IBM Software Development Kit for Multicore Acceleration V3.1 continues to enable ease of application programming for multicore solutions

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At a glance

IBM® Software Development Kit (SDK) for Multicore Acceleration V3.1 delivers:

- Multiple platform support for development
- Eclipse-based Integrated Development Environment (IDE) plug-ins for building, compiling, and debugging
- Development libraries and frameworks
  - Cell/B.E and hybrid High-Performance Computing (HPC) software example code
  - Product-level Accelerated Library Framework (ALF) and Data Communication and Synchronization (DaCS)
- Performance tools
  - Performance Debugging Tool
  - Feedback Directed Program Restructuring (FDPR-Pro) for gathering information to facilitate optimization
- Market segment library enablement
  - Highly optimized Basic Linear Algebra Subprograms (BLAS)
  - Linear Algebra Package (LAPACK)
  - 1D and 2D Fast Fourier Transforms (FFT)
  - Monte Carlo Random Number Generator Library
  - Mathematical Acceleration Subsystem (MASS/MASSV)
  - Standardized Single Instruction Multiple-Data (SIMD) math libraries

Overview

IBM Software Development Kit for Multicore Acceleration V3.1 (SDK) includes a suite of tools, libraries, frameworks, and examples that improve the ability to develop and optimize applications and algorithms for IBM BladeCenter® QS21 and QS22 blades. V3.1 of the SDK builds upon previous versions with new libraries and enhancements that can improve ease of programming and developer productivity, and enable greater performance of applications and workloads. In addition, it allows developers to plug in third-party ISV libraries to integrate with their solutions.

IBM SDK for Multicore Acceleration includes the following components:
• Eclipse-based Integrated Development Environment (IDE)
• Development libraries and frameworks
• GNU toolchain
• Performance tools
• Example code and tutorials

SDK V3.0 clients with a valid software maintenance agreement (one year of software maintenance is included with the purchase of SDK V3.0) are entitled to receive SDK V3.1 for free from the following Passport Advantage® Web site

http://www.ibm.com/software/passportadvantage

Key prerequisites

The execution platform is either the BladeCenter QS21 and QS22 running the supported operating system of Red Hat Enterprise Linux® 5. A minimum version level of 5.2 is required for BladeCenter QS21 and QS22 using SDK V3.1.

The supported development environments are any x86, x86_64, PowerPC64, and Cell Broadband Engine™ Architecture. Examples of those are as follows:

• IBM BladeCenter QS21
• IBM BladeCenter QS22
• IBM BladeCenter JS21 and JS22; and Power Systems servers
• IBM BladeCenter HS21 and LS21; and System x™ servers

Planned availability dates

• October 24, 2008: Electronic software delivery
• November 14, 2008: Physical software delivery

Description

IBM Software Development Kit (SDK) for Multicore Acceleration V3.1 contains the following components:

• An Eclipse-based IDE for building, compiling, and debugging applications leveraging the compilers, programming model frameworks, and analysis tools of the SDK.
• Development libraries and frameworks:
  − The ALF provides a programming environment for data and task parallel applications and libraries. The ALF API is designed to provide library developers a set of interfaces to simplify library development on heterogeneous multicore systems. Library developers can use the framework to offload the computationally intensive work to the accelerators, facilitating the development of more complex applications by combining several function offload libraries.
  − The DaCS library provides a set of services designed to ease the development of applications and application frameworks in a heterogeneous multitiered (for example, memory hierarchy) system. The DaCS services are implemented as a set of APIs that provide a layer of architectural neutrality for application developers on a variety of multicore memory hierarchy systems.
  − BLAS is a widely-used API for commonly used linear algebra operations in high-performance computing (HPC) and other scientific domains. BLAS is widely used as the basis for other high-quality linear algebra software.
  − SIMD math libraries are available for the Power Processor Unit (PPU) Vector/SIMD Multimedia Extension and the Synergistic Processing Unit (SPU).
• Performance tools:
– FDPR-Pro tool to gather information for feedback-directed optimization through static code analysis.
– Performance Debugging Tool provides tools to analyze the execution of Cell/B.E.™ applications and track problems to optimize performance.
• Example source code:
– Examples, libraries, demos, and code to demonstrate the use of tools, libraries, and hardware features are available. A tutorial to guide the user through the creation of an example application is also included.
• Market Segment Enablement Libraries
– Basic Linear Algebra Subroutines (BLAS) is an API for commonly used linear algebra operations in HPC and other scientific domains. It is widely used as the basis for other high-quality linear algebra software such as Linear Algebra Package (LAPACK), which is also supported by SDK. SDK implementation of BLAS and LAPACK provide all of the functions for the PPE and the most commonly used single precision and double precision routines are performance optimized using SPE acceleration.
– The Fast Fourier Transform (FFT) library provides one dimensional (1D) and two dimensional (2D) FFTs on vectors and matrices, respectively. The 1D FFT is for single precision only but can support very large vectors up to 131,072 elements. The 2D FFT is supported for both single precision and double precision matrices up to 2048 by 2048.
– Standardized SIMD math libraries are provided for the PPE Vector and SIMD Multimedia Extensions and for the SPEs. By computing multiple results at one time, SIMD math functions help programmers obtain much higher performance from their PPE and SPE programs than would be possible from a corresponding traditional scalar math library.
– A Random Number Generator and Transform library provides different types of random number generators and distributions for use in Monte Carlo simulations and other types of applications that require random numbers. Commonly used generators such as Mersenne Twister and Sobol are available for both PPE and SPE applications.
– Mathematical Acceleration Subsystem (MASS), shipped with the XL compilers, consists of libraries of mathematical intrinsic functions tuned for optimum performance on SPU and PPU. These libraries offer improved performance over the standard mathematical library routines, are thread-safe, and support both 32-bit and 64-bit compilations in C, C++, and Fortran applications.

Beta and prototype components are available on IBM developerWorks®

http://www.ibm.com/software/passportadvantage

These components are available to increase the functionality of the SDK. When used in conjunction with the SDK, these components enable development of applications that run on hybrid HPC systems that leverage multiple QS22 blades for performance with x86-based or POWER™ processor-based servers.

Some of the SDK beta and prototype components are:

• Hybrid development libraries:
  – The Accelerated Library Framework for Hybrid-x86 (ALF for Hybrid-x86) provides ALF function for the hybrid environment.
  – The Data Communication and Synchronization library for Hybrid-x86 (DaCS for Hybrid-x86) enables writing from an x86 system to PPE on a Cell/B.E.-based blade server attached as an accelerator.

• Performance tools:
  – Profile enhancements to improve the function of oProfile (a system-wide profiler on Linux operating system) for Cell/B.E.-based blade servers
  – Hybrid System Performance Monitoring and Trace Facility that enables performance monitoring and tracing in a hybrid environment
  – Performance Debugging Tool (PDTR) for hybrid systems
  – Hardware performance monitoring available through perfmon2 and CellPerfCount

• Public version of the secure SDK, the APIs and tools required to secure applications created by the SDK.
Visual Performance Analyzer, an Eclipse-based performance visualization toolkit consists of four major components: Profile Analyzer, Code Analyzer, Pipeline Analyzer, and Counter Analyzer. For more information, refer to IBM alphaWorks®.

http://www.alphaworks.ibm.com/tech/vpa

The execution platform is either the BladeCenter QS21 and QS22 running the supported operating system of Red Hat Enterprise Linux 5. A minimum version level of 5.2 is required for BladeCenter QS21 and QS22 using SDK V3.1.

The supported development environments are any x86, x86_64, PowerPC64, and Cell Broadband Engine Architecture. Examples of those are as follows:

- IBM BladeCenter QS21
- IBM BladeCenter QS22
- IBM BladeCenter JS21 and JS22; and Power Systems servers
- IBM BladeCenter HS21 and LS21; and System x servers

Product preview

To complement SDK for Multicore Acceleration V3.1, the XL C/C++ for Multicore Acceleration for Linux, V10.1 compiler product is enhanced to include support for the single-source compilation technology for application development. The implementation of the single-source compilation technology is based on the OpenMP Application Program Interface V2.5. A single source program using OpenMP directives can be compiled and linked to generate PPU and SPU code segments in one invocation. The compiler directs parallel regions to be executed on SPEs, addressing local store limitations through automatic code overlay generation and data transfers to and from main memory, while seeking to improve performance through parallel execution and optimization. Further information about XL C/C++ for Multicore Acceleration for Linux is available at

http://www-01.ibm.com/software/awdtools/xlcpp/multicore

Section 508 of the U.S. Rehabilitation Act

Accessibility by people with disabilities: A US Section 508 Voluntary Product Accessibility Template (VPAT) containing details on the product's accessibility compliance can be requested at


Product positioning

Systems based on multicore microprocessors offer outstanding processing performance over conventional processors. Those companies willing to modify their applications to take full advantage of the Cell Broadband Engine (Cell/B.E.) architecture can benefit from these high performance processors to leap ahead of their competitors. To help you optimize applications quickly using your existing software development staff, IBM Software Development Kit (SDK) for Multicore Acceleration V3.1 facilitates multicore programming.

IBM SDK for Multicore Acceleration is a highly reliable and easy-to-use development toolkit with IBM support. It provides debugging and performance tuning tools as well as an integrated development environment, all of which are designed to run on an enterprise-level Linux operating system. Using this SDK, you can plug in third-party ISV libraries to further expand the software ecosystem that you can leverage in your applications.

Program number

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<tr>
<td>5724-S84</td>
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Offering Information

Product information is available via the Offering Information Web site

http://www.ibm.com/common/ssi

Also, visit the Passport Advantage Web site

http://www.ibm.com/software/passportadvantage

Publications

The IBM Systems Information Center provides you with a single, searchable information center where you can access product documentation for IBM systems hardware, operating systems, and server software. Through a consistent framework, you can efficiently find information and personalize your access. The IBM Systems Information Center is at

http://publib.boulder.ibm.com/infocenter/systems

In addition, the following publications are available with electronic download or on media.

Software Development Kit (SDK) V3.1 for Multicore Acceleration

• Installation Guide
• Programmer's Guide
• Programming Tutorial
• Security V3.1 Installation and User's Guide (prototype)

Programming library documentation

• ALF Programmer's Guide and API Reference
• BLAS Programmer's Guide and API Reference
• DACS Programmer's Guide and API Reference
• LAPACK Programmer's Guide and API Reference
• Monte Carlo Library API Reference Manual
• FFT Library API Reference Manual
• 3D FFT Library API Reference Manual (prototype)
• SIMD Math Library API Reference Manual
• SPE Cryptographic Library User Documentation V1.0 (prototype)
• SPE Runtime Management library
• SPE Runtime Management Library Version V1.2 to V2.2 Migration Guide
• SPU Runtime Library Extensions Guide
• Example Library API Reference

Programming tools and standards

• C/C++ Language Extensions for Cell/B.E. Architecture V2.6
• IBM XL C/C++ single-source compiler
• IDE Tutorial and User's Guide
• Performance Tools Reference
• SPU Application Binary Interface Specification V1.9
• SIMD Math Library Specification
• Cell/B.E. Linux Reference Implementation Application Binary Interface Specification V1.2
• SPU Assembly Language Specification V1.7
Hardware documentation

- PowerPC® User Instruction Set Architecture - Book I
- PowerPC Virtual Environment Architecture - Book II
- PowerPC Operating Environment Architecture - Book III
- Vector/SIMD Multimedia Extension Technology Programming Environments Manual
- Cell Broadband Engine Architecture
- Cell Broadband Engine Registers
- Synergistic Processor Unit (SPU) Instruction Set Architecture

Technical information

Specified operating environment

**Hardware requirements**

The target execution platform for applications created using SDK V3.1 is the BladeCenter QS21 and QS22.

The supported development environments are any x86, x86_64, PowerPC64, and Cell Broadband Engine Architecture. Examples of those are as follows:

- IBM BladeCenter QS21
- IBM BladeCenter QS22
- IBM BladeCenter JS21 and JS22; and Power Systems servers
- IBM BladeCenter HS21 and LS21; and System x servers

Applications developed with IBM SDK for Multicore Acceleration V3.1 execute on BladeCenter QS21 and QS22 machines. These applications may also execute on other Cell/B.E. architecture-compliant platforms but are not supported by IBM.

**Software requirements**

Red Hat Enterprise Linux 5 operating system: A minimum version level of 5.2 is required for BladeCenter QS21 and QS22.

The program's specifications and specified operating environment information may be found in documentation accompanying the program, if available, such as a README file, or other information published by IBM, such as an announcement letter. Documentation and other program content may be supplied only in the English language.

**Companion products**

The following IBM products are complementary to SDK:

- IBM BladeCenter QS21 (machine type 0792).
- IBM BladeCenter QS22 (machine type 0793).
- Red Hat Enterprise Linux 5 operating system. A minimum version level of 5.2 is required for BladeCenter QS21 and QS22.
- IBM XL C/C++ for Multicore Acceleration for Linux compiler, V9.0, or later.
- IBM XL Fortran for Multicore Acceleration for Linux compiler, V11.1, or later.

**Limitations**

SDK for Multicore Acceleration V3.1 does not support cluster-level software to create cluster file system, cluster scheduler, a remote monitoring, event and management structure, a protocol stack, or other cluster software.

For additional information, refer to the License Information document that is available on the IBM Software License Agreement Web site.
Planning information

Installability

SDK must be installed on a host development system. The supported development environments are any x86, x86_64, PowerPC64, and Cell Broadband Engine Architecture. Examples of those are as follows:

- IBM BladeCenter QS21
- IBM BladeCenter QS22
- IBM BladeCenter JS21 and JS22; and Power Systems servers
- IBM BladeCenter HS21 and LS21; and System x servers

Applications developed with IBM SDK for Multicore Acceleration V3.1 execute on BladeCenter QS21 and QS22 machines. These applications may also execute on other Cell/B.E. architecture-compliant platforms but are not supported by IBM.

Packaging

SDK for Multicore Acceleration V3.1 ships in a media pack, including two CD-ROMs. This program, when downloaded from a Web site, contains the applicable IBM license agreement and License Information, if appropriate, and will be presented for acceptance at the time of installation of the program. For future reference, the license and License Information will be stored in a directory such as LICENSE.TXT.

Security, auditability, and control

SDK for Multicore Acceleration uses the security and auditability features of the Linux operating system. The customer is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communication facilities.

Global Technology Services

Contact your IBM representative for the list of selected services available in your country, either as standard or customized offerings for the efficient installation, implementation, or integration of this product.

Ordering information

For ordering information, consult your IBM representative or authorized IBM Business Partner, or visit

http://www.ibm.com/software/passportadvantage/

Product group: IBM other
Product Identifier Description: IBM SDK for Multicore Acceleration
PID: 5724-S84
Product category: IBM other

Charge metric

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IBM Software Development
IBM Software Development Kit for Multicore Acceleration V3.1 consists of two chargeable components.

- IBM SDK for Multicore Acceleration for Developers (Toolkit) is for software development. The Toolkit includes tools, libraries, samples, and an execution environment (Toolkit Runtime Environment) needed for development and testing of Cell applications. Purchasing the Toolkit entitles clients' use of it for the sole purposes of evaluation, development, test, and demonstration. Clients can also use 100 copies of the Toolkit Runtime Environment for the same purposes. The charge metric for the Toolkit is a Concurrent User License.

  A concurrent user is one and only one individual within or outside an enterprise. The number of Proof of Entitlements (PoEs) required is for the highest number of users simultaneously accessing the program or any program components either directly or indirectly (via a multiplexing program, device, or application server) through any means on behalf of the user.

- IBM Software Development Kit for Multicore Acceleration Runtime (Runtime Code) includes the execution environment required for applications. The Runtime Code must be purchased in addition to the Toolkit if it is to be used for anything but evaluation, development, test, or demonstration. In addition, the Runtime Code must be purchased if evaluation, development, test, or demonstration requires in excess of 100 copies (for example, execution on 100 Cell/B.E. processors) of the Runtime Code.

  Runtime Code is licensed using Processor Value Units. You must purchase the appropriate number of Processor Value Units to authorize the use of the Runtime Code in a production environment.

  More information on the IBM Processor Value Unit strategy can be obtained at
  

The program install application is used to select installation of the complete Toolkit (including Toolkit Runtime Environment) or just the Runtime Code.

**Passport Advantage**

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IBM SDK Multicore Acceleration
Run Time Processor Value Unit
SW MAINT REINSTATE 12 MO D61JVLL

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S/390® and System z® IBM Operational Support Services - SoftwareXcel is an option if you desire added services.

License Information form number

L-PJSA-7F9L7T

The program's License Information will be available for review on the IBM Software License Agreement Web site


Limited warranty applies

Yes

Money-back guarantee

If for any reason you are dissatisfied with the program and you are the original licensee, you may obtain a refund of the amount you paid for it, if within 30 days of your invoice date you return the program and its PoE to the party from whom you obtained it. If you downloaded the program, you may contact the party from whom you acquired it for instructions on how to obtain the refund.

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Volume orders (IVO)
Yes. Contact your IBM representative.

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Passport Advantage applies
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   http://www.ibm.com/software/passportadvantage

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   http://www.ibm.com/support/handbook

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System i Software Maintenance applies
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Variable charges apply
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Educational allowance available
Education allowance does not apply.

Special education prices are available for qualified customers through Passport Advantage.

Prices

Contact your local IBM representative for the applicable one-time charge (OTC).
Passport Advantage

For Passport Advantage information and charges, contact your IBM representative or authorized IBM Business Partner. Additional information is also available on the following Passport Advantage Web site

http://www.ibm.com/software/passportadvantage

Announcement countries

All European, Middle Eastern, and African countries

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http://www.ibm.com/planetwide/

Corrections

(Corrected on February 6, 2009)

The Product positioning section has changed.