
# Networking Academy: Intermediate System to Intermediate System

Hunter Zhuang

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## Purpose

The purpose of this lab was to set up three Intermediate System to Intermediate System (IS-IS) areas with at least 6 routers in the topology in a linear fashion. This would result in end-to-end connectivity in the host devices at each end of the topology. To complete this task, one needs to learn how to configure IS-IS on a router as well as how to enable IS-IS routing on interfaces.

## Background Information

Intermediate System to Intermediate System (IS-IS) is a routing protocol, which is software that is written with the purpose of moving information through a network of routers and computers. IS-IS does this by calculating the best route for a packet through a topology with Dijkstra's algorithm.

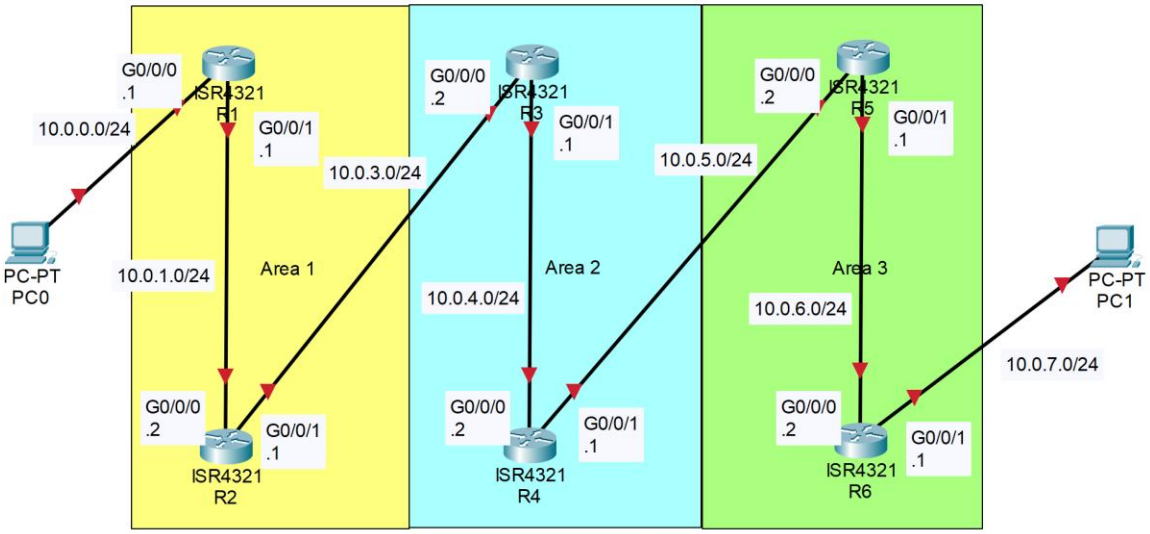
More specifically IS-IS is a link-state routing protocol. Link-state routing protocols find destination routes by gathering information from the links on each router; then each router will forward that link-state information throughout the entire network. Other routers will use this information to create a topology of the network, which will then supply the routes for each router. IS-IS can designate areas, which can speed up route calculation times and is easier to manage. IS-IS routers can be level 1, level 2, or level 1-2 (both); level 1 routers connect with other intra-area routers and level 2 routers connect with routers that inter-area.

IS-IS is quite similar to Open Shortest Path First (OSPF) another link-state routing protocol, but there are some differences. For example, IS-IS can route for IPv4 and IPv6 in the same instance and IS-IS can do partial route calculation, allowing for the network to converge quicker. One big difference that OSPF has with areas is that it needs a backbone area (often area 0) and when bordering two areas, an ABR (area border router) is required. An ABR is a router that is in two areas simultaneously. ISIS doesn't need a backbone area, nor does it need an ABR to bridge two areas.

## Lab Summary

In this lab, three IS-IS areas, with two routers each, were set up. In total, six 4321 routers were configured, so that routes to IPv4 networks could be supplied to each router. The goal was to have end-to-end connectivity, which would allow the two hosts at the end to communicate with each other. It is important to note that further information related to the setup of this lab is available here: https://github.com/101zh/IS-ISRoutingLab.

## Network Diagram




## Lab Commands

**`ip router isis`**

- Indicates a link with an IPv4 address to advertise to IS-IS. (On an interface)

**`ipv6 router isis`**

- Indicates a link with an IPv6 address to advertise to IS-IS. (On an interface)

**`router isis`**

- Creates and enters a configuration of an instance of IS-IS

  **`net`** *`[network-entity-title]`*

  - Sets the network entity title, which is formatted like this: “49.0002.0000.0000.0001.00”. “49” is the Address Family Identifier (AFI); “0002” is the area; “0000.0000.0001” is the system ID, unique to each router; and “00” must end the network entity title (NET).

  **`metric-style`** `[style]`

  - Sets the metric-style. “wide” is used for IPv6 because new style TLVs (Tuple: Type, Length, Value) are required for IPv4 and IPv6. “narrow” style only allows for old style TLVs and “transition” style new and old style TLVs

## Problems

Very few problems were encountered in this lab. The only problem was a typo in the network entity title for the sixth router, causing a duplicate title to be in the topology. So that was quickly fixed after the typo was spotted. Other than that, the configuration and topology were set up without too much difficulty.

## Conclusion

All in all, this lab was completed quite successfully. After configuring many other routing protocols in the past, configuring IS-IS didn’t pose as much of a challenge; Experience with other routing protocols served well.

## Configurations

### R1 Configuration

```
hostname R1
interface GigabitEthernet0/0/0
 ip address 10.0.0.1 255.255.255.0
 ip router isis 1
 no shut
 negotiation auto
interface GigabitEthernet0/0/1
 ip address 10.0.1.1 255.255.255.0
 ip router isis 1
 no shut
 negotiation auto
router isis 1
 net 49.0001.0000.0001.00
 metric-style narrow
```

### R2 Configuration

```
hostname R2
interface GigabitEthernet0/0/0
 ip address 10.0.1.2 255.255.255.0
 ip router isis 1
 no shut
 negotiation auto
interface GigabitEthernet0/0/1
 ip address 10.0.3.1 255.255.255.0
 ip router isis 1
 no shut
 negotiation auto
router isis 1
 net 49.0001.0000.0002.00
 metric-style narrow
```

### R3 Configuration

```
hostname R3
interface GigabitEthernet0/0/0
 ip address 10.0.3.2 255.255.255.0
 ip router isis 2
 no shut
 negotiation auto
interface GigabitEthernet0/0/1
 ip address 10.0.4.1 255.255.255.0
 ip router isis 2
 no shut
 negotiation auto
```

```
router isis 2
 net 49.0002.0000.0003.00
 metric-style narrow
```

### R4 Configuration

```
hostname R4
interface GigabitEthernet0/0/0
 ip address 10.0.4.2 255.255.255.0
 ip router isis 2
 no shut
 negotiation auto
interface GigabitEthernet0/0/1
 ip address 10.0.5.1 255.255.255.0
 ip router isis 2
 no shut
 negotiation auto
router isis 2
 net 49.0002.0000.0004.00
 metric-style narrow
```

### R5 Configuration

```
hostname R5
interface GigabitEthernet0/0/0
 ip address 10.0.5.2 255.255.255.0
 ip router isis 3
 no shut
 negotiation auto
interface GigabitEthernet0/0/1
 ip address 10.0.6.1 255.255.255.0
 ip router isis 3
 no shut
 negotiation auto
router isis 3
 net 49.0003.0000.0005.00
 metric-style narrow
```

### R6 Configuration

```
hostname R6
interface GigabitEthernet0/0/0
 ip address 10.0.6.2 255.255.255.0
 ip router isis 3
 no shut
 negotiation auto
interface GigabitEthernet0/0/1
 ip address 10.0.7.1 255.255.255.0
 ip router isis 3
```

```
 no shut
 negotiation auto
router isis 3
 net 49.0003.0000.0006.00
 metric-style narrow
```