Introduction

You have been asked to specify the requirements and design for a new game under consideration by Boffin Games Ltd – Dundee's leading developer of games which target the iPhone.

The game will eventually incorporate advanced multi-player interaction but what you are being asked to design is a proof of concept demonstrator which focuses on an initial, reduced functionality version. The game will target the iPhone 4s and will be developed using the Xcode IDE. The game, when running, must make efficient use of its resources so as not to exceed any memory constraints of the iPhone.

Game description

The game is called 'JADE'. The objective of the game is to navigate a map of real world locations using the GPS[1] capabilities of the iPhone in order to locate a set of THREE virtual "key stones"[2] which have been placed at some of these locations. When all key stones have been collected the player may make their way to the final location for the game, known dramatically as the 'The Exit'. The key stones, when brought together will form a key which will allow the player to unlock a door in the 'The Exit' and complete the game.

Game landscape, locations, and paths

The game will display a map containing destinations which correspond to locations in the real world. Each map destination will have a collection of coordinates which define the GPS boundary of the corresponding real world location that the destination represents. For example, one possible game could comprise locations which are spread across Dundee. One location may be Costa Coffee in the Overgate centre. Another location may be Braes Bar, another could be the fountain in Dundee City Square, or platform 2 of the train station, or the 2nd floor of the University tower building. The map for this game would therefore contain a set of destinations which correspond to these real locations in Dundee and which record their GPS positional boundaries. When the game is played, players will have to physically visit these locations in order to locate the virtual key stones that they may contain. Each destination on the map will be given a name and a description. The destination's name may or may not correspond to the name of its real world counterpart. For example, a destination on the map corresponding to Costa Coffee in Dundee may be given a name of "Dragon's Lair" in the game. Also, various graphics may be used to represent and render the destinations on the map and which, again, may not bear any resemblance to the destination's real-world counterpart. E.g. a graphic of a castle may be rendered instead of an image of the Costa Coffee store. However, the description of this destination would make it clear that it is actually Costa Coffee that the destination corresponds to; to provide players with clues about where to go.

[1] The Global Positioning System (GPS) allows you to calculate a 3 dimensional location of an object anywhere in the world based on its latitude, longitude and altitude/height. See http://en.wikipedia.org/wiki/Global_Positioning_System for more detailed info.

[2] The virtual 'key stones' are made of the precious stone 'Jade' – hence the name of the game.

Destinations on the game map will be linked to each other via one or more virtual paths. For example, there may be a path which links Costa Coffee to the University Tower Building and a path linking Braes Bar to the Tower too, but there may be no direct path between Costa and Braes on the map. This means that, if a player is currently located in the Costa Coffee location, they would have an option to move directly to the Tower Building location. However, they wouldn't be able to move directly to Braes since there is no direct link between these locations on the map. Instead they could only get to Braes indirectly by following paths through other connected locations on the map.

Paths are intended purely as a mechanism for specifying links between one destination on the map to another. Paths don't have their own GPS coordinates and a player can choose any means of travelling along a path that they wish. For example, if a player has to get from Braes Bar to Costa Coffee, they can choose any route they want to get there and can travel by any means, e.g. bike, car, or helicopter. The game isn't concerned about how a player moves *between* locations. Rather, it is concerned with being able to detect when they arrive at their selected destination (usually by detecting that the GPS coordinates of the player's iPhone are within the GPS coordinates that define the boundary of the intended destination).

As will be described later, each location in the game may contain items that players can collect and/or require activities to be completed by the player.

Starting / joining a game

To start a game, the player must search for a game in their current GPS location. A dedicated game server will exist for JADE which will host a repository of all known JADE games in various countries and which can be queried for information about available games. When provided with the GPS location of an iPhone the game server will return a list of all games which are within reasonable proximity of the iPhone's location. For example, if someone standing in Dundee City Centre searched for a game, they may find games available on the University Campus, the Hilltown area, Broughty Ferry, and others. A list of available games will be provided to the player, ordered in terms of proximity and containing information about the name of the game, a brief description, and the number of players currently playing it. **NOTE: the game server software is being developed by another team of people, it is their responsibility to design the logic required to answer questions about game availability. Your system simply needs to be able to call these services and receive the data returned.**

Once a list of available games has been retrieved and displayed the player must provide a name they wish to use during the game and select the game they want to join. The game application will then issue a request to the game server to download the actual data for the selected game onto the iPhone. This data will include: the map/landscape for the game, pre-populated with its various locations/destinations and their contents, and paths between them; and a collection of questions which will be used during the game (see later).

The player will then be asked to make their way to the starting location (one of the locations on the game map will be designated as the starting location). The game will wait until the player has physically moved to the starting location. This will typically be achieved by monitoring the GPS location of the

phone and waiting for it to move within the known boundaries of the intended destination. At which point the player will be then be offered options to take a turn of the game.

At the start of a game a player will be provided with a 100% health level and will also be provided with a 'bag' - this will be used during the game to hold items that the player can pick up, including key stones.

Player movement

Players move around the game using what is known as the 'Oracle'. The oracle is a virtual cup which when shaken will dispense a set of stones which will form the shape of a number. This number dictates the number of locations a player may move around the landscape.

For example, assume a player is currently positioned on the starting location. The player shakes the Oracle and receives the number '3'. This means the player can move to a destination which is within three path lengths of their current location. The game will automatically search pathways from the current location and highlight all of those which the player can move to. The player may then select the destination they wish to visit.

Once selected, the game will then wait for the player to enter that destination – typically by monitoring the GPS location of the phone and waiting for it to move within the known boundaries of the intended destination. Once the player has been detected as entering that destination the game will immediately subject them to various virtual actions or events depending upon the destination's type. Each destination on the map will be classified as one of the following: a 'no frills' location; a 'question' location; a 'key stone' location; a 'wild card' location; and 'The Exit' location. For example, the destination on the game map which corresponds to Costa Coffee may have been classified as a 'question' location within the game. Therefore, when the player is detected as entering Costa Coffee, the game will present the player with virtual actions or outcomes to perform which are befitting of a 'question' location (described below). The various destination types and their intended virtual outcomes are described below.

No Frills Locations

Some locations are 'no frills' destination types where nothing of interest happens. When a player enters a 'no frills' location, they simply shake the Oracle in order to move on to the next location.

Question Locations

Some locations are "question" destination types. These are locations where a player will be asked to answer a question or solve a puzzle before they can progress onto another location within the game. For example, "what is the capital city of Hungary?" The question will be presented and the user will type their answer. When a game of JADE is downloaded to play it will contain a collection of pre defined questions which can be used in these locations. Some questions may just be general knowledge. Some questions may ask something which relates specifically to the real world location that the player is currently situated within. For example, if the player happens to be in Costa Coffee, the question may ask about something which has been placed inside that location, e.g. "what colour of shirt is the 3rd person

from the left wearing in the poster on the Costa Coffee counter?" or "What is the last item on the menu?" etc. When retrieving questions to present within the current location, the location's id can be specified in order to receive questions which may relate specifically to that location.

If a player answers a question correctly they can use the Oracle to proceed to the next location in the game. If they answer incorrectly they won't be allowed to proceed until a correct answer has been provided. The same question will either be repeated over and over until the correct answer is provided. Or a different question entirely will be presented. When a player answers a question incorrectly, they will lose a percentage of their health, e.g. 10%. If a player's health falls below 15% they will be automatically requested to move to a 'regeneration' location within the game where their health will be replenished back to 100%. The regeneration location is typically the starting location for the game.

'Trade health for new question': in certain game locations, when a player is presented with a question that they don't know the answer to, they may be provided with an option to give up some of their health level (5%) instead of answering the question. In this case, a new question will be displayed to the player to try instead.

Keystone locations

Some locations are "key stone" destination types, i.e. they contain one of the virtual key stones which players are expected to collect during the game in order to be able to progress to the final "Exit" to unlock its door. Key stone locations are similar to Question locations, i.e. the player will be presented with a question. The only difference is that, if they get the answer correct they win a key stone, which will be placed into their bag.

Wildcard locations

Some locations are wild card destination types. When a player enters one of these they will find themselves subject to a virtual action or outcome which will either be beneficial or detrimental to their progress within the game. When a wildcard destination is entered a wildcard will be retrieved at random from a wildcard collection and presented to the player. The following wildcards will be provided:

- "Energy boost": the player's energy level will be increased by 10%
- "Question Immunity Spell": the player will be awarded a question immunity spell which they can add to their bag and can use this spell to help them bypass questions they don't know the answer to in future locations.
- "Give It Up": the player must relinquish something from their bag such as a key stone or question immunity spell, or give up 5% of their health.

A range of additional wildcards are planned for the future such as encountering various virtual creatures within game locations (e.g. serpents, trolls, School of Computing lecturers ☺) and being able to pick up virtual weapons, shields, or spells (e.g. invisibility cloaks, hypnotic trances, smoke screens). However, these will not be implemented in the current version of the game.

"The Exit" location

One of the locations in the game is the final destination type of "The Exit". This is the location which players will move to once they have gathered all three virtual key stones. When they enter this location the game will bring the key stones together to unlock a virtual door into "The Exit" and inform the player that they have completed the game.

Player messaging and status updates

In the initial version of JADE players simply make their own way around the game landscape without any direct interaction with other players. However, player 'messaging' will be supported, i.e. the ability for one player to broadcast a message to any other players who may be playing the same game at the same time. Messaging will primarily be handled by the JADE game server.

At the start of a player's turn (i.e. any time options are being presented to a player to select from), alongside options to shake the Oracle, etc., the player will be provided with an option to broadcast a message to other players. After entering their message the game application will issue the message text to the JADE game server along with the player's name and the id of the game they are currently playing. The game server will then handle the logic for recording the message and ensuring it is relayed to other players (the game server development team will be handling this).

At the start of a player's turn (i.e. any time options are being presented to select from), the game application can issue a request to the game server to retrieve any messages which have been broadcast by other players, if available. These will then be displayed to the player alongside the other game options, e.g. "Player 'x' says: 'Boo!' "

The game publishers are also keen to explore integration with social networking sites in order to promote awareness of the game and to build up a large user base. Therefore, during a player's turn, an option will also be provided to allow them to post a status update to Facebook, e.g. 'Craig is Grumpy because he lost 5% of his health'. The application will integrate via the Facebook API or web service interface in order to achieve this.