



DDHMC Lattice QCD Application Performance

Sep 2008



- **The following research was performed under the HPC Advisory Council activities**
 - Participating vendors: Sun, Mellanox
 - Compute resource - HPC Advisory Council Cluster Center
- **For more info please refer to**
 - www.mellanox.com, www.sun.com

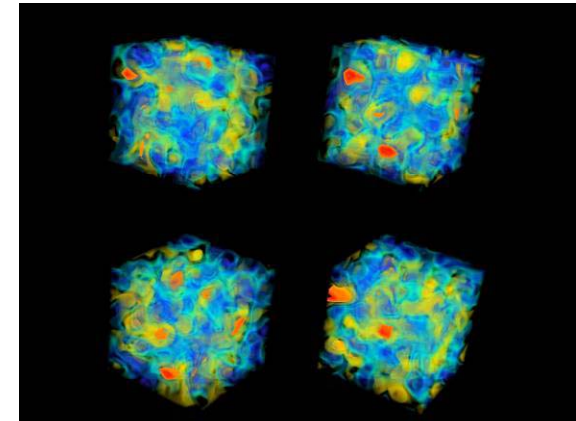
- **CAE related applications**

- Computational Aided Engineering

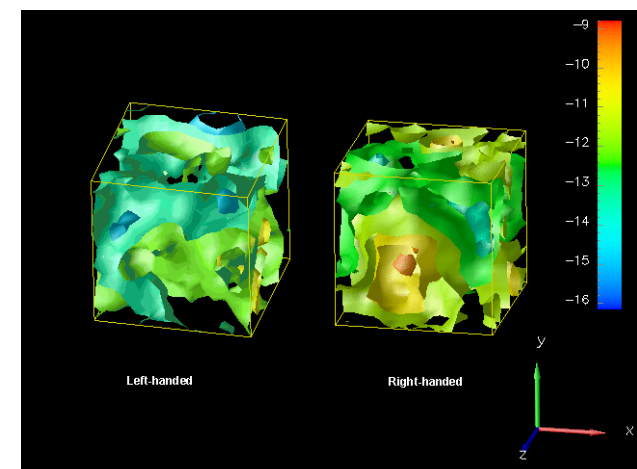
- **Lattice Quantum Chromo**

Dynamics calculations are solving fundamental problems in particle and nuclear physics with large-scale computer calculations

- Lattice QCD is a theory of quarks and gluons formulated on a space-time lattice



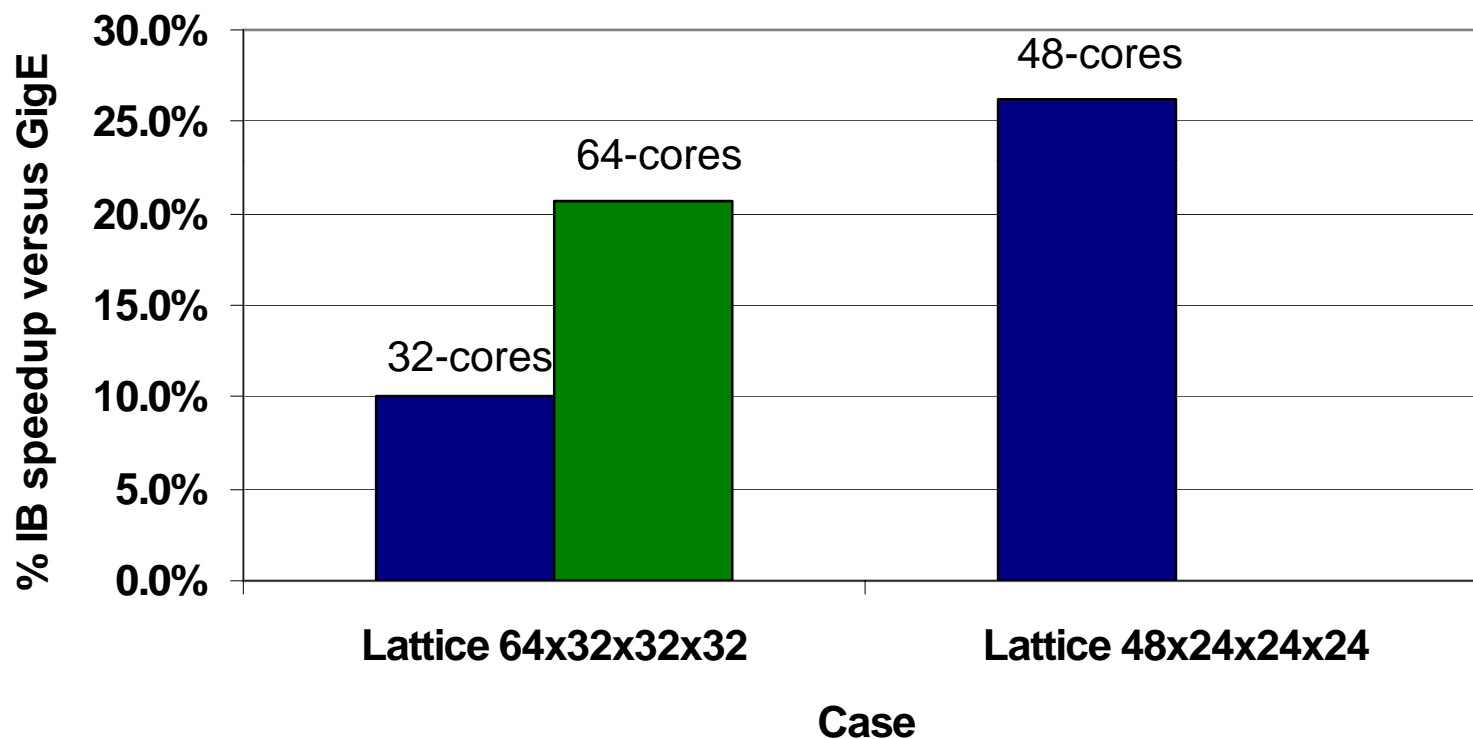
Data courtesy of M. McGuigan CSC and Taku Izubuchi RIKEN-BNL



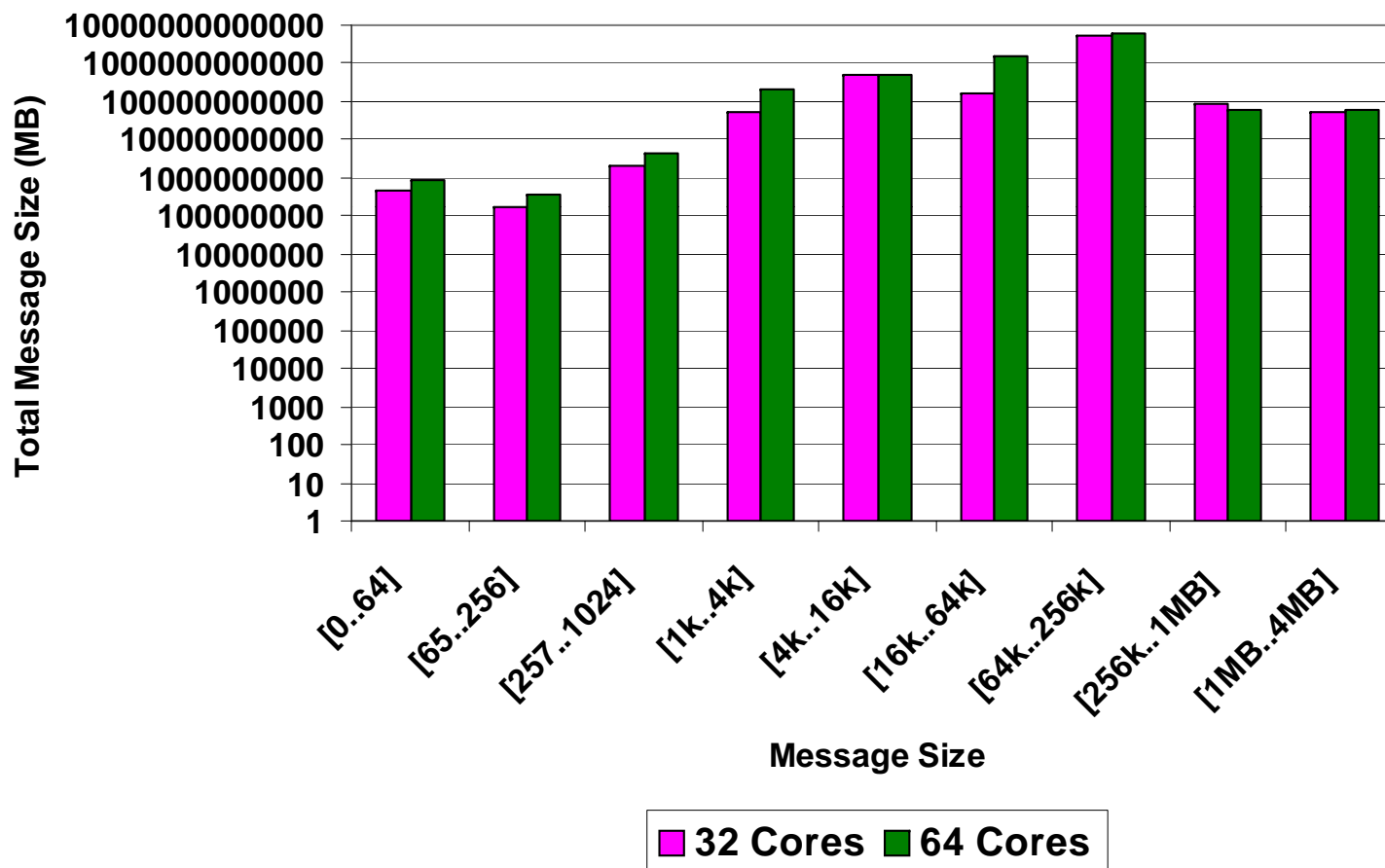
- **Lattice QCD performance comparison of IB versus GigE**
 - InfiniBand demonstrates higher performance for any case
 - Performance gap increases with cluster size
- **Case studies (few examples):**
 - Jefferson Lab
 - 396-node and 280-node InfiniBand clusters
 - Fermi National Accelerator Laboratory
 - 518-node and 600-node InfiniBand clusters



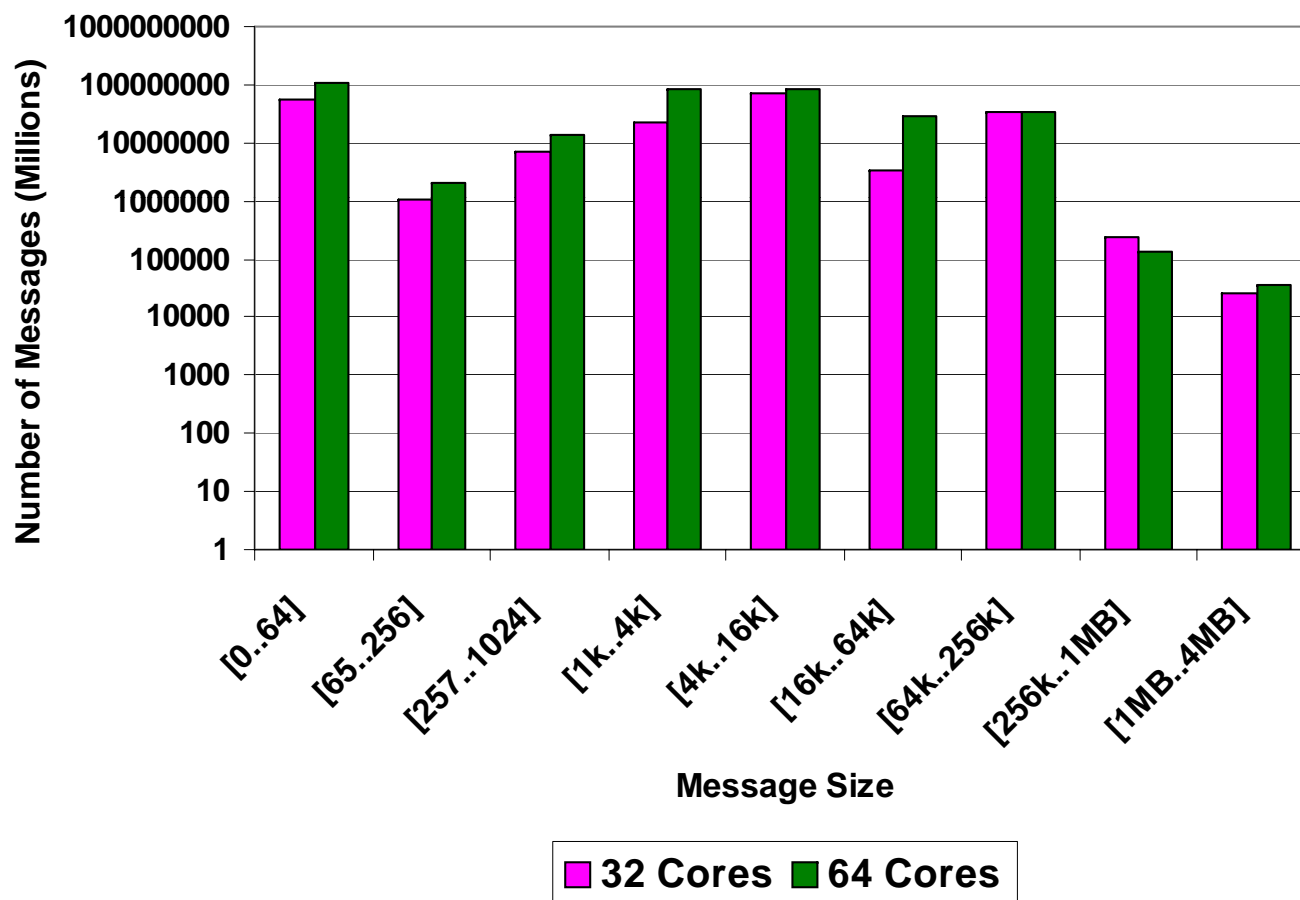
Lattice QCD Performance Benchmarks



Lattice-QCD Profiling Total Byte Send per Message Size



Lattice-QCD Profiling Number of Messages Send per Message Size



System Configurations

- Mellanox Cluster Center (HPC Advisory Council)
- 8 nodes SUN 2200 cluster
- Intel Xeon Quad-core X5472 CPUs
- Mem: 32GB
- Mellanox InfiniBand ConnectX DDR HCA
- OS: RH 5.1, compiler: gcc version 4.1.2
- MPI: OpenMPI

Thank You

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