
Improve application performance and developer productivity using the latest IBM XL Fortran for Linux compiler

Highlights

IBM® XL Fortran for Linux, V15.1.5:

- Includes a compiler to support Linux for little endian distributions.
- Offers an alternative no-charge, fully functional community edition.
- Supports a commonly used subset of CUDA Fortran.
- Leverages the capabilities of the latest POWER8® architecture.
- Maximizes application performance through industry leading optimization technology.
- Eases application migration to Power Systems™.
- Supports a number of OpenMP 4.5 features including the constructs to allow applications offloading computation and data to the NVIDIA GPU (available with select POWER8 server models).

Includes a compiler to support Linux for little endian distributions

IBM XL Fortran for Linux, V15.1.5, 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 SP1, RHEL 7.1, RHEL 7.2, RHEL 7.3, 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 POWER8 platform. 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.

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, V15.1.5 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. The NVIDIA CUDA Toolkit V8.0 for POWER8 is required during the compilation and linking process. CUDA Toolkit V8.0 for POWER8 is available from NVIDIA.

Leverages the capabilities of the latest POWER8 architecture

XL Fortran V15.1.5 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` produces object code with instructions that will run on the POWER8 hardware platforms. `-qtune=pwr8` tunes instruction selection, scheduling, and architecture-dependent performance enhancements for the POWER8 hardware platforms, while allowing for binary compatibility with previous POWER® processors.

XL Fortran is shipped with a set of Mathematical Acceleration Subsystem (MASS) libraries for high-performance mathematical computing. 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. These highly tuned MASS libraries are enhanced to support the POWER8 architecture. In addition to the scalar library, MASS for POWER8 includes both a vector version (for arbitrary length arrays) and a SIMD or Single-Instruction Multiple Data version (for the vector datatypes). All the vector and SIMD POWER8 MASS libraries exploit the POWER8 vector instruction set, as does the scalar library for Linux for little endian distributions.

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.

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. XL Fortran for Linux provides full support for OpenMP 3.1 and partial support for OpenMP 4.5.

Starting from V15.1.5, the OpenMP 4.5 features such as device constructs and data mapping are added so that applications can accelerate by offloading compute-intensive parts of an application and associated data to the NVIDIA GPU that comes with a number of POWER8 servers. These device constructs include TARGET, TEAMS, DISTRIBUTE, and TARGET DATA. The runtime routines `omp_get_default_device`, `omp_get_num_teams`, `omp_get_team_num`, and `omp_is_initial_device` are supported to query the target environment. When combined with the POWER8 CPU, the NVIDIA GPU provides a unique platform for heterogeneous and high-performance computing, which has proven to be highly efficient for running several technical computing workloads. This computational capability is built on top of massively parallel and multi-threaded cores within the NVIDIA GPUs and the IBM POWER8 processors. Parallel operations within applications, such as data analysis or HPC (High performance computing) workloads, can be offloaded to GPUs.

XL Fortran for Linux, V15.1.5 for little endian distributions also provides high performance computing with support for Power System servers such as the S822LC (Minsky), which contain two POWER8 CPUs, up to four NVIDIA Tesla P100 GPUs, and NVIDIA's accelerated NVLink interconnect.

Summary

IBM compilers are designed to 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 Fortran for Linux compilers, contact your IBM representative, IBM Business Partner, or visit XL Fortran for Linux product page at <http://ibm.biz/xlfortran-linux>.

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

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