University College London

Department of Computer Science

M.Sc. in Data Communication Networks and Distributed Systems, 2000

Z11 Multimedia Systems

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EXAMINATION QUESTIONS

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QUESTION 1

a) Explain, with the help of diagrams, the basic components of a lossy compression scheme for motion video data in the H.261 video-telephony standard.

[12 marks]

b) Outline the trade-offs between quality, bandwidth, delay and loss which are behind the choice of inter-frame and intra-frame compression for typical schemes in use today (e.g. H.261, or MPEG II).

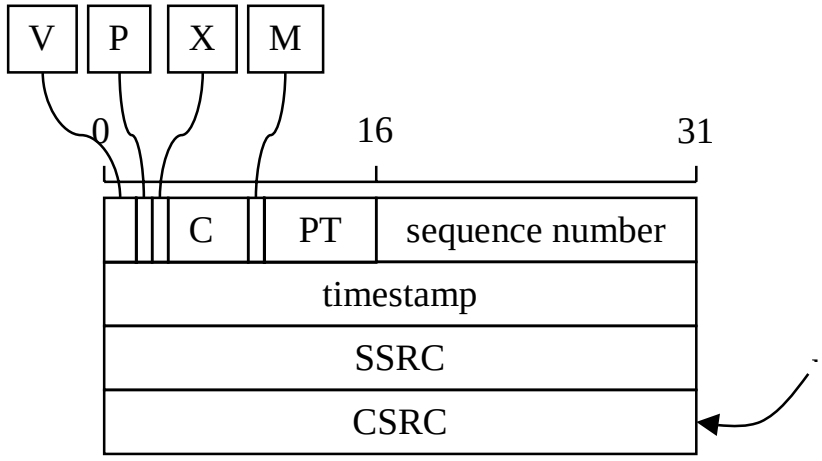
[13 marks]

QUESTION 2

a) The World Wide Web is often enhanced by the use of proxy-cacheing systems. Outline the operation of these components.

[6 marks]

b) What are the characteristics of streamed media that make the use of caches potentially more complex?



[9 marks]

c) In the Internet, RTP (illustrated above) is used to carry audio, video and other time-structured continuous media over the UDP/IP service. Explain the use of the Synchronisation Source and timestamp and other relevant fields in reconstructing the best playout time at a receiver for single and multiple streams.

[10 marks]

QUESTION 3

You are a climber/reporter in the latest Everest expedition. A national TV station is sponsoring your place in the expedition, and in return you must report live every day using a multimedia satellite phone from camps along the route. As the team climbs, you are also contracted to record video sequences of the views, (such as the Khumbu ice fall), which can be uploaded later. Before the expedition, you need to specify just the remote systems the TV station needs to purchase, as you have your own special light-weight IP-based equipment to use on the mountain.

a) Draw high-level host application software block diagram of the multimedia satellite phone (draw the diagram just for the audio) and the remote video file receiver.

[10 marks]

b) Calculate the approximate (but reasonably accurate, state any assumptions you make) bandwidth required from the satellite connection for the satellite phone (audio and video)

[15 marks]

Assume:

Satellite phone audio: ADPCM codec (sampling frequency = 8kHz), which produces 4 bits per codeword. Assume that 160 bytes of codewords are sent in their own RTP/UDP/IP packet.

Satellite phone video: H.261 frame intra-coded video codec (with no inter-frame coding), which operates at 2 frames per second, and codes Y (352 x 288 pixels),U (176 x 144 pixels) and V (176 x 144 pixels) frames. Each pixel is coded using 8 bits per pixel. H.261 coding gives 20:1 compression. Assume that a maximum of 1024 bytes can be sent in each RTP/UDP/IP packet.

RTP/UDP/IP header: 40 bytes

[10 marks]