Chapter 21
Protocol Independent Multicast (PIM)

21.1 Overview

Traditional multicast routing mechanisms (for example, DVMRP and MOSPF) were intended for use within regions where groups are densely populated or bandwidth is universally plentiful. When groups, and senders to these groups, are distributed sparsely across a wide area, these "dense mode" schemes do not perform efficiently. PIM is made of two protocols, one for each type of group distribution. PIM Sparse Mode, PIM-SM, provides efficient routing for a group distributed sparsely across a wide area. PIM Dense Mode, PIM-DM, provides multicast routing for a densely populated group.

Multicasting protocols require two different functions in order to create source-based trees or group-based trees:

- a set of routes used to calculate the reverse path forwarding
- a mechanism by which to build trees

PIM is protocol independent because it depends on existing unicast routes to calculate the reverse path forwarding. In contrast, DVMRP passes this set of routes within the protocol.

There are two versions of the PIM-SM protocol. PIM-SM version 1 is documented in RFC 2117. PIM-SM version 2 was constructed to address some of the shortcomings of PIM-SM version 1. GateD implements only version 2, which is an RFC but is not considered complete enough to implement (RFC 2362). In going from draft-ietf-pim-sm-v2-new-01 to draft-ietf-pim-sm-v2-new-02, the BSR functionality was removed and placed in its own internet draft. GateD implements the PIM-SM protocol as described in draft-ietf-pim-sm-v2-new-02, but the BSR functionality as described in draft-ietf-pim-sm-v2-new-01.

GateD does not currently implement PIM-DM.

21.2 PIM Syntax

```
pim ( on | off){
  [ traceoptions trace_options ; ]
  [ hello-interval sec ; ]
  [ hello-holdtime sec ; ]
  [ hello-priority pri ; ]
  [ mrt-period sec ; ]
  [ mrt-stale-mult m ; ]
  [ assert-holdtime sec ; ]
  [ jp-interval sec ; ]
  [ jp-holdtime sec ; ]
```

```
        sparse component_name {
            [ mrt-spt-mult m ; ]
            [ threshold bps ; ]
            [ threshold-dr bps ; ]
            [ threshold-rp bps ; ]
            [ reg-sup-timeout secs ; ]
            [ probe-period secs ; ]
            [ static-rp grp-address masklen len rp-address ; ]
            [ bsr-holdtime secs ; ]
            [ wholepkt-checksum ; ]
            [ rp-switch-immediate ; ]
            [ dr-switch-immediate ; ]
            [ bsr ( off | no ) | ( address | on | yes ) [ {
                    [ priority pri ; ]
                    [ bsr-period secs ; ]
            } ] ; ]
              [ crp ( off | no ) | ( address | on | yes ) [ {
                           [ priority pri ; ]
                    [ crp-holdtime secs ; ]
                    [ crp-adv-period crp-adv-periodsecs ; ]
                    [ group {
                          [ group-address [ priority pri ] ; ]
                          [ group-address mask mask [ priority pri ] ;
                               [ group-address masklen length [ priority pri
] ; ]
                          [ all [ priority pri ] ; ]
                             [ host host [ priority pri ] ; ]
                       } ; ]
               } ] ; ]
            interface interface-list [ {
                    [ ( enable | disable ) ; ]
                    [ hello-interval sec ; ]
                    [ hello-holdtime sec ; ]
                    [ hello-priority pri ; ]
                    [ assert-holdtime sec ; ]
                    [ jp-interval sec ; ]
                    [ jp-holdtime sec ; ]
                    [ boundary ; ]
            } ] ;
         };
        };
```

More detailed information on PIM commands can be found on page 376 of the *Command Reference Guide*.

21.3 Defaults

PIM must be configured to run on at least one interface.

```
pim on {
    traceoptions none;
    mrt-spt-mult 14;
    hello-interval 30;
    hello-holdtime 105;
    hello-priority 0;
    mrt-period 15;
    mrt-stale-mult 14;
    assert-holdtime 180;
    jp-interval 60;
    jp-holdtime 210;
    sparse "sm0" {
        interface all {
            hello-interval 30;
            hello-holdtime 105;
            hello-priority 0;
            assert-holdtime 180;
            jp-interval 60;
            jp-holdtime 210;
        };
        crp no;
        bsr no;
        threshold 1000
        threshold-dr 1000
        threshold-rp 1000
        reg-sup-timeout 60
        probe-period 5
        bsr-holdtime 130
    };
};
```

21.4 PIM Tracing Options

See “Chapter 4 Trace Statements” on page 15 for generic traceoptions, and refer to below for PIM-specific tracing options.

Packet tracing options (which may be modified with **`detail`**, **`send`** or **`recv`**):

`packets -` Trace all PIM packets.
`hello -` Trace PIM router hello packets.

register - Trace PIM register and register stop packets.
bootstrap - Trace PIM bootstrap packets.
jp - Trace PIM Join/Prune packets.
assert - Trace PIM assert packets.
debug - Trace state information that is mostly of use to developers.

21.5 Examples

Example 1

The following example configures a PIM-SM component that runs on interfaces fxp0 and fxp1, and uses OSPF to determine the unicast topology.

```
ospf yes {
    defaults {
        ribs unicast multicast;
    };
    backbone {
        interface fxp0 fxp1;
        priority 1 ;
        auth simple “mypw” ;
    };
};
pim yes {
    sparse "smo" {
        interface fxp0 {
            enable;
        };
        interface fxp1 {
            enable;
        };
    };
};
```

Example 2

This is a sample use of PIM-SMv2 over RIP. On interfaces qe0, qe1, qe2, and qe3 IGMP is also running.

```
traceoptions "/var/tmp/gated.log" replace all ;
igmp yes {
    interface le0 { disable; };
    interface qe0 { enable; };
```

```
    interface qe1 { enable; };
    interface qe2 { enable; };
    interface qe3 { enable; };
};
pim yes {
    traceoptions "/var/tmp/gated.log" replace packets route;
    sparse "sm0" {
        interface le0 { disable; };
        interface qe0 { enable; };
        interface qe1 { enable; };
        interface qe2 { enable; };
        interface qe3 { enable; };
        bsr qe0 {
            priority 1;
        };
        crp qe0;
    };
};
rip yes {
    traceoptions none ;
    interface le0 noripin noripout ;
    interface qe ripout ripin version 2;
};
static {
    default gateway 198.32.4.1 preference 20 retain;    # router
   10.2.0.0 mask 255.255.255.0 gateway 10.1.0.3 preference 50 multicast
     unicast;
};
import proto rip  {
    all unicast multicast;
};
export proto rip {
    proto rip {
        all restrict;
    };
};
```