

CPSC 460/560 Mid-term Exam Solution

Winter 2012

Problem #1

1. a)

Application layer
Transport layer
Network layer
Link layer
Physical layer

b) Physical layer, link layer & network layer

c)

HTTP	SMTP	FTP	UDP
Application layer	Application layer	Application layer	Transport layer

2.

Nodal processing	Transmission time	Propagation delay	Queuing time
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3.

a) Reduce user-perceived latency; reduce load on original web servers; reduce backbone bandwidth

b) Client-side (local cache, web proxy); server-side (reverse proxy cache); CDN

4. HTTP 1.1 supports consistent connections while HTTP 1.0 one TCP connection is only for one request-reply exchange. HTTP 1.1 supports multiple request-response exchanges over a single connection, thereby improving performance.

5. Delay = $(5000\text{km}/2.5 \times 10^8 \text{ m/s}) + (1000 \times 8 \text{ b}/1 \text{ Mbps})$

$$= 0.02s + 0.008s = 28\text{msec}$$

Problem #2

- a) Utilization = $T_{\text{trans}} / (T_{\text{trans}} + \text{RTT})$
 $T_{\text{trans}} = 1250 * 8 / 10^9 = 0.01 \text{ msec}$
 $\text{RRT} = 2 * T_{\text{prop}} = 2 * (1000 * 5000 / 10^6) = 10 \text{ msec}$
 So: Utilization = $0.01 / (0.01 + 10) = 0.001$
- b) Assume window size N
 Then, we have
 $0.01 * N / (0.01 + 10) = 1$
 So N = 1000

Problem # 3

- a) No. Only one timer is maintained for the unacked packet with smallest sequence #

b) Retransmit all sent yet unacked packets in the sender window
- Difference:
 Go-Back-N maintains one timer while Selective Repeat maintains one timer for each unacked packets;
 Go-Back-N senders send all unacked packets while Selective Repeat senders send one packet upon a timeout event;
 Go-Back-N receivers do not have buffer out-of-order packets while Selective Repeat receivers buffer out-of-order packets.

Problem #4

(1) Message-type	source	dest	delay
HTTP GET request	m1.a.com	local web proxy	0
DNS lookup(www.b.com)	local web proxy	local DNS	0
DNS lookup(.com)	local DNS	root DNS servers	500ms
DNS response(.com)	root DNS server	local DNS	500ms
DNS lookup(b.com)	local DNS	top-level DNS server(.com)	500ms
DNS response(auth. DNS Server for b.com)	top-level DNS	local DNS	500ms
DNS lookup(www.b.com)	local DNS	auth. DNS server@b.com	100ms
DNS response(www.b.com)	auth. DNS@b.com	local DNS	100ms
DNS response(www.b.com)	local DNS	local web proxy	0
TCP connection request	local web proxy	www.b.com	100ms
TCP connection response	www.b.com	local web proxy	100ms

HTTP GET request	local web proxy	www.b.com	100ms
HTTP GET response	www.b.com	local web proxy	
$1\text{Gbit}/1\text{Gbps} + 1\text{Gbit}/1\text{Mbps} + 1\text{Gbit}/1\text{Gbps} + 100\text{ms} = 1102\text{ms}$			
HTTP GET response	local web proxy	m1.a.com	$1\text{Gbit}/1\text{Gbps} = 1\text{ms}$

(2) Given messages outlined above, add delays = 3603ms

(3) Message-type	source	dest	delay
HTTP GET request	m2.a.com	local web proxy	0
HTTP Conditional GET	local web proxy	www.b.com	100ms
HTTP response	www.b.com	local web proxy	100ms
HTTP GET response	local web proxy	m2.a.com	$1\text{Gbit}/1\text{Gbps} = 1\text{ms}$