Introduction to Arduino Microcontrollers

What is a Microcontroller ?

- A Microcontroller (8 bit) does one task very fast and very well, like a cell phone, microwave, etc.

- It's does one program over and over again and never changes, programmed stored in ROM and has all I/O support hardware on board the chip.

- Can be very very low power ie. Thermostat - Nano Watts!

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What is a Microprocessor ?

A microprocessor (32/64 Bit) on the other hand can run multiple programs and change programs, just like your PC.

Does very large complex programs and very complex math and has external I/O support like video cards, audio, lan, etc. and storage on large disk.

Is a power hog! 500Watts!

The line is blurring between these two.

For example ARM processors (32 Bit) for example a smart phones.

These microcontrollers are so powerful they run multiple programs very similar to microprocessor but keep the low power characteristic of a microcontroller

Fun Fact Motorola Droid can hit 52 Mflop/s, which is more than 15 times faster than the CPUs used in the 1979 Cray-1.

What is Arduino?

- Physical computing platform
- Open source
- "Hardware Abstracted" Wiring Language
- USB programmable
- Large community
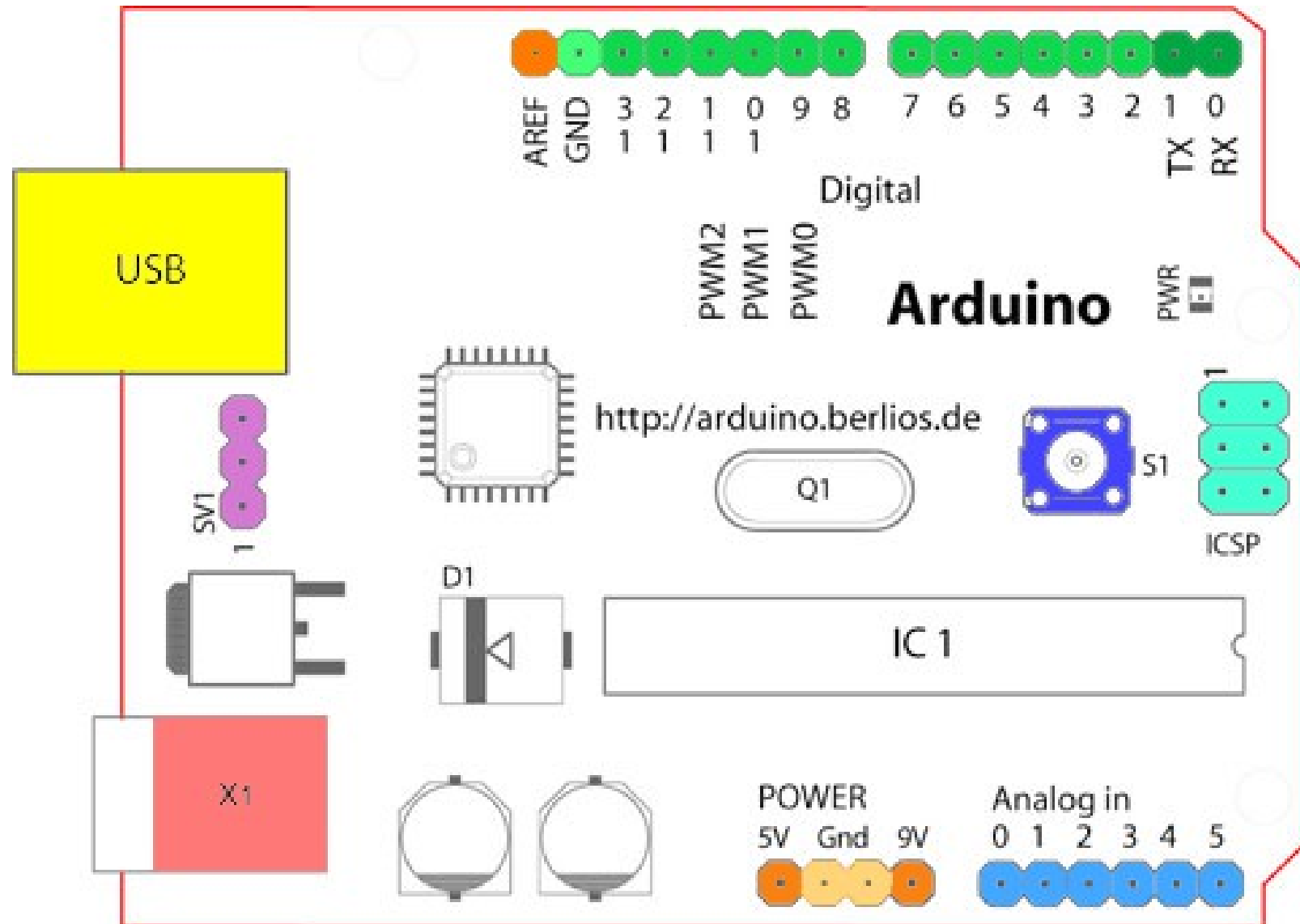- Multi platform Win/Mac/Linux
- Inexpensive
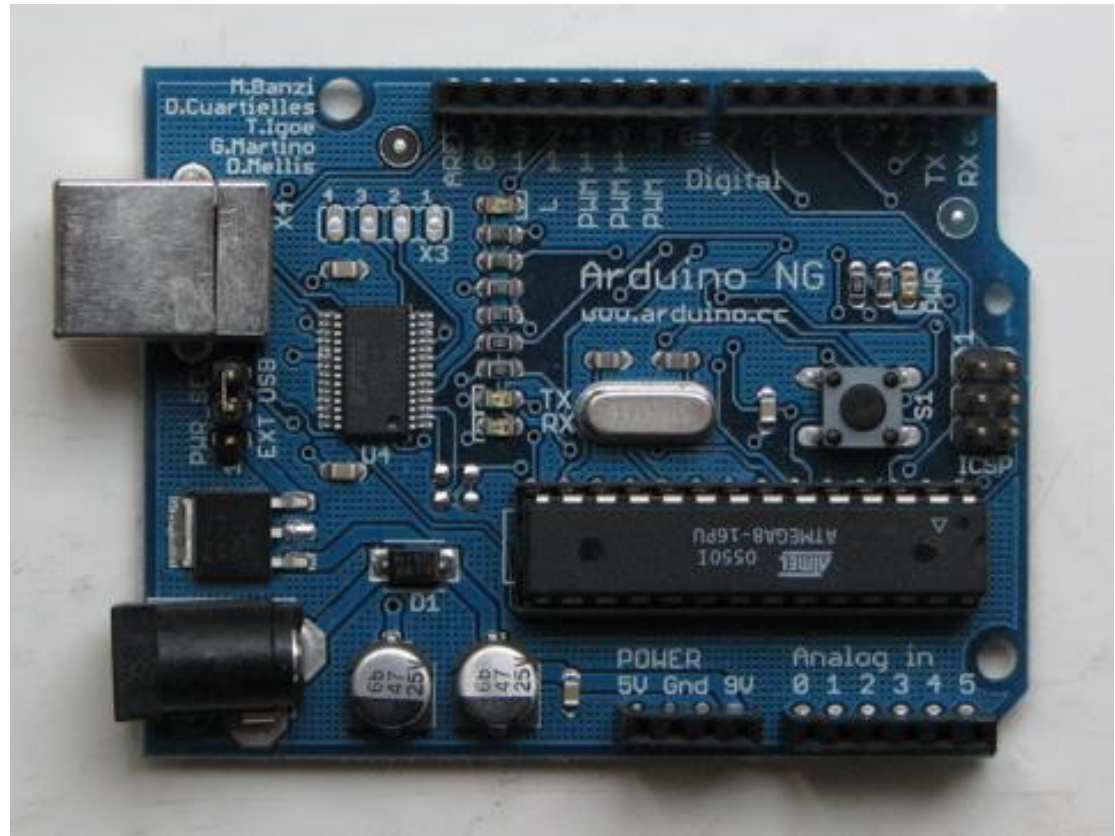
What is Arduino?

- Based on ATmega328 – 8 BIT
- w. USB interface
- Voltage regulator
- Specs
    - RISC @ 16 Mhz, 20 MIPS
    - 32 K Memory
    - 6 Ch 10 Bit A/D
    - PWM, I2C, SPI
- The "power" is in:
    - Standard board design
    - Wiring language
    - Open Source
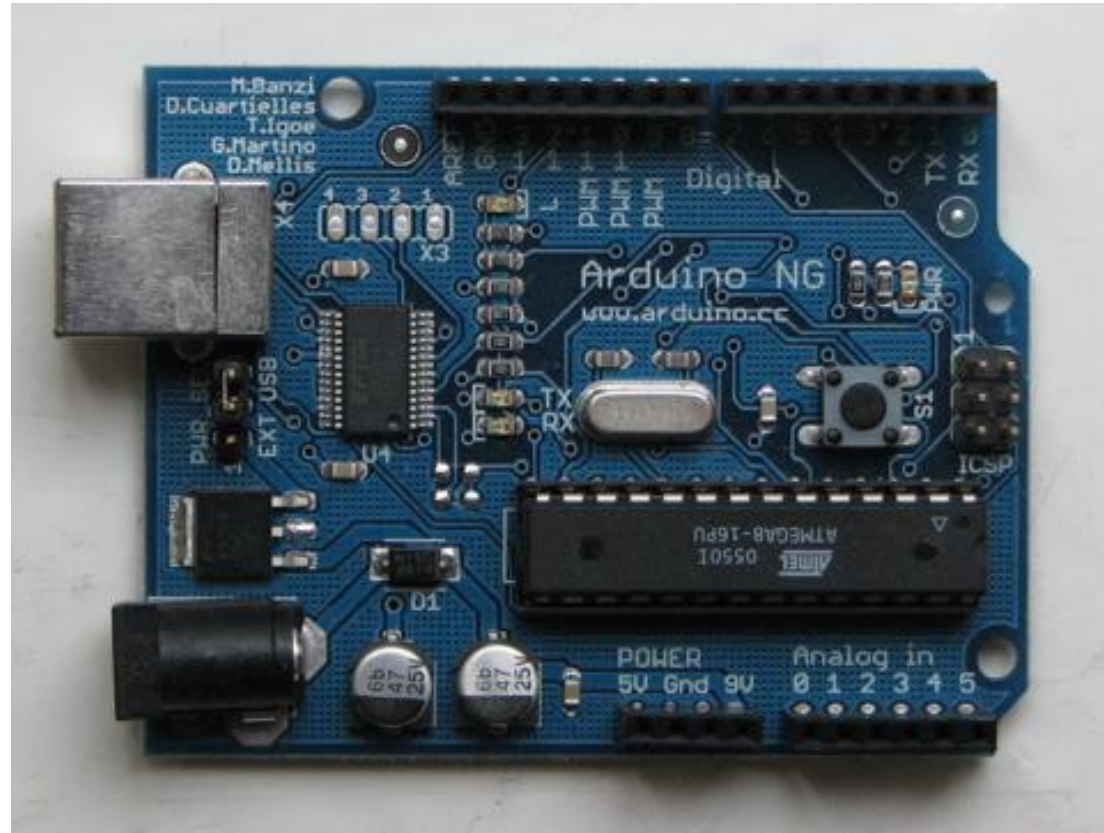
Arduino Board Overview

What do these do?

Digital IO (LEDs, switches)

Analog IO (resistive sensor data)
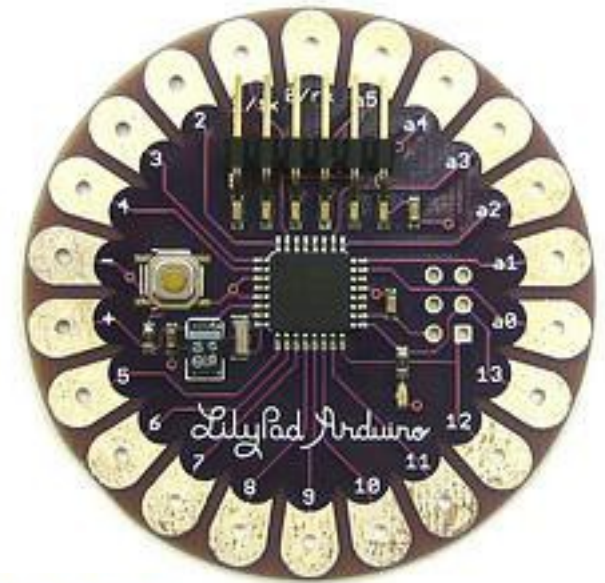
Serial Connection (Sensors, GPS, etc)

Program from your computer

Your limit is only your creativity!

Terminology

- I/O Board - main microcontroller
- Shield - add-on boards
- Sketch - the program
- Sensor - components (thermistors, etc.)
- Modules - serial data (GPS module, etc.)

Arduino I/O Boards

14 current boards

Shields

Datalogging Shield

Wave Shield

Touchscreen Shield

More Shields...

XBee Shield

Ethernet Shield

Wifi Shield
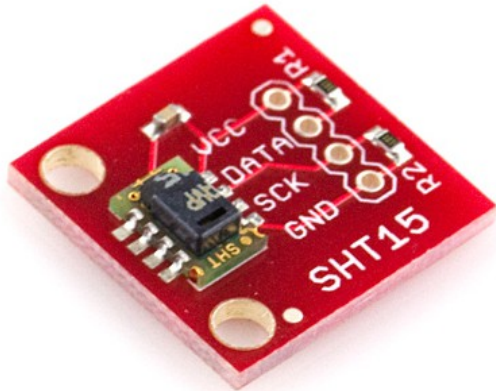
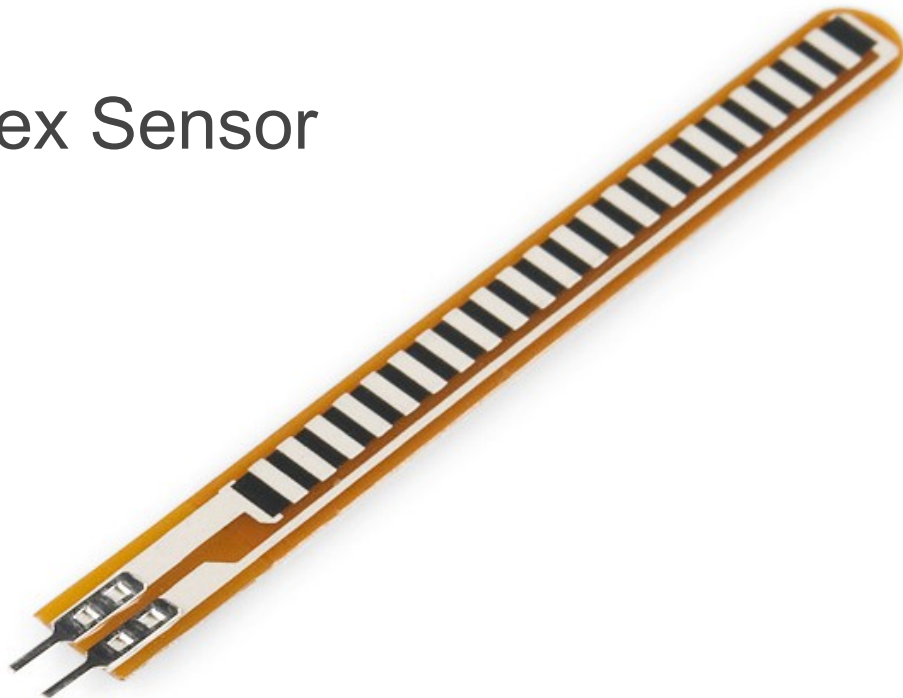# Even more shields!
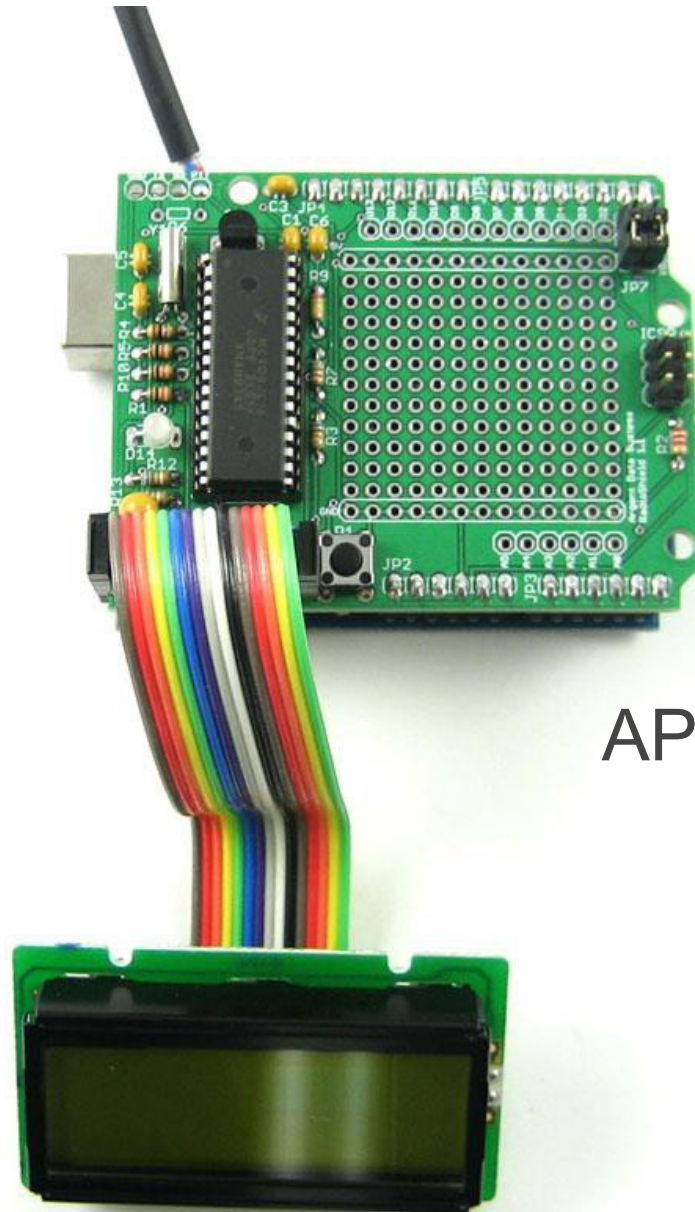
APRS Shield

Sensors

Fingerprint Scanner

Gas Sensor

Temp & Humidity

Flex Sensor

Geiger Counter

Sensors

Photo/thermistor, infared, force sensitive resistor, Hall effect, Piezo, tilt sensor..