EIGRP-OSPF Redistribution

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Purpose

The lab is performed with the intent to learn the definition and the basic configuration of *EIGRP-OSPF Redistribution.* We, students, would show multiple results to our instructor to get this lab checked off and to ensure a proper redistribution of EIGRP routes into OSPF and vice-versa, which in turn would further our understanding on the topic. We had to set the *Administrative Distance (AD)* between the internal and external EIGRP routes to 90 and 105 respectively. The *Reliability* must have been set to 245and *Delay* must have been set to 900 microseconds. The conditions mentioned above could be achieved because of the rearrangement of the *K* *values* in the EIGRP *metrics*. This would further provide us with the knowledge of the *EIGRP metric calculation formula*. This lab would also provide us students with a bit of experience of configuring the *Catalyst 6500* switch.

Background Information

The use of a routing protocol to advertise routes that are learned by some other means, such as by another routing protocol, static routes, or directly connected routes, is called redistribution. In this lab we would be redistributing EIGRP routes into OSPF. Redistribution becomes a necessity while implicating multiple routing protocols in a LAN. Differences in routing protocols such as metrics, administrative distance, etcetera, can affect redistribution. These conditions must be solved while configuring the network with the protocols.

Unlike OSPF, which provide routing updates based on OSPF hello packets, EIGRP updates routing information by utilizing 5 metrics: minimum bandwidth, delay, load, reliability, and Maximum Transmission Unit (MTU). Of these five metrics, by default, only minimum bandwidth and delay are used to compute best path. EIGRP metrics are partly decided by the individual metric’s value set during the configuration and partly due to switching the K values associate to those metrics, on or off.

K Values are not the metric components. They are only the place holder or influencer for actual metric components in metric calculation formula, so when we enable or disable a K value, we enable or disable its associate metric component. EIGRP uses 4 out of 5 components to calculate the routing metric. Below is a table that explains the K values associated with each component, used in calculating the total EIGRP metrics: -

| K Value | Component | Description |
| --- | --- | --- |
| K1 | Bandwidth | Lowest bandwidth of route |
| K2 | Load | Worst load on route based on packet rate |
| K3 | Delay | Cumulative interface delay of route |
| K4 | Reliability | Worst reliability of route based on keep alive |
| K5 | MTU | Smallest MTU in path [Not used in route calculation] |

The Coalition of these components and K values can indeed be seen in the formula used for calculating the total EIGRP metric: -

256\*[(k1\*bw)+{(k2\*bw)/256-load}+(k3\*delay)]\*[k5/(reliability+k4)]

Administrative distance is the feature that routers use to select the best path when there are two or more different routes to the same destination from two different routing protocols. Administrative distance defines the reliability of a routing protocol. Each routing protocol is prioritized in order of most to least reliable (believable) with the help of an administrative distance value. All the routing protocols carry a default AD with them. That AD, however, can be changed during the configuration process.

The Catalyst 6500 is a modular chassis network switch manufactured by Cisco Systems since 1999, capable of delivering speeds of up to "400 million packets per second". A 6500 comprises a chassis, power supplies, one or two supervisors, line cards and service modules. A chassis can have 3, 4, 6, 9 or 13 slots each, depending on the model of the series being utilized. The supervisor engine provides centralized forwarding information and processing; up to two of these cards can be installed in a chassis to provide active/standby or stateful failover.

Lab Summary

The lab commenced as per our instructor’s provided topology. We began by configuring OSPF area 1 on our network and quickly moved on to configure EIGRP 20. The redistribution process requires just a single command on each routing protocol being utilized in the LAN, which we executed. The metrics were conventionally set up on the EIGRP configuration, such that, it would set the reliability to out desired result, but would not do so with our delay. We, then, changed the k values under the EIGRP router configs to accommodate and correlate it with our delay and reliability. We later, configured the EIGRP Ads, such that it would make the AD of an externally learned route through EIGRP, 105. The process required us to execute a single command on all the nodes orchestrating EIGRP.

Topology and IP Addressing Scheme

A screenshot of a cell phone

Description generated with high confidence

Configurations

Step 1: -

Begin the lab by replicating the physical topology and the IP addressing scheme given in the topology diagram. Use the Interface *{interface-id}* and IP address *{IP address and subnet mask}* command to do so. One might also need to initiate the no switchport command on the interface of the switches to feed an IP address on that interface.

Step 2: -

After replicating the physical and the logical topology, one should proceed to configure OSPF among all the nodes. To avoid making the overall configuration complicated, one must configure single-area OSPF. It is advised for the network implementer to begin the OSPF configuration by configuring Area 1. To gain information on the basic configuration of OSPF areas and networks, one should kindly refer to the Multi-Area OSPF Lab.

Step 3: -

The configurator should now move on to configure EIGRP. They should use the topology diagram to assist them in orchestrating the nodes, which require EIGRP configuration, if they need to. The engineer should use the Router EIGRP 20 command, and then the network *{network address} {wildcard-bits}* to feed a network into the EIGRP routing process. The network orchestrator must execute these commands on all the routers, orchestrating EIGRP.

Step 4: -

The Basic configuration of both the protocols should be completed at this point. From this step, the student would learn to redistribute routes learned from both protocols into one another. In this step, the student would learn to implement the command, required to configure OSPF to learn routes from EIGRP. The network engineer can begin step 5 and come back to this step in the end if he/she/they desire to. The network engineer must, however, remember that this step must be completed on the node, which would be performing OSPS and EIGRP, which in this scenario, happens to be R3. Under the OSPF router config mode, the network engineer should establish the redistribute eigrp 20 subnets command. The number ‘20’ in the command is the AS number used by EIGRP in its process. Due to this command, the router receives the instructions to flood routing updates learned from EIGRP 20, to its OSPF neighbors. This is the only command required to redistribute packets EIGRP packets into OSPF.

Step 5: -

Unlike the step required to redistribute EIGRP into OSPF, redistributing OSPF into EIGRP, are comparatively more complicated. For doing so, the network administrator must first enter the EIGRP router configuration mode and enforce the redistribute ospf *{OSPF process-i.d.} metric {bandwidth} {delay} {reliability} {load} {MTU size}*. The only two values that we care about, for the completion of this lab are delay and delay and reliability, and we, therefore, would put 245 as the value for reliability and *90* as the value for delay. The reason for feeding the value, 90 instead of 900 is that EIGRP metrics count the delay value in every tens of microseconds, and hence, 900/10 gives us 90. If the network troubleshooter, however, checks the inspects the values that the administrator, just put in, using either the show ip topology command or show ip eigrp topology *{network address presented in the EIGRP routing table} {subnet mask}*, he/she/they would not be able to spot the desired value for the EIGRP delay. That happens because the because the k values in the EIGRP metrics have not yet been customized according to the values that were put in during the redistribution process. To change the k values, the network administrator must effectuate the metric weights *{Type of Service, <0-8>} {k1 value} {k2 value} {k3 value} {k4 value} {k5 value}* under the EIGRP router config mode. At this point we should refer to the table presented on the background information, which state that k3 and k4 correlate to the delay and reliability values, respectively. The engineer must turn those k values on, using the digit 1 and feed in 0 for the rest of the k values to turn those values off.

Step 6: -

Most of the lab should have been completed at this point, except for setting a custom AD. The network engineer must use the distance eigrp 20 *{internal AD} {External AD}* command to accomplish the goal. We would put in the number 90 for internal AD and 105 for external AD, because we are required to do so. This command must be executed on all the routers/nodes running EIGRP. One can verify the operation of this command, using the show ip route command.

R1 Configuration: -

hostname Router

boot-start-marker

boot system disk0:/s72033-adventerprisek9\_wan-mz.122-33.SXI13.bin

boot-end-marker

no aaa new-model

vtp domain cisco

vtp mode transparent

mls netflow interface

mls cef error action reset

spanning-tree mode pvst

spanning-tree extend system-id

diagnostic bootup level minimal

redundancy

main-cpu

auto-sync running-config

mode sso

vlan internal allocation policy ascending

vlan access-log ratelimit 2000

interface FastEthernet3/1

no ip address

shutdown

interface FastEthernet3/2

no ip address

shutdown

interface FastEthernet3/3

no ip address

shutdown

interface FastEthernet3/4

no ip address

shutdown

interface FastEthernet3/5

no ip address

shutdown

interface FastEthernet3/6

no ip address

shutdown

interface FastEthernet3/7

no ip address

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interface FastEthernet3/8

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interface FastEthernet3/9

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interface FastEthernet3/10

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interface FastEthernet3/47

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interface FastEthernet3/48

no ip address

shutdown

interface GigabitEthernet5/1

no ip address

shutdown

interface GigabitEthernet5/2

no ip address

shutdown

interface FastEthernet6/1

ip address 172.16.2.2 255.255.255.0

interface FastEthernet6/2

no ip address

shutdown

interface FastEthernet6/3

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interface FastEthernet6/4

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interface FastEthernet8/46

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shutdown

interface FastEthernet8/47

no ip address

shutdown

interface FastEthernet8/48

no ip address

shutdown

interface Vlan1

no ip address

shutdown

router eigrp 20

network 172.16.2.0 0.0.0.255

metric weights 6 0 0 1 1 1

distance eigrp 90 105

eigrp router-id 172.16.2.2

ip classless

ip forward-protocol nd

no ip http server

no ip http secure-server

control-plane

dial-peer cor custom

line con 0

line vty 0 4

login

end

R2 Configuration: -

hostname Router

boot-start-marker

boot-end-marker

no aaa new-model

memory-size iomem 10

ip cef

no ipv6 cef

multilink bundle-name authenticated

voice-card 0

license udi pid CISCO2901/K9 sn FTX180180M8

license accept end user agreement

license boot module c2900 technology-package securityk9

license boot module c2900 technology-package uck9

vtp domain cisco

vtp mode transparent

redundancy

interface Embedded-Service-Engine0/0

no ip address

shutdown

interface GigabitEthernet0/0

ip address 172.16.1.2 255.255.255.0

duplex auto

speed auto

interface GigabitEthernet0/1

ip address 172.16.2.1 255.255.255.0

duplex auto

speed auto

interface Serial0/0/0

no ip address

shutdown

clock rate 2000000

interface Serial0/0/1

no ip address

shutdown

clock rate 2000000

router eigrp 20

network 172.16.1.0 0.0.0.255

network 172.16.2.0 0.0.0.255

metric weights 6 0 0 1 1 1

redistribute ospf 2 metric 1 900 245 255 65535

distance eigrp 90 105

eigrp router-id 172.16.2.1

router ospf 2

network 172.16.1.0 0.0.0.255 area 12

network 172.16.2.0 0.0.0.255 area 12

router ospf 12

redistribute eigrp 20 subnets

ip forward-protocol nd

no ip http server

no ip http secure-server

control-plane

mgcp profile default

gatekeeper

shutdown

line con 0

line aux 0

line 2

no activation-character

no exec

transport preferred none

transport output lat pad telnet rlogin lapb-ta mop udptn v120 ssh

stopbits 1

line vty 0 4

login

transport input all

scheduler allocate 20000 1000

end

R3 Configuration: -

hostname Router

boot-start-marker

boot-end-marker

no aaa new-model

memory-size iomem 10

ip cef

no ipv6 cef

multilink bundle-name authenticated

voice-card 0

license udi pid CISCO2901/K9 sn FTX180180M5

license accept end user agreement

license boot module c2900 technology-package securityk9

license boot module c2900 technology-package uck9

vtp domain cisco

vtp mode transparent

redundancy

interface Embedded-Service-Engine0/0

no ip address

shutdown

interface GigabitEthernet0/0

ip address 192.168.3.1 255.255.255.0

duplex auto

speed auto

interface GigabitEthernet0/1

ip address 172.16.1.1 255.255.255.0

delay 90

duplex auto

speed auto

interface Serial0/0/0

no ip address

shutdown

clock rate 2000000

interface Serial0/0/1

no ip address

shutdown

clock rate 2000000

interface GigabitEthernet0/1/0

no ip address

shutdown

duplex auto

speed auto

router eigrp 20

network 172.16.1.0 0.0.0.255

metric weights 6 0 0 1 1 1

redistribute ospf 1 metric 1 89 245 255 65535

redistribute ospf 2 metric 1 90 245 255 65535

distance eigrp 90 105

eigrp router-id 172.16.1.1

router ospf 1

router-id 192.168.3.1

redistribute eigrp 20 subnets

network 192.168.3.0 0.0.0.255 area 15

router ospf 3

network 192.168.3.0 0.0.0.255 area 12

ip forward-protocol nd

no ip http server

no ip http secure-server

control-plane

mgcp profile default

gatekeeper

shutdown

line con 0

line aux 0

line 2

no activation-character

no exec

transport preferred none

transport output lat pad telnet rlogin lapb-ta mop udptn v120 ssh

stopbits 1

line vty 0 4

login

transport input all

scheduler allocate 20000 1000

end

R4 Configurations: -

hostname Router

boot-start-marker

boot-end-marker

no aaa new-model

memory-size iomem 10

ip cef

no ipv6 cef

multilink bundle-name authenticated

voice-card 0

license udi pid CISCO2901/K9 sn FTX180180M5

license accept end user agreement

license boot module c2900 technology-package securityk9

license boot module c2900 technology-package uck9

vtp domain cisco

vtp mode transparent

redundancy

interface Embedded-Service-Engine0/0

no ip address

shutdown

interface GigabitEthernet0/0

ip address 192.168.3.2 255.255.255.0

duplex auto

speed auto

interface GigabitEthernet0/1

no ip address

duplex auto

speed auto

shutdown

interface Serial0/0/0

no ip address

shutdown

clock rate 2000000

interface Serial0/0/1

no ip address

shutdown

clock rate 2000000

interface GigabitEthernet0/1/0

no ip address

shutdown

duplex auto

speed auto

router ospf 1

router-id 192.168.3.1

network 192.168.3.0 0.0.0.255 area 15

router ospf 3

network 192.168.3.0 0.0.0.255 area 12

ip forward-protocol nd

no ip http server

no ip http secure-server

control-plane

mgcp profile default

gatekeeper

shutdown

line con 0

line aux 0

line 2

no activation-character

no exec

transport preferred none

transport output lat pad telnet rlogin lapb-ta mop udptn v120 ssh

stopbits 1

line vty 0 4

login

transport input all

scheduler allocate 20000 1000

end

Problems: -

The motive of this lab was a little arduous to accomplish. We had to focus and invest a lot of our time on understanding the definition of the protocol that we would operate in this lab. We faced numerous problems towards the end of the lab. Our instructor asked us to show him the delay, and although we were confident of the fact that we had configured the network correctly, when we showed him the requirement that he asked for, the numbers appeared to be very damaged, and were nowhere near the result that we desired. After a little research on the internet, which initially had us confused because of the equation, we managed to understand the core concept behind the k values and their relation to the metrics.

Our external EIGRP AD, which we had to change to 105, was not appearing to be 105 as the command that is necessary to execute this function was only performed on R3 because we thought that like the EIGRP metrics, which are determined by R3 and are only determined to be preformed on R3, that command would also be needed on R3. After we, however, enforced the command on all the routers in the network, just to be safe, due to which the results matched our intentions, we learned that distance EIGRP command is necessary to be deployed on each node performing EIGRP.

Conclusions: -

The lab was successfully completed and the motive of working on this lab was fulfilled. We learnt about the Redistribution techniques, and that too while using two of the most used routing protocols used in our class, i.e. EIGRP and OSPF. Redistribution has quickly established itself to be one of the widest used techniques in the networking industry, and rightly so. With daily growth of networks, and to meet the public’s demand, it becomes a necessity to use redistribution to merge different LANs, using different routing protocols within their LANs. Redistributing EIGRP and OSPF provides us with the ability to “merge” two of the world’s widest used routing protocols.