

Comparison of TAS, TTAS, CLH and MCS Locking Algorithms

Name: Rohit Kapoor

Roll No: cs21mtech12011

Program Design

In the given project, we need to compare the performance of the TAS, TTAS, CLH and MCS locking algorithms. The program takes as input, a file named “inp-params.txt”. The no of threads, the value of k and two sleep params i.e. lambda1 and lambda2 are given as the input to the program.

- Each thread enters the critical section k times and is blocked in case some other thread is accessing the critical section.
- The program logs the messages in a output.txt file.

Tabulation of Data

For obtaining the data for the project the value of k is set as 10 and that of lambda1 and lambda2 is set as 1 and 2 respectively.

The avg. Entry times in micro-seconds of various locking algorithms are tabulated below:

No of Threads	TAS	TTAS	CLH	MCS
2	350	350	350	350
4	1158	1200	1250.16	1250.16
8	2733	2820	3037.6	3050
16	5930	5733	6709	6617
32	12323	12270	14346	14246
64	25494	25205	30332	30304

Table 1: Average entry times of various algorithms in Micro-sec.

The avg. Exit times in nano-sec of the various locking algorithms are tabulated below:

No. of Threads	TAS	TTAS	CLH	MCS
2	1268	1261.33	1230.8	1505.35
4	1281	1018.65	1171.48	1392.48
8	1126	1051.27	1120.45	1234.76
16	921.52	855.34	1034.16	1102
32	863	767.68	889.55	1017
64	818.8	758.68	847.51	1018.64

Table 2: Average exit times of various locking algorithms.

Graphical Analysis

Entry Times :

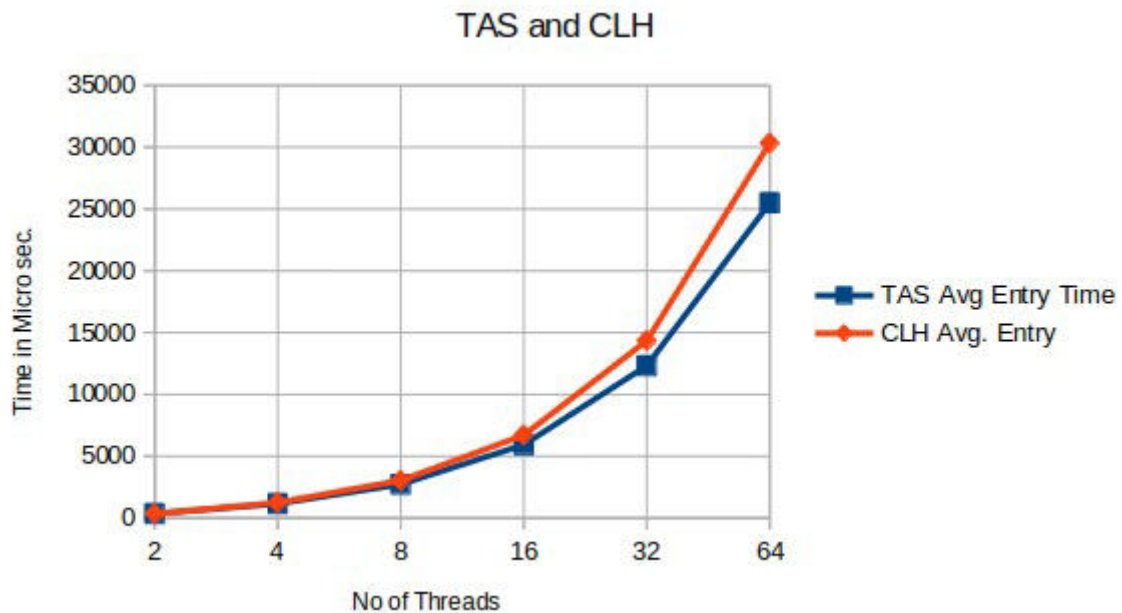


Fig. 1 : Average entry times for TAS and CLH

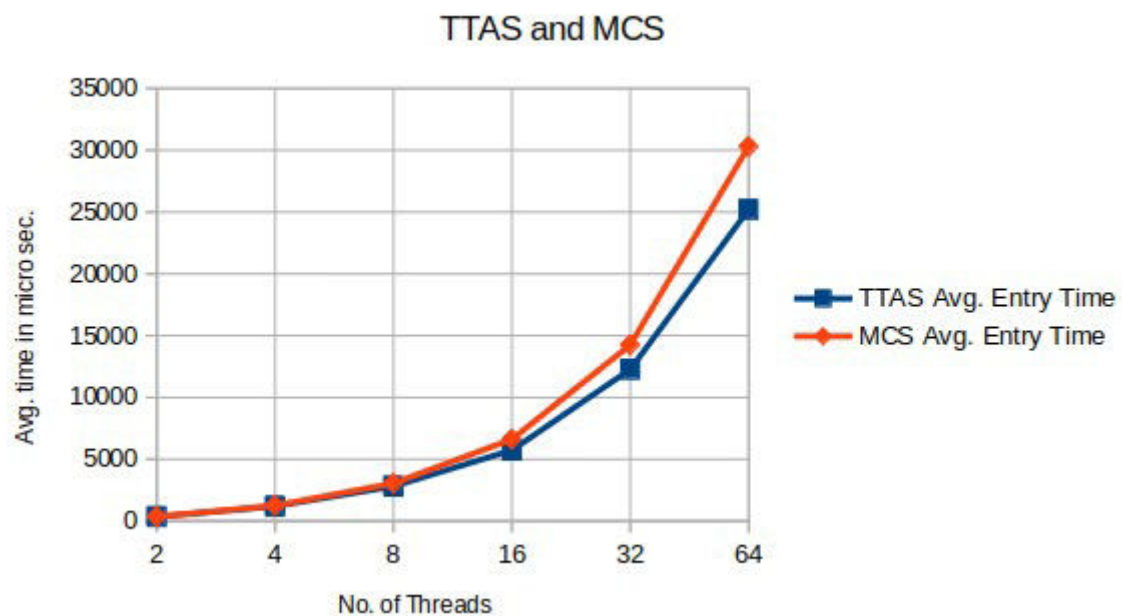


Fig. 2 : Average entry times for TTAS and MCS locking algorithms

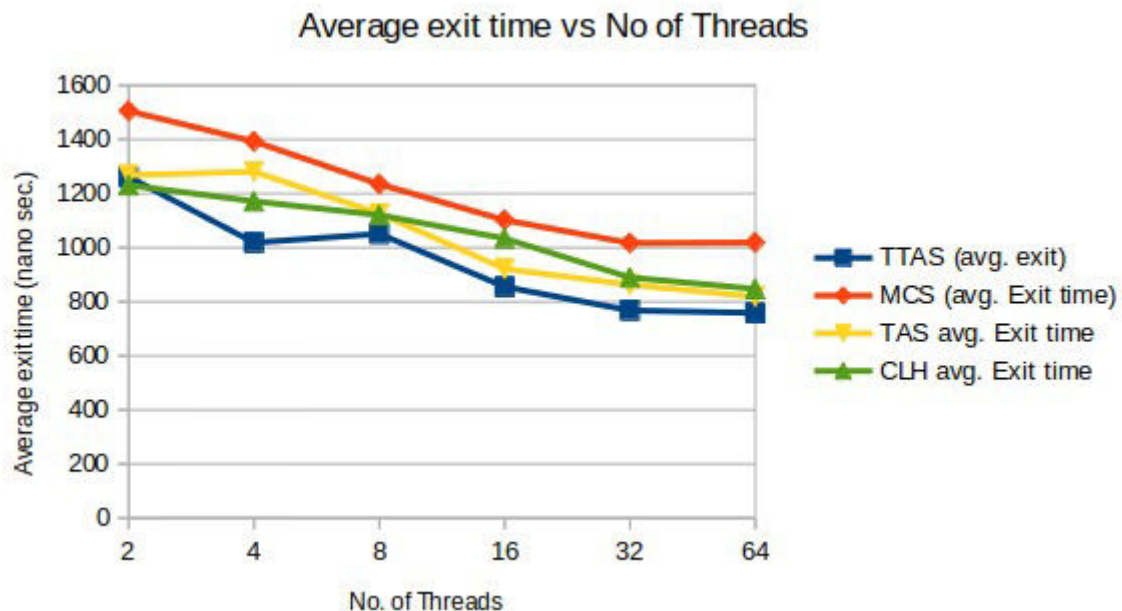
Exit Times:

Fig. 3 Average exit times of the algorithms vs no of threads.

ObservationsEntry Times

- From the graphical analysis, it can be observed that, TAS and TTAS give almost equal performance but TTAS is performing slightly better which is expected as TTAS produces lesser traffic over the system bus.
- Similarly in case of CLH and MCS locking algorithms, MCS is performing slightly better than CLH at higher values, since both algorithms are based on queues and the memory architecture of the system is not NUMA, hence both are expected to have similar performance.
- Amongst TTAS and MCS, TTAS is performing better because it does not maintain a queue, further the number of threads is smaller hence memory contention at the time of unlocking is not a big issue, but in case the number of threads were very large the MCS or CLH would have given better performance.

Exit Times

- From the graphs it can be observed that TTAS is taking the least amount of time to unlock.
- All the algorithms show a decreasing trend in the amount of time taken to perform the unlock operations.
- The queue based algorithm i.e. CLH and MCS are taking more time to unlock because they need to change two memory locations while TAS and TTAS algorithms need to access only one memory location hence they are unlocking faster.

Conclusion

According to the observations made in this assignment TTAS locking algorithm is taking the minimum average entry time and also the minimum average unlocking time. Amongst the queue based algorithms MCS is performing slightly better in entry while CLH is doing better during the exit phase.