Bhartiya Vidya Bhavan's
Sardar Patel Institute of Technology, Mumbai-400058
Department of Computer Science and Engineering
**OEIT1:Blockchain Technology and Applications**

## Lab-6A: Create Non Fungible Tokens (NFTs)

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Branch: COMPS B
**Objective: Create Nonfungible Tokens (NFTs)**

**Outcomes:** After successful completion of lab students should be able to

1. Create a new NFT project
2. Configure the network to deploy on Ganache
3. Configure the private key
4. Create the badge image
5. Add the badge to the local IPFS
6. Pin the badge to a remote IPFS
7. Create the badge metadata
8. Deploy the smart contract
9. Award the badge to your wallet
10. Check the badge on Etherscan
11. Add the badge to your mobile wallet

**System Requirements:**
PC (C2D, 4GB RAM, 100GB HDD space and NIC),Ubuntu Linux 14.04/20.04
Internet connectivity,Python Cryptography and Pycrypto,REST API,Go Language
Go Ethereum, Truffle Suite, Metamask, IPFS, OpenSea Market Place

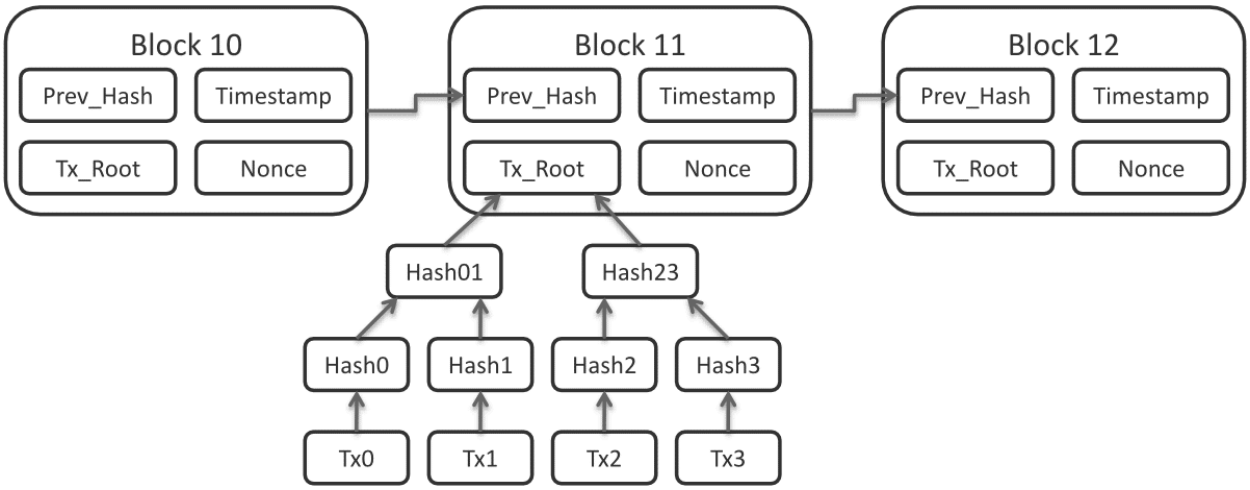



Figure-1: Blockchain Implementation

**Procedure:**

[1] Install Ethereum Blockchain

Clone it from git and compile it. https://github.com/ethereum/go-ethereum

$cd ~

$mkdir BTA

$cd BTA

$mkdir lab6a

$cd lab6a

Refer to [1]

Follow the steps and add screenshots for every step with captions.

**UniqueContract.sol**

```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.19;

import
"@openzeppelin/contracts/token/ERC721/extensions/ERC721URIStorage.sol
";

contract UniqueAsset is ERC721URIStorage {
    uint private _tokenIds;

    constructor() ERC721("UniqueAsset", "UNA") {}

    function awardItem(address recipient, string memory metadata)
public returns (uint256) {
        uint256 newItemId = _tokenIds;
        _mint(recipient, newItemId);
        _tokenIds += 1;
        _setTokenURI(newItemId, metadata);
        return newItemId;
    }
}
```

**migration file**

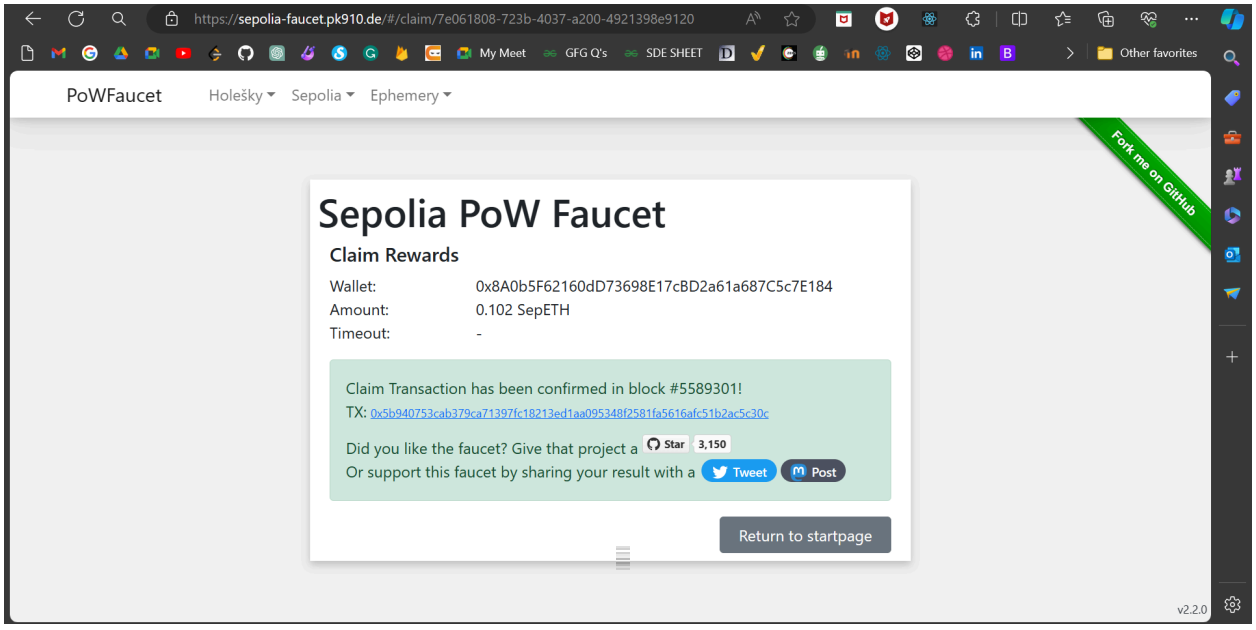
```
const UniqueAsset = artifacts.require("UniqueAsset");

module.exports = function(deployer) {
    deployer.deploy(UniqueAsset);
};
```

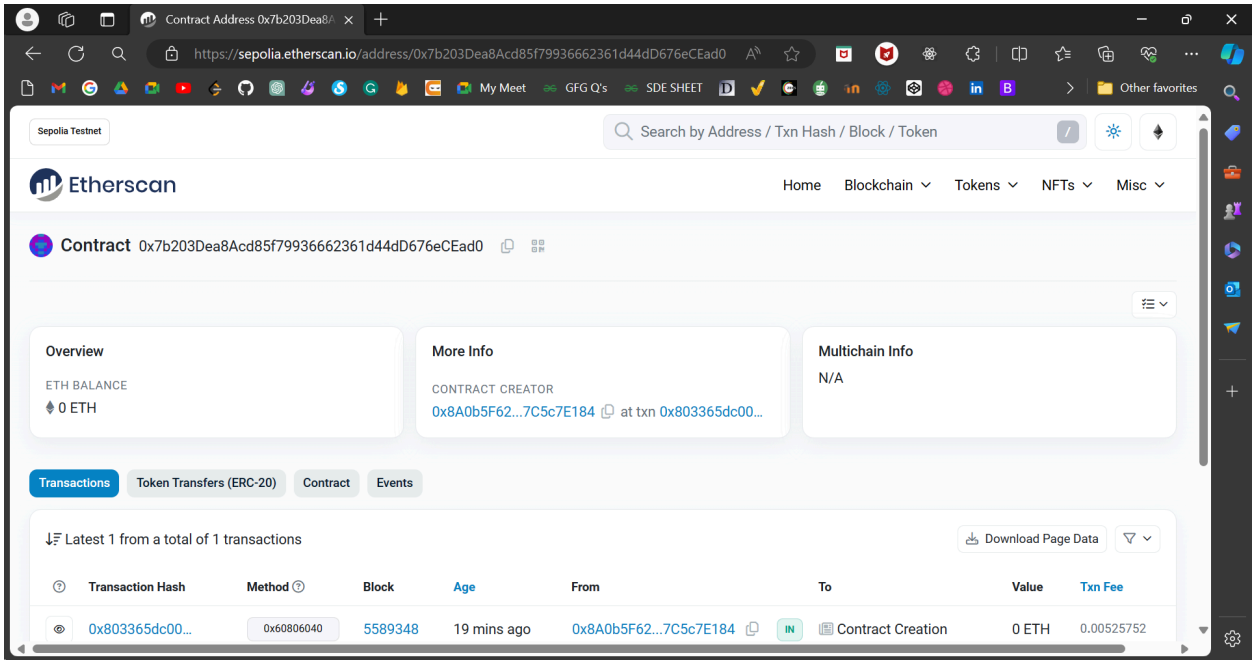
**truffle-config.js**

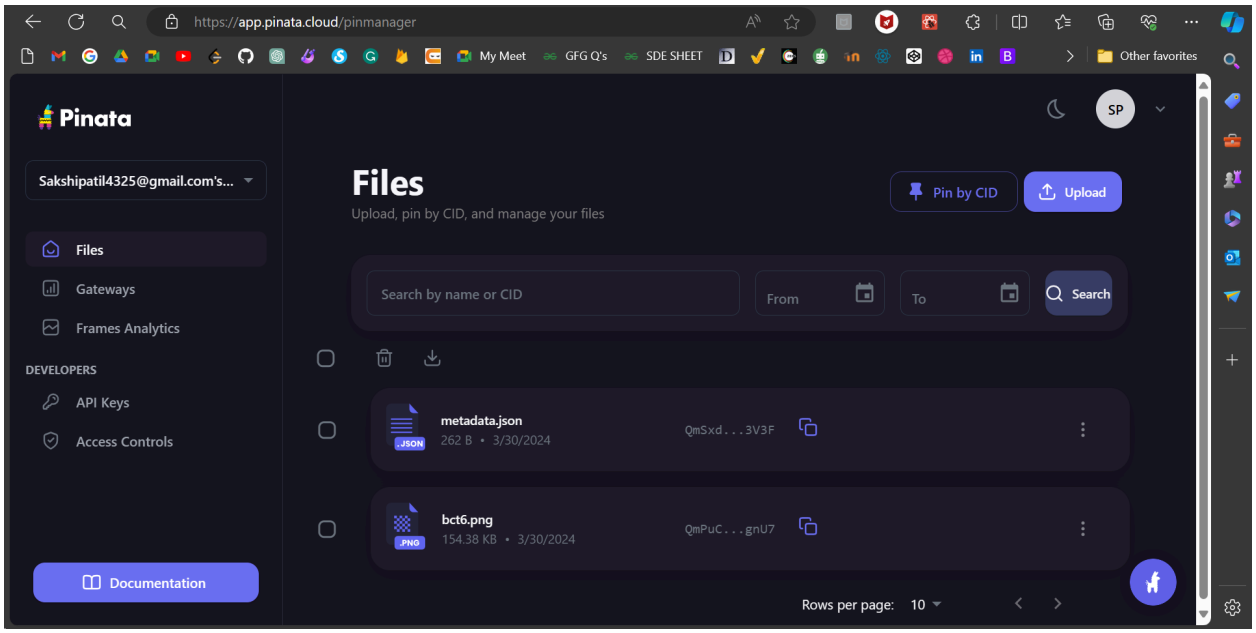
```
const HDWalletProvider = require('@truffle/hdwallet-provider');

module.exports = {
  networks: {
    sepolia: {
      provider: () => new HDWalletProvider(
        "drastic taste win among vapor best thrive uncover vibrant
index quarter margin",

"https://sepolia.infura.io/v3/fcb58e5accf94b498717e664cd2a3c2e"
      ),
      network_id: 11155111, // Sepolia's network id
      chain_id: 5, // Sepolia's chain id
      gas: 5500000, // Gas limit used for deploys
      confirmations: 2, // # of confirmations to wait between
deployments (default: 0)
      timeoutBlocks: 2000, // # of blocks before a deployment times
out (minimum/default: 50)
      skipDryRun: false // Skip dry run before migrations? (default:
false for public nets)
    },
  },
  compilers: {
    solc: {
      version: "0.8.21", // Fetch exact version from solc-bin
(default: truffle's version)
      settings: { // See the solidity docs for advice about
optimization and evmVersion
        optimizer: {
          enabled: false,
          runs: 200
        },
        evmVersion: "byzantium"
      }
    }
  }
};
```

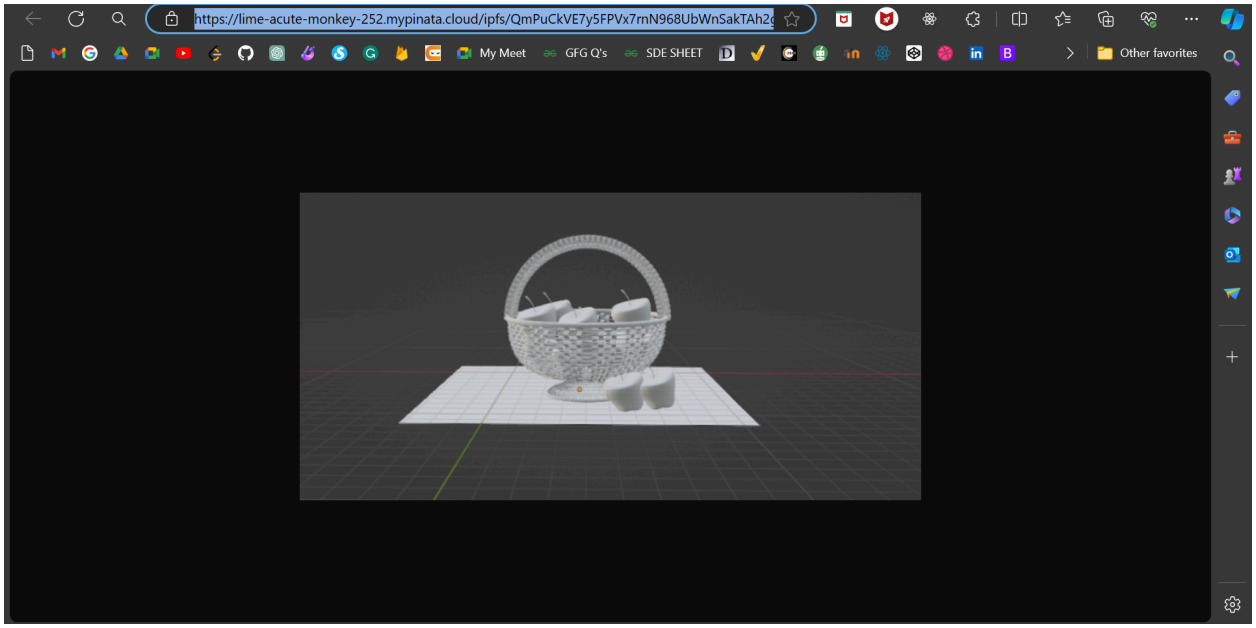
```
PS C:\Users\aspur\OneDrive\BCT\EXPERIMENTS\06A. NFTS> npx truffle compile
 Compiling your contracts...
 ===========================
 ✓ Fetching solc version list from solc-bin. Attempt #1
 ✓ Downloading compiler. Attempt #1.
 > Compiling .\contracts\UniqueAsset.sol
```

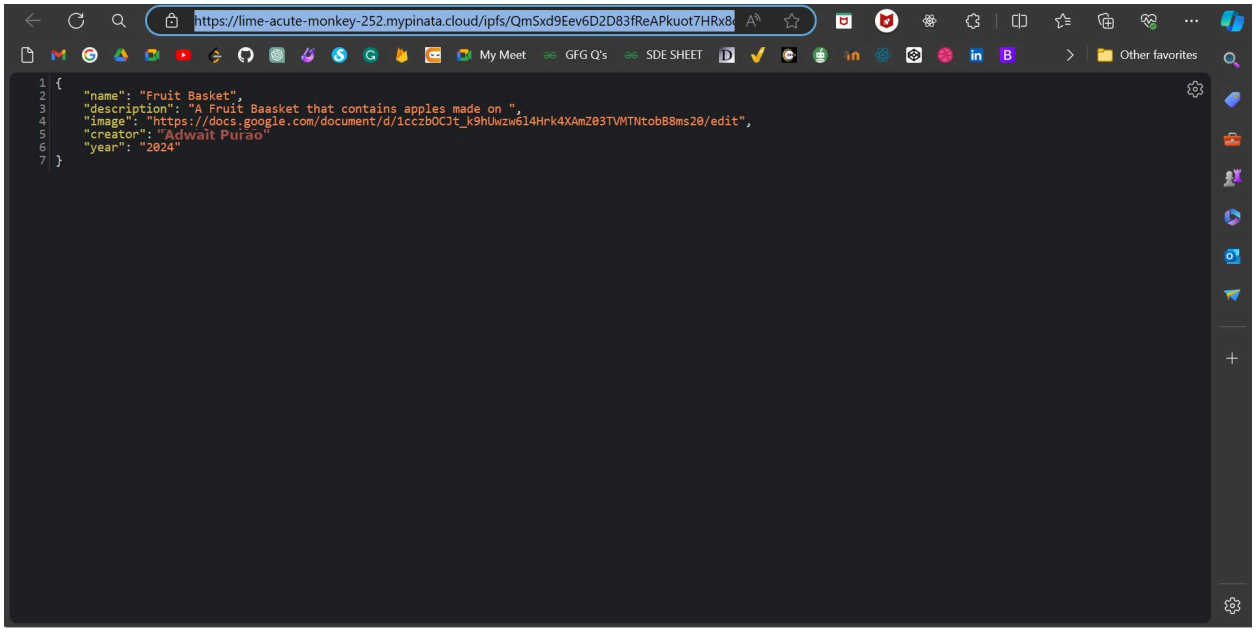
```
PS C:\Users\aspur\OneDrive\BCT\EXPERIMENTS\06A. NFTS> npx truffle migrate --network sepolia

Compiling your contracts...
===========================
> Compiling @openzeppelin\contracts\interfaces\IERC165.sol
> Compiling @openzeppelin\contracts\interfaces\IERC4906.sol
> Compiling @openzeppelin\contracts\interfaces\IERC721.sol
> Compiling @openzeppelin\contracts\interfaces\draft-IERC6093.sol
> Compiling @openzeppelin\contracts\token\ERC721\ERC721.sol
> Compiling @openzeppelin\contracts\token\ERC721\IERC721.sol
> Compiling @openzeppelin\contracts\token\ERC721\IERC721Receiver.sol
> Compiling @openzeppelin\contracts\token\ERC721\extensions\ERC721URIStorage.sol
> Compiling @openzeppelin\contracts\token\ERC721\extensions\IERC721Metadata.sol
> Compiling @openzeppelin\contracts\utils\Context.sol
> Compiling @openzeppelin\contracts\utils\Strings.sol
> Compiling @openzeppelin\contracts\utils\introspection\ERC165.sol
> Compiling @openzeppelin\contracts\utils\introspection\IERC165.sol
> Compiling @openzeppelin\contracts\utils\math\Math.sol
> Compiling @openzeppelin\contracts\utils\math\SignedMath.sol
> Compiling .\contracts\UniqueAsset.sol
> Artifacts written to C:\Users\SAKSHI PATIL\Downloads\exp6\build\contracts
> Compiled successfully using:
   - solc: 0.8.21+commit.d9974bed.Emscripten.clang


Migrations dry-run (simulation)
===============================
> Network name:    'sepolia-fork'
> Network id:      11155111
> Block gas limit: 30000000 (0x1c9c380)
```

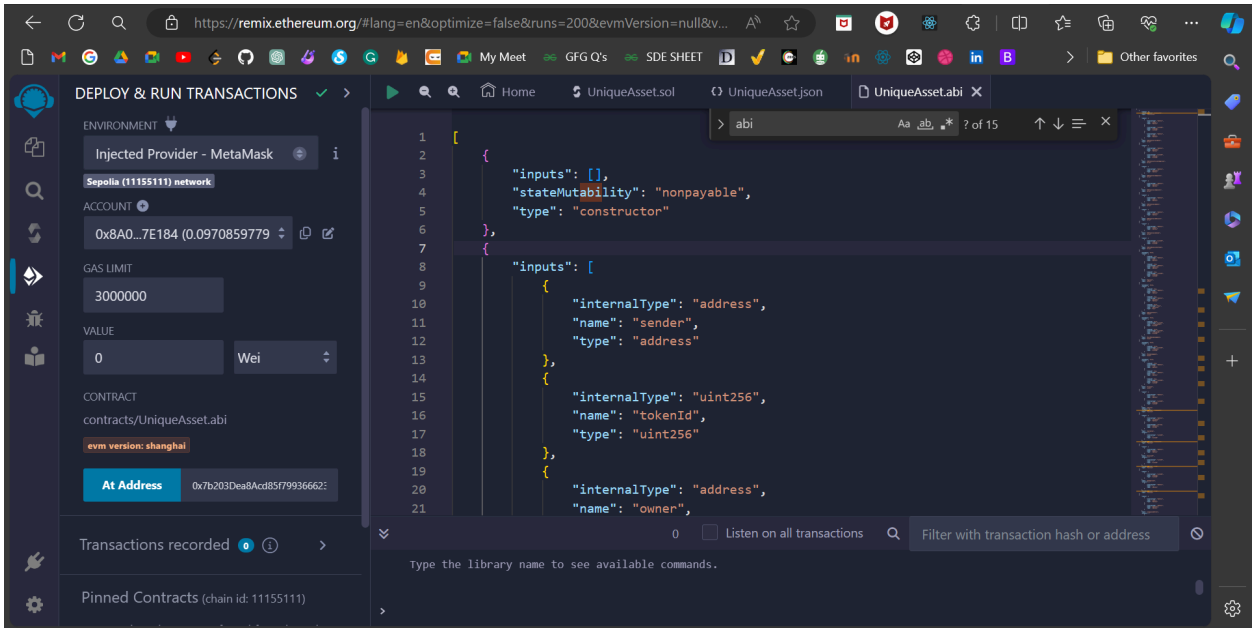


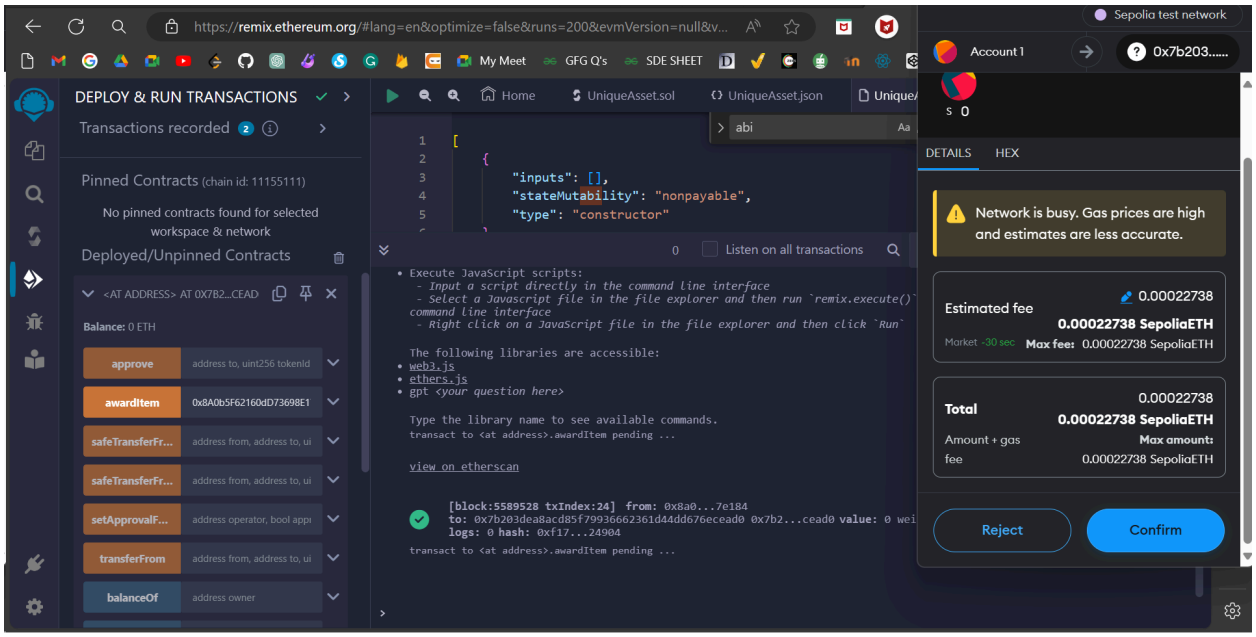

Contract Address 0x7b203Dea8A
https://sepolia.etherscan.io/address/0x7b203Dea8Acd85f79936662361d44dD676eCEad0
Sepolia Testnet
Search by Address / Txn Hash / Block / Token
Etherscan
Home
Blockchain
Tokens
NFTs
Misc
Contract 0x7b203Dea8Acd85f79936662361d44dD676eCEad0
Overview
ETH BALANCE
0 ETH
More Info
CONTRACT CREATOR
0x8A0b5F62...7C5c7E184 at txn 0x803365dc00...
Multichain Info
N/A
Transactions
Token Transfers (ERC-20)
Contract
Events
Latest 1 from a total of 1 transactions
Download Page Data
Transaction Hash
Method
Block
Age
From
To
Value
Txn Fee
0x803365dc00...
0x60806040
5589348
19 mins ago
0x8A0b5F62...7C5c7E184
IN
Contract Creation
0 ETH
0.00525752

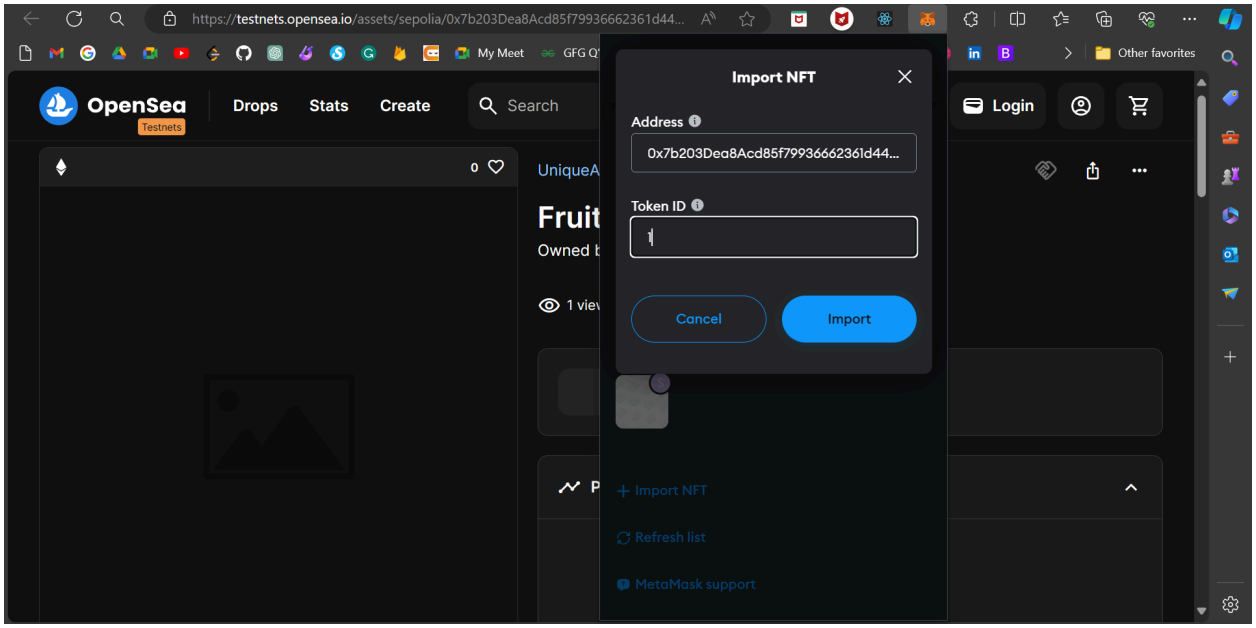

https://app.pinata.cloud/pinmanager
Pinata
Sakshipatil4325@gmail.com's...
Files
Gateways
Frames Analytics
DEVELOPERS
API Keys
Access Controls
Documentation
Files
Upload, pin by CID, and manage your files
Pin by CID
Upload
Search by name or CID
From
To
Search
metadata.json
262 B • 3/30/2024
QmSxd...3V3F
bct6.png
154.38 KB • 3/30/2024
QmPuC...gnU7
Rows per page: 10

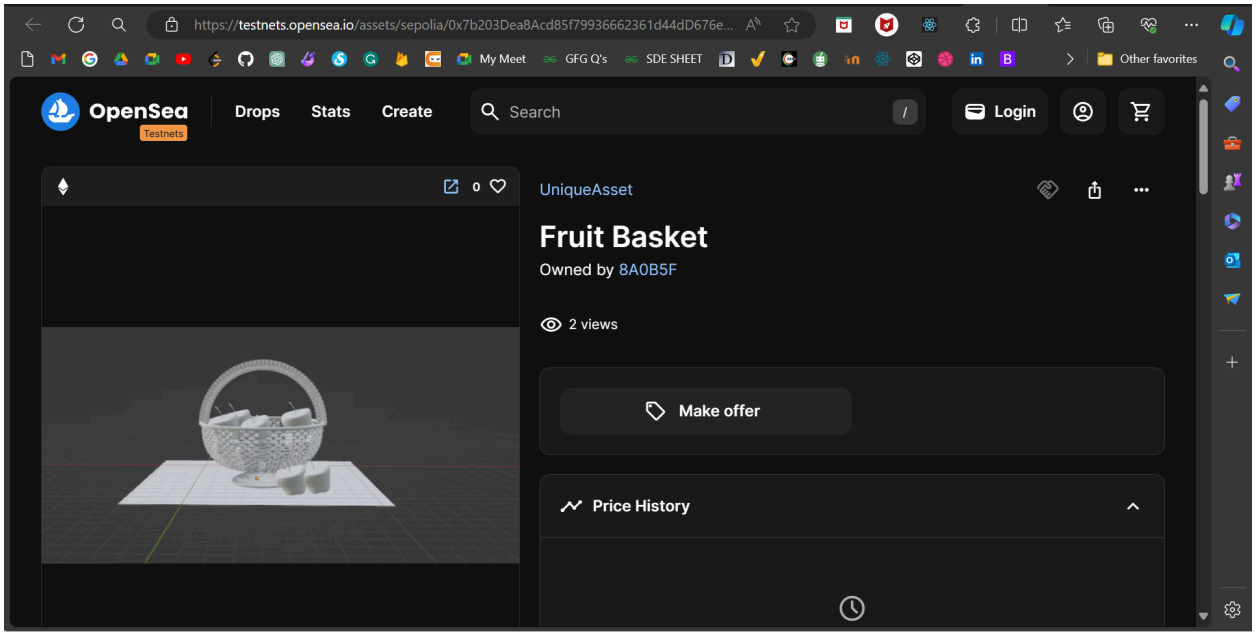

https://lime-acute-monkey-252.mypinata.cloud/ipfs/QmPuCkVE7y5FPVx7rnN968UbWnSakTAh2
My Meet
GFG Q's
SDE SHEET
Other favorites


https://lime-acute-monkey-252.mypinata.cloud/ipfs/QmSxd9Eev6D2D83fReAPkuot7HRx8
My Meet
GFG Q's
SDE SHEET
Other favorites
{
"name": "Fruit Basket",
"description": "A Fruit Baasket that contains apples made on ",
"image": "https://docs.google.com/document/d/1cczbOCJt_k9hUwzw614Hrk4XAmZ03TVMTNtobB8ms20/edit",
"creator": "Adwait Purao"
"year": "2024"
}


https://remix.ethereum.org/#lang=en&optimize=false&runs=200&evmVersion=null&v...
DEPLOY & RUN TRANSACTIONS
ENVIRONMENT
Injected Provider - MetaMask
Sepolia (11155111) network
ACCOUNT
0x8A0...7E184 (0.0970859779
GAS LIMIT
3000000
VALUE
0
Wei
CONTRACT
contracts/UniqueAsset.abi
evm version: shanghai
At Address
Transactions recorded
Pinned Contracts (chain id: 11155111)
Home
UniqueAsset.sol
UniqueAsset.json
UniqueAsset.abi
abi
Listen on all transactions
Filter with transaction hash or address
Type the library name to see available commands.


DEPLOY & RUN TRANSACTIONS
Transactions recorded
Pinned Contracts (chain id: 11155111)
No pinned contracts found for selected workspace & network
Deployed/Unpinned Contracts
Balance: 0 ETH
approve
awardItem
safeTransferFr...
setApprovalF...
transferFrom
balanceOf
Sepolia test network
Account 1
DETAILS
HEX
Network is busy. Gas prices are high and estimates are less accurate.
Estimated fee
0.00022738
0.00022738 SepoliaETH
Max fee: 0.00022738 SepoliaETH
Total
Amount + gas fee
Max amount:
Reject
Confirm




[Fruit Basket - Asset Opensea]

**Conclusion:**

In this lab, we delved into the process of crafting Nonfungible Tokens (NFTs) on the Ethereum blockchain through the Sepolia network. Our journey began with setting up the development environment, initializing a new NFT project, and fine-tuning the network for deployment on Sepolia. Leveraging a Solidity contract, we sculpted a token that extends the ERC721URIStorage contract, thus enabling the minting of distinct tokens paired with metadata.

With Truffle as our tool, we orchestrated the deployment, landing our contract on the Sepolia network, and allocated tokens to designated addresses. Our exploration culminated in scrutinizing the tokens on Etherscan and mastering the inclusion of these tokens in mobile wallets and marketplaces like OpenSea, equipping us with practical prowess in NFT conception and deployment.

**References:**

[1] Chapter 5  ERC-721 Non Fungible Tokens

https://www.oreilly.com/library/view/getting-started-with/9781484280454/html/521550_1_En_5_Chapter.xhtml

[2] Mastering Blockchain Technology by Imran Bashir 4th Edition Chapter 11,12 and 13,Packt Publications