

DuelReality

Jerry Charles
Hadi Ghantous
Xiaobin Liu

Advisor: Professor Jackson
October 7, 2017



Team Members

Hadi Ghantous



Jerry Charles



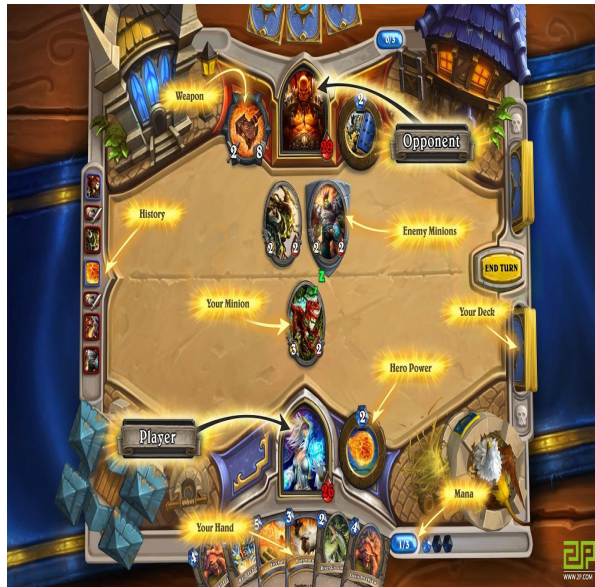
Xiaobin Liu



Collectible Card Game Playerbase

Hearthstone

Over 70 million registered accounts worldwide



Magic: the Gathering

Over 20 million players worldwide



Yu-Gi-Oh

Over 20 million online accounts registered worldwide



Problem Statement

- Physical card games:
 - No visual effects, plain and boring!
 - Cards are easy to duplicate, card game inventor gains little profit from selling cards
- Online card games:
 - Purely virtual
 - No real social interaction
 - Virtually multiplayer, Physically singleplayer

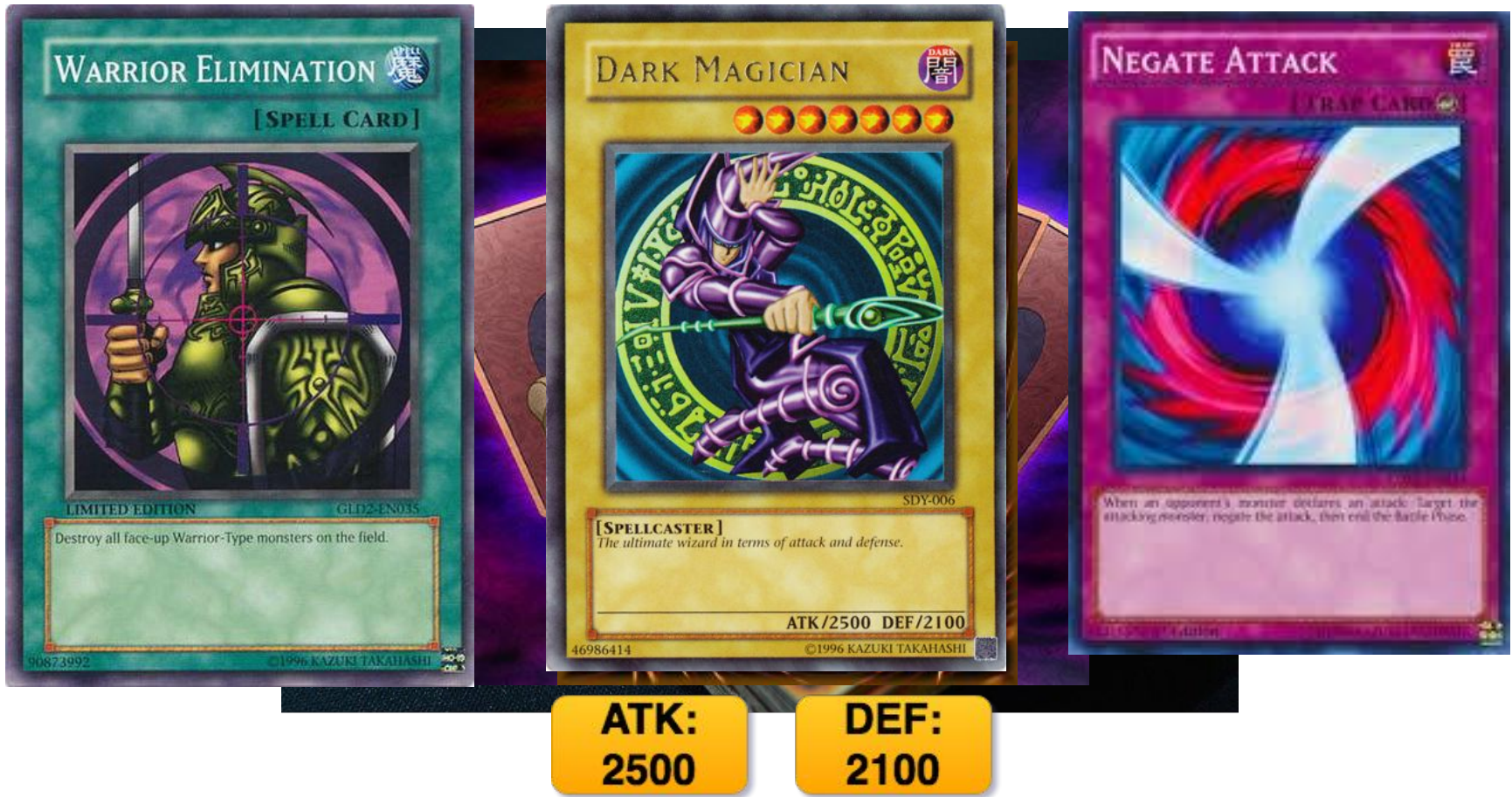


Assess Needs (Our Solution)

- Connect the virtual world with our physical world
 - Step toward hologram and mixed reality gaming
- Social benefit
 - Help making friends
 - Ease solitary game addiction
- Cards can't be duplicated
 - Unable to replicate unique card ID's and cheat

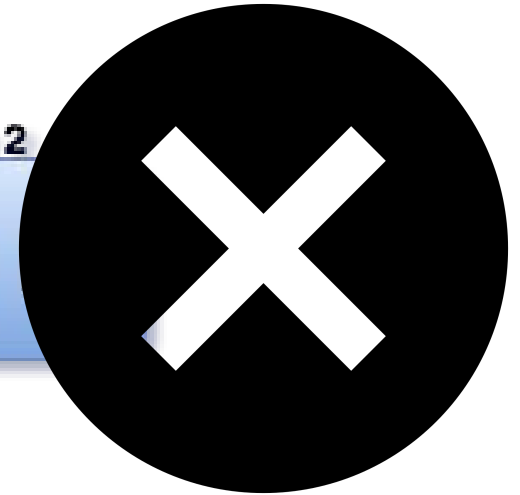
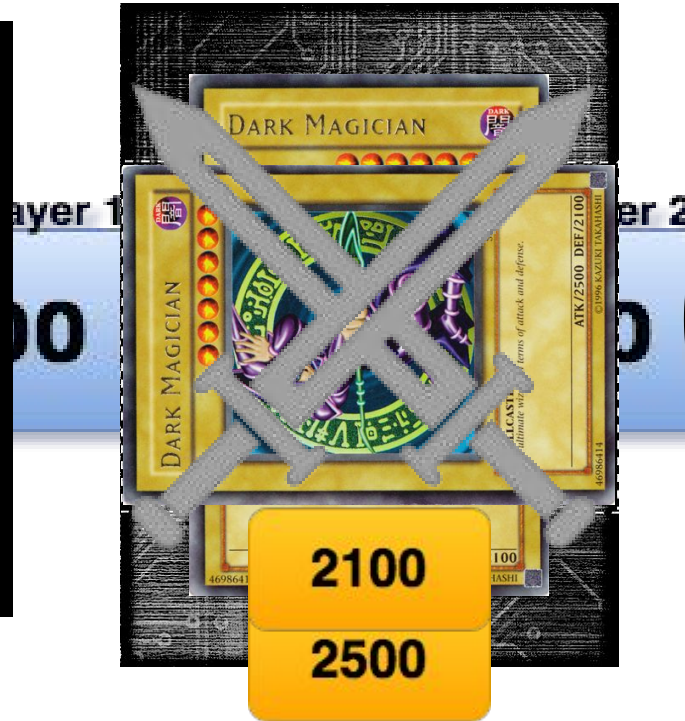


Our Card Game mechanism



Our Card Game mechanism

Round One



Our Card Game mechanism



Our Card Game mechanism





Department of Electrical and Computer Engineering

Advisor: Prof. Jackson



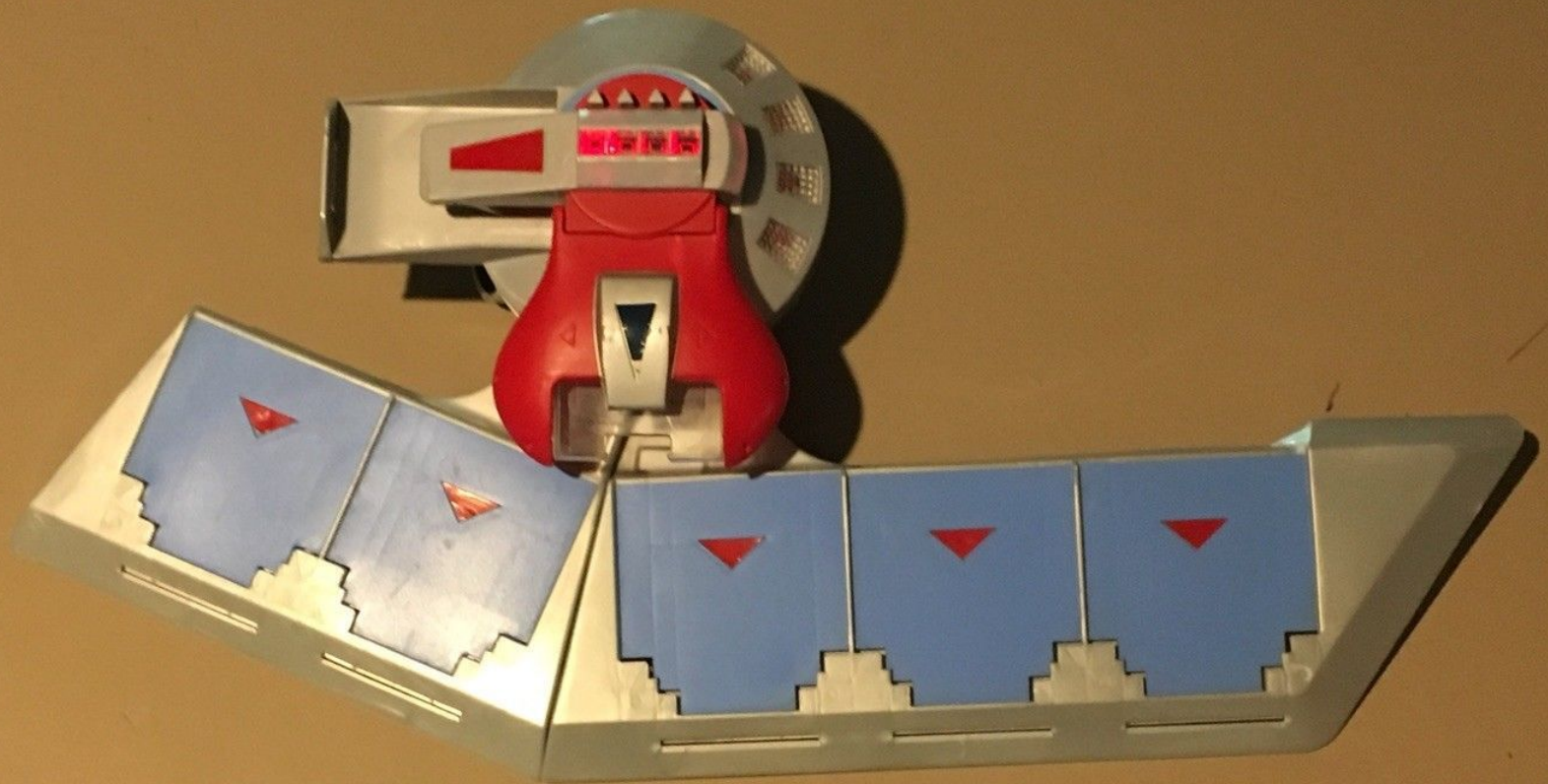
System Specifications

- Minimum of 20 cards needed for each player
 - RFID Tags attached to each card
- Wristband device is light enough to wear and hold still
- Support 2 Player Mode (need 2 wristband devices)
- Meet Child Safety Standards of Consumer Product Safety Commission
- 4+ hours battery life
- Inexpensive

Hardware Components

- Wristband Structure:
 - Buttons and LCD screen on each case
 - RFID readers (5 each)
 - Microprocessor and Bluetooth Module
 - Power supply
- Additional Components:
 - Projector
 - RFID Tagged Cards
 - Phone App

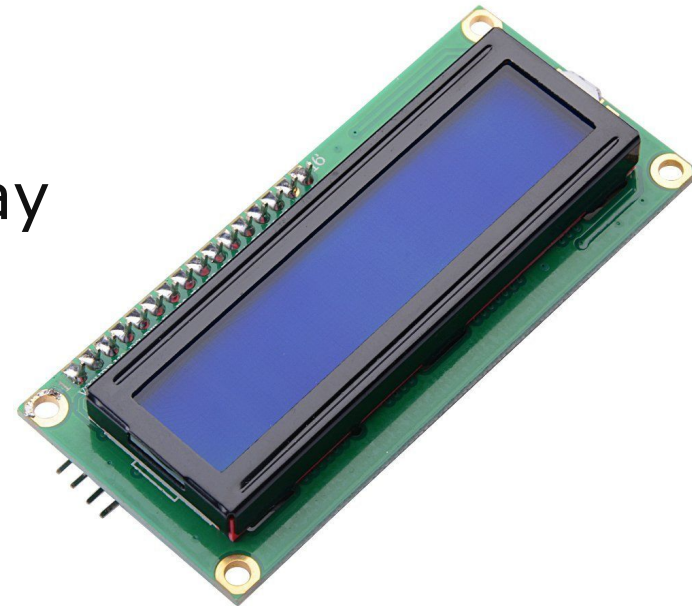
Support Wristband Casing



Display Screen

SunFounder LCD1602 Module

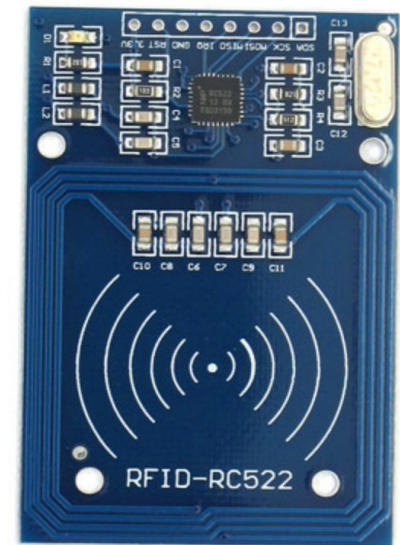
- Operate Voltage: 5V
- Displays 2-lines X 16-characters
- Blue Backlight LCD Module
- Displays lifepoints, and gameplay messages.
- Weight: approx. 45g



RFID Reader

Mifare RC522 RF Sensor Module

- Operating Frequency: 13.56MHz
- Data transfer rate: Maximum 10Mbit/s
- Operating current: 13-26mA/DC 3.3V
- Idle current : 10-13mA/DC 3.3V.
- Sleep current: <80uA
- Read Range: 0 - 60mm (1 card)
- Weight: 15 g



Microprocessor

Arduino UNO

- Used for Prototyping
 - Code Transferred later to ATmega328
- Weight: 25 g
- ATmega328 microcontroller
- Input voltage 7-12V
- 14 Digital I/O Pins (6 PWM outputs)
- 6 Analog Inputs
- 32k Flash Memory
- 16Mhz Clock Speed



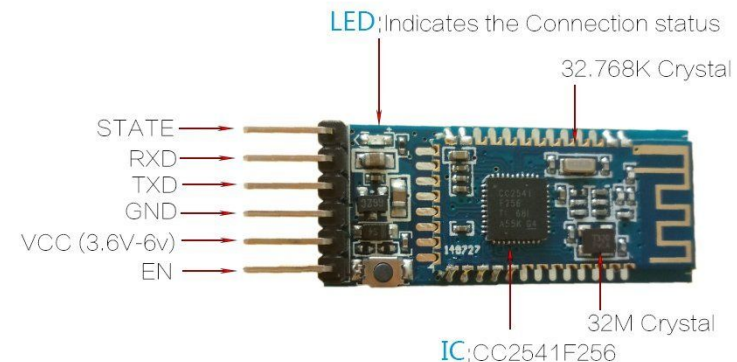
Bluetooth Module

DSD TECH SH-HC-08 Bluetooth 4.0 BLE Slave Module

- Working voltage: 3.3V to 6V
- Effective distance: 10 meters
- Default baud rate : 9600 bps
- Weight: 6 g
- Supports bluetooth 4.0 ble mode
- Compatible with ios7.0 or later and Android 4.3 or later
- Operating Current: 10-30 mA

SH-HC-08 Bluetooth 4.0 BLE Module

Fully compatible with iOS devices(iPhone,iPad)
Also compatible with Android 4.3 or later.



Microcontroller and Power Bank

Atmega328 processor



CPU Type: 8-bit AVR
Max Frequency: 20 MHz
6.75mA @ 5V

Power Bank

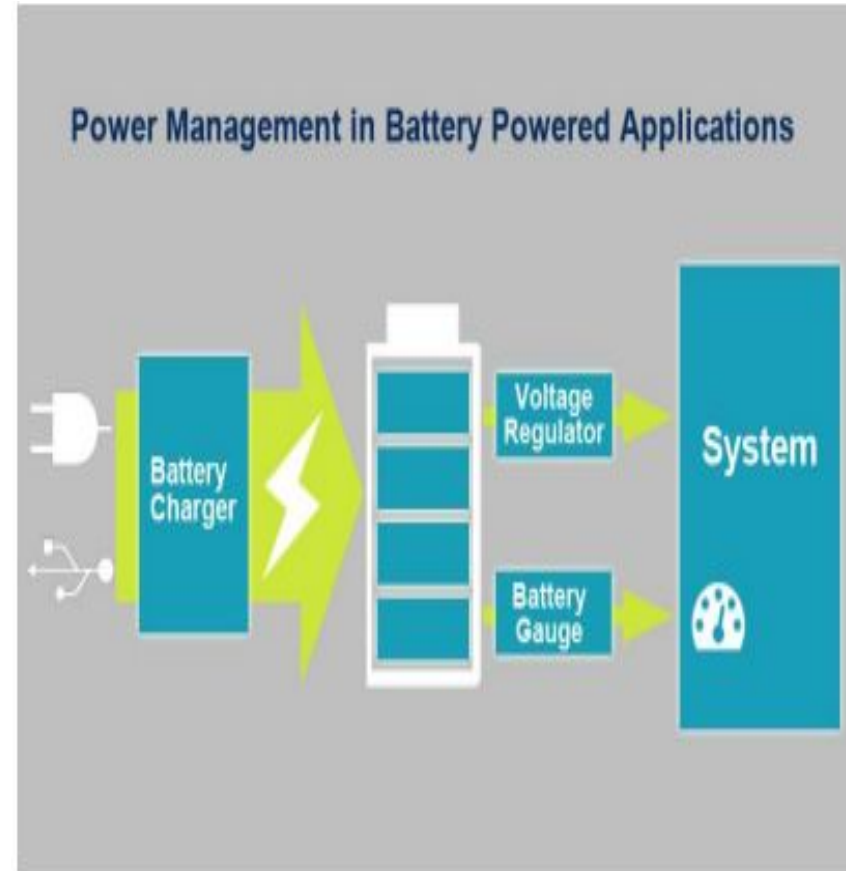


Capacity: 20000 mAh
Output Voltage: 12V
Output Current: 1A

Whole device Operating time:
 $20000 \text{ mAh} / 166.75 \text{ mA} = 120 \text{ hrs}$

Power Supply and Management

- Requirements
 - Various voltage requirements within wristbands
 - Readers, Microprocessor, LCD screen, Bluetooth module
- Implementation
 - Custom circuit board for power distribution
 - Amplification and attenuation of voltage as needed



Projector



DeepLee DP300 Portable LED Projector

- Input Voltage: 5V/2A
- Dimensions: 4.7 x 1.9 x 3.4 inches
- Weight: Approx 250g
- SD Card Slot, HDMI, VGA, AV, USB Port, Built in Speakers

Portable Theater

Support 5V/2A portable power supply enhance running time.
(Portable powerbank is not included)



Phone App

Provide midway connection from wristband devices to the internet (server)

Why Android?

- Open source
- Better programming experience

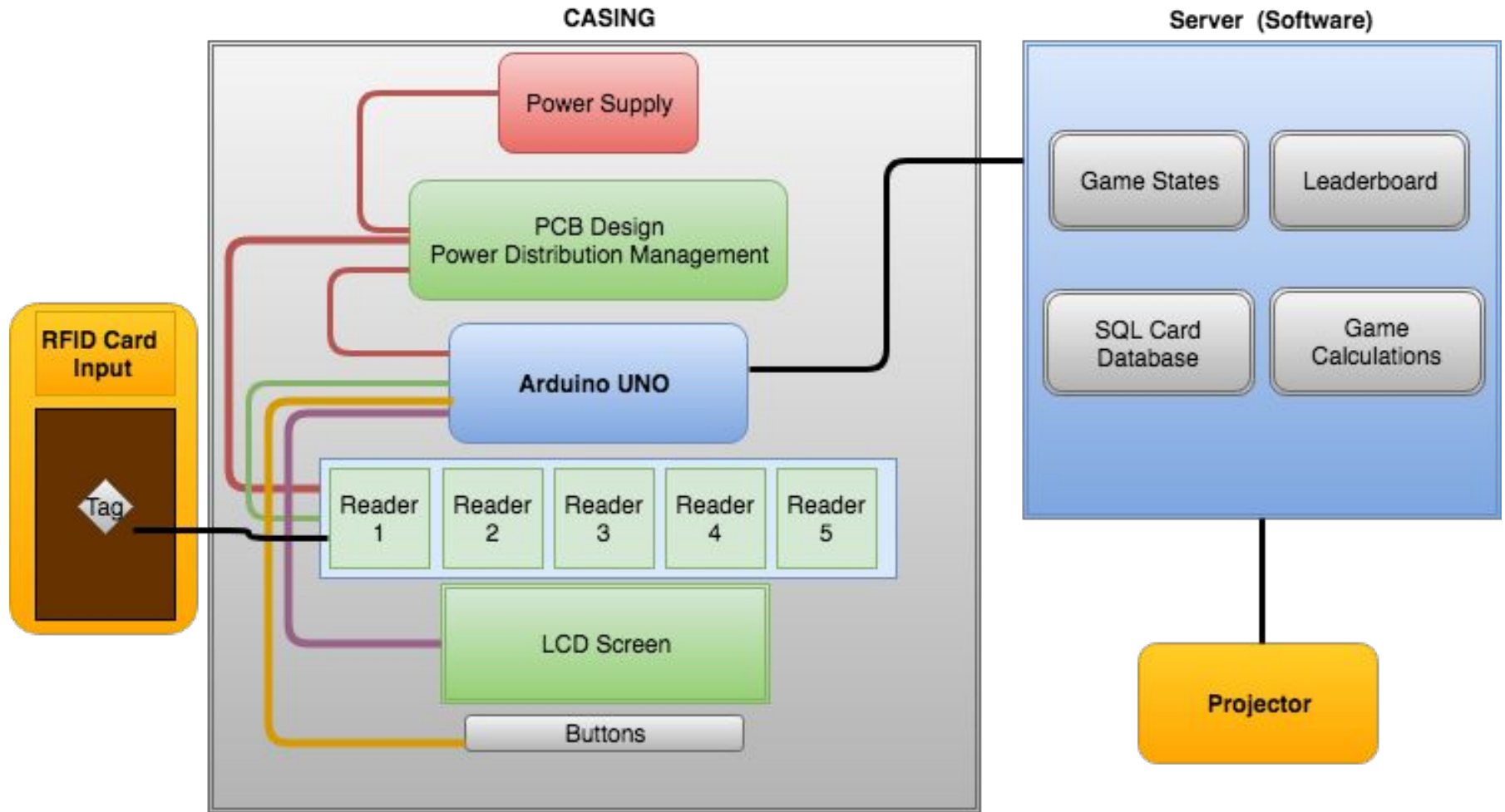


Optional features

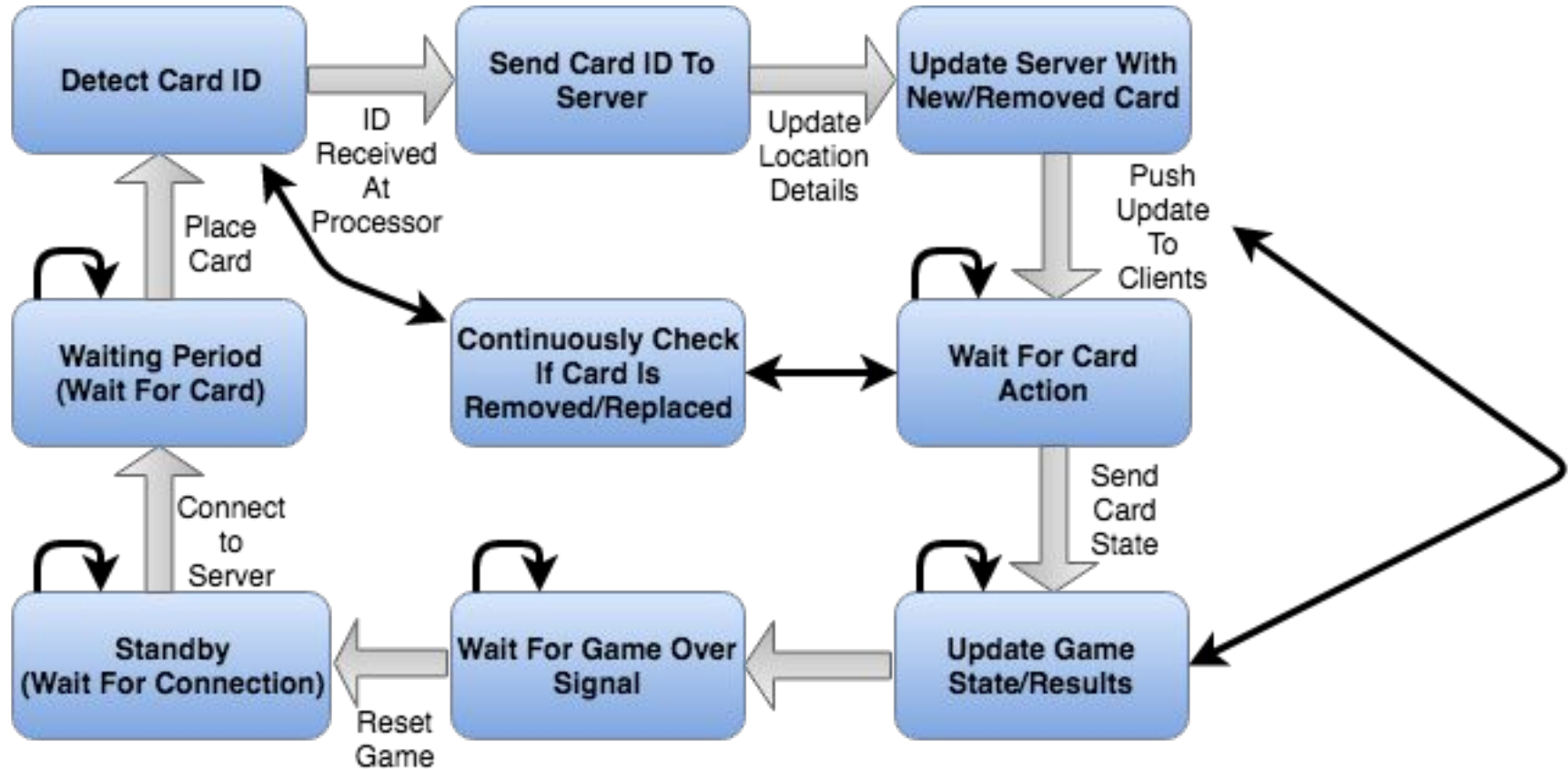
- Personal game account
- Game history
- Leaderboards
- Achievement



Block Diagram



State Machine



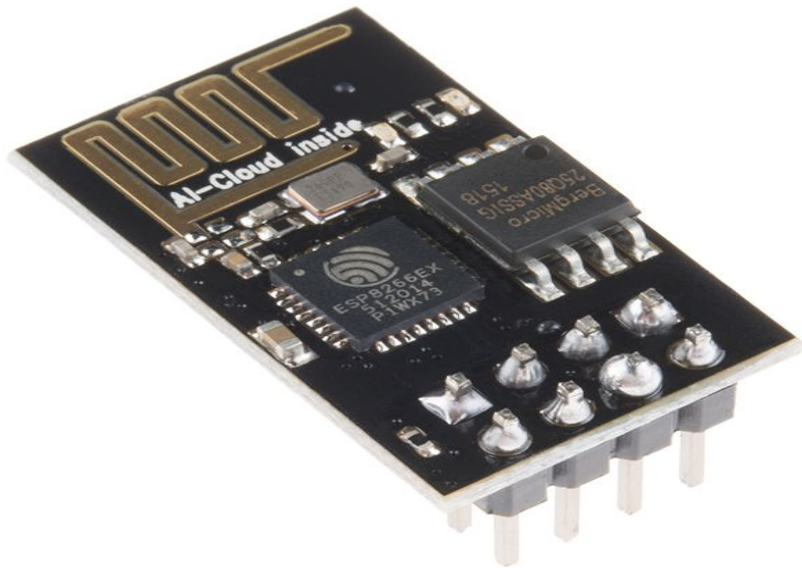
Estimated Budget (Per Device)

5 readers	\$12
Microprocessor	\$22
Bluetooth Module	\$8
LCD Screen	\$6
Wristband	\$20
PCB Power Supply & accessories	\$22
Total	\$90

Design Alternatives

ESP8266 WIFI Module

➤ Most uncertain part of the project is the internet connection.



- Integrated TCP/IP protocol
- Flash disk size from 512k to 1MB.

Design Alternatives - Home Network

Players Connect to Personal Home Network Server



MDR Deliverables

- Communication between at least one RFID reader and microprocessor ready. We will need to expand to other readers.
- Communication between the system and the internet established.
- Provide steady power to readers, microprocessor, and Bluetooth module.

Individual Responsibilities

- Jerry: Communication between readers and microprocessor. Implementation of processors tasks.
- Hadi: Communication with internet using Bluetooth enabled microprocessor and server implementation.
- Xiaobin: Custom circuit board for power distribution, circuit setup and power consumption analysis, and later on ATmega328 PCB design.

Questions ?