

Homework Assignment 1

Due in class on Tuesday, January 23, 2001. This is a *firm* deadline.
(Please write your name, your email address, and the date on the homework that you hand in.)

1. (15 points) List three ways in which a company might, immediately or eventually, make money by "giving away" a digital information product to consumers, free of charge. (Each way is worth 5 points. Some can be described in as little as one word; none should take more than one paragraph.)
2. (20 points) General-interest newspaper and magazine articles were traditionally printed on paper and sold at newsstands. They can now be produced in digital form and posted on websites. Give one way in which this change is significant for each of the following groups, and briefly explain why you think it is a change for the better, a change for the worse, or a mixed bag. (Answers to (a) - (d) should each be one paragraph.)
 - (a) (5 points) Journalists (*i.e.*, producers of articles)
 - (b) (5 points) Readers (*i.e.*, consumers of articles)
 - (c) (5 points) Publishers
 - (d) (5 points) Advertisers
3. (15 points) For some time, popular music has been distributed on physical CDs. It can now be distributed in MP3 files. From a technological point of view, these two distribution methods are fundamentally different. Give three ways in which, from a business point of view, these two distribution methods are either fundamentally similar or fundamentally different, and explain the nature of the similarity or difference. (Each way is worth 5 points and should be explained in at most one paragraph.)
4. (30 points) Consider the following toy network (see Figure 1); u , v , w , and x are network nodes, and the numbers are link costs. Table 1 shows the shortest-path table for the network in Figure 1. Table 2 shows the IP-forwarding table for w . Table 3 shows the IP-forwarding table for u .

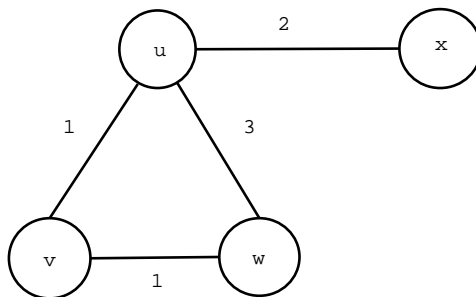


Figure 1: Toy Network 1.

Source	Destination	Path
u	v	$u \rightarrow v$
u	w	$u \rightarrow v \rightarrow w$
u	x	$u \rightarrow x$
v	u	$v \rightarrow u$
v	w	$v \rightarrow w$
v	x	$v \rightarrow u \rightarrow x$
w	u	$w \rightarrow v \rightarrow u$
w	v	$w \rightarrow v$
w	x	$w \rightarrow v \rightarrow u \rightarrow x$
x	u	$x \rightarrow u$
x	v	$x \rightarrow u \rightarrow v$
x	w	$x \rightarrow u \rightarrow v \rightarrow w$

Table 1: Shortest-path table for Toy Network 1.

Destination	Next Hop
u	v
v	v
x	v

Table 2: IP-Forwarding table for w .

Destination	Next Hop
v	v
w	v
x	x

Table 3: IP-Forwarding table for u .

- (a) (12 points) Give an IP-forwarding table for A in the toy network in Figure 2.
- (b) (12 points) Give an IP-forwarding table for A in the toy network in Figure 3. (Note: The network in Figure 3 is identical to that of Figure 2, except that the cost of link $A \leftrightarrow D$ is 4 instead of 2.)

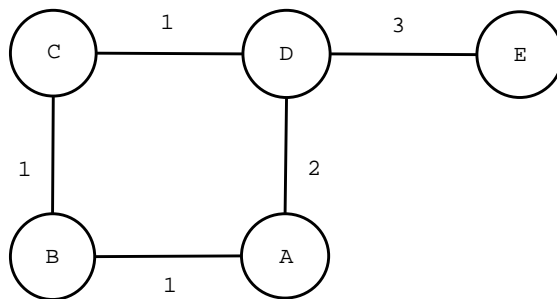


Figure 2: Toy Network 2.

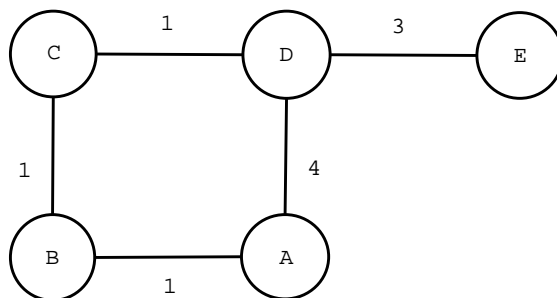


Figure 3: Toy Network 3.

- ****(c) (6 points) Explain a potential problem with straightforward shortest-path routing that this small example illustrates. (Hint: Suppose the volume of traffic entering the network through node A is extremely high.)
5. (20 points) Identify each of the following as a property of the Internet, the telephone network, or both.
- (a) (5 points) Privacy and authentication are potential problems for end users.
 - (b) (5 points) New products and services can often be introduced unilaterally by their inventors.
 - (c) (5 points) There is a long-standing, established technological and legal framework for cooperation with law-enforcement agencies and other national authorities.
 - (d) (5 points) Group pricing is often used by network-service providers and by other businesses that sell products used on the network.