

Solution Set for CPSC 156 Exam
March 1, 2007

Question 1

- (a) Two points were given for each of the following.
1. multiplexed utilization of existing networks
 2. survivability in the face of failure
 3. support multiple types of communications services
 4. accommodate a variety of network types
 5. permit distributed management of resources
 6. cost effective
 7. low effort to attach a host
 8. account for resources
- (b) A newly attached machine needs IP addresses for:
1. Itself (to use as source address)
 2. A DNS server (to map the names of destinations to their IP addresses)
 3. A default router (through which to reach other machines, including the DNS server)
- (c) Correct answers include but are not limited to
1. wiretapping capability (demanded by governments)
 2. tax-collection capability (governments)
 3. the ability to block transmission of illegal or classified material (governments)
 4. the ability to block access to pornography (parents or enterprises)
 5. the ability to block or monitor transmission of copyright material (rights holders)

Question 2

- (a) Fair uses of a copyright work are those that do not require explicit permission of the copyright owner. More precisely, from reading assignment **Digital Dilemma**, Chapter 4: “fair use of a copyrighted work, including such use by reproduction in copies or phonorecords or by any other means specified by that section, for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research, is not an infringement of copyright. In determining whether the use made of a work in any particular case is a fair use, the factors to be considered shall include:
1. the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;
 2. the nature of the copyrighted work;
 3. the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
 4. the effect of the use upon the potential market for or value of the copyrighted work.
- The fact that a work is unpublished shall not itself bar a finding of fair use if

such finding is made upon consideration of all the above factors.”

- (b) Correct answers (worth two points each) include but are not limited to:
1. Digital copies are perfect.
 2. Digital copies can be made at zero cost.
 3. Digital copying is not necessarily a good proxy for infringement.
 4. A perfect TPS could moot fair use: no infringement, no charge, no fair-use defense.
 5. No TPS can be perfect in today’s computers. General purpose PCs are programmable, and hence TPSs are circumventable (at least by experts).
- (c) In his February 6, 2007 essay “Thoughts on Music,” Jobs says that Apple has thus far Needed to use DRM in its iTunes system, because major-label record companies, which own the copyrights on most widely distributed popular music, refused to enter into a licensing agreement without it. (Perhaps Apple was also hoping that the FairPlay DRM system would lock consumers into iTunes by erecting a [low] barrier to the movement of songs to other digital-music players, but you need not have included this point in your answer for full credit.) Jobs goes on to say that, because DRM has failed to prevent piracy or to force people to buy music, and DRM annoys consumers, digital-music distributors should do away with it. His conclusion that DRM has failed to force people to buy music is based on the observation that, of the 22 billion songs purchased last year, 20 billion were sold DRM-free on CDs, while only 2 billion were sold online in DRM-protected formats.

Question 3

- (a) Disintermediation is the shrinkage of the retail chain that occurs when web-based communication is used to bypass one or more of the intermediaries that traditionally operated between manufacturers and consumers.
- (b) Reintermediation occurs when a new type of intermediary inserts itself into the retail chain, providing value to consumers, manufacturers, distributors, and/or other parties in a manner that would not be possible without the Internet and the web.
- (c) Multichannel retailers are those that communicate with their customers (for sales, marketing, *etc.*) through multiple channels, *e.g.*, through some combination of websites, brick-and-mortar stores, printed catalogs, television, and telephone. Advantages enjoyed by multichannel retailers include opportunities to leverage offline brands, to use profits from offline channels to subsidize e-tail start-up (rather than relying on venture capitalists), to use established distribution and fulfillment infrastructure, and to mine data on existing customers.
- (d) It is hard for a typical C2C seller to do market research and set an optimal fixed price. Auctions allow such sellers to increase revenue by requiring potential buyers to declare how much they are willing to pay.

Question 4

- (a) Analysis of the contents of web pages and of the link structure of the WWW digraph.
- (b) The crawler traverses the entire web to find new, updated, and removed pages. PageRank is a linear-algebraic algorithm that calculates the importance of a webpage; it uses the link structure of the WWW digraph and, in particular, interprets a link from page A to page B as a “vote” by A for B.
- (c) 65% of books are in copyright and out of print; libraries are basically the only places in which most people can get access to these books. This fact is indeed relevant to the question of whether Google’s proposed project is fair use. For example, one of the four factors that go into determining whether something is fair use is the effect that the use will have on the market for the copyright work. By letting a work go out of print, the publisher has ensured that there is no market for new copies of this work. Thus, by providing search technology that makes it easier to locate these books, Google could not destroy the (nonexistent) market for them; it might, in fact, create a market for some of them, in response to which publishers could reprint them and make a profit. (Other arguments could be made for the relevance of the fact that 65% of books are in copyright and out of print; full credit will be given for any sound argument.)
- (d) The database of scanned books could be hacked; digital copies of books could then be distributed by pirates.

Question 5

- (a) A product exhibits *network effects* if its value to any single user is strongly positively correlated with the total number of users. It exhibits *lock-in* and *high switching costs* if the cost of discarding it for a competing product is greater than the sticker price of the new product (because of, *e.g.*, technical difficulties of switching or reliance on the rest of the user community). Information and communication technologies (ICTs) very often exhibit network effects. ICT industries often involve systems of interoperating components and durable complementary assets. Prime examples are Intel processors, the Windows PC Platform, and numerous PC application programs. Users become locked in and experience high switching costs, because it is much more difficult and costly to discard an entire system of interoperating components than it is to discard one product. Moreover, individual decisions to switch can be futile if most users of the system of interoperating ICT components do not switch.
- (b) eBay is not just a network-effected technology. It is also a massive community of people. Network effects fueled rapid, widespread adoption of the Netscape browser, but in fact it was WWW browsing in general that ultimately benefited from those effects; the value that one person derives from access to a browser depends on the number of other people who have access to browsers (because more good web pages will be posted if more people can view them) but not on which particular browser(s) are in use. This is not true of auction sites: For an online buyer or seller to benefit from growth in the size of the C2C-commerce community, the particular site(s) that he or she uses must experience this

growth.

- (c) A company can profit from providing one product for free and selling a complementary product. For example, viewers for Microsoft WORD and PowerPoint files are available for free, but Microsoft sells the programs one needs to create or modify WORD and PowerPoint files. Similarly, viewers for PDF files are available for free, but Adobe sells the program needed to create or modify PDF files. A company could also profit from giving away an information product and selling support or training services; this is Red Hat's business model.

Question 6

- (a)
- | | | |
|-------------------|---|--------------------|
| Physical Layer | ↔ | Ethernet |
| IP Layer | ↔ | Routing |
| Transport Layer | ↔ | Congestion control |
| Application Layer | ↔ | Email |
- (b)
- ```
<form>
 <input type="checkbox" name="color" value="B">blue

 <input type="checkbox" name="color" value="R">red

 <input type="checkbox" name="color" value="Y">yellow
</form>
```
- (c) This scenario is given in <http://zoo.cs.yale.edu/classes/cs155/fall01/cranor.ppt> and was presented in class on February 6, 2007: Suppose that the same online-advertising company displays ads on a health-information site and on a bookstore site. If you click on one of the ad company's ads while using the health-information site, the ad company may store a cookie on your computer that includes information about the medical conditions you looked up. If you later click on one of the same ad company's ads while using the bookstore site, that cookie could be retrieved and the information stored in it used in an interaction between the ad company and the bookstore site. Full credit was given for any technically accurate answer, not just the ad-company scenario. Note, however, that (1) cookies are only sent back to the site that set them (as stated in <http://zoo.cs.yale.edu/classes/cs155/fall01/cranor.ppt> and presented in class on February 6, 2007), and (2) cookies are data records, not programs; they do not send anything anywhere.
- (d)
1. False
  2. False. (If you've visited this site before, your machine may have cached the address.)
  3. True
  4. False. (This task is centrally managed by ICANN.)