****

**School of Computing**

**Group/Team: 9**

**Assignment #1 - JADE Game System**

**Software Requirements Specification**

**Table of Contents**

[**Glossary**](#_13hpk4e4h4f1) **9**

[Conformance Glossary](#_b4uevz5w6ztc) 9

[Glossary](#_r13yq9imylqi) 9

[**Introduction**](#_38o5ofier0qg) **10**

[**Background/Vision**](#_pm7z4k252yp3) **10**

[**Functional Requirements**](#_lrvf3klmmvq7) **11**

[R1 Navigable map locations](#_wq2x1f7ea9wz) 11

[R1.1 Keystones locations](#_7duh78pd2w0d) 11

[R1.2 Hiding keystones](#_8njfvkec1a7m) 11

[R1.3 Finding Keystones](#_8g0fbuihjumc) 12

[R2 The key](#_10pzuuw87062) 12

[R2.1 Unlocking the door](#_7b8d6tpj3kdj) 12

[R3 Location feature](#_xyrttcopaplf) 12

[**Game Landscape, Locations and Paths**](#_irlec9i4wyzp) **12**

[R4 Displaying map locations](#_5szl9ln2znkk) 12

[R4.1 Pathways to locations](#_bkstbgj5yxtk) 12

[R4.1.1 Pathways presented as virtual](#_q13l2op1b3mu) 12

[R4.1.2 Multiple pathways](#_7h4gfjbtd094) 12

[R4.1.3 Displaying the best route](#_upd7u1truen9) 13

[R4.2 Location correspondence to real-world locations](#_wk2v4rmm8de7) 13

[R4.3 Hiding the real-world location](#_3ignkopx4idn) 13

[R4.3.1 Giving the real-world location an imaginary name and icon to disguise it](#_gong3gnvyfu4) 13

[R5 Finding the real-world location](#_4adbpene94ra) 13

[R5.1 Selecting a location to travel to](#_jqun13ksbls4) 13

[R5.2 Directing a player to a location](#_yknkmvr0xi78) 13

[R5.3 Reaching a real-world location.](#_ijoqp0nmj0xx) 14

[R6 GPS coordinates of a map location](#_t66oy9pue6c6) 14

[R6.1 Defining the boundaries of a location](#_v17m2rapmg74) 14

[R7 Detecting a player’s location](#_mm1r79puka0d) 14

[R7.1 Tracking a player](#_lcim6hemaam7) 14

[R7.2 Detecting if a player has reached a location](#_fs90ej8ma466) 14

[R7.3 Detecting if a chosen destination is reached](#_4mhu3cz4tc4n) 14

[R8 Triggering events](#_l4p4nf49rcku) 14

[R9 Destination names](#_yupqxxsjp2er) 15

[R9.1 Imaginary destination names](#_d7loym4dcy00) 15

[R9.2 Relation of the location name to the real-world counterpart](#_9jdd1gxdvxt3) 15

[R10 Destination descriptions](#_dyxchcgcs07f) 15

[R11 Pathways to destinations](#_ioi0c5xr815e) 15

[R12 Transportation methods](#_pwzris9h8y4a) 15

[R13 The final location](#_manbcnaiz3v2) 15

[R14 Themes](#_1t4t1qnl4d6a) 16

[R14.1 Landscape and locations in relation to themes](#_wzkvhfrtsg7p) 16

[R14.2 Imaginary names and icons in relation to themes](#_23hddhmb749x) 16

[R15 Additional downloadable games](#_v1nz2pz4tbud) 16

[R15.1 Location based downloadable games](#_jch7lh5qdqql) 16

[R15.1.1 Themes of downloadable location based games](#_xf3h1hrf15az) 16

[R15.2 User designed games](#_8dk8kd7mudry) 16

[R15.2.1 Uploading user designed games](#_z459a2ni3gby) 17

[R16 Representing destinations with images](#_ecps3pntcvst) 17

[R17 Navigational hints](#_4rn5ukmsqt1h) 17

[R18 Collectable items](#_23rlm1j36afy) 17

[R18.1 Player choice on collecting items](#_192pxm87t6j1) 17

[R19 Activities at locations](#_f5sx1el1e2cm) 17

[R20 Games which span worldwide](#_bs3wi0sclgwk) 17

[**Player Movement**](#_crrha33ttvos) **17**

[R21 Moving around using the ‘Oracle’](#_guoyhr3goi3m) 18

[R21.1 Shaking the ‘Oracle’](#_zdboe8im9bs2) 18

[R21.2 Dispersing the stones](#_a04undigssws) 18

[R21.3 Number to be formed](#_ww17o623kcnb) 18

[R21.4 The number dictates the player movement](#_456e7vpzb01v) 18

[R21.5 Ability to move up to the number shown](#_gmv2d8h9ijr9) 18

[R22 Search for pathways](#_624xd4bz8htw) 18

[R22.1 Highlight the pathways](#_wah97q4snldz) 18

[R22.2 Selecting a pathway](#_o1cvrklcn5gs) 19

[R23 Entering the desired destination](#_qljfes72cona) 19

[R23.1 Boundaries of the intended destination](#_m0ypmns8gm9a) 19

[R24 Navigation guidance](#_32gmhbjwj0sp) 19

[R24.1 Navigational arrow](#_ao4ihlcro1y1) 19

[R24.2 Displaying the direction of travel](#_xccfaw7gz6ug) 19

[R24.3 Approximate distance](#_zbfbme854xdk) 19

[R25 Google Maps web service](#_qnjcm9r9lc1o) 20

[R25.1 Send GPS coordinates](#_2a8g93t6gkp) 20

[R25.2 Additional navigational information](#_cwelfudx9g1b) 20

[R26 Destination hints/clues](#_olntq80f1bm) 20

[R26.1 Making use of the hints/clues](#_8ji76agr7br) 20

[R26.2 Option to view travel hints/clues](#_3y4gzj7h0sn4) 20

[R26.3 Cost of displaying hints/clues](#_hf1x0jdd0s9t) 21

[R26.4 Percentage of player’s health as a trade-off](#_twp8a6737lpt) 21

[R28 Virtual actions or events](#_lvv4dx9bhv9o) 21

[R29 Destination types](#_c9pyeqjjzzem) 21

[R29.1 Select destination without knowing its type](#_uk5mby2nl41k) 21

[R29.2 Display virtual actions or outcomes](#_378bamm8q2n7) 21

[R29.3 Intermediate locations](#_i0jicfuiia2q) 21

[R29.3.1 In Intermediate locations nothing occurs](#_yeqps180dh9d) 22

[R29.4 Question locations](#_caqttgc8hyx6) 22

[R29.4.1 Display question](#_gjfn0ac8wori) 22

[R29.3.2 Type or select answer](#_kbhiizpc84nh) 22

[R29.4.3 Collection of pre-defined questions](#_j97daio5oucy) 22

[R29.4.3.1 Pre-defined questions in use](#_knhybfhdmcwl) 22

[R29.4.3.2 Knowledge that the questions cover](#_9h9sbivx8f4o) 22

[R29.4.3.3 Receive questions based on location’s id](#_bfjhdhusz91i) 22

[R29.4.4 Result of correct answer](#_yyrp4vcrtgrd) 23

[R29.4.5 Incorrect answer](#_h9pr9wxh3q31) 23

[R29.4.5.1 Result of incorrect answer](#_vw2ipngsqby4) 23

[R29.4.5.2 Repetition or different question option](#_t7625r5kso6i) 23

[R29.4.5.3 Consequences of incorrect answer](#_qozl6wj4nvek) 23

[R29.4.6 Give up health instead of answering the question](#_5r6ag6uy8osv) 23

[R29.4.6.1 Result of give up option](#_wvb35jx7a0v0) 24

[R29.5 Key stone locations](#_b16nzhiy8yo0) 24

[R29.5.1 Present a question at key stone locations](#_3v586exbhnmi) 24

[R29.5.2 Corrects answer wins a key stone](#_vv0jogw5eb47) 24

[R29.5.2.1 Key stone into player’s inventory](#_epulgprd5qkl) 24

[R29.5.3 After correct answer has been answer](#_3287pnrlcyau) 24

[R29.6 Wildcard locations](#_kpdo0vg3eitl) 24

[R29.6.1 Outcome of entering a Wildcard locations](#_312fcvpuyzr5) 24

[R29.6.2 Random wildcard upon entering](#_za0lik1yjg8j) 25

[R29.6.2.1 Energy Boost](#_jiy3xhkbm176) 25

[R29.6.2.1.1 Energy Boost at 100%](#_fh54ahhcyyfz) 25

[R29.6.2.2 Question Immunity Spell](#_a0f1w7ud33w1) 25

[R29.6.2.2.1 Storing the Question Immunity Spell](#_uyr582ylh32h) 25

[R29.6.2.3 Give It Up](#_46vgp3l05ecg) 25

[R29.6.3 Display the wildcard](#_xwemm6ol8s7q) 25

[R29.7 The Exit location](#_emdjesq76hse) 25

[R29.7.1 Outcome of entering The Exit location](#_r0y4wepk5bw7) 25

[R30 Regeneration location](#_4nnf20imbiil) 26

[R30.1 Outcome of reaching Regeneration location](#_i5i8wu9v1ng) 26

[R30.2 Position of the Regeneration location](#_8vim4kbpx8w1) 26

[**Starting / Joining a game**](#_gqdjfdzax2w) **26**

[R31 Starting a game.](#_hkj475dpfac0) 26

[R32 Hosting the game.](#_gxrnxoekvx2c) 26

[R33 Searching for a game.](#_p1rz0xalxjz4) 26

[R34 Calling game server services.](#_bbpf0gm0uw3v) 26

[R35 Communicating with the game server.](#_mortn8bujwuj) 27

[R36 Player names in the game.](#_o59o0otkc8n5) 27

[R37 Selecting a game.](#_ht52wqa5vx2g) 27

[R38 Downloading game data.](#_ny65p899n2s) 27

[R39 Required Data.](#_9q48v6ye3w0v) 27

[R40 Starting location.](#_w2byxe1phdsw) 27

[R41 Designating starting location](#_ujzacnnx9dr) 27

[R42 Highlighting starting location.](#_kfks83i24koz) 27

[R43 Moving to the starting location.](#_unejpkxm929z) 28

[R44 Taking the starting turn.](#_92xz4i2zxgrq) 28

[R45 Starting health.](#_domu9dyw7viq) 28

[R46 Starting items.](#_21jne3x1qwsv) 28

[R47 Storing items.](#_624kgbfl5wcp) 28

[R48 Storing Keystones](#_li3cupmbjjvk) 28

[**Player Messaging and status updates**](#_nd45gffhzxjn) **28**

[R49 Player Messaging.](#_flahd61gne5j) 28

[R50 Handling messages.](#_2igv65z4b4mo) 28

[R51 Messaging options at the start of a turn.](#_nw4v9u5x9uw1) 29

[R52 Sending message data.](#_wvn5yejrng50) 29

[R53 Displaying messages to players](#_wj2be0qhau6l) 29

[R54 Retrieving messages.](#_22fgw1hkho9c) 29

[R55 Displaying retrieved messages.](#_76grf36cuf0w) 29

[R56 Posting status updates.](#_j4vl7ga6kfaw) 29

[R57 Using the Facebook API](#_tpj5rkgacrwl) 29

[**Game Packs**](#_1uko1csrogji) **30**

[R58 Obtaining game packs.](#_1lcumjsu6c5b) 30

[R59 Game pack content.](#_7g58jq1xt00w) 30

[R60 Purchasing game packs.](#_eq71ihluh4zi) 30

[R61 Collecting payment information](#_a86uuuvzuyid) 30

[R62 Processing payments.](#_nyclprz6fuio) 30

[**Non-Functional**](#_ava3vectvwbi) **30**

[R63 Targeted Android version](#_f6mh3ztb6xoo) 31

[R64 Google’s Flutter development toolkit](#_qjzt9g6fhngw) 31

[R65 Advanced multiplayer interaction](#_s6l0ttteo28w) 31

[R66 Google Services](#_s3k9mcfic799) 31

[R67 Google’s Material Design guidelines](#_su36bt2hzmim) 31

[**Player movement**](#_h2ggemszl3mx) **31**

[R68 GPS signal timeout](#_h4wsqbx5y3at) 31

[R69 Frame rate of the game](#_z2jjox3ke84r) 31

[R69.1 Lower frame rate](#_ft3e169g7bjg) 32

[**Starting / Joining a game**](#_d0rvezquenjf) **32**

[R70 Memory Management](#_ykc62djup30f) 32

[**Player messaging and status updates**](#_prmucvpz3xrb) **32**

[R71 Storing personal information](#_q0u912dqfb10) 32

[**Game Landscape, Locations and Paths**](#_5ush1qisrwax) **32**

[R72 A fused provider to provide the best experience](#_c4h9fypxo0he) 32

[R73 Determining the best route to take](#_qvlk1gyvhsij) 32

[**Use Case Specification.**](#_v6uilptvhpah) **32**

[1. Starting a game.](#_w5pstjl3rdaz) 33

[Basic Flow of Events.](#_ni2y0g6mb1ar) 34

[Alternative flows](#_kts6r9kcb5ir) 34

[\*1 - Player quits the game.](#_s1vmpngarbup) 34

[A1 - Player doesn’t have an internet connection.](#_edn9iun43s8w) 35

[A2 - JADE Game Server is down.](#_6ux09g1izphu) 35

[A3 - No games available to the player.](#_acqfl4ekxqxr) 35

[A4 - Player doesn't enter a name.](#_y8nc23ysdhps) 35

[A5 - GPS signal timeout](#_lx50tbooxfay) 36

[2. Moving Location.](#_6pu78wx0n8iu) 37

[Basic Flow of Events.](#_ml0llpvztb4i) 37

[Alternative flows](#_e34t0c6g9kn7) 37

[\*1 - Player quits the game.](#_qn3t4v0i0nh) 37

[A1 - Player tries to select a non valid location.](#_hk8zz69bnaa3) 37

[3. Sending a message.](#_6y4egjtago74) 39

[Basic Flow of Events.](#_a9mmamnwzqcj) 39

[Alternative flows](#_ifvxtt97bs0d) 39

[\*1 - Player quits the game.](#_4racfqrup3bw) 39

[A2 - JADE Game Server is down.](#_jkzn8jahxm8y) 40

[A3 - Player doesn’t have an internet connection.](#_r95ly5tjnosw) 40

[4. Retrieve messages.](#_8d9s36hxz00j) 41

[Basic Flow of Events.](#_ko5jdswcja1d) 41

[Alternative flows](#_ciji7rrdg7ie) 41

[\*1 - Player quits the game.](#_yz84abarr4zo) 41

[A1 - No new messages available](#_e64y1pxbrbzm) 41

[A2 - JADE Game Server is down.](#_9fuueq38qr3h) 42

[5. Buying a Game Pack.](#_yiox5bnkg721) 43

[Basic Flow of Events.](#_1zgqkujdoq49) 43

[Alternative flows](#_uhfz46u4abb) 43

[\*1 - Player quits the game.](#_fiu7p36ylb5t) 43

[A1 - Player cancels the purchase.](#_tm3m6t3te284) 43

[A2 - Player doesn’t enter required payment information](#_rs8xoeu8pea2) 44

[A3 - Payment Server is down](#_awnx6enx7mhu) 44

[A4 - incorrect card details](#_ijrrlaf1dc7q) 44

[6. Interaction with destination types](#_jl7bohhvr4cb) 45

[Basic Flow of Events.](#_hofkih5sa6rl) 45

[Alternative flows](#_sz0bbr4me0la) 45

[\*1 - Player quits the game.](#_jafs8bpwirw6) 45

[A1 - Intermediate location](#_6k82j3uvm5m5) 45

[A2 - Question location](#_qbms4uvwbcf4) 46

[A2.0 - Health below 15%](#_l6szn49fgg8g) 46

[A2.1 - Correct answer](#_df1hw8rd75p3) 46

[A2.2 - Incorrect answer](#_d26nup4rw60h) 46

[A2.2.0 - Send to Regeneration location](#_smqa247er1pv) 47

[A2.2.1 - Repeat Question](#_pf69i4i542v8) 47

[A2.2.2 - Different Question](#_yj2y6qntwctm) 47

[A2.3 - Give up health instead of answering the question](#_pn3zntkhsx5r) 47

[A2.4 - Use Question Immunity Spell](#_3vcxwfptlzsn) 48

[A3 - Key stone location](#_kaunxiao0bjr) 48

[A3.0 - Health below 15%](#_493rpcvv63yv) 48

[A3.1 - Correct answer](#_mlb6rpefbt7a) 49

[A3.2 - Incorrect answer](#_exepplrh0okl) 49

[A3.2.0 - Send to Regeneration location](#_l8rre4ucv9n0) 49

[A3.2.1 - Repeat Question](#_7ez0z01ymx38) 49

[A3.2.2 - Different Question](#_nyggj76bvv4s) 50

[A3.3 - Give up health instead of answering the question](#_r74dck1ggclp) 50

[A3.4 - Use Question Immunity Spell](#_rtj22c4hhiqe) 50

[A4 - Wildcard location](#_hgv0rmate3ak) 51

[A4.1 - Energy Boost Wildcard](#_jx2v7gp6kkvo) 51

[A4.2 - Question Immunity Spell](#_hs7gmfxv2vjc) 51

[A4.3 - Give It Up](#_fsym584qrul0) 51

[A4.3.1 - Give Up 5%](#_7tqbccp69wyh) 52

[A4 - The Exit location](#_yps44d8zbu22) 52

[A5 - Regeneration location](#_xmhz30xo1c6h) 52

[7. Posting a status update.](#_u8zudellvn66) 53

[Basic Flow of Events.](#_wihfmunayja) 53

[**Use Case Diagram**](#_xlx2qiqvxke7) **53**

[**Threat Model Report**](#_dk9spqt27ltv) **54**

[Spoofing](#_gmj69m3hmtgy) 54

[Tampering](#_nzkglybsupar) 55

[Repudiation](#_itkotjynuqhw) 55

[Information Disclosure](#_qyall9ejmq7j) 55

[Denial of Service](#_nnupy4d1imrm) 55

[Elevation of Privilege](#_1uwkt9rd93vk) 56

# 

# **Glossary**

## ***Conformance Glossary***

The following keywords are used to differentiate between different levels of requirements and optionality, as defined in IEEE Std 100-1992 [RD11].

**Shall**: indicates a mandatory requirement. To ensure interoperability with other products conforming to this standard, all mandatory requirements must be followed strictly with no deviation.

**Should:** indicates a recommended but not mandatory requirement. Allows flexibility of choice between several possible alternatives while indicating a strongly preferred alternative. Indicates that a certain course of action is desirable but not mandatory, or indicates that a certain course of action is deprecated but not prohibited.

**May:** indicates a suggested course of action without implying preference over any other possible course of action.

## **Glossary**

|  |  |
| --- | --- |
| Term | Description |
| Player/User | A Player/User is a person who is directly interacting with the JADE game. |
| JADE Game Server | The JADE Game Server is an external server that handles requests from the JADE Game System, this includes sending and receiving data to or from the Player. |
| Payment Server | The payment server is an external system that handles payments. |
| Google maps web service | An external location system used to determine the location of the player. |
|  |  |

# 

# **Introduction**

A multiplayer, location based Android game for Boffin Games Ltd is to be developed. This document provides a specification of the requirements for this system.

## **Background/Vision**

This version of the game focuses on an initial, reduced functionality of the game, so it can work as a proof of concept demonstrator. The game will target the latest version of the Android operating system (10.0) so that it can utilize the newest Android features such as gesture navigation and dark mode. The game will be developed using Google’s ‘Flutter’ development toolkit rather than Android Studio – this is because Boffin Games are shifting all of their cross-platform development to Flutter.

# 

# **Functional Requirements**

## **R1 Navigable map locations**

The user shall navigate on a map of locations in order to find three virtual keystones. **(Figure 1)**

**Rationale:** The game is dependant map locations to find keystones which allow the game to be completed

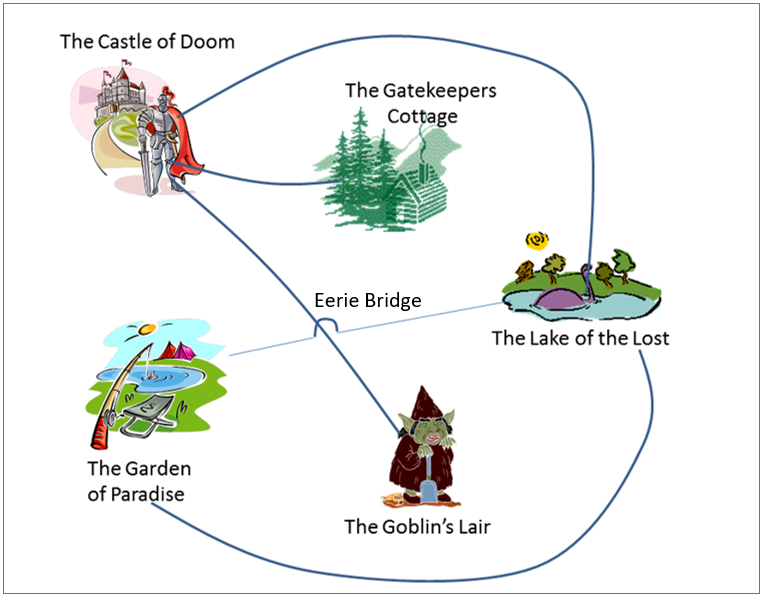


Figure 1. A game landscape comprising locations to travel between

### **R1.1 Keystones locations**

Each keystone shall be stored in a different location.

**Rationale:** Keystones will be in different locations so as to make the player work to complete the game.

### **R1.2 Hiding keystones**

Players shall not know where keystones are located.

**Rationale:** keystones are meant to be hard to find and must be discovered through exploration.

### **R1.3 Finding Keystones**

The player shall be able to find the virtual keystones through the process of discovery.

**Rationale:** Exploration and then discovery of the keystones is essential to the game functioning.

## **R2 The key**

The keystones shall be brought together to form a key, upon arriving at The Exit.

**Rationale:** The key is considered an essential part of the game to complete it.

### **R2.1 Unlocking the door**

The player shall be able to unlock a door and complete the game with the key.

**Rationale:** Being able to unlock the door with the key is considered an essential part of the game.

## **R3 Location feature**

The game shall make use of androids location features to operate.

**Rationale:** The game will need location features to track the player.

## **Game Landscape, Locations and Paths**

## **R4 Displaying map locations**

The game shall display a map of locations/destinations to the user.

**Rationale:** Displaying the map is essential to the game to show the user possible places they can travel to.

### **R4.1 Pathways to locations**

The locations are connected via one or more pathways

**Rationale:** pathways will show a general route or direction to the destination.

#### **R4.1.1 Pathways presented as virtual**

Pathways shall be virtual.

**Rationale:** The pathways do not correspond to real routes, they will have to be virtual.

#### **R4.1.2 Multiple pathways**

Destinations on the map may be linked by more than 1 pathway to show a real-life route the player can take.

**Rationale:** Rather than making the user figure out how to make it between destinations, in the interest of speed and usability the game could map a recommended route to take.

#### **R4.1.3 Displaying the best route**

The game may display the best route to take, as virtual pathway(s).

**Rationale:** The game may calculate the route which takes the shortest time to travel and display it to the user as virtual pathways, in the interest of time and usability.

### **R4.2 Location correspondence to real-world locations**

The locations on the map should correspond to a real-world location.

**Rationale:** The locations should be a point of interest or landmark so the player can be sure to know when they have reached their destination.

### **R4.3 Hiding the real-world location**

The player shall not be initially aware of which real-world locations that the map locations

correspond to.

**Rationale:** It is considered essential to the game that the player discovers what the real-world location is themselves so that they cannot just get directions via an alternate method.

#### **R4.3.1 Giving the real-world location an imaginary name and icon to disguise it**

The real-world locations shall be given alternative, imaginary names and icons

instead.

**Rationale:** This is essential to disguising the real-world locations well.

## **R5 Finding the real-world location**

The player shall become aware of the real world locations through gameplay.

**Rationale:** They will become aware of the real-world location by naturally following the directions given in the game and arriving at the real-world location which corresponds to the in-game location.

### **R5.1 Selecting a location to travel to**

The player shall first select a destination/location on the map to travel to.

**Rationale:** The player can select a destination as there will be multiple to choose from and there is no particular order to which you have to travel to. This will also allow the game to know where to direct the player to.

### **R5.2 Directing a player to a location**

The player shall be guided to the real-world location that the selected map destination/location corresponds to through pathways **(R4.1)**.

**Rationale:** They will be guided to a location through pathways as the actual place will be hidden and the in-game map may not necessarily be to scale or accurate to real life in any way.

### **R5.3 Reaching a real-world location.**

The real world-location will become apparent when the corresponding map destination has been reached, in game.

**Rationale:** The real-world location shall be a landmark of sorts and it will obvious that it is the place as it will be the only thing in the immediate vicinity.

## **R6 GPS coordinates of a map location**

Each map location shall store a set of GPS coordinates

**Rationale:** The GPS coordinates are essential for the system knowing where a location is.

### **R6.1 Defining the boundaries of a location**

A set of GPS coordinates shall define the boundaries of the real world location it

Represents.

**Rationale:** Defining the boundaries of a location through a set of coordinates shall be essential to telling whether or not a player has entered a location.

## **R7 Detecting a player’s location**

The system shall use the player’s device’s GPS to detect where they are currently.

**Rationale:** It is essential that the system knows where the player is so it can tell when a player has reached a location or not.

### **R7.1 Tracking a player**

Only when the game is being played shall it be possible to track a user’s location.

**Rationale:** It would drain the battery of a player’s device and be a breach of privacy if a player was constantly being tracked when they were not playing it.

### **R7.2 Detecting if a player has reached a location**

The system shall be able to detect whether or not the player is within a location or not by whether or not the phone GPS is within a location’s boundaries **(R6.1)**.

**Rationale:** Detecting if a player has reached their destination is essential to the functioning of the game.

### **R7.3 Detecting if a chosen destination is reached**

The system shall be able to tell if the chosen destination is reached by the player.

**Rationale:** The system should be able to, specifically, tell if a player has reached the chosen location.

## **R8 Triggering events**

A game-specific event may be triggered if a given destination is reached.

**Rationale:** game specific events are tied to specific locations and thus the only way they can be triggered is by reaching them.

## **R9 Destination names**

Each destination on the map shall have a name.

**Rationale:** The name will be used to set it apart from other locations among other things (such as icons).

### **R9.1 Imaginary destination names**

The destination’s name should be imaginary.

**Rationale:** The player should not be able to tell what the real-world location is from it’s name so using the real name would be great for the game.

### **R9.2 Relation of the location name to the real-world counterpart**

The destination’s name should not relate to the name of it’s real world counterpart.

**Rationale:** The location does not necessarily have to relate to its real-world counterpart (for example, the real-world location is costa coffee, it’s imaginary name doesn’t have to be “the imaginary cafe” it could be “epic super castle!”).

## **R10 Destination descriptions**

Each destination on the map should have a description.

**Rationale:** A description would add a sense of depth and background to the game and maybe allow for clues

## **R11 Pathways to destinations**

Destinations on the map shall be linked by a pathway.

**Rationale:** Pathways will serve to link the destinations together but they may not necessarily be a real life path to the destination.

## **R12 Transportation methods**

A player shall be able to use any means of transport they wish.

**Rationale:** The player will be able to use whatever transport to reach the destination they wish, whether it is walking, car, bus, train, plane or anything else.

## **R13 The final location**

The final location shall be called The Exit.

**Rationale:** The final location is to be called the exit. This is simple for the player to understand that this is the end point of the game.

## **R14 Themes**

Different themes should be downloaded for users to play.

**Rationale:** Different themes may be downloaded as an optional extra for players to add to the game.

### **R14.1 Landscape and locations in relation to themes**

If a theme is being used, the landscape and locations on the map shall change depending on the theme.

**Rationale:** The themes will change the appearance of the landscape and locations on the map.

### **R14.2 Imaginary names and icons in relation to themes**

The alternative imaginary names and icons **(R4.3.1)** should suit the theme of the game.

**Rationale:** The themes will change the names and icons of each location on the map as they should suit the style of the theme.

## **R15 Additional downloadable games**

Different games may be downloaded for users to play.

**Rationale:** Different games may be downloaded so that the player can play other games.

### **R15.1 Location based downloadable games**

There may be different games to download depending on your location.

**Rationale:** There may be different games to download depending on your location as they will depend on that specific location to operate properly.

#### **R15.1.1 Themes of downloadable location based games**

The downloadable location based games may have their own themes **(R14)**.

**Rationale:** The location based games may have their own set of themes to download.

### **R15.2 User designed games**

Users may be able to design their own games for the system.

**Rationale:** The player may want to make their own custom games for the system.

#### **R15.2.1 Uploading user designed games**

Users may be able to upload their own games for others to play.

**Rationale:** The user may want to share their designed game with others.

## **R16 Representing destinations with images**

Various graphics/images shall be used to represent destinations on the map.

**Rationale:** Images should be used to represent destination to make them memorable.

## **R17 Navigational hints**

Every destination on the map should have a set of descriptive navigational hints associated

with it.

**Rationale:** Navigational hints could help the player get to their destination

## **R18 Collectable items**

Each destination may contain collectable items.

**Rationale:** These are items at different locations which can be collected.

### **R18.1 Player choice on collecting items**

The player may collect or leave the items if they wish.

**Rationale:** These items will have no real impact on winning or losing so they can be collected as an optional thing to do.

## **R19 Activities at locations**

Locations may require activities to be completed which the player must complete to

Proceed.

**Rationale:** Some locations may not be as simple as visiting it and moving on to the next one to complete the game but may need you to do some extra gameplay and achieve a goal to proceed.

## **R20 Games which span worldwide**

There may be games which span across different towns, cities and countries in the world.

**Rationale:** The games do not have to be limited to a small area or a single city, they can span up to the entire world and require much more travelling.

## **Player Movement**

## **R21 Moving around using the ‘Oracle’**

Players shall move around the game using what is known as 'Oracle'.

**Rationale:** This is a virtual cup which shows the way to the player.

### **R21.1 Shaking the ‘Oracle’**

The oracle is a virtual cup that shall be able to be shaken.

**Rationale:** This virtual cup is shaken by moving the player's phone or sliding the virtual cup up and down.

### **R21.2 Dispersing the stones**

The oracle shall dispense a set of stones.

**Rationale:** These stones later will form a number which will help the user move around the landscape.

### **R21.3 Number to be formed**

Dispersed stones shall form the shape of a number.

**Rationale:** After the stones are dispersed the user can move around up to the number of locations shown by the ‘Oracle’

### **R21.4 The number dictates the player movement**

The number shown from the dispersed stones shall dictate the number of locations a player may move around the landscape.

**Rationale:** This number represents the maximum path lengths the player can move around the landscape.

### **R21.5 Ability to move up to the number shown**

The player shall be able to move to a destination which is up to the number formed by the dispersed stones path lengths away from their current location.

**Rationale:** If the player is in the starting location, and the number shown by the ‘Oracle’ is number ‘n’, this means that the move to a destination on the map which up to ‘n’ path to the current location. The player can choose to go to a location which is less than or equal to the ‘n’ path length.

## **R22 Search for pathways**

The game shall automatically search for pathways from their current location.

**Rationale:** As the player moves to a new location on the landscape so the available pathways changes.

### **R22.1 Highlight the pathways**

The game shall highlight all of those which the player can move to.

**Rationale:** By highlighting the pathway the player can easily distinguish on which pathway they can go.

### **R22.2 Selecting a pathway**

The player shall be able to select the destination they wish to visit.

**Rationale:** By selecting one of the available pathways the player chooses its way to go.

## **R23 Entering the desired destination**

The game shall then wait for the player to enter that destination by monitoring the GPS location of their device.

**Rationale:** As the player moves around the game using its real GPS coordinates the game shall wait for the player to reach the boundaries of the desired location.

### **R23.1 Boundaries of the intended destination**

The game shall wait for the player to move within the known boundaries of the intended destination.

**Rationale:** As the GPS coordinates cannot be 100% accurate. Each destination has boundaries and if the player has reached the boundaries, the game can conclude that the player has reached its location.

## **R24 Navigation guidance**

The game shall provide navigational guidance to the player to help them get to the correct destination.

**Rationale:** As noted previously, players will not know which real-world location represents the destination they have chosen. So the player must receive some sort of guidance in order to go there.

### **R24.1 Navigational arrow**

The navigational guidance should primarily be in the form of a navigational arrow.

**Rationale:** The navigation guidance could also be in the form of in-game elements which resemble real world location.

### **R24.2 Displaying the direction of travel**

Navigational arrow shall be displayed to show the direction in which the player must travel.

**Rationale:** The arrow points to an in-game location as well as to a real-world location. As the user moves north in the real world, the player moves north in the landscape of the game. The arrow could make use of the built-in gyroscope inside the phone (if available).

### **R24.3 Approximate distance**

Navigational arrow shall display the approximate distance to the destination.

**Rationale:** The player is in their right to know what is the real-world distance to the desired location, as some of the location might be too far away to travel to. The approximate distance is also some sort of guidance tool for the user.

### **R25 Google Maps web service**

The JADE game shall make use of the Google Maps web service to assist it during the navigational guidance.

**Rationale:** As this is an Android targeted game and most such phones have this service installed the game will make use of this and use it for assisting the navigational guidance.

### **R25.1 Send GPS coordinates**

The game shall periodically send the current GPS location of the player to Google Maps along with the GPS coordinates of their selected destination **(R67)**.

**Rationale:** As the player moves around the real-world its location in-game changes as well and it must be up-to-date.

### **R25.2 Additional navigational information**

The game shall be able to retrieve the navigational information required such as the direction to travel in (north, north-east, etc.) and the distance to the destination.

**Rationale:** This information could be gathered using the Google Maps web services or the built-in gyroscope inside the phone (if available).

## **R26 Destination hints/clues**

Each destination may have descriptive hints/clues associated with it.

**Rationale:** Hints/clues are used to help the player determine where they need to go.

### **R26.1 Making use of the hints/clues**

The player may make use of the descriptive hits/clues to help them determine where they need to go.

**Rationale:** The player will draw its own conclusions based on the hints/clues provided by the game.

### **R26.2 Option to view travel hints/clues**

An option to view travel hints/clues shall be presented to the player when they have selected the destination to travel to.

**Rationale:** If the player is stuck in a specific position he/she can make use of this feature in order to progress in the game.

### **R26.3 Cost of displaying hints/clues**

Making use of displaying hints/clues option shall come at a cost.

**Rationale:** The cost could be in the form of percentage of player’s health or in-game items they possess.

### **R26.4 Percentage of player’s health as a trade-off**

Each clue may incur a percentage decrease in the player’s heath as a trade-off for being given information that helps them get to their destination more quickly.

**Rationale:** Different types of clues could take higher or lower percentage in order to be unlocked.

## **R28 Virtual actions or events**

Once the player is detected as having reached/entered the destination that they are travelling to **(R23.1)** they may be subjected to various virtual actions or events upon the destination's type. **(R29)**

**Rationale:** The virtual actions or events depend on the destination type.

## **R29 Destination types**

Each destination on the map shall be classified as an 'intermediate' location, a 'question' location, a 'key stone' location, a 'wild card' location or 'The Exit' location.

**Rationale:** Different destination types represent different actions or events.

### **R29.1 Select destination without knowing its type**

During the gameplay, the player shall simply select a location to travel to without knowing what type of location he/she has selected.

**Rationale:** It is going to become clear upon entering what is the purpose of the selected location.

### **R29.2 Display virtual actions or outcomes**

If the destination on the game map has been classified as one of the above **(R29)** the game shall present the player with virtual actions or outcomes to perform.

**Rationale:** The user should easily draw the conclusion that he/she should perform the action displayed.

### **R29.3 Intermediate locations**

Intermediate locations may take the form of navigational points on the game map (such as a bridge to cross or a cross-roads to move in different subsequent directions from).

**Rationale:** Locations between the players location and the desired location. Bridges to cross or a cross-roads could represent real-world ones.

#### **R29.3.1 In Intermediate locations nothing occurs**

If a player ends up on an intermediate location during their turn, then nothing shall occur (simply player shall begin their next turn)

**Rationale:** Intermediate locations have the use of navigational points and nothing else.

### **R29.4 Question locations**

If a player ends up on a question location they shall be asked to answer a question or solve a puzzle before they can progress with the game.

**Rationale:** This is essential to the game. As the player answers questions he/she makes progress.

#### **R29.4.1 Display question**

The question shall be presented.

**Rationale:** Displaying the question will tell the user that action is required.

#### **R29.3.2 Type or select answer**

The user shall be able to type or select their answer.

**Rationale:** Selecting or typing the answer of the question will determine the outcome.

#### **R29.4.3 Collection of pre-defined questions**

The JADE game shall contain a collection of pre-defined questions.

**Rationale:** The game will not be able to be played if pre-defined questions do not exist. The game should not rely solely on user defined questions.

##### **R29.4.3.1 Pre-defined questions in use**

Pre-defined questions shall be used in question type locations.

**Rationale:** By using pre-defined questions we are sure that always a question is displayed to the user.

##### **R29.4.3.2 Knowledge that the questions cover**

Questions shall be general knowledge or relate specifically to the real-world location that the player is currently situated within.

**Rationale:** Example of location-specific questions could be: “What is the last item on the menu?”, “Which person does a statue represent?”, etc.

##### **R29.4.3.3 Receive questions based on location’s id**

When retrieving questions from the question collection, a location's id should be specified in order to receive questions which relate specifically to that location.

**Rationale:** Each question will be connected in the database via the id of the location. By querying the id of the location, the system shall receive all questions which have relation with the location id.

#### **R29.4.4 Result of correct answer**

If a player answers a question correctly they shall be able to proceed to the next location in the game.

**Rationale:** Answering the question correctly gives the player the ability to make progress in the game.

#### **R29.4.5 Incorrect answer**

If they answer incorrectly, they shall not be allowed to proceed until a correct answer has been provided.

**Rationale:** Answering the question incorrectly does not give the player right to make progress in the game.

##### **R29.4.5.1 Result of incorrect answer**

The same question shall either be repeated over and over until the correct answer is provided or a different question entirely shall be presented.

**Rationale:** By repetition of the same question or by providing completely different one the player is being challenged until the correct answer is received.

##### **R29.4.5.2 Repetition or different question option**

The location settings shall determine which option to use.

**Rationale:** Different locations can have different option set regarding whether the question is repeated or completely different one is provided in case of incorrect answer provided.

##### **R29.4.5.3 Consequences of incorrect answer**

When a player answers a question incorrectly, they shall lose a percentage of their health (e.g. 10%) **(R30)**

**Rationale:** The player does not have unlimited attempts as the user’s health bar consists only of 100% which is the same as 10 questions answered incorrectly.

#### **R29.4.6 Give up health instead of answering the question**

In certain game locations, when a player is presented with a question that they don't know the answer to, they shall be provided with an option to give up a percentage of their health instead of answering the question. **(R29.6.2.2)**

**Rationale:** The player can choose to play it in a secure way that comes at a cost instead of answering the same or different question several times which may come at a higher cost.

##### **R29.4.6.1 Result of give up option**

In that the option to give up **(R29.4.6)** is chosen the player shall bypass the question and continue moving through the game.

**Rationale:** When the player has decided to give up, he/she is not required to give an answer to the question and the question is skipped.

### **R29.5 Key stone locations**

“Key stone” locations shall contain one of the virtual key stones that players are expected to collect. **(R1.2)**

**Rationale:** This is a hard to find location which is found through the process of exploration.

#### **R29.5.1 Present a question at key stone locations**

The player shall be represented with a question similar to Question locations. **(R29.4)**

**Rationale:** The question anatomy is similar to Question type location. Pre-defined questions are in use.

#### **R29.5.2 Corrects answer wins a key stone**

If the player answers the question correctly they shall win a key stone.

**Rationale:** Answering the question correctly gives a reward to the user and the ability to process the game.

##### **R29.5.2.1 Key stone into player’s inventory**

When the player has won a key stone, this key stone shall be placed into their bag.

**Rationale:** The player has an inventory bag where items like key stones are stored.

#### **R29.5.3 After correct answer has been answer**

The player shall be able to proceed to the next location if he/she provides the correct answer to the question.

**Rationale:** Simply give to the user the ability to process the game.

### **R29.6 Wildcard locations**

When a player enters a wildcard location they shall be subject to a virtual action or outcome.

**Rationale:** When the player enters a wildcard location he/she does not know the outcome.

#### **R29.6.1 Outcome of entering a Wildcard locations**

The wildcard outcome shall either be beneficial or detrimental to a players progress within the game.

**Rationale:** This is intended to inject an element of surprise into the game.

#### **R29.6.2 Random wildcard upon entering**

When a player enters a wildcard location they shall receive a random wildcard from the wildcard collection below.

**Rationale:** This collection has three different wildcards.

##### **R29.6.2.1 Energy Boost**

Energy Boost is a Wildcard which shall increase player’s energy level by 10% **(R45)**

**Rationale:** As the player loses percentage of their health in other in-game locations, he/she needs to regenerate somehow.

###### **R29.6.2.1.1 Energy Boost at 100%**

If the player already has 100% they may not receive the health increase.

**Rationale:** This is because the maximum is 100% and is already reached. If the player has 95%, they will receive only 5%.

##### **R29.6.2.2 Question Immunity Spell**

Question Immunity Spell is a Wildcard which shall allow players to bypass questions they do not know the answer to without incurring any health penalty. **(R29.4) (R29.5)**

**Rationale:** This spell can be used in question type locations or key stone locations.

###### **R29.6.2.2.1 Storing the Question Immunity Spell**

Question Immunity Spell is a Wildcard which shall be stored in the player's inventory bag.

**Rationale:** This spell needs to be stored somewhere in order to be used in the future.

##### **R29.6.2.3 Give It Up**

Give It Up is a Wildcard which shall give the option to the player to relinquish something from their bag or give up 5% of their health.

**Rationale:** The player can relinquish items such as key stone question immunity spell.

#### **R29.6.3 Display the wildcard**

The game shall display the wildcard to the user.

**Rationale:** Simply display the randomly selected wildcard.

### **R29.7 The Exit location**

The Exit location shall be revealed once the player has collected the final key stone.

**Rationale:** The game ends when the player has collected all of the required key stones.

#### **R29.7.1 Outcome of entering The Exit location**

When the player has entered the exit location the game shall inform the player that they have completed the game.

**Rationale:** Completion of the game has been reached.

## **R30 Regeneration location**

If a player's health falls below 15%, they shall be automatically requested to move to a 'regeneration' location within the game.

**Rationale:** The player’s health is too low in this case in order to continue.

### **R30.1 Outcome of reaching Regeneration location**

When a player moves to a 'regeneration' location their health shall be replenished back to 100%.

**Rationale:** As the player loses percentage of their health in other in-game locations, he/she needs to regenerate somehow.

### **R30.2 Position of the Regeneration location**

The regeneration location shall be the starting point of the game. **(R40)**

**Rationale:** The game requires the player to be at the starting location for the player to replenish back to 100%.

## **Starting / Joining a game**

## **R31 Starting a game.**

To start a game a player shall search for a game in their current location.

**Rationale:** Due to the player having to be physically in the location of the game it is essential the player can search and choose a location that suits where they want to play.

## **R32 Hosting the game.**

A dedicated game server shall host a repository of all known JADE games.

**Rationale:** A dedicated server is essential as they offer reliability and performance.

## **R33 Searching for a game.**

The dedicated game server shall return a list of all games within a reasonable proximity of the player when a player searches for a game.

**Rationale:** This gives the player a choice in which game they play.

## **R34 Calling game server services.**

The game shall be able to call the game server services

**Rationale:** Since the server is being developed by another team it is the systems job to simply call these services.

## **R35 Communicating with the game server.**

The game shall be able to receive data from the game server

**Rationale:** Since the server is being developed by another team it is the systems job to simply receive data from the game server.

## **R36 Player names in the game.**

The player shall provide the name they wish to use during the game

**Rationale:** Allows a player to be identified in game by other players.

## **R37 Selecting a game.**

The player shall select the game they wish to play from the options provided **(R33)**

**Rationale:** Allows the player to choose which game they wish to play, meaning a player has more choice so can play the maps or games they like the most.

## **R38 Downloading game data.**

The game shall issue a request to the game server to download the data for the selected game onto the players device.

**Rationale:** Since all the game data is on the game server, the system has to issue a request to the game server to download the data onto the players device.

## **R39 Required Data.**

The data that the game downloads shall include the pre-populated map for the game, and a collection of questions and puzzles.

**Rationale:** This is the data that is required for a player to play a game.

## **R40 Starting location.**

Players shall be asked to make their way to the starting location when the game starts.

**Rationale:** The game requires the player to be at the starting location for the player to take their first turn.

## **R41 Designating starting location**

A location on the game map shall be designated as the starting location.

**Rationale:** A starting location is needed for the game.

## **R42 Highlighting starting location.**

The starting location (**R40**) shall be highlighted in the game map.

**Rationale:** This allows the player to easily identify the starting location so that they can make their way to it to start the game.

## **R43 Moving to the starting location.**

The game shall wait until the player has physically moved to the starting location.

**Rationale:** This is to make sure that the player is ready to start the game by waiting until they are at the starting location to start.

## **R44 Taking the starting turn.**

Once the player has reached the starting point they shall be offered the option to take a turn.

**Rationale:** This allows the players to start the game when they want to.

## **R45 Starting health.**

At the start of the game players shall be provided with 100% health level.

**Rationale:** The player starts with 100% at the start of the game as they can lose health later in the game.

## **R46 Starting items.**

At the start of the game players shall be provided with a bag.

**Rationale:** The player needs a bag to carry items and keystones.

## **R47 Storing items**.

The bag **(R46)** shall be used to store items that the player can pick up.

**Rationale:** The player can store items that they can then use later on in activities.

## **R48 Storing Keystones**

The bag shall be able to store keystones.

**Rationale:** The player needs to collect and store keystones in order to reach the exit of the game.

## **Player Messaging and status updates**

## **R49 Player Messaging**.

The game shall support player messaging.

**Rationale:** This allows players to communicate with other players.

## **R50 Handling messages.**

Messaging shall be primarily handled by the JADE game server

**Rationale:** Messaging is server based so shall be handled by the game server.

## **R51 Messaging options at the start of a turn.**

The player shall be provided with the option to broadcast a message at the start of their turn.

**Rationale:** This gives the player the option to send a message to the server.

## **R52 Sending message data**.

The game application shall send the message text, player name and game id to the JADE game server.

**Rationale:** This is all the data needed for the game server to display the message

## **R53 Displaying messages to players**

In the event of **(R52)** the game server shall then handle the logic for recording the message and relaying it to other players

**Rationale:** Since messaging is handled server side the game server shall handle this logic

## **R54 Retrieving messages.**

At the start of the players turn the game shall issue a request to the game server to retrieve messages.

**Rationale:** Allows the players to see other players messages,

## **R55 Displaying retrieved messages.**

In the event of messages being retrieved **(R54)** the message shall be displayed to the player alongside the other game options.

**Rationale:** This allows Players to communicate with each other.

## **R56 Posting status updates.**

During a players turn or during specific game events an option shall be provided to a player to allow them to post a status update to facebook.

**Rationale:** By giving the player the option to post about the game on facebook it could lead to other people downloading the game.

## **R57 Using the Facebook API**

The application shall integrate the facebook API to achieve **(R56)**

**Rationale:** This is the best way to integrate with facebook.

## **Game Packs**

## **R58 Obtaining game packs.**

It shall be possible for players to purchase and download game packs.

**Rational:** Players will be able to purchase game packs that contain additional content.

## **R59 Game pack content.**

Game packs should contain additional map layouts, skins, and actions.

**Rationale:** Game packs should contain content that changes the game for the player. This gives the player an incentive to purchase these game packs.

## **R60 Purchasing game packs.**

Game packs shall be purchased directly from boffin games.

**Rationale:** This means no third party sites take a percentage of the payment.

## **R61 Collecting payment information**

An in-game form shall be used to collect users payment information

**Rationale:** This allows players to pay for the game packs from within the game.

## **R62 Processing payments.**

The Boffin Games payment server shall be used to process card payments collected from **(R61)**

**Rationale:** This is used to process payments from players to boffin games.

# 

# **Non-Functional**

## **R63 Targeted Android version**

The game shall target version 10.0 of the Android operating system.

**Rational:** So that the game can utilize the newest Android features such as gesture navigation and dark mode.

## **R64 Google’s Flutter development toolkit**

The game shall be developed using google’s Flutter development toolkit.

**Rationale:** This is because Boffin Games are shifting all of their cross-platform development from Android Studio to Flutter.

## **R65 Advanced multiplayer interaction**

The game may eventually incorporate advanced multiplayer interaction.

**Rationale:** This version of the game focuses on an initial, reduced functionality of the game, so it can work as a proof of concept demonstrator.

## **R66 Google Services**

The Android phone on which the game is played shall have Google Services installed.

**Rationale:** As some of the newest Huawei phones still run Android but they do not have the right to have Google Services installed this is constraint that must be considered.

## **R67 Google’s Material Design guidelines**

In terms of User Interface the App shall comply with Google's Material Design guidelines.

**Rationale:** If these guidelines are followed the result will be a modern looking game.

## **Player movement**

## **R68 GPS signal timeout**

The delay between request of player’s location and receiving the coordinates shall not be below 6 seconds.

**Rationale:** As the player could lose GPS signal they need to receive a message that their location cannot be retrieved.

## **R69 Frame rate of the game**

Consideration shall be made for the frame rate of the game.

**Rationale:** This game is not intended to have intensive gameplay.

### **R69.1 Lower frame rate**

The game shall be possible to play at a lower frame rate.

**Rationale:** As this game that could consume a lot of battery while playing having the option to play the game in lower frame rate could save a lot of power.

## **Starting / Joining a game**

## **R70 Memory Management**

The memory resources of the game should not exceed 128MB

**Rationale:** This is to ensure optimum compatibility.

## **Player messaging and status updates**

## **R71 Storing personal information**

Due to **(R56)** personal data for the user shall be stored during the game.

**Rationale:** It is expected that some personal data like their location or social media credentials will be stored.

## **Game Landscape, Locations and Paths**

## **R72 A fused provider to provide the best experience**

The game shall use a “fused” provider of GPS location provider and the network location provider to use less battery and maintain accuracy of location.

**Rationale:** The game will make use of a fused provider of the two as using the GPS location provider is accurate consumes but too much battery and the network location provider can be faster but is dependent on network connectivity. To make use of both at the same time would mean less battery consumption but still maintaining location accuracy.

## **R73 Determining the best route to take**

The game may make use of google maps API to determine the best route to a destination.

**Rationale:** Google Maps is considered the biggest and best in web mapping services and has a large library of related APIs and extensive documentation.

# **Use Case Specification.**

**List of Actors.**

**-Player**

A Player is a person who is directly interacting with the JADE game.

**-JADE Game Server**

The JADE Game Server is an external server that handles requests from the JADE Game System, this includes sending and receiving data to or from the Player.

**-Payment Server**

The payment server is an external system that handles payments.

**-Google maps web service**

An external location system used to determine the location of the player.

## 

## **1. Starting a game.**

**Actors**

The following actors are involved in this use case: <Player> and <JADE Game Server>

**Brief Description**

The player starts a game.

### **Basic Flow of Events.**

The use case begins when the <Player> searches for a game in their current location.

|  |  |
| --- | --- |
| System | Queries the JADE Game Server for available games. **A1, A2, A5** |
| <JADE Game Server> | Returns a list of all available games which are in reasonable proximity to the player. **A3** |
| System | Displays a list of available games to the Player, ordered in terms of proximity, containing information about the game. |
| <Player> | Provides a name they wish to use and selects an available game. **A4** |
| System | Issues a request to the JADE Game Server to download the game data onto the Players phone. **A1, A2** |
| <JADE Game Server> | Fulfills systems request and downloads data to players phone |
| System | Starts game. |

### **Alternative flows**

#### **\*1 - Player quits the game.**

At any point the player can quit the game.

|  |  |
| --- | --- |
| <Player> | Closes the game |
| System | Stops running |

#### **A1 - Player doesn’t have an internet connection.**

The System tries to query the JADE Game Server but can’t send the query.

|  |  |
| --- | --- |
| System | Can’t connect to the internet to send query. |
| System | Tries again until successful connection |

#### 

#### **A2 - JADE Game Server is down.**

The system tries to query the JADE Game Server but gets no response.

|  |  |
| --- | --- |
| System | Queries the JADE Game Server for available games but can’t connect |
| JADE Game Server | Does nothing |
| System | Displays that the JADE Game Server is down to the Player. |

#### 

#### **A3 - No games available to the player.**

The JADE Game Server returns an empty list of games a player can play.

|  |  |
| --- | --- |
| <JADE Game Server> | Returns no games |
| System | Displays that there are no games available in the users location. |

#### **A4 - Player doesn't enter a name.**

The player does not provide a name but selects a game.

|  |  |
| --- | --- |
| <Player> | Selects a game but does not enter a name |
| System | Asks the user to enter a name again. |
| <Player> | Enters Name (**A4)** |
| System | Returns to main loop |

#### 

#### **A5 - GPS signal timeout**

The player does not provide location permission or loses GPS signal but selects to start a game.

|  |  |
| --- | --- |
| <Player> | Selects a game but does not provide GPS location. |
| System | Prompts the user that signal is lost. |
| <Player> | Selects game **(A4)** |
| System | Returns to main loop |

## **2. Moving Location.**

**Actors.**

The following actors are involved in this use case: <Player>

**Brief Description.**

The player can move location by using the Oracle.

### **Basic Flow of Events.**

The use case begins after the <Player> has started the game.

|  |  |
| --- | --- |
| System | Gives player the option to take a turn |
| <Player> | Takes a turn and rolls oracle. |
| System | Displays valid locations Player can move to. |
| <Player> | Chooses a location to travel to. **A1.** |
| System | Shows an arrow directing the player towards the selected location. |
| <Player> | Reaches the location. |

### **Alternative flows**

#### **\*1 - Player quits the game.**

At any point the player can quit the game.

|  |  |
| --- | --- |
| <Player> | Closes the game |
| System | Stops running |

#### **A1 - Player tries to select a non valid location.**

Player tries to select a non valid location to travel to

|  |  |
| --- | --- |
| System | Tells player that the location they are trying to travel to is invalid and to select a valid location |
| <Player> | Selects location to travel to **(A1)** |
| System | Returns to main loop |

## **3. Sending a message.**

**Actors.**

The following actors are involved in this use case: <Player>, <JADE Game Server>

**Brief Description.**

The player can send a message at the start of their turn.

### **Basic Flow of Events.**

The use case begins at the start of a <Players> turn.

|  |  |
| --- | --- |
| System | Provides Player with the option to broadcast a message to other players. |
| <Player> | Player selects the option to send a message and sends a message. **A1, A3** |
| System | Sends message data to JADE Game Server to relay to other players. **A2, A3** |
| System | Show options again. |

### **Alternative flows**

#### **\*1 - Player quits the game.**

At any point the player can quit the game.

|  |  |
| --- | --- |
| <Player> | Closes the game |
| System | Stops running |

**A1 - Player tries to send a blank message**

<Player> selects the option to send a message but does not input any text and tries to send the message

|  |  |
| --- | --- |
| <Player> | Tries to send blank message |
| System | Prompts <Player> to input text before sending message |
| <Player> | Sends message **A1** |
| System | Returns to main loop |

#### **A2 - JADE Game Server is down.**

The system tries to query the JADE Game Server but gets no response.

|  |  |
| --- | --- |
| JADE Game Server | Does nothing |
| System | Displays that the JADE Game Server is down to the Player. |
| System | Tries again **A2** |
| System | Returns to main loop |

#### **A3 - Player doesn’t have an internet connection.**

The System tries to query the JADE Game Server but can’t send the query.

|  |  |
| --- | --- |
| System | Can’t connect to the internet to send query. |
| System | Tries again until successful connection **A3** |
| System | Returns to the main loop. |

#### 

## 

## **4. Retrieve messages.**

**Actors.**

The following actors are involved in this use case: <Player>, <JADE Game Server>

**Brief Description.**

At the start of every player’s turn the game tries to retrieve any messages which have been broadcasted by other players in the same game.

### **Basic Flow of Events.**

The use case begins at the start of every <Player>’s turn.

|  |  |
| --- | --- |
| <Player> | Player makes a turn. |
| System | The System issues a request to the JADE Game Server by providing the id of the game being played. **A1, A2** |
| <JADE Game Server> | Returns a list of all new available messages available. |
| System | Displays new messages in the following format: (Player ‘x’ says: ‘Boo!’) |

### **Alternative flows**

#### **\*1 - Player quits the game.**

At any point the player can quit the game.

|  |  |
| --- | --- |
| <Player> | Closes the game |
| System | Stops running |

#### **A1 - No new messages available**

An empty list is provided. There is nothing to display.

|  |  |
| --- | --- |
| <JADE Game Server> | Returns an empty list. |
| System | Nothing happens. |

#### **A2 - JADE Game Server is down.**

The system tries to query the JADE Game Server but gets no response.

|  |  |
| --- | --- |
| <JADE Game Server> | Does nothing |
| System | Displays that the JADE Game Server is down to the Player. |
| System | The System tries again to retrieve information about new messages. **A2** |
| System | Returns to main loop |

#### 

## **5. Buying a Game Pack.**

**Actors**

The following actors are involved in this use case: <Player> and <Payment Server>

**Brief Description**

The player buys a game pack.

### **Basic Flow of Events.**

The use case starts when the player selects the option to buy a game pack

|  |  |
| --- | --- |
| System | Provides an in-game form for the <Player> to enter their payment information. |
| <Player> | Enters payment information. **A1, A2** |
| System | Sends form details to <Payment Server> to be processed. **A3** |
| <Payment Server> | Processes card details. **A4** |

## **Alternative flows**

#### **\*1 - Player quits the game.**

At any point the player can quit the game.

|  |  |
| --- | --- |
| <Player> | Closes the game |
| System | Stops running |

#### **A1 - Player cancels the purchase.**

The player chooses to not enter payment information and cancels the transaction

|  |  |
| --- | --- |
| <Player> | Cancels the transaction |
| System | Quits to the main menu. |

#### **A2 - Player doesn’t enter required payment information**

The player does not enter all of the required payment information into the form

|  |  |
| --- | --- |
| <Player> | Does not enter required payment information |
| System | Does not send the form and requests the user to enter all required fields |
| <Player> | Enters form details **A2** |
| System | Returns to the Mesmain loop. |

#### **A3 - Payment Server is down**

The system send the form details to the payment server but received no response

|  |  |
| --- | --- |
| <Payment server> | Does not respond to the JADE Systems request |
| System | Informs the player it can’t connect to the payment server |
| System | Try’s Again **A3** |
| System | Returns to the main loop. |

#### **A4 - incorrect card details**

The payment server informs the System that the card details were invalid

|  |  |
| --- | --- |
| <Payment server> | Returns that card details were invalid |
| System | Informs the player the card details were invalid |
| System | Returns to the start of the main loop. |

## 

## **6. Interaction with destination types**

**Actors**

The following actors are involved in this use case: <Player> and <JADE Game Server>

**Brief Description**

The player enters the boundaries of one of the following destination types: 'intermediate' location, a 'question' location, a 'key stone' location, a 'wild card' location or 'The Exit' location.

### **Basic Flow of Events.**

The use case begins when the <Player> moves within the known boundaries of the intended destination.

|  |  |
| --- | --- |
| <Player> | Reaches the boundaries of the intended destination. |
| System | Check the type of the destination. **A1, A2, A3, A4, A5** |
| <Player> | Searches his/her next location. |

### **Alternative flows**

#### **\*1 - Player quits the game.**

At any point the player can quit the game.

|  |  |
| --- | --- |
| <Player> | Closes the game |
| System | Stops running |

#### **A1 - Intermediate location**

When the player ends in an intermediate location nothing happens.

|  |  |
| --- | --- |
| System | Nothing happens. |
| System | Return to main loop |

#### 

#### **A2 - Question location**

When the player ends up on a question location they shall be asked to answer a question.

|  |  |
| --- | --- |
| System | Check Player’s health if it is above 15%. **A2.0** |
| System | Retrieves a random question from the pre-defined collection based on location’s id |
| System | Displays the question to the player |
| <Player> | Provides an answer **A2.1, A2.2, A2.3, A2.4** |
| System | Return to main loop |

#### 

##### **A2.0 - Health below 15%**

Player can not continue.

|  |  |
| --- | --- |
| System | Tell the player that they need to visit the regeneration location. |

#### 

##### **A2.1 - Correct answer**

When the player answers the question correctly they should continue with their game.

|  |  |
| --- | --- |
| System | Answer received is correct |
| System | Return to **A2** |

#### 

##### **A2.2 - Incorrect answer**

Player is not allowed to continue until the correct answer is provided.

|  |  |
| --- | --- |
| System | Answer received is incorrect |
| System | Player’s health is decreased by 10%. **A2.2.0** |
| System | System checks the location setting. **A2.2.1, A2.2.2** |
| System | Return to **A2** |

#### 

###### **A2.2.0 - Send to Regeneration location**

If a player's health falls below 15%, they shall be automatically requested to move to a ‘regeneration location’.

|  |  |
| --- | --- |
| System | Hide question from the screen. |
| System | Tell the player that they need to visit the regeneration location. |

#### 

###### **A2.2.1 - Repeat Question**

The location setting is set to repeat the question until the correct answer is provided.

|  |  |
| --- | --- |
| System | Display the same question to the Player. |
| <Player> | Provides an answer **A2.1, A2.2, A2.3** |

#### 

###### **A2.2.2 - Different Question**

The location setting is set to display different question to the user until the correct answer is provided.

|  |  |
| --- | --- |
| System | Retrieves a random question from the pre-defined collection based on location’s id which is different from the previous one. |
| System | Displays the question to the player |
| <Player> | Provides an answer **A2.1, A2.2, A2.3** |

##### **A2.3 - Give up health instead of answering the question**

If the player does not know the answer to the question he/she can give up a percentage of their health instead.

|  |  |
| --- | --- |
| <Player> | Selects to give up |
| System | Reduces player’s health by x% |
| System | Return to **A2** |

#### 

##### **A2.4 - Use Question Immunity Spell**

If the player does not know the answer to the question he/she can use Question Immunity Spell from their bag.

|  |  |
| --- | --- |
| <Player> | Selects to use Question Immunity Spell |
| System | Removes wildcard from player’s inventory. |
| System | Return to **A2** |

#### 

#### **A3 - Key stone location**

“Key stone” location contains virtual stones that players collect.

|  |  |
| --- | --- |
| System | Check Player’s health if it is above 15%. **A3.0** |
| System | Retrieves a random question from the pre-defined collection based on location’s id |
| System | Displays the question to the player |
| <Player> | Provides an answer **A3.1, A3.2, A3.3, A3.4** |
| System | Adds the key stone to the player's inventory bag. |
| System | Return to main loop |

#### 

##### **A3.0 - Health below 15%**

Player can not continue.

|  |  |
| --- | --- |
| System | Tell the player that they need to visit the regeneration location. |

#### 

##### **A3.1 - Correct answer**

When the player answers the question correctly they should continue with their game.

|  |  |
| --- | --- |
| System | Answer received is correct |
| System | Return to **A3** |

#### 

##### **A3.2 - Incorrect answer**

Player is not allowed to continue until the correct answer is provided.

|  |  |
| --- | --- |
| System | Answer received is incorrect |
| System | Player’s health is decreased by 10%. **A3.2.0** |
| System | System checks the location setting. **A3.2.1, A3.2.2** |
| System | Return to **A3** |

#### 

###### **A3.2.0 - Send to Regeneration location**

If a player's health falls below 15%, they shall be automatically requested to move to a ‘regeneration location’.

|  |  |
| --- | --- |
| System | Hide question from the screen. |
| System | Tell the player that they need to visit the regeneration location. |

#### 

###### **A3.2.1 - Repeat Question**

The location setting is set to repeat the question until the correct answer is provided.

|  |  |
| --- | --- |
| System | Display the same question to the Player. |
| <Player> | Provides an answer **A3.1, A3.2, A3.3** |

#### 

###### **A3.2.2 - Different Question**

The location setting is set to display different question to the user until the correct answer is provided.

|  |  |
| --- | --- |
| System | Retrieves a random question from the pre-defined collection based on location’s id which is different from the previous one. |
| System | Displays the question to the player |
| <Player> | Provides an answer **A3.1, A3.2, A3.3** |

##### **A3.3 - Give up health instead of answering the question**

If the player does not know the answer to the question he/she can give up a percentage of their health instead.

|  |  |
| --- | --- |
| <Player> | Selects to give up |
| System | Reduces player’s health by x% |
| System | Return to **A3** |

#### 

##### **A3.4 - Use Question Immunity Spell**

If the player does not know the answer to the question he/she can use Question Immunity Spell from their bag.

|  |  |
| --- | --- |
| <Player> | Selects to use Question Immunity Spell |
| System | Removes wildcard from player’s inventory. |
| System | Return to **A3** |

#### 

#### **A4 - Wildcard location**

The outcome of visiting a wildcard location is either beneficial or detrimental to a player’s progress within the game.

|  |  |
| --- | --- |
| System | System selects random wildcard. **A4.1, A4.2, A4.3** |
| System | Displays the wildcard to the player |
| System | Return to main loop |

#### 

##### **A4.1 - Energy Boost Wildcard**

Increases Player’s health by 10%

|  |  |
| --- | --- |
| System | Increases player’s energy by 10%. |
| System | Return to **A4** |

##### **A4.2 - Question Immunity Spell**

Allows players to bypass questions they do not know the answer to without incurring any health penalty.

|  |  |
| --- | --- |
| System | Adds the key stone to the player's inventory bag. |
| System | Return to **A4** |

##### **A4.3 - Give It Up**

The Player must relinquish something from their bag or give up 5% of their health.

|  |  |
| --- | --- |
| System | Asks the user to give up an item. |
| <Player> | Selects an item to give up. **A4.3.1** |
| System | Removes selected item from player’s inventory. |
| System | Return to **A4** |

###### **A4.3.1 - Give Up 5%**

The Player loses 5% of their health.

|  |  |
| --- | --- |
| System | System decreases the player's energy by 5%. |
| System | Return to **A4** |

#### 

#### **A4 - The Exit location**

The player has completed the game.

|  |  |
| --- | --- |
| System | Informs the player that they have finished the game. |

#### 

#### **A5 - Regeneration location**

Player’s health is increased to 100%.

|  |  |
| --- | --- |
| <Player> | Raches the Regeneration location |
| System | Increases Player’s health to 100% |

#### 

## 

## **7. Posting a status update.**

**Actors**

The following actors are involved in this use case: <Player>

**Brief Description**

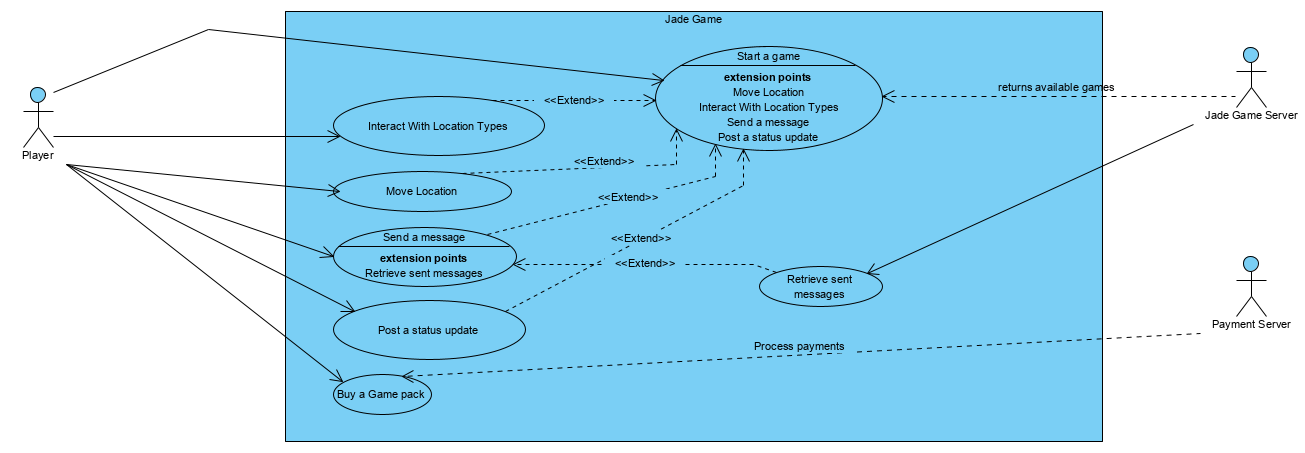
The player posts a facebook status update.

### **Basic Flow of Events.**

The use case starts when the player selects the option to post a status update to facebook

|  |  |
| --- | --- |
| <Player> | Selects option to post a status update to facebook |
| System | System posts a status update using the facebook API. |

# Use Case Diagram



If the diagram is too small please refer to the use case diagram pdf located in the zip file.

# Threat Model Report

## Spoofing

The user may not be the same person every time. To make sure that it is always the same user, it would be beneficial to add in an extra layer of security as a login username and password. Another way in which a spoofing attack may occur is if an attacker intercepts the data between the JADE Game Server and the Players device. Allowing the Attacker to send the Player Data as if it was being downloaded from the server.

## Tampering

One way in which a Player could try and tamper with the system is through SQL Injection. TO prevent this all user inputs should be validated before being sent to the JADE Game Server or the Payment Server so that malicious code can not be run on a database. Files should also be encrypted to prevent the user from editing them on their device.

## 

## Repudiation

The system should keep logs of all the users’ activities and store them securely. These are things such as players messages, games a player has played and made, the game packs a player had bought etc.

## 

## Information Disclosure

Furthering the use of login details, make sure that the password cannot be too simple (must include a capital letter, a lowercase letter, a special character and at least 10 characters long) - said passwords should also be encrypted wherever they are stored..

The messages sent from a user should be encrypted so that if it were intercepted, it would not be exposed to people who are not meant to see it.

The error messages should not disclose any information, possibly show an oversimplified error message to the user with barely any details.

## 

## Denial of Service

The user should not be able to send too many messages at a time and overload the server. There should be a limit to the amount of messages a user can send at a time or in a given period of time (foo example, one every 30 seconds).

Similarly, a user should not be able to attack the upload feature when making a game and uploading it for others to see. They should only be able to upload a game then have to wait a while after the game is uploaded to upload another.

## 

## Elevation of Privilege

When a player is making their own game, they may have too much freedom to do whatever they want. There should be limitations to what they can do. Such as, having game templates in which you can only add basic personalisations to it.

The player should additionally not have any access to the game’s files whilst creating or playing a game at any moment.