IBM XL C/C++ for AIX, V13.1.3

Improve application performance and developer productivity using the latest IBM XL C/C++ for AIX compiler

Highlights

IBM® XL C/C++ for AIX®, V13.1.3:

- Leverages the capabilities of the latest POWER8™ architecture
- Maximizes application performance through industry leading optimization technology
- Improves developer productivity with partial support of C11, C++11, and OpenMP 4.0 features
- Eases application migration to Power Systems™ through conformance to the ISO C99 and ISO C++03 standards and a subset of the latest C11 and C++11 standards

Leverages the capabilities of the latest POWER8 architecture

XL C/C++ for AIX, V13.1 generates code that leverages the capabilities of the latest POWER8 architecture. Compiler suboptions for architecture and tuning specify code generation for the POWER8 processor architecture. `-qarch=pwr8` instructs the compiler to produce code that can fully exploit the POWER8 architecture. `-qtune=pwr8` enables optimizations, such as instruction scheduling, that maximize performance on POWER8 systems, while allowing for binary compatibility with previous POWER® processors.

XL C/C++ for AIX provides built-in functions for direct programmer access to the POWER architecture. While most programmers will rely on the compiler to exploit processor features automatically, built-in functions give you an easy way to access specific instructions or processor features using C or C++ function call syntax and C or C++ variables. XL C/C++ for AIX, V13.1.3 provides built-in functions supporting new POWER8 features such as vector processing, cryptography, cache management and transactional memory.

The Mathematical Acceleration Subsystem (MASS) libraries contain frequently used math intrinsic functions that enable improved performance over the corresponding standard system library functions. These highly tuned MASS libraries are enhanced to support the POWER8 processors:

- The vector MASS library contains vector functions that are tuned for the POWER8 architecture. These functions can be used in either 32-bit or 64-bit mode.
- XL C/C++ ships with a single-instruction, multiple-data (SIMD) MASS library tuned specifically for the POWER8 processor.

Maximizes application performance through industry-leading compiler optimization technology

The optimization and hardware exploitation features in IBM XL C/C++ help improve programming productivity. The XL C/C++ compiler generates code that delivers leading-edge performance from existing and new hardware, often with no source code changes.

Entity visibility attributes describe whether and how an entity that is defined in one module can be referenced or used in other modules. By using the visibility attributes for entities, you can get the following benefits:

- Decreasing the size of shared libraries
- Reducing the chance of symbol collision
- Allowing more optimization for the compile and link phases
- Improving the efficiency of dynamic linking

XL C/C++ provides faster compile time for large applications. In addition, the use of machine resources is improved by reducing the amount of memory required by the compiler. Header files, which are repeatedly used in applications, are cached within the compiler to speed up overall

processing during compile time. The compiler and optimizer use the greater addressability of the 64-bit process space, thereby allowing significantly larger programs to be optimized.

The profile directed feedback (PDF) optimization collects information about an application run with typical input data and then applies transformations to the program based on that information. PDF can ensure that the performance of the application is optimized for its important inputs. Application profile monitoring and profile directed feedback capabilities minimize the need for manual tuning to achieve desirable performance on large, complex applications.

Eases application migration to IBM Power Systems

Make your applications portable with the XL compilers, which offer industry compliant programming languages and extensions. XL compilers help programmers easily maintain and run their applications on IBM systems.

IBM XL C/C++ conforms to the following programming language specifications for C/C++: C89, C99, C++ 98, and C++03; and supports a subset of the C11 and C++11 standards.

Augmenting the standardized language levels, the XL C/C++ compiler has implemented C and C++ language extensions to support vector programming and a subset of GNU C and C++ language extensions. In addition, the XL C++ compiler maintains close support of Boost C++ library releases.

C11 and C++11 features

XL C/C++ supports a subset of the C11 and C++11 features. XL C/C++ for AIX, V13.1.3, supports the following C11 and C++11 features:

The typedef redeclaration
: Using the typedef redeclaration, you can redefine a name that is a previous typedef name in the same scope to refer to the same type. The XL C compiler supports all types, including a variable modified type.

Generic selection
: Generic selection provides a mechanism to choose an expression according to a given type name at compile time. A common usage is to define type generic macros.

Defaulted and deleted functions
: This feature introduces two new forms of function declarations to define explicitly defaulted functions and deleted functions. For the explicitly defaulted functions, the compiler generates the default implementations, which are more efficient than manually programmed implementations. The compiler disables the deleted functions to avoid calling unwanted functions. You can use the `-qlanglvl=defaultanddelete` option to enable this feature.

Generalized constant expressions
: In V13.1, the generalized constant expressions feature extends the set of expressions permitted within constant expressions. The implementation of this feature in XL C/C++ V12.1 was a partial implementation of what is defined in the C++11 standard. In this release, enhancements are made to support user-defined constexpr objects and constexpr pointers or references to constexpr functions and objects. You can use the `-qlanglvl=constexpr` option to enable this feature.

The nullptr keyword
: This feature introduces nullptr as a null pointer constant. The nullptr constant can be distinguished from integer 0 for overloaded functions. The constants of 0 and NULL are treated as the integer type for overloaded functions, whereas nullptr can be implicitly converted to only the pointer type, pointer-to-member type, and bool type. You can use the `-qlanglvl=nullptr` option to enable this feature.

Full support of OpenMP 3.1 and partial support of OpenMP 4.0

XL C/C++ provides full support for OpenMP 3.1 so programmers can automate parallel programming and take advantage of multiprocessor systems. Some of the features include finer control of the number of threads used in nested parallelism, full control of where a thread can switch from one task to another task, and more types of atomic operation to better synchronize parallel code.

XL C/C++ for AIX, V13.1.3 also supports the following OpenMP 4.0 features:

Update and capture clause enhancements
The update and capture clauses of the atomic construct are extended to support more expression forms.

OMP_DISPLAY_ENV environment variable
You can use the OMP_DISPLAY_ENV environment variable to display the values of the internal control variables (ICVs) associated with the environment variables and the build-specific information about the runtime library.

Summary

IBM compilers allow applications to take advantage of virtually all the hardware exploitation features provided by IBM processors including POWER8. By utilizing leading-edge optimization technologies in IBM compilers, organizations can improve their return on investment in hardware assets, while increasing programmer productivity.

Organizations often wait until they upgrade their hardware to upgrade their compilers. However, given that the compilers can deliver significant improvements in application performance and programmer productivity, compilers offer a cost-effective way to get more out of existing technology. By periodically upgrading compilers, programmers can take advantage of new language, usability and optimization features, and stay ahead of competitors on the technology curve.

For more information

To learn more about the IBM XL C/C++ for AIX compiler, contact your IBM representative, IBM Business Partner, or visit: XL C/C++ for AIX at www.ibm.com/software/products/en/xlcpp-aix.

Get started today by downloading a trial version of the XL C/C++ for AIX compiler at www.ibm.com/developerworks/downloads/r/xlcplusaix/.

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