



Block Chain Technology for Secure Transaction

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ABSTRACT

The rapid growth of digital banking has improved convenience and accessibility but has also introduced significant security challenges, including phishing attacks, data breaches, OTP interception, and unauthorized transactions. Traditional banking systems rely heavily on centralized databases and token-based authentication mechanisms, which remain vulnerable to various cyber threats. This paper proposes a tokenless blockchain-based secure transaction framework that employs digital signatures and a permissioned blockchain ledger for authentication and transaction validation. The proposed system eliminates dependency on OTPs and external communication networks while ensuring transparency, immutability, and tamper-resistant transaction records. SHA-256 hashing is used to secure transaction blocks, and only authorized banking nodes participate in the validation process. Experimental implementation demonstrates improved security, enhanced auditability, and greater reliability compared to conventional banking systems.

Keywords: Blockchain, Digital Banking, Tokenless Authentication, SHA-256, Digital Signatures, Secure Transactions.

1. INTRODUCTION

Digital banking has transformed financial services by enabling fast and convenient transactions. However, increasing dependence on centralized infrastructures and token-based authentication methods such as OTPs and SMS verification has exposed banking systems to cyberattacks including phishing, SIM-swapping, and credential theft. Blockchain technology offers a decentralized approach to transaction validation and data storage, providing enhanced security and transparency.

This research proposes a tokenless blockchain-based banking system that utilizes cryptographic digital signatures and a permissioned blockchain network. The proposed framework aims to reduce vulnerabilities associated with traditional authentication mechanisms while maintaining secure and transparent transaction processing.



2. LITERATURE REVIEW

Recent studies have explored blockchain applications in authentication and financial security. Zhang et al. introduced decentralized identity systems for tokenless authentication, while Ali et al. proposed blockchain-backed authentication using cryptographic signatures. Li et al. developed blockchain-based identity verification frameworks for banking applications. Other researchers have highlighted the benefits of smart contracts, decentralized governance, and immutable ledgers in enhancing transaction security and reducing fraud.

Despite these advancements, challenges such as scalability, interoperability, and efficient key management remain important research concerns.

3. PROPOSED METHODOLOGY

The proposed system replaces token-based authentication with cryptographic digital signatures and a permissioned blockchain ledger. Users authenticate transactions using private-public key cryptography rather than OTPs or hardware tokens.

The transaction workflow includes:

1. User authentication through digital signatures.
2. Transaction verification by authorized banking nodes.
3. SHA-256 hash generation for transaction integrity.
4. Block creation and validation.
5. Storage of validated transactions in an immutable blockchain ledger.

The decentralized architecture eliminates single points of failure and provides enhanced resistance against unauthorized modifications.

4. SYSTEM ARCHITECTURE

The system follows a three-layer architecture:

Presentation Layer

Provides JSP-based interfaces for users, administrators, auditors, and agents.

Application Layer

Contains transaction processing, authentication modules, blockchain management, smart contract execution, and auditing mechanisms.

Data Layer

Stores user information in MySQL databases and transaction records within a permissioned blockchain ledger.





- Reliable decentralized transaction validation.

The image shows a 'Bank Admin Login' interface for 'BlockSecure Bank'. It features a dark blue background with a central white login form. The form has fields for 'Bank' (a dropdown menu showing 'SBI Bank'), 'Username' (containing 'admin_sbi'), and 'Password' (masked with dots). A yellow 'Login' button is at the bottom of the form. Below the button, there are links for 'Forgot' and 'Default: admin / admin123'. A 'Back' button is in the top right corner of the page.

Figure 3 : Bank Admin Login Interface

The image shows an 'Admin Control Panel' for 'BlockSecure Bank'. It features a dark blue sidebar with navigation links: 'BANK ADMIN', 'Dashboard', 'View Deposits', 'View Transfers', 'Fraud Panel', 'Blockchain Ledger', and 'Back'. The main content area is titled 'Users (Account Requests / Authorization)' and includes a note: 'Generate an 11-digit account number and SHA-256 hash to authorize users'. Below this is a table with columns: ID, Full Name, Username, Account No, Account Hash, Status, and Action. The table contains six rows of user data, each with a 'Generate Account' button. The 'Status' column for all users is 'authorized'.

ID	Full Name	Username	Account No	Account Hash	Status	Action
504	Greenhma Reddy	Greenhmareddy_25	61394941845	eb54c3b11115291016d2c29a8f9c8e70ea403222b523090b172878364883ea	authorized	Generate Account
491	Vijay Iyer	vijay488	64109176431	b8299d87c0be71b8bc46810051436358c163ab9f312340753dcca7868a2748b	authorized	Generate Account
493	Kiran Patel	kiran490	64354209613	f6e0e74fdb3c7af9ede522452d04d7b62c131da06264a18806889e7664485f1	authorized	Generate Account
495	Rekha Banerjee	retha492	64950734801	16a596ce09c7ed2577f083ac19ab91a67f3b298c709ad807d77b7be289da96	authorized	Generate Account
497	Ganesh Mehta	ganesh494	20160119047	8de7040757edc593f81e983ca145e62de8c53b032cb7015e1d2428995c13b738	authorized	Generate Account
498	Bhavna Roy	bhavna495	70533225806	60e5a0e3e56c90247036107705535693829b84d92858271d788b554f8b5f64	authorized	Generate Account

Figure 4: Admin Dashboard – User Authorization Panel



BlockSecure Bank								
ADMIN								
admin_sbi								
Dashboard								
Deposit Requests								
View Transfers								
Fraud Panel								
Blockchain Ledger								
Back								

Deposit Requests								
All Deposit Requests								
Forward (Auditor/Agent) → Approve (Admin) → Blockchain record.								
ID	User	Bank	Account	Amount	Status	Forwarded By	Date	Action
304	Greshma Reddy	SBI Bank	63394941845	Rs. 2888.00	permitted	admin_sbi	2026-04-11 18:47:12.0	Approve
303	Ramesh	SBI Bank	64795605326	Rs. 10000.00	permitted	admin_sbi	2026-04-11 16:51:19.0	Approve
302	Greshma Reddy	SBI Bank	63394941845	Rs. 5000.00	permitted	admin_sbi	2026-04-10 03:08:32.0	Approve
301	Ramesh	SBI Bank	64795605326	Rs. 1000.00	forwarded	agent2	2026-04-10 03:07:21.0	Approve
251	Prakash Reddy	Ash Bank	69221011101	Rs. 183872.80	permitted	admin	2026-04-09 18:20:34.0	Approve
252	Kavita Joshi	HDFC Bank	63792165664	Rs. 310057.44	permitted	auditor20	2026-04-09 18:20:34.0	Approve
253	Mohan Gupta	SBI Bank	61664260496	Rs. 262272.85	permitted	auditor18	2026-04-09 18:20:34.0	Approve
254	Lakshmi Chopra	ICICI Bank	65680523926	Rs. 320631.51	permitted	admin_sbi	2026-04-09 18:20:34.0	Approve

Figure 5 : Admin Deposit Requests Panel

BlockSecure Bank					
BANK ADMIN					
admin_sbi					
Dashboard					
View Deposits					
View Transfers					
Fraud Panel					
Blockchain Ledger					
Back					

Blockchain Transaction Ledger					
Blocks					
Stored in MySQL 'blockchain' table.					
Index	Timestamp	Transaction Data	Previous Hash	Current Hash	Nonce
0	2024-09-06 20:54:02	Genesis Block	0	7c99e6d4e3c52269177472b0b3b2efee1c3e7c6f7254289ae093b53be411dc8	493
1	2024-12-16 00:03:55	DEPOSIT>User:Poorna Chopra Account:68397041061 Amount:60297.86 Bank:ICICI Bank	7c99e6d4e3c52269177472b0b3b2efee1c3e7c6f7254289ae093b53be411dc8	a5cb4f1b07d05307009175051a19c40b293e36f199f1eaa0d3ae41e5d5269b09a	343
1	2026-04-11 11:23:01.075	DEPOSIT_APPROVED id=303 approved_by=admin_sbi	00059car462a61cd4aaf30bdeed8b62b4450f522601b0f03eb9674eac3b08185	0006a809aa50cd994c9eabc762e7a076e77a179866ae229b3834aafdcdd112b	12601
1	2026-04-09 21:43:08.629	DEPOSIT_APPROVED id=302 approved_by=admin_sbi	000faa2d788fb0f165bfc2d31b1be54a7633d34e2f7b2af3a2c366ab115cad1	00036d87c1c46c35847df6301434330309b3b944a2ee27a724922d3ea0cd9531	1680
1	2026-04-09 21:06:44.677	DEPOSIT_APPROVED id=251 approved_by=admin	000890b25adfe165bba043483e463bd9797a9aa2378fafa4b35657240392c87e	0003bbae086a9464951fcd22d7a0536669810afa662ae45d580917dc4b1ce43	4568
2	2024-11-03 13:41:46	DEPOSIT>User:Mohan Choudhary Account:68397041061 Amount:40180.44 Bank:ICICI Bank	a5cb4f1b07d05307009175051a19c40b293e36f199f1eaa0d3ae41e5d5269b09a	2372e903d3730539fb315830ad4d04485243a1a1804b5d4e330b0b4af30c4a81	254

Figure 6 : Blockchain Transaction Ledger View



The image shows a 'New User Registration' form on a dark blue background. The form is white with a dark blue header. It contains the following fields: 'Full Name' (text input), 'Bank' (dropdown menu with 'Select Bank' text), 'Username' (text input), and 'Password' (text input). Below the fields is a large orange 'Register' button. At the bottom of the form, there is a link 'Already have an account? Login' and a 'Home' link.

Figure 7 : New User Registration Interface

The image shows a 'BlockSecure Bank' user dashboard. The top bar includes the bank name 'BlockSecure Bank' and a 'Logout' button. The left sidebar contains a 'USER' section with a 'ramesh' profile and a list of menu items: 'Dashboard', 'Account Generation', 'Deposit Request', 'Transfer Request', 'Mini Statement', and 'Back'. The main content area is titled 'Welcome, Ramesh' and displays 'Account Details' for a 'pending' status. The balance is 'Rs. -1111.00'. The account number is '64795605326' and the account hash is 'abc123hash'. There is a 'Request / Refresh Account Status' button. On the right, there is a 'Quick Actions' section with buttons for 'Send Deposit Request', 'Send Transfer Request', and 'View Mini Statement'. A note at the bottom states: 'Your requests are first reviewed by the Auditor and then approved by the Bank Admins. Approved transactions are added to the blockchain ledger.'

Figure 8 : User Dashboard Overview



6. CONCLUSION AND FUTURE WORK

This paper presented a tokenless blockchain-based secure banking framework designed to overcome limitations of traditional token-dependent authentication systems. By leveraging digital signatures, SHA-256 hashing, and permissioned blockchain technology, the system provides secure, transparent, and tamper-proof transaction processing.

Future work includes integration with Hyperledger Fabric or Ethereum, deployment on cloud platforms, incorporation of smart contracts for automated verification, implementation of AI-based fraud detection, and development of mobile banking applications.

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