CS 261 Object Oriented Design and Programming
Project Report

TEAM: Cipher Catenae

TEAM MEMBERS:

(202151005) Aditya Chaplot
(202151178) Anmol Wadhwani
(202151123) Rachit Singh Chahar
(202151135) Rohit Kumar Varshney
(202151140) Sarvesh Vedprakash Singh
(202151174) Tridib Nandi

ACKNOWLEDGEMENT:

We have taken efforts in this project. However, it would not have been possible without the kind support and help of many individuals and organizations. We would like to extend our sincere thanks to all of them.

We are highly indebted to our Course instructor, Prof. Pramit Mazumdar, for his guidance and constant supervision as well as for providing necessary information regarding the project and also for her support in completing the project.
We would like to express our gratitude towards our seniors and batchmates for their kind co-operation and encouragement which helped us in completion of this project.
We would like to express our special gratitude and thanks to those who took part in our application trial, for giving us such attention and time.

Our thanks and appreciations also go to our colleagues who helped in developing the project and people who have willingly helped us out with their abilities.

PROJECT: Meta Square and GhostRunner

DESCRIPTION:

META SQUARE:

Meta Square is the ultimate shopping destination. With shops and stores, you can find everything you need in one convenient, virtual location. From the latest fashion trends to home decor, electronics, and more, there is something for everyone. With an immersive virtual environment, you can explore the mall and shop with ease. And with the latest technology, you can check out with a few clicks and have your purchases delivered right to your door.

We created Meta Square so that you can operate a physical avatar in the virtual world using all of your VR gear. When you are spawned in Meta Square, you can visit the nearby shops and stores since the avatar travels in accordance with your commands. Almost everything in the store is available for you to view for yourself. For instance, by clicking on the pants in the Louis Vuitton store in Meta Square, the pants will then be added to the mannequin on their own, creating a surreal shopping experience. The buyer will have the option to modify the mannequin's proportions in future updates, try on the items, and then purchase the appropriate size.

We have included the game "GhostRunner" for entertainment reasons similar to those found in malls. To play the game, the consumer must pay in the cryptocurrency Solana. Complex games will be introduced as the application improves to keep users interested and make the experience worthwhile. We are currently asking the user for 0.5 solana every game.

GHOSTRUNNER:

The camera switches from first person to third person as soon as the avatar enters the game, and the GameObject (Player) will spawn in the game's environment. To return to his native land, he must discover five arcanes throughout the game, and he will be directed through the plot by blue pole-shaped guides with clues on them, as soon as the game begins.

Every guide that comes into contact with the player emits a hint that will lead the player toward an arcane inadvertently. The player must go to the portal where it says "Congratulations, you have finished the game" after collecting all the arcanes and the player is brought back to Meta Square with the following click.

TECHNOLOGY READINESS LEVEL (TRL): Our application is currently on **TRL level 3.**

TECHNOLOGY USED:

- Firebase
- Unity (VR and game)
- Web3
- Visual Studio Code

OOPS CONCEPTS USED:

- Encapsulation
- Abstraction
- Polymorphism
- Inheritance
- Modularity

NUMBER OF END USERS FOR OUR APPLICATION:

We will start by implementing our concept for this virtual reality space on a modest scale. We will share our entertaining and engaging application with our fellow classmates as well as our institute's seniors and juniors so that we may take their suggestions into consideration and develop it for use on a greater scale. In all, we thus anticipate that there will be **500 users**.

AGE GROUP OF THE END USERS:

We are currently developing the application for our institute’s students. Accordingly, the age range of the end users would be between **18 and 25 years.**
The age group will vary, however, depending on the age range of the intended population if we are successful in expanding the use of this application.

LIFE SPAN OF OUR APPLICATION:

Our application is expected to last between **one and two years**, depending on a variety of conditions. The goal is to make this application even more dynamic and industry-ready after 1-2 years by adding more intriguing features, trying to incorporate additional capabilities, and working toward the goals outlined in future updates.

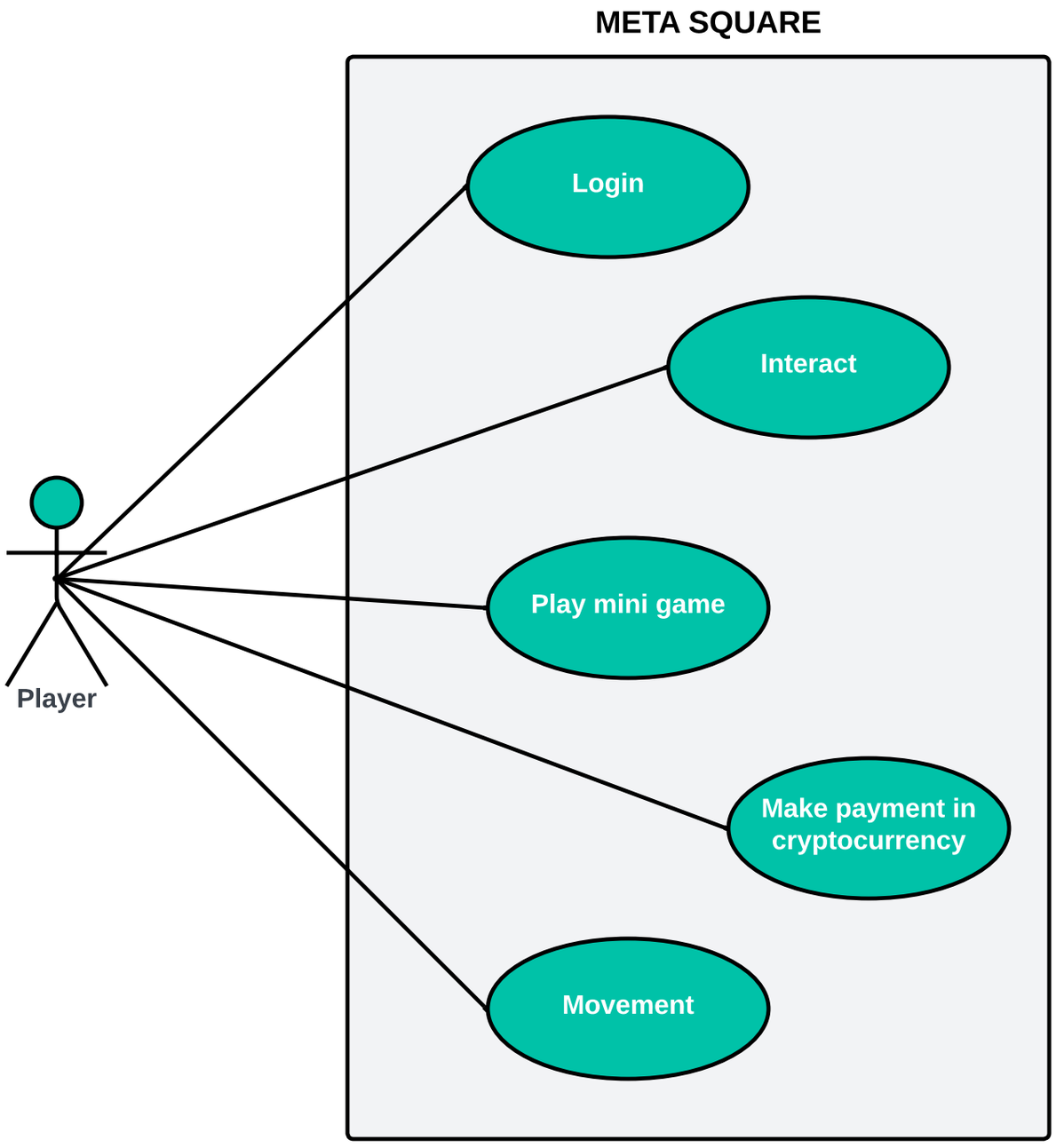
COST (HARDWARE/SOFTWARE) REQUIRED FOR THE OVERALL IMPLEMENTATION OF THE SYSTEM:

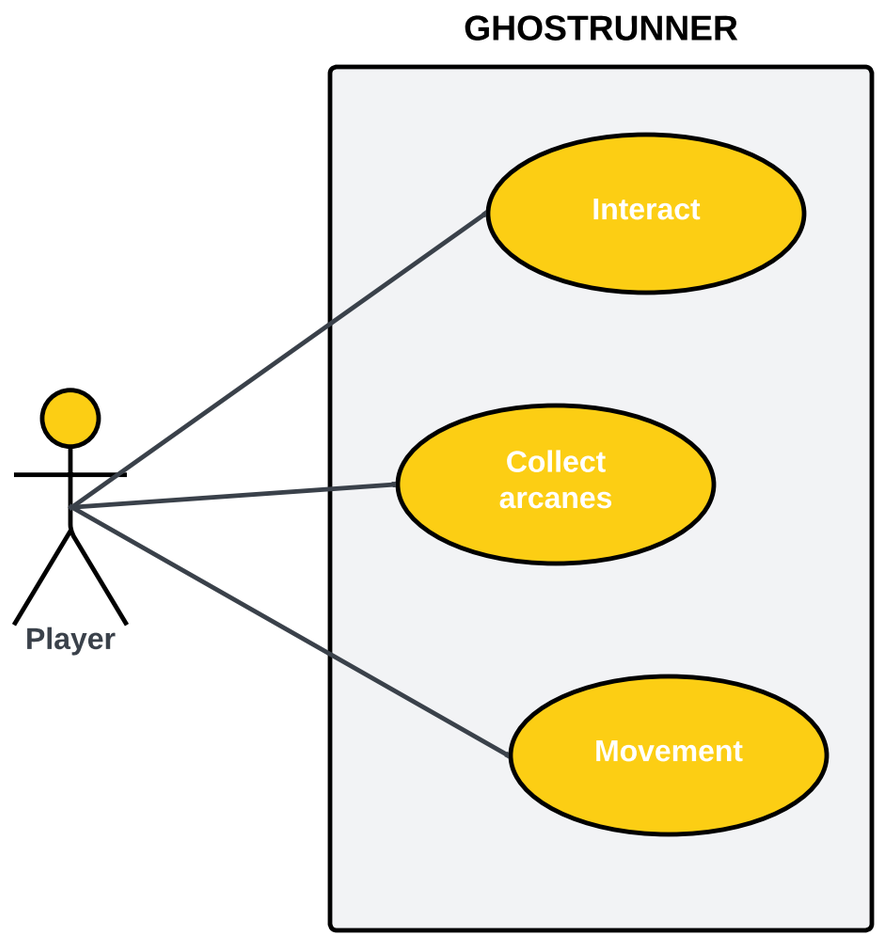
We have proposed a low-cost and easily data verifiable-based virtual reality space. Additionally, it depends on how many people we will include on the server, as the more users we add, the bigger or more sophisticated server we will require.
As Solana SDK is an open source blockchain platform so, currently, building this app will cost approximately **5000 INR** for the server and database for the login page.
However, in order to test our application and make modifications for compatibility with headsets, we may require an oculus set or VR headset in the future to prepare our app industry ready for a greater scale. That will cost us an additional **50,000 INR.**

STAKEHOLDERS (RESPONSIBILITIES OF EACH STAKEHOLDER):

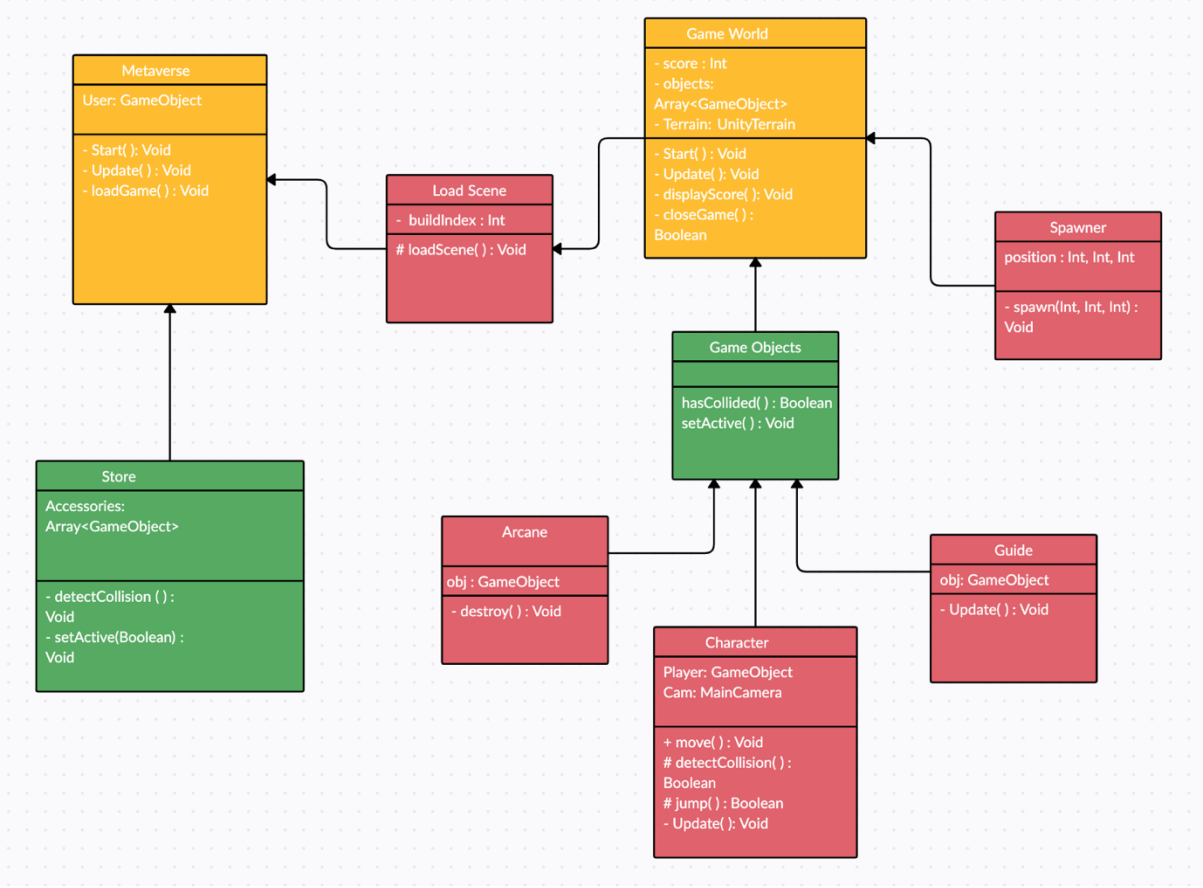
In the future, we will contact various brands and collaborate with them to provide them the opportunity to showcase their shops in our virtual era so that our customers may purchase from them, transforming the concept of window shopping into actual virtual shopping. In a similar vein, we'll try to contact other gaming companies so that we may add more intriguing games to our virtual world and implement the concept of cloud gaming.
Even our team members are stakeholders in our app as its developers, and it is our responsibility to continuously check for little bugs in our app, fix them as needed, and also provide exciting updates.

USE-CASE DIAGRAM DEPICTING THE OVERALL TOP-LEVEL VIEW OF THE SYSTEM TO BE IMPLEMENTED:



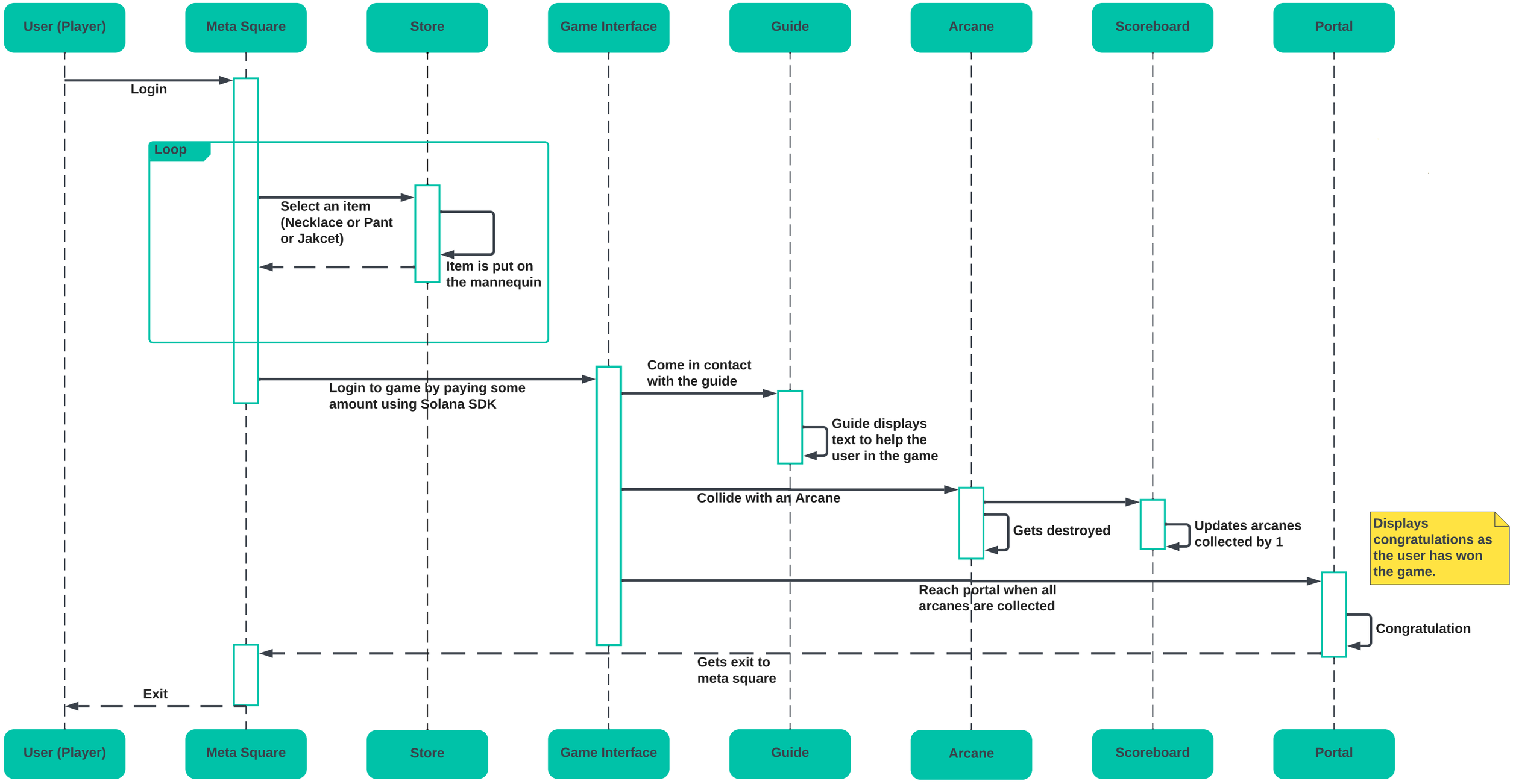


CLASS DIAGRAM DEPICTING THE ABSTRACT CONCEPT OF THE WORKING OF THE SYSTEM:



SEQUENCE DIAGRAM DEPICTING HOW THE MESSAGES WOULD BE TRANSFERRED WITHIN THE META SQUARE AND THE GAME:

META SQUARE AND GHOSTRUNNER



EXPLANATION OF EACH MODULE OF THE PROJECT:

Three modules, each taken on by two members of our team, made up our project. We made sure that each subteam had at least two team members so that they could discuss any doubts they had about their particular module. Finally, we connected each module to create the whole application by bringing them all together. This not only helped us divide up the work fairly, but it also increased our efficiency and taught us how to coordinate well.

Our project was divided into the following three modules:

STORES:

We incorporated a variety of shops in our virtual space, including tech, jewellery, and clothing retailers. Users can virtually experience several in-store aspects, such as clothing and jewellery, which is a unique feature of these store. Apple, Louis Vuitton, and Chanel Stores are just a few of the stores we have in our virtual space. Each store's exoskeleton was first constructed, and then we added details like mannequins, that could be utilised for testing products and may provide a hint as to the exhibited product. Finally, we combined each shop into a single entity in our virtual space.

In the future, we will allow in-store cryptocurrency transactions, which will be accessible to a larger amount of population.

THE GAME:

Our virtual space's game is a premium upgrade that takes cryptocurrencies (solana in our case). The character can be controlled by the player in this interactive game. The primary characteristic of this game is its extensive checkpoint system. The goal of the game is to gather all of the arcanes in order to win.

In the future, we intend to add more levels, as well as other games and activities. Overall, it will represent the game zone that we see in malls and other places.

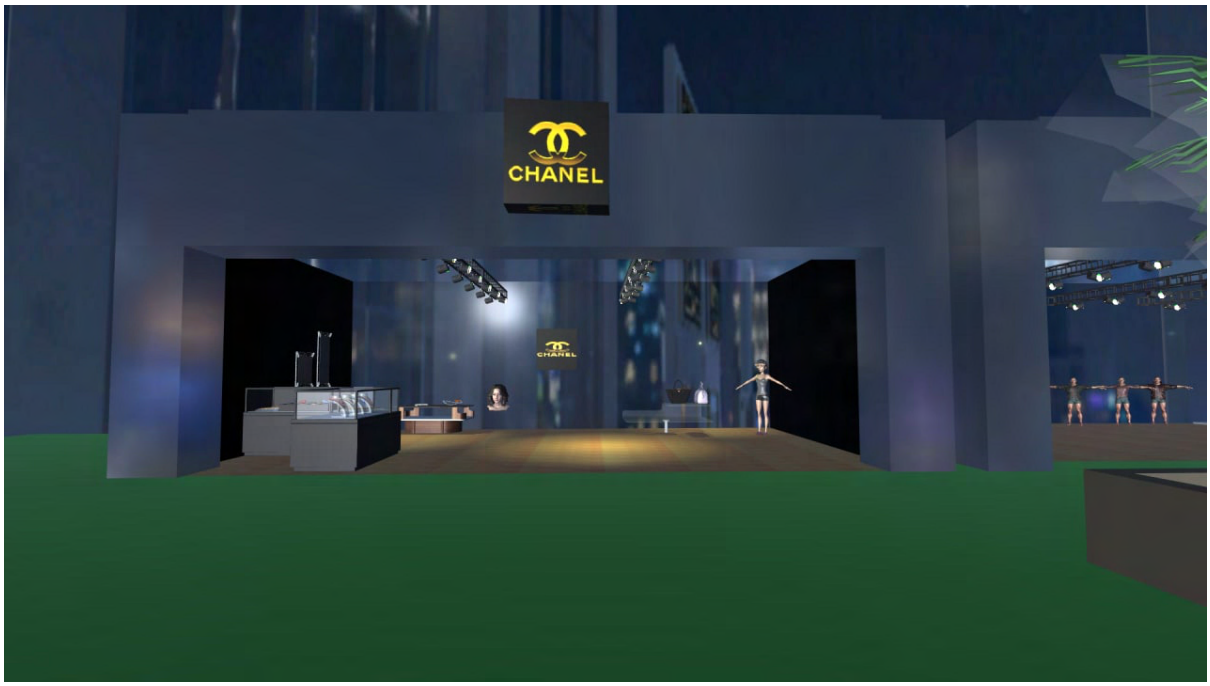
EXTERIOR ENVIRONMENT OF THE GAME AS WELL AS THE META SQUARE:

The exterior world is essentially a picture of an economically successful window shopping mall with a little game and metaverse inside. It foreshadows a day in the near future when we will encounter similar buying practises. Many of the MNCs will save time and money as a result. The MNCs may also buy or lease the store, bringing the host an economic benefit.

For the metaverse and the game portion, we used "UNITY." Additionally, Web3 was employed with C# for the transactional and development portions, respectively.

SCREENSHOTS OF THE IMPLEMENTED SYSTEM AND EXPLANATION:

META SQUARE:

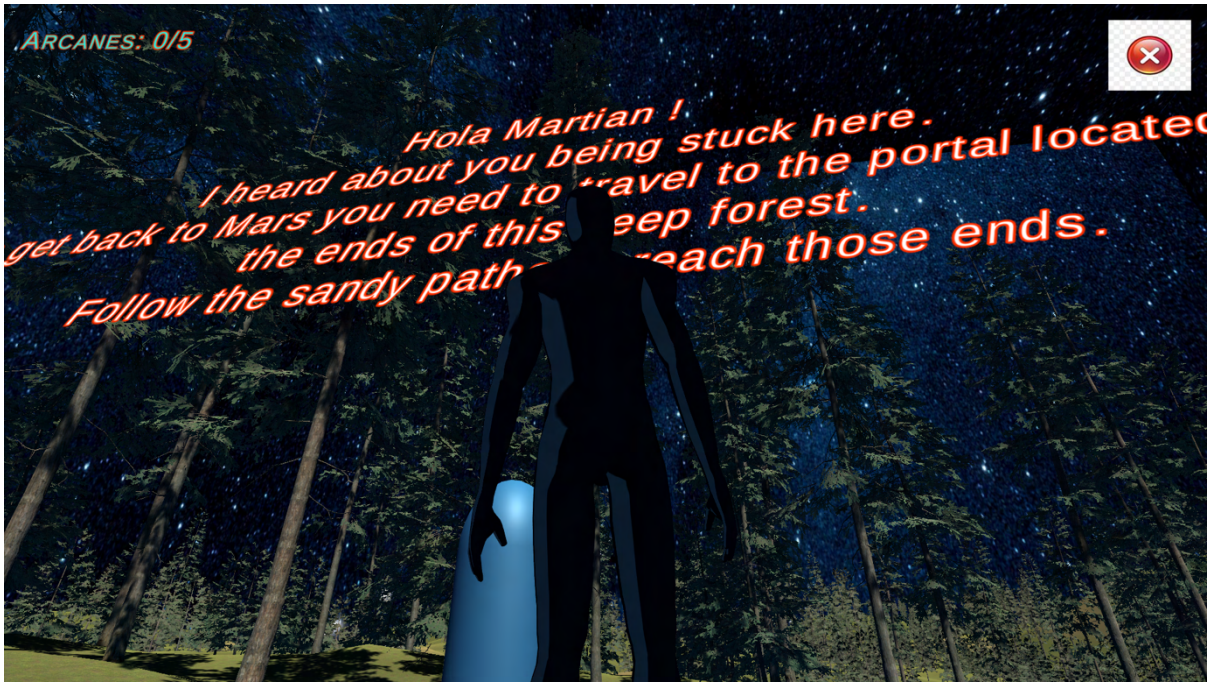


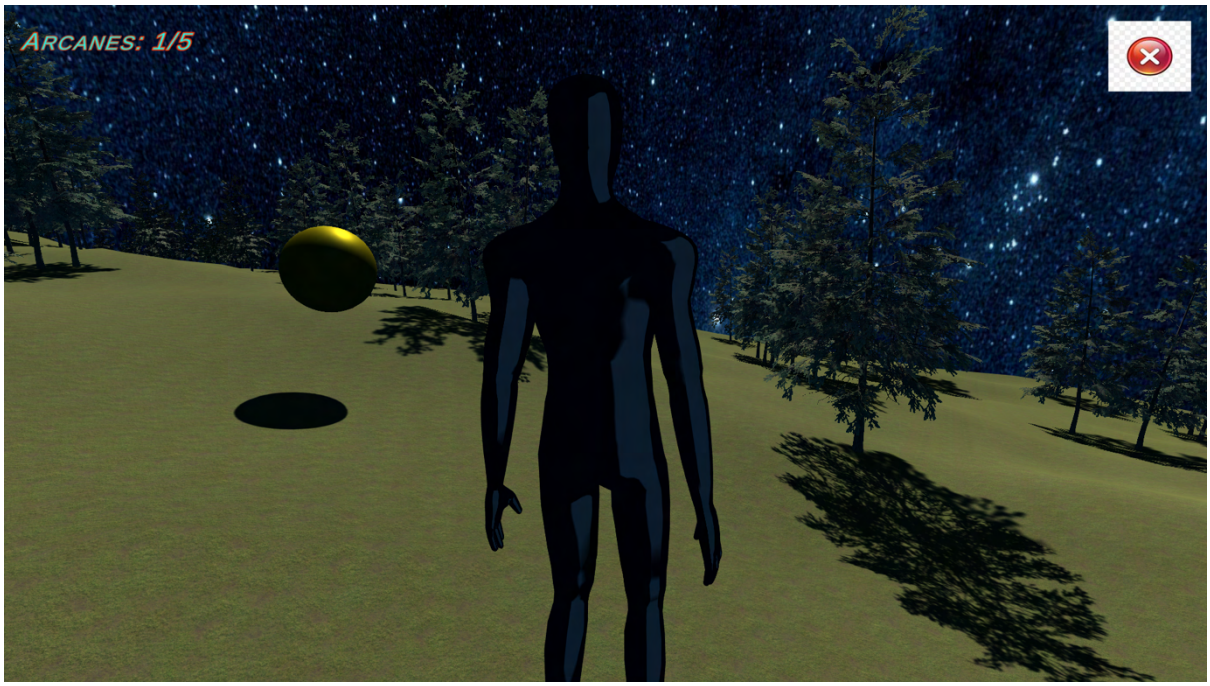
The user enters the Meta Square Virtual Space Mall and is greeted by the Cipher Catenae development team. This mall has a variety of virtual brand stores so that customers may shop from the comfort of their homes and try on items from various stores to replicate the feeling of window shopping. There are currently only three stores with the names Apple Inc., Chanel, and Louis Vuitton Corp., and customers may only view items on mannequins that have been put up in the store.

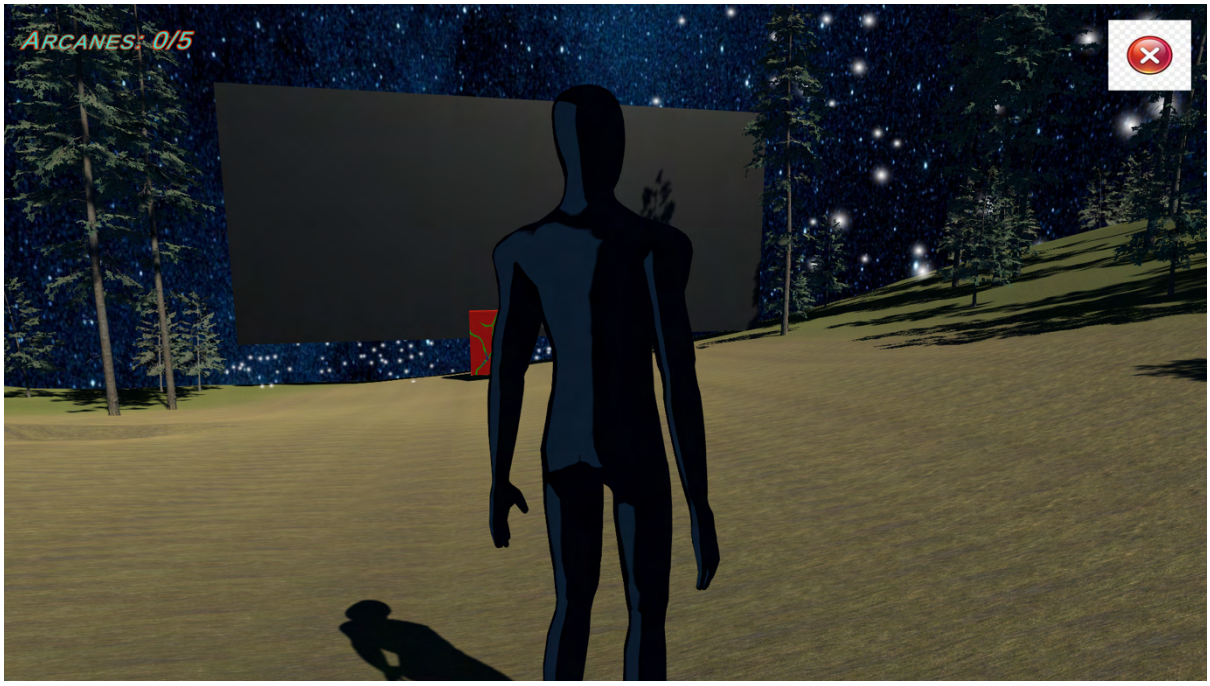
Our future plans call for collaborations with a growing variety of companies and the integration of their virtual brand stores in order to transform Meta Square into a full-fledged mall. In case the user wants to see how the item looks on them and whether it will suit them, we also have a plan to design a customisable mannequin that will reflect them based on their body proportions. This will make it more pleasant for consumers.

These stores will be maintained by the brands themselves, which will benefit customers who will enjoy online shopping from the convenience of their homes as well as ease the financial burden of a physical store. The mall has a game zone to make it more entertaining and participatory. A minigame that we created and integrated with the game zone is also available. Once users collide with the game's Ghost Runner board, they will enter into the game. Once the game entrance window has been opened, a little fee in the form of the cryptocurrency Solana is required. You can access the game after paying the cost.

GHOSTRUNNER:


ARCANES: 0/5
Hola Martian !
I heard about you being stuck here.
get back to Mars you need to travel to the portal located
the ends of this eep forest.
Follow the sandy path each those ends.


ARCANES: 1/5



So, we can see a strange guy in these images. He is the ghost, and the game is called GhostRunner. It is an adventure game in which the player is given a goal to gather all the arcanes as well as a mission to complete in order to win the game. The game's arcanes spawn at random, and several guides are placed around the game to help the player and assist them better comprehend the game's fundamentals. To make it more fascinating and engaging and to provide a sense of mystery, the story is set in a starry night with a forest as the background. Mountains and some of the deformities of planes may be seen in the landscape. The players' ultimate task, which must be completed in order to complete the game and win it, is to locate a missing piece and return it to the portal once they have collected all the arcanes.

In order to make our space more interactive and enjoyable, we intend to broaden its scope to include cloud games. To that end, we plan to provide a platform to various gaming communities and game development companies, allowing them to deploy their games there and directly host them on cloud servers, which will reduce the hardware requirements of both these organisations and users.

FUTURE SCOPE AND UPDATES:

So, when it comes to the program's potential for the future, it may certainly make a lot of things feasible very soon. First of all, the online environment we developed serves as a virtual mall, complete with shops, games, and entertaining activities for users.
For instance, we only know how the garment would seem in the photographs when we purchase from several shopping websites (clothing purchasing sites). We are unsure of how it will seem on a dummy, and certain features are not available in the applications we are currently using. Dummies are employed in stores and malls in the virtual world to make shopping more captivating and interesting. It seems that everyone who has to buy clothes

will make a virtual dummy with their measurements and use it as a model for themselves. All of this will not only save time and cut down on unnecessary orders, but it will also make shopping much more enjoyable.

Additionally, we will collaborate with a big number of businesses to offer cloud gaming. Future gaming in the cloud will take some time, but its only limitations will be the human developments that haven't yet been achieved.

As far as we are acquainted, cryptocurrencies will likely become the dominant form of money in the future since they offer the highest level of financial security. As a result, we are utilizing cryptocurrency transactions to authenticate players and enable game play. When the companies' app prototypes are ready or if they decide to release these cloud games, Meta Square will collaborate with a variety of cloud gaming providers, including Google Stadia, Netflix Gaming, Box, and Microsoft Gaming. Additionally, we would allow companies to open stores in Meta Square and turn our virtual area into a large online marketplace by selling them spaces or blocks in our virtual space.

Additionally, as the application develops, we may add an art gallery that offers possibilities for different artists to make NFTs in the real world, display them or auction them off in the virtual world, and receive payment in cryptocurrency.

REFERENCES:

Solana SDK to connect Solana blockchain with our app:

- https://github.com/garbles-labs/Solana.Unity-SDK

For 3D models:

- https://sketchfab.com/tags/unity3d

For Solana wallet extension:

- **https://chrome.google.com/webstore/detail/sollet/fhmfendgdocmcbmfikdcogofphi mnkno?hl=en**

Solana devnet faucet for test tokens:

- https://solfaucet.com/