1DT066 (Homework 1)
Deadline: 18 Nov 2011 (Friday) 17:00

Please submit answers to liam.mcnamara@it.uu.se

Question 1
What are "protocol layers" in computer communication? What advantages do they have?
Describe the "Internet Protocol" stack of layers, stating what each layer attempts to achieve, and giving an example of that protocol. Where is this protocol implemented in Internet interconnection equipment (e.g., routers and end systems)?
[10 Marks]

Question 2
a. Explain the differences between circuit switching and packet switching.
b. Suppose that users are sharing a 1 Mbps link through statistical multiplexing. Each user requires 200 kbps when transmitting, but each user transmits only 10 percent of the time. When circuit switching is used, how many users can be supported?
c. For the remainder of this problem, suppose packet switching is used. If there are 10 users, what is the probability that there are 6 or more users transmitting simultaneously?
[5 Marks]

Question 3
Describe the operation of the TCP congestion control scheme, covering the two phases of slow start, congestion avoidance and the triggers of duplicate ack and timeout that set it in motion.
[6 Marks]

Question 4
Visit the Go-Back-N Java applet at the companion Web site.
http://www.cs.mum.edu/courses/cs450/GoBackN.htm
a. Have the source send five packets, and then pause the animation before any of the five packets reach the destination. Then kill the first packet and resume the animation. Describe what happens.
b. Repeat the experiment, but now let the first packet reach the destination and kill the first acknowledgement. Describe again what happens.
c. Finally, try sending six packets. What happens?
[6 Marks]

Question 5
What is an AS? Contrast interior and exterior routing according to the goals they are trying to accomplish. Why do we need both routing protocols?
[5 marks]

Question 6
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 up to 125 interfaces, and Subnet 2 and 3 are each required to support up to 60 interfaces. Provide three network addresses (of the form a.b.c.d/x) that satisfy these constraints.
[3 Marks]
Question 7
What main problem is IPv6 meant to solve? What other solutions have been deployed to mitigate this problem? What drawbacks/limitations do these other solutions have?
[5 Marks]

Question 8
Suppose 10 people want to communicate with each other using symmetric key encryption. All communication between any two people is kept secret from the other group members.
   a. How many keys are required in the system as a whole?
   b. Now suppose that public key encryption is used. How many keys are required in this case?
[3 Marks]

[Total Marks: 43]