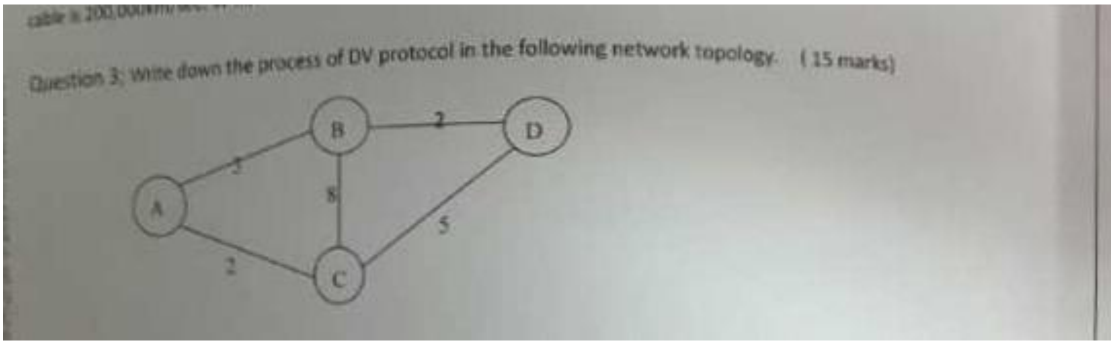
1.stop-and-wait protocol. frame size is 1250 bytes, 25 bytes overhead, ack frame is 25bytes. Calculate the efficiency of channel, a bit error probability is 10^{-6},10^{-5} and 10^{-4}.

2. . Consider building a CSMA/CD network running at 100Mbps over a 1-km with no repeaters. The signal speed in the cable is 200,000km/sec. What's the minimum frame size?

3.dv algorithm. question 3 in picture exam.jpg.



4.four Ipaddress 56.6.96.0/21, 56.6.104.0/21, 56.6.112.0/21, 56.6.120.0/21? Are they can be aggregated? If yes, to what? If no, why?

5.

3. Consider a configuration in which packets are sent from computers on a LAN to systems on other networks. All of these packets must pass through a router that connects the LAN to a widearea network and hence to the outside world.

   Let us look at the traffic from the LAN through the router. Packets arrive with a mean arrivalrate of 5 per second. The average packet length is 144 bytes, and it is assumed that packetlength is exponentially distributed. Line speed from the router to the wide-area network is9600 bps. The following questions are asked:

   (a) What is the utilization of the link of the router?

   (b) What is the mean residence time in the router?

   (c) How many packets are in the router, including those waiting for transmission and the one currently being transmitted (if any), on the average?

Solution:

(a) Mean arrival rate(throughput): X=5 packets/sec

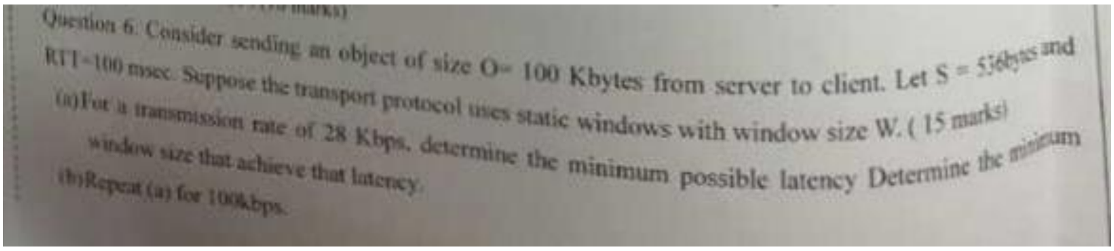
Average service time: S=((144bytes/packet)*(8bits/byte))/9600bps=0.12sec/packet

Utilization(time the router is busy): U=X*S=(5 packets/sec)*(0.12 sec/packet)=0.6

(b) The mean residence time is T=S/(1-U)=(0.12 sec/packet)/(1-0.6)=0.3 sec/packet

(c) Number of packets in the router is E[n]=U/(1-U)=1.5 packets

6.question 6 in picture exam.jpg.



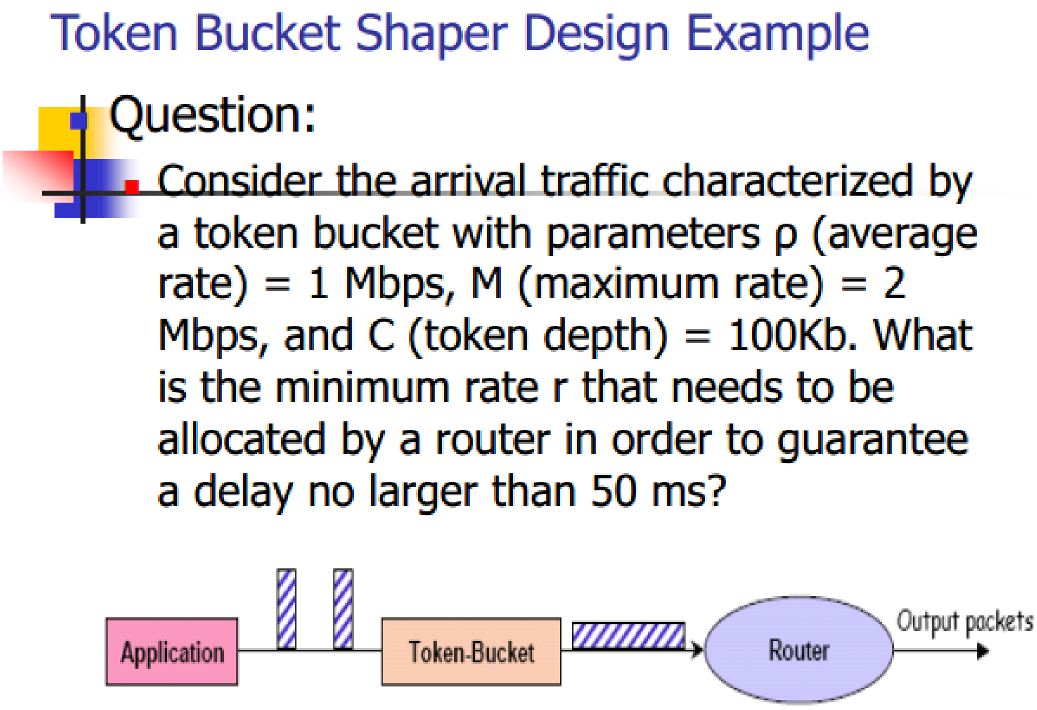
Question 6: Consider sending an object of size O= 100 Kbytes from server to client. Let S = 536bytes and RTT=100 msec. Suppose the transport protocol uses static windows with window size W. (15 marks)

(a)For a transmission rate of 28 Kbps, determine the minimum possible latency. Determine the minimum window size that achieve that latency.

(b)Repeat (a) for 100kbps.

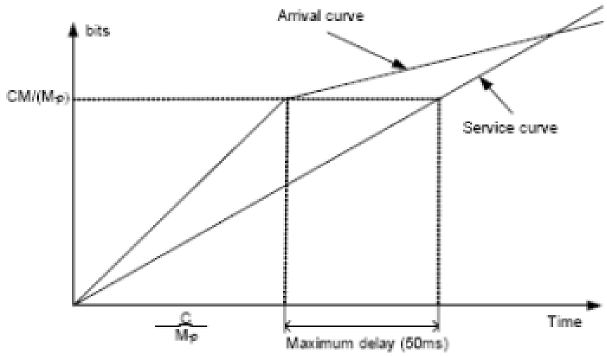
7. the sender sends a lot of data. then enter idle for a period of time, now time is t1. On the time t2, the sender begin tans data. What are the advantage and disadvantage of tcp Congwin and threshold value of t2. What alternative do you have? Why?

8. like this



Token Bucket Shaper Design Example (cont'd)

- We consider the worst case where the maximum burst length is given by
  S=C/(M-r)
- Then the maximum accumulative amount of arrival traffic to the router is MS=MC/(M-r)
- We can draw the arrival and service curve as follows



The minimum rate needs to be allocated by the router in order to guarantee a delay no larger than 50 ms is just the slope of the service curve. From the above figure, we can see the slope is given by:

$$
\begin{aligned}
r &= \frac{CM/(M-\rho)}{C/(M-\rho)+50} \\
&= \frac{(100Kb*2Mb/s)/(2Mb/s-1Mb/s))}{100Kb/(2Mb/s-1Mb/s)+50ms} \\
&= \frac{200Kb}{(200Kb/2Mb/s)+50ms} \\
&= 200Kb/150MS \\
&= 1.3333Mb/s
\end{aligned}
$$

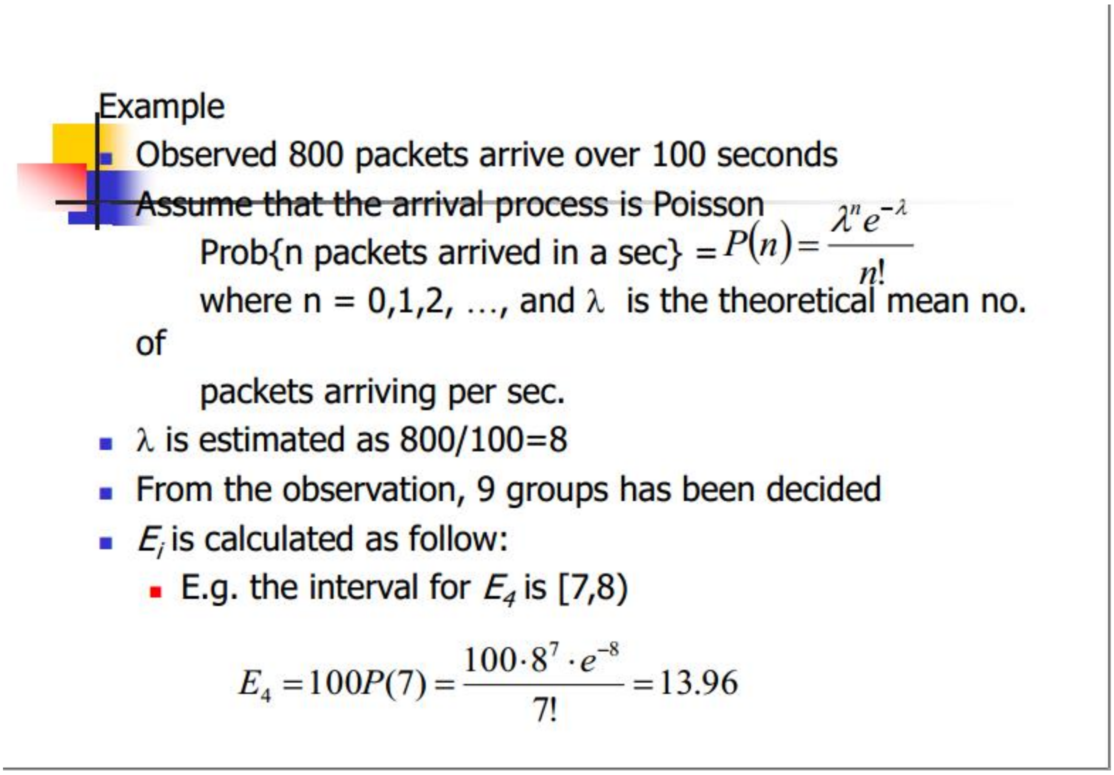
The minimum rate r that needs to be allocated by a router in order to guarantee a delay no larger than 50 ms=1.333Mb/s

9. 156 packets, geom p=0.364, $p(x)=p(1-p)^x$ (x=1,2,…n)

j	interval	Nj
1	[0]	57
2	[1,2]	56
3	[3,4,…]	43

Is the data pass the test by 90precent confidence level.

like this problem.



- The result is summarized as follow:

Group i	1	2	3	4	5	6	7	8	9
Interval i	[0,5)	[5,6)	[6,7)	[7,8)	[8,9)	[9,10)	[10,11)	[11,12)	[12,∝)
O_i	6	11	10	14	12	19	7	9	12
E_i	9.96	9.16	12.21	13.96	13.96	12.41	9.93	7.22	11.19
$\frac{(O_i - E_i)^2}{E_i}$	1.58	0.37	0.40	0.0001	0.27	3.50	0.86	0.44	0.058

- From the above, we have

$$\sum_{i=1}^{9} \frac{(O_i - E_i)^2}{E_i} = 7.485$$

- The degree of freedom = N-m-1= 9-1-1=7

  with m=1 as we have estimated one unknown parameter λ
- With α=0.05, $\chi^2_{\alpha,7}$ =14.1 > 7.485, we cannot reject that the real-world process is Poisson
  - We conclude that input arrival process is Poisson