



# St. Francis Institute of Technology

## *Department of Computer Engineering*

# Blockchain-based DRM Management System

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# Introduction

- The music industry is confronted with a significant challenge: the need to strike a delicate balance between compensating artists adequately and ensuring accessibility for consumers. Conventional Digital Rights Management (DRM) systems often impose restrictions on user control, impeding fair revenue distribution.
- Our solution harnesses blockchain technology, a secure and transparent distributed ledger, to tackle the shortcomings of existing DRM solutions.
  - Decentralized Control: By eliminating the necessity for a central authority, artists and publishers retain greater autonomy over their content and pricing.
  - Transparent Transactions: All transactions, including purchases, royalties, and ownership records, are immutably recorded on the blockchain, ensuring accountability and traceability.



# Introduction

- Fair Revenue Distribution: Smart contracts automate royalty payments according to predefined rules, ensuring that artists receive their rightful share for each song play or purchase.
- This initiative presents a more equitable and secure music distribution ecosystem. Artists stand to benefit from transparent royalty payments and enhanced control over their content. Consumers gain access to a broader array of music with flexible licensing options. Ultimately, the music industry flourishes on a secure and efficient platform that fosters creativity and innovation.



# Literature Review

Ref	Year	Research Paper Name	Point of Reference	Analysis
1	2020	Innovating in the Music Industry: Blockchain, Streaming and Revenue Capture	Evolution of Music Industry Business Model.[1]	The paper acknowledges the impact of streaming platforms on music consumption patterns, setting the stage for the need to address the outdated royalty distribution system.[1]
			Challenges in Royalty Distribution.[1]	It highlights the disparity in financial benefits, where musicians receive a smaller share compared to middlemen such as platforms, labels, and publishers.[1]
			Results and Challenges.[1]	It indicates that while blockchain technology has the potential to revolutionize royalty distribution, there is a lack of knowledge and interest in its implementation among industry professionals.[1]



# Literature Review

Ref	Year	Research Paper Name	Point of Reference	Analysis
2	2021	Securing music sharing platforms: A Blockchain-Based Approach.	Digital Era Impact on Music Storage.[2]	This paper highlights the shift to digital music storage and the challenges faced by artists due to unauthorized downloading and sharing of their works..[2]
			Blockchain and IPFS Integration for Copyright Protection.[2]	It demonstrates how blockchain and IPFS together ensure copyright protection, file retrieval, and revenue validation..[2]
			Consensus Mechanism and Proof of Stake (PoS).[2]	It discusses the importance of consensus in blockchain networks, particularly PoS in Ethereum, to validate transactions and maintain the integrity of the blockchain..[2]



# Literature Review

Ref	Year	Research Paper Name	Point of Reference	Analysis
3	2023	Blockchain based digital rights management systems: Design principles for the music industry	The paper proposes design principles for blockchain-based DRM systems that provide an integrated and flexible solution by enabling transparent music licensing structures, consistent and complete rights metadata, and efficient and royalty payout. [3]	<p>(1) <b>Store public metadata on a distributed ledger</b> : The evolution to on-demand music streaming, together with the absence of a global rights database, has resulted in the development of complex licensing processes over time, which are error-prone and time-consuming. [3]</p> <p>(2) <b>Validate metadata via a consensus mechanism on a permissioned blockchain</b> : Various organizations in the music industry currently maintain separate databases, leading to inconsistent and incomplete music metadata. [3]</p> <p>(3) <b>Algorithmically enforce royalty payout via stablecoin</b> : Complex licensing structures and dispersed metadata lead to massive delays in the payout of royalties to rights owners, with one billion US dollars annually unallocated. [3]</p>



# Proposed Statement

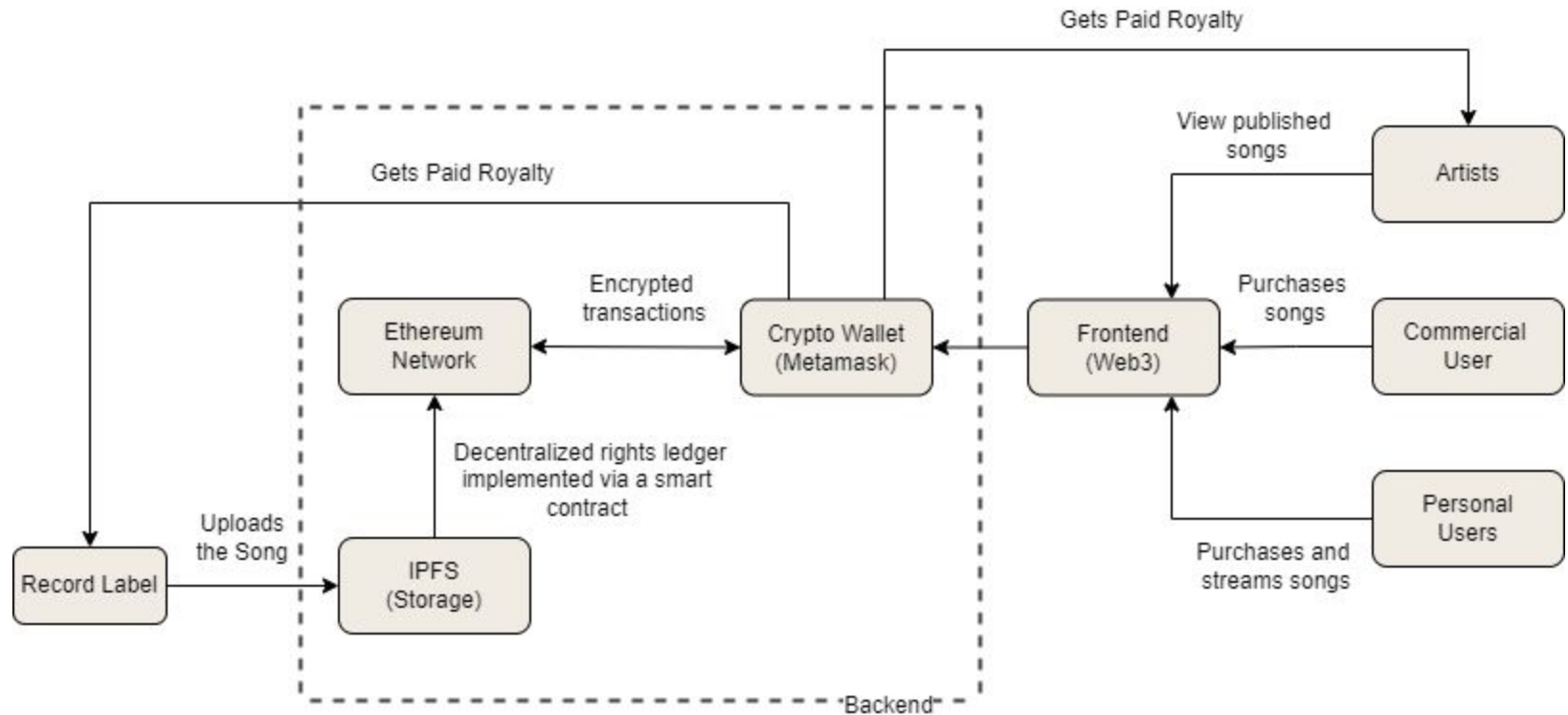
- Current music royalty distribution models lack transparency, leading to unfair artist compensation and limited access for consumers. Our project addresses these issues, introducing a decentralized platform to revolutionize music distribution, ensuring fairness, security, and creativity for all users.
- Features of a blockchain-based DRM system include:
  - Blockchain Security
  - User-Friendly Gateway
  - Content registration
  - Record Label Catalog Management
  - Royalty distribution
  - Smart Contract Automation





# Work Flow of the system

## Block Diagram

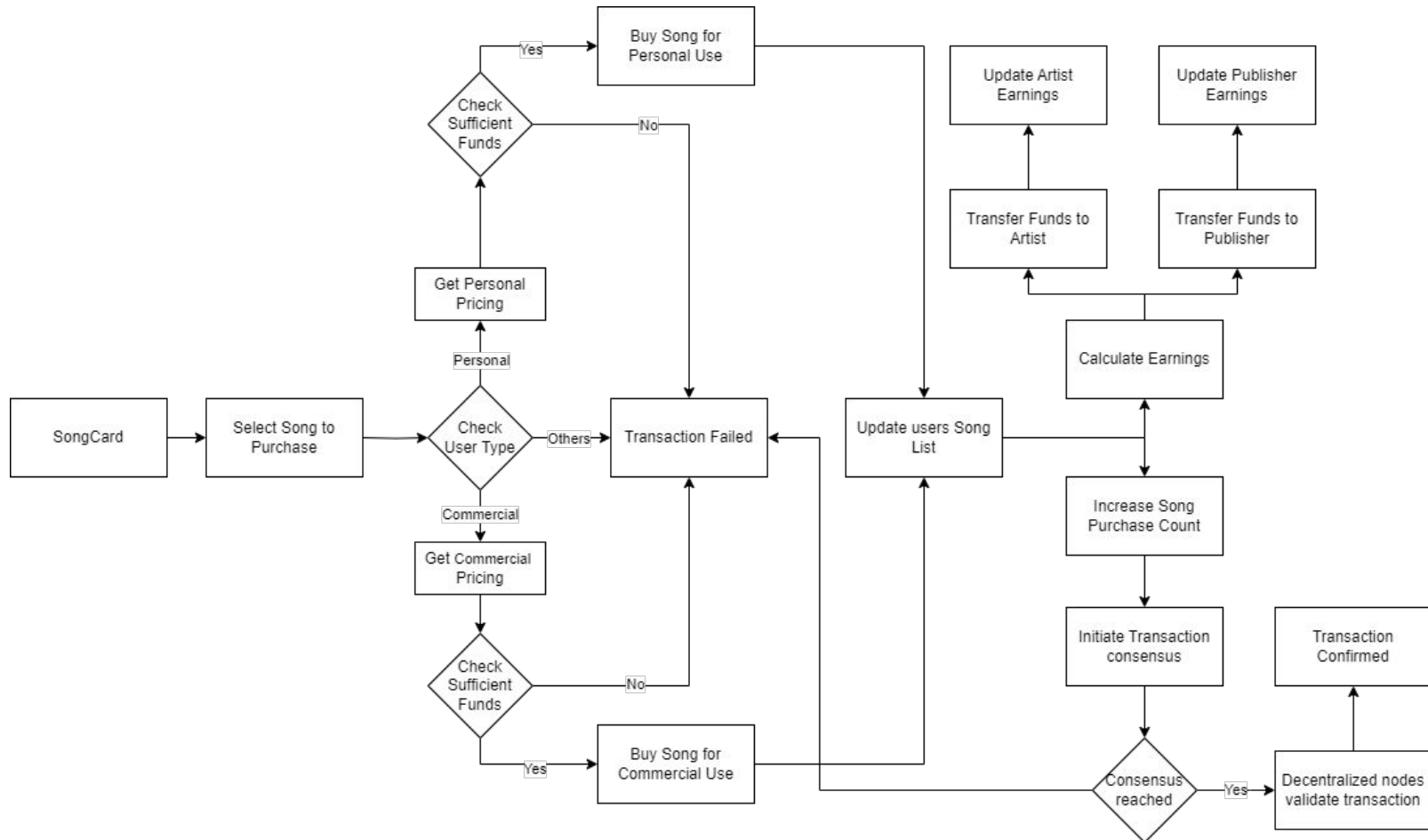


# Experimental Setup

- **Hardware Specifications:**
  - Operating System : Windows 10 or above / Mac OS.
  - RAM : 8GB or above.
  - CPU : Intel core i5 9400F and above.
  - Memory : 250GB SSD.
  - Screen Resolution : 1280 x 800 minimum.
  - Internet : Minimum of 1 Mbps.
- **Software Specifications:**
  - A web browser like google chrome or Microsoft edge.
  - VS Code or other user-friendly interfaces like Komodo IDE, Mobirise.
  - Ganache : A testing blockchain environment.
  - MetaMask or any other cryptocurrency wallet used to interact with the Ethereum blockchain.



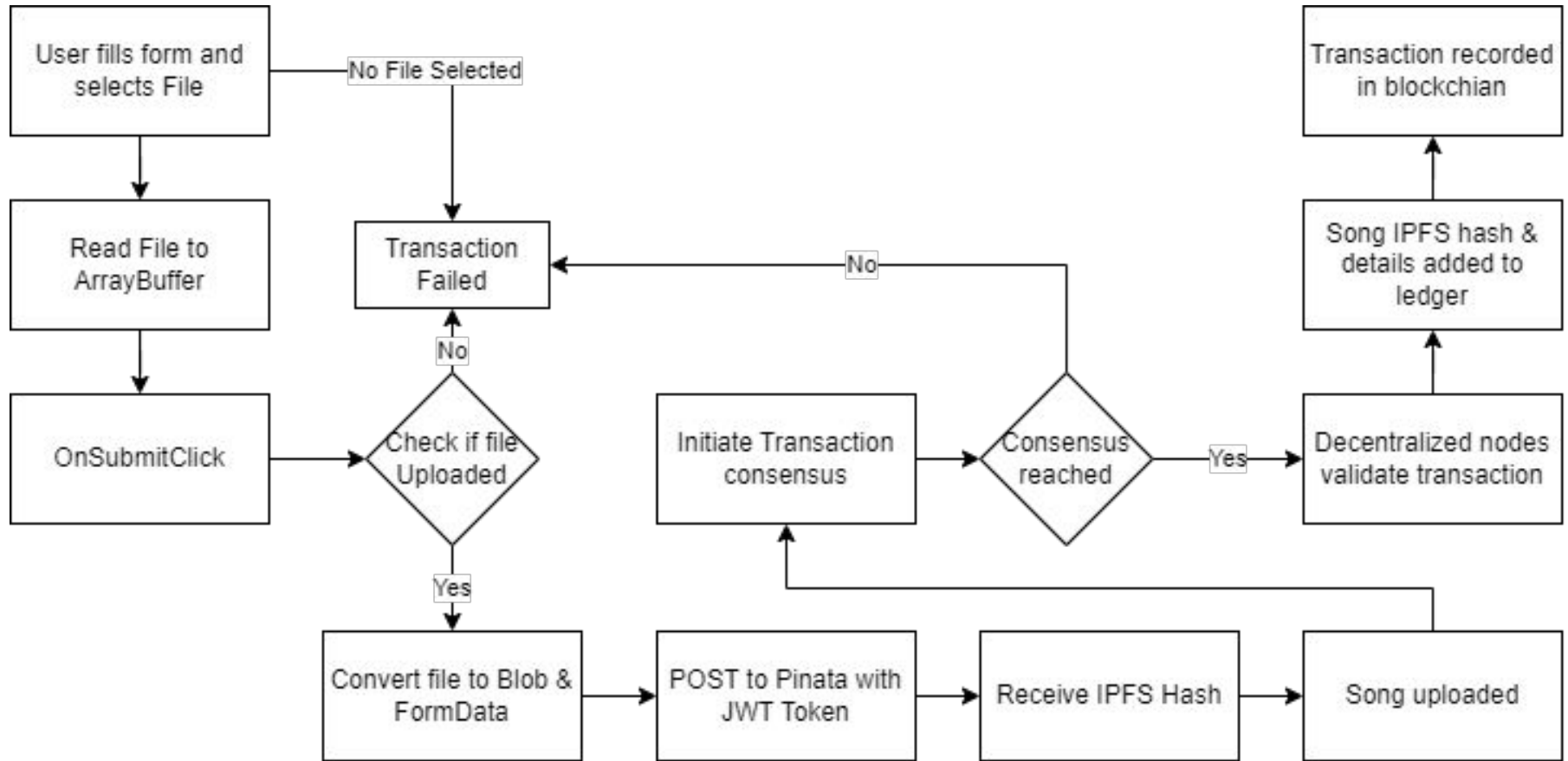
# Results and Discussions



Buy Song Functionality



# Results and Discussions



Add Song Functionality



# Results and Discussions



Personal

Record Label

Artist

Commercial

Username

Register



# Results and Discussions































## Warner Inc.

Record Label ID : 1

Total Songs Sold : 3

Total Earnings : 11.25 ETH

Search by song name...

 Killshot	 Rap	 Eminem	 P 10000	 C 15000	 1	Show Details
 I Wonder	 Pop	 Kanye	 P 15000	 C 17500	 0	Show Details
 Flashing Lights	 Pop	 Kanye	 P 15000	 C 17500	 0	Show Details
 Runaway	 Pop	 Eminem	 P 10000	 C 15000	 0	Show Details
 Heartless	 Pop	 Kanye	 P 15000	 C 17500	 0	Show Details

Add Song +



# Results and Discussions

The image shows a user interface for adding a new song. A central white modal titled 'Add Song' with a music note icon is overlaid on a dark background. The modal contains five input fields with the following values: 'Mockingbird', 'Rap', '15000', '20000', and '75'. Below these fields is a file upload icon (a document with an upward arrow) and a '1,2' label. At the bottom of the modal is a black 'Publish' button. The background interface is dimmed, showing a search bar with the text 'Search by song name...', a list of songs on the left (Runaway, Heartless, Rap God, Godzilla) with their genres (Pop, Rap), and a list of details on the right with 'Show Details' buttons.

**Add Song**

Mockingbird


Rap

15000

20000

75

1,2



Publish

Search by song name...

Runaway Pop

Heartless Pop

Rap God Rap

Godzilla Rap

Show Details

Show Details

Show Details

Show Details



# Results and Discussions

 Warner Inc.

Publisher ID : 1

Total Songs Sold : 0

Total Earnings : 0 ETH

 Rap God

 Rap

 Eminem

 P 15000

 C 20000

 0

Show Details

 Godzilla

 Rap

 Eminem & Kanye

 P 15000

 C 17500

 0

Show Details

Add Song 






# Results and Discussions


Blockus































Library

Store

 Ashwin


Personal ID: 1

 Store


 Killshot	 Rap	 Eminem	 Warner Inc.	 10000	
 I Wonder	 Pop	 Kanye	 Warner Inc.	 15000	
 Flashing Lights	 Pop	 Kanye	 Warner Inc.	 15000	
 Runaway	 Pop	 Eminem	 Warner Inc.	 10000	
 Heartless	 Pop	 Kanye	 Warner Inc.	 15000	




























# Results and Discussions

 Ashwin

Personal ID: 1

 Store

 Killshot	 Rap	 Eminem	 Warner Inc.	 1000
 I Wonder	 Pop	 Kanye	 Warner Inc.	 1500
 Flashing Lights	 Pop	 Kanye	 Warner Inc.	 1500
 Runaway	 Pop	 Eminem	 Warner Inc.	 1000
 Heartless	 Pop	 Kanye	 Warner Inc.	 1500

Library

Store

MetaMask

Ganache

Personal - Ashwin → 0x9f82f...1C1E3

http://localhost:3000

0x9f82f...1C1E3 : BUY SONG

10 ETH

DETAILS HEX


Estimated fee 0.0035951  
0.0035951 ETH  
Site suggested -16 sec Max fee: 0.0035951 ETH  
Fee details

Total 10.0035951  
10.0035951 ETH  
Amount + gas fee Max amount: 10.0035951 ETH

Reject Confirm



# Results and Discussions

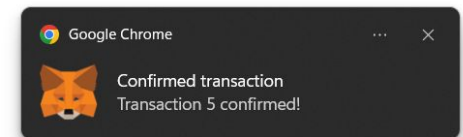
 Ashwin  
Personal ID: 1

 Library



Library

Store



# Results and Discussions




















 **Eminem**

Artist ID : 1

Totals Songs sold : 1

Total Earnings : 7.5 ETH

Search by song name...

 Killshot	 Rap	 Warner Inc.	 P 10000	 C 15000	 1	Show Details
 Runaway	 Pop	 Warner Inc.	 P 10000	 C 15000	 0	Show Details
 Rap God	 Rap	 Warner Inc.	 P 15000	 C 20000	 0	Show Details
 Godzilla	 Rap	 Warner Inc.	 P 15000	 C 17500	 0	Show Details



# Results and Discussions

 Eminem


Artist ID : 1

Totals Songs sold : 1

Total Earnings : 7.5 ETH

Search by song name...

Hide Details


 Song Name: Killshot

 Artist Name: Warner Inc.

 Genre: Rap


 Total Earned: 18750 mETH

 Personal Cost: 10000 mETH


 Personal Licenses: 1


 Commercial Cost: 15000 mETH

 Commercial Licenses: 0

 Runaway

 Pop

 Warner Inc.

 P 10000


 C 15000


 0





















Show Details



# Results and Discussions

 **Wedding Events Inc.**  
Commercial ID: 1

 **Store**

 Flashing Lights	 Pop	 Kanye	 Warner Inc.
 Runaway	 Pop	 Eminem	 Warner Inc.
 Heartless	 Pop	 Kanye	 Warner Inc.
 Rap God	 Rap	 Eminem	 Warner Inc.
 Godzilla	 Rap	 Eminem & Kanye	 Warner Inc.

Library

Store


MetaMask

Ganache

Commercial - ... → 0x9f82f...1C1E3

https://www.weddingeventsinc.com

0x9f82f...1C1E3 : BUY SONG ⓘ

 17.5 ETH

DETAILS HEX

Estimated fee

0.00366508

**0.00366508 ETH**

Site suggested -15 sec

Max fee: 0.00366508 ETH

Fee details ▾

Total

17.50366508

**17.50366508 ETH**

Amount + gas fee

Max amount: 17.50366508 ETH

Reject

Confirm



# Results and Discussions

 Wedding Events Inc.


Commercial ID: 1

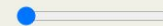
 Library

 Godzilla

 Rap

 Eminem & Kanye

 Warner Inc.




Library


Store























# Results and Discussions

 **Growels Mall**

Commercial ID: 2

 **Store**

Search songs...




 Flashing Lights	 Pop	 Kanye	 Warner Inc.
 Runaway	 Pop	 Eminem	 Warner Inc.
 Heartless	 Pop	 Kanye	 Warner Inc.
 Rap God	 Rap	 Eminem	 Warner Inc.
 Godzilla	 Rap	 Eminem & Kanye	 Warner Inc.

Library




Store

Select an account




Search accounts

 **Artist - Eminem** 114.059 ETH :  
 0x750de...6267C  114.059 ETH  




Imported

 **Artist - Kanye** 106.559 ETH :  
 0xd5600...d37DB  106.559 ETH  

Imported


 **Commercial - Event** 82.494 ETH :  
 0xab9BE...7e62b  82.494 ETH  

Imported

 **Commercial - Mall** 99.998 ETH :  
 0xEc59b...160b3  99.998 ETH  

Imported

Hidden accounts


2 

+ Add account or hardware wallet








# Results and Discussions


 **Growels Mall**


Commercial ID: 2

 **Library**

 Godzilla

 Rap


 Eminem & Kanye


 Warner Inc.


Library


Store


Select an account

 0x750de...6267C 120.622 ETH  
Imported

 Artist - Kanye 113.122 ETH  
0xd5600...d37DB 113.122 ETH  
Imported

 Commercial - Event 82.494 ETH  
0xab9BE...7e62b 82.494 ETH  
Imported

 Commercial - Mall 82.495 ETH  
0xEc59b...160b3 82.495 ETH  
Imported

 Hidden accounts 2

+ Add account or hardware wallet



# Conclusion

- The Blockchain-Based DRM Management System represents a significant advancement in addressing the complex challenges of the modern music industry through blockchain technology.
- Its implementation ensures transparency, security, and efficiency in managing digital rights, royalties, and music licensing, benefiting artists, record labels, users, and commercial entities.
- The system's use of smart contracts automates royalty payments, ensuring fair compensation for stakeholders and improving the efficiency of the music ecosystem.
- Future enhancements should focus on addressing scalability, processing times, legal implications, and user verification to ensure the system's effectiveness and integrity in real-world applications.



# References

- [1] Moreira, Maria Alice Bosseljon Roche. Innovating in the music industry: Blockchain, Streaming & Revenue Capture. Diss. (2020)
- [2] Adjei-Mensah, Isaac, et al. "Securing music sharing platforms: A Blockchain-Based Approach." arXiv preprint arXiv:2110.05949 (2021).
- [3] Ciriello, R.F., Torbensen, A.C.G., Hansen, M.R.P. et al. Blockchain-based digital rights management systems: Design principles for the music industry. Electron Markets 33, 5 (2023).



# References

[4] Pastukhov, Dmitry. "Soundcharts | Market Intelligence for the Music Industry." *Soundcharts.com*, 20 Nov. 2019, [www.soundcharts.com/blog/how-the-music-publishing-works](http://www.soundcharts.com/blog/how-the-music-publishing-works). Accessed 24 Oct.2023.

[5] "Blockchain: Forging the Future of Asset Management." BDO, 17 Aug. 2020, [www.bdo.com/insights/industries/financial-services/blockchain-forging-the-future-of-asset-management](http://www.bdo.com/insights/industries/financial-services/blockchain-forging-the-future-of-asset-management). Accessed 24 Oct. 2023.

