

Hoja de trabajo 3

Ejercicio 1

a. Se observa que se corre 10 veces

```
root@6e6bebc67c58:/parallel_computing# ./hello
Hello world
Hello world
Hello world
Hello world
Hello world
Hello world
Hello world
Hello world
Hello world
Hello world
```

b. Modifique el programa para correr 2 bloques de 1024 hilos. Modificarlo también para que imprima su nombre y carnet.

Busque en el despliegue de consola el mensaje del último hilo de la serie (1023).

```
root@6e6bebc67c58:/parallel_computing# nvcc hello.cu -o hello
hello.cu: In function 'int main()':
hello.cu:29:22: warning: 'cudaError_t cudaThreadSynchronize()' is deprecated [-Wdeprecated-declarations]
   29 |     cudaThreadSynchronize(); //deprecated
      |     ~~~~~
/usr/local/cuda/bin/../targets/x86_64-linux/include/cuda_runtime_api.h:1052:46: note: declared here
 1052 | extern __CUDA_DEPRECATED __host__ cudaError_t CUDARTAPI cudaThreadSynchronize(void);
      |
root@6e6bebc67c58:/parallel_computing# ./hello
Hello world from thread 1023, block 1
Hello world from thread 1023, block 0
Name: Diego Alonzo, Carne: 20172
Name: Diego Alonzo, Carne: 20172
root@6e6bebc67c58:/parallel_computing#
```

c. Compute Capability



CUDA-Enabled GeForce and TITAN Products

GeForce and TITAN Products

GPU	Compute Capability
GeForce RTX 4090	8.9
GeForce RTX 4080	8.9
GeForce RTX 4070 Ti	8.9
GeForce RTX 4060 Ti	8.9
GeForce RTX 3090 Ti	8.6
GeForce RTX 3090	8.6
GeForce RTX 3080 Ti	8.6
GeForce RTX 3080	8.6
GeForce RTX 3070 Ti	8.6
GeForce RTX 3070	8.6
GeForce RTX 3060 Ti	8.6
GeForce RTX 3060	8.6
GeForce GTX 1650 Ti	7.5

GeForce Notebook Products

GPU	Compute Capability
GeForce RTX 4090	8.9
GeForce RTX 4080	8.9
GeForce RTX 4070	8.9
GeForce RTX 4060	8.9
GeForce RTX 4050	8.9
GeForce RTX 3080 Ti	8.6
GeForce RTX 3080	8.6
GeForce RTX 3070 Ti	8.6
GeForce RTX 3070	8.6
GeForce RTX 3060 Ti	8.6
GeForce RTX 3060	8.6
GeForce RTX 3050 Ti	8.6
GeForce RTX 3050	8.6

```
root@6e6bebc67c58:/parallel_computing# ./getSpecs
Warp size: 32
Max threads per block: 1024
Max block dimensions (x, y, z): (1024, 1024, 64)
Max grid dimensions (x, y, z): (2147483647, 65535, 65535)
Max grid size X: 2147483647
Max grid size Y: 65535
Max grid size Z: 65535
Max block size X: 1024
Max block size Y: 1024
Max block size Z: 64
```

Basado en eso tiene una compute capability de 8.6 dado que es RTX 3500 > RTX 3000

d. Modifique el programa para correr un bloque con 2048 hilos

```
root@6e6bebc67c58:/parallel_computing# ./hello1_2048
root@6e6bebc67c58:/parallel_computing#
```

No imprime nada, esto es debido a que lo máximo de hilos que puede tener es de 1024.

e. Busque en la tabla CC

	GeForce RTX 3080 Ti Laptop GPU	GeForce RTX 3080 Laptop GPU	GeForce RTX 3070 Ti Laptop GPU	GeForce RTX 3070 Laptop GPU	GeForce RTX 3060 Laptop GPU	GeForce RTX 3050 Ti Laptop GPU	GeForce RTX 3050 Laptop GPU
GPU Engine Specs:							
NVIDIA CUDA® Cores	7424	6144	5888	5120	3840	2560	2048 - 2560
Boost Clock (MHz)	125 - 1500 MHz	1245 - 1710 MHz	1035 - 1485 MHz	1290 - 1620 MHz	1283 - 1703 MHz	1035 - 1605 MHz	990 - 1740 MHz
GPU Subsystem Power (W)	80 - 150 W	80 - 150 W	80 - 125 W	80 - 125 W	80 - 115 W	35 - 80 W	35 - 80 W
Memory Specs:							
Standard Memory Config	16 GB GDDR6	16 GB GDDR6 8 GB GDDR6	8 GB GDDR6	8 GB GDDR6	8 GB GDDR6	4 GB GDDR6	8 GB GDDR6 4 GB GDDR6
Memory Interface Width	256-bit	256-bit	256-bit	256-bit	192-bit	128-bit	64 - 128-bit
Technology Support:							
Ray Tracing Cores	2nd Generation	2nd Generation	2nd Generation	2nd Generation	2nd Generation	2nd Generation	2nd Generation
Tensor Cores	3rd Generation	3rd Generation	3rd Generation	3rd Generation	3rd Generation	3rd Generation	3rd Generation
NVIDIA Architecture	Ampere	Ampere	Ampere	Ampere	Ampere	Ampere	Ampere
Microsoft DirectX® 12 Ultimate	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NVIDIA DLSS	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NVIDIA Reflex	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NVIDIA Broadcast	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PCI Express Gen 4	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Resizable BAR	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NVIDIA GeForce Experience™	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NVIDIA Ansel	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NVIDIA FreeStyle	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NVIDIA ShadowPlay™	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NVIDIA Highlights	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NVIDIA G-SYNC	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Game Ready Drivers	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NVIDIA Studio Drivers	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NVIDIA Omniverse	Yes	Yes	Yes	Yes	Yes	-	-
NVIDIA GPU Boost™	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vulkan RT API, OpenGL 4.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HDMI®	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DisplayPort™	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NVIDIA Encoder	7th Generation	7th Generation	7th Generation	7th Generation	7th Generation	7th Generation	7th Generation
NVIDIA Decoder	5th Generation	5th Generation	5th Generation	5th Generation	5th Generation	5th Generation	5th Generation
CUDA Capability	8.6	8.6	8.6	8.6	8.6	8.6	8.6
VR Ready	Yes	Yes	Yes	Yes	Yes	No	No

No encontré una tabla que me indicara eso por lo que decidí hacer un programa que me obtuviera esas especificaciones:

```
root@6e6bebc67c58:/parallel_computing# ./getSpecs
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Max grid dimensions (x, y, z): (2147483647, 65535, 65535)
Max grid size X: 2147483647
Max grid size Y: 65535
Max grid size Z: 65535
Max block size X: 1024
Max block size Y: 1024
Max block size Z: 64
```

Ejercicio 2

- a. Descargue, compile y ejecute hello2.cu. Observe la relación de la configuración de la llamada al kernel con la geometría de los hilos y el resultado. Escriba la respuesta a los dos enunciados:
 - a. Maximo ID de hilos: 240

- b. Ejecución de los hilos en orden: Los hilos van en conjuntos de 20 en 20 de manera que empieza en 100 hasta 119, luego pasa a otro bloque y así.

```
root@6e6bebc67c58:/parallel_computing# ./hello2
Hello world from 100
Hello world from 101
Hello world from 102
Hello world from 103
Hello world from 104
Hello world from 105
Hello world from 106
Hello world from 107
Hello world from 108
Hello world from 109
Hello world from 110
Hello world from 111
Hello world from 112
Hello world from 113
Hello world from 114
Hello world from 115
Hello world from 116
Hello world from 117
Hello world from 118
Hello world from 119
Hello world from 60
Hello world from 61
Hello world from 62
Hello world from 63
Hello world from 64
```

- b. Observe que la fórmula genérica para cálculo del ID global está en los comentarios. Modifique el programa para que imprima también su nombre y carné. Luego, realice la siguiente modificación al programa (al inicio del main) y use la

fórmula genérica para derivar el nuevo cálculo de ID.

```
root@6e6bebc67c58:/parallel_computing# ./hello2_ex2
Hello world says Diego Alonzo carne 20172 from thread: 32
Hello world says Diego Alonzo carne 20172 from thread: 63
Hello world says Diego Alonzo carne 20172 from thread: 224
Hello world says Diego Alonzo carne 20172 from thread: 255
Hello world says Diego Alonzo carne 20172 from thread: 32
Hello world says Diego Alonzo carne 20172 from thread: 63
Hello world says Diego Alonzo carne 20172 from thread: 160
Hello world says Diego Alonzo carne 20172 from thread: 191
Hello world says Diego Alonzo carne 20172 from thread: 32
Hello world says Diego Alonzo carne 20172 from thread: 63
Hello world says Diego Alonzo carne 20172 from thread: 224
Hello world says Diego Alonzo carne 20172 from thread: 255
Hello world says Diego Alonzo carne 20172 from thread: 0
Hello world says Diego Alonzo carne 20172 from thread: 31
Hello world says Diego Alonzo carne 20172 from thread: 96
Hello world says Diego Alonzo carne 20172 from thread: 127
Hello world says Diego Alonzo carne 20172 from thread: 0
Hello world says Diego Alonzo carne 20172 from thread: 31
Hello world says Diego Alonzo carne 20172 from thread: 32
Hello world says Diego Alonzo carne 20172 from thread: 63
Hello world says Diego Alonzo carne 20172 from thread: 64
Hello world says Diego Alonzo carne 20172 from thread: 95
Hello world says Diego Alonzo carne 20172 from thread: 32
Hello world says Diego Alonzo carne 20172 from thread: 63
Hello world says Diego Alonzo carne 20172 from thread: 64
Hello world says Diego Alonzo carne 20172 from thread: 95
Hello world says Diego Alonzo carne 20172 from thread: 96
Hello world says Diego Alonzo carne 20172 from thread: 127
```

- c. Revise nuevamente la información del Compute Capability respecto a las dimensiones máximas de hilos-bloque en x, y, & z para una grilla. Cree una configuración para lanzar exitosamente el kernel para procesar 100,000 datos. (Sugerencia: busque una configuración que lance como mínimo 100,000 hilos. Modifique el kernel para que imprima el mensaje únicamente s

i es el ID global máximo).

```
root@6e6bebc67c58:/parallel_computing# ./hello2_ex3
Hello world from 1024
Hello world from 7168
Hello world from 11264
Hello world from 17408
Hello world from 0
Hello world from 6144
Hello world from 3072
Hello world from 10240
Hello world from 9216
Hello world from 16384
Hello world from 5120
Hello world from 2048
Hello world from 13312
Hello world from 8192
Hello world from 19456
Hello world from 4096
Hello world from 15360
Hello world from 12288
Hello world from 18432
Hello world from 14336
Hello world from 2047
Hello world from 12287
Hello world from 8191
```