

CS351- CLOUD COMPUTING MIDTERM EXAM

(Chapters 1 & 2 from Kurose's book and Chapter 1 from Tanenbaum's book)
(You may use three index cards of size 3in X 5in with notes)

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1. (20 points) State two differences between the following concepts.

a. TCP versus UDP

Transmission Control Protocol has a high overhead to guarantee message integrity, UDP does not and is much faster.

TCP packets are guaranteed to arrive in a specific order, while UDP packets are not.

b. GET versus Conditional GET messages in HTTP

Normal GET always returns the resource, while conditional get may return an unmodified response code.

Conditional GET expects a If-Modified-Since header, but normal GET does not.

c. Client-Server versus P2P communication

Client-server is many-to-one connection, P2P is many to many

P2P is decentralized, peers moderate themselves. Client server is moderated by the server.

d. Packet Switched versus Circuit Switched

Packet switching allocates links on the fly, while circuit switching does not (reserved).

Circuit switching wastes link connection during silent periods while packet switching could use those links for another connection.

e. Routing Table versus Forwarding Table

Routing Tables are the same at each node, while forwarding tables are different for each node.

Forwarding tables map adjacent links to final destinations, while routing table do not.

2. ($6 * 3 = 18$ points)

a. What are the three major components that can be attacked in a networked system? Give one example of each.

Network Core: congest traffic on the network

End Systems: malware to compromise a machine on the network

Network Edge: block connections from being made into part of the network.

b. Describe the term size scalability in a distributed system? Name three major aspects of the system that should be scalable?

Scalability refers to the ease of increasing the processing volume of the system. - number of nodes, number of networking controllers, ...

c. Explain the three types of DNS servers that a local DNS server has to communicate with in order to resolve a DNS name into IP address. What does each server provide?

Root → finds top-down server for correct domain type

TDS → finds authoritative server for domain family

Authoritative → resolves resource and specific host name to IP address.

3. (12 points each 12 * 5 = 60 points)

A. Explain the meaning of the statement "HTTP is a stateless protocol". Explain the sequence of HTTP messages used to implement HTTP cookies so the server 'remembers' the client?

a single HTTP request and response will not remember previous transactions, however, cookies are used to associate server content with a certain user

C: HTTP request

S: HTTP response w/ cookie id header

C: browser remembers cookie and includes it in future requests to that host if browser has cookies enabled.

B. Answer the following questions in relation to the P2P system, named DHT (Distributed Hash Table) for sharing large databases.

a) What activities take place when a node joins the circular DHT?

b) What activities take place when a node leaves the circular DHT?

c) Why does a node store two predecessors and successors to belong to DHT?

a) new node receives id for hashing
data that more closely matches new ID is shared

b) Data is shared with neighbors, then the neighbors change their neighbor ids to match each other and the leaving node disconnects.

c) each node knows two neighbors on each side in case a node unexpectedly drops. in this case, the dropped node's neighbors still have references to each other, and can adjust.

no change

C), The text below shows the reply sent from the server in response to the HTTP GET message in the question above. Answer the following questions, indicating where in the message below you find the answer.

```
HTTP/1.1 200 OK<cr><lf>Date: Tue, 07 Mar 2008
12:39:45GMT<cr><lf>Server: Apache/2.0.52 (Fedora)
<cr><lf>Last-Modified: Sat, 10 Dec2005 18:27:46
GMT<cr><lf>ETag: "526c3-f22-a88a4c80"<cr><lf>Accept-
Ranges: bytes<cr><lf>Content-Length: 3874<cr><lf>
Keep-Alive: timeout=max=100<cr><lf>Connection:
Keep-Alive<cr><lf>Content-Type: text/html; charset=
ISO-8859-1<cr><lf><cr><lf><!doctype html public "-
//w3c//dtd html 4.0 transitional//en"><lf><html><lf>
<head><lf> <meta http-equiv="Content-Type"
content="text/html; charset=iso-8859-1"><lf> <meta
name="GENERATOR" content="Mozilla/4.79 [en] (Windows NT
5.0; U) Netscape]"><lf> <title>CMPSCI 453 / 591 /
NTU-ST550A Spring 2005 homepage</title><lf></head><lf>
<much more document text following here (not shown)>
```

- Was the server able to successfully find the document or not? What time was the document reply provided?
- When was the document last modified?
- How many bytes are there in the document being returned?
- What are the first 5 bytes of the document being returned?
- Did the server agree to a persistent connection?

a) yes, body of response contains (the start of) the document. 200 OK
Doc reply was provided by the Date! header on Tue, March 7
12:39:45 GMT

b) Last-Modified: header says 10 Dec 2005 18:27:46 GMT

c) Content-Length header says 3874 bytes (iso charset defines
1 char as 1 byte)

d) "<!doc" are the first five bytes of the body. according
to charset header, each character is one byte.

e) server agreed to persistent connection to Keep-Alive: max
and connection: Keep-alive

D. Briefly describe how protocols are used in email communication. Include user agent, mail servers, message queues, pull and push protocols used in your description. Identify message headers and response codes in the exchange below and describe what is going on the exchange below.

C: list
S: 1 498
S: 2 912
S: .
C: retr 1
S: blah blah ...
S:blah
C: dele 2
C: quit
S +OK POP3 Server signing off

SMTP is used from sender agent to send message to sender mail server, queue and deliver to receiver mail server. (Implemented w/ TCP transport)
SMTP is a Push protocol. A pull protocol like IMAP and POP3 is used for the receiver user agent to "pull" new messages from the server to read.

POP3 transaction:

- list header, server lists message IDs and size terminated with .
.
.
.
 - retr header pulls message with correct ID
 - dele header marks message for delete based on ID
 - quit, terminates connection and server deletes marked messages.
- +OK response code indicates success

E. Define the four possible end-to-end delays and the throughput of a message transfer?

Suppose Host A wants to send a file to Host B. The path from Host A to Host B has three links, of rates $R_1=500$ Kbps, $R_2=2$ Mbps, and $R_3=1$ Mbps (1 Mbps = 1000Kbps)

a. Assuming no other traffic in the network, and the file size is 4Mb, what is the throughput for the file transfer?

b. Assuming a file size of 4Mb, calculate the transmission delay node A.

- processing delay: time for checksumming & error/integrity checks
- queuing delay: time for waiting in line at switch for transmission
- transmission delay: time to push all data onto the wire
- propagation delay: time taken for a bit to travel over a link
- throughput: number of bits per unit time that can be sent given network constraints.

$$b) \frac{4\text{Mb}}{\left(\frac{0.5\text{Mbps}}{s}\right)} = 8s$$

$500 \text{ Kbps} = 0.5 \text{ Mbps}$

a) throughput is 500 Kbps, bottleneck of R_1



(2 points), Name the topic that was most interesting to you so far. (All answers are correct!)

HTTP, Formal RFC definition, Cluster systems,