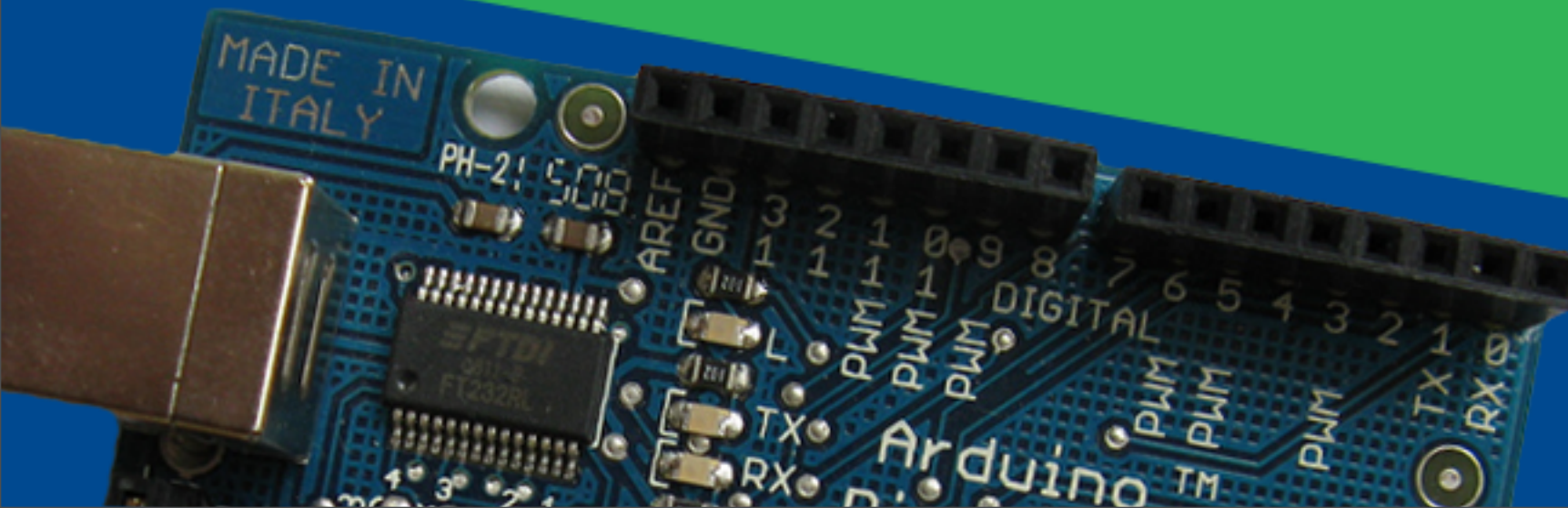


Connecting Hardware to Flex



A practical guide to connecting open source hardware (Arduino's) to Flex

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Class Software



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Who am I?

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



Electronics Trends

- Low cost small components
- More complex components with simple standard interfaces
- Cheap low volume board manufacture



Computing Trends

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



Communication Trends

- Low cost long range wireless
- Mesh networks



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
- Commercial and open source products and kits are available



Arduino



Open source hardware and software
platform



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Arduino Platform

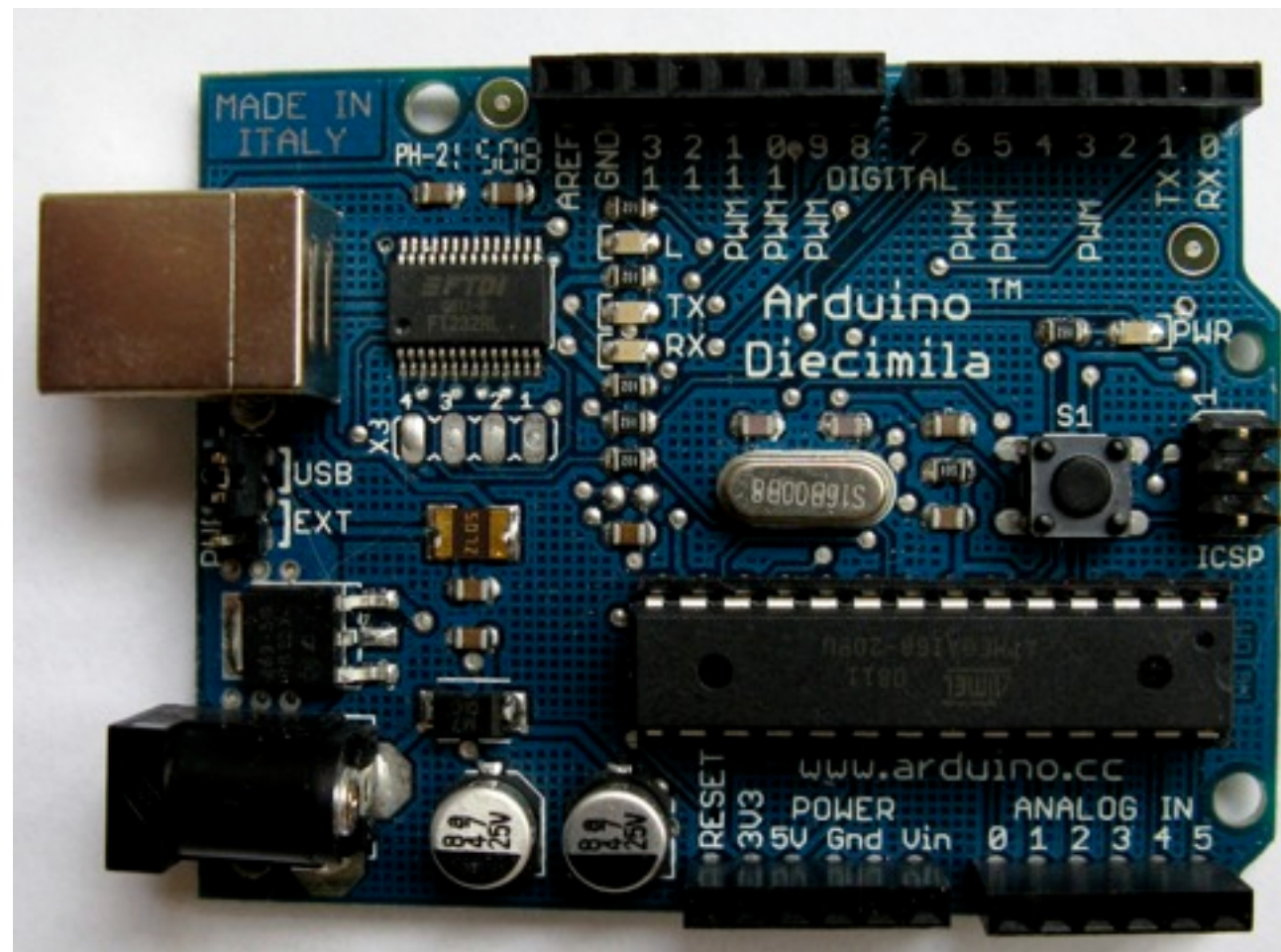
- Open source hardware and software platform
- Easy to program
- Hardware is flexible, fast, low power and low cost



Arduino Hardware

- Comes in a number of shapes sizes
- Low cost
- Easy to program
- Easy to extend

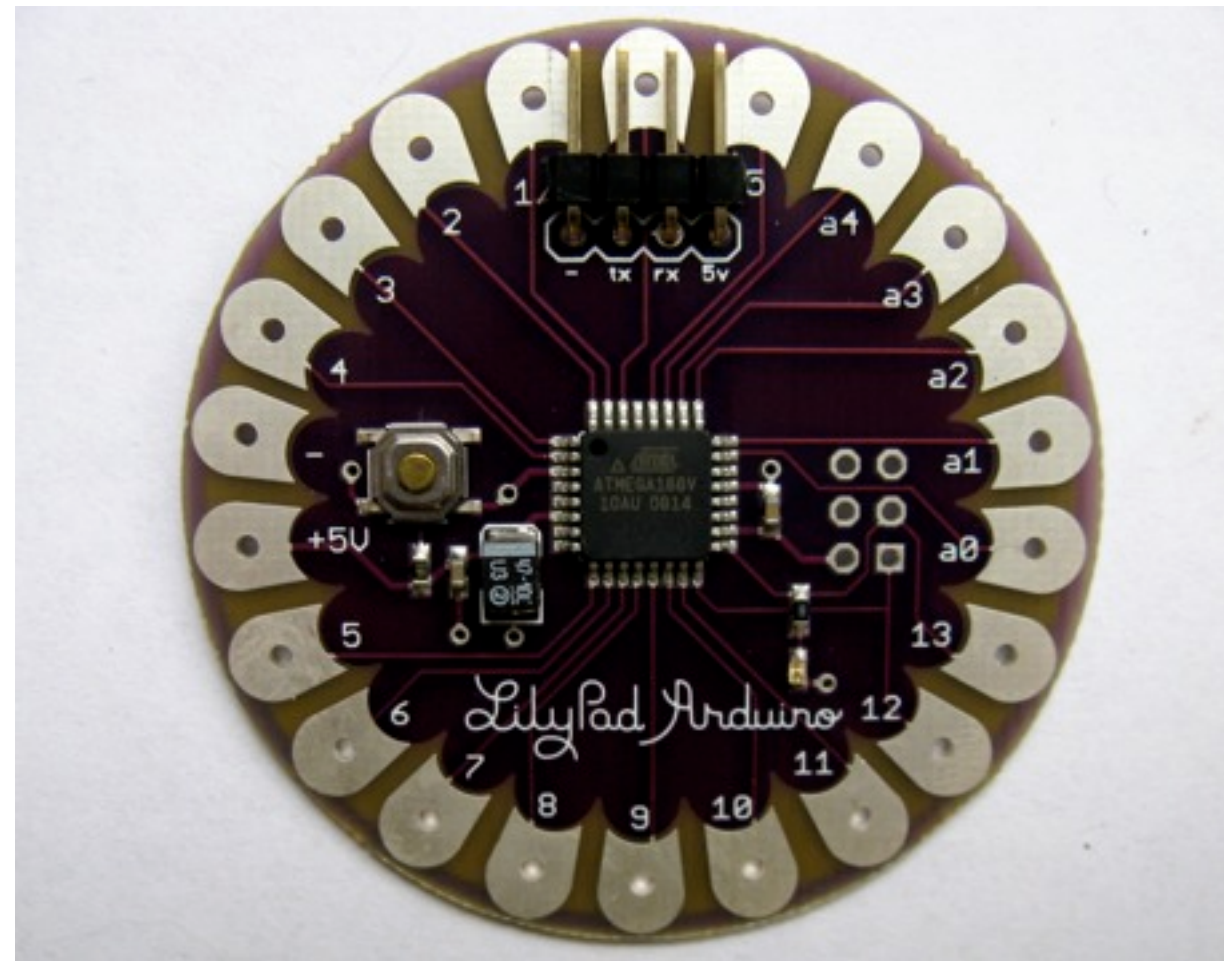




Arduino Boards

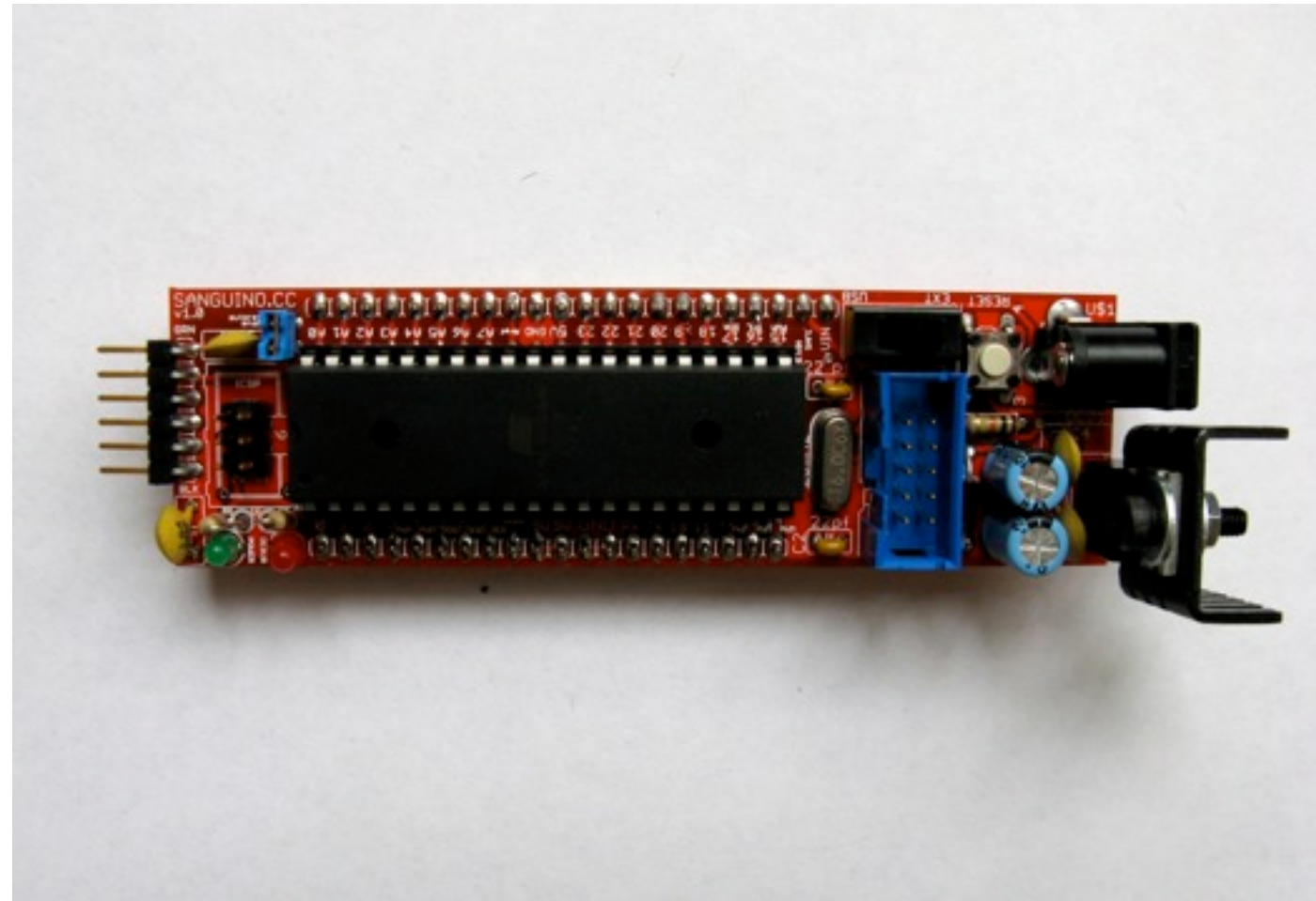


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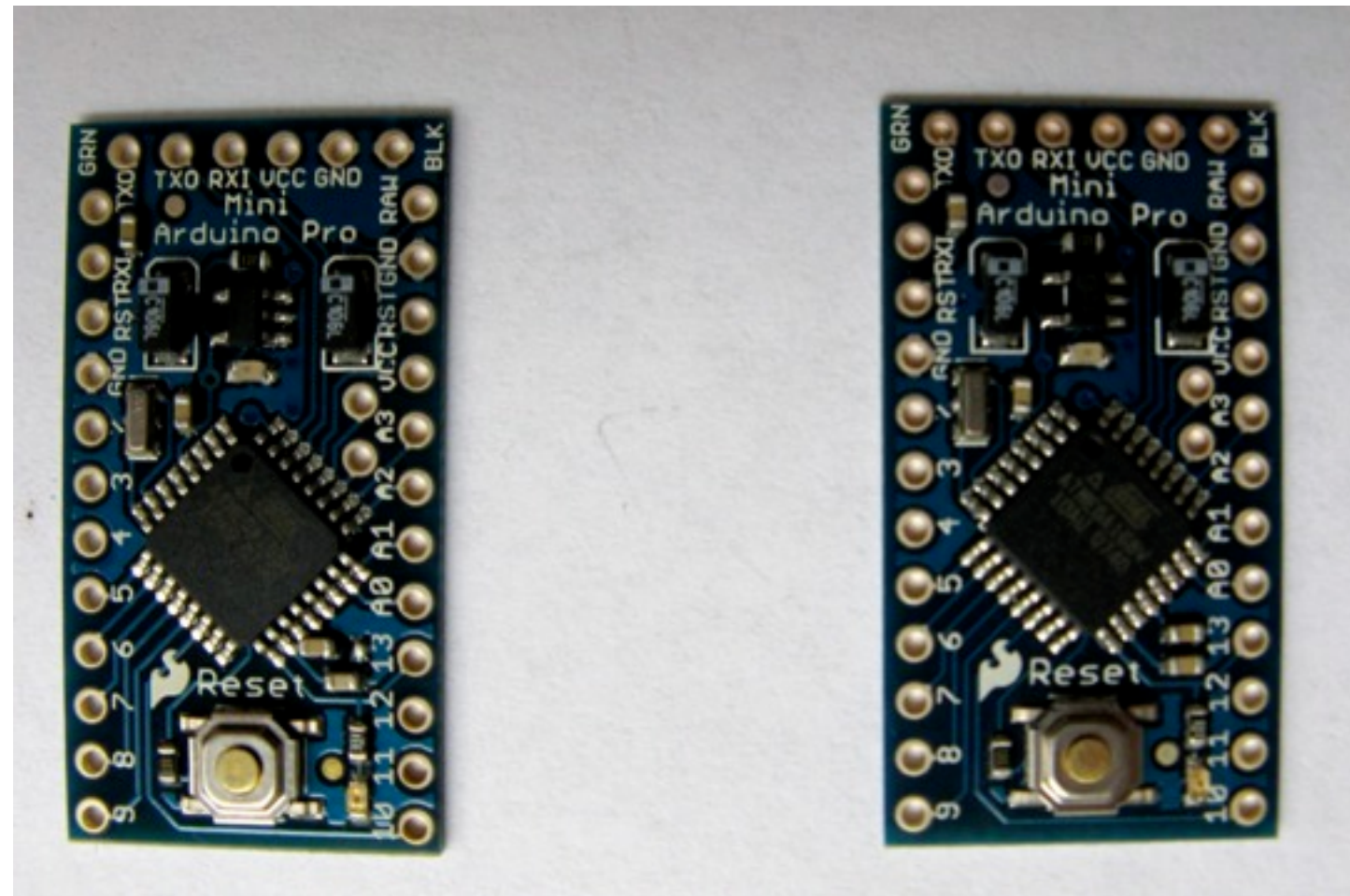
Arduino Boards





Arduino Boards





Arduino Boards

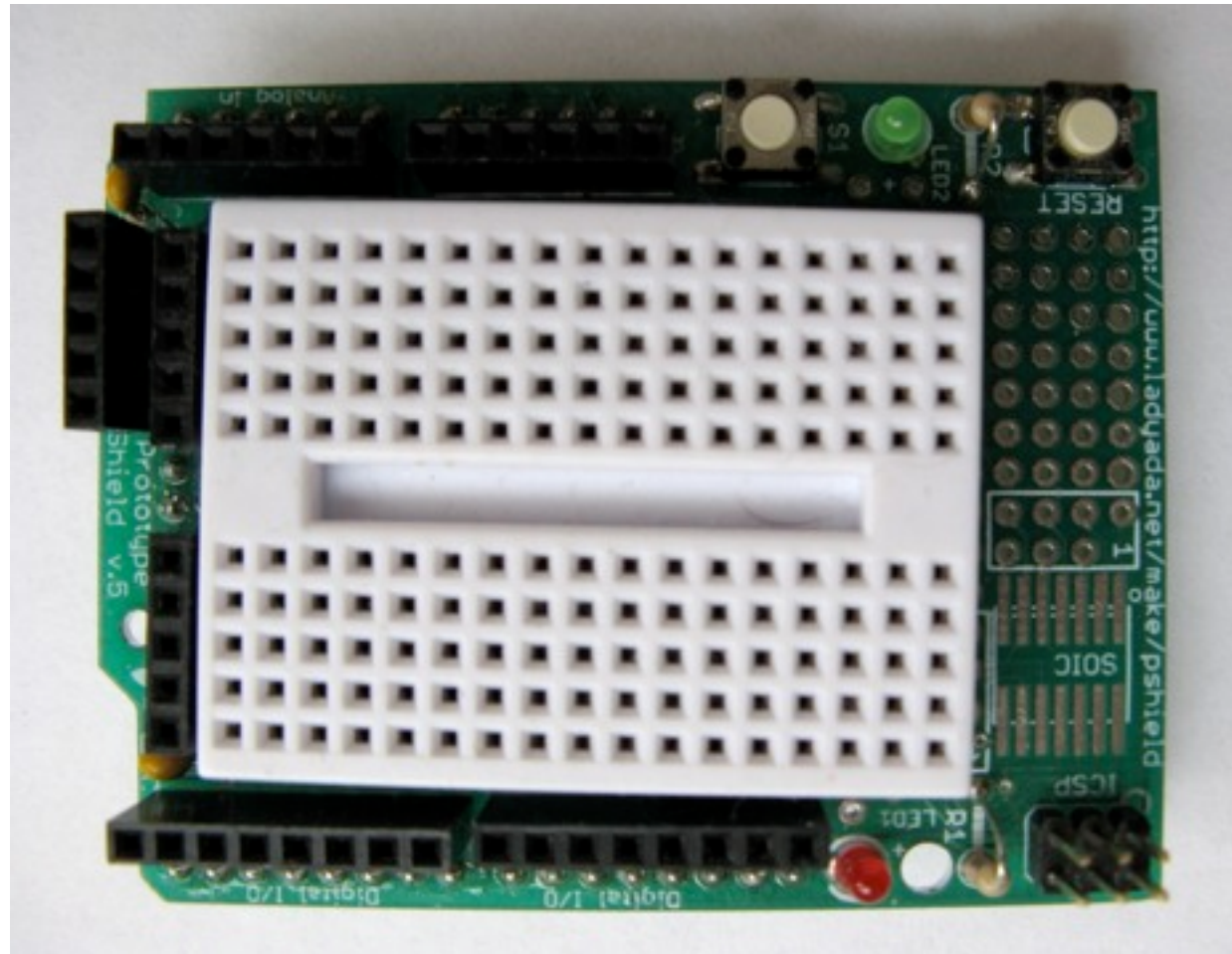




Arduino Shields



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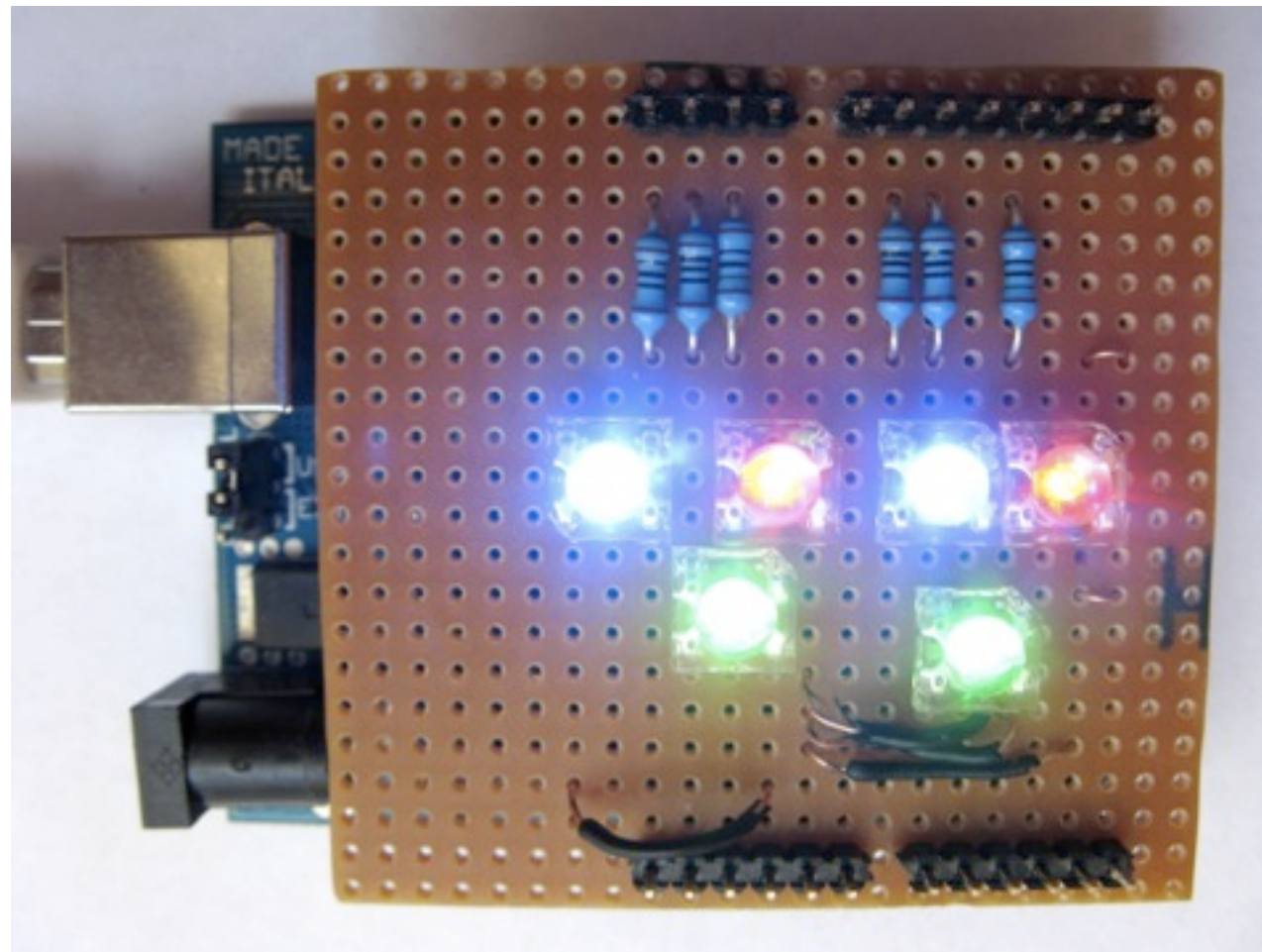
Arduino Shields





Arduino Shields





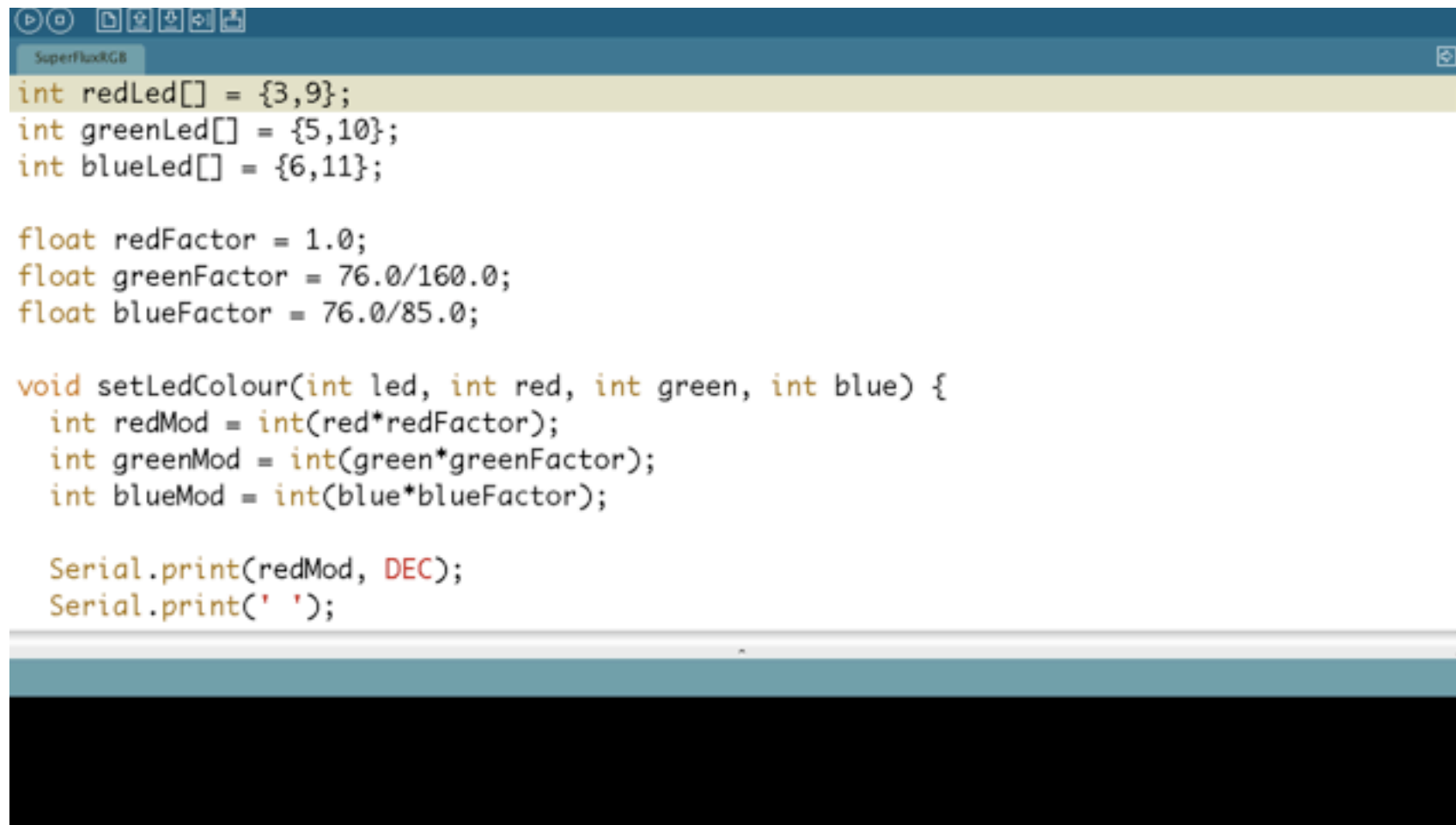
Arduino Shields



Arduino Software Platform

- Open source cross platform IDE
- Alpha but very stable
- Code in high level C like language
- Updated frequently
- Growing and active community





```
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(' ');
```

Arduino IDE



Arduino Code

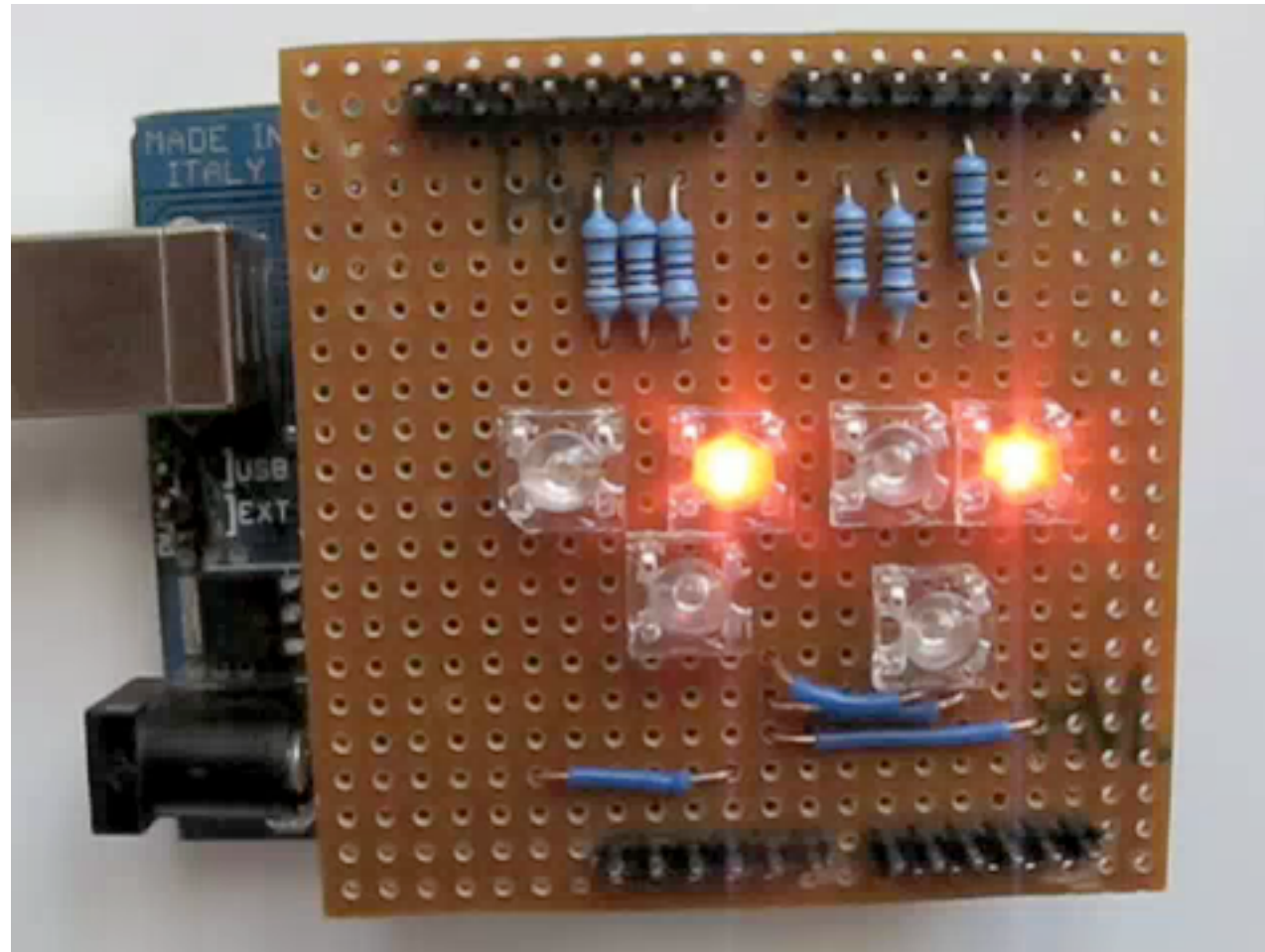
- C like high level language
- Inbuilt functions to read and set digital and analog inputs and outputs
- Includes libraries to perform common hardware or software tasks



Led Shield Demo



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Led Shield Demo



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Setup and Loop Functions

- Setup function called once

```
void setup() {  
  ...  
}
```

- Loop function called over and over again

```
void loop() {  
  ...  
}
```



Setting Digital Outputs

- Set digital pin as output in setup

```
pinMode(pin, OUTPUT);
```

- Digital outputs turned on or off in setup or loop

```
digitalWrite(pin, HIGH);
```

```
digitalWrite(pin, LOW);
```



Flex



Flex to Arduino communication

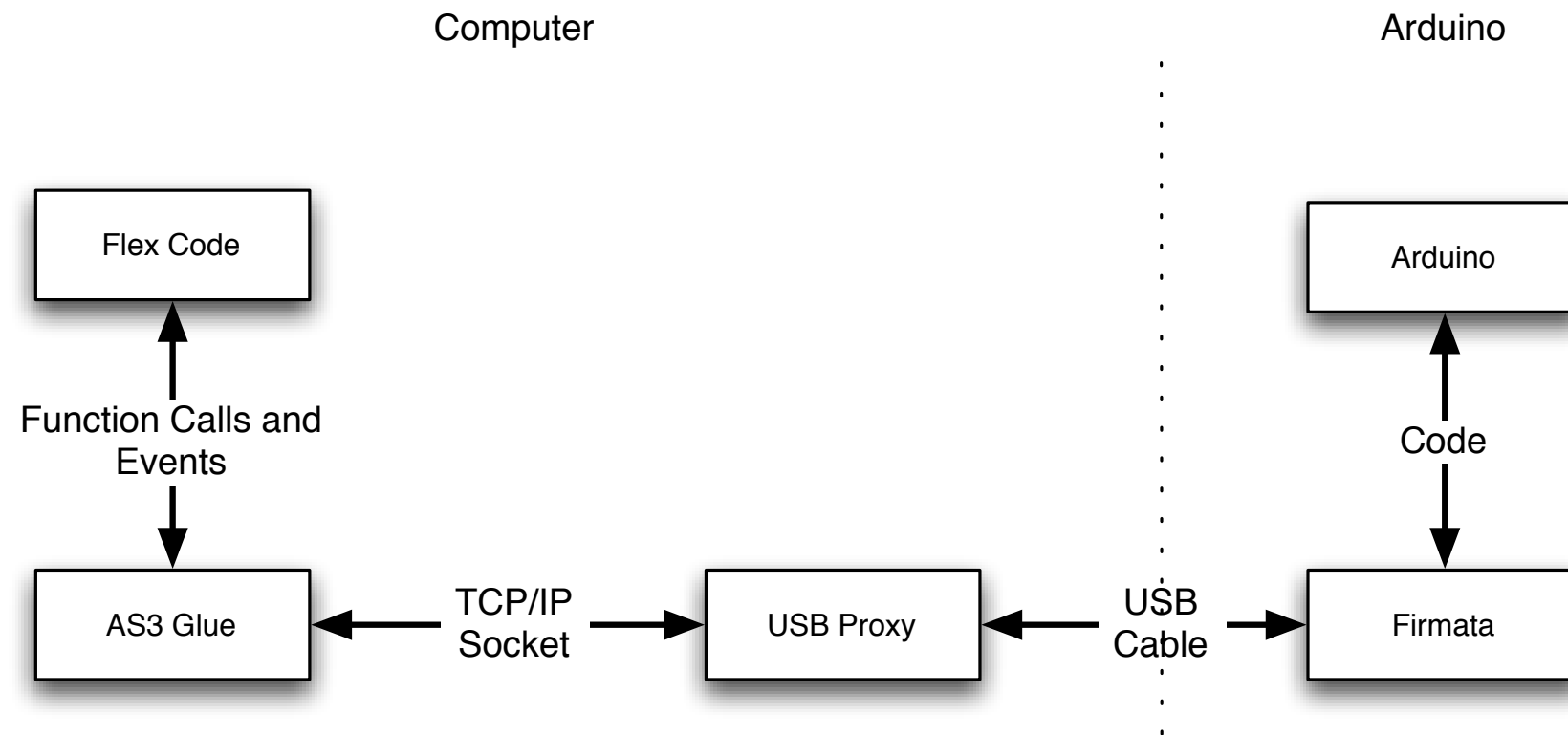


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Layers of Communication

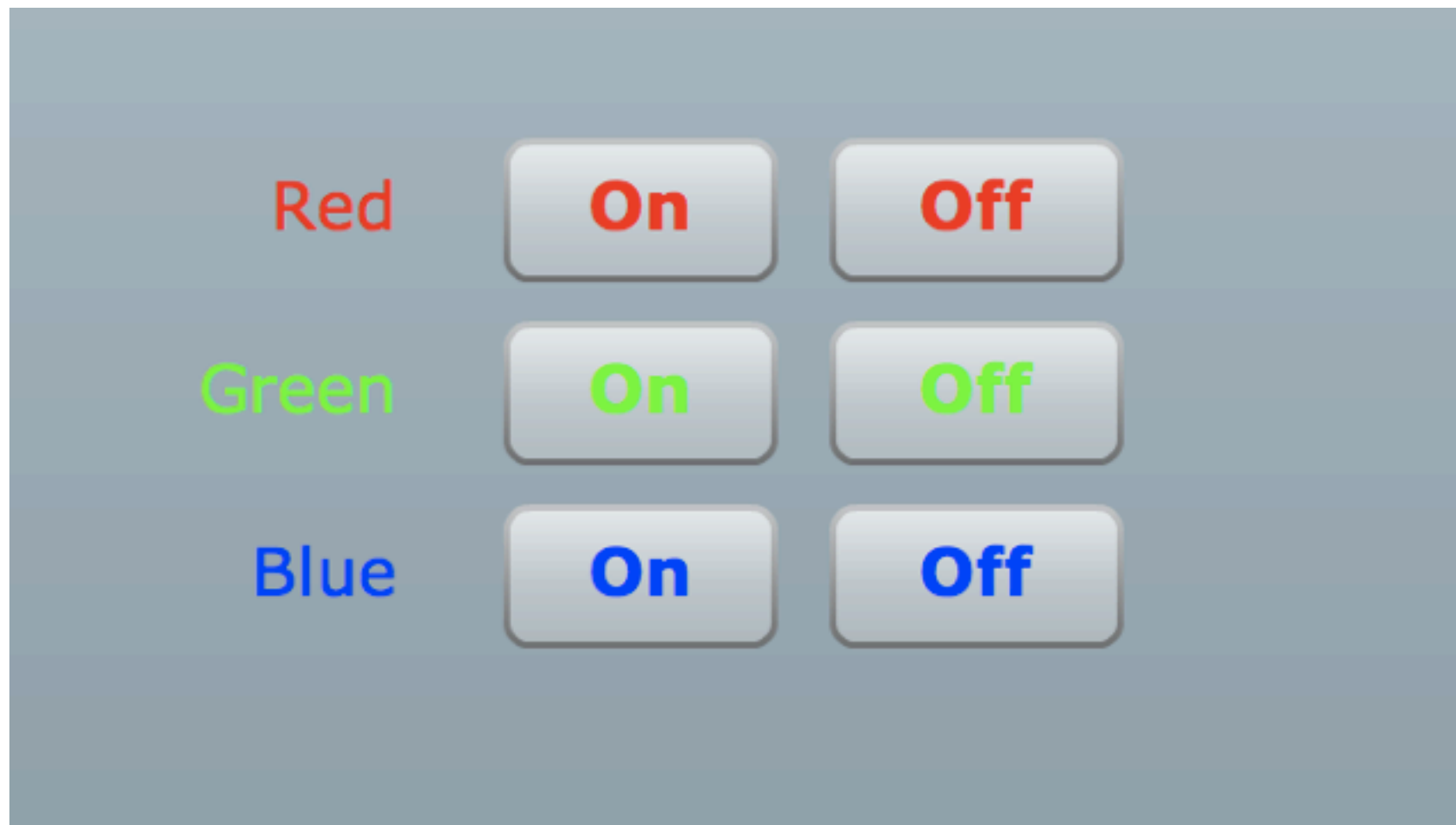
- Flex to proxy via an Actionscript library
- Proxy to USB communication
- USB to arduino





Flex to Arduino





Flex Led Demo



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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);
```



AS3Glue Events

- Uses Flex events for digital inputs.
- Listen for changes via event listener

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

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



Wireless Communication

Wireless communication with XBee
modems



XBee Modems

- Hardware wireless modem
- Low cost
- Consume very little power
- Good range
- Easy to configure





XBee Modem



XBee Networks

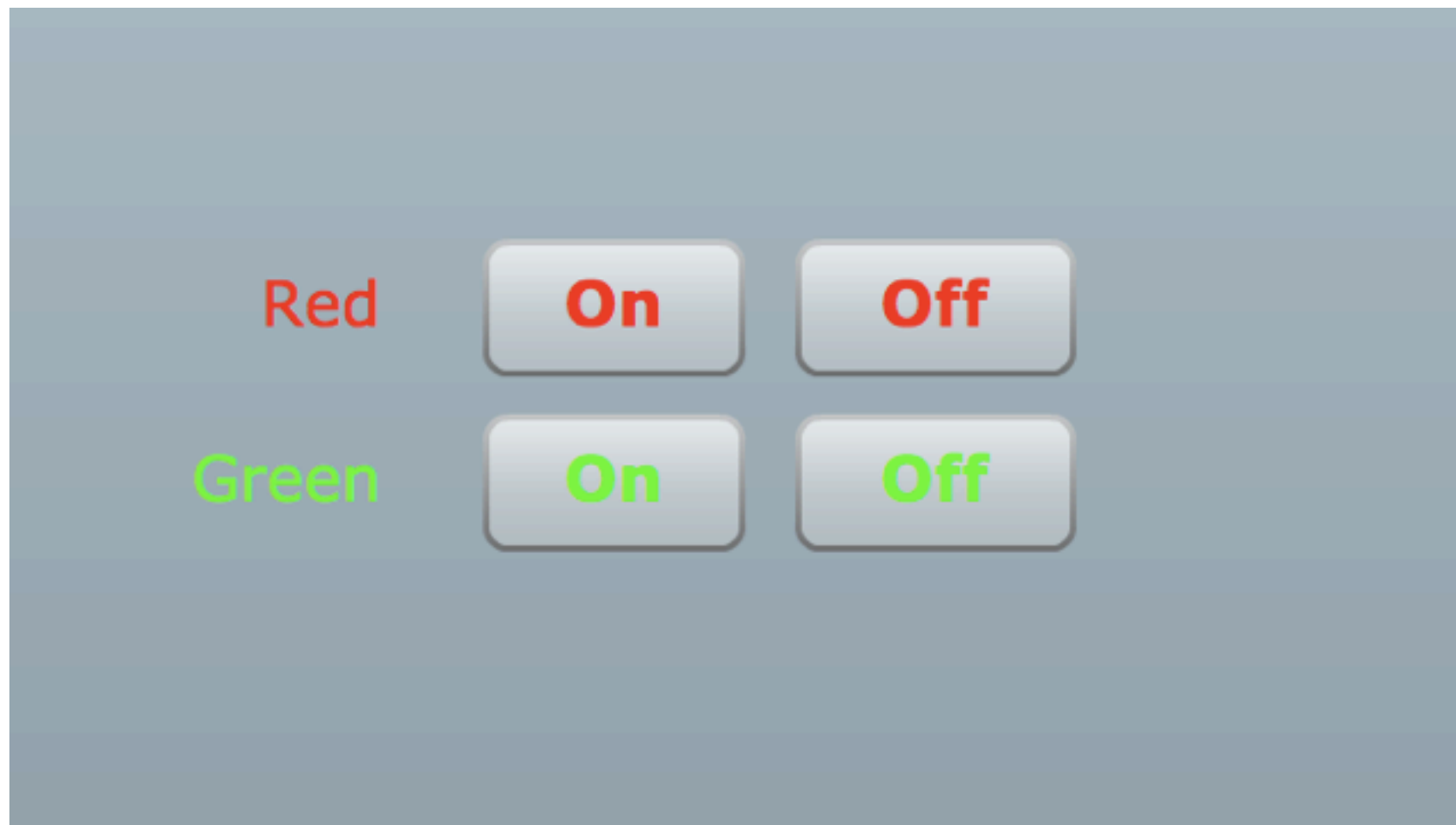
- Point to point
- Point to multipoint
- Mesh



Funnel IO

- Arduino based hardware
- Java server
- Flex library





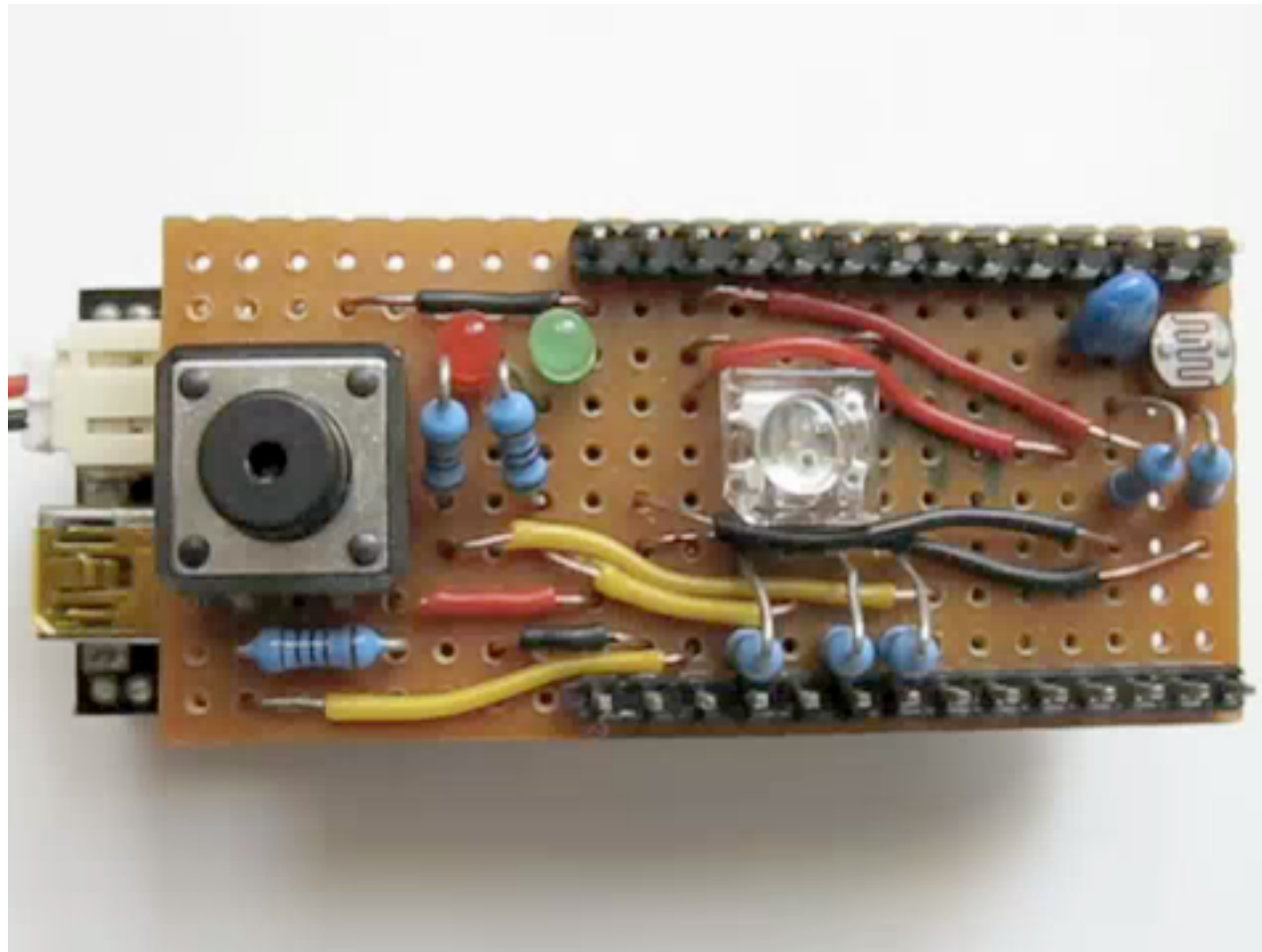
Funnel Digital Output



Funnel Digital Output



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Funnel Digital Output



Setting Digital Output

- Create FIO instance

```
var fio:Fio = new Fio([1], Fio.FIRMATA);
```

- Turn digital output on or off by setting value

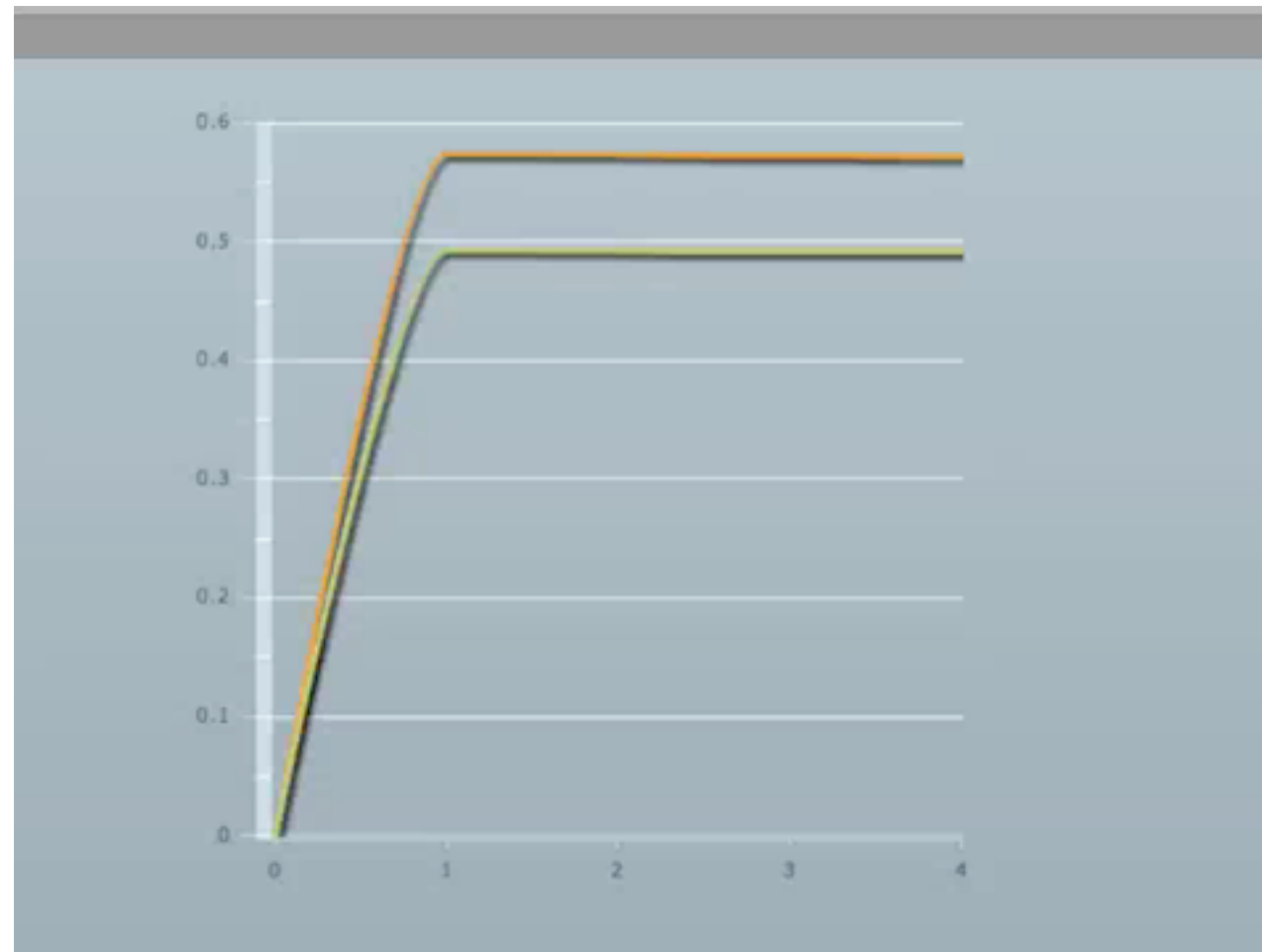
```
fio.ioModule(1).digitalPin(pin).value = 1;
```



Funnel Analog Graph



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Funnel Analog Graph



Reading Analog Input

- Read analog value same way as digital value

```
value = ioModule(1).analogPin(pin).value;
```

- Event based
`analogPin(pin).addListener(PinEvent.CHANGE, function);`
- Timer based



Issues

- Debugging can be hard
- No simulator
- Memory, power and speed limits
- Need a little electronic knowledge



Why do this?

- Expose yourself to new ideas and new ways of solving problems
- Involves interaction with the real world
- Encourages creativity
- Platform limits improves programming skill



It's Fun!



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Questions?

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



Useful Sites

List of useful hardware of software sites



Software Sites

- Arduino <http://www.arduino.cc> for software, user forum and playground
- AS3Glue <http://code.google.com/p/as3glue/>
- Funnel IO <http://funnel.cc/>



Hardware Sites

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



Other Sites

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

