GPU Technology Conference 2010 Sessions on
Energy Exploration (subject to change)

IMPORTANT: Visit www.nvidia.com/gtc for the most up-to-date schedule and to enroll into sessions to ensure your spot in the most popular courses.

2142 - Complex Geophysical Imaging Algorithms Enabled by GPU technology

Learn how computational expensive geophysical methods with 100s of TB of data become a commercial reality through the adoption of GPUs. The first part of the talk will give an overview of the computational challenges for imaging facing the oil and gas industry. The second part will show how the current most advanced methods are taking advantage of the GPU technology.

Speaker: David Nichols, Schlumberger

Topics: Energy Exploration, Algorithms & Numerical Techniques, High Performance Computing

Time: Wednesday, September, 22nd, 14:00 - 14:50

2128 - Hybrid Quantum Mechanics/Electrodynamics (QM/ED) Modeling of Solar Cells on a CUDA Cluster

One of the greatest challenges of the twenty-first century is the utilization of renewable energy. In providing a theoretical explanation and guidelines for computer-aided design of dye-sensitized solar cell (DSSC), we recently developed a hybrid multi-scale quantum mechanics/classical electrodynamics (QM/ED) methodology.

Our numerical simulations were tested on a CUDA enabled Linux cluster using CP2K. We extended its CUDA implementation to MPI parallel environment. Our preliminary results demonstrated a superior performance advantage of hybrid MPI/GPGPU programming that could potentially shorten the total simulation wall time by an order of magnitude.

Speaker: Hanning Chen, Northwestern University

Topics: Quantum Chemistry, Energy Exploration, Molecular Dynamics, Physics Simulation

Time: Wednesday, September, 22nd, 17:00 - 17:50

2059 - Industrial Seismic Imaging on GPUs

At Hess Corporation, we have moved the most computationally intensive parts of our seismic imaging codes from CPUs to GPUs over the past few years. In this talk I will give an overview of seismic imaging, highlighting the physical and computational algorithms of these codes. I will discuss our software approach and the programming effort to port them to GPUs, concluding with a summary of our progress in adopting GPUs in production.

Speaker: Scott Morton, Hess Corporation

Topics: Energy Exploration, High Performance Computing

Time: Wednesday, September, 22nd, 11:00 - 11:50

2170 - Lattice Boltzmann Multi-Phase Simulations in Porous Media using GPUs

Learn how a very efficient implementation of multiphase lattice Boltzmann methods (LBM) based on CUDA delivers significant benefits for predictions of properties in rocks. This simulator on NVIDIA hardware enables us to perform pore scale multi-phase (oil-water-matrix) simulations in natural porous media and to predict important rock properties like absolute permeability, relative permeabilites, and capillary pressure. We will show videos of these simulations in complex real world porous media and rocks.

Speaker: Jonas Toelke, Ingrain

Topics: Computational Fluid Dynamics, Energy Exploration

Time: Wednesday, September, 22nd, 15:00 - 15:50

2141 - Moving the Frontier of Oil and Gas Exploration and Production with GPUs

Learn how the Oil and Gas Industry is embracing GPUs in order to tackle new and complex oil and gas plays around the world. The first part of this talk gives an overview of the business and geopolitical drivers of the industry, followed with the critical contribution of computation in the quest for secure supply of energy.

Speakers: Maurice Nessim, Schlumberger, Shashi Menon, Schlumberger

Topics: Energy Exploration, High Performance Computing

Time: Wednesday, September, 22nd, 10:00 - 10:50

2174 - Reverse Time Migration on GPUs

Learn how GPUs can be used to accelerate subsurface imaging for Oil & Gas exploration. We will discuss results and lessons learned while implementing a Reverse Time Migration algorithm on GPUs achieving significant performance improvements over a comparable CPU implementation.

Speaker: Alex Loddoch, Chevron

Topics: Energy Exploration, High Performance Computing

Time: Wednesday, September, 22nd, 15:00 - 15:50

2226 - Reverse Time Migration with GMAC

Get a close look at implementing Reverse Time Migration (RTM) applications across multiple GPUs. We will focus on how RTM applications can be scaled using the GMAC asymmetric distributed shared memory (ADSM) library to break the problem into manageable chunks. We will provide an introduction to GMAC and discuss handling boundary conditions and using separate kernels to improve efficiency.

Speakers: Javier Cabezas, Barcelona Supercomputing Center, Mauricio Araya, Barcelona Supercomputing Center

Topics: Energy Exploration, Algorithms & Numerical Techniques, High Performance Computing

Time: Wednesday, September, 22nd, 16:00 - 16:50

2014 - Scalable Subsurface Data Visualization Framework

Mental Images' DiCE-based geospatial library is a CUDA and cluster-based visualization framework that enables scalable processing and rendering of huge amounts of subsurface data for interactive seismic interpretation.

Geospatial exploration in the oil and gas industries is concerned with scanning the earth's subsurface structure for detecting oil and for cost-effective drilling of detected oil reservoirs.

Efficient seismic interpretation requires the interpreters to be able to interactively explore huge amounts of volumetric seismic information with embedded stacked horizons to gain visual insight into the subsurface structure and to determine where oil recovery facilities and drilling infrastructure shall be built.

Speakers: Tom-Michael Thamm, mental images GmbH, Marc Nienhaus, mental images GmbH

Topics: Energy Exploration, Databases & Data Mining, Imaging, Tools & Libraries

Time: Wednesday, September, 22nd, 17:00 - 17:50