PRODUCT BRIEF

The Intel® Xeon Phi™ Product Family

Highly-Parallel Processing for Unparalleled Discovery

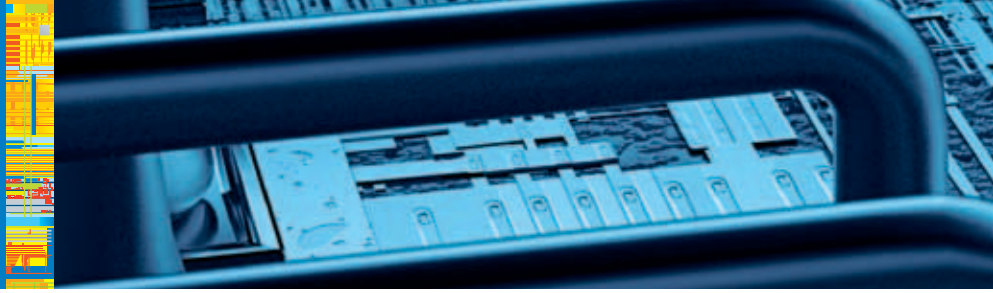
Breakthrough Performance for Your Highly-Parallel Applications

Extracting extreme performance from highly-parallel applications just got easier. Intel® Xeon Phi™ coprocessors, based on Intel Many Integrated Core (MIC) architecture, complement the industry-leading performance and energy-efficiency of the Intel® Xeon® processor E5 family to enable dramatic performance gains for some of today's most demanding applications—up to 1.2 teraflops per coprocessor.[1] You can now achieve optimized performance for even your most highly-parallel technical computing workloads, while maintaining a unified hardware and software environment.[2]

"Moving a code to Intel Xeon Phi might involve sitting down and adding a couple lines of directives that takes a few minutes. Moving a code to a GPU is a project."[3]

–Dan Stanzione, Deputy Director at Texas Advanced Computing Center

The Intel Xeon Phi Coprocessor



Even Higher Efficiency for Parallel Processing

While a majority of applications will continue to achieve maximum performance using Intel Xeon processors, certain highly-parallel applications will benefit dramatically by using Intel Xeon Phi coprocessors. Each coprocessor features many more and smaller cores, many more threads, and wider vector units. The high degree of parallelism compensates for the lower speed of each individual core to deliver higher aggregate performance for highly-parallel code.

You can use Intel Xeon processors and Intel Xeon Phi coprocessors together to optimize performance for almost any workload. To take full advantage of Intel Xeon Phi coprocessors, an application must scale well to over one-hundred threads, and either make extensive use of vectors or efficiently use more local memory bandwidth than is available on an Intel Xeon processor. Learn more at http://software.intel.com/en-us/articles/is-intelr-xeon-phitm-coprocessor-right-for-you.

A Single Programming Model for All Your Code

A broad ecosystem of programming languages, models, and tools support Intel® architecture and all of them can be used with both Intel Xeon processors and Intel Xeon Phi coprocessors. Applications that run on one processor family will run on the other. This uniformity can greatly reduce the complexity of software development. Existing applications will need to be tuned and recompiled to maximize throughput, but your developers won't need to rethink the entire problem or master new tools and programming models. Instead, they can reuse existing code and maintain a common code base using familiar tools and methods.

Code can be optimized just once for both Intel Xeon processors and Intel Xeon Phi coprocessors. The same techniques deliver optimal performance for both, so the investment you make in parallelizing your code will deliver benefits across the full range of computing environments.

A Family of Coprocessors for Diverse Needs

Intel Xeon Phi coprocessors provide up to 61 cores, 244 threads, and 1.2 teraflops of performance, and they come in a variety of configurations to address diverse hardware, software, workload, performance, and efficiency requirements.[1] They also come in a variety of form factors, including a standard PCIe* x16 form factor (with active, passive, or no thermal solution), and a dense form factor that offers additional design flexibility (Table 2).

- **The Intel® Xeon Phi™ Coprocessor 3100** family provides outstanding parallel performance. It is an excellent choice for compute-bound workloads, such as MonteCarlo, Black-Scholes, HPL, LifeSc, and many others. Active and passive cooling options provide flexible support for a variety of server and workstation systems.
- **The Intel® Xeon Phi™ Coprocessor 5100** family is optimized for high-density computing and is well-suited for workloads that are memory-bandwidth bound, such as STREAM, memory-capacity bound, such as ray-tracing, or both, such as reverse time migration (RTM). These coprocessors are passively cooled and have the lowest thermal design power (TDP) of the Intel Xeon Phi product family.
- **The Intel® Xeon Phi™ Coprocessor 7100** family provides the most features and the highest performance and memory capacity of the Intel Xeon Phi product family. This family supports Intel® Turbo Boost Technology 1.0, which increases core frequencies during peak workloads when thermal conditions allow. Passive and no thermal solution options enable powerful and innovative computing solutions.

Better Performance, More Flexibility

Table 1. Intel® Xeon Phi™ Coprocessor Family Overview

FEATURES	DETAILS	BENEFITS
Intel® Many Integrated Cores (MIC) architecture	▪ Up to 61 cores, 244 threads, and 16 GB of GDDR5 memory (352 GB/s bandwidth) per coprocessor ▪ Double-wide (256-bit) vector engines and 512-bit SIMD instructions ▪ Ideal for highly-parallel, vector-intensive, and memory-bound code	Up to 1.2 teraflops of double-precision performance per coprocessor[1]
Familiar Intel® architecture programming model	Developers can: ▪ Use familiar methods and tools, including the latest Intel® Software Development products ▪ Maintain a common code base for Intel® Xeon® processors and Intel® Xeon Phi™ coprocessors	Simplified development and dual-benefit for performance optimization
Linux* hosting capability	Run each coprocessor under the host operating system or as an independent server running Red Hat Enterprise Linux* 6.x or SuSE Linux* 12+	Exceptional execution flexibility
IP Addressable	Supports standard clustering models.	Simple scaling
Industry-leading silicon technology	▪ Intel 22 nm technology with 3D Tri-Gate transistors ▪ Power envelopes as low as 225 Watts per coprocessor	Exceptional compute density and energy efficiency
Flexible form factors	▪ Standard x16 PCIe* cards (with active, passive, or no thermal solution) and a unique dense form factor (DFF) for more customized integration ▪ Use up to 8 coprocessors per host server	Flexible integration and scalability
Flexible Execution Models	▪ Multicore only – MAIN() runs on host processor ▪ Multicore Hosted with Manycore Offload – MAIN() runs on host processor and select routines are executed on the coprocessor ▪ Symmetric execution – MAIN() runs symmetrically on processor and coprocessor ▪ Manycore only – Boot from host processor, MAIN() runs on coprocessor	Best flexibility for optimizing workload performance

Table 2. Intel® Xeon Phi™ Product Family Specifications

PRODUCT NUMBER	FORM FACTOR &, THERMAL SOLUTION[4]	BOARD TDP (WATTS)	NUMBER OF CORES	FREQUENCY (GHz)	PEAK DOUBLE PRECISION PERFORMANCE (GFLOP)	PEAK MEMORY BANDWIDTH (GB/s)	MEMORY CAPACITY (GB)	INTEL® TURBO BOOST TECHNOLOGY
3120P	PCIe, Passive	300	57	1.1	1003	240	6	N/A
3120A	PCIe, Active	300	57	1.1	1003	240	6	N/A
5110P	PCIe, Passive	225	60	1.053	1011	320	8	N/A
5120D	Dense form factor, None	245	60	1.053	1011	352	8	N/A
7110P	PCIe, Passive	300	61	1.238	1208	352	16	Peak turbo frequency: 1.33 GHz
7120X	PCIe, None	300	61	1.238	1208	352	16	

Get Started Today!

The Intel® Xeon Phi™ coprocessors can dramatically accelerate performance for your highly-parallel applications to help you push the boundaries of innovation and scientific discovery—without requiring your software developers to reinvent the wheel.

Driving Supercomputing to New Heights

Some of today's most successful high performance computing centers are using Intel Xeon Phi coprocessors to deliver massive new parallel computing capability.

- The 10 petaflop Stampede Supercomputer at the Texas Advanced Computing Center (TACC) includes thousands of both Intel Xeon processors and Intel Xeon Phi coprocessors.[5]
- The #1 most energy-efficient supercomputer on the November 2012 GREEN500 list achieved its top ranking using Intel Xeon processors and Intel Xeon Phi coprocessors.[6]

Learn more at **intel.com/xeonphi**

[1] Claim based on calculated theoretical peak double precision performance capability for a single coprocessor. 16 DP FLOPS/clock/core * 61 cores * 1.238 GHz = 1.208 TeraFlops.

[2] Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more information go to **http://www.intel.com/performance**

[3] **hpcwire.com/hpcwire/2011-04-21/tacc_steps_up_to_the_mic.html**

[4] Form factors and thermal solutions include: Standard x16 PCIe cards (PCIe), available with passive cooling (P), active cooling (A), or no thermal solution (NTS); and dense form factor (DFS) cards, which are a derivative of the standard PCIe form factor card and are designed for more customized implementations. Contact your Intel sales representative or your distributor for more information and the latest specifications

[5] Read the Intel press release at: **http://newsroom.intel.com/community/intel_newsroom/blog/2013/03/27/10-petaflops-supercomputer-stampede-powered-by-intelr-xeon-phitm-coprocessors-officially-dedicated-today**

[6] Get more information at: **http://www.intel.com/content/www/us/en/processors/xeon-phi/xeon-phi-coprocessor-testimonial-nics-video.html?wapkw=nics+xeon+phi**

[7] Claim based on calculated theoretical peak double precision performance capability for a single coprocessor. 16 DP FLOPS/clock/core * 61 cores * 1.238GHz = 1.208 TeraFlops

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