The Push procedure includes both a precondition and a postcondition. (These are examples of Ada 2012; the notation S^06 is the postcondition reflecting the semantics of Push: the element E is inserted at the position defined by the new Length, and the values at all other positions are unchanged. (The last term in the postcondition uses the function Not_Full to state that the stack is not full.)

The contracts likely to be of most benefit are subprogram preconditions and postconditions. A subprogram’s caller has to ensure that the precondition holds when the subprogram is invoked; the implementer of the subprogram can then ensure that the precondition holds upon entry. The implementer has to ensure that the postcondition is satisfied when the subprogram returns, and the client (caller) can then assume that the postcondition holds. This combination of requirements and permissions defines the subprogram’s contract.

As an example, the procedure in the adjacent program fragment pushes a value onto a (fixed-size) stack whose element type is named Element. The Not_Full function illustrates a new Ada 2012 feature, the ability to provide an expression as a function invocation in a subprogram’s pre- or postcondition. For function implementation is in effect part of the interface for the subprogram.

The browser contents are drawn using vector graphics, allowing export to pdf.

A variety of other new features combine to improve the IDE’s overall quality and scope. Here are some examples:

• Based on customer suggestions, GPS now allows centralized handling of all Version Control System menus, making it easier to perform customization.

• New browser contents are drawn using vector graphics, allowing export to pdf.

• A new number of automatic code fixes have been added.

• Users can interactively specify the metrics to be computed by GNATmetrics.

• GPS 5.1 is a compatible with GNAT Pro versions 3.16a1 through 6.4.2. It is available on a wide variety of host configurations, including platforms running Linux, Solaris, and Windows. To learn more, please contact info@adacore.com.

Mixed-language development is common on large projects. It makes it easy to write and bring applications. Invoking Ada and other languages, GPS has enhanced its support for C and C++ in several areas:

• Basic support for a new feature, smart completion of identifiers, is available for variables, types/classes, and macros.

• New support for Ada- C navigation allows the developer to directly invoke the declaration of a C function to its Ada specification, and then immediately bring up the corresponding C function body.

• GPS now supports navigation in C itself, from a function call to its definition and vice versa, as well as call graph construction.

• GPS 5.5 provides better integration with CodePeer. Among the enhancements are new views for race conditions (global data used across tasks without protection) and for “score cards” (total passed/passed counters per file or project). The GPS locations view is now synchronized with CodePeer reports, so that clicking on a CodePeer diagnostic will highlight the relevant line in the GPS locations view. More flexible filtering allows the user to focus on either warnings or checks. And to facilitate sharing across a development team, the GPS/CodePeer integration supports alternate database/ output formats.

A new major release of the GNAT Programming Studio (GPS) IDE brings a number of enhancements including extended support for C and C++, improved integration with the CodePeer automated code review and validation tool, more powerful source editing, and improved GUI performance.

Thales selects GNAT Pro High-Integration Edition

The GNAT Pro High-Integration Edition to develop onboard instrument software for the next generation of the Argos satellite project. Argos is a unique, satellite-based worldwide location and data collection system dedicated to studying and protecting the environment. In addition to these core tasks, the Argos satellite family has a number of safety-related functions, including boat position determination, territorial security, and law enforcement.

The GNAT Pro Insider is published twice a year simultaneously in New York and Paris by Adacore.

4.9 GNAT Pro insider

For up-to-date information on conferences where Adacore is participating, please visit www.adacore.com/category/press-center/events/

Medelec 2011
November 29–December 1, Cambridge, UK
Adacore is a Bronze level sponsor and exhibitor. Ben Biroglo is presenting a tutorial on the upcoming DO-178C, avionic safety standard, and Greg Gicca is conducting a GNAT Ada-a-leave session.

ESC (Embedded Systems Conference)
Silicon Valley 2012
March 26–29, 2012 / San Jose CA, US
Adacore is exhibiting at this conference. esc-conference.com/siliconvalley/

Safety-critical Systems Symposium (SSS ’12)
February 7–9, 2012 / Bristol, UK
Adacore is a main sponsor of this event.

www.scssi.org.uk/ssss12/

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4.9 GNAT Pro insider
The language is supported by an Open Source toolset, the Rodin platform plug-in for Eclipse. Rodin includes editors, powerful proof tools, and a variety of extensions.

The Event-B modeling language is based on set theory, with refinement semantics.

interest from a number of industrial partners in fields such as aerospace, automotive, mass transportation, and space systems.

language. Ada is an attractive target for code generation, and its use has attracted some considerable interest from industry.

The University of Southampton's Electronics and Computer Science Department uses Ada in Research and Teaching

The current releases >

Ada in Research and Teaching University of Southampton, UK

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Event-B models may be annotated to facilitate code generation. For the research group at the University of Southampton, Ada is the preferred code generation target, with its multi-tasking and interruption facilities especially useful. The research work in this area is part of the funded Deploy project: www.deploy-project.eu

On the teaching side, the university has introduced an Ada-based fourth-year student Group Development Project, to engineer a "model" automotive application. They are using Leo Mindstorms, with the GNAT GPL version. In future work it is hoped to link Event-B to Mindstorms through Ada. As stated by Dr. Andy Edmunds: "We would like to enthuse students by showing that there are some interesting practical aspects to Formal Methods. In addition to the educational value, experience gained using the Game sensor and actuators could be of use when conducting research with the safety-critical systems that we are interested in."

Contact information for Dr. Edmunds: a2@ecs.soton.ac.uk

Ada in Research and Teaching University of Southampton, UK

The University of Southampton’s Electronics and Computer Science Department uses Ada as a target language in their Formal Methods research, and has introduced Ada for student projects with Lego Mindstorms. The research interests of the new Electronics and Software Systems group include the formal specification of embedded software. Using the Event-B modeling language, Ada is an attractive target for code generation, and it has attracted interest from a number of industrial partners in fields such as aerospace, automotive, mass transportation, and space systems.

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Enhancements include a new implementation of controlled types checking both model consistency and consistency between different abstraction levels. Interest from a number of industrial partners in fields such as aerospace, language. Ada is an attractive target for code generation, and its use has attracted the formal specification of embedded systems, using the Event-B modeling language. The research interests of the new Electronics and Software Systems group include Ada as a target language in their Formal Methods research, and has introduced Ada using Lego Mindstorms, with the GNAT GPL version. In future work it is hoped to link Event-B to Mindstorms through Ada. As stated by Dr. Andy Edmunds: “We would like to encourage students by showing that there are some interesting practical aspects to Formal Methods. In addition to the educational value, experience gained using the Lego sensors and actuators could be of use when conducting research with the safety-critical systems that we are interested in.”

Tell us about your background and how you came to be involved with Ada and AdaCore. What is your current role? I came to the United States in 1991 as a student from Lima, Peru, and I graduated from George Washington University with a degree in Mechanical Engineering. The Internet was just getting started back then, and the computer industry was going through one of its periodic technological earthquakes. This all looked pretty exciting to a new college graduate, so I moved into the computer field and got a variety of different perspectives from jobs at SAK, Cachebox, and GTE Government Systems. My background is technical, but I am very much a “people person.” On one occasion, after I had presented an enterprise deployment design for a DoD program, one of my colleagues told me that I should be in technical product sales. I soon had the chance to see if he was right; I accepted a job offer from Aonix as a sales representative selling Ada compilers to Department of Defense integrators. I found that I definitely enjoyed this kind of work, and after Aonix I joined Harris Corporation selling secure solutions to various federal departments. This was a very good growth experience and gave me a perspective on sales to government agencies and contractors. I joined AdaCore in 2007 as Director of Strategic Accounts, where my past experience in sales and customer relationships is proving very valuable.

You've been in Sales-related positions for more than ten years, so you have a direct customer-centric perspective. Any "lessons learned" from your experience? There's an old saying, “the customer is always right.” The mistake I've seen at some companies is to try to sell technology that might be top notch but doesn't solve the real problems that the customer has. So a company needs to do two things: First, stay in touch with its customers, on a personal level, to understand their real requirements. Second, have an adaptable technology that can accommodate new requirements smoothly. At AdaCore we've been pretty successful on both fronts. It's my job, and the job of my sales colleagues, to keep in regular contact with our customers so that we know the directions they want to take with our products. Also, the way that we handle support, with questions going directly to the developers, means that we get an immediate “heads up” on how our products are being used. New features in a product like GNAT Pro often result from customer comments and requests that come through our front line support. And as far as our technology is concerned, it has proved to be highly adaptable over the years. There are technical reasons for this, but an important factor is our Open Source approach. This makes it easier for us to take advantage of complementary tools and products, as we did in developing the GNATemulator tool based on QEMU.

Any hobbies or outside interests that you'd like to share? My background is technical, so maybe it's not too surprising that I enjoy building my own computers, configuring my home theatre/entertainment setup, and playing video games. And for something completely different, I have a pet parrot who can say a few words in both English and Spanish.

Webinar Schedule A webinar introducing and demonstrating the new GPS 5.1 features was presented by Nicolas Setton on November 15. To view this webinar, or to learn more about the AdaCore webinar series, please visit www.adacore.com/home/products/gnatonpro/webinars/

Tell us about your background and how you came to be involved with Ada and AdaCore. What is your current role? I came to the United States in 1991 as a student from Lima, Peru, and I graduated from George Washington University with a degree in Mechanical Engineering. The Internet was just getting started back then, and the computer industry was going through one of its periodic technological earthquakes. This all looked pretty exciting to a new college graduate, so I moved into the computer field and got a variety of different perspectives from jobs at SAK, Cachebox, and GTE Government Systems. My background is technical, but I am very much a “people person.” On one occasion, after I had presented an enterprise deployment design for a DoD program, one of my colleagues told me that I should be in technical product sales. I soon had the chance to see if he was right; I accepted a job offer from Aonix as a sales representative selling Ada compilers to Department of Defense integrators. I found that I definitely enjoyed this kind of work, and after Aonix I joined Harris Corporation selling secure solutions to various federal departments. This was a very good growth experience and gave me a perspective on sales to government agencies and contractors. I joined AdaCore in 2007 as Director of Strategic Accounts, where my past experience in sales and customer relationships is proving very valuable.

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Ada 2012 directly supports contract-based programming: the ability to associate Boolean conditions (dynamic "contracts") with declared program entities. The contracts can be automatically checked at key points in the program’s execution. The contracts likely to be of most benefit are subprogram preconditions and postconditions. A subprogram’s caller has to ensure that the precondition holds when the subprogram is invoked; the implementer of the subprogram can then assume that the precondition holds upon entry. The implementer has to ensure that the postcondition is satisfied when the subprogram returns, and the client (caller) can then assume that the postcondition holds. This combination of requirements and permissions defines the subprogram’s contract.

As an example, the procedure in the adjacent program fragment pushes a value onto a (fixed-size) stack whose element type is named Element. For all:

```
package Stack is
  type Element is private;
  type Stack is array (Positive range <>) of Element;
  type Not_Full is (S : Stack) return Boolean is
    (S.Length < S.Max_Length); -- Expression function
  type Push (S : Stack; E : in Element) is new Not_Full (S);
  procedure Push (S : in out Stack; E : in Element) with new -- new notation
    return Not_Full (S), Post --> (S.Length = S'Old.Length + 1)
    and (for all J in 1 .. S'Old.Length => S.Data (J) = S'Old.Data (J));
end Stack;
```

The Push procedure includes both a precondition and a postcondition. (The last term in the postcondition uses the notation S'Old to mean the value of S on entry to the procedure. The postcondition reflects the semantics of Push: the element E is inserted at the position defined by the new length, and the values at all other positions are unchanged. (The last term in the postcondition uses the new quantification syntax for purposes of illustration; it could have been expressed more succinctly using a slice comparison.)

Contracts apply to private types as well as concrete types and may be used with Ada’s Object- Oriented Programming features. The contract facility is already being utilized in practice. The Hi-Lite research project www.open-do.org/projects/hilite/ is developing a new verification strategy that combines formal proofs and testing, with Ada 2012’s contract-based programming features serving as foundation.

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**Technology Corner**

**Contract-Based Programming in Ada 2012**

AdaCore is a main sponsor of this event. AdaCore’s Ada 2012 Standard is in effect part of the interface for the subprogram. As an example, the program fragment expresses more succinctly using a slice comparison.)