CS575 Project 5

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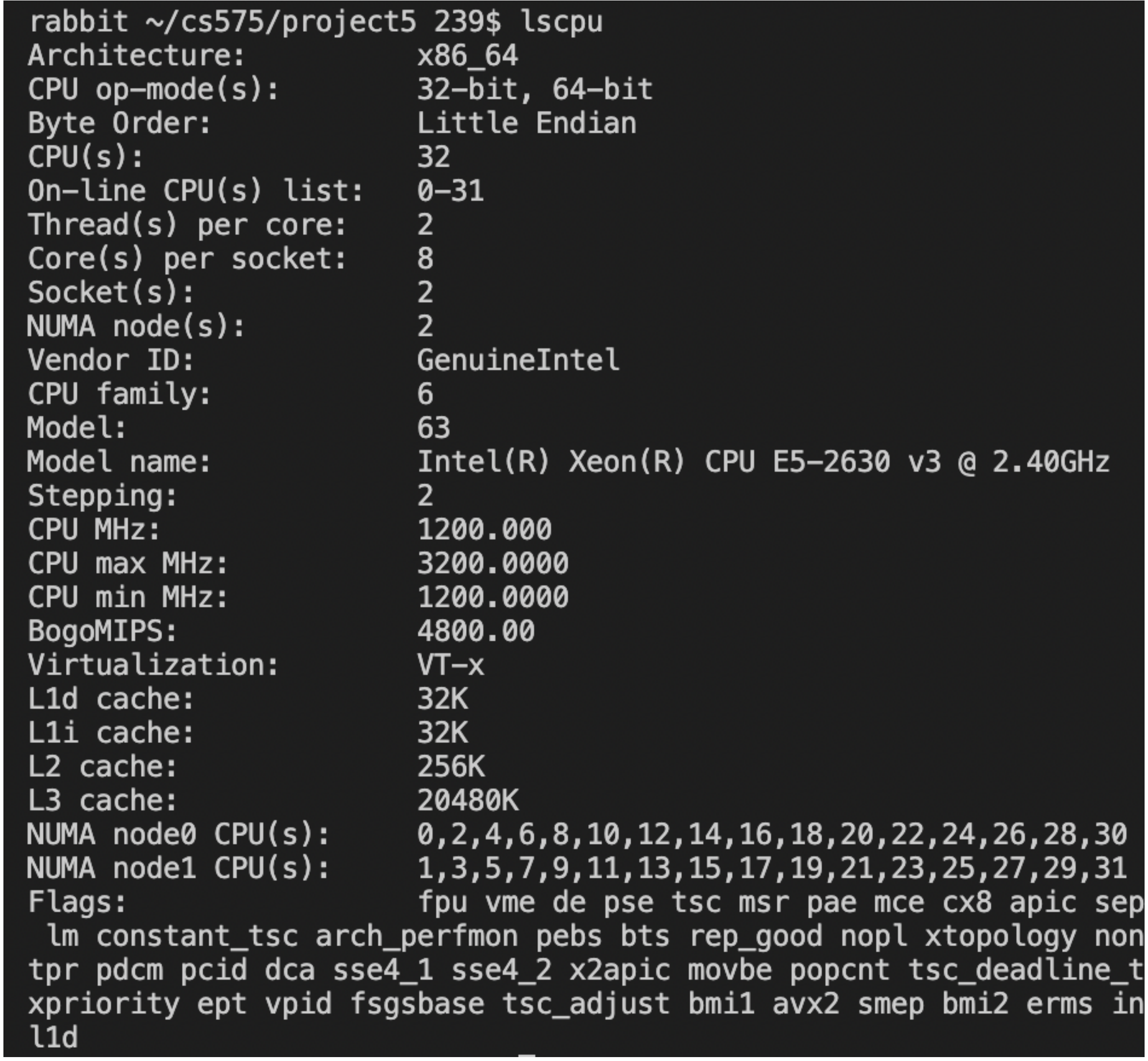
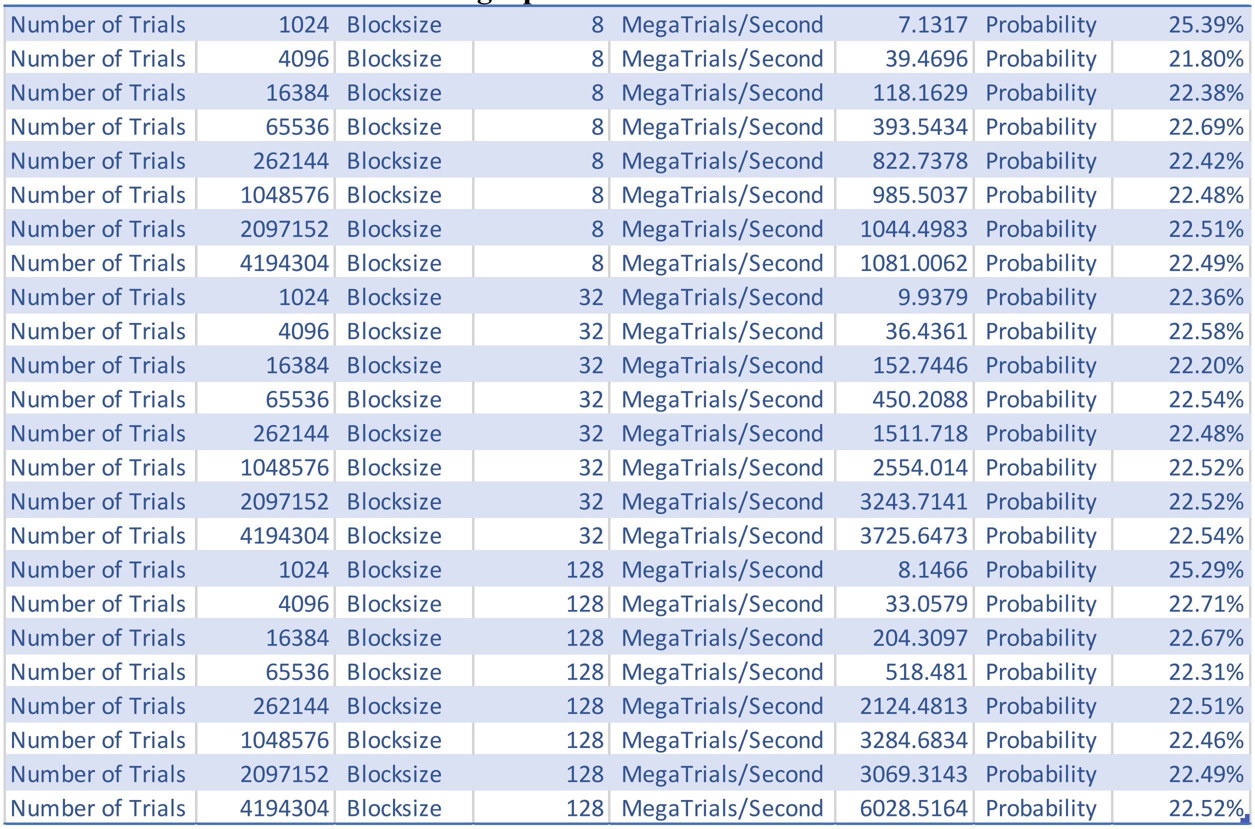
1. **Tell what machine you ran this on**

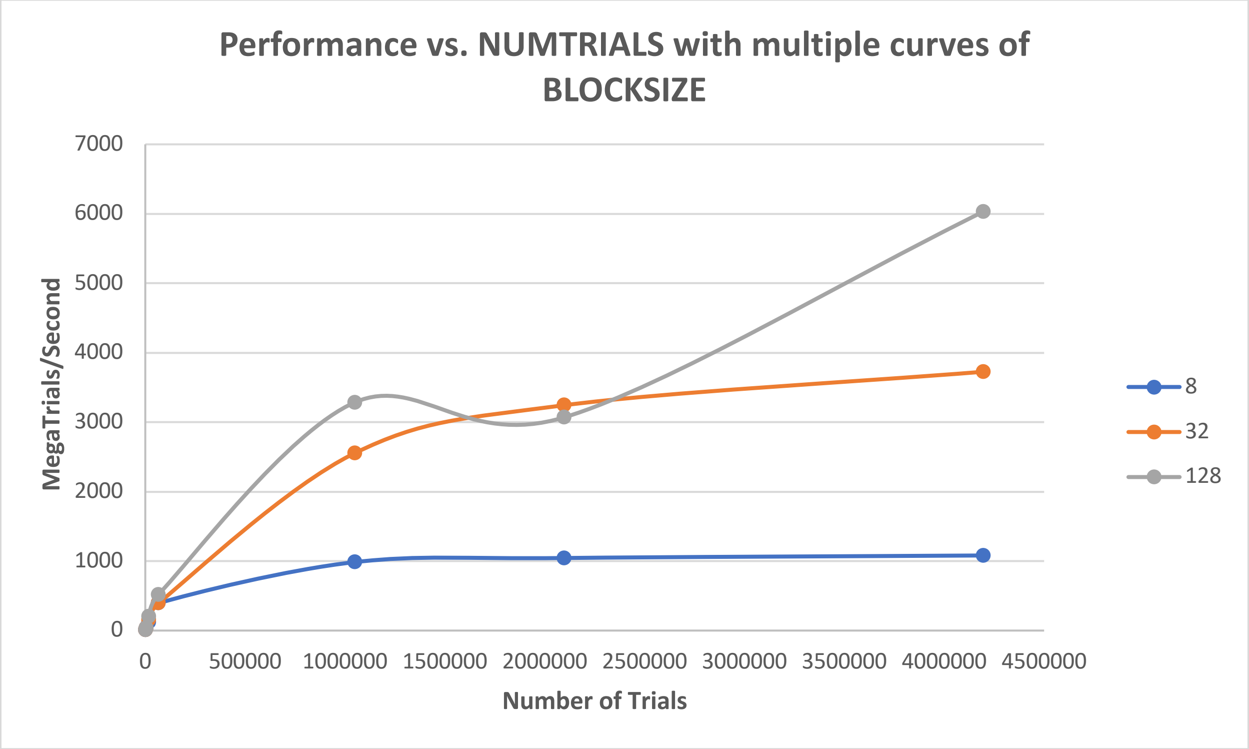


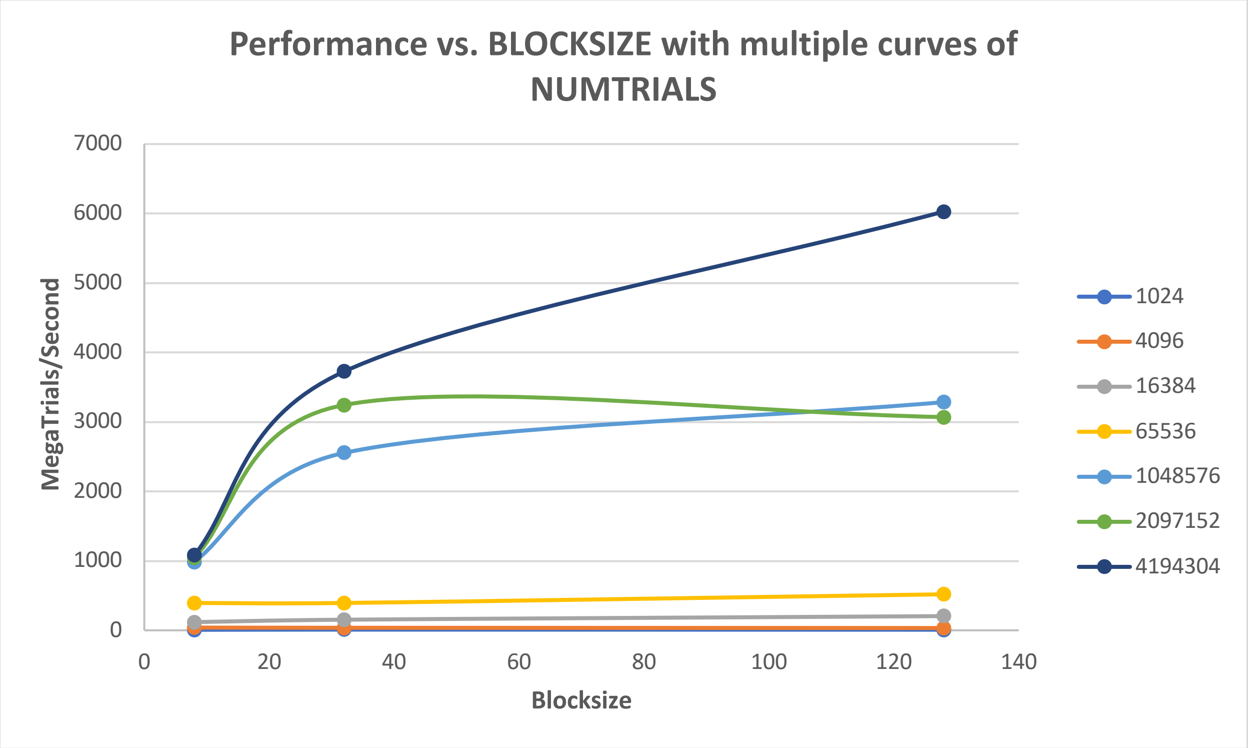
```
rabbit ~/cs575/project5 239$ lscpu
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
CPU(s):                32
On-line CPU(s) list:   0-31
Thread(s) per core:    2
Core(s) per socket:    8
Socket(s):             2
NUMA node(s):          2
Vendor ID:             GenuineIntel
CPU family:            6
Model:                 63
Model name:            Intel(R) Xeon(R) CPU E5-2630 v3 @ 2.40GHz
Stepping:              2
CPU MHz:               1200.000
CPU max MHz:           3200.0000
CPU min MHz:           1200.0000
BogoMIPS:              4800.00
Virtualization:        VT-x
L1d cache:             32K
L1i cache:             32K
L2 cache:              256K
L3 cache:              20480K
NUMA node0 CPU(s):     0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30
NUMA node1 CPU(s):     1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31
Flags:                 fpu vme de pse tsc msr pae mce cx8 apic sep
 lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology non
tpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_t
xpriority ept vpid fsgsbase tsc_adjust bmi1 avx2 smep bmi2 erms in
l1d
```

2. Show the table and the two graphs



Number of Trials	1024	Blocksize	8	MegaTrials/Second	7.1317	Probability	25.39%
Number of Trials	4096	Blocksize	8	MegaTrials/Second	39.4696	Probability	21.80%
Number of Trials	16384	Blocksize	8	MegaTrials/Second	118.1629	Probability	22.38%
Number of Trials	65536	Blocksize	8	MegaTrials/Second	393.5434	Probability	22.69%
Number of Trials	262144	Blocksize	8	MegaTrials/Second	822.7378	Probability	22.42%
Number of Trials	1048576	Blocksize	8	MegaTrials/Second	985.5037	Probability	22.48%
Number of Trials	2097152	Blocksize	8	MegaTrials/Second	1044.4983	Probability	22.51%
Number of Trials	4194304	Blocksize	8	MegaTrials/Second	1081.0062	Probability	22.49%
Number of Trials	1024	Blocksize	32	MegaTrials/Second	9.9379	Probability	22.36%
Number of Trials	4096	Blocksize	32	MegaTrials/Second	36.4361	Probability	22.58%
Number of Trials	16384	Blocksize	32	MegaTrials/Second	152.7446	Probability	22.20%
Number of Trials	65536	Blocksize	32	MegaTrials/Second	450.2088	Probability	22.54%
Number of Trials	262144	Blocksize	32	MegaTrials/Second	1511.718	Probability	22.48%
Number of Trials	1048576	Blocksize	32	MegaTrials/Second	2554.014	Probability	22.52%
Number of Trials	2097152	Blocksize	32	MegaTrials/Second	3243.7141	Probability	22.52%
Number of Trials	4194304	Blocksize	32	MegaTrials/Second	3725.6473	Probability	22.54%
Number of Trials	1024	Blocksize	128	MegaTrials/Second	8.1466	Probability	25.29%
Number of Trials	4096	Blocksize	128	MegaTrials/Second	33.0579	Probability	22.71%
Number of Trials	16384	Blocksize	128	MegaTrials/Second	204.3097	Probability	22.67%
Number of Trials	65536	Blocksize	128	MegaTrials/Second	518.481	Probability	22.31%
Number of Trials	262144	Blocksize	128	MegaTrials/Second	2124.4813	Probability	22.51%
Number of Trials	1048576	Blocksize	128	MegaTrials/Second	3284.6834	Probability	22.46%
Number of Trials	2097152	Blocksize	128	MegaTrials/Second	3069.3143	Probability	22.49%
Number of Trials	4194304	Blocksize	128	MegaTrials/Second	6028.5164	Probability	22.52%





3. **What patterns are you seeing in the performance curves?**
   In the above figures, I am seeing a huge capacity on the performance. Even though there have been 4 million plus trials, the outcomes are continually growing. Nevertheless, the maximum performance of the program executing on the GPU (using rabbit) appears to be limited to 128 blocks. When the data size is large, the software performs better than when the data size is small.
4. **Why do you think the patterns look this way?**
   The reason why I think the patterns look this way is because I'm working with a GPU, which can handle enormous data sets. With that, once the block size is appropriate for the data amount, more data usually means higher efficiency. In addition, for parallel computing, many data sets can be collected at the same time and stored in different blocks. The primary reason for this is that the number of trials and block sizes are both growing.
5. **Why is a BLOCKSIZE of 8 so much worse than the others?**
   Because BLOCKSIZE 8 indicates that there are only 8 threads per block, and more threads per block means greater performance. Here, the lowest number of BLOCKSIZE is 8, so this is the reason why it is significantly lower than the others.
6. **How do these performance results compare with what you got in Project #1? Why?**
   Because this project (project#5) uses CUDA to compute some functions, the GPU permits a large number of threads to do our calculation, and GPU chips are specialized to handle streaming data, the performance is significantly better than project#1.
7. **What does this mean for the proper use of GPU parallel computing?**
   It signifies that GPU is capable of handling large amounts of data.