CCIEv5 Quick Guide For Redistribution & Path Control

Redistribution

Redistribution can happen between:

- routing protocol to routing protocol
- static routes to routing protocol
- directly connected routes to routing protocol instead of using network command we can use ***Redistribution connected*** or both depend on our requirements

Redistribution happened outbound

Which mean if we Redistribute OSPF into RIP in R1 nothing change in R1 RIB but change will be in his sending routes to other rip neighbors , they will start receive OSPFroutes

Default Seed Metric (which mean use this metric with any redistribute routes coming to you)

- Default seed metric for RIP,& EIGRP is infinity (Zero) so we need to add "metric" keyword to Redistribution command , with IS-IS its infinity but will work fine.

- OSPF default seed metric is 20 for IGP 1 for BGP

- BGP default seed metric is set to IGP metric

examples to change seed metric value:

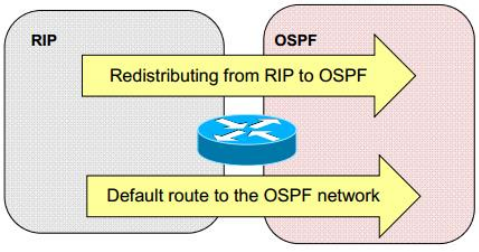
router rip or router ospf
default-metric 5

router eigrp 1
deafult-metric 1 1 1 1 1

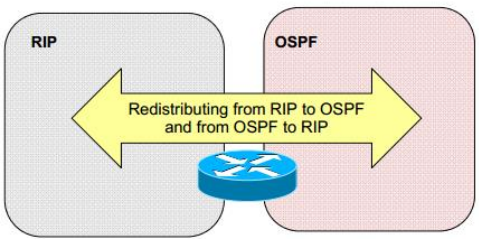
Things To Remember:

- The concepts of one way Redistribution / two way Redistribution /multipoint Redistribution

One-Point One-Way Redistribution



One-Point Two-Way Redistribution



- Redistribute between EIGRP 100 and EIGRP 200 doesn't need metric configured, it will be D EX in routing table and that's it.

Router eigrp 100
Redis eigrp 200

But for best Practice I would recommend to use " redis eigrp 200 metric 10000 100 255 1 1500"

Redistribution & OSPF

- With ospf we need keyword "subnets " to support classless networks in Redistribution

router ospf 1
Redistribution rip subnets
Redistribution eigrp 100 subnets
subnets will allow to redistribute classless networks

router ospf 1
redistribute eigrp 100 metric-type 1
mean use E1 , if not specified router will use E2 by default

router ospf 1
redistribute static
redistribute static routes on this router into ospf process

- the default behavior for OSPF is redistribute all routes , still we can type :

router eigrp 100
redistribute ospf 1 match internal external 1 external 2

Example 1 :
we can decide what to send from you to others
lets say R2 is Redistribution point ospf in eigrp , eigrp in ospf between R1 & R3

he receive many networks from R3 BUT will send 11.0.0.0 only from R3 to R1
R2(config)#access-list 1 permit 11.0.0.0
R2(config)#route-map only11 permit 10
R2(config-route-map)#match ip address 1
R2(config-route-map)#exit
R2(config)#router eigrp 3
R2(config-router)#Redis ospf 1 metric 1 1 1 1 1 route-map only11

Example 2 :
R2 will advertise 33.33.33.33 to R1 without using network command
R2(config)#access-list 2 permit 33.33.33.33 0.0.0.0
R2(config)#route-map net33 permit 10
R2(config-route-map)#match ip address 2
R2(config-route-map)#exit
R2(config)#router eigrp 3
R2(config-router)#Redis ospf 1 route-map net33

Redistribution OSPF into BGP

```
router bgp 100
redistribute ospf 1
!-- This redistributes only OSPF intra- and inter-area routes into BGP.

router bgp 100
redistribute ospf 1 match external 1 external 2
!--- This redistributes ONLY OSPF External routes, but both type-1 and type-2.

router bgp 100
redistribute ospf 1 match internal external 1 external 2
!--- This redistributes all OSPF routes into BGP.

router bgp 100
redistribute ospf 1 match nssa-external 1 nssa-external 2
!--- This redistributes only OSPF NSSA-external routes  Type-1 and Type-2 into BGP.
```

Redistribution BGP into IGP

When BGP is redistributed into an IGP, only eBGP learned routes get redistributed.
you will need to enable redistribution of iBGP routes into IGP.

```
router bgp 65345
bgp redistribute-internal
!
router ospf 100
redistribute bgp 65345 subnets
```

Redistribution OSPF default route into BGP

```
route-map map_default_only permit 10
match ip address acl_default_only
!
ip access-list standard acl_default_only
permit 0.0.0.0
!
router bgp 64601
network 0.0.0.0
redistribute ospf 1 route-map map_default_only
default-information originate
!--- distributes the default route in bgp
```

Distribute-list

distribute-list out command filters updates going out of the interface or routing protocol specified in the command, into the routing process under which it is configured.

distribute-list in command filters updates going into the interface specified in the command, into the routing process under which it is configured.

Distribute-list Example :
R1 will not advertise 111.111.111.111

access-list 90 permit 10.0.0.0
access-list 90 permit 1.1.1.1 0.0.0.0
access-list 90 permit 192.168.10.0 0.0.0.255

router eigrp 3
distribute-list 90 out FastEthernet0/0

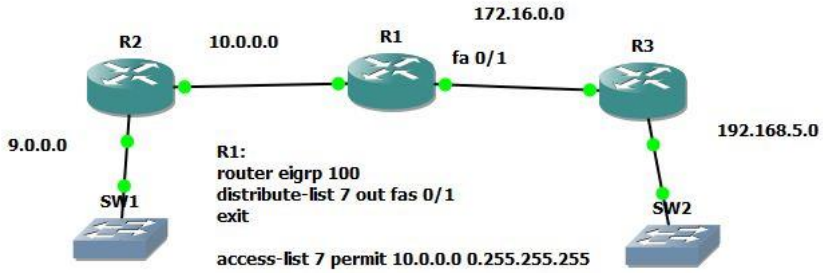
distribute-list is applied to f0/0 out as of outgoing packets on that interface will be filtered by acl 90.

Distribute-list & OSPF

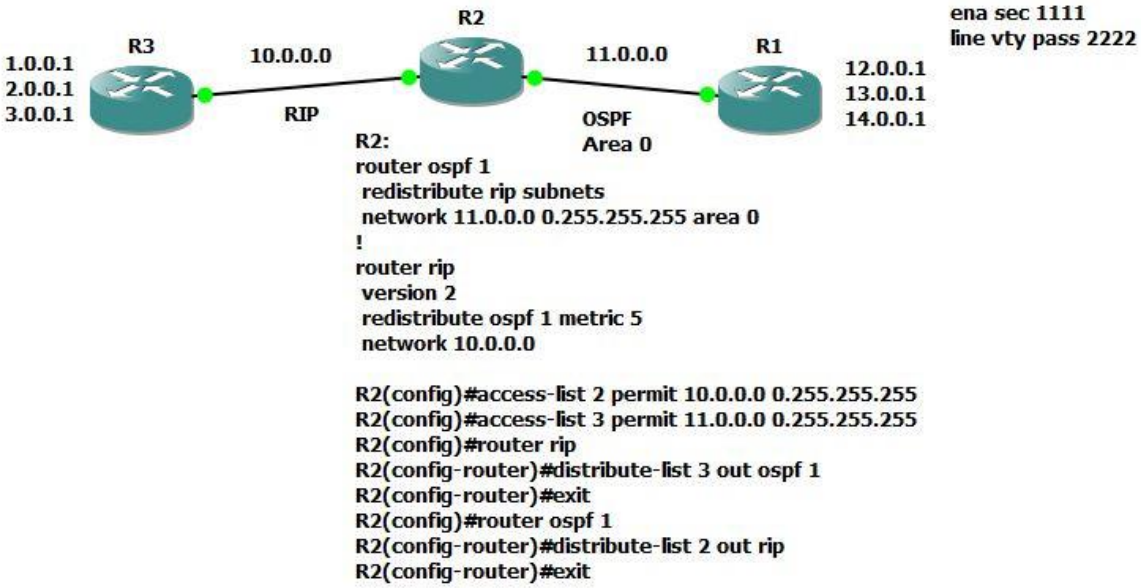
- The distribute-list commands are supported in OSPF but work differently than distance-vector routing protocols such as Routing Information Protocol (RIP) and Enhanced Interior Gateway Routing Protocol (EIGRP). OSPF routes cannot be filtered from entering the OSPF database. The distribute-list in command only filters routes from entering the routing table; it does not prevent link-state packets from being propagated. Therefore, this command does not help conserve router memory, and it does not prohibit a router from propagating filtered routes to other routers.

- Use of the distribute-list in command in OSPF may lead to routing loops in the network if not implemented carefully.

- The command distribute-list out works only on the routes being redistributed by the Autonomous System Boundary Routers (ASBRs) into OSPF. It can be applied to external type 2 and external type 1 routes, but not to intra-area and interarea routes.



hide network 9.0.0.0 from being advertiste to R3 by EIGRP



Passive Interface

In EIGRP the passive-interface command stops both outgoing and incoming routing updates , so The two routers are not neighbors any more. But, if you want the outgoing routing updates alone be suppressed but the inbound updates continue to be received (and the routers still continue to be neighbors), then use the distribute-list command:

```
R1(config)#access-list 20 deny any
R1(config)#router eigrp 1
R1(config-router)#no passive-interface serial 0
R1(config-router)#distribute-list 20 out serial 0
```

In OSPF the passive-interface has a similar behavior to EIGRP. The command suppresses hello packets and hence neighbor relationships

In RIP this command will disable sending multicast updates via a specific interface but will allow listening to incoming updates from other RIP speaking neighbors. Still u can use neighbor command to send receive unicast

Routing protocol	Suppresses outgoing routing updates	Suppresses incoming routing updates	Stops neighbor adjacency
RIP	✓		
EIGRP	✓	✓	✓
OSPF	✓	✓	✓
IS-IS	✓	✓	✓

Distance command

- The distance command is designed to provide a route selection parameter for a single prefix that is learned from two or more route sources. Route sources include: Connected routes, static routes, dynamic routing protocols such as RIP, OSPF, EIGRP, BGP.

- The distance command is not designed to provide a route selection parameter for a single prefix that is learned from the very same route source. For routing protocols, the parameter to use for route selection for a single prefix that is learned from one and only one dynamic routing protocol is the routing protocol metric.

The IOS distance command can be used in a number of different ways. Here are some:

1. Distance XXX - this sets the distance for all routes selected by a given routing protocol

2. Distance XXX Y.Y.Y.Y M.M.M.M - this sets the distance for all routes learned from a specific source-router within the specified routing domain. For distance vector routing protocols, the specified "source-router" is identified by the updated source address that is assigned to a common subnet of the router configured with this version of the distance command. For link-state routing protocols, the specified "source-router" is the RID of the link-state router that origininated the route. This router could be several hops away.

3. Distance XXX Y.Y.Y.Y M.M.M.M<ACL> this is identical to the previous version of the command but it is applied to only a subset of routes that match the ACL.

Distance Example 1:

```
R3(config)#router ospf 1
R3(config-router)#distance ospf external 234
```

So if we had this route

```
O E2    11.11.11.11/32 [110/20] via 11.0.0.2, 00:01:02, FastEthernet0/1
```

It will be change to

```
O E2    11.11.11.11/32 [234/20] via 11.0.0.2, 00:01:02, FastEthernet0/1
```

OSPF Distance Command Parameters:

intra-area *dist1*	(Optional) Sets the distance for all routes within an area. The default value is 110.
inter-area *dist2*	(Optional) Sets the distance for all routes from one area to another area. The default value is 110.
external *dist3*	(Optional) Sets the distance for routes from other routing domains, learned by Redistribution . The default value is 110.

Distance Example 2:
router ospf 1
distance ospf ext 140 inter-area 110 intra-area 100

router eigrp 1
distance eigrp 80 100 **(80 EIGRP internal AD , 100 EIGRP external AD instead of 90 170)**

Distance Example 3:
Change AD for all networks but must match ACL 1
access-list 1 permit 10.0.0.0 0.0.0.255
router ospf 1
distance 125 0.0.0.0 255.255.255.255 1

Source	Administrative Distance
Directly connected	0
Static route	1
EIGRP summary	5
External BGP	20
EIGRP	90
IGRP	100
OSPF	110
IS-IS	115
RIP	120
ODR	160
External EIGRP	170
Internal BGP	200
Unknown	255

Distance Example 4:
router ospf 1
distance 95

or
distance 105 192.168.1.2 0.0.0.0 (chnage AD to 105 for all routes recieved from 192.168.1.2)

or
distance 105 192.168.1.2 0.0.0.0 2 (chnage AD to 105 for any routes match acl 2 recieved from 192.168.1.2)

Offset List

Is the mechanism for increasing incoming and outgoing metrics to routes learned via EIGRP or Routing Information Protocol (RIP), But NOT OSPF.
Optionally, an offset list can be limited by specifying either an access list or an interface.

Example:

```
R2#sh ip route eigrp
    11.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
D       11.11.11.11/32 [90/409600] via 10.0.0.1, 00:02:16, FastEthernet0/0

R2(config)#router eigrp 3
R2(config-router)#offset-list 7 in 90400 f0/0
R2(config)#access-list 7 permit 11.11.11.11

R2#sh ip route eigrp
    11.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
D       11.11.11.11/32 [90/500000] via 10.0.0.1, 00:00:04, FastEthernet0/0
```

in = Applies the access list to incoming metrics.
out = Applies the access list to outgoing metrics.

Tagging

You can tag routes using a route-map , then do something with these tagged routes .

Tagging example :

```
route-map tag deny 10
match tag 10
route-map tag permit 20
set tag 10
```

(no match so all traffic will be tagged)

```
router ospf 1
Redistribution rip subnets route-map TAG
```

(NOW any routes wanna be Redistribution into ospf will be tagged with 10)

finally because of clause 10 , any tagged routes with 10 will not Redistribution

Prefix-lists

Prefix-lists can be used to filter prefixes and are far more powerful than simple access-lists and we use it with route-map or distribute-list

```
R1(config)#ip prefix-list FILTERTHIS seq 5 deny 172.16.1.0/24
R1(config)#ip prefix-list FILTERTHIS seq 10 permit 0.0.0.0/0 le 32
```

The first line denies 172.16.1.0/24 and the second line permits 0.0.0.0/0 (all networks) if they have a subnet mask of /32 or smaller…in other words "everything". This line is the equivalent of "permit ip any any".

Let's enable it on router R1to see what the result is:

```
R1(config)#router eigrp 12
R1(config-router)#distribute-list prefix FILTERTHIS in
```

you will see 172.16.1.0/24 has been filtered and all the other networks are permitted.

Examples :

allow class A that not subnnted
ip prefix-list yasser seq5 permit 0.0.0.0/1 ge 8 le 8

IF with subnnted : ge 8 le 32

allow class B that not subnnted
ip prefix-list yasser seq5 permit 128.0.0.0/1 ge 16 le 16

IF with subnnted : ge 16 le 32

allow class B that not subnnted
ip prefix-list yasser seq5 permit 192.0.0.0/1 ge 24 le 24

IF with subnnted : ge 24 le 32

allow only network 194.1.1.0/24
ip prefix-list yasser seq5 permit 194.1.1.0/26

allow networks with prefix-length of 25 or greater
ip prefix-list yasser seq5 permit 0.0.0.0/0 ge 25

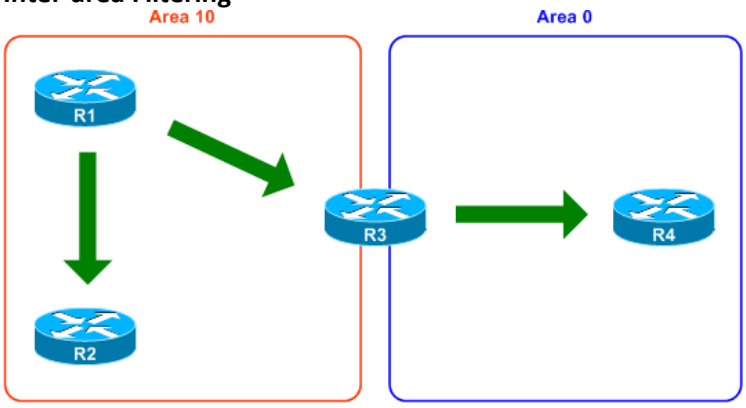
allow networks with prefix-length equel to or less than 25
ip prefix-list yasser seq5 permit 0.0.0.0/0 le 25

allow networks with prefix-length of 16 to 25
ip prefix-list yasser seq5 permit 0.0.0.0/0 ge 16 le 25

OSPF Filtering

There are two points at which OSPF routes can be filtered: within an area, or between areas on an area border router (ABR).

Inter-area Filtering



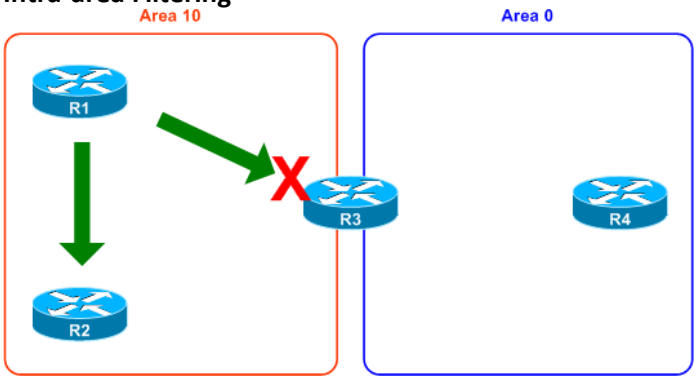
We can implement inter-area filtering (filtering between areas) on R3 to prevent the route from being advertised outside of area 10. First, we define a prefix list on R3 to deny the 192.0.2.0/24 prefix and allow all others:

R3(config)# ip prefix-list Deny_Test_Route deny 192.0.2.0/24 le 32
R3(config)# ip prefix-list Deny_Test_Route permit 0.0.0.0/0 le 32

Appending le 32 to the first prefix list entry ensures that any more-specific routes within 192.0.2.0/24 are denied as well (as opposed to only the exact /24 route).
Next we reference it as an area filter within OSPF configuration. The area filter-list statement below tells the router to apply our prefix list to routes being distributed out of area 10. (Don't forget to re-establish neighbor adjacencies afterward so that the new policy takes effect.)

R3(config)# router ospf 1
R3(config-router)# area 10 filter-list prefix Deny_Test_Route out

Intra-area Filtering



R3(config)# ip prefix-list Deny_Test_Route deny 192.0.2.0/24 le 32
R3(config)# ip prefix-list Deny_Test_Route permit 0.0.0.0/0 le 32

```
R3(config)# router ospf 1
R3(config-router)# distribute-list prefix Deny_Test_Route in
```

So R2 is still receiving the 192.0.2.0/24 route from R1 but R3 is not.

EIGRP Route-map filtering

When you use EIGRP as routing protocol, you have two options for filtering advertised routes:

- distribute-lists
- redistribute-statement with route-map

Received networks can only be filtered out with

- distribute-lists

The following example shows how to configure a route map to match an EIGRP external protocol metric
route with an allowable deviation of 100, a source protocol of BGP, and an autonomous system 45000.
When the two match clauses are true, the tag value of the destination routing protocol is set to 5. The route
map is used to distribute incoming packets for an EIGRP process.

```
Router(config)# route-map metric-range
Router(config-route-map)#match metric external 500 +- 100
Router(config-route-map)#match source-protocol bgp 45000
Router(config-route-map)# set tag 5
Router(config-route-map)#exit
Router(config)# router eigrp 1
Router(config-router)#network 172.16.0.0
Router(config-router)#distribute-list route-map metric_range in
```

The following example shows how to configure a route map to match EIGRP routes with a metric of 110,
200, or an inclusive range of 700 to 800. When the match clause is true, the tag value of the destination
routing protocol is set to 10. The route map is used to redistribute EIGRP packets.

```
Router(config)#route-map metric-eigrp
Router(config-route-map)# match metric 110 200 750 +- 50
Router(config-route-map)#set tag 10
Router(config-route-map)#exit
Router(config)#router eigrp 1
Router(config-router)#network 172.21.1.0/24
Router(config-router)#redistribute eigrp route-map metric-eigrp
```

Static Route Manipulation

- For p2p links use exit interface in static route : ip route 10.0.0.0 255.0.0.0 serial 0/0

- For broadcast links like fas use both next hop address and exit interface : ip route 10.0.0.0 255.0.0.0 fas 0/0 11.0.0.1

Static route permanent:
ip route 10.0.0.0 255.0.0.0 11.0.0.1
if interface go to 11.0.0.1 goes down , static route removed from routing table
to keep it there use
ip route 10.0.0.0 255.0.0.0 11.0.0.1 permanent

Floating static route:
change AD for static route from 1 to such as 130
this called floating static route
ip route 10.0.0.0 255.0.0.0 11.0.0.1 130

General Notes:

- changing the interface delay / bandwidth parameter is the preferred method of influencing path selection in EIGRP

- changing the interface ospf cost / bandwidth parameter is the preferred method of influencing path selection in OSPF

- max 30 dynamic routing process per router ex:ospf 1, ospf 20 , eigrp 100 , bgp , rip , eigrp 200.....etc

Kindly read my following Articles:

- Route-Map Basics
- PBR Lab 1
- PBR Lab2

CCSI: YASSER AUDA

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