

# Connecting Hardware to ColdFusion

- Justin Mclean
- Twitter @justinmclean
- <http://www.classsoftware.com>



CF.Objective()

# 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 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

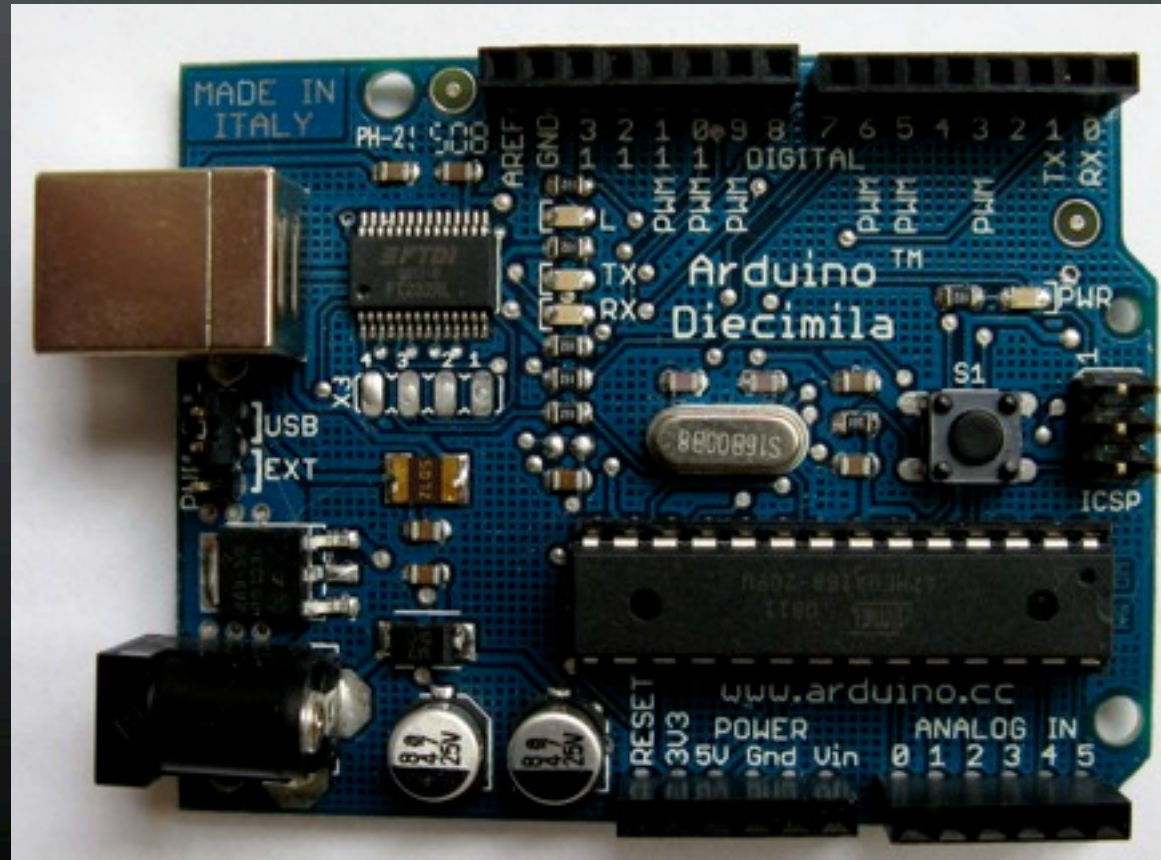
- Open source hardware and software platform
- Easy to program
- Hardware is flexible, fast, low power and low cost

# Arduino Hardware

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



# Arduino Boards



# Arduino Shields



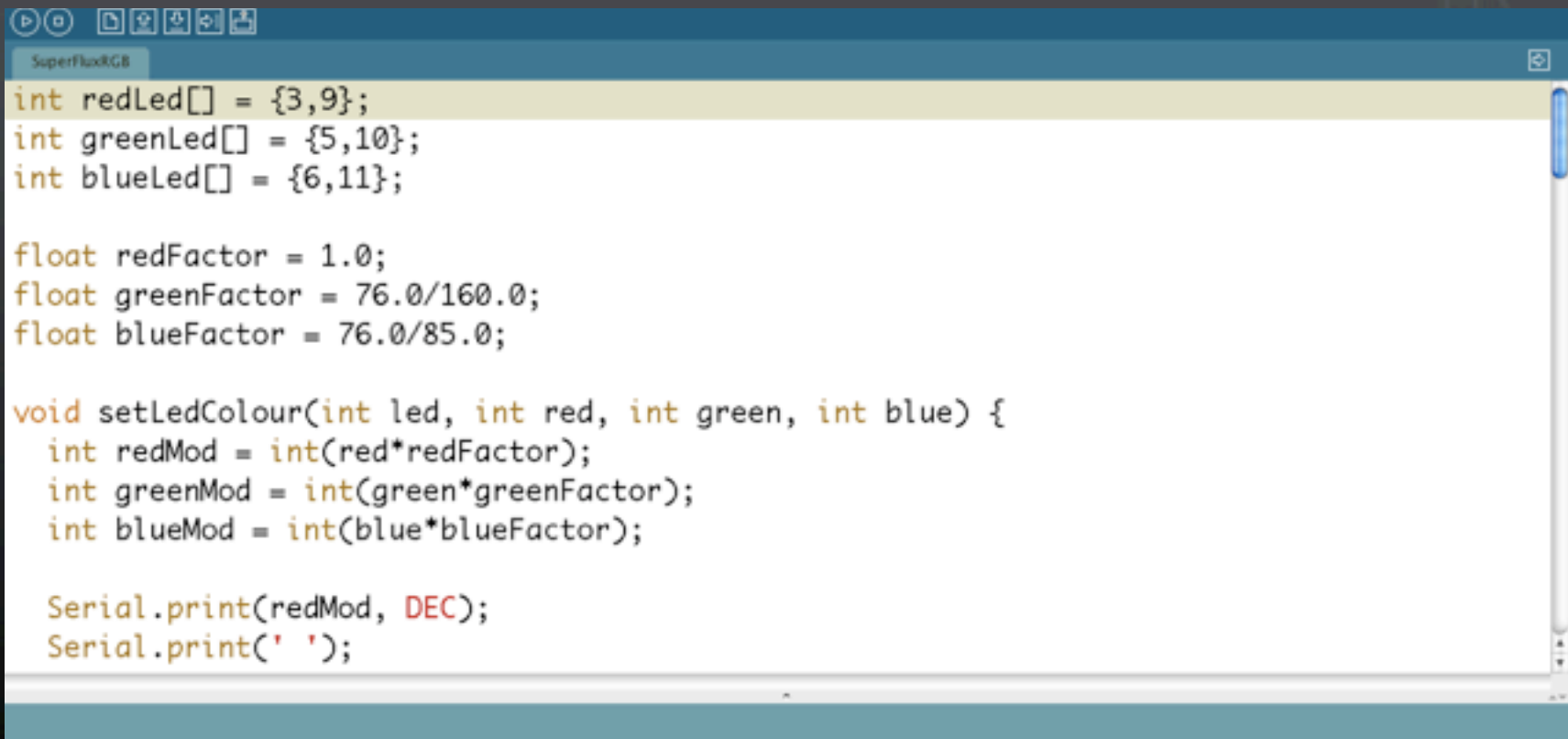
# Arduino Software Platform

- 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

# Arduino IDE



```
int redLed[] = {3,9};
int greenLed[] = {5,10};
int blueLed[] = {6,11};

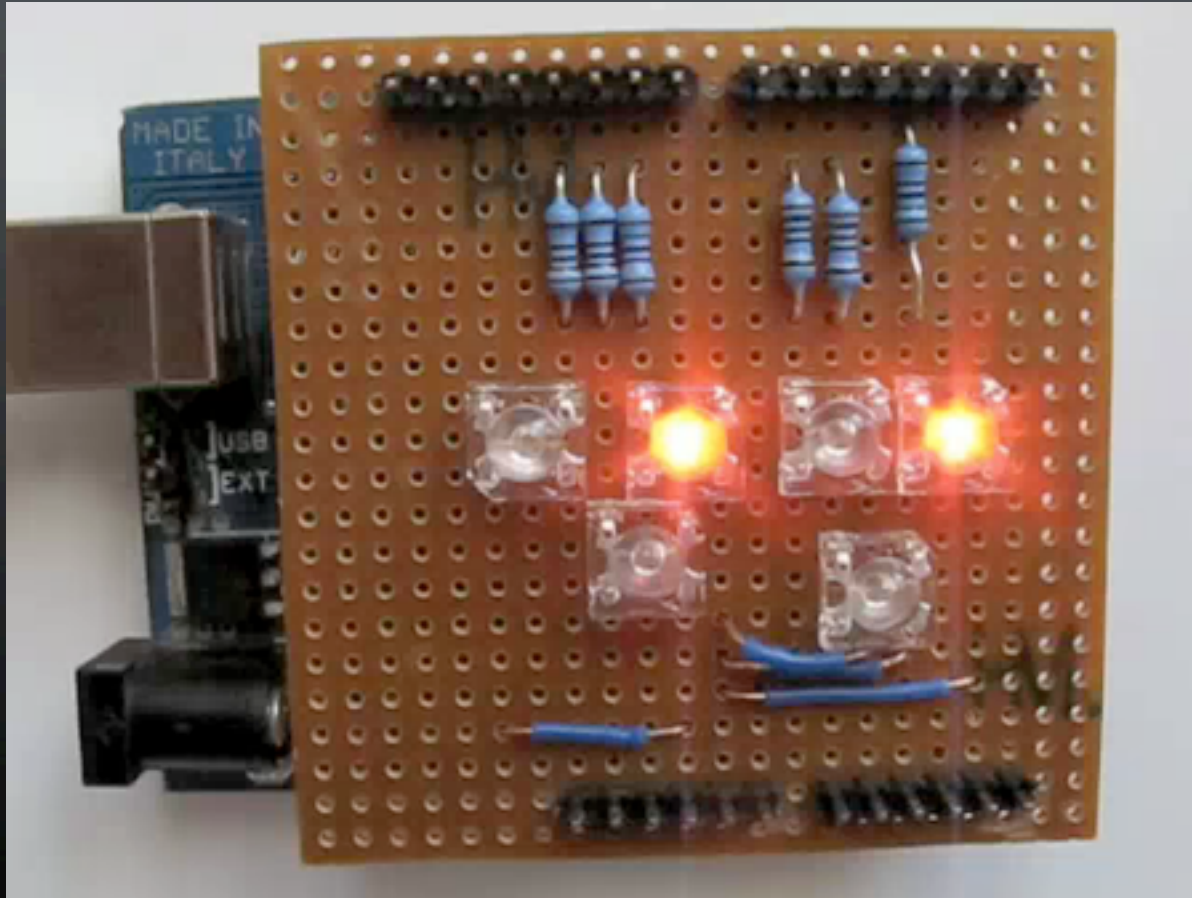
float redFactor = 1.0;
float greenFactor = 76.0/160.0;
float blueFactor = 76.0/85.0;

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



# Issues

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

# Connecting ColdFusion

- How to communicate between ColdFusion and Arduino



CF.Objective()



# ColdFusion Communication

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

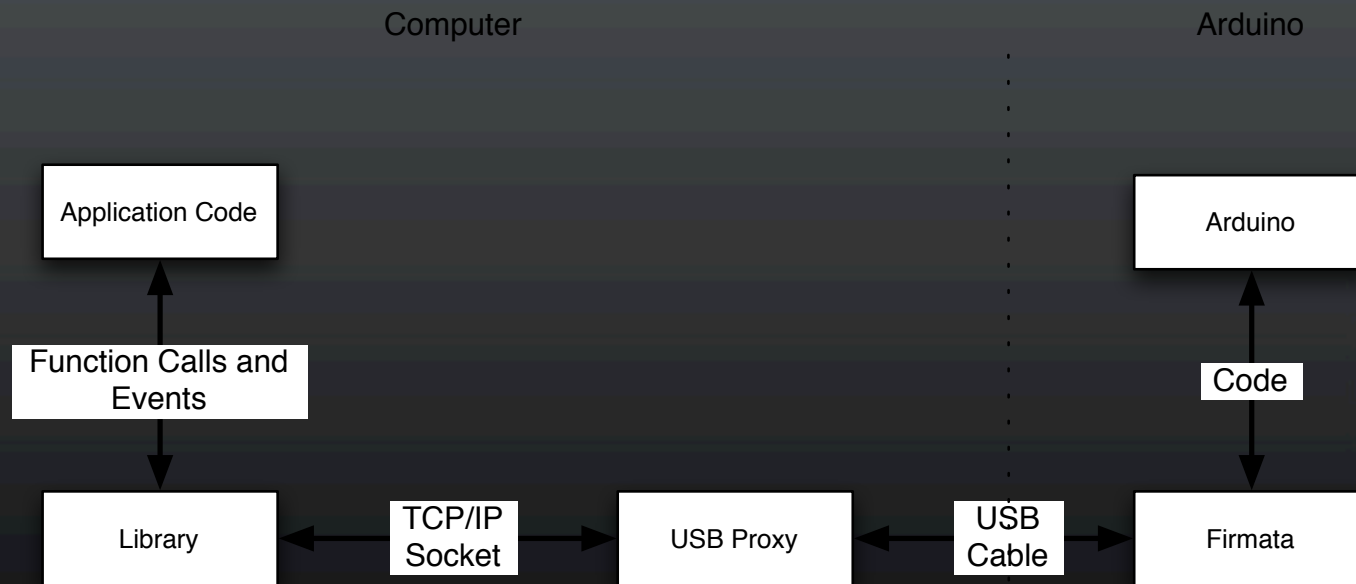


CF.Objective()

# 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
- No ColdFusion library exists yet

# Firmata Protocol

| Type           | Command | MIDI | Byte #1  | Byte #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 Component

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

# ColdFusion Arduino Component

- 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

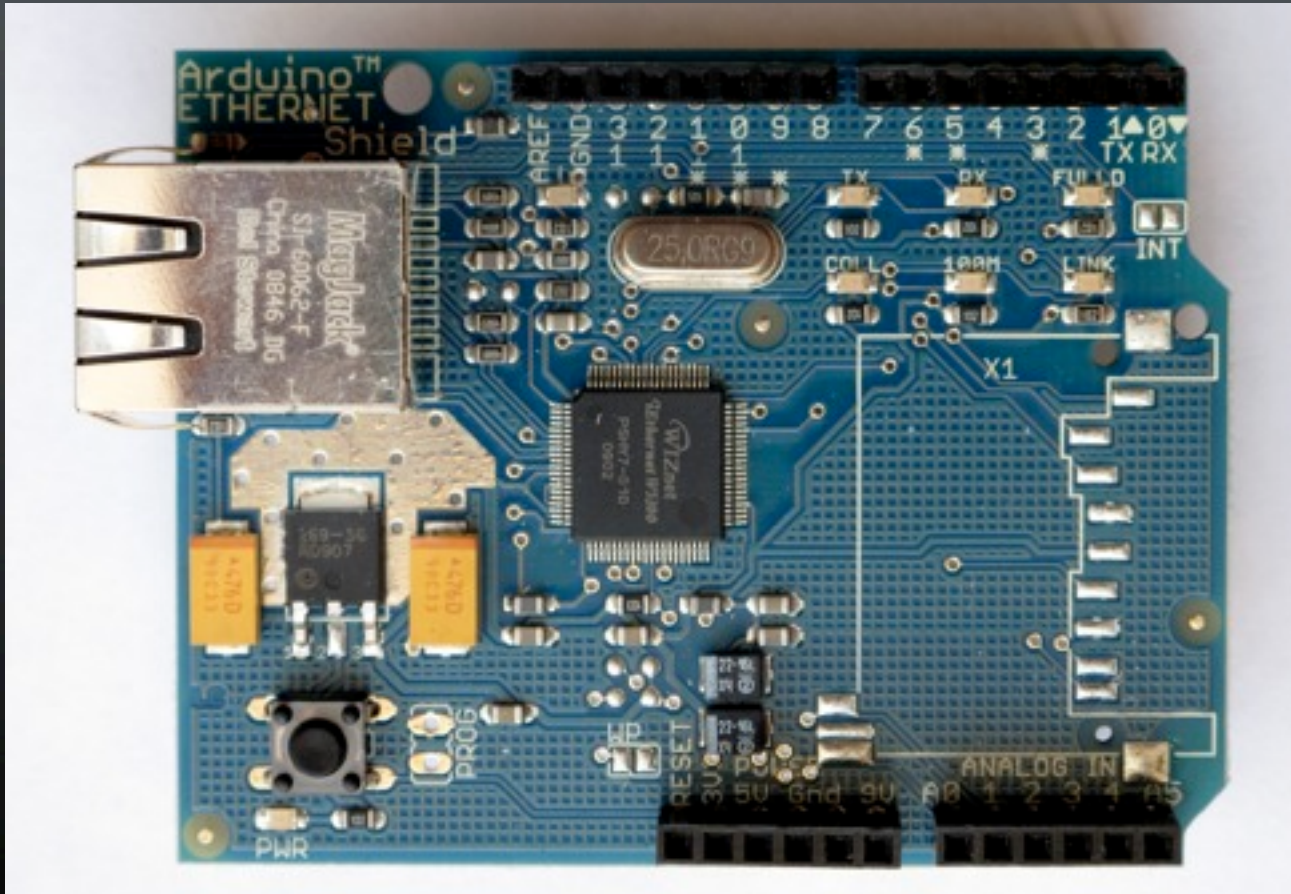
# Ethernet

- Using Arduino Ethernet Shields

# Ethernet Shields

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

# Ethernet Shields



# Ethernet Arduino Code

- Web server code
- Easy to 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



CF.Objective()



# 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 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

|               |   |         |                     |             |       |        |          |          |        |
|---------------|---|---------|---------------------|-------------|-------|--------|----------|----------|--------|
| XmIText       |   |         |                     |             |       |        |          |          |        |
| XmlAttributes | <table> <tr><td colspan="2">struct</td></tr> <tr><td>disposition</td><td>fixed</td></tr> <tr><td>domain</td><td>physical</td></tr> <tr><td>exposure</td><td>indoor</td></tr> </table> | struct  |                     | disposition | fixed | domain | physical | exposure | indoor |
| struct        |   |         |                     |             |       |        |          |          |        |
| disposition   | fixed   |         |                     |             |       |        |          |          |        |
| domain        | physical  |         |                     |             |       |        |          |          |        |
| exposure      | indoor  |         |                     |             |       |        |          |          |        |
| name          | <table> <tr><td>XmIText</td><td>office</td></tr> </table>   | XmIText | office              |             |       |        |          |          |        |
| XmIText       | office  |         |                     |             |       |        |          |          |        |
| lat           | <table> <tr><td>XmIText</td><td>51.5235375648154</td></tr> </table>   | XmIText | 51.5235375648154    |             |       |        |          |          |        |
| XmIText       | 51.5235375648154  |         |                     |             |       |        |          |          |        |
| lon           | <table> <tr><td>XmIText</td><td>-0.0807666778564453</td></tr> </table>  | XmIText | -0.0807666778564453 |             |       |        |          |          |        |
| XmIText       | -0.0807666778564453   |         |                     |             |       |        |          |          |        |
| ele           | <table> <tr><td>XmIText</td><td>23.0</td></tr> </table>   | XmIText | 23.0                |             |       |        |          |          |        |
| XmIText       | 23.0  |         |                     |             |       |        |          |          |        |

|               |  |         |     |               |   |          |     |          |       |          |     |
|---------------|--|---------|-----|---------------|---|----------|-----|----------|-------|----------|-----|
| XmIText       |  |         |     |               |   |          |     |          |       |          |     |
| XmlAttributes | <table> <tr><td colspan="2">struct</td></tr> <tr><td>id</td><td>0</td></tr> </table>   | struct  |     | id            | 0   |          |     |          |       |          |     |
| struct        |  |         |     |               |   |          |     |          |       |          |     |
| id            | 0  |         |     |               |   |          |     |          |       |          |     |
| value         | <table> <tr> <td>XmIText</td><td>292</td></tr> <tr> <td>XmlAttributes</td><td> <table> <tr><td colspan="2">struct</td></tr> <tr><td>maxValue</td><td>658.0</td></tr> <tr><td>minValue</td><td>0.0</td></tr> </table> </td></tr> </table> | XmIText | 292 | XmlAttributes | <table> <tr><td colspan="2">struct</td></tr> <tr><td>maxValue</td><td>658.0</td></tr> <tr><td>minValue</td><td>0.0</td></tr> </table> | struct   |     | maxValue | 658.0 | minValue | 0.0 |
| XmIText       | 292  |         |     |               |   |          |     |          |       |          |     |
| XmlAttributes | <table> <tr><td colspan="2">struct</td></tr> <tr><td>maxValue</td><td>658.0</td></tr> <tr><td>minValue</td><td>0.0</td></tr> </table>  | struct  |     | maxValue      | 658.0   | minValue | 0.0 |          |       |          |     |
| 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 a ColdFusion one

# 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 the session or email me at [justin@classsoftware.com](mailto:justin@classsoftware.com)

# Questions?

- Ask now, see me after session or email [justin@classsoftware.com](mailto:justin@classsoftware.com)



CF.Objective()

# 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

- Little Bird Electronics (AUS) <http://www.littlebirdelectronics.com/>
- 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/>