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Developing and Putting into Practice a Secure Chat App for Message Integrity using Blockchain Technology

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Abstract

Because online messaging platforms are expanding so quickly, secure communication has become a crucial component of contemporary digital systems. Conventional chat programs usually rely on centralized servers, which can result in security problems like message manipulation, illegal access, and data breaches. The design and implementation of a blockchain-based secure chat application that guarantees dependable and tamper-resistant user communication is presented in this work in order to address these issues. To preserve the validity and integrity of messages sent inside the platform, the suggested method incorporates blockchain technology. It is very impossible to change or manipulate previously transmitted data because each message is linked to a cryptographic hash and preserved in a blockchain structure. The fast expansion of online messaging platforms has made secure communication a crucial component of contemporary digital systems. Conventional chat programs usually depend on centralized servers, which can result in security problems like message manipulation, illegal access, and data breaches. This work covers the design and implementation of a blockchain-based secure chat application that guarantees dependable and tamper-resistant user communication in order to address these issues. In order to preserve the validity and integrity of messages sent inside the network, the suggested method incorporates blockchain technology. It is very impossible to change or manipulate previously sent data because each message is linked to a cryptographic hash and kept in a blockchain structure.

Keywords
Blockchain, Secure Chat Application, Message Integrity, Decentralized Communication, Cryptographic Hashing, Secure Messaging System, Django Web Framework, Data Security, Tamper-Proof Communication, Blockchain Verification.

I. Introduction

With messaging apps playing a vital role in both personal and professional contacts, digital communication has become an essential component of daily life in recent years. However, the majority of conventional messaging systems use centralized designs, in which a single server stores and manages all data. Data breaches, illegal access, and possible message manipulation are just a few of the security dangers brought on by this centralized system. Ensuring the privacy, authenticity, and integrity of communication has become a major concern for both individuals and enterprises as cyber threats continue to grow. Blockchain technology has become a viable way to deal with these security issues. Blockchain is a distributed, decentralized ledger system that stores data in a series of blocks that are protected by cryptography. Transparency and immutability are ensured because once data is entered into the blockchain, it is very difficult to change or remove. Due to these features, blockchain technology is being investigated more and more for uses other than cryptocurrencies, such as secure communication networks. The creation of a blockchain-based chat program intended to offer safe and impenetrable communication is the main goal of this study. The suggested solution incorporates blockchain techniques to confirm message integrity and guarantee that user communication is reliable. Every message sent via the program is recorded in a blockchain

structure and connected with a cryptographic hash, enabling users to confirm whether the content has been changed after transmission.

II. Problem Statement

Conventional messaging systems have a number of security flaws, such as message manipulation, centralized data storage, and opaque communication procedures. Users of many messaging apps are unable to confirm whether their communications have been intercepted or changed. A secure communication platform that guarantees message integrity, authenticity, and privacy is thus required. In order to provide decentralized message storage and verification procedures that improve security and trust in digital communication, a blockchain-based solution is necessary.

III. Methodology

The goal of the suggested blockchain-based secure chat program is to guarantee safe and impenetrable user communication. To preserve communication integrity and transparency, the solution combines blockchain technology with an online messaging platform. The suggested system's technique is divided into multiple phases that explain the creation, processing, storing, and verification of communications. User registration is the first step in the process, where new users create an account by entering their username, password, and other necessary information. After registering, users can use their login credentials to access the system through a secure authentication procedure that makes use of the Django framework.

Users can interact in real time with other registered users using the chat interface after successfully logging in. The system uses the backend server to process messages sent by users. At this point, hashing methods are used to create a cryptographic hash value for the message. This hash guarantees that the message content may be checked at a later time to find any illegal changes. After that, the hash is put in the blockchain structure as a component of a block. The message data, timestamp, current hash value, and hash of the previous block are all included in each block. By creating a continuous chain of blocks, this linking method renders the stored data unchangeable and impervious to manipulation.

A message integrity checking method is also part of the system. The system recalculates the hash value and compares it with the hash stored on the blockchain when retrieving a message. The message is verified to be genuine and unaltered if both values match. The system flags the message as possibly manipulated if the values are different. The program also offers an administrative feature that lets administrators control registered users and keep an eye on user activity. This aids in keeping the platform under appropriate supervision and management.

IV. Screens of this study

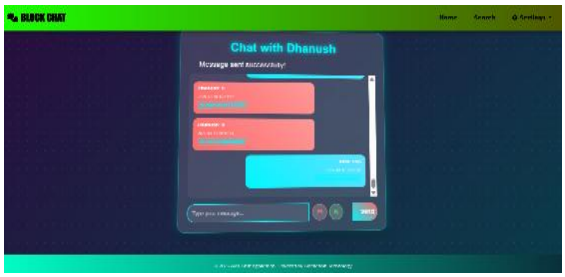

Fig: Message Integrity Verification and a Secure Chat Interface

The blockchain-based chat application's main chat interface, which allows users to communicate in real time, is depicted in the figure. Conversations between users are shown on the interface, along with timestamps that show when each message was sent. Users can use a unique tool called "Verify Message Integrity" to see if the message has been changed after it has been sent. Blockchain-based hashing algorithms are used by this verification process to guarantee the legitimacy of stored messages. The UI offers an easy-to-use setting for transparent and safe communication.

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Fig: Interface for the Admin Dashboard

The blockchain-based chat application's admin dashboard is seen in this illustration. Administrators can effectively monitor and control the system thanks to the dashboard. Administrators can monitor registered users and keep control of the platform with this interface. The dashboard preserves blockchain-based security measures while offering a centralized view of the application's operations. The chat platform's safe operation and appropriate system management are made possible by this administrative feature.

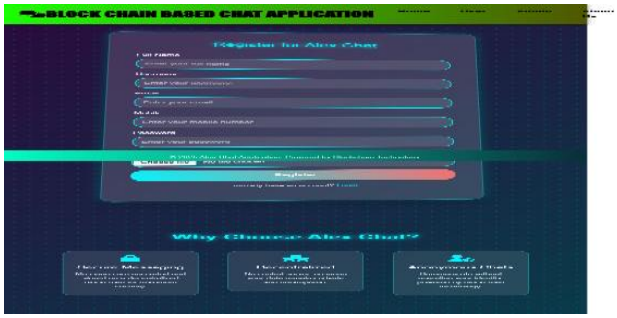

Fig: Interface for User Registration

The User Registration Page, where new users can register for an account in the chat program, is depicted in the figure. Important details including complete name, username, email address, mobile number, and password are gathered by the registration form. Following a successful registration, this data is safely kept in the database. New users can access the chat platform and interact with other registered users by completing the registration process. A seamless onboarding procedure is guaranteed by the interface's straightforward and user-friendly design.

Fig: Interface for User Login

The blockchain-based chat application's User Login Page is shown in this figure. By providing their username and password, registered users can log in. Before allowing access to the chat system, the authentication procedure confirms the user's credentials. Users can safely send and receive messages within the program after authenticating. This login process guarantees that only registered users may engage in discussion and helps shield the site from unwanted access.

Fig: Interface for Admin Login

The Admin Login Page, intended for system administrators, is depicted in the figure. Administrators can use their specific login credentials to access the system. Administrators can manage users and keep an eye on system activity once they have successfully authenticated. This feature guarantees that only authorized individuals have access to administrative controls. The blockchain-based chat application's overall security and administration are improved by the admin login process.

V. Conclusion

The design and execution of a blockchain-based secure chat program that guarantees dependable and impenetrable user communication was demonstrated in this study. To preserve message integrity and authenticity, the solution combines blockchain technology with an online messaging platform. The system may identify any unauthorized changes by creating cryptographic hash values for every communication and connecting them via a blockchain structure. Features including user registration, secure login, real-time chat conversation, and an administrative dashboard for system monitoring are all included in the built program. When compared to conventional centralized messaging platforms, the experimental results show that the suggested approach successfully increases communication security and transparency.

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