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Blocktalk Conversational Payments Refined

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***Abstract*—BlockTalk is a conversational AI platform created to simplify blockchain-based payment transactions. BlockTalk encapsulates a conversational interface around an extremely easy to use user wallet management and transaction process using a chatbot. BlockTalk consists of a React.js frontend application with Node.js as the business logic backend, Firebase for the real-time database and authentication, and Neucron API for more securely interacting with the blockchain. BlockTalk seeks to diminish the technical hurdles and complexity of the current blockchain payment systems with users able to do a transaction using paymail and manage their wallets without having to consume and understand extremely deep technical complexity. The purpose of BlockTalk's platform is to make it easier for users when making payments, to create increased efficiencies throughout the transaction processes, create a more secure transaction experience, and create increased adoption rate of blockchain payments. The experimental results indicated fast, secure transactions with an easier user experience. This paper fills the gap of providing blockchain-based payments to the everyday user by simply bridging digital payments with conversational AI. Future work involves supporting multichains and improved features that assist users through the use of AI capabilities to provide ongoing financial advice and assistance.**

***Index Terms*—Index Terms— Blockchain, Conversational AI, Digital Payments, Chatbot, Neucron API, Wallet Management**

I. INTRODUCTION

In the modern digital landscape, blockchain technology is changing the way financial transactions are conducted by providing secure, transparent, and decentralized payment systems. While blockchain technology has potential to enhance the way people conduct payments, complexity around blockchain wallets and transaction processes make it difficult for every day users to participate in the emerging financial landscape. For users, managing cryptographic keys, recognizing wallet addresses in a blockchain network, or even using a new and complex interface is only manageable if you have technical knowledge. BlockTalk takes advantage of these barriers for everyday users by using a conversational AI interface to facilitate payments. Our conversational AI interacts with the user to facilitate blockchain payments without the need for technical knowledge - using conversational commands to create a wallet, send/receive payments, and check balances. By applying blockchain security in a user-friendly conversational AI interface, we believe BlockTalk can help provide non-technical users with a new way to improve the payment processes they engage with everyday that is more efficient and secure. In this paper, we will present our design, implementation, and evaluation of BlockTalk and how we can bridge the gap between complex blockchain technology and everyday users.

The remaining of this paper is organized as follows. Section II presents a literature review. Section III shows typical consensus algorithms used in blockchain. Section IV summarizes the technical challenges and the recent advances in this area. Section V discusses some possible future directions, and Section VI concludes the paper.

II. LITERATURE REVIEW

A. The Impact of Blockchain Technology on Business Models in Payments Industry

This paper explores the impact of blockchain on the transformation of business models across the payments sector. Easier, faster, secure and lower-cost transactions have enormous implications for traditional business models in payments. Blockchain has the potential to disrupt established payment models and eliminate intermediaries, develop peer-to-peer and increase the efficiency and perhaps lower costs of international payments, and introduce new payment services that provide programmability. Decentralized ledgers and smart contracts have enormous benefits and dramatically change how payments can be managed in business models. Blockchain allows settlement in minutes, compared to days in traditional payments. Blockchain increases transparency and reduces

transactional costs illustrating how fin-techs and payment companies are quickly and routinely adopting blockchain which has led to mainstream adoption. We have also shown that blockchain empowers both businesses and consumers by improving payment efficiency and creating opportunities for competitive advantage. We highlight future directions for research that involve integrating smart contracts, better multi-chain interoperability, and continued exploration of AI-enabled payment automation to enhance improvements in global digital payments.

B. Block Trace Creates an AI Chatbot to Make Blockchain Transaction

The understandings gained from Block Trace's AI powered blockchain chatbot Robby, presents very useful relevance for advancing blockchain analysis in your project. By using AI to simplify searches of blockchain data, Robby addresses issues with working through large datasets and identifying patterns that fit well with the goals of your project. Robby's natural language processing capabilities demonstrate ways that AI can enhance user accessibility and improve decisions made while executing blockchain tasks. In addition, Robby's feedback systems and security-oriented features illustrate possible ways to enhance blockchain tools. The work presented here produces a standard for the integration of AI with blockchain technology, that directly supports the project goal of improving efficiency and security.

C. Blockchain For Secure Payments: A Bibliometric review

This research examines the use of artificial intelligence (AI) technology in blockchain analysis with the goal of supporting transaction monitoring and fraud detection. The research problem involved three primary challenges, scalability, anomaly detection, and transaction mapping, faced often by blockchain landscapes. An AI technology approach, including machine learning and, natural language (NLP), provided effective methods to train models of raw data and examination of complex patterns. The usability of a secure transaction analysis process was stressed by providing AI-integrated tools that facilitate robust insights into network behavior. The conclusions provide theoretical and practical methods of overcoming the analytics barriers of blockchain and contribute to a more extensive understanding of AI's potential to alter blockchain technology and inform future improvements.

D. Blockchain and Mobile Payment: Assessment on Privacy and Usability and a Scheme for Enhancement

This article provides useful information to your project on secure blockchain transactions, profiling privacy issues and performance barriers in blockchain-enabled mobile payment systems. This paper proposes a payment scheme with transaction privacy and performance improvements and provides practical methods to improve transaction speed and security; the feasibility study covers public and consortium blockchains and provides a wide view on various implementation circumstances. Also, findings from the paper on maximizing transactions per second (TPS) and minimizing transaction times can inform your project's technical design for meeting the privacy and performance objectives.

E. Peer-to-peer payment system and crypto-currency using blockchain technology with a secure wallet and multi-signature transactions

The focus of this paper is on applying blockchain technology to improve security in e-commerce and online trading transactions through the removal of third-party intermediaries. The paper provides several examples of using Bitcoin to carry out peer-to-peer payments, highlighting the benefits of doing so, such as faster transaction times and less reliance on intermediaries, compared to banking institutions. The paper also describes the development of a high-security, open-source wallet, that enabled crash recovery, ease of use, and integration with third-party services using a microservices architectural design. The paper further advocates for blockchain as a remedy for inflationary fiat currency, and putting Bitcoin in the context of stable currency. Overall, this paper expands insights on blockchain as secure and reliable payment systems, and how you might consider them in developing appropriate processes as it relates to the capabilities of your project plan's desire to provide reliable and highly secure blockchain-based solutions.

F. Contract Wallet Using Emails

This document offers a unique system for handling crypto assets with the use of contract wallets and managing the wallet with an email account. It is not necessary to manage cryptographic keys. The key innovation presented in this project is the use of zero knowledge proofs (ZKP) as an email confirmation method. The ZKP combined with DomainKeys Identified Mail (DKIM) is used to secure the transaction. Key features of the system include the utilization of existing secure decentralized services and outsourcing the non-essential components to non-trusted parties whilst still maintaining security as well as decentralization. Also included in the report is a tool for variable-regex mapping that allows the user to map functions of the blockchain in contracts and easily address deficiencies without needing to implement ZKP skills. A demonstration was provided of an email-based application for exchanging crypto assets using Uniswap. This project illustrates the advancements in secure and usable blockchain applications and represents a positive step toward achieving goals regarding the usability and efficiency of blockchain-based transaction systems.

III. METHODOLOGY

A. System Design

BlockTalk is organized as a modular client-server system consisting of four parts: the frontend chatbot interface, the backend service layer, a cloud database for authentication and data persistence, and the Neucron API where interaction with the blockchain occurs. This modular approach supports scalability, maintainability, and a communication model with a suitable level of security.

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1) Frontend (React.js): The frontend is implemented using React.js and is primarily the chatbot interface where users can interact with the overall system. The UI accepts natural language commands and tokenizes the input into structured requests. The UI application also handles input validation, and displays any responses passed back from the backend in real-time.

2) Backend (Node.js): The backend is built using Node.js and Express.js. It receives a user request from the frontend, identifies the intent of the command (e.g., send money, check balance, create wallet), and associates that intent with a specific function. The functions can communicate with Firebase, and the Neucron API to conduct the secured operations. Additionally, the backend handles session management and error management.

3) Database and Authentication (Firebase): Firebase is utilized for authentication and user data storage. The authentication can be done with email/password, or with third-party services (e.g., Google). The Firebase Realtime Database stores user-sensitivedata such as wallet addresses, transaction logs, and a history of all sessions, which allows conversations to persistently refer back to prior messages.

4) Blockchain API (Neucron): Neucron API is a middleware for blockchain that handles wallet creation, balance-checking, transactions using paymail addresses, and several other standards. Neucron API abstracts away all the complex logic of interacting with the blockchain to conform to other systems like backend services. Neucron API provides advanced security features using access tokens and encrypted API requests that maintain trust, security, and data integrity.

B. Workflow

The following steps provide an overview of a typical transaction flow in BlockTalk:

1) The user types a command into the chatbot (i.e. send 10 coins to user@paymail.com).
2) The Frontend app processes and validates input and sends it to the backend service..
3) The Backed service takes the command, parses out the intent, and verifies the session/authentication token.
4) The backend service invokes the geared Neucron API resource-endpoint corresponding to the user request that interacts with the blockchain to make the transaction.
5) The backend service updates the appropriate user account in Firebase updating the account balance and transaction history.
6) The chatbot informs the user with a confirmation message.

This layered, methodical approach to handling sensitive blockchain actions pertaining to wallet access and payments, while facilitating a convenient user conversation experience, increases your security and your user's peace of mind!

C. System Architecture

The architecture of BlockTalk is built to enable smooth and secure blockchain-based payments through chat. The

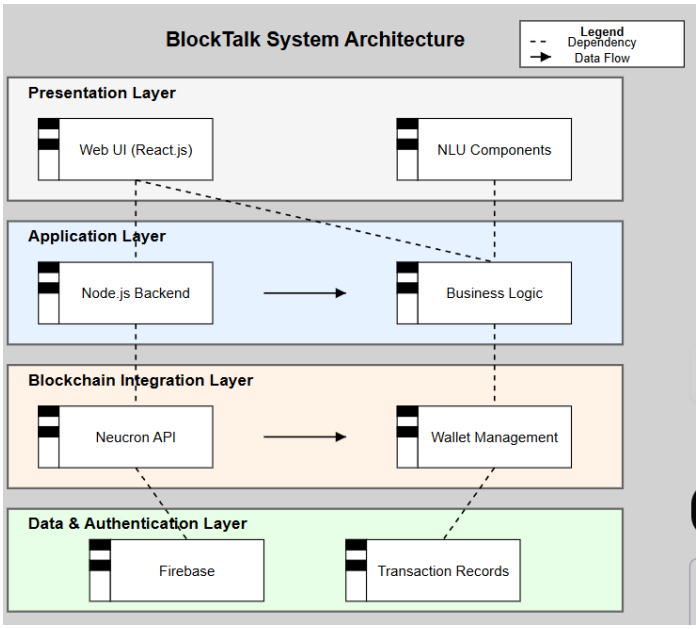

Fig. 1. BlockTalk System Architecture

architecture is modular and client-server based, and consists of the following four main layers: user interface, application logic, real-time database, and blockchain integration . The layered architecture allows for scalable and maintainable application architecture that separates the concerns of each of its components and abstracts the dataflows between them.

1) Conversational AI Layer: Conversational AI Layer: The chatbot interface makes up this layer using NLU modules, dialog management, and intent/entity extraction steps. When the user submits an input, the NLU identifies and classifies the user's intent and extracts the entities needed for a valid execution.
2) Application Logic Layer: The backend is built using a Node.js engine to become the decision-making processor where application logic will take place. The backend manages session state, verifies user inputs, coordinates the workflow between the chatbot interface and blockchain services, and handles the business logic for wallet management and transaction processing.
3) Blockchain Integration Layer: This is the layer that uses APIs like Neucron to connect to the blockchain networks. This layer manages wallet creation, key management, paymail resolution, transaction signing, and broadcasting. The blockchain management of a distributed ledger allows for data immutability, transparency, and decentralization resulting in confidentiality and trust for payments.
4) Data and Authentication Layer: Firebase is a serverless platform used to help with user authentication, session management, and provide a real-time data store to cache user profiles, wallet metadatas, and transaction histories. All key management operations and sensitive processes are protected with encrypted connections.

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D. Technology Stack

BlockTalk incorporates a modern, scalable, and cloud-ready technology stack for real-time interactions, secure transactions, and blockchain integration using conversational AI. The selected technologies have a focus on ensuring modularity, scalability, and ease of development. Table I summarizes the major components of the system and their supported technologies.

TABLE I
TECHNOLOGY STACK USED IN BLOCKTALK

Component	Technology Used
Frontend	React.js, JavaScript
Backend	Node.js
Database	Firebase Realtime Database, Firebase Authentication
Blockchain Integration	Neucron API
Chatbot Development	Rule-based NLP (Natural Language Processing)

- **Frontend:** The user interface is built on a React.js engine, providing a responsive and dynamic exchange between the chatbot and the user.
- **Backend:** A lightweight Node.js server forwards user requests, controls the flow, and manages the communication with the blockchain and database.
- **Database and Authentication:** A real-time database in Firebase stores user data, wallet meta data, transaction history, and provides secure user authentication.
- **Blockchain Integration:** Neucron API is used to abstract other complexities of performing blockchain operations like wallet creation, paymail resolution, and cryptocurrency transactions, from bot users.
- **Chatbot Development:** A rule-based natural language processing module that is able to model and extract user intents and entities from user conversational input is enabled to graphical allow accurate command interpretation and execution from user requests.

IV. IMPLEMENTATION

BlockTalk was designed following a modular, layered architecture to accommodate scaling, security, and user experience. The system was broken down into four principal layers of functionality: (1) Frontend, (2) Backend, (3) Real-time Database, and (4) Blockchain.

A. Frontend (React.js)

Developed the frontend layer to deliver a chatbot-based user interface using React.js. The user can input natural language, with the ability to process any potential command structures using the major functionalities such as:

- Interactive chatbot interface.
- Capture user intents on wallet creation, fund transfer, balance inquiry, etc.
- JSON structured object send to backend
- Real time updates/feedback on backend responses.

B. Backend (Node.js)

The backend interprets chatbot commands, routes them to the appropriate services and handles the business logic. The backend is built in Node.js and exposes RESTful APIs. The back end will take the following commands:

- *Create Wallet*
- *Check Wallet Balance*
- *Cryptocurrency using Paymail*

The backend also has a few validation modules to check for user authentication, wallet address validation, and transaction validation. The back end serves as a bridging service that sits between the chatbot and the blockchain middleware, managing all API calls and client session management.

C. Real-Time Database (Firebase)

Firebase is used to store data in real-time and authenticate users. Store user profiles, metadata of wallets, information from chatbot sessions, transaction history, and so much more in Firebase. Firebase Authentication provides multiple ways to sign in, including email & password sign-in and social logins, which facilitates secure access and user management.

Key functionalities include:

- Secure storage of user and wallet interests.
- Real-time histories of previous transactions.
- Continuity of user sessions when interacting with chatbot sessions.

Both data synchronization on the front-end and back-end is consistently managed through Firebase's real-time features when user information is generated or updated resulting in a consistent and reliable user experience.

D. Blockchain Middleware (Neucron API)

Neucron API provides a gateway to the blockchain and abstracts the complexity of the blockchain operations. The backend will make secure messages to Neucron to call blockchain-specific functions that will perform operations such as:

- Wallet creation and linkage to user accounts.
- Paymail resolving for simpler user-to-user payments
- Authorizing/Signing transactions and then broadcasting to the blockchain network

All API requests are encrypted and Neucron endpoints are protected by secure API tokens. Neucron allows for secure, low-latency blockchain interactions, which are fundamental for real-time payment apps.

E. Security Measures

Security was a primary focus during implementation. Key security measures include:

- Secure API communication using HTTPS and token-based authentication.
- User authentication and authorization managed through Firebase Authentication.
- Input validation for paymail addresses and transaction amounts to prevent fraud.

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- Encryption of sensitive data during transmission and storage.

These measures ensure the integrity, confidentiality, and availability of BlockTalk's services.

V. Results and Evaluation

BlockTalk's performance and usability was tested in comprehensive testing and user trials . Aspects of system performance were measured in completed transaction accuracy, responding time, user satisfaction, and system reliability for several common real-world types of transactions.

A. Experimental Setup

he testing implemented a targeted sample of 10 users and was undertaken as if they were opting to complete a real blockchain payment transaction under the potential confusion of actually completing a real payment transaction. Each user needed to perform a number of tasks, specifically wallet creation, balance inquiry, fund transfer using paymail, and then session handling using the chatbot conversational interface.

Performance metrics were gathered from testing the outcome of the operations, response time of the system, and user engagement and satisfaction from reporting through a questionnaire.

B. Performance Metrics

The following performance metrics gathered from testing was based on the following set of measures:

- **Transaction Success Rate:** Percentage of successful versus attempted transactions, was 75%, showing reliability and stability of the system.
- **Average Response Time:** The average response time from the user input to chatbot reply was 5 seconds. Indicating real time interaction.
- **User Satisfaction Score:** Relative to the post-testing surveys indicating the user satisfaction, users indicated their satisfaction averaged a rating of 4/5, typically noting in opened form reporting how easy and intuitive the conversational based interface was.

C. Result Analysis

The high transaction success rate demonstrates the robustness of the backend logic and secure communication with the blockchain middleware via Neucron API. The quick response time ensures that users experience minimal delays, enhancing the conversational flow of interactions.

Feedback from users emphasized that BlockTalk made blockchain operations considerably simpler compared to conventional blockchain wallet applications. The majority of users (80%) indicated that they preferred using a chatbot over manual interfaces for common blockchain transactions.

D. Comparative Observations

Relative to traditional blockchain wallet applications:

- Users took approximately 20 % less time to formalize transactions..
- First-time users could complete blockchain operations without technical support.
- The conversational model reduced user error - for example, mistyping wallet addresses - because the user could confirm actions.

In summary, these results indicate that BlockTalk meets the requirements to overcome the technical gap, resulting in an accessible and usable space for blockchain technology.

VI. Outputs

To assess the functionality and user experience with BlockTalk, a number of functions (core output screens) were developed and tested. These outputs illustrate the convenience of blockchain operations with a user-friendly chatbot interface.

A. Login and Sign-Up Screens

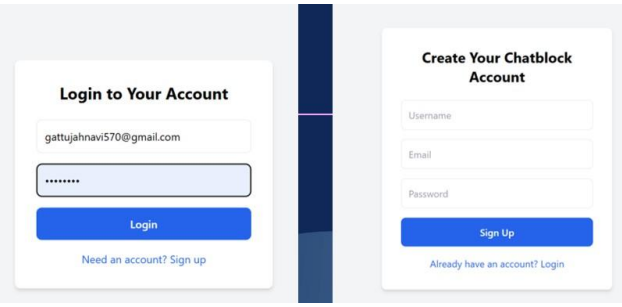

Fig. 2. Login interface for secure access to BlockTalk.

User authentication through a secure login or sign-up screen is shown in (Fig. 2). Users are automatic created with a blockchain wallet and a user profile upon authentication.

B. Chatbot Interaction Screens

Once users are logged in, they can issue commands to the chatbot, as shown in Fig. 3, to create wallets, check balances, view transaction history, and send cryptocurrency via paymail addresses. The chatbot receives user requests and interacts via a rule-based NLP module, allowing the execution of blockchain operations securely.

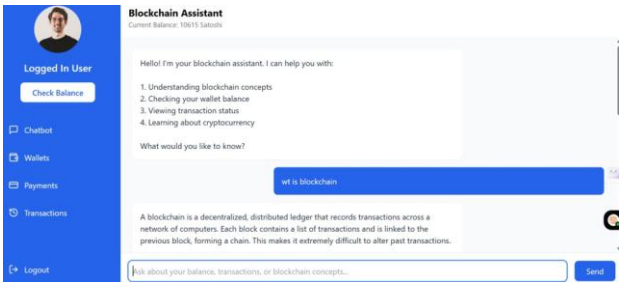

Fig. 3. Chatbot interface facilitating blockchain payment using paymail.

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C. Transaction Confirmation Screen

Once the user initiates payment, they get real time confirmation with (Fig. 4) providing transparency and bill or payment success.

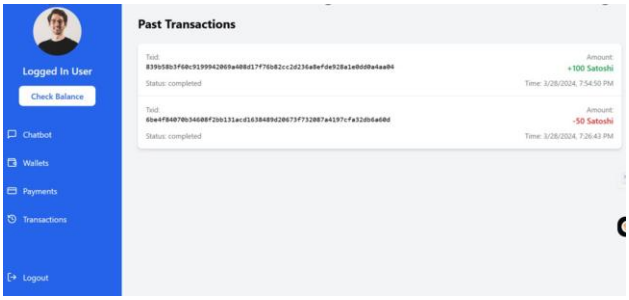

Fig. 4. Transaction confirmation screen ensuring payment success.

D. Wallet Creation

As shown in Fig. 5, the wallet creation process involves user authentication, wallet generation through the Neucron API, secure storage of wallet metadata in Firebase, and chatbot confirmation back to the user. This ensures an automated, secure, and user-friendly setup without exposing private keys.

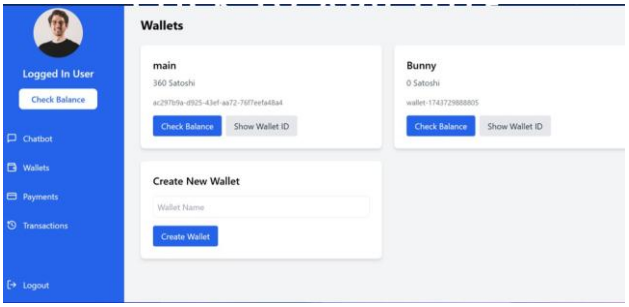

Fig. 5. Wallet creation process in BlockTalk using Firebase Authentication and Neucron API integration.

VII. Conclusion

BlockTalk appropriately illustrates how conversational AI can mitigate the barriers to blockchain-based payment systems for users that are not technically adept. BlockTalk provides a bridge between complex blockchain technology and non-chalant financial transactions by incorporating a chatbot user interface on top of a blockchain wallet, wallet creation, balance inquiry, and secure paymail-based transactions.

The modular architecture comprises of a React.js frontend, Node.js backend, a live link to Firebase storage, and a Neucron API layer to conduct the blockchain operations that provides real-time responsiveness, high success rates for transactions, and high user satisfaction.

BlockTalk has proven that it provides improved user experience, and decreased complexity of transactions which fosters larger levels of blockchain adoption by providing the users with a more accessible, conversational service to complete digital payment actions. Future upgrades will add further functionality to the platform with the addition of multi-chain support, and AI-generated financial guidance enabled to assist end-users in their digital payment experiences.

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