parco2015

JÜLICH FORSCHUNGSZENTRUM

MAXI mini-symposium: *Multi-system Application Extreme-scaling Imperative*

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http://www.fz-juelich.de/ias/jsc/MAXI

Background

Technology trends

- energy-efficient processors with many relatively weak cores
- organised in compute nodes with restricted shared memory
- combined with co-processors and accelerators with separate address space

Current generation of leadership supercomputers have many thousands of processors/cores

- and exascale computer systems are expected to have many more

Applications need to be extremely scalable and adaptable to effectively exploit such systems

- hybrid parallelisation combining message-passing, multi-threading, vectorisation

Diversity of current leadership HPC computer systems

Cores	Name	System	Processor	(cores)	Accelerator	(cores)	Site
3 120 000	Tianhe-2	NUDT IVB-FEP	Xeon(12C)	384 000	31S1P(57M)	2 736 000	NSCC-GZ, China
1 572 864	Sequoia	IBM Blue Gene/Q	PowerPC(16C)	1 572 864			LLNL, USA
786 432	Mira	IBM Blue Gene/Q	PowerPC(16C)	786 432			ANL, USA
705 024	Kei	K computer	SPARC64(8C)	705 024			RIKEN AICS, Japan
560 640	Titan	Cray XK7	Opteron(16C)	299 008	K20x(14S)	261 632	ORNL, USA
462 462	Stampede	Dell PowerEdge	Xeon(16C)	102 400	SE10P(61M)	390 400	TACC, USA
458 752	JUQUEEN	IBM Blue Gene/Q	PowerPC(16C)	458 752			JSC, Germany
452 400	Blue Waters	Cray XE6+XK7	Opteron(16C)	393 600	K20x(14S)	58 800	NCSA, USA
147 456	SuperMUC	IBM iDataPlex	Xeon(8C)	147 456			LRZ, Germany
115 984	Piz Daint	Cray XC30	Xeon(8C)	42 176	K20x(14S)	73 808	CSCS, Switzerland
94 608	Hornet	Cray XC40	Xeon(12C)	94 608			HLRS, Germany
86 016	SuperMUC.2	IBM NeXtScale	Xeon(14C)	86 016			LRZ, Germany

This mini-symposium

Invited HPC application developers to share and discuss their extreme-scaling experience

- with a variety of the largest scale computer systems
  - *Blue Gene, Cray, K computer, Linux clusters, etc.*

Goal is to review and discuss

- characteristics of extreme-scaling applications and their execution configurations
- experience with multiple diverse large-scale computer systems
  - *portability of the applications and their adaptations/optimisations for extreme scale*
- common extreme-scaling issues, observed gaps in an 'ideal' solution
  - *technology limitations, programming models, file I/O, debugging/analysis tools, ...*
- application readiness in respect of envisaged exascale computer systems

Agenda: Thursday 3 Sept

10:00-11:00 Session E8

- Extreme-scaling applications 24/7 on JUQUEEN Blue Gene/Q
  - *Dirk Brömmel (JSC)*
- Earthquake simulations at petascale – Optimizing high order ADER-DG in SeisSol
  - *Michael Bader (TUM)*

(break + file alarm test)

11:30-12:30 Session E9

- Performance evaluation of the LBM solver Musubi on various HPC architectures
  - *Jiaxing Qi (Uni. Siegen)*
- waLBerla, an ultra-scalable multi-physics simulation framework for piece-wise regular grids
  - *Christian Godenschwager (FAU Erlangen-Nuremberg)*

Agenda: Thursday 3 Sept [cont]

(lunch)

14:00-15:30 Session E10

- FE²TI: Computational scale bridging for dual-phase steels
  - *Martin Lanser (Uni. Köln)*
- Simulating morphologically detailed neuronal networks at extreme scale
  - *Aleksandr Ovcharenko (EPFL)*
- Discussion

(break)

16:00-10:30 Social Event

Agenda: Friday 4 Sept

10:00-11:00 Session E11

- High throughput simulations of two-phase flows on Blue Gene/Q
  - *Panagiotis Hadjidoukas (ETH Zurich)*
- Direct numerical simulation of fluid turbulence at extreme scale with psOpen
  - *Jens Henrik Göbbert (RWTH Aachen University)*

(break)

11:30-13:00 Session E12

- Extreme scale-out SuperMUC phase 2, lessons learned
  - *Nicolay Hammer (LRZ)*
- "K-scale" applications on the K computer and co-design effort for development of "post-K"
  - *Miwako Tsuji (RIKEN AICS)*

Mini-symposium organisers

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