Assignment 1 Report

For this assignment, The Game of Life is created using data parallelism and task parallelism and tested with different input. The execution times of these programs are recorded, and multiple patterns discovered upon review of the data.

The gol_data.c program which uses data parallelism, presents an exponential decrease in execution time as the number of threads increases. This outcome is expected as a greater number of threads allows for a greater division of work. My testing results prove this outcome to be accurate. The gol_data.c program was executed 10 times using identical game conditions on the SoCS server, increasing the thread count by 1 each time up to 4. When using 1 thread to execute The Game of Life with a 100 by 100 grid and 10,000 iterations, the mean execution time was approximately 6.1 seconds. When using 2 threads with the same conditions, the mean execution time was approximately 4.5 seconds, which presents a decrease of 1.6 seconds. Continuing this pattern with 3 threads and 4 threads, the execution time continues to decrease by 0.4 seconds and 0.3 seconds respectively. These results are identified as the total number of squares in The Game of Life grid are divided by the total number of threads. Therefore, the number of squares each thread requires to check decreases as the number of threads increase resulting in a decrease in execution time.

The results from my gol_task.c program presents a much greater execution time than that of the gol_data.c program. The gol_task.c program uses task parallelism which is expected to take longer as there is more work to be completed by the threads for each iteration of the game. New messages are continuously being sent and received from two queues which are added to The Game of Life grid. After executing the gol_task.c program 10 times on the SoCS server with identical game conditions to the gol_data.c program, the mean execution time was approximately

86.7 seconds. The test results were expected as this program takes approximately 20 times longer to execute. This is due to that fact that one thread is searching through every square in the grid at all times in comparison to multiple threads dividing this work evenly. In addition, a second and third thread are continuously reading from two message queues, which is inefficient for The Game of Life program as iterations can be created without the use of message queues.

Overall, the fixed number of threads and the greater amount of work, causes the gol_data.c program to have a longer execution time than the gol_data.c program.