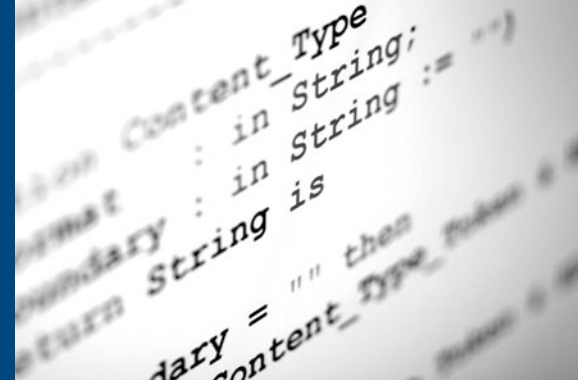


# GNAT Pro

## insider

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## newsflash

### New Toolsuite Course

AdaCore is introducing a new 3-day course covering the IDE (GPS, Eclipse/GNATbench), coding style quality (gnapp, gnatcheck), memory analysis (gnatmem, dynamic stack usage), interfacing with other languages (C, C++, Java), advanced debugging techniques, testing (Aunit, code coverage), and code optimization.

### Tristan Gingold Named binutils Release Manager

AdaCore EU senior software engineer Tristan Gingold is the new release manager for binutils, a collection of GNU tools (assembler, linker, etc.) used with gcc and gdb. In this role, which entails planning and conducting the annual release of the binutils package, he creates and tests the release branch, builds the source package, and performs other release-related functions. Tristan has been participating in the binutils community for two years.

### Greg Gicca Elected SIGAda Officer

AdaCore US's Director of Safety and Security Marketing, Greg Gicca, was elected earlier this year as ACM SIGAda's Vice Chair for Liaison. This position involves maintaining an outreach initiative and interfacing with other organizations that are involved with or affected by Ada. Greg's term of office extends through June 2011. He has been active in SIGAda for many years and is the conference Chair for SIGAda 2009.

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## Introducing GNAT Pro High-Integrity Edition for MILS

Complementing its support for safety-critical development, AdaCore is launching a new product for applications that need to meet security certification requirements: the GNAT Pro High-Integrity Edition for MILS. This version of GNAT Pro is being implemented on Wind River Systems' VxWorks MILS platform. Specialized run-time libraries are provided, reflecting the required security assurance (known as Evaluation Assurance Levels, or EALs, ranging from 1 to 7). The product also includes the SPARK Pro toolset, which is especially valuable at the highest EALs where formal or semi-formal approaches are required.

Three run-time libraries are supplied, allowing the product to be used across a broad range of application domains and security criticality:

- ▶ A full Ada run-time library, most appropriate for systems at EAL 1 through 3
- ▶ The Ravenscar/Cert run-time library, for EAL 4 or EAL 5
- ▶ The Zero Footprint (ZFP) run-time library, for EAL 5 through 7

These highest EAL levels demand formal or semi-formal methods. The combination of the SPARK language (an Ada subset extended with a notation for specifying a program's "contracts"), the ZFP library, and the SPARK Pro toolset help reduce the development effort and simplify security certification. The SPARK language and toolset have a proven success record for high-security systems, as has been demonstrated on projects such as NSA's Tokeneer.

The product's adaptability makes it especially attractive for developing systems that run on MILS-compliant platforms (Multiple Independent Levels of Security). In a MILS architecture, applications at different security levels can run on a single processor, and security partitioning ensures that each program is protected from the others. With the GNAT Pro High-Integrity Edition for MILS, each application can be written using the appropriate run-time library.

The GNAT Pro High-Integrity Edition for MILS will be available during Q1 2010 on Wind River's VxWorks MILS platform.

## Model-Based Design Projects Underway

As part of the Open-DO initiative to promote the use of Open Source technology in safety-critical systems, AdaCore is engaged in a number of projects focusing on modeling technologies. In one of these the company is investigating the concept of model compilers that can actively assist in the verification process. Such compilers, known as *verifying model compilers*, generate object code for a target platform starting from a high-level model but also perform specific verification functions. Coupled with the verification of the model itself, such a compiler would formally guarantee end-to-end correctness: property preservation from model to source code. GNAT Pro, SPARK Pro, and CodePeer all fit into this technology.

AdaCore is also contributing to the Gene-Auto project ([forge.open-do.org/projects/geneauto/](http://forge.open-do.org/projects/geneauto/)), sponsored by Information Technology for European Advancement (ITEA). Gene-Auto seeks to achieve 100% qualified code generation, optimized for the target, starting from commonly-used models such as Matlab/Simulink and SciLab/SciCos, and based on formal techniques. AdaCore is also participating in the on-going development and evolution of the UML and SysML standards ([www.omg.org/docs/ad/09-08-22.pdf](http://www.omg.org/docs/ad/09-08-22.pdf)).

Model-based design presents a number of challenges for safety certification, but these projects promise to provide tools and technologies that offer effective solutions.

## SPARK Pro 8.1.4

This new version of SPARK Pro includes enhancements from Praxis High Integrity Systems to the SPARK language and toolset. New features in SPARK include:

- ▶ Labels on statements, for use with debuggers,
- ▶ Unqualified array aggregates as initialization of “out” mode formal parameters, which is useful when the formal parameter is unconstrained.

Enhancements to the SPARK tools include:

- ▶ Generating cross-reference information for SPARK annotations that can drive navigation in GPS 4.4.0 and above,
- ▶ Generating GraphViz-compatible visualizations of the VC Generator output,
- ▶ Improved Simplifier analysis and Verification Condition (VC) generation.

SPARK Pro 8.1.4 is available on Windows, SPARC/Solaris, Mac OS X, 32-bit Linux, and 64-bit Linux.

## GPS 4.4

The latest version of the GNAT Programming Studio IDE brings a variety of new features including:

- ▶ Improved user interface, memory usage and speed,
- ▶ Entity View,
- ▶ Enhanced documentation generation to support both API documentation and source code browsing,
- ▶ Hyperlinks in source editor for quick source and web navigation,
- ▶ Support for CodePeer and Couverture toolsets,
- ▶ Improved SPARK support, in particular source navigation in annotations,
- ▶ Tip of the Day,
- ▶ Unified visual diff within a source editor,
- ▶ New source navigation menus to display a type hierarchy and jump to the first subtype of an Ada type,
- ▶ Plug-ins that carry out functions such as
  - Setting formatting preferences automatically from gnatpp project switches
  - Invoking gnatpp to automatically reformat on save.

*current releases continued on page 4*

## Spotlighting a GAP Member

### The Australian National University (Canberra, Australia)

At the Australian National University (ANU), Ada plays an integral part in teaching and research, at both the undergraduate and graduate levels. Dr. Uwe Zimmer has been using Ada, with the GNAT technology on Linux, Windows, Mac, and Embedded MPC5554, in two major courses:

- ▶ Concurrent and Distributed Systems, for Computer Science and Engineering students in their second year ([cs.anu.edu.au/student/comp4330/](http://cs.anu.edu.au/student/comp4330/)), and
- ▶ Real-Time and Embedded Systems, for Computer Science and Engineering students in their last year and for Masters students ([cs.anu.edu.au/student/comp2310/](http://cs.anu.edu.au/student/comp2310/)).

Dr. Zimmer selected Ada because of its strong support for sound software development in general, its collection of features for tasking, real-time, and embedded systems in particular, and the availability of the GNAT Ada development environment for the target platforms used in the courses. “In retrospect, Ada was a natural choice, and students are quick to take advantage of the language’s benefits,” said Dr. Zimmer. “Since Ada is standardized and interplatform compatible, many students develop their projects on their own computers and then submit their work without our being able to tell which platform was used.”

Ada-based projects at the ANU include communication systems and sonar processing, and one student will be using Ada (and GNAT for the MPC5554 and AVR processors) for his Ph.D. thesis work on high-integrity design and programming for small Unmanned Aerial Vehicles, specifically helicopters.

As summed up by Dr. Zimmer, “We are happy Ada and GNAT users here at the ANU. Ada is a highly efficient teaching tool that leads seamlessly into full industrial deployment, and AdaCore’s support is unparalleled.”

For links to papers on the communications and sonar projects at the ANU, please see Dr. Zimmer’s web page: [transit-port.net/Uwe.Zimmer/](http://transit-port.net/Uwe.Zimmer/).

## GNAT Pro 6.3

The next major release of the GNAT Pro development environment, GNAT Pro 6.3, will offer a wide variety of enhancements, many based on customer comments and requests. The improvements are in several areas:

- ▶ Availability on new platforms including 64-bit Windows, VxWorks MILS, Embedded Linux (Elinos), PikeOS (ARINC 653), and LynxOS 5;
- ▶ Multi-language technical support: to provide a complete solution for customers who are using Ada along with other languages, full support for C++ will be available as an option, together with support for Ada and C;
- ▶ Implementation of Ada 2005 features such as conditional expressions;
- ▶ Improvements in a number of tools:
  - Pretty printer (gnatpp),
  - Coding standard verifier (gnatcheck),
  - Stack size analysis (gnatstack),
  - Unused subprogram elimination (gnatelim);
- ▶ Compiler enhancements, including code optimization and better warning and error messages.

GNAT Pro 6.3 will be available on most platforms during Q1 2010.

## GNAT Pro High-Integrity Edition on SYSGO’s PikeOS

As part of its partnership with SYSGO AG, AdaCore is porting the GNAT Pro High-Integrity Edition for DO-178B to PowerPC PikeOS, an RTOS dedicated to the development of embedded and mission-critical systems. The new product will provide Ravenscar and Zero Footprint run-time libraries. It complements AdaCore’s previous offerings for SYSGO’s platforms, GNAT Pro for x86 and PowerPC ElinOS, and will be available Q1 2010.



Navinda Kottege with a Serafina autonomous mini submersible at the Australian National University. Photo by Uwe Zimmer.



# Interview with Pat Rogers

## Senior Member of the Technical Staff, AdaCore US

### **Tell us about your background and how you came to be involved with Ada and AdaCore. What is your current role?**

I got hooked on computers at age 11, at an IBM exhibit in an international exposition. I spent the day at their booth and quickly realized that I had found my calling. I worked as a COBOL and Fortran programmer in college. My Pascal course was therefore a revelation: compilable pseudocode! Another course presented Ada (the 1980 version) as "industrial strength Pascal," and I was hooked again. When I graduated from college I knew that Intermetrics was developing Ada technology so I made a point of getting hired by them. NASA was showing interest in Ada, and I got to do some Ada research in Houston while working on embedded control applications.

I left Intermetrics to work with Dr. Charles McKay (University of Houston at Clear Lake) on various NASA-funded projects including one that led to the choice of Ada for the International Space Station. We were members of SIGAda's Ada Real-Time Environment Working Group (ARTEWG), helping to define real-time extensions for Ada 83. That effort led to a distributed Ada implementation for the Air Force, more real-time projects, teaching Ada, innumerable Ada conferences, and a Ph.D. from the University of York (UK) in the area of fault tolerance. In late 2002 I joined AdaCore, and I'm the company's Texas office.

Currently I support real-time/embedded systems developers, create and conduct courses, provide technical sales support, and develop parts of our GNATbench Eclipse plug-in for Ada.

### **You have been delivering courses on real-time and embedded-systems programming for many years. What sorts of technological changes have you observed in this application domain?**

"Embedded" used to mean "bare-board," but real-time operating systems are now common. The wealth of functionality they provide is extraordinary, compared to what was once the norm. In terms of programming languages, concurrency has finally become mainstream, and even C++ is moving in that direction. But unlike Java and C++, Ada 95 built on the software engineering advances made in concurrent language design, and Ada 2005 has extended them even further. Similarly, Ada 2005 represents the state-of-the-art in real-time programming support. The POSIX real-time extensions may eventually catch up, but by then the next version of the Ada standard will no doubt go further.

All in all, the advances in technology have been remarkable, although I do find it surprising that our industry continues to "discover" mechanisms (such as semaphores) introduced the same year I got hooked on computing! And it's also a bit frustrating that people are now fussing over how best to exploit multicore in programming languages, when Ada has supplied an effective solution since its earliest days.

### **You are a principal architect of AdaCore's GNATbench product, an Eclipse plug-in. How does Eclipse fit into AdaCore's product strategy?**

We've seen the use of Eclipse spread rapidly, and so we will continue to enhance our Ada plug-in. In particular, we share as much underlying technology as possible with GPS (our flagship IDE), so that both environments benefit when new capabilities are created.

In the early 1980s, the so-called Stoneman requirements document for Ada Programming Support Environments stated that a major benefit of the Ada effort would stem from "introducing and distributing effective software development and support environments." Decades later, we can make a good case that both GPS and GNATbench meet and exceed the original Stoneman requirements, which were rather advanced for their time. And they're certainly far less expensive, more powerful, and faster than anything that the Stoneman authors may have anticipated.

### **Any hobbies or outside interests that you'd like to share?**

I'm a 3rd Dan black belt in Tae Kwon Do. Completely unrelatedly, I founded the AdaCore "Wicked Uncles" club. The Uncles teach the young children of AdaCore parents to do things that their parents

would rather not have them know, such as how to squeeze a bit of peach between one's fingers to see it fly across the table. There's been some resistance but overall it has been a very rewarding effort.

## GNAT Pro InSight Webinar Series

### **Tuesday, 13 October / Getting started with SPARK**

Rod Chapman (Praxis High Integrity Systems) presents the concepts behind the Correctness-by-Construction methodology, demonstrates the SPARK toolset, and discusses current and potential research topics for the academic community.

### **Tuesday, 10 November / GPS 4.4: New features and capabilities**

This webinar demonstrates several new features of the GNAT Programming Studio IDE including the improved user interface, enhanced documentation generation, hyperlinks in the source editor, an improved outline view, new source navigation menus, new plug-ins, and Tip of the Day.

To register, please visit [www.adacore.com/home/products/gnatpro/webinars](http://www.adacore.com/home/products/gnatpro/webinars)

## GNATbench 2.4

This new version of GNATbench, AdaCore's plug-in for Eclipse and Wind River Systems Workbench, supports the latest release of Eclipse and offers a variety of enhancements including:

- ▶ Navigating between specs and bodies without needing to compile them,
- ▶ Navigating to imported C and C++ completions,
- ▶ Full integration for gnatmetric, gnatcheck, and gnatpp,
- ▶ Optional use of the "make" utility for builds,
- ▶ New tool-chain management options such as multiple tool-chains per project.

## GNAT Pro for VxWorks

GNAT Pro is now available across the entire range of active versions of Wind River Systems' VxWorks RTOS. The specific configurations supported are:

- ▶ VxWorks 5
- ▶ VxWorks 6, including VxWorks 6.7 and support for SMP and AMP
- ▶ VxWorks 6 on the PowerQUICC III (E500V2) architecture
- ▶ VxWorks 6.6 Cert (VxWorks DO-178B platform)
- ▶ VxWorks 653
- ▶ VxWorks MILS

Run-time libraries certifiable to DO-178B Level A can be made available for both VxWorks 653 and VxWorks 6.6 Cert.

## GNAT Pro for LynxOS

GNAT Pro is now available on all active versions of LynuxWorks' LynxOS:

- ▶ LynxOS 4.x
- ▶ LynxOS 5.x

The same version of GNAT Pro is used on both operating system versions, allowing developers to choose the RTOS that best meets their needs and to easily migrate their Ada applications from version LynxOS 4 to LynxOS 5.

## CodePeer To Be Released Q1 2010

CodePeer, a source code analyzer that detects run-time and logic errors in Ada programs, will be available during Q1 2010. This tool, developed in partnership with SofCheck, serves as a code reviewer and identifies constructs that are likely to lead to run-time errors such as buffer overflows. CodePeer may be used either as a standalone tool or fully integrated into the GNAT Pro environment.

# contracts

### Lockheed Martin Aeronautics (US)

Lockheed Martin Aeronautics, Marietta, Georgia, is using GNAT Pro to develop the Flight Management System Interface Manager and Radio Control software on the C-130J Super Hercules aircraft. The specific product is GNAT Pro High-Integrity Edition for a PowerPC target running Wind River Systems' VxWorks 653. For more information please see [www.adacore.com/2009/06/01/c-130j/](http://www.adacore.com/2009/06/01/c-130j/).

### Astrium (UK)

Astrium (UK), a wholly owned subsidiary of EADS, has selected the Ada programming language and AdaCore's GNAT Pro development environment for use on the new Sentinel-1 environmental monitoring satellite. Astrium will use GNAT Pro to implement the Synthetic Aperture Radar (SAR) Electronics Subsystem, which controls Sentinel-1's C-band SAR. For more information please see [www.adacore.com/2009/05/26/astrium/](http://www.adacore.com/2009/05/26/astrium/).

## Simulation Technology Eases Functional Testing

AdaCore is launching a new simulation product, based on the Open Source QEMU technology, to help programmers test earlier in the development process and to simplify the setup for functional testing automation. The product is available for the PowerPC VxWorks 653 and LEON bareboard platforms.

Functional testing is an integral part of software development but is often difficult on embedded platforms because of limited hardware resources, complex setup, or endianness issues. QEMU technology addresses these problems by allowing testing to be performed on the host machine, but it reduces the overhead of interpretive approaches by translating target object code into host platform instructions.

The GNAT Pro insider is published twice a year simultaneously in New York and Paris by AdaCore

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**AdaCore**  
The GNAT Pro Company

## Conferences / Events ■ September 2009 – April 2010

### SAFECOMP 2009 - Object Oriented Software in Safety Systems Workshops 15-18 September Hamburg, Germany

Cyrille Comar is giving a talk "DO-178C: upcoming guidance for OOS". [www.safecomp.org](http://www.safecomp.org)

### Wind River Aerospace + Defense EU Seminar Series 30 September / Toulouse, France 18 November / London, UK 25 November / Paris, France

AdaCore is a sponsor of this event. [www.windriver.com/announces/ad\\_conference2009-emea/](http://www.windriver.com/announces/ad_conference2009-emea/)

### IET System Safety 2009 26-28 October / London, UK

AdaCore is the main sponsor of this event. [conferences.theiet.org/system-safety/index.htm](http://conferences.theiet.org/system-safety/index.htm)

### SIGAda 2009 1-5 November Tampa Bay FL, US

AdaCore is a Platinum sponsor of this conference, and Greg Gicca is conference Chair. Ben Brosgol, Quentin Ochem, and Pat Rogers are giving tutorials, and AdaCore is organizing a Birds-of-a-Feather session on GNAT technology. [www.sigada.org/conf/sigada2009](http://www.sigada.org/conf/sigada2009)

### Safety-Critical Systems Symposium '10 9-11 February Bristol, UK

AdaCore is an exhibitor at this event. [www.safety-club.org.uk/diary.html?opt=detail&id=105](http://www.safety-club.org.uk/diary.html?opt=detail&id=105)

### ESC Silicon Valley 2010 26-29 April San Jose CA, US

AdaCore is an exhibitor at this conference. [www.embedded.com/esc/sv](http://www.embedded.com/esc/sv)