

CPSC155a: First Hour Exam  
October 16, 2001

Instructions: Answer exactly four of the following five questions. Do not answer all five. If you do answer all five, the first four answers in your blue book(s) will be graded, and the fifth will be ignored.

Please remember to put your name and email address on the cover of your blue book(s).

**Question 1.**

Recall that there are four major “layers” of Internet protocols: The transport layer, the physical layer, the IP layer (also known as the network layer), and the application layer.

- (a) (5 points) What is the ordering of the layers? That is, which is the “lowest” layer, which is built directly “on top of” the lowest, which is built directly on top of the second-lowest, and which is built-directly on top of the third-lowest?
- (b) (5 points) Which layer is most central to the way the Internet works and has changed the least during the years that the Internet has been in use?
- (c) (5 points) Which of the following Internet services or protocols is responsible for mapping domain names to IP addresses?
  1. OSPF routing
  2. BGP routing
  3. DNS
  4. TCP
- (d) (5 points) Which of the following is an important architectural difference between the Internet and the telephone system?
  1. The Internet is a packet-based network, and the telephone system is a connection-based network.
  2. In the Internet architecture, the intelligence is “at the endpoints,” while, in the telephone system, the intelligence is “in the network.”
  3. Internet traffic is carried over many routers, operated by a changing set of “unknown” parties, while, in the telephone system, traffic is carried by relatively few, “well-known” communications companies.
  4. All of the above.
- (e) (5 points) True or False: The architectural principle of layering makes the Internet a fertile, fast-moving, and dynamic environment for electronic commerce. In particular, inventors and entrepreneurs need not go through the typically long, difficult process of designing, implementing, and deploying a modification *of the network infrastructure* in order to launch a new application-layer product aimed at end users.

**Question 2.**

- (a) (5 points) One well-known strategy used by information businesses is to make one product available for free in the hope of selling a complementary product. Name one company we covered in class that has used this strategy.
- (b) (5 points) True or False: Online retailers typically exhibit significant network effects.

- (c) (6 points) Give two revenue models for online advertising.
- (d) (4 points) True or False: B2C e-commerce has thus far been unsuccessful in low-margin businesses.
- (e) (5 points) Which of the following strategies currently seems most promising for B2C e-commerce?
  - a. Increase advertising
  - b. Multi-channel retailing
  - c. B2C pure plays
  - d. Expansion into international markets

**Question 3.**

- (a) (5 points) Which of the following online content-distribution systems is a “pure Peer-to-Peer” system?
  - a. The original Napster
  - b. Real Networks
  - c. The original Gnutella
  - d. All of the above
- (b) (5 points) Recall that the Recording Industry Association of America (RIAA) sued Napster successfully. What did the RIAA charge Napster with?
  - a. Illegal circumvention of a technological protection measure
  - b. Contributory and vicarious copyright infringement
  - c. Plagiarism
  - d. All of the above
- (c) (5 points) Recall that the Digital Millennium Copyright Act (DMCA) makes it illegal, under most circumstances, to circumvent technological protection measures that effectively protect copyrighted works. However, the DMCA contains some exceptions to this general rule, *i.e.*, it says that there are some legitimate reasons to circumvent such a measure. Give an example of something that the DMCA considers a legitimate reason to circumvent.
- (d) (5 points) Which of the following novel content-distribution services or models has all of the following properties? It makes explicit provisions for artist compensation; compensation is not based on per-unit royalties; it does not attempt to restrict copying and re-distribution of published works.
  - a. The “Street Performer” model
  - b. The original Napster
  - c. The original Gnutella
  - d. All of the above
- (e) (5 points) Recall that the First-Sale Rule is an established part of copyright law that has effectively advanced the constitutional goal of “promot[ing] progress of science and the useful arts” by, for example, enabling the establishment of libraries and second-hand bookstores. True or False: The First-Sale Rule can be applied as easily to digital works as it can to physically embodied works.

**Question 4.**

- (a) (9 points) For three points each, match each technique in the left-hand column with the item in the right-hand column that best describes the purpose that the technique can serve in an online content-distribution business.

Encryption

Detection of unauthorized copies of digital documents

Digital Signature

Scrambling of digital documents so that, while in transmission or storage, they are unintelligible to eavesdroppers

Watermarking

Assured provenance of digital documents

- (b) (5 points) Public-key cryptography and public-key signatures are potentially quite useful for Internet commerce. For example, prospective customers of an Internet merchant can use the merchant's public encryption key to send a private message to the merchant, even though this merchant and prospective customer have never met and thus cannot use a symmetric-key cryptosystem that requires shared keys. For public-key technology to fulfill this potential, the merchant needs a certified public key or, more generally, a "trustworthy online identity." Which company that we discussed in class is in the business of providing public-key certificates, online trust, and the establishment of online identity?
- (c) (6 points) Encryption is well understood in the R&D community, and good encryption technology is implemented and widely available. Nonetheless, breakable encryption was recently fielded in a high-profile content-distribution system. What is the name of the content-distribution system, and what is the name of the "circumvention tool" used to break the encryption?
- (d) (5 points) True or False: Technical protection for mass-market content delivered to networked, general-purpose PCs is inherently hard because, among other reasons, the content must ultimately be rendered, and those bits can be captured at the time of rendering.

**Question 5.**

- (a) (15 points) Recall that HTTP and standard browser construction make it fairly straightforward for websites to monitor and record the activities of their users. For five points each, give three ways in which commercial websites often use the customer data collected in this way.
- (b) (5 points) Which company is currently the top online advertiser (measured in number of impressions)?
- (c) (5 points) Online advertising has not (yet?) fulfilled the high expectations that advertisers had for it at the dawn of web-based commerce. Give one plausible explanation of the fact that these expectations have not yet been fulfilled.