truebit

Case study

quadrans | truebit

Truebit's Traceability Solution: A Case Study in Blockchain-Powered Supply Chain Transparency

How Truebit's transparent compute tackles the €8 million TRICK project's toughest challenges, delivering unmatched security, scalability, and cost-effectiveness for intricate textile and food supply chains.

Introduction

The TRICK Project (TRaceability Information management by bloCKchain) is an ambitious initiative funded by the European Union's Horizon 2020 research and innovation program. With €8 million in funding, TRICK aims to develop a blockchain-based platform that enables textile and food companies to collect and manage secure product data, promoting sustainable practices across supply chains. The Quadrans Foundation, a non-profit organization, is one of the key technology contributors, providing blockchain technology infrastructure to support TRICK's goals.

Situation

The TRICK Project involves a consortium of 32 partners from 11 countries, including manufacturers, retailers, research institutions, and technology providers such as The Quadrans Foundation.

The project seeks to address several key challenges in the textile and food industries:

- Ensuring transparency and traceability throughout complex supply chains
- Verifying the authenticity of products and combating counterfeiting
- Facilitating compliance with environmental and ethical standards
- Making advanced traceability solutions accessible and affordable for SMEs

Quadrans' blockchain technology is designed to provide a secure, immutable record of transactions and certifications, allowing stakeholders to track products from origin to end-user. This system aims to enhance trust, reduce fraud, and streamline regulatory compliance processes.

The consortium identified specific requirements for the project. These included a standardized platform to effectively manage and authenticate supply chain data, focusing on traceability, transparency, and sustainability. The platform needed to handle various critical documents and certifications, such as environmental footprint reports, health protection assessments, and anti-counterfeiting measures. Additionally, the system had to be designed with interoperability in mind, allowing for potential future integration with different blockchain technologies already in use by some companies.

Challenge

As Quadrans began implementing their blockchain solution for the TRICK project, they encountered several significant challenges. The project required seamless communication between different blockchain systems, specifically between the private Hyperledger blockchain used for sensitive data and the public Quadrans blockchain. Ensuring secure and efficient data transfer between these environments proved complex, highlighting the need for enhanced interoperability.

Scalability emerged as another critical issue. As the volume of data and transactions grew, Quadrans faced difficulties maintaining their blockchain system's performance and efficiency. The execution of complex smart contracts, crucial for managing the diverse range of certifications and documents, strained the on-chain resources. This challenge was compounded by problems verifying supply chain data for both textile and food industries.

Cross-chain security posed another significant risk. Maintaining high levels of security while facilitating transactions between the private and public blockchains was crucial, as any vulnerability in this process could potentially compromise the integrity of the entire system. Additionally, Quadrans needed to future-proof its solution, ensuring it could integrate additional public or private blockchains.

The solution also needed to work with standard interfaces like DNS, HTTPS, and APIs to be practical for real-world applications, a capability often lacking in traditional blockchain implementations. These interconnected challenges threatened to undermine the core objectives of the TRICK project - creating an affordable, efficient, and secure platform for SMEs to manage their supply chain data and certifications.

Solution

To address the challenges faced by Quadrans in the TRICK project, Truebit Verify was integrated as a cornerstone of the solution. Truebit introduced a new transparent computation paradigm, which provides explicit certificates for data and event provenance "unchained" from any particular network. This approach, along with several innovative features, was designed to overcome the identified obstacles.

The integration process began with designing a system architecture that used both Hyperledger Fabric and Quadrans blockchains. Truebit's technology was crucial in bridging these environments, facilitating offchain computation and secure data transfer between blockchains. This allowed Quadrans to automate compliance and validate transactions across the complex supply chain.

Truebit enabled the TRICK platform to efficiently handle the processing and verification of large volumes of supply chain data, including secure document uploads and certifications, without overburdening the blockchain resources. This approach was key in creating a system that could meet the diverse needs of both the textile and food industries while maintaining performance and security.

At the heart of Truebit's solution is a cloud-capable "Hub" that orchestrates Nodes, similar to how smart contracts govern Solvers and Verifiers in traditional blockchain systems. This Hub plays a critical role in managing the multitude of interactions throughout the system. Truebit's offchain computation capability forms the foundation of their solution, executing complex smart contracts outside the main blockchain to significantly reduce the computational burden on the network.

To tackle interoperability issues, Truebit developed a sophisticated cross-chain verification system. This system acts as a secure conduit between different blockchain environments, ensuring data integrity and authenticity during transfers. The result is a seamless flow of information across the entire platform, catering to the diverse needs of both the textile and food supply chains.

Truebit's verification protocol efficiently manages the intricate verification processes required in these industries. By optimizing the handling of supply chain data and certifications, the system maintains high performance without compromising security. This approach allows the TRICK platform to process and verify large volumes of data across various stages of the supply chain.

Looking towards future needs, Truebit's solution incorporates a flexible, adaptable architecture. This design allows for the integration of additional blockchain networks as the TRICK ecosystem expands, ensuring the platform remains at the forefront of blockchain technology. Finally, Truebit's solution optimizes the use of blockchain resources, reducing operational costs and creating efficiencies, making the system accessible and affordable for SMEs and aligning with the project's goal of democratizing advanced traceability solutions.

Results and benefits

The integration of Truebit's technology into the Quadrans blockchain for the TRICK project has yielded several significant outcomes:

- Enhanced Interoperability: Seamless communication between private Hyperledger and public Quadrans blockchains
- Improved Scalability: Efficient handling of complex smart contracts without overwhelming on-chain resources
- Efficient Data Management: Ability to process and verify large volumes of supply chain data
- Integration with External Systems: Successful integration with systems like the Italian Customs and Monopolies Agency's AIDA
- Affordability for SMEs: Progress towards creating an affordable, standardized platform
- Enhanced Security: Bolstered security and trustworthiness for cross-chain transactions
- Expanded Applicability: Potential for application in other industries with similar challenges
- Streamlined Regulatory Processes: Facilitation of smoother audits and inspections
- Improved Customs Operations: Streamlined goods transfer and customs clearance processes

The TRICK platform has demonstrated its capabilities through successful pilots in both the textile and food industries. These pilots have showcased the platform's data management capabilities and its integration with external systems, validating its potential for real-world applications.

The platform's ability to securely store and share compliance-related documents is expected to facilitate smoother audits and inspections, potentially streamlining regulatory processes for participating companies. Additionally, by providing a transparent and verifiable record of goods and their documentation, the TRICK platform is poised to streamline customs operations for goods transfer, facilitating quicker and more efficient customs clearance processes.

While significant progress has been made, the project is still in an advanced development stage with ongoing demonstrations and refinements. The full realization of benefits is expected as the platform moves towards full-scale implementation and commercial deployment.

Early results from testnet environments are highly encouraging. The integration of Truebit for offchain computation has demonstrated remarkable potential for cost savings and efficiency gains. By significantly reducing the processing load on the blockchain, Truebit's solution promises to improve resource utilization substantially. Furthermore, the Quadrans blockchain has shown notable cost advantages in hardware management and transaction costs compared to other Ethereum-compatible blockchains.

Conclusion

The partnership between Quadrans and Truebit has resulted in a robust, scalable, and secure blockchain solution that addresses the complex needs of supply chain management in the textile and food industries. By introducing the concept of transparency and leveraging explicit certificates, Truebit's solution offers a level of trust and efficiency previously unattainable with traditional blockchain approaches.

As the project continues to evolve, it holds the promise of transforming how businesses, particularly SMEs, manage and verify their supply chain data, potentially setting new standards for transparency and traceability in these sectors. Integrating standard interfaces like DNS, HTTPS, and APIs ensures that the solution is practical for real-world applications, bridging the gap between blockchain technology and mainstream business needs.

By overcoming significant technical challenges through innovative blockchain solutions, the TRICK project is paving the way for more efficient, transparent, and sustainable supply chains. As it moves towards full implementation, the platform has the potential to revolutionize not only the textile and food industries but also serve as a model for other sectors facing similar traceability challenges.