XcalableACC

Overview

XcalableACC (XACC) is a directive-based language extension of C and Fortran for accelerated cluster systems.
- High productivity by directives
- High performance by direct communication between accelerators

Components

- XcalableMP (XMP) for distributed-memory parallelism
- XMP is a directive-based language extension of C and Fortran for cluster systems
- OpenACC for offloading works for accelerators
- OpenACC is another directive-based language extension for heterogeneous CPU/Accelerator systems
- XACC extensions for communication of data on accelerators

Evaluation using Lattice QCD

What is Lattice QCD?

Solve the quantum chromodynamics (QCD) theory of quarks and gluons

\[
D_{x,y} = \frac{\delta_{x,y} - \kappa}{2} \sum_{\mu=1}^3 \left[ (1 - \gamma_5)\not{\partial} \not{\partial}_{x+y,\mu} + (1 + \gamma_5)\not{\partial} \not{\partial}_{x-y,\mu} \right]
\]

The four-dimensional space-time continuum is replaced by a four-dimensional hypercubic lattice

We have used the Lattice QCD mini-application developed by Hideo Matsufuru (KEK)

The Lattice QCD mini-application uses a part of the Bridge++, which is a real world application (http://bridge.kek.jp/Lattice-code/)

Typical stencil application

Evaluation

http://ccs.tsukuba.ac.jp/eng/research-activities/projects/ha-pacs/

- Ivy Bridge E5-2680v2, 10Cores x 2 Sockets
- DDR3 128GB (59.7GB/s x 2, NUMA)
- NVIDIA K20X (D.P. 1.31TFlops) x 4 GPUs
- DDR5 6GB (250GB/s)
- InfiniBand 4xQDR x 2rails, 8GB/s
- MVAPICH2-GDR 2.1a, gcc-4.4.7, etc.

Performance (Problem Size: 32x32x32x32)

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