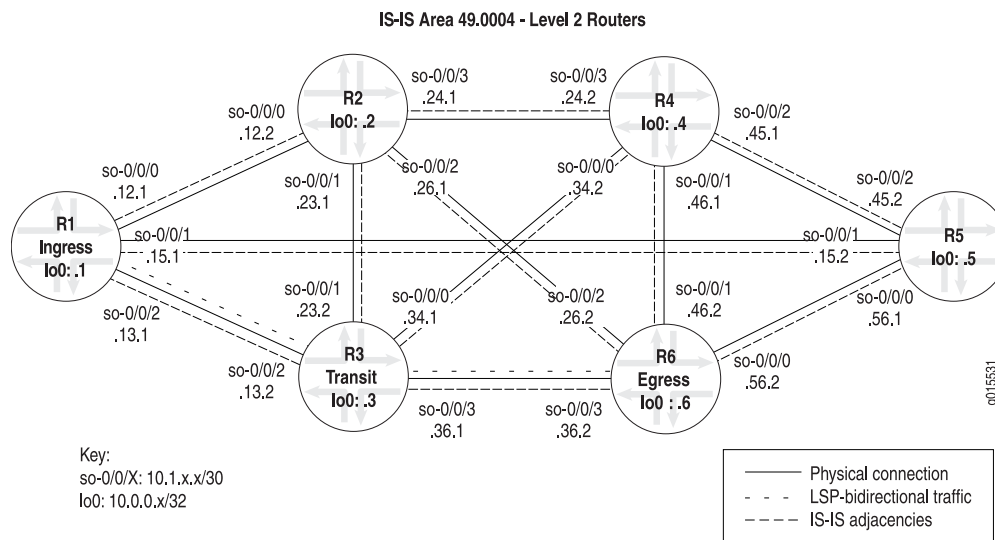


## Configure IS-IS as the IGP

Before you can run MPLS on your network, you should have an IGP running on all specified routers and interfaces. The IGP can be either IS-IS or OSPF. For the steps to configure OSPF, see Configure OSPF as the IGP.

**Figure 1: IS-IS Network Topology**



The IS-IS IGP in the MPLS network in Figure 1 consists of the following:

- All routers are configured for Level 2, therefore default CSPF LSPs can occur.
- All routers are in IS-IS area 49.0004. However, the routers in this network could be in any area because Level 2 adjacencies occur between all directly connected Level 2 routers regardless of which area they are in.
- Level 2 adjacencies between all directly connected Level 2 routers as follows:
  - R1 is adjacent to R2, R3, and R5
  - R2 is adjacent to R1, R3, R4, and R6
  - R3 is adjacent to R1, R2, R4, and R6
  - R4 is adjacent to R2, R3, R5, and R6
  - R5 is adjacent to R1, R4, and R6
  - R6 is adjacent to R2, R3, R4, and R5

When you configure IS-IS as the IGP, you must enable IS-IS on the router, configure International Organization for Standardization (ISO) addressing, and enable IS-IS on all router interfaces.

You can enable IS-IS throughout the rest of the network by repeating Step 1, “Enable IS-IS on Routers in Your Network” on page 2 through Step 3, “Enable IS-IS on Router Interfaces” on page 5 as appropriate on other routers until all routers and interfaces establish IS-IS adjacencies.

To configure IS-IS and establish IS-IS adjacencies, follow these steps:

1. Enable IS-IS on Routers in Your Network on page 2
2. Configure ISO Addressing on page 4
3. Enable IS-IS on Router Interfaces on page 5
4. Verify That IS-IS Adjacencies Are Established on page 6

## **Enable IS-IS on Routers in Your Network**

**Action** To enable IS-IS on routers in your network, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit protocols isis
```

2. Disable Level 1 if appropriate for your network:

```
[edit protocols isis]
user@host# set level 1 disable
```

3. Configure the interface:

```
[edit protocols isis]
user@host# edit interface type-fpc/pic/port level level-number metric metric
```

4. Disable the management interface if you have included the `interface all` statement, as shown in Sample Output 2 on page 3:

```
[edit protocols isis]
user@host# set interface fxp0.0 disable
```

5. Include the loopback interface (lo0) if you have listed all interfaces separately, as shown in Sample Output 1 on page 3:

```
[edit protocols isis]
user@host# set interface lo0.0
```

6. Set the loopback interface (lo0) to passive:

```
[edit protocols isis]
user@R1# set interface lo0 passive
```

7. Verify and commit the configuration:

```
user@host# show

user@host# commit
```

**Sample Output 1**

```

user@R1> edit
Entering configuration mode

[edit]
user@R1# edit protocols isis

[edit protocols isis]
user@R1# set level 1 disable

[edit protocols isis]
user@host# edit interface all level 2 metric 10

[edit protocols isis]
user@host# set interface lo0.0

[edit protocols isis]
user@host# set interface lo0 passive

[edit protocols isis]
user@R1# show
level 1 disable;
interface so-0/0/0.0;
interface so-0/0/1.0;
interface so-0/0/2.0;
interface lo0.0;
    passive;
}

[edit protocols isis]
user@R1# commit
commit complete

```

**Sample Output 2**

```

[edit protocols isis]
user@R6# show
level 1 disable;
interface all {
    level 2 metric 15;
}
interface fxp0.0 {
    disable;
}
interface lo0.0 {
    passive;
}

```

**Meaning** Sample Output 1 shows that IS-IS Level 1 is disabled, making this a Level 2 router. All routers in the network shown in MPLS Network Topology are running at one IS-IS level (Level 2), therefore default CSPF LSPs can occur.

Because R1 in Sample Output 1 has all IS-IS enabled interfaces listed, including the loopback interface (lo0), you do not need to include the **disable** statement for the management interface (fxp0). All interfaces have unit number 0, the default if a unit number is not specified. When you configure an interface at the [edit protocols isis] hierarchy level, and you do not include the logical unit, the default 0 is appended to the interface name, for example, so-0/0/1.0.

Sample Output 2 does not list the interfaces configured with IS-IS; instead, all interfaces are configured, including the loopback interface (lo0) and the management interface (fxp0). Therefore, you do not need to include a separate statement for the

loopback (lo0) interface. However, in this instance, it is best practice to disable the management interface (fxp0) so that IS-IS packets are not sent over it. If you do not disable the management interface (fxp0) when you include the **interface-all** statement, the IS-IS protocol can form adjacencies over the management backbone, but traffic does not flow because transit traffic does not go out of the management interface.

Sample Output 2 also shows that all interfaces on R6 are configured with a metric of 15. A metric is not required to configure IS-IS on your interfaces. The default metric value is 10 (with the exception of the loopback [lo0] interface, which has a default metric of 0). A metric is included to demonstrate that you can configure a metric for IS-IS if the default (10) is not appropriate for your network.

Both sample outputs show the **passive** statement included in the configuration of the loopback (lo0) interface. Including the **passive** statement is considered best practice and ensures the following:

- Protocols are not run over the loopback (lo0) interface
- When the router ID (RID) is configured manually, ensures that the loopback (lo0) interface is advertised to other networks.



**NOTE:** It is considered best practice to configure the RID manually to avoid duplicate RID problems.

---

## Configure ISO Addressing

**Purpose** For a router to support IS-IS, you must configure an ISO network entity title (NET) address on one of the router's interfaces, preferably the loopback interface (lo0).

**Action** To configure ISO addressing, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces
```

2. Include a NET address for the loopback interface:

```
[edit interfaces]
user@host# set lo0 unit number family iso address address
```

3. Verify and commit the configuration:

```
user@host# show

user@host# commit
```

**Sample Output** user@R1> **edit**  
Entering configuration mode

```

[edit]
user@R1# edit interfaces

[edit interfaces]
user@R1# set lo0 unit 0 family iso address 49.0004.1000.0000.0001.00

[edit interfaces]
userR1# show
[...Output truncated...]
lo0 {
    unit 0 {
        family inet {
            address 10.0.0.1/32;
        }
        family iso {
            address 49.0004.1000.0000.0001.00;
        }
    }
}

[edit interfaces]
user@R1# commit
commit complete

```

**Meaning** The sample output shows that the loopback (lo0) interface is configured with the NET address 49.0004.1000.0000.0001.00. The loopback interface (lo0) becomes a point of connection from the router to the IS-IS network. Every router in an IS-IS network must have at least one ISO NET address that identifies a point of connection to the IS-IS network. The NET address is generally configured on the loopback (lo0) interface. Routers that participate in multiple areas can have multiple NET addresses.

All the routers in the network shown in MPLS Network Topology share a Level 2 database containing identical information. A common Level 2 database occurs in this case because all adjacencies are Level 2, and all routers are within the same IS-IS area (49.0004). Level 2 LSP flooding reaches all routers in the network due to the presence of a single level. For more information on determining the NET address, see the *JUNOS Routing Protocols Configuration Guide*.

## Enable IS-IS on Router Interfaces

**Purpose** Enable reception and transmission of ISO protocol data units (PDUs) on each router interface in the network with the **family** statement, which identifies which protocol packets are accepted into the interfaces. For example, valid IS-IS packets are dropped if the interface is not configured with the **family iso** statement.

**Action** To configure support for IS-IS on router interfaces in your network, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```

[edit]
user@host# edit interfaces

```

2. Configure IS-IS:

```

[edit interfaces]
user@host# set type-fpc/pic/port unit number family iso

```

3. Verify and commit the configuration:

```
user@host# show
user@host# commit
```

**Sample Output**

```
user@R1> edit
Entering configuration mode

[edit]
user@R1# edit interfaces

[edit interfaces]
user@R1# set so-0/0/2 unit 0 family iso

[edit interfaces]
userR1# show
[...Output truncated...]
so-0/0/2 {
  unit 0 {
    family inet {
      address 10.1.13.1/30;
    }
    family iso;
  }
}

[edit interfaces]
user@R1# commit
commit complete
```

**Meaning** The sample output shows that the interface so-0/0/2 is configured with IS-IS.

## Verify That IS-IS Adjacencies Are Established

**Purpose** After configuring IS-IS, you must verify that neighboring routers have formed adjacencies with each other.

**Action** To verify IS-IS adjacencies, enter the following JUNOS command-line interface (CLI) operational mode command:

```
user@host> show isis adjacency
```

**Sample Output**

```
user@R1> show isis adjacency
Interface          System      L State      Hold (secs) SNPA
so-0/0/0.0         R2          2 Up         25
so-0/0/1.0         R5          2 Up         23
so-0/0/2.0         R3          2 Up         20

user@R3> show isis adjacency
Interface          System      L State      Hold (secs) SNPA
so-0/0/0.0         R4          2 Up         25
so-0/0/1.0         R2          2 Up         25
so-0/0/2.0         R1          2 Up         26
so-0/0/3.0         R6          2 Up         25
```

```

user@R6> show isis adjacency
Interface          System      L State      Hold (secs) SNPA
so-0/0/0.0         R5          2 Up         19
so-0/0/1.0         R4          2 Up         22
so-0/0/2.0         R2          2 Up         22
so-0/0/3.0         R3          2 Up         19

```

**Sample Output**

```

user@R1> show isis adjacency
Interface          System      L State      Hold (secs) SNPA
so-0/0/0.0         R2          2 Up         25
so-0/0/1.0         R5          2 Up         23
so-0/0/2.0         R3          2 Up         20

```

```

user@R3> show isis adjacency
Interface          System      L State      Hold (secs) SNPA
so-0/0/0.0         R4          2 Up         25
so-0/0/1.0         R2          2 Up         25
so-0/0/2.0         R1          2 Up         26
so-0/0/3.0         R6          2 Up         25

```

```

user@R6> show isis adjacency
Interface          System      L State      Hold (secs) SNPA
so-0/0/0.0         R5          2 Up         19
so-0/0/1.0         R4          2 Up         22
so-0/0/2.0         R2          2 Up         22
so-0/0/3.0         R3          2 Up         19

```

**Meaning** The sample output from the ingress, transit, and egress routers shows that all routers in the network shown in MPLS Network Topology have formed IS-IS adjacencies.