
Optimize your HPC and Cognitive applications and fully exploit POWER9 architecture using the latest IBM XL Fortran for Linux compiler

Highlights

IBM® XL Fortran for Linux, V15.1.6:

- Leverages the capabilities of the latest POWER9 architecture.
- Supports a number of OpenMP 4.5 features including the constructs to allow applications offloading computation and data to the NVIDIA GPUs.
- Supports a commonly used subset of CUDA Fortran.
- Maximizes application performance through industry leading optimization technology.
- Eases application migration to Power Systems™.
- Ships a single package containing compilers that run on either little endian or big endian Linux distributions.
- Offers an alternative no-charge, fully functional Community Edition.

Leverages the capabilities of the latest POWER9 architecture

XL Fortran for Linux, V15.1.6 for little endian distributions generates code that leverages the capabilities of the latest POWER9 architecture. Compiler suboptions for architecture and tuning specify code generation for the POWER9 processor architecture. `-qarch=pwr9` instructs the compiler to produce code that can fully exploit the POWER9 architecture. `-qtune=pwr9` enables optimizations, such as instruction scheduling, that maximize performance on the POWER9 architecture, while allowing for binary compatibility with previous POWER® processors.

The Mathematical Acceleration Subsystem (MASS) libraries contain frequently used elementary and special mathematical functions that enable improved performance over the corresponding standard system library functions. XL Fortran for Linux, V15.1.6 adds a new vector library and SIMD library to contain functions that are tuned for the POWER9 architecture.

Supports a number of OpenMP 4.5 features

OpenMP is a portable and scalable programming model that gives programmers a simple, flexible, and standard interface for developing parallel applications for platforms ranging from the desktop to the supercomputer. The combination of the IBM POWER processors and the NVIDIA GPUs provides a platform for heterogeneous high-performance computing that can run several technical computing workloads efficiently. The computational capability is built on top of massively parallel and multithreaded cores within the NVIDIA GPUs and the IBM POWER processors.

XL Fortran for Linux provides full support for OpenMP 3.1 and partial support for OpenMP 4.0 and OpenMP 4.5. You can use the supported OpenMP 4.5 features such as device constructs and data mapping to accelerate your applications by offloading compute-intensive parts of an application and associated data to the NVIDIA GPUs.

In XL Fortran for Linux, V15.1.6 for little endian distributions, you can use the `-qgtarch` option to specify the real or virtual GPU architectures where the code can run, overriding the default GPU architecture.

This allows the compiler to take maximum advantage of the capabilities and machine instructions which are specific to a GPU architecture, or common to a virtual architecture.

XL Fortran for Linux, V15.1.6 for little endian distributions also provides high performance computing with support for Power® System server AC922 and NVIDIA GPU Volta.

Supports a commonly used subset of CUDA Fortran

CUDA is a parallel programming model and software environment that was developed by NVIDIA. It provides programmers with a set of instructions that enable GPU acceleration for data-parallel computations.

XL Fortran for Linux for little endian distributions supports a commonly used subset of CUDA Fortran for offloading computations to the NVIDIA GPU and increases the computing performance of many applications by using CUDA directly or by linking to GPU-accelerated libraries. In V15.1.6, CUDA Fortran support in XL Fortran for Linux is improved with better performance for kernels, more functions, and customized configurations.

The NVIDIA CUDA Toolkit 9.0 or 9.1 available from NVIDIA is required during the compilation and linking process.

Maximizes application performance through industry-leading compiler optimization technology

XL Fortran for Linux implements the symbol visibility attributes, pragmas, and options that describe whether and how an entity that is defined in one module can be referenced or used in other modules. 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

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 and complex applications.

Eases application migration to IBM Power Systems

Make 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.

XL Fortran continues the multiphase implementation of the latest Fortran language standard, Fortran 2008. It also implements a subset of Technical Specification 29113, which will be part of the next Fortran standard.

XL Fortran fully implements the Fortran 2003 standard. XL Fortran continues to give you the flexibility to rebuild FORTRAN 77, Fortran 90, Fortran 95, and Fortran 2003 source code and link it all into the same application. Similarly, object code or libraries compiled using previous versions of XL Fortran are still compatible with the newest XL Fortran compiler and runtime environment.

To facilitate porting to IBM platforms, XL Fortran also supports commonly used Fortran language extensions. IBM's commitment to standards compliance and IBM XL Fortran's advanced language interoperability mean that existing code can be ported to newer IBM hardware with no programming effort.

Ships a single package containing compilers that run on either little endian or big endian Linux distributions

IBM XL Fortran for Linux, V15.1.6, contains two Fortran compilers that support:

- Linux for little endian distributions on IBM Power servers configured for little endian mode, supporting Ubuntu Server 14.04, 14.10, and 16.04, SLES 12, SLES 12 SP3, RHEL 7.3, RHEL 7.4, RHEL 7.4 for Power Little Endian (POWER9), and CentOS 7
- Linux for big endian distributions on IBM Power servers configured for big endian mode, supporting RHEL 6, RHEL 7, and SLES 11

Offers a no-charge, fully functional Community Edition

XL Fortran for Linux Community Edition for little endian distributions is a no-charge, fully functional Fortran compiler. The release of the community edition allows for convenient availability of the XL Fortran compiler so that developers can experience the advantages of IBM compiler technology on the POWER9 architecture. This product is not warranted and does not provide for any subscription, service, or support.

The full XL Fortran for Linux compiler priced per user continues to be available for order. To obtain full warranty and world-class IBM support, consider licensing the full XL Fortran for Linux compiler.

Summary

IBM compilers are designed to allow applications to take advantage of virtually all the hardware exploitation features provided by IBM processors. 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 Fortran for Linux compilers, contact your IBM representative, IBM Business Partner, or visit XL Fortran for Linux at <https://www.ibm.com/us-en/marketplace/xl-fortran-linux-compiler-power>.

Get started today by downloading a Community Edition of the XL Fortran for Linux compiler at www.ibm.com/developerworks/downloads/r/xlfortranlinux/.

December 2017

References in this document to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM program product in this publication is not intended to state or imply that only IBM's program product may be used. Any functionally equivalent program may be used instead.

IBM, the IBM logo, ibm.com[®], POWER, POWER9, Power Architecture[®], and Power Systems are trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the Web at "Copyright and trademark information" at www.ibm.com/legal/copytrade.shtml.

NVIDIA and CUDA are either registered trademarks or trademarks of NVIDIA Corporation in the United States, other countries, or both.

Linux is a trademark of Linus Torvalds in the United States, other countries, or both.

© **Copyright IBM Corporation 2017.**

US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.