


# Concurrent Real-Time Programming with Ada

---

Fabien Chouteau

Embedded Software Engineer at AdaCore

 Twitter : @DesChips

 GitHub : Fabien-Chouteau

 Hackaday.io: Fabien.C

# Tasks

```
-- Task type declaration  
task type My_Task (Prio : System.Priority)  
  with Priority => Prio;
```

```
T1 : My_Task (Prio => 1);  
T2 : My_Task (Prio => 2);
```

# Time

```
task body My_Task is
  Period          : constant Time_Span := Milliseconds (100);

  Next_Release : Time := Clock + Period;
  -- Set Initial release time
begin
  loop
    -- Suspend My_Task until the Clock is greater
    -- than Next_Release.
    delay until Next_Release;
    -- Compute the next release time
    Next_Release := Next_Release + Period;

    -- Do something really cool at 10Hz...
  end loop;
end My_Task;
```

# Mutual exclusion and shared resources

```
protected My_Protected_Object
  with Priority => 3
is

  procedure Set_Data (Data : Integer);
    -- Protected procedures can read and/or modify the
    -- protected data.

  function Data return Integer;
    -- Protected functions can only read the protected data

private
  -- Protected data are declared in the private part
  PO_Data : Integer := 0;
end;
```

# Synchronization 1/2

```
protected My_Protected_Object is
  entry Wait_For_Signal;
  procedure Send_Signal;
private
  We_Have_A_Signal : Boolean := False;
end My_Protected_Object;
```

## Synchronization 2/2

```
protected body My_Protected_Object is

    entry Wait_For_Signal when We_Have_A_Signal is
    begin
        We_Have_A_Signal := False;
    end Wait_For_Signal;

    procedure Send_Signal is
    begin
        We_Have_A_Signal := True;
    end Send_Signal;

end My_Protected_Object;
```

# Interrupt handling 1/2

```
protected My_Protected_Object
  with Interrupt_Priority => 255
is
  entry Get_Next_Character (C : out Character);

private
  procedure UART_Interrupt_Handler
    with Attach_Handler => UART_Interrupt;

  Received_Character : Character := ASCII.NUL;
  We_Have_A_Character : Boolean := False;
end;
```

## Interrupt handling 2/2

```
protected body My_Protected_Object is

  entry Get_Next_Character (C : out Character)
    when We_Have_A_Character
  is
  begin
    C := Received_Character;
    We_Have_A_Char := False;
  end Get_Next_Character;

  procedure UART_Interrupt_Handler is
  begin
    Received_Character := A_Character_From_UART_Device;
    We_Have_A_Character := True;
  end UART_Interrupt_Handler;
end;
```



- Firmware library
- Hardware and vendor independent
- 100% Ada
- Hosted on GitHub:  
`github.com/AdaCore/Ada_Drivers_Library`

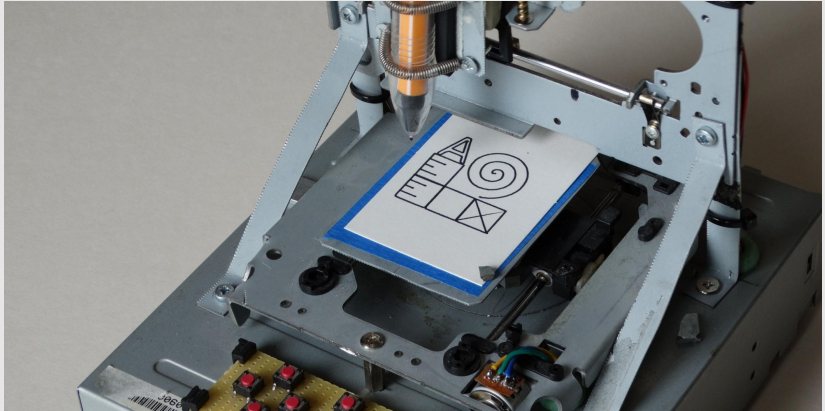
# Crazyflie 2.0 Flight controller

[blog.ada-core.com/how-to-prevent-drone-crashes-using-spark](http://blog.ada-core.com/how-to-prevent-drone-crashes-using-spark)



# CNC Controller

[blog.adacore.com/make-with-ada-arm-cortex-m-cnc-controller](http://blog.adacore.com/make-with-ada-arm-cortex-m-cnc-controller)



# Pendulum clock LED

[blog.adacore.com/writing-on-air](http://blog.adacore.com/writing-on-air)

