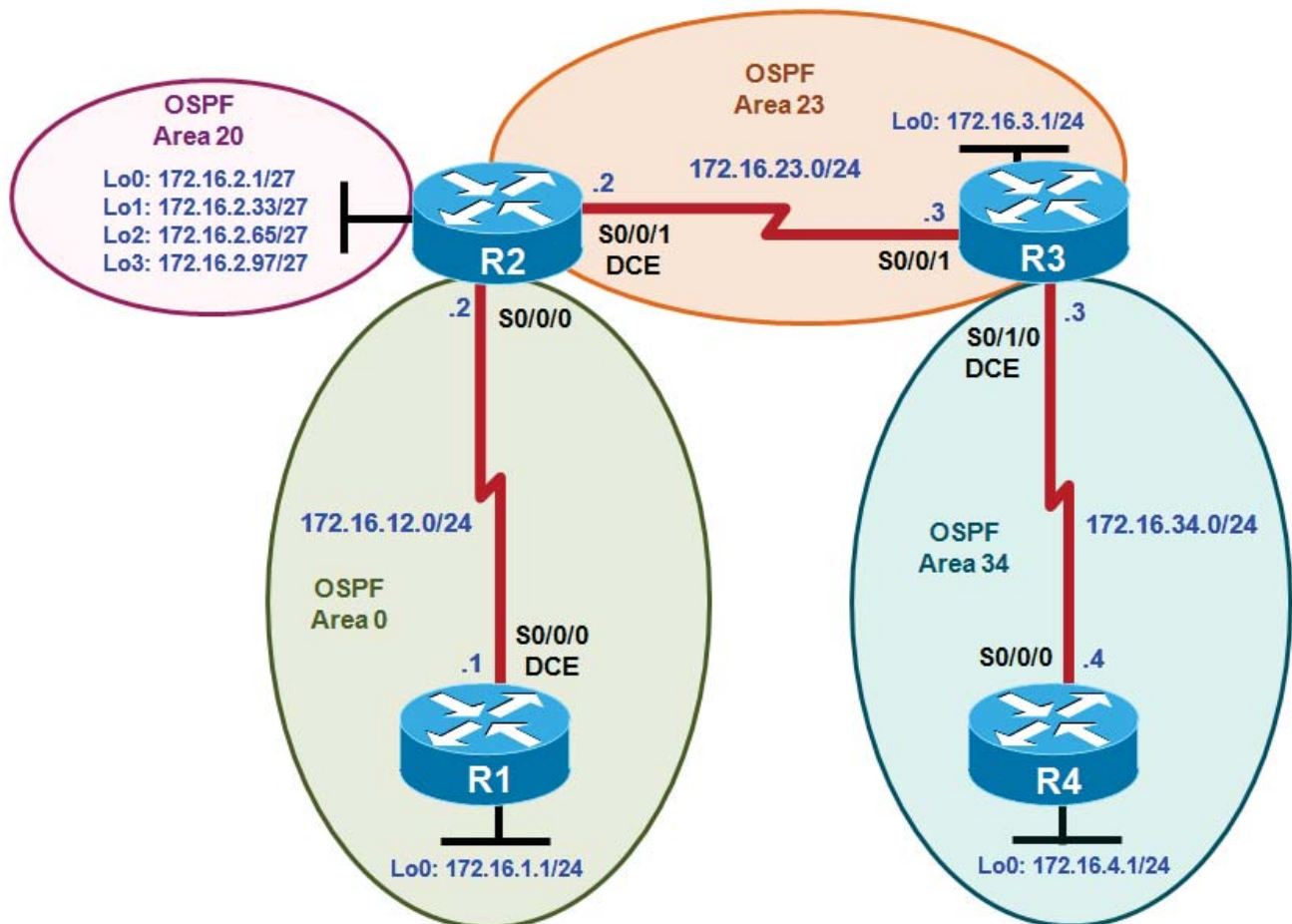


Chapter 3 Lab 3-5, OSPF Challenge Lab **Instructor Version**

Topology



Objectives

- Implement the topology diagram following the instructions in the Configuration Requirements section.

Required Resources

- 4 routers (Cisco 1841 with Cisco IOS Release 12.4(24)T1 Advanced IP Services or comparable)
- Serial and console cables

Note: This lab uses Cisco 1841 routers with Cisco IOS Release 12.4(24)T1 and the Advanced IP Services image c1841-advipservicesk9-mz.124-24.T1.bin. You can use other routers (such as 2801 or 2811) and Cisco IOS Software versions if they have comparable capabilities and features. Depending on the router model and Cisco IOS Software version, the commands available and output produced might vary from what is shown in this lab.

Configuration Requirements

1. Configure the interfaces in the diagram with the IP addresses shown.
2. Configure the bandwidth to reflect the actual bandwidth of all serial links.
3. Configure OSPF with interfaces in the areas shown in the diagram.
4. Configure R2 to summarize area 20 with the most specific mask possible.
5. Make the link between R1 and R2 have the OSPF network type of broadcast, with R1 as the DR.
6. Configure R1 to always originate a default route.
7. Modify the link between R2 and R3 to have hello timers and dead timers that are double the default values.
8. Make the link between R2 and R3 have a cost of 500.
9. Configure area 34 to be a totally stubby area.
10. Use MD5 authentication with the keyword "cisco" over the link between R3 and R4.
11. Figure out the hidden issue in the topology that you need to address to have full connectivity.
12. Run a Tcl script on all routers to verify that there is connectivity between the IP addresses in the topology.

Notes: _____

Router Interface Summary Table

Router Interface Summary				
Router Model	Ethernet Interface #1	Ethernet Interface #2	Serial Interface #1	Serial Interface #2
1700	Fast Ethernet 0 (FA0)	Fast Ethernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)
1800	Fast Ethernet 0/0 (FA0/0)	Fast Ethernet 0/1 (FA0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
2600	Fast Ethernet 0/0 (FA0/0)	Fast Ethernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)
2800	Fast Ethernet 0/0 (FA0/0)	Fast Ethernet 0/1 (FA0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
Note: To find out how the router is configured, look at the interfaces to identify the type of router and how many interfaces the router has. Rather than list all combinations of configurations for each router class, this table includes identifiers for the possible combinations of Ethernet and serial interfaces in the device. The table does not include any other type of interface, even though a specific router might contain one. For example, for an ISDN BRI interface, the string in parenthesis is the legal abbreviation that can be used in Cisco IOS commands to represent the interface.				

Explanation of Selected Requirements – Instructor Version

The requirement to address a hidden issue in the topology to have full connectivity means that you must build a virtual link across area 23 to have area 34 connected to the backbone.

TCL Script

```
R1# tclsh
R1(tcl)#
foreach address {
172.16.1.1
172.16.2.1
172.16.2.33
172.16.2.65
172.16.2.97
172.16.3.1
172.16.4.1
172.16.12.1
172.16.12.2
172.16.23.2
172.16.23.3
172.16.34.3
172.16.34.4
} {
ping $address }

R1(tcl)# tclquit
```

Device Configurations (Instructor version)

Router R1

```
hostname R1
!
interface Loopback0
 ip address 172.16.1.1 255.255.255.0
!
interface Serial0/0/0
 ip address 172.16.12.1 255.255.255.0
 ip ospf network broadcast
 ip ospf priority 10
 clock rate 64000
 bandwidth 64
 no shutdown
!
router ospf 1
 log-adjacency-changes
 network 172.16.1.0 0.0.0.255 area 0
 network 172.16.12.0 0.0.0.255 area 0
 default-information originate always
end
```

Router R2

```
hostname R2
!
interface Loopback0
 ip address 172.16.2.1 255.255.255.224
!
interface Loopback1
 ip address 172.16.2.33 255.255.255.224
!
interface Loopback2
 ip address 172.16.2.65 255.255.255.224
!
interface Loopback3
 ip address 172.16.2.97 255.255.255.224
!
interface Serial0/0/0
 ip address 172.16.12.2 255.255.255.0
 ip ospf network broadcast
 bandwidth 64
 no shutdown
!
interface Serial0/0/1
 ip address 172.16.23.2 255.255.255.0
 ip ospf cost 500
 ip ospf hello-interval 20
 ip ospf dead-interval 80
 clock rate 64000
 bandwidth 64
 no shutdown
!
router ospf 1
 area 20 range 172.16.2.0 255.255.255.128
 area 23 virtual-link 172.16.3.1
 network 172.16.2.0 0.0.0.255 area 20
 network 172.16.12.0 0.0.0.255 area 0
 network 172.16.23.0 0.0.0.255 area 23
end
```

Router R3

```
hostname R3
!
interface Loopback0
 ip address 172.16.3.1 255.255.255.0
!
interface Serial0/0/1
 ip address 172.16.23.3 255.255.255.0
 ip ospf cost 500
 ip ospf hello-interval 20
 ip ospf dead-interval 80
 bandwidth 64
 no shutdown
!
interface Serial0/1/0
 ip address 172.16.34.3 255.255.255.0
 ip ospf authentication message-digest
```

CCNPv6 ROUTE

```
ip ospf message-digest-key 1 md5 cisco
clock rate 64000
bandwidth 64
no shutdown
!
router ospf 1
 area 23 virtual-link 172.16.2.97
 area 34 stub no-summary
 network 172.16.3.0 0.0.0.255 area 23
 network 172.16.23.0 0.0.0.255 area 23
 network 172.16.34.0 0.0.0.255 area 34
end
```

Router R4

```
hostname R4
!
interface Loopback0
 ip address 172.16.4.1 255.255.255.0
!
interface Serial0/0/0
 ip address 172.16.34.4 255.255.255.0
 ip ospf authentication message-digest
 ip ospf message-digest-key 1 md5 cisco
 bandwidth 64
 no shutdown
!
router ospf 1
 area 34 stub
 network 172.16.4.0 0.0.0.255 area 34
 network 172.16.34.0 0.0.0.255 area 34
end
```