COMPSCI 314 S2C Assignment 3
2011

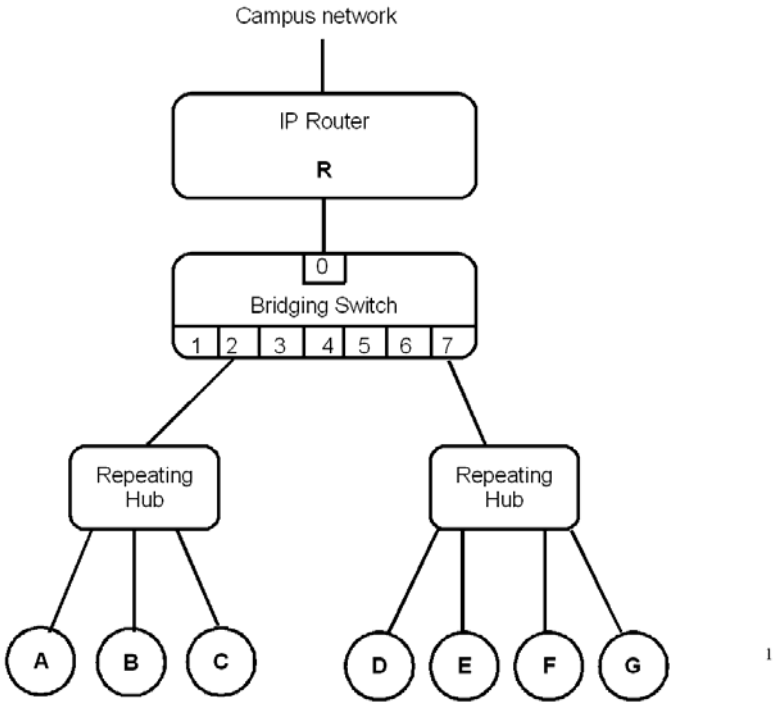
Department of Computer Science
The University of Auckland

*This assignment contributes **5%** of your overall course mark. Submit your assignment **as a single PDF file** to the **Assignment Drop Box**. Include all **workings** and **explanations**. Marks will be deducted for ambiguous solutions. Zero marks are awarded if the answers contain no explanation. Also, refer to the Departmental policy on cheating and plagiarism. Cut-and-paste without acknowledgment of the source is not acceptable.*

***Assignment Drop Box** (https://adb.ec.auckland.ac.nz/adb/).*
Departmental Policy on Cheating on Assignments: *see Assignments page of the course web site.*

[Total: 50 marks]
[5 marks for each sub-question]

Consider the network drawn below. All the links are serial Ethernet. A, B,...G are the MAC addresses of various computers and R is the MAC address of the IP router's interface connected to the switch. The ports on the switch are numbered for convenience.



The switch needs a routing table to tell it which MAC address is found on which port, with entries like C: 2, G: 7, etc. (Address C is on port 2, address G is on port 7, etc.) Initially, this table is empty.

Q1. Learning process [20 marks]

a) A sends a packet to C. What gets added to the routing table? Explain your answer.
[A: 2 is added. The switch will see the packet and from its source address, learn that address A is on port 2.]

b) A sends a packet to D. What gets added to the routing table? Explain your answer.
[Nothing is added. The switch already knows where A is so there is no new information.]

c) What will cause the entries C: 2 and G: 7 to be added to the routing table?
[When they send their first packets; for example when C replies to A.]

d) What will cause the entry R: 0 to be added to the routing table?
[When the router sends its first packet, for whatever reason. There's nothing special about the router, as far as the switch is concerned.]

Q2. Internet access [10 marks]

A wants to contact *mybank.example.com*, a server out in the Internet, using TCP.

a) List the main steps that will occur, mentioning your assumptions.
[Assume that A has been configured with a DNS server's IP address and with R's IP address as its default router. Then the main steps are:
A sends ARP request for R; R replies.
A sends DNS query for *mybank.example.com* via R; DNS server replies.
A sends TCP SYN to *mybank* via R; *mybank* replies with SYN/ACK.]

b) Will these steps cause anything to be added to the routing table in the switch?
[If R: 0 is not already in the table, it will be added after R sends its ARP reply. Otherwise nothing.]

Q3. Router tables [10 marks]

The router also contains its own routing table for IP addresses.

a) What is the minimum information this table will need at start-up?
[The subnet prefix assigned to its interface R, and the IP address of at least one neighbour router on its interface to the campus network.]

b) Will the router need to learn anything when A contacts *mybank.example.com*? If so, what?
[It will need to learn A's MAC address, by using ARP on its interface R.]

Q4. Security [10 marks]

a) Computer E contains malicious software that is capturing all packets on its Ethernet interface. Is A at risk? Explain your answer.
[It depends. The switch will not copy packets travelling between A and R onto its port 7, so E can never observe them. But if A communicates with D,E,F or G, the malicious software can observe the packets.]

b) If A encrypts data sent to *mybank.example.com* using A's private RSA key, will the user be safer? Explain your answer.
[Not at all. Since anybody may know A's public key, anybody may decrypt A's messages. A should encrypt the data using *mybank*'s public key; then only mybank can decrypt them, using *mybank*'s private key.]