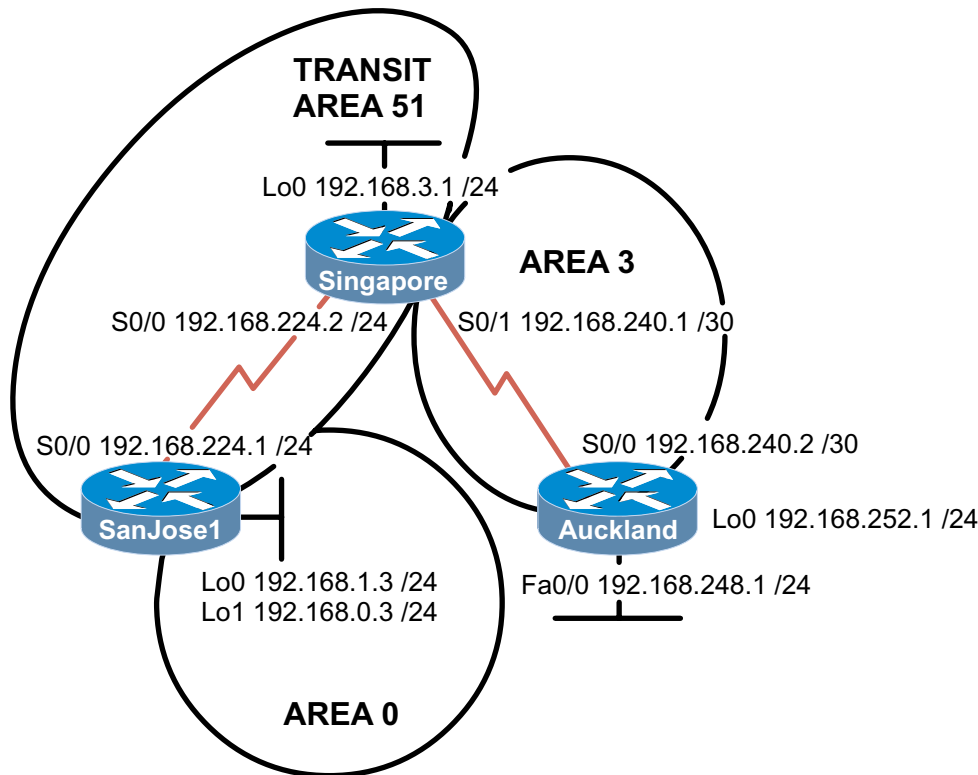


5.8.4: Configuring Virtual Links



Objective

In this lab, you configure an OSPF virtual link so that a disconnected area can reach the backbone, as required by OSPF.

Scenario

At midnight, your pager goes off as you are sleeping in your San Jose home. You are informed that connectivity to Auckland and Singapore has been intermittent for several hours. You log on to the corporate network from home, run some diagnostics, and determine that you can't get to Auckland. Also, you notice that the Shortest Path First algorithm is being recalculated often on your core routers. The instability seems to be associated with the Asian region of your network. Singapore local time is approximately 4:30 p.m. You call the technical support lead in Singapore to ask if they are experiencing any network connectivity issues. He is disappointed that you noticed already, but he proudly says that he has added OSPF Area 3 in Auckland so that external routes do not need be redistributed. You agree that it would be best to include Auckland in the OSPF autonomous system, but you disagree that another area should be created. A teleconference is set for tomorrow, and you go about restoring connectivity and stability. A proper OSPF design has all areas adjacent to Area 0, but Area 3 is disconnected from the backbone. You will configure a virtual link through Area 51, connecting Area 3 to the backbone, Area 0.

Step 1

Build and configure the network according to the diagram. Also configure multiarea OSPF according to the diagram (do not configure the virtual link yet). Configure each router with the loopback address indicated in the diagram.

Use **ping** to test connectivity between all directly connected interfaces. Each router should be able to ping its serial link partner.

Step 2

After you configure the network according to the diagram, check Auckland's routing table:

```
Auckland#show ip route

Gateway of last resort is not set

    192.168.240.0/30 is subnetted, 1 subnets
C       192.168.240.0 is directly connected, Serial0/0
C       192.168.248.0/24 is directly connected, FastEthernet0/0
C       192.168.252.0/24 is directly connected, Loopback0
```

1. The routing table should be devoid of OSPF routes. Why?

Interarea traffic must transit the backbone area. Even though Area 51 and Area 3 are adjacent, they do not share OSPF routing updates.

Verify that Auckland has established a neighbor relationship with Singapore by using the **show ip ospf neighbor** command:

```
Auckland#show ip ospf neighbor

Neighbor ID  Pri  State  Dead Time  Address      Interface
192.168.240.1  1  FULL/  00:00:33  192.168.240.1  Serial0/0
```

2. What state exists between Singapore and Auckland?

Singapore and Auckland should have successfully established adjacencies, shown as the "full" neighbor state.

Step 3

Because Area 3 is not connected to the backbone, OSPF routing is broken in this network. You must configure a virtual link, or drastically redesign the network, in order to make routing work. To quickly restore connectivity, you will configure a virtual link between Singapore (Area 3's ABR) and SanJose3 (Area 0's ABR). Thus, the transit area between Area 3 and Area 0 will be Area 51. Enter the following commands on Singapore:

```
Singapore(config)#router ospf 1
Singapore(config-router)#area 51 virtual-link 192.168.1.3
```

Note: You must specify SanJose3 by its router ID.

In order for the virtual link to function, you must configure both ends of the link. On SanJose3, issue the following commands:

```
SanJose3(config)#router ospf 1
SanJose3(config-router)#area 51 virtual-link 192.168.240.1
```

You can verify the creation of the virtual link by checking Auckland's routing table:

```
Auckland#show ip route

Gateway of last resort is not set

O IA 192.168.224.0/24 [110/845] via 192.168.240.1, 00:01:25,
    Serial0/0
    192.168.240.0/30 is subnetted, 1 subnets
C     192.168.240.0 is directly connected, Serial0/0
O IA 192.168.232.0/24 [110/65] via 192.168.240.1, 00:01:25,
    Serial0/0
C     192.168.248.0/24 is directly connected, FastEthernet0/0
    192.168.0.0/32 is subnetted, 1 subnets
O IA   192.168.0.3 [110/846] via 192.168.240.1, 00:00:35,
    Serial0/0
    192.168.1.0/32 is subnetted, 1 subnets
O IA   192.168.1.3 [110/846] via 192.168.240.1, 00:00:35,
    Serial0/0
C     192.168.252.0/24 is directly connected, Loopback0
```

If it receives OSPF routes, the virtual link is operational.

Alternatively, you can issue the command **show ip ospf virtual-links** on Singapore:

```
Singapore#show ip ospf virtual-links
Virtual Link OSPF_VL0 to router 192.168.1.3 is up
  Run as demand circuit
  DoNotAge LSA allowed.
  Transit area 51, via interface Serial0/0, Cost of using 781
  Transmit Delay is 1 sec, State POINT_TO_POINT,
  Timer intervals configured, Hello 10, Dead 40, Wait 40,
    Retransmit 5
  Hello due in 00:00:00
  Adjacency State FULL (Hello suppressed)
  Index 1/3, retransmission queue length 0, number of
    retransmission 1
  First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
  Last retransmission scan length is 1, maximum is 1
  Last retransmission scan time is 0 msec, maximum is 0 msec
```

1. According to the output of this command, what is the state of the virtual link?
-