SOLUTION BRIEF

GPU-Packed Cray® CS-Storm Cluster Supercomputer Speeds Reverse Time Migration Calculations

Cray CS-Storm for RTM
The Cray CS-Storm cluster is a high-density accelerator compute system based on the Cray® CS400™ cluster supercomputer. Featuring up to eight NVIDIA® Tesla® GPU accelerators and a peak performance of more than 15 teraflops per node, the CS-Storm system is one of the most powerful single-node cluster architectures available today.

Faster RTM Unlocks Opportunities
Improved Reservoir Management
• Higher fidelity images
• More complex surveys
• Increased confidence for decision-making
• Increased reserves and revenue

Better Drilling Decisions
• More accurate images
• Improved confidence in earth model
• More efficient production

Optimized CS-Storm Configuration for Oil & Gas Users
• Up to eight NVIDIA Tesla K80 GPU accelerators per node
• Double-precision performance of up to 15 teraflops
• Air-cooled platform
• Interconnect options: 3D torus/fat tree, single/dual rail, QDR/FDR InfiniBand
• Software: Customizable HPC cluster software stack, Cray Advanced Cluster Engine system management, Cray Programming Environment on Cluster Systems
• Storage: Cray Tiered Adaptive Storage and Cray® Sonexion® storage solutions

Challenge: Processing Complex Seismic Workflows
Reverse time migration (RTM) can dramatically improve the efficiency of hydrocarbon exploration and production by enabling accurate imaging of highly complex subsurface areas using data from new and historical surveys.

However, the RTM modeling and analysis process requires such an enormous amount of computational power that it pushes most commodity infrastructures to their limits. The consequence for organizations executing RTM algorithms on commodity clusters is unacceptably long run times and jobs that sometimes stall or fail. Poor performance on RTM algorithms forces choices between lengthened project schedules and decision making using less accurate surveys.

RTM Workflows on GPUs
While RTM workloads traditionally have been run on general-purpose processors, they are particularly well suited for graphical processing units (GPU). Applications can see between four and 10 times performance improvements on GPU accelerators over x86 processors. However, using non-GPU-centric infrastructure can hinder these potential performance gains.

Given the computationally intensive nature of RTM applications and their suitability for GPU-based technologies, organizations seeking to port their RTM applications from an x86 to a GPU architecture face several risks, including: system unpredictability, performance bottlenecks and inefficiency.

Solution: Cray CS-Storm for Reverse Time Migration
The Cray CS-Storm system for reverse time migration is a configuration of the accelerator-optimized CS-Storm cluster supercomputer that has been optimized for complex seismic imaging workflows. It delivers extreme sustained complex processing performance, predictably and reliably, in an extremely dense and efficient package.

Predictability
Porting from x86 to GPU architectures can introduce risks, including overall system reliability, upgrade suitability and system manageability. The CS-Storm cluster is an HPC environment built around GPU architectures, to perform reliably and predictably. Additionally, the system is future-proof, accommodating both current and next-generation GPUs.

About Cray
Cray provides highly advanced systems and solutions that help organizations of all types solve their most difficult computing, storage and data analytics challenges. The company’s comprehensive portfolio includes expertly optimized cluster systems, extremely scalable, powerful supercomputers, advanced storage systems, and high-performance data analytics and discovery platforms. Founded in 1972, Cray has focused exclusively on developing, building and supporting supercomputing technologies for over 40 years.

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Performance
While GPU architectures show performance improvements of 4 to 10 times over x86 processors, you can encounter many bottlenecks getting there. In answer, the CS-Storm system is a holistic solution, optimized to eliminate bottlenecks and ensure extremely high performance at every level.

Efficiency
The CS-Storm cluster improves efficiency in every part of the stack, including increased GPU density, improved GPU-CPU communications, and a wide range of energy efficiencies built into Cray CS cluster supercomputers.

One of the most computationally complex algorithms or processes a geophysicist encounters, it can take days or weeks to run an RTM calculation. But with the concentration of computational power in the CS-Storm system — each rack can hold up to 22 2U server nodes (up to 170 GPUs per rack) — the time to complete a calculation dramatically decreases. The Cray CS-Storm for RTM increases your productivity, providing you the fastest, most efficient way to process your most complex seismic imaging workflows.