Guerre Géo

A Professional Report on an Educational Game with Geo-Caching Implementation

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I Project Description

1 Project Overview

Guerre Géo is an educational and adventurous game, which generates interesting puzzles and trivia questions based on the location of the user. Guerre Géo is primarily a mobile-based application supported by iOS and Android and it involves geo-caching to collect user's location information to generate challenges as the user proceeds in the game.

Once the users register for the game, all players can choose between two teams – Bandits and Warriors. Each player can score points, known as 'Coins', by solving the challenges located at various places worldwide, which will be known as 'coinstop'. The puzzles/challenges that the user solves will be known as 'défi'. For each successful défi solved, players not only add coins to their personal account known as 'treasure box' but coins also get added to the team that they belong to. Moreover, when two players are in the same location, the players from the opposite teams have the option to challenge each other and defeat the contenders by solving different set of defies on the location where the two contenders request the challenge. These requested challenges from the opposite team will be known as 'duel'. Additionally, based on the winner of the duel, coins get transferred from one player to another. As a result, a flow of coins and excitement is maintained throughout the game. If a user continues to lose coins by playing duel, the player can even run out of the coins. Thus, the main goal of each player is to collect as many coins as possible without ever going to bankrupt.

Guerre Géo is developed with the goal of providing adventurous experience while adding educational value to it. The puzzles created throughout the game will involve location, element spotting, history about the location and riddles, all based off the location. As a result, the game will be a great tool for learning about history and geography of cities. Thus, Guerre Géo is an attempt to bring new excitement in a location-based gaming experience by challenging user both physically and mentally.

2 The Purpose of the Project

2a The User Business or Background of the Project Effort

There are millions of mobile games available for both android and iOS mobile phone users. Some of the famous games played by people between the ages of 14-25 are Subway Surfers, Candy Crush, Temple Run, etc. Usually people sit on their couch four hours while play games on their mobile phone. According to a research released by the Entertainment Software Association, more than 150 million Americans play video games and 42% of them play on regular bases for at least three hours per week. Amongst these players, 54% play in multiplayer mode. Our goal is to target these audiences by offering multiple features and activities into one game.

Guerre Géo's approach is to make users motivated to be physically active. By providing défi at coinspots and hotspots around cities, Guerre Géo provides multiple ways for players to explore various cities. Guerre Géo generates puzzle and trivia based défi about locations' geography and players have to solve it; thus, it provides great way to improve their geographical knowledge and puzzle solving abilities. This game also lets a player compete with the players from opponent team, by dueling them when they are at the same location. By solving défi at Coinstop, duels, and hotspots, players can fill their treasure box with coins and gems. Guerre Géo will be a platform for people to learn and test their geographical knowledge, while being physically active.

2b Goals of the Project

Guerre Géo is an approach to educate people about various locations' geography and make users physically active by providing défi challenges at coinspots and hotspots around their cities and having duel challenges that lets them compete with players in either team Warriors or Bandits.

2c Measurement

We have to keep track of certain measurements in order to determine our goal's successfulness. In order to see how many people are interested in the game, we have to keep track of downloads from Google play store and Apple store. To measure if people are actually making an effort to visit Coinspots and Hotspots, we will track the number of gems and coins collected by players and the place of collection. Further, we can measure the duration that the game is opened and closed by the players, which can be used to see how much time players spend playing this game. These data along with the number of app downloads would be used to determine the popularity of the game. In addition to the measurement of popularity, we can use take other data to generate revenue. We will keep track of the player's age to help us target advertising. The statistics can help us improve the application and continually keep capturing a larger audience.

3 The Scope of the Work

3a The Current Situation

Currently there are many mobile games, which involves the use of user's location, multi-users battling, solving puzzles. Instead of digging through different games to play multi-user games or puzzle solving game, users can experience everything into one game. Guerre Géo brings excitement of winning the battle along with solving défi while exploring amazing places in various cities.

3b The Context of the Work

The diagram below provides support for the development of the game. It is drawn from a perspective when the player plays the game, which highlights the possible options available for the player and the events that would trigger those options.

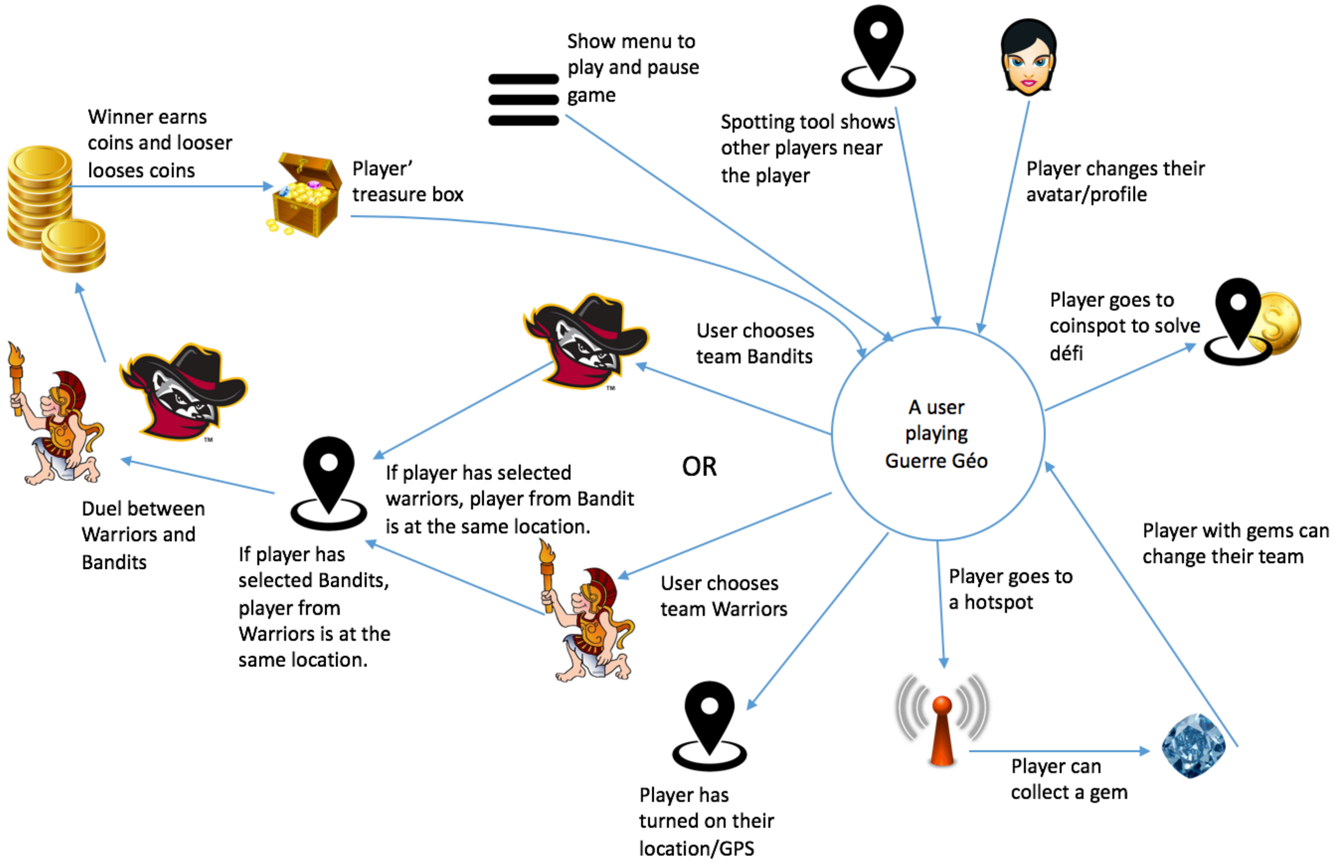

Show menu to play and pause game
Spotting tool shows other players near the player
Player changes their avatar/profile
Winner earns coins and looser looses coins
Player' treasure box
Player goes to coinspot to solve défi
User chooses team Bandits
A user playing Guerre Géo
OR
If player has selected warriors, player from Bandit is at the same location.
Duel between Warriors and Bandits
If player has selected Bandits, player from Warriors is at the same location.
User chooses team Warriors
Player with gems can change their team
Player goes to a hotspot
Player can collect a gem
Player has turned on their location/GPS

Figure 1: Work Context Diagram

3c Work Partitioning

No.	Event Name	Input and Output	Summary
1.	Player chooses a team	I/P: Player selects a team.	Player chooses their team: Warriors or Bandits.
2.	Player gets a trivia to answer.	I/P: Player answers the trivia question.	Player is proposed with a trivia question related

		O/P: Player gets rewarded.	to their geo location and team.
3.	Player wining coins.	I/P: Player has successfully finished his/her task. O/P: Player’s treasure of coins.	When player successfully answers Défi, they earn coins, which get added to their treasure.
3.	Player solve puzzle at a hotspot.	I/P: Player solves the puzzle. O/P: Player gets a gem added to their treasure box.	When the player is at a hotspot, they get to solve puzzle related to the hotspot’s location.
4.	Player can request duel.	I/P: Player chooses a player from opponent team. O/P: Both players get a trivia to solve.	When two players from opponent teams are nearby, in terms of location, they can request a duel to compete with each other.
5.	Player can change their team.	I/P: Player chooses to be part of the other team. O/P: Player’s treasure transfers to their new team.	If player has a gem, then they get an option to switch their team.
6.	Player can change their avatar.	I/P: Player edit’s their avatar. O/P: Player’s new avatar is saved.	At any point in the game, player can change their avatar and update profile.

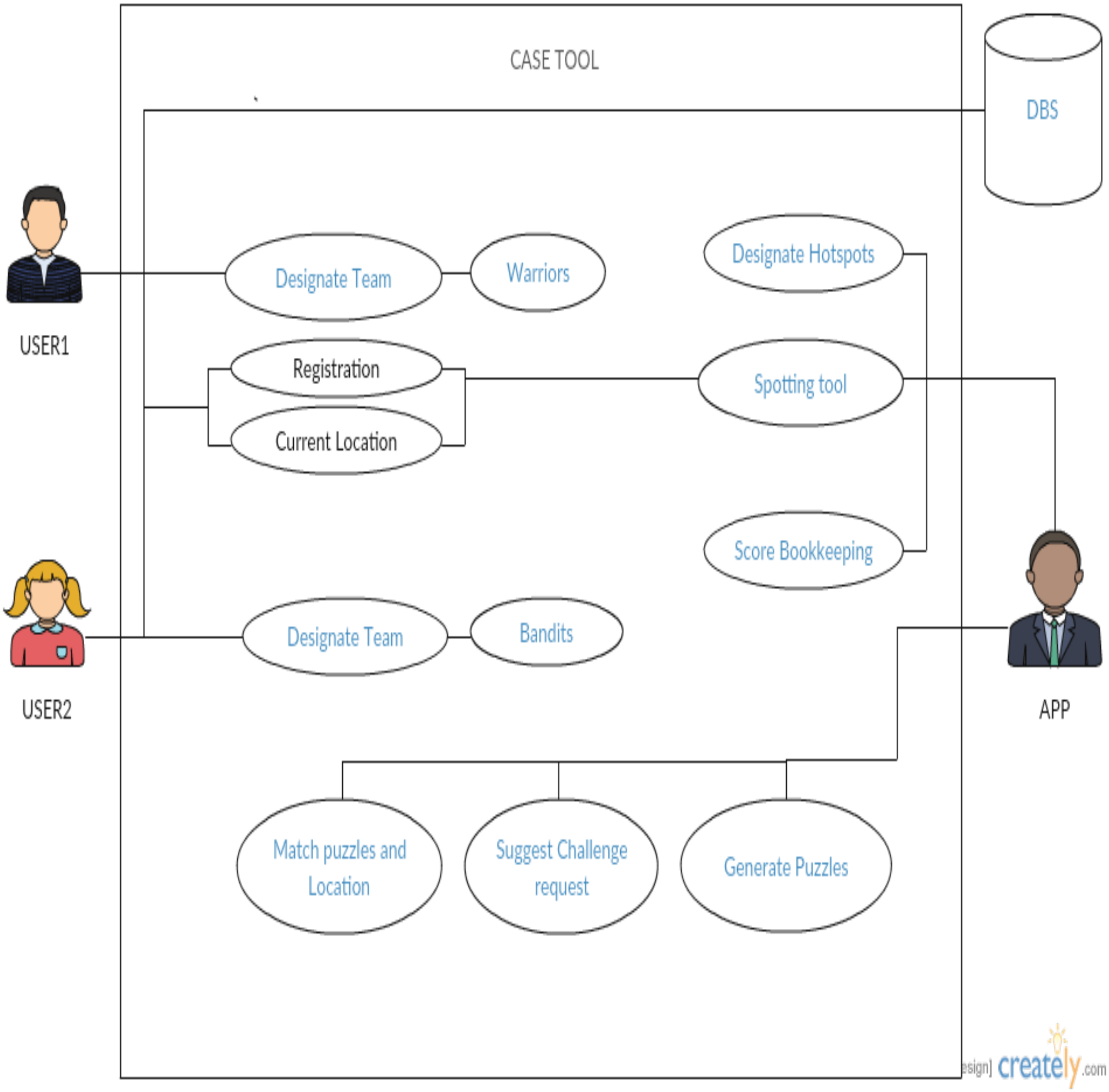
3d Competing Products

There are many puzzle solving and location-based games such as Candy Crush, Pokémon Go, Geocaching, etc. These games only challenge the users in some ways. However, Guerre Géo will not only make the users physically active by going around cities to find hotspot for challenges, but it will also educate them about cities’ geography.

4 The Scope of the Product

The main goal of this Case tool is to give the developers a basic layout of how to build this game successfully. The Case tool directly indicates the external entities needed for this game and tasks of each of these entities specifically so that their roles and dependencies with other entities are clearly understandable. Updating the basic ideas from the case tool we can build this game efficiently.

4a Scenario Diagram(s)



4b Product Scenario List

1. Player Registration
2. Team Assignment to the Players
3. User's Current Location
4. Edit User Profile
5. View the treasure box
6. Find coinstop/hotspots in nearby surroundings
7. Spot défi
8. Visit coinstop and solve défi
9. Spotting tool
10. Suggested player's duel requests
11. Accept/decline duel request
12. Duel scoring
13. Switch teams
14. Défi hints

4c Individual Product Scenarios

Player Registration:
Upon signing for the game the first time the user has to sign up for the game. For this the user provides a username, which will be used, for other users to challenge and spot the player on the spotting tool to request challenges. The registrations will also maintain a basic record of players and their respective scores, in case a user wants to sign in with a different device.

Team Assignment to the Players:
Once the user has registered for the game, the player gets to choose between team Bandits or team Warriors. Ever since the first time the player gets assigned to either, it is important to note that the users cannot change the team until they use a gem. The défi of the player is decided based on the team that they belong to.

User's Current Location:
After the player has is assigned the team they get a pop up window asking permission to access player's location. As the game, involves geo-caching, it is important that the player allows the application to access the current location of the player. If the player denies access to location, then the player is taken to screen, which informs player can't move forward without providing location access. If player does access to the location, then the player will be taken to the Spotting tool.

Spotting Tool:
Once the player enters the spotting tool the actual UI for the game, contains the minified version of the user's location in form of a virtual map. As the user moves around, the screen will also

change displaying if any coinstop or hotspots are located near the player. It will also display if any other players are located around them.

Find 'coinstop/hotspots' in nearby surroundings:
As the player moves around in the spotting tool the user will be able to see if there are any hotspots or coinstops are present around. These coinstops will basically be seen as animated symbol 'coins'. The player at coinstops can earn coins by solving a défi. However, if the player arrives at a hotspot, shown as an animated star, the screen will ask the player if they want to take the défi of the location and earn a gem. Having a gem gives a player two optional powers. Firstly, they can decline a requested duel from another player if they use a gem. Further, in exchange of a gem they can also switch teams.

Locate Défi:
As the user arrives on the Hotspots or Coinstops they will be notified about a 'défi' located there and the value of that défi. Défi is a challenge or a puzzle that users solve to earn coins. Once they accept défi, their screen will display a challenge for them to solve. These défi will be based on player's location as well as the team they belong in the game.

Visit coinstops and solve défis:
Once the player solves the défi, the designated points for the défi will be added to the player's account termed as 'coins'. The player can never lose any points when they are playing a défi even if they fail to solve the défi. Moreover, there is no limit to how many coins a player can earn as long as there are definite numbers of challenges to be solved at each location. The worth of the défi decreases if the player stays in the same location for an extended period of time. Thus, the player is forced to visit a different location to solve défis that have more value.

View the Treasure Box:
At any given point if the user wants to view the scores earned so far then there will be an icon located on one of the corners of the screen. This icon will take the user to the screen, which will give the player the history of the points earned by them.

Edit Player Profile:
Apart from the view options, the player also has a player profile located in Character menu. In the Character Menu, the player has access to change name, username, modify their avatar, and connect to social media such as Facebook, WhatsApp, Snapchat to share their scores or their location based of the game.

Suggested Player's Challenge Requests:
When there are multiple players present at a hotspot or coinstop especially from opposite teams, then the application will have an algorithm, which will generate Duel Request suggestion based on the scores of the players and most common locations visited. However, these would be just mere suggestions. The player can still challenge players apart from the suggestion lists as long as they are from the opposite team.

Duel Request:

The challenge request that one player makes to another from an opposing team is called Duel. At any given point, in the same location, a player from Bandits team can make a request for duel to a player to from Warriors or vice-versa. However, the duel that will be given this time will be based of correctness as well as time, in order to declare the winner among the participants in the duel. Any player can make a duel request to any other player from their opposite team as long as they are in the same location.

Duel Scoring

Once two players have played a duel, the winner will be declared and the winning player earns coins and the loser loses the same amount of coins. The number of coins lost/received is determined by the Défi's coin value.

Switch Teams:

A player can only switch teams if they have earned gems from Hotspots. No player can switch teams at any point in the game if they do not have gems.

Défi Hints:

If a player is unable to solve a défi, they can request a hint. However, upon requesting a hint the player will lose five coins from the total worth of that défi. The maximum hints each player can receive on each Défi is three.

5 Stakeholders

5a The Client

The client for this application will be a gaming company. The client should understand the value of location-based games and want to make them unique. Guerre Géo not only gets players active, but also makes them mentally fit by learning about their surroundings and gaining general knowledge. Our main target clients are Nintendo and Colopl.

Nintendo is a very successful company who specializes in the gaming industry. They recently had a huge success with Pokémon Go, which is another location-based game. Having Nintendo as an investor can bring a large fan-base of customers and open up many doors of opportunity.

Colopl's main goal as a company is location-based games. Guerre Géo, therefore, will immediately capture their interest. Furthermore, the location-based trivia concept will take location-based games a step further; this is something Colopl will be intrigued to seek, as their main competence is location-based games. Having Colopl as inventors will gain a large geocaching customer fan-base.

5b The Customer

The ideal customer-base for Guerre Géo will be teenagers and young adults from the ages 14+. As this is a trivia-based game, some questions may be more difficult to answer for any age group younger than specified. There will also be challenging puzzles that will be geared towards an older age group.

Though the age range's minimum target is set low, anyone that is motivated to learn and be physically active is the ideal customer. Guerre Géo gives customers a great platform to explore cities and its general surroundings, learn about the city, and duel with opposing teams. The wide variety of questions and locations will keep customers continually motivated to visit as many locations as possible, as well as explore the city.

5c Hands-On Users of the Product

User category: The most likely user for Guerre Géo is students and active city-dwellers. This game is geared towards users that are ages 14+ and anyone that is motivated to walk around and solve challenges.

User role: The user has the responsibility of answering as many trivia and puzzle questions as they can about various locations. They must attain maximal points for themselves as well as their team (Warriors or Bandits).

Subject matter experience: If the user has knowledge about various locations' fun facts, puzzles, and history, this would be an advantage. However, the user can even learn as they play the game.

Technological experience: The user does not need any special technology skills other than being able to use the smartphone that they are running Guerre Géo on.

Other user characteristics:

- Motivated to walk around
- Motivated to learn about current locations
- Motivated to duel and defeat other team members
- Interested in trivia, puzzles, and/or various location knowledge
- General high school knowledge may come in handy (history, city fun facts, etc.)
- Must be literate in region's language
- Age group: approximately 14+
- Gender neutral
- Enjoy exploring/traveling

Users may come from a wide variety of ages and occupations. There is no limitation on who may use this application, though a teenage/young adult may be more motivated to do so. As long as the user has the motivation to walk around and challenge themself, they will enjoy this game.

5d Priorities Assigned to Users

Key users: The key users of Guerre Géo are regular customers who are choosing to play a trivia, location-based game. The users will be given the task of collecting as many coins as possible, via trivia and puzzle questions. The user can also duel the opposing team members, as well as collect gems to switch teams altogether.

Secondary users: The secondary users of Guerre Géo are not players, but rather promoters and advertisers. To gain revenue, this application will allow companies to promote the game, and in return, users will have advertisements within the app. For example, Papa John's may put announcements of Guerre Géo in their restaurants and/or website. Then, while opening or playing the game, the user will see ads of Papa Johns. This will allow Papa Johns and Guerre Géo to help each other and gain more popularity.

5e User Participation

The user will be expected to choose a team, Warriors or Bandits, and walk to Hotspots and Coinspots. The user will need to be able to answer fun-fact trivia questions or puzzles about their nearby locations. They will need to spend some time at various locations to be able to collect coins and gems. Staying idle in one location will not advance the user much; they will gain minimal coins if they are not moving to new locations. The user will also be able to duel opposing team members and try to capture even more coins.

5f Maintenance Users and Service Technicians

The company's Development and Testing teams will be responsible for maintaining Guerre Géo. As bugs pop up, these teams will error-check and fix the underlying source code for this application. The Developers will also be responsible for adding new features to the program as time elapses.

5g Other Stakeholders

Testers: The Testers will be responsible for debugging any errors that show up. They will continually monitor users' issues and feedback. They will also do the initial tests to make sure the application can go in the market.

Business Analysts (BA): The Business Analyst team will be in charge of making sure Guerre Géo is meeting market demands and needs. They will mostly consult with the Marketing team and Developers to continually improve Guerre Géo's impact in the industry.

Developers: The Developers will be responsible for creating the entirety of the source code for Guerre Géo. They will also continue to add any new features that may be needed.

Marketing Experts: The Marketing team will be in charge of advertising Guerre Géo well enough to introduce a larger and larger fan-base. Furthermore, they will work with the BA team to report suggestions of what features should be added for customers.

Legal Experts: The Legal team will need to handle any issues and concerns for Guerre Géo. They will also take care of any liabilities that users claim from this application, as well as branding.

6 Mandated Constraints

6a Solution Constraints

The product must contain all the components of the game. In order to make the app useable, the app must be on a mobile device because the incentive is for the user to move as well as improve their knowledge. Thus, the mobile device must be a smart phone with location sensors and a camera. Specifically, another constraint is that the operating system on the device must be an Android 4.4+ or iOS 8.8+ to show the UI and its features. Furthermore, the puzzles should be low high school level and up because that is our target audience and the level of general knowledge a common person should have.

6b Implementation Environment of the Current System

Since the app needs a mobile device, the app size cannot be too big such that it takes up too much of the user's storage and it does not make the user's experience slow. As said in the previous section, the operating system on the devices need to be Android 4.4+ or iOS 8.8+ to show the UI and its features. Furthermore, the user's device needs to have fully functional Geolocation sensor, touchscreen sensor, and visible screen to see the app. We would also need servers to store the user's data.

6c Partner or Collaborative Applications

Firstly, in order to generate revenue for this game, we have talk to companies and agencies about whether they wish to advertise their products or services. Advertising can be targeted towards the game's user demographics and even location based. An example would be a "Papa John's Pizza" ad when the user is about to walk past the store. Furthermore, the game requires Geolocation data for the current location, so would have to work with their team to get license to use. Also, there will be a contract for the augmented reality feature of the game because it is a specialized topic that not many programmers know how to implement it.

6d Off-the-Shelf Software

Since this app requires that it be on a mobile device, the developers have to implement the code in two editors and languages. When they are making an android application, they will need to use Android Studio and JVM (Java Virtual Machine). If they are making an iOS app, then they will require XCode and swift library access.

6e Anticipated Workplace Environment

The product's target audience is a person aged 14 and up and has a smart phone. The product can be expanded to educational institutions if they wish that their students get mentally fit as well as get some physical exercise. The product should also advertise to potential companies who wish to advertise on the application. If we consider just a common user, the purpose of the game is for user to move and learn about their surroundings. Thus, any public place should be open. However, private property and religious sites are off limits, but there will be puzzles somewhere around the perimeter of the site. As for business establishments, users can have clues inside of buildings such as the lobby, but not upper levels where security clearance is involved. In addition, because the game requires movement, the user is exercising, which is good for their health. As the popularity of the game increases, this game can become a social activity so this changes the cultural and social norms of the group of people playing Guerre Géo.

6f Schedule Constraints

The release date of this product should not conflict with a release of another "exciting" product so that our product is not overshadowed. Also, advertising to potential advertisers on the game would require at least a prototype of the game. If not, the marketing team would have to sell the game with words and statistics alone. Explaining with only statistics would lower the chances of getting investors for Guerre Géo.

6g Budget Constraints

There are multiple teams, contractors, resources and other factors required for the game to reach fruition. The initial team would include front-end designers and developers, back-end developers, data management, augmented reality contract (it is a specialized topic), application security, legal consultant team, marketing team, and initial around-the-clock hiccup maintenance team after release. These are the roles required but multiple roles can be applied to one person. In terms of resources, multiple servers and storage would be needed, as well as coding and management software, marketing supplies, and other miscellaneous supplies for the teams to use. Totaling the cost would require approx.: $80,000 (USD) not paying the employees. Including salaries of employees, and keeping in mind it is a startup, it would be a minimum cost of approximately $200,000.

7 Naming Conventions and Definitions

7a Definitions of Key Terms

- **Warriors** - Team that is the "good guys" in the game; get the positive clues.
- **Bandits** - Team that is the "bad guys" in the game; get the negative clues.
- **Défi** -The clues, questions, or trivia to be solve by player. They are based on the location and what team the player is on and is located in that area.
- **Coins** - Points the user gets awarded on solving a puzzle at a coinspot or winning a duel
- **Coinstop** - where we collect coins by solving puzzles/trivia and located through the city
- **Hotspot** - Random locations where a user can collect gems from solving défi
- **Gems**- gems are received at hotspots. They can be used to switch teams or back out of a duel
- **Duel**- when user has challenged a player from opposing team and this can happen at any location including coinstops and hotspots.
- **Profile** - the character's profile
- **Character** – means an avatar for a player. The term is mostly used when talking about a general player on one team
- **Character Menu** – The player's strength, coins, gems, and history of challenges
- **Main Menu** – Game menu such as pause, play and about
- **Spotting tool** - The map used to check if any other player is in that current area and is useful when to duel a player.
- **Treasure box** - accumulation of a user's total coins
- **Player-** A user and participate of the game. *Synonym* to Player and Character; Term is mostly used when talking about scenarios in the game
- **Teams** - can refer to teams in the game such as: Warriors or Bandits, but it can also refer to the departments within this business such as: Marketing, Legal...etc.
- **User** – *Synonym* to Player and Character; Term is mostly used by the developers of the game
- **Guerre Géo** – This is the game that needs to be implemented. *Translate* to: Geographic War.

7b UML and Another Notation Used in This Document

This document follows the guidelines and regulations of the UML as described by Fowler's book.

7c Data Dictionary for Any Included Models

UI = front-end navigation + colors + pages + schemas + elements (objects such as buttons)

Data Management = SQL Querying + Databases + Connections + security measures + server information

Legal Consulting = potential lawsuit risk management + government regulations and privacy rules + NDA agreements + patents

Testing = testers + division of code index + product examination statistics + suggestion cards + testing reports

8 Relevant Facts and Assumptions

8a Facts

The key emphasis for Guerre Géo is to make a trivia and location-based game. This application must be able to:

- Provide an easy-to-use user interface where any user will be able to navigate with ease. This user interface will also be able to show the user all of their essential information: coins, team, treasure box, questions, locations, Hotspots, Coinspots, etc.
- Users will be able to duel with opposing team members. These duels will challenge both players with more trivia questions and allow them each to either win or lose coins.
- Warrior users will receive more positive questions about their current location (such as awards, accomplished people, etc.), while Bandits will receive more negative questions (such as dictators, battles, etc.).
- Users may not create a username that is already in use (no duplicates). Usernames must also only contain letters and numbers.

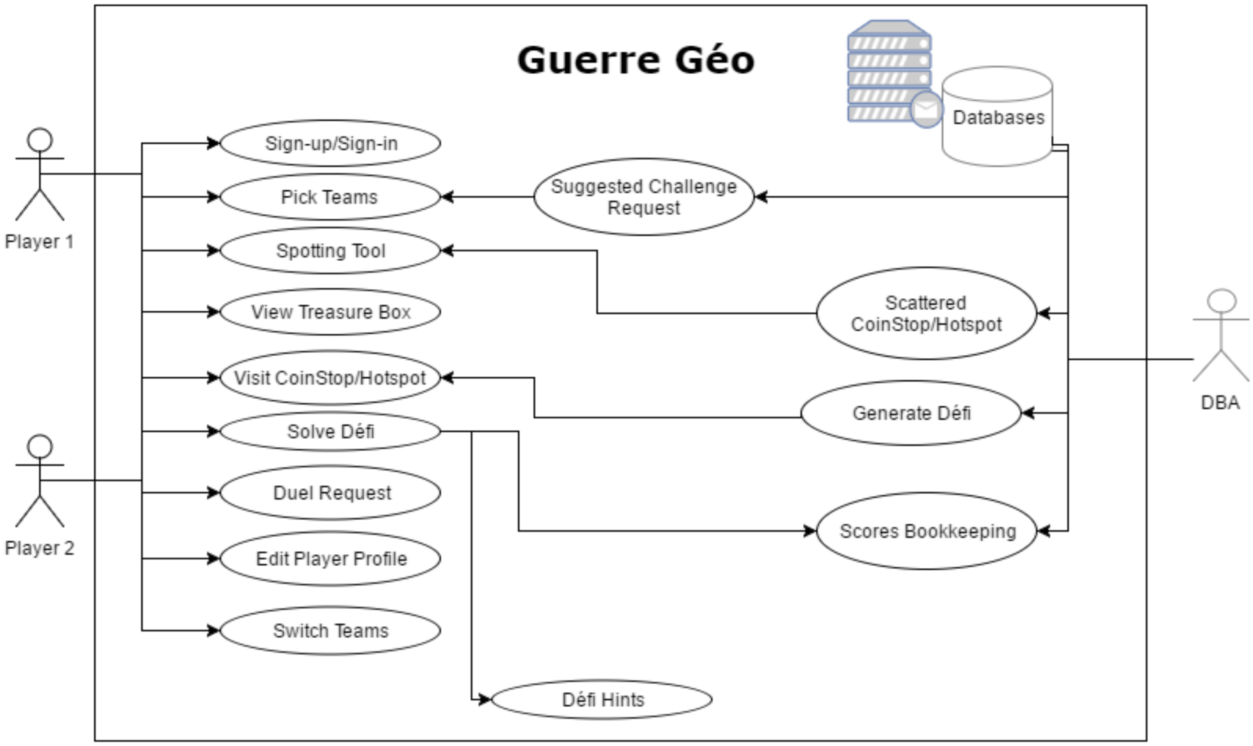
8b Assumptions

- The user may be on the Warriors Team or Bandits Team, but not both.
- The user will walk to specific locations with a mobile device and follow all game rules.
- The users will not Google/cheat to get trivia answers.
- Guerre Géo will always have Internet (data, Wi-Fi) and location/GPS access.
- The user will use the application on an Android (4.4+) or iOS (8+) mobile device.
- The application will have access to camera, volume control, and device settings.
- The mobile device will have a minimum of 2GB RAM and approximately 500MB storage space.

II Requirements

9 Product Use Cases

9a Use Case Diagrams



9b Product Use Case List

1. Sign-up/Sign-in
2. Pick Teams
3. Spotting Tool
4. View Treasure Box
5. Visit Coinstop/Hotspot
6. Solve défi
7. Duel Request
8. Edit Player Profile

9. Switch Teams
10. Défi Hints
11. Suggested challenge request
12. Scores Bookkeeping
13. Scatter Coinstop/Hotspot
14. Generate défi

9c Individual Product Use Cases

Use case name:	Sign-up/Sign-in
Participating actors:	Player, DBA
Flow of events:	1. Player clicks on the app button 2. Phone system will open the application. 3. If the player is visiting first time the player will sign-up for the game. 4. The player signs up for the game. 5. The information of the signup is recorded in the database. 6. If the player is returning player then will be asked to enter username and password. 7. Player enters username and password. 8. Username and password are validated and the player moves to the next screen.
Entry Condition:	○ The phone should be working. ○ The app should be successfully downloaded in the phone.
Exit Condition:	○ In either sign-up or sign-in player should be validated and verified appropriately.
Quality requirements:	○ The sign-up and login should be submitted in less than 4 seconds.

Use case name:	Pick Teams
Participating actors:	Player, DBA

Flow of events:	1. The player gets option to pick team. 2. The player will pick one of the team. 3. The database records the team selected. 4. The player is informed about the current score of the selected team. 5. The player lands to Spotting tool.
Entry Condition:	◦ The player should be verified or logged in. ◦ If returning player, then cannot select teams again.
Exit Condition:	◦ Returning player should have been assigned to only one team. ◦ New player should be assigned to the only one team.
Quality requirements:	◦ The information about each team should be given. ◦ Spotting Tool should be displayed in less than 3 seconds.

Use case name:	Spotting Tool
Participating actors:	Players, DBA
Flow of events:	1. The player selects spotting tool. 2. The DBA populates the screen with the map of player's location. 3. Locates the player on the map. 4. Map gets populated with the nearby coinstop/hotspot. 5. The player looks around in the map. 6. Player locates coinstop/hotspot
Entry Condition:	◦ Player must be successfully logged in and assigned to a team. ◦ Must have selected the spotting tool icon.
Exit Condition:	◦ Player must exit the spotting tool by clicking on the exit button. ◦ Player must have selected a Coinstop/Hotspot.
Quality requirements:	◦ Maps should be loaded in less than 3 seconds. ◦ Data on the map should be loaded with Coinstop/Hotspot in 2 seconds.

Use case name:	View Treasure Box
Participating actors:	Player

Flow of events:	1. Player clicks on the treasure box icon on the screen. 2. Player can see the score of the current coins collected so far in the game. 3. Player can see the current score of the teams. 4. Player exits out of the treasure box.
Entry Condition:	◦ Player must have clicked on the treasure box icon. ◦ Coins of the player should be accurate from the database.
Exit Condition:	◦ The player must have exited from the treasure box option.
Quality requirements:	◦ The points of both, player and teams should be displayed accurately within 3 seconds. ◦ The player should not be allowed to change anything in the treasure box.

Use case name:	Visit coinstop/hotspot
Participating actors:	Player
Flow of events:	1. The player locates a Coinstop/hotspot on the Spotting tool. 2. The player clicks on the Coinstop/hotspot icon. 3. The player will be zoomed to the location of Coinstop/hotspot. 4. The Défi of that location will be displayed.
Entry Condition:	◦ The player has selected the coinstop to be visited.
Exit Condition:	◦ The Défi should be displayed on the player's screen.
Quality requirements:	◦ The time between the selection of Coinstop/hotspot and visiting Coinstop/hotspot should be instantaneous.

Use case name:	Solve Défi
Participating actors:	Player, DBA

Flow of events:	1. The player visits Coinstop/hotspot. 2. Based on the location DBA displays Défi for that location. 3. The player tries to solve Défi. 4. If succeeds in solving Défi then earns coins. 5. If fails to solve the Défi then the player request Défi hints.
Entry Condition:	◦ The player has to visit the Coinstop/hotspot. ◦ Player cannot visit two Coinstop/hotspot at one point.
Exit Condition:	◦ The player should be able to solve the Défi or request Défi hints.
Quality requirements:	◦ Every player should get the Défi based on the teams they belong to and their current location. ◦ Each Défi that any player receives should never be repeated ever again in the game.

Use case name:	Duel Request
Participating actors:	Players
Flow of events:	1. Player finds other players from the opposite team in same location. 2. Finds an opponent and clicks on the opponent's icon. 3. Views the opponent's profile. 4. Requests a duel that both the players can play.
Entry Condition:	◦ The opponent player should be in the same location. ◦ The opponent should be from the opposite team.
Exit Condition:	◦ The opponent player accepts the duel.
Quality requirements:	◦ Only one duel can be requested at any given time. ◦ The duel request should be sent to the opponents on less than 3 seconds.

Use case name:	Edit Player Profile
Participating actors:	Player, DBA
Flow of events:	1. The player clicks on the edit profile icon. 2. The application displays the current information of the player stored in the databases.

	3. Player edits the information. 4. The user information gets verified and stored in database. 5. The players see the newly updated information.
Entry Condition:	◦ The player has selected the edit profile option. ◦ The player should not be in middle of solving a défi.
Exit Condition:	◦ Edited information of the player is successfully saved in the database.
Quality requirements:	◦ The information should be updated in the database is less than 2 seconds. ◦ The information getting stored should be verified against databases to avoid any matches.

Use case name:	Switch Teams
Participating actors:	Player
Flow of events:	1. The player wins a duel. 2. The player earns a gem. 3. The player is asked if they want to change the teams. 4. The player changes the team. 5. The database gets updated with the information of the newly picked team. 6. The player is taken to the updated spotting tool.
Entry Condition:	◦ The player has won a gem after winning a duel.
Exit Condition:	◦ The player loses the gem in trade of switching teams.
Quality requirements:	◦ Updating of the player information post switch must be done within 3 seconds.

Use case name:	Défi Hints
Participating actors:	Player
Flow of events:	1. The player is solving a défi.

	2. Unable to solve défi, the player requests the défi hints. 3. Player loses the coin in trade off getting a hint. 4. Player solves the défi or keeps requesting hints for two more hints.
Entry Condition:	◦ The player is middle of solving a défi. ◦ Player has not already requested 3 hints.
Exit Condition:	◦ The player successfully solves défi, using hints. ◦ The player has run out of 3 hints.
Quality requirements:	◦ The hint should be helpful for the player to solve the défi. ◦ The hint should not be too easy or too hard to solve défi.

Use case name:	Suggested Challenge Request
Participating actors:	DBA, Player
Flow of events:	1. Player selects which team he wants to be in. 2. DBA saves the team in which the player has selected and updates information in the database. 3. Updates the défi that the user will get at each location based on the selected team. 4. DBA runs the algorithm as to which that finds the opponent player that will be located in player's current location. 5. Continues to find opponent and show notification until the player is in the game. 6. The player selects the opponent that he wants to challenge. 7. The player sends the duel request to the opponent.
Entry Condition:	◦ The player must be in playing the game. ◦ The player's location must be turned on. ◦ Player should be on the spotting tool.
Exit Condition:	◦ The player must send a duel request to an opponent. ◦ The player closes the suggested challenge request.
Quality requirements:	◦ The suggested challenge list should be updated as the player moves from one location to another in less than 5 seconds. ◦ The player suggested should be from the opposite team and must be present in the same location as the requesting player.

Use case name:	Scores bookkeeping

Participating actors:	DBA, Player
Flow of events:	1. Player starts the game. 2. The DBA initializes the scoring for the player based on the team selected. 3. Player proceeds in the game and solves the défi. 4. The scores of the défi will be updated based on the location and type of défi - duel/non-duel. 5. Player loses a duel. 6. Points will be reduced from the losing player and added to winning opponents account. 7. Player uses hints. 8. Points get reduced from the player’s account.
Entry Condition:	◦ The player is assigned to only one team. ◦ The player has started playing the game.
Exit Condition:	◦ The player stops playing the game.
Quality requirements:	◦ The scores should be updated in less than 2 seconds.

Use case name:	Scatter Coinstop/Hotspot
Participating actors:	DBA
Flow of events:	1. The player starts playing the game. 2. The DBA has collected data about various locations in the city. 3. The DBA decides the location where the coinstop/Hotspot will be located based on the information stored in the database. 4. The DBA shows the Coinstop/Hotspot on the spotting tool. 5. The DBA updates and adds new locations based on the information collected. 6. Generates various défis.
Entry Condition:	◦ The data of various places will be gathered. ◦ The locations and information’s is well linked.
Exit Condition:	◦ Game is no longer being used.

Quality requirements:	◦ The locations should not have coinstop/hotspot located in same place but scattered in the city. ◦ All players will have same set of the coinstop/hotspots.

Use case name:	Generate Défi
Participating actors:	DBA
Flow of events:	1. The Coinstop/Hotspot are scattered in the city. 2. A predefined library, which will store information of various locations, will be created. 3. Based on the locations and the type of the player the défi gets generated. 4. Player screen will display the generated défi.
Entry Condition:	◦ The location and information is well linked.
Exit Condition:	◦ The game is no longer in use.
Quality requirements:	◦ The défi generated will be location specific. ◦ The défi generated should be tailored according to the player's team.

10 Functional Requirements

Requirement #: 1	**Requirement Type:** Functional	**Event/use case#:** Signup/Sign-in
Description:	The system must provide a means for the players to sign up for the game.	
Rationale:	To be able to keep player's game history.	
Fit Criterion:	The user's data must be saved in the database and they should be given option to pick a team.	
Customer Satisfaction: 4	**Customer Dissatisfaction:** 5	

Priority: High **Conflicts:** N/A

History: Created October 27, 2016

Requirement #: 2 **Requirement Type:** Functional **Event/use case#:** Pick Teams

Description: The system must provide an option to choose teams.

Rationale: To give an option to the player to select between team Bandits or Warriors.

Fit Criterion: The game's color scheme would reflect the chosen team.

Customer Satisfaction: 4 **Customer Dissatisfaction:** 2

Priority: Medium **Conflicts:** N/A

History: Created October 27, 2016

Requirement #: 3 **Requirement Type:** Functional **Event/use case#:** Spotting Tool

Description: The system must provide all users with an option to spot their location and other players near them.

Rationale: To show where the player is and other players nearby.

Fit Criterion: The player's location should be pointing to where he/she is.

Customer Satisfaction: 4 **Customer Dissatisfaction:** 3

Priority: Medium **Conflicts:** Server should be able to keep up with the changes of the location.

History: Created October 27, 2016

Requirement #: 4	**Requirement Type:** Functional	**Event/use case#:** View Treasure Box
Description:	The system must provide the players an option to view the amount of coins collected.	
Rationale:	To show the player’s treasure box.	
Fit Criterion:	The user’s coins should reflect the amount of coins they have collected.	
Customer Satisfaction: 4	**Customer Dissatisfaction:** 5	
Priority: Medium	**Conflicts:** N/A	
History:	Created October 27, 2016	

Requirement #: 5	**Requirement Type:** Functional	**Event/use case#:** Duel Request
Description:	The system must provide an option to request duel challenge to another player.	
Rationale:	To be able to compete and challenge other players.	
Fit Criterion:	Both players should be from opposite teams.	
Customer Satisfaction: 3	**Customer Dissatisfaction:** 1	
Priority: High	**Conflicts:** N/A	
History:	Created October 27, 2016	

Requirement #: 6	**Requirement Type:** Functional	**Event/use case#:** Switch Teams
Description:	The system must provide an option to switch teams.	

Rationale: To give an option to the player to be part of a different team.

Fit Criterion: The player uses their gem to switch team.

Customer Satisfaction: 4 **Customer Dissatisfaction:** 2

Priority: Low **Conflicts:** N/A

History: Created October 27, 2016

Requirement #: 7 **Requirement Type:** Functional **Event/use case#:** Solve Défi

Description: The system must provide a means for the player to solve défi.

Rationale: To let the player win coins and gems.

Fit Criterion: The player must have right solution to the défi.

Customer Satisfaction: 5 **Customer Dissatisfaction:** 5

Priority: High **Conflicts:** N/A

History: Created October 27, 2016

Requirement #: 8 **Requirement Type:** Functional **Event/use case#:** N/A

Description: The system must provide an option to view défi hints.

Rationale: To ensure the player is able to move on to a new défi.

Fit Criterion: The player can receive maximum of 3 hints and each hint would result in the loss of 5 coins.

Customer Satisfaction: 5	**Customer Dissatisfaction:** 5
Priority: Medium	**Conflicts:** N/A
History:	Created October 27, 2016

Requirement #: 9	**Requirement Type:** Functional	**Event/use case#:** N/A
Description:	The system must allow database to suggest duel request with players.	
Rationale:	To show the current player when players from the opposing team is near them.	
Fit Criterion:	The suggested player must be from opposite team as the current player.	
Customer Satisfaction: 4	**Customer Dissatisfaction:** 3	
Priority: Medium	**Conflicts:** N/A	
History:	Created October 27, 2016	

Requirement #: 10	**Requirement Type:** Functional	**Event/use case#:** Scatter Coinspot/Hotspot
Description:	The system must allow DBA to add coinspots and hotspots around the city.	
Rationale:	Random coinspots and hotspots should be added to allow users to visit them to solve défi.	
Fit Criterion:	Coinspot and hotspot places should be accessible at all time by everyone and they should not be placed at the same location.	
Customer Satisfaction: 5	**Customer Dissatisfaction:** 5	

Priority: High	**Conflicts:** N/A	
History:	Created October 27, 2016	

Requirement #: 11	**Requirement Type:** Functional	**Event/use case#:** Score Bookkeeping
Description:	The system must allow the database to keep the player's score.	
Rationale:	To allow the player to keep track of their performance.	
Fit Criterion:	The score reflects changes based on the hints used and the player’s team.	
Customer Satisfaction: 4	**Customer Dissatisfaction:** 4	
Priority: High	**Conflicts:** N/A	
History:	Created October 27, 2016	

Requirement #: 12	**Requirement Type:** Functional	**Event/use case#:** Generate Défi
Description:	The system must allow the DBA to generate défi based on the location.	
Rationale:	To allow the players to solve défi at a coinspot or hotspot.	
Fit Criterion:	The défi should be about the location of the coinspot or hotspot.	
Customer Satisfaction: 4	**Customer Dissatisfaction:** 5	
Priority: High	**Conflicts:** N/A	
History:	Created October 27, 2016	

Requirement #: 13	**Requirement Type:** Functional	**Event/use case#:** N/A
Description:	The system must be able to provide locations around the world.	
Rationale:	To be able to put coinspots and hotspots around the city.	
Fit Criterion:	The map should show every street and building of the city.	
Customer Satisfaction: 4	**Customer Dissatisfaction:** 5	
Priority: High	**Conflicts:** N/A	
History:	Created October 27, 2016	

Requirement #: 14	**Requirement Type:** Functional	**Event/use case#:** Edit Player Profile
Description:	The system must allow the user to edit their profile.	
Rationale:	To edit user's avatar or personal information.	
Fit Criterion:	When changing user's password, the user must verify their old password.	
Customer Satisfaction: 3	**Customer Dissatisfaction:** 1	
Priority: Medium	**Conflicts:** N/A	
History:	Created October 27, 2016	

11 Data Requirements

The information needed to create puzzles for the game will be stored in the cloud. Also the server access will be required for proper cloud storage of the records of the players. Other than that the passwords of the players will also be encrypted to protect their privacy.

12 Performance Requirements

12a Speed and Latency Requirements

It is very important that Guerre Géo is quickly able adapt to changes. Therefore, measuring the speed and latency of the game is very important. The following are speed and latency requirements for Guerre Géo:

- After the player solves défi, new défi should be shown within 2 seconds.
- When player's location changes, system must update the player's location within 3 seconds.
- System must load spotting tool and the treasure box within 3 seconds.
- When player requests duel challenge, the system should check that the challenge is being requested to a player from opposite team and défi should be shown to both players within 3 seconds.
- When player requests a hint, it should be shown within 2 seconds.

12b Precision or Accuracy Requirements

For a better user experience, the Guerre Géo should be precise and accurate for all players. The following requirements should be considered to create a precise and accurate game.

- The défi must be accurate based on the player's location.
- The system should provide same défi to both players, when a duel challenge is requested.
- The system should accurately verify player's solutions to the défi.
- The system should accurately keep track of the player's coins and provide hints accordingly.

12c Capacity Requirements

The server should be able to handle large number of players playing the game at once. The server should be able to keep a track of locations. Also, the game should be available for up to 5000 people for a particular location.

13 Dependability Requirements

13a Reliability Requirements

- The product shall not fail more than once per week and no data shall be lost due to the failure.
- The user should not have to uninstall and reinstall the app completely.
- The app should be refreshed or restarted and the error should be gone or an error message should pop up when entering the affected area.
- The last saved state of the app must be saved before the app interrupts and closes fully. No security protocol must be compromised when there is an error.
- There should be alerts to notify developers of the issue and be able to work around the clock to fix it.

13b Availability Requirements

The product should be available year around, 365 days, and should be available 24 hours a day unless there is a need for maintenance or emergency improvement. In the case that the game needs to go down, it will go down during the nighttime of the location. Nighttime refers to the time when the numbers of users are very low and usually in the time of the night (12 am to 5am). Also, when the system recovers from only a complete emergency shutdown of the entire game, then the user will receive compensation in terms of points based on which team there are in.

13c Robustness or Fault-Tolerance Requirements

The implementation of the game should have good error checking and proper error message system implemented. Thus, when the error occurs, the error can set off flags and send the developer team message so they can easily find the error, shut the particular part of the game feature or system down and work on it. The game should operate in local mode since it already has the map of nearby region. The game shall provide up to 15 minutes of operation should it become disconnected to the phone's battery in the case of a disaster.

13d Safety-Critical Requirements

Since this game requires the user to move around while being active and looking at a device frequently, there are safety and risk of damage to a property or person requirements involved. The clear statement is “GUERRE GÉO is not responsible for any user's action or the actions of its investors”. No blame or legal prosecution will be on the company for the defendant's actions. Furthermore, any harm done to another person or property, public and private, is not the company's liability or responsibility. The company will follow the legal laws and documents of each country and state. There will be a safety-critical team within the organization to make sure any new feature or new infrastructure will not be compromised legally or otherwise. In the unlikelihood case of a bad feature or hardware, the application must not overheat the phone and cause any damage to the user. Then the company is responsible for the care of the user.

14 Maintenance and Supportability Requirements

14a Maintenance Requirements

- Every development team and member must leave behind very detailed notes about the product, source code, bugs, execution notes, and requirements notes. Every new employee that works on this application will have access to this documentation. They will also continue to add onto and fix documentation as needed.
- If a user encounters a bug, there will be an accessible button option where they can report the bug and any other relevant information that the user wants to give about the bug. Once the user does this, their stack information will be saved along with this request. This will be stored into a database that will save these bugs and be sent back to the Development team to fix. The attempt to fix these bugs occurs immediately, prioritizing most important to least. The entire Development team should be able to have access to this data in order to fix bugs as quickly as possible. Then, as soon as bugs are fixed, deployment will occur as quickly as possible, keeping in mind an Agile-methodology where we want features to be readily available and updated with frequent deployments. Deployment itself should not take more than a few hours, so as to limit the time users don't have access to the application.

14b Supportability Requirements

- The application will be made available to both Android and iOS mobile devices, and compatibility with the latest versions. These devices must have Wi-Fi/Data and location services enabled, in order to track the device's location.
- The users will be able to report issues and give feedback. They can express any concerns, issues, or advice on improvements. This information will all be sent back to the Development team to help address these concerns/tips.
- There will be a "How to Use" page to give the user advice on how to get started using the application. Within this page will also contain a "Frequently Asked Questions" page that will start off with generic questions made up by testers. As more and more users begin to use the application, real-world user questions will be added on as well. This page will also include answers to these questions. The users themselves will also have access to answers these questions (if they are logged onto the application).
- There will be a "How to Play" page to give the user clear-cut rules on gameplay. Here, every question, scoring, location, user, team, and duel rules will be included to give the user maximum information on how to play Guerre Géo. There will also be tips on here to give users a little nudge on efficient gameplay. This guide will tell the user what they can accomplish and how.
- If the user needs live help from a Guerre Géo employee, they can fill out a form with their email and question. Questions will be addressed within a maximum of 2 days, in

which the Technical Support team will work diligently to answer. Or, if the user would prefer calling a live person, they can call the customer service telephone line.

14c Adaptability Requirements

- The product will be made available to anyone who owns an Android or iOS mobile device with Wi-Fi/Data and location services enabled. Anyone with these criteria will be able to download and play this application. This means this application must be able to use Google Maps from anywhere in the world and adapt to each region's language.
- This application will be expected to run on most commonly used versions of Android and iOS mobile devices. Wi-Fi/Data and location services must be enabled.
- This product must be accustomed to deployments and bug fixes to that it is easy to update.
- If signal is lost during gameplay, the most current state must be saved and available on user's profile. This will be restored as soon as signal is gained again. This will allow the user to login to their profile from any device and continue where they left off in the game.

14d Scalability or Extensibility Requirements

- The size of the database will increase in response to how many users there are. Initially, a large database size will be given (about 100,000 users). From then on, the database must adapt to growing user population.
- The Development, Support, Testing, and IT teams must increase as the volume of users increases.
- The system must be able to support about 70% of its users an hour so as to keep most users satisfied. It must be able to process a minimum of 70% of the users implementing 1 transaction every 2 minutes. As this application is a quick-moving game, there will need to be almost constant system support for as many users as possible.

15 Security Requirements

15a Access Requirements

- Access to the application will depend upon position of the employee at the company. Developers, Testers, IT, and Managers will have the most read and write access to code and documentation. Managers have access to private and sensitive data, while other employees do not.
- Every employee will have accounts with secure logins and security measures.
- Managers will have admin accounts for full read and write access to every part of the application. All other employees will have regular accounts with varying read and write privileges to various parts of the application.

14e Longevity Requirements

- The long-term goal of this application is to make this application the leader in location-based games. As time goes on, more intuitive features must be implemented to continually keep users engaged in application. As we build our brand, we will gain more of an edge or acquire other gaming companies and eventually become the mobile-games industry leader.
- Since this application will be free on the Play Store and App Store, the budget must include advertising (in and out of the application) and profits from selling user data.
- The application should have enough cash flow to last at least 1 year without income if the application does not make enough profits right away.
- The application should still continue to run even if the company goes under. In this case, we must warn customers that they will be losing supportability. To attain new game features (even if company goes under), we will put this project onto the OpenSource community so users can add to it as they please.

15b Integrity Requirements

- The application's database will be copied to a backup server everyday in order to recover any losses the main server may have.
- A signal loss within a user's application should affect a remote application's performance.
- The application will have firewalls set in place to make sure user data does not get leaked from any network server.

15c Privacy Requirements

- Any and all information entered by the user (email, phone number, credit card, password, etc) will be securely stored and encrypted.
- This product will ask the user if they agree to the terms and conditions of being able to collect the user's data, location, and trivia information. If user disagrees, they will not be able to use the application, and nor will the application extract any data from the user. Since this application will need profits from user data, the user must agree to these terms in order to use it.
- This product will immediately notify the user if the terms and conditions change in any way. The user is responsible for reading the changes once notified, and disagrees to them if desired.

15d Audit Requirements

The application must keep records of people who have used this product. It must also keep records of companies this application gives its business to. This will be the legal document of the bill of sales.

15e Immunity Requirements

- To make sure user's data is not leaked through different servers, this application will have active firewalls set in place to block viruses and malicious activity.
- Strong passwords must be required to prevent users from being hacked.
- This software must collaborate securely with the latest mobile device versions.

16 Usability and Humanity Requirements

16a Ease of Use Requirements

The usability of the application for the user should be easy to use and should challenge them and gain general knowledge about the place they live in. The tutorial when the user first opens the application will be easy instructions on how to play the game. The game should be able to use the product easily and the user needs to bring their general knowledge and how fast they can recall facts. The user should also have a high satisfaction rate. They should want to find more clues and find other users to duel. When the player answers défi properly, they will receive rewards in terms of points and other prizes for local stores. The application should also be easy to use for someone 14 years old and older and this game should make the user want to find more clues and duel more to earn more. Also, the application will be in the language of the user's preference and the character avatar should be able to be save their appearance.

16b Personalization and Internationalization Requirements

The application will be accessible to users around the world so the application must be personalized for multiple languages, cultural terms, idioms and symbols. The user should be able to configure their avatar to contain fashion of their region and cultural trends. The user should be able to choose their language. Also, based on the location, the advertisers should be able to connect with the user by presenting something appealing otherwise the advertisers would not be chosen for the ad.

16c Learning Requirements

The application's target audience is the general audience in high school and over. The user should have a basic general knowledge about the location they are playing the game in. As the player solves the puzzles and duels with other players, the players gain points, physical activity and more general knowledge.

16d Understandability and Politeness Requirements

The application shall use symbols and words that are naturally understandable by the user's community such as direction signals, location pins and markers, and words understandable by the user in their user's preference language. Also, the application shall hide the details of its construction, infrastructure, data, map location rendering from the user.

16e Accessibility Requirements

The application shall conform to the Americans with Disabilities Act. It should also be accessible for any physical disability and they can move location to location since the game requires the player to move places. If a user is colorblind or a hearing disability, the user should not be affected by not being able to play the game.

16f User Documentation Requirements

There are few manuals needed for the production of this game and for the users. There is the manual for the technical specifications to accompany the product. Then there is a user manual, a service manual for the people who maintain it, emergency protocol manual, security protocol for specific scenarios manual, and a manual stating the legal licensing and patents of the company.

16g Training Requirements

The training to play the game will be imbedded within the game. When the user opens the app for the first time, there will be a set of instructions and tutorials with arrows to show how to play the game and get the player started. For any new feature added, the player will receive a description of the change or new actions for the feature. The development team will implement all the training.

17 Look and Feel Requirements

17a Appearance Requirements

- The product should be appealing to the users with attractive GUI.
- The user's desired action should not be complicated to find or achieve and annoy the user.
- The user should feel inclined to solve the clues and be challenged and be happy during and after the game.
- The GUI will follow the Rule of Thirds and will be available for any user of any culture or disability.

17b Style Requirements

- The user should be signed in to play the game.
- The défi should be readable in all sizes of smartphones.
- If visual aid is present as a défi, it should have a high resolution for clear visibility.

18 Operational and Environmental Requirements

18a Expected Physical Environment

- The application will only work via the Internet and will only be accessible on Android and iOS mobile devices.
- The application will not work in the absence of Wi-Fi/Data nor location services.
- The product should be usable regardless of location characteristics (less people, more noise, etc).

18b Requirements for Interfacing with Adjacent Systems

- The application will work on all the latest versions of Android and iOS mobile devices.
- The application will include a database server to store all user and game data.
- The application will be able to run on a relatively low Internet speed, but might have a lag in this case.
- The application must be served to different countries with the same supportability and Google Maps access; speed and data will be given to user as the country's laws allow.

18c Productization Requirements

- The user has the option to include credit or debit card information to make in-app purchases (not required)
- The application should not take longer than 5 seconds to load all the user and game data
- If a user wants to use the application, they must create an account using their email and/or phone number
- In order to distribute the product, the user must have Internet access to download the application and be able to use its full functionality. Users must also have location services enabled for this application.

18d Release Requirements

- Once a new release has been created, the Development team receives a notification and decides whether to upgrade application or not. If an update request is sent out, each team will maintain their role to keep up with this upgrade.
- Once a new release is deployed, each user must accept terms and conditions again. Otherwise, the application will not update.

19 Cultural and Political Requirements

19a Cultural Requirements

The game is called Guérre Géo, which is French for geographic war. The game would not suitable for someone who has dislike for anything French, are anti-war or anti-violent in any form, do not believe in good and evil/bad and any religious or cultural section that is against some members of society not learning about the world around them. Also, the game should be aware of public holidays for all countries and use it as a way of promoting special features and promotions for the game. Furthermore, the product shall not be offensive to religious or ethnic groups in terms of words, character avatars, or any clue or puzzle.

19b Political Requirements

The application shall be made for Android and iOS and as iOS app development can only be done on XCode and Swift on Macintosh computers, there will be used of both - Macintosh and Windows computers. Furthermore, the clues for the game can be about topics involving politics but will not be biased or incline towards a specific group. This section contains requirements that are specific to the political factors that affect the acceptability of the product.

20 Legal Requirements

20a Compliance Requirements

- All the software and product licenses used for application will be owned.
- User data (game usage, locations, answers, etc) will be protected and confidential.
    - Some data is subject to be sold to clients, but will remain anonymous.
    - Data is subject to be released to legal authorities as requested.
- Names, terminology, and logos will be trademarked by release-time.

20b Standards Requirements

- Application will be available 24 hours a day, all year-round
    - Note: Once a month (or as needed), in the least busy hour, there will be a set maintenance hour where the application will be unable to users
- Application will always remain signed in to the last user that signed in, unless a user selects “Log out”
- The user profile will store all user characteristics, points, and trivia-history
- Application will update location and data every couple seconds as it is in use and open
- Application will update once a day if not in use/open, so as to conserve battery and data usage

III Design

21 System Design

21a Design goals

In order for this game to be optimal and maintain popularity in the market, there are design goals that would significantly improve the game. The average human in the 21st century often values speed in a game. The system should be fast at the cost of some accurate calculations. The game should show the user's location as quickly as possible and it is acceptable if the user's location is on the other side of the block, rather than the exact location. Furthermore, in the Spotting tool, if all the surrounding users of the opposite team are available, all of them do not have to be generated as long as there are a few, and is fast. Secondly, the user sees the UI only, so the UI has to be easy to navigate. The user should not have to login every time and stay logged in. The user should feel secure as well when there is any major update on the game, such as when they earned major points or switched teams. Lastly, it is crucial to continuously improve the server connections databases, since the game is going to expand to other cities and more users.

22 Current Software Architecture

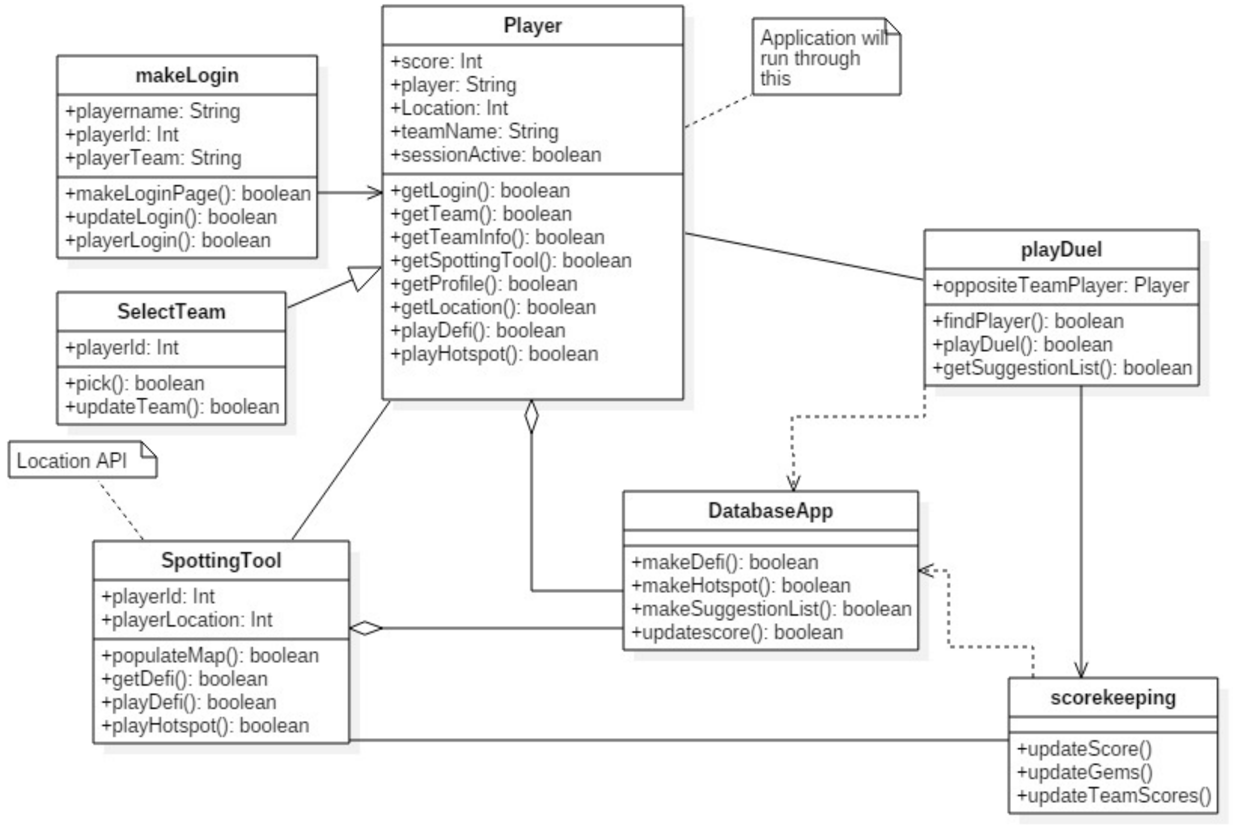
This game is available on Android and iOS mobile devices. Android devices need to have greater than version 4.4 to run the game. Similarly, iOS devices will need to have 8.8+ version to run the game.

23 Proposed Software Architecture

23a Overview

Guerre Géo will operate using the Multi-Tier Design Pattern, as each player will be interacting with the server to get location based puzzles. Moreover, using this pattern, the application will be going back and forth to get results and update scores based on the client-side as the player proceeds in the game. Multi-Tier Design will be a three-tier architecture which will consist of the presentation tier, where the players will provide input by playing the game, whereas the Domain logic tier is where the algorithm will match the location with the puzzles. Finally, a Data Storage tier will consist of the all the information of various locations in forms of puzzles/riddles which is well categorized not only based on location, but also the team that the player belongs to.

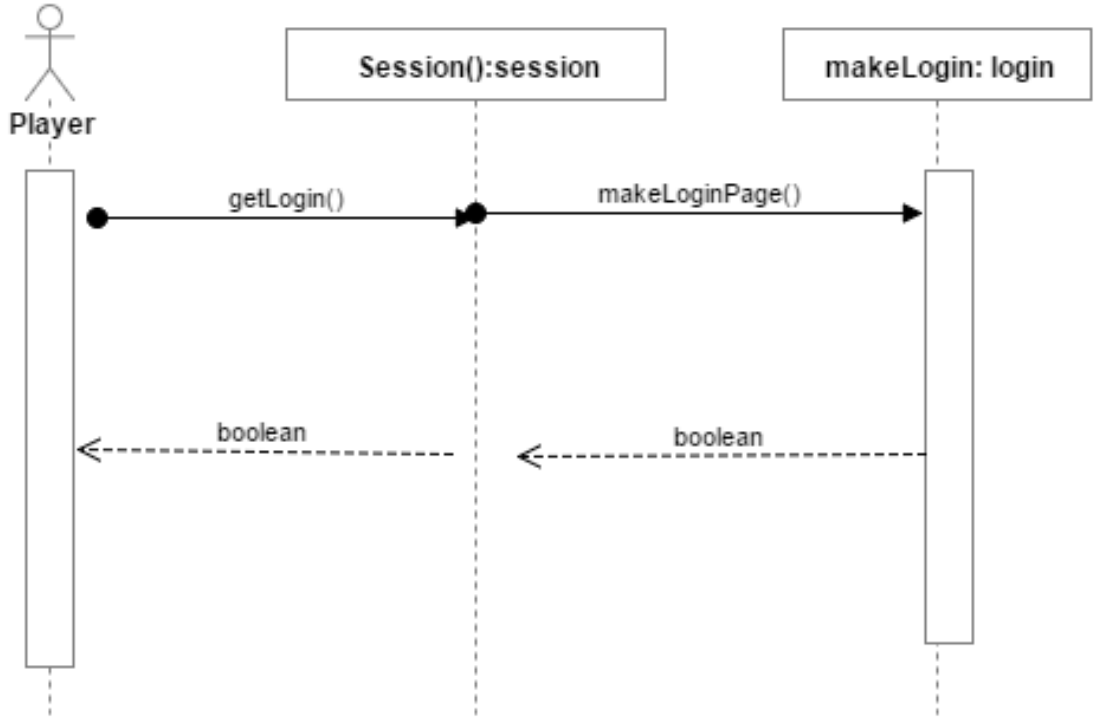
23b Class Diagrams



*For testing purposes most functions return 0 on success and -1 on error, and therefore have a return value of Boolean.

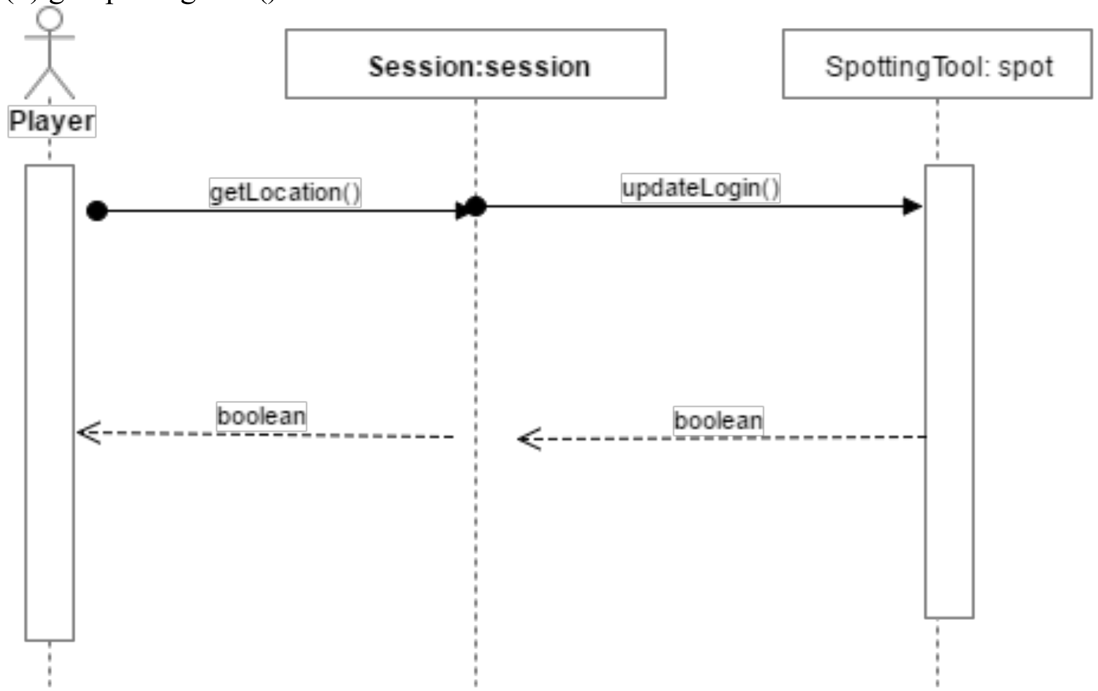
23c Dynamic Model

a. getLogin():



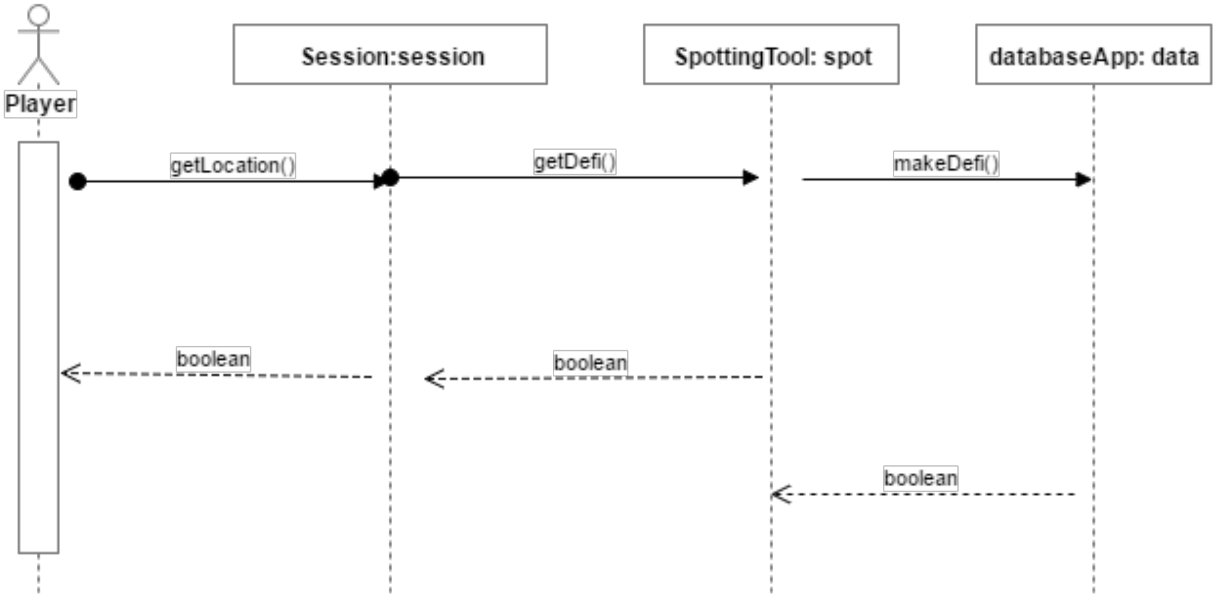
The function will return Boolean based on the success and failure of the login page generation.

(b) getSpottingTool():



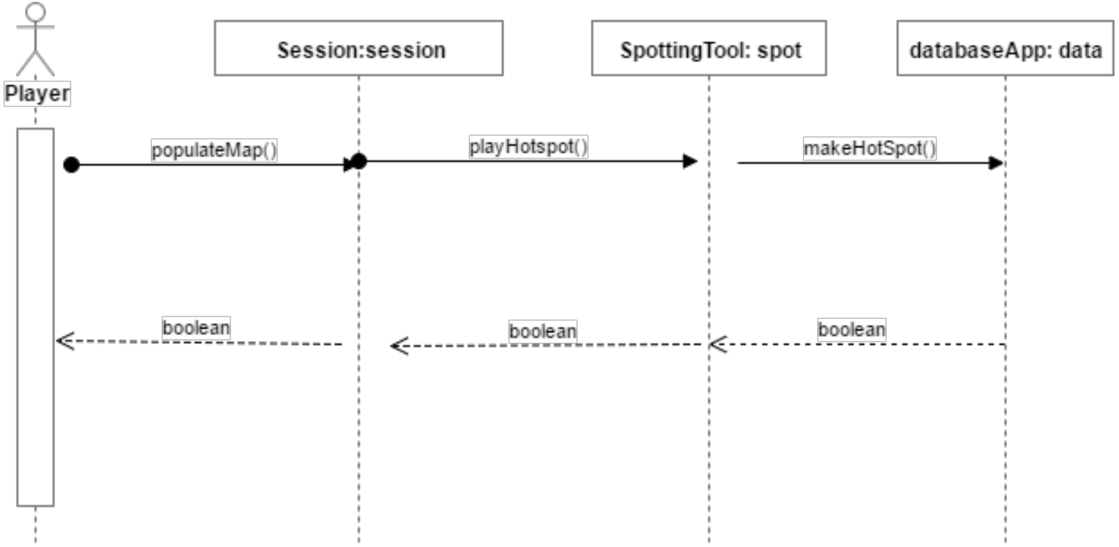
The function will return Boolean based on the success and failure while loading spotting tool.

(c) playDefi()



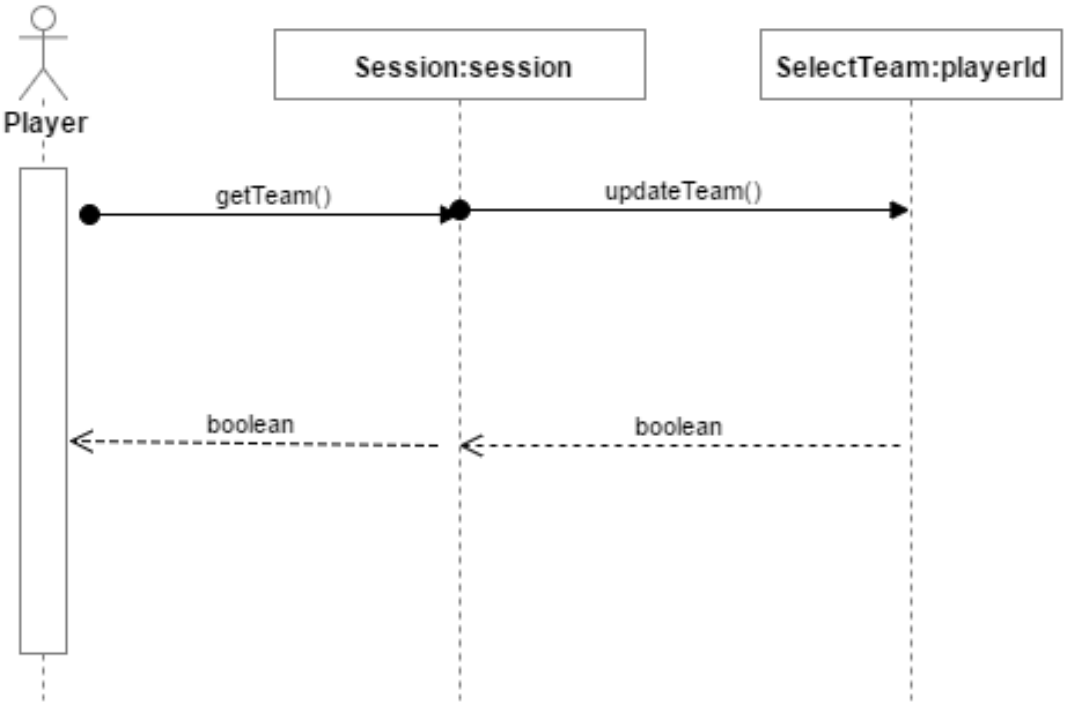
If the player is able to open the défi the function will return true else false.

(d) playHotspot()



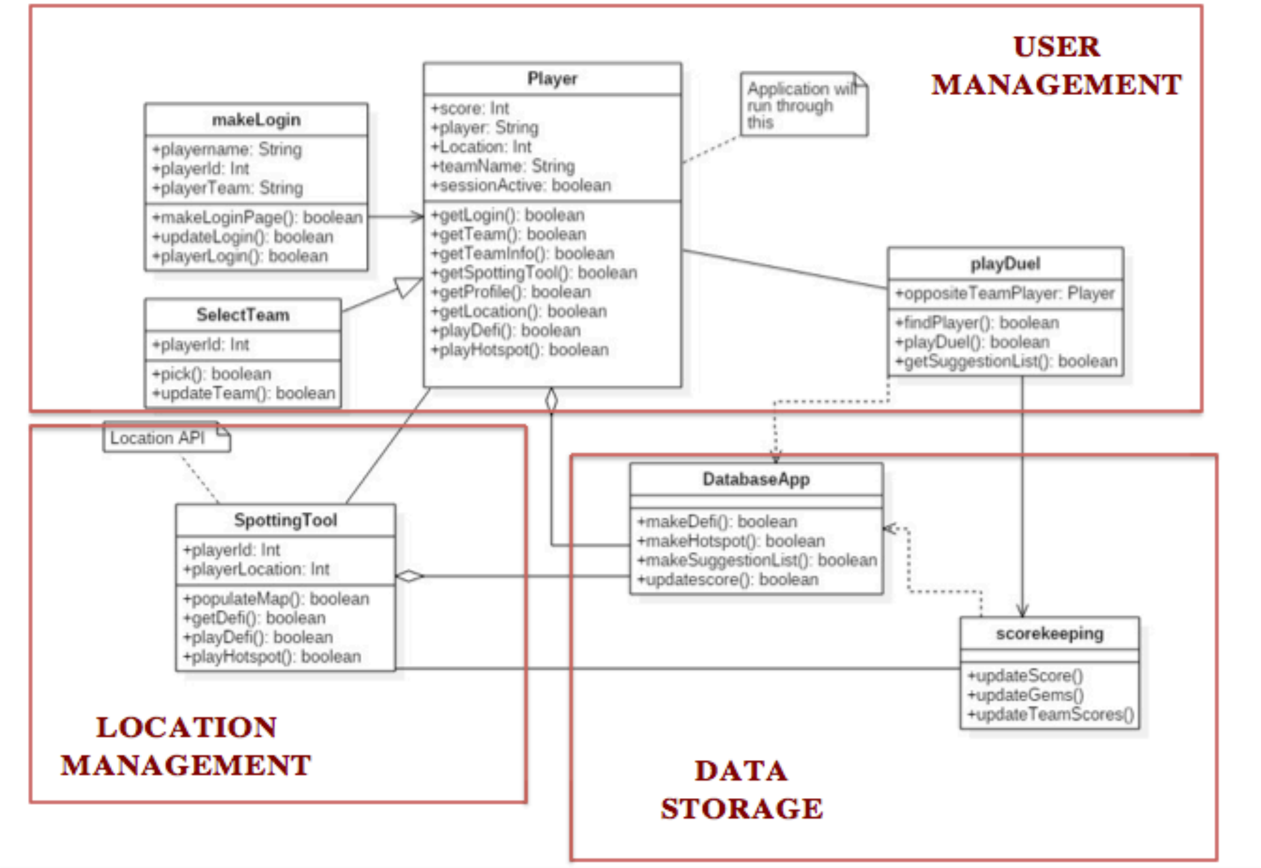
The return value of the function will be based on the success of the function to populate a Hotspot for the player.

(e) getTeam():



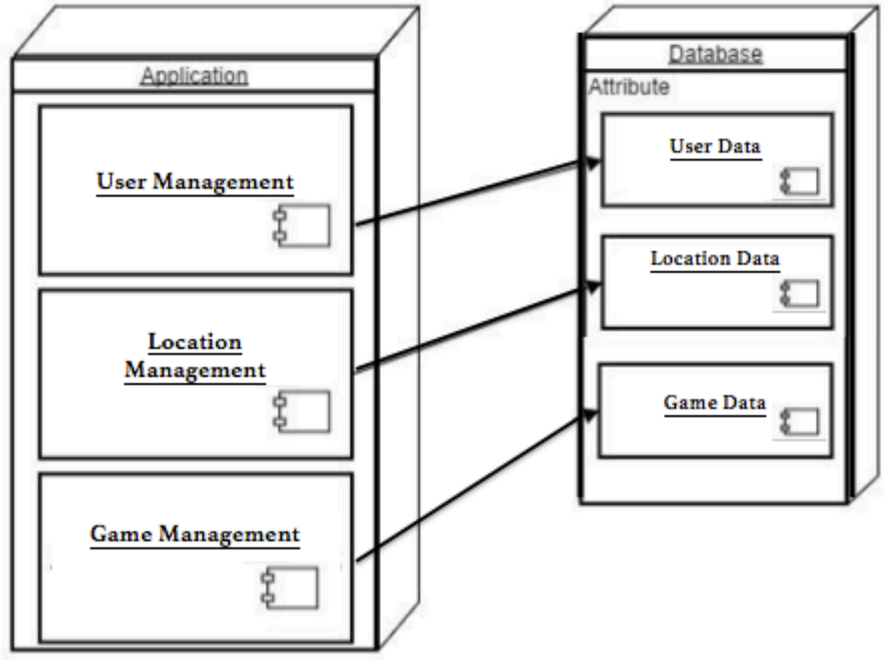
The return value of the function is decided based on success of the team information being fetched from the system.

23d Subsystem Decomposition



23e Hardware/Software Mapping

This application is designed to work with a database that keeps track of all the user information (profile, score, etc.), location, and game (défis, défi solutions, duels, etc.) data. The Application side is the instance of the program that is shown to the user through the smartphone app; it reports all data back to the database.



23f Data Dictionary

User	This is the user instance that contains information about a user that is logged in and playing the game.
Duel challenge	This is the game instance that allows players to battle opposing team members in a défi
Database	This is the storage system of the application that keeps all information about the user, game, and location. It allows users to be able to log off and on without data loss. It also prevents data loss by automatically saving data often.
Défi	This is the game instance that asks users specific questions to answer correctly for points. This is based on the user's location.
Score	This is the user instance that keeps track of how the user is doing in a game. It goes up if the user gets défis correct, down otherwise.

Team	This is the game and user instance that keeps track of which team each user is on (Bandits or Warriors). It is also essential to know for duels and Hotspots.
Location	This is the location instance that continually keeps track of where the user is at all times in the application/real-world. The location is essential in order to give the user full game functionality.
Spotting tool	This shows the player's location, coinstops and hotspots near them.

23g Persistent Data management

All persistent data of this game will be stored into a database. The database will store the player's profile, the number of defies they have solved, and the number of duel challenges they have participated in. Additionally, their reward information will also be stored into the database. The database will not only hold the player's current team information, but it will also save information of the previous teams the player played for.

23h Access control and security

Guerre Géo, being a location based game, depends heavily on the user interaction; however, each player will have only a definite control over how various tools of the game will be used. For instance, in case of using the Spotting tool, the player can decide when to close/open the tool and also move around in the map to proceed successfully in the game. However, other than that, the player does not have access to change anything in the Spotting tool as the database administrator will decide where Coinstop/Hotspot will be located as well as show the players from the opposing team.

Similarly, in order to protect the privacy of each player, all players will have access to change their respective information, such as edit profile, view scores, and social media access. However, no player has access to any personal information of any other player other than scores of the players.

23i Global software control

The overall control of the application will be dependent on how the player reacts with the application as well as how the application returns the response from the database. Thus, overall the application will run in coordination between the player and information stored in the database. All the actions that are performed by the player will reach from the presentation tier to domain logic tier, and from there will get the information from the data storage tier. Thus, any action performed by the player, which is not foreseen by the application, will not be able to pass through domain logic tier, which will prevent any data loss and run the application without any interruptions.

23j Boundary conditions

There would be two primary boundary conditions. Firstly, in case of some external problem such as if the game is force-closed (i.e. a phone is turned off, loss of signal etc.), then if the player is in the middle of solving a défi then it will be terminated. Thus, no data will be sent to the server and the player will neither lose nor gain points for that défi. Moreover, if the player comes back to play the défi again a new défi will be generated. Secondly, another boundary condition is when the player's location cannot be found while the player opens a défi, they will be able to complete the challenge and earn points as long as there is valid network connection. However, upon completion of that défi no new défi will be provided to the player until the player's location is not acquired by the application.

24 Subsystem Services

- **Data storage**: This is used when a user signs up for the game. The user information would get stored into a database. Moreover, when players solve défi, their rewards would get stored into the database. This gets used when players use features such as, editing their profile, changing teams, or requesting duel challenge to another player.
- **Spotting tool**: players use this system when they want to locate nearby players, coinspot, and hotspot stations.
- **Coinspot**: This is used by players. They would go there to solve défi or challenge other players at the coinspot.

25 User Interface

The User Interface for a game is very critical. The user's experience is how the company is going to make revenue. The user interface should follow basic UI practice rules. It should be clean, consistent with the team, and provide same color scheme throughout every feature. There should be multiple UI testing done before launching the project. Furthermore, inspiration for mobile-based UI would be Temple Run, Pokémon Go, and CS Go.

26 Object Design

26a Object Design Trade-offs

It is logical to implement the game using an object-oriented design language. Also the implementation design has to be structured in such a way that it cannot be a risk to security. Thus, we use information hiding heuristics, which is the “Need to Know” principle. The trade-off is that information hiding is safer but it will be slower and hurt efficiency. However, in the long run, having a game that can be hacked is more detrimental to the company than having a release date more than expected.

26b Interface Documentation Guidelines

There are a considerable number of requirements for this game. So having interfaces that must be implemented is critical to meeting those requirements. There are some guidelines such as only the operations of a class are allowed to manipulate its attributes. The user can hide external objects of other subsystems to ensure security. Also, consulting with contractors, such as for Augmented Reality, will require the developers to communicate what classes, values, and attributes they require.

26c Packages

There are multiple packages for the game. There are the packages from the Android and Swift Libraries, Augmented Reality, and the hardware and network. The good news is that Android and iOS will help with all that connection including networking and hardware. In terms of software development, there should only be one large package and multiple subsections of classes. See Class Diagram above in section 23.

26d Class Interfaces

The overall design of the code and its classes will be useful in ensuring the implementation of the project. The attributes and operations are crucial without specifying their type or parameters. These should be visible by the appropriate subsections of the implementation. Furthermore, adding contracts and adding type signature information would be good in the interface so that it forces the developers to code with certain formats and requirements so that the implementation works and produces a good game.

IV Test Plans

27 Features to be tested

- Spotting tool
- Placing and solving of défi at coinspot and hotspot
- Requesting duel
- Providing hints
- Updating location and data for the game
- Editing Profile
- Viewing Treasure Box

28 Pass/Fail Criteria

- Solving défi - It's answer must match to the correct answer.
- Duel Request - Player should only be able to request duel when another player is nearby.
- Location - Défi must only be based on the player's location and player's location should be updated in the spotting tool under 3 seconds.
- There should be défi available for all coinspot and hotspots.
- The user should be able to view their treasure box.
- The user should be able to edit their profile at any time.

29 Approach

A regular maintenance will be carried out to validate the functionalities of various features in the game. This maintenance will not only be for the application, but also on the server and database to which the game is connected. The main goal of this approach is to affirm all the predefined requirements of the game and also test them.

30 Suspension and Resumption

If a majority of test cases for a test fails or testers are not able to debug the test, testing will be suspended temporarily. The code will be deferred back to the Development team to fix the code implementation. Once the Developers have addressed and resolved the code section, testing will once again be resumed for more test cases.

31 Testing Material

The application must be able to work on a mobile device and be tested on an emulator as well as an iPhone and Android phone of any model. The hardware should not overheat the system or cause any malfunction to the rest of the phone. The application should not take up the entire phone's memory, data usage, or drain the phone's battery.

32 Test Cases

Test Case 1: Compatibility Test
Description: The tester uses both Android and iOS mobile phones (of all versions this application guarantees to work on), and opens/uses Guérre Géo.
Prerequisite: The tester will need all necessary requirements for each device they test application on.
Expected Result: The tester is able to open Guerre Géo to its login screen and be able to create a profile, as well as see the game environment within application's map. The tester will also be able to open any reachable trivia-questions around their surroundings.

Test Case 2: User Login
Description: The test will attempt to create a profile and login to Guérre Géo.
Prerequisite: The tester has an email address or phone number to be able to save Guérre Géo's user profile data into.
Expected Result: The tester is able to create a profile and login. They will be presented with the home screen of the application, which shows the map in the middle and any available coinspots or hotspots. The tester should also be able to see a menu on the left side that will have more options.

Test Case 3: Functional Features Test
Description: The tester tests to see if all functionality of Guerre Géo is working as intended. This includes crucial features, such as updating location of user, scoring, and viewing/answering défi questions.
Prerequisite: The tester is logged in and has access to their map homepage.
Expected Result: The tester is able to select all the main features of Guerre Géo and each feature works as intended.

Test Case 4: Multi-Player Feature Test

Description: The tester tests if the multiplayer feature works properly on the homepage. This includes testing whether users can duel nearby users on the opposing team for a trivia-question(s). The tester will also make sure that users on the same team cannot duel each other.
Prerequisite: The tester is logged in and has access to their map homepage. There also needs to be another user from the opposite team for this testing to occur.
Expected Result: The tester is able to duel nearby users from the opposing team. The 2 users will be given a trivia-question(s) during this duel. The tester will be unable to duel anyone that is on his or her own team. These features will not have any lag or delay.

Test Case 5: IDE/Repo Test
Description: The tester tests to see if the IDE compiles and executes correctly with all the different languages, including but not limited to: Java, Swift, C, C++, C#, and Objective-C. The tester must also check if the saved files are properly backed up in the project repository.
Prerequisite: The tester is logged in and has access to their map homepage. The tester must have knowledge on testing in different programming languages.
Expected Result: All working programs are able to compile and execute accurately. The saved files are also saved in the project repository under their respective user and menu branches.

33 Test Schedule

The tests should be written along with the implementation of the game. Furthermore, there should be continual independent testing done to ensure the implementation and business tasks are aligned and meet the requirements and standards. The testing of the overall game should take about 3-4 weeks at the end assuming all the tests have been written by developers and need to fix the bugs that were found.

V Project Issues

34 Open Issues

Open issues are issues that come up from requirements analysis. These issues have not been concretely settled. Yet, these are very crucial issues to continually address as they may determine the growth and efficiency of the application. Some issues include (but are not limited to):

- **Data Management and Connectivity:**

The application relies on the user's location and internet services. At times, these may become disconnected due to bad network or other reasons. In such scenarios, points, defis, user profiles, and all other game activities and data should be kept safe by some other means. At no point should user data be lost and unrecoverable due to connectivity problems.

- **Broad Defi Range:**
  An immediate setback to this application could entail of users losing interest due to the lack of variety in defi questions. To counteract this, as a company we must continually be putting new defi into the application with every update. Furthermore, trending questions (via Google, Social Media, etc), will also be posted, as they will attract users to solve the questions they may be more familiar with.

- **Wide-Location Support:**
  The immediate goal of the application is to support location services for big cities in the United States of America. However, this application has potential to have a global-market. To accommodate for this long-term goal, it is essential that location and user data is collected for multiple areas around the world. This will allow the application to continually grow in its potential.

- **Multiple-Language Support:**
  As stated above, expanding this application on a global scale is a potential goal. In order to do this, the application must support the language of whichever country it supports. As a company, we will not expect the users to know English. Rather, users should feel comfortable using this application without this minor setback.

- **Version Updates:**
  Updates for this application should be continuous as well as responsive to user reports/complaints. As a company, we should decide when and how often the application should be updated. We should also have available a qualified technical department that is capable of knowing how to patch new version of code to an existing application.

35 Off-the-Shelf Solutions

35a Ready-Made Products

In order for the product to be on the market as soon as possible, while the hype of Pokémon Go exists, we can contract the augmented reality (AR) part of the process. There are specialists who know how to implement AR and bring them to this company. However, there are issues with AR in general. It is a hazard to public and user's safety and it can create motion sickness. Research is currently being done to overcome this, but it is a current situation that cannot be avoided.

35b Reusable Components

It is going to be hard to implement this game without using libraries and other APIs. For Android development, there are a lot of libraries available for making and designing the app. Similarly, for Swift, there are libraries that Apple provides. Furthermore, there are other graphics such as OpenGL. It is better to reuse than reinvent it all since all this work has already been made to use for others.

35c Products That Can Be Copied

There are sample gaming app templates available and there is a small price to pay. They can then customize it to the game's preference. A generator for the clues and quizzes can be from another company and can be copied if not copyrighted. Furthermore, the AR basic setup will be same for any AR game can be copied and then customized.

36 New Problems

36a Effects on the Current Environment

It is essential that the application is continuously and efficiently active during its duration. Because of this, user experience is key. From the application interface, usability, to accuracy, the application must be able to handle it at all times. Furthermore, because of the expected (at least) thousands of users, the servers and technology must not crash. Rather, they should be able to handle high loads throughout the entirety of the application's life, as well as any bugs that may show up.

36b Effects on the Installed Systems

This application uses dependencies from installed systems. The goal of the application though is to have no effect on the actual system itself. No matter what the processor usage of the installed systems is, the system must run smoothly at all times, with only minimal glitches.

36c Potential User Problems

This application is aimed to be as user-friendly as possible. The target age group is 14+ years old. Though, unless a player does not play smartphone-games, they might have a little bit of trouble getting used to the game to begin with. Furthermore, if a player is unfamiliar with smartphones in general, this application will be more difficult to learn the functionalities of.

36d Limitations in the Anticipated Implementation Environment That May Inhibit the New Product

If the user happens to lose Internet or location connectivity, this application may be prone to internal glitches. As a company, we will do everything that is possible to make sure the user can load this application back from where they left off without any hassle from their side, despite the glitches.

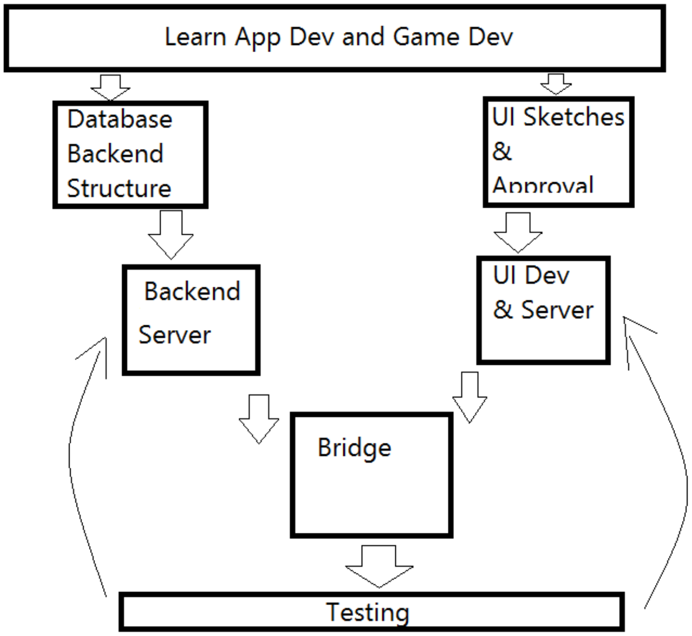
36e Follow-up Problems

There may be follow up issues that come up after launching this application. Currently, this application is aimed to support a few thousand players simultaneously. In order to scale up as more players play this game, the development and testing teams also need to be scaled up. Furthermore, data management and storage will be vital to scale up as well. Another issue that may come up is outdated maps. In order to tackle this problem, we will continuously update the maps as often as possible and at least every update.

37 Tasks

37a Project Planning

The standard procedure to deliver this product is to have a certain timeline for each stage. The user needs to be able to have the skill of developing a mobile app and understand gaming development. This diagram will explain how the process works:



37b Planning of the Development Phases

Specification of each phase of development and the components in the operating environment: to learn the app and game development, gaming software, XCode and Android Studio for learning app development. Then for the database and backend structure, the majority of it is in SQL, Servers, Sockets, Internet Browsers, and other forms of software and hardware. For the UI, since it is a mobile app, there will be multiple devices, both Apple and Android supportive, and different software versions in each device for testing. All other phases do not require hardware, but testing would require software such as Testing Environment and a plan for testing suite.

38 Migration to the New Product

38a Requirements for Migration to the New Product

The biggest migration to a new product would occur when a new version of the Android and iOS is rolled out to Android and iOS user, respectively. We might have to modify the code to maintain the compatibility with the newer operating systems. We will use a phase implementation to update the game. We also have to consider an update on the software that we use to build the game, such as Android-Studio and Xcode. When updating this software, we would first make sure we have a backup and that it doesn't break any functionality. First we would need recent updated software, and then we can update the code to satisfy the game's compatibility with newer versions of Android and iOS.

In the first phase, we would update the software that is used for game developing. After that, in the second phase of updating the code, we first have to test that the basic functionality, such as solving défi, generating défi, and keeping the player's score, is working correctly. Furthermore, in the next phase, we would add any new features that the updated mobile system provides. We might need the employees to get training if there are any major changes in the new mobile system.

38b Data That Has to Be Modified or Translated for the New System

Data would need to be translated if we are changing the language the game is written in. For example, when Apple introduced Swift, if we were using Objective-C and we wanted to switch to Swift, then we would need to translate the data from Objective-C to Swift. Other than this major change of language, we would not have to translate any data when we update the code editing software or the Operating System's version that the game is compatible for.

39 Risks

The biggest risk for Guerre Géo is getting inaccurate location or not having access to location. If there is bad weather disabling us from getting the location, then the system would not be able to generate défi, display coinstops, hotspots, or nearby players.

Following are some other risks:

- Inaccurate location
- Inaccurate data shown in spotting tool
- Unavailable coinspot/hotspot locations
- Repetitive défi
- Assuming that enough people will choose different teams, so that they can play duel challenges.

40 Costs

The minimum cost for creating this game will be about $200,00. This covers the cost of equipment, employees, maintenance, and marketing. Since Guerre Géo is Android and iOS compatible, we need to invest in getting the right type of computers for developing. We also need servers and database setup. This would add up to $80,000. For maintaining the game, we would need about $5,000. Further, the cost of employees and marketing would add up to the remaining amount.

41 Waiting Room

In the first release of the game, we may not be able to implement some required features due to lack of time, resources, or other boundary conditions. However, they must get completed for the second release. One of the features that might not get implemented, if there is not enough time, is updating the user profile. One of the big features in updating the user profile is the ability to change the avatar. Since this will not affect the player from playing the game, we can save it for the second release. Another feature that might not get implemented due to lack of resources is the hotspot. This is an important feature, but it gives the user the chance to win a gem, which can be used to switch their team. This is important for a better user experience, but it can be introduced in the second release if we have a lack of employees or money to implement it.

42 Ideas for Solutions

We must test the game thoroughly before releasing it. We can release a beta version and have a few people use it. This will give us an idea if we are accurately reading the location or not. Also, we will be able to check if we are getting the accurate défi based on the location. Furthermore, we will need a research team to learn and gather fascinating facts about the location. The défi would be generated according to the researched facts.

43 Project Retrospective

The approach of developing Guerre Géo was led by the idea of developing a location-based game, which is not only adventurous, but also educational. Apart from making the game entertaining, this game is also built to challenge players both mentally and physically. Not just that, building the game itself was a challenging as we strived to compete with some of the already existing location based games, such as Pokémon go.

Apart from that, development of this game was also a great success because of the remarkable contribution by all the group members of the team in terms of ideas, vision, collaboration, and assembling those ideas together to output a product that will be easy to use and liked by the largest number of mobile users.

Originally the development just started with brainstorming some ideas as a team. And then we moved to converting selected ideas to various elements of the game piece-by-piece. Each aspect of the game, such as logistics, rules, glossary of the game elements etc., were discussed and verified by each team member. Thus, by building each piece over a short period of time, the final picture of the game was established. Moreover, with great team effort any weak aspects of the game and any future improvisations were discussed.

VI Glossary

1. Warriors - Team that is the “good guys” in the game; get the positive clues.
2. Bandits - Team that is the “bad guys” in the game; get the negative clues.
3. Défi -The clues, questions, or trivia to be solve by player. They are based on the location and what team the player is on and is located in that area.
4. Coins - Points the user gets awarded on solving a puzzle or winning a duel
5. Coinspots - where we collect coins by solving puzzles/trivia
6. Hotspot - Random locations in the city where a user can collect gems from solving Défi
7. Gems- gems are received at hotspots. They can be used to switch teams or back out of a duel
8. Duel- when user has challenged a player from opposing team and this can happen at any location including coinstops and hotspots.
9. Profile - the character’s profile
10. Character Menu – The player’s strength, coins, gems, and history of challenges
11. Main Menu – Game menu such as pause, end game, and play, about
12. Player- A user and participate of the game
13. Character – means an avatar for a player
14. Spotting tool - The map used to check if any other player is in that current area, useful to duel a player.
15. Treasure box - accumulation of a user’s total coins
16. Teams - can refer to teams in the game such as: Warriors or Bandits, but it can also refer to the departments within this business such as: Marketing, Legal...etc.
17. UI - user interface; what the client sees when app is open, paused or on the device
18. UML - Unified Modeling Language; used for creating diagrams of the implementation

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2. Images used in Work Context diagram:
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VIII Index