

Advanced Routing Case Study

Implement given case study

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NET3008 - Case Study Topology

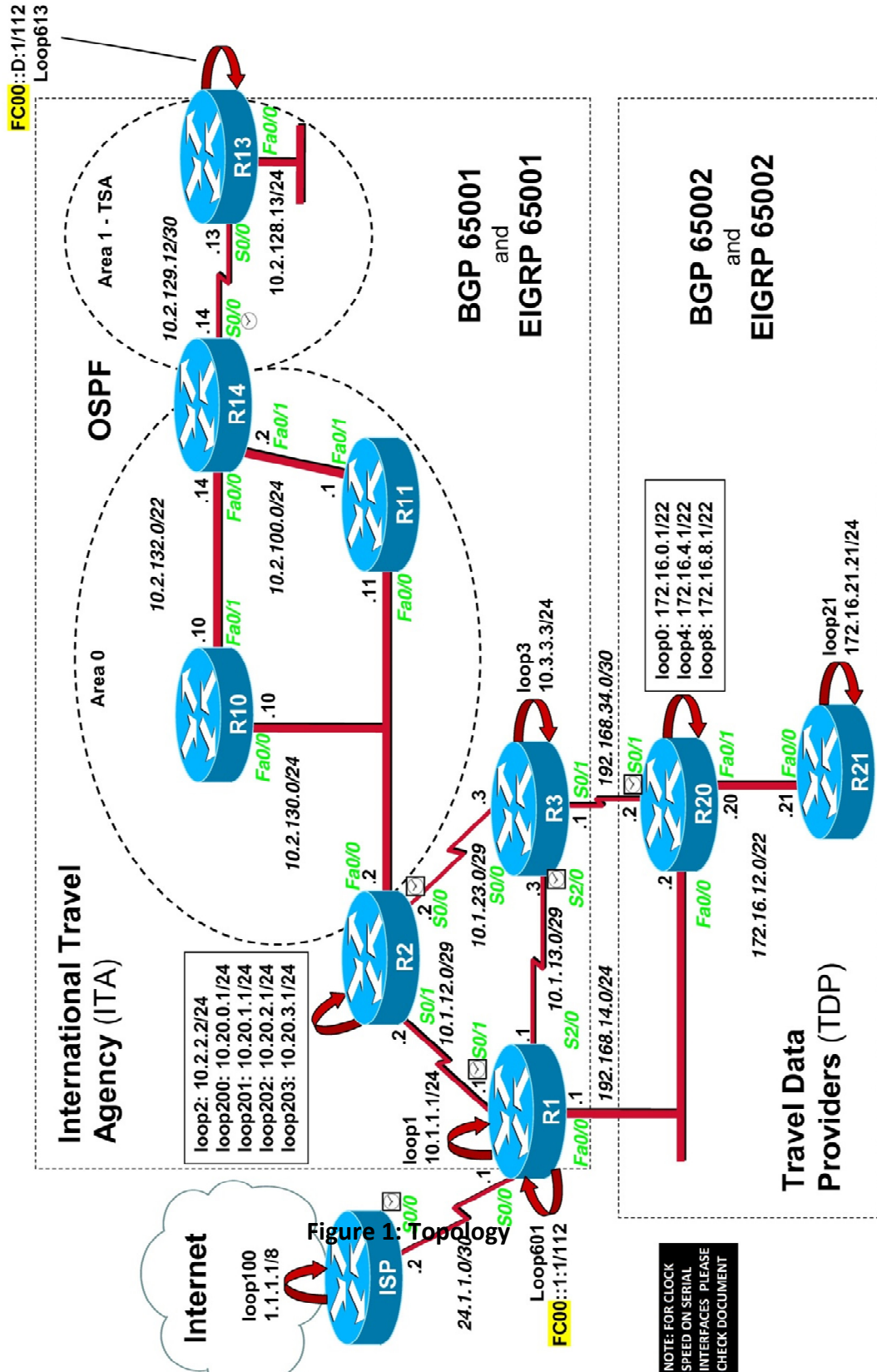


Figure 1: Topology

IP Address Table:

DEVICE	INTERFACE	IP ADDRESS	SUBNET MASK
Router ISP	Serial 0/0/0	24.1.1.2	255.255.255.252
	Loopback 100 (INTERNET)	1.1.1.1	255.0.0.0
International Travel Agency (ITA)			
Router 1	Serial 0/0/0	24.1.1.1	255.255.255.252
	Serial 0/0/1 ☹	10.1.12.1	255.255.255.248
	Serial 0/2/0	10.1.13.1	255.255.255.248
	Fast Ethernet 0/0	192.168.14.1	255.255.255.0
	Loopback 1	10.1.1.1	255.255.255.0
	Loopback 601	FEC0::1:1/112	-
Router 2	Serial 0/0/0 ☹	10.1.23.2	255.255.255.248
	Serial 0/0/1	10.1.12.2	255.255.255.248
	Fast Ethernet 0/0	10.2.130.2	255.255.255.0
	Loopback 2	10.2.2.2	255.255.255.0
	Loopback 200	10.20.0.1	255.255.255.0
	Loopback 201	10.20.1.1	255.255.255.0
	Loopback 202	10.20.2.1	255.255.255.0
	Loopback 203	10.20.3.1	255.255.255.0
Router 3	Serial 0/0/0	10.1.23.3	255.255.255.248
	Serial 0/0/1	192.168.34.1	255.255.255.252
	Serial 0/2/0 ☹	10.1.13.3	255.255.255.248
	Loopback 3	10.3.3.3	255.255.255.0
Router 10	Fast Ethernet 0/0	10.2.130.10	255.255.255.0
	Fast Ethernet 0/1	10.2.132.10	255.255.252.0
Router 11	Fast Ethernet 0/0	10.2.130.11	255.255.255.0
	Fast Ethernet 0/1	10.2.100.1	255.255.255.0
Router 14	Fast Ethernet 0/0	10.2.132.14	255.255.252.0
	Fast Ethernet 0/1	10.2.100.2	255.255.255.0
	Serial 0/0/0 ☹	10.2.129.14	255.255.255.252
Router 13	Serial 0/0/0	10.2.129.13	255.255.255.252
	Fast Ethernet 0/0	10.2.128.13	255.255.255.0
	Loopback 613	FC00::D:1/112	-

Travel Data Providers (TDP)			
Router 20	Serial 0/1 ☺	192.168.34.2	255.255.255.252
	Fast Ethernet 0/0	192.168.14.2	255.255.255.0
	Fast Ethernet 0/1	172.16.12.20	255.255.252.0
	Loopback 0	172.16.0.1	255.255.252.0
	Loopback 4	172.16.4.1	255.255.252.0
	Loopback 8	172.16.8.1	255.255.252.0
Router 21	Fast Ethernet 0/0	172.16.12.21	255.255.252.0
	Loopback 21	172.16.21.21	255.255.255.0

Table 1: IP Addresses

Functional Requirements

1. Routers R2, R10, R11, R13 and R14 should participate in OSPF
 - a. Router ID's should use the following format 192.168.100.# where # is the router number
 - b. R2, R10, R11 and R14 should be in Area 0 and advertise the following networks were appropriate. 10.2.100.0/24, 10.2.130.0/24, 10.2.132.0/22
 - c. Area 1 should be a totally stubby area. R14 and R13 should advertise network 10.2.129.12/30 in Area 1 and R13 should also advertise network 10.2.128.0/24
 - d. Area 1 should summarize networks going into Area 0
 - e. Set the DR and BDRs as following

	Network	DR	BDR
i	10.2.130.0/24	R10	R11
ii	10.2.132.0/22	R14	R10
iii	10.2.100.0/24	R11	R14

2. Routers R1, R2, R3 should participate in EIGRP with AS 65001 with no auto-summarization
 - a. All IPV4 loopback networks should be advertised
 - b. All directly connected networks should be advertised except s0/0/0 on R1 and F0/0 on R2.
3. Routers R20 and R21 should participate in EIGRP with AS 65002 with no auto-summarization
 - a. All connected networks and all loopbacks should be advertised
4. R1, R2, R3 should participate in IBGP with AS 65001
 - a. They should form a full mesh IBGP and peer on loopbacks
 - b. R2 should advertise network 10.0.0.0/8 for EBGp
5. R20 should have BGP with AS 65002.
 - a. R20 should neighbor with R1 and R20 should neighbor with R3 to create 2 EBGp links
 - b. R20 should advertise network 172.16.0.0/19
6. R2 should Redistribute EIGRP into OSPF
 - a. Use a route-map to make 192.168.0.0/16 to be E1 routes, all other routes should be redistributed normally
7. R2 should redistribute OSPF into EIGRP
 - a. Use a route-map to only redistribute 10.2.100.0/24
 - b. Create a static route to 10.2.128.0/21 and redistribute static routes

8. Static Routes

- a. R1 should have default static route to ISP and redistributed into EIGRP
- b. R1 should have a floating static route to prevent traffic destined to 10.0.0.0/8 from going out on the internet
- c. R21 should have default static route to R20
- d. R20 should have 2 floating static routes back to ITA and prefer Ethernet

9. R1 and R3 should use MED to prefer the Ethernet link to R20

10. R1 and R3 should use local preference to prefer Ethernet link back from R20

11. Should be a 6to4 tunnel between R1 and R13 to provide reachability between loop601 and loop613.

Implementation Analysis

1.

a. Set router ID's on all OSPF routers

```
R2(config-t)# router ospf 110
R2(config-router)# router-id 192.168.100.2

R10(config-t)# router ospf 110
R10(config-router)# router-id 192.168.100.10

R11(config-t)# router ospf 110
R11(config-router)# router-id 192.168.100.11

R13(config-t)# router ospf 110
R13(config-router)# router-id 192.168.100.13

R14(config-t)# router ospf 110
R14(config-router)# router-id 192.168.100.14
```

b. Add OSPF Area 0 networks

```
R2(config-router)# network 10.2.130.0 0.0.0.255 area 0

R10(config-router)# network 10.2.130.0 0.0.0.255 area 0
R10(config-router)# network 10.2.132.0 0.0.3.255 area 0

R11(config-router)# network 10.2.100.0 0.0.0.255 area 0
R11(config-router)# network 10.2.130.0 0.0.0.255 area 0

R14(config-router)# network 10.2.100.0 0.0.0.255 area 0
R14(config-router)# network 10.2.132.0 0.0.3.255 area 0
```

c. Add OSPF Area 1 networks and make it totally stubby

```
R14(config-router)# network 10.2.129.12 0.0.0.3 area 1
```

Make it totally stubby

```
R14(config-router)# area 1 stub no-summary
```

d. Summarize Area 1 into Area 0

```
R14(config-router)# area 1 range 10.2.128.0 255.255.254.0
```

e. **Add OSPF prioritizes to interfaces to select DR's and BDR's, use 10 for DR's and 5 for BDR's**

i. R10(config-t)# int fa0/0
R10(config-int)# ip ospf priority 10

R11(config-t)# int fa0/0
R11(config-int)# ip ospf priority 5

ii. R14(config-t)# int fa0/0
R14(config-int)# ip ospf priority 10

R10(config-t)# int fa0/1
R10(config-int)# ip ospf priority 5

iii. R11(config-t)# int fa0/1
R11(config-int)# ip ospf priority 10

R14(config-t)# int fa0/1
R14(config-int)# ip ospf priority 5

2. **Configure no auto summarization and AS 65001 on Routers R1, R2 and R3, configuration is the same so R# represents router number**

R#(config-t)# router eigrp 65001
R#(config-router)# no auto-summary

a. **Advertise loopbacks**

R1(config-router)# network 10.1.1.0 0.0.0.255
R2(config-router)# network 10.2.2.0 0.0.0.255
R2(config-router)# network 10.20.0.0 0.0.3.255
R3(config-router)# network 10.3.3.0 0.0.0.255

b. **Directly connected networks**

R1(config-router)# network 10.1.12.0 0.0.0.7
R1(config-router)# network 10.1.13.0 0.0.0.7
R1(config-router)# network 192.168.14.0

R2(config-router)# network 10.1.12.0 0.0.0.7
R2(config-router)# network 10.1.23.0 0.0.0.7

R3(config-router)# network 10.1.13.0 0.0.0.7

```
R3(config-router)# network 10.1.23.0 0.0.0.7
R3(config-router)# network 192.168.34.0 0.0.0.3
```

3. Configure no auto summarization and AS 65002 on R20 and R21

```
R#(config-t)# router eigrp 65002
R#(config-router)# no auto-summary
```

```
a. R20(config-router)# network 172.16.0.0 0.0.3.255
R20(config-router)# network 172.16.4.0 0.0.3.255
R20(config-router)# network 172.16.8.0 0.0.3.255
R20(config-router)# network 172.16.12.0 0.0.3.255
R20(config-router)# network 192.168.14.0
R20(config-router)# network 192.168.34.0 0.0.0.3
```

```
R21(config-router)# network 172.16.12.0 0.0.3.255
R21(config-router)# network 172.16.21.0 0.0.0.255
```

4. Configure IBGP with AS 65001 on R1, R2, R3

```
R#(config-t)# router bgp 65001
```

```
a. Full mesh and peer on loopbacks
R1(config-router)# neighbor 10.2.2.2 remote-as 65001
R1(config-router)# neighbor 10.2.2.2 update-source Loopback1

R1(config-router)# neighbor 10.2.2.2 next-hop-self
R1(config-router)# neighbor 10.3.3.3 remote-as 65001
R1(config-router)# neighbor 10.3.3.3 update-source Loopback1
R1(config-router)# neighbor 10.3.3.3 next-hop-self

R2(config-router)# neighbor 10.1.1.1 remote-as 65001
R2(config-router)# neighbor 10.1.1.1 update-source Loopback2

R2(config-router)# neighbor 10.1.1.1 next-hop-self
R2(config-router)# neighbor 10.3.3.3 remote-as 65001
R2(config-router)# neighbor 10.3.3.3 update-source Loopback2
R2(config-router)# neighbor 10.3.3.3 next-hop-self

R3(config-router)# neighbor 10.1.1.1 remote-as 65001
R3(config-router)# neighbor 10.1.1.1 update-source Loopback3

R3(config-router)# neighbor 10.1.1.1 next-hop-self
R3(config-router)# neighbor 10.2.2.2 remote-as 65001
```

```
R3(config-router)# neighbor 10.2.2.2 update-source Loopback3
R3(config-router)# neighbor 10.2.2.2 next-hop-self
```

b. R2(config-router)# aggregate-address 10.0.0.0 255.0.0.0 summary-only

5. Create EBGP Neighbors

```
R20(config-t)# router bgp 65002
```

a. R20(config-router)# neighbor 192.168.14.1 remote-as 65001
R20(config-router)# neighbor 192.168.34.1 remote-as 65001

```
R1(config-router)# neighbor 192.168.14.2 remote-as 65002
R3(config-router)# neighbor 192.168.34.2 remote-as 65002
```

b. R20(config-t)# ip route 172.16.0.0 255.255.224.0 Null0
R20(config-t)# router bgp 65002
R20(config-router)# network 172.16.0.0 mask 255.255.224.0

6. Redistribute EIGRP into OSPF

a. R2(config-t)# ip access-list standard ACL_E1
permit 192.168.0.0 0.0.255.255

```
R2(config-t)#route-map E1_Routes permit 10
match ip address ACL_E1
```

```
set metric-type type-1
```

```
R2(config-t)# route-map E1_Routes permit 20
```

```
R2(config-t)# router ospf 110
```

```
R2(config-router)# redistribute eigrp 65001 subnets route-map E1_Routes
```

7. Redistribute OSPF into EIGRP

a. R2(config-t)# ip access-list standard ACL_OSPF_Route
permit 10.2.100.0 0.0.0.255

```
R2(config-t)# route-map RM_OSPF_Routes permit 10
match ip address ACL_OSPF_Routes
```

```
R2(config-t)# router eigrp 65001
```

```
R2(config-router)# redistribute ospf 110 metric 10000 100 255 1 1500
route-map RM_OSPF_ROUTES
```

- b. R2(config-t)# ip route 10.2.128.0 255.255.248.0 Null0
R2(config-t)# router eigrp 65001
R2(config-router)# redistribute static

8. Static Routes

- a. R1(config-t)# ip route 0.0.0.0 0.0.0.0 24.1.1.2
R2(config-t)# router eigrp 65001
R2(config-router)# redistribute static
- b. R1(config-t)# ip route 10.0.0.0 255.0.0.0 Null0 250
- c. R21(config-t)# ip route 0.0.0.0 0.0.0.0 172.16.12.20
- d. R20(config-t)# ip route 0.0.0.0 0.0.0.0 192.168.14.1
R20(config-t)# ip route 0.0.0.0 0.0.0.0 Serial0/0/1 5

9. MED to prefer the Ethernet link to R20

```
R1(config-t)# route-map Pri_Med permit 10
set metric 50
R1(config-t)# router bgp 65001
R1(config-router)# neighbor 192.168.14.2 route-map Pri_Med out

R3(config-t)# route-map Sec_Med permit 10
set metric 100
R3(config-t)# router bgp 65001
R3(config-router)# neighbor 192.168.34.2 route-map Sec_Med out
```

10. Local Preference to prefer Ethernet link from R20

```
R1(config-t)# route-map Pri_Local permit 10
set local-preference 100
R1(config-t)# router bgp 65001
R1(config-router)# neighbor 192.168.14.2 route-map Pri_Local in

R3(config-t)# route-map Sec_Local permit 10
set local-preference 50
R3(config-t)# router bgp 65001
R3(config-router)# neighbor 192.168.34.2 route-map Sec_Local in
```

11. 6to4 Tunnel R1 to R13

```
R1(config-t)# interface Tunnel0
R1(config-int)# ipv6 address 2002:A01:C01::1/64
R1(config-int)# tunnel source Serial0/0/1
```

```
R1(config-int)# tunnel mode ipv6ip 6to4
```

```
R1(config-t)# ipv6 route 2002::/16 Tunnel0
```

```
R1(config-t)# ipv6 route FC00::/16 2002:A02:810C::C
```

```
R13(config-t)# interface Tunnel0
```

```
R13(config-int)# ipv6 address 2002:A02:810C::C/64
```

```
R13(config-int)# tunnel source Serial0/0/0
```

```
R13(config-int)# tunnel mode ipv6ip 6to4
```

```
R13(config-t)# ipv6 route 2002::/16 Tunnel0
```

```
R13(config-t)# ipv6 route FC00::/16 2002:A01:C01::1
```

User Acceptance Test Plan:

Tcl Script:

```
foreach address {  
1.1.1.1  
24.1.1.2  
24.1.1.1  
10.1.1.1  
10.1.12.1  
10.1.12.2  
10.1.13.1  
10.1.13.3  
192.168.14.1  
192.168.14.2  
192.168.34.1  
192.168.34.2  
172.16.0.1  
172.16.4.1  
172.16.8.1  
172.16.12.20  
172.16.12.21  
172.16.21.21  
10.3.3.3  
10.1.23.3  
10.1.23.2  
10.2.2.2  
10.20.0.1  
10.20.1.1  
10.20.2.1  
10.20.3.1  
10.2.130.2  
10.2.130.10  
10.2.132.10  
10.2.130.11  
10.2.100.1  
10.2.132.14  
10.2.100.2  
10.2.129.14  
10.2.129.13  
10.2.128.13  
FC00::1:1  
FC00::D:1  
}{  
ping $address }
```

NOTE: IPv6 addresses should be used on Router 1 and 13 to verify Tunnel.

Test Sequence/Router	Description	Specifics (Privileged mode cmd)	Expected Result	Sign off
Connectivity				
All Routers	All Routers should communicate to all other routers and Internet	Run TCL Script (given before)	Successful ping	
R21	Make sure R21 is able to communicate to Routers 13	Ping 10.2.128.13 source 172.16.21.21	Successful ping	
R21	Fastest path is chosen from R21 to R13	Trace route 10.2.128.13	Path taken R20 -> R1 -> R2 -> R11 -> R14 -> R13	
R21	Connection to Internet should be successful	Ping 1.1.1.1 source 172.16.21.21	Successful Ping	
R21	Fastest path is chosen from R21 to ISP	Trace route 1.1.1.1	Path taken R20 -> R1 -> ISP	
R21	Make sure R21 is able to communicate to R2's loopbacks	Ping 10.20.3.1 source 172.16.21.21	Successful Ping	
R21	Make sure R21 is able to communicate to R2 Loopback with R20's Fa0/0 shutdown	Ping 10.2.2.2 source 172.16.21.21	Successful ping	
R21	Fastest path is chosen from R21 to R2 Loopback with R20's Fa0/0 shutdown	Trace route 10.2.2.2	Path taken R20 -> R3 -> R2	
R13	Connection to Internet should be successful	Ping 1.1.1.1 source 10.2.128.13	Successful Ping	
R2	Make sure R2 is able to communicate to Routers 13	Ping 10.2.128.13 source 10.2.2.2	Successful ping	
R2	Make sure R2 is able to communicate to Routers 13	Ping 10.2.128.13 source 10.20.2.1	Successful ping	
R20	Make sure R20 is able to communicate to Routers 13	Ping 10.2.128.13 source 172.16.0.1	Successful ping	
R20	Make sure R20 is able to communicate to Routers 13	Ping 10.2.128.13 source 172.16.8.1	Successful ping	
IPv6				

R1	Make sure R1 is able to communicate to Routers 13 using IPv6 Tunnel	Ping ipv6 FC00::D:1 source FC00::1:1	Successful Ping	
R1	Verify route to R13 IPv6. 2002:A01:C01::1 is IPv4 of s0/0/1. Hence 6to4	Show ipv6 route	Should observe Local: 2002:A01:C01::1/128 [0/0] via Tunnel0, receive Static: FC00::/16 [1/0] via 2002:A02:810D::D	
R13	Make sure R13 is able to communicate to Routers 1 using IPv6 Tunnel	Ping ipv6 FC00::1:1 source FC00::D:1	Successful Ping	
R13	Verify route to R1 IPv6. 2002:A02:810D::D is IPv4 of s0/0/0. Hence 6to4	Show ipv6 route	Should observe Local: 2002:A02:810D::D/128 [0/0] via Tunnel0, receive Static: FC00::/16 [1/0] via 2002:A01:C01::1	
Router IDs				
R10 ID	Verify router ID for OSPF process	Show IP ospf	192.168.100.10	
R11 ID	Verify router ID for OSPF process	Show IP ospf	192.168.100.11	
R14 ID	Verify router ID for OSPF process	Show IP ospf	192.168.100.14	
R13 ID	Verify router ID for OSPF process	Show IP ospf	192.168.100.13	
R2 ID	Verify router ID for OSPF process	Show IP ospf	192.168.100.2	
OSPF				
R2, R10, R11, R14	Verify running protocol ospf	show ip ospf	Should observe all the mentioned routers in Area 0	
R13, R14	Verify running protocol ospf	show ip ospf	Should observe all the mentioned routers in Area 1	
R13, R14	Verify the type of OSPF area	show ip ospf	Should observe that Area 0 is Totally Stubby Area (TSA)	
R2, R10, R11	Verify Designated Router in 10.2.130.0/24 network	Show ip ospf neighbor	Should observe that R10 is the DR	

R2, R10, R11	Verify Backup Designated Router in 10.2.130.0/24 network	Show ip ospf neighbor	Should observe that R11 is the BDR	
R10, R14	Verify Designated Router in 10.2.132.0/22network	Show ip ospf neighbor	Should observe that R14 is the DR	
R10, R14	Verify Backup Designated Router in 10.2.132.0/22network	Show ip ospf neighbor	Should observe that R10 is the BDR	
R11, R14	Verify Designated Router in 10.2.100.0/24network	Show ip ospf neighbor	Should observe that R11 is the DR	
R11, R14	Verify Backup Designated Router in 10.2.100.0/24network	Show ip ospf neighbor	Should observe that R14 is the BDR	
R14	R14 should summarize Area 1 routes as a single route into Area 0, which is 10.2.128.0/23.	(config)#router ospf 110 (config-router)# area 1 range 10.2.128.0 255.255.254.0	#Show run should include area 1 range 10.2.128.0 255.255.254.0 in OSPF 110 process	
R2	R14 should summarize Area 1 routes as a single route into Area 0, which is 10.2.128.0/23.	Show ip route	Observe O IA 10.2.128.0/23 [110/783] via 10.2.130.11, Fa0/0 and [110/783] via 10.2.130.10, Fa0/0	
Static Routing				
R1	Verify static (null) discard route to prevent "blackholing"	Show ip route	Observe quad zero (null) route as S* 0.0.0.0/0 [1/0] via 24.1.1.2	
R20	Verify default route to ITA from TDP is using R1 Fa0/0 interface	Show ip route	Observe quad zero (null) route as S* 0.0.0.0/0 [1/0] via 192.168.14.1	
R20	Verify floating static (null) discard route configured on R1. Two routes to TDP should be seen for fa0/0 goes down	Show ip route	Should Observer two routes to 10.0.0.0/8 B 10.0.0.0/8 [20/50] via 192.168.14.1, 192.168.34.0/30 is subnetted, 1 subnets	
R2	Excluded loopbacks of "10.20" network. advertise static	Show ip route	Observe Static route as 10.20.0.0/22 is directly connected,	

	summary into BGP		Null0	
R20	Excluded loopbacks of "10.20" network. advertise static summary into BGP	Show ip route	Observe BGP route as B 10.0.0.0/8 [20/50] via 192.168.14.1	
Multi-Exit Discriminator (MED) Routing				
R1	Check the Primary MED named "Pri_Med" traffic through correct interf.	show ip bgp summary	Confirm in map metric is set to 50 while traffic goes to ITA And uses R1 Fa0/0 interface for traffic	
Local Preference				
R1	Check the local preference named "Pri_Local" traffic through correct interf.	show ip bgp summary	Confirm that local-preference is set to 100 while traffic goes to TDP And uses R1 Fa0/0 interf. for traffic	
Summary Routing				
R20	Check summary route to ITA representing all directly-connected "172" networks not detailed routes	show ip route	Should observe 172.16.0.0/16 is variably subnetted, 6 subnets, 3 masks	
R1	Check summary route to ITA representing all directly-connected "172" networks not detailed routes	show ip route	Should Observe B 172.16.0.0 [20/0] via 192.168.14.2	
EIGRP				
R14	Redistribute all EIGRP routes into OSPF and force "192.168" routes to be type E1.	show ip route	Observe OSPF route as O E1 192.168.14.0/24 [110/22] via 10.2.132.10, Fa0/0, [110/22] via 10.2.100.1, Fa0/1	

Table 2: Test Plan

Team Contributions:

Functional Requirements: Chris

Implementation Analysis: Chris

Topology diagram: Rocky

IP Address Table: Rocky

User Acceptance Test Plan: Rocky

Team Contributions: Chris

Final Documentation: Rocky

Configurations

```
ISP# sh run
Building configuration...

Current configuration : 1498 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname ISP
!
boot-start-marker
boot-end-marker
!
logging message-counter syslog
enable secret 5 $1$haKy$Tys58mGbG3Pb1fwsMlm9/.
!
no aaa new-model
memory-size iomem 10
!
dot11 syslog
ip source-route
!
!
ip cef
!
!
no ip domain lookup
ip host R13 10.2.129.13
ip host R14 10.2.100.2
ip host R11 10.2.130.11
ip host R10 10.2.130.10
ip host R2 10.1.1.2
ip host R3 10.1.13.3
ip host R20 192.168.14.2
ip host R21 172.16.12.21
ip host R1 24.1.1.1
no ipv6 cef
!
multilink bundle-name authenticated
!
!
voice-card 0
!
!
archive
 log config
  hidekeys
interface Loopback100
 ip address 1.1.1.1 255.0.0.0
!
interface FastEthernet0/0
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface FastEthernet0/1
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface Serial0/0/0
 bandwidth 128
 ip address 24.1.1.2 255.255.255.252
```

```

clock rate 128000
!
interface Serial0/0/1
no ip address
shutdown
clock rate 125000
!
ip forward-protocol nd
ip route 0.0.0.0 0.0.0.0 Serial0/0/0
no ip http server
no ip http secure-server
control-plane
banner motd ^CNo Unauthorized access!^C
!
line con 0
exec-timeout 15 0
password cisco
logging synchronous
login
line aux 0
line vty 0 4
exec-timeout 15 0
password cisco
logging synchronous
login
!
scheduler allocate 20000 1000
end

```

ISP#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

```

C    1.0.0.0/8 is directly connected, Loopback100
    24.0.0.0/30 is subnetted, 1 subnets
C      24.1.1.0 is directly connected, Serial0/0/0
S*   0.0.0.0/0 is directly connected, Serial0/0/0

```

R1# show run

Building configuration...

Current configuration : 2803 bytes

```

!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R1
!
boot-start-marker
boot-end-marker
!
logging message-counter syslog
enable secret 5 $1$UfME$JggbExcYnr5lg/eZyhOJr.
!
no aaa new-model
memory-size iomem 10
!
dot11 syslog

```

```

ip source-route
!
!
ip cef
!
!
no ip domain lookup
ip host R13 10.2.129.13
ip host R14 10.2.100.2
ip host R11 10.2.130.11
ip host R10 10.2.130.10
ip host R2 10.1.12.2
ip host R3 10.1.13.3
ip host R20 192.168.14.2
ip host R21 172.16.12.21
ip host ISP 24.1.1.2
ipv6 unicast-routing
ipv6 cef
!
multilink bundle-name authenticated
!
!
voice-card 0
!
!
archive
log config
hidekeys
!
!
!
interface Loopback1
ip address 10.1.1.1 255.255.255.0
!
interface Loopback601
no ip address
ipv6 address FC00::1:1/112
!
interface Tunnel0
no ip address
no ip redirects
ipv6 address 2002:A01:C01::1/64
tunnel source Serial0/0/1
tunnel mode ipv6ip 6to4
!
interface FastEthernet0/0
ip address 192.168.14.1 255.255.255.0
duplex auto
speed auto
!
interface FastEthernet0/1
no ip address
shutdown
duplex auto
speed auto
!
interface Serial0/0/0
bandwidth 128
ip address 24.1.1.1 255.255.255.252
no fair-queue
!
interface Serial0/0/1
bandwidth 128
ip address 10.1.12.1 255.255.255.248
clock rate 128000
!
interface BRI0/1/0
no ip address
encapsulation hdlc
shutdown

```

```

!
interface Serial0/2/0
bandwidth 128
ip address 10.1.13.1 255.255.255.248
!
interface Serial0/2/1
no ip address
shutdown
clock rate 125000
!
router eigrp 65001
redistribute static
network 10.1.1.0 0.0.0.255
network 10.1.12.0 0.0.0.7
network 10.1.13.0 0.0.0.7
network 192.168.14.0
no default-information out
no auto-summary
!
router bgp 65001
no synchronization
bgp log-neighbor-changes
neighbor 10.2.2.2 remote-as 65001
neighbor 10.2.2.2 update-source Loopback1
neighbor 10.2.2.2 next-hop-self
neighbor 10.3.3.3 remote-as 65001
neighbor 10.3.3.3 update-source Loopback1
neighbor 10.3.3.3 next-hop-self
neighbor 192.168.14.2 remote-as 65002
neighbor 192.168.14.2 route-map Pri_Local in
neighbor 192.168.14.2 route-map Pri_Med out
no auto-summary
!
ip forward-protocol nd
ip route 0.0.0.0 0.0.0.0 24.1.1.2
ip route 10.0.0.0 255.0.0.0 Null0 250
no ip http server
no ip http secure-server
ipv6 route 2002::/16 Tunnel0
ipv6 route FC00::/16 2002:A02:810C::C
!
route-map Pri_Med permit 10
set metric 50
!
route-map Pri_Local permit 10
set local-preference 100
control-plane
!
!
!
banner motd ^CNo Unauthorized access!^C
!
line con 0
exec-timeout 15 0
password cisco
logging synchronous
login
line aux 0
line vty 0 4
exec-timeout 15 0
password cisco
logging synchronous
login
!
scheduler allocate 20000 1000
end

```

R1#show ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
 D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
 N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
 E1 - OSPF external type 1, E2 - OSPF external type 2
 i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
 ia - IS-IS inter area, * - candidate default, U - per-user static route
 o - ODR, P - periodic downloaded static route

Gateway of last resort is 24.1.1.2 to network 0.0.0.0

```
C 192.168.14.0/24 is directly connected, FastEthernet0/0
  172.16.0.0/19 is subnetted, 1 subnets
B   172.16.0.0 [20/0] via 192.168.14.2, 00:50:00
  24.0.0.0/30 is subnetted, 1 subnets
C   24.1.1.0 is directly connected, Serial0/0/0
  10.0.0.0/8 is variably subnetted, 9 subnets, 5 masks
C   10.1.13.0/29 is directly connected, Serial0/2/0
C   10.1.12.0/29 is directly connected, Serial0/0/1
D   10.3.3.0/24 [90/20640000] via 10.1.13.3, 03:03:13, Serial0/2/0
D   10.2.2.0/24 [90/20640000] via 10.1.12.2, 03:03:14, Serial0/0/1
C   10.1.1.0/24 is directly connected, Loopback1
D EX 10.0.0.0/8 [170/20512000] via 10.1.12.2, 03:03:14, Serial0/0/1
D   10.1.23.0/29 [90/21024000] via 10.1.13.3, 03:03:14, Serial0/2/0
    [90/21024000] via 10.1.12.2, 03:03:14, Serial0/0/1
D   10.20.0.0/22 [90/20512000] via 10.1.12.2, 03:03:15, Serial0/0/1
D EX 10.2.128.0/21 [170/20512000] via 10.1.12.2, 03:03:15, Serial0/0/1
  192.168.34.0/30 is subnetted, 1 subnets
D   192.168.34.0 [90/21024000] via 10.1.13.3, 01:57:50, Serial0/2/0
S*  0.0.0.0/0 [1/0] via 24.1.1.2
```

R1#show ipv6 route

IPv6 Routing Table - Default - 7 entries

Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
 B - BGP, M - MIPv6, R - RIP, I1 - ISIS L1
 I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP
 EX - EIGRP external
 O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
 ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2

```
S 2002::/16 [1/0]
  via Tunnel0, directly connected
C 2002:A01:C01::/64 [0/0]
  via Tunnel0, directly connected
L 2002:A01:C01::1/128 [0/0]
  via Tunnel0, receive
S FC00::/16 [1/0]
  via 2002:A02:810C::C
C FC00::1:0/112 [0/0]
  via Loopback601, directly connected
L FC00::1:1/128 [0/0]
  via Loopback601, receive
L FF00::/8 [0/0]
  via Null0, receive
```

R2#sh run

Building configuration...

Current configuration : 3152 bytes

```
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R2
!
boot-start-marker
boot-end-marker
!
```

```

logging message-counter syslog
enable secret 5 $1$c6hO$OTuFwAZU.gpPF3JRYz28A.
!
no aaa new-model
memory-size iomem 10
!
dot11 syslog
ip source-route
!
!
ip cef
!
!
no ip domain lookup
ip host R13 10.2.129.13
ip host R14 10.2.132.14
ip host R11 10.2.130.11
ip host R10 10.2.130.10
ip host R1 10.1.1.1
ip host R3 10.1.23.3
ip host R20 192.168.34.2
ip host R21 172.16.12.21
ip host ISP 24.1.1.2
no ipv6 cef
!
multilink bundle-name authenticated
!
!
voice-card 0
!
!
vtp domain CISCO
vtp mode transparent
archive
log config
hidekeys
interface Loopback2
ip address 10.2.2.2 255.255.255.0
!
interface Loopback200
ip address 10.20.0.1 255.255.255.0
!
interface Loopback201
ip address 10.20.1.1 255.255.255.0
!
interface Loopback202
ip address 10.20.2.1 255.255.255.0
!
interface Loopback203
ip address 10.20.3.1 255.255.255.0
!
interface FastEthernet0/0
ip address 10.2.130.2 255.255.255.0
duplex auto
speed auto
!
interface FastEthernet0/1
no ip address
shutdown
duplex auto
speed auto
!
interface Serial0/0/0
bandwidth 128
ip address 10.1.23.2 255.255.255.248
ip summary-address eigrp 65001 10.20.0.0 255.255.252.0 5
no fair-queue
clock rate 128000
!
interface Serial0/0/1

```

```

bandwidth 128
ip address 10.1.12.2 255.255.255.248
ip summary-address eigrp 65001 10.20.0.0 255.255.252.0 5
!
router eigrp 65001
 redistribute static
 redistribute ospf 110 metric 10000 100 255 1 1500 route-map RM_OSPF_ROUTES
 network 10.1.12.0 0.0.0.7
 network 10.1.23.0 0.0.0.7
 network 10.2.2.0 0.0.0.255
 network 10.20.0.0 0.0.3.255
 no auto-summary
!
router ospf 110
 router-id 192.168.100.2
 log-adjacency-changes
 redistribute eigrp 65001 subnets route-map E1_Routes
 network 10.2.130.0 0.0.0.255 area 0
 default-information originate
!
router bgp 65001
 no synchronization
 bgp log-neighbor-changes
 network 10.2.2.0 mask 255.255.255.0
 aggregate-address 10.0.0.0 255.0.0.0 summary-only
 neighbor 10.1.1.1 remote-as 65001
 neighbor 10.1.1.1 update-source Loopback2
 neighbor 10.1.1.1 next-hop-self
 neighbor 10.3.3.3 remote-as 65001
 neighbor 10.3.3.3 update-source Loopback2
 neighbor 10.3.3.3 next-hop-self
 no auto-summary
!
ip forward-protocol nd
ip route 10.0.0.0 255.0.0.0 Null0
ip route 10.2.128.0 255.255.248.0 Null0
ip route 10.20.0.0 255.255.252.0 Null0
no ip http server
no ip http secure-server
ip access-list standard ACL_E1
 permit 192.168.0.0 0.0.255.255
ip access-list standard ACL_OSPF_Route
 permit 10.2.100.0 0.0.0.255
!
!
route-map E1_Routes permit 10
 match ip address ACL_E1
 set metric-type type-1
!
route-map E1_Routes permit 20
!
route-map RM_OSPF_Routes permit 10
 match ip address ACL_OSPF_Routes
 control-plane
 banner motd ^CNo Unauthorized access!^C
!
line con 0
 exec-timeout 15 0
 password cisco
 logging synchronous
 login
line aux 0
line vty 0 4
 exec-timeout 15 0
 password cisco
 logging synchronous
 login
!
scheduler allocate 20000 1000
end

```

R2#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2

ia - IS-IS inter area, * - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route

Gateway of last resort is 10.1.12.1 to network 0.0.0.0

```
D 192.168.14.0/24 [90/20514560] via 10.1.12.1, 01:31:01, Serial0/0/1
172.16.0.0/19 is subnetted, 1 subnets
B 172.16.0.0 [200/0] via 10.1.1.1, 00:26:52
10.0.0.0/8 is variably subnetted, 17 subnets, 6 masks
D 10.1.13.0/29 [90/21024000] via 10.1.23.3, 02:40:05, Serial0/0/0
[90/21024000] via 10.1.12.1, 02:40:05, Serial0/0/1
C 10.1.12.0/29 is directly connected, Serial0/0/1
D 10.3.3.0/24 [90/20640000] via 10.1.23.3, 02:40:04, Serial0/0/0
C 10.2.2.0/24 is directly connected, Loopback2
D 10.1.1.0/24 [90/20640000] via 10.1.12.1, 02:40:04, Serial0/0/1
S 10.0.0.0/8 is directly connected, Null0
C 10.20.2.0/24 is directly connected, Loopback202
C 10.1.23.0/29 is directly connected, Serial0/0/0
C 10.20.3.0/24 is directly connected, Loopback203
C 10.20.0.0/24 is directly connected, Loopback200
S 10.20.0.0/22 is directly connected, Null0
C 10.20.1.0/24 is directly connected, Loopback201
O 10.2.100.0/24 [110/2] via 10.2.130.11, 01:32:29, FastEthernet0/0
O IA 10.2.128.0/23 [110/783] via 10.2.130.11, 01:29:22, FastEthernet0/0
[110/783] via 10.2.130.10, 01:29:22, FastEthernet0/0
S 10.2.128.0/21 is directly connected, Null0
C 10.2.130.0/24 is directly connected, FastEthernet0/0
O 10.2.132.0/22 [110/2] via 10.2.130.10, 01:31:45, FastEthernet0/0
192.168.34.0/30 is subnetted, 1 subnets
D 192.168.34.0 [90/21024000] via 10.1.23.3, 01:34:40, Serial0/0/0
D*EX 0.0.0.0/0 [170/21024000] via 10.1.12.1, 02:30:06, Serial0/0/1
```

R2#sh ip bgp

BGP table version is 14, local router ID is 10.20.3.1

Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
r RIB-failure, S Stale

Origin codes: i - IGP, e - EGP, ? - incomplete

Network	Next Hop	Metric	LocPrf	Weight	Path
r> 10.0.0.0	0.0.0.0		32768	i	
s> 10.2.2.0/24	0.0.0.0	0	32768	i	
*>i172.16.0.0/19	10.1.1.1	0	100	0	65002 i

R2#sh ip bgp summary

BGP router identifier 10.20.3.1, local AS number 65001

BGP table version is 14, main routing table version 14

3 network entries using 396 bytes of memory

3 path entries using 156 bytes of memory

4/3 BGP path/bestpath attribute entries using 672 bytes of memory

1 BGP AS-PATH entries using 24 bytes of memory

0 BGP route-map cache entries using 0 bytes of memory

0 BGP filter-list cache entries using 0 bytes of memory

Bitfield cache entries: current 1 (at peak 1) using 32 bytes of memory

BGP using 1280 total bytes of memory

BGP activity 6/3 prefixes, 11/8 paths, scan interval 60 secs

Neighbor	V	AS MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
----------	---	------------	---------	--------	-----	------	---------	--------------

10.1.1.1	4	65001	125	124	14	0	0 01:59:55	1
10.3.3.3	4	65001	131	127	14	0	0 02:02:23	0
R2#								
R3# sh run Building configuration... Current configuration : 2325 bytes ! version 12.4 service timestamps debug datetime msec service timestamps log datetime msec no service password-encryption ! hostname R3 ! boot-start-marker boot-end-marker ! logging message-counter syslog enable secret 5 \$1\$Llj3\$0gnCC3RLF4Tb8kIP4xmDh1 ! no aaa new-model memory-size iomem 5 ! dot11 syslog ip source-route ! ! ip cef ! ! no ip domain lookup ip host R13 10.2.129.13 ip host R14 10.2.100.2 ip host R10 10.2.130.10 ip host R11 10.2.130.11 ip host R1 10.1.13.1 ip host R20 192.168.34.2 ip host R21 172.16.12.21 ip host ISP 24.1.1.2 ip host R2 10.1.23.2 no ipv6 cef ! multilink bundle-name authenticated ! ! voice-card 0 ! ! archive log config hidekeys interface Loopback3 ip address 10.3.3.3 255.255.255.0 ! interface FastEthernet0/0 no ip address shutdown duplex auto speed auto ! interface FastEthernet0/1 no ip address shutdown duplex auto speed auto ! interface Serial0/0/0								

```

bandwidth 128
ip address 10.1.23.3 255.255.255.248
no fair-queue
!
interface Serial0/0/1
bandwidth 128
ip address 192.168.34.1 255.255.255.252
!
interface Serial0/2/0
bandwidth 128
ip address 10.1.13.3 255.255.255.248
clock rate 128000
!
interface Serial0/2/1
no ip address
shutdown
clock rate 2000000
!
router eigrp 65001
network 10.1.13.0 0.0.0.7
network 10.1.23.0 0.0.0.7
network 10.3.3.0 0.0.0.255
network 192.168.34.0 0.0.0.3
no auto-summary
!
router bgp 65001
no synchronization
bgp log-neighbor-changes
neighbor 10.1.1.1 remote-as 65001
neighbor 10.1.1.1 update-source Loopback3
neighbor 10.1.1.1 next-hop-self
neighbor 10.2.2.2 remote-as 65001
neighbor 10.2.2.2 update-source Loopback3
neighbor 10.2.2.2 next-hop-self
neighbor 192.168.34.2 remote-as 65002
neighbor 192.168.34.2 route-map Sec_Local in
neighbor 192.168.34.2 route-map Sec_Med out
no auto-summary
!
ip forward-protocol nd
no ip http server
no ip http secure-server
!
route-map Sec_Med permit 10
set metric 100
!
route-map Sec_Local permit 10
set local-preference 50
control-plane
banner motd ^CNo Unauthorized access!^C
!
line con 0
exec-timeout 15 0
password cisco
logging synchronous
login
line aux 0
line vty 0 4
exec-timeout 15 0
password cisco
logging synchronous
login
!
scheduler allocate 20000 1000
end

R3#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP

```

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
 N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
 E1 - OSPF external type 1, E2 - OSPF external type 2
 i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
 ia - IS-IS inter area, * - candidate default, U - per-user static route
 o - ODR, P - periodic downloaded static route

Gateway of last resort is 10.1.13.1 to network 0.0.0.0

```
D 192.168.14.0/24 [90/20514560] via 10.1.13.1, 01:33:35, Serial0/2/0
  172.16.0.0/19 is subnetted, 1 subnets
B   172.16.0.0 [200/0] via 10.1.1.1, 00:29:26
  10.0.0.0/8 is variably subnetted, 9 subnets, 5 masks
C   10.1.13.0/29 is directly connected, Serial0/2/0
D   10.1.12.0/29 [90/21024000] via 10.1.23.2, 02:42:38, Serial0/0/0
    [90/21024000] via 10.1.13.1, 02:42:38, Serial0/2/0
C   10.3.3.0/24 is directly connected, Loopback3
D   10.2.2.0/24 [90/20640000] via 10.1.23.2, 02:42:38, Serial0/0/0
D   10.1.1.0/24 [90/20640000] via 10.1.13.1, 02:42:38, Serial0/2/0
D EX 10.0.0.0/8 [170/20512000] via 10.1.23.2, 02:42:38, Serial0/0/0
C   10.1.23.0/29 is directly connected, Serial0/0/0
D   10.20.0.0/22 [90/20512000] via 10.1.23.2, 02:42:38, Serial0/0/0
D EX 10.2.128.0/21 [170/20512000] via 10.1.23.2, 02:42:39, Serial0/0/0
  192.168.34.0/30 is subnetted, 1 subnets
C   192.168.34.0 is directly connected, Serial0/0/1
D*EX 0.0.0.0/0 [170/21024000] via 10.1.13.1, 02:32:39, Serial0/2/0
```

R3#sh ip bgp
 BGP table version is 15, local router ID is 10.3.3.3
 Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
 r RIB-failure, S Stale
 Origin codes: i - IGP, e - EGP, ? - incomplete

Network	Next Hop	Metric	LocPrf	Weight	Path
r>i10.0.0.0	10.2.2.2	0	100	0	i
*>i172.16.0.0/19	10.1.1.1	0	100	0	65002 i
*	192.168.34.2	0	50	0	65002 i

R3#sh ip bgp summary
 BGP router identifier 10.3.3.3, local AS number 65001
 BGP table version is 15, main routing table version 15
 2 network entries using 264 bytes of memory
 3 path entries using 156 bytes of memory
 5/2 BGP path/bestpath attribute entries using 840 bytes of memory
 1 BGP AS-PATH entries using 24 bytes of memory
 0 BGP route-map cache entries using 0 bytes of memory
 0 BGP filter-list cache entries using 0 bytes of memory
 Bitfield cache entries: current 1 (at peak 3) using 32 bytes of memory
 BGP using 1316 total bytes of memory
 BGP activity 5/3 prefixes, 9/6 paths, scan interval 60 secs

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
10.1.1.1	4	65001	129	135	15	0	0	02:04:45	1
10.2.2.2	4	65001	129	134	15	0	0	02:04:56	1
192.168.34.2	4	65002	138	136	15	0	0	01:33:45	1

R3#

R10# show run
 Building configuration...

Current configuration : 1655 bytes
 !
 version 12.4
 service timestamps debug datetime msec
 service timestamps log datetime msec

```

no service password-encryption
!
hostname R10
!
boot-start-marker
boot-end-marker
!
logging message-counter syslog
enable secret 5 $1$59D/$Of4tX71aAKvoHonIE3Y0z0
!
no aaa new-model
memory-size iomem 10
!
dot11 syslog
ip source-route
!
!
ip cef
!
!
no ip domain lookup
ip host R13 10.2.129.13
ip host R14 10.2.132.14
ip host R11 10.2.130.11
ip host R2 10.2.130.2
ip host R1 10.1.1.1
ip host R3 10.1.23.3
ip host R20 192.168.34.2
ip host R21 172.16.12.21
ip host ISP 24.1.1.2
no ipv6 cef
!
multilink bundle-name authenticated
!
!
voice-card 0
!
!
vtp domain CISCO
vtp mode transparent
vtp version 2
archive
log config
hidekeys
!
!
!
interface FastEthernet0/0
ip address 10.2.130.10 255.255.255.0
ip ospf priority 10
duplex auto
speed auto
!
interface FastEthernet0/1
ip address 10.2.132.10 255.255.252.0
ip ospf priority 5
duplex auto
speed auto
!
interface Serial0/0/0
no ip address
shutdown
no fair-queue
clock rate 125000
!
interface Serial0/0/1
no ip address
shutdown
clock rate 125000
!

```

```

router ospf 110
router-id 192.168.100.10
log-adjacency-changes
network 10.2.130.0 0.0.0.255 area 0
network 10.2.132.0 0.0.3.255 area 0
!
ip forward-protocol nd
no ip http server
no ip http secure-server
control-plane
banner motd ^CNo Unauthorized access!^C
!
line con 0
exec-timeout 15 0
password cisco
logging synchronous
login
line aux 0
line vty 0 4
exec-timeout 15 0
password cisco
logging synchronous
login
!
scheduler allocate 20000 1000
end

```

R10#show ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is 10.2.130.2 to network 0.0.0.0

```

O E1 192.168.14.0/24 [110/21] via 10.2.130.2, 01:31:59, FastEthernet0/0
    10.0.0.0/8 is variably subnetted, 15 subnets, 4 masks
O E2 10.1.13.0/29 [110/20] via 10.2.130.2, 01:34:02, FastEthernet0/0
O E2 10.1.12.0/29 [110/20] via 10.2.130.2, 01:34:02, FastEthernet0/0
O E2 10.3.3.0/24 [110/20] via 10.2.130.2, 01:34:02, FastEthernet0/0
O E2 10.2.2.0/24 [110/20] via 10.2.130.2, 01:34:02, FastEthernet0/0
O E2 10.1.1.0/24 [110/20] via 10.2.130.2, 01:34:02, FastEthernet0/0
O E2 10.20.2.0/24 [110/20] via 10.2.130.2, 01:34:02, FastEthernet0/0
O E2 10.1.23.0/29 [110/20] via 10.2.130.2, 01:34:02, FastEthernet0/0
O E2 10.20.3.0/24 [110/20] via 10.2.130.2, 01:34:02, FastEthernet0/0
O E2 10.20.0.0/24 [110/20] via 10.2.130.2, 01:34:02, FastEthernet0/0
O E2 10.20.0.0/22 [110/20] via 10.2.130.2, 01:34:02, FastEthernet0/0
O E2 10.20.1.0/24 [110/20] via 10.2.130.2, 01:34:02, FastEthernet0/0
O 10.2.100.0/24 [110/2] via 10.2.132.14, 01:32:45, FastEthernet0/1
    [110/2] via 10.2.130.11, 01:33:30, FastEthernet0/0
O IA 10.2.128.0/23 [110/782] via 10.2.132.14, 01:30:23, FastEthernet0/1
C 10.2.130.0/24 is directly connected, FastEthernet0/0
C 10.2.132.0/22 is directly connected, FastEthernet0/1
    192.168.34.0/30 is subnetted, 1 subnets
O E1 192.168.34.0 [110/21] via 10.2.130.2, 01:34:05, FastEthernet0/0
O*E2 0.0.0.0/0 [110/1] via 10.2.130.2, 01:16:04, FastEthernet0/0
R10#

```

R11# show run

Building configuration...

Current configuration : 1639 bytes

!
version 12.4

```

service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R11
!
boot-start-marker
boot-end-marker
!
logging message-counter syslog
enable secret 5 $1$91ba$yrd/AtqBrmZtUJjeicRk81
!
no aaa new-model
memory-size iomem 10
!
dot11 syslog
ip source-route
!
!
ip cef
!
!
no ip domain lookup
ip host R13 10.2.129.13
ip host R14 10.2.100.2
ip host R10 10.2.130.10
ip host R2 10.2.130.2
ip host R1 10.1.1.1
ip host R3 10.1.23.3
ip host R20 192.168.34.2
ip host R21 172.16.12.21
ip host ISP 24.1.1.2
no ipv6 cef
!
multilink bundle-name authenticated
!
!
voice-card 0
!
!
vtp domain CISCO
vtp mode transparent
archive
log config
hidekeys
!
!
!
interface FastEthernet0/0
ip address 10.2.130.11 255.255.255.0
ip ospf priority 5
duplex auto
speed auto
!
interface FastEthernet0/1
ip address 10.2.100.1 255.255.255.0
ip ospf priority 10
duplex auto
speed auto
!
interface Serial0/0/0
no ip address
shutdown
no fair-queue
clock rate 125000
!
interface Serial0/0/1
no ip address
shutdown
clock rate 125000

```

```

!
router ospf 110
router-id 192.168.100.11
log-adjacency-changes
network 10.2.100.0 0.0.0.255 area 0
network 10.2.130.0 0.0.0.255 area 0
!
ip forward-protocol nd
no ip http server
no ip http secure-server
!
!
!
control-plane
banner motd ^CNo Unauthorized access!^C
!
line con 0
exec-timeout 15 0
password cisco
logging synchronous
login
line aux 0
line vty 0 4
exec-timeout 15 0
password cisco
logging synchronous
login
!
scheduler allocate 20000 1000
end

```

R11#show ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
 D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
 N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
 E1 - OSPF external type 1, E2 - OSPF external type 2
 i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
 ia - IS-IS inter area, * - candidate default, U - per-user static route
 o - ODR, P - periodic downloaded static route

Gateway of last resort is 10.2.130.2 to network 0.0.0.0

```

O E1 192.168.14.0/24 [110/21] via 10.2.130.2, 01:34:43, FastEthernet0/0
    10.0.0.0/8 is variably subnetted, 15 subnets, 4 masks
O E2 10.1.13.0/29 [110/20] via 10.2.130.2, 01:36:46, FastEthernet0/0
O E2 10.1.12.0/29 [110/20] via 10.2.130.2, 01:36:46, FastEthernet0/0
O E2 10.3.3.0/24 [110/20] via 10.2.130.2, 01:36:46, FastEthernet0/0
O E2 10.2.2.0/24 [110/20] via 10.2.130.2, 01:36:46, FastEthernet0/0
O E2 10.1.1.0/24 [110/20] via 10.2.130.2, 01:36:46, FastEthernet0/0
O E2 10.20.2.0/24 [110/20] via 10.2.130.2, 01:36:46, FastEthernet0/0
O E2 10.1.23.0/29 [110/20] via 10.2.130.2, 01:36:46, FastEthernet0/0
O E2 10.20.3.0/24 [110/20] via 10.2.130.2, 01:36:46, FastEthernet0/0
O E2 10.20.0.0/24 [110/20] via 10.2.130.2, 01:36:46, FastEthernet0/0
O E2 10.20.0.0/22 [110/20] via 10.2.130.2, 01:36:46, FastEthernet0/0
O E2 10.20.1.0/24 [110/20] via 10.2.130.2, 01:36:46, FastEthernet0/0
C 10.2.100.0/24 is directly connected, FastEthernet0/1
O IA 10.2.128.0/23 [110/782] via 10.2.100.2, 01:33:05, FastEthernet0/1
C 10.2.130.0/24 is directly connected, FastEthernet0/0
O 10.2.132.0/22 [110/2] via 10.2.130.10, 01:35:28, FastEthernet0/0
    [110/2] via 10.2.100.2, 01:35:18, FastEthernet0/1
    192.168.34.0/30 is subnetted, 1 subnets
O E1 192.168.34.0 [110/21] via 10.2.130.2, 01:36:48, FastEthernet0/0
O*E2 0.0.0.0/0 [110/1] via 10.2.130.2, 01:18:46, FastEthernet0/0
R11#

```

R13#sh run

Building configuration...

```

Current configuration : 2003 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R13
!C::C
boot-start-marker
boot-end-marker
!
logging message-counter syslog
enable secret 5 $1$Jiq6$Qb0ez1kkOaGLLXkjd2Xh.
!
no aaa new-model
memory-size iomem 10
!
dot11 syslog
ip source-route
!
!
!
ip cef
!
!
!
no ip domain lookup
ip host R21 172.16.12.21
ip host ISP 24.1.1.2
ip host R14 10.2.129.14
ip host R10 10.2.132.10
ip host R11 10.2.100.1
ip host R2 10.2.130.2
ip host R1 10.1.1.1
ip host R3 10.1.23.3
ip host R20 192.168.34.2
ipv6 unicast-routing
ipv6 cef
!
multilink bundle-name authenticated
!
!
voice-card 0
!
!
!
vtp domain CISCO
vtp mode transparent
archive
log config
hidekeys
interface Loopback613
no ip address
ipv6 address FC00::D:1/112
!
interface Loopback614
ip address 10.2.128.13 255.255.255.0
ip ospf network point-to-point
!
interface Tunnel0
no ip address
no ip redirects
ipv6 address 2002:A02:810C::C/64
tunnel source Serial0/0/0
tunnel mode ipv6ip 6to4
!
interface FastEthernet0/0
no ip address
shutdown
duplex auto
speed auto

```

```

!
interface FastEthernet0/1
no ip address
shutdown
duplex auto
speed auto
!
interface Serial0/0/0
bandwidth 128
ip address 10.2.129.13 255.255.255.252
!
interface Serial0/0/1
no ip address
shutdown
clock rate 2000000
!
router ospf 110
router-id 192.168.100.13
log-adjacency-changes
area 1 stub
network 10.2.128.0 0.0.0.255 area 1
network 10.2.129.12 0.0.0.3 area 1
!
ip forward-protocol nd
no ip http server
no ip http secure-server
ipv6 route 2002::/16 Tunnel0
ipv6 route FC00::/16 2002:A01:C01::1
control-plane
voice-port 0/1/0
!
voice-port 0/1/1
!
banner motd ^CNo Unauthorized access!^C
!
line con 0
exec-timeout 15 0
password cisco
logging synchronous
login
line aux 0
line vty 0 4
exec-timeout 15 0
password cisco
logging synchronous
login
!
scheduler allocate 20000 1000
end

```

R13#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, * - candidate default, U - per-user static route
o - ODR, P - periodic downloaded static route

Gateway of last resort is 10.2.129.14 to network 0.0.0.0

```

10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C    10.2.129.12/30 is directly connected, Serial0/0/0
C    10.2.128.0/24 is directly connected, Loopback614
O*IA 0.0.0.0/0 [110/782] via 10.2.129.14, 01:48:30, Serial0/0/0

```

```

R13#sh ipv6 route
IPv6 Routing Table - Default - 7 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, M - MIPv6, R - RIP, I1 - ISIS L1
       I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP
       EX - EIGRP external
       O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
S 2002::/16 [1/0]
  via Tunnel0, directly connected
C 2002:A02:810D::/64 [0/0]
  via Tunnel0, directly connected
L 2002:A02:810C::C/128 [0/0]
  via Tunnel0, receive
S FC00::/16 [1/0]
  via 2002:A01:C01::1
C FC00::D:0/112 [0/0]
  via Loopback613, directly connected
L FC00::D:1/128 [0/0]
  via Loopback613, receive
L FF00::/8 [0/0]
  via Null0, receive
R13#

```

```

R14# show run
Building configuration...

Current configuration : 1695 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R14
!
boot-start-marker
boot-end-marker
!
logging message-counter syslog
enable secret 5 $1$seL$sahKAdoxiDc6tz4R.5QwB.
!
no aaa new-model
memory-size iomem 10
!
dot11 syslog
ip source-route
!
!
ip cef
!
!
no ip domain lookup
ip host R13 10.2.129.13
ip host R10 10.2.132.10
ip host R11 10.2.100.1
ip host R2 10.2.130.2
ip host R1 10.1.1.1
ip host R3 10.1.23.3
ip host R20 192.168.34.2
ip host R21 172.16.12.21
ip host ISP 24.1.1.2
no ipv6 cef
!
multilink bundle-name authenticated
!
!
voice-card 0
!

```

```

!
archive
 log config
  hidekeys
!
!
!
interface FastEthernet0/0
 ip address 10.2.132.14 255.255.252.0
 ip ospf priority 10
 duplex auto
 speed auto
!
interface FastEthernet0/1
 ip address 10.2.100.2 255.255.255.0
 duplex auto
 speed auto
!
interface Serial0/0/0
 bandwidth 128
 ip address 10.2.129.14 255.255.255.252
 clock rate 128000
!
interface Serial0/0/1
 no ip address
 shutdown
 clock rate 125000
!
router ospf 110
 router-id 192.168.100.14
 log-adjacency-changes
 area 1 stub no-summary
 area 1 range 10.2.128.0 255.255.254.0
 network 10.2.100.0 0.0.0.255 area 0
 network 10.2.129.12 0.0.0.3 area 1
 network 10.2.132.0 0.0.3.255 area 0
!
ip forward-protocol nd
no ip http server
no ip http secure-server
!
!
!
control-plane
banner motd ^CNo Unauthorized access!^C
!
line con 0
 exec-timeout 15 0
 password cisco
 logging synchronous
 login
line aux 0
line vty 0 4
 exec-timeout 15 0
 password cisco
 logging synchronous
 login
!
scheduler allocate 20000 1000
end

```

R14#show ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
 D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
 N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
 E1 - OSPF external type 1, E2 - OSPF external type 2
 i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
 ia - IS-IS inter area, * - candidate default, U - per-user static route

o - ODR, P - periodic downloaded static route

Gateway of last resort is 10.2.132.10 to network 0.0.0.0

```
O E1 192.168.14.0/24 [110/22] via 10.2.132.10, 01:34:03, FastEthernet0/0
    [110/22] via 10.2.100.1, 01:34:03, FastEthernet0/1
    10.0.0.0/8 is variably subnetted, 17 subnets, 5 masks
O E2 10.1.13.0/29 [110/20] via 10.2.132.10, 01:34:03, FastEthernet0/0
    [110/20] via 10.2.100.1, 01:34:03, FastEthernet0/1
O E2 10.1.12.0/29 [110/20] via 10.2.132.10, 01:34:03, FastEthernet0/0
    [110/20] via 10.2.100.1, 01:34:03, FastEthernet0/1
O E2 10.3.3.0/24 [110/20] via 10.2.132.10, 01:34:03, FastEthernet0/0
    [110/20] via 10.2.100.1, 01:34:03, FastEthernet0/1
O E2 10.2.2.0/24 [110/20] via 10.2.132.10, 01:34:03, FastEthernet0/0
    [110/20] via 10.2.100.1, 01:34:03, FastEthernet0/1
O E2 10.1.1.0/24 [110/20] via 10.2.132.10, 01:34:03, FastEthernet0/0
    [110/20] via 10.2.100.1, 01:34:03, FastEthernet0/1
O E2 10.20.2.0/24 [110/20] via 10.2.132.10, 01:34:05, FastEthernet0/0
    [110/20] via 10.2.100.1, 01:34:05, FastEthernet0/1
O E2 10.1.23.0/29 [110/20] via 10.2.132.10, 01:34:05, FastEthernet0/0
    [110/20] via 10.2.100.1, 01:34:05, FastEthernet0/1
O E2 10.20.3.0/24 [110/20] via 10.2.132.10, 01:34:05, FastEthernet0/0
    [110/20] via 10.2.100.1, 01:34:05, FastEthernet0/1
O E2 10.20.0.0/24 [110/20] via 10.2.132.10, 01:34:05, FastEthernet0/0
    [110/20] via 10.2.100.1, 01:34:05, FastEthernet0/1
O E2 10.20.0.0/22 [110/20] via 10.2.132.10, 01:34:05, FastEthernet0/0
    [110/20] via 10.2.100.1, 01:34:05, FastEthernet0/1
O E2 10.20.1.0/24 [110/20] via 10.2.132.10, 01:34:05, FastEthernet0/0
    [110/20] via 10.2.100.1, 01:34:05, FastEthernet0/1
C 10.2.100.0/24 is directly connected, FastEthernet0/1
C 10.2.129.12/30 is directly connected, Serial0/0/0
O 10.2.128.0/24 [110/782] via 10.2.129.13, 01:30:02, Serial0/0/0
O 10.2.128.0/23 is a summary, 01:34:00, Null0
O 10.2.130.0/24 [110/2] via 10.2.132.10, 01:34:05, FastEthernet0/0
    [110/2] via 10.2.100.1, 01:34:05, FastEthernet0/1
C 10.2.132.0/22 is directly connected, FastEthernet0/0
    192.168.34.0/30 is subnetted, 1 subnets
O E1 192.168.34.0 [110/22] via 10.2.132.10, 01:34:05, FastEthernet0/0
    [110/22] via 10.2.100.1, 01:34:05, FastEthernet0/1
O*E2 0.0.0.0/0 [110/1] via 10.2.132.10, 01:19:40, FastEthernet0/0
    [110/1] via 10.2.100.1, 01:19:40, FastEthernet0/1
```

R14#sh ip ospf database

OSPF Router with ID (192.168.100.14) (Process ID 110)

Router Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
192.168.100.2	192.168.100.2	62	0x80000009	0x0089D6	1
192.168.100.10	192.168.100.10	1859	0x80000010	0x007F7A	2
192.168.100.11	192.168.100.11	1903	0x80000012	0x00C189	2
192.168.100.14	192.168.100.14	1845	0x80000017	0x009B97	2

Net Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum
10.2.100.1	192.168.100.11	1903	0x80000003	0x002811
10.2.130.10	192.168.100.10	1365	0x80000009	0x001924
10.2.132.14	192.168.100.14	1845	0x80000003	0x000904

Summary Net Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum
10.2.128.0	192.168.100.14	1845	0x80000003	0x00DEE4

Router Link States (Area 1)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
192.168.100.13	192.168.100.13	1393	0x8000000F	0x00D2C5	3

192.168.100.14 192.168.100.14 1592 0x8000000E 0x0045EE 2

Summary Net Link States (Area 1)

Link ID	ADV Router	Age	Seq#	Checksum
0.0.0.0	192.168.100.14	1848	0x80000003	0x008ED1

Type-5 AS External Link States

Link ID	ADV Router	Age	Seq#	Checksum	Tag
0.0.0.0	192.168.100.2	842	0x80000003	0x001261	110
10.1.1.0	192.168.100.2	64	0x80000006	0x006D52	0
10.1.12.0	192.168.100.2	64	0x80000006	0x00C9F1	0
10.1.13.0	192.168.100.2	64	0x80000006	0x00BEFB	0
10.1.23.0	192.168.100.2	64	0x80000006	0x005060	0
10.2.2.0	192.168.100.2	64	0x80000006	0x005667	0
10.3.3.0	192.168.100.2	1853	0x80000005	0x00417B	0
10.20.0.0	192.168.100.2	64	0x80000007	0x00822D	0
10.20.0.255	192.168.100.2	64	0x80000006	0x00931A	0
10.20.1.0	192.168.100.2	64	0x80000006	0x008824	0
10.20.2.0	192.168.100.2	67	0x80000006	0x007D2E	0
10.20.3.0	192.168.100.2	67	0x80000006	0x007238	0
192.168.14.0	192.168.100.2	1855	0x80000003	0x003D9A	0
192.168.34.0	192.168.100.2	67	0x80000004	0x004C79	0

R14#

R20#sh run

Building configuration...

Current configuration : 2182 bytes

!

version 12.4

service timestamps debug datetime msec

service timestamps log datetime msec

no service password-encryption

!

hostname R20

!

boot-start-marker

boot-end-marker

!

logging message-counter syslog

enable secret 5 \$1\$ILM/\$BMJNXaSI2hlxloviRlfoZ1

!

no aaa new-model

memory-size iomem 10

!

dot11 syslog

ip source-route

!

!

ip cef

!

!

no ip domain lookup

ip host R13 10.2.129.13

ip host R14 10.2.100.2

ip host R10 10.2.130.10

ip host R11 10.2.130.11

ip host R2 10.2.23.2

ip host R1 10.1.13.1

ip host R3 192.168.34.1

ip host R21 172.16.12.21

ip host ISP 24.1.1.2

no ipv6 cef

!

multilink bundle-name authenticated

!

!

```

voice-card 0
!
!
vtp domain CISCO
vtp mode transparent
archive
log config
hidekeys
interface Loopback0
ip address 172.16.0.1 255.255.252.0
!
interface Loopback4
ip address 172.16.4.1 255.255.252.0
!
interface Loopback8
ip address 172.16.8.1 255.255.252.0
!
interface FastEthernet0/0
ip address 192.168.14.2 255.255.255.0
duplex auto
speed auto
!
interface FastEthernet0/1
ip address 172.16.12.20 255.255.252.0
duplex auto
speed auto
!
interface Serial0/0/0
no ip address
shutdown
clock rate 125000
!
interface Serial0/0/1
bandwidth 128
ip address 192.168.34.2 255.255.255.252
clock rate 128000
!
router eigrp 65002
network 172.16.0.0 0.0.3.255
network 172.16.4.0 0.0.3.255
network 172.16.8.0 0.0.3.255
network 172.16.12.0 0.0.3.255
network 192.168.14.0
network 192.168.34.0 0.0.0.3
no auto-summary
!
router bgp 65002
no synchronization
bgp log-neighbor-changes
network 172.16.0.0 mask 255.255.224.0
neighbor 192.168.14.1 remote-as 65001
neighbor 192.168.34.1 remote-as 65001
no auto-summary
!
ip forward-protocol nd
ip route 0.0.0.0 0.0.0.0 192.168.14.1
ip route 0.0.0.0 0.0.0.0 Serial0/0/1 5
ip route 172.16.0.0 255.255.224.0 Null0
no ip http server
no ip http secure-server
control-plane
banner motd ^CNo Unauthorized access!^C
!
line con 0
exec-timeout 15 0
password cisco
logging synchronous
login
line aux 0
line vty 0 4

```

```

exec-timeout 15 0
password cisco
logging synchronous
login
!
scheduler allocate 20000 1000
end

```

R20#sh ip route

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
 D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
 N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
 E1 - OSPF external type 1, E2 - OSPF external type 2
 i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
 ia - IS-IS inter area, * - candidate default, U - per-user static route
 o - ODR, P - periodic downloaded static route

Gateway of last resort is 192.168.14.1 to network 0.0.0.0

```

C   192.168.14.0/24 is directly connected, FastEthernet0/0
    172.16.0.0/16 is variably subnetted, 6 subnets, 3 masks
D   172.16.21.0/24 [90/156160] via 172.16.12.21, 00:39:31, FastEthernet0/1
C   172.16.12.0/22 is directly connected, FastEthernet0/1
C   172.16.8.0/22 is directly connected, Loopback8
C   172.16.4.0/22 is directly connected, Loopback4
C   172.16.0.0/22 is directly connected, Loopback0
S   172.16.0.0/19 is directly connected, Null0
B   10.0.0.0/8 [20/50] via 192.168.14.1, 01:34:51
    192.168.34.0/30 is subnetted, 1 subnets
C   192.168.34.0 is directly connected, Serial0/0/1
S*  0.0.0.0/0 [1/0] via 192.168.14.1

```

R20#sh ip bgp

BGP table version is 15, local router ID is 172.16.8.1
 Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
 r RIB-failure, S Stale
 Origin codes: i - IGP, e - EGP, ? - incomplete

Network	Next Hop	Metric	LocPrf	Weight	Path
* 10.0.0.0	192.168.34.1	100	0	65001	i
*> 192.168.14.1		50	0	65001	i
*> 172.16.0.0/19	0.0.0.0	0	32768		i

R20#sh ip bgp summary

BGP router identifier 172.16.8.1, local AS number 65002
 BGP table version is 15, main routing table version 15
 2 network entries using 264 bytes of memory
 3 path entries using 156 bytes of memory
 4/2 BGP path/bestpath attribute entries using 672 bytes of memory
 1 BGP AS-PATH entries using 24 bytes of memory
 0 BGP route-map cache entries using 0 bytes of memory
 0 BGP filter-list cache entries using 0 bytes of memory
 Bitfield cache entries: current 1 (at peak 3) using 32 bytes of memory
 BGP using 1148 total bytes of memory
 BGP activity 5/3 prefixes, 6/3 paths, scan interval 60 secs

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ	OutQ	Up/Down	State/PfxRcd
192.168.14.1	4	65001	98	101	15	0	0	01:35:01	1
192.168.34.1	4	65001	105	105	15	0	0	01:35:01	1

R20#

R21#sh run

Building configuration...

```

Current configuration : 1824 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R21
!
boot-start-marker
boot-end-marker
!
logging message-counter syslog
enable secret 5 $1$YwB6$B6xJuRFCeX0Px4QBg04P51
!
no aaa new-model
memory-size iomem 10
!
dot11 syslog
ip source-route
!
!
!
ip cef
!
!
!
no ip domain lookup
ip host R13 10.2.129.13
ip host R14 10.2.100.2
ip host R10 10.2.130.10
ip host R11 10.2.130.11
ip host R2 10.2.23.2
ip host R1 10.1.13.1
ip host R3 192.168.34.1
ip host R20 172.16.12.20
ip host ISP 24.1.1.2
no ipv6 cef
!
multilink bundle-name authenticated
!
!
voice-card 0
!
!
vtp domain CISCO
vtp mode transparent
archive
log config
hidekeys
interface Loopback21
ip address 172.16.21.21 255.255.255.0
!
interface FastEthernet0/0
ip address 172.16.12.21 255.255.252.0
duplex auto
speed auto
!
interface FastEthernet0/1
no ip address
shutdown
duplex auto
speed auto
!
interface Serial0/0/0
no ip address
shutdown
no fair-queue
clock rate 2000000
!
interface Serial0/0/1

```

```

no ip address
shutdown
clock rate 2000000
!
interface Serial0/2/0
no ip address
shutdown
clock rate 125000
!
interface Serial0/2/1
no ip address
shutdown
clock rate 125000
!
router eigrp 65002
network 172.16.12.0 0.0.3.255
network 172.16.21.0 0.0.0.255
no auto-summary
!
ip forward-protocol nd
ip route 0.0.0.0 0.0.0.0 172.16.12.20
no ip http server
no ip http secure-server
control-plane
voice-port 0/1/0
!
voice-port 0/1/1
!
banner motd ^CNo Unauthorized access!^C
!
line con 0
exec-timeout 15 0
password cisco
logging synchronous
login
line aux 0
line vty 0 4
exec-timeout 15 0
password cisco
logging synchronous
login
!
scheduler allocate 20000 1000
end
R21#
R21#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is 172.16.12.20 to network 0.0.0.0

D   192.168.14.0/24 [90/30720] via 172.16.12.20, 00:40:55, FastEthernet0/0
    172.16.0.0/16 is variably subnetted, 6 subnets, 3 masks
C   172.16.21.0/24 is directly connected, Loopback21
C   172.16.12.0/22 is directly connected, FastEthernet0/0
D   172.16.8.0/22 [90/156160] via 172.16.12.20, 00:40:55, FastEthernet0/0
D   172.16.4.0/22 [90/156160] via 172.16.12.20, 00:40:55, FastEthernet0/0
D   172.16.0.0/22 [90/156160] via 172.16.12.20, 00:40:55, FastEthernet0/0
D   172.16.0.0/19 [90/28160] via 172.16.12.20, 00:40:55, FastEthernet0/0
    192.168.34.0/30 is subnetted, 1 subnets
D   192.168.34.0 [90/20514560] via 172.16.12.20, 00:40:55, FastEthernet0/0
S*  0.0.0.0/0 [1/0] via 172.16.12.20

R21#sh ip protocols

```

Routing Protocol is "eigrp 65002"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Default networks flagged in outgoing updates
Default networks accepted from incoming updates
EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
EIGRP maximum hopcount 100
EIGRP maximum metric variance 1
Redistributing: eigrp 65002
EIGRP NSF-aware route hold timer is 240s
Automatic network summarization is not in effect
Maximum path: 4
Routing for Networks:
 172.16.12.0/22
 172.16.21.0/24
Routing Information Sources:
 Gateway Distance Last Update
 172.16.12.20 90 00:41:40
Distance: internal 90 external 170