# NFT MARKETPLACE

## A PROJECT REPORT

*Submitted by*

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**to**

**The APJ Abdul Kalam Technological University**

***In partial fulfillment of the requirements for the award of the Degree of***

**MASTER OF COMPUTER APPLICATIONS**


**Thangal Kunju Musaliar College of Engineering**
**Kerala**
**DEPARTMENT OF COMPUTER APPLICATIONS**

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# DECLARATION

I undersigned hereby declare that the project report NFT MARKETPLACE, submitted for partial fulfillment of the requirements for the award of degree of Master of Computer Applications of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by me under supervision of Dr.NADERA BEEVI S . This submission represents my ideas in my own words and where ideas or words of others have been included, I have adequately and accurately cited and referenced the original sources. I also declare that I have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in my submission. I understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University.

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## C E R T I F I C A T E

This is to certify that, the project report entitled **"NFT MARKETPLACE"** is submitted by **NITHIN RAJ (TKM20MCA-2027)** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the degree of Master of Computer Applications, is a bonafide record of the project work carried out by him under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Internal Supervisor Head of the Department External Examiner

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# ABSTRACT

Decentralized apps (dApps) provide an unique open-source software ecosystem that is safe and robust by running on top of a blockchain and peer-to-peer (P2P) network that functions as a form of operating system. Additionally, it enables programmers to design new web tools, many of which have caught the attention of international corporate marketplaces. Non-fungible tokens (NFTs) are transferrable ownership stakes in digital goods including music, video games, collectibles, and artwork. Since early 2021, the phenomena and its marketplaces have seen rapid growth. In the last few years, the Non-Fungible Token (NFT) industry has exploded. The idea behind NFT was inspired by an Ethereum token standard that sought to provide each token a distinct identity using recognisable indicators. These tokens' distinctive identifiers may be tied to virtual or digital assets. With NFTs, all designated properties may be freely exchanged with values that are based on their ages, rarity, liquidity, etc. The market for decentralised applications (DApps) has been considerably boosted as a result. However, the NFT ecosystem is still in its early stages of development, and the NFT technologies are still in their infancy. A digital platform for purchasing and selling NFTs is known as an NFT marketplace. This system provides a market place where non-fungible tokens may be directly sold at a set price based on the Etherium standard. On this platform, NFTs may be created by any user. On this site, users may sell their NFTs to other users in exchange for cryptocurrencies or cash, as well as keep and exhibit them. On some NFT markets, users may mint their NFTs directly on the website.

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# Chapter 1

# INTRODUCTION

We may use NFTs as tokens to denote ownership of certain goods. They enable us to tokenize items like as artwork, valuables, and even real estate. The Ethereum blockchain secures them, preventing anybody from changing the ownership record or creating new NFTs by copying and pasting existing ones. They can only have one legitimate owner at a time. NFT is an acronym for non-fungible token. You may use the economic phrase ”non-fungible” to describe anything like your furniture, a music file, or your computer. These objects have special qualities that make them incomparable to other things. Contrarily, fungible goods are exchangeable because they are defined by their worth rather than by their special qualities. Because 1 ETH or $1 USD may be exchanged for another 1 ETH or $1 USD, for instance, these currencies are fungible. NFTs provide solutions to some of the issues facing the internet today. The attributes of physical goods, such as scarcity, uniqueness, and evidence of ownership, must be replicated as everything becomes increasingly digital. Not to add that digital products often only function inside the confines of their particular offering. NFTs are distinct from ERC-20 tokens like DAI and LINK because each one is entirely unique and cannot be divided, unlike ERC-20 tokens. Any unique piece of digital data that can be tracked by utilising blockchain as a public ledger may be assigned or claimed to belong to someone using NFTs. An NFT is created using digital objects to represent assets, whether they are digital or not.

## 1.1 Problem Definition

Ethereum is a standard blockchain that can issue NFT, however Ethereum has an ERC (Ethereum Request for Comments) token standard, and ERC-721 is often utilised as the NFT issuance standard. The blockchain stores the data structure of ERC-721-based NFTs, including information such as token ID, holder address, and token URI (Uniform Resource Identifier). This token's irreplaceability is ensured by its unique identifier, which is a unique value. A token URI is an attribute that specifies the location of related content information (metadata) with an NFT. The name of the material, its description, the URL (Uniform Resource Locator) of the data, etc. may be characterised as metadata. The token URI recorded on the blockchain as NFT specifies the location of the metadata, the URL of the content data in the metadata specifies the location of the content data, and the content data is related to the NFT. Notably, because the data capacity that can be stored on the blockchain is limited, metadata and content data are often maintained outside of the blockchain (off-chain).

## 1.2 Objective

The project's major purpose is to:

- That the seller can mint the NFTs
- Users can sell directly to the marketplace
- That the user can buy these minted NFTs
- Users can mint the NFTs in Polygon network backed by Ethereum network
- Users can also mint the NFTs in Solana network

# Chapter 2

# RELATED WORKS

This section discusses numerous research of blockchain and its transactions for NFT marketplaces.

## 2.1 Blockchains and Smart Contracts for the Internet of Things [1]

Stakeholders from several sectors have recently shown interest in blockchain. utilities, real estate, and the government, in addition to finance and healthcare. because Applications that formerly functioned if blockchain were installed are the cause of this increase of interest. You can no longer reproduce work decentralizedly unless via trustworthy intermediaries. It provides the central authority with the same functionality and degree of dependability. which is this was not feasible before. The following justifies our claim that blockchain facilitates a network of trust: Even if there is no trust between the parties, they may still bargain. absence of reliable individuals By prompt mediation of the parties to a transaction, the arbitrator is referring. broad use of cryptography; blockchain networks establish authority behind each contact, which is a fundamental component online. A self-executing programme housed on the blockchain is used to combine smart contracts. These ideas are put into practise, and a better dispersed and highly automated process is produced. It must complete this. Researchers and developers in the Internet of Things (IoT) industry are drawn to blockchain.

It goes without saying that the switch to a decentralised network shouldn't be permitted. It is always reasonable. Moreover, despite these transitions Your application criteria might include: This is not possible with a blockchain-based network. blockchain As we will see, despite the numerous advantages that smart contracts provide, they are not without flaws. The goal of this article is to explain how blockchains and smart contracts operate and to list the benefits and drawbacks of using them. displays systems, blockchain, and IoT techniques. able can be combined. The reader is now in a position to identify themselves. Possible new applications for IoT operations Smart choices in the blockchain integration project. Following is a breakdown of the thesis. Currently being looked into What is a blockchain, and how does it operate as a network? In essence, Network parties may engage in interactive transactions. Automating and installing.

## 2.2 Automated Generation of Test Cases for Smart Contract Security Analyzers [2]

Smart contracts are the cornerstone of blockchain services. A blockchain-based piece of software known as a contract conducts business. The most popular business model at the moment is Ethereum. shrewd agreement Delivering smart contracts: It differs from a typical computer in several ways. Smart contracts are used on a blockchain platform. bytecode execution in compiled bytecode format As a result, even when a mistake is found, it cannot be corrected. Code Boolean A unique virtual computer is used to execute Bytecode. shrewd agreement Smart contracts provide functional components. Blockchain technologies and services, sensitive data storage, and cryptocurrency. Smart contracts are becoming more secure. Smart contracts have been tried, however there have been some documented problems (TheDAO and Parity wallet attacks). It seems that manual verification is my sole option for verification. It is not enough to protect crypto assets from attackers. immutability; This makes it difficult to acquire smart contracts. There isn't another chance to correct the error. The situation is as follows. If used often, active protection is implemented. automated process similar to that used in the design of digital integrated circuits. Therefore, the automatic security analysis tool known as "contract analyzer" is widely used.

The Ethereum Security Survey found that, apart from safe encryption for developers, using

a contracts analyzer is the best method of security. Blockchain technology is still in its early phases of dependably generating accurate findings, even though employing a contract analyzer will be an essential aspect of developing blockchain services. In the majority of contract parsers, considerable false positive and false negative errors have been discovered in recent assessments of contract parsers. providing lucrative false positives and false negatives for attackers on the blockchain In order to generate a false negative, attackers develop malicious smart contracts, or ”trojans.” Evil developers, on the other hand, deliberately take advantage of complex weaknesses to generate false positives. To attract other attackers, they reveal a known vulnerability, but a hidden defect will subtly neutralise the exploit.

## 2.3 Formal Specification Smart-Contract Language for Legally Binding Decentralized Autonomous Organizations [3]

Since the traditional business models were displaced by blockchain technologies, new ones have emerged. information exchange and resource integration in business management. The latter is based on a centralised model; with a hierarchical structure and lacks confidence among the participants as well as transparency in interorganizational operations. Decentralization is a method of doing business where copies of each transaction are spread among participants and transactions are divided among them. The idea of delegating power and tasks to several levels of operational units inside an organisation is shifting as a result of blockchain technology. Blockchain is a distributed ledger and peer-to-peer network in the digital world where commercial transactions are recorded and securely stored. There is no need for participants in a commercial transaction to have any faith in one another since each duplicate record gets sent to each participant's ledger. In order to confirm transactions controlled by a peer-to-peer network, blockchain removes centralised organisations. The Through decentralisation and power structure mediators, blockchain technology's latest advancements enable and revolutionise company processes. So unalterable The traceability of blockchain technology increases trust between participants, speeds up transactions, and decreases transaction costs by doing away with the need for intermediaries.

For certain organisations, sharing information is crucial to collaboration. For instance, in a

supply chain and X-road, a wide range of collaborating partners are dedicated from manufacturing to delivery, and process integration of each stakeholder requires a huge interchange of information. Cooperation is challenging for commercial activities between firms due to uneven communication. Through smart contracts, blockchain technology regulates how business activities are carried out between businesses and allows for decentralised independent organisations (DAOs). A DAO is a group or enterprise that automates its operations by adhering to the rules and regulations laid down in the program's encrypted specifications. Recent DAOs (like DAOs) are run by the software industry with the goal of employing blockchain technology to reimplement conventional decision-making norms. In order to increase shareholder transparency and follow the aforementioned laws of the DAOs, which are controlled by computer code, payments and transactions made by DAOs are documented on a blockchain.

## 2.4 Next Generation Smart Contract Decentralized Application Platform [4]

Two radical and unique ideas were simultaneously revealed to Satoshi Nakamoto when he initially developed the Bitcoin network in January 2009. The first is "bitcoin," a peer-to-peer electronic money with a decentralised system that retains value in the absence of a central issuer, backing, or inherent value. Therefore the term "bitcoin" has so far garnered the majority of the public's attention, both politically and otherwise. the excessive price volatility of a currency without a central bank. The idea of a blockchain powered by proof of work to allow for public consensus on the sequence of transactions is another, equally significant component of Satoshi's grand experiment. If a company has 50 bitcoins and simultaneously transfers them to A and B, only the first verified transaction will be completed. This is known as a deposit-first mechanism in the context of bitcoin. The development of decentralised digital money has been hampered for decades by the lack of an inherent means to distinguish between the two prior transactions. The first trustworthy decentralised solution is Satoshi's blockchain. And right now, interest is beginning to focus on how the second aspect of the bitcoin technology may be leveraged to generate additional revenue.

Commonly mentioned applications include the use of digital assets on the blockchain to rep-

resent unique currencies and financial instruments called coloured coins, ownership of underlying physical equipment called smart property, irreplaceable assets like domain names called Namecoin, as well as more complex ones like decentralised exchanges, financial derivatives, peer-to-peer games, and blockchain identities and reputation systems. The study of ”smart contracts,” which are automated systems that transfer digital assets in accordance with arbitrary specified criteria, is another crucial field of study. As an example, a monetary contract would read something like this: ”A can withdraw up to X currency units per day, B can take up to Y per day, A and B together can withdraw whatever, and A can block B from withdrawing.” Decentralized Autonomous Organizations (DAOs), which are composed of long-term smart contracts that hold assets and specify all of the organization's policies, are the natural extension of this. Ethereum aims to provide a blockchain with the official Turing-complete programming language that can be used to create ”contracts” that can be used to encode arbitrary state transition functions, enabling the user to create any of the systems mentioned above, as well as many other things we haven't even thought of, by writing logic in a few lines of code.

## 2.5 Document Security And Storage On Blockchain [5]

Blockchain has been working with us since 2009. For seven years it prevented the attempt to destroy it, manipulation or cooperation. Although at a crossroads in technological development, there are many use cases around the world. Industries, including the field of document management. The legalization of electronic documents imposes new tasks on business managers. In the case of paper records, the recorder assumes responsibility for the record or agrees with the statements contained in the report. signature or countersignature. From the point of view of the Director of Archives, the report belongs to the meeting he designated. symptom Synonym for report. Therefore, authorization and accountability using the concepts of decentralization, proof-of-work and time-stamping features of the blockchain. Hashing also saves document content, holds authors accountable, and saves time. Save the document. Based on the above concept, the project reads the content of the uploaded document instead of scanning the document as an image. It then hashes the read content and uploads this information to the blockchain network instead of the original content. The content is safe. Therefore, this process ensures the security of the content even if it is uploaded to the

public registry.

## 2.6 Introducing Ethereum and Solidity Foundations of Cryptocurrency and Blockchain Programming for Beginners [6]

Application developers who are interested in creating products and services and non-coders who are curious about Ethereum's potential are the two main groups of thinkers who are more interested in the blockchain system and Ethereum. This is perhaps because they work in or are interested in the financial services, consulting, insurance, law, game design, government, logistics, product, or computer design industries. It gives both programmers and non-coders a framework in which to think about what to construct and how to do it. It connects computers with economic, financial, and, where appropriate, banking history. As with other open source software projects, Ethereum is accessible to those who have experience programming in other contexts, therefore the issue for programmers is often not the code itself. The difficulty is in getting you to comprehend the idea of a "crypto economy," or a set of incentives and disincentives designed to safeguard a network. Guessing how the ecosystem will change and how you fit in is difficult for non-coders. Exaggerated claims that blockchain would modernise the financial industry, transform insurance, and eliminate damaged counterfeit products are possible. Open source blockchain networks like Ethereum and Bitcoin serve as the foundation for opening a software-based savings system that includes account administration and a native exchange for transferring between accounts. a bit like the game Exclusive. People refer to these native units as trade coins, tokens, or cryptocurrencies, but they are identical to tokens in every other system in that they are coins (or certificates) that are exclusively usable in this system.

## 2.7 Blockchain technology and enterprise operational capabilities: An empirical test" [7]

Operational capabilities, or OCs for short, are organisational skills that enable a business to "make a living," usually through gaining competitive advantage through enhanced business pro-

cesses and so lowering company expenses. The most crucial challenges for multinational organisations are to encourage enterprise transformation and enhance their OCs. At the same time, the quick growth of information technology offers businesses a great chance to increase OCs and management models, assisting them in offering customers goods and services with a high added value. Information technology would bring a ”new normal” to global economic development, according to the annual World Economic Forum 2016, which took place in Switzerland in January 2016 and had as its subject ”managing the fourth industrial revolution.” A distributed ledger database for verifiably and permanently storing business transactions between parties is what blockchain technology is. Due to its distinctive consensus method and suitable encryption algorithms, it has steadily gained interest in a number of industries. From the viewpoint of enterprises, the successful fusion of internal and external information sources contributes significantly and favourably to the enhancement of firms' OCs. In addition to solving various issues with external cooperation and traditional enterprise management linked to information sharing and resource integration, BT also introduces a new method of company operation and management. The development of BT and its use, however, still face several challenges. The State Council's guidelines on actively promoting ”Internet Plus” point out that traditional businesses lack the knowledge and skills necessary to use internet information technology and that there are numerous barriers to the creation of new formats, such as a lack of resources and qualified personnel. Additionally, few firms have actual plans to use BT, despite the fact that many are aware of its potential. Most academics focused on business process modelling up to this point, and they developed a meta-model for carrying out secure business transactions utilising BT and an enterprise operating system. They also aimed to reduce the security risks associated with business transaction executions to boost confidence, authenticity, robustness, and fraud traceability. In terms of specific application, they diverted BT's focus in previous years to a number of industries, including the legal field, the energy industry, banking, and others.

## 2.8 Blockchain technology for decentralized autonomous organizations [8]

Decentralized Autonomous Enterprises (DAO) are now needed by organisations due to their constantly changing operational and economic demands. Decentralized autonomous Organizations (DAO) are novel scalable, self-organizing coordination on the blockchain, controlled by smart contracts, and their core operations are automated agreeing to rules and principles assigned in code without human involvement. Centralized Autonomous Organizations (CAO) lack transparency and are managed by a small number of effective managers. The need for Decentralized Autonomous Organizations (DAO) and major initiatives in this area are covered in this chapter. Then, using the Ethereum blockchain and its Turing complete programming language with smart contract computing capabilities, we present a potential solution. A technology that enables the creation of organisations where members maintain direct real-time monitoring of submitted collects and governance norms are written, automated, and enforced using software is developed. To create a Decentralized Autonomous Organization (DAO) on the Ethereum blockchain, basic smart contract code is put together. We also go through how the DAOs code operates, focusing on the core elements of setup and governance, such as structure, formation, and voting rights. DAOs are assumed to have consented to the future expectation of the business working. However, the blockchain industry currently lacks an operational foundation for DAOs.

## 2.9 The Age of Cryptocurrency: How Bitcoin and Digital Money are Challenging the Global Economic Order [9]

Overnight, the word ”bitcoin” gained popularity. It is a cyber-mystery with a fervent following that makes headlines and sparks unending media discussion. Despite the fact that it can purportedly be used to purchase anything from vehicles to coffee, few people appear to actually comprehend what it is. Thus, the question: Why should anyone be interested in bitcoin? The authoritative response to this query is provided in The Age of Cryptocurrency by Wall Street journalists Paul Vigna and Michael J. Casey. In addition to integrating the billions of ”unbanked” people in the

globe into a new global economy, cybermoney is ready to start a revolution that might completely reimagine established financial and social institutions. Cryptocurrency presents the promise of a financial system without a middleman, one that is owned by the users and protected from the devastation of a crisis like the one that occurred in 2008. However, the most well-known cybercurrency, bitcoin, has a reputation for volatility, unpredictable fluctuations, and illegal operations; others worry it has the potential to destroy employment and the idea of a nation-state. Above all, it indicates a significant, far-reaching change—for better or bad. But you disregard it at your risk because it is here to stay. The origins of bitcoin, its purpose, and the information you need to know to navigate a cyber-economy are all demystified by Vigna and Casey. The world of cryptocurrencies will appear quite different from the world of paper money, and The Age of Cryptocurrency will teach you how to prepare for this.

# Chapter 3

# METHODOLOGY

The NFT marketplace is a decentralised platform where users can produce, buy, sell, and store non-fungible tokens, as the name suggests. While blockchain, the platform's underlying technology, assures transparency and immutable documentation of the process of digital asset tokenization and trade, an NFT marketplace facilitates NFT minting and trading on a worldwide scale. NFT storage is likewise handled by the market. Nearly every market that deals with digital assets is being taken over by NFT markets, which are growing in popularity in sectors including gaming, art, social networking, and music. To store NFTs, the user must register on the platform and install a cryptocurrency wallet. Then, users can upload stuff to display their effort, creating their own assets. Users are able to establish a fee in crypto tokens for their NFTs. the customers want to purchase these NFTs at a set cost. When an item is put up for sale, a transaction is started in the user wallet to start a personal trade smart contract.

## 3.1 Proposed system

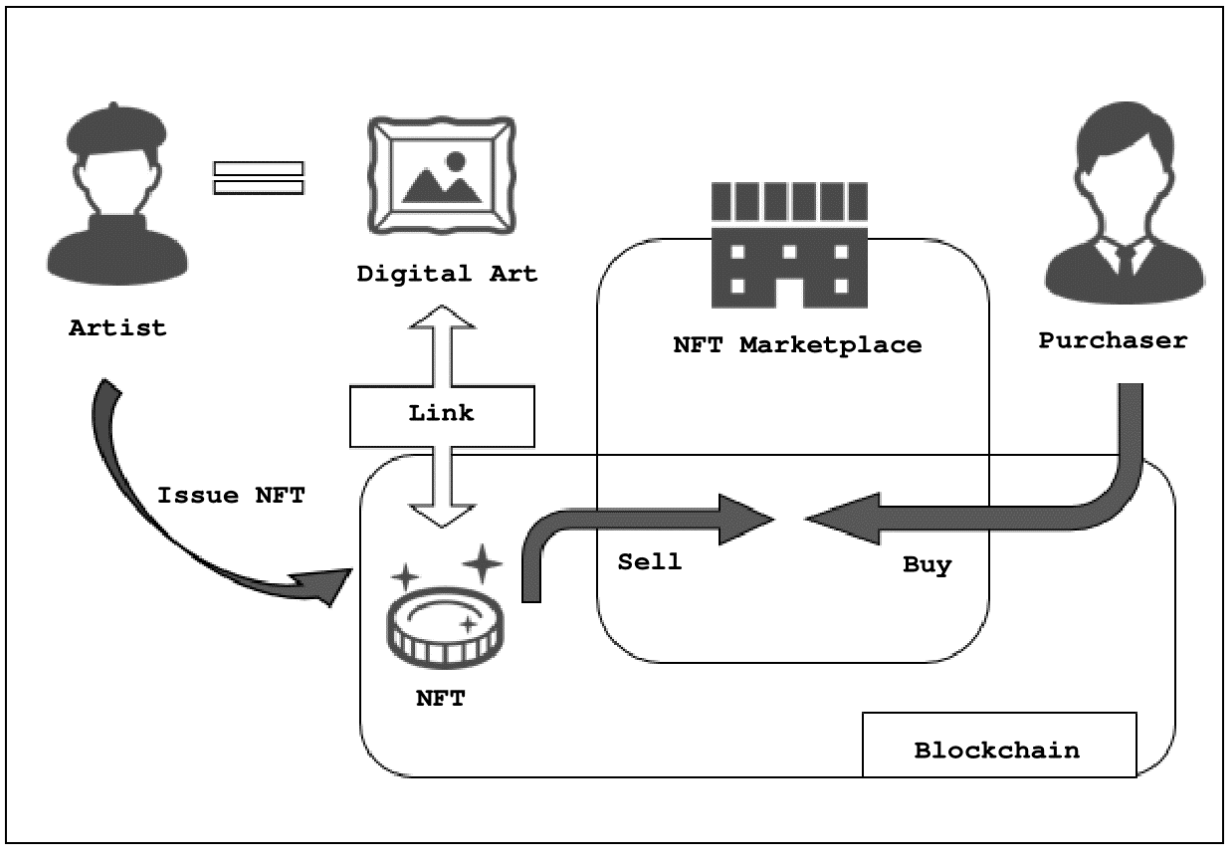


Figure 3.1: Block diagram of the proposed system

## 3.2 System Architecture

A Non-fungible Token (NFT) is essentially a digital asset or cryptographic asset that differs from a fungible token by having a special identification code and metadata. They cannot be traded or exchanged for comparable value, just like cryptocurrencies. The flow of the project is shown in Figure 3.1. The proposed system consist of five major phases:

1. Users can mint the digital contents as NFT tokens

2. The tokens are listed in to the marketplaces

3. The purchaser can buy these NFTs using cryptocurrency

4. The owner can sell the purchased NFTs to other parties

5. Users can mint the NFTs via Polygon network or Solana network

### 3.2.1 Blockchain

A distributed database or ledger that is shared by computer network nodes is known as a blockchain. For storing data, a blockchain functions as a digital database. Keeping a secure and decentralised record of transactions in cryptocurrency systems like Bitcoin is the most well-known use of blockchain technology. Blockchain technology innovates by promoting confidence without the need for a reliable third party by ensuring the security and integrity of a data record. In contrast to how it is typically organised, data is organised differently on a blockchain. In blockchains, data is gathered in sets called blocks, each of which include a collection of data. The blocks that make up a block chain known as the blockchain each have a certain amount of storage capacity. A block is sealed when it is complete and connected to the block preceding it. Following the upload of the initial block, each new piece of data is combined to create a new block, which is then finished and added to the chain. In contrast to databases, which typically arrange their data into tables, a blockchain, as its name suggests, arranges its data into components (blocks) that are connected together. This data format, when used in a decentralised way, is meant to provide an irreversible chronology of data. Each completed block is securely sealed before being added to the schedule. Every block that is a part of the chain is assigned a precise timestamp. Nearly all of the components of online commerce depend on financial institutions functioning as trustworthy third parties to process electronic payments. Even while the system functions successfully for the majority of transactions, trust-based models nevertheless have certain fundamental issues. Because financial organisations must arbitrate disagreements in every transaction, completely irreversible transactions are not feasible. The cost of mediation drives up transaction costs, creates a minimum transaction size, disallows the possibility of small, infrequent transactions, and drives up the cost of irreversible bankruptcy for immutable services. Given the possibility of a reversal, confidence is more necessary. Traders need to be wary of their customers and demand more information than is required. It is understood that fraud will always happen to some extent. Without a trustworthy

individual, there is no way to send money through a communication channel, but real cash may be used to eliminate these costs and uncertainties. An electronic payment system that allows two willing parties to interact with each other directly without the assistance of a third party and is based on cryptographic proof rather than faith is needed. Buyers are insured by the traditional escrow mechanism, while IT providers are protected from fraud by irreversible transactions.

#### 3.2.1.1 Transactions

What it refer to as an electronic money is a collection of digital signatures. By adding a hash of the previous transaction and the new owner's public key to the end of the coin and digitally signing it, each owner may transfer ownership of the currency to the next. By looking at the signatures, the payee may verify the ownership chain. The issue is that the payee cannot swear for the truth that one of the owners did not use the coin more than once. A traditional remedy is the creation of a reliable central authority, or mint, which verifies every transaction for double spending. The money must be returned to the mint after each transaction to be re-minted, and only coins made by the mint itself are regarded to be double-spend-proof. This system's drawback is that all transactions must go via the mint's operation, which controls the future of the whole monetary system in a manner comparable to a bank. We're trying to figure out a way to let the payee know that the prior owners didn't sign any earlier contracts. Due to the fact that the earliest transaction is the one that matters for our purposes, we are unconcerned with future efforts to double-spend. Being aware of each one is the only way to be certain there hasn't been a transaction. Each transaction was known to the simulation's mint, which decided which should go through first. We need a mechanism that allows parties to agree on one history of the order in which they were received in order to do this without using a trusted third party. The disclosure of transactions is also required. The payee should demonstrate that a majority of nodes concurred that a certain transaction was the first transaction received at the time of the payee. The flow of the blockchain transaction is shown in the Figure 3.2

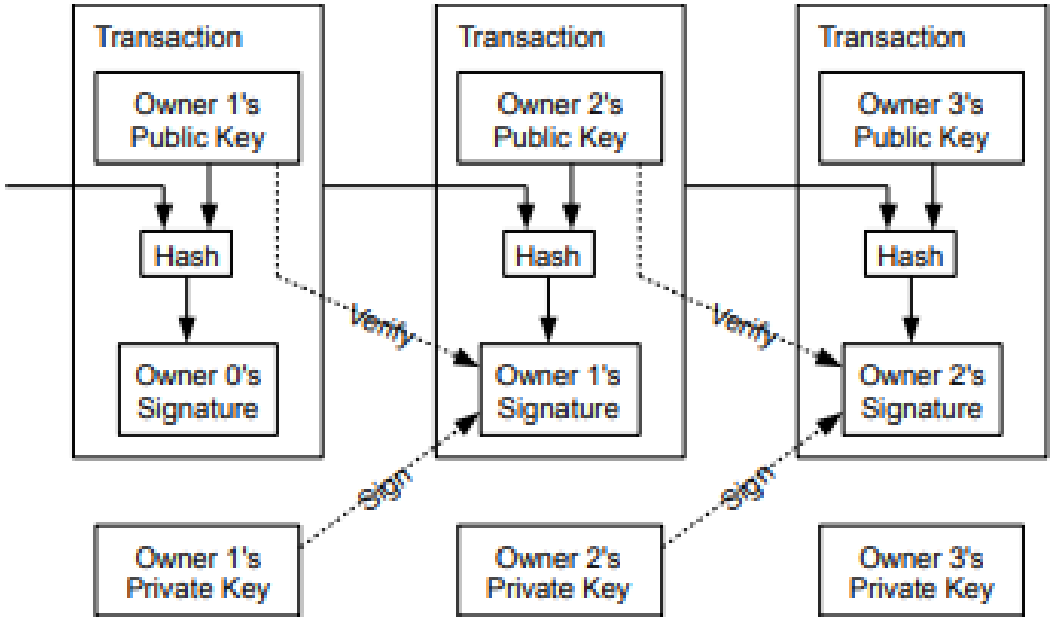


Figure 3.2: Blockchain Transaction Flow

#### 3.2.1.2 Timestamp Server

The first stage in the method we propose is the timestamp server. A hash must be developed and extensively disseminated, for example in a newspaper or Usenet article, in order for a block of objects to be timestamped to work [2-5]. It is obvious from the timestamp that the data had to be present at the time in order to be included in the hash. Each timestamp strengthens the chain of timestamps that came before it by include the previous timestamp in its hash. The architecture of the blockchain timestamp server is shown in the Figure 3.3

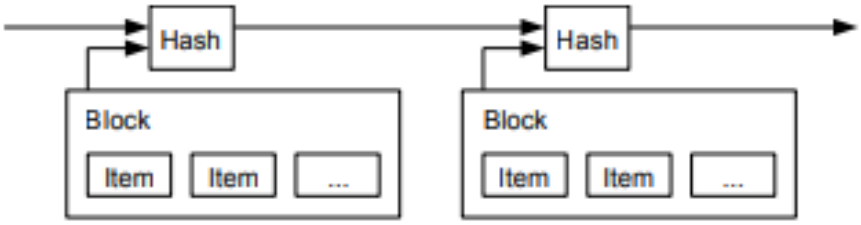


Figure 3.3: Blockchain Timestamp

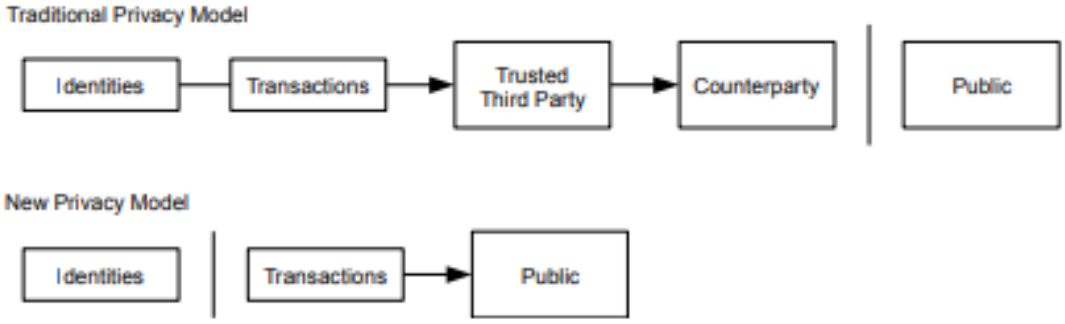


Figure 3.4: Privacy Model

#### 3.2.1.3 Privacy

The traditional banking strategy guarantees a certain level of privacy by restricting access to information to the parties involved and the trusted third party. This method cannot be used because all transactions must be made public, however privacy can still be preserved by preventing the flow of information by anonymizing public keys. Even when money is being moved from one person to another in plain sight, no one can be identified. This is akin to the level of information revealed by stock exchanges, where the ”tape,” or the timing and value of specific trades, are made available to the public without disclosing the identity of the parties involved. In order to prevent transactions from being linked to the same owner, each transaction should use a distinct key pair as an additional firewall. Due to the requirement to show that the same owner controlled each input, some linkage is still required for multi-input transactions. In the event that the owner of a key is made public, linking can reveal more transactions that belonged to the same owner.The privacy model of blockchain is shown in the Figure 3.4

### 3.2.2 NFT WORKFLOW

Non-fungible tokens, or NFTs, are now experiencing a boom and are rapidly gaining popularity.It is now assisting digital artists, whether they are creating music, photographs, or art exhibitions, to showcase their talents and long-term monetize them. While we all understand what NFTs are but have you ever asked a simple question on what makes it awesome? Or, how is a simple piece of art going to be implemented in real-world application? Or most importantly, how are NFT holders actually making money out of these digital pieces We at Kyte.One have researched thoroughly and have come up with a very clean but simple architecture that clearly defines the workflow of NFTs. You will have a clear picture instilled in your brain which you can relate to in million other fields. Let's dive deep into it without any further delays.

#### 3.2.2.1 The Buying Phase

The first thing to keep in mind is that companies that want to launch their NFTs would first construct their NFT before launching on either their own NFT marketplace or other marketplaces. Following the debut of NFT in either of the marketplaces, consumers now visit the marketplace to purchase NFTs and claim ownership of these digital artefacts in exchange for tokens. The fact that the companies launching their NFTs identify a number of advantages with these tiny works of art gives users ample justification for holding their NFTs, which is a crucial point to highlight. Users are free to determine whether or not to continue their transactions based on the rewards they receive.

For the sake of clarity, let's assume that a restaurant creates its own NFT and that each NFT holder receives the designation "Premium Customers" with much more privileges on the restaurant's platform when placing an order. As a result, the user now has premium membership status after purchasing NFT, which improves customer loyalty to the company.

#### 3.2.2.2 The Redemptions Phase

Up until this point, it was obvious on what grounds a buyer purchased a company's NFTs. We will now move on to the section of our NFT workflow that describes how these NFT holders can redeem their advantages. We would illustrate this by going to one of the business stores after

purchasing the NFT from the same food establishment. You provide your digital asset, in this case an NFT, when you arrive at the store. The business then uses its Membership Verification App to verify the ownership and validity of the NFT. The company then checks the information and gives them the advantages related if the NFT owner stated in the app matches the one exhibiting the NFT for redemption. Since this is a restaurant, you might be entitled to a free burger, a free drink, or a specific percentage off the entire price. It entirely depends on the advantages connected with the kind of NFTs you own.

Now, it is conceivable for firms to state that they offer three various NFT types: SILVER, GOLD, and DIAMOND. Each of these NFT types will come with a unique set of advantages. The rewards will then be given to you based on the types of NFT that you possess.

#### 3.2.2.3 The NFT Selling Phase

Over time, the cost of these NFTs rises. In addition to other advantages, the uniqueness of these digital assets rises with each NFT sold, leaving the user with the option of how much they want to sell their NFTs for. Keep in mind that the NFTs will now be offered for sale.

But suddenly a straightforward query appears! Hey, the user sold the NFT for more money, but what does that mean for the business's profit? These questions would arise in the mind of any layperson, and there is only one solution: commissions. In practise, consumers will list their NFTs for sale on the market at, say, 10X the price they paid for them. The firm will then receive a set amount of commission specified in the smart contract. So, in a way, it benefits both buyers and sellers as well as enterprises.

#### 3.2.2.4 The Long Term NFT Holders

Most users won't want to sell their NFTs so quickly based on the potential for the future that these tokens hold, and for businesses, this makes them incredibly devoted consumers. Simply keeping track of which customers have been holding onto their NFT for, say, more than 24 months would accomplish the goal. In these situations, firms can improve the rarity level of existing NFTs by adding additional perks, which would make that particular NFT rarer as there are more benefits attached. Now, the subsequent purchaser of that specific NFT will enjoy greater advantages over the competition. In the end, the cost of NFT rises when it is sold.

Let's look at a straightforward illustration of the potential advantages. Again using a restaurant as an example, the owner decides to add burgers to their menu as a new item. As a super-loyal customer, you would be invited to a trial and asked to vote on whether or not the particular burger met the criteria to be on our menu in addition to receiving a discount for having these NFTs. I hope you have a general idea of the extra advantages that a really devoted consumer can receive.

## 3.3 Software Requirement and Specification

The tools used for the project are :

• Solidity

• Node.js

• Next.js

• Hardhat

• IPFS

• Ethers.js

• Polygon

• Solana

• Metaplex

• Metamask Wallet

• Phantom Wallet

### 3.3.1 Solidity

For the purpose of creating and implementing smart contracts on Blockchain systems, the Ethereum Network team created Solidity, an object-oriented programming language. Smart contracts are created on the blockchain system to carry out business logic and generate a series of transaction records. It is a tool for creating machine-level code that is compiled for the Ethereum Virtual Machine (EVM). It is extremely similar to C and C++ in terms of simplicity of understanding and mastery. A "main" in C, for example, is identical to a "contract" in Solidity. Numerous programming concepts, such as variables, functions, classes, arithmetic operations, string manip-

ulation, and others, are shared by the computer language Solidity. Solidity is growing swiftly as a relatively new language. Solidity is currently the predominant language on Ethereum and other private blockchains operating on competing platforms, such Monax and its Hyperledger Burrow blockchain, which uses Tendermint for consensus. SWIFT has created a proof of concept that utilises Solidity and operates on Burrow.

#### 3.3.1.1 Smart Contracts

A smart contract is a computer programme or transaction protocol that allows legally relevant events and actions to be automatically executed, controlled, or documented in line with the terms of a contract or an agreement. The need of trusted intermediates, arbitration and enforcement fees, fraud losses, and purposeful and inadvertent exceptions are all things that smart contracts are intended to do away with. Vending machines are the first instance of smart contract implementation technology. A poor implementation of the smart contract concept proposed by computer scientist, lawyer, and cryptographer Nick Szabo is shown in the 2014 Ethereum white paper as the Bitcoin protocol. Since Bitcoin, many other cryptocurrencies have enabled scripting languages, allowing the development of more complex smart contracts between shady parties. It's critical to understand the difference between smart contracts and smart legal contracts. The latter is a conventional legally-binding agreement written in plain English, but certain clauses are specified and put into practise in machine-readable code.

### 3.3.2 Node.js

Node.js is an open-source, cross-platform runtime environment for JavaScript that utilises the V8 engine and runs JavaScript code outside of a web browser. It may be used to build scalable network applications. JavaScript is a scripting language that programmers may use to build command-line tools and server-side scripts, which generate dynamic web page content on the server before the page is sent to the user's web browser. As a consequence, Node.js represents a "JavaScript everywhere" paradigm, bringing together the development of online applications around a single programming language rather than distinct languages for server-side and client-side scripts. Asynchronous I/O is supported by Node.js' event-driven architecture. For real-time Web appli-

cations as well as web applications with various input/output activities, these design choices aim to maximise performance and scalability (e.g., real-time communication programmes and browser games). The administration of the Node.js distributed development project has been transferred from the Node.js Foundation to the OpenJS Foundation, which is funded by the Collaborative Projects programme of the Linux Foundation. In the business realm, Node.js is used by organisations including GoDaddy, Groupon, IBM, LinkedIn, Microsoft, Netflix, PayPal, Rakuten, SAP, Walmart, Yahoo!, and Amazon Web Services. It is possible to create Web servers and networking tools with the aid of a collection of ”modules” that handle several core functions, JavaScript, and Node.js. Networking (DNS, HTTP, TCP, TLS/SSL, or UDP), binary data (buffers), data streams, cryptographic procedures, and other essential functions are all covered by separate modules. The Node.js modules make use of an API that is meant to make building server applications easier. Despite the fact that other languages may be converted into JavaScript, Node.js only natively supports JavaScript. Dart, TypeScript, ClojureScript, and CoffeeScript are just a few of the languages that may be used to construct Node.js programmes. Usually, Node.js is used to create web servers and other network programmes. The primary difference between Node.js and PHP is that Node.js functions are non-blocking, while the majority of PHP functions block until completion (some only run until earlier instructions have finished) (commands execute concurrently or even in parallel, and use callbacks to signal completion or failure). Node.js is officially supported on Linux, macOS, and these operating systems, as well as tier 2 support for SmartOS, IBM AIX, Microsoft Windows 8.1 and Server 2012 (and later), as well as experimental support for FreeBSD. OpenBSD is functional for IBM I (AS/400), and LTS versions are available. The given source code may be updated by third parties to support other platforms like NonStop OS and Unix servers, or it may be built on systems that are equivalent to those that are officially supported.

### 3.3.3 Next.js

The open-source web development framework Next.js supports server-side rendering and the production of static webpages for React-based online applications on top of Node.js. The React documentation lists Next.js under ”Recommended Toolchains” and suggests it to developers as a workaround for ”Building a server-rendered webpage using Node.js.” Next.js enables developers

to construct server-side applications in addition to client-side browser rendering, unlike traditional React apps. The firm that owns the Next.js trademarks and copyrights and is in charge of the creation of the open-source version of the programme is Vercel, previously known as ZEIT. The ability to create static webpages and display content on the server is provided by the React framework Next.js. React is a JavaScript library that is often used to develop web apps that are JavaScript-rendered in the client's browser. However, developers are conscious of a number of drawbacks with this strategy, such as the inability to support users who do not have access to JavaScript or who have disabled it, potential security issues, noticeably longer page loads, and a potential detrimental effect on the site's overall search engine optimization. Frameworks like Next.js circumvent these problems by allowing a portion or the whole of the website to be rendered on the server before being provided to the client. Next.js is among the most well-liked React frameworks. It's one of many proposed "toolchains" that are easily accessible when creating a new app, all of which provide a degree of abstraction to make common tasks easier. Next.js, which requires Node.js, may be set up using Node Package Manager. In 2019, Google contributed to the Next.js project by contributing 43 pull requests that aided in the removal of extra JavaScript, sped up loading, and added improved analytics. As of March 2020, a large number of important websites, including as Netflix, GitHub, Uber, Ticketmaster, and Starbucks, are adopting the framework. It was disclosed in the beginning of 2020 that Vercel had secured $21 million in Series A funding to support software updates. The project's lead developer is Tim Neutkens, while Guillermo Rauch, who created the framework in the first place, serves as CEO of Vercel at the moment.

### 3.3.4 Hardhat

The Ethereum software development environment is called Hardhat. It is made up of many parts that may be used to edit, compile, debug, and deploy your dApps and smart contracts, together forming a whole development environment. Hardhat Network, a local Ethereum network node optimised for development, is already included with Hardhat. It enables you to execute tests, deploy contracts, and debug code all locally on a single workstation. It responds to JSON-RPC and WebSocket requests while running as an in-process or standalone daemon. By default, it automatically and without delay mines a block for every transaction it gets.

### 3.3.5 IPFS

The InterPlanetary File System (IPFS), a protocol and peer-to-peer network, is used to store and exchange data in distributed file systems. In a global namespace that connects all computing devices, IPFS employs content-addressing to identify each file. Similar to BitTorrent, users may host and receive content via IPFS. In contrast to a centralised server, IPFS is based on a decentralised network of user-operators, each of whom has a fraction of the total amount of data. As a result, a trustworthy system is created for file sharing and archiving. A distributed hash table(DHT) allows any network user to serve a file by its content address, allowing other peers to locate and request that content from any node that has it. The goal of IPFS is to establish a single worldwide network, in contrast to BitTorrent. If two users publish a block of data with the identical hash value, the peers receiving the material from ”user 1” and the peers getting it from ”user 2” will swap data. IPFS aims to displace the current methods for distributing static online material by using HTTP-accessible gateways. Instead of downloading and setting up an IPFS client on their device, users may choose to utilise a public gateway; A list of these gateways is maintained up to current on the IPFS GitHub website.

#### 3.3.5.1 Infura

A strong blockchain development package is Infura. Developers may concentrate on creating and growing next-generation software by using APIs and developer tools, which offer quick, dependable access to the Ethereum and IPFS networks. The API of Infura offers direct access to the Ethereum network via HTTPS and WebSockets and is supported by a state-of-the-art microservices-driven architecture. With Infura Transactions (ITX), the solution for gas price and transaction management, transactions proceed seamlessly and swiftly. The Infura Ethereum API suite offers direct access to the Ethereum network via HTTPS and WebSockets. building blocks for decentralised applications. A distributed system called IPFS is used to store and access files, websites, programmes, and data. A more robust web is made possible by Infura’s IPFS API and dedicated gateway, which connect apps of all sizes to distributed safe storage quickly and easily.

### 3.3.6 Ethers.js

A full and lightweight toolkit for interfacing with the Ethereum Blockchain and its ecosystem is what the ethers.js library strives to be. It was initially intended to be used with ethers.io, but it has subsequently developed into a more versatile library.

### 3.3.7 Polygon

A decentralised Ethereum scaling platform is called Polygon. Previously, it was referred to as the Matic Network. The initial purpose of Polygon was to address the issues with the Ethereum platform's high fees and slow transaction processing time. To build, maintain, and link scalable decentralised apps (dApps) and Ethereum-compatible blockchains, Polygon is now a network of second-layer (L2) solutions and independent sidechains. Anurag Arjun, Mihailo Bjelic, Jaynti Kanani, and Sandeep Nailwal established Polygon in 2017. MATIC is the native token of Polygon. Running on Ethereum is Polygon. It develops and links Ethereum-compatible projects. By offering consumers extra capabilities in the areas of security, blockchain autonomy, user experience (UX), developer experience (DX), and modularity, Polygon enhances Ethereum. By enabling communication between Ethereum and other blockchains, as well as reconciliation between Ethereum and other current blockchain networks, Polygon enables the deployment of existing blockchains as well as the creation of new, original ones. While keeping the security, compatibility, and structural benefits of Ethereum, Polygon strives to expand the flexibility, scalability, and autonomy of blockchain applications. The platform offers low-cost, high-speed transactions to encourage the use of Ethereum and decentralised projects, particularly DeFi (decentralised finance) tools. Transaction costs on Polygon are consistently cheap. Regular Polygon charges are one cent. The quick transactions made possible by Polygon are another significant benefit. Up to 65,000 transactions can be processed by Polygon in a single second (TPS).

### 3.3.8 Solana

A permissionless blockchain is being implemented by the open-source project Solana. The open-source project is maintained by the Geneva, Switzerland-based Solana Foundation. The company's decentralised blockchain platform uses Proof of History (PoH) consensus and concurrent GPU

parallelization to run faster than rival blockchains, with lower latency and lower transaction costs, all at layer-1 and without sharding. On a 1-gigabit network, Solana claims that the blockchain can handle 710,000 transactions per second without data partitioning. The Solana Foundation established Solana in 2017, and in March 2020, it was formally introduced. The Proof of History consensus algorithm in the protocol is intended to increase scalability while also making it easier to create decentralised apps (dApps). Solana is a cryptocurrency and adaptable dApp platform, much to Ethereum. In order to draw in more developers and aid Solana in scaling, the network speed is meant to lessen congestion on the network and lower network expenses. SOL, the native coin of Solana, is utilised to cover transaction costs and for governance staking. The native coin of the Solana blockchain is called SOL, and it serves as the governance token. The network's transaction costs are paid using this utility and governance token, which may also be staked for network governance. According to the Solana firm, Anatoly Yakovenko's 2017 whitepaper on the Proof of History served as the foundational document. This was predicated on his knowledge of how much easier network synchronisation is made by a stable clock from his expertise creating distributed systems like Qualcomm, Mesosphere, and Dropbox. In contrast to centralised systems like Visa, which can process 65,000 transactions per second, Bitcoin and Ethereum have failed to expand above fifteen transactions per second globally. This was done in order to create a blockchain that was speedier. Solana claims that after the modification, the blockchain of the company can execute 710,000 transactions per second over a 1-gigabit ethernet network.

### 3.3.9 Metaplex

An open-source web framework and a decentralised protocol called Metaplex enable artists, businesses, and other creators to set up self-hosted NFT stores. In order to make the launch of NFTs easier, Metaplex is a collection of tools, smart contracts, and other resources. The company's plans now include other use cases where an NFT may be valuable, despite its prior concentration on serving the demands of the arts and entertainment sector. The Solana-powered protocol, which consists of two main parts: an on-chain programme and a self-hosted front-end web2 application; enables the generation and minting of non-fungible tokens, auctions, and visualising NFTs in a uniform manner across wallets and applications. The on-chain programming of the protocol

enables support for various sale kinds, automated creator payouts, and the elimination of extra costs to centralised authority. Perpetual royalties can also be hard-coded into NFTs because to the Metaplex protocol's design, which enables inventors to get a portion of secondary sales.

### 3.3.10 Metamask Wallet

A software cryptocurrency wallet called MetaMask is used to communicate with the Ethereum blockchain. Users can utilise a browser extension or mobile app to access their Ethereum wallet, which can then be used to connect with decentralised applications. ConsenSys Software Inc., a blockchain software firm that specialises in Ethereum-based infrastructure and tools, is the company behind MetaMask. With MetaMask, users may send and receive Ethereum-based cryptocurrencies and tokens, broadcast transactions, store and manage account keys, and securely connect to decentralised applications using a suitable web browser or the built-in browser of the mobile app. By defining interactions between Metamask and Smart Contracts using a JavaScript plugin like Web3js or Ether, developers connect Metamask to their decentralised applications. In order to get the cheapest exchange rate, the Metamask application aggregates many decentralised exchanges (DEXs) to provide an integrated service for trading Ethereum tokens. The service cost for this feature, known as MetaMask Swaps, is equal to 0.875 percent of the transaction value. According to Bloomberg, MetaMask's browser extension had more than 21 million active users as of November 2021.

### 3.3.11 Phantom Wallet

Phantom Wallet is a non-custodial digital wallet and browser extension built on the Solana blockchain. The wallet stores digital currency like DeFi and NFTs and authenticates transactions on behalf of its customers using private keys. Numerous popular browsers, including Chrome, Firefox, Edge, and Brave, are supported by the plugin. The wallet offers the ability to transfer and receive tokens and cryptocurrencies, accumulate NFTs, and even trade tokens within the wallet. Injecting a Solana object into the javascript context via the Phantom extension enables the wallet to communicate with any website a user visits. The Phantom flag on the Solana object verifies the existence of an API. To access the wallet, Phantom Wallet users can either download the software to their

computer or simply install an extension to their web browser. There are no strict KYC (Know Your User) procedures to sign up for the wallet; users must log in using a password. For simple transactions, the dashboard offers Send and Receive buttons. Phantom uses the Token MetaData Program to differentiate between NFTs and cryptocurrency assets. As its name implies, collectibles like NFTs are non-fungible, whereas cryptocurrencies are thought of as fungible assets. The NFTs (Non-Fungible Tokens) differ from the other by having a uri field. Such assets are displayed in the collectibles page; otherwise, the assets are displayed in the home tab. The following asset metadata is gathered and used by Phantom Wallet.

# Chapter 4

# RESULTS AND DISCUSSIONS

Non-Fungible Tokens, or NFTs, are cryptographic assets built on blockchain technology that can be distinguished from one another by their distinctive identification codes and meta-data. Since they are all identical, even cryptocurrencies cannot be distinguished from one another. This is the reason why they, unlike NFT, which are completely unique, cannot be traded at equivalence for commercial use.

The NFT marketplace differs significantly from eCommerce marketplaces in that it offers a wide variety of features and types. A distinctive business model is developing and NFTs or digital assets can be stored, traded, and exhibited to a huge audience. The NFT Business Model, wherein special non-fungible tokens relating to art, video, audio, and other sorts are bought and sold, is being created via NFT marketplaces. To create, deploy, and maintain NFT marketplaces and NFTs, this is introducing NFT development practises. Having a crypto wallet is a must to transact at an NFT marketplace because all transactions, including buying, selling, and storing NFTs, take place through that wallet.

## 4.1 User Interface

### 4.1.1 Graphical User Interface

The main objective of developing user interface is to deploying the NFT marketplace in an website. The application consist of two phases:

• Front End

• Programming Interface

#### 4.1.1.1 Front End

The front end of this project is developed using the Next.js framework.

#### 4.1.1.2 Programming Interface

The back end of this project is developed using the Node.js,IPFS API.

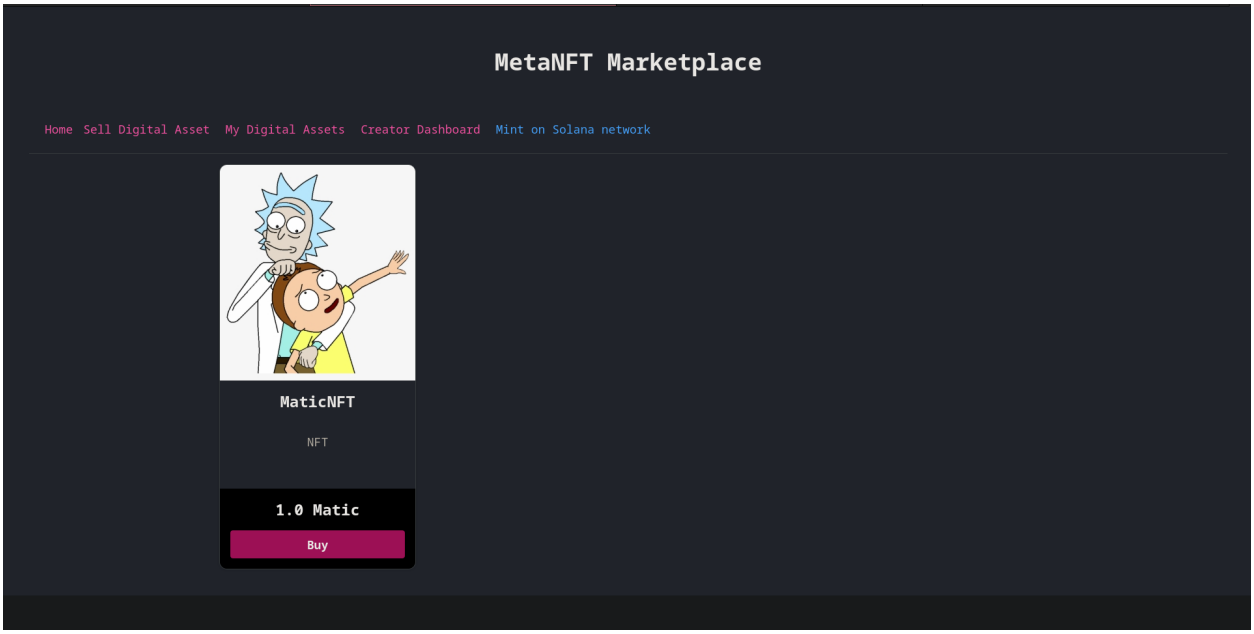


Figure 4.1: Home page

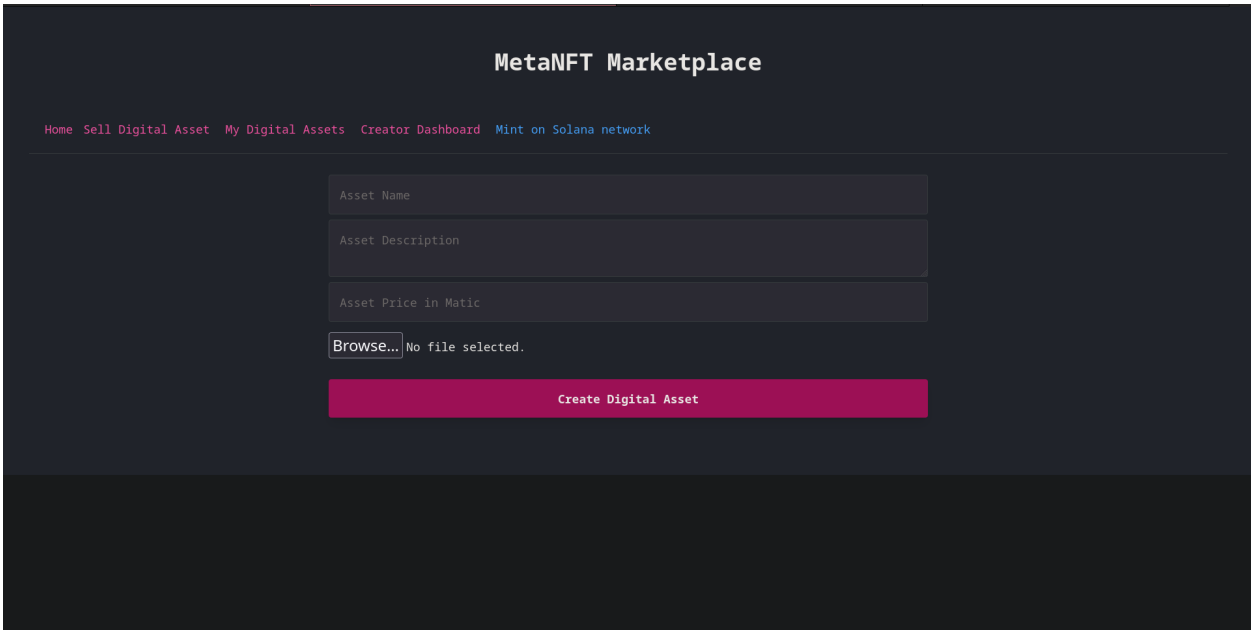


Figure 4.2: Sell Digital Asset

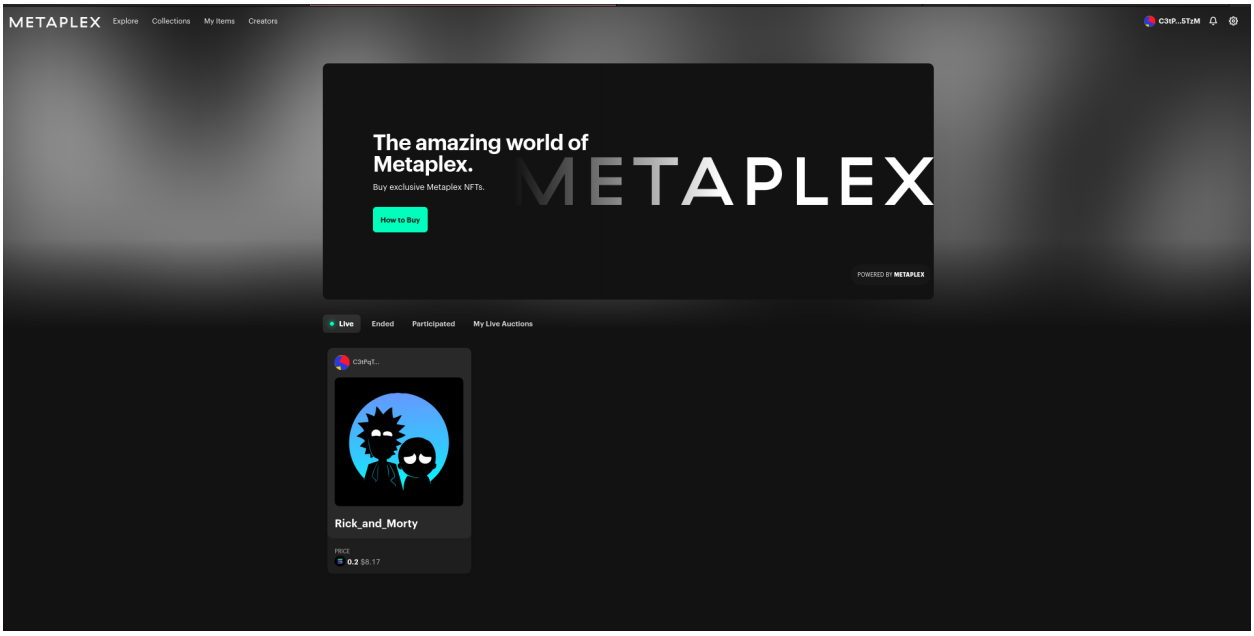


Figure 4.3: Home page of Solana Metaplex

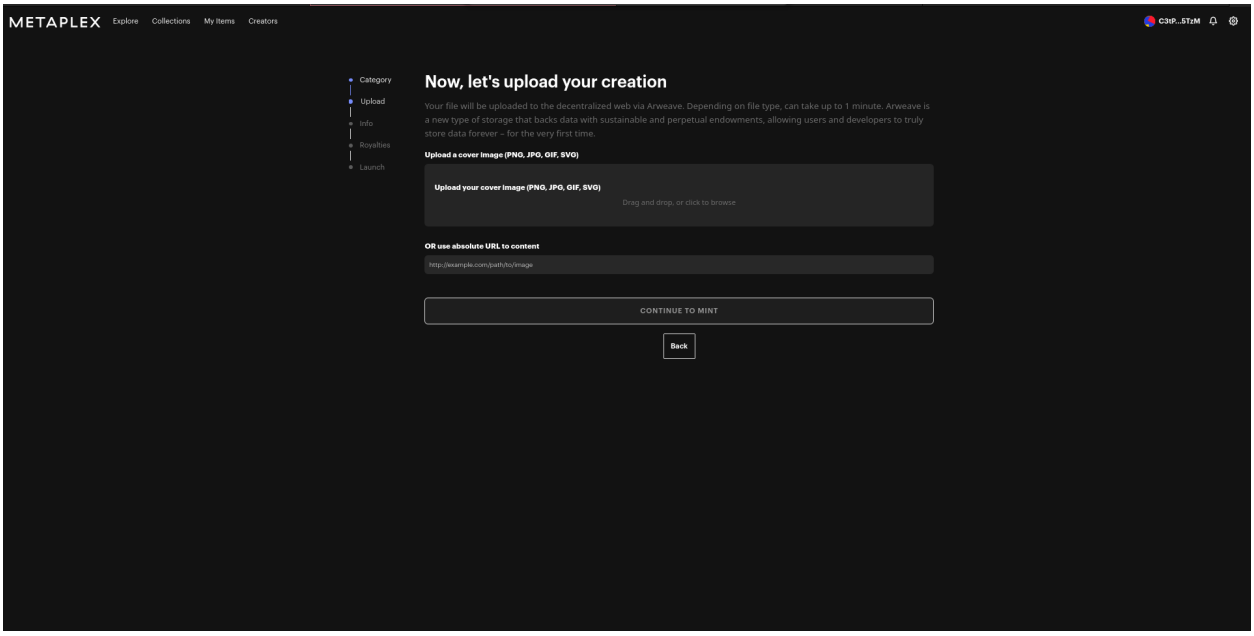


Figure 4.4: Upload page for digital asset

# Chapter 5

# CONCLUSION

One benefit of NFT technology is that it lets artists and content producers keep all of their copyright. gives both the makers and the collectors unparalleled levels of confidence. Non-fungible tokens exchanged on an NFT marketplace are distinct from equivalent fungible entities. Since most NFTs today are digital, creators may find new opportunities to provide their followers with something special and uncommon by developing new revenue streams. NFTs also have the potential for royalties, which give the original artist a certain share of any future sales of the artwork. Many people who are curious about the best NFT market would be glad to learn how to start an NFT collection. Buyers who are interested may be seeking for ways to purchase NFTs. It is possible for artists to list their NFT works for sale on specialised marketplaces. Customers might search the market for NFTs and then use bidding to buy the item of their choice. Therefore, to ensure lucrative agreements on the artwork, collectibles, and other digital assets, any NFT developer or enthusiast must browse the NFT marketplace list.

## 5.1 Advantages

The main merits of proposed model are:

- The capacity to demonstrate ownership is the main advantage of non-fungible tokens. The assignment of property to a particular fund can be facilitated by NFTs because they run on a blockchain network.

- Non-fungible tokens' advantages primarily depend on their uniqueness.
- It is simple to trade NFTs freely on certain markets with a wide choice of trading possibilities.
- NFT help to promote shared prosperity. Because NFTs connect content creators from different areas into one environment, they can open up new opportunities for shared prosperity for all players.

## 5.2 Future Enhancement

In future, Users will be able to purchase parcels on Decentraland after LAND tokens are implemented. Adding new assets to the system and implementing them. NFTs have the potential to be enormously beneficial to a wide range of businesses because of the increased transaction security and processing costs they provide, in addition to the fact that they provide a new platform for the gig economy to function on.

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# APPENDIX

## A Screenshots

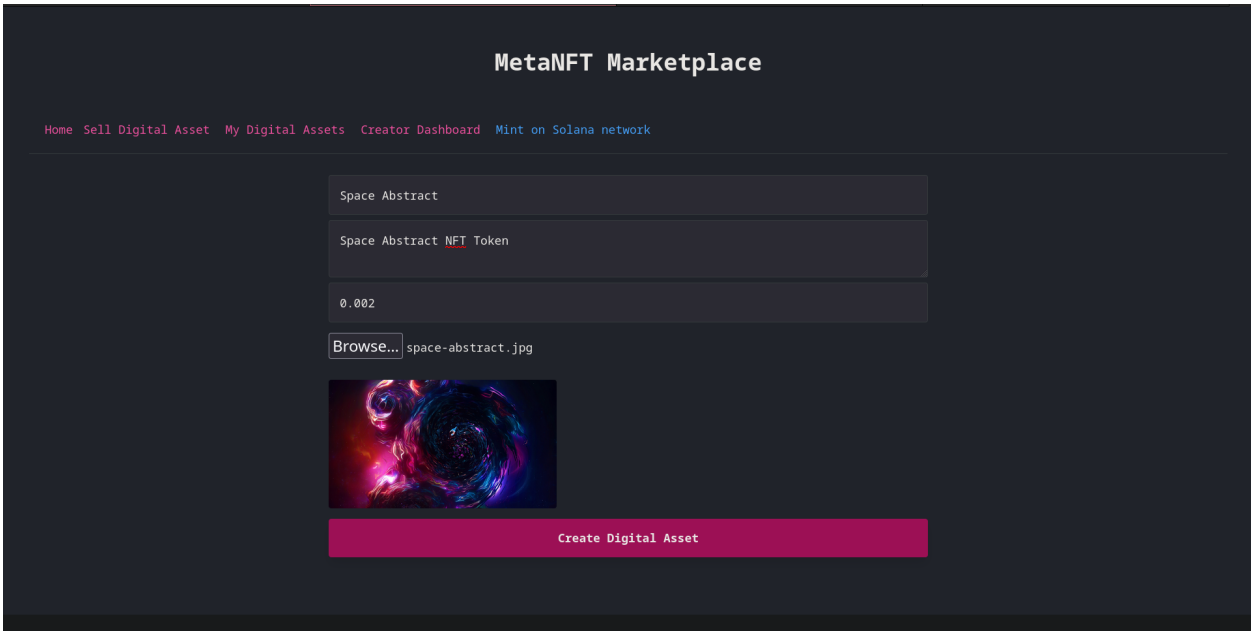


Figure A.1 : Polygon-Sell Digital Asset

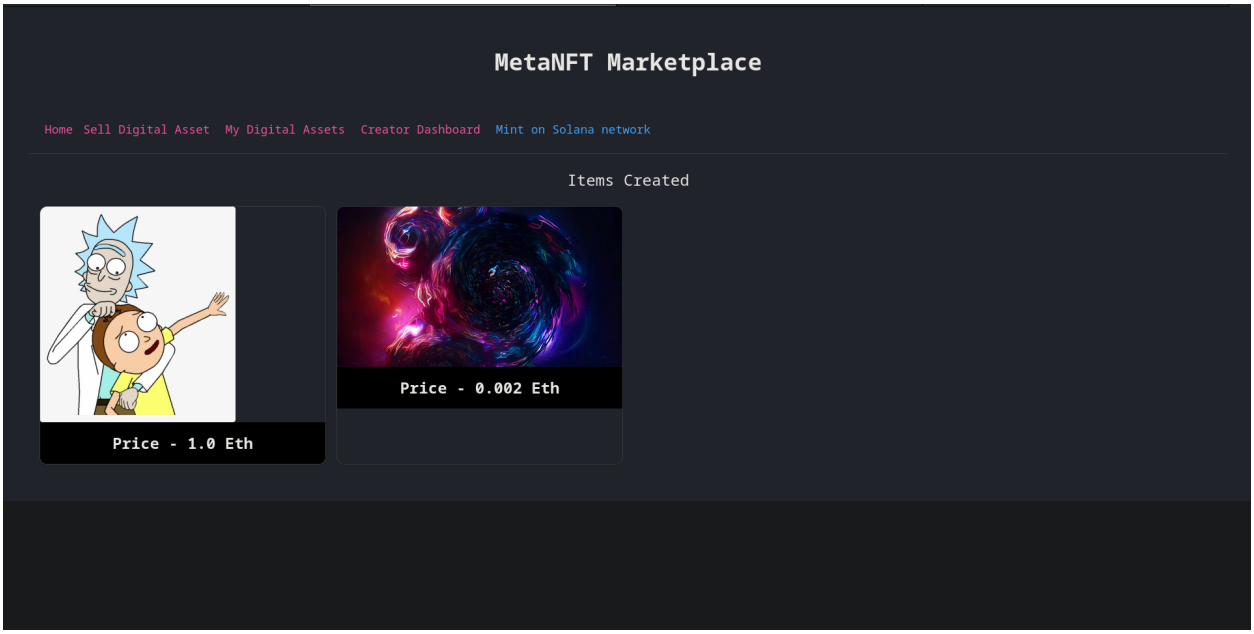


Figure A.2 : Creator Dashboard

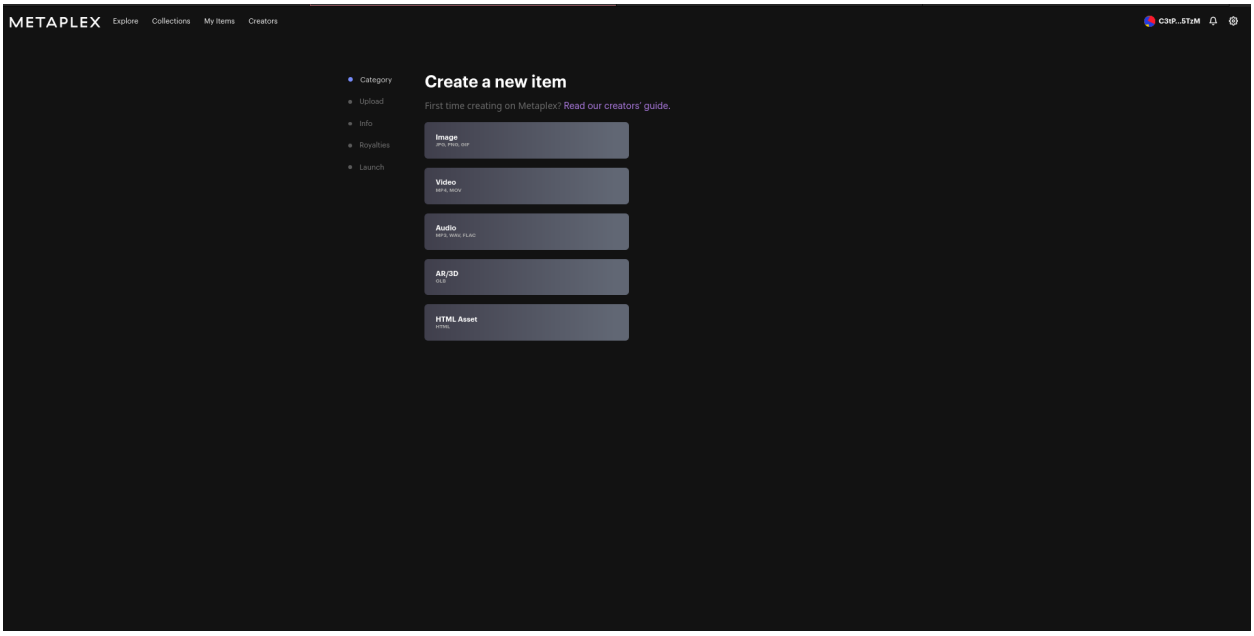


Figure A.3 : Create a new item

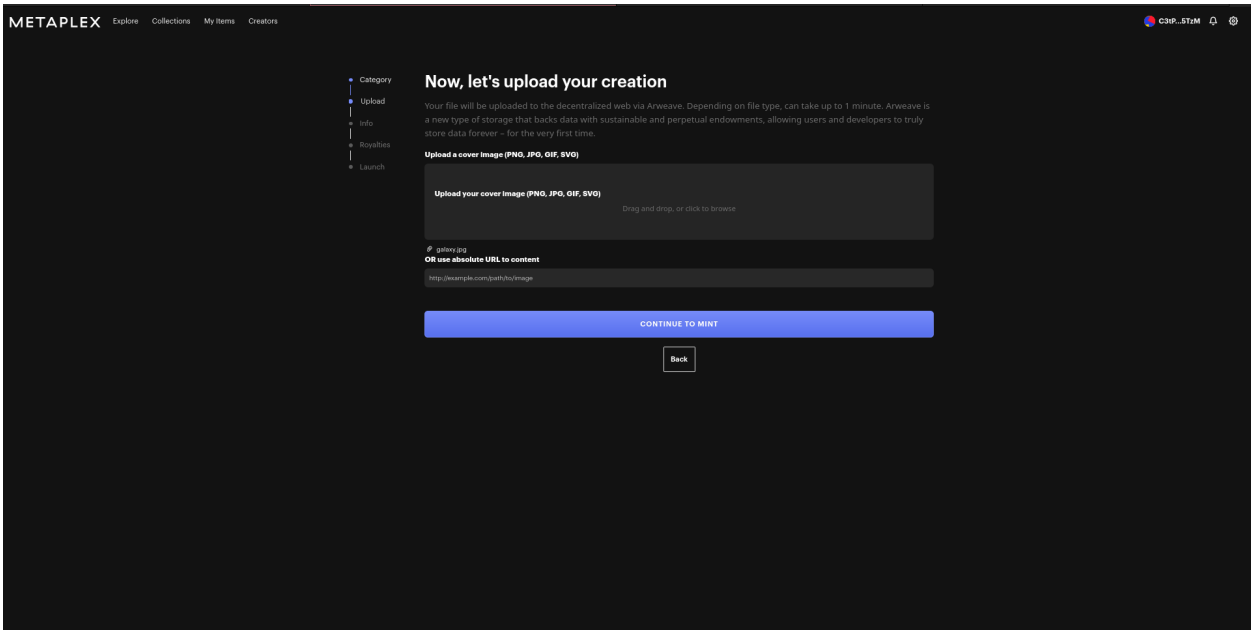


Figure A.4 : Upload Digital asset

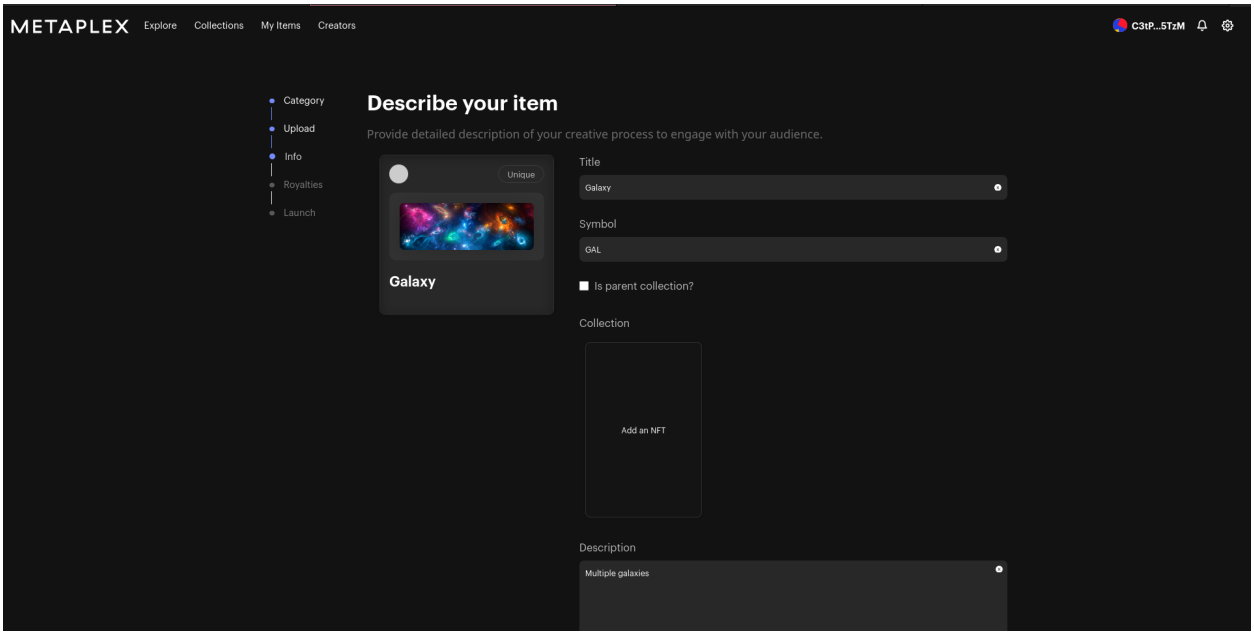


Figure A.5 : Description Item

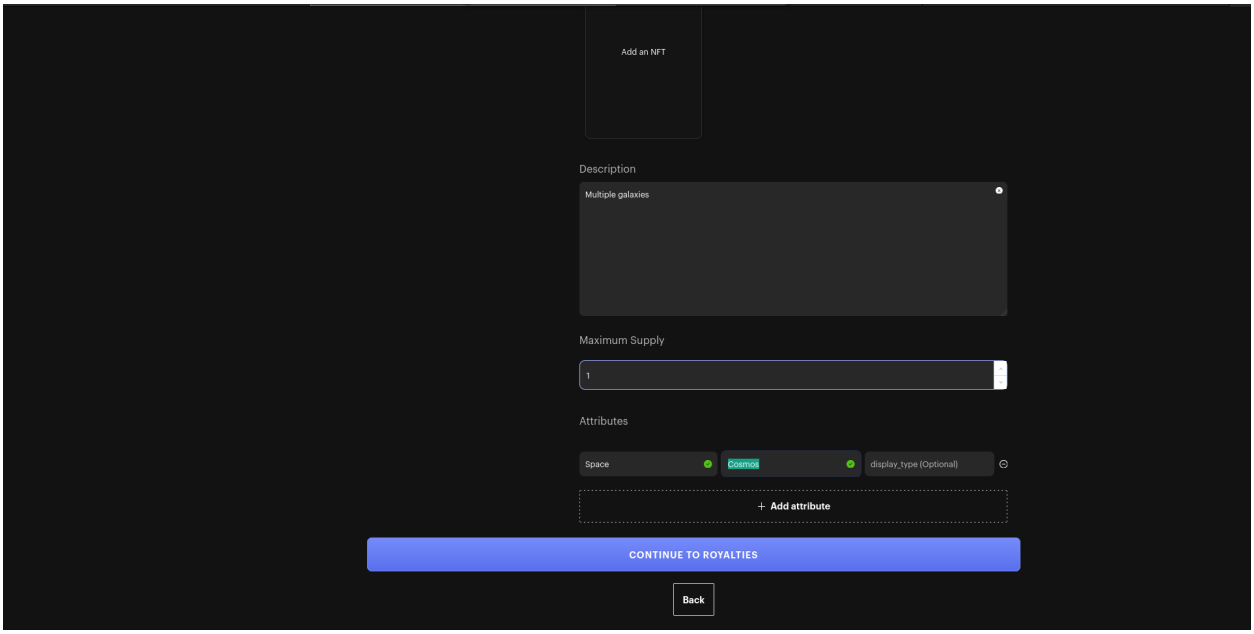


Figure A.6 : Description Item-2

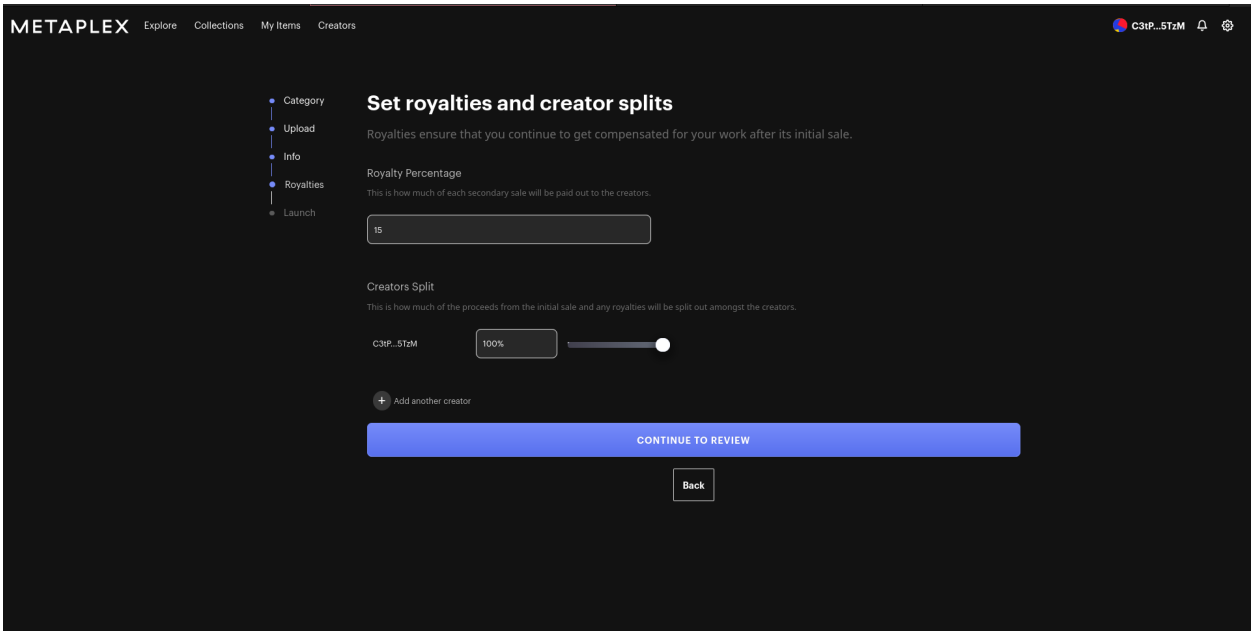


Figure A.7 : NFT Royalties

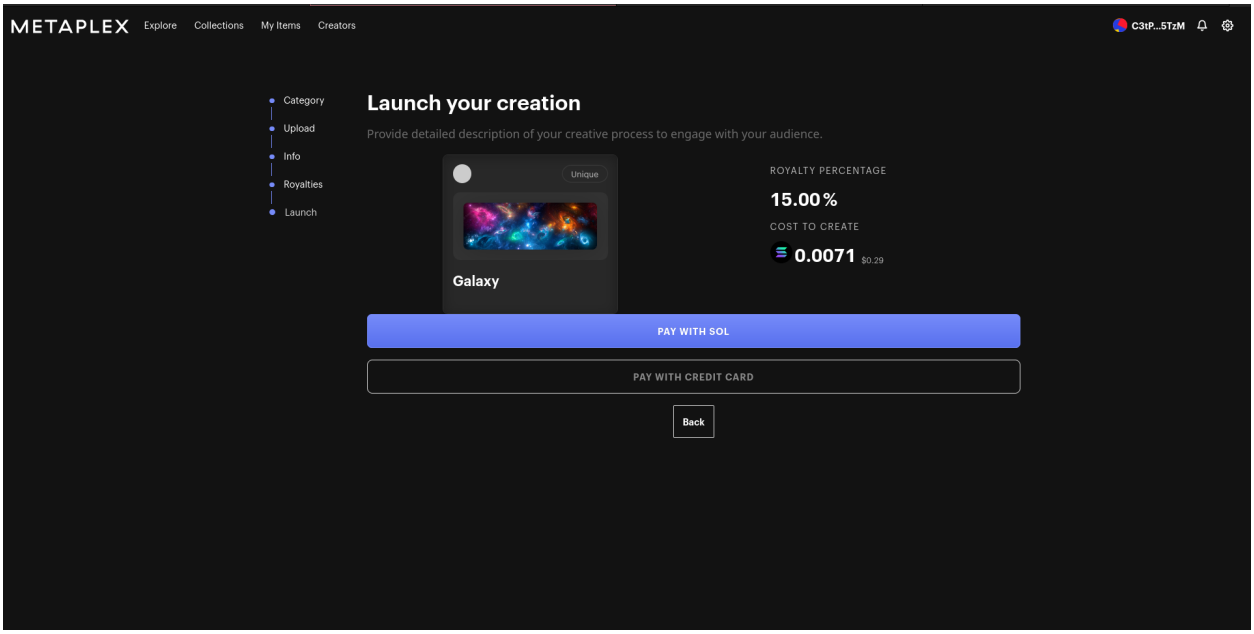


Figure A.8 : NFT Launch payment

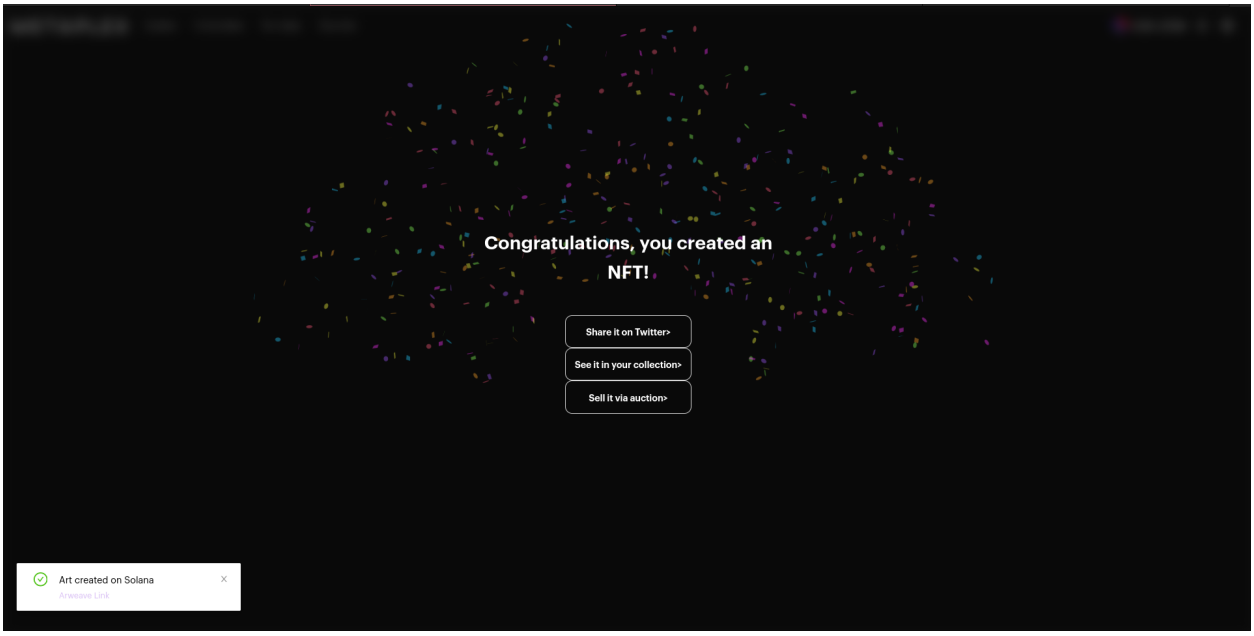


Figure A.9 : Solana Success Page

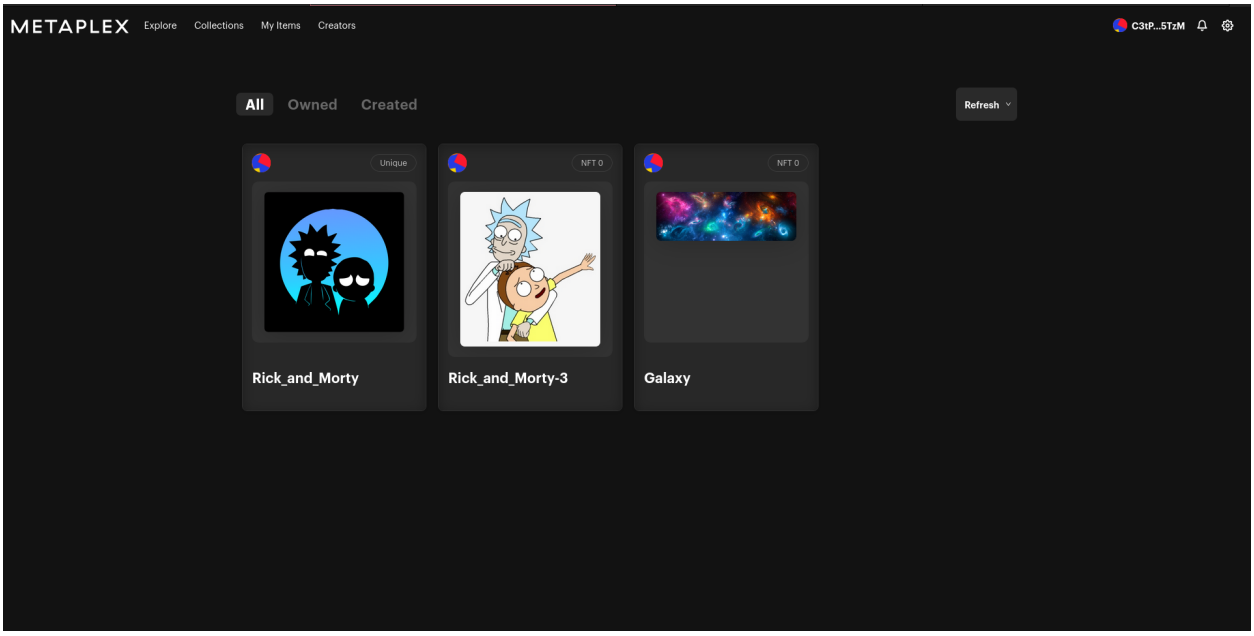


Figure A.10 : Solana all NFTs

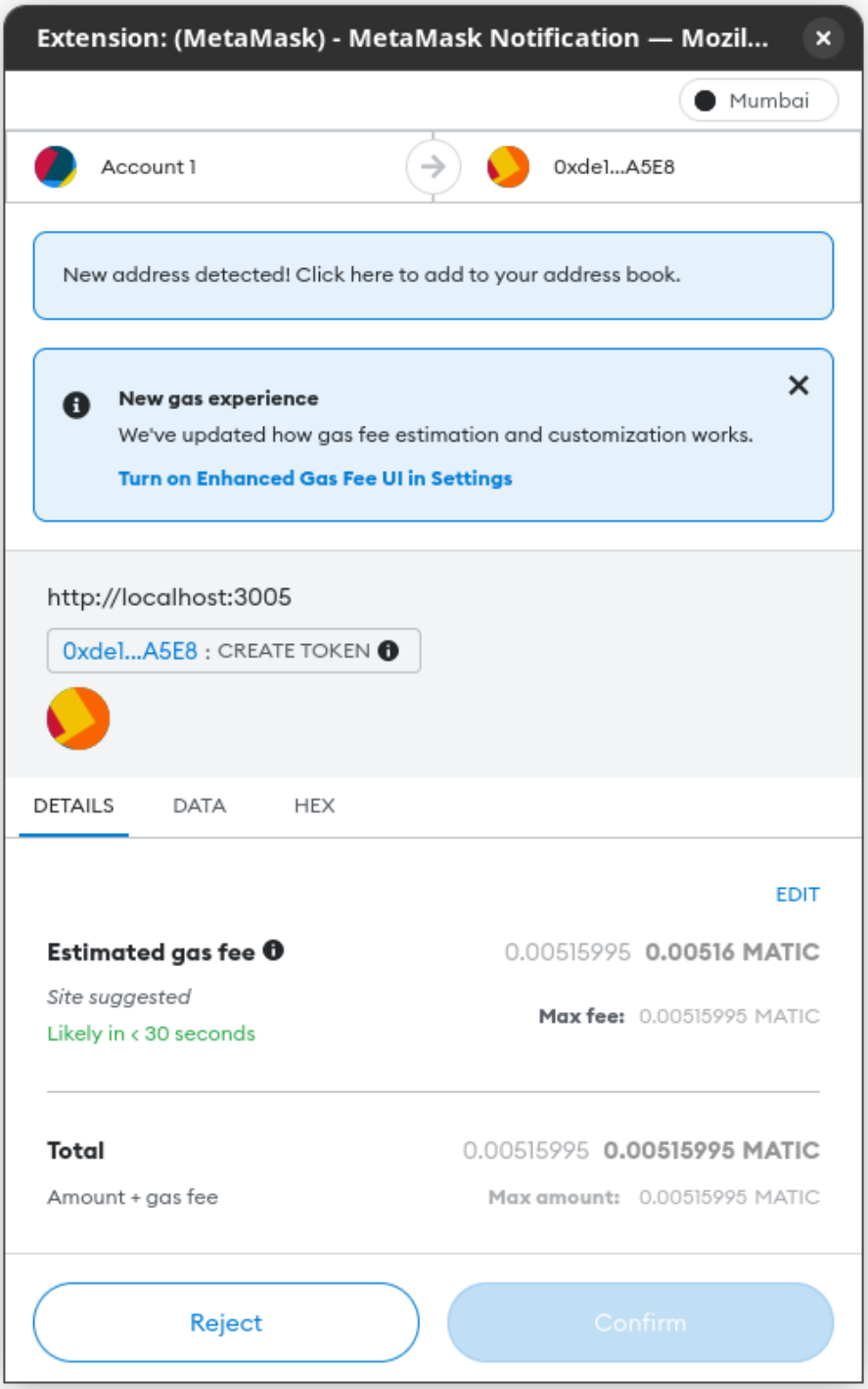


Figure A.11 : Payment Transaction

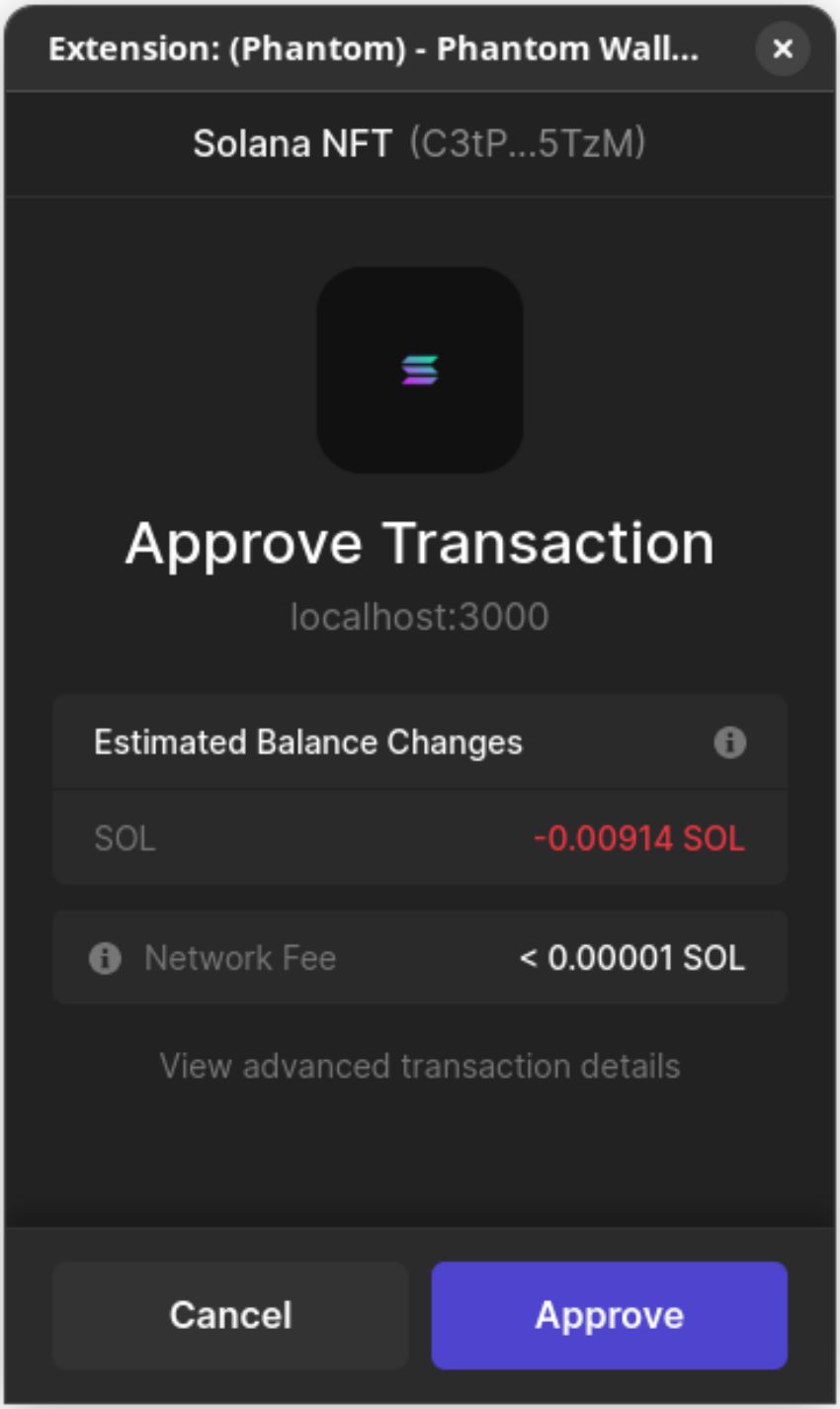


Figure A.12 : Solana Transactions

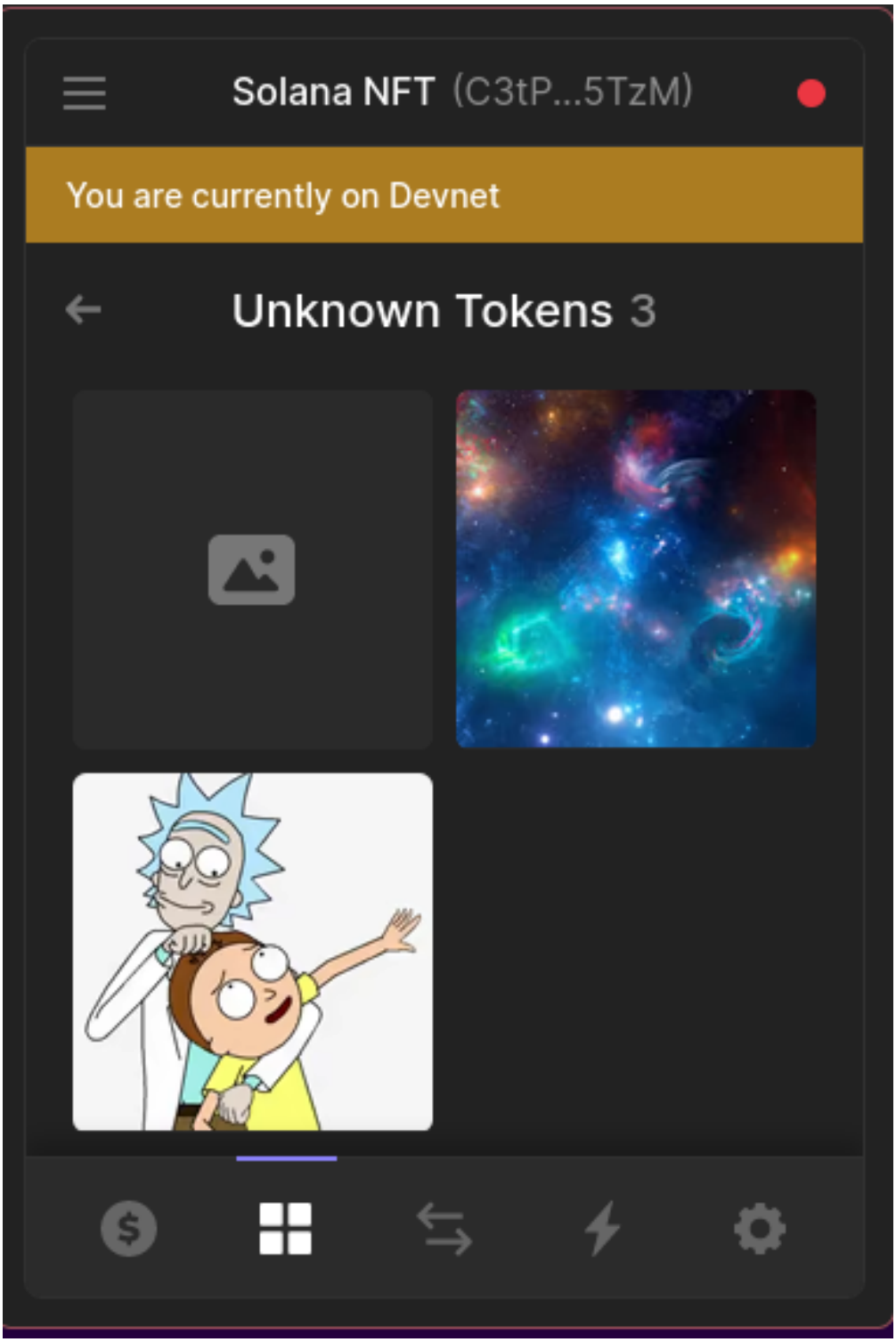


Figure A.13 : Solana Phantom wallet