

Intel[®] Xeon Phi[™] Coprocessor **Applications and Solutions Catalog**

Public Version | Rev 3 | January 2015



APPLICATION DOMAIN

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IS YOUR APPLICATION MISSING?

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If you have completed a community or proprietary code, published a technical paper, or optimized your application for Intel® Xeon Phi™ coprocessors, please fill out the form with the details so that we can update this list.

About this document

This document contains a growing list of available, downloadable or work in progress code that can be run, or is actively being optimized to run on Intel® Xeon Phi™ coprocessors.

Intel® Xeon® processors are optimized to deliver the best performance for most applications. This document focuses on workloads that are expected to exploit the higher levels of parallelism, vectorization, and memory bandwidth provided by Intel® Xeon Phi™ coprocessors.

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 Indicates code optimization complete and recipe/benchmark available.

WORK IN PROGRESS Indicates work in progress with application vendor or community code.

If code is optimized to run on the Intel® Xeon Phi™ Coprocessor, a recipe (detailed how-to information for compiling, running, optimizing software, or benchmark) or specific benchmark information will be available; links to related information including articles, blogs, and press releases are also provided. Some codes are not commonly accessible and downloadable or shareable by their owners, but we reflect them here, if useful benchmark information is published.

Otherwise we list information on where the code is being optimized so that you can inquire with the institutions where the work is happening.

For a list of Intel compilers**, analyzers, debuggers, libraries, and third party tools please also see <https://software.intel.com/en-us/articles/intel-and-third-party-tools-and-libraries-available-with-support-for-intel-xeon-phitm>

**Optimization Notice: Intel's compilers may or may not optimize to the same degree for non-Intel microprocessors for optimizations that are not unique to Intel microprocessors. These optimizations include SSE2, SSE3, and SSSE3 instruction sets and other optimizations. Intel does not guarantee the availability, functionality, or effectiveness of any optimization on microprocessors not manufactured by Intel. Microprocessor-dependent optimizations in this product are intended for use with Intel microprocessors.

Certain optimizations not specific to Intel microarchitecture are reserved for Intel microprocessors. Please refer to the applicable product User and Reference Guides for more information regarding the specific instruction sets covered by this notice.

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ASTROPHYSICS			
Application/Code	Description	Status	For More Information
Astrophysics codes	COSMOS directly tests mathematical theories against the latest observational data	WORK IN PROGRESS	COSMOS at Cambridge Information Article
Finite Difference Time Domain Method (FDTD)	Algorithm widely used in electromagnetic simulation		Case study
GADGET	Software for cosmological N-body/ SPH simulations	WORK IN PROGRESS	Leibniz Supercomputing Center Information
Hogbom Clean Benchmark – ASKAP	Used to benchmark a variety of platforms for the Australian SKA Pathfinder (ASKAP) Science Data Processor		Recipe/download code

BENCHMARKS			
Application/Code	Description	Status	For More Information
GEMM/STREAM/ LINPACK	Benchmark Suites targeting Floating Point and GDDR Memory bandwidth		Intel® MPSS User Guide GEMM Results STREAM/LINPACK Results
The Scalable Heterogeneous Computing Benchmark – SHOC	Benchmark Suite used for measuring performance and stability of Coprocessor-based systems		Recipe/download code

NOTE: Many benchmarks are described in greater detail here: www.intel.com/xeonphi. Click on the “Performance” link in the right hand channel of that page to view details.

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CLIMATE AND WEATHER			
Application/Code	Description	Status	For More Information
ADCIRC	Advanced CIRCulation is a community-based shallow water model	WORK IN PROGRESS	University of Oklahoma
CAM5	Community Atmosphere Model (CAM) is the latest in a series of global atmosphere models developed primarily at the National Center for Atmospheric Research (NCAR)	WORK IN PROGRESS	Lawrence Berkeley National Labs Information
CFSv2	Numerical weather prediction and climate model	WORK IN PROGRESS	Center for Development of Advanced Computing (C-DAC)
COSMO	High-precision numerical weather prediction system	WORK IN PROGRESS	ETH Zurich
ECHAM6	New major version of the series of atmospheric general circulation models	WORK IN PROGRESS	CSC Finland
HARMONIE	Regional weather forecasting model	WORK IN PROGRESS	Irish Centre for High-End Computing (ICHEC)
HBM	3D Ocean Model		Recipe/download code Information
Model for Prediction Across Scales (MPAS)	Project for developing atmosphere, ocean, and other earth-system simulation components for use in climate and weather studies	WORK IN PROGRESS	University of Colorado & NCAR Information
NASA Overflow	Compressible 3-D flow solver that solves time-dependent Reynolds-averaged Navier-Stokes equations		Benchmark

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CLIMATE AND WEATHER, CONTINUED

Application/Code	Description	Status	For More Information
NOAA NIM	Non-hydrostatic Icosahedral weather forecasting model		Recipe/download code
Weather Research and Forecasting model (WRF)	Numerical weather prediction system		University of Colorado & NCAR University of Wisconsin-Madison Recipe/download code Recipe/download code for conus2.5km in Symmetric mode

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CLUSTER AND WORKLOAD MANAGEMENT

Application/Code	Description	Status	For More Information
Adaptive Computing MOAB HPC Suite	Dynamic scheduling, provisioning, and management of multi-step/multi-application services across HPC		Information
Altair* PBS Professional	HPC workload management product		Success story
Bright Cluster* Manager	Install, schedule, monitor, and manage HPC clusters		Information
ET International Swarm* (Beta)	Resource management and task scheduling		Information
Ganglia Distributed Monitoring System*	Scalable distributed monitoring system for high-performance computing systems		Information (See build instructions in MPSS User Guide) Configuration
IBM* Platform LSF	Workload management platform for distributed HPC	WORK IN PROGRESS	Information Webcast
IBM* Platform HPC	Cluster provisioning, monitoring, management, workload scheduling, and reporting		Information
IBM* Platform Cluster Manager	Cluster management software		Information
MPICH	High performance and widely portable implementation of the Message Passing Interface (MPI) standard		Information
Univa Grid Engine* Software	Distributed resource management software platform		Information

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DIGITAL CONTENT CREATION

Application/Code	Description	Status	For More Information
EMBREE	Collection of high-performance ray tracing kernels		Recipe/download code
Superresolution processing	SD to HD video conversion		Solution brief

ENERGY

Application/Code	Description	Status	For More Information
Acceleware* AxRTM	Library used for the accurate imaging of complex subsurface geologies		Information
DownUnder GeoSolutions	Seismic processing and interpretation solutions for Oil and Gas industry		Announcement Video Blog
ISO3DFD	Seismic Modeling code		Benchmark Recipe/download code Blog
RTM Petrobras	Seismic Imaging code		Benchmark Information
TTI 3DFD	Used in developing Seismic Modeling		Benchmark

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FINANCIAL SERVICES

Application/Code	Description	Status	For More Information
Binomial Options Pricing Model	Used to value options in quantitative Financial Services		Recipe/download code
Binomial SP and DP	Single and double precision benchmark in Financial Services		Benchmark
BlackScholes Merton Formula	Financial derivative pricing		Recipe/download code
BlackScholes SP and DP	Financial Services double precision benchmarks		Benchmark
Monte Carlo European Options Pricing	Model to calculate the value of options with multiple sources of uncertainty or with complicated features		Recipe/download code
Monte Carlo RNG SP and DP	Simulation utilizing random numbers to model outcomes based on statistical or experiential data		Benchmark Recipe/download code
Monte Carlo SP and DP	Financial Services benchmarks		Benchmark
STAC A2	Benchmark for testing analytic workloads involved in pricing and risk management		Benchmark Information
Xcelerit	Acceleration tools for financial services, engineering, and research		Blog

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GEOPHYSICS			
Application/Code	Description	Status	For More Information
ELMER/Ice	Ice sheet, glaciers, and ice flow modelling	WORK IN PROGRESS	CSC-Finland
SeisSol	Earthquake/seismic simulation	WORK IN PROGRESS	Leibniz Supercomputing Centre and Technische Universität München
SPECFEM3D Cartesian	Simulates acoustic, elastic, coupled acoustic/elastic, poro-elastic, or seismic wave propagation	WORK IN PROGRESS	CINECA Information
UTBench	Benchmark code based on GeoFEM, solves 3D static linear-elastic problems in solid mechanics	WORK IN PROGRESS	Information Technology Center (ITC), the University of Tokyo

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Life Sciences

[Bioinformatics](#)

[Computational Chemistry](#)

[Molecular Dynamics](#)

BIOINFORMATICS

Application/Code	Description	Status	For More Information
BLAST	DNA sequence match searching applications		Recipe/download code
Bowtie 2	Aligns read sequences to large genomes	WORK IN PROGRESS	John Hopkins University
BWA – Burrows Wheeler Alignment Tool	Maps low-divergent sequences against a large reference genome		Recipe/download code Benchmark
cryo-EM Technique (cryo Electron Microscopy)	3D biological structure extraction/analysis	WORK IN PROGRESS	Dana-Farber Cancer Institute (DFCI) and Harvard Medical School
MPI-HMMER 2.3	A hidden Markov model for analyzing protein sequences		Recipe/download code Benchmark

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Life Sciences Continued

COMPUTATIONAL CHEMISTRY

Application/Code	Description	Status	For More Information
DiRAC Codes	Compute molecular properties using relativistic quantum chemical methods	WORK IN PROGRESS	Information
GAMESS	Computational chemistry software (General Atomic and Molecular Electronic Structure System)	WORK IN PROGRESS	Iowa State University
Integral Calculation Library	A library for calculation of electronic integrals	WORK IN PROGRESS	Georgia Institute of Technology
NEURON	Used for building and using computational models of neurons and networks of neurons	WORK IN PROGRESS	San Diego Supercomputer Center, University of California San Diego
NWChem	Scalable computational chemistry tools and code		Lawrence Berkeley National Laboratory Recipe/download code News announcement

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Life Sciences Continued

MOLECULAR DYNAMICS

Application/Code	Description	Status	For More Information
AMBER	A Molecular Simulation package		Recipe/download code
BUDE	Molecular Docking	WORK IN PROGRESS	University of Bristol presentation details
DL_POLY	General purpose, classical molecular dynamics simulation application	WORK IN PROGRESS	Irish Centre for High-End Computing (ICHEC)
GROMACS	A versatile molecular dynamics package		Recipe/download code Benchmark
LAMMPS	A classic molecular dynamics application		Recipe/download code Benchmark
NAMD	A molecular dynamics application for simulation of large bio molecular systems		University of Illinois at Urbana-Champaign Recipe/download code Benchmark

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LANGUAGES AND DEVELOPMENT TOOLS

Application/Code	Description	Status	For More Information
Agner Fog's Vector Class Library	Tool that allows handling of multiple data in parallel thus speeding C++ code		Get code
Allinea* DDT and MAP	Software development tools and application performance analytics		Information
Intel® Parallel Studio XE 2015	C++ and Fortran Compilers and Libraries, optimized libraries and routines, analysis, and optimization tools		Information
Mathworks* MATLAB	Performance analysis tools to test app-to-system resource efficiency		Recipe/download code
Overhead and Speedometer	Simulation utilizing random numbers to model outcomes based on statistical or experiential data		Information
PAPI	Standard application programming interface (API) for accessing hardware performance counters		Information
pyMIC	Module for offloading from Python applications		Get module
R software*	Open-source software environment for statistical computing and analysis		Texas Advanced Computing Center Recipe/download code
Rogue Wave TotalView and MemoryScape	Tools and libraries to help developers create high performance, highly parallel applications		Information
Tuning and Analysis (TAU)	Profiling and tracing toolkit for performance analysis of parallel programs		University of Oregon Where to get TAU

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LIBRARIES

Application/Code	Description	Status	For More Information
Accelereyes ArrayFire	Library of functions for matrix arithmetic, signal processing, linear algebra, statistics, and image processing		Information
Boost	C++ library project		Recipe/download code
Libxphi	Offloading capabilities for BLAS3 functions to dynamically linked binaries		Get library
LIBXSMM	Library for small matrix-matrix multiplications		Get library
LIBXSTREAM	Library to program with streams, events		Download code
MAGMA	Dense linear algebra library		Get library
MVAPICH2	Provides support for hybrid MPI+PGAS programming models with unified communication runtime		Get library
NAG	Numerical library for mathematical and statistical computation		Get library

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Manufacturing

[Computer Aided Engineering \(CAE\)](#)

[Computational Fluid Dynamics](#)

COMPUTER AIDED ENGINEERING (CAE)

Application/Code	Description	Status	For More Information
Altair RADIOSS*	Highly scalable structural analysis solver for highly non-linear problems under dynamic loadings	WORK IN PROGRESS	Case study Video
Ansys* Mechanical v.15 & v.16	Finite element analysis tool for structural analysis, including linear, nonlinear, and dynamic studies		Ansys* Benchmark Case study Solution brief
Mantevo MiniFE	Mini-application encapsulating performance characteristics of an implicit finite element method application		Recipe/download code
SIMULIA Abaqus*	Visual tests and realistic simulation software	WORK IN PROGRESS	Information

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COMPUTATIONAL FLUID DYNAMICS (CFD)

Application/Code	Description	Status	For More Information
AVBP	A parallel CFD code for reactive unsteady flow simulations on hybrid grids	WORK IN PROGRESS	CERFACS
FrontFlow/Blue code	Finite element program for geometrical calculations in moving boundary interface	WORK IN PROGRESS	Center for Research on Innovative Simulation Software (CISS)
LBS3D	Simulation tools for multiphase flows		Recipe/download code
OpenFOAM	Computational Fluid Dynamics		Louisiana State University
OpenLB	Open source Lattice Boltzmann code		Download code
ROTORSIM	Compressible finite-volume fluid simulation code	WORK IN PROGRESS	University of Bristol product page
SU2	Stanford University Unstructured (SU2), Computational Fluid Dynamics	WORK IN PROGRESS	Stanford University
TAU and TRACE	Leading CFD solvers in the European aerospace industry	WORK IN PROGRESS	Technische Universität Dresden Center for Information Services and High Performance Computing

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MATERIAL SCIENCES

Application/Code	Description	Status	For More Information
Geant (Geometry and Tracking)	Simulates the passage of particles through matter	WORK IN PROGRESS	São Paulo State University (Universidade Estadual Paulista, UNESP)
GPAW	Package for quantum mechanical simulations	WORK IN PROGRESS	CSC- Finland
miniGhost	Finite difference mini-application		Recipe/download code
Quantum ESPRESSO*	Electronic-structure calculations and materials modeling at the nanoscale		Recipe/download code
VASP	Atomic scale materials modelling	WORK IN PROGRESS	Zuse-Institut Berlin

NANOTECHNOLOGY

Application/Code	Description	Status	For More Information
NEMO5	Fifth edition of the NanoElectronics Modeling Tools	WORK IN PROGRESS	Purdue University

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PHYSICS			
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BAGEL & BFM (QCD)	Assembler kernel generation library for QCD and linear algebra operations	WORK IN PROGRESS	The University of Edinburgh
Chroma QCD	Application suite for LQCD applications		Github Repository Main code repository
Elmer	Multi-physics finite element package	WORK IN PROGRESS	CSC-Finland
GTC-P	Code for turbulence simulation in support of the burning plasma experiment		Recipe/download code
QCD Bench	Analyzes the characteristics and behavior of elementary particles and quark	WORK IN PROGRESS	Center for Computational Sciences (CCS), University of Tsukuba
QphiX-QCD	Library containing highly optimized Wilson-Dslash, Wilson Clover operator, and Krylov subspace solvers for Lattice QCD simulations		Get library

SCIENTIFIC VISUALIZATION			
Application/Code	Description	Status	For More Information
VisIt	Scientific visualization technology	WORK IN PROGRESS	University of Tennessee and Oak Ridge National Laboratory Information

Contact your local Intel® sales office or your distributor to obtain the latest specifications and before placing your product order.

Find out more about Intel® Xeon Phi™ Coprocessor details or where to buy, go to <http://intel.com/xeonphi>

For Intel® Xeon Phi™ Coprocessor developer resources go to: <http://software.intel.com/xeonphi>

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