Introduction to Arduino

Presented by Jeffrey Arcand

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What is Arduino?

Arduino is a combination of circuit boards, and software that's made for them.

They were originally made in Italy for an Electrical Engineering course, and have since become very popular in DIY / hobbyist community.

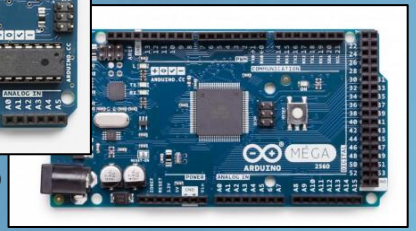
The Arduino company oversees the community, is the primary producer of boards, and provides direction to the development of the Arduino IDE.

Arduino's embrace of "open" design concepts has allowed many other companies and individuals to make their own boards and software.

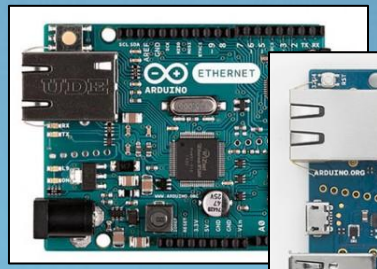
Arduino's cheap price and huge support community keep it popular, despite more powerful alternatives coming to market since.

Sample Arduino Boards

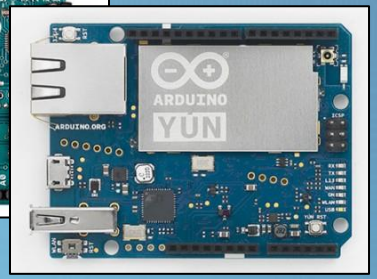
Arduino Uno



Arduino Mega

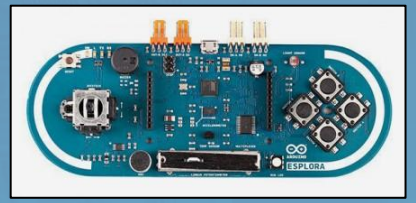


Arduino Ethernet

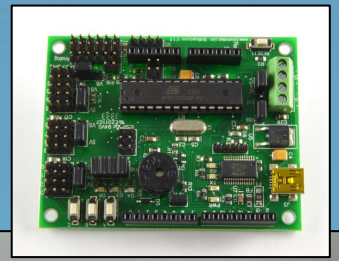


Arduino Yún

Arduino Esplora

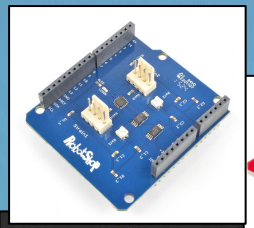


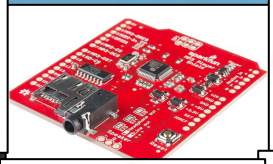
Lynxmotion BotBoarduino

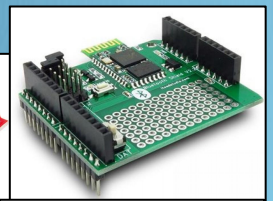


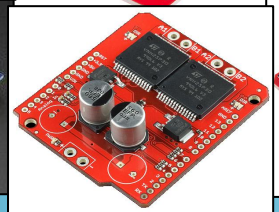
Microview

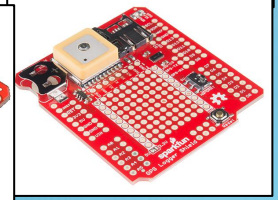
SHIELDS



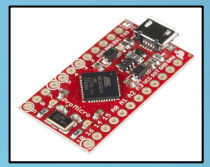




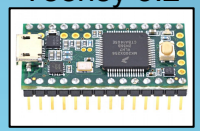




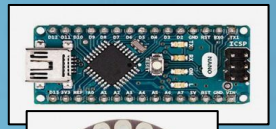
Pro Micro 5V/16MHz

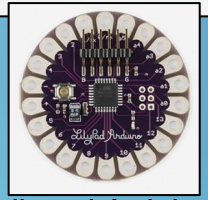


Teensy 3.2



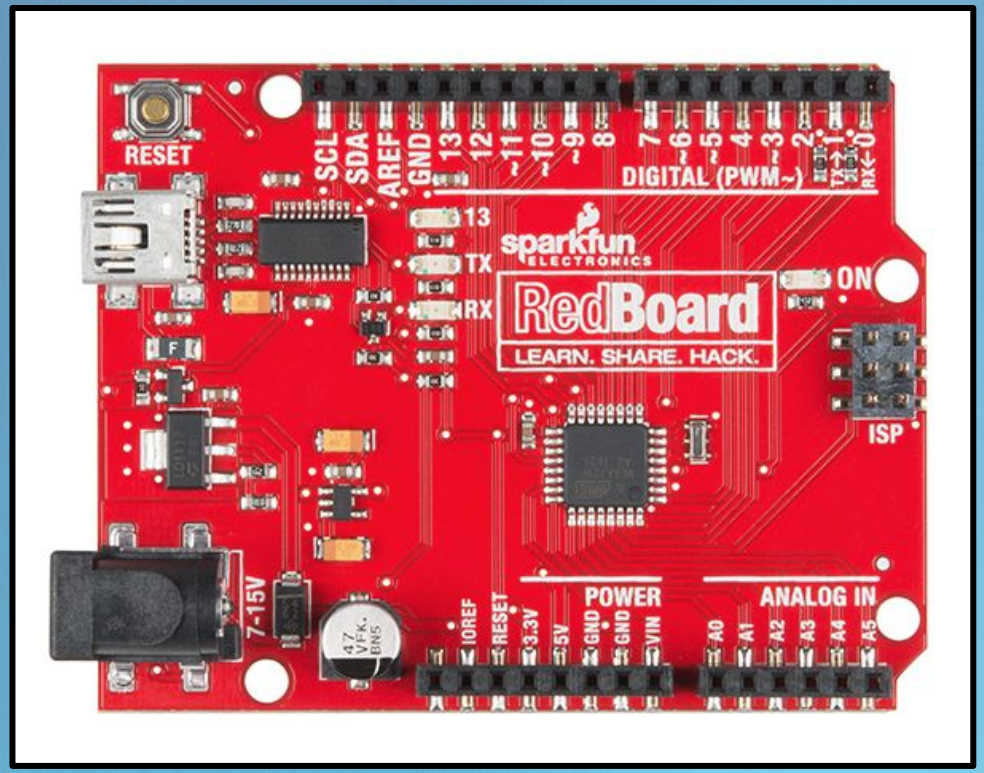
Arduino Nano





Lilypad Arduino

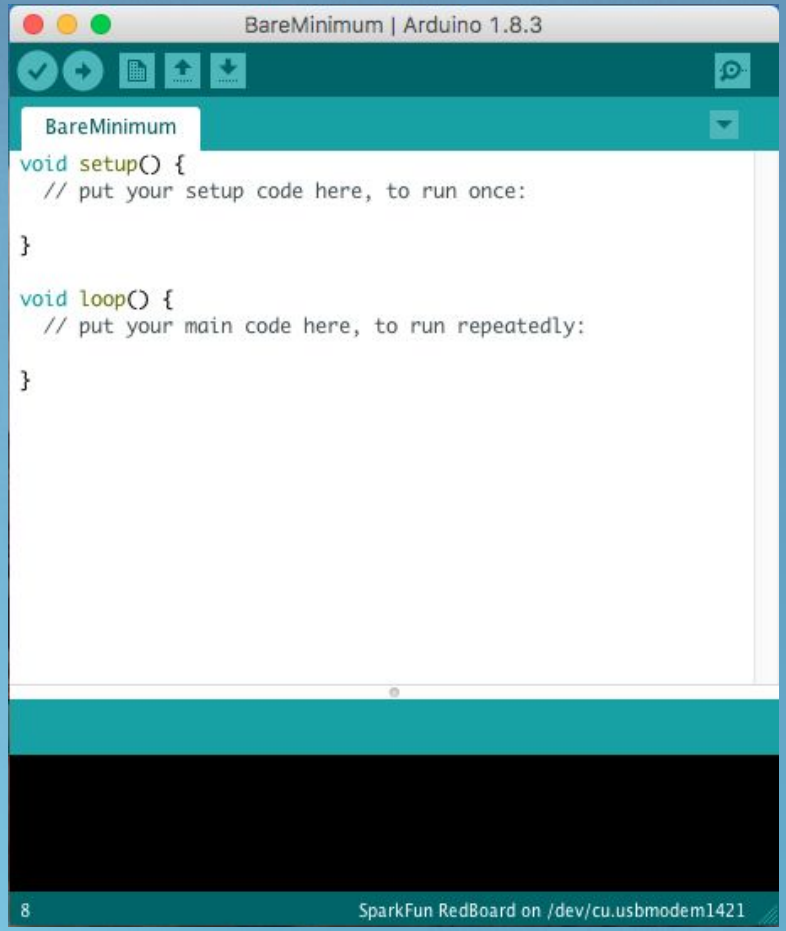
Basic Arduino Board Layout



- Headers:
  - Digital Pins: 0-13
  - Analog Pins: A0-A5
  - Power
  - +Special Functions
- Main Microcontroller Chip
  - ATmega328P
  - Arduino is all the parts combined
- Serial Programmer Chip
  - FTDI FT231XS
- Voltages:
  - VIN: 7-12V (sometimes 15V)
  - VCC_IO: 5V (sometimes 3.3V)

Arduino IDE Software

- https://www.arduino.cc/en/Main/Software#download
- Relatively Basic Coding Environment
- Calls projects: “Sketches”
- Lots of Arduino specific IDE features:
  - Has LOTS of built-in Examples
  - Includes “Libraries” for more advanced Arduino board features
- Supports multiple boards
  - Tools -> Board
- Select USB port:
  - Tolls -> Port



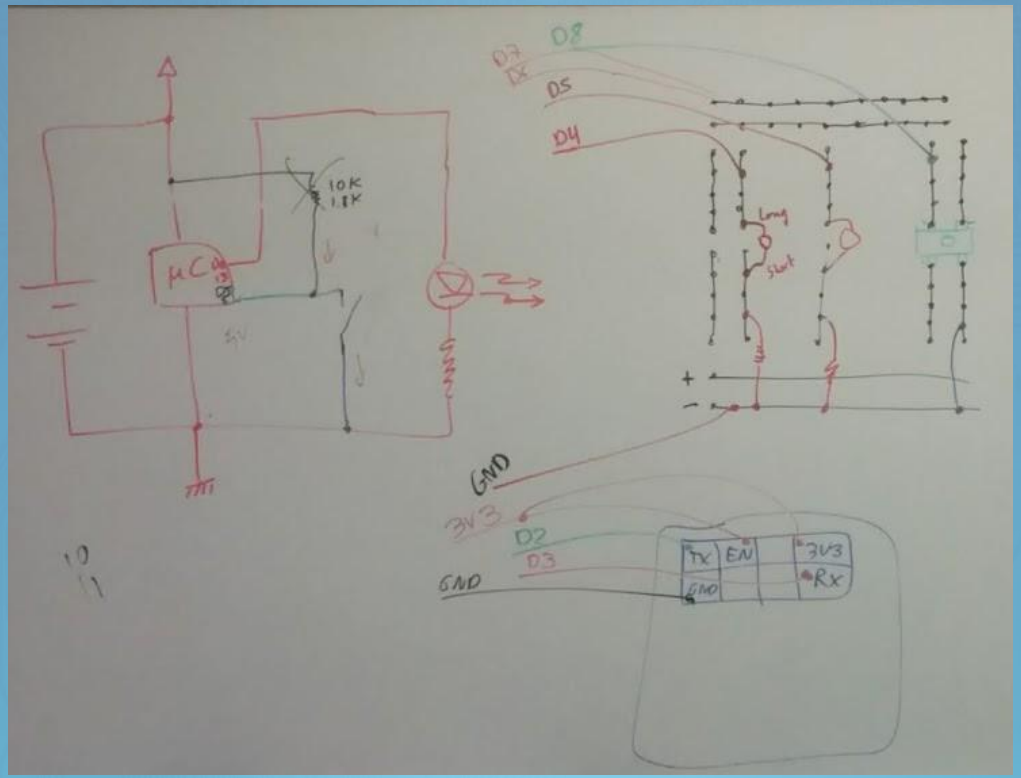
Digital Output

- Basic electrical circuit
  - V = IR
  - See picture in 2 slides
- “Blink” example (from File -> Examples -> 01.Basics)
- Doing it on a breadboard
  - See picture in 2 slides
- 4-LED chain
  - See picture in 2 slides

Digital Input

- Basic electrical circuit
  - Importance of pull-up/down resistors
  - See picture on next slide
- “DigitalReadSerial” example (from 01.Basics)
- “DigitalInputPullup” example (from 02.Digital)
- Breadboard circuit
  - See picture on next slide
- Serial monitor
  - Use it to view debug output of live program and circuit

Whiteboard Circuit Diagrams



Analog Input

- Basic electrical circuit
- “AnalogInOutSerial” example (from 03.Analog)
- 10-bit ADC - Analog to Digital Converter
- Analog input to bar graph

Other components

- Sensors
- DC motors
- Servo motors
- I2C devices
- SPI devices
- Serial devices

ESP8266 Wifi Module

- Serial module
- Jeffrey's sample code
  - https://github.com/jarcand/YPIEEE-Workshop/blob/master/Esp8266Connect/Esp8266Connect.ino
- Protocol
  - Format: "POST RFID<device-ID-number> Button<answer-letter>"
  - Ex: "POST RFID7 ButtonA"
  - Close connect after sending message
- Connect to the test server
  - https://github.com/jarcand/YPIEEE-Workshop/blob/master/TestServer/TestServer.java
  -

Arduino Links

- Arduino IDE download:
  - https://www.arduino.cc/en/Main/Software#download
- Getting Started:
  - https://www.arduino.cc/en/Guide/HomePage
- Arduino Introduction:
  - https://www.arduino.cc/en/Guide/Introduction
- Tutorials:
  - https://www.arduino.cc/en/Tutorial/HomePage
- Language Reference:
  - https://www.arduino.cc/reference/en/

RedBoard Links

- Differences between Arduino Uno and RedBoard:
  - https://learn.sparkfun.com/tutorials/redboard-vs-uno
- RedBoard Schematic:
  - https://cdn.sparkfun.com/datasheets/Dev/Arduino/Boards/RedBoard-V22.pdf
- RedBoard Graphical Pinout:
  - https://cdn.sparkfun.com/datasheets/Dev/Arduino/Boards/Redboardv1.pdf
- RedBoard Hookup Guide:
  - https://learn.sparkfun.com/tutorials/redboard-hookup-guide
- ATmega328P Datasheet (442 pages):
  - http://www.atmel.com/Images/Atmel-42735-8-bit-AVR-Microcontroller-ATmega328-328P_Datasheet.pdf