# COMP5416 Assignment 2

## Question 1

Assume that packets from each host arrive according to a Poisson process independently of other hosts. Find the minimum gateway buffer size (in octets) to ensure a packet loss probability of not more than 0.001 at the gateway for any utilization that does not exceed 90%.

As we know that the utilization should not exceed 90%, and the occupancy , since we already know that therefore in order to keep the occupancy less than 90%,  
therefore

Our simulation program was built based on the r\_ssq\_n.c program from week 9 tutorial. As we already know the inter arrival rate, mean packet length and transmission capacity, therefore the lost packet probability will be only decided by the minimum buffer size and the number of events (in our program it is generated randomly by the program ranging from 1000 to 100000).

For each buffer size, the program runs 100 times in order to calculate the mean probability and we have the following Chart:

And this table contains the origin data:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Buffer size (KB) | |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | |
| Packet loss (%) | |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 0.1598% | 0.1355% | 0.1280% | 0.1199% | 0.1085% | 0.0872% | 0.0714% | 0.0726% | 0.0651% | 0.0546% | |
| 95% confidence interval | |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 0.0135% | 0.0117% | 0.0136% | 0.0111% | 0.0112% | 0.0097% | 0.0082% | 0.0106% | 0.0092% | 0.0070% | |

From the chart we can see that the first buffer size that can keep the packet loss less than 0.1% is 41KB and the according probability of lost packet is satisfies our expectation that equals to 0.0001.

## Question 2

For the gateway buffer size found in question 1, plot the packet loss probability for packet arrival rates of =60, 80, 100, 120 packets/second per host. What conclusions can you draw? Explain.

We are following the same simulation program as question 1. As we know that all the hosts are sending packets through a Poisson Process and they are all independent to each other, therefore we know that for we can model the 10 sources as a single source with 10 times higher than the per node (since all the are the same).

Here is a table about the simulated result:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 40 | 60 | 80 | 100 | 120 | 140 | 160 |
| Packet loss (%) | 0.0 | 0.0 | 0.0 | 0.000038 | 0.004357 | 0.049131 | 0.102507 |
| 95% confidence interval | 0.0 | 0.0 | 0.0 | 0.000017 | 0.000247 | 0.000744 | 0.000770 |

From the table we can see that there is nearly none packet loss when , and the packet loss starts to increase when keeps increasing when . We can see the result from the graph: