Software Requirements Specification

Version 1.1

3rd March 2022

NFT Marketplace

Submitted in partial fulfillment

Of the requirements of

Software Engineering LAB

Prepared By

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Tushar Kumar- 199301263

Sarthak Ahuja- 199301246

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1.0. Purpose

1.1. Introduction

This Software Requirements Specification provides a complete description of all the functions and specifications of the NFT Marketplace.

The expected audience of this document is the faculty of CSE department, Dr. Neha Choudhary

1.2. Scope

The NFT marketplace is designed to provide a platform to people trading in the same. It enables them to buy, mint and explore NFTs from a wide range of options. It works on the polygon network so therefore will not require minimum gas fees.

1.3. Glossary

Term	**Definition**
ETH	Ethereum
NFT	Non Fungible Token -
Block chain	System on which a record of transaction is made in bitcoin or any other cryptocurrency are maintained across several computer thet are linked in a peer to peer network
DeFi	Decentralized finance
Daaps	Decentralized applications
Peer to peer network	Group of computer linked together with equal permissions and responsibilities to process data
Meta mask	Software crypto currency wallet used to interact with the blockchain
HTML	Hypertext Markup language
Polygon	Polygon is layer-2 scaling solution that runs alongside Ethereum blockchain
CSS	Cascading Style Sheets
Smart contracts	A smart contract is a self-executing contract with the terms of the agreement between buyer and seller being directly

	written into lines of code.
Mint	Process of turning a digital file into a crypto collectible or digital assets on the blockchain
SRS	Software Requirements Specification
Survey	Form filled out and submitted by an Alum using the CISWAAB.
Tbd	To be decided
Tbn	To be named
Web Site	A place on the world wide web

1.4. References

Tbd
//Ethereum whitpaper, polygon whitepaper

1.5. Document overview

The remainder of this document is two chapters, the first providing a full description of the project for the Departments of CSE. It lists all the functions performed by the system. The final chapter concerns details of each of the system functions and actions in full for the software developers' assistance. These two sections are cross-referenced by topic; to increase understanding by both groups involved.

2.0. Overall description

The NFT marketplace is designed to provide a platform to people trading in the same. It enables them to buy, mint and explore NFTs from a wide range of options. It works on the polygon network so therefore will not require minimum gas fees.

2.1. System environment

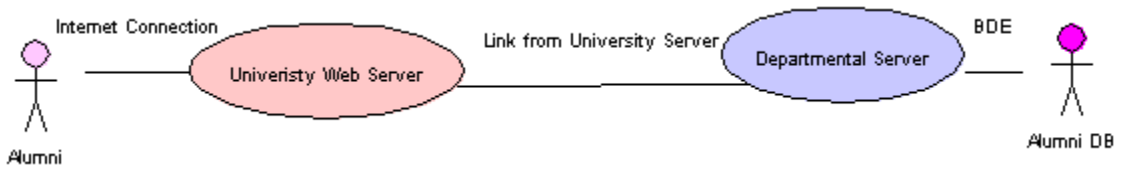


Figure 1 System Design

The NFT marketplace will be operated from the Netlify.

2.2. Functional requirements

Functional Requirements are those that refer to the functionality of the system, i.e., what services it will provide to the user. Nonfunctional (supplementary) requirements pertain to other information needed to produce the correct system and are detailed separately.

FUNCTIONAL REQUIREMENTS-

- Authentications
- Filtering
- Explore NFT
- Selling NFTs
- Buyng NFTs

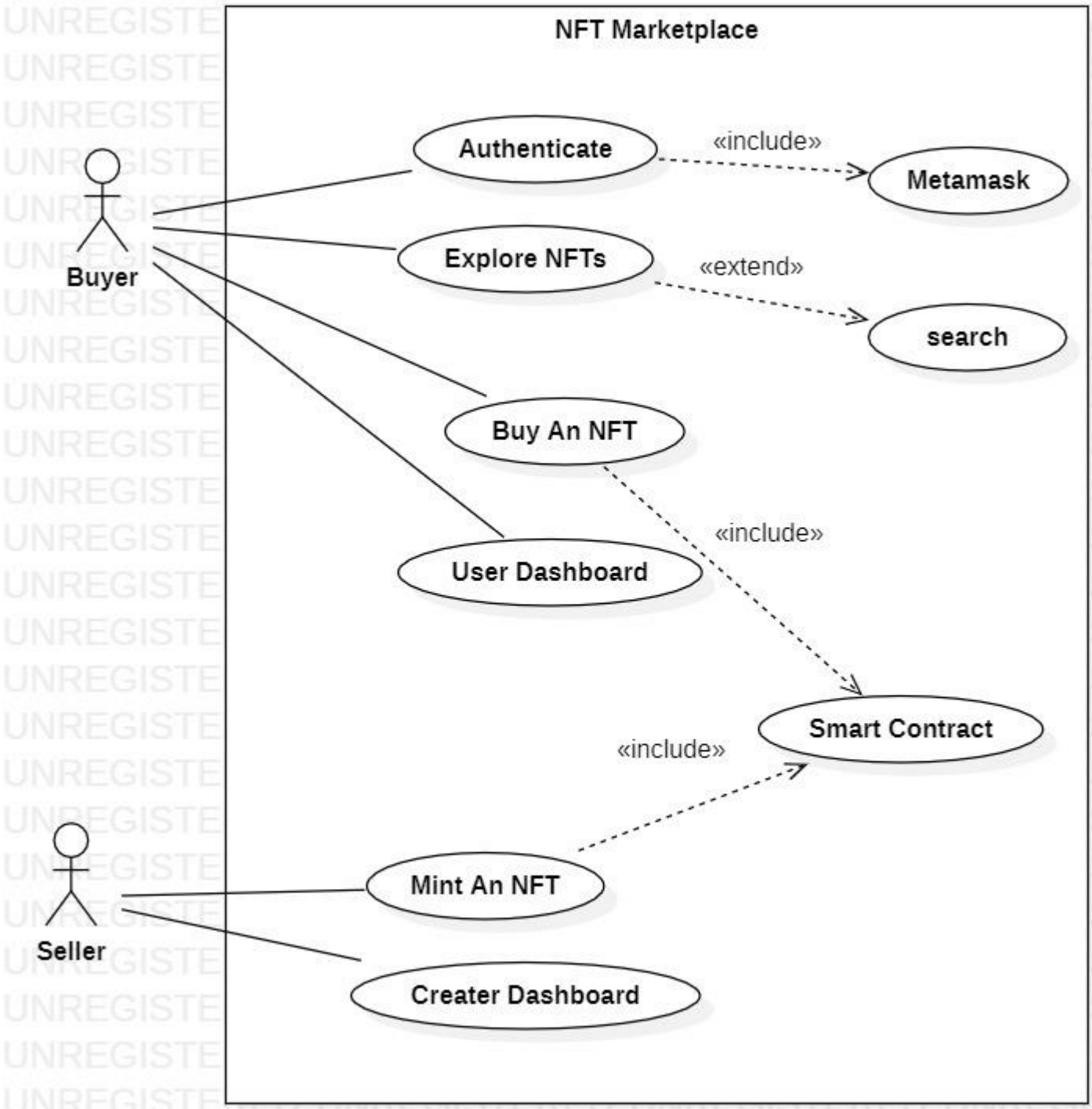
2.3. Use cases

Since user onboarding to any decentralized app starts by connecting a crypto wallet, this becomes an essential part of any software working on a blockchain.

Your customers will need a wallet to receive bonuses and awards either in the form of virtual money, currency, or non-fungible tokens.

It provides a platform for the user to explore and filter out NFTs.
User can buy a particular NFT by Authenticating their meta mask wallet
.The transaction details are stored and fetched via smart contract which is stored on the polygon chain. The user dashboard panel enables to view history of past transaction which showcases previously bought and currently possesed NFTs.

The seller is able to mint NFTs using our marketplace . While creating the same we enable them to categorize them and provide intrinsic details such as listing price , description and quantity . The seller is also able to view the list of NFTs he has created and sold using our creater dashboard .



2.4. Non-functional requirements

There are requirements that are not functional in nature. Specifically, these are the constraints the system must work within.

NON-FUNCTIONAL REQUIREMENTS-

- Secure
- Smart contracts
- Fast
- Scalable

3.0. Requirement specifications

3.1. External interface specifications

The only external system is Metamask used to login and verify user account. It facilitates all transactions occuring on the portal. It is a software cryptocurrency wallet used to interact with the Ethereum blockchain

3.2. Functional Requirements

Following are some of the features that can be added to the NFT marketplace:

3.2.1. Buy NFT

Use Case Name:	Buy NFT
Priority	Essential
Trigger	Buy button
Precondition	Buyer is connected to his metamask wallet and has sufficient balance
Basic Path	User selects buy option in the marketplace Transaction verified through metamask wallet
Alternate Path	N/A
Postcondition	User on the Home page

Exception Path	If wallet balance insufficient or netowork failure

3.2.2. Sell NFT

Use Case Name:	Sell NFT
Priority	Essential
Trigger	create button
Precondition	User on the create page and has sufficient balance to pay for listing price
Basic Path	1. User slects create option from dashboard and fills necessary details 2. Transaction verified through metamask
Alternate Path	N/A
Postcondition	User on the Home page
Exception Path	If a particular detail missed or balance is insufficent

3.2.3. ReList NFT

Use Case Name:	Relist NFT
Priority	Essential
Trigger	Resell button
Precondition	User on the myNFT page and has sufficient balance to pay for listing price
Basic Path	1. User slects relist option from dashboard 2. Transaction verified through metamask
Alternate Path	N/A
Postcondition	User on the Home page
Exception Path	If balance is insufficent

3.3. Detailed Non-Functional Requirements

3.3.1 Logical Structure of the Data

The logical structure of the data to be stored in the Polygon network is given below:-

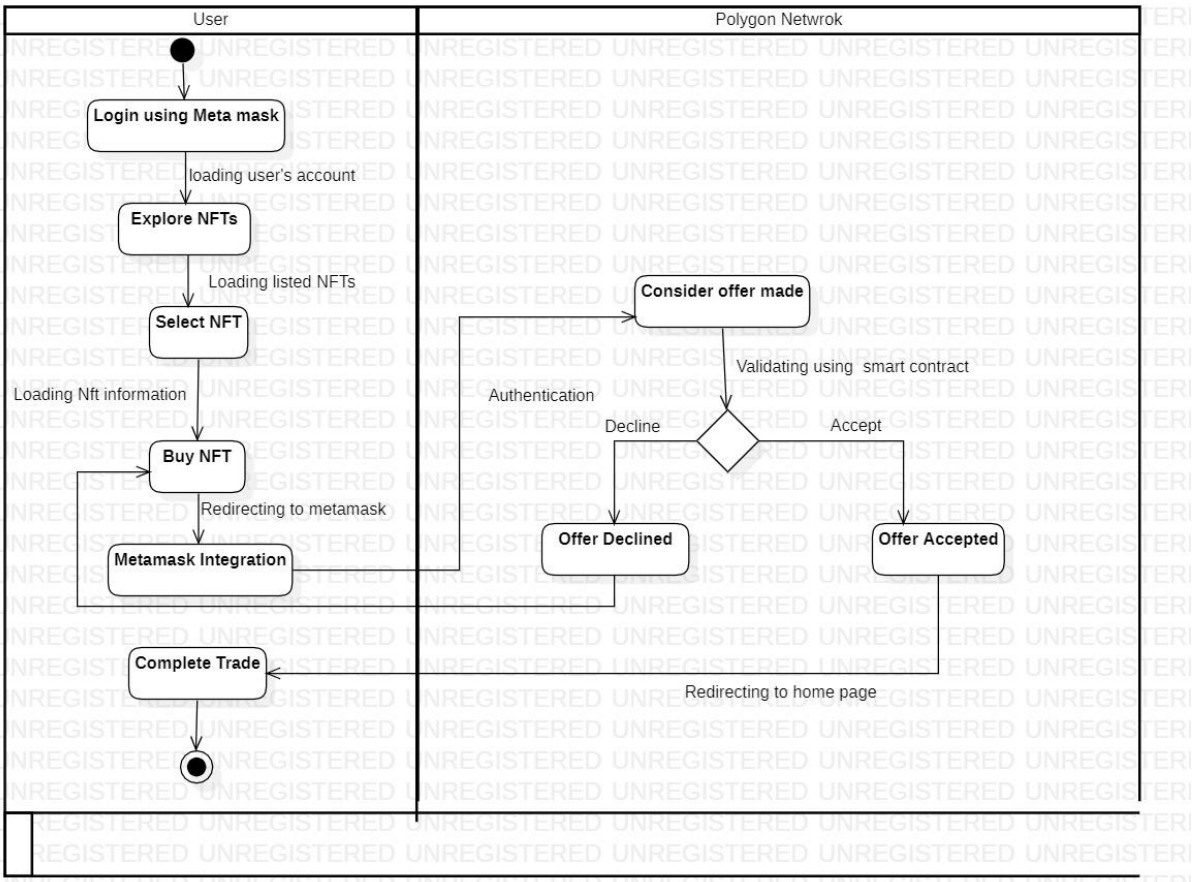
NFT Entity

Data Item	Type	Description	Comment
Name	Text	Name of Asset	
Description	Text	Description of Asset	
Price	Integer	Price of the Asset	May change
Image	Varbinary	Image of the Asset	

3.4. System Evolution

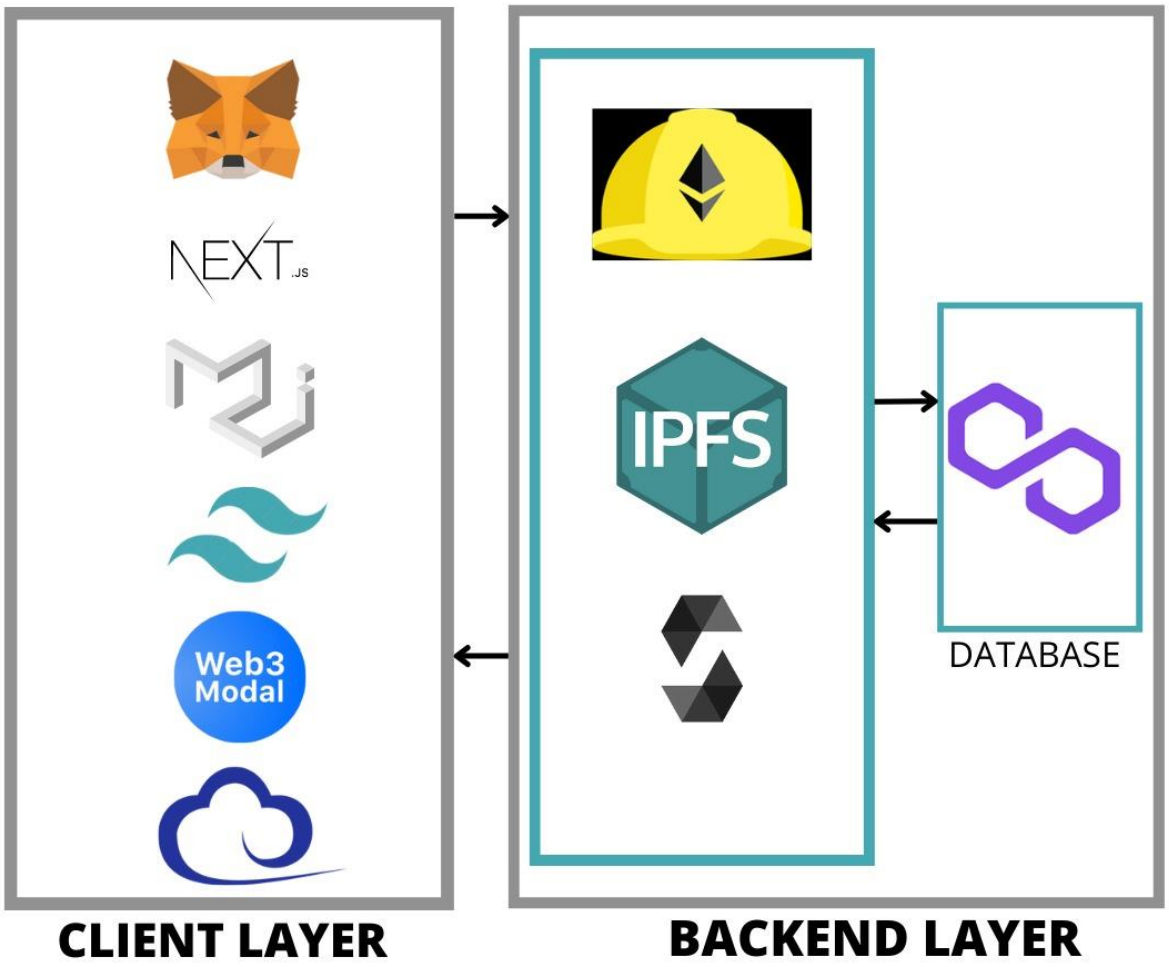
In the future the system can be extended to allow open auctions giving buyers the ability to place their bids following the system of a conventional open auction . The users will only be able to interact with the marketplace using our own cryptocurrency $WAGMI which will be relased later on in the future

Analysis Diagrams



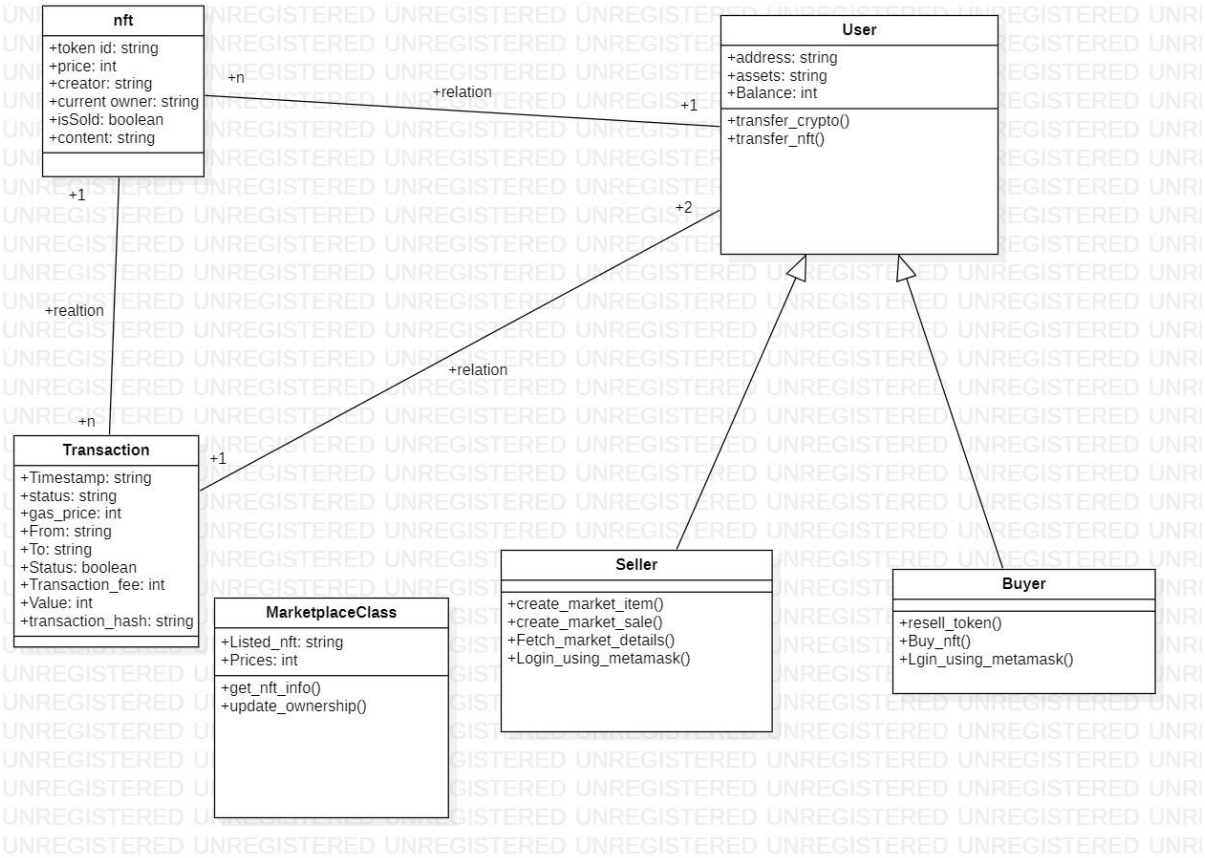
Activity Diagram

An activity diagram is a behavioral diagram i.e. it depicts the behavior of a system. An activity diagram portrays the control flow from a start point to a finish point showing the various decision paths that exist while the activity is being executed



Architecture Diagram

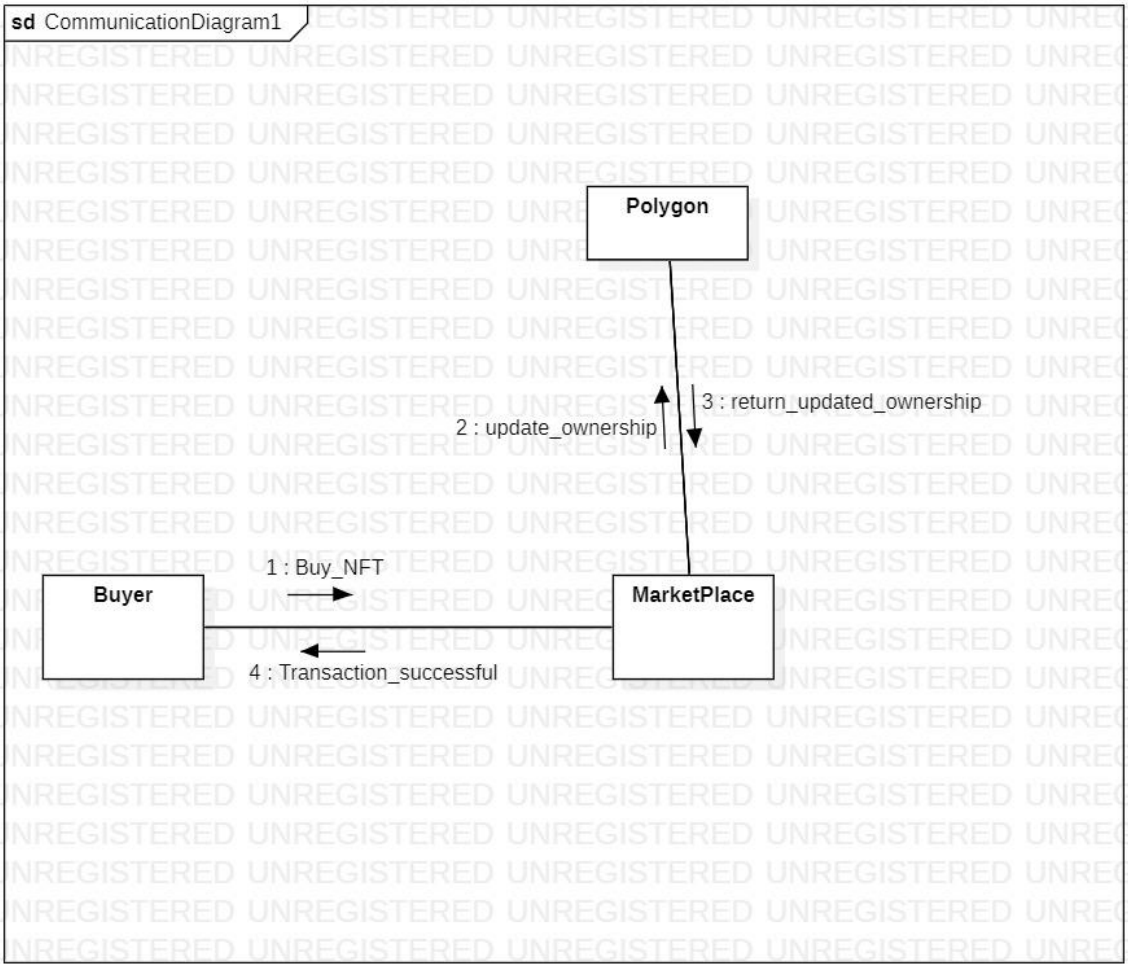
A simple architecture diagram (UML) helps system designers and developers visualize the high-level structure of their system or application to ensure it meets their users' needs. It can also help describe patterns that are used throughout the design.



Class Diagram

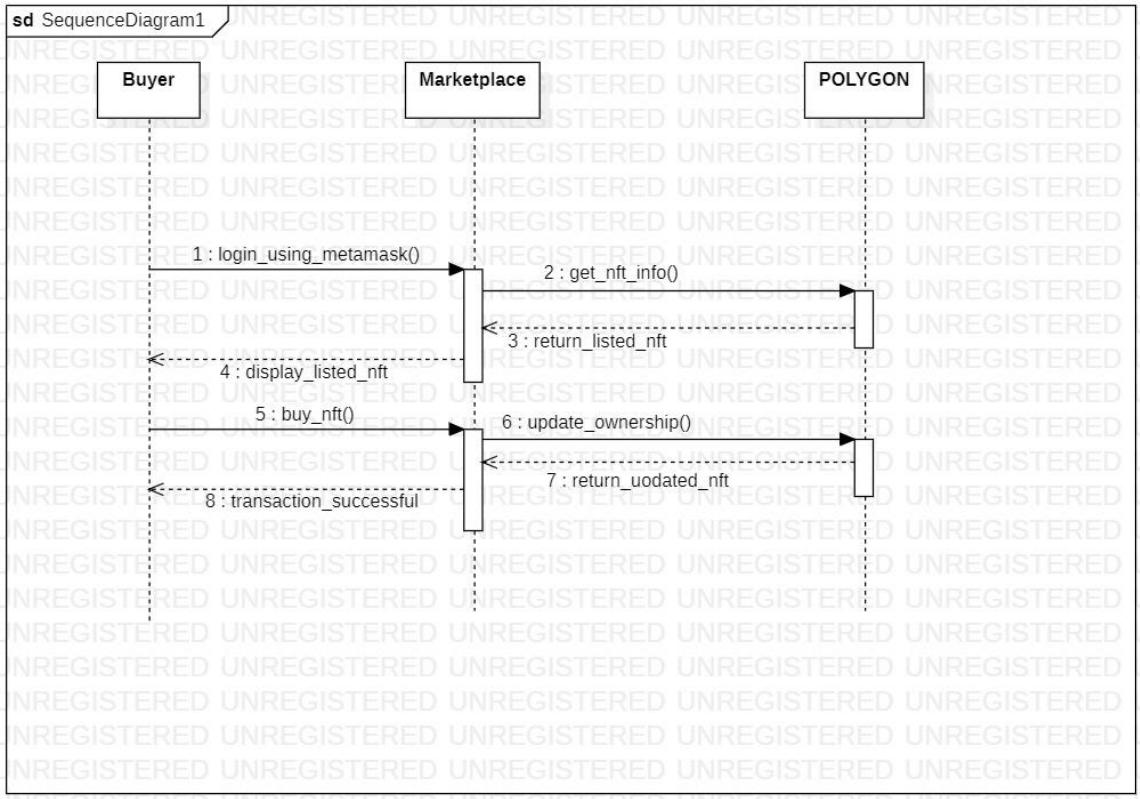
Class diagram is a static diagram. It represents the static view of an application. Class diagram is not only used for visualizing, describing, and documenting different aspects of a system but also for constructing executable code of the software application.

Class diagram describes the attributes and operations of a class and also the constraints imposed on the system. The class diagrams are widely used in the modeling of objectoriented systems because they are the only UML diagrams, which can be mapped directly with object-oriented languages.



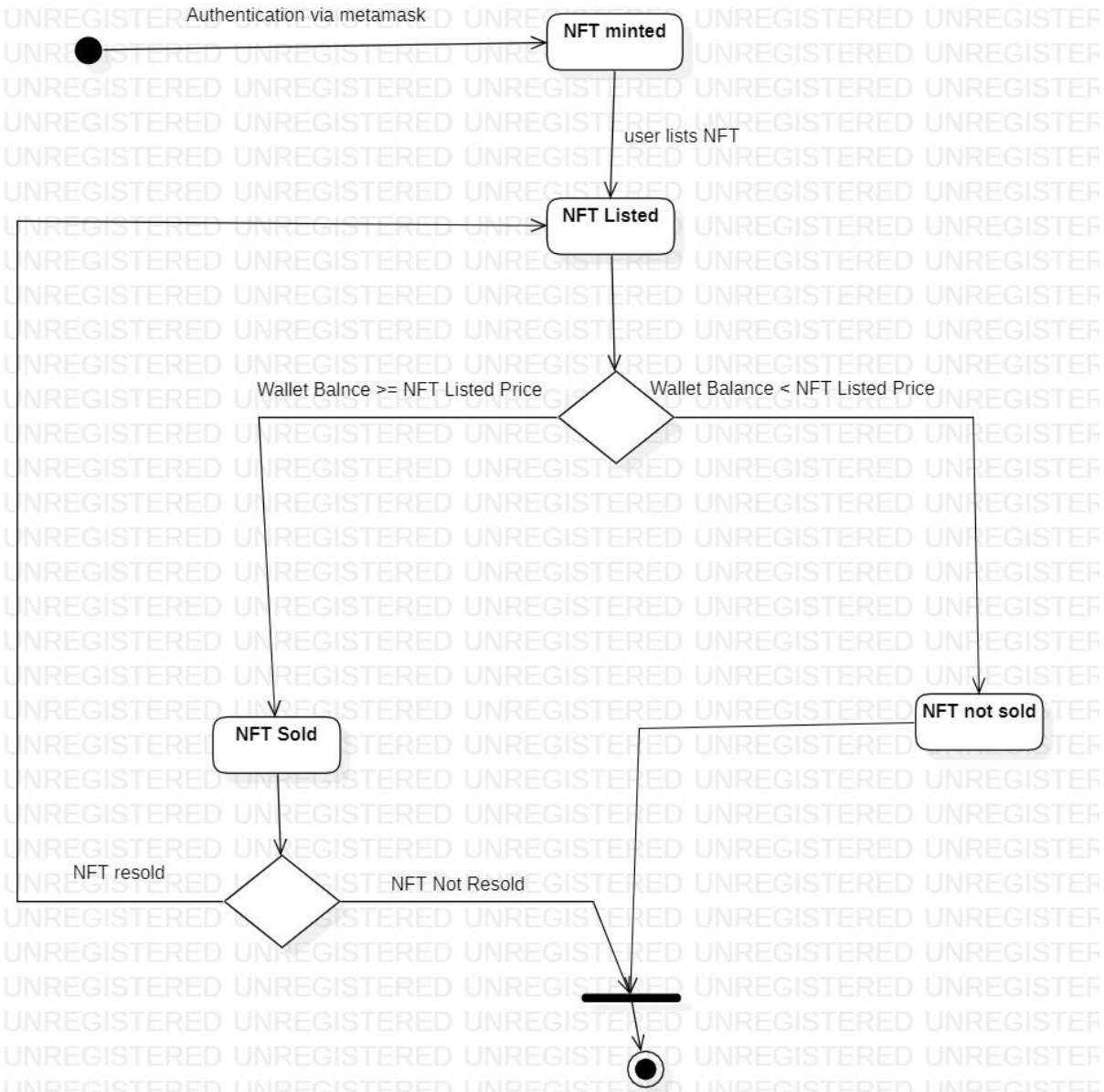
Communication diagram

UML communication diagrams, like the sequence diagrams - a kind of interaction diagram, shows how objects interact. A communication diagram is an extension of object diagram that shows the objects along with the messages that travel from one to another. In addition to the associations among objects, communication diagram shows the messages the objects send each other



Sequence Diagram

A sequence diagram is a type of interaction diagram because it describes how—and in what order—a group of objects works together. These diagrams are used by software developers and business professionals to understand requirements for a new system or to document an existing process.

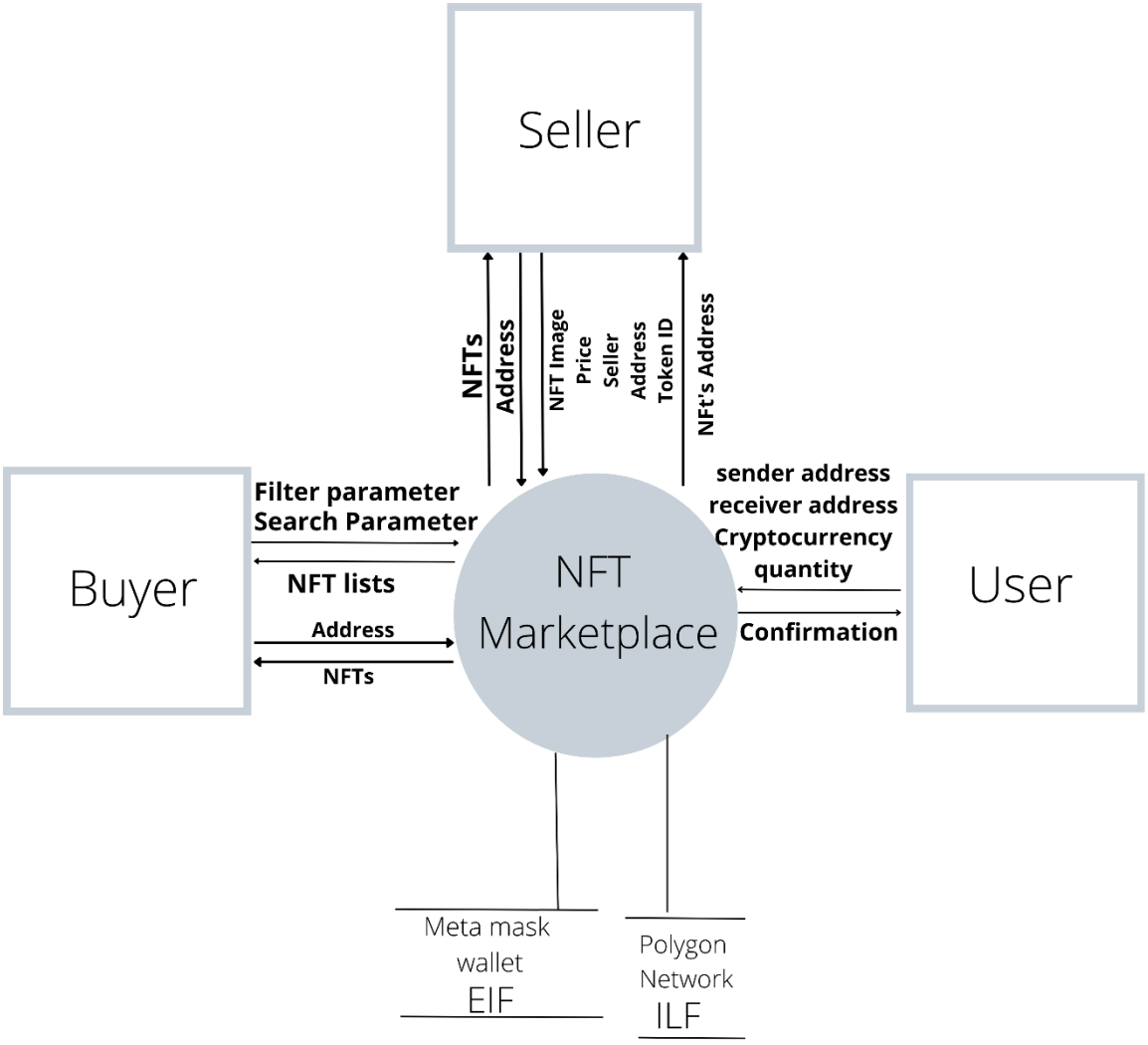


State Diagram

A state diagram is a type of diagram used in computer science and related fields to describe the behavior of systems. State diagrams require that the system described is composed of a finite number of states; sometimes, this is indeed the case, while at other times this is a reasonable abstraction.

COCOMO for NFT MarketPlace

Data Flow Diagram(DFD)



-

Functional Units:-

1) External inputs – 8 which is classified as high
2) External outputs-3 which is classified as low
3) Enquires – 4 which is classified as low
4) External Interface files –1 which is classified as low
5) Internal Logic files – 1 which is classified as low

Function point value for the project with the following information

- Number of user inputs = 8
- Number of user outputs = 4
- Number of user inquiries = 4
- Number of files = 1
- Number of external interfaces = 1

Functional wights for the same:-

- user inputs = 6
- user outputs = 4
- user inquiries = 4
- ILF = 7
- EIF = 5

UFP : Unadjusted Function Point = 6*8+4*4+4*4+1*7+1*7
=48+16+16+7+5
=92

COMPLEXITY ADJUSTMENT FACTORS

SL no.	Subject	Grade
1	Extent of complex data processing	5
2	Extent of complex inputs,outputs,online queries and files	5
3	Extent of online data entries	5
4	Extent of online updating of master files	5
5	Extent of change and focus on ease of use	2
6	Performance requirement	4

CAF(Complexity adjustment factor)= $(0.65+ 0.01 \sum F_i)$
$=0.65 + 0.01(5+5+5+5+2+4)$
$=0.65+0.01*26 =0.65+0.26$ **= 0.91**

Functional Point(FP) = UFP *CAF
= 92* 0.91
= **83.72**

Size = LOC(per FP) *FP = 47 * 83.72
= **3934.84**
=3.934 KLOC

Mode	Project Size	Nature of Project	Innovation	Deadline
Organic	**Typically 2-50 KLOC**	**Small size project, Experienced developers.**	**Little**	**Not Tight**

- **It take the form:**
- Effort(E) = a_b * (KLOC)$^{b}{}_{b}$(in Person-months)
- DevelopmentTime(D) = c_b * (E) $^{d}{}_{b}$ (in month)
- Average staff size(SS) = E/D (in Person)
- Productivity(P) = KLOC / E (in KLOC/Person-month)

Project	a_b	b_b	c_b	d_b
Organic	**2.4**	**1.05**	**2.5**	**0.38**

Results:-

Effort= 2.4 * $(3.934)^{1.05}$ = **10.111**

Development Time(D) = 2.5 * $(10.111)^{0.38}$ **=6.022**

Average Staff Size(SS) = 10.111/6.022=**1.679**

Productivity(P) = 3.934/10.111=**0.389**

White Box Testing

Here we have identified the DD graph fro the fetchItemsListed() used in our solidity contract. In an effort towards the same direction we have computed the cyclomatic complexity and identified all independent paths. Test cases were also designed for the same

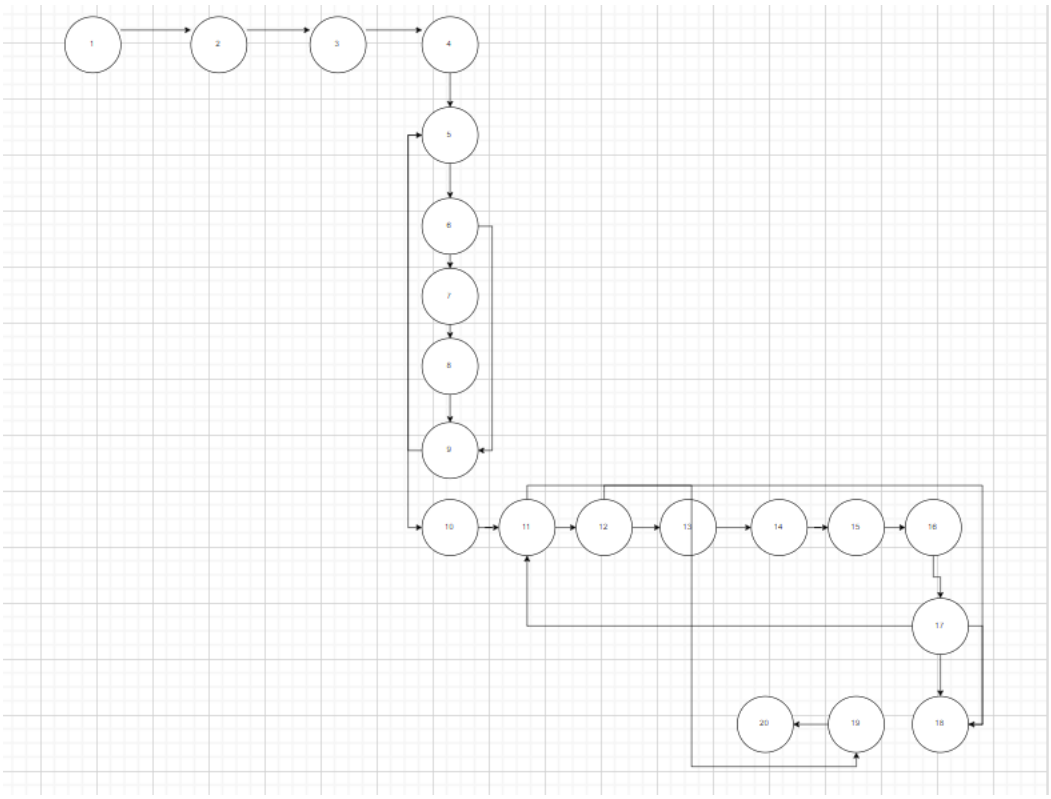
CODE:-

```
1)function fetchItemsListed() public view returns (MarketItem[] memory) {
   2)  uint totalItemCount = _tokenIds.current();
    3) uint itemCount = 0;
    4) uint currentIndex = 0;

    5) for (uint i = 0; i < totalItemCount; i++) {
      6) if (idToMarketItem[i + 1].seller == msg.sender) {
        7) itemCount += 1;
   8)   }

    9) }
   10) MarketItem[] memory items = new MarketItem[](itemCount);
    11) for (uint i = 0; i < totalItemCount; i++) {
      12) if (idToMarketItem[i + 1].seller == msg.sender) {
       13)  uint currentId = i + 1;
       14)  MarketItem storage currentItem = idToMarketItem[currentId];
        15) items[currentIndex] = currentItem;
        16) currentIndex += 1;
      17) }
    18) }
    19) return items;
  20) }
```

DD Graph:-



CYCLOMATIC COMPLEXITY:-

The cyclomatic complexity can be calculated using the formula E-N+2P where

E is the no. of edges which is 23 in this case
N is the no. of nodes which is 20 in this case
P is no. of connected componenets whose value is always 1

Cyclomatic complexity is 23-2-+2= **5** in this case

INDEPENDENT PATHS:-

Path 1:-
1->2->3->4->5->6->7->8->9->7->10->11->12->13->14->15->16->17->18->11->19->20
This path is followed only when idToMarketItem[i + 1].seller == msg.sender

Path 2:-
1->2->3->4->5->6->9->7->10->11->12->13->14->15->16->17->18->11->19->20
This path is never followed as the if conditions are same for both

Path 3:-
1->2->3->4->5->6->9->7->10->11->12->18->11->19->20
This path is followed only when idToMarketItem[i + 1].seller != msg.sender

Path 4:-
1->2->3->4->5->6->7->8->9->7->10->11->12->18->11->19->20
This path is never followed as the if conditions are same for both

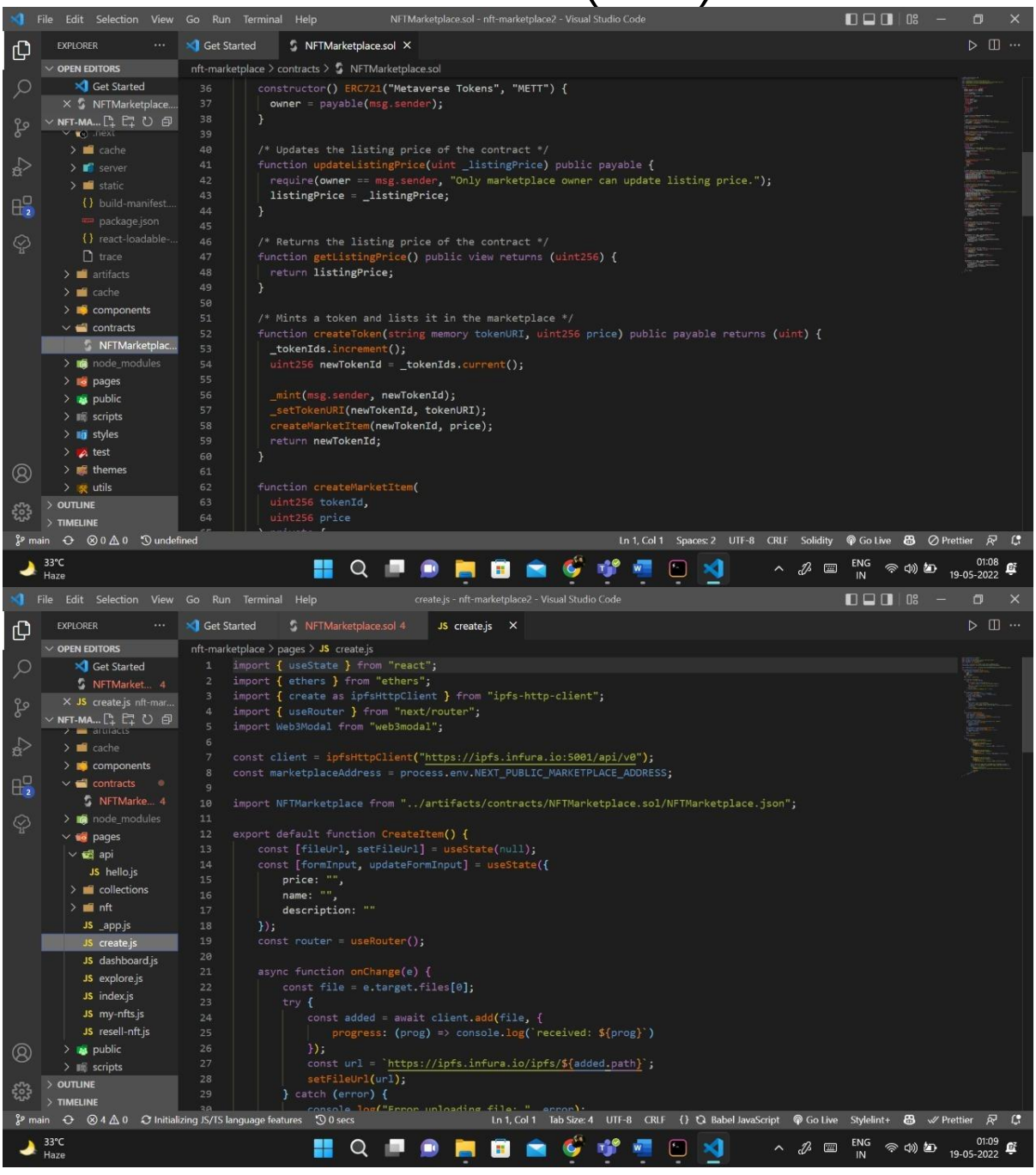
Path 5:-
There will be 4 independent paths but loops exists so various combinations of the same can be considered

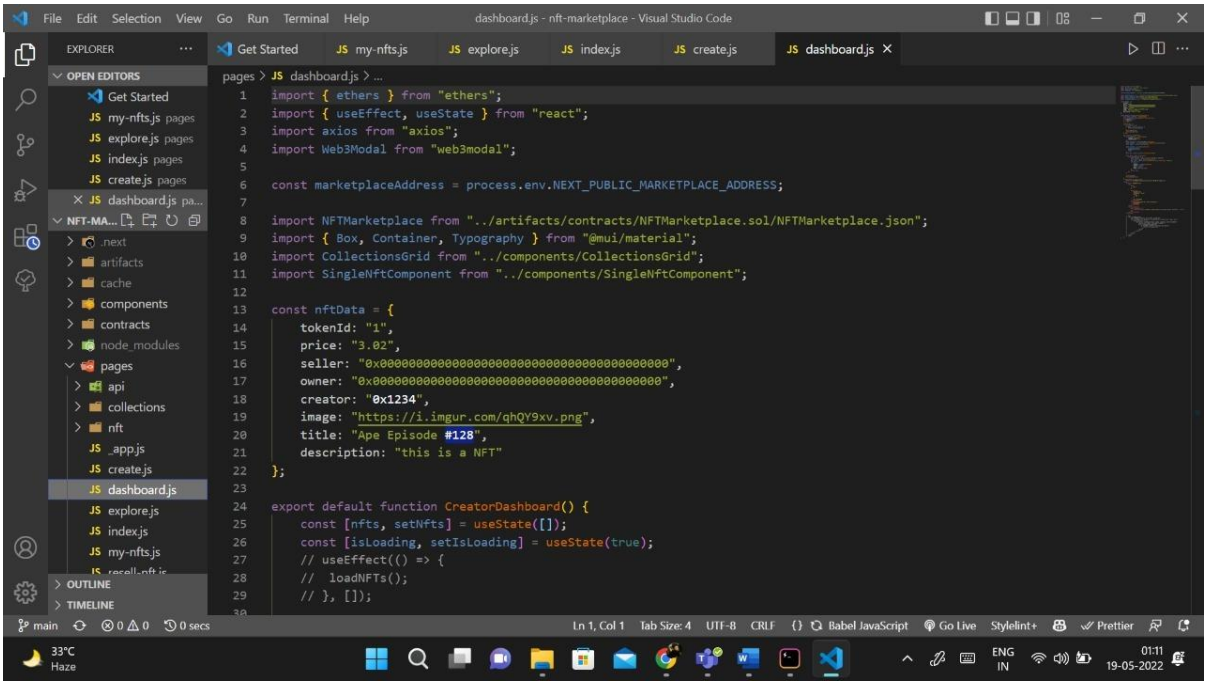
Black box testing
Decision table testing

C_1:User is Buyer	True								False							
C_2:NFT owned	True				False				True				False			
C_3:NFT minted	True		False		True		False		True		False		True		False	
C_4:Sufficient balance	True	False	True	False	True	False	True	False	True	False	True	False	True	False	True	False
	A1 A3 A4	A4	A1 A3		A1 A4	A4	A1		A2 A4	A4	A2		A2 A	A4	A2	

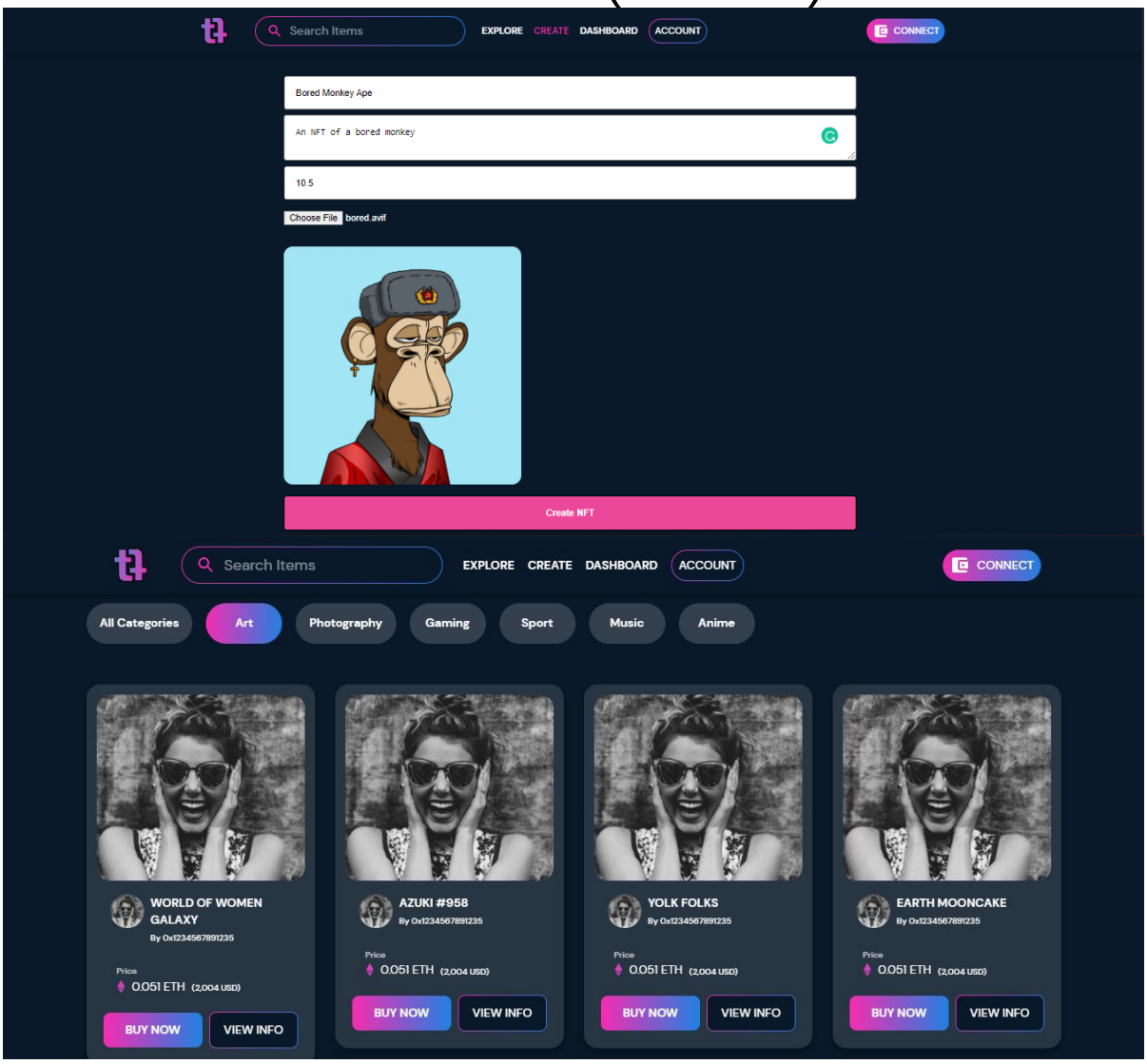
A1- Buy NFT
A2-Sell NFT
A3-Resell NFT
A4-My NFT page available

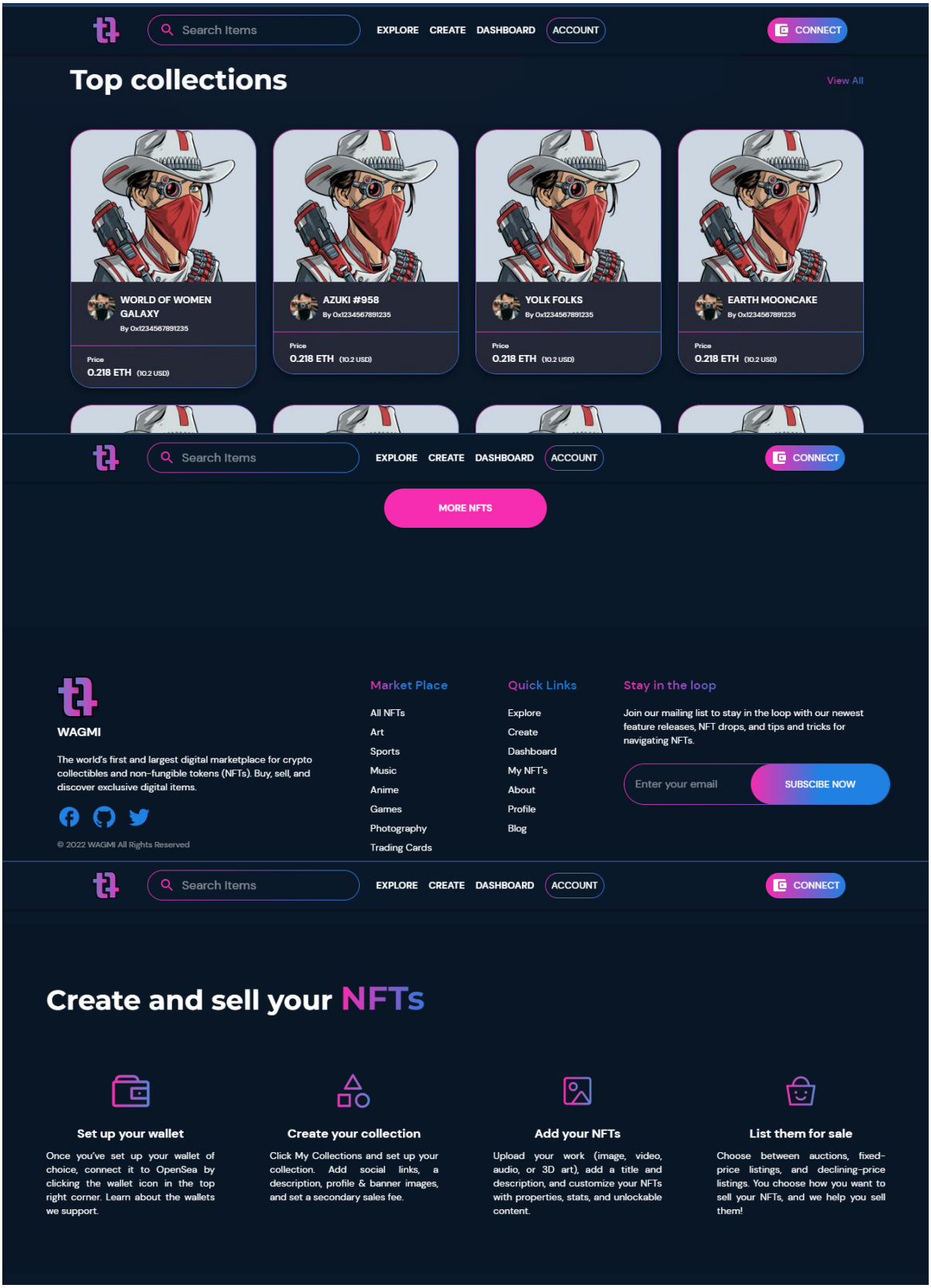
ScreenShots(code)




File Edit Selection View Go Run Terminal Help
dashboard.js - nft-marketplace - Visual Studio Code
EXPLORER
OPEN EDITORS
Get Started
my-nfts.js pages
explore.js pages
index.js pages
create.js pages
dashboard.js pa...
NFT-MA...
.next
artifacts
cache
components
contracts
node_modules
pages
api
collections
nft
_app.js
create.js
dashboard.js
explore.js
index.js
my-nfts.js
OUTLINE
TIMELINE
Get Started
my-nfts.js
explore.js
index.js
create.js
dashboard.js
pages > dashboard.js > ...
import { ethers } from "ethers";
import { useEffect, useState } from "react";
import axios from "axios";
import Web3Modal from "web3modal";
const marketplaceAddress = process.env.NEXT_PUBLIC_MARKETPLACE_ADDRESS;
import NFTMarketplace from "../artifacts/contracts/NFTMarketplace.sol/NFTMarketplace.json";
import { Box, Container, Typography } from "@mui/material";
import CollectionsGrid from "../components/CollectionsGrid";
import SingleNftComponent from "../components/SingleNftComponent";
const nftData = {
tokenId: "1",
price: "3.02",
seller: "0x0000000000000000000000000000000000000000",
owner: "0x0000000000000000000000000000000000000000",
creator: "0x1234",
image: "https://i.imgur.com/qhQY9xv.png",
title: "Ape Episode #128",
description: "this is a NFT"
};
export default function CreatorDashboard() {
const [nfts, setNfts] = useState([]);
const [isLoading, setIsLoading] = useState(true);
// useEffect(() => {
// loadNFTs();
// }, []);
main
0 0 0 secs
Ln 1, Col 1 Tab Size: 4 UTF-8 CRLF Babel JavaScript Go Live Stylelint+ Prettier
33°C
Haze
ENG
IN
01:11
19-05-2022

Screenshots(frontend)




Search Items
EXPLORE
CREATE
DASHBOARD
ACCOUNT
CONNECT
Top collections
View All
WORLD OF WOMEN GALAXY
By 0x1234567891235
Price
0.218 ETH (10.2 USD)
AZUKI #958
By 0x1234567891235
Price
0.218 ETH (10.2 USD)
YOLK FOLKS
By 0x1234567891235
Price
0.218 ETH (10.2 USD)
EARTH MOONCAKE
By 0x1234567891235
Price
0.218 ETH (10.2 USD)
MORE NFTS
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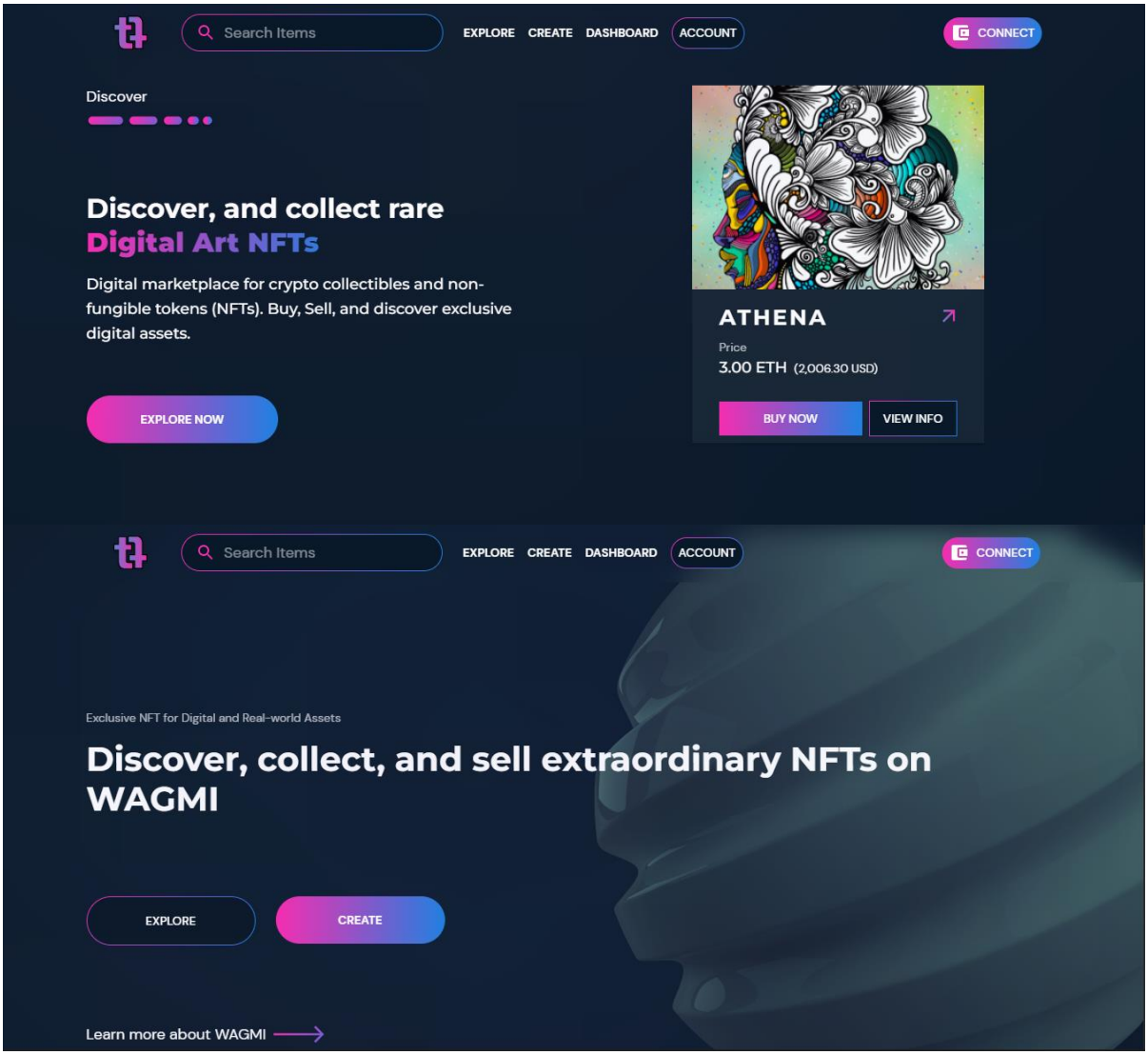
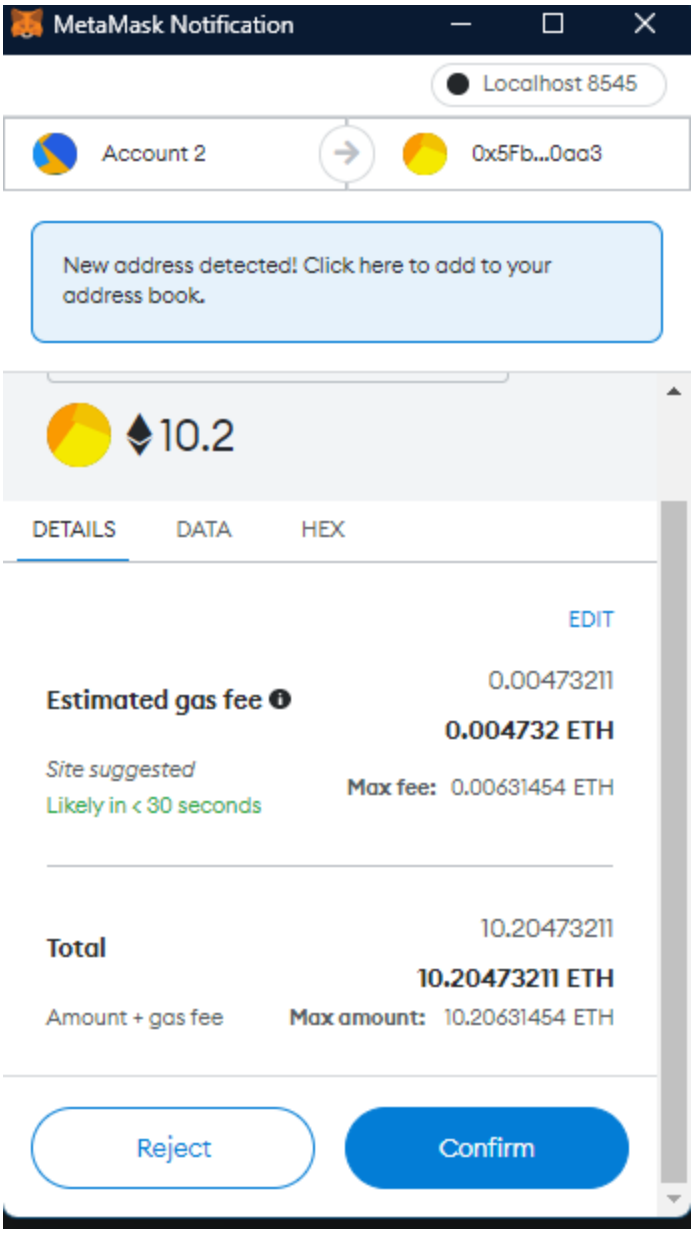
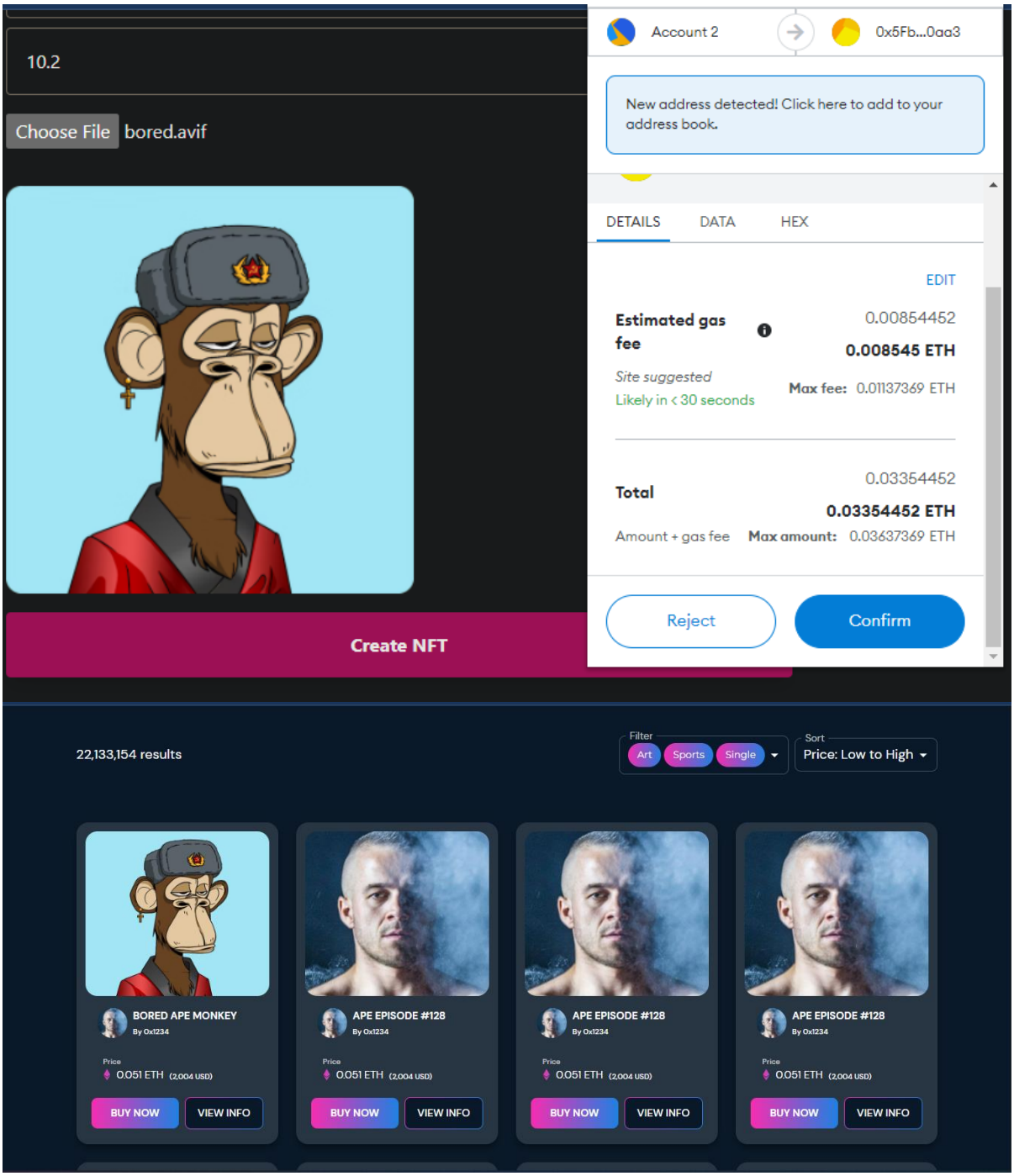
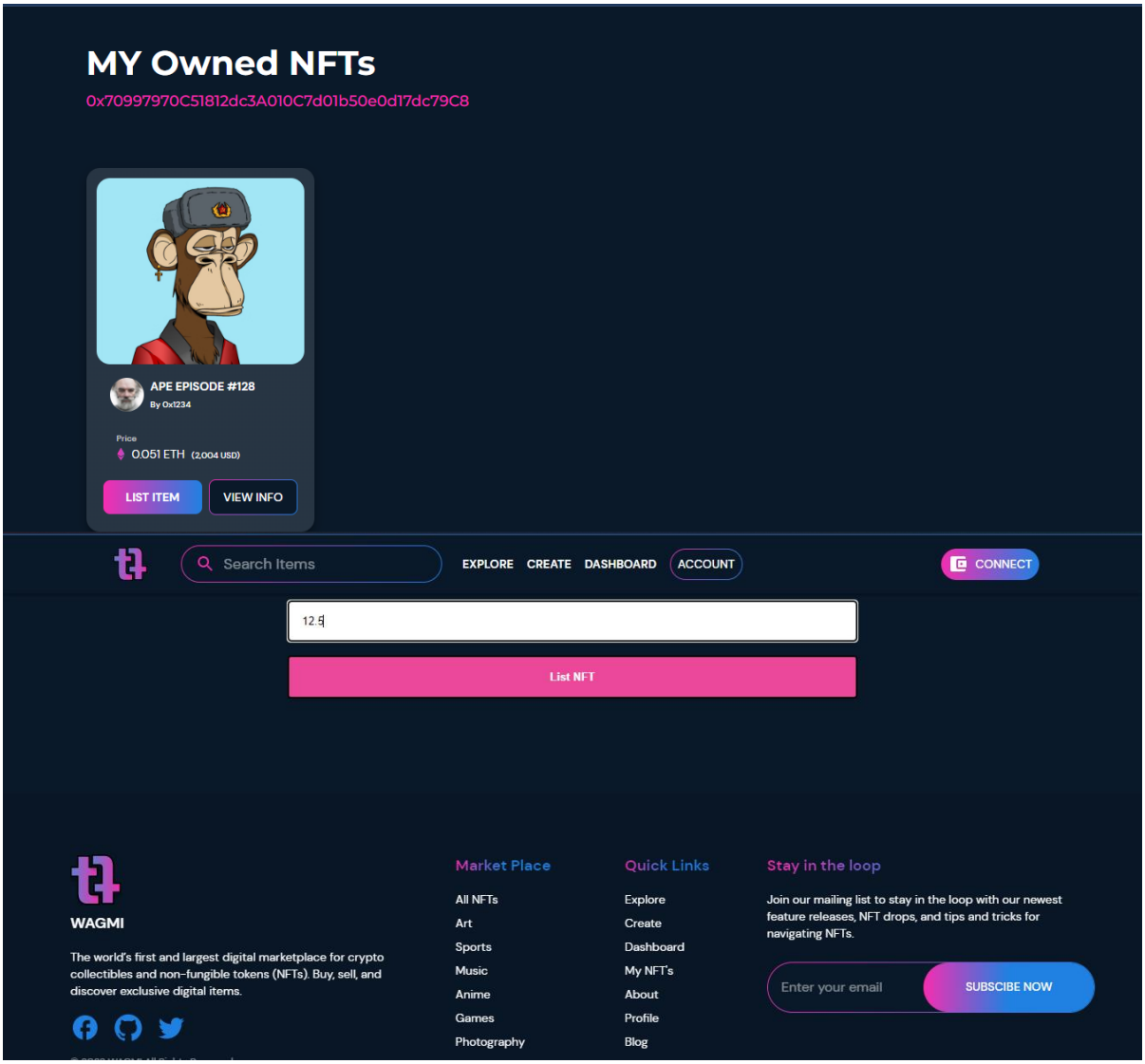
All NFTs
Art
Sports
Music
Anime
Games
Photography
Trading Cards
Quick Links
Explore
Create
Dashboard
My NFT's
About
Profile
Blog
Stay in the loop
Join our mailing list to stay in the loop with our newest feature releases, NFT drops, and tips and tricks for navigating NFTs.
Enter your email
SUBSCIBE NOW
Create and sell your NFTs
Set up your wallet
Once you've set up your wallet of choice, connect it to OpenSea by clicking the wallet icon in the top right corner. Learn about the wallets we support.
Create your collection
Click My Collections and set up your collection. Add social links, a description, profile & banner images, and set a secondary sales fee.
Add your NFTs
Upload your work (image, video, audio, or 3D art), add a title and description, and customize your NFTs with properties, stats, and unlockable content.
List them for sale
Choose between auctions, fixed-price listings, and declining-price listings. You choose how you want to sell your NFTs, and we help you sell them!


Search Items
EXPLORE
CREATE
DASHBOARD
ACCOUNT
CONNECT
Discover
Discover, and collect rare
Digital Art NFTs
Digital marketplace for crypto collectibles and non-fungible tokens (NFTs). Buy, Sell, and discover exclusive digital assets.
EXPLORE NOW
ATHENA
Price
3.00 ETH (2,006.30 USD)
BUY NOW
VIEW INFO
Search Items
EXPLORE
CREATE
DASHBOARD
ACCOUNT
CONNECT
Exclusive NFT for Digital and Real-world Assets
Discover, collect, and sell extraordinary NFTs on WAGMI
EXPLORE
CREATE
Learn more about WAGMI


MetaMask Notification
Localhost 8545
Account 2
0x5Fb...0aa3
New address detected! Click here to add to your address book.
10.2
DETAILS
DATA
HEX
EDIT
Estimated gas fee
0.00473211
0.004732 ETH
Site suggested
Likely in < 30 seconds
Max fee: 0.00631454 ETH
Total
10.20473211
10.20473211 ETH
Amount + gas fee
Max amount: 10.20631454 ETH
Reject
Confirm


10.2
Choose File
bored.avif
Create NFT
Account 2
0x5Fb...0aa3
New address detected! Click here to add to your address book.
DETAILS
DATA
HEX
EDIT
Estimated gas fee
0.00854452
0.008545 ETH
Site suggested
Likely in < 30 seconds
Max fee: 0.01137369 ETH
Total
0.03354452
0.03354452 ETH
Amount + gas fee
Max amount: 0.03637369 ETH
Reject
Confirm
22,133,154 results
Filter
Art
Sports
Single
Sort
Price: Low to High
BORED APE MONKEY
By 0x1234
APE EPISODE #128
By 0x1234
APE EPISODE #128
By 0x1234
APE EPISODE #128
By 0x1234
Price
0.051 ETH (2,004 USD)
BUY NOW
VIEW INFO


MY Owned NFTs
0x70997970C51812dc3A010C7d01b50e0d17dc79C8
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By 0x1234
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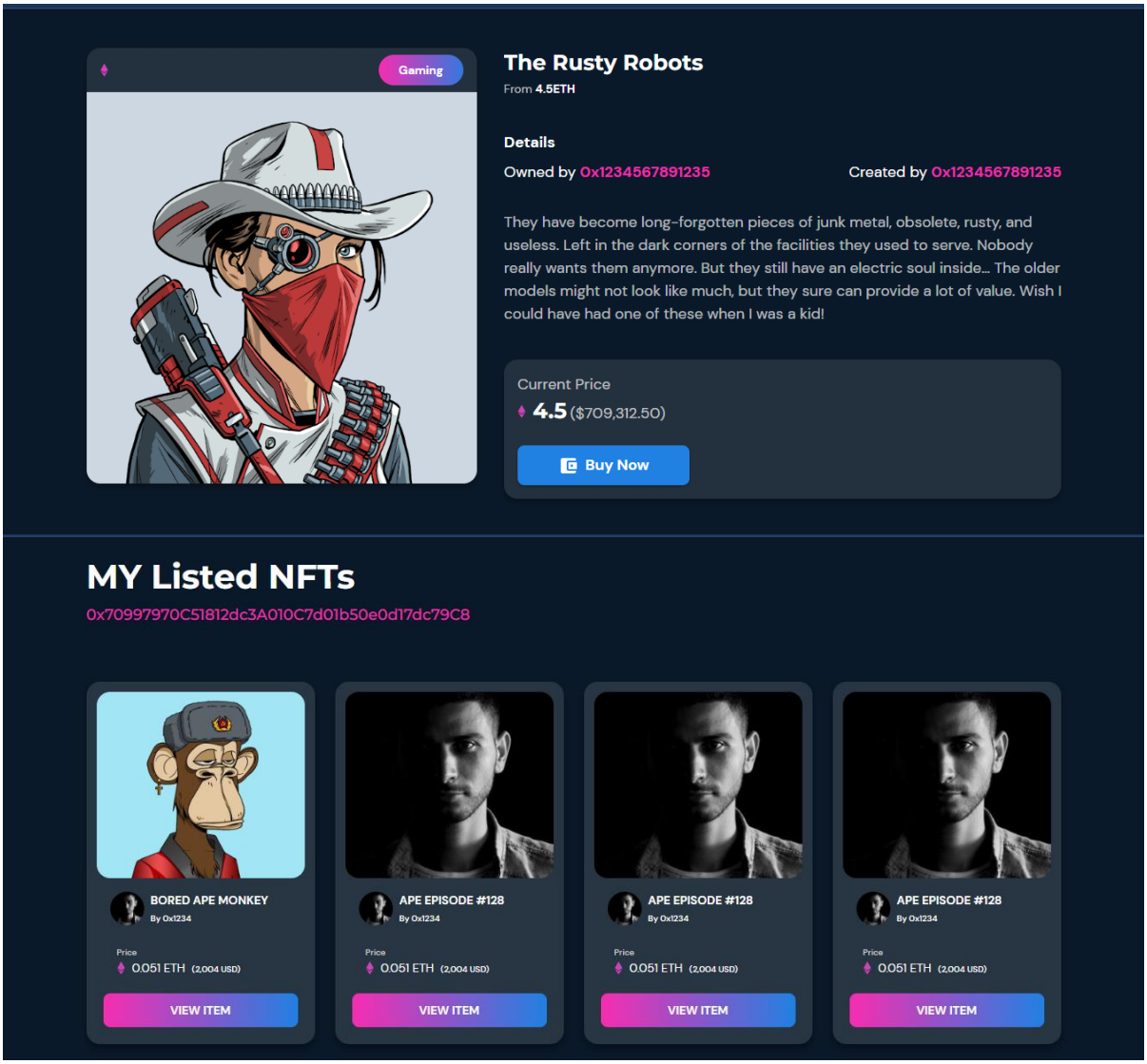
Gaming
The Rusty Robots
From 4.5ETH
Details
Owned by 0x1234567891235
Created by 0x1234567891235
They have become long-forgotten pieces of junk metal, obsolete, rusty, and useless. Left in the dark corners of the facilities they used to serve. Nobody really wants them anymore. But they still have an electric soul inside... The older models might not look like much, but they sure can provide a lot of value. Wish I could have had one of these when I was a kid!
Current Price
4.5 ($709,312.50)
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