

Simulation of Routing Protocols on a Communication Network and Route-Redistribution

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Abstract: OSI model is a reference model for communication in a computer network. Network layer is the third layer in the OSI model [1]. The network layer provides connectivity and path selection between two host systems. It is responsible for routing data packets and selecting the best path to deliver data. The network layer prioritizes data known as Quality of Service (QOS) [2]. Routers [3] and Layer 3 switches operate at the network layer. A Router can also act as a Layer 2 and Layer 1 device. A routing protocol [4] specifies how routers communicate with each other. A routing protocol is a set of rules used by routers to determine the most appropriate path into which they should forward packets towards their intended destination. In this paper we give you a brief introduction on redistribution. Using 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. This situation never arises in the case of single protocol routing environment but multi-protocol routing is common for a number of reasons like company mergers, multiple departments managed by multiple network administrators, and multi-vendor environments. Route redistribution allows different routing protocols to exchange routing information. In this paper we have considered one such situation of route redistribution. Redistribution is done at the boundary routers at the boundary of two merged companies- company A and company B, adapting OSPF and EIGRP routing protocols respectively in their respective AS.

Keywords: Route-redistribution, Network layer, OSI model, Quality of Service (QOS), Routers and Layer 3 switches, multi-protocol routing, redistribution, Open Shortest Path First (OSPF) and EIGRP, Autonomous System (AS)

I. INTRODUCTION

The OSI model consists of 7 layers. A layered network model is used to reduce complexity, standardize interfaces, to facilitate modular engineering, simplify learning and working. Following are the seven layers of the OSI model

- Layer 1- Physical Layer- It is responsible for binary transmission. Defines the electrical, mechanical, procedural and functional specifications for activating, maintaining and deactivating the physical link.
- Layer 2- Data link Layer- It defines how data is formatted for transmission and how an access to the network is controlled.
- Layer 3- Network Layer- It provides connectivity and path selection between two host systems, routes data packets, best path selection to deliver data and prioritizes data known as QOS.
- Layer 4- Transport Layer- It handles transportation issues between hosts, ensures data transport reliability, establishes, maintains and terminates virtual circuits, information flow control and provides reliability through fault detection and recovery.
- Layer 5, 6 and 7- Session Layer, Presentation Layer and Application Layer respectively.

A router is an electronic device and/or software that connects at least two networks and forwards packets among them according to the information in the packet headers and the routing table. There are many routing protocols to which specify how routers communicate with each other. A routing protocol is a set of rules used by routers to determine the most appropriate path to which packet is to be forwarded from source to the destination. Following are the routing protocols

- RIP version 1 and 2 [5]
- EIGRP [6]
- OSPF [7]
- IS-IS [8]
- BGP [9]

RIP, EIGRP, OSPF and IS-IS are Interior Gateway Protocols and BGP is an Exterior Gateway Protocol. IGPs are used inside an Autonomous Systems and BGP is used for communication between different Autonomous Systems (AS).

II. PROBLEM STATEMENT

Consider a company A whose routers are configured with OSPF routing protocol and enclosed within area 0. Consider another company B using EIGRP as the Internal routing protocol. OSPF and EIGRP are configured within the AS of company A and company B respectively. Due to some reason company A decides to merge with company B. In this case we have to connect networks running different routing protocols. Route redistribution allows different routing protocols to exchange routing information. Route redistribution needs to be carried out at the boundary routers. The routers in 'A' must be able to send and receive data packets to and from 'B' respectively. The data must be encrypted and intrusion free communication must be enabled.

III. REDISTRIBUTION

Route redistribution allows different routing protocols to exchange routing information. Each routing protocol on a network is separated into an Autonomous System (AS). All routers in the same autonomous system have complete knowledge of the entire AS. Figure 1 shows the network topology of the merger between company A and company B.

Route redistribution needs to be carried out at the boundary routers R5 and R6. The general procedure followed is

- Locate the boundary router(s). This is the router where redistribution will be configured.
- Choose a protocol to be the core (backbone protocol). A general rule of thumb is to pick OSPF or EIGRP.
- Determine the edge protocol. If you are migrating, this is the protocol that will be phased out.
- Configure the router to redistribute from the edge protocol to the backbone protocol.
- Configure the router to redistribute from the backbone protocol to the edge protocol.
- Check redistribution by using the show route command.

IV. RESULTS AND FINDINGS

Figure 2, 3 and 4 shows the procedure of route-redistribution being carried out on boundary router R5. Similarly redistribution is carried out on router R6 which is the other boundary router between company A and company B. Figure 5 shows an effort to ping the router at company B from R1. It was noted to be a success as all the 5 ICMP packets echoed back on time.

```
interface FastEthernet0/0
no ip address
shutdown
duplex half
!
interface Serial1/0
ip address 10.1.54.5 255.255.255.0
serial restart-delay 0
clock rate 64000
!
interface Serial1/1
ip address 10.1.57.5 255.255.255.0
serial restart-delay 0
clock rate 64000
!
interface Serial1/2
no ip address
shutdown
serial restart-delay 0
!
```

```
interface Serial1/3
no ip address
shutdown
serial restart-delay 0
!
interface Serial1/4
no ip address
shutdown
serial restart-delay 0
```

Figure 2 shows the redistribution being done on boundary router R5

V. CONCLUSIONS

In this paper a typical example of route redistribution at the boundary router(s) was considered and configured. An example of a company A merging with company B where, company A uses OSPF as its IGP within its AS and company B uses EIGRP as its IGP within its AS was taken. After the company merger redistribution had to be done for successful communication between the routers belonging to two different AS and following two different routing protocols.

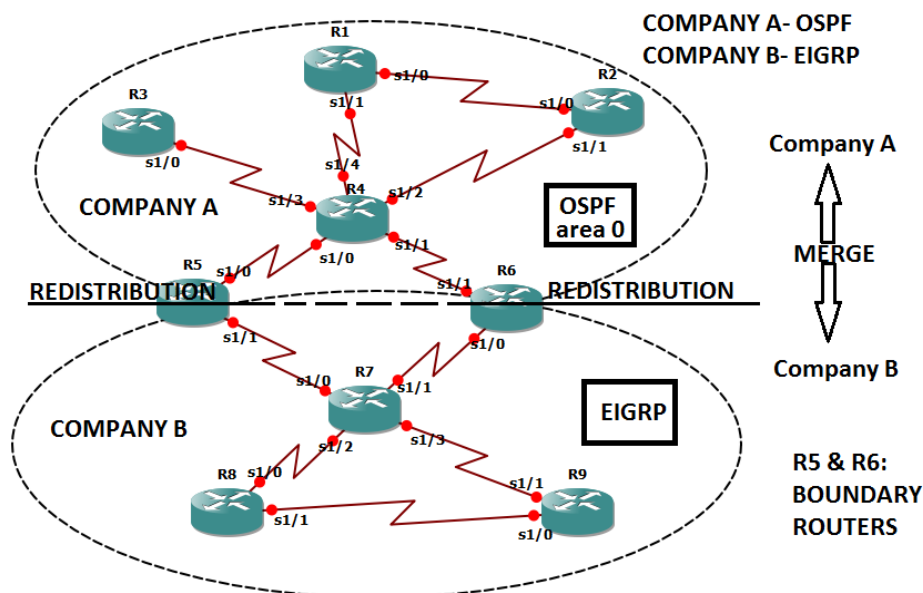


Figure 1 shows the network topology of the merger between Company A and Company B

```
R1
R1(config)#
R1(config)#
R1(config)#
R1(config)#
R1(config)#^Z
R1#
*Aug 4 15:54:33.747: %SYS-5-CONFIG_I: Configured from console by console
R1#ping 10.1.34.4

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.34.4, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 324/407/500 ms
R1#
R1#
R1#
R1#
R1#
R1#
R1#
```

Figure 5 shows an effort to ping the router at company B from R1. It was noted to be a success as all the 5 ICMP packets echoed back on time.

```
!  
interface Serial1/5  
no ip address  
shutdown  
serial restart-delay 0  
!  
interface Serial1/6  
no ip address  
shutdown  
serial restart-delay 0  
!  
interface Serial1/7  
no ip address  
shutdown  
serial restart-delay 0  
!  
router ospf 2  
log-adjacency-changes  
redistribute rip subnets  
network 10.1.54.5 0.0.0.0 area 0  
!  
router rip  
version 2  
redistribute ospf 2 metric 2  
network 10.0.0.0  
no auto-summary  
!  
ip forward-protocol nd  
no ip http server  
no ip http secure-server
```

Figure 3 shows the redistribution being done on boundary router R5 (cont.)

```
control-plane  
!  
!  
!  
!  
!  
!  
!  
!  
gatekeeper  
shutdown  
!  
!  
line con 0  
exec-timeout 0 0  
privilege level 15  
logging synchronous  
stopbits 1  
line aux 0  
exec-timeout 0 0  
privilege level 15  
logging synchronous  
stopbits 1  
line vty 0 4  
login  
!  
end
```

Figure 4 shows the redistribution being done on boundary router R5 (cont.)

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