

Problem 1:

- 1a) A circuit switched network would be suitable for this kind of an application because the application continuously sends out packets with small k intervals that are fixed and runs for a long time. This would allow the application to utilize sources fully when the packet is being transferred and the channel can be then given to another application during the k interval when the application is not running.
- 1b) a congestion control would be needed in the case when more than one application is transmitting data at the same time and the same rate. This would cause the link to get congested if there would be more applications also transmitting data at the same time causing delays in transmission and also maybe packet losses.

Problem 2:

- 2a) 10,000 users in circuit switching
- 2b) $\sum_{k=10000}^M \binom{M}{k} 0.1^k a^{M-k}$ where the M is the maximum users with probability of 10000 users being active being less than 1.
- 2c) $1 - \sum_{k=0}^M \binom{M}{k} p^k (1-p)^{M-k}$

Problem 3:

- 3a) $d_{prop} = m/s$
- 3b) $d_{trans} = L/R$
- 3c) $end - to - end\ delay = d_{trans} + d_{prop}$
 $end - to - end\ delay = m/s + L/R$
- 3d) The last bit of the packet has just been transferred on to the link and is out of host A.
- 3e) the first bit of the packet is still in the link being propagated to host B if $d_{prop} > d_{trans}$
- 3f) the first bit has reached host B if $d_{prop} < d_{trans}$
- 3g) 535,714.3 meters

Problem 4:

4a) to first packet switch = 4 s

To Destination = $4 \times 3 = 12$ s

4b) for first packet from host to first packet switch = 0.001s

The second packet will arrive at the first switch after 0.002s.

4c) 4.002 seconds. With message segmentation, the time to transfer the packet from source to destination is much lower than transferring the message without segmentation.

4d) Message segmentation adds an overhead size to the packets (for header and trailer) to ensure that packets are received and combined in the correct order.

In case a packet is lost, it has to be retransferred

Time can be taken to divide the message in packets and to rejoin them at the destination