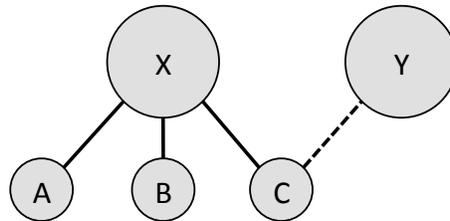


# Homework 2

*Due: October 20th, 2015, 11:59pm*

## 1 IP Prefixes



X, Y, A, B, C are ASes, with X and Y being transit ASes providing service to the others. X has allocated to it 143.112/16, and Y has allocated to it 222.10.192/18. Initially, the link YC does not exist. Assume that there are other client ASes connected to X and Y occupying the rest of their IP ranges.

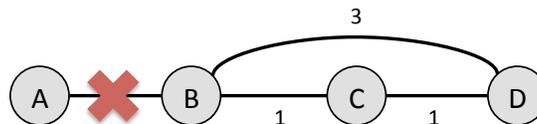
- X allocates the first 1/8th of its address space to A, the second 1/8th of its address space to B, and the second 1/4th of its address space to C. What are the address ranges of A, B, and C, in CIDR notation?
- Assume that the ASes aggregate their prefixes as much as they can in their BGP announcements. Assuming that the link YC does not exist, what prefix(es) does X announce?
- If we add the link YC, making C multi-homed, what prefix(es) does X announce? What prefix(es) does Y announce?
- Now if C removes the link XC, but keeps the same prefix as before, what prefix(es) do X and Y announce? Why is it undesirable that IP address allocation be decoupled from the network topology?

## 2 IP Forwarding

Consider a network of four nodes in a straight line: A, B, C, D. AB has an MTU of 1500, BC has an MTU of 400, CD has an MTU of 600.

- Node A sends an IP packet of size 30k. Remembering IP header sizes, describe the sequences of frames that will be sent along AB, BC, and CD.
- If you are building a reliable sliding window protocol on top of UDP, how would you break up a 2MB transfer on this network. Why?
- FastPath, a maker of super high-performance routers, remarked that their IPv6 routers could have been even better if the source address and destination address had been specified in the opposite order. What are they talking about? Quantify the speedup they might achieve if the router has 100Mb/s ports.

## 3 Distance Vector Routing



Suppose A, B, and C are running a distance vector protocol, and the numbers denote the link costs. Let us consider only the routes to A, and that the routes have converged. A hunter then comes and shoots down the link between A and B<sup>1</sup> Use the syntax [(dest),<cost>,<next hop>] for update messages. (E.g., B receives msg [A, 2, C])

- List a sequence of updates that would cause a routing loop to be formed involving B, C, D. When would the loop be broken?
- Describe if and how (a) poison reverse, (b) path vector, and (c) DSDV would each prevent the loop from happening.
- What happens to an IP packet sent from a node connected to router D, destined to A, while the loop is in effect?

<sup>1</sup>[http://www.itnews.com.au/News/232831\\_us-hunters-shoot-down-google-fibre.aspx](http://www.itnews.com.au/News/232831_us-hunters-shoot-down-google-fibre.aspx)