Introduction to Routers

TEL-335
Week 3 – Interior Routing with RIPv1

Last Week: Brief Review

- Static routes are handy for manually forcing a router to take a specific path
- Static routes can be a big burden if there is more than a couple of routers and networks involved
- The solution to this problem is dynamic routing protocols

Dynamic Routing Protocols

- Dynamic routing protocols allow routers to communicate routing information to each other
- Remember from last week the key ingredients to a routing table:
  - IP network and subnet mask (if classless)
  - Metric(s)
  - Direction
- Dynamic routing protocols need to communicate all of this!

Dynamic Routing Protocols

- Two major types of dynamic routing protocols:
  1. Distance Vector
  2. Link State

Distance Vector Routing

- Work like the name implies:
  - Distance = how far away a network is (measured in hops in the case of RIP)
  - Vector = which direction a network is (next-hop IP address or interface)
- RIP: Routing Information Protocol
  - This week's lab is RIPv1
  - RIPv2 is next week
- IGRP: Interior Gateway Routing Protocol
- BGP: Border Gateway Protocol

Distance Vector Routing

- Operation:
  - A router advertises routes corresponding to all of its directly connected interfaces out all of its interfaces with a hop count of zero
  - Any directly connected router that receives this information sets the hop count to one and advertises it out its own interfaces along
  - The routes propagate from one router to another in this method, until all routes are propagated throughout the network
  - Some issues can crop up because of this behavior

Distance Vector Routing - Issues

- A router learns a route it advertised, but with a higher hop count – it ignores the information since it already knows a better way to get to the network
- If the network becomes unavailable, however, the router will accept the route with the higher hop count thinking it is the best path
- This will create a routing loop and it's called "counting to infinity"
- RIP specifies "infinity" as 16 hops, so this problem will go away after 15 iterations of advertising the route
- This also means a RIP network can only be 15 hops "wide"

Distance Vector Routing - Issues

- Three ways to help this problem
  - Split horizon: Not advertising routes out the same interface they were learned… "A" will not advertise its route for "C" back to "B"
  - Split horizon with poisoned reverse – advertising routes out the same interface they were learned, but with an infinite hop count (better than just split horizon)
  - Triggered updates – sends updated route information as soon as it is learned rather than waiting for the update period to expire

RIPv1

- Is classful – it doesn't include any subnet mask information in route updates
  - We'll see how this affects things during the lab
- Broadcasts routing updates to the broadcast address (255.255.255.255) on UDP port 520
- Broadcasts updates about every 30 seconds (a little jitter is added to prevent all the routers in a network from sending updates at exactly the same time)

RIPv1 (continued)

- Performs split horizon and triggered updates
  - There is conflicting information about whether poisoned reverse is employed or not – the debugging information doesn't indicate that poisoned reverse is used, however some reference books claim RIP uses poisoned reverse, perhaps it's just Cisco's implementation that doesn't
  - The book claims that the routers don't perform split horizon unless it's specifically configured, but that's not true (the default configuration is to use split horizon, it can be disabled with "no ip split-horizon" in interface configuration mode)

RIPv1 (continued)

- Uses a "holddown" timer (180 seconds) to add a bit of skepticism to learned routes with higher hop counts (for routes with higher hop counts learned from the same interface the previous hop count was learned from)
- Uses an expiration timer (180 seconds) for routes that haven't been updated
  - When the timer expires the route will advertise the route with an infinite metric (16 hops)
- Uses a garbage collection timer (240 seconds) to remove routes that expire
  - The route is removed 60 seconds after the expiration timer runs out

RIPv1 (continued)

- Once a router has multiple ways of learning routes, it needs to be able to prefer certain methods more than others
  - This is accomplished with the administrative distance value
  - If the administrative distance is the same (which means the same routing protocol or static route, etc), the router then looks at the metric
  - The routers specify the administrative distance as the first value in the [AD/Metric] entry for each route in the routing table.

LAB!