AT&T

Multicast Routing Configuration Guide, 17.2.0

November 2017

Supporting AT&T Vyatta Network Operating System

Contents

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Copyright Statement

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property. All other marks are the property of their respective owners.

The training materials and other content provided herein for assistance in training on the Vyatta vRouter may have references to Brocade as the Vyatta vRouter was formerly a Brocade product prior to AT&T's acquisition of Vyatta. Brocade remains a separate company and is not affiliated to AT&T.

About This Guide

This guide describes how to enable and configure multicast routing on AT&T products that run on the AT&T Vyatta Network Operating System (referred to as a virtual router, vRouter, or router in the guide).

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Multicast Routing Overview

IP multicast

There are four types of transmission over a network:

- Unicast—In unicast transmission, a single sender transmits a message to a single receiver (one-to-one). Unicast transmission is signaled to the network by using an IP address in the unicast range. Unicast transmission is supported in both IPv4 and IPv6.
- Broadcast—In broadcast transmission, a sender transmits a message to all possible destinations ("all-hosts on this subnet") and all receivers receive a copy of the message (one-to-many). In IPv4, broadcast transmission is signaled to the network by using the "broadcast address" 255.255.255.255 or a directed broadcast address formed from the network prefix but using all binary 1s for the host portion of the address. Broadcast transmission is not supported in IPv6; instead, IPv6 defines the "all-nodes" multicast address.
- Multicast—In multicast transmission, a group of receivers interested in a particular stream forms a group (one-to-many). The sender sends the message from its unicast address to the multicast group address. The network routers are responsible for propagating the message to all interested receivers. Multicast groups are identified using a special range of addresses. In IPv4, the former class D addresses compose the multicast range of addresses. In IPv6, multicast addresses are identified from the prefix FF00::/8.
- Anycast—In anycast transmission, a message from a single sender is sent to the topologically "closest" node in a group of potential receivers (one-to-one-of-many). Anycast is used in network load balancing and in certain network protocols, such as Domain Name System (DNS).

IP multicast uses multicast transmission over the IP infrastructure, transmitting to a multicast address at the IP routing level. Networks using IP multicast deliver content to multiple users in various groups—for example, IP multicast is often used for content delivery such as streaming media and IPTV. IP multicast is described in RFC 1112, *Host Extensions for IP Multicasting*.

Note:

For specific information about the Internet Group Management Protocol (IGMP) and the Multicast Listener Discovery (MLD) protocol, see AT&T Vyatta Network Operating System IGMP and MLD Configuration Guide.

For specific information about Protocol Independent Multicast (PIM), see AT&T Vyatta Network Operating System PIM Configuration Guide.

For specific information about Multicast Source Discovery Protocol (MSDP), see AT&T Vyatta Network Operating System MSDP Configuration Guide.

Multicast channels

To receive a particular multicast data stream, hosts join a multicast group. The group is identified by its multicast address. The communication between the host and router for this purpose is managed by using the Internet Group Management Protocol (IGMP).

Hosts send an IGMP Join message to their local multicast router, signaling their intention to join the group (G), as represented by a multicast address. The source device (S) that delivers the content sends the message addressed to the multicast address of G. The multicast "channel" is the combination of the IP address of the content source and multicast address of the group—called an (S, G) pair. For messages for which the source can be any device, the S is replaced by the asterisk wildcard ("*"), which means "any source."

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Multicast addresses

For IPv4, addresses in the range 224.0.0.0 to 239.255.255.255 are reserved for multicasting. In the classful addressing system, this is registered as class D. In the Classless Inter-Domain Routing (CIDR) addressing model, the prefix of this group is 224.0.0.0/4.

Within the IPv4 multicast range, address assignments are specified in RFC 5771, *IANA Guidelines for IPv4 Multicast Address Assignments*. The following table lists a summary of these assignments. Note that, of these addresses, the network address 224.0.0.0 is guaranteed not to be assigned to any group.

Table 1: Multicast address assignments

Addresses	Usage
Link Local Scope	
224.0.0.1	All systems on this subnet
224.0.0.2	All routers on this subnet
224.0.0.13	All PIM routers address group
Global Scope	
224.0.1.0 to 238.255.255.255	Allocated for multicast traffic across the Internet. SSM reserves the range 232.0.0.0/8. The addresses 224.0.1.39 and 224.0.1.40 are used for Auto-RP negotiation. You can assign the remaining IP addresses to your ISM applications.
Administrative Scope (AS)	
239.0.0.0/8	Allocated for organizations that own an AS number to multicast across the Internet. The AS number of the organization is embedded in the second and third octets of the multicast IP address. For example, AS64501 is 0xFBF5, with FB and F5 (or 251 and 245 in decimal) representing the second and third octets of the IP address, respectively. The resulting subnet 233.251.24.0 is globally reserved for AS64201 to use. These addresses are called GLOP addresses.

For IPv6, multicast addressing is specified in RFC 3513, *IP Version 6 Addressing Architecture*. In essence, IPv6 multicast addresses are derived from the FF00::/8 prefix.

Multicast routing protocols

The multicast routing protocols supported by the AT&T Vyatta vRouter are IGMP, Multicast Listener Discovery (MLD), and Protocol Independent Multicast (PIM).

- IGMP controls multicast communication between hosts and multicast routers on IPv4 networks, allowing hosts to manage membership of multicast groups. MLD performs this function on IPv6 networks.
- PIM controls multicast communication between multicast routers, so that they can track packet distribution.

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Types of multicast

In IP networks, multicast information is propagated through the use of distribution trees created by the multicast routers. Routers create source trees that provide the shortest path to each destination; these trees are called shortest path trees (SPTs). The source of the multicast message is always the root of an SPT.

Multicast depends on which of two models of multicast is in effect:

- Internet standard multicast *(page 9)*
- Source-specific multicast *(page 9)*

Internet standard multicast

In Internet Standard Multicast (ISM), a receiver can receive messages from any source and from multiple sources. In ISM, receivers are not aware of sources; they express interest in receiving a traffic stream by subscribing to the group of interest (G).

In the ISM model, the multicast router discovers and tracks all multicast sources that are sending messages to an address, maintaining information about all sources, and routing data from all sources to all interested receivers. The router does this by maintaining a state table of (S, G) entries. When the number of sources is large, the burden on the multicast router can become heavy.

Source-specific multicast

In Source-Specific Multicast (SSM), receivers are aware of sources. A receiver explicitly requests a stream from a sender in a group the receiver has joined, using a Join message that specifies the source (an (S, G) Join), and explicitly excludes the use of the wildcard for source—that is, it disallows the (*, G) Join.

Because SSM-enabled hosts track sources of the multicast transmission themselves, multicast routers do not need to discover the multicast sources themselves, and they need to store and maintain only the (*, G) state in the multicast routing table. This greatly reduces the burden on the multicast router.

For IPv4, the destination addresses must be in the range 232.0.0.0/8. For IPv6, the addresses must be in the range FF3x::/96.

SSM is specified in RFC 3569, *An Overview of Source-Specific Multicast (SSM)* and RFC 4607, *Source-Specific Multicast for IP*.

Supported standards

This section presents the following topics:

- RFCs *(page 9)*
- MIBs *(page 10)*

RFCs

The AT&T implementation of multicast routing complies with the following standards:

- RFC 1112: *Host Extensions for IP Multicasting*
- RFC 2236: *Internet Group Management Protocol, Version 2*
- RFC 2710: *Multicast Listener Discovery (MLD) for IPv6*
- RFC 3376: *Internet Group Management Protocol, Version 3*
- RFC 3569: *An Overview of Source-Specific Multicast (SSM)*
- RFC 3810: *Multicast Listener Discovery version 2 (MLDv2) for IPv6*
- RFC 4604: *Using Internet Group Management Protocol Version 3 (IGMPv3) and Multicast Listener Discovery Protocol Version 2 (MLDv2) for Source-Specific Multicast*
- RFC 4607: *Source-Specific Multicast for IP*

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

MIBs

The Vyatta implementation of multicast routing supports the following Simple Management Network Protocol (SNMP) management information bases (MIBs).

- IGMP-MIB, RFC2933: *Internet Group Management Protocol MIB*
- IPMROUTE, RFC 2932: *IPv4 Multicast Routing MIB*
- MLD-MIB, RFC 3019: *IP Version 6 Management Information Base for The Multicast Listener Discovery Protocol*

For a list of all MIBs supported on the AT&T Vyatta vRouter, see AT&T Vyatta Network Operating System Remote Management Configuration Guide.

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Multicast Configuration

Before you begin

It is assumed that routers depicted in the examples that follow are configured to provide basic connectivity. This configuration includes the host-name, Ethernet, or data plane interfaces, and gateway-address. See AT&T vRouter Quick Start Guide for information on basic system configuration.

> **Note:** In the AT&T Vyatta vRouter, a data plane interface is an abstraction that represents the underlying physical or virtual Ethernet interface of the system. The terms Ethernet interface and data plane interface are synonymous in this guide.

Basic PIM-SM multicast configuration

This section presents a configuration example that provides PIM sparse mode multicast capability between the sender of multicast traffic (Source) and a receiver of multicast traffic (Receiver). Three routers are configured for this example: R1, R2 and RP.

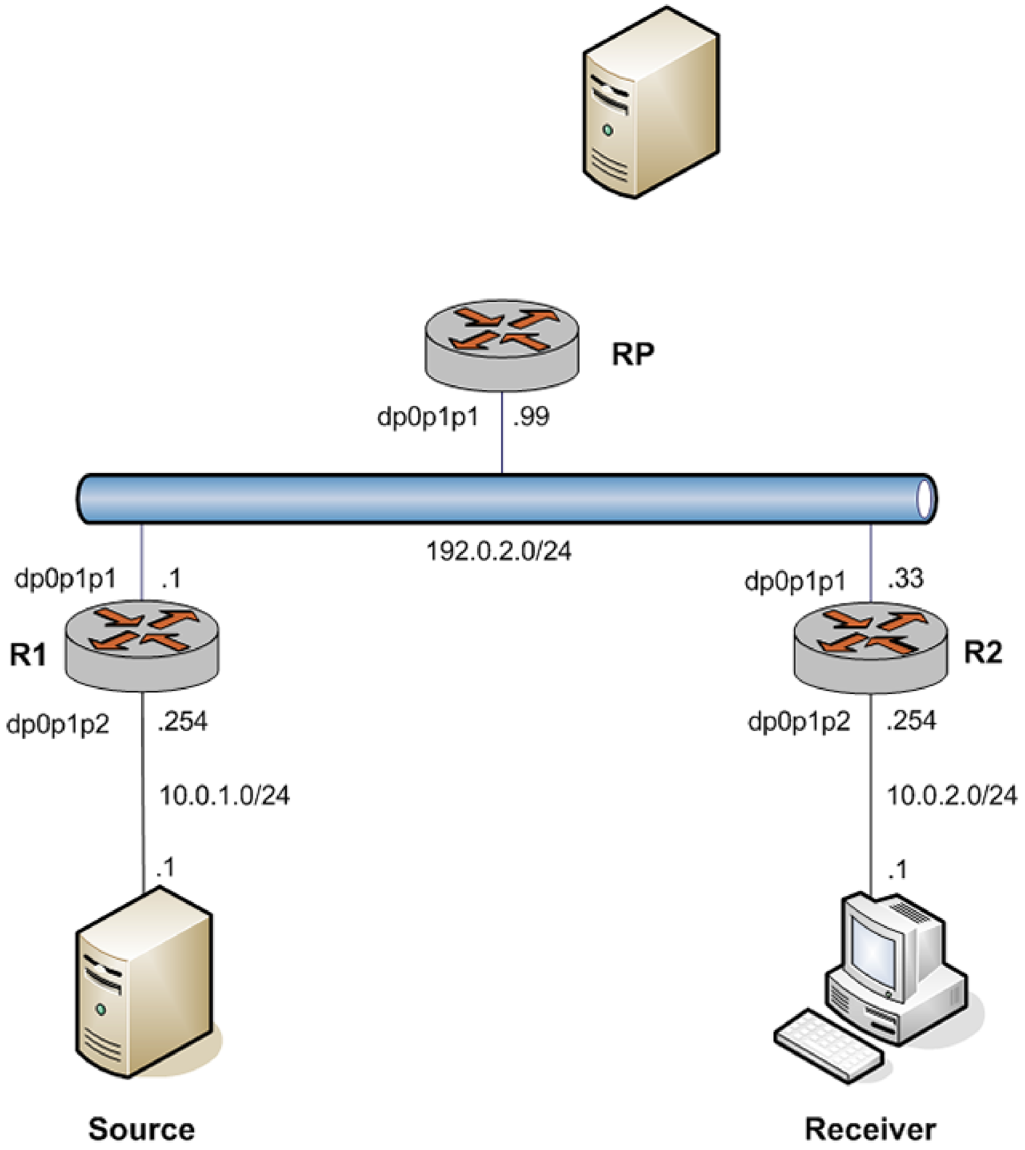
R1 and R2 are configured for PIM sparse mode operation and point to RP as the rendezvous point router. RP is configured as the rendezvous point router.

> **Note:** It is assumed that the Sender and Receiver contain software to send and receive multicast traffic.

When you have finished the example, these systems will be configured as shown in the following figure.

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Figure 1: Basic PIM-SM multicast setup



Configure R1

The multicast network in the example extends from R1 through the 192.0.2.0/24 LAN segment to R2 and RP. In this example, you configure R1 for PIM sparse mode multicast operation.

The following procedure creates a PIM sparse mode multicast configuration on R1.

Table 2: Creating a PIM sparse mode configuration on R1

Step	Command
Configure PIM sparse mode on dp0p1p1.	`vyatta@R1# set interfaces dataplane dp0p1p1 ip pim mode sparse`
Commit the configuration.	`vyatta@R1# commit`

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Step	Command

View the configuration.	`vyatta@R1# show interfaces dataplane dp0p1p1`
	` ip`
	`    pim {`
	`        mode sparse`
	`    }`

Configure PIM sparse mode on dp0p1p2.	`vyatta@R1# set interfaces dataplane dp0p1p2`
	` ip pim mode sparse`

Commit the configuration.	`vyatta@R1# commit`

View the configuration.	`vyatta@R1# show interfaces dataplane dp0p1p2`
	` ip`
	`    pim {`
	`        mode sparse`
	`    }`

Configure multicast routing.	`vyatta@R1# set protocols multicast ip routing`

Specify the location of the rendezvous point router.	`vyatta@R1# set protocols pim rp-address`
	` 192.0.2.99`

Commit the configuration.	`vyatta@R1# commit`

View the configuration.	`vyatta@R1# show protocols`
	`    multicast {`
	`        ip {`
	`            routing {`
	`            }`
	`        }`
	`    }`
	`    pim {`
	`        rp-address 192.0.2.99 {`
	`        }`
	`    }`

Configure R2

The multicast network in the example extends from R1 through the 192.0.2.0/24 LAN segment to R2 and RP. In this example, you configure R2 for PIM sparse mode multicast operation.

The following procedure creates a PIM sparse mode multicast configuration on R2.

Table 3: Creating a PIM sparse mode configuration on R2

Step	Command

Configure PIM sparse mode on dp0p1p1.	`vyatta@R2# set interfaces dataplane dp0p1p1`
	` ip pim mode sparse`

Commit the configuration.	`vyatta@R2# commit`

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Step	Command

View the configuration.	`vyatta@R2# show interfaces dataplane dp0p1p1 ip`
	`    pim {`
	`        mode sparse`
	`    }`

Configure PIM sparse mode on dp0p1p2.	`vyatta@R2# set interfaces dataplane dp0p1p2 ip pim mode sparse`
Commit the configuration.	`vyatta@R2# commit`

View the configuration.	`vyatta@R2# show interfaces dataplane dp0p1p2 ip`
	`    pim {`
	`        mode sparse`
	`    }`

Configure multicast routing.	`vyatta@R2# set protocols multicast ip routing`
Specify the location of the rendezvous point router.	`vyatta@R2# set protocols pim rp-address 192.0.2.99`
Commit the configuration.	`vyatta@R2# commit`

View the configuration.	`vyatta@R2# show protocols`
	`    multicast {`
	`        ip {`
	`            routing {`
	`            }`
	`        }`
	`    }`
	`    pim {`
	`        rp-address 192.0.2.99 {`
	`        }`
	`    }`

Configure RP

The multicast network in the example extends from R1 through the 192.0.2.0/24 LAN segment to R2 and RP. In this example, you configure RP for PIM sparse mode multicast operation.

The following procedure creates a PIM sparse mode multicast configuration on RP.

Table 4: Creating a PIM sparse mode configuration on RP

Step	Command
Configure PIM sparse mode on dp0p1p1.	`vyatta@RP# set interfaces dataplane dp0p1p1 ip pim mode sparse`
Commit the configuration.	`vyatta@RP# commit`

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

<table>
<tr><th>Step</th><th>Command</th></tr>
<tr><td>View the configuration.</td><td><pre>vyatta@RP# show interfaces dataplane dp0p1p1
 ip
    pim {
        mode sparse
    }</pre></td></tr>
<tr><td>Configure multicast routing.</td><td><pre>vyatta@RP# set protocols multicast ip routing</pre></td></tr>
<tr><td>Specify the location of the rendezvous point router.</td><td><pre>vyatta@RP# set protocols pim rp-address
 192.0.2.99</pre></td></tr>
<tr><td>Commit the configuration.</td><td><pre>vyatta@RP# commit</pre></td></tr>
<tr><td>View the configuration.</td><td><pre>vyatta@RP# show protocols
    multicast {
        ip {
            routing {
            }
        }
    }
    pim {
        rp-address 192.0.2.99 {
        }
    }</pre></td></tr>
</table>

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Multicast Routing Commands

clear ip mroute statistics

Clears IPv4 statistics for multicast routing.

Syntax:

```
clear ip mroute statistics [ group group [ source source ]]
```

When used with no option, this command clears all IPv4 statistics for multicast routing.

group

Clears statistics for the specified IPv4 multicast group in IPv4 multicast address format.

source

Used in source-specific multicast. Clears statistics for the specified IPv4 multicast source. The format is an IPv4 multicast address.

Operational mode

Use this command to clear statistics for multicast routing.

clear ipv6 mroute statistics

Clears IPv6 statistics for multicast routing.

Syntax:

```
clear ipv6 mroute statistics [ group group [ source source ]]
```

When used with no option, this command clears all IPv6 statistics for multicast routing.

`group` ***group***

Clears statistics for the specified IPv6 multicast group. The format is an IPv6 multicast address.

`source` ***source***

Used in source-specific multicast. Clears statistics for the specified IPv6 multicast source. The format is an IPv6 multicast address.

Operational mode

Use this command to clear IPv6 statistics for multicast routing.

interfaces <interface> ip multicast ttl-threshold <ttl>

Sets the time-to-live (TTL) threshold for multicast packets.

Syntax:

```
set interfaces interface ip multicast ttl-threshold ttl
```

Syntax:

```
delete interfaces interface ip multicast ttl-threshold
```

Syntax:

```
show interfaces interface ip multicast ttl-threshold
```

The TTL for multicast packets is 0. The default value 0 means that all multicast packets are forwarded out to the interface.

interface

The type keyword and identifier of an interface. For detailed keywords and arguments that can be specified as interfaces, refer to Supported Dataplane Interfaces *(page 32)*.

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

ttl

The TTL value is the hop count. The range is 0 through 255. The default is 0.

Configuration mode

```
interfaces interface {
    ip {
        multicast {
            ttl-threshold ttl
        }
    }
}
```

Use this command to configure the TTL threshold for multicast packets being forwarded from the specified interface. Only multicast packets with a TTL value greater than the threshold are forwarded.

Use the `set` form of this command to configure the multicast TTL value.

Use the `delete` form of this command to restore the default TTL value for multicast.

Use the `show` form of this command to show multicast TTL configuration.

monitor command <mtrace-command>

Monitors an `mtrace` command.

Syntax:
`monitor command` *mtrace-command*

Syntax:
`run monitor command` *mtrace-command*

mtrace-command

The `mtrace` command to be monitored. The `mtrace` command must be enclosed in quotation marks.

Operational mode.

Configuration mode

Use this command to display the output of an `mtrace` command. The session stays open and display information is refreshed every two seconds.

Use the `run` form of this command in configuration mode.

monitor protocol multicast

Sets debugging options for multicast routing.

Syntax:
`monitor protocol multicast [[` **`background`** `{` **`start`** `|` **`stop`** `}] | {` **`enable`** `|` **`disable`** `} {` **`ip`** `|` **`ipv6`** `} [` **`event`** `|` **`fib-msg`** `|` **`mrib-msg`** `|` **`mrt`** `|` **`mtrace`** `|` **`mtrace-detail`** `|` **`nsm-msg`** `|` **`register-msg`** `|` **`stats`** `|` **`vif`** `]]`

Multicast debugging is disabled.

`background`

Performs debugging operations in the background.

`start`

Starts debugging in the background.

`stop`

Stops debugging in the background.

`enable`

Enables the specified debugging option.

`disable`

Disables the specified debugging option.

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

ip
Specifies IPv4 multicast debugging.

ipv6
Specifies IPv6 multicast debugging.

event
Displays debugging messages for multicast events.

fib-msg
Reports all forwarding information base messages.

mrib-msg
Reports all multicast routing information base messages.

mrt
Displays debugging messages for multicast routes.

mtrace
Displays multicast traceroute debugging.

mtrace-detail
Displays detailed multicast traceroute debugging.

nsm-msg
Reports all Network Services Module messages.

register-msg
Reports all Protocol Independent Multicast (PIM) register messages.

stats
Displays debugging messages for multicast statistics.

vif
Displays debugging messages for multicast-enabled vif interfaces.

Operational mode

Use this command to enable or disable debugging for multicast and to configure multicast debugging options.

The following example starts debugging in the background for IPv4 multicast events.

```
vyatta@vyatta:~$monitor protocol multicast enable ip event
```

The following example disables all IPv6 multicast debugging.

```
vyatta@vyatta:~$monitor protocol multicast disable ipv6
```

mtrace <host>

Displays the route that packets take from a multicast source.

Syntax:
set mtrace *host* [**destination** *addr* [**group** *group* [**detail**] | **detail**] | **group** *group* [**destination** *addr* [**detail**] | **detail**] | **detail**]

Output shows routes from the source host to the host on which the command is entered.

host
The host that is the source for the trace. The host is either a name (if DNS is being used on the network) or an IPv4 or IPv6 unicast address.

addr
The host that is the destination for the trace. The host is either an IPv4 or IPv6 unicast address.

group
The multicast group to trace. The format is an IPv4 or IPv6 multicast address.

detail

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Displays detailed output. This output includes IP multicast packet-rate and packet-loss information.

Operational mode

Use this command to show the path from a source to a receiver in a multicast network.

The following example displays a trace from 10.14.0.1 through 10.12.0.2 using group 226.0.0.1.

```
vyatta@vyatta:~$mtrace 10.14.0.1 destination 10.12.0.2 group 226.0.0.1
Mtrace from 10.14.0.1 to 10.12.0.2 via group 226.0.0.1
Querying full reverse path...
  0  ? (10.12.0.2)
 -1  ? (10.12.0.2)  PIM  thresh^ 1  RPF interface
 -2  ? (10.12.0.1)  PIM  thresh^ 1
 -3  ? (10.14.0.1)
Round trip time 1 ms
```

The following example displays a detailed trace from 10.14.0.1 through 10.12.0.2 using group 226.0.0.1.

```
vyatta@vyatta:~$mtrace 10.14.0.1 destination 10.12.0.2 group 226.0.0.1 detail
Mtrace from 10.14.0.1 to 10.12.0.2 via group 226.0.0.1
Round trip time 0 ms

Waiting to accumulate statistics... Results after 10 seconds:

  Source        Response Dest    Packet Statistics For     Only For Traffic
10.14.0.1       10.12.0.2        All Multicast Traffic     From 10.14.0.1
     v       __/  rtt    0 ms    Lost/Sent = Pct  Rate       To 226.0.0.1
10.14.0.1
10.12.0.1
     v     ^      ttl    1          0            0 pps       0            0 pps
10.12.0.2                      RPF interface
     v      \__   ttl    2
10.12.0.2       10.12.0.2
  Receiver      Query Source
```

protocols multicast ip log

Enables IPv4 MRIB logs.

Syntax:

set protocols multicast ip log { **all** | **event** | **fib-msg** | **mrib-msg** | **mrt** | **mtrace** | **mtrace-detail** | **nsm-msg** | **register-msg** | **stats** | **vif** }

Syntax:

delete protocols multicast ip log { **all** | **event** | **fib-msg** | **mrib-msg** | **mrt** | **mtrace** | **mtrace-detail** | **nsm-msg** | **register-msg** | **stats** | **vif** }

Syntax:

show protocols multicast ip log { **all** | **event** | **fib-msg** | **mrib-msg** | **mrt** | **mtrace** | **mtrace-detail** | **nsm-msg** | **register-msg** | **stats** | **vif** }

None

all

Enables MRIB debugging for all multicast protocol parameters.

event

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Enables MRIB debugging for all multicast events.

`fib-msg`

Enables MRIB debugging for only multicast FIB events.

`mrib-msg`

Enables MRIB debugging for only multicast RIB events.

`mrt`

Enables MRIB debugging for multicast routes.

`mtrace`

Enables MRIB debugging for multicast trace routes.

`mtrace-detail`

Enables MRIB debugging for multicast traceroute messages.

`nsm-msg`

Enables MRIB debugging for multicast NSM messages.

`register-msg`

Enables MRIB debugging for multicast PIM register messages.

`stats`

Enables MRIB debugging for multicast statistics.

`vif`

Enables MRIB debugging for multicast virtual interfaces.

Configuration mode

```
protocols {
multicast ip {
          log {
            all
           event
         fib-msg
        mrib-msg
             mrt
          mtrace
   mtrace-detail
         nsm-msg
    register-msg
           stats
             vif
               }
            }
          }
```

Use the `set` form of this command to enable IPv4 multicast routing information base (MRIB) logs.

Use the `delete` form of this command to remove IPv4 MRIB logs.

Use the `show` form of this command to view IPv4 MRIB logs.

protocols multicast ipv6 log

Enables IPv6 MRIB logs.

Syntax:

`set protocols multicast ipv6 log` { **`all`** | **`event`** | **`fib-msg`** | **`mrib-msg`** | **`mrt`** | **`mtrace`** | **`mtrace-detail`** | **`nsm-msg`** | **`register-msg`** | **`stats`** | **`vif`** }

Syntax:

`delete protocols multicast ipv6 log` { **`all`** | **`event`** | **`fib-msg`** | **`mrib-msg`** | **`mrt`** | **`mtrace`** | **`mtrace-detail`** | **`nsm-msg`** | **`register-msg`** | **`stats`** | **`vif`** }

Syntax:

`show protocols multicast ipv6 log` { **`all`** | **`event`** | **`fib-msg`** | **`mrib-msg`** | **`mrt`** | **`mtrace`** | **`mtrace-detail`** | **`nsm-msg`** | **`register-msg`** | **`stats`** | **`vif`** }

None

`all`

Enables MRIB debugging for all multicast protocol parameters.

`event`

Enables MRIB debugging for all multicast events.

`fib-msg`

Enables MRIB debugging for only multicast FIB events.

`mrib-msg`

Enables MRIB debugging for only multicast RIB events.

`mrt`

Enables MRIB debugging for multicast routes.

`mtrace`

Enables MRIB debugging for multicast trace routes.

`mtrace-detail`

Enables MRIB debugging for multicast traceroute messages.

`nsm-msg`

Enables MRIB debugging for multicast NSM messages.

`register-msg`

Enables MRIB debugging for multicast PIM register messages.

`stats`

Enables MRIB debugging for multicast statistics.

`vif`

Enables MRIB debugging for multicast virtual interfaces.

Configuration mode

```
protocols {
multicast ipv6 {
          log {
            all
           event
         fib-msg
        mrib-msg
             mrt
          mtrace
   mtrace-detail
         nsm-msg
    register-msg
           stats
             vif
               }
            }
          }
```

Use the `set` form of this command to enable IPv6 multicast routing information base (MRIB) logs.

Use the `delete` form of this command to remove IPv6 MRIB logs.

Use the `show` form of this command to view IPv6 MRIB logs.

protocols multicast ip log-warning <warning-limit>

Sets a warning threshold for IPv4 multicast routes.

Syntax:

`set protocols multicast ip log-warning` *warning-limit*

Syntax:

`delete protocols multicast ip log-warning`

Syntax:

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

```
show protocols multicast ip log-warning
```

If this value is not configured, the system issues a warning only when the maximum number of routes has been reached.

warning-limit

The number of IPv4 multicast routes that causes the system to generate a warning. The value configured for this argument must not exceed the value set for the maxmimum route limit that is configured by using the `protocols multicast ip route-limit` *route-limit* command. The range is 1 through 2147483647.

Configuration mode

```
protocols {
    multicast {
        ip {
            log-warning warning-limit
        }
    }
}
```

Use this command to configure the warning threshold for IPv4 routes in the multicast routing table. When this limit is exceeded, the system continues to generate a message until the maximum number of multicast routes is reached that is configured by using the `protocols multicast ip route-limit` *route-limit* command.

Use the `set` form of this command to configure the warning threshold for IPv4 multicast routes.

Use the `delete` form of this command to restore the default IPv4 warning threshold.

Use the `show` form of this command to show the IPv4 warning threshold configuration.

protocols multicast ip route-limit <route-limit>

Sets the maximum number of IPv4 routes that can be added to the multicast routing table.

Syntax:

`set protocols multicast ip route-limit` *route-limit*

Syntax:

```
delete protocols multicast ip route-limit
```

Syntax:

```
show protocols multicast ip route-limit
```

The maximum number of IPv4 multicast routes is 2,147,483,647.

route-limit

The maximum number of IPv4 routes that can be added to the multicast routing table. The value configured for this argument must be greater than or equal to the log warning limit that is configured by using the `protocols multicast ip log-warning` *warning-limit* command. The range is 1 through 2147483647.

Configuration mode

```
protocols {
    multicast {
        ip {
            route-limit route-limit
        }
    }
}
```

Use this command to limit the number of IPv4 routes that can be added to the multicast routing table.

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Use the `set` form of this command to specify the IPv4 multicast route limit.

Use the `delete` form of this command to restore the default IPv4 multicast route limit.

Use the `show` form of this command to show the IPv4 multicast route limit configuration.

protocols multicast ip routing

Enables IPv4 multicast routing.

Syntax:

```
set protocols multicast ip routing
```

Syntax:

```
delete protocols multicast ip routing
```

Syntax:

```
show protocols multicast ip routing
```

IPv4 multicast routing is disabled.

Configuration mode

```
protocols {
    multicast {
        ip {
            routing {
            }
        }
    }
}
```

Use this command to enable the system to use multicast routing protocols for IPv4 traffic.

When this configuration node is deleted, multicast routing protocols such as the Internet Group Management Protocol (IGMP) and Protocol Independent Multicast (PIM) do not work for IPv4 traffic, even if configured.

Use the `set` form of this command to enable multicast routing.

Use the `delete` form of this command to remove the multicast routing configuration.

Use the `show` form of this command to display the multicast routing configuration.

protocols multicast ipv6 log-warning <warning-limit>

Sets the warning threshold for IPv6 multicast routes.

Syntax:

`set protocols multicast ipv6 log-warning` *warning-limit*

Syntax:

```
delete protocols multicast ipv6 log-warning
```

Syntax:

```
show protocols multicast ipv6 log-warning
```

If this value is not configured, the system issues a warning only when the maximum number of routes has been reached.

warning-limit

The number of IPv6 multicast routes that causes the system to generate a warning. The value configured for this argument must not exceed the value set for the maximum route limit that is

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

configured by using the `protocols multicast ipv6 route-limit` *route-limit* command. The range is 1 through 2147483647.

Configuration mode

```
protocols {
    multicast {
        ipv6 {
            log-warning warning-limit
        }
    }
}
```

Use this command to configure the warning threshold for IPv6 routes in the multicast routing table. When this limit is exceeded, the system continues to generate a message until the maximum number of multicast routes is reached that is configured by using the `protocols multicast ipv6 route-limit` *route-limit* command.

Use the `set` form of this command to configure the IPv6 warning threshold.

Use the `delete` form of this command to restore the default IPv6 warning threshold.

Use the `show` form of this command to show the IPv6 warning threshold configuration.

protocols multicast ipv6 route-limit <route-limit>

Sets the maximum number of IPv6 routes that can be added to the multicast routing table.

Syntax:
`set protocols multicast ipv6 route-limit` *route-limit*

Syntax:
`delete protocols multicast ipv6 route-limit`

Syntax:
`show protocols multicast ipv6 route-limit`

The maximum number of IPv6 multicast routes is 2,147,483,647.

route-limit

The maximum number of IPv6 routes that can be added to the multicast routing table. The value configured for this argument must be greater than or equal to the log warning limit that is configured by using the `protocols multicast ip log-warning` *warning-limit* command. The range is 1 through 2147483647.

Configuration mode

```
protocols {
    multicast {
        ip {
            route-limit route-limit
        }
    }
}
```

Use this command to limit the number of IPv6 routes that can be added to the multicast routing table.

Use the `set` form of this command to specify the IPv6 multicast route limit.

Use the `delete` form of this command to restore the default IPv6 multicast route limit.

Use the `show` form of this command to show the IPv6 multicast route limit configuration.

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

protocols multicast ipv6 routing

Enables IPv6 multicast routing.

Syntax:
```
set protocols multicast ipv6 routing
```

Syntax:
```
delete protocols multicast ipv6 routing
```

Syntax:
```
show protocols multicast ipv6 routing
```

IPv6 multicast routing is disabled.

Configuration mode

```
protocols {
    multicast {
        ipv6 {
            routing {
            }
        }
    }
}
```

Use this command to enable the system to use multicast routing protocols for IPv6 traffic.

When this configuration is deleted, multicast routing protocols such as the Multicast Listener Discovery (MLD) and PIM do not work for IPv6 traffic, even if configured.

Use the `set` form of this command to enable IPv6 multicast routing.

Use the `delete` form of this command to remove IPv6 multicast routing configuration.

Use the `show` form of this command to display the IPv6 multicast routing configuration.

reset ip mroute

Removes IPv4 entries from the multicast routing information base of the specified group.

Syntax:
```
reset ip mroute [ group group [ source source ] ]
```

When used with no option, this command deletes all routes from the multicast routing information base.

group

The IPv4 multicast group in IPv4 multicast address format. Routes are removed for the specified group.

source

Used in source-specific multicast. Removes routes for the specified IPv4 multicast source. The format is an IPv4 multicast address.

Operational mode

Use this command to remove IPv4 routes from the multicast routing and forwarding information bases.

Each multicast routing protocol has a distinct command for clearing multicast routes from the routing table for the protocol.

reset ipv6 mroute

Removes IPv6 entries from the multicast routing information base.

Syntax:

`reset ipv6 mroute [` **`group`** *`group`* `[` **`source`** *`source`* `]]`

When used with no option, this command deletes all routes from the multicast routing information base.

`group` ***group***

Removes IPv6 routes for the specified multicast group. The format is an IPv6 multicast address.

`source` ***source***

Used in source-specific multicast. Shows multicast routes for the specified IPv6 multicast source. The format is an IPv6 address.

Operational mode

Use this command to remove IPv6 routes from the multicast routing and forwarding information bases. Each multicast routing protocol has a distinct command for clearing multicast routes from the routing table for the protocol.

show ip mroute

Displays the IPv4 multicast routing table.

Syntax:

`show ip mroute [` **`group`** *`group`* `[` **`source`** *`source`* `]] [` **`dense`** `|` **`sparse`** `|` **`count`** `|` **`summary`** `]`

When used with no option, this command displays information for the complete IPv4 multicast routing table.

`group` ***group***

Shows IPv4 multicast routes for the specified multicast group. The format is an IPv4 multicast address.

`source` ***source***

Used in source-specific multicast. Shows multicast routes for the specified IPv4 multicast source. The format is an IPv4 multicast address.

`dense`

Shows dense-mode IPv4 multicast routes.

`sparse`

Shows sparse-mode IPv4 multicast routes.

`count`

Shows IPv4 multicast-route and packet-count information.

`summary`

Shows abbreviated IPv4 multicast route information.

Operational mode

Use this command to display the IPv4 multicast routing table.

The following example shows how to display an IPv4 multicast routing table.

```
vyatta@vyatta:~$show ip mroute

IP Multicast Routing Table
Flags: I - Immediate Stat, T - Timed Stat, F - Forwarder installed
Timers: Uptime/Stat Expiry
Interface State: Interface (TTL)
(10.10.1.52, 224.0.1.3), uptime 00:00:31, stat expires 00:02:59
Owner PIM-SM, Flags: TF
Incoming interface: wm0
Outgoing interface list:
wm1 (1)
vyatta@vyatta:~$
```

The following example shows how to display routes for multicast group 224.0.1.3 and source 10.10.1.52.

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

```
vyatta@vyatta:~$show ip mroute group 224.0.1.3 source 10.10.1.52
IP Multicast Routing Table
Flags: I - Immediate Stat, T - Timed Stat, F - Forwarder installed
Timers: Uptime/Stat Expiry
Interface State: Interface (TTL)
(10.10.1.52, 224.0.1.3), uptime 00:03:24, stat expires 00:01:28
Owner PIM-SM, Flags: TF
Incoming interface: wm0
Outgoing interface list:
wm1 (1)vyatta@vyatta:~$
```

The following example shows how to display packet counts for multicast routes.

```
vyatta@vyatta:~$show ip mroute count

IP Multicast Statistics
Total 1 routes using 132 bytes memory
Route limit/Route threshold: 2147483647/2147483647
Total NOCACHE/WRONGVIF/WHOLEPKT recv from fwd: 1/0/0
Total NOCACHE/WRONGVIF/WHOLEPKT sent to clients: 1/0/0
Immediate/Timed stat updates sent to clients: 0/0
Reg ACK recv/Reg NACK recv/Reg pkt sent: 0/0/0
Next stats poll: 00:01:10
Forwarding Counts: Pkt count/Byte count, Other Counts: Wrong If pkts
Fwd msg counts: WRONGVIF/WHOLEPKT recv
Client msg counts: WRONGVIF/WHOLEPKT/Imm Stat/Timed Stat sent
Reg pkt counts: Reg ACK recv/Reg NACK recv/Reg pkt sent
(10.10.1.52, 224.0.1.3), Forwarding: 2/19456, Other: 0
Fwd msg: 0/0, Client msg: 0/0/0/0, Reg: 0/0/0
vyatta@vyatta:~$
```

The following example shows how to display a summary of the multicast routing table.

```
vyatta@vyatta:~$show ip mroute summary

IP Multicast Routing Table
Flags: I - Immediate Stat, T - Timed Stat, F - Forwarder installed
Timers: Uptime/Stat Expiry
Interface State: Interface (TTL)
(10.10.1.52, 224.0.1.3), 00:01:32/00:03:20, PIM-SM, Flags: TF
vyatta@vyatta:~$
```

show ip multicast interface

Displays information about IPv4 multicast-enabled interfaces.

Syntax:

`show ip multicast interface` [*interface*]

When used with no option, this command shows information for all IPv4 multicast-enabled interfaces.

interface

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Mandatory. The type keyword and identifier of an interface. For detailed keywords and arguments that can be specified as interfaces, refer to Supported Dataplane Interfaces *(page 32)*.

Operational mode

Use this command to show operational information for IPv4 multicast-enabled interfaces.

The following example shows how to display all IPv4 multicast interface information.

```
vyatta@vyatta:~$ show ip multicast

Interface Vif Owner TTL Local Remote Uptime
Idx Module Address Address
wlm0 0 PIM-SM 1 192.168.1.53 0.0.0.0 00:04:26
Register 1 1 192.168.1.53 0.0.0.0 00:04:26
wlm1 2 PIM-SM 1 192.168.10.53 0.0.0.0 00:04:25
vyatta@vyatta:~$
```

The following example shows how to display IPv4 multicast interface information for the wlm0 interface.

```
vyatta@vyatta:~$ show ip multicast interface wlm0

Interface Vif Owner TTL Local Remote Uptime
Idx Module Address Address
wlm0 0 PIM-SM 1 192.168.1.53 0.0.0.0 00:05:17
vyatta@vyatta:~$
```

show ip multicast mrinfo <host>

Displays information about IPv4 multicast neighbors.

Syntax:

`show ip multicast mrinfo host [ source-addr | interface ]`

host

The host that is being queried. The host is either a name (if DNS is being used on the network) or an IPv4 unicast address.

source-addr

Optional. The source address used in the mrinfo request. If omitted, the IPv4 address of the interface on which the request is sent is used.

interface

Optional. The source address used in the mrinfo request is the IPv4 address of the interface specified. If omitted, the IPv4 address of the interface on which the request is sent is used. For detailed keywords and arguments that can be specified as interfaces, refer to Supported Dataplane Interfaces *(page 32)*.

Operational mode

Use this command to show information about IPv4 multicast neighbors.

The following example shows how to display information about the IPv4 multicast neighbor mbone.phony.dom.net.

```
vyatta@vyatta:~$ show ip multicast mrinfo mbone.phony.dom.net
127.148.176.10 (mbone.phony.dom.net) [version 3.3]:
127.148.176.10 -> 0.0.0.0 (?) [1/1/querier]
```

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

```
127.148.176.10 -> 127.0.8.4 (mbone2.phony.dom.net) [1/45/tunnel]
127.148.176.10 -> 105.1.41.9 (momoney.com) [1/32/tunnel/down]
127.148.176.10 -> 143.192.152.119 (mbone.dipu.edu) [1/32/tunnel]
vyatta@vyatta:~$
```

show ip rpf <source>

Displays Reverse Path Forwarding (RPF) information for a specific IPv4 multicast source address.

Syntax:

`show ip rpf` *source*

source

An IPv4 multicast source address.

Operational mode

Use this command to display the RPF information for a specific IPv4 multicast source address.

The following example shows how to display RPF information for the source address 172.18.92.1.

```
vyatta@vyatta:~$show ip rpf 172.18.92.1
RPF Information for 172.18.92.1
    RPF interface: dp0p1p1
    RPF neighbor: 172.18.93.100
    RPF prefix length: 24
    RPF distance: 1
    RPF mteric: 1
vyatta@vyatta:~$
```

show ipv6 mroute

Displays the IPv6 multicast routing table.

Syntax:

`show ipv6 mroute [` **`group`** *group* `[` **`source`** *source* `]] [` **`dense`** `|` **`sparse`** `|` **`count`** `|` **`summary`** `]`

When used with no option, this command displays information for the complete IPv6 multicast routing table.

`group` ***group***

Shows IPv6 multicast routes for the specified multicast group. The format is an IPv6 multicast address.

`source` ***source***

Used in source-specific multicast. Shows multicast routes for the specified IPv6 multicast source. The format is an IPv6 multicast address.

`dense`

Shows dense-mode IPv6 multicast routes.

`sparse`

Shows sparse-mode IPv6 multicast routes.

`count`

Shows IPv6 multicast-route and packet-count information.

`summary`

Shows abbreviated IPv6 multicast route information.

Operational mode

Use this command to display the IPv6 multicast routing table.

The following example shows how to display an IPv6 multicast routing table.

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

```
vyatta@vyatta:~$show ipv6 mroute

IPv6 Multicast Routing Table
Flags: I - Immediate Stat, T - Timed Stat, F - Forwarder installed
Timers: Uptime/Stat Expiry
Interface State: Interface
(3ffe:10:10:1::96, ff1e::10), uptime 00:00:09, stat expires 00:03:21
Owner PIM-SMv6, Flags: TF
Incoming interface: wm0
Outgoing interface list:
wm1
(3ffe:10:10:1::96, ff1e::12), uptime 00:00:02, stat expires 00:03:28
Owner PIM-SMv6, Flags: TF
Incoming interface: wm0
Outgoing interface list:
wm1
vyatta@vyatta:~$
```

show ipv6 multicast interface

Displays information about IPv6 multicast-enabled interfaces.

Syntax:
`show ipv6 multicast interface` [*interface*]

When used with no option, this command shows information for all IPv6 multicast-enabled interfaces.

interface
The type keyword and identifier of an interface. For detailed keywords and arguments that can be specified as interfaces, refer to Supported Dataplane Interfaces *(page 32)*.

Operational mode

Use this command to show operational information for IPv6 multicast-enabled interfaces.

The following example shows how to display all IPv6 multicast interface information.

```
vyatta@vyatta:~$show ipv6 multicast

Interface Mif Owner Uptime
Idx Module
wlm0 0 PIM-SMv6 00:17:18
Register 1 00:17:18
wlm1 2 PIM-SMv6 00:17:18
vyatta@vyatta:~$
```

The following example shows how to display all IPv6 multicast interface information for the wlm0 interface.

```
vyatta@vyatta:~$show ipv6 multicast wlm0

Interface Mif Owner Uptime
Idx Module
wlm0 0 PIM-SMv6 00:19:06
vyatta@vyatta:~$
```

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

show ipv6 rpf <source>

Displays Reverse Path Forwarding (RPF) information for a specific IPv6 multicast source address.

Syntax:

`show ipv6 rpf` *source*

source

An IPv6 multicast source address.

Operational mode

Use this command to display RPF information for a specific IPv6 multicast source address.

The following example shows how to display RPF information for the IPv6 source address 2036::6.

```
vyatta@vyatta:~$show ipv6 rpf 2036::6
RPF Information for 2036::6
    RPF interface: dp0p1p3
    RPF neighbor: fe80::250:56ff:fe9b:5aaf
    RPF prefix length: 64
    RPF distance: 2
    RPF mteric: 110
vyatta@vyatta:~$
```

show monitoring protocols multicast

Shows information about multicast debugging configuration.

Syntax:

`show monitoring protocols multicast` { **`ip`** | **`ipv6`** }

`ip`

Shows what IPv4 multicast debugging options are enabled.

`ipv6`

Shows what IPv6 multicast debugging options are enabled.

Operational mode

Use this command to see what debugging options are currently enabled for IPv4 or IPv6 multicast routing.

The following example shows how to display the current configuration for IPv4 multicast debugging.

```
vyatta@vyatta:~$show monitoring protocols multicast ip

Debugging status:
MRIBv4 event debugging is on
MRIBv4 VIF debugging is on
MRIBv4 route debugging is on
MRIBv4 route statistics debugging is on
MRIBv4 FIB message debugging is on
MRIBv4 PIM Register message debugging is on
MRIBv4 NSM IPC message debugging is on
MRIBv4 MRIB IPC message debugging is on
MRIBv4 traceroute debugging is on
MRIBv4 traceroute detailed debugging is on
vyatta@vyatta:~$
```

Supported Data Plane Interfaces

The following table shows the syntax and parameters of the supported types of data plane interfaces.

hack: broke the first row into several rows to make page break because table width doesn't work yet.

Interface Type	Syntax	Parameters
Data plane	`dataplane` *interface-name*	*interface-name*: The name of a data plane interface. Following are the supported formats of the interface name: • `dp`*x*`p`*y*`p`*z*—The name of a data plane interface, where — `dp`*x* specifies the data plane identifier (ID). Currently, only dp0 is supported. — p*y* specifies a physical or virtual PCI slot index (for example, p129). — `p`*z* specifies a port index (for example, p1). For example, dp0p1p2, dp0p160p1, and dp0p192p1.
		• `dp`*x*`em`*y* —The name of a data plane interface on a LAN-on-motherboard (LOM) device that does not have a PCI slot, where `em`*y* specifies an embedded network interface number (typically, a small number). For example, dp0em3.
		• `dp`*x*`s`*y*—The name of a data plane interface in a system in which the BIOS identifies the network interface card to reside in a particular physical or virtual slot *y*, where *y* is typically a small number. For example, for the dp0s2 interface, the BIOS identifies slot 2 in the system to contain this interface.

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Interface Type	Syntax	Parameters
		- `dpxPnpypz` —The name of a data plane interface on a device that is installed on a secondary PCI bus, where `Pn` specifies the bus number. You can use this format to name data plane interfaces on large physical devices with multiple PCI buses. For these devices, it is possible to have network interface cards installed on different buses with these cards having the same slot ID. The value of *n* must be an integer greater than 0. For example, dp0P1p162p1 and dp0P2p162p1.
		- `dp0vrrp`*N* — The name of a VRRP data plane interface, where *N* is the nth VRRP group that is created. This name is generated by the router when rfc-compatibility mode is used. The first created interface is dp0vrrp1, the second is dp0vrrp2, and so on.
Data plane vif	`dataplane` *interface-name* `vif` *vif-id* [`vlan` *vlan-id*]	*interface-name*: Refer to the preceding description. *vif-id*: A virtual interface ID. The ID ranges from 1 through 4094. *vlan-id*: The VLAN ID of a virtual interface. The ID ranges from 1 through 4094.

VRF Support

VRF support for multicast

You can configure multicast within a routing instance by using the CLI, NetConf, or SNMP. When you configure multicast on the vRouter without specifying a routing instance, the configuration applies to the default routing instance. To configure multicast for a particular routing instance, specify the instance.

All protocol-specific multicast commands can be applied to specific routing instances. For example, the following commands apply the indicated protocols to the RED routing instance.

```
vyatta@R1# set routing routing-instance RED protocols multicast ...
vyatta@R1# set routing routing-instance RED protocols pim ...
vyatta@R1# set routing routing-instance RED protocols pim6 ...
vyatta@R1# set routing routing-instance RED protocols igmp ...
vyatta@R1# set routing routing-instance RED protocols mld ...
vyatta@R1# set routing routing-instance RED protocols msdp ...
```

Any multicast configuration that is applied to an interface can be referred to under a routing instance to bind it to that instance, as in the following examples. In these examples, the dp0p161p1 interface is bound to the RED routing instance.

```
vyatta@R1# set routing routing-instance RED interfaces dp0p161p1 ip pim
vyatta@R1# set routing routing-instance RED interfaces dp0p161p1 ip igmp
vyatta@R1# set routing routing-instance RED interfaces dp0p161p1 ip multicast
vyatta@R1# set routing routing-instance RED interfaces dp0p161p1 ipv6 pim
vyatta@R1# set routing routing-instance RED interfaces dp0p161p1 ipv6 mld
```

You can apply routing instances to **show** commands for supported protocols. The following example shows details about IPv6 MLD groups for the RED routing instance. If no routing instance is specified, the command applies to the default routing instance.

```
vyatta@vyatta:~$ show ipv6 mld groups routing-instance RED detail
```

You can apply routing instances to **reset** commands. The following example shows how to clear IP BGP addresses for routing instance RED. If no routing instance is specified, the command applies to the default routing instance.

```
vyatta@vyatta:~$ reset ip bgp routing-instance RED detail
```

Logging by multicast protocols is configured on a per routing instance basis. If no routing instance is specified, the command applies to the default routing instance. The following example shows how to enable all PIM logs in the RED routing instance.

```
vyatta@vyatta:~$ monitor protocol multicast routing-instance RED pim enable
```

Command support for VRF routing instances

VRF allows an AT&T Vyatta vRouter to support multiple routing tables, one for each VRF routing instance. Some commands in this guide support VRF and can be applied to particular routing instances.

Use the guidelines in this section to determine correct syntax when adding VRF routing instances to commands. For more information about VRF, refer to AT&T Vyatta Network Operating System Basic Routing Configuration Guide. This guide includes an overview of VRF, VRF configuration examples, information about VRF-specific features, and a list of commands that support VRF routing instances.

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Adding a VRF routing instance to a Configuration mode command

For most Configuration mode commands, specify the VRF routing instance at the beginning of a command. Add the appropriate VRF keywords and variable to follow the initial action (**`set`**, **`show`**, or **`delete`**) and before the other keywords and variables in the command.

Example: Configuration mode example: syslog

The following command configures the syslog logging level for the specified syslog host. The command does not include a VRF routing instance, so the command applies to the default routing instance.

```
vyatta@R1# set system syslog host 10.10.10.1 facility all level debug
vyatta@R1# show system syslog
syslog {
    host 10.10.10.1 {
            facility all {
                    level debug
            }
    }
}
```

The following example shows the same command with the VRF routing instance (GREEN) added. Notice that **`routing routing-instance GREEN`** has been inserted between the basic action (**set** in the example) and the rest of the command. Most Configuration mode commands follow this convention.

```
vyatta@R1# set routing routing-instance GREEN system syslog host 10.10.10.1 facility all
 level debug
vyatta@R1# show routing
routing {
     routing-instance GREEN {
             system {
                     syslog {
                            host 11.12.13.2:514 {
                                     facility all {
                                             level debug
                                     }
                             }
                     }
             }
     }
}
```

Example: Configuration mode example: SNMP

Some features, such as SNMP, are not available on a per-routing instance basis but can be bound to a specific routing instance. For these features, the command syntax is an exception to the convention of specifying the routing instance at the beginning of Configuration mode commands.

The following example shows how to configure the SNMPv1 or SNMPv2c community and context for the RED and BLUE routing instances. The first two commands specify the RED routing instance as the context for community A and BLUE routing instance as the context for community B. The subsequent commands complete the configuration.

For more information about configuring SNMP, refer to AT&T Vyatta Network Operating System Remote Management Configuration Guide.

```
vyatta@R1# set service snmp community commA context RED
vyatta@R1# set service snmp community commB context BLUE
vyatta@R1# set service snmp view all oid 1
vyatta@R1# set service snmp community commA view all
```

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

```
vyatta@R1# set service snmp community commB view all
vyatta@R1# show service snmp community
 community commA {
        context RED
        view all
 }
 community commB {
        context BLUE
        view all
 }
[edit]
vyatta@vyatta#
```

Adding a VRF routing instance to an Operational mode command

The syntax for adding a VRF routing instance to an Operational mode command varies according to the type of command parameters:

- If the command does not have optional parameters, specify the routing instance at the end of the command.
- If the command has optional parameters, specify the routing instance after the required parameters and before the optional parameters.

Example: Operational mode examples without optional parameters

The following command displays dynamic DNS information for the default routing instance.

```
vyatta@vyatta:~$ show dns dynamic status
```

The following command displays the same information for the specified routing instance (GREEN). The command does not have any optional parameters, so the routing instance is specified at the end of the command.

```
vyatta@vyatta:~$ show dns dynamic status routing-instance GREEN
```

Example: Operational mode example with optional parameters

The following command obtains multicast path information for the specified host (10.33.2.5). A routing instance is not specified, so the command applies to the default routing instance.

```
vyatta@vyatta:~$ mtrace 10.33.2.5 detail
```

The following command obtains multicast path information for the specified host (10.33.2.5) and routing instance (GREEN). Notice that the routing instance is specified before the optional **detail** keyword.

```
vyatta@vyatta:~$ mtrace 10.33.2.5 routing-instance GREEN detail
```

Example: Operational mode example output: SNMP

The following SNMP **show** commands display output for routing instances.

```
vyatta@vyatta:~$ show snmp routing-instance
Routing Instance SNMP Agent is Listening on for Incoming Requests:
Routing-Instance            RDID
```

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

```
-----------------           ----
RED                         5

vyatta@vyatta:~$ show snmp community-mapping
SNMPv1/v2c Community/Context Mapping:
Community                   Context
---------                   -------
commA                       'RED'
commB                       'BLUE'
deva                        'default'


vyatta@vyatta:~$ show snmp trap-target
SNMPv1/v2c Trap-targets:
Trap-target                   Port   Routing-Instance Community
-----------                   ----   ---------------- ---------
1.1.1.1                              'RED'           'test'


vyatta@vyatta:~$ show snmp v3 trap-target
SNMPv3 Trap-targets:
Trap-target                   Port   Protocol Auth Priv Type   EngineID              Routing-
Instance User
-----------                   ----   -------- ---- ---- ----   --------
 ---------------- ----
2.2.2.2                       '162'  'udp'    'md5      'infor                       'BLUE'
         'test'
```

List of Acronyms

Acronym	Description
ACL	access control list
ADSL	Asymmetric Digital Subscriber Line
AH	Authentication Header
AMI	Amazon Machine Image
API	Application Programming Interface
AS	autonomous system
ARP	Address Resolution Protocol
AWS	Amazon Web Services
BGP	Border Gateway Protocol
BIOS	Basic Input Output System
BPDU	Bridge Protocol Data Unit
CA	certificate authority
CCMP	AES in counter mode with CBC-MAC
CHAP	Challenge Handshake Authentication Protocol
CLI	command-line interface
DDNS	dynamic DNS
DHCP	Dynamic Host Configuration Protocol
DHCPv6	Dynamic Host Configuration Protocol version 6
DLCI	data-link connection identifier
DMI	desktop management interface
DMVPN	dynamic multipoint VPN
DMZ	demilitarized zone
DN	distinguished name
DNS	Domain Name System
DSCP	Differentiated Services Code Point
DSL	Digital Subscriber Line
eBGP	external BGP
EBS	Amazon Elastic Block Storage
EC2	Amazon Elastic Compute Cloud
EGP	Exterior Gateway Protocol
ECMP	equal-cost multipath
ESP	Encapsulating Security Payload
FIB	Forwarding Information Base
FTP	File Transfer Protocol
GRE	Generic Routing Encapsulation
HDLC	High-Level Data Link Control
I/O	Input/Output
ICMP	Internet Control Message Protocol
IDS	Intrusion Detection System
IEEE	Institute of Electrical and Electronics Engineers

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Acronym	Description
IGMP	Internet Group Management Protocol
IGP	Interior Gateway Protocol
IPS	Intrusion Protection System
IKE	Internet Key Exchange
IP	Internet Protocol
IPOA	IP over ATM
IPsec	IP Security
IPv4	IP Version 4
IPv6	IP Version 6
ISAKMP	Internet Security Association and Key Management Protocol
ISM	Internet Standard Multicast
ISP	Internet Service Provider
KVM	Kernel-Based Virtual Machine
L2TP	Layer 2 Tunneling Protocol
LACP	Link Aggregation Control Protocol
LAN	local area network
LDAP	Lightweight Directory Access Protocol
LLDP	Link Layer Discovery Protocol
MAC	medium access control
mGRE	multipoint GRE
MIB	Management Information Base
MLD	Multicast Listener Discovery
MLPPP	multilink PPP
MRRU	maximum received reconstructed unit
MTU	maximum transmission unit
NAT	Network Address Translation
NBMA	Non-Broadcast Multi-Access
ND	Neighbor Discovery
NHRP	Next Hop Resolution Protocol
NIC	network interface card
NTP	Network Time Protocol
OSPF	Open Shortest Path First
OSPFv2	OSPF Version 2
OSPFv3	OSPF Version 3
PAM	Pluggable Authentication Module
PAP	Password Authentication Protocol
PAT	Port Address Translation
PCI	peripheral component interconnect
PIM	Protocol Independent Multicast
PIM-DM	PIM Dense Mode
PIM-SM	PIM Sparse Mode
PKI	Public Key Infrastructure
PPP	Point-to-Point Protocol
PPPoA	PPP over ATM

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.

Acronym	Description
PPPoE	PPP over Ethernet
PPTP	Point-to-Point Tunneling Protocol
PTMU	Path Maximum Transfer Unit
PVC	permanent virtual circuit
QoS	quality of service
RADIUS	Remote Authentication Dial-In User Service
RHEL	Red Hat Enterprise Linux
RIB	Routing Information Base
RIP	Routing Information Protocol
RIPng	RIP next generation
RP	Rendezvous Point
RPF	Reverse Path Forwarding
RSA	Rivest, Shamir, and Adleman
Rx	receive
S3	Amazon Simple Storage Service
SLAAC	Stateless Address Auto-Configuration
SNMP	Simple Network Management Protocol
SMTP	Simple Mail Transfer Protocol
SONET	Synchronous Optical Network
SPT	Shortest Path Tree
SSH	Secure Shell
SSID	Service Set Identifier
SSM	Source-Specific Multicast
STP	Spanning Tree Protocol
TACACS+	Terminal Access Controller Access Control System Plus
TBF	Token Bucket Filter
TCP	Transmission Control Protocol
TKIP	Temporal Key Integrity Protocol
ToS	Type of Service
TSS	TCP Maximum Segment Size
Tx	transmit
UDP	User Datagram Protocol
VHD	virtual hard disk
vif	virtual interface
VLAN	virtual LAN
VPC	Amazon virtual private cloud
VPN	virtual private network
VRRP	Virtual Router Redundancy Protocol
WAN	wide area network
WAP	wireless access point
WPA	Wired Protected Access

© 2017 AT&T Intellectual Property. All rights reserved. AT&T and Globe logo are registered trademarks of AT&T Intellectual Property.