP routes that the router can record before it generates a system log warning message.
- The warning alerts you so you can identify routers that are injecting large numbers of routes into the MBone.
- Example

  host1:boston(config)#**ip dvmrp route-hog-notification 5000**

- Use the **no** version to restore the default value, 10,000 routes.

ip dvmrp route-limit

- Use to limit the number of routes that the router can advertise on each interface.
- Example

  host1:boston(config)#**ip dvmrp route-limit 5000**

- Use the **no** version to restore the default value, 7000 routes.

Filtering DVMRP Reports

You can configure an interface to accept only reports with routes that appear on a standard IP access list. You can refine the set of accepted routes further, by defining a second access list of neighbors who can supply the specified routes.

For example, suppose you define an access list that specifies that the router accepts only reports for the route 172.16.2.0/24. You then define a second access list that specifies that only neighbors 192.168.1.1 and 193.168.1.1 can supply this route. If neighbor 192.168.2.2 supplies the route, the DVMRP router rejects this report.

You can also modify the value (distance) that the router associates with a DVMRP route when it computes the RPF interface for the source of a multicast packet. By default, the router associates a distance of 0 with DVMRP routes; this value specifies that the router use DVMRP, rather than a unicast routing protocol, to transport multicast datagrams.

However, in a configuration where PIM discovers multicast routes and a unicast routing protocol performs RPF lookups, you can increase the administrative distance to favor the unicast protocol.

For information about defining access lists, see *JUNOSe IP Services Configuration Guide, Chapter 1, Configuring Routing Policy*.

ip dvmrp accept-filter

- Use to filter routes in DVMRP reports in accordance with a standard IP access list.
- Specify a standard IP access list of sources for which the interface can accept routes.
- Specify a DVMRP administrative distance to favor a unicast routing protocol.
- Specify a neighbor list to restrict the neighbors from which reports for routes on the first list can be accepted.
- Example

  host1:boston(config-if)#**ip dvmrp accept-filter boston-list 4 neighbor-list boston-neighbors**

- Use the **no** version to disable a filter.

Configuring DVMRP Summary Addresses

You can configure an interface to advertise a summary address with a known metric rather than a more specific route. DVMRP advertises the summary address if the DVMRP routing table contains a more specific route that matches the address and mask of the summary address.

If you want to advertise all routes rather than a summary, disable automatic summarization on the interface (**no ip dvmrp auto-summary**). By default, the router automatically summarizes DVMRP routes. DVMRP automatic summarization maps a unicast subnet route to a classful network number route when the subnet has a different network number from the IP address of the interface (or tunnel) over which the advertisement travels. If the interface is unnumbered, the router compares the network number of the numbered interface to the IP address to which the unnumbered interface points.

If you configure a summary address on an interface and do not disable automatic summarization, the interface advertises the least-specific address.

ip dvmrp auto-summary

- Use to reenable the router to summarize routes automatically for this interface. By default, automatic summarization is enabled.
- Example

  host1:boston(config-if)#**ip dvmrp auto-summary**

- Use the **no** version to disable automatic summarization for this interface.

ip dvmrp summary-address

- Use to advertise DVMRP summary addresses on an interface. By default, an interface advertises only summary addresses generated by automatic summarization.
- If you configure multiple overlapping summary addresses on an interface, the one with the shortest mask takes preference.
- Use the **metric** keyword to specify a DVMRP metric (hop count); the default metric value is 1.
- Example

  host1:boston(config-if)#**ip dvmrp summary-address 192.48.1.2 255.255.255.0 metric 1**

- Use the **no** version to stop advertising a summary address on the interface.

Changing the Metric for a Route

The metric for DVMRP is hop count. For example, a route with two hops over a slow serial line is preferable to a route with three hops over a faster optical line.

The router increases the number of DVMRP routes in incoming reports by a default metric of one and in outgoing reports by a default of 0. You can change the metric for an interface to promote or demote the preference for associated routes.

ip dvmrp metric-offset

- Use to adjust the number of hops associated with a route. This action specifies that the route is more efficient or less efficient than an alternative route.
- Use the **in** keyword to specify the number of hops by which the router increases the number of DVMRP routes advertised in incoming DVMRP reports. This option is the default.
- Use the **out** keyword to specify the number of hops by which the router increases the number of DVMRP routes advertised in outgoing DVMRP reports.
- Example

  host1:boston(config-if)#**ip dvmrp metric-offset in 3**

- Use the **no** version to revert to the default settings: 1 for incoming reports and 0 for outgoing reports.

Importing Routes from Other Protocols

You can import routing information from other protocols into the DVMRP routing table. Only routes that appear in the RPF table can be imported. To do so:

1. If you want to use IS-IS, OSPF, or RIP routes, make those routes available to multicast protocols. See *Defining Static Routes for Reverse-Path Forwarding* on page 27.
2. Access Router Configuration mode.
3. Specify a route map.
4. Import information from one type of routing domain into another.

redistribute

- Use to import information from another type of routing domain to the DVMRP domain. DVMRP can import only routes that appear in the RPF table.
- Specify the source protocol from which routes are being redistributed. It can be one of the following keywords: **bgp**, **isis**, **ospf**, **static**, or **connected**.
- Use the **static** keyword to redistribute static IP multicast routes into DVMRP.
- Use the **connected** keyword to redistribute routes that are established automatically in the RPF table when another multicast routing protocol, such as PIM, is enabled on an interface.

- Use the **route-map** keyword to configure the route map to filter imported routes from the source routing protocol to the current routing protocol. If you do not specify the **route-map** option, all routes are redistributed. If you specify the **route-map** option, but no route map tags are listed, no routes are imported.
- Example—Importing routing information from BGP into DVMRP

  host1:boston(config-router)#**redistribute bgp 100 route-map boston-map**

- Use the **no** version to disable redistribution.

route-map

- Use to specify a route map.
- Example

  host1:boston(config-router)#**route-map boston-map atm 3/2**

- Use the **no** version to delete the route map. If you do not specify an interface, it removes the global route map if one exists.

router dvmrp

- Use to create and enable DVMRP processing on a VR or to access DVMRP Router Configuration mode.
- Example

  host1:boston(config)#**router dvmrp**

- Use the **no** version to remove DVMRP from the VR.

Specifying Routes to Be Advertised

By default, if DVMRP owns an interface, that interface advertises all DVMRP routes it has learned to its neighbors. You can specify the routes that the interface advertises by issuing the **ip dvmrp announce-filter** command in conjunction with a standard IP access list. The IP access list defines the DVMRP routes that are advertised.

ip dvmrp announce-filter

- Use to specify the DVMRP routes for an interface to advertise.
- Specify a standard IP access list of routes for the interface to advertise.
- Example

  host1:boston(config-if)#**ip dvmrp announce-filter boston-list**

- Use the **no** version to enable the interface to advertise all DVMRP routes that it has learned.

Preventing Dynamic Route Distribution

By default, if you make changes to a route map, the router dynamically redistributes the routes in DVMRP. To prevent this dynamic redistribution, use the **disable-dynamic-redistribute** command.

disable-dynamic-redistribute

- Use to halt the dynamic redistribution of routes that are initiated by changes to a route map; dynamic redistribution is enabled by default.
- Example

  host1(config-router)#**disable-dynamic-redistribute**

- There is no **no** version.

Exchanging DVMRP Unicast Routes

DVMRP maintains its own unicast routing table, based on distance vector calculations. The routing table defines the best-known distance to each destination and how to get there. The router updates the table by exchanging information with its neighbors. The DVMRP routing table is used solely for RPF lookups.

By default, if DVMRP owns an interface, that interface exchanges DVMRP unicast routes with its neighbors, and you cannot disable the exchange of routes. However, you can enable and disable the exchange of DVMRP unicast routes on interfaces that DVMRP does not own.

When an interface exchanges DVMRP routes, the router obtains routes from DVMRP report messages and stores them in its DVMRP routing table. Other multicast protocols, such as PIM, can then use these routes for RPF lookups. With this feature, PIM can use the DVMRP routing table even when the router is not running DVMRP.

All interfaces, including tunnels, support DVMRP unicast routing. DVMRP tunnels use DVMRP multicast routing to support DVMRP unicast routing.

ip dvmrp unicast-routing

- Use to enable the exchange of DVMRP unicast routes on an interface not owned by DVMRP.
- Example

  host1:boston(config-if)#**ip dvmrp unicast-routing**

- Use the **no** version to disable the exchange of DVMRP unicast routes on an interface not owned by DVMRP.

Disabling and Removing DVMRP

You can disable DVMRP on a VR or an interface without removing the configuration. You can also remove DVMRP from a VR or an interface.

disable

- Use to disable DVMRP processing on a VR without removing the DVMRP configuration. By default, DVMRP processing is enabled.
- Example

  host1:boston(config-router)#**disable**

- Use the **no** version to reenable DVMRP processing on a VR.

ip dvmrp

- Use to activate DVMRP on an interface.
- This command automatically creates and enables DVMRP processing on the current VR.
- Issue this command to identify this interface as one that DVMRP owns.
- Example

  host1:boston(config-if)#**ip dvmrp**

- Use the **no** version to remove DVMRP from an interface.

ip dvmrp disable

- Use to disable DVMRP processing on an interface without removing the DVMRP configuration.
- Example

  host1:boston(config-if)#**ip dvmrp disable**

- Use the **no** version to reenable DVMRP processing on an interface.

router dvmrp

- Use to create and enable DVMRP processing on a VR or to access Router Configuration mode.
- Example

  host1:boston(config)#**router dvmrp**

- Use the **no** version to remove DVMRP from a VR.

Clearing DVMRP Routes

You can clear one or more routes from the DVMRP routing table. However, if you do so, the routes might reappear in the routing table if they are rediscovered.

clear ip dvmrp routes

- Use to clear DVMRP routes from the routing table.
- If you do not specify any options, the router removes all routes except those associated with its own interfaces from the DVMRP table.
- If you specify an IP address but not a subnet mask, the router removes the longest route to that IP address from the DVMRP table.
- If you specify a subnet mask, the router removes that specific route from the DVMRP table.
- Example

  host1:boston#**clear ip dvmrp routes**

- There is no **no** version.

Configuring DVMRP Tunnels

DVMRP tunnels enable the exchange of IP multicast traffic between routers separated by networks that do not support multicast routing. For information about DVMRP tunnels, see *JUNOSe IP Services Configuration Guide, Chapter 10, Configuring IP Tunnels*.

Monitoring DVMRP

You can establish a reference point for DVMRP statistics by setting the statistics counters to zero.

You can display DVMRP information with the **show ip dvmrp** commands.

baseline ip dvmrp

- Use to set the counters for DVMRP statistics to zero, which establishes a reference point, or baseline, for DVMRP statistics.
- Example

  (host1)#**baseline ip dvmrp**

- There is no **no** version.

show ip dvmrp

- Use to display DVMRP information for a VR.
- Field descriptions
  - Dvmrp Administrative State—State of DVMRP in the software: Enabled or Disabled
  - Mcast Administrative State—State of multicasting in the software: Enabled or Disabled
  - Dvmrp Version—Version of DVMRP with which this software is compatible
  - GenerationID—A number the router generates each time it reboots; when the number changes, neighbors discard all information previously learned from the router
  - Number of Routes—Number of routes in the DVMRP routing table
  - Number of Triggered Routes—Number of routes waiting to be advertised, because a parameter for the route changed
  - Reachable Routes—Number of routes that the router can currently reach
  - Route-hog-notification—Number of DVMRP routes that the router can record before it generates a system log warning message
  - Route-limit—Maximum number of routes that the router can advertise on each interface
  - Send-S32-Prunes-Only—Indicator of whether the router sends only S-32 prunes
    - true—Router sends only S-32 prunes and grafts to ensure compatibility with other protocols, such as PIM
    - false—Router sends S-32 and S/Prefix grafts and prunes
- Example

```
host1:boston>show ip dvmrp
Routing Process DVMRP - Distance Vector Multicast Routing Protocol
  Dvmrp Administrative State:         Enabled
  Multicast Administrative State:     Enabled
  Dvmrp Version:                      3.255
  Generation ID:                      0x46828e2b
  Number of Routes:                   2
  Number of Triggered Routes:         0
  Reachable Routes:                   2
  route-hog-notification:             10000
  route-limit:                        7000
  Send-S32-Prunes-Only:               true
  unicastRoutingOnly:                 false
  Graceful Restart Duration:          60
  Graceful Restart is:                complete (timer 0 seconds)
  Redistribution                      None Configured
  dynamic-redistribution:             enabled
```

show ip dvmrp interface

- Use to display DVMRP parameters for the specified interfaces.
- Field descriptions
  - Interface—Type and specifier of the interface connected to a source. For details about interface types and specifiers, see *JUNOSe Command Reference Guide, About This Guide*.
  - SourceAddress—IP address of the interface or, for an unnumbered interface, address of the loopback interface
  - Network/Mask—Network and mask of the subnet on which the interface resides
  - Received Bad Packets/RBdPk—Number of bad packets received on this interface
  - Received Bad Routes/RBdRt—Number of bad routes received on this interface
  - Routes Sent/SntRt—Number of bad routes advertised on this interface
  - Administrative State—Configured state of DVMRP on this interface: enabled or Disabled
  - Summary Address(es)—Specific summary address or addresses that this interface should advertise
  - auto-summary—Status of automatic summarization: Enabled or Disabled
  - metric-offset in—Number of hops by which the router increases a DVMRP route advertised in incoming DVMRP reports
  - metric-offset out—Number of hops by which the router increases a DVMRP route advertised in outgoing DVMRP reports
  - announce-filter—Routes advertised by the interface
  - accept-filter(s)—Names of IP access lists that specify the sources for which the interface accepts routes
- Example 1

```
host1:v3#show ip dvmrp interface
Interface: ATM2/0.1
      SourceAddress:                      1.0.0.1
      Network/Mask:                   1.0.0.1/24
      Received Bad Packets:                    0
      Received Bad Routes:                     0
      Routes Sent:                             0
      Administrative State:              Enabled
      Summary Address(es)          None Configured
      auto-summary:                      Disabed
      metric-offset in:                        1
      metric-offset out:                       0
      announce-filter:                      None
      accept-filter(s)             None Configured
```

- Example 2

```
host1:boston#show ip dvmrp interface brief
  Interface          SourceAddress   Network/Mask        RBdPk RBdRt SntRt
  atm5/0.14          14.0.1.1        14.0.1.1/8             0     0     2
  atm5/0.15          15.0.1.1        15.0.1.1/8             0     0     2
```

show ip dvmrp mroute

- Use to display information about DVMRP routes to multicast groups.
- Field descriptions
  - (S,G) pair—Source, Group pair value
  - Uptime—Time, in seconds, that this (S, G) pair entry has been in the routing table
  - Upstream Prune—Whether the router has sent prune messages for this group
  - RPF Interface—Interface that provides the shortest path back to the source
  - Outgoing interface list—Types and specifiers of interfaces through which the VR forwards DVMRP messages, such as atm3/0. For details about interface types and specifiers, see *JUNOSe Command Reference Guide, About This Guide*.
- Example

```
host1:boston#show ip dvmrp mroute
IP DVMRP Multicast Routing Table
(40.0.0.0/16,  228.1.1.1)  Uptime: 77
  Upstream Prune: none
  RPF Interface
      atm5/0.40
  Outgoing interface list:
      atm5/0.31
```

show ip dvmrp neighbor

- Use to display information about DVMRP neighbors.
- Specify the **brief** keyword to view a summary of information.
- Field descriptions
  - Neighbor Address/NbrAddress—IP address of the neighbor
  - Interface—Interface type and specifier, such as atm3/0. For details about interface types and specifiers, see *JUNOSe Command Reference Guide, About This Guide*.
  - Neighbor upTime/UpTime—Length of time, in seconds, that this router has been a neighbor
  - Neighbor Major Version/Maj—Major number of the DVMRP version on the neighbor
  - Neighbor Minor Version/Min—Minor number of the DVMRP version on the neighbor
  - Neighbor Capabilities/Cap—Capability of the neighbor
    - Prune/P—Ability to send prune messages
    - GenerationId/G—Ability to create a generation ID number
    - Mtrace/M—Ability to trace multicast routes
    - Netmask/N—Ability to send prunes and grafts with a network mask address

- Neighbor State/State—Status of communications with the neighbor
  - Active—Router is able to communicate with this neighbor
  - Down—Neighbor is down
  - Ignoring—Router is not accepting messages from this neighbor
  - Oneway—Router is receiving messages from the neighbor, but the neighbor does not include the router's IP address in the messages. This state can indicate a starting transition, or a problem.
- Generation ID—Number that the neighbor generates each time it boots; when the number changes, the VR discards all information previously learned from the router.
- Routes Received—Number of routes received from this neighbor
- Bad Routes Received—Number of bad routes received from this neighbor
- Bad Packets Received—Number of bad packets received from this neighbor

- Example 1

```
host1:boston#show ip dvmrp neighbor
Neighbor Address:                  14.0.0.1
      Interface:                   atm5/0.14
      Neighbor upTime:               28
      Neighbor Major Version:         3
      Neighbor Minor Version:        255
      Neighbor Capabilities:  Prune  GenerationId  Mtrace  NetMask
      Neighbor State:             Active
      Genereneration ID:        0x3a13fbc2
      Routes Received:                1
      Bad Routes Received             0
      Bad Packets Received:           0
```

- Example 2

```
host1:v3#show ip dvmrp neighbor brief
  Interface          NbrAddress      UpTime Maj Min Cap   State
  atm5/0.14          14.0.0.1            32   3 255 PGMN  Active
  atm5/0.15          15.0.0.1            34   3 255 PGMN  Active
```

show ip dvmrp route

- Use to display information about DVMRP routes.
- Specify an IP address to display the best route to that address.
- Specify an IP address and subnet mask to display the route that exactly matches this IP address and subnet mask
- Specify an interface type and specifier to display routes associated with that interface. For details about interface types and specifiers, see *JUNOSe Command Reference Guide, About This Guide*.
- Specify the **brief** keyword to view a summary of information.

- Field descriptions
  - Prefix—IP address of the network
  - Length—Length of the subnet mask for the network
  - usNbr/Owner—IP address of the upstream neighbor associated with this route or a description of the origin of the route
    - Dvmrp Local—Route is associated with a directly attached network
    - Dvmrp Aggregate—Route is an aggregate route determined by summarization
  - Metric—Metric associated with this interface for this route
  - ExpireTime—Time, in seconds, until the VR starts the process for removing the route
  - UpTime—Length of time, in seconds, that the route has been in the DVMRP routing table
  - Interface—Type and specifier for the interface, such as atm3/0.
- Example 1

```
host1:boston>show ip dvmrp route
Prefix/Length        usNbr/Owner       Metric ExpireTime UpTime Interface
  14.0.0.0/8         Dvmrp Local          1      Never     18   atm5/0.14
    Downstream Interface(s)
        Interface
        atm5/0.15
  15.0.0.0/8         Dvmrp Local          1      Never     18   atm5/0.15
    Downstream Interface(s)
        None
  25.0.0.0/8         14.0.0.1             2        129     11   atm5/0.14
    Downstream Interface(s)
        Interface
        atm5/0.15
```

- Example 2

```
host1:v3#show ip dvmrp route brief
  Prefix/Length      usNbr/Owner       Metric ExpireTime UpTime Interface
  14.0.0.0/8         Dvmrp Local          1      Never     26   atm5/0.14
  15.0.0.0/8         Dvmrp Local          1      Never     26   atm5/0.15
  25.0.0.0/8         14.0.0.1             2        121     19   atm5/0.14
```

show ip dvmrp routeNextHop

- Use to display information about the next hop.
- Field descriptions
  - addr—IP address of the next-hop router
  - mlen—Mask length of the next-hop router
  - ifIndex—SNMP interface index for the interface that connects to the next hop
  - Type—Description of the next-hop router
    - leaf—Neighbor with no downstream neighbors
    - branch—Neighbor with downstream neighbors
- Example

```
host1:boston>show ip dvmrp routeNextHop
  addr/mlen          ifIndex  Type
  172.16.0.0/16            4  leaf
  172.17.0.0/16            4  leaf
  172.18.0.0/16            3  leaf
  172.19.0.0/16            3  leaf
  172.19.0.0/16            4  branch
```