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A performance evaluation of CCS QCD Benchmark on Intel Xeon Phi (KNC) systems

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The most computationally demanding part of Lattice QCD simulations is solving quark propagators.

Quark propagators are typically obtained with a linear equation solver utilizing HPC machines.

The success of Lattice QCD simulations owes much to the development of numerical algorithms and optimization for the quark solver, and evolution of HPC machines.

The CCS QCD Benchmark is a benchmark program solving the Wilson-Clover quark propagator, and is developed at Center of Computational Sciences (CCS), University of Tsukuba.

This is designed to be as simple as possible and is written in plain Fortran 90 so that new algorithms or new HPC architectures can be evaluated quickly with this benchmark program.

We optimized the benchmark program for a Intel Xeon Phi (Knights Corner, KNC) system named "COMA (PACS-IX)" at CCS Tsukuba under the Intel Parallel Computing Center program.

A single precision BiCGStab solver with the overlapped Restricted Additive Schwarz (RAS) preconditioner was implemented using SIMD intrinsics, OpenMP and MPI in the offload-mode.

In this talk, we will show the optimization methods and the performance of the CCS QCD benchmark on the COMA system.

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