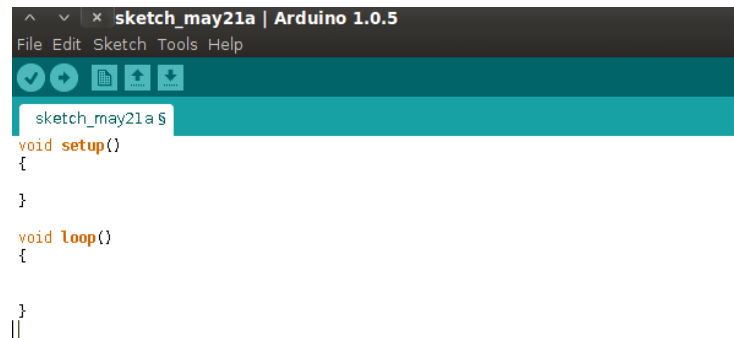

Arduino para programadores



@caligari

Hackathon IOT - GPUL

A Coruña - 9 abril 2016

Antes dos microcontroladores

1980's

- ❑ Chips especializados
- ❑ 'Vademecum' de chips
- ❑ Funcións hardware
- ❑ Circuitos combinados



Microprocesadores: software!



- ❑ Intel 8080 (1974)
- ❑ Zilog Z80 (1976)
- ❑ Reloxo 2 MHz - 20 MHz
- ❑ Rexistros de 8 bits
- ❑ **Bus de direcciones** 16 bits
- ❑ **Software** monolítico
- ❑ Sistema Operativo CP/M

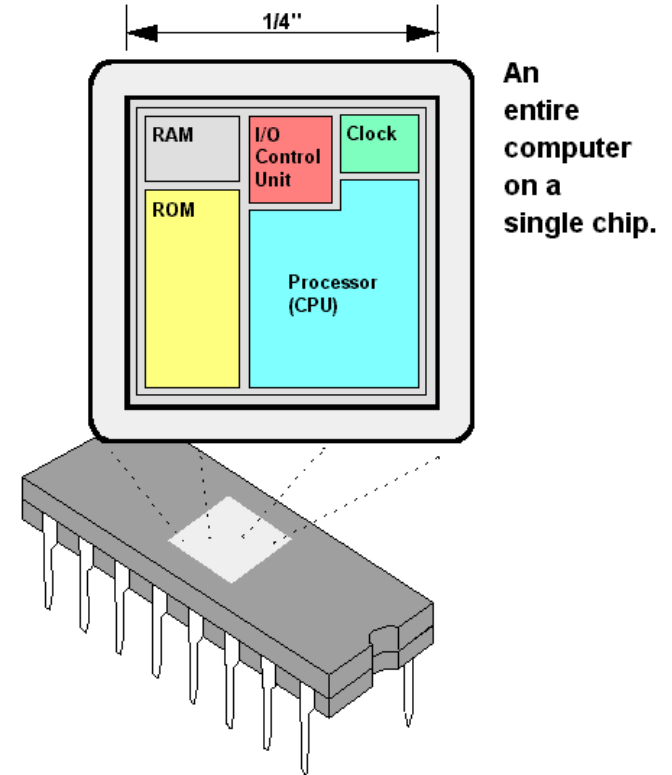
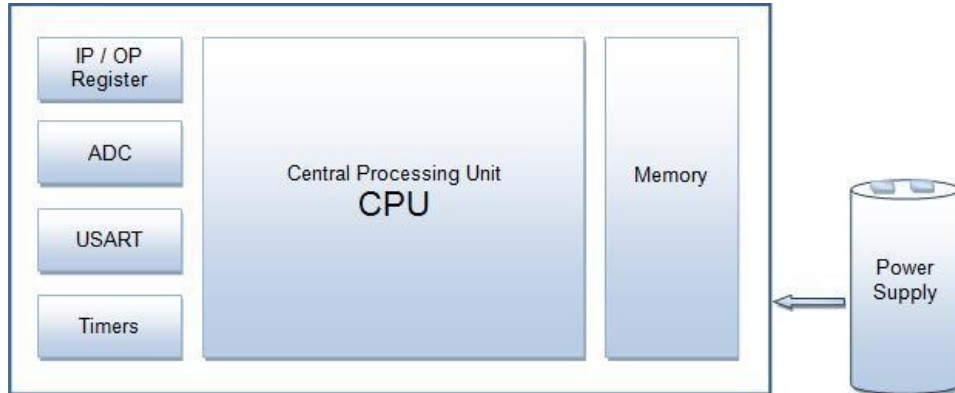
Os comezos...



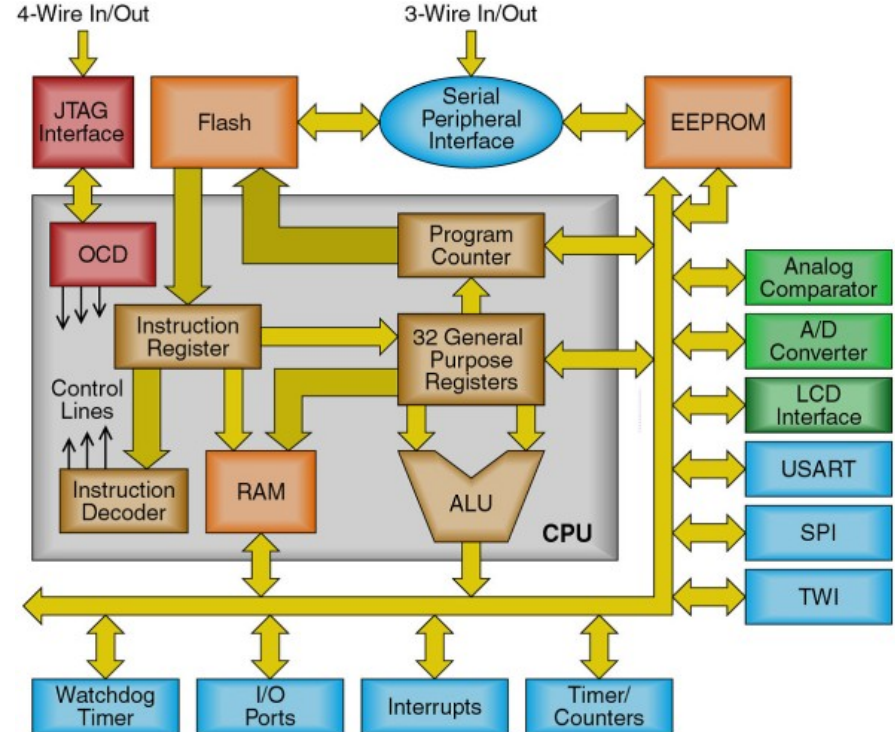
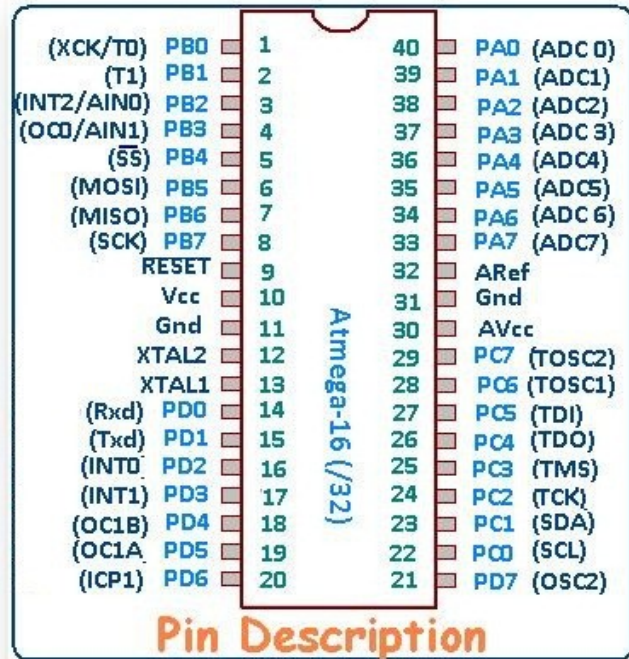
Microcontroladores: Chips v2.0

3 unidades funcionais **integradas**:

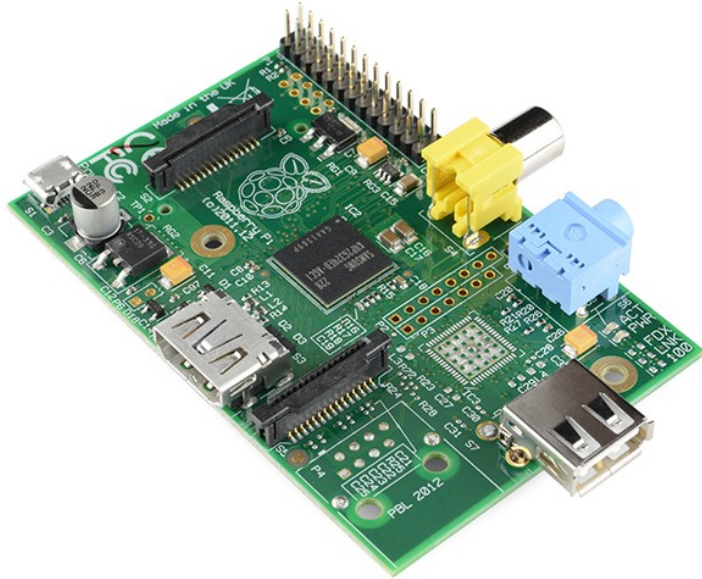
- ❑ CPU
- ❑ Memória
- ❑ I/O programáveis



Evolución dos microcontroladores



Entre microcontrolador e ordenador

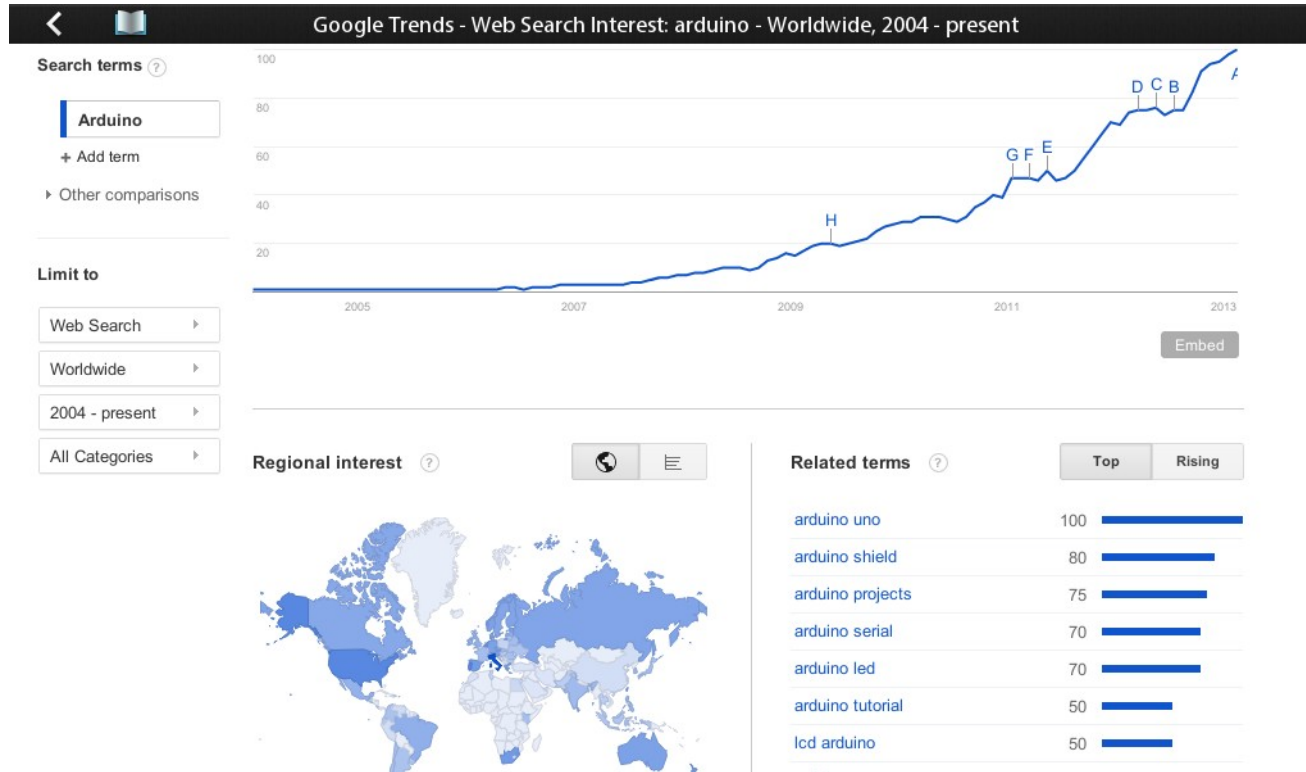


Raspberry Pi



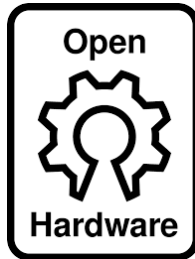
BeagleBone Black

Unha nova tendencia OSHW (IoT)

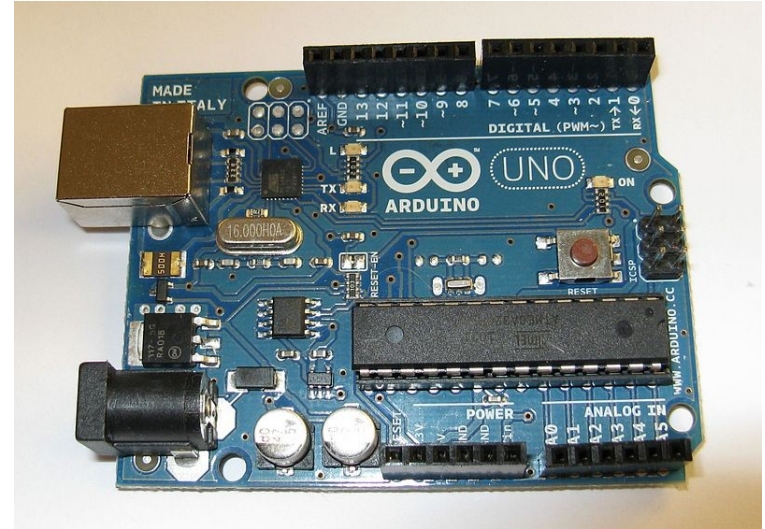


Arduino

Plataforma de Hardware Libre



Placa + Microcontrolador
Contorna Desenvolvimento
Comunidade Arduino



Interaction Design Institute Ivrea



2001 - 2005

Arte + Interacción



Arduino core team

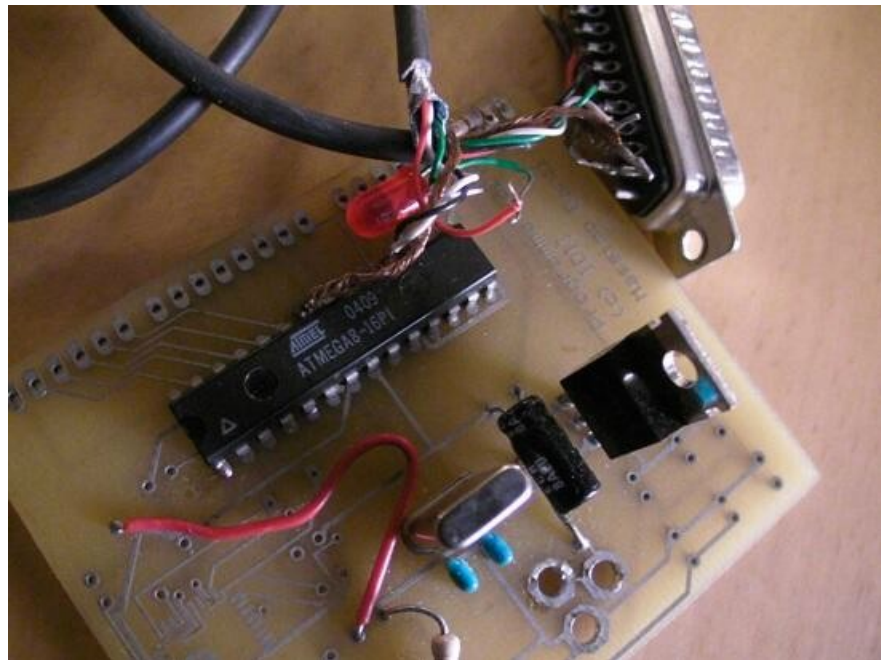
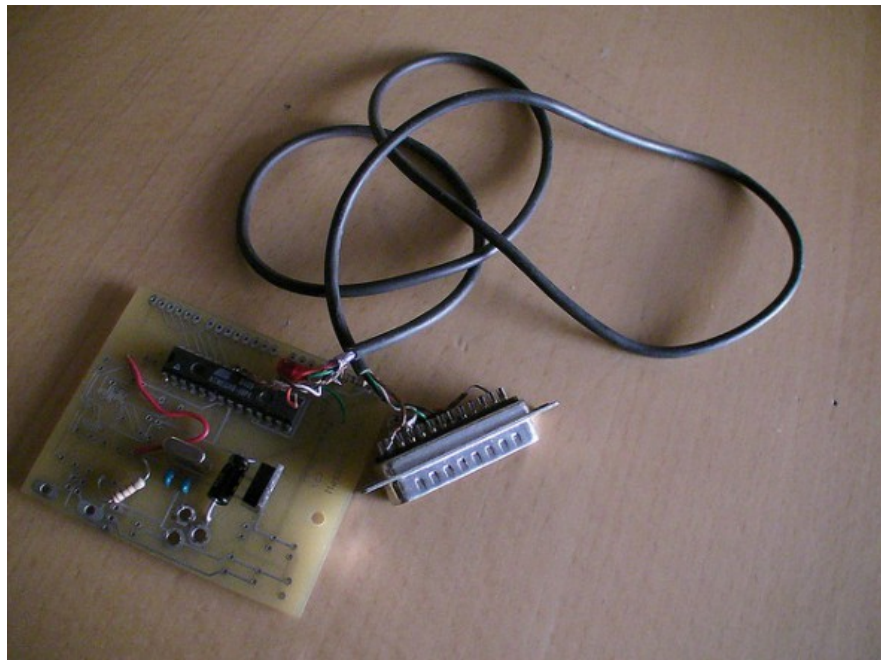


David Cuartielles,
Gianluca Martino,
Tom Igoe,
David Mellis,
Massimo Banzi



**Hernando
Barragán**

O primeiro Arduino



Etimoloxía

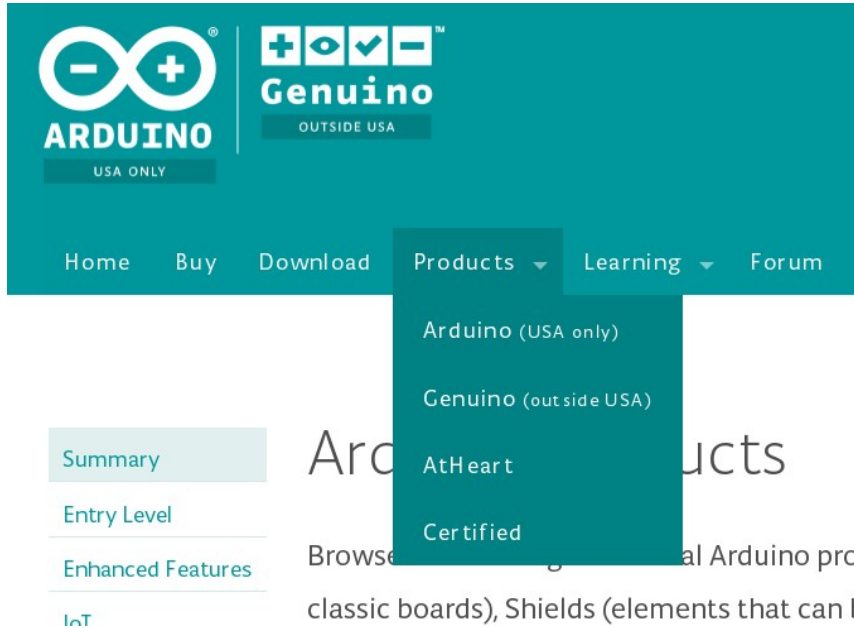


Il Bar di Re Arduino
(Milano)



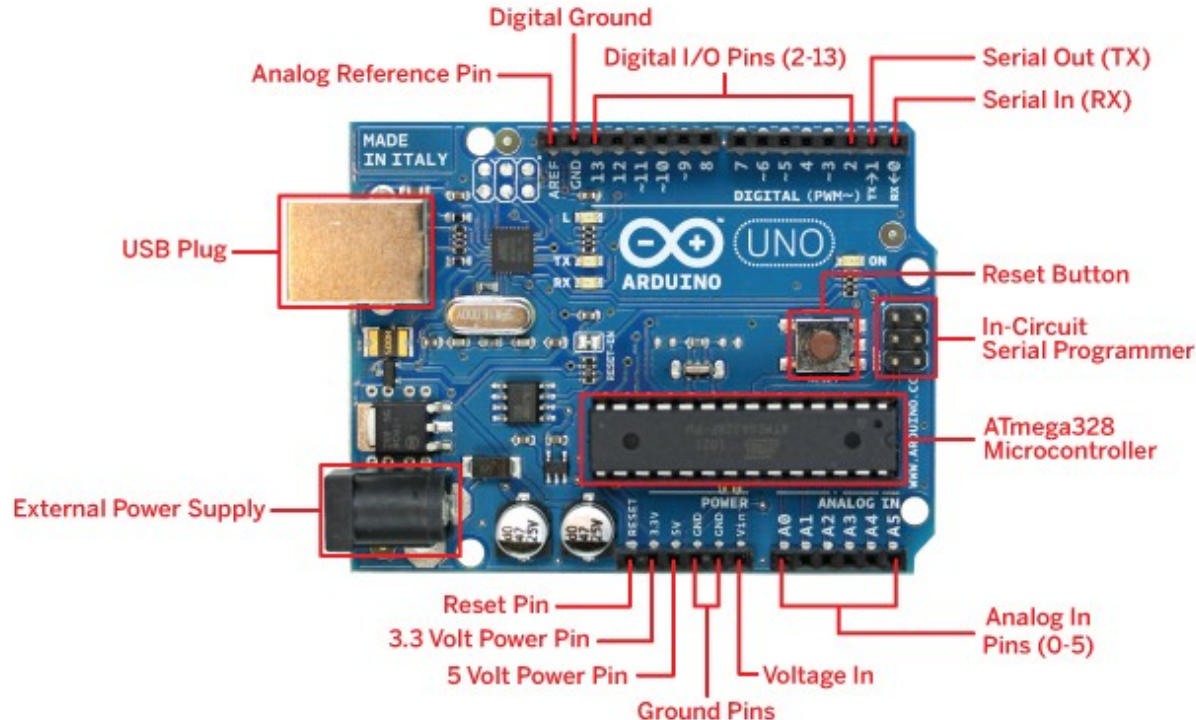
Rei Arduino I de Ivrea
(990-1014)

Arduino ou Genuino?



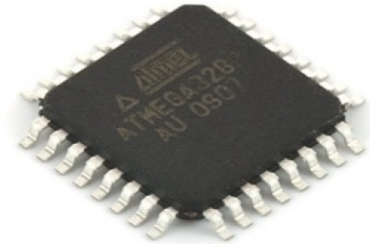
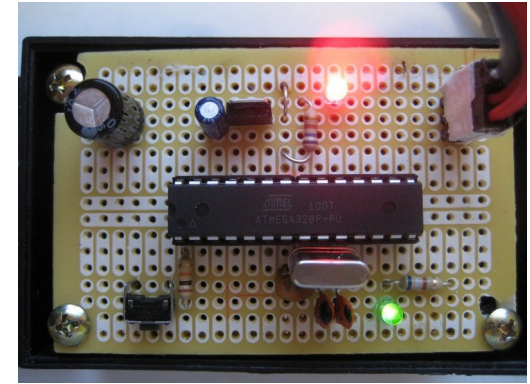
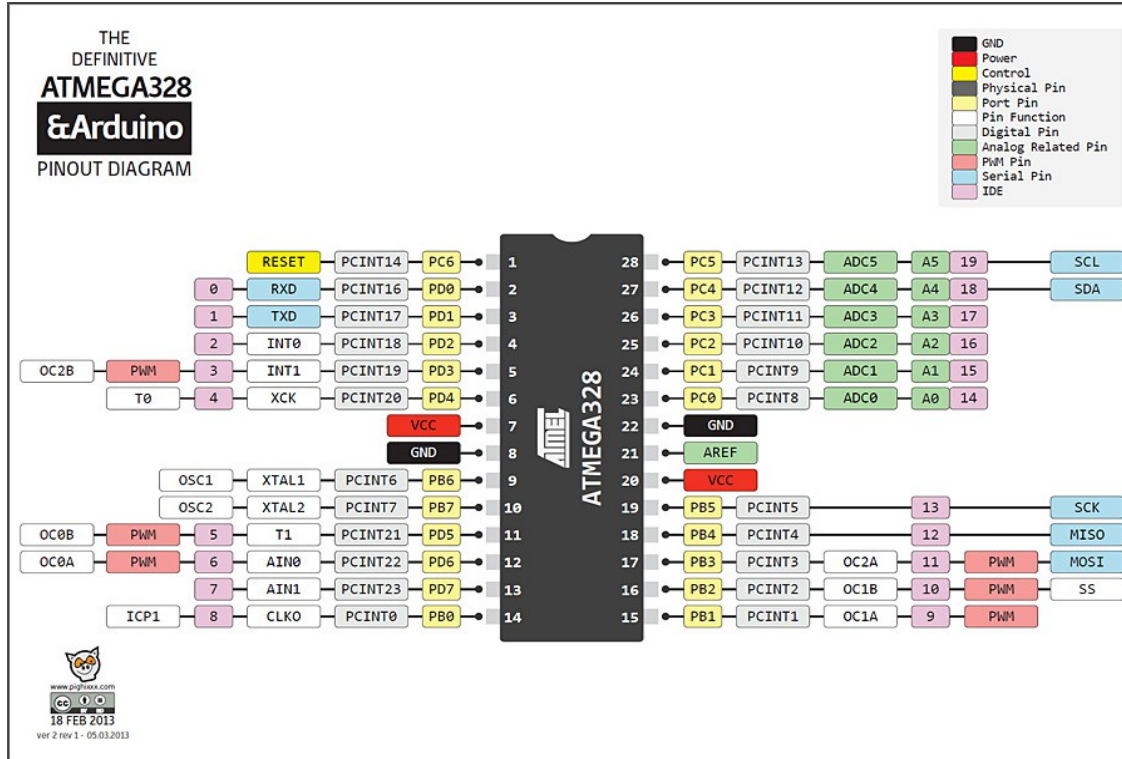
Massimo Banzi + Limor Fried

Placa Arduino: vista xeral



- ❑ Microcontroller: ATmega328
- ❑ Operating Voltage: 5V
- ❑ Input Voltage: 7-12V
- ❑ Digital I/O Pins: 14 (6 PWM)
- ❑ Analog Input Pins: 6
- ❑ DC Current per I/O Pin: 40 mA
- ❑ DC Current for 3.3V Pin: 50 mA
- ❑ **Flash Memory: 32 KB**
- ❑ **SRAM: 2 KB**
- ❑ EEPROM: 1 KB
- ❑ Clock Speed: 16 MHz
- ❑ Length: 68.6 mm
- ❑ Width: 3.4 mm
- ❑ Weight: 25 g

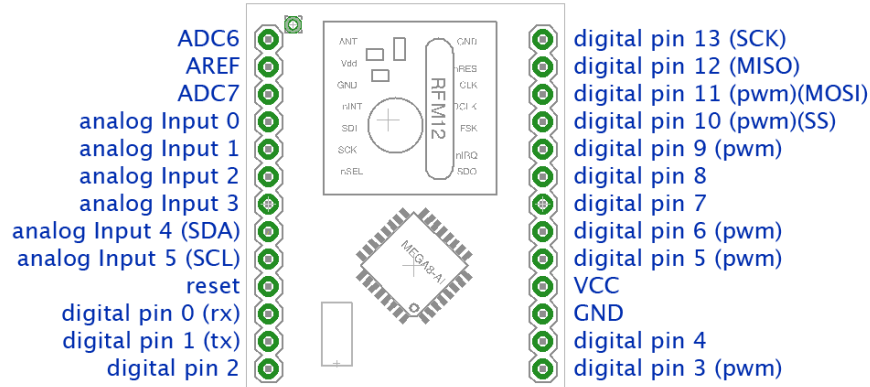
O coração do Arduino: ATmega328



Capacidade hardware

	ATMega168	ATMega328	ATmega1280
Flash (2k for bootloader)	16kB	32kB	128kB
SRAM	1kB	2kB	8kB
EEPROM	512B	1kB	4kB

Arduino pins



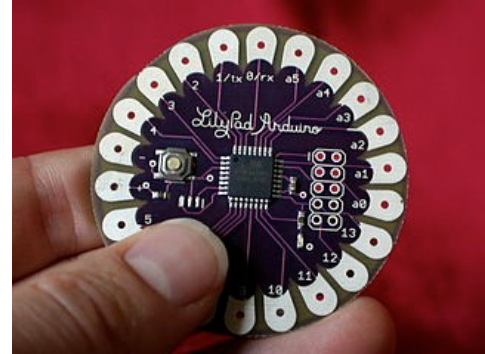
	Duemilanove/ Nano/ Pro/ ProMini	Mega
# of IO	14 + 6 analog (Nano has 14+8)	54 + 16 analog
Serial Pins	0 - RX 1 - TX	0 - RX1 1 - TX1 19 - RX2 18 - TX2 17 - RX3 16 - TX3 15 - RX4 14 - TX4
Ext Interrupts	2 - (Int 0) 3 - (Int 1)	2,3,21,20,19,18 (IRQ0- IRQ5)
PWM pins	5,6 - Timer 0 9,10 - Timer 1 3,11 - Timer 2	0-13
SPI	10 - SS 11 - MOSI 12 - MISO 13 - SCK	53 - SS 51 - MOSI 50 - MISO 52 - SCK
I2C	Analog4 - SDA Analog5 - SCK	20 - SDA 21 - SCL

As claves do éxito de Arduino

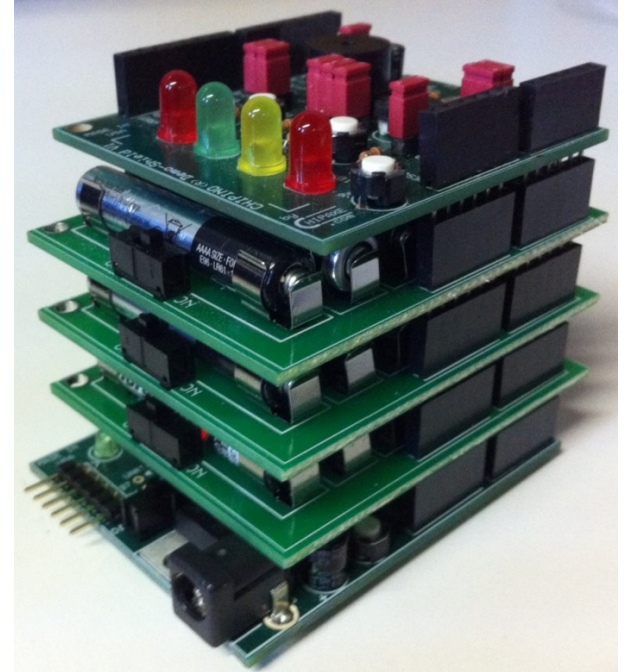
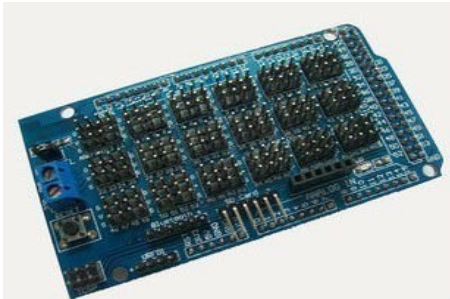
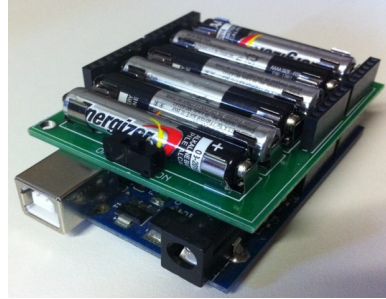
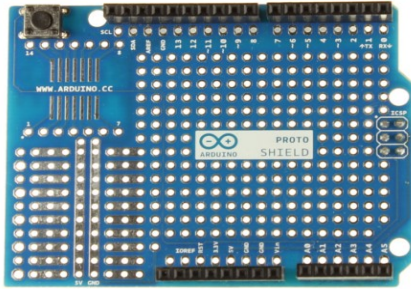
- ❑ Deseño *OpenSource*: **comunidade**
- ❑ Unha **conexión USB** e *bootloader* por *ICSP*
- ❑ **Regulación de voltaxe** de alimentación
- ❑ A escolla do microcontrolador **ATmega328**
- ❑ Conectores de **pins** para **expansión** sinxela



Outros sabores de placa Arduino



Arduino Shields



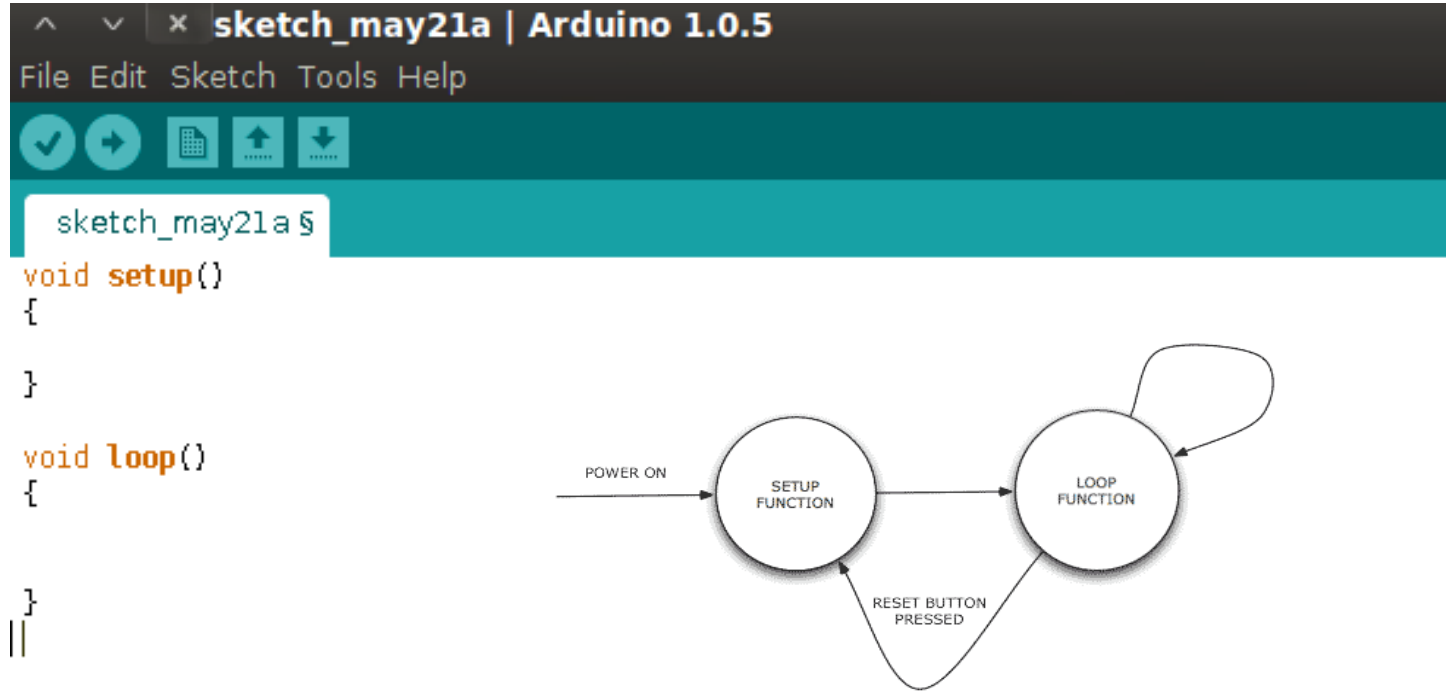
Arduino IDE

<http://arduino.cc>

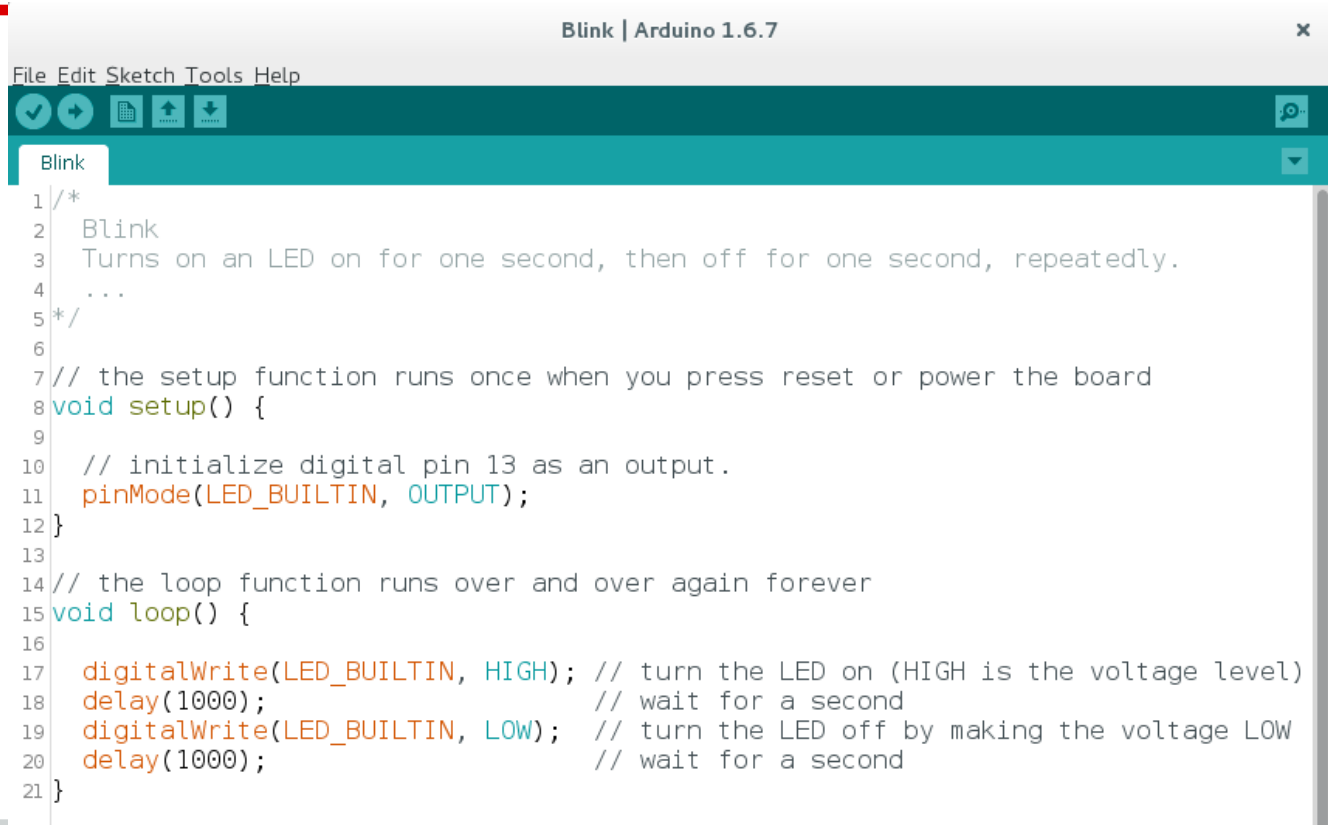


- ❑ Entorno feito em Java (multiplataforma)
- ❑ Herdado doutro IDE (Processing/Wiring)
- ❑ Usa GNU toolchain por debaixo (**Make, GCC, binutils**)
- ❑ GCC crosscompiling para ARM (AVR-gcc)
- ❑ AVR Downloader/UploaDEr (AVRdude e bootloader)
- ❑ Outras alternativas (**platform.io**)

Sketch Arduino “.ino”



Blink (“Hello world” uC)

A screenshot of the Arduino IDE interface. The title bar at the top reads "Blink | Arduino 1.6.7". Below the title bar is a menu bar with "File", "Edit", "Sketch", "Tools", and "Help". Under the "Sketch" menu, a dropdown is open showing "Blink" with a small downward arrow icon to its right. The main workspace contains the following C++ code:

```
1 /*  
2  Blink  
3  Turns on an LED on for one second, then off for one second, repeatedly.  
4  ...  
5 */  
6  
7 // the setup function runs once when you press reset or power the board  
8 void setup() {  
9  
10     // initialize digital pin 13 as an output.  
11     pinMode(LED_BUILTIN, OUTPUT);  
12 }  
13  
14 // the loop function runs over and over again forever  
15 void loop() {  
16  
17     digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)  
18     delay(1000);                      // wait for a second  
19     digitalWrite(LED_BUILTIN, LOW);  // turn the LED off by making the voltage LOW  
20     delay(1000);                      // wait for a second  
21 }
```

Grazas! (e feliz Hackathon IoT!)



#BeDuinoMyFriend