Writing Task

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> sendFrame() requires the caller to provide the destination MAC address when sending IP packets, but users of IP layer won't provide the address to you. Explain how you addressed this problem when implementing IP protocol.

Answer:

When sending an IP packet, we should specify the destination IP address, so according to our routing table, we can easily find the path towards the destination, and the path records the next hop MAC address, which means we don't have to manually specify the MAC address.

Another problem lies in how to know about the MAC address across the virtual link. In my protocol, each node will broadcast `ADVERTISE` packet to the nodes it connects to, which will tell other nodes the state and MAC/IP address of the node, so that we can record the information received in the routing table.

> Describe your routing algorithm.

Answer:

I use the link-state routing algorithm in my protocol. When receiving `ADVERTISE` packet from other nodes, the node will maintain a `EDGE` table to describe the topology of the whole network, and whenever a new edge comes in, it'll broadcast all the edges in the edge table to other nodes nearby.

When the topology of the network is compact, the router will calculate the shortest path according to the topology using Dijkastra algorithm. The routing table is as the follow:

```
-----------Routing Table-----------
 Routing Entry 0: Dest IP: 12.13.14.0, Dest Mask: 255.255.255.0, Next HOP ID: 0,
 Next MAC Addr: 86:3c:2e:8e:5d:5a
 Routing Entry 1: Dest IP: 156.29.37.0, Dest Mask: 255.255.255.0, Next HOP ID: 1,
 Next MAC Addr: 02:bf:1a:8e:80:e4
 Routing Entry 2: Dest IP: 230.76.16.0, Dest Mask: 255.255.255.0, Next HOP ID: 1,
 Next MAC Addr: 02:bf:1a:8e:80:e4
----------------------------------
```

> To implement routing properly, you need to detect other hosts/let other hosts know about you. In this lab, you are not required to detect hosts not running your protocol stack automatically/let them know about you, but you must not make them complain about strange incoming packets. Describe how your IP implementation achieved this goal.

Answer:

Actually the above answers have already answered the question. Each node will send `ADVERTISE` to other nodes nearby by broadcasting. The received `ADVERTISE` packet will help the node know the existing nodes in the neighbor, and the `ADVERTIS` packets will only be sent to nodes under the virtual ethernet link without interference with other nodes not supporting my protocol.