



IBM XL C/C++ for Linux on z Systems, V1.2 delivers vector SIMD and auto-SIMD support, and performance enhancements to further exploit IBM z13 servers

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At a glance

IBM[®] XL C/C++ for Linux[™] on z Systems[™], V1.2 delivers the following features and benefits:

- Additional performance and optimization enhancements to exploit the latest IBM z[™] Systems' new vector extension facility (SIMD) instructions, and auto-SIMD support, to help improve the performance of your XL C/C++ applications
- Generation of highly optimized code to exploit IBM z Systems[™] servers, which allows your programmers to focus on coding instead of performance
- Support for the latest programming language standards for C and C++, which includes C11 compliance and support for a majority of the C++11 standards, to deliver increased functionality and easier portability of your source code
- Enhancements to the tuning and optimizations of the Automatically Tuned Linear Algebra Software (ATLAS) library, which consists of linear algebra functions, to exploit the vector facility in z13[™] for potential performance improvements
- Enhancements to the tuning and optimizations of the IBM Mathematical Acceleration Subsystem (MASS) library of frequently used mathematical procedures, to exploit the vector facility in z13 for potential performance improvements
- GNU Compiler Collection (GCC) compatibility for easier porting and integration of your code
- Provision for IBM compiler service and support, which differentiates IBM in the marketplace

For ordering, contact your IBM representative or Americas Call Center. For more information, contact the Americas Call Centers at 800-IBM-CALL (426-2255). (Reference: LE001)

Overview

XL C/C++ for Linux on z Systems, V1.2, a C/C++ compiler for application development, takes advantage of the latest IBM z Systems servers that run on selected Linux distributions. This XL C/C++ compilation technology for Linux on z Systems

- Strengthens the platform.
- Exploits the z Systems environment.

- Provides superior performance.

A key strength of XL C/C++ for Linux on z Systems is its ability to generate highly optimized code for execution on z Systems servers. The newest member of the IBM XL compiler family, is built on the performance gains from many years of IBM compiler optimization experience with existing XL C/C++ compilers that are available for IBM z/OS^(R), IBM z/VM^(R), IBM AIX^(R), and Linux on IBM Power SystemsTM. With XL C/C++ for Linux on z Systems, you can create and port applications for execution on the next generation of IBM systems, which support selected Linux distributions that are built on IBM z/Architecture^(R) technology. This product is designed for development of high-performing business applications and system programs, while maximizing hardware utilization with fast application performance.

Based on mature IBM compiler experience, XL C/C++ for Linux on z Systems, V1.2:

- Delivers vector single instruction, multiple data (SIMD) and auto-SIMD support for the new vector extension facility (SIMD) instructions available on IBM z13TM servers.
- Supports generation of highly optimized code that exploits the z Systems servers.
- Supports programming language standards, which includes C11 compliance and support for additional features of the C++11 standard.
- Provides a high level of source compatibility with GCC while providing binary coexistence.
- Helps improve programmer productivity through run time performance and error detection features.
- Delivers enhancements to the ATLAS and IBM MASS libraries to take advantage of the vector facility in z13 for potential performance improvements.

Key prerequisites

IBM z Systems servers that support the following:

- Red Hat Enterprise Linux for IBM System z^(R) 6.3
- Red Hat Enterprise Linux for IBM System z 7.0
- Red Hat Enterprise Linux for IBM System z 7.1
- Red Hat Enterprise Linux for IBM System z 7.2
- SUSE Linux Enterprise Server for System z 11 SP3
- SUSE Linux Enterprise Server for System z 12

Required hard disk space: 310 MB

Planned availability date

December 18, 2015

Description

XL C/C++ compiler for Linux on z Systems

XL C/C++ for Linux on z Systems brings mature IBM compiler experience to Linux distributions that run on z Systems servers. XL C/C++ supports the generation of highly optimized code, which exploits the z Systems servers, adheres to the latest programming standards and provides a high level of GCC compatibility. This allows you to easily port your applications to Linux distributions that run on z Systems servers.

Vector SIMD and auto-SIMD support

XL C/C++ for Linux on z Systems, V1.2 supports the vector single instruction, multiple data (SIMD) and auto-SIMD instructions that are provided with the z13 vector extension facility and corresponding vector programming language extensions. This exploitation of the vector facility in z13 helps improve the performance of your XL C/C++ applications.

Enhancements to the ATLAS and IBM MASS libraries are also delivered to take advantage of the vector facility in z13 for potential performance improvements. The IBM MASS library is intended for accelerated execution of elementary mathematical functions that serves as a higher performance alternative to the standard math library. The ATLAS library is designed to provide linear algebra function support for BLAS (Basic Linear Algebra Subprograms) and LAPACK (Linear Algebra PACKage) functions that are routinely used in Business Analytics and Optimization solutions.

XL C/C++ for Linux on z Systems, V1.2 delivers both single-threaded and multi-threaded versions of the ATLAS libraries that are tuned and optimized for z13 processors. These two libraries provide a powerful framework for development of new Business Analytics workloads, porting math-intensive workloads from other platforms, and can help accelerate Business Analytics workloads on z Systems.

Programming language standards

XL C/C++ for Linux on z Systems strives to maximize performance and functionality of your scientific, technical, and commercial applications through standards compliance. With representation from the IBM compiler development team on the ISO/ANSI C and C++ committees, IBM is in a position to understand and influence the latest updates, clarifications, and recommendations to the C and C++ standards.

XL C/C++ for Linux on z Systems conforms with:

- Information Technology - Programming Languages - C, ISO/IEC 9899:1990 (also known as C90)
- Information Technology - Programming Languages - C, ISO/IEC 9899:1999 (also known as C99)
- Information Technology - Programming Languages - C++, ISO/IEC 14882:1998 (also known as C++98)
- Information Technology - Programming Languages - C++, ISO/IEC 14882:2003(E) (also known as C++2003)
- Information Technology - Programming Languages - Extensions for the programming language C to support new character types, ISO/IEC RT 19769
- Draft Technical Report on C++ Library Extensions, ISO/IEC TR 19768:2007
- Information Technology - Programming Languages - C, ISO/IEC 9899:2011 (also known as C11)
- Information Technology - Programming Languages - C++, ISO/IEC 14882:2011 (also known as C++11) (partial support for C++11)
- Information Technology - Programming Languages - C++, ISO/IEC 14882:2014 (also known as C++14) (partial support for C++14)

XL C/C++ for Linux on z Systems, V1.2 supports the following C++14 features:

- Polymorphic lambda expressions
- Variable templates

XL C/C++ for Linux on z Systems, V1.2 supports the following C++11 features:

- Alignment support
- constexpr
- Explicit overrides and final
- Generalized attributes
- Inheriting constructors

- Local and unnamed types as template arguments
- Monomorphic lambdas expressions
- New character types
- New definitions of POD types
- noexcept
- Non-static data member initializers
- Range-based for
- Raw string literals
- ref-qualifiers
- Template aliases
- Unicode names (UCN) and unicode literals
- Uniform initialization
- Unrestricted unions
- User-defined literals

XL C/C++ for Linux on z Systems, V1.2 is C11 compliant and supports a majority of the C++11 standards. Support of programming language standards allows for portability of your source code among a variety of compiler implementations, and between multiple operating systems and hardware platforms.

New built-in functions

XL C/C++ for Linux on z Systems, V1.2 delivers the following new built-in functions:

- `__cp`
This function compares two signed packed decimals.
- `__cvb`
This function converts an 8-byte signed packed decimal value to a signed binary integer.
- `__cvbg`
This function converts a packed-decimal value to a 64-bit signed binary integer.
- `__cvd`
This function converts a signed binary integer to a packed decimal.
- `__cvdg`
This function converts a 64-bit signed binary integer to a packed decimal.
- `__dp`
This function performs a divide operation on a signed packed decimal integer.
- `__fidbr`
This function rounds a long binary floating point number to a floating point integer using the specified rounding mode.
- `__fiebr`
This function rounds a short binary floating point number to a floating point integer using the specified rounding mode.
- `__mp`
This function performs a multiply operation on a signed packed decimal integer.
- `__srp`
This function shifts a signed packed decimal with or without rounding.
- `__zap`
This function places a signed packed decimal at a given address.

New compiler options and pragma directive

XL C/C++ for Linux on z Systems, V1.2 delivers the following new compiler options:

- `-ftree-vectorize (-qsimd)`
The `-ftree-vectorize (-qsimd)` option is added to control whether the compiler can automatically take advantage of vector instructions for processors that support them.
- `-gdwarf (-qdbgfmt)`
The `-gdwarf (-qdbgfmt)` option is added to control the format for the debugging information in object files.
- `-mzvector`
The `-mzvector` option is added to enable compiler support for vector programming including the `vector` and `__vector` keywords, and vector built-in functions.
- `-qidirfirst`
The `-qidirfirst` option is added to control whether the compiler searches for user included files in directories that are specified by the `-I` option before searching any other directories.
- `-qinline`
The level suboption is added to indicate the relative degree of inlining. In addition, the `-qinline+<function_name>` and `-qinline-<function_name>` options are added to control whether the named functions must be inlined or must not be inlined.

XL C/C++ for Linux on z Systems, V1.2 delivers the following new pragma directive:

- `#pragma nosimd`
The `#pragma nosimd` pragma is added to disable automatic generation of vector instructions.

GNU compatibility

XL C/C++ for Linux on z Systems, for selected Linux distributions, provides for a much greater level of GNU source compatibility. With the higher level of GNU source compatibility, porting of applications, which was originally developed with GCC and g++ compilers, is easier than ever before. There is also binary compatibility with GNU-built objects, archives, and shared objects. You now have the versatility to use the IBM compiler to build parts of your application that will benefit from the higher performance offered and still bind the IBM and GNU compiled parts together in a single application.

IBM Service and Support

XL C/C++ for Linux on z Systems brings with it IBM Service and Support. The IBM Service and Support organization is made up of teams of individuals who work together to provide you with the responsive platform and cross-platform software support that you require. For complex or code-related problems, IBM has specialized, skilled service teams with access to the experts in our development laboratories, as required. Therefore, you have access to the right level of IBM expertise when you need it, no matter where they are located.

Product positioning

Delivers multiple platform XL C/C++ and Fortran

XL C/C++ for Linux on z Systems, V1.2 is part of a larger family of IBM XL C, C++, and Fortran compilers, which support multiple platforms, such as IBM z/OS (C/C++), IBM z/VM (C/C++), AIX, Linux on IBM Power Systems, IBM Blue Gene/Q™, and now Linux on IBM z Systems (C/C++).

The modular structure of these compilers delivers optimizations and functionality on multiple platforms and languages. Each product includes a good portion of common code, so features and optimizations are tested in multiple languages and on multiple

platforms. Common code, along with compliance with international standards, makes source-level portability of applications between IBM platforms easier.

Built on a common architecture, XL C, XL C/C++, and XL Fortran compilers promote consistency and reliability on many IBM platforms and non-IBM platforms.

Infrastructure matters

The XL family of compilers, in conjunction with z Systems, continues to be a key platform for business applications, while it generates ongoing savings and value. This makes the high-performance XL C/C++ for Linux on z Systems compiler an optimal fit for the requirements of big data and Business Analytics.

One of the most discussed topics in the IT world is the migration of applications to a cloud environment. With an infrastructure that includes z Systems, the latest Linux distributions, and XL C/C++ for Linux on z Systems compiler, implementing a cloud environment is easier than ever before.

Organizations that look to invest in open standards and open source-based architectures should consider the new XL C/C++ for Linux on z Systems compiler. Make XL C/C++ the backbone of your IT application development environment to drive competitive differentiation.

Program number

Program number	VRM	Program name
5725-N01	1.2	IBM XL C/C++ for Linux on z Systems

Offering Information

Product information is available via the Offering Information website

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

Also, visit the Passport Advantage^(R) website

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

Publications

No hardcopy publications are shipped with this program.

Services

Software Services

IBM Software Services has the breadth, depth, and reach to manage your services needs. You can leverage the deep technical skills of our lab-based, software services team and the business consulting, project management, and infrastructure expertise of our IBM Global Services team. Together, we provide the global reach, intellectual capital, industry insight, and technology leadership to support a wide range of critical business needs.

To learn more about IBM Software Services or to contact a Software Services sales specialist, visit

<http://www.ibm.com/software/sw-services/>

Technical information

Specified operating environment

Hardware requirements

IBM z Systems servers that support the following:

- Red Hat Enterprise Linux for IBM System z 6.3
- Red Hat Enterprise Linux for IBM System z 7.0
- Red Hat Enterprise Linux for IBM System z 7.1
- Red Hat Enterprise Linux for IBM System z 7.2
- SUSE Linux Enterprise Server for System z 11 SP3
- SUSE Linux Enterprise Server for System z 12

Required hard disk space: 310 MB

Software requirements

One of the following operating systems:

- Red Hat Enterprise Linux for IBM System z 6.3
- Red Hat Enterprise Linux for IBM System z 7.0
- Red Hat Enterprise Linux for IBM System z 7.1
- Red Hat Enterprise Linux for IBM System z 7.2
- SUSE Linux Enterprise Server for System z 11 SP3
- SUSE Linux Enterprise Server for System z 12

Required software for documentation:

- HTML browser to access HTML documentation
- Portable Document Format (PDF) viewer to view PDF files

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. Such information is provided subject to the following Statement of Good Security Practices: IT system security involves protecting systems and information through prevention, detection and, response to improper access from within and outside your enterprise. Improper access can result in information being altered, destroyed, misappropriated, or misused, or can result in damage to or misuse of your systems, including for use in attacks on others. No IT system or product should be considered completely secure and no single product, service, or security measure can be completely effective in preventing improper use or access. IBM systems, products, and services are designed to be part of a lawful, comprehensive security approach, which will necessarily involve additional operational procedures, and may require other systems, products, or services to be most effective.

Important: IBM does not warrant that any systems, products, or services are immune from, or will make your enterprise immune from, the malicious or illegal conduct of any party.

Planning information

Web information

For information regarding XL C/C++, refer to

Packaging

This offering is delivered through the Internet or through physical media.

Packaging information

XL C/C++ for Linux on z Systems, V1.2 package contains:

- One DVD-ROM containing XL C/C++ for Linux on z Systems, V1.2 product
- XL C/C++ for Linux on z Systems, V1.2 Quickstart Guide
- Passport Advantage customer letter
- Passport Advantage media pack pointer sheet

This program, when downloaded from a website, 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

XL C/C++ for Linux on z Systems, V1.2 uses the security and auditability features of the host hardware or software.

The customer is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communication facilities.

Ordering information

This product is only available via Passport Advantage. It is not available as shrinkwrap.

Product group: IBM XL C/C++

Product: IBM XL C/C++ for Linux on z Systems, V1.2 (5725-N01)

Product category: XL C/C++

Passport Advantage

Program name/Description	Part number
IBM XL C/C++ for Linux on z Systems, V1.2 Media Package English	BA19TML
IBM XL C/C++ for Linux on z Systems Processor Value Unit Lic + SW S&S 12 Mo	D1DCBLL
IBM XL C/C++ for Linux on z Systems Processor Value Unit Annual SW S& Rnwl	E0KU7LL
IBM XL C/C++ for Linux on z Systems Processor Value Unit SW S&S Reinstate 12 Mo	D1DCCLL

Passport Advantage customer: Media pack entitlement details

Customers with active maintenance or subscription for the products listed are entitled to receive the corresponding media pack.

Entitled maintenance offerings description	Part number
IBM XL C/C++ for Linux on z Systems Processor Value Unit Lic + SW S&S 12 Mo	D1DCBLL

Entitled maintenance offerings description	Part number
IBM XL C/C++ for Linux on z Systems Processor Value Unit Annual SW S& Rnwl	E0KU7LL
IBM XL C/C++ for Linux on z Systems Processor Value Unit SW S&S Reinstate 12 Mo	D1DCCLL
Media packs description	Part number
IBM XL C/C++ for Linux on z Systems, V1.2 Media Package English	BA19TML

Charge metric

Program name	Part number or PID number	Charge metric
XL C/C++ for Linux on z Systems, V1.2	BA19TML / 5725-N01	PVU

Processor Value Unit (PVU)

PVU is a unit of measure by which the program can be licensed. The number of PVU entitlements required is based on the processor technology (defined within the PVU table by processor value, brand, type, and model number at the website below) and the number of processors made available to the program. IBM continues to define a processor, for the purpose of PVU-based licensing, to be each processor core on a chip (socket). A dual-core processor chip, for example, has two processor cores. The PVU table can be found at

http://www.ibm.com/software/lotus/passportadvantage/pvu_licensing_for_customers.html

Licensee can deploy the program using either full capacity licensing or virtualization capacity (sub-capacity) licensing according to the Passport Advantage Sub-Capacity Licensing Terms (refer to the web page below). If using full capacity licensing, licensee must obtain PVU entitlements sufficient to cover all activated processor cores* in the physical hardware environment made available to or managed by the program, except for those servers from which the program has been permanently removed. If using virtualization capacity licensing, licensee must obtain entitlements sufficient to cover all activated processor cores made available to or managed by the program, as defined according to the Virtualization Capacity License Counting Rules at

http://www.ibm.com/software/lotus/passportadvantage/Counting_Software_licenses_using_specific_virtualization_technologies.html

* An activated processor core is a processor core that is available for use in a physical or virtual server, regardless of whether the capacity of the processor core can be or is limited through virtualization technologies, operating system commands, BIOS settings, or similar restrictions.

Notes

- Some programs may require licenses for the program **and** what is being managed. In that case, the following applies. In addition to the entitlements required for the program directly, licensee must obtain PVU entitlements for this program sufficient to cover the processor cores managed by the program.
- Some programs may be licensed on a managed basis only. In that case, the following applies. Instead of the entitlements required for the program directly, licensee must obtain PVU entitlements for this program sufficient to cover the processor cores managed by the program.
- A few programs on an exception basis may be licensed on a referenced basis. In that case, the following applies. Rather than obtaining entitlements for the activated processor cores available to the program, licensee must obtain PVU entitlements for this program sufficient to cover the environment made available to the referenced program as if the program itself were executing everywhere the referenced program was executing, independent of the basis on which the referenced program is licensed.

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License Information number

L-MCHN-A2URAY

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

<http://www.ibm.com/software/sla/sladb.nsf>

Limited warranty applies

Yes

Limited warranty

IBM warrants that when the program is used in the specified operating environment, it will conform to its specifications. The warranty applies only to the unmodified portion of the program. IBM does not warrant uninterrupted or error-free operation of the program or that IBM will correct all program defects. You are responsible for the results obtained from the use of the program.

IBM provides you with access to IBM databases containing information on known program defects, defect corrections, restrictions, and bypasses at no additional charge. For further information, consult the IBM Software Support Handbook found at

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

IBM will maintain this information for at least one year after the original licensee acquires the program (warranty period).

Program technical support

Technical support of a program product version or release will be available for a minimum of five years from the general availability date, as long as your Software Subscription and Support (also referred to as Software Maintenance) is in effect.

This technical support allows you to obtain assistance (via telephone or electronic means) from IBM for product-specific, task-oriented questions regarding the installation and operation of the program product. Software Subscription and Support (Software Maintenance) also provides you with access to updates (modifications or fixes), releases, and versions of the program. You will be notified, via announcement letter, of discontinuance of support with 12 months' notice. If you require additional technical support from IBM, including an extension of support beyond the discontinuance date, contact your IBM representative or IBM Business Partner. This extension may be available for a fee.

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.

For clarification, note that (1) for programs acquired under the IBM International Passport Advantage offering, this term applies only to your first acquisition of the program and (2) for programs acquired under any of IBM's On/Off Capacity on Demand (On/Off CoD) software offerings, this term does not apply since these offerings apply to programs already acquired and in use by you.

Volume orders (IVO)

Yes. Contact your IBM representative.

Passport Advantage applies

Yes, and through the Passport Advantage website at <http://www.ibm.com/software/passportadvantage>

Software Subscription and Support applies

Yes. Software Subscription and Support (also referred to as Software Maintenance) is included with licenses purchased through Passport Advantage and Passport Advantage Express^(R). Product upgrades and Technical Support are provided by the Software Subscription and Support offering as described in the Agreements. Product upgrades provide the latest versions and releases to entitled software and Technical Support provides voice and electronic access to IBM support organizations, worldwide.

IBM includes one year of Software Subscription and Support with each program license acquired. The initial period of Software Subscription and Support can be extended by the purchase of a renewal option, if available.

While your Software Subscription and Support is in effect, IBM provides you assistance for your routine, short duration installation and usage (how-to) questions, and code-related questions. IBM provides assistance via telephone and, if available, electronic access, only to your information systems (IS) technical support personnel during the normal business hours (published prime shift hours) of your IBM support center. (This assistance is not available to your end users.) IBM provides Severity 1

assistance 24 hours a day, 7 days a week. For additional details, consult your *IBM Software Support Handbook* at

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

Software Subscription and Support does not include assistance for the design and development of applications, your use of programs in other than their specified operating environment, or failures caused by products for which IBM is not responsible under the applicable agreements.

For additional information about the International Passport Advantage Agreement and the IBM International Passport Advantage Express Agreement, visit the Passport Advantage website at

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

IBM Operational Support Services - SoftwareXcel

No

System i Software Maintenance applies

No

Variable charges apply

No

Educational allowance available

Not applicable.

Statement of good security practices

IT system security involves protecting systems and information through prevention, detection, and response to improper access from within and outside your enterprise. Improper access can result in information being altered, destroyed, or misappropriated or can result in misuse of your systems to attack others. Without a comprehensive approach to security, no IT system or product should be considered completely secure and no single product or security measure can be completely effective in preventing improper access. IBM systems and products are designed to be part of a comprehensive security approach, which will necessarily involve additional operational procedures, and may require other systems, products, or services to be most effective. IBM does not warrant that systems and products are immune from the malicious or illegal conduct of any party.

Prices

Passport Advantage

For Passport Advantage information and charges, contact your IBM representative. Additional information is also available at

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

Order now

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For IBM representative: callserv@ca.ibm.com

For IBM Business Partner: pwcs@us.ibm.com

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Note: Shipments will begin after the planned availability date.

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