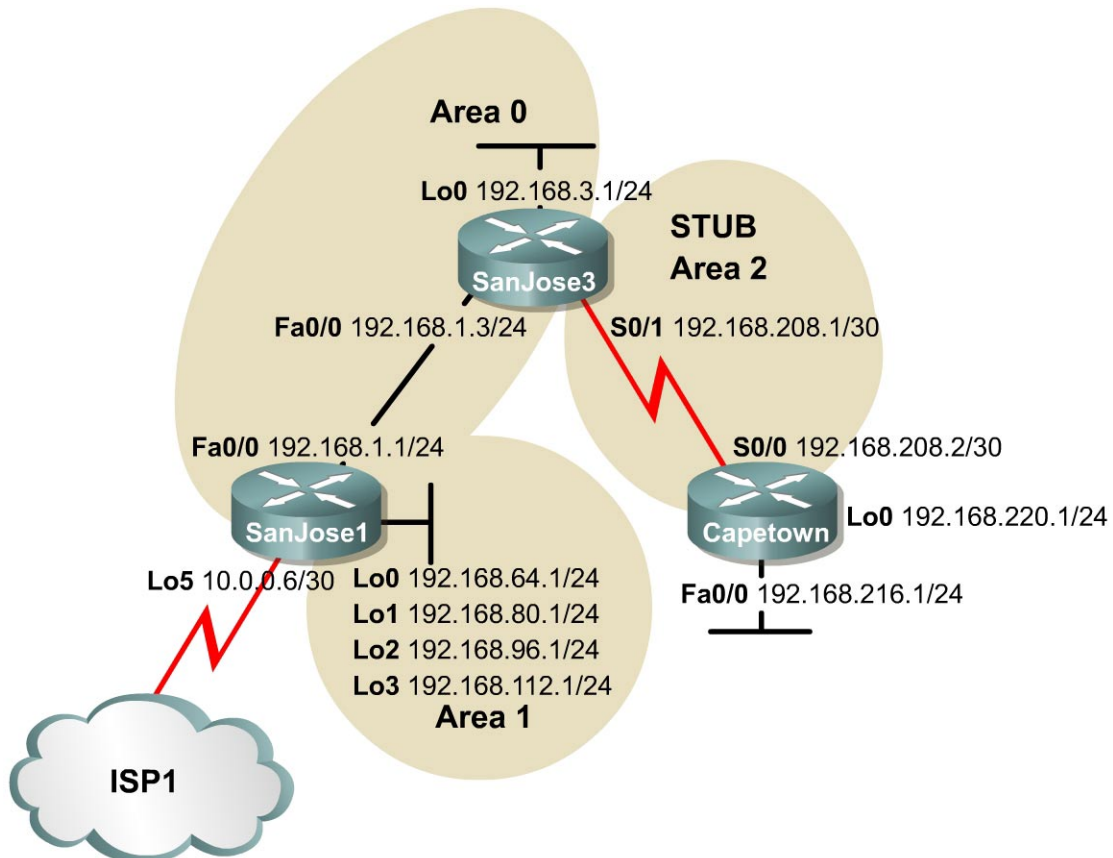


## Lab 6.9.4 Configuring a Stub Area and a Totally Stubby Area



### Objective

In this lab, an OSPF stub area and a totally stubby area will be configured.

### Scenario

The Capetown router needs to be upgraded as it is suspected that the router is not keeping up with the growth of the OSPF internetwork. Diagnostics are performed and it is discovered that the router could benefit from more memory due to the large routing table. The router could also use a faster processor because of frequent Shortest Path First calculations. It is decided instead to create a smaller and more stable routing table using a stub or totally stubby area configuration.

### Step 1

Build and configure the network according to the diagram. Configure multiarea OSPF according to the diagram. However, do not configure a stub area yet. Use the configuration files from the previous lab if available and make adjustments as necessary.

**Note:** The loopback, Lo5, on SanJose1 can be ignored for now.

Configure each router with the loopback address as indicated in the diagram. Be sure to configure SanJose1 with additional loopbacks using Lo0, Lo1, Lo2, and Lo3. These loopback interfaces will simulate the serial links to other local San Jose sites.

```
Capetown#show ip route
<output omitted>
Gateway of last resort is not set
  192.168.208.0/30 is subnetted, 1 subnets
C       192.168.208.0 is directly connected, Serial0/0
  192.168.64.0/32 is subnetted, 1 subnets
O IA    192.168.64.1 [110/66] via 192.168.208.1, 00:20:04, Serial0/0
C       192.168.216.0/24 is directly connected, FastEthernet0/0
  192.168.80.0/32 is subnetted, 1 subnets
O IA    192.168.80.1 [110/66] via 192.168.208.1, 00:20:04, Serial0/0
  192.168.96.0/32 is subnetted, 1 subnets
O IA    192.168.96.1 [110/66] via 192.168.208.1, 00:20:04, Serial0/0
  192.168.112.0/32 is subnetted, 1 subnets
O IA    192.168.112.1 [110/66] via 192.168.208.1, 00:20:05, Serial0/0
C       192.168.220.0/24 is directly connected, Loopback0
O IA    192.168.1.0/24 [110/65] via 192.168.208.1, 00:20:05, Serial0/0
  192.168.3.0/32 is subnetted, 1 subnets
O IA    192.168.3.1 [110/65] via 192.168.208.1, 00:20:07, Serial0/0
```

Use **ping** and **show ip route** to test connectivity between all interfaces. Each router should be able to ping all network interfaces.

## Step 2

Create a loopback interface as follows to simulate the serial interface connecting to ISP1:

```
SanJose1(config)#interface lo5
SanJose1(config-if)#ip address 10.0.0.6 255.255.255.252
```

Configure SanJose1 as follows to redistribute an external route into the OSPF domain:

```
SanJose1(config)#ip route 10.0.0.0 255.0.0.0 null0
SanJose1(config)#router ospf 1
SanJose1(config-router)#redistribute static
```

Check the routing tables of all three routers. They should be complete.

```
Capetown#show ip route
<output omitted>
Gateway of last resort is not set
  192.168.208.0/30 is subnetted, 1 subnets
C       192.168.208.0 is directly connected, Serial0/0
  192.168.64.0/32 is subnetted, 1 subnets
O IA    192.168.64.1 [110/66] via 192.168.208.1, 00:07:32, Serial0/0
C       192.168.216.0/24 is directly connected, FastEthernet0/0
  192.168.80.0/32 is subnetted, 1 subnets
O IA    192.168.80.1 [110/66] via 192.168.208.1, 00:07:32, Serial0/0
O E2    10.0.0.0/8 [110/20] via 192.168.208.1, 00:00:35, Serial0/0
  192.168.96.0/32 is subnetted, 1 subnets
O IA    192.168.96.1 [110/66] via 192.168.208.1, 00:07:32, Serial0/0
  192.168.112.0/32 is subnetted, 1 subnets
O IA    192.168.112.1 [110/66] via 192.168.208.1, 00:07:32, Serial0/0
C       192.168.220.0/24 is directly connected, Loopback0
O IA    192.168.1.0/24 [110/65] via 192.168.208.1, 00:07:34, Serial0/0
  192.168.3.0/32 is subnetted, 1 subnets
O IA    192.168.3.1 [110/65] via 192.168.208.1, 00:07:34, Serial0/0
```

SanJose3 and Capetown should also have a Type 2 external route to 10.0.0.0/8. They will not have a specific route to the loopback network, 10.0.0.4/30. That network has not clearly been advertised by any means.

### Step 3

Capetown has several interarea (IA) routes and one external (E2) route. In complex OSPF networks, a large number of external and interarea routes can needlessly weigh down some routers. Capetown is in a stub area, an area with one egress point. Capetown does not need external routing information, or even interarea summaries. Capetown just needs a default route to the ABR, SanJose3.

By configuring Area 2 as a stub area, SanJose3 automatically produces a default route into Area 2. Use the following commands to configure the stub area:

```
SanJose3(config)#router ospf 1
SanJose3(config-router)#area 2 stub
```

Also configure Capetown as follows:

```
Capetown(config)#router ospf 1
Capetown(config-router)#area 2 stub
```

Verify that Area 2 is a stub by issuing the **show ip ospf** command:

```
Capetown#show ip ospf
Routing Process "ospf 1" with ID 192.168.220.1
Supports only single TOS(TOS0) routes
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 0. Checksum Sum 0x0
Number of DCbitless external LSA 0
Number of DoNotAge external LSA 0
Number of areas in this router is 1. 0 normal 1 stub 0 nssa
External flood list length 0
Area 2
Number of interfaces in this area is 2
It is a stub area
Area has no authentication
SPF algorithm executed 6 times
Area ranges are
Number of LSA 9. Checksum Sum 0x428E6
Number of DCbitless LSA 0
Number of indication LSA 0
Number of DoNotAge LSA 0
Flood list length 0
```

1. According to the output of this command, what type of OSPF area is Area 2?

---

Now check Capetown's routing table. Notice that a default route, 0.0.0.0/0, has been generated by the ABR, SanJose3, on the stub area and now appears in Capetown's table.

```
Capetown#show ip route
<output omitted>
Gateway of last resort is 192.168.208.1 to network 0.0.0.0

    192.168.208.0/30 is subnetted, 1 subnets
C       192.168.208.0 is directly connected, Serial0/0
    192.168.64.0/32 is subnetted, 1 subnets
O IA    192.168.64.1 [110/66] via 192.168.208.1, 00:01:01, Serial0/0
```

```

C    192.168.216.0/24 is directly connected, FastEthernet0/0
    192.168.80.0/32 is subnetted, 1 subnets
O IA   192.168.80.1 [110/66] via 192.168.208.1, 00:01:01, Serial0/0
    192.168.96.0/32 is subnetted, 1 subnets
O IA   192.168.96.1 [110/66] via 192.168.208.1, 00:01:01, Serial0/0
    192.168.112.0/32 is subnetted, 1 subnets
O IA   192.168.112.1 [110/66] via 192.168.208.1, 00:01:02, Serial0/0
C    192.168.220.0/24 is directly connected, Loopback0
O IA   192.168.1.0/24 [110/65] via 192.168.208.1, 00:01:02, Serial0/0
    192.168.3.0/32 is subnetted, 1 subnets
O IA   192.168.3.1 [110/65] via 192.168.208.1, 00:01:03, Serial0/0
O*IA  0.0.0.0/0 [110/65] via 192.168.208.1, 00:01:03, Serial0/0

```

## 2. What type of OSPF route is Capetown's default route?

---

Recall that interarea (IA) routes point to networks in different areas within the same OSPF autonomous system.

Because Area 2 is a stub area, all external routes, Type 5 LSAs, have been prevented from reaching internal routers.

## 3. Look carefully at Capetown's routing table. Does it still have a route to 10.0.0.0/8?

---

All external routes are filtered from stub areas and are replaced with a default route.

### Step 4

It is decided that the stub area configuration is not making a substantial impact on Area 2. Because Capetown can use the default route to its ABR for all nonlocal area traffic, it is decided to filter Type 3 and Type 4 interarea routes from Area 2. To do this, Area 2 must be configured as a totally stubby area, which is a Cisco proprietary feature.

Use the following commands on SanJose3, the ABR, to configure Area 2 as a totally stubby area:

```

SanJose3(config)#router ospf 1
SanJose3(config-router)#no area 2 stub
SanJose3(config-router)#area 2 stub no-summary

```

The **no-summary** keyword at the ABR keeps interarea routes from entering stub Area 2, creating a totally stubby area. Only the ABR needs the additional configuration. The role of Area 2 internal routers has not changed.

Return to Capetown and check its routing table:

```

Capetown#show ip route
<output omitted>
Gateway of last resort is 192.168.208.1 to network 0.0.0.0

    192.168.208.0/30 is subnetted, 1 subnets
C     192.168.208.0 is directly connected, Serial0/0
C     192.168.216.0/24 is directly connected, FastEthernet0/0
C     192.168.220.0/24 is directly connected, Loopback0
O*IA  0.0.0.0/0 [110/65] via 192.168.208.1, 00:00:25, Serial0/0

```

## 4. What has changed?

---

5. Does Area 2 still have connectivity to 10.0.0.0/8? Test with `ping 10.0.0.6`.
- 

Interarea routes have also been replaced by a default route.

Capetown should get a positive response by forwarding ICMP requests to SanJose3 using the default route 0.0.0.0/0. SanJose3 has a default route to network 10.0.0.0/8, and SanJose1 has a directly connected route to 10.0.0.4/30 with the loopback interface 10.0.0.6/30.