

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING  
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SYSTEM REQUIREMENTS SPECIFICATION  
CSE 4316: SENIOR DESIGN I  
FALL 2019



**xXPew<sup>3</sup>Xx**  
**LASERS: COMBAT EVOLVED**

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## REVISION HISTORY

Revision	Date	Author(s)	Description
0.1	10.01.2015	GH	document creation
0.2	10.18.2019	PL	edit front page
0.3	10.21.2019	DD, JA, KG, PL, TZ	complete draft

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# 1 PRODUCT CONCEPT

This section describes the purpose, use, and intended user audience for Lasers: Combat Evolved. Lasers: Combat Evolved is an Android application that allows for real time tracking of player positions in games of laser tag and also the ability for players to communicate within the game.

## 1.1 PURPOSE AND USE

In Lasers: Combat Evolved, users will be able to start/join games and pick teams before a game starts. Once the game starts the user will be able to see the position of people on the same team as them and interact with their team using their map as an interface.

## 1.2 INTENDED AUDIENCE

The application will be primarily intended for groups of people aged 15-40 that want to play laser tag over large geographical areas, such as a college campus.

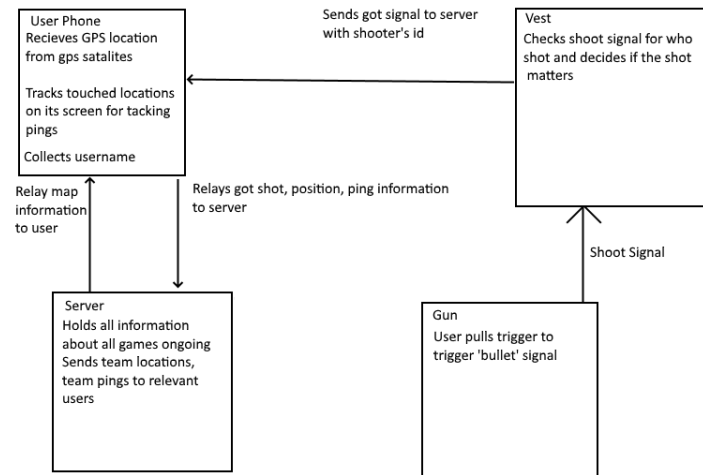


Figure 1: Lasers: Combat Evolved conceptual drawing



Name	Description	Use
Username	What the user will be referred to as in the app.	Input by user to identify each unique user
GPS Location	The location the user is currently at.	Get, Display and Updates from the user's phone to be marked on the allies maps.
Map	The map of the play area	Requested from the google maps api based on user location
AR Map	The map with player positions	Compiled from the data input by the users and displayed onto the user's phone
Pings	Places touched by the user on the map	Sent from the user's phone to the server
Bullets	The signal from the laser gun	On user trigger pull sent from gun to user vest and includes shooter id

## 2 PRODUCT DESCRIPTION

This section provides the reader with an overview of Lasers: Combat Evolved. The primary operational aspects of the product, from the perspective of end users, maintainers and administrators, are defined here. The key features and functions found in the product, as well as critical user interactions and user interfaces are described in detail.

### 2.1 FEATURES & FUNCTIONS

Laser: Combat Evolved allows user to experience Laser Tag game with more mobile accessibility.

Features :

- 1 . Map Radar System : New map system that allow user to recognize and notify the user for both team member and enemies when spotted on the radar.

### 2.2 EXTERNAL INPUTS & OUTPUTS

Main input for the game plays come from the Laser Shooter device. In addition, another input would be user information when they try to establish their nickname for the game play, create and access to the room.

### 2.3 PRODUCT INTERFACES

We simply divided the operating interfaces into General Interface and Game-play Interface. Main interface will include all of the pregame setting such as log-in system, setting, make room and join room. Game-play Interface will consist of the other functionality that users will use during game such as map , communicating.

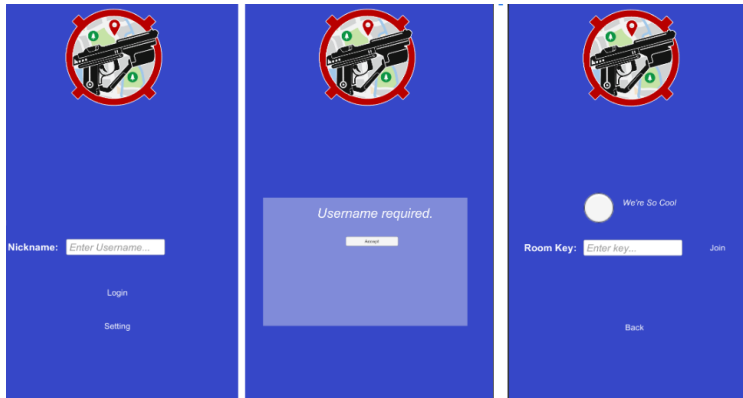


Figure 2: Lasers: Combat Evolved - Basic User Interface

### 3 CUSTOMER REQUIREMENTS

#### 3.1 CUSTOM BUILD SYSTEM

##### 3.1.1 DESCRIPTION

A personalized system for this specific type of game application with interaction from both client server and main server.

##### 3.1.2 SOURCE

Customer Requirement

##### 3.1.3 CONSTRAINTS

Engineer a personalized system for this specific type of game application. Can not use an existing system

##### 3.1.4 STANDARDS

Firebase servers used have successfully completed [1] the ISO 27001 and SOC 1, SOC 2, and SOC 3 evaluation process, and some have also completed the ISO 27017 and ISO 27018 certification process.

##### 3.1.5 PRIORITY

Critical

#### 3.2 SEPARATE DEVICE -APPLICATION SYSTEM

##### 3.2.1 DESCRIPTION

Hardware related devices are separated from the system application

##### 3.2.2 SOURCE

Customer Requirement

##### 3.2.3 CONSTRAINTS

Limit one device ("gun", vest) per system application ( 1 device per phone app)

##### 3.2.4 STANDARDS

Standards for the Arduino [2] 4WD Driver Platform V1.0 is to be maintained

##### 3.2.5 PRIORITY

Critical

### **3.3 REAL-TIME MAP FEATURES**

#### **3.3.1 DESCRIPTION**

Implements real-time map system on the user's current location

#### **3.3.2 SOURCE**

Customer Requirement

#### **3.3.3 CONSTRAINTS**

Must have an actual map Must have a mini map

#### **3.3.4 STANDARDS**

Mapbox [5] API v5 Calculate optimal driving, walking, and cycling routes using traffic- and incident-aware routing. Produce turn-by-turn instructions. Produce routes with up to 25 coordinates for the driving, walking, and cycling profiles, or up to three coordinates for the driving-traffic profile

#### **3.3.5 PRIORITY**

Critical

### **3.4 MAP CUSTOMIZATION**

#### **3.4.1 DESCRIPTION**

Allow User to create their own play area boundaries

#### **3.4.2 SOURCE**

Customer Requirement

#### **3.4.3 CONSTRAINTS**

Must allow user to create their own custom map

#### **3.4.4 STANDARDS**

Geographic coordinates to a Mapbox API [4], they should be formatted in the order longitude, latitude and specified as decimal degrees in the WGS84 coordinate system. This pattern matches existing standards, including GeoJSON and KML.

#### **3.4.5 PRIORITY**

High

### **3.5 CUSTOM CLOUD BASED**

#### **3.5.1 DESCRIPTION**

Using cloud based system instead of the traditional router-based system

#### **3.5.2 SOURCE**

Customer Requirement

#### **3.5.3 CONSTRAINTS**

Must use a cloud based system Assuming the maximum capacity is 10

#### **3.5.4 STANDARDS**

The IEEE Cloud Computing [3] Initiative has originated two working drafts as their standards for cloud services: P2301 (Cloud Profiles), and P2302 (Intercloud)

### **3.5.5 PRIORITY**

Critical

## **3.6 COMMUNICATION**

### **3.6.1 DESCRIPTION**

Allow user to communicate with other players/team-mates

### **3.6.2 SOURCE**

Customer Requirement

### **3.6.3 CONSTRAINTS**

Must allow user to communicate through the app

### **3.6.4 STANDARDS**

Establish standards IEEE 802.20 Mobile Broadband Wireless Access - IEEE 802.20 mission [6] and project scope

### **3.6.5 PRIORITY**

Critical

## **4 PACKAGING REQUIREMENTS**

### **4.1 HARDWARE DELIVERY**

#### **4.1.1 DESCRIPTION**

The gun and vest required to play

#### **4.1.2 SOURCE**

Team Decision

#### **4.1.3 CONSTRAINTS**

Gun and vest will be in set only

#### **4.1.4 STANDARDS**

#### **4.1.5 PRIORITY**

Critical

### **4.2 SOFTWARE DELIVERY**

#### **4.2.1 DESCRIPTION**

How will a person get the app

#### **4.2.2 SOURCE**

Team Decision

#### **4.2.3 CONSTRAINTS**

Downloadable via google play store

#### **4.2.4 STANDARDS**

#### **4.2.5 PRIORITY**

Critical

## **5 PERFORMANCE REQUIREMENTS**

### **5.1 ROUTER RANGE RESTRICTION**

#### **5.1.1 DESCRIPTION**

Application must not have any restricted on how far could one player to player within a set amount of ranges. However, the application will allow the host to set the range limit which when one player moved outside of the designated area, they will be banned from the game. This is different then a restricted range from the router perspective since the device will be freely to be move without any delay or lagging during the game with the new features.

#### **5.1.2 SOURCE**

This is a team decision.

#### **5.1.3 CONSTRAINTS**

One of the biggest constrain is network. Players' devices must be able to tap into the internet via WiFi or their own cellular network to play the game. The main reason for this is due to the fact the common signal such as Bluetooth or regular router will have its own limitation. However, based on theory we found out that by using a combination of Bluetooth and internet, the system could work much more efficient.

#### **5.1.4 STANDARDS**

- Mobile Device must be-able to connect to WiFi. - Mobile Device must have Bluetooth connection. - The Mobile Device must be-able to connect with the IR emitter and the vest.

#### **5.1.5 PRIORITY**

This is one of the Critical Priority of the app.

### **5.2 USER FRIENDLY INTERFACE**

#### **5.2.1 DESCRIPTION**

Application must allow user to complete the basic phase such as login, make room, join room with the maximum time of 1 minutes. We strive for the easiest way for player to use our application and increase the game play experience. We modify the complex log-in system to be an more basic and robust. This is due to the facts that players must know others players and they must be on the same designated area to play the games and win. Therefore, complex system is unnecessary for the game itself.

#### **5.2.2 SOURCE**

This is a team decision but the original source was similar to how Kahoot login work .

#### **5.2.3 CONSTRAINTS**

- Users must have the application to run the app - Users must interact with application - Users must follow appropriate instruction of the User Inteface

#### **5.2.4 STANDARDS**

- 3 button standards - KISS ( KEEP IT STUPID SIMPLE )

#### **5.2.5 PRIORITY**

Low

## **6 SAFETY REQUIREMENTS**

The wearable vest will include electronic components. Product is designed to be worn on the person's body, electronic component safety will be a priority. Moisture and contact with water should be avoided. All wires should be covered, and should not come in contact with the skin. Additionally the "gun" component will include a power source, electronics, and an infrared emitter. Contact with water should be avoided. Battery should be in case, with wires covered, and should not come in contact with the skin. Any cables used for charging or plug in, will be insulated properly. Additionally direct eye contact with the infrared emitter should be avoided.

### **6.1 LABORATORY EQUIPMENT LOCKOUT/TAGOUT (LOTO) PROCEDURES**

#### **6.1.1 DESCRIPTION**

Any fabrication equipment provided used in the development of the project shall be used in accordance with OSHA standard LOTO procedures. Locks and tags are installed on all equipment items that present use hazards, and ONLY the course instructor or designated teaching assistants may remove a lock. All locks will be immediately replaced once the equipment is no longer in use.

#### **6.1.2 SOURCE**

CSE Senior Design laboratory policy

#### **6.1.3 CONSTRAINTS**

Equipment usage, due to lock removal policies, will be limited to availability of the course instructor and designed teaching assistants.

#### **6.1.4 STANDARDS**

Occupational Safety and Health Standards 1910.147 - The control of hazardous energy (lockout/tagout).

#### **6.1.5 PRIORITY**

Critical

### **6.2 NATIONAL ELECTRIC CODE (NEC) WIRING COMPLIANCE**

#### **6.2.1 DESCRIPTION**

Any electrical wiring must be completed in compliance with all requirements specified in the National Electric Code. This includes wire runs, insulation, grounding, enclosures, over-current protection, and all other specifications.

#### **6.2.2 SOURCE**

CSE Senior Design laboratory policy

#### **6.2.3 CONSTRAINTS**

High voltage power sources, as defined in NFPA 70, will be avoided as much as possible in order to minimize potential hazards.

#### **6.2.4 STANDARDS**

NFPA 70

#### **6.2.5 PRIORITY**

Critical

## **7 MAINTENANCE & SUPPORT REQUIREMENTS**

### **7.1 SOFTWARE UPDATES**

#### **7.1.1 DESCRIPTION**

Users will be able to get their updates through the Google Play store. The team will therefore be pushing all their new content onto the Play store.

#### **7.1.2 SOURCE**

Team Decision

#### **7.1.3 CONSTRAINTS**

When new versions are tested and found free of bugs in normal usage

#### **7.1.4 STANDARDS**

Google Play Launch Standards

#### **7.1.5 PRIORITY**

High



## **8 OTHER REQUIREMENTS**

### **8.1 REQUIREMENT NAME**

#### **8.1.1 DESCRIPTION**

No extra requirements right now.

#### **8.1.2 SOURCE**

Team Decision

#### **8.1.3 CONSTRAINTS**

When we find some we will add it to the requirements.

#### **8.1.4 STANDARDS**

Compatible with the application on android.

#### **8.1.5 PRIORITY**

Low

## **9 FUTURE ITEMS**

### **9.1 SUPPORT MULTIPLE GAMES**

#### **9.1.1 DESCRIPTION**

Currently the system will not work correctly if someone shoots someone in a different game from them and in the future we plan to implement checking so that if this happens there won't be a problem

#### **9.1.2 SOURCE**

Team Decision

#### **9.1.3 CONSTRAINTS**

#### **9.1.4 STANDARDS**

#### **9.1.5 PRIORITY**

Moderate

## REFERENCES

- [1] Firebase. Privacy and security in firebase.
- [2] Seeed Hardware. 4wd driver platform v1.0.
- [3] IEEE. Standards in cloud computing.
- [4] Mapbox. Maps service.
- [5] Mapbox. Navigation service.
- [6] IEEE Wiki. Ieee 802.20.