Connecting Hardware to ColdFusion

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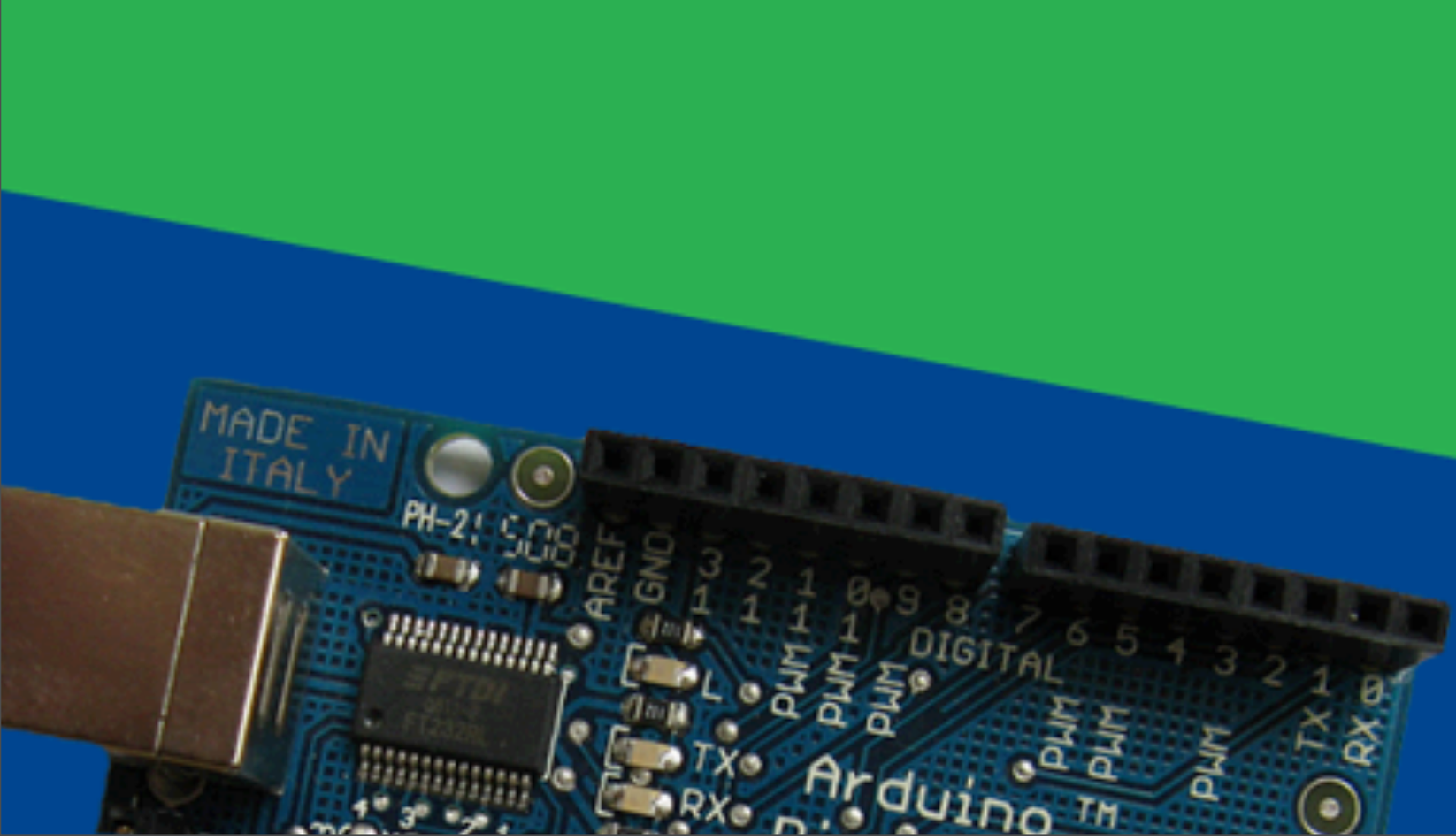


Who am I?

- Director of Class Software for 10 + years
- Developing and creating web applications for 15 years
- Programming for 25 years
- Adobe Community Professional
- 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

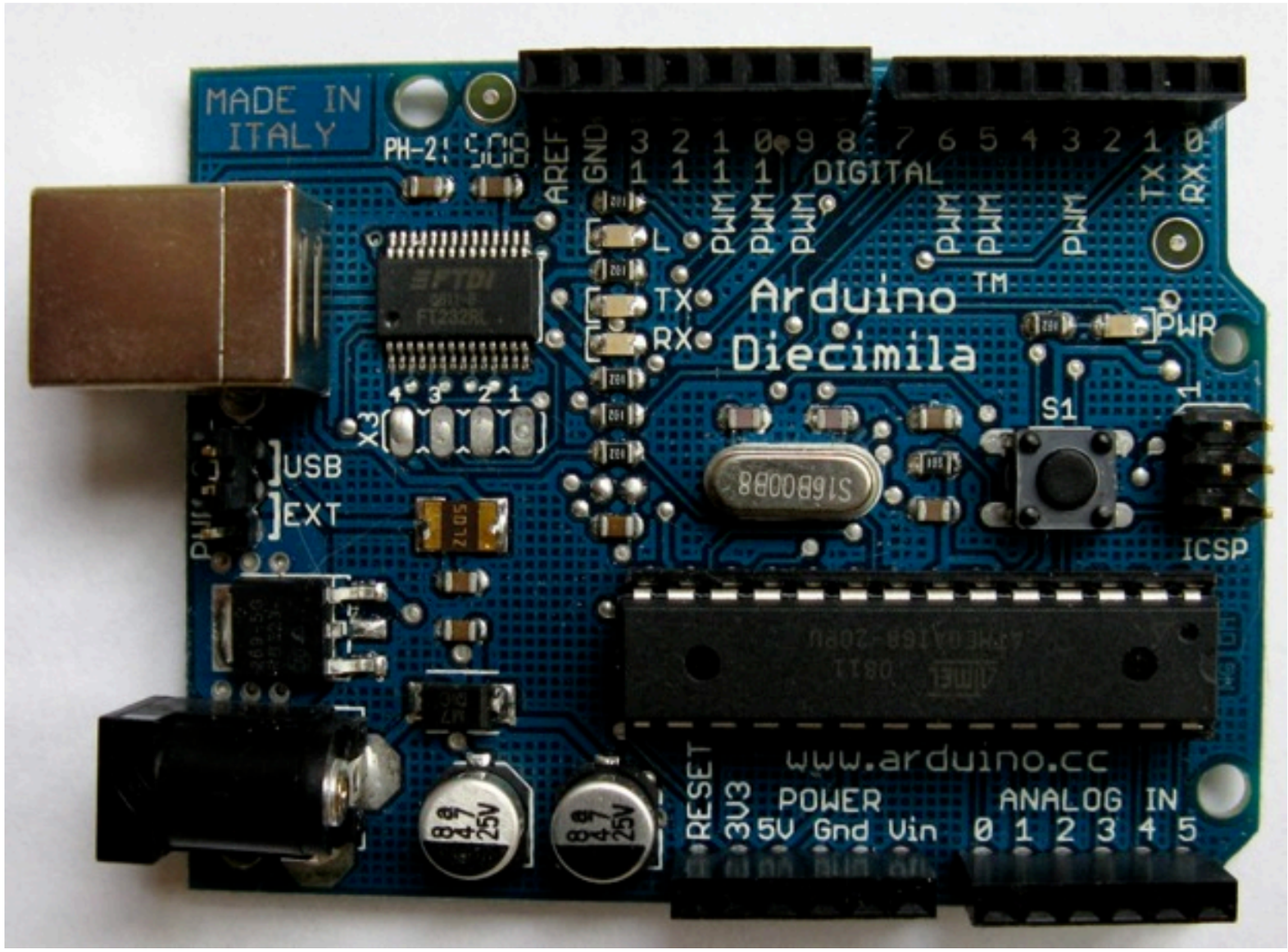
Arduino Platform

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

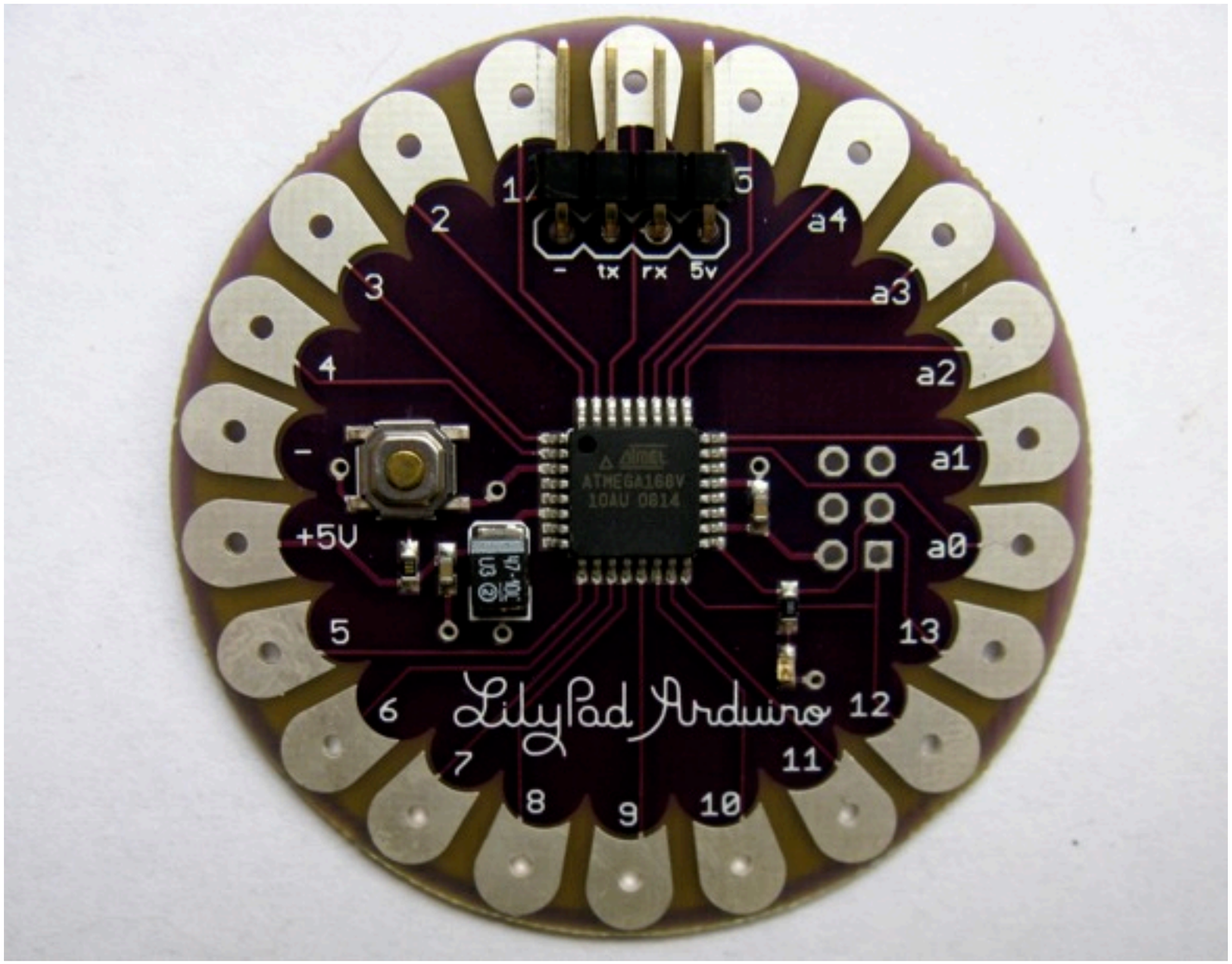
Arduino Hardware

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

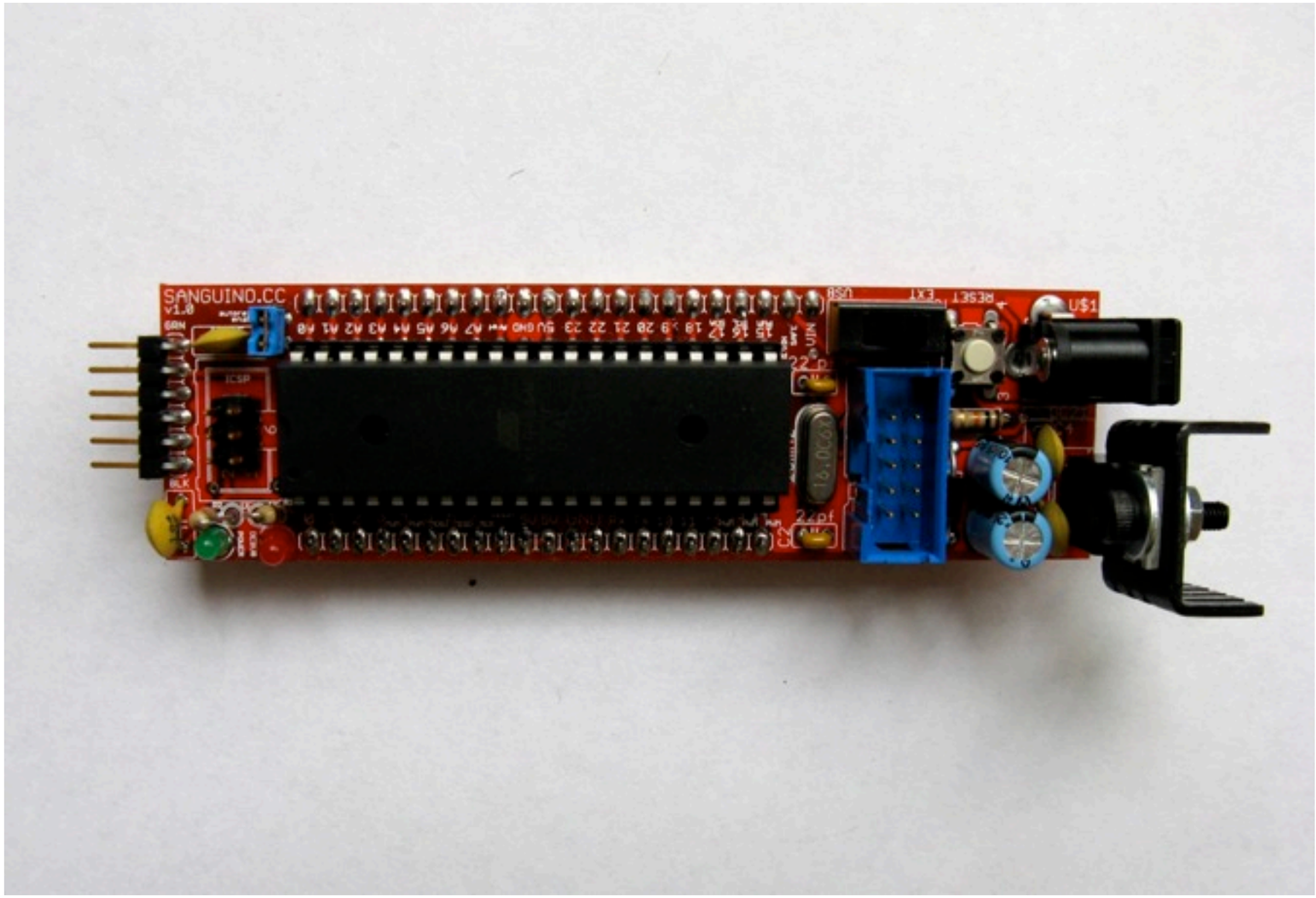
Arduino Boards



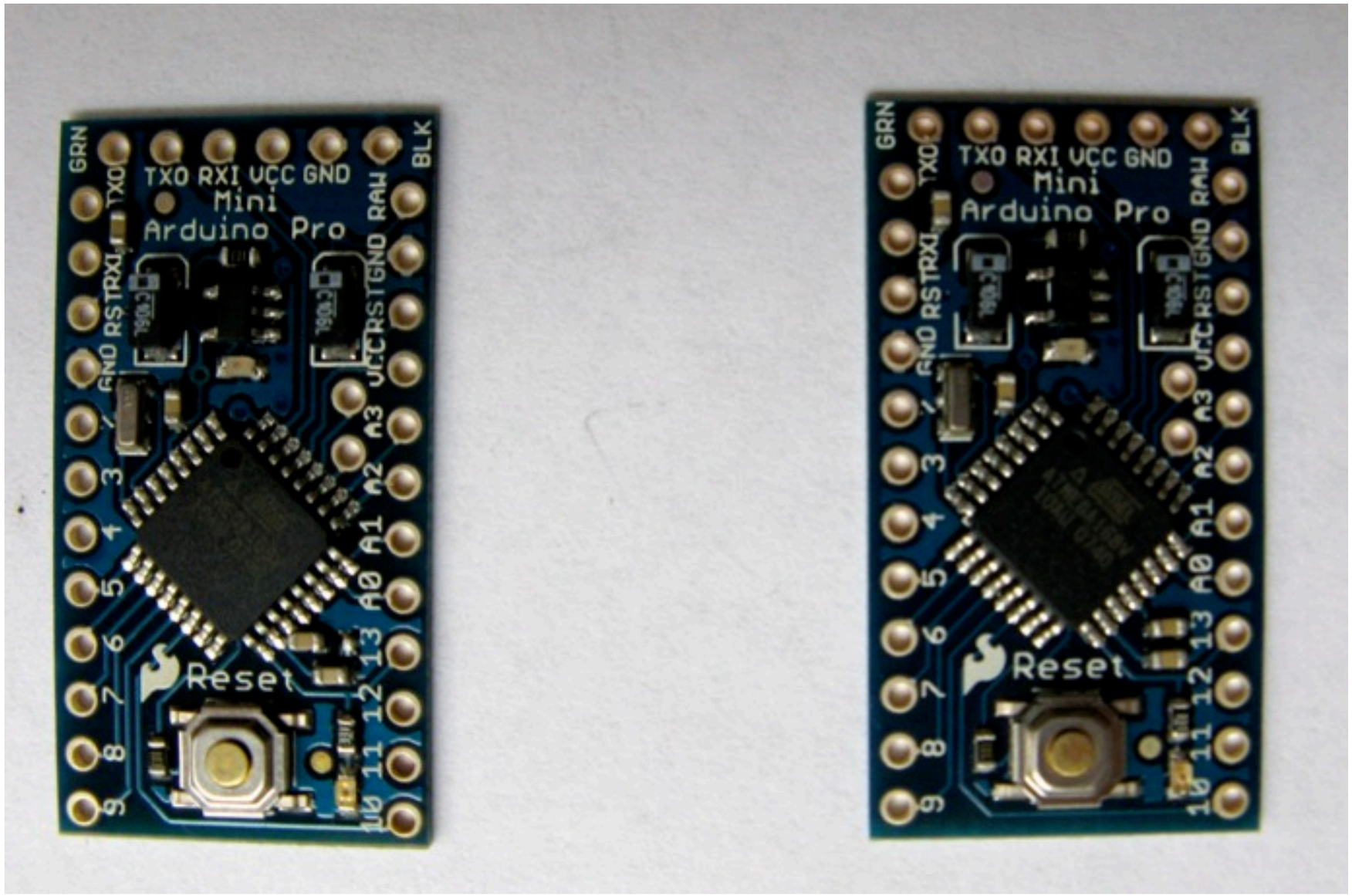
Arduino Boards



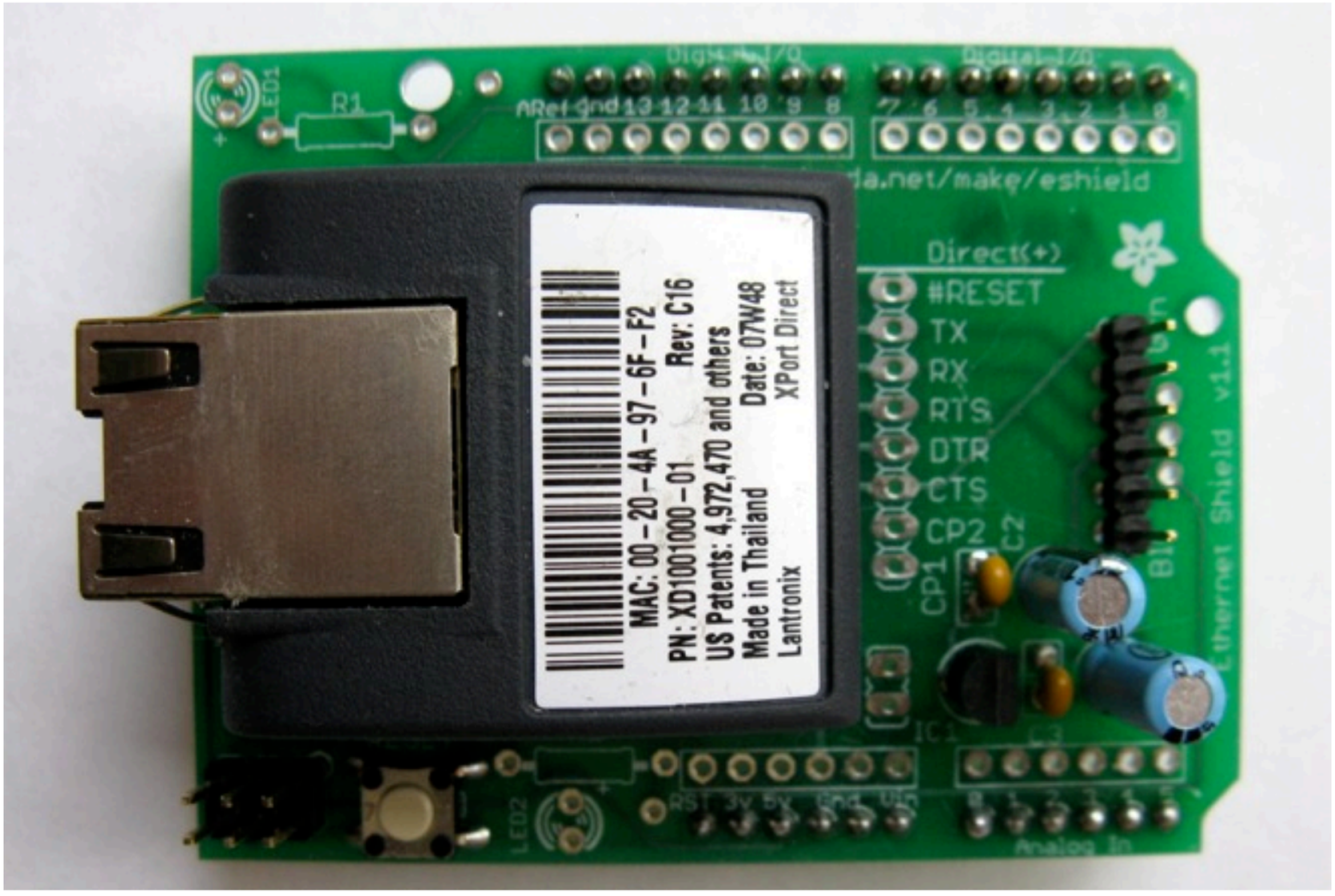
Arduino Boards



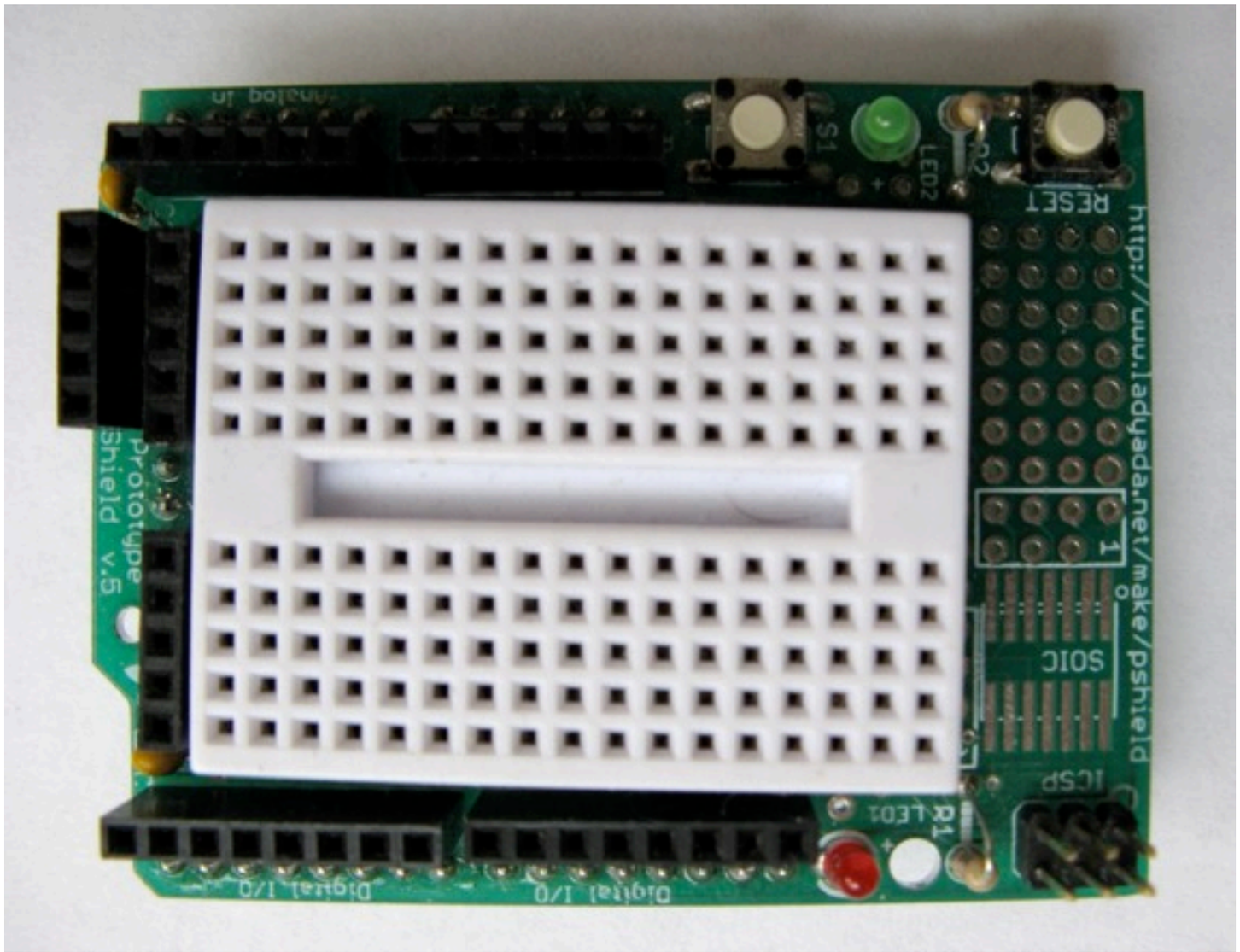
Arduino Boards



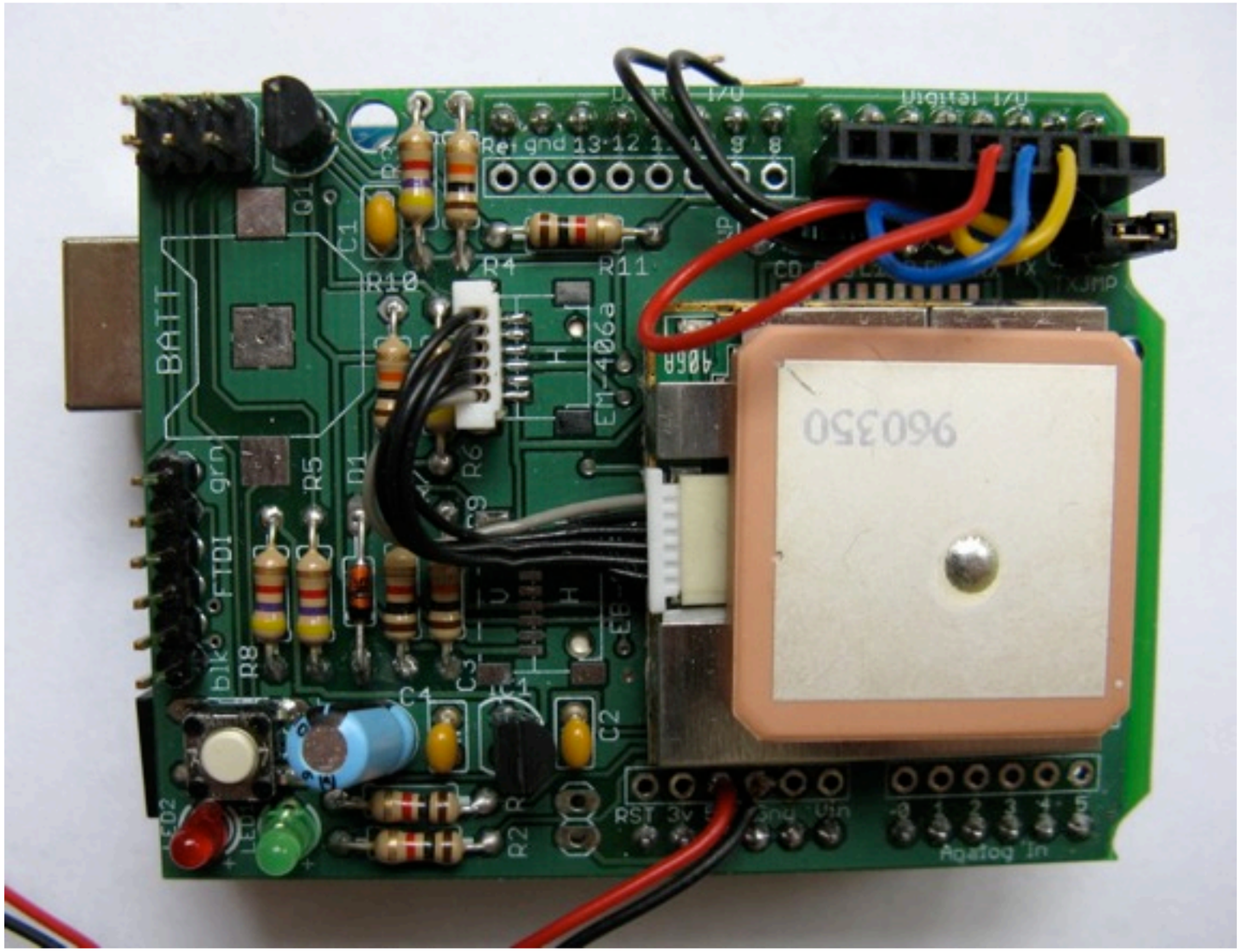
Arduino Shields



Arduino Shields



Arduino Shields



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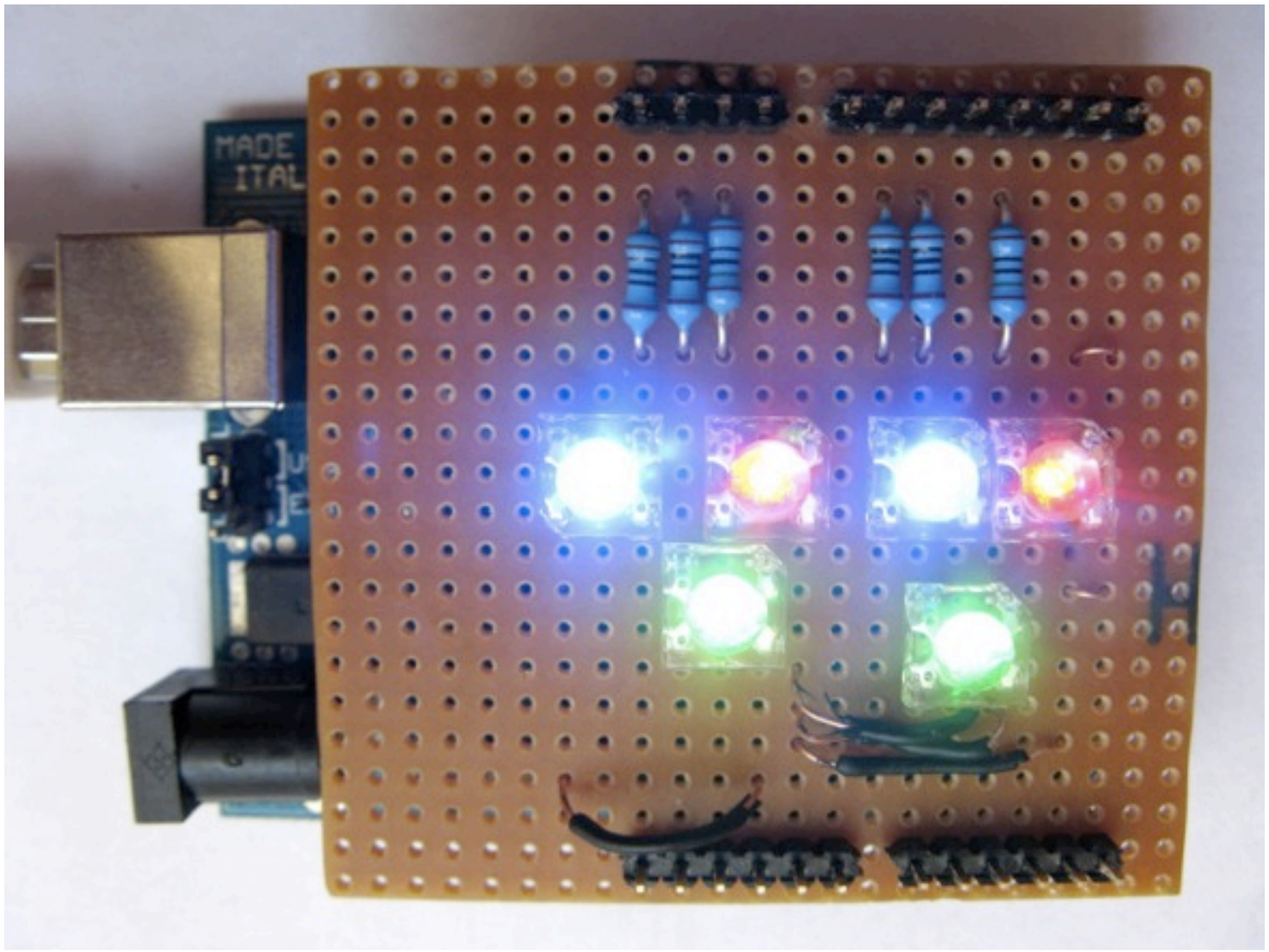


Arduino Software Platform

- 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

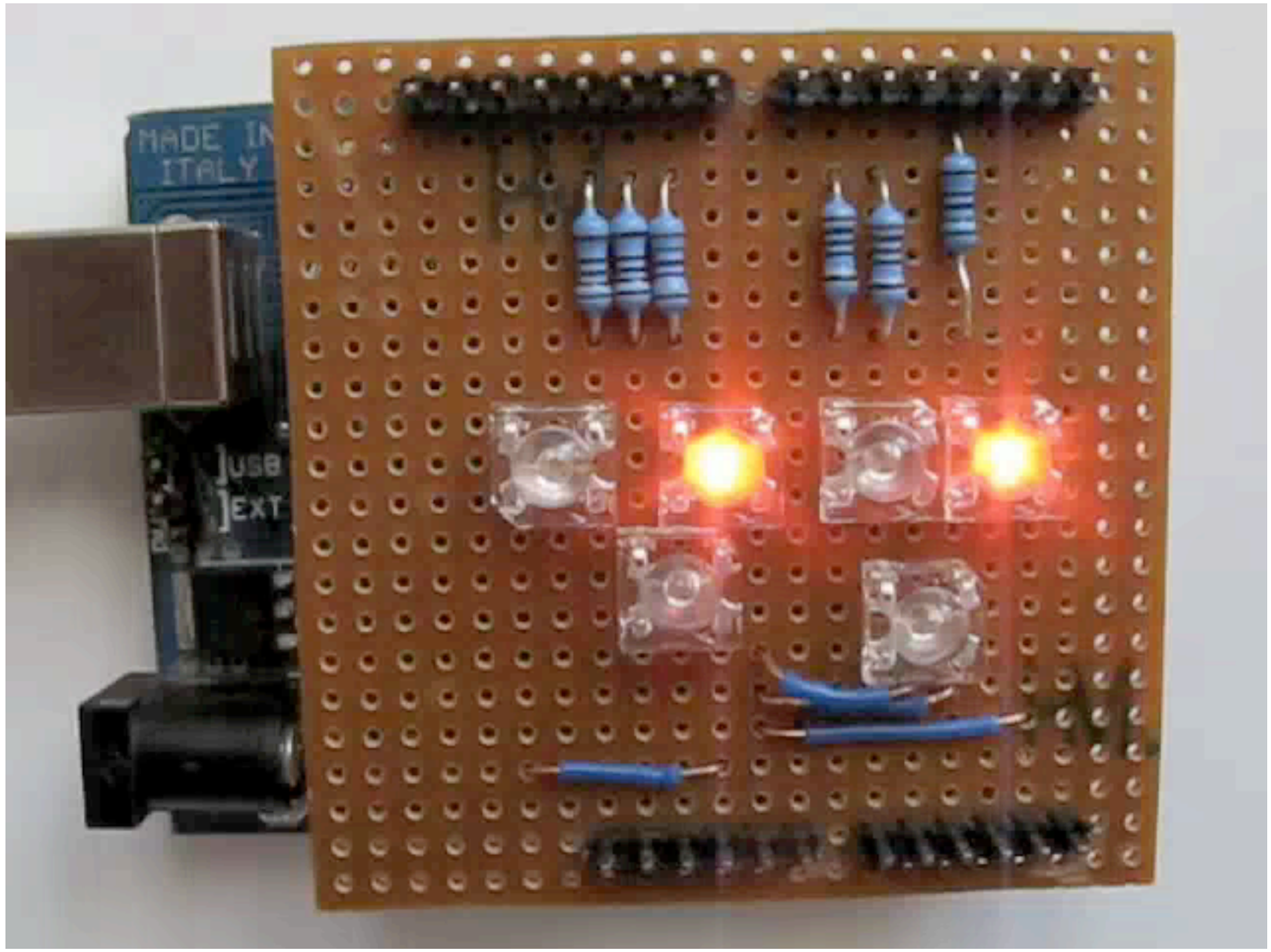
Arduino IDE

SuperFluxRGB

```
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 ColdFusion

How to communicate between ColdFusion and the Arduino Platform

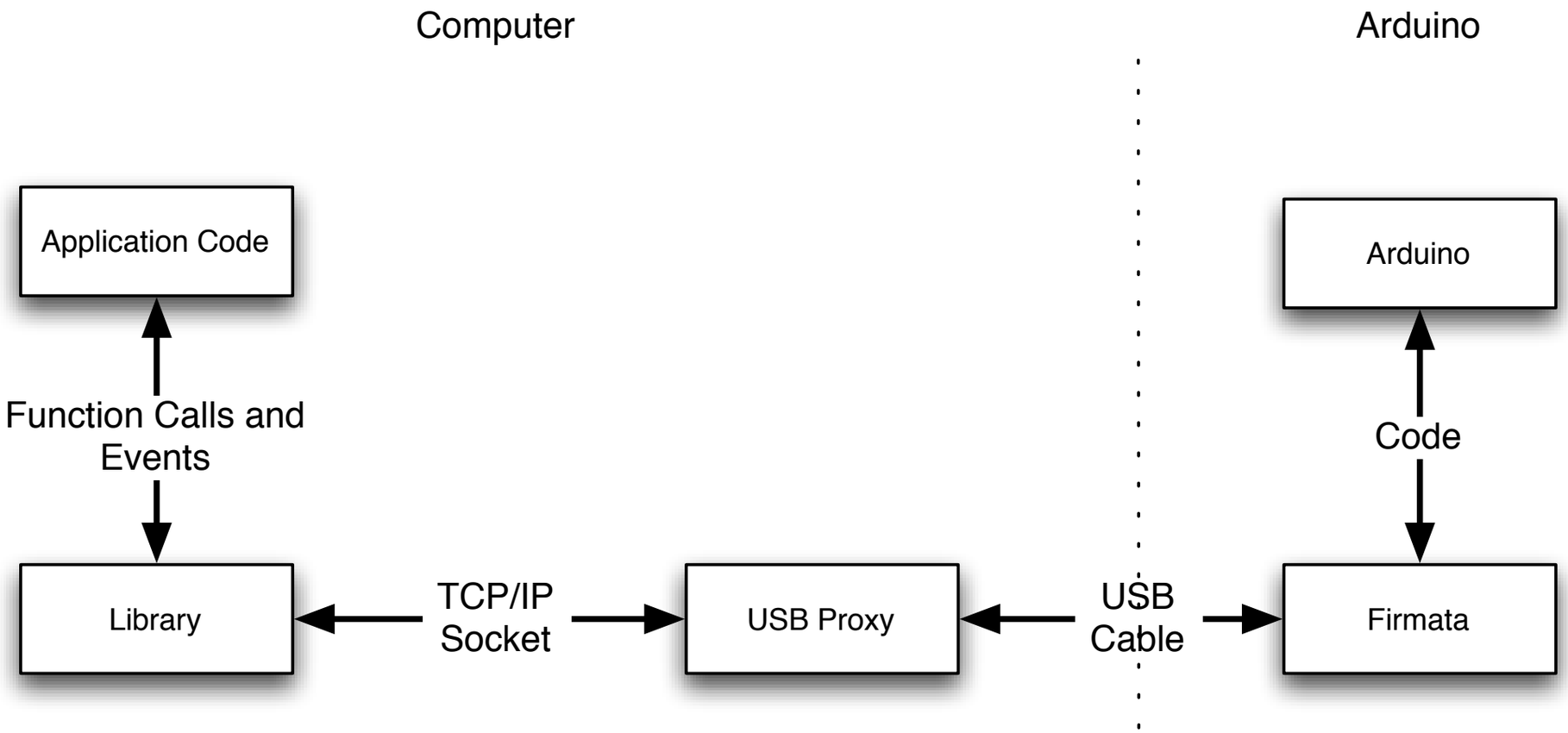
ColdFusion Communication

- ColdFusion can't easily talk USB
- Use a socket to USB proxy
- ColdFusion can't easily talk raw sockets

Layers of Communication

- ColdFusion to proxy via Java/CFML code
- Proxy to USB communication
- USB to Arduino

Connection Diagram



Firmata Protocol

- Simple Binary Protocol
- Based on MIDI
- Easy to extend
- Standard Arduino software library

Firmata Protocol

Type	Command	MIDI	Byte #1	Btye #2
Analog	0xE0	pin	Bits 0-6	Bits 7-13
Digital	0x90	port	Bits 0-6	Bits 7-13
Report Analog	0xC0	pin	0 or 1	
Report Digital	0xD0	port	0 or 1	
Pin Mode	0xF4	port	0 or 1	
Version	0xF9			
Reset	0xFF			

ColdFusion Socket

- Mixed Java/CFML code
- ColdFusion 8 or 9 makes it easy

ColdFusion Arduino

- Alpha software
- ColdFusion implementation of Firmata
- Read analog values
- Read/write digital values

ColdFusion Arduino Demo

struct	
NAME	StandardFirmata
VERSION	2.1

Issues

- Arduino startup time
- Auto reset
- Not a persistent connect
- Proxy must be running on machine Arduino is connected to
- Use under load

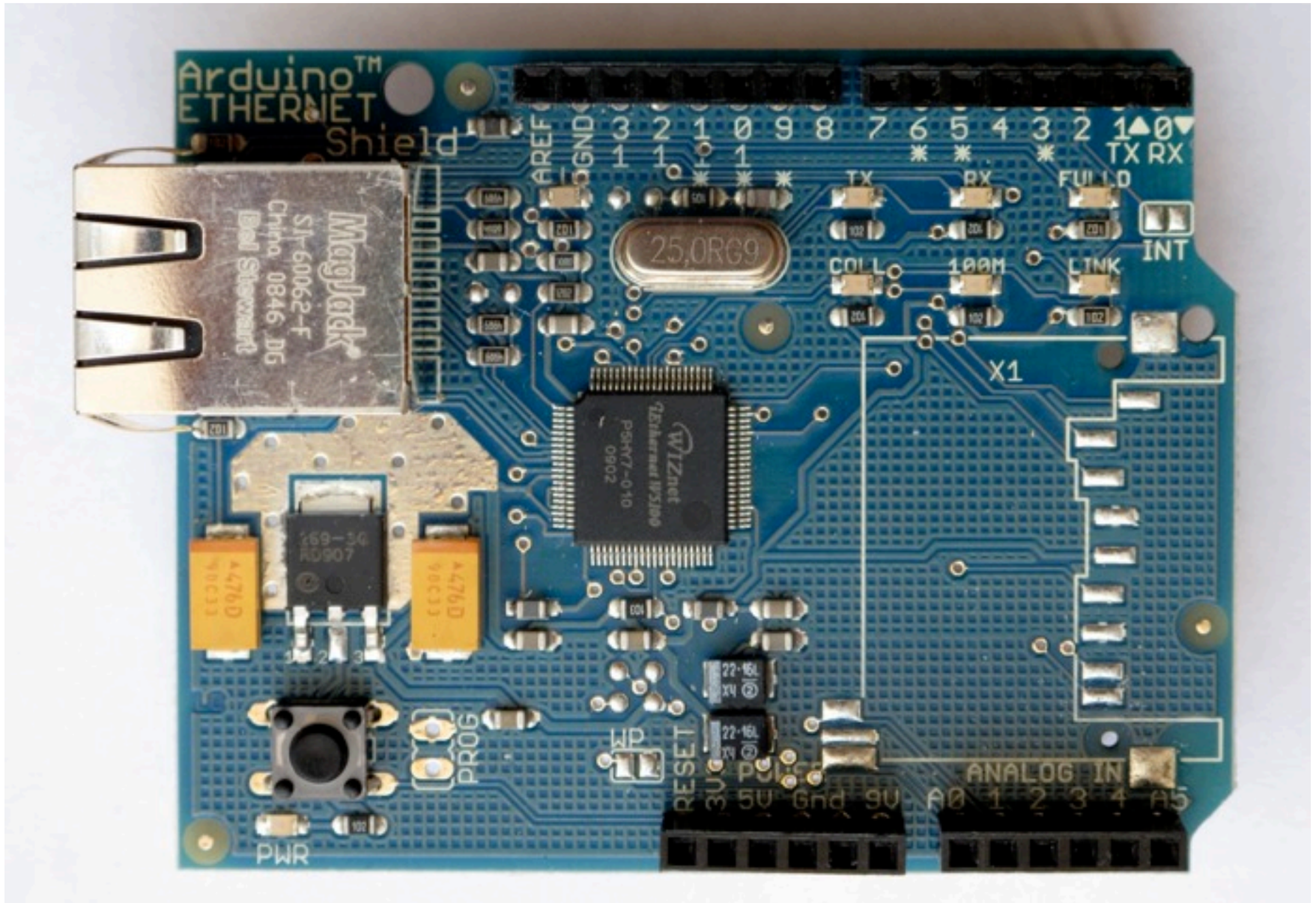
Ethernet

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



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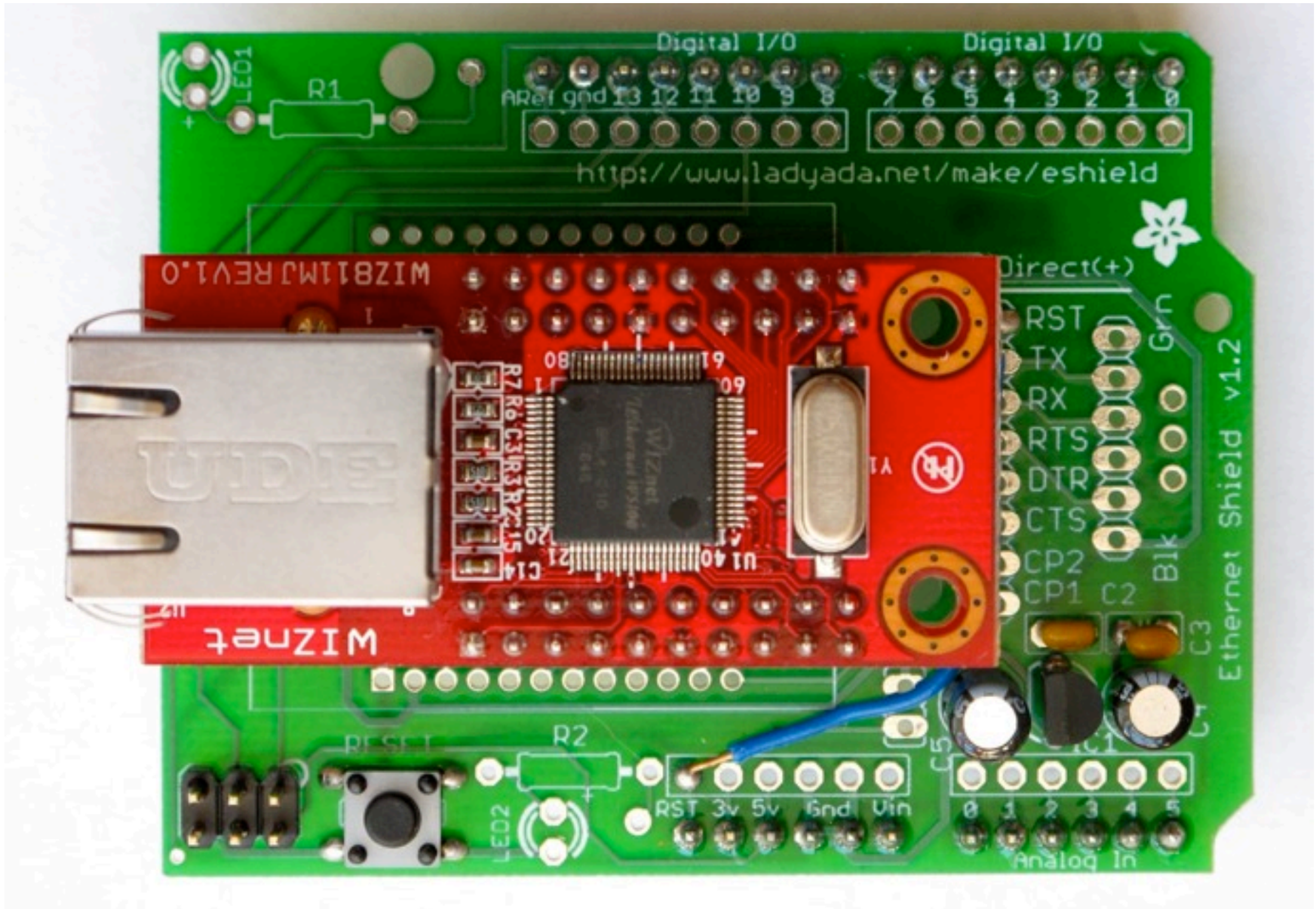
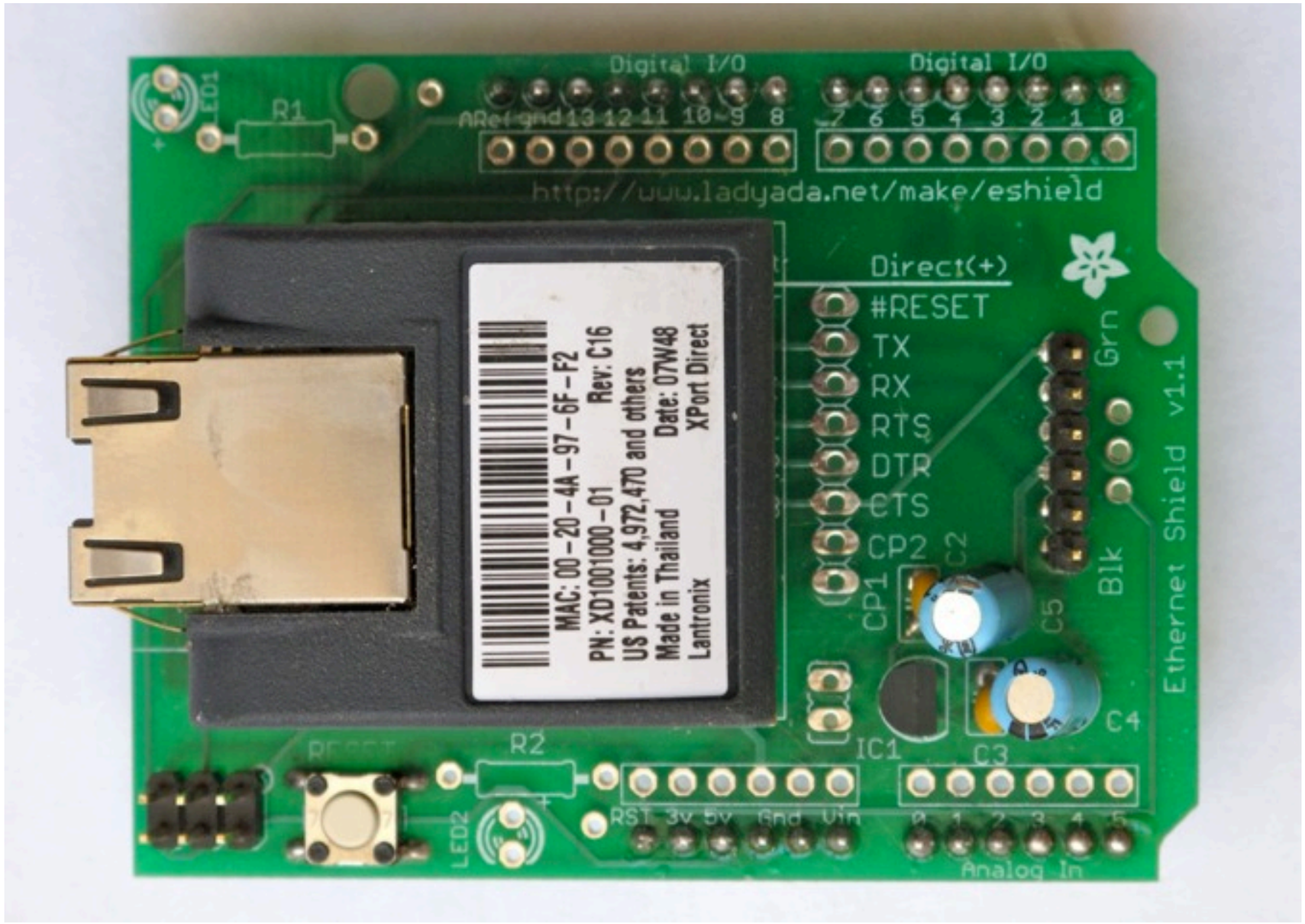


Ethernet Shields



Ethernet Arduino Code

- Can run as web server
- Code easy to write or modify

ColdFusion Code

- CFHTTP to get data
- Data returned as XML
- Parse XML via ParseXML()
- Display or act on values

ColdFusion Ethernet Demo

Light

struct	
pin	4
value	123

Temperature

struct	
pin	5
value	484

Pachube

An easier way to connect Arduinos

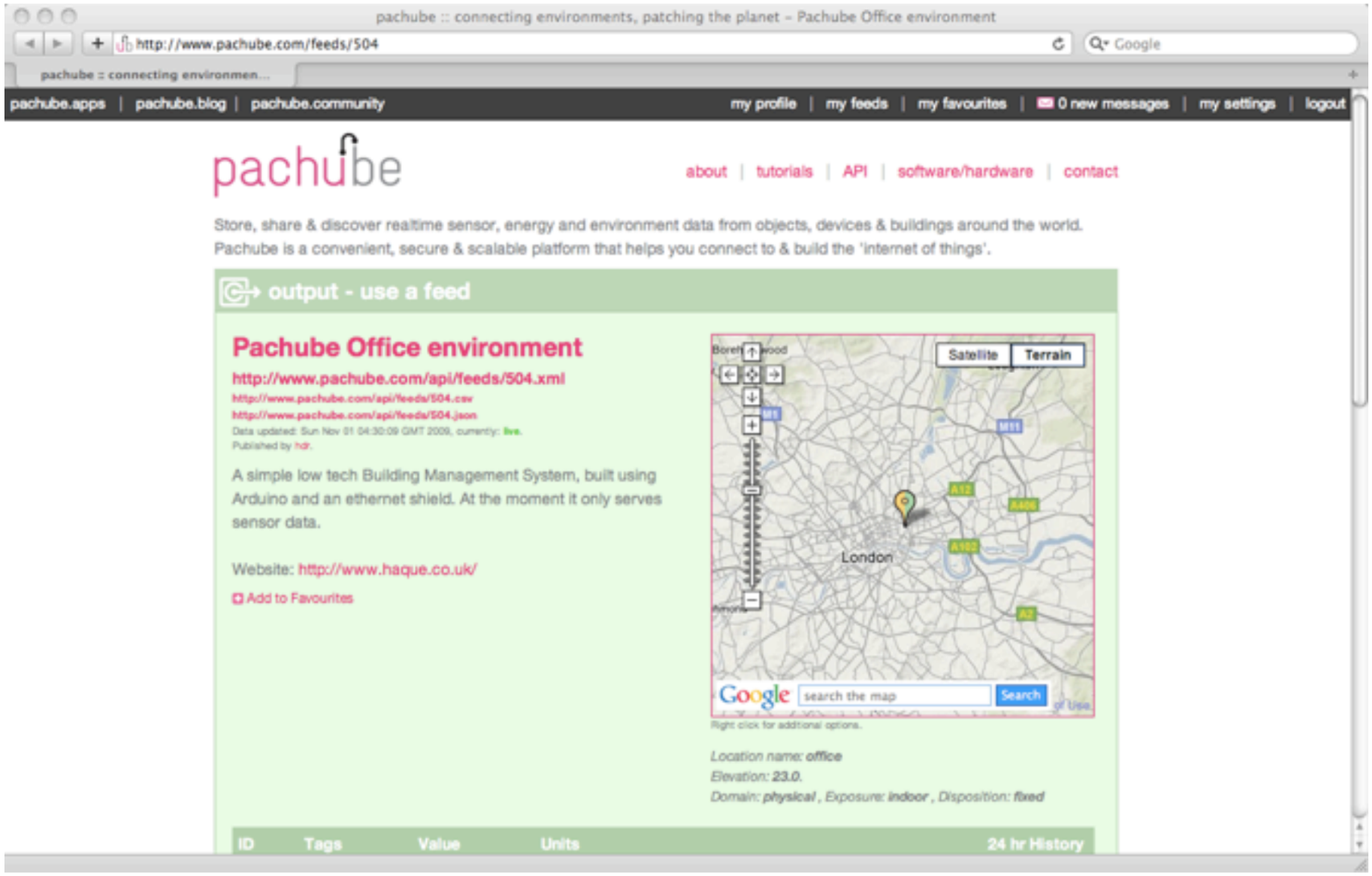
Pachube

- Store and share and access realtime sensor data
- Simple and secure
- API to interact with all data and services
- Graphs and maps

Pachube


pachube :: connecting environments, patching the planet
http://www.pachube.com/
Google
pachube :: connecting environmen...
pachube.apps | pachube.blog | pachube.community
my profile | my feeds | my favourites | 0 new messages | my settings | logout
pachube
about | tutorials | API | software/hardware | contact
Store, share & discover realtime sensor, energy and environment data from objects, devices & buildings around the world.
Pachube is a convenient, secure & scalable platform that helps you connect to & build the 'internet of things'.
Map view | List view
search feeds or tags
search
all | agriculture | building | device | energy | environment | transport | other
Satellite
Terrain
Google
search the map
Search
Terms of Use
send | link
RSS | Atom
input - register a feed
If you have a device, building, environment or sensor (either physical or virtual) that is connected to the internet (wired, wireless or via SMS gateway) and you want to store, share, graph and distribute its datastreams in realtime...
... then register a feed!
output - use a feed
If you have a device, building, environment or actuator (either physical or virtual) that is connected to the internet, or if you have a website, and you want to embed, monitor or connect to an existing environment...
... then use a feed!
latest news
Triggers bring 'push' capabilities to Pachube
As promised a few weeks ago, we're going to be rolling out a whole host of new features th... - more

Pachube


pachube :: connecting environments, patching the planet – Pachube Office environment
http://www.pachube.com/feeds/504
Google
pachube :: connecting environmen...
pachube.apps | pachube.blog | pachube.community
my profile | my feeds | my favourites | 0 new messages | my settings | logout
pachube
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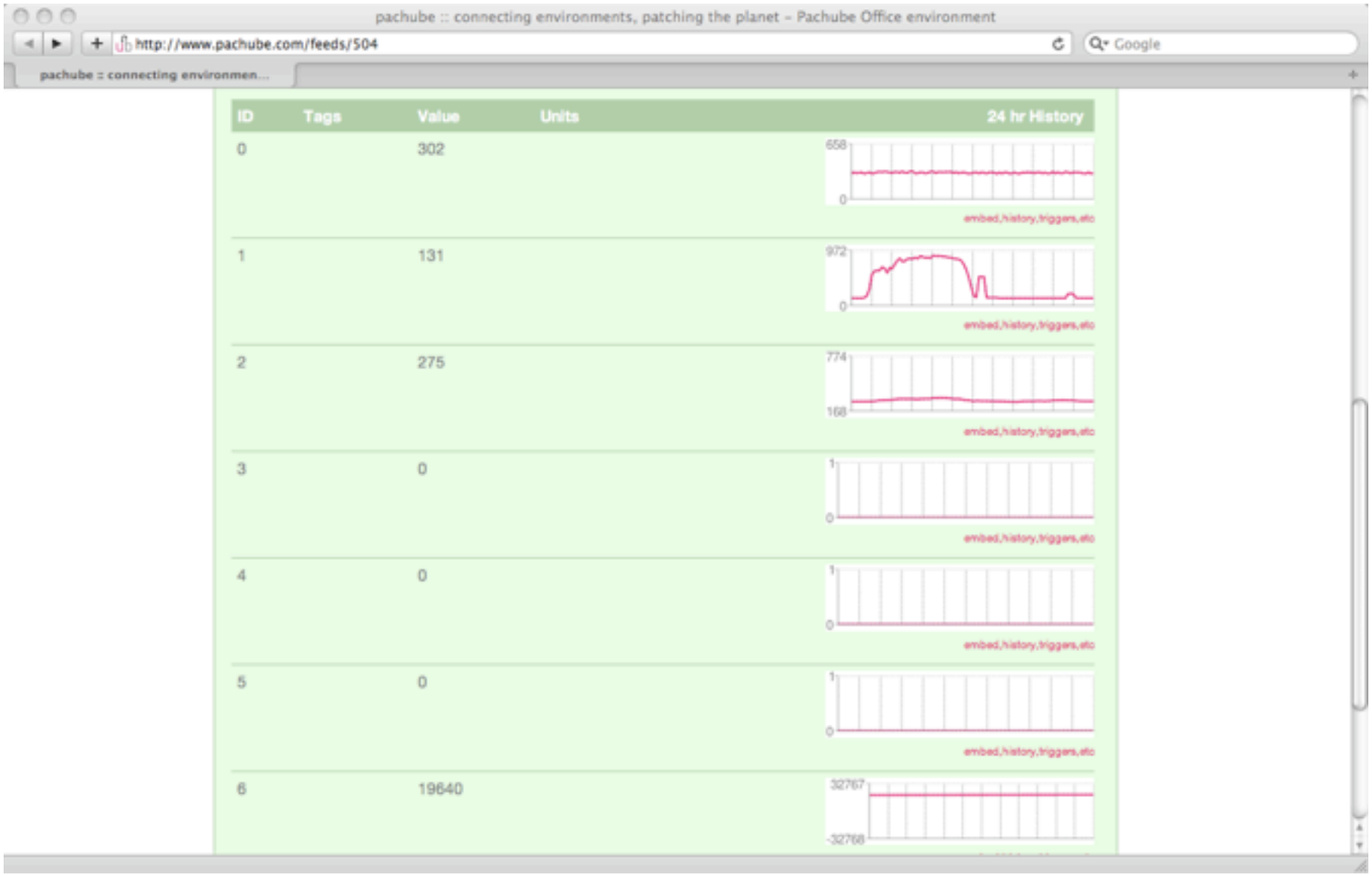
Store, share & discover realtime sensor, energy and environment data from objects, devices & buildings around the world.
Pachube is a convenient, secure & scalable platform that helps you connect to & build the 'internet of things'.
output - use a feed
Pachube Office environment
http://www.pachube.com/api/feeds/504.xml
http://www.pachube.com/api/feeds/504.csv
http://www.pachube.com/api/feeds/504.json
Data updated: Sun Nov 01 04:30:09 GMT 2009, currently: live.
Published by hdr.
A simple low tech Building Management System, built using Arduino and an ethernet shield. At the moment it only serves sensor data.
Website: http://www.haque.co.uk/
Add to Favourites
Satellite
Terrain
London
Google
search the map
Search
Right click for additional options.
Location name: office
Elevation: 23.0.
Domain: physical , Exposure: indoor , Disposition: fixed
ID
Tags
Value
Units
24 hr History

Pachube


pachube :: connecting environments, patching the planet – Pachube Office environment
http://www.pachube.com/feeds/504
Google
pachube :: connecting environmen...
ID
Tags
Value
Units
24 hr History
0
302
658
0
embed,history,triggers,etc
1
131
972
0
embed,history,triggers,etc
2
275
774
168
embed,history,triggers,etc
3
0
1
0
embed,history,triggers,etc
4
0
1
0
embed,history,triggers,etc
5
0
1
0
embed,history,triggers,etc
6
19640
32767
-32768

Pachube API

- Communicates HTTP
- Plain text (csv), XML or Jason
- REST based
- Large base of supported languages

Pachube Arduino Code

- Runs on Arduino with ethernet shield
- Sends values to Pachube
- Can request values directly or via Pachube

ColdFusion

- Call pachube API using CFHTTP
- ParseXML()
- XML is in EEML format
- Display or act on values

Demo

XmlText	
XmlAttributes	**struct** disposition: fixed domain: physical exposure: indoor
name	XmlText: office
lat	XmlText: 51.5235375648154
lon	XmlText: -0.0807666778564453
ele	XmlText: 23.0

XmlText	
XmlAttributes	**struct** id: 0
value	XmlText: 292 XmlAttributes: **struct** maxValue: 658.0 minValue: 0.0

Pachube Triggers

- Pachube can call an URL when an analog or digital value changes or goes over or under a value
- The URL can be ColdFusion URL

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

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/