

Fortran Resources ¹

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¹The original basis for this document was Mike Metcalf's Fortran Information File. The next input came from people on comp-fortran-90. Details of how to subscribe or browse this list can be found in this document. If you have any corrections, additions, suggestions etc to make please contact us and we will endeavor to include your comments in later versions. Thanks to all the people who have contributed.

Revision history

- 13 March 2014. Added book entry. Updated some of the compiler entries. Thanks to Damian Rouson for the book link and Bill Long for the prod on updating the compiler entries.
- 10 February 2014, Added an errata entry for the The Fortran 2003 Handbook and an index entry for the same book. Thanks to Dick Hendrickson and John Harper for posting to comp-fortran-90 about these items.
- February 2014, Checked various entries and web links. Missed some urls with leading and trailing spaces in an earlier update, and these have now been fixed. Corrected some spelling.
- November 29 2013. Added one new book entry and updated an existing book entry.
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Chapter 1

Books

- Version 1.13, 13 March 2013. Added an on-line source. Scientific Programming in Fortran 2003 A tutorial Including Object-Oriented Programming Katherine Holcomb University of Virginia. The reference first appeared on Linked In and was mentioned by Damian Rouson. Bill Long then contacted us about the resource file being out of date and we then added the reference.
- Version 1.12, 10 February 2014; Updated the Fortran 2003 Handbook entry.
- Version 1.11, February 2014; Corrected some spelling.
- Version 1.10, November 2013; Added an entry for the Hanson and Hopkins book. Also updated the entry on Adams, Brainerd et al, which is now available from Springer as an ebook in PDF format.
- Version 1.9, May 2013; An errata list for Modern Fortran Explained, Metcalf, Reid and Cohen is now available.
- Version 1.8, January 2013; Added Section 1.1, Metcalf, Reid, Cohen; Thanks to Anton Shterenlikht for pointing out this omission!
- Version 1.7, August 2012; Added Section 1.1, Chivers; Added Section 1.1, Markus;
- Version 1.6, January 2012; Added Section 1.5 Chivers;
- Version 1.5, October 2011; Added Section 1.1 Chivers; Added Section 1.1 Clerman; Added Section 1.1 Gnu Fortran; Added Section 1.1 Rouson Added Section 1.2 Lakshmivarahan;
- Version 1.4, July 2010; Added Section 1.1 Brainerd; Added Section 1.1 McCormack; Added Section 1.1 Ray; Added Section 1.2 Rajaram; Added Section 1.3 Barlow et al; Added Section 1.4 Chandra et al; Added Section 1.4 Chapman et al;
- Version 1.3, June 2009; Removed invalid web address in Morgan and Schonfelder entry; Corrected spelling in Chinese entry;

- Version 1.2, September 2008; Added Section 1.1, Adams et al; Added Section 1.10, Ciaburro;
- Version 1.1, September 2007; Added Section 1.1, Chapman; Added Section 1.2, Lemmon;

1.1 Fortran 2003 and 2008 - English

- Adams, J.C., Brainerd, W.S., Hendrickson, R.A., Maine, R.E., Martin, J.T., Smith, B.T., The Fortran 2003 Handbook, The Complete Syntax, Features and Procedures, 2008, Springer Verlag, ISBN: 978-1-84628-378-9. This book is also available as an ebook in PDF format. An errata file is available at

http://www.fortran.com/F03HB_errata.html

and an additional set of index entries at

<http://homepages.ecs.vuw.ac.nz/~harper/f2003handbookindex>

- Brainerd, W.S., Guide to Fortran 2003 Programming, 2009, Springer Verlag, ISBN 978-1-84882-542-0
- Chapman S.J., Fortran 95/2003 For Scientists and Engineers, 2007, McGraw-Hill. ISBN 978-0073191577, ISBN 0073191574
- Chivers I.D., Sleightholme J., Introduction to Programming with Fortran: With coverage of Fortran 90, 95, 2003, 2008 and 77. 2012, Springer Verlag. ISBN-10: 0857292323 ISBN-13: 978-0857292322, Second Edition
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- Richard J. Hanson, Tim Hopkins, Numerical Computing with Modern Fortran. Publisher: Society for Industrial & Applied (November 30, 2013) Language: English ISBN-10: 1611973112 ISBN-13: 978-1611973112
- Katherine Holcomb, University of Virginia, Scientific Programming in Fortran 2003, A tutorial Including Object-Oriented Programming

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- Ray S., A Textbook on Fortran 2003, 2009, Alpha Science International, ISBN 978-1-84265-479-8
- Rouson D., Xia J., Xu X., Scientific Software Design: The Object-Oriented Way Cambridge University Press, 2011. ISBN-10: 0521888131 ISBN-13: 978-0521888134

1.2 Fortran 95 - English

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- Adams J.C., Brainerd W.S., Martin J.T. and Smith B.T., Fortran Top 95, Ninety Five Key Features of Fortran 95, \$10 The book is only available in PDF form from the Fortran Store, <http://www.fortran.com/>
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- Etzel M., Dickinson K., Digital Visual Fortran 90 Programmer's Guide, 1999, Digital Press. ISBN 1-55558-218-4.

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- Lakshmivarahan S., Sudarshan K. Dhall, Programming in Fortran 90/95, Publisher: Pearson Custom Publishing (2002) ASIN: B000XM3WZ0
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- Vowels R., Introduction to Fortran 90/95, Algorithms, and Structured Programming, Part 1: Introduction to Fortran 90, Part 2: Algorithms and Fortran 90. ISBN 0-9596384-8-2.

1.3 Fortran 90 - English

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- Adams, Brainerd, Martin, Smith and Wagener, Fortran 90 Handbook, 1992, McGraw Hill. ISBN 0-07-000406-4.
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- Redwine ., Upgrading to Fortran 90, 1995, Springer-Verlag, ISBN 0-387-97995-6.
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- Wagener ., Fortran 90 Concise Reference, 1998, Absoft. ISBN 0-9670066-0-0.

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- Atlas for Computing Mathematical Functions ... in Fortran 90 and Mathematica - Thompson, Wiley, 1997, 0-471-18171-4.
- Contemporary Computing for Technical Engineers and Scientists: using Fortran 90 and spreadsheets - Forsythe, PWS, 1997, 0-534-93139-1.
- Numerical Recipes in Fortran 90: The Art of Parallel Scientific Computing, Volume 2 of Fortran Numerical Recipes - Press, Teukolsky, Vetterling and Flannery, Cambridge U. Press, ISBN 0-521-57439-0, 1996. Code can be downloaded (purchased) from <http://www.nr.com/>. A CDROM is also available (see Web site).

1.5 Chinese

- Introduction to Programming with Fortran, with coverage of Fortran 90, 95, 2003 and 77. Ian Chivers and Jane Sleightholme. Posts and Telecom Press and Springer-Verlag London. 2009. ISBN 978-7-115-21227-6. (A translation of Introduction to Programming in Fortran).
- Programming Language Fortran 90 - He Xingui, Xu Zuyuan, Wu Qingbao and Chen Ming yuan, China Railway Publishing House, Beijing, ISBN 7-113-01788-6/TP.187, 1994.
- Fortran 90 - Walter S. Brainerd, Charles H. Goldberg, Jeanne C. Adams, CHEP, Beijing, and Springer, Berlin, 2000, ISBN 7-04-007937-2 (a translation of Programmer's Guide to Fortran 90).

1.6 Dutch

- Fortran 90 - W.S. Brainerd, Ch.H. Goldberg, and J.C. Adams, translated by J.M. den Haan, Academic Service, 1991, ISBN 90 6233 722 8.

1.7 Finnish

- Fortran 90/95 - Juha Haataja, Jussi Rahola and Juha Ruokolainen. Center for Scientific Computing (Finland), 2001, 339 pages, 3rd edition, ISBN 952-9821-60-3. WWW version: <http://www.csc.fi/oppaat/f95/>

1.8 French

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- Fortran 90. Les concepts fondamentaux, the translation of Fortran 90 Explained, M. Metcalf, J. Reid, translated by M. Caillat and B. Pichon, AFNOR, 1993, Paris, ISBN 2-12-486513-7.
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1.9 German

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- Die Programmiersprache F W. Gehrke, Springer-Verlag, ISBN 3-540-63376-6.
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- Fortran 90: eine informelle Einfhruung M. Heisterkamp, BI-Wissenschaftsverlag, 1991, ISBN 3-411-15321-0.
- Fortran 90 Kurs: technisch orientiert - G. Schmitt, Oldenbourg, 1996, ISBN 3-486-23896-5
- Fortran 90, Lehr- und Arbeitsbuch fr das erfolgreiche Programmieren, W.S. Brainerd, C.H. Goldberg, and J.C. Adams, translated by Peter Thomas and Klaus G. Paul, R. Olbenbourg Verlag, Muenchen, 1994, ISBN 3-486-22102-7.
- Fortran 90 Lehr- und Handbuch - T. Michel, BI-Wissenschaftsverlag, 1994.
- Fortran 90 Referenz-Handbuch: der neue Fortran-Standard W. Gehrke, Carl Hansen Verlag, 1991, ISBN3-446-16321-2.
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- Programmierung mit Fortran 90 - Bumer, Vieweg, Braunschweig, 1997, ISBN 3-528-05208-2.
- Programmieren in Fortran - Erasmus Langer, Springer-Verlag, Wien New York, 1993. ISBN 3-211-82446-4, 0-387-82446-4.
- Software Entwicklung in Fortran 90 - berhuber and Meditz, Springer Verlag, 1993, ISBN 0-387-82450-2.

1.10 Italian

- Titolo: Programmare con Fortran versioni 90/95/2003 Autore: Ciaburro Giuseppe

<http://www.ibs.it/code/978882336882/ciaburro-giuseppe/programmare-con-fortran.html>

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1.11 Japanese

- Fortran 90 Explained - Metcalf and Reid, translated by H. Nisimura, H. Wada, K. Nishimura, M. Takata, Kyoritsu Shuppan Co., Ltd., 1993, ISSN 0385-6984.
- Interactive Fortran 77, A Hands On Approach - I.D. Chivers and Malcom Clark. Ellis Horwood, 1984. Keigaku Publishing Company, Tokyo.

1.12 Russian

- An Explanation of the Fortran 90 Programming Language (translation of Fortran 90 Explained - Metcalf and Reid), translated P. Gorbounov, Mir, Moscow, 1995, ISBN 5-03-001426-8. Available also from Petr.Gorbounov@cern.ch.
- FORTRAN 77 to Fortran 90 Tutorial - Einarsson and Shokin, Russian Academy of Sciences, Novosibirsk, 1995, ISBN 5-85826-013-6.

1.13 Swedish

- Fortran 90 - en introduktion - Blom, Studentlitteratur, Lund, 1994, ISBN 91-44-47881-X.

Chapter 2

Compilers

- Update 1.14, March 2014. Updated some of the compiler entries. Thanks to Bill Long for the prod to get us to do the update.
- Version 1.13, May 2013. Added an entry for Lahey GNU Shasta compiler. Thanks to Polyhedron Software for this information.
- Version 1.12, January 2013. Added entry for OpenUH. Minor editorial changes. Thanks to Anton Shterenlikht for these updates and corrections.
- Version 1.11, January 2013. Added entry for Nocturnal Aviation Software.
- Version 1.10, August 2012. Updated Nag entry. 5.3 release supports openMP. Also updated product availability entry.
- Version 1.9, November 2010. Updated Absoft in response to an email from Wood Lotz.
- Version 1.8, July 2010. Updated Sun to reflect takeover by Oracle. Updated Salford to reflect Silverfrost rebranding.
- Version 1.7, June 2009. Updated the Cray and Intel entries. Added a new section on compilers that are no longer available. This has involved moving the entries on Apogee, Compaq and NA Software into this section. For historical completeness we've also added an entry for EPC to this section.
- Version 1.6, September 2008. Updated the NAG entry with more details of the Fortran Builder IDE.
- Version 1.5, September 2007. Updated Absoft Entry, Compaq, Fortran Company, Fujitsu, Gnu Fortran 95, G95, IBM, Intel, Lahey/Fujitsu, NAG, NA Software, NEC, Pathscale, PGI, Salford/Silverfrost, SGI, Sun.

2.1 Introduction

The following is a list of companies and organisations that provide Fortran compilers that conform to the Fortran 90, 95, 2003 and 2008 standards.

For up to date information you should visit the vendor site.

Fortran Forum has a more or less standing table on compilers that support features from the 2003 and 2008 standards. The gfortran, g95 and Sun compilers are free for Linux, and gfortran and g95 are free for Windows.

2.2 Absoft

<http://www.absoft.com/>

The following is taken from the Absoft site.

Pro Fortran 2014 - Builds Faster Code, Faster with Absoft's Exclusive Dynamic AP Load Balancing Technology, AVX support, OpenMP 3.0 support, SMP Analyzer, Tools Plug-in, New HPC Scientific Engineering Math Library, GPU options (Linux and Windows) and more! Available on Windows, Mac Linux!

2.3 Cray

<http://www.cray.com/>

Cray has a fully optimizing Fortran 2008 compiler available for the Cray XE, XK, and XC series systems. This compiler also supports OpenMP, OpenACC, and TS 29113 for additional C interoperability.

2.4 Fortran Company

<http://www.fortran.com/>

The Fortran Company offers F, the subset language, for Unix and Windows, some in highly optimizing versions. All of the full professional versions of the F compiler are available free by downloading them from the F anonymous ftp directory.

The Fortran Tools include a Fortran 95 compiler with a graphical user interface that runs on Linux or Windows on a CD. The CD also includes several Fortran books in PDF format and many tools, such as Matran, a matrix computation library that uses the highly tuned Atlas libraries, a plotting package, and a library of routines to create GUIs for your Fortran application programs.

2.5 Fujitsu

<http://www.fujitsu.com/global/>

Fortran 95 (Solaris) A powerful, updated development system used for FORTRAN productive applications Current version: Sun Studio 9

The ISO Fortran 95 Standard is fully supported, additionally there are enhancements for Fortran77 such as pointers/structures, binary/octal/hexadecimal constants, etc. High optimization includes automatic parallelization and OpenMP support. A Fortran runtime system optimized for UltraSPARC is now also included in the package. The development environment consists of the following components:

Workbench: An integral development environment for the C/C++ and Fortran compilers, for compiler control, program execution, debugging, performance analysis, coverage etc. with a Motif-based graphical user interface (GUI).

Visual Analyzer: A development and migration tool for C/C++ and Fortran programs. The enclosed Source Analyzer allows the static program structure and the global data relations to be visualized. It contains a class browser, cross references and a calling graph viewer.

Parallel Analyser: Consists of an integrated development environment for the OpenMP programming. It contains a manager, a debugger and a profiler.

Fujitsu also has a Fortran 95 compiler for Linux and a highly optimized, native Fortran 95 compiler, Fortran/VPP and HPF, for its VPP supercomputers.

2.6 Gnu Fortran

<http://gcc.gnu.org/wiki/GFortran>

<http://gcc.gnu.org/fortran/>

The following is taken from their wiki.

The purpose of the GNU Fortran (GFortran) project is to develop the Fortran compiler front end and run-time libraries for GCC, the GNU Compiler Collection. GFortran development is part of the GNU Project. We seek to bring free number crunching to a broad spectrum of platforms and users.

In particular, the project wishes to reach users of the Fortran language, be it in the scientific community, education, or commercial environments. The GFortran compiler is fully compliant with the Fortran 95 Standard and includes legacy F77 support. In addition, a significant number of Fortran 2003 and Fortran 2008 features are implemented. Please give it a try. If you encounter problems, contact us at the mailing list or file a problem report in bugzilla.

GFortran development follows the open development process. We do this to attract a diverse team of developers and to ensure that GFortran works on multiple

architectures and diverse environments. We always need more help. If you are interested in participating, please contact us at fortran@gcc.gnu.org. (Also check out our mailing lists page)

2.7 g95

<http://www.g95.org/>

g95 is a stable, production Fortran 95 compiler available for multiple cpu architectures and operating systems. Innovations and optimizations continue to be worked on. Parts of the F2003 standard have been implemented in g95.

2.8 Hewlett Packard

The web address that describes all of the compilers and supported hardware and operating systems is

http://h21007.www2.hp.com/dspp/tech/tech_TechSoftwareDetailPage_IDX/1,1703,6235,00.1

HP's Fortran products are available for multiple platforms: Windows, Tru64 UNIX AlphaServer systems, Linux AlphaServer systems, and HP OpenVMS (Alpha / VAX).

- Visual Fortran for Windows

- Fortran for Linux Alpha

- Fortran for Tru64 UNIX Alpha

- Fortran for HP OpenVMS Alpha

- Fortran for HP OpenVMS Integrity

- Fortran for HP OpenVMS VAX

- Fortran for HP-UX

The Windows product, Compaq Visual Fortran, includes the Microsoft Developer Studio IDE which can be shared with Microsoft Visual C++. Parallel execution using OpenMP-directed decomposition or HPF is included on the Tru64 UNIX platform. On Windows NT, SMP parallel execution using directed decomposition is available through Visual. Compaq Fortran for Linux Alpha Systems is available as a free download under a Technology Enthusiast license for non-commercial use. All Compaq Fortran 95 products include the Compaq Extended Math Library of optimized scientific subroutines and the allocatable array extensions.

2.9 IBM

<http://www-306.ibm.com/software/awdtools/fortran/>

<http://www-306.ibm.com/software/awdtools/fortran/xlfortran/features/f2003.html>

The following is taken from their site.

Standards-based Fortran compilers help you create high-performance applications

IBM Fortran Compilers help you create and maintain computationally intensive programs on a number of different platforms. The Fortran language provides a set of mathematical computation features, array manipulation and constructs to help you create complex modeling algorithms.

Product editions :

VS FORTRAN: Compiles and generates applications for the IBM z/OS and IBM z/VM platforms. It includes a compiler, a library and interactive debugging facilities. Features — Product support

XL Fortran for AIX: Compiles and generates IBM AIX applications on IBM Power Systems including the IBM POWER7 processors. It provides advanced optimization and performance-tuning features. Features — Pricing — Product support

XL Fortran for Blue Gene/Q: Features — Product support

XL Fortran for Linux: Compiles and generates Linux applications on Power Systems including the POWER7 processors. It provides advanced optimization and performance-tuning features.

2.10 Intel

<http://software.intel.com/en-us/intel-compilers/>

The following is taken from the Intel site.

Intel Fortran Compiling Suites include advanced optimization and multithreading capabilities, highly optimized performance libraries and analysis tools for creating fast reliable multithreaded applications.

Intel offers optimizing Fortran compilers for the IA-32, x64 and IA-64 (Intel Itanium) architectures running the Linux, Mac OS X (IA-32 and x64) or Windows operating systems. Intel Fortran is fully compliant with Fortran 95 and supports most of Fortran 2003, as well as many popular extensions. The compiler offers automatic parallelization and vectorization and supports OpenMP 3.0, as well as generating optimized code for the latest Intel processors and compatible non-Intel processors.

On all platforms, the Intel Fortran compiler includes the Intel Math Kernel Library, a library of highly optimized, extensively threaded math routines for science, engineering, and financial applications. The IMSL Fortran Numeric Library 6.0 from Visual Numerics is an option on Windows.

On Windows, the compiler integrates into Microsoft Visual Studio 2003, 2005 or 2008 and includes a self-sufficient Fortran development environment based on Microsoft Visual Studio 2008. The Windows compiler also provides mechanisms to interface Fortran code with the Microsoft COM and .NET environments. Academic and student pricing is available.

2.11 Lahey/Fujitsu

<http://www.lahey.com/>

Lahey/Fujitsu Fortran 95 is produced by the Lahey/Fujitsu alliance. LF95 is available in three Windows configurations: Express, Standard, and PRO, and two Linux configurations: Express and PRO. All configurations feature: VAX, IBM, and POSIX language extensions, allocatable array enhancements, etc. The Windows and Linux Express version is command line only and features the compiler, linker and debugger. PRO for Windows adds a Fortran-smart Windows editor, a debugger, an AUTOMAKE make utility, and an enhanced Winteracter Starter kit (WiSK) for creating true Windows programs with Fortran, and a Coverage Analysis Tool that detects unexecuted code and performs range of operation checking. The PRO is compatible with Visual C++, Visual Basic, and Delphi and also includes Fujitsus SSL2 Math Library and Visual Analyzer (see below). The PRO Linux version offers auto-parallelization, OpenMP compatibility, thread-safe BLAS and LAPACK, WiSK, AUTOMAKE, and Fujitsus SSL2. All products come with free technical support and are available at:

<http://www.lahey.com/>

Also available is a subset compiler, elf90.

It would appear that the Windows version is no longer under active development. The last update was dated December 2004.

2.12 Lahey/GNU Shasta Compiler

<http://www.lahey.com/>

Full Fortran 95/90/77 compliance with extensive support for the Fortran 2003 and 2008 standards; targets 32 and 64-bit Windows. Includes the automatic-parallelizing GFortran compiler, Visual Studio 2012 Shell, Lahey's Exclusive Visual Studio Fortran support, Winteracter WiSK Graphics package, and more! Compatible with Windows 8/7 (32 and 64-bit) and more!

2.13 NAG

<http://www.nag.co.uk/nagware.asp>

The NAG Fortran Compiler, derived from the world's first Fortran 90 Compiler from NAG is robust, highly tested, and valued by developers all over the globe for its checking capabilities and detailed error reporting. Available on a wide range of Unix and Windows platforms it accepts fixed or free format Fortran 95 input and many common Fortran 77 extensions are allowed. A large number of Fortran 2003 language features are now available. HPF code is also compiled and checked though

only single processor output is generated. The 5.3 release supports a good working subset of OpenMP 3.

The following versions are available.

Apple Intel Mac64 Release 5.3 gcc 4.2

HP PA-RISC 1.1 Release 5.1 HP ANSI C

IBM Power AIX Release 5.1 AIX XL C 6.0

IBM Z9 Linux Release 5.1 gcc 3.4.6

IBM Z9 Open Edition Release 5.2 IBM C

Linux x86-32 Release 5.3 gcc 3.2.2

Linux64 Release 5.3 gcc 4.1.2

Sun SPARC Solaris Release 5.2 gcc 3.4.2

Sun SPARC Solaris Release 5.2 Sun C v 5.5

x86 and x86-64 Windows Release 5.3

An integrated Fortran IDE is also available for Windows.

<http://www.nag.co.uk/nagware/np/fortranbuilder.asp>

2.14 NEC

<http://www.nec.com/>

NEC has a native, optimizing Fortran 95 compiler, FORTRAN90/SX, with an automatic vectorization and parallelization capability, for its supercomputer SX series. HPF/SX V2 provides functions conforming to the specification of HPF1.1 and HPF2.0 and can be used with vector processing functions in SX Fortran and with parallel processing functions using microtasking.

2.15 Nocturnal Aviation Software

<http://www.nocturnalaviationsoftware.com/>

<http://www.nocturnalaviationsoftware.com/FTranProjectBuilder/>

The following is taken from their site.

Nocturnal Aviation Software is an indie Mac software developer located in Tallahassee, FL. We have almost 40 years of Fortran programming experience, 26 years of Mac user experience and have been coding for the Mac since the OS X public beta, a decade ago. We wrote these Apps to use in our own programming work because nothing else like them is available. We'd like to say "Providing software solutions since 2011", but that won't sound too impressive for quite a few years. One has to start somewhere.

2.16 OpenUH

<http://www2.cs.uh.edu/~openuh/>

The following is taken from their site.

OpenUH is an open source, optimizing compiler suite for C, C++ and Fortran 95. It supports a variety of architectures including IA-32, X86_64, IA-64. To achieve portability, OpenUH is able to emit optimized C or Fortran 77 code that may be compiled by a native compiler on other platforms. The supporting runtime libraries are also portable - the OpenMP runtime library is based on the portable Pthreads interface while the Coarray Fortran runtime library is based, optionally, on the portable GASNet or ARMCI communications interfaces. OpenUH includes support for a new version of the Dragon tool that gathers and displays static and dynamic information about a user's application.

2.17 Oracle - originally Sun

<http://www.oracle.com/us/sun/index.htm>

<http://www.sun.com/>

<http://developers.sun.com/sunstudio/>

<http://developers.sun.com/sunstudio/downloads/express/>

Sun Studio software delivers high-performance, optimizing C, C++, and Fortran compilers for the Solaris OS on SPARC, and both Solaris and Linux on x86/x64 platforms, including the latest multi-core systems.

What's in Sun Studio:

All Compilers - Specify 32-bit or 64-bit Address Model, Auto-parallelization of single-threaded code, Flags, Static data-race and deadlock-detection for x86, Math and Visual Instruction Set Support in SPARC64 VI, Option for Floating-Point, Fused or Multiply-Add Instructions, Option for Thread Analyzer support, Linux Support, OpenMP and OpenMPI support, Support for the directives, clauses and attributes.

Fortran Compiler - Interval arithmetic support on Solaris Intel platform, Faster compilation time for source files, UNSIGNED arguments, Backward compatibility with f77

C Compiler - More options, Auto-parallelization of single-threaded code, GNU C compatibility

C++ Compiler - More options, ABI compatibility, Compiler flags to optimize for multicore architectures, Static linking the standard C++ runtime library.

2.18 PathScale

http://www.pathscale.com/products/pathscale_compiler_suite

The following was taken from the Pathscale site.

PathScale's goal is to make it easier to develop and deploy 64-bit applications into clustered environments. PathScale has developed one of the industry's highest-performance C, C++, and Fortran compilers for 64-bit Linux based systems.

2.19 PGI

<http://www.pgroup.com/>

High-performance Optimizing Parallel Compilers For multi-core 64-bit x64 and 32-bit x86 processor-based Linux, Mac OS X and Windows workstations, servers and clusters. PGI Workstation includes a single seat license for PGI's suite of compilers and tools. Also available with a multi-user network floating license (PGI Server). The PGI CDK Cluster Development Kit includes all the software for building and programming a turn-key Linux cluster. PGI Visual Fortran fully integrates PGI parallel Fortran into Microsoft Windows using Microsoft Visual Studio 2005.

2.20 Silverfrost, nee Salford Software

<http://www.silverfrost.com/11/ftn95/overview.aspx>

Salford Software markets FTN95, a Fortran 95 compiler for Win32, running on Windows 95/NT/2000/XP PCs. It has announced its Fortran 95 compiler for Microsoft .NET (FTN95 for .NET). This compiler will produce fast executables from source files that may be any combination of Fortran 77, Fortran 90 and Fortran 95. FTN95 for .NET, including integrated Help and Debugger, is supplied bundled with FTN95 for Win32 and, optionally, with Microsoft Visual Studio for .NET. A low-cost, fully-featured personal edition is also available.

2.21 SGI

<http://www.sgi.com/products/software/irix/tools/fortran.html>

The following is taken from the SGI site.

2.21.1 MIPSpro Fortran Compilers

This 64-bit ANSI Fortran 77 compiler is ideal for systems running IRIX 6.x. It is compatible with VAX/VMS Fortran and supports Cray extensions. The 7.4 version of the MIPSpro Fortran 77 and Fortran 90 compilers now support the OpenMP 2.0 standard. Among the new features introduced in the OpenMP 2.0 specification are:

- WORKSHARE directive
- COPYPRIVATE clause for the broadcast of sequential reads
- Portable timing routines

2.21.2 MIPSpro Fortran 90 Compiler

A 64 bit ANSI Fortran 90 compiler with additional support for user-defined multiprocessing directives for systems running IRIX 6.x. Compatible with VAX/VMS Fortran and supports Cray extensions. With the release of version 7.4, Fortran 90 specific support under the OpenMP 2.0 standard are:

- Parallelization of F90 array syntax via the WORKSHARE directive
- Privatization of deferred shape and assumed shape objects

The full Fortran 2.0 specification can be obtained from the OpenMP Web site at:
<http://www.openmp.org>

For more information, read about the MIPSpro compilers.

2.22 Sun - see Oracle

2.23 No longer available

2.23.1 Apogee

<http://www.apogee.com/>

Features of the FORTRAN 77/90 Compiler

No longer available. Originally available for the Solaris/SPARC platforms, the compiler conforms to Sun's Solaris ABI and produces assembler code files acceptable to Sun's Solaris assembler. When used in the FORTRAN 77 compilation mode, the compiler is compliant with the MIL-STD 1753 FORTRAN 77 and accepts most FORTRAN 77 extensions of Sun, IBM, and other F77 compilers. The supported F77 extensions include structures, length qualification on types, additional data and constant types, initializations in type statements, additional statements (END DO, DO WHILE, POINTER, VOLATILE, etc.), computations with aggregates, namelist-directed I/Os, and debugging statements.

When used in the Fortran 90 mode, the compiler is compliant with the ANSI/ISO Fortran 90 standard.

2.23.2 Compaq

This compiler is no longer under development. This ceased when Intel bought out the technology from HP. Still widely used with legacy software. Copies for sale can be found on Ebay and similar sites.

2.23.3 EPC

Edinburgh Portable Compilers was an early vendor to produce a Fortran 90 compilation system. A report by Adam Marshall from Liverpool University has a comparison of several early Fortran 90 compilers. It can be found at the address below.

<http://www.liv.ac.uk/HPC/FortranCompilerStudyHTML/FortranCompilerStudyHTML.html>

2.23.4 NA Software

<http://www.nasoftware.co.uk/home.html>

No longer available.

Chapter 3

Debuggers

- Version 1 January 2013. Thanks to Anton Shterenlikht for the initial request for a section on debuggers. Thanks to Wood Lotz, Van Snyder, Bill Long and Tobias Burnus for their contributions.

3.1 Introduction

A number of contributors have mentioned the simple inclusion of print statements in your code - which is of course simple and very effective.

3.2 Absoft

The following information was provided by Wood Lotz.

Absoft Fx3 debugger

It supports Fortran, C and asm and has been evolving over the past 15 years. During that period it has supported and or sold with, a wide variety of compilers though currently we offer it only as a component bundled with the Absoft Pro Fortran products for Windows, Linux and Mac.

Product overview

http://www.absoft.com/Absoft_FxDebugger.htm

3.3 DDT

<http://www.allinea.com/products/ddt/>

The following information is taken from the above site.

Allinea DDT is the most advanced debugging tool available for scalar, multi-threaded and large-scale parallel applications. It debugs code on:

workstations GPUs clusters, and... the very largest supercomputers. Comprehensive and easy-to-use Allinea DDT has many features that are missing from ordinary debuggers such as memory debugging and data visualization. With an acclaimed

user interface that wins praise for ease-of-use and capability, it is quite simply an integral part of efficient software development.

Simplifying debugging at scale For multi-threaded or OpenMP development, Allinea DDT enables threads to be controlled individually and collectively with advanced capabilities for comparing data across threads.

The Parallel Stack Viewer is a unique way to see the program state of all processes and threads at a glance. You can easily spot rogue processes or threads and even using it to define new control groups, making massive parallel programs far easier to manage. The Allinea DDT interface scales amazingly to provide the same clarity of information at thousands of processes as at a handful. It highlights commonality and differences using summary views and data comparisons to focus your attention.

Allinea DDT has been proven at scale on the most powerful systems - including debugging applications at over 200,000 cores simultaneously. Allinea DDT puts you in control of your application, whether you are working with a workstation or a thousand processor, high-performance cluster.

Debug code on the CPU and GPU from a single tool This powerful combination gives you all the advanced debugging features of Allinea DDT but with the enhanced ability to debug CUDA code. With a single tool, you can debug hybrid MPI, OpenMP and CUDA applications on a single workstation or GPU cluster. Features such as the detection of invalid memory accesses, the visualization of GPU data, and GPU thread control have been designed to help you find the GPU porting bugs quickly and easily.

Allinea DDT supports the NVIDIA CUDA Toolkit and is fully compatible with NVIDIA's Fermi architecture.

3.4 gnu gdb

A "-g" without further optimization option (such as -O2) usually disables optimization, which some compiler have otherwise by default. "-g" can also be used with optimization; however, the optimization makes debugging more difficult (even though compilers might try hard to keep some debugging information available).

Additionally, "-g" may or may not have an effect on code generation - especially when used together with optimization (such as -O2); some compilers generate the same code with debug information than without, others allow "-g -O2" but generate slightly different code than with only "-O2". Using "-O1 -g" is often a good compromise between performance and debuggability as it does some optimization but usually no inlining and other debugging unfriendly optimizations.

For GCC:

- * GCC by default has no optimization (-O0), thus "-g" doesn't change the optimization level.
- * GCC generates the same code with and without "-g" for all optimization levels [if not, it is a bug]
- * GCC 4.8 has the new option -Og, which enables optimizations that do not interfere with debugging.

In addition, newer debug formats (DWARF, latest is DWARF4) allow for better debugging support, but require also newer debugging tools. For instance, -gdwarf-4

is the default in GCC with/since 4.8 but requires GDB 7.5, Valgrind 3.8 and elftools 0.154. GCC also supports (since 4.7) a GNU extension (supported by GDB 7.4, proposed for DWARF5) "entry value"/ "call site" which allows - with restrictions - to debug function calls where the argument has been passed in registers. (For completeness: DWARF4 is supported - optionally - since GCC 4.6.)

3.5 Intel IDB

3.6 LLDB

3.7 Microsoft Visual Studio Debugger

3.8 totalview

Visit

<http://www.roguewave.com/products/totalview.aspx>
for detailed information.

Here is some information taken from the above site.

TotalView is a GUI-based source code defect analysis tool that gives you unprecedented control over processes and thread execution and visibility into program state and variables.

It allows you to debug one or many processes and/or threads in a single window with complete control over program execution. This allows you to set breakpoints, stepping line by line through the code on a single thread, or with coordinated groups of processes or threads, and run or halt arbitrary sets of processes or threads. You can reproduce and troubleshoot difficult problems that can occur in concurrent programs that take advantage of threads, OpenMP, MPI, GPUs or coprocessors.

TotalView provides analytical displays of the state of your running program for efficient debugging of memory errors and leaks and diagnosis of subtle problems like deadlocks and race conditions. Whether you are a scientific and technical computing veteran, or a software professional new to the development challenges of multi-core or parallel applications, TotalView gives you the insight needed to find and correct errors quickly, validate prototypes, verify calculations and certify code. TotalView works with C, C++ and Fortran applications written for Linux (including the Blue Gene platforms), UNIX and Mac OS X platforms. It includes sophisticated memory debugging and analysis, reverse debugging, Xeon Phi coprocessor and OpenACC / CUDA debugging capabilities.

A tutorial is available at

<https://computing.llnl.gov/tutorials/totalview/>

Here is some additional information from that site.

TotalView is a sophisticated and powerful tool used for debugging and analyzing both serial and parallel programs. TotalView provides source level debugging for serial, parallel, multi-process and multi-threaded codes, and can be used in a variety

of UNIX environments, including those with distributed, clustered, stand-alone and SMP machines. TotalView provides both a graphical user interface and command line interface. TotalView has been selected as the Department of Energy's ASC debugger of choice for its HPC platforms.

This tutorial has three parts, each of which includes a lab exercise. Part 1 begins with an overview of TotalView and then provides detailed instructions on how to set up and use its basic functions. Part 2 continues by introducing a number of new functions and also providing a more in-depth look at some of the basic functions. Part 3 covers parallel debugging, including threads, MPI, OpenMP and hybrid programs. Part 3 concludes with a discussion on debugging in batch mode.

Level/Prerequisites: This tutorial is one of the eight tutorials in the 4+ day "Using LLNL's Supercomputers" workshop. It is intended for those who are new to TotalView. A basic understanding of parallel programming in C or Fortran is required. The material covered in the following tutorials would also be beneficial for those who are unfamiliar with parallel programming in MPI, OpenMP and/or POSIX threads:

3.9 Valgrind

Visit

<http://valgrind.org/>

for more information. Here is an extract taken from that site.

Valgrind is an instrumentation framework for building dynamic analysis tools. There are Valgrind tools that can automatically detect many memory management and threading bugs, and profile your programs in detail. You can also use Valgrind to build new tools.

The Valgrind distribution currently includes six production-quality tools: a memory error detector, two thread error detectors, a cache and branch-prediction profiler, a call-graph generating cache and branch-prediction profiler, and a heap profiler. It also includes three experimental tools: a heap/stack/global array overrun detector, a second heap profiler that examines how heap blocks are used, and a SimPoint basic block vector generator. It runs on the following platforms: X86/Linux, AMD64/Linux, ARM/Linux, PPC32/Linux, PPC64/Linux, S390X/Linux, MIPS/Linux, ARM/Android (2.3.x and later), X86/Android (4.0 and later), X86/Darwin and AMD64/Darwin (Mac OS X 10.6 and 10.7, with limited support for 10.8).

Valgrind is Open Source and or Free Software, and is freely available under the GNU General Public License, version 2.

Here is an extract from the Wikipedia entry on Valgrind.

Valgrind is a GPL licensed programming tool for memory debugging, memory leak detection, and profiling. It is named after the main entrance to Valhalla in Norse mythology. Valgrind was originally designed to be a free memory debugging tool for Linux on x86, but has since evolved to become a generic framework for creating dynamic analysis tools such as checkers and profilers. It is used by a number of Linux-based projects.[3] Since version 3.5, Valgrind also works on Mac OS X. The orig-

inal author of Valgrind is Julian Seward, who in 2006 won a Google-O'Reilly Open Source Award for his work on Valgrind. Several others have also made significant contributions, including Cerion Armour-Brown, Jeremy Fitzhardinge, Tom Hughes, Nicholas Nethercote, Paul Mackerras, Dirk Mueller, Bart Van Assche, Josef Weidenborfer and Robert Walsh. Valgrind is in essence a virtual machine using just-in-time (JIT) compilation techniques, including dynamic recompilation. Nothing from the original program ever gets run directly on the host processor. Instead, Valgrind first translates the program into a temporary, simpler form called Intermediate Representation (IR), which is a processor-neutral, SSA-based form. After the conversion, a tool (see below) is free to do whatever transformations it would like on the IR, before Valgrind translates the IR back into machine code and lets the host processor run it. Even though it could use dynamic translation (that is, the host and target processors are from different architectures), it doesn't. Valgrind recompiles binary code to run on host and target (or simulated) CPUs of the same architecture.

3.10 WinDbg

Van

I had been using totalview. With Lahey and Fujitsu 6.20e on Linux, it was the only debugger that understood their defective debugging tables – including the Fujitsu debugger.

But... the license for totalview is expensive. So when we switched from LF95 to Intel, and Intel provided idb, we started using idb.

I wish we still had totalview. idb is difficult to use, especially to view arrays. It's also rather slow.

Bill

A related topic would be corresponding compiler support. Typically compilers will optimize away parts of the code and discard symbol information, making the use of debuggers problematic. An option like "-g" often cures this, but at the expense of turning off most optimization. Options for intermediate cases between -g and (none) would be useful to document.

1) Print *

2) Totalview -

www.roguewave.com/products/totalview.aspx

3) DDT -

www.allinea.com/products/ddt

4) gdb and lgdb (parallel version of gdb)

Totalview, DDT, and lgdb support parallel codes, which is increasingly a requirement.

gdb is free and powerful; the user interface has a 'high nerd factor'.

Chapter 4

Fortran aware editors and IDEs

- Version 1.5, October 2011. Updated photran entry.
- Version 1.4, July 2010. Added SunStudio Express entry.
- Version 1.31, April 2006. Added Windows Zeus entry.

4.1 Windows

4.1.1 Absoft Editor (ae)

<http://www.absoft.com>

4.1.2 CRiSP

www.crisp.com <http://www.crisp.demon.co.uk>

4.1.3 Compaq Visual Fortran 6.x

No longer available

4.1.4 editeur

www.studioware.com

4.1.5 emacs/xemacs - stand alone

<http://www.gnu.org/software/emacs/emacs.html>

4.1.6 emacs/xemacs - cygwin components

<http://www.cygwin.com/>

4.1.7 gvim/vim - stand alone

<http://www.vim.org/>

4.1.8 gvim/vim - cygwin component

<http://www.cygwin.com/>

4.1.9 jed. wjed (Windows)

<http://www.jedsoft.org/jed/>

4.1.10 lahey ed

<http://www.lahey.com/>

4.1.11 Microsoft Visual Studio 6

No longer available.

4.1.12 Microsoft Visual Studio.NET

There are a number of vendors that have provided integration with Microsoft Visual Studio .NET. These include

Intel Visual Fortran

www.intel.com

Lahey/Fujitsu Fortran

www.lahey.com

Silverfrost Salford FTN95

<http://www.silverfrost.com/11/ftn95/overview.aspx>

4.1.13 nedit - cygwin

<http://www.nedit.org/>

4.1.14 ntemacs

<http://www.gnu.org/software/emacs/windows/ntemacs.html>

4.1.15 photran

<http://www.eclipse.org/photran/>

Photran is an IDE and refactoring tool for Fortran based on Eclipse and the CDT. Photran is a component of the Eclipse Parallel Tools Platform (PTP).

4.1.16 Salford plato

<http://www.silverfrost.com/11/ftn95/overview.aspx>

4.1.17 UltraEdit

www.ultraedit.com

4.1.18 xemacs/emacs - stand alone

<http://www.gnu.org/software/emacs/emacs.html>

4.1.19 xemacs/emacs - cygwin components

<http://www.cygwin.com/>

4.1.20 Zeus ide

<http://www.zeusedit.com/fortran.html>

4.2 Linux/Unix

4.2.1 CRiSP

www.crisp.com <http://www.crisp.demon.co.uk>

4.2.2 emacs/xemacs

<http://www.gnu.org/software/emacs/emacs.html>

4.2.3 jed, xjed (Unix(all flavours)/OpenVMS) wjed (Windows)

<http://www.jedsoft.org/jed/>

4.2.4 nedit

<http://www.nedit.org/>

4.2.5 Oracle Solaris Studio Express

<http://developers.sun.com/sunstudio/downloads/express/>
Requires a Java run time.

4.2.6 photran

<http://www.eclipse.org/photran/>

Photran is an IDE and refactoring tool for Fortran based on Eclipse and the CDT. Photran is a component of the Eclipse Parallel Tools Platform (PTP).

Requires a Java run time.

4.3 Apple OS X

4.3.1 Absoft Editor

<http://www.absoft.com/>

4.3.2 BBEdit

http://www.apple.com/downloads/macosx/productivity_tools/bbedit.html

4.3.3 emacs/xemacs

pre-installed

4.3.4 Photran

www.photran.org/

4.3.5 Smultron

<http://smultron.sourceforge.net/>

4.3.6 TextMate

<http://macromates.com/>

4.3.7 TextWrangler

http://www.apple.com/downloads/macosx/productivity_tools/textwrangler.html

4.3.8 Vim

Pre-installed

4.3.9 Xcode

<http://developer.apple.com/>

4.3.10 xemacs/emacs

pre-installed

Chapter 5

Commercial Courses

- Version 1.4, August 2012. Updated several entries.
- Version 1.3, November 2011. Notified by Shaun Forth at Cranfield of their changes. Also added the HECToR entries.
- Version 1.2, August 2010.
- Version 1.1, September 2008
- Version 1.0, January 2006.

5.1 Ian Chivers and Jane Sleightholme

Ian Chivers and Jane Sleightholme are available to do tailored on site courses. Courses include

- Introduction to Modern Programming in Fortran
- Advanced Features of Modern Fortran

See

<http://www.fortranplus.co.uk>

5.2 Cranfield University

Cranfield University offers a variety of Fortran programming courses.

- Introduction to Programming in Fortran 95 and 2003 (3 days)
- Advanced Programming in Fortran 95 and 2003 (3 days)

- Fortran 95 - 2003 for Fortran 95 Programmers (3 days)

These may be taken at the University's Shrivenham Campus or may be delivered at an organisation's site. For more details see

<http://www.cranfield.ac.uk/cds/amsc/fortran.html>.

Additionally, on the HPC front, we run

- High Performance and Parallel Computing (5 days)

<http://www.cranfield.ac.uk/cds/shortcourses/highperfparallelcomputing.html>

which includes MPI up to intermediate level and introductory OpenMP delivered using both Fortran 95 and C. See

<http://www.rmcs.cranfield.ac.uk/amorg>

and follow link to AMORG Short Courses.

5.3 The Fortran Company

<http://www.fortran.com/>

Follow training links.

5.4 Hector

As part of the HECToR project NAG run a number of courses that may be of interest. This project has now been replaced by the Archer service. We will be updating this section when we have verified details. These are the Nag run courses.

- Object Oriented Programming in Fortran 2003
- Parallel IO
- Coarray Fortran
- Parallel Programming with MPI
- OpenMP
- Multicore
- Fortran 95

Contact

<http://www.hector.ac.uk/cse/training/>

for up to date information about dates and more details about the content and duration.

5.5 Lahey

<http://www.lahey.com/>

The Fortran 95 Workshop is a six-session, hands-on, Fortran 95 workshop led by Thomas M. Lahey, CEO, Lahey Computer Systems, Inc.

5.6 Michael Metcalf

formerly of CERN, Switzerland, and an ex-member of J3 and WG5, offers a Fortran 95 course that lasts for six 75-minute sessions. There is an F version too. He is happy to negotiate holding either version anywhere in the world. These courses are suitable for graduates, or equivalent level, and are a useful way to kick-start a Fortran 90/95 or an F activity at a given site. Contact at michael.metcalf@t-online.de, or Manfred-von-Richthofen Strae 15, 12101 Berlin, Germany, +0049.30.78952573.

5.7 Nihon NAG, Numerical Algorithms Group Japan

Offers a Fortran Introduction course and Fortran consultancy. Their top page is

<http://www.nag-j.co.jp/>

They also have online material for their Fortran Introduction course, starting from

<http://www.nag-j.co.jp/fortran/index.html>

5.8 PTR Associates

Currently offer two Fortran courses.

<http://www.ptr.co.uk/fortran-conversion-course.html>

<http://www.ptr.co.uk/fortran-programming.html>.

5.9 Purple Sage Computing Solutions, Inc

is offering three Workshops to Fortran programmers: The Fortran Modernization, Optimization and Parallelization Workshop; The Parallelization for Fortran Programmers Workshop; and The fthreads Workshop. Contact dnagle@erols.com or

<http://users.erols.com/dnagle>.

Also on offer is a one day workshop on the new features of Fortran 2000. See

<http://users.erols.com/dnagle/wsf2000.html>.

for more details.

5.10 John Reid

John is Convenor of WG5, and offers a Fortran 90 course. He is happy to negotiate holding it anywhere in the world. It is suitable for graduates, or equivalent level, and is a useful way to kick-start a Fortran 90 activity at a given site.

Contact john.reid@stfc.ac.uk.

5.11 France

Simulog, attn. Mr. E. Plestan,
1 rue James Joule, F-78286 Guyancourt Cedex, France
Tel: +33 1 30 12 27 80 fax: +33 1 30 12 27 27
info@simulog.fr

5.12 Japan

5.12.1 Nihon NAG, Numerical Algorithms Group Japan

Offers a Fortran Introduction course and Fortran consultancy. Their top page is

<http://www.nag-j.co.jp/>

They also have online material for their Fortran Introduction course, starting from

<http://www.nag-j.co.jp/fortran/index.html>

A Japanese company offering courses and conversion consultancy is SofTek Systems, Inc. (see above).

Chapter 6

On Line Training Material

- Version 1.1 August 2012. Removed Edinburgh entry - no longer available. Removed Manchester entry - no longer available.
- Version 1.0 January 2006

6.1 CERN

<http://wwwinfo.cern.ch/asdoc/f90.html>

6.2 Paul Dubois

<http://prdownloads.sourceforge.net/pyfortran/OBF90.zip>.

lecture notes and class materials on Object Based Programming in Fortran 90 (In WinZip, on the Options—Configuration menu, turn off tar smart convert CR/LF.)

6.3 Linkoping University

<http://www.nsc.liu.se/~boein/f77to90/f77to90.html>

Fortran 77 to 90 Conversion Course

6.4 Liverpool University

<http://www.liv.ac.uk/HPC/HPCpage.html>

Covers f90 and HPF, with Java-enhanced Web pages.

6.5 French

Support de cours Fortran 90 IDRIS - Corde & Delouis

www.idris.fr/data/cours/lang/fortran/choix_doc.html

Chapter 7

Graphics and Windows Programming

- Version 1.3, January 2013, added pgplot
- Version 1.2, August 2012, updated various entries
- Version 1.1, June 2009; updated web links.
- Version 1.0, January 2006.

7.1 Introduction

This can be broken down into

- Simple graphics programming using a library
- visual interface via raw windows programming
- visual interface via visual development environment

Here are some of the library and development offerings.

7.2 dislin

DISLIN is a high-level plotting library for displaying data as curves, polar plots, bar graphs, pie charts, 3D-color plots, surfaces, contours and maps.

<http://www.dislin.de/>

<http://www.mps.mpg.de/dislin/>

<http://www.mps.mpg.de/dislin/contents.html>

7.2.1 Worked examples

<http://www.mps.mpg.de/dislin/examples.html>

7.3 gino

GINO is a suite of high-end development tools for creating complex 2D and 3D graphics and GUI applications. The products are ideally suited for aerospace, defence, utilities and other leading engineering organizations. The GINO products are available for Fortran, C/C++, VB, Delphi and .NET programming environments.

<http://www.gino-graphics.com>

<http://www.polyhedron.co.uk/>

<http://www.polyhedron.com/gino-ginomain0html>

7.3.1 Documentation

The software is supplied with on-line manuals in a variety of formats depending on the environment it is running (Windows Help, HTMLHelp, HTMLHelp2, PDF) and Printed Manuals are available at an additional cost.

<http://www.gino-graphics.com/downloads/manuals.htm>

7.3.2 Worked examples

None

7.4 ginomenu

GINOMENU is a subroutine toolkit for developing GUI applications under Windows. It provides extensive window and widget building modules allowing professional user-interfaces to be created under Windows 9x/NT/2000/XP without the need to get involved in MFC, API or mixed-language programming.

<http://www.gino-graphics.com/support.html>

<http://www.polyhedron.co.uk/>

<http://www.polyhedron.com/gino-ginomain0html>

7.4.1 Documentation

Windows HTML Help, PDF and printed documentation

<http://www.gino-graphics.com/support.html>

7.5 interacter

<http://www.polyhedron.co.uk/> INTERACTER is our original multi-platform user-interface and graphics subroutine library for Fortran 77/9x developers.

7.5.1 Documentation

None

7.5.2 Worked examples

None

7.6 opengl

OpenGL is the premier environment for developing portable, interactive 2D and 3D graphics applications. Since its introduction in 1992, OpenGL has become the industry's most widely used and supported 2D and 3D graphics application programming interface (API), bringing thousands of applications to a wide variety of computer platforms. OpenGL fosters innovation and speeds application development by incorporating a broad set of rendering, texture mapping, special effects, and other powerful visualization functions. Developers can leverage the power of OpenGL across all popular desktop and workstation platforms, ensuring wide application deployment.

<http://www.opengl.org/>

7.6.1 Documentation

None

7.6.2 Worked examples

None

f90gl is a public domain implementation of the official Fortran 90 bindings for OpenGL.

<http://math.nist.gov/f90gl/>

Precompiled f90gl libraries are available for some compilers. Lahey LF90, LF95 and ELF90:

[`http://www.lahey.com\(searchforOpenGL\)`](http://www.lahey.com(searchforOpenGL))

Compaq CVF (formerly DVF):

[`http://www.compaq.com/fortran/`](http://www.compaq.com/fortran/)

(click on "Downloads" and search for f90GL)

Intel Visual Fortran:

[`https://premier.intel.com/`](https://premier.intel.com/)

(Registered users log in, select File Downloads and search for f90gl.)

7.6.3 Documentation

[`http://math.nist.gov/f90gl/documentation.html`](http://math.nist.gov/f90gl/documentation.html)

7.6.4 Worked examples

Some precompiled libraries may not include the example programs or the source code for the examples. The following files contain the examples subdirectory from the f90gl distribution.

Unix: fglexamp.tar.gz gzipped tar file (73K) Win32: fglexamp.zip zip file (134K)

7.7 pgplot

[`http://www.astro.caltech.edu/~tjp/pgplot/`](http://www.astro.caltech.edu/~tjp/pgplot/)

The following is taken from the pgplot site.

The PGPLOT Graphics Subroutine Library is a Fortran- or C-callable, device-independent graphics package for making simple scientific graphs. It is intended for making graphical images of publication quality with minimum effort on the part of the user. For most applications, the program can be device-independent, and the output can be directed to the appropriate device at run time.

The PGPLOT library consists of two major parts: a device-independent part and a set of device-dependent "device handler" subroutines for output on various terminals, image displays, dot-matrix printers, laser printers, and pen plotters. Common file formats supported include PostScript and GIF.

PGPLOT itself is written mostly in standard Fortran-77, with a few non-standard, system-dependent subroutines. PGPLOT subroutines can be called directly from a

Fortran-77 or Fortran-90 program. A C binding library (cpgplot) and header file (cpgplot.h) are provided that allow PGPLOT to be called from a C or C++ program; the binding library handles conversion between C and Fortran argument-passing conventions.

PGPLOT has been tested with UNIX (most varieties, including Linux, SunOS, Solaris, HPUX, AIX, Irix, and MacOS X/Darwin) and OpenVMS operating systems. I am unable to provide support for DOS, Microsoft Windows, but I do distribute code provided by users for use with these operating systems.

7.8 realwin

RealWin lets a Fortran programmer create full-featured applications for Microsoft 32-bit Windows platforms.

<http://www.indowsway.com/home.htm>

<http://www.indowsway.com/>

7.8.1 Documentation

None

7.8.2 Worked examples

None

7.9 toolmaster

http://www.avs.com/software/soft_t/toolm.html

Toolmaster agX is a cross-platform graphics library. For FORTRAN programmers, AVS offers FGL/AGL, which provides equivalent functionality to the agX C library.

7.9.1 Documentation

None

7.9.2 Worked examples

http://www.avs.com/software/soft_t/toolm.html

7.10 winteracter

<http://www.polyhedron.co.uk/> Winteracter is a modern GUI toolset for the Fortran 90/95 programming language. It consists of various visual development tools and a substantial subroutine library. Versions are available for most Fortran 9x compilers.

7.10.1 Documentation

None

7.10.2 Worked examples

None

7.11 Microsoft Windows graphics programming

This can be done in a variety of ways.

The following is a good book with examples of doing this using Compaq Visual Fortran.

Norman Lawrence, Compaq Visual Fortran: A Guide to Creating Windows Applications.

He also has coverage of opengl.

It is also possible to develop the visual interface using Visual Basic and call fortran dlls.

If you have Compaq Visual Fortran then the on-line Programmers Guide has coverage of mixed language programming with examples.

The following compilers offer intergrated support for Windows programming under .NET.

7.11.1 Lahey/Fujitsu

<http://www.lahey.com/>

PRO for Windows adds a Fortran-smart Windows editor, a debugger, an AUTOMAKE make utility, and an enhanced Winteracter Starter kit (WiSK) for creating true Windows programs with Fortran, and a Coverage Analysis Tool that detects unexecuted code and performs range of operation checking. The PRO is compatible with Visual C++, Visual Basic, and Delphi and also includes Fujitsus SSL2 Math Library and Visual Analyzer (see below).

7.11.2 Salford Software

<http://www.silverfrost.com/11/ftn95/overview.asp>

FTN95 for .NET, including integrated Help and Debugger, is supplied bundled with FTN95 for Win32 and, optionally, with Microsoft Visual Studio for .NET. A low-cost, fully-featured personal edition is also available.

Chapter 8

Parallel Programming

- Version 1.8, January 2013. Minor updates pointed out by Anton Shterenlikht
- Version 1.7, January 2013. Added section on examples of combinations of compilers and MPI libraries that work, or have worked in the past.
- Version 1.6, August 2012; Updated several entries; Added several books;
- Version 1.5, October 2011; Updated gfortran mpi entry; updated Intel coarray entry; updated NAG openmp entry
- Version 1.4, August 2010; Updated coarray, mpi and openmp entries.
- Version 1.3, July 2010; Added g95 entry. Modified gfortran entry.
- Version 1.2, June 2009; Corrected and updated several web addresses.
- Version 1.1, January 2006.

8.1 Introduction

The Fortran language has been standardised a number of times

- Fortran 66
- Fortran 77
- Fortran 90
- Fortran 95
- Fortran 2003
- Fortran 2008

and Fortran 2008 was completed in 2010.

The Fortran 90 standard added whole array features and a WHERE construct that were aimed at parallel programming.

The Fortran 95 standard added the FORALL construct, and PURE and ELEMENTAL procedures to help with parallel programming.

Fortran 2008 added coarrays.

Independently of the Fortran Standards Committees there have been a number of other developments aimed at parallel programming including

- HPF
- MPI
- OpenMP
- Posix Threads

and each of these is covered in more depth below.

Two tutorials on parallel programming are given below.

http://www.mhpcc.edu/training/workshop/parallel_intro/MAIN.html

<http://users.actcom.co.il/~choo/lupg/tutorials/parallel-programming-theory/parallel->

8.1.1 Books

- Rainer Keller (Editor), David Kramer (Editor), Jan-Philipp Weiss (Editor), Facing the Multicore-Challenge II: Aspects of New Paradigms and Technologies in Parallel Computing (Lecture Notes in Computer Science / Theoretical Computer Science and General Issues) Springer, 2012, ISBN-10: 364230396X, ISBN-13: 978-3642303968
- K. De Bosschere (Author), E. H. D'Hollander (Author), G. R. Joubert (Author), D. Padua (Author), F. Peters (Author), Applications, Tools and Techniques on the Road to Exascale Computing, 2012, IOS Press, ISBN-10: 1614990409 ISBN-13: 978-1614990406
- Kristjn Jnasson (Editor), Applied Parallel and Scientific Computing: 10th International Conference, PARA 2010, 2012, Springer, ISBN-10: 3642281508, ISBN-13: 978-3642281501
- Victor Malyshev (Editor), Parallel Computing Technologies: 11th International Conference, PaCT 2011, Kazan, Russia, September 19-23, 2011, Proceedings (Lecture Notes in ... Computer Science and General Issues), 2012, Springer, ISBN-10: 3642231772 ISBN-13: 978-3642231773

8.2 Automatic

By this is meant automatic parallelisation of the code without source code modification.

8.3 Coarray Fortran

Coarray Fortran is a small extension to Fortran 2003. It is a simple, explicit notation for data decomposition, such as that often used in message-passing models, expressed in a natural Fortran-like syntax. The syntax is architecture-independent and may be implemented not only on distributed memory machines but also on shared memory machines and even on clustered machines.

Coarray Fortran was the major component of the Fortran 2008 standard.

8.4 HPF

The High Performance Fortran Forum (HPFF), a coalition of industry, academic and laboratory representatives, works to define a set of extensions to Fortran 90 known collectively as High Performance Fortran (HPF). HPF extensions provide access to high-performance architecture features while maintaining portability across platforms.

Harvey Richardson has provided a historical perspective on HPF. Visit

<http://www.zeenty.com/HPF/HPF-intro.pdf>

Requires source code modification.

8.5 MPI

MPI is a library specification for message-passing, proposed as a standard by a broadly based committee of vendors, implementors, and users.

<http://www-unix.mcs.anl.gov/mpi/>

<http://www-unix.mcs.anl.gov/mpi/mpich/>

http://en.wikipedia.org/wiki/Message_Passing_Interface

8.5.1 Books

- Aoyama, Yukiya; Nakano, Jun (1999) RS/6000 SP: Practical MPI Programming, ITSO. Available as a pdf.

- Gropp, William; Lusk, Ewing; Skjellum, Anthony (1999a). Using MPI, 2nd Edition: Portable Parallel Programming with the Message Passing Interface. Cambridge, MA, USA: MIT Press Scientific And Engineering Computation Series. ISBN 978-0-262-57132-6.
- Pacheco, Peter S. (1997) Parallel Programming with MPI.[1] 500 pp. Morgan Kaufmann ISBN 1558603395.
- Yiannis Cotronis (Editor), Anthony Danalis (Editor), Dimitris Nikolopoulos (Editor), Jack Dongarra (Editor) Recent Advances in the Message Passing Interface: 18th European MPI Users' Group Meeting, EuroMPI 2011, Santorini, Greece, September 18-21, 2011. ... / Programming and Software Engineering), 2011, Springer, ISBN-10: 3642244483, ISBN-13: 978-3642244483

8.5.2 Courses

In the UK the Hector service

<http://www.hector.ac.uk/>

provide various parallel programming courses. Details of their courses can be found at

<http://www.hector.ac.uk/cse/training/>

Cambridge University provide an MPI Course, offered by Nick Maclaren. See

<http://www-uxsup.csx.cam.ac.uk/courses/MPI/>

8.5.3 Requirements

Requires the installation of the MPI library (some compiler companies offer a bundle of compiler and MPI library) and source code modification.

8.6 OpenMP

The OpenMP Application Program Interface (API) supports multi-platform shared-memory parallel programming in C/C++ and Fortran on all architectures, including Unix platforms and Windows NT platforms. Jointly defined by a group of major computer hardware and software vendors, OpenMP is a portable, scalable model that gives shared-memory parallel programmers a simple and flexible interface for developing parallel applications for platforms ranging from the desktop to the super-computer.

<http://www.openmp.org/>

<http://en.wikipedia.org/wiki/OpenMP>

8.6.1 Books

- R. Chandra, R. Menon, L. Dagum, D. Kohr, D. Maydan, J. McDonald, Parallel Programming in OpenMP. Morgan Kaufmann, 2000. ISBN 1558606718
- Parallel Programming in OpenMP, Chandra et al, 2007, Morgan Kaufmann, ISBN 978-1-55860-671-5
- B. Chapman, G. Jost, R. van der Pas, D.J. Kuck (foreword), Using OpenMP: Portable Shared Memory Parallel Programming. The MIT Press (October 31, 2007). ISBN 0262533022
- Using OpenMP, Chapman et al, 2007, MIT Press, ISBN 978-0262533027
- Barbara Chapman (Editor), Federico Massaioli (Editor), Matthias S. Mller (Editor), Marco Rorro (Editor), OpenMP in a Heterogeneous World: 8th International Workshop on OpenMP, IWOMP 2012, Rome, Italy, June 11-13, 2012. Springer, ISBN-10: 3642309607 ISBN-13: 978-3642309601
- Barbara M. Chapman (Editor), William D. Gropp (Editor), Kalyan Kumaran (Editor), Matthias S. Mller (Editor), OpenMP in the Petascale Era: 7th International Workshop on OpenMP, IWOMP 2011, Chicago, IL, USA, June 13-15, 2011, Springer, ISBN-10: 364221486X ISBN-13: 978-3642214868

8.6.2 Courses

In the UK the Hector service

<http://www.hector.ac.uk/>

provide various parallel programming courses. Details of their courses can be found at

<http://www.hector.ac.uk/cse/training/>

8.6.3 Resources

<http://www.openmp.org/wp/resources/>

<http://www.openmp.org/wp/resources/openmp-compilers>

<http://openmp.org/wp/openmp-specifications/>

8.6.4 Requirements

Requires source code modification.

8.7 Posix Threads

Posix Threads is a library specification for multithreading, proposed as a standard by a broadly based committee of vendors, implementors, and users.

<http://www.llnl.gov/computing/tutorials/pthreads/> Requires the installation of a threading library. Many operating systems come with a threading library pre-installed.

Also requires source code modification.

<http://www.llnl.gov/computing/tutorials/pthreads/>

8.8 Notes on the table below

Here is a quote from an email from Bill Long of Cray.

These interchanges took place on comp-fortran-90 at

<http://www.jiscmail.ac.uk/lists/comp-fortran-90.html>

The archives go back to 1997 and can be searched.

```
{
BEGIN QUOTE
>>
>>Erik Schnetter wrote:
>>
>>>
```

```

>>>Since MPI and threads are implemented as libraries, they work with
>>>every compiler. They are on a rather low level. HPF and OpenMP are,
>>>in a way, language extensions that are translated into MPI or threads
>>>by the compiler.
>>>
>>>
>>>
>>Perhaps a bit simplistic to say "they work with every compiler".
>>Whether MPI or threads (and what kind of threads) work is generally
>>independent of the compiler, but not of the operating system. HPF,
>>OpenMP, and some forms of automatic parallelization often involve
>>compiler generated calls to library routines, but
>>not necessarily to MPI or POSIX threads library routines.
>>A vendor might opt for something more efficient.
>>
>>For many of the entries in Ian's list, there is an
>>implied combination of compiler, OS, and hardware.
>>For such a combination it is reasonable to talk
>>about support for MPI or pthreads.
>>Perhaps it would be helpful to be more explicit
>>about that combination. Most of the parallel
>>programming schemes depend on more than just the compiler.
>>
>>Cheers,
>>Bill
>>
END QUOTE

```

Here is a quote from an email from Malcolm Cohen of NAG

```

BEGIN QUOTE
>>
>>Erik Schnetter said:
>>> The IBM Fortran compiler supports Posix threads:
>>>
>>>As I suspect do most. Certainly the NAG compiler does.
>>>
>>>Cheers,
>>>--
>>>.....
>>>Malcolm Cohen, Nihon NAG, Tokyo, Japan.
>>>(malcolm@nag-j.co.jp)
>>>
END QUOTE

```

In the light of these comments I've added a 'C' category which means that you will need to check your

- hardware
- operating system version
- compiler version
- MPI version or Posix Threads version

to see if the combination works.

The Y entry normally means that the compiler supplier provide a bundled or fully supported offering.

8.9 Table of compilers and supported parallel options

	Automatic	Co Array	HPF	MPI	OpenMP	Posix Threads
Absoft				Y	Y	C
Cray						
PVP	Y			Y	Y	C
T3E		Y		Y		C
X1		Y		Y	Y	C
Fujitsu						
Sparc				C	Y	C
g95						
		P				
gfortran		P		Y	Y	
HP						
HP-UX				C	Y	C
Tru64 Unix			Y	C	Y	C
Openvms						
Alpha				C		C
Openvms						
Integrity				C		C
Openvms						
VAX				C		C
CVF						
Windows				C		C

IBM					
XL	Y		C	Y	Y
Intel	Y	Y	C	Y	C
Lahey/Fujitsu					
Pro Linux	Y		C	Y	C
NAG					
Apple			C	Y	C
HP PA-RISC 1.1			C		C
IBM Power AIX			C		C
IBM Z9 Linux			C		C
IBM Z9					
Open Edition			C		C
Linux x86-32			C	Y	C
Linux64			C	Y	C
Sun SPARC Solaris			C		C
Sun SPARC Solaris			C		C
x86 and x86-64					
Windows			C	Y	C
NEC					
SX	Y		C		C
Pathscale	Y		Y	Y	C
Portland Group	Y	Y	C	Y	C
SGI					
IRIX	Y		C	Y	C
SUN	Y		Y	Y	C
	Automatic	Co Array	HPF	MPI	OpenMP
					Posix Threads

Please see the following for up to date details of compiler conformance to the Fortran 2003 and 2008 standards, and hence support for coarrays.

http://www.fortranplus.co.uk/resources/fortran_2003_2008_compiler_support.pdf

8.10 Parallelisation Tools

8.10.1 Crescent Bay Software

Offer a range of parallelisation tools.

http://www.crescentbaysoftware.com/end_user.html

http://www.crescentbaysoftware.com/vast_parallel.html

http://www.crescentbaysoftware.com/vast_toOpenMP.html

Offer a tool to help parallelise Fortran 77, Fortran 90 or Fortran 95 code.
Their web address is

The tool can generate either MPI calls or OpenMP calls.

The following is a list of combinations of compilers and MPI library versions that are known to work or have worked in the past.

The list is not exhaustive, and other combinations do work.

```
hardware:      IBM Power4 64-bit systems or compatible
operating system: AIX v5.3 or compatible
Fortran compiler: XL Fortran v9.1 or compatible
MPI:          IBM Parallel Operating Environment v4.1.1 or compatible
```

```
hardware:      Apple G4/G5 Power Macintosh
operating system: Mac OS X 10.3.9, Mac OS X 10.4.5
Fortran compiler: GNU g77 3.4.5
                (needs linker found in cctools-528.5.dmg or later
                see ftp://gcc.gnu.org/pub/gcc/infrastructure/)
C compiler:    Apple bundled gcc compiler (4.0.0 or 3.3)
                or FSF gcc 3.4.5 or FSF gcc 4.0.2
```

or IBM XLC compiler 6.0
and compatible compilers
MPI: MPICH2 version 1.0.3 compatible

8.11.3 Nag

hardware: AMD64
operating system: 64-bit Linux
Fortran compiler: NAGWare f95 Release 5.0 and compatible
C compiler: gcc 3.3 and compatible
MPI: MPICH 1.2.6 and compatible

8.11.4 PGI

hardware: AMD64
operating system: 64-bit Linux
Fortran compiler: Portland Group pgf77 6.0-5 and compatible
C compiler: Portland Group pgcc 6.0-5 and compatible
MPI: MPICH 1.2.6 and compatible

8.11.5 Oracle

hardware: Sun Fire V890+, UltraSPARC IV+, 1500MHz, 24 cores
operating system: Solaris 10 Update 3
Fortran compiler: Sun Studio 11 Fortran 95 8.2
compiler options: -fsimple=1 -xvector=no -ftrap=%none -KPIC -xarch=v9a -dalign -st
C compiler: Sun Studio 11 C Compiler 5.8
compiler options: -DAdd_ -xarch=v9a -KPIC -O
MPI: Sun ClusterTools 7
BLAS: Sun Studio 11 Sun Performance Library

8.11.6 Intel

hardware: Intel EM64T systems and compatible (including AMD64)
operating system: Linux for x86-64 with glibc-2.5 and compatible
Fortran compiler: Intel(R) Fortran Intel(R) 64 Compiler
Version 11.0 and compatible
C compiler: Intel(R) C Intel(R) 64 Compiler
Version 11.0 and compatible
MPI: Intel(R) MPI Library 3.2 for Linux
ScaLAPACK: Intel(R) Math Kernel Library 10.1 for Linux
BLAS/LAPACK: Intel(R) Math Kernel Library 10.1 for Linux

Chapter 9

Fortran Software Tools

- Version 1.3, May 2013: Added Visustin Flow charting software. Updated various entries.
- Version 1.2, 2011; Added refactoring as part of title; Add Photran entry;
- Version 1.1, June 2009; Added web address for convert; Added web address for for_struct; Updated Nag entry - tools no longer available, being incorporated into the compiler.
- Version 1.0, January 2006.

9.1 Refactoring

Wikipedia has a detailed coverage of code refactoring that is a good place to start. Have a look at

http://en.wikipedia.org/wiki/Code_refactoring

Here is their first paragraph.

Code refactoring is disciplined technique for restructuring an existing body of code, altering its internal structure without changing its external behavior, undertaken in order to improve some of the nonfunctional attributes of the software. Typically, this is done by applying series of refactorings, each of which is a (usually) tiny change in a computer program's source code that does not modify its functional requirements. Advantages include improved code readability and reduced complexity to improve the maintainability of the source code, as well as a more expressive internal architecture or object model to improve extensibility.

Photran is listed in the Wikipedia entry as a Fortran refactoring tool.

9.2 Convert

Fortran 77 to Fortran 90 converter by Mike Metcalf.

<http://www.nag.co.uk/nagware/Examples/convert.f90>

9.3 Forcheck

A Fortran analyzer and programming aid, here is an extract describing the product.

- is the oldest and most comprehensive Fortran verifier on the market. It performs a full static analysis of an entire Fortran program or a separate analysis of one or more subprograms. detects more anomalies in your program than the compiler. Because it locates bugs as early in the development phase as possible, it saves you time and helps you to produce more reliable programs.
- is ideally suited to get a fast insight in existing and legacy programs. It composes optimal documentation with a call-tree and cross-reference tables both on the program-unit as on the program level.
- can be used as a software engineering tool in the various stages of the development process.
- can verify the conformance to the Fortran standards. Moreover it supports many language extensions of all popular compilers. FORCHECK is fully configurable so you can tune the analysis and output to your needs.
- can store the global information of the analyzed program-units in libraries. You can reference these libraries in subsequent FORCHECK runs to verify the consistency of all references and common-blocks.
- is very suitable as a cross-platform development tool.
- is available on many platforms from PC to supercomputer. It supports most Fortran extensions of all popular compilers.
- is sold with full guarantee and support.

<http://www.forcheck.nl/>

9.4 FOR_STRUCT

<http://www.cobalt-blue.com/fs/fsmain.htm>

Restructures FORTRAN into Clean, Maintainable Code.

9.5 FOR_STUDY

Analyzes and Documents your FORTRAN code.

<http://www.cobalt-blue.com/>

9.6 Fortran90-lint

For Fortran 90 program analysis

<http://www.cleanscape.net/products/downloads/ftpflint.html>

9.7 NAGWare Fortran Tools

The tools provide users with the ability to analyse and transform Fortran 77 and Fortran 95 code. They have been withdrawn as an individual product and are being added to the compiler.

<http://www.nag.co.uk/>

9.8 photran

Photran is an Integrated Development Environment (IDE) for Fortran 77, 90, 95, and 2003 based on Eclipse and the CDT. The project is maintained by the University of Illinois at Urbana-Champaign and IBM.

<http://www.eclipse.org/photran/>

9.9 plusFORT

The following is taken from their web site.

plusFORT, from Polyhedron Software, is a multi-purpose suite of tools for analyzing and improving Fortran programs. It combines restructuring and reformatting with global static analysis, dynamic analysis and many other features in a single powerful package. plusFORT is a one-stop solution for programmers, project managers, and quality assurance engineers working with Fortran source code.

SPAG - Fortran source code restructuring, Quality Assurance using plusFORT, GXCHK - Global Static Analysis, Dynamic Analysis, Coverage Analysis.

<http://www.polyhedron.com/>

9.10 VAST/77to90

Fortran 77 to Fortran 90 translator

http://www.crescentbaysoftware.com/vast_77to90.html

9.11 Visustin

Automated flowcharting software. The following is taken from their web site.

Visustin is an automated flow chart program for software developers and document writers. Save documentation efforts with automatic code visualization. Visustin reverse engineers your source code to flow charts or UML Activity Diagrams. Visustin reads the if and else statements, loops and jumps and builds a diagram fully automated.

No manual drawing is required. Visustin flowcharts ABAP, ActionScript, Ada, ASP, several assembly languages, BASIC, .bat files, C, C++, C Sharp, Clipper, COBOL, ColdFusion, Delphi, Fortran, Java, JavaScript, JCL (MVS), JavaServer Pages, LotusScript, Matlab, MXML, Pascal, Perl, PHP, PL/I, PL/SQL, PowerBuilder PowerScript, PureBasic, Python, QB, REALbasic, REXX, Ruby, SAS, Unix shell script (bash, csh, tcsh, ksh, sh), Tcl, TSQL, VB, VBA, VBScript, VB.Net, Visual FoxPro and XSLT.

<http://www.aivosto.com/visustin.html>

Chapter 10

Fortran Electronic Lists

- Version 1.3, August 2012. Added Linkedin.
- Version 1.2, November 2011. Expanded comp.lang.fortran entry with more information about usenet.
- Version 1.1, January 2006.

10.1 comp-fortran-90

Jiscmail hosted. Restricted to questions about Fortran since the publication of the Fortran 90 standard. Can either browse on-line or subscribe and get postings via email. Postings are archived and go back to 1997.

<http://www.jiscmail.ac.uk/lists/comp-fortran-90.html>

10.2 comp.lang.fortran

Usenet news hosted Fortran list. Covers all aspects of Fortran.

Usenet is a worldwide distributed Internet discussion system. Users read and post messages (called articles or posts, and collectively termed news) to one or more categories, known as newsgroups. Discussions are generally threaded with modern news reader software.

Usenet is distributed amongst a large, changing set of servers that store and forward messages to one another in so-called news feeds. Individual users may read messages from and post messages to a local server operated by their Internet service provider, university, or employer.

Newsreader clients

Newsgroups are typically accessed with special client software that connects to a news server. Newsreader clients are available for all major operating systems.

Web accessible newsgroups

Web front ends to newsgroups mean that many people now no longer need to use download and install or configure a news reader client Google Groups is one such web based front end and web browsers can access Google Groups.

Free usenet news service

<http://www.eternal-september.org/>

Welcome to news.eternal-september.org news.eternal-september.org is a private project providing free access to text-only Usenet News. The server has a 100MBit connection to several Internet backbones and is integrated into the Usenet via more than 60 peers.

Free access to the news server news.eternal-september.org provides free read and write access to all text newsgroups. It requires a registration that can be done online.

<http://groups.google.co.uk/group/comp.lang.fortran?lnk=lr>

<http://groups.google.ca/group/comp.lang.fortran>

10.3 LinkedIn

LinkedIn is a social networking website for people in professional occupations. As of June 2012, LinkedIn reports more than 175 million registered users in more than 200 countries and territories.

<http://www.linkedin.com/> The Fortran Programmers Group has 1697 members as of August 2012.

The site is available in English, French, German, Italian, Portuguese, Spanish, Dutch, Swedish, Romanian, Russian, Turkish, Japanese, Czech, Polish, Korean, Bahasa Indonesia, and Bahasa Malaysia.

10.4 Compiler specific

Some of the compiler suppliers provide electronic list support. Some provide an email address for technical support.

10.4.1 Absoft

<http://forums.absoft.com/>

support@absoft.com

10.4.2 Apogee

`info@apogee.com`

10.4.3 Compaq

10.4.4 Cray

10.4.5 Fortran Company

You can subscribe to an e-mail list by sending e-mail to `majordomo@fortran.com` with the following in the body of the message:

`subscribe f-interest-group@fortran.com`

10.4.6 Fujitsu

10.4.7 Gnu Fortran 95

You can reach us at the `fortran@gcc.gnu.org` mailing list; for details please refer to our mailing lists page.

`http://gcc.gnu.org/lists.html`

10.4.8 G95

`http://groups.google.com/group/gg95`

10.4.9 Hewlett Packard

`vf-support@hp.com`

10.4.10 IBM

Requires registration.

10.4.11 Intel

Requires registration.

<https://premier.intel.com/WhatsNew.aspx>

10.4.12 Lahey Fujitsu

Requires registration.

<http://www.lahey.com/support.htm>

<http://www.laheyforum.com/>

10.4.13 NAG

Requires registration.

support@nag.co.uk

10.4.14 NA Software**10.4.15 NEC**

<http://www.nec.com/global/support/index.html>

10.4.16 Pathscale

Requires registration.

<http://pathscale.com/support.html>

support@pathscale.com

10.4.17 PGI

Various offerings.

<http://www.pgroup.com/support/index.htm>

10.4.18 Salford Software

Various options.

<http://www.silverfrost.com/22/ftn95/support/index.asp>

10.4.19 SGI

Various options.

<http://www.sgi.com/support/customerservice.html>

10.4.20 SUN

<http://forums.sun.com/category.jspa?categoryID=113>

Chapter 11

Fortran Standard Bodies

- Version 1.1, August 2012; Updated J3 entry to reflect organisation within the US
- Version 1.0, January 2006.

11.1 Introduction

There are two main Fortran standards bodies and these are WG5 and PL22.3 (formerly J3). Each is covered in turn below.

11.2 WG5

Their home page is:-

<http://www.nag.co.uk/sc22wg5/>

Their document ftp site is at:-

<ftp://ftp.nag.co.uk/sc22wg5/>

The following

<http://www.nag.co.uk/sc22wg5/links.html>

has links to documents relating to the following standards: Fortran 66, Fortran 77, Fortran 90, Fortran 95, Fortran 2003 and Fortran 2008.

11.3 PL22.3

Task Group PL22.3 (formerly J3) is responsible for the development and interpretation of the United State and International standards for Programming Language Fortran.

This technical committee is the U.S. TAG to ISO/IEC JTC1 SC22/WG5

Current participants (August 2012) include

Bierman,	Emeritus
Brainerd,	Emeritus
Cray Inc,	Bill Long
Hendrickson,	Emeritus
Hirschert,	Emeritus
IBM Corporation,	Daniel Chen
Intel Corporation,	Stan Whitlock
Jet Propulsion Laboratory,	Van Snyder
Lahey,	Emeritus
Maine,	Emeritus
Martin,	Emeritus
Meissner,	Emeritus
National Center for Atmospheric Research,	
North,	Emeritus
Oracle,	Robert Corbett
Smith,	Emeritus
The Numerical Algorithms Group Ltd,	Malcolm Cohen
United States Dept of Energy,	
Wagener,	Emeritus

<http://standards.incits.org/a/public/group/pl22.3>

The PL22.3 - J3 home page is:-

<http://www.j3-fortran.org/>

Their list of members (August 2012) is given below.

Voting Principals

=====

Daniel Chen,	IBM Corp.
Malcolm Cohen,	Nihon Numerical Algorithms Group K.K.

Robert Corbett,	Oracle America
William Long,	Cray Inc.
Dan Nagle	Chair PL22.3
Craig E. Rasmussen,	Los Alamos National Laboratory
Van Snyder,	Jet Propulsion Laboratory
Stan Whitlock,	Intel Corporation

Voting alternatives

=====

Aleksandar Donev	- Craig Rasmussen
Steve Lionel	- Stan Whitlock
Kelvin Li	- Daniel Chen
Lorri Menard	- Stan Whitlock
Toon Moene	- Craig Rasmussen
John K. Reid	- Dan Nagle
Damian Rouson	- Craig Rasmussen
C. R. Schult	- William Long
Dr. John Wallin	- Dan Nagle
Rafik Zurob	- Daniel Chen

Their version of the working draft is at:-

<http://www.j3-fortran.org/doc/standing/links/007.pdf>

Chapter 12

Other Web Links

- Version 1.2, June 2009; Updated several web links.
- Version 1.1, September 2008
- Version 1.0, January 2006

12.1 Fortran History

12.1.1 A brief history of FORTRAN-Fortran

<http://www.ibiblio.org/pub/languages/fortran/ch1-1.html>

12.1.2 Computer Languages History (preview)

<http://www.levenez.com/lang/history.html>

12.1.3 Computer Languages History

<http://www.levenez.com/lang/>

12.1.4 Fortran A few historical details

Nolongeravailable.

12.1.5 Open Directory - Fortran Tutorials Fortran 90 and 95

http://www.dmoz.org/Computers/Programming/Languages/Fortran/Tutorials/Fortran_90_and_95

12.1.6 Open Directory - Fortran

<http://dmoz.org/Computers/Programming/Languages/Fortran/>

12.1.7 The Fortran (not the foresight) saga

http://www.fortranplus.co.uk/resources/brian_meeks_fortran_saga.pdf

12.2 Computer Arithmetic

12.2.1 What every computer scientist should know about floating point arithmetic

<http://www.validlab.com/goldberg/paper.pdf>

12.2.2 IEEE 754r - Wikipedia, the free encyclopedia

http://en.wikipedia.org/wiki/IEEE_754r

12.2.3 IEEE 754 Standard for Binary Floating-Point Arithmetic

<http://grouper.ieee.org/groups/754/>

12.2.4 IEEE Standard 754 Floating-Point

<http://stevhollasch.com/cgindex/coding/ieeefloat.html>

12.2.5 William Kahan

<http://www.cs.berkeley.edu/~wkahan/>

12.2.6 IEEE 754 floating-point test software

<http://www.math.utah.edu/~beebe/software/ieee/>

12.2.7 Interval FAQ from Alejandro Casares – What machines support IEEE 754

<http://www.mscs.mu.edu/~georgec/IFAQ/casares1.html>

12.2.8 Decimal Arithmetic - FAQ 1

<http://www2.hursley.ibm.com/decimal/decifaq1.html#emphasis>

12.2.9 General Decimal Arithmetic

<http://www2.hursley.ibm.com/decimal/>

12.3 Programming

12.3.1 Calling FORTRAN and C from Java

<http://www.csharp.com/javacfort.html>

12.3.2 CS 267 Applications of Parallel Computers

<http://www.cs.berkeley.edu/~yozo/cs267.sp05/>

12.3.3 Hillside.net - Design Patterns Book - DP Book

<http://hillside.net/patterns/DPBook/DPBook.html>

12.3.4 Hillside.net - Design Patterns Book - Source

<http://hillside.net/patterns/DPBook/Source.html>

12.3.5 Home page of Les Hatton

<http://www.leshatton.org/>

12.3.6 Parallel Programming - Basic Theory For The Unwary

<http://users.actcom.co.il/~choo/lupg/tutorials/parallel-programming-theory/parallel>

12.3.7 Putting a Java Interface on your C, C++, or Fortran Code

<http://www.math.ucla.edu/~anderson/JAVAclass/JavaInterface/JavaInterface.html>

12.3.8 Teach Yourself Programming in Ten Years

<http://www.norvig.com/21-days.html>