

A Music Creation and Music NFT Trading System Based on Blockchain and Multi-layer Minting

Abstract—This demo innovatively puts forward the concept of multi-layer minting and designs a rational royalty distribution method. Based on the above, we construct an integrated karaoke and NFT trading system called NFT-K, which employs NFT technology for copyright protection of musical works and utilizes smart contracts to facilitate automatic and transparent royalty distributions among different layers of minters. The system is scheduled to launch in North America later.

Keywords—NFT, blockchain, smart contract, digital music, royalty distribution

I. INTRODUCTION

Copyright protection and royalty distribution are two longstanding challenges in the digital music industry. The proposed system focuses on the multi-layer minting of NFT and the royalty distribution involved in the process. Multi-layer minting is critical to the NFT ecosystem as it encourages more creators and investors to participate and provides an opportunity for digital artists to create long-term value [1]. However, with this comes the question of how to distribute royalties and profits fairly. This involves determining the revenue share of each participant in the different stages of the process, and how to ensure that the creators of the digital assets can continue to benefit from subsequent secondary market sales [2]. To address the challenges mentioned above, we designed and developed an integrated karaoke system called NFT-K, which uses smart contracts to distribute royalties automatically and transparently. In this system, users can customize and deploy smart contracts, upload and sing music works, mint and trade NFTs, and get a fair return from the process.

II. DESIGN OF NFT-K SYSTEM

A. Overview of NFT-K System

NFT-K is a music industry NFT application that integrates various functionalities. All APIs are implemented using a REST architecture, facilitating the creation of multiple interfaces such as Android applications, iOS apps, and web interfaces—all backed by a unified middle layer and SQL database.

The system architecture of NFT-K is illustrated in Fig. 1. Overall, the system comprises a decentralized blockchain architecture and a centralized client/server architecture consisting of AWS servers. Users manage cryptocurrencies and interact with DApps through a digital wallet integrated into their web browser. All user-generated requests are sent to the backend for processing and returning corresponding execution results. We utilize IPFS [3] to store related files of music NFTs, which is designed as a distributed file system that uses peer-to-peer approaches for storing and sharing

hypermedia content, making content distribution more efficient, reliable, and decentralized. To simplify and enhance our DApps development process, we use Alchemy's set of APIs [4] provided to operate on the blockchain. Once deployed, smart contracts written in Solidity automatically execute code-based protocols. The blockchain securely stores various tamper-proof information, including users' NFT minting data and transaction details, royalty distribution records, as well as digital asset ownership transfers. Cryptocurrency sending and receiving operations are facilitated through digital wallets.

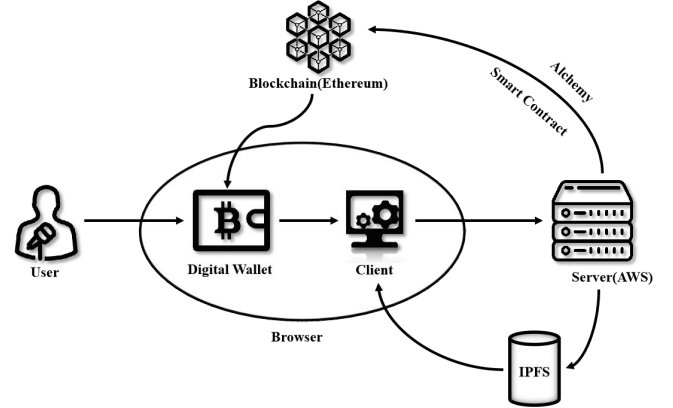


Fig. 1. The system architecture of NFT-K.

B. Multi-layer Minting

The novel concept challenges the conventional notion of classical NFT, leveraging the inherent immutability of underlying technology to safeguard original music creations while also encouraging users to engage in higher-level recreation and reinterpretation. Unlike conventional NFTs that treat original creations as unique and unalterable entities, the framework proposed in this demo encourages re-creation, facilitating interaction and communication between artworks. Moreover, recreation and multi-layer minting offer an innovative revenue model for original creators.

The process of music recreation and NFT derivative minting is illustrated in Fig. 2. In the first stage, users submit a formal request to the platform expressing their desire to create a derivative NFT from an original musical composition. The platform verifies ownership based on blockchain records. If users do not own the NFT, they must purchase it to proceed further. Existing owners must follow smart contract regulations, including checking maximum minting layers and amounts. It is important for requesters with ownership to carefully evaluate these thresholds in order not to exceed them during the creation process. Once all inspection conditions are met, including verifying ownership rights, and complying with

limitations, a successful derivative NFT can be considered created through minting.

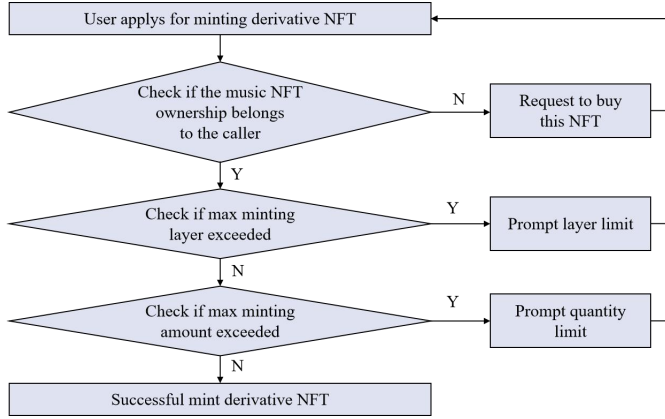


Fig. 2. NFT derivative music creation and derivative minting based on original music works.

C. Royalty Distribution Mechanism

In the process of NFT transactions, the original creators can achieve sustainable profits by incorporating transaction royalties into the smart contract code. It should be noted that we have developed two types of smart contracts to ensure loose coupling between logical relationships—NFT smart contracts and market smart contracts. Minting is performed on NFT contracts, while trading takes place on market contracts. There is only one market contract deployed by the manager, whereas multiple NFT contracts can be deployed by each user to restrict and regulate the behavior of subsequent layer minters (e.g., maximum layer, maximum number of minting, NFT collection size, single transaction limit, royalty distribution ratio, etc.).

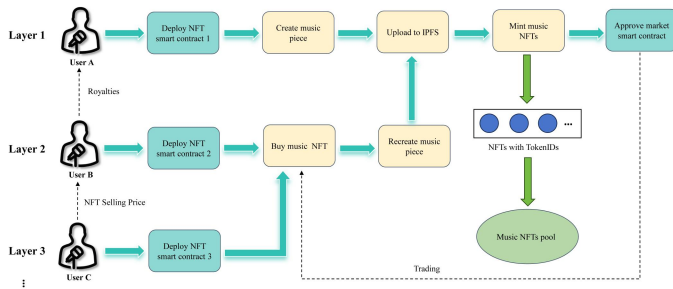


Fig. 3. Multi-layer minting royalty distribution diagram using three users as an example.

Fig. 3 provides a detailed illustration of the royalty distribution mechanism during users' multi-layer minting of NFTs with three users involved. Assuming user A is the original creator who has created, uploaded, and minted a music piece after deploying an NFT smart contract. This represents the first-layer minting (also known as original minting). Next, user A intends to showcase and sell his NFTs on the platform, therefore he needs to approve the market

contract address. The essence of approval lies in locating the market contract through its contract address so that it can be called later. All actions related to the transaction (such as adding it for sale/purchase/update/takedown) must occur post-approval.

User B browses through available NFTs for sale on the platform and admires User A's work, thus intending to purchase User A's NFTs. Consequently, User B deploys his own NFT smart contract, recreates the music piece after purchasing User A's NFT (e.g., adding his own voice or favorite music elements), and re-mints it. This constitutes the secondary minting.

Similarly, User B grants authorization to the market contract, enabling the product to be listed and finally purchased by User C. The selling price set by User B is paid by User C, with the sales revenue being received by User B. Simultaneously, User B is responsible for calculating the royalty based on the benefit and allocating it to User A, who receives the corresponding royalty income. Upon completing the purchase, User C can proceed with subsequent actions. Other users can also follow this logic for higher-level creation and minting. Each NFT generated by a user will possess a unique TokenID associated with it. All users' NFTs continue to flow into the platform's music NFTs pool for enthusiasts to acquire and recreate.

III. CONCLUSION

In this demo, we will present NFT-K, a karaoke and music NFT trading system that allows users to upload original music (accompaniment and vocal), mint NFTs, create music based on existing NFT music, trade NFTs, manage portfolios, and network with other musicians, artists, and users. The system introduces a novel concept of multi-layer minting (or derivative minting) for the first time to encourage the creation of derivative music while simultaneously protecting the copyrights of original music works. This ensures the fair distribution of royalties among all parties involved, extends the concept of the NFT collection, and increases the exposure of the digital assets.

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