

# White Paper for Rune Network Cryptocurrency

## Executive Summary

The Rune Network is a decentralized cryptocurrency system that allows users to open wallets, share the network's currency amongst each other in a secure and efficient manner. It is designed as a demonstration and application of cryptography in the context of cryptocurrency. The project uses multiple cryptographic algorithms to ensure secure, scalable, and efficient digital transactions. This white paper outlines the technical specifications, functionality, and vision for Rune Network. The project aims to provide a transparent and adaptable blockchain solution, enabling users to perform transactions, mine rewards, and maintain balances with robust encryption mechanisms and minimal resource requirements.

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## Features and Innovations

### 1. Blockchain Structure

- **Genesis Block:** Establishes the foundation of the blockchain, containing an initial reward transaction.
- **Blocks:**
  - Composed of a previous block hash, transactions, timestamp, and nonce.
  - Each block ensures the integrity and immutability of transactions.
- **Transactions:**
  - Stored as structured dictionaries with keys: **amount**, **payer**, and **payee**.
  - Validated and formatted for consistency.

### 2. Encryption and Security

- **Blockchain Encryption:** Utilizes AES encryption (via Fernet) for secure storage of blockchain data.
- **Wallet Encryption:** Passwords are hashed using **Werkzeug** to protect user credentials.
- **Data Validation:**
  - Transactions and blockchain structure are rigorously validated during processing.
  - The system includes checks for corrupted or invalid data.

### 3. Mining Operations

- **Proof of Work (PoW):**
  - Ensures block validity by solving cryptographic puzzles with adjustable difficulty.
- **Internal Mining:**
  - Allows for network operation without external miners.
  - Ensures pending transactions are processed efficiently.
- **Miner Rewards:**
  - Distributed to participating miners or internal processes upon successful mining.

## 4. Wallet System

- **Address Generation:**
  - Uses public key cryptography and hashing to create secure wallet addresses.
- **Balance Tracking:**
  - Calculated by aggregating transaction histories across the blockchain.
- **Persistent Storage:**
  - Wallets are stored in encrypted JSON files to ensure user data integrity.

## 5. Transaction Management

- **Pending Transactions:** Queued for mining and validation.
  - **Automatic Processing:** Ensures pending transactions are processed promptly.
  - **Rewards System:** Incentivizes network participants to maintain blockchain operations.
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# Technical Details

## 1. Blockchain Specifications

- **Hashing Algorithm:** SHA-256 for block and transaction hashing.
- **Encryption:** AES-based Fernet for blockchain data.
- **Difficulty Adjustment:**
  - Mining difficulty can be tailored to demonstrate feasibility during initial stages.

## 2. Data Persistence

- **Blockchain Storage:** Encrypted data stored in `blockchain_storage.json`.
- **Wallet Storage:** Encrypted data stored in `wallets.json`.

## 3. Transaction Model

- Transactions include the following fields:
  - `amount`: Value being transferred.

- **payer**: Sender's wallet address.
- **payee**: Recipient's wallet address.

## 4. Mining Algorithm

- **Nonce Calculation:**
    - Adjusted iteratively until block hash meets difficulty requirements.
  - **Rewards:**
    - Default miner reward of 1 Rune coin per mined block.
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## Deployment Plan

### 1. Phase 1: Development

- Finalize blockchain core functionality.
- Integrate wallet generation and encryption.
- Test mining processes.

### 2. Phase 2: Demonstration

- Deploy on a local network for academic and research purposes.
- Showcase mining, transaction validation, and wallet integration.

### 3. Phase 3: Future Development Goals

- Optimize codebase for larger transaction volumes.
  - Implement advanced features such as nodes, node registration, node discovery, dynamic mining job allocation.
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## Vision and Future Development

The Rune Network aspires to provide a lightweight, secure, and user-friendly blockchain system for educational and practical applications. Future enhancements include:

- Dynamic mining job allocation.
  - Node integration.
  - Support for multiple consensus mechanisms.
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## Conclusion

Rune Network demonstrates the innovative, efficient and secure application of cryptography in the context of digital finance.