deti universidade de aveiro
departamento de eletrónica, telecomunicações e informática

Assignment 2 – Proof of Work

Arquiteturas de Alto Desempenho

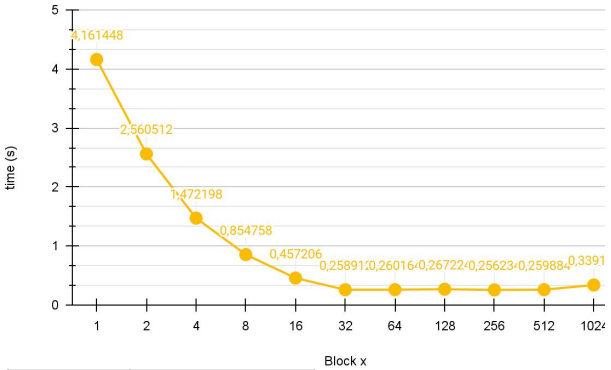
Work done by:
-Lúcia Sousa 93086
-Rodrigo Martins 93264
Gr5 TP2

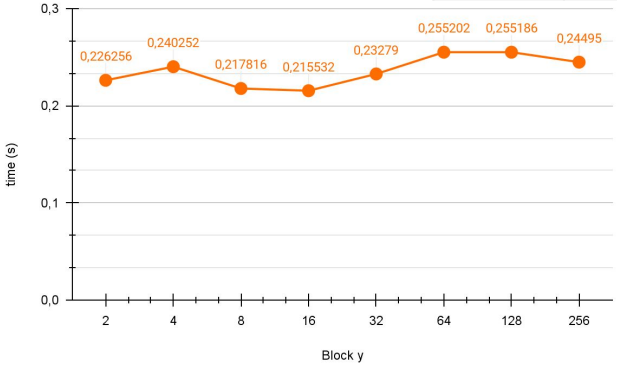
january 2022
Academic year 2021/2022

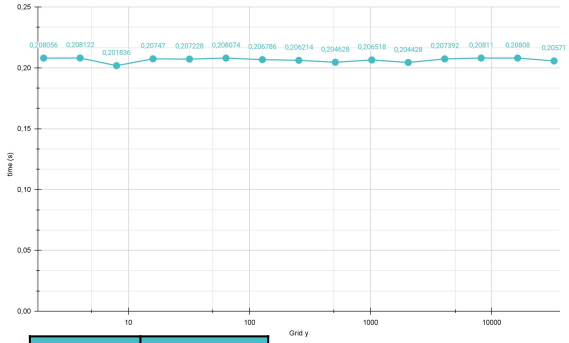
PoW24

Getting the optimal grid and block setup

Grid.x	Grid.y	Block.x	Block.y	number blocks	number threads per block
262144	8	16	16	2097152	256







block x	time (s)
1	4,161448
2	2,560512
4	1,472198
8	0,854758
16	0,457206
32	0,258912
64	0,260164
128	0,267224
256	0,256234
512	0,259884
1024	0,339148

21-0-8-0

standard deviation
1,270349326

block y	time (s)
2	0,226256
4	0,240252
8	0,217816
16	0,215532
32	0,23279
64	0,255202
128	0,255186
256	0,24495

21-0-4-4

standard deviation
0,01553727264

grid y	time (s)
2	0,208056
4	0,208122
8	0,201836
16	0,20747
32	0,207228
64	0,208074
128	0,206786
256	0,206214
512	0,204628
1024	0,206518
2048	0,204428
4096	0,207392
8192	0,20811
16384	0,20808
32768	0,20571

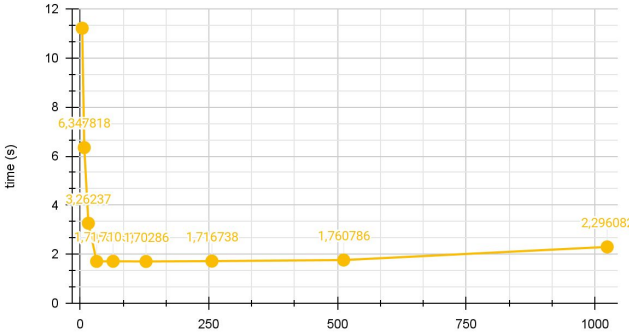
18-3-4-4

standard deviation
0,001795521222

PoW27

Getting the optimal grid and block setup

Grid.x	Grid.y	Block.x	Block.y	number blocks	number threads per block
262144	128	32	4	33554432	128

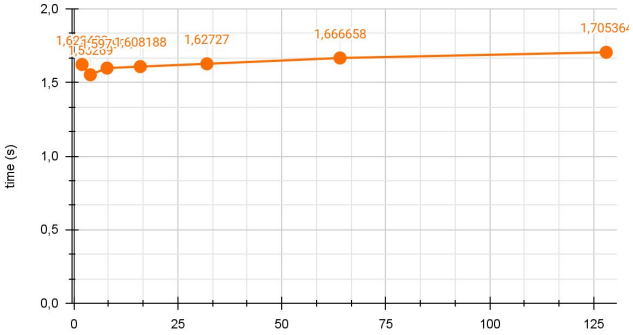


block x	time (s)
4	11,214564
8	6,347818
16	3,26237
32	1,70567
64	1,71051
128	1,70286
256	1,716738
512	1,760786
1024	2,296082

Block x

25-0-7-0

standard deviation
3,259250217

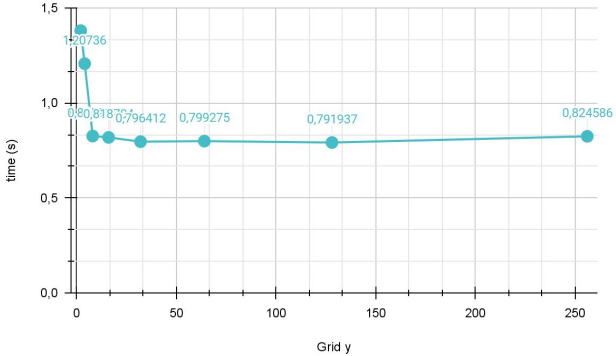


block y	time (s)
2	1,622422
4	1,55269
8	1,597992
16	1,608188
32	1,62727
64	1,666658
128	1,705364

Block y

25-0-5-2

standard deviation
0,04906104618



grid y	time (s)
2	1,38123
4	1,20736
8	0,825914
16	0,818704
32	0,796412
64	0,799275
128	0,791937
256	0,824586

18-7-5-2

standard deviation
0,2295531034

Device Information

- Device 0: "GeForce GTX 1660 Ti"
- CUDA Driver Version / Runtime Version 10.2 / 10.2
- CUDA Capability Major/Minor version number: 7.5
- Total amount of global memory: 5.81 GBytes (6233391104 bytes)
- GPU Clock rate: 1860 MHz (1.86 GHz) Memory
- Clock rate: 6001 Mhz
- Memory Bus Width: 192-bit
- L2 Cache Size: 1572864 bytes
- Max Texture Dimension Size (x,y,z) 1D=(131072), 2D=(131072,65536), 3D=(16384,16384,16384)
- Max Layered Texture Size (dim) x layers 1D=(32768) x 2048, 2D=(32768,32768) x 2048
- Total amount of constant memory: 65536 bytes
- Total amount of shared memory per block: 49152 bytes
- Total number of registers available per block: 65536
- Warp size: 32
- Maximum number of threads per multiprocessor: 1024
- Maximum number of threads per block: 1024
- Maximum sizes of each dimension of a block: 1024 x 1024 x 64
- Maximum sizes of each dimension of a grid: 2147483647 x 65535 x 65535
- Maximum memory pitch: 2147483647 bytes

Conclusion

$$speed_{up} = \frac{execution\ time\ PoW24}{execution\ time\ PoW24\ improved} = \frac{4,161448}{0,201836} = 20,6$$

$$speed_{up} = \frac{execution\ time\ PoW27}{execution\ time\ PoW27\ improved} = \frac{11,214564}{0,791937} = 14,2$$

$$active\ threads = \frac{number\ of\ \ registers\ per\ block}{number\ of\ \ registers\ per\ thread} = \frac{65536}{255} = 257$$

$$occupancy\ registers = \frac{active\ warps}{maximum\ active\ warps} = \frac{257}{1536} = 0,167 = 16,7\%$$

number of SMs: 24
number of Cores: 1536
number of Cores per SM: 64 Cores/SM