BLOCKCHAIN BASED NFT PLATFORM

A CAPSTONE PROJECT REPORT

Submitted in partial fulfillment of the
requirement for the award of the
Degree of

MASTER OF TECHNOLOGY
IN
INTEGRATED SOFTWARE ENGINEERING

by

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VIT-AP UNIVERSITY
AMARAVATI - 522237

May 2022

CERTIFICATE

This is to certify that the Capstone Project work titled "**BLOCKCHAIN BASED NFT PLATFORM**" that is being submitted by **Amit Kumar Sahu (18MIS7250), Papugani Varshini (18MIS7035) and Sunkaranam Venkata Surya Vamsi (18MIS7211)** is in partial fulfillment of the requirements for the award of Master of Technology, is a record of bonafide work done under my guidance. The contents of this Project work, in full or in parts, have neither been taken from any other source nor have been submitted to any other Institute or University for award of any degree or diploma and the same is certified.

Dr. D. Sumathi
Guide

The thesis is satisfactory / unsatisfactory

Internal Examiner **External Examiner**

Approved by

PROGRAM CHAIR **DEAN**

M. Tech. SE School Of Computer Science and Engineering

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It is indeed a pleasure to thank my friends who persuaded and encouraged me to take up and complete this task. At last but not least, I express my gratitude and appreciation to all those who have helped me directly or indirectly toward the successful completion of this project.

Place: Amaravati

ABSTRACT

In this paper a secure and robust system is presented which can automatically trade the digital assets in a blockchain based platform and at the same time record every transaction in an immutable block. NFTs are provided in different forms like digital, art, sketch work, music and videos. NFTs popularity has been increasing day by day which crossed $40 billion revenue in 2021 NFT market report which was finalized by blockchain data company chainalysis. Some of the most used nft marketplace to sell and buy our digital assets are Opensea, Rarible, NBA Top Shot. Opensea is the largest nft marketplace with ancient and well organized nft standards that was launched in 2017 which is active today. The main cryptocurrencies used in opensea are ethereum, Solana and USDC. We cannot use normal currencies like rupees, dollars, euros. Marketplace can be used by any kind of people. We can create account easily and start searching for our new nft business. Opensea marketplace charges 2.5% of every single transaction. We must also need to pay tax gas fee for finishing NFT transactions with Ethereum.Opensea is best choice for starters.when it comes rarible allows users to trade art collections,video games and huge number of nfts.Even rarible charges 2.5% tax fee on every transaction we made on it.But best feature in rarible is we can also made payments using our credit cards and fiat currencies.

NFT marketplace will handle different transfer of exchange fees from one party to other.The working of nft marketplace is user need to create his own account and install specified digital wallet to store his nfts.users can also create their assets by uploading items to publish their work.After that they can select their payment way and next step is to list items for sale.The user select biding process for a fixed price or auction way of selling his nft or buying also follows same procedure.A transaction is created when shortlisted an item for trade and will launch smart contract for users wallet.

Ethereum is most popular nft marketplace now a days because transaction data and meta data is flexibly verifiable on ethereum,so it was easy to publish ownership.Eth never goes down so nfts

are always on for sale.Some of the major nft standards are ERC-721, ERC-1155, FA2 AND TRC-721.frontend frameworks used are react,angular and vue.Minting an nft means just converting a digital folder into a blockchain based nft.nfts provide many ways to make money either by renting your nft,gaining royalty on them, staking our nft and even by flipping your nft.Flipping basically means buying an nft on a specified marketplace and trading it for higher price.But experts suggests to buy only nfts having some inherent value.cryptos,nft and other virtual digital assets are still not well used assets in india because investing in them may cause losses.

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CHAPTER 1

INTRODUCTION

Before the introduction of NFTs the value of digital art was very cheap compared to the price that people are now selling on blockchain platforms. Can be anything digital, such as a piece of art or drawings or music. NFTs can represent real-world items like artwork. “Tokenizing” this real world tangible assets makes buying, selling and trading them more efficient while reducing the probability of fraud.

Non Fungible Tokens (NFTs) have been a booming technology that is enhancing the authenticity, safety, integrity and privacy of the users. Since the year 2021, NFTs have started hyping out with a huge marketplace. The digital art creators were finally able to sell their piece of digital art without middlemen. Blockchain is a promising technology which is widely known for it’s immutability, privacy and protection of users. The most important part of this marketplace is the use of smart contracts, which can be altered as per the need of the seller.

1.1 BACKGROUND AND LITERATURE SURVEY

In 2021-28.4 thousand and in this year over 22.6 thousand NFTs were sold. NFT transactions on popular marketplaces — most days in April and May of 2021 had between 1,000 and 3,000 unique wallets buying NFTs. Till now around 2.4 million NFTs sold on OpenSea, the largest NFT marketplace.NFTs are becoming some of the most profitable blockchain-based experiments in history. High-profile influencers, like Twitter CEO Jack Dorsey, have recently made the news by auctioning off NFTs. Based on its current growth rate, reputable sources forecast the NFT market to grow to about $80 billion by 2025. The following figure shows the expected growth.

Total sales coming out to $91.8 million, it makes *The Merge* the most expensive NFT sale by a mile.

1.2 PROBLEM DEFINITION

Lack of existing platforms that would credit or give ownership to the real/genuine owner of the digital asset.

Either the digital assets are copied, or are sold in other platforms without authenticity or sense of ownership, which leads to duplicate assets.

Identity theft and hacking has been around for several years and thus in need of a platform which is resistant from these.

User's selling digital assets and later falsifying statements that they didn't buy/sell the digital asset.

1.3 OBJECTIVES

The main aim of the project is to build an open digital economy with a new type of digital goods called Non-fungible tokens and create a marketplace where we can sell and buy digital art.

NFTs are unique cryptographic tokens that exist on a blockchain and cannot be replicated.

People are excited about a brand new type of digital goods called non-fungible tokens or NFTs.

It wouldn't probably make a lot of sense to build an application where you're trading in assets that are two to ten dollars on ethereum because the transaction itself costs more than that and transactions per second are slow but working on scalable solutions like polygon transaction fee is lesser and faster.

1.4 SCOPE OF THE PROJECT

The main Scope of building nft based blockchain marketplace is nft tokens are government issued digital currencies and are used for many in-app purchases in many gaming applications all over the world.

We can alot from the blockchain usage in future which will be expanding alot.Its safe to assume that the nft market will continue to grow then it may totally change the currency system.
Real estate is major asset class in which most money is being invested.NFT can employed in real estate in several ways.Example we can place the ownership of piece of our land or property on a particular blockchain and allow others to see it.

Just like artwork or memorabilia in classic traditional sense,some NFT collections can be appreciate in value while others will be forgotten easily.

NFT marketplace enables users to buy,sell and trade their unique nfts legally in most seamless manner with most common digital currencies like ethereum.

CHAPTER - 2

METHODOLOGY

2.1 TECHNOLOGY USED

◦ Polygon Network (Blockchain Network)

◦ Next.js (Backend framework)

◦ HTML & CSS

◦ Solidity (Blockchain based programming language)

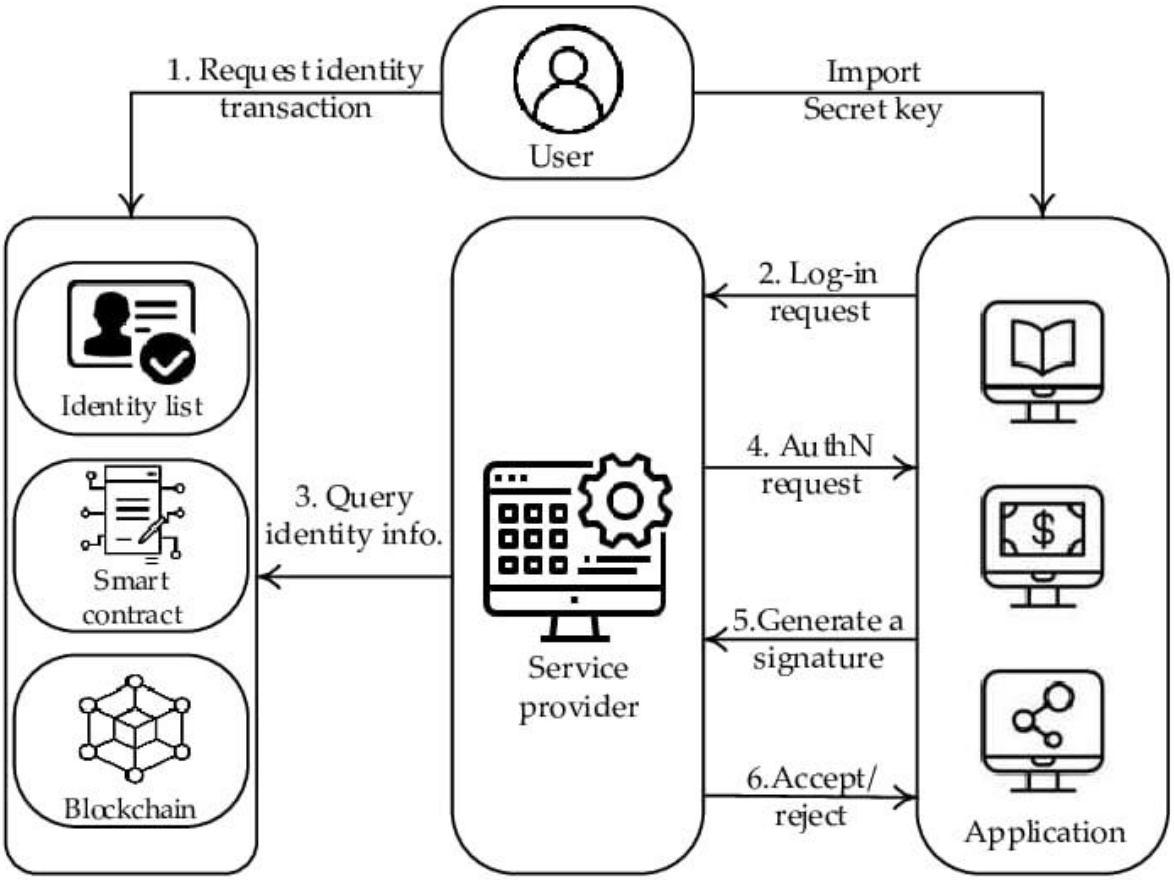
◦ IPFS (InterPlanetary File System)

◦ Ethers.js (Interact with Ethereum blockchain)

◦ Hardhat (Smart contracts simulation)

◦ Google Chrome/ Mozilla / Safari / Brave (METAMASK Plugin)

2.2 PROPOSED METHOD



The main two processes included in proposed model is registration and login

Registration: In registration we first initialize users public key as their identity key which is username.The next step is uploading this identity key on our blockchain,in which transactions made can be verified by other external users.Later the user can generate an identity transaction.

Login:After registration,user will login to system and the procedure is

1)The user uses identity information and transfer their secret key into the service application for login.

2)A user who needs to log in sends a login request to the main network service provide.

3)The service provider verifies the login request,extract the main hash,queries with the blockchain, and retrieves the identity information from an identity list.

4)The network's service provider responds with authentication request when the total above mentioned process is completed.A timestamp,user's username and signature will be included in authentication request.

5)User creates a unique signature with five main parameters:timestamp,username,public key and username and public key of service provider.Here user authentication is used as signature.

6)The network's service provider verifies the received information and if the information received is valid,the authentication succeeds.
7)If not authentication fails and users login is denied

2.3 WORKFLOW

>> Create a piece of digital art which in terms of our context is known as NFT (Non Fungible Tokens), basically the unique nft will be associated with the digital art work. The process of converting your digital art to NFT is known as mining. NFTs are mined once they are created.

>> The second step is to create a META MASK wallet. So basically it's a plugin which is available only on your browser store. Following are the steps to create a META MASK wallet.

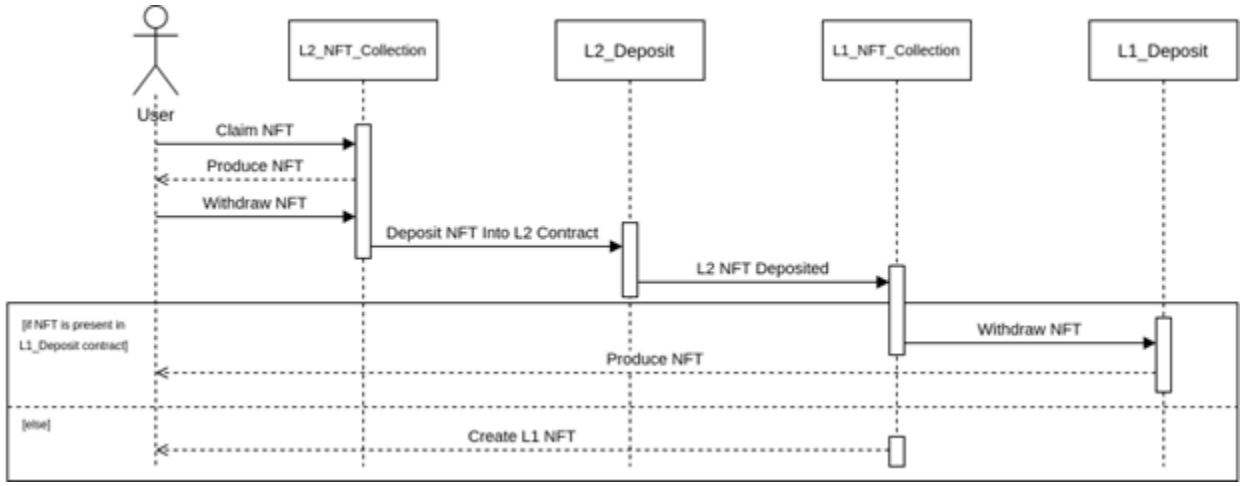
1. Download the extension and add from here https://metamask.io/
2. Click on the meta mask wallet extension and click on get started button.
3. Create a wallet and set a strong password for it.
4. Then securely store the seed phrase for your metamask wallet.
5. Confirm your secret phase for opening a meta mask wallet.
6. Finally now you are ready with your new meta mask wallet.

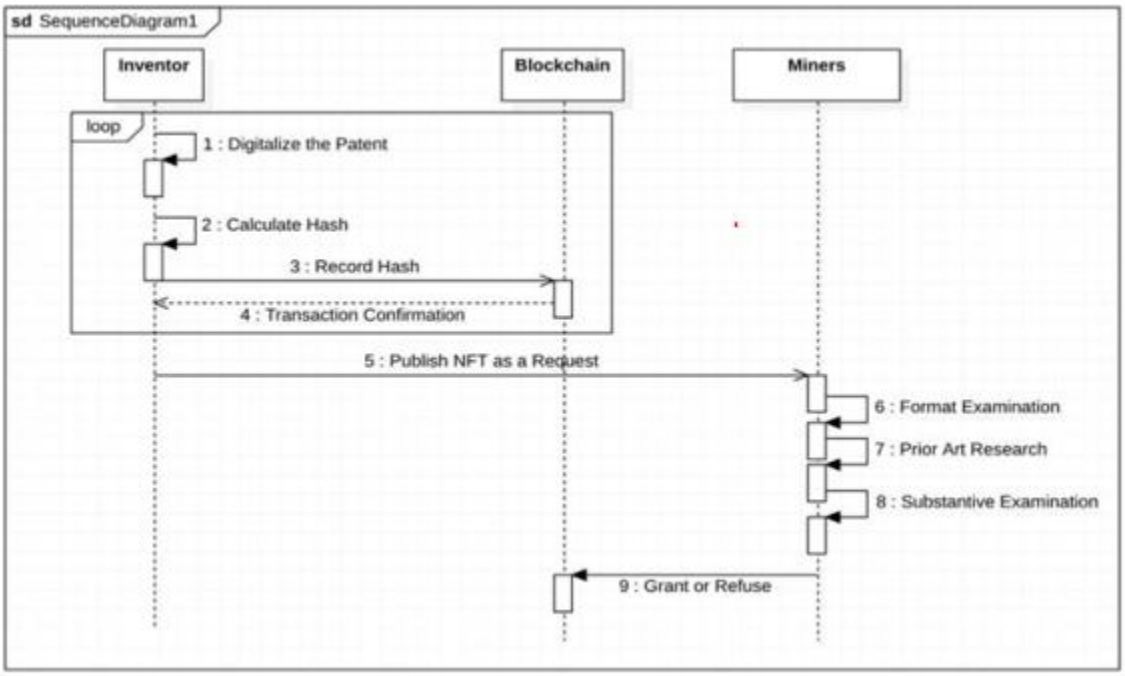
>> Login and authenticate to our application by giving permission to your META MASK wallet. A pop will come from your browser extension and it's up to the user whether they want to give permission.

>> Upload your digital asset to the website and provide metadata for the same. Confirm the contract and pay the gas fee to list your item for sale. (Amt will be deducted from your metamask account)
>> Now the NFT is ready for sale in the marketplace. The buyer will login to his/her metamask wallet and buy the NFT by clicking on the buy button. The buyer needs to confirm the smart contract. After the confirmation the respective amount will be deducted from the buyer's account and finally the amount will be added to the seller's account.

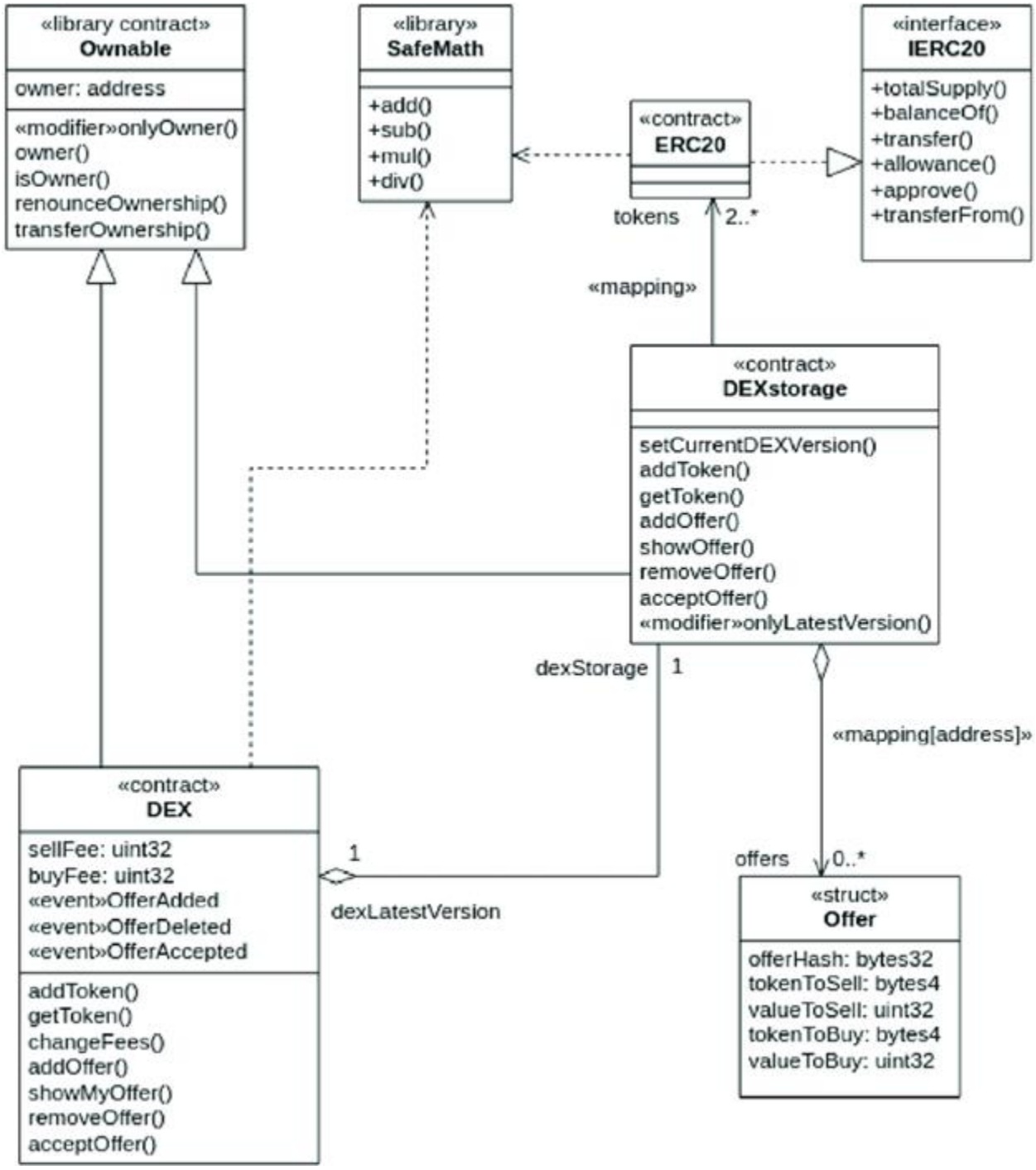
2.4 UML DIAGRAMS

SEQUENCE DIAGRAMS:

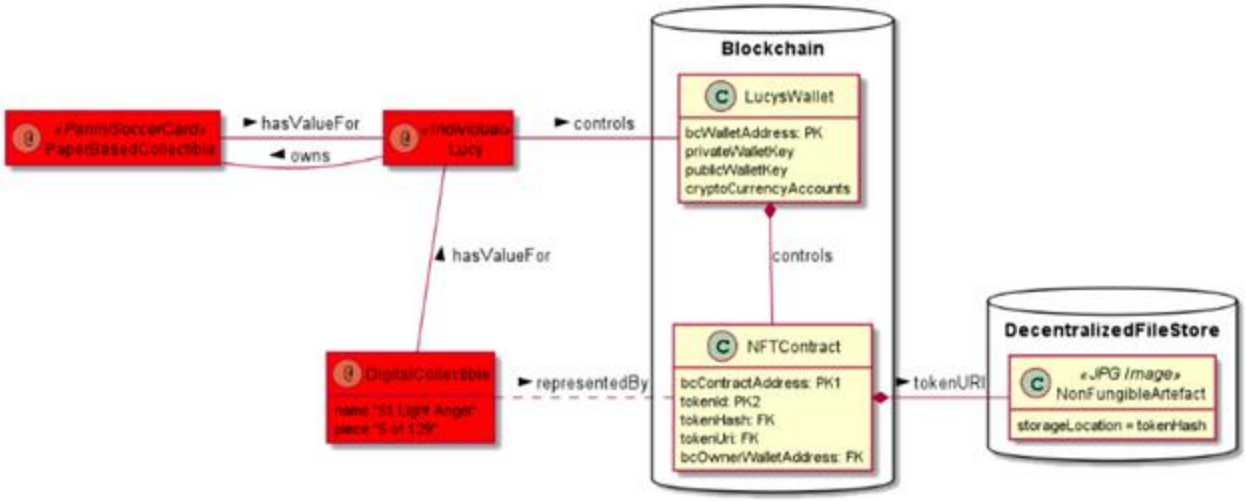


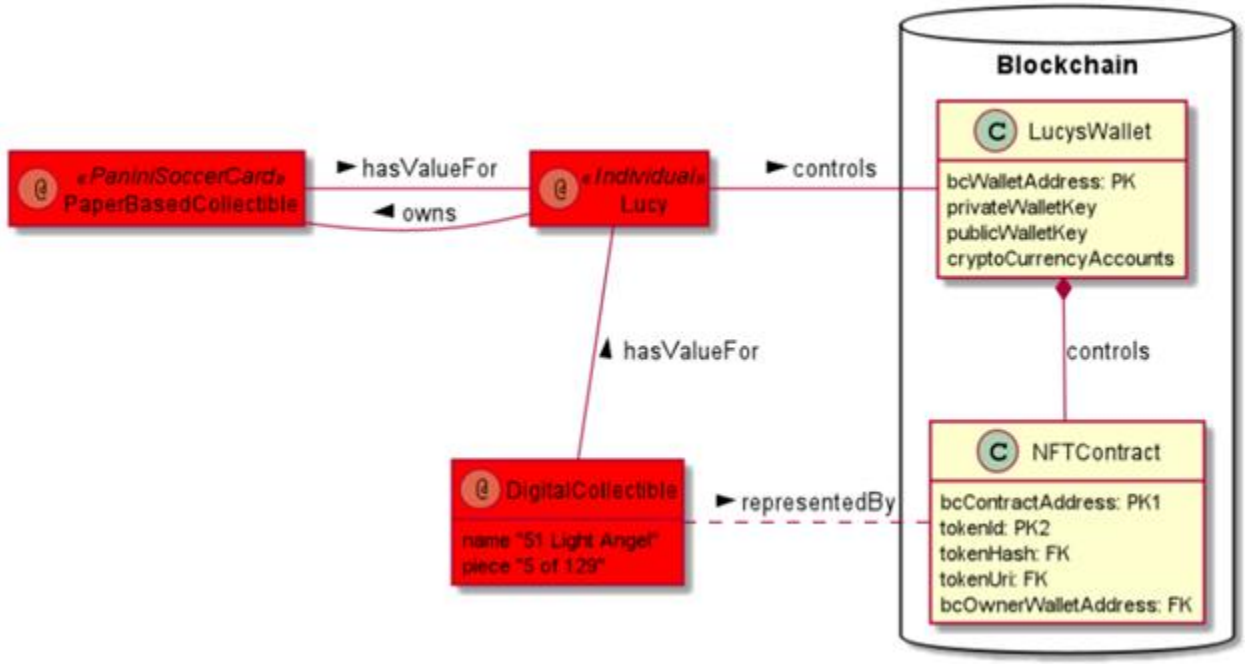


CLASS DIAGRAM:

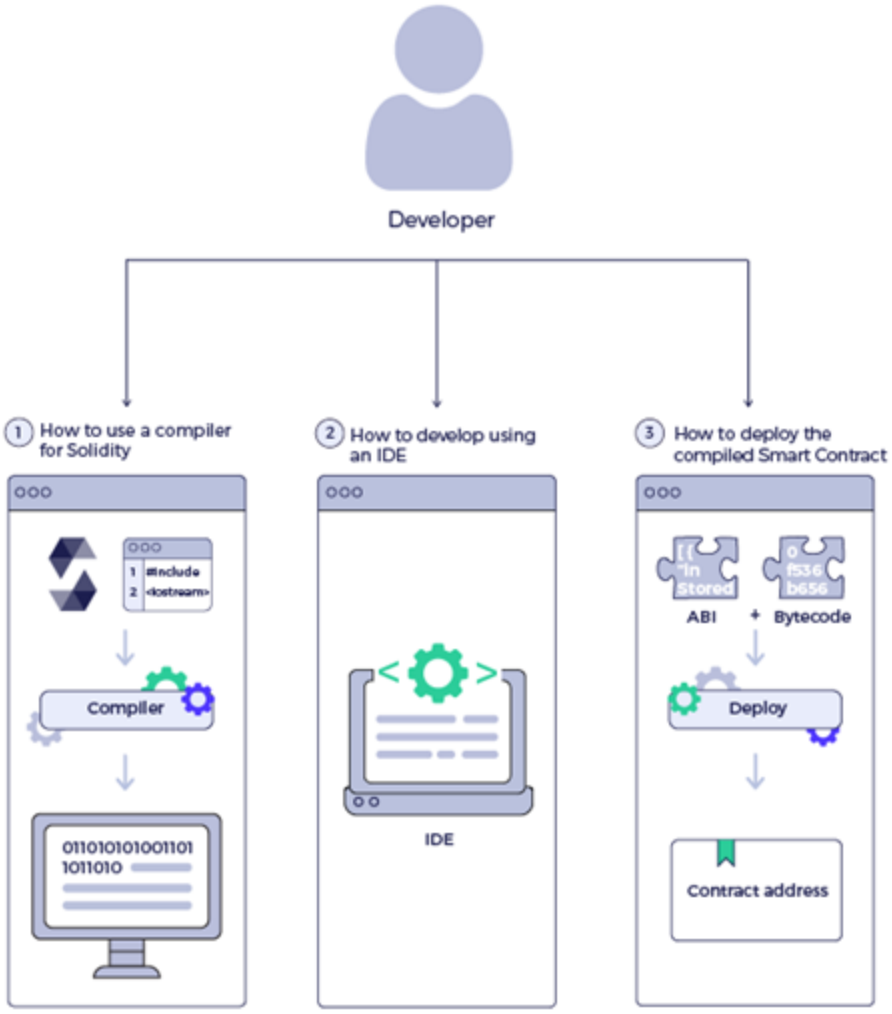


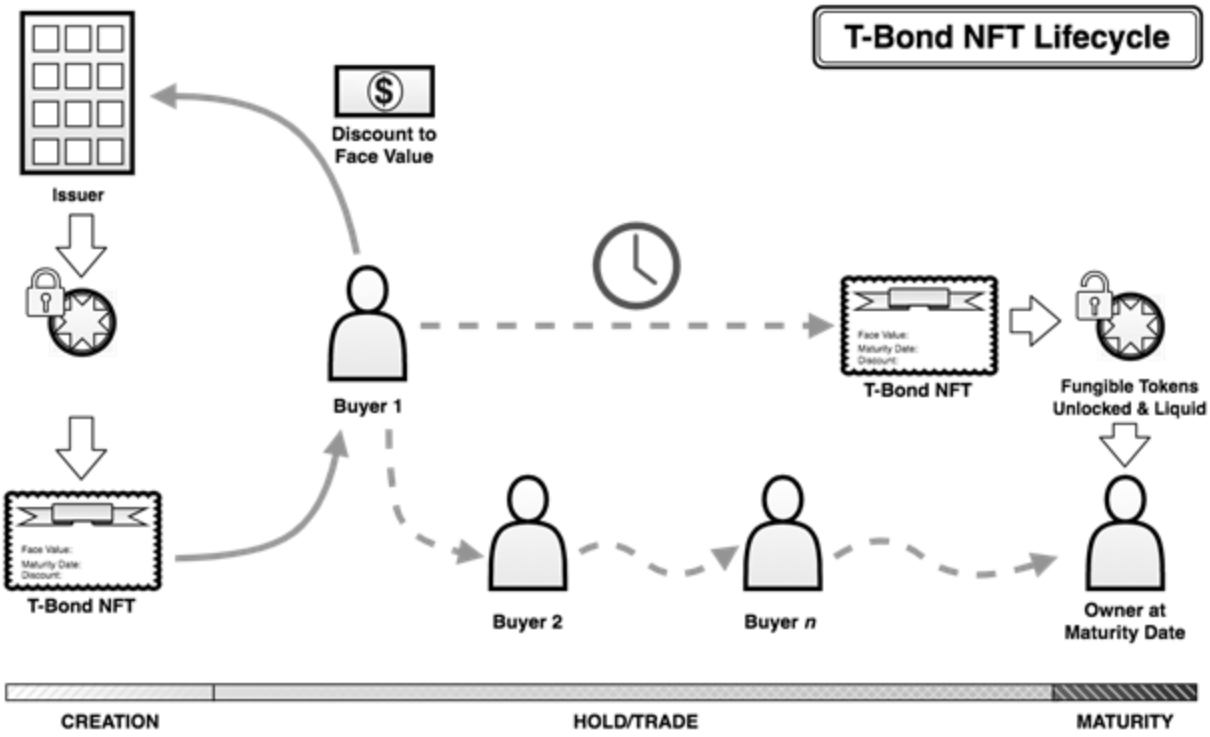
OBJECT DIAGRAMS:



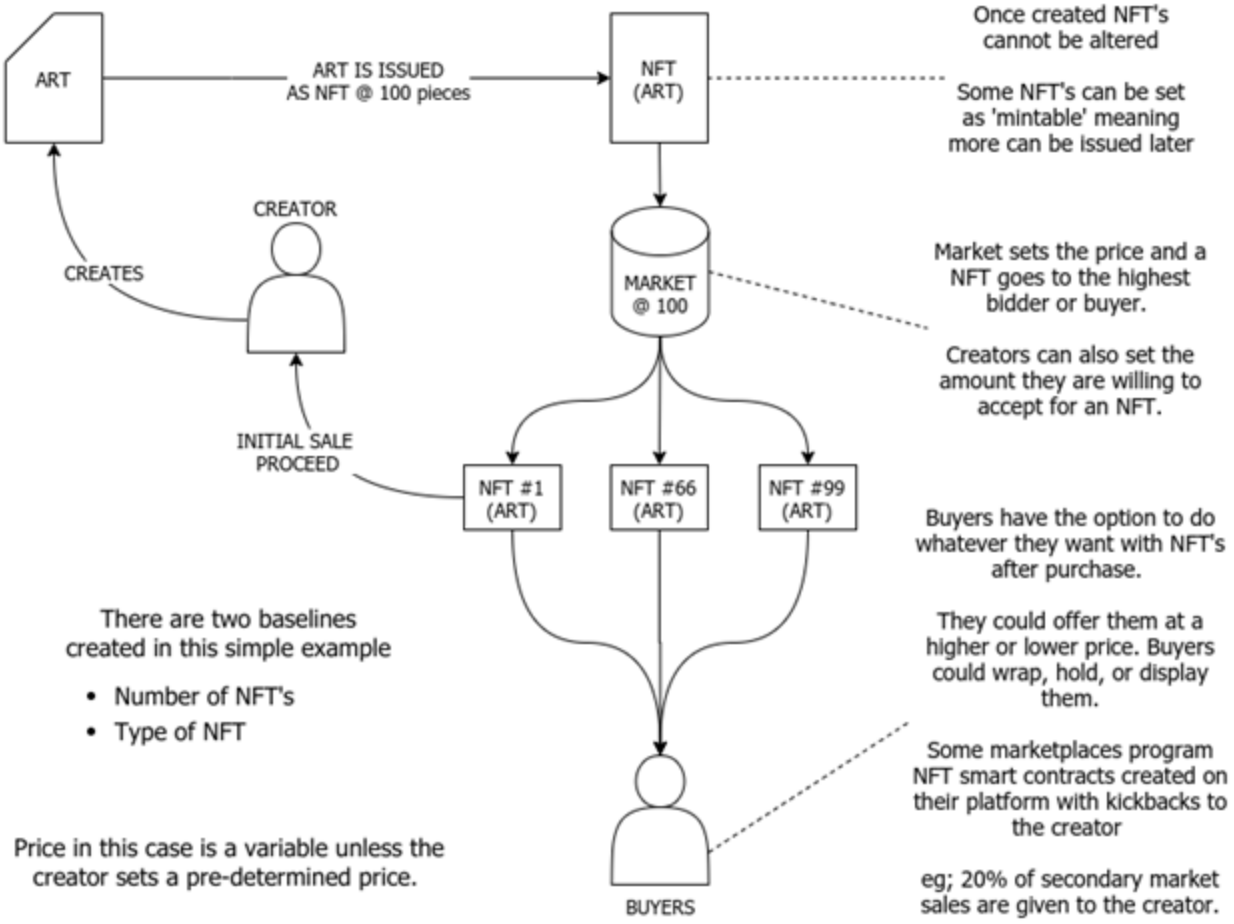


WORKING AS NFT DEVELOPER:


Developer
1 How to use a compiler for Solidity
2 How to develop using an IDE
3 How to deploy the compiled Smart Contract
Compiler
0110101010011011011010
IDE
ABI
+ Bytecode
Deploy
Contract address


T-Bond NFT Lifecycle
Issuer
Discount to Face Value
Buyer 1
Face Value:
Maturity Date:
Discount:
T-Bond NFT
Fungible Tokens Unlocked & Liquid
Face Value:
Maturity Date:
Discount:
T-Bond NFT
Buyer 2
Buyer n
Owner at Maturity Date
CREATION
HOLD/TRADE
MATURITY

Simple example of an NFT



CHAPTER - 3

CONCLUSION

3.1 TESTING SMART CONTRACT

```
PS E:\memeraki\polygon-ethereum-nextjs-marketplace-main> npx hardhat test


  NFTMarket
items:  [
  {
    price: '1000000000000000000',
    tokenId: '2',
    seller: '0xf39Fd6e51aad88F6F4ce6aB8827279cfffFb92266',
    owner: '0x0000000000000000000000000000000000000000',
    tokenUri: 'https://www.mytokenlocation2.com'
  }
]
    √ Should create and execute market sales (2098ms)


  1 passing (2s)

PS E:\memeraki\polygon-ethereum-nextjs-marketplace-main>
```

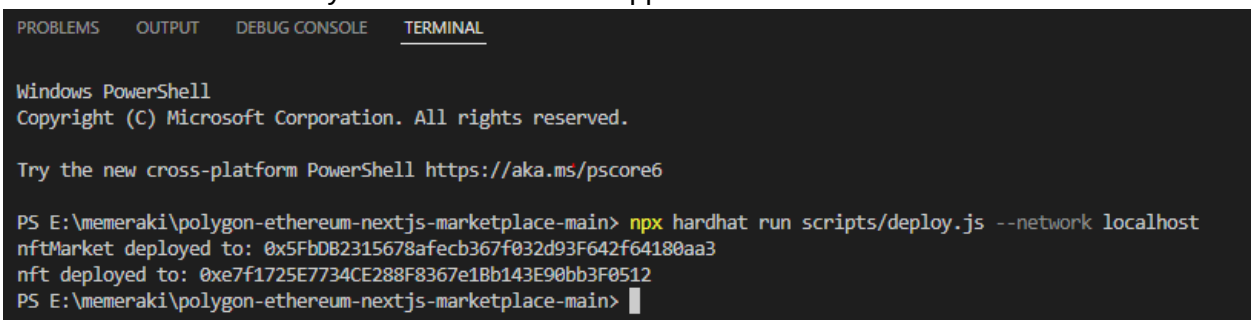
Testing the smart contract.From here we can say that the smart contract is working properly and transactions will be working fine.

3.2 DEPLOYING TO LOCAL NODE

Deploying to local node - hardhat envIronment

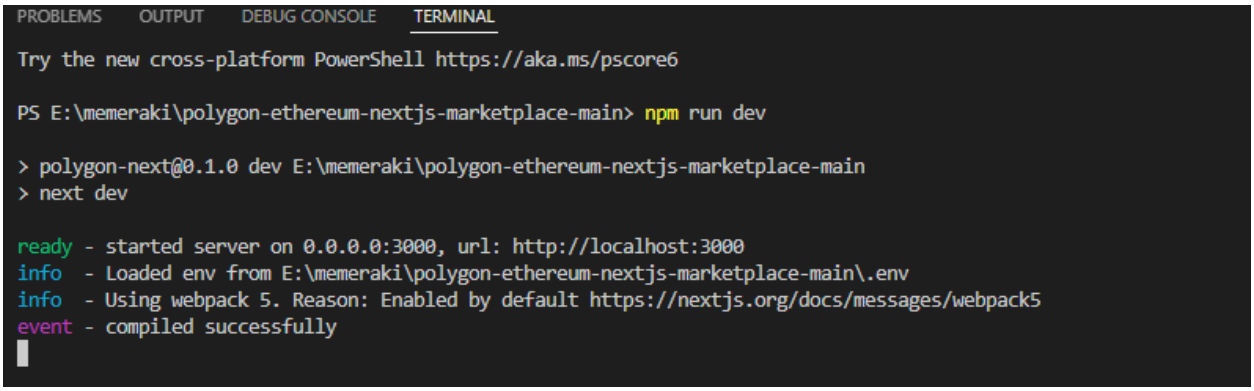
```
PS E:\memeraki\polygon-ethereum-nextjs-marketplace-main> npx hardhat node
Started HTTP and WebSocket JSON-RPC server at http://127.0.0.1:8545/

Accounts
========
Account #0: 0xf39fd6e51aad88f6f4ce6ab8827279cfffb92266 (10000 ETH)
Private Key: 0xac0974bec39a17e36ba4a6b4d238ff944bacb478cbed5efcae784d7bf4f2ff80

Account #1: 0x70997970c51812dc3a010c7d01b50e0d17dc79c8 (10000 ETH)
Private Key: 0x59c6995e998f97a5a0044966f0945389dc9e86dae88c7a8412f4603b6b78690d

Account #2: 0x3c44cdddb6a900fa2b585dd299e03d12fa4293bc (10000 ETH)
Private Key: 0x5de4111afa1a4b94908f83103eb1f1706367c2e68ca870fc3fb9a804cdab365a

Account #3: 0x90f79bf6eb2c4f870365e785982e1f101e93b906 (10000 ETH)
Private Key: 0x7c852118294e51e653712a81e05800f419141751be58f605c371e15141b007a6

Account #4: 0x15d34aaf54267db7d7c367839aaf71a00a2c6a65 (10000 ETH)
Private Key: 0x47e179ec197488593b187f80a00eb0da91f1b9d0b13f8733639f19c30a34926a

Account #5: 0x9965507d1a55bcc2695c58ba16fb37d819b0a4dc (10000 ETH)
Private Key: 0x8b3a350cf5c34c9194ca85829a2df0ec3153be0318b5e2d3348e872092edffba
```

This will create 20 dummy accounts to test the application. Each account will have 1000 Ethers.



3.3 DEPLOYING SMART CONTRACT

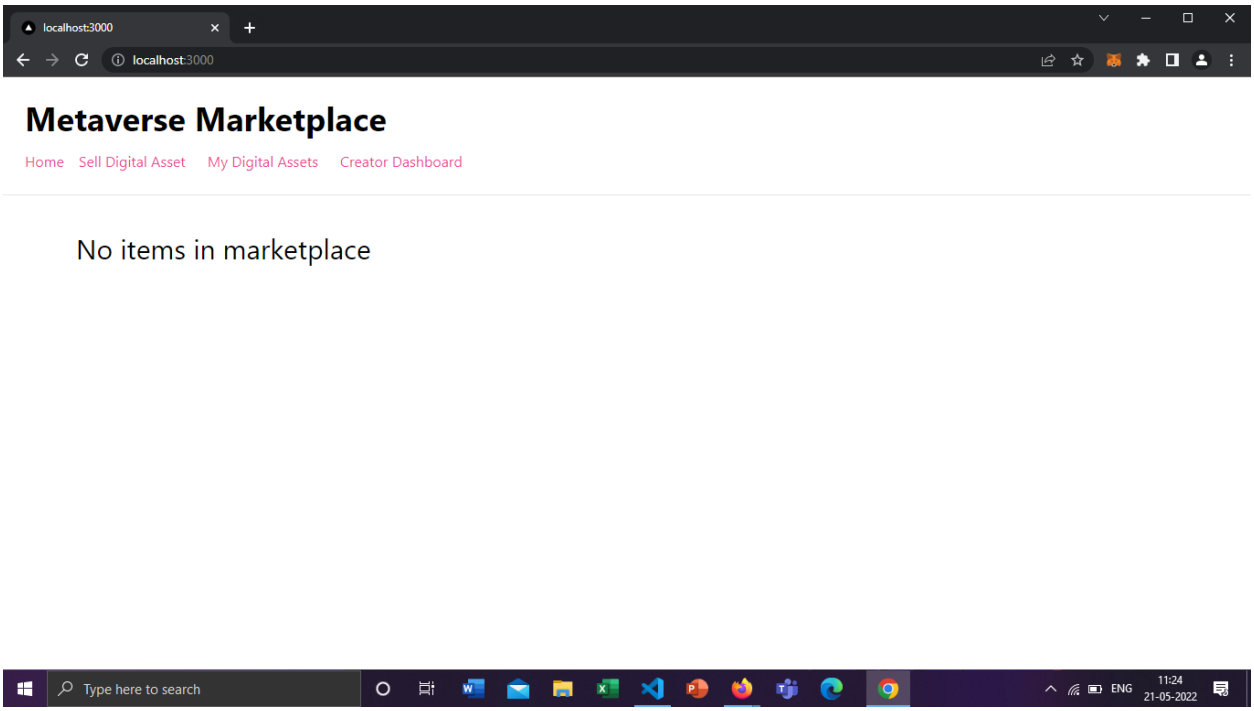
Deploying smart contracts. Parallelly on other terminal we will deploy our smart contract. The address of the nftMarket and nft we will copy and add it to our configuration file.



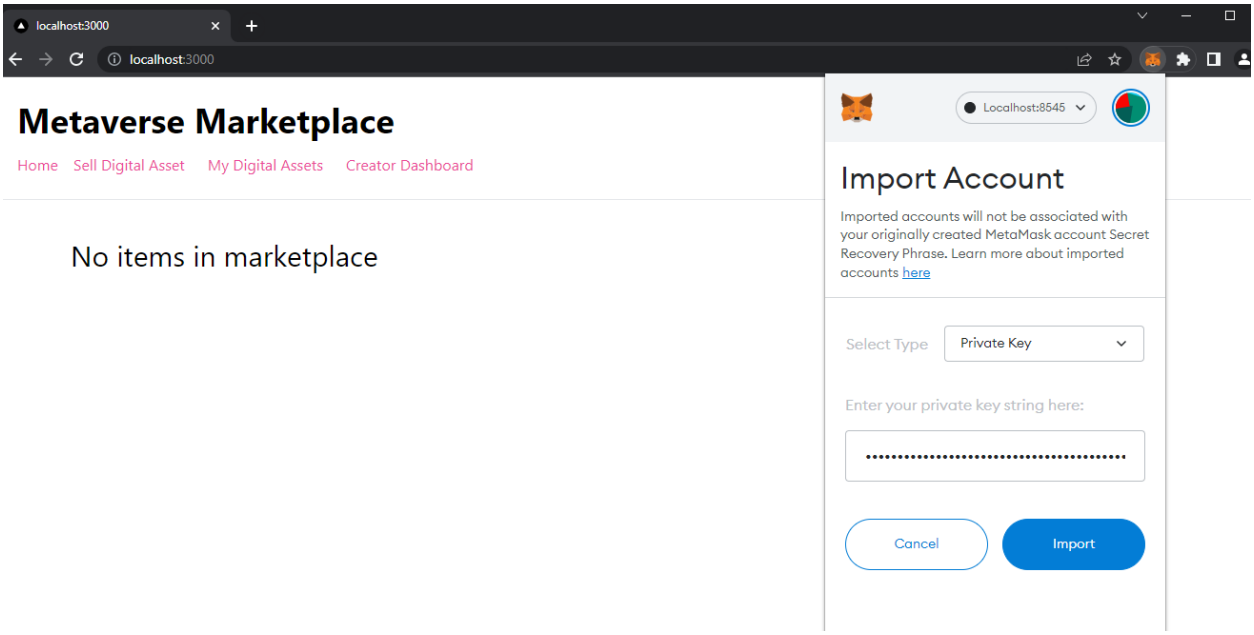
3.4 STARTING THE DEVELOPMENT SERVER

Parallelly in another terminal we will run the development server
Accessing the application through browser (localhost:3000)

3.4.1 Home page

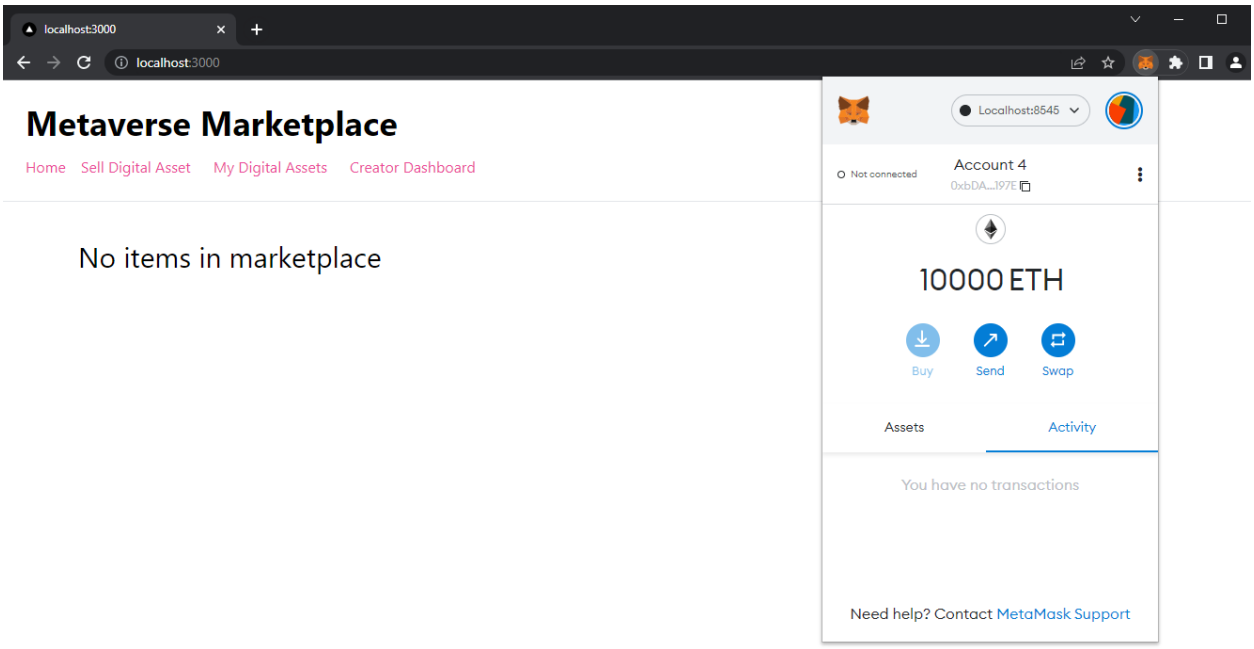


3.4.2 Importing accounts to meta mask wallet

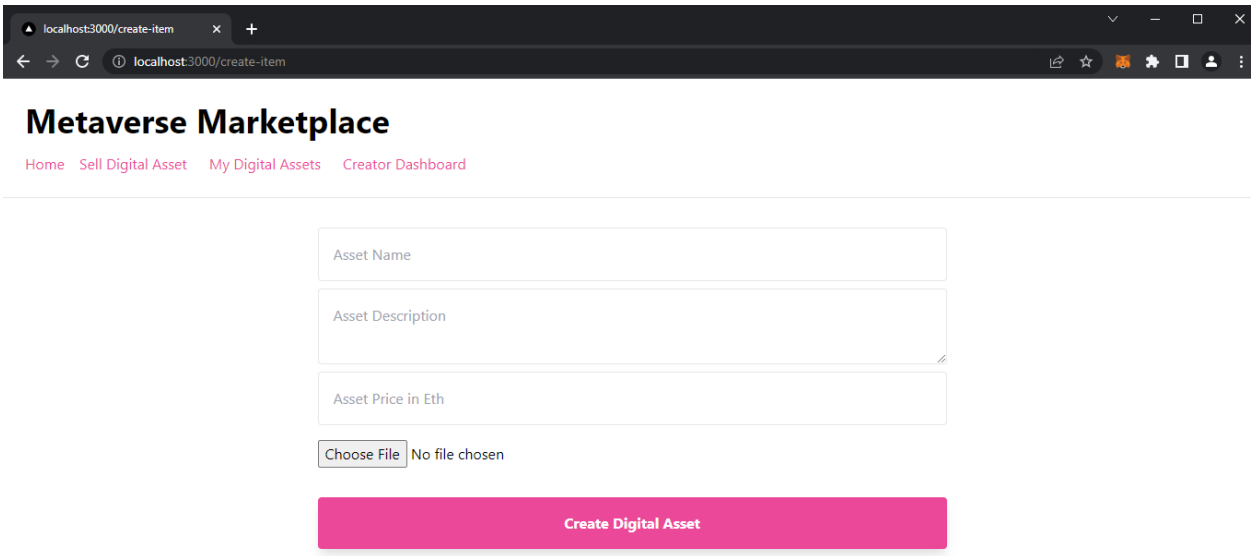


3.4.3 Uploading asset

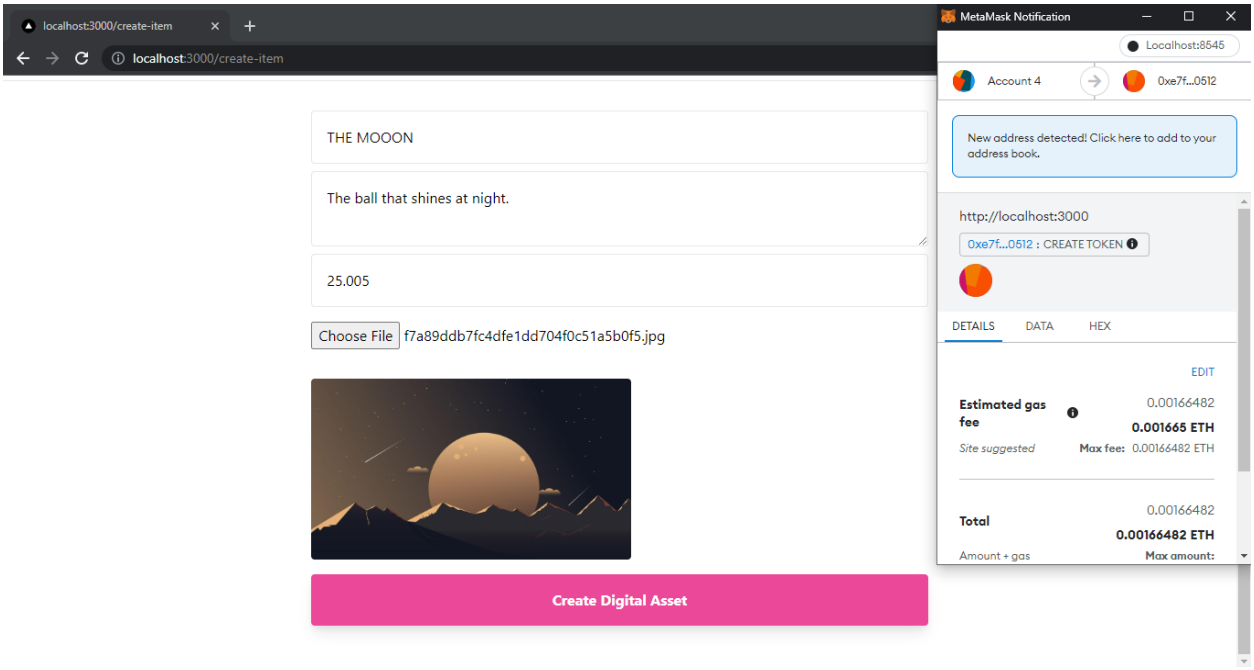
We will switch to account 4 and upload the digital art

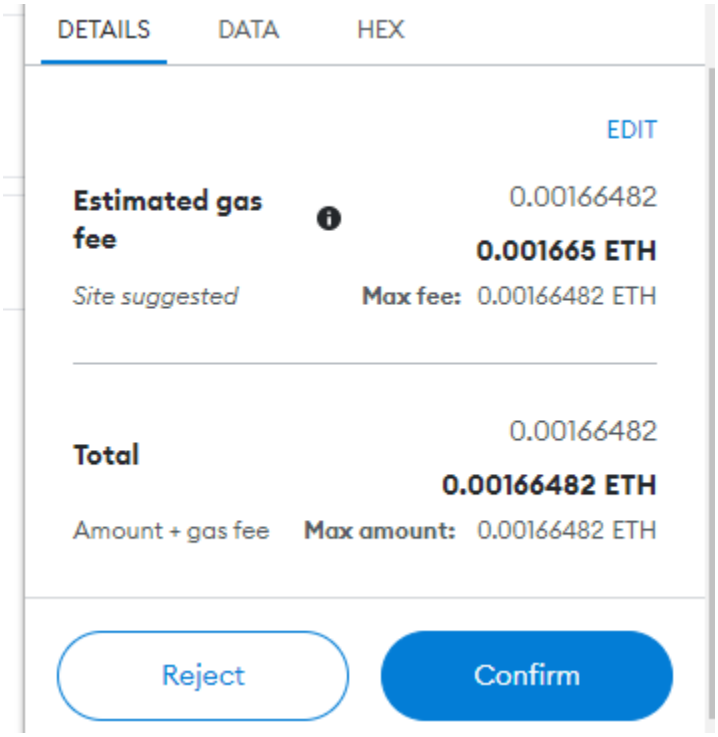


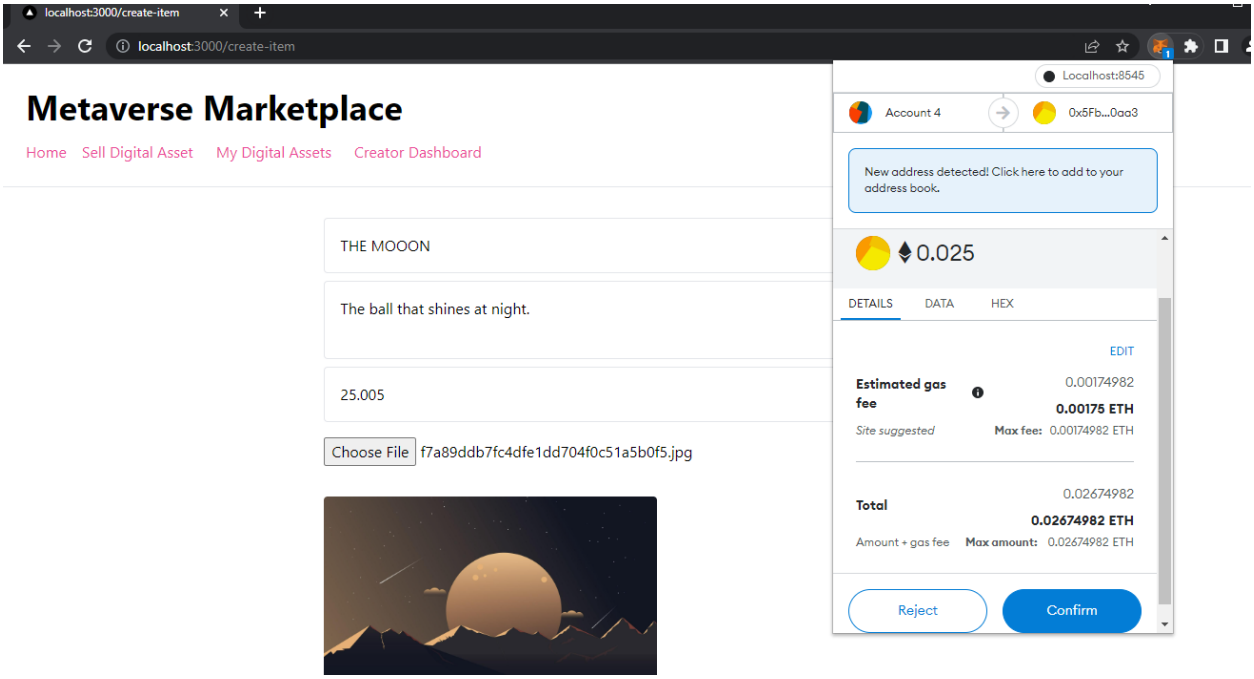
Click on sell digital assets



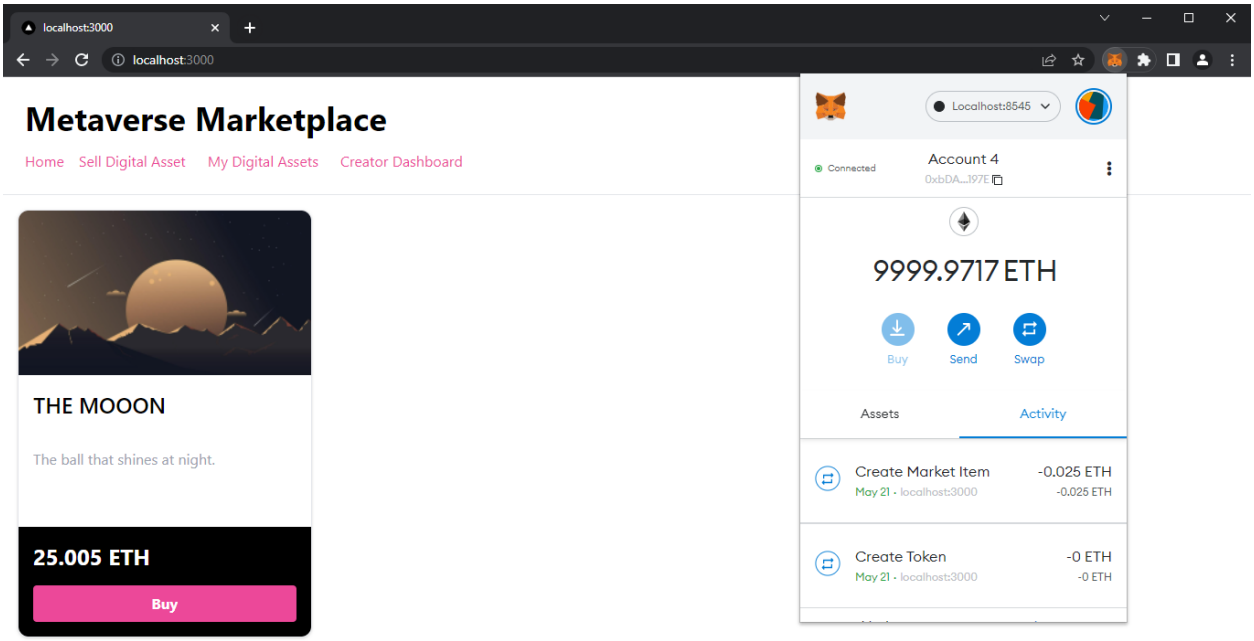
Give contract permission to pay gas fees and upload the digital art into the market place.


localhost:3000/create-item
THE MOOON
The ball that shines at night.
25.005
Choose File
f7a89ddb7fc4dfe1dd704f0c51a5b0f5.jpg
Create Digital Asset
MetaMask Notification
Localhost:8545
Account 4
0xe7f...0512
New address detected! Click here to add to your address book.
http://localhost:3000
0xe7f...0512 : CREATE TOKEN
DETAILS
DATA
HEX
EDIT
Estimated gas fee
0.00166482
0.001665 ETH
Site suggested
Max fee: 0.00166482 ETH
Total
0.00166482
0.00166482 ETH
Amount + gas
Max amount:

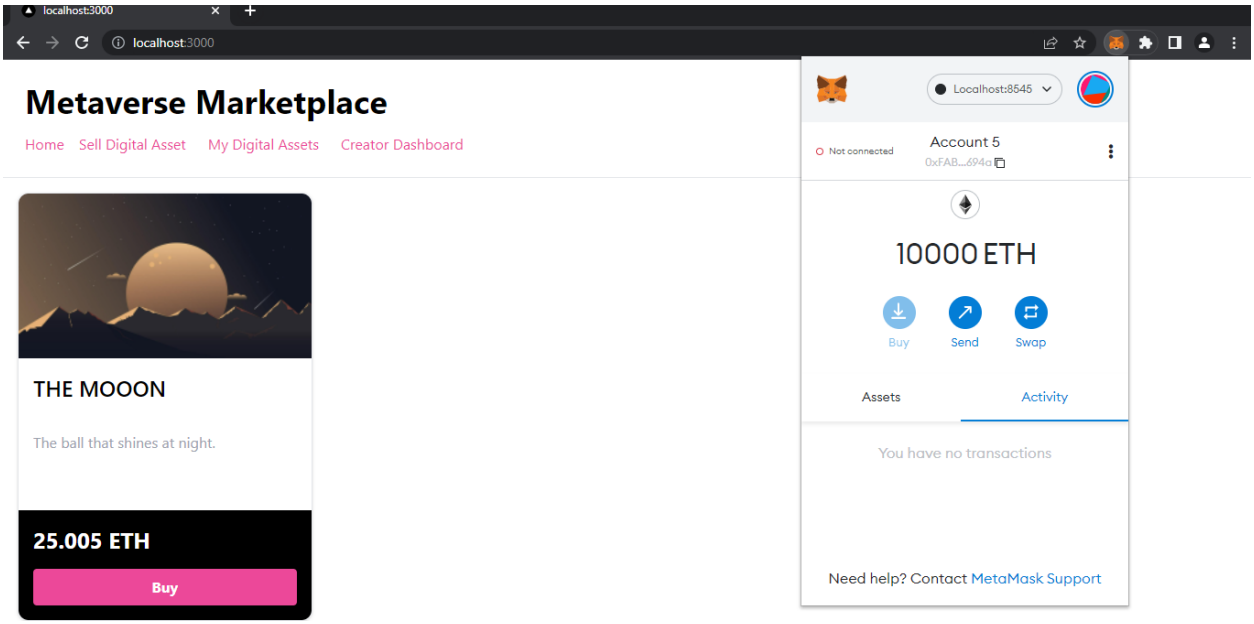

DETAILS
DATA
HEX
EDIT
Estimated gas fee
0.00166482
0.001665 ETH
Site suggested
Max fee: 0.00166482 ETH
Total
0.00166482
0.00166482 ETH
Amount + gas fee
Max amount: 0.00166482 ETH
Reject
Confirm



The amount will be deducted from your META MASK wallet.

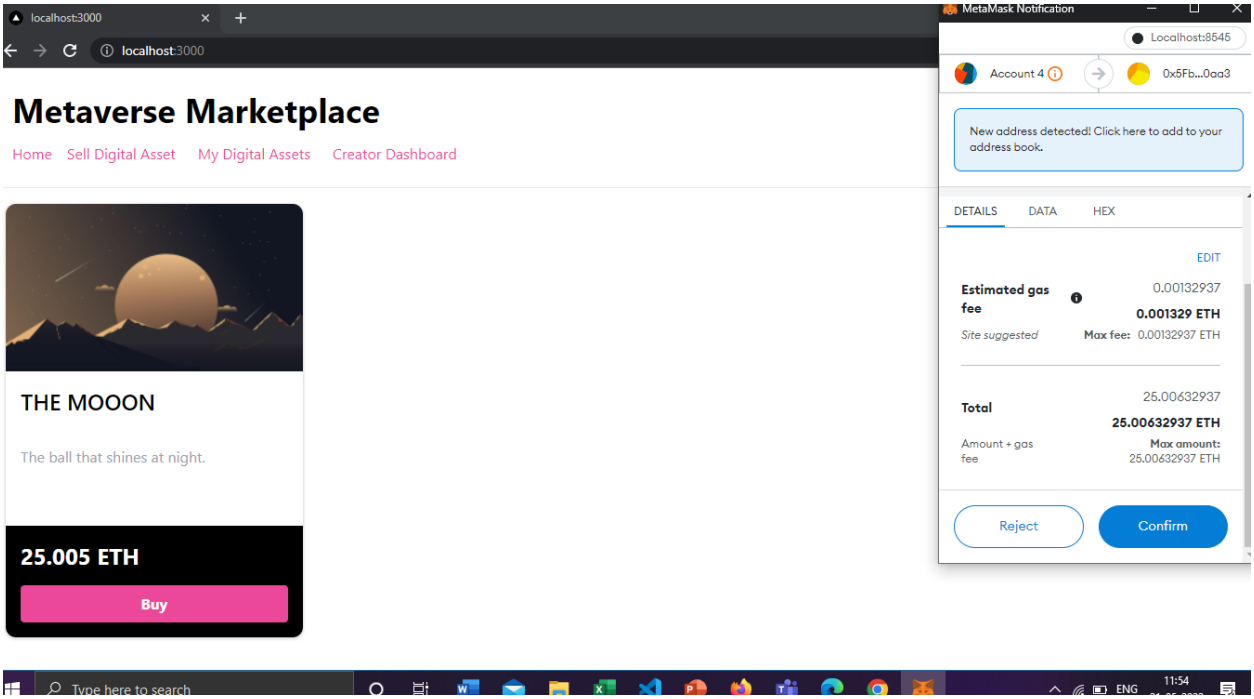


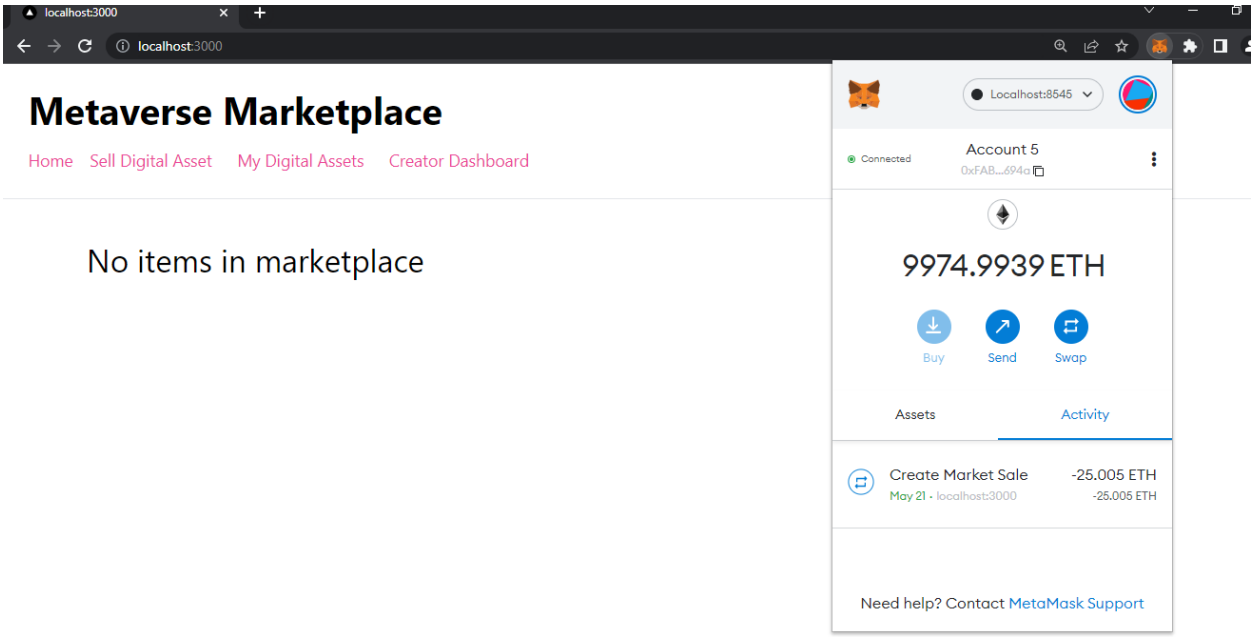
Now we will switch over to other account that will act as a buyer (Account 5)



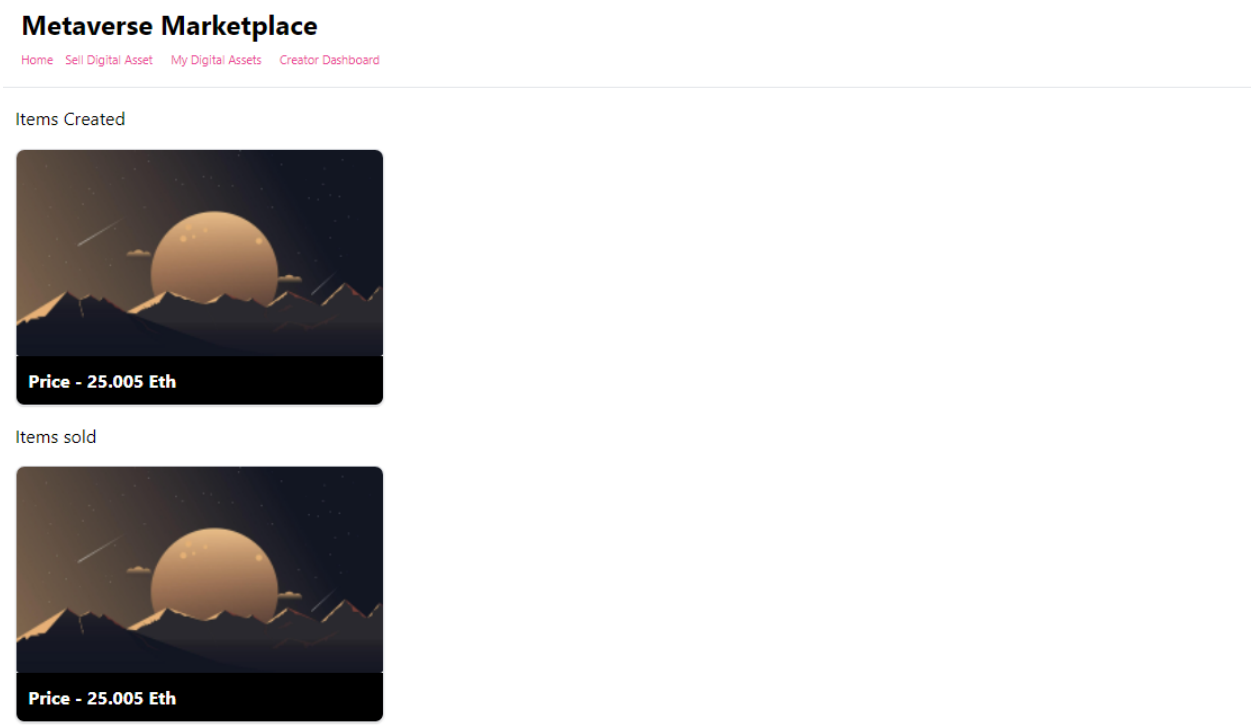
3.4.4 Buying asset

Buying the digital art (NFT) with Account 5

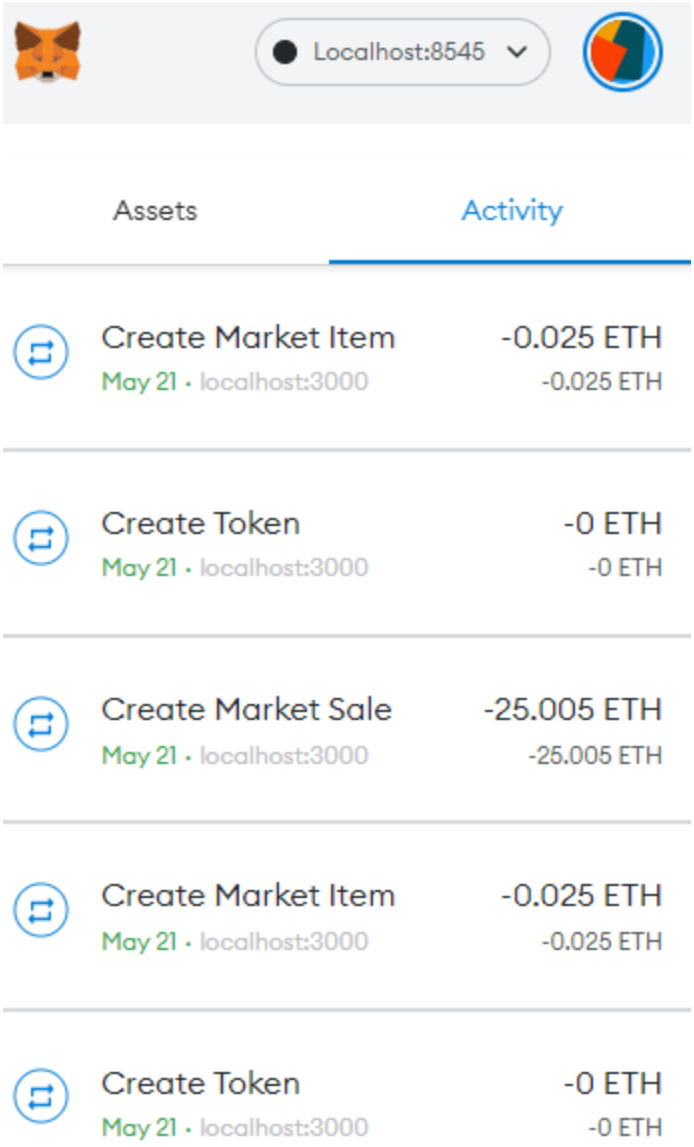


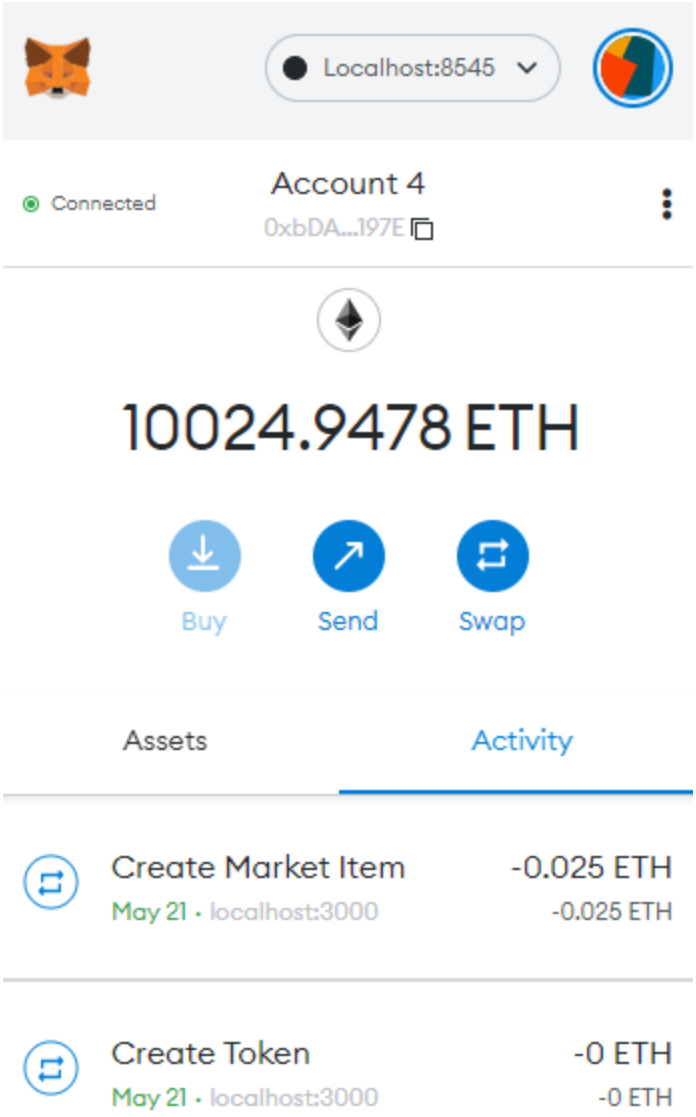


3.4.5 Creator dashboard



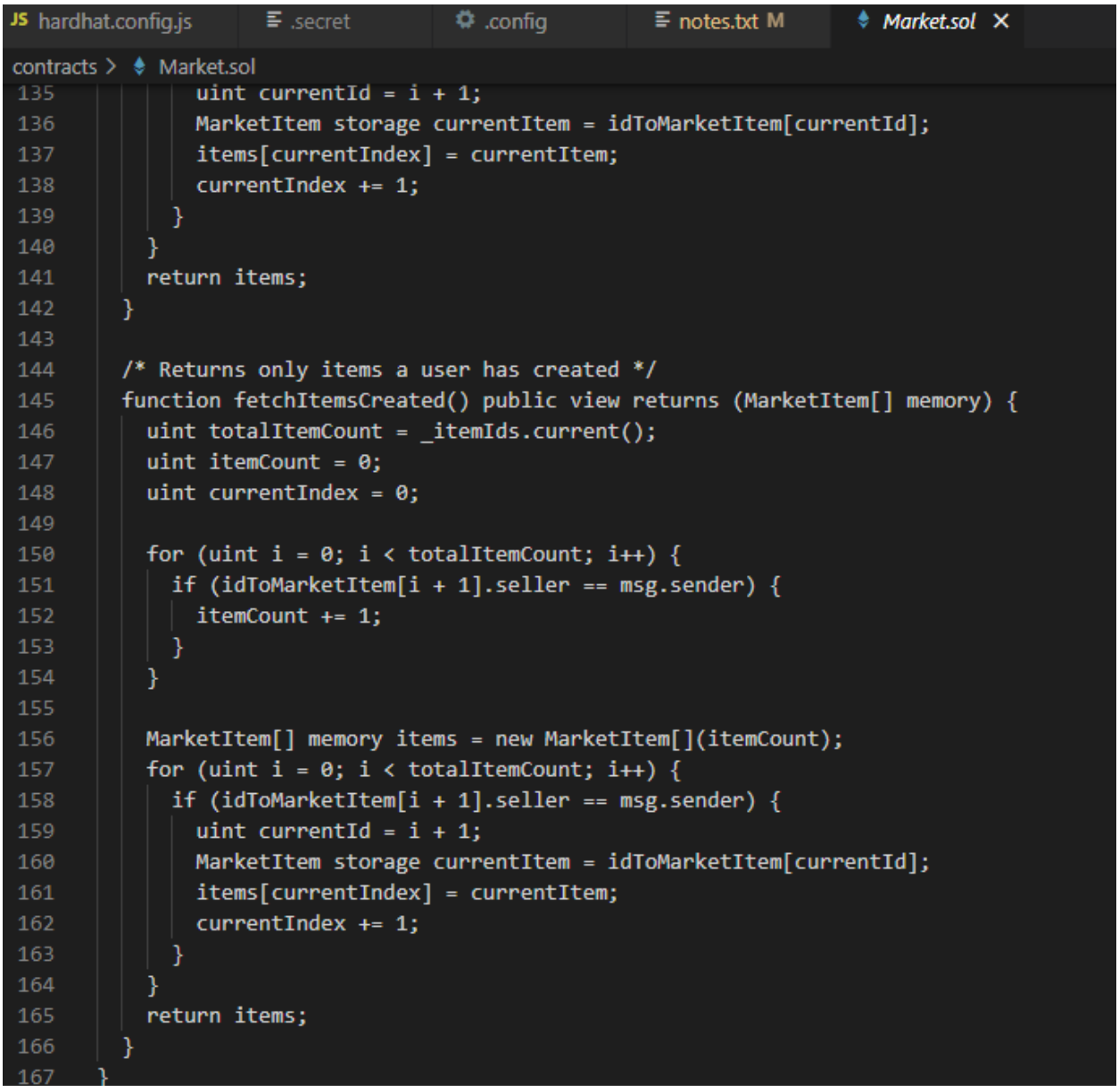
So finally by observing the below pictures we can say that the transaction has successfully completed.


Localhost:8545
Assets
Activity
Create Market Item
May 21 · localhost:3000
-0.025 ETH
-0.025 ETH
Create Token
May 21 · localhost:3000
-0 ETH
-0 ETH
Create Market Sale
May 21 · localhost:3000
-25.005 ETH
-25.005 ETH
Create Market Item
May 21 · localhost:3000
-0.025 ETH
-0.025 ETH
Create Token
May 21 · localhost:3000
-0 ETH
-0 ETH

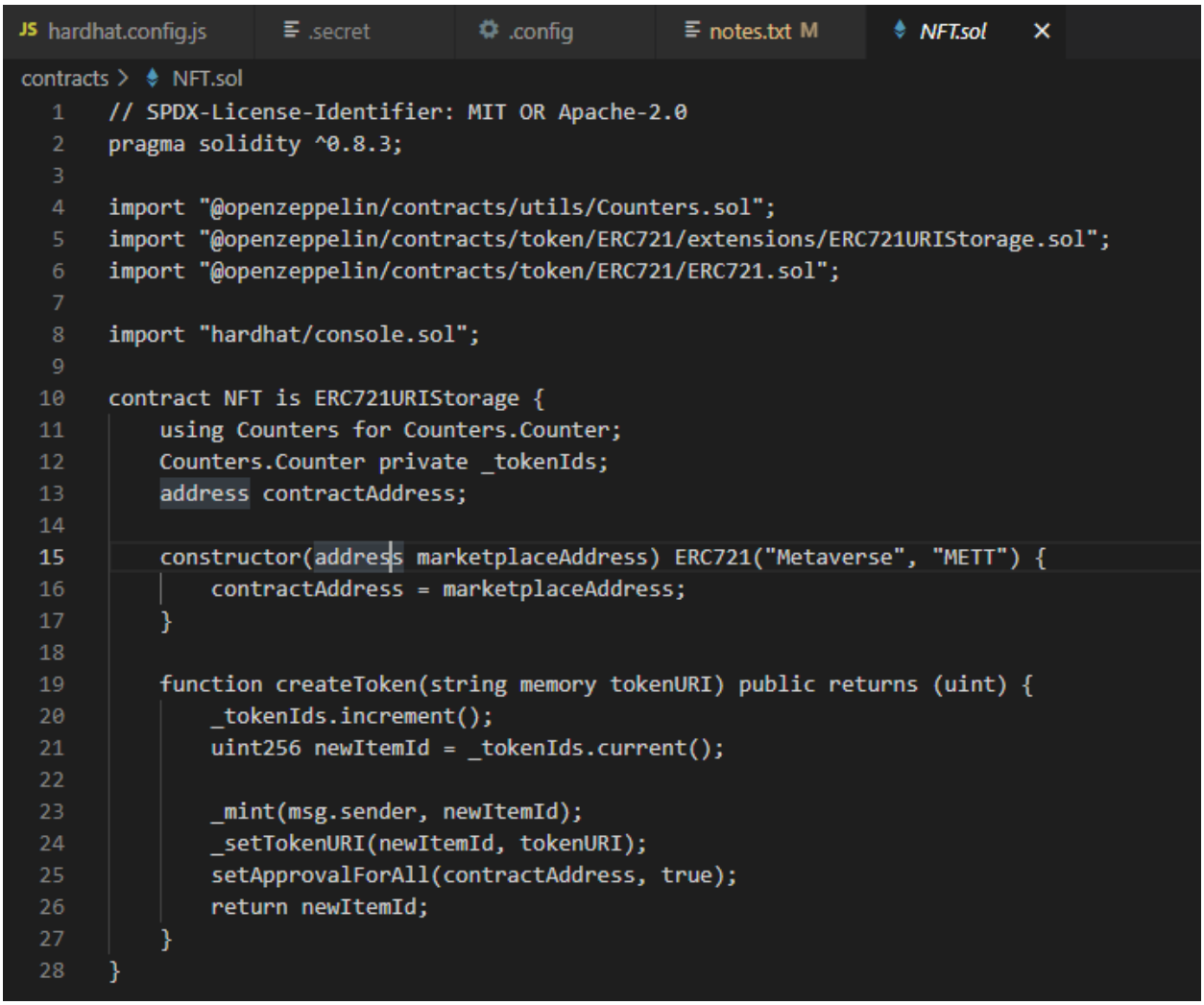

Localhost:8545
Connected
Account 4
0xbDA...197E
10024.9478 ETH
Buy
Send
Swap
Assets
Activity
Create Market Item
May 21 · localhost:3000
-0.025 ETH
-0.025 ETH
Create Token
May 21 · localhost:3000
-0 ETH
-0 ETH

3.5 CODE SNIPPETS

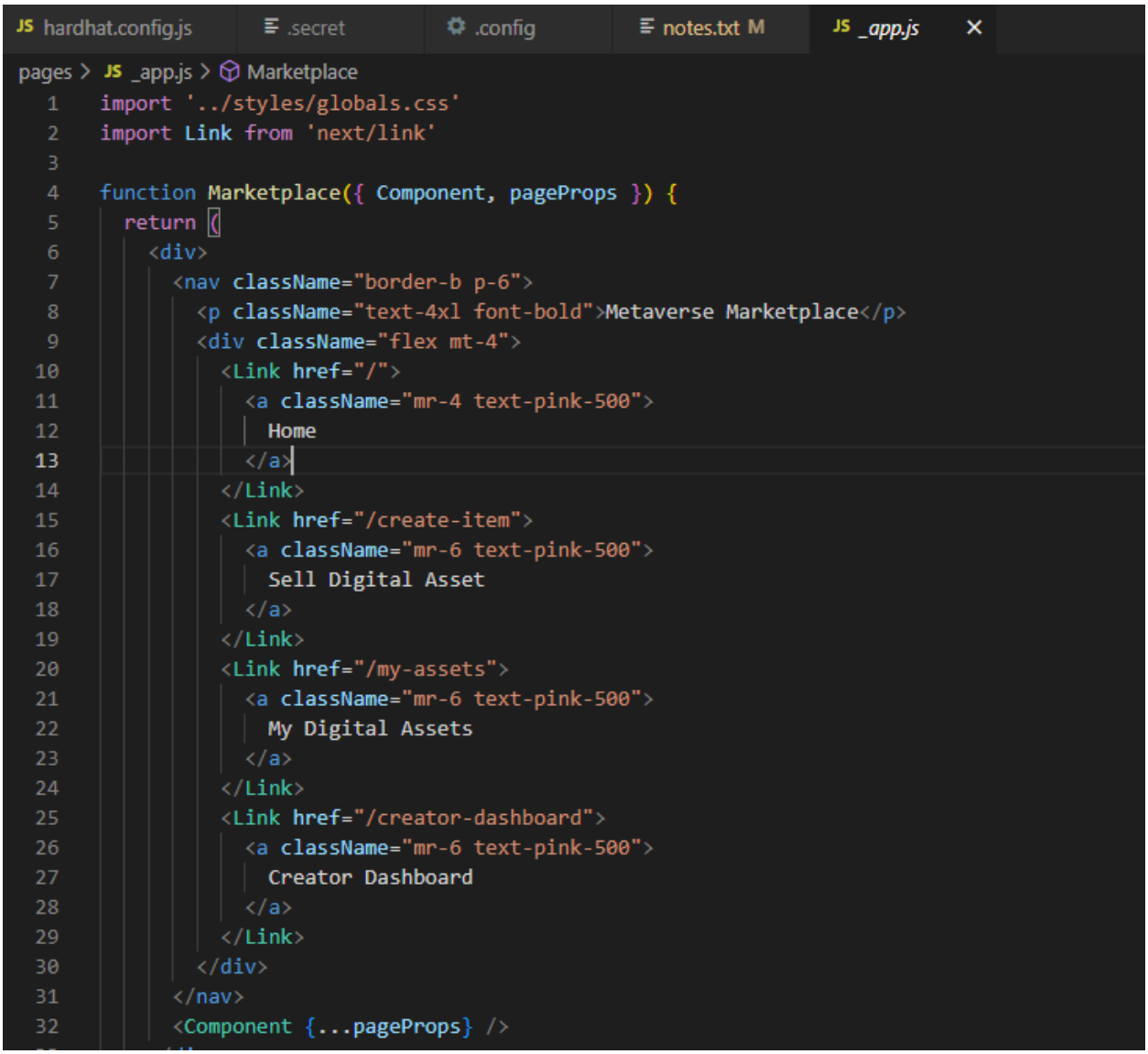
3.5.1 Market.sol (nft market place code)



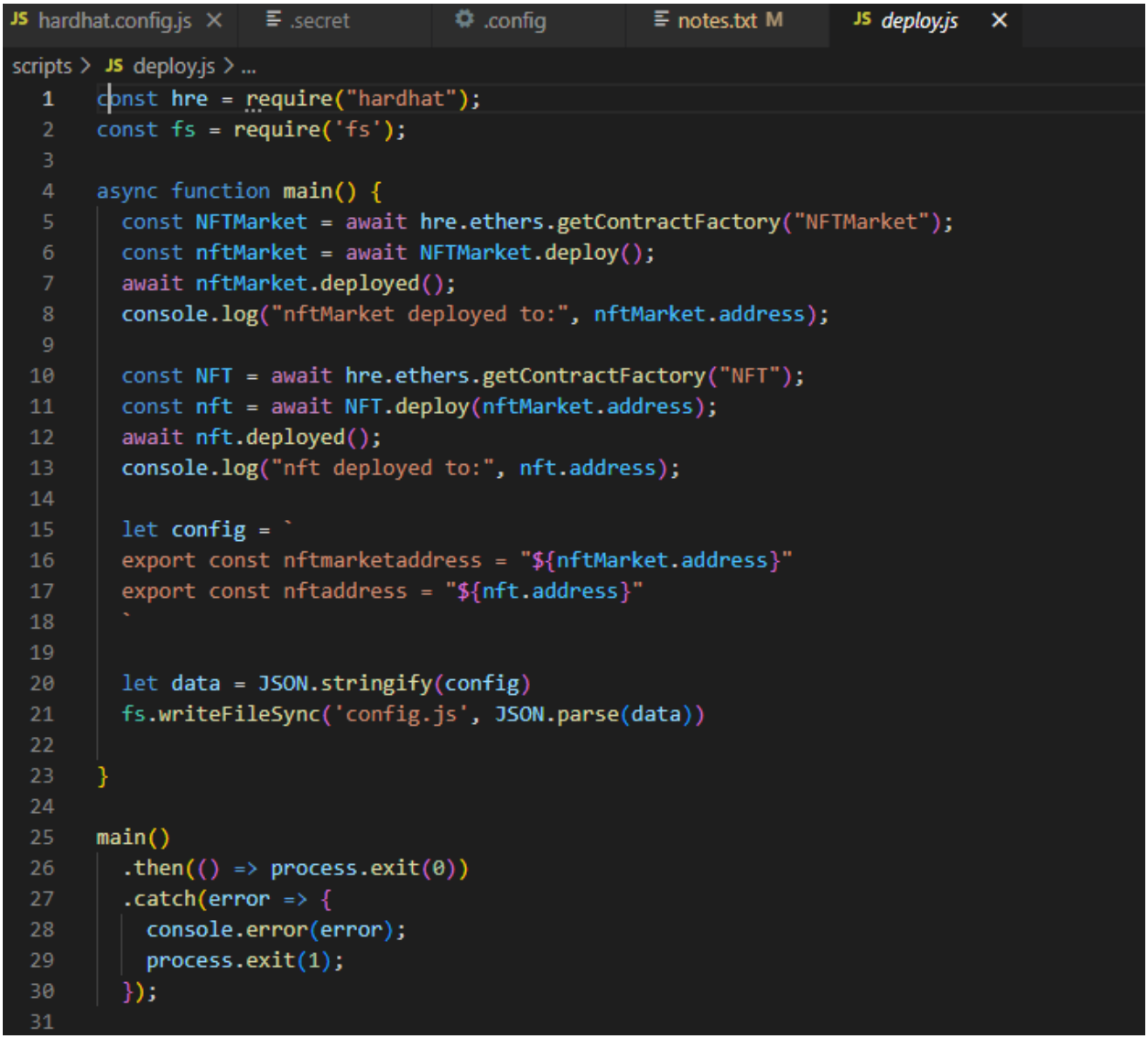
3.5.2 NFT.sol (creating tokens)



3.5.3 _app.js (home page of application)

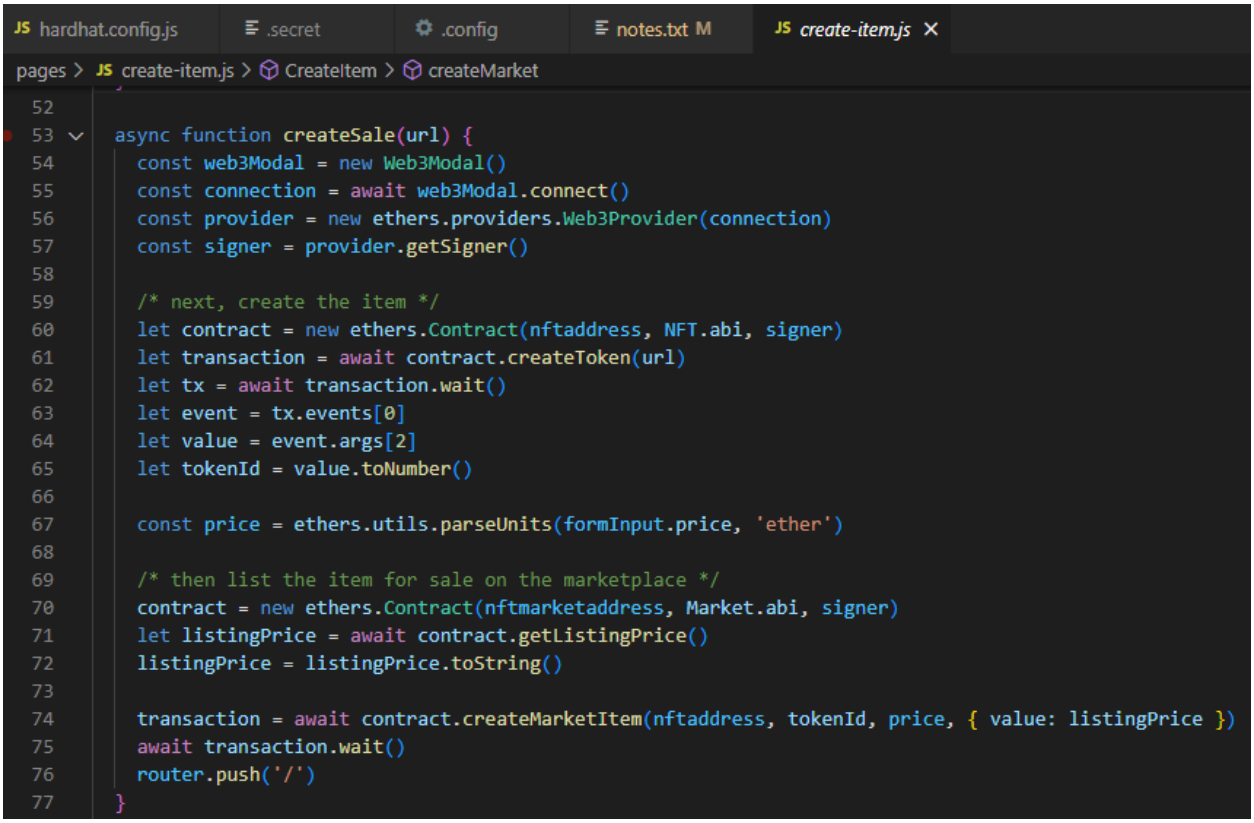


3.5.4 Deploy.js (deploying to localhost)


hardhat.config.js
.secret
.config
notes.txt M
deploy.js
scripts > deploy.js > ...
const hre = require("hardhat");
const fs = require('fs');
async function main() {
const NFTMarket = await hre.ethers.getContractFactory("NFTMarket");
const nftMarket = await NFTMarket.deploy();
await nftMarket.deployed();
console.log("nftMarket deployed to:", nftMarket.address);
const NFT = await hre.ethers.getContractFactory("NFT");
const nft = await NFT.deploy(nftMarket.address);
await nft.deployed();
console.log("nft deployed to:", nft.address);
let config = `
export const nftmarketaddress = "${nftMarket.address}"
export const nftaddress = "${nft.address}"
`
let data = JSON.stringify(config)
fs.writeFileSync('config.js', JSON.parse(data))
}
main()
.then(() => process.exit(0))
.catch(error => {
console.error(error);
process.exit(1);
});

pages > JS create-item.js > CreateItem > createMarket

```
6
7   const client = ipfsHttpClient('https://ipfs.infura.io:5001/api/v0')
8
9   import {
10    nftaddress, nftmarketaddress
11  } from '../config'
12
13  import NFT from '../artifacts/contracts/NFT.sol/NFT.json'
14  import Market from '../artifacts/contracts/Market.sol/NFTMarket.json'
15
16  export default function CreateItem() {
17    const [fileUrl, setFileUrl] = useState(null)
18    const [formInput, updateFormInput] = useState({ price: '', name: '', description: '' })
19    const router = useRouter()
20
21    async function onChange(e) {
22      const file = e.target.files[0]
23      try {
24        const added = await client.add(
25          file,
26          {
27            progress: (prog) => console.log(`received: ${prog}`)
28          }
29        )
30        const url = `https://ipfs.infura.io/ipfs/${added.path}`
31        setFileUrl(url)
32      } catch (error) {
33        console.log('Error uploading file: ', error)
34      }
35    }
```



3.6 REFERENCES

◦https://screenrant.com/expensive-nfts-sold-so-far/

◦https://opensea.io/

◦https://ethereum.org/en/nft/

◦https://ethereum.org/en/developers/docs/smart-contracts/

◦https://www.investopedia.com/web-20-web-30-5208698

◦https://polygon.technology/