



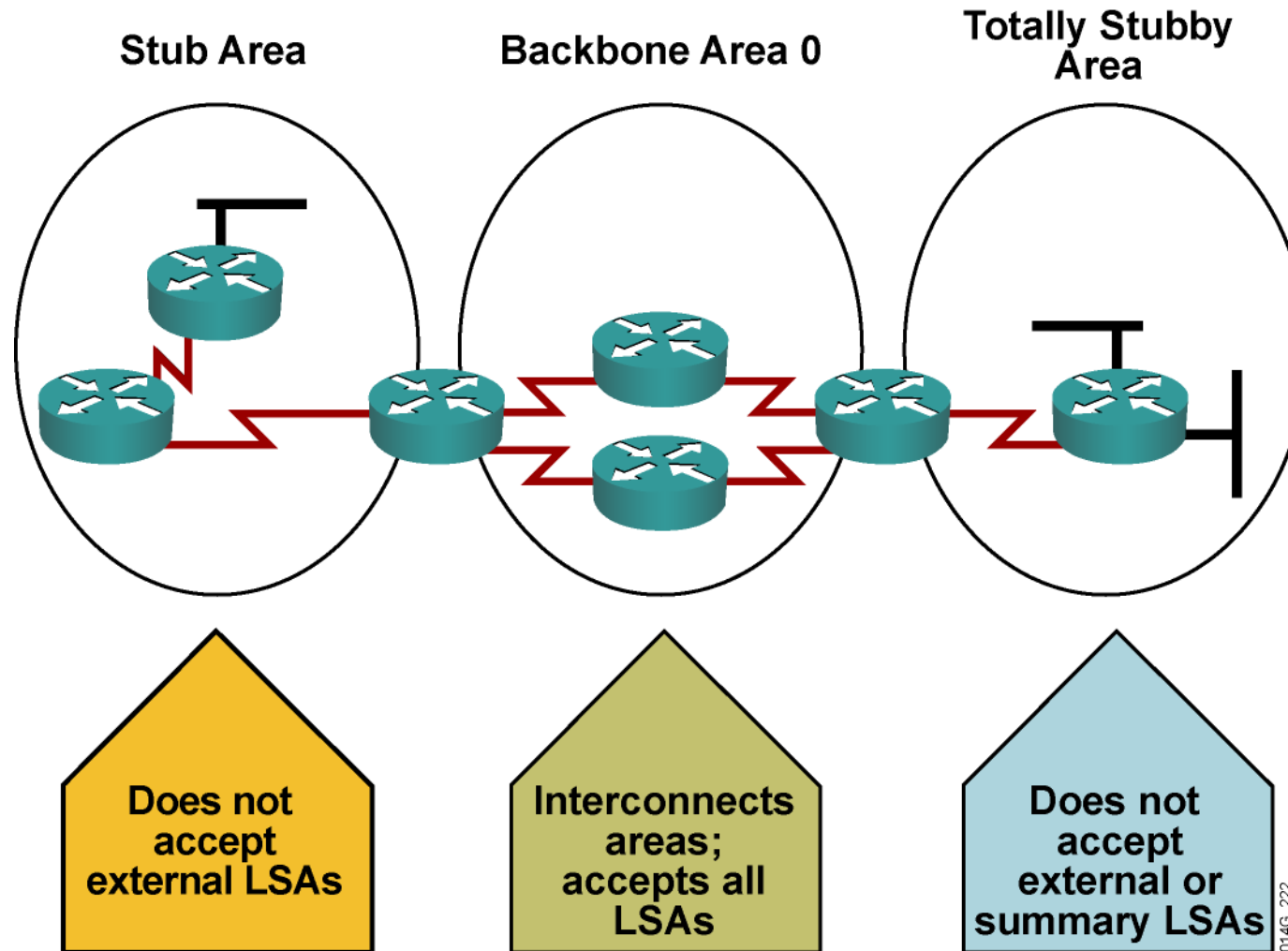
OSPF Stubby

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Types of Areas



Stub and Totally Stub Area Rules

An area can be stub or totally stub if: 一个区域能够成为Stub的一些条件:

There is a single ABR, or if there is more than one ABR, suboptimal routing paths to other areas or external autonomous systems are acceptable. 最好是只有一个ABR, 如果有多个ABR可能会产生一个次优路径。

All routers in the area are configured as **stub routers**.

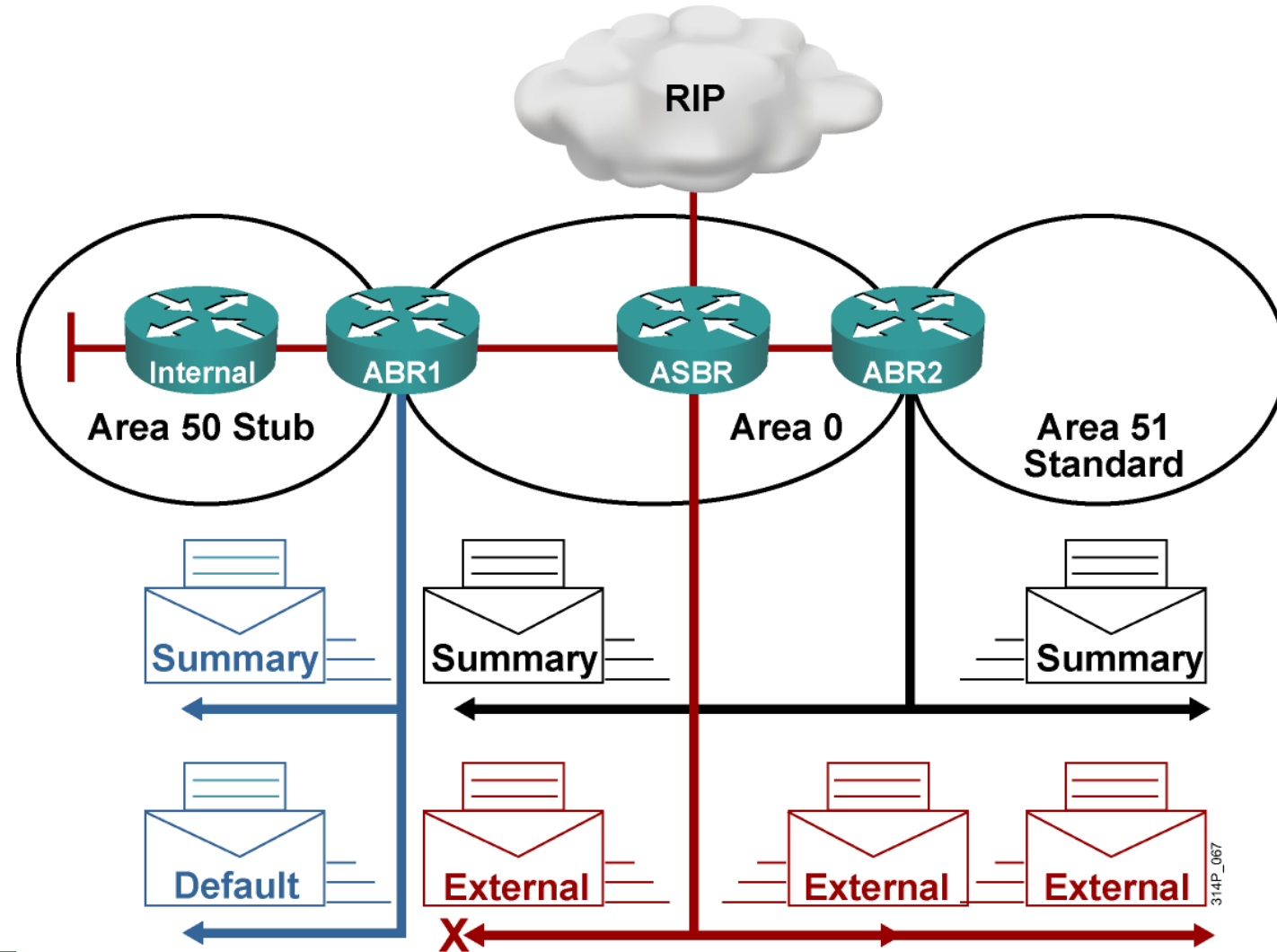
There is **no ASBR** in the area.

The area is **not area 0**.

No virtual links go through the area.

Using Stub Areas

- External LSAs are stopped.
- Default route is advertised into stub area by the ABR.
- All routers in area 50 must be configured as stub.



Stub Area Configuration

```
RouterA(config-router) #
```

```
area area-id stub [no-summary]
```

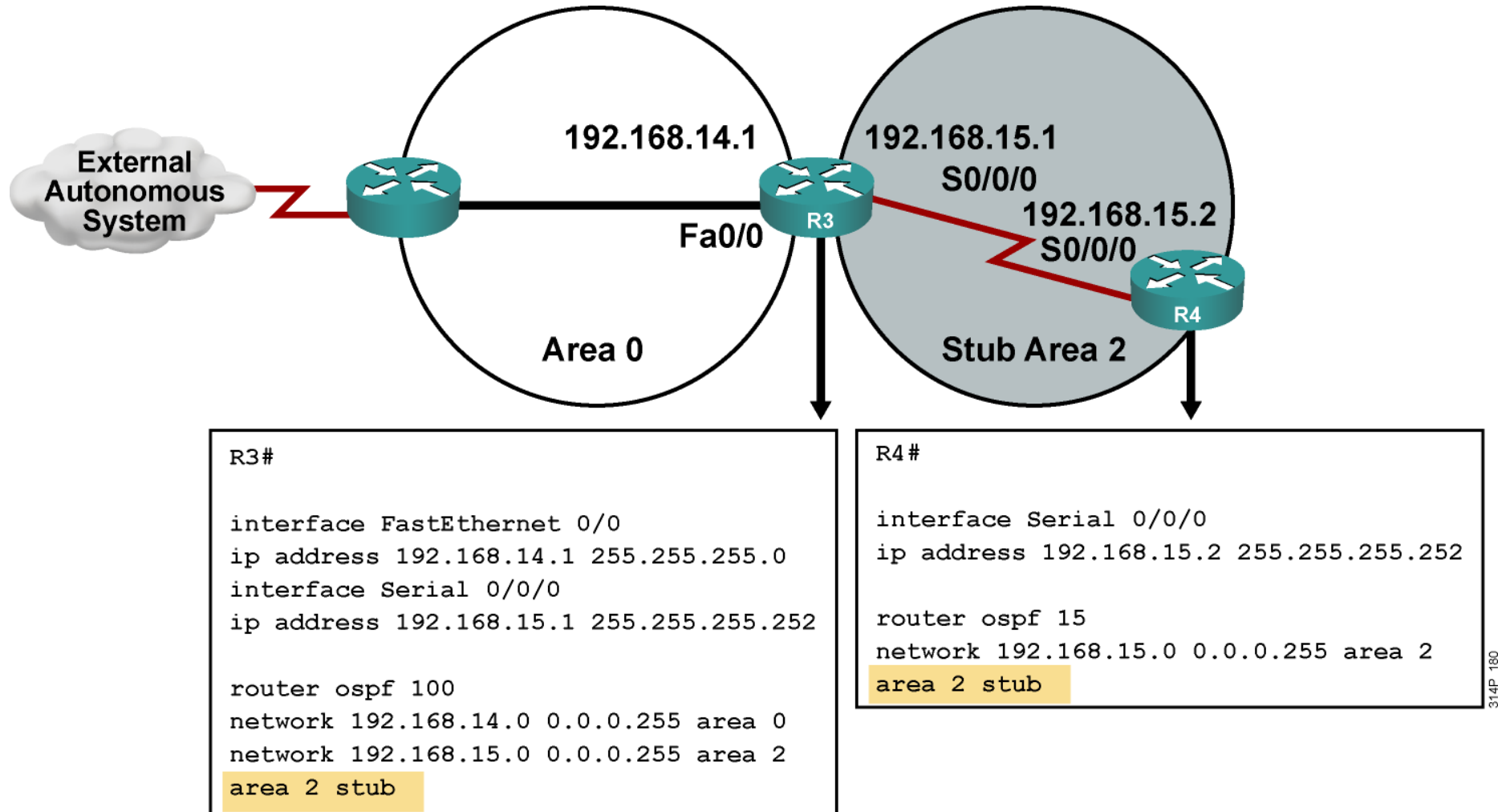
- This command turns on stub area networking.
- All routers in a stub area must use the stub command.

```
RouterA(config-router) #
```

```
area area-id default-cost cost
```

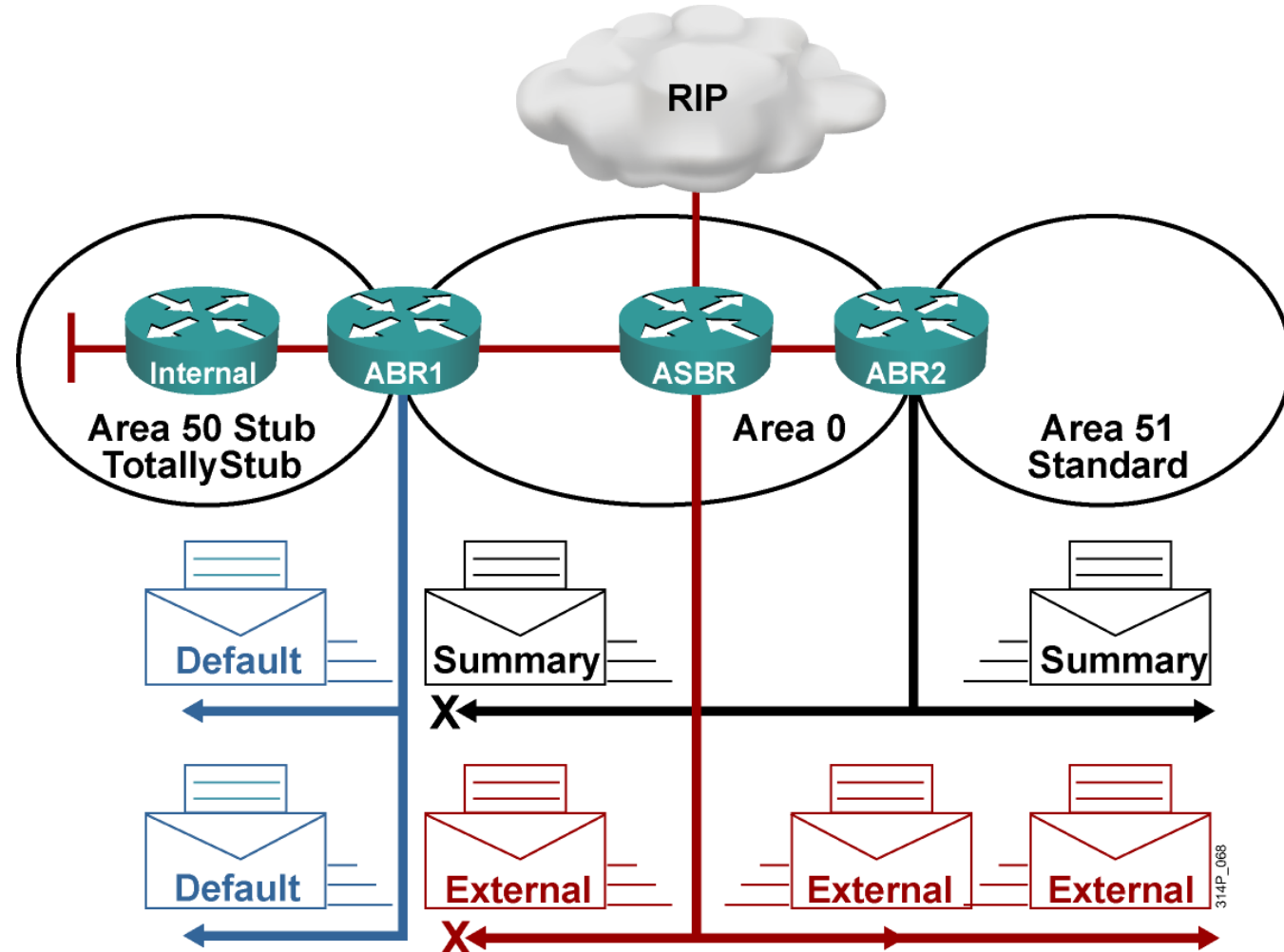
- This command defines the cost of a default route sent into the stub area.
- **The default cost is 1.**

OSPF Stub Area Configuration Example



Using Totally Stubby Areas

- External LSAs are stopped.
- Summary LSAs are stopped.
- Routing table is reduced to a minimum.
- All routers must be configured as stub.
- ABR must be configured as totally stubby.
- This is a Cisco **proprietary** feature.



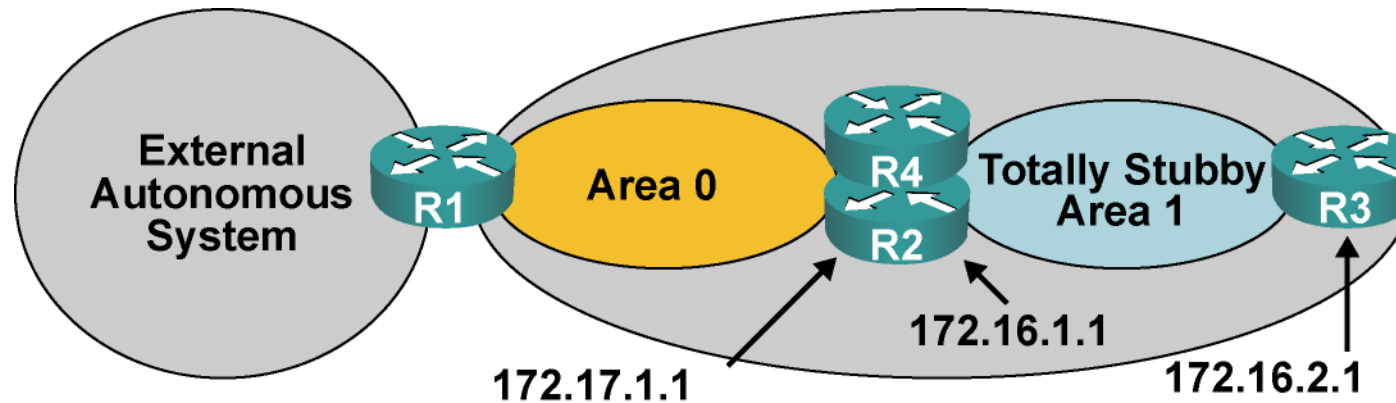
Totally Stubby Configuration

```
RouterA(config-router)#
```

```
area area-id stub no-summary
```

- The addition of no-summary on the ABR creates a totally stubby area and prevents all summary LSAs from entering the stub area.

Totally Stubby Configuration Example



```
Router2(config)# router ospf 10
Router2(config-router)# network 172.17.0.0 0.0.255.255 area 0
Router2(config-router)# network 172.16.0.0 0.0.255.255 area 1
Router2(config-router)#area 1 stub no-summary
Router2(config-router)#area 1 default-cost 5
Router2(config-router)# ! R2 is the preferred ABR
```

```
Router3(config)# router ospf 10
Router3(config-router)# network 172.16.0.0 0.0.255.255 area 1
Router3(config-router)# area 1 stub
```

```
Router4(config)# router ospf 10
Router4(config-router)# network 172.17.0.0 0.0.255.255 area 0
Router4(config-router)# network 172.16.0.0 0.0.255.255 area 1
Router4(config-router)#area 1 stub no-summary
Router4(config-router)#area 1 default-cost 10
```

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Routing Table in a Standard Area

```
P1R3#sh ip route
<output omitted>

Gateway of last resort is not set
  172.31.0.0/32 is subnetted, 4 subnets
O IA   172.31.22.4 [110/782] via 10.1.1.1, 00:02:44, FastEthernet0/0
O IA   172.31.11.1 [110/1] via 10.1.1.1, 00:02:44, FastEthernet0/0
O IA   172.31.11.2 [110/782] via 10.1.3.4, 00:02:52, Serial0/0/0
        [110/782] via 10.1.1.1, 00:02:52, FastEthernet0/0
O IA   172.31.11.4 [110/782] via 10.1.1.1, 00:02:44, FastEthernet0/0
  10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks
O     10.11.0.0/24 [110/782] via 10.1.1.1, 00:03:22, FastEthernet0/0
C     10.200.200.13/32 is directly connected, Loopback0
C     10.1.3.0/24 is directly connected, Serial0/0/0
O     10.1.2.0/24 [110/782] via 10.1.3.4, 00:03:23, Serial0/0/0
C     10.1.1.0/24 is directly connected, FastEthernet0/0
O     10.1.0.0/24 [110/782] via 10.1.1.1, 00:03:23, FastEthernet0/0
O E2   10.254.0.0/24 [110/50] via 10.1.1.1, 00:02:39, FastEthernet0/0
P1R3#
```

Routing Table in a Stub Area

```
P1R3#sh ip route
<output omitted>
```

```
Gateway of last resort is 10.1.1.1 to network 0.0.0.0
```

```
172.31.0.0/32 is subnetted, 4 subnets
```

```
O IA 172.31.22.4 [110/782] via 10.1.1.1, 00:01:49, FastEthernet0/0
```

```
O IA 172.31.11.1 [110/1] via 10.1.1.1, 00:01:49, FastEthernet0/0
```

```
O IA 172.31.11.2 [110/782] via 10.1.3.4, 00:01:49, Serial0/0/0
```

```
[110/782] via 10.1.1.1, 00:01:49, FastEthernet0/0
```

```
O IA 172.31.11.4 [110/782] via 10.1.1.1, 00:01:49, FastEthernet0/0
```

```
10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
```

```
O 10.11.0.0/24 [110/782] via 10.1.1.1, 00:01:50, FastEthernet0/0
```

```
C 10.200.200.13/32 is directly connected, Loopback0
```

```
C 10.1.3.0/24 is directly connected, Serial0/0/0
```

```
O 10.1.2.0/24 [110/782] via 10.1.3.4, 00:01:50, Serial0/0/0
```

```
C 10.1.1.0/24 is directly connected, FastEthernet0/0
```

```
O 10.1.0.0/24 [110/782] via 10.1.1.1, 00:01:50, FastEthernet0/0
```

```
O*IA 0.0.0.0/0 [110/2] via 10.1.1.1, 00:01:51, FastEthernet0/0
```

```
P1R3#
```

Routing Table in a Stub Area with Summarization

```
P1R3#sh ip route
<output omitted>

Gateway of last resort is 10.1.1.1 to network 0.0.0.0
  172.31.0.0/16 is variably subnetted, 2 subnets, 2 masks
O IA   172.31.22.4/32 [110/782] via 10.1.1.1, 00:13:08, FastEthernet0/0
O IA   172.31.11.0/24 [110/1] via 10.1.1.1, 00:02:39, FastEthernet0/0
  10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
O     10.11.0.0/24 [110/782] via 10.1.1.1, 00:13:08, FastEthernet0/0
C     10.200.200.13/32 is directly connected, Loopback0
C     10.1.3.0/24 is directly connected, Serial0/0/0
O     10.1.2.0/24 [110/782] via 10.1.3.4, 00:13:09, Serial0/0/0
C     10.1.1.0/24 is directly connected, FastEthernet0/0
O     10.1.0.0/24 [110/782] via 10.1.1.1, 00:13:09, FastEthernet0/0
O*IA  0.0.0.0/0 [110/2] via 10.1.1.1, 00:13:09, FastEthernet0/0
P1R3#
```

Routing Table in a Totally Stubby Area

```
P1R3#sh ip route  
<output omitted>
```

```
Gateway of last resort is 10.1.1.1 to network 0.0.0.0
```

```
10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
```

```
O 10.11.0.0/24 [110/782] via 10.1.1.1, 00:16:53, FastEthernet0/0
```

```
C 10.200.200.13/32 is directly connected, Loopback0
```

```
C 10.1.3.0/24 is directly connected, Serial10/0/0
```

```
O 10.1.2.0/24 [110/782] via 10.1.3.4, 00:16:53, Serial10/0/0
```

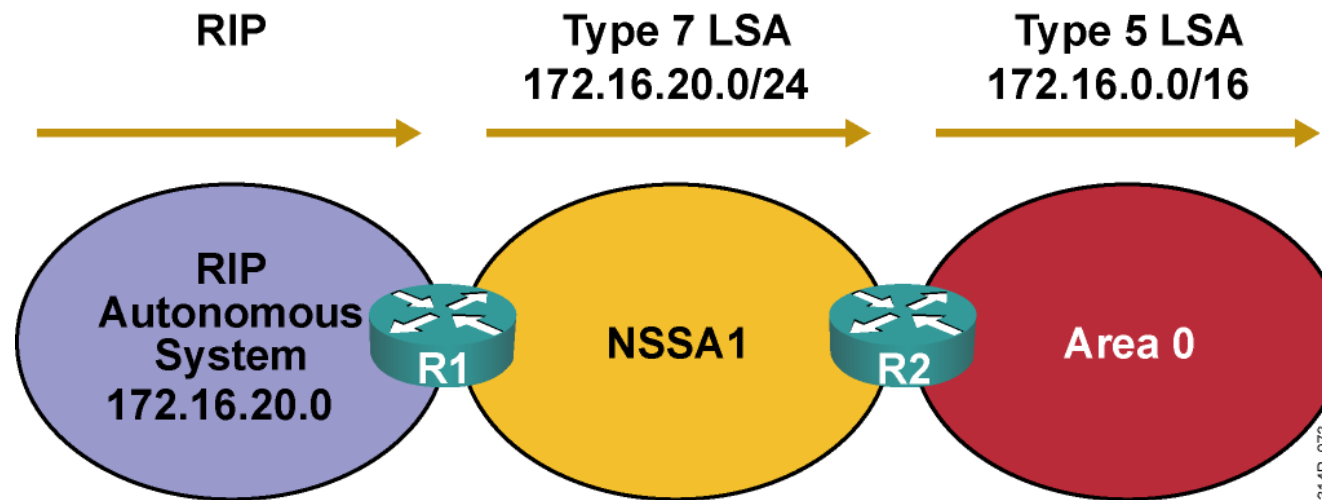
```
C 10.1.1.0/24 is directly connected, FastEthernet0/0
```

```
O 10.1.0.0/24 [110/782] via 10.1.1.1, 00:16:53, FastEthernet0/0
```

```
O*IA 0.0.0.0/0 [110/2] via 10.1.1.1, 00:00:48, FastEthernet0/0
```

```
P1R3#
```

Not-So-Stubby Areas



- NSSA breaks stub area rules.
- ASBR (R1) is allowed in NSSA.
- Special LSA type 7 defined, sent by ASBR.
- ABR (R2) converts LSA type 7 to LSA type 5.
- ABR sends default route into NSSA instead of external routes from other ASBRs.
- NSSA is an RFC addendum.

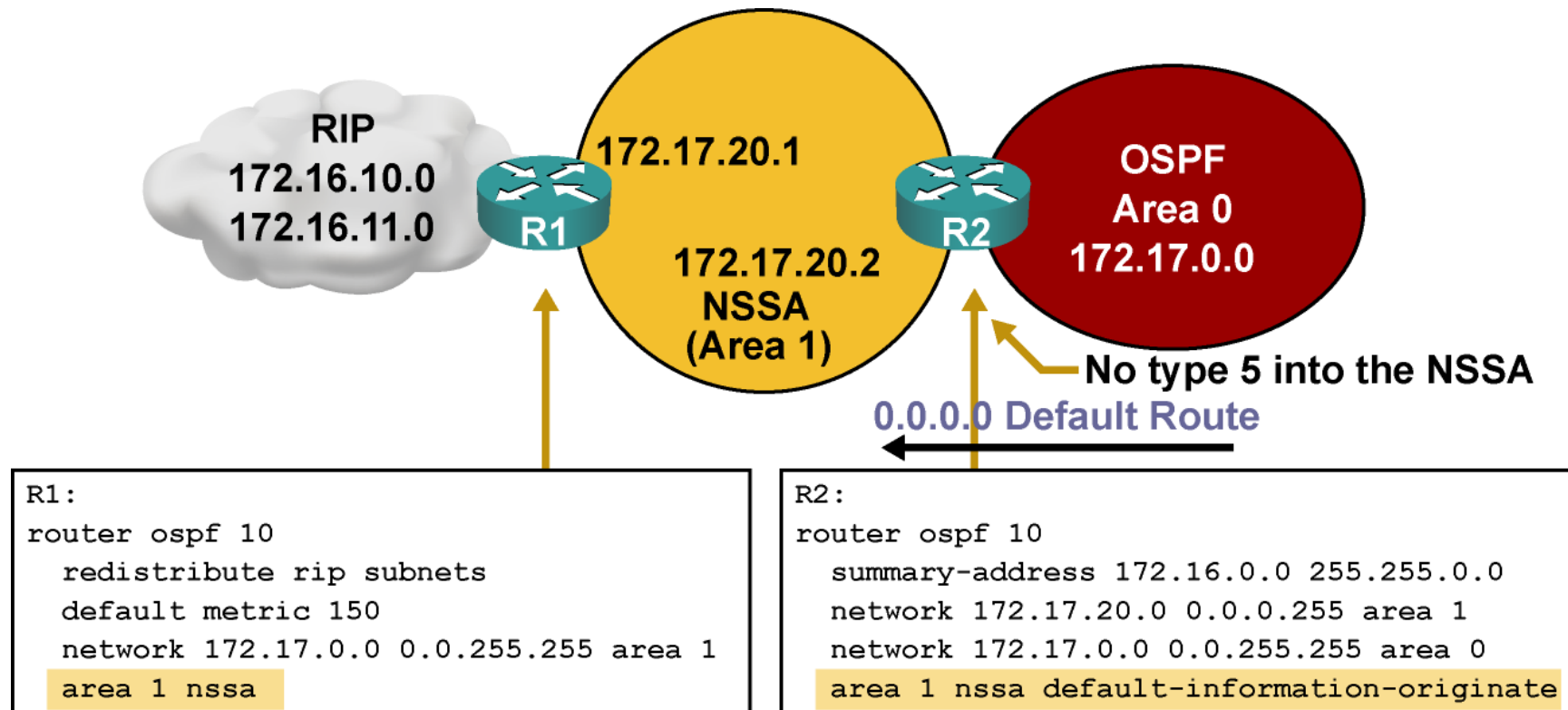
NSSA Configuration

```
RouterA(config-router)#
```

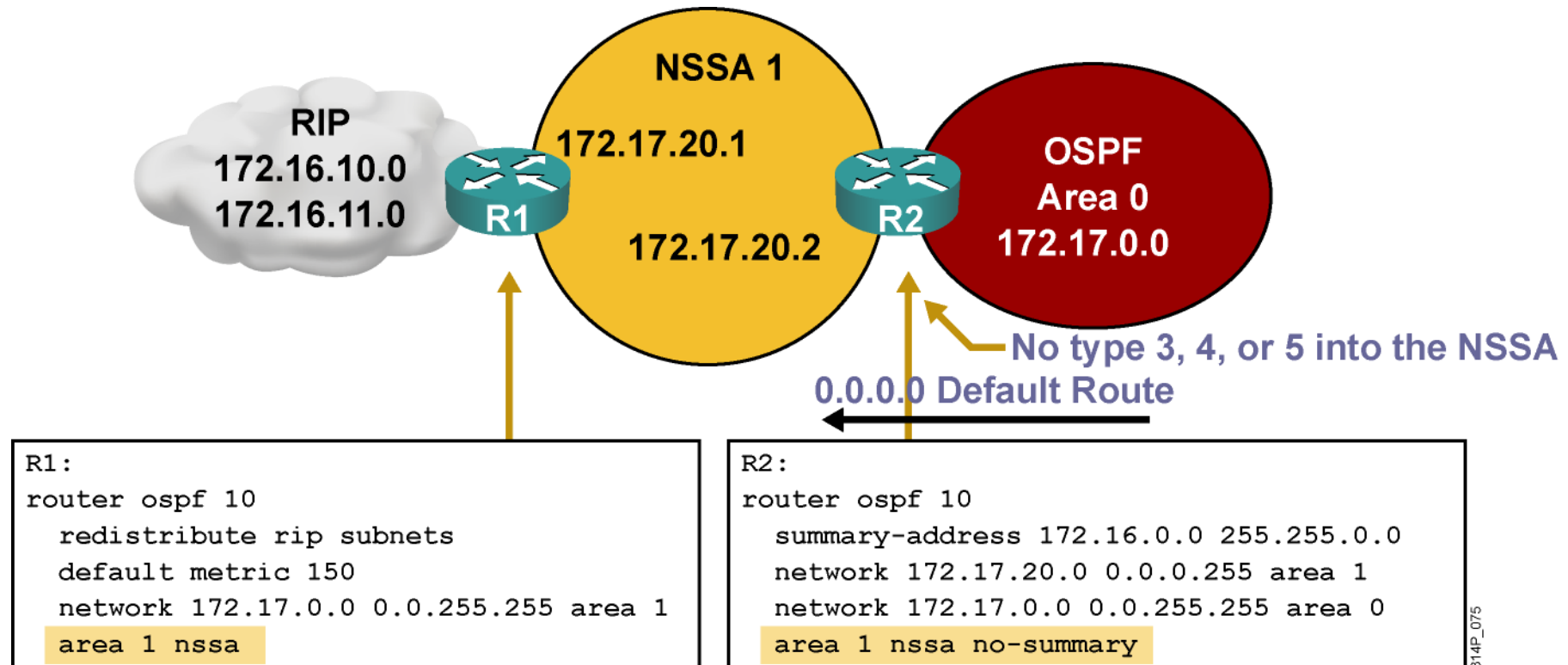
```
area area-id nssa [no-redistribution] [default-  
information-originate [metric metric-value] [metric-  
type type-value]] [no-summary]
```

- Use this command instead of the `area stub` command to define the area as NSSA.
- The `no-summary` keyword creates an NSSA totally stubby area; this is a Cisco proprietary feature.

Example: NSSA Configuration



NSSA Totally Stubby Configuration



- NSSA totally stubby area is a Cisco proprietary feature.

show Commands for Stub and NSSA

RouterA#

```
show ip ospf
```

- Displays which areas are normal, stub, or NSSA

RouterA#

```
show ip ospf database
```

- Displays details of LSAs

RouterA#

```
show ip ospf database nssa-external
```

- Displays specific details of each LSA type 7 update in database

RouterA#

```
show ip route
```

- Displays all routes

Summary

There are several OSPF area types: standard, backbone, stub, totally stubby, and NSSA.

Use the area *area-id* stub command to define an area as stubby.

Use the area *area-id* stub command with the no-summary keyword on the ABR only to define an area as totally stubby.

For stub areas, external routes are not visible in the routing table, but are accessible via the intra-area default route. For totally stubby areas, interarea and external routes are not visible in the routing table, but are accessible via the intra-area default route.

Use the area *area-id* nssa command to define an area as NSSA.

Use show ip ospf, show ip ospf database, show ip route commands to verify all types of stub areas. Use the show ip ospf database nssa-external command to display details of type 7 LSAs.

Thank you.

