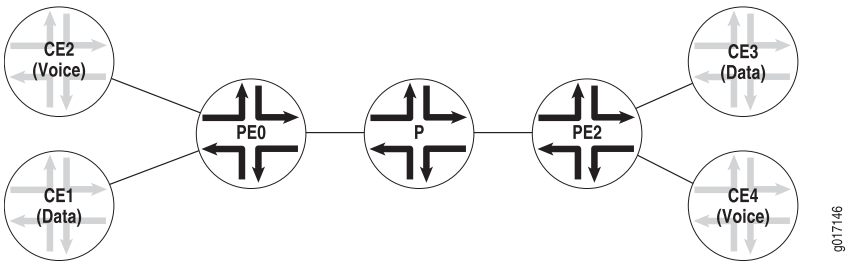
Example: Nonforwarding Instances Configuration

Figure 1: Nonforwarding Instances Topology Diagram



In Figure 1, routers CE1, CE2, CE3, and CE4 are CE routers, PE0 and PE2 are PE routers, and Router P is the provider core transit router. CE1 and CE3 are part of a "community of interest" group called *data*, whereas CE2 and CE4 belong to a group called *voice*. Your goal is to connect the members of each group to each other by using a nonforwarding instance at the PE routers.

Note that routers PE0, CE1, and CE2 mirror the configurations on PE2, CE3, and CE4, respectively. Therefore, the latter routers are not shown in this example. The loopback addressing scheme for this network is shown in Table 1.

Table 1: Nonforwarding Instances—Loopback Addresses

Router	Loopback Address
CE1	10.255.255.172
CE2	10.255.255.180
PE0	10.255.255.176
P	10.255.255.178
PE2	10.255.255.174
CE3	10.255.255.182
CE4	10.255.255.181

Routers CE1, CE2, CE3, and CE4 only need basic connectivity to their directly connected PE router. You enable OSPF on the interface that connects the CE routers to the PE routers. Since the configurations for all the CE routers are almost identical, only CE3 and CE4 are shown.

Router CE3

```
[edit]
protocols {
   ospf {
      area 0.0.0.0 {
```

```
        interface t3-0/0/0.0;
      }
    }
}
```

Router CE4

```
[edit]
protocols {
    ospf {
        area 0.0.0.0 {
            interface t3-0/0/2.0;
        }
    }
}
```

PE router configuration is next. Because the configuration for Router PE0 and Router PE2 mirror each other, only Router PE2 is displayed.

You must enable the auto-export statement at the edit-routing-options hierarchy level for both the main configuration and the nonforwarding instances, establish policies that set tags on packets arriving from the CE routers, and accept packets into a specific instance that matches the corresponding outbound tags. Specifically, you configure the router to attach a*data* tag to all packets coming from Router CE3 and a*voice*tag to all packets arriving from Router CE4. Also, forward any OSPF traffic coming from the core with a*data* tag to Router CE3: send OSPF core traffic with a*voice*tag to Router CE4.

Router PE2

```
[edit]
routing-options {
    auto-export;
}
protocols {
    ospf {
        export [tag-voice tag-data];
        area 0.0.0.0 {
            interface t3-0/1/1.0;
        }
    }
}
routing-instances {
    data {
        instance-type no-forwarding;
        interface t3-0/1/3.0;
        routing-options {
            auto-export;
        }
        protocols {
            ospf {
                export import-data;
                area 0.0.0.0 {
                    interface all;
                }
            }
        }
    }
```

```
    voice {
      instance-type no-forwarding;
      interface t3-0/1/0.0;
      routing-options {
        auto-export
      }
      protocols {
        ospf {
          export import-voice;
          area 0.0.0.0 {
            interface all;
          }
        }
      }
    }
  }
  policy-options {
    policy-statement tag-voice {
      from instance voice;
      then {
        tag 11;
        accept;
      }
    }
    policy-statement tag-data {
      from instance data;
      then {
        tag 12;
        accept;
      }
    }
    policy-statement import-voice {
      from {
        instance master;
        protocol ospf;
        tag 11;
      }
      then accept;
    }
    policy-statement import-data {
      from {
        instance master;
        protocol ospf;
        tag 12;
      }
      then accept;
    }
  }
```

On Router P, the provider core router configuration is simple. Include the interfaces that connect to the two PE routers (PE0 and PE2) in the OSPF process.

Router P

```
[edit]
protocols {
  ospf {
```

```
        area 0.0.0.0 {
            interface t1-0/1/1.0;
            interface t3-0/0/1.0;
        }
    }
}
```

If all the configurations are correct, routers CE1 and CE3 (the routers tagged with the*data*tag) can send traffic to one another and routers CE2 and CE4 (the routers tagged with the*voice* tag) can communicate bidirectionally, but routers with different tag types cannot reach each other.

Verifying Your Work

To verify that the nonforwarding instances configuration is functioning properly, you can use the following commands:

- show ospf database
- show route detail
- ping

The following sections show the output of these commands used with the configuration example:

- Router PE2 Status on page 4
- Router CE3 Status on page 5

Router PE2 Status

```
user@PE2> show ospf database
    OSPF link state database, area 0.0.0.0
 Type       ID               Adv Rtr           Seq      Age  Opt  Cksum  Len
Router *10.255.255.174    10.255.255.174    0x80000014   180  0x2  0x14b3  60
Router 10.255.255.176    10.255.255.176    0x80000010   592  0x2  0x14c1  60
Router 10.255.255.178    10.255.255.178    0x80000007  1074  0x2  0x9329  84
    OSPF AS SCOPE link state database
 Type       ID               Adv Rtr           Seq      Age  Opt  Cksum  Len
Extern   10.255.255.172    10.255.255.176    0x8000000f   489  0x2  0xd258  36
Extern   10.255.255.180    10.255.255.176    0x8000000f   189  0x2  0x948d  36
Extern  *10.255.255.181    10.255.255.174    0x8000000f   780  0x2  0x968c  36
Extern  *10.255.255.182    10.255.255.174    0x8000000f   480  0x2  0x7aa8  36

user@PE2> show ospf database instance voice
    OSPF link state database, area 0.0.0.0
 Type       ID               Adv Rtr           Seq      Age  Opt  Cksum  Len
Router   10.255.255.181    10.255.255.181    0x80000008  1112  0x2  0x29ac  60
Router  *192.255.197.117  192.255.197.117  0x8000000c  2681  0x2  0x5d7a  48
    OSPF AS SCOPE link state database
 Type       ID               Adv Rtr           Seq      Age  Opt  Cksum  Len
Extern  *10.255.255.180    192.255.197.117  0x80000001  2681  0x2  0x5cf7  36

user@PE2> show ospf database instance data
    OSPF link state database, area 0.0.0.0
 Type       ID               Adv Rtr           Seq      Age  Opt  Cksum  Len
Router   10.255.255.182    10.255.255.182    0x8000000b  1117  0x2  0x53d   60
```

```
Router  *192.255.197.249  192.255.197.249  0x8000000e  2686  0x2  0xbd05  48
    OSPF AS SCOPE link state database
 Type       ID               Adv Rtr           Seq      Age  Opt  Cksum  Len
Extern  *10.255.255.172    192.255.197.249  0x80000002  2686  0x2  0x7d5a  36
```

Router CE3 Status

```
user@CE3> ping 10.255.255.172
PING 10.255.255.172 (10.255.255.172): 56 data bytes
64 bytes from 10.255.255.172: icmp_seq=0 ttl=252 time=2.978 ms
64 bytes from 10.255.255.172: icmp_seq=1 ttl=252 time=2.903 ms
^C
--- 10.255.255.172 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max/stddev = 2.903/2.941/2.978/0.037 ms

user@CE3> ping 10.255.255.180
PING 10.255.255.180 (10.255.255.180): 56 data bytes
^C
--- 10.255.255.180 ping statistics ---
2 packets transmitted, 0 packets received, 100% packet loss

user@CE3> show ospf database
    OSPF link state database, area 0.0.0.0
 Type       ID               Adv Rtr           Seq      Age  Opt  Cksum  Len
Router  *10.255.255.182    10.255.255.182    0x8000000b  1164  0x2  0x53d   60
Router   192.255.197.249  192.255.197.249  0x8000000e  2735  0x2  0xbd05  48
    OSPF AS SCOPE link state database
 Type       ID               Adv Rtr           Seq      Age  Opt  Cksum  Len
Extern   10.255.255.172    192.255.197.249  0x80000002  2735  0x2  0x7d5a  36

user@CE3> show route 10.255.255.172 detail

inet.0: 31 destinations, 32 routes (30 active, 0 holddown, 1 hidden)
10.255.255.172/32 (1 entry, 1 announced)
        *OSPF   Preference: 150
                Next hop: via t3-0/0/0.0, selected
                State: <Active Int Ext>
                Local AS:    69
                Age: 47:23      Metric: 2       Tag: 12
                Task: OSPF
                Announcement bits (1): 0-KRT
                AS path: I
```

Published: 2010-04-15