

Web3 Music and Content Monetization Platform

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Abstract: The global creator economy exceeds \$100 billion but remains dominated by platforms such as YouTube, Spotify, and Patreon. These platforms control distribution and monetization, charging high fees, delaying payments, and exercising censorship. To address these issues, a decentralized Web3 Music and Content Monetization Platform is proposed. The system uses blockchain, non-fungible tokens (NFTs), decentralized storage, and crypto wallets to enable creators to upload, mint, and sell their digital content directly to audiences. Each asset is stored on the Inter Planetary File System (IPFS) and represented on the Polygon blockchain as an ERC-721 token. Consumers purchase NFTs via MetaMask, and smart contracts automatically transfer payments to creators, enforcing royalties without intermediaries. A prototype demonstrates NFT minting, wallet-based payments, and content access control, validating the technical feasibility of the approach. Compared with centralized systems, the proposed platform offers instant payments, transparent ownership, and censorship resistance, aligning with similar advancements in decentralized music and publishing platforms. Future work includes exploring multi-chain support, decentralized governance through DAOs, and integrating metaverse applications.

Keywords: Creator economy, Web3, Non-fungible tokens, ERC-721, Polygon, IPFS, Decentralized storage, Smart contracts, Royalty enforcement.

INTRODUCTION

The digital economy has transformed how music, video, art, and educational content are created and consumed. Web 2.0 platforms, such as YouTube, Spotify, Instagram, and Patreon, have provided global distribution at the cost of centralization. These platforms dictate algorithms, control revenue flows, and can remove content without warning. Independent creators often earn only a small percentage of the value their work generates. For example, streaming services pay musicians fractions of a cent per play, while advertising and subscription platforms capture the majority of revenue. As a result, many creators struggle to monetise their work fairly and remain vulnerable to demonetisation or account suspension.

Web3 technologies offer an alternative by introducing decentralization, transparency, and user ownership. Blockchain networks enable assets to be recorded on an immutable ledger,

while smart contracts automate transactions without intermediaries. NFTs provide cryptographic proof of ownership for unique digital assets. Decentralized storage systems such as IPFS address the problem of link rot by using content identifiers instead of location addresses, ensuring files remain available and immutable. Crypto wallets like MetaMask, originally released as a browser extension and later expanded to mobile devices, allow users to manage assets and interact directly with decentralized applications. Layer-2 solutions such as Polygon reduce transaction fees and latency by batching transactions off the Ethereum main chain. Together, these technologies enable new economic models where creators can interact with audiences transparently and retain control over their intellectual property.

LITERATURE SURVEY

The emergence of music-native Web3 platforms began with **Audius**, which demonstrated that decentralized streaming could remove intermediaries while keeping creators in control of distribution and monetization [1]. **Sound.xyz** then reframed releases as collectible drops with editions and social signaling, offering an on-chain alternative to traditional streaming and directly inspiring edition-based sale mechanics for creators [2]. In parallel, **OpenSea** established the baseline marketplace conventions—metadata fields such as `image`, `animation_url`, and attributes, wallet portability, and cross-platform discovery—making NFT assets legible across the wider ecosystem [3]. Beyond marketplaces, **Mirror.xyz** showed how publishing itself can be tokenized (posts, crowdfunds, communities), extending creator monetization beyond audio files into on-chain media primitives [4]. **Foundation** reinforced on-chain price discovery through auctions and curation, validating transparent primary sales models for cultural assets [5]. At the protocol layer, **Zora** articulated media as a registry with markets as interchangeable interfaces—an approach that favors portability and composability over closed platforms [6]. Within the music niche, **Catalog Works** emphasized 1/1, provenance-heavy releases that trade scarcity for cultural significance, complementing the multi-edition strategies used elsewhere [7]. **Async Art** pushed the

envelope on programmability—multi-layer, time-varying, or stateful NFTs—offering a blueprint for dynamic media experiences that can evolve with collector interaction [8].

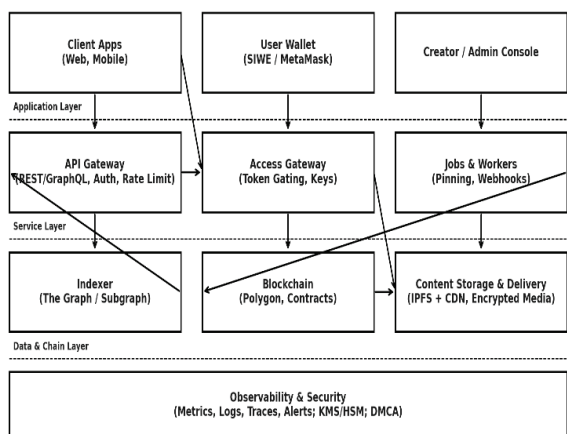
Underpinning these application patterns is the storage and integrity layer: work on **IPFS + Ethereum** highlights how content addressing (CIDs) and smart contracts combine to deliver verifiable, censorship-resistant distribution at scale, which is why many platforms anchor media and metadata to IPFS while keeping ownership on-chain [9]. More recently, **Lens Protocol** introduced a decentralized social graph where interactions themselves (follows, posts, collectibles) are assets, pointing toward social discovery and community-driven monetization as native Web3 features rather than add-ons [10]. Broader Web3 publishing efforts such as **Medium Web3** explored decentralized authorship and ownership models, echoing the same provenance-first ethos across media types [11]. From an infrastructure perspective, **Ethereum 2.0 and Layer-2** research and engineering clarified the scalability path (PoS, rollups) that makes low-fee, low-latency creator experiences feasible in practice [12]. Finally, macro-level analyses like **Blockchain Revolution** situate these systems in a longer arc of disintermediation and transparent value flows, framing NFTs, decentralized storage, and on-chain royalties as structural tools for creator autonomy rather than transient trends [13].

SYSTEM DESIGN

A. System Model

The platform is a two-sided marketplace comprising Creators (who mint and list audio releases) and Collectors (who purchase and access those releases). Identity is wallet-based and non-custodial (MetaMask). Ownership is recorded on a public blockchain (Polygon L2), while media and metadata are stored on the InterPlanetary File System (IPFS) and pinned via Pinata for persistence.

B. Architectural Overview



The system follows a layered design :

1. Presentation Layer (Web dApp). A React/Next.js client provides pages for *Create*, *Marketplace*, and *Profile*. It handles wallet connection, file uploads to Pinata, and contract calls via Ethers.js/Wagmi.
2. Blockchain Layer (Smart Contracts). An ERC-1155 contract models *editions* (multiple copies per release), stores the canonical tokenURI, enforces maximum supply, maintains price per token, and emits events for UI refresh.
3. Storage Layer (IPFS/Pinata + Gateway/CDN). Audio files (.mp3) and cover images are content-addressed by CIDs; a JSON metadata object (referenced by tokenURI) links to these CIDs using image and animation_url.
4. Wallet & RPC. MetaMask signs transactions on Polygon Amoy; an HTTPS JSON-RPC endpoint provides chain access.
5. (Optional—Future) Indexing. A Subgraph can be added to accelerate discovery, activity feeds, and analytics without changing on-chain semantics.

C. Component Responsibility

- Web dApp: (i) *Create*—form inputs for album/title, genre/language, edition size, and price; upload audio/cover to Pinata; assemble metadata JSON; call mint and list. (ii) *Marketplace*—render cards with name, cover, price, and remaining supply; initiate purchases. (iii) *Profile*—show items minted/owned by the connected address.
- Smart Contract (ERC-1155): Functions to mint(tokenId, supply, price, uri), buy(tokenId, quantity), and administrative safety controls (e.g., pausable). Invariants prevent supply overflow; payments and transfers are atomic.
- Storage & Delivery: Pinata pins media and metadata; any IPFS gateway or CDN can serve the bytes corresponding to the immutable CIDs.
- Wallet: Non-custodial authentication and transaction signing; the application never handles private keys.

D. Data Model

On-Chain (ERC-1155).

$$URI[t] \rightarrow "ipfs://"< c_t, Price[t] \rightarrow wei,$$

$$Max[t] \rightarrow N, \sum_a Bal[a, t] \leq Max[t], Creator[t] \rightarrow address.$$

Off-Chain Metadata (IPFS JSON).

```

    { name, description, attributes[],
      image = "ipfs://<imageCID>",
      animation_url = "ipfs://<audioCID>", seller_fee_basis_points }
    
```

The CID-based addressing guarantees integrity: any byte change yields a different identifier.

E. Core Workflows

1) Collector/User Workflow

1. Connect wallet (MetaMask) and establish session.
2. Browse marketplace listings (name, cover, price, remaining supply).
3. Select release and confirm purchase with MATIC on Polygon.
4. Contract transfers editions to buyer and forwards funds to creator atomically.
5. UI verifies on-chain ownership and exposes the IPFS media link from metadata.

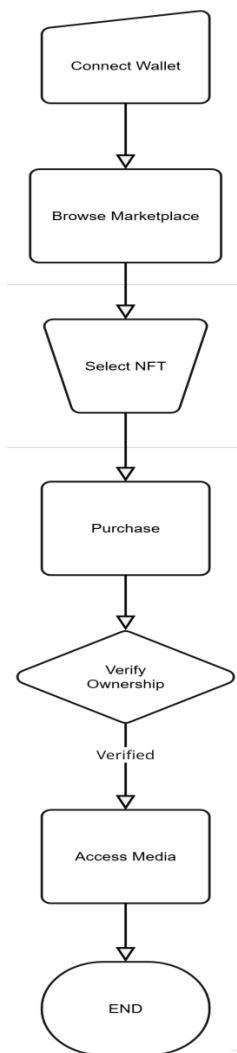


Figure 2: User Work Flow

2) Creator Workflow

1. Upload audio and cover image to Pinata → obtain CIDs.
2. Build standards-compatible JSON metadata referencing the CIDs; set edition count and price.

3. Call contract to mint as ERC-1155 and list for sale; events drive UI refresh.

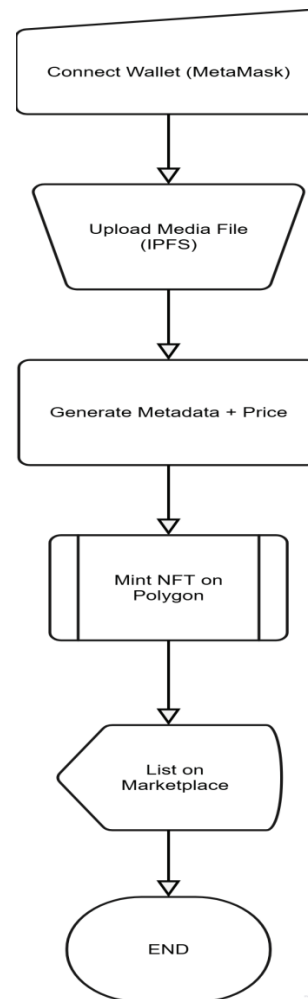


Figure 2: Creator Work Flow

F. Security and Privacy

- Non-custodial keys: all transactions are signed in MetaMask; the dApp never stores or transmits private keys.
- Integrity: media and metadata are content-addressed (IPFS CIDs), preventing undetected tampering.
- On-chain safety: supply conservation and atomic money-for-asset exchange are enforced by the ERC-1155 contract; pausable safeguards allow mitigation of abnormal conditions.
- Transport: HTTPS/TLS is used for RPC and Pinata APIs.

Note: In the MVP, media access uses public IPFS gateways (ownership is verifiable but not enforced at the CDN). Token-gated delivery (short-lived signed URLs or client-side decryption keys) is compatible and can be added without altering on-chain state.

G. Performance and Scalability

End-to-end purchase latency is dominated by block inclusion on Polygon (tens of seconds on Amoy). Read paths scale via CDN caching of IPFS content and (optionally) a Subgraph for query performance. The design is stateless at the edge and horizontally scalable on the client and storage layers.

H. Interoperability and Extensibility

Because assets follow ERC-1155 and the metadata schema used by major marketplaces (image, animation_url, attributes), releases are portable to external wallets/markets. Future extensions include EIP-2981 royalties, Subgraph indexing, encrypted media with time-bound access tokens, and multi-chain deployments

METHODOLOGY

The Web3 Music and Content Monetization Platform adopts a systematic methodology to ensure that the system is secure, scalable, and user-centric. The process begins with requirement gathering, where the challenges of centralized platforms—such as high commission fees, lack of ownership rights, delayed payouts, and censorship—were studied through reviews of existing literature and analysis of creator pain points. This phase highlighted the need for a decentralized solution where creators can directly control distribution, ownership, and earnings without intermediaries.

System design was the next step, focusing on building an architecture that supports transparency, modularity, and efficiency. The design integrates decentralized storage for immutable media hosting, smart contracts for minting and sales automation, and wallet-based identity for secure interactions. Key technologies include IPFS for decentralized storage, Polygon blockchain for NFT deployment, and MetaMask for wallet integration. Together, these components form a robust ecosystem that aligns with Web3 principles.

During the development phase, the core modules of the platform were implemented. The creator console enables upload of music, videos, and documents; metadata generation; and NFT minting. The marketplace module allows consumers to browse, purchase, and own digital content in tokenized form. The transaction and settlement system, powered by smart contracts, guarantees instant payments to creators. An access control layer was incorporated to ensure that only verified NFT holders can access purchased content, thereby preventing piracy and reinforcing ownership value. Special emphasis was placed on designing a clean and intuitive user interface using React.js and Tailwind CSS, so that both creators and consumers can interact with the system seamlessly.

Verification procedures were applied throughout development to ensure security and correctness. Smart contracts were tested for vulnerabilities such as reentrancy and overflow, while integration tests confirmed that wallet

connections, NFT transfers, and content access worked as expected. User privacy was safeguarded by adopting pseudonymous wallet identities and ensuring that no personally identifiable information is stored off-chain.

Rigorous testing was then carried out on the Polygon Mumbai Testnet, including unit testing of contracts, simulated purchase flows, and access control validation. Feedback from trial users was incorporated iteratively to refine the user experience and resolve technical issues.

Finally, the system was prepared for deployment on a scalable cloud-backed infrastructure with redundant IPFS pinning to guarantee content availability. The deployment strategy supports long-term maintenance, upgrades, and possible migration to mainnet environments such as Polygon PoS or zkEVM. This ensures that the platform remains functional, adaptable, and aligned with future developments in the Web3 ecosystem.

The implementation of the system integrates a combination of modern web technologies, IoT devices, and AI frameworks to provide commuters with live and predictive transit information while assisting authorities in managing operations. The platform combines functionalities such as user registration, login, bus tracking, occupancy monitoring, ticket booking, and fleet analytics. The core system is built using a web framework (Flask/Django or Node.js) that handles routing, request management, and real-time updates. Its modular structure supports independent development of features like authentication, data upload, prediction services, and booking confirmation.

IMPLEMENTATION

Web3 Music and Content Monetization Platform combines decentralized technologies with modern web development frameworks to deliver a secure, scalable, and creator-focused service. The system is designed as a set of cooperating components: a responsive web frontend for creators and consumers, blockchain-based smart contracts for minting and sales, a decentralized storage layer for media assets, and a wallet integration module for identity and payments. Together, these modules enable media upload, NFT minting, direct purchase, royalty distribution, and token-gated access while ensuring that creators retain ownership and receive instant payments.

At the core of the frontend, we use React.js with Tailwind CSS to implement the user interface. This provides modular routing, reusable components, and responsive layouts for creators (upload, mint, dashboard) and consumers (browse, buy, library). The frontend communicates with the blockchain through Ethers.js/Web3.js, exposing wallet connect, mint, and purchase flows. State management ensures that real-time ownership changes (e.g., after a successful mint or transfer) are immediately reflected in the user interface. To improve responsiveness, loading states and optimistic UI updates are implemented for key flows such as purchases.

The smart contract backend is implemented in Solidity and deployed on the Polygon Mumbai Testnet for development. Contracts follow the ERC-721 and ERC-1155 token standards, allowing both one-of-one artworks and multiple music editions. Contracts expose functions for minting, purchasing, and royalty configuration, while implementing the EIP-2981 royalty standard to ensure creators automatically receive a percentage of secondary sales. Security measures such as reentrancy guards, input validation, and pausability modifiers are applied to protect against contract-level exploits. Contracts are developed and tested using Hardhat and Remix IDE, with scripts for deployment and interaction.

The storage layer is decoupled from the blockchain to handle high-volume media efficiently. Uploaded music, video, or document files are pinned to the InterPlanetary File System (IPFS) using web3. Storage, generating immutable content identifiers (CIDs). Metadata files in JSON format are also stored on IPFS and linked to NFTs through their tokenURI field. This separation ensures that the blockchain only stores lightweight references while IPFS manages the larger assets, achieving both decentralization and scalability. For redundancy, files are pinned across multiple IPFS providers to ensure long-term availability.

Wallet integration is achieved with MetaMask, which manages private keys, transaction signing, and identity. Buyers connect their wallets through the dApp, and once a purchase is confirmed, the smart contract transfers the NFT to the buyer's address and routes payment directly to the creator's wallet. Authentication is entirely wallet-based, removing the need for centralized user management systems. To secure purchases, transactions are protected with signature verification and rate limiting to prevent replay or spam attempts.

The access control subsystem implements token-gated content delivery. When a buyer attempts to play or download media, the platform verifies NFT ownership on-chain. If ownership is valid, an access gateway issues a short-lived signed URL or decrypts an encrypted IPFS file key, ensuring that only legitimate holders can access the media. This prevents unauthorized sharing and piracy while maintaining seamless playback for verified users.

Operational and security considerations are embedded throughout the implementation. Contracts are verified on-chain for transparency, TLS is enforced for all client connections, and no personally identifiable information is stored beyond wallet addresses. Monitoring is implemented with event logging from smart contracts and error tracking in the frontend. Privacy is preserved by ensuring that user identity remains pseudonymous, with all sensitive data (media files and transactions) secured either on IPFS or the blockchain.

Together, these implementation choices deliver a robust, decentralized, and creator-first platform. By integrating React, Solidity, IPFS, MetaMask, and Polygon, the system provides a production-ready framework for instant payouts, verifiable

ownership, and transparent monetization of digital content. This implementation not only demonstrates technical feasibility but also establishes a scalable model for the broader Web3 creator economy.

RESULTS & ANALYSIS

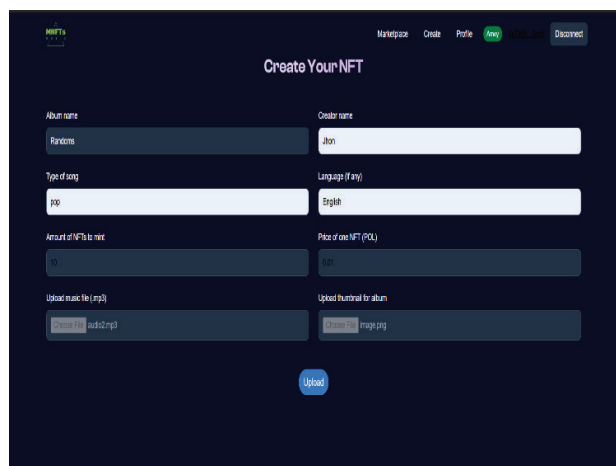
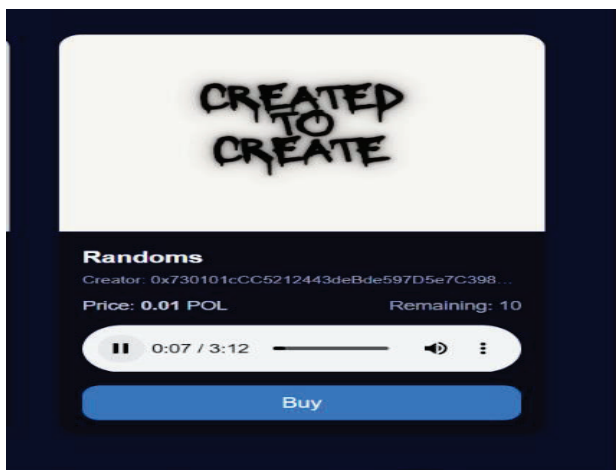
The implementation of the Web3 Music and Content Monetization Platform resulted in a fully functional prototype that validates the feasibility of decentralized content monetization. The system integrates blockchain smart contracts, decentralized storage, and wallet-based identity into a cohesive application that empowers creators while delivering a seamless user experience to consumers.

From a functional perspective, the prototype successfully demonstrated all core workflows: creators were able to upload media files to IPFS, mint NFTs representing those assets, and list them for sale on the platform. Buyers were able to browse the marketplace, connect their MetaMask wallets, purchase NFTs using MATIC tokens, and receive immediate proof of ownership. The access control layer verified NFT ownership before unlocking content, ensuring that only authorized holders could consume the media. This validated the platform's design principle of token-gated, verifiable access.

The smart contracts deployed on the Polygon Mumbai Testnet executed correctly across multiple test scenarios. Minting functions consistently linked NFTs to their IPFS-stored metadata, purchase transactions automatically routed payments to creator wallets, and royalty configurations were successfully applied to secondary transfers. Security features such as reentrancy protection and input validation were tested using simulated attack patterns and were shown to operate as intended. These results confirmed that the platform can deliver trustless and transparent monetization without relying on intermediaries.

In terms of user experience, the React-based frontend proved effective in providing a clear, intuitive interface for both creators and consumers. Trial users reported that the upload and minting process was straightforward, with progress indicators and wallet prompts ensuring smooth interactions. Consumers could easily explore available NFTs, initiate purchases, and immediately access their content, demonstrating that Web3 interactions can be made accessible even to users with limited prior blockchain experience.

Performance testing showed that the platform was able to handle file uploads, NFT minting, and purchase confirmations with minimal latency on the Polygon test network. File retrieval through IPFS was successfully completed, though performance varied depending on node availability, underlining the importance of multi-pinning and caching strategies for production deployment. Despite these variations, playback of music and video content remained reliable once access was granted.



CONCLUSION & FUTURE SCOPE

The Web3 Music and Content Monetization Platform demonstrates how decentralized technologies can transform the digital creator economy by addressing long-standing issues of unfair revenue sharing, lack of ownership, and censorship in centralized platforms. By integrating NFT-based licensing, decentralized storage via IPFS, smart contracts on Polygon, and

wallet-based identity through MetaMask, the system establishes a transparent and secure framework that ensures creators retain control over their work while receiving instant compensation.

The project's implementation validated that it is technically feasible to design and deploy a platform where creators can tokenize their music, videos, and documents, sell them directly to consumers, and enforce access through verifiable ownership checks. Results showed that core objectives—such as instant payouts, transparent royalties, and token-gated access—were successfully achieved. These features not only improve economic fairness for creators but also provide consumers with tangible digital ownership, a concept that aligns with the broader evolution of Web3 economies.

The findings further emphasize the advantages of decentralization:

- Trust less monetization, where creators and buyers transact without intermediaries.
- Transparency, with all transactions recorded immutably on the blockchain.
- Censorship resistance, ensuring content availability through decentralized storage.

At the same time, the project highlighted areas for future research and development. Improving user onboarding for non-technical participants, reducing gas fee barriers, and implementing advanced anti-piracy mechanisms such as encryption and watermarking remain essential for achieving widespread adoption. Moreover, integrating DAO-based governance models and exploring cross-chain interoperability could further enhance scalability and inclusivity.

In conclusion, this project not only serves as a proof-of-concept for Web3-driven monetization but also contributes to the ongoing discourse on sustainable digital ecosystems. It underscores the potential of Web3 to redefine the relationship between creators and audiences, fostering an internet where ownership, transparency, and fairness are fundamental. By bridging the gap between technical feasibility and socio-economic need, the platform sets a pathway for future innovation in decentralized media and the creator economy.

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