Cypress Semiconductor: Arduino "Friendly" PSoC Shield

Design Presentation

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Outline

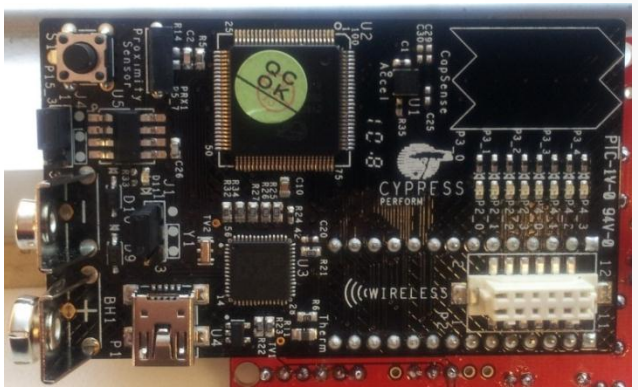
- Goals
- Hardware and Software Components
- Design Considerations
- Project specifications vs. current Project
- Applications
- Demos
- Future Recommendations
- Summary
- Questions

Goals

- **Expand Cypress Market base**
  - Interface PSoC5 with Arduino Ethernet Shield
  - Design a PCB to interface PSoC5 to all Arduino Shields
  - Demonstrate capabilities by creating a mini web server and interfacing with other hardware

Hardware

- **PSoC**:
  - Programmable System on Chip, also called a mixed system array
  - Contains a CPU and programmable hardware
  - Has sub systems on a single chip
  - Used to build embedded systems



- **PSoC 5**: First Touch Kit

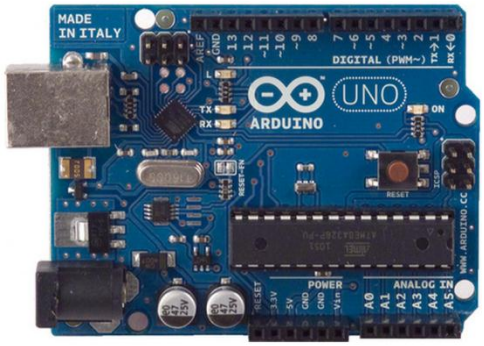
- ARM Cortex M3 processor

  Proximity Sensor, Accelerometer, CapSense slider, 28 external I/O pins

  Thermistor, 12-pin wireless module header, High Speed USB.

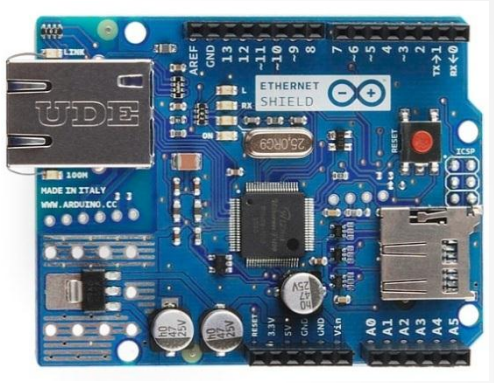
Hardware

- **Arduino**:
  - Open-source physical computing platform based on a simple microcontroller board (AVR Atmega)
  - Includes a software development environment
  - Can be connected to one or more daughterboards, known as shields
  - Targeted at Android developers, hobbyists, and students (low cost, easy to develop)

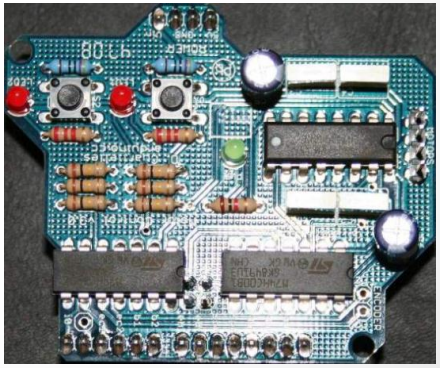


Hardware

- **Arduino Ethernet Shield:**
  - Standard RJ-45 Ethernet connection
  - Wiznet W5100 ethernet chip
    - Implements IP stack including TCP/UDP
  - MicroSD card slot
  - SPI bus shared by Ethernet and MicroSD



- **Motor Control Shield:**
  - Controls Up to 3 DC motors
  - Used to demonstrate design's compatibility with other Arduino shields

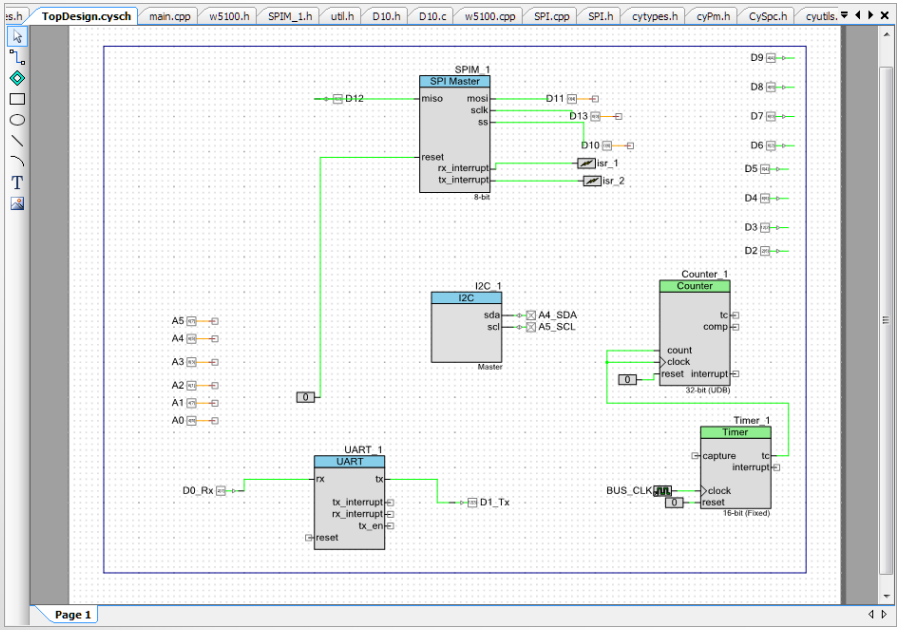


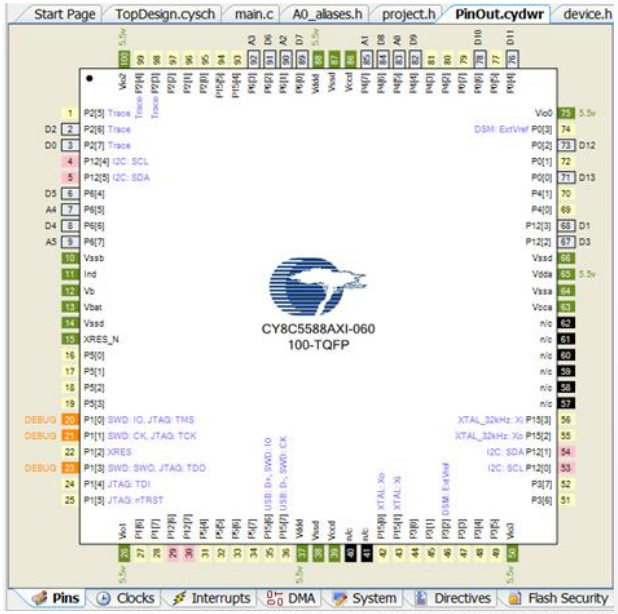
Hardware

- **PCB**: Printed Circuit Board
  - The PCB connects the PSoC 5 to the Arduino Shields
  - Side by Side configuration for easy replacement of components
  - Plastic base enclosure for better aesthetics
- **Final Packaged Layout**

Software

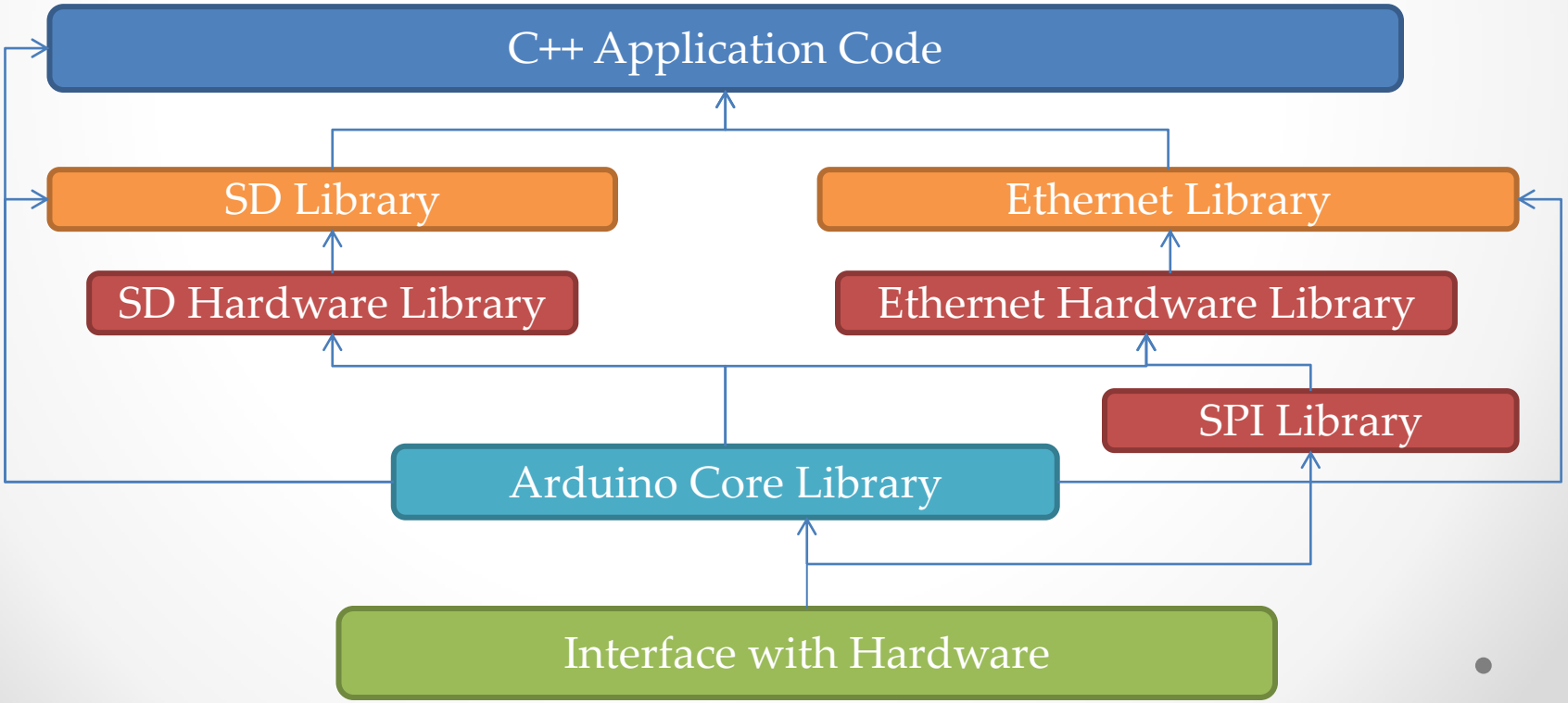
- PSoC Creator
  - Development environment
  - Schematic design of hardware components
  - IDE for C, generates C API's for components





Software

- Arduino libraries
  - Used by Arduino and Arduino Shields
    - Atmega328 with 32KB of flash for the standard board
  - Written in C++

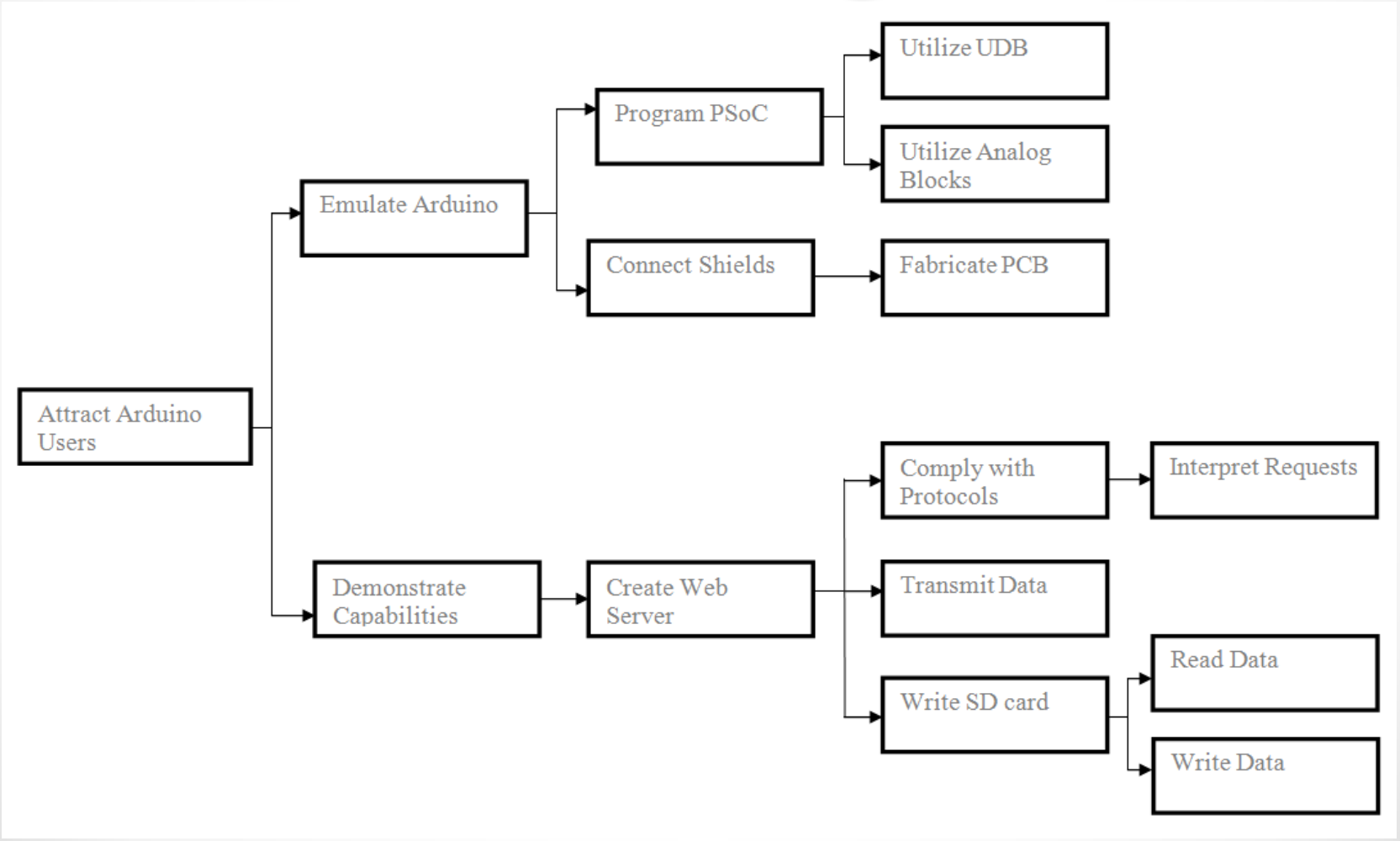


Design Specifications vs. Actual Project

Specification	Required	Implemented
Interface PSoC5 with Ethernet Shield	√	√
Web Server	√	√
SD Card Reader/Writer*	√	√
PCB		√
Additional Shields		√
Additional Applications		√

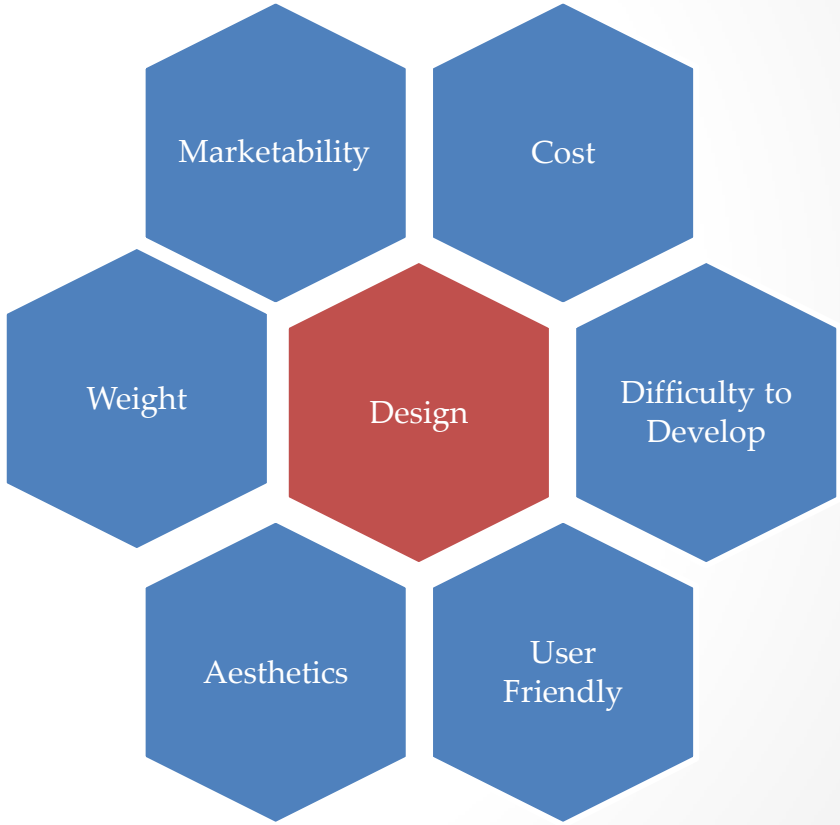
**Completed after submission of final report*

FAST Diagram

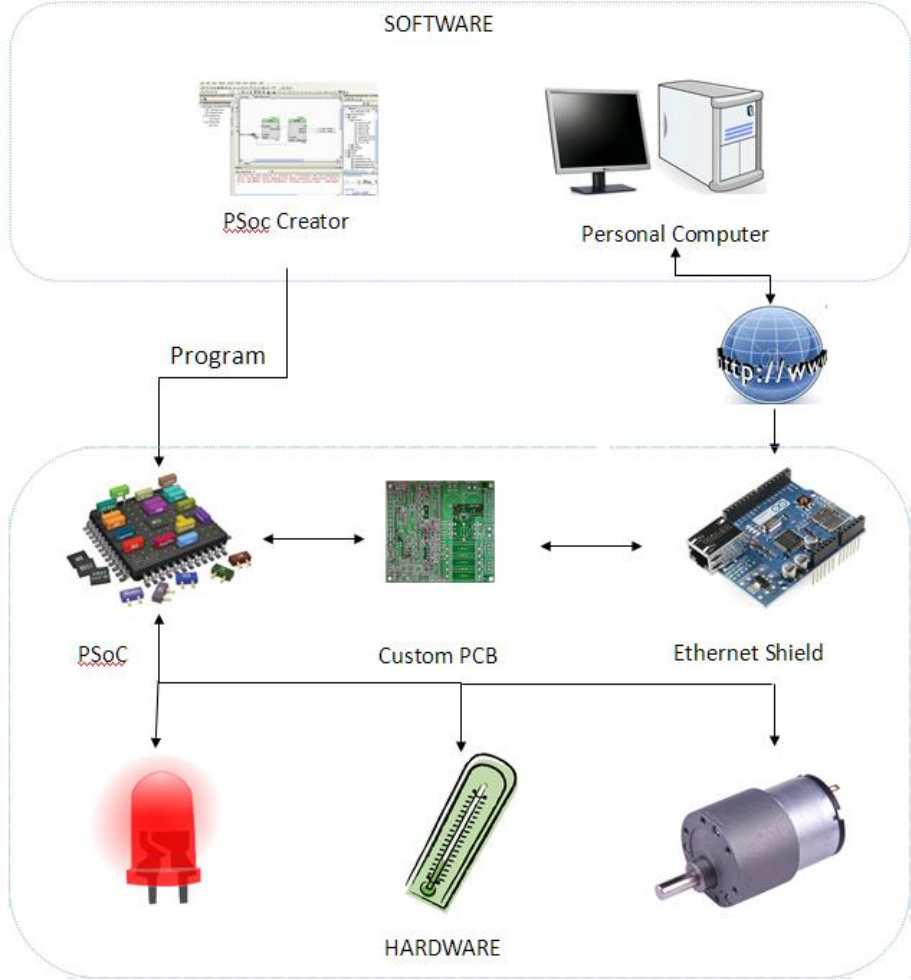


Design Consideration

- Possible Hardware Solutions
- Possible Software Solutions
- Possible Software Demos



Component Diagram

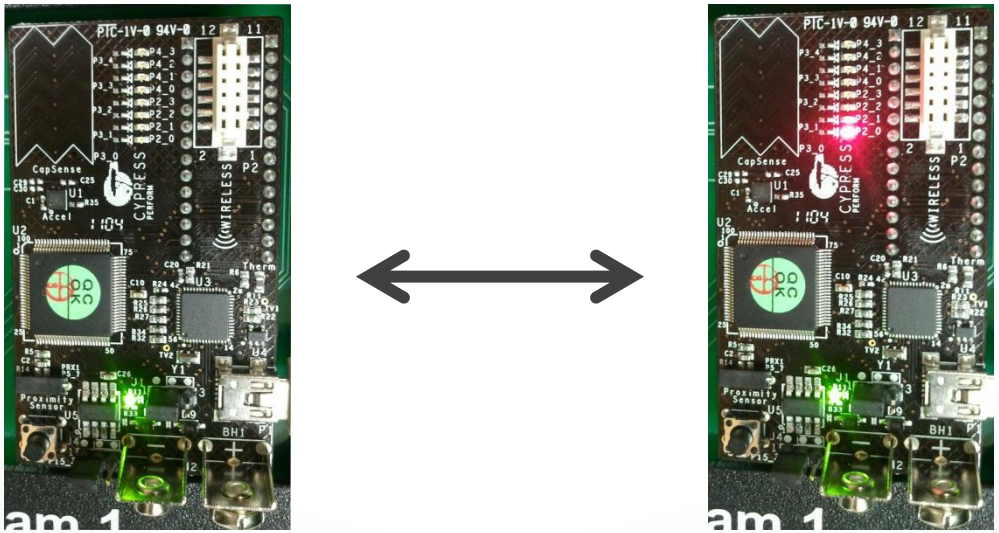


Applications

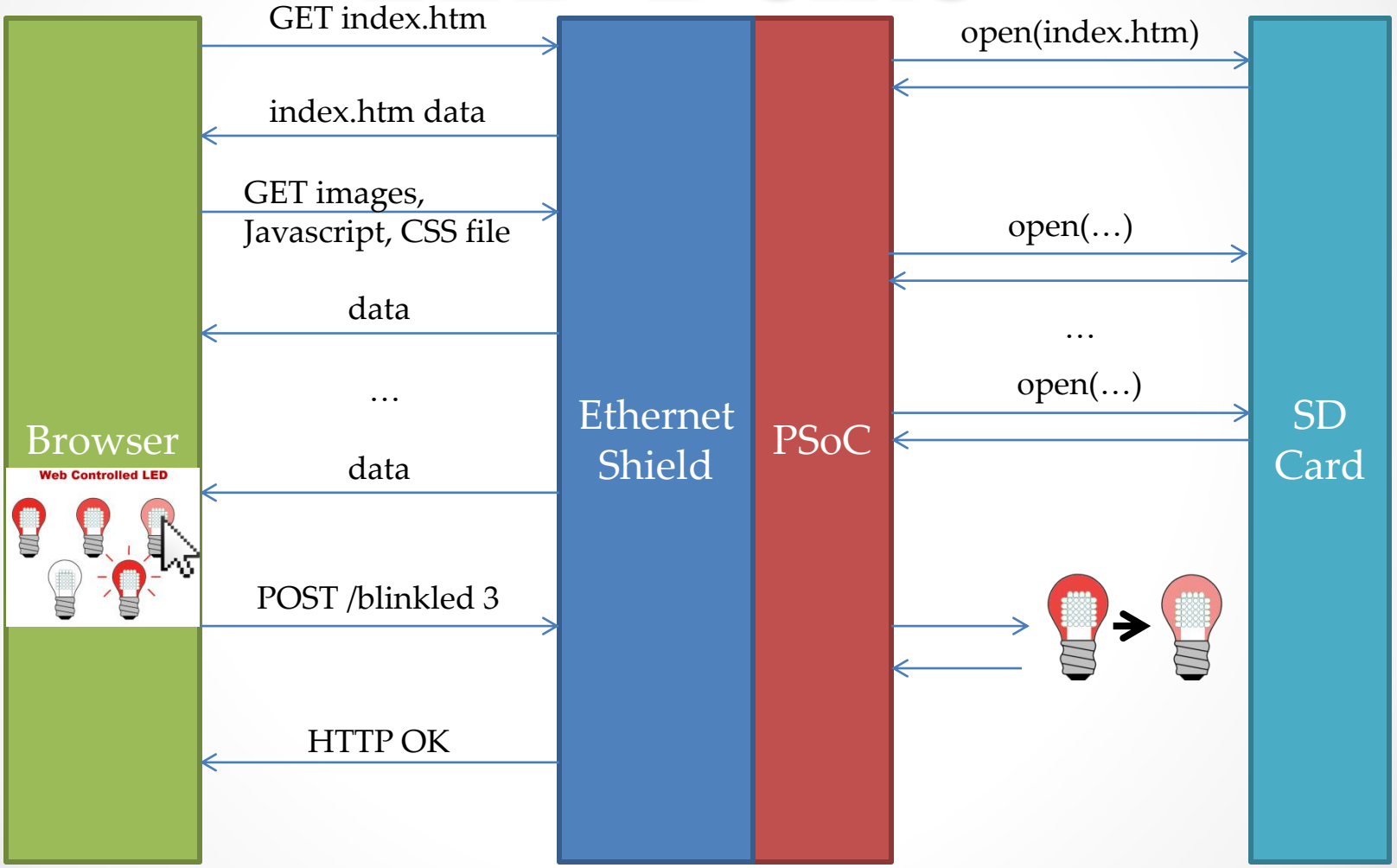
- Internet of Things
  - Home Automation
  - Remote Data Collection
- Web Server
- Android interface

LED Demo

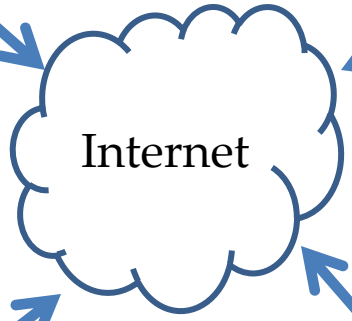
- Control an LED from a web browser
- LED has 5 states: On, Dim, Dimmer, Blinking, Off
- User interface loaded from PSoC
- Applicable to a wide range of devices and appliances



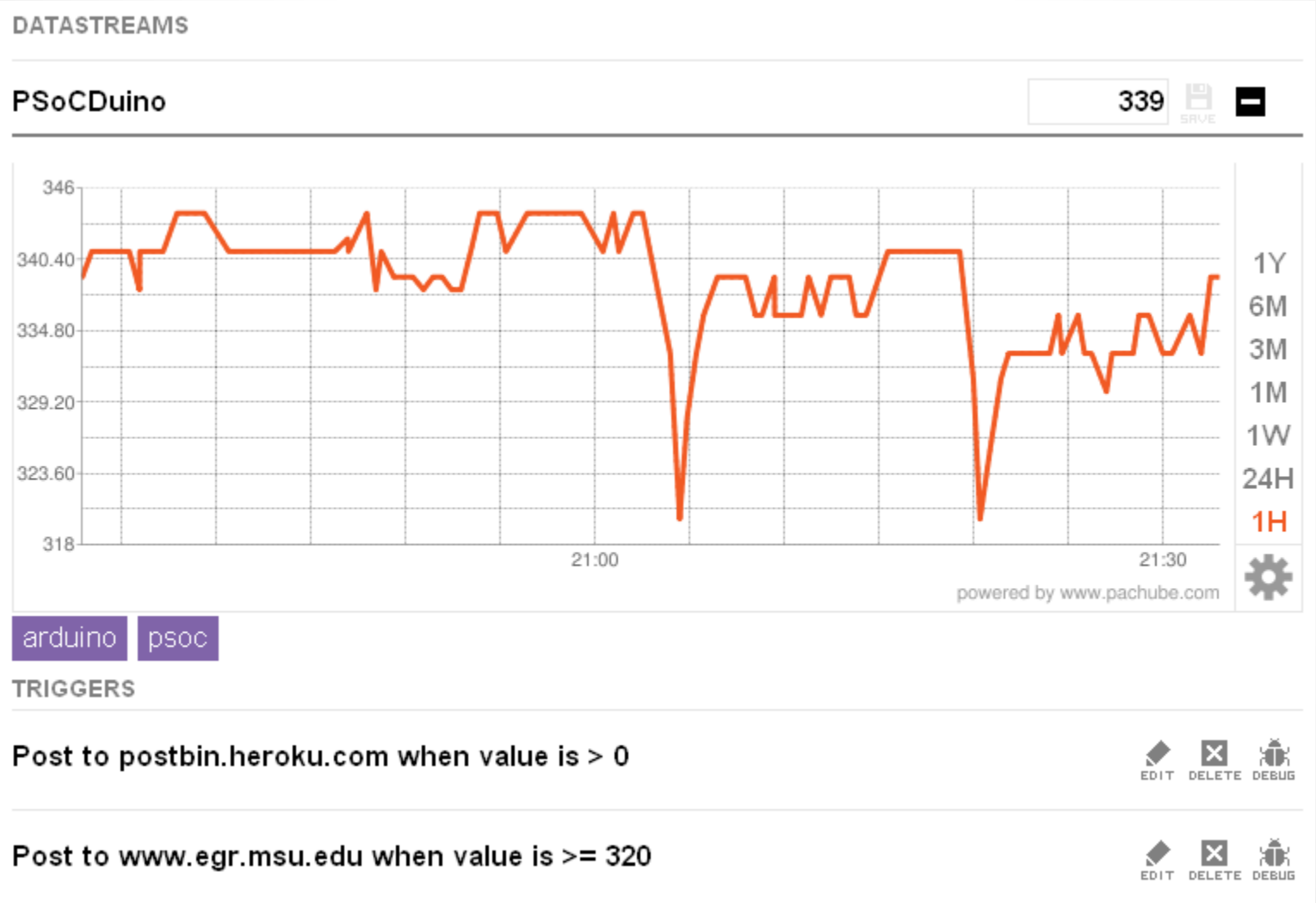
LED Demo


GET index.htm
index.htm data
GET images,
Javascript, CSS file
data
…
data
POST /blinkled 3
HTTP OK
open(index.htm)
open(…)
…
open(…)
Browser
Web Controlled LED
Ethernet
Shield
PSoC
SD
Card

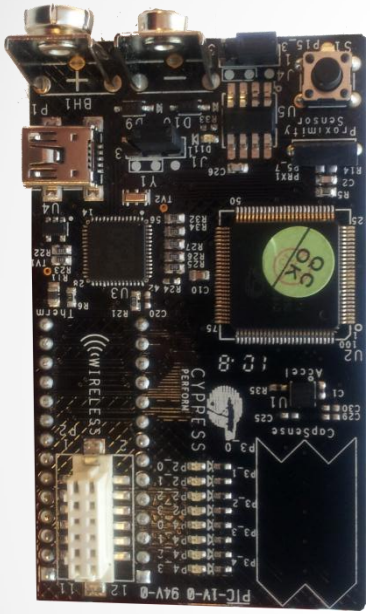
"The Internet of Things"

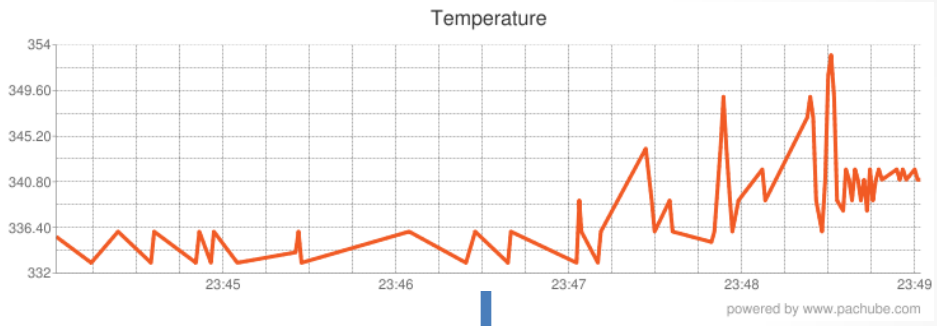


Pachube:


DATASTREAMS
PSoCDuino
339
SAVE
346
340.40
334.80
329.20
323.60
318
21:00
21:30
1Y
6M
3M
1M
1W
24H
1H
powered by www.pachube.com
arduino
psoc
TRIGGERS
Post to postbin.heroku.com when value is > 0
EDIT
DELETE
DEBUG
Post to www.egr.msu.edu when value is >= 320
EDIT
DELETE
DEBUG

Real Time Temperature Notifications

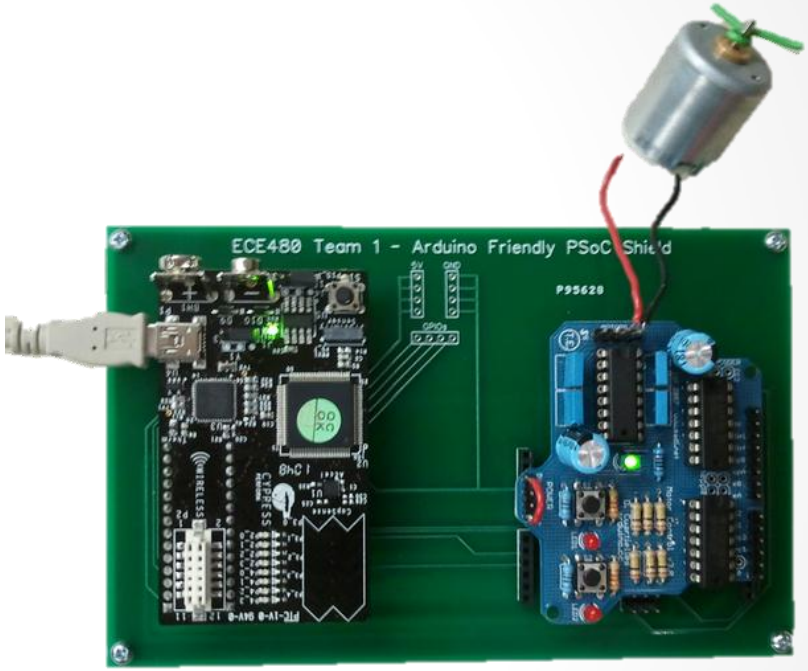




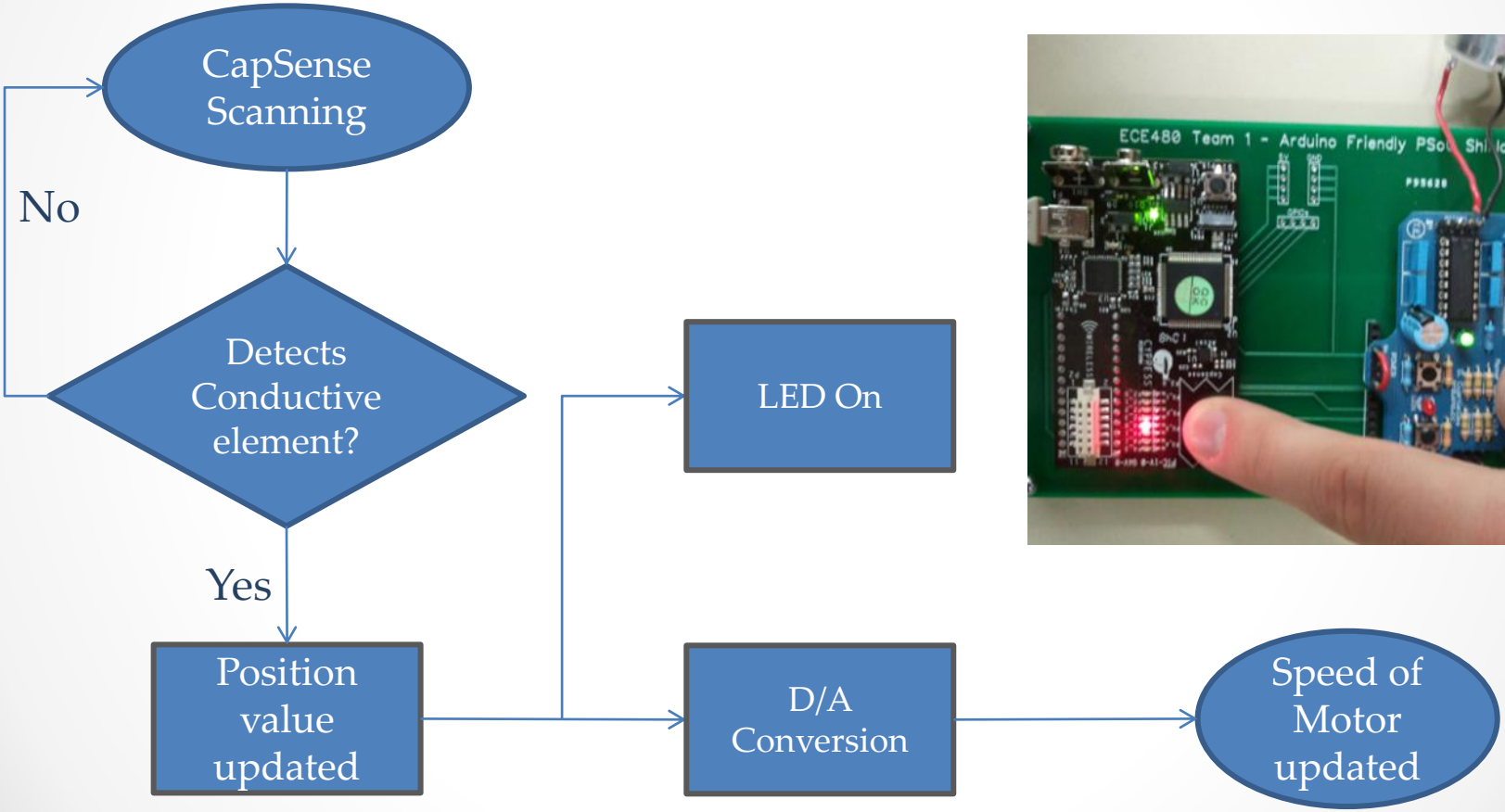
EMAIL ← **PHP SCRIPT**

Motor Shield Demo

- Arduino Friendly PSoC Shield connects to Arduino Motor Shield
- CapSense slider used to control speed of DC Motor
- Illustrates the design's compatibility with other Arduino Shields



Motor Control Flow



Future Design Recommendations

- Arduino Library porting
- Test compatibility with other Arduino shields
- Additional applications illustrating compatibility
- Consider developing a shield

Summary

- Completion of design objectives provided by sponsor
- PSoC is “Arduino Friendly”
- Hardware Solution
  - PCB
  - Packaging
- Software Solution
  - Ported Arduino Libraries
  - Demo applications

Questions