School of Computing and Information Systems

COMP30023: Computer Systems

Tutorial Week 2

Service Models, Application Layer: HTTP and Cookies

1. List two advantages and two disadvantages of having international standards for network protocols.

2. Suppose the *algorithms* used to implement the operations at layer k are changed. Do the implementations of the operations at layers $k-1$ and $k+1$ need to change accordingly?

3. Suppose there is a change in the service (set of operations) provided by layer k. How does this impact services at layers $k-1$ and $k+1$?

4. Suppose that an application generates a message of length M bytes and there are n lower layers each of which adds a h-byte header. What fraction of the network bandwidth is filled with headers?

   Optional: To give yourself a feeling for the role of overheads, plot this for $M = 100$, $h = 20$ and N ranging from 2 to 7. Plot it again for $M = 30$, $n = 5$ and h ranging from 8 to 30. Plot it again for $M = 1536$, $n = 5$ and h ranging from 8 to 30.

5. List five nonproprietary Internet applications and the application-layer protocols that they use. (Search beyond the lecture notes.)

6. Consider an e-commerce site that wants to keep a purchase record for each of its customers. Describe how this can be done with cookies.

7. Consider the following string of ASCII characters that were captured by Wireshark when the browser sent an HTTP GET message (i.e., this is the

actual content of an HTTP GET message). The characters $\langle cr \rangle \langle lf \rangle$ are carriage return and line-feed characters Answer the following questions, indicating where in the HTTP GET message below you find the answer.

```
GET /people/index.html HTTP/1.1<cr><lf>
Host: cis.unimelb.edu.au<cr><lf>
Connection: keep-alive<cr><lf>
Cache-Control: max-age=0<cr><lf>
Upgrade-Insecure-Requests: 1<cr><lf>
User-Agent: Mozilla/5.0 (Windows NT 6.1; Win64; x64)
AppleWebKit/537.36 (KHTML, like Gecko) Chrome/64.0.3282.186 Safari/537.36<cr><lf>
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,
image/webp,image/apng,*/*;q=0.8<cr><lf>
Accept-Encoding: gzip, deflate<cr><lf>
Accept-Language: en-AU,en;q=0.9<cr><lf>
<cr><lf>
```

(a) What is the URL of the document requested by the browser?

(b) What version of HTTP is the browser running?

(c) Does the browser request a non-persistent or a persistent connection?

(d) What is the IP address of the host on which the browser is running?

(e) What type of browser initiates this message? Why is the browser type needed in an HTTP request message?

8. True or false?

(a) A user requests a Web page that consists of some text and three images. For this page, the client will send one request message and receive four response messages.

(b) Two distinct Web pages (for example, http://cis.unimelb.edu.au/research/ and http://cis.unimelb.edu.au/people) can be sent over the same persistent connection.

(c) With nonpersistent connections between browser and origin server, it is possible for a single TCP connection to carry two distinct HTTP request messages.

(d) The Date: header in the HTTP response message indicates when the object in the response was last modified.

(e) HTTP response messages never have an empty message body.