Programación en paralelo con CUDA

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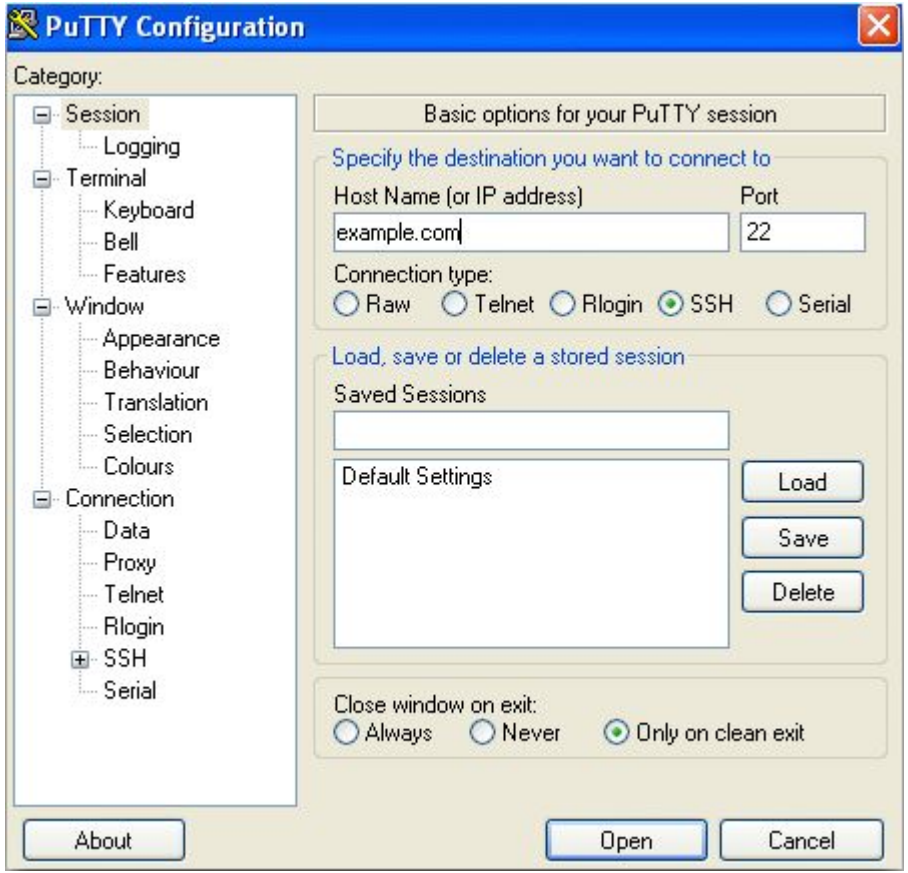
- Instalación de software.
- Introducción a CUDA

Instalación de software

Software requerido

- Windows
  - Putty (http://www.putty.org/)
  - TurboVNC (https://goo.gl/JJ6y4X)
  - WinSCP (https://goo.gl/CUwUrr)
- MacOS
  - TurboVNC (https://goo.gl/JJ6y4X)
- Linux
  - SSH (`sudo apt-get install openssh-server`)
  - TurboVNC (https://goo.gl/JJ6y4X)

Conectarse al servidor (Windows)



Conectarse al servidor (Windows)

Conectarse al servidor (Linux, MacOS)

- Abrir una terminal.
- `ssh -XC usuario@10.25.24.6`

Habilitar/acceder escritorio remoto

```
> ssh -XC pperezm@10.25.24.6
pperezm@10.25.24.6's password:
Welcome to Ubuntu 16.04.3 LTS (GNU/Linux
4.10.0-37-generic x86_64)

pperezm@gpuserver:~$ vncserver

Desktop 'TurboVNC: gpuserver:1 (pperezm)' started
on display gpuserver:1

Starting applications specified in
/home/pperezm/.vnc/xstartup.turbovnc
Log file is /home/pperezm/.vnc/gpuserver:1.log
```

Habilitar/acceder escritorio remoto

Habilitar/acceder escritorio remoto

Habilitar/acceder escritorio remoto

```
pperezm@gpuserver:~$ vncserver -list
TurboVNC server sessions:
X DISPLAY #  PROCESS ID
:1       3538

pperezm@gpuserver:~$ vncserver -kill :1
Killing Xvnc process ID 3538

pperezm@gpuserver:~$ vncserver -list
TurboVNC server sessions:
X DISPLAY #  PROCESS ID
```

Ejecutar una aplicación que utiliza CUDA

Introducción de CUDA

CPU vs. GPU

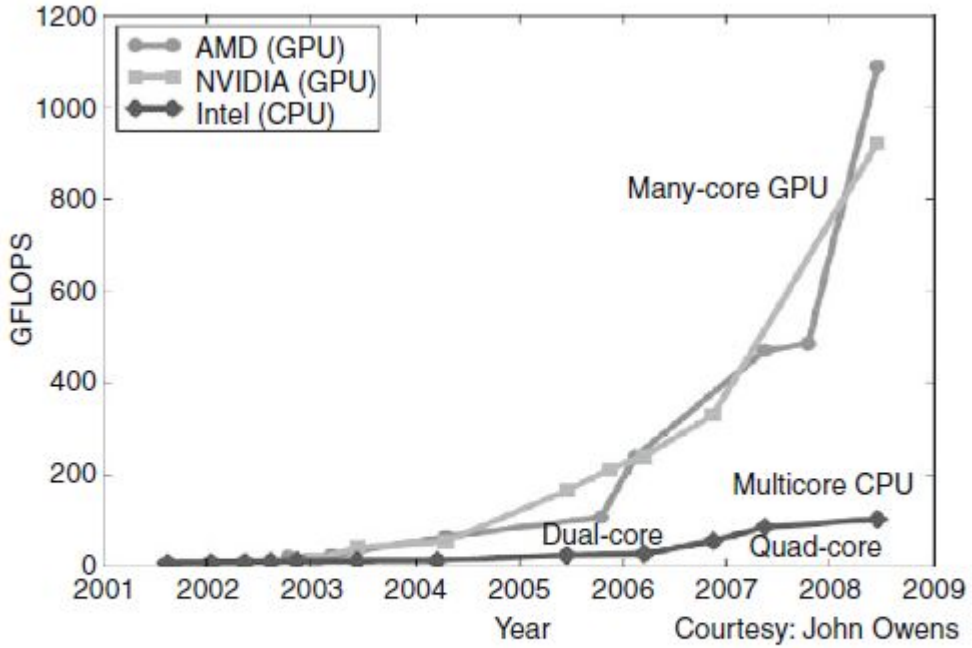


FIGURE 1.1

Enlarging performance gap between GPUs and CPUs.

- CPU está especializado para el desempeño de código secuencial. GPU está espacializado en punto flotante.
- La velocidad de acceso a la memoria en ambas arquitecturas.

CPU vs. GPU

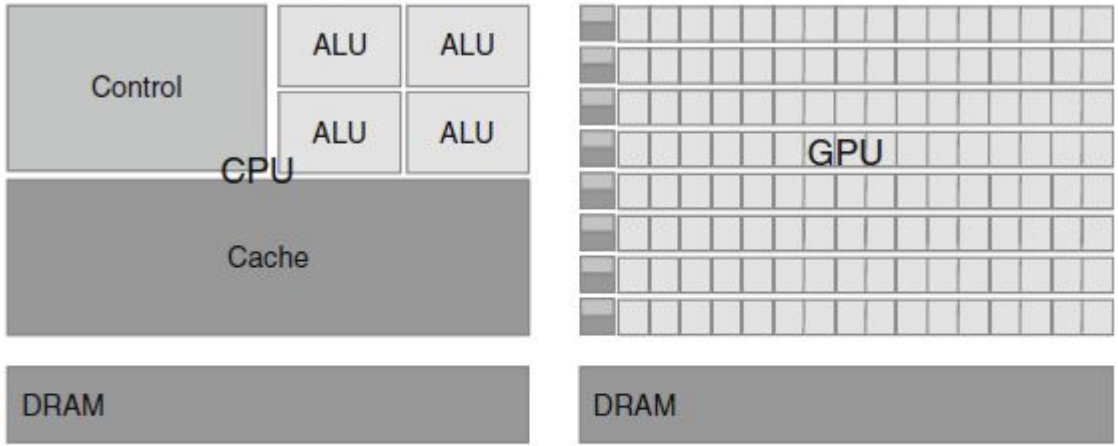
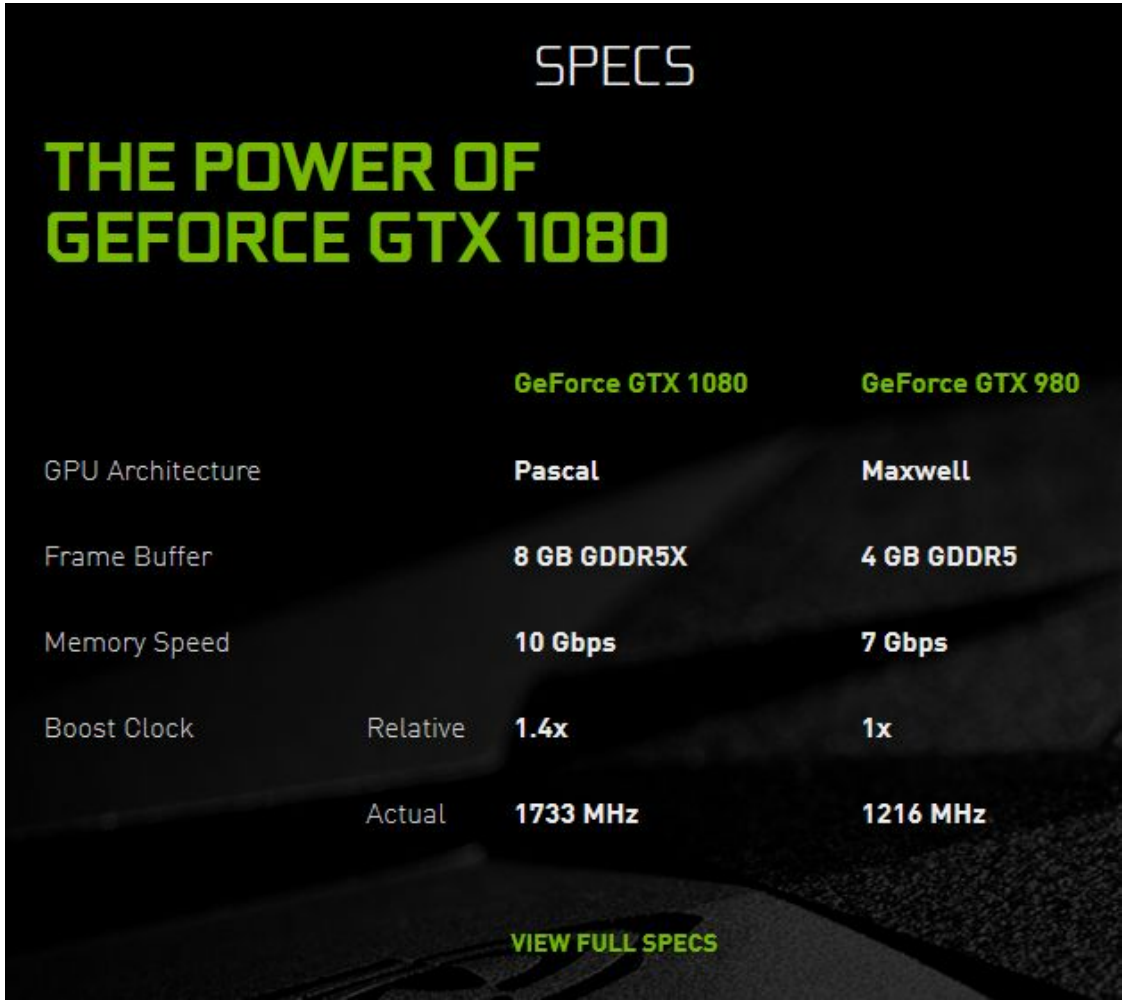


FIGURE 1.2

CPUs and GPUs have fundamentally different design philosophies.

CPU vs. GPU


SPECS
THE POWER OF GEFORCE GTX 1080
GeForce GTX 1080
GeForce GTX 980
GPU Architecture
Pascal
Maxwell
Frame Buffer
8 GB GDDR5X
4 GB GDDR5
Memory Speed
10 Gbps
7 Gbps
Boost Clock
Relative
1.4x
1x
Actual
1733 MHz
1216 MHz
VIEW FULL SPECS

CPU vs. GPU

Quadro K5000

GPU Specs	
CUDA Cores[1]	1536
Single Precision Compute Performance	2.1 Teraflops
GPU Memory Specs	
Memory Size Total	4GB GDDR5
Memory Interface	256-bit
Memory Bandwidth (GB/sec)	173 GB/s

CPU vs. GPU

Breakthrough Titan Performance

Jaguar Specs (2011)	
Compute Nodes	18,688
Login & I/O Nodes	256
Memory per node	16 GB
# of Opteron cores	224,256
# of NVIDIA K20 “Kepler” accelerators (2013)	N/A
Total System Memory	300 TB
Total System Peak Performance	2.3 Petaflops

Titan Specs (2012)	
Compute Nodes	18,688
Login & I/O Nodes	512
Memory per node	32 GB + 6 GB
# of Opteron cores	299,008
# of NVIDIA K20 “Kepler” accelerators (2013)	18,688
Total System Memory	710 TB
Total System Peak Performance	20+ Petaflops