MARC Program In China

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Aug 16th, 2011
Agenda

• What you can expect to get out of this session
• Intel MARC Program Overview
  – MARC stands for Many-core Applications Research Community (MARC)
• MARC Program in China
• Call for Action
• Back Ups
What you can expect

- Understanding of why and what MARC Program is
- What is the value to you
- How to participate and what support we provide in China
What is Tera-scale?

TIPs of compute power operating on Tera-bytes of data

http://techresearch.intel.com/articles/Tera-Scale/1421.htm
Performance Scaling Challenges

Energy Efficiency

Design Complexity

Programming Models

Emerging Applications
Single-chip Cloud Computer Experimental Processor


<table>
<thead>
<tr>
<th>Technology</th>
<th>45nm Hi-K CMOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interconnect</td>
<td>9 Metal (Cu)</td>
</tr>
<tr>
<td>Transistors</td>
<td>Die: 1.3B, Tile: 48M</td>
</tr>
<tr>
<td>Tile Area</td>
<td>18.7mm²</td>
</tr>
<tr>
<td>Die Area</td>
<td>567.1mm²</td>
</tr>
</tbody>
</table>
Motivations for SCC

• Many-core processor research
  – High-performance power-efficient fabric
  – Fine-grain power management
  – Message-based programming support

• Parallel Programming research
  – Better support for scale-out model servers
    • Operating system, communication architecture
  – Scale-out programming model for client
    • Programming languages, runtimes

Not a product, nor a product prototype!
MARC - Many-core Applications Research Community

- Make SCC available to external researchers
- Documentation, Tools, Open Source Code on all Intel SCC S/W+H/W
- Encourage User-contributed software, Peer discussion, shared ideas
- Open invitation for research proposals

http://communities.intel.com/community/marc
MARC Today is Worldwide

Altreonic, Barcelona Supercomputing Center, ET International, ETH Zurich, Florida International University, FORTH-ICS (University of Crete), Galicia Supercomputing Center (CESGA), Georgia Tech University, Hasso-Plattner-Institute, Huawei, Karlsruhe Institute of Technology (KIT), Lessius-Mechelen - Campus De Nayer, Mercury Computer Systems, Microsoft, ONERA, Purdue University, Reservoir Labs, Rutgers University, RWTH Aachen University, Sabanci University, Seoul National University, Stanford University, SUNY Binghamton, Swiss Federal Institute Zurich, Texas A&M University, Technical University Berlin, Technical University Braunschweig, Technical University Cottbus, Tshingua University, Turku University, University of California - Irvine, UNICAMP, University of Amsterdam, University of Auckland New Zealand, University of Bayreuth, University of Bologna, University of Cambridge, University of Cyprus, University of Edinburgh, University of Erlangen, University of Glasgow, University of Hertfordshire, University of Illinois Urbana Champaign, University of Innsbruck, University of Michigan Ann Arbor, University of Missouri Kansas City, University of Oxford, University of Paderborn, University of Potsdam, University of Texas Austin, University of Toronto, University of Vienna, Vrije Universiteit, and many others
Research Results – Summer 2011

Over 50 Papers

Major Conferences

Super Computing 2010 (SC10)
High Performance Computing (HPCS11)
ISLPED
PLDI
IPCCC 2011
ISCA Workshop on Emerging Applications and Manycore Architecture
ACM Symposium on High Performance Parallel and Distributed Computing
SICSA
ISCA/A4MMC – 2011 Int. Workshop on Applications for Multi and Manycore
MTS/IEEE Oceans 2011
EuroPar 2011

...And Many Others
ICCPC: Growing MARC in China

• ICCPC with Intel Labs China opening SCC Datacenter in Wuxi
• ICCPC assuming China-wide technical support for MARC
• Joining Huawei and Tsinghua University in MARC Today:
  – Shanghai University
  – Institute of Software, Chinese Academy of Sciences
  – Institute of Computing Technology, Chinese Academy of Sciences
  – Supercomputing Center, Chinese Academy of Sciences
  – South China University of Technology
  – Science & Technology University of China
Summary

• ICCPC and Intel are excited to share SCC with China’s Research Community
  http://communities.intel.com/community/marc

• New ICCPC SCC Datacenter will provide a unique capability for China’s Universities
  – Programming Research and Curriculum Development

• We request China’s participation and look forward to
  – More Chinese friends in MARC
  – New research activities on SCC

In 2012, at the first ICCPC MARC Symposium in China, Intel will honor the top 3 Papers submitted
Will you be one of the 3?
Back Up
Some Useful Info

- SCC Proposal Template
- SCC website
- Intel Lab China Contact for MARC
  - [Jiajie.wu@intel.com](mailto:Jiajie.wu@intel.com)
SCC Software Continues to Grow

- **New Tools for researchers**
  - SW Managed Coherence for SCC: provides SW based cache coherence
  - X10 (HPC language from IBM based on PGAS model)
  - GNU Fortran, Intel Fortran, iTRACE
  - ETI Baremetal Environment for SCC
  - Microsoft Visual Studio SCC Extensions
  - POP-SHM: increased memory footprint and dynamic capabilities for shared memory applications

- **New Operating Systems**
  - Barrelifish experimental many core OS from Microsoft/ETH Zurich
  - MINIX

- **New Community Contributions**
  - iRCCE: A Non-Blocking Communications Extension to RCCE
  - RCCE_comm: Collective Communications Library for SCC
  - RCKMPI: Message Passing Interface for SCC
  - Elemental: Layered Hi-Perf library for distributed-memory systems
  - Inter-core interrupt and process notifying code

- **Under investigation**
  - Xen (Linux Virtualization SW)
  - Plan 9 (Distributed OS from Bell Labs, exascale candidate)

**Most contributions now coming from MARC researchers, not Intel**