

INTRO TO ARDUINO



What is Arduino?

Where are they used or what are they used for?

How do you program them?

Where can I go to learn more?

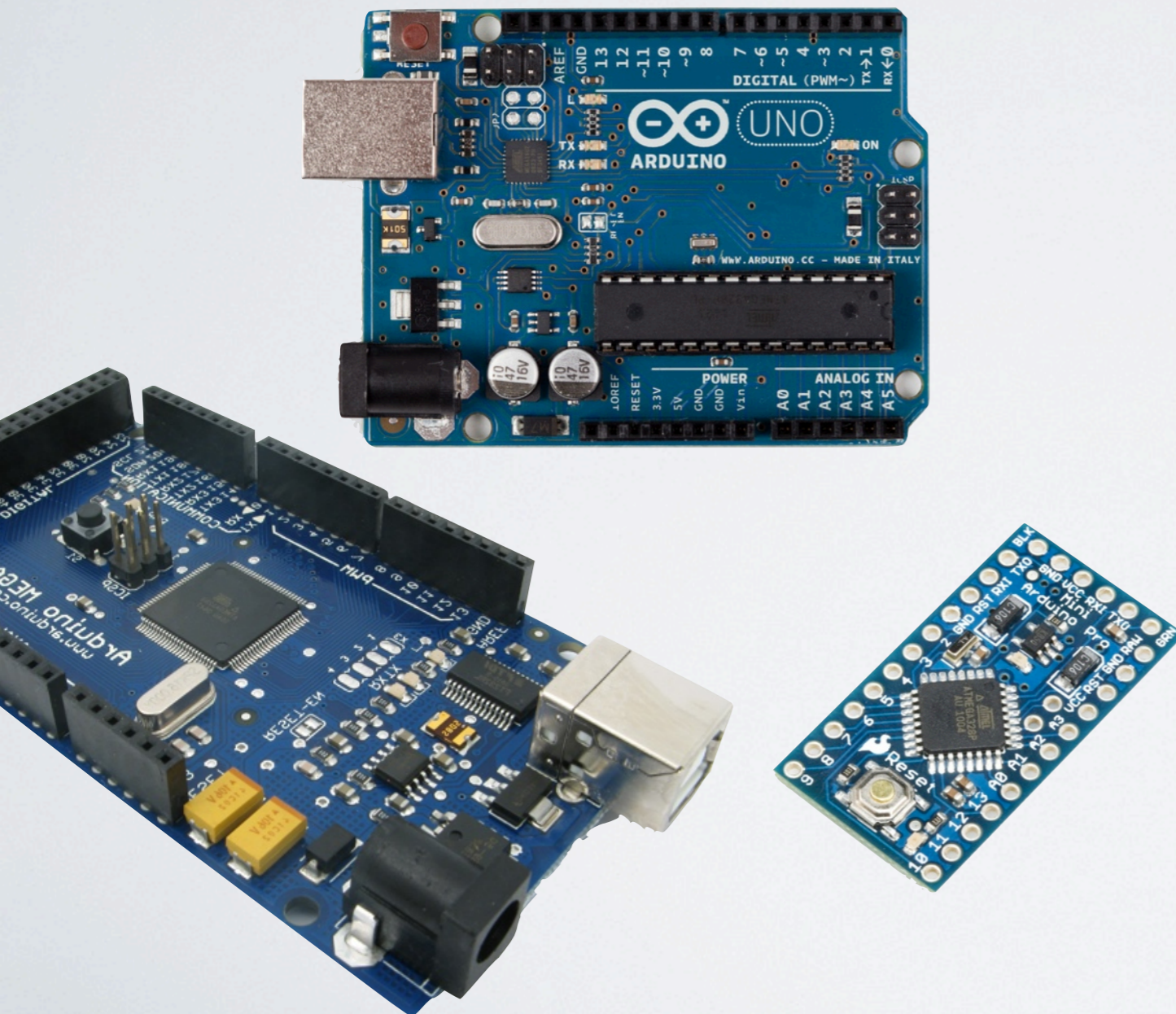
What is Arduino?

What is Arduino?

a micro-controller system that
is relatively easy for beginners
who have no software or
electronics experience

What is Arduino?

Hardware



Software

A screenshot of the Arduino IDE interface. The title bar reads "Blink | Arduino 1.0". The menu bar includes "File", "Edit", "Sketch", "Tools", and "Help". The main text area contains the following code:

```
/*
 * Blink
 * Turns on an LED on for one second, then off for one second, repeat
 *
 * This example code is in the public domain.
 */

void setup() {
  // initialize the digital pin as an output.
  // Pin 13 has an LED connected on most Arduino boards:
  pinMode(13, OUTPUT);
}

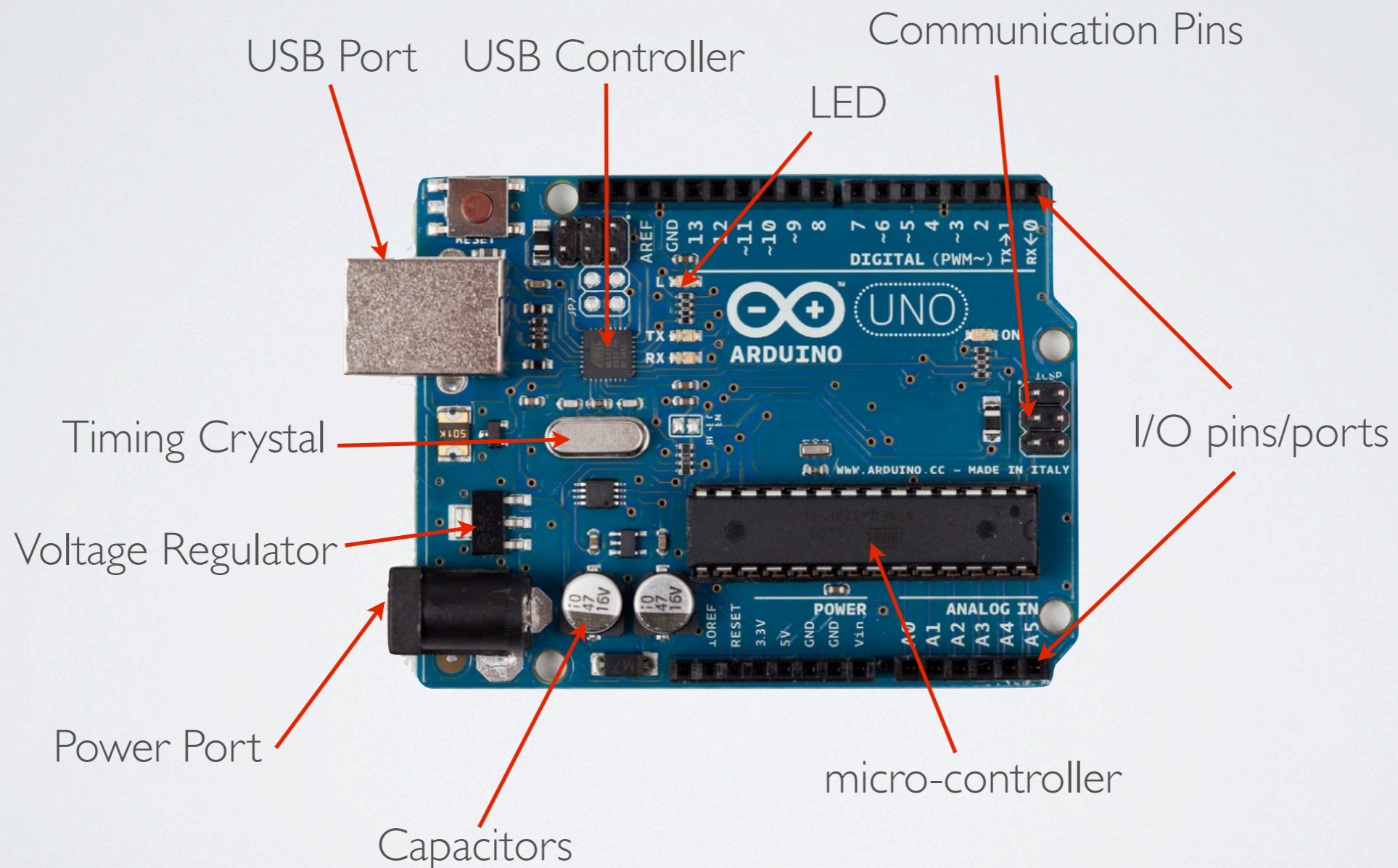
void loop() {
  digitalWrite(13, HIGH); // set the LED on
  delay(1000);            // wait for a second
  digitalWrite(13, LOW);  // set the LED off
  delay(1000);            // wait for a second
}
```

The status bar at the bottom shows "1" on the left and "Arduino Mega 2560 or Mega ADK on /dev/ttyACM0" on the right. A message box at the bottom of the text area says "Done uploading." and "Binary sketch size: 1556 bytes (of a 258048 byte maximum)".

What is Arduino?

Hardware

Micro-Controller Board



What is Arduino?

Hardware

Main Hardware Components

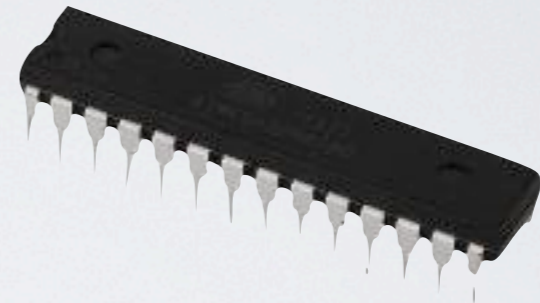
- Micro-Controller
- Input and Output Ports
- Serial Communication Ports
- Timers
- Output Indicators

What is Arduino?

Hardware

Micro-Controller

- Tiny/Small Controllers
- Tiny Computers
- Low Power
- Integrated Circuit (IC)



What is Arduino?

Hardware

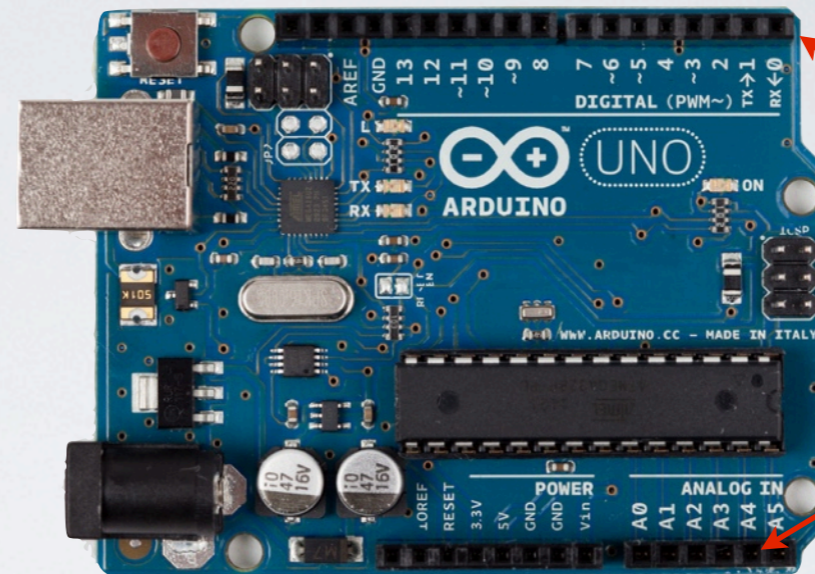
I/O Ports

Input Ports

-for reading sensors

Output Ports

- for sending commands to external hardware like motors and servos

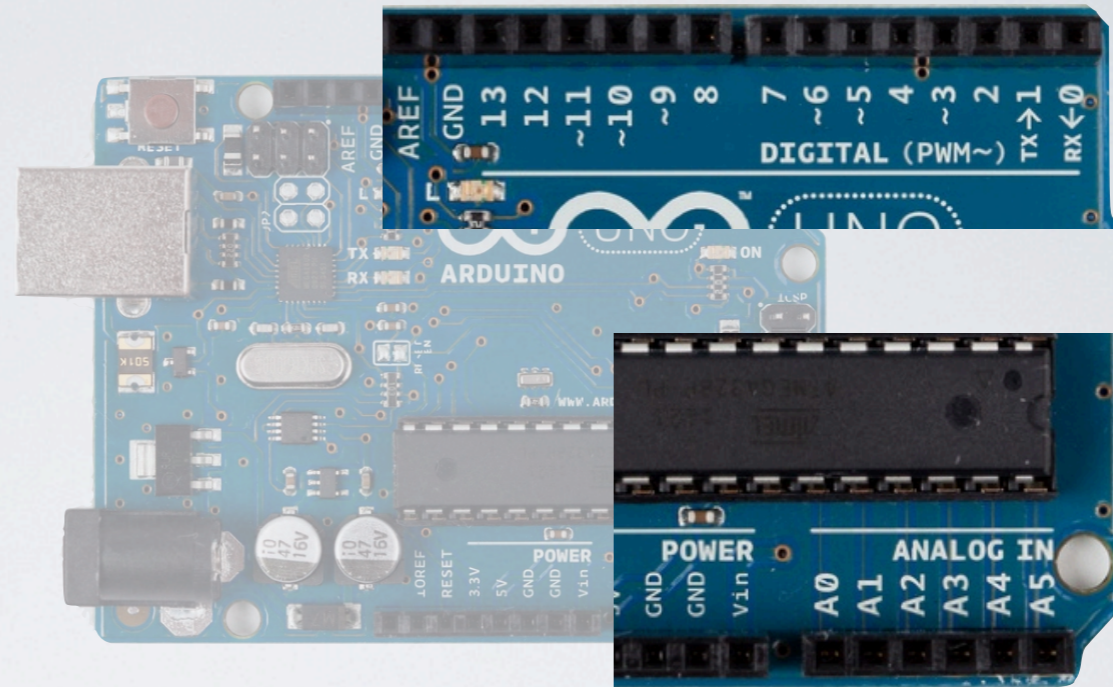


I/O pins/ports

What is Arduino?

Hardware

2 Types of I/O Ports



Digital I/O

Analog In

Analog

- for reading analog sensors which send continuous data
- connected to an Analog-to-Digital Converter (ADC)
- read and convert signals from 0 to 5V to a number from 0 to 1023

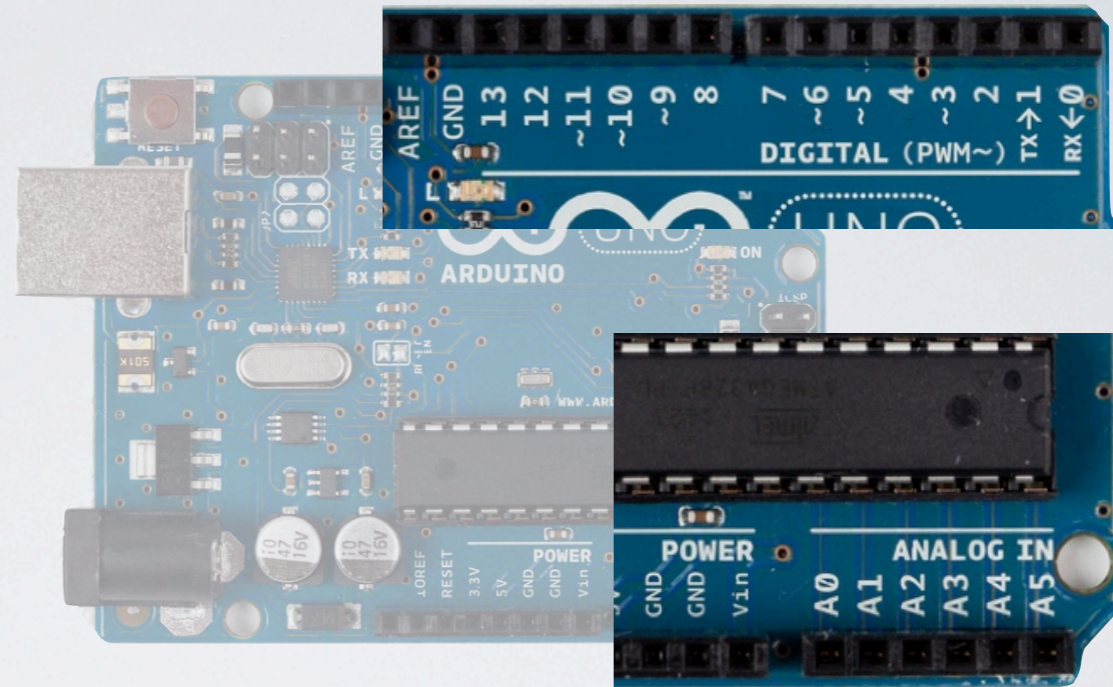
Digital Ports

- are either ON or OFF, ON = 5V, OFF = 0V

What is Arduino?

Hardware

2 Types of I/O Ports



Digital I/O

Analog In

Digital Ports

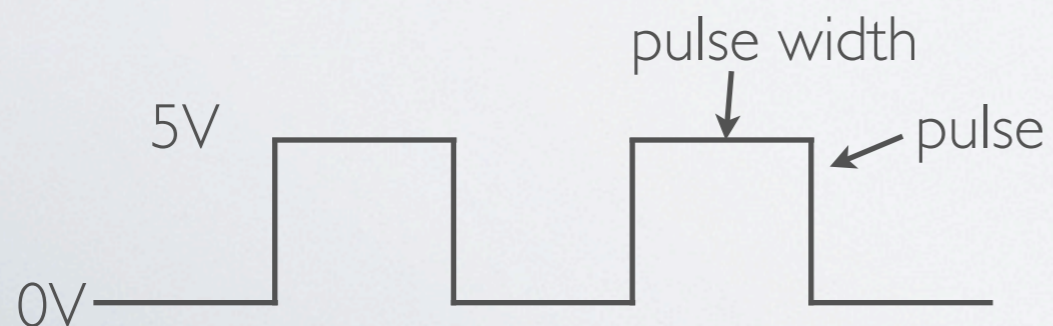
-used for controlling most external devices

Motors

LEDs

Servos

-Output a square wave



Less Power



More Power



What is Arduino?

Hardware

Communication Ports

- Used to program the micro-controller
- Used to send data
- Used to operate other devices like digital video cameras
- Used to communicate between micro-controllers



What is Arduino?

Hardware

Timers

- Used by the micro-controller to measure the passing of time for:

 - Clocks

 - Sonar

 - Wait Commands

 - Interrupts

 - etc...

Output Indicators

- LEDs

**Where are micro-controllers
used?**

Where are micro-controllers used?

Found in almost any complex electronic device

Music players

Ovens

Microwaves

Cars/Vehicles

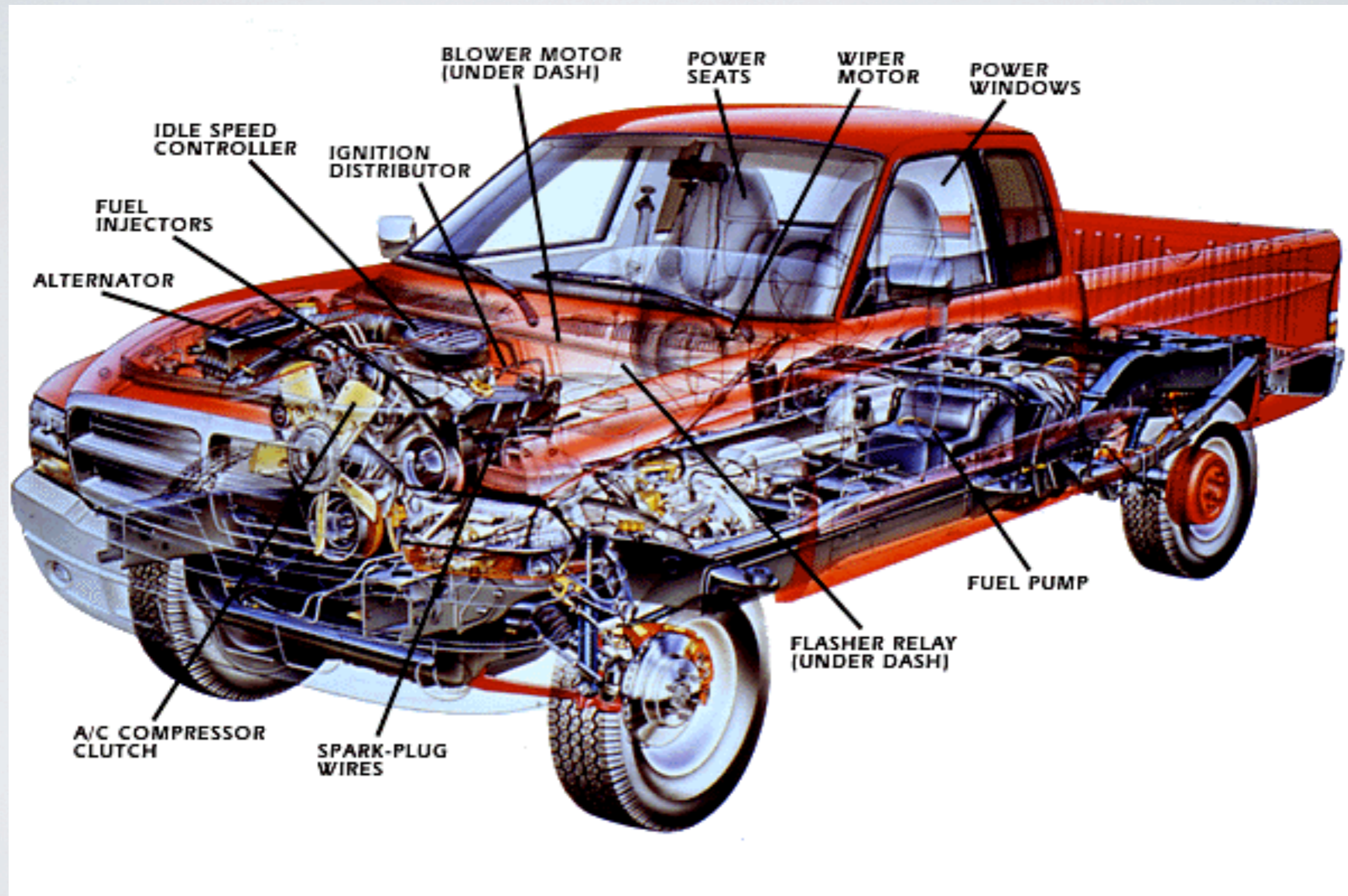
Heating systems

Robots

Control Systems in Industrial Plants

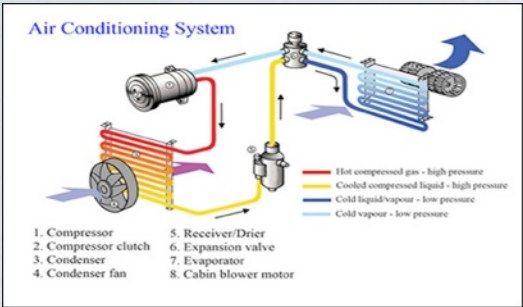
Remote Control Cars/Airplanes

Where are micro-controllers used?



Where are micro-controllers used?

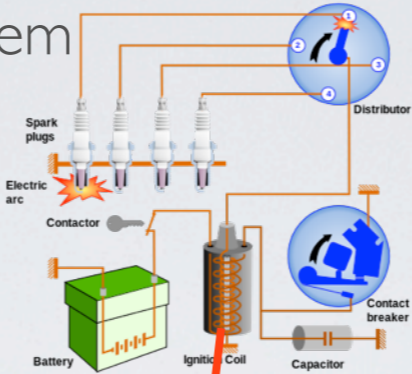
Air Conditioning



Fuel Gauge



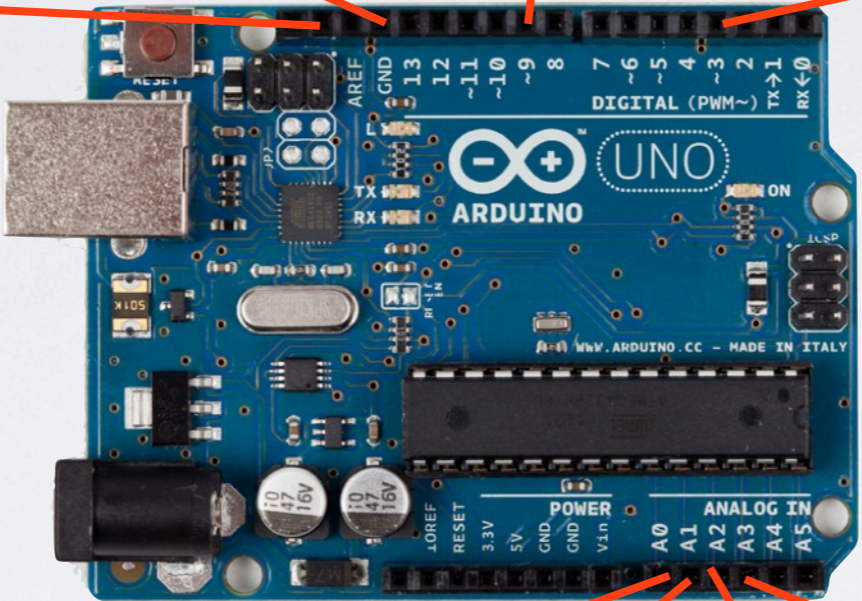
Ignition System



Speedometer



Digital Out



Analog In

AC Temp Sensor



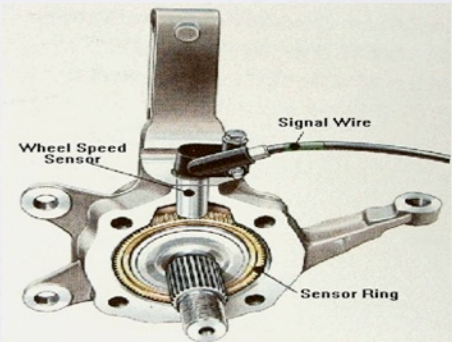
Fuel Tank Sensor



Oxygen Sensor



ABS Sensor



How do you program them?

How do you program them?

Arduino IDE

Write

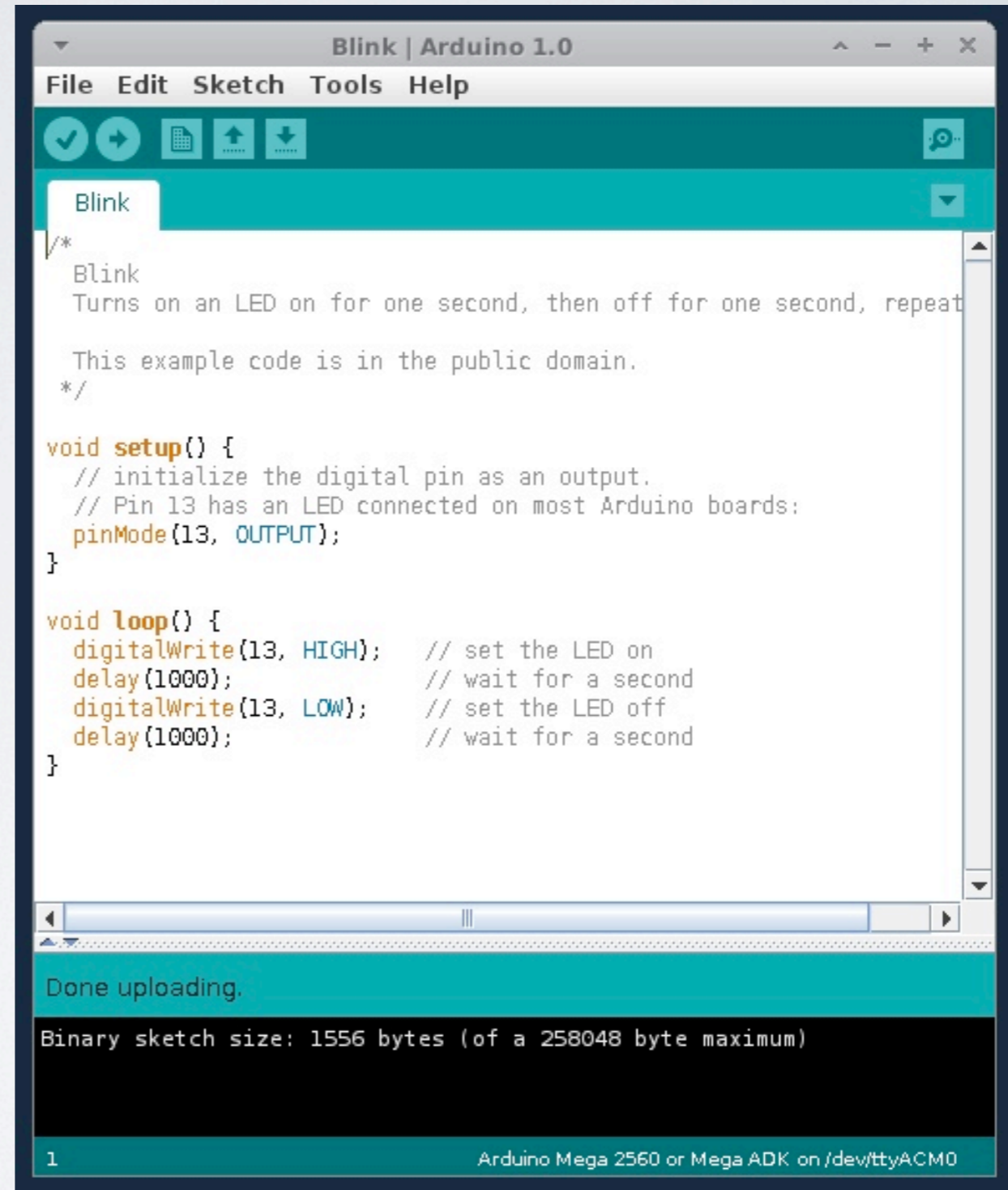
Edit

Upload

Serial Monitor

What Programming
Language?

- Processing
- C/C++

A screenshot of the Arduino IDE interface. The title bar reads "Blink | Arduino 1.0". The menu bar includes "File", "Edit", "Sketch", "Tools", and "Help". Below the menu bar is a toolbar with icons for checking, running, and uploading. The main text area shows the "Blink" sketch code, which includes a comment block describing the sketch and two functions: "void setup()" and "void loop()". The "void loop()" function contains code to turn an LED on and off with a 1000ms delay. At the bottom, a status bar shows "Done uploading." and "Binary sketch size: 1556 bytes (of a 258048 byte maximum)". The bottom-most status bar indicates the board is "Arduino Mega 2560 or Mega ADK on /dev/ttyACM0".

```
Blink | Arduino 1.0
File Edit Sketch Tools Help

Blink
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  delay(1000);            // wait for a second
}

Done uploading.
Binary sketch size: 1556 bytes (of a 258048 byte maximum)

1 Arduino Mega 2560 or Mega ADK on /dev/ttyACM0
```

How do you program them?

Arduino Program Structure

```
//pre setup code - declarations and initializations
```

```
void setup(){
```

```
// Place code here that needs to run only once  
}
```

```
void loop(){
```

```
//Place code here that needs to be repeated  
}
```

How do you program them?

DEMO

**Where can I go to learn
more?**

Where can I go to learn more?

Arduino Website

<http://arduino.cc>

Society of Robots

<http://www.societyofrobots.com/>

Google

Arduino Tutorials

Programming in C Tutorial

Where can I go to learn more?

Where to buy an Arduino?

Radioshack (expensive)

Amazon.com

Sainsmart.com

Where to buy Robot Parts

Pololu.com

Servocity.com

Robotshop.com

DFrobot.com

THANK YOU