Application Note

Configure PIM Sparse Mode with Static RP

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Purpose

This application note explains how to configure Protocol Independent Multicast (PIM) sparse mode with static rendezvous points (RPs). In addition, PIM uses routing information from MBGP for the multicast RPF check.

Requirement

Two routers configured for PIM sparse mode and MBGP.

The example presented in this application note uses the routers shown in the preceeding figure. In this figure, two routers are connected using a T3 link. The routers belong to two different autonomous systems (ASs), one managed by the network provider and the other by the customer. The intent is to establish an EBGP session between the two routers to exchange both unicast and multicast routing information. Similarly, the network provider’s access router exchanges both unicast and multicast routing information with the network provider’s core routers using IBGP. The network provider routers and customer routers use PIM Sparse Mode as the multicast routing protocol with static RP configuration.
Procedure

1. Establish a single EBGP session between the network provider’s access router and the customer’s router, and establish IBGP sessions between the network provider’s access router and the network provider’s core routers. Configure the sessions to exchange both unicast and multicast routing information.

The following configuration fragments show the BGP group configuration on the network provider’s access router and the customer’s router.

**Network Provider’s Access Router Configuration**

```protobuf
protocols {
  bgp {
    group to-core-routers {
      type internal;
      peer-as 65001;
      local-address 192.168.10.1;
      nlri any;
      neighbor 192.168.11.1;
      neighbor 192.168.12.1;
    }
    group to-customer-router {
      type external;
      peer-as 65002;
      nlri any;
      neighbor 192.168.1.2;
    }
  }
}
```

2. Configure two RIB groups (or routing table groups).
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The first RIB group named ifrg contains local interface routes. This ensures that local interface routes get added to both the inet.0 table (for use by unicast protocols) and inet.2 table (for multicast RPF check). After defining the ifrg RIB group, use the `interface-routes` statement to insert interface routes into this rib-group. By default, interface routes are imported into routing table inet.0 only.

The second RIB group named mcrg contains inet.2 routes. After defining the mcrg RIB group, associate it with protocol PIM to enable multicast RPF checks.

**Network Provider’s Access Router Configuration**

```plaintext
routing-options {
  interface-routes {
    rib-group ifrg;
  }
  rib-groups {
    ifrg {
      import-rib [ inet.0 inet.2 ];
    }
    mcrg {
      export-rib inet.2;
      import-rib inet.2;
    }
  }
  protocols {
    pim {
      rib-group mcrg;
    }
  }
}
```

**Customer’s Configuration**

```plaintext
routing-options {
  interface-routes {
    rib-group ifrg;
  }
  rib-groups {
    ifrg {
      import-rib [ inet.0 inet.2 ];
    }
    mcrg {
      export-rib inet.2;
      import-rib inet.2;
    }
  }
  protocols {
    pim {
      rib-group mcrg;
    }
  }
}
```

3. Configure the session directory announcement protocol (SAP) to enable session directory protocol (SDP) and SAP. Enable PIM sparse mode on the appropriate interfaces and configure static RP.
Network Provider's Access Router Configuration

protocols {
sap;
pim {
  rp {
    static {
      address 192.168.13.1 {
        group-ranges {
          224.0.0.0/4;
        }
      }
    }
    interface t3-2/0/0.0 {
      mode sparse;
    }
    interface so-0/0/0.0 {
      mode sparse;
    }
    interface so-1/0/0.0 {
      mode sparse;
    }
  }
}
}

Customer's Configuration

protocols {
sap;
pim {
  rp {
    static {
      address 192.168.13.1 {
        group-ranges {
          224.0.0.0/4;
        }
      }
    }
    interface t3-3/0/0.0 {
      mode sparse;
    }
}
}

4. Configure multicast scoping to block all multicast traffic for auto-RP and multicast traffic in the 239.0.0.0/8 range from entering and leaving the respective domains.

Network Provider's Access Router Configuration

routing-options {
  multicast {
    scope RP-Announce {
      prefix 224.0.1.39/32;
      interface t3-2/0/0.0;
    }
  }
}
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```
} scope RP-Discovery {
  prefix 224.0.1.40/32;
  interface t3-2/0/0.0;
}
} scope Admin {
  prefix 239.0.0.0/8;
  interface t3-2/0/0.0;
}
}

Customer's Configuration

```routing-options {
  multicast {
    scope RP-Announce {
      prefix 224.0.1.39/32;
      interface t3-3/0/0.0;
    }
    scope RP-Discovery {
      prefix 224.0.1.40/32;
      interface t3-3/0/0.0;
    }
    scope Admin {
      prefix 239.0.0.0/8;
      interface t3-3/0/0.0;
    }
  }
}
```

The complete network provider configuration and customer configuration are listed in the “Additional Notes” section.

Confirm

After completing the configuration, follow these steps to confirm that the router is functioning properly:

1. Type `show bgp summary` to confirm that the BGP sessions has been established and that you are receiving routing updates for both unicast and multicast (inet.0 and inet.2).

```user@router> show bgp summary
Groups: 2   Peers: 3 Down Peers: 0
Table    Tot Paths  Act Paths Suppressed    History Damp State    Pending
inet.0    247933      82110          0          0          0          0
inet.2     37887      12631          0          0          0          0
Peer             AS      InPkt     OutPkt    OutQ   Flaps Last Up/Dwn
State|Active/Received/Damped...
192.168.11.1      65001     227506       1201       0       0    09:52:50 82086/82633/0
12628/12628/0
192.168.12.1      65001     226357       1197       0       0    09:52:22 1/82633/0
0/12628/0
192.168.1.2       65002       1188      63202       0       0    09:52:44 3/3/0
```

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2. Type `show pim interfaces` to list the interfaces on which PIM is configured.

```
user@router> show pim interfaces
Name     Stat Mode  V State Priority DR address Neighbors
so-0/0/0.0  Up Sparse   2 P2P 1
so-1/0/0.0  Up Sparse   2 P2P 1
so-0/0/0.0  Up Sparse   2 P2P 1
```

3. Type `show pim neighbors` to view information about the PIM neighbors.

```
user@router> show pim neighbors
Interface   DR priority Neighbor addr    V Mode    Holdtime Timeout
so-0/0/0.0     none 192.168.20.121 2 Sparse 90 67
so-1/0/0.0     none 192.168.20.125 2 Sparse 90 61
so-0/0/0.0     none 192.168.1.2 2 Sparse 90 83
```

4. Type `show pim rps` to view information about the PIM RPs.

```
user@router> show pim rps
RP address     Type Holdtime Timeout Active groups Group prefixes
192.168.0.16    static 0 None 1 224.0.0.0/4
```

5. Type `show pim join extensive` to view information about the PIM groups.

```
user@router> show pim join extensive
Group Source RP Flags
224.2.127.254 0.0.0.0 192.168.0.16 sparse,rptree,wildcard
   Upstream interface: so-0/0/0.0
   Upstream State: Join to RP
   Downstream Neighbors:
     Interface: local
224.2.127.254 192.168.131.169 sparse,spt-pending
   Upstream interface: so-0/0/0.0
   Upstream State: Join to Source
   Downstream Neighbors:
     Interface: local
224.2.127.254 192.168.83.33 sparse,spt
   Upstream interface: so-1/0/0.0
   Upstream State: Join to Source, Prune to RP
   Downstream Neighbors:
     Interface: local
224.2.127.254 192.168.1.26 sparse,spt
   Upstream interface: so-1/0/0.0
   Upstream State: Join to Source, Prune to RP
   Downstream Neighbors:
     Interface: local
233.44.221.1 192.168.76.253 sparse
   Upstream interface: so-1/0/0.0
   Upstream State: Join to Source
   Downstream Neighbors:
     Interface: t3-2/0/0.0
     192.168.1.2 State: Join Flags: S Timeout: 176
233.44.221.2 192.168.76.253 sparse
   Upstream interface: so-1/0/0.0
   Upstream State: Join to Source
   Downstream Neighbors:
     Interface: t3-2/0/0.0
     192.168.1.2 State: Join Flags: S Timeout: 171
233.44.221.5 192.168.76.251 sparse
   Upstream interface: so-1/0/0.0
   Upstream State: Join to Source
   Downstream Neighbors:
     Interface: t3-2/0/0.0
     192.168.1.2 State: Join Flags: S Timeout: 134
```
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233.44.221.6    192.168.76.251    sparse
Upstream interface: so-1/0/0.0
Upstream State: Join to Source
Downstream Neighbors:
  Interface: t3-2/0/0.0
    192.168.1.2    State: Join    Flags: S    Timeout: 168
233.44.221.22   192.168.95.19    sparse
Upstream interface: so-0/0/0.0
Upstream State: Join to Source
Downstream Neighbors:
  Interface: t3-2/0/0.0
    192.168.1.2    State: Join    Flags: S    Timeout: 125

6. Type `show multicast scope` to display administratively scoped multicast information.

```
user@router> show multicast scope
Scope name        Group Prefix    Interface          Rejects
RP-Announce       224.0.1.39     /32 t3-2/0/0.0    0
RP-Discovery      224.0.1.40     /32 t3-2/0/0.0    0
Admin             239.0.0.0      /8  t3-2/0/0.0    0
local             239.255.0.0    /16 t3-2/0/0.0    0
```

7. Type `show multicast sessions` to display information about announced multicast information.

```
user@router> show multicast sessions
4J KRVM Radio
APAN test
Aural abuse
Avods ENST
CAIDA IEC SIGCOMM ’99 Session Archive
CDT - Roxy (private session)
DigiStar 1-800-2-SATCOM
FUNET-TV 1 (H.261)
FUNET-TV WU channel
FUNET-TV: Enterprise Forum (H.261)
FreeBSD Lounge
IETF Channel 1
IETF Channel 2
IETF Feedback Whiteboard
```

Additional Notes

Network Provider’s Access Router Configuration (JUNOS 3.4)

```
routing-options
  interface-routes {
    rib-group ifrg;
  }
rib-groups {
  ifrg {
    import-rib [ inet.0 inet.2 ];
  }
  mcrg {
    export-rib inet.2;
    import-rib inet.2;
  }
}
multicast {
  scope RP-Announce {
    prefix 224.0.1.39/32;
    interface t3-2/0/0.0;
  }
  scope RP-Discovery {
    prefix 224.0.1.40/32;
    interface t3-2/0/0.0;
  }
}```
scope Admin {
    prefix 239.0.0.0/8;
    interface t3-2/0/0.0;
}
}
}
protocols {
    bgp {
        group to-core-routers {
            type internal;
            peer-as 65001;
            local-address 192.168.10.1;
            nlri any;
            neighbor 192.168.11.1;
            neighbor 192.168.12.1;
        }
        group to-customer-router {
            type external;
            peer-as 65002;
            nlri any;
            neighbor 192.168.1.2;
        }
    }
    sap;
    pim {
        rib-group mcrg;
        rp {
            static {
                address 192.168.13.1 {
                    group-ranges {
                        224.0.0.0/4;
                    }
                }
            }
            interface t3-2/0/0.0 {
                mode sparse;
            }
            interface so-0/0/0.0 {
                mode sparse;
            }
            interface so-1/0/0.0 {
                mode sparse;
            }
        }
    }
}

Customer's Configuration (JUNOS 3.4)

routing-options {
    interface-routes {
        rib-group ifrg;
    }
    rib-groups {
        ifrg {
            import-rib [ inet.0 inet.2 ];
        }
        mcrg {
            export-rib inet.2;
            import-rib inet.2;
        }
    }
Configure PIM Sparse Mode with Static RP

```c
multicast {
    scope RP-Announce {
        prefix 224.0.1.39/32;
        interface t3-2/0/0.0;
    }
    scope RP-Discovery {
        prefix 224.0.1.40/32;
        interface t3-2/0/0.0;
    }
    scope Admin {
        prefix 239.0.0.0/8;
        interface t3-2/0/0.0;
    }
}

protocols {
    bgp {
        group to-network-provider {
            type external;
            peer-as 65001;
            nlri any;
            neighbor 192.168.1.1;
        }
    }
    sap;
    pim {
        rib-group mcrg;
        rp {
            static {
                address 192.168.13.1 {
                    group-ranges {
                        224.0.0.0/4;
                    }
                }
            }
            interface t3-3/0/0.0 {
                mode sparse;
            }
        }
    }
}
```

References

JUNOS Internet Software Configuration Guide