COP6611.001S16 Operating Systems Assignment P1
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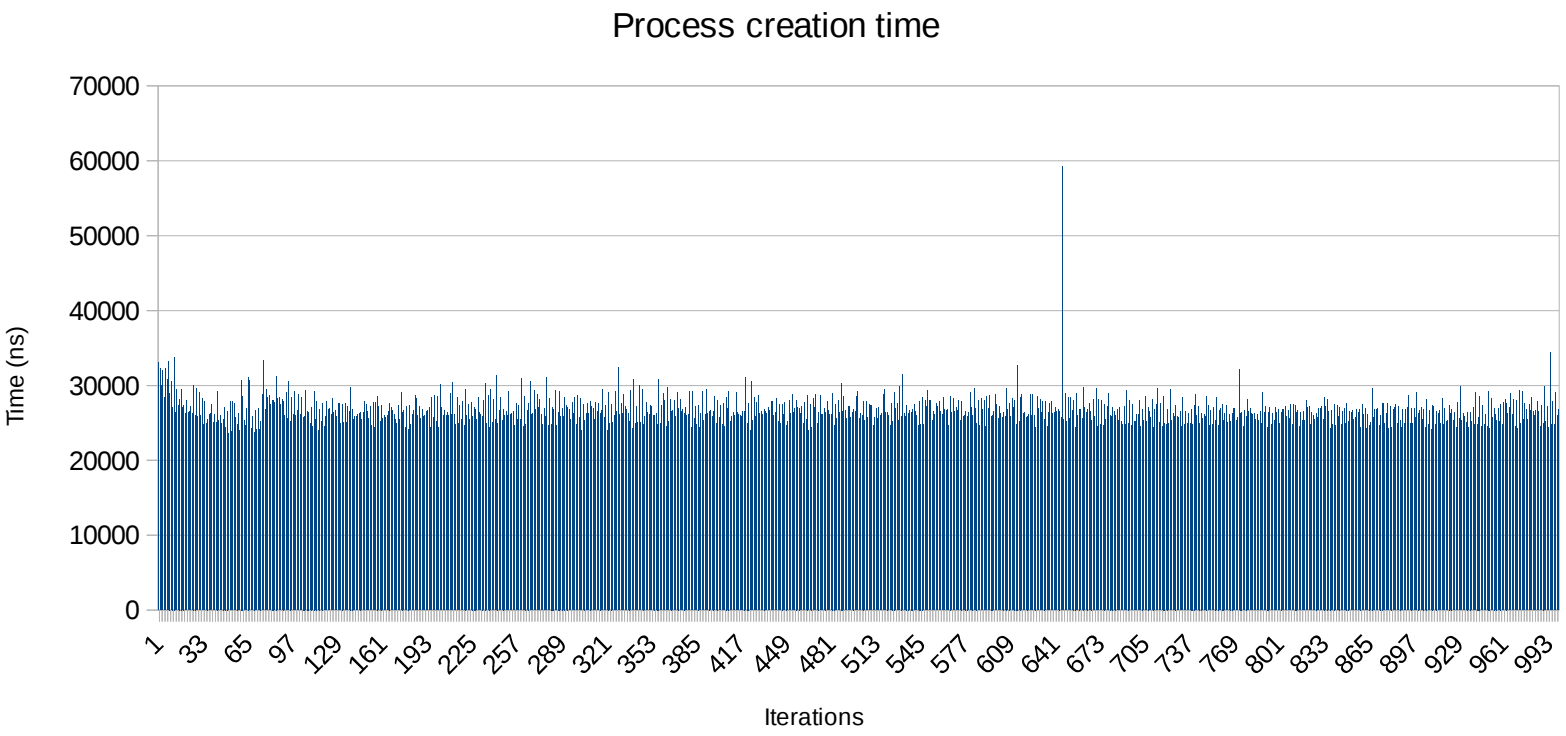
Purpose: Measure the estimated time required for (a) process creation (b) thread creation, and (c) context switching

PROCESS CREATION

This is measured by taking the times just before and after calling the fork() system call.
An average is calculated by repeating the operation 1000 times.
Result - Average process creation time: 26784.14 ns



Analysis – From the above plot we can concur that process creation takes approximately an average time under 30000 ns and is fairly constant. There is however a sharp spike at one iteration, which might have occurred as some other process was scheduled in between obtaining the times and calling fork().

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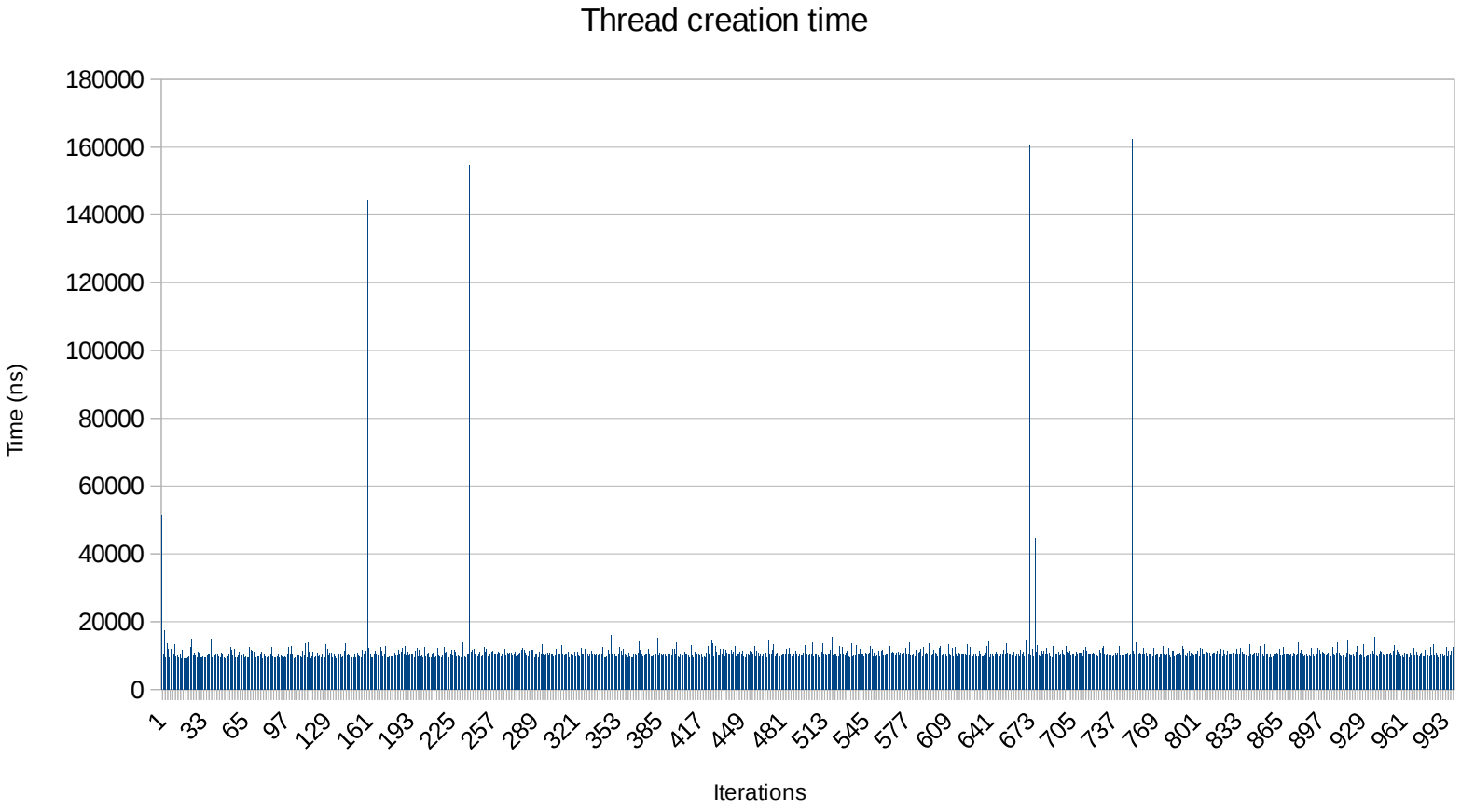
Thread Creation

This is measured by taking the times just before and after calling pthread_create().
An average is calculated by repeating the operation 1000 times.
Result - Average thread creation time: 11326.13 ns



Analysis – From the above plot we can concur that thread creation time is fairly constant and takes an average and is under 15000 ns. There are a few high spikes and that might have occurred due to scheduling of some other process in between obtaining the times and creating the threads.

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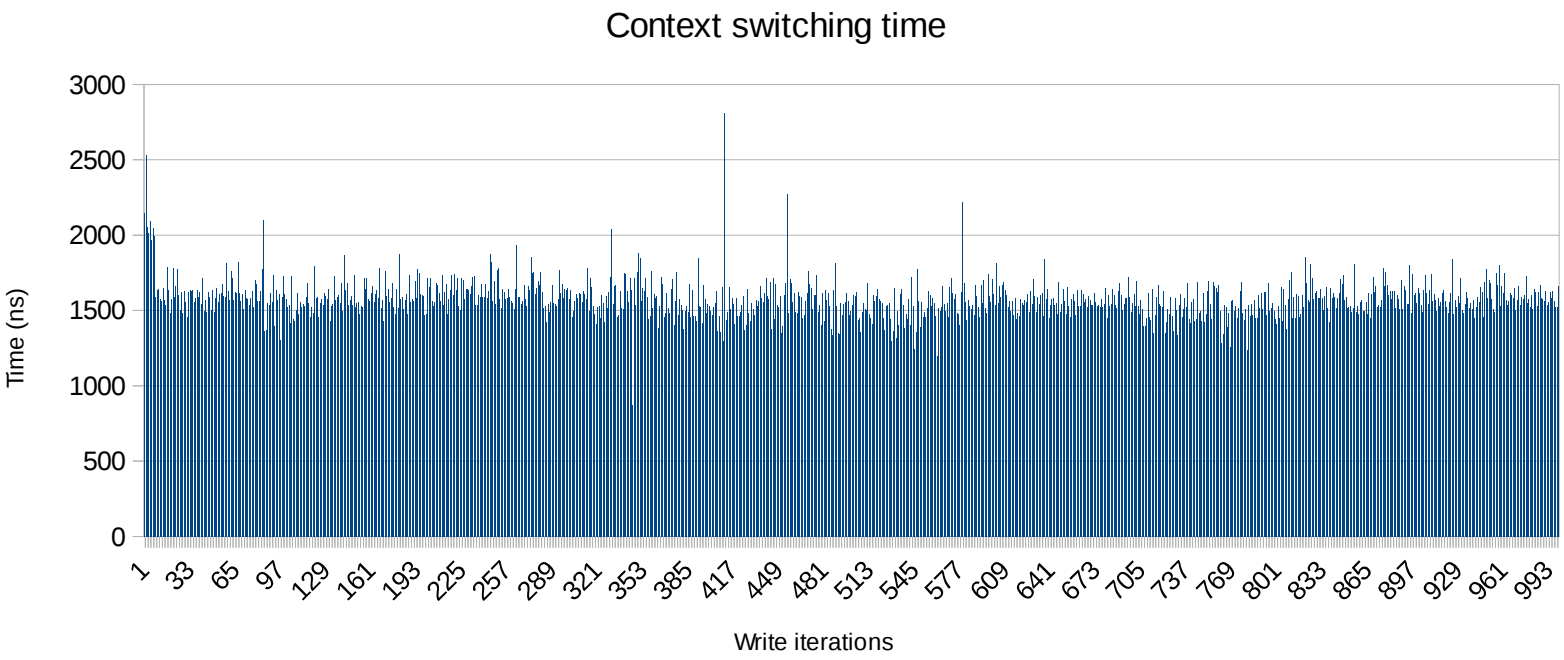
Context switching

Although it is not possible to manually make the context switch happen, we can trick the OS into making it possible. Here we are using 2 pipes as a means of IPC between the parent and the child process. The parent process first writes some data to the first pipe, then takes the time and then waits to read from the second pipe. The child process reads the sent data from the first pipe, takes the time and then write the time value to the second pipe to send to the parent. Now, since read() is a blocking call, it is expected that the OS will schedule some other process in the meantime, thereby making the context switch happen.
An average is calculated by writing data to the pipe 1000 times.
Result – Average context switching time: 1579.36 ns



Analysis – From the above plot we can see that the time taken for context switching is fairly constant at approximately under 1800 ns. One or two spikes can be seen which might be because of scheduling some other process in between.

Note

Timestamp is taken using the clock_gettime(CLOCK_MONOTONIC_RAW, &timespec) as this provides a more accurate time than gettimeofday() and is not guilty of slewing.
[Ref.: https://blog.habets.se/2010/09/gettimeofday-should-never-be-used-to-measure-time]