

Graded Unit 2: Planning

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# Design

## Elevator Pitch

Dusk Of The Universe is a tower defence game in which the player must defend a VIP from an alien horde. Over the course of the game, the player will have to move the VIP to the other side of the map to win, however will be attacked more frequently towards the end. This means the player must not only pay attention to the aliens gaining ground, but the whereabouts of the VIP as well as the relative positioning of towers to defend it.

## USPs

* The game is a two sided battle in which the player wins by aggressively getting their VIP to the other side of the map using user made towers and, against increasing pressure of attack.
* The player must construct towers out of tower components that will be unlocked as the player makes progress.
* The number of towers the player can build on the map has severe limits, this means that the player must shift towers around to bring the VIP to the goal.
* Player can only truly accurately pinpoint an alien’s whereabouts with the range of a tower, anywhere else will make it exceedingly difficult to find them.
* Each level will have aliens with different appearances, **the player must figure out what alien does what and how to fight it**. The game will leave it to the player to figure out the strengths and weaknesses of each alien. After enough of a particular alien has been killed, a page on that alien will be added to the wiki for reference.

## Key Features

* Towers can be constructed from earned components.
* Player must figure out the strengths/weaknesses of each alien.
* Controllable VIP must reach the other side of the map by reorganizing and moving towers to win.

## Target Audience, Platform and Genre

10yrs+ according to the ESRB 10+ rating. The actual target audience will not only be kids and younger teenagers, but young adults that enjoy strategy games with a little story as well.

Platform: PC

Genre(s): Sci-fi, Story, Strategy, Tower Defence.

## Hook

Construct towers with unique properties and abilities to fight off aliens that are attack your VIP. Get the VIP to the other side of the map while aggressively moving towers to cover them.

## Gameplay (Level View)

The player will start the level with their VIP at the right hand side entrance of the map. The VIP is surrounded by guards that will follow and defend him, they are not invulnerable however. The player will have a starting amount of cash that can be upgraded as they progress through the game. This cash will be used for building towers the player has designed. When the player is ready the wave will begin and the VIP will become controllable. **The VIP can only move when waves are in progress.** When the wave starts, the aliens will go for the VIP (unless the alien attacks towers, in which case it will attack them if seen first). The longer the game carries on, the harder it becomes and the more diverse the waves will be. If the player takes too long to get the VIP to the goal, the VIP and guards will get overwhelmed by sheer numbers and force, putting time pressure on completing the level.

## Gameplay (Construction View)

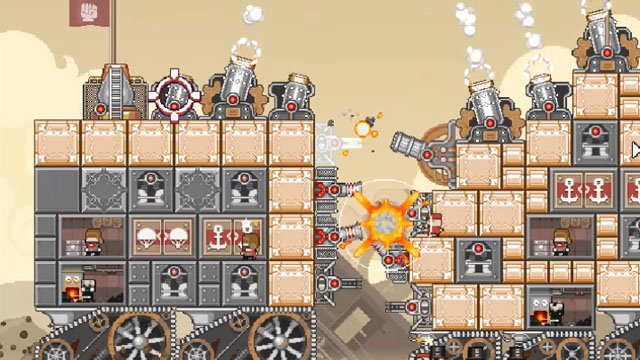
Throughout a level the player must manage, reorganize and shuffle towers around the VIP to win. This process will also include the activity of constructing the towers. The player can make use of different tower sizes (small, medium, large, perhaps even an expensive extra-large variant) as bases for construction. Each size will have component limits. On this base the player must place a rotor base component on which the rest of the components of the tower will rely on for basic aiming function.

The rotor base components will come as various types of base with different slots, allowing more complex designs to be built. On this the regular components will be added. These parts will have slots for utility modules and offensive modules (the balance of these modules that the player utilizes will determine the ending of the story). Utility modules will include booster mods (enhance all other modules specified by the booster) and offensive modules will be weapons. The stats/abilities of the tower will also be displayed for the player to see.

To get an idea of how the tower editor will look, see Space Pirates And Zombies & Legends of Pegasus ship editors and mash them together. The tower would start with the base block. This base block will have an amount of health, capacity for tower (component and module count) and a single slot on which the base rotor will sit. There will be tree types of base rotor; basic, standard and advanced which will have 1, 2 and 4 chassis slots respectively. Chassis slots will hold the useful components. These are the offensive and utility modules. This system would mean that with few components and modules, many combinations and unique towers can be created by the player. This would be one of the core aspects of the game.

## Art Style

The art style being aimed for is of the pixel art type. It will be simple with a little detail like more modern pixel art games.



The art style being aimed at will similarly resemble the art style of Steamlands pictured right. It will resemble 8 bit art with a little more complexity than is usually found in the 8 bit category. The idea is to make it simple, with a little detail so that it is still interesting.

Steamlands source **[1]**

Something to note is that while there is decent detail in the art, it also has a simplicity that is pleasant to look at, and thus has a nice retro feeling. It gives the player a very nice experience of the game and also lets the player be more able to focus on the complexity of the gameplay itself, rather than be overwhelmed by the art detail, giving emphasis to the game mechanics.

Story screens that may be used however will be more focused on the detail since that is one of the main function of the screens.

## Competitive Analysis

Dusk Of The Universe has no direct competitor, however similarities can be found in other games within its genre of tower defence.

### Create your own Tower Defence (CyoTD for short) **[2]**

A game found on multiple web game sites by Fun Flow Studios. The major similarity here is the ability to create custom towers, however the major difference is that here it is not constricted.

While Dusk Of The Universe restricts how towers are made by slots and module counts, CyoTD allows you to customize the look and the attributes of the towers you make directly. This means you could have a tower with nigh incalculable range and damage with a cost of 1 credit if you so wished.

A major difference between them is the pathfinding, as CyoTD follows paths determined by the creator. Dusk Of The Universe on the other hand will follow a target around the map and will clamp on both sides on some situations.

### Gemcraft Games **[3]**

Relatively well known among web game players and more so among tower defence enthusiasts is the Gemcraft series. The similarity this game shares is a little more direct than the game above. In Gemcraft you can make towers of custom attributes by combining gems of different types to create unique mixtures of abilities.

The difference in tower customization with Dusk Of The Universe is that instead of fusing components, the towers will be constructed, much like a Lego tower for example. You cannot build more of the tower if you run out of bricks and is limited by the foundations made (in this games case, the foundations used). Gemcraft however combines the different gems into a single gem as opposed to connecting them together.

Another similarity is the variable paths as Gemcrafts creeps can be routed by building walls and extending their travelling distance. However the player cannot block them from their goal directly by building walls all around their goal. The main difference is that the goal of the creeps of Gemcraft is immobile and cannot move. In Dusk Of The Universe the player must move their VIP to an optimal position to succeed.

## Media Catalogue

### Art Work

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Total Dimensions (Width) x (Height) | Resolution DPI | Colour Depth | Format |
| Terrain Sheet | (144) x (288) | 36 | 8 | PNG |
| Monster Sheet | (288) x (1728) | 36 | 8 | PNG |
| Player Animation Sheet | (288) x (144) | 36 | 8 | PNG |
| Guard Animation Sheet | (288) x (144) | 36 | 8 | PNG |
| Module Sheet | (288) x (504) | 36 | 8 | PNG |
| Module Icon Sheet | (504) x (36) | 36 | 8 | PNG |
| Projectile Sheet | (288) x (504) | 36 | 8 | PNG |
| GUI and Buttons (Variable) | (36 – 720) x (36 – 720) | 36 | 8 | PNG |

#### Terrain Sheet

|  |  |
| --- | --- |
| Name / Purpose | Section Dimensions (Width) x (Height) |
| Level 1 Tile sheet – Contains frames of tiles to be used on level 1 such as:   * Path Tile * Path Border Tiles * Environment Tiles | (144) x (72) |
| Level 2 Tile sheet – Contains frames of tiles to be used on level 2 such as:   * Path Tile * Path Border Tiles * Environment Tiles | (144) x (72) |
| Level 3 Tile sheet – Contains frames of tiles to be used on level3 such as:   * Path Tile * Path Border Tiles * Environment Tiles | (144) x (72) |
| Level 4 Tile sheet – Contains frames of tiles to be used on level 4 such as:   * Path Tile * Path Border Tiles * Environment Tiles | (144 x (72) |

#### Monster Sheet

|  |  |
| --- | --- |
| Name / Purpose | Section Dimensions (Width) x (Height) |
| Type 1 Alien Animation Sheet for Level 1 | (288) x (144) |
| Type 2 Alien Animation Sheet for Level 1 | (288) x (144) |
| Type 3 Alien Animation Sheet for Level 1 | (288) x (144) |
| Type 1 Alien Animation Sheet for Level 2 | (288) x (144) |
| Type 2 Alien Animation Sheet for Level 2 | (288) x (144) |
| Type 3 Alien Animation Sheet for Level 2 | (288) x (144) |
| Type 1 Alien Animation Sheet for Level 3 | (288) x (144) |
| Type 2 Alien Animation Sheet for Level 3 | (288) x (144) |
| Type 3 Alien Animation Sheet for Level 3 | (288) x (144) |
| Type 1 Alien Animation Sheet for Level 4 | (288) x (144) |
| Type 2 Alien Animation Sheet for Level 4 | (288) x (144) |
| Type 3 Alien Animation Sheet for Level 4 | (288) x (144) |

#### Module Sheet

|  |  |
| --- | --- |
| Name / Purpose | Section Dimensions (Width) x (Height) |
| Normal Cannon Animation Sheet | (288) x (36) |
| Heavy Cannon Animation Sheet | (288) x (36) |
| Laser Cannon Animation Sheet | (288) x (36) |
| Missile Cannon Animation Sheet | (288) x (36) |
| Flame Cannon Animation Sheet | (288) x (36) |
| Splash Area Cannon Animation Sheet | (288) x (36) |
| Siege Laser Cannon Animation Sheet | (288) x (36) |
| Range Booster | (288) x (36) |
| Time Dilator | (288) x (36) |
| Damage Booster | (288) x (36) |
| Rate of Fire Booster | (288) x (36) |
| Health Booster | (288) x (36) |
| Healing Module (Guards) | (288) x (36) |
| Motivator (Guard power up) | (288) x (36) |

#### Projectile Sheet

|  |  |
| --- | --- |
| Name / Purpose | Section Dimensions (Width) x (Height) |
| Normal Projectile Animation Sheet | (288) x (36) |
| Normal Projectile Hit Animation Sheet | (288) x (36) |
| Heavy Projectile Animation Sheet | (288) x (36) |
| Heavy Projectile Hit Animation Sheet | (288) x (36) |
| Laser Animation Sheet | (288) x (36) |
| Laser Hit Animation Sheet | (288) x (36) |
| Missile Animation Sheet | (288) x (36) |
| Missile Explosion Animation Sheet | (288) x (36) |
| Flame Animation Sheet | (288) x (36) |
| Flame Hit Animation Sheet | (288) x (36) |
| Splash Area Animation Sheet | (288) x (36) |
| Splash Area Hit Animation Sheet | (288) x (36) |
| Siege Laser Animation Sheet | (288) x (36) |
| Siege Laser Hit Animation Sheet | (288) x (36) |

## Audio

|  |  |  |
| --- | --- | --- |
| Name / Purpose | Length (mins: seconds) | Format |
| Main Menu Music | 3: 00? | MP3 |
| Level Selection Menu Music | 3: 00? | MP3 |
| Level Music (Levels 1, 2, 3 & 4) | 3: 00? | MP3 |
| Cut scene / Ending Music | 3: 00? | MP3 |
| Normal & Heavy Cannon Sounds Effects | 0: 01? | WAV |
| Laser Sound Effects | 0: 01? | WAV |
| Missile Sound Effects | 0: 01? | WAV |
| Flame Sound Effects | 0: 01? | WAV |
| Splash Area Sound Effects | 0: 01? | WAV |
| Guard Fighting Effects | 0: 01? | WAV |
| Monster Fighting Effects | 0: 01? | WAV |
| Monster Death Effects | 0: 02? | WAV |

## Game AI Requirements

The in game AI will include 3 different aliens, guards and towers.

### Aliens

All aliens will be trying to attack the player’s VIP in order to beat the player however not always directly. Type 1 aliens simply travel towards the player and will clash with guards (if applicable i.e. the guard is alive and in the way) and also travel at a decent pace. Type 2 aliens will travel quickly, have slightly decreased maximum health, but will prioritize towers over the player and will also go off the path to achieve this if necessary. Type 3 aliens will be “tanky”, thus having a much larger max health, however, they are slow and will also ignore guards attacking them in favour of the player. Guards will still attack the type 3 as normal despite not slowing it down or stopping it.

### Guards

Guards are half player controlled, half AI. The player can redirect guards to help with defence of the VIP, however this is where the control ends. The guards will automatically intercept aliens heading for the VIP within a certain distance. The guards will then lock combat with them until either manually ordered to move, the enemy is killed or they are killed. This will prevent aliens from moving forwards (with the exception of type 3 aliens).

### Towers

The aiming mechanics of towers are rather simple for the most part. The tower turns to an enemy within range and fires. However the modules built into the tower behave independently. For example a heavy cannon will have a fairly wider range than a standard cannon, so if both are built into a single tower, the large will fire first. On top of this they will also have independent rates of fire and attack damage, allowing for “Franken Turrets” if you will. The utility modules will also behave in a similar manner if applicable. This effect will give the tower a very surreal appearance as it activates upon fighting an enemy.

# Investigation

## Resources

### Hardware

* HP Pavilion Laptop (Intel CORE i5, Nividia GTX 950m)
* Edinburgh College Computers (Mainly those in GR112/114) – regular keyboard, regular mouse and nividia graphics card (unknown model)
* Xbox 360 (PC) gamepad
* Shogun Ballista MKI gaming mouse
* USB Extension

### Software

* Visual Studio 2010(College), 2013 and 2015 (Home)
* Microsoft Word
* XNA framework
* Photoshop/Paint.NET
* Unity 3D

### Personal Skills

* Good C# Programming skills
* Good sketching (Conceptualization & concept artwork)
* Decent graphics design skills

## Purpose and Scope

### Purpose

The purpose of the project is to create a product (game) to entertain an audience of ages 10+ and work within the ESRB (10+) guidelines given.

### Scope

The scope of the project includes:

* Planning, development and evaluation documentation.
* Implementing AI pathfinding.
* Implementing Enemy AI behaviour (attack VIP, attack towers).
* Implementing Guard Behaviour and controls.
* Implementing VIP controls.
* Implement basic options menu.
* Add short story to go with the gameplay.
* Applying patch to the final game if necessary.
* Create artwork for the game

Out of scope

* Regularly patching the game.
* Levelling up system.
* Story line.
* Adding high score tables and achievements.

## Functional Requirements

* **Requirement ID: FR1**
* **Requirement:** GUI Framework
* **Rationale:** The game must have a menu system in order to operate, without it, it would not be very playable.
* **Dependencies: NFR2**
* **Importance:** Critical
* **Risks:** Without a menu system/framework, the player would not be able to play properly and the game would essentially be a failure. Detectability is high, probability is low.
* **Assumptions:** Such a system can be coded with current coding skills.
* **Pre-Conditions:** Placeholder GUI menu art has been created for use.
* **Post-Conditions:** There will be a working menu system for the player to use.
* **Requirement ID: FR2**
* **Requirement:** Point & click controllable player
* **Rationale:** One of the main points of the game is to safely escort a VIP using the player made towers.
* **Dependencies: NFR2**
* **Importance:** Critical
* **Risks:** Without a VIP, the essence of what makes the game truly unique is lost. Detectability High, probability is low.
* **Assumptions:** The VIP and controls can be made with currently held coding skills
* **Pre-Conditions:** Placeholder VIP image has been created for use.
* **Post-Conditions:** A VIP will be place on the screen that the player can direct.

* **Requirement ID: FR3**
* **Requirement:** VIP guard
* **Rationale:** The game will be vastly more difficult if the VIP has no counter measures against attack but towers.
* **Dependencies: NFR2**
* **Importance:** Medium – High
* **Risks:** Without guards, the gameplay will be much more difficult. Detectability is high, probability is low to medium.
* **Assumptions:** The guards and the AI for them can be made using currently held coding skills.
* **Pre-Conditions:** Placeholder guard image has been created.
* **Post-Conditions:** Two guards will be on either side of the VIP and can be told where to go.

* **Requirement ID: FR4**
* **Requirement:** Pathfinding
* **Rationale:** Pathfinding will be needed for aliens to navigate the map to the VIP.
* **Dependencies:** N/A
* **Importance:** Critical
* **Risks:** Without pathfinding, getting enemies to navigate would be exceedingly hard. This would be due to have to:
  + **Give the enemy AI Rules for navigation by considering every collision scenario.**
  + **Or Generate paths on the map along sets of vectors (random generation would make this even harder).**

Detectability is high, probability is low to medium.

* **Assumptions:** Currently held coding skills are good enough to create such a system.
* **Pre-Conditions:** Placeholder art for tiles has been made.
* **Post-Conditions:** If breadth first search algorithm is used, the tiles should all have parents except the target location. This means that all the walkable tiles should have parents that lead to the target. (Every walkable location linked to target tile will have a parent. Following the parents will get you to the “common ancestor” or target tile).

* **Requirement ID: FR5**
* **Requirement:** Alien implementation
* **Rationale:** Without enemies, there essentially wouldn’t be a game (since this is in the tower defence category).
* **Dependencies: FR4**
* **Importance:** Critical
* **Risks:** Without enemies, the game would be extremely boring since the category/genre of the game relies on them (and the game would be impossible to complete). Detectability is high, probability is low.
* **Assumptions:** The aliens can be implemented using current coding skills.
* **Pre-Conditions:** A tile map has been created and has a working pathfinding system.
* **Post-Conditions:** Aliens move towards and attack VIP and Guards.

* **Requirement ID: FR6**
* **Requirement:** Tower placement mechanics
* **Rationale:** Tower placing mechanics will be needed for this game to work in any way.
* **Dependencies: NFR2**
* **Importance:** Critical
* **Risks:** None, as without this, there is effectively no game and thus **must** be implemented.
* **Assumptions:** The coding skills required are already held.
* **Pre-Conditions:** N/A
* **Post-Conditions:** Tower placement works as planned.
* **Requirement ID: FR7**
* **Requirement:** Tower Construction Menu
* **Rationale:** One of the unique selling point sis the ability to build custom towers.
* **Dependencies: FR1**
* **Importance:** Critical
* **Risks:** Since this is a unique selling point of the game, it would be a huge loss not to have it.
* **Assumptions:** the coding skills for the task are already acquired.
* **Pre-Conditions:** Menu framework has been constructed.
* **Post-Conditions:** Construction menu available for use in creating towers.
* **Requirement ID: FR8**
* **Requirement:** Custom Towers
* **Rationale:** This is a big selling point of the game.
* **Dependencies: FR7**
* **Importance:** Critical
* **Risks:** With current coding skills, only single offset positions and matrices have been used. This may require the use of combining multiple offset vectors and/or multiple matrices. Detectability for this risk is high, probability of this risk is medium to high, since this is essentially unexplored territory programming wise.
* **Assumptions:** Knowledge to implement such a system is already acquired, although not attempted.
* **Pre-Conditions:** Tower construction menu has been created and tower placement system is in place.
* **Post-Conditions:** A working tower is created using the placing system. It will also fire projectiles from the correct offset positions, aim and fire at aliens. If the tower consists of entirely utility modules and thus no offensive modules, aiming and firing may not be the case.
* **Requirement ID: FR9**
* **Requirement:** Wave mechanics
* **Rationale:** For a tower defence to be good, decent wave mechanics must be added.
* **Dependencies: FR5, FR2, FR3**
* **Importance:** Critical
* **Risks:** If ongoing wave mechanics are not implemented, the game will be boring. Detectability is high, probability is low.
* **Assumptions:** The coding skills required are good enough.
* **Pre-Conditions:** Aliens are working as intended as are the guards and VIP.
* **Post-Conditions:** Wave after wave of aliens spawn and gradually get harder to tackle over time.
* **Requirement ID: FR10**
* **Requirement:** Settings
* **Rationale:** It would be nice if the player can alter settings to suit needs.
* **Dependencies: FR1**
* **Importance:** Medium
* **Risks:** N/A
* **Assumptions:** N/A
* **Pre-Conditions:** N/A
* **Post-Conditions:** Player can adjust things like volume and resolution.

## Non-Functional Requirements

* **Requirement ID: NFR1**
* **Requirement:** Theme (Glow)
* **Rationale:** The game to be created has been given a “theme” or rather must contain glow in some way, even just in name form.
* **Dependencies:** N/A
* **Importance:** Critical
* **Risks:** No risks
* **Assumptions:** N/A
* **Pre-Conditions:** N/A
* **Post-Conditions:** The game involves the word glow in some way, be it name or art.
* **Requirement ID: NFR2**
* **Requirement:** Placeholder art
* **Rationale:** Placeholder art will be required for feature testing.
* **Dependencies:** N/A
* **Importance:** High
* **Risks:** N/A
* **Assumptions:** The software needed is already owned.
* **Pre-Conditions:** Required software is available for use.
* **Post-Conditions:** Placeholder artwork is available for testing.
* **Requirement ID: NFR3**
* **Requirement:** final artwork
* **Rationale:** For the game to look good it must have decent art.
* **Dependencies:** N/A
* **Importance:** High
* **Risks:** N/A
* **Assumptions:** The software needed is already owned.
* **Pre-Conditions:** Required software is available for use.
* **Post-Conditions:** Placeholder artwork is available for testing.
* **Requirement ID: NFR4**
* **Requirement:** Suitable to 10 years and up
* **Rationale:** The game is required by the brief to be appropriate for 10 year olds and older.
* **Dependencies:** N/A
* **Importance:** Critical
* **Risks:** N/A
* **Assumptions:** N/A
* **Pre-Conditions:** Brief read.
* **Post-Conditions:** Game made is suitable.

## Timescales and Risks

Deadlines for this project:

* 24th February – Planning Documentation.
* 18th May – Development Documentation and Game.
* 8th June – Evaluation Documentation.

Main risks that may delay or force changes:

* Pathfinding not working properly.
* AI actors not behaving accordingly.
* Requiring extra software for features that may not be supported by currently used software.

## Other Influencing Factors

Problems may arise at home that may prevent development. This however is unlikely and even if it were to occur, would have to be rather extreme to affect the development in such a way.

# Planning

## Development Approach

The software development approach being aimed for is agile development with some minor changes.

Each milestone will be built incrementally and tested rapidly to build up to the end milestone and adding the new function/feature. The aim for each increment towards the next milestone will be once every two to eight days instead of every one to four weeks, due to the size and nature of the project. The final milestone should be achieved by the development deadline, preferably earlier.

The reason for this approach is not only to be able to work at a relatively fast pace but also so I know exactly how much progress I have made towards the end game.

# Bibliography

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**Pathfinding research**

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(2, 3, 4) <https://en.wikipedia.org/wiki/Breadth-first_search>, Breadth-first Search article, last modified February 10th, 2016.

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