

FLORIDA INTERNATIONAL UNIVERSITY

Senior Project Final Presentation

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DREAM: Digital Twin Room Emulator and Asset Manager

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What is DREAM?

The goal of the DREAM project is to create an accurate virtual model to reflect a physical object or place in the real world (Digital Twin). This project sought to represent places found around FIU for a user to experience in Virtual Reality using the Unity Game Engine. The user will be able to traverse the digital twin, interact with passive objects and even interact with some objects in the experience that affect other objects outside the digital twin.



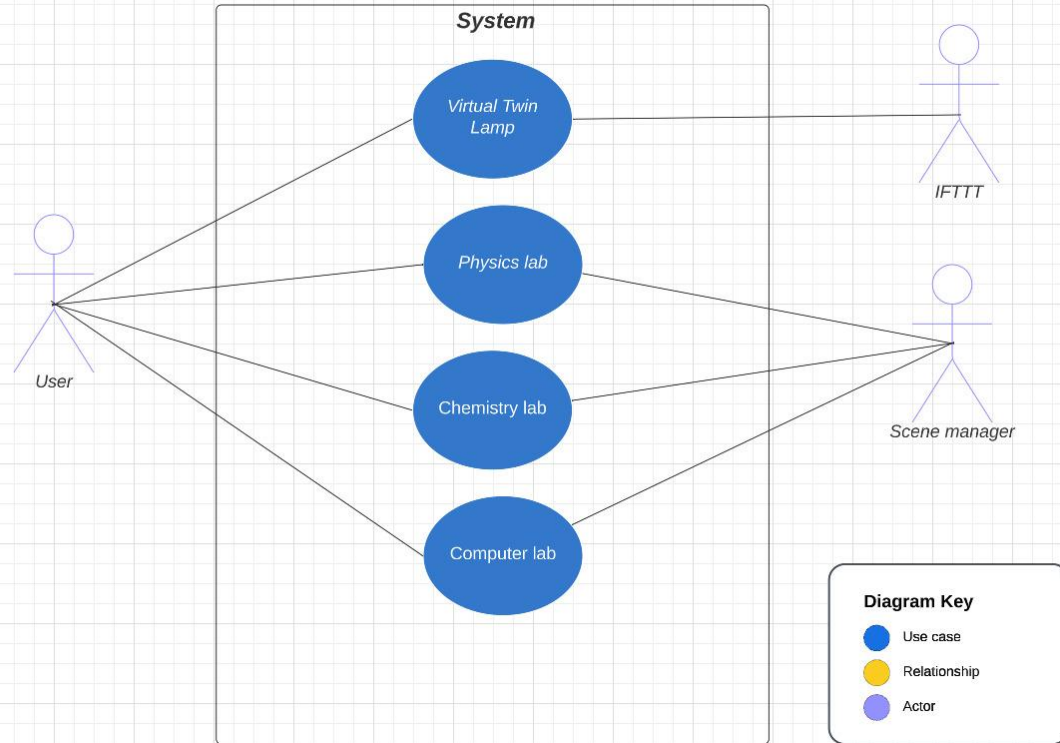
User Stories

- Connected a bulb light that works with WiFi to IFTTT website from which we can use the device triggering an event inside our project.
- Implemented Button Interactable and create IoP connection using IFTTT API
- Implemented a Scene Manager such that the player is able to seamlessly transition from one experience to the next.
- Implemented UI for selecting room to travel to from a hub
- Implemented backend system for saving and loading rooms during runtime
- Created Digital Twin Instances for a Bio, Physics, and Chem Lab Examples

Most notably from this list the implementation of the use of the switch to trigger the event of turning on a lamp in the digital twin also will turn on a lamp in the real world through the use of the an IoT Switch using the IFTTT API.

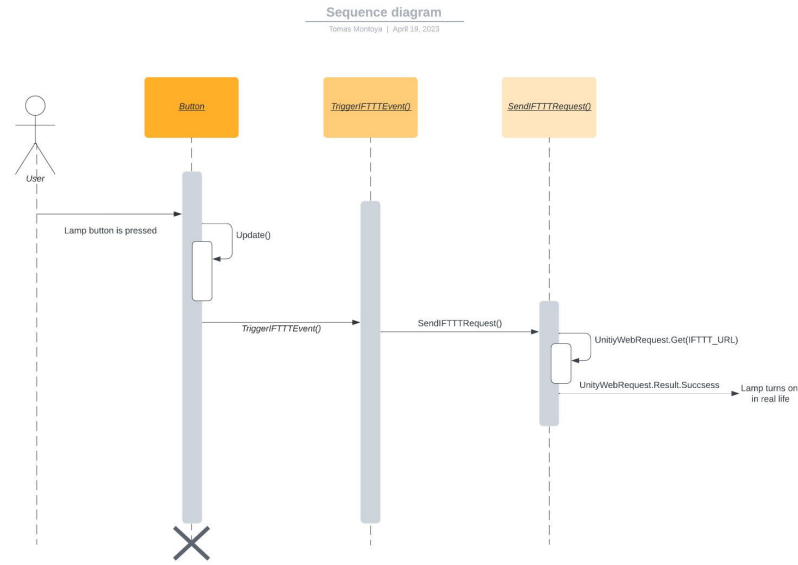
Use Cases

This is the Use Cases of the project. The most significant use case would be the usage of IFTTT on devices in the Digital Twin that will have real world effects like the lamp in the physics lab Digital Twin is able to be control the lamp in the real world from the Digital Twin by the press of a button.



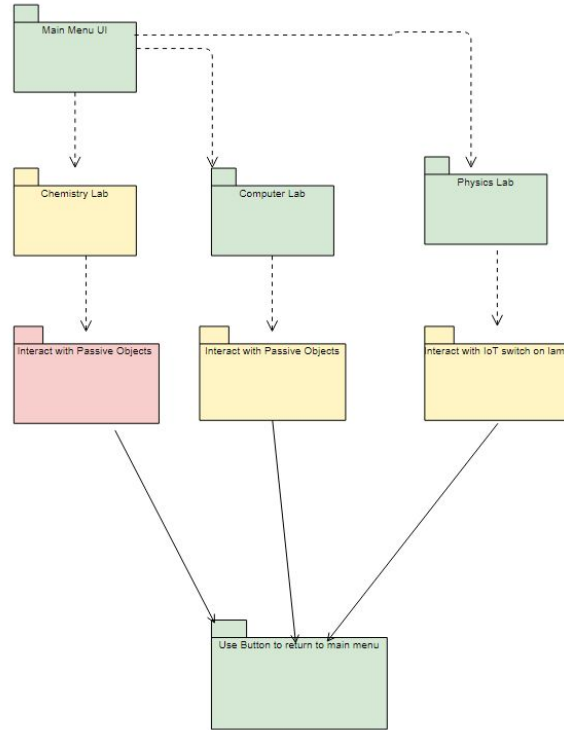
Sequence Diagram

Shown here is a sequence Diagram that outlines the loop for when the user wants to use the IoT lamp in the Physics Lab Digital Twin



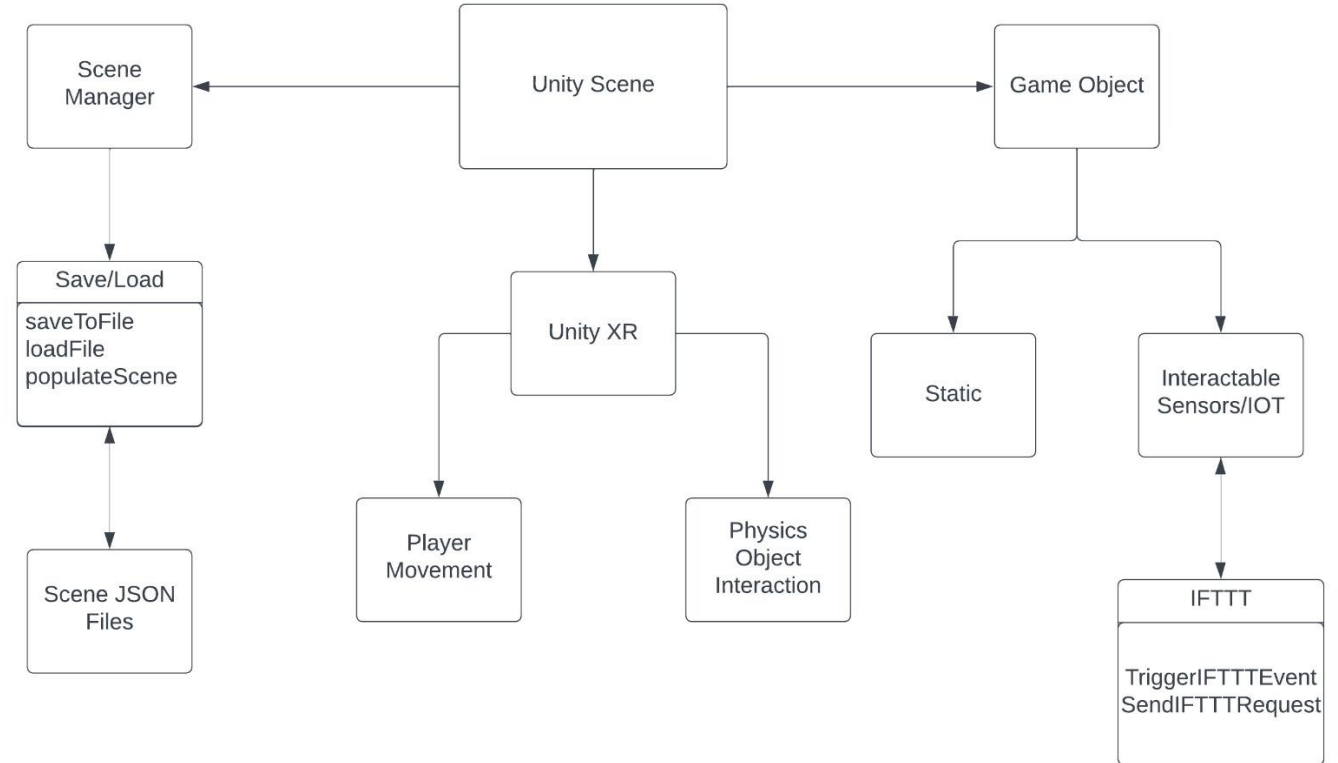
Architecture

This is a package diagram which outlines all of the features we have implemented this iteration.



Deployment Diagram

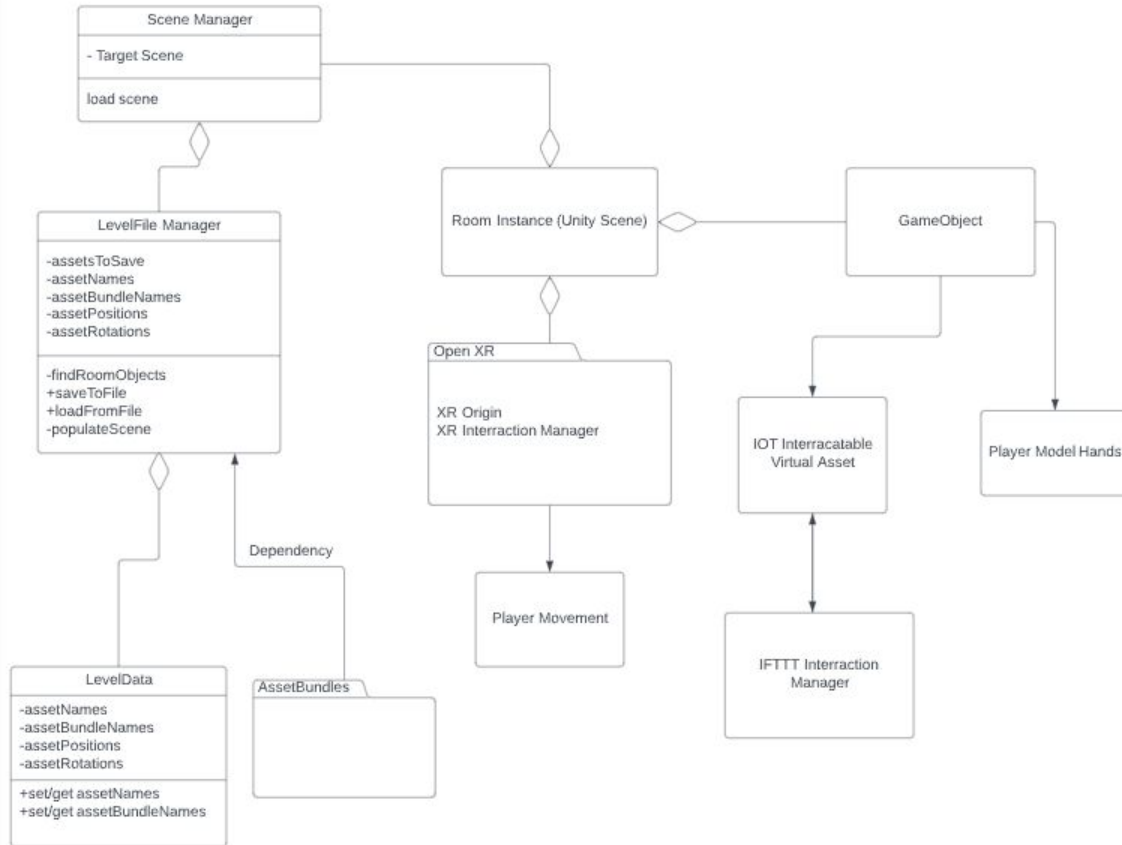
Since this was the first iteration of the project the entire team was responsible for creating and deploying all of these nodes in this diagram.



Safety & Persistence

- Security/Privacy Features
- Persistent Data Features

Class Diagram



Main Algorithm

```

1  using System.Collections.Generic;
2  using UnityEngine;
3  using UnityEngine.UI;
4  using UnityEngine.SceneManagement;
5
6  public class StartScreenUI : MonoBehaviour
7  {
8      public Dropdown levelDropdown;
9      public Button startButton;
10
11     private void Start()
12     {
13         // Populate the dropdown with the available scenes
14         List<string> sceneNames = new List<string>();
15         for (int i = 0; i < SceneManager.sceneCountInBuildSettings; i++)
16         {
17             string scenePath = SceneUtility.GetScenePathByBuildIndex(i);
18             string sceneName = System.IO.Path.GetFileNameWithoutExtension(scenePath);
19             sceneNames.Add(sceneName);
20         }
21         levelDropdown.AddOptions(sceneNames);
22
23         // Add a listener to the start button
24         startButton.onClick.AddListener(StartGame);
25     }
26
27     private void StartGame()
28     {
29         // Load the selected scene from the dropdown
30         int sceneIndex = levelDropdown.value;
31         SceneManager.LoadScene(sceneIndex);
32     }
33 }

```

This is the algorithm that was used to implement the menu driven UI to transport the player to the digital experience that they choose. Once the player hits the button they will return to the room with this menu.

Test Suites & Cases

- When the user hits the button in each of the experiences how long does it take to return to the main menu?
- When the user interacts with the IoT switch how does it take for the lamp in the real world to turn on after the one in the digital twin turns on?
- When the user makes a selection in the menu does the user go to the correct experience and how long did it take before this happened?

Summary

This project offers an insight on how to make implement a digital twin. We were able to replicate real places here at FIU that a user is able to traverse and feel almost like they are at a lab at FIU. With the rise in popularity in VR this can be a new and innovative way to provide new incoming students with a virtual orientation from the comfort of their own home.

Any Questions?

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