Team 26: Bomb Squad

University of Massachusetts Amherst
BE REVOLUTIONARY™

Team Members

Ethan LaFleur - Electrical Engineer

Krishna Vijayakumar - Computer Engineering

Edward “Matt” Buiser - Computer Engineering

Project Goal

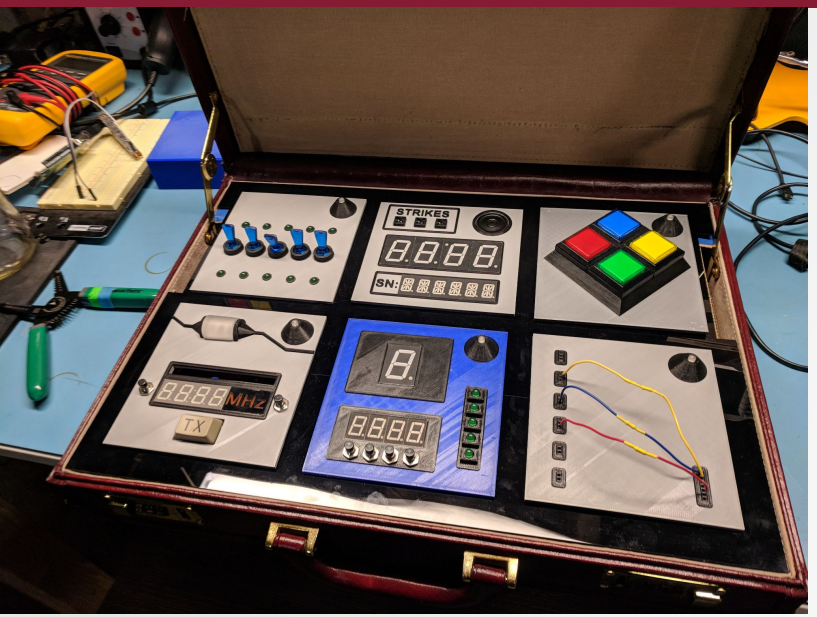
To bring a fun virtual reality/online game: Keep Talking and Nobody Explodes, to the physical world. To extend this game to a wider audience and incorporate a level of randomness that allows for replayability like the online game.

Background: Keep Talking and Nobody Explodes

- **Our game will be modeled after the online video game: “Keep Talking and Nobody Explodes”**
- **This game is available for Consoles, PCs, and mobile devices**
- **There is also a virtual reality version**
- **Rules of the game:**
  - One player has a bomb in front of them
  - The other player has a manual for how to defuse the bomb
  - Player with bomb must describe modules on the bomb to player with manual
  - Player with manual instructs how to defuse

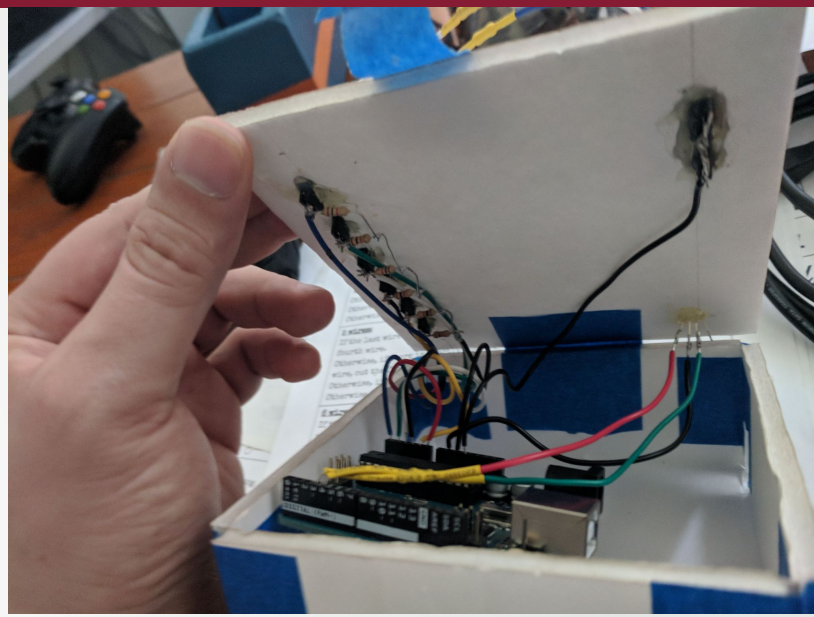
Problem Statement

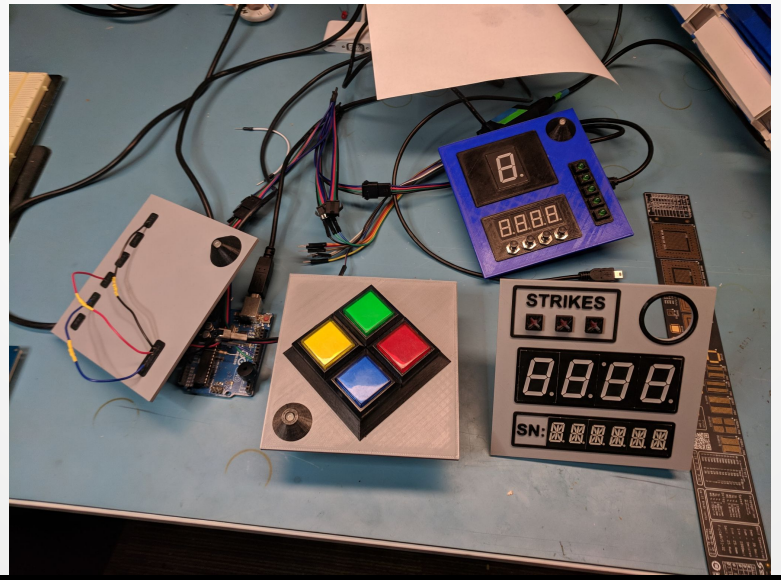
Technology such as video game consoles, or virtual reality systems are not available to many people. Also many people who did not grow up with this type of technology have a difficult time traversing the digital landscape. This limits the exposure of online games. Our solution will bring an online game: Keep Talking and Nobody Explodes to the tabletop. It will eliminate the need for technology and will be more appropriate for all types of people.



Existing Versions

There is no commercial products of a physical version.
Few DIY projects on the internet.
Flybye22 on Reddit in 2018.
https://www.reddit.com/r/ktane/comments/a3fgyt/i_made_a_physical_version_of_the_video_game_keep/

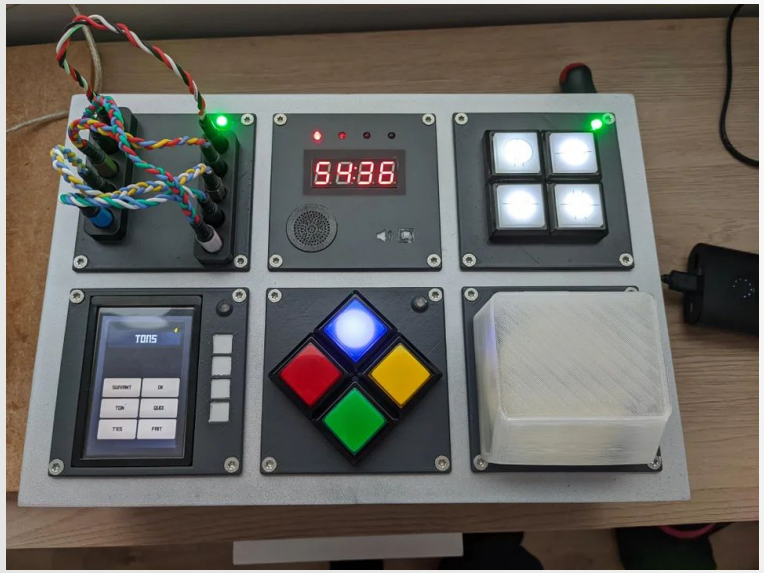


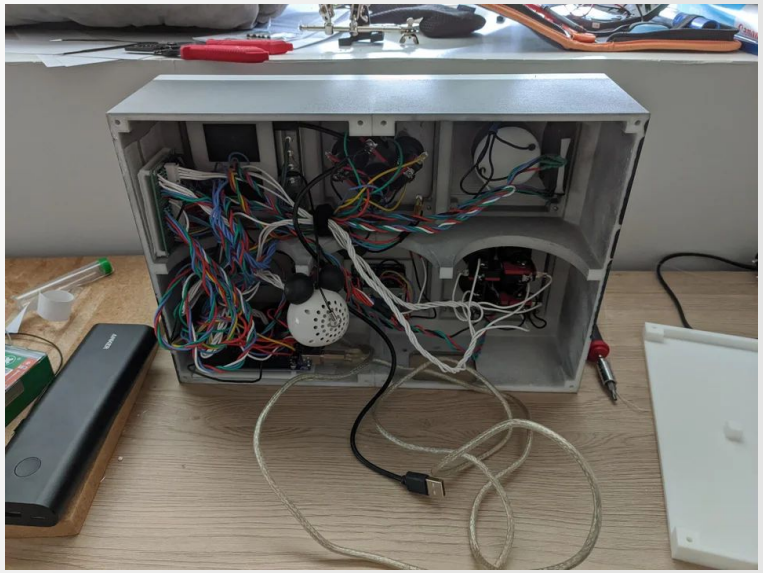


Existing Solutions (Cont.)

Benoit2600 on Reddit in 2020

https://www.reddit.com/r/3Dprinting/comments/j0q9ls/i_made_a_bomb_keep_talking_nobody_explodes/





System Specifications

- Uses a physical “bomb” with modules already installed
- Randomizes each individual module every time a new level starts
- Randomizes which modules are active on each run
- Includes difficulties in the form of levels that a user can set before each run
- Includes at least 5 regular modules and 2 “needy” modules
  - Wires Module
  - Simon Says
  - Discharging a capacitor
- Some modules will be adapted for our implementation
- Modular approach
  - One master module to keep track of all modules
  - Each module contains its own information and ruleset
- Rechargeable Power
- Manual will be converted to an app
  - Selectable options for modules on app

Master Module

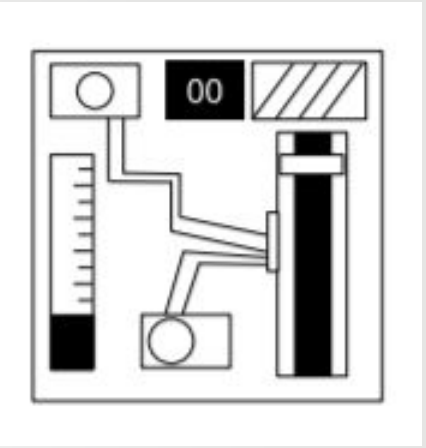
- **All child modules report to the Master Module**

- **Will use I2C protocol**

- **Master Module will keep track of the following:**
  - Number of Strikes across all child modules
  - Generating the Serial Number
  - Master Timer
  - Which modules are active in a given run
  - Which modules have been completed

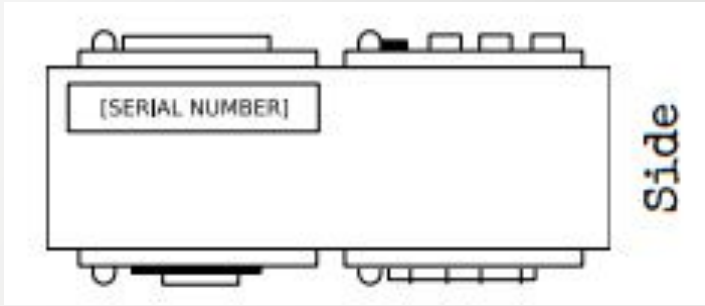
- **Will communicate via bluetooth to IOS device**

Needy Modules



- Much simpler than regular modules
- “Discharging a Capacitor”
- Pop up randomly and must attend to quickly before timer runs out

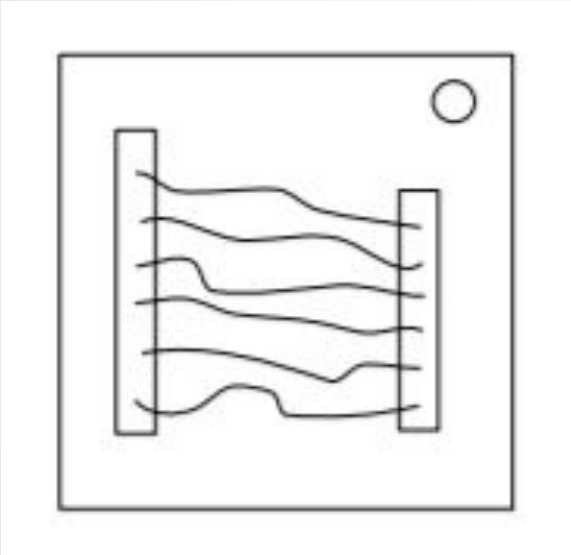
Serial Number Appendix



- Random Serial Number
- Different indexes of Serial Number effect some module solutions
- Change the way to solve certain Modules

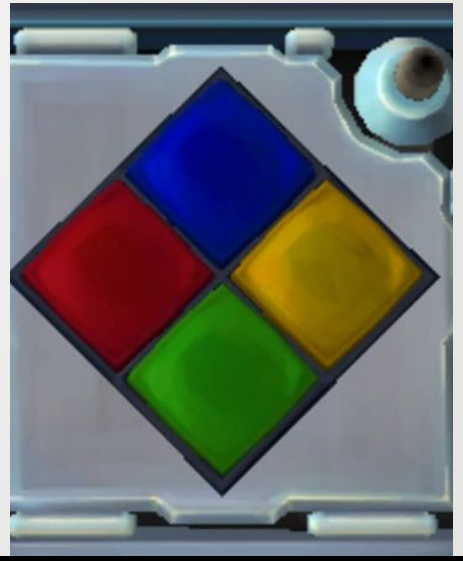
On the Subject of Wires

- 3-6 Wires based on level
- Randomized colors
- Buttons to simulate cutting



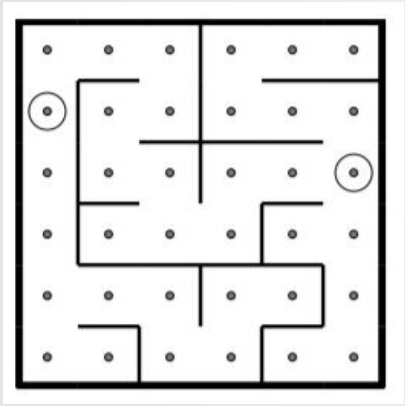
On the Subject of Simon Says

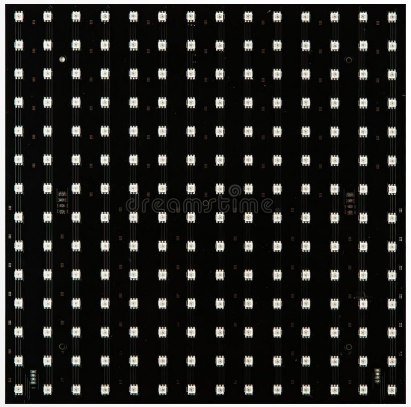
- 4 colored LEDs
- Randomized order
- Length of sequence increases based on level
- Solution varies based on # of strikes and SN



On the Subject of Mazes

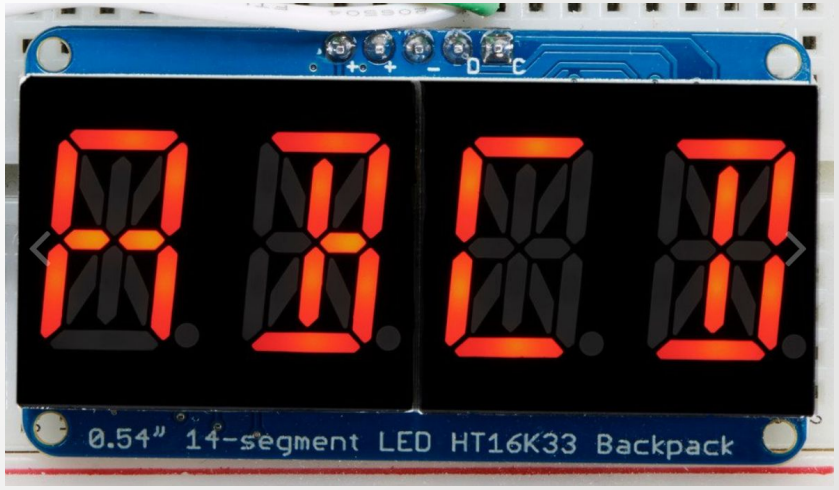
- Bomb shows blank matrix with start and end position
- Full maze shown in manual





On the Subject of Passwords

- Manual has all passwords
- Communicates password to player who will input it to bomb
- Bomb player cycles through possibilities for each letter



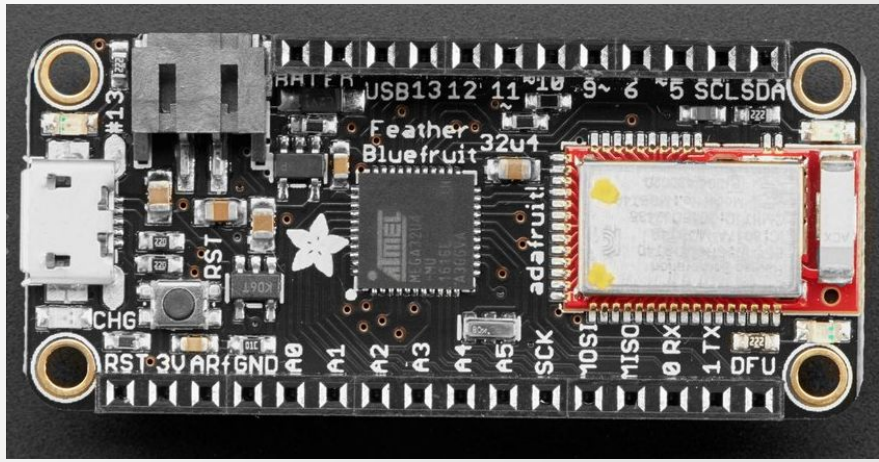
On the Subject of Clues

- **Clue word displays on an OLED**
  - Word association game
- **Word corresponds with one of 6 pictures in the manual**
- **Picture will tell you which button to press on the bomb**

Microcontrollers

Prototype using microcontrollers and breadboards

- 1 primary board (Master Module), 1 secondary chip (for each Child Module)
- Primary board will have bluetooth capabilities
- I2C communication protocol



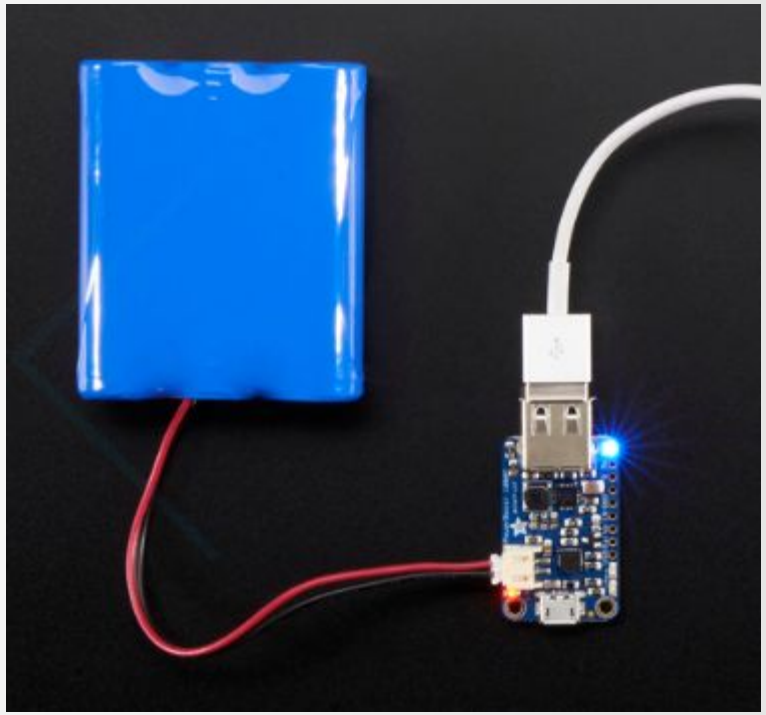
Prospective Microcontrollers for Rapid Prototyping:

- Adafruit Feather 32u4 Bluefruit for master module
- ATmega328P-PU for child modules

Power

- **Rechargeable Power**
- **Only one “Non-Needy” Module powered at a time**
- **For Rapid Prototyping:**
  - Adafruit Feather uses 3.3V
  - ATmega328P uses 4-5V

- **PowerBoost 1000 Charger**
- **3.7V Lithium Ion Battery Pack**
- **AC-DC Wall Converter**

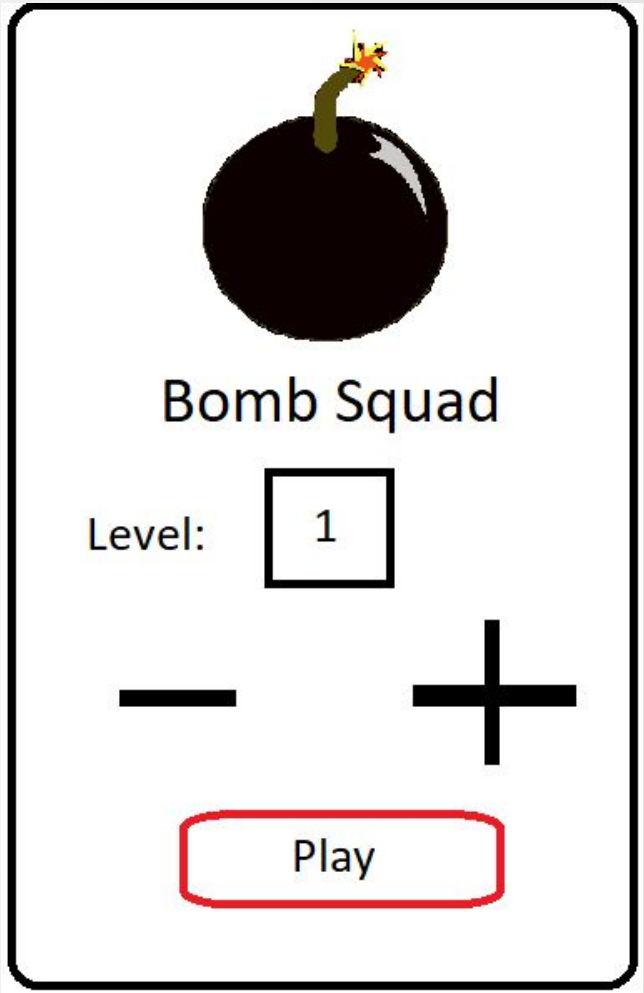


The App/Bluetooth

- **Controls level difficulty**

- **Module instructions**
  - Button for each module will link you to another page on how to solve the module

- **Start game button**
- **Sends message containing level data to device**

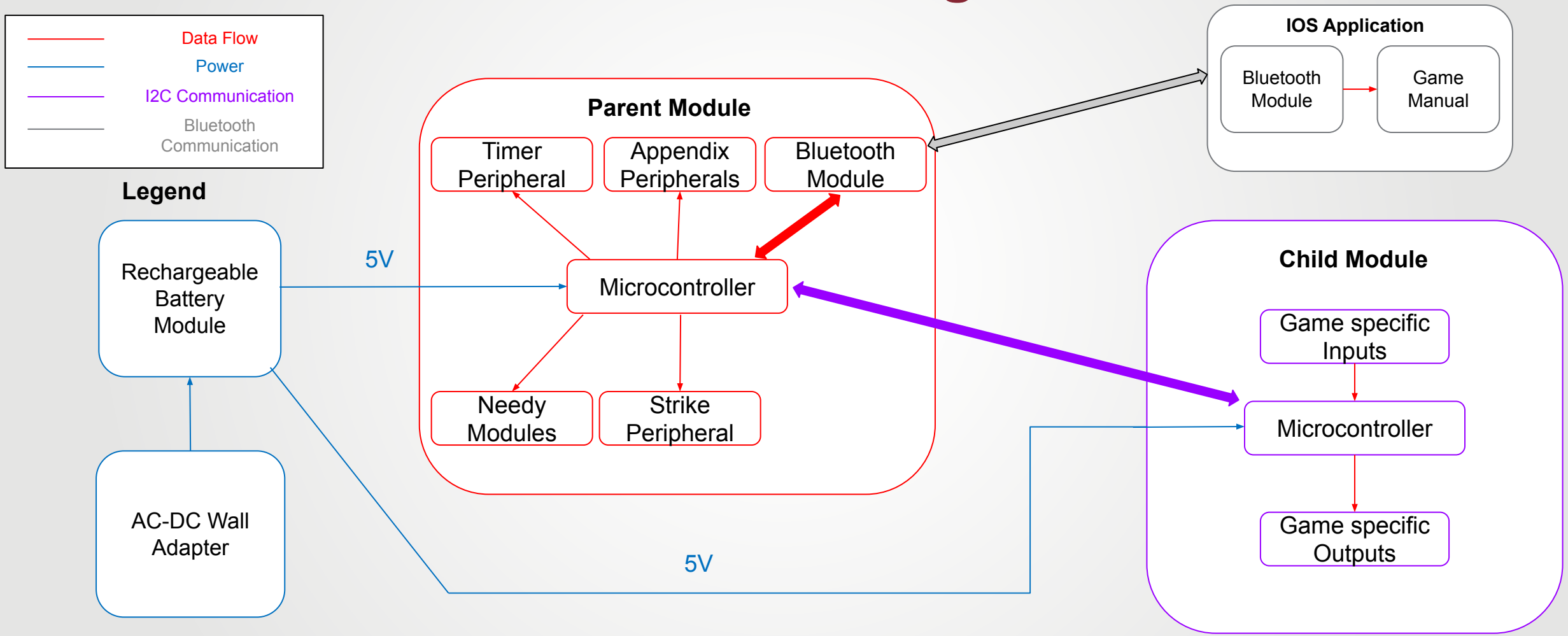


Significant PCB Specifications

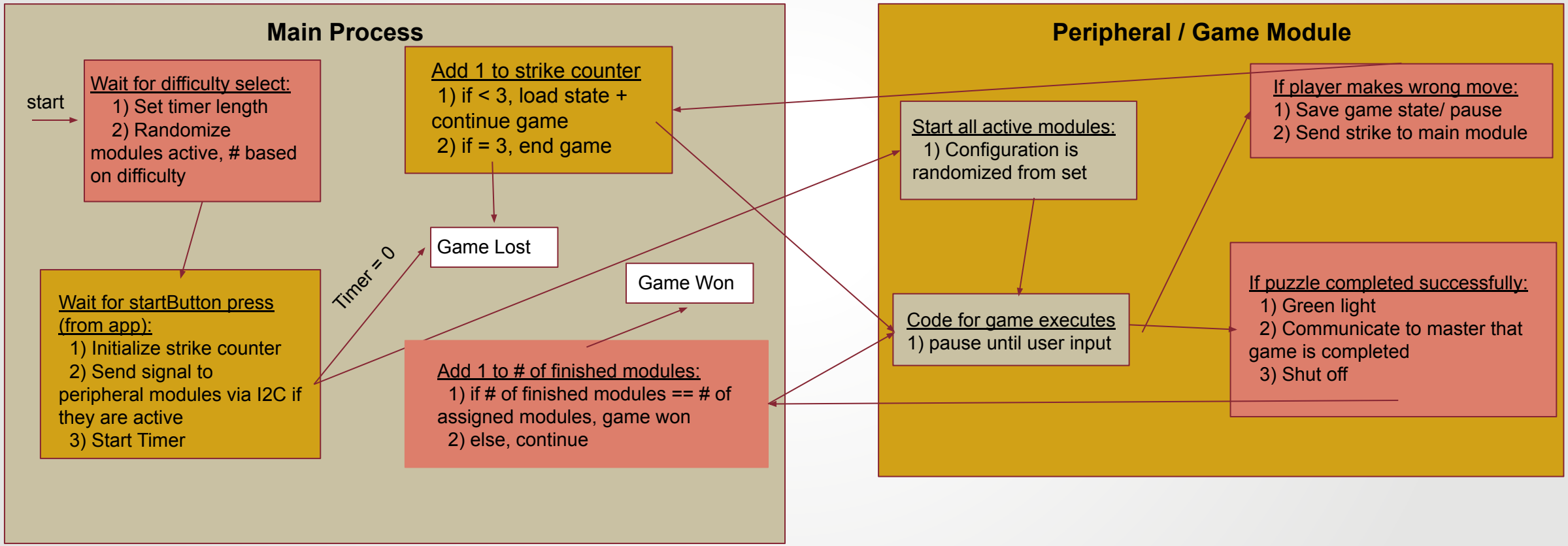
- **Parent board**
  - ATmega32u4 microcontroller
  - Needy module control
  - Bluetooth and I2C communications
  - Voltage regulating

- **Child boards x6**
  - Atmega328p microcontrollers
  - I2C communication for level data from Parent
  - I/O peripherals for gameplay

Hardware Block Diagram



Software Block Diagram - Game State



Estimated Costs

Projected Parts Needed	Projected Costs
2x 16x32 LED matrix	$50
4x LED arrow buttons	$16
4x LED arcade buttons	$10
2x 4 digit 7 segment led display	$0 - Have already
20 Single LEDs	$0 - M5
2x OLED display	$0 - Have from JDP
5x Atmega328p Microcontrollers	$12.25
1x PowerBoost 1000 Charger	$19.95
1x AC-DC Wall Adapter	$7.50

Estimated Costs (Cont.)

Projected Parts Needed (cont.)	Projected Costs (cont.)
1x Lithium Ion Battery	$24.50
1x Adafruit Feather 32u4 Bluefruit Board	$33
Initial PCB Designs (6-7, one for each microcontroller)	$130
PCB Revisions	$100
Total Cost Estimate	$403

MDR Deliverables

What to expect for MDR presentation:

- ❑ The prototypes for a select few of our modules working in conjunction with each other using solderless breadboards
- ❑ A Report of how random the system
- ❑ A basic version of the app capable of communicating with system
- ❑ The ability to be powered by a rechargeable power source

Team Member Responsibilities

Ethan LaFleur:

- Team Coordinator: In charge of organizing and running weekly meetings both with the team and also with advisor. Coordinate our presentations/demonstrations with team evaluators.
- Hardware Lead: Determine the hardware that will be used for each module and how to assemble efficiently. Ensure the project is powered in a manner that meets the specifications and is efficient.

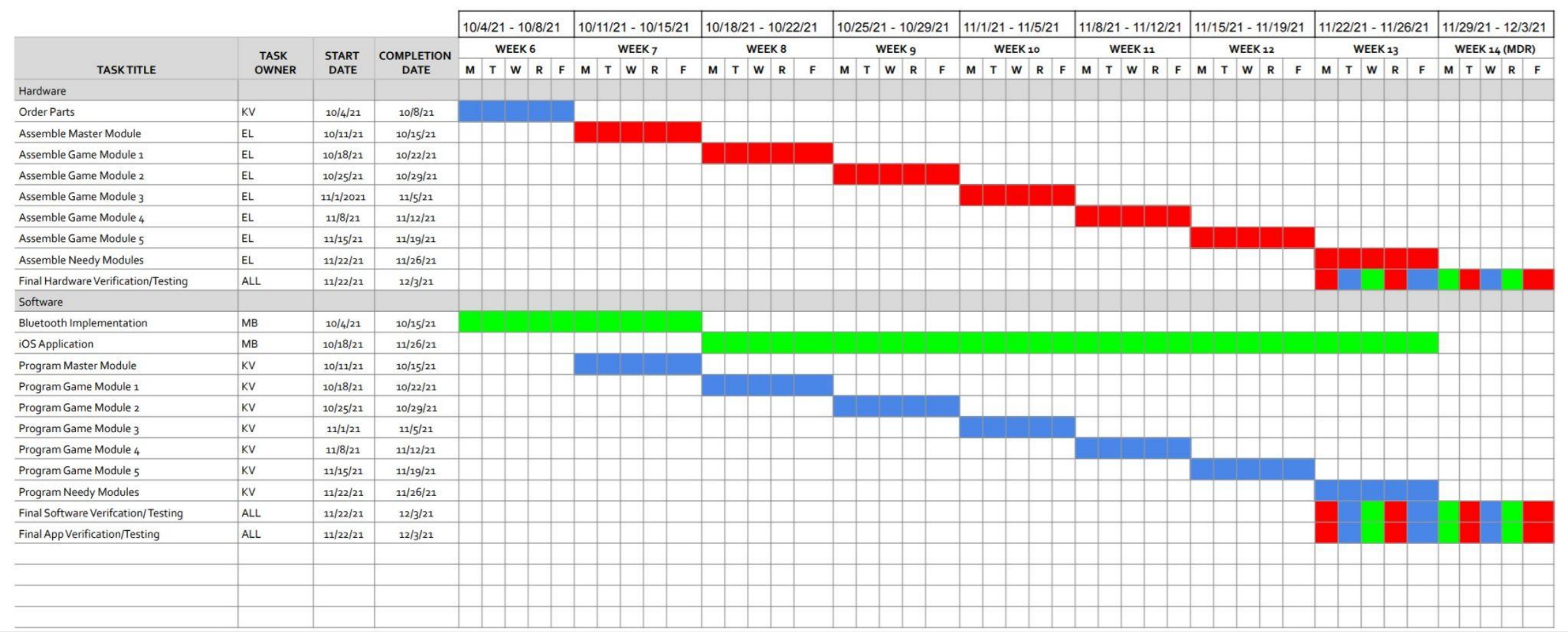
Krishna Vijayakumar:

- Budget Lead: Ensure budget is spent effectively and keep track of total money spent.
- On Board Programmer: Develop software to run on the microcontrollers in accordance with the game specifications.

Matt Buiser:

- PCB Lead: Design PCB's to be used after rapid prototyping. Do in a way such that the project meets specifications and works efficiently. PCB's for each non-needy module.
- Off Board Programmer: Design IOS application and implement bluetooth communication from app to master microcontroller.

Gantt Chart



TASK TITLE	TASK OWNER	START DATE	COMPLETION DATE
Hardware			
Order Parts	KV	10/4/21	10/8/21
Assemble Master Module	EL	10/11/21	10/15/21
Assemble Game Module 1	EL	10/18/21	10/22/21
Assemble Game Module 2	EL	10/25/21	10/29/21
Assemble Game Module 3	EL	11/1/2021	11/5/21
Assemble Game Module 4	EL	11/8/21	11/12/21
Assemble Game Module 5	EL	11/15/21	11/19/21
Assemble Needy Modules	EL	11/22/21	11/26/21
Final Hardware Verification/Testing	ALL	11/22/21	12/3/21
Software			
Bluetooth Implementation	MB	10/4/21	10/15/21
iOS Application	MB	10/18/21	11/26/21
Program Master Module	KV	10/11/21	10/15/21
Program Game Module 1	KV	10/18/21	10/22/21
Program Game Module 2	KV	10/25/21	10/29/21
Program Game Module 3	KV	11/1/21	11/5/21
Program Game Module 4	KV	11/8/21	11/12/21
Program Game Module 5	KV	11/15/21	11/19/21
Program Needy Modules	KV	11/22/21	11/26/21
Final Software Verifcation/ Testing	ALL	11/22/21	12/3/21
Final App Verification/Testing	ALL	11/22/21	12/3/21

Questions?


Thank you for your time!
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