

Übung1

BCN

IT Security - VZ

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1 Analysis of RIP

a) Analyze and record the routing tables of routers RHQ0 and REast1

a. How many routes were learned?

On RHQ0 9 routes were learned.

```
RHQ0(config)#do show 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, m - OMP
       n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA
       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
       H - NHRP, G - NHRP registered, g - NHRP registration summary
       o - ODR, P - periodic downloaded static route, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR
       & - replicated local route overrides by connected

Gateway of last resort is 199.1.1.65 to network 0.0.0.0

S*    0.0.0.0/0 [1/0] via 199.1.1.65, Ethernet1/0
R      172.16.0.0/16 [120/2] via 172.31.255.254, 00:00:25, Ethernet0/1
      172.17.0.0/30 is subnetted, 1 subnets
R        172.17.255.252 [120/2] via 172.31.255.254, 00:00:25, Ethernet0/1
R      172.18.0.0/16 [120/2] via 172.31.255.250, 00:00:09, Ethernet0/2
R      172.19.0.0/16 [120/2] via 172.31.255.250, 00:00:09, Ethernet0/2
      172.30.0.0/16 is variably subnetted, 2 subnets, 2 masks
C        172.30.0.0/16 is directly connected, Ethernet0/0
L        172.30.255.254/32 is directly connected, Ethernet0/0
      172.31.0.0/16 is variably subnetted, 9 subnets, 2 masks
R        172.31.255.228/30 [120/2] via 172.31.255.254, 00:00:25, Ethernet0/1
R        172.31.255.232/30 [120/1] via 172.31.255.250, 00:00:09, Ethernet0/2
R        172.31.255.236/30 [120/1] via 172.31.255.250, 00:00:09, Ethernet0/2
R        172.31.255.240/30 [120/1] via 172.31.255.254, 00:00:25, Ethernet0/1
R        172.31.255.244/30 [120/1] via 172.31.255.254, 00:00:25, Ethernet0/1
C        172.31.255.248/30 is directly connected, Ethernet0/2
L        172.31.255.249/32 is directly connected, Ethernet0/2
C        172.31.255.252/30 is directly connected, Ethernet0/1
L        172.31.255.253/32 is directly connected, Ethernet0/1
      199.1.1.0/24 is variably subnetted, 2 subnets, 2 masks
C        199.1.1.64/30 is directly connected, Ethernet1/0
L        199.1.1.66/32 is directly connected, Ethernet1/0
```

On REast1 11 routes were learned

REast1#show 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, m - OMP
n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA
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
H - NHRP, G - NHRP registered, g - NHRP registration summary
o - ODR, P - periodic downloaded static route, l - LISP
a - application route
+ - replicated route, % - next hop override, p - overrides from PfR
& - replicated local route overrides by connected

Gateway of last resort is 172.31.255.253 to network 0.0.0.0

```
R* 0.0.0.0/0 [120/1] via 172.31.255.253, 00:00:24, Ethernet0/0
R 172.16.0.0/16 [120/1] via 172.31.255.246, 00:00:02, Ethernet0/1
172.17.0.0/30 is subnetted, 1 subnets
R 172.17.255.252 [120/1] via 172.31.255.242, 00:00:01, Ethernet0/2
R 172.18.0.0/16 [120/3] via 172.31.255.253, 00:00:24, Ethernet0/0
R 172.19.0.0/16 [120/3] via 172.31.255.253, 00:00:24, Ethernet0/0
R 172.30.0.0/16 [120/1] via 172.31.255.253, 00:00:24, Ethernet0/0
172.31.0.0/16 is variably subnetted, 10 subnets, 2 masks
R 172.31.255.228/30 [120/1] via 172.31.255.246, 00:00:02, Ethernet0/1
[120/1] via 172.31.255.242, 00:00:01, Ethernet0/2
R 172.31.255.232/30 [120/2] via 172.31.255.253, 00:00:24, Ethernet0/0
R 172.31.255.236/30 [120/2] via 172.31.255.253, 00:00:24, Ethernet0/0
C 172.31.255.240/30 is directly connected, Ethernet0/2
L 172.31.255.241/32 is directly connected, Ethernet0/2
C 172.31.255.244/30 is directly connected, Ethernet0/1
L 172.31.255.245/32 is directly connected, Ethernet0/1
R 172.31.255.248/30 [120/1] via 172.31.255.253, 00:00:24, Ethernet0/0
C 172.31.255.252/30 is directly connected, Ethernet0/0
L 172.31.255.254/32 is directly connected, Ethernet0/0
199.1.1.0/30 is subnetted, 1 subnets
R 199.1.1.64 [120/1] via 172.31.255.253, 00:00:24, Ethernet0/0
```

b) What is the administrative distance of RIP? Where can you find this value on the router?

120, when you run show ip route, on a learned route it will show on here.

R 172.16.0.0/16 [120/1]

Rip Hop Count

c) How could you reduce the size of the routing tables?

By summarating networks,for example instead of writing an entry for each network like 172.19.0.0, 172.17.0.0 , ect . We can write when configuring rip “network 172.0.0.0” , and this will summarize all networks.

d) Which timers does RIP utilize?

It has update, invalid, holddown, and flush updates.

e) How can the current values of these timers be displayed?

They can be displayed via show Ip protocols

```
RHQ0 :
Routing Protocol is "rip"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Sending updates every 30 seconds, next due in 14 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Redistributing: rip
  Default version control: send version 2, receive version 2
    Interface          Send  Recv  Triggered RIP  Key-chain
    Ethernet0/1         2     2      No             none
    Ethernet0/2         2     2      No             none
    Ethernet1/0         2     2      No             none
  Automatic network summarization is not in effect
  Maximum path: 4
  Routing for Networks:
    172.30.0.0
    172.31.0.0
    199.1.1.0
  Passive Interface(s):
    Ethernet0/0
  Routing Information Sources:
    Gateway         Distance      Last Update
    172.31.255.254    120          00:00:22
    172.31.255.250    120          00:00:17
  Distance: (default is 120)
```

f) Do some research on how to harden RIPv6

Can be done via “redistribute connected” command,we disable the ipv6 router rip process1 on all host interface,and write redistribute connect on all Default gateway routers for hosts.

a. Ensure that RIPv6 updates are sent out only on point-to-point links only.

Write this command on all host interfaces, in this case its e0/0 for RHQ0, RWest 2 and 3 , Reast 2 and 3.

```
Ipv6 router rip process1
Redistribute connected
exit
Int e0/0
no ipv6 rip process1 enable
exit
```

In this way the host interfaces are not advertising updates for RIPng but they can still reach routed networks.

2 OSPFv2 (Lab report)

a) Analyze the routing table of the routers RHQ0 and REast1. Which protocol is used to populate the entries in the routing table now? Rip is still being used.

```
RHQ0#show 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, m - OMP
       n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA
       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
       H - NHRP, G - NHRP registered, g - NHRP registration summary
       o - ODR, P - periodic downloaded static route, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR
       & - replicated local route overrides by connected

Gateway of last resort is 199.1.1.65 to network 0.0.0.0

S*    0.0.0.0/0 [1/0] via 199.1.1.65
R      172.16.0.0/16 [120/2] via 172.31.255.254, 00:00:22, Ethernet0/1
R      172.17.0.0/16 [120/2] via 172.31.255.254, 00:00:22, Ethernet0/1
R      172.18.0.0/16 [120/2] via 172.31.255.250, 00:00:18, Ethernet0/2
R      172.19.0.0/16 [120/2] via 172.31.255.250, 00:00:18, Ethernet0/2
       172.30.0.0/16 is variably subnetted, 2 subnets, 2 masks
C      172.30.0.0/16 is directly connected, Ethernet0/0
L      172.30.255.254/32 is directly connected, Ethernet0/0
       172.31.0.0/16 is variably subnetted, 9 subnets, 2 masks
R      172.31.255.228/30 [120/2] via 172.31.255.254, 00:00:22, Ethernet0/1
R      172.31.255.232/30 [120/1] via 172.31.255.250, 00:00:18, Ethernet0/2
R      172.31.255.236/30 [120/1] via 172.31.255.250, 00:00:18, Ethernet0/2
R      172.31.255.240/30 [120/1] via 172.31.255.254, 00:00:22, Ethernet0/1
```

```
R      172.31.255.244/30 [120/1] via 172.31.255.254, 00:00:22, Ethernet0/1
C      172.31.255.248/30 is directly connected, Ethernet0/2
L      172.31.255.249/32 is directly connected, Ethernet0/2
C      172.31.255.252/30 is directly connected, Ethernet0/1
L      172.31.255.253/32 is directly connected, Ethernet0/1
      199.1.1.0/24 is variably subnetted, 2 subnets, 2 masks
C      199.1.1.64/30 is directly connected, Ethernet1/0
L      199.1.1.66/32 is directly connected, Ethernet1/0
RHQ0#
```

REast1#show 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, m - OMP
 n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA
 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
 H - NHRP, G - NHRP registered, g - NHRP registration summary
 o - ODR, P - periodic downloaded static route, l - LISP
 a - application route
 + - replicated route, % - next hop override, p - overrides from PfR
 & - replicated local route overrides by connected

Gateway of last resort is 172.31.255.253 to network 0.0.0.0

```
O*E2  0.0.0.0/0 [110/1] via 172.31.255.253, 1d16h, Ethernet0/0
R      172.16.0.0/16 [120/1] via 172.31.255.246, 00:00:21, Ethernet0/1
R      172.17.0.0/16 [120/1] via 172.31.255.242, 00:00:12, Ethernet0/2
R      172.18.0.0/16 [120/3] via 172.31.255.253, 00:00:20, Ethernet0/0
R      172.19.0.0/16 [120/3] via 172.31.255.253, 00:00:20, Ethernet0/0
R      172.30.0.0/16 [120/1] via 172.31.255.253, 00:00:20, Ethernet0/0
      172.31.0.0/16 is variably subnetted, 10 subnets, 2 masks
R      172.31.255.228/30 [120/1] via 172.31.255.246, 00:00:21, Ethernet0/1
      [120/1] via 172.31.255.242, 00:00:12, Ethernet0/2
R      172.31.255.232/30 [120/2] via 172.31.255.253, 00:00:20, Ethernet0/0
R      172.31.255.236/30 [120/2] via 172.31.255.253, 00:00:20, Ethernet0/0
C      172.31.255.240/30 is directly connected, Ethernet0/2
L      172.31.255.241/32 is directly connected, Ethernet0/2
C      172.31.255.244/30 is directly connected, Ethernet0/1
L      172.31.255.245/32 is directly connected, Ethernet0/1
O      172.31.255.248/30 [110/20] via 172.31.255.253, 1d16h, Ethernet0/0
C      172.31.255.252/30 is directly connected, Ethernet0/0
```

```
L      172.31.255.254/32 is directly connected, Ethernet0/0
      199.1.1.0/30 is subnetted, 1 subnets
R      199.1.1.64 [120/1] via 172.31.255.253, 00:00:20, Ethernet0/0
REast1#
```

b)Analyze the OSPF topology table and the neighbor table of RHQ0 and REast1.

The topology table shows the process-ID,current router ID and the area it is in. The neighbour table shows the neighbor routers ,their IDs, priority,State, dead time intervals, ipv4 Address and their interfaces. RHQ has 2; REast1 and RWest1 , while REast has 3 ; RHQ0 REast1 and REast 2

```
Area : 0 (0 nodes)
RHQ0#show ip ospf topology
      Process OSPF-10

Instance : global
Router ID : 1.1.1.1
Area : 0 (0 nodes)
RHQ0#show ip ospf neighbor

Neighbor ID      Pri   State           Dead Time   Address        Interface
172.31.255.250   1    FULL/BDR        00:00:31    172.31.255.250 Ethernet0/2
1.1.1.5          1    FULL/BDR        00:00:35    172.31.255.254 Ethernet0/1
RHQ0#
REast1#show ip ospf topology
      Process OSPF-10

Instance : global
Router ID : 1.1.1.5
Area : 0 (0 nodes)
REast1#show ip os
REast1#show ip ospf ne
REast1#show ip ospf neighbor

Neighbor ID      Pri   State           Dead Time   Address        Interface
1.1.1.1          1    FULL/DR         00:00:35    172.31.255.253 Ethernet0/0
REast1#
```

RHQ0 and REast1

3 Analysis OSPFv3 (Lab report)

- a) Analyze the routing table of the routers RHQ0 and REast1. Which protocol is used to populate the entries in the routing table now?

RIP is still used to populate the routing tables because Routes are yet to be distributed.

```
RHQ0#show ipv6 route
IPv6 Routing Table - default - 10 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, HG - NHRP registered
       Hg - NHRP registration summary, HE - NHRP External, I1 - ISIS L1
       I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP
       EX - EIGRP external, ND - ND Default, NDp - ND Prefix, DCE - Destination
       NDr - Redirect, RL - RPL, O - OSPF Intra, OI - OSPF Inter
       OE1 - OSPF ext 1, OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1
       ON2 - OSPF NSSA ext 2, la - LISP alt, lr - LISP site-registrations
       ld - LISP dyn-eid, la - LISP away, le - LISP extranet-policy
       lp - LISP publications, ls - LISP destinations-summary, a - Application
       m - OMP
S  ::/0 [1/0]
   via 2001:DB8:ACAD:1::1
C  2001:DB8:ACAD:1::/127 [0/0]
   via Ethernet1/0, directly connected
L  2001:DB8:ACAD:1::/128 [0/0]
   via Ethernet1/0, receive
R  2001:DB8:ACAD:AC16::/64 [120/3]
   via FE80::1, Ethernet0/1
R  2001:DB8:ACAD:AC17::/64 [120/3]
   via FE80::1, Ethernet0/1
R  2001:DB8:ACAD:AC18::/64 [120/3]
   via FE80::1, Ethernet0/2
R  2001:DB8:ACAD:AC19::/64 [120/3]
   via FE80::1, Ethernet0/2
C  2001:DB8:ACAD:AC1E::/64 [0/0]
   via Ethernet0/0, directly connected
L  2001:DB8:ACAD:AC1E::254/128 [0/0]
   via Ethernet0/0, receive
L  FF00::/8 [0/0]
   via Null0, receive
RHQ0#
```

RHQ0 ipv6 routing table

Reast learn the default route via OSPF.

```
REast1#show ipv6 route
IPv6 Routing Table - default - 8 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
        B - BGP, R - RIP, H - NHRP, HG - NHRP registered
        Hg - NHRP registration summary, HE - NHRP External, I1 - ISIS L1
        I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary, D - EIGRP
        EX - EIGRP external, ND - ND Default, NDp - ND Prefix, DCE - Destination
        NDr - Redirect, RL - RPL, O - OSPF Intra, OI - OSPF Inter
        OE1 - OSPF ext 1, OE2 - OSPF ext 2, ON1 - OSPF NSSA ext 1
        ON2 - OSPF NSSA ext 2, Ia - LISP alt, lr - LISP site-registrations
        ld - LISP dyn-eid, lA - LISP away, le - LISP extranet-policy
        lp - LISP publications, ls - LISP destinations-summary, a - Application
        m - OMP
OE2 ::/0 [110/1], tag 1
    via FE80::, Ethernet0/0
R   2001:DB8:ACAD:1::/127 [120/2]
    via FE80::, Ethernet0/0
R   2001:DB8:ACAD:AC16::/64 [120/2]
    via FE80::1:2, Ethernet0/1
R   2001:DB8:ACAD:AC17::/64 [120/2]
    via FE80::1:3, Ethernet0/2
R   2001:DB8:ACAD:AC18::/64 [120/4]
    via FE80::, Ethernet0/0
R   2001:DB8:ACAD:AC19::/64 [120/4]
    via FE80::, Ethernet0/0
R   2001:DB8:ACAD:AC1E::/64 [120/2]
    via FE80::, Ethernet0/0
L   FF00::/8 [0/0]
    via Null0, receive
REast1#
```

REast1ipv6 routing table

4 Analysis Multiarea OSPF Dual Stack and Route Redistribution (Lab report)

a) Analyze the changes in the routing tables of RHQ0, RWest2 and RWest3.

- O E1 → OSPF External Type 1 Routes from outside OSPF, cost includes internal path)
- O E2 → OSPF External Type 2 Routes from outside OSPF, fixed cost) (source Skript in E Campus.)
- O IA → OSPF Inter-Area Routes learned from another OSPF area

```
S* 0.0.0.0/0 [1/0] via 199.1.1.65, Ethernet1/0
O E1 172.16.0.0/16 [110/110] via 172.31.255.254, 00:32:23, Ethernet0/1
    172.17.0.0/30 is subnetted, 1 subnets
O E1    172.17.255.252 [110/110] via 172.31.255.254, 00:32:26, Ethernet0/1
O      172.19.0.0/16 [110/30] via 172.31.255.250, 01:56:01, Ethernet0/2
    172.30.0.0/16 is variably subnetted, 2 subnets, 2 masks
C      172.30.0.0/16 is directly connected, Ethernet0/0
L      172.30.255.254/32 is directly connected, Ethernet0/0
    172.31.0.0/16 is variably subnetted, 9 subnets, 2 masks
O E1    172.31.255.228/30 [110/110] via 172.31.255.254, 00:32:23, Ethernet0/1
O IA    172.31.255.232/30 [110/20] via 172.31.255.250, 02:03:25, Ethernet0/2
O IA    172.31.255.236/30 [110/20] via 172.31.255.250, 02:03:25, Ethernet0/2
O E1    172.31.255.240/30 [110/110] via 172.31.255.254, 00:32:31, Ethernet0/1
O E1    172.31.255.244/30 [110/110] via 172.31.255.254, 00:32:31, Ethernet0/1
C      172.31.255.248/30 is directly connected, Ethernet0/2
L      172.31.255.249/32 is directly connected, Ethernet0/2
C      172.31.255.252/30 is directly connected, Ethernet0/1
L      172.31.255.253/32 is directly connected, Ethernet0/1
    199.1.1.0/24 is variably subnetted, 2 subnets, 2 masks
C      199.1.1.64/30 is directly connected, Ethernet1/0
L      199.1.1.66/32 is directly connected, Ethernet1/0
```

RHQ0

```
O*E2 0.0.0.0/0 [110/10] via 172.31.255.237, 01:36:11, Ethernet0/1
O E1 172.16.0.0/16 [110/130] via 172.31.255.237, 00:33:30, Ethernet0/1
    172.17.0.0/30 is subnetted, 1 subnets
O E1    172.17.255.252 [110/130] via 172.31.255.237, 00:33:32, Ethernet0/1
    172.18.0.0/16 is variably subnetted, 2 subnets, 2 masks
C      172.18.0.0/16 is directly connected, Ethernet0/0
L      172.18.255.254/32 is directly connected, Ethernet0/0
O IA 172.19.0.0/16 [110/30] via 172.31.255.237, 01:36:11, Ethernet0/1
    172.31.0.0/16 is variably subnetted, 8 subnets, 2 masks
O E1    172.31.255.228/30 [110/130] via 172.31.255.237, 00:33:30, Ethernet0/1
O IA    172.31.255.232/30 [110/20] via 172.31.255.237, 01:36:11, Ethernet0/1
C      172.31.255.236/30 is directly connected, Ethernet0/1
L      172.31.255.238/32 is directly connected, Ethernet0/1
```

```
O E1 172.31.255.240/30 [110/130] via 172.31.255.237, 00:33:37, Ethernet0/1
O E1 172.31.255.244/30 [110/130] via 172.31.255.237, 00:33:37, Ethernet0/1
O IA 172.31.255.248/30 [110/20] via 172.31.255.237, 01:36:11, Ethernet0/1
O IA 172.31.255.252/30 [110/30] via 172.31.255.237, 01:36:11, Ethernet0/1
199.1.1.0/30 is subnetted, 1 subnets
O IA 199.1.1.64 [110/30] via 172.31.255.237, 01:36:11, Ethernet0/1
```

RWest2

```
O*E2 0.0.0.0/0 [110/10] via 172.31.255.233, 01:59:30, Ethernet0/1
O E1 172.16.0.0/16 [110/130] via 172.31.255.233, 00:35:53, Ethernet0/1
172.17.0.0/30 is subnetted, 1 subnets
O E1 172.17.255.252 [110/130] via 172.31.255.233, 00:35:55, Ethernet0/1
172.19.0.0/16 is variably subnetted, 2 subnets, 2 masks
C 172.19.0.0/16 is directly connected, Ethernet0/0
L 172.19.255.254/32 is directly connected, Ethernet0/0
172.31.0.0/16 is variably subnetted, 8 subnets, 2 masks
O E1 172.31.255.228/30 [110/130] via 172.31.255.233, 00:35:53, Ethernet0/1
C 172.31.255.232/30 is directly connected, Ethernet0/1
L 172.31.255.234/32 is directly connected, Ethernet0/1
O IA 172.31.255.236/30 [110/20] via 172.31.255.233, 01:59:30, Ethernet0/1
O E1 172.31.255.240/30 [110/130] via 172.31.255.233, 00:36:00, Ethernet0/1
O E1 172.31.255.244/30 [110/130] via 172.31.255.233, 00:36:00, Ethernet0/1
O IA 172.31.255.248/30 [110/20] via 172.31.255.233, 01:59:30, Ethernet0/1
O IA 172.31.255.252/30 [110/30] via 172.31.255.233, 01:59:30, Ethernet0/1
199.1.1.0/30 is subnetted, 1 subnets
O IA 199.1.1.64 [110/30] via 172.31.255.233, 01:59:30, Ethernet0/1
```

RWest3

5 Analysis Multiarea OSPF Dual Stack – Stub & Totally Stub Area (Lab report)

a) Analyze the routing tables of RWest2 and RWest3. What's the difference? Which entries have changed and why?

- Stubby areas allow only LSA 1 2 and 3 ,so Point to Point, Network and Summary of other areas,Totally stubby allow only LSA 1 and 2 ,also only Point to point and within area,both don't allow LSA 4 and 5 ,just the default route.
- Default Route Added: O*IA 0.0.0.0/0 now exists, pointing to 172.31.255.237.
- External Routes Removed: No more O E1 or O E2 routes (Totally Stub Areas block them).
- Most Inter-Area Routes Removed: Only essential O IA routes remain.
- Simplified Routing: Instead of multiple routes, RWest2 now relies on a single default route for external and inter-area traffic.

Gateway of last resort is 172.31.255.237 to network 0.0.0.0

```
O*IA 0.0.0.0/0 [110/11] via 172.31.255.237, 00:00:26, Ethernet0/1
      172.18.0.0/16 is variably subnetted, 2 subnets, 2 masks
C      172.18.0.0/16 is directly connected, Ethernet0/0
L      172.18.255.254/32 is directly connected, Ethernet0/0
O IA 172.19.0.0/16 [110/30] via 172.31.255.237, 00:00:26, Ethernet0/1
      172.31.0.0/16 is variably subnetted, 5 subnets, 2 masks
O IA 172.31.255.232/30 [110/20] via 172.31.255.237, 00:00:26, Ethernet0/1
C      172.31.255.236/30 is directly connected, Ethernet0/1
L      172.31.255.238/32 is directly connected, Ethernet0/1
O IA 172.31.255.248/30 [110/20] via 172.31.255.237, 00:00:26, Ethernet0/1
O IA 172.31.255.252/30 [110/30] via 172.31.255.237, 00:00:26, Ethernet0/1
      199.1.1.0/30 is subnetted, 1 subnets
O IA 199.1.1.64 [110/30] via 172.31.255.237, 00:00:26, Ethernet0/1
```

RWest2

- All external (O E1/E2) and inter-area (O IA) routes removed
- Only directly connected (C) and local (L) routes remain
- Default route (O*IA 0.0.0.0/0) added for all non-local traffic

Gateway of last resort is 172.31.255.233 to network 0.0.0.0

```
O*IA 0.0.0.0/0 [110/11] via 172.31.255.233, 00:05:31, Ethernet0/1
      172.19.0.0/16 is variably subnetted, 2 subnets, 2 masks
C      172.19.0.0/16 is directly connected, Ethernet0/0
L      172.19.255.254/32 is directly connected, Ethernet0/0
      172.31.0.0/16 is variably subnetted, 2 subnets, 2 masks
C      172.31.255.232/30 is directly connected, Ethernet0/1
L      172.31.255.234/32 is directly connected, Ethernet0/1
```

RWest3