Trustify

Distributed Blockchain-based Product Review System

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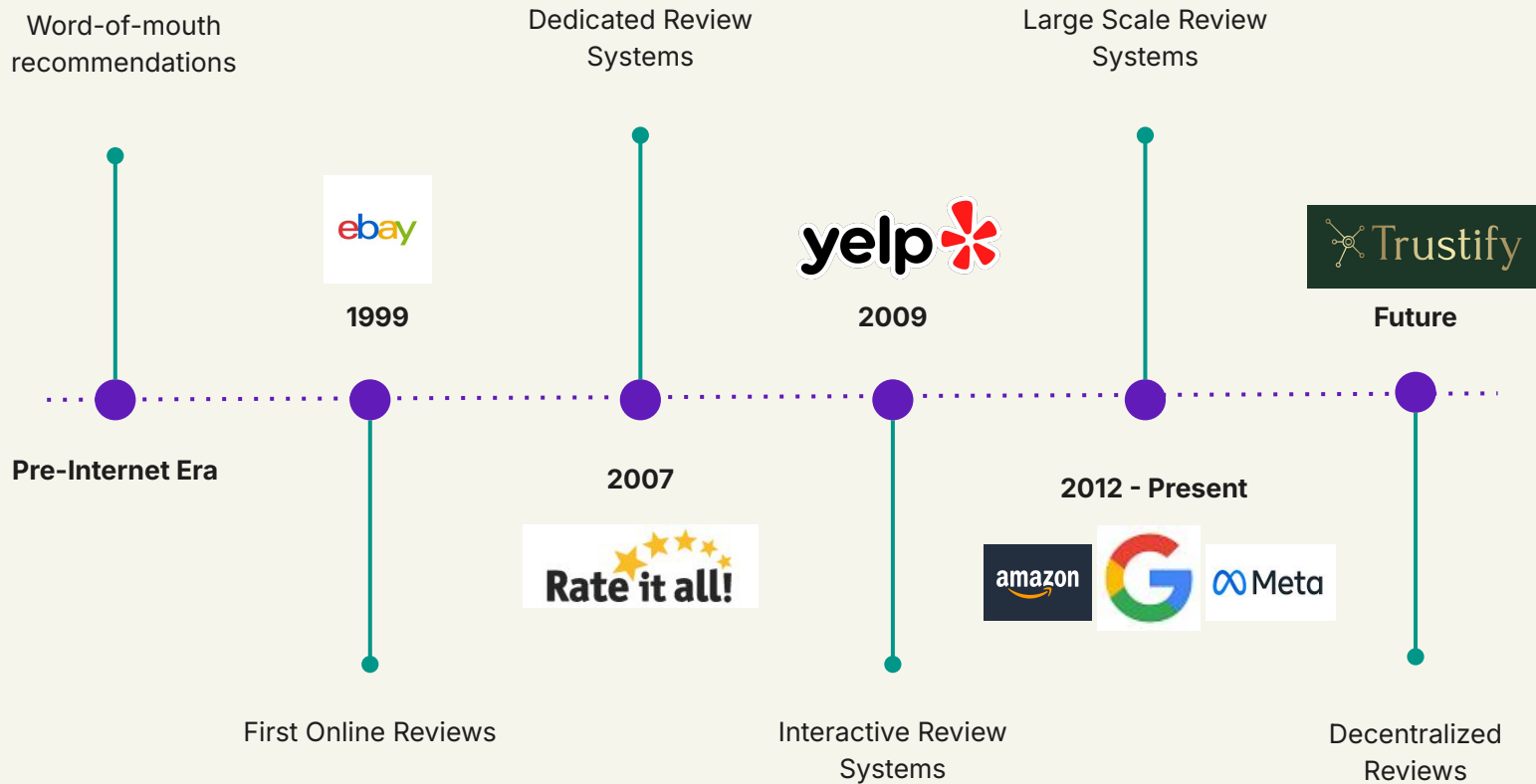
Sachin C

Significance of Online Reviews

Market Impact:

- Majority of consumers read online reviews before purchasing
- People trust online reviews as much as personal recommendations
- Online reviews annually have a billion dollar market impact.

The Evolution of Product Reviews

Word-of-mouth recommendations

Dedicated Review Systems

Large Scale Review Systems

1999

2009

Future

Pre-Internet Era

2007

2012 - Present

First Online Reviews

Interactive Review Systems

Decentralized Reviews

Trust Crisis: Why Traditional Systems Fall Short?

1. Fake Review Farms
   - Organized review manipulation
   - Sophisticated AI-generated reviews
2. Platform Bias
   - Selective review filtering
   - Opaque ranking algorithms
3. Data Security
   - Centralized data breaches
   - Review history manipulation

Project Goals

- Create a decentralized platform for authentic and immutable product reviews in Go.
- Validate authentic purchases and reviews without a central authority.
- Achieve distributed consensus on review validity across nodes.
- Implement a trust mechanism to prevent review manipulation and transparent history.

BLOCK CHAIN
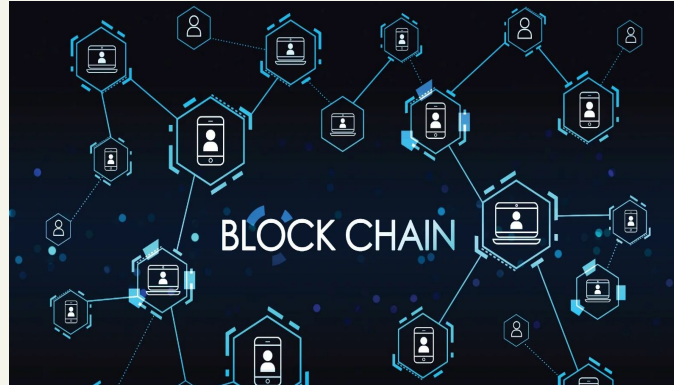
Challenges

- **Scalability:** Efficiently handling high review volume under PoW constraints
- **Immutable Storage:** Balancing permanent record-keeping with storage costs
- **Proof of Purchase:** Verifying that reviewers are actual buyers
- **Building Blockchain From Scratch:** Implementing foundational structures and protocols
- **Meaningful Rewards:** Incentivizing honest participation via purchase-backed tokens

Elements

Purchase Transaction
Inputs - UTXOs from wallet
Outputs - UTXOs for the
seller + surplus to buyer

Review Transaction
No input and output

Coinbase Transaction
Outputs - Reward UTXOs for
the miner and reviewers

Block Confirmation
Based on a predefined
confirmation depth, currently
set to 6

Data Structures
Priority Queues for Mempool
Global UTXOSet for faster
lookup

Incentives

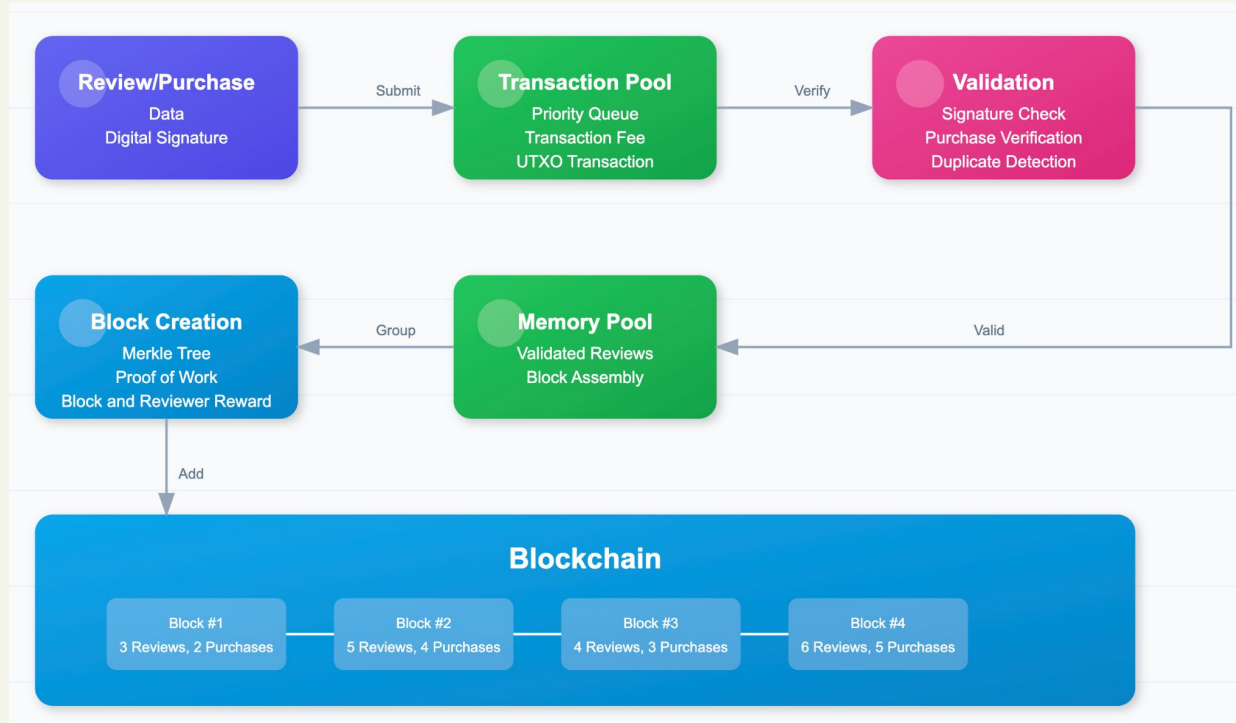Rewards for block miners
Rewards for reviewers

Wallet

Private Key
Public Key
Bitcoin Address
Balance UTXOs

Communication Protocols
UDP Broadcasting of
transactions and blocks for
validation

TCP communication for the
GetBlocks protocol to
resolve block forking

Normal Operation

Review/Purchase
Data
Digital Signature

Submit →

Transaction Pool
Priority Queue
Transaction Fee
UTXO Transaction

Verify →

Validation
Signature Check
Purchase Verification
Duplicate Detection

Block Creation
Merkle Tree
Proof of Work
Block and Reviewer Reward

← *Group*

Memory Pool
Validated Reviews
Block Assembly

← *Valid*

Add ↓

Blockchain

Block #1	Block #2	Block #3	Block #4
3 Reviews, 2 Purchases	5 Reviews, 4 Purchases	4 Reviews, 3 Purchases	6 Reviews, 5 Purchases

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Validate a transaction

For review transactions
1. Digital signature
2. Proof of Purchase
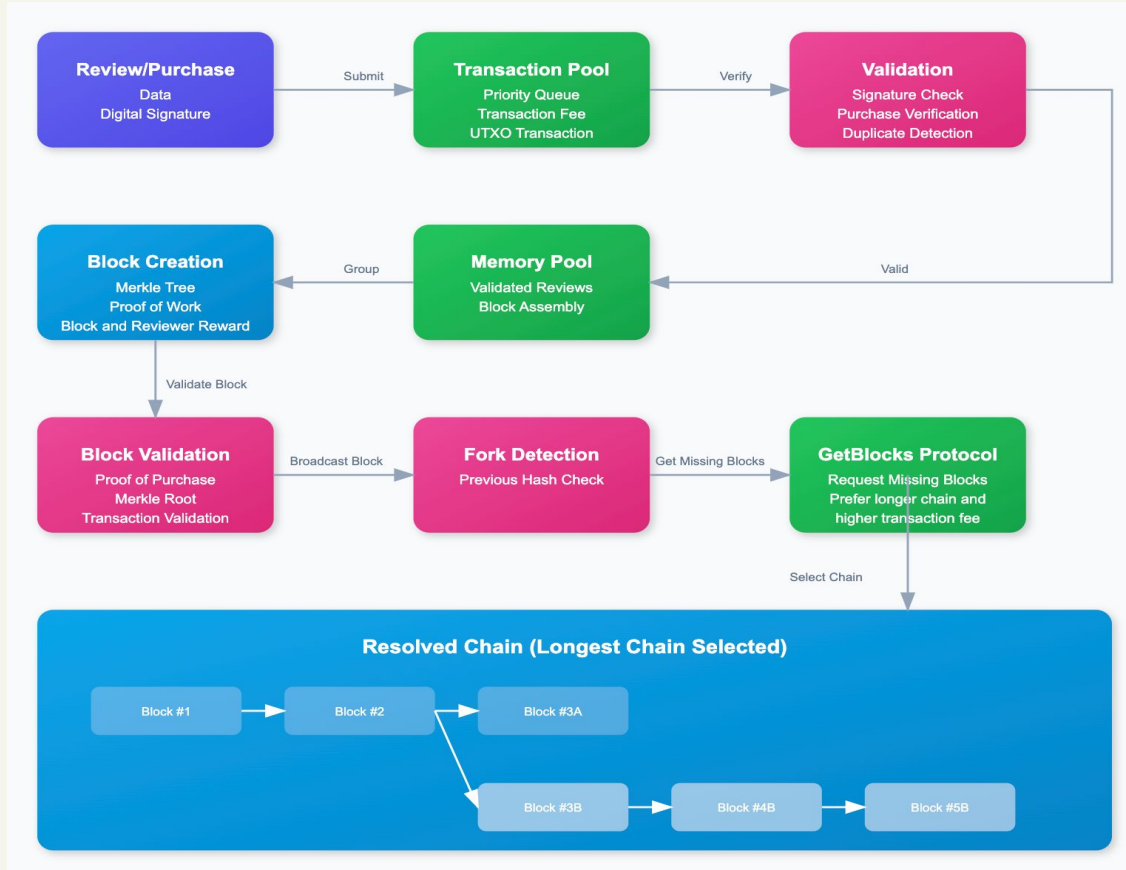3. Duplicate Reviews

For purchase transaction
1. Digital Signature
2. Sufficient balance
3. Double spending

Cryptography

1. Data is serialized and hashed using SHA-256 algorithm
2. Digitally signed using ECDSA algorithm

Forking

Review/Purchase
Data
Digital Signature

Submit →

Transaction Pool
Priority Queue
Transaction Fee
UTXO Transaction

Verify →

Validation
Signature Check
Purchase Verification
Duplicate Detection

Block Creation
Merkle Tree
Proof of Work
Block and Reviewer Reward

← Group

Memory Pool
Validated Reviews
Block Assembly

Valid →

Validate Block ↓

Block Validation
Proof of Purchase
Merkle Root
Transaction Validation

Broadcast Block →

Fork Detection
Previous Hash Check

Get Missing Blocks →

GetBlocks Protocol
Request Missing Blocks
Prefer longer chain and
higher transaction fee

Select Chain ↓

Resolved Chain (Longest Chain Selected)

Block #1 → Block #2 → Block #3A
Block #2 → Block #3B → Block #4B → Block #5B

Validate a block

1. Proof of Work
2. Merkle Root
3. Transactions
4. Timestamp

Block Forking

1. Detect forking (Block does not extend the ledger)
2. Request for missing blocks
3. Prefer longer chains with more transaction fee
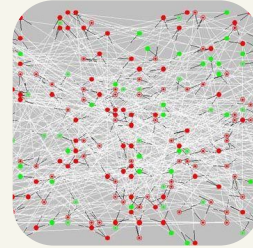4. Update the ledger

Future Work

Data Structures and Storage
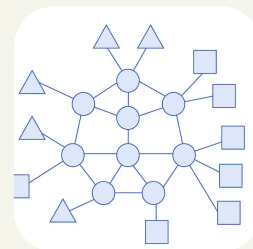

Web platform development

Performance optimization and scalable solutions

Oracle Integration (Purchase Validation)

Smart contracts

Node Types (Reduce burden)

Conclusion

- Our **distributed blockchain-based product review system** addresses key issues like transparency, immutability, and trust in modern review systems.
- Successfully implemented:
  - A peer-to-peer network for transaction and block communication.
  - Proof of Work consensus to validate blocks.
  - Incentive mechanisms to reward miners and reviewers.
- **Trustify** showcases how blockchain technology can replace centralized product reviews, ensuring fairness, transparency, and trust for users.

"Empowering trust in product reviews through decentralization." - Trustify Team.