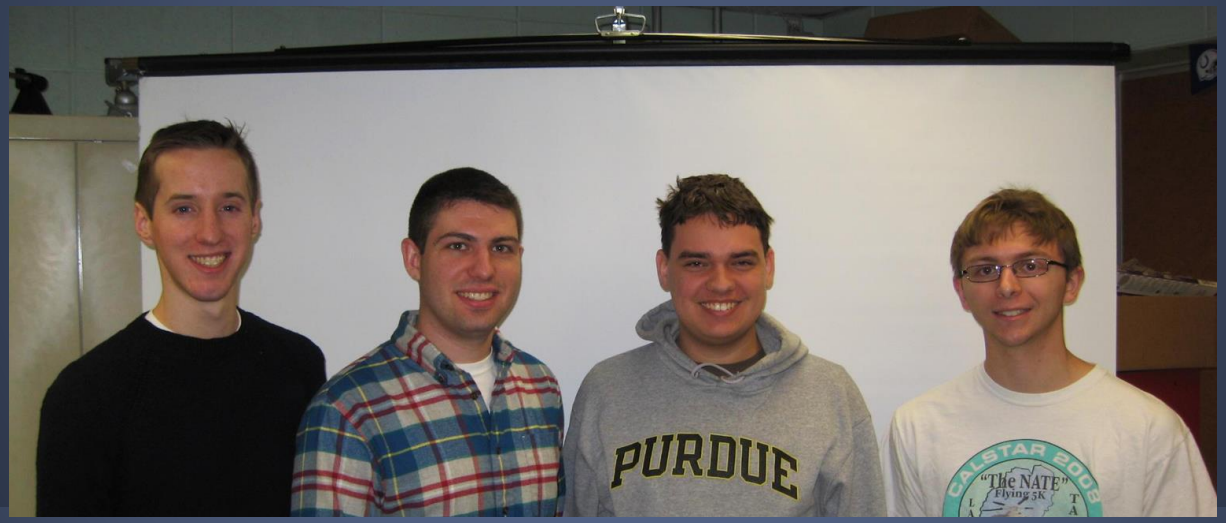
ECE 477 Design Review
Team 2 - Spring 2015
R.I.S.K.



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Outline

- Project overview
- Project-specific success criteria
- Block diagram
- Component selection rationale
- Packaging design
- Schematic and theory of operation
- PCB layout
- Software design/development status
- Project completion timeline
- Questions / discussion

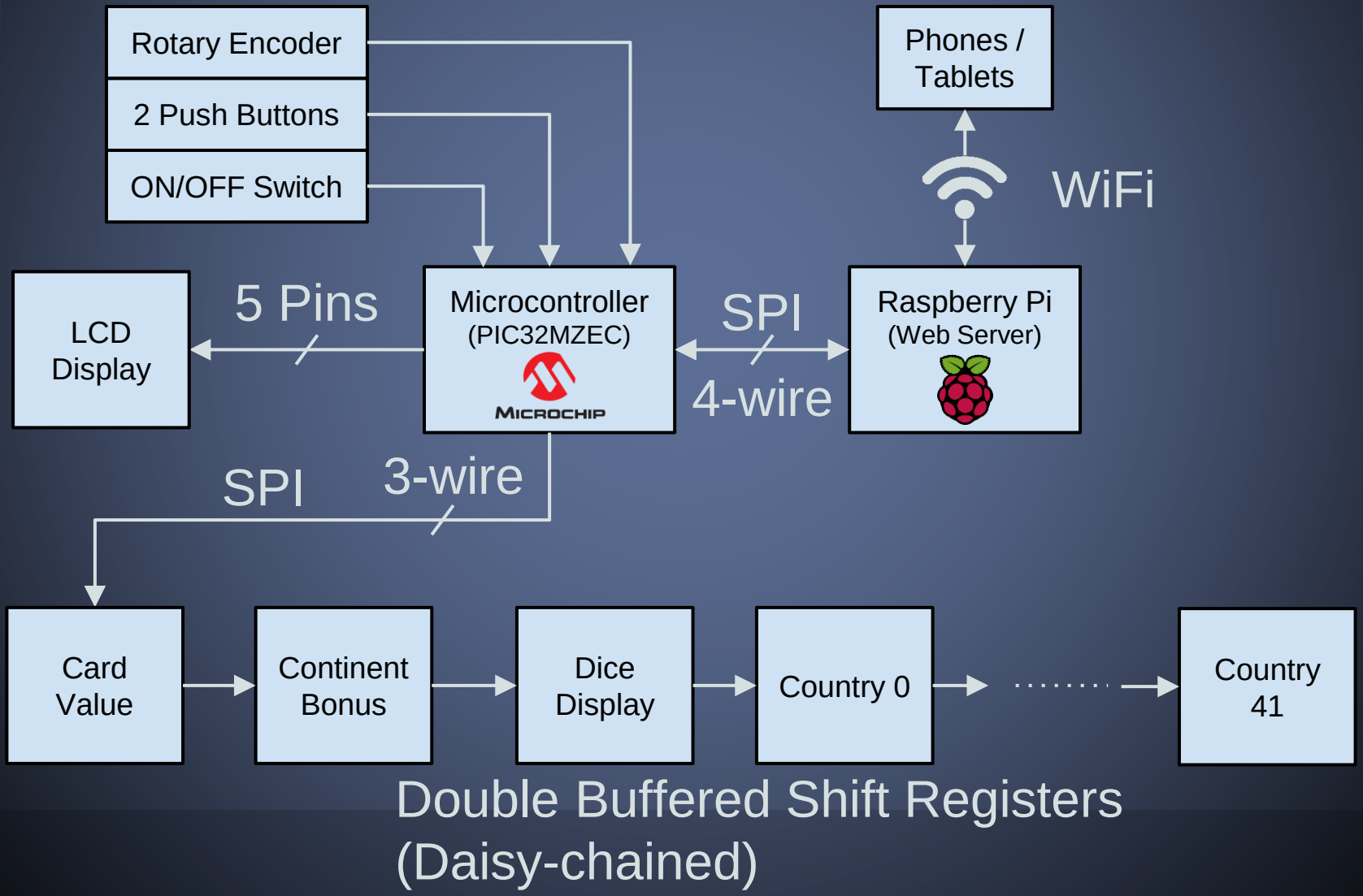
Project Overview

- Electronic implementation of the board game RISK
- Game state information will be displayed via LED displays
- Cards will be managed via a mobile web app
- Goal: improve ease of setting up/playing game

Project-Specific Success Criteria

1. An ability to keep track of the game state, such as troop numbers, country ownership, and battle information.
2. An ability to display troop counts and country ownership to the players via LEDs, 7-segment displays, and an LCD screen.
3. An ability to modify game state based on user input.
4. An ability to coordinate the distribution, display, and usage of Country Cards via a mobile web app.
5. An ability to collect statistical data related to gameplay and to compute and display statistics about gameplay and random events.

Block Diagram



Component Selection

- Microcontroller: PIC32MZ2048ECM064
  - 50 Mb/s SPI modules
  - Powerful enough for our needs

Family	Part	Clock	RAM	Pins	Cost
PIC32MZEC	PIC32MZ 2048M064	200 MHz	512 kB	64	$13.52
PIC24	PIC24FJ25 6DA206	16 MIPS	98 kB	64	$7.15

Component Selection

- Web Server: Raspberry Pi
  - Easy-to-use WiFi adapter

	Shows Card Type	Shows Countries	Card Privacy	Hardware Required
LED	Yes	No	No	Lots
LCD	Yes	Yes	No	Some
Web App	**Yes**	**Yes**	**Yes**	**Minimal**

Component Selection

- Shift Registers: 74HC595D
  - Most bits we could find for reasonable cost
  - Easy to daisy chain
  - Has separate clocks for shifting data and latching it to output pins
  - Surface mount to save board space
- Original Idea: I2C
  - Each country would have its own address
  - Too complex to be feasible

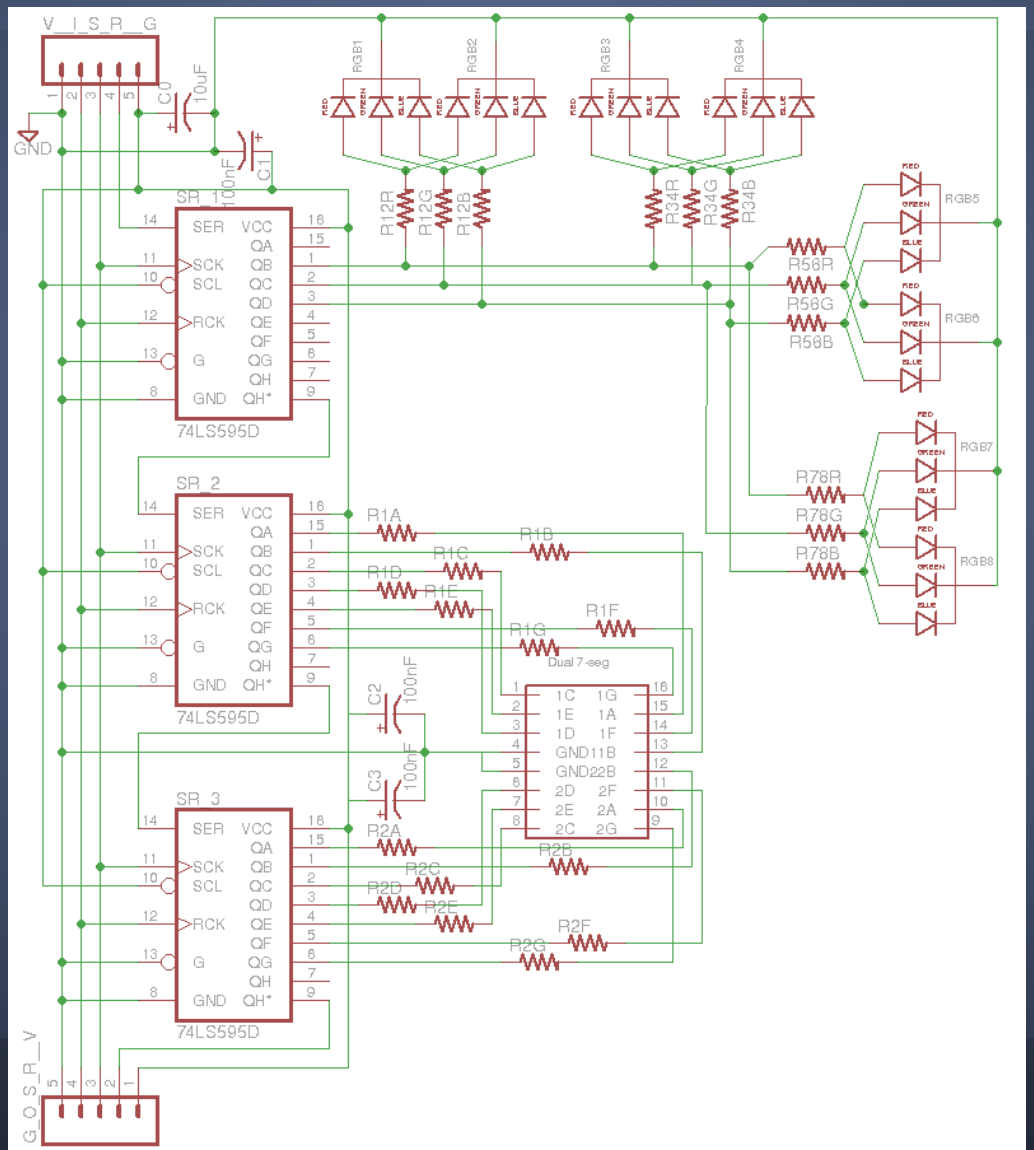
Component Selection

- LCD Display: Gravitech 20x4 LCD
  - Enough space for relevant game information
  - Uses very common HD44780 controller
- Original Idea: 16x2 LCD
  - Readily available
  - Not enough space to describe game actions

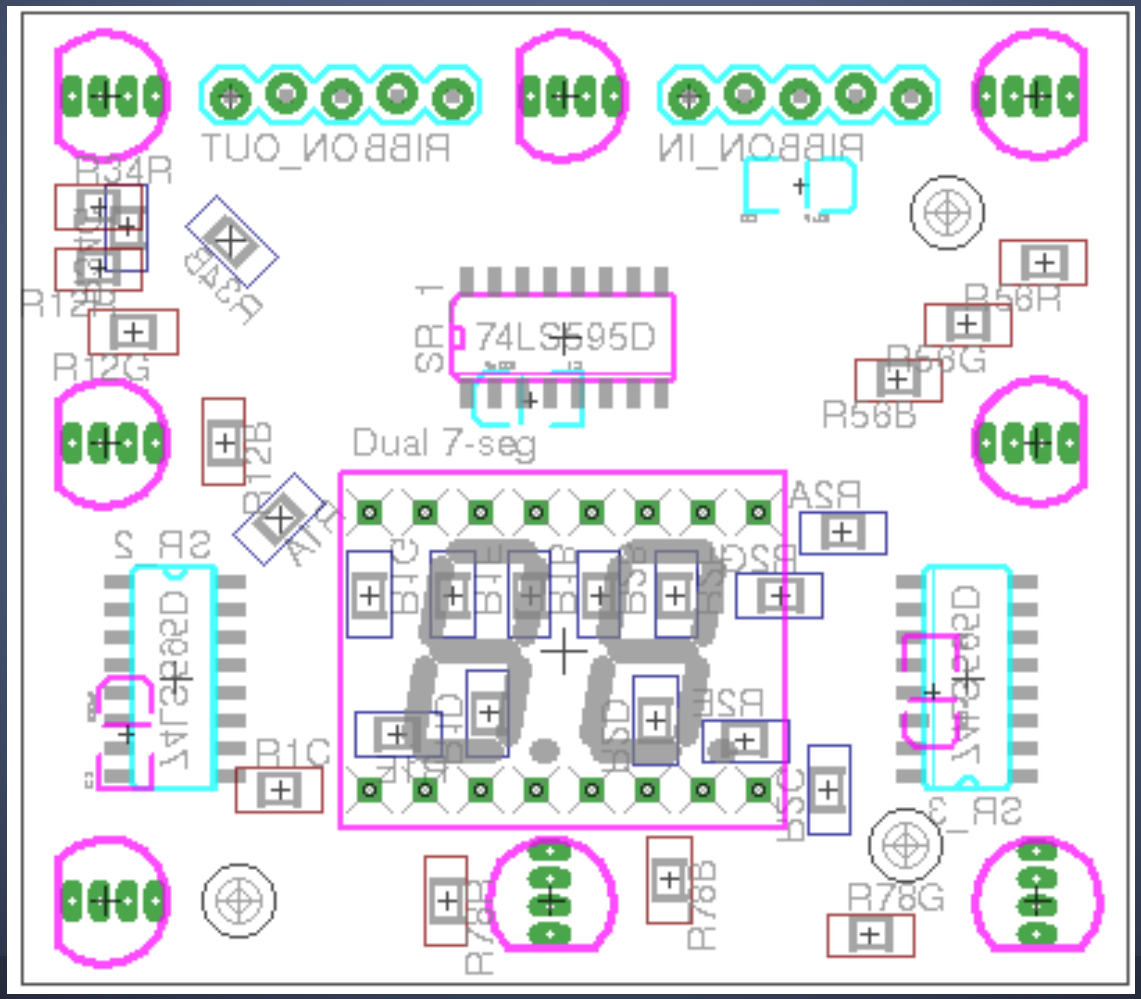
Packaging Design

- Frosted acrylic for top surface, opaque acrylic for others
- Rotary encoder and two buttons

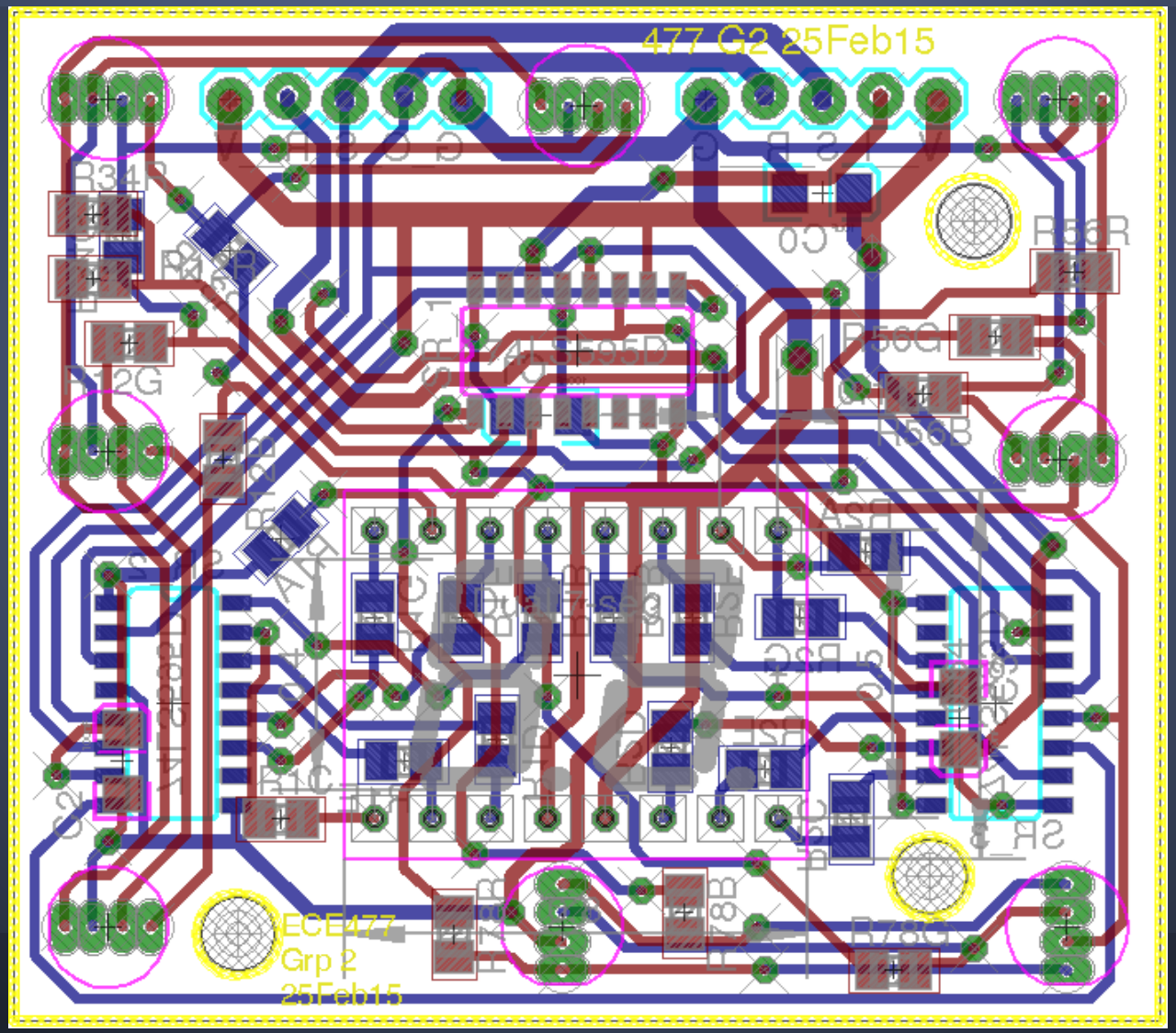
Country Schematic



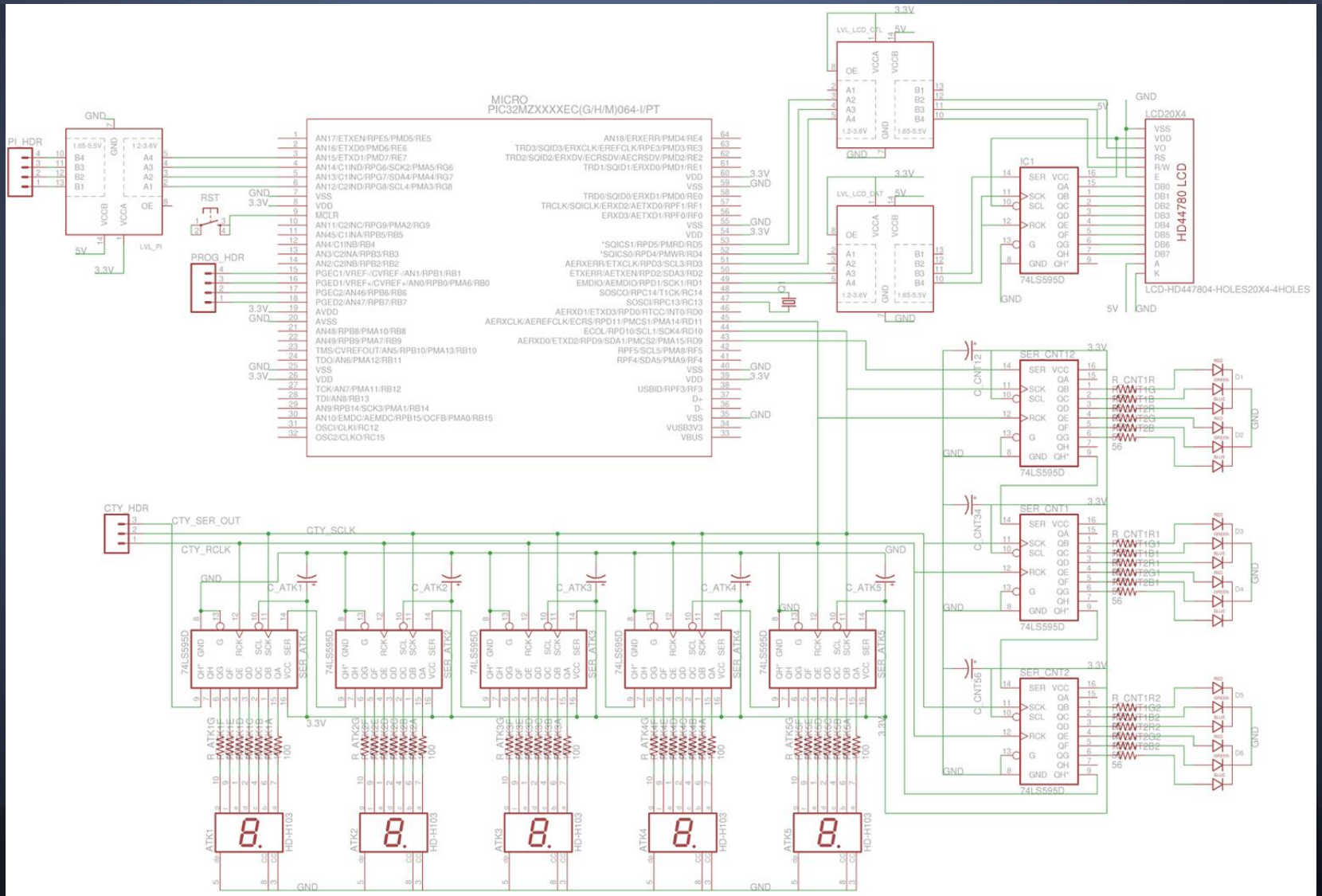
Country PCB (Components)



Country PCB (Full)



Main Board Schematic

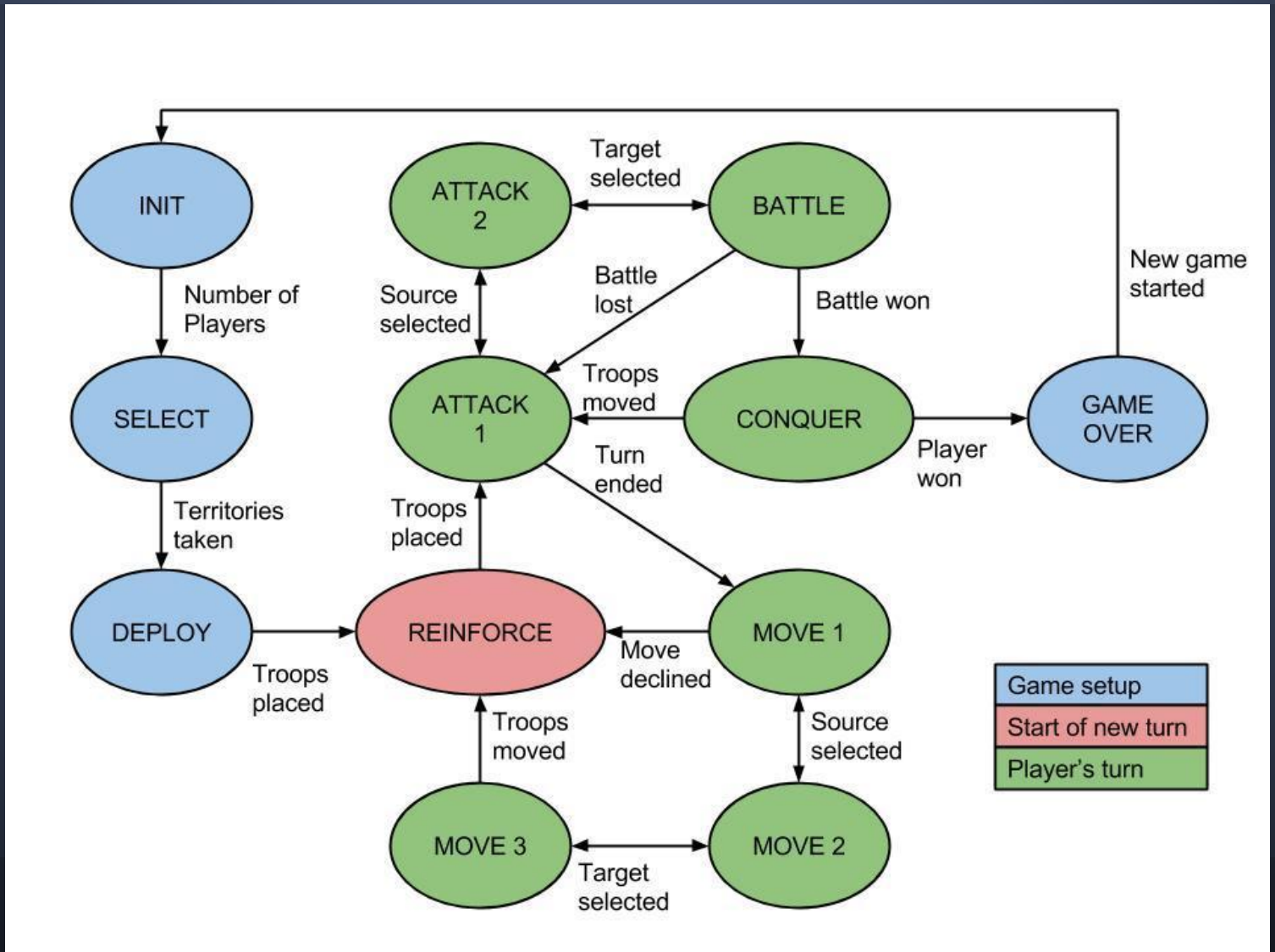


Main Board Layout

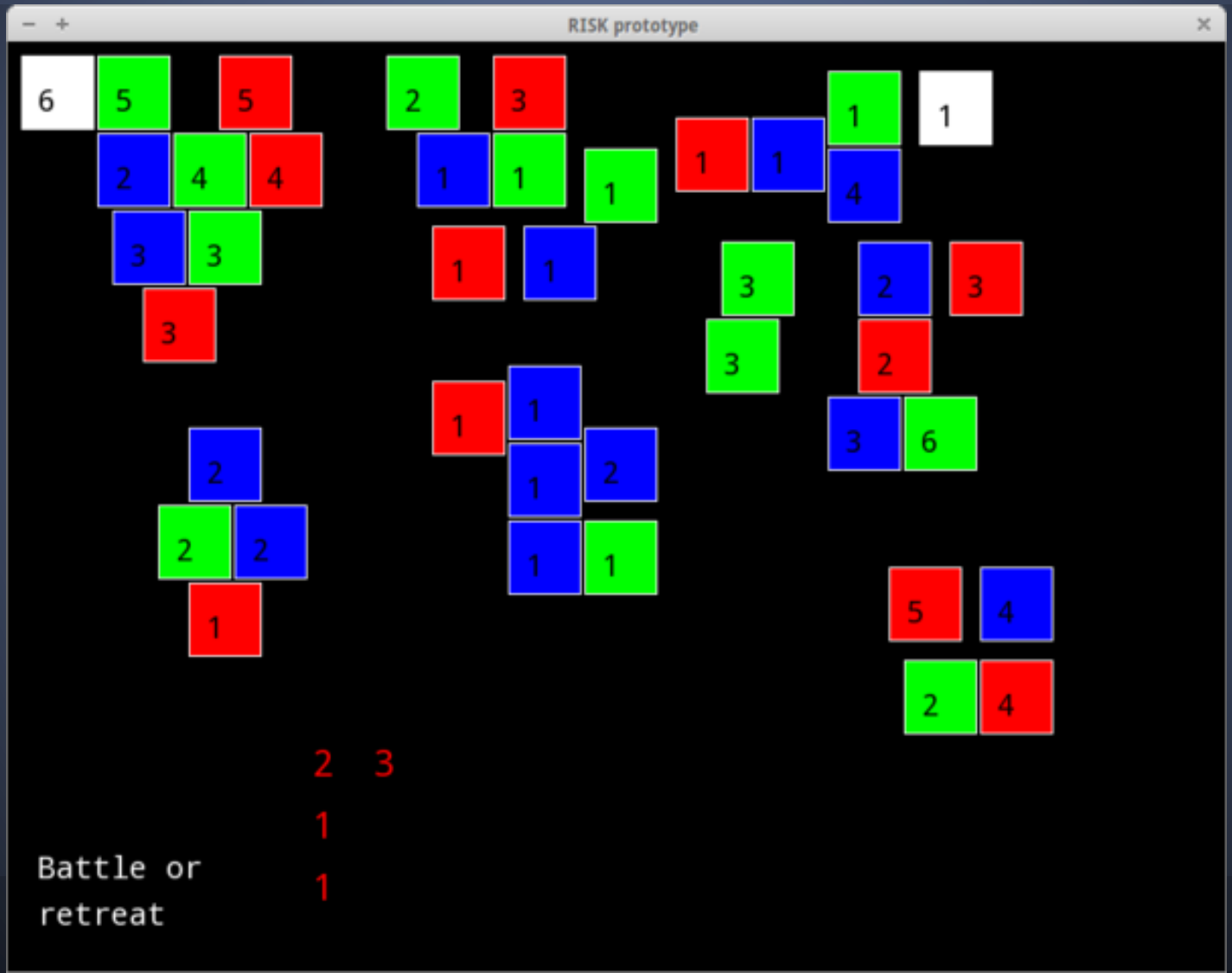
Software Development

- Hardware drivers
  - LCD and SPI drivers in development
  - Main loop in design
- Game logic
  - Complete

Software Development



Software Development



Software Development

- Raspberry Pi
  - Ad-hoc network setup complete
  - SPI commands in development
    - Must be master
  - Websockets are in development

Software Development

- Web app
  - Graphics complete
  - Webpage in development
  - Submitting cards in development

Project Timeline

- Week 8:
  - Finalize Country PCB revisions, submit
  - Finish Main PCB Schematic
  - Start Main PCB Layout
- Week 9:
  - Finish designing and order Main PCB
  - Start Microcontroller IO (SPI) programming
  - Continue Web app: fetch card info from Pi (server)
- Week 10 / 11:
  - Solder parts onto country PCBs
  - Connect Raspberry Pi and microcontroller over SPI

Project Timeline

- Week 12:
  - Solder parts onto country PCBs
  - Solder parts onto main PCB
  - Pi / Web app: send cards successfully
  - Micro: compute statistics
  - Web App: display statistics
- Week 13 / 14 / 15:
  - Debugging
- Week 16:
  - Packaging

Questions?