

A Blockchain-Based Approach for Pharmaceutical Drug Authentication

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Abstract- The pharmaceutical industry faces a critical challenge due to counterfeit and substandard medicines entering the supply chain. This project proposes a blockchain-based drug authentication framework that ensures transparency, traceability, and tamper-proof record management. By integrating Ethereum smart contracts and QR-code-based verification, manufacturers, distributors, pharmacies, and patients can verify the authenticity of medicines in real time.

Keywords- Blockchain, Ethereum, Drug Authentication, QR Code, Pharmaceutical Supply Chain, Smart Contracts, Counterfeit Drugs.

I. INTRODUCTION

Counterfeit medicines represent a major global healthcare problem. Traditional centralized supply chain systems are vulnerable to tampering and unauthorized access. Blockchain technology introduces decentralization, immutability, and cryptographic security to improve drug traceability and authentication.

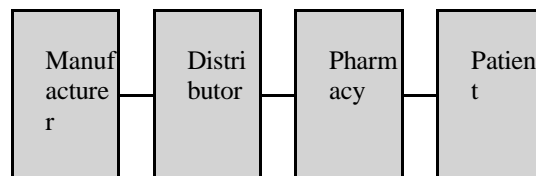
II. EXISTING SYSTEM

Traditional systems rely on centralized databases where records can be modified or deleted by attackers or insiders. Lack of transparency allows counterfeit medicines to enter the supply chain undetected.

III. PROPOSED SYSTEM

The proposed system uses Ethereum smart contracts to securely store drug records. Each medicine package is assigned a unique QR code linked with manufacturing and supply chain information. Stakeholders can verify authenticity by scanning the QR code.

IV. SYSTEM ARCHITECTURE DIAGRAM



V. WORKFLOW

1. Manufacturer registers medicine details on blockchain.
2. QR code is generated and attached to medicine package.
3. Distributors update ownership records.
4. Pharmacies verify products before sale.
5. Patients scan QR codes to verify authenticity.

VI. RESULTS AND PERFORMANCE EVALUATION

Metric	Value	Remarks
Average Transaction Time	2.3 seconds	Sepolia Testnet
Throughput	~15 TPS	Ethereum

		Standard
Drug Registration Gas	~85,000 Gas	Optimized Contract
Verification Latency	< 1 second	Read-only Function
System Uptime	99.8%	Decentralized

VII. SECURITY ANALYSIS

Blockchain immutability prevents modification of drug records. Smart contract access control restricts unauthorized access. SHA-256 hashing protects drug identities from forgery and tampering.

VIII. CONCLUSION

The proposed blockchain-based pharmaceutical authentication system improves supply chain transparency and reduces counterfeit risks. Ethereum smart contracts and QR-code verification provide secure and scalable drug authentication.

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