

**Polyhedron
Software**

Newsletter

Introducing Intel Parallel Studio

The Ultimate All-In-One Parallelism Toolkit for the Visual Studio C++ Developer



Intel Parallel Studio is a comprehensive and easy-to-use parallel-programming toolset designed specifically for Visual Studio C/C++ developers who want to take advantage of the new generation of multicore processors.

The Parallel Studio toolset consists of 3 packages that integrate into Visual Studio 2008 to provide end-to-end parallel programming capability.

Intel Parallel Composer - Compile & Debug

An integrated set of compilers, debuggers and libraries including:

- ▶ the Intel C++ compiler with OpenMP,
- ▶ the Intel Parallel Debugger Extension,
- ▶ the Intel Math Kernel Library (MKL),
- ▶ the Intel Threading Building Blocks library (TBB),
- ▶ the Intel Integrated Performance Primitives library (IPP).

Intel Parallel Inspector - Find Errors

An easy-to-use, proactive “bug finder” for C/C++ multicore applications. Unlike traditional error checkers, Intel Parallel Inspector detects hard-to-find threading and memory errors in one tool. It provides root-cause analysis for crash-causing threading and memory defects by monitoring the runtime behaviour of the code and then maps errors to the source-code line, call stack, and memory reference.

Intel Parallel Amplifier - Tune

A threading and performance profiler used to understand an application's parallel behaviour. Unlike other profilers, Intel Parallel Amplifier was specifically designed for parallel applications and includes threading analysis to pinpoint multicore bottlenecks without needing to know the processor architecture or assembly code.

Intel Visual Fortran Ver 11.1



Intel Fortran is available for Windows (32 and 64 bit flavours), Linux and MAC OS systems. The Windows version now includes the Visual Studio 2008 “Shell” IDE, but you can still integrate it into other versions of Visual Studio for mixed-language programming.

The Professional edition includes advanced optimization, multithreading, and processor support, as well as automatic processor dispatch, vectorization, and loop unrolling. It also includes optimized maths processing functions in the Intel® Math Kernel Library (MKL).

F2003 Standard

The compiler now includes most of the features from the Fortran 2003 standard including object-oriented features, type-bound procedures/operators and C interoperability features that make it easier to develop mixed-language applications. It is one of the most complete F2003 compilers commercially available and full F2003 compliance is being actively pursued.

Advanced Optimization Features

- ▶ *High Performance Parallel Optimizer (HPO)* offers an improved ability to analyse, optimize, and parallelize more “loopnests”. This revolutionary capability combines vectorization, parallelization, and loop transformations into a single pass which is faster, more effective, and more reliable than doing the task in discrete phases.
- ▶ *Automatic Vectorizer* analyses loops and determines when it is safe and effective to execute several iterations of the loop in parallel.
- ▶ *Inter-procedural Optimization (IPO)* dramatically improves performance of small- or medium-sized functions that are used frequently, especially programs that contain calls within loops.
- ▶ *Profile-Guided Optimization (PGO)* improves application performance by reducing instruction-cache thrashing, reorganizing code layout, shrinking code size, and reducing branch mis-predictions.

World Wide Web

Polyhedron's website is widely respected as a source for impartial reference material
Visit us at: <http://www.polyhedron.com>

New **absoft**® Fortran Compiler

Absoft have just announced the release of Ver 11.0 of their Fortran compiler. Focussing on support for parallel development, Linux, Mac/Intel and Windows releases will all be available by Nov 2009. One of the key new features is the multi-thread debugger, which is currently available on the Linux platform and will be ported to Windows and Mac in due course.

Other new features include:

- ▶ improved scheduler generates faster code on Intel multi-core systems,
- ▶ integrated OpenMP (Ver 2.5) support and code generation,
- ▶ Fx3 debugger support for parallel threads for SMP debugging (Linux),
- ▶ expanded TR15581/F2003 feature support (ALLOCATABLE attributes),
- ▶ an enhanced IDE.

In addition, IMSL Ver 6.0 numerical Fortran libraries will be available as an option. These libraries now include additional support for SMP and MPI parallel environments.



Mathematica 7 adds the capability for instant parallel computing. On any multicore computer system, Mathematica 7 is automatically set up to be able to run multiple parts of a computation concurrently - and for the first time makes parallel computing easy enough that it can be used in seconds as a routine part of everyday work.



The symbolic character of the Mathematica language allows unprecedentedly straightforward support of many existing and new parallel programming paradigms and data-sharing models; and Mathematica's parallel infrastructure is set up to allow seamless scaling to networks, clusters, grids and clouds.



What is CUDA? (and where does PGI fit in?)

GPGPU/CUDA

The mass market for graphics cards capable of realistic rendering in computer games has led to an odd situation: there may be many times more raw computing power on the graphics card of a modern games computer than in the CPU. General-Purpose computation on Graphics Processing Units (GPGPU) is the process of applying that power to traditional computational applications.

Modern GPUs such as NVIDIA's GTX260 and Tesla C1060 cards have IEEE compliant floating point hardware, and, crucially for many applications, offer 64 bit floating point arithmetic. The hardware is normally accessed using a proprietary language such as NVIDIA's CUDA - just compile the CUDA source code and link the object files with your CPU based application. OpenCL is a standardized alternative to CUDA.

GPGPU works best with applications that are highly parallel; you may need thousands of threads operating in parallel to get close to the potential of the hardware. However if your application will work that way, the speed gains can be impressive: a factor of 10 or more, compared even to the fastest current CPUs, may be achievable.

PGI Compilers

PGI have taken a lead in developing GPGPU interfaces for traditional languages. The PGI 9.0 release includes the PGI Accelerator™ Fortran and C99 compilers supporting x64+NVIDIA Linux. The PGI Accelerator compilers split portions of the application between the x64 CPU and GPU as specified by user directives, and generate an optimized mapping of loops automatically to use the available hardware.

The 10.0 release (scheduled for late 2009) also includes "CUDA Fortran", a Fortran extension co-defined by PGI and NVIDIA. CUDA Fortran gives the Fortran programmer the same detailed and low-level access to GPU hardware as the current CUDA C compiler. In version 10, both options - the high level "Accelerator" compilers, and the low level CUDA Fortran - will be available for Windows, Linux and Mac.

Polyhedron and CUDA

Polyhedron has been developing CUDA based mathematical software since the first 64 bit capable GPUs were launched, and can offer consultancy on most GPGPU projects.



Current Lahey Fortran Compilers for Windows

The new Lahey-Fujitsu 7.2 Pro Fortran for Windows combines Microsoft's Visual Studio 2008 shell with Lahey-Fujitsu's proven compiler technology. You can also integrate the compiler with an existing VS2008 installation if you need to do multi-language programming (a VS2005 integration is available on special request).

The Pro version also includes:

- WiSK, the *Winteracter* Starter Kit,
- Polyhedron's Automake,
- Fujitsu's Visual Analyzer, Windows Debugger,

- Coverage Analysis and Sampler tools,
- the Fujitsu Scientific Subroutine Library 2 and Optimized BLAS / LAPACK Libraries,
- the Fujitsu C Language System.

LF95 7.2 Express is a cut-down alternative to the Pro version for command line usage or for integrating into a 3rd party IDE such as ED for Windows or the *Winteracter* Development Environment (WiDE).

Version 7.2 is compatible with both 32 and 64 bit versions of Windows XP, Vista and Windows 7.



Fortran 2003? - Forcheck Ver 14 is There Now!

No Fortran compiler for the PC supports all of the new Fortran 2003 standard, but the Forcheck Ver 14 static analyser supports the complete language! By using compiler emulation files, you can keep up with new releases of the compilers as well as checking for full standard conformance. If you want to know what's in F2003, see John Reid's white paper at http://www.fortranplus.co.uk/resources/john_reid_new_2003.pdf

As well as full Fortran 2003 support, Forcheck Ver 14 has many improvements from Ver 13. Analysis and reporting has been improved, and among other features, the data types parameters are now being presented in the cross-reference tables.

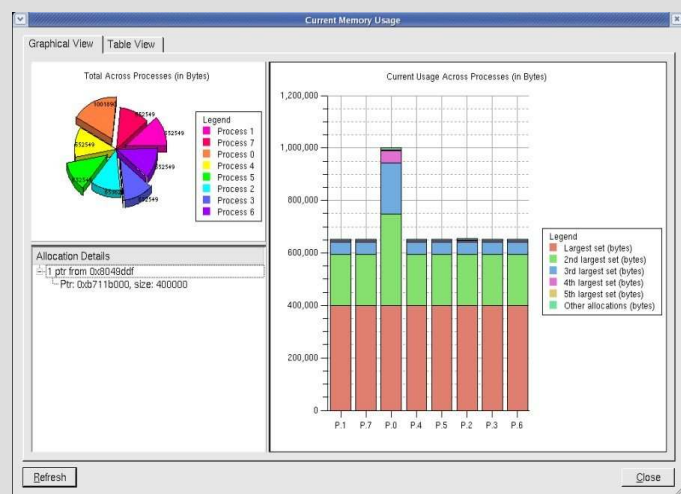
For more information on buying or upgrading Forcheck go to <http://www.polyhedron.com/forcheck>



Fortran Parallel Debuggers

Debugging parallel and multi-threaded applications is a problem. With the major compiler vendors only just getting round to providing in-built support in this area, there is currently only one effective mature solution.

Polyhedron Software is therefore pleased to announce the inclusion of the Allinea family of parallel debuggers in its product line. The range consists of 3 simple-to-use tools for programmers of parallel and multi-threaded software:



Allinea DDT - Distributed Debugging Tool; graphical debugger for Fortran & C/C++ programs running on Linux/Sun Solaris etc.

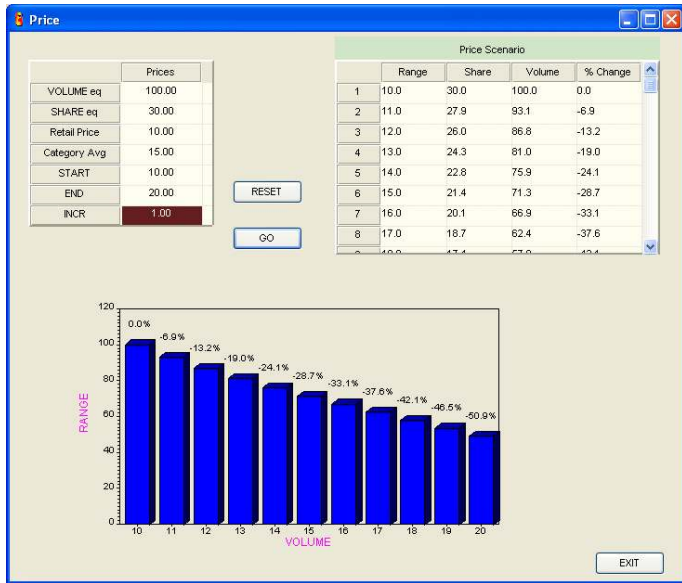
Allinea DDTLite - Microsoft Visual Studio add-in for C, C++, C#, Python, Fortran and all .NET languages.

Allinea OPT - Performance profiler for OPTimization of C, C++ & Fortran programs running on almost every flavour of Linux.

All three tools have powerful and intuitive user interfaces that improve productivity and make finding bugs and performance bottlenecks a doddle! These tools really do simplify and speed up the programming of parallel and multithreaded software.

For more information on the Allinea range of parallel debuggers go to <http://www.polyhedron.com/Allinea>

Does Your Fortran Program Need a GUI?



Few Fortran programs, even the simplest, would not be improved by the addition of a Graphical User Interface (GUI). However, the challenges of visual event driven design and mixed language programming discourage many Fortran developers from straying far from a console application with a command line user interface. However, GUI development in Fortran is not as difficult as you might imagine. In fact, there are two excellent GUI builder tools available that greatly simplify the task: **Winteracter** and **GINOMENU Studio**. GUI interfaces are even more powerful when the program can interact with databases and read spreadsheet files using QT Software's **ForDBC** and **qtXLS**.

So which GUI builder is right for you? Well, of course, that all depends on the specific requirements of your program and the development and target environments you are working with. Evaluation copies of both products are available through our website, and we will be happy to discuss your needs by phone or email - or, if you are still uncomfortable about visual programming, we will even build the GUI for you!

Polyhedron Consultancy Services - Fortran Old to New

Fortran is still one of the best scientific and technical programming languages available, and using the features in F95 and F2003, it is possible to write robust, highly maintainable code. However, up-to-date Fortran programming skills are now rare and much legacy Fortran code is un-commented, difficult to understand, GOTO infested spaghetti code. In these circumstances, it is easy to take the "leave well alone" attitude, but when the day comes when something has to be done, Polyhedron can help.

If you want to use your in-house skills, our Fortran re-factoring tool set **plusFORT**, most notably the SPAG code renovation and analysis tool, is indispensable. Moreover, if you no longer have adequate Fortran expertise to do the job yourself, we can offer a quick, competitive consultancy service.

Drawing on over 20 years experience developing and supporting Fortran products, Polyhedron Software have the skills to you solve your problems - small or large. From quick advice on technical issues, re-engineering of major legacy software systems, to adding GUI interfaces to existing applications, we have the experience you need for a cost-effective solution.

Contact us on +44 (0)1865-300579 or look at our website at <http://www.polyhedron.com/consultancy>

SPECIAL OFFER! Automake for FREE!

For all customers who buy a copy of any Fortran or C++ compiler until end-March 2010, we will give away a FREE Linux or Windows copy of our AUTOMAKE utility - <http://www.polyhedron.com/pfother0html#automake>

AUTOMAKE is a fully automatic alternative to the UNIX style MAKE utility. Unlike MAKE, AUTOMAKE builds and maintains the dependency database (or "make-file") itself. This removes a major source of error: users of a conventional MAKE may omit a dependency or specify it wrongly.

AUTOMAKE handles the one dependency that conventional MAKE utilities choke on - that of the makefile on the code.

Feedback

At Polyhedron Software, we value customer feedback and suggestions. Whether it is about work we have done, products we have sold or software we have developed. In particular we would like to know what, if any, product enhancements you are interested in, or even new ideas for products that don't seem to be available.

Send your comments to us at feedback@polyhedron.com

Need Training?

Did you know that Polyhedron Software can meet your Fortran training requirements? Either using our own highly experienced staff or in conjunction with our training partners, we can offer a selection of Fortran training courses to suit your specific needs.

More details are at <http://www.polyhedron.com/training>

Polyhedron Software Ltd

Linden House, 93 High Street, Standlake, WITNEY, OX29 7RH United Kingdom
Tel (+44/0)1865-300579, Fax (+44/0)1865-300232, Email sales@polyhedron.com
www.polyhedron.com