Outline

- Who is AdaCore?
- Major products
- GNAT Pro product lines
- GNAT Pro 18
- Safety certification
- AdaCore for the community
Who is AdaCore?
Who is AdaCore?

Tool provider helping people build software that matters.

A present 2H\Bookstore of June?

Everything obviously using pen marker on glass the reality*

*apart from the age of the presenter
Who We Are

Founded in 1994 (US) and 1996 (France) to commercialize / productize the GNAT Ada technology

- Software development tools/environments for organizations building critical systems
- Headquarters in New York City and Paris
- Staff comprises around 100 people, distributed worldwide

Deep technical expertise in many areas

- Ada Language
- Compiler Technology
- Embedded Computing
- Static Analysis
- Dynamic Analysis
- Formal Methods
- Safety Certification
- Model-based development
Who We Are

Customers worldwide in the most demanding domains

- Commercial and military avionics
- Air Traffic Management / Control
- Space
- Rail
- Medical
- Financial services

www.adacore.com/customers
We Are Dedicated to...

**Ada and SPARK languages**
- Complete implementation of latest standards (Ada 2012, SPARK 2014)
- GNAT Academic Program for colleges and universities

**Active participation in professional organizations**
- ISO WG9 Ada Rapporteur Group
- Ada-Europe, SIGAda, Ada Resource Association, ...
- FACE Consortium - [www.opengroup.org/face](http://www.opengroup.org/face)

**Improving High-Integrity software development**
- RTCA/EUROCAE SC205/WG71 (DO-178C/ED-12C Committee)
- Booklets on using AdaCore technologies with rail (EN 50128) and airborne software (DO-178C) standard

**Open collaboration**
- Freely-Licensed Open Source Software (“FLOSS”)
- Many projects on GitHub
Major Products
AdaCore Products

GNATPro
- GCC-based compilation system, IDEs, toolset, libraries
- Multi-language support: Ada (all versions), C, ...
- Native and cross platforms
  - Targets include RTOS (e.g. Wind River VxWorks, SYSGO PikeOS, LST LynxOS) and bare metal

CodePeer
- Advanced static analysis tool for Ada
- Detects potential bugs / vulnerabilities including many from CWE
AdaCore Products

- **SPARK Pro**
  - Formal analysis tool for proving program properties (SPARK 2014)
  - SPARK Adoption Guidance booklet (with Thales)

- **QGen**
  - Model-based development environment with debugger and qualifiable code generator to SPARK or MISRA-C
  - Processes a safe subset of Simulink® and Stateflow® models

All products backed by “front-line support”
GNAT Pro product lines
GNAT Pro product lines

**GNAT PRO ASSURANCE**
- Designed for certification and long-lived projects

**GNAT PRO ENTERPRISE**
- Industrial-Grade Software Development

**GNAT PRO DEVELOPER**
- Getting up and running with Ada
Sustain branches will provide

- Safety analysis on known-problems (including impact analysis)
- Potential safety-critical fixes
- Access to fixed releases beyond the yearly branch cut
GNAT Pro 18
GNAT Pro 18 overview

- 57 platforms (52 cross, 5 native)
  - Including latest Ada 2012 corrigendum
- Based on GCC 6.4 & GDB 7.10
- SPARK Discovery available to all GNAT Pro customers
- GNATstack available to all Enterprise and Assurance customers
New ports

- PowerPC 64bits VxWorks 7
- x86 32bits VxWorks 7
- Aarch64 (ARM 64bits) bare metal
- **pragma Ada_2020**

- **@ shorthand**

- **delta aggregates**

```ada
type Powers is array (1..5) of Integer;
type Table is array (1..4) of Powers;
Thing : Table;
begin
  Thing := (others => (for I in Powers'range => I));
  Thing (2) := (@ with delta for all J in 3..5 => @ (J) ** 2);
end;
```

```ada
Very_Long_Expression (Very_Long_Variable).Very_Long_Field := @ + 1;
```

```ada
Post => X = (X'Old with delta Foo => 12, Bar | Baz => 42);
```
GNAT – Improved Code Generation

- Automatic reordering of components in record types with discriminants

- New pragma No_Component_Reordering

- Improved inlining of subprograms coming from a parent package

- Various improvements in C binding generation
  - More accurate binding for enumerals and constants, supporting the declaration of const-qualified variables.

- Various other performance enhancements
GNAT – Warning Improvements

- Option to treat warnings about run-time exceptions as errors (-gnatwE)

- New warning for ineffective use and use type clauses (-gnatwu)
GNAT - Cross Platforms

- Avoid -mlongcall code size bloat
  - LynxOS-178 2.2.4
  - VxWorks 6/7 RTP
- Shared libgnat available on all cross Linux targets
- Pre-built XMLAda on all cross targets with a full runtime
- Native ZFP runtime comes preinstalled
GNAT - Bare Metal

- GNAT Pro C for PowerPC and p55
- SMP support for ARM Cortex-A
- Clean BSP / Runtime separation
- Support arbitrary run-time additions
- Use ARM semihosting for Ada.Text_IO (arm-elf)
- Improvements in GPS integration
GNAT Pro for C and C++

- C support is now available on:
  - all Natives
  - all VxWorks 6 configurations
  - all VxWorks 7 configurations
  - all Bare Metal targets
  - all Embedded Linux configurations

- C++ support is available on all natives

- Features include:
  - GNATstack
  - latest GCC, C and C++ versions
  - compatibility with GNATcoverage
  - GNATemulator (when available)
  - availability of Assurance product
  - GPS support
  - GNAT Tracker support
  - Ada/C++ OOP & exception compatibility
  - endianness specification clauses
Tools

- **GNATcheck – Qualified Coding Standard Checker**
  - 24 new rules implemented and qualified
  - Several qualification kits delivered

- **GNATcoverage – Qualified Coverage**
  - Qualification material migrated to DO-178C & Ada2012
  - Support for probes iSystem and Lauterbach
  - Support for compressed ELF sections
  - Work in progress: instrumentation based scheme

- **GNATtest – Unit Testing Framework**
  - More options to control which parts of the user application to select for testing and for stubbing
  - More options to customize the generated harness
GPR2

- New GPR engine using langkit/libadalang
- Ability to work with multiple project hierarchies
- Published on GitHub: github.com/AdaCore
GPS – UI Improvements

- Improved experience for newcomers, including a revamped welcome screen, and a "first time" assistant
- New, clearer Search dialog
- New Memory Usage View
- Build & Run, Build & Debug buttons
- Button to switch between perspectives
• Simpler to extend and customize
• First-class support for Git workflows, including a history view
GPS – Debugger Support

- Support for interfacing to the debugger via GDB-MI
- New Registers view, allowing registers edition
- Improved control on representation of debugged data
GNAT CCG

Common Code Generator

- GNAT Compiler that takes a subset of Ada as input and generates MISRA-C compliant code as output
- ZFP runtime: No tasking, no controlled types, no exception propagation
- Also removed from ZFP: no tagged types, only representation clauses that can be mapped easily to C representation clauses (e.g. bitfields)
- Packed arrays supported
- All runtime checks except overflow checks
- All user assertions (assert, pre/postconditions, ...)
Software Certification
AdaCore and Safety- and Security-Critical Software

Static Analysis
- CodePeer
- GNATmetric
- GNATstack
- GNATcheck

Formal Verification
- SPARK Pro / SPARK 2014

Dynamic Analysis
- GNATemulator
- GNATcoverage
- GNATtest (and AUnit)

Model-Based Development
- QGen

GNAT Pro Ada
- Certification and Qualification Material
- Certifiable Run-Time Libraries
- Traceability Package
# Certification / Tool Qualification Experience

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## Tools

**Avionics (DO-178B/C)**
- Coding Standard Checker (GNATcheck)
- Code Coverage (GNATcoverage)
- Run-Time Error Detection (CodePeer)

**Railway (EN 50128)**
- Compiler (GNAT Pro)
- Coding Standard Checker (GNATcheck)
- Code Metrics (GNATmetric)
- Testing Framework (GNATtest&AUnit)
- Code Coverage (GNATcoverage)
- Absence of Run-Time Errors (GNATprove–SPARK Pro)
- Data & Control Flow Analysis (CodePeer)

**Space**
- Ravenscar Minimal (PowerPC / bareboard)
- Ravenscar SFP (ERC32, LEON2, LEON3 bareboard)

## Other
- Traceability Package
AdaCore for the community
GNAT Community 2018

- BBC micro:bit first class support
- RISC-V support
- SPARK included in the package by default
- Arm-elf hosted on Mac
Make With Ada 2018

- Embedded software project competition sponsored by AdaCore.
- Open to individuals and small teams using the Ada or SPARK languages to develop dependable, open, inventive and collaborative projects.
- www.makewithada.org
Learn.adacore.com

- Interactive learning platform designed to teach the Ada and SPARK programming languages.
- Courses featuring hands-on labs and easy to understand code snippets,
- Opportunity to see, understand and experiment with the language capabilities.
Thank you
AdaCore

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