Mid-term Review

- Mid-term will occur in class on 10/20/2021.
- One page note(front and back) is permitted.
- Closed book
- Total time is 75 minutes
- Questions includes:
  - 10 short-answer questions
  - 10 True/False questions
  - 10 Multiple-choice questions
  - 3 Long-answer questions

Midterm Review

- What's Internet, protocol?
- Network Edge
  - Access networks, physical media
- Network Core
  - Packet-switching: Store and forward; end-end delay; queuing and loss;
  - Circuit switching: TDM vs FDM; Example.

Midterm Review

- Packet delay
  - Four sources of packet delay;
- Packet loss
- Throughput
- Protocol layer
  - Internet protocol stack
- Encapsulation

Midterm Review

- Network security
  - DoS
  - Packet sniffing
  - IP spoofing

Chapter 2

- Application models
  - Client-server
  - peer-to-peer (P2P)
- Socket

Midterm Review

- Transport protocols
  - TCP
  - UDP
- Web and HTTP
  - HTTP protocol
  - Persistence and non-persistence HTTP
  - RTT
  - HTTP response time
  - HTTP response message (see example)
  - Cookies
  - Web caches
  - Conditional GET

Midterm Review

- Electronic mail
  - Three major components
  - SMTP
  - Mail access protocols (IMAP, HTTP)
  - SMTP vs HTTP

Midterm Review

- DNS
  - Definition
  - Services
  - Different Tiers of servers
  - DNS resolution example
  - DNS records (resource records (RR))
- P2P
  - Example about file distribution using CS vs P2P
  - BitTorrent

Midterm Review

- Video Streaming
  - DASH: server and client
  - Content distribution networks
- Socket programing
  - UDP and TCP
  - Application example

MidtermReview

Chapter 3

- Transport-layer services
- Multiplexing and demultiplexing
- UDP
- Internet checksum
- Rdt1.0 to 3.0
- Pipelined protocols
  - Go-Back N
  - Selective repeat

Midterm Review

- Part1: 10 Short-answer questions (**carefully, briefly** and **clearly**.)

What is the main reason that packet loss may occur in computer network?

Midterm Review

- Part 2: 10 True/False questions

Packet switching is dedicated, while circuit switching is not.

Midterm Review

Part 3: 10 Multiple-choice questions (Single answer)

5. Which of the following about SMTP is false?
(a) It enables a mail server to send email messages to another mail server
(b) User agent cannot use it to retrieve email
(c) It typically uses a connectionless protocol such as UDP
(d) Unlike FTP it uses a single port number

Midterm Review

Part 4: Long-answer questions

In the process of developing a reliable data transfer (rdt) protocol, we may face several issues and have several intermediate versions of this protocol to solve them, such as rdt 1.0, rdt 2.0, rdt 2.1, rdt 2.2, rdt 3.0. Although these versions are not in practical use, their methods become very useful for generating the de-factor protocol, i.e. TCP. In the following questions, please help summarize what methods we can borrow from these early versions.

Midterm Review

Part 4: Long-answer questions

Suppose users share a 3 Mbps link. Also suppose each user requires 150 kbps when transmitting, but each user transmits only 10 percent of the time. (See the discussion of packet switching versus circuit switching in Section 1.3.)

a. When circuit switching is used, how many users can be supported?

b. For the remainder of this problem, suppose packet switching is used. Find the probability that a given user is transmitting.

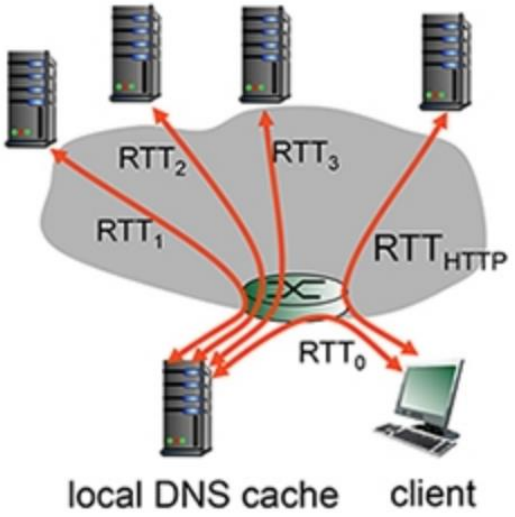
c. Suppose there are 120 users. Find the probability that at any given time, exactly *n* users are transmitting simultaneously. (*Hint*: Use the binomial distribution.)

d. Find the probability that there are 21 or more users transmitting simultaneously.

DNS and HTTP delays

Before doing this question, you might want to review sections 2.2.1 and 2.2.2 on HTTP (in particular the text surrounding Figure 2.7) and the operation of the DNS (in particular the text surrounding Figure 2.19).

Suppose within your Web browser you click on a link to obtain a Web page. The IP address for the associated URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose that four DNS servers are visited before your host receives the IP address from DNS. The first DNS server visited is the local DNS cache, with an RTT delay of $RTT_0 = 4$ msecs. The second, third and fourth DNS servers contacted have RTTs of 2, 31, and 43 msecs, respectively. Initially, let's suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text. Suppose the RTT between the local host and the Web server containing the object is $RTT_{HTTP} = 7$ msecs.



1. Assuming zero transmission time for the HTML object, how much time elapses from when the client clicks on the link until the client receives the object?
2. Now suppose the HTML object references 10 very small objects on the same web server. Neglecting transmission times, how much time elapses from when the client clicks on the link until the base object and all 10 additional objects are received from web server at the client, assuming non-persistent HTTP and no parallel TCP connections?
3. Repeat 2. above but assume that the client is configured to support a maximum of 5 parallel TCP connections, with non-persistent HTTP.
4. Repeat 2. above but assume that the client is configured to support a maximum of 5 parallel TCP connections, with persistent HTTP.
5. What do you notice about the overall delays (taking into account both DNS and HTTP delays) that you computed in cases 2., 3. and 4. above?