

# Inside AdaCore

---

## *January-June 2018*

- ▶ New GNAT Pro Product Lines
  - ▶ GNAT Pro Assurance Selected for MDA Space Application
  - ▶ Dr. Peter Chapin Receives 2017 Robert Dewar Award
  - ▶ Sustained Branches
  - ▶ Tech Days 2017
  - ▶ *Make with Ada* Winners Announced
  - ▶ SPARK Discovery
  - ▶ Spotighting a GAP Member: US Air Force Academy (Colorado Springs, CO)
  - ▶ Interview with Robert Tice
  - ▶ New Product Release
  - ▶ GNAT Pro CCG Expands Ada Availability
  - ▶ GNAT Pro on iOS and Android
- 
- A large satellite dish antenna is mounted on a tall metal tower. The dish is a complex grid of metal struts forming a parabolic shape. The tower is also made of metal lattice. The background is a dark blue night sky filled with many small, bright stars. In the lower right, there is a faint glow of light, possibly from a sunset or sunrise, with some clouds visible. The overall scene is a technical and scientific setting.

# New GNAT Pro Product Lines

AdaCore's flagship GNAT Pro offering has been rebranded into three product lines: GNAT Pro Enterprise, GNAT Pro Assurance and GNAT Pro Developer.

GNAT Pro Enterprise encompasses the previous GNAT Pro (Native), GNAT Pro Cross and GNAT Pro Safety-Critical. All platforms, technology and pricing are the same as before, and existing accounts on these previous products have been moved to GNAT Pro Enterprise with no changes.

GNAT Pro Assurance is a new product line that extends GNAT Pro Enterprise and is particularly targeted to customers with long-lived projects and/or certification requirements. It includes a specialized support service known as Sustained Branches, which allows customers to receive critical fixes long after the initial product release as well as advanced analyses of known problems on that branch. Tool qualification and run-time library certification material is available as a GNAT Pro Assurance option for software safety standards including DO-178B/C (avionics), EN 50128 (rail), and ECSS-E-ST-40C / ECSS-Q-ST-80C (space).

GNAT Pro Developer is an entry-level offering for projects looking to migrate to Ada and take advantage of the language's benefits for software reliability and maintainability. Available on native platforms as well as ARM bare metal and Linux, GNAT Pro Developer offers a targeted set of capabilities including an Ada 2012 compiler and the GNAT Programming Studio (GPS) IDE. On-line support is included, through a public interface on a frequently updated version of the technology.

For further information on these three product lines, including a detailed comparison, please see [www.adacore.com/gnatpro/](http://www.adacore.com/gnatpro/).

---

## GNAT Pro Assurance Selected for MDA Space Application Sustained Branches

MDA, a business unit of Maxar Technologies, has selected the GNAT Pro Assurance Ada development environment for the LEON3 target processor, to produce the software for a Ku-Band communication subsystem that will replace the current version.

This critical International Space Station subsystem has to work reliably over the long term, a requirement that led MDA to maintain Ada as the implementation language. With GNAT Pro Assurance's Sustained Branch service, MDA can continue developing and maintaining their software over the long term using a specific version of the GNAT Pro technology, with access to code generator updates to correct critical issues.

The replacement Ku-Band subsystem, known as the Space to Ground Transmitter Receiver Controller (SGTRC) will interface with the existing International Space Station (ISS) Space-to-Ground Antenna, previously provided by MDA. The project includes a prototype and test unit. The new SGTRC communication subsystem will support the long-term mission of the ISS and ensure the reliability and availability of high speed data connections between the ISS, Mission Control Centers and science laboratories on the ground.

A number of tools in the GNAT Pro Assurance product can help MDA meet their project's goals. These include the GNAT Programming Studio IDE, static analysis tools for stack usage computation and code metrics calculation, an emulator that in effect executes LEON3 target code on the host, a testing harness generator, and many others, backed by expert support provided by the AdaCore product developers themselves.

For more information, please see the press release at [www.adacore.com/press/mda-gnatpro-space-station/](http://www.adacore.com/press/mda-gnatpro-space-station/).

## Dr. Peter Chapin Receives 2017 Robert Dewar Award

Dr. Peter Chapin (Vermont Technical College) was awarded ACM SIGAda's Robert Dewar Award for Outstanding Ada Community Contributions. Dr. Chapin's work includes a major role in developing Vermont Tech's Lunar CubeSat, which was programmed in SPARK/Ada.

SIGAda's award is named in memory of Dr. Robert Dewar, a professor of Computer Science at New York University and one of the founders of AdaCore. During his long and distinguished career Dr. Dewar was a major contributor to the Ada language effort and its supporting technology.

The Sustained Branch service supplied as part of GNAT Pro Assurance provides specialized product maintenance on a particular version of the technology. A Sustained Branch is a specific GNAT Pro version that AdaCore maintains during the customer's subscription. If a tool defect has a critical impact (for example a code generation error affecting the customer software's certification), AdaCore will address the issue. The correction may entail supplying a corrective release, which will be in the context of the sustained branch and thus extremely close to the release in use; with GNAT Pro Enterprise such a correction would only be available in the next official major version, or in a wavefront (development release) leading to that version.

If a corrective release is supplied, AdaCore will analyze any prospective change and make the analysis available to the customer, simplifying any impact analysis required for certification purposes. If the customer's subscription includes tool qualification or traceability analysis documentation, then these materials will be maintained in synchronization with the releases of the Sustained Branch. For more details, please see [www.adacore.com/gnatpro/assurance/](http://www.adacore.com/gnatpro/assurance/).

## Tech Days 2017

AdaCore's annual Tech Days conferences in Paris on October 5 and in Boston on November 15-16 provided attendees with in-depth information about the company's latest technologies and its roadmap for future enhancements. As a sampling of the topics that were covered, the presentations gave updates on the major product lines, showed how to calibrate CodePeer for use on large bodies of code, previewed anticipated features in Ada 2020, described how to deal with platform obsolescence, summarized libadalog and its uses for lightweight static analysis, and explained how to use the GNAT project facility to share resources of various types across projects. The Paris Tech Day included customer presentations from Emmanuelle Mescam (ArianeGroup) on "Flight software of the Ariane 6 launcher", and from Wiljan Derks (Nexperia) on "Ada in a real-time Windows-based manufacturing system". The Boston Tech Days featured Paul E. Black (NIST) as keynote speaker; his presentation "Formal methods, strong languages, and other lessons learned" focused on the results presented in the NIST report "Dramatically Reducing Software Vulnerabilities".

Both the Paris and Boston events were highly acclaimed, and plans are taking shape for similar Tech Days conferences during the October-November 2018 timeframe.



# Make with Ada Winners Announced

The 2017 Make With Ada competition attracted a number of highly qualified entries from around the world, and the three winning projects demonstrated innovative solutions to challenging embedded system requirements. Using the GNAT Community Edition for Bare Board ARM, the projects spanned a range of application areas and met the competition's goal of showing the benefits of Ada for low-level software that needs to be reliable, efficient, and maintainable.

The 1st-place prize of €5000/\$5500 was awarded to Jonas Attertun from Sweden for his Ada Motorcontrol, a software platform for developing a brushless DC motor controller. He used a custom, open-source board with an STM32F446 microprocessor, a sensed field-oriented control algorithm, and a logging feature to simplify development and allow users to visualize what is happening. The software was implemented on top of the Ravenscar runtime for the ARM Cortex M4-based stm32f4xx. As noted by Mr Attertun in his project log: "The project shows that Ada can be used successfully for a bare-metal project that requires fast execution. The design is, thanks to Ada's many nice features, much easier to understand compared to a lot of the other C implementations out there, where, as a worst case, everything is done in a single Interrupt Service Routine. The combination of increased design readability and the strictness of Ada makes the resulting software safer and simplifies further collaborative development and reuse."

The 2nd-place prize of €2000/ \$2200 went to German Rivera from the US, who also won last year's 2nd-place prize. This year his project was a Smartwatch. He developed the embedded software of a "Swiss Army Knife" watch in Ada 2012 using a Hexiwear IoT wearable development board with two NXP Kinetis microcontrollers: a K64F (Cortex-M4 core) for running the main embedded application software, and a KW40 (Cortex M0+ core) for running a wireless connectivity stack.

The 3rd place prize of €1000/\$1100 was awarded to Manuel Iglesias Abbatemarco from Ecuador for his Ada IoT Stack project. This project added several components to the Ada Drivers Library to support an IoT Framework based on an existing lwIP (lightweight IP) implementation ported to the embedded STM32 Ethernet family of devices.

The 2018 Make with Ada, the third in this annual series of competitions, is in the planning stages. To learn more, please follow the news on Twitter at [@adaprogrammers](#), check on-line at [www.makewithada.org/](http://www.makewithada.org/) (which also has links to the project logs for the 2017 winning entries) or send an email to [mwac@adacore.com](mailto:mwac@adacore.com).

## SPARK Discovery

SPARK Discovery is an introductory version of the SPARK Pro formal verification language and toolset, included at no cost in all GNAT Pro subscriptions since release 17.2. With SPARK Discovery users can check that their source code satisfies the SPARK constraints, that all variables are initialized before use, that data and information flows are correct, and that the code is free from run-time errors. SPARK Discovery may be applied at the Stone, Bronze and Silver levels of software assurance as described in the SPARK adoption guidance document co-authored with Thales and available at [www.adacore.com/books/implementation-guidance-spark/](http://www.adacore.com/books/implementation-guidance-spark/).

SPARK Discovery is integrated into the GPS IDE and offers a simple way for users to experiment with formal methods, to see their benefits in preventing bugs from being introduced, and to gain experience with modern proof technology. For more advanced uses such as proving integrity properties, or to take advantage of additional proof automation, transitioning to the SPARK Pro product would be appropriate.

## academic corner

### Spotlighting a GAP Member

## US Air Force Academy (Colorado Springs, CO)

DNS (Domain Name System) servers are an essential component of the standard suite of internet software. Today's DNS servers, however, are rife with security flaws, including remote code execution, buffer overflows and forced termination due to bad packets. Dr. Barry Fagin, Professor of Computer Science at the US Air Force Academy and Dr. Martin Carlisle of Carnegie Mellon University (formerly at the US Air Force Academy) have developed IRONSIDES, an authoritative/recursive internet server written in Ada and SPARK, with the provable absence of these and other security flaws. Using SPARK, they demonstrated that IRONSIDES was free of run-time errors, and also that a number of application-specific security properties were met.

According to Prof. Fagin, "When we first started this project, we wanted to investigate the use of formal methods in reducing security flaws in internet software. Ada and SPARK were really the only logical choice. We had security in mind from the beginning and wanted the confidence of mathematical proofs behind our results."

The project had two goals: to show that a DNS server could be developed with provably better security properties than the two most popular alternatives (WINDNS and BIND), and to demonstrate that the added security did not come at the expense of efficiency. Both goals were met. IRONSIDES' performance as an authoritative server is comparable to or better than WINDNS on Windows and BIND on Unix. Detailed experiments running it as a recursive server against eight others, including WINDNS and BIND, also showed that it performed very well. The project's success shows that Ada/SPARK and its associated tools are a practical and effective way to help achieve the security necessary for DNS servers, including the prevention of single-packet denial of service attacks and all forms of remote code execution.

Additional information about IRONSIDES may be found in "Making DNS Servers Resistant to Cyber Attacks: An Empirical Study on Formal Methods and Performance" by Barry Fagin, Bradley Klanderma and Martin Carlisle (2017 IEEE 41st Annual Computer Software and Applications Conference), [tinyurl.com/2017-acsac-ironsides-pdf](http://tinyurl.com/2017-acsac-ironsides-pdf).

*The GNAT Academic Program (GAP) is an AdaCore initiative to foster the teaching of Ada and SPARK in colleges and universities. GAP members get free access to AdaCore's GNAT technology, including support. For further information please visit [www.adacore.com/academia/](http://www.adacore.com/academia/) or send an email to [gap-contact@adacore.com](mailto:gap-contact@adacore.com).*

# Robert Tice

## Technical Account Manager



► **Rob, tell us about your background and how you came to be involved with Ada and AdaCore. What is your current role?**

Once upon a time, I used to take all the electronics in the house apart. I still do this, but now at least I can figure out how to get it back together . . . most of the time. As a kid, I remember building little radios on a Radio Shack breadboard kit. This kept me away from the TV and kitchen appliances for

a while until I decided to make a stronger radio and subsequently smoked the breadboard kit. For fear that I might start disassembling things in the house again, my dad gave me a Rabbit Semiconductor development board he had lying around that had an LCD display and a few LEDs on it. It came with an IDE and a compiler for Dynamic C, which was a quirky C variant with some weird features and run-time support. That platform wowed the crowd at science fairs; “Look, I can make the LED turn on and off and text scroll across the screen when I press this button!”

I also remember programming a bit with QBasic as a kid. There was a “cool” feature that I found where I could access the system beep function and set durations and frequencies for the beep. One day, after school, I programmed the system beep to play a suite of songs. In high school I upgraded from system beeps to real instruments, specifically guitars and synthesizers; I was fascinated more by the hardware than the actual “making music” part. Because I wanted to build my own electronic instruments, I decided to study electrical engineering at Rensselaer Polytechnic Institute in Troy, NY. My focus was analog circuit design and signal processing, and that’s when I really found programming. I prototyped a few basic signal generators, distortion circuits and modulators in MATLAB, then tried to port that to C/C++ to embed in a real-time system.

After college I joined a music technology company as a hardware and embedded software engineer. I was working mostly in C and C++, primarily on bare-metal and Linux systems. The part that fascinated me the most about this experience was the design of the languages and compilers. I really enjoyed trying to produce elegant and efficient code, and then trying to understand the compiler’s optimization patterns. Since I was working on very resource-restricted processors, this was essential.

I discovered AdaCore when I decided to move into a different industry and a more customer-facing role. I had never heard of the Ada programming language before researching AdaCore, but the design of the language and its benefits to some of the most technologically advanced projects in the world spoke to my inner nerd. I am now a Technical Account Manager in the New York office, which allows me to work with customers on a technical level.

► **You’ve done a lot of embedded systems development in C. How did you find the experience of using Ada for this type of software, compared with C?**

Learning Ada was actually a pretty easy experience. AdaCore has a lot of community material designed for people like me who come from C, C++, or even Java; it introduces Ada by relating its features to concepts found in these other languages. What I find interesting, though, are the features that are unique to Ada. When programming an embedded system, I spend a lot of time considering bytes, bits and memory. In C, this means bit shifts and masks, implicit casts, or pointer machinations. I found that most of this, most of the time, is not necessary in Ada.

Making the transition from C style to Ada does entail a bit of a learning curve. At first, Ada with all its checks can seem fussy and overly demanding; C has much more freedom. But soon an epiphany sets in, and the Ada design philosophy makes sense. This usually happens around the time you start debugging your application. With Ada, things just work, or when they don’t it’s generally easy to know why. With C some anomaly would mean code rage: hours of frustration in the debugger.

► **Any hobbies or outside interests that you’d like to share?**

At the moment, I am restoring a 1972 Fender Rhodes Stage 88 piano. I also have a collection of hardware and software synthesizers that I enjoy making funny sounds with.

It’s interesting that sound synthesis has made such a resurgence in the last few years, especially in the industry of software modeling of vintage hardware synths. I think the modeling technology of electronic circuitry has made a lot of progress recently. Combine that with the increased processing power, and we get almost perfect replicas of the hardware synthesizers used in iconic songs from the 70s and 80s.

At AdaCore there are a few great musicians who love to twiddle with these things as well. One of our engineers has created a synth library in Ada that is available publicly on GitHub. It’s a lot of fun to play with, and I am looking forward to creating some of my own great synthesizer models with Ada.

---

## Stay Up-to-Date with AdaCore On-Line

Follow the latest news from AdaCore through a variety of resources:

- Company blog site: [blog.adacore.com/](http://blog.adacore.com/)
- Development Log: [www.adacore.com/devlog](http://www.adacore.com/devlog)
- YouTube channel: [www.youtube.com/channel/UCOC7qHXMYZe-w1737\\_Vv7Yg](http://www.youtube.com/channel/UCOC7qHXMYZe-w1737_Vv7Yg)
- Twitter: [twitter.com/adacorecompany/](http://twitter.com/adacorecompany/)
- The SPARK 2014 ecosystem: [www.spark-2014.org/](http://www.spark-2014.org/)

## New Product Release

AdaCore’s annual Q1 release cycle brings across-the-board enhancements, many of which stem from customer suggestions. Below is a sampling of new features in the V18 products; details may be found on-line in AdaCore’s “New Features” pages:

- ▶ GNAT Pro base technology: [docs.adacore.com/R/relnotes/features-18](https://docs.adacore.com/R/relnotes/features-18)
- ▶ GPS and GNATbench IDEs: [docs.adacore.com/R/relnotes/features-gps-18](https://docs.adacore.com/R/relnotes/features-gps-18)
- ▶ GPR library and tools : [docs.adacore.com/R/relnotes/features-gprbuild-18](https://docs.adacore.com/R/relnotes/features-gprbuild-18)
- ▶ CodePeer: [docs.adacore.com/R/relnotes/features-codepeer-18](https://docs.adacore.com/R/relnotes/features-codepeer-18)
- ▶ SPARK Pro: [docs.adacore.com/R/relnotes/features-spark-18](https://docs.adacore.com/R/relnotes/features-spark-18)
- ▶ QGen: [docs.adacore.com/R/relnotes/features-qgen-18](https://docs.adacore.com/R/relnotes/features-qgen-18)

### GNAT Pro 18.1 Development Environment

GNAT Pro has added some new tools. All subscriptions now include the SPARK Discovery verification technology, described elsewhere in this newsletter, and the GNAT Pro Assurance and GNAT Pro Enterprise products come with the GNATstack stack analysis tool.

A variety of compiler enhancements have been made. All versions of GNAT Pro on all platforms incorporate a revised treatment of elaboration checks (with additional precision in calculating elaboration dependencies), better code efficiency, preliminary support for several prospective Ada 2020 features, and improved compiler warnings.

Target-specific enhancements include avoidance of `-mlongcall` code size expansion on VxWorks 6/7 RTP and LynxOS-178 2.2.4, shared libgnat on cross Linux targets, GNAT Pro C availability for bare metal PowerPC and p55, and SMP support on ARM Cortex-A. PowerPC 64bit VxWorks 7, Intel x86 32bit VxWorks 7, and Aarch64 ARM 64bit bare metal are new target platforms.

Customers will see a number of new benefits in the GNAT Pro tool suite and IDEs. The GPRbuild project tool has been upgraded with performance improvements and better handling of specialized installations; the GNATcheck coding standard checker has added more than twenty

new rules, with supporting qualification material available for DO-178C; GNATcoverage’s tool qualification material has been adapted to DO-178C and Ada 2012, and support has been introduced for Lauterbach probes; and the GNATtest unit testing framework has added several new options. The GNAT Programming Studio (GPS) IDE has incorporated performance and user interface improvements, for example in the C/C++ navigation engine, and GNATbench supports Eclipse 4.8 Oxygen as well as Wind River Workbench 4.12 and the diab compiler.

### CodePeer 18.1 Advanced CWE-Compatible Static Analyzer for Ada

CodePeer enhancements include an update of the tool qualification kit to DO-178C with coverage of additional Ada constructs such as exceptions, access types, and generic units; an improved user experience through integration of GNAT warnings in the tool output, better performance, and easier analysis of non-GNAT code; and fewer “false positives”.

### SPARK Pro 18.1 Formal Verification Toolsuite

SPARK Pro has improved the specification of units in the predefined environment (through preconditions on the numeric functions and contracts on formal containers), has enhanced the automation of proofs (by integrating the CodePeer engine as an additional prover, upgrading the support for floating-point, and performing loop unrolling for simple “for” loops), and has added the ability to perform interactive proofs in GPS. On the roadmap for SPARK 19 is a “safe pointer” facility that provides access to subprograms, access to constant data, and Rust-like pointers based on ownership.

### QGen 18.1 Model-Based Development Toolsuite

QGen now supports versions of Simulink®/Stateflow® up to 2017b, implements several new blocks (Sqrt, Memory), provides a compatibility checker to verify compliance of sample models with the supported Simulink®/Stateflow® subset, performs better range propagation for bus signals, and offers increased efficiency in the debugger.

---

## GNAT Pro CCG Expands Ada Availability

The new GNAT Pro CCG product (Common Code Generator) is a compiler that takes a SPARK-like subset of Ada—basically excluding features that require run-time support—and generates C source code. It thus allows customers to use Ada for any target processor that has a C compiler even if no Ada compiler is available. The C program that is output is not meant as maintainable source code, but rather serves as a portable intermediate representation (which will be input to a C compiler) during the building of an executable. With GNAT Pro CCG, Ada programs complying with the supported subset can run on virtually any target processor. For more information please contact [info@adacore.com](mailto:info@adacore.com).

## GNAT Pro on iOS and Android

GNAT Pro today is available for mobile platforms running ARM-Android and ARM64-iOS. This product is hosted on 32-bit Windows and Linux for Android, and 64-bit MacOS for iOS. To help guide future product development, AdaCore is looking for feedback from customers and prospects who are considering migrating to, or developing projects on, these mobile platforms. Please contact [info@adacore.com](mailto:info@adacore.com) to indicate your interest, or open a Ticket Number in the usual fashion.

Both products target the native mobile environment and comprise a complete toolsuite for developing and maintaining applications either solely in Ada, or using Ada together with the relevant platform-specific language (Java on Android, or Swift or Objective-C on iOS). Developers can exploit the software engineering benefits of the Ada language, while also taking advantage of the libraries and services provided by the mobile platforms.



## MHI Aerospace Systems Corporation Selects QGen

MHI Aerospace Systems Corporation (MASC), a member of the Mitsubishi Heavy Industries Group, has selected the QGen toolset to develop the software for the Throttle Quadrant Assembly (TQA) system. This avionics research project is being conducted to meet the Level C objectives in the DO-178C safety standard for airborne software and its DO-331 supplement on Model-Based Development and Verification. The use of a qualified code generator can help save significant effort in developing and verifying the software, and the planned availability (in Q4 2018) of qualification material from AdaCore factored strongly in MASC's decision to choose QGen. The QGen code generator can be qualified at the highest Tool Qualification Level, TQL-1 (equivalent to a development tool in DO-178B).

## DENSO Using SPARK to Demonstrate Freedom from Interference

AdaCore has completed a research project for DENSO, a global automotive technology supplier headquartered in Japan. This project—Application of Formal Methods to Help Achieve Freedom From Interference—was conducted jointly with the University of Nagasaki and had the goal of simplifying the development of safety-critical automotive applications in an ISO 26262 context. The project investigated the use of VDM as a design method, and SPARK as an implementation language, for safety-critical components in systems where legacy C code is prevalent. The SPARK components need to be protected from potential interference from the legacy C code, as required by ISO 26262 (“Freedom from Interference”, or “FFI”). The project has met its goals and showed the practical benefits of introducing formal methods in a system comprising both legacy code and new critical components. DENSO selected AdaCore because of the company's expertise in formal methods, as proven by the SPARK Pro technology.

## GNAT Pro Available for QNX ARM64

The V18 GNAT Pro releases include support for a new cross configuration, hosted on Linux64 and targeted to Blackberry QNX ARM64 (an RTOS commonly used in automotive, industrial automation, medical, security and railway systems). This product is available across all three product lines—GNAT Pro Assurance, GNAT Pro Enterprise and GNAT Pro Developer—allowing current GNAT Pro Ada users to port their code to QNX, and making it easy for C developers on QNX to migrate to Ada or SPARK. Ultimately aimed at supporting all architectures, the product is initially targeted to the ARM Cortex A family. GNAT Pro for QNX will thus support development for platforms including the ARM 57 running on the NVIDIA Drive PX2, and the ARM 53 running on the Xilinx Ultrascale+.

## Formal Methods Conference at NIST

Following up on the successful *Frama-C and SPARK Day* that was held in Paris last May, a similar event is planned for the June 2018 timeframe at NIST (National Institute for Standards and Technology) in Gaithersburg, MD. The goal of the conference is to bring together the developers and users of formal verification technologies such as SPARK and Frama-C, to share experience and to highlight recent progress. Further information will be available on the AdaCore and NIST websites, [www.adacore.com/events/](http://www.adacore.com/events/) and [www.nist.gov/news-events/events/](http://www.nist.gov/news-events/events/).

## calendar highlights / January–June 2018

For up-to-date information on conferences where AdaCore is participating, please visit [www.adacore.com/events/](http://www.adacore.com/events/).

### ERTS<sup>2</sup> 2018 (Embedded Real Time Software and Systems) January 31–February 2, 2018 Toulouse, France

AdaCore is exhibiting at this conference, and AdaCore personnel are presenting papers on software safety, avionics certification, drone autopilot software, and lightweight semantic checkers. Speakers include Romain Béguet, Cyrille Comar, Clément Fumex and Yannick Moy. [www.erts2018.org/](http://www.erts2018.org/)

### FOSDEM '18 (Free / Open Source Developers' European Meeting) February 3–4, 2018 Brussels, Belgium

AdaCore personnel are delivering presentations on the Ada drivers library, free / open-source development in SPARK, Ada tool development with libadalang, source code analysis through langkit, and the O'PAVES open platform for autonomous vehicles. The speakers are Raphaël Amiard, Fabien Chouteau, Yannick Moy and Pierre-Marie de Rodat. [fosdem.org/2018/](http://fosdem.org/2018/)

### SSS '18 (Safety-Critical Systems Symposium) February 6–8, 2018 York, UK

AdaCore is exhibiting at this event. [scsc.org.uk/e503](http://scsc.org.uk/e503)

### Embedded World Conference 2018 February 27–March 3, 2018 Nuremberg, Germany

AdaCore is exhibiting at this event, in Hall 4, Booth 149. [www.embedded-world.eu/](http://www.embedded-world.eu/)

### TU Automotive June 6–7, 2018 Detroit MI, US

AdaCore is exhibiting at this event. [automotive.knect365.com/tu-auto-detroit/](http://automotive.knect365.com/tu-auto-detroit/)

### Ada-Europe 2018 June 18–22, 2018 Lisbon, Portugal

AdaCore is a sponsor and exhibitor for this event. [www.ada-europe.org/](http://www.ada-europe.org/)

### AEE 2018 (Avionics & Flight Ops) June 19–20, 2018 Munich, Germany

AdaCore is exhibiting at this event. [www.ae-expo.eu/](http://www.ae-expo.eu/)

*Inside AdaCore* is published twice a year simultaneously in New York and Paris by AdaCore.

150 W. 30th Street, 16th floor  
New York, NY 10001, USA  
tel +1 212 620 7300  
fax +1 212 807 0162

46 rue d'Amsterdam  
75009 Paris, France  
tel +33 1 49 70 67 16  
fax +33 1 49 70 05 52

info@adacore.com  
www.adacore.com

**AdaCore**

© Copyright 2018 AdaCore. All rights reserved.  
All trademarks are the property of their respective owners.