

Endless

Game Design Document



Team

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Client

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Instructor

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Table of Contents

- Project Information
 - Target Platforms
 - Language and Game Engine
 - Source Control
 - Ticket Tracking
- High Concept
- Genre
- Objectives
- Setting
- Game Modes
- Ships
 - Mecha
 - Jupiter
 - Clank R7
 - SoulEater
 - Arbiter
 - LockOn
- Level Designs
 - Asteroid Field
 - Planet PAIN!
 - Sunshine
- Game Mechanics
 - Basic Game Rules
 - Weapon Types
 - Bullet
 - Explosive
 - Plasma
 - Subsystem Management
 - Power-ups
 - Game Controls
 - Ship Actions:
 - Weapons:
 - Thrusters:
 - Modes:
- User Interface
- Controller Mapping
- Networking

Table of Contents

- Assets and Art

Ships

- Mecha
- SoulEater
- Lock On
- Arbiter
- Jupiter
- Clank

Space Backgrounds (4096 x 4096)

- Cloudy Nebula
- Purple Nebula
- Empty Space

Particle Effects

- Thrusters
- Explosions
 - Damage
 - Collision / Projectile Fire / Hit (Complete)
 - Shields (Complete)
 - Projectile Firing (Complete)
- Power-up Pickup

Sound

- Game Sounds
- In Game Music

Use Cases

Class Diagram

Project Information

Target Platforms

Endless will be available on Windows, Mac, and Linux machines.

Language and Game Engine

Endless will be developed using the Unity Game Engine with C# scripting.

Source Control

Bitbucket

Ticket Tracking

JIRA - venzon.info:8080

Game Information

High Concept

Players are pitted against each other in action packed space combat built around each players ability to pilot. Players choose from a selection of unique ships and battle to be the best.

Genre

Action Arcade Shooter

Objectives

Players duke it out in all out space combat in either team deathmatch or free for all game modes.

Each player gets to choose from multiple ship styles.

Each Individual ship has different strengths and weaknesses.

Setting

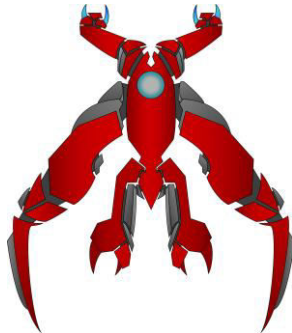
You're in space shooting things. Mostly Other people.

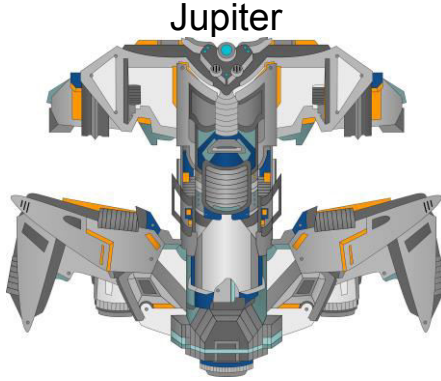
Game Modes

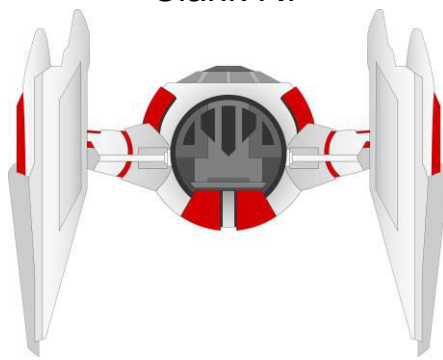
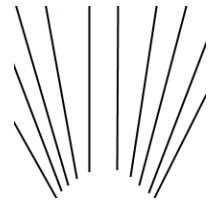
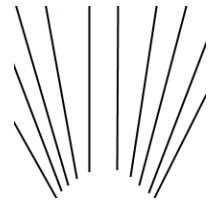
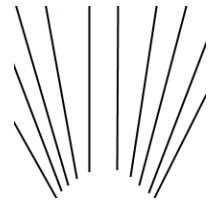
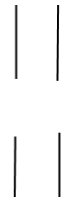
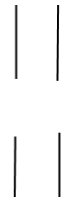
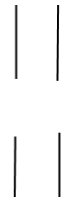
- Free for All
- Team Deathmatch
- Capture the Flag - Future
- Real-Time Strategy - Future
 - Real-Time Strategy mode will change it to where ships have varying cargo capacity that allow them to collect and secure resources from around the map and bring them back to their home base for permanent team upgrades. On death, players will drop the resources they are currently carrying and either team may intercept the resources to place them in their cargo. The end goal is to eliminate the enemy base and all remaining ships.

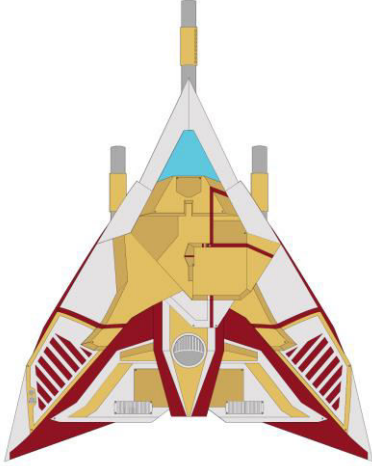

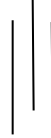
Gameplay

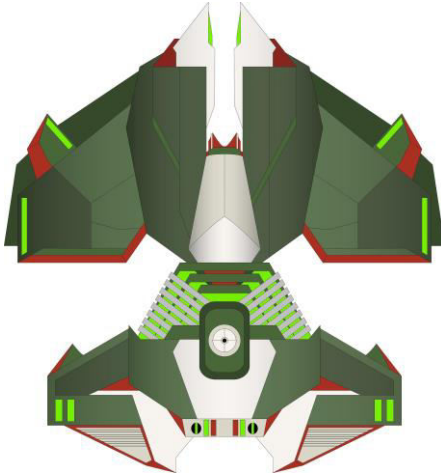
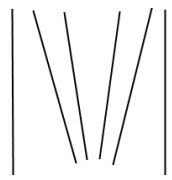
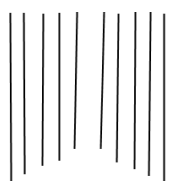
Ships

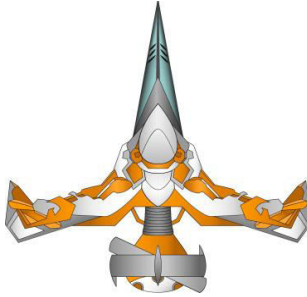
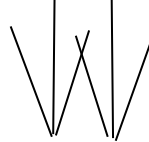
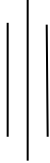
<div>Mecha</div> <div></div>		<div>Primary Weapon</div> <div>Machine Gun - Bullets<div>2 projectile<div>1.25 damage each</div><div>.15 second fire rate</div><div>300 m/s init velocity</div><div>.65 second lifespan</div></div></div>	
Hull	15%	<div>Secondary Weapon</div> <div>Twin Laser Burst - Plasma<div>2 projectiles<div>2.5 damage each</div><div>.25 second fire rate</div><div>275 m/s init velocity</div><div>.7 second lifespan</div></div></div>	
Shield	15%		
Thrusters	250		
<div>Special:</div> <div>Thruster Boost</div>		<div>The Mecha's thruster strength is increased proportionally to the amount of damage taken on the hull. For every 1% of damage on the Mecha's hull, the Mecha receives a 1% increase to the Thruster subsystem. Mecha cannot boost.</div>	

<div></div> <div>Jupiter</div>			
Hull	25%	<div>Primary Weapon</div> <div>Quad Laser Cannons - Plasma</div> <div>4 Projectiles</div> <div>3 Damage each</div> <div>.15 Second fire rate</div> <div>350 m/s init velocity</div> <div>.45 second lifespan</div>	
Shield	25%		
Thrusters	150	<div>Secondary Weapon</div> <div>Photon Torpedoes - Explosive</div> <div>4 Projectiles</div> <div>25 Damage each</div> <div>1 Second fire rate</div> <div>300 m/s init velocity</div> <div>.85 second lifespan</div>	
<div>Special:</div> <div>Weapon Proficiency</div>			

<div>Clank R7</div> 		<table><tr><th colspan="2">Primary Weapon</th></tr><tr><td><div>Spread Shot - Bullet</div><div>10 Projectiles</div><div>2 Damage each</div><div>.4 Second fire rate</div><div>300 m/s init velocity</div><div>.65 second lifespan</div></td><td></td></tr></table>		Primary Weapon		<div>Spread Shot - Bullet</div> <div>10 Projectiles</div> <div>2 Damage each</div> <div>.4 Second fire rate</div> <div>300 m/s init velocity</div> <div>.65 second lifespan</div>	
Primary Weapon							
<div>Spread Shot - Bullet</div> <div>10 Projectiles</div> <div>2 Damage each</div> <div>.4 Second fire rate</div> <div>300 m/s init velocity</div> <div>.65 second lifespan</div>							
Hull	15%	<table><tr><th colspan="2">Secondary Weapon</th></tr><tr><td><div>Duo Double Missiles - Explosive</div><div>4 Projectile</div><div>10 Damage</div><div>1.25 Second fire rate</div><div>250 m/s init velocity</div><div>1 second lifespan</div></td><td></td></tr></table>		Secondary Weapon		<div>Duo Double Missiles - Explosive</div> <div>4 Projectile</div> <div>10 Damage</div> <div>1.25 Second fire rate</div> <div>250 m/s init velocity</div> <div>1 second lifespan</div>	
Secondary Weapon							
<div>Duo Double Missiles - Explosive</div> <div>4 Projectile</div> <div>10 Damage</div> <div>1.25 Second fire rate</div> <div>250 m/s init velocity</div> <div>1 second lifespan</div>							
Shield	15%						
Thrusters	225						
<div>Special: Backfiring</div>		Explosive projectile also fires behind Clank R7.					

<div>SoulEater</div> <div></div>			
		<div>Primary Weapon</div> <div>Plasma Wave - Plasma</div> <div>7 Projectile</div> <div>.5 Damage continuously</div> <div>.1 second fire rate</div> <div>400 m/s init velocity</div> <div>.45 second lifespan</div> <div></div>	
		<div>Secondary Weapon</div> <div>Homing Rockets - Explosive</div> <div>3 Projectile</div> <div>20 Damage</div> <div>1.1 second fire rate</div> <div>250 m/s fire rate</div> <div>1.1 second lifespan</div> <div></div>	
Hull	20%		
Shield	15%		
Thrusters	175		
Special: Medically Engineered		SoulEaters shield will begin regenerating sooner and will regenerate faster than other ships.	

<div style="text-align: center;"> Arbiter  </div>			
		Primary Weapon	
		Bullet CF - Bullet 6 Projectile 3 Damage .375 Second fire rate 300 m/s init velocity .6 Second lifespan	
		Secondary Weapon	
		Plasma Pulse - Plasma 10 Projectile 1 Damage .65 Second fire rate 325 m/s init velocity .75 Second lifespan	
Hull	25%		
Shield	25%		
Thrusters	150		
Special: Over Shield		Arbiter receives additional maximum shield strength based on how much hull damage he has taken. 1% of hull damage is a 1% bonus maximum shield.	

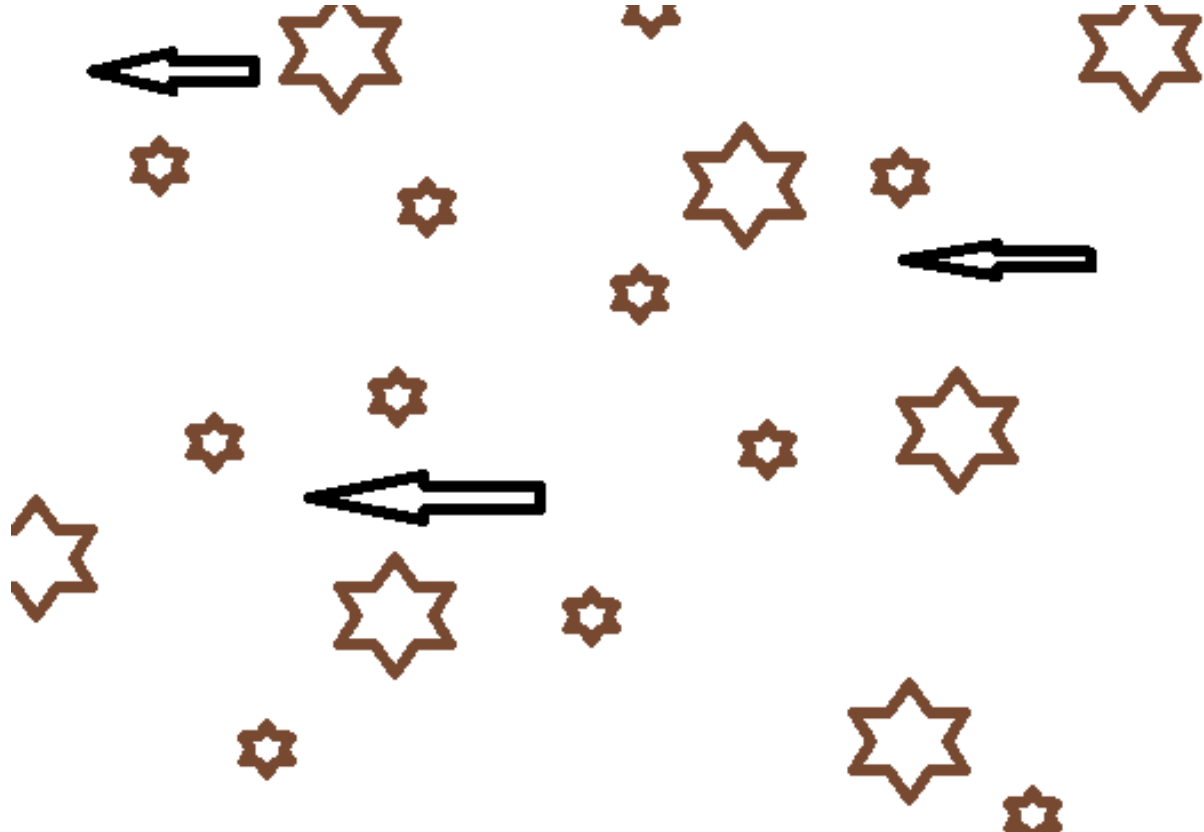
<div>LockOn</div> <div></div>		<div>Primary Weapon</div> <div><div>Shotgun Blast - Bullets</div><div>9 projectiles</div><div>2 damage each</div><div>.6 second fire rate</div><div>275 m/s init velocity</div><div>.6 second lifespan</div></div> <div></div>	
Hull	15%	<div>Secondary Weapon</div> <div><div>Laser Spike - Plasma</div><div>5 projectile</div><div>5 damage each</div><div>1 second fire rate</div><div>350 m/s init velocity</div><div>.9 second lifespan</div></div> <div></div>	
Shield	15%		
Thrusters	200		
<div>Special:</div> <div>Patience is a Virtue</div>		<div>Every seven seconds, LockOn will fire a double shot with the next weapon fired, dealing double damage.</div>	

Level Designs

Level ideas Summary

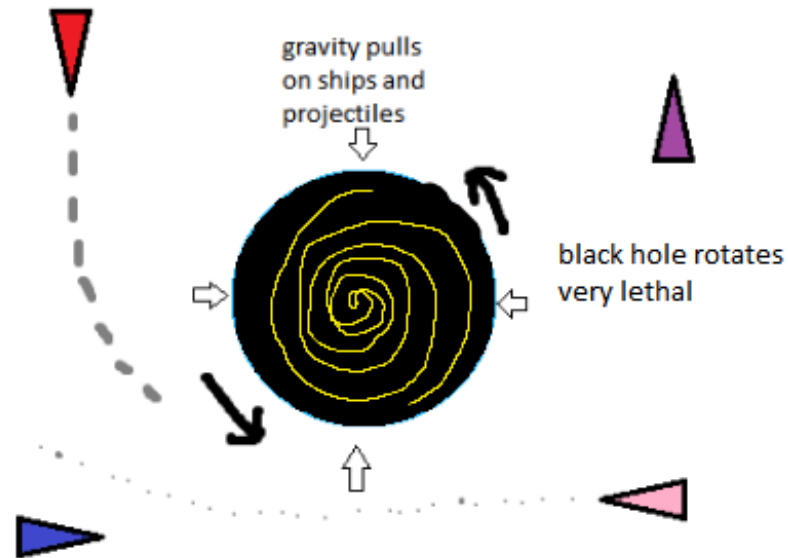
- Asteroid Field (quick free for all map, fast pace)
- Blackhole! (team map, gravity)

Asteroid Field



- Small map
- Free For All
- Asteroid spawn on the right side of the map and flow left, asteroids will also delete on exiting the map boundaries
- Asteroids are lethal to player, though not invulnerable. Player can destroy them with weapons

Blackhole!



- Medium Map
- Team Deathmatch
- randomized spawns around the map
- gravity pulls the players, rockets, and bullets towards the black hole
 - If a player enters the play hole they will lose control of their ship until they exit
 - If a player hits the center of the black hole they will be destroyed

Game Mechanics

Basic Game Rules

- All ships possess the following :
 - Hull
 - Used to measure a ship's integrity. When the integrity reaches 0%, the ship is dead
 - Shield
 - Provides protection for the hull. If shield is reduced to 0%, the ship is not dead.
 - Engine
 - Determines the thruster capability of the ship (acceleration, max velocity, turning speed)
 - Primary Weapon
 - A weapon for the ship. Can shoot bullets, plasma, or explosives.
 - Secondary Weapon
 - Another weapon for the ship. Can shoot bullets, plasma, or explosives.
 - Special
 - A passive ability that improves a specific functionality of the ship

Weapon Types

- Bullet

- Ignore shields
- Typically deal very low hull damage
- Damage Calculations
 - $\text{Shield Damage} = 0$
 - $\text{Hull Damage} = \text{BulletDamage} - (\text{BulletDamage} * \text{HullDamageReduction})$

- Explosive

- Extremely reduced damage versus shields
- Typically deal very high hull damage
- Can be destroyed mid-air
- Damage Calculations
 - $\text{ShieldDamage} = \text{ExplosiveDamage} - (\text{ExplosiveDamage} * \text{ShieldDamageReduction}) * 0.25$
 - $\text{HullDamage} = \text{ExplosiveDamage} - (\text{ExplosiveDamage} * \text{HullDamageReduction})$

- Plasma

- Improved damage versus shields
- Typically deal low hull damage
- Damage Calculations
 - $\text{ShieldDamage} = \text{PlasmaDamage} - (\text{PlasmaDamage} * \text{ShieldDamageReduction}) * 2$
 - $\text{HullDamage} = \text{PlasmaDamage} - (\text{PlasmaDamage} * \text{HullDamageReduction})$

Ship Actions:

Weapons:

Primary Weapon- Activates the ship's first weapon.

Secondary Weapon- Activates the ship's second weapon.

Special Weapon- Activates the effects of the ship's unique special weapon.

Thrusters:

Forward Thrusters- Activates the thrusters which propel the ship forward.

Backward Thrusters- Activates the thrusters which propel the ship backward.

Leftward Thrusters- Activates the thrusters which propel the ship to its left.

Rightward Thrusters- Activates the thrusters which propel the ship to its right.

Left Rotational Thrusters- Activate thrusters to rotate the ship counterclockwise.

Right Rotational Thrusters- Activate thrusters to rotate the ship clockwise.

Modes:

Change Energy Focus (Thrusters/Hull, Weapons, Shields)

Switches the ship into modes which alter the regeneration rates of various subsystems. Exact mechanics to be determined.

Game Controls

Each action can be mapped to any keypress or mouse button when using a keyboard and mouse, or any button press when using a controller.



XBOX (360 and ONE)

In Game:

- Move Left: Left Joy Stick
- Move Right: Left Joy Stick
- Move Down: Left Joy Stick
- Move Forward: Left Joy Stick
- Weapon 1: A
- Weapon 2: B
- Boost: Right Bumper
- Settings In Game: A

Menu's

- Menu Back: B
- Menu Select: Left Bumper
- Traverse Up: D-Pad
- Traverse Down: D-Pad



PC

In Game:

- Move Left: A
- Move Right: D
- Move Down: S
- Move Forward: W
- Weapon 1: Left Click
- Weapon 2: Right Click
- Boost: Z
- Settings In Game: K

Menu's

- Menu Back: Escape
- Menu Select: S
- Traverse Up: Up Arrow
- Traverse Down: Down Arrow



Playstation (PS4 and PS3)

In Game:

- Move Left: Left Joy Stick
- Move Right: Left Joy Stick
- Move Down: Left Joy Stick
- Move Forward: Left Joy Stick
- Weapon 1: Square
- Weapon 2: X
- Boost: L1
- Settings In Game: R1

Menu's

- Menu Back: Circle
- Menu Select: L1
- Traverse Up: D-Pad
- Traverse Down: D-Pad

User Interface

Overall rules to GUI theme:

1. Consistent throughout all platforms.
2. GUI encompasses map
 - Map disappears when GUI is swiped/minimized.
 - Map will not take up too much of screen.
3. Visual window square in map to show vision.
4. Must be easy to navigate through!
5. Check control buttons on phone devices to make sure user is comfy.
6. Style Options
 - Fun and Colorful (comical)
 - **Grittier, more realistic (starcraft II style)**
 - Combination of both (first two options)
7. GUI will encompass a specific layer. The layer will dictate what ship the user is using.

Detail Design:

The main menu is one canvas using C# code to manipulate everything around the menu. It supports all aspect ratios this way. An empty game object with a script is floating around the canvas gathering and saving all the important information about the player (controls, player name). This gameobject is then loading when the level starts and a don't destroy script is then applied to make sure all the controls and setting the player chose in the main menu is transferred over to his/her game. Think of it as a friendly little robot that saves all your configurations for you and follows you everywhere you go helping you out.

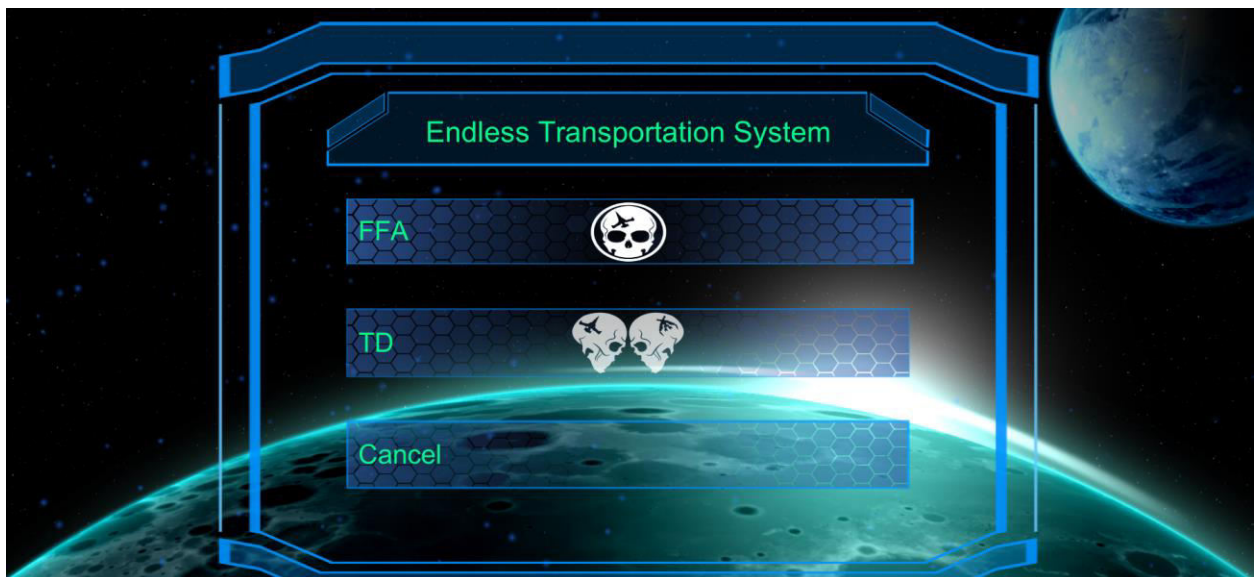
1st Iteration Main Menu

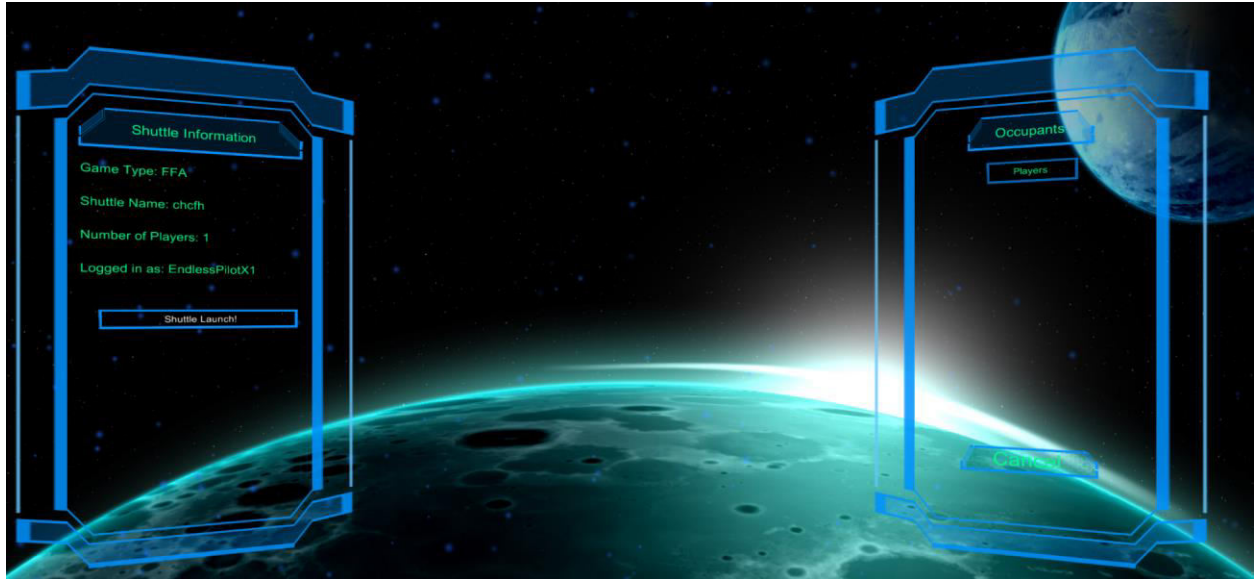


2nd Iteration



3rd Iteration

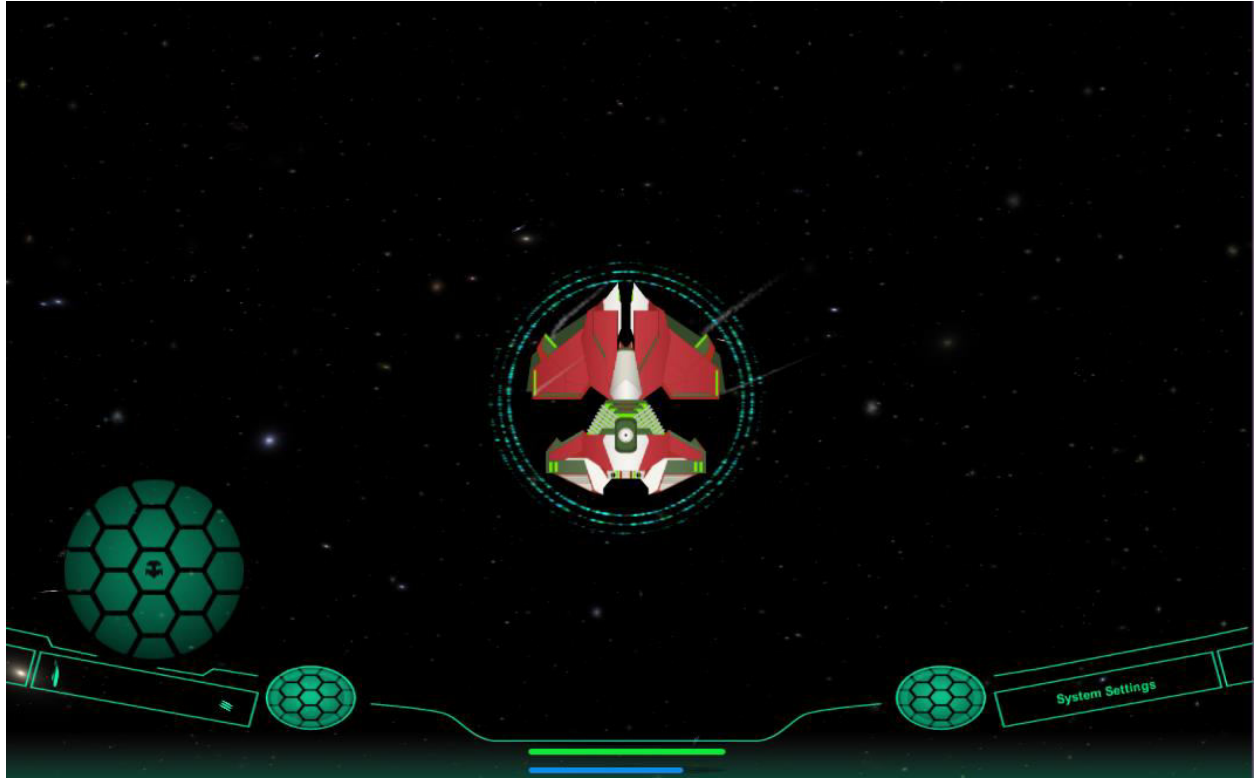




Last Iteration

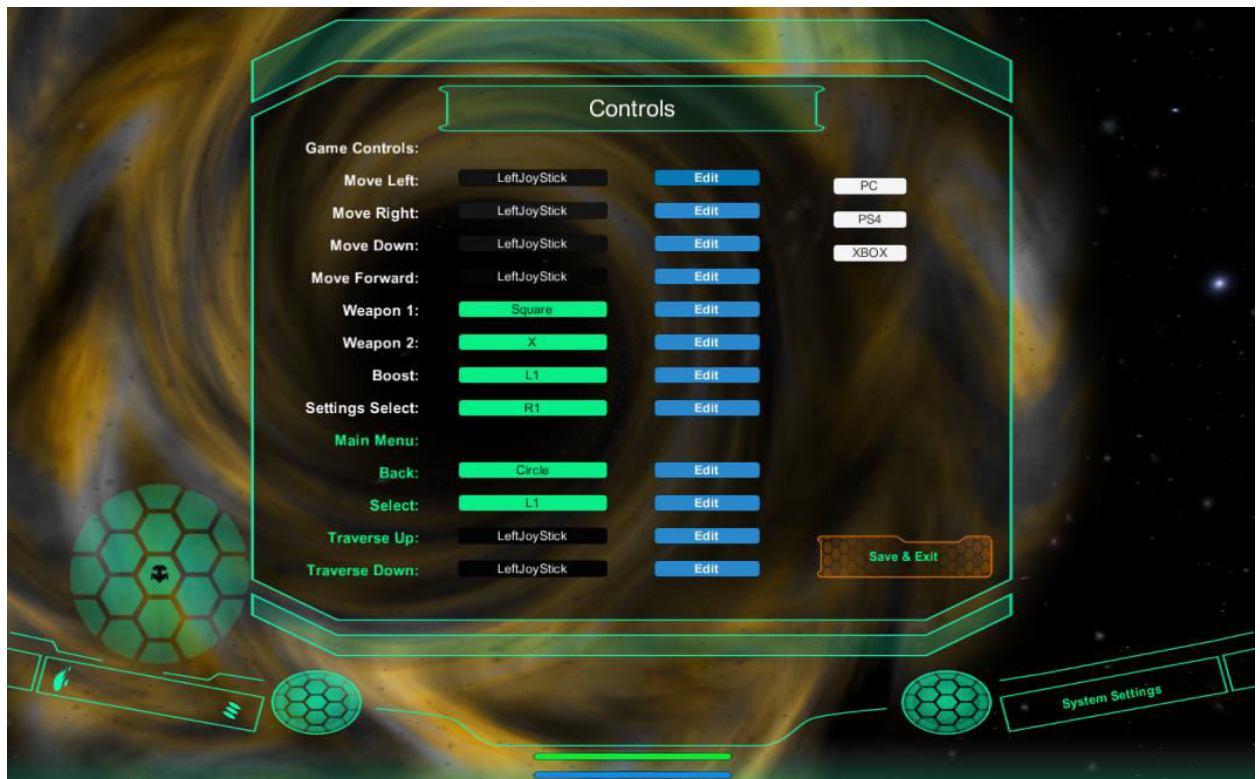






Controller Mapping

The game is fully customizable while in the main menu and the in game. The controller mapping is Xbox 360, PS4, PS3, Xbox One, and Keyboard/Mouse ready. If no controller is plugged in then the controls will be mapped only to the keyboard/mouse. If a controller is plugged in, it will detect the type of controller through JoyStick string names such as “Wireless Controller”(PS4), or “Unknown Wireless Controller”(Bluetooth connected PS4), and map it accordingly. It will map the controller and keyboard/mouse controls so the user can use both to their desire.



The way the controller settings menu is coded is that it adds the available codes for the controller to a C# dynamic list at the load up. When the user is choosing his/her mappings, it checks all the other controls already mapped and skips over them so a user cannot map two buttons to one function. This helps in preventing errors, and also reduces some cheating of adding multiple mappings to one button. The menu is controller ready to traverse and select buttons, switch ships, create lobbies, and so on.

Networking

[Photon Unity Networking Plugin](#) provided by **Exit Games**.

It is an independent networking engine for multiplayer platform games.

<https://www.photonengine.com/en/Photon>

Game is networked using UDP networking provided by Photon.

Supports **Host Migration** is the main reason for choosing this networking engine.

The syntax/documentation is located at:

<https://doc.photonengine.com/en/pun/current/tutorials/tutorial-marco-polo>

Syntax and Classes:

Specific C# classes provided by Photon. It is applied all throughout the menu and the Lobby system in the game created by this multiplayer engine. To edit custom properties of these players in your game you must create custom properties with the Hash table function.

Server:

It is connected right now to the Photon Unity Cloud Server.(provides 100 users free)

2nd phase will be connected to a dedicated server if the lag is too bad provided from Photon after heavily testing the application/game.

Master Client:

The master client is provided with its own C# functions to determine who in fact, is the master client. The master is allowed to click on players in the lobby and kick them from the lobby before the game begins.

Huge Notes:

Game/Application connects to a default lobby on connection success. Players in this lobby can only see games created by players in this specific lobby. We are not allowing players to join or create lobbies as of yet. Everyone gets to see all the games depending on Free For All or Team Deathmatch.

Overall Scheme:

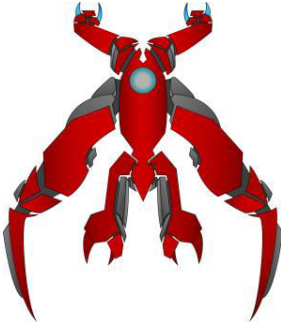
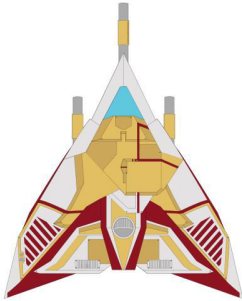
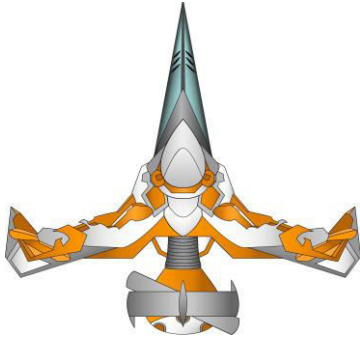
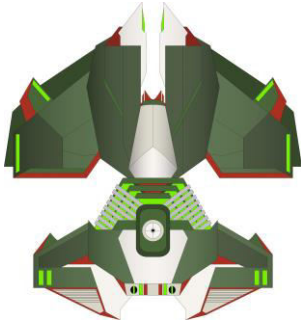
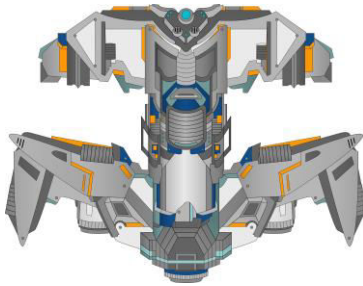
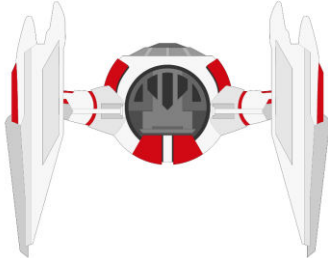
Connection > Default Lobby > RoomsList (game lobbies) > playersList (in the game room/lobby)
Photon gives you arraylists of these rooms and players for you to manipulate how you would like within your game/application.

Custom Properties:

Player properties can be added on Photon Network Connection with Custom Properties. The specific player custom properties added are bools of isReady(is player ready to launch the game from lobby), isLevelLoaded (has the player loaded the specified level), red team(user is in the red team), blue team(user is on the blue team).

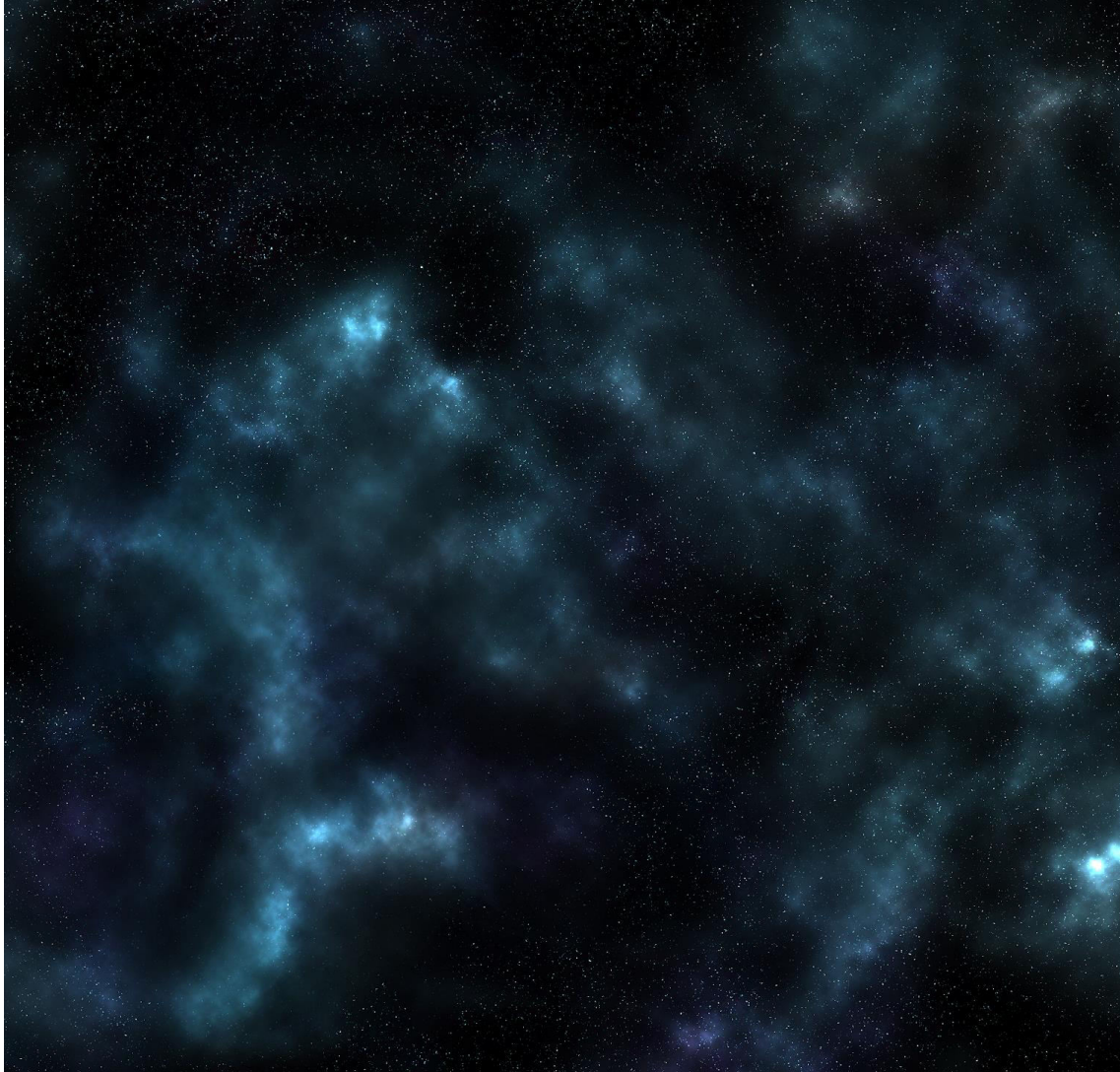
Assets and Art

Ships

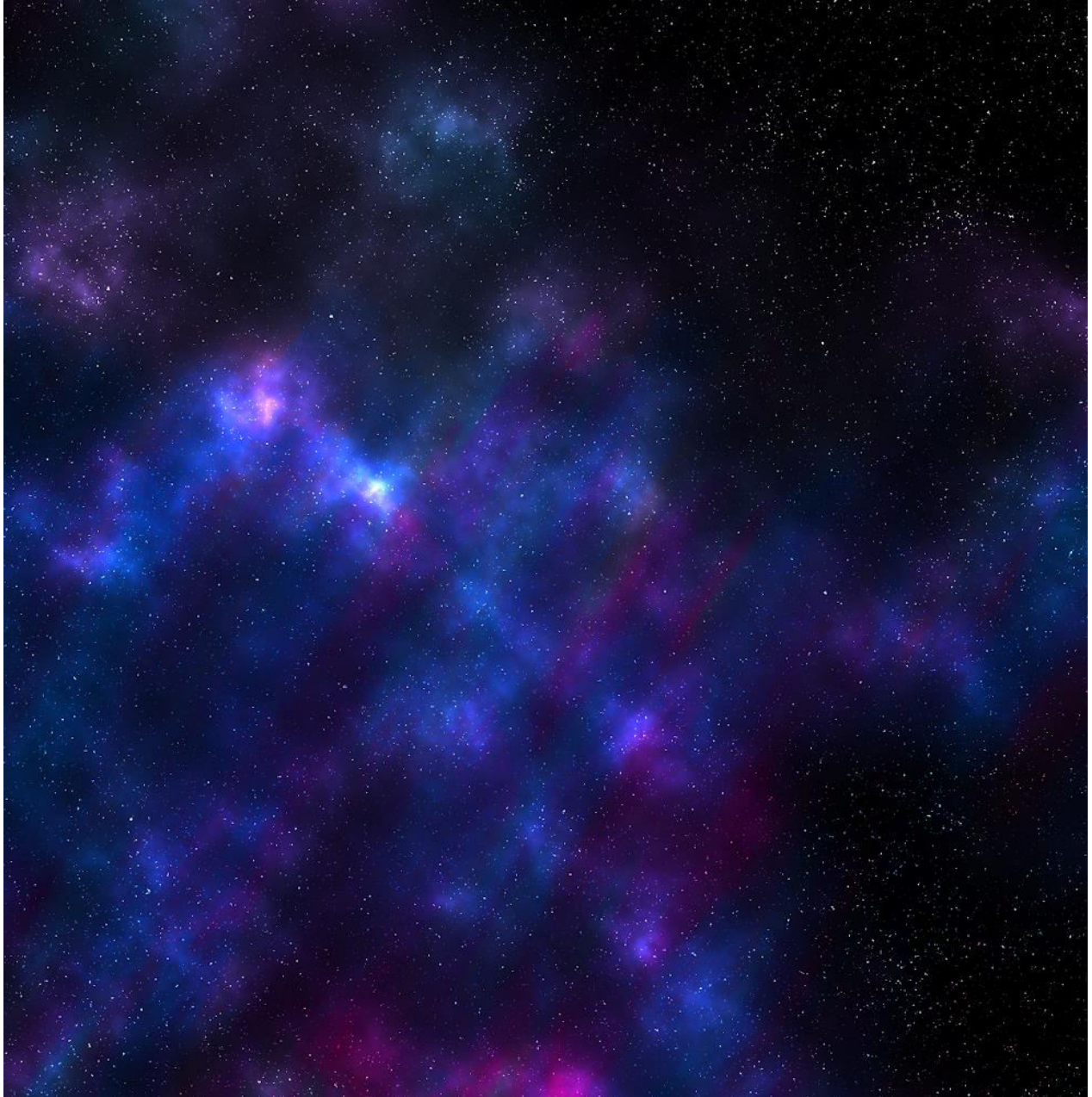
Mecha	SoulEater
	
Lock On	Arbiter
	
Jupiter	Clank
	

Space Backgrounds (4096 x 4096)

Cloudy Nebula



Cropped to Show details



Cropped to Show details

Empty Space



Cropped to Show details

Space Backgrounds (2048x2048)

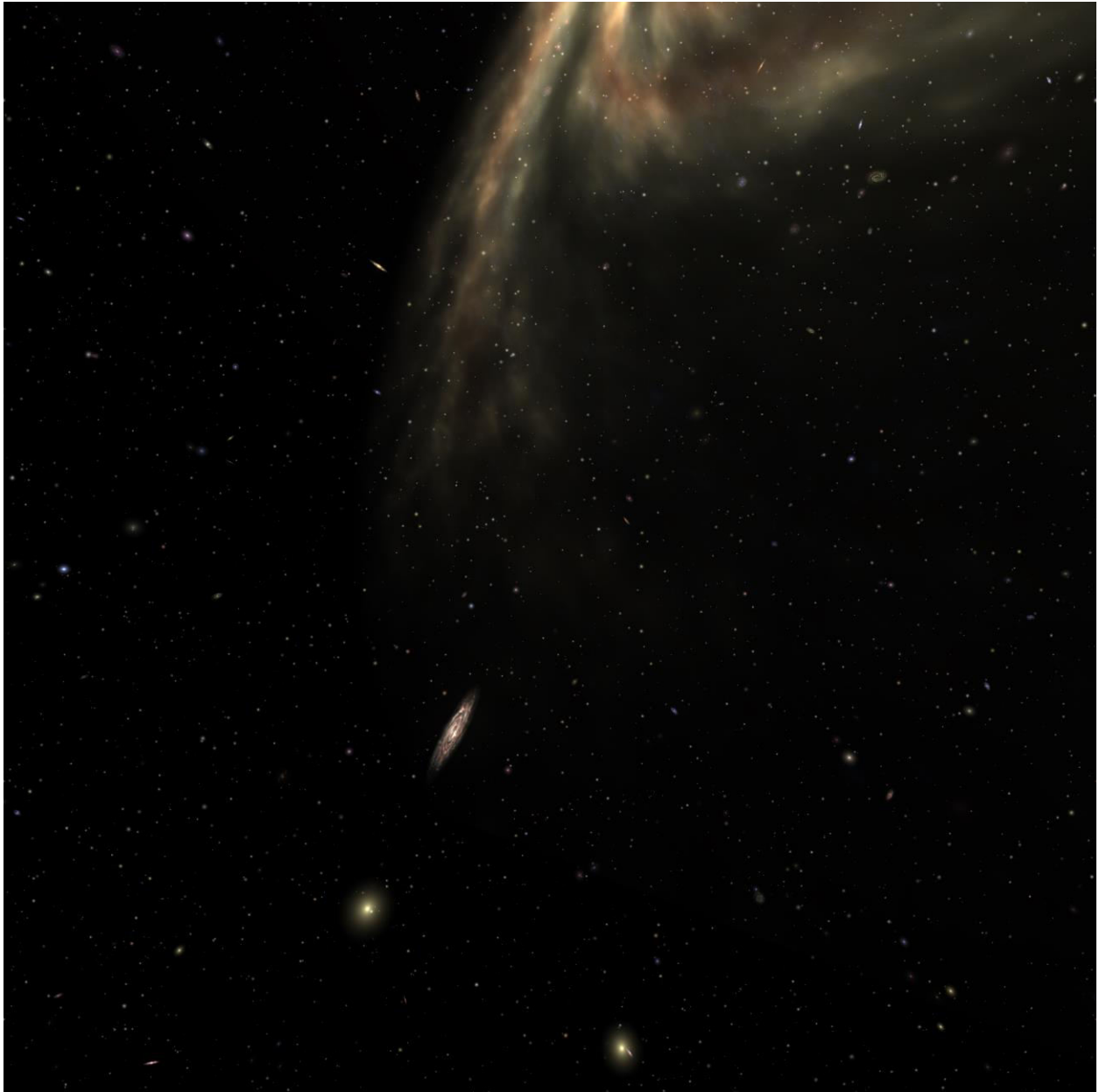
The Following were Imported from Unity asset store for free.

Package Name: GalaxyBox 1.0

Publisher: LemonSpawn

Link to Store Page: <http://u3d.as/7Un>

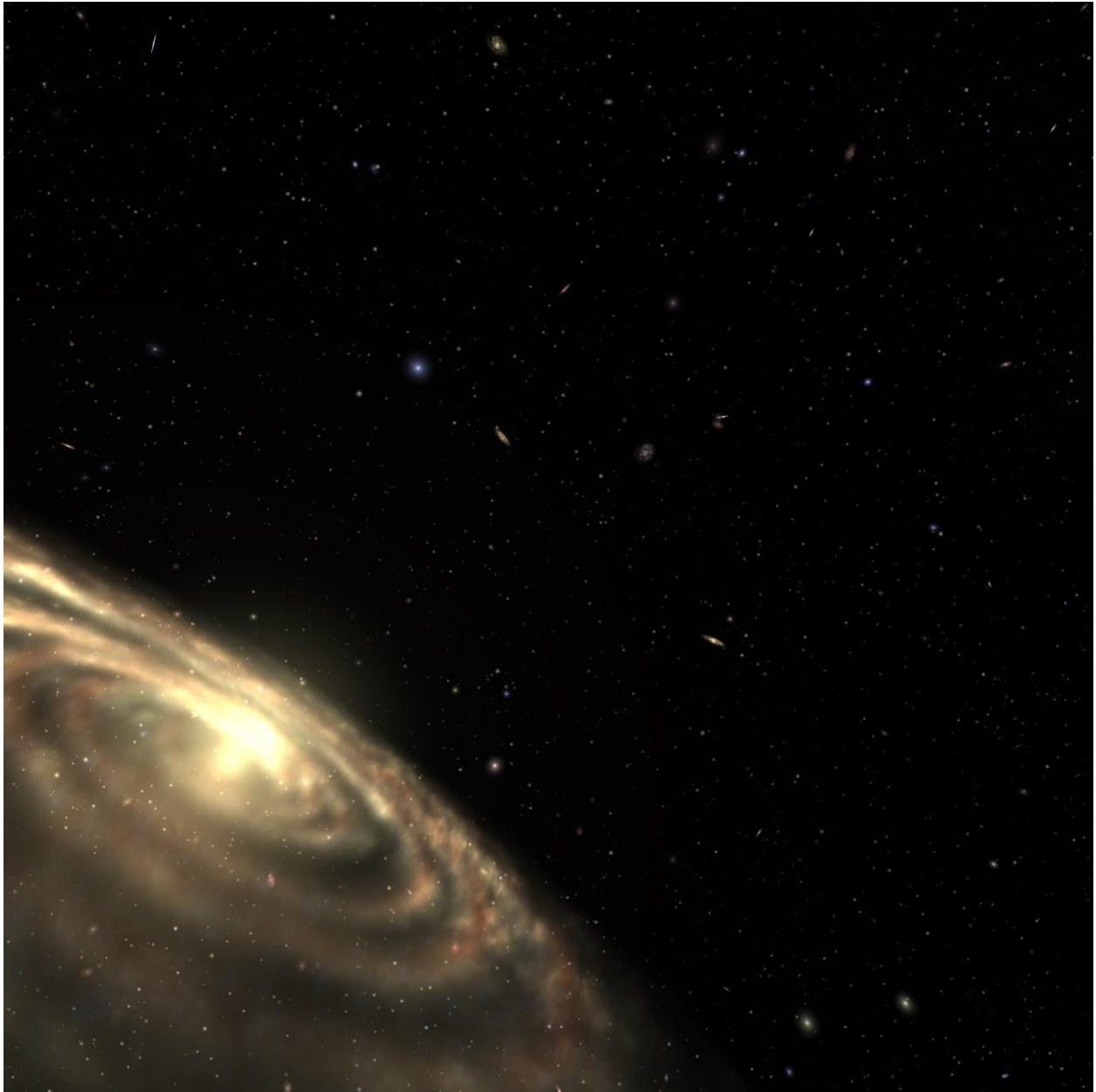
Nebula (skybox2X-)



Stars Front (skybox2X+)



Nebula2 (skybox2Y+)



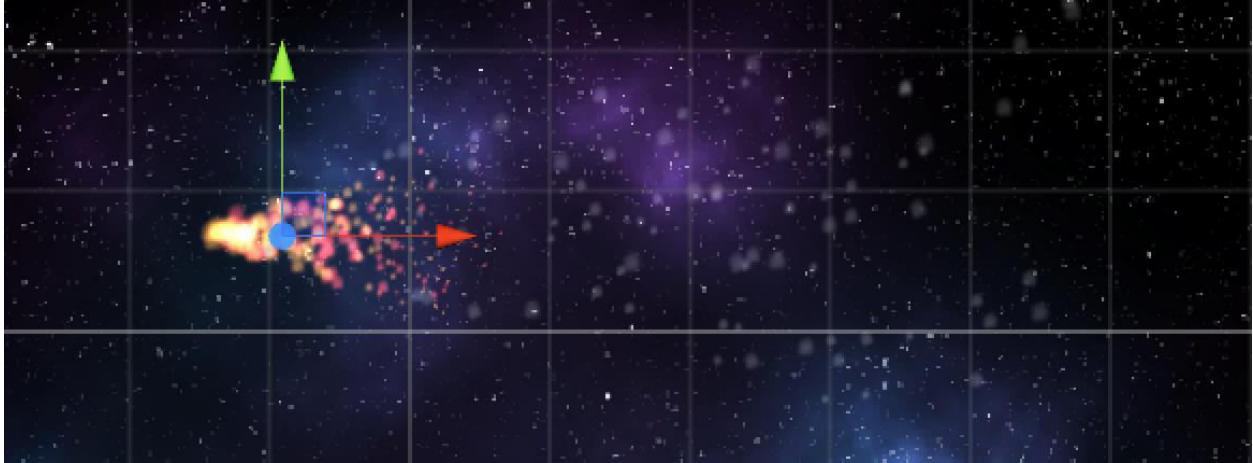
Stars Back (skybox2Z-)



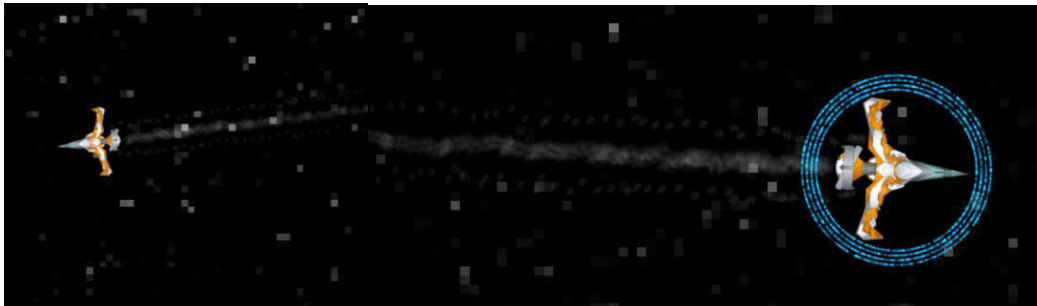
Particle Effects

Thrusters

- Rocket Flame Thrusters (Complete)

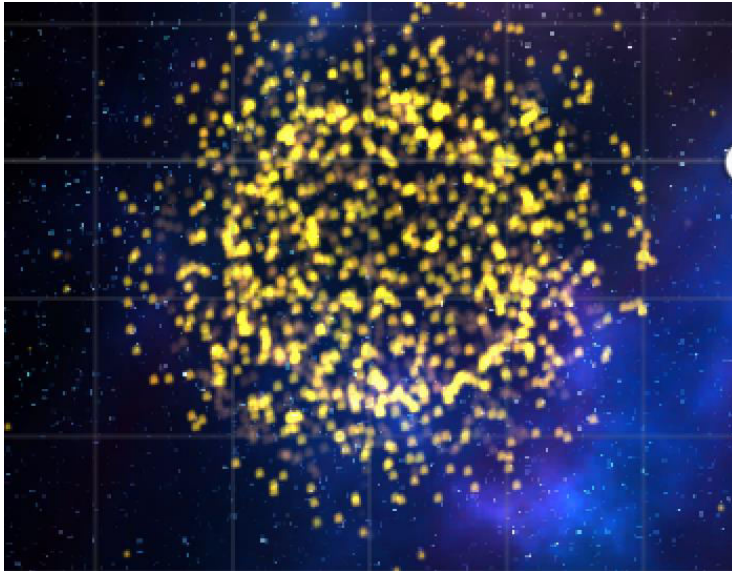


- Pulse
- Ship

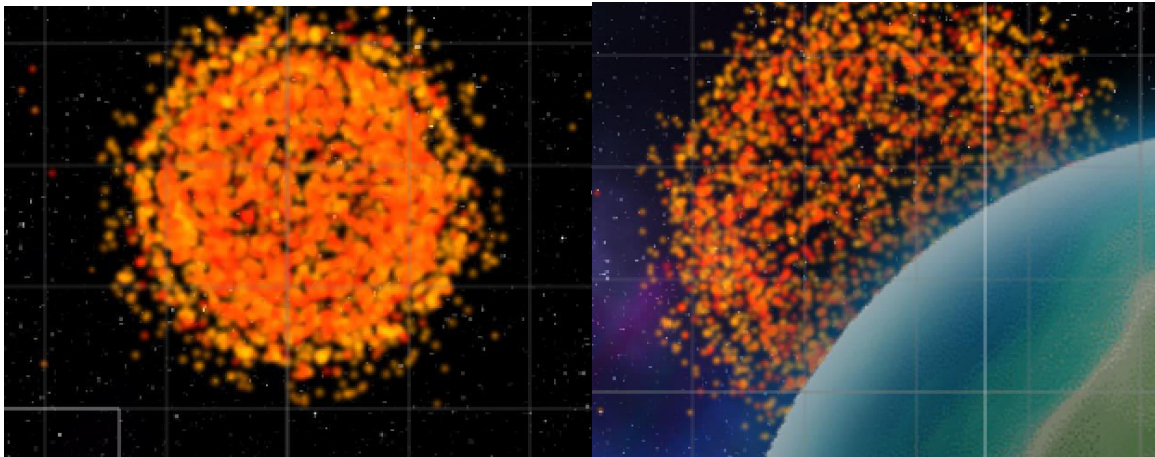


Explosions

- Yellow (Complete)



- Orange (Complete)



- Blue

Damage

- Smoke to indicate damage (Complete)

Collision / Projectile Fire / Hit (Complete)

Shields (Complete)



The Shields have been scripted to have 4 levels of shields. These levels are visible by the number of rings displayed around the ship. Each level roughly represents 25% of the ship's shield integrity.

The shields take in a 0 - 100 integer. As shields are gained and lost there is a damage burst effect applied that helps visually show the user that damage has been done.

Additionally Shields from 10 - 25 are slightly red tinted, Shields from 25 - 50 are Slightly Yellow, shields from 50 - 75 are slightly green and shields from 75 - 100 are normal blue.

As damage is done and shields drop to the various levels, 0 - 4 the shields immediately give the user visual feedback as to their current shield health.

Projectile Firing (Complete)

Power-up Pickup

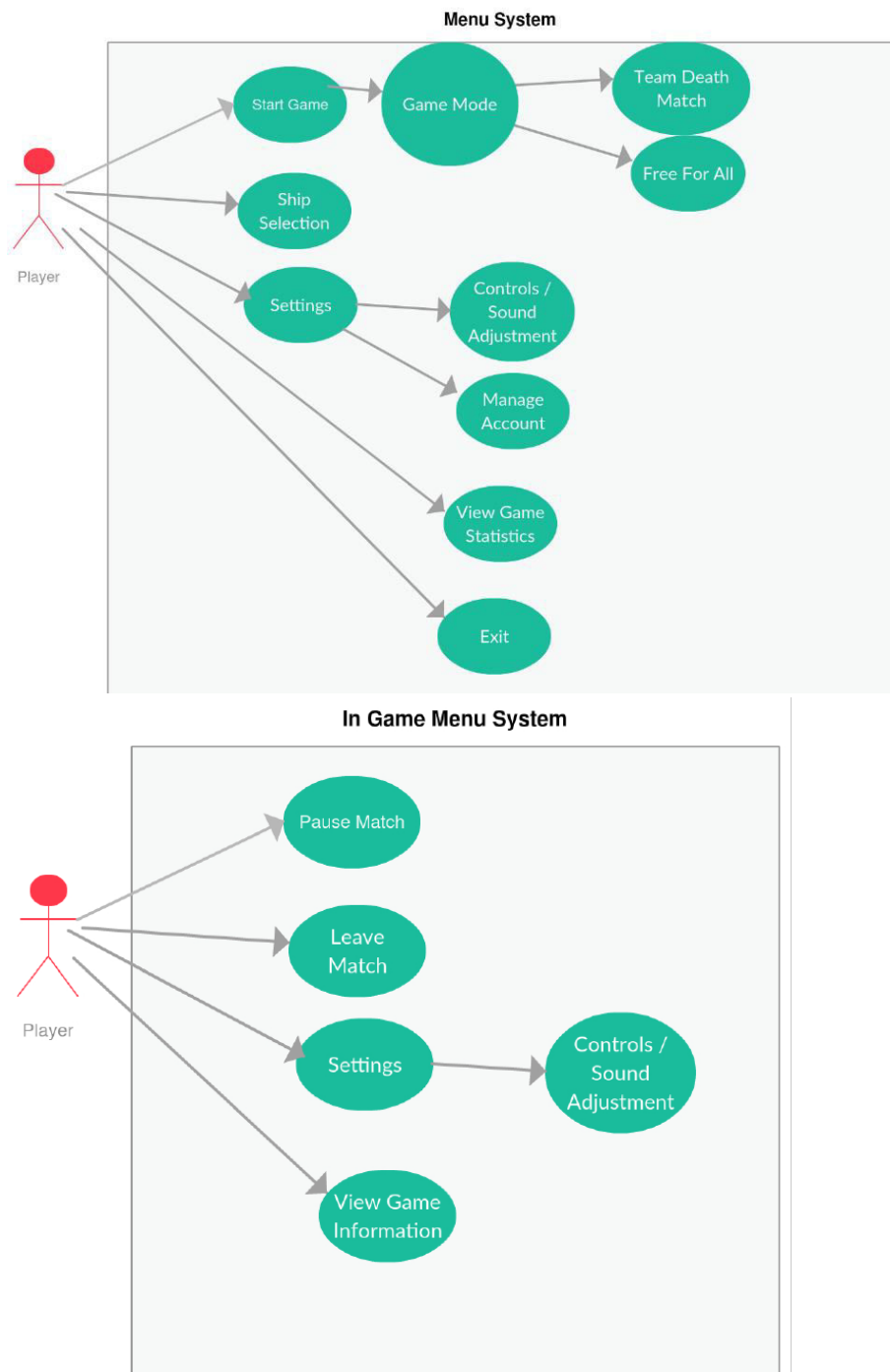
Sound

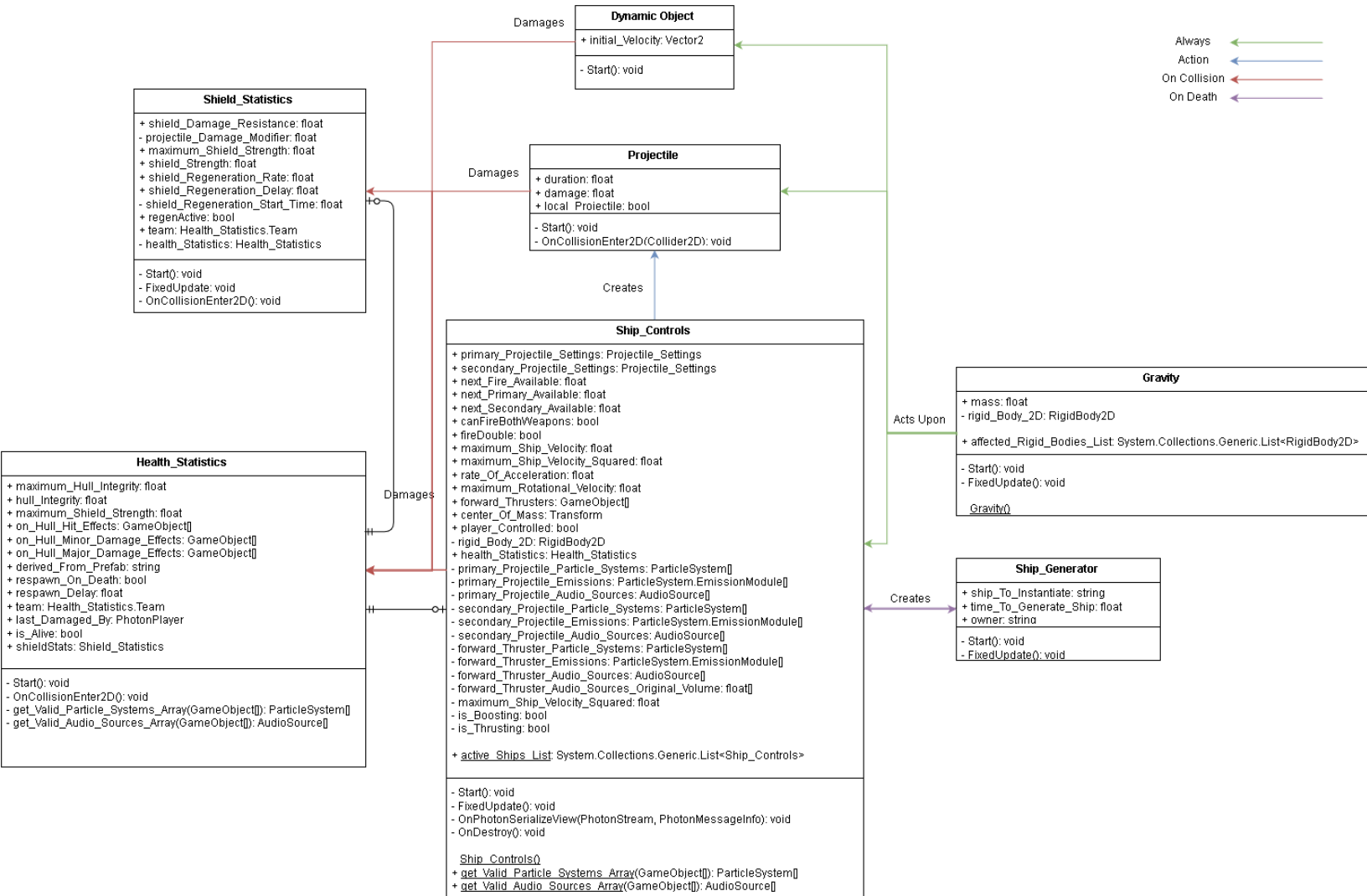
Game Sounds

Name	Filename	License	Original Source	Used As	Used	Creator
Pin Drop Sound	MenuButton	Attribution 3.0	http://soundbible.com/1073-Pin-Drop.html	Menu Button Selection	Yes	Mike Koenig
Huge Explosion 5	ShipExplosion	Creative Commons	https://www.freesound.org/people/CGEffex/sounds/93845/	Ship Explosion	Yes	CGEffex
Sound5	PowerUpPickup	Creative Commons	https://www.freesound.org/people/Kastenfrosch/sounds/162471/	Power Up Pickup		Kastenfrosch
Rocket Sound	RocketHum	Sampling Plus 1.0	http://soundbible.com/1498-Rocket.html	Rocket Traveling Through Space	Yes	dobroride
Appear Sound	PlayerRespawn	Public Domain	http://soundbible.com/1686-Appear.html	Player Respawn		KP
Bottle Rocket Sound	RocketFiring	Attribution 3.0	http://soundbible.com/709-Bottle-Rocket.html	Rocket Firing From Ship	Yes	Mike Koenig
Laser Construction Kit	LaserFiring	Unity Free Assets	https://www.assetstore.unity3d.com/en/#!/content/15966	Laser Firing	Yes	Bubaproducer

Documentation

Use Cases





Class Diagram

Future Additions

Subsystem Management

Each ship has three subsystems

- Weapons
- Shields
- Thrusters

Two points will be allocated to each subsystem by default. This gives a total of 6 points to allocate out. Any subsystem can only have a max of 4 points at any given time.

Each system benefits from the amount of focus placed on them. 4 points makes a subsystem work at optimal power and output while the other two systems end up running sub par.

Systems have power requirements. Each system will have an available buffer that expends itself and the recharge rate of this buffer will be augmented by the subsystem management of each player.

Camera Control

Each player's Camera can be controlled by mapped key or button presses. On systems with a mouse present, bringing the cursor to the edge of the screen will move the camera in that direction, and clicking on the minimap will untoggle Camera Follow and move the Camera to the location corresponding to the area clicked.

Camera Controls:

Button Controls:

Toggle Camera Follow- The Camera will center itself above the player's ship.

Move Camera:

Left- The Camera will move to the screen's left.

Right- The Camera will move to the screen's right.

Up- The Camera will move to the screen's upward direction.

Down- The Camera will move to the screen's downward direction.

Towards Screen (Zoom in)- The Camera's size will be lowered, simulating that the camera has moved in towards the screen or been zoomed in.

Away from Screen (Zoom out)- The Camera's size will be raised, simulating that the camera has moved out away from the screen or been zoomed out.

Mouse Controls:

Jump to location on minimap- Moves the Camera to the location on the minimap.

Pan Camera:

Left- The Camera will move to the screen's left.

Right- The Camera will move to the screen's right.

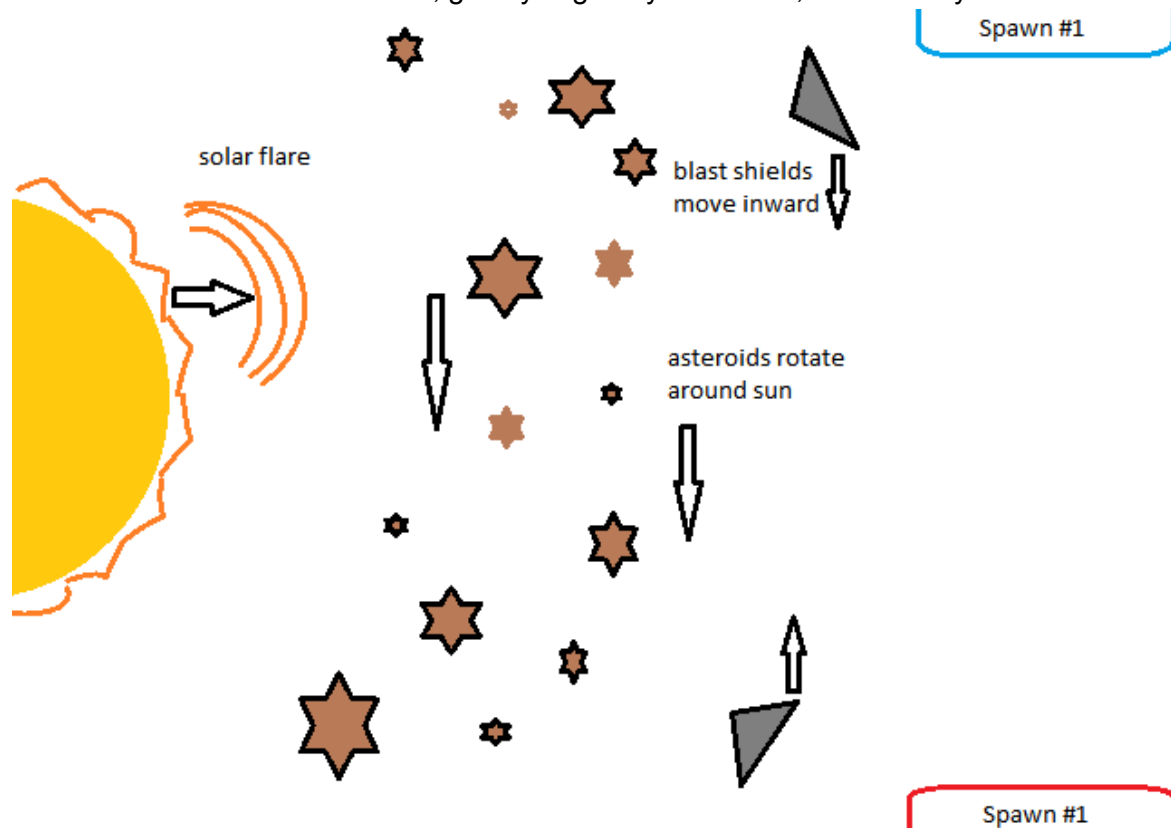
Up- The Camera will move to the screen's upward direction.

Down- The Camera will move to the screen's downward direction.

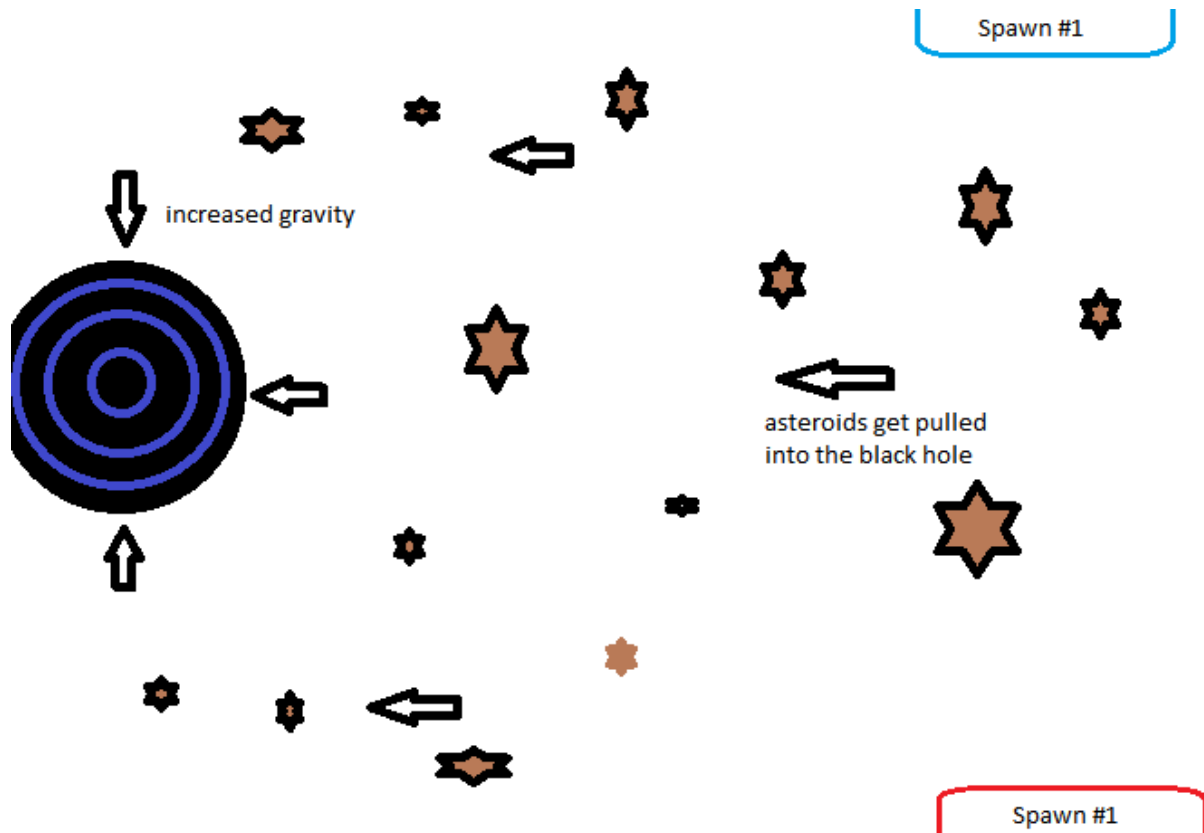
Map

Sunshine

- large map
- dynamic cycles
 - sun w/ solar flares, the sun has gravity, and asteroid belt
 - supernova, sun explodes, must hide behind blast shields or perish
 - black hole, gravity is greatly increased, asteroids fly into black hole



During the supernova phase the blast shields move from off level onto level. Ships must hide behind the blast shields or they will be killed by the blast. The map will increase in brightness, dim quickly, then flash extremely bright destroying everything caught in it.



After supernova, the sun turns into a black hole increasing gravity and pulled ships and asteroids into it, “eating” them. After the black hole has devoured enough, it reverts back to the first state, a sun.

Power-ups

Three various kinds.

- Weapons
- Shields
- Thrusters

Power-ups can be collected by destroying asteroids or ships currently powered up. (At a reduced amount)

Power-ups give boosts to ship systems to give players an advantage in combat.

Each ship can have a max number of power-ups X