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MUSIC STREAMING DECENTRALIZED APP USING BLOCKCHAIN

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ABSTRACT
The streaming of music and other forms of entertainment are heavily reliant on digital technologies in the present world. The purchase of physical copies of music albums is preferred over subscription-based internet services. The listener can easily access excellent services through online streaming platforms like Spotify, Apple iTunes, and Google Music. However, problems of these systemsinclude lengthy reimbursement delays for artists, a lack of transparency, and unclear terms for payments and licensing. In this paper, we present a solution that employs the Ethereum blockchain and IPFS protocol to address all three of these issues. Using smart contracts, transactions
are recorded on the Ethereum blockchain for payment administration. The IPFS protocol, a peer-to-peer protocol, is utilized to store music files because storing huge files on the Ethereum network is expensive. Both the artist and the listener interact with the front end via a browser and the front end is constructed using Web3.js. The smart contract will specify a PPP (Pay-Per-Play) model with a set fee or as determined by the artist. Additionally, the artist may include additional supporters and divide the proceeds with them. Although streaming is a free service, listeners can provide tips to the performers to show their appreciation. As a result, a fully autonomous music streaming system can be created with the least amount of involvement from third parties and a direct connection between the artist and listener.

Keywords:
Blockchain, crypto, Ethereum, IPFS, Music, Smart Contract

I. Introduction
The dissemination of digital information is quickly expandingin today's world, particularly in the areas of music and video. More and more consumers are adopting digital content or online services with a subscription model rather than purchasing physical copies. This is so that users may easily access content anywhere, at any time, using digital technology. A significant problem for composers, producers, and musicians is that they are unclear of how their royalties are calculated and are unable to get essential detailed information on how and where their audience is listening to their music [1].
The lack of a validated global registry of music creatives and their works is one of the industry's biggest issues right now. A solution has been offered by streaming services like Spotify and Apple iTunes, although it is not as transparent and fair for users of these services. The amount received by the artist for their contribution is negligible in comparison to the money made by these services [2]. The majority of these issues can be solved with blockchain thanks to its fundamental advantages, such as increased transparency, improved security, improved traceability, increased efficiency, and lower costs[3]. Blockchain's immutability, which is its most significant characteristic, is guaranteed by the peer-to-peer network design and mining utilizing consensus algorithms like Proof- of-Work (Pow) and Proof-of-Stake (PoS).

EXISTING SYSTEM

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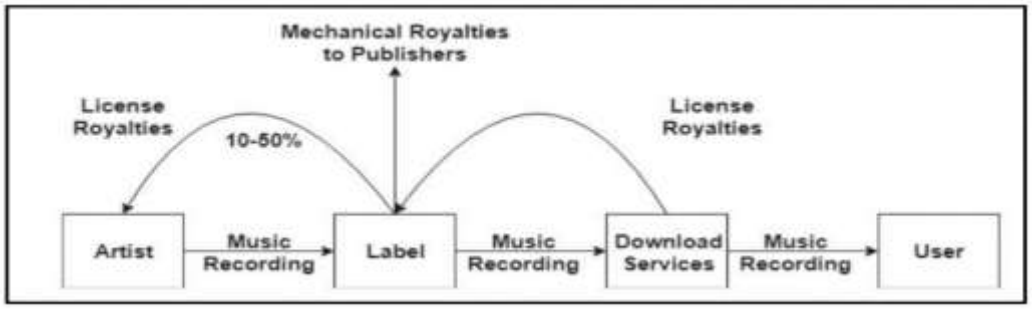

Figure 1: Music recording royalty flow (Digital music download service)

In the current digital age, it is essential for musicians to publish their music online so that users can buy and download it. An additional method of getting the content to the audience is through streaming services. Without the support of a big media partner, artists are compelled to develop independent distribution channels for their work. While the ability for artists to make their work available to their followers via internet streaming and video distribution platforms proven to be a blessing, they are still subject to expensive fees or commissions for the same [15]. For digital album downloads, fees range from 15% to 40% [5].

Therefore, the only two options left for artists are to either raise the price of their work in order to earn more money or accept the meagre amount of money received. If the price of their recordings is raised, there is a potential that people won't buy them, which would leave them penniless. Therefore, most artists are obliged to select the choice of accepting less pay.

The primary reasons that streaming services and online music stores have discovered themselves playing a crucial role in the industry are the existing user base due to the large variety of music available and the powerful marketing [1].

We put up a solution to fix all the problems with the way the music business operates that were previously discussed. To do this, we require three key elements: Interplanetary File System, Ethereum (Smart Contracts), and Blockchain Technology (IPFS). The internal organization of the decentralized music streaming service is as follows: (Fig. 3)

1. Frontend: Built with a heavy emphasis on web3.js and uses HTML, CSS, and JavaScript. The Web3 module supports the interaction of frontend components and the Ethereum network. Through a browser, users and artists can engage with the blockchain and IPFS platform.
2. Blockchain: The platform's immutable digital ledger that will house all the contract codes and transactions is blockchain. Here, the payment information and history will be kept.
3. Backend: Even though the majority of data storage and transactions take place on the blockchain, accessing the blockchain quickly becomes quite inefficient. As a result, we recommend using the NodeJS backend.
4. IPFS: When an artist uploads a song, the frontend will send the music file and description to IPFS and produce and store the uploaded file's hash on the blockchain because blockchain storage is cheaper than traditional storage.

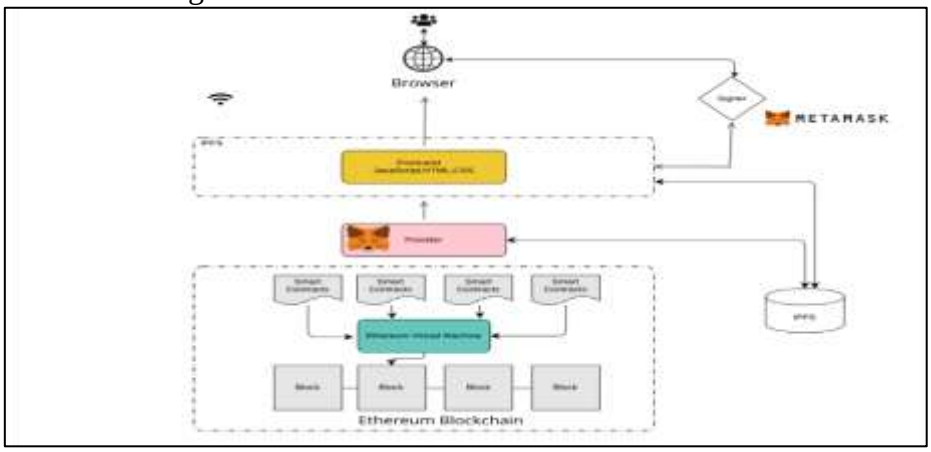

Figure 3 Internal structure of proposed application

The underlying technology of the many cryptocurrencies that are currently popular on the market is blockchain. Satoshi's Nakamoto first described its use in a paper written by him in 2008 and implemented in the following year. Although Satoshi's digital money, bitcoin, was innovative in many ways, the technology itself was the most significant breakthrough. Users were able to swap coins directly using this peer-to-peer model without the assistance of a third party for verification [4]. Although transaction processing was the primary function of blockchain, it has the potential to disrupt other industries were. A decentralized and distributed approach would be preferable to a centralized one. The use cases for blockchain include from smart contracts, personal data protection, identity, health records, news publishing, supply chains, food and products traceability, and voting [5–6].

The blockchain is a distributed ledger that consists of an ever-growing sequence of blocks that are added one after another and contain important data [7]. Each peer keeps a consistent copy of the ledger and keeps working on the longest chain. This has two key advantages that make it a great solution for our issue. The first benefit is that data stored on a distributed ledger is immutable, offering a record that has not been changed or updated [8]. Second, network of peers keeps an exact duplicate, preventing a single point of failure. Blockchain security is provided by the block chaining technique. Blocks contain the results of the hash algorithm, which are computed on the preceding block (for example, keccak256 in Ethereum) [7]. Hash algorithms are resistant to collisions. Each block has a distinct hash value and simultaneously stores the hash of the previous block, making it challenging to alter or modify its contents. This is since any change at one block would necessitate computing the hash values for all subsequent blocks. Furthermore, by simply checking the hash of the most recent block mined, any user can determine the veracity of a blockchain.

➢ Ethereum and Smart Contract

Ethereum is a decentralized, open source blockchain platform that allows developers to build and deploy decentralized applications (dApps). It was created in 2015 by Vitalik Buterin and has since become one of the most popular blockchain platforms for building Apps. Applications created on top of Ethereum run exactly as intended, free from fraud, censorship, or third- party interference. Smart contracts, which are account- holding objects on the Ethereum Blockchain, are used to accomplish this. They store data, make judgements, and deliver automated payments thanks to the underlying code they carry. Although contracts are established by their creators, the Ethereum network itself is where they are executed and the services they offer are provided. Theoretically, smart contracts will continue to function as long as the network is operational and will only be turned off if that is how were designed. This eliminates the requirement for a third party to manage payments and keep track of the quantity of users and plays.

❖ InterPlanetary File System (IPFS)

The Interplanetary File System (IPFS) is a decentralized, peer-to-peer file-sharing system that allows users to share and access files over the internet. Juan Benet developed it in 2015, and since then it has gained popularity as an alternative to conventional centralised file-sharing platforms. IPFS works by breaking a file into smaller pieces, known as blocks, and distributing them across a network of computers, or nodes. Each block is identified by a unique hash, and users can access a file by requesting the blocks associated with its hash. One of the main benefits of IPFS is that it allows for faster download speeds and decentralized data archiving. Instead of storing all the content on a single server or cloud, IPFS distributes the data across a network of nodes, making it more efficient and resilient. It is also resource-oriented, meaning that it points to the resource itself rather than the location where it is stored. This makes it more flexible and efficient than traditional location-oriented protocols like HTTP.[10]

❖ WORK.

1. Blockchain and transactions
2. Tokens
3. Smart

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4. IPFS

1. The artist uploads their music to a web frontend, which is a user interface for interacting with the platform.
2. The web front end then uploads the music to IPFS (InterPlanetary File System), which is a decentralized, peer-to-peer file-sharing system. IPFS stores the music on a network of computers, or nodes, and generates a unique hash for each block of the file. The artist can then obtain the links to the music files on IPFS.

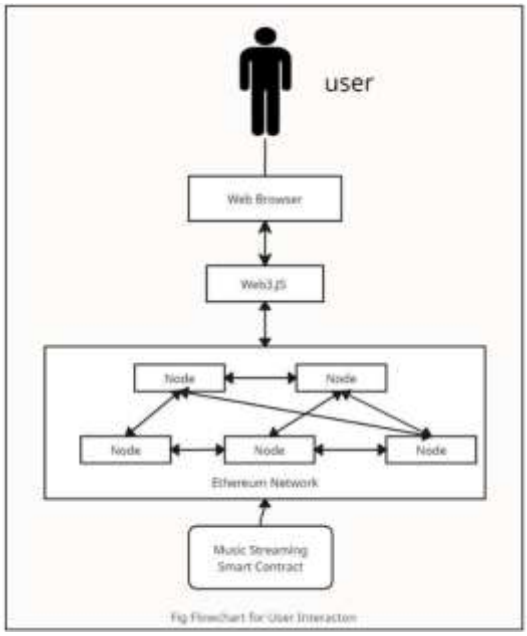


Figure 4: Flowchart for User Interaction

3. The artist uploads their music to a web frontend, which is a user interface for interacting with the platform.
4. The web front end then uploads the music to IPFS (InterPlanetary File System), which is a decentralized, peer-to-peer file-sharing system. IPFS stores the music on a network of computers, or nodes, and generates a unique hash for each block of the file. The artist can then obtain the links to the music files on IPFS.
5. The web front end uses a library called web3.js to communicate with the smart contract on the Ethereum blockchain. A smart contract is a self- executing contract that is stored and replicated on the blockchain. The artist can use the smart contract to store the IPFS links and metadata about the tracks, such as the artist's name, track name, and payment information.
6. Users can access the music by requesting the IPFS links from the smart contract. They can play the tracks for free, and tokens will be transferred from a pool to the artist's wallet. Users can also tip the artist with additional tokens if they choose.
7. The transaction transfers tokens from the user's wallet to the artist's wallet. This can be done automatically with smart contracts, without the need for intermediaries.
8. The artist can check their balance and see how many tokens they have earned from the web front end. They can also withdraw the tokens from their wallet if they wish.

A. Blockchain and Transactions

A blockchain's transactions can be viewed and verified using a block explorer. It enables users to look for specific transactions, blocks, or addresses and view information like the transaction's date, time, and value. Users are able to monitor both their overall spending and their spending on a specific artist [11]. On a platform built on blockchain technology, miners are crucial to preserving the blockchain's integrity. For their work confirming and logging transactions on the blockchain, miners are often rewarded with tokens[12]. The proof-of-work (POW) technique is used by the platform you described

to choose which miners can contribute new blocks to the blockchain. This requires a certain amount of computing work on the part of miners to find a valid hash for a block of data. When a miner discovers a reliable hash, they can add the block to the blockchain and earn tokens as compensation.

B. IPFS as File Storage

A permanent and immutable record of the music file can be made by utilizing a smart contract to index the music file's hash on the blockchain. This can help keep track of who owns the file, how it is being used, and make sure it hasn't been tampered with or changed. Additionally, IPFS storage of the music file can offer more security and defence against censorship or unlawful downloading. The file is made more resilient and less exposed to attacks by being stored on a distributed network of nodes as opposed to a single server. The network will be informed and can take action to safeguard the integrity of the system and the records if there is any discrepancy in the file, such as if the root hash changes or the file is edited in any manner. This can help to maintain the system's security and dependability and prevent illegal access[13].

❖ CHALLENGES FACED

1. Broad adoption

Since incumbent's view blockchain technology as a danger, they would oppose its adoption. Blockchain is viewed negatively since Bitcoin and other cryptocurrencies are outlawed in many countries. Although upcoming artists might be prepared to adopt the new system, major labels cannot be claimed to be in the same situation. [14].

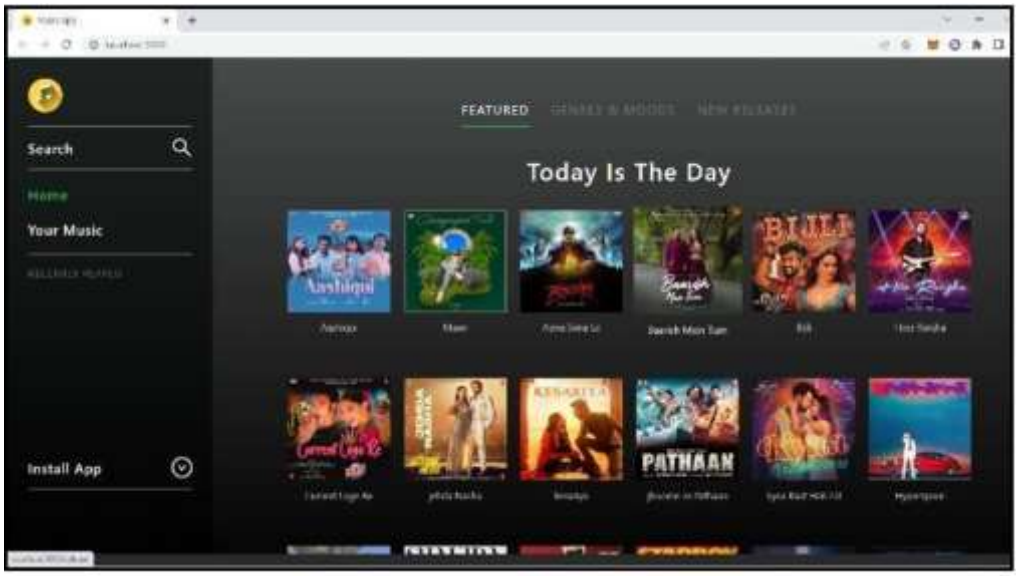
2. Scalability

Scalability is one of the biggest problems that blockchain technology is now experiencing. Since the majority of blockchains can only process a finite number of transactions per second, using them for large-scale applications can be slow and expensive.

3. Erroneous Data

The difficulty of changing or deleting data once it has been added to the ledger is one of the problems of blockchain technology[8]. Correct data will coexist with wrong data in the blockchain even though it can be entered correctly again. This might also result in disagreements between the partners, which would once more require the assistance of the courts to settle.

❖ RESULT AND ANALYSIS



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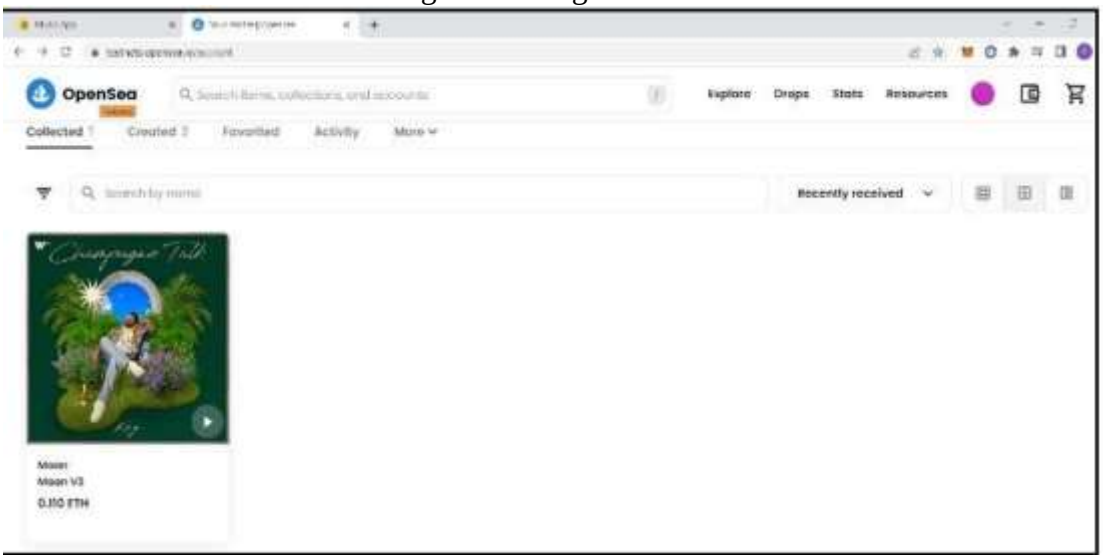
The picture looks to be a glimpse of the home screen of a music player, where users can view featured tracks and begin their musical journey.

The picture looks to be a screenshot of an album page on a music player, where when an album is opened, a list of all the songs from that album is shown. Users may effortlessly navigate through the music because to the list's attractive design and though.



The image appears to be a screenshot of a music player that utilizes OpenSea, a decentralized marketplace for digital assets. Users can use OpenSea to access songs from their separate albums, and can spend Ethereum, a cryptocurrency, on subscriptions or purchases. This allows users to own the digital assets they buy and control how they use them.

❖ **Comparative analysis**

Table 1: Comparison with other platforms

	Apple Music	LINE Music	YouTube Music	Our System
Strengths	Largest music repository. Digital Locker for storing Your own library of songs.	Largest Japanese catalog available. Payment could be billed through local Mobile network provider.	Includes video content. Digital Locker for storing your own library of songs.	More Secure due to distributed networks. Direct payment transactions between fans and artists.

Weaknesse	Focused on iOS. No free version	Not all contents are available to stream No Free Version (some paid exclusives) No in-depth playlist/recommendation curation	No free version. Playlist generator is not too intelligent to put related songs together.	Only Ethereum based transactions.

❖ CONCLUSION

Although blockchain is mostly used for cryptocurrency, it has been proposed for usage in several other applications, some of which are either in development or already in use. Smart contracts use computer code to eliminate the intermediary and automate the payment process. The current system of paying royalties to artists does not facilitate quicker payments because they must first go through several intermediaries. The owner will be able to track their artist's profile and the royalties received because all middlemen commissions between the artist and the consumer will be eliminated. To reach vital mass it may not only require support from distributors but also the involvement of artists in selling of their creative music. Thus, the artists will finally receive fair compensation for their efforts. Additionally, the use of gas prevents the loss of time and computational resources due to unintentional endless loops in smart contracts.
scenarios include irrigation, fertilisation, the use of pesticides, weed management, plant growth monitoring, crop disease management, and field-level phenotyping. Additionally, an investigation into the use of unmanned aerial vehicle (UAV) systems in intricate agricultural settings is carried out.

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❖ References

[1]M. Takano, H. Mizukami,"Analysis of the changes in listening trends of a music streaming service," 2017 IEEE International Conference on Big Data (Big Data), Boston, MA, 2017, pp. 3139-3142
[2]Stephen Brett, inmusik white paper ver 3.02 https://inmusik.co/wpcontent/uploads/2018/10/inmusik- wp-v3.02.pdf
[3]T. Salman, M. Zolanvari, A. Erbad, R. Jain, and M. Samaka, "Security Services Using Blockchains: A State-of- the-Art Survey," in IEEE Communications Surveys & Tutorials.
[4]Satoshi Nakamoto,"Bitcoin: A Peer-to-Peer Electronic Cash System",2008. https://bitcoin.org/bitcoin.pdf
[5]Ahmed Kosba, Andrew Miller, Elaine Shi, Zikai Wen, Charalampos Papamanthou,"Hawk: The Blockchain Model of Cryptography and Privacy-Preserving Smart Contracts", Security and Privacy(SP), 2016 IEEE symposium on, 23-25 May 2016, San Jose (USA), pp. 839- 858
[6]M. Swan “Blockchain blueprint for a new economy.” O’Reilly Media Inc. 2015
[7]Tapscott, D. and Tapscott, A. (2016) “Blockchain Revolution: How the Technology behind Bitcoin Is Changing Money, Business, and the World”. Penguin, New York.
[8]K. Zhang and H. Jacobsen, "Towards Dependable, Scalable, and Pervasive Distributed Ledgers with