SECURING THE CORPORATE NETWORK USING EIGRP IPV6 ADDRESSING AND PASSIVE INTERFACE

C.Rakesh, P.Praveen sundar , M.Subramani ,M.Sindhubala

Abstract-- EIGRP is an Interior Gateway Protocol (IGP) designed for routing within a single administrative domain or autonomous system (AS). It is a classless protocol which means each route entry in an update includes a subnet mask as well. The subnet masks sent with each route in updates may be of different length. This feature is called variable-length subnet 0masking and it allows for subnetting as well as address aggregation or summarization. EIGRP packets can also be optionally authenticated using an MD5 checksum, if authentication is configured. EIGRP uses the Diffusing Update Algorithm (DUAL) to achieve fast convergence while remaining loop-free at all times. EIGRP updates are not sent at regular intervals; rather, updates are sent only when a metric or topology change takes place. Also, the updates will include only routes that have changed and not every entry in the routing table. In other words, EIGRP updates are both non-periodic and partial in contrast to other distance vector protocols like Routing Information Protocol (RIP). You may recall that RIP sends updates at regular intervals and includes all routes in the routing table in every update. These characteristics mean that EIGRP uses much less bandwidth than other distance vector protocols, a feature that is especially useful on low-bandwidth Wide Area Network (WAN) links.

Index terms – EIGRP, IPv6, Routing, OSPF, Local Area Network, Wide Area Network.

1 INTRODUCTION

Routing algorithms determine the specific choice of route. Each router has a prior knowledge only of networks attached to it directly. A routing protocol shares this information first among immediate neighbors, and then throughout the network. This way, routers gain knowledge of the topology of the network. Some of the examples of routing protocol are RIP, EIGRP, and OSPF. This document describe the Enhanced Interior Gateway Routing Protocol (EIGRP), routing protocol designed and developed by Cisco Systems which uses DUAL Finite State Machine Algorithm (FSM). Enhanced Interior Gateway Routing Protocol (EIGRP) is an advanced distance-vector routing protocol that is used on a computer network to help automate routing decisions and configuration.If the router does not contain a valid path to the destination, the traffic is discarded. EIGRP is a dynamic routing protocol by which routers automatically share route information. This eases the workload on a network administrator who does not have to configure changes to the routing table manually.EIGRP is used on a router to share routes with other routers within the same autonomous system. Unlike other well-known routing protocols, such as RIP, EIGRP only sends incremental updates, reducing the workload on the router and the amount of data that needs to be transmitted.By working with a service provider that supports EIGRP, we don't lose routinginformation such as minimum bandwidth, delay, and route type, which happens when you have to redistribute routes between routing protocols. Preserving routing information leads to better routing decisions at the edge, which creates a better user experience for Cisco employees and partners. EIGRP is an enhanced version of IGRP. The same distance vector technology found in IGRP is also used in EIGRP, and the underlying distance information remains unchanged. The convergence properties and the operating efficiency of this protocol have improved significantly. This allows for an improved architecture while retaining existing investment in IGRP. The convergence technology is based on research conducted at SRI International. The Diffusing Update Algorithm (DUAL) is the algorithm used to obtain loop−freedom at every instant throughout a route computation. This allows all routers involved in a topology change to synchronize at the same time. Routers that are not affected by topology changes are not involved in the recomputation. The convergence time with DUAL rivals that of any other existing routing protocol. EIGRP has been extended to be network−layer−protocol independent, thereby allowing DUAL to support other protocol suites.

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2. SYSTEM ANALYSIS

2.1. NETWORK SPECIFICATIONS:

2.1.1HARDWARE:

- CISCOROUTERS2800&3560
- CISCOSWITCH'S
- CABLES(SERIAL,ETHERNET,CONSOLE)
- CISCOFIREWALL

2.1.2 SOFTWARE:

- CISCO IOS 12.3
- CISCOIP COMMUNICATOR 7
- CISCO PACKET TRACER 5.3.3 SIMULATOR
- GNS3 SIMULATOR

2.2 HARDWARESPECIFICATION

2.2.1 SERVER:

- INTEL2.40GHZ
- RAM2GB
- 40GBHDD

2.2.2 CLIENT:

- INTELP-IV2.21GHZ
- RAM512MB
- 40 GBHDD

2.3 SOFTWAREENVIRONMENT

2.3.1 SERVER:

- WINDOWS2003

2.3.2 CLIENT:

- WINDOWSXP

3. RELATED WORK:

3.1.1 RIP

THE ROUTING INFORMATION PROTOCOL (RIP) IS A VETERAN DISTANCE-VECTOR ROUTING PROTOCOL THAT USES UDP ORT 520 FOR MESSAGE ENCAPSULATION. IT CONSISTS OF TWO MESSAGE TYPES.

1. A REQUEST MESSAGE IS USED TO ASK NEIGHBORING ROUTERS TO SEND AN UPDATE.
2. A RESPONSE MESSAGE CARRIES THE UPDATE.

WHEN RIP IS CONFIGURED ON A ROUTER, IT SENDS BROADCAST PACKETS CONTAINING THE REQUEST MESSAGE OUT THE ENTIRE RIP ENABLED INTERFACES AND THEN LISTENS FOR RESPONSE MESSAGES. ROUTERS RECEIVING THE REQUEST MESSAGE RESPOND TO IT BY SENDING THEIR ROUTING TABLES IN THE RESPONSE MESSAGE. THIS PROCESS CONTINUES UNTIL THE NETWORK IS CONVERGED. A RIP ROUTER SENDS OUT ITS FULL ROUTING TABLE IN ITS UPDATE ONCE IN 30 SECONDS. IF ANY NEW ENTRY IS FOUND IN AN UPDATE, THE RIP ROUTER ENTERS IT INTO THE ROUTING TABLE ALONG WITH THE SENDING ROUTER'S ADDRESS. IT USES THE HOP COUNT AS A METRIC FOR DETERMINING BEST PATHS. THE MAXIMUM HOP COUNT IS15; THEREBY PREVENTING ROUTING LOOPS IN THE NETWORK. THIS ALSO LIMITS THE SIZE OF THE NETWORK SUPPORTED BY IT. IF THE HOP COUNT OF AN INCOMING ROUTE IS 16, IT IS CONSIDERED TO BE INACCESSIBLE OR UNDESIRABLE AND IS AT AN INFINITE DISTANCE. RIP PREVENTS INAPPROPRIATE INFORMATION FROM PROPAGATING THROUGHOUT THE NETWORK, BY THE USE OF ITS FEATURES LIKE SPLIT HORIZON, ROUTE POISONING AND HOLD DOWN TIMERS, THUS PROVIDING STABILITY TO THE NETWORK.

VERSIONS:

RIPV1:RIPV1 SUPPORTS CLASS FULL ROUTING; THEREFORE VARIABLE LENGTH SUBNET MASKS (VLSM) CANNOT BE USED. THERE IS ALSO NO AUTHENTICATION MECHANISM.

RIPV2:RIPV2 SUPPORTS CLASSLESS INTER-DOMAIN ROUTING (CIDR).IT USES MD5 MECHANISM FOR AUTHENTICATION. IN MODERN IP-BASED NETWORKS CAN TRANSMIT INFORMATION USING DIFFERENT WAYS OF ADDRESSING AND DELIVERY: DELIVERY OF A PARTICULAR SPECIFIED DEVICE (UNICAST), MULTICAST DELIVERY (MULTICAST) AND BROADCAST DELIVERY (BROADCAST). ALL THESE TYPES OF INFORMATION DELIVERY IMPLY THE USE OF ROUTING PROTOCOLS. SEPARATE NO LESS INTERESTING QUESTION IS THE MULTIPATH ROUTING. FOR EXAMPLE, FOR HIGH-PRIORITY VOICE TRAFFIC CAN PAVE A PATH THROUGH THE NETWORK, AND FOR LOW PRIORITY - OTHER. IN MANY WORKS DEALING WITH ROUTING PROTOCOLS, PROVIDES A DESCRIPTION OF THEM, OR THE ADVANTAGES AND DISADVANTAGES. THERE IS THEREFORE A NEED FOR A QUALITATIVE COMPARISON, AND FORMING RECOMMENDATIONS FOR THE USE OF PROTOCOLS, WHICH WOULD GIVE AN IDEA OF THE POSSIBILITIES FOR THEIR USE.

RIP IS THE FIRST ROUTING PROTOCOL IMPLEMENTED ON TCP/IP. IT USES DISTANCE-VECTOR ALGORITHM. USES A HOP COUNT MECHANISM TO FIND AN OPTIMAL PATH FOR PACKET ROUTING. MAX HOP COUNT (16 HOPS) USED TO PREVENT INFINITE LOOPS.

BUT IF MORE THAN ONE LINK WITH SAME HOP COUNT TO THE NETWORK IS OBTAINED THEN RIP AUTOMATICALLY PERFORM A ROUND-ROBIN LOAD BALANCING. RIP CAN CONSIDER UP TO SIX EQUAL-COST LINKS. THE DISADVANTAGE OF THIS PROTOCOL IS THAT THE PROBLEM ARISES WHEN THE TWO LINKS TO A REMOTE NETWORK HAVE THE DIFFERENT BANDWIDTH BUT SAME HOP COUNTS. MAIN ADVANTAGE OF USING RIP IS: SIMPLE PROTOCOL AND EASY TO IMPLEMENT. DISADVANTAGE: NETWORK SIZE LIMITATION.

3.1.2OSPF

IT IS AN OPEN STANDARD ROUTING PROTOCOL WHICH CAN BE IMPLEMENTED BY NUMBER OF VENDORS, INCLUDING CISCO. OSPF USE THE DIJKSTRA ALGORITHM WHICH FIRSTLY CONSTRUCTS THE SHORTEST PATH TREE THEN POPULATES THE ROUTING TABLE WITH THE RESULTING BEST PATHS. OSPF CONVERGES QUICKLY AND ALSO SUPPORTS MULTIPLE, EQUAL –COST ROUTES TO THE SAME DESTINATION.

VARIOUS FEATURES OF OSPF ARE:

- AREA AND AUTONOMOUS SYSTEM
- MINIMIZES ROUTING UPDATE TRAFFIC
- SCALABILITY
- SUPPORTS VLSM/CIDR
- UNLIMITED HOP COUNTS

LINK-STATE ROUTING PROTOCOL IS ALSO KNOWN AS SHORTEST PATH ROUTING PROTOCOL, AS IT COMPUTE THE FINEST PATH IN THE NETWORK WHICH IS THE SHORTEST PATH

AVAILABLE FROM THE SOURCE NETWORK TO THE DESTINATION NETWORK. EACH ROUTER JOINED THE ROUTING DOMAIN, WILL HELD LINK STATE DATABASES WHICH CONSIST OF A ROUTER LIST IN THE NETWORK. EVERY ROUTER HAS THE SAME DATABASE. THE DATABASE THEN IS USED TO DESCRIBE TO NETWORK TOPOLOGY. EACH ROUTER IN THE SAME DOMAIN WILL RUN THE ALGORITHM USING THEIR LINK-STATE DATABASE. FIRSTLY, THEY WILL BUILD A TREE WITH EACH ROUTER AS THE ROOT. THEN, THE TREE CONSISTS OF SHORTEST PATH AVAILABLE TO EACH ROUTER IN THAT NETWORK. OTHER ROUTER WHICH IS JOINED THE NETWORK WILL BE KNOWN AS LEAVE. LINK STATE ADVERTISEMENT (LSA) IS RESPONSIBLE FOR THE ROUTING INFORMATION EXCHANGE BETWEEN ROUTERS. NEIGHBOR ROUTER INFORMATION CAN BE KNOWN EACH TIME LSA IS RECEIVED. LSA IS SENT BY EACH ROUTING USING FLOODING METHOD. EACH ROUTER FLOODS ITS LSA TO THE NETWORK, AND THEN EACH ROUTER WILL RECEIVE THE LSA AND PROCESSED IT. EVERY TIME A NETWORK TOPOLOGY ALTERED, ROUTER WILL SEND LSA TO THE NETWORKS. THUS THE OTHER ROUTERS WILL KNOW ABOUT THE NETWORK TOPOLOGY CHANGES SOON. DIJKSTRA ALGORITHM IS USED TO COMPUTES THE SHORTEST PATH FROM EACH ROUTER TO OTHER ROUTER IN THE SAME ROUTING DOMAIN. DIJKSTRA ALGORITHM USED COST FOR EACH LINK AVAILABLE IN THE ROUTER FOR THE COMPUTATION. OSPF IS A ROUTING PROTOCOL DEVELOPED BY INTERIOR GATEWAY PROTOCOL (IGP) WORKING GROUP OF THE INTERNET ENGINEERING TASK FORCE (IETF) FOR INTERNET PROTOCOL (IP) NETWORK. OSPF IS A CONNECT STATE ROUTING PROTOCOL THAT IS USED TO DISTRIBUTE ROUTING INFORMATION WITHIN A SINGLE AUTONOMOUS SYSTEM (AS). OSPF HAS FIVE DIFFERENT PACKET TYPES. EACH PACKET HAS A SPECIFIC PURPOSE IN OSPF ROUTE.

3.1.3 IGRP

IT IS THE PROTOCOL WHICH IS USED IN LARGE NETWORKS. IT USES AN AUTONOMOUS SYSTEM NUMBER FOR ACTIVATION AND GIVES A FULL ROUTE TABLE UPDATE AFTER EVERY 90 SECONDS. IT USES USE THE BANDWIDTH AND DELAY AS A METRIC TO DETERMINE THE BEST ROUTE TO AN INTERNETWORK. IGRP HAS THE MAXIMUM HOP COUNT OF 255(DEFAULT AS 100). IGRP IS NO LONGER SUPPORTED BY THE CISCO. IGRP IS A PROTOCOL THAT ALLOWS GATEWAYS TO BUILD UP THEIR ROUTING TABLE BY EXCHANGING INFORMATION WITH OTHER GATEWAYS. A GATEWAY STARTS OUT WITH ENTRIES FOR ALL OF THE NETWORKS THAT ARE DIRECTLY CONNECTED TO IT. IT GETS INFORMATION ABOUT OTHER NETWORKS BY EXCHANGING ROUTING UPDATES WITH ADJACENT GATEWAYS. IN THE SIMPLEST CASE, THE GATEWAY WILL FIND ONE PATH THAT REPRESENTS THE BEST WAY TO GET TO EACH NETWORK. A PATH IS CHARACTERIZED BY THE NEXT GATEWAY TO WHICH PACKETS SHOULD BE SENT, THE NETWORK INTERFACE THAT SHOULD BE USED, AND METRIC INFORMATION. METRIC INFORMATION IS A SET OF NUMBERS THAT CHARACTERIZE HOW GOOD THE PATH IS. THIS ALLOWS THE GATEWAY TO COMPARE PATHS THAT IT HAS HEARD FROM VARIOUS GATEWAYS AND DECIDE WHICH ONE TO USE. THERE ARE OFTEN CASES WHERE IT MAKES SENSE TO SPLIT TRAFFIC BETWEEN TWO OR MORE PATHS. IGRP WILL DO THIS WHENEVER TWO OR MORE PATHS ARE EQUALLY GOOD. THE USER CAN ALSO CONFIGURE IT TO SPLIT TRAFFIC WHEN PATHS ARE ALMOST EQUALLY GOOD. IN THIS CASE MORE TRAFFIC WILL BE SENT ALONG THE PATH WITH THE BETTER METRIC. THE INTENT IS THAT TRAFFIC CAN BE SPLIT BETWEEN A 9600 BPS LINE AND A 19200 BPS LINE, AND THE 19200 LINE WILL GET ROUGHLY TWICE AS MUCH TRAFFIC AS THE 9600 BPS LINE.

4. EIGRP

IT IS A PROPRIETARY CISCO PROTOCOL THAT RUNS ON CISCO ROUTERS. IT IS THE MOST POPULAR ROUTING PROTOCOL WHICH IS USED THESE DAYS. EIGRP IS A CLASSLESS, ENHANCED DISTANCE VECTOR PROTOCOL AS COMPARE TO THE OTHER CISCO PROPRIETARY PROTOCOL LIKE IGRP. IT IS AN INDEPENDENT SYSTEM WHICH DESCRIBES THE SET OF CONTIGUOUS ROUTERS THAT RUN THE SAME ROUTING PROTOCOL AND SHARE ROUTING INFORMATION. IN EIGRP WHILE DESIGNING A NETWORK THE SUBNET MASK IN ITS ROUTES UPDATES IS INCLUDED AND THUS ADVERTISEMENT OF SUBNET INFORMATION ALLOWS US TO USE VARIABLE LENGTH SUBNET MASKS (VLSMS) AND SUMMARIZATION WHICH IS IMPOSSIBLE IN IGRP. EIGRP IS ALSO CONSIDERED AS HYBRID ROUTING PROTOCOL AS IT HAS THE CHARACTERISTICS OF BOTH DISTANCE-VECTOR AS WELL AS THE LINK-STATE ROUTING PROTOCOL. IT SENDS TRADITIONAL DISTANCE-VECTOR UPDATES CONTAINING INFORMATION ABOUT THE NETWORK AND THE COST OF REACHING THEM FROM THE ASPECT OF ADVERTISING ROUTER UNLIKE OSPF. IT ACT AS LINK-STATE ALSO AS IT SYNCHRONIZES ROUTING TABLES BETWEEN NEIGHBORS AT STARTUP AND THEN SENDS SPECIFIC UPDATES ONLY WHEN TOPOLOGY CHANGES OCCUR. THUS EIGRP IS SUITABLE FOR VERY LARGE NETWORKS. EIGRP CAN LOAD-BALANCE UP TO FOUR EQUAL-COST LINKS. BUT WHILE CONFIGURING IT IS DETERMINED THAT EIGRP CAN LOAD-BALANCE ACROSS UP TO SIX EQUAL-/UNEQUAL COST LINKS TO A REMOTE NETWORK.

1) ACCURATELY ROUTING LOAD CALCULATING AND HETEROGENEOUS NETWORK PROTOCOLS SUPPORTING. EIGRP INHERITS ADVANTAGES OF IGRP. EIGRP CALCULATES ROUTES ACCORDING TO INFORMATION SUCH AS NETWORK BANDWIDTH, TOTAL DELAY, PATH RELIABILITY, PATH LOADING, SO THE ROUTES TABLE IS MORE ACCURATE. EIGRP ALSO SUPPORT IPX, CLNP.
2) LOW USAGE OF NETWORK RESOURCE. DURING NORMAL OPERATION, USAGE OF NETWORK RESOURCE IS VERY LOW; ONLY HELLO PACKETS ARE TRANSMITTED ON A STABLE NETWORK. WHEN A CHANGE OCCURS, ONLY ROUTING TABLE CHANGES ARE PROPAGATED, NOT ENTIRE ROUTING TABLE; THIS REDUCES THE LOAD THE ROUTING PROTOCOL ITSELF PLACES ON THE NETWORK. EIGRP ALSO CAN CONTROL THE PACKETS TRANSMISSION AND REDUCE THE USAGE OF INTERFACE BANDWIDTH, SO IT CAN AVOID INFLUENCE TO NORMAL SERVICES DATA PACKETS.
3) LOOP-FREE AND FAST CONVERGENCE. EIGRP USES DUAL, ONLY ROUTING TABLE CHANGES ARE PROPAGATED; AND TO ONE ROUTE, ONLY RELATIVE ROUTERS WILL RECALCULATES。
4) THE CIPHER TEXT AUTHENTICATION MODE WITH MD5 ALGORITHM IS SUPPORTED.

5) VARIABLE LENGTH SUBNET MASK ROUTES AGGREGATION. EIGRP SUPPORT VARIABLE LENGTH SUBNET MASK ROUTES AGGREGATION BY CONFIGURATION, IS REDUCES TRANSMISSION OF ROUTING INFORMATION AND SAVE BANDWIDTH.

6) SUPPORT LOAD-BALANCE OVER EQUAL COST OR UNEQUAL COST .EIGRP CAN SEND TRAFFIC IN PROPORTION OVER SEVERAL UNEQUAL COST PATHS, THIS PROMOTES THE UTILITY RATE OF NETWORK RESOURCE; BUT IS ALSO INCREASE WORKLOAD OF ROUTERS, SO THIS WAY IS NOT COMMENDED EVEN BY CISCO.

7) CONFIGURATION IS SIMPLE. THERE'S NO COMPLICATED AREA SETTING AND IT NEED NOT ADOPT DIFFERENT CONFIGURATION TO DIFFERENT NETWORK INTERFACE. IT ONLY NEEDS TO START EIGRP PROCESS ON ROUTERS, AND USES NETWORK COMMAND TO CONFIGURE INTERFACE.

VARIOUS TERMS USED IN EIGRP ARE:

NEIGHBOR DISCOVERY: EIGRP ROUTERS MUST BECOME NEIGHBORS TO EXCHANGE THE ROUTES WITH EACH OTHER. TO ESTABLISH THE NEIGHBOR SHIP THREE CONDITIONS THAT ARE CONSIDERED ARE HELLO OR ACK RECEIVED, AS NUMBERS MATCH AND IDENTICAL METRICS (K VALUES). FEASIBLE DISTANCE: IT IS CONSIDERED AS THE BEST METRIC AMONG ALL PATHS TO A REMOTE NETWORK, ALSO INCLUDES THE METRIC TO THE NEIGHBOR WHICH ADVERTISES THE REMOTE NETWORK. THIS ROUTE IS CONSIDERED AS THE BEST PATH AND IS AVAILABLE IN THE ROUTING TABLE. THE METRIC OF A FEASIBLE DISTANCE IS THE METRIC REPORTED BY THE NEIGHBOR AND THE METRIC TO THE NEIGHBOR REPORTING THE ROUTE. REPORTED/ADVERTISED DISTANCE: THE NEIGHBOR THAT REPORTS THE METRIC OF A REMOTE NETWORK IS KNOWN ASTHE ADVERTISED DISTANCE. IT IS ALSO DEFINED AS THEROUTING TABLE METRIC OF THE NEIGHBOR.

FEASIBLE SUCCESSOR: THE PATH WHOSE REPORTED DISTANCE IS LESS THAN THE FEASIBLE DISTANCE IS THE FEASIBLE SUCCESSOR. IT ALSO CONSIDERS THE BACKUP ROUTES. IT MAINTAINS SIX FEASIBLE SUCCESSORS IN THE TOPOLOGY TABLE AND ONLY ONE BEST METRIC (THE SUCCESSOR) IS COPIED AND PLACED IN THE ROUTING TABLE. A DESTINATION ENTRY IS MOVED FROM THE TOPOLOGY TABLE TO THE ROUTING TABLE WHEN THERE IS A FEASIBLE SUCCESSOR. ALL MINIMUM COST PATHS TO THE DESTINATION FORM A SET. FROM THIS SET, THE NEIGHBORS THAT HAVE AN ADVERTISED METRIC LESS THAN THE CURRENT ROUTING TABLE METRIC ARE CONSIDERED FEASIBLE SUCCESSORS. FEASIBLE SUCCESSORS ARE VIEWED BY A ROUTER AS NEIGHBORS THAT ARE DOWNSTREAM WITH RESPECT TO THE DESTINATION. THESE NEIGHBORS AND THE ASSOCIATED METRICS ARE PLACED IN THE FORWARDING TABLE. WHEN A NEIGHBOR CHANGES THE METRIC IT HAS BEEN ADVERTISING OR A TOPOLOGY CHANGE OCCURS IN THE NETWORK, THE SET OF FEASIBLE SUCCESSORS MAY HAVE TO BE RE−EVALUATED. HOWEVER, THIS IS NOT CATEGORIZED AS A ROUTE RECOMPUTATION.

SUCCESSOR: A SUCCESSOR ROUTE IS THE BEST ROUTE TO A REMOTE NETWORK WHICH IS USED BY EIGRP TOFORWARD TRAFFIC TO A DESTINATION AND IS THEN STORED IN THE ROUTING TABLE. FEASIBLE SUCCESSOR ROUTES ARE BACKED UP IN THE ROUTING TABLE ONLY IF ONE IS AVAILABLE. THE FEASIBLE DISTANCE AND THE FEASIBLE SUCCESSORS IN THE TOPOLOGY TABLE AS BACKUP LINKS ARE USED TO CONVERGE NETWORK INSTANTLY, AND UPDATES TO ANY NEIGHBOR ARE THE ONLY TRAFFIC SENT FROM EIGRP.

CHARACTERISTICS OF EIGRP ARE CLASSIFIED AS:

BACKUP ROUTES: EIGRP IS THE ONLY ROUTING PROTOCOL THAT SUPPORTS BACKUP ROUTES. AS IN OTHER ROUTING PROTOCOLS LIKE OSPF, LOOSE ITS BEST ROUTE IN A NETWORK DUE TO SOME FAILURE THEN IT HAS TO BROADCAST FOR A HELP WHEREAS EIGRP SIMPLY LOOK AT ITS BACKUP ROUTES WHICH ARE MAINTAINED IN THE TOPOLOGY TABLE.

SIMPLE CONFIGURATION: EIGRP CONSIDERS THE BEST OF BOTH DISTANCE-VECTOR AND LINK-STATE ROUTING PROTOCOL. THUS FROM THE DISTANCE VECTOR ROUTING PROTOCOLS IT ATTAINS THE EASE OF CONFIGURATION.

FLEXIBILITY OF SUMMARIZATION: THIS MEANS TO SUMMARIZE ANYWHERE IN THE NETWORK RATHER THAN HAVING THE SPECIFIC ROUTERS THAT DO SUMMARIZATION. IT IS WIDE OPEN TO SUMMARIZE WHILE DESIGNING.

UNEQUAL COST LOAD BALANCING: NO OTHER ROUTING PROTOCOL DOES IT. EIGRP CAN TAKE UNEQUALLY LOAD DISTRIBUTION BY CONSIDERING THE METRIC CALCULATIONS.

SUPPORTS MULTIPLE NETWORKS PROTOCOL: EIGRP CAN REPLACE NOVELL RIP AND APPLE TALK ROUTING TABLE MAINTENANCE PROTOCOL (RTMP), SERVING BOTH IPX AND APPLE TALK NETWORKS WITH POWERFUL EFFICIENCY.

3.3.2 EIGRP STATUS CODES:

1) PASSIVE – NETWORK AVAILABLE
2) ACTIVE – NETWORK UNAVAILABLE
3) UPDATE – NETWORK IS BEING UPDATED
4) QUERY – OUTSTANDING QUERY – WAITING FOR ACK
5) REPLY – GENERATING A REPLY TO A QUERY
6) STUCK IN ACTIVE (SIA) – ROUTER IS QUERYING ABOUT A NETWORK THAT IS UNAVAILABLE AND NOT GETTING ANY RESPONSES BACK AND THIS LEADS TO CONVERGENCE PROBLEM. WE CAN PREVENT THIS SIA STATE BY USING SUMMARIZATION OR STUB ROUTER CONCEPT.THE ADVANTAGES USING EIGRP ARE AS FOLLOW:

1) EASY TO CONFIGURE.
2) LOOP FREE ROUTES.
3) KEEPS BACKUP PATH TO THE DESTINATION NETWORK.
4) CONVERGENCE TIME IS LOW AND BANDWIDTH UTILIZATION.
5) SUPPORT VARIABLE LENGTH SUBNET MASK (VLSM) ANDCLASSLESS INTER DOMAIN ROUTING (CIDR).
6) SUPPORTS AUTHENTICATION.

THE DISADVANTAGE OF USING EIGRP IS AS FOLLOW:

1) CONSIDERED AS CISCO PROPRIETARY ROUTING PROTOCOL.
2) ROUTERS FROM OTHER VENDOR ARE NOT ABLE TO UTILIZE EIGRP.

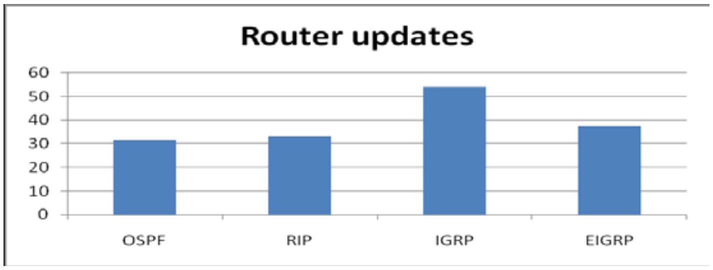


FIG. ROUTER UPDATES COMPARISON OF VARIOUS PROTOCOLS

4.1 IPV6

IPV6 IS A 128 BITS OR 16 BYTES ADDRESSING SCHEME, WHICH IS REPRESENTED BY A SERIES OF EIGHT 16 BITS FIELD SEPARATED BY COLONS [14]. THE FORMAT OF IPV6 IS X:X:X:X:X:X:X:X ,WHERE X IS 16 BITS HEXADECIMAL NUMBERS WITH LEADING ZEROS IN EACH X FIELD ARE OPTIONAL. SUCCESSIVE X FIELDS WITH 0 CAN BE REPRESENTED AS :: BUT ONLY ONCE, FOR EXAMPLE 2031:0000:0000:013F:0000:0000:0000:0001. SECURITY IN IPV6 IS INHERIT, WHICH PROVIDES AUTHENTICATION AND ENCRYPTION AND HAS SIMPLE HEADER FORMAT FOR HIGHER PROCESSING. HERE, TABLE 1 REPRESENTS THE COMMON DIFFERENCE BETWEEN IPV4 AND IPV6.

IP Versions	Deployment year	Address Size	Number of addresses available	Format of address	Prefix notation
IPv4	1981	32	2^{32}=4,294,967,296	Dotted decimal notation	192.168.0.0/24
IPv6	1999	128	2^{128}=approximately 3.4×10^{38} addresses	Hexadecimal notation	2001:abcd:abcd::/48

CONFIGURATION OF IPV6 ON ROUTER

A) TO ENABLE IPV6 ROUTING

ROUTER (CONFIG) # IPV6 UNICAST-ROUTING

B) CONFIGURE IPV6 ADDRESS

ROUTER (CONFIG-IF)# IPV6 ADDRESS <IPV6 ADDRESS>/<PREFIX>

5. IMPLEMENTATION ENVIRONMENT :

5.1 SUMMARIZATION

5.1.1AUTO–SUMMARIZATION

EIGRP PERFORMS AN AUTO–SUMMARIZATION EACH TIME IT CROSSES A BORDER BETWEEN TWO DIFFERENT MAJOR NETWORKS. FOR EXAMPLE, IN FIGURE 13, ROUTER TWO ADVERTISES ONLY THE 10.0.0.0/8 NETWORK TO ROUTER ONE, BECAUSE THE INTERFACE ROUTER TWO USES TO REACH ROUTER ONE IS IN A DIFFERENT MAJOR NETWORK.

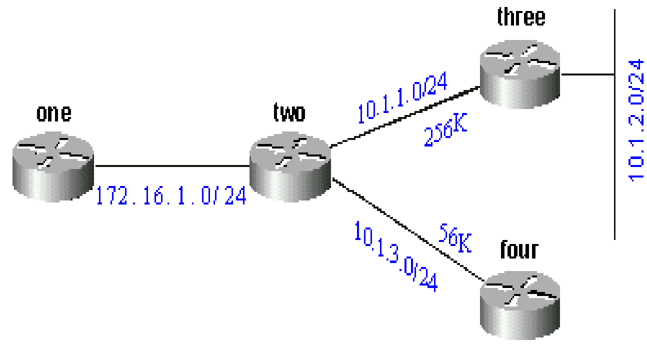


Figure 13

ON ROUTER ONE, THIS LOOKS LIKE THE FOLLOWING:
ONE# SHOW IP EIGRP TOPOLOGY 10.0.0.0
IP–EIGRP TOPOLOGY ENTRY FOR 10.0.0.0/8
STATE IS PASSIVE, QUERY ORIGIN FLAG IS 1, 1
SUCCESSOR(S), FD IS 11023872
ROUTING DESCRIPTOR BLOCKS:
172.16.1.1 (SERIAL0), FROM 172.16.1.2, SEND FLAG IS 0X0
COMPOSITE METRIC IS (11023872/10511872), ROUTE IS INTERNAL
VECTOR METRIC:
MINIMUM BANDWIDTH IS 256 KBIT
TOTAL DELAY IS 40000 MICROSECONDS
RELIABILITY IS 255/255
LOAD IS 1/255
MINIMUM MTU IS 1500
HOP COUNT IS 1

THIS ROUTE IS NOT MARKED AS A SUMMARY ROUTE IN ANY WAY; IT LOOKS LIKE AN INTERNAL ROUTE. THE METRIC IS THE BEST METRIC FROM AMONG THE SUMMARIZED ROUTES. NOTE THAT THE MINIMUM BANDWIDTH ON THIS ROUTE IS 256K, ALTHOUGH THERE ARE LINKS IN THE 10.0.0.0 NETWORK THAT HAVE A BANDWIDTH OF 56K.

ON THE ROUTER DOING THE SUMMARIZATION, A ROUTE IS BUILT TO NULL0 FOR THE SUMMARIZED ADDRESS:
TWO# SHOW IP ROUTE 10.0.0.0
ROUTING ENTRY FOR 10.0.0.0/8, 4 KNOWN SUBNETS
ATTACHED (2 CONNECTIONS)
VARIABLY SUBNETTED WITH 2 MASKS
REDISTRIBUTING VIA EIGRP 2000
C 10.1.3.0/24 IS DIRECTLY CONNECTED, SERIAL2
D 10.1.2.0/24 [90/10537472] VIA 10.1.1.2, 00:23:24, SERIAL1
D 10.0.0.0/8 IS A SUMMARY, 00:23:20, NULL0
C 10.1.1.0/24 IS DIRECTLY CONNECTED, SERIAL1

THE ROUTE TO 10.0.0.0/8 IS MARKED AS A SUMMARY THROUGH NULL0. THE TOPOLOGY TABLE ENTRY FOR THIS SUMMARY ROUTE LOOKS LIKE THE FOLLOWING:
TWO#SHOW IP EIGRP TOPOLOGY 10.0.0.0
IP–EIGRP TOPOLOGY ENTRY FOR 10.0.0.0/8
STATE IS PASSIVE, QUERY ORIGIN FLAG IS 1, 1
SUCCESSOR(S), FD IS 10511872
ROUTING DESCRIPTOR BLOCKS:
0.0.0.0 (NULL0), FROM 0.0.0.0, SEND FLAG IS 0X0
(NOTE: THE 0.0.0.0 HERE MEANS THIS ROUTE IS ORIGINATED

BY THIS ROUTER)
COMPOSITE METRIC IS (10511872/0), ROUTE IS INTERNAL
VECTOR METRIC:
MINIMUM BANDWIDTH IS 256 KBIT
TOTAL DELAY IS 20000 MICROSECONDS
RELIABILITY IS 255/255
LOAD IS 1/255
TO MAKE ROUTER TWO
MINIMUM MTU IS 1500
HOP COUNT IS 0
ADVERTISE THE COMPONENTS OF THE 10.0.0.0 NETWORK INSTEAD OF A SUMMARY, CONFIGURE NO AUTO−SUMMARYON THE EIGRP PROCESS ON ROUTER TWO:
ON ROUTER TWO
ROUTER EIGRP 2000
NETWORK 172.16.0.0
NETWORK 10.0.0.0
NO AUTO−SUMMARY
WITH AUTO−SUMMARY TURNED OFF, ROUTER ONE NOW SEES ALL OF THE COMPONENTS OF THE 10.0.0.0 NETWORK:
ONE# SHOW IP EIGRP TOPOLOGY
IP−EIGRP TOPOLOGY TABLE FOR PROCESS 2000
CODES: P − PASSIVE, A − ACTIVE, U − UPDATE, Q − QUERY, R − REPLY,
R − REPLY STATUS
P 10.1.3.0/24, 1 SUCCESSORS, FD IS 46354176
VIA 20.1.1.1 (46354176/45842176), SERIAL0
P 10.1.2.0/24, 1 SUCCESSORS, FD IS 11049472
VIA 20.1.1.1 (11049472/10537472), SERIAL0
P 10.1.1.0/24, 1 SUCCESSORS, FD IS 11023872
VIA 20.1.1.1 (11023872/10511872), SERIAL0
P 172.16.1.0/24, 1 SUCCESSORS, FD IS 2169856
VIA CONNECTED, SERIAL0
THERE ARE SOME CAVEATS WHEN DEALING WITH THE SUMMARIZATION OF EXTERNAL ROUTES THAT ARE COVERED LATER IN THE AUTO−SUMMARIZATION OF EXTERNAL ROUTES SECTION.

5.1.2MANUAL SUMMARIZATION

EIGRP ALLOWS YOU TO SUMMARIZE INTERNAL AND EXTERNAL ROUTES ON VIRTUALLY ANY BIT BOUNDARY USING MANUAL SUMMARIZATION. FOR EXAMPLE, IN FIGURE 14, ROUTER TWO IS SUMMARIZING THE 192.1.1.0/24, 192.1.2.0/24, AND 192.1.3.0/24 INTO THE CIDR BLOCK 192.1.0.0/22.
NOTE THE IP SUMMARY−ADDRESS EIGRP COMMAND UNDER INTERFACE SERIAL0, AND THE SUMMARY ROUTE VIA NULL0.

ROUTER A CONFIGURATION

DEVICE>ENABLE
DEVICE(CONFIG)# CONFIGURE TERMINAL
DEVICE(CONFIG)# ROUTER EIGRP 1
DEVICE(CONFIG-ROUTER)# EXIT
DEVICE(CONFIG)# INTERFACE ETHERNET 1/0
DEVICE(CONFIG-IF)# IP AUTHENTICATION MODE EIGRP 1 MD5
DEVICE(CONFIG-IF)# IP AUTHENTICATION KEY-CHAIN EIGRP 1 KEY1
DEVICE(CONFIG-IF)# EXIT
DEVICE(CONFIG)# KEY CHAIN KEY1
DEVICE(CONFIG-KEYCHAIN)# KEY 1
DEVICE(CONFIG-KEYCHAIN-KEY)# KEY-STRING 0987654321
DEVICE(CONFIG-KEYCHAIN-KEY)# ACCEPT-LIFETIME 04:00:00 DEC 4 2006 INFINITE
DEVICE(CONFIG-KEYCHAIN-KEY)# SEND-LIFETIME 04:00:00 DEC 4 2006 04:48:00 DEC 4 1996
DEVICE(CONFIG-KEYCHAIN-KEY)# EXIT
DEVICE(CONFIG-KEYCHAIN)# KEY 2
DEVICE(CONFIG-KEYCHAIN-KEY)# KEY-STRING 1234567890
DEVICE(CONFIG-KEYCHAIN-KEY)# ACCEPT-LIFETIME 04:00:00 JAN 4 2007 INFINITE
DEVICE(CONFIG-KEYCHAIN-KEY)# SEND-LIFETIME 04:45:00 JAN 4 2007 INFINITE

ROUTER B CONFIGURATION

DEVICE>ENABLE
DEVICE(CONFIG)# CONFIGURE TERMINAL
DEVICE(CONFIG)# ROUTER EIGRP 1
DEVICE(CONFIG-ROUTER)# EXIT
DEVICE(CONFIG)# INTERFACE ETHERNET 1/0
DEVICE(CONFIG-IF)# IP AUTHENTICATION MODE EIGRP 1 MD5
DEVICE(CONFIG-IF)# IP AUTHENTICATION KEY-CHAIN EIGRP 1 KEY2
DEVICE(CONFIG-IF)# EXIT
DEVICE(CONFIG)# KEY CHAIN KEY2
DEVICE(CONFIG-KEYCHAIN)# KEY 1
DEVICE(CONFIG-KEYCHAIN-KEY)# KEY-STRING 0987654321
DEVICE(CONFIG-KEYCHAIN-KEY)# ACCEPT-LIFETIME 04:00:00 DEC 4 2006 INFINITE
DEVICE(CONFIG-KEYCHAIN-KEY)# SEND-LIFETIME 04:00:00 DEC 4 2006 INFINITE
DEVICE(CONFIG-KEYCHAIN-KEY)# EXIT
DEVICE(CONFIG-KEYCHAIN)# KEY 2
DEVICE(CONFIG-KEYCHAIN-KEY)# KEY-STRING 1234567890
DEVICE(CONFIG-KEYCHAIN-KEY)# ACCEPT-LIFETIME 04:00:00 JAN 4 2007 INFINITE
DEVICE(CONFIG-KEYCHAIN-KEY)# SEND-LIFETIME 04:45:00 JAN 4 2007 INFINITE
REDISTRIBUTION:
INTRODUCTION

THE USE OF A ROUTING PROTOCOL TO ADVERTISE ROUTES THAT ARE LEARNED BY SOME OTHER MEANS, SUCH AS BY ANOTHERROUTING PROTOCOL, STATIC ROUTES, OR DIRECTLY CONNECTED ROUTES, IS CALLED REDISTRIBUTION. WHILE RUNNING A SINGLEROUTING PROTOCOL THROUGHOUT YOUR ENTIRE IP INTERNETWORK IS DESIRABLE, MULTI−PROTOCOL ROUTING IS COMMON FOR ANUMBER OF REASONS, SUCH AS COMPANY MERGERS, MULTIPLE DEPARTMENTS MANAGED BY MULTIPLE NETWORK ADMINISTRATORS, AND MULTI−VENDOR ENVIRONMENTS. RUNNING DIFFERENT ROUTING PROTOCOLS IS OFTEN PART OF A NETWORKDESIGN. IN ANY CASE, HAVING A MULTIPLE PROTOCOL ENVIRONMENT MAKES REDISTRIBUTION A NECESSITY. DIFFERENCES IN ROUTING PROTOCOL CHARACTERISTICS, SUCH AS METRICS, ADMINISTRATIVE DISTANCE, CLASSFUL AND CLASSLESCAPABILITIES CAN EFFECT REDISTRIBUTION. CONSIDERATION MUST BE GIVEN TO THESE DIFFERENCES FOR REDISTRIBUTION TOSUCCEED.
COMPONENTS USED
THE INFORMATION IN THIS DOCUMENT IS BASED ON THESE

SOFTWARE AND HARDWARE VERSIONS

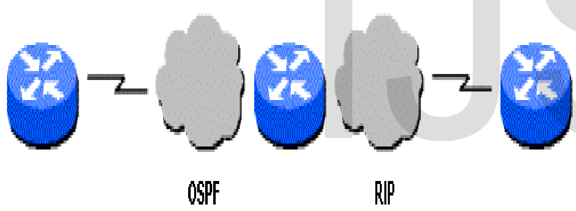
· CISCO IOS® SOFTWARE RELEASE 12.2(10B)

· CISCO 2500 SERIES ROUTERS

THE INFORMATION IN THIS DOCUMENT WAS CREATED FROM THE DEVICES IN A SPECIFIC LAB ENVIRONMENT. ALL OF THE DEVICES USED IN THIS DOCUMENT STARTED WITH A CLEARED (DEFAULT) CONFIGURATION. IF YOUR NETWORK IS LIVE, MAKE SURE THAT YOU UNDERSTAND THE POTENTIAL IMPACT OF ANY COMMAND.

METRICS

WHEN YOU REDISTRIBUTE ONE PROTOCOL INTO ANOTHER, REMEMBER THAT THE METRICS OF EACH PROTOCOL PLAY AN IMPORTANT ROLE IN REDISTRIBUTION. EACH PROTOCOL USES DIFFERENT METRICS. FOR EXAMPLE, THE ROUTING INFORMATION PROTOCOL (RIP) METRIC IS BASED ON HOP COUNT, BUT INTERIOR GATEWAY ROUTING PROTOCOL (IGRP) AND ENHANCED INTERIOR GATEWAY ROUTING PROTOCOL (EIGRP) USE A COMPOSITE METRIC BASED ON BANDWIDTH, DELAY, RELIABILITY, LOAD, AND MAXIMUM TRANSMISSION UNIT (MTU), WHERE BANDWIDTH AND DELAY ARE THE ONLY PARAMETERS USED BY DEFAULT. WHEN ROUTES ARE REDISTRIBUTED, YOU MUST DEFINE A METRIC THAT IS UNDERSTANDABLE TO THE RECEIVING PROTOCOL. THERE ARE TWO METHODS TO DEFINE METRICS WHEN REDISTRIBUTING ROUTES.



YOU CAN DEFINE THE METRIC FOR THAT SPECIFIC REDISTRIBUTION ONLY:

ROUTER RIP

REDISTRIBUTE STATIC METRIC 1

REDISTRIBUTEOSPF 1 METRIC 1

OR YOU CAN USE THE SAME METRIC AS A DEFAULT FOR ALL REDISTRIBUTION (USING THE DEFAULT−METRIC COMMAND SAVES WORK BECAUSE IT ELIMINATES THE NEED FOR DEFINING THE METRIC SEPARATELY FOR EACH REDISTRIBUTION.): ROUTER RIP

REDISTRIBUTE STATIC

REDISTRIBUTEOSPF 1

DEFAULT−METRIC 1

ADMINISTRATIVE DISTANCE

IF A ROUTER IS RUNNING MORE THAN ONE ROUTING PROTOCOL AND LEARNS A ROUTE TO THE SAME DESTINATION USING BOTH ROUTING PROTOCOLS, THEN WHICH ROUTE SHOULD BE SELECTED AS THE BEST ROUTE? EACH PROTOCOL USES ITS OWN METRIC TYPE TO DETERMINE THE BEST ROUTE. COMPARING ROUTES WITH DIFFERENT METRIC TYPES CANNOT BE DONE. ADMINISTRATIVE DISTANCES TAKE CARE OF THIS PROBLEM. ADMINISTRATIVE DISTANCES ARE ASSIGNED TO ROUTE SOURCES SO THAT THE ROUTE FROM THE MOST PREFERRED SOURCE WILL BE CHOSEN AS THE BEST PATH. REFER TO ROUTE SELECTION IN CISCO ROUTERS FOR MORE INFORMATION ABOUT ADMINISTRATIVE DISTANCES AND ROUTE SELECTION.

ADMINISTRATIVE DISTANCES HELP WITH ROUTE SELECTION AMONG DIFFERENT ROUTING PROTOCOLS, BUT THEY CAN CAUSE PROBLEMS FOR REDISTRIBUTION. THESE PROBLEMS CAN BE IN THE FORM OF ROUTING LOOPS, CONVERGENCE PROBLEMS, OR INEFFICIENT ROUTING. SEE BELOW FOR A TOPOLOGY AND DESCRIPTION OF A POSSIBLE PROBLEM.

OSPF

THIS OUTPUT SHOWS AN OSPF ROUTER REDISTRIBUTING STATIC, RIP, IGRP, EIGRP, AND IS−IS ROUTES.

ROUTEROSPF 1

NETWORK 131.108.0.0 0.0.255.255 AREA 0

REDISTRIBUTE STATIC METRIC 200 SUBNETS

REDISTRIBUTE RIP METRIC 200 SUBNETS

REDISTRIBUTEIGRP 1 METRIC 100 SUBNETS

REDISTRIBUTE EIGRP 1 METRIC 100 SUBNETS

REDISTRIBUTEISIS METRIC 10 SUBNETS

THE OSPF METRIC IS A COST VALUE BASED ON 108/ BANDWIDTH OF THE LINK IN BITS/SEC. FOR EXAMPLE, THE OSPF COST OF ETHERNET IS 10: 108/107 = 10

NOTE: IF A METRIC IS NOT SPECIFIED, OSPF PUTS A DEFAULT VALUE OF 20 WHEN REDISTRIBUTING ROUTES FROM ALL PROTOCOLS EXCEPT BORDER GATEWAY PROTOCOL (BGP) ROUTES, WHICH GET A METRIC OF 1.

WHEN THERE IS A MAJOR NET THAT IS SUBNETTED, YOU NEED TO USE THE KEYWORD SUBNET TO REDISTRIBUTE PROTOCOLS INTO OSPF. WITHOUT THIS KEYWORD, OSPF ONLY REDISTRIBUTES MAJOR NETS THAT ARE NOT SUBNETTED.

IT IS POSSIBLE TO RUN MORE THAN ONE OSPF PROCESS ON THE SAME ROUTER. HOWEVER, RUNNING MORE THAN ONE PROCESS OF THE SAME PROTOCOL IS RARELY NEEDED, AND CONSUMES THE ROUTER'S MEMORY AND CPU.

YOU DO NOT NEED TO DEFINE METRIC OR USE THE DEFAULT−METRIC COMMAND WHEN REDISTRIBUTING ONE OSPF PROCESSINTO ANOTHER.

6.EXPERIMENT RESULTS

6.1 Routing table

The letter C represents that the routing is directly connected to the router 0. The letter D represents that the routing is local and is done by using EIGRP. The following command shows IPv6-specific EIGRP routes:

Routing table statistics:

IPv6 Routing Table - 6 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
U - Per-user Static route, M - MIPv6
I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
D - EIGRP, EX - EIGRP external

Command: router0#sh ipv6 route

IPv6-routing table for router 0.

6.2 Routing protocol information

The routing protocol information shows that EIGRP IPV6 routing protocol has been established and assigned process ID is 10. EIGRP is enabled on interface fast Ethernet0/0, serial0/0/0 and serial0/0/1.Maximum hop count supported by EIGRP is 100.

Command: router0#sh ipv6 protocol
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "static
IPv6 Routing Protocol is "eigrp 10 "
EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
EIGRP maximum hopcount 100
EIGRP maximum metric variance 1
Interfaces:
FastEthernet0/0
Serial0/0/0
Serial0/0/1
Redistributing: eigrp 10
Maximum path: 16
Distance: internal 90 external 170

Command: router1#sh ipv6 protocol
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "static
IPv6 Routing Protocol is "eigrp 10 "
EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
EIGRP maximum hopcount 100
EIGRP maximum metric variance 1
Interfaces:
FastEthernet0/0
Serial0/0/0
Serial0/0/1
Redistributing: eigrp 10
Maximum path: 16
Distance: internal 90 external 170

6.3 IPv6 EIGRP neighbor information

The obtained results also display the neighbors discovered by the EIGRP IPv6. It shows the link for local addresses of router0 and router1. These results are listed in Table 4 and Table 5.

Command: router0#sh ipv6 eigrp neighbor

6.4 EIGRP IPv6 Topology information

To display output of the EIGRP IPv6 topology table, authors used the EIGRP IPv6 topology command in privileged EXEC mode. The following EIGRP IPv6 topology command can be used to determine diffusion update algorithm (DUAL) states and to debug possible DUAL problems.

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply, r - Reply status

Command: router0#sh ipv6 EIGRP topology

7. CONCLUSION

Routing is the process of moving packets from one network to the other network. Basically, the routing involves two activities: determining best path and forwarding packets through this path. These two activities of routing vary on the basis of selection of routing protocol. However, various routing protocol selects different selection process for the best path. Routing protocols such as RIP, OSPF, IS-IS, and EIGRP directly impacts on internet efficiency. So these routing protocols should use IPv6 address as the IPv4 addresses are depleted day-by-day. EIGRP protocol has better routing capabilities hence EIGRP IPv6 will be mainly used in the future.

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