Homework 2: L2 and L3

Due: 11:59 PM, Oct 18, 2019

Contents

1 IP and Ethernet

```
      100.28.3.1
          R1
          |
     -----SW---------
    /              \
  H1                H2
100.28.3.2        100.28.3.250
```
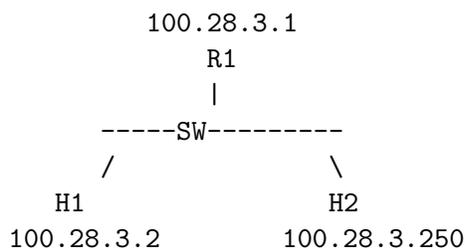
In the sketch above, H1, H2, and the R1's interface 1 are connected to the same switch, and are in the same broadcast domain.

Initially, the three interfaces have the same network mask, 255.255.255.0. H1 and H2 are configured with gateway 100.28.3.1.

H1 tries to send an IP packet to H2 (it already knows H2's IP address).

1. What is the destination MAC address in the Ethernet frame sent by H1 that contains the IP packet to H2? (You may assume H1, H2, and R1 have MAC addresses H1_MAC, H2_MAC, and R1_MAC respectively)

2. What is the destination IP address in the IP packet?

3. What is the ARP query that H1 does to send this packet?

Now you go and change the network mask of H1 to be 255.255.255.128, and assume the ARP cache is erased.

1. What is the destination MAC address in the Ethernet frame sent by H1 that contains the IP packet to H2?

2. What is the destination IP address in the IP packet?

3. What is the ARP query that H1 does to send this packet?

4. Will this packet reach H2? Why?

2   BGP - Gao-Rexford Model

Recall the Gao-Rexford model of BGP route propagation.

In the following graph, nodes represent ASes, directed edges go from customers to providers, and bi-directed edges represent peering relationships.
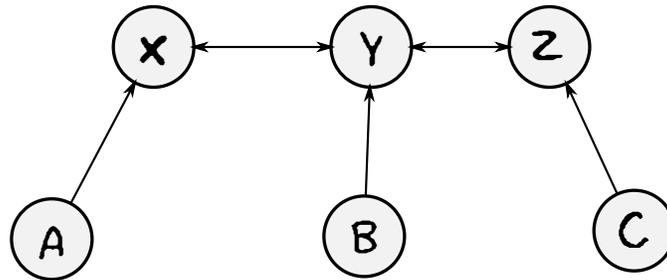
Nodes at A are mad, because they cannot communicate with with nodes in C.

1. Why not? In the current topology, who would be in a disadvantage if this communication were to happen, and how so?

2. List **four distinct** modifications to the graph (changing the type or direction of edges, adding or removing edges) that would allow nodes at A, B, and C to all talk to each other. (e.g., have AS i become a customer of AS j, etc). In other words, list 4 alternative topologies where nodes in A, B, and C could all mutually communicate.

3   In a world without...

What do you need to do manually for a network with IP over Ethernet to work, if you don't have the following protocols/features working. Answers can be, for example, of the form 'fill X table with Y entries', or 'determine unique ids for Z', or 'nothing', etc.

1. ARP:

2. DHCP:

3. MAC Learning at the switches:

4. Spanning Tree:

5. OSPF:

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