GNAT Pro insider

newsflash

▶ **Contract Award from Indian Aeronautical Development Establishment**

The Aeronautical Development Establishment (ADE) of India has chosen AdaCore's GNAT Pro High-Integrity Edition for DO-178B as the Ada environment for creating the safety-critical flight-control systems that will underpin advanced Indian defense programs. Mistral Solutions, an AdaCore commercial partner, is the contractor who will be implementing these systems.

▶ **GNAT Pro Port to Nucleus OS on ARM Processors**

A GNAT Pro cross-development toolset is now available for Mentor Graphics' Nucleus OS running on ARM processors. This toolset, hosted on Windows XP and integrated into the GNAT Programming Studio IDE, includes a full Ada compiler and an Ada-aware debugger that works with JTAG tools such as Mentor's MAJIC probe.

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New Release of GNAT Programming Studio

GPS 4.2, the latest version of AdaCore's extensible Ada development environment, has added a number of new features. Among the major enhancements to GPS are heightened support for code coverage and improved generation of documentation.

With GPS 4.2, developers can visualize a program's coverage information at different degrees of granularity, from the project level down to individual source lines. And GPS's new documentation generator uses Web 2.0 technologies to generate HTML pages, thus providing an efficiently browsable view of a system's components.

Other benefits of GPS are its multi-language support (including Ada, C, and C++), its availability on a wide range of host environments, its ability to connect to version control systems such as SVN, and its intuitive visual interface. Since third-party tools can be integrated into the GPS menus, users see a unified interface that simplifies development.

> *"Among the major enhancements to GPS are heightened support for code coverage and improved generation of documentation."*

Features introduced in GPS 4.2 include:

▪ **Graphical support for code coverage** (gcov)

▪ **Better documentation generation,** with faster and improved HTML

▪ **Full ability** to manage files and directories from GPS

▪ **Enhanced code completion,** including support for the *Object.Method* sytax introduced in Ada 2005

▪ **Source editor improvements** to tooltips, program navigation, and code indentation

▪ **Enhanced treatment** of dispatching calls and primitives, for better understanding (prior to run time) of which subprograms may be invoked.

New plug-ins support:

▪ Easing DO-178B-oriented code standard verification through gnatcheck

▪ Invoking the addr2line utility

▪ Listing a program's unused entities (previously provided by gnatxref)

▪ Displaying dependency paths across files

▪ Performing cut/copy/paste in a contextual menu

▪ Recomputing Ada cross references.

For more information, please visit **www.adacore.com/2007/12/10/gps-420/** and select the link to the archived webinar.

Contract Award for Coverage Analysis Project

AdaCore is leading the Couverture project ("Project Coverage"), a research effort for producing a modular coverage analysis framework and associated artifacts that can be reused in DO-178B development-tool qualification processes. The project will provide non-intrusive technology for analyzing code coverage, based on target hardware virtualization on the host platform, in particular the QEMU tool. This Freely-Licensed Open-Source Software (FLOSS) tool uses new virtual machine techniques, avoiding performance degradation typical of CPU emulators.

< current releases >

GNAT Pro 6.1

This year marks the 12th annual release of the GNAT Pro technology. GNAT Pro 6.1 offers more than 150 new features and is available on the largest set of supported platforms in the industry: 44 configurations (including 28 cross compilers) on 79 different operating system versions, including multiple variants of Windows, Linux, and Solaris.

GNAT Pro 6.1's new features include:

- High-Integrity Editions for Vx Works 6, including the Ravenscar profile
- Thread-safe profiling with gprof, a tool currently available for GNAT Pro on several platforms
- Enhanced Ada support in gcov, a coverage analysis tool
- Enhanced tools such as gnatcheck, gnatpp, and gnatmetric, to support a wider variety of coding styles and coding standards
- New warnings to help detect errors earlier
- An updgraded debugging engine
- Improved robustness and efficiency for Ada 2005 features
- Better real-time support on Win32 platforms
- Fully-integrated Windows .NET framework support.

GNATbench 2.1

The latest release of GNATbench, AdaCore's Eclipse-based Ada development environment, provides enhanced project management and presentation capabilities, new language-sensitive editor and source navigation features, new wizards, and an improved builder. GNATbench 2.1 offers tighter integration with Wind River's Workbench environment, and an ability for users to exploit the large pool of software development capabilities already available within the Eclipse framework.

GNATcheck Tool

The GNATcheck coding standard verification tool has been enhanced with additional predefined checks, including a rule that detects violation of specified metric limits (e.g., a program's cyclomatic complexity exceeding some upper bound)

GNATcheck, supplied as part of the standard GNAT Pro development environment, meets the growing need for automated verification in safety-critical avionics systems and is especially useful when compliance with the DO-178B standard is required. The tool's extensibility allows developers to completely define a coding standard (referred to as "Software Code Standard" in DO-178B) as a set of rules, for example a subset of permitted language features. By checking that a program conforms with the resulting rules, GNATcheck can help the developer meet one of the requirements from DO-178B.

Qualification of GNATcheck as a verification tool under DO-178B is in progress.

Code Coverage Technology

The off-the-shelf gcc-based gcov tool, which instruments the object code to allow line-by-line coverage analysis of the source program, is now fully supported on all native platforms and is integrated into GPS. Additionally, AdaCore is participating in the "couverture" research project, which is investigating instrumentation-free coverage techniques based on virtualizing the target hardware on the host. Further information on this project is included in an article on page 1.

< in the pipeline >

‣ GNAT Ada-Java Interfacing Suite

A collection of add-on tools for interfacing between Ada and Java is scheduled for release during Q2 2008. They support mixed-language Ada/Java development, in particular:

- Calling natively-compiled Ada code from Java
- Compiling Ada to JVM bytecodes and communicating between Ada and Java directly.

The toolsuite exploits the Java Native Interface (JNI) for the first scenario, but automates the generation of the JNI-related "glue code" to ease the job of the developer. An updated version of AdaCore's JGNAT product handles the second scenario. The tools take advantage of Ada 2005's new features to provide an interfacing mechanism that complies with the Ada standard.

A future version of the toolsuite will support the invocation of Java methods from natively-compiled Ada code.

‣ GNAT Pro Reusable Components

Later this year AdaCore will be releasing a collection of Ada packages that have been used in the implementation of GPS and GNAT Tracker. This new user-visible component library will support:

- Interfacing with scripting languages, in particular python
- Creating and parsing email messages and mailboxes
- Splitting messages into multiple streams under the control of a configuration file
- Fast static string searching based on the Boyer-Moore algorithm
- Manipulating strings through template substitution
- Interfacing with mmap for memory-mapped I/O, to read disk files efficiently.

The GNAT Pro component collection should be especially useful to developers who are implementing enterprise-oriented systems.

< academia corner >

Dewar/Schonberg Article Exposes Computer Science Education Failures

An article by AdaCore's Robert Dewar and Ed Schonberg in the January 2008 issue of *Crosstalk* has generated a significant buzz in the Software Engineering community, including a lively debate (over 1000 entries) on **slashdot.org**, a site that is frequented by engineers in the computer industry. The article, entitled "Computer Science Education: where are the software engineers of tomorrow?" argues for a more formal training for computer science students (more math, more algorithms, more exposure to Formal Methods), and more practice in different programming languages. Computer science curricula at many institutions have been "dumbed down", perhaps in the interest of attracting more students, but lowering the standards has produced a generation of graduates who are woefully lacking in some basic skills.

The authors also argue, based on their direct experience in academia and confirmed by their colleagues, against the use of Java as a first programming language. They identify the advantages of Ada as a language for both beginning programmers and advanced computer science students, with its benefits for instilling sound Software Engineering discipline, but they go on to show the importance of other languages and their associated programming paradigms. They conclude by pointing out that the good software engineer of tomorrow will know and appreciate Java, Lisp, ML, C++, and others, but will be able to "write Ada in any language."

The full article may be found at **www.stsc.hill.af.mil/crosstalk/2008/01/0801DewarSchonberg.html**

< focus >

Interview with Emmanuel Briot
Project Manager,
Information Systems Technology,
AdaCore Europe

GNAT Pro Insider Tell us a bit about your background. How did you come to be involved with Ada and AdaCore? What is your current role?

▸ **Emmanuel Briot** I started using Ada in the late 1990s at Telecom Bretagne, for a neural networks project. That led to an internship at AdaCore in New York, where I implemented several packages in the GNAT Pro predefined library and also worked on an early Emacs-based IDE for Ada, GLIDE.

After my internship I joined the AdaCore Paris office, and I continued to focus on user interface software. I was the offical FSF maintainer for the Emacs Ada mode and a member of the AdaCore team that developed GtkAda, a portable open-source Ada graphics toolkit. An internal "proof of concept" project to explore applications of GtkAda successfully demonstrated the potential of that technology as the basis of a portable and extensible Integrated Development Environment, and I have been one of the principal designers of the resulting GNAT Programming Studio (GPS) product. I am also working on a number of other tools in the GNAT Pro environment, including XML/Ada to process XML, and AWS to implement web services.

GNAT Pro Insider The tools that you just mentioned—XML/Ada and AWS—help GNAT Pro users develop technology-bridging applications. What are some of Ada's advantages in these enterprise-oriented domains?

▸ **Emmanuel Briot** First, for many of our customers Ada is the primary development language, and it is a major benefit if Ada can be used for their entire application: providing web-oriented functionality, interfacing with databases or XML files, and so on.

Second, Ada's technical features help make our customers' systems more reliable and more maintainable. One example is the support for concurrency, a natural requirement for web servers. Unlike other languages, which either ignore the issue or else provide low-level/error-prone mechanisms, Ada offers a well-structured multi-tasking model that makes the program's intent clear. Another example—indeed, a reason that many users select Ada—is the compile-time checking that helps detect most errors before the server even starts. In that spirit we have developed libraries that provide type-safe interfaces to databases (a paper on that subject is being presented at Ada-Europe in June) and to the templates that are used to generate web pages. This is quite different from, and more reliable than, the dynamic approach taken by languages such as PHP.

At AdaCore of course we use Ada internally for our product development, taking advantage of the various Ada 2005 Object-Oriented Programming enhancements. I especially appreciate the "overriding" keyword, which helps detect errors early, and the *Object.Operation* notation, which makes the program both easier to write and easier to read.

GNAT Pro Insider You have been involved with the design and implementation of GNAT Tracker, AdaCore's web-based customer interface. What were the main objectives for this system? How do you see it evolving in the future?

▸ **Emmanuel Briot** GNAT Tracker is the customer-visible part of our support services. But it is just one component of a much larger infrastructure that includes an internal CRM (customer-relationship management) system and other tools. Indeed, our infrastructure toolsuite effectively integrates the management of engineering, quality assurance, sales, and customer support. It was designed for flexibility (for example, allowing both browser-based and command-line access), support for email interaction, simplicity of use, efficiency, and of course security for customer access.

In a typical scenario, a customer opens a ticket to report an issue that they have identified. The email interchange between the customer and AdaCore's engineering staff is fully tracked and is accessible to the customer through GNAT Tracker. This dialogue may result in the construction of one or more test cases (to show resolution of the issue) which are then added to the AdaCore internal test suite that is run automatically every night. The system therefore integrates the entire customer interaction process: handling the initial report, tracking all correspondence, and running the testsuites. Future enhancements include support for 2nd-generation web technology ("Web 2.0") and AJAX, with the goal of improving web page interactivity and performance. As always, we will be listening to suggestions from our customers for other ideas.

Webinar Schedule

The GNAT Pro InSight Webinar series will be continuing this Spring, with a focus on recently released products:

■ GNAT Pro 6.1 (Monday, May 5), Presented by Greg Gicca and Cyrille Comar

■ GNATbench 2.1 (Tuesday, June 17), Presented by Pat Rogers

Each consists of a presentation of the product's features and benefits and a tool demo or related information, followed by a question and answer session.

To enroll, or to view recordings of previous webinars, please visit **www.adacore.com/home/gnatpro/webinars**.

< technology corner >

Pragmas Precondition and Postcondition

The notions of precondition (a predicate that must be true before a subprogram is called) and postcondition (a predicate that must be true when a subprogram returns) provide a powerful way to specify and control the construction of code. Bertrand Meyer, the designer of the Eiffel programming language, has coined the phrase "design by contract" to denote a software development approach that is based on these concepts.

GNAT Pro is introducing two new pragmas, named Precondition and Postcondition, to support formal specification and checking of these conditions. As an example:

```
function Days (M : String) return Natural; -- days in month
pragma Precondition (M = "JAN" or M = "FEB" . . .  or M = "DEC");
pragma Postcondition    ((M = "JAN" and Days'Result = 31)
                    or else
                (M = "FEB" and Days'Result = 28)
                    or else . . . );
```

If precondition and postcondition checks are enabled (through the -gnata switch or special pragmas for this purpose), then before the call the precondition expression will be evaluated, and on return the postcondition expression will be evaluated. Unless both expressions are True, an exception will be raised.

Preconditions and postconditions play several roles: they act as formal specifications, they provide input to proof tools, and they result in run time checks.

GNAT Pro users interested in trying these new pragmas can contact AdaCore and request a wavefront release.

Conferences / Events ▪ April - October 2008

ESC Silicon Valley 2008

14–18 April / San Jose CA, US

AdaCore is exhibiting at this event (Booth 1943). www.cmp-egevents.com/web/esv/home

SSTC 2008

29 April – 2 May / Las Vegas NV, US

Ben Brosgol is presenting a tutorial on software safety and security certification issues and programming language technology, and AdaCore is exhibiting at this conference (Booth 211). www.sstc-online.org/

HP OpenVMS Bootcamp Partner Roundhouse

20 May / Nashua NH, US

AdaCore is exhibiting at this event, highlighting the GNAT Pro technology on HP's OpenVMS platform for Integrity servers. h71000.www7.hp.com/symposium

User Experience of Tools for Safety-Critical Systems

5 June / London UK

AdaCore is a major sponsor of this event, which is organized by the Safety-Critical Systems Club in the UK. www. safety-club.org.uk /diary.html?opt=detail&id=70

Ada-Europe 2008

16–20 June / Venice, Italy

AdaCore staff are presenting a tutorial and several papers, and are chairing a panel. AdaCore is also exhibiting at this event. www.math.unipd.it/ae2008

GCC Developers' Summit 2008

17–19 June / Ottawa, Canada

Arnaud Charlet is presenting a tutorial about the GNAT Front End's requirements on GCC Back-End technology. AdaCore is a sponsor of this conference. www.gccsummit.org/2008/

3rd IET International Conference on System Safety

20–22 October / Birmingham, UK

AdaCore is the major sponsor of this event. conferences.theiet.org/safety

SIGAda 2008

26–30 October / Portland OR, US

Ben Brosgol is delivering a keynote address, and AdaCore is exhibiting at this conference. ww.sigada.org/conf/sigada2008

ESC Boston 2008

27–30 October / Boston MA, US

AdaCore is exhibiting at this event. www.embedded.com/esc/boston/

newsflash

▶ **Availability of GPRbuild 1.1**
This new release of GPRbuild, AdaCore's multi-language build tool, is now available on all major GNAT Pro native and cross platforms. GPRbuild 1.1 offers improved handling of projects that use a combination of languages (including Ada, C, C++, Assembly, and others), better support for very large subsystems, and new features for dealing with inter-unit dependencies.

▶ **Participation in LAMBDA Project**
AdaCore is participating in the LAMBDA project, a research effort aimed at producing a set of tools for modeling, simulating, and analyzing embedded systems, with a particular focus on the aerospace domain.

▶ **Availability of Ada UK Videos**
Videos for the presentations at Ada UK 2007 are now available on the AdaCore corporate website: www.adacore.com/home/ada_answers/lectures /ada_uk07
This conference, featuring a distinguished group of experts on Ada and high-integrity software, included talks on Ada 2005, the DO-178C effort, the SPARK language, Ada for real-time systems, and Ada for security-critical applications.

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