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A Blockchain Based Decentralized NFT Marketplace

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Abstract: *With the advancement of technology around the globe lead to a rise of technology called Blockchain and amazing technology that completely eradicates the centralized network. Blockchain Technology has got its applications from finance, gaming, supply-chian etc. One of Applications of this amazing technology are NFT's(Non Fungible Token's) That act as a digital assets in the world of Blockchain. NFT's can be any form of data from art, music to video etc. The interest of NFT's have been growing in every field of various industries like fashion, gaming, etc. Non-fungible tokens (NFTs) are transferrable rights to digital assets, such as art, in-game items, collectables, or music. The phenomenon and its markets have grown significantly since early 2021.The information about the NFT's are stored onto the blockchain Where each information is kept encrypted and prevented from attack as its impossible to alter the data in the blockchian. This cutting-edge technology continues to grow and capture the attention of the masses as more applications of NFT's are identified with time. The System proposed in this paper allows consumers to transfer encrypted content and write it to NFT's. Various consumers can approach the content of NFT's by mentioning their purchase or endorsement. Confidential information is licensed for a period of time, after which the information is appropriately deleted.*

Keywords: NFT, Token, Block chain, Asset, Ethereum, Fungible

I. INTRODUCTION

Technology advancement and digitization were not always regarded as partners in the evolution of the arts industry. This viewpoint and mindset are about to shift. With their involvement in various Non-Fungible Token projects, content creators, artists, and personalities from a variety of industries have dominated the headlines. This turning away from traditional business models has been accomplished by recognizing the powerful tools and innovative features provided by blockchain technology. The usability of such technology has been directly proportional to the curve of discovery of novel business concepts involving tokens andtokenization processes. users no longer have ownership over their data. Presenting a new generation of solutions not only provides users with the ability to control their data but also offers an alternative to the vulnerabilities and lack of availability often found in centralized frame works.

Blockchain systems include decentralized peer-to-peer networks. A work that stores a ledger composed of blocks of stateful transformers action. A consensus mechanism has been agreed between all countries

A peer to decide which transactions are considered correct.

A missionless public blockchain where any entity canparticipate Network and all transactions are held in plaintext, typically Using Proof of Work and Proof of Stake Consensus Mechanisms Together. Approved Private and Consortium Blockchain where only approved entities can join the network. They often use other consensus mechanisms such as

Practical Byzantine Fault Tolerance.

Objects in the virtual world were once deemed to be difficult toprove their uniqueness and distinguish ability in order to be considered "non-fungible." Code is code: 1s and 0s that may beregenerated and are hence, to a significant extent, fungible.

II. BACKGROUND AND RELATED WORKS

Blockchain is aimed to be one of the most revolutionizing technologies in the technological industry. However, the firstfew glimpses from major players such as Google and Microsoft were not playable. Issues such as latency and

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low quality are consistently seen across all services. This research was done by Matthieu Nadini, Laura Alessandretti, Et al. on2021. The sole purpose of this research was for mapping theNFT revolution (market trends, trade networks, and visual features). The NFT market is less than four years old and has boomed in 2021. The research paper present history of 6.1 million NFT trades, across six main NFT categories including art, games and collectibles. NFT collections tend to be visually homogeneous and the most traders are specialised. The predictability of NFT prices revealing that, while past history is as expected the best predictor, also NFT specifc properties, such as the visual features of the associated digital object, help increase predictability. market comprises closely connected communities of buyers and sellers who tend to operate within a specific category of NFT. This research is done by Usman W.chohan on April 21, 2021. The purpose of this research is to identify few problems related to Non- fungible tokenfunctioning such as Blockchain, scarcity and value. The research envoys us that Non-Fungible Tokens

(NFTs) have garnered remarkable investor attention recently, with some NFTs securing selling prices that may have seemed unthinkable for a non-fungible virtual asset. This raises fascinating questions about value and scarcity with respect to blockchain technology, through a prism of non-fungibility of a digital asset, and this paper aims to draw attention to these questions insofar as they may shape an alternative space of blockchain development and exchange going forward.

This research is done by Nicola Borri, Yukun Liu, and Aleh Tsyvinski on march 2022. In this paper, they've constructed a comprehensive dataset of the NFT market. This data allows detailed analysis of this market from the finance and asset pricing point of view.

They show that NFTs behave differently from both the existing asset classes and from cryptocurrencies but have their own NFT-specific driving forces. We note that while this market is relatively recent, understanding its properties from the finance point of view is important as NFTs may potentially become a cornerstone of the metaverse and Web 3.0

III. METHODOLOGY

3.1 Blockchain

Blockchain technology is a type of digital ledger that is used to keep track of transactions. This ledger is made up of multiple blocks, and each block contains information about a specific transaction. Because this ledger is decentralized, it is difficult for anyone to change or delete past transactions. Blockchain technology also provides benefits in terms of reliability, collaboration, organization, quality and transparency. Overall, this technology makes it easier for people to use decentralized applications without needing to provide end-to-end data and performance control to any server.

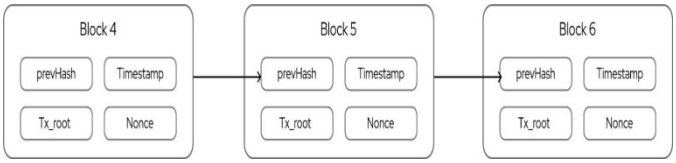

Fig. 1. Blockchain - Block Diagram

Ethereum is a decentralized, open-source blockchain platform that enables the creation of smart contracts and decentralized applications (DApps). It was founded by Vitalik Buterin, a Russian-Canadian programmer and writer who first described the concept of Ethereum in a white paper in 2013.

Ethereum operates on a decentralized network, meaning that it is not controlled by any single entity or group of individuals. Instead, it relies on a network of computers, known as nodes, to validate and process transactions. These transactions arerecorded on the Ethereum blockchain, a publicly accessible distributed ledger that tracks all activity on the network.

One of the key features of Ethereum is the ability to create and execute smart contracts, which are self-executing contracts with the terms of the agreement between buyer and seller being directly written into lines of code. Smart contracts enable the automation of many types of transactions, reducing the need for intermediaries and making the process faster and more efficient. Ethereum has also become a popular platform for initial coin offerings (ICOs), a fundraising mechanism in which new projects sell their underlying crypto tokens in exchange for bitcoin or ether.

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3.2 Smart Contracts

Smart contracts can be considered the soul of the blockchain network, which governs all transactions on the blockchain network. [10] Smart contracts are configured to arbitrate all transactions. We can say that smart contracts are rules designed to handle all events that occur in the blockchain network. A smart contract can be a line of code on top of a blockchain that contains the rules by which multiple parties agree to this contract of interaction. If and when these predefined rules are met, the smart contract is automatically executed. .With a smart contract, a relationship can be established between persons, institutions and their property. Smart can greatly reduce transaction costs. It can be said that it is an automatically enforced code, which means that it unifies the rules of transactions and indirectly reduces transaction costs: reaching agreements, formalizing them, enforcing them. Smart contracts are written in various languages depending on the network ,For Ethereum/polygon they are generally written using solidity whereas for the purpose of the solano they are written in Rust.

```
contract ERC721 {
    function name ( ) constant returns (string name);
    function symbol ( ) constant returns (string symbol);
    function toeaISuppIy() constant returns (uint256 toeaISuppIy);
    function balanceof(address _owner) constant returns (uint balance);
    function ownerOE (uint256 tokenId) constant returns (address owner);
    function approve (address _ to, uint256 _tokenId);
    function takeOwnership(unit256 _tokenId);
    function transfer (address _Eo, uint256 tokenId);
    function tokenOEOwnerByIndex( address _owner, uint256 index) constant returns (uint tokenId);
    function tokenMeeadata(uint256 _tokenId) constant returns (string infourl);
    event Transfer(address indexed _from, address indexed _ to, uint256 _tokenId);
    event Approval(address indexed _owner, address indexed _ approved, uint256 _tokenId);
}
```

Since the NFT project is built on Ethereum chain we focus in using solidity.

3.3 EVM - Ethereum Virtual Machine

Ethereum is a digital currency used on the Ethereum blockchain. Ether records all transactions between accounts as transferred money. Ether is the fuel for Ethereum's operations. It enables a wide range of applications from cryptocurrency trading to monetary applications, advanced token and resource management and storage, shared frameworks, personal management systems and voting modules, and resource and identity intensive applications.

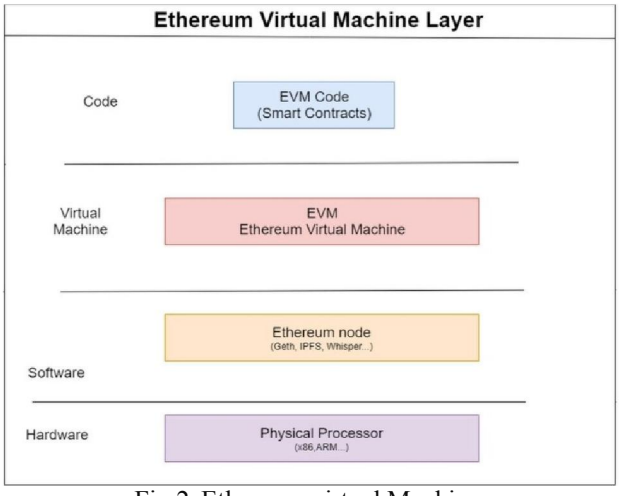

Fig.2 Ethereum virtual Machine

EVM - Ethereum Virtual Machine is the runtime environment elements of Ethereum smart matches [10]. It's not strictly a sandbox in fact, completelyseparate in each case, meaning that the code inside the EVM does not have access

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to the organization, the file system, or the election cycles. Great deals even have limited access to select offers. The Ethereum Virtual Machine provides security by preventing verification attacks, a growing problem in the crypto industry. In addition, EVM decodes and implements the Ethereum programming language, ensuring seamless compatibility.

- **Address and Transaction:** Blockchain addresses and transactions are the two of the most fundamental and most crucial components in the Blockchain Ecosystem. A Address acts as a unique identification or as a unique identifier in the receiving or transferring assets ,just like in the centralized ecosystem of Banks. The Address aregenerally 26 to 35 characters composed of Alphanumeric strings ,It varies according the network chain we operate on. In perspective of NFT's the owner need to posses a valid key and send the assets to another via a valid/useful; signature(digital).Transaction generally take certain amount of time based on the network congestion. On successful transaction a valid transaction hash is generated which indicates a successful execution. The above action is generally occurred within a wallet and it is referred astransaction in chain of ERC-777 as smart-contract based.
- **Data Encoding:** Encoding is a process in which data of one form is converted to another, encoding Is generally doe to ensure the efficiency of the data is provided, to conserve memory of the uncompressed formats and in-order to achieve high resolution/quality. In Blockchain networks like Bitcoin, Ethereum etc uses hex values that are used the purpose of encoding the transactional data, function and arguments. This indicates when someone's buys or owns a particular NFT. It generalizes that he/she is claiming the ownership of NFT based IP rights as well as art creator's hex. Others can try to claim or get the information in raw data but that just provides basic information about the NFT and it doesn't claim any ownership or the property of particular NFT.

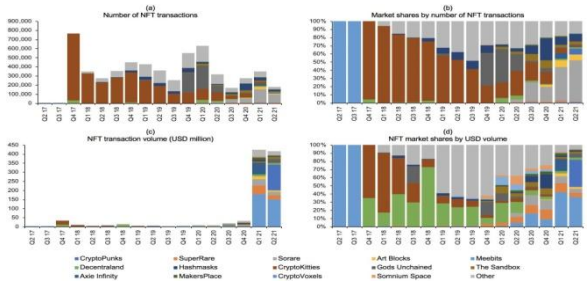
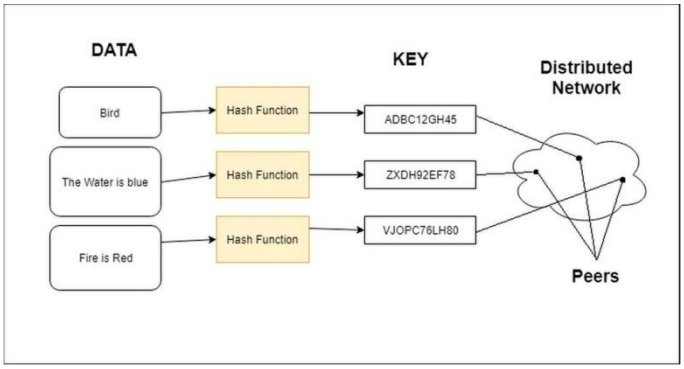


Fig: 3 NFT Transactions

3.4 IPFS

IPFS could be a distributed classification system, used as a distributed knowledge storage service, and for sharing content in a very censorship-resistant manner, of times employed by localized applications, principally supported blockchain technology. IPFS could be a P2P classification system to store and share knowledge. Content additional to IPFS receives a novel hash akin to the contents of the resource (i.e. files in a very folder or contents of a file). The hash is exclusive and is completely totally different although there's solely a distinctionof 1 single character.



IPFS will use the content of the file to find its address, rather than employing a name, as hypertext transfer protocol will. The name of the info is changeless. The references between knowledge things and their various suppliers square

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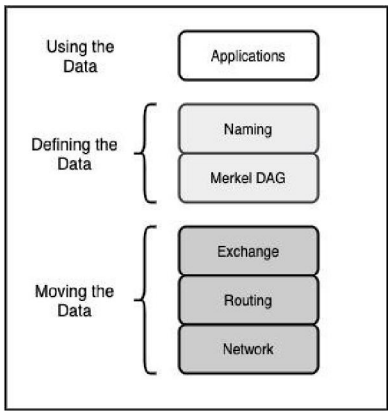
measure keep in a very Kademlia-based DHT. The DHT is employed for routing, which suggests to announce freshly additional knowledge to the network, and facilitate to find knowledge that's requested by any node. little values (about 1KB) square measure keep directly on the DHT. For values larger, the DHT stores references, that square measure the NodeIds of peers Who will serve the block.

There are unit 3 layers: the primary one is for mistreatment the information, the second for outlining the information, and also the last one is for moving the information. For distributing files and knowledge, IPFS uses the BitSwap protocol, almost like the BitTorrent protocol. Bitswap may be a message-based protocol wherever all messages contain want- lists or blocks. Indeed, it acquires blocks requested by the consumer having a "want List", and it sends blocks to peers that have a "have List" [2]. Blocks area unit binary structures of information that contain a precise quantity of the files.



3.5 NFT - Non Fungible Tokens

Fungible is anything that is transferable and has unique properties and has a value. In general cryptocurrencies each token has same value. On the contrary, a Non-Fungible Token has unique values and properties. Each NFT can be exchanged because of their value defined nature rather than their unique properties. Nft are ownership controlled architecture ,when someone creates and mint a NFT they execute a code that is being stored in Smart-contracts as ERC-721 standard form.

Fig 5: Cryptokitties NFT's

Ethereum is one of the currently most used Blockchian network for the purposes of NFTs. However, there are several other of blockchains that are increasingly known with in use of NFT's, including:

1. Binance Smart chain
2. Polka dot
3. WASH
4. Stream through Neat Labs

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5. Tezos
6. Universe

Every blockchain has its own different unique NFT token standardization, wallet administrations and viable markets. Since Ethereum has the largest organic NFT system And Has an amazing community and developer friendly we use Ethereum Network in our development.Major Ethereum NFT Marketplaces include:

1. Open Sea
2. Rare
3. Coin bar

Properties of NFT's

1. **Authenticity:** The Existence of a NFT can be verified asthe information of Metadata and ownership are available publicly for the users to verify .
2. **Transparent Performance:** All the NFT transactions likeMinting, selling, buying, transferring etc all these are available publicly which can be easily verified using the chain explorer's.
3. **Accessibility:** The NFT ecosystem is hackproof and impenetrable to the losses of information. All the NFTS areavailable to the users to buy or sell all the time.
4. **Tamper-resistance:** The NFT Metadata is Tamper-proofand the ownership is transferred once a successful Transaction has been verified.
5. **Usability:** Each and every NFT maintain a real-time data that provides details about the current seller/buyer to provide info to the user .
6. **Atomicity:** ACID(isolation, consistency, durability) Properties like that on in regular Database system are also followed in NFT Ecosystem.
7. **Tradability:** Every NFT can be traded with othersbased on the users need.

IV. PROPOSED ARCHITECTURE

The proposed architecture enables decentralized computation .

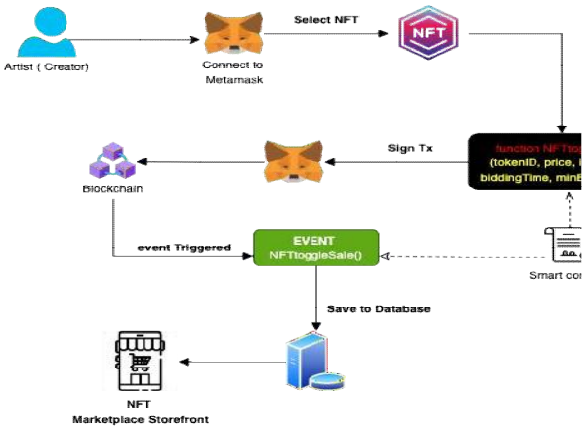

Fig 6: Architecture

4.1 Authentication

Authentication is required, to perform actions in the platform. Although browse functions(Browse NFTs, Browse User, Browse Collection) should be open (unauthenticated), but some features like Create Profile, Edit Profile, Like NFT, Create collection, and Delete Collection, need authentication toidentify the user.

You can use normal Email / Password or Social Login based Authentication and generate a JWT token, or else if you don'twant to use this Authentication, you can also do using Web3 Wallets like Metamask

4.2 Profiling

We show the user Profile in the Marketplace, associated with each NFT Card, Leaderboard, Collection, Bidder List, and other places. So we need a maintain the Profile of the user which may include the user's fullname, username, bio, cover image, avatar & other users' public information..

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Uploading Metadata to IPFS: You should transfer your NFT's information to IPFS (InterPlanetary File System). information includes the NFT's Assets (Image, video, GIF), title, description, and Properties. as a resultof we tend to are making a nonfungible token, we must make sure that the metadata is permanent and decentralised. Thus, storing it in IPFS is that the best option.Uploading these files to a centralised info puts your file's security at risk. once you upload your NFT's metadata to IPFS, you may be assigned a metadata ID (IPFS key)

4.3 Mint your NFT

Take the metadata ID from the IPFS, use it as token URI, and sign the transaction, to mint an NFT.

V. CONCLUSION

The proposed architecture makes use of the decentralized network on the Ethereum blockchain to ensure the availability of nodes. Non-fungible tokens (NFTs) are a relatively mature technology in the blockchain sector that have the potential to significantly impact the virtual asset market. The article discusses the process of creating and uploading an asset using NFTs and how ownership is structured with these tokens. It also touches on technical aspects such as the distribution method and how blockchain and smart contracts can facilitate secure transactions

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