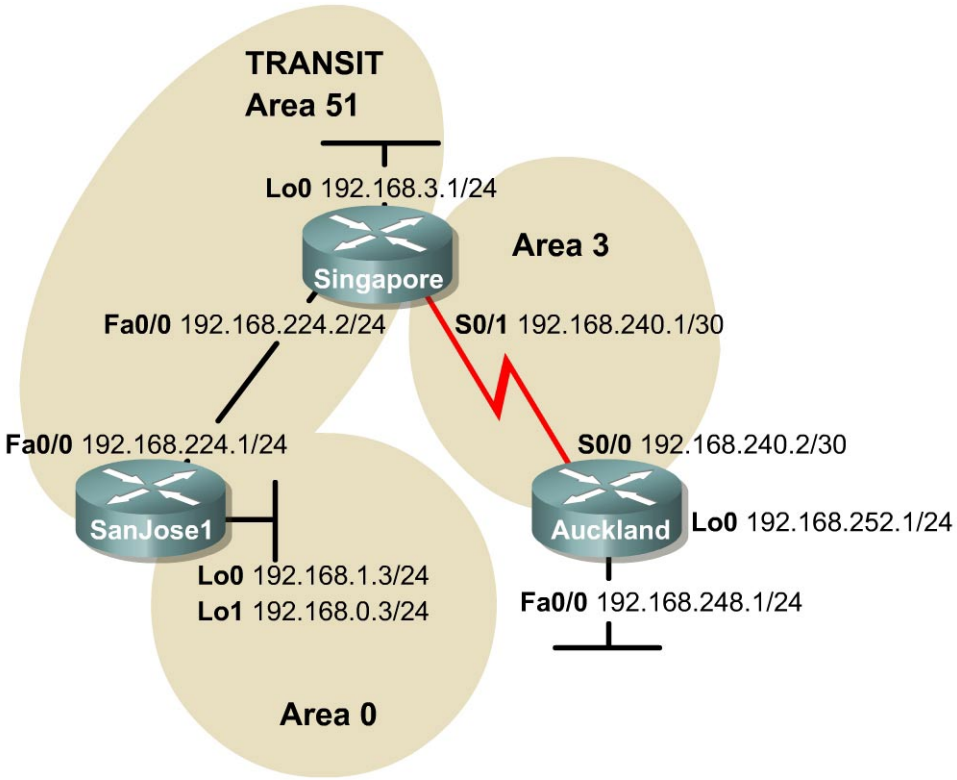
Lab 6.9.6 Configuring Virtual Links



Objective

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

Scenario

While asleep at home in San Jose, California, the pager goes off. Information is given that the connectivity to Auckland and Singapore has been intermittent for several hours. Logging on to the corporate network from home, and running some diagnostics, it is determined that Auckland cannot be reached. Also, it is noticed that the shortest path first algorithm is being recalculated often on the core routers. The instability seems to be associated with the Asian region on the network. Singapore local time is approximately 4:30 p.m. The technical support lead in Singapore is called and asked if they are experiencing any network connectivity issues. Technical support is disappointed that this was already noticed, but they indicate that OSPF Area 3 in Auckland has already been added. They say that therefore external routes do not need to be redistributed. It is agreed that it would be best to include Auckland in the OSPF autonomous system. However, there is disagreement over whether another area should be created. A teleconference is set for the next day to discuss the situation, while engaging in restoring connectivity and stability. A proper OSPF design has all areas adjacent to Area 0, but Area 3 is disconnected from the backbone. A virtual link through Area 51 will be configured, 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. However, do not configure the virtual link yet. Configure each router with the loopback address indicated in the diagram. Use the configuration files from the previous lab if available. Make adjustments as necessary. However, it is easiest to just remove and reapply the OSPF process.

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

Step 2

After configuring the network according to the diagram, check Auckland's routing table as follows:

```
Auckland#show ip route
<output omitted>
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?

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Inter-area 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?

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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. Configure a virtual link, or drastically redesign the network, in order to make routing work. To quickly restore connectivity, configure a virtual link between Singapore and SanJose1. Singapore is the ABR for Area 3, while SanJose1 is the ABR for Area 0. Therefore, 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: SanJose1 must be specified by its router ID.

In order for the virtual link to function, configure both ends of the link. On SanJose1, issue the following commands:

```
SanJose1 (config)#router ospf 1
SanJose1(config-router)#area 51 virtual-link 192.168.3.1
```

Verify the creation of the virtual link by checking Auckland's routing table as follows:

```
Auckland#show ip route
<output omitted>
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 192.168.3.0/24 [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, the command **show ip ospf virtual-links** can be issued 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
```

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

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