Chapter 40
PIM Configuration Guidelines

To configure PIM, include the pim statement at the [edit protocols] hierarchy level:

```
protocols {
    pim {
        disable;
        dense-groups {
            addresses;
        }
        rib-group group-name;
        traceoptions {
            file name <replace> <size size> <files number> <no-stamp>
                <(world-readable | no-world-readable)>;
            flag flag <flag-modifier> <disable>;
        }
        interface interface-name {
            disable;
            mode (dense | sparse | sparse-dense);
            priority number;
            version version;
        }
        rp {
            local {
                disable;
                address address;
                group-ranges {
                    destination-mask;
                }
                hold-time seconds;
                priority number;
            }
            auto-rp (announce | discovery | mapping);
            bootstrap-priority number;
            static {
                address address {
                    version version;
                    group-ranges {
                        destination-mask;
                    }
                }
            }
        }
    }
}
```

By default, PIM is disabled.

This chapter describes the following tasks for configuring PIM:

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For a configuration example, see "Examples: Configure PIM" on page 416.

Minimum PIM Configuration

To enable PIM on all interfaces on the router, include at least the following statements at the [edit protocols] hierarchy level. By default, PIM operates in dense mode. All other PIM configuration statements are optional.

```
[edit protocols]
protocols {
    pim;
}
```

Enable PIM

To enable PIM routing on the router, include the pim statement at the [edit protocols] hierarchy level:

```
[edit protocols]
pim {
    rib-group group-name;
    interface interface-name;
}
```

To optionally associate with PIM a routing table group that imports and exports routes into the specified routing table group, include the rib-group statement. The routing table group is a group that you defined with the rib-groups statement at the [edit routing-options] hierarchy level. For more information, see "Create Routing Table Groups" on page 123.

You can specify the interface or interfaces on which to enable PIM. Specify the full interface name, including the physical and logical address components. For details about specifying interfaces, see the *JUNOS Internet Softw are Configur ation Guide: Interf aces and Chassis* . If you do not specify any interfaces, PIM is enabled on all router interfaces. Generally, you specify interface names only if you are disabling PIM on certain interfaces.

You cannot configure both PIM and DVMRP on the same interface.

Configure Dense, Sparse, or Sparse-Dense Mode

By default, PIM interfaces operate in dense mode on all interfaces. To configure PIM to operate in sparse mode on an interface, include the mode sparse statement within the interface statement at the [edit protocols pim interface *interface-name*] hierarchy level:

```
[edit protocols pim interface interface-name]
mode sparse;
```

To explicitly configure PIM to operate in dense mode on an interface, include the mode dense statement within the interface statement at the [edit protocols pim interface *interface-name*] hierarchy level:

```
[edit protocols pim interface interface-name]
mode dense;
```

Sparse-dense mode is a mode in which some groups are forwarded using dense mode and some are forwarded using sparse mode. To configure PIM to operate in sparse-dense mode on an interface, include the mode sparse-dense statement to enable the mode and the dense-groups statement at the [edit protocols pim] hierarchy level to specify which groups are operating in dense mode:

```
[edit protocols pim]
dense-groups {
   addresses;
}
interface interface-name {
   mode sparse-dense;
}
```

Example: Configure Sparse-Dense Mode

Configure PIM sparse-dense mode on all interfaces, specifying that the groups 224.0.1.39 and 224.0.1.40 are using dense mode:

```
pim {
    dense-groups {
        224.0.1.39;
        224.0.1.40;
    }
    interface all {
        version 1;
        mode sparse-dense;
    }
}
```

Configure the Priority to Be Elected the Designated Router

By default, a PIM interface has the lowest likelihood of being elected to be the designated router. To modify the likelihood, include the priority statement at the [edit protocols pim interface *interface-name*] hierarchy level:

```
[edit protocols pim interface interface-name]
priority number;
```

The default priority is 1. Configure a larger number to increase the interface's likelihood of being elected to be the designated router.

Change the PIM Version

All systems on a subnet must run the same version of PIM.

By default, the JUNOS software uses PIM version 2. To configure PIM version 1, include the version statement at the [edit protocols pim interface *interface-name*] hierarchy level:

```
[edit protocols pim interface interface-name]
version 1;
```

Configure the Router's Properties for Becoming a Candidate RP

Each multicast group has a shared tree through which receivers learn about new multicast sources and new receivers learn about all multicast sources. The rendezvous point (RP) is the root of this shared tree.

To configure this router's properties for becoming a candidate RP, include the rp statement at the [edit protocols pim] hierarchy level:

```
[edit protocols pim]
rp {
    local {
        disable;
        address address;
        group-ranges {
            destination-mask;
        }
        hold-time seconds;
        priority number;
    }
    auto-rp (announce | discovery | mapping);
    bootstrap-priority number;
    static {
        address address {
            version version;
            group-ranges {
                destination-mask;
            }
        }
    }
}
```

This section discusses the following tasks:

Configure the Router's Priority for Becoming the Bootstrap Router on page 412

Configure the Router's RP Properties on page 412

Configure the Local RP Address on page 412

Configure the Router's RP Priority on page 413

Configure the Groups for Which the Router Is the RP on page 413

Modify the RP Hold-Time Period on page 413

Configure Static RPs on page 414

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Configure the Router's Priority for Becoming the Bootstrap Router

To determine which router is the RP, all routers within a PIM domain collect bootstrap messages. (A PIM domain is a contiguous set of routers that all implement PIM and are configured to operate within a common boundary.) The domain's bootstrap router originates bootstrap messages, and these messages are sent hop by hop within the domain. The routers use bootstrap messages to distribute RP information dynamically and to elect a bootstrap router when necessary.

By default, the router has a bootstrap priority of 0, which means the router can never be the bootstrap router. To modify this priority, include the bootstrap-priority statement at the [edit protocols pim] hierarchy level. The router with the highest priority value is elected to be the bootstrap router. In the case of a tie, the router with the highest IP address is elected to be the bootstrap router.

```
[edit protocols pim]
bootstrap-priority number;
```

Configure the Router's RP Properties

To configure the router's RP properties, include the local statement at the [edit protocols pim rp] hierarchy level:

```
[edit protocols pim rp local]
local {
    disable;
    address address;
    group-ranges {
        destination-mask;
    }
    hold-time seconds;
    priority number;
}
```

Configure the Local RP Address

You specify the local RP address by including the address statement at the [edit protocols pim rp local] hierarchy level:

```
[edit protocols pim rp local]
address address;
```

Configure the Router's RP Priority

The router's priority value for becoming the RP is included in the bootstrap messages that the router sends. The bootstrap router uses the priority value to try to limit the number of candidate RPs it includes in the bootstrap message for a particular group range. After the set of candidate RPs is distributed, each router determines algorithmically the RP from the candidate RP set using a well-known hash function.

By default, the priority value is set to 0, which means that the bootstrap router can override the group range being advertised by the candidate RP. To modify the router's priority, include the priority statement at the [edit protocols pim rp local] hierarchy level:

```
[edit protocols pim rp local]
priority number;
```

The priority can be a number in the range 0 through 255.

Configure the Groups for Which the Router Is the RP

By default, a router running PIM is eligible to be the RP for all groups (224.0.0.0/4). To limit the groups for which this router can be the RP, include the group-ranges statement at the [edit protocols pim rp local] hierarchy level:

```
[edit protocols pim rp local]
group-ranges number {
    destination-mask;
}
```

Modify the RP Hold-Time Period

For candidate RPs, the hold time is used by the bootstrap router to time out RPs. If the bootstrap router does not receive a candidate-RP advertisement from an RP within the hold time, it removes that router from its list of candidate RPs. The default hold time is 150 seconds.

To modify the hold-time value for the local RP, include the hold-time statement at the [edit protocols pim rp local] hierarchy level:

```
[edit protocols pim rp local]
hold-time seconds;
```

Configure Static RPs

To configure static RPs, include the static statement at the [edit protocols pim rp] hierarchy level:

```
[edit protocols pim rp]
static {
    address address {
        version version;
        group-ranges {
            destination-mask;
        }
    }
}
```

The default static RP address is 224.0.0.0/4. To configure other addresses, include one or more address statements.

For each static RP address, you can optionally specify the PIM version and the groups for which this address can be the RP. The default PIM version is version 1.

The RP that you select for a particular group must be consistent across all routers in a multicast domain.

Configure Auto-RP

When PIM is operating in sparse or sparse-dense mode, you can configure how the router handles automatic RP announcement and discovery. You can configure the router to advertise that it is eligible to be the RP, to learn which systems are RPs, and to run the RP election algorithm. However, you must first configure the two multicast groups, 224.0.1.39 and 224.0.1.40, as dense groups (the router must be running in sparse-dense mode), or configure a static RP for those two groups.

To configure automatic RP features, include the auto-rp statement at the [edit protocols pim rp] hierarchy level:

```
[edit protocols pim rp]
auto-rp (announce | discovery | mapping);
```

The announce option configures the router to advertise that it can be the RP.

The discovery option configures the router to advertise that it can be the RP and to automatically discover the list of RPs by listening for RP mapping messages.

The mapping option configures the router to advertise, listen, and be the mapping agent that runs the RP election algorithm and that advertises the elected RPs.

The RP that you select for a particular group must be consistent across all routers in a multicast domain.

The router joins the auto-RP groups on the configured interfaces and on the loopback interface, lo0.0. For auto-RP to work correctly, you must configure an IP address on the loopback interface. You can use the loopback address 127.0.0.1.

Trace PIM Protocol Traffic

To trace PIM protocol traffic, you can specify options in the global traceoptions statement at the [edit routing-options] hierarchy level, and you can specify PIM-specific options by including the traceoptions statement at the [edit protocols pim] hierarchy level:

```
[edit protocols pim]
traceoptions {
   file name <replace> <size size> <files number> <no-stamp>
      <(world-readable | no-world-readable)>;
   flag flag <flag-modifier> <disable>;
}
```

You can specify the following PIM-specific options in the PIM traceoptions statement:

assert—Trace assert messages, which are used to resolve which one of the parallel routers connected to a multi-access LAN is responsible for forwarding packets onto the LAN.

bootstrap—Trace bootstrap messages, which are sent periodically by the PIM domain's bootstrap router and are forwarded, hop by hop, to all routers in that domain.

cache—Trace the packets in the PIM routing cache.

graft—Trace graft and graft acknowledgment messages.

hello—Trace hello packets, which are sent so neighboring routers can discover each other.

join—Trace join messages, which are sent to join a branch onto the multicast distribution tree.

packets—Trace all PIM packets.

prune—Trace prune messages, which are sent to prune a branch off of the multicast distribution tree.

register—Trace register and register-stop messages. Register messages are sent to the RP when a multicast source first starts sending to a group.

rp—Trace candidate RP advertisements.

To trace the paths of multicast packets, use the mtrace command, as described in the *JUNOS Internet Softw are Command R eference*.

For general information about tracing, see information on tracing and logging operations in the *JUNOS Internet Softw are Configur ation Guide: Inst allation and Sy stem Management* .

Example: Trace PIM Protocol Traffic

Trace only unusual or abnormal operations to routing-log, and trace detailed information about all PIM messages to pim-log:

```
routing-options {
    traceoptions {
        file routing-log;
        flag errors;
    }
}
protocols {
    pim {
        interface so-0/0/0;
        traceoptions {
            file pim-log;
            flag packets;
        }
    }
}
```

Examples: Configure PIM

Configure PIM:

```
[edit]
sap;
pim {
    interface so-5/0/1;
    interface so-5/0/2;
    traceoptions {
        file log-pim;
        flag normal;
        flag state;
    }
}
```

Configure PIM in sparse-dense mode:

```
pim {
    dense-groups {
        224.0.1.39/32;
        224.0.1.40/32;
    }
    rp {
        auto-rp discovery;
    }
    interface all {
        mode sparse-dense;
        version 1;
    }
}
```