IDN-11

More on Next-Door-Neighbors

Robert Hinden

November 1983

I want to expand how a gateway aquires next-door-neighbors. This will not include neighbor discovery, which I think is a seperate issue. This discussion assumes that gateways know about all of their neighbor gateways, both by number and addresses. I will propose some rules (algorithms?) and then work through some examples to show that they work. First some definations and rules:

1) A gateway is neighbors with all other gateways on its attached networks. All gateways on the same network are neighbors with each other.

2) A gateway is next-door-neighbors with two neighbor gateways on each of its attached networks. These neighbor gateways must be up.

3) A gateways next-door-neighbors are the neighbor gateways with gateway numbers closest to is own. For instance, given neighbor gateways with numbers 1, 2, 5, 6, 10, and 11, Gateway 5 would pick Gateway 2 and Gateway 6 as next-door-neighbors, gateway 11 would pick gateway 10 and gateway 1 as next-door-neighbors, etc.

4) A gateway should declare a neighbor up by sending it "pings" before making it its next-door-neighbor.

5) A gateway should try to bring up all neighbors that it know about that would be better next-door-neighbors than the one it currently has.

6) When a gateways next-door-neighbor goes down, it should pick a new next-door-neighbor, but still keep trying to bring up the neighbor gateways that went down (which would be a better next-door-neighbor).

7) When a gateway is coming up, it should not pick next-door-neighbors until it has learned about the other gateways. It should pick its next-door-neighbors just before it starts sending its own routing updates.

Now for some examples. Lets assume that gateways G1, G5, G10, G15, G20, G25, G30, and G35 are are all on the same net. They are all up and neighbors with each other. The next-door-neighbor relationships look like:

```
G10 --- G15 --- G20 --- G25 --- G30 --- G35
 |                                       |
 -----------------------------------------
```

If G20 went down, then both G15 and G25 would declare G20 down, and pick a new next-door-neighbor, which happen to be each other. This would look like:

```
G10 --- G15 ----------- G25 --- G30 --- G35
 |                                       |
 |              G20                      |
 |                                       |
 -----------------------------------------
```

When G20 comes back up, G15 and G25 will notice that is back up because they are still trying to bring it up, and reacquire it as a next-door-neighbor.

Now, suppose that instead of G20 coming back up G25 and G30 also go down. This would result in the following next-door-neighbor relationship:

```
G10 --- G15 --------------------------- G35
 |                                       |
 |              G20     G25     G30      |
 |                                       |
 -----------------------------------------
```

G15 and G35 would be trying to bring up G20, G25 and G30, because they are better next-door-neighbors than the one that they currently have. If G25 comes up, it will become next-door-neighbors with G15 and G35. G15 and G25 will be trying to bring up G20, and G25 and G35 will be trying to bring up G30. This will look like:

```
G10 --- G15 ----------- G25 ---------- G35
 |                                       |
 |              G20            G30       |
 |                                       |
 -----------------------------------------
```

Now suppose that a new gateway G23 comes up. It knows (or learns) about all of its neighbor gateways. After it makes contact with one of its neighbors and receives a set of routing updates, it picks its next-door-neighbors (G15 and G25) and begins sending its own routing updates. This will cause G15 and G25 to learn that it is up and pick it as their next-door-neighbor. This will look like:

```
G10 --- G15 ---------- G23 --- G25 ---------- G35
 |                                              |
 |              G20                  G30        |
 |                                              |
 ------------------------------------------------
```

G15 and G23 will be trying to bring up G20, and G25 and G35 will be trying to bring up G30. G25 will have stopped trying to bring up G20 because it learned of a new gateway that was a better next-door-neighbor.

A general comment: The procedure in step 3) is an example one. The main requirnment of the procedure it that it give consistant results. Others that might work include the physical distance between gateways, the number of hops on a network, etc. It should not be a procedure that gives dynamic results, such as delay measurement.