Accelerating Insights...
In the Technical Computing Transformation

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TOP500 Highlights

427 of 500 (85%) of all systems
111 of 114 (97%) of new systems

**Intel® Xeon Phi™**
in Jun’14 list

#1—TOP500 system

#1—Intel® Xeon Phi™ Total Rmax > GPU’s Total Rmax

**PRACE ISC Award—2014**

1<sup>st</sup> Sustained 1PFlop Real Science Performance on an IA-based System

Use Intel processors

Source: www.top500.org
The Democratization of HPC...
A 20 Year Retrospective

$/FLOP

10^8
10^5
10
1

1994
YEAR
2014

>15,000X IMPROVEMENT

Beowulf Cluster

Pioneering Science

High ROI Industry Innovations

*Source: Intel per socket estimate comparing Intel DX4™ processor (Beowulf) versus Intel® Xeon Phi™ (Knights Corner)
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HPC’s Next Stage

New Usages
- 3D Printing

New Access
- HPC Cloud Service

New Models
- Crowdsourcing

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Technology Waterfalls from the Top

Top 500 <15%

All Other Technical Computing >85%

Performance Waterfall*
#1 Top500 System to Single Socket

6-8 years
#1 to #500

~9 years
#500 to Single Socket

*plus.....similar waterfalls for other capabilities in areas like fabrics, storage, software, ...

Source: Top500.org and Intel Estimate of Top500 sockets as % of sum of analysts reports of HPC and branded Workstations sockets. Performance waterfall timelines based on TOP500.org statistics (#1-#500) and Intel estimate (#500 to projected Intel Knights Landing)
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Unveiling Details of Knights Landing
(Next Generation Intel® Xeon Phi™ Products)

**Platform Memory:** DDR4 Bandwidth and Capacity Comparable to Intel® Xeon® Processors

**Compute:** Energy-efficient IA cores
- Microarchitecture enhanced for HPC
- 3X Single Thread Performance vs Knights Corner
- Intel Xeon Processor Binary Compatible

**On-Package Memory:**
- up to 16GB at launch
- 5X Bandwidth vs DDR4
- 1/3X the Space
- 5X Power Efficiency

Jointly Developed with Micron Technology

All products, computer systems, dates and figures specified are preliminary based on current expectations, and are subject to change without notice. 1Over 3 Teraflops of peak theoretical double-precision performance is preliminary and based on current expectations of cores, clock frequency and floating point operations per cycle. FLOPS = cores x clock frequency x floating-point operations per second per cycle. 2Modified version of Intel® Silvermont microarchitecture currently found in Intel® Atom™ processors. 3Modifications include AVX512 and 4 threads/core support. 4Projected peak theoretical single-thread performance relative to 1st Generation Intel® Xeon Phi™ Coprocessor 7120P (formerly codenamed Knights Corner). 5Binary Compatible with Intel Xeon processors using Haswell Instruction Set (except TSX). 6Projected results based on internal Intel analysis of Knights Landing memory vs Knights Corner (GDDR5). 7Projected result based on internal Intel analysis of STREAM benchmark using a Knights Landing processor with 16GB of ultra high-bandwidth versus DDR4 memory only with all channels populated.
**Announcing**

**Intel® Omni Scale—The Next-Generation Fabric**

- Designed for Maximum Scalability
- Rich Set of Programming Models
- Flexible Configurations
- End-to-End Solution

**INTEGRATION**

- Intel® Omni Scale Fabric
  - Starting with Knights Landing
- Intel® Omni Scale Fabric
  - Future 14nm generation

**Coming in ‘15**

- PCIe Adapters
- Edge Switches
- Director Systems
- Intel Silicon Photonics
- Open Software Tools*

*OpenFabrics Alliance
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The Future Is Here

Knights Landing Supercomputer…the 1st of Many

System name: Cori

>9300 Knights Landing nodes

Next Generation Intel® Xeon Phi™ Products (Knights Landing)

“...a significant step in advancing supercomputing design toward the kinds of computing systems we expect to see in the next decade as we advance to exascale.”

Steve Binkley
Associate Director of the Office of Advanced Scientific Computing Research

“Cori will provide a significant increase in capability for our users and will provide a platform for transitioning our very broad user community to many core architectures.”

Sudip Dosanjh
NERSC Director

Modernizing Community Codes... *Together*

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