MINESPIDER

Protocol for Due Diligence Data in the Raw Material Supply Chain

v.0.40

Nathan Williams

Overview and Summary of Changes

The following whitepaper outlines Minespider's SILQ blockchain protocol for supply chain traceability.

The original SILQ protocol was built with the issue of conflict funding in mind. It operated by creating certificates representing specific masses of material at the point of extraction and following them as they passed down the supply chain. Since the release of version 0.36, Minespider has conducted pilots tracking lead batteries and tin from mine to manufacturer. In conducting these pilots we observed that there are many different use cases present in the raw materials supply chain that require a slightly different approach to address properly. For example, starting with a brand and mapping a supply chain back to the source required a workaround to function with the original protocol.

As a result we have re-thought which functions of decentralized blockchain traceability should live in the protocol and which functions should be moved to the application layer. This document builds upon version 0.36 released in December 2018, and incorporates significant design modifications to account for learnings and outcomes of live projects conducted throughout 2019.

Core principles

SILQ protocol is a blockchain for creating, transferring, and linking **digital certificates** along the raw materials value chain and allowing companies to upload their own responsibility data to these certificates, demonstrating both from where the materials originated, and under what conditions they were produced.

Although there have been some significant changes to the design of the protocol since the previous version of the white paper, the core principles remain largely the same:

- The protocol should connect downstream manufacturers to raw material producers and provide a high degree of confidence in the supply chain connection
- The protocol for responsible blockchain sourcing must be open and decentralized
- Supply chain data must be self-sovereign. Neither Minespider nor other actors on the platform should be able to access supply chain data they do not own
- The protocol should incentivize all supply chain actors to participate, adopting it as a standard
- Small companies should be able to use the protocol as easily as large ones

Changes to the protocol scope

The SILQ protocol was originally designed with the application of conflict minerals in mind. Since the original white paper a wide range of applications and use cases have emerged for the protocol across several industries. The protocol was originally designed to track material flows downstream starting from a known producer. Many use cases and projects do not start with a known producer, but rather with a brand trying to get more insight into their supply chain.

Incentives of the players

The original vision of the SILQ protocol was to provide financial incentives for companies to share sourcing data, however for the most part these incentives did not prove to be motivating for companies to join. Factors that were a stronger incentive for companies to participate were better market access, cheaper and easier compliance, and reduction of supply chain risks.

Changes to how certificates work

Originally we designed the SILQ protocol as a way of creating digital certificates that would represent shipments of metal which travelled along the supply chain along with the material itself. The protocol was designed specifically for tracking material flowing in one direction in the supply chain. It required a certifying party to estimate production volumes and grade at the mine site itself, and to apply the protocol to other industry use cases required work-arounds

In this update we make the following three changes **at the protocol level**:

1. Any Minespider account can create a certificate without the involvement of a third-party certifier.
2. Certificates do not change ownership, but instead can contain a number of links to associated accounts and other certificates.
3. Mass-balance is not enforced at the protocol level.

What this effectively means is that the conflict-mineral tracking use case is no longer handled by the protocol itself, but at the application layer. The focus of the new SILQ protocol is **encrypting and linking** the digital certificates, allowing more flexibility for the applications built on top.

Example using original SILQ Protocol

Mine	Concentrator	Transport	Smelter
100 tons at 4% purity	10 tons at 40% purity	10 tons at 40% purity	4 tons at 99% purity
4 ton certificate ----->	---------->	---------->	3.96 ton certificate

In the original SILQ protocol a certifier visits the mine and certifies them for producing 4 tons per month of calculated metal weight (100 tons at 4% purity). The Calculated Metal Weight remains the same for the certificate as it follows the metal through the concentrating, smelting and manufacturing process. We can see a few challenges with this approach:

- Accuracy is critical at every stage of the process, because it is difficult to account for variance in CMW.
- If a supply chain participant such as the transporter declines to participate, the chain is broken.
- Traceability cannot begin until all entities are known and onboarded which can be a slow process.
- Passing ownership of a certificate requires a smart contract. If the conditions are not met the contract will not execute, which can be confusing for the user if they are not blockchain-savvy.

Example using updated SILQ Protocol

Mine	Concentrator	Smelter	Manufacturer
100 tons at 4% purity	10 tons at 40% purity	4 tons at 100% purity	8 tons at 50% purity
100 ton ore certificate linked to concentrator	10 ton concentrate certificate linked to smelter	4 ton ingot certificate linked to Manufacturer	8 ton component certificate linked to their customer

In the updated protocol, certificates do not change ownership. Each supply chain participant creates their own certificate as they send a shipment to the next step of the chain. Transformations in the product, changes in grade, and quality of the data entered is all managed in the **application** layer

- The protocol is less sensitive to variance in grade measurements because each stage can make measurements of their own inputs and outputs.
- If a supply chain participant declines to participate, this can be recorded in the preceding and subsequent certificates that material passed through a non-participating member.
- Traceability can begin at any known point in the supply chain, even without having the participation of all supply chain members.
- Because certificates do not change ownership, a smart contract is not needed for the system to work. This allows additional flexibility in designing the user experience for people working with the tracked materials.