HPCG UPDATE: SC’16

Jack Dongarra
Michael Heroux
Piotr Luszczek
HPCG Status
HPCG Update: Agenda

5:15: 10 minute presentations:

Mike Heroux, HPCG Update.
Massimiliano Fatica, Nvidia Update.
Alexander Kleymenov, Intel Update.
Kiyoshi Kumahata, Riken/Fujitsu Update.
Bob Ciotti, NASA/SGI Update.
Costas Bekas, IBM Update.
Yutong Lu, NUDT Update.
Peter Kogge, HPCG Analysis.
Haohuan Fu, Wuxi Update.

Open discussion

6:55: Awards Presentation for top 3 systems
HPCG 3.0 Release, Nov 11, 2015

• Available on GitHub.com
  • Using GitHub issues, pull requests, Wiki.

• Optimized 3.0 version:
  • Vendor or site developed.
  • Used for all results (AFAWK).
  • Intel, Nvidia, IBM: Available to their customers.

• All future results require HPCG 3.0 use.
• Quick Path option makes this easier.
Main HPCG 3.0 Features

See http://www.hpcg-benchmark.org/software/index.html for full discussion

- Problem generation is timed.
- Memory usage counting and reporting.
- Memory bandwidth measurement and reporting.
- "Quick Path" option to make obtaining results on production systems easier.
- Provides 2.4 rating and 3.0 rating in output.
- Command line option (--rt=) to specify the run time.
Other Items

• Reference version on GitHub:
  • https://github.com/hpcg-benchmark/hpcg
  • Website: hpcg-benchmark.org.
  • Mail list hpcg.benchmark@gmail.com

• HPCG & Student Cluster Competitions.
  • Used in SC15/16, ASC
  • SC15: HPCG replaced HPL, ranking matched overall cluster ranking.

• HPCG-optimized kernels going into vendor libraries.
• Next event: ISC’16:
Summary

- HPCG is
  - Addressing original goals.
  - Rewarding vendor investment in features we care about.

- HPCG has traction.
  - Original goal of top 50 systems is reachable, and more.
  - 101 entries SC16

- Version 3.X is the final planned major version.
  - 3.1 (beta): Includes support for heterogeneous execution.
HPCG RANKINGS
NOVEMBER 2016
<table>
<thead>
<tr>
<th>Rank</th>
<th>Site</th>
<th>Computer</th>
<th>Cores</th>
<th>Rmax Pflops</th>
<th>HPCG Pflops</th>
<th>HPCG /HPL % of Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RIKEN Advanced Institute for Computational Science</td>
<td>K computer, SPARC64 VIIIfx 2.0GHz, Tofu interconnect</td>
<td>705,024</td>
<td>10.5</td>
<td>0.603</td>
<td>5.7%</td>
</tr>
<tr>
<td>2</td>
<td>NSCC / Guangzhou</td>
<td>Tianhe-2 NUDT, Xeon 12C 2.2GHz + Intel Xeon Phi 57C + Custom</td>
<td>3,120,000</td>
<td>33.8</td>
<td>0.580</td>
<td>1.7%</td>
</tr>
<tr>
<td>3</td>
<td>Joint Center for Advanced High Performance Computing Japan</td>
<td>Oakforest-PACS – PRIMERGY CX600 M1, Intel Xeon Phi 7250 68C 1.4GHz, Intel OmniPath, Fujitsu</td>
<td>557,056</td>
<td>24.9</td>
<td>0.385</td>
<td>2.8%</td>
</tr>
<tr>
<td>4</td>
<td>National Supercomputing Center in Wuxi, China</td>
<td>Sunway TaihuLight – Sunway MPP, SW26010 260C 1.45GHz, Sunway, NRCPC</td>
<td>10,649,600</td>
<td>93.0</td>
<td>0.3712</td>
<td>0.4%</td>
</tr>
<tr>
<td>5</td>
<td>DOE/SC/LBNL/NERSC USA</td>
<td>Cori – XC40, Intel Xeon Phi 7250 68C 1.4GHz, Cray Aries, Cray</td>
<td>632,400</td>
<td>13.8</td>
<td>0.355</td>
<td>2.6%</td>
</tr>
<tr>
<td>6</td>
<td>DOE/NNSA/LLNL USA</td>
<td>Sequoia – IBM BlueGene/Q, PowerPC A2 16C 1.6GHz, 5D Torus, IBM</td>
<td>1,572,864</td>
<td>17.1</td>
<td>0.330</td>
<td>1.9%</td>
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<tr>
<td>7</td>
<td>DOE/SC/Oak Ridge Nat Lab</td>
<td>Titan - Cray XK7 , Opteron 6274 16C 2.200GHz, Cray Gemini interconnect, NVIDIA K20x</td>
<td>560,640</td>
<td>17.5</td>
<td>0.322</td>
<td>1.8%</td>
</tr>
<tr>
<td>8</td>
<td>DOE/NNSA/LANL/SNL</td>
<td>Trinity - Cray XC40, Intel E5-2698v3, Aries custom, Cray</td>
<td>301,056</td>
<td>8.10</td>
<td>0.182</td>
<td>2.3%</td>
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<tr>
<td>9</td>
<td>NASA / Mountain View</td>
<td>Pleiades - SGI ICE X, Intel E5-2680, E5-2680v2, E5-2680v3, E5-2680v4, Infiniband FDR, HPE/SGI</td>
<td>243,008</td>
<td>5.9</td>
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<tr>
<td>10</td>
<td>DOE/SC/Argonne National Laboratory</td>
<td>Mira - BlueGene/Q, Power BQC 16C 1.60GHz, 5D Torus, IBM</td>
<td>786,432</td>
<td>8.58</td>
<td>0.167</td>
<td>1.9%</td>
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</table>
Comparison Peak, HPL
Comparison Peak, HPL, & HPCG

HPCG BoF on Wednesday at 5:15pm in Room 355-E
<table>
<thead>
<tr>
<th>Rnk</th>
<th>Machine</th>
<th>Cores</th>
<th>HPL Res</th>
<th>HPL Rnk</th>
<th>HPCG PF/s</th>
<th>% Peak</th>
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<td>10.510</td>
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<td>0.6027</td>
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<td>Tianhe-2</td>
<td>3,120,000</td>
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<td>2</td>
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<td>Oakforest</td>
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<td>6</td>
<td>0.3855</td>
<td>1.5%</td>
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<tr>
<td>4</td>
<td>TaihuLight</td>
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<td>93.015</td>
<td>1</td>
<td>0.3712</td>
<td>0.3%</td>
</tr>
<tr>
<td>5</td>
<td>Cori</td>
<td>632,400</td>
<td>13.832</td>
<td>5</td>
<td>0.3554</td>
<td>1.3%</td>
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<tr>
<td>6</td>
<td>Sequoia</td>
<td>1,572,864</td>
<td>17.173</td>
<td>4</td>
<td>0.3304</td>
<td>1.6%</td>
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<tr>
<td>7</td>
<td>Titan</td>
<td>560,640</td>
<td>17.590</td>
<td>3</td>
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<tr>
<td>8</td>
<td>Trinity</td>
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<td>0.1826</td>
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<td>243,008</td>
<td>5.952</td>
<td>13</td>
<td>0.1752</td>
<td>2.5%</td>
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<tr>
<td>10</td>
<td>Mira</td>
<td>786,432</td>
<td>8.587</td>
<td>9</td>
<td>0.1670</td>
<td>1.7%</td>
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