SLAFKA

A permissioned blockchain prototype for nuclear safeguards

SLAFKA is a prototype distributed ledger technology (DLT) platform built in collaboration between the Finnish Radiation and Nuclear Safety Authority STUK, the Stimson Center and the University of New South Wales. It is based on STUK's current nuclear accounting database and allows nuclear facilities to record nuclear material assets on a blockchain. SLAFKA is built using Hyperledger Fabric, one of the most popular and best supported permissioned blockchain frameworks, enabling limited membership and control over user permissions and data access.

Permissioning and Confidentiality

SLAFKA maintains strict access control rules to comply with confidentiality of nuclear accounting information. Facilities can only see nuclear material possessed by them or being sent to them.
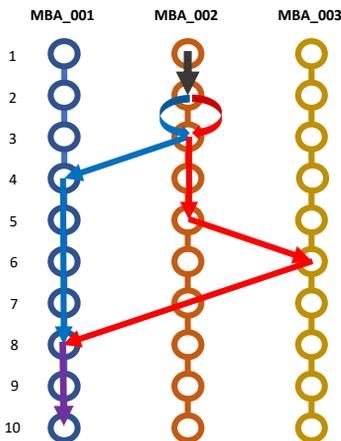

Figure 1. Scenario showing transfer and rebatching between three MBAs. A batch is split into two at MBA_002, transferred into MBA_001 and MBA_003 and eventually recombined at MBA_001.

Safeguards information management

SLAFKA covers a broad swathe of safeguards functionality:
- Domestic shipments and receipts of nuclear material
- Foreign shipments and receipts
- Nuclear production and loss
- Rebatches and encapsulation at a deep geological repository
- Inspection and verification by regulator

Figure 2. SLAFKA User Interface

User friendly

SLAFKA possesses an intuitive, cloud-based user interface that can be accessed by logging in from any web browser. SLAFKA doesn't require any technical DLT/Blockchain knowledge to use.

Why DLT for safeguards?

Immutability

Transactions are immutable and can only be appended, not edited. Immutability is particularly important due to the building of the final disposal facility for spent nuclear fuel in Finland, requiring better integrity for nuclear material records.
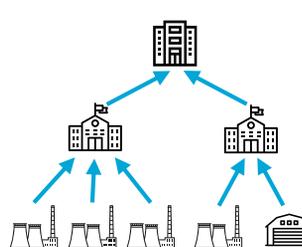
Transit Matching

DLT is a possible solution to the 'transit matching' problem of linking up reporting shipments of materials by one facility to the reported receipts of materials by another.

"With blockchain technology, register data could be available to the authorities correct and unchanged. This would also improve the efficiency of nuclear material supervision processes." – Elina Martikka, Head of International Cooperation (STUK)*

Participation

Instead of operators reporting directly to a regulator(s), they digitally transact materials between one another and the regulator(s) sees (and verifies) this.
Holders should feel a greater sense of involvement and participation.

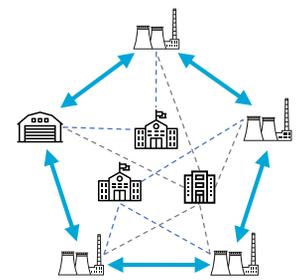Present day safeguards reporting | SLAFKA safeguards reporting

Figure 3. SLAFKA allows facilities to transact assets between one another whilst being observed by the appropriate regulators.

*STUK. (2020) *Blockchain offers new opportunities for safeguards of nuclear materials* [Press release]