Timber Tracking

Reducing Complexity of Due Diligence by using Blockchain Technology (Position Paper)

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Abstract. Managing and verifying forest products in a value chain is often reliant on easily manipulated document or digital tracking methods – Chain of Custody Systems. We aim to create a new means of tracking timber by developing a tamper proof digital system based on Blockchain technology. Blockchain will be combined with new digital protocols for physical verification and authentication. Deliverables include online traceability system, and procedures for entering and verifying data inputs. Certification schemes and governments gain increased legitimacy from tamper-proof means to comply with timber trade requirements. Global companies gain from efficient traceability; society at large benefits from increased tax revenues, anti-corruption, and environmental benefits from sustainable forestry. We think this potential collaboration between government and industry can help simplify a variety of current due diligence processes, in this paper we focus on timber tracking.

1 Introduction

Trade in illegally harvested timber is highly lucrative and estimated to be worth between USD 51–152 billion annually. This results in the loss of crucial resources for developing countries, while damaging their economies, public trust, and institutional structures [8]. From 2006 to 2013, the import volume of illegal wood products by China, India, and Vietnam increased by over 50 percent [7]. This problem resembles the case for blood diamonds that has recently tracked by the everledger using a blockchain system that currently covers over one million registered diamonds [5].

Companies in many regions are required (and interested) to ensure the usage of commodities from that follow legal and sustainable land management practices, and have installed procurement practices to enable sustainable values. Growing regulations such as the European Timber Regulation (EUTR) requires European companies to conduct due diligence and ensure that imported timber is not illegally sourced. One such solution is to use independently certified "ecolabels" that verify legality, environmental and social sustainability of products. However, these practices rely on a paper-based analog "chain of custody" (COC)

systems to control the flow of certified materials from land to marketplace. Obvious problems with COC systems are:

- Resource intensive and low tech, and expensive process
- Lack of trust due to reliance on paper trails, which can be easily tampered which are vulnerable to artificially inflated volumes and product substitutions
- Centralized design, e.g., designated government authorities, IT solution providers and intricate manual certification of all companies along the entire supply chain

2 Blockchain Technology

Blockchain is a distributed database that is characterized by decentralization, consensus, validity, immutability, and authentication. Bitcoin, the most well-known use of Blockchain [9], is used for validation of financial transactions. Nodes validate new blocks by attempting to solve a cryptographic puzzle that can only be solved using substantial computing power. The successful node is remunerated for its efforts by receiving Bitcoin. However, new blocks can only be added if there is no double-spending of Bitcoin – i.e., volume control. Vitalik Buterin [2] understood the potential of the Blockchain technology and started Ethereum, a Blockchain initiative which aimed to develop a freely programmable Blockchain that allows all kinds of business logics put into code, called smart contracts. This ability transformed Blockchain from a protocol to support money transfer into something that creates a wide range of opportunities. Smart contracts can be embedded into the digital representation of physical assets, facilitating autonomous contract enforcement. Blockchain would then fulfill the role of a notary, ensuring that contracts are fulfilled and not tampered with. Blockchain technology has the capacity to create a true peer-to-peer economy without intermediaries. In our context, that means avoiding the need to rely on complicated paper work between individuals but establishing a decentralized mechanism that would allow any participants to find precisely the source of any timber in any product created during the supply chain. This can be achieved via a variety of the popular platforms such as Ethereum or distributed ledger technology solution designated to build intra-company networks such as Hyperledger Fabric, and R3 Corda [1,3].

We would recommend building a platform agnostic as possible to allow a potential interface to different platforms (between Hyperldeger, R3 Corda and Ethereum for instance). In previous work on financial contracts over Ethereum [4], the possibility for using a domain specific language to consider financial contracts and business processes. Building on top of such a technology allows the fabric layer of the distributed ledger technology to be changed to a different one and reduce relying on a specific technology.

Current gaps in Blockchain technology relevant for timber supply chain tracking includes:

– A digital tracking technology that is able to identify requirements on computational performance, consistency, security, and privacy
– A Blockchain to employ smart contracts' analysis with tools to support productive application development by users and guarantee safety and security of smart contracts
– A system with contract manager architecture that provides a safe execution environment on top of Blockchain technology when a trade cannot be reverted

3 Proposed Solution

We propose a single, tamper-proof system for digital tracking of timber in a supply chain that verifies the physical product. We use Blockchain technology, to generate a digital ledger of transactions for trade in forest products (or potentially other commodities) which cannot be manipulated.

In the past twenty years, there have been several public and private initiatives looking to address environmental and social issues around harvesting of natural commodities. Stakeholders have tried to solve these issues through various means, including [8], however, as indicated by the Interpol. It is estimated that illegal logging accounts for 50–90 percent of all forestry activities in key producer tropical forests, such as those of the Amazon Basin, Central Africa and Southeast Asia, and 15–30 percent of all wood traded globally. The means used today to try and to stop illegal logging includes:

– Governments, who have tried to find policy solutions
– NGOs, who have tried to implement eco-label certification schemes
– Verification bodies assisting companies in developing their own due diligence systems
– Commercial companies who try to implement their own sustainable sourcing policies

To illustrate the problem above. Consider the following COC scenario (cf. Figure 1): A company in country D wants to assess that an imported products is made of legal timber. The timber is imported to country D from a country A, which is suspected to have a large amount of illegal timber alongside with legal timber. The first level of complexity is to understand where the timber is sourced and follow an appropriate due diligence to find out that the source is legal. However, another likely scenario is that a country imports a timber based product (such as a table) from a country that itself imported that timber from another country. This further contributes to the complexity of the problem, especially in the absence of tamper proof systems (and obviously in many scenarios there may be even more countries and companies involved.) Even so, a product consists of timber from a variety of origins and complexity grows even further. This scenario becomes complex by fan-in and fan-out of trading transactions. In general, there are no-sufficient tests to the trail of document of timber tracking. The reason is the complexity of the due diligence process and the high costs

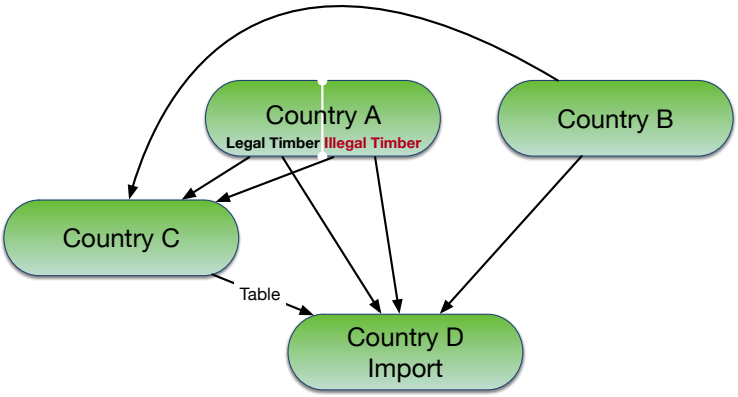

Fig. 1. Due diligence COC scenario for illegal timber

of verifying the paper trails. This problem can resemble the problem of money laundering when the origins of transaction are hard to trace.

Fortunately, Blockchain based systems can be installed to help tracking the problem in hand such as can be seen in Figure 2. Authorities supervise *legal* timber and certify its legal state in a Blockchain. A Blockchain entry (transaction) can be linked to physical evidence, e.g., its DNA profile in digital form as cryptographic hash. The importing company can now query the Blockchain for a certification of a composite product, e.g. a table, by tracing the certifications of its components.

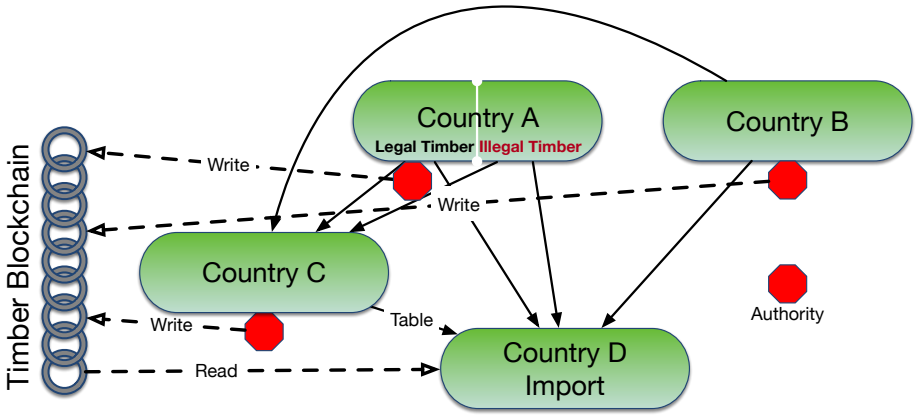

Fig. 2. Due diligence COC scenario for illegal timber using Blockchain technology

In the end, each of these stakeholders are forced to rely on one crucial point: that commercial traders are not purposefully manipulating their supply chains. This project will solve that need through use of digital, tamper-proof technologies.

We pick up this problem and our approach addresses previously mentioned issue in the following way:

- Use Blockchain technology to enable fraud protected volume control along supply chain entities — a major challenge in current supply chain management systems
- Make sourcing environmentally and socially responsible commodities more efficient, and more trustworthy
- Allow companies to source responsibly from areas normally perceived as high risk — opening the market to a wider variety of raw materials while ensuring environmental and social sustainability
- Safeguard forest areas previously thought of as non-viable forestland, currently at risk of being converted to oil palm plantations and other agricultural uses

We expect that a successful solution has to fulfill the following requirements:

- Scalable for multiple hundred parties allowing for 100k transactions per minute
- Efficient computation and verification of transactions for legality, environmental and social sustainability
- Provides a public key infrastructure for certifying transactions
- Usability of the solution on mobile devices
- Digital representation (data structure) of transaction data
- Physical evidence, e.g. DNA trace, linked to a digital representation

We expect future changes and impact:

- Commercial companies can use the system to verify information about commodities they are buying and selling.
- Government regulators can use the system to verify information needed for the implementation of relevant environmental and trade policies (such as EU Timber Regulation, U.S. Lacey Act, Australian Illegal Logging Regulation).
- Certification schemes can use this approach as an alternative to outdated chain-of-custody systems and thereby increase trustworthiness of these systems.

4 Conclusion

We find the problem of ensuring sustainability in supply chains to be a particular interesting case for the use of Blockchain technology. In this position paper, we would like to further encourage research and development of such system and we in particular are interested in collaboration on the topic and similar problems. A lot of efforts has been done on utilizing Blockchain technology for the financial sector [10,6,4] and we hope to see further applications of Blockchain technology to sustainability and society.

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