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# Revision History

# Project Description

## Introduction

Tower Defence is a type of real-time strategy video game that has been around since the early 1990’s. The object of the [game](#_Business_Entities) is to prevent computer controlled [enemies](#_Business_Entities) to get to the end of a certain linear path. To achieve this, the [player](#_Business_Entities) will strategically place [towers](#_Business_Entities) which will kill (or inflict some sort of damage) the [enemies](#_Business_Entities) before they reach the end of the path. Killing (or damaging) [enemies](#_Business_Entities) and completing certain levels and tasks will give [points](#_Business_Entities) and money to the player which can be used to buy more towers or even upgrade current ones in anticipation of stronger enemies in upcoming levels. [Hi-scores](#_Business_Entities) will be kept and the player will also have the option to create or edit his/her own [maps](#_Business_Entities). The visual theme of the game will be medieval/fantasy.

The purpose of this document is to outline exactly how this particular version of Tower Defence will run and the requirements and constraints imposed on the programmers of the [game](#_Business_Entities). A full domain model, in-depth use cases and an overview of the business rules associated with this project will also be contained within this document.

## Context

This [game](#_Business_Entities) is designed for players of all ages and of all video game skill levels. The concept of the game and the navigation of the options is simple enough for any player to pick up and play. In addition, player-chosen difficulty levels enable any player to play the game comfortably.

## Business Goals

The goal of this [game](#_Business_Entities) is to recapture the timeless charm and integrity of Tower Defence all while adding some new features to keep the [players](#_Business_Entities) on their toes. The variable difficulty level will also help in drawing in [players](#_Business_Entities) of all ages and skill levels to maximize the scope of [players](#_Business_Entities).

## Domain Model



As can be observed from the domain model, our user is a [Player](#_Business_Entities). [Player](#_Business_Entities) can play [Game](#_Business_Entities) on a [Map](#_Business_Entities) of his choice and earn a [Score](#_Business_Entities). In a Game, Player purchases and places [Structures](#_Business_Entities) on the Map. Structures act as defenses: they shoot [Projectiles](#_Business_Entities) that damage [Enemies](#_Business_Entities) which move along the [Path](#_Business_Entities). When an Enemy is killed, Player earns a given amount of [Score Points](#_Business_Entities) that he can use to purchase Structures.

There are many types of Structures, Projectiles and Enemies. Each type has specific parameters that make it unique.

Player can also use [Map Manager](#_Business_Entities) to manage Maps. Player can create, edit or delete Maps.

## Actors

Player is a User who plays the game.

# Functional Requirements

## Overview



## Use Cases

### Use Case: Enter Map Manager

**Successful Outcomes:**Primary Actor successfully enters Map Manager

|  |  |
| --- | --- |
| **Use Case Package** | Map Management |
| **ID** | UC-MM-01 |
| **Use Case Goal** | Primary actor enters Map Manager |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor has launched the game |
| **Domain Entities** | [Player, MapManager, Map](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to enter Map Manager |  |
| 2 | System launches Map Manager |  |
| 3 | *Use case end successfully* |  |

### Use Case: Create new map

**Successful Outcomes:**Primary Actor successfully creates new map

|  |  |
| --- | --- |
| **Use Case Package** | Map Management |
| **ID** | UC-MM-02 |
| **Use Case Goal** | Primary actor creates new Map |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor performed Enter Map Manager ([UC-MM-01](#_Use_Case:_Enter)). |
| **Domain Entities** | [Player, Map Manager, Map](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention of creating a new Map |  |
| 2 | System prompts Primary Actor to enter map properties. |  |
| 3 | Primary actor enters map properties and confirms (BR7). |  |
| 4 | System initializes and saves new map according to entered properties. |  |
| 5 | *Use case ends successfully.* |  |

**Alternative Flows:**

**3a The chosen map properties are invalid**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 3a.1 | The map properties chosen are invalid. |  |
| 3a.2 | System informs Primary Actor of the error and prompts re-try. |  |
| 3a.3 | *Use case resumes at Main Success Scenario step 2.* |  |

### Use Case: Edit map

**Successful Outcomes:**Primary Actor successfully edits parameters of a map

|  |  |
| --- | --- |
| **Use Case Package** | Map Management |
| **ID** | UC-MM-03 |
| **Use Case Goal** | Primary Actor edits parameters of a map |
| **Actors** | Primary Actor: Player |
| **Level** | Summary Goal |
| **Precondition** | Primary Actor performed Enter Map Manager ([UC-MM-01](#_Use_Case:_Enter)). |
| **Domain Entities** | [Player, Map Manager, Map](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to edit an existing map. |  |
| 2 | System prompts Primary Actor to select an existing map to edit. |  |
| 3 | Primary Actor selects existing map and confirms. |  |
| 4 | System loads selected map and presents Primary Actor with editing options. | Extended functionality is available after this step (more specific map editing options) |
| 5 | *Use case ends successfully.* |  |

**Alternative Flows:**

**2 System cannot locate an existing map valid for editing.**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 2.1 | System informs Primary Actor that no maps are available for editing. |  |
| 2.2 | *Use case ends unsuccessfully.* |  |

### Use Case: Edit scenery

<<extends>> Edit map @ Step 4

**Successful Outcomes:**

|  |  |
| --- | --- |
| **Use Case Package** | Map Management |
| **ID** | UC-MM-04 |
| **Use Case Goal** | Primary Actor edits scenery of Map |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor performed Enter Map Manager ([UC-MM-01](#_Use_Case:_Enter)). Primary Actor is currently editing a map ([UC-MM-03](#_Use_Case:_Edit)). |
| **Domain Entities** | [Player, Map Manager, Map](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to edit the scenery of an existing map. |  |
| 2 | System presents Primary Actor with scenery editing options. |  |
| 3 | Primary Actor edits scenery parameters of the map. |  |
| 4 | *Use case ends successfully.* |  |

**Alternative Flows:**

**3a Primary Actor enters invalid scenery parameters**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 3a.1 | System resets scenery parameters |  |
| 3a.2 | System notifies Primary Actor of failure to edit scenery |  |
| 3a.3 | *Use case ends unsuccessfully* |  |

### Use Case: Edit scenery elements

<<extends>> Edit map @ Step 4 <<includes>> Place Object

**Successful Outcomes:**

|  |  |
| --- | --- |
| **Use Case Package** | Map Management |
| **ID** | UC-MM-05 |
| **Use Case Goal** | Primary Actor edits scenery of Map |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor performed Enter Map Manager ([UC-MM-01](#_Use_Case:_Enter)). Primary Actor is currently editing a map ([UC-MM-03](#_Use_Case:_Edit)). |
| **Domain Entities** | [Player, Map Manager, Map](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to edit scenery elements |  |
| 2 | System presents Primary Actor with scenery element editing options | Options: edit scenery, add scenery element, move scenery element, edit path |
| 3 | Primary Actor edits scenery |  |
| 4 | System validates and applies new scenery parameters |  |
| 5 | *Use case ends successfully.* |  |

**Alternative Flows:**

**3a Primary Actor desires to move existing scenery element**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 3a.1 | Primary Actor selects existing scenery element which he desires to move |  |
| 3a.2 | Primary Actor performs Place Object ([UC-OI-01](#_Use_Case:_Place)) |  |
| 3a.3 | *Use case ends successfully* |  |

**3aa Place Object is performed unsuccessfully**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 3aa.1 | System resets position of scenery element |  |
| 3aa.2 | System notifies Primary Actor of failure to place scenery object |  |
| 3aa.3 | *Use case ends unsuccessfully* |  |

**3b Primary Actor desires to add a new scenery element**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 3b.1 | Primary Actor indicates intention to add a new scenery element |  |
| 3b.2 | System presents Primary Actor with available scenery elements |  |
| 3b.3 | Primary Actor selects a scenery element |  |
| 3b.4 | Primary Actor performs Place Object ([UC-OI-01](#_Use_Case:_Place)) |  |
| 3b.5 | *Use case ends successfully* |  |

**3bbPlace Object is performed unsuccessfully**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 3aa.1 | System resets position of scenery element |  |
| 3aa.2 | System notifies Primary Actor of failure to place scenery object |  |
| 3aa.3 | *Use case ends unsuccessfully* |  |

**4a System fails to validate new scenery parameters**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 4a.1 | System resets scenery parameters |  |
| 4a.2 | System notifies Primary Actor of failure to edit scenery |  |
| 4a.3 | *Use case ends unsuccessfully* |  |

### Use Case: Edit path

<<extends>>Edit scenery elements @ Step 2

**Successful Outcomes:**Primary Actor edits parameters of path

|  |  |
| --- | --- |
| **Use Case Package** | Map Management |
| **ID** | UC-MM-06 |
| **Use Case Goal** | Primary Actor edits path |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor is using Map Manager ([UC-MM-01](#_Use_Case:_Enter)). Primary Actor is currently editing a map ([UC-MM-03](#_Use_Case:_Edit)). Primary Actor desires to edit a Path element during Edit Scenery Elements ([UC-MM-04](#_Use_Case:_Edit_1)) |
| **Domain Entities** | [Player, Map Manager, Map, Path](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | System presents Primary Actor with path element editing options. |  |
| 2 | Primary Actor edits path parameters. |  |
| 3 | System validates new path parameters ([BR6](#_Business_Rules)) |  |
| 4 | *Use case ends successfully.* |  |

**Alternative Flows**

**4a System fails to validate new path parameters**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 4a.1 | System resets path parameters |  |
| 4a.2 | System notifies Primary Actor of failure to edit path |  |
| 4a.3 | *Use case ends unsuccessfully* |  |

### Use Case: Save map

<<extends>> Edit map@ Step 5

**Successful Outcomes:**Primary Actor saves currently open map

|  |  |
| --- | --- |
| **Use Case Package** | Map Management |
| **ID** | UC-MM-07 |
| **Use Case Goal** | Primary Actor saves currently open map |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor is using Map Manager ([UC-MM-01](#_Use_Case:_Enter)). Primary Actor is currently editing a map ([UC-MM-03](#_Use_Case:_Edit)). |
| **Domain Entities** | [Player, Map Manager, Map](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to save currently open map |  |
| 2 | System prompts Primary Actor to enter a map name |  |
| 3 | Primary Actor enters map name and confirms |  |
| 4 | System validates map parameters and entered map name ([BR7](#_Business_Entities)) |  |
| 5 | *Use case ends successfully.* |  |

**Alternative Flows**

**4a System fails to validate map parameters**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 4a.2 | System notifies Primary Actor of failure to save map |  |
| 4a.3 | *Use case ends unsuccessfully* |  |

### Use Case: Delete map

<<includes>> Enter MapManager

**Successful Outcomes:**Primary Actor deletes an existing map

|  |  |
| --- | --- |
| **Use Case Package** | Map Management |
| **ID** | UC-MM-08 |
| **Use Case Goal** | Primary Actor successfully deletes an existing map |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor is using Map Manager ([UC-MM-01](#_Use_Case:_Enter)). |
| **Domain Entities** | [Player, Map Manager, Map](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to delete an existing map. |  |
| 2 | System prompts Primary Actor to select a map from existing maps |  |
| 3 | Primary Actor selects map to delete |  |
| 4 | System prompts Primary Actor for confirmation |  |
| 5 | Primary Actor confirms |  |
| 6 | System deletes selected map |  |
| 7 | *Use case ends successfully.* |  |

**Alternative Flows:**

**4a Primary Actor cancels the deletion of map**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 4a.1 | Primary Actor indicates intention to cancel the deletion of map |  |
| 4a.2 | System aborts the deletion of map |  |
| 4a.3 | *Use case ends unsuccessfully* |  |

### Use Case: Create New Profile

**Successful Outcomes:** Primary Actor creates a new profile

|  |  |
| --- | --- |
| **Use Case Package** | Game Time |
| **ID** | UC-GT-01 |
| **Use Case Goal** | Primary Actor successfully enters SinglePlayer |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Username has to be available ([BR9](#_Business_Rules)). Password has to be valid ([BR10](#_Business_Rules)). |
| **Domain Entities** | [Player, SinglePlayer](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to create a new profile and enter the game as a new user. |  |
| 2 | System prompts Primary Actor for his new username and password. |  |
| 3 | Primary Actor types well his username and password. |  |
| 4 | Primary Actor enters the game. |  |
| 5 | *Use case ends successfully.* |  |

**Alternative Flows:**

**3a Existing username**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 3a.1 | Primary Actor types in an existing username. |  |
| 3a.2 | System prompts re-try creating an account with a different username. |  |
| 3a.3 | Primary Actor confirms. |  |
| 3a.4 | *Use case resumes at Main Success Scenario step 2.* |  |

**3b Invalid password**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 3b.1 | Primary Actor types in an invalid password. |  |
| 3b.2 | System prompts re-try creating an account with a valid password. |  |
| 3b.3 | Primary Actor confirms. |  |
| 3b.4 | *Use case resumes at Main Success Scenario step 2.* |  |

**3c Existing username or wrong password**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 3b.1 | Primary Actor types in an existing username or password. |  |
| 3b.2 | System prompts re-try entering his credentials. |  |
| 3b.3 | Primary Actor denies. |  |
| 3b.4 | *Use case ends unsuccessfully.* |  |

### Use Case: Login

**Successful Outcomes:** Primary Actor logs in

|  |  |
| --- | --- |
| **Use Case Package** | Game Time |
| **ID** | UC-GT-01 |
| **Use Case Goal** | Primary Actor successfully enters SinglePlayer |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Existing Profile ([BR11](#_Business_Rules)). |
| **Domain Entities** | [Player, SinglePlayer](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to enter the game with his existing profile. |  |
| 2 | System prompts Primary Actor for his username and password. |  |
| 3 | Primary Actor types well his username and password. |  |
| 4 | Primary Actor enters the game. |  |
| 5 | *Use case ends successfully.* |  |

**Alternative Flows:**

**3a Wrong username or password**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 3a.1 | Primary Actor types in a wrong username or password. |  |
| 3a.2 | System prompts re-try entering his credentials. |  |
| 3a.3 | Primary Actor confirms. |  |
| 3a.4 | *Use case resumes at Main Success Scenario step 2.* |  |

**3b Wrong username or password**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 3b.1 | Primary Actor types in a wrong username or password. |  |
| 3b.2 | System prompts re-try entering his credentials. |  |
| 3b.3 | Primary Actor denies. |  |
| 3b.4 | *Use case ends unsuccessfully.* |  |

### Use Case: Start new game

<<includes>> Select map

**Successful Outcomes:** Primary Actor selects map to play on

|  |  |
| --- | --- |
| **Use Case Package** | Game Time |
| **ID** | UC-GT-01 |
| **Use Case Goal** | Primary Actor successfully selects map |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor has performed Login ([UC-PM-01](#_Use_Case:_Login)). |
| **Domain Entities** | [Player, SinglePlayer, Game, Map](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to start a new game. |  |
| 2 | System prompts Primary Actor to select map. |  |
| 3 | Primary Actor performs Select map ([UC-GT-02](#_Use_Case:_Select)) |  |
| 4 | System responds by presenting the properties of the new Game and prompts Primary Actor for confirmation. |  |
| 5 | Primary Actor confirms. |  |
| 6 | System initializes a new game. |  |
| 7 | *Use case ends successfully.* |  |

**Alternative Flows:**

**3a Select Map ends unsuccessfully.**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 3a.1 | System notifies Primary Actor that a new game could not be started. |  |
| 3a.2 | Primary Actor confirms. |  |
| 3a.3 | *Use case ends unsuccessfully.* |  |

### Use Case: Select map

**Successful Outcomes:** Primary Actor selects map to play on

|  |  |
| --- | --- |
| **Use Case Package** | Game Time |
| **ID** | UC-GT-02 |
| **Use Case Goal** | Primary Actor successfully selects map |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor has performed login ([UC-PM-01](#_Use_Case:_Login)). |
| **Domain Entities** | [Player, SinglePlayer, Game](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | System notifies Primary Actor of available maps. |  |
| 2 | Primary Actor indicates intention to select a specific Map. |  |
| 3 | System responds by presenting the properties of the selected Map and prompts Primary Actor for confirmation. |  |
| 4 | Primary Actor confirms. |  |
| 5 | *Use case ends successfully.* |  |

**Alternative Flows:**

1a System cannot locate any existing maps.

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1a.1 | System notifies Primary Actor that no maps exist. |  |
| 1a.2 | Primary Actor confirms. |  |
| 1a.3 | *Use case ends unsuccessfully.* |  |

### Use Case: Load game

**Successful Outcomes:**Primary Actor loads a saved game

|  |  |
| --- | --- |
| **Use Case Package** | Game Time |
| **ID** | UC-GT-03 |
| **Use Case Goal** | Primary Actor successfully loads a game |
| **Actors** | Primary Actor: Player |
| **Level** | Summary Goal |
| **Precondition** | Primary Actor has performed login ([UC-PM-01](#_Use_Case:_Login)).Player has saved games ([BR 8](#_Business_Rules)). |
| **Domain Entities** | [Player, SinglePlayer, Map, Game](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to load a game. |  |
| 2 | System prompts Primary Actor to select a game to load from a list. |  |
| 3 | Primary Actor selects and confirms. |  |
| 4 | System loads map and starts up a Game. |  |
| 5 | *Use case ends successfully.* |  |

**Alternative Flows:**

**2a. No saved games exist**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 2a.1 | System notifies Primary Actor that no saves games exist. |  |
| 2a.2 | Primary Actor confirms. |  |
| 2a.3 | *Use case ends unsuccessfully.* |  |

### Use Case: Play game

**Successful Outcomes:**Primary Actor begins to play a game

|  |  |
| --- | --- |
| **Use Case Package** | Game Time |
| **ID** | UC-GT-04 |
| **Use Case Goal** | Primary Actor successfully beings to play a game |
| **Actors** | Primary Actor: Player |
| **Level** | Summary Goal |
| **Precondition** | Primary Actor has performed login ([UC-PM-01](#_Use_Case:_Login)). Primary Actor has performed Load Game ([UC-GT-03](#_Use_Case:_Load)) or Start New Game ([UC-GT-01](#_Use_Case:_Start)). |
| **Domain Entities** | [Player, SinglePlayer, Map, Game](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to start a game. |  |
| 2 | System prompts Primary Actor for confirmation about starting a new game on specified map. |  |
| 3 | Primary Actor confirms. |  |
| 4 | System loads map and starts up a Game. |  |
| 5 | *Use case ends successfully.* |  |

### Use Case: Start enemy attack

<<extends>> Play game @ Step 4

**Successful Outcomes:**Primary Actor starts an enemy attack

|  |  |
| --- | --- |
| **Use Case Package** | Game Time |
| **ID** | UC-GT-04 |
| **Use Case Goal** | Primary Actor successfully starts an enemy attack |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor is using SinglePlayer ([UC-GT-01](#_Use_Case:_Start)). Primary Actor is playing a game ([UC-GT-03](#_Use_Case:_Play)). |
| **Domain Entities** | [Player, SinglePlayer, Game, Enemy](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to start enemy attack. |  |
| 2 | System verifies if map contains defensive Structures. |  |
| 3 | System starts an enemy attack. |  |
| 4 | *Use case ends successfully.* |  |

**Alternative Flows:**

**2a. System discovers that no defensive structures exist on map**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 2a.1 | System informs Primary Actor that there are no defensive structure placed. |  |
| 2a.2 | Primary Actor confirms. |  |
| 2a.3 | System aborts enemy attack. |  |
| 2a.4 | *Use case ends unsuccessfully.* |  |

### Use Case: Sell structure

**<<**extends>> Play game @ Step 4

**Successful Outcomes:**Primary Actor sells an existing structure

|  |  |
| --- | --- |
| **Use Case Package** | Game Time |
| **ID** | UC-GT-06 |
| **Use Case Goal** | Primary Actor successfully sells an existing Structure |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor is using SinglePlayer ([UC-GT-01](#_Use_Case:_Start)). Primary Actor is playing a game ([UC-GT-03](#_Use_Case:_Play)). Structure exists in Game ([BR2](#_Business_Rules)). |
| **Domain Entities** | [Player, SinglePlayer, Game, Structure](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention of selling a specific structure. |  |
| 2 | System prompts Primary Actor to confirm the sale. |  |
| 3 | Primary Actor confirms. |  |
| 4 | System removes the structure and updates user's resources with its resell value. |  |
| 5 | *Use case ends successfully.* |  |

### Use Case: Buy structure

<<extends>> Play game; <<includes>> Place Object

**Successful Outcomes:**Primary Actor buys a structure

|  |  |
| --- | --- |
| **Use Case Package** | Game Time |
| **ID** | UC-GT-06 |
| **Use Case Goal** | Primary Actor successfully buys a Structure |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor is using SinglePlayer ([UC-GT-01](#_Use_Case:_Start)). Primary Actor is playing a game ([UC-GT-03](#_Use_Case:_Play)). Player has enough Score Points ([BR3](#_Business_Rules)). |
| **Domain Entities** | [Player, SinglePlayer, Game, Structure](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention of buying a structure. |  |
| 2 | System verifies the available resources of the Primary Actor. Then prompts the Primary Actor to confirm. |  |
| 3 | Primary Actor confirms. |  |
| 4 | Primary Actor performs Place Object ([UC-GT-07](#_Use_Case:_Place)) |  |
|  | *Use case ends successfully.* |  |

**Alternative Flows:**

**2a. Not Enough Available Resources**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 2a.1 | System informs Primary Actor that there is not enough available resources. |  |
| 2a.2 | Primary Actor aborts. |  |
| 2a.3 | *Use case ends unsuccessfully.* |  |

### Use Case: Place object

**Successful Outcomes:**Primary Actor places a structure

|  |  |
| --- | --- |
| **Use Case Package** | Object Interaction |
| **ID** | UC-OI-01 |
| **Use Case Goal** | Primary Actor successfully places a Structure |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor is currently performing Play Game ([UC-GT-03](#_Use_Case:_Play)) or Edit Map ([UC-MM-03](#_Use_Case:_Edit)). |
| **Domain Entities** | [Player, SinglePlayer, Game, Structure](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates where to put the Structure on the Map. |  |
| 2 | System verifies if the selected area if appropriate. |  |
| 3 | System places the Structure at the area specified by the Primary Actor. |  |
| 4 | *Use case ends successfully.* |  |

**Alternative Flows:**

**2a. Selected Area is Invalid**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 2a.1 | System informs Primary Actor that the selected area is invalid and prompts re-try. |  |
| 2a.2 | *Use case resumes at Main Success Scenario step 1.* |  |

**2a. Selected Area is Invalid**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 2a.1 | System informs Primary Actor that the selected area is invalid and prompts re-try. |  |
| 2a.2 | Primary Actor aborts. |  |
| 2b.3 | *Use case ends unsuccessfully.* |  |

### Use Case: Exit game

<<extends>> Play Game

**Successful Outcomes:**Primary Actor exits Game

|  |  |
| --- | --- |
| **Use Case Package** | Game Time |
| **ID** | UC-GT-09 |
| **Use Case Goal** | Primary Actor successfully exits the Game |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor is using SinglePlayer ([UC-GT-01](#_Use_Case:_Start)). Primary Actor is playing a game ([UC-GT-03](#_Use_Case:_Play)). |
| **Domain Entities** | [Player, SinglePlayer, Game](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention of exiting the Game. |  |
| 2 | System prompts the Primary Actor for confirmation |  |
| 3 | Primary Actor confirms. |  |
| 4 | System sends Primary Actor to the main menu. |  |
| 5 | *Use case ends successfully.* |  |

### Use Case: Save game

**Successful Outcomes:**Primary Actor saves a Game

|  |  |
| --- | --- |
| **Use Case Package** | Game Time |
| **ID** | UC-GT-10 |
| **Use Case Goal** | Primary Actor successfully saves a Game |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor is using SinglePlayer ([UC-GT-01](#_Use_Case:_Start)). Primary Actor is playing a game ([UC-GT-03](#_Use_Case:_Play)). Valid Game Name ([BR5](#_Business_Rules)). |
| **Domain Entities** | [Player, SinglePlayer, Game](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to save the current Game. |  |
| 2 | System prompts Primary Actor to enter a name and to confirm. |  |
| 3 | Primary Actor confirms. |  |
| 4 | *Use case ends successfully.* |  |

**Alternative Flows:**

**2a Invalid Name Entered**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 2a.1 | Name entered by the Primary Actor is not valid. |  |
| 2a.2 | System informs Primary Actor of the error and prompts re-try. |  |
| 2a.3 | *Use case resumes at Main Success Scenario step 1.* |  |

**2b Invalid Name Entered**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 2b.1 | Name entered by the Primary Actor is not valid. |  |
| 2b.2 | System informs Primary Actor of the error and prompts re-try. |  |
| 2b.3 | Primary Actor aborts. |  |
| 2b.4 | *Use case ends unsuccessfully.* |  |

### Use Case: View score

<<extends>> Play Game

**Successful Outcomes:**Primary Actor views Score

|  |  |
| --- | --- |
| **Use Case Package** | Game Time |
| **ID** | UC-GT-12 |
| **Use Case Goal** | Primary Actor successfully view score |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor is using SinglePlayer([UC-GT-01](#_Use_Case:_Start)). |
| **Domain Entities** | [Player, SinglePlayer, Score, Score Point](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to view Score. |  |
| 2 | System responds by presenting a list of Scores. |  |
| 3 | *Use case ends successfully.* |  |

### Use Case: Inspect Structure

**Successful Outcomes:**Primary Actor inspects a Structure

|  |  |
| --- | --- |
| **Use Case Package** | Game Time |
| **ID** | UC-GT-13 |
| **Use Case Goal** | Primary Actor successfully inspects a Structure |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor is using SinglePlayer ([UC-GT-01](#_Use_Case:_Start)). Primary Actor is playing a game ([UC-GT-03](#_Use_Case:_Edit)). Primary Actor has placed a structure ([UC-GT-07](#_Use_Case:_Place)). |
| **Domain Entities** | [Player, SinglePlayer, Game, Structure](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to inspect a specific Structure. |  |
| 2 | System responds by presenting the properties of the selected Structure. |  |
| 3 | *Use case ends successfully.* |  |

**Alternative Flows:**

**3a Primary Actor Inspects Another Structure**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 3a.1 | Primary Actor wished to continue inspecting Structures. |  |
| 3a.2 | *Use case restarts at step 1.* |  |

### Use Case: Upgrade Structure

**Successful Outcomes:**Primary Actor inspects a Structure

|  |  |
| --- | --- |
| **Use Case Package** | Game Time |
| **ID** | UC-GT-14 |
| **Use Case Goal** | Primary Actor successfully upgrades a Structure |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor is using SinglePlayer ([UC-GT-01](#_Use_Case:_Start)). Primary Actor is playing a game ([UC-GT-03](#_Use_Case:_Play)). Primary Actor has placed a structure ([UC-GT-07](#_Use_Case:_Place)). Player has enough Score Points ([BR3](#_Business_Rules)). |
| **Domain Entities** | [Player, SinglePlayer, Game, Structure](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to upgrade a specific Structure. |  |
| 2 | System verifies the available resources of the Primary Actor. Then prompts the Primary Actor to confirm. |  |
| 3 | Primary Actor confirms. |  |
| 4 | *Use case ends successfully.* |  |

**Alternative Flows:**

**2a. Not Enough Available Resources**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 2a.1 | System informs Primary Actor that there is not enough available resources. |  |
| 2a.2 | Primary Actor aborts. |  |
| 2a.3 | *Use case ends unsuccessfully.* |  |

### Use Case: Inspect Enemy

**Successful Outcomes:**Primary Actor inspects a Structure

|  |  |
| --- | --- |
| **Use Case Package** | Game Time |
| **ID** | UC-GT-15 |
| **Use Case Goal** | Primary Actor successfully inspects a Structure |
| **Actors** | Primary Actor: Player |
| **Level** | User Goal |
| **Precondition** | Primary Actor is using SinglePlayer ([UC-GT-01](#_Use_Case:_Start)). Primary Actor is playing a game ([UC-GT-03](#_Use_Case:_Play)). Primary Actor has started an enemy attack ([UC-GT-04](#_Use_Case:_Start_1)). |
| **Domain Entities** | [Player, SinglePlayer, Game, Enemy](#_Business_Entities) |

**Main Success Scenario:**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 1 | Primary Actor indicates intention to inspect a specific Enemy. |  |
| 2 | System responds by presenting the properties of the selected Enemy. |  |
| 3 | *Use case ends successfully.* |  |

**Alternative Flows:**

**3a Primary Actor Inspects Another Structure**

|  |  |  |
| --- | --- | --- |
| **Step** | Action | Notes |
| 3a.1 | Primary Actor wished to continue inspecting Enemies. |  |
| 3a.2 | *Use case restarts at step 1.* |  |

## User Story Conversion

## Business Rules

|  |  |  |  |
| --- | --- | --- | --- |
| **Number** | **Label** | **Business Rule** | **Notes** |
| BR2 | Structure exists in Game | Before starting an attack, the System will check if there are any Structure in Game, so that the Primary Actor can defend itself. Also, if the Player wants to sell a Structure, there should be an existing one in Game. |  |
| BR3 | Player has enough Score Points | In order to buy or upgrade a Structure, an amount of Score Points are required. Once the Structure has been successfully bought or upgraded, the required Score Points will be deducted. |  |
| BR4 | Valid selected area for Structure | Structures must be placed in an area on the Map that is not part of the Path or not already occupied by other Structures. |  |
| BR5 | Valid Game Name | For the name of the saved Game to be valid, it must be between 1 and 30 characters, and only contain numbers ['0'...'9'], lowercase ['a'...'z'] and upper case letters ['A'...'Z'], dashes ['-'], and underscores ['\_']. The name must also be unique. |  |
| BR6 | Valid Path | The path created on the map has to be continuous and contain no loop. It must have a starting and an ending point. |  |
| BR7 | Valid Map | A valid map name must be between 1 and 30 characters, and only contain numbers ['0'...'9'], lowercase ['a'...'z'] and upper case letters ['A'...'Z'], dashes ['-'], and underscores ['\_']. The size of the map must be [10-30]x[10-30]. In the presence of a path, path must be valid. |  |
| BR8 | Saved Game | To load a Game, there must be an existing saved game. |  |
| BR9 | Valid Username | For the username to be valid, it must be unoccupied by another user. |  |
| BR10 | Valid Password | For the password of the user to be valid, it must be between 5 and 15 characters, and only contain numbers [‘0’...’9’], lowercase [‘a’...’z’] and upper case letters [‘A’...’Z’], dashes[‘-‘], and underscores [‘\_’]. |  |
| BR11 | Existing Profile | In order to log in a profile, there must be an existing one. |  |

# Non-Functional Requirements

With regards to the non-functional requirements, it is essential that the game be user friendly. This includes menus and options that are easily navigable and that are simple to understand. The game must look nice and presentable and in-game options must be organized in a way which will not confuse the user.

In addition, the game will be in English. It is thus imperative to avoid any spelling or grammar mistakes in the text of the game.

# Design Constraints

In terms of constraints, the first and most important thing to note is that this game must be completed by the first week of April. It is essential that this time constraint be respected.

It is also required that this game be programmed in JAVA and that all in-game sprites be designed using the Swing library and public-use images. While little intricate features of the game are open to programmer imagination, the integrity of the original Tower Defence game must be maintained. The following features must be present:

* Main menu and Hi-scores complete with a user login feature.
* A functional map editor which can differentiate between valid and non-valid maps. The path and the scenery must be separate. (Path must have one entry and one exit point)
* Currency system to buy different types of towers with different attributes. (Status ailment, range, strength, projectile type etc…)
* Enemies (Wave-based) that will oppose the player. There will be several types of enemies each with their own unique attributes. (Hit points, speed, kill worth etc…)
* Towers can only be put on the scenery and enemies can only travel on the path.

While these features must be present the final design can also include additional features

# Glossary

## Business Entities

|  |  |
| --- | --- |
| **Business Entity** | **Description** |
| Player | User of the application able to play games and create or edit maps. |
| Map Manager | System that allows Player to create new or edit existing maps. |
| Singleplayer | System that allows Player to play on existing maps. |
| Game | Description of the progress of Player playing Singleplayer. |
| Map | Visual and logical description of the game world on which Player can play on. |
| Path | Sequence of tiles on Map that Enemies are allowed to move along. |
| Score | Total score achieved by Player while playing Game. |
| Score Point | In-game currency that can be earned by eliminating Enemies and spent on purchasing Structures. |
| Structure/Tower | Purchasable defenses placed on Map by Player during Game. Structures shoot Projectiles at Enemies. |
| Projectile | In-game objects that damage and eliminate Enemies thus earning Score Points to add to Player’s Score. |
| Enemy | Physical objects that move along Path on Game’s Map and can damage Player’s base upon reaching it. |

# References

**Daniel Sinnig PhD**: Lecture Slides, ECSE-321.