Cypress Semiconductor: Arduino "Friendly" PSoC Shield

Proposal Presentation

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Outline

- Goals
- Background
- Hardware and Software Component
- Diagrams
- Applications
- Project Management
- 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.

Background

- **PSoC**:
  - Programmable System on Chip, also called a mixed system array.
  - Contains a CPU and programmable hardware.
  - Has sub systems on a single chip. The systems and the connections between them are configured to achieve a system on chip.
  - Used to build embedded systems.

Background

- **Arduino**:
  - Open-source physical computing platform based on a simple microcontroller board.
  - Includes a software development.
  - Can be connected to one or more daughterboards, known as shields.
  - Until recently Arduino was a hardware platform for hobbyists and students, but now it has been endorsed by Google as an Android Development Platform.

Hardware

- **PSoC 5**: CY8CKIT-014 FirstTouch Starter Kit
  - ARM Cortex M3 processor
  - Serial Wire Debugging, Accelerometer, Thermistor, Proximity Sensing, CapSense® touch-sensing, 12-pin wireless module header, 28 general purpose I/O pins (GPIOS)

http://www.cypress.com/?rID=43674

Hardware

- **Arduino Ethernet Shield**:
  - Standard RJ-45 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 DC motors
  - Will be used to demonstrate design's compatibility
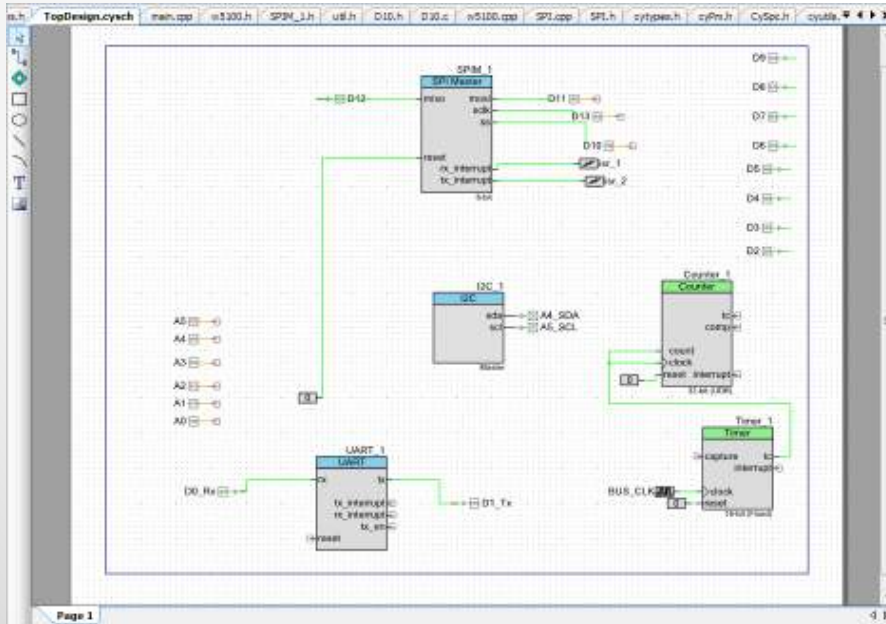   with other Arduino shields

Hardware

- **PCB**: Printed Circuit Board
  - o Used to support and connect electronic components.
  - o These boards are widely used in electronics.
  - o They are inexpensive and very reliable.
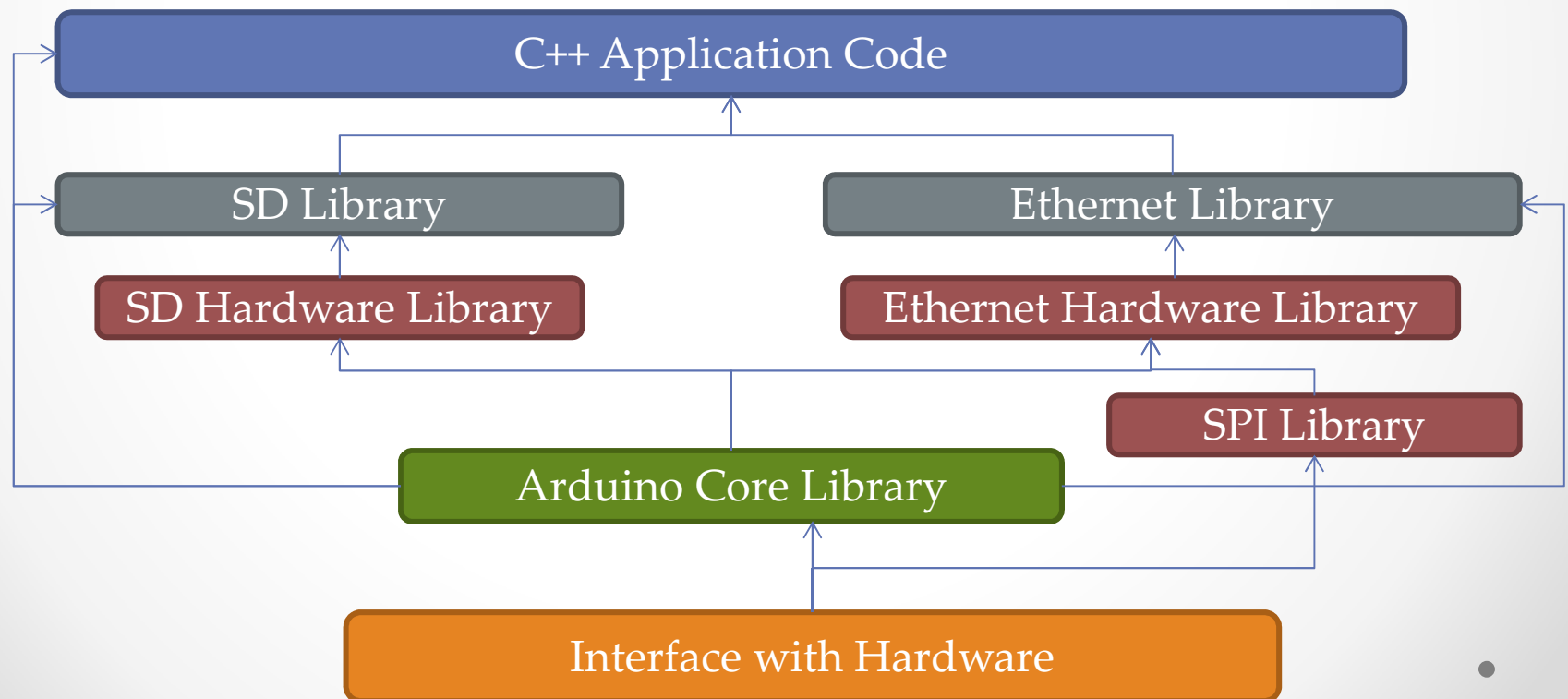 - o In our case the PCB will connect the PSoC 5 to the Arduino Shields.
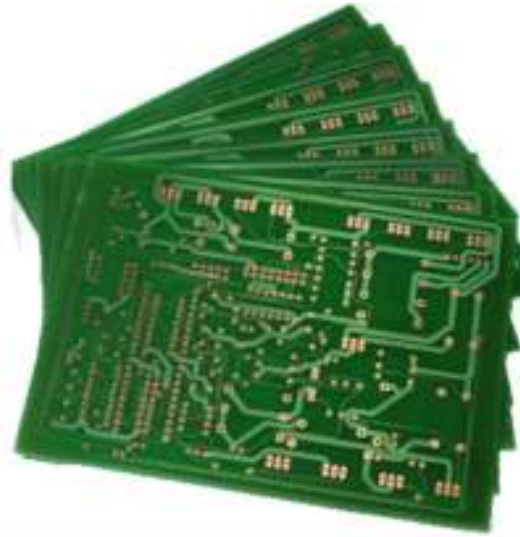
Software

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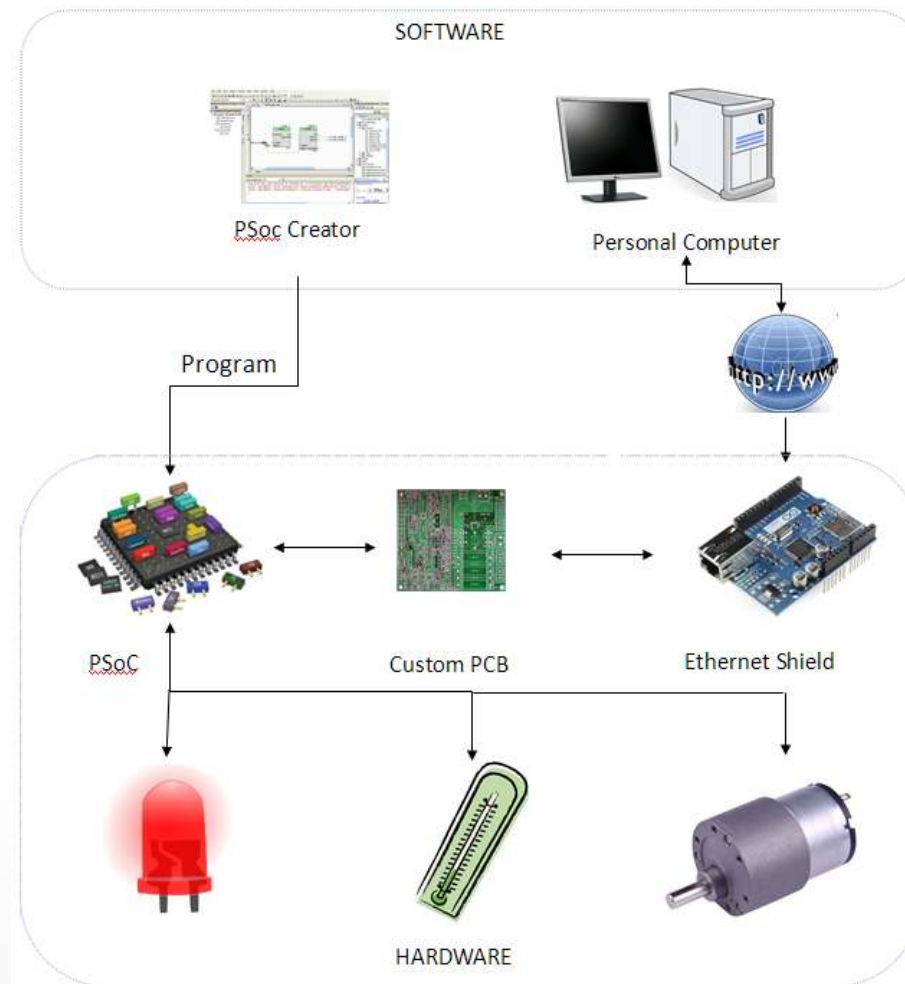 - IDE for C, generates C API's for components

Software

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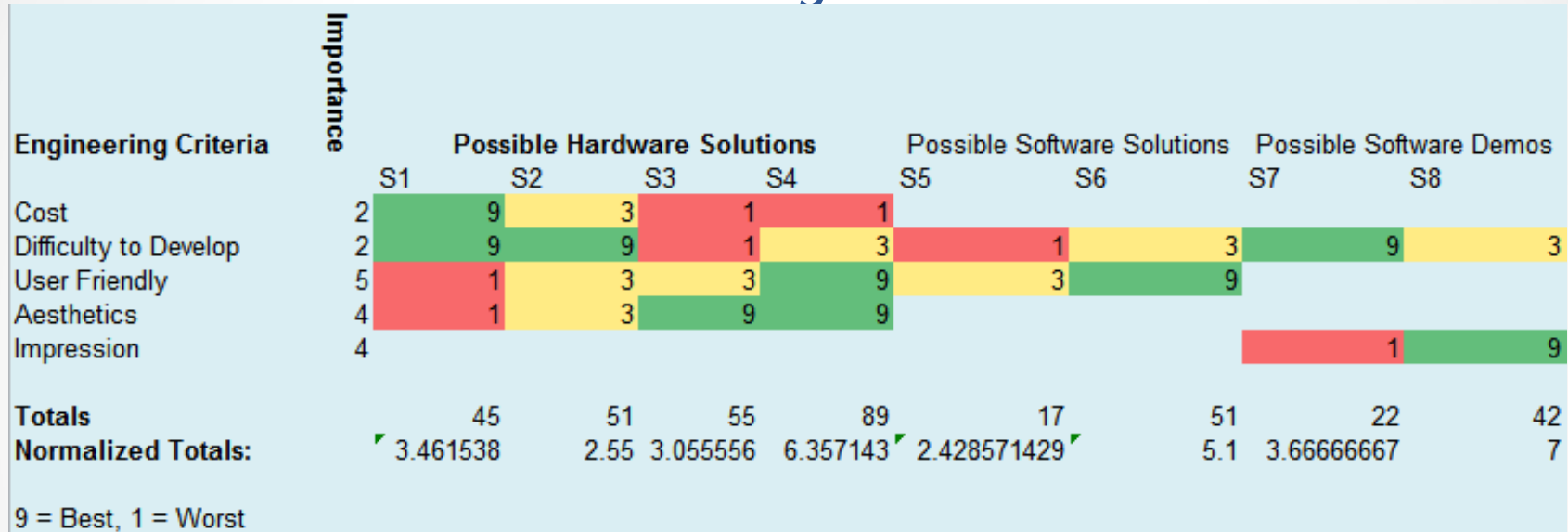 - Written in C++

Component Diagram

FAST Diagram
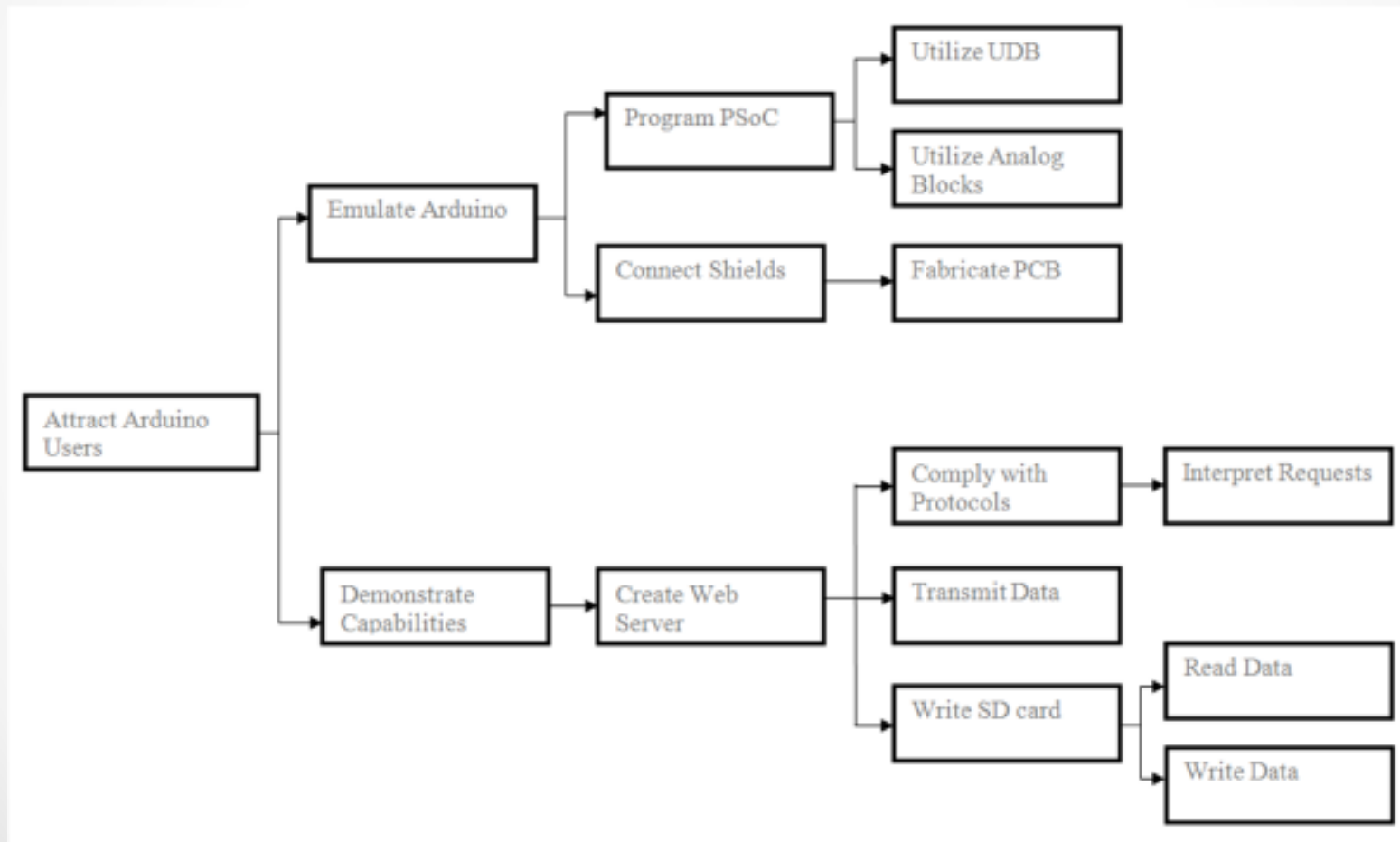
Applications

- Turning an LED on and off over the internet.

- Reading a message on a webpage and then sending the message to the SD card.

- Writing a message from the SD card to a website.

- Integration with social media; Sending messages or data retrieved by the PSoC to Twitter

Feasibility Matrix

Engineering Criteria	Importance	Possible Hardware Solutions				Possible Software Solutions		Possible Software Demos	
		S1	S2	S3	S4	S5	S6	S7	S8
Cost	2	9	3	1	1				
Difficulty to Develop	2	9	9	1	3	1	3	9	3
User Friendly	5	1	3	3	9	3	9		
Aesthetics	4	1	3	9	9				
Impression	4							1	9
Totals		45	51	55	89	17	51	22	42
Normalized Totals:		3.461538	2.55	3.055556	6.357143	2.428571429	5.1	3.66666667	7

9 = Best, 1 = Worst

| Hardware Component		
Connect PSoC to shield via protosheild	S1	This setup has already been completed
Connect PSoC to shield via a custom PCB (stacked) without enclosure	S2	Involves creation of a PCB similar to the protosheild
Connect PSoC to shield via a custom PCB (stacked) with enclosure	S3	Stacked design may prove difficult to mount due to irregular structure
Connect PSoC to shield via a custom PCB (side by side) with enclosure	S4	Placing the PSoC and shield side by side may be easier to mount
Software Component		
Create ethernet and SD software from scratch	S5	Allows for custom design, but involves more coding
Port ethernet and SD software from Arduino libraries	S6	Involves research and debugging of pre-made code, but platform independent code can be reused easily
Include demos from Arduino	S7	Demo code available and fairly platform-independent
Include custom demos	S8	Requires more research, may yield more impressive results

Risk Analysis

Task	Description	Risk
Design and fabrication of PCB extends beyond delivery date	Major, Low Likelihood	Low (5)
Difficulty porting Arduino libraries to PSoC Creator Environment	Serious, Low Likelihood	Moderate (8)
Server application demo development issues	Serious, Low Likelihood	Moderate (8)

Likelihood	Minimal	Minor	Major	Serious	Catastrophic
Near Certainty	5	10	15	20	25
Highly Likely	4	8	12	16	20
Likely	3	6	9	12	15
Low Likelihood	2	4	5	8	10
Extremely Improbable	1	2	3	4	6

Severity/ Impact

Risk Legend

Low (Green)	≤ 5
Moderate (Yellow)	≥ 5, ≤ 12
High (Red)	≥ 12

Gantt Chart
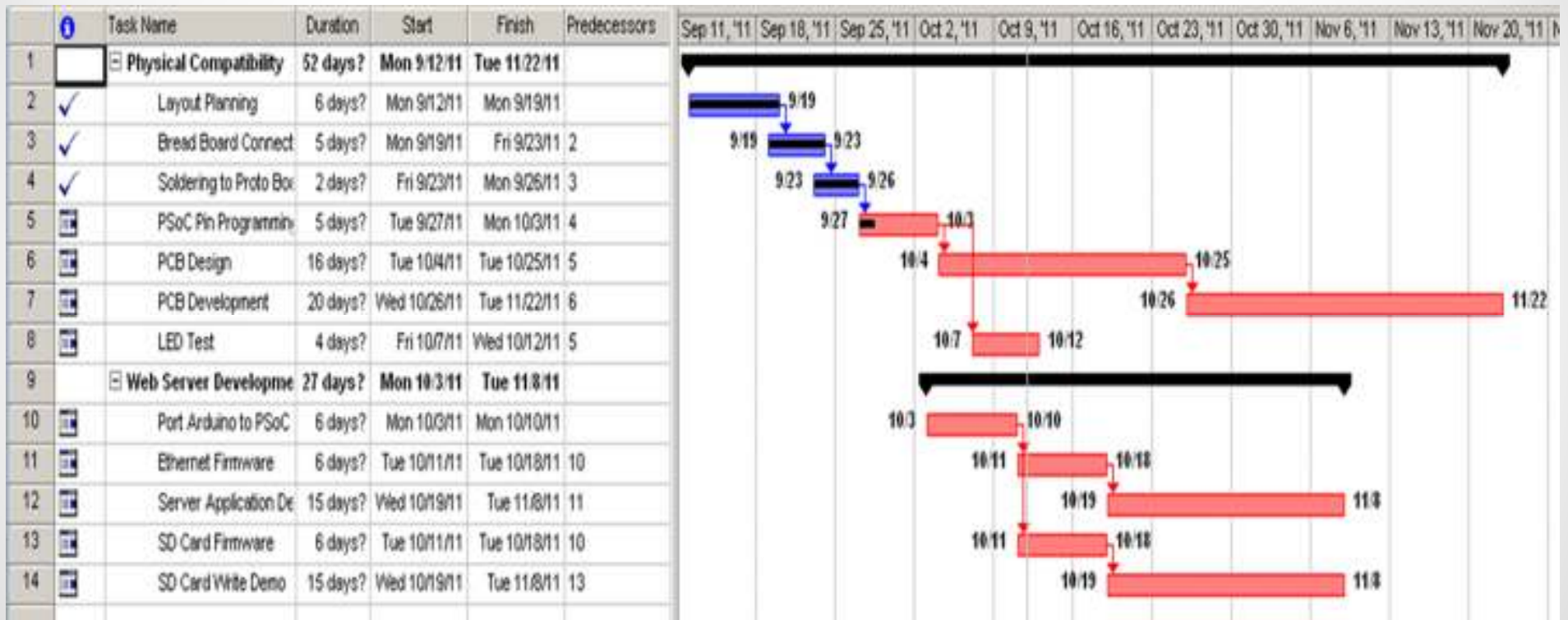
Project Managment

Team Member	Technical Role
Aaron	PSoC Creator Pin Configuration and Design
Matt and Nate	Porting Arduino Ethernet code, SD Card code
Brett	Power consumption analysis and Soldering
Brett and Cecilia	PCB Design, Packaging, Pin Configuration and design

Budget

- $500 allocated
- Proposed design solution will stay well under the allocated funds
- Cypress provided Team 1 with two PSoC First Touch kits

Item	Cost
Arduino Ethernet Shield	$46.72
Sparkfun Arduino ProtoShield Kit	$20.51
PCB Fabrication (approximation)	$70.00
Arduino Motor Shield	$19.25
Additional Hardware (Headers, etc.)	$5.00
Packaging (Approx.)	$30.00
TOTAL:	**$191.48**