UNIPASS: A TICKETING SYSTEM

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Abstract: The blockchain-based NFT ticketing system represents a groundbreaking solution for the event ticketing industry, offering unparalleled security and transparency. By utilizing blockchain technology and Non-Fungible Tokens (NFTs), it effectively addresses longstanding issues such as ticket fraud and scalping. Each event ticket is uniquely represented as an NFT on the blockchain, ensuring complete transparency and tamper-proof ownership and transfer. This innovative approach streamlines the ticketing process for users while preventing unauthorized resale, guaranteeing that only legitimate ticket holders gain access to events. Notably, the system enhances the overall user experience by enabling secure ticket purchases using cryptocurrencies, seamless ticket transfers, and refund requests within predefined parameters. Additionally, feedback and ratings for events are securely recorded on the blockchain, fostering trust between event organizers and attendees. Ultimately, the blockchain-based NFT ticketing system is revolutionizing event ticketing by instilling a new era of trust, integrity, and convenience in the industry.

Index Terms **- Blockchain, Event, NFT, Smart contract, Ticket.**

I. INTRODUCTION

The Block-chain-Based NFT Ticketing System marks a significant advancement in event ticketing, addressing longstanding issues like counterfeit tickets and scalping. It introduces an innovative approach that utilizes blockchain technology and Non-Fungible Tokens (NFTs) to transform the ticket distribution and management process. By emphasizing decentralization, transparency, and immutability, the system aims to provide secure and reliable solutions to the challenges faced by the ticketing industry. Through the issuance of unique NFTs for each ticket, it streamlines the ticketing process and ensures a secure chain of ownership, preventing unauthorized resale and ensuring that only legitimate ticket holders can access events. Additionally, the system integrates with the growing cryptocurrency ecosystem, enabling attendees to securely purchase tickets and facilitating easy and secure ticket transfers.

With a focus on improving the user experience, the system also allows for refunds within predefined constraints and collects event feedback directly on the blockchain. This innovative approach not only represents a significant technological advancement but also heralds a transformative era in event participation, fostering trust and convenience for all stakeholders. Moreover, the system has the potential to reshape event organizers' business models by reducing fraud and providing valuable data for decision-making. By leveraging the transparent and automated nature of blockchain technology, organizers can make informed decisions regarding pricing, capacity planning, and marketing strategies, ultimately enhancing their relationship with audiences and offering personalized experiences. Overall, the Block-chain-Based NFT Ticketing System promises to revolutionize the event industry by enhancing efficiency and fostering innovation.

II. REVIEW OF LITERATURE STUDY

Er. Ompal, Rahul kumar, Suryansh Gautam, Suyash Srivastava, Yash Raj Singh [1]. The research paper on the Blockchain-Based NFT Ticketing System introduces a transformative solution for the event ticketing industry. Leveraging blockchain technology and Non-Fungible Tokens (NFTs), the system addresses longstanding issues such as ticket fraud and scalping. By representing each event ticket as a unique NFT on the blockchain, the system ensures transparent and tamper-proof ownership, simplifying the ticketing process while preventing unauthorized resale.

Sapna Rangari, Anshul Thakre, Aniket Potbhare, Shreyash Gajbhiye, Prince Wasnik [2]. The research paper offers an in-depth analysis of the application and impact of QR codes in online reservation systems. It explores the growing significance of QR codes across various sectors, highlighting their role in enhancing the efficiency and convenience of reservations. The paper discusses their deployment in contexts such as restaurant bookings, travel reservations, and event ticketing, providing insights into the technical aspects of QR code implementation and considerations related to security and privacy.

Punyaslok Sarkar, Sherly Noel [3]. This paper presents a comprehensive project aimed at developing an efficient and user-friendly platform for online ticket reservations in various domains. The project encompasses essential components such as user authentication, secure payment processing, real-time availability updates, and potentially QR code integration for enhanced ticket validation.

P. Suresh, B. Muni Archana [4]. With air travel being a predominant mode of transportation, the fierce competition among airlines has led to discounts and added luxuries for customers, making the online reservation process increasingly popular. Leveraging the ever-expanding reach of the World Wide Web, this research project aims to create an efficient Online Flight Tickets Booking System, allowing travelers to access all flight information, including timings and costs, in one convenient location.

Ranjana Singh, Prajwal Choudhari, Abhishek Kolte, Nikshay Jain [5]. The Cloud-Based M-Ticket Booking System is a user-friendly platform designed for the convenient booking of train and bus tickets. The system provides real-time updates and notifications to minimize the risk of double bookings and enhance the booking experience. Operating from the cloud, it grants users the flexibility to book tickets anytime and anywhere, eliminating the need for physical ticket offices and long queues.

Amjad Aldweesh [6]. The paper discusses the growing issues of copyright violation in digital subscription services, particularly electronic ticketing (E-ticketing). Traditional E-ticketing systems, due to their centralized nature, incur significant costs and privacy concerns. To address these challenges, the paper introduces a blockchain-based E-ticketing framework. This blockchain model eliminates third-party involvement, enhances data security, and preserves user privacy by separating credential information from financial transactions.

Nan Hao [7]. The paper explores the innovative application of proof-of-work, a foundational technology in public blockchains, to the train ticket market, aiming to enhance the security of the ticketing system. Focusing on China's internet train ticketing system, the paper evaluates internal and external security threats and devises a proof-of-work-based algorithm. It adapts the algorithm to address various challenges, including geographical distinctions, credit rating considerations, and system load variations.

Yohanes Priadi Wibisono, Clara Hetty Primasari, Saverius Rischo Setyo Kurniawan [8]. This research delves into the challenges of organizing events within both commercial and non-commercial organizations, with a specific focus on the context of universities, exemplified by Universitas Atma Jaya Yogyakarta. The study underscores the resource-intensive and somewhat inefficient nature of event organization, which includes tasks like marketing, registration, ticketing, participant validation, and certificate distribution.

Aji Nugraha, Debby Ratna Daniel, Anak Agung Gde Satia Utama [9]. Running a multi-sport event presents the need for an efficient accounting information system for ticket sales, which not only streamlines the process but also minimizes the risk of fraudulent activities. The case study from the 18th Asian Games in 2018 revealed issues related to ticket sales facilities, such as vendor diversion and challenges in ensuring spectators' rights matched their purchased tickets, leading to problems like false seats and unauthorized access to arenas.

Shi-Cho Cha, Wei-Ching Peng, Tzu-Yang Hsu, Chu-Lin Chang, Shang-Wei Li [10]. This study introduces the concept of a privacy-preserving Blockchain-Based Ticketing Service (BB Tickets) to address issues related to event ticketing. BB Tickets utilizes blockchain technology to store event and ticket information, ensuring data integrity. By leveraging this technology, ticket buyers can verify the authenticity of their purchased tickets and address disputes.

Tralyn Le, Yoohwan Kim, Ju-Yeon Jo [11]. The paper introduces a blockchain-based reseller system designed to ensure product ownership, prevent unauthorized reselling, and guarantee secure ownership transfer. This system employs a mutual collateral method to deter dishonest behavior by both sellers and buyers. Built on the Ethereum blockchain, it utilizes ERC-721 tokens to define the products being traded. Sellers are required to verify their identity through a valid MetaMask account and pay an initial registration fee.

Hongkai Wang, Yiyang Yao, Qitong Hou, Xiaoyi Wang, Lei Zeng, Weiwei Qiu, Dong He, Qiang Wang [12]. This paper introduces a novel work ticket system built on blockchain technology, focusing on employee identity authentication, trustworthy work ticket status management, and precise authority control. Notably, it enables users to have full control over their private keys, stored locally, thus mitigating the risk of large-scale information leaks.

J. D. Preece, J. M. Easton [13]. The paper presents a block-chain based digital ticketing platform that utilizes IBM's (International business Machine Corporation) Hyper-ledger Fabric to distribute tickets among organizations, offering flexible payment options and the potential to eliminate paper ticketing.

Sina Rafati Niya, Simon Bachmann, Claudio Brasser, Michael Bucher, Nicholas Spielmann, Burkhand Stiller [14]. The paper addresses the challenges associated with electronic event ticket counterfeiting, profiteering, and the emergence of black markets. To counter these issues, the study introduces a Decentralized Ticketing platform known as DeTi. DeTi employs Ethereum's Smart Contracts to offer dedicated service management features, enabling users to verify the authenticity of event tickets. It also introduces a novel mechanism to detect fraudulent events.

S.A. Jayalath, Chathura Rajapakse, J. M. D. Senanayake [15]. This study highlights the crucial role of ticketing mechanisms in public transportation systems and the challenges posed by traditional online payment methods, which are often unsuitable for micropayments due to minimum transaction requirements set by transaction processing companies. To address this issue, the study proposes an Ethereum-based micro-transaction model for implementation in Sri Lanka's public transport sector, specifically in bus ticketing. In this model, bus tickets are transformed into Ethereum smart contracts to manage payment distribution.

III. METHODOLOGY

The NFT-based ticketing system leverages blockchain technology to establish a transparent and secure ecosystem for managing event tickets. Within this framework, various entities including ticket issuers, buyers, and event staff interact seamlessly, ensuring the authenticity and traceability of each ticket transaction. At the core of the system lies the deployment of smart contracts on the Ethereum blockchain. These contracts govern the creation, issuance, and transfer of NFT tickets, providing a robust foundation for ticket management. Integration with MetaMask, a widely used Ethereum wallet browser extension, enables users to securely interact with the blockchain and sign transactions. Ticket creation and issuance are facilitated through a user interface accessible to ticket issuers, allowing them to specify event details and generate unique NFT tickets. Buyers can then browse available events, select desired tickets, and make purchases directly through the platform, with MetaMask handling payment processing securely. To ensure seamless entry into events, each NFT ticket is embedded with metadata and a QR code upon purchase. Venue staff can scan these QR codes to verify ticket authenticity, leveraging blockchain records for validation. Furthermore, ticket holders have the flexibility to transfer their NFT tickets to others, facilitated by smart contract functions and MetaMask integration. This allows for secure and transparent ticket transfers between users. Thorough testing, including smart contract functionalities and user interface interactions, is conducted to ensure the system's robustness. Security audits are also performed to identify and mitigate potential vulnerabilities, bolstering the platform's resilience against threats. Documentation and reporting play a crucial role in capturing project milestones, challenges, and lessons learned throughout the development lifecycle. User guides and tutorials are created to facilitate user adoption and ensure a smoot experience for all stakeholders involved.

3.1 Smart Contracts:

These contracts are immutable and tamper-proof once deployed on the blockchain, providing trust and security to parties involved in the agreement. Smart contracts are a key feature of blockchain technology and find applications in various fields such as finance, supply chain management, real estate, and more.

3.1.1 Event Contract:

Defines roles and permissions for entities involved in event management. Functions include event creation, updating, and deletion. Handles event emissions for these actions.

3.1.2 Ticket Contract:

Manages ticket creation, issuance, and validation. Handles events for ticket transactions.

Transaction Contract:

Facilitates secure transactions between entities. Handles event emissions for transactional activities. Define a standardized event structure for various transactions. Emit events in smart contract functions.

3.2 Integration with MetaMask and Ethereum:

Develop integration with MetaMask, a browser extension for interacting with the Ethereum blockchain. Utilize Web3.js library to connect the front-end interface with MetaMask, enabling users to sign transactions and interact with smart contracts securely.

3.2.1 Ticket Purchase and Blockchain Transactions:

Enable ticket buyers to browse available events and select desired tickets through a user-friendly interface. Integrate MetaMask for payment processing, allowing users to purchase tickets using Ether (ETH) or other cryptocurrencies directly from their Ethereum wallet.

3.2.2 QR Code Scanning for Entry:

Generate QR codes for each ticket upon purchase, embedding ticket metadata such as event details and ticket ID. Develop a QR code scanning feature at event entry points, allowing venue staff to verify ticket authenticity by matching scanned QR code data with blockchain records.

3.2.3 Ticket Transfer and Ownership:

Implement a transfer function in the ticket contract to facilitate secure and transparent ticket transfers between users. Utilize blockchain transactions to transfer ticket ownership, ensuring authenticity and traceability.

3.2.4 UI Development and Database Integration:

Develop web-based dashboards for event organizers, ticket buyers, using technologies like ReactJS and Tailwind CSS. Using databases to store event details, and ticket information.

3.3 Integration with React App:

Develop a React app for ticket buyers to browse events, purchase tickets, and access event information on the go. Integrate with Web3.js library to interact with smart contracts from the web app, enabling seamless ticket transactions.
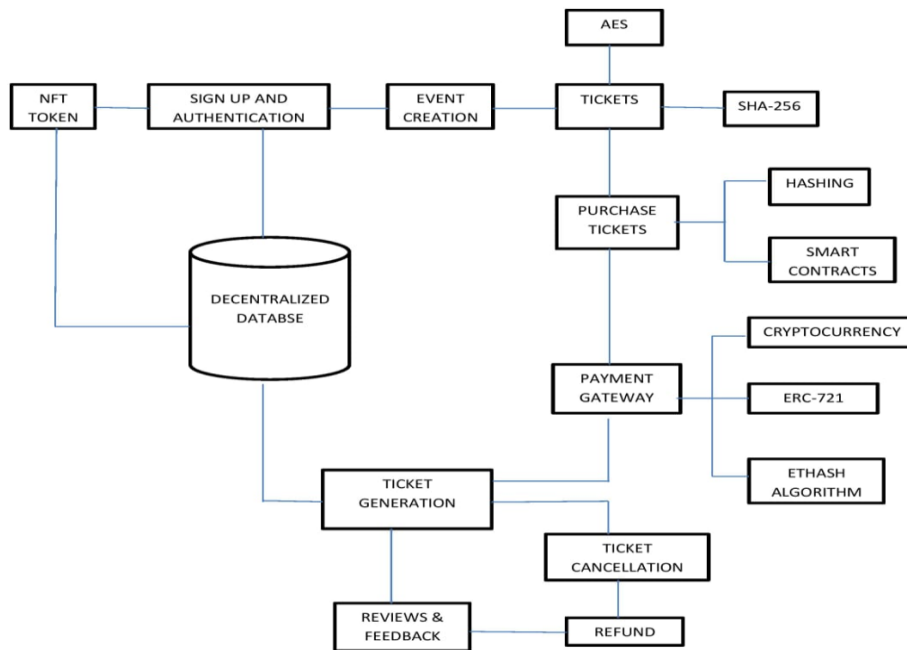
IV. DESIGN DETAILS:

Fig. 1: Block Diagram

The block diagram for an NFT-based ticket system outlines the key steps involved in managing event tickets using blockchain technology. Initially, event organizers create events within the system, detailing event specifics such as date, venue, and ticket types. Users then purchase tickets through the platform, selecting desired options and completing transactions, possibly using cryptocurrency via MetaMask. Upon purchase, users receive unique NFT-based tickets, each associated with a QR code for entry. Attendees can scan these QR codes at the event venue for admission. Additionally, users have the flexibility to transfer their tickets to others securely. This process ensures that ownership of NFT tickets is accurately recorded and managed on the blockchain, providing transparency and security throughout the ticketing lifecycle.

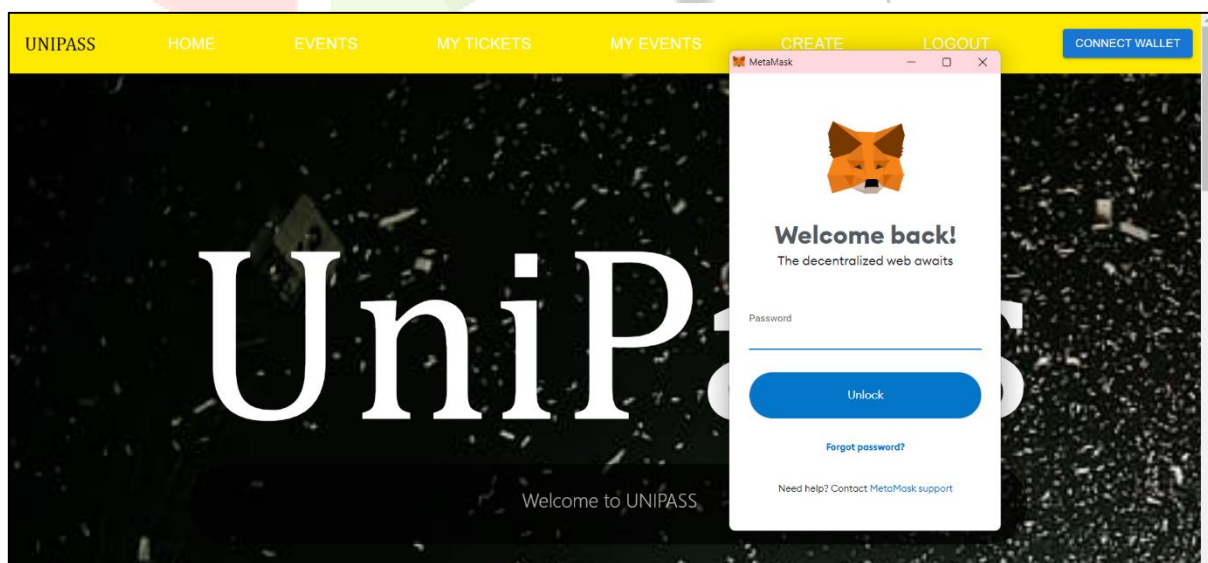## V. IMPLEMENTATION RESULTS:

Fig 5.1: Home page with MetaMask connection

The Figure 5.1 shows the home page of the project which consist of tabs like home, events, my tickets, create event, log out and connect with wallet. It also shows the MetaMask wallet connectivity. It helps users to use cryptocurrency to purchase tickets.

Fig 5.2: Create Event Page

The Figure 5.2 shows the Create Event page of the project which allows users to create an event according to them. User can add event name, description, number of tickets which will be available for event, set price of tickets, and add a image for an event. Events created will be saved in the Events page where the general public can buy tickets.

Fig 5.3: Event Ticket Page

The Figure 5.3 shows the digital ticket can be purchased by the user. User can simply select the number of tickets and click on buy option to purchase them. The payment will be done through MetaMask wallet using Ethereum cryptocurrency.

VI. CONCLUSION:

In conclusion, the emergence of the NFT-based ticketing system marks a significant advancement in the realm of event management. By leveraging blockchain technology and Non-Fungible Tokens (NFTs), this innovative system addresses long-standing issues such as ticket fraud, scalping, and inefficient distribution. Through the creation of unique NFTs for each ticket, the system ensures transparency, security, and tamper-proof solutions, thus instilling trust among event organizers and attendees alike. Moreover, the integration of cryptocurrency payments, seamless ticket transfers, and automated refund mechanisms enhance the overall user experience, ushering in a new era of convenience and accessibility. The NFT-based ticketing system holds promise for revolutionizing the event industry, offering organizers newfound efficiency and opportunities for growth in the digital age. By combining blockchain's security and NFTs uniqueness, the system ensures the authenticity of tickets and offers a sustainable, eco-friendly solution.

REFERENCES

[1] Er. Ompal, Rahul kumar, Suryansh Gautam, Suyash Srivastava, Yash Raj Singh, "Block chain based NFT ticketing system", International Journal of Research publication and Reviews, 2023.

[2] Sapna Rangari, Anshul Thakre, Aniket Potbhare, Shreyash Gajbhiye, Prince Wasnik, "A literature review on online reservation system using "Qr-code", International Research Journal of Modernization in Engineering Technology and Science, 2023.

[3] Punyaslok Sarkar, Sherly Noel, "A project on online ticket booking system.", International Research Journal of Engineering and Technology, 2020.

[4] A. P. Suresh, B. M. Archana, "Online Flight Tickets Booking System.", IJIRT, 2018.

[5] Ranjana Singh, Prajwal Choudhari, Abhishek Kolte, Nikshay Jain, "M-ticket booking system", IJIRMPS, 2023.

[6] Amjad Aldweesh, "Block Ticket: A framework for electronic tickets based on smart contract.", Universiti Teknologi Malaysia, 2023.

[7] Nan Hao, "Ticket Market Design Based on Permission less Block-chain", IEEE, 2018.

[8] Yohanes Priadi Wibisono, Clara Hetty Primasari, Saverious Rischo Setyo Kurniawan, "Analysis of Event Marketing, Registration, and Ticketing Digitalization", ResearchGate, 2020.

[9] Aji Nugraha, Debby Ratna Daniel, Anak Agung Gde Satia Utama, "Improving multi-sport event ticketing accounting information system design through Implementing RFID.", ResearchGate, 2021.

[10] Shi-Cho Cha, Wei-Ching Peng, Tzu-Yang Hsu, Chu-Lin Chang, Shang-Wei Li, "A Block-chain based Privacy Preserving Ticketing Service.", International Journal of Production Research, 2018.

[11] Tralyn Le, Yoohwan Kim, Ju-Yeon Jo, "Implementation of a Block-chain-Based Event Reselling System.", IEEE, 2019.

[12] Hongkai Wang, Yiyang Yao, Qitong Hou, Xiaoyi Wang, Lei Zeng, Weiwei Qiu, Dong He, Qiang Wang, "Design of Work Ticket System and Scheduling Algorithm based on Block-chain.", IEEE, 2020.

[13] J. D. Preece, J. M. Easton, "Block-chain Technology as a Mechanism for Digital Railway Ticketing.", IEEE, 2019.

[14] Sina Rafati Niya, Simon Bachmann, Claudio Brasser, Michael Bucher, Nicholas Spielmann, Burkhand Stiller, "DeTi: A Decentralized Ticketing Management Platform.", ResearchGate, 2022.

[15] S.A. Jayalath, Chathura Rajapakse, J. M. D. Senanayake, "A micro-transaction model based on block-chain technology to improve service levels in public transport sector",IEEE, 2020.