Product Brief

intel software

Cross-Architecture Programming
Intel® oneAPI Base Toolkit

Develop Cross-Architecture Applications for CPUs, GPUs, and FPGAs

Take the smart path to accelerated computing – without the economic and technical burdens of proprietary programming models.

Many data-centric workloads run best when they're deployed across a mix of heterogeneous architectures—CPU, GPU, FPGA, and other accelerators. But different architectures typically require unique languages, tools, and libraries— adding complexity for developers and limiting code reuse. This makes it hard to take advantage of multiarchitecture solutions and inefficient to optimize application performance.

oneAPI is an industry initiative, managed by the UXL Foundation, creating an open, standards-based, multiarchitecture programming model to simplify development for a wide range of data-centric workloads across a variety of architectures. It includes an open multiarchitecture language, C++ with SYCL, plus advanced libraries.

Use it for:

- High -performance computing (HPC)
- Machine learning, deep learning, and analytics
- IoT applications
- Video processing
- Rendering
- And more

Who needs it?

- Developers looking to maximize performance, productivity, and freedom of architectural choice by building cross-architecture applications and solutions that take advantage of a variety of Intel® CPUs, GPUs, and FPGAs.
- Developers with existing CUDA code who want to take advantage of other architectures by porting their code to C++ with SYCL code.

What it does

Intel software developer tools bring developers productive and performant heterogeneous programming.

Future-ready programming model provides freedom of choice.

- **Get an open alternative to single-vendor/proprietary lock-in** for easy architecture retargeting.
- **Apply your skills to the next innovation,** not rewriting software for the next hardware platform.

Let's you realize all your hardware's value.

- **Expose and exploit all the cutting-edge features of the latest CPU, GPU, and FPGA hardware.** For instance, get the most from **Intel® Xeon® Scalable processors**, which enable **Intel® Advanced Vector Extensions 512 (Intel® AVX- 512)** including **Intel® Advanced Matrix Extensions (Intel® AMX)** for AI acceleration.

Intel® oneAPI Base Toolkit

Direct Programming

Intel® oneAPI DPC++/C++ Compiler

Intel® DPC++ Compatibility Tool

Intel® Distribution for Python*

Intel® FPGA Add-On for oneAPI Base Toolkit

API-Based Programming

Intel® oneAPI DPC++ Library

Intel® oneAPI Math Kernel Library

Intel® oneAPI Data Analytics Library

Intel® oneAPI Threading Building Blocks

Intel® oneAPI Collective Communications Library

Intel® oneAPI Deep Neural Network Library

Intel® Integrated Performance Primitives

Analysis & Debug

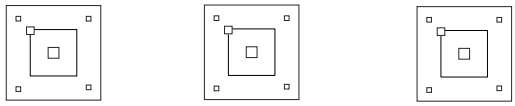
Intel® VTune™ Analyzer

Intel® Advisor

Intel® Distribution for GDB*

†Hardware support varies by individual oneAPI tool.

*Other names and brands may be claimed as the property of others.



Let's you quickly and confidently develop performant code.

- **Make development fast and efficient** with a complete set of cross-architecture libraries and advanced tools.
- **Easily integrate with legacy code, including migrating CUDA** code to C++ with SYCL.

Highlights

Intel® oneAPI DPC++/C++ Compiler for direct programming

C++ with SYCL allows code reuse across hardware targets and enables high productivity and performance across CPU, GPU, and FPGA architectures while permitting accelerator-specific tuning. The unified Intel® oneAPI DPC++/C++ Compiler also includes full modern C++.

Libraries for API-based programming

Powerful libraries—including deep learning, math, and video and media processing—are preoptimized to accelerate compute-intensive workloads.

Advanced analysis and debug tools

Get what you need for performance profiling, design advice, accelerator offload modeling, and cross-architecture debug:

What you get

The Intel® oneAPI Base Toolkit is a core set of tools and libraries for building and deploying high-performance, data-centric applications across diverse architectures:

- **Intel® oneAPI DPC++/C++ Compiler:** A standards-based, cross- architecture compiler supporting C++, C, SYCL, and OpenMP, it leverages well-proven LLVM compiler technology and Intel's history of compiler performance leadership. Experience seamless compatibility with popular compilers, development environments, and operating systems.
- **Intel® DPC++ Compatibility Tool:** Migrate CUDA source code to C++ with SYCL using this assistant.
- **Intel® Distribution for Python:** Achieve near-native code performance through acceleration of core Python numerical, scientific, and machine learning packages that are built using Intel® performance libraries.
- **Intel® oneAPI DPC++ Library:** Speed up data-parallel workloads with these key productivity algorithms and functions.
- **Intel® oneAPI Threading Building Blocks:** Simplify parallelism with this advanced threading and memory-management template library.

- **Intel® oneAPI Math Kernel Library:** Accelerate math-processing routines, including matrix algebra, fast Fourier transforms (FFT), and vector math.
- **Intel® oneAPI Data Analytics Library:** Boost machine learning and data analytics performance.
- **Intel® oneAPI Deep Neural Network Library:** Develop fast neural networks on with performance-optimized building blocks.
- **Intel® oneAPI Collective Communications Library:** Implement optimized communication patterns to distribute deep learning and machine learning model training across multiple nodes.
- **Intel® Advisor:** Design code for efficient vectorization, threading, and offloading to accelerators.
- **Intel® Integrated Performance Primitives:** Speed performance of imaging, signal processing, data compression, cryptography, and more.
- **Intel® VTune™ Profiler:** Find and optimize performance bottlenecks across CPU, GPU, and FPGA systems.
- **Intel® Distribution for GDB*:** Enables deep, system-wide debug of DPC++, C, C++, and Fortran code.
- **Intel® FPGA Add-on for oneAPI Base Toolkit (optional):** Program these reconfigurable hardware accelerators to speed specialized, data-centric workloads.

Priority Support

Every paid version of Intel® oneAPI Base Toolkit automatically includes Priority Support at our Online Service Center for a timespan that starts at purchase, typically one year.

You get:

- **Direct and private interaction with Intel's support engineers,** including the ability to submit confidential support requests.
- **Accelerated response time** for toolkit-related technical questions and other product needs
- **Ability to influence product features and quality.**
- **Priority Support** for escalated defects
- **Free download access** to all new product updates and continued access to older versions of the product
- **Access to a vast library** of self-help documentation that builds off decades of experience in creating high-performance code.
- **Additional services** at reduced cost, including on-site or online training and consultation by Intel technical consulting engineers.

Related products: Add domain-specific toolkits for specialized workloads.

You can choose from two add-on toolkits in combination with the Intel oneAPI Base Toolkit for specialized tools:

- **Intel® HPC Toolkit:** Deliver fast applications with tools to build, analyze, optimize, and scale HPC applications with the latest techniques in vectorization, multithreading, multi-node parallelization, and memory optimization.
- **Intel® Rendering Toolkit:** Get powerful rendering and ray-tracing libraries for high-fidelity visualization applications. Examples include medical research, geophysical exploration, filmmaking, advanced game development, and anything else that requires massive amounts of raw data to be quickly rendered into rich, realistic visuals.

Try your code in the Intel® Developer Cloud

Develop, run, and optimize your code in the Intel® Developer Cloud for access to the latest Intel® CPU and GPU hardware and Intel developer software tools.

Get started.

- Learn More about Intel® oneAPI Base Toolkit ›
- Get the Intel® oneAPI Base Toolkit with Priority Support ›
- Check out the Intel® Developer Cloud ›

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