NVIDIA

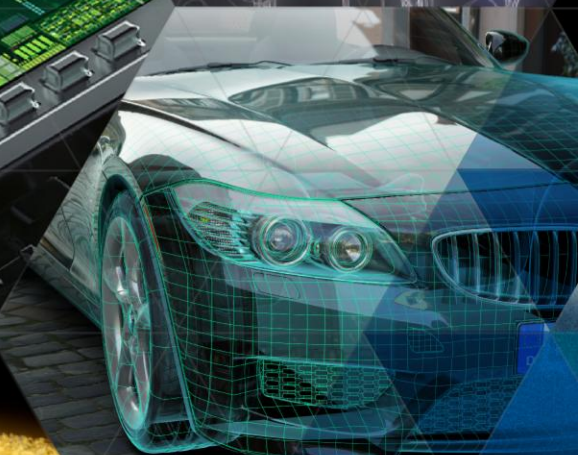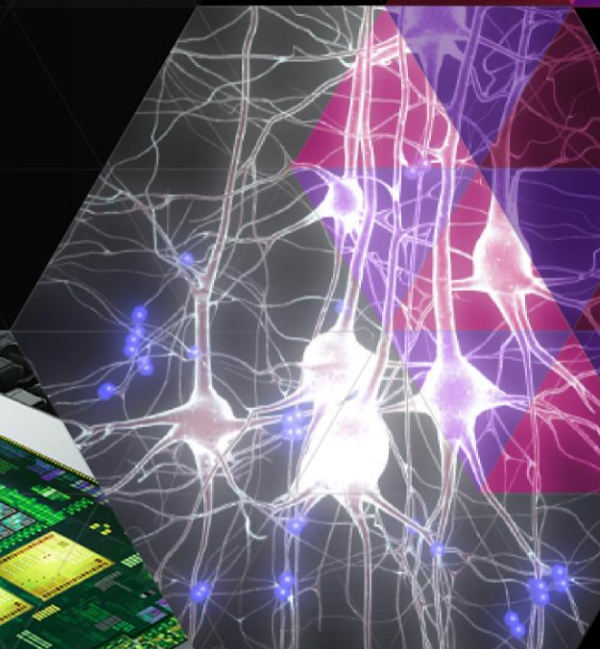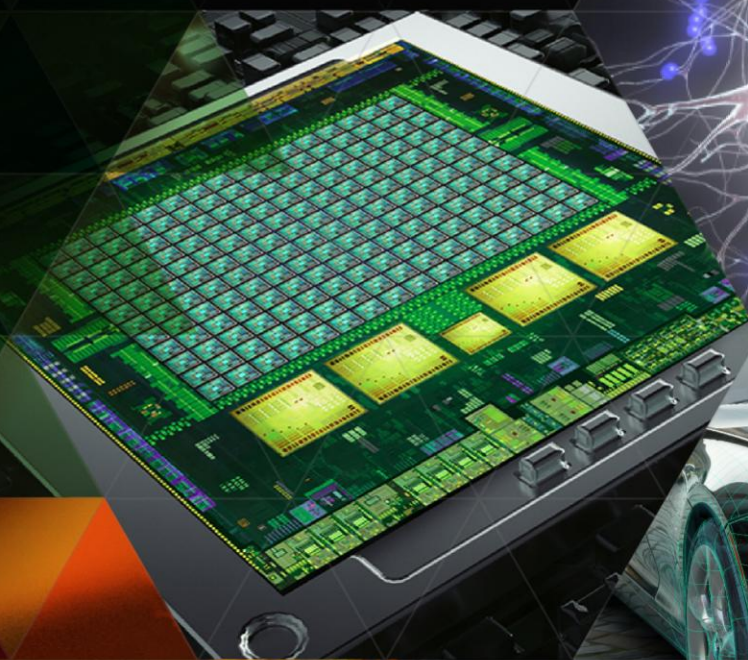## THE VISUAL COMPUTING COMPANY

3 KEY TAKEAWAYS

▸ CORAL : 2 US flagship Supercomputers powered by Tesla by 2017

▸ OpenACC is ready for Primetime

▸ Deep learning is stunningly effective across perceptual domains

NVIDIA.

US TO BUILD TWO FLAGSHIP SUPERCOMPUTERS
POWERED BY THE TESLA PLATFORM

100-300 PFLOPS Peak

10x in Scientific App Performance
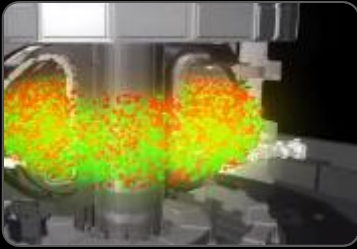
IBM POWER9 CPU + NVIDIA Volta GPU

NVLink High Speed Interconnect
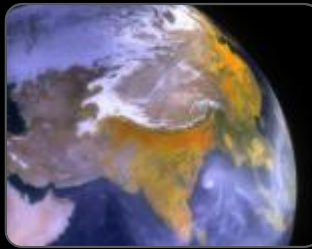
40 TFLOPS per Node, >3,400 Nodes

2017

Major Step Forward on the Path to Exascale
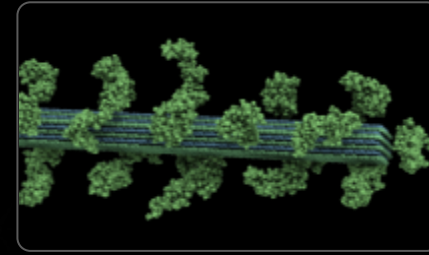
CORAL: BUILT FOR GRAND SCIENTIFIC CHALLENGES

Fusion Energy
Role of material disorder, statistics, and fluctuations in nanoscale materials and systems.

Climate Change
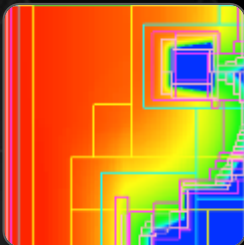Study climate change adaptation and mitigation scenarios; realistically represent detailed features

Biofuels
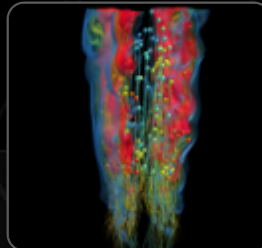Search for renewable and more efficient energy sources

Astrophysics
Radiation transport – critical to astrophysics, laser fusion, atmospheric dynamics, and medical imaging
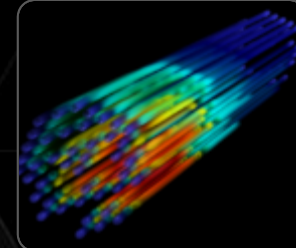
Combustion
Combustion simulations to enable the next gen diesel/bio-fuels to burn more efficiently

Nuclear Energy
Unprecedented high-fidelity radiation transport calculations for nuclear energy applications
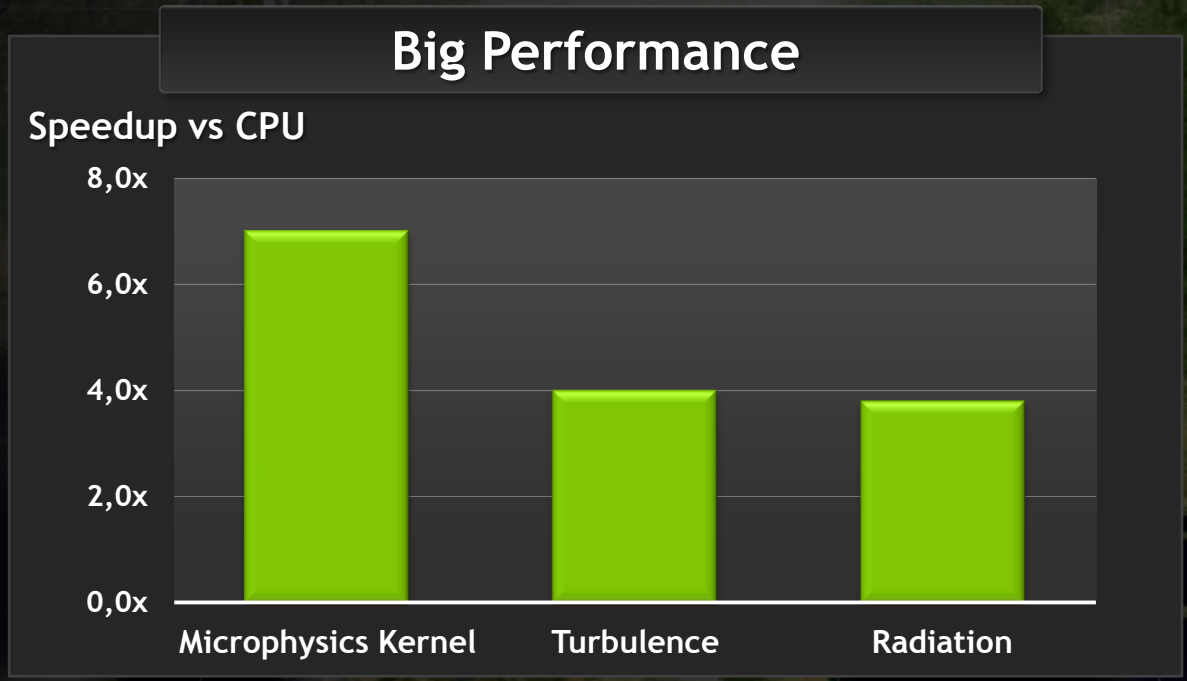
OPENACC
SIMPLE, PORTABLE & POWERFUL

Minimal Effort

Total LOC	% LOC Modified	# of Codes to Maintain
60K Lines	**5%**	**1 Source**

Big Performance

Speedup vs CPU

" OpenACC makes GPU porting accessible to domain scientists. Using OpenACC directives, we were able to successfully port a large part of COSMO. "

Xavier Lapillonne, Member of the HP2C Team

Note: OpenACC used to port Physics modules of COSMO
Details in: http://www.cray.com/sites/default/files/resources/OpenACC_213462.12_OpenACC_Cosmo_CS_FNL.pdf

OPENACC IS READY FOR PRIMETIME

77x Speedup with 2 OpenACC Directives

PowerGrid App for MRI Reconstruction @NCSA Hackathon, April 2015
Speed-up compared to 2 OpenMP Threads

Immediate Speedup with 2 Days of Effort

"*Much easier to learn than OpenMP or MPI. Ridiculously easy.*"

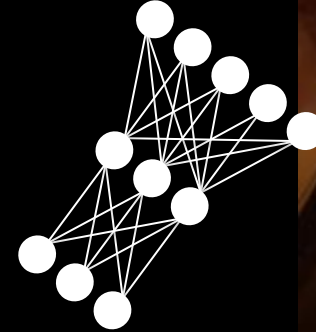LS-Dalton, Quantum Chemistry, April 2015

2x Speedup in a Few Hours at GTC

Numeca CFD App @GTC, March 2015
Speed-up vs multicore CPU

⬢ NVIDIA.

DEEP LEARNING: UNREASONABLY EFFECTIVE*

Image Classification, Object Detection, Localization,
Action Recognition, Scene Understanding

Speech Recognition, Speech Translation,
Natural Language Processing

Pedestrian Detection, Traffic Sign Recognition

Breast Cancer Cell Mitosis Detection,
Volumetric Brain Image Segmentation

*Credited to Yann LeCun, Facebook AI Research & Center for Data Science, NYU