云计算技术实验一性能测试报告

组名：一朵花三根草

成员：杨佳政 201708010207

巴琰雯 201708010211

缴天朔 201708010301

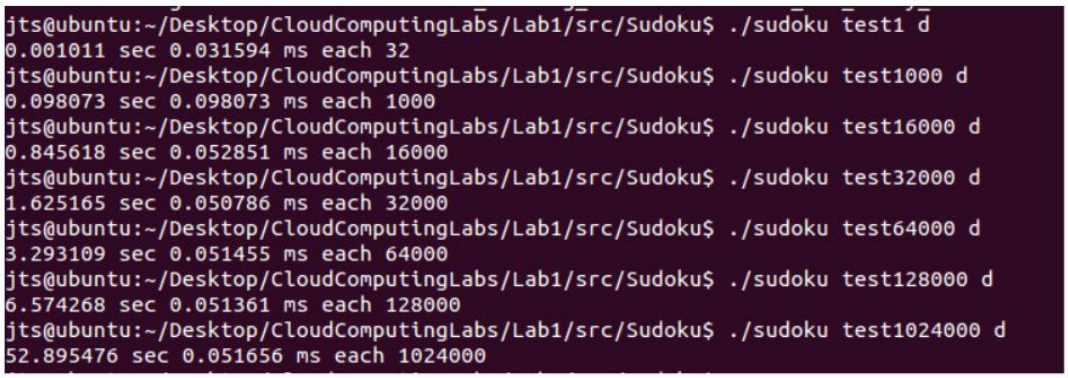
赵国强 201708010328

【概述】

我们是根据当前机器的可用 CPU 核数来确定解题线程数的，解题线程数与可用 CPU 核数相等。我们设置了五个等级的环境（分别有不同数量的可用 CPU 核以及单线程版本）及七种不同的数据规模（从小到大题目数量为 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。

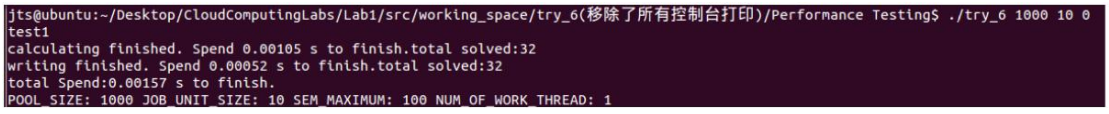
【测试结果】

一、单线程（原代码）



二、单线程

（1）32



（2）1000

```
jts@ubuntu:~/Desktop/Untitled Folder$ ./try_6 1000 10 1
./test1000
calculating finished. Spend 0.05321 s to finish.total solved:1000
writing finished. Spend 0.00755 s to finish.total solved:1000
total finished. Spend 0.06075 s to finish.POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 1
```

（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 0.77965 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
```

（4）32000

```
jts@ubuntu:~/Desktop/Untitled Folder$ ./try_6 1000 10 1
./test32000
calculating finished. Spend 1.47374 s to finish.total solved:32000
writing finished. Spend 0.22230 s to finish.total solved:32000
total finished. Spend 1.69605 s to finish.POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 1
```

（5）64000

```
jts@ubuntu:~/Desktop/Untitled Folder$ ./try_6 1000 10 1
./test64000
calculating finished. Spend 2.93880 s to finish.total solved:64000
writing finished. Spend 0.46896 s to finish.total solved:64000
total finished. Spend 3.40776 s to finish.POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 1
```

（6）128000

```
jts@ubuntu:~/Desktop/Untitled Folder$ ./try_6 1000 10 1
./test128000
calculating finished. Spend 6.17305 s to finish.total solved:128000
writing finished. Spend 0.87644 s to finish.total solved:128000
total finished. Spend 7.04948 s to finish.POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 1
```

（7）1024000

```
jts@ubuntu:~/Desktop/Untitled Folder$ ./try_6 1000 10 1
./test1024000
calculating finished. Spend 48.37857 s to finish.total solved:1024000
writing finished. Spend 7.15910 s to finish.total solved:1024000
total finished. Spend 55.53766 s to finish.POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 1
```

三、双线程

（1）32

```
jts@ubuntu:~/Desktop/Untitled Folder$ ./try_6 1000 10 1
./test1
calculating finished. Spend 0.00186 s to finish.total solved:32
writing finished. Spend 0.00032 s to finish.total solved:32
total finished. Spend 0.00218 s to finish.POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 3
```

（2）1000

```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)$ ./try_6 1000 10 1
./test1000.2
calculating finished. Spend 0.03148 s to finish.total solved:1000
writing finished. Spend 0.01061 s to finish.total solved:1000
total finished. Spend 0.04209 s to finish.POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 2
```

（3）16000

```
jts@ubuntu:~/Desktop/Untitled Folder$ ./try_6 1000 10 1
./test16000
calculating finished. Spend 0.28006 s to finish.total solved:16000
writing finished. Spend 0.11233 s to finish.total solved:16000
total finished. Spend 0.39239 s to finish.POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 3
```

（4）32000

```
jts@ubuntu:~/Desktop/Untitled Folder$ ./try_6  1000 10 1
./test32000
calculating finished. Spend 0.97552 s to finish.total solved:32000
writing finished. Spend 0.22294 s to finish.total solved:32000
total finished. Spend 1.19846 s to finish.POOL_SIZE: 1000 JOB_UNIT_SIZE: 10 SEM_MAXIMUM: 100 NUM_OF_WORK_THREAD: 2
jts@ubuntu:~/Desktop/Untitled Folder$
```

（5）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
```

（6）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
```

（7）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
```

四、三线程

（1）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
```

（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 0.06633 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
```

（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
```

（4）32000

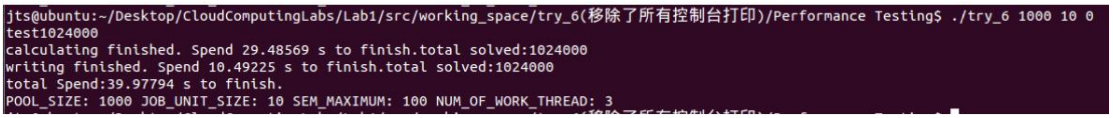
```
jts@ubuntu:~/Desktop/CloudComputingLabs/Lab1/src/working_space/try_6(移除了所有控制台打印)/Performance Testing$ ./try_6 1000 10 0
test32000
calculating finished. Spend 1.29080 s to finish.total solved:32000
writing finished. Spend 0.30984 s to finish.total solved:32000
total Spend:1.60064 s to finish.
POOL_SIZE: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

（5）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
```

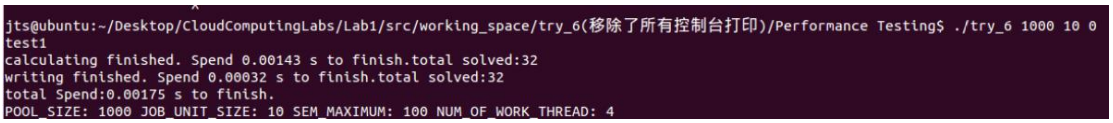
（6）128000

（7）1024000



五、四线程

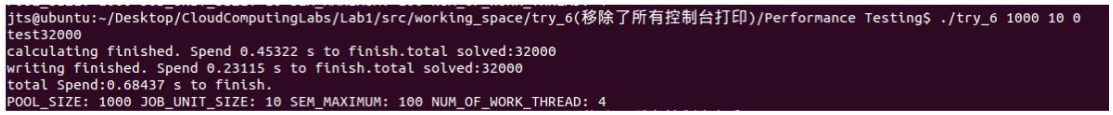
（1）32



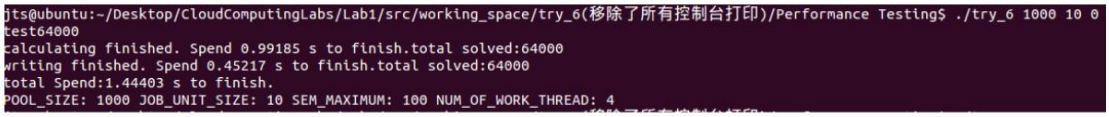
（2）1000

（3）16000

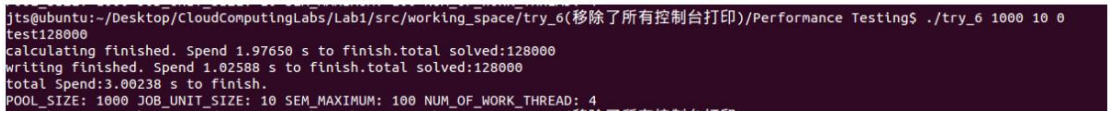
（4）32000



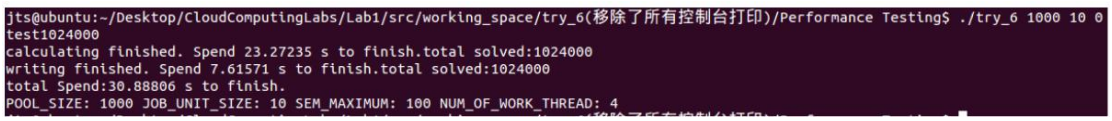
（5）64000



（6）128000



（7）1024000

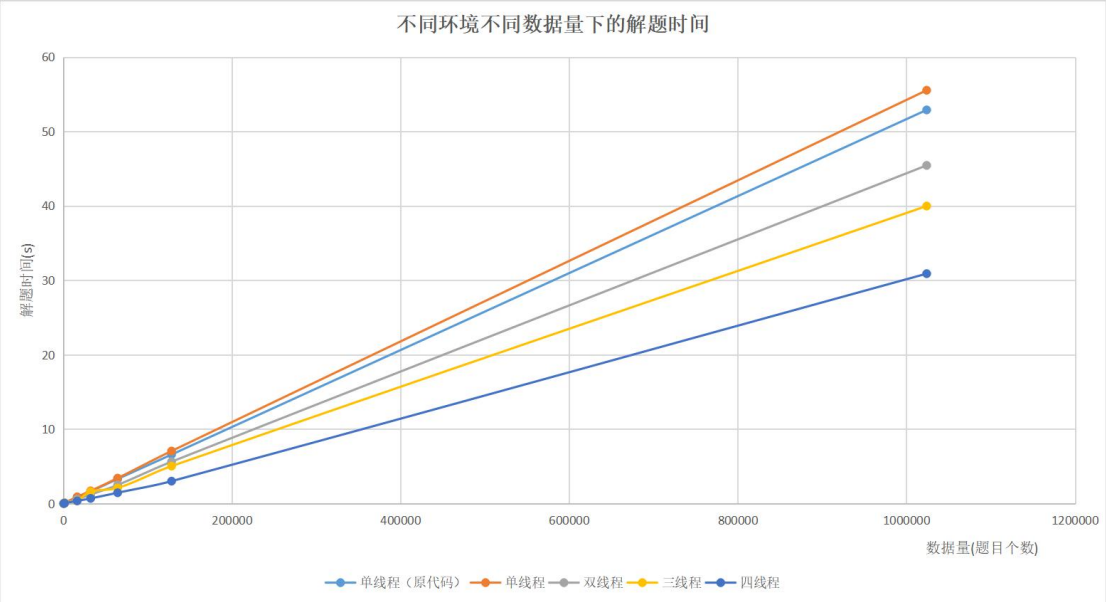


【分析表/图】

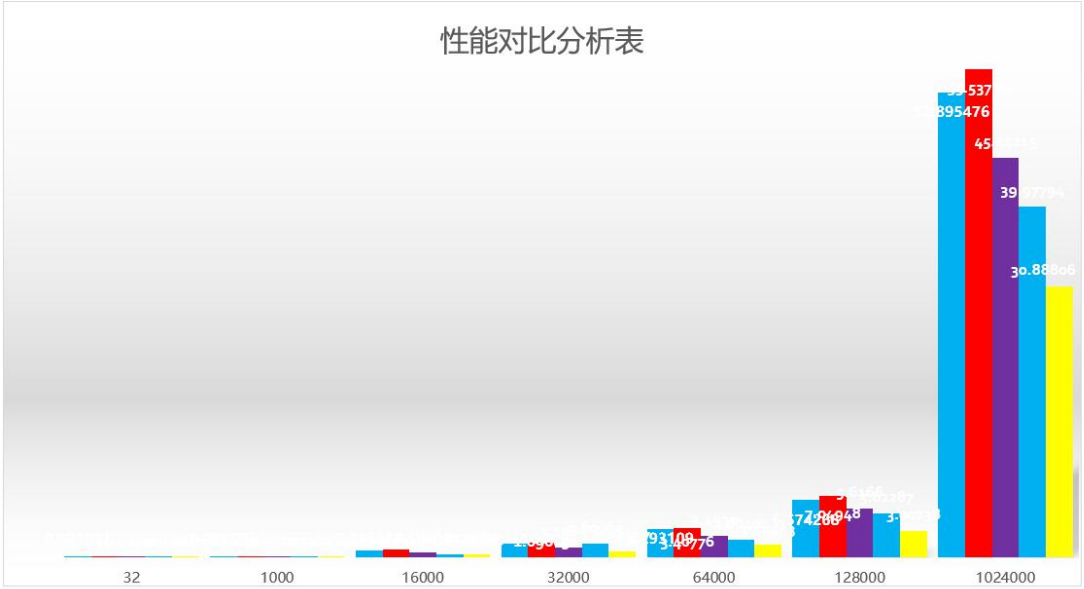
下面来用表格总结整体性能时间：

下列数据默认单位为秒

环境 / 解题时间(s) / 数据量	单线程（源代码）	单线程	双线程	三线程	四线程
32	0.001011	0.00157	0.00117	0.00218	0.00175
1000	0.098073	0.06075	0.04209	0.07362	0.03306
16000	0.845618	0.89331	0.58465	0.39239	0.34805
32000	1.625165	1.69605	1.19846	1.60064	0.68437
64000	3.293109	3.40776	2.4931	2.08401	1.44403
128000	6.574268	7.04948	5.6166	5.02287	3.00238
1024000	52.895476	55.53766	45.44125	39.97794	30.88806

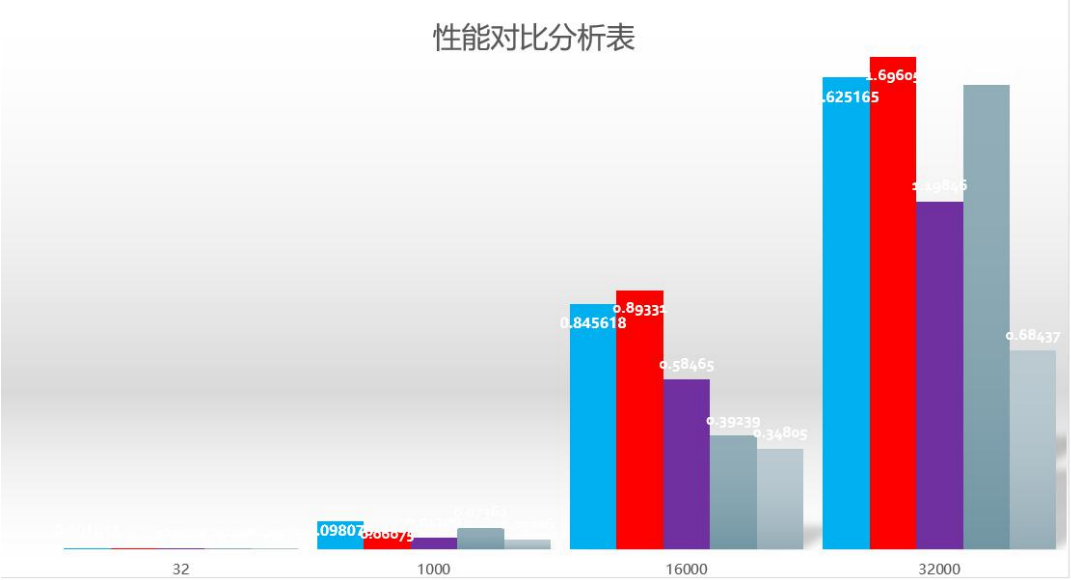


用柱形图更为直观感受



注：蓝、红、绿、紫、黄色柱分别代表单线程（源代码）、单线程、双线程、三线程、四线程

由于前四个图基本显示不出来，因为后面的时间太长，所以这里我再次在下方加入前四个部分的对比图以显示。



加速比以如下公式定义：

Sp=T1/Tp，其中指 CPU 数量，T1 指顺序执行算法的执行时间，Tp 指当有 p 个处理器时，并行算法的执行时间。当 Sp=p 时，Sp 为先行加速比（理想加速比），也就是理论上来说多核有几核加速比理论上就应该是几，下面计算了所有数据规模的加速比。

加速比：

环境 / 解题时间(s) / 数据量	单线程（源代码）	单线程	双线程	三线程	四线程	单线程加速比	双线程加速比	三线程加速比	四线程加速比
32	0.001011	0.00157	0.00117	0.00218	0.00175	64.39%	86.41%	46.38%	57.77%
1000	0.098073	0.06075	0.04209	0.07362	0.03306	161.44%	233.01%	133.22%	296.65%
16000	0.845618	0.89331	0.58465	0.39239	0.34805	94.66%	144.64%	215.50%	242.96%
32000	1.625165	1.69605	1.19846	1.60064	0.68437	95.82%	135.60%	101.53%	237.47%
64000	3.293109	3.40776	2.4931	2.08401	1.44403	96.64%	132.09%	158.02%	228.05%
128000	6.574268	7.04948	5.6166	5.02287	3.00238	93.26%	117.05%	130.89%	218.97%
1024000	52.895476	55.53766	45.44125	39.97794	30.88806	95.24%	116.40%	132.31%	171.25%

【总结】

可以明显看到，在测试的所有数据量大小的情况下，所有线程下的加速比与理想加速比的差距都是极大的。但是横向来比较，相同数据量下，用较多解题线程优势更明显，起码从单线程到四线程是一个递增的趋势；但是纵向来比较的话就不一定，可能是由于 cache 等一些问题，导致加速比有波动。当然也有可能是其他问题。但尽管与理想有一定差距，多线程的优势还是体现得很明显，数据规模庞大的情况下，多线程是占据绝对优势的。但在题目数量有限时（比如只有

32），多线程优势就没什么优势，这可能是因为基础开销过大。至此报告结束，performance test report 的要求已经全部完成，感谢老师和主教的辛勤奉献。