

CS3523: Operating Systems - II

Programming Assignment 4 - Report

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1 Overview

This assignment implements CAS, TAS, and bounded CAS mutual exclusion algorithms.

2 Implementation

Each file first declares all the global variables required for the algorithms so as to avoid having to pass them to each thread separately. The log file object has also been declared globally so that each thread can write to it without having to reopen and close it for each thread.

The `testCS()` function implements the aforementioned mutual exclusion algorithms:

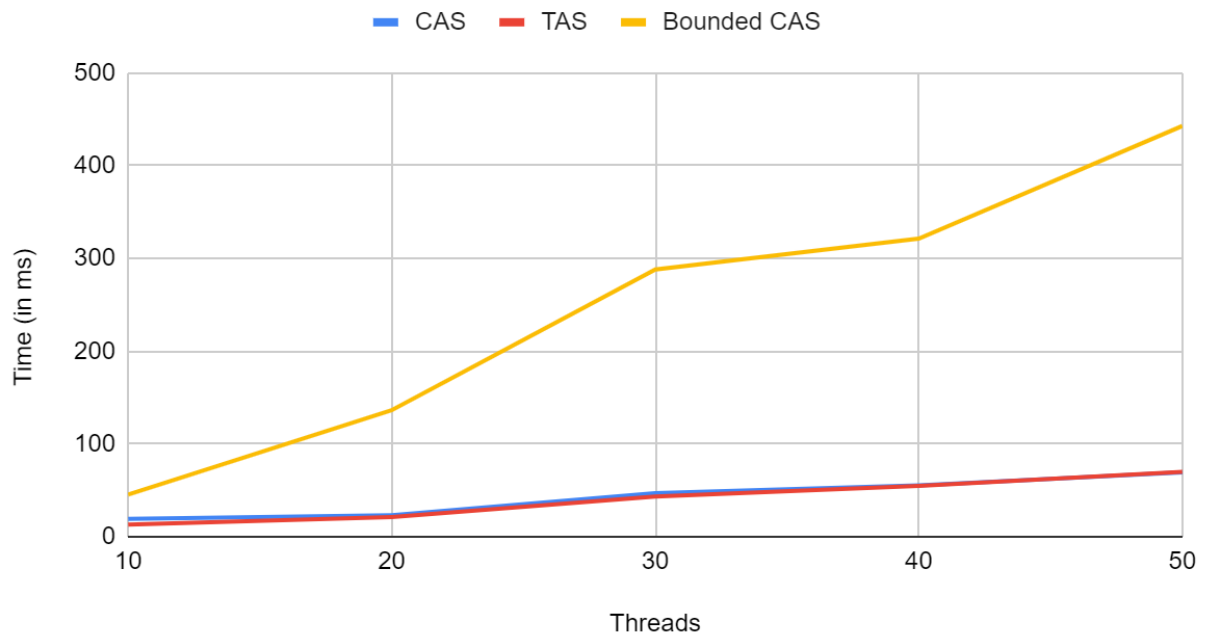
- The exponential distributions are created at the beginning of the function to randomly generate waiting times for simulation purposes.
- The functions make use of the `localtime()` function to retrieve the current time in minutes and seconds, and the `gettingtimeofday()` function is used to increase the precision to milliseconds.
- The rest of the structure of the program is the same as the pseudocode given in the assignment document. Each algorithm has a slightly different entry and exit section while everything remains the same.
- The following functions were used in the entry sections to modify the lock values as needed:
 - **CAS and bounded CAS:** `atomic_compare_exchange_strong()`
 - **TAS:** `test_and_set()`
- The `usleep()` function is used to simulate the critical and the remainder sections using the values generated by the exponential distribution function.

The main function only reads the input file into variables creates the required number of threads to execute the `testCS()` function and joins them once they are done executing. It also prints the average and worst waiting times to the console.

3 Comparison

3.1 Average Waiting Times

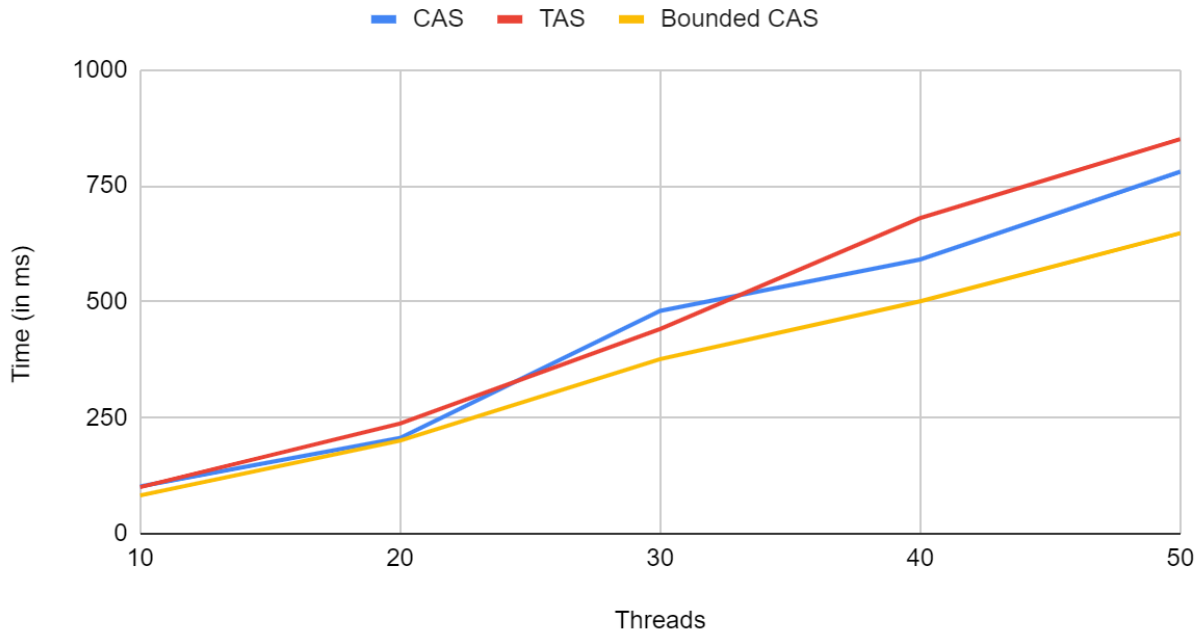
Average Waiting Time (in ms)



It is clear from the graph that CAS and TAS are similar to each other in terms of performance. The average time taken by the bounded CAS algorithm is significantly higher since it tries to prevent starvation thereby resulting in a much higher average waiting time for all processes.

3.2 Worst Wating Times

Worst Waiting Time (in ms)



The worst waiting times of CAS and TAS are close to each other, but as the number of threads increases, CAS seems to have smaller worst waiting times. The bounded CAS algorithm's worst waiting times are much lesser when compared to the other two because its main goal is to prevent starvation so that no process is left waiting for unfairly large amounts of time.