

Decentralized Asset Marketplace

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ABSTRACT

We developed a Blockchain-based Decentralized Assets Marketplace. For this, we used smart contracts in the Ethereum Blockchain while maintaining a decentralized database using IPFS. The smart contract can perform credible transactions without a middleman, and the transactions on the blockchain are trackable and irreversible. Therefore, neither the buyer nor the seller can breach the contract. When planning the functionality of decentralized marketplaces, we have considered some aspects such as in the absence of a central authority, user journeys for sellers and buyers must be intuitive and frictionless. This application is built to ensure trust and credibility in the NFT ecosystem. Lack of data and its privacy leads to the loss of value and ownership and We believe that the blockchain-based marketplace can help to resolve these issues by offering many advantages such as increased traceability, tamper resistance, and ensuring that trust is achieved without the need for centralized power.

Keywords: Blockchain Technology, Decentralized Asset Marketplace, Non-fungible tokens

INTRODUCTION

The idea behind the Decentralized Asset Marketplace is to buy, sell and trade digital assets with more security, credibility and accountability. All these features are possible due to the use of Blockchain technology. Blockchain technology is simply a shared and advanced database mechanism which allows more secure and transparent transactions on the network. Blockchain is a digital and decentralized ledger of transactions. It's used to securely record transactions, like the transfer of cryptocurrency. Transactions blockchains keep track of, so they're highly secure. In fact, transactions on a blockchain can be irreversible—once they're completed, they are permanent and cannot be changed. Blockchain technology was invented in 2008 when Satoshi Nakamoto published the whitepaper titled Bitcoin: A Peer-to-Peer Electronic Cash System, which contains an outline for permissionless digital money that uses cryptography to regulate transactions and create a public record of all transactions.

There are many issues and challenges in the traditional transaction system. Such as privacy, third-party/bank interference, slow speed of transactions and centralization. Blockchain technology helps us to bring a revolutionary change in terms of these challenges. Due to this blockchain technology is gaining popularity in the field of financial services, government services, marketplaces, research and development and medical services.

Here are some properties of blockchain technology which make it unique-

1) Distributed Ledger Technology

Distributed Ledger Technology (DLT) is a set of records maintained by multiple sources, where each participant holds an identical copy of the same data. However, strong two-way authenticated links are being formed between these copies in order to enable Trustless Distributed System (TDS) and Distributed Ledger.

2) Smart Contract

Smart contracts are a type of program that automatically execute the terms in a contract when certain conditions are met. In other words, it is a computer program that takes place on a blockchain network and the computer protocol can be programmed to meet contractual obligations.

3) Immutable

The immutability of blockchain technology is extremely important. If a transaction is made through a blockchain and the record of it cannot be changed, then it will not be able to be manipulated or manipulated in any way by anyone. This will ensure that all records are kept intact and can later be used as evidence - which is incredibly important for many industries.

4) Transparent

Transparency means that everyone can see who owns which assets, what those assets are worth, and how much they're worth. Transparent blockchains provide a collaborative community based on sharing resources and ideas.

We developed a Decentralized Asset Marketplace (DAM), which is an ambitious project to create a trustless and decentralized marketplace platform based on blockchain technology. The goal is to provide a smooth way of trading tokens and coins while balancing the risks associated with fiat transactions. Decentralized Asset Marketplace is a website where users can upload, trade, and sell virtual items. NFTs are unique digital objects that represent and replicate the appearance of real-world entities so that they can be digitally represented for exclusive ownership. The need for an NFT marketplace is to provide an efficient, safe and secure service to consumers. We strive to be a one-stop shop that caters to all your needs as a buyer or seller and helps you achieve your goal of buying, selling or trading your NFTs anytime anywhere.

A Decentralized Asset Marketplace will be a way for people to sell/buy their assets on the blockchain. We expect that this will include any activity which involves the exchange of digital tokens, including but not limited to: voting, tipping, selling virtual assets for a specific price and many more. In this way, you would be able to trade one item for another or make a profit by selling your items privately with all parties knowing the current value of each item and how it is being traded. This is what we believe should be possible in order to allow users to take full control over all aspects of their content.

BACKGROUND

This marketplace is different from traditional marketplaces because they use a decentralized form of technology that was intended to record transactions and verify them. The transaction records are stored on every computer connected to the network, verifying the authenticity of each one. Blockchain relies on a decentralized technology platform that has been developed specifically for marketplaces. It works a bit differently from traditional marketplaces because it stores all records of transactions in ledgers that are available on the network. Every computer that is attached to the network verifies these transactions, creating a transparent system where no records can be altered by just one individual or entity.

Before the beginning of the cryptocurrency market and blockchain technology, assets were traded via an asset exchange. These assets are not NFTs, but LITs (low-investment traded objects) or COTS (clearly-traded objects). An asset is a non-fungible digital asset that can be used to represent either physical or other types of assets. The introduction of blockchain marketplaces allowed a way for users to trade their digital assets with ease, while also giving them a permanent record of these trades that could be passed on down through their family tree if they died.

Limitations of existing asset marketplaces-

The major limitation of existing asset marketplaces is that there is a general lack of trust. Hidden costs, arbitrary limits and restrictions on specific types of contracts are what prevent investors from selling their virtual assets easily. As a result of their centralized nature, existing asset marketplaces face security and trust issues. Due to low liquidity, transactions are subject to significant delays, especially during ICOs. Crypto-to-fiat conversion fees further increase transaction costs. There is a lack of information on the developers, including history and reputation, as well as the exchanges themselves, leading to greater uncertainty surrounding the security of assets and a lack of recourse in case of fraud or theft. Ownership is difficult to verify, which prevents investors from knowing that they're actually buying tokens from the official developers.

NFTs (Non-fungible tokens)-

Non-fungible tokens and fungible tokens are two different types of blockchain tokens. They both have a value on the blockchain, but their value comes in a completely different ways. The main difference between a non-fungible token (NFT) and the fungible token is that NFTs are not simply interchangeable with other assets and therefore stand out as assets to be used on particular platforms. NFTs, or Non-Fungible Tokens, are assets that have an intrinsic value and are only unique to the item in question. As opposed to fungible tokens, these assets have no value once issued, nor can their supply be increased after issuance. They are often used to represent a collectible (like a physical item or artwork), but can also mean virtual goods such as video games. NFTs can be used to represent anything from rare collectible items to physical goods like art, real estate, and even something as simple as a digital file. The value of an NFT is determined by how much someone is willing to pay for it.

The ability to transfer NFTs without the original token's authorisation makes them influential digital collectables that can be traded over a peer-to-peer network or sold on an auction site like eBay. NFTs work similarly to traditional collectibles such as Beanie Babies or Pokémon cards—once you own one of these unique items, it will never go up in price or decrease in value. They are not issued tokens that hold real-world value; they're digital representations of digital collectible objects.

When it comes to non-fungible (unique) tokens, there are a wide range of use cases that have already been tested and proven. For example, they can be used in loyalty programs and as rewards for collecting points that can be exchanged for products or services; they can provide new ways to interact with games or to enhance them with images, audio, and video; they can enable the creation of virtual economies and allow goods to be sold in the game without ever being removed, and they can be used as one-of-a-kind tokens of appreciation. Any place where there is demand for non-fungible tokens requires a non-fungible blockchain solution.

The advantages of NFTs include-

- The main advantage of using NFTs over traditional cryptocurrencies is their ability to exist on an immutable ledger called the blockchain. This means that no matter how many copies you make of your digital asset, it will always be exactly the same as the original.
- They're transparent and fungible, meaning their value doesn't depend on whether or not someone else values them more highly than you do.
- NFTs have no central authority controlling them—these assets can be traded without having to rely on third parties like banks or governments because they are stored in digital wallets held by users themselves
- Another advantage of using NFTs is that they allow for complete anonymity for users who don't want their identity revealed when interacting with other people online or offline (for example, buying something from someone else).

SYSTEM OVERVIEW

A decentralized asset marketplace (DAM) is a place to store, buy and sell Assets in the form of NFTs. An asset marketplace stores NFT assets and combines a user-friendly interface with powerful backend properties that support blockchain technology at its core.

In an Asset marketplace, sellers and buyers play a significant role.

Firstly, a user, whether buyer or seller, needs to sign up on the Platform using their Ethereum Addresses and install a digital wallet to store Assets.

Sellers create their assets and upload them on Decentralized Asset Marketplace to show their work. The Sellers then select the number of payment tokens they would like to accept for their art or keep them as free assets. The next step is to list items for sale. Finally, a smart contract for the seller's wallet is initiated to verify addresses, and upon approval, the Assets will appear on the Platform ready to buy.

When a user visits the Marketplace to buy an Asset, they are asked to register themselves using the Ethereum Address and Crypto Wallet. After successful registration, the buyer can buy the desired assets from the list. Again a smart contract for the buyer's wallet is initiated to verify addresses and required funds, and upon approval, the new owner details are added to the Blockchain.

Features of Decentralized Asset Marketplace-

Following are the features we have implemented while developing our Decentralized Asset Marketplace.

1) Online Store

NFT Marketplace is an online store web application that offers users all the information required for an asset: asset details, owner, and price. It is a complete-fledged web application with User-Friendly Frontend and a secure and robust Backend.

2) Create Assets NFT Listing

After creating an asset, a user can upload them as NFT on our Platform on the Create NFT page. While creating an NFT user is asked to fill in the required information about the Asset. The information includes the name of the NFT, Tags, Description of it, and the listing price at which the buyer can buy the Asset.

3) Filters

Filters are an absolute necessity as they make it easier to navigate a site, specifically if the web application contains many assets to choose from. Using the filters feature, Buyers can look for desired Assets by category, price, listing owner, or a specific collection.

4) **Searching items**

Our Decentralized Asset Marketplace supports category management, Asset Tagging, and a Search Bar. In addition, users can make use of the search bar to search NFTs.

5) **Buying NFT**

Our Decentralized Asset Marketplace allows users to buy NFT listed on the Platform. On Successful transactions, the buyer is the new rightful owner of the NFT

6) **Wallet**

A wallet is used to send, receive and store Non-Fungible Tokens, and it is used for tracking transactions between buyers and sellers and is also used for record keeping. We integrated this feature by connecting Metamask, which is a Cryptocurrency Wallet that is already in use. Metamask gives the user an address where NFTs are stored, and all transactions occur.

TECHNOLOGY STACK

Blockchain Platform

For the NFT marketplace, Ethereum is one of the most widely used Blockchain Network platforms.

It is easier to prove ownership on the Ethereum network as NFT metadata and transaction history is publicly verifiable. In addition, the Non-Fungible Tokens share a common Ethereum Backend. As a result, NFTs will always be available for sale as the Ethereum network is robust and rarely goes down.

Polygon

Polygon is a platform that is based and layered on Ethereum. Polygon is a decentralized Ethereum scaling platform that allows users to build user-friendly and scalable decentralized applications (dApps) with very low transaction fees and without compromising security. Polygon is compatible with various Ethereum security and token standards. In addition, it offers ready-to-use tools to build or scale secure networks. Polygon offers two networks for public use. One is Main Network or simply Mainnet, and the other is Test Network or Testnet. We have used Polygon's Mumbai Test Network for deploying our Marketplace, as it is secure and free to use.

Crypto Wallet

A Crypto wallet is used to send, receive and store Non-Fungible Tokens over a blockchain network. A crypto wallet needs to be linked with a blockchain address to function.

Metamask

MetaMask is a popular, mature, and reliable cryptocurrency wallet that interacts with the Ethereum blockchain. Metamask allows users to manage their crypto assets using a mobile app or a browser extension, which can then be used to interact with dApps or decentralized applications. In addition, the wallet allows users to add multiple EVM network tokens.

Development Environment

In developing Ethereum-based decentralized applications, we need a development environment to test and debug smart contracts written using Solidity. Furthermore, smart contracts can not be modified once deployed on the blockchain network; hence, testing and debugging smart contracts before deploying on the network is necessary. For this, we have used Hardhat.

Hardhat

Hardhat is an Ethereum development environment used to create, test, debug and deploy smart contract code in Solidity. Hardhat also provides various useful features to developers in developing Decentralized Applications.

Storage Platform

The media files related to the NFT can not be stored on the Polygon Test Network. The Test Network stores only the metadata and owner details, not the actual files; hence, we have used IPFS as a storage platform.

IPFS

IPFS (InterPlanetary File System) is a peer-to-peer hypermedia protocol that is designed to store content in a decentralized way. Files and other content related to the Non-Fungible Tokens can not be stored directly on the blockchain network. IPFS stores all that data. IPFS provides features like content addressing to identify a file uniquely in a global space in the network.

NFT Standards

NFTs are created using various NFT Standards like ERC-721, ERC-1155, and ERC-998. These standards are used for creating NFTs on the Ethereum Network. We have used ERC-721 for our asset marketplace. ERC-721 is a guideline or a template that developers agree to follow. It is a widely used standard for creating NFTs. Since it is a widely used standard, it is compatible with various applications. Creating NFTs using OpenZeppelin's ERC721 implementation ensures that each NFT is uniquely named, making it non-fungible. In addition, OpenZeppelin's ERC721 implementation provides functionalities like auto-increment token id and safeMint so everyone can mint NFT.

Frontend Framework

The front end of a website is the first thing users notice when they visit the site. For developing the frontend part of our marketplace web application, we have used Next.JS, which is a React framework.

Next.JS

React is a JavaScript library for the rapid development of reactive web applications.

Next.js is a React JS framework that enables you to build SEO-friendly, extremely user-friendly, and super-fast static websites and web applications. In addition, it provides several extra features like server-side rendering.

METHODOLOGY

In this section, we explain in detail how our Decentralized Asset Marketplace works and the processes occurring on and off the chain. This section also helps show how the different entities, i.e., sellers, marketplace web applications, smart contracts, and buyers, interact.

A. Registration

All the participating users (Sellers and Buyers) in the system must have Ethereum Addresses. Buying and selling of the Assets take place through the marketplace. The Ethereum addresses are used for account information, transaction history and record keeping. This ensures that all actions taken by the users are recorded on-chain and that all users are held accountable. The marketplace Smart Contract registers the users on the network to complete the registration. The network uses proof-of-stake to ensure that sellers are honest and trustworthy.

B. Minting NFT

Minting is creating new NFTs on the blockchain network through computational processes to create new blocks, validate information, and record information on the network. Minting uses the Proof-of-Stake consensus mechanism. NFTs are minted with respect to the ERC-721 Standard, a widely used standard for creating NFTs on the Ethereum Network. When the seller uploads an asset, a new NFT is minted and listed on the Marketplace Platform.

C. Smart Contract

A Smart contract is a program stored on a blockchain that runs when certain predefined conditions are met. Smart contracts are self-executing lines of code with the terms of an agreement between buyer and seller that are automatically verified and executed over a blockchain network. To secure the deposit and process the payment, we make use of smart contracts. The decentralized ledger records every transaction after verifying it via smart contract. Because the smart contract executes itself, trustless transactions are possible. The blockchain's transactions are trackable and irreversible, and the smart contract can carry out credible transactions without the assistance of trusted third parties. As a result, neither the seller nor the buyer can break the contract. The smart contract is a protocol for binding the seller and the buyer, and events trigger the execution of the smart contract. The triggers can be the payment from the buyer to the seller or minting new NFTs.

D. Storing NFTs Metadata

When minted, each NFT carries metadata with it. A Uniform resource identifier (URI), identification number and price are the data stored in the metadata. The NFT also has a unique hash associated with its ID. The InterPlanetary File System generates this hash. NFTs represent proof of ownership of an asset. These data can not be stored on the blockchain network, and only the hash which indicates the ownership is stored on the chain. Hence, it is stored on the IPFS, a decentralized file storage system, and its unique hash is stored on the chain as part of the metadata.

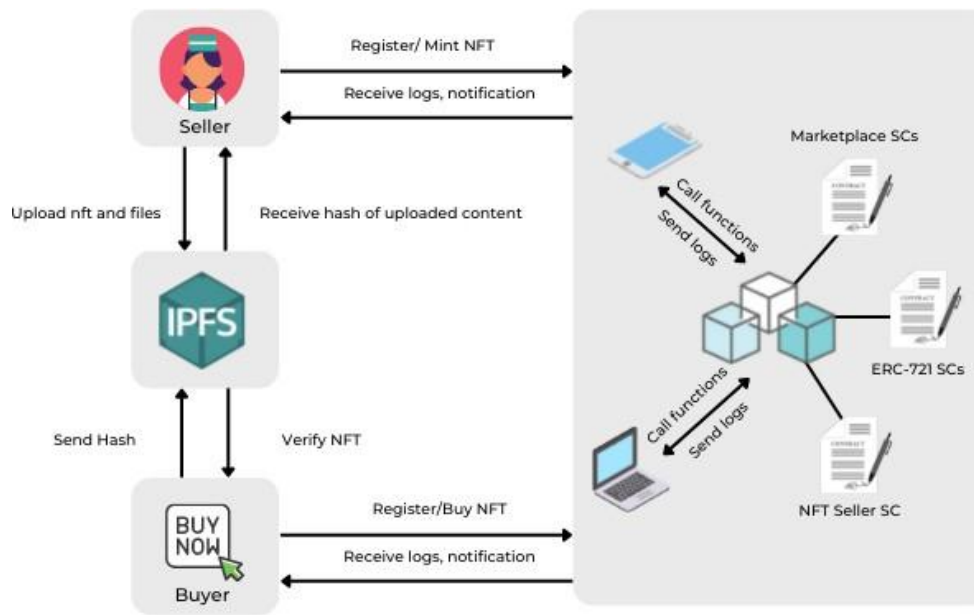


Figure 1: System Architecture of Decentralized Asset Marketplace

E. Buying NFTs

When the seller mints the NFT, and its data is finally stored on the IPFS, it is listed on our Decentralized Asset Marketplace and is available to buy. The buyer filters out their desired NFT. The selected item is checked from the item set database. The selected NTF is later sent to the smart contract to verify the purchase and transaction. The smart contract sends a request to approve the following payment. The request is sent to the user's wallet. The user then approves the payment to buy the NFT. Payment approval status is checked from the user's wallet. After the payment is approved, the status is sent to the smart contract. After completing the transaction, the smart contract looks after the amount transferred to the seller's wallet. The seller receives the amount of the NFT. After a successful transaction, the ownership is transferred to the buyer, and it is stored on the chain.

CONCLUSION

We proposed a blockchain-based reputation solution for the NFT ecosystem. Our solution leverages the intrinsic security features of blockchain technology, such as data integrity, tamper-proof logs, transparency, accountability, and non-repudiation. Our system design incorporates the decentralised IPFS and stores its hash on the chain to enforce trust in the NFT marketplaces. We developed smart contracts that automate registration, rewards, and incentives. Our design is carefully structured to handle known marketplace attacks and to eradicate the actions of illegitimate users. Lack of data and its privacy leads to the loss of value and ownership and we believe that the blockchain-based marketplace can help resolve these issues by offering many advantages that will bring some benefits such as increased traceability, tamper resistance, and ensures that trust is achieved without the need for centralised power. It also means that consumers have greater transparency and power. There is no central control, which prevents the monopoly of large companies. The smart contract brings some benefits are overbooking prevention, double-spending prevention, lower transaction costs, and fraud prevention. It also means the payment will be efficient, fast, and cost-reduced for a blockchain-based marketplace. It must be kept in mind that blockchain is a technology that, compared to other ones (Internet, the web), is still in its early stages yet Blockchain has great potential to revolutionise the way of doing business and making payments across the world without consideration of geographical boundaries

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