ZK Smart NFC by TrustChain

TrustChain is a company that aims to provide secure and efficient solutions for anti-counterfeiting, document security, and off-chain payments using blockchain technology. TrustChain's flagship product, **ZK Smart NFC**, uses secure NFC (Near Field Communication) technology combined with the **Zero Knowledge proof** technology with Mina Protocol blockchain to provide an innovative and secure solution for a range of use cases.

Check our Github

Background

Problem

Counterfeiting is a major problem in many industries, including fashion, food and beverage, and electronics. Counterfeit goods not only result in lost revenue for legitimate businesses but can also be dangerous for consumers. Document fraud is also a problem, with fake IDs and other documents being used for identity theft and other illegal activities. Traditional payment methods can also be slow and expensive, with high transaction fees and long processing times.

Clothing & Fasion Counterfeiting is a major issue in the clothing and fashion industry, with fake products being sold at lower prices, resulting in lost revenue for legitimate businesses. It not only affects the brand image of a company but also causes harm to consumers, who may unknowingly purchase counterfeit products that may be harmful to their health.

Document security Document security is also a problem, with fake IDs and other documents being used for identity theft and other illegal activities. This can lead to significant financial losses and reputational damage for businesses and individuals alike.

Pharmaceuticals and healthcare Counterfeit pharmaceuticals is one of the most valuable segments of global commerce in illegally copied items. Millions of individuals worldwide suffer damage and even death as a result of fake medications. It causes significant harm to the brands of major pharmaceutical makers. Recently, there have been several reports of fraudulent COVID vaccines being given to various nations' populations.

For instance, the discovery of fake Covishield (produced by the Serum Institute of India) by the World Health Organization (WHO) raised serious concerns among all relevant parties. Also, Pfizer's fake vaccination vials were found in various locations both inside and outside of the United States. This has caused concern among consumers and the government, to overcome to this governments across regions are exercising laws to probability the use of counterfeiting medicines.

Consumers and the government are both concerned about this, so to combat it, governments worldwide are enforcing rules that make the use of fake medications

more likely. The market for counterfeit pharmaceuticals has expanded as a result of rising online pharmacy usage and the emergence of a new large-scale manufacturer of fake medications.

Solution

TrustChain's ZK Smart NFC technology provides a secure and efficient solution to these problems. By combining NFC technology with the Mina Protocol blockchain, TrustChain can provide a secure and immutable ledger of data that can be easily accessed and verified. The NFC chip is embedded with a secure chip that stores the private key, making it impossible for the private key to be accessed. The NFC data is encoded during setup, and the hash data is saved in the leaf of the NFC Merkle Tree. The root hash of the Merkle Tree is saved in the smart contract.

Architecture

Smart NFC TrustChain's ZK Smart NFC technology works by encoding NFC data during setup, which is then saved in the leaf of the NFC Merkle Tree. The root hash of the Merkle Tree is saved in the smart contract, which can be easily accessed and verified. For each scan, a new hash is generated by [tagId, publicKey, scan counter], ensuring that each scan is unique and verifiable.

Step 1. Encode The first step in using TrustChain's ZK Smart NFC technology is to scan an empty NFC by the Trusted Service Manager. This can be done by clothing and fashion brands, food and beverage factories, or any other company that wants to ensure the authenticity of their products.

Metadata, including the URL and zkApp private key, is then saved on the NFC chip.

Step 2. Save hashes of NFC's on Merkle Tree The next step is to save the hashes of the NFCs on the Merkle Tree. This is done by the Trusted Service Manager and ensures that each NFC is unique and verifiable.

Step 3. Deloy Smart Contract on Mina Protocol and saved NFC root hash of the NFC's on Merkle Tree The next step is to deploy the smart contract on the Mina Protocol and save the NFC root hash of the NFCs on the Merkle Tree. This creates an immutable ledger of data that can be easily accessed and verified.

Step 4. Scan and verify The final step is to scan the NFC and verify its authenticity. This can be done using a simple smartphone app that can easily access the NFC data and compare it to the hash stored on the Merkle Tree.

Anti-Counterfeit Clothing & Fasion

TrustChain's ZK Smart NFC technology can be used to provide secure and efficient solutions for anti-counterfeiting in the clothing and fashion industry.

Smart NFCs can be embedded in clothing, shoes, and other fashion products, ensuring that each product is unique and verifiable.

Document security

TrustChain's ZK Smart NFC technology can also be used to provide secure solutions for document security. Smart NFCs can be used for identity cards, key passes for building access, and other official sign documents, ensuring that each document is unique and verifiable.

Food & Beverages

ZK Smart NFC can be utilized in the food and beverage industry to enhance food safety and quality through secure and transparent supply chain management.

- Each product in the supply chain, from the farm to the store, will have a unique NFC tag. These tags will contain information such as the origin of the product, date of harvest or production, and any relevant quality or safety information. These tags can be read by NFC-enabled devices, such as smartphones or tablets.
- Securely storing data: The data contained in the NFC tags will be stored on a secure server using blockchain technology. This ensures that the data is tamper-proof, and each transaction can be verified by all parties involved in the supply chain.
- Zero Knowledge Proof protocol: The Zero Knowledge Proof protocol will be used to ensure that the data stored on the server is only accessible to authorized parties. This ensures that sensitive information such as pricing, trade secrets, and other confidential data is kept secure.
- Transparent supply chain management: Consumers can scan the NFC tags using their smartphones to obtain information about the product, such as its origin, quality, and safety information. This provides consumers with a greater level of transparency about the products they purchase, which can increase trust in the food and beverage industry.
- Faster recall process: In the event of a product recall, the Zero Knowledge Smart NFC technology can be used to quickly and efficiently locate the affected products in the supply chain. This reduces the risk of contaminated or unsafe products being sold to consumers, which can improve food safety and public health.

In summary, the use of Zero Knowledge Smart NFC technology can improve food safety and quality in the food and beverage industry through secure and transparent supply chain management.

Transport Track and trace

Transport track and trace is a critical application that requires high levels of security and data integrity to ensure the safety and security of goods being transported. Zero Knowledge Smart NFC (Near Field Communication) technology offers a secure and reliable solution for transport track and trace.

The architecture of the system involves placing Zero Knowledge Smart NFC tags on each item being transported. These tags are equipped with an NFC chip that can securely store information about the item, such as its origin, destination, and any other relevant details. The tags are designed to be tamper-proof, ensuring that the information stored on them cannot be altered or manipulated.

As the item moves through the transport system, it is scanned at various checkpoints using an NFC-enabled device such as a smartphone or tablet. The NFC chip in the tag communicates with the device, securely transmitting the information stored on the tag. This information is then stored in a centralized database, which can be accessed by authorized parties such as transport operators, regulatory bodies, and customers.

The Zero Knowledge Smart NFC technology ensures that all data is encrypted and secured using advanced cryptographic algorithms. The data is transmitted securely over the air, preventing unauthorized access or interception. Additionally, the use of zero-knowledge proofs ensures that the data can be verified without revealing any sensitive information.

Overall, the use of Zero Knowledge Smart NFC technology offers a highly secure and efficient solution for transport track and trace. It allows transport operators to track and monitor the movement of goods in real-time, providing greater visibility and control over the transport process. This technology can help to improve efficiency, reduce costs, and ensure the safety and security of transported goods.

MinaCash/ Custom token Cash NFC

TrustChain's ZK Smart NFC technology can also be used for off-chain physical payments without transaction costs. This can be used as a payment method during events, as a gift card, or as a marketing product physical airdrop.

Use Cases: - Offchain physical payment without transaction cost - Payment method during events - Payment method as gifcard - Marketing product physical airdrop

Products: - Mina / Custom token on Smart NFC physical coin - Mina / Custom token on Smart NFC bracelet - Mina / Custom token on Smart NFC ring - Mina / Custom token on Smart NFC giftcard - Mina / Custom token on Smart NFC business card

Smart contract interface:

```
type IMinaCash = {
  updatecommittedNfcRoot(newcommittedNfcRoot: Field): Bool; // emits "NfcRootUpdated" event
  updateTrustedServiceManager(newTrustedServiceManager: PublicKey): Bool; // emits TrustedSe
  withdraw(to: PublicKey, amount: UInt64): Bool; // emits "Withdraw" event
  // events
  events: {
    NfcRootUpdated: ProvablePure<{
      oldRoot: Field;
      newRoot: Field;
    }>;
    TrustedServiceManagerRootUpdated: ProvablePure<{
      oldRoot: Field;
      newRoot: Field;
    }>;
    Withdraw: ProvablePure<{
      from: PublicKey;
      to: PublicKey;
      amount: UInt64;
    }>;
  };
};
```

Market

The global anti-counterfeit packaging market size was accounted at **USD 140.27 billion** in 2022 and it is expected to reach around **USD 472.08 billion** by 2032.

Key Market Opportunities

Growing demand from emerging markets - Emerging economies like China and India are creating new opportunities for the anti-counterfeit packaging sector. Urbanization, an increase in the number of middle-class people, and increased disposable incomes will all contribute to a rise in demand for anti-counterfeit packaging. In China and India, internet sales have considerably expanded. The world is now more susceptible to counterfeiting due to the volume of items that the same number of people carry and handle every day.

By weakening anti-counterfeit packing materials, forgers and counterfeiters have made it simpler to carry fake goods. Due to significant expansion in vital industrial industries including pharmaceuticals, apparel and clothing, food and drinks, and agriculture in emerging economies, the packaging industry has great potential to establish a foundation and grow its operations. This presents an opportunity for anti-counterfeit packaging companies to expand their operations and cater to the growing demand.

Pre-Order Pricing

- Pre-encoded **20 mm Smart NCF physical coin** Price per coin without Mina/Custom token: 10 - 99 S4.35 100 - 499 $4.22 500 - 999 $4.05 1,000 - 4,999 $3.94 5,000 - 9,999 $3.88 10,000 - 49,999 $3.86

Pre-order here

- Pre-encoded **Custom design Smart NFC Giftcard** Price per card : 100 - 199 $15.78 200 - 499 $9.32 500 - 999 $8.77 1,000 - 1,999 $8.43 2,000 - 4,999 $8.29 5,000 - 9,999 $7.12 10,000 - 19,999 $7.09 20,000 - 49,999 $7.05 Pre-order here

Standard budget $50,000

- Branding & Design $5,000
- Website $5000
- Encoding Mobile App for TrustedServiceManager $10,000
- Scan & Verify Mobile App $10,000
- Backend NFC tag management $10,000
- Backend Whitelabel API for Brands/Factory $10,000

Advanced budget $80,000

Marketing - Organize Events $10,000 - Production Mina Cash Smart NFC for Offchain Airdrop $20,000

Team

- Als Albrick - Co-Owner - EventsManager
- Irman - Co-Owner - Blockchain specialist
- Santy - Co-Owner - Buisiness development
- Dian - Co-Owner - International partnership
- Trustchain dev (anonymous) - Freelancer

References:

- Global market