

# Reconfigurable Computing Solutions for Seismic Processing

## Summary

Reconfigurable computing solutions from SRC Computers provide powerful processing for the seismic processing market in a much smaller footprint and with significantly reduced total cost of ownership over microprocessor-based clusters.

- High I/O bandwidths for orders of magnitude more performance for compute-intensive seismic processing applications
- Racks of servers can be replaced with a single SRC system
- Power consumption and cooling costs reduced by 90%

## Challenges

The advanced seismic migration algorithms used on large 3D surveys can take days if not weeks of computing time. The push for ever more accurate subsurface imaging quality has driven the computational intensity up by orders of magnitude.

The past 10 years have seen most cluster-based computing environments double the cluster size in the attempt to deliver just a 2x reduction in compute time of new leading edge migration algorithms. This has worked in the past, but the feasibility of continuing this trend is in doubt for many reasons. One of the major reasons is that the sheer size, weight and power requirements of even larger systems will not be feasible for most companies.

Many companies are searching for alternate computational capabilities to give a dramatic decrease (at least a 10x) in compute time for their leading edge migration algorithms. In order to support the accelerated computational rate, the I/O bandwidth requirements need to increase by orders of magnitude. The increased I/O bandwidth requirements are a major stumbling block for most of the alternate compute technologies.

## Solutions

SRC Computers delivers high performance reconfigurable computer systems that have very high I/O bandwidths to match the orders of magnitude computational speedup that customers in the seismic processing industry require. An example of such a performance gain is the Reverse Time Migration application showing more than 20x performance gain over leading microprocessor-based systems.

A 3D model of the shallow subsurface (0 - .5 sec), at submeter resolution, constructed from high resolution seismic data

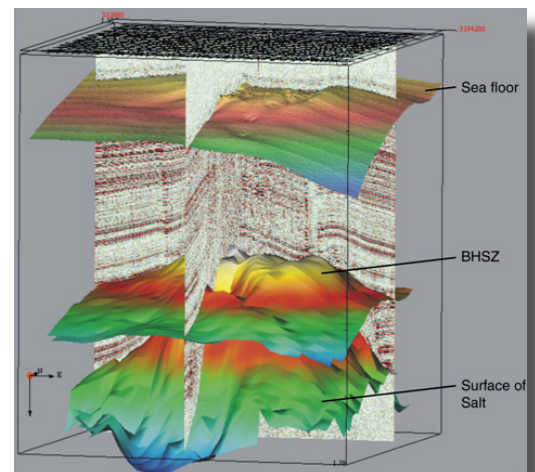


Image courtesy of the U.S. Dept. of Energy/NETL's The Gulf of Mexico-Hydrate Research Consortium



⇒ Power consumption and cooling costs reduced by 90%

⇒ DAYS of compute time reduced to HOURS with SRC reconfigurable computing systems

⇒ 20x performance gain on the Reverse Time Migration algorithm

## System Attributes

Attributes of SRC scalable computing solutions that help achieve significant application performance gains include:

- MAP® processors, the SRC reconfigurable compute element, that deliver orders of magnitude speedup over microprocessors using very low power and generating very little heat
- Rotating Common Memory (RCM) that delivers the 3D seismic data to compute at a sustained rate of 3.6 GBytes/sec
- Global Common Memories (GCM) that can be dedicated to a MAP processor delivering 3.6 GBytes/sec. Example use:
  - Reverse Time Migration can use multiple GCMs as input/output data volumes to MAP processors and ping-ponged between time steps
- Application specific memory access that does not suffer from cache miss penalties seen by microprocessors. These data transfers can deliver at least 2.8 GBytes/sec bandwidth. Example access patterns:
  - Matrix transpose
  - 2D planes out of 3D volumes
  - 3D mini-volumes
  - Processor-to-processor communication bandwidths of 3.6 GBytes/sec

## Find Out More

Contact SRC Computers today to find out how you can get more performance per watt over traditional microprocessor-based systems. **Call (719) 262-0213** or **e-mail [sales@srccomputers.com](mailto:sales@srccomputers.com)** to speak with our applications experts. Please also visit our web site at **[www.srccomputers.com](http://www.srccomputers.com)**.



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