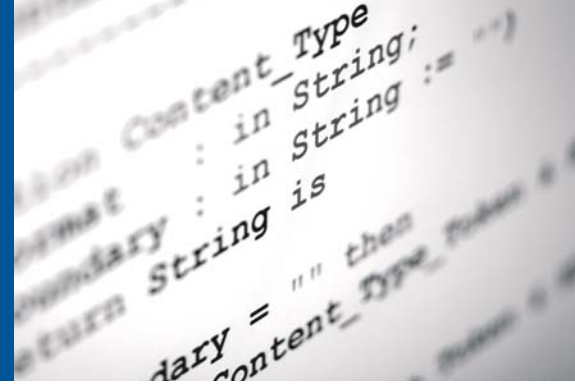


# GNAT Pro

## insider

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## newsflash

- ▶ **New version numbering for GNAT Pro**  
In 2007 AdaCore will be moving to a new numbering scheme for product releases. The release scheduled for Q1 2007 will be 6.0.1, where the transition to the "6" series indicates a major release, more specifically the inclusion of complete Ada 2005 support. The followup release scheduled for later in the year will be 6.0.2. More details on the new numbering scheme may be found in the Developers Center section of the AdaCore website.
- ▶ **New GNATbench release**  
AdaCore recently launched a stand-alone version of the GNATbench plug-in that integrates Ada into native (standard) Eclipse on Windows and GNU Linux. GNATbench provides GNAT Pro users on these platforms with the familiar Eclipse "look and feel" and supports both all-Ada and mixed-language development. GNATbench is also available for cross development on Windows and Solaris hosts, using Wind River's Workbench 2.5.

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## GNAT Pro and Ada 2005 Coming to .NET

**AdaCore is porting the GNAT Pro technology to Microsoft's .NET framework, in an effort that will, for the first time, bring a commercial Ada development environment to this platform.**

.NET has been attracting increased attention in the software industry as an ECMA/ISO standardized alternative to Java. With the port of GNAT Pro to .NET, AdaCore customers will be able to exploit state-of-the-art developments provided by this platform. GNAT Pro for .NET will also offer new solutions for multilanguage software design, a typical requirement on large systems. GNAT Pro takes advantage of .NET's CLI (Common Language Infrastructure), which at present supports more than 40 languages.

One of GNAT Pro's strengths is the wide range of platforms and configurations on which it is implemented, currently numbering more than 40. That in turn makes Ada's source code portability a reality, since developers can move their applications to any of these platforms, often by simply recompiling. GNAT Pro for .NET will bring a new dimension to portability: an application compiled once will run on .NET and also on .NET-compatible systems such as the Mono framework, which is available on several Unix platforms.

The GNAT Pro port to .NET is being performed under a customer contract and is scheduled for availability in mid-2007. The port will include support for Microsoft Visual Studio .NET 2005.

## GNATstack Tool Available

GNATstack, a static analysis tool that computes the maximum stack usage for each task in a program, is being added as a standard tool in the GNAT Pro High-Integrity Edition, and as an add-on for the other GNAT Pro product editions. GNATstack is especially useful for safety-critical and other high-integrity applications, where the memory requirements need to be known before program execution. The tool calculates the maximum stack size by analyzing per-subprogram stack usage as well as control flow.

For additional information on GNATstack, please visit the AdaCore website [www.adacore.com](http://www.adacore.com).

## New GCC Technology

As part of AdaCore's general upgrade strategy, GNAT Pro 6.0.1 on several platforms will incorporate a new code generator based on gcc 4.1. This enhancement, important to the long-term maintenance of the GNAT technology, offers new target support opportunities and thus will make it possible to port GNAT Pro to additional platforms. The new gcc code generator also provides more aggressive optimization capabilities, which will benefit customers by improving the performance of applications built by GNAT Pro. Early performance analysis has shown speed improvements up to 10-15% on most architectures, and up to 20% on PowerPCs.

# What's Coming in GNAT Pro 6.0.1

Besides full support for Ada 2005 and, on some platforms, the upgrade to a new code generator, the next GNAT Pro release will bring many new features and enhancements.

## ▶ Object Oriented Programming

- better interfacing with C++ classes
- faster compilation of units using OOP
- improved code generation

## ▶ Better warnings for likely program errors

- infinite loops
- useless assignments
- unused or unassigned variables
- alignment conflicts
- suspicious array indexing

## ▶ Support for Ada 2005 in companion tools such as gnatpp and gnatmetrics

### ▶ Tasking improvements

(depending on the platform)

- wider range of priorities
- better support of priority ceiling inheritance

### ▶ Elaboration

- friendlier elaboration order
- warning on variables potentially used before their initialization in elaboration blocks

### ▶ Debugger

- watchpoint support on some embedded targets
- better backtraces
- new command to help locate sources.

## New Version of gprmake

AdaCore's multi-language program build tool, gprmake, has been updated to provide a number of important enhancements. These include:

- support for Ada, C and C++ by default
- support for multi-language libraries
- support for new languages and/or toolchains through configuration files
- independence from a specific GNAT Pro version (that is, the same gprmake will work with different GNAT Pro releases).

A beta program for the new gnatmake will be initiated before the end of 2006. If you are a current GNAT Pro customer interested in participating in this beta program, please contact [sales@adacore.com](mailto:sales@adacore.com).

## New Version of GNAT Tracker

GNAT Tracker, the web-based interface to GNAT Pro customer support, is being enhanced.

### Planned improvements include:

- a new design allowing easier information retrieval;
- additional details about the status of customer tickets, wavefronts, and downloads;
- access to the Developer Center, where customers can find the latest news on GNAT Pro technology, technical papers, and code samples.

**The new version of GNAT Tracker is planned for early 2007.**

## AdaCore at Conferences November 2006 - April 2007

### SIGAda 2006

Annual International Conference  
on the Ada Programming Language

12-16 November 2006 / Albuquerque, NM, US

AdaCore is a platinum sponsor of this conference. Robert Dewar is delivering a keynote address, Ben Brosgol is presenting a tutorial, and Ed Schonberg is conducting a "Birds of a Feather" session on AdaCore's GNAT Academic Program.

[www.sigada.org/conf/sigada2006/](http://www.sigada.org/conf/sigada2006/)

### Avionics 07

Avionics Exhibition and Conference

7-8 March 2007 / Amsterdam, The Netherlands

AdaCore is a headline sponsor of this conference.

[www.avionics-event.com/](http://www.avionics-event.com/)

### SIGCSE 2007

Technical Symposium  
on Computer Science Education

7-10 March 2007 / Covington, KY

(metro Cincinnati area), US

AdaCore is an exhibitor at this conference.

[www.cs.potsdam.edu/sigcse07/](http://www.cs.potsdam.edu/sigcse07/)

### IRTAW-13

13th International Real-Time Ada Workshop

17-19 April 2007 / Woodstock, VT, US

AdaCore is the local host for this workshop.

[www.adaresource.org/irtaw13/](http://www.adaresource.org/irtaw13/)

## Spotlighting a GAP Member: University of Northern Iowa

**GAP (the GNAT Academic Program)** is an AdaCore initiative that provides GNAT technology to colleges and universities in order to encourage the use of Ada for teaching and research. The University of Northern Iowa, in Cedar Falls, Iowa, US, was one of the first institutions to join this program, with Prof. John McCormick as the university representative. Signing up for GAP was a natural decision for UNI and for Prof. McCormick, since he has been using Ada and GNAT in Computer Science courses there since 1997. GNAT was first selected for an upper-division course on concurrent programming, where it was enthusiastically embraced by students and faculty. GNAT and Ada are currently being used in a traditional data structures course, and will likely be adopted in a fundamentals course that focuses on software engineering.

"I cannot speak of GNAT and GAP without expressing my delight with AdaCore for their helpfulness to academics," said Prof. McCormick. "There were many times while I was working on the second edition of my *Ada Plus Data Structures* textbook when AdaCore engineers helped me to understand some new Ada 2005 feature. Having a working compiler for the new language so quickly is a remarkable technical feat. Making it available to academia is just as remarkable, and we very much appreciate AdaCore's commitment."



# Interview with Bob Duff

## Senior Software Engineer, AdaCore US

**GNAT Pro Insider:** Tell us a bit about your background, how you came to be involved with Ada and AdaCore, and what your current role is.

**Bob Duff:** I first became acquainted with Ada during the Ada Language Evaluation in the early 1980s while with a company that produced hardware test equipment programmed in assembly language and Pascal. My early interest in Ada led me, after getting a degree in Applied Mathematics from Carnegie-Mellon University, to work on one of the first Ada 83 compilers. I have spent most of my career designing programming languages, developing compilers and related tools for a number of programming languages, and I have also implemented real-time systems and other commercial software products.

I joined AdaCore in 2005. I was attracted by the company's excellent software development process, its highly skilled staff, and the opportunity to work with and on free software using my favorite programming language. At AdaCore I'm currently implementing some of the new Ada 2005 features in the GNAT compiler technology, and I'm also participating in the implementation of other GNAT tools such as PolyORB.

**GNAT Pro Insider:** You were active in the development of both Ada 95 and Ada 2005. How would you compare the two language design efforts?

**Bob Duff:** I worked full time for several years on the Ada 95 language design project, and wrote major portions of the Ada 95 Reference Manual. This was an effort by a closely-knit small team, with Tucker Taft as the team leader. It was also a major revision and a considerable technical challenge.

The Ada 2005 effort was more modest, but still significant in terms of the enhancements. Unlike the development of both Ada 83 and Ada 95, which had outside funding, the Ada 2005 standardization process was conducted by volunteers—well actually by a technical team supported by their employers—and I was one of the participants.

Ada 95 improved Ada 83 in three major areas: support for object-oriented programming, real-time embedded systems, and hierarchical library packages. Perhaps the most interesting new feature of Ada 2005 is multiple inheritance of Java-like interfaces, which helps integrate Ada's object-oriented and concurrency features. For example, task entries and protected entries can override operations of so-called "synchronized interfaces." This is very much a breakthrough in language technology.

**GNAT Pro Insider:** You've developed commercial software in many different languages. How much of a difference does the language make? How about tools?

**Bob Duff:** The success of software projects is determined by a wide variety of factors including programming language, people skills, development process, and development tools. In one sense the programming language is only one of these factors, but it definitely has a major impact on project success. Furthermore, the language choice is something that can be controlled fairly easily, and it can affect other factors (supporting good processes, preventing insecurities such as buffer overflow, influencing how developers think, etc.)

Using a language like Ada will not ensure success, but it can help in a major way when compared to many of the other popular languages. Ada was designed from the start to support sound software engineering, and it has evolved to keep up with language technology over the past two decades and indeed in many ways has advanced the state of the art.

**GNAT Pro Insider:** Ada 2005 offers enhancements in many areas. Which features in particular do you think will be of the most benefit to users?

**Bob Duff:** I mentioned multiple inheritance of interfaces above, but from a practical point of view, the improvement with the most benefit in terms of general applicability is probably the new Containers library. This will make it much easier for programmers to define sophisticated data structures in a standard, efficient, and type-safe manner.

## Public Courses at AdaCore NY

Starting in January 2007, AdaCore will be conducting public courses on Ada and the GNAT Pro development environment at its New York City office. All courses combine lectures with hands-on workshops using the latest versions of the GNAT Pro tools. For detailed outlines and a complete schedule for January through June, 2007, please refer to the AdaCore website [www.adacore.com/home/gnatpro/add-on\\_services/training](http://www.adacore.com/home/gnatpro/add-on_services/training)

# New Target Platforms for GNAT Pro

The increasing usage of 32-bit embedded processors is creating a need for languages and tools that can achieve high run-time performance while scaling up to promote reliability and maintainability as application size and complexity grow. To help meet this need, AdaCore has implemented GNAT Pro for two new target architectures, thus bringing Ada's advantages to developers on these platforms.

## GNAT Pro for the MPC5554

AdaCore has implemented its GNAT Pro cross development environment for the Freescale e200 processor core used in the MPC5554 microcontroller. This product, which provides the "Zero Footprint" run-time profile appropriate for bareboard systems, is commercially available and is currently in use by AdaCore customers developing a variety of complex real-time control applications. Hardware tools from Macraigor and iSystem, incorporating a gdbserver and connecting to the 5554's JTAG and NEXUS interfaces, allow the use of the GPS debugger interface and make cross debugging easier.

## GNAT Pro for the LEON

Under a contract from the European Space Agency, AdaCore has implemented its GNAT Pro cross development environment for the LEON SPARC target processor. This product, which includes support for the Ravenscar tasking profile, will be available in late 2006 on Solaris and GNU Linux host platforms. The LEON processor is the architecture of choice for European space on-board systems, and with GNAT Pro these applications will be able to exploit the new Ada 2005 high-integrity capabilities.

## More Ada 2005 Features Available in GNAT Pro

AdaCore has completed its implementation of Ada 2005. The most significant features of the new standard have been available for over a year, allowing GNAT Pro customers and GAP members to take early advantage of "limited with" clauses, interfaces, synchronized interfaces, prefix notation for calls to primitive operations, nested type extensions, anonymous access types, the Containers library, and the Ravenscar tasking profile. The next release of the GNAT technology will offer additional noteworthy **Ada 2005 features**:

- **the full implementation of the extended return statement.** Through this feature an application can create objects from limited types in many more contexts than previously.
- **the full implementation of the vector and matrix operations in the predefined library.** These operations are provided through a portable interface to the standard numeric routines in the LAPACK linear algebra package. They will allow programmers to write scientific code completely within Ada.
- **the full implementation of the new scheduling and dispatching facilities of the Real-Time Annex.** These significant extensions to the tasking model are being implemented in collaboration with the developers of MaRTE OS at the University of Cantabria, Spain. They will initially be available on Linux platforms through an additional tasking run-time library based on MaRTE OS.
- **the full implementation of the new features in the Ada.Calendar package.** The range of the Time type has been extended, support for time zones has been improved, and new conversion operations have been added for Time and Duration.

## newsflash

### ► THALES development contract

AdaCore has been awarded a contract from THALES to implement GNAT Pro's Zero Footprint (ZFP) run-time profile on Windows and Solaris platforms. The ZFP support will be enhanced with backtrace and local exception handler support, and the AUnit unit testing framework will be adapted to handle ZFP-based programs. Although the ZFP profile is intended for software fielded on embedded processors, often for safety-critical systems, having this profile available on a native platform makes development and testing much easier. The native ZFP products are scheduled for release in Q1 2007.

### ► ASSERT project selects Ada 2005

ASSERT, a European Union-sponsored project to improve the development of critical embedded real-time systems, is adopting the Ada 2005 language and AdaCore's open-source GNAT development environment. ASSERT (Automated proof-based System and Software Engineering for Real-Time) will use Ada 2005 to develop a run-time platform and integration framework comprising software components that can be reused for aerospace and other high-integrity systems.

### ► QUALOSS contract

As part of the QUALOSS (Quality of Open Source Software) project funded by the European Union, AdaCore will be conducting a case study to test high-level quality models for free software. One direction for this study, currently at the planning stage, is to use a third-party model to analyze AdaCore's existing infrastructure for building, managing, and maintaining the GNAT code base and related technology. The results of such a study would then help to improve both AdaCore's practices and the external model.

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104 Fifth Avenue, 15th floor	8 rue de Milan
New York, NY 10011-6901, USA	75009 Paris, France
tel +1 212 620 7300	tel +33 1 49 70 67 16
fax +1 212 807 0162	fax +33 1 49 70 05 52

sales@adacore.com  
www.adacore.com

**AdaCore**  
The GNAT Pro Company