Configuring an EIGRP based Routing Model

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Abstract- The term *routing* is used for taking a packet from one device and sending it through the network to another device on a different network. Routers don't really care about hosts—they only care about networks and the best path to each network. Due to the major role that routing protocol play in computer network infrastructures, special cares have been given to routing protocols with built –in security constraints. In this paper we have shown how we can do routing with an EIGRP based routing protocol. A network model of Cisco routers has been employed in a network simulation software 'packet tracer'. Eventually an EIGRP routing protocol has been configured and run on a network model. Among all the routing protocols available EIGRP protocol has been mostly used for routing a complex network.

Index Terms- cisco, configuring, EIGRP, network, packet tracer, routing, routing protocol, simulation

I. INTRODUCTION

Enhanced IGRP (EIGRP) is a classless, enhanced distance-vector protocol that gives us a real edge over another Cisco proprietary protocol, Interior Gateway Routing Protocol (IGRP). That's basically why it's called Enhanced IGRP. Like IGRP, EIGRP uses the concept of an autonomous system.

EIGRP is sometimes referred to as a hybrid routing protocol because it has characteristics of both distance-vector and link-state protocols. For example, EIGRP doesn't send link-state packets as OSPF does; instead, it sends traditional distance-vector updates containing information about networks plus the cost of reaching them from the perspective of the advertising router. And EIGRP has link-state characteristics as well—it synchronizes routing tables between neighbors at startup and then sends specific updates only when topology changes occur. This makes EIGRP suitable for very large networks. EIGRP has a maximum hop count of 255 (the default is set to 100).

There are a number of powerful features that make EIGRP a real standout from IGRP and other protocols. The main ones are listed here:

1) Support for IP and IPv6 (and some other useless routed protocols) via protocol dependent modules.
2) Considered classless (same as RIPv2 and OSPF).
3) Support for VLSM/CIDR.
4) Support for summaries and discontiguous networks.
5) Efficient neighbor discovery.
6) Communication via Reliable Transport Protocol (RTP).
7) Best path selection via Diffusing Update Algorithm (DUAL).

B. Neighbour Discovery

Before EIGRP routers are willing to exchange routes with each other, they must become neighbors. There are three conditions that must be met for neighbourship establishment:

1) Hello or ACK received
2) AS numbers match
3) Identical metrics (K values)

Link-state protocols tend to use Hello messages to establish neighborship (also called adjacencies) because they normally do not send out periodic route updates and there has to be some mechanism to help neighbours realize when a new peer has moved in or an old one has left or gone down. To maintain the neighbourship relationship, EIGRP routers must also continue receiving Hellos from their neighbors.

Let's define some terms before we move on:

C. Feasible distance

This is the route that you will find in the routing table because it is considered the best path. The metric of a feasible distance is the metric reported by the neighbor (called reported or advertised distance) plus the metric to the neighbor reporting the route.

D. Advertised distance

This is the metric of a remote network, as reported by a neighbor. It is also the routing table metric of the neighbor and is the same as the second number in parentheses as displayed in the topology table, the first number being the feasible distance.

E. Neighbor table

Each router always keeps state information about adjacent neighbors. When a newly discovered neighbor is learned, the address and interface of the neighbor are recorded, and this information is held in the neighbor table, stored in RAM. There is one neighbor table for each protocol-dependent module.

F. Topology table

The topology table is populated by the protocol-dependent modules and acted upon by the Diffusing Update Algorithm (DUAL). It contains all destinations advertised by neighboring routers, holding each destination address and a list of neighbors that have advertised the destination.

G. Feasible successor

A feasible successor is a path whose reported distance is less than the feasible distance, and it is considered a backup route. EIGRP will keep up to six feasible successors in the topology table. Only the one with the best metric (the successor) is copied and placed in the routing table.

H. Successor

A successor route (think successful!) is the best route to a remote network. A successor route is used by EIGRP to forward traffic to a destination and is stored in the routing table. It is backed up by a feasible successor route that is stored in the topology table—if one is available. By using the feasible distance, and

having feasible successors in the topology table as backup links, the network can converge instantly, and updates to any neighbor make up the only traffic sent from EIGRP.

II. EIGRP METRICS

Another thing about EIGRP is that unlike many other protocols that use a single factor to compare routes and select the best possible path, EIGRP can use a combination of four:

1) Bandwidth
2) Delay
3) Load
4) Reliability

Like IGRP, EIGRP uses only bandwidth and delay of the line to determine the best path to a remote network by default.

And it's worth noting that there's a fifth element, maximum transmission unit (MTU) size. This element has never been used in EIGRP calculations, but it's a required parameter in some EIGRP related commands, especially those involving redistribution. The value of the MTU element represents the smallest MTU value encountered along the path to the destination network.

III. VIRTUAL NETWORK SIMULATION MODEL

We have developed a virtual networking model comprising of CISCO routers by using Virtual networking simulation software named packet tracer as shown in fig 1. We have used many components such as routers, switches and make physical connection by connection cables to serial and fast Ethernet ports.
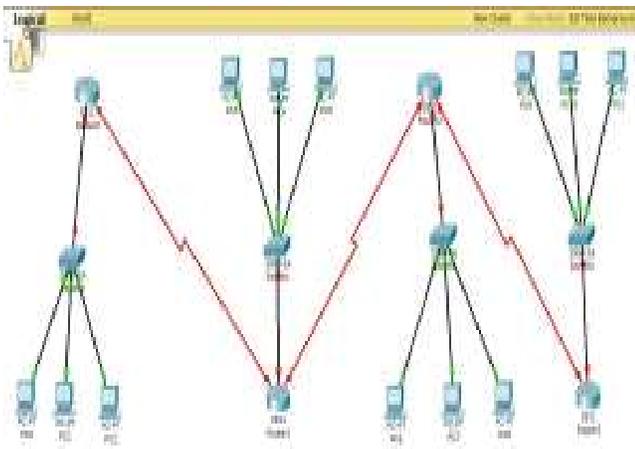

Figure 1: virtual network model on packet tracer

IV. CONFIGURING NETWORK WITH EIGRP

A. Configuring CISCO Routers

After implementing the physical model we need to do configuring of network with EIGRP routing protocol. There are two modes from which EIGRP commands are entered: router configuration mode and interface configuration mode. Router configuration mode enables the protocol, determines which networks will run EIGRP, and sets global characteristics. Interface configuration mode allows customization of summaries, metrics, timers, and bandwidth.

To start an EIGRP session on a router, use the router eigrp command followed by the autonomous system number of your network. You then enter the network numbers connected to the router using the network command followed by the network number as shown in the following commands.

Router(config)# router eigrp 200
Router(config-router)# network 172.16.0.0
Router(config-router)# network 10.0.0.0

A.1: Router 0 Configuration

--- System Configuration Dialog ---
Continue with configuration dialog? [yes/no]: n
Press RETURN to get started!
Router>enable
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface fastEthernet 0/0
Router(config-if)#ip address 192.168.10.1 255.255.255.0
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#interface serial 0/2/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/2/0, changed state to down
Router(config-if)#clock rate 9600
Router(config-if)#bandwidth 64000
Router(config-if)#exit
Router(config)#exit

%SYS-5-CONFIG_I: Configured from console by console
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router eigrp ?
<1-65535> Autonomous system number
Router(config)#router eigrp
Router(config-router)#network 192.168.10.0 255.255.255.0
Router(config-router)#network 10.0.0.0 255.0.0.0
Router(config-router)#exit
Router(config)#exit

A.2: Running Configuration Output

Router#show running-config
Building configuration...
Current configuration : 580 bytes
interface FastEthernet0/0
ip address 192.168.10.1 255.255.255.0
duplex auto
speed auto
interface FastEthernet0/1
no ip address
duplex auto
speed auto
shutdown
interface Serial0/2/0

bandwidth 64000
ip address 10.0.0.1 255.0.0.0
clock rate 9600
interface Serial0/3/0
no ip address
shutdown
interface Vlan1
no ip address
shutdown
router eigrp 3
network 192.168.10.0
network 10.0.0.0
auto-summary
ip classless
line con 0
line vty 0 4
login
end

After this we need to apply the same configuration commands to another routers in the network with their own serial and fast Ethernet port IP. After that we need to configure each pc in network model.But here we are showing connectivity between only pc '1' and pc '3'.

B. Configuring PC

After configuring our Cisco routers we need to configure our personal computers pc '1' and pc '3' .But for this we don't need to use any command we can do this manually by just filling address of IP, Subnet Mask, and Default Gateway as shown in below figures.
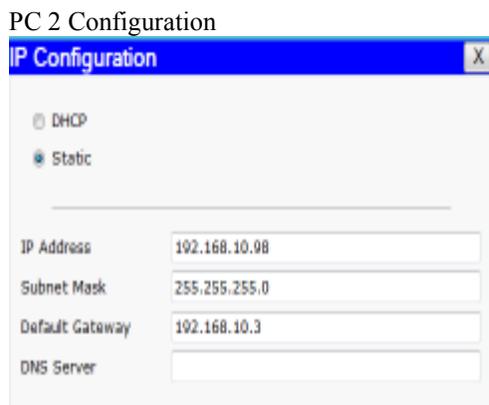

Figure 2: Pc 1 Configuration

PC 2 Configuration

Figure 3: Pc3 configuration

V. VERIFYING NETWORK MODEL

We can easily check or verify our routing model by going in command- line window application of packet tracer. After typing cmd command a black screen comes where we can write ping command to check connectivity between different local and wide area networks.After this command it shows the reply from connected networks as shown below.

Figure 4: running window showing connectivity

VI. CONCLUSION

Routing protocols are used basically for routing of data. In this paper we have developed a virtual network model based on EIGRP routing protocol. It has shown that EIGRP choose best routing path on the basis of four metrics bandwidth, delay, load , reliability. EIGRP is the first internet routing protocol that provides loop freedom at every instant and convergence times comparable to those obtained with standard link state protocols. furthermore, EIGRP provides multiple paths to every destination that may have different weights.

As of this writing , EIGRP is mostly deployed in part of cisco system's engineering network. It has shown that how we can easily configured and run an EIGRP networking model in laboratory environment. Similarly we can also implement this model in the real world internetwork.

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