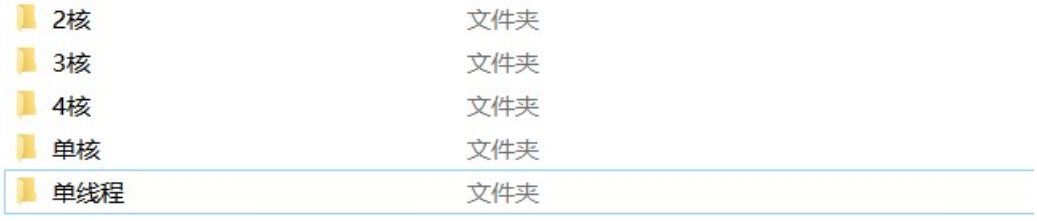
性能表现报告

完成目标：

一： **Compare the performance of your “super-fast” Sudoku solving program with a simple singlethread version, using the same input and under the same environment.**（将“超级快速”数独解题程序的性能与简单的单线程版本进行比较，使用相同的输入，在相同的环境下。）

二： **Change the input (e.g., change file size) and environment (e.g., using machines with different CPUs and hard drives), and draw several curves of your program ’ s performance under various conditions.**（更改输入（例如，更改文件大小）和环境（例如，使用具有不同 **CPU** 和硬盘），并绘制程序性能曲线。

为了完成目标，首先我们设置了五个等级的环境（分别使用不同核 **CPU** 版本以及简单单线程版本），如下图：



及七种不同的数据规模，从小到大题目数量位 **32 1000 16000 32000 64000 128000 1024000** 这样就涵盖了两个问题中 不同输入大小 不同环境 以及包含最简单版本的单线程

32
1000
16000
32000
64000
128000
1024000

下面来首先展示各组的测试结果：

单线程：

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/Sudoku$ ./sudoku test1 d
0.001011 sec 0.031594 ms each 32
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/Sudoku$ ./sudoku test1000 d
0.098073 sec 0.098073 ms each 1000
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/Sudoku$ ./sudoku test16000 d
0.845618 sec 0.052851 ms each 16000
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/Sudoku$ ./sudoku test32000 d
1.625165 sec 0.050786 ms each 32000
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/Sudoku$ ./sudoku test64000 d
3.293109 sec 0.051455 ms each 64000
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/Sudoku$ ./sudoku test128000 d
6.574268 sec 0.051361 ms each 128000
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/Sudoku$ ./sudoku test1024000 d
52.895476 sec 0.051656 ms each 1024000
```

单核：

32

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test1
calculating finished. Spend 0.00105 s to finish.total solved:32
writing finished. Spend 0.00052 s to finish.total solved:32
total Spend:0.00157 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 1
```

1000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test1000
calculating finished. Spend 0.05473 s to finish.total solved:1000
writing finished. Spend 0.00788 s to finish.total solved:1000
total Spend:0.06261 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 1
```

16000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test16000
calculating finished. Spend 0.77965 s to finish.total solved:16000
writing finished. Spend 0.11366 s to finish.total solved:16000
total Spend:0.89331 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 1
```

32000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test32000
calculating finished. Spend 1.52552 s to finish.total solved:32000
writing finished. Spend 0.22104 s to finish.total solved:32000
total Spend:1.74656 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 1
```

64000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test64000
calculating finished. Spend 3.28763 s to finish.total solved:64000
writing finished. Spend 0.46621 s to finish.total solved:64000
total Spend:3.75384 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 1
```

128000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test128000
calculating finished. Spend 7.26748 s to finish.total solved:128000
writing finished. Spend 0.95715 s to finish.total solved:128000
total Spend:8.22463 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 1
```

1024000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test1024000
calculating finished. Spend 60.39694 s to finish.total solved:1024000
writing finished. Spend 10.25713 s to finish.total solved:1024000
total Spend:70.65407 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 1
```

双核：

32

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test1
calculating finished. Spend 0.00138 s to finish.total solved:32
writing finished. Spend 0.00029 s to finish.total solved:32
total Spend:0.00167 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 2
```

1000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test1000
calculating finished. Spend 0.33226 s to finish.total solved:1000
writing finished. Spend 0.00667 s to finish.total solved:1000
total Spend:0.33892 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 2
```

16000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test16000
calculating finished. Spend 0.46405 s to finish.total solved:16000
writing finished. Spend 0.12061 s to finish.total solved:16000
total Spend:0.58465 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 2
```

32000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test32000
calculating finished. Spend 1.82052 s to finish.total solved:32000
writing finished. Spend 0.23014 s to finish.total solved:32000
total Spend:2.05066 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 2
```

64000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test64000
calculating finished. Spend 2.02759 s to finish.total solved:64000
writing finished. Spend 0.46252 s to finish.total solved:64000
total Spend:2.49010 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 2
```

128000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test128000
calculating finished. Spend 4.64194 s to finish.total solved:128000
writing finished. Spend 0.97167 s to finish.total solved:128000
total Spend:5.61361 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 2
```

1024000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test1024000
calculating finished. Spend 34.99794 s to finish.total solved:1024000
writing finished. Spend 10.44421 s to finish.total solved:1024000
total Spend:45.44215 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 2
```

三核：

32

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test1
calculating finished. Spend 0.00334 s to finish.total solved:32
writing finished. Spend 0.00032 s to finish.total solved:32
total Spend:0.00365 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 3
```

1000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test1000
calculating finished. Spend 0.06633 s to finish.total solved:1000
writing finished. Spend 0.00729 s to finish.total solved:1000
total Spend:0.07362 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 3
```

16000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test16000
calculating finished. Spend 0.89724 s to finish.total solved:16000
writing finished. Spend 0.12404 s to finish.total solved:16000
total Spend:1.02128 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 3
```

32000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test32000
calculating finished. Spend 1.29080 s to finish.total solved:32000
writing finished. Spend 0.30984 s to finish.total solved:32000
total Spend:1.60064 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 3
```

64000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test64000
calculating finished. Spend 1.63006 s to finish.total solved:64000
writing finished. Spend 0.45394 s to finish.total solved:64000
total Spend:2.08401 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 3
```

128000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test128000
calculating finished. Spend 3.69475 s to finish.total solved:128000
writing finished. Spend 1.32813 s to finish.total solved:128000
total Spend:5.02287 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 3
```

1024000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test1024000
calculating finished. Spend 29.48569 s to finish.total solved:1024000
writing finished. Spend 10.49225 s to finish.total solved:1024000
total Spend:39.97794 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 3
```

四核：

32

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test1
calculating finished. Spend 0.00143 s to finish.total solved:32
writing finished. Spend 0.00032 s to finish.total solved:32
total Spend:0.00175 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 4
```

1000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test1000
calculating finished. Spend 0.02542 s to finish.total solved:1000
writing finished. Spend 0.00764 s to finish.total solved:1000
total Spend:0.03306 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 4
```

16000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test16000
calculating finished. Spend 0.23556 s to finish.total solved:16000
writing finished. Spend 0.11249 s to finish.total solved:16000
total Spend:0.34805 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 4
```

32000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test32000
calculating finished. Spend 0.45322 s to finish.total solved:32000
writing finished. Spend 0.23115 s to finish.total solved:32000
total Spend:0.68437 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 4
```

64000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test64000
calculating finished. Spend 0.99185 s to finish.total solved:64000
writing finished. Spend 0.45217 s to finish.total solved:64000
total Spend:1.44403 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 4
```

128000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test128000
calculating finished. Spend 1.97650 s to finish.total solved:128000
writing finished. Spend 1.02588 s to finish.total solved:128000
total Spend:3.00238 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 4
```

1024000

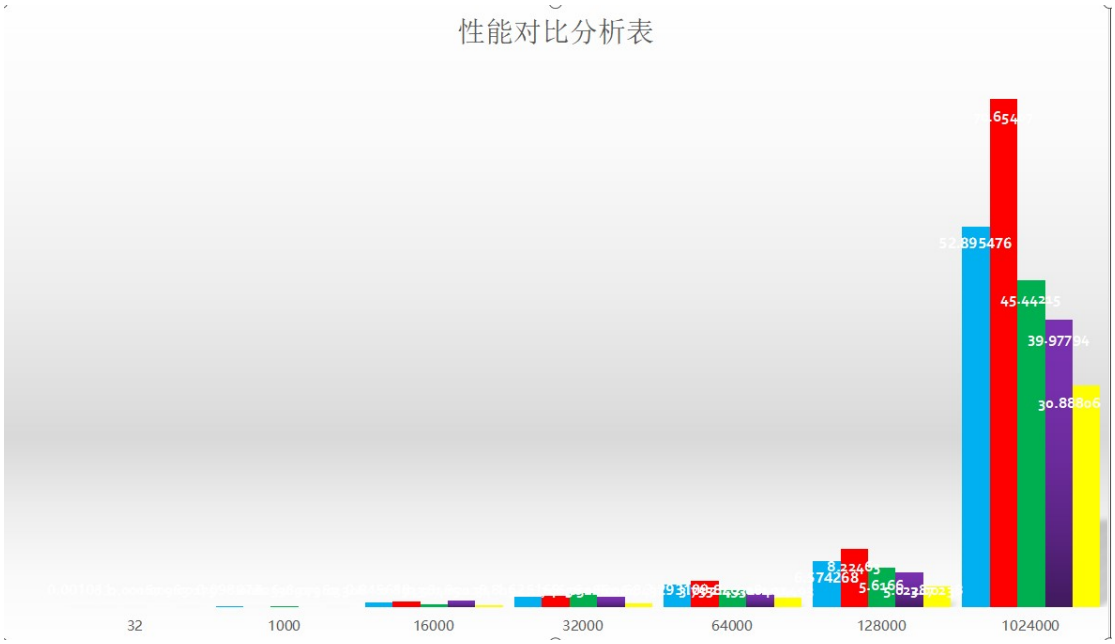
```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test1024000
calculating finished. Spend 23.27235 s to finish.total solved:1024000
writing finished. Spend 7.61571 s to finish.total solved:1024000
total Spend:30.88806 s to finish.
POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 4
```

下面来用表格总结整体性能时间：

数据性能分析表

数据量	单线程	单核	双核	三核	四核
32	0.001011	0.00157	0.00167	0.00365	0.00175
1000	0.098073	0.006261	0.33892	0.07362	0.03306
16000	0.845618	0.89331	0.58465	1.02128	0.34805
32000	1.625165	1.74656	2.05066	1.60064	0.68437
64000	3.293109	3.75384	2.4931	2.08401	1.44403
128000	6.574268	8.22463	5.6166	5.02287	3.00238
1024000	52.895476	70.65407	45.44215	39.97794	30.88806

用柱形图更为直观感受



注：蓝 红 绿 紫 黄分别代表 单线程 单核 双核 三核 四核

总结：

可以看到在数据规模庞大的情况下，多核是占据绝对优势的，但在题目数量有限时，多线程优势就不是很明显，至此报告结束，**performance test report** 的要求已经全部完成，感谢助教和老师

的辛勤奉献。