TCOM 515

Lecture 4: EIGRP

Objectives

- EIGRP Background
- EIGRP Advantages
- EIGRP Operation
- EIGRP Neighbors & Adjacencies
- DUAL
- EIGRP Packet header

EIGRP Background

- EIGRP stands for Enhanced Interior Gateway Routing Protocol.
- EIGRP is Cisco’s proprietary Interior gateway protocol (IGP).
- It is a distance-vector protocol that has that has link-state characteristics.
- EIGRP version 1 is current version

EIGRP Advantages

- Fast convergence
- Uses minimal network resources
- Auto-summarization
- Authentication
- Classless, supports VLSM and CIDR
- Unequal Cost Load Balancing

EIGRP terminology

- Topology table-contains all routes advertised by neighbors, each entry consists of the metric to the destination address and the neighbor(s) that advertised the destination.
- Feasible distance (FD)-metric for the best path to a destination.
- Successor- next hop router
- Feasibility condition – a neighbor router advertising a path to destination with lower metric than current metric in router.
- Feasible successor-neighbor advertising a metric lower than FD to destination.
- Neighbor table

EIGRP Metric & Paths

EIGRP metric based on the lowest bandwidth and the total delay on the path to the destination

Metric = bandwidth + delay

Bandwidth = (10^7/lowest bandwidth) * 256

Delay = total delay * 256

EIGRP can also use load and reliability in addition to bandwidth and delay.

Path Types

Internal-routes advertised within the EIGRP autonomous system

External-routes from outside of autonomous system (redistribution)

EIGRP Operation

EIGRP has four major components

- Protocol-dependent modules
- Reliable transport protocol
- Neighbor discovery/recovery
- Diffusing update algorithm (DUAL)

Protocol-Dependent Modules

EIGRP supports IP, IPX, and AppleTalk

Reliable Transport Protocol

- Reliable transport protocol (RTP) used to manage the sending and receiving of EIGRP packets.
- RTP uses multicast (224.0.0.10) to send packets, neighbor sends acknowledgement after receipt of certain type of packets
- EIGRP packet types
  - Hellos
  - Acknowledgement
  - Updates
  - Queries and replies
- When multicast is used to send first packet, retransmissions use unicast if no ACK received

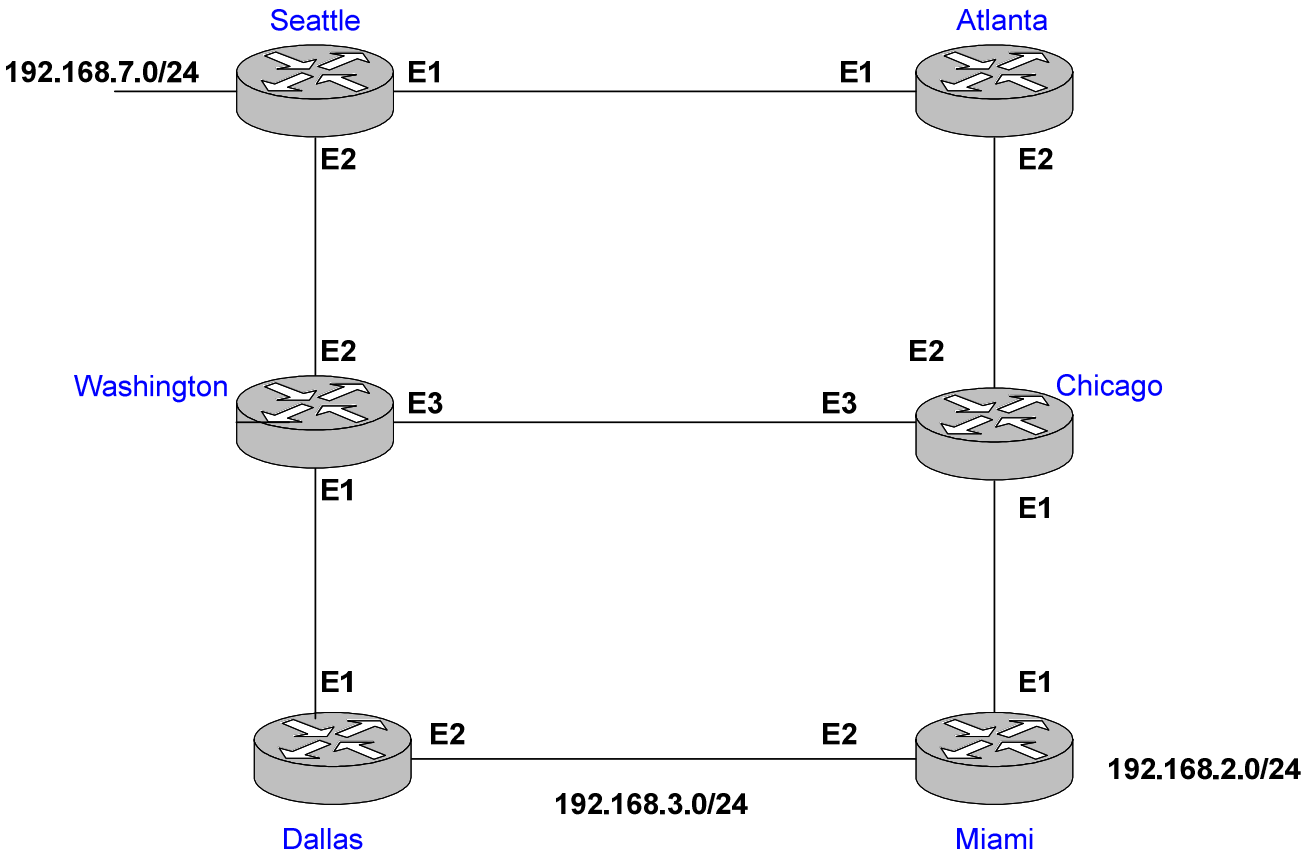
Neighbor Discovery/Recovery

- EIGRP uses hello packets to identify itself and find neighbors.
- Hellos are sent out to EIGRP enabled routers on directly connected networks.
- Neighbor adjacency will be formed after discovery.
- If a hello packet is not received by hold time, neighbor is declared down.
- Neighbors are recorded in a neighbor table.

Diffusing Update Algorithm

- Router will perform DUAL if no feasible successor is found in topology table.
- Router begins diffusing computation by querying all of its neighbors for a feasible successor, the route becomes active.
- Neighbor router will check for FD in its topology table and send reply back to originating router if one exists. If no FD exists, the neighbor router will also start the diffusing computation and send queries to its neighbors.
- After receiving replies to its queries, the router will choose new successor and FD. If no feasible successor is found, route is declared unreachable.
- Router will then send update with new information to neighbors.

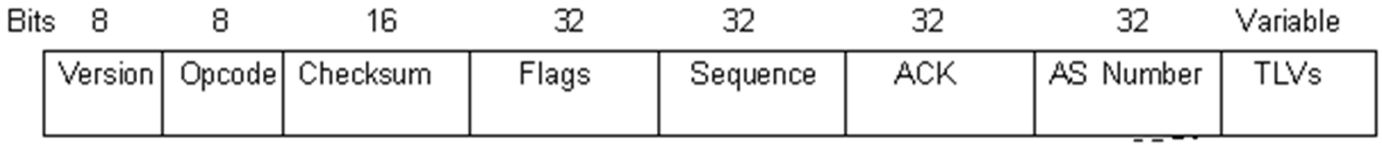
EIGRP DUAL Example



DUAL Issues

- Timeout for replies to queries is 3 minutes, this can cause Stuck In Active (SIA) routes.
- Neighbors that does not respond will be considered as down.
- Solutions
  - Route summarization – this will reduce the query range.
  - EIGRP stub routing - queries are not sent to stub routers

EIGRP Packet Header



Version - only one version of EIGRP
Opcode – EIGRP packet type
- 1 - Update
- 3 - Query
- 4 - Reply
- 5 – Hello
- 6 – IPX SAP

Checksum - this is calculated for the whole EIGRP portion of the IP datagram
Flags – two flags, Init and Conditional Receive. Init bit means that the route in this packet is the first in a new neighbor relationship. The Conditional Receive bit used in Reliable Multicasting algorithm.
Sequence - the 32-bit sequence number used by RTP.
ACK - the 32-bit sequence last heard from the neighbor.
AS Number - the Autonomous System number of the EIGRP domain.
Type/Length/Value (TLV) – generally used to describe a route

Summary

- EIGRP terms
- EIGRP metric
- DUAL
- EIGRP operation
- EIGRP packet headers
- Reading assignment: Chapter 7