



webinale

the holistic web conference

2010



Justin Mclean, Class Software

Connecting Hardware to Rich Internet Applications

Flex and the Arduino platform

Who am I?

- ✕ Director of Class Software for 10 + years
- ✕ Developing and creating web applications for 15 years
- ✕ Programming for 25 years
- ✕ Adobe community professional in Flex
- ✕ Adobe certified developer and trainer in ColdFusion and Flex
- ✕ Based in Sydney Australia



Electronics Trends

- ✕ Low cost components
- ✕ Small components
- ✕ Complex components with simple standard interfaces



Computing Trends

- ✕ Easier to program
- ✕ Use of high level languages
- ✕ Software tools
- ✕ Open source



Are We There Yet?

- ✕ Low cost fast devices
- ✕ It's easy to communicate between devices and computers
- ✕ Can build complex systems from off the shelf components





Arduino

Overview of the Arduino Platform



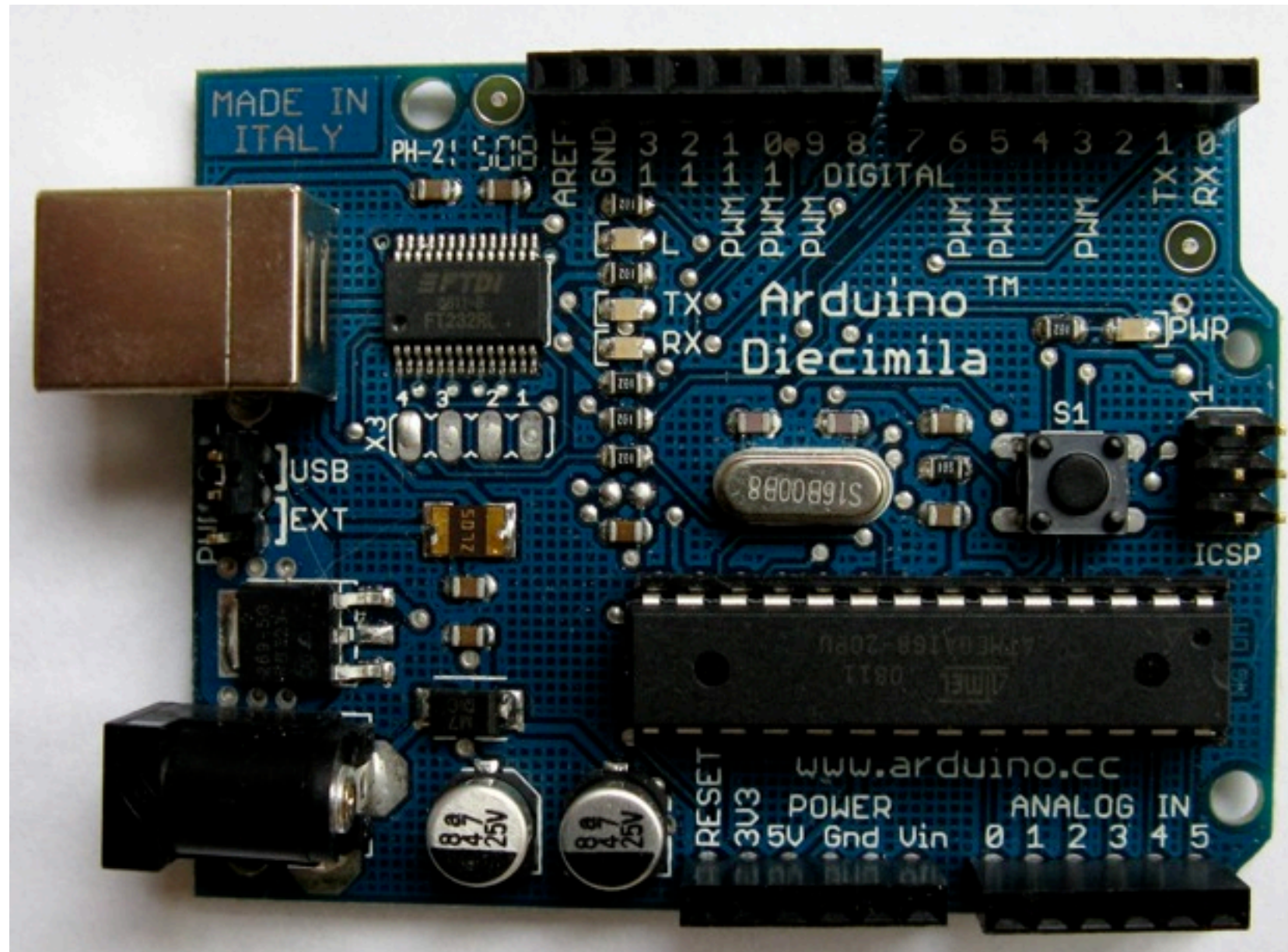
Arduino Platform

- ✕ Open source hardware and software platform
- ✕ Easy to program
- ✕ Hardware is flexible, fast, low power and low cost

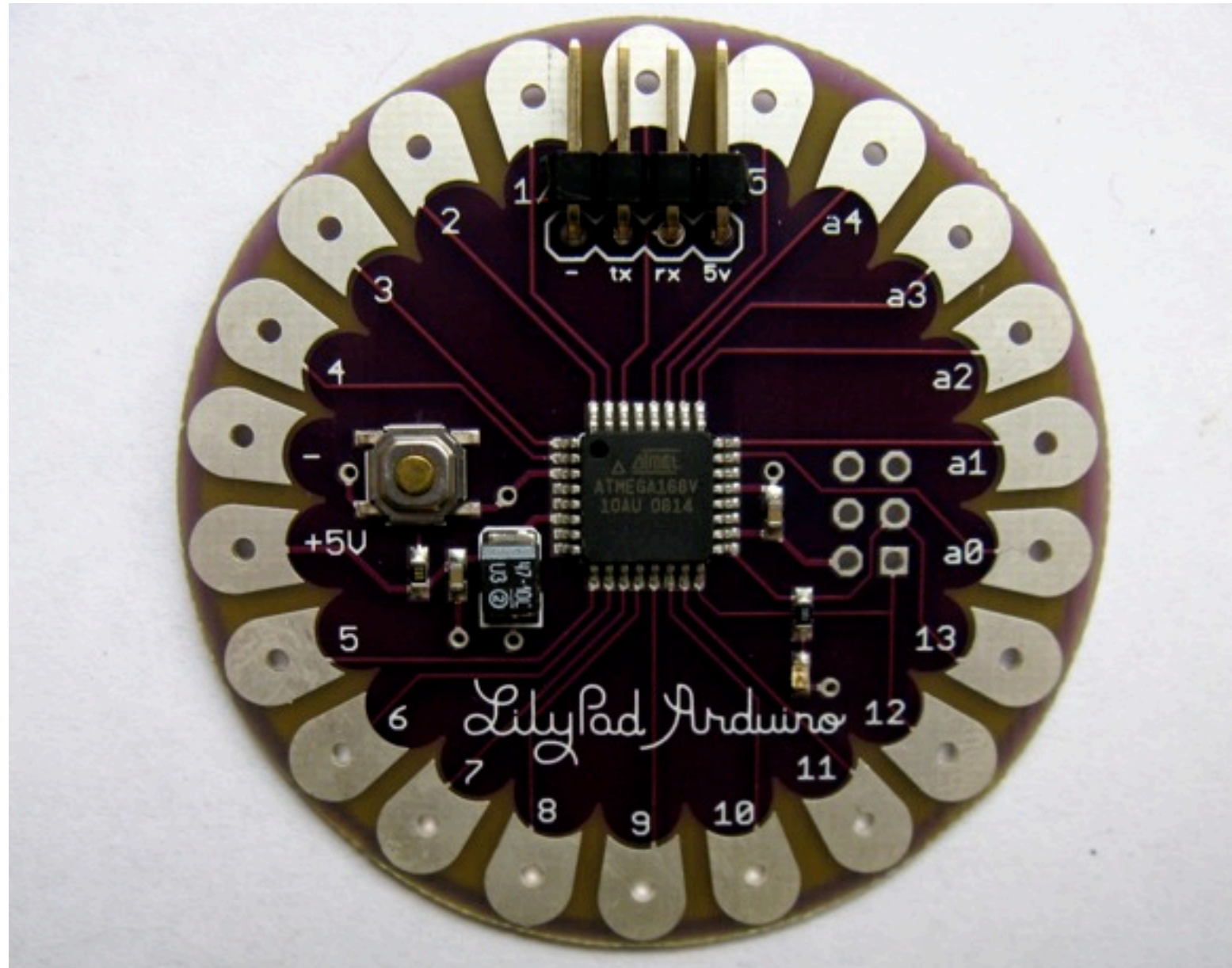
Arduino Hardware

- × Comes in a number of shapes sizes
- × Low cost
- × Easy to extend
- × Digital inputs/outputs
- × Analog inputs

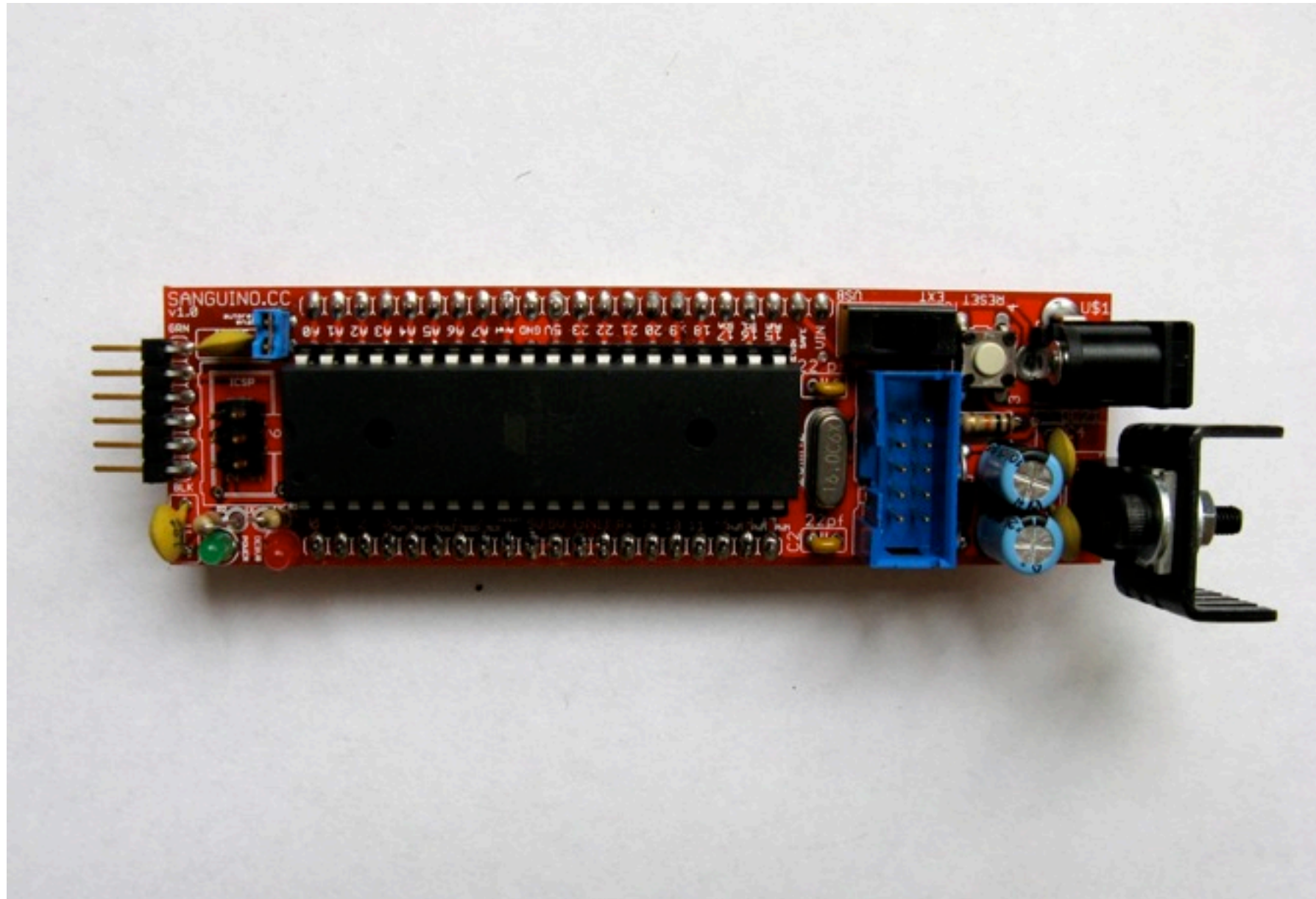
Arduino Boards



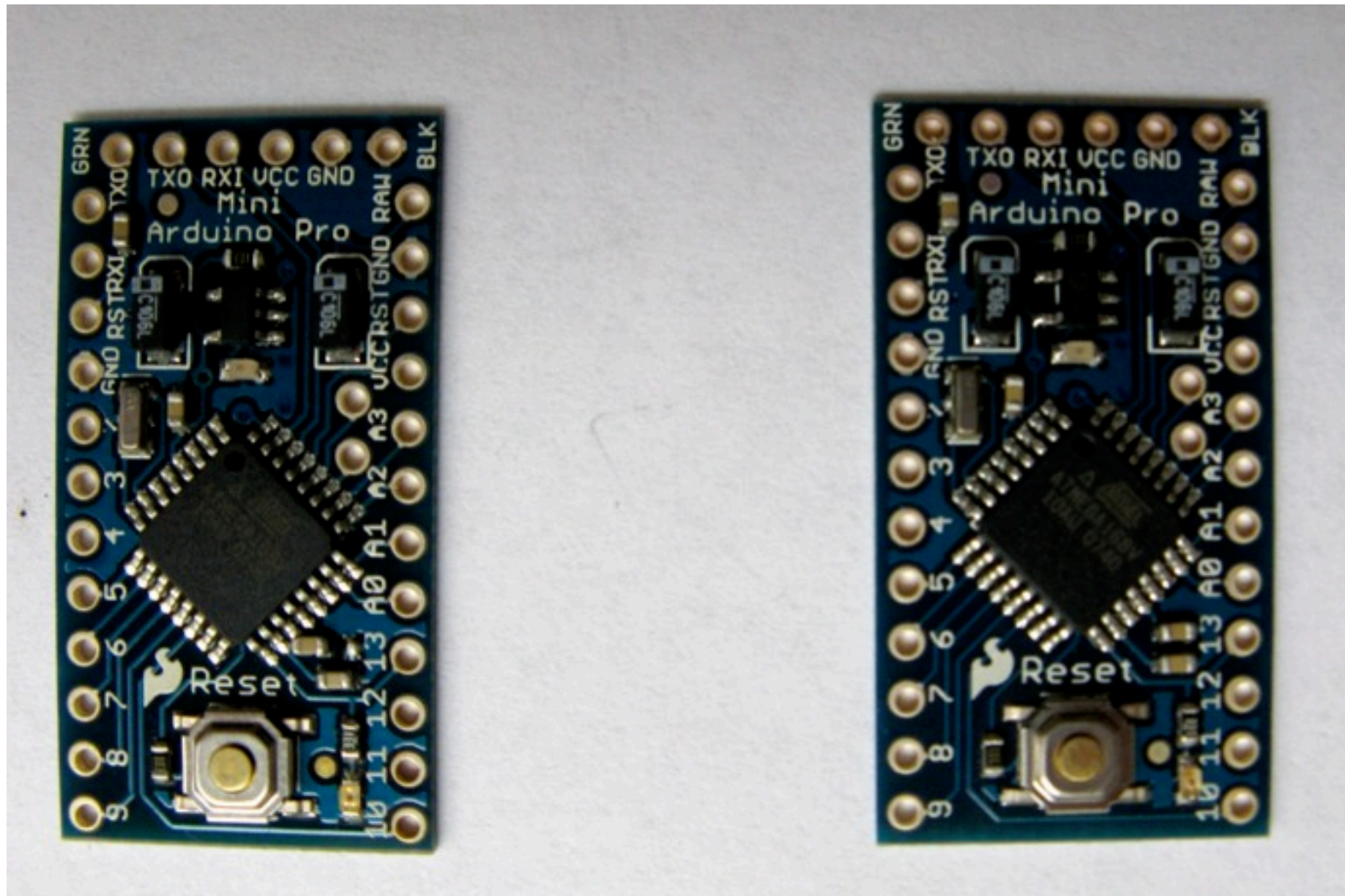
Arduino Boards



Arduino Boards



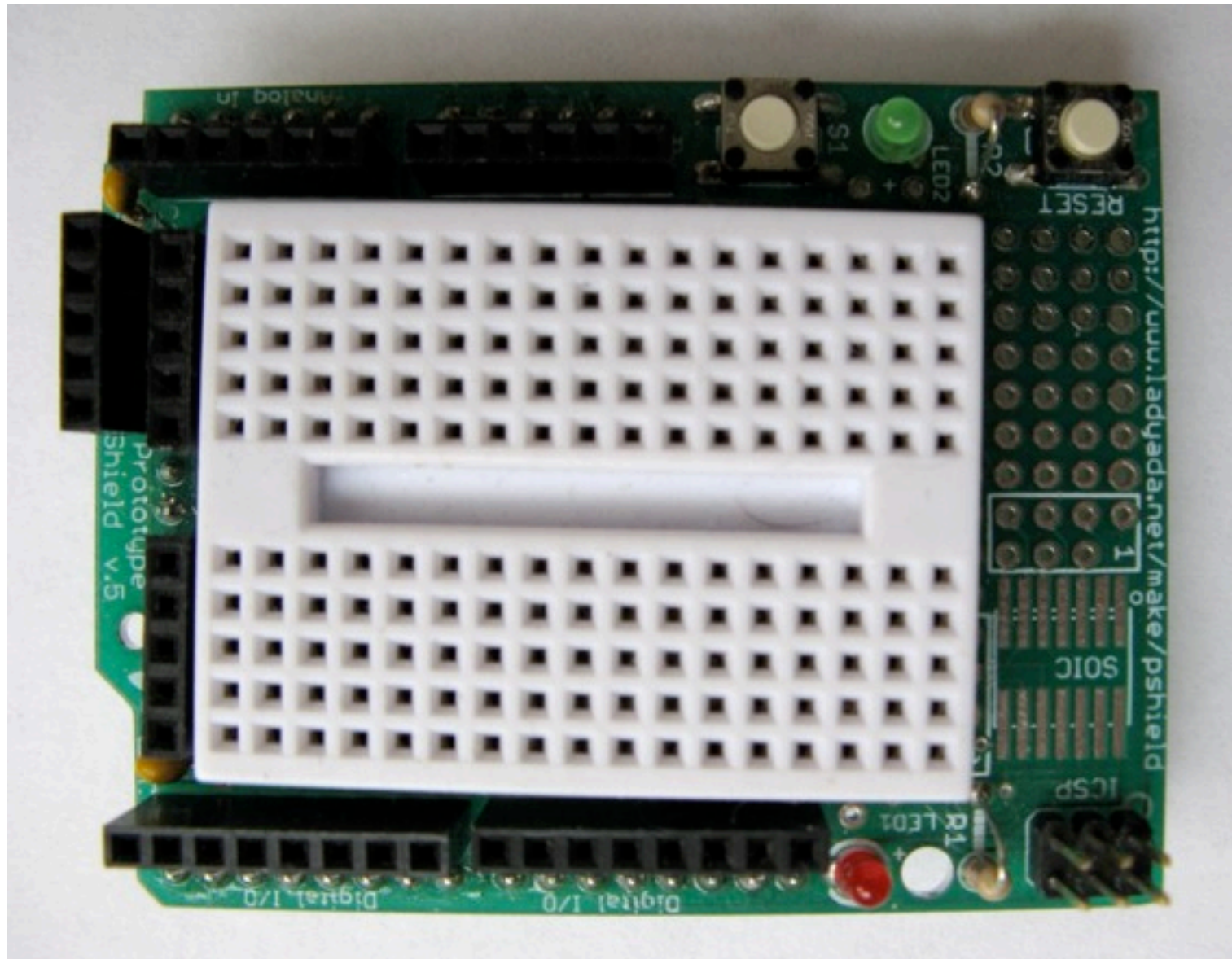
Arduino Boards



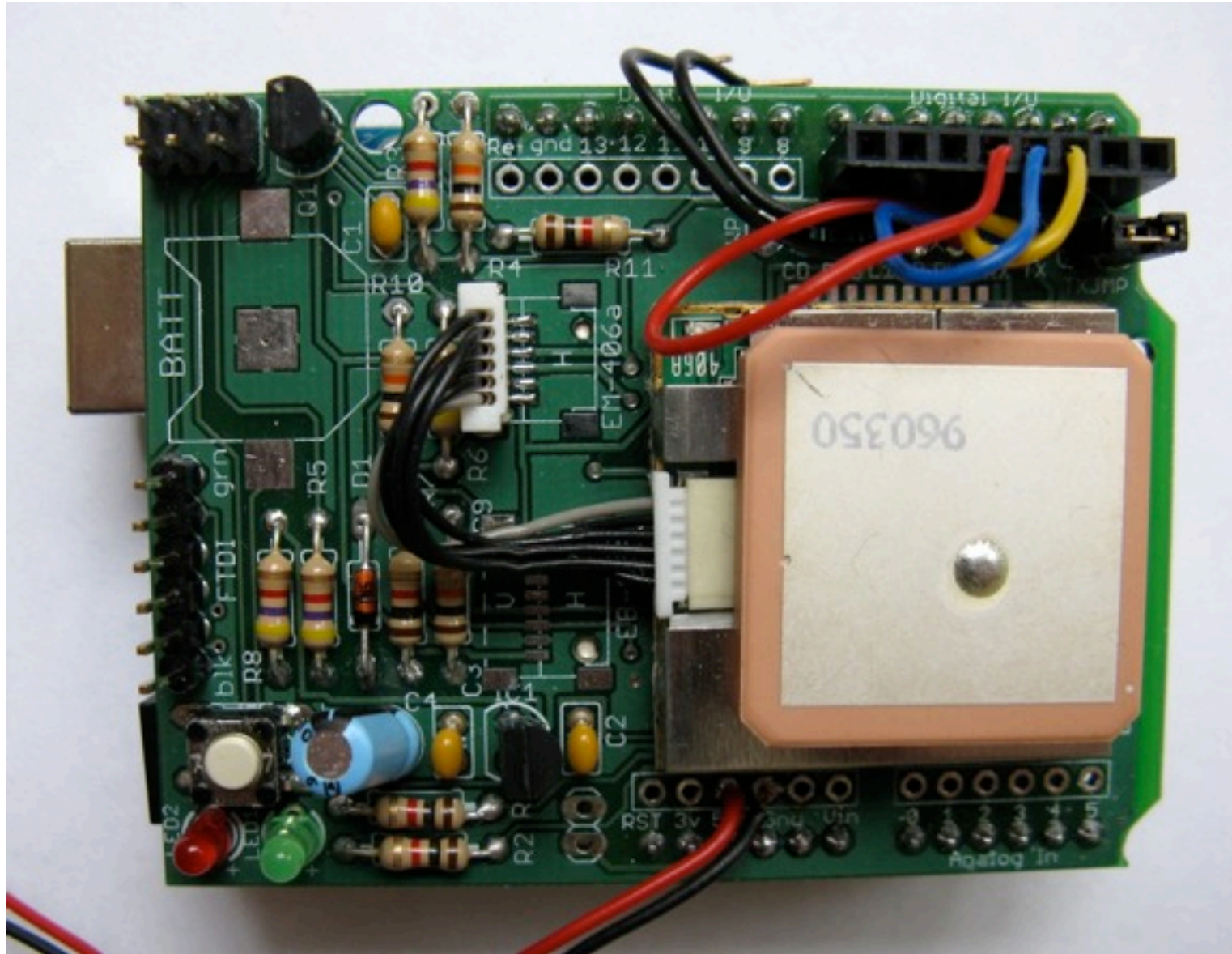
Arduino Shields



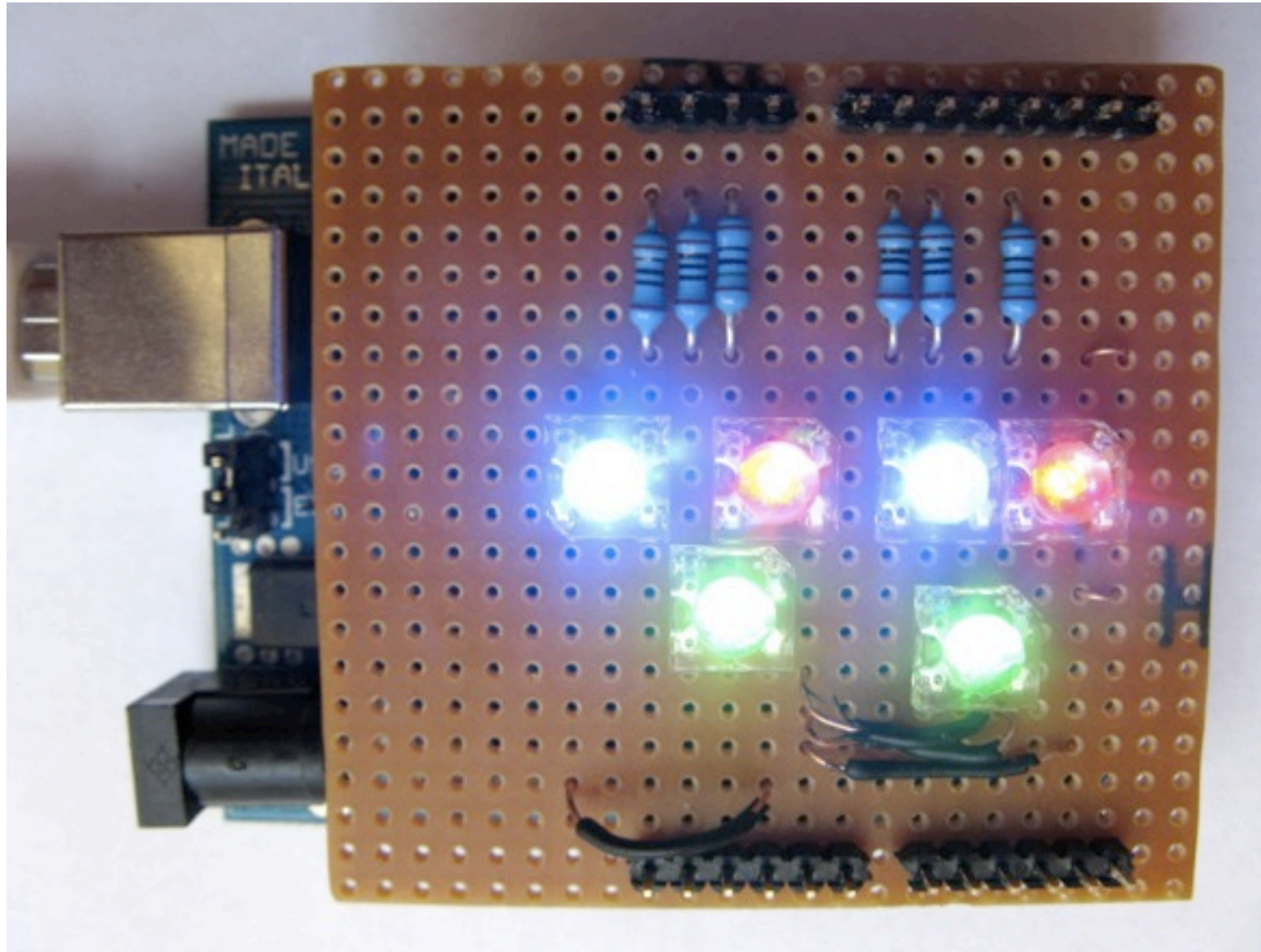
Arduino Shields



Arduino Shields



Arduino Shields



Arduino Software Platform

- ✕ Open source cross platform IDE
- ✕ Alpha but very stable
- ✕ Updated frequently
- ✕ Growing and active community



Arduino Code

- ✕ C like high level language
- ✕ Inbuilt functions to read and set digital and analog inputs and outputs
- ✕ Includes libraries to perform common hardware or software tasks
- ✕ Once uploaded programs are permanent

Arduino IDE

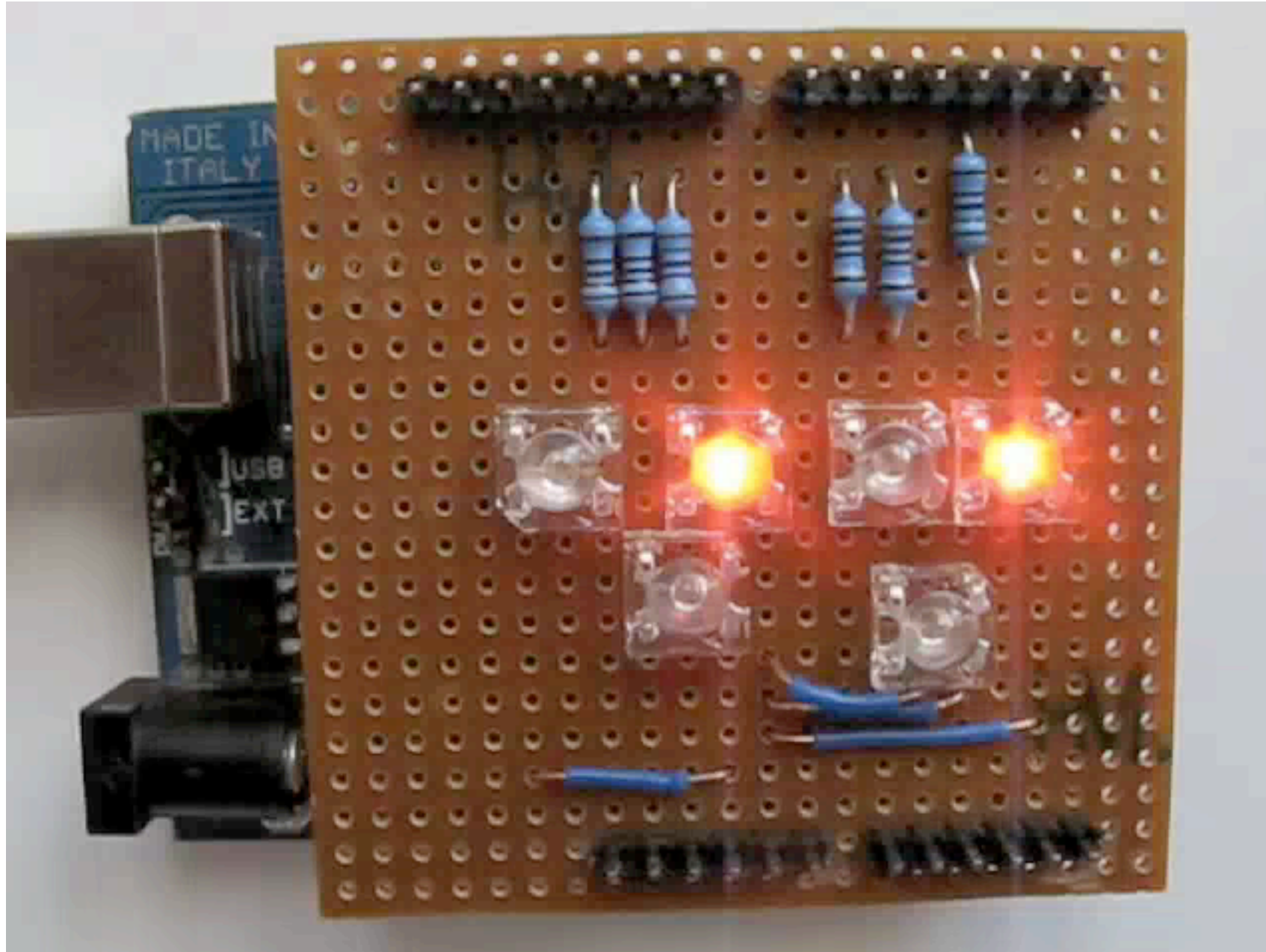
A screenshot of the Arduino IDE interface. The top toolbar shows icons for running, stopping, saving, and other functions. The main text area contains C++ code for controlling three LEDs (red, green, blue) with specific pin numbers and scaling factors. The code is color-coded: keywords in blue, integers in orange, floats in green, and strings in red. The bottom of the IDE shows a dark area for the serial monitor and a light blue area for the hardware component selection.

```
int redLed[] = {3,9};  
int greenLed[] = {5,10};  
int blueLed[] = {6,11};  
  
float redFactor = 1.0;  
float greenFactor = 76.0/160.0;  
float blueFactor = 76.0/85.0;  
  
void setLedColour(int led, int red, int green, int blue) {  
    int redMod = int(red*redFactor);  
    int greenMod = int(green*greenFactor);  
    int blueMod = int(blue*blueFactor);  
  
    Serial.print(redMod, DEC);  
    Serial.print(' ');
```

Led Shield Demo



Led Shield Demo



Issues

- ✕ Debugging can be hard
- ✕ No simulator
- ✕ Memory, power and speed limits
- ✕ Helps to have a little electronics knowledge



Connecting Arduinos to the Web

How Arduinos can communicate with the world



Connection Methods

- ✕ Direct to computer (USB)
- ✕ Wireless (XBee modems)
- ✕ Ethernet or WiFi
- ✕ “The Cloud”



Supported Languages

- × Flash and Flex
- × Processing
- × Python
- × Ruby
- × Java
- × C, C++, C# and Objective C
- × .NET



Flex

Flex to Arduino direct connection

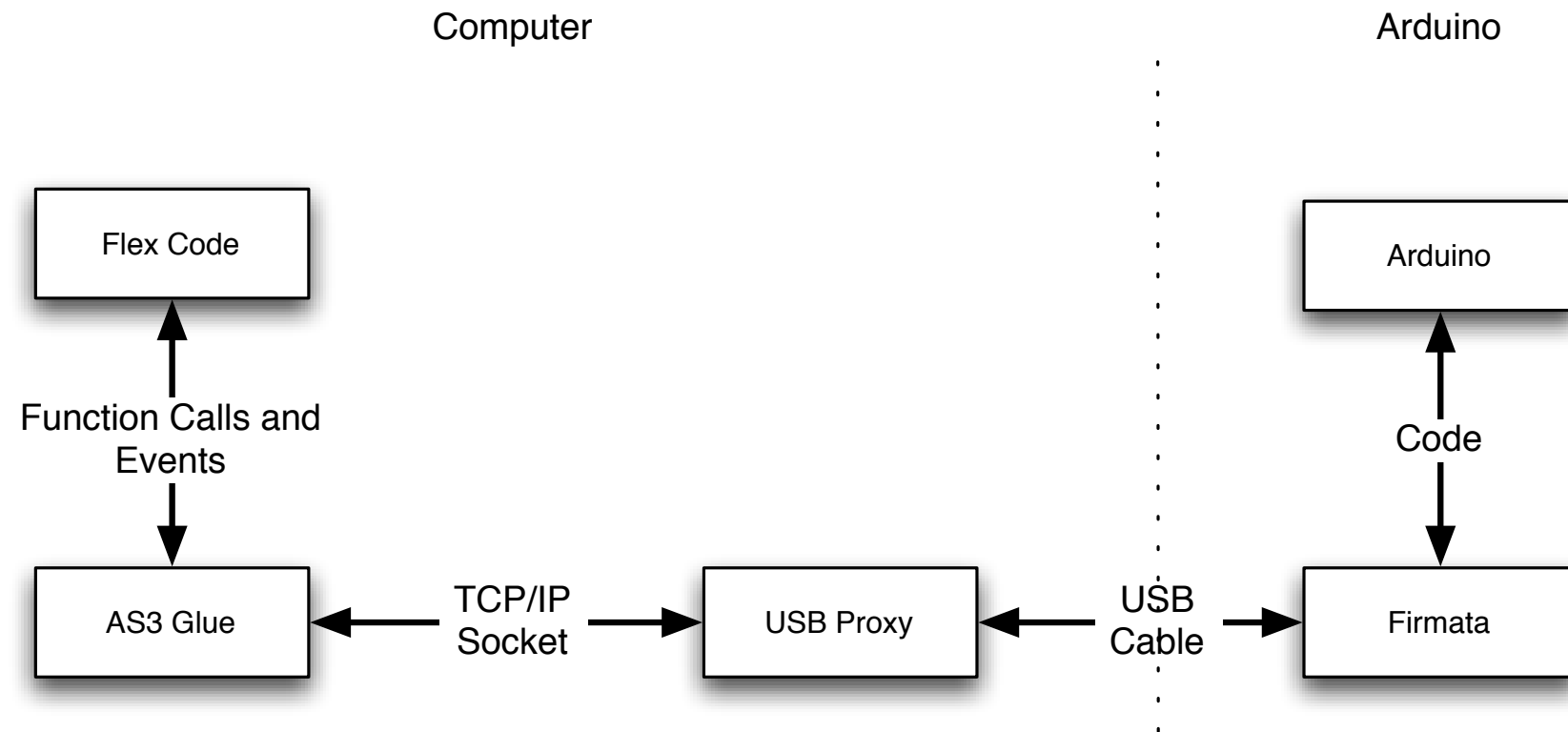


Layers of Communication

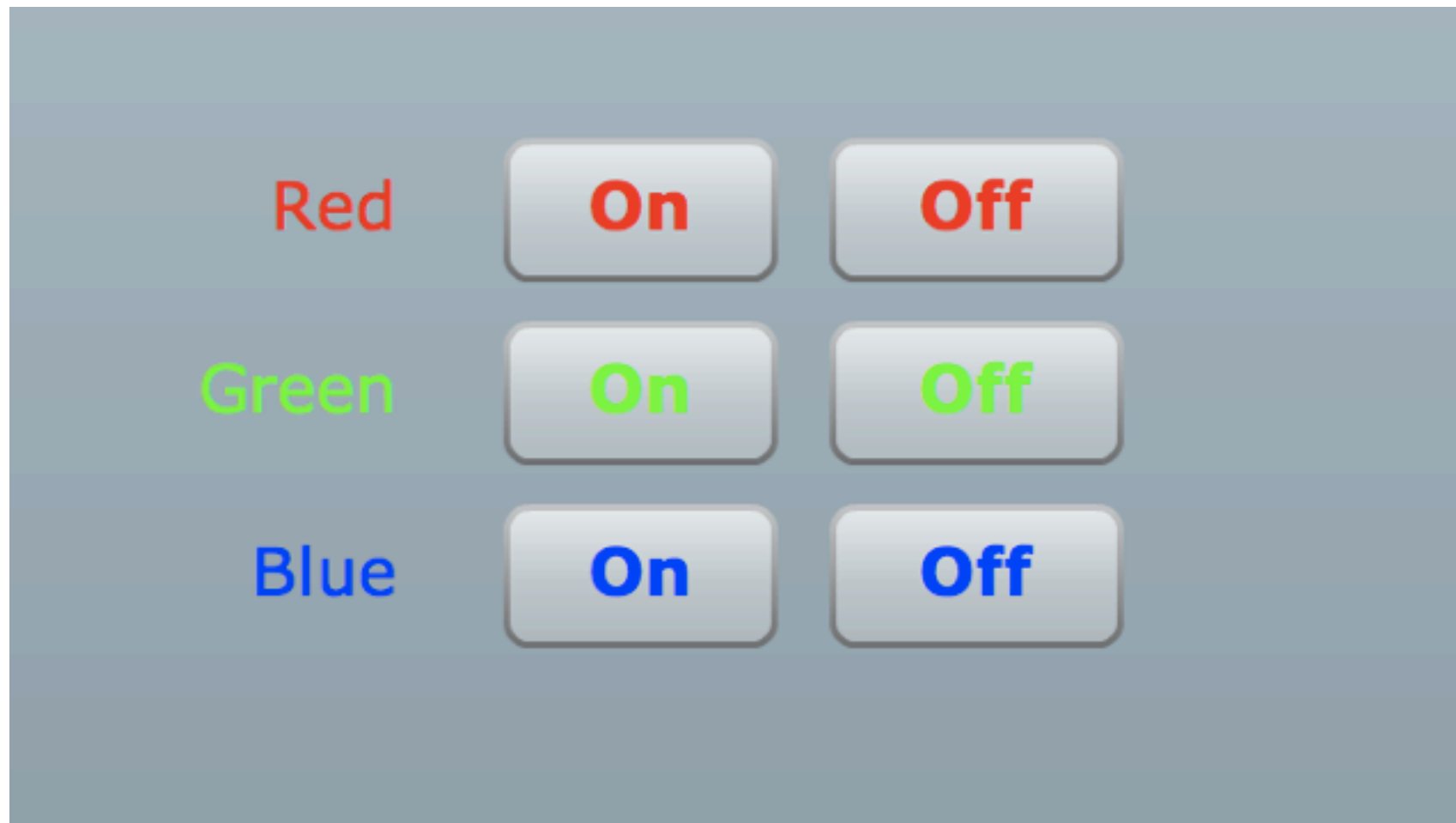
- ✕ Flex to proxy via an Actionscript library
- ✕ Proxy to USB communication
- ✕ USB to arduino



Flex to Arduino



Flex Led Demo



AS3Glue Digital Output

- ✕ Create arduino instance
`var arduino:Arduino = new Arduino();`
- ✕ Wait for firmware version
- ✕ Set digital pin as output
`arduino.setPinMode(pin, Arduino.OUTPUT);`
- ✕ Turn digital output on
`arduino.writeDigitalPin(pin, Arduino.HIGH);`



Danger Shield Demo



AS3Glue Analog Input

- ✕ Turn on analog reporting

```
arduino.setAnalogPinReporting(pin, Arduino.ON);
```

- ✕ Listen for changes via event listener

```
arduino.addEventListener  
(ArduinoEvent.ANALOG_DATA, onReceiveData);
```

```
public function onReceiveData  
(event:ArduinoEvent):void {
```

```
....  
}
```





Ethernet

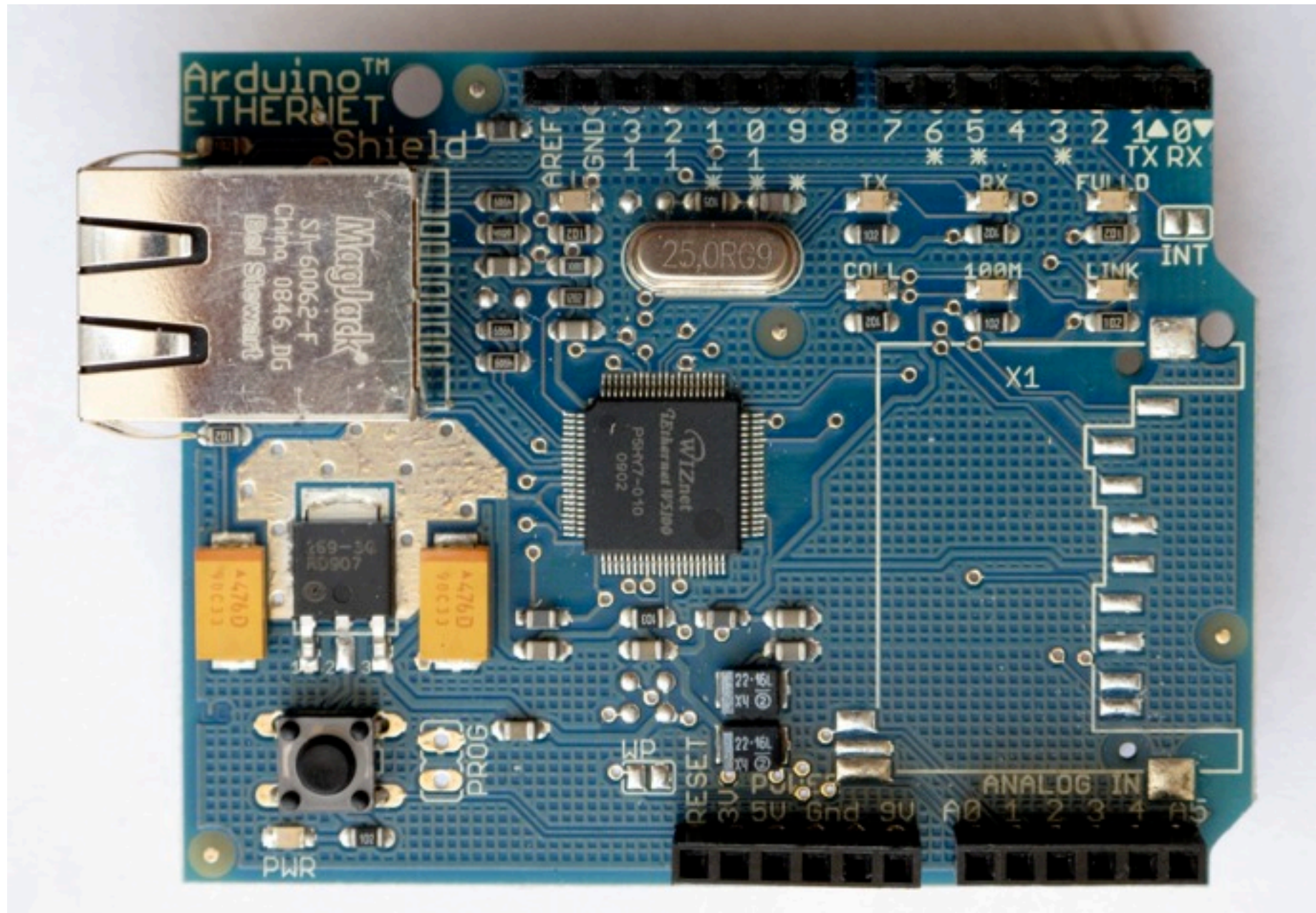
Using Arduino Ethernet Shields



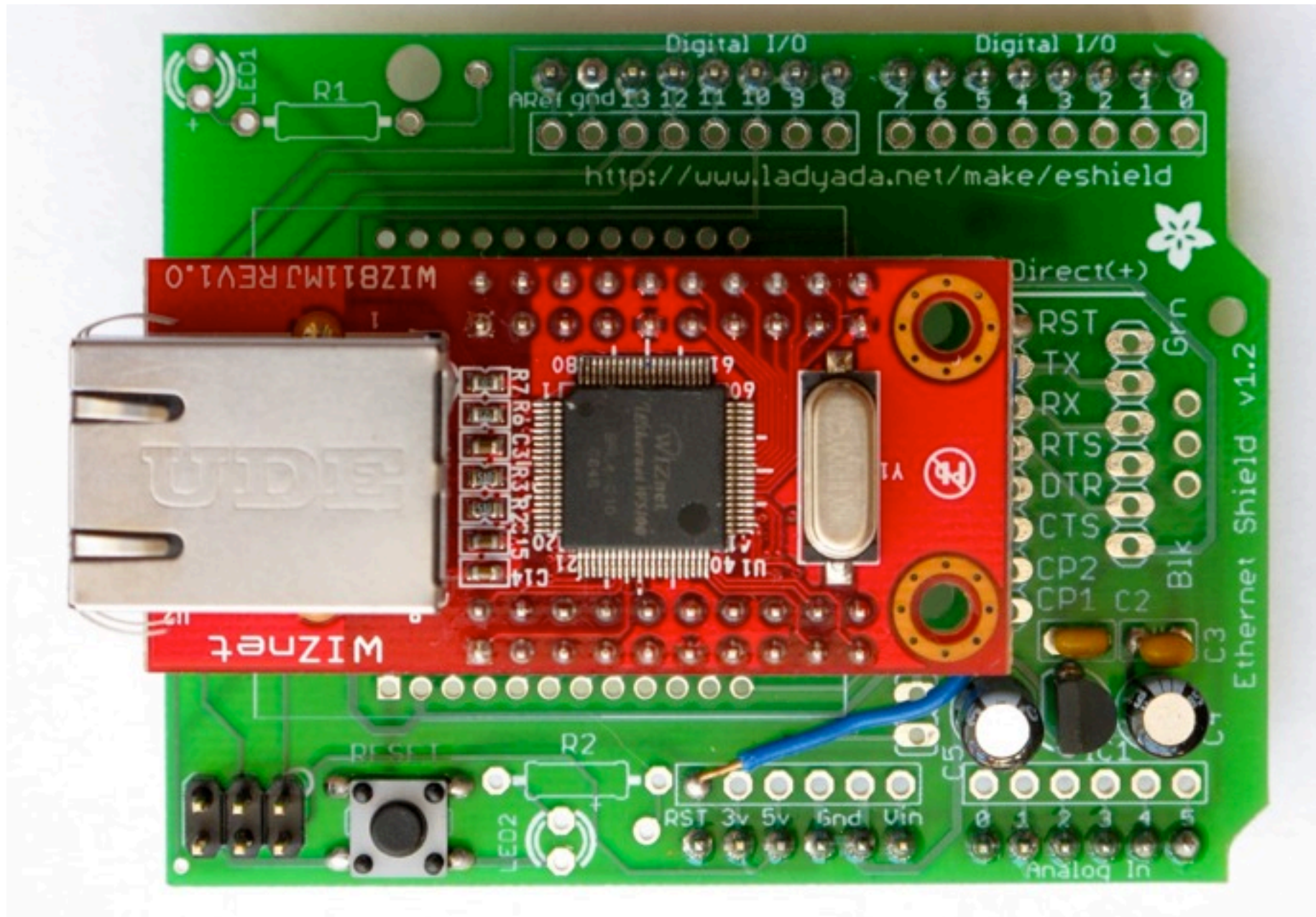
Ethernet Shields

- ✕ Allow direct internet connection
- ✕ No dedicated PC needed
- ✕ Shields need a little config
- ✕ Can act as web server or client

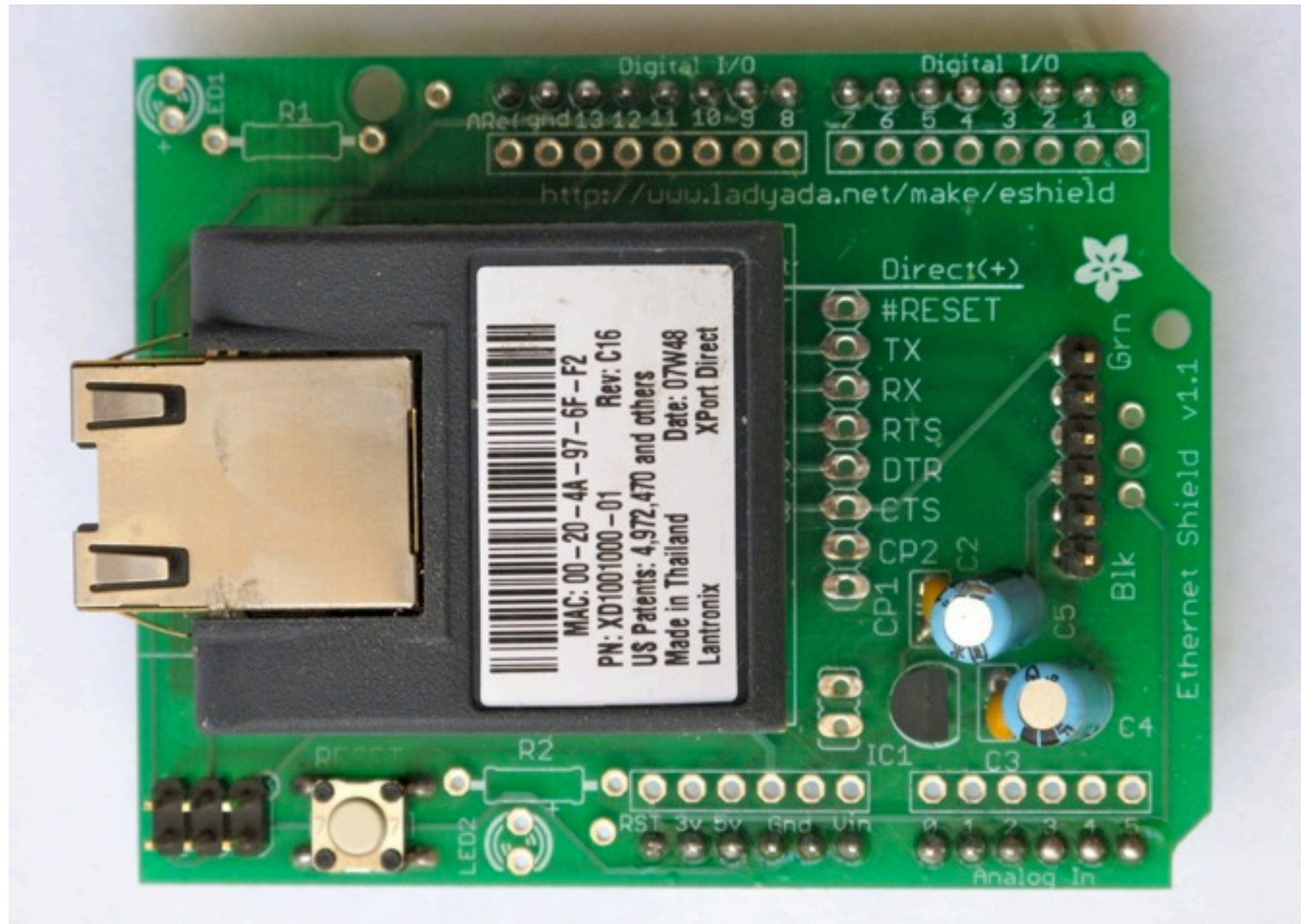
Ethernet Shields



Ethernet Shields



Ethernet Shields



Web Servers

- × Simpler than you think
- × A web server:
 - × Listens for connections
 - × Parse requests
 - × Send back status messages/resources requested



HTTP Requests

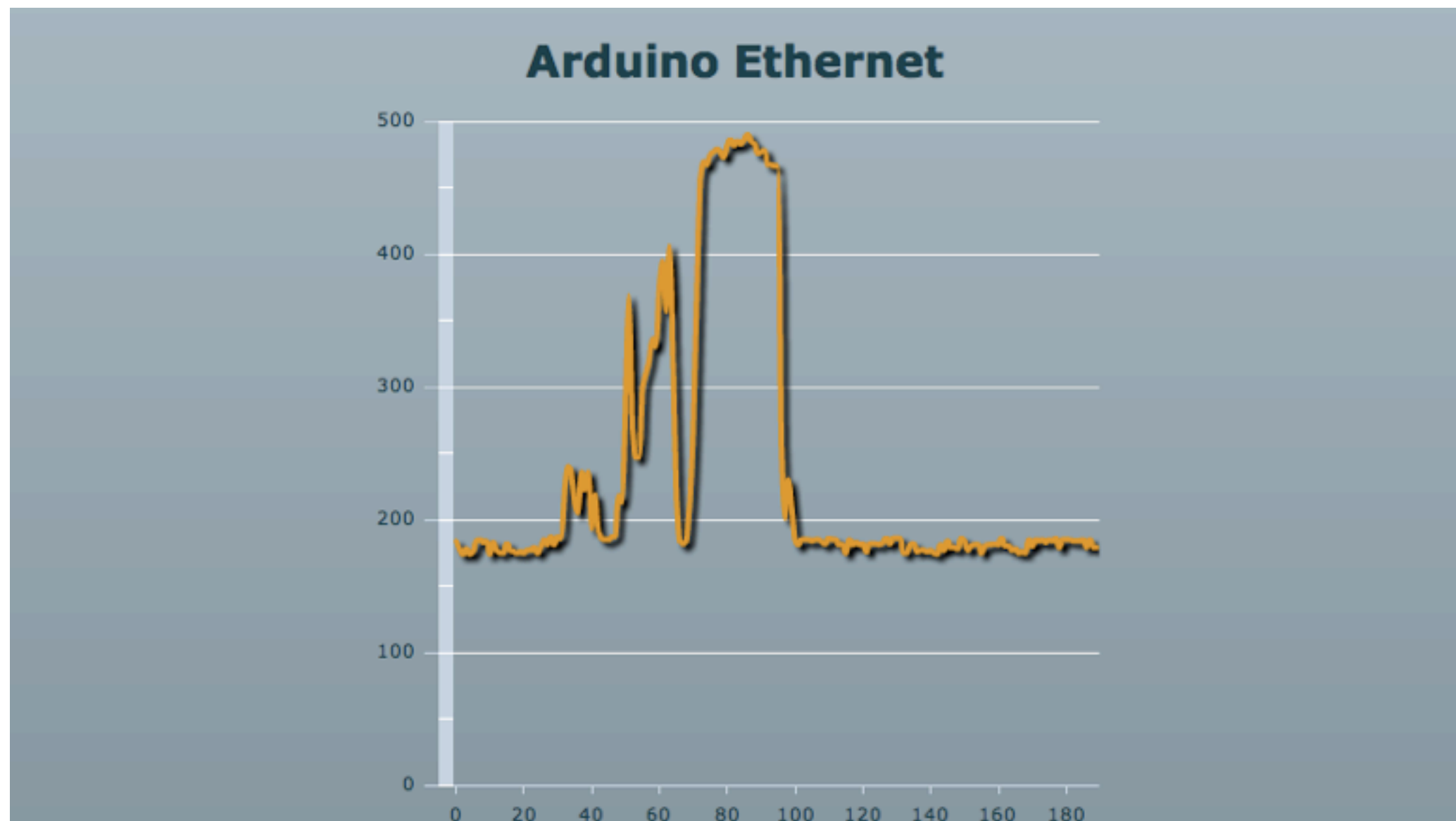
- ✕ Start with request "GET index.html HTTP/1.1"
- ✕ Optional headers "Accept-Language: en"
- ✕ Empty line
- ✕ Optional message body (POST and other requests)

Ethernet Arduino Code

- ✕ Web server code
- ✕ Easy to modify



Ethernet Demo





Rich Internet Applications

Ideas on how and where to use this technology



Environmental Monitoring

- ✕Indoors or outdoors
- ✕Wide range of sensors
- ✕Sleep mode/low power consumption



Home Automation

- ✕ Power and utilities monitoring
- ✕ Controlling Lights and Heating/Cooling
- ✕ Garden watering/monitoring



Security and Safety

- ✕ Security systems
- ✕ Location reporting
- ✕ Bike jackets



Why do this?

- ✕ Expose yourself to new ideas and new ways of solving problems
- ✕ Involves interaction with the real world
- ✕ Encourages creativity
- ✕ Makes you a better programmer



It's Fun!



Questions?

Ask now, see me after session or email
justin@classsoftware.com

Slides and code can be found at
<http://blog.classsoftware.com/>



Useful Sites

List of useful hardware and software sites



Software Sites

- ✕ Arduino <http://www.arduino.cc> for software, user forum and playground
- ✕ Ethernet Shields <http://arduino.cc/en/Reference/Ethernet>
- ✕ Pachhub <http://www.pachube.com/>

Hardware Sites

- ✕ Spark Fun (US) <http://www.sparcfun.com/>
- ✕ Adafruit Industries (US) <http://www.adafruit.com/>
- ✕ Electronic Goldmine (US) <http://www.goldmine-elec.com/>



Other Sites

- ✕ Lady Ada <http://www.ladyada.com/>
- ✕ Evil Mad Scientist <http://www.evilmadscientist.com/>
- ✕ NY Resistor <http://www.nycresistor.com/>
- ✕ Make Zine <http://www.makezine.com/>

