CS 455: Computer Communications and Networking
HW-4: Network layer

Grading, submission and late policy:

- You are expected to complete this homework **on your own** (not with a partner)
- This lab accounts for **4%** of your final grade
- The standard late policy applies - Late penalty for this lab will be 15% for each day. Submissions that are late by 3 days or more will not be accepted
- You will submit your solution via Blackboard

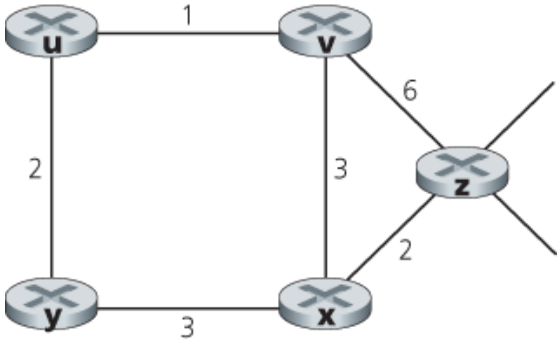
1. [20 pt] Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix 223.1.17/24. Also, suppose that Subnet 1 is required to support at least 40 interfaces, Subnet 2 is to support at least 80 interfaces, and Subnet 3 is to support at least 20 interfaces. Provide three network addresses (of the form a.b.c.d/x) that satisfy these constraints.

2. [20 pt] Consider the topology shown in Figure 4.20 in the textbook. Denote the three subnets with hosts (starting clockwise at 12:00) as Networks A, B, and C. Denote the subnets without hosts as Networks D, E, and F.
    a. Assign network addresses to each of these six subnets, with the following constraints: All addresses must be allocated from 214.97.254/23; Subnet A should have enough addresses to support 250 interfaces; Subnet B should have enough addresses to support 120 interfaces; and Subnet C should have enough addresses to support 120 interfaces. Of course, subnets D, E and F should each be able to support two interfaces. For each subnet, the assignment should take the form a.b.c.d/x or a.b.c.d/x – e.f.g.h/y.
    b. Using your answer to part (a), provide the forwarding tables (using longest prefix matching) for each of the three routers.

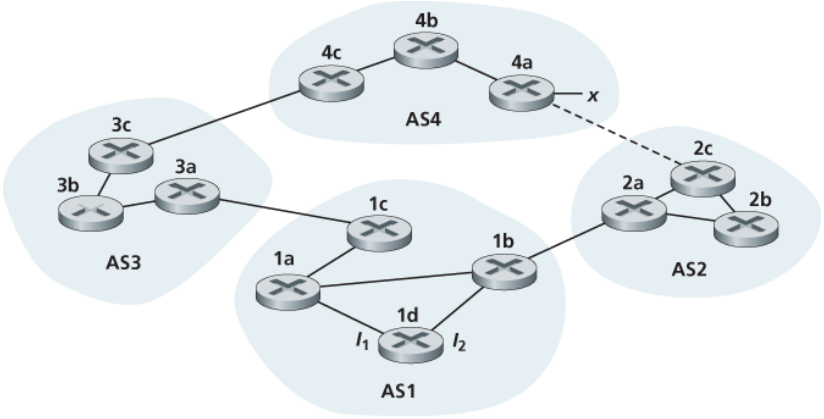
3. [20 pt] Consider the SDN OpenFlow network shown in Figure 4.30 in the textbook. Suppose that the desired forwarding behavior for datagrams arriving at s2 is as follows:
    a. any datagrams arriving on input port 1 from hosts h5 or h6 that are destined to hosts h1 or h2 should be forwarded over output port 2;
    b. any datagrams arriving on input port 2 from hosts h1 or h2 that are destined to hosts h5 or h6 should be forwarded over output port 1;
    c. any arriving datagrams on input ports 1 or 2 and destined to hosts h3 or h4 should be delivered to the host specified;
    d. hosts h3 and h4 should be able to send datagrams to each other.

Specify the flow table entries in s2 that implement this forwarding behavior.

4. [20 pt] Consider the network shown below. Assume that the distance vector announcements are made in the following order u, v, x, y, and then z. How many iterations after which node z will have the shortest paths calculated to all other nodes? For each iteration, show who sends out the DV and which other nodes update/modify their DV?



5. [20 pt] Consider the network shown below. Suppose AS3 and AS2 are running OSPF for their intra-AS routing protocol. Suppose AS1 and AS4 are running RIP for their intra-AS routing protocol. Suppose eBGP and iBGP are used for the inter-AS routing protocol. Initially suppose there is no physical link between AS2 and AS4.



   a. Router 3c learns about prefix x from which routing protocol: OSPF, eBGP, or iBGP?
   b. Router 3a learns about x from which routing protocol?
   c. Router 1c learns about x from which routing protocol?
   d. Router 1d learns about x from which routing protocol?