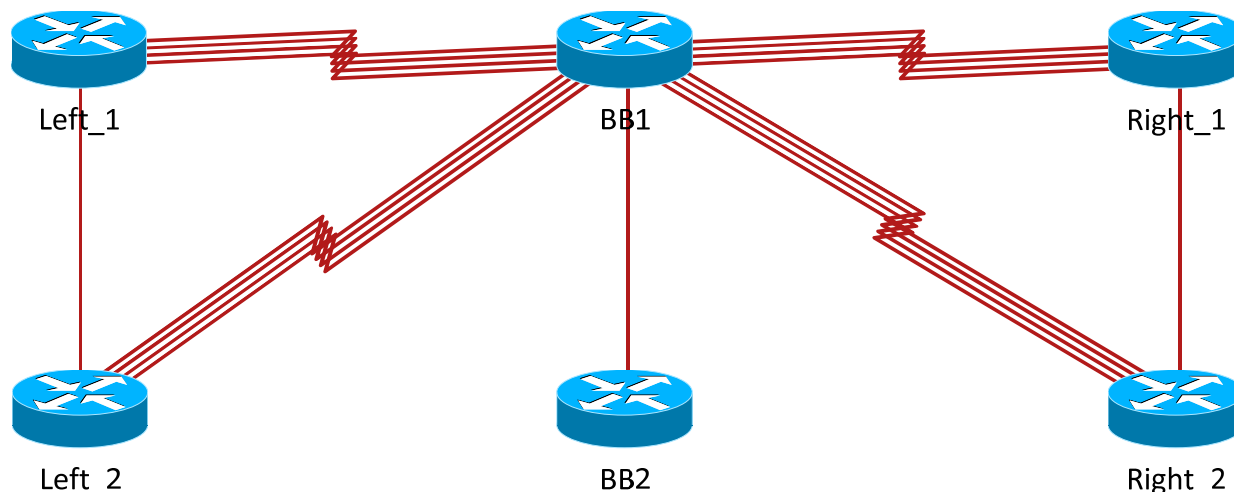


EIGRP Lab



Ip addressing scheme

Local Router	Local Interface	Ip Address	Remote Router	Remote Interface
Left_1	Fa 0/0	172.16.0.1/24	Left_2	Fa 0/0
	Lo 1	192.168.0.1/26	-	-
	Lo 2	192.168.0.65/26	-	-
	Lo 3	192.168.0.129/26	-	-
	Lo 4	192.168.0.193/26	-	-
	Se 1/0	192.168.2.1/26	BB1	Se 1/0
	Se 1/1	192.168.2.65/26	BB1	Se 1/1
	Se 1/2	192.168.2.129/26	BB1	Se 1/2
	Se 1/3	192.168.2.193/26	BB1	Se 1/3
Left_2	Fa 0/0	172.16.0.2/24	Left_1	Fa 0/0
	Lo 1	192.168.1.1/26	-	-
	Lo 2	192.168.1.65/26	-	-
	Lo 3	192.168.1.129/26	-	-
	Lo 4	192.168.1.193/26	-	-
	Se 1/0	192.168.3.1/26	BB1	Se 2/0
	Se 1/1	192.168.3.65/26	BB1	Se 2/1
	Se 1/2	192.168.3.129/26	BB1	Se 2/2
	Se 1/3	192.168.3.193/26	BB1	Se 2/3
Right_1	Fa 0/0	172.16.1.1/24	Right_2	Fa 0/0
	Lo 1	192.168.4.1/26	-	-
	Lo 2	192.168.4.65/26	-	-
	Lo 3	192.168.4.129/26	-	-
	Lo 4	192.168.4.193/26	-	-
	Se 1/0	192.168.6.1/26	BB1	Se 3/0
	Se 1/1	192.168.6.65/26	BB1	Se 3/1
	Se 1/2	192.168.6.129/26	BB1	Se 3/2
	Se 1/3	192.168.6.193/26	BB1	Se 3/3
Right_2	Fa 0/0	172.16.1.2/24	Right_1	Fa 0/0
	Lo 1	192.168.5.1/26	-	-
	Lo 2	192.168.5.65/26	-	-
	Lo 3	192.168.5.129/26	-	-

	Lo 4	192.168.5.193/26	-	-
	Se 1/0	192.168.7.1/26	BB1	Se 4/0
	Se 1/1	192.168.7.65/26	BB1	Se 4/1
	Se 1/2	192.168.7.129/26	BB1	Se 4/2
	Se 1/3	192.168.7.193/26	BB1	Se 4/3
BB1	Fa 0/0	10.0.0.2/24	BB2	Fa 0/0
	Se 1/0	192.168.2.2/26	Left_1	Se 1/0
	Se 1/1	192.168.2.66/26	Left_1	Se 1/1
	Se 1/2	192.168.2.130/26	Left_1	Se 1/2
	Se 1/3	192.168.2.194/26	Left_1	Se 1/3
	Se 2/0	192.168.3.2/26	Left_2	Se 1/0
	Se 2/1	192.168.3.66/26	Left_2	Se 1/1
	Se 2/2	192.168.3.130/26	Left_2	Se 1/2
	Se 2/3	192.168.3.194/26	Left_2	Se 1/3
	Se 3/0	192.168.6.2/26	Right_1	Se 1/0
	Se 3/1	192.168.6.66/26	Right_1	Se 1/1
	Se 3/2	192.168.6.130/26	Right_1	Se 1/2
	Se 3/3	192.168.6.194/26	Right_1	Se 1/3
	Se 4/0	192.168.7.2/26	Right_2	Se 1/0
	Se 4/1	192.168.7.66/26	Right_2	Se 1/1
	Se 4/2	192.168.7.130/26	Right_2	Se 1/2
	Se 4/3	192.168.7.194/26	Right_2	Se 1/3
BB2	Fa 0/0	10.0.0.1/24	BB1	Fa 0/0

Configure the appropriate ip addresses on every router.

Task 1-1

Configure all routers to run eigrp 1 and advertise all connected routes. Use the wildcard mask corresponding to the subnet.

Router Left_1 configuration:

```

Left_1#configure terminal
Left_1(config)#router eigrp 1
Left_1(config-router)#no auto-summary
Left_1(config-router)#network 192.168.2.0 0.0.0.63
Left_1(config-router)#network 192.168.2.64 0.0.0.63
Left_1(config-router)#network 192.168.2.128 0.0.0.63
Left_1(config-router)#network 192.168.2.192 0.0.0.63
Left_1(config-router)#network 192.168.0.0 0.0.0.63
Left_1(config-router)#network 192.168.0.64 0.0.0.63
Left_1(config-router)#network 192.168.0.128 0.0.0.63
Left_1(config-router)#network 192.168.0.192 0.0.0.63
Left_1(config-router)#network 172.16.0.0 0.0.0.255

```

Router Left_2 configuration:

```

Left_2#configure terminal
Left_2(config)#router eigrp 1
Left_2(config-router)#no auto-summary
Left_2(config-router)#network 172.16.0.0 0.0.0.255
Left_2(config-router)#network 192.168.3.0 0.0.0.63
Left_2(config-router)#network 192.168.3.64 0.0.0.63
Left_2(config-router)#network 192.168.3.128 0.0.0.63
Left_2(config-router)#network 192.168.3.192 0.0.0.63
Left_2(config-router)#network 192.168.1.0 0.0.0.63
Left_2(config-router)#network 192.168.1.64 0.0.0.63
Left_2(config-router)#network 192.168.1.128 0.0.0.63

```

```
Left_2(config-router)#network 192.168.1.192 0.0.0.63
```

Router Right_1 configuration:

```
Right_1#configure terminal
Right_1(config)#router eigrp 1
Right_1(config-router)#no auto-summary
Right_1(config-router)#network 172.16.1.0 0.0.0.255
Right_1(config-router)#network 192.168.6.0 0.0.0.63
Right_1(config-router)#network 192.168.6.64 0.0.0.63
Right_1(config-router)#network 192.168.6.128 0.0.0.63
Right_1(config-router)#network 192.168.6.192 0.0.0.63
Right_1(config-router)#network 192.168.4.0 0.0.0.63
Right_1(config-router)#network 192.168.4.64 0.0.0.63
Right_1(config-router)#network 192.168.4.128 0.0.0.63
Right_1(config-router)#network 192.168.4.192 0.0.0.63
```

Router Right_2 configuration:

```
Right_2#configure terminal
Right_2(config)#router eigrp 1
Right_2(config-router)#no auto-summary
Right_2(config-router)#network 172.16.1.0 0.0.0.255
Right_2(config-router)#network 192.168.7.0 0.0.0.63
Right_2(config-router)#network 192.168.7.64 0.0.0.63
Right_2(config-router)#network 192.168.7.128 0.0.0.63
Right_2(config-router)#network 192.168.7.192 0.0.0.63
Right_2(config-router)#network 192.168.5.0 0.0.0.63
Right_2(config-router)#network 192.168.5.64 0.0.0.63
Right_2(config-router)#network 192.168.5.128 0.0.0.63
Right_2(config-router)#network 192.168.5.192 0.0.0.63
```

Router BB1 configuration:

```
BB1#configure terminal
BB1(config)#router eigrp 1
BB1(config-router)#no auto-summary
BB1(config-router)#network 10.0.0.0 0.0.0.255
BB1(config-router)#network 192.168.2.0 0.0.0.63
BB1(config-router)#network 192.168.3.0 0.0.0.63
BB1(config-router)#network 192.168.6.0 0.0.0.63
BB1(config-router)#network 192.168.7.0 0.0.0.63
BB1(config-router)#network 192.168.2.64 0.0.0.63
BB1(config-router)#network 192.168.3.64 0.0.0.63
BB1(config-router)#network 192.168.6.64 0.0.0.63
BB1(config-router)#network 192.168.7.64 0.0.0.63
BB1(config-router)#network 192.168.2.128 0.0.0.63
BB1(config-router)#network 192.168.3.128 0.0.0.63
BB1(config-router)#network 192.168.6.128 0.0.0.63
BB1(config-router)#network 192.168.7.128 0.0.0.63
BB1(config-router)#network 192.168.2.192 0.0.0.63
BB1(config-router)#network 192.168.3.192 0.0.0.63
BB1(config-router)#network 192.168.6.192 0.0.0.63
BB1(config-router)#network 192.168.7.192 0.0.0.63
```

Router BB2 configuration:

```
BB2#configure terminal
BB2(config)#router eigrp 1
BB2(config-router)#no auto-summary
BB2(config-router)#network 10.0.0.0 0.0.0.255
```

Random verification:

```
BB1#sh ip eigrp neighbors
```

EIGRP-IPv4 Neighbors for AS(1)							
H	Address	Interface	Hold Uptime (sec)	SRTT (ms)	RTO	Q Cnt	Seq Num
2	10.0.0.1	Fa0/0	11 00:02:24	12	200	0	57
16	192.168.3.65	Se2/1	12 00:02:40	53	318	0	247
15	192.168.2.193	Se1/3	10 00:02:40	51	306	0	249
14	192.168.7.1	Se4/0	11 00:02:40	68	408	0	239
13	192.168.7.193	Se4/3	10 00:02:40	66	396	0	243
12	192.168.7.65	Se4/1	13 00:02:41	115	690	0	240
11	192.168.3.129	Se2/2	11 00:02:41	109	654	0	248
10	192.168.6.65	Se3/1	13 00:02:41	96	576	0	238
9	192.168.2.1	Se1/0	14 00:02:41	53	318	0	246
8	192.168.3.193	Se2/3	10 00:02:41	45	270	0	250
7	192.168.6.129	Se3/2	13 00:02:42	44	264	0	240
6	192.168.7.129	Se4/2	14 00:02:42	58	348	0	242
5	192.168.2.65	Se1/1	14 00:02:42	55	330	0	247
4	192.168.3.1	Se2/0	14 00:02:42	49	294	0	249
3	192.168.2.129	Se1/2	10 00:02:42	53	318	0	248
1	192.168.6.1	Se3/0	14 00:02:43	45	270	0	239
0	192.168.6.193	Se3/3	12 00:02:43	46	276	0	241

Task 1-2

Configure the following eigrp router ids for routers.

Router	Router-ID
Left_1	1.1.1.1
Left_2	2.2.2.2
Right_1	3.3.3.3
Right_2	4.4.4.4
BB1	5.5.5.5
BB2	6.6.6.6

Router Left_1 configuration:

```
Left_1#configure terminal
Left_1(config)#router eigrp 1
Left_1(config-router)#eigrp router-id 1.1.1.1
```

Router Left_2 configuration:

```
Left_1#configure terminal
Left_1(config)#router eigrp 1
Left_1(config-router)#eigrp router-id 2.2.2.2
```

Router Right_1 configuration:

```
Left_1#configure terminal
Left_1(config)#router eigrp 1
Left_1(config-router)#eigrp router-id 3.3.3.3
```

Router Right_2 configuration:

```
Left_1#configure terminal
Left_1(config)#router eigrp 1
Left_1(config-router)#eigrp router-id 4.4.4.4
```

Router BB1 configuration:

```
Left_1#configure terminal
Left_1(config)#router eigrp 1
Left_1(config-router)#eigrp router-id 5.5.5.5
```

Router BB2 configuration:

```
Left_1#configure terminal
Left_1(config)#router eigrp 1
Left_1(config-router)#eigrp router-id 6.6.6.6
```

Random verification:

```
BB1#sh ip eigrp topology 172.16.0.0 255.255.255.0
EIGRP-IPv4 Topology Entry for AS(1)/ID(5.5.5.5) for 172.16.0.0/24
  State is Passive, Query origin flag is 1, 4 Successor(s), FD is 2172416
  Descriptor Blocks:
    192.168.2.65 (Serial1/1), from 192.168.2.65, Send flag is 0x0
      Composite metric is (2172416/28160), route is Internal
      Vector metric:
        Minimum bandwidth is 1544 Kbit
        Total delay is 20100 microseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 1
        Originating router is 1.1.1.1
```

Task 1-3

On Left_1, Left_2, Right_1 and Right_2 the Fa 0/0 interface should not send eigrp hellos.

Router Left_1 configuration:

```
Left_1#configure terminal
Left_1(config)#router eigrp 1
Left_1(config-router)#passive-interface fastEthernet 0/0
```

Router Left_2 configuration:

```
Left_2#configure terminal
Left_2(config)#router eigrp 1
Left_2(config-router)#passive-interface fastEthernet 0/0
```

Router Right_1 configuration:

```
Right_1#configure terminal
Right_1(config)#router eigrp 1
Right_1(config-router)#passive-interface fastEthernet 0/0
```

Router Right_2 configuration:

```
Right_2#configure terminal
Right_2(config)#router eigrp 1
Right_2(config-router)#passive-interface fastEthernet 0/0
```

Random verification:

```
Left_1#sh ip eigrp neighbors
EIGRP-IPv4 Neighbors for AS(1)
```

H	Address	Interface	Hold (sec)	Uptime	SRTT (ms)	RTO	Q Cnt	Seq Num
3	192.168.2.194	Se1/3	14	00:08:37	24	200	0	1097
2	192.168.2.2	Se1/0	11	00:08:38	37	222	0	1098
1	192.168.2.66	Se1/1	13	00:08:39	25	200	0	1099
0	192.168.2.130	Se1/2	14	00:08:39	22	200	0	1096

Task 1-4

Configure Left_1, Left_2, Right_1 and Right_2 as stub connected routers.

Router Left_1 configuration:

```
Left_1#configure terminal
Left_1(config)#router eigrp 1
Left_1(config-router)#eigrp stub connected
```

Router Left_2 configuration:

```
Left_2#configure terminal
Left_2(config)#router eigrp 1
Left_2(config-router)#eigrp stub connected
```

Router Right_1 configuration:

```
Right_1#configure terminal
Right_1(config)#router eigrp 1
Right_1(config-router)#eigrp stub connected
```

Router Right_2 configuration:

```
Right_2#configure terminal
Right_2(config)#router eigrp 1
Right_2(config-router)#eigrp stub connected
```

Task 1-5

Configure authentication on all eigrp links connected to BB1 from Left and Right routers, using chain1 for Se 1/0, with password1 on key1, using chain2 for Se 1/1, with password2 on key2 and so on for Se 1/2 and Se 1/3. Key1-4 should be valid until 02-08-2010 13:15 PM, and Key5-8 should be valid from 02-08-2010 13:00 PM, an infinite amount of time.

Router BB1, Left and Right configuration:

```
#configure terminal
(config)#key chain chain1
(config-keychain)#key 1
(config-keychain-key)#key-string password1
(config-keychain-key)#accept-lifetime 13:00:00 2 aug 2007 13:15:00 2 aug 2008
(config-keychain-key)#send-lifetime 13:00:00 2 aug 2007 13:15:00 2 aug 2008
(config-keychain-key)#exit
(config-keychain)#key 5
(config-keychain-key)#key-string password5
(config-keychain-key)#accept-lifetime 13:00:00 2 aug 2008 infinite
(config-keychain-key)#send-lifetime 13:00:00 2 aug 2008 infinite
(config-keychain-key)#exit
(config-keychain)#exit
(config)#key chain chain2
(config-keychain)#key 2
(config-keychain-key)#key-string password2
(config-keychain-key)#accept-lifetime 13:00:00 2 aug 2007 13:15:00 2 aug 2008
(config-keychain-key)#send-lifetime 13:00:00 2 aug 2007 13:15:00 2 aug 2008
(config-keychain-key)#exit
(config-keychain)#key 6
(config-keychain-key)#key-string password6
(config-keychain-key)#accept-lifetime 13:00:00 2 aug 2008 infinite
(config-keychain-key)#send-lifetime 13:00:00 2 aug 2008 infinite
(config-keychain-key)#exit
(config-keychain)#exit
(config)#key chain chain3
(config-keychain)#key 3
(config-keychain-key)#key-string password3
(config-keychain-key)#accept-lifetime 13:00:00 2 aug 2007 13:15:00 2 aug 2008
```

```

(config-keychain-key)#send-lifetime 13:00:00 2 aug 2007 13:15:00 2 aug 2008
(config-keychain-key)#exit
(config-keychain)#key 7
(config-keychain-key)#key-string password7
(config-keychain-key)#accept-lifetime 13:00:00 2 aug 2008 infinite
(config-keychain-key)#send-lifetime 13:00:00 2 aug 2008 infinite
(config-keychain-key)#exit
(config-keychain)#exit
(config)#key chain chain4
(config-keychain)#key 4
(config-keychain-key)#key-string password4
(config-keychain-key)#accept-lifetime 13:00:00 2 aug 2007 13:15:00 2 aug 2008
(config-keychain-key)#send-lifetime 13:00:00 2 aug 2007 13:15:00 2 aug 2008
(config-keychain-key)#exit
(config-keychain)#key 8
(config-keychain-key)#key-string password8
(config-keychain-key)#accept-lifetime 13:00:00 2 aug 2008 infinite
(config-keychain-key)#send-lifetime 13:00:00 2 aug 2008 infinite

#configure terminal
(config)#interface serial 1/0
(config-if)#ip authentication mode eigrp 1 md5
(config-if)#ip authentication key-chain eigrp 1 chain1
(config-if)#end
(config)#interface serial 2/0
(config-if)#ip authentication mode eigrp 1 md5
(config-if)#ip authentication key-chain eigrp 1 chain2
(config-if)#end
(config)#interface serial 3/0
(config-if)#ip authentication mode eigrp 1 md5
(config-if)#ip authentication key-chain eigrp 1 chain3
(config-if)#end
(config)#interface serial 4/0
(config-if)#ip authentication mode eigrp 1 md5
(config-if)#ip authentication key-chain eigrp 1 chain4
(config-if)#end

```

Added Router BB1 configuration:

```

BB1(config)#inter serial 2/0
BB1(config-if)#ip authentication mode eigrp 1 md5
BB1(config-if)#ip authentication key-chain eigrp 1 chain1
BB1(config-if)#exit
BB1(config)#inter serial 2/1
BB1(config-if)#ip authentication mode eigrp 1 md5
BB1(config-if)#ip authentication key-chain eigrp 1 chain2
BB1(config-if)#exit
BB1(config)#inter serial 2/2
BB1(config-if)#ip authentication mode eigrp 1 md5
BB1(config-if)#ip authentication key-chain eigrp 1 chain3
BB1(config-if)#exit
BB1(config)#inter serial 2/3
BB1(config-if)#ip authentication mode eigrp 1 md5
BB1(config-if)#ip authentication key-chain eigrp 1 chain4
BB1(config-if)#exit
BB1(config)#inter serial 3/0
BB1(config-if)#ip authentication mode eigrp 1 md5
BB1(config-if)#ip authentication key-chain eigrp 1 chain1
BB1(config-if)#exit
BB1(config)#inter serial 3/1
BB1(config-if)#ip authentication mode eigrp 1 md5
BB1(config-if)#ip authentication key-chain eigrp 1 chain2
BB1(config-if)#exit

```

```

BB1(config)#inter serial 3/2
BB1(config-if)#ip authentication mode eigrp 1 md5
BB1(config-if)#ip authentication key-chain eigrp 1 chain3
BB1(config-if)#exit
BB1(config)#inter serial 3/3
BB1(config-if)#ip authentication mode eigrp 1 md5
BB1(config-if)#ip authentication key-chain eigrp 1 chain4
BB1(config-if)#exit
BB1(config)#inter serial 4/0
BB1(config-if)#ip authentication mode eigrp 1 md5
BB1(config-if)#ip authentication key-chain eigrp 1 chain1
BB1(config-if)#exit
BB1(config)#inter serial 4/1
BB1(config-if)#ip authentication mode eigrp 1 md5
BB1(config-if)#ip authentication key-chain eigrp 1 chain2
BB1(config-if)#exit
BB1(config)#inter serial 4/2
BB1(config-if)#ip authentication mode eigrp 1 md5
BB1(config-if)#ip authentication key-chain eigrp 1 chain3
BB1(config-if)#exit
BB1(config)#inter serial 4/3
BB1(config-if)#ip authentication mode eigrp 1 md5
BB1(config-if)#ip authentication key-chain eigrp 1

```

Random verification:

```

Left_1#debug eigrp packets
. . .
*Jun 19 16:13:53.447: EIGRP: received packet with MD5 authentication, key id = 5
. . .
Left_1#undebug all

Left_1#sh key chain
Key-chain chain1:
  key 1 -- text "password1"
    accept lifetime (13:00:00 UTC Aug 2 2007) - (13:15:00 UTC Aug 2 2008)
    send lifetime (13:00:00 UTC Aug 2 2007) - (13:15:00 UTC Aug 2 2008)
  key 5 -- text "password5 "
    accept lifetime (13:00:00 UTC Aug 2 2008) - (infinite) [valid now]
    send lifetime (13:00:00 UTC Aug 2 2008) - (infinite) [valid now]
. . .

```

Task 1-6

Configure all eigrp processes to log neighbor changes.

Router Left_1 configuration:

```

Left_1#configure terminal
Left_1(config)#router eigrp 1
Left_1(config-router)#eigrp log-neighbor-changes

```

Router Left_2 configuration:

```

Left_2#configure terminal
Left_2(config)#router eigrp 1
Left_2(config-router)#eigrp log-neighbor-changes

```

Router Right_1 configuration:

```

Right_1#configure terminal
Right_1(config)#router eigrp 1
Right_1(config-router)#eigrp log-neighbor-changes

```

Router Right_2 configuration:

```
Right_2#configure terminal
Right_2(config)#router eigrp 1
Right_2(config-router)#eigrp log-neighbor-changes
```

Router BB1 configuration:

```
BB1#configure terminal
BB1(config)#router eigrp 1
BB1(config-router)#eigrp log-neighbor-changes
```

Router BB2 configuration:

```
BB2#configure terminal
BB2(config)#router eigrp 1
BB2(config-router)#eigrp log-neighbor-changes
```

Task 1-7

Configure on Left and Right routers summary address to be sent to BB1 for loopback interfaces.

Configure on BB1 one summary for serial and loopback links, and one summary for ethernet links from the topology to be advertised to BB2.

Router Left_1 configuration:

```
Left_1#configure terminal
Left_1(config)#interface serial 1/0
Left_1(config-if)#ip summary-address eigrp 1 192.168.0.0 255.255.255.0
Left_1(config-if)#exit
Left_1(config)#interface serial 1/1
Left_1(config-if)#ip summary-address eigrp 1 192.168.0.0 255.255.255.0
Left_1(config-if)#exit
Left_1(config)#interface serial 1/2
Left_1(config-if)#ip summary-address eigrp 1 192.168.0.0 255.255.255.0
Left_1(config-if)#exit
Left_1(config)#interface serial 1/3
Left_1(config-if)#ip summary-address eigrp 1 192.168.0.0 255.255.255.0
```

Router Left_2 configuration:

```
Left_2#configure terminal
Left_2(config)#interface serial 1/0
Left_2(config-if)#ip summary-address eigrp 1 192.168.1.0 255.255.255.0
Left_2(config-if)#exit
Left_2(config)#interface serial 1/1
Left_2(config-if)#ip summary-address eigrp 1 192.168.1.0 255.255.255.0
Left_2(config-if)#exit
Left_2(config)#interface serial 1/2
Left_2(config-if)#ip summary-address eigrp 1 192.168.1.0 255.255.255.0
Left_2(config-if)#exit
Left_2(config)#interface serial 1/3
Left_2(config-if)#ip summary-address eigrp 1 192.168.1.0 255.255.255.0
```

Router Right_1 configuration:

```
Right_1#configure terminal
Right_1(config)#interface serial 1/0
Right_1(config-if)#ip summary-address eigrp 1 192.168.4.0 255.255.255.0
Right_1(config-if)#exit
Right_1(config)#interface serial 1/1
Right_1(config-if)#ip summary-address eigrp 1 192.168.4.0 255.255.255.0
```

```
Right_1(config-if)#exit
Right_1(config)#interface serial 1/2
Right_1(config-if)#ip summary-address eigrp 1 192.168.4.0 255.255.255.0
Right_1(config-if)#exit
Right_1(config)#interface serial 1/3
Right_1(config-if)#ip summary-address eigrp 1 192.168.4.0 255.255.255.0
```

Router Right_2 configuration:

```
Right_2#configure terminal
Right_2(config)#interface serial 1/0
Right_2(config-if)#ip summary-address eigrp 1 192.168.5.0 255.255.255.0
Right_2(config-if)#exit
Right_2(config)#interface serial 1/1
Right_2(config-if)#ip summary-address eigrp 1 192.168.5.0 255.255.255.0
Right_2(config-if)#exit
Right_2(config)#interface serial 1/2
Right_2(config-if)#ip summary-address eigrp 1 192.168.5.0 255.255.255.0
Right_2(config-if)#exit
Right_2(config)#interface serial 1/3
Right_2(config-if)#ip summary-address eigrp 1 192.168.5.0 255.255.255.0
```

Random verification:

```
BB1#sh ip route 192.168.5.0 255.255.255.0
% Subnet not in table
BB1#
```

Troubleshoot why the route is not in the BB1 routing table.

Router BB1 configuration:

```
BB1#configure terminal
BB1(config)#interface fastEthernet 0/0
BB1(config-if)#ip summary-address eigrp 1 192.168.0.0 255.255.248.0
BB1(config-if)#ip summary-address eigrp 1 172.16.0.0 255.255.254.0
```

Verification on BB2:

```
BB2#sh ip route
Codes: L - local, 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, + - replicated route

Gateway of last resort is not set

 10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.0.0.0/24 is directly connected, FastEthernet0/0
L       10.0.0.1/32 is directly connected, FastEthernet0/0
       172.16.0.0/23 is subnetted, 1 subnets
D       172.16.0.0 [90/2174976] via 10.0.0.2, 00:02:27, FastEthernet0/0
D       192.168.0.0/21 [90/2172416] via 10.0.0.2, 00:02:55, FastEthernet0/0
BB2#
```

Missing configuration from Left and Right routers, for last troubleshooting problem:

```
#configure terminal
(config)#router eigrp 1
(config-router)#eigrp stub connected summary
```

Second verification:

```
BB1#sh ip route 192.168.5.0 255.255.255.0
Routing entry for 192.168.5.0/24
  Known via "eigrp 1", distance 90, metric 2297856, type internal
  Redistributing via eigrp 1
  Last update from 192.168.7.129 on Serial4/2, 00:01:04 ago
  Routing Descriptor Blocks:
  * 192.168.7.193, from 192.168.7.193, 00:01:04 ago, via Serial4/3
    Route metric is 2297856, traffic share count is 1
    Total delay is 25000 microseconds, minimum bandwidth is 1544 Kbit
    Reliability 255/255, minimum MTU 1500 bytes
    Loading 1/255, Hops 1
  192.168.7.129, from 192.168.7.129, 00:01:04 ago, via Serial4/2
    Route metric is 2297856, traffic share count is 1
    Total delay is 25000 microseconds, minimum bandwidth is 1544 Kbit
    Reliability 255/255, minimum MTU 1500 bytes
    Loading 1/255, Hops 1
  192.168.7.65, from 192.168.7.65, 00:01:04 ago, via Serial4/1
    Route metric is 2297856, traffic share count is 1
    Total delay is 25000 microseconds, minimum bandwidth is 1544 Kbit
    Reliability 255/255, minimum MTU 1500 bytes
    Loading 1/255, Hops 1
  192.168.7.1, from 192.168.7.1, 00:01:04 ago, via Serial4/0
    Route metric is 2297856, traffic share count is 1
    Total delay is 25000 microseconds, minimum bandwidth is 1544 Kbit
    Reliability 255/255, minimum MTU 1500 bytes
    Loading 1/255, Hops 1
```

Task 1-8

On all serial links, configure eigrp to use a maximum of 30 percent of bandwidth.

Configuration:

```
(config-if)#ip bandwidth-percent eigrp 1 30
```

Task 1-9

On all serial interfaces, modify the hello interval to 2 seconds and the hold down timer to 6 seconds.

Configuration:

```
(config-if)#ip hello-interval eigrp 1 2
(config-if)#ip hold-time eigrp 1 6
```

Task 1-10

On Left and Right router, modify the bandwidth of the serial link as follows:

Interface	New bandwidth
Se 1/0	64
Se 1/1	128
Se 1/2	192
Se 1/3	256

Modify the load balance that all serial link to BB1 will be used, using variance command.

Left and Right routers configuration:

```
#configure terminal
(config)#interface serial 1/0
```

```
(config-if)#bandwidth 64
(config-if)#interface serial 1/1
(config-if)#bandwidth 128
(config-if)#interface serial 1/2
(config-if)#bandwidth 192
(config-if)#interface serial 1/3
(config-if)#bandwidth 256
```

Router BB1 configuration:

```
BB1#configure terminal
BB1(config)#int serial 1/0
BB1(config-if)#bandwidth 64
BB1(config-if)#int serial 1/1
BB1(config-if)#bandwidth 128
BB1(config-if)#int serial 1/2
BB1(config-if)#bandwidth 192
BB1(config-if)#int serial 1/3
BB1(config-if)#bandwidth 256
BB1(config-if)#int serial 2/0
BB1(config-if)#bandwidth 64
BB1(config-if)#int serial 2/1
BB1(config-if)#bandwidth 128
BB1(config-if)#int serial 2/2
BB1(config-if)#bandwidth 192
BB1(config-if)#int serial 2/3
BB1(config-if)#bandwidth 256
BB1(config-if)#int serial 3/0
BB1(config-if)#bandwidth 64
BB1(config-if)#int serial 3/1
BB1(config-if)#bandwidth 128
BB1(config-if)#int serial 3/2
BB1(config-if)#bandwidth 192
BB1(config-if)#int serial 3/3
BB1(config-if)#bandwidth 256
BB1(config-if)#int serial 4/0
BB1(config-if)#bandwidth 64
BB1(config-if)#int serial 4/1
BB1(config-if)#bandwidth 128
BB1(config-if)#int serial 4/2
BB1(config-if)#bandwidth 192
BB1(config-if)#int serial 4/3
BB1(config-if)#bandwidth 256
```

Verification:

```
BB1#sh ip route 192.168.0.0
Routing entry for 192.168.0.0/24
  Known via "eigrp 1", distance 90, metric 10639872, type internal
  Redistributing via eigrp 1
  Last update from 192.168.2.193 on Serial1/3, 00:05:40 ago
  Routing Descriptor Blocks:
  * 192.168.2.193, from 192.168.2.193, 00:05:40 ago, via Serial1/3
    Route metric is 10639872, traffic share count is 1
    Total delay is 25000 microseconds, minimum bandwidth is 256 Kbit
    Reliability 255/255, minimum MTU 1500 bytes
    Loading 1/255, Hops 1
```

Calculating the variance factor:

```
BB1#sh ip eigrp topology 192.168.0.0/24
EIGRP-IPv4 Topology Entry for AS(1)/ID(5.5.5.5) for 192.168.0.0/24
  State is Passive, Query origin flag is 1, 1 Successor(s), FD is 2297856
  Descriptor Blocks:
```

```

192.168.2.193 (Serial1/3), from 192.168.2.193, Send flag is 0x0
Composite metric is (10639872/128256), route is Internal
Vector metric:
  Minimum bandwidth is 256 Kbit
  Total delay is 25000 microseconds
  Reliability is 255/255
  Load is 1/255
  Minimum MTU is 1500
  Hop count is 1
  Originating router is 1.1.1.1
192.168.2.1 (Serial1/0), from 192.168.2.1, Send flag is 0x0
Composite metric is (40640000/128256), route is Internal
Vector metric:
  Minimum bandwidth is 64 Kbit
  Total delay is 25000 microseconds
  Reliability is 255/255
  Load is 1/255
  Minimum MTU is 1500
  Hop count is 1
  Originating router is 1.1.1.1
192.168.2.129 (Serial1/2), from 192.168.2.129, Send flag is 0x0
Composite metric is (13973248/128256), route is Internal
Vector metric:
  Minimum bandwidth is 192 Kbit
  Total delay is 25000 microseconds
  Reliability is 255/255
  Load is 1/255
  Minimum MTU is 1500
  Hop count is 1
  Originating router is 1.1.1.1
192.168.2.65 (Serial1/1), from 192.168.2.65, Send flag is 0x0
Composite metric is (20640000/128256), route is Internal
Vector metric:
  Minimum bandwidth is 128 Kbit
  Total delay is 25000 microseconds
  Reliability is 255/255
  Load is 1/255
  Minimum MTU is 1500
  Hop count is 1
  Originating router is 1.1.1.1

```

Divide Serial 1/0 FD with Serial 1/3 FD and choose to the next integer number. Answer here will be 3, but a variance of 3 will not be ok because FD of Serial 1/3 multiplied by 3 will not be greater than FD of Serial 1/0, will be equal. So choose next integer number even if the answer is an integer number.

BB1, Left and Right routers configuration:

```

#configure terminal
(config)#router eigrp 1
(config-router)#variance 4

```

Verification:

```

BB1#sh ip route 192.168.0.0
Routing entry for 192.168.0.0/24
  Known via "eigrp 1", distance 90, metric 10639872, type internal
  Redistributing via eigrp 1
  Last update from 192.168.2.1 on Serial1/0, 01:25:46 ago
  Routing Descriptor Blocks:
  * 192.168.2.193, from 192.168.2.193, 01:25:46 ago, via Serial1/3
    Route metric is 10639872, traffic share count is 240

```

```
Total delay is 25000 microseconds, minimum bandwidth is 256 Kbit
Reliability 255/255, minimum MTU 1500 bytes
Loading 1/255, Hops 1
192.168.2.129, from 192.168.2.129, 01:25:46 ago, via Serial1/2
Route metric is 13973248, traffic share count is 183
Total delay is 25000 microseconds, minimum bandwidth is 192 Kbit
Reliability 255/255, minimum MTU 1500 bytes
Loading 1/255, Hops 1
192.168.2.65, from 192.168.2.65, 01:25:46 ago, via Serial1/1
Route metric is 20640000, traffic share count is 124
Total delay is 25000 microseconds, minimum bandwidth is 128 Kbit
Reliability 255/255, minimum MTU 1500 bytes
Loading 1/255, Hops 1
192.168.2.1, from 192.168.2.1, 01:25:46 ago, via Serial1/0
Route metric is 40640000, traffic share count is 63
Total delay is 25000 microseconds, minimum bandwidth is 64 Kbit
Reliability 255/255, minimum MTU 1500 bytes
Loading 1/255, Hops 1
```

Task 1-11

Configure 10.10.10.1/24 as secondary ip address on Fa 0/0 of BB1 router.

Advertise this secondary network into eigrp and check on BB2 to see if it is advertised.

Disable ip split-horizon on the corresponding interfaces for this secondary ip to be advertised.

Router BB2 configuration:

```
BB2#configure terminal
BB2(config)#interface fastEthernet 0/0
BB2(config-if)#ip address 10.10.10.1 255.255.255.0 secondary
BB2(config-if)#exit
BB2(config)#router eigrp 1
BB2(config-router)#network 10.10.10.0 0.0.0.255
```

Verification on BB1:

```
BB1#sh ip route 10.10.10.0 255.255.255.0
% Subnet not in table
```

Configuration of ip split horizon on BB2:

```
BB2#configure terminal
BB2(config)#interface fastEthernet 0/0
BB2(config-if)#no ip split-horizon
```

Second verification on BB1:

```
BB1#sh ip route 10.10.10.0 255.255.255.0
% Subnet not in table
```

Again, configuration of ip split horizon on BB2:

```
BB2#configure terminal
BB2(config)#interface fastEthernet 0/0
BB2(config-if)#no ip split-horizon eigrp 1
```

Next verification on BB1:

```
BB1#sh ip route 10.10.10.0 255.255.255.0
Routing entry for 10.10.10.0/24
  Known via "eigrp 1", distance 90, metric 30720, type internal
  Redistributing via eigrp 1
  Last update from 10.0.0.1 on FastEthernet0/0, 00:03:50 ago
  Routing Descriptor Blocks:
```

```
* 10.0.0.1, from 10.0.0.1, 00:03:50 ago, via FastEthernet0/0
Route metric is 30720, traffic share count is 1
Total delay is 200 microseconds, minimum bandwidth is 100000 Kbit
Reliability 255/255, minimum MTU 1500 bytes
Loading 1/255, Hops 1
```

Task 1-12

Using offset-list, modify the eigrp calculated metric to be the same on all serial link. Modifying the bandwidth is not allowed. For Left routers configuration should be made on Left routers, for Right routers configuration should be made on BB1 router. Change the variance to 1 on all involved routers and verify if there are still 4 feasible routes in the BB1 routing table.

Router Left_1 configuration:

```
Left_1#configure terminal
Left_1(config)#access-list 1 permit 192.168.0.0 0.0.0.255
Left_1(config)#router eigrp 1
Left_1(config-router)#offset-list 1 out 30000128 se 1/3
Left_1(config-router)#offset-list 1 out 26666752 se 1/2
Left_1(config-router)#offset-list 1 out 20000000 se 1/1
Left_1(config-router)# variance 1
```

Router Left_2 configuration:

```
Left_2#configure terminal
Left_2(config)#access-list 1 permit 192.168.1.0 0.0.0.255
Left_2(config)#router eigrp 1
Left_2(config-router)#offset-list 1 out 30000128 se 1/3
Left_2(config-router)#offset-list 1 out 26666752 se 1/2
Left_2(config-router)#offset-list 1 out 20000000 se 1/1
Left_2(config-router)# variance 1
```

Router BB1 configuration:

```
BB1#configure terminal
BB1(config)#access-list 1 permit 192.168.4.0 0.0.0.255
BB1(config)#access-list 2 permit 192.168.5.0 0.0.0.255
BB1(config)#router eigrp 1
BB1(config-router)#offset-list 1 in 30000128 serial 3/3
BB1(config-router)#offset-list 1 in 26666752 serial 3/2
BB1(config-router)#offset-list 1 in 20000000 serial 3/1
BB1(config-router)#offset-list 2 in 30000128 serial 4/3
BB1(config-router)#offset-list 2 in 26666752 serial 4/2
BB1(config-router)#offset-list 2 in 20000000 serial 4/1
BB1(config-router)#variance 1
```

Verification on BB1:

```
BB1#sh ip eigrp topology 192.168.5.0/24
EIGRP-IPv4 Topology Entry for AS(1)/ID(5.5.5.5) for 192.168.5.0/24
State is Passive, Query origin flag is 1, 4 Successor(s), FD is 2297856
Descriptor Blocks:
192.168.7.1 (Serial4/0), from 192.168.7.1, Send flag is 0x0
Composite metric is (40640000/128256), route is Internal
Vector metric:
Minimum bandwidth is 64 Kbit
Total delay is 25000 microseconds
Reliability is 255/255
Load is 1/255
Minimum MTU is 1500
Hop count is 1
Originating router is 4.4.4.4
```

```

192.168.7.65 (Serial4/1), from 192.168.7.65, Send flag is 0x0
Composite metric is (40640000/20128256), route is Internal
Vector metric:
  Minimum bandwidth is 128 Kbit
  Total delay is 806250 microseconds
  Reliability is 255/255
  Load is 1/255
  Minimum MTU is 1500
  Hop count is 1
  Originating router is 4.4.4.4
192.168.7.129 (Serial4/2), from 192.168.7.129, Send flag is 0x0
Composite metric is (40640000/26795008), route is Internal
Vector metric:
  Minimum bandwidth is 192 Kbit
  Total delay is 1066670 microseconds
  Reliability is 255/255
  Load is 1/255
  Minimum MTU is 1500
  Hop count is 1
  Originating router is 4.4.4.4
192.168.7.193 (Serial4/3), from 192.168.7.193, Send flag is 0x0
Composite metric is (40640000/30128384), route is Internal
Vector metric:
  Minimum bandwidth is 256 Kbit
  Total delay is 1196880 microseconds
  Reliability is 255/255
  Load is 1/255
  Minimum MTU is 1500
  Hop count is 1
  Originating router is 4.4.4.4

```

Task 1-13

Configure GigaEthernet 1/0 on BB2 with ip 111.111.111.111/24.

Inject from BB2 a default route into the eigrp process by redistributing a static route.

When you can see this default route on all Left and Right routers, remove this configuration from BB2.

Configuration on BB2:

```

BB2#configure terminal
BB2(config)#int gigabitEthernet 1/0
BB2(config-if)#no shutdown
BB2(config-if)#ip address 111.111.111.111 255.255.255.0
BB2(config-if)#exit
BB2(config)#ip route 0.0.0.0 0.0.0.0 gigabitEthernet 1/0
BB2(config)#router eigrp 1
BB2(config-router)#redistribute static

```

Verification on Left_1:

```

Left_1#sh ip route
. . .
D*EX 0.0.0.0/0 [170/10514688] via 192.168.2.194, 00:04:19, Serial1/3
. . .

```

Task 1-14

Inject from BB2 a default route into the eigrp process by using a summary to 0.0.0.0/0 network.

Router BB2 configuration:

```
BB2#configure terminal
BB2(config)#interface fastEthernet 0/0
BB2(config-if)#ip summary-address eigrp 1 0.0.0.0 0.0.0.0
```

Verification on Left_1:

```
Left_1#sh ip route
. . .
D* 0.0.0.0/0 [90/10516992] via 192.168.2.194, 00:00:07, Serial1/3
. . .
```

Task 1-15

Inject into eigrp a default candidate route of 9.9.9.99/24, creating a Loopback interface with ip address 9.9.9.9/24. You should use the ip default-network command to achieve this.

Router BB1 configuration:

```
BB2#configure terminal
BB2(config)#ip default-network 9.9.9.99
```

This route will not be in the routing table, because there is no connected interface to that subnet, as you can see below:

```
BB2#sh ip route
Codes: L - local, 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, + - replicated route

Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C    10.0.0.0/24 is directly connected, FastEthernet0/0
L    10.0.0.1/32 is directly connected, FastEthernet0/0
C    10.10.10.0/24 is directly connected, FastEthernet0/0
L    10.10.10.1/32 is directly connected, FastEthernet0/0
111.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C    111.111.111.0/24 is directly connected, GigabitEthernet1/0
L    111.111.111.111/32 is directly connected, GigabitEthernet1/0
172.16.0.0/23 is subnetted, 1 subnets
D    172.16.0.0 [90/10516992] via 10.0.0.2, 01:43:06, FastEthernet0/0
D    192.168.0.0/21 [90/10514432] via 10.0.0.2, 01:43:06, FastEthernet0/0
```

Now, let's create the loopback interface:

```
BB2#configure terminal
BB2(config)#int lo 1
BB2(config-if)#ip address 9.9.9.9 255.255.255.0
```

Verification of the routing table again:

```
BB2#sh ip route
Codes: L - local, 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, + - replicated route
```

Gateway of last resort is not set

```
9.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
S 9.0.0.0/8 [1/0] via 9.9.9.99
C 9.9.9.0/24 is directly connected, Loopback1
L 9.9.9.9/32 is directly connected, Loopback1
```

Now we have this static route in the routing table. There are two methods of creating this static route:

1.

```
BB2(config)#ip default-network 9.9.9.99
```

2.

```
BB2(config)#ip route 9.0.0.0 255.0.0.0 9.9.9.99
```

The result will be the same.

Now we will make this static route as a candidate default for the BB2 router:

```
BB2#configure terminal
BB2(config)#ip default-network 9.0.0.0
```

This command will work ONLY if you have a static route in the routing table, even created by the same command, or create by the ip route command.

Verification of the BB2 routing table again:

```
BB2#sh ip route
Codes: L - local, 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, + - replicated route
```

Gateway of last resort is 9.9.9.99 to network 9.0.0.0

```
S* 0.0.0.0/0 [1/0] via 9.9.9.99
* 9.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
S* 9.0.0.0/8 [1/0] via 9.9.9.99
C 9.9.9.0/24 is directly connected, Loopback1
L 9.9.9.9/32 is directly connected, Loopback1
```

Now this route is a candidate default route.

Let's advertise this default candidate route into the eigrp:

```
BB2#configure terminal
BB2(config)#router eigrp 1
BB2(config-router)#redistribute static
```

Verification on BB1:

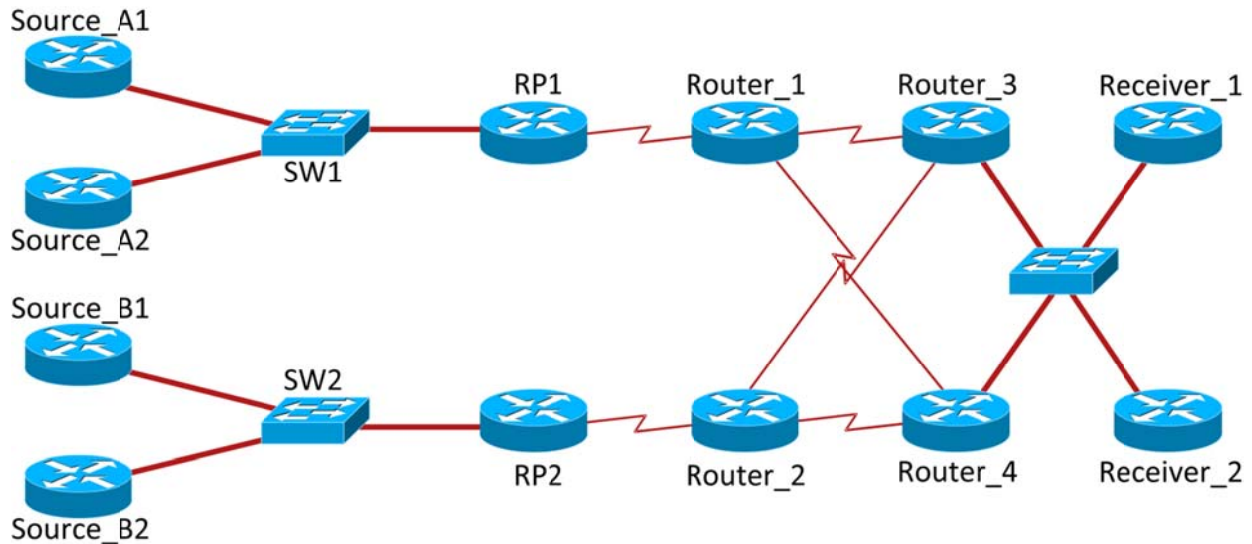
```
BB1# sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2
i - IS-IS, su - IS-IS summary, 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, + - replicated route
```

Gateway of last resort is not set

```
D*EX 9.0.0.0/8 [170/156160] via 10.0.0.1, 00:00:56, FastEthernet0/0
```

This is a candidate default route, received from an eigrp router.

Multicasts Lab



Ip addressing scheme

Local Router	Local Interface	Ip Address	Remote Router	Remote Interface
Source_A1	Fa 0/0	10.0.0.1/29	SW1	-
Source_A2	Fa 0/0	10.0.0.2/29	SW1	-
Source_B1	Fa 0/0	10.0.1.1/29	SW2	-
Source_B2	Fa 0/0	10.0.1.2/29	SW2	-
RP1	Fa 0/0	10.0.0.4/29	SW1	-
	Se 1/0	172.16.0.1/30	Router_1	Se 1/0
RP2	Fa 0/0	10.0.1.4/29	SW1	-
	Se 1/0	172.16.1.1/30	Router_2	Se 1/0
Router_1	Se 1/0	172.16.0.2/30	RP1	Se 1/0
	Se 1/2	172.16.4.1/30	Router_4	Se 1/2
	Se 1/3	172.16.2.1/30	Router_3	Se 1/3
Router_2	Se 1/0	172.16.1.2/30	RP2	Se 1/0
	Se 1/2	172.16.5.1/30	Router_3	Se 1/2
	Se 1/3	172.16.3.1/30	Router_4	Se 1/3
Router_3	Fa 0/0	192.168.0.1/29	SW3	-
	Se 1/2	172.16.5.2/30	Router_2	Se 1/2
	Se 1/3	172.16.2.2/30	Router_1	Se 1/3
Router_4	Fa 0/0	192.168.0.2/29	SW3	-
	Se 1/2	172.16.4.2/30	Router_1	Se 1/2
	Se 1/3	172.16.3.2/30	Router_2	Se 1/3
Receiver_1	Fa 0/0	192.168.0.3/29	SW3	-
Receiver_2	Fa 0/0	192.168.0.4/29	SW3	-

Source and Receiver routers are having a static default route out of Fa 0/0 interface.
 RPX and Router_X routers are running eigrp 100, advertising all connected networks.

Random initial verification:

```
Source_A1#ping 192.168.0.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.1, timeout is 2 seconds:
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/26/60 ms
```

```
Source_A1#ping 10.0.1.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 10.0.1.1, timeout is 2 seconds:
```

```
!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/22/28 ms
```

Task 2-1

- Configure multicast routing on all routers, with pim in dense mode on every router and connected interface.
- Verify the configuration by sending a multicast stream from one source and joining from one receiver router.
- Erase all configurations.

Configuration of multicast routing, on every router except Source and Receiver:

```
#configure terminal
(config)#ip multicast-routing
```

Under every connected interface where multicast routing is enable:

```
(config-if)#ip pim dense-mode
```

Generating a multicast stream from Source_1:

```
Source_A1#ping 239.9.9.9 repeat 1000
```

```
Sending 1000, 100-byte ICMP Echos to 239.9.9.9, timeout is 2 seconds:
```

```
.....
```

Verification on RP2 mroute table, you can see this stream:

```
RP2#sh ip mroute
```

```
IP Multicast Routing Table
```

```
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
       L - Local, P - Pruned, R - RP-bit set, F - Register flag,
       T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
       X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
       U - URD, I - Received Source Specific Host Report,
       Z - Multicast Tunnel, z - MDT-data group sender,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       V - RD & Vector, v - Vector
```

```
Outgoing interface flags: H - Hardware switched, A - Assert winner
```

```
Timers: Uptime/Expires
```

```
Interface state: Interface, Next-Hop or VCD, State/Mode
```

```
(*, 239.9.9.9), 00:02:20/stopped, RP 0.0.0.0, flags: D
```

```
Incoming interface: Null, RPF nbr 0.0.0.0
```

```
Outgoing interface list:
```

```
Serial1/0, Forward/Dense, 00:02:20/00:00:00
```

```
(10.0.0.1, 239.9.9.9), 00:02:20/00:00:38, flags: PT
```

```
Incoming interface: Serial1/0, RPF nbr 172.16.1.2
```

```
Outgoing interface list: Null
```

```
(*, 224.0.1.40), 00:04:12/stopped, RP 0.0.0.0, flags: DCL
```

```
Incoming interface: Null, RPF nbr 0.0.0.0
```

```
Outgoing interface list:
```

```
Serial1/0, Forward/Dense, 00:04:12/00:00:00
```

Because we are running dense mode, we can see this stream on every router.

Joining this group from Receiver_1:

```
Receiver_1#configure terminal
Receiver_1(config)#int fastEthernet 0/0
Receiver_1(config-if)#ip igmp join-group 239.9.9.9
```

Output on Source_A1 after joining this group from Receiver_1:

```
Source_A1#ping 239.9.9.9 repeat 1000

Type escape sequence to abort.
Sending 1000, 100-byte ICMP Echos to 239.9.9.9, timeout is 2 seconds:
.....
.....
.....
Reply to request 178 from 192.168.0.3, 36 ms
Reply to request 179 from 192.168.0.3, 28 ms
Reply to request 180 from 192.168.0.3, 40 ms
```

Verification on Receiver_1:

```
Receiver_1#sh ip igmp interface
FastEthernet0/0 is up, line protocol is up
  Internet address is 192.168.0.3/29
  IGMP is enabled on interface
  Current IGMP host version is 2
  Current IGMP router version is 2
  IGMP query interval is 60 seconds
  IGMP configured query interval is 60 seconds
  IGMP querier timeout is 120 seconds
  IGMP configured querier timeout is 120 seconds
  IGMP max query response time is 10 seconds
  Last member query count is 2
  Last member query response interval is 1000 ms
  Inbound IGMP access group is not set
  IGMP activity: 1 joins, 0 leaves
  Multicast routing is disabled on interface
  Multicast TTL threshold is 0
  Multicast groups joined by this system (number of users):
    239.9.9.9(1)
```

Task 2-2

- Configure multicast routing in sparse mode with one static rendezvous-point on RP1 router.
- Verify the configuration by sending a multicast stream from one source and joining from one receiver router.
- Erase all configurations.

Configuration of multicast routing, on every router except Source and Receiver:

```
#configure terminal
(config)#ip multicast-routing
(config)#ip pim rp-address 172.16.0.1
```

Under every connected interface where multicast routing is enable:

```
(config-if)#ip pim sparse-mode
```

Show ip mroute on Router3:

```
Router_3#sh ip mroute
IP Multicast Routing Table
. . .
(*, 224.0.1.40), 00:13:27/stopped, RP 172.16.0.1, flags: SJPC
```

```
Incoming interface: Serial1/3, RPF nbr 172.16.2.1
Outgoing interface list: Null
```

Show ip mroute on Router1:

```
Router_1#sh ip mroute
IP Multicast Routing Table
. . .
(*, 224.0.1.40), 00:16:41/00:02:48, RP 172.16.0.1, flags: SJCL
  Incoming interface: Serial1/0, RPF nbr 172.16.0.1
  Outgoing interface list:
    Serial1/3, Forward/Sparse, 00:15:26/00:02:48
```

Start stream from Source_A1:

```
Source_A1#ping 239.9.9.9 repeat 1000
```

Start stream from Source_A2:

```
Source_A2#ping 239.9.9.99 repeat 1000
```

Show ip mroute on RP1:

```
RP1# sh ip mroute
IP Multicast Routing Table
. . .
(*, 239.9.9.99), 00:00:19/stopped, RP 172.16.0.1, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(10.0.0.2, 239.9.9.99), 00:00:19/00:02:40, flags: PT
  Incoming interface: FastEthernet0/0, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(*, 239.9.9.9), 00:01:31/stopped, RP 172.16.0.1, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(10.0.0.1, 239.9.9.9), 00:01:31/00:01:28, flags: PT
  Incoming interface: FastEthernet0/0, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(*, 224.0.1.40), 00:02:08/00:02:45, RP 172.16.0.1, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Serial1/0, Forward/Sparse, 00:01:50/00:02:38
    FastEthernet0/0, Forward/Sparse, 00:02:08/00:02:45
```

Join from Receiver_1:

```
Receiver_1#configure terminal
Receiver_1(config)#int fastEthernet 0/0
Receiver_1(config-if)#ip igmp join-group 239.9.9.9
```

Join from Receiver_2:

```
Receiver_2#configure terminal
Receiver_2(config)#interface fastEthernet 0/0
Receiver_2(config-if)#ip igmp join-group 239.9.9.99
```

Show ip mroute on RP1:

```
RP1#sh ip mroute
IP Multicast Routing Table
. . .
(*, 239.9.9.99), 00:04:39/00:02:52, RP 172.16.0.1, flags: S
```

```

Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  Serial1/0, Forward/Sparse, 00:01:36/00:02:52

(10.0.0.2, 239.9.9.99), 00:04:39/00:02:37, flags: T
  Incoming interface: FastEthernet0/0, RPF nbr 0.0.0.0
  Outgoing interface list:
    Serial1/0, Forward/Sparse, 00:01:36/00:02:52

(*, 239.9.9.9), 00:05:52/00:02:34, RP 172.16.0.1, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Serial1/0, Forward/Sparse, 00:01:54/00:02:34

(10.0.0.1, 239.9.9.9), 00:05:52/00:03:17, flags: T
  Incoming interface: FastEthernet0/0, RPF nbr 0.0.0.0
  Outgoing interface list:
    Serial1/0, Forward/Sparse, 00:01:54/00:02:37

(*, 224.0.1.40), 00:06:28/00:03:12, RP 172.16.0.1, flags: SJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Serial1/0, Forward/Sparse, 00:06:10/00:03:12
    FastEthernet0/0, Forward/Sparse, 00:06:28/00:02:28

```

Task 2-3

- Configure multicast routing in sparse mode with two static rendezvous-points on RP1 and RP2 routers. 239.9.9.1 and 239.9.9.2 will be permitted on RP1; 239.10.10.1 and 239.10.10.2 will be permitted on RP2.
- Verify the configuration by sending a multicast stream from one source and joining from one receiver router.
- Erase all configurations.

Configuration of multicast routing, on every router except Source and Receiver:

```

#configure terminal
(config)#ip multicast-routing
(config)#access-list 1 permit 239.9.9.1
(config)#access-list 1 permit 239.9.9.2
(config)#access-list 2 permit 239.10.10.1
(config)#access-list 2 permit 239.10.10.2
(config)#ip pim rp-address 172.16.0.1 1
(config)#ip pim rp-address 172.16.1.1 2

```

Under every connected interface where multicast routing is enable:

```
(config-if)#ip pim sparse-mode
```

Start stream from Source_A1:

```
Source_A1#ping 239.10.10.1 repeat 1000
```

Start stream from Source_A2:

```
Source_A2#ping 239.9.9.1 repeat 1000
```

Join from Receiver_1:

```
Receiver_1#configure terminal
Receiver_1(config-if)#ip igmp join-group 239.10.10.1
```

Join from Source_B1:

```
Source_B1#configure terminal
Source_B1(config)#int fastEthernet 0/0
Source_B1(config-if)#ip igmp join-group 239.10.10.1
```

Join from Receiver_2:

```
Receiver_2#configure terminal
Receiver_2(config)#interface fastEthernet 0/0
Receiver_2(config-if)#ip igmp join-group 239.9.9.1
```

Show ip mroute on Router_1:

```
Router_1#sh ip mroute
. . .

(*, 239.10.10.1), 00:10:25/stopped, RP 172.16.2.1, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(10.0.0.1, 239.10.10.1), 00:10:25/00:02:13, flags: T
  Incoming interface: Serial1/0, RPF nbr 172.16.0.1
  Outgoing interface list:
    Serial1/3, Forward/Sparse, 00:00:45/00:03:20
    Serial1/2, Forward/Sparse, 00:10:24/00:02:55

(*, 224.0.1.40), 00:21:53/stopped, RP 0.0.0.0, flags: DCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Serial1/0, Forward/Sparse, 00:21:53/00:02:10
```

Show ip mroute on Router_2:

```
Router_1#sh ip mroute

(*, 239.9.9.1), 00:00:22/stopped, RP 172.16.0.1, flags: S
  Incoming interface: Serial1/0, RPF nbr 172.16.0.1
  Outgoing interface list:
    Serial1/2, Forward/Sparse, 00:00:22/00:03:07

(10.0.0.2, 239.9.9.1), 00:00:21/00:03:08, flags: T
  Incoming interface: Serial1/0, RPF nbr 172.16.0.1
  Outgoing interface list:
    Serial1/2, Forward/Sparse, 00:00:21/00:03:08

(*, 239.10.10.1), 00:26:20/stopped, RP 172.16.2.1, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(10.0.0.1, 239.10.10.1), 00:26:20/00:02:16, flags: T
  Incoming interface: Serial1/0, RPF nbr 172.16.0.1
  Outgoing interface list:
    Serial1/3, Forward/Sparse, 00:16:40/00:03:14
    Serial1/2, Forward/Sparse, 00:26:19/00:02:43

(*, 224.0.1.40), 00:37:48/stopped, RP 0.0.0.0, flags: DCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Serial1/0, Forward/Sparse, 00:37:48/00:01:16
```

Show ip mroute on Router_2:

```
Router_2#sh ip mroute
. . .
```

```

(*, 239.10.10.2), 00:11:41/00:02:22, RP 172.16.1.1, flags: S
  Incoming interface: Serial1/0, RPF nbr 172.16.1.1
  Outgoing interface list:
    Serial1/3, Forward/Sparse, 00:11:41/00:02:38

(*, 239.10.10.1), 00:29:45/00:03:15, RP 172.16.1.1, flags: S
  Incoming interface: Serial1/0, RPF nbr 172.16.1.1
  Outgoing interface list:
    Serial1/3, Forward/Sparse, 00:29:45/00:03:15

(10.0.0.1, 239.10.10.1), 00:29:46/00:02:18, flags: T
  Incoming interface: Serial1/2, RPF nbr 172.16.5.2
  Outgoing interface list:
    Serial1/0, Forward/Sparse, 00:20:05/00:03:25

(*, 224.0.1.40), 00:34:14/stopped, RP 0.0.0.0, flags: DCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Serial1/0, Forward/Sparse, 00:34:14/00:00:00

```

Task 2-4

- Configure multicast routing in sparse mode with one auto rendezvous-point on RP1 router, Se 1/0 interface.
- Verify the configuration by sending a multicast stream from one source and joining from one receiver router.
- Erase all configurations.

Configuration of multicast routing, on every router except Source and Receiver:

```

#configure terminal
(config)#ip multicast-routing

```

Under every connected interface where multicast routing is enable:

```

(config-if)#ip pim sparse-mode

```

Configuration on RP1:

```

RP1(config)#ip pim send-rp-announce loopback 1 scope 10
RP1(config)#ip pim send-rp-discovery scope 10

```

Create stream from Source_A1:

```

Source_A1#ping 239.9.9.9 repeat 1000

```

Join from Receiver_1:

```

Receiver_1#configure terminal
Receiver_1(config)#int fa 0/0
Receiver_1(config-if)#ip igmp join-group 239.9.9.9

```

Show ip mroute on RP1:

```

RP1#sh ip mroute
. . .

(*, 239.9.9.9), 00:00:04/stopped, RP 172.16.0.1, flags: SP
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list: Null

(10.0.0.1, 239.9.9.9), 00:00:04/00:02:55, flags: PT
  Incoming interface: FastEthernet0/0, RPF nbr 0.0.0.0
  Outgoing interface list: Null

```

```
(* , 224.0.1.39), 00:00:04/00:02:55, RP 0.0.0.0, flags: DCL
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  Loopback1, Forward/Sparse, 00:00:05/00:02:54
  Serial1/0, Forward/Sparse, 00:00:05/00:02:54
  FastEthernet0/0, Forward/Sparse, 00:00:05/00:02:54

(* , 224.0.1.40), 00:00:05/00:02:54, RP 0.0.0.0, flags: DCL
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  FastEthernet0/0, Forward/Sparse, 00:00:05/00:02:54
```

Note: Auto-RP will work ONLY in sparse-dense mode.

Under every connected interface where multicast routing is enable:

```
(config-if)#ip pim sparse-dense-mode
```

Task 2-5

- Create interface Lo 1 on RP1 with ip address 1.1.1.1/24 and interface Lo 2 on RP2 with ip 2.2.2.2/24. Enable multicast routing in sparse-dense mode on these two interfaces.
- Configure multicast routing in sparse-dense mode with two auto rendezvous-points on RP1 and RP2 routers.
- Configure RP1 for ip address 239.9.9.1 and 239.9.9.2; configure RP2 for ip address 239.10.10.1 and 239.10.10.2.
- Verify the configuration by sending a multicast stream from one source and joining from one receiver router.

Configuration of multicast routing, on every router except Source and Receiver:

```
#configure terminal
(config)#ip multicast-routing
```

Under every connected interface where multicast routing is enable:

```
(config-if)#ip pim sparse-mode
```

Configuration on RP1:

```
RP1(config)#int lo 1
RP1(config-if)# ip address 1.1.1.1 255.255.255.0
RP1(config-if)#ip pim sparse-dense-mode
RP1(config-if)#exit
RP1(config)#access-list 1 permit 239.9.9.1
RP1(config)#access-list 1 permit 239.9.9.2
RP1(config)#ip pim send-rp-announce loopback 1 scope 10 group-list 1
RP1(config)#ip pim send-rp-discovery scope 10
```

Configuration on RP2:

```
RP2#configure terminal
RP2(config)#access-list 1 permit 239.10.10.1
RP2(config)#access-list 1 permit 239.10.10.2
RP2(config)#int lo 1
RP2(config-if)#ip address 2.2.2.2 255.255.255.0
RP2(config-if)#ip pim sparse-dense-mode
RP2(config-if)#exit
RP2(config)#ip pim send-rp-announce lo 1 scope 10 group-list 1
RP2(config)#ip pim send-rp-discovery scope 10
```

Create stream from Source_A1:

```
Source_A1#ping 239.9.9.1 repeat 1000
```

Create stream from Source_A2:

```
Source_A2#ping 239.10.10.1 repeat 1000
```

Joining from Receiver_1:

```
Receiver_1#configure terminal
Receiver_1(config)#int fa 0/0
Receiver_1(config-if)#ip igmp join-group 239.9.9.1
Receiver_1(config-if)#ip igmp join-group 239.10.10.1
```

Show ip mroute on RP1:

```
RP1#sh ip mroute
. . .

(*, 239.9.9.1), 00:03:48/00:02:31, RP 1.1.1.1, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Serial1/0, Forward/Sparse, 00:02:46/00:02:31

(10.0.0.1, 239.9.9.1), 00:03:48/00:03:28, flags: T
  Incoming interface: FastEthernet0/0, RPF nbr 0.0.0.0
  Outgoing interface list:
    Serial1/0, Forward/Sparse, 00:02:46/00:03:27

(*, 239.10.10.1), 00:03:44/stopped, RP 2.2.2.2, flags: SPF
  Incoming interface: Serial1/0, RPF nbr 172.16.0.2
  Outgoing interface list: Null

(10.0.0.2, 239.10.10.1), 00:00:20/00:03:13, flags: FT
  Incoming interface: FastEthernet0/0, RPF nbr 0.0.0.0
  Outgoing interface list:
    Serial1/0, Forward/Sparse, 00:00:20/00:03:09

(*, 224.0.1.39), 00:04:23/stopped, RP 0.0.0.0, flags: DCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback1, Forward/Sparse-Dense, 00:04:23/00:00:00
    Serial1/0, Forward/Sparse, 00:04:23/00:02:38
    FastEthernet0/0, Forward/Sparse-Dense, 00:04:23/00:00:00

(2.2.2.2, 224.0.1.39), 00:00:21/00:02:38, flags: LT
  Incoming interface: Serial1/0, RPF nbr 172.16.0.2
  Outgoing interface list:
    Loopback1, Forward/Sparse-Dense, 00:00:21/00:00:00
    FastEthernet0/0, Forward/Sparse-Dense, 00:00:21/00:00:00

(1.1.1.1, 224.0.1.39), 00:03:56/00:02:03, flags: LT
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    FastEthernet0/0, Forward/Sparse-Dense, 00:03:56/00:00:00
    Serial1/0, Forward/Sparse, 00:03:56/00:02:38

(*, 224.0.1.40), 00:04:23/00:02:38, RP 0.0.0.0, flags: DCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    FastEthernet0/0, Forward/Sparse-Dense, 00:04:23/00:00:00
```

Show ip mroute on RP2:

```
RP2#sh ip mroute
. . .
(*, 239.10.10.1), 00:00:29/stopped, RP 2.2.2.2, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Serial1/0, Forward/Sparse-Dense, 00:00:29/00:03:00

(10.0.0.2, 239.10.10.1), 00:00:28/00:02:34, flags: PT
  Incoming interface: Serial1/0, RPF nbr 172.16.1.2
  Outgoing interface list: Null

(*, 224.0.1.39), 00:04:34/stopped, RP 0.0.0.0, flags: DCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Loopback1, Forward/Sparse-Dense, 00:04:35/00:00:00
    Serial1/0, Forward/Sparse-Dense, 00:04:35/00:00:00
    FastEthernet0/0, Forward/Sparse-Dense, 00:04:35/00:00:00

(2.2.2.2, 224.0.1.39), 00:03:57/00:02:30, flags: LT
  Incoming interface: Loopback1, RPF nbr 0.0.0.0
  Outgoing interface list:
    FastEthernet0/0, Forward/Sparse-Dense, 00:03:57/00:00:00
    Serial1/0, Forward/Sparse-Dense, 00:03:57/00:00:00

(1.1.1.1, 224.0.1.39), 00:04:04/00:02:55, flags: LT
  Incoming interface: Serial1/0, RPF nbr 172.16.1.2
  Outgoing interface list:
    Loopback1, Forward/Sparse-Dense, 00:04:04/00:00:00
    FastEthernet0/0, Forward/Sparse-Dense, 00:04:04/00:00:00

(*, 224.0.1.40), 00:04:35/stopped, RP 0.0.0.0, flags: DCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Serial1/0, Forward/Sparse-Dense, 00:04:35/00:00:00
    FastEthernet0/0, Forward/Sparse-Dense, 00:04:35/00:00:00

(172.16.0.1, 224.0.1.40), 00:04:16/00:02:32, flags: LT
  Incoming interface: Serial1/0, RPF nbr 172.16.1.2
  Outgoing interface list:
    FastEthernet0/0, Forward/Sparse-Dense, 00:04:16/00:00:00
```