PROJECT 2 - REPORT

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Two mutex protocols are implemented and are abbreviated as below for this report:

1. Roucairol & Carvalho – RC
2. Ricart & Agrawala - RA

The mutex protocols are configured to run for various values of four parameters:

1. Number of nodes – n
2. Mean inter-request delay – d (in ms)
3. Mean CS-execution time – c (in ms)
4. Number of CS requests (per node) – r

For the experimental evaluation, we fix $n = 10, d = 10, r = 500$ and vary c from $5ms$ to $250ms$ for both RC and RA protocols and the result for each set is averaged over five runs.

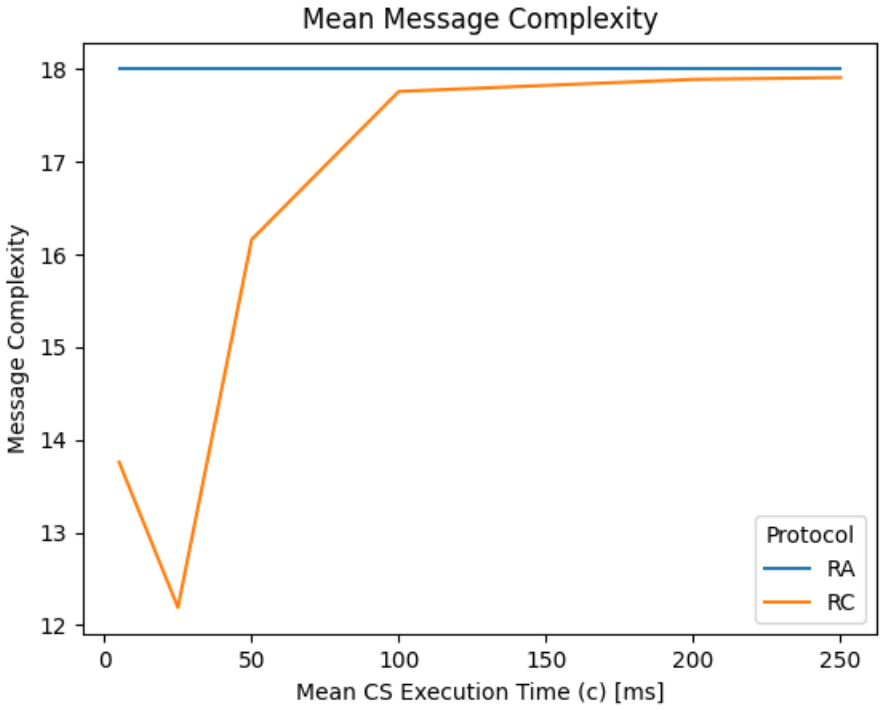

Figure 1: Comparison of Average Message Complexity

The first metric measured is mean message complexity and shown in figure 1. It is the number of messages exchanged before a node can enter its CS. For RA, the message complexity remains constant at 18 for all values of c. [9 requests + 9 replies for $n = 10$ node system]. This is because for each CS request, a node has to send a request and receive corresponding reply from all other nodes. For RC, the average message complexity increases with increasing value of c, except for very small value of c. The message complexity of RC is lower than RA as a node can avoid sending a fresh request if it has already received a reply from another node and has not sent a reply to it. However, for high values of c, it is close to RA's message complexity.

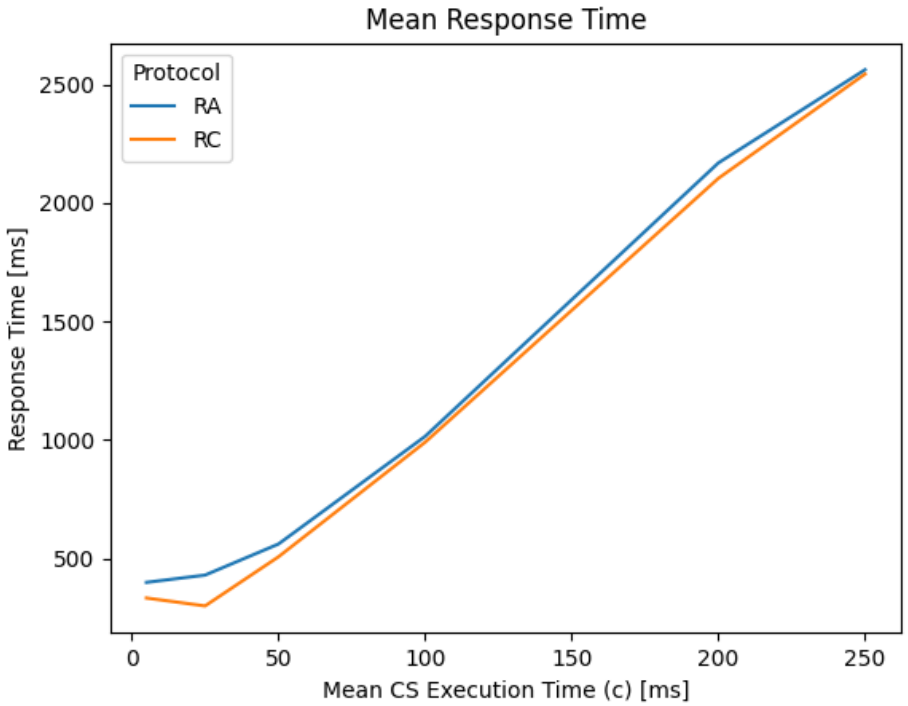

Figure 2: Comparison of Average Response Time

The second metric measured is mean response time which is shown in figure 2. Both mutex algorithms have an increasing trend with increasing values of c. This is due to the increase in critical section execution time, which increases the time a node waits for replies from other nodes. RC has comparatively better (smaller) average response time than RA, since it can reduce the number of request-reply required from other nodes if it has already received a reply from that node. This difference in mean response time between RA and RC is larger for smaller values of c.

The third metric measured is mean system throughput as shown in figure 3. High system throughput is observed for small values of c. The average throughput drops sharply as c increases for both mutex protocols. RC has a better throughput than RA for lower values of c. This is because it can enter CS again if it has not sent replies to other nodes, increasing number of CS executed comparatively. However, the system throughput values are similar for both RA and RC when c has a sufficiently large value.

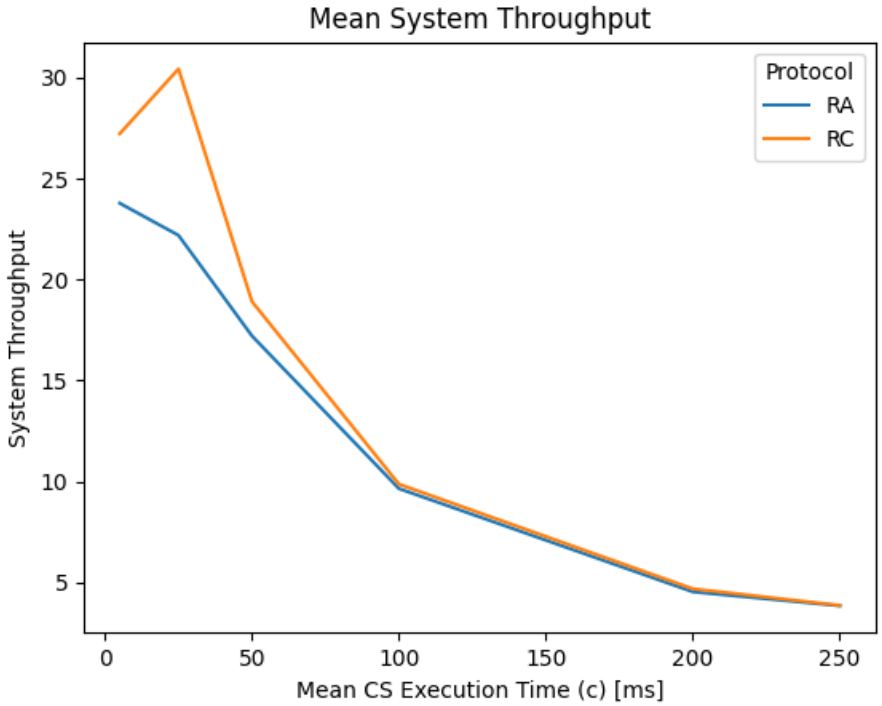

Figure 3: Comparison of Average System Throughput

In summary, RC has comparatively better performance across all the three measured metrics than RA for small values of c but the performance is very similar when c is sufficiently large.