



Séminaire Informatique Haute Performance au Campus Ter@tec
Département Sciences de la Simulation et de l'Information

Jeudi 27 Avril 2017

11h00

**Bâtiment Ter@tec
Salle Morisot – 2^{ième} étage**

Scaling Parallel Seismic Raytracing

Pr. Allen D. Malony, University of Oregon

Marine geologists use seismic tomography techniques to determine the 3D geophysical structure of the ocean floor. At the heart of seismic tomography methods is a forward solver used to compute minimum travel times from all locations in a earth model to sensors used in seismic experiments. The Stingray seismic raytracer developed at the University of Oregon was originally based on Dijkstra's single-source shortest-path (SSSP) algorithm. Unfortunately, the algorithm's inherent sequential nature limits its scalability. SSSP problems can also be solved in an iterative data parallel fashion based on the Bellman-Ford-Moore (BFM) algorithm. To overcome inherent scaling problems (both in time and space), a data parallel algorithm for seismic raytracing was developed and implemented. It allows for a scalable partitioning of the seismic model in multiple dimensions and high degrees of concurrency. However, it requires multiple iterations to converge. The tradeoff of greater parallelism potential and convergence governs performance. Results are presented for OpenMP, CUDA, and MPI experiments on seismic models of significantly larger size than Stingray has processed before.

The talk will include discussion of future direction, including the building of an integrated environment for geoinformatics that supports the full data management, analytics, simulation modeling, computational integration (e.g., geodynamics), visualization, and workflow for seismologists and earth scientists.

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