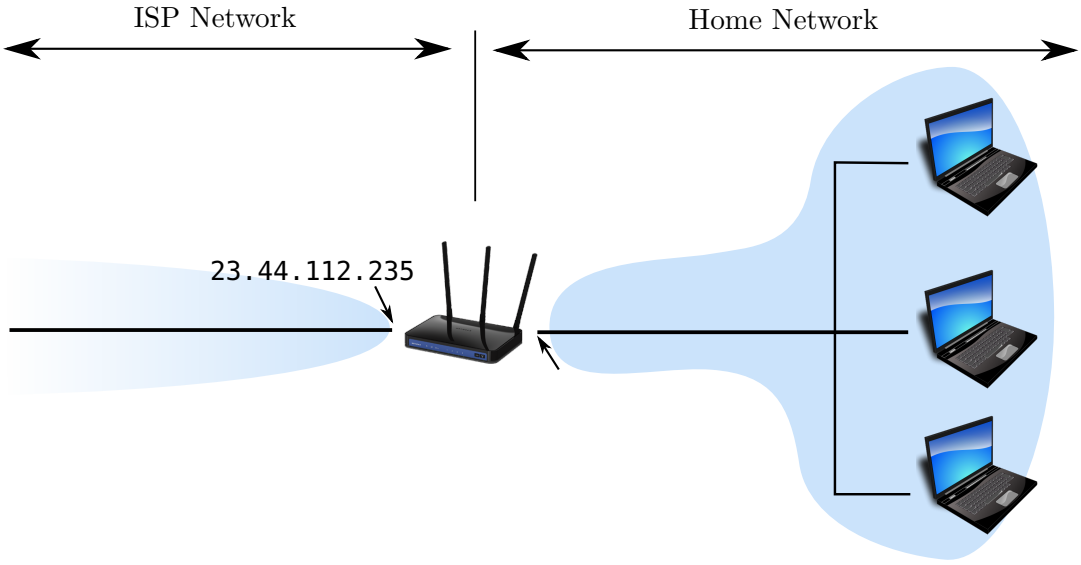
National University of Singapore
School of Computing
CS2105: Introduction to Computer Networks
Semester 1, 2018/2019

Tutorial 6
Network Layer: Control Plane

These questions will be discussed during the next week's discussion group meetings. Please be prepared to answer these questions during the session in class. Some of the questions are taken from the textbook, so please bring it along for reference.

1. **[Modified from KR, Chapter 4, P16]** onsider the network setup in the following figure. Suppose that the ISP assigns the router the address `24.34.112.235` and that the network address (i.e. network prefix) of this home network is `192.168.1/24`.



   (a) Give an example IP address assignment to all interfaces in this home network.

   (b) Suppose each host has two ongoing TCP connections, all to port 80 of a server at `128.119.40.86`. Provide example corresponding entries in the NAT translation table.

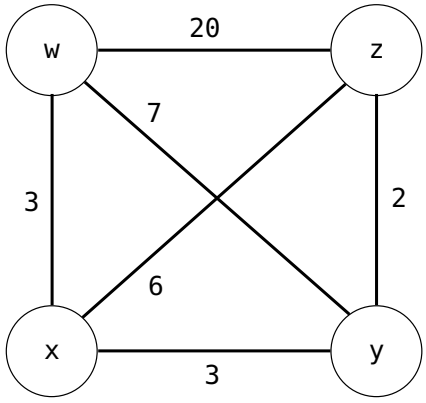
2. **[Modified from KR, Chapter 4, P14]** Consider sending a 1500-byte IP datagram into a link that has an MTU of 500 bytes. Suppose the original datagram is stamped with the identification number 422. Also assume that IP header is 20 bytes long.

   (a) How many fragments will be generated?

   (b) What is the length of each fragment (including IP header)?

   (c) What are the values of identification number, offset and flag in each fragment?

3. **[CS2105 Final Exam, April 2006]** The following diagram shows a simple network topology with 4 nodes. The links in the diagram are labeled with the cost of each link. The nodes run distance vector routing protocol. The protocol has terminated, and each node knows the cost of the minimum cost path to every other node.



(a) The following table shows an incomplete routing table at node x. Fill in the missing distance vector for x and z.

	cost to w	cost to x	cost to y	cost to z
from x		0		
from y			0	
from z				0

Now, suppose the cost of the link between x and w increases from 3 to 20. Node x detects the changes in the cost. Before x receives any new distance vector from its neighbors, triggered by these changes, x recomputes its new minimum-cost path to w, y, and z, and updates its distance vector.

(b) Suppose that poisoned reverse is NOT used. What is the new computed cost from x to w?

(c) Suppose that poisoned reverse is used. What is the new computed cost from x to w?

4. **[KR, Chapter 5, P9]** Can the poisoned reverse solve the general count-to-infinity problem? Justify your answer.

5. **[KR, Chapter 4, P36]** RIP is an application layer problem. How does it implement network-layer functionality?

6. **[Modified from KR, Chapter 4, P18]** Two hosts A and B participate in a peer-to-peer file sharing application and need to connect to each other. Both A and B, however, are behind NATs.

   Devise a technique that will allow A to establish a TCP connection with B without application-specific NAT configuration, if

   (a) the NAT router uses a simple, predictable, algorithm to allocate a public port number for mapping to the local/private port number.

   (b) there is a third host, C, participating in the same file sharing session, that is not behind NAT.