

---

# **Software Requirements Specification**

**for**

## **Ecosystems 3D**

**Version 0.1.0**

**Luis Palomino Trevilla A01228574**

**Brian Reyes Gálvez A01633401**

**Juan Carlos Quirino A01632369**

**Tecnológico de Monterrey Campus Guadalajara**

**06/01/2020**

# Table of Contents

<b>Introduction</b>	<b>2</b>
<b>Purpose</b>	<b>2</b>
<b>Intended Audience and Reading Suggestions</b>	<b>2</b>
<b>Product Scope</b>	<b>2</b>
<b>Overall Description</b>	<b>3</b>
<b>Product Perspective</b>	<b>3</b>
<b>Product Functions</b>	<b>3</b>
<b>User Classes and Characteristics</b>	<b>4</b>
<b>Operating Environment</b>	<b>4</b>
<b>Design and Implementation Constraints</b>	<b>4</b>
<b>User Documentation</b>	<b>4</b>
<b>External Interface Requirements</b>	<b>5</b>
<b>User Interfaces</b>	<b>5</b>
<b>Hardware Interfaces</b>	<b>7</b>
<b>Software Interfaces</b>	<b>7</b>
<b>Communications Interfaces</b>	<b>7</b>
<b>System Features</b>	<b>8</b>
<b>Ecosystem Selection Menu</b>	<b>8</b>
<b>Ecosystem Visualization and Navigation</b>	<b>8</b>
<b>Organism Visualization</b>	<b>9</b>
<b>HUD Interaction</b>	<b>10</b>
<b>Other Nonfunctional Requirements</b>	<b>11</b>
<b>Performance Requirements</b>	<b>11</b>
<b>Safety Requirements</b>	<b>11</b>
<b>Security Requirements</b>	<b>11</b>
<b>Software Quality Attributes</b>	<b>11</b>

# **1. Introduction**

## **1.1 Purpose**

The product described in this specification document is intended to be an educational software that can be used anywhere with most devices. This software is primarily targeted at elementary school students and it takes advantage of new web technologies and the ease of internet access in most parts of the world to make it accessible for anyone who has a stable internet connection. This SRS describes the product in its entirety for version 0.1.0.

## **1.2 Intended Audience and Reading Suggestions**

This document is intended for potential developers, testers, final users or anyone who wants to know the specific details about this software. The recommended sequence for reading the document will vary depending on the audience. In general, it's better to begin with the overview sections. After that, developers and testers can continue reading the external interface requirements, system features and nonfunctional requirements. Final users can skip to the system features section.

## **1.3 Product Scope**

Ecosystems 3D is an interactive, educational web application that allows students to explore four different ecosystems of the world without leaving their homes. The software provides a simple yet powerful way of navigating through different ecosystems and exploring each one of them, this includes being able to visualize and interact with their flora and fauna. Most of the interaction will be performed in the screen. However, the software includes a graphical interface that will show relevant information to the user about each ecosystem and its living organisms. The goal of this product is to create an experience where students can learn by interacting with the virtual environment of each ecosystem.

## 2. Overall Description

### 2.1 Product Perspective

This product is an attempt to create a virtual experience where students can travel to any of the four available ecosystems in the world to learn more about them. There are a lot of virtual experiences out there, but this product creates a different experience from those available on the internet. The product itself is intended to be used for educational purposes and its target audience are elementary school students.

### 2.2 Product Functions

- The application's ecosystem selection menu renders a globe with different ecosystems.
- The application displays a UI in the menu screen with basic instructions.
- The application makes the ecosystems easy to spot in the globe by using a spotlight.
- The globe will be constantly rotating on its y axis.
- The user can select any ecosystem inside the globe to explore it.
- When selecting an ecosystem or going back to the ecosystem selection, a loading screen will appear while the assets are being loaded into the scene.
- Each ecosystem is represented by a *three.js* scene and so is the ecosystem selection menu.
- When exploring an ecosystem, the application displays a brief description about the selected ecosystem in the UI.
- An ecosystem will have both animals and plants that have information attached to them.
- The user can click on any living organism to get more information about it.
- When the user clicks on a living organism, the camera starts an animation to zoom into the organism.
- The user can move the camera around while exploring an ecosystem.
- While exploring an ecosystem, the application displays a HUD with a button to play or pause the ecosystem's ambient sound and another one to reset the camera to its initial position.

- While exploring an ecosystem, the UI displays a button to go back to the ecosystem selection.
- During camera animations, the user is not allowed to modify the camera in any way.

## 2.3 User Classes and Characteristics

There are two possible user classes identified in this product. The first class is comprised by teachers or instructors that want to understand how the product works. They might not use the product very frequently. The second class are any type of students that use the product for curiosity and/or learning. This user class might use the product with more frequency and they are the most important ones to satisfy.

## 2.4 Operating Environment

The software will be a web application which can be accessed by almost any device with internet access. In this version, the software has no support for mobile devices and must be used strictly with a computer or tablet. The application is compatible with any Javascript enabled browser with the exception of *Internet Explorer* and *Microsoft Edge*. For the best experience, *Google Chrome* or *Firefox* is recommended.

## 2.5 Design and Implementation Constraints

Developing this project, where a lot of 3D models will be loaded into memory can consume a lot of resources. Developers will need to have a powerful computer to develop the application without problems. Since there is no one in the team with 3d modeling experience, all models and textures will be retrieved from free online sites, which might not be fully optimized or accurate. After the first version is delivered, the development team will no longer continue to work on the product.

## 2.6 User Documentation

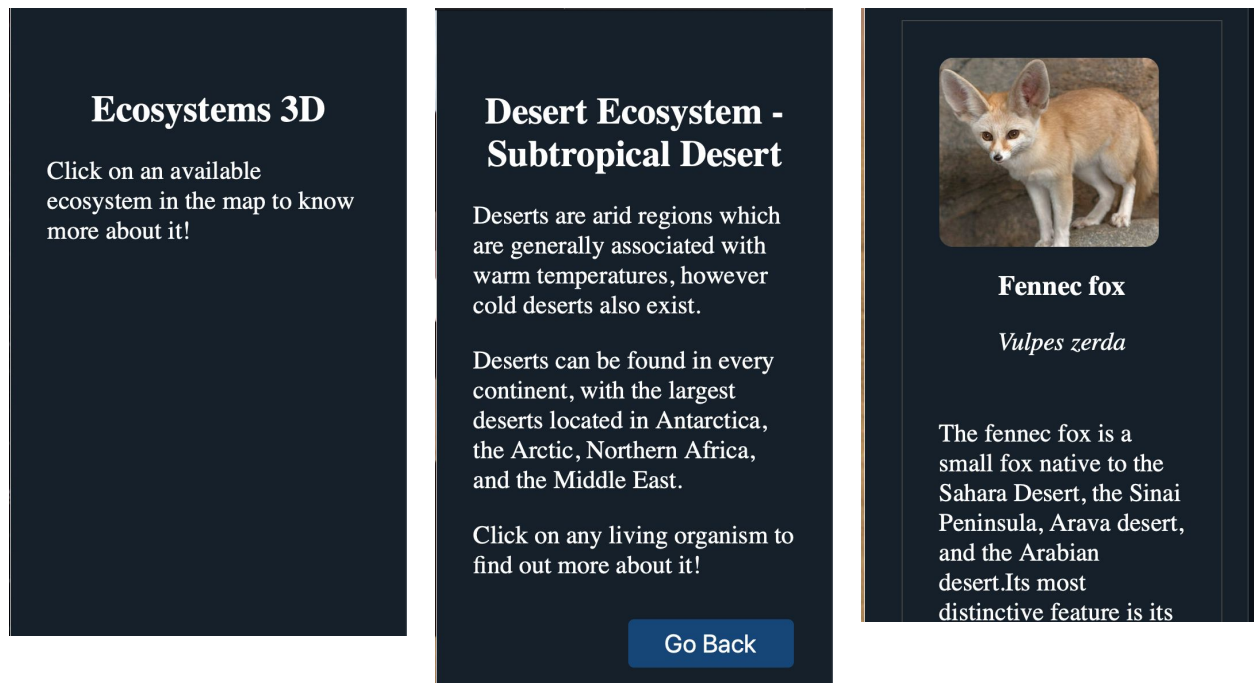
This project comes with a user manual that can be found [here](#). Useful for anyone reading this document, not only end users.

### 3. External Interface Requirements

#### 3.1 User Interfaces

**3.1.1** Information panel: It is located at the right side of the application, it serves the purpose of providing information about the current ecosystem, and the selected organism, once an organism is selected a button 'Go Back' is enabled to return to the initial information and return to the ecosystem selection in the 3d canvas [3.1.2].

##### 3.1.1.1



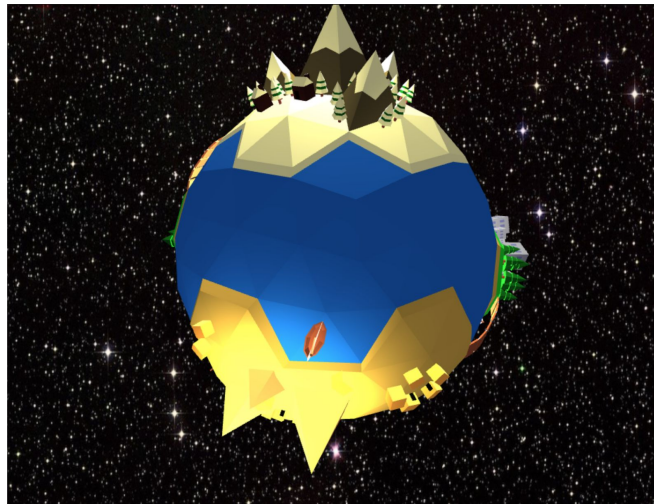
**3.1.2** 3D Canvas: The 3d canvas renders the application.

**3.1.2.1** First screen from the 3d canvas shows a 3d model of a globe which serves as a menu to the different ecosystems available to view, these are highlighted and can be selected by hovering to the desired ecosystem and performing a click with the cursor, the user can rotate the globe by dragging the globe while holding left click.

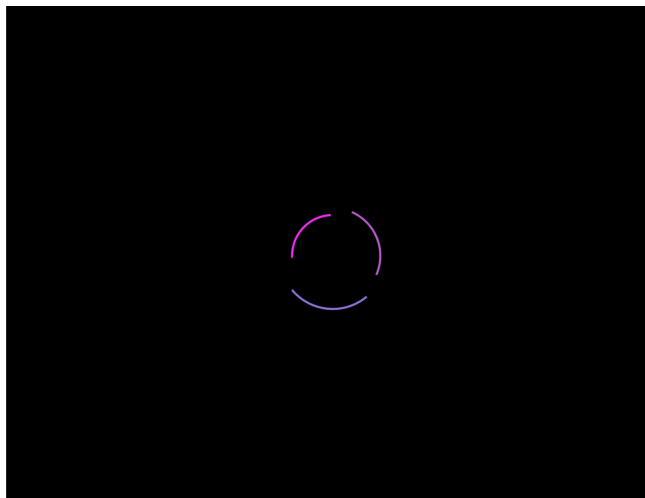
**3.1.2.2** Once a ecosystem is selected, this one begins to load into the canvas, while the models are being loaded into the scene there is a screen indicating that some action is being performed.

**3.1.2.3** After loading, the user can interact with the ecosystem with the cursor, hold left click to orbit a point, hold right click to move around the scene, when an organism is selected the camera will move to a position to highlight it, and the information panel [3.1.1] will show information about the organism.

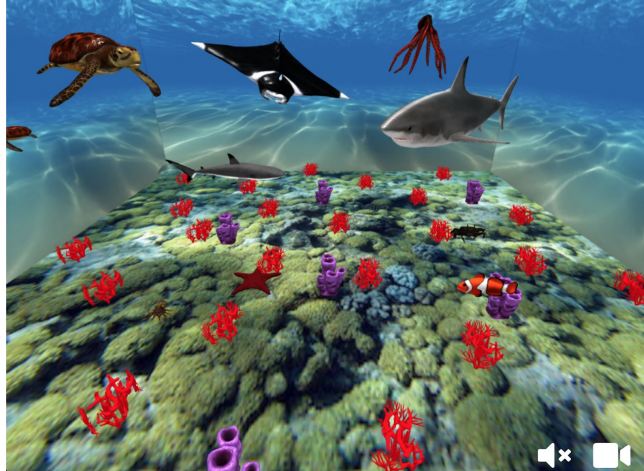
3.1.2.1



3.1.2.2



3.1.2.3



### 3.2 Hardware Interfaces

Since Ecosystems 3D uses WebGL and Three.js, it is recommended to have at least 8GB system memory and modern graphics hardware for 3D. Minimum requirements for WebGL are a high-performance graphic cards, with 512MB of video memory. However, for full performance we recommend a graphics card with 1GB of video memory at least, because we are working with 3D scenes that render multiple models. As mentioned early, WebGL does not fully support the whole 3D capabilities for mobile devices, because of this, the product is currently not available or functional on this kind of devices.

### 3.3 Software Interfaces

Ecosystems 3D requires *Node* and *NPM* to be installed into the system in order to run the server, to run the application a one of the following browsers is required [Google Chrome 9+, Firefox 4+, Opera 15+, Safari 5.1+].

### 3.4 Communications Interfaces

The product communicates over the HTTP protocol, no internet connection is required to load extra assets, unless the application is being accessed remotely.



## **4. System Features**

### **4.1 Ecosystem Selection Menu**

#### 4.1.1 Description and Priority

The application needs to have a way of selecting an ecosystem to be explored. This feature requires a globe to be rendered with the four available ecosystems. The globe will have an animation and it will be rotating in its y axis. The user will be able to move around the camera and click on any available ecosystem to explore it.

#### 4.1.2 Stimulus/Response Sequences

User loads the application using their preferred browser. The ecosystem selection globe is presented to them. They can see in the UI some instructions about how to move around the camera and select an ecosystem. User moves around the camera to see all highlighted available ecosystems. User clicks on any available ecosystem, the menu scene is disposed and the selected ecosystem scene is loaded.

#### 4.1.3 Functional Requirements

- The application's ecosystem selection menu renders a globe with different ecosystems.
- The application displays a UI in the menu screen with basic instructions of how to use the software.
- The application makes the ecosystems easy to spot in the globe by using a spotlight.
- The globe will be constantly rotating on its y axis.
- The user can select any ecosystem inside the globe to explore it.

### **4.2 Ecosystem Visualization and Navigation**

#### 4.2.1 Description and Priority

The application must be able to render each one of the available ecosystems as a different three.js scene and populated them with 3D models of their flora and fauna. The user can explore the ecosystem by rotating, panning and zooming in/out using the mouse and they can also choose to go back to the previous screen.

#### 4.2.2 Stimulus/Response Sequences

User selects an ecosystem from the menu. A loading screen appears while the scene is being rendered. Once the scene has rendered, the ecosystem selected is shown to the user, as well as a brief description of the ecosystem in the UI. The user starts moving around its camera and exploring the ecosystem. The user can click the go back button in the UI to return to the previous screen, which triggers the loading screen again.

#### 4.2.3 Functional Requirements

- When selecting an ecosystem or going back to the ecosystem selection, a loading screen will appear while the assets are being loaded into the scene.
- Each ecosystem is represented by a three.js scene and so is the ecosystem selection menu.
- When exploring an ecosystem, the application displays a brief description about the selected ecosystem in the UI.
- An ecosystem will have both animals and plants that have information attached to them.
- The user can move the camera around while exploring an ecosystem.
- While exploring an ecosystem, the UI displays a button to go back to the ecosystem selection.

### 4.3 Organism Visualization

#### 4.3.1 Description and Priority

The application must show information about each one of the living organisms when clicked and move the camera to provide a better angle to visualize the organism selected. The information will be shown in the UI. Both flora and fauna will be clickable.

#### 4.3.2 Stimulus/Response Sequences

User selects an ecosystem from the menu and waits for it to be loaded. The user clicks on a living organism, then the camera makes a smooth animation to focus the organism selected. Then, the information for the organism is shown in the UI. The user can continue moving the camera around and selecting different living organisms.

#### 4.3.3 Functional Requirements

- The user can click on any living organism to get more information about it.
- When the user clicks on a living organism, the camera starts an animation to zoom into the organism.
- During camera animations, the user is not allowed to modify the camera in any way.
- The user can move the camera around while exploring an ecosystem.

## 4.4 HUD Interaction

### 4.3.1 Description and Priority

The application will have a HUD on the bottom right corner that provides two buttons to control the camera and the audio. The camera button will reset the camera to its original position and the audio button will serve as a toggle for the ambient audio of the ecosystem.

### 4.3.2 Stimulus/Response Sequences

User selects an ecosystem from the menu and waits for it to be loaded. The user clicks on the audio HUD button to toggle the ecosystem audio on. The user starts to hear the ambient sound. The user clicks on an organism and the camera zooms in to it. The user clicks on the camera HUD button. Then, the camera starts an animation to return to its original position.

### 4.3.3 Functional Requirements

- While exploring an ecosystem, the application displays a HUD with a button to play or pause the ecosystem's ambient sound and another one to reset the camera to its initial position.
- When the user clicks on a living organism, the camera starts an animation to zoom into the organism.
- During camera animations, the user is not allowed to modify the camera in any way.

## **5. Other Nonfunctional Requirements**

### **5.1 Performance Requirements**

Project Ecosystems 3D requires an OpenGL compatible graphics card, 2 gigahertz CPU and 4GB of ram, in order to be able to run the 3d canvas to avoid the scene becoming unresponsive while the user navigates it. A lower end is capable of running Ecosystems 3D and render the scenes properly, but it is not recommended.

### **5.2 Safety Requirements**

To ensure the connection is secure from the user to the web application, the connection must be established using HTTPS.

### **5.3 Security Requirements**

Ecosystems 3D does not have any security requirements and thus any type of user can use it without any additional privileges.

### **5.4 Software Quality Attributes**

It is possible to extend the content of the of *Ecosystems 3D* ecosystems, since these are separate modules from the engine that renders them, many ecosystems can be added without breaking functionality of any other part of the project. This can also be said about living organisms within an ecosystem.