EE384B: Multimedia Networking and Communications

Quiz #3
Closed Book
Time: 30 minutes

May 31, 2001

Score: ___ / 24

Name:_____

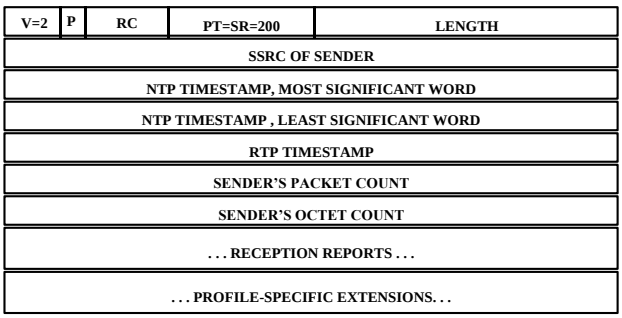
E-mail:_____

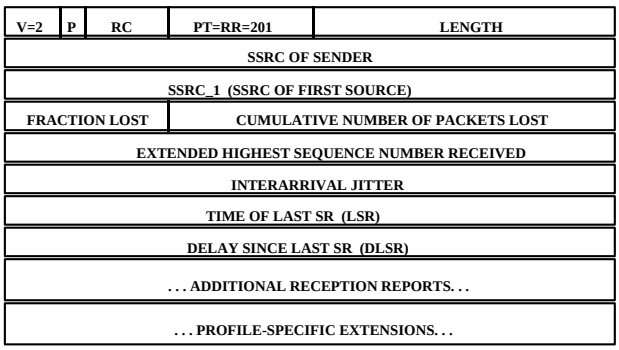
☐ SITN student ☐ On-campus student

I agree to abide by the Stanford Honor Code:_____
(signature)

Question 1: RTCP Reports (3 points)

For your reference, the RTCP Sender and Receiver Report headers are reproduced below (from RFC 1889).





a) Based on the Receiver Reports, the sender is capable of computing the round-trip delay between it and the receiver. Explain how the sender does it. (1 point)

b) RTCP reports can be used by a sender to adapt to network conditions. Identify which information the sender will use to adapt, and explain how the sender adapts to network conditions based on the information you identified. (2 points)

Question 2: RTP Profiles (4 points)

a) The RTP specification is incomplete, on purpose. It needs a profile for actual interoperation of specific media. Why was RTP designed this way? (1 point)

b) There are a few fields in the RTP header that are defined by the profile. The timestamp is one of them. In some profiles, the timestamp is monotonically increasing; however, in some other profiles, you can find successive RTP packets with the same timestamp, or even RTP successive RTP packets where the timestamp of the later packet is ***less*** than the timestamp of an earlier packet. Why is that? (1 point)

c) RFC 2733 defines an RTP profile for Forward Error Correction. However, RTP runs on top of UDP (which includes a checksum over the data), and most physical layers also include a CRC over the layer-2 packet. Therefore, the likelihood that an RTP receiver will get a packet with errors in it is infinitesimal; packets with errors will be discarded in the lower protocol layers prior to being delivered to the application. What is the purpose, then, of RFC 2733? Why is it useful? (2 points)

Question 3: Session Protocols (SAP/SDP) (5 points)

a) The Session Description Protocol (SDP) is a textual protocol, i.e., the protocol fields use human-readable ASCII text. Other, more traditional protocols, such as IP, RTP and even SAP use binary encoding for their fields. Identify one advantage and one disadvantage of using text encoding over binary encoding. (2 points)

b) SAP announcements are multicast periodically on a well-known address and port. However, RFC 2974 requires that the actual interval between two successive announcements be set to $\mathbf{2(1+}\boldsymbol{a}\mathbf{)}\boldsymbol{T}\mathbf{/3}$, where $\boldsymbol{T}$ is the announcement period and $\boldsymbol{a}$ is a random variable, uniformly distributed between 0 and 1. Why is that? (1 point)

c) RFC 2974 requires that the announcement period $\boldsymbol{T}$ in seconds be set to $\mathbf{max(300;\ (8*}\boldsymbol{n}\mathbf{*}\boldsymbol{S}\mathbf{)/}\boldsymbol{B}\mathbf{)}$, where $\boldsymbol{n}$ is the number of announcements in the system, $\boldsymbol{S}$ is the announcement size in bytes, and $\boldsymbol{B}$ is the configured bandwidth. Explain how $\boldsymbol{n}$ is determined and what is the purpose of setting the announcement period according to this formula. (2 points)

Question 4: RTSP (2 points)

In the "universe" of IP multimedia protocols, we have RTP to carry the stream; SDP to describe the session; SAP to carry the SDP to the receiver; and RSVP to reserve the resources. Given all that, what exactly is the purpose of RTSP? (In other words, why do we need it? What function does it perform that is not included in the protocols above?)

Question 5: H.323 (4 points)

Opening an H.323 Version 1 connection is a four-step process. Each of the four steps is indicated below. For each step, identify which information is typically exchanged. (1 point each)

a) H.225.0 Terminal to Gateway Signaling (RAS)

b) H.225.0 Call Signaling

c) H.245 Control Channel

d) H.245 Logical Channel(s)

Question 6: H.323 Version 2 Fast Connect (3 points)

Use the signaling exchange in question 5 as a reference. One of the new features introduced in H.323 Version 2 is called "Fast Connect". Regarding "Fast Connect":

a) What is the issue that "Fast Connect" is solving? (1 point)

b) How does "Fast Connect" solve this issue? (2 points)

Question 7: VoIP Issues (3 points)

When designing a VoIP transport, one of the variables is the IP packet size to use. There are reasons for using large packets, and reasons for using small packets. Make the argument for both cases, i.e., indicate what are the reasons for using large packets, and what are the reasons for using small packets. Conclude by making a recommendation on which way to go - large or small.

Bonus Question: T.120 MCS Topology (4 additional points)

Consider the following scenario: a number of T.120 terminals connected by an Ethernet segment. Logically, the T.122/125 MCS providers are arranged in a tree, but physically they are connected to a bus. Now, assume that one node in this conference wants to transmit a binary file to a set of other nodes, using T.127. The standards require that this file be transmitted using the logical tree, from the source node to the top MCS provider and then back to the destinations. In this Ethernet, this is really inefficient; the source could directly multicast the data to all the destinations simultaneously and be done with it. Why does T.120 force the communication to be this way? In other words, what are we gaining by sending the data over this logical tree?