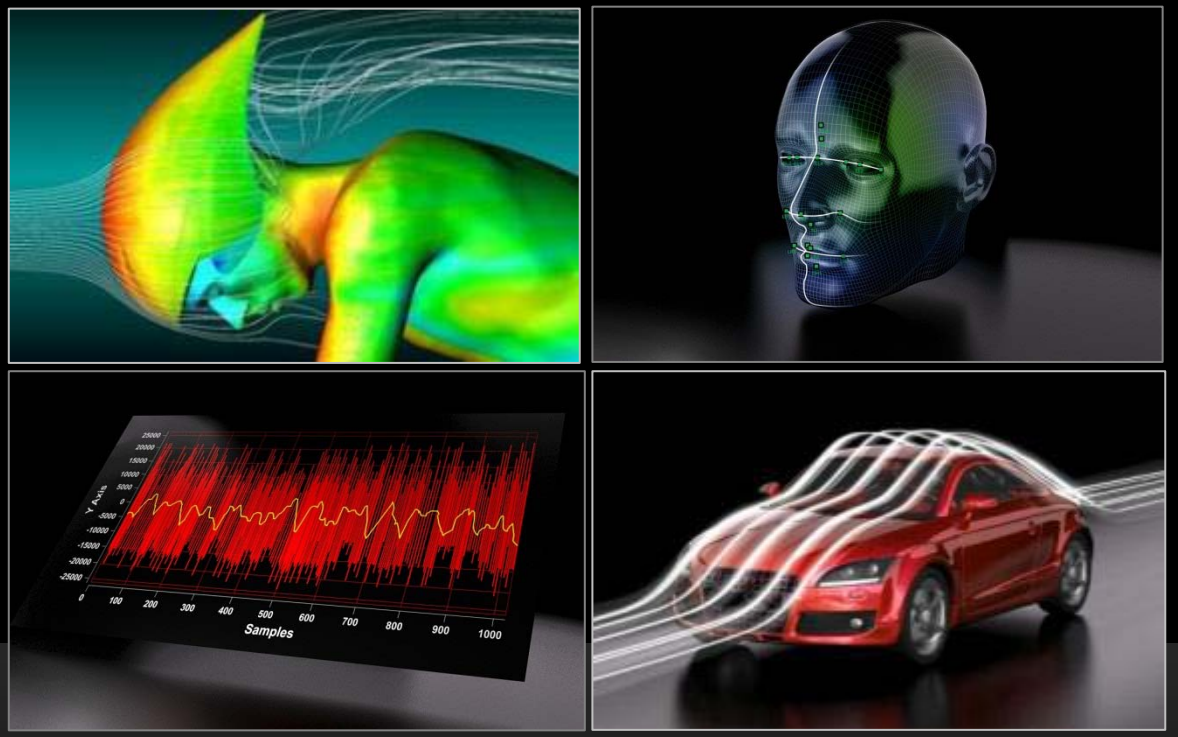
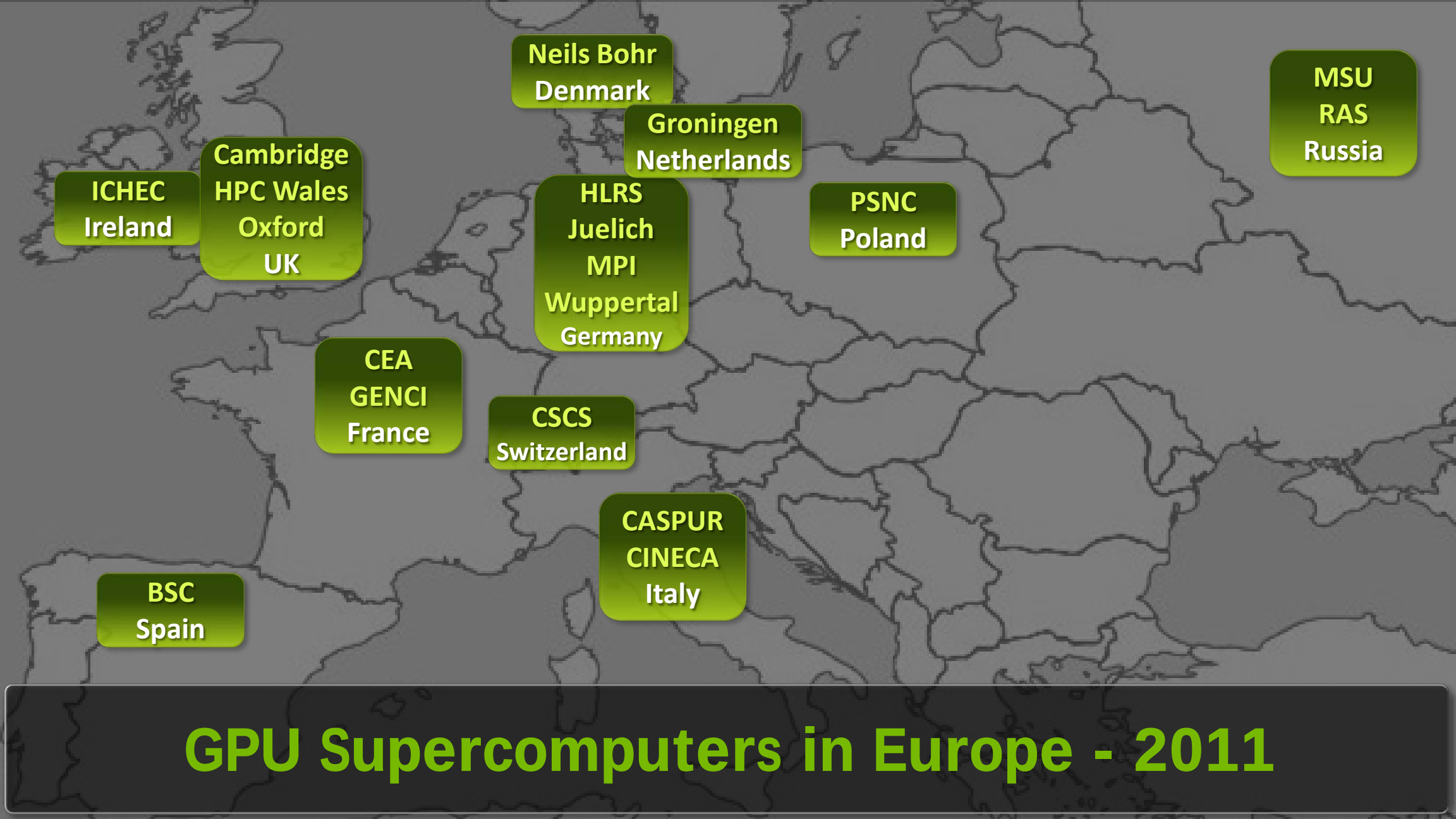
Tesla
GPU Computing



GPU Technology Update

www.nvidia.com/tesla

GPU Supercomputers in Europe - 2010


Neils Bohr
Denmark
Groningen
Netherlands
MSU
RAS
Russia
ICHEC
Ireland
Cambridge
HPC Wales
Oxford
UK
HLRS
Juelich
MPI
Wuppertal
Germany
PSNC
Poland
CEA
GENCI
France
CSCS
Switzerland
CASPUR
CINECA
Italy
BSC
Spain
GPU Supercomputers in Europe - 2011

Fastest Supercomputer in Russia

Moscow State University

1.3 Petaflops Peak

1554 Tesla X2070 GPUs

+1554 Intel CPUs

Research Topics

- **Ocean Modeling**
- **Climate Change**
- **Genomic Medicine**
- **Galaxy Formation**

Tesla GPUs Supercharge

The Fastest Supercomputers in

China
India
Italy
Japan
Russia
Spain

World's Fastest Molecular Dynamics Simulation

Sustained Performance of 1.87 Petaflops/s

Institute of Process Engineering (IPE)

Chinese Academy of Sciences (CAS)

Simulation for Crystalline Silicon

Used for Photovoltaic cells & Semiconductors

Used all 7168 Tesla GPUs on Tianhe-1A GPU Supercomputer

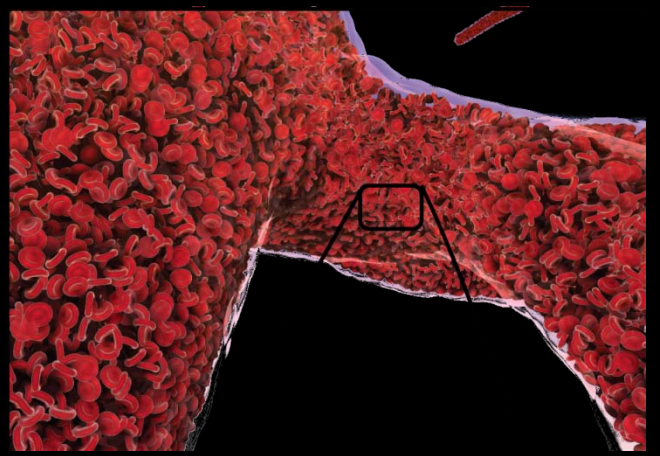
Large Scale GPU Simulations on Tsubame

ASUCA Weather Modeling

3990 Tesla GPUs

76.1 Tflops

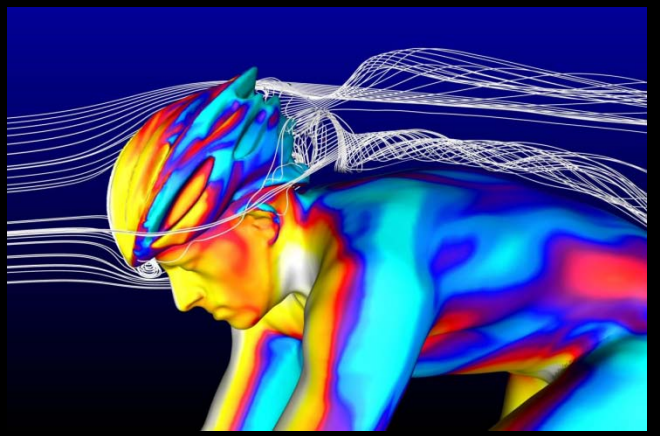
Blood Flow Simulations



4000 Tesla GPUs

600 Tflops

Himeno: Navier Stokes



1024 Tesla GPUs

7.9 Tflops

The Biggest Hurdle to the Adoption of GPUs

The Misconception that GPU Computing is Hard

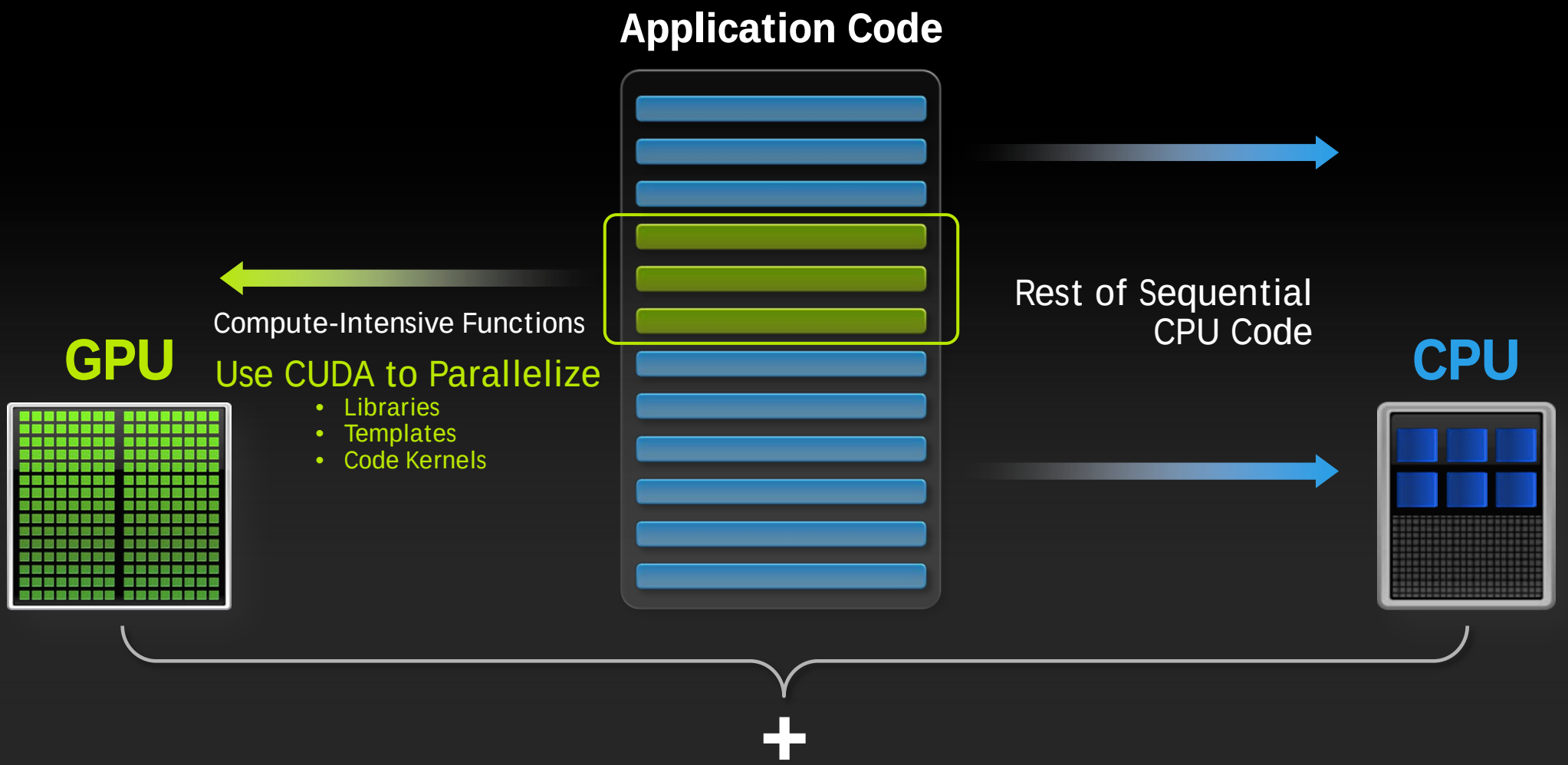
3 Myths about CUDA

1. You have to port your entire application to the GPU

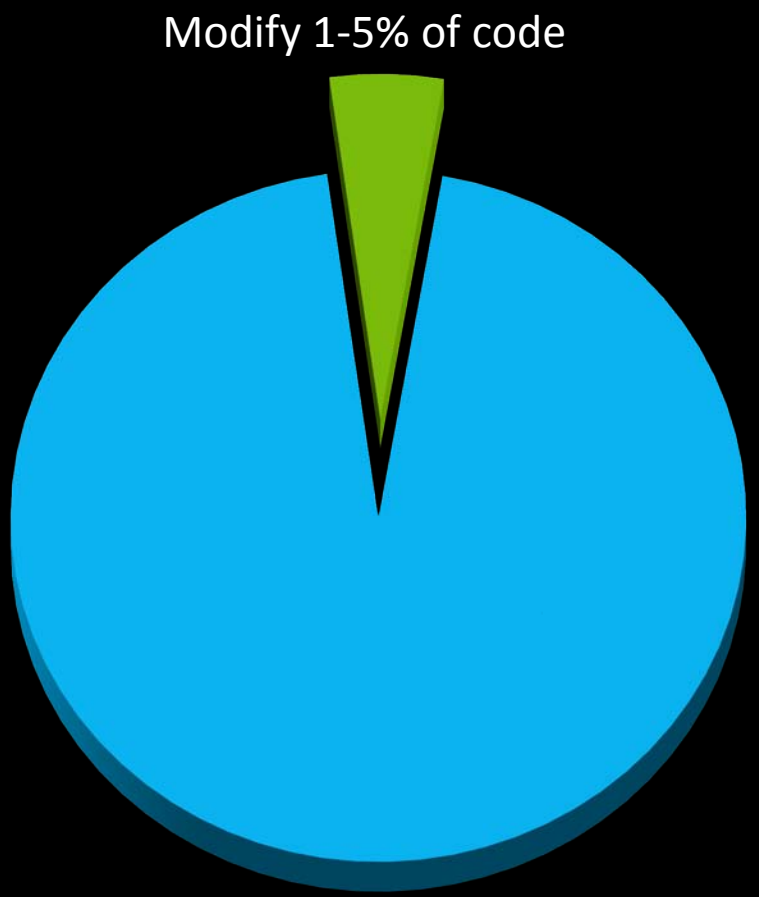
2. It is really hard to accelerate your application

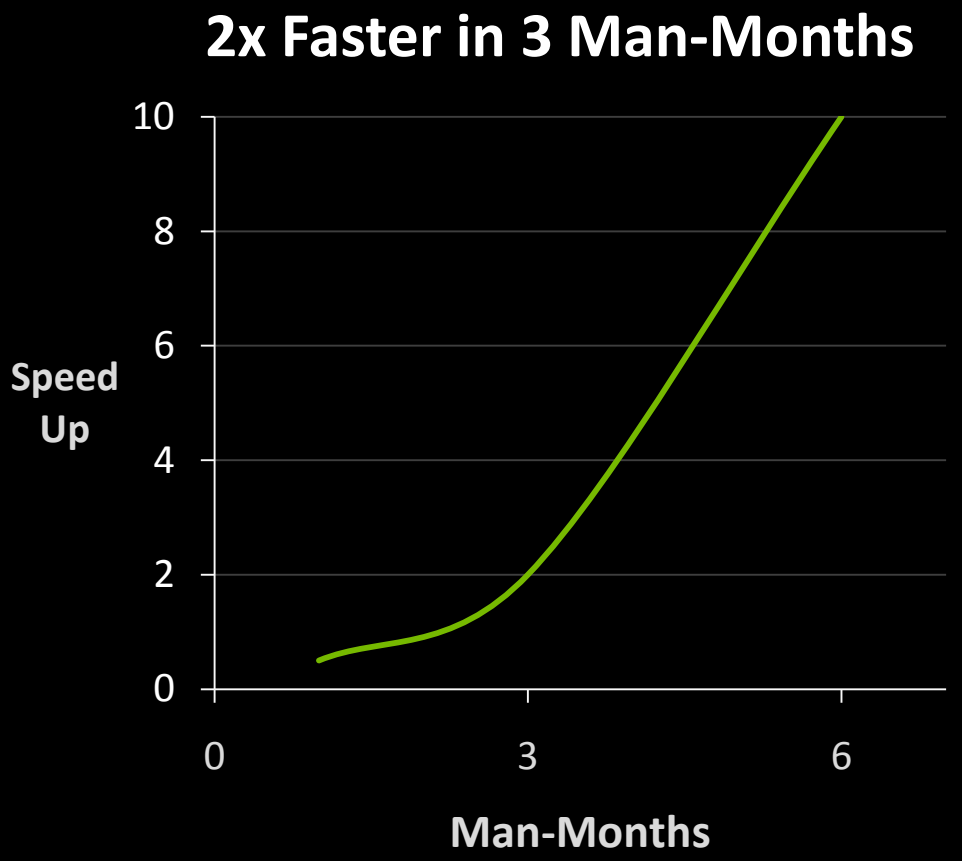
3. There is a PCI-e Bottleneck

Small Change, 10x Speedup



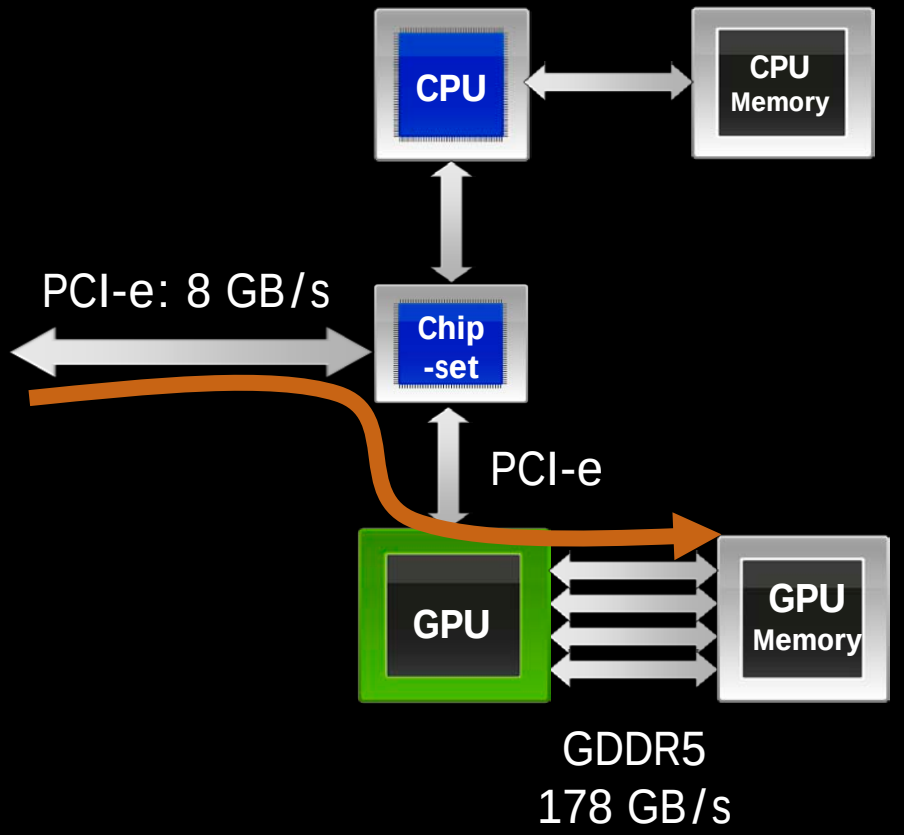
Customer Surveys Show Us





The Network is the Bottleneck

- Overlapped Data Transfers / Compute hide most of the latency
- GPUDirect gets data directly into the GPU
- GPU will become more autonomous



Soul of NVIDIA's GPU Roadmap

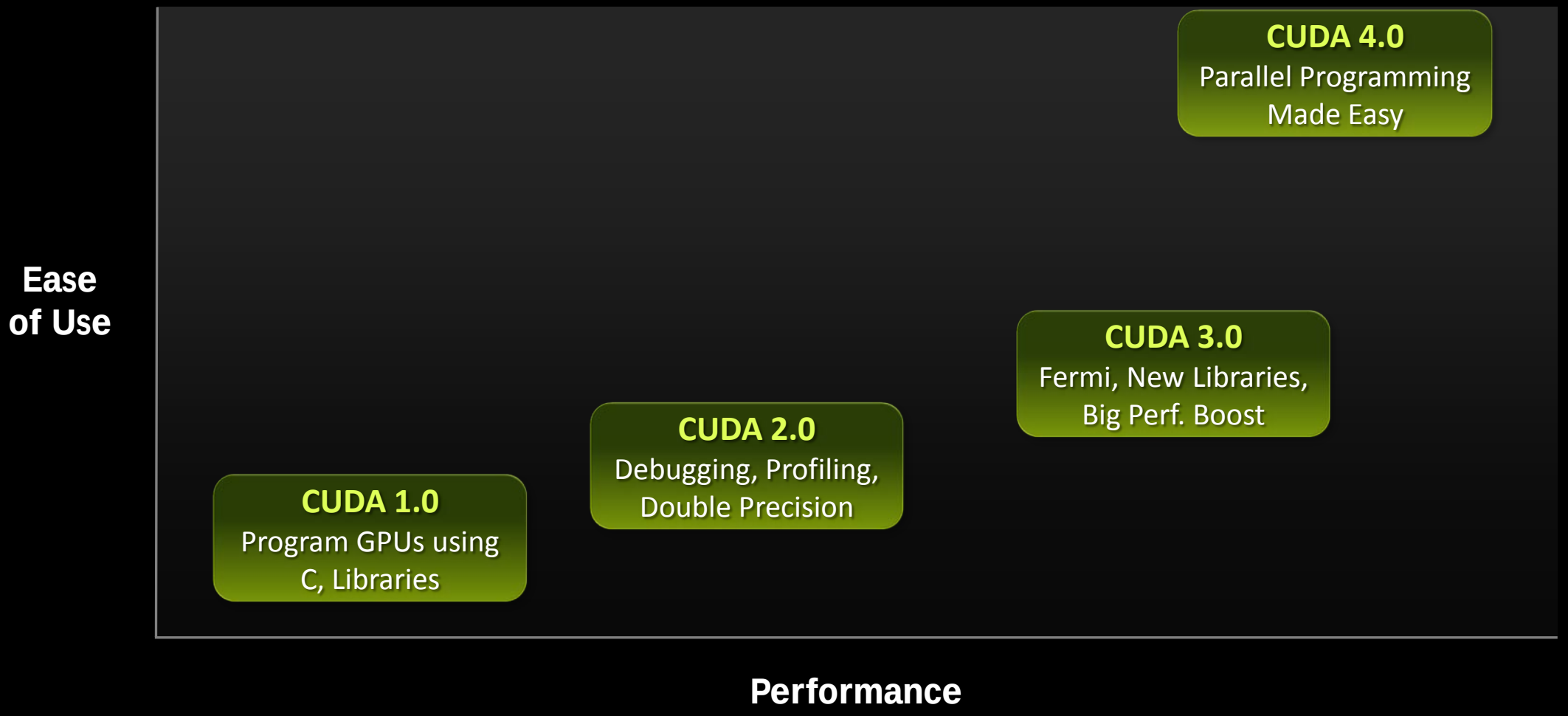
Increase Performance / Watt

Make Parallel Programming Easier

Run more of the Application on the GPU

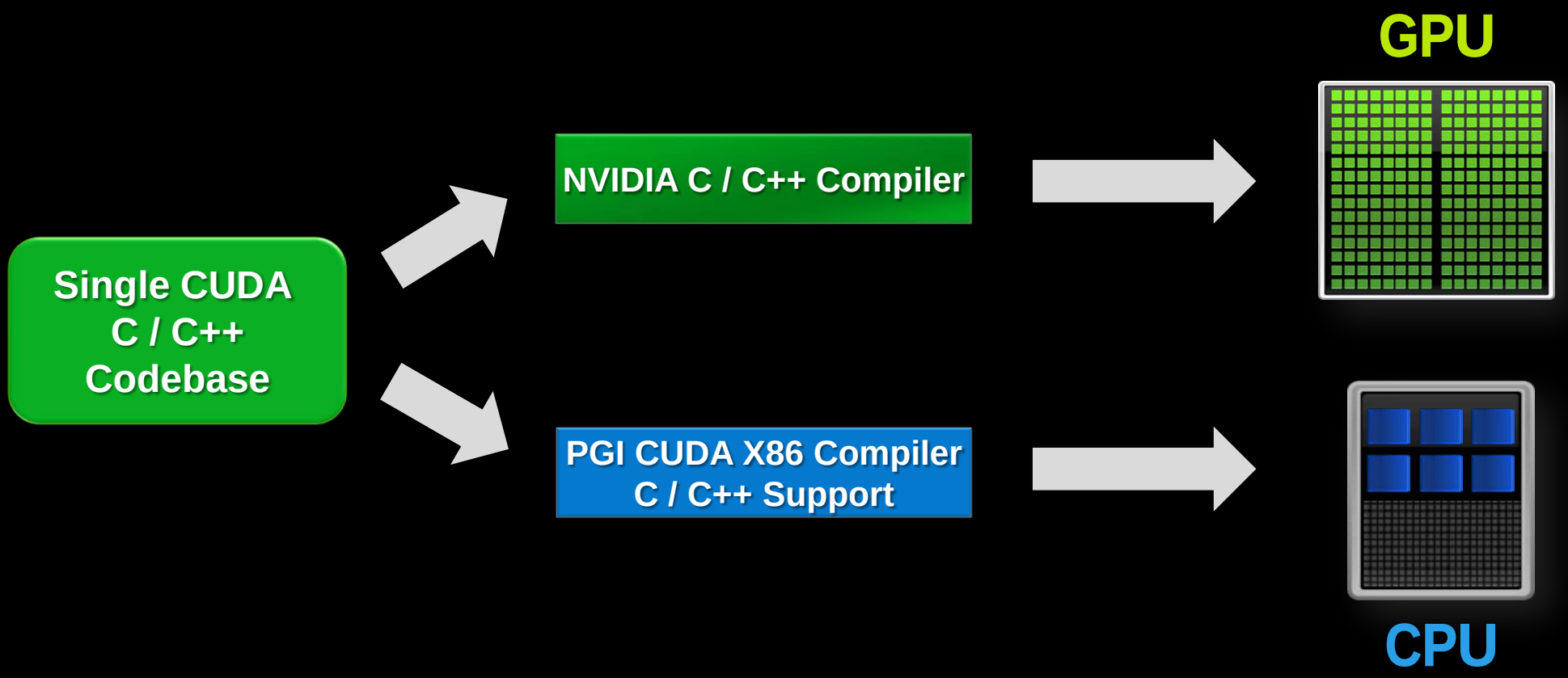
CUDA Architecture Roadmap

CUDA 4.0: Big Leap In Usability



PGI CUDA x86

CUDA Now Available for CPUs and GPUs



CUDA GPUs: Only GPU to Support All Languages

CUDA C

CUDA C++

CUDA Fortran

OpenCL

Direct-Compute

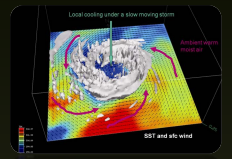
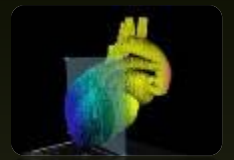
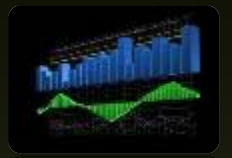
C++ AMP

NVIDIA CUDA GPUs

CPU

Other Devices

GPUs are Mainstream

Oil & Gas	Edu/Research	Government	Life Sciences	Finance	Manufacturing
					
Schlumberger	Chinese Academy of Sciences	Air Force Research Laboratory	Boston Scientific	Bloomberg	Agilent
BR PETROBRAS	Georgia Tech	NASA	MGH 1811 Mass General Hospital	BNP PARIBAS	ANSYS
TOTAL Chevron	HARVARD School of Engineering and Applied Sciences	Naval Research Laboratory	Max Planck Institute	STANDARD LIFE	Autodesk
Paradigm	OAK RIDGE National Laboratory	BAE SYSTEMS	BECKMAN COULTER	SciComp Inc. NumeriX	SIMULIA ACUSIM SOFTWARE