

# Embedded Programming with Ada

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# Ada and SPARK

- Designed for Safety and Security
- Powerful means of specification
- Strong type checking
- Object Oriented Programming
- Concurrent programming features, including support for multicore
- Generic templates
- Encapsulation
- Hierarchical program composition / programming-in-the-large

# Specifications

```
type Power is range 0 .. 100;

procedure Set_Motor_Power (P : Power);
--  Set desired power for the motor
```

## Resources and Performances

Comparable to C/C++ for the same level of features:

- Do you need exceptions?
- Do you need Object Oriented Programming?
- Do you need an RTOS?
- Do you need run-time checks?

# Supported Platforms

- ARM Cortex-A
- ARM Cortex-R
- ARM Cortex-M
- PowerPC 32 and 64
- x86 and x86-64
- SPARC
- RISC-V
- and more...

# Ravenscar Tasking

A.K.A There's a mini-RTOS in my language<sup>1</sup>

- Tasks (threads)
- Time handling
  - Clock
  - Delays
- Protected Objects:
  - Mutual exclusion
  - Synchronization between tasks
  - Interrupt handling

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<sup>1</sup>[blog.adacore.com/theres-a-mini-rtos-in-my-language](http://blog.adacore.com/theres-a-mini-rtos-in-my-language)

# Hardware mapping

```
-- High level view of the type
type Power is range 0 .. 100

-- Hardware representation of the type
with Size      => 8,
     Alignment => 16;
```

# Interfacing with C / Assembly

```
with Interfaces.C; use Interfaces.C;

[...]

function My_C_Function (A : int) return int;
pragma Import (C, My_C_Function, "my_c_function");

function My_Ada_Function (A : int) return int;
pragma Export (C, My_Ada_Function, "my_ada_function");
```

## Getting started demo

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# Download and install the tools: [adacore.com/community](http://adacore.com/community)

## Download GNAT Community Edition

For free software developers, hobbyists, and students.

### x86-64 GNU Linux (64 bits)

#### GNAT GPL Ada

[gnat-gpl-2017-x86\\_64-linux-bin.tar.gz](#)  
SHA-1: 9682e2e1f2f232ce03fe21d77b14c37a0de5649b

496.34 MB May 17 2017

#### SPARK Discovery

[spark-discovery-gpl-2017-x86\\_64-linux-bin.tar.gz](#)  
SHA-1: a70d75c71508ed3ab0ecb4a34fcc1dff9a9d9089

104.06 MB May 29 2017

### ARM ELF (hosted on linux)



#### GNAT GPL Ada

[gnat-gpl-2017-arm-elf-linux-bin.tar.gz](#)  
SHA-1: 71b5830d0242dfcb294d8895960f969bbc5c2417

548.9 MB May 17 2017

# Download Ada Drivers Library

This screenshot shows the GitHub repository page for AdaCore's Ada\_Drivers\_Library. The repository has 1,179 commits, 22 branches, 0 releases, and 15 contributors. The main content area lists various files and their recent commits. A prominent red arrow points from the bottom left towards the 'Clone with HTTPS' button.

Ada source code and complete sample GNAT projects for selected bare-board platforms supported by GNAT.

1,179 commits 22 branches 0 releases 15 contributors BSD-3-Clause

Branch: master New pull request Create new file Upload files Find file Clone or download

File	Commit Message	Date
.gitignore	Use new GPRbuild attribute: Create_Missing_Dirs	7 months ago
boards	robust, safer version of GPIO_Pull	5 months ago
components	SGTL5000: Fix some typos	3 months ago
docs	docs/filesystem.md: Add doc for directory handling	3 months ago
examples	Examples: Bring back the blinky and serial examples for the STM32F4 d...	2 months ago
hal	HAL.SDMMC: Add single and multiple block write cmd definition	5 months ago
middleware	File_IO: Improve error handling	2 months ago
scripts	Examples: Bring back the blinky and serial examples for the STM32F4 d...	2 months ago
testsuite	Monitor.Block_Drivers: Show data size	5 months ago
arch	add convenience macro to conditionally declare a pin	3 months ago

Clone with HTTPS Use SSH  
Get Git or checkout with SVN using the web URL.  
[https://github.com/AdaCore/Ada\\_Drivers\\_Library](https://github.com/AdaCore/Ada_Drivers_Library)

Download ZIP

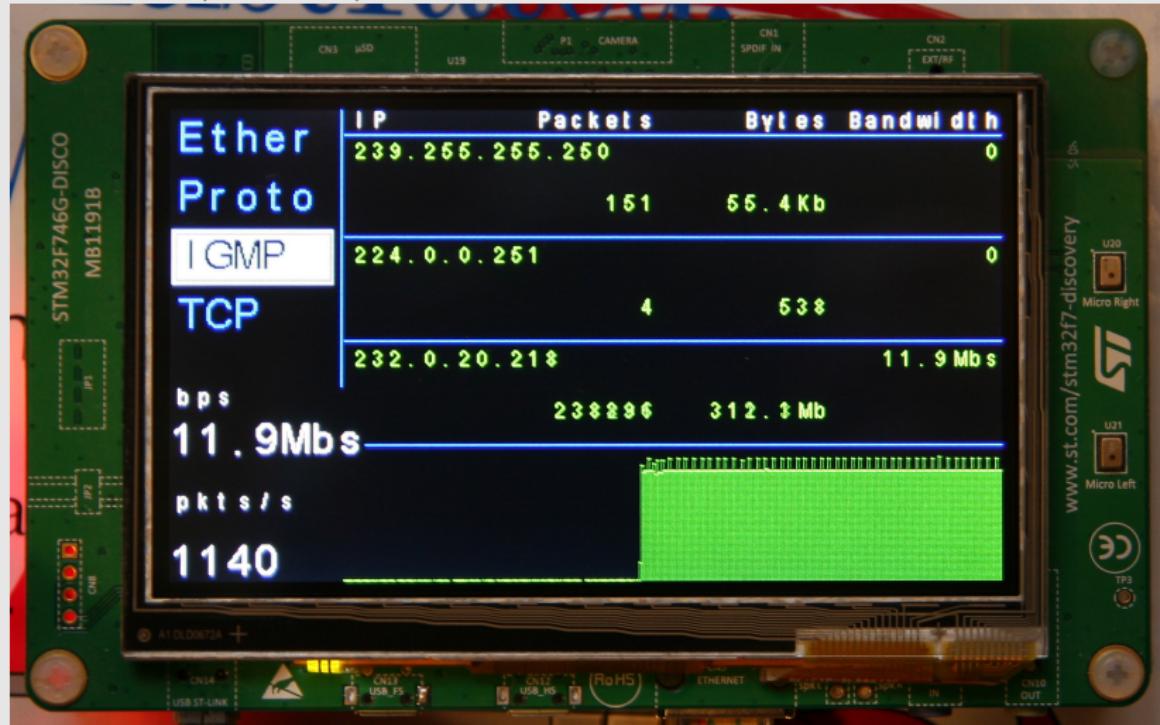
## The Make with Ada Competition

- Embedded software project competition
- Open to everyone
- ~8000 euros in prize
- [makewithada.org](http://makewithada.org) (Twitter @adaprogrammers)

**MAKE***with***Ada**

# 2016 Winner project (Stephane Carrez)

[github.com/stcarrez/etherscope](https://github.com/stcarrez/etherscope)



# 2017 Winner project (Jonas Attertun)

[blog.adacore.com/make-with-ada-2017-brushless-dc-motor-controller](http://blog.adacore.com/make-with-ada-2017-brushless-dc-motor-controller)

